Oracle9*i*

Application Developer's Guide - Advanced Queuing

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Oracle9*i* Application Developer's Guide - Advanced Queuing, Release 2 (9.2)

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Preface

This reference describes features of application development and integration using Oracle Advanced Queuing. This information applies to versions of the Oracle database server that run on all platforms, unless otherwise specified.

This preface contains these topics:

Audience

Oracle9i Application Developer's Guide - *Advanced Queuing* is intended for programmers who develop applications that use Advanced Queuing.

Organization

This document contains:

Chapter 1, "Introduction to Oracle Advanced Queuing"

This chapter describes the requirements for optimal messaging systems.

Chapter 2, "Basic Components"

This chapter describes features of Advanced Queuing, including general, enqueue, and dequeue features.

Chapter 3, "AQ Programmatic Environments"

This chapter describes the elements you need to work with and issues to consider in preparing your AQ application environment.

Chapter 4, "Managing AQ"

This chapter discusses issues related to managing Advanced Queuing, such as migrating queue tables (import-export), security, Oracle Enterprise Manager support, protocols, sample DBA actions to prepare for working with Advanced Queuing, and current restrictions.

Chapter 5, "Performance and Scalability"

This chapter discusses performance and scalability issues.

Chapter 6, "Frequently Asked Questions"

This chapter answers frequently asked questions.

Chapter 7, "Modeling and Design"

This chapter covers the fundamentals of Advanced Queueing modeling and design.

Chapter 8, "A Sample Application Using AQ"

This chapter considers the features of Advanced Queuing in the context of a sample application.

Chapter 9, "Administrative Interface"

This chapter describes the administrative interface to Advanced Queuing.

Chapter 10, "Administrative Interface: Views"

This chapter depicts views in the administrative interface using use cases and state diagrams.

Chapter 11, "Operational Interface: Basic Operations"

This chapter describes the operational interface to Advanced Queuing in terms of use cases.

Chapter 12, "Creating Applications Using JMS"

This chapter discusses the features of the Oracle JMS interface to Advanced Queuing in the context of a sample application.

Chapter 13, "JMS Administrative Interface: Basic Operations"

This chapter depicts the administrative interface to Advanced Queuing using use cases.

Chapter 14, "JMS Operational Interface: Basic Operations (Point-to-Point)"

This chapter describes point-to-point operations.

Chapter 15, "JMS Operational Interface: Basic Operations (Publish-Subscribe)"

This chapter describes publish-subscribe operations.

Chapter 16, "JMS Operational Interface: Basic Operations (Shared Interfaces)"

This chapter describes shared interface operations.

Chapter 17, "Internet Access to Advanced Queuing"

This chapter describes how to perform AQ operations over the Internet by using Simple Object Access Protocol (SOAP) and Internet Data Access Presentation (IDAP), and transmitting messages over the Internet using transport protocols such as HTTP or SMTP.

Chapter 18, "Messaging Gateway"

This chapter describes how AQ-based applications can communicate with non-Oracle messaging systems using Messaging Gateway.

Appendix A, "Oracle Advanced Queuing by Example"

This appendix provides examples of operations using different programmatic environments.

Appendix B, "Oracle JMS Interfaces, Classes, and Exceptions"

This appendix provides a list of Oracle JMS interfaces, classes, and exceptions.

Appendix C, "Scripts for Implementing BooksOnLine"

This appendix contains scripts used in the BooksOnLine example.

Appendix D, "JMS and AQ XML Servlet Error Messages"

This appendix lists error messages.

Appendix E, "Unified Modeling Language Diagrams"

This appendix provides a brief explanation of use case diagrams and UML notation.

Related Documentation

For more information, see these Oracle resources:

- *Oracle9i Application Developer's Guide* - *Fundamentals*
- *PL/SQL User's Guide and Reference*
- *Oracle9i Supplied Java Packages Reference*
- *Oracle9i Supplied PL/SQL Packages and Types Reference*

Many books in the documentation set use the sample schemas of the seed database, which is installed by default when you install Oracle. Refer to *Oracle9i Sample Schemas* for information on how these schemas were created and how you can use them yourself.

In North America, printed documentation is available for sale in the Oracle Store at

`http://oraclestore.oracle.com/`

Customers in Europe, the Middle East, and Africa (EMEA) can purchase documentation from

`http://www.oraclebookshop.com/`

Other customers can contact their Oracle representative to purchase printed documentation.

To download free release notes, installation documentation, white papers, or other collateral, please visit the Oracle Technology Network (OTN). You must register online before using OTN; registration is free and can be done at

```
http://otn.oracle.com/admin/account/membership.html
```

If you already have a username and password for OTN, then you can go directly to the documentation section of the OTN Web site at

```
http://otn.oracle.com/docs/index.htm
```

To access the database documentation search engine directly, please visit

```
http://tahiti.oracle.com
```

Conventions

This section describes the conventions used in the text and code examples of this documentation set. It describes:

- Conventions in Text
- Conventions in Code Examples
- Conventions for Windows Operating Systems

Conventions in Text

We use various conventions in text to help you more quickly identify special terms. The following table describes those conventions and provides examples of their use.

Convention	Meaning	Example
Bold	Bold typeface indicates terms that are defined in the text or terms that appear in a glossary, or both.	When you specify this clause, you create an **index-organized table**.
Italics	Italic typeface indicates book titles or emphasis.	*Oracle9i Database Concepts* Ensure that the recovery catalog and target database do *not* reside on the same disk.

Convention	Meaning	Example
UPPERCASE monospace (fixed-width) font	Uppercase monospace typeface indicates elements supplied by the system. Such elements include parameters, privileges, datatypes, RMAN keywords, SQL keywords, SQL*Plus or utility commands, packages and methods, as well as system-supplied column names, database objects and structures, usernames, and roles.	You can specify this clause only for a `NUMBER` column. You can back up the database by using the `BACKUP` command. Query the `TABLE_NAME` column in the `USER_TABLES` data dictionary view. Use the `DBMS_STATS.GENERATE_STATS` procedure.
lowercase monospace (fixed-width) font	Lowercase monospace typeface indicates executables, filenames, directory names, and sample user-supplied elements. Such elements include computer and database names, net service names, and connect identifiers, as well as user-supplied database objects and structures, column names, packages and classes, usernames and roles, program units, and parameter values. **Note:** Some programmatic elements use a mixture of UPPERCASE and lowercase. Enter these elements as shown.	Enter `sqlplus` to open SQL*Plus. The password is specified in the `orapwd` file. Back up the datafiles and control files in the `/disk1/oracle/dbs` directory. The `department_id`, `department_name`, and `location_id` columns are in the `hr.departments` table. Set the `QUERY_REWRITE_ENABLED` initialization parameter to `true.` Connect as `oe` user. The `JRepUtil` class implements these methods.
lowercase italic monospace (fixed-width) font	Lowercase italic monospace font represents placeholders or variables.	You can specify the *parallel_clause*. Run U*old_release*.SQL where *old_release* refers to the release you installed prior to upgrading.

Conventions in Code Examples

Code examples illustrate SQL, PL/SQL, SQL*Plus, or other command-line statements. They are displayed in a monospace (fixed-width) font and separated from normal text as shown in this example:

```
SELECT username FROM dba_users WHERE username = 'MIGRATE';
```

The following table describes typographic conventions used in code examples and provides examples of their use.

<table>
<tr><th>Convention</th><th>Meaning</th><th>Example</th></tr>
<tr><td>[ ]</td><td>Brackets enclose one or more optional items. Do not enter the brackets.</td><td><code>DECIMAL (digits [, precision])</code></td></tr>
<tr><td>{ }</td><td>Braces enclose two or more items, one of which is required. Do not enter the braces.</td><td><code>{ENABLE | DISABLE}</code></td></tr>
<tr><td>|</td><td>A vertical bar represents a choice of two or more options within brackets or braces. Enter one of the options. Do not enter the vertical bar.</td><td><code>{ENABLE | DISABLE}</code>
<code>[COMPRESS | NOCOMPRESS]</code></td></tr>
<tr><td>...</td><td>Horizontal ellipsis points indicate either:
■ That we have omitted parts of the code that are not directly related to the example
■ That you can repeat a portion of the code</td><td><code>CREATE TABLE ... AS subquery;</code>

<code>SELECT col1, col2, ... , coln FROM employees;</code></td></tr>
<tr><td>.
.
.</td><td>Vertical ellipsis points indicate that we have omitted several lines of code not directly related to the example.</td><td><code>SQL> SELECT NAME FROM V$DATAFILE;</code>
<code>NAME</code>
<code>------------------------------------</code>
<code>/fsl/dbs/tbs_01.dbf</code>
<code>/fs1/dbs/tbs_02.dbf</code>
<code>.</code>
<code>.</code>
<code>.</code>
<code>/fsl/dbs/tbs_09.dbf</code>
<code>9 rows selected.</code></td></tr>
<tr><td>Other notation</td><td>You must enter symbols other than brackets, braces, vertical bars, and ellipsis points as shown.</td><td><code>acctbal NUMBER(11,2);</code>
<code>acct   CONSTANT NUMBER(4) := 3;</code></td></tr>
<tr><td>Italics</td><td>Italicized text indicates placeholders or variables for which you must supply particular values.</td><td><code>CONNECT SYSTEM/system_password</code>
<code>DB_NAME = database_name</code></td></tr>
<tr><td>UPPERCASE</td><td>Uppercase typeface indicates elements supplied by the system. We show these terms in uppercase in order to distinguish them from terms you define. Unless terms appear in brackets, enter them in the order and with the spelling shown. However, because these terms are not case sensitive, you can enter them in lowercase.</td><td><code>SELECT last_name, employee_id FROM employees;</code>
<code>SELECT * FROM USER_TABLES;</code>
<code>DROP TABLE hr.employees;</code></td></tr>
</table>

Convention	Meaning	Example

`lowercase`	Lowercase typeface indicates programmatic elements that you supply. For example, lowercase indicates names of tables, columns, or files.
	Note: Some programmatic elements use a mixture of UPPERCASE and lowercase. Enter these elements as shown.
		`SELECT last_name, employee_id FROM employees;`
		`sqlplus hr/hr`
		`CREATE USER mjones IDENTIFIED BY ty3MU9;`

Conventions for Windows Operating Systems

The following table describes conventions for Windows operating systems and provides examples of their use.

Convention	Meaning	Example
Choose Start >	How to start a program.	To start the Database Configuration Assistant, choose Start > Programs > Oracle - *HOME_NAME* > Configuration and Migration Tools > Database Configuration Assistant.
File and directory names	File and directory names are not case sensitive. The following special characters are not allowed: left angle bracket (<), right angle bracket (>), colon (:), double quotation marks ("), slash (/), pipe (|), and dash (-). The special character backslash (\) is treated as an element separator, even when it appears in quotes. If the file name begins with \\, then Windows assumes it uses the Universal Naming Convention.	`c:\winnt"\"system32 is the same as` `C:\WINNT\SYSTEM32`
`C:\>`	Represents the Windows command prompt of the current hard disk drive. The escape character in a command prompt is the caret (^). Your prompt reflects the subdirectory in which you are working. Referred to as the *command prompt* in this manual.	`C:\oracle\oradata>`

Convention	Meaning	Example
Special characters	The backslash (\) special character is sometimes required as an escape character for the double quotation mark (") special character at the Windows command prompt. Parentheses and the single quotation mark (’) do not require an escape character. Refer to your Windows operating system documentation for more information on escape and special characters.	`C:\>exp scott/tiger TABLES=emp QUERY=\"WHERE job='SALESMAN' and sal<1600\"` `C:\>imp SYSTEM/`*`password`*` FROMUSER=scott TABLES=(emp, dept)`
HOME_NAME	Represents the Oracle home name. The home name can be up to 16 alphanumeric characters. The only special character allowed in the home name is the underscore.	`C:\> net start Oracle`*`HOME_NAME`*`TNSListener`

Convention	Meaning	Example
ORACLE_HOME and *ORACLE_ BASE*	In releases prior to Oracle8*i* release 8.1.3, when you installed Oracle components, all subdirectories were located under a top level *ORACLE_HOME* directory that by default used one of the following names: ■ C:\orant for Windows NT ■ C:\orawin98 for Windows 98 This release complies with Optimal Flexible Architecture (OFA) guidelines. All subdirectories are not under a top level *ORACLE_HOME* directory. There is a top level directory called *ORACLE_BASE* that by default is C:\oracle. If you install the latest Oracle release on a computer with no other Oracle software installed, then the default setting for the first Oracle home directory is C:\oracle\ora*nn*, where *nn* is the latest release number. The Oracle home directory is located directly under *ORACLE_BASE*. All directory path examples in this guide follow OFA conventions. Refer to *Oracle9i Database Getting Started for Windows* for additional information about OFA compliances and for information about installing Oracle products in non-OFA compliant directories.	Go to the *ORACLE_BASE**ORACLE_ HOME*\rdbms\admin directory.

Documentation Accessibility

Our goal is to make Oracle products, services, and supporting documentation accessible, with good usability, to the disabled community. To that end, our documentation includes features that make information available to users of assistive technology. This documentation is available in HTML format, and contains markup to facilitate access by the disabled community. Standards will continue to evolve over time, and Oracle Corporation is actively engaged with other market-leading technology vendors to address technical obstacles so that our documentation can be accessible to all of our customers. For additional information, visit the Oracle Accessibility Program Web site at http://www.oracle.com/accessibility/

Accessibility of Code Examples in Documentation JAWS, a Windows screen reader, may not always correctly read the code examples in this document. The conventions for writing code require that closing braces should appear on an otherwise empty line; however, JAWS may not always read a line of text that consists solely of a bracket or brace.

What's New in Advanced Queuing?

This section describes the new Advanced Queuing features of Oracle9*i* and previous releases.

The following sections describe the new features in Oracle Advanced Queuing:

- Oracle9i Release 2 (9.2.0) New Features
- Oracle9i (9.0.1) New Features in Advanced Queuing
- Oracle8i New Features in Advanced Queuing

Oracle9*i* Release 2 (9.2.0) New Features

- **Oracle Messaging Gateway**

  The interaction between different messaging systems is a common integration requirement. Messaging Gateway allows Advanced Queuing to propagate messages to and from non-Oracle messaging systems. It allows secure, transactional, and guaranteed one-time-only delivery of messages between Oracle Advanced Queuing and IBM MQSeries v5.1 and v5.2. See Chapter 18, "Messaging Gateway" for more information.

- **Standard JMS Support**

  Oracle's JMS implementation conforms to Sun Microsystems' JMS 1.0.2b standard. See "J2EE Compliance" on page 12-3.

- **XMLType Payload Support**

  You no longer need to embed an XMLType attribute in an Oracle object type. You can directly use an XMLType message as the message payload.

Oracle9*i* (9.0.1) New Features in Advanced Queuing

Oracle9*i* introduces the following new Advanced Queuing features to improve e-business integration and use standard Internet transport protocols:

- **Internet Integration**

  To perform queuing operations over the Internet, Advanced Queuing takes advantage of the Internet Data Access Presentation (IDAP), which defines message structure using XML. Using IDAP, AQ operations such as enqueue, dequeue, notification, and propagation can be executed using standard Internet transport protocols—HTTP(S) and SMTP. Third-party clients, including third-party messaging vendors, can also interoperate with AQ over the Internet using Messaging Gateway.

  IDAP messages can be requests, responses, or an error response. An IDAP document sent from an AQ client contains an attribute for designating the remote operation; that is, enqueue, dequeue, or register accompanied by operational data. The AQ implementation of IDAP can also be used to execute batched enqueue and dequeue of messages.

  The HTTP and SMTP support in AQ is implemented by using the AQ servlet which is bundled with the Oracle database server. A client invokes the servlet through an HTTP post request that is sent to the Web server. The Web server invokes the servlet mentioned in the post method if one is not already invoked.

The servlet parses the content of the IDAP document and uses the AQ Java API to perform the designated operation. On completion of the call, the servlet formats either a response or an error response as indicated by IDAP and sends it back to the client.

IDAP is transport independent and therefore can work with other transport protocols transparently. Oracle9*i* supports HTTP and SMTP; other proprietary protocols can also be supported using the callout mechanism through transformations.

- **Advanced Queuing Security over the Internet**

  AQ functionality allows only authorized Internet users to perform AQ operations on AQ queues. An Internet user connects to a Web server, which in turn connects to the database using an application server. The Internet user doing the operation is typically not the database user connected to the database. Also, the AQ queues may not reside in the same schema as the connected database user. Advanced Queuing uses proxy authentication so that only authorized Internet users can perform AQ operations on AQ queues.

- **LDAP Integration**

  OID Integration: To leverage LDAP as the single point for managing generic information, Advanced Queuing is integrated with the Oracle Internet Directory (OID) server. This addresses the following requirements:

  - Global topics (queues): AQ queue information can be stored in an OID server. OID provides a single point of contact to locate the required topic or queue. Business applications (users) looking for specific information need not know in which database the queue is located. Using the industry standard Java Messaging Service (JMS) API, users can directly connect to the queue without explicitly specifying the database or the location of the topic or queue.

  - Global events: OID can be used as the repository for event registration. Clients can register for database events even when the database is down. This allows clients to register for events such as “Database Open,” which would not have been possible earlier. Clients can register for events in multiple databases in a single request.

  XML Integration: XML has emerged as a standard for e-business data representations. The XMLType datatype has been added to the Oracle server to support operations on XML data. AQ not only supports XMLType data type payloads, but also allows definitions of subscriptions based on the contents of an XML message. This is powerful functionality for online market places where multiple vendors can define their subscriptions based on the contents of the orders.

- **Transformation Infrastructure**

  Applications are designed independent of each other. So, the messages they understand are different from each other. To integrate these applications, messages have to be transformed. There are various existing solutions to handle these transformations. AQ provides a transformation infrastructure that can be used to plug in transformation functionality from Oracle Application Interconnect or other third-party solutions such as Mercator without losing AQ functionality. Transformations can be specified as PL/SQL call back functions, which are applied at enqueue, dequeue, or propagation of messages. These PL/SQL callback functions can call third-party functions implemented in C, Java, or PL/SQL. XSLT transformations can also be specified for XML messages.

- **AQ Management**

  You can use new and enhanced Oracle Enterprise Manager to manage Advanced Queuing, as follows:

  - Improved UI task flow and administration of queues, including a topology display at the database level and at the queue level, error and propagation schedules for all the queues in the database, and relevant initialization parameters (init.ora)
  - Ability to view the message queue

  Oracle diagnostics and tuning pack supports alerts and monitoring of AQ queues. Alerts can be sent when the number of messages for a particular subscriber exceeds a threshold. Alerts can be sent when there is an error in propagation. In addition, queues can be monitored for the number of messages in ready state or the number of messages per subscriber.

- **Additional Enhancements**

  PL/SQL notifications and e-mail notifications: Oracle9*i* allows notifications on the queues to be PL/SQL functions. Using this functionality, users can register PL/SQL functions that will be called when a message of interest is enqueued. Using e-mail notification functionality, an e-mail address can be registered to provide notifications. E-mail will be sent if the message of interest arrives in the queue. Presentation of the e-mail message can also be specified while registering for e-mail notification. Users can also specify an HTTP URL to which notifications can be sent.

Dequeue enhancements: Using the dequeue with a condition functionality, subscribers can select messages that satisfy a specified condition from the messages meant for them.

Overall performance improvements: AQ exhibits overall performance improvements as a result of code optimization and other changes.

Propagation enhancements: The maximum number of job queue processes has been increased from 36 to 1000 in Oracle9*i*. With Internet propagation, you can set up propagation between queues over HTTP. Overall performance improvements have been made in propagation due to design changes in the propagation algorithm.

- **JMS Enhancements**

  All the new Oracle9*i* features are supported through JMS, as well as the following:

  - Connection pooling: Using this feature, a pool of connection can be established with the Oracle database server. Later, at the time of establishing a JMS session, a connection from the pool can be picked up.
  - Global topics: This is the result of the integration with Oracle Internet Directory. AQ Queue information can be stored and looked up from OID.
  - Topic browsing: Allows durable subscribers to browse through the messages in a publish-subscribe (topic) destination, and optionally allows these subscribers to purge the browsed messages (so that they are no longer retained by AQ for that subscriber).
  - Exception listener support: This allows a client to be asynchronously notified of a problem. Some connections only consume messages, so they have no other way to learn that their connection has failed.

Oracle8*i* New Features in Advanced Queuing

The Oracle8*i* release included the following Advanced Queuing features:

- **Queue-level access control**
- **Nonpersistent queues**
- **Support for Oracle Parallel Server**
- **Rule-based subscribers for publish-subscribe**
- **Asynchronous notification**

- **Sender identification**
- **Listen capability (wait on multiple queues)**
- **Propagation of messages with LOBs**
- **Enhanced propagation scheduling**
- **Dequeuing message headers only**
- **Support for statistics views**
- **Java API (native AQ)**
- **Java Messaging Service (JMS) API**
- **Separate storage of history management information**

1

Introduction to Oracle Advanced Queuing

In this chapter, Oracle Advanced Queuing (AQ) and the requirements for complex information handling in an integrated environment are discussed under the following topics:

What Is Advanced Queuing?

When Web-based business applications communicate with each other, producer applications enqueue messages and consumer applications dequeue messages. Advanced Queuing provides database-integrated message queuing functionality. Advanced Queuing leverages the functions of the Oracle database so that messages can be stored persistently, propagated between queues on different machines and databases, and transmitted using Oracle Net Services, HTTP(S), and SMTP.

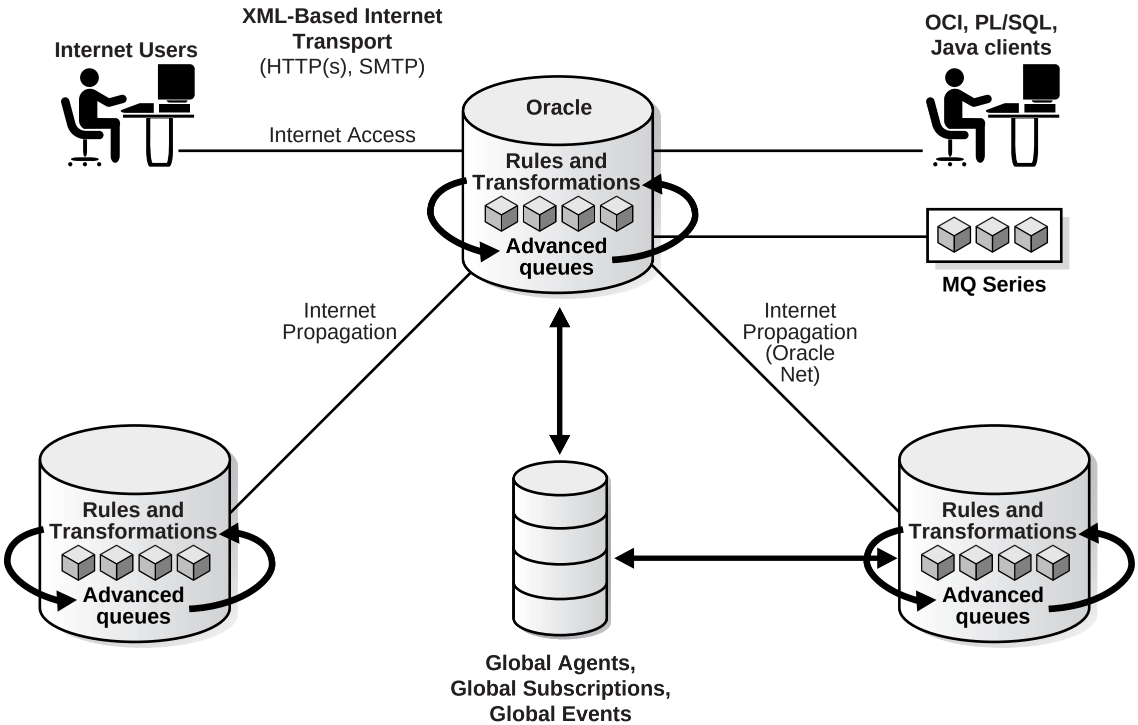
Since Oracle Advanced Queuing is implemented in database tables, all the operational benefits of high availability, scalability, and reliability are applicable to queue data. Standard database features such as recovery, restart, and security are supported in Advanced Queuing, and queue tables can be imported and exported. Refer to Chapter 4, "Managing AQ" for more information. You can also use database development and management tools such as Oracle Enterprise Manager to monitor queues. Refer to "Oracle Enterprise Manager Support" on page 4-8.

Advanced Queuing in Integrated Application Environments

Advanced Queuing provides the message management functionality and asynchronous communication needed for application integration. In an integrated environment, messages travel between the Oracle database server and the applications and users, as shown in Figure 1–1. Using Oracle Net Services, messages are exchanged between a client and the Oracle database server or between two Oracle databases. Oracle Net Services also propagates messages from one Oracle queue to another. Or, as shown in Figure 1–1, you can perform Advanced Queuing operations over the Internet using transport protocols such as HTTP, HTTPS, or SMTP. In this case, the client, a user or Internet application, produces structured XML messages. During propagation over the Internet, Oracle servers communicate using structured XML also. Refer to Chapter 17, "Internet Access to Advanced Queuing" for more information on Internet integration with Advanced Queuing.

Application integration also involves the integration of heterogeneous messaging systems. AQ seamlessly integrates with existing non-Oracle messaging systems like IBM MQSeries through Messaging Gateway, thus allowing existing MQSeries-based applications to be integrated into an Oracle AQ environment. Refer to Chapter 18, "Messaging Gateway" for more information on AQ integration with non-Oracle messaging systems.

Figure 1–1 Integrated Application Environment Using Advanced Queuing



Interfaces to Advanced Queuing

You can access Advanced Queuing functionality through the following interfaces:

- PL/SQL using `DBMS_AQ`, `DBMS_AQADM`, and `DBMS_AQELM`. Refer to the *Oracle9i Supplied PL/SQL Packages and Types Reference.*
- Visual Basic using Oracle Objects for OLE. Refer to the Online Help for Oracle Objects for OLE.
- Java using the `oracle.AQ` Java package. Refer to the *Oracle9i Supplied Java Packages Reference.*
- Java Message Service (JMS) using the `oracle.jms` Java package. Refer to the *Oracle9i Supplied Java Packages Reference.*
- Internet access using HTTP, HTTPS, and SMTP

Queuing System Requirements

Advanced Queuing meets queuing system requirements for performance, scalability, and persistence. Refer to Chapter 5, "Performance and Scalability" for more information.

Performance

Requests for service must be decoupled from supply of services to increase efficiency and provide the infrastructure for complex scheduling. Advanced Queuing exhibits high performance characteristics as measured by the following metrics:

- Number of messages enqueued / dequeued per second
- Time to evaluate a complex query on a message warehouse
- Time to recover / restart the messaging process after a failure

Scalability

Queuing systems must be scalable. Advanced Queuing exhibits high performance as the number of programs using the application increases, as the number of messages increases, and as the size of the message warehouse increases.

Persistence for Security

Messages that constitute requests for service must be stored persistently, and processed exactly once, for deferred execution to work correctly in the presence of network, machine, and application failures. Advanced Queuing is able to meet requirements in the following situations:

- Applications that do not have the resources to handle multiple unprocessed messages arriving simultaneously from external clients or from programs internal to the application.
- Communication links between databases that are not available all the time or are reserved for other purposes. If the system falls short in its capacity to deal with these messages immediately, the application must be able to store the messages until they can be processed.
- Eternal clients or internal programs that are not ready to receive messages that have been processed.

Persistence for Scheduling

Queuing systems need message persistence so they can deal with priorities: messages arriving later may be of higher priority than messages arriving earlier; messages arriving earlier may have to wait for messages arriving later before actions are executed; the same message may have to be accessed by different processes; and so on. Priorities also change. Messages in a specific queue can become more important, and so need to be processed with less delay or interference from messages in other queues. Similarly, messages sent to some destinations can have a higher priority than others.

Persistence for Accessing and Analyzing Metadata

Message persistence is needed to preserve message metadata, which can be as important as the payload data. For example, the time that a message is received or dispatched can be a crucial for business and legal reasons. With the persistence features of Advanced Queuing, you can analyze periods of greatest demand or evaluate the lag between receiving and completing an order.

General Features of Advanced Queuing

The following general features are discussed:

- Point-to-Point and Publish-Subscribe Messaging
- Oracle Internet Directory
- Oracle Enterprise Manager Integration
- Message Format Transformation
- SQL Access
- Support for Statistics Views
- Structured Payloads
- Retention and Message History
- Tracking and Event Journals
- Queue-Level Access Control
- Nonpersistent Queues
- Support for Oracle9i Real Application Clusters
- XMLType Payloads

- Internet Integration and Internet Data Access Presentation

Refer to Chapter 8, "A Sample Application Using AQ" for a hypothetical scenario in which the messaging system for a hypothetical online bookseller, BooksOnLine, is described. Many features discussed here are exemplified in the BooksOnLine example.

Point-to-Point and Publish-Subscribe Messaging

A combination of features allows publish-subscribe messaging between applications. These features include rule-based subscribers, message propagation, the listen feature, and notification capabilities.

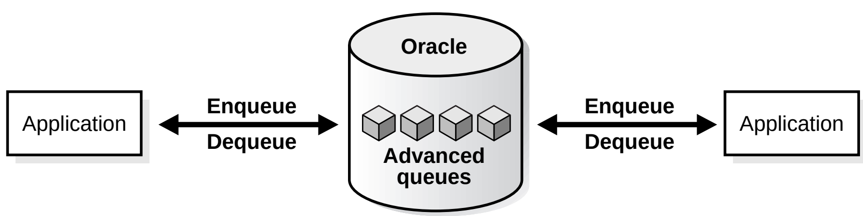
Advanced Queuing sends and receives messages in the following ways:

- Point-to-Point
- Publish-Subscribe

Point-to-Point

A point-to-point message is aimed at a specific target. *S*enders and receivers decide on a common queue in which to exchange messages. Each message is consumed by only one receiver. Figure 1–2 shows that each application has its own message queue, known as a single-consumer queue**.**

Figure 1–2 Point-to-Point Messaging



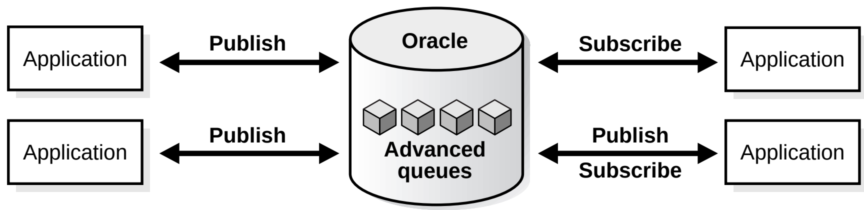
Publish-Subscribe

A publish-subscribe message can be consumed by multiple receivers, as shown in Figure 1–3. Publish-subscribe messaging has a wide dissemination mode—broadcast—and a more narrowly aimed mode—multicast, also called point-to-multipoint.

Broadcasting is the equivalent of a radio station not knowing exactly who the audience is for a given program. The dequeuers are **subscribers** to **multiconsumer**

queues In contrast, multicast is the same as a magazine publisher who knows who the subscribers are. Multicast is also referred to as point-to-multipoint because a single publisher sends messages to multiple receivers, called **recipients,** who may or may not be subscribers to the queues that serve as exchange mechanisms.

Figure 1–3 Publish-Subscribe Mode



Oracle Internet Directory

Oracle Internet Directory is a native LDAPv3 directory service built on the Oracle database that centralizes a wide variety of information, including e-mail addresses, telephone numbers, passwords, security certificates, and configuration data for many types of networked devices. You can look up enterprise-wide queuing information—queues, subscriptions, and events—from one location, the Oracle Internet Directory. Refer to the *Oracle Internet Directory Administrator’s Guide* for more information.

Oracle Enterprise Manager Integration

You can use Enterprise Manager to do the following:

- Create and manage queues, queue tables, propagation schedules, and transformations
- Monitor your AQ environment using the AQ topology at the databse and queue levels, and by viewing queue errors and queue and session statistics. Refer to "Oracle Enterprise Manager Support" on page 4-8.

Message Format Transformation

The message format transformation feature supports applications that use data in different formats. A transformation defines a mapping from one Oracle data type to another. The transformation is represented by a SQL function that takes the source data type as input and returns an object of the target data type.

A transformation can be specified as follows:

- During enqueue, to transform the message to the correct type before inserting it into the queue.

  You can convert a message to the payload type of the queue at enqueue time. Thus, the type of the message to be enqueued need not match the payload type of the queue.

- During dequeue, to receive the message in the desired format

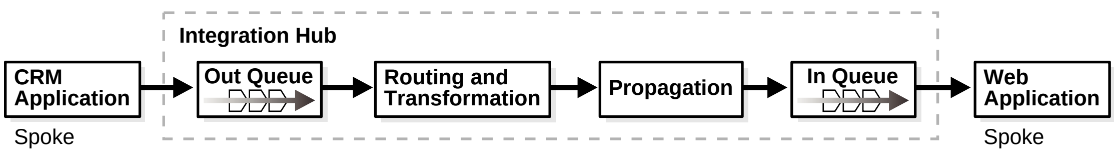
  A message can be transformed to the desired format before returning it to the dequeuer.

- By a remote subscriber, who can choose to receive a message in a format different from the format of the source queue

  Before propagating the message to the remote subscriber, the message is transformed according to the transformation that the remote subscriber specified when subscribing to the queue.

As Figure 1–4 shows, queuing, routing, and transformation are essential building blocks to an integrated application architecture. The figure shows how data from the Out queue of a CRM application is routed and transformed in the integration hub and then propagated to the In queue of the Web application. The transformation engine maps the message from the format of the Out queue to the format of the In queue.

Figure 1–4 Transformations in Application Integration



Refer to "Message Format Transformation" on page 8-6 for more information.

SQL Access

Messages are placed in normal rows in a database table, and so can be queried using standard SQL. This means that you can use SQL to access the message properties, the message history, and the payload. With SQL access you can also do auditing and tracking. All available SQL technology, such as indexes, can be used to optimize access to messages.

Support for Statistics Views

Basic statistics about queues are available using the GV$AQ view.

Structured Payloads

You can use object types to structure and manage message payloads. RDBMSs in general have a richer typing system than messaging systems. Since Oracle is an object-relational DBMS, it supports both traditional relational types as well as user-defined types. Many powerful features are enabled as a result of having strongly typed content, such as content whose format is defined by an external type system. These include:

- Content-based routing: Advanced Queuing can examine the content and automatically route the message to another queue based on the content.
- Content-based subscription: a publish and subscribe system is built on top of a messaging system so that you can create subscriptions based on content.
- Querying: the ability to execute queries on the content of the message enables message warehousing.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Structured Payloads" on page 8-11.

Retention and Message History

The systems administrator specifies the retention duration to retain messages after consumption. Advanced Queuing stores information about the history of each message, preserving the queue and message properties of delay, expiration, and retention for messages destined for local or remote receivers. The information contains the enqueue and dequeue times and the identification of the transaction that executed each request. This allows users to keep a history of relevant messages. The history can be used for tracking, data warehouse, and data mining operations, as well as specific auditing functions.

To see this feature applied in the context of the BooksOnLine scenario, refer to Retention and Message History on page 8-27.

Tracking and Event Journals

If messages are retained, they can be related to each other. For example, if a message m2 is produced as a result of the consumption of message m1, m1 is related to m2. This allows users to track sequences of related messages. These sequences represent event journals, which are often constructed by applications. Advanced Queuing is designed to let applications create event journals automatically.

When an online order is placed, multiple messages are generated by the various applications involved in processing the order. Advanced Queuing offers features to track interrelated messages independent of the applications that generated them. You can determine who enqueued and dequeued messages, who the users are, and who did what operations.

With Advanced Queuing tracking features, you can use SQL `SELECT` and `JOIN` statements to get order information from `AQ$QUETABLENAME` and the views `ENQ_TRAN_ID`, `DEQ_TRAN_ID`, `USER_DATA` (the payload), `CORR_ID`, and `MSG_ID`. These views contain the following data used for tracking:

- Transaction IDs—from `ENQ_TRAN_ID` and `DEQ_TRAN_ID`, captured during enqueuing and dequeuing.
- Correlation IDs—from `CORR_ID`, part of the message properties
- Message content that can be used for tracking—`USER_DATA`

Queue-Level Access Control

The owner of an 8.1-style queue can grant or revoke queue-level privileges on the queue. Database administrators can grant or revoke new AQ system-level privileges to any database user. Database administrators can also make any database user an AQ administrator.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Queue-Level Access Control" on page 8-4.

Nonpersistent Queues

Advanced Queuing can deliver nonpersistent messages asynchronously to subscribers. These messages can be event-driven and do not persist beyond the failure of the system (or instance). Advanced Queuing supports persistent and nonpersistent messages with a common API.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Nonpersistent Queues" on page 8-17.

Support for Oracle9*i* Real Application Clusters

An application can specify the instance affinity for a queue table. When Advanced Queuing is used with Real Application Clusters and multiple instances, this information is used to partition the queue tables between instances for queue-monitor scheduling. The queue table is monitored by the queue monitors of the instance specified by the user. If an instance affinity is not specified, the queue tables is arbitrarily partitioned among the available instances. There can be pinging between the application accessing the queue table and the queue monitor monitoring it. Specifying the instance affinity does not prevent the application from accessing the queue table and its queues from other instances.

This feature prevents pinging between queue monitors and Advanced Queuing propagation jobs running in different instances. If compatibility is set to Oracle8*i*, release 8.1.5 or higher, an instance affinity (primary and secondary) can be specified for a queue table. When Advanced Queuing is used with Real Application Clusters and multiple instances, this information is used to partition the queue tables between instances for queue-monitor scheduling as well as for propagation. At any time, the queue table is affiliated to one instance. In the absence of an explicitly specified affinity, any available instance is made the owner of the queue table. If the owner of the queue table is terminated, the secondary instance or some available instance takes over the ownership for the queue table.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Support for Oracle Real Application Clusters" on page 8-30.

XMLType Payloads

You can create queues that use the new opaque type, `XMLType.` These queues can be used to transmit and store messages that are XML documents. Using `XMLType`, you can do the following:

- Store any type of message in a queue
- Store documents internally as CLOBs
- Store more than one type of payload in a queue
- Query XMLType columns using the operators `ExistsNode()` and `SchemaMatch()`
- Specify the operators in subscriber rules or dequeue conditions

Internet Integration and Internet Data Access Presentation

You can access AQ over the Internet by using Simple Object Access Protocol (SOAP). Internet Data Access Presentation (IDAP) is the SOAP specification for AQ operations. IDAP defines the XML message structure for the body of the SOAP request. An IDAP-structured message is transmitted over the Internet using transport protocols such as HTTP or SMTP. Refer to "Propagation over the Internet: HTTP and SMTP" on page 1-12 and Chapter 17, "Internet Access to Advanced Queuing" for more information.

Propagation over the Internet: HTTP and SMTP

Figure 1–5 shows the architecture for performing AQ operations over HTTP. The major components are:

- The AQ client program
- The Web server/ServletRunner hosting the AQ servlet
- The Oracle database server

The AQ client program sends XML messages (conforming to IDAP) to the AQ servlet, which understands the XML message and performs AQ operations. Any HTTP client, for example Web browsers, can be used. The Web server/ServletRunner hosting the AQ servlet interprets the incoming XML messages. Examples include Apache/Jserv or Tomcat. The AQ servlet connects to the Oracle database server and performs operations on the users' queues.

Figure 1–5 Architecture for Performing AQ Operations Using HTTP

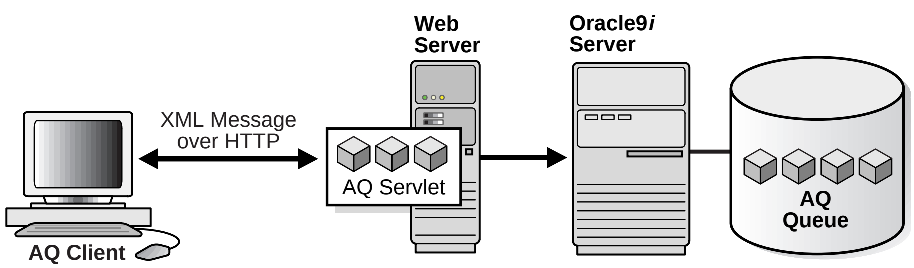
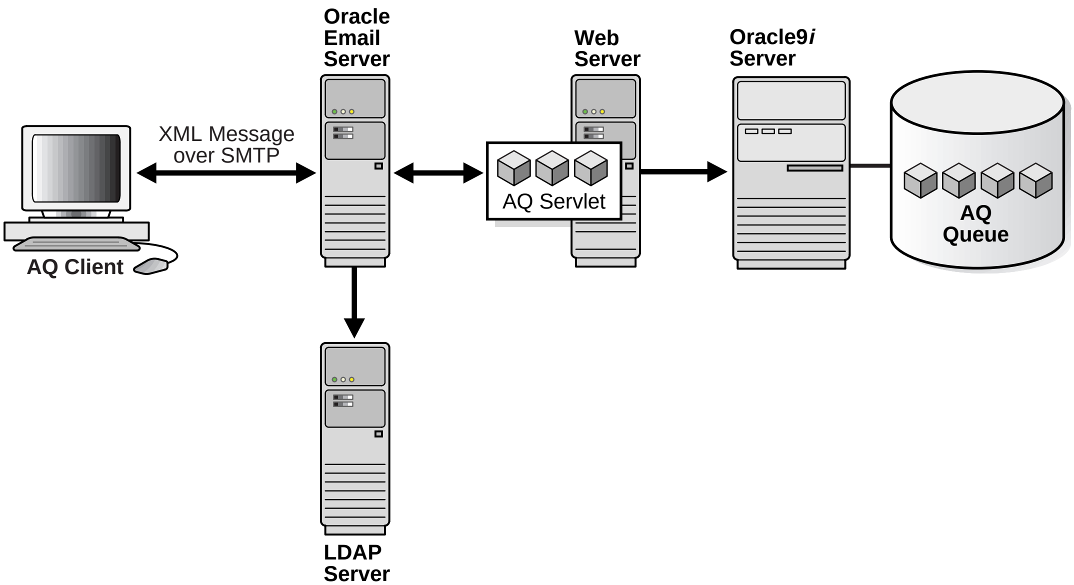


Figure 1–6 shows additional components in the architecture for sending AQ messages over SMTP:

- E-mail server
- LDAP server (Oracle Internet Directory)

The e-mail server verifies client signatures using certificates stored in LDAP and then routes the request to the AQ servlet.

Figure 1–6 Architecture for Performing AQ Operations Using SMTP



The Internet Data Access Presentation (IDAP)

The Internet Data Access Presentation (IDAP) uses the Content-Type of `text/xml` to specify the body of the SOAP request. XML provides the presentation for IDAP request and response messages as follows:

- All request and response tags are scoped in the SOAP namespace.
- AQ operations are scoped in the IDAP namespace.
- The sender includes namespaces in IDAP elements and attributes in the SOAP body.
- The receiver processes IDAP messages that have correct namespaces; for the requests with incorrect namespaces, the receiver returns an invalid request error.
- The SOAP namespace has the value `http://schemas.xmlsoap.org/soap/envelope/`
- The IDAP namespace has the value `http://ns.oracle.com/AQ/schemas/access`

Refer to Chapter 17, "Internet Access to Advanced Queuing" for more information about IDAP.

Nonrepudiation and the AQ$<QueueTableName> View

Advanced Queuing maintains the entire history of information about a message along with the message itself. You can look up history information by using the `AQ$<QueueTableName>` view. This information serves as the proof of sending and receiving of messages and can be used for nonrepudiation of the sender and nonrepudiation of the receiver. Refer to Chapter 10, "Administrative Interface: Views" for more information about the `AQ$<QueueTableName>` view.

The following information is kept at enqueue for nonrepudiation of the enqueuer:

- AQ agent doing the enqueue
- Database user doing the enqueue
- Enqueue time
- Transaction ID of the transaction doing the enqueue

The following information is kept at dequeue for nonrepudiation of the dequeuer:

- AQ agent doing dequeue
- Database user doing dequeue
- Dequeue time
- Transaction ID of the transaction doing dequeue

After propagation, the `Original_Msgid` field in the destination queue of propagation corresponds to the message ID of the source message. This field can be used to correlate the propagated messages. This is useful for nonrepudiation of the dequeuer of propagated messages.

Stronger nonrepudiation can be achieved by enqueuing the digital signature of the sender at the time of enqueue with the message and by storing the digital signature of the dequeuer at the time of dequeue.

Enqueue Features

The following features apply to enqueuing messages.

Correlation Identifiers

Users can assign an identifier to each message, thus providing a means to retrieve specific messages at a later time.

Subscription and Recipient Lists

A single message can be designed to be consumed by multiple consumers. A queue administrator can specify the list of subscribers who can retrieve messages from a queue. Different queues can have different subscribers, and a consumer program can be a subscriber to more than one queue. Further, specific messages in a queue can be directed toward specific recipients who may or may not be subscribers to the queue, thereby overriding the subscriber list.

You can design a single message for consumption by multiple consumers in a number of different ways. The consumers who are allowed to retrieve the message are specified as explicit recipients of the message by the user or application that enqueues the message. Every explicit recipient is an agent identified by name, address, and protocol.

A queue administrator may also specify a default list of recipients who can retrieve all the messages from a specific queue. These implicit recipients become subscribers to the queue by being specified in the default list. If a message is enqueued without specifying any explicit recipients, the message is delivered to all the designated subscribers.

A rule-based subscriber is one that has a rule associated with it in the default recipient list. A rule-based subscriber will be sent a message with no explicit recipients specified only if the associated rule evaluated to TRUE for the message. Different queues can have different subscribers, and the same recipient can be a subscriber to more than one queue. Further, specific messages in a queue can be directed toward specific recipients who may or may not be subscribers to the queue, thereby overriding the subscriber list.

A recipient may be specified only by its name, in which case the recipient must dequeue the message from the queue in which the message was enqueued. It may be specified by its name and an address with a protocol value of 0. The address should be the name of another queue in the same database or another Oracle database (identified by the database link), in which case the message is propagated to the specified queue and can be dequeued by a consumer with the specified name. If the recipient's name is NULL, the message is propagated to the specified queue in the address and can be dequeued by the subscribers of the queue specified in the address. If the protocol field is nonzero, the name and address are not interpreted by the system and the message can be dequeued by a special consumer. To see this feature applied in the context of the BooksOnLine scenario, refer to "Elements of Advanced Queuing" on page 1-21.

Priority and Ordering of Messages in Enqueuing

It is possible to specify the priority of the enqueued message. An enqueued message can also have its exact position in the queue specified. This means that users have three options to specify the order in which messages are consumed: (a) a sort order specifies which properties are used to order all message in a queue; (b) a priority can be assigned to each message; (c) a sequence deviation allows you to position a message in relation to other messages. Further, if several consumers act on the same queue, a consumer will get the first message that is available for immediate consumption. A message that is in the process of being consumed by another consumer will be skipped.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Priority and Ordering of Messages" on page 8-38.

Message Grouping

Messages belonging to one queue can be grouped to form a set that can only be consumed by one user at a time. This requires that the queue be created in a queue table that is enabled for message grouping. All messages belonging to a group have to be created in the same transaction and all messages created in one transaction belong to the same group. This feature allows users to segment complex messages into simple messages; for example, messages directed to a queue containing invoices can be constructed as a group of messages starting with the header message, followed by messages representing details, followed by the trailer message.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Message Grouping" on page 8-51.

Propagation

This feature enables applications to communicate with each other without having to be connected to the same database or the same queue. Messages can be propagated from one Oracle AQ to another, irrespective of whether the queues are local or remote. Propagation is done using database links and Oracle Net Services.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Propagation" on page 8-107.

Sender Identification

Applications can mark the messages they send with a custom identification. Oracle also automatically identifies the queue from which a message was dequeued. This allows applications to track the pathway of a propagated message or a string messages within the same database.

Time Specification and Scheduling

Delay interval or expiration intervals can be specified for an enqueued message, thereby providing windows of execution. A message can be marked as available for processing only after a specified time elapses (a delay time) and has to be consumed before a specified time limit expires.

Rule-Based Subscribers

A message can be delivered to multiple recipients based on message properties or message content. Users define a rule-based subscription for a given queue as the mechanism to specify interest in receiving messages of interest. Rules can be specified based on message properties and message data (for object and raw payloads). Subscriber rules are then used to evaluate recipients for message delivery.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Rule-Based Subscription" on page 8-86.

Asynchronous Notification

The asynchronous notification feature allows clients to receive notification of a message of interest. The client can use it to monitor multiple subscriptions. The client does not have to be connected to the database to receive notifications regarding its subscriptions.

Clients can use the OCI function, `LNOCISubcriptionRegister`, or the PL/SQL procedure `DBMS_AQ.REGISTER` to register interest in messages in a queue. Refer to "Registering for Notification" in Chapter 11, "Operational Interface: Basic Operations" for more information.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Asynchronous Notifications" on page 8-97.

Dequeue Features

The following features apply to dequeuing messages.

Recipients

A message can be retrieved by multiple recipients without the need for multiple copies of the same message. To see this feature applied in the context of the BooksOnLine scenario, refer to "Multiple Recipients" on page 8-63.

Designated recipients can be located locally or at remote sites. To see this feature applied in the context of the BooksOnLine scenario, refer to "Local and Remote Recipients" on page 8-64.

Navigation of Messages in Dequeuing

Users have several options to select a message from a queue. They can select the first message or once they have selected a message and established a position, they can retrieve the next. The selection is influenced by the ordering or can be limited by specifying a correlation identifier. Users can also retrieve a specific message using the message identifier.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Message Navigation in Dequeue" on page 8-65.

Modes of Dequeuing

A DEQUEUE request can either browse or remove a message. If a message is browsed, it remains available for further processing. If a message is removed, it is not available more for DEQUEUE requests. Depending on the queue properties, a removed message may be retained in the queue table.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Modes of Dequeuing" on page 8-69.

Optimization of Waiting for the Arrival of Messages

A DEQUEUE can be issued against an empty queue. To avoid polling for the arrival of a new message, a user can specify if and for how long the request is allowed to wait for the arrival of a message.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Optimization of Waiting for Arrival of Messages" on page 8-75.

Retries with Delays

A message must be consumed exactly once. If an attempt to dequeue a message fails and the transaction is rolled back, the message will be made available for reprocessing after some user-specified delay elapses. Reprocessing will be attempted up to the user-specified limit.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Retry with Delay Interval" on page 8-77.

Optional Transaction Protection

ENQUEUE and DEQUEUE requests are normally part of a transaction that contains the requests, thereby providing the desired transactional behavior. You can, however, specify that a specific request is a transaction by itself, making the result of that request immediately visible to other transactions. This means that messages can be made visible to the external world as soon as the ENQUEUE or DEQUEUE statement is issued or after the transaction is committed.

Exception Handling

A message may not be consumed within given constraints, such as within the window of execution or within the limits of the retries. If such a condition arises, the message will be moved to a user-specified exception queue.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Exception Handling" on page 8-80.

Listen Capability (Wait on Multiple Queues)

The listen call is a blocking call that can be used to wait for messages on multiple queues. It can be used by a gateway application to monitor a set of queues. An application can also use it to wait for messages on a list of subscriptions. If the listen returns successfully, a dequeue must be used to retrieve the message.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Listen Capability" on page 8-90.

Dequeue Message Header with No Payload

The dequeue mode REMOVE_NODATA can be used to remove a message from a queue without retrieving the payload. Use this mode to delete a message with a large payload whose content is irrelevant.

Propagation Features

The following features apply to propagating messages. Refer to "Internet Integration and Internet Data Access Presentation" on page 1-11 for information on propagation over the Internet.

Automated Coordination of Enqueuing and Dequeuing

Recipients can be local or remote. Because Oracle does not support distributed object types, remote enqueuing or dequeuing using a standard database link does not work. However, you can use AQ message propagation to enqueue to a remote queue. For example, you can connect to database X and enqueue the message in a queue, DROPBOX, located in database X. You can configure AQ so that all messages enqueued in DROPBOX will be automatically propagated to another queue in database Y, regardless of whether database Y is local or remote. AQ will automatically check if the type of the remote queue in database Y is structurally equivalent to the type of the local queue in database X and propagate the message.

Recipients of propagated messages can be applications or queues. If the recipient is a queue, the actual recipients are determined by the subscription list associated with the recipient queue. If the queues are remote, messages are propagated using the specified database link. Only AQ-to-AQ message propagation is supported.

Propagation of Messages with LOBs

Propagation handles payloads with LOB attributes. To see this feature applied in the context of the BooksOnLine scenario, refer to "Propagation of Messages with LOB Attributes" on page 8-111.

Propagation Scheduling

Messages can be scheduled to propagate from a queue to local or remote destinations. Administrators can specify the start time, the propagation window, and a function to determine the next propagation window (for periodic schedules).

Enhanced Propagation Scheduling Capabilities

Detailed run-time information about propagation is gathered and stored in the DBA_QUEUE_SCHEDULES view for each propagation schedule. This information can be used by queue designers and administrators to fix problems or tune performance. For example, available statistics about the total and average number of message / bytes propagated can be used to tune schedules. Similarly, errors reported by the view can be used to diagnose and fix problems. The view also describes additional information such as the session ID of the session handling the propagation, and the process name of the job queue process handling the propagation.

To see this feature applied in the context of the BooksOnLine scenario, refer to "Enhanced Propagation Scheduling Capabilities" on page 8-114.

Third-Party Support

AQ allows messages to be enqueued in queues that can then be propagated to different messaging systems by third-party propagators. If the protocol number for a recipient is in the range 128 - 255, the address of the recipient is not interpreted by AQ and so the message is not propagated by the AQ system. Instead, a third-party propagator can then dequeue the message by specifying a reserved consumer name in the dequeue operation. The reserved consumer names are of the form `AQ$_P#`, where # is the protocol number in the range 128–255. For example, the consumer name `AQ$_P128` can be used to dequeue messages for recipients with protocol number 128. The list of recipients for a message with the specific protocol number is returned in the `recipient_list` message property on dequeue.

Another way for Advanced Queuing to propagate messages to and from third-party messaging systems is through Messaging Gateway, an Enterprise Edition feature of Advanced Queuing. Messaging Gateway dequeues messages from an AQ queue and guarantees delivery to a third-party messaging system like MQSeries. Messaging Gateway can also dequeue messages from third-party messaging systems and enqueue them to an AQ queue. Refer to Chapter 18, "Messaging Gateway" for more information.

Elements of Advanced Queuing

By integrating transaction processing with queuing technology, persistent messaging in the form of **Advanced Queuing** is possible. This section defines a number of Advanced Queuing terms.

Message

A message is the smallest unit of information inserted into and retrieved from a queue. A message consists of the following:

- Control information (metadata)
- Payload (data)

The control information represents message properties used by AQ to manage messages. The payload data is the information stored in the queue and is transparent to Oracle AQ. A message can reside in only one queue. A message is created by the enqueue call and consumed by the dequeue call.

Queue

A queue is a repository for messages. There are two types of queues: user queues, also known as normal queues, and exception queues. The user queue is for normal message processing. Messages are transferred to an exception queue if they cannot be retrieved and processed for some reason. Queues can be created, altered, started, stopped, and dropped by using the Oracle AQ administrative interfaces. Refer to Chapter 9, "Administrative Interface" for more information.

User queues can be persistent (the default) or nonpersistent queues. Persistent queues store messages in database tables. These queues provide all the reliability and availability features of database tables. Nonpersistent queues store messages in memory. They are generally used to provide an asynchronous mechanism to send notifications to all users that are currently connected.

Queue Table

Queues are stored in queue tables. Each queue table is a database table and contains one or more queues. Each queue table contains a default exception queue. Figure 7–1, "Basic Queues" on page 7-2 shows the relationship between messages, queues, and queue tables.

Agent

An agent is a queue user. This can be an end user or an application. There are two types of agents:

- Producers who place messages in a queue (enqueuing)
- Consumers who retrieve messages (dequeuing)

Any number of producers and consumers may be accessing the queue at a given time. Agents insert messages into a queue and retrieve messages from the queue by using the Oracle AQ operational interfaces. Refer to Chapter 11, "Operational Interface: Basic Operations" for more information.

An agent is identified by its `name`, `address` and `protocol.` Refer to "Agent Type (aq$_agent)" on page 2-3 in Chapter 2, "Basic Components" for a formal description of this data structure.

- The name of the agent may be the name of the application or a name assigned by the application. A queue may itself be an agent—enqueuing or dequeuing from another queue.
- The address field is a character field of up to 1024 bytes that is interpreted in the context of the protocol. For instance, the default value for the protocol is 0, signifying a database link addressing. In this case, the address for this protocol is of the form

  `queue_name@dblink`

  where `queue_name` is of the form `[schema.]queue` and `dblink` may either be a fully qualified database link name or the database link name without the domain name.

Recipient

The recipient of a message may be specified by its name only, in which case the recipient must dequeue the message from the queue in which the message was enqueued. The recipient may be specified by name and an address with a protocol value of 0. The address should be the name of another queue in the same database or another Oracle database (identified by the database link) in which case the message is propagated to the specified queue and can be dequeued by a consumer with the specified name. If the recipient's name is `NULL`, the message is propagated to the specified queue in the address and can be dequeued by the subscribers of the queue specified in the address. If the protocol field is nonzero, the name and address are not interpreted by the system and the message can be dequeued by a special consumer (refer to "Third-Party Support" on page 1-21).

Recipient and Subscription Lists

Multiple consumers can consume a single message:

- The enqueuer can explicitly specify the consumers who may retrieve the message as recipients of the message. A recipient is an agent identified by a name, address, and protocol.
- A queue administrator can specify a default list of recipients who can retrieve messages from a queue. The recipients specified in the default list are known as subscribers. If a message is enqueued without specifying the recipients, the message is sent to all the subscribers.

Different queues can have different subscribers, and the same recipient can be a subscriber to more than one queue. Further, specific messages in a queue can be directed toward specific recipients who may or may not be subscribers to the queue, thereby overriding the subscriber list.

Rule

A rule is used to define one or more subscribers' interest in subscribing to messages that conform to that rule. The messages that meet the rule criterion are delivered to the interested subscribers. A rule is specified as a boolean expression (one that evaluates to true or false) using syntax similar to the WHERE clause of a SQL query. The boolean expression can include conditions on the following:

- Message properties (currently priority and correlation identifier)
- User data properties (object payloads only)
- Functions (as specified in the WHERE clause of a SQL query)

Rule-Based Subscribers

A rule-based subscriber is a subscriber with associated rules in the default recipient list. If an associated rule evaluates to TRUE for a message, the message is sent to the rule-based subscriber even if the message has no specified recipients.

Transformation

A transformation defines a mapping from one Oracle data type to another. The transformation is represented by a SQL function that takes the source data type as input and returns an object of the target data type. A transformation can be specified during enqueue, to transform the message to the correct type before inserting it into the queue. It can be specified during dequeue to receive the message in the desired format. If specified with a remote subscriber, the message will be transformed before propagating it to the destination queue.

Queue Monitor

The queue monitor (QMNn) is a background process that monitors messages in queues. It provides the mechanism for message delay, expiration, and retry delay. The QMNn also performs garbage collection for the queue table and its indexes and index-organized tables (IOTs). For example, the QMNn determines when all subscribers of multiconsumer queues have received a message and subsequently removes the message from the queue table and supporting indexes and IOTs.

You can start a maximum of 10 multiple queue monitors at the same time. You start the queue monitors by setting the dynamic `init.ora` parameter `aq_tm_processes`. The queue monitor wakes up every minute, or whenever there is work to do, for instance, if a message is marked expired or ready to be processed.

Java Message Service Terminology

When using the `oracle.jms` Java package, keep in mind the following:

- The JMS equivalent of enqueue is **send**.
- The destination of messages is a **queue**, without any qualification.
- The container of messages is a **topic**, and each application can **publish** on or **subscribe** to a given topic.
- **Topic** in JMS maps to a **multiconsumer queue** in the other AQ interfaces.
- The Java package `oracle.jms` has classes and interfaces to implement Oracle extensions to the public JMS standard.

Demos

The following demos can be found in the `$ORACLE_HOME/rdbms/demo` directory. Refer to `aqxmlreadme.txt` and `aqjmsreadme.txt` in the demo directory for more information.

Table 1–1 Demos

Demo and Locations	Topic
`aqjmsdemo01.java`	Enqueue text messages and dequeue based on message properties
`aqjmsdemo02.java`	Message Listener demo
`aqjmsdemo03.java`	Message Listener demo
`aqjmsdemo04.java`	Oracle Type Payload - Dequeue on payload content
`aqjmsdemo05.java`	Example of the queue browser
`aqjmsdemo06.java`	Schedule propagation between queues in the database
`aqjmsdmo.sql`	Set up AQ JMS demos

Table 1–1 Demos

Demo and Locations	Topic
aqjmsREADME.txt	Describe the AQ Java API and JMS demos
aqorademo01.java	Enqueue and dequeue RAW messages
aqorademo02.java	Enqueue and dequeue object type messages using the Custom Datum interface
aqoradmo.sql	Setup file for AQ java API demos
aqxml01.xml	AQXmlSend—Enqueue to ADT single-consumer queue with piggyback commit
aqxml02.xml	AQXmlReceive—Dequeue from ADT single-consumer queue with piggyback commit
aqxml03.xml	AQXmlPublish—Enqueue to ADT (with LOB) multiconsumer queue
aqxml04.xml	AQXmlReceive—Dequeue from ADT multi-consumer queue
aqxml05.xml	AQXmlCommit—Commit previous operation
aqxml06.xml	AQXmlSend—Enqueue to JMS Text single-consumer queue with piggyback commit
aqxml07.xml	AQXmlReceive—Dequeue from JMS Text single-consumer queue with piggyback commit
aqxml08.xml	AQXmlPublish—Enqueue JMS MAP message with recipient into multiconsumer queue
aqxml09.xml	AQXmlReceive—Dequeue JMS MAP message from multiconsumer queue
aqxml10.xml	AQXmlRollback—Roll back previous operation
aqxmlhtp.sql	HTTP Propagation
AQDemoServlet.java	Servlet to post AQ XML files (for Jserv)
AQPropServlet.java	Servlet for AQ HTTPpropagation
newaqdemo00.sql	Create users, message types, tables, and so on
newaqdemo01.sql	Set up queue_tables, queues, subscribers and set up
newaqdemo02.sql	Enqueue messages
newaqdemo03.sql	Install dequeue procedures

Table 1–1 Demos

Demo and Locations	Topic
`newaqdemo04.sql`	Perform blocking dequeue
`newaqdemo05.sql`	Perform listen for multiple agents
`newaqdemo06.sql`	Clean up users, queue_tables, queues, subscribers (cleanup script)
`ociaqdemo00.c`	Enqueue messages
`ociaqdemo01.c`	Perform blocking dequeue
`ociaqdemo02.c`	Perform listen for multiple agents

2

Basic Components

The following basic components are discussed in this chapter:

- Data Structures
- Enumerated Constants in the Administrative Interface
- Enumerated Constants in the Operational Interface
- INIT.ORA Parameter File Considerations

Data Structures

The following chapters discuss the Advanced Queuing administrative and operational interfaces in which data structures are used:

- Chapter 9, "Administrative Interface"
- Chapter 11, "Operational Interface: Basic Operations"

Object Name (object_name)

Purpose

To name database objects. This naming convention applies to queues, queue tables, and object types.

Syntax

```
object_name := VARCHAR2
object_name := [<schema_name>.]<name>
```

Usage

Names for objects are specified by an optional schema name and a name. If the schema name is not specified, then the current schema is assumed. The name must follow the reserved character guidelines in the *Oracle9i SQL Reference*. The schema name, agent name, and the object type name can each be up to 30 bytes long. However, queue names and queue table names can be a maximum of 24 bytes.

Type Name (type_name)

Purpose

To define queue types.

Syntax

```
type_name := VARCHAR2
type_name := <object_type> | "RAW"
```

Usage

Table 2–1 lists usage information for `type_name`.

Table 2–1 Type Name (type_name)

Parameter	Description
<object_types>	For details on creating object types please refer to *Oracle9i Database Concepts*. The maximum number of attributes in the object type is limited to 900.
"RAW"	To store payload of type RAW, AQ creates a queue table with a LOB column as the payload repository. The size of the payload is limited to 32K bytes of data. Because LOB columns are used for storing RAW payload, the AQ administrator can choose the LOB tablespace and configure the LOB storage by constructing a LOB storage string in the storage_clause parameter during queue table creation time.

Agent Type (aq$_agent)

Purpose

To identify a producer or a consumer of a message.

Syntax

```
TYPE aq$_agent IS OBJECT (
   name          VARCHAR2(30),
   address       VARCHAR2(1024),
   protocol      NUMBER)
```

Usage

All consumers that are added as subscribers to a multiconsumer queue must have unique values for the AQ$_AGENT parameters. You can add more subscribers by repeatedly using the DBMS_AQADM.ADD_SUBSCRIBER procedure up to a maximum of 1024 subscribers for a multiconsumer queue. Two subscribers cannot have the same values for the NAME, ADDRESS, and PROTOCOL attributes for the AQ$_AGENT type. At least one of the three attributes must be different for two subscribers.

Table 2–2 lists usage information for aq$_agent.

Table 2–2 Agent (aq$_agent)

Parameter	Description
`name` (`VARCHAR2(30)`)	Name of a producer or consumer of a message.The name must follow the reserved character guidelines in the Oracle9i SQL Reference.
`address` (`VARCHAR2(1024)`)	Protocol specific address of the recipient. If the protocol is 0 (default), the address is of the form `[schema.]queue[@dblink]`.
`protocol` (`NUMBER`)	Protocol to interpret the address and propagate the message. The default value is 0.

AQ Recipient List Type (aq$_recipient_list_t)

Purpose

To identify the list of agents that will receive the message.

Syntax

```
TYPE aq$_recipient_list_t IS TABLE OF aq$_agent
           INDEX BY BINARY_INTEGER;
```

AQ Agent List Type (aq$_agent_list_t)

Purpose

To identify the list of agents for `DBMS_AQ.LISTEN` to listen for.

Syntax

```
TYPE aq$_agent_list_t IS TABLE OF aq$_agent
           INDEX BY BINARY INTEGER;
```

AQ Subscriber List Type (aq$_subscriber_list_t)

Purpose

To identify the list of subscribers that subscribe to this queue.

Syntax

```
TYPE aq$_subscriber_list_t IS TABLE OF aq$_agent
          INDEX BY BINARY INTEGER;
```

AQ Registration Info List Type (aq$_reg_info_list)

Purpose

To identify the list of registrations to a queue.

Syntax

```
TYPE aq$_reg_info_list AS VARRAY(1024) OF sys.aq$_reg_info
```

AQ Post Info List Type (aq$_post_info_list)

Purpose

To identify the list of anonymous subscriptions to which messages are posted.

Syntax

```
TYPE aq$_post_info_list AS VARRAY(1024) OF sys.aq$_post_info
```

AQ Registration Info Type

The `aq$_reg_info` data structure identifies a producer or a consumer of a message.

Syntax

```
TYPE sys.aq$_reg_info IS OBJECT (
   name      VARCHAR2(128),
   namespace NUMBER,
   callback  VARCHAR2(4000),
   context   RAW(2000));
```

Attributes

Table 2–3 AQ Registration Info Type Attributes

Attribute	Description
name	Specifies the name of the subscription. The subscription name is of the form <schema>.<queue> if the registration is for a single consumer queue and <schema>.<queue>:<consumer_name> if the registration is for a multiconsumer queue.
namespace	Specifies the namespace of the subscription. To receive notifications from AQ queues the namespace must be DBMS_AQ.NAMESPACE_AQ. To receive notifications from other applications using DBMS_AQ.POST or OCISubscriptionPost(), the namespace must be DBMS_AQ.NAMESPACE_ANONYMOUS.
callback	Specifies the action to be performed on message notification. For e-mail notifications, the form is mailto://xyz@company.com For AQ PL/SQL Callback, use plsql://<schema>.<procedure>?PR=0 for raw message payload or plsql://<schema>.<procedure>?PR=1 for ADT message payload converted to XML
context	Specifies the context that is to be passed to the callback function. Default: NULL

Table 2–4 shows the actions performed when different notification mechanisms/presentations are specified for nonpersistent queues.

Table 2–4 Nonpersistent Queues

Queue Payload Type	Presentation Specified					
	RAW			XML		
	Notification Mechanism			Notification Mechanism		
	LNOCI	E-mail	PL/SQL Callback	LNOCI	E-mail	PL/SQL Callback
RAW	The callback receives the RAW data in the payload.	Not supported	The PL/SQL callback receives the RAW data in the payload.	The callback receives the XML data in the payload.	The XML data is formatted as a SOAP message and e-mailed to the registered e-mail address.	The PL/SQL callback receives the XML data in the payload.
ADT	Not supported.	Not supported.	Not supported.	The callback receives the XML data in the payload.	The XML data is formatted as a SOAP message and e-mailed to the registered e-mail address.	The PL/SQL callback receives the XML data in the payload.

AQ Notification Descriptor Type

The `aq$_descriptor` data structure specifies the AQ Descriptor received by the AQ PL/SQL callbacks upon notification.

Syntax

```
TYPE sys.aq$_descriptor IS OBJECT (
  queue_name    VARCHAR2(30),
  consumer_name VARCHAR2(30),
  msg_id        RAW(16),
  msg_prop      msg_prop_t);
```

Attributes

Table 2–5 AQ Notification Descriptor Type

Attribute	Description
queue_name	Name of the queue in which the message was enqueued which resulted in the notification.

Table 2–5 AQ Notification Descriptor Type

Attribute	Description
consumer_name	Name of the consumer for the multiconsumer queue
msg_id	Id of the message.
msg_prop	Message properties.

AQ Post Info Type

The `aq$_post_info` data structure specifies anonymous subscriptions to which you want to post messages.

Syntax

```
TYPE sys.aq$_post_info IS OBJECT (
  name       VARCHAR2(128),
  namespace  NUMBER,
  payload    RAW(2000));
```

Attributes

Table 2–6 AQ Post Info Type Attributes

Attribute	Description
name	Name of the anonymous subscription to which you want to post to.
namespace	To receive notifications from other applications using `DBMS_AQ.POST` or `OCISubscriptionPost()`, the namespace must be `DBMS_AQ.NAMESPACE_ANONYMOUS`.
payload	The payload to be posted to the anonymous subscription Default: `NULL`

Enumerated Constants in the Administrative Interface

When enumerated constants such as `INFINITE`, `TRANSACTIONAL`, and `NORMAL_QUEUE` are selected as values, the symbol must be specified with the scope of the packages defining it. All types associated with the administrative interfaces must be prepended with `DBMS_AQADM`. For example:

```
DBMS_AQADM.NORMAL_QUEUE
```

Table 2–7 lists the enumerated constants.

Table 2–7 Enumerated Constants in the Administrative Interface

Parameter	Options
retention	0,1,2...INFINITE
message_grouping	TRANSACTIONAL, NONE
queue_type	NORMAL_QUEUE, EXCEPTION_QUEUE, NON_PERSISTENT_QUEUE

Enumerated Constants in the Operational Interface

When using enumerated constants such as BROWSE, LOCKED, and REMOVE, the PL/SQL constants must be specified with the scope of the packages defining them. All types associated with the operational interfaces must be prepended with DBMS_AQ. For example:

```
DBMS_AQ.BROWSE
```

Table 2–8 lists the enumerated constants.

Table 2–8 Enumerated Constants in the Operational Interface

Parameter	Options
visibility	IMMEDIATE, ON_COMMIT
dequeue mode	BROWSE, LOCKED, REMOVE, REMOVE_NODATA
navigation	FIRST_MESSAGE, NEXT_MESSAGE, NEXT_TRANSACTION
state	WAITING, READY, PROCESSED, EXPIRED
sequence_deviation	BEFORE, TOP
wait	FOREVER, NO_WAIT
delay	NO_DELAY
expiration	NEVER
namespace	NAMESPACE_AQ, NAMESPACE_ANONYMOUS

INIT.ORA Parameter File Considerations

You can specify the AQ_TM_PROCESSES and JOB_QUEUE_PROCESSES parameters in the init.ora parameter file.

AQ_TM_PROCESSES Parameter

A parameter called AQ_TM_PROCESSES should be specified in the init.ora parameter *file* if you want to perform time monitoring on queue messages. Use this for messages that have delay and expiration properties specified. This parameter should be set to at least 1. It can be set in a range from 0 to 10. Setting it to any other number will result in an error. If this parameter is set to 1, one queue monitor process (QMN) will be created as a background process. If the parameter is not specified, or is set to 0, the queue monitor process is not created.

Table 2–9 lists parameter information.

Table 2–9 AQ_TM_PROCESSES Parameter

Parameter	Options
Parameter Name	aq_tm_processes
Parameter Type	integer
Parameter Class	Dynamic
Allowable Values	0 to 10
Syntax	aq_tm_processes = <0 to 10>
Name of process	ora_qmn<n>_<oracle sid>
Example	aq_tm_processes = 1

JOB_QUEUE_PROCESSES Parameter

Propagation is handled by job queue (SNP) processes. The number of job queue processes started in an instance is controlled by the init.ora parameter JOB_QUEUE_PROCESSES. The default value of this parameter is 0. For message propagation to take place, this parameter must be set to at least 2. The database administrator can set it to higher values if there are many queues from which the messages have to be propagated, or if there are many destinations to which the messages have to be propagated, or if there are other jobs in the job queue.

> **See Also:** *Oracle9i SQL Reference* for more information on JOB_QUEUE_PROCESSES.

The Java Advanced Queuing API supports both the administrative and operational features of Advanced Queuing. In developing Java programs for messaging applications, you will use JDBC to open a connection to the database and then use `oracle.AQ`, the Java AQ API for message queuing. This means that you will no longer need to use PL/SQL interfaces.

3

AQ Programmatic Environments

This chapter describes the elements you need to work with and issues to consider in preparing your AQ application environment. The following topics are discussed:

Programmatic Environments for Accessing AQ

The following programmatic environments are used to access the Advanced Queuing functions of Oracle:

- Native AQ Interface
  - PL/SQL (`DBMS_AQADM` and `DBMS_AQ` packages): supports administrative and operational functions
  - C (OCI): supports operational functions
  - Visual Basic (OO4O): supports operational functions
  - Java (oracle.AQ package using JDBC): supports administrative and operational functions
- JMS Interface to AQ
  - Java (`javax.jms` and `oracle.jms` packages using JDBC): supports the standard JMS administrative and operational functions and Oracle JMS extensions
- XML Interface to AQ
  - The AQ XML servlet supports operational functions using an XML message format.

Refer to Table 3–1, " AQ Programmatic Environments" for the AQ programmatic environments and syntax references.

Table 3–1 AQ Programmatic Environments

Language	Precompiler or Interface Program	Syntax Reference	In This Chapter See...
PL/SQL	`DBMS_AQADM` and `DBMS_AQ` Package	*Oracle9i Supplied PL/SQL Packages and Types Reference*	"Using PL/SQL to Access AQ" on page 3-3
C	Oracle Call Interface (OCI)	*Oracle Call Interface Programmer's Guide*	"Using OCI to Access AQ" on page 3-4

Table 3–1 (Cont.) AQ Programmatic Environments

Language	Precompiler or Interface Program	Syntax Reference	In This Chapter See...
Visual Basic	Oracle Objects For OLE (OO4O)	Oracle Objects for OLE (OO4O) is a Windows-based product included with Oracle Client for Windows NT. There are no manuals for this product, only online help. Online help is available through the Application Development submenu of the Oracle installation.	"Using AQ Java (oracle.AQ) Classes to Access AQ" on page 3-6
Java (AQ)	`oracle.AQ` package using JDBC Application Programmatic Interface (API)	*Oracle9i Supplied Java Packages Reference*	"Using AQ Java (oracle.AQ) Classes to Access AQ" on page 3-6
Java (JMS)	`oracle.JMS` package using JDBC Application Programmatic Interface (API)	*Oracle9i Supplied Java Packages Reference*	"Using AQ Java (oracle.AQ) Classes to Access AQ" on page 3-6 and "Using Oracle Java Message Service to Access AQ" on page 3-8
AQ XML Servlet	`oracle.AQ.xml.AQ xmlServlet` using HTTP or SMTP	*Oracle9i Supplied Java Packages Reference*	"Using the AQ XML Servlet to Access AQ" on page 3-11

Using PL/SQL to Access AQ

The PL/SQL packages `DBMS_AQADM` and `DBMS_AQ` support access to Oracle Advanced Queuing administrative and operational functions using the native AQ interface. These functions include the following:

- Create: queue, queue table, nonpersistent queue, multiconsumer queue/topic, RAW message, message with structured data
- Get: queue table, queue, multiconsumer queue/topic
- Alter: queue table, queue/topic
- Drop: queue/topic
- Start or stop: queue/topic

- Grant and revoke privileges
- Add, remove, alter subscriber
- Add, remove, alter AQ Internet agents
- Grant or revoke privileges of database users to AQ Internet agents
- Enable, disable, and alter propagation schedule
- Enqueue messages to single consumer queue (point-to-point model)
- Publish messages to multiconsumer queue/topic (publish-subscribe model)
- Subscribing for messages in multiconsumer queue
- Browse messages in a queue
- Receive messages from queue/topic
- Register to receive messages asynchronously
- Listen for messages on multiple queues/topics
- Post messages to anonymous subscriptions
- Bind or unbind agents in a LDAP server
- Add or remove aliases to AQ objects in a LDAP server

> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference* for detailed documentation, including parameters, parameter types, return values, examples, `DBMS_AQADM` and `DBMS_AQ` syntax.

Available PL/SQL `DBMS_AQADM` and `DBMS_AQ` functions are listed in detail in Table 3–2 through Table 3–9.

Using OCI to Access AQ

Oracle Call Interface (OCI) provides an interface to Oracle Advanced Queuing functions using the native AQ interface.

An OCI client can perform the following actions:

- Enqueue messages
- Dequeue messages
- Listen for messages on sets of queues

- Register to receive message notifications

In addition, OCI clients can receive asynchronous notifications for new messages in a queue using OCISubscriptionRegister.

> **See:** *Oracle Call Interface Programmer's Guide*: "OCI and Advanced Queuing" and "Publish-Subscribe Notification" sections, for syntax details.

For queues with user-defined payload type, OTT must be used to generate the OCI mapping for the Oracle type. The OCI client is responsible for freeing the memory of the AQ descriptors and the message payload.

Examples

LNOCI Interface

See Appendix A, "Oracle Advanced Queuing by Example" under "Enqueuing and Dequeuing Of Messages" on page A-11 for OCI Advanced Queuing interface examples.

Managing OCI Descriptor Memory

See Appendix A, "Oracle Advanced Queuing by Example" under "AQ and Memory Usage" on page A-72 for examples illustrating memory management of OCI descriptors.

Using Visual Basic (OO4O) to Access AQ

Visual Basic (OO4O) supports access to Oracle Advanced Queuing operational functions using the native AQ interface.

These functions include the following:

- Create: connection, RAW message, message with structured data
- Enqueue messages to single consumer queue (point-to-point model)
- Publish messages to multiconsumer queue/topic (publish-subscribe model)
- Browse messages in a queue
- Receive messages from queue/topic
- Register to received messages asynchronously

For More Information

For more information about OO4O, refer to the following Web site:

- http://technet.oracle.com

  Select Products > Internet Tools > Programmer. Scroll down to: Oracle Objects for OLE. At the bottom of the page is a list of useful articles for using the interfaces.

- http://www.oracle.com/products

  Search for articles on OO4O or Oracle Objects for OLE.

Using AQ Java (oracle.AQ) Classes to Access AQ

The Java AQ API supports both the administrative and operational features of Advanced Queueing. In developing Java programs for messaging applications, you use JDBC to open a connection to the database and to oracle.AQ, the Java AQ API for message queuing.

Oracle9i Supplied Java Packages Reference describes the common interfaces and classes based on current PL/SQL interfaces.

- Common interfaces are prefixed with **“AQ”**. These interfaces will have different implementations in Oracle8*i* and Oracle Lite.
- In this document we describe the common interfaces and their corresponding Oracle8*i* implementations, that are in turn prefixed with “**AQOracle”**.

Accessing Java AQ Classes

The Java AQ classes are located in `$ORACLE_HOME/rdbms/jlib/aqapi*.jar`. In release 9.2, Oracle JMS conforms to Sun Microsystems’ JMS 1.0.2b standard. These classes can be used with any OracleJDBC driver, version 8*i* and higher.

- **Using OCI8 or Thin JDBC Driver**
  - For JDK 1.3, include the following in the `CLASSPATH`:
    - `$ORACLE_HOME`/jdbc/lib/classes12.zip
    - `$ORACLE_HOME`/jlib/jndi.jar
    - `$ORACLE_HOME/rdbms/jlib/aqapi13.jar`
    - `$ORACLE_HOME`/rdbms/jlib/jmscommon.jar

- For JDK 1.2, include the following in the CLASSPATH
  - $ORACLE_HOME/jdbc/lib/classes12.zip
  - $ORACLE_HOME/jlib/jndi.jar
  - $ORACLE_HOME/rdbms/jlib/aqapi12.jar
  - $ORACLE_HOME/rdbms/jlib/jmscommon.jar
- For JDK 1.1, include the following in the CLASSPATH:
  - $ORACLE_HOME/jdbc/lib/classes111.zip
  - $ORACLE_HOME/jlib/jndi.jar
  - $ORACLE_HOME/rdbms/jlib/aqapi11.jar
  - $ORACLE_HOME/rdbms/jlib/jmscommon.jar
- **Using Oracle Server Driver in JServer:** If the application is using the Oracle Server driver and accessing the Java AQ API from Java stored procedures, the Java files are generally automatically preloaded in a Java-enabled database. If the Java files are not loaded, you must first load the `jmscommon.jar` and `aqapi.jar` files into the database using the `loadjava` utility.

Advanced Queuing Examples

Appendix A, “Oracle Advanced Queuing by Example” contains the following examples:

- Enqueue and Dequeue of Object Type Messages (CustomDatum interface) Using Java
- Enqueue and Dequeue of Object Type Messages (using SQLData interface) Using Java
- Create a Queue Table and Queue Using Java
- Create a Queue and Start Enqueue/Dequeue Using Java
- Create a Multiconsumer Queue and Add Subscribers Using Java
- Enqueue of RAW Messages using Java
- Dequeue of Messages Using Java
- Dequeue of Messages in Browse Mode Using Java
- Enqueue of Messages with Priority Using Java

- Enqueuing and Dequeuing Object Type Messages That Contain LOB Attributes Using Java

Managing the Java AQ API

The various implementations of the Java AQ API are managed with `AQDriverManager`. Both OLite and Oracle9*i* will have an `AQDriver` that is registered with the `AQDriverManager`. The driver manager is used to create an `AQSession` that can be used to perform messaging tasks.

The Oracle8*i* AQ driver is registered using the Class.forName ("oracle.AQ.AQOracleDriver") command.

When the `AQDriverManager.createAQSession`() method is invoked, it calls the appropriate `AQDriver` (among the registered drivers) depending on the parameter passed to the `createAQSession`() call.

The Oracle9*i* `AQDriver` expects a valid JDBC connection to be passed in as a parameter to create an AQSession. Users must have the execute privilege on the `DBMS_AQIN` package to use the AQ Java interfaces. Users can also acquire these rights through the `AQ_USER_ROLE` or the `AQ_ADMINSTRATOR_ROLE`. Users will also need the appropriate system and queue privileges for 8.1-style queue tables.

Using Oracle Java Message Service to Access AQ

Java Message Service (JMS): JMS is a messaging standard defined by Sun Microsystems, Oracle, IBM, and other vendors. JMS is a set of interfaces and associated semantics that define how a JMS client accesses the facilities of an enterprise messaging product.

Oracle Java Message Service: Oracle Java Message Service provides a Java API for Oracle Advanced Queuing based on the JMS standard. Oracle JMS supports the standard JMS interfaces and has extensions to support the AQ administrative operations and other AQ features that are not a part of the standard.

Standard JMS Features

Standard JMS features include:

- Point-to-point model of communication - using queues
- Publish-subscribe model of communication - using topics

- Five types of messages - ObjectMessage, StreamMessage, TextMessage, BytesMessage, MapMessage
- Synchronous and Asynchronous delivery of messages
- Message selection based on message header fields/properties

Oracle JMS Extensions

Oracle JMS extensions include the following:

- Administrative API to create queue tables, queues and topics
- Point-to-multipoint communication using recipient lists for topics
- Message propagation between destinations. Allows the application to define remote subscribers.
- Supports transacted sessions that enable you to perform JMS as well as SQL operations in one atomic transaction.
- Message retention after messages have been dequeued
- Message delay - messages can be made visible after a certain delay
- Exception handling - messages are moved to exception queues if they cannot be processed successfully
- In addition to the standard JMS message types, Oracle supports `AdtMessages`. These are stored in the database as Oracle objects and hence the payload of the message can be queried after it is enqueued. Subscriptions can be defined on the contents of these messages as opposed to just the message properties.
- Topic browsing - allows durable subscribers to browse through the messages in a publish-subscribe (topic) destination, and optionally allows these subscribers to purge the browsed messages (so that they are no longer retained by AQ for that subscriber).

Accessing Standard and Oracle JMS

Oracle JMS uses JDBC to connect to the database, hence it applications can run as follows:

- Outside the database using the OCI8 or thin JDBC driver
- Inside Oracle8*i* JServer using the Oracle Server driver

The standard JMS interfaces are in the `javax.jms` package.

The Oracle JMS interfaces are in the `oracle.jms` package.

- Using OCI8 or Thin JDBC Driver: To use JMS with clients running outside the database, you must include the appropriate JDBC driver, JNDI jar files and the following AQ jar files in your CLASSPATH:
  - For JDK 1.1 include the following:

    `$ORACLE_HOME/rdbms/jlib/jmscommon.jar`

    `$ORACLE_HOME/rdbms/jlib/aqapi11.jar`

    `$ORACLE_HOME/jlib/jndi.jar`

    `$ORACLE_HOME/jdbc/lib/classes111.jar`
  - For JDK 1.2 include the following:

    `$ORACLE_HOME/rdbms/jlib/jmscommon.jar`

    `$ORACLE_HOME/rdbms/jlib/aqapi.jar`

    `$ORACLE_HOME/jlib/jndi.jar`

    `$ORACLE_HOME/jdbc/lib/classes12.jar`
- Using Oracle Server Driver in JServer: If your application is running inside the JServer, you should be able to access the Oracle JMS classes that have been automatically loaded when the JServer was installed. If these classes are not available, you may have to load `jmscommon.jar` followed by `aqapi.jar` using the `$ORACLE_HOME/rdbms/admin/initjms` SQL script.

Privileges

Users must have `EXECUTE` privilege on the `DBMS_AQIN` and `DBMS_AQJMS` packages to use the Oracle JMS interfaces. Users can also acquire these rights through the `AQ_USER_ROLE` or the `AQ_ADMINSTRATOR_ROLE`.

Users will also need the appropriate system and queue or topic privileges to send or receive messages.

For More Information

Oracle JMS interfaces are described in detail in the *Oracle9i Supplied Java Packages Reference*.

Using the AQ XML Servlet to Access AQ

You can use the AQ XML servlet to access Oracle9i AQ over HTTP using Simple Object Access Protocol (SOAP) and an XML message format called Internet Data Access Presentation (IDAP).

Using the AQ servlet, a client can perform the following actions:

- Send messages to single-consumer queues
- Publish messages to multiconsumer queues/topics
- Receive messages from queues
- Register to receive message notifications

The servlet can be created by defining a Java class that extends the `oracle.AQ.xml.AQxmlServlet` or `oracle.AQ.xml.AQxmlServlet20` class. These classes in turn extend the `javax.servlet.http.HttpServlet` class.

The servlet can be deployed on any Web server or ServletRunner that implements Javasoft's Servlet 2.0 or Servlet 2.2 interfaces.

- To deploy the AQ Servlet with a Web server that implements Javasoft's Servlet2.0 interfaces, you must define a class that extends the `oracle.AQ.xml.AQxmlServle20` class.
- To deploy the AQ Servlet with a Web server that implements Javasoft's Servlet2.2 interfaces, you must define a class that extends the `oracle.AQ.xml.AQxmlServlet` class.

The servlet can be compiled using JDK 1.1.x or JDK 1.2.x libraries.

- For JDK 1.1.x the CLASSPATH must contain:

```
$ORACLE_HOME/jdbc/lib/classes111.jar
$ORACLE_HOME/jlib/jta.jar
$ORACLE_HOME/jdbc/lib/nls_charset11.jar
$ORACLE_HOME/jlib/jndi.jar
$ORACLE_HOME/lib/lclasses11.zip
$ORACLE_HOME/lib/xmlparserv2.jar
$ORACLE_HOME/lib/xschema.jar
$ORACLE HOME/rdbms/jlib/aqapi11.jar
$ORACLE_HOME/rdbms/jlib/jmscommon.jar
$ORACLE_HOME/rdbms/jlib/aqxml.jar
$ORACLE_HOME/rdbms/jlib/xsu111.jar
$ORACLE_HOME/lib/servlet.jar
```

- For JDK 1.2.x the CLASSPATH must contain:

```
$ORACLE_HOME/jdbc/lib/classes12.jar
$ORACLE_HOME/jlib/jta.jar
$ORACLE_HOME/jdbc/lib/nls_charset12.jar
$ORACLE_HOME/jlib/jndi.jar
$ORACLE_HOME/lib/lclasses12.zip
$ORACLE_HOME/lib/xmlparserv2.jar
$ORACLE_HOME/lib/xschema.jar
$ORACLE_HOME/rdbms/jlib/aqapi.jar
$ORACLE_HOME/rdbms/jlib/jmscommon.jar
$ORACLE_HOME/rdbms/jlib/aqxml.jar
$ORACLE_HOME/rdbms/jlib/xsu12.jar
$ORACLE_HOME/lib/servlet.jar
```

Since the servlet uses JDBC OCI drivers to connect to the Oracle9*i* database server, the 9i Oracle client libraries must be installed on the machine that hosts the servlet. The `LD_LIBRARY_PATH` must contain `$ORACLE_HOME/lib.`

Refer to Chapter 17, "Internet Access to Advanced Queuing" for more information on Internet access to Advanced Queuing.

Comparing AQ Programmatic Environments

Available functions for the AQ programmatic environments are listed by use case in Table 3–2 through Table 3–9. Use cases are described in Chapter 9 through Chapter 11 andChapter 13 through Chapter 16. Refer to Chapter E, "Unified Modeling Language Diagrams" for an explanation of use case diagrams.

AQ Administrative Interfaces

Table 3–2 lists the equivalent AQ administrative functions for three programmatic environments, PL/SQL, Java (native AQ), and Java (JMS).

Table 3–2 Comparison of AQ Programmatic Environments: Administrative Interface

Use Case	PL/SQL	Java (Native)	Java (JMS)
Create a Connection Factory	N/A	N/A	AQjmsFactory.getQueueConnectionFactory AQjmsFactory.getTopicConnectionFactory
Register a Connection Factory in a LDAP server	N/A	N/A	AQjmsFactory.registerConnectionFactory
Create a Queue Table	DBMS_AQADM.create_queue_table	Create AQQueueTableProperty, then AQSession.createQueueTable	AQjmsSession.createQueueTable
Get a Queue Table	Use <schema>.<queue_table_name>	AQSession.getQueueTable	AQjmsSession.getQueueTable
Alter a Queue Table	DBMS_AQADM.alter_queue_table	AQQueueTable.alter	AQQueueTable.alter
Drop a Queue Table	DBMS_AQADM.drop_queue_table	AQQueueTable.drop	AQQueueTable.drop
Create a Queue	DBMS_AQADM.create_queue	AQSession.createQueue	AQjmsSession.createQueue
Get a Queue	Use <schema>.<queue_name>	AQSession.getQueue	AQjmsSession.getQueue
Create a Nonpersistent Queue	DBMS_AQADM.create_np_queue	Not supported	Not supported
Create a Multiconsumer Queue/Topic	DBMS_AQADM.create_queue in a queue table with multiple consumers enabled	AQSession.createQueue in a queue table with multiple consumers enabled	AQjmsSession.createTopic in a queue table with multiple consumers enabled
Get a Multiconsumer Queue/Topic	Use <schema>.<queue_name>	AQSession.getQueue	AQjmsSession.getTopic
Alter a Queue/Topic	DBMS_AQADM.alter_queue	AQQueue.alterQueue	AQjmsDestination.alter

Table 3–2 (Cont.) Comparison of AQ Programmatic Environments: Administrative Interface

Use Case	PL/SQL	Java (Native)	Java (JMS)
Start a Queue/Topic	DBMS_AQADM.start_queue	AQQueue.start AQQueue.startEnqueue AQQueue.startDequeue	AQjmsDestination.start
Stop a Queue/Topic	DBMS_AQADM.stop_queue	AQQueue.stop AQQueue.stopEnqueue AQQueue.stopDequeue	AQjmsDestination.stop
Drop a Queue/Topic	DBMS_AQADM.drop_queue	AQQueue.drop AQQueueTable.dropQueue	AQjmsDestination.drop
Grant System Privileges	DBMS_AQADM.grant_system_privilege	Not supported	AQjmsSession.grantSystemPrivilege
Revoke System Privileges	DBMS_AQADM.revoke_system_privilege	Not supported	AQjmsSession.revokeSystemPrivilege
Grant a Queue/Topic Privilege	DBMS_AQADM.grant_queue_privilege	AQQueue.grantQueuePrivilege	AQjmsDestination.grantQueuePrivilege AQjmsDestination.grantTopicPrivilege
Revoke a Queue/Topic Privilege	DBMS_AQADM.revoke_queue_privilege	AQQueue.revokeQueuePrivilege	AQjmsDestination.revokeQueuePrivilege AQjmsDestination.revokeTopicPrivilege
Verify a Queue Type	DBMS_AQADM.verify_queue_types	Not supported	Not supported
Add a Subscriber	DBMS_AQADM.add_subscriber	AQQueue.addSubscriber	See Table 3–6, " Comparison of AQ Programmatic Environments: Operational Interface—Subscribing for Messages in a Multiconsumer Queue/Topic, Publish-Subscribe Model Use Cases"

Table 3–2 (Cont.) Comparison of AQ Programmatic Environments: Administrative Interface

Use Case	PL/SQL	Java (Native)	Java (JMS)
Alter a Subscriber	DBMS_AQADM.alter_subscriber	AQQueue.alterSubscriber	See Table 3–6, " Comparison of AQ Programmatic Environments: Operational Interface—Subscribing for Messages in a Multiconsumer Queue/Topic, Publish-Subscribe Model Use Cases"
Remove a Subscriber	DBMS_AQADM.remove_subscriber	AQQueue.removeSubscriber	See Table 3–6, " Comparison of AQ Programmatic Environments: Operational Interface—Subscribing for Messages in a Multiconsumer Queue/Topic, Publish-Subscribe Model Use Cases"
Schedule Propagation	DBMS_AQADM.schedule_propagation	AQQueue.schedulePropagation	AQjmsDestination.schedulePropagation
Enable a Propagation Schedule	DBMS_AQADM.enable_propagation_schedule	AQQueue.enablePropagationSchedule	AQjmsDestination.enablePropagationSchedule
Alter a Propagation Schedule	DBMS_AQADM.alter_propagation_schedule	AQQueue.alterPropagationSchedule	AQjmsDestination.alterPropagationSchedule
Disable a Propagation Schedule	DBMS_AQADM.disable_propagation_schedule	AQQueue.disablePropagationSchedule	AQjmsDestination.disablePropagationSchedule
Unschedule a Propagation	DBMS_AQADM.unschedule_propagation	AQQueue.unschedulePropagation	AQjmsDestination.unschedulePropagation
Create an AQ Internet Agent	DBMS_AQADM.create_aq_agent	not supported	not supported
Alter an AQ Internet Agent	DBMS_AQADM.alter_aq_agent	not supported	not supported

Table 3–2 (Cont.) Comparison of AQ Programmatic Environments: Administrative Interface

Use Case	PL/SQL	Java (Native)	Java (JMS)
Drop an AQ Internet Agent	DBMS_AQADM.drop_aq_agent	not supported	not supported
Grant Database User privileges to an AQ Internet Agent	DBMS_AQADM.enable_db_agent	not supported	not supported
Revoke Database User privileges from an AQ Internet Agent	DBMS_AQADM.disable_db_agent	not supported	not supported
Add alias for queue, agent, ConnectionFactory in a LDAP server	DBMS_AQADM.add_alias_to_ldap	not supported	not supported
Delete alias for queue, agent, ConnectionFactory in a LDAP server	DBMS_AQADM.del_alias_from_ldap	not supported	not supported

AQ Operational Interfaces

Table 3–3 through Table 3–9 list equivalent AQ operational functions for the programmatic environments PL/SQL, Java (native AQ), OCI, AQ XML Servlet, and JMS, for various use cases.

Table 3–3 Comparison of AQ Programmatic Environments: Operational Interface—Create Connection, Session, Message Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Create a Connection	N/A	Create JDBC connection	OCIServerAttach	Open an HTTP connection after authenticating with the Web server	AQjmsQueueConnectionFactory.createQueueConnection AQjmsTopicConnectionFactory.createTopicConnecion
Create a Session	N/A	AQDriverManager.createAQSession	OCISessionBegin	An HTTP servlet session is automatically started with the first SOAP request	QueueConnection.createQueueSession TopicConnecion.createTopicSession

Table 3–3 (Cont.) Comparison of AQ Programmatic Environments: Operational Interface—Create Connection, Session, Message Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Create a RAW Message	Use SQL RAW type for message	AQQueue.createMessage Set AQRawPayload in message	Use OCIRaw for Message	Supply the hex representation of the message payload in the XML message. E.g.: `<raw>0234f452 3</raw>`	Not supported
Create a Message with Structured Data	Use SQL ADT type for message	AQQueue.createMessage Set AQObjectPayload in message	Use SQL ADT type for message	For ADT queues that are not JMS queues (that is, they are not type `AQ$_JMS_*`), the XML specified in `<message payload>` must map to the SQL type of the payload for the queue table. For JMS queues, the XML specified in the `<message_payload>` must be one of the following: `<jms_text_message>`, `<jms_map_message>`, `<jms_bytes_message>`, `<jms_object_message>`	Session.createTextMessage Session.createObjectMessage Session.createMapMessage Session.createBytesMessage Session.createStreamMessage AQjmsSession.createAdtMessage
Create a Message Producer	N/A	N/A	N/A	N/A	QueueSession.createSender TopicSession.createPublisher

Table 3–4 Comparison of AQ Programmatic Environments: Operational Interface—Enqueue Messages to a Single-Consumer Queue, Point-to-Point Model Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Enqueue a Message to a single-consumer queue	DBMS_AQ.enqueue	AQQueue.enqueue	LNOCIAQEnq	`<AQXmlSend>`	QueueSender.send
Enqueue a Message to a queue - specify visibility options	DBMS_AQ.enqueue Specify visibility in ENQUEUE_OPTIONS	AQQueue.enqueue Specify visibility in AQEnqueueOption	LNOCIAQEnq Specify OCI_ATTR_VISIBILITY in LNOCIAQEnqOptions	`<AQXmlSend>` Specify `<visibility>` in `<producer_options>`	Not supported
Enqueue a Message to a single-consumer queue - specify message properties - priority, expiration	DBMS_AQ.enqueue Specify priority, expiration in MESSAGE_PROPERTIES	AQQueue.enqueue Specify priority, expiration in AQMessageProperty	LNOCIAQEnq Specify LNOCI_ATTR_PRIORITY, LNOCI_ATTR_EXPIRATION in LNOCIAQMsgProperties	`<AQXmlSend>` Specify `<priority>`, `<expiration>` in `<message_header>`	Specify priority and TimeToLive during QueueSender.send OR MessageProducer.setTimeToLive & MessageProducer.setPriority followed by QueueSender.send

Table 3–4 (Cont.) Comparison of AQ Programmatic Environments: Operational Interface—Enqueue Messages to a Single-Consumer Queue, Point-to-Point Model Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Enqueue a Message to a single-consumer Queue - specify message properties - correlationID, delay, exception queue	DBMS_AQ.enqueue Specify correlation, delay, exception_queue in MESSAGE_PROPERTIES	AQQueue.enqueue Specify correlation, delay, exception queue in AQMessageProperty	LNOCIAQEnq Specify OCI_ATTR_CORRELATION, OCI_ATTR_DELAY, LNOCI_ATTR_EXCEPTION_QUEUE in LNOCIAQMsgProperties	<AQXmlSend> Specify <correlation_id>, <delay>, <exception_queue> in <message_header>	Message.setJMSCorrelationID Delay and exception queue specified as provider specific message properties JMS_OracleDelay JMS_OracleExcpQ followed by QueueSender.send
Enqueue a Message to a single-consumer Queue - specify Message Properties (user-defined)	Not supported Properties should be part of payload	Not supported Properties should be part of payload	Not supported Properties should be part of payload	<AQXmlSend> Specify <name> and <int_value>, <string_value>, <long_value>, etc. in <user_properties>	Message.setIntProperty Message.setStringProperty Message.setBooleanProperty etc. followed by QueueSender.send
Enqueue a Message to a single-consumer Queue - specify Message Transformation	DBMS_AQ.enqueue Specify transformation in ENQUEUE_OPTIONS	AQQueue.enqueue Specify transformation in AQDequeueOption	LNOCIAQEnq Specify OCI_ATTR_TRANSFORMATION in LNOCIAQEnqOptions	<AQXmlSend> Specify <transformation> in <producer_options>	AQjmsQueueSender.setTransformation followed by QueueSender.send

Table 3–5 Comparison of AQ Programmatic Environments: Operational Interface—Publish Messages to a Multiconsumer Queue/Topic, Publish-Subscribe Model Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Publish a Message to a Multiconsumer queue/Topic (using default subscription list)	DBMS_AQ.enqueue Set recipient_list to NULL in MESSAGE_PROPERTIES	AQQueue.enqueue Set recipient_list to NULL in AQMessageProperty	LNOCIAQEnq Set OCI_ATTR_RECIPIENT_LIST to NULL in LNOCIAQMsgProperties	`<AQXmlPublish>`	TopicPublisher.publish
Publish a Message to a Multiconsumer queue/Topic (using specific recipient list) See footnote-1	DBMS_AQ.enqueue Specify recipient list in MESSAGE_PROPERTIES	AQQueue.enqueue Specify recipient_list in AQMessageProperty	LNOCIAQEnq Specify OCI_ATTR_RECIPIENT_LIST in LNOCIAQMsgProperties	`<AQXmlPublish>` Specify `<recipient_list>` in `<message_header>`	AQjmsTopicPublisher.pubish Specify recipients as an array of AQjmsAgent
Publish a Message to a multiconsumer Queue/Topic - specify message properties - priority, expiration	DBMS_AQ.enqueue Specify priority, expiration in MESSAGE_PROPERTIES	AQQueue.enqueue Specify priority, expiration in AQMessageProperty	LNOCIAQEnq Specify OCI_ATTR_PRIORITY, LNOCI_ATTR_EXPIRATION in LNOCIAQMsgProperties	`<AQXmlPublish>` Specify `<priority>`, `<expiration>` in the `<message_header>`	Specify priority and TimeToLive during TopicPublisher.publish OR MessageProducer.setTimeToLive & MessageProducer.setPriority followed by TopicPublisher.publish

Table 3–5 (Cont.) Comparison of AQ Programmatic Environments: Operational Interface—Publish Messages to a Multiconsumer Queue/Topic, Publish-Subscribe Model Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Publish a Message to a multi-consumer queue / topic - specify send options - correlationID, delay, exception queue	DBMS_AQ.enqueue Specify correlation, delay, exception_queue in MESSAGE_PROPERTIES	AQQueue.enqueue Specify correlation, delay, exception queue in AQMessageProperty	LNOCIAQEnq Specify OCI_ATTR_CORRELATION, OCI_ATTR_DELAY, LNOCI_ATTR_EXCEPTION_QUEUE in LNOCIAQMsgProperties	<AQXmlPublish> Specify <correlation_id>, <delay>, <exception_queue> in <message_header>	Message.setJMSCorrelationID Delay and exception queue specified as provider specific message properties JMS_OracleDelay JMS_OracleExcpQ followed by TopicPublisher.publish
Publish a Message to a topic-specify Message Properties (user-defined)	Not supported Properties should be part of payload	Not supported Properties should be part of payload	Not supported Properties should be part of payload	<AQXmlPublish> Specify <name> and <int_value>, <string_value>, <long_value>, etc. in <user_properties>	Message.setIntProperty Message.setStringProperty Message.setBooleanProperty etc. followed by TopicPublisher.publish
Publish a Message to a topic-specify Message Transformation	DBMS_AQ.enqueue Specify transformation in ENQUEUE_OPTIONS	AQQueue.enqueue Specify transformation in AQDequeueOption	LNOCIAQEnq Specify OCI_ATTR_TRANSFORMATION in LNOCIAQEnqOptions	<AQXmlPublish> Specify <transformation> in <producer_options>	AQjmsTopicPublisher.setTransformation followed by TopicPublisher.publish

Table 3–6 Comparison of AQ Programmatic Environments: Operational Interface—Subscribing for Messages in a Multiconsumer Queue/Topic, Publish-Subscribe Model Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Add a Subscriber	See administrative interfaces	See administrative interfaces	Not supported	Not supported	TopicSession.createDurableSubscriber AQjmsSession.createDurableSubscriber
Alter a Subscriber	See administrative interfaces	See administrative interfaces	Not supported	Not supported	TopicSession.createDurableSubscriber AQjmsSession.createDurableSubscriber using the new selector
Remove a Subscriber	See administrative interfaces	See administrative interfaces	Not supported	Not supported	AQjmsSession.unsubscriber

Table 3–7 Comparison of AQ Programmatic Environments: Operational Interface—Browse Messages in a Queue Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Browse messages in a Queue/Topic	DBMS_AQ.dequeue Set dequeue_mode to BROWSE in DEQUEUE_OPTIONS	AQQueue.dequeue Set dequeue_mode to BROWSE in AQDequeueOption	LNOCIAQDeq Set OCI_ATTR_DEQ_MODE to BROWSE in LNOCIAQDeqOptions	<AQXmlReceive> Specify <dequeue_mode> BROWSE in <consumer_options>	QueueSession.createBrowser QueueBrowser.getEnumeration Not supported on Topics oracle.jms.AQjmsSession.createBrowser oracle.jms.TopicBrowser.getEnumeration
Browse messages in a Queue/Topic - locking messages while browsing	DBMS_AQ.dequeue Set dequeue_mode to LOCKED in DEQUEUE_OPTIONS	AQQueue.dequeue Set dequeue_mode to LOCKED in AQDequeueOption	LNOCIAQDeq Set OCI_ATTR_DEQ_MODE to LOCKED in LNOCIAQDeqOptions	<AQXmlReceive> Specify <dequeue_mode> LOCKED in <consumer_options>	AQjmsSession.createBrowser - set locked to TRUE. QueueBrowser.getEnumeration Not supported on Topics oracle.jms.AQjmsSession.createBrowser oracle.jms.TopicBrowser.getEnumeration

Table 3–8 Comparison of AQ Programmatic Environments: Operational Interface—Receive Messages from a Queue/Topic Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Start a connection for receiving messages	N/A	N/A	N/A	N/A	Connection.start
Create a Message Consumer	N/A	N/A	N/A	N/A	QueueSession.createQueueReceiver TopicSession.createDurableSubscriber AQjmsSession.createTopicReceiver
Dequeue a message from a queue/topic - specify visibility	DBMS_AQ.dequeue Specify visibility in DEQUEUE_OPTIONS	AQQueue.dequeue Specify visibility in AQDequeueOption	LNOCIAQDeq Specify OCI_ATTR_VISIBILITY in LNOCIAQDeqOptions	<AQXmlReceive> Specify <visibility> in <consumer_options>	Not supported
Dequeue a message from a queue/topic - specify transformation	DBMS_AQ.dequeue Specify transformation in DEQUEUE_OPTIONS	DBMS_AQ.dequeue Specify transformation in AQDequeueOption	LNOCIAQDeq Specify OCI_ATTR_TRANSFORMATION in LNOCIAQDeqOptions	<AQXmlReceive> Specify <transformation> in <consumer_options>	AQjmsQueueReceiver.setTransformation AQjmsTopicSubscriber.setTransformation AQjmsTopicReceiver.setTransformation
Dequeue a message from a queue/topic - specify navigation mode	DBMS_AQ.dequeue Specify navigation in DEQUEUE_OPTIONS	DBMS_AQ.dequeue Specify navigation in AQDequeueOption	LNOCIAQDeq Specify OCI_ATTR_NAVIGATION in LNOCIAQDeqOptions	<AQXmlReceive> Specify <navigation> in <consumer_options>	AQjmsQueueReceiver.setNavigationMode AQjmsTopicSubscriber.setNavigationMode AQjmsTopicReceiver.setNavigationMode

Table 3–8 (Cont.) Comparison of AQ Programmatic Environments: Operational Interface—Receive Messages from a Queue/Topic Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Dequeue a message from a single consumer queue	DBMS_ AQ.dequeue Set dequeue_ mode to REMOVE in DEQUEUE_ OPTIONS	AQQueue.dequeue Set dequeue_ mode to REMOVE in AQDequeueOption	LNOCIAQDeq Set OCI_ATTR_ DEQ_MODE to REMOVE in LNOCIAQDeqOptions	`<AQXmlReceive>`	QueueReceiver.receive or QueueReceiver.receiveNoWait or AQjmsQueueReceiver.receiveNoData
Dequeue a message from a multiconsumer Queue/Topic (using subscription name)	DBMS_ AQ.dequeue Set dequeue_ mode to REMOVE and Set consumer_ name to subscription name in DEQUEUE_ OPTIONS	AQQueue.dequeue Set dequeue_ mode to REMOVE and Set consumer_ name to subscription name in AQDequeueOption	LNOCIAQDeq Set OCI_ATTR_ DEQ_MODE to REMOVE and Set OCI_ATTR_ CONSUMER_ NAME to subscription name in LNOCIAQDeqOptions	`<AQXmlReceive>` Specify `<consumer_name>` in `<consumer_options>`	Create a durable TopicSubscriber on the Topic using the subscription name, then TopicSubscriber.receive or TopicSubscriber.receiveNoWait or AQjmsTopicSubscriber.receiveNoData
Dequeue a message from a multiconsumer Queue/Topic (using recipient name)	DBMS_ AQ.dequeue Set dequeue_ mode to REMOVE and Set consumer_ name to recipient name in DEQUEUE_ OPTIONS	AQQueue.dequeue Set dequeue_ mode to REMOVE and Set consumer_ name to recipient name inAQDequeueOption	LNOCIAQDeq Set OCI_ATTR_ DEQ_MODE to REMOVE and Set OCI_ATTR_ CONSUMER_ NAME to recipient name in LNOCIAQDeqOptions	`<AQXmlReceive>` Specify `<consumer_name>` in `<consumer_options>`	Create a TopicReceiver on the Topic using the recipient name, then AQjmsSession.createTopicReceiver AQjmsTopicReceiver.receive or AQjmsTopicReceiver.receiveNoWait or AQjmsTopicReceiver.receiveNoData

Table 3–9 Comparison of AQ Programmatic Environments: Operational Interface—Register to Receive Messages Asynchronously from a Queue/Topic Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Receive messages Asynchronously from a single-consumer queue	Define a PL/SQL callback procedure Register it using DBMS_ AQ.register	Not supported	LNOCISubscriptionRegister Specify queue_ name as subscription name LNOCISubscriptionEnable	<AQXmlRegister> Specify queue name in <destination> and notification mechanism in <notify_url>	Create a QueueReceiver on the queue, then QueueReceiver.setMessageListener
Receive messages Asynchronously from a multiconsumer queue/Topic	Define a PL/SQL callback procedure Register it using DBMS_ AQ.register	Not supported	LNOCISubscriptionRegister Specify queue:OCI_ ATTR_ CONSUMER_ NAME as subscription name LNOCISubscriptionEnable	<AQXmlRegister> Specify queue name in <destination>, consumer in <consumer_name> and notification mechanism in <notify_url>	Create a TopicSubscriber or TopicReceiver on the topic, then TopicSubscriber.setMessageListener TopicReceiver.setMessageListener

Table 3–9 (Cont.) Comparison of AQ Programmatic Environments: Operational Interface—Register to Receive Messages Asynchronously from a Queue/Topic Use Cases

Use Case	PL/SQL	Java (Native AQ)	OCI	AQ XML Servlet	JMS
Listen for messages on multiple Queues/Topics	-	-	-	-	-
Listen for messages on one (many) single-consumer queues	DBMS_AQ.listen Use agent_name as NULL for all agents in agent_list	Not supported	LNOCIAQListen Use agent_name as NULL for all agents in agent_list	Not supported	Create multiple QueueReceivers on a QueueSession, then QueueSession.setMessageListener
Listen for messages on one(many) multiconsumer queues/Topics	DBMS_AQ.listen Specify agent_name for all agents in agent_list	Not supported	LNOCIAQListen Specify agent_name for all agents in agent_list	Not supported	Create multiple TopicSubscribers or TopicReceivers on a TopicSession, then TopicSession.setMessageListener

4

Managing AQ

This chapter discusses the following topics related to managing Advanced Queuing:

- Security
- Oracle 8.1-Style Queues
- Queue Table Export-Import
- Oracle Enterprise Manager Support
- Using Advanced Queuing with XA
- Restrictions on Queue Management
- Propagation Issues
- Oracle 8.0-Style Queues

Security

Configuration information can be managed through procedures in the DBMS_AQADM package. Initially, only SYS and SYSTEM have execution privilege for the procedures in DBMS_AQADM and DBMS_AQ. Users who have been granted EXECUTE rights to these two packages will be able to create, manage, and use queues in their own schemas. Users also need the MANAGE ANY QUEUE privilege to create and manage queues in other schemas.

Users of the JMS or Java AQ APIs will need EXECUTE privileges on DBMS_AQJMS (also available through AQ_ADMINSTRATOR_ROLE and AQ_USER_ROLE) and DBMS_AQIN.

Administrator Role

The AQ_ADMINISTRATOR_ROLE has all the required privileges to administer queues. The privileges granted to the role let the grantee:

- Perform any queue administrative operation, including create queues and queue tables on any schema in the database
- Perform enqueue and dequeue operations on any queues in the database
- Access statistics views used for monitoring the queue workload
- Create transformations using DBMS_TRANSFORM
- Execute all procedures in DBMS_AQELM
- Execute all procedures in DBMS_AQJMS

User Role

You should avoid granting AQ_USER_ROLE in Oracle9*i* and 8.1 since this role will not provide sufficient privileges for enqueuing or dequeuing on Oracle9*i* or 8.1-compatible queues.

Your database administrator has the option of granting the system privileges ENQUEUE ANY QUEUE and DEQUEUE ANY QUEUE, exercising DBMS_AQADM.GRANT_SYSTEM_PRIVILEGE and DBMS_AQADM.REVOKE_SYSTEM_PRIVILEGE directly to a database user, if you want the user to have this level of control. You as the application developer give rights to a queue by granting and revoking privileges at the object level by exercising DBMS_AQADM.GRANT_QUEUE_PRIVILEGE and DBMS_AQADM.REVOKE_QUEUE_PRIVILEGE.

As a database user, you do not need any explicit object-level or system-level privileges to enqueue or dequeue to queues in your own schema other than the execute right on DBMS_AQ.

Access to AQ Object Types

All internal AQ objects are now accessible to PUBLIC.

Oracle 8.1-Style Queues

Compatibility

For 8.1-style queues, the compatible parameter of init.ora and the compatible parameter of the queue table should be set to 8.1 to use the following features:

- Queue-level access control
- Nonpersistent queues (automatically created when queue table compatible = 8.1)
- Support for Oracle Parallel Server environments
- Rule-based subscribers for publish-subscribe
- Asynchronous notification
- Sender identification
- Separate storage of history management information

Security

AQ administrators of an Oracle9*i* database can create 8.1-style queues. All 8.1 security features are enabled for 8.1-style queues. Note that AQ 8.1 security features work only with 8.1-style queues. When you create queues, the default value of the compatible parameter in DBMS_AQADM.CREATE_QUEUE_TABLE is 8.1.

Table 4–1 lists the AQ security features and privilege equivalences supported with 8.1-style queues.

Table 4–1 Security with 8.1-Style Queues

Privilege	8.1.x-Style Queues in a 8.1.x Database or Higher
AQ_USER_ROLE	Not supported. Equivalent privileges: ■ execute right on dbms_aq ■ enqueue any queue system privilege ■ dequeue any queue system privilege ■ execute right on dbms_transform
AQ_ADMINISTRATOR_ROLE	Supported.
Execute right on DBMS_AQ	Execute right on DBMS_AQ should be granted to all AQ users. To enqueue/dequeue on 8.1-compatible queues, the user needs the following privileges: ■ execute right on DBMS_AQ ■ enqueue/dequeue privileges on target queues, or ENQUEUE ANY QUEUE/DEQUEUE ANY QUEUE system privileges

Privileges and Access Control

You can grant or revoke privileges at the object level on 8.1- style queues. You can also grant or revoke various system-level privileges. The following table lists all common AQ operations and the privileges need to perform these operations for an Oracle9*i* or 8.1-compatible queue:

Table 4–2 Operations and Required Privileges

Operation(s)	Privileges Required
CREATE/DROP/MONITOR own queues	Must be granted execute rights on DBMS_AQADM. No other privileges needed.
CREATE/DROP/MONITOR any queues	Must be granted execute rights on DBMS_AQADM and be granted AQ_ADMINISTRATOR_ROLE by another user who has been granted this role (SYS and SYSTEM are the first granters of AQ_ADMINISTRATOR_ROLE)
ENQUEUE/ DEQUEUE to own queues	Must be granted execute rights on DBMS_AQ. No other privileges needed.

Table 4–2 Operations and Required Privileges

Operation(s)	Privileges Required
ENQUEUE/ DEQUEUE to another's queues	Must be granted execute rights on DBMS_AQ and be granted privileges by the owner using DBMS_AQADM.GRANT_QUEUE_PRIVILEGE.
ENQUEUE/ DEQUEUE to any queues	Must be granted execute rights on DBMS_AQ and be granted ENQUEUE ANY QUEUE or DEQUEUE ANY QUEUE system privileges by an AQ administrator using DBMS_AQADM.GRANT_SYSTEM_PRIVILEGE.

LNOCI Applications

For an OCI application to access an 8.1-style queue, the session user has to be granted either the object privilege of the queue he intends to access or the ENQUEUE ANY QUEUE or DEQUEUE ANY QUEUE system privileges. The EXECUTE right of DBMS_AQ will not be checked against the session user's rights if the queue he intends to access is an Oracle9*i* or 8.1-compatible queue.

Security Required for Propagation

AQ propagates messages through database links. The propagation driver dequeues from the source queue as owner of the source queue; hence, no explicit access rights have to be granted on the source queue. At the destination, the login user in the database link should either be granted ENQUEUE ANY QUEUE privilege or be granted the rights to enqueue to the destination queue. However, if the login user in the database link also owns the queue tables at the destination, no explicit AQ privileges need to be granted.

Queue Table Export-Import

When a queue table is exported, the queue table data and anonymous blocks of PL/SQL code are written to the export dump file. When a queue table is imported, the import utility executes these PL/SQL anonymous blocks to write the metadata to the data dictionary.

Exporting Queue Table Data

The export of queues entails the export of the underlying queue tables and related dictionary tables. Export of queues can only be done at queue-table granularity.

Exporting Queue Tables with Multiple Recipients

A queue table that supports multiple recipients is associated with the following tables:

- A dequeue index-organized table (IOT)
- A time-management index-organized table
- A subscriber table (for 8.1-compatible queue tables)
- A history index-organized table (for 8.1-compatible queue tables)

These tables are exported automatically during full database mode and user mode exports, but not during table mode export. See "Export Modes" on page 4-6.

Because the metadata tables contain rowids of some rows in the queue table, the import process will generate a note about the rowids being obsoleted when importing the metadata tables. This message can be ignored, since the queuing system will automatically correct the obsolete rowids as a part of the import operation. However, if another problem is encountered while doing the import (such as running out of rollback segment space), you should correct the problem and repeat the import.

Export Modes

Exporting operates in full database mode, user mode, and table mode, as follows. Incremental exports on queue tables are not supported.

- Full database mode—Queue tables, all related tables, system-level grants, and primary and secondary object grants are exported automatically.
- User mode—Queue tables, all related tables, and primary object grants are exported automatically.
- Table mode—This mode is not recommended. If you need to export a queue table in table mode, you must export all related objects that belong to that queue table. For example, when exporting an 8.1-compatible multiconsumer queue table `MCQ`, you must also export the following tables:

```
AQ$_<queue_table>_I (the dequeue IOT)
AQ$_<queue_table>_T (the time-management IOT)
AQ$_<queue_table>_S (the subscriber table)
AQ$_<queue_table>_H (the history IOT)
```

Importing Queue Table Data

Similar to exporting queues, importing queues entails importing the underlying queue tables and related dictionary data. After the queue table data is imported, the import utility executes the PL/SQL anonymous blocks in the dump file to write the metadata to the data dictionary.

Importing Queue Tables with Multiple Recipients

A queue table that supports multiple recipients is associated with the following tables:

- A dequeue IOT
- A time-management IOT
- A subscriber table (for 8.1-compatible queue tables)
- A history IOT (for 8.1-compatible queue tables)

These tables must be imported as well as the queue table itself.

Import IGNORE Parameter

You should not import queue data into a queue table that already contains data. The `IGNORE` parameter of the import utility should always be set to `NO` when importing queue tables. If the `IGNORE` parameter is set to `YES`, and the queue table that already exists is compatible with the table definition in the dump file, then the rows will be loaded from the dump file into the existing table. At the same time, the old queue table definition and the old queue definition will be dropped and re-created. Hence, queue table and queue definitions prior to the import will be lost, and duplicate rows will appear in the queue table.

Creating AQ Administrators and Users

Creating a User as an AQ Administrator

To set a user up as an AQ administrator, do the following:

```
CONNECT system/manager
CREATE USER aqadm IDENTIFIED BY aqadm;
GRANT AQ_ADMINISTRATOR_ROLE TO aqadm;
GRANT CONNECT, RESOURCE TO aqadm;
```

Additionally, you can grant execute privilege on the AQ packages as follows:

```
GRANT EXECUTE ON DBMS_AQADM TO aqadm;
GRANT EXECUTE ON DBMS_AQ TO aqadm;
```

This allows the user to execute the procedures in the AQ packages from within a user procedure.

Creating Users AQUSER1 and AQUSER2

If you want to create AQ users who create and access queues within their own schemas, follow the steps outlined in "Creating a User as an AQ Administrator" except do not grant the AQ_ADMINISTRATOR_ROLE.

```
CONNECT system/manager
CREATE USER aquser1 IDENTIFIED BY aquser1;
GRANT CONNECT, RESOURCE TO aquser1;
```

Additionally, you can grant execute privilege on the AQ packages as follows:

```
GRANT EXECUTE ON DBMS_AQADM to aquser1;
GRANT EXECUTE ON DBMS_AQ TO aquser1;
```

If you wish to create an AQ user who does not create queues but uses a queue in another schema, first follow the steps outlined in the previous section. In addition, you must grant object level privileges. However, note that this applies only to queues defined using 8.1 compatible queue tables.

```
CONNECT system/manager
CREATE USER aquser2 IDENTIFIED BY aquser2;
GRANT CONNECT, RESOURCE TO aquser2;
```

Additionally, you can grant execute on the AQ packages as follows:

```
GRANT EXECUTE ON DBMS_AQADM to aquser2;
GRANT EXECUTE ON DBMS_AQ TO aquser2;
```

For aquser2 to access the queue, aquser1_q1 in aquser1 schema, aquser1 must execute the following statements:

```
CONNECT aquser1/aquser1
EXECUTE DBMS_AQADM.GRANT_QUEUE_PRIVILEGE(
  'ENQUEUE','aquser1_q1','aquser2',FALSE);
```

Oracle Enterprise Manager Support

Oracle Enterprise Manager supports most of the administrative functions of Advanced Queuing. AQ functions are found under the Distributed node in the navigation tree of the Enterprise Manager console. Functions available through Enterprise Manager include:

- Using queues as part of the schema manager to view properties
- Creating, starting, stopping, and dropping queues
- Scheduling and unscheduling propagation
- Adding and removing subscribers
- Viewing propagation schedules for all queues in the database
- Viewing errors for all queues in the database
- Viewing the message queue
- Granting and revoking privileges
- Creating, modifying, or removing transformations

Using Advanced Queuing with XA

You must specify "Objects=T" in the xa_open string if you want to use the AQ OCI interface. This forces XA to initialize the client-side cache in Objects mode. You do not need to do this if you plan to use AQ through PL/SQL wrappers from OCI or Pro*C. The LOB memory management concepts from the Pro* documentation are not relevant for AQ raw messages because AQ provides a simple RAW buffer abstraction (although they are stored as LOBs).

When using the AQ navigation option, you must reset the dequeue position by using the `FIRST_MESSAGE` if you want to continue dequeuing between services (such as `xa_start` and `xa_end` boundaries). This is because XA cancels the cursor fetch state after an `xa_end`. If you do not reset, you will get an error message stating that the navigation is used out of sequence (ORA-25237).

Restrictions on Queue Management

See the following topics for restrictions on queue management:

- Collection Types in Message Payloads
- Synonyms on Queue Tables and Queues
- Tablespace Point-in-Time Recovery
- Nonpersistent Queues

Note: Queue names and queue table names are converted to upper case. Mixed case (upper and lower case together) is not supported for queue names and queue table names.

Collection Types in Message Payloads

You cannot construct a message payload using a VARRAY that is not itself contained within an object. You also cannot currently use a NESTED Table even as an embedded object within a message payload. However, you can create an object type that contains one or more VARRAYs, and create a queue table that is founded on this object type.

For example, the following operations are allowed:

```
CREATE TYPE number_varray AS VARRAY(32) OF NUMBER;
CREATE TYPE embedded_varray AS OBJECT (col1 number_varray);
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE(
  queue_table          =>     'QT',
  queue_payload_type    =>     'embedded_varray');
```

Synonyms on Queue Tables and Queues

All AQ PL/SQL calls do not resolve synonyms on queues and queue tables. Although you can create a synonyms, you should not apply the synonym to the AQ interface.

Tablespace Point-in-Time Recovery

AQ currently does not support tablespace point-in-time recovery. Creating a queue table in a tablespace will disable that particular tablespace for point-in-time recovery.

Nonpersistent Queues

Currently you can create nonpersistent queues of `RAW` and `ADT` type.You are limited to sending messages only to subscribers and explicitly specified recipients who are local. Propagation is not supported from nonpersistent queues. When retrieving messages, you cannot use the dequeue call, but must instead employ the asynchronous notification mechanism, registering for the notification by mean of `LNOCISubcriptionRegister`.

Propagation Issues

Propagation makes use of the system queue `aq$_prop_notify_X`, where `X` is the instance number of the instance where the source queue of a schedule resides, for handling propagation run-time events. Messages in this queue are stored in the system table `aq$_prop_table_X`, where `X` is the instance number of the instance where the source queue of a schedule resides.

Caution: The queue `aq$_prop_notify_X` should never be stopped or dropped and the table `aq$_prop_table_X` should never be dropped for propagation to work correctly.

Execute Privileges Required for Propagation

Propagation jobs are owned by SYS, but the propagation occurs in the security context of the queue table owner. Previously propagation jobs were owned by the user scheduling propagation, and propagation occurred in the security context of the user setting up the propagation schedule. The queue table owner must be granted `EXECUTE` privileges on the `DBMS_AQADM` package. Otherwise, the Oracle snapshot processes will not propagate and generate trace files with the error identifier SYS.`DBMS_AQADM` not defined. Private database links owned by the queue table owner can be used for propagation. The user name specified in the connection string must have `EXECUTE` access on the `DBMS_AQ` and `DBMS_AQADM` packages on the remote database.

The Number of Job Queue Processes

The scheduling algorithm places the restriction that at least two job queue processes be available for propagation. If there are nonpropagation-related jobs, then more job queue processes are needed. If heavily loaded conditions (a large number of active schedules, all of which have messages to be propagated) are expected, you should start a larger number of job queue processes and keep in mind the need for nonpropagation jobs as well. In a system that only has propagation jobs, two job queue processes can handle all schedules. However, with more job queue processes, messages are propagated faster. Since one job queue process can propagate messages from multiple schedules, it is not necessary to have the number of job queue processes equal to the number of schedules.

Optimizing Propagation

In setting the number of JOB_QUEUE_PROCESSES, DBAs should be aware that this number is determined by the number of queues from which the messages have to be propagated and the number of destinations (rather than queues) to which messages have to be propagated.

A scheduling algorithm handles propagation. The algorithm optimizes available job queue processes and minimizes the time it takes for a message to show up at a destination after it has been enqueued into the source queue, thereby providing near-OLTP behavior. The algorithm can handle an unlimited number of schedules and various types of failures. While propagation tries to make the optimal use of the available job queue processes, the number of job queue processes to be started also depends on the existence of nonpropagation-related jobs such as replication jobs. Hence, it is important to use the following guidelines to get the best results from the scheduling algorithm.

The scheduling algorithm uses the job queue processes as follows (for this discussion, an active schedule is one that has a valid current window):

- If the number of active schedules is less than half the number of job queue processes, the number of job queue processes acquired corresponds to the number of active schedules.
- If the number of active schedules is more than half the number of job queue processes, after acquiring half the number of job queue processes, multiple active schedules are assigned to an acquired job queue process.
- If the system is overloaded (all schedules are busy propagating), depending on availability, additional job queue processes will be acquired up to one less than the total number of job queue processes.
- If none of the active schedules handled by a process has messages to be propagated, then that job queue process will be released.
- The algorithm performs automatic load balancing by transferring schedules from a heavily loaded process to a lightly load process such that no process is excessively loaded.

Handling Failures in Propagation

The scheduling algorithm also has robust support for handling failures. It may not be able to propagate messages from a queue due to various types of failures. Some of the common reasons include failure of the database link, non-availability of the remote database, non-existence of the remote queue, remote queue not started and security violation while trying to enqueue messages into the remote queue. Under all these circumstances the appropriate error messages will be reported in the DBA_QUEUE_SCHEDULES view. When an error occurs in a schedule, propagation of messages in that schedule is attempted periodically using an exponential backoff algorithm for a maximum of 16 times, after which the schedule is disabled. If the problem causing the error is fixed and the schedule is enabled, the error fields that indicate the last error date, time, and message will still continue to show the error information. These fields are reset only when messages are successfully propagated in that schedule. During the later stages of the exponential backoff, many hours or even days can elapse between propagation attempts. This happens when an error has been neglected for a long time. Under such circumstances it may be better to unschedule the propagation and schedule it again.

Propagation from Object Queues

Note that AQ does not support propagation from object queues that have BFILE or REF attributes in the payload.

Guidelines for Debugging AQ Propagation Problems

This discussion assumes that you have created queue tables and queues in source and target databases and defined a database link for the destination database. The notation assumes that you will supply the actual name of the entity (without the brackets).

To begin debugging, do the following:

1. Turn on propagation tracing at the highest level using event 24040, level 10.

   Debugging information will be logged to job queue trace files as propagation takes place. You can check the trace file for errors and for statements indicating that messages have been sent.

2. Check the database link to database 2.

   You can do this by doing `select count(*)` from @.

3. Check that the propagation schedule has been created and that a job queue process has been assigned.

   Look for the entry in `dba_queue_schedules` and `aq$_schedules`. Check that it has a '`jobno`' in `aq$_schedules`, and that there is an entry in `job$` or `dbms_jobs` with that jobno.

4. Make sure that at least two job queue processes are running.

5. Check for messages in the source queue with `select count(*) from` where `q_name = '<queue_name>';`
6. Check for messages in the destination queue with the same kind of `select`.
7. Check to see who is using job queue processes.

   Is it possible that the propagation job is being starved of processing time by other jobs?
8. Check to see that `sys.aq$_prop_table_` exists in `dba_queue_tables` and that queue `aq$_prop_notify_` exists in `dba_queues` (used for communication between job queue processes).
9. Check that the consumer attempting to dequeue a message from the destination queue is a recipient of the propagated messages.

   For 8.1-style queues, you can do the following:

```
select consumer_name, deq_txn_id, deq_time, deq_user_id,
  propagated_msgid from aq$
  where queue = '<queue_name>';
```

   For 8.0-style queues, you can obtain the same information from the history column of the queue table:

```
select h.consumer, h.transaction_id, h.deq_time, h.deq_user,
h.propagated_msgid from t, table(t.history) h
where t.q_name = '<queue_name>';
```

   or

```
select consumer, transaction_id, deq_time, deq_user,
propagated_msgid from
the(select cast(history as sys.aq$_dequeue_history_t)
from  where q_name = '<queue_name>');
```

Oracle 8.0-Style Queues

If you use 8.0-style queues and 8.1 or higher database compatibility, the following features are not available:

- Support for Oracle Parallel Server environments
- Asynchronous notification

To use these features, you should migrate to 8.1-style or higher queues.

For more information, see:

- "Security Required for Propagation" on page 4-5
- *Oracle9i Database Migration*

Migrating To and From 8.0

To upgrade a 8.0-style queue table to an 8.1-style queue table or to downgrade a 8.1-style queue table to an 8.0-style queue table, use `DBMS_AQADM.MIGRATE_QUEUE_TABLE`. Table 4–3 lists the parameters for `DBMS_AQADM.MIGRATE_QUEUE_TABLE`.

Syntax

```
DBMS_AQADM.MIGRATE_QUEUE_TABLE(
    queue_table         IN        VARCHAR2,
    compatible          IN        VARCHAR2)
```

Table 4–3 DBMS_AQADM_MIGRATE_QUEUE_TABLE Parameters

Parameter	Description
`queue_table` (`IN VARCHAR2`)	Specifies name of the queue table that is to be migrated.
`compatible`	Set to `8.1` to upgrade an 8.0 queue table to 8.1 compatibility. Set to `8.0` to downgrade an 8.1 queue table to 8.0 compatibility.

Example: Upgrading an 8.0 Queue Table to an 8.1-Compatible Queue Table

---

Note: You may need to set up the following data structures for certain examples to work:

```
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE (
   queue_table            => 'qtable1',
   multiple_consumers     => TRUE,
   queue_payload_type     => 'aq.message_typ',
   compatible             =>'8.0');
```

```
EXECUTE DBMS_AQADM.MIGRATE_QUEUE_TABLE(
```

```
queue_table => 'qtable1',
compatible   => '8.1');
```

Importing and Exporting with 8.0-Style Queues

Because the metadata tables contain rowids of some rows in the queue table, the import and export processes will generate a note about the rowids being obsoleted when importing the metadata tables. This message can be ignored, since the queuing system will automatically correct the obsolete rowids as a part of the import operation. However, if another problem is encountered while doing the import or export (such as running out of rollback segment space), you should correct the problem and repeat the import or export.

Roles in 8.0

Access to AQ operations in Oracle 8.0 is granted to users through roles that provide execution privileges on the AQ procedures. The fact that there is no control at the database object level when using Oracle 8.0 means that, in Oracle 8.0, a user with the AQ_USER_ROLE can enqueue and dequeue to any queue in the system. For finer-grained access control, use 8.1-style queue tables in an 8.1- compatible or higher database.

AQ administrators of an Oracle9*i* or 8.1 database can create queues with 8.0 compatibility; 8.0-style queues are protected by the 8.0-compatible security features.

If you want to use 8.1 security features on a queue originally created in an 8.0 database, the queue table must be converted to 8.1 style by running DBMS_AQADM.MIGRATE_QUEUE_TABLE on the queue table.

> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference* for more information on DBMS_AQADM.MIGRATE_QUEUE_TABLE

If a database downgrade is necessary, all 8.1-style queue tables have to be either converted back to 8.0 compatibility or dropped before the database downgrade can be carried out. During the conversion, all Oracle9*i* or 8.1 security features on the queues, like the object privileges, will be dropped. When a queue is converted to 8.0 compatibility, the 8.0 security model applies to the queue, and only 8.0 security features are supported.

Security with 8.0-Style Queues

Table 4–4 lists the AQ security features and privilege equivalences supported with 8.0-style queues.

Table 4–4 Security with 8.0.x-Style Queues

Privilege	8.0.x-Style Queues in an 8.0.x Database	8.0.x Compatible Queues in a 8.1.x Database
AQ_USER_ROLE	Supported. The grantee is given the execute right of DBMS_AQ through the role.	Supported. The grantee is given the execute right of dbms_aq through the role.
AQ_ADMINISTRATOR_ROLE	Supported.	Supported.
Execute right on DBMS_AQ	Execute right on DBMS_AQ should be granted to developers who write AQ applications in PL/SQL.	Execute right on DBMS_AQ should be granted to developers who write AQ applications in PL/SQL.

Access to AQ Object Types

The procedure grant_type_access was made obsolete in release 8.1.5 for 8.0-style queues.

LNOCI Application Access to 8.0-Style Queues

For an OCI application to access an 8.0-style queue, the session user has to be granted the EXECUTE rights of DBMS_AQ.

Pluggable Tablespaces and 8.0-Style Multiconsumer Queues

A tablespace that contains 8.0-style multiconsumer queue tables should not be transported using the pluggable tablespace mechanism. The mechanism will work, however, with tablespaces that contain only single-consumer queues as well as 8.1 compatible multiconsumer queues. Before you can export a tablespace in pluggable mode, you have to alter the tablespace to read-only mode. If you try to import a read-only tablespace that contains 8.0-style multiconsumer queues, you will get an Oracle error indicating that you cannot update the queue table index at import time.

Autocommit Features in the DBMS_AQADM Package

The autocommit parameters in the CREATE_QUEUE_TABLE, DROP_QUEUE_TABLE, CREATE_QUEUE, DROP_QUEUE, and ALTER_QUEUE calls of the DBMS_AQADM package are deprecated for 8.1.5 and subsequent releases. Oracle continues to support this parameter in the interface for backward compatibility.

5

Performance and Scalability

This chapter discusses the following topics:

- Performance Overview
- Basic Tuning Tips
- Propagation Tuning Tips

Performance Overview

Queues are stored in database tables. The performance characteristics of queue operations are similar to underlying database operations. The code path of an enqueue operation is comparable to `SELECT` and `INSERT` into a multicolumn queue table with three IOTs. The code path of a dequeue operation is comparable to `SELECT, DELETE,` and `UPDATE` operations on similar tables.

Advanced Queuing in the Oracle Real Application Clusters Environment

Oracle Real Application Clusters can be used to ensure highly available access to queue data. The tail and the head of a queue can be extreme hot spots. Since Oracle Real Application Clusters may not scale well in the presence of hot spots, limit normal access to a queue from one instance only. If an instance failure occurs, messages managed by the failed instance can be processed immediately by one of the surviving instances.

Advanced Queuing in a Shared Server Environment

Queue operation scalability is similar to the underlying database operation scalability. If a dequeue operation with wait option is issued in a shared server environment, the shared server process will be dedicated to the dequeue operation for the duration of the call, including the wait time. The presence of many such processes can cause severe performance and scalability problems and can result in deadlocking the shared server processes. For this reason, it is recommended that dequeue requests with wait option be issued using dedicated server processes. This restriction is not enforced.

Basic Tuning Tips

Advanced Queuing table layout should be considered similar to a layout with ordinary database tables and indexes.

> **See Also:** *Oracle9i Database Performance Tuning Guide and Reference* for tuning recommendations

Running Enqueue and Dequeue Processes Concurrently—Single Queue Table

Some environments need to process messages in a constant flow, thus requiring that both enqueue and dequeue processes run concurrently. If the message delivery system has only one queue table and one queue, all processes must work on the same segment area at the same time, which impedes delivering a high number of messages at reasonable performance levels.

The best number for concurrent processes must be defined according to available system resources. For example, on a four-CPU system, it is reasonable to start with two concurrent enqueue and two concurrent dequeue processes. If the optimal number of messages that should be delivered through the system has not been achieved, rather than increasing the number of processes, use several subscribers for load balancing.

Running Enqueue and Dequeue Processes in Serial—Single Queue Table

When enqueue and dequeue processes are not running concurrently, that is, messages are first enqueued and then dequeued, contention on the same data segment is lower than in the case of concurrent processes. In this case, the total time taken to deliver messages by the system is longer than when they run concurrently. Increasing the number of processes helps both enqueuing and dequeuing. The message throughput rate is higher for enqueuers than for dequeuers when the number of processes is increased. Normally, the dequeue operations throughput is much less than the enqueue operation (`INSERT`) throughput because dequeue operations perform `SELECT`, `DELETE`, and `UPDATE`.

Propagation Tuning Tips

Propagation can be considered a special kind of dequeue operation with an additional `INSERT` at the remote (or local) queue table. Propagation from a single schedule is not parallelized across multiple job queue processes. Rather, they are load balanced. For better scalability, configure the number of propagation schedules according to the available system resources (CPUs).

Propagation rates from transactional and nontransactional (default) queue tables vary to some extent because Oracle determines the batching size for nontransactional queues, whereas for transactional queues, batch size is mainly determined by the user application.

6

Frequently Asked Questions

This section answers some of the most commonly asked questions about Advanced Queuing. This chapter discusses questions in the following areas:

- General Questions
- JMS Questions
- Internet Access Questions
- Oracle Internet Directory Questions—Global Agents, Global Events, and Global Queues
- Transformation Questions
- Performance Questions
- Installation Questions

General Questions

How are messages that have been dequeued but are still retained in the queue table accessed?

Access messages using SQL. Messages in the queue table (either because they are being retained or because they have not yet been processed). Each queue has a view that you can use (see "Selecting the Number of Messages in Different States for the Whole Database" on page 10-33).

Message retention means the messages are there, but how does the subscriber access these messages?

Typically we expect the subscriber to access the messages using the dequeue interface. If, however, you would like to see processed or waiting messages, you can either dequeue by message id or use SQL.

Can the sort order be changed after the queue table is created?

You cannot change the sort order for messages after you have created the queue table.

How do I dequeue from an exception queue?

The exception queue for a multiconsumer queue must also be a multiconsumer queue.

Expired messages in multiconsumer queues cannot be dequeued by the intended recipients of the message. However, they can be dequeued in the REMOVE mode once (only once) using a `NULL` consumer name in dequeue options. Messages can also be dequeued from an exception queue by specifying the message ID.

Expired messages can be dequeued only by specifying message ID if the multiconsumer exception queue was created in a queue table without the compatible parameter or with the compatible parameter set to '8.0'

What does the latency parameter mean in scheduling propagation?

If a latency less than 0 was specified in the propagation schedule, the job is rescheduled to run after the specified latency. The time at which the job actually runs depends on other factors, such as the number of ready jobs and the number of `job_queue_processes.` It may also be affected by the value for `job_queue_interval.` Please refer to the MANAGING JOB QUEUES chapter of the Oracle9i Database Administrator's Guide for more information on job queues and SNP background processes.

How can I control the tablespaces in which the queue tables are created?

You can pick a tablespace for storing the queue table and all its ancillary objects using the `storage_clause` parameter in `DBMS_AQADM.CREATE_QUEUE_TABLE.` However, once you pick the tablespace, all IOTs and indexes created for that queue table will go to the specified tablespace. Currently, you do not have a choice to split them between different tablespaces.

How do you associate Oracle Parallel Server instance affinities with queue tables?

In 8.1 you can associate OPS instance affinities with queue tables. If you are using `q1` and `q2` in different instances, you can use `alter_queue_table` (or even create queue table) on the queue table and set the `primary_instance` to the appropriate `instance_id.`

Can you give me some examples of a subscriber rule containing - message properties - message data properties.

Yes, here is a simple rule that specifies message properties - rule = 'priority 1'; here are example rules that specify a combination of message properties and data attributes: rule = `'priority 1 AND tab.userdata.sal 1000' rule =` `'`((priority between 0 AND 3) OR correlation = `’BACK_ORDERS')` AND `tab.userdata.customer_name` like ''JOHN DOE'')'

Note that user data properties or attributes apply only to object payloads and must be prefixed with tab.userdata in all cases. Check documentation for more examples.

Is registration for notification (OCI) the same as starting a listener?

No. Registration is an OCI client call to be used for asynchronous notifications (that is, push). It provides a notification from the server to the client when a message is available for dequeue. A client side function (callback) is invoked by the server when the message is available. Registration for notification is both nonblocking and nonpolling.

What is the use of non-persistent queues?

To provide a mechanism for notification to all users that are currently connected. The non-persistent queue mechanism supports the enqueue of a message to a non-persistent queue and OCI notifications are used to deliver such messages to users that are currently registered for notification.

Is there a limit on the length of a recipient list? Or on the number of subscribers for a particular queue?

Yes, 1024 subscribers or recipients for any queue.

How can I clean out a queue with UNDELIVERABLE messages?

You can dequeue these messages by `msgid.` You can find the `msgid` by querying the queue table view. Eventually the messages are moved to the exception queue (you must have the AQ background process running for this to happen). You can dequeue these messages from the exception queue with a normal dequeue.

Is it possible to update the message payload after it has been enqueued?

Only by dequeuing and enqueuing the message again. If you are changing the message payload, it is a different message.

Can asynchronous notification be used to invoke an executable every time there is a new message?

Notification is possible only to OCI clients. The client does not have to be connected to the database to receive notifications. The client specifies a callback function which will be executed for each message. Asynchronous Notification cannot be used to invoke an executable, but it is possible for the callback function to invoke a stored procedure.

Does propagation work from multiconsumer queues to single-consumer queues and vice versa?

Propagation from a multiconsumer queue to a single consumer queue is possible. The reverse is not possible (propagation is not possible from a single consumer queue).

Why do I sometimes get ORA-1555 error on dequeue?

You are probably using the `NEXT_MESSAGE` navigation option for dequeue. This uses the snapshot created during the first dequeue call. After that the other dequeue calls generate more undo which fills up the rollback segment and hence generates 1555.

The workaround is to use the `FIRST_MESSAGE` option to dequeue the message. This will reexecute the cursor and get a new snapshot. This might not perform as well, so we suggest you dequeue them in batches: `FIRST_MESSAGE` for one, and `NEXT_MESSAGE` for the next, say, 1000 messages, and then `FIRST_MESSAGE` again, and so on.

What are the different subscriber types recorded on the subscriber table?

The `subscriber_types` and their values are:

1 - Current Subscriber. The subscribers name, address and protocol are in the same row.

2 - Ex subscriber - A subscriber that unsubscribed but had agent entries in the history `aq$_queuetable_h IOT.`

4 - Address - Used to store addresses of recipients. The name is always `NULL.` The address is always non-NULL.

8 - Proxy for Propagation - The name is always `NULL.`

database proxy to local queues, address=`NULL,` protocol=0

database proxy to remote queues, address=dblink address, protocol=0

3rd party proxies, address = `NULL,` protocol = 3rd party protocol.

After a message has been moved to an exception queue, is there a way, using SQL or otherwise, of identifying which queue the message resided in before moving to the exception queue?

No, AQ does not provide this information. To get around this, the application could save this information in the message.

What is the order in which messages are dequeued if many messages are enqueued in the same second?

When the `enq_time` is the same for messages, there is another field called step_no that will be monotonically increasing (for each message that has the same `enq_time).` Hence this helps in maintaining the order of the messages. There will be no situation when both `enq_time` and `step_no` are the same for more than one message enqueued from the same session.

What happened to OMB? When should we use AQ and when should we use Oracle MessageBroker?

In Oracle9i, OMB functionality is provided in the Oracle database. So, if you are using the Oracle9i database, use the functionality offered by the database.

You do not need OMB.

With Oracle8i, use OMB in the following scenarios:

- To integrate with MQ Series
- To use HTTP framework

Use JMS functionality directly from the database in other scenarios.

Can I use AQ with Virtual Private Database?

Yes, you can specify a security policy with AQ queue tables. While dequeuing, use the dequeue condition (`deq_cond`) or the correlation ID for the policy to be applied. You can use "1=1" as the dequeue condition. If you do not use a dequeue condition or correlation ID, the dequeue will result in an error.

How do I clean up my retained messages?

The Advanced Queuing retention feature can be used to automatically clean up messages after the user-specified duration after consumption.

I have an application in which I inserted the messages for the wrong subscriber. How do I clean up those messages?

You can do a dequeue with the subscriber name or by message ID. This consumes the messages, which will be cleaned up after their retention time expires.

I'm running propagation between multiple Oracle databases. For some reason, one of the destination databases has gone down for an extended duration. How do I clean up messages for that destination?

To clean up messages for a particular subscriber, you can remove the subscriber and add the subscriber again. Removing the subscriber removes all the messages for that subscriber.

Messaging Gateway Questions

Where is the Messaging Gateway log file?

By default, the Messaging Gateway log file is in the `$ORACLE_HOME/mgw/log` directory. The location can be overridden by the `log_directory` parameter of the `mgw.ora` file. A new log file is created each time the MGW agent starts. The format of the log file name is `"oramgw-hostname-timestamp-processid.log"`.

How do I interpret exception messages in a Messaging Gateway log file?

The exception messages logged to the MGW log file may include one or more linked exceptions (`[Linked-exception]`), which are helpful in determining the problem. A `java.sql.SQLException` may include an Oracle error message and possibly a PL/SQL stack trace.

The following example shows entries from a MGW log file when an invalid value (`'bad_service_name'`) was specified for the database parameter of `dbms_` mgwadm.db_connect_info. This resulted in the MGW agent being unable to establish database connections.

```
>>2002-01-15 15:45:12  MGW  AdminMgr  0 LOG
Connecting to database using connect string = jdbc:oracle:oci8:@BAD_SERVICE_NAME
>>2002-01-15 15:45:15  MGW  Engine  0 3
Agent is shutdown.
oracle.mgw.admin.MgwAdminException: [241]  Failed to connect to database. SQL
error: 12154, connect string: jdbc:oracle:oci8:@BAD_SERVICE_NAME
[…Java stack trace here…]

[Linked-exception]
java.sql.SQLException: ORA-12154: TNS:could not resolve service name
[…Java stack trace here…]
```

How do I know if the Messaging Gateway agent is running?

Use the MGW_GATEWAY view to show gateway status information. The AGENT_STATUS and AGENT_PING fields indicate the current agent status and whether it is active and responsive to pings. AGENT_STATUS progresses through the following values when the MGW agent is started:

1. NOT_STARTED
2. START_SCHEDULED
3. STARTING
4. INITIALIZING
5. RUNNING

Will the Messaging Gateway agent automatically restart if the database shuts down or crashes while the agent is running?

The MGW agent may or may not automatically restart after a database shutdown or crash. The MGW agent should always be shut down before shutting down the database. If the MGW agent is running when a database SHUTDOWN NORMAL is done, the database will not shut down due to the database connections held by the MGW agent. For IMMEDIATE or ABORT the agent will not restart if the agent has time to exit normally; otherwise the agent will restart the next time the database is started.

Why does the database not shut down when the Messaging Gateway agent is running?

The MGW agent establishes connections with the database and those connections prevent the database from shutting down for a `SHUTDOWN NORMAL` command. Call `dbms_mgwadm.shutdown` to shut down the MGW agent before shutting down the database.

Why does MGW_GATEWAY view always show an AGENT_STATUS of START_SCHEDULED?

Messaging Gateway uses job queues in the Oracle database to start the MGW agent process. At least one job queue process must be configured to execute queued jobs in the background. The gateway job is scheduled to execute immediately, but will not do so until a job queue process is available. If the gateway status remains `START_SCHEDULED` for an extended period of time, it may indicate that the database instance has been started with no or too few job queue processes. The Messaging Gateway holds its job queue process for the lifetime of that MGW agent session.

You should verify that the database instances have been started, with enough job queue processes so one is available for use by Messaging Gateway. A minimum value of 2 is recommended.

`init.ora` parameters:

`JOB_QUEUE_PROCESSES` specifies the number of job queue processes for each instance.

Dynamic parameters:

```
ALTER SYSTEM SET JOB_QUEUE_PROCESSES = <number>;
```

After starting the Messaging Gateway agent, why does the MGW_GATEWAY view show an AGENT_STATUS of NOT_STARTED?

The `MGW_GATEWAY` view provides status information about the gateway agent. A `NOT_STARTED` status indicates that the agent is not running. If the MGW agent encounters a fatal error while starting or running, the `LAST_ERROR_MSG` field is nonnull.

Do the following:

1. Check if a MGW log file has been generated and whether it indicates any errors. If a log file is not present, the gateway agent process was probably not started.
2. Verify that the listener has been started.

3. Verify that the values specified in `tnsnames.ora` and `listener.ora` are correct. Incorrect or mismatched values will prevent the listener from starting the MGW agent. process.
4. Verify that the values specified in `mgw.ora` are correct. Incorrect values may cause the MGW agent to terminate due to abnormal error conditions.
5. Correct the problem indicated by the error and start the MGW agent.

What if the MGW_GATEWAY view shows LAST_ERROR_MSG of "ORA-28575: unable to open RPC connection to external procedure agent?"

- Verify that the listener has been started. If `listener.ora` has been modified, the listener must be stopped and restarted before the changes will take effect.
- `tnsnames.ora` must have a net service name entry named `MGW_AGENT`. This entry is not needed for Messaging Gateway on Windows NT.
- The SID value specified for `CONNECT_DATA` of the `MGW_AGENT` net service name in `tnsnames.ora` must match the `SID_NAME` value of the `SID_DESC` entry in `listener.ora`.
- If the `MGW_AGENT` net service name is set up for an IPC connection, the `KEY` values for `ADDRESS` in `tnsnames.ora` and `listener.ora` must match.
- Verify that other values in `tnsnames.ora` or `listener.ora` are correct.

What if MGW_GATEWAY view shows LAST_ERROR_MSG of "ORA-32830: result code <value> returned by Messaging Gateway agent?"

The result code may be one of the following:

`-1`...An error occurred starting the Java Virtual Machine (JVM). Check the MGW log file for an entry that contains one of the following lines.

- `Can’t create Java VM`

  Verify that the Java version you are using is correct. Verify that your operating system version and patch level are sufficient for the JDK version. Verify that you are using a reasonable value for the JVM heap size. The heap size is specified by the `max_memory` parameter of `dbms_mgwadm.alter_agent`.

- `Can't find class oracle.mgw.engine.Agent`

  Verify that the `CLASSPATH` set in `mgw.ora` contains `mgw.jar`. For example:

```
set CLASSPATH=<ORACLE_HOME>/mgw/classes/mgw.jar
```

`-2`...An error occurred reading `mgw.ora`. Verify that the file is readable.

`-3`...An error occurred creating the MGW log file. Verify that the log directory is writeable. The default location is `<ORACLE_HOME>/mgw/log`.

`-100`...The MGW agent JVM encountered a runtime exception or error on startup.

`-101`...The MGW agent shut down due to a fatal error. Check the MGW log file.

Why does the Messaging Gateway log file show "ORA-01034: ORACLE not available" when attempting to start Messaging Gateway agent?

This error may indicate that the database has not been started or that the environment used by the Messaging Gateway agent to connect to the database is not correct.

Example 1

If the MGW log file shows the following two Oracle errors

- `ORA-01034: ORACLE not available`
- `ORA-27101: shared memory realm does not exist`

then the gateway agent is attempting to connect to the database using a local IPC connection, but the `ORACLE_SID` value is not correct.

A local connection is used when `dbms_mgwadm.db_connect_info` is called with a `NULL` value for the database parameter. If a local connection is desired, the correct `ORACLE_SID` value must be set in the MGW agent process. This can be done by adding the following line to `mgw.ora`.

```
set ORACLE_SID = <sid_value>
```

Note that `ORACLE_SID` need not be set if `dbms_mgwadm.db_connect_info` is called with a nonnull value for the database parameter. In this case the value should specify a net service name from `tnsnames.ora`.

Can I use an AQ single consumer queue as a propagation source?

No, only an AQ multi-consumer queue can be used as a propagation source queue.

When is a Messaging Gateway subscriber flagged as DELETE_PENDING removed?

An MGW subscriber will be flagged as `DELETE_PENDING` when `dbms_mgwadm.remove_subscriber` is called to remove the subscriber in a nonforced manner and either the MGW agent is not running or the agent is running but unable to perform all necessary clean up action at that time.

The MGW agent tries to remove a `DELETE_PENDING` subscriber:

1. Each time `dbms_mgwadm.remove_subscriber` is called and the agent is running.
2. Each time the MGW agent is started and it finds a `DELETE_PENDING` subscriber.

What is the maximum message size for AQ queues with RAW payload?

For AQ queues with `RAW` payload, the MGW agent can propagate messages of 32512 bytes or less. If the message size is larger than 32512 bytes, an error occurs when the agent attempts to enqueue or dequeue the message.

Which instance of Oracle Real Application Clusters is used for the Messaging Gateway agent?

The `DBMS_MGWADM.STARTUP` procedure submits a job queue job that starts the MGW agent external process when the job is executed. The instance and force can be used to control the job and instance affinity. By default the job is set up so that it can be run by any instance.

Propagation Questions

How can I control when message propagation occurs?

The MGW agent propagates messages when a propagation subscriber and schedule are configured for the same source queue, destination queue, and propagation type. You can control when propagation occurs by using `dbms_mgwadm.enable_propagation_schedule` and `dbms_mgwadm.disable_propagation_schedule`. By default, the propagation schedule is enabled when it is first created.

To create a propagation job that is initially disabled, call the following APIs in the indicated order:

1. `dbms_mgwadm.schedule_propagation`
2. `dbms_mgwadm.disable_propagation_schedule`
3. `dbms_mgwadm.add_subscriber`

In release 9.2, the propagation schedule window parameters are not used.

How do I tell if messages are being propagated or moved to the exception queue?

The `PROPAGATED_MSGS` field of the `MGW_SUBSCRIBERS` view indicates how many messages have been successfully propagated. The `EXCEPTIONQ_MSGS` field indicates how many messages have been moved to the exception queue. Both these fields are reset to zero when the MGW agent is started.

When are messages moved to the propagation job exception queue?

If a MGW subscriber has been configured with an exception queue, the MGW agent will move messages to that exception queue the first time the MGW agent encounters a propagation failure due to a message conversion failure. A message conversion failure is indicated by `oracle.mgw.common.MessageException` in the MGW log file.

How do I recover from a message conversion failure? How do I continue processing when oracle.mgw.common.MessageException occurs?

If a message conversion failure occurs, `oracle.mgw.common.MessageException` is be logged to the MGW log file. If this occurs, the MGW agent probably cannot propagate the message causing the failure, and the propagation job will eventually be disabled.

If the log file indicates that the failure is due to an exception being raised in a transformation function used for an AQ dequeue (outbound propagation) or AQ enqueue (inbound propagation), verify that the transformation function is correct.

The MGW subscriber can be configured with a propagation exception queue. If a message conversion failure occurs, the MGW agent moves that message to the exception queue and then continues processing the propagation job.

How do I recover a failed propagation job?

If a propagation job runs into failures during processing, the MGW agent retries up to 16 times in an exponential backoff scheme before disabling the job.

To recover from a failed propagation job, do the following:

1. Look at the MGW log file to determine the nature of the failure and correct the problem. For a message conversion failure, the MGW subscriber may need to be configured with an exception queue.
2. Call `dbms_mgwadm.reset_subscriber` to reset the subscriber state. The MGW agent will attempt to recover the failed job and retry the propagation.

Why are messages moved to the default AQ exception queue upon propagation failures for an outbound propagation job?

The MAX_RETRIES parameter of AQ queues controls when AQ moves messages to an AQ exception queue for a failed dequeue attempt. The default value is NULL, which resolves to the value 5 in Oracle 9i.

If the parameter value is too small, messages in the queues can be moved into AQ exception queues if the MGW agent keeps running into failures when processing MGW subscribers. The AQ messages moved to AQ exception queues cause unrecoverable failures on the associated MGW subscribers. The MAX_RETRIES parameter for AQ queues that are used as a propagation source should be set to at least 16, and preferably a much larger value.

Transformation Questions

How do I use transformations?

An MGW subscriber can be configured with a transformation to use during an AQ dequeue for outbound propagation or an AQ enqueue for inbound propagation.

Do the following:

1. Create the transformation function.
2. Grant EXECUTE to the MGW agent user or to PUBLIC on the function and the object types it references.
3. Call dbms_transform.create_transformation to register the transformation.
4. Call dbms_mgwadm.add_subscriber to create a MGW subscriber using the transformation, or dbms_mgwadm.alter_subscriber to alter an existing subscriber.

The value passed in the transformation parameter for these APIs must be the registered transformation name and not the function name.

What happens if a transformation raises an exception?

If a transformation function raises an exception, a message conversion failure occurs and will be indicated by an oracle.mgw.common.MessageException in the MGW log file.

What transformation exceptions might I see in a Messaging Gateway log file?

The exception messages logged to the MGW log file often include a linked exception that provides additional information. If the linked exception is a `java.sql.SQLException`, it may include an Oracle error message and possibly a PL/SQL stack trace.

ORA-25229 is typically thrown by AQ when the transformation function raises a PL/SQL exception or some other Oracle error occurs when attempting to use the transformation.

Example 1

```
Errors occured during processing of subscriber SUB_MQ2AQ_2
oracle.mgw.common.GatewayException: [722]  Message transformation failed; queue:
MGWUSER.DESTQ_SIMPLEADT, transform:
MGWUSER.MGW_BASIC_MSG_TO_SIMPLEADT
[…Java stack trace here…]
[Linked-exception]
oracle.mgw.common.MessageException: [722]  Message transformation failed; queue:
MGWUSER.DESTQ_SIMPLEADT, transform:
MGWUSER.MGW_BASIC_MSG_TO_SIMPLEADT
[…Java stack trace here…]
[Linked-exception]
java.sql.SQLException: ORA-25229: error on transformation of message msgid:
9749DB80C85B0BD4E03408002086745E
ORA-00604: error occurred at recursive SQL level 1
ORA-00904: invalid column name
[…Java stack trace here…]
```

Possible causes of transformation exceptions include:

1. The MGW agent user may not have `EXECUTE` privilege on the transformation function. It is not sufficient to grant `EXECUTE` to `MGW_AGENT_ROLE` and then grant `MGW_AGENT_ROLE` to the agent user. `EXECUTE` privilege on the transformation function must be granted directly to the agent user or to `PUBLIC`.
2. The transformation function may not exist, even though the registered transformation does. If the transformation function does not exist, it must be re-created.
3. The MGW agent user may not have `EXECUTE` privilege on the payload object type for the queue indicated in the exception. It is not sufficient to grant `EXECUTE` to `MGW_AGENT_ROLE` and then grant `MGW_AGENT_ROLE` to the agent

user. EXECUTE privilege on the object type must be granted directly to the agent user or to PUBLIC.

Example 2

```
Errors occured during processing of subscriber SUB_AQ2MQ_2
oracle.mgw.common.GatewayException: [703]  Failed to retrieve information for
transformation mgwuser.SAMPLEADT_TO_MGW_BASIC_MSG
[…Java stack trace here…]
```

The transformation indicated in the exception may not exist. Note that the transformation parameter of dbms_mgwadm.add_subscriber specifies the name of the registered transformation and not the name of the transformation function.

Example 3

```
Errors occured during processing of subscriber SUB_AQ2MQ_2
oracle.mgw.common.GatewayException: [703]  Failed to retrieve information for
transformation mgwuser.SAMPLEADT_TO_MGW_BASIC_MSG
[…Java stack trace here…]

[Linked-exception]
java.sql.SQLException: "from_type" is null
[…Java stack trace here…]
```

The MGW agent user may not have EXECUTE privilege on the object type used for the from_type of the transformation indicated in the exception. It is not sufficient to grant EXECUTE to MGW_AGENT_ROLE and then grant MGW_AGENT_ROLE to the agent user. EXECUTE privilege on the object type must be granted directly to the agent user or to PUBLIC.

Example 4

```
Errors occured during processing of subscriber SUB_AQ2MQ_2
oracle.mgw.common.GatewayException: [703]  Failed to retrieve information for
transformation mgwuser.SAMPLEADT_TO_MGW_BASIC_MSG
[…Java stack trace here…]

[Linked-exception]
java.sql.SQLException: "to_type" is null
[…Java stack trace here…]
```

The MGW agent user may not have EXECUTE privilege on the object type used for the to_type of the transformation indicated in the exception. It is not sufficient to grant EXECUTE to MGW_AGENT_ROLE and then grant MGW_AGENT_ROLE to the agent user. EXECUTE privilege on the object type must be granted directly to the agent user or to PUBLIC.

JMS Questions

Why do the JMS dbms_aqadm.add_subscriber and dbms_aqadm.remove_subscriber calls sometimes hang when there are concurrent enqueues or dequeues happening on the same queue to which these calls are issued?

Add_subscriber and remove_subscriber are administrative operations on a queue. Though AQ does not prevent applications from issuing administrative and operational calls concurrently, they are executed serially. Both add_subscriber and remove_subscriber will block until pending transactions that have enqueued or dequeued messages commit and release the resources they hold. It is expected that adding and removing subscribers will not be a frequent event. It will mostly be part of the setup for the application. The behavior you observe will be acceptable in most cases. The solution is to try to isolate the calls to add_subscriber and remove_subscriber at the setup or cleanup phase when there are no other operations happening on the queue. That will make sure that they will not stay blocked waiting for operational calls to release resources.

Why do the TopicSession.createDurableSubscriber and TopicSession.unubscribe calls raise JMSException with the message "ORA - 4020 - deadlock detected while trying to lock object"?

CreateDurableSubscriber and unsubscribe calls require exclusive access to the Topics. If there are pending JMS operations (send / publish / receive) on the same Topic before these calls are issued, the ORA - 4020 exception is raised.

There are two solutions to the problem:

1. Try to isolate the calls to createDurableSubscriber and unsubscribe at the setup or cleanup phase when there are no other JMS operations happening on the Topic. That will make sure that the required resources are not held by other JMS operational calls. Hence the error ORA - 4020 will not be raised.
2. Issue a TopicSession.commit call before calling createDurableSubscriber and unsubscribe call.

Why doesn't AQ_ADMINISTRATOR_ROLE or AQ_USER_ROLE always work for AQ applications using Java/JMS API?

In addition to granting the roles, you would also need to grant execute to the user on the following packages:

- grant execute on `sys.dbms_aqin` to `<userid>`
- grant execute on `sys.dbms_aqjms` to `<userid>`

Why do I get java.security.AccessControlException when using JMS MessageListeners from Java stored procedures inside Oracle8*i* JServer?

To use MessageListeners inside Oracle8*i* JServer, you can do one for the following

1. `GRANT JAVASYSPRIV` to `<userid>`

Call `dbms_java.grant_permission ('JAVASYSPRIV', 'SYS:java.net.SocketPermission', '*', 'accept,connect,listen,resolve');`

Internet Access Questions

What is IDAP?

IDAP is Internet Data Access Presentation. IDAP defines the message structure for the body of a SOAP request. An IDAP message encapsulates the AQ request and response in XML. IDAP is used to perform AQ operations such as enqueue, dequeue, send notifications, register for notifications, and propagation over the Internet standard transports—HTTP(s) and e-mail. In addition, IDAP encapsulates transactions, security, transformation, and the character set ID for requests.

Which Web servers are supported for AQ Internet access functionality? Do I have to use Apache or can I use any Web server? Which servlet engines are supported for AQ Internet access? Can I use Tomcat?

Internet access functionality for AQ is supported on Apache. This feature is certified to work with Apache, along with the Tomcat or Jserv servlet execution engines. However, the code does not prevent the servlet from working with other Web server and servlet execution engines that support Java Servlet 2.0 or higher interfaces.

How do I get transactional behavior while using e-mail for AQ operations?

When you send IDAP messages through SMTP, each request is a separate transaction. The IDAP request must contain `<AQXmlCommit/>` as part of the message request to ensure that the operation is committed.

How does an Internet agent tie to an AQ agent stored in Oracle Internet Directory?

You can create an alias to an AQ agent in Oracle Internet Directory (OID). You can use these AQ agent aliases in the IDAP document sent over the Internet to perform AQ operations. Using aliases prevents exposing the internal name of the AQ agent.

Can I use my own authentication framework for authentication?

Yes, you can use your own authentication framework for authentication. HTTP `POST` requests to the AQ Servlet for AQ operations must be authenticated by the Web server. For example, in Apache, the following can be used to restrict access (using basic authentication) to servlets installed under aqserv/servlet. In this example, all users sending `POST` requests to the servlet are authenticated using the users file in `/apache/htdocs/userdb`.

```
<Location /aqserv/servlet>
    <Limit POST>
            AuthName "Restrict AQ Servlet Access"
            AuthType Basic
            AuthUserFile /apache/htdocs/userdb/users
            require valid-user
    </Limit>
</Location>
```

Oracle Internet Directory Questions—Global Agents, Global Events, and Global Queues

Which events can be registered in Oracle Internet Directory (OID)?

All types of events—system events, user events, and notifications on queues—can be registered with OID. System events are database startup, database shutdown, and system error events. User events include user log on and user log off, DDL statements (create, drop, alter), and DML statement triggers. Notifications on queues include OCI notifications, PL/SQL notifications, and e-mail notifications.

How do I use agent information stored in an OID?

You can create aliases for an AQ agent in OID. These aliases can be specified while performing AQ operations-enqueue, dequeue, and notifications. This is specifically useful while performing AQ operations over the Internet when you do not want to expose an internal agent name. An alias can be used in an AQ operation (IDAP request).

Transformation Questions

What happens to enqueue, dequeue, or propagation if the transformation mapping raises an error?

Enqueue and dequeue of the message will raise the error to the application. If the error occurs during the dequeue operation, the retry count of the message is incremented. If the retry count exceeds `max_retries,` the message is moved to the exception queue. If the error occurs during propagation, it is handled in a manner similar to dequeue; propagation of the message will fail. It will be attempted again and the message will be moved to the exception queue when retry count exceeds `max_retries` for the queue.

How do you do transformation of XML data?

Transformation of XML data can be done in one of the following ways:

- Using the extract operator supported on `XMLType` to return an object of `XMLType` after applying the supplied `XPath` expression.
- Creating a PL/SQL function that transforms the `XMLType` object by applying an XSLT transformation to it, using the package `XSLPROCESSOR.`

Performance Questions

What is the maximum number of queues that a table can have without affecting performance?

Performance is not affected by the number of queues in a table.

When messages are moved from one queue to another using propagation, is there any optimization to move the messages in batches, rather than one at a time?

Yes, if it is optimized, propagation happens in batches.

If the remote queue is in a different database, we use a sequencing algorithm to avoid the need for a two-phase commit.

When a message needs to be sent to multiple queues in the same destination, it is sent multiple times. If the message needs to be sent to multiple consumers in the same queue at the destination, it is sent only once.

When is it useful to create indexes on a queue table? How do I create them?

Creating an index on the queue table is useful in the following scenarios:

a. Dequeuing using correlation ID: To expedite dequeue, an index can be created on the column `corr_id` of the underlying queue table `AQ$_<QueueTableName>.`

b. Dequeue using a condition: Assume this condition to the where-clause for the `SELECT` on the underlying queue table. An index on `<QueueTableName>` can be created to expedite the performance this `SELECT` statement.

What is the performance of Java (JMS) versus the PL/SQL API for AQ?

We do not have a specific performance evaluation of JMS versus the PL/SQL API. In general, the PL/SQL API is slightly better than the JMS API. The performance of the JMS and PL/SQL APIs in version 8.1.7 and higher should be comparable.

Installation Questions

How do I set up Internet access for AQ? What components are required?

See Chapter 17 for a full discussion. The following summarizes the steps required to set up Internet access for AQ queues:

1. Set up the AQ Servlet: If you are using a servlet execution engine that supports the Java Servlet 2.2 specification (such as Tomcat), you must create a servlet that extends the `oracle.AQ.xml.AQxmlServlet` class. If you are using a servlet execution engine that supports the Java Servlet 2.0 specification (like Apache Jserv), you must create a servlet that extends the `oracle.AQ.xml.AQxmlServlet20` class. Implement the `init()` method in the servlet to specify database connection parameters.

2. Set up user authentication: Configure the Web server to authenticate all the users that send `POST` requests to the AQ Servlet. Only authenticated users are allowed to access the AQ Servlet.
3. Set up user authorization: Register the AQ agent name that will be used to perform AQ operations using `DBMS_AQADM.CREATE_AQ_AGENT.` Map the AQ agent to the database users using `DBMS_AQADM.ENABLE_DB_ACCESS.`
4. Now clients can write SOAP requests and send them to the AQ Servlet using HTTP `POST.`

How do I set up e-mail notifications?

Here are the steps for setting up your database for e-mail notifications:

1. Set the SMTP mail host: Invoke `DBMS_AQELM.SET_MAILHOST` as an AQ administrator.
2. Set the SMTP mail port: Invoke `DBMS_AQELM.SET_MAILPORT` as an AQ administrator. If not explicit, set defaults to 25.
3. Set the SendFrom address: Invoke `DBMS_AQELM.SET_SENDFROM`.
4. After setup, you can register for e-mail notifications using the OCI or PL/SQL API.

How do I perform AQ operations using e-mail?

See Chapter 17 for a full discussion. Currently, these operations are supported by Oracle Email Server 5.5 and higher. In summary, follow the steps for setting up Internet access for AQ. In addition, do the following:

1. Create an AQ Internet agent to access the servlet using SMTP. This agent's digital certificate should be registered in LDAP. The certificate location must be specified when the agent is registered using the `DBMS_AQADM.CREATE_AQ_AGENT` procedure.
2. Set up the Web server: Configure the Web server to receive requests from a user called `ORACLE_SMTP_AGENT.` This user will be used to access the AQ Servlet. Also specify `setEmailServerAddr` or `setEmailServerHost` in the `init()` method of the AQ Servlet.
3. Set up Oracle Email Server:
   a. Run `$ORACLE_HOME/admin/emailrule.sql` to create an AQ schema on the e-mail server database.

b. Create an e-mail account for the destination database in which the AQ operations are to be performed.

c. Set up an e-mail rule for the destination database, so that it can route the AQ requests to the AQ Servlet on the web server. This can be done using the `DBMS_AQST.REGISTER_DB` procedure.

4. Now clients can write IDAP requests and send to the AQ Servlet using e-mail.

How do I set up AQ propagation over the Internet?

See Chapter 17 for a full discussion. In summary, follow the steps for setting up Internet access for AQ. The destination databases need to be set up for Internet access, as follows:

1. At the source database, create the dblink with protocol as http, and host and port of the Web server running the AQ Servlet with the username password for authentication with the Web server / servlet runner. For example, if the Web server is running on machine `webdest.oracle.com` and listening for requests on port 8081, then the connect string of the database is `(DESCRIPTION=(ADDRESS=(PROTOCOL=http)(HOST=webdest.oracle.com)(PORT=8081))` If SSL is used, specify https as the protocol in the connect string. The database link is created as follows: `create public database link propdb connect to john identified by welcome using '(DESCRIPTION=(ADDRESS=(PROTOCOL=http)(HOST=webdest.oracle.com)(PORT=8081))';` where user `John` with password `Welcome` is used to authenticate with the Web server, and is also known by the term AQ HTTP agent.

2. If SSL is used, create an Oracle wallet and specify the wallet path at the source database `execute dbms_aqadm.set_aq_propagationwallet('/home/myuid/cwallet.sso', 'welcome');`

3. Deploy the AQ Servlet at the destination database: Create a class `AQPropServlet` that extends `oracle.AQ.xml.AQxmlServlet20` (if you are using a Servlet 2.0 execution engine like Apache Jserv) or extends `oracle.AQ.xml.AQxmlServlet` (if you are using a Servlet 2.2 execution engine like Tomcat). This servlet must connect to the destination database. The servlet must be deployed on the Web server in the path `aqserv/servlet.`

NOTE: In Oracle9*i*, the propagation servlet name and deployment path are fixed, that is, they must be AQPropServlet and the aqserv/servlet respectively.

---

4. At the destination database: Set up the authorization and authentication for the Internet user performing propagation, in this case, `John.`
5. Start propagation at the source site by calling `dbms_aqadm.schedule_propagation('src_queue', 'propdb').`

7

Modeling and Design

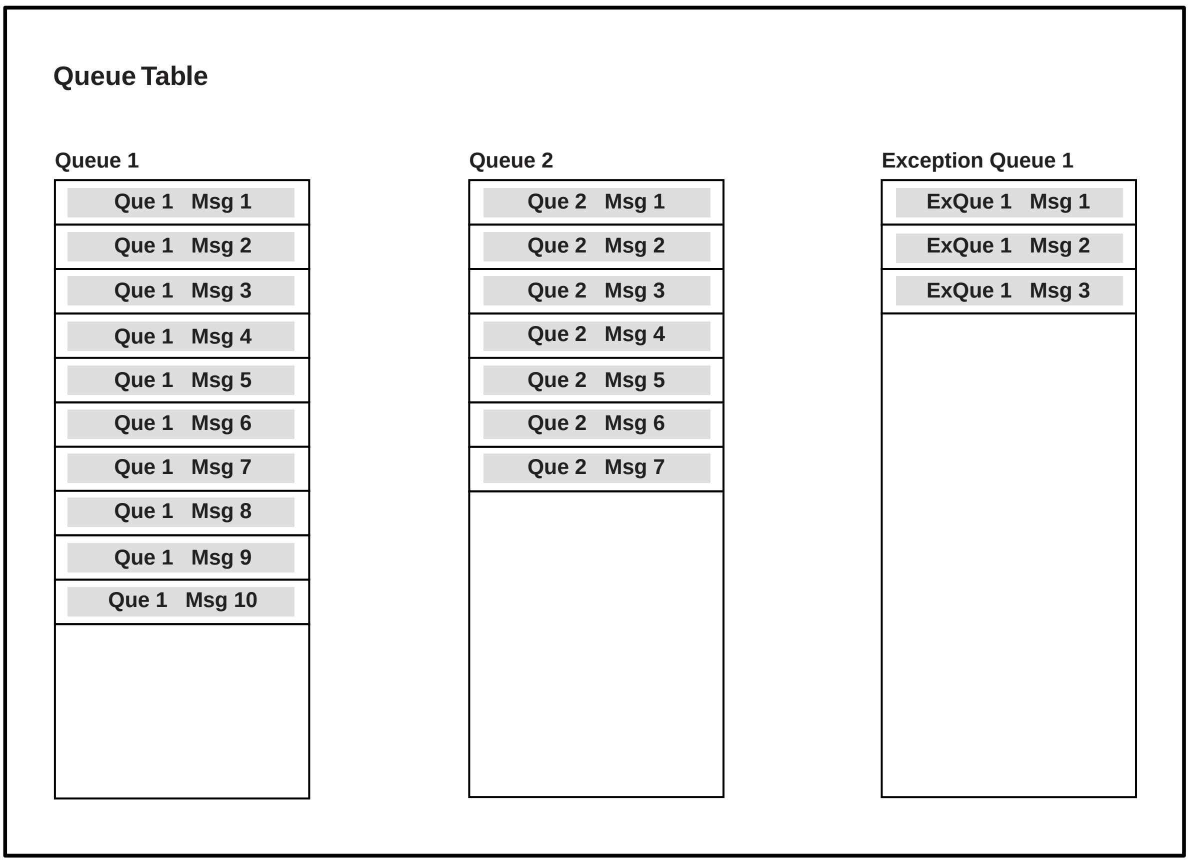
This chapter covers the fundamentals of AQ modeling and design in the following sections:

Modeling Queue Entities

Figure 7–1 shows a queue table that contains the following queues and messages:

- Queue1—contains 10 messages
- Queue2—contains 7 messages
- ExceptionQueue1—contains 3 messages

Figure 7–1 Basic Queues



Basic Queuing

Basic Queuing — One Producer, One Consumer

At its most basic, one producer may enqueue different messages into one queue. Each message will be dequeued and processed once by one of the consumers. A message will stay in the queue until a consumer dequeues it or the message expires. A producer may stipulate a delay before the message is available to be consumed, and a time after which the message expires. Likewise, a consumer may wait when trying to dequeue a message if no message is available. Note that an agent program, or application, can act as both a producer and a consumer.

Basic Queuing — Many Producers, One Consumer

At a slightly higher level of complexity, many producers may enqueue messages into a queue, all of which are processed by one consumer.

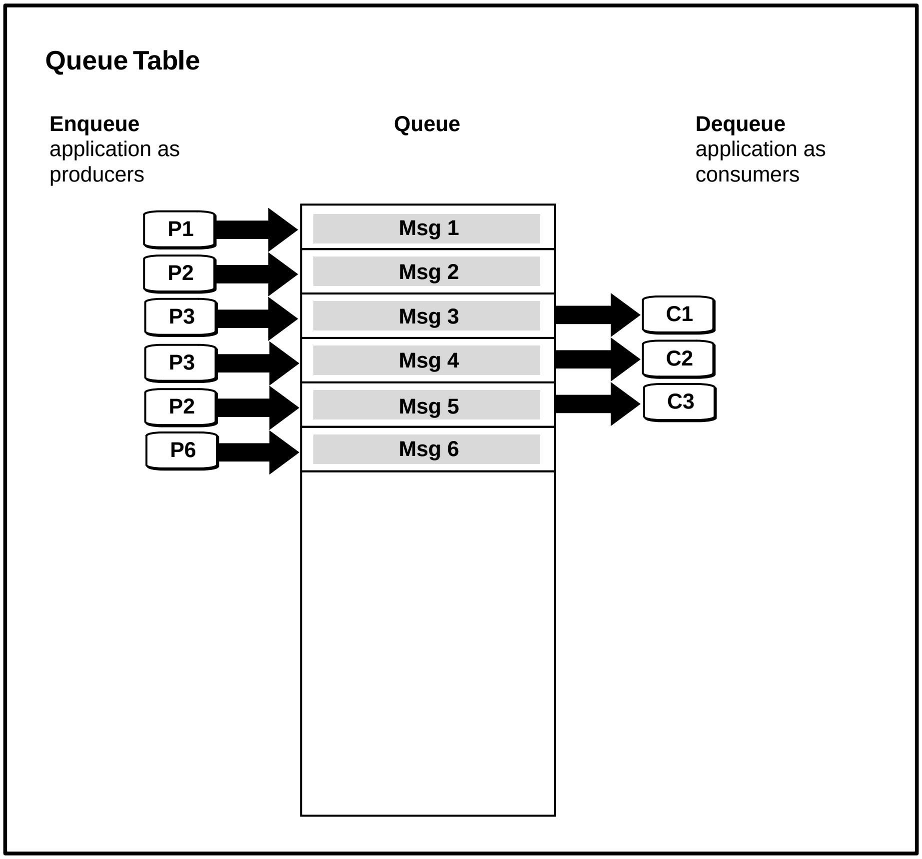
Basic Queuing — Many Producers, Many Consumers of Discrete Messages

In this next stage, many producers may enqueue messages, each message being processed by a different consumer depending on type and correlation identifier. See Figure 7–2.

Basic Queuing Illustrated

Figure 7–2 portrays a queue table that contains one queue into which messages are being enqueued and from which messages are being dequeued.

Figure 7–2 Modeling Basic Queuing



Producers

The figure indicates that there are 6 producers of messages, although only four are shown. This assumes that two other producers (P4 and P5) have the right to enqueue messages even though there are no messages enqueued by them at the moment portrayed by the figure. The figure shows that:

- A single producer may enqueue one or more messages.
- Producers may enqueue messages in any sequence.

Consumers

According to the figure, there are 3 consumers of messages, representing the total population of consumers. The figure shows that:

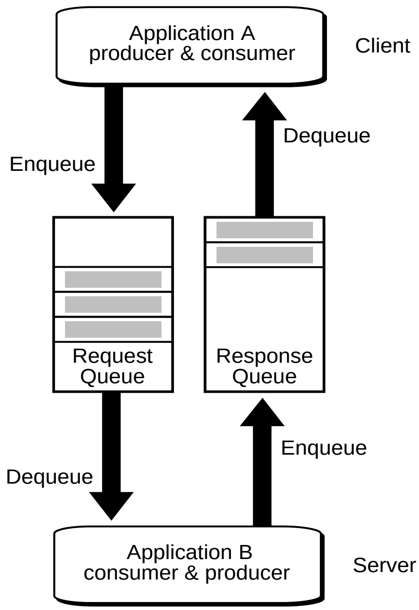
- Messages are not necessarily dequeued in the order in which they are enqueued.
- Messages may be enqueued without being dequeued.

AQ Client-Server Communication

The figure portrays the enqueuing of multiple messages by a set of producers, and the dequeuing of messages by a set of consumers. What may not be readily evident in that sketch is the notion of time and the advantages offered by Oracle AQ.

Client-Server applications normally execute in a synchronous manner, with all the disadvantages of that tight coupling described earlier. Figure 7–3 demonstrates the asynchronous alternative using AQ. In this example *Application B* (a server) provides service to *Application A* (a client) using a request/response queue.

Figure 7–3 Client-Server Communication Using AQ



1. *Application A* enqueues a request into the request queue.
2. *Application B* dequeues the request.
3. *Application B* processes the request.
4. *Application B* enqueues the result in the response queue.
5. *Application A* dequeues the result from the response queue.

In this way the client does not have to wait to establish a connection with the server, and the server dequeues the message at its own pace. When the server is finished processing the message, there is no need for the client to be waiting to receive the result. In this way a process of double-deferral frees both client and server.

Note: The various enqueue and dequeue operations are part of different transactions.

Multiconsumer Dequeuing of the Same Message

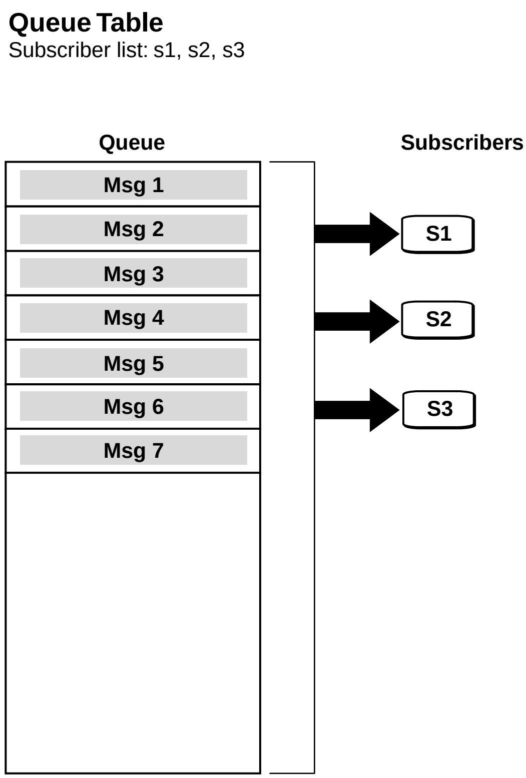
A message can only be enqueued into one queue at a time. If a producer had to insert the same message into several queues in order to reach different consumers, this would require management of a very large number of queues. Oracle AQ provides two mechanisms to allow for multiple consumers to dequeue the same message: *queue subscribers* and *message recipients*. The queue must reside in a queue table that is created with multiple consumer option to allow for subscriber and recipient lists. Each message remains in the queue until it is consumed by all its intended consumers.

Queue Subscribers Using this approach, multiple consumer-subscribers are associated with a queue. This will cause all messages enqueued in the queue to be made available to be consumed by each of the queue subscribers. The subscribers to the queue can be changed dynamically without any change to the messages or message producers. Subscribers to the queue are added and removed by using the Oracle AQ administrative package. Figure 7–4 shows multiple producers enqueuing messages into queue, each of which is consumed by multiple consumer-subscribers.

Message Recipients A message producer can submit a list of recipients at the time a message is enqueued. This allows for a unique set of recipients for each message in the queue. The recipient list associated with the message overrides the subscriber list associated with the queue, if there is one. The recipients need not be in the subscriber list. However, recipients may be selected from among the subscribers.

Figure 7–4 describes the case in which three consumers are all listed as subscribers of a queue. This is the same as saying that they all subscribe to all the messages that might ever be enqueued into that queue.

Figure 7–4 Multiconsumer Dequeuing of the Same Message

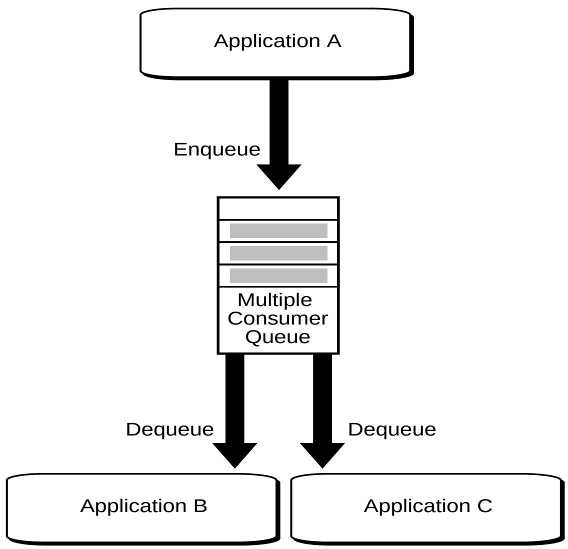


The figure illustrates a number of important points:

- The figure portrays the situation in which the 3 consumers are subscribers to 7 messages that have already been enqueued, and that they might become subscribers to messages that have not yet been enqueued.
- Every message will eventually be dequeued by every subscriber.
- There is no priority among subscribers. This means that there is no way of saying which subscriber will dequeue which message first, second, and so on. Or, put more formally: the order of dequeuing by subscribers is undetermined.
- We have no way of knowing from the figure about messages they might already have been dequeued, and which were then removed from the queue.

Figure 7–5 illustrates the same technology from a dynamic perspective. This examples concerns a scenario in which more than one application needs the result produced by an application. Every message enqueued by *Application A* is dequeued by *Application B* and *Application C*. To make this possible, the multiconsumer queue is specially configured with *Application B* and *Application C* as queue subscribers. Consequently, they are implicit recipients of every message placed in the queue.

Figure 7–5 Communication Using a Multiconsumer Queue

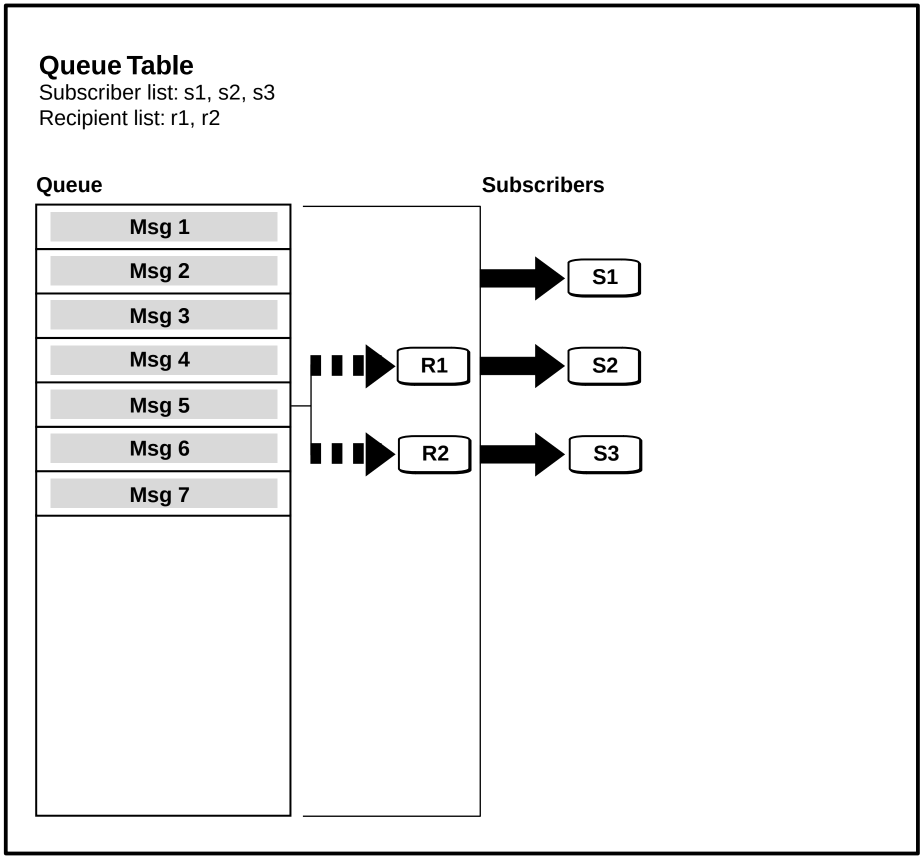


Note: Queue subscribers can be applications or other queues.

Dequeuing of Specified Messages by Specified Recipients

Figure 7–6 shows how a message can be specified for one or more recipients. In this case, *Message 5* is specified to be dequeued by *Recipient-1* and *Recipient-2*. Neither of the recipients is one of the 3 subscribers to the queue.

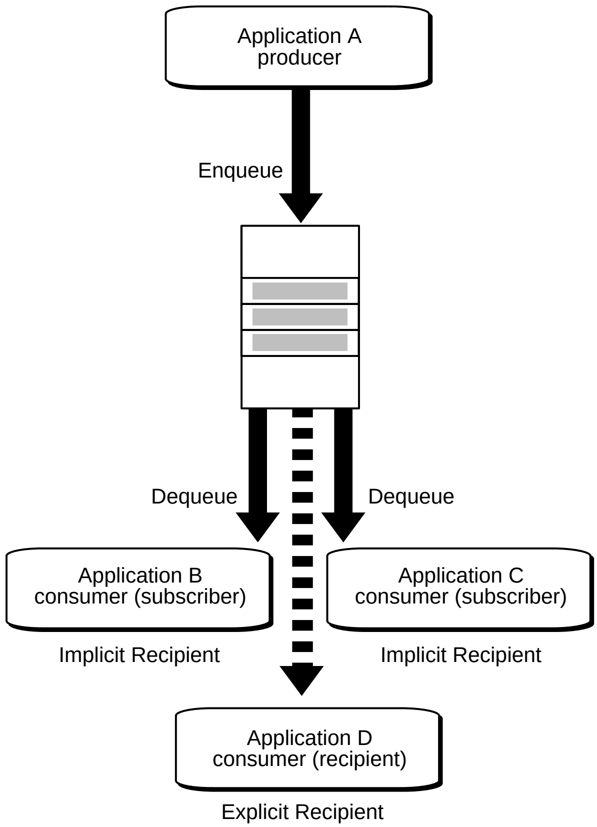
Figure 7–6 Dequeuing of Specified Messages by Specified Recipients



We earlier referred to *subscribers* as implicit recipients in that they are able to dequeue all the messages placed into a specific queue. This is like subscribing to a magazine and thereby implicitly gaining access to all its articles. The category of consumers that we have referred to as *recipients* may also be viewed as explicit recipients in that they are designated targets of particular messages.

Figure 7–7 shows how Oracle AQ can adjust dynamically to accommodate both kinds of consumers. In this scenario *Application B* and *Application C* are implicit recipients (subscribers). But messages can also be explicitly directed toward specific consumers (recipients) who may or may not be subscribers to the queue. The list of such recipients is specified in the enqueue call for that message and overrides the list of subscribers for that queue. In the figure, *Application D* is specified as the sole recipient of a message enqueued by *Application A*.

Figure 7–7 Explicit and Implicit Recipients of Messages

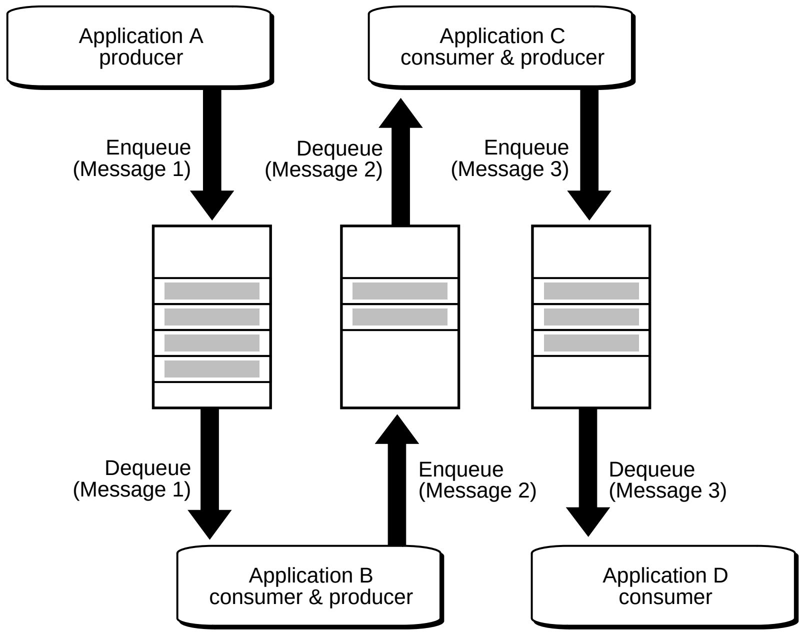


Note: Multiple producers may simultaneously enqueue messages aimed at different targeted recipients.

AQ Implementation of Workflows

Figure 7–8 illustrates the use of AQ for implementing workflows, also knows as chained application transactions. It shows the steps in the workflow performed by Applications A, B, C and D. The queues are used to buffer the flow of information between different processing stages of the business process. By specifying delay interval and expiration time for a message, a window of execution can be provided for each of the applications.

Figure 7–8 Implementing Workflows using AQ



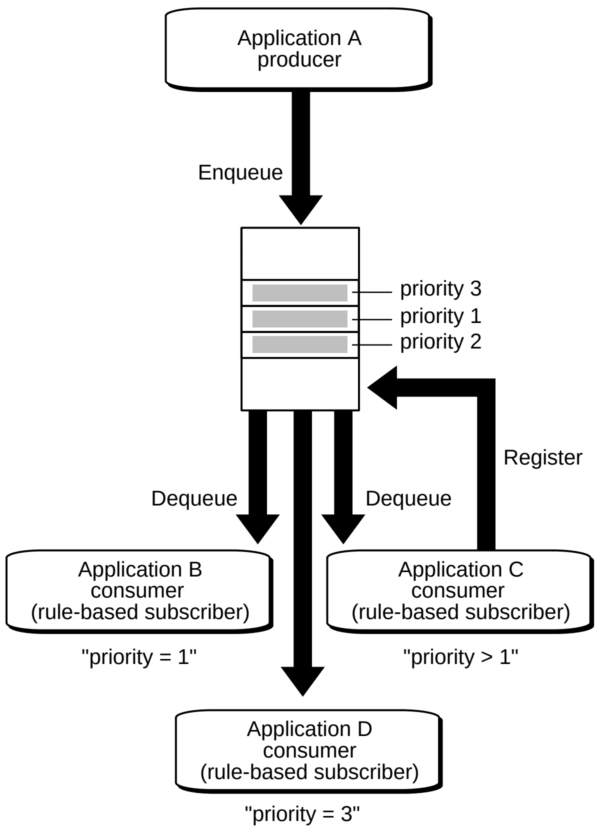
From a workflow perspective, the passing of messages is a business asset above and beyond the value of the payload data. Hence, AQ supports the optional retention of messages for analysis of historical patterns and prediction of future trends.

Note: The contents of the messages 1, 2 and 3 can be the same or different. Even when they are different, messages may contain parts of the of the contents of previous messages.

AQ Implementation of Publish/Subscribe

Figure 7–9 illustrates the use of AQ for implementing a publish / subscribe messaging scheme between applications. Application A is a publisher application which is publishing messages to a queue. Applications B, C, D are subscriber applications. Application A publishes messages anonymously to a queue. These messages are then delivered to subscriber applications based on the rules specified by each application. Subscriber applications can specify interest in messages by defining a rule on message properties and message data content.

Figure 7–9 Implementing Publish/Subscribe using AQ



In the example shown, application B has subscribed with rule "priority=1", application C has subscribed with rule "priority > 1", and application D has subscribed with rule "priority = 3". Application A enqueues 3 messages (priority 3, 1, 2). Application B receives a single message (priority 1), application C receives two messages (priority 2, 3) and application D receives a single message (priority 3). Thus, message recipients are computed dynamically based on message properties and content. The figure also illustrates how application C uses asynchronous notification for message delivery. Application C registers for messages on the queue. When messages arrive, application C is notified and can dequeue the messages.

Message Propagation

Fanning-Out of Messages

In AQ, message recipients can be either consumers or other queues. If the message recipient is a queue, the actual recipients are determined by the subscribers to the queue (which may in turn be other queues). Thus it is possible to fan-out messages to a large number of recipients without requiring them all to dequeue messages from a single queue.

For example, a queue, *Source*, may have as its subscribers queues *dispatch1@dest1* and *dispatch2@dest2.* Queue *dispatch1@dest1* may in turn have as its subscribers the queues *outerreach1@dest3* and *outerreach2@dest4,* while queue *dispatch2@dest2* has as subscribers the queue *outerreach3@dest21* and *outerreach4@dest4*. In this way, messages enqueued in *Source* will be propagated to all the subscribers of four different queues.

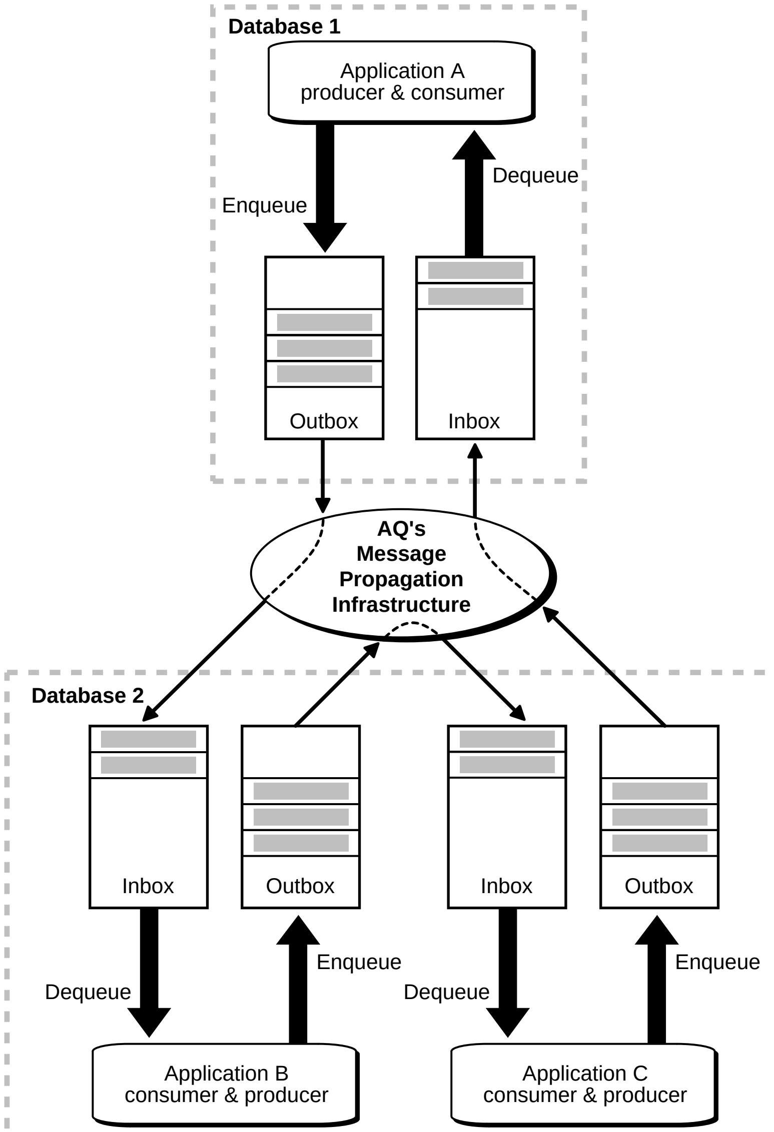
Compositing (Funneling)

You can also combine messages from different queues into a single queue, sometimes described as compositing. For example, if queue *composite@endpoint* is a subscriber to both *funnel1@source1* and *funnel2@source2,* then the subscribers to *composite@endpoint* can get all messages enqueued in those queues as well as messages enqueued directly to itself.

Propagation and Advanced Queuing

Figure 7–10 illustrates applications on different databases communicating using AQ. Each application has an inbox and an outbox for handling incoming and outgoing messages. An application enqueues a message into its outbox irrespective of whether the message is sent locally (on the same node) or remotely (on a different node). An application dequeues messages from its inbox irrespective of whether the message originates locally or remotely. AQ facilitates all interchanges, treating messages on the same basis.

Figure 7–10 Message Propagation



8

A Sample Application Using AQ

In Chapter 1, "Introduction to Oracle Advanced Queuing" a messaging system for a hypothetical company, BooksOnLine, was described. In this chapter the features of AQ in the BooksOnLine sample application are discussed under the following headings:

A Sample Application

The operations of a large bookseller, BooksOnLine, are based on an online book ordering system that automates activities across the various departments involved in the sale. The front end of the system is an order entry application used to enter new orders. Incoming orders are processed by an order processing application that validates and records the order. Shipping departments located at regional warehouses are responsible for ensuring that orders are shipped on time. There are three regional warehouses: one serving the East Region, one serving the West Region, and a third warehouse for shipping international orders. After an order is shipped, the order information is routed to a central billing department that handles payment processing.The customer service department, located at a separate site, is responsible for maintaining order status and handling inquiries.

The features of AQ are exemplified within the BooksOnLine scenario to demonstrate the possibilities of AQ technology. A script for the sample code is provided in Appendix C, "Scripts for Implementing BooksOnLine").

General Features of Advanced Queuing

In this section, the following topics are discussed:

- System-Level Access Control
- Queue-Level Access Control
- Message Format Transformation
- Structured Payloads
- XMLType Queue Payloads
- Nonpersistent Queues
- Retention and Message History
- Publish-Subscribe Support
- Support for Oracle Real Application Clusters
- Support for Statistics Views

System-Level Access Control

Oracle supports system-level access control for all queuing operations, allowing an application designer or DBA to designate users as queue administrators. A queue administrator can invoke AQ administrative and operational interfaces on any queue in the database. This simplifies the administrative work because all administrative scripts for the queues in a database can be managed under one schema. For more information, see "Oracle Enterprise Manager Support" on page 4-8.

PL/SQL (DBMS_AQADM Package): Scenario and Code

In the BooksOnLine application, the DBA creates BOLADM, the BooksOnLine Administrator account, as the queue administrator of the database. This allows BOLADM to create, drop, manage, and monitor queues in the database. If PL/SQL packages are needed in the BOLADM schema for applications to enqueue and dequeue, the DBA should grant ENQUEUE_ANY and DEQUEUE_ANY system privileges to BOLADM:

```
CREATE USER BOLADM IDENTIFIED BY BOLADM;
GRANT CONNECT, RESOURCE, aq_administrator_role TO BOLADM;
GRANT EXECUTE ON dbms_aq TO BOLADM;
GRANT EXECUTE ON dbms_aqadm TO BOLADM;
EXECUTE dbms_aqadm.grant_system_privilege('ENQUEUE_ANY','BOLADM',FALSE);
EXECUTE dbms_aqadm.grant_system_privilege('DEQUEUE_ANY','BOLADM',FALSE);
```

If using the Java AQ API, BOLADM must be granted execute privileges on the DBMS_AQIN package:

```
GRANT EXECUTE ON DBMS_AQIN to BOLADM;
```

In the application, AQ propagators populate messages from the Order Entry(OE) schema to the Western Sales (WS), Eastern Sales (ES) and Worldwide Sales (OS) schemas. The WS, ES and OS schemas in turn populate messages to the Customer Billing (CB) and Customer Service (CS) schemas. Hence the OE, WS, ES and OS schemas all host queues that serve as the source queues for the propagators.

When messages arrive at the destination queues, sessions based on the source queue schema name are used for enqueuing the newly arrived messages into the destination queues. This means that you need to grant schemas of the source queues enqueue privileges to the destination queues.

To simplify administration, all schemas that host a source queue in the BoooksOnLine application are granted the ENQUEUE_ANY system privilege:

```
EXECUTE dbms_aqadm.grant_system_privilege('ENQUEUE_ANY','OE',FALSE);
EXECUTE dbms_aqadm.grant_system_privilege('ENQUEUE_ANY','WS',FALSE);
EXECUTE dbms_aqadm.grant_system_privilege('ENQUEUE_ANY','ES',FALSE);
EXECUTE dbms_aqadm.grant_system_privilege('ENQUEUE_ANY','OS',FALSE);
```

To propagate to a remote destination queue, the login user specified in the database link in the address field of the agent structure should either be granted the ENQUEUE ANY QUEUE privilege, or be granted the rights to enqueue to the destination queue. If the login user in the database link also owns the queue tables at the destination, no explicit privilege grant is needed.

Visual Basic (OO4O): Example Code

Use the dbexecutesql interface from the database for this functionality.

Java (JDBC): Example Code

No example is provided with this release.

Queue-Level Access Control

Oracle supports queue-level access control for enqueue and dequeue operations. This feature allows the application designer to protect queues created in one schema from applications running in other schemas. The application designer needs to grant only minimal access privileges to the applications that run outside the queue schema. The supported access privileges on a queue are ENQUEUE, DEQUEUE and ALL. For more information, see "Oracle Enterprise Manager Support" on page 4-8.

Scenario

The BooksOnLine application processes customer billings in its CB and CBADM schemas. CB (Customer Billing) schema hosts the customer billing application, and the CBADM schema hosts all related billing data stored as queue tables.

To protect the billing data, the billing application and the billing data reside in different schemas. The billing application is allowed only to dequeue messages from CBADM_shippedorders_que, the shipped order queue. It processes the messages, and then enqueues new messages into CBADM_billedorders_que, the billed order queue.

To protect the queues from other illegal operations from the application, the following two grant calls are needed:

PL/SQL (DBMS_AQADM Package): Example Code

```
/* Grant dequeue privilege on the shopped orders queue to the Customer
   Billing application. The CB application retrieves orders that are shipped but
   not billed from the shipped orders queue. */
EXECUTE dbms_aqadm.grant_queue_privilege(
   'DEQUEUE','CBADM_shippedorders_que', 'CB', FALSE);
```

```
/* Grant enqueue privilege on the billed orders queue to Customer Billing
   application. The CB application is allowed to put billed orders into this
   queue after processing the orders. */

EXECUTE dbms_aqadm.grant_queue_privilege(
   'ENQUEUE', 'CBADM_billedorders_que', 'CB', FALSE);
```

Visual Basic (OO4O): Example Code

Use the dbexecutesql interface from the database for this functionality.

Java (JDBC): Example Code

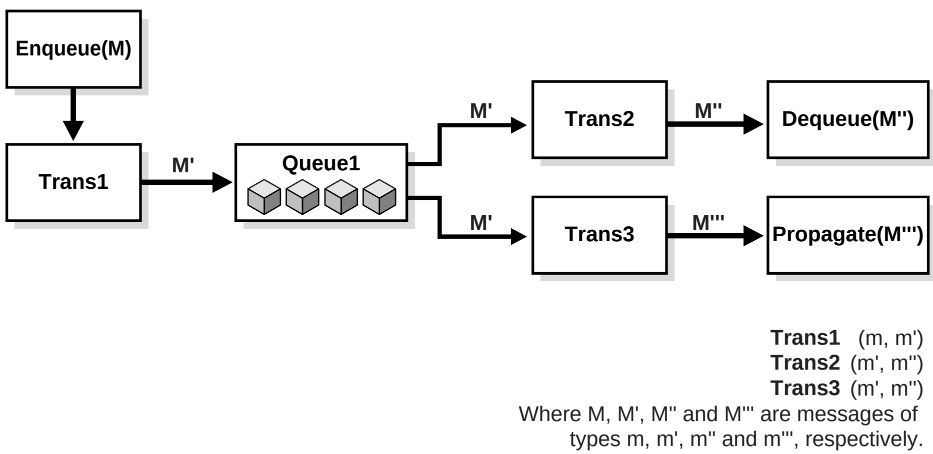
```
public static void grantQueuePrivileges(Connection db_conn)
{
    AQSession  aq_sess;
    AQQueue    sh_queue;
    AQQueue    bi_queue;

    try
    {
        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        /* Grant dequeue privilege on the shipped orders queue to the Customer
           Billing application. The CB application retrieves orders that are
           shipped but not billed from the shipped orders queue. */

        sh_queue = aq_sess.getQueue("CBADM", "CBADM_shippedorders_que");

        sh_queue.grantQueuePrivilege("DEQUEUE", "CB", false);

        /* Grant enqueue privilege on the billed orders queue to Customer
           Billing application.The CB application is allowed to put billed
           orders into this queue after processing the orders. */

        bi_queue = aq_sess.getQueue("CBADM", "CBADM_billedorders_que");

        bi_queue.grantQueuePrivilege("ENQUEUE", "CB", false);
    }
    catch (AQException ex)
    {
        System.out.println("AQ Exception: " + ex);
```

```
    }
}
```

Message Format Transformation

You can define transformation mappings between different message payload types. Transformation mappings are defined as SQL expressions that can include PL/SQL functions (including callouts) and Java stored procedures. Only one-to-one message transformations are supported. The transformation engine is tightly integrated with Advanced Queuing to facilitate transformation of messages as they move through the database messaging system. Figure 8–1 shows how transformations are integrated with Advanced Queuing.

Figure 8–1 Transformations Integrated with Advanced Queuing



Transformation mappings can be used during enqueue, dequeue, and propagation operations. To use a transformation at enqueue, the mapping is specified in the enqueue options. To use a transformation at dequeue, the mapping is specified either in the dequeue options or when you add a subscriber. A mapping specified in the dequeue options overrides a mapping specified with `ADD_SUBSCRIBER`. To use a transformation at propagation, the mapping is specified when you add a subscriber.

PL/SQL (DBMS_TRANSFORM Package): Scenario and Code

In the BooksOnLine application, assume that the order type is represented differently in the order entry and the shipping applications.

The order type of the Order Entry application (in schema OE) is as follows:

```
create or replace type order_typ as object (
        orderno         number,
        status          varchar2(30),
        ordertype       varchar2(30),
        orderregion     varchar2(30),
        custno          number,
        paymentmethod   varchar2(30),
        items           orderitemlist_vartyp,
        ccnumber        varchar2(20),
        order_date      date);

create or replace type customer_typ as object (
        custno          number,
        custid          varchar2(20),
        name            varchar2(100),
        street          varchar2(100),
        city            varchar2(30),
        state           varchar2(2),
        zip             number,
        country         varchar2(100));

create or replace type book_typ as object (
        title           varchar2(100),
        authors         varchar2(100),
        ISBN            varchar2(20),
        price           number);

create or replace type orderitem_typ as object (
        quantity        number,
        item            book_typ,
        subtotal        number);

create or replace type orderitemlist_vartyp as varray (20) of
orderitem_typ;
```

The order item of the shipping application is defined as follows

```
create or replace type order_typ_sh as object (
        orderno         number,
        status          varchar2(30),
        ordertype       varchar2(30),
        orderregion     varchar2(30),
        customer        customer_typ_sh,
        paymentmethod   varchar2(30),
```

```
        items           orderitemlist_vartyp,
        ccnumber        varchar2(20),
        order_date      date);

create or replace type customer_typ_sh as object (
        custno          number,
        name            varchar2(100),
        street          varchar2(100),
        city            varchar2(30),
        state           varchar2(2),
        zip             number);

create or replace type book_typ_sh as object (
        title           varchar2(100),
        authors         varchar2(100),
        ISBN            varchar2(20),
        price           number);

create or replace type orderitem_typ_sh as object (
        quantity        number,
        item            book_typ,
        subtotal        number);

create or replace type orderitemlist_vartyp_sh as varray (20) of
orderitem_typ_sh;
```

The Overseas Shipping application uses a `sys.XMLType` attribute.

Creating Transformations

You can create transformations in the following ways:

- Create a single PL/SQL function that returns an object of the target type or the constructor of the target type.

  This representation is preferable for simple transformations or transformations that are not easily broken down into independent transformations for each attribute.

```
execute dbms_transform.create_transformation(
           schema => 'OE', name => 'OE2WS',
           from_schema => 'OE', from_type => 'order_typ',
           to_schema => 'WS', to_type => 'order_typ_sh',
           transformation(
               'WS.order_typ_sh(source.user_data.orderno,
                                source.user_data.status,
```

```
                                source.user_data.ordertype,
                                source.user_data.orderregion,

WS.get_customer_info(source.user_data.custno),
                                source.user_data.paymentmethod,
                                source.user_data.items,
                                source.user_data.ccnumber,
                                source.user_data.order_date)');
```

In the BooksOnline application, assume that the Overseas Shipping site represents the order as an XMLType payload. The Order Entry site represents the order as an Oracle object, `ORDER_TYP`. Since the Overseas Shipping site subscribes to messages in the `OE_BOOKEDORDERS_QUE` queue, a transformation is applied before messages are propagated from the Order Entry site to the Overseas Shipping site.

The transformation is defined as follows:

```
CREATE OR REPLACE FUNCTION CONVERT_TO_ORDER_XML(input_order TYPE OE.ORDER_
TYP)
RETURN SYS.XMLType AS
   new_order SYS.XMLType;
BEGIN
   select SYS_XMLGEN(input_order) into new_order from dual;
   RETURN new_order;
END CONVERT_TO_ORDER_XML;

execute dbms_transform.create_transformation(
   schema =>         'OS',
   name   =>         'OE2XML',
   from_schema =>    'OE',
   from_type =>      'ORDER_TYP',
   to_schema =>      'SYS',
   to_type =>        'XMLTYPE',
   transformation => 'CONVERT_TO_ORDER_XML(source.user_data)');

/*  Add a rule-based subscriber for Overseas Shipping to the Booked orders
queues with Transformation. Overseas Shipping handles all non-US orders: */
DECLARE
 subscriber     aq$_agent;
BEGIN
 subscriber := aq$_agent('Overseas_Shipping','OS.OS_bookedorders_que',null);

 dbms_aqadm.add_subscriber(
        queue_name     => 'OE.OE_bookedorders_que',
```

```
        subscriber     => subscriber,
        rule           => 'tab.user_data.orderregion = ''INTERNATIONAL'''
        transformation => 'OS.OE2XML');
END;
```

- Create a separate expression specified for each attribute of the target type. This representation simplifies transformation mapping creation and management for individual attributes of the destination type. It is useful when the destination type has many attributes.

```
/* first create the transformation without any transformation expression*/
execute dbms_transform.create_transformation(
           schema => 'OE', name => 'OE2WS',
           from_schema => 'OE', from_type => 'order_typ',
           to_schema => 'WS', to_type => 'order_typ_sh');

/* specify each attribute of the target type as a function of the source
type*/
execute dbms_transform.modify_transformation(
           schema => 'OE', name => 'OE2WS',
           attribute_number => 1,
           transformation => 'source.user_data.orderno');

execute dbms_transform.modify_transformation(
           schema => 'OE', name => 'OE2WS',
           attribute_number => 1,
           transformation => 'source.user_data.status');

execute dbms_transform.modify_transformation(
           schema => 'OE', name => 'OE2WS',
           attribute_number => 1,
           transformation => 'source.user_data.ordertype');

execute dbms_transform.modify_transformation(
           schema => 'OE', name => 'OE2WS',
           attribute_number => 1,
           transformation => 'source.user_data.orderregion');

execute dbms_transform.modify_transformation(
           schema => 'OE', name => 'OE2WS',
           attribute_number => 1,
           transformation =>
'WS.get_customer_info(source.user_data.custno)');

execute dbms_transform.modify_transformation(
```

```
            schema => 'OE', name => 'OE2WS',
            attribute_number => 1,
            transformation => 'source.user_data.payment_method');

execute dbms_transform.modify_transformation(
            schema => 'OE', name => 'OE2WS',
            attribute_number => 1,
            transformation => 'source.user_data.orderitemlist_vartyp');

execute dbms_transform.modify_transformation(
            schema => 'OE', name => 'OE2WS',
            attribute_number => 1,
            transformation => 'source.user_data.ccnumber');

execute dbms_transform.modify_transformation(
            schema => 'OE', name => 'OE2WS',
            attribute_number => 1,
            transformation => 'source.user_data.order_date');
```

Visual Basic (OO4O): Example Code

No example is provided with this release.

Java (JDBC): Example Code

No example is provided with this release.

Structured Payloads

With Oracle AQ, you can use object types to structure and manage the payload of messages. The object-relational capabilities of Oracle provide a rich set of data types that range from traditional relational data types to user-defined types.

Using strongly typed content, that is, content whose format is defined by an Oracle object type system, makes the following features available:

- Content-based routing: Advanced Queuing can examine the content and automatically route messages to another queue based on content.
- Content-based subscription: a publish and subscribe system can be built on top of a messaging system so that you can create subscriptions based on content.
- XML: Use the flexibility and extensibility of XML with AQ messages. XMLType has additional operators to simplify the use of XML data. The operators include XMLType.existsNode( ) and XMLType.extract( ).

You can also create payloads that contain Oracle objects with XMLType attributes. These can be used for transmitting and storing messages that contain XML documents. By defining Oracle objects with XMLType attributes, you can do the following:

- Store more than one type of XML document in the same queue. The documents are stored internally as CLOBs.
- Query XMLType attributes using the operators `XMLType.existsNode()`, `XMLType.extract()`, and so on.

PL/SQL (DBMS_AQADM Package): Scenario and Code

The BooksOnLine application uses a rich set of data types to model book orders as message content.

- Customers are modeled as an object type called `customer_typ`.

```
CREATE OR REPLACE TYPE customer_typ AS OBJECT (
        custno          NUMBER,
        name            VARCHAR2(100),
        street          VARCHAR2(100),
        city            VARCHAR2(30),
        state           VARCHAR2(2),
        zip             NUMBER,
        country         VARCHAR2(100));
```

- Books are modeled as an object type called `book_typ`.

```
CREATE OR REPLACE TYPE book_typ AS OBJECT (
        title           VARCHAR2(100),
        authors         VARCHAR2(100),
        ISBN            NUMBER,
        price           NUMBER);
```

- An order item that represents an order line item is modeled as an object type called `orderitem_typ`. An order item is a nested type that includes the book type.

```
CREATE OR REPLACE TYPE orderitem_typ AS OBJECT (
        quantity        NUMBER,
        item            BOOK_TYP,
        subtotal        NUMBER);
```

- An order item list is used to represent a list of order line items and is modeled as a `varray` of order items;

```
CREATE OR REPLACE TYPE orderitemlist_vartyp AS VARRAY (20) OF orderitem_typ;
```

- An order is modeled as an object type called `order_typ`. The order type is a composite type that includes nested object types defined earlier. The order type captures details of the order, the customer information, and the item list.

```
CREATE OR REPLACE TYPE order_typ as object (
        orderno         NUMBER,
        status          VARCHAR2(30),
        ordertype       VARCHAR2(30),
        orderregion     VARCHAR2(30),
        customer        CUSTOMER_TYP,
        paymentmethod   VARCHAR2(30),
        items           ORDERITEMLIST_VARTYP,
        total           NUMBER);
```

- Some queues in the BooksOnline application model an order using a `SYS.XMLType` payload.

Visual Basic (OO4O): Example Code

Use the `dbexecutesql` interface from the database for this functionality.

Java (JDBC): Example Code

After creating the types, use JPublisher to generate Java classes that map to the SQL types.

1. Create an input file "jaqbol.typ" for JPublisher with the following lines:

```
TYPE boladm.customer_typ as Customer
TYPE boladm.book_typ as Book
TYPE boladm.orderitem_typ AS OrderItem
TYPE boladm.orderitemlist_vartyp AS OrderItemList
TYPE boladm.order_typ AS Order
```

2. Run JPublisher with the following arguments:

```
jpub -input=jaqbol.typ -user=boladm/boladm -case=mixed -methods=false
-compatible=CustomDatum
```

This will create Java classes Customer, Book, OrderItem and OrderItemList that map to the SQL object types created earlier:

3. Load the Java AQ driver and create a JDBC connection:

```
public static Connection loadDriver(String user, String passwd)
```

```
{
   Connection db_conn = null;
   try
   {
         Class.forName("oracle.jdbc.driver.OracleDriver");

      /* your actual hostname, port number, and SID will
      vary from what follows. Here we use 'dlsun736,' '5521,'
      and 'test,' respectively: */

      db_conn =
               DriverManager.getConnection(
               "jdbc:oracle:thin:@dlsun736:5521:test",
               user, passwd);

      System.out.println("JDBC Connection opened ");
      db_conn.setAutoCommit(false);

      /* Load the Oracle8i AQ driver: */
      Class.forName("oracle.AQ.AQOracleDriver");

      System.out.println("Successfully loaded AQ driver ");
   }
   catch (Exception ex)
   {
      System.out.println("Exception: " + ex);
      ex.printStackTrace();
   }
   return db_conn;
```

XMLType Queue Payloads

You can create queues with `XMLType` payloads. These can be used for transmitting and storing messages that contain XML documents. By defining Oracle objects with XMLType attributes, you can do the following:

- Store more than one type of XML document in the same queue. The documents are stored internally as CLOBs.
- Selectively dequeue messages with XMLType attributes using the operators `XMLType.existsNode()`, `XMLType.extract()`, and so on.

> **See Also:** *Oracle9i XML Database Developer's Guide* - *Oracle XML DB* for details on XMLType operations

- Define transformations to convert Oracle objects to XMLType.
- Define rule-based subscribers that query message content using XMLType operators such as `XMLType.existsNode()` and `XMLType.extract()`.

In the BooksOnline application, assume that the Overseas Shipping site represents the order as `SYS.XMLType`. The Order Entry site represents the order as an Oracle object, `ORDER_TYP`.

The Overseas queue table and queue are created as follows:

```
BEGIN
dbms_aqadm.create_queue_table(
   queue_table        => 'OS_orders_pr_mqtab',
   comment            => 'Overseas Shipping MultiConsumer Orders queue table',
   multiple_consumers => TRUE,
   queue_payload_type => 'SYS.XMLTtype',
   compatible         => '8.1');
END;

BEGIN
dbms_aqadm.create_queue (
   queue_name   => 'OS_bookedorders_que',
   queue_table  => 'OS_orders_pr_mqtab');
END;
```

Since the representation of orders at the Overseas Shipping site is different from the representation of orders at the Order Entry site, a transformation is applied before messages are propagated from the Order Entry site to the Overseas Shipping site.

```
/*  Add a rule-based subscriber (for Overseas Shipping) to the Booked orders
queues with Transformation. Overseas Shipping handles all non-US orders: */
DECLARE
  subscriber     aq$_agent;
BEGIN
  subscriber := aq$_agent('Overseas_Shipping','OS.OS_bookedorders_que',null);

  dbms_aqadm.add_subscriber(
   queue_name     => 'OE.OE_bookedorders_que',
   subscriber     => subscriber,
   rule           => 'tab.user_data.orderregion = ''INTERNATIONAL''',
   transformation => 'OS.OE2XML');
END;
```

For more details on defining transformations that convert the type used by the Order Entry application to the type used by Overseas shipping, see "Creating Transformations" on page 8-8.

Assume that an application processes orders for customers in Canada. This application can dequeue messages using the following procedure:

```
/*  Create procedures to enqueue into single-consumer queues: */
create or replace procedure get_canada_orders() as
deq_msgid                RAW(16);
dopt                     dbms_aq.dequeue_options_t;
mprop                    dbms_aq.message_properties_t;
deq_order_data           SYS.XMLTtype;
no_messages              exception;
pragma exception_init    (no_messages, -25228);
new_orders               BOOLEAN := TRUE;

begin
        dopt.wait := 1;

/* Specify dequeue condition to select Orders for Canada */
        dopt.deq_condition := 'tab.user_data.extract(
''/ORDER_TYP/CUSTOMER/COUNTRY/text()'').getStringVal()=''CANADA''';

            dopt.consumer_name : = 'Overseas_Shipping';

        WHILE (new_orders) LOOP
          BEGIN
            dbms_aq.dequeue(
                queue_name         => 'OS.OS_bookedorders_que',
                dequeue_options    => dopt,
                message_properties => mprop,
                payload            => deq_order_data,
                msgid              => deq_msgid);
            commit;

            dbms_output.put_line(' Order for Canada - Order: ' ||
                                   deq_order_data.getStringVal());

          EXCEPTION
            WHEN no_messages THEN
                 dbms_output.put_line (' ---- NO MORE ORDERS  ---- ');
                 new_orders := FALSE;
          END;
```

```
        END LOOP;
end;
```

Nonpersistent Queues

A message in a nonpersistent queue is not stored in a database table. You create a nonpersistent queue, which can be either a single-consumer or multiconsumer type. These queues are created in a system-created queue table (`AQ$_MEM_SC` for single-consumer queues and `AQ$_MEM_MC` for multiconsumer queues) in the schema specified by the `create_np_queue` command. Subscribers can be added to the multiconsumer queues (see "Creating a Nonpersistent Queue" on page 9-26). Nonpersistent queues can be destinations for propagation.

You use the enqueue interface to enqueue messages into a nonpersistent queue in the normal way. You can enqueue RAW and Object Type (ADT) messages into a nonpersistent queue. You retrieve messages from a nonpersistent queue through the asynchronous notification mechanism, registering for the notification (using `LNOCISubcriptionRegister` or `DBMS_AQADM.REGISTER`) for the queues you are interested in (see "Registering for Notification" on page 11-55).

When a message is enqueued into a queue, it is delivered to clients with active registrations for the queue. The messages are published to the interested clients without incurring the overhead of storing them in the database.

See Also: Documentation on `DBMS_AQADM.REGISTER` in *Oracle9i Supplied PL/SQL Packages and Types Reference* and documentation on `LNOCISubscriptionRegister` in *Oracle Call Interface Programmer's Guide.*

Scenario

Assume that there are three application processes servicing user requests at the Order Entry system. The connection dispatcher shares out connection requests from the application processes. It attempts to maintain a count of the number of users logged on to the Order Entry system and the number of users for each application process. The application processes are named `APP_1`, `APP_2`, `APP_3`. (Application process failures are not considered in this example.)

Using nonpersistent queues meets the requirements in this scenario. When a user logs on to the database, the application process enqueues to the multiconsumer nonpersistent queue, `LOGIN_LOGOUT`, with the application name as the consumer name. The same process occurs when a user logs out. To distinguish between the two events, the correlation of the message is `LOGIN` for logins and `LOGOUT` for logouts.

The callback function counts the login/logout events for each application process. Note that the dispatcher process needs to connect to the database for registering the subscriptions only. The notifications themselves can be received while the process is disconnected from the database.

PL/SQL (DBMS_AQADM Package): Example Code

```
CONNECT oe/oe;
/* Create the Object Type/ADT adtmsg */
CREATE OR REPLACE TYPE adtmsg AS OBJECT (id NUMBER, data VARCHAR2(4000));

/* Create the multiconsumer nonpersistent queue in OE schema: */
EXECUTE dbms_aqadm.create_np_queue(queue_name         => 'LOGON_LOGOFF',
                                  multiple_consumers => TRUE);

/* Enable the queue for enqueue and dequeue: */
EXECUTE dbms_aqadm.start_queue(queue_name => 'LOGON_LOGOFF');

/* Nonpersistent Queue Scenario - procedure to be executed upon logon: */
CREATE OR REPLACE PROCEDURE  User_Logon(app_process IN VARCHAR2)
AS
  msgprop        dbms_aq.message_properties_t;
  enqopt         dbms_aq.enqueue_options_t;
  enq_msgid      RAW(16);
  payload        RAW(1);
BEGIN
  /* visibility must always be immediate for NonPersistent queues */
  enqopt.visibility:=dbms_aq.IMMEDIATE;
  msgprop.correlation:= 'LOGON';
  msgprop.recipient_list(0) := aq$_agent(app_process, NULL, NULL);
  /* payload is NULL */
  dbms_aq.enqueue(
        queue_name         => 'LOGON_LOGOFF',
        enqueue_options    => enqopt,
        message_properties => msgprop,
        payload            => payload,
        msgid              => enq_msgid);

END;

/* Nonpersistent queue scenario - procedure to be executed upon logoff: */
CREATE OR REPLACE PROCEDURE  User_Logoff(app_process IN VARCHAR2)
```

```
AS
  msgprop       dbms_aq.message_properties_t;
  enqopt        dbms_aq.enqueue_options_t;
  enq_msgid     RAW(16);
  payload       adtmsg;
BEGIN
  /* Visibility must always be immediate for NonPersistent queues: */
  enqopt.visibility:=dbms_aq.IMMEDIATE;
  msgprop.correlation:= 'LOGOFF';
  msgprop.recipient_list(0) := aq$_agent(app_process, NULL, NULL);
  /* Payload is NOT NULL: */
payload := adtmsg(1, 'Logging Off');

dbms_aq.enqueue(
        queue_name         => 'LOGON_LOGOFF',
        enqueue_options    => enqopt,
        message_properties => msgprop,
        payload            => payload,
        msgid              => enq_msgid);
 END;
/


/* If there is a login at APP1, enqueue a message into 'login_logoff' with
   correlation 'LOGIN': */
EXECUTE User_logon('APP1');

/* If there is a logout at APP3, enqueue a message into 'login_logoff' with
   correlation 'LOGOFF' and payload adtmsg(1, 'Logging Off'): */
EXECUTE User_logoff('App3');

 /* The OCI program which waits for notifications: */
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <oci.h>
#ifdef WIN32COMMON
#define sleep(x)   Sleep(1000*(x))
#endif

/* LOGON / password:  */
static text *username = (text *) "OE";
static text *password = (text *) "OE";

/* The correlation strings of messages: */
```

```
static char  *logon = "LOGON";
static char  *logoff = "LOGOFF";

/* The possible consumer names of queues: */
static char *applist[] = {"APP1", "APP2","APP3"};

static OCIEnv *envhp;
static OCIServer *srvhp;
static OCIError *errhp;
static OCISvcCtx *svchp;

static void checkerr(/*_ OCIError *errhp, sword status _*/);

struct process_statistics
{
  ub4  logon;
  ub4  logoff;
};

typedef struct process_statistics process_statistics;

int main(/*_ int argc, char *argv[] _*/);

/* Notify Callback: */
ub4 notifyCB(ctx, subscrhp, pay, payl, desc, mode)
dvoid *ctx;
LNOCISubscription *subscrhp;
dvoid *pay;
ub4    payl;
dvoid *desc;
ub4    mode;
{
 text                *subname;   /* subscription name */
 ub4                  lsub;      /* length of subscription name */
 text                *queue;     /* queue name */
 ub4                 *lqueue;    /* queue name */
 text                *consumer;  /* consumer name */
 ub4                  lconsumer;
 text                *correlation;
 ub4                  lcorrelation;
 ub4                  size;
 ub4                  appno;
 OCIRaw              *msgid;
 OCIAQMsgProperties  *msgprop;   /* message properties descriptor */
 process_statistics   *user_count = (process_statistics *)ctx;
```

```
 OCIAttrGet((dvoid *)subscrhp, OCI_HTYPE_SUBSCRIPTION,
                            (dvoid *)&subname, &lsub,
                            OCI_ATTR_SUBSCR_NAME, errhp);

 /* Extract the attributes from the AQ descriptor: */
 /* Queue name: */
 OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&queue, &size,
           OCI_ATTR_QUEUE_NAME, errhp);

 /* Consumer name: */
 OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&consumer, &lconsumer,
           OCI_ATTR_CONSUMER_NAME, errhp);

 /* Message properties: */
 OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&msgprop, &size,
           OCI_ATTR_MSG_PROP, errhp);

 /* Get correlation from message properties: */
  checkerr(errhp, OCIAttrGet(msgprop, OCI_DTYPE_AQMSG_PROPERTIES,
                            (dvoid *)&correlation, &lcorrelation,
                            OCI_ATTR_CORRELATION, errhp));

  if (lconsumer == strlen(applist[0]))
  {
    if (!memcmp((dvoid *)consumer, (dvoid *)applist[0], strlen(applist[0])))
     appno = 0;
    else if (!memcmp((dvoid *)consumer, (dvoid *)applist[1],
strlen(applist[1])))
     appno = 1;
    else if (!memcmp((dvoid *)consumer, (dvoid *)applist[2],
strlen(applist[2])))
     appno = 2;
    else
    {
     printf("Wrong consumer in notification");
     return;
    }
  }
  else
  {  /* consumer name must be "APP1", "APP2" or "APP3"  */
    printf("Wrong consumer in notification");
    return;
  }
```

```
  if (lcorrelation == strlen(logon) &&                    /* logon event */
      !memcmp((dvoid *)correlation, (dvoid *)logon, strlen(logon)))
  {
     user_count[appno].logon++;
                         /* increment logon count for the app process */
         printf("Logon by APP%d \n", (appno+1));
         printf("Logon Payload length = %d \n", pay1);
   }
  else if  (lcorrelation == strlen(logoff) &&           /* logoff event */
      !memcmp((dvoid *)correlation,(dvoid *)logoff, strlen(logoff)))
  {
     user_count[appno].logoff++;
                        /* increment logoff count for the app process */
     printf("Logoff by APP%d \n", (appno+1));
     printf("Logoff Payload length = %d \n", pay1);
  }
  else                            /* correlation is "LOGON" or "LOGOFF" */
    printf("Wrong correlation in notification");

  printf("Total  : \n");

  printf("App1 : %d \n", user_count[0].logon-user_count[0].logoff);
  printf("App2 : %d \n", user_count[1].logon-user_count[1].logoff);
  printf("App3 : %d \n", user_count[2].logon-user_count[2].logoff);

}

int main(argc, argv)
int argc;
char *argv[];
{
  OCISession *authp = (OCISession *) 0;
  OCISubscription *subscrhp[3];
  ub4 namespace = OCI_SUBSCR_NAMESPACE_AQ;
  process_statistics  ctx[3] = {{0,0}, {0,0}, {0,0}};
  ub4 sleep_time = 0;

  printf("Initializing OCI Process\n");

  /* Initialize OCI environment with OCI_EVENTS flag set: */
  (void) OCIInitialize((ub4) OCI_EVENTS|OCI_OBJECT, (dvoid *)0,
                       (dvoid * (*)(dvoid *, size_t)) 0,
                       (dvoid * (*)(dvoid *, dvoid *, size_t))0,
                       (void (*)(dvoid *, dvoid *)) 0 );
```

```
  printf("Initialization successful\n");

  printf("Initializing OCI Env\n");
  (void) OCIEnvInit( (OCIEnv **) &envhp, OCI_DEFAULT, (size_t) 0, (dvoid **) 0
);
  printf("Initialization successful\n");

  checkerr(errhp, OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &errhp,
LNOCI_HTYPE_ERROR,
                  (size_t) 0, (dvoid **) 0));

  checkerr(errhp, OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &srvhp,
LNOCI_HTYPE_SERVER,
                  (size_t) 0, (dvoid **) 0));

  checkerr(errhp, OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &svchp,
LNOCI_HTYPE_SVCCTX,
                  (size_t) 0, (dvoid **) 0));

  printf("connecting to server\n");
  checkerr(errhp, OCIServerAttach( srvhp, errhp, (text *)"inst1_alias",
         strlen("inst1_alias"), (ub4) OCI_DEFAULT));
  printf("connect successful\n");

  /* Set attribute server context in the service context: */
  checkerr(errhp, OCIAttrSet( (dvoid *) svchp, OCI_HTYPE_SVCCTX, (dvoid *)srvhp,
                  (ub4) 0, OCI_ATTR_SERVER, (OCIError *) errhp));

  checkerr(errhp, OCIHandleAlloc((dvoid *) envhp, (dvoid **)&authp,
                     (ub4) OCI_HTYPE_SESSION, (size_t) 0, (dvoid **) 0));

  /* Set username and password in the session handle: */
  checkerr(errhp, OCIAttrSet((dvoid *) authp, (ub4) OCI_HTYPE_SESSION,
                 (dvoid *) username, (ub4) strlen((char *)username),
                 (ub4) OCI_ATTR_USERNAME, errhp));

  checkerr(errhp, OCIAttrSet((dvoid *) authp, (ub4) OCI_HTYPE_SESSION,
                 (dvoid *) password, (ub4) strlen((char *)password),
                 (ub4) OCI_ATTR_PASSWORD, errhp));

  /* Begin session: */
  checkerr(errhp, OCISessionBegin ( svchp,  errhp, authp, OCI_CRED_RDBMS,
                        (ub4) OCI_DEFAULT));

  (void) OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX,
```

```
                    (dvoid *) authp, (ub4) 0,
                    (ub4) OCI_ATTR_SESSION, errhp);

  /* Register for notification: */
  printf("allocating subscription handle\n");
 subscrhp[0] = (OCISubscription *)0;
 (void) OCIHandleAlloc((dvoid *) envhp, (dvoid **)&subscrhp[0],
                       (ub4) OCI_HTYPE_SUBSCRIPTION,
                       (size_t) 0, (dvoid **) 0);

 /* For application process APP1: */
 printf("setting subscription name\n");
 (void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) "OE.LOGON_LOGOFF:APP1",
                (ub4) strlen("OE.LOGON_LOGOFF:APP1"),
                (ub4) OCI_ATTR_SUBSCR_NAME, errhp);

 printf("setting subscription callback\n");
 (void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) notifyCB, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_CALLBACK, errhp);

(void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *)&ctx, (ub4)sizeof(ctx),
                (ub4) OCI_ATTR_SUBSCR_CTX, errhp);

 printf("setting subscription namespace\n");
 (void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) &namespace, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_NAMESPACE, errhp);

printf("allocating subscription handle\n");
 subscrhp[1] = (OCISubscription *)0;
 (void) OCIHandleAlloc((dvoid *) envhp, (dvoid **)&subscrhp[1],
                       (ub4) OCI_HTYPE_SUBSCRIPTION,
                       (size_t) 0, (dvoid **) 0);

 /* For application process APP2: */
 printf("setting subscription name\n");
 (void) OCIAttrSet((dvoid *) subscrhp[1], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) "OE.LOGON_LOGOFF:APP2",
                (ub4) strlen("OE.LOGON_LOGOFF:APP2"),
                (ub4) OCI_ATTR_SUBSCR_NAME, errhp);

 printf("setting subscription callback\n");
```

```
 (void) OCIAttrSet((dvoid *) subscrhp[1], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) notifyCB, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_CALLBACK, errhp);

(void) OCIAttrSet((dvoid *) subscrhp[1], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *)&ctx, (ub4)sizeof(ctx),
                (ub4) OCI_ATTR_SUBSCR_CTX, errhp);

 printf("setting subscription namespace\n");
 (void) OCIAttrSet((dvoid *) subscrhp[1], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) &namespace, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_NAMESPACE, errhp);

  printf("allocating subscription handle\n");
 subscrhp[2] = (OCISubscription *)0;
 (void) OCIHandleAlloc((dvoid *) envhp, (dvoid **)&subscrhp[2],
                       (ub4) OCI_HTYPE_SUBSCRIPTION,
                       (size_t) 0, (dvoid **) 0);

 /* For application process APP3: */
 printf("setting subscription name\n");
 (void) OCIAttrSet((dvoid *) subscrhp[2], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) "OE.LOGON_LOGOFF:APP3",
                (ub4) strlen("OE.LOGON_LOGOFF:APP3"),
                (ub4) OCI_ATTR_SUBSCR_NAME, errhp);

 printf("setting subscription callback\n");
 (void) OCIAttrSet((dvoid *) subscrhp[2], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) notifyCB, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_CALLBACK, errhp);

(void) OCIAttrSet((dvoid *) subscrhp[2], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *)&ctx, (ub4)sizeof(ctx),
                (ub4) OCI_ATTR_SUBSCR_CTX, errhp);

 printf("setting subscription namespace\n");
 (void) OCIAttrSet((dvoid *) subscrhp[2], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) &namespace, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_NAMESPACE, errhp);

 printf("Registering fornotifications \n");
 checkerr(errhp, OCISubscriptionRegister(svchp, subscrhp, 3, errhp,
                                         OCI_DEFAULT));

 sleep_time = (ub4)atoi(argv[1]);
```

```
  printf ("waiting for %d s \n", sleep_time);
  sleep(sleep_time);

  printf("Exiting");
  exit(0);
}

void checkerr(errhp, status)
LNOCIError *errhp;
sword status;
{
  text errbuf[512];
  sb4 errcode = 0;

  switch (status)
  {
  case OCI_SUCCESS:
    break;
  case OCI_SUCCESS_WITH_INFO:
    (void) printf("Error - OCI_SUCCESS_WITH_INFO\n");
    break;
  case OCI_NEED_DATA:
    (void) printf("Error - OCI_NEED_DATA\n");
    break;
  case OCI_NO_DATA:
    (void) printf("Error - OCI_NODATA\n");
    break;
  case OCI_ERROR:
    (void) OCIErrorGet((dvoid *)errhp, (ub4) 1, (text *) NULL, &errcode,
                        errbuf, (ub4) sizeof(errbuf), OCI_HTYPE_ERROR);
    (void) printf("Error - %.*s\n", 512, errbuf);
    break;
  case OCI_INVALID_HANDLE:
    (void) printf("Error - OCI_INVALID_HANDLE\n");
    break;
  case OCI_STILL_EXECUTING:
    (void) printf("Error - OCI_STILL_EXECUTE\n");
    break;
  case OCI_CONTINUE:
    (void) printf("Error - OCI_CONTINUE\n");
    break;
  default:
    break;
  }
}
```

```
/* End of file tkaqdocn.c */
```

Visual Basic (OO4O): Example Code

This feature is not supported currently.

Java (JDBC): Example Code

This feature is not supported through the Java API.

Retention and Message History

Advanced Queuing allows the retention of the message history after consumption. The messages and their histories can be queried using SQL. This allows business analysis of the integrated system. In certain cases, messages need to be tracked. For example, if a message is produced as a result of the consumption of another message, the two are related. As the application designer, you may want to keep track of such relationships. Taken together, retention, message identifiers, and SQL queries make it possible to build powerful message warehouses.

Scenario

Assume that you need to determine the average order processing time. This includes the time the order has to wait in the `backed_order` queue. You want to know the average wait time in the `backed_order` queue. SQL queries can determine the wait time for orders in the shipping application. Specify the retention as `TRUE` for the shipping queues and specify the order number in the correlation field of the message.

For simplicity, only orders that have already been processed are analyzed. The processing time for an order in the shipping application is the difference between the enqueue time in the `WS_bookedorders_que` and the enqueue time in the `WS_shipped_orders_que` (see "tkaqdoca.sql: Script to Create Users, Objects, Queue Tables, Queues & Subscribers" on page C-2 of Appendix C, "Scripts for Implementing BooksOnLine".

PL/SQL (DBMS_AQADM Package): Example Code

```
SELECT  SUM(SO.enq_time - BO.enq_time) / count (*) AVG_PRCS_TIME
   FROM WS.AQ$WS_orders_pr_mqtab BO , WS.AQ$WS_orders_mqtab SO
   WHERE SO.msg_state = 'PROCESSED' and BO.msg_state = 'PROCESSED'
   AND SO.corr_id = BO.corr_id and SO.queue = 'WS_shippedorders_que';

/* Average waiting time in the backed order queue: */
SELECT SUM(BACK.deq_time - BACK.enq_time)/count (*) AVG_BACK_TIME
   FROM WS.AQ$WS_orders_mqtab BACK
   WHERE BACK.msg_state = 'PROCESSED' AND BACK.queue = 'WS_backorders_que';
```

Visual Basic (OO4O): Example Code

Use the dbexecutesql interface from the database for this functionality.

Java (JDBC): Example Code

No example is provided with this release.

Publish-Subscribe Support

Advanced Queuing supports the publish-subscribe model of application integration. In the model, publishing applications put the message in the queue. The subscribing applications subscribe to the message in the queue. More publishing and subscribing applications can be dynamically added without changing the existing publishing and subscribing applications. Advanced Queuing also supports content-based subscriptions. The subscriber can subscribe to a subset of messages in the queue based on the message properties and the contents of the messages. A subscriber to a queue can also be another queue or a consumer on another queue.

You can implement a publish-subscribe model of communication using Advanced Queuing as follows:

- Set up one or more queues to hold messages. These queues should represent an area or subject of interest. For example, a queue can be used to represent billed orders.
- Set up a set of rule-based subscribers. Each subscriber may specify a rule which represents a specification for the messages that the subscriber wishes to receive. A null rule indicates that the subscriber wishes to receive all messages.
- Publisher applications publish messages to the queue by invoking an enqueue call.

- Subscriber applications may receive messages in the following manner:
  - A dequeue call retrieves messages that match the subscription criteria.
  - A listen call may be used to monitor multiple queues for subscriptions on different queues. This is a more scalable solution in cases where a subscriber application has subscribed to many queues and wishes to receive messages that arrive in any of the queues.
  - Use the OCI notification mechanism. This allows a push mode of message delivery. The subscriber application registers the queues (and subscriptions specified as subscribing agent) from which to receive messages. This registers a callback to be invoked when messages matching the subscriptions arrive.

Scenario

The BooksOnLine application illustrates the use of a publish-subscribe model for communicating between applications. The following subsections give some examples.

Defining queues The Order Entry application defines a queue (`OE_booked_orders_que`) to communicate orders that are booked to various applications. The Order Entry application is not aware of the various subscriber applications and thus, a new subscriber application can be added without disrupting any setup or logic in the Order Entry (publisher) application.

Setting Up Subscriptions The various shipping applications and the customer service application (that is, Eastern region shipping, Western region shipping, Overseas shipping and Customer Service) are defined as subscribers to the `booked_orders` queue of the Order Entry application. Rules are used to route messages of interest to the various subscribers. Thus, Eastern Region shipping, which handles shipment of all orders for the East coast and all rush U.S. orders, expresses the subscription rule as follows:

```
rule  => 'tab.user_data.orderregion = ''EASTERN'' OR
(tab.user_data.ordertype = ''RUSH'' AND
tab.user_data.customer.country = ''USA'') '
```

Each subscriber can specify a local queue where messages are to be delivered. The Eastern region shipping application specifies a local queue (`ES_booked_orders_que`) for message delivery by specifying the subscriber address as follows:

```
subscriber := aq$_agent('East_Shipping', 'ES.ES_bookedorders_que', null);
```

Setting Up Propagation Enable propagation from each publisher application queue. To allow subscribed messages to be delivered to remote queues, the Order Entry application enables propagation by means of the following statement:

```
execute dbms_aqadm.schedule_propagation(queue_name => 'OE.OE_bookedorders_que');
```

Publishing Messages Booked orders are published by the Order Entry application when it enqueues orders (into the `OE_booked_order_que`) that have been validated and are ready for shipping. These messages are then routed to each of the subscribing applications. Messages are delivered to local queues (if specified) at each of the subscriber applications.

Receiving Messages Each of the shipping applications and the Customer Service application will then receive these messages in their local queues. For example, Eastern Region Shipping only receives booked orders that are for East Coast addresses or any U.S. order that is marked `RUSH`. This application then dequeues messages and processes its orders for shipping.

Support for Oracle Real Application Clusters

Real Application Clusters can be used to improve AQ performance by allowing different queues to be managed by different instances. You do this by specifying different instance affinities (preferences) for the queue tables that store the queues. This allows queue operations (enqueue and dequeue) on different queues to occur in parallel.

The AQ queue monitor process continuously monitors the instance affinities of the queue tables. The queue monitor assigns ownership of a queue table to the specified primary instance if it is available, failing which it assigns it to the specified secondary instance.

If the owner instance of a queue table terminates, the queue monitor changes ownership to a suitable instance such as the secondary instance.

AQ propagation is able to make use of Real Application Clusters, although it is transparent to the user. The affinities for jobs submitted on behalf of the propagation schedules are set to the same values as that of the affinities of the respective queue tables. Thus a `job_queue_process` associated with the owner instance of a queue table will be handling the propagation from queues stored in that queue table, thereby minimizing pinging. Additional discussion on this topic can be found under AQ propagation scheduling (see "Scheduling a Queue Propagation" on page 9-71 in Chapter 9, "Administrative Interface").

See also: *Oracle9i Real Application Clusters Setup and Configuration*

Scenario

In the BooksOnLine example, operations on the `new_orders_queue` and `booked_order_queue` at the order entry (OE) site can be made faster if the two queues are associated with different instances. This is done by creating the queues in different queue tables and specifying different affinities for the queue tables in the `create_queue_table()` command.

In the example, the queue table `OE_orders_sqtab` stores queue `new_orders_queue` and the primary and secondary are instances 1 and 2 respectively. Queue table `OE_orders_mqtab` stores queue `booked_order_queue` and the primary and secondary are instances 2 and 1 respectively. The objective is to let instances 1 and 2 manage the two queues in parallel. By default, only one instance is available, in which case the owner instances of both queue tables will be set to instance 1. However, if Real Application Clusters are set up correctly and both instances 1 and 2 are available, then queue table `OE_orders_sqtab` will be owned by instance 1 and the other queue table will be owned by instance 2. The primary and secondary instance specification of a queue table can be changed dynamically using the `alter_queue_table()` command as shown in the following example. Information about the primary, secondary and owner instance of a queue table can be obtained by querying the view `USER_QUEUE_TABLES` (see "Selecting Queue Tables in User Schema" on page 10-21 in "Administrative Interface: Views").

Note: Queue names and queue table names are converted to upper case. Mixed case (upper and lower case together) is not supported for queue names and queue table names.

PL/SQL (DBMS_AQADM Package): Example Code

```
/* Create queue tables, queues for OE  */
CONNECT OE/OE;
EXECUTE dbms_aqadm.create_queue_table( \
        queue_table        => 'OE_orders_sqtab',\
        comment            => 'Order Entry Single-Consumer Orders queue table',\
        queue_payload_type => 'BOLADM.order_typ',\
        compatible         => '8.1',\
        primary_instance   => 1,\
        secondary_instance => 2);
```

```
EXECUTE dbms_aqadm.create_queue_table(\
        queue_table        => 'OE_orders_mqtab',\
        comment            => 'Order Entry Multi Consumer Orders queue table',\
        multiple_consumers => TRUE,\
        queue_payload_type => 'BOLADM.order_typ',\
        compatible         => '8.1',\
        primary_instance   => 2,\
        secondary_instance => 1);

EXECUTE dbms_aqadm.create_queue ( \
        queue_name         => 'OE_neworders_que',\
        queue_table        => 'OE_orders_sqtab');

EXECUTE dbms_aqadm.create_queue ( \
        queue_name         => 'OE_bookedorders_que',\
        queue_table        => 'OE_orders_mqtab');

/* Check instance affinity of OE queue tables from AQ administrative view: */
SELECT queue_table, primary_instance, secondary_instance, owner_instance
FROM user_queue_tables;

/* Alter instance affinity of OE queue tables: */
EXECUTE dbms_aqadm.alter_queue_table( \
        queue_table        => 'OE.OE_orders_sqtab',\
        primary_instance   => 2,\
        secondary_instance => 1);

EXECUTE dbms_aqadm.alter_queue_table(  \
        queue_table        => 'OE.OE_orders_mqtab', \
        primary_instance   => 1,\
        secondary_instance => 2);

/* Check instance affinity of OE queue tables from AQ administrative view: */
SELECT queue_table, primary_instance, secondary_instance, owner_instance
FROM user_queue_tables;
```

Visual Basic (OO4O): Example Code

This feature currently not supported.

Java (JDBC): Example Code

```
public static void createQueueTablesAndQueues(Connection db_conn)
{
    AQSession            aq_sess;
    AQQueueTableProperty sqt_prop;
```

```
AQQueueTableProperty mqt_prop;
AQQueueTable         sq_table;
AQQueueTable         mq_table;
AQQueueProperty      q_prop;
AQQueue              neworders_q;
AQQueue              bookedorders_q;

try
{
    /* Create an AQ Session: */
    aq_sess = AQDriverManager.createAQSession(db_conn);

    /* Create a single-consumer orders queue table */
    sqt_prop = new AQQueueTableProperty("BOLADM.order_typ");
    sqt_prop.setComment("Order Entry Single-Consumer Orders queue table");
    sqt_prop.setCompatible("8.1");
    sqt_prop.setPrimaryInstance(1);
    sqt_prop.setSecondaryInstance(2);

    sq_table = aq_sess.createQueueTable("OE", "OE_orders_sqtab", sqt_prop);

    /* Create a multiconsumer orders queue table */
    mqt_prop = new AQQueueTableProperty("BOLADM.order_typ");
    mqt_prop.setComment("Order Entry Multi Consumer Orders queue table");
    mqt_prop.setCompatible("8.1");
    mqt_prop.setMultiConsumer(true);
    mqt_prop.setPrimaryInstance(2);
    mqt_prop.setSecondaryInstance(1);

    mq_table = aq_sess.createQueueTable("OE", "OE_orders_mqtab", mqt_prop);


    /* Create Queues in these queue tables */
    q_prop = new AQQueueProperty();

    neworders_q = aq_sess.createQueue(sq_table, "OE_neworders_que",
                                      q_prop);

    bookedorders_q = aq_sess.createQueue(mq_table, "OE_bookedorders_que",
                                         q_prop);

}
catch (AQException ex)
{
    System.out.println("AQ Exception: " + ex);
```

```
    }
}

public static void alterInstanceAffinity(Connection db_conn)
{
    AQSession             aq_sess;
    AQQueueTableProperty sqt_prop;
    AQQueueTableProperty mqt_prop;
    AQQueueTable          sq_table;
    AQQueueTable          mq_table;
    AQQueueProperty       q_prop;

    try
    {

        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        /* Check instance affinities */
        sq_table = aq_sess.getQueueTable("OE", "OE_orders_sqtab");

        sqt_prop = sq_table.getProperty();
        System.out.println("Current primary instance for OE_orders_sqtab: " +
                           sqt_prop.getPrimaryInstance());

        mq_table = aq_sess.getQueueTable("OE", "OE_orders_mqtab");
        mqt_prop = mq_table.getProperty();
        System.out.println("Current primary instance for OE_orders_mqtab: " +
                           mqt_prop.getPrimaryInstance());

        /* Alter queue table affinities */
        sq_table.alter(null, 2, 1);

        mq_table.alter(null, 1, 2);

        sqt_prop = sq_table.getProperty();
        System.out.println("Current primary instance for OE_orders_sqtab: " +
                           sqt_prop.getPrimaryInstance());

        mq_table = aq_sess.getQueueTable("OE", "OE_orders_mqtab");
        mqt_prop = mq_table.getProperty();
        System.out.println("Current primary instance for OE_orders_mqtab: " +
                           mqt_prop.getPrimaryInstance());

    }
```

```
    catch (AQException ex)
    {
        System.out.println("AQ Exception: " + ex);
    }
}
```

Support for Statistics Views

Each instance keeps its own AQ statistics information in its own SGA, and does not have knowledge of the statistics gathered by other instances. When a GV$AQ view is queried by an instance, all other instances funnel their AQ statistics information to the instance issuing the query.

Scenario

The gv$ view can be queried at any time to see the number of messages in waiting, ready or expired state. The view also displays the average number of seconds messages have been waiting to be processed. The order processing application can use this to dynamically tune the number of order processing processes (see "Selecting the Number of Messages in Different States for the Whole Database" on page 10-33 in Chapter 10, "Administrative Interface: Views").

PL/SQL (DBMS_AQADM Package): Example Code

```
CONNECT oe/oe

/* Count the number as messages and the average time for which the messages have
   been waiting: */
SELECT READY, AVERAGE_WAIT FROM gv$aq Stats, user_queues Qs
  WHERE Stats.qid = Qs.qid and Qs.Name = 'OE_neworders_que';
```

Visual Basic (OO4O): Example Code

Use the dbexecutesql interface from the database for this functionality.

Java (JDBC): Example Code

No example is provided with this release.

Internet Access

See Chapter 17, "Internet Access to Advanced Queuing" for information on Internet access to Advanced Queuing features.

Enqueue Features

In this section, the following topics are discussed:

- Subscriptions and Recipient Lists
- Priority and Ordering of Messages
- Time Specification: Delay
- Time Specification: Expiration
- Message Grouping
- Retry with Delay Interval
- Message Transformation During Enqueue
- Enqueue Using the AQ XML Servlet

Subscriptions and Recipient Lists

After consumption by dequeue, messages are retained for the time specified in `retention_time`. When `retention_time` expires, messages are removed by the time manager process.

After processing, the message is removed if the `retention_time` of the queue is 0, or retained for the specified retention time. While the message is retained the message can either be queried using SQL on the queue table view or by dequeuing using the `BROWSE` mode and specifying the message ID of the processed message.

Advanced Queuing allows a single message to be processed and consumed by more than one consumer. To use this feature, you must create multiconsumer queues and enqueue the messages into these multiconsumer queues. Advanced Queuing allows two methods of identifying the list of consumers for a message: subscriptions and recipient lists.

Subscriptions

You can add a subscription to a queue by using the `DBMS_AQADM.ADD_SUBSCRIBER` PL/SQL procedure (see "Adding a Subscriber" on page 9-58 in Chapter 9, "Administrative Interface"). This lets you specify a consumer by means of the `AQ$_AGENT` parameter for enqueued messages. You can add more subscribers by repeatedly using the `DBMS_AQADM.ADD_SUBSCRIBER` procedure up to a maximum of 1024 subscribers for a multiconsumer queue.

All consumers that are added as subscribers to a multiconsumer queue must have unique values for the `AQ$_AGENT` parameter. This means that two subscribers cannot have the same values for the NAME, ADDRESS and PROTOCOL attributes for the AQ$_AGENT type. At least one of the three attributes must be different for two subscribers (see "Agent Type (aq$_agent)" on page 2-3 for formal description of this data structure).

You cannot add subscriptions to single-consumer queues or exception queues. A consumer that is added as a subscriber to a queue will only be able to dequeue messages that are enqueued after the DBMS_AQADM.ADD_SUBSCRIBER procedure is completed. In other words, messages that had been enqueued before this procedure is executed will not be available for dequeue by this consumer.

You can remove a subscription by using the DBMS_AQADM.REMOVE_SUBSCRIBER procedure (see "Removing a Subscriber" in Chapter 9, "Administrative Interface"). AQ will automatically remove from the queue all data corresponding to the consumer identified by the AQ$_AGENT parameter. In other words, it is not an error to execute the REMOVE_SUBSCRIBER procedure even when there are pending messages that are available for dequeue by the consumer. These messages will be automatically made unavailable for dequeue after the REMOVE_SUBSCRIBER procedure is executed. In a queue table that is created with the compatible parameter set to '8.1' or higher, such messages that were not dequeued by the consumer will be shown as "UNDELIVERABLE" in the AQ$<queue_table> view. Note that a multiconsumer queue table created without the compatible parameter, or with the compatible parameter set to '8.0', does not display the state of a message on a consumer basis, but only displays the global state of the message.

Recipient Lists

You do not need to specify subscriptions for a multiconsumer queue if the producers of messages for enqueue supply a recipient list of consumers. In some situations it may be desirable to enqueue a message that is targeted to a specific set of consumers rather than the default list of subscribers. You accomplish this by specifying a recipient list at the time of enqueuing the message.

- In PL/SQL you specify the recipient list by adding elements to the recipient_list field of the message_properties record.
- In OCI the recipient list is specified by using the LNOCISetAttr procedure to specify an array of LNOCI_DTYPE_AQAGENT descriptors as the recipient list (LNOCI_ATTR_RECIPIENT_LIST attribute) of an LNOCI_DTYPE_AQMSG_PROPERTIES message properties descriptor.

If a recipient list is specified during enqueue, it overrides the subscription list. In other words, messages that have a specified recipient list will not be available for dequeue by the subscribers of the queue. The consumers specified in the recipient list may or may not be subscribers for the queue. It is an error if the queue does not have any subscribers and the enqueue does not specify a recipient list (see "Enqueuing a Message" on page 11-4 in Chapter 11, "Operational Interface: Basic Operations").

Priority and Ordering of Messages

The message ordering dictates the order that messages are dequeued from a queue. The ordering method for a queue is specified when a queue table is created (see "Creating a Queue Table" on page 9-4 in Chapter 9, "Administrative Interface").

Priority ordering of messages is achieved by specifying priority, enqueue time as the sort order for the message. If priority ordering is chosen, each message will be assigned a priority at enqueue time by the enqueuer. At dequeue time, the messages will be dequeued in the order of the priorities assigned. If two messages have the same priority, the order in which they are dequeued is determined by the enqueue time. A first-in, first-out (FIFO) priority queue can also be created by specifying the enqueue time, priority as the sort order of the messages.

Scenario

In the BooksOnLine application, a customer can request:

- FedEx shipping (priority 1),
- Priority air shipping (priority 2). or
- Regular ground shipping (priority 3).

The Order Entry application uses a priority queue to store booked orders. Booked orders are propagated to the regional booked orders queues. At each region, orders in these regional booked orders queues are processed in the order of the shipping priorities.

The following calls create the priority queues for the Order Entry application.

PL/SQL (DBMS_AQADM Package): Example Code

```
/* Create a priority queue table for OE: */
EXECUTE dbms_aqadm.create_queue_table( \
   queue_table         => 'OE_orders_pr_mqtab', \
   sort_list           =>'priority,enq_time', \
   comment             => 'Order Entry Priority  \
                          MultiConsumer Orders queue table',\
   multiple_consumers  => TRUE, \
   queue_payload_type  => 'BOLADM.order_typ', \
```

```
   compatible          => '8.1', \
   primary_instance    => 2, \
   secondary_instance  => 1);

EXECUTE dbms_aqadm.create_queue ( \
   queue_name          => 'OE_bookedorders_que', \
   queue_table         => 'OE_orders_pr_mqtab');

/* When an order arrives, the order entry application can use the following
   procedure to enqueue the order into its booked orders queue. A shipping
   priority is specified for each order: */
CREATE OR REPLACE procedure order_enq(book_title        IN VARCHAR2,
                                      book_qty          IN NUMBER,
                                      order_num         IN NUMBER,
                                      shipping_priority IN NUMBER,
                                      cust_state        IN VARCHAR2,
                                      cust_country      IN VARCHAR2,
                                      cust_region       IN VARCHAR2,
                                      cust_ord_typ      IN VARCHAR2) AS

OE_enq_order_data        BOLADM.order_typ;
OE_enq_cust_data         BOLADM.customer_typ;
OE_enq_book_data         BOLADM.book_typ;
OE_enq_item_data         BOLADM.orderitem_typ;
OE_enq_item_list         BOLADM.orderitemlist_vartyp;
enqopt                   dbms_aq.enqueue_options_t;
msgprop                  dbms_aq.message_properties_t;
enq_msgid                RAW(16);

BEGIN
   msgprop.correlation := cust_ord_typ;
   OE_enq_cust_data    := BOLADM.customer_typ(NULL, NULL, NULL, NULL,
                                cust_state, NULL, cust_country);
   OE_enq_book_data    := BOLADM.book_typ(book_title, NULL, NULL, NULL);
   OE_enq_item_data    := BOLADM.orderitem_typ(book_qty,
                                OE_enq_book_data, NULL);
   OE_enq_item_list    := BOLADM.orderitemlist_vartyp(
                                BOLADM.orderitem_typ(book_qty,
                                OE_enq_book_data, NULL));
   OE_enq_order_data   := BOLADM.order_typ(order_num, NULL,
                                cust_ord_typ, cust_region,
                                OE_enq_cust_data, NULL,
                                OE_enq_item_list, NULL);

   /*Put the shipping priority into message property before enqueuing
```

```
        the message: */
      msgprop.priority    := shipping_priority;
      dbms_aq.enqueue('OE.OE_bookedorders_que', enqopt, msgprop,
                          OE_enq_order_data, enq_msgid);
           COMMIT;
     END;
     /


/* At each region, similar booked order queues are created. The orders are
   propagated from the central Order Entry's booked order queues to the regional
   booked order queues.For example, at the western region, the booked orders
   queue is created.
   Create a priority queue table for WS shipping: */
EXECUTE dbms_aqadm.create_queue_table( \
   queue_table        =>  'WS_orders_pr_mqtab',
   sort_list          =>'  priority,enq_time',  \
   comment            =>  'West Shipping Priority  \
                           MultiConsumer Orders queue table',\
   multiple_consumers => TRUE, \
   queue_payload_type => 'BOLADM.order_typ', \
   compatible         => '8.1');

/* Booked orders are stored in the priority queue table: */
EXECUTE dbms_aqadm.create_queue ( \
   queue_name         => 'WS_bookedorders_que', \
   queue_table        => 'WS_orders_pr_mqtab');

/* At each region, the shipping application dequeues orders from the regional
   booked order queue according to the orders' shipping priorities, processes
   the orders, and enqueues the processed orders into the shipped orders queues
   or the back orders queues. */
```

Visual Basic (OO4O): Example Code

```
Dim OraSession as object
Dim OraDatabase as object
Dim OraAq as object
Dim OraMsg as Object
Dim OraOrder,OraCust,OraBook,OraItem,OraItemList as Object
Dim Msgid as String

   Set OraSession = CreateObject("OracleInProcServer.XOraSession")
   Set OraDatabase = OraSession.DbOpenDatabase("dbname", "user/pwd", 0&)
```

```
set oraaq = OraDatabase.CreateAQ("OE.OE_bookedorders_que")
Set OraMsg = OraAq.AQMsg(ORATYPE_OBJECT, "BOLADM.order_typ")
Set OraOrder = OraDatabase.CreateOraObject("BOLADM.order_typ")
Set OraCust = OraDatabase.CreateOraObject("BOLADM.Customer_typ")
Set OraBook = OraDatabase.CreateOraObject("BOLADM.book_typ")
Set OraItem = OraDatabase.CreateOraObject("BOLADM.orderitem_typ")
Set OraItemList = OraDatabase.CreateOraObject("BOLADM.orderitemlist_vartyp")

' Get the values of cust_state,cust_country etc from user(form_based
' input) and then a cmd_click event for Enqueue
' will execute the subroutine order_enq.
Private Sub Order_enq()

OraMsg.correlation = txt_correlation
'Initialize the customer details
     OraCust("state") = txt_cust_state
OraCust("country") = txt_cust_country
     OraBook("title") = txt_book_title
OraItem("quantity") = txt_book_qty
OraItem("item") = OraBook
OraItemList(1) = OraItem
OraOrder("orderno") = txt_order_num
OraOrder("ordertype") = txt_cust_order_typ
OraOrder("orderregion") = cust_region
OraOrder("customer") = OraCust
OraOrder("items") = OraItemList

'Put the shipping priority into message property before enqueuing
'  the message:
OraMsg.priority = priority
OraMsg = OraOrder
Msgid = OraAq.enqueue

'Release all allocations
End Sub
```

Java (JDBC): Example Code

```
public static void createPriorityQueueTable(Connection db_conn)
{
    AQSession              aq_sess;
    AQQueueTableProperty mqt_prop;
    AQQueueTable           pr_mq_table;
    AQQueueProperty        q_prop;
    AQQueue                bookedorders_q;
```

```
    try
    {

        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        /* Create a priority queue table for OE */
        mqt_prop = new AQQueueTableProperty("BOLADM.order_typ");
        mqt_prop.setComment("Order Entry Priority " +
                            "MultiConsumer Orders queue table");
        mqt_prop.setCompatible("8.1");
        mqt_prop.setMultiConsumer(true);

        mqt_prop.setSortOrder("priority,enq_time");

        pr_mq_table = aq_sess.createQueueTable("OE", "OE_orders_pr_mqtab",
                                               mqt_prop);

        /* Create a Queue in this queue table */
        q_prop = new AQQueueProperty();

        bookedorders_q = aq_sess.createQueue(pr_mq_table,
                                              "OE_bookedorders_que", q_prop);

        /* Enable enqueue and dequeue on the queue */
        bookedorders_q.start(true, true);

    }
    catch (AQException ex)
    {
        System.out.println("AQ Exception: " + ex);
    }
}


/* When an order arrives, the order entry application can use the following
   procedure to enqueue the order into its booked orders queue. A shipping
   priority is specified for each order
 */
public static void order_enqueue(Connection db_conn, String book_title,
                                 double book_qty, double order_num,
                                 int ship_priority, String cust_state,
                                 String cust_country, String cust_region,
                                 String cust_order_type)
```

```
{
    AQSession         aq_sess;
    AQQueue           bookedorders_q;
    Order             enq_order;
    Customer          cust_data;
    Book              book_data;
    OrderItem         item_data;
    OrderItem[]       items;
    OrderItemList     item_list;
    AQEnqueueOption   enq_option;
    AQMessageProperty m_property;
    AQMessage         message;
    AQObjectPayload   obj_payload;
    byte[]            enq_msg_id;

    try
    {

        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        cust_data = new Customer();
        cust_data.setCountry(cust_country);
        cust_data.setState(cust_state);

        book_data = new Book();
        book_data.setTitle(book_title);

        item_data = new OrderItem();
        item_data.setQuantity(new BigDecimal(book_qty));
        item_data.setItem(book_data);

        items = new OrderItem[1];
        items[0] = item_data;

        item_list = new OrderItemList(items);

        enq_order = new Order();
        enq_order.setCustomer(cust_data);
        enq_order.setItems(item_list);
        enq_order.setOrderno(new BigDecimal(order_num));
        enq_order.setOrdertype(cust_order_type);

        bookedorders_q = aq_sess.getQueue("OE", "OE_bookedorders_que");
```

```
            message = bookedorders_q.createMessage();

            /* Put the shipping priority into message property before enqueuing */
            m_property = message.getMessageProperty();

            m_property.setPriority(ship_priority);

            obj_payload = message.getObjectPayload();

            obj_payload.setPayloadData(enq_order);

            enq_option = new AQEnqueueOption();

            /* Enqueue the message */
            enq_msg_id = bookedorders_q.enqueue(enq_option, message);

            db_conn.commit();

        }
        catch (AQException aq_ex)
        {
            System.out.println("AQ Exception: " + aq_ex);
        }
        catch (SQLException sql_ex)
        {
            System.out.println("SQL Exception: " + sql_ex);
        }

    }

    /* At each region, similar booked order queues are created. The orders are
       propagated from the central Order Entry's booked order queues to the
       regional booked order queues.
       For example, at the western region, the booked orders queue is created.
       Create a priority queue table for WS shipping
     */
    public static void createWesternShippingQueueTable(Connection db_conn)
    {
        AQSession             aq_sess;
        AQQueueTableProperty mqt_prop;
        AQQueueTable          mq_table;
        AQQueueProperty       q_prop;
        AQQueue               bookedorders_q;

        try
```

```
    {

        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);


        /* Create a priority queue table for WS */
        mqt_prop = new AQQueueTableProperty("BOLADM.order_typ");
        mqt_prop.setComment("Western Shipping Priority " +
                            "MultiConsumer Orders queue table");
        mqt_prop.setCompatible("8.1");
        mqt_prop.setMultiConsumer(true);
        mqt_prop.setSortOrder("priority,enq_time");

        mq_table = aq_sess.createQueueTable("WS", "WS_orders_pr_mqtab",
                                            mqt_prop);

        /* Booked orders are stored in the priority queue table: */
        q_prop = new AQQueueProperty();

        bookedorders_q = aq_sess.createQueue(mq_table, "WS_bookedorders_que",
                                             q_prop);

        /* Start the queue */
        bookedorders_q.start(true, true);

    }
    catch (AQException ex)
    {
        System.out.println("AQ Exception: " + ex);
    }

  /* At each region, the shipping application dequeues orders from the
     regional booked order queue according to the orders' shipping priorities,
     processes the orders, and enqueues the processed orders into the shipped
     orders queues or the back orders queues.
   */
}
```

Time Specification: Delay

AQ supports delay delivery of messages by letting the enqueuer specify a delay interval on a message when enqueuing the message, that is, the time before that a message cannot be retrieved by a dequeue call. (see "Enqueuing a Message [Specify

Message Properties]" on page 11-9 in Chapter 11, "Operational Interface: Basic Operations"). The delay interval determines when an enqueued message is marked as available to the dequeuers after the message is enqueued.

When a message is enqueued with a delay time set, the message is marked in a WAIT state. Messages in WAIT state are masked from the default dequeue calls. A background time-manager daemon wakes up periodically, scans an internal index for all WAIT state messages, and marks messages as READY if their delay time has passed. The time-manager will then post to all foreground processes that are waiting on queues for messages that have just been made available.

Scenario

In the BooksOnLine application, delay can be used to implement deferred billing. A billing application can define a queue where shipped orders that are not billed immediately can be placed in a deferred billing queue with a delay. For example, a certain class of customer accounts, such as those of corporate customers, may not be billed for 15 days. The billing application dequeues incoming shipped order messages (from the shippedorders queue) and if the order is for a corporate customer, this order is enqueued into a deferred billing queue with a delay.

PL/SQL (DBMS_AQADM Package): Example Code

```
/* Enqueue an order to implement deferred billing so that the order is not made
   visible again until delay has expired: */
CREATE OR REPLACE PROCEDURE defer_billing(deferred_billing_order order_typ)
AS
  defer_bill_queue_name    VARCHAR2(62);
  enqopt                   dbms_aq.enqueue_options_t;
  msgprop                  dbms_aq.message_properties_t;
  enq_msgid                RAW(16);
BEGIN

/* Enqueue the order into the deferred billing queue with a delay of 15 days: */
  defer_bill_queue_name := 'CBADM.deferbilling_que';
  msgprop.delay := 15*60*60*24;
  dbms_aq.enqueue(defer_bill_queue_name, enqopt, msgprop,
                  deferred_billing_order, enq_msgid);
END;
/
```

Visual Basic (OO4O): Example Code

```
   set oraaq = OraDatabase.CreateAQ("CBADM.deferbilling_que")
   Set OraMsg = OraAq.AQMsg(ORATYPE_OBJECT, "BOLADM.order_typ")
```

```
Set OraOrder = OraDatabase.CreateOraObject("BOLADM.order_typ")

Private Sub defer_billing

OraMsg = OraOrder
OraMsg.delay = 15*60*60*24
OraMsg = OraOrder 'OraOrder contains the order details
Msgid = OraAq.enqueue

End Sub
```

Java (JDBC): Example Code

```
public static void defer_billing(Connection db_conn, Order deferred_order)
{
    AQSession         aq_sess;
    AQQueue           def_bill_q;
    AQEnqueueOption   enq_option;
    AQMessageProperty m_property;
    AQMessage         message;
    AQObjectPayload   obj_payload;
    byte[]            enq_msg_id;

    try
    {
        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        def_bill_q = aq_sess.getQueue("CBADM", "deferbilling_que");

        message = def_bill_q.createMessage();

        /* Enqueue the order into the deferred billing queue with a delay
           of 15 days */
        m_property = message.getMessageProperty();
        m_property.setDelay(15*60*60*24);

        obj_payload = message.getObjectPayload();
        obj_payload.setPayloadData(deferred_order);

        enq_option = new AQEnqueueOption();

        /* Enqueue the message */
        enq_msg_id = def_bill_q.enqueue(enq_option, message);
```

```
        db_conn.commit();
    }
    catch (Exception ex)
    {
        System.out.println("Exception " + ex);
    }

}
```

Time Specification: Expiration

Messages can be enqueued with an expiration that specifies the interval of time the message is available for dequeuing. Note that expiration processing requires that the queue monitor be running. The producer can also specify the time when a message expires, at which time the message is moved to an exception queue.

Scenario

In the BooksOnLine application, expiration can be used to control the amount of time that is allowed to process a back order. The shipping application places orders for books that are not available on a back order queue. If the shipping policy is that all back orders must be shipped within a week, then messages can be enqueued into the back order queue with an expiration of 1 week. In this case, any back orders that are not processed within one week are moved to the exception queue with the message state set to `EXPIRED`. This can be used to flag any orders that have not been shipped according to the back order shipping policy.

PL/SQL (DBMS_AQADM Package): Example Code

```
CONNECT BOLADM/BOLADM
/* Req-enqueue a back order into a back order queue and set a delay of 7 days;
   all back orders must be processed in 7 days or they are moved to the
   exception queue: */
CREATE OR REPLACE PROCEDURE requeue_back_order(sale_region varchar2,
                                               backorder order_typ)
AS
  back_order_queue_name    VARCHAR2(62);
  enqopt                   dbms_aq.enqueue_options_t;
  msgprop                  dbms_aq.message_properties_t;
  enq_msgid                RAW(16);
BEGIN
  /* Look up a back order queue based the the region by means of a directory
     service: */
  IF sale_region = 'WEST' THEN
```

```
    back_order_queue_name := 'WS.WS_backorders_que';
  ELSIF sale_region = 'EAST' THEN
    back_order_queue_name := 'ES.ES_backorders_que';
  ELSE
    back_order_queue_name := 'OS.OS_backorders_que';
  END IF;

  /* Enqueue the order with expiration set to 7 days: */
  msgprop.expiration := 7*60*60*24;
  dbms_aq.enqueue(back_order_queue_name, enqopt, msgprop,
                  backorder, enq_msgid);
END;
/
```

Visual Basic (OO4O): Example Code

```
   set oraaq1 = OraDatabase.CreateAQ("WS.WS_backorders_que")
   set oraaq2 = OraDatabase.CreateAQ("ES.ES_backorders_que")
   set oraaq3 = OraDatabase.CreateAQ("CBADM.deferbilling_que")
   Set OraMsg = OraAq.AQMsg(ORATYPE_OBJECT, "BOLADM.order_typ")
   Set OraBackOrder = OraDatabase.CreateOraObject("BOLADM.order_typ")

Private Sub Requeue_backorder
   Dim q as oraobject
   If sale_region = WEST then
      q = oraaq1
   else if sale_region = EAST then
      q = oraaq2
   else
      q = oraaq3
   end if

   OraMsg.delay = 7*60*60*24
   OraMsg = OraBackOrder 'OraOrder contains the order details
   Msgid = q.enqueue

End Sub
```

Java (JDBC): Example Code

```
/* Re-enqueue a back order into a back order queue and set a delay of 7 days;
   all back orders must be processed in 7 days or they are moved to the
   exception queue */
public static void requeue_back_order(Connection db_conn,
```

```
                                           String sale_region, Order back_order)
{
    AQSession         aq_sess;
    AQQueue           back_order_q;
    AQEnqueueOption   enq_option;
    AQMessageProperty m_property;
    AQMessage         message;
    AQObjectPayload   obj_payload;
    byte[]            enq_msg_id;

    try
    {
        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        /* Look up a back order queue based on the region */
        if(sale_region.equals("WEST"))
        {
            back_order_q = aq_sess.getQueue("WS", "WS_backorders_que");
        }
        else if(sale_region.equals("EAST"))
        {
            back_order_q = aq_sess.getQueue("ES", "ES_backorders_que");
        }
        else
        {
            back_order_q = aq_sess.getQueue("OS", "OS_backorders_que");
        }

        message = back_order_q.createMessage();

        m_property = message.getMessageProperty();

        /* Enqueue the order with expiration set to 7 days: */
        m_property.setExpiration(7*60*60*24);

        obj_payload = message.getObjectPayload();
        obj_payload.setPayloadData(back_order);

        enq_option = new AQEnqueueOption();

        /* Enqueue the message */
        enq_msg_id = back_order_q.enqueue(enq_option, message);

        db_conn.commit();
```

```
        }
        catch (Exception ex)
        {
            System.out.println("Exception :" + ex);
        }
    }
```

Message Grouping

Messages belonging to one queue can be grouped to form a set that can only be consumed by one user at a time. This requires that the queue be created in a queue table that is enabled for transactional message grouping (see "Creating a Queue Table" on page 9-4 in Chapter 9, "Administrative Interface"). All messages belonging to a group have to be created in the same transaction and all messages created in one transaction belong to the same group. With this feature, you can segment complex messages into simple messages.

For example, messages directed to a queue containing invoices can be constructed as a group of messages starting with the header message, followed by messages representing details, followed by the trailer message. Message grouping is also useful if the message payload contains complex large objects such as images and video that can be segmented into smaller objects.

The general message properties (priority, delay, expiration) for the messages in a group are determined solely by the message properties specified for the first message (head) of the group, irrespective of which properties are specified for subsequent messages in the group.

The message grouping property is preserved across propagation. However, it is important to note that the destination queue where messages have to be propagated must also be enabled for transactional grouping. There are also some restrictions you need to keep in mind if the message grouping property is to be preserved while dequeuing messages from a queue enabled for transactional grouping (see "Dequeue Methods" on page 8-58 and "Modes of Dequeuing" on page 8-69 for additional information).

Scenario

In the BooksOnLine application, message grouping can be used to handle new orders. Each order contains a number of books ordered one by one in succession. Items ordered over the Web exhibit similar behavior.

In the following example, each enqueue corresponds to an individual book that is part of an order and the group/transaction represents a complete order. Only the first enqueue contains customer information. Note that the `OE_neworders_que` is stored in the table `OE_orders_sqtab`, which has been enabled for transactional grouping. Refer to the example code for descriptions of procedures `new_order_enq()` and `same_order_enq()`.

> **Note:** Queue names and queue table names are converted to upper case. Mixed case (upper and lower case together) is not supported for queue names and queue table names.

PL/SQL (DBMS_AQADM Package): Example Code

```
connect OE/OE;

/* Create queue table for OE:  */
EXECUTE dbms_aqadm.create_queue_table( \
        queue_table        => 'OE_orders_sqtab',\
        comment            => 'Order Entry Single-Consumer Orders queue table',\
        queue_payload_type => 'BOLADM.order_typ',\
        message_grouping   => DBMS_AQADM.TRANSACTIONAL, \
        compatible         => '8.1',  \
        primary_instance   => 1,\
        secondary_instance => 2);

/* Create neworders queue for OE: */
EXECUTE dbms_aqadm.create_queue ( \
        queue_name         => 'OE_neworders_que',
        queue_table        => 'OE_orders_sqtab');

/* Login into OE account :*/
CONNECT OE/OE;
SET serveroutput on;
/* Enqueue some orders using message grouping into OE_neworders_que,
   First Order Group: */
EXECUTE BOLADM.new_order_enq('My First   Book', 1, 1001, 'CA');
EXECUTE BOLADM.same_order_enq('My Second  Book', 2);
COMMIT;
/
/* Second Order Group: */
EXECUTE BOLADM.new_order_enq('My Third   Book', 1, 1002, 'WA');
COMMIT;
/
/* Third Order Group: */
EXECUTE BOLADM.new_order_enq('My Fourth  Book', 1, 1003, 'NV');
EXECUTE BOLADM.same_order_enq('My Fifth   Book', 3);
```

```
EXECUTE BOLADM.same_order_enq('My Sixth   Book', 2);
COMMIT;
/
/* Fourth Order Group: */
EXECUTE BOLADM.new_order_enq('My Seventh Book', 1, 1004, 'MA');
EXECUTE BOLADM.same_order_enq('My Eighth  Book', 3);
EXECUTE BOLADM.same_order_enq('My Ninth   Book', 2);
COMMIT;
/
```

Visual Basic (OO4O): Example Code

This functionality is currently not available.

Java (JDBC): Example Code

```
public static void createMsgGroupQueueTable(Connection db_conn)
{
    AQSession            aq_sess;
    AQQueueTableProperty sqt_prop;
    AQQueueTable         sq_table;
    AQQueueProperty      q_prop;
    AQQueue              neworders_q;

    try
    {

        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        /* Create a single-consumer orders queue table */
        sqt_prop = new AQQueueTableProperty("BOLADM.order_typ");
        sqt_prop.setComment("Order Entry Single-Consumer Orders queue table");
        sqt_prop.setCompatible("8.1");
        sqt_prop.setMessageGrouping(AQQueueTableProperty.TRANSACTIONAL);

        sq_table = aq_sess.createQueueTable("OE", "OE_orders_sqtab", sqt_prop);

        /* Create new orders queue for OE */
        q_prop = new AQQueueProperty();

        neworders_q = aq_sess.createQueue(sq_table, "OE_neworders_que",
                                          q_prop);

    }
```

```
    catch (AQException ex)
    {
        System.out.println("AQ Exception: " + ex);
    }
}
```

Message Transformation During Enqueue

Continuing the scenario introduced in "Message Format Transformation" on page 8-6, the Order Entry and Shipping applications have different representations for the order item. The order entry application represents the order item in the form of the ADT `OE.order_typ`. The Western shipping application represents the order item in the form of the ADT `WS.order_typ_sh`. Therefore, the queues in the OE schema are of payload type `OE.orders_typ` and those in the WS schema are of payload type `WS.orders_typ_sh`.

Message transformation can be used during enqueue. This is especially useful for verification and transformation of messages during enqueue. An application can generate a message based on its own data model. The message can be transformed to the data type of the queue before it is enqueued using the transformation mapping.

Scenario

At enqueue time, assume that instead of propagating messages from the `OE_booked_orders_topic`, an application dequeues the order, and, if it is meant for Western Shipping, publishes it to the `WS_booked_orders_topic`.

PL/SQL (DBMS_AQ Package): Example Code

The application can use transformations at enqueue time as follows:

```
CREATE OR REPLACE FUNCTION
  fwd_message_to_ws_shipping(booked_order  OE.order_typ)
   RETURNS boolean AS

 enq_opt   dbms_aq.enqueue_options_t;
 msg_prp   dbms_aq.message_properties_t;
BEGIN

 IF (booked_order.order_region = 'WESTERN' and
     booked_order.order_type != 'RUSH') THEN
   enq_opt.transformation := 'OE.OE2WS';
   msg_prp.recipient_list(0) := aq$_agent('West_shipping', null, null);
```

```
    dbms_aq.enqueue('WS.ws_bookedorders_topic',
                     enq_opt, msg_prp, booked_order);

    RETURN true;
  ELSE
     RETURN false;
  END IF;
END;
```

Visual Basic (OO4O): Example Code

No example is provided with this release.

Java (JDBC): Example Code

No example is provided with this release.

Enqueue Using the AQ XML Servlet

You can perform enqueue requests over the Internet using IDAP. See Chapter 17, "Internet Access to Advanced Queuing" for more information on sending AQ requests using IDAP.

Scenario

In the BooksOnLine application, a customer can request:

- FedEx shipping (priority 1),
- Priority air shipping (priority 2). or
- Regular ground shipping (priority 3).

The Order Entry application uses a priority queue to store booked orders. Booked orders are propagated to the regional booked orders queues. At each region, orders in these regional booked orders queues are processed in the order of the shipping priorities.

The following calls create the priority queues for the Order Entry application.

PL/SQL (DBMS_AQADM Package): Example Code

```
/* Create a priority queue table for OE: */
EXECUTE dbms_aqadm.create_queue_table( \
   queue_table         => 'OE_orders_pr_mqtab', \
   sort_list           =>'priority,enq_time', \
   comment             => 'Order Entry Priority  \
```

```
                              MultiConsumer Orders queue table',\
   multiple_consumers  => TRUE, \
   queue_payload_type  => 'BOLADM.order_typ', \
   compatible          => '8.1', \
   primary_instance    => 2, \
   secondary_instance  => 1);

EXECUTE dbms_aqadm.create_queue ( \
   queue_name          => 'OE_bookedorders_que', \
   queue_table         => 'OE_orders_pr_mqtab');
```

Assume that a customer, John, wants to send an enqueue request using SOAP. The XML message will have the following format.

```
<?xml version="1.0"?>
   <Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>
        <AQXmlSend xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <producer_options>
            <destination>OE.OE_bookedorders_que</destination>
          </producer_options>

          <message_set>
            <message_count>1</message_count>

            <message>
              <message_number>1</message_number>
              <message_header>
                <correlation>ORDER1</correlation>
<priority>1</priority>
 <sender_id>
   <agent_name>john</agent_name>
         </sender_id>
              </message_header>

              <message_payload>

               <ORDER_TYP>
                     <ORDERNO>100</ORDERNO>
                     <STATUS>NEW</STATUS>
                     <ORDERTYPE>URGENT</ORDERTYPE>
                     <ORDERREGION>EAST</ORDERREGION>
                     <CUSTOMER>
                        <CUSTNO>1001233</CUSTNO>
                        <CUSTID>JOHN</CUSTID>
```

```
                        <NAME>JOHN DASH</NAME>
                        <STREET>100 EXPRESS STREET</STREET>
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                        <STATE>CA</STATE>
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            </message>
          </message_set>

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        </AQXmlSend>
      </Body>
</Envelope>
```

Dequeue Features

When there are multiple processes dequeuing from a single consumer queue or dequeuing for a single consumer on the multiconsumer queue, different processes skip the messages that are being worked on by a concurrent process. This allows multiple processes to work concurrently on different messages for the same consumer.

In this section, the following topics are discussed:

- Dequeue Methods
- Multiple Recipients
- Local and Remote Recipients
- Message Navigation in Dequeue
- Modes of Dequeuing
- Optimization of Waiting for Arrival of Messages
- Retry with Delay Interval
- Exception Handling
- Rule-Based Subscription
- Listen Capability
- Message Transformation During Dequeue
- Dequeue Using the AQ XML Servlet

Dequeue Methods

A message can be dequeued using one of the following dequeue methods:

- Correlation identifier
- Message identifier
- Dequeue condition
- Default dequeue

A correlation identifier is a user-defined message property (of `VARCHAR2` datatype) while a message identifier is a system-assigned value (of `RAW` datatype). Multiple messages with the same correlation identifier can be present in a queue, while only one message with a given message identifier can be present. If there are multiple messages with the same correlation identifier, the ordering (enqueue order) between messages may not be preserved on dequeue calls. The correlation identifier cannot be changed between successive dequeue calls without specifying the first message navigation option.

A dequeue condition is an expression that is similar in syntax to the WHERE clause of a SQL query. Dequeue conditions are expressed in terms of the attributes that represent message properties or message content. The messages in the queue are evaluated against the conditions and a message that satisfies the given condition is returned.

A default dequeue means that the first available message for the consumer of a multiconsumer queue or the first available message in a single-consumer queue is dequeued.

Note that dequeuing with correlation identifier, message identifier, or dequeue condition will not preserve the message grouping property (see "Message Grouping" on page 8-51 and "Message Navigation in Dequeue" on page 8-65 for more information).

Scenario

In the BooksOnLine example, rush orders received by the East shipping site are processed first. This is achieved by dequeuing the message using the correlation identifier, which has been defined to contain the order type (rush/normal). For an illustration of dequeuing using a message identifier, refer to the get_northamerican_orders procedure discussed in the example under "Modes of Dequeuing" on page 8-69.

PL/SQL (DBMS_AQADM Package): Example Code

```
CONNECT boladm/boladm;

/*  Create procedures to dequeue RUSH orders */
create or replace procedure get_rushtitles(consumer in varchar2) as

deq_cust_data            BOLADM.customer_typ;
deq_book_data            BOLADM.book_typ;
deq_item_data            BOLADM.orderitem_typ;
deq_msgid                RAW(16);
dopt                     dbms_aq.dequeue_options_t;
mprop                    dbms_aq.message_properties_t;
deq_order_data           BOLADM.order_typ;
qname                    varchar2(30);
no_messages              exception;
```

```
pragma exception_init    (no_messages, -25228);
new_orders               BOOLEAN := TRUE;

begin

        dopt.consumer_name := consumer;
        dopt.wait := 1;
        dopt.correlation := 'RUSH';

        IF (consumer = 'West_Shipping') THEN
                qname := 'WS.WS_bookedorders_que';
        ELSIF (consumer = 'East_Shipping') THEN
                qname := 'ES.ES_bookedorders_que';
        ELSE
                qname := 'OS.OS_bookedorders_que';
        END IF;

        WHILE (new_orders) LOOP
          BEGIN
            dbms_aq.dequeue(
                queue_name => qname,
                dequeue_options => dopt,
                message_properties => mprop,
                payload => deq_order_data,
                msgid => deq_msgid);
            commit;

            deq_item_data := deq_order_data.items(1);
            deq_book_data := deq_item_data.item;

            dbms_output.put_line(' rushorder book_title: ' ||
                                    deq_book_data.title ||
                            ' quantity: ' || deq_item_data.quantity);
          EXCEPTION
            WHEN no_messages THEN
                 dbms_output.put_line (' ---- NO MORE RUSH TITLES ---- ');
                 new_orders := FALSE;
          END;
        END LOOP;

end;
/

CONNECT EXECUTE on get_rushtitles to ES;
```

```
/* Dequeue the orders: */
CONNECT ES/ES;

/*  Dequeue all rush order titles for East_Shipping: */
EXECUTE BOLADM.get_rushtitles('East_Shipping');
```

Visual Basic (OO4O): Example Code

```
   set oraaq1 = OraDatabase.CreateAQ("WS.WS_backorders_que")
   set oraaq2 = OraDatabase.CreateAQ("ES.ES_backorders_que")
   set oraaq3 = OraDatabase.CreateAQ("CBADM.deferbilling_que")
   Set OraMsg = OraAq.AQMsg(ORATYPE_OBJECT, "BOLADM.order_typ")
   Set OraBackOrder = OraDatabase.CreateOraObject("BOLADM.order_typ")

Private Sub Requeue_backorder
   Dim q as oraobject
   If sale_region = WEST then
      q = oraaq1
   else if sale_region = EAST then
      q = oraaq2
   else
      q = oraaq3
   end if

   OraMsg.delay = 7*60*60*24
   OraMsg = OraBackOrder 'OraOrder contains the order details
   Msgid = q.enqueue

End Sub
```

Java (JDBC): Example Code

```
public static void getRushTitles(Connection db_conn, String consumer)
{
    AQSession         aq_sess;
    Order             deq_order;
    byte[]            deq_msgid;
    AQDequeueOption   deq_option;
    AQMessageProperty msg_prop;
    AQQueue           bookedorders_q;
    AQMessage         message;
    AQObjectPayload   obj_payload;
    boolean           new_orders = true;

    try
    {
```

```
        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        deq_option = new AQDequeueOption();

        deq_option.setConsumerName(consumer);
        deq_option.setWaitTime(1);
        deq_option.setCorrelation("RUSH");

        if(consumer.equals("West_Shipping"))
        {
            bookedorders_q = aq_sess.getQueue("WS", "WS_bookedorders_que");
        }
        else if(consumer.equals("East_Shipping"))
        {
            bookedorders_q = aq_sess.getQueue("ES", "ES_bookedorders_que");
        }
        else
        {
            bookedorders_q = aq_sess.getQueue("OS", "OS_bookedorders_que");
        }

        while(new_orders)
        {
            try
            {
              /* Dequeue the message */
              message = bookedorders_q.dequeue(deq_option, Order.getFactory());

              obj_payload = message.getObjectPayload();

              deq_order = (Order)(obj_payload.getPayloadData());

              System.out.println("Order number " + deq_order.getOrderno() +
                                   " is a rush order");

            }
            catch (AQException aqex)
            {
              new_orders = false;
              System.out.println("No more rush titles");
              System.out.println("Exception-1: " + aqex);
            }
        }
    }
```

```
    catch (Exception ex)
    {
        System.out.println("Exception-2: " + ex);
    }

}
```

Multiple Recipients

A consumer can dequeue a message from a multiconsumer, normal queue by supplying the name that was used in the AQ$_AGENT type of the DBMS_AQADM.ADD_SUBSCRIBER procedure or the recipient list of the message properties. (See "Adding a Subscriber" on page 9-58 or "Enqueuing a Message [Specify Message Properties]" on page 11-9 for more information).

- In PL/SQL the consumer name is supplied using the consumer_name field of the dequeue_options_t record.
- In OCI the consumer name is supplied using the LNOCISetAttr procedure to specify a text string as the LNOCI_ATTR_CONSUMER_NAME of an LNOCI_DTYPE_AQDEQ_OPTIONS descriptor.
- In OO4O, the consumer name is supplied by setting the consumer property of the OraAQ object.

Multiple processes or operating system threads can use the same consumer_name to dequeue concurrently from a queue. In that case AQ will provide the first unlocked message that is at the head of the queue and is intended for the consumer. Unless the message ID of a specific message is specified during dequeue, the consumers can dequeue messages that are in the READY state.

A message is considered PROCESSED only when all intended consumers have successfully dequeued the message. A message is considered EXPIRED if one or more consumers did not dequeue the message before the EXPIRATION time. When a message has expired, it is moved to an exception queue.

The exception queue must also be a multiconsumer queue. Expired messages from multiconsumer queues cannot be dequeued by the intended recipients of the message. However, they can be dequeued in the REMOVE mode exactly once by specifying a NULL consumer name in the dequeue options. Hence, from a dequeue perspective, multiconsumer exception queues behave like single-consumer queues because each expired message can be dequeued only once using a NULL consumer name. Note that expired messages can be dequeued only by specifying a message ID if the multiconsumer exception queue was created in a queue table with the compatible parameter set to '8.0'.

Beginning with release 8.1.6, only the queue monitor removes messages from multiconsumer queues. This allows dequeuers to complete the dequeue operation by not locking the message in the queue table. Since the queue monitor removes messages that have been processed by all consumers from multiconsumer queues approximately once every minute, users may see a delay when the messages have been completely processed and when they are physically removed from the queue.

Local and Remote Recipients

Consumers of a message in multiconsumer queues (either by virtue of being a subscriber to the queue or because the consumer was a recipient in the enqueuer's recipient list) can be local or remote.

- A local consumer dequeues the message from the same queue into which the producer enqueued the message. Local consumers have a non-`NULL` `NAME` and `NULL` `ADDRESS` and `PROTOCOL` field in the `AQ$_AGENT` type (see "Agent Type (aq$_agent)" on page 2-3 in Chapter 2, "Basic Components").
- A remote consumer dequeues from a queue that is different from the queue where the message was enqueued. As such, users need to be familiar with and use the AQ propagation feature to use remote consumers. Remote consumers can fall into one of three categories:

  a. The `ADDRESS` field refers to a queue in the same database. In this case the consumer will dequeue the message from a different queue in the same database. These addresses will be of the form `[schema].queue_name` where `queue_name` (optionally qualified by the schema name) is the target queue. If the schema is not specified, the schema of the current user executing the `ADD_SUBSCRIBER` procedure or the enqueue is used (see "Adding a Subscriber" on page 9-58, or "Enqueuing a Message" on page 11-4 in Chapter 11, "Operational Interface: Basic Operations"). Use the `DBMS_AQADM.SCHEDULE_PROPAGATION` command with a `NULL` destination (which is the default) to schedule propagation to such remote consumers (see "Scheduling a Queue Propagation" on page 9-71 in Chapter 9, "Administrative Interface").

  b. The `ADDRESS` field refers to a queue in a different database. In this case the database must be reachable using database links and the `PROTOCOL` must be either `NULL` or 0. These addresses will be of the form `[schema].queue_name@dblink`. If the schema is not specified, the schema of the current user executing the `ADD_SUBSCRIBER` procedure or the enqueue is used. If the database link is not a fully qualified name (does not have a domain name specified), the default domain as specified by the `db_domain` init.ora parameter will be used. Use the DBMS_AQADM.SCHEDULE_PROPAGATION procedure with the database link as the destination to schedule the propagation. AQ does not support the use of synonyms to refer to queues or database links.

c. The ADDRESS field refers to a destination that can be reached by a third party protocol. You will need to refer to the documentation of the third party software to determine how to specify the ADDRESS and the PROTOCOL database link, and on how to schedule propagation.

When a consumer is remote, a message will be marked as PROCESSED in the source queue immediately after the message has been propagated, even though the consumer may not have dequeued the message at the remote queue. Similarly, when a propagated message expires at the remote queue, the message is moved to the DEFAULT exception queue of the remote queue's queue table, and not to the exception queue of the local queue. As can be seen in both cases, AQ does not currently propagate the exceptions to the source queue. You can use the MSGID and the ORIGINAL_MSGID columns in the queue table view (AQ$<queue_table>) to chain the propagated messages. When a message with message ID m1 is propagated to a remote queue, m1 is stored in the ORIGINAL_MSGID column of the remote queue.

The DELAY, EXPIRATION and PRIORITY parameters apply identically to both local and remote consumers. AQ accounts for any delay in propagation by adjusting the DELAY and EXPIRATION parameters accordingly. For example, if the EXPIRATION is set to one hour, and the message is propagated after 15 minutes, the expiration at the remote queue will be set to 45 minutes.

Since the database handles message propagation, OO4O does not differentiate between remote and local recipients. The same sequence of calls/steps are required to dequeue a message for local and remote recipients.

Message Navigation in Dequeue

You have several options for selecting a message from a queue. You can select the "first message". Alternatively, once you have selected a message and established its position in the queue (for example, as the fourth message), you can then retrieve the "next message".

The first message navigation perfoms a SELECT on the queue. The next message navigation fetches from the results of the SELECT run in the first message navigation. Thus performance is optimized because subsequent dequeues need not run the entire SELECT again.

These selections work in a slightly different way if the queue is enabled for transactional grouping.

- If the "first message" is requested, the dequeue position is reset to the beginning of the queue.
- If the "next message" is requested, the position is set to the next message of the same transaction
- If the "next transaction" is requested, the position is set to the first message of the next transaction.

Note that the transaction grouping property is negated if a dequeue is performed in one of the following ways: dequeue by specifying a correlation identifier, dequeue by specifying a message identifier, or dequeuing some of the messages of a transaction and committing (see "Dequeue Methods" on page 8-58).

In navigating through the queue, if the program reaches the end of the queue while using the "next message" or "next transaction" option, and you have specified a nonzero wait time, then the navigating position is automatically changed to the beginning of the queue. If a zero wait time is specified, you may get an exception when the end of the queue is reached.

Scenario

The following scenario in the BooksOnLine example continues the message grouping example already discussed with regard to enqueuing (see "Dequeue Methods" on page 8-58).

The `get_orders`() procedure dequeues orders from the `OE_neworders_que`. Recall that each transaction refers to an order and each message corresponds to an individual book in the order. The `get_orders`() procedure loops through the messages to dequeue the book orders. It resets the position to the beginning of the queue using the first message option before the first dequeues. It then uses the next message navigation option to retrieve the next book (message) of an order (transaction). If it gets an error message indicating all message in the current group / transaction have been fetched, it changes the navigation option to next transaction and gets the first book of the next order. It then changes the navigation option back to next message for fetching subsequent messages in the same transaction. This is repeated until all orders (transactions) have been fetched.

PL/SQL (DBMS_AQADM Package): Example Code

```
CONNECT boladm/boladm;

create or replace procedure get_new_orders as
```

```
deq_cust_data           BOLADM.customer_typ;
deq_book_data           BOLADM.book_typ;
deq_item_data           BOLADM.orderitem_typ;
deq_msgid               RAW(16);
dopt                    dbms_aq.dequeue_options_t;
mprop                   dbms_aq.message_properties_t;
deq_order_data          BOLADM.order_typ;
qname                   VARCHAR2(30);
no_messages             exception;
end_of_group            exception;
pragma exception_init   (no_messages, -25228);
pragma exception_init   (end_of_group, -25235);
new_orders              BOOLEAN := TRUE;

BEGIN

        dopt.wait := 1;
        dopt.navigation := DBMS_AQ.FIRST_MESSAGE;
        qname := 'OE.OE_neworders_que';
        WHILE (new_orders) LOOP
          BEGIN
            LOOP
                BEGIN
                    dbms_aq.dequeue(
                        queue_name          => qname,
                        dequeue_options     => dopt,
                        message_properties  => mprop,
                        payload             => deq_order_data,
                        msgid               => deq_msgid);

                    deq_item_data := deq_order_data.items(1);
                    deq_book_data := deq_item_data.item;
                    deq_cust_data := deq_order_data.customer;

                    IF (deq_cust_data IS NOT NULL) THEN
                      dbms_output.put_line(' **** NEXT ORDER **** ');
                      dbms_output.put_line('order_num: ' ||
                                deq_order_data.orderno);
                      dbms_output.put_line('ship_state: ' ||
                                deq_cust_data.state);
                    END IF;
                    dbms_output.put_line(' ---- next book ---- ');
                    dbms_output.put_line(' book_title: ' ||
                                deq_book_data.title ||
```

```
                                ' quantity: ' || deq_item_data.quantity);
                EXCEPTION
                    WHEN end_of_group THEN
                      dbms_output.put_line ('*** END OF ORDER ***');
                      commit;
                      dopt.navigation := DBMS_AQ.NEXT_TRANSACTION;
                END;
            END LOOP;
          EXCEPTION
            WHEN no_messages THEN
                 dbms_output.put_line (' ---- NO MORE NEW ORDERS ---- ');
                 new_orders := FALSE;
          END;
        END LOOP;

END;
/

CONNECT EXECUTE ON get_new_orders to OE;

/*  Dequeue the orders: */
CONNECT OE/OE;
EXECUTE BOLADM.get_new_orders;
```

Visual Basic (OO4O): Example Code

```
Dim OraSession as object
Dim OraDatabase as object
Dim OraAq as object
Dim OraMsg as Object
Dim OraOrder,OraItemList,OraItem,OraBook,OraCustomer  as Object
Dim Msgid as String

   Set OraSession = CreateObject("OracleInProcServer.XOraSession")
   Set OraDatabase = OraSession.DbOpenDatabase("", "boladm/boladm", 0&)
   set oraaq = OraDatabase.CreateAQ("OE.OE_neworders_que")
   Set OraMsg = OraAq.AQMsg(ORATYPE_OBJECT, "BOLADM.order_typ")
       OraAq.wait = 1
   OraAq.Navigation = ORAAQ_DQ_FIRST_MESSAGE

private sub get_new_orders
   Dim MsgIsDequeued as Boolean
   On Error goto ErrHandler
   MsgIsDequeued = TRUE
       msgid = q.Dequeue
```

```
    if MsgIsDequeued then
  set OraOrder = OraMsg
  OraItemList = OraOrder("items")
  OraItem = OraItemList(1)
  OraBook = OraItem("item")
  OraCustomer = OraOrder("customer")

     ' Populate the textboxes with the values
  if( OraCustomer ) then
     if OraAq.Navigation <> ORAAQ_DQ_NEXT_MESSAGE then
        MsgBox " ********* NEXT ORDER *******"
     end if
     txt_book_orderno = OraOrder("orderno")
     txt_book_shipstate = OraCustomer("state")
  End if
  OraAq.Navigation = ORAAQ_DQ_NEXT_MESSAGE
  txt_book_title = OraBook("title")
  txt_book_qty  = OraItem("quantity")
 Else
  MsgBox " ********* END OF  ORDER *******"
End if

ErrHandler :
   'Handle error case, like no message etc
   If OraDatabase.LastServerErr = 25228 then
      OraAq.Navigation = ORAAQ_DQ_NEXT_TRANSACTION
      MsgIsDequeued = FALSE
      Resume Next
   End If
   'Process other errors
end sub
```

Java (JDBC): Example Code

No example is provided with this release.

Modes of Dequeuing

A dequeue request can either view a message or delete a message (see "Dequeuing a Message" on page 11-44 in Chapter 11, "Operational Interface: Basic Operations").

- To view a message, you can use the browse mode or locked mode.
- To consume a message, you can use either the remove mode or remove with no data mode.

If a message is browsed, it remains available for further processing. Similarly if a message is locked, it remains available for further processing after the lock is released by performing a transaction commit or rollback. After a message is consumed, using either of the remove modes, it is no longer available for dequeue requests.

When a message is dequeued using REMOVE_NODATA mode, the payload of the message is not retrieved. This mode can be useful when the user has already examined the message payload, possibly by means of a previous BROWSE dequeue. In this way, you can avoid the overhead of payload retrieval that can be substantial for large payloads

A message is retained in the queue table after it has been consumed only if a retention time is specified for a queue. Messages cannot be retained in exception queues (refer to the section on exceptions for further information). Removing a message with no data is generally used if the payload is known (from a previous browse/locked mode dequeue call), or the message will not be used.

Note that after a message has been browsed, there is no guarantee that the message can be dequeued again since a dequeue call from a concurrent user might have removed the message. To prevent a viewed message from being dequeued by a concurrent user, you should view the message in the locked mode.

In general, use care while using the browse mode. The dequeue position is automatically changed to the beginning of the queue if a nonzero wait time is specified and the navigating position reaches the end of the queue. Hence repeating a dequeue call in the browse mode with the "next message" navigation option and a nonzero wait time can dequeue the same message over and over again. We recommend that you use a nonzero wait time for the first dequeue call on a queue in a session, and then use a zero wait time with the next message navigation option for subsequent dequeue calls. If a dequeue call gets an "end of queue" error message, the dequeue position can be explicitly set by the dequeue call to the beginning of the queue using the "first message" navigation option, following which the messages in the queue can be browsed again.

Scenario

In the following scenario from the BooksOnLine example, international orders destined to Mexico and Canada are to be processed separately due to trade policies and carrier discounts. Hence, a message is viewed in the locked mode (so no other concurrent user removes the message) and the customer country (message payload) is checked. If the customer country is Mexico or Canada, the message is consumed (deleted from the queue) using REMOVE_NODATA (since the payload is already known). Otherwise, the lock on the message is released by the commit call. Note that the remove dequeue call uses the message identifier obtained from the locked mode dequeue call. The `shipping_bookedorder_deq` (refer to the example code for the description of this procedure) call illustrates the use of the browse mode.

PL/SQL (DBMS_AQADM Package): Example Code

```
CONNECT boladm/boladm;

create or replace procedure get_northamerican_orders as

deq_cust_data          BOLADM.customer_typ;
deq_book_data          BOLADM.book_typ;
deq_item_data          BOLADM.orderitem_typ;
deq_msgid              RAW(16);
dopt                   dbms_aq.dequeue_options_t;
mprop                  dbms_aq.message_properties_t;
deq_order_data         BOLADM.order_typ;
deq_order_nodata       BOLADM.order_typ;
qname                  VARCHAR2(30);
no_messages            exception;
pragma exception_init  (no_messages, -25228);
new_orders             BOOLEAN := TRUE;

begin

        dopt.consumer_name := consumer;
        dopt.wait := DBMS_AQ.NO_WAIT;
        dopt.navigation := dbms_aq.FIRST_MESSAGE;
        dopt.dequeue_mode := DBMS_AQ.LOCKED;

        qname := 'OS.OS_bookedorders_que';

        WHILE (new_orders) LOOP
          BEGIN
            dbms_aq.dequeue(
                queue_name => qname,
                dequeue_options => dopt,
                message_properties => mprop,
                payload => deq_order_data,
                msgid => deq_msgid);

            deq_item_data := deq_order_data.items(1);
            deq_book_data := deq_item_data.item;
            deq_cust_data := deq_order_data.customer;
```

```
              IF (deq_cust_data.country = 'Canada' OR
                  deq_cust_data.country = 'Mexico' ) THEN

                  dopt.dequeue_mode := dbms_aq.REMOVE_NODATA;
                  dopt.msgid := deq_msgid;
                  dbms_aq.dequeue(
                          queue_name => qname,
                          dequeue_options => dopt,
                          message_properties => mprop,
                          payload => deq_order_nodata,
                          msgid => deq_msgid);
                  commit;

                  dbms_output.put_line(' **** next booked order **** ');
                  dbms_output.put_line('order_no: ' || deq_order_data.orderno ||
                          ' book_title: ' || deq_book_data.title ||
                          ' quantity: ' || deq_item_data.quantity);
                  dbms_output.put_line('ship_state: ' || deq_cust_data.state ||
                          ' ship_country: ' || deq_cust_data.country ||
                          ' ship_order_type: ' || deq_order_data.ordertype);

              END IF;

              commit;
              dopt.dequeue_mode := DBMS_AQ.LOCKED;
              dopt.msgid := NULL;
              dopt.navigation := dbms_aq.NEXT_MESSAGE;
            EXCEPTION
              WHEN no_messages THEN
                   dbms_output.put_line (' ---- NO MORE BOOKED ORDERS ---- ');
                   new_orders := FALSE;
            END;
          END LOOP;

  end;
  /

  CONNECT EXECUTE on get_northamerican_orders to OS;

  CONNECT ES/ES;

  /*  Browse all booked orders for East_Shipping: */
  EXECUTE BOLADM.shipping_bookedorder_deq('East_Shipping', DBMS_AQ.BROWSE);

  CONNECT OS/OS;
```

```
/*  Dequeue all international North American orders for Overseas_Shipping: */
EXECUTE BOLADM.get_northamerican_orders;
```

Visual Basic (OO4O): Example Code

OO4O supports all the modes of dequeuing described earlier. Possible values include:

- ORAAQ_DQ_BROWSE (1) - Do not lock when dequeuing
- ORAAQ_DQ_LOCKED (2) - Read and obtain a write lock on the message
- ORAAQ_DQ_REMOVE (3)(Default) -Read the message and update or delete it.

```
Dim OraSession as object
Dim OraDatabase as object
Dim OraAq as object
Dim OraMsg as Object
Dim OraOrder,OraItemList,OraItem,OraBook,OraCustomer  as Object
Dim Msgid as String

   Set OraSession = CreateObject("OracleInProcServer.XOraSession")
   Set OraDatabase = OraSession.DbOpenDatabase("", "boladm/boladm", 0&)
   set oraaq = OraDatabase.CreateAQ("OE.OE_neworders_que")
       OraAq.DequeueMode = ORAAQ_DQ_BROWSE
```

Java (JDBC): Example Code

```
public static void get_northamerican_orders(Connection db_conn)
{

    AQSession         aq_sess;
    Order             deq_order;
    Customer          deq_cust;
    String            cust_country;
    byte[]            deq_msgid;
    AQDequeueOption   deq_option;
    AQMessageProperty msg_prop;
    AQQueue           bookedorders_q;
    AQMessage         message;
    AQObjectPayload   obj_payload;
    boolean           new_orders = true;

    try
    {
```

```
/* Create an AQ Session: */
aq_sess = AQDriverManager.createAQSession(db_conn);

deq_option = new AQDequeueOption();

deq_option.setConsumerName("Overseas_Shipping");
deq_option.setWaitTime(AQDequeueOption.WAIT_NONE);
deq_option.setNavigationMode(AQDequeueOption.NAVIGATION_FIRST_MESSAGE);
deq_option.setDequeueMode(AQDequeueOption.DEQUEUE_LOCKED);

bookedorders_q = aq_sess.getQueue("OS", "OS_bookedorders_que");

while(new_orders)
{
    try
    {
      /* Dequeue the message - browse with lock */
      message = bookedorders_q.dequeue(deq_option, Order.getFactory());

      obj_payload = message.getObjectPayload();

      deq_msgid = message.getMessageId();
      deq_order = (Order)(obj_payload.getPayloadData());

      deq_cust = deq_order.getCustomer();

      cust_country = deq_cust.getCountry();

      if(cust_country.equals("Canada") ||
         cust_country.equals("Mexico"))
      {
        deq_option.setDequeueMode(
                          AQDequeueOption.DEQUEUE_REMOVE_NODATA);
        deq_option.setMessageId(deq_msgid);


        /* Delete the message */
        bookedorders_q.dequeue(deq_option, Order.getFactory());

        System.out.println("----  next booked order ------");
        System.out.println("Order no: " + deq_order.getOrderno());
        System.out.println("Ship state: " + deq_cust.getState());
        System.out.println("Ship country: " + deq_cust.getCountry());
        System.out.println("Order type: " + deq_order.getOrdertype());
```

```
            }

            db_conn.commit();

            deq_option.setDequeueMode(AQDequeueOption.DEQUEUE_LOCKED);
            deq_option.setMessageId(null);
            deq_option.setNavigationMode(
                                      AQDequeueOption.NAVIGATION_NEXT_MESSAGE);
          }
          catch (AQException aqex)
          {
            new_orders = false;
            System.out.println("--- No more booked orders ----");
            System.out.println("Exception-1: " + aqex);
          }
      }

    }
    catch (Exception ex)
    {
        System.out.println("Exception-2: " + ex);
    }

}
```

Optimization of Waiting for Arrival of Messages

AQ allows applications to block on one or more queues waiting for the arrival of either a newly enqueued message or for a message that becomes ready. You can use the DEQUEUE operation to wait for the arrival of a message in a queue (see "Dequeuing a Message" on page 11-44) or the LISTEN operation to wait for the arrival of a message in more than one queue (see "Listening to One or More Single-Consumer Queues" on page 11-23.

When the blocking DEQUEUE call returns, it returns the message properties and the message payload. By contrast, when the blocking LISTEN call returns, it discloses only the name of the queue where a message has arrived. A subsequent DEQUEUE operation is needed to dequeue the message.

Applications can optionally specify a timeout of zero or more seconds to indicate the time that AQ must wait for the arrival of a message. The default is to wait forever until a message arrives in the queue. This optimization is important in two ways. It removes the burden of continually polling for messages from the application. And it saves CPU and network resource because the application remains blocked until a new message is enqueued or becomes READY after its DELAY time. Applications can also perform a blocking dequeue on exception queues to wait for arrival of EXPIRED messages.

A process or thread that is blocked on a dequeue is either awakened directly by the enqueuer if the new message has no DELAY or is awakened by the queue monitor process when the DELAY or EXPIRATION time has passed. Applications cannot only wait for the arrival of a message in the queue that an enqueuer enqueues a message, but also on a remote queue, if propagation has been scheduled to the remote queue using DBMS_AQADM.SCHEDULE_PROPAGATION. In this case, the AQ propagator will wake up the blocked dequeuer after a message has been propagated.

Scenario

In the BooksOnLine example, the get_rushtitles procedure discussed under dequeue methods specifies a wait time of 1 second in the dequeue_options argument for the dequeue call. Wait time can be specified in different ways as illustrated in the following code.

- If the wait time is specified as 10 seconds, the dequeue call is blocked with a time out of 10 seconds until a message is available in the queue. This means that if there are no messages in the queue after 10 seconds, the dequeue call returns without a message. Predefined constants can also be assigned for the wait time.
- If the wait time is specified as DBMS_AQ.NO_WAIT, a wait time of 0 seconds is implemented. The dequeue call in this case will return immediately even if there are no messages in the queue.
- If the wait time is specified as DBMS_AQ.FOREVER, the dequeue call is blocked without a time out until a message is available in the queue.

PL/SQL (DBMS_AQADM Package): Example Code

```
/* dopt is a variable of type dbms_aq.dequeue_options_t.
   Set the dequeue wait time to 10 seconds: */
dopt.wait := 10;

/* Set the dequeue wait time to 0 seconds: */
dopt.wait := DBMS_AQ.NO_WAIT;

/* Set the dequeue wait time to infinite (forever): */
dopt.wait := DBMS_AQ.FOREVER;
```

Visual Basic (OO4O): Example Code

OO4O supports asynchronous dequeuing of messages. First, the monitor is started for a particular queue. When messages that fulfil the user criteria are dequeued, the user's callback object is notified.

Java (JDBC): Example Code

AQDequeueOption deq-opt;

deq-opt = new AQDequeueOption ();

Retry with Delay Interval

If the transaction dequeuing the message from a queue fails, it is regarded as an unsuccessful attempt to consume the message. AQ records the number of failed attempts to consume the message in the message history. Applications can query the retry_count column of the queue table view to find out the number of unsuccessful attempts on a message. In addition, AQ allows the application to specify, at the queue level, the maximum number of retries for messages in the queue. If the number of failed attempts to remove a message exceeds this number, the message is moved to the exception queue and is no longer available to applications.

Retry Delay

A bad condition can cause the transaction receiving a message to end. AQ allows users to hide the bad message for a prespecified interval. A retry_delay can be specified along with maximum retries. This means that a message that has had a failed attempt will be visible in the queue for dequeue after the retry_delay interval. Until then it will be in the WAITING state. In the AQ background process, the time manager enforces the retry delay property. The default value for maximum retries is 5. The default value for retry delay is 0. Note that maximum retries and retry delay are not available with 8.0-compatible multiconsumer queues.

PL/SQL (DBMS_AQADM Package): Example Code

```
/*  Create a package that enqueue with delay set to one day: /*
     CONNECT BOLADM/BOLADM
    >
     /* queue has max retries = 4 and retry delay = 12 hours */
     execute dbms_aqadm.alter_queue(queue_name = 'WS.WS_BOOKED_ORDERS_QUE',
     max_retr
     ies = 4,
                                         retry_delay = 3600*12);
```

```
>
 /* processes the next order available in the booked_order_queue */
 CREATE OR REPLACE PROCEDURE  process_next_order()
 AS
   dqqopt                    dbms_aq.dequeue_options_t;
   msgprop                   dbms_aq.message_properties_t;
   deq_msgid                 RAW(16);
   book                      BOLADM.book_typ;
   item                      BOLADM.orderitem_typ;
   BOLADM.order_typ          order;
 BEGIN
>
   dqqopt.dequeue_option := DBMS_AQ.FIRST_MESSAGE;
   dbms_aq.dequeue('WS.WS_BOOKED_ORDERS_QUEUE', dqqopt, msgprop, order,
 deq_msgid
 );
>
   /* for simplicity, assume order has a single item */
  item = order.items(1);
   book = the_orders.item;
>
   /* assume search_inventory searches inventory for the book */
   /* if we don't find the book in the warehouse, abort transaction */
   IF  (search_inventory(book) != TRUE)
       rollback;
   ELSE
      process_order(order);
   END IF;
>
 END;
 /
```

Visual Basic (OO4O): Example Code

Use the dbexecutesql interface from the database for this functionality.

Java (JDBC): Example Code

```
public static void setup_queue(Connection db_conn)
{
    AQSession          aq_sess;
    AQQueue            bookedorders_q;
    AQQueueProperty    q_prop;

    try
    {
```

```
            /* Create an AQ Session: */
            aq_sess = AQDriverManager.createAQSession(db_conn);

            bookedorders_q = aq_sess.getQueue("WS", "WS_bookedorders_que");

            /* Alter queue - set max retries = 4 and retry delay = 12 hours */
            q_prop = new AQQueueProperty();
            q_prop.setMaxRetries(4);

            q_prop.setRetryInterval(3600*12);  // specified in seconds

            bookedorders_q.alterQueue(q_prop);


        }
        catch (Exception ex)
        {
            System.out.println("Exception: " + ex);
        }

    }
    public static void process_next_order(Connection db_conn)
    {
        AQSession         aq_sess;
        Order             deq_order;
        OrderItem         order_item;
        Book              book;
        AQDequeueOption   deq_option;
        AQMessageProperty msg_prop;
        AQQueue           bookedorders_q;
        AQMessage         message;
        AQObjectPayload   obj_payload;

        try
        {
            /* Create an AQ Session: */
            aq_sess = AQDriverManager.createAQSession(db_conn);

            deq_option = new AQDequeueOption();

            deq_option.setNavigationMode(AQDequeueOption.NAVIGATION_FIRST_MESSAGE);

            bookedorders_q = aq_sess.getQueue("WS", "WS_bookedorders_que");
```

```
        /* Dequeue the message */
        message = bookedorders_q.dequeue(deq_option, Order.getFactory());

        obj_payload = message.getObjectPayload();

        deq_order = (Order)(obj_payload.getPayloadData());

        /* for simplicity, assume order has a single item */
        order_item = deq_order.getItems().getElement(0);
        book = order_item.getItem();

        /* assume search_inventory searches inventory for the book
         * if we don't find the book in the warehouse, abort transaction
         */
        if(search_inventory(book) != true)
          db_conn.rollback();
        else
          process_order(deq_order);

    }
    catch (AQException aqex)
    {
        System.out.println("Exception-1: " + aqex);
    }
    catch (Exception ex)
    {
        System.out.println("Exception-2: " + ex);
    }
}
```

Exception Handling

AQ provides four integrated mechanisms to support exception handling in applications: EXCEPTION_QUEUES, EXPIRATION, MAX_RETRIES and RETRY_DELAY.

An exception_queue is a repository for all expired or unserviceable messages. Applications cannot directly enqueue into exception queues. Also, a multiconsumer exception queue cannot have subscribers associated with it. However, an application that intends to handle these expired or unserviceable messages can dequeue from the exception queue. The exception queue created for messages intended for a multiconsumer queue must itself be a multiconsumer queue. Like any other queue, the exception queue must be enabled for dequeue using the

DBMS_AQADM.START_QUEUE procedure. You will get an Oracle error if you try to enable an exception queue for enqueue.

When a message has expired, it is moved to an exception queue. The exception queue for a message in multiconsumer queue must also be a multiconsumer queue. Expired messages from multiconsumer queues cannot be dequeued by the intended recipients of the message. However, they can be dequeued in the REMOVE mode exactly once by specifying a NULL consumer name in the dequeue options. Hence, from a dequeue perspective multiconsumer exception queues behave like single-consumer queues because each expired message can be dequeued only once using a NULL consumer name. Messages can also be dequeued from the exception queue by specifying the message ID.

The exception queue is a message property that can be specified during enqueue time (see "Enqueuing a Message [Specify Message Properties]" on page 11-9 in Chapter 11, "Operational Interface: Basic Operations"). In PL/SQL users can use the exception_queue attribute of the DBMS_AQ.MESSAGE_PROPERTIES_T record to specify the exception queue. In OCI users can use the LNOCISetAttr procedure to set the LNOCI_ATTR_EXCEPTION_QUEUE attribute of the LNOCIAQMsgProperties descriptor.

If an exception queue is not specified, the default exception queue is used. If the queue is created in a queue table, for example, QTAB, the default exception queue will be called AQ$_QTAB_E. The default exception queue is automatically created when the queue table is created. Messages are moved to the exception queues by AQ under the following conditions:

- The message is not being dequeued within the specified expiration interval. For messages intended for more than one recipient, the message will be moved to the exception queue if one or more of the intended recipients was not able to dequeue the message within the specified expiration interval. The default expiration interval is DBMS_AQ.NEVER, meaning the messages will not expire.
- The message is being dequeued successfully. However, because of an error that arises while processing the message, the application that dequeues the message chooses to roll back the transaction. In this case, the message is returned to the queue and will be available for any applications that are waiting to dequeue from the same queue. A dequeue is considered rolled back or undone if the application rolls back the entire transaction, or if it rolls back to a save point that was taken before the dequeue. If the message has been dequeued but rolled back more than the number of times specified by the retry limit, the message will be moved to the exception queue.

For messages intended for multiple recipients, each message keeps a separate retry count for each recipient. The message is moved to the exception queue only when retry counts for all recipients of the message have exceeded the specified retry limit. The default retry limit is 5 for single-consumer queues and 8.1-compatible multiconsumer queues. No retry limit is not supported for 8.0-compatible multiconsumer queues.

- The statement executed by the client contains a dequeue that succeeded but the statement itself was undone later due to an exception. To understand this case, consider a PL/SQL procedure that contains a call to DBMS_AQ.DEQUEUE. If the dequeue procedure succeeds but the PL/SQL procedure raises an exception, AQ will attempt to increment the RETRY_COUNT of the message returned by the dequeue procedure.
- The client program successfully dequeued a message but terminated before committing the transaction.

Messages intended for 8.1-compatible multiconsumer queues cannot be dequeued by the intended recipients once the messages have been moved to an exception queue. These messages should instead be dequeued in the REMOVE or BROWSE mode exactly once by specifying a NULL consumer name in the dequeue options. The messages can also be dequeued by their message IDs.

Messages intended for single consumer queues, or for 8.0-compatible multiconsumer queues, can only be dequeued by their message IDs once the messages have been moved to an exception queue.

Users can associate a RETRY_DELAY with a queue. The default value for this parameter is 0, meaning that the message will be available for dequeue immediately after the RETRY_COUNT is incremented. Otherwise the message will be unavailable for RETRY_DELAY seconds. After RETRY_DELAY seconds, the queue monitor marks the message as READY.

For a multiconsumer queue, RETRY_DELAY is for each subscriber.

Scenario

In the BooksOnLine application, the business rule for each shipping region is that an order will be placed in a back order queue if the order cannot be filled immediately. The back order application will try to fill the order once a day. If the order cannot be filled within 5 days, it is placed in an exception queue for special processing. You can implement this process by making use of the retry and exception handling features in AQ.

The following example shows how you can create a queue with specific maximum retry and retry delay interval.

PL/SQL (DBMS_AQADM Package): Example Code

```
/* Example for creating a back order queue in Western Region which allows a
   maximum of 5 retries and 1 day delay between each retry. */
CONNECT BOLADM/BOLADM
BEGIN
  dbms_aqadm.create_queue (
        queue_name              => 'WS.WS_backorders_que',
        queue_table             => 'WS.WS_orders_mqtab',
        max_retries             => 5,
        retry_delay             => 60*60*24);
END;
/

/* Create an exception queue for the back order queue for Western Region. */
CONNECT BOLADM/BOLADM
BEGIN
  dbms_aqadm.create_queue (
        queue_name              => 'WS.WS_backorders_excpt_que',
        queue_table             => 'WS.WS_orders_mqtab',
        queue_type              => DBMS_AQADM.EXCEPTION_QUEUE);
end;
/

/* Enqueue a message to WS_backorders_que and specify WS_backorders_excpt_que as
the exception queue for the message: */
CONNECT BOLADM/BOLADM
CREATE OR REPLACE PROCEDURE enqueue_WS_unfilled_order(backorder order_typ)
 AS
   back_order_queue_name    varchar2(62);
   enqopt                   dbms_aq.enqueue_options_t;
   msgprop                  dbms_aq.message_properties_t;
   enq_msgid                raw(16);
 BEGIN

   /* Set back order queue name for this message: */
   back_order_queue_name := 'WS.WS_backorders_que';

   /* Set exception queue name for this message: */
   msgprop.exception_queue := 'WS.WS_backorders_excpt_que';

   dbms_aq.enqueue(back_order_queue_name, enqopt, msgprop,
```

```
                  backorder, enq_msgid);
 END;
 /
```

Visual Basic (OO4O): Example Code

The exception queue is a message property that can be provided at the time of enqueuing a message. If this property is not set, the default exception queue of the queue will be used for any error conditions.

```
set oraaq = OraDatabase.CreateAQ("CBADM.deferbilling_que")
Set OraMsg = OraAq.AQMsg(ORATYPE_OBJECT, "BOLADM.order_typ")
Set OraOrder = OraDatabase.CreateOraObject("BOLADM.order_typ")
OraMsg = OraOrder
   OraMsg.delay = 15*60*60*24
   OraMsg.ExceptionQueue = "WS.WS_backorders_que"
   'Fill up the order values
   OraMsg = OraOrder 'OraOrder contains the order details
   Msgid = OraAq.enqueue
```

Java (JDBC): Example Code

```
public static void createBackOrderQueues(Connection db_conn)
{
    AQSession          aq_sess;
    AQQueue            backorders_q;
    AQQueue            backorders_excp_q;
    AQQueueProperty    q_prop;
    AQQueueProperty    q_prop2;
    AQQueueTable       mq_table;

    try
    {
        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        mq_table = aq_sess.getQueueTable("WS", "WS_orders_mqtab");


        /* Create a back order queue in Western Region which allows a
           maximum of 5 retries and 1 day delay between each retry. */

        q_prop = new AQQueueProperty();
        q_prop.setMaxRetries(5);
        q_prop.setRetryInterval(60*24*24);
```

```
        backorders_q = aq_sess.createQueue(mq_table, "WS_backorders_que",
                                          q_prop);

        backorders_q.start(true, true);

        /* Create an exception queue for the back order queue for
           Western Region. */
        q_prop2 = new AQQueueProperty();
        q_prop2.setQueueType(AQQueueProperty.EXCEPTION_QUEUE);

        backorders_excp_q = aq_sess.createQueue(mq_table,
                                          "WS_backorders_excpt_que", q_prop2);

    }
    catch (Exception ex)
    {
        System.out.println("Exception " + ex);
    }

}

/* Enqueue a message to WS_backorders_que and specify WS_backorders_excpt_que
   as the exception queue for the message: */
public static void enqueue_WS_unfilled_order(Connection db_conn,
                                             Order back_order)
{
    AQSession         aq_sess;
    AQQueue           back_order_q;
    AQEnqueueOption   enq_option;
    AQMessageProperty m_property;
    AQMessage         message;
    AQObjectPayload   obj_payload;
    byte[]            enq_msg_id;

    try
    {
        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        back_order_q = aq_sess.getQueue("WS", "WS_backorders_que");

        message = back_order_q.createMessage();

        /* Set exception queue name for this message: */
        m_property = message.getMessageProperty();
```

```
            m_property.setExceptionQueue("WS.WS_backorders_excpt_que");

            obj_payload = message.getObjectPayload();
            obj_payload.setPayloadData(back_order);

            enq_option = new AQEnqueueOption();

            /* Enqueue the message */
            enq_msg_id = back_order_q.enqueue(enq_option, message);

            db_conn.commit();
        }
        catch (Exception ex)
        {
            System.out.println("Exception: " + ex);
        }

    }
```

Rule-Based Subscription

Messages can be routed to various recipients based on message properties or message content. Users define a rule-based subscription for a given queue to specify interest in receiving messages that meet particular conditions.

Rules are Boolean expressions that evaluate to `TRUE` or `FALSE`. Similar in syntax to the `WHERE` clause of a SQL query, rules are expressed in terms of the attributes that represent message properties or message content. These subscriber rules are evaluated against incoming messages and those rules that match are used to determine message recipients. This feature thus supports the notions of content-based subscriptions and content-based routing of messages.

Subscription rules can also be defined on an attribute of type XMLType using XML operators such as `ExistsNode`.

Scenario

For the BooksOnLine application, we illustrate how rule-based subscriptions are used to implement a publish-subscribe paradigm utilizing content-based subscription and content-based routing of messages. The interaction between the Order Entry application and each of the Shipping Applications is modeled as follows:

- Western Region Shipping handles orders for the Western region of the U.S.

- Eastern Region Shipping handles orders for the Eastern region of the U.S.
- Overseas Shipping handles all non-U.S. orders.
- Overseas Shipping checks for the XMLType attribute to identify special handling.
- Eastern Region Shipping also handles all U.S. rush orders.

Each shipping application subscribes to the OE booked orders queue. The following rule-based subscriptions are defined by the Order Entry user to handle the routing of booked orders from the Order Entry application to each of the Shipping applications.

PL/SQL (DBMS_AQADM Package): Example Code

```
CONNECT OE/OE;
```

Western Region Shipping defines an agent called 'West_Shipping' with the WS booked orders queue as the agent address (destination queue where messages must be delivered). This agent subscribes to the OE booked orders queue using a rule specified on order region and ordertype attributes.

```
/*  Add a rule-based subscriber for West Shipping -
    West Shipping handles Western region U.S. orders,
    Rush Western region orders are handled by East Shipping: */
DECLARE
  subscriber     aq$_agent;
BEGIN
  subscriber := aq$_agent('West_Shipping', 'WS.WS_bookedorders_que', null);
  dbms_aqadm.add_subscriber(
                queue_name => 'OE.OE_bookedorders_que',
                subscriber => subscriber,
                rule       => 'tab.user_data.orderregion =
                    ''WESTERN'' AND tab.user_data.ordertype != ''RUSH''');
END;
/
```

Eastern Region Shipping defines an agent called East_Shipping with the ES booked orders queue as the agent address (the destination queue where messages must be delivered). This agent subscribes to the OE booked orders queue using a rule specified on orderregion, ordertype and customer attributes.

```
/*  Add a rule-based subscriber for East Shipping -
    East shipping handles all Eastern region orders,
    East shipping also handles all U.S. rush orders: */
DECLARE
  subscriber     aq$_agent;
```

```
BEGIN
  subscriber := aq$_agent('East_Shipping', 'ES.ES_bookedorders_que', null);
  dbms_aqadm.add_subscriber(
        queue_name => 'OE.OE_bookedorders_que',
        subscriber => subscriber,
        rule       => 'tab.user_data.orderregion = ''EASTERN'' OR
                      (tab.user_data.ordertype = ''RUSH'' AND
                       tab.user_data.customer.country = ''USA'') ');
END;
```

Overseas Shipping defines an agent called `Overseas_Shipping` with the OS booked orders queue as the agent address (destination queue to which messages must be delivered). This agent subscribes to the OE booked orders queue using a rule specified on the `orderregion` attribute. Since the representation of orders at the Overseas Shipping site is different from the representation of orders at the Order Entry site, a transformation is applied before messages are propagated from the Order Entry site to the Overseas Shipping site.

```
/*  Add a rule-based subscriber (for Overseas Shipping) to the Booked orders
queues with Transformation. Overseas Shipping handles all non-US orders: */
DECLARE
  subscriber     aq$_agent;
BEGIN
  subscriber := aq$_agent('Overseas_Shipping','OS.OS_bookedorders_que',null);

  dbms_aqadm.add_subscriber(
        queue_name     => 'OE.OE_bookedorders_que',
        subscriber     => subscriber,
        rule           => 'tab.user_data.orderregion = ''INTERNATIONAL''',
        transformation => 'OS.OE2XML');
END;
```

See "Message Format Transformation" on page 8-6 for more details on defining transformations.

Assume that the Overseas Shipping site has a subscriber, `Overseas_DHL`, for handling `RUSH` orders. Since `OS_bookedorders_que` has the order details represented as an `XMLType`, the rule uses XPath syntax.

```
DECLARE
  subscriber     aq$_agent;
BEGIN
  subscriber := aq$_agent('Overseas_DHL', null, null);

  dbms_aqadm.add_subscriber(
```

```
        queue_name     => 'OS.OS_bookedorders_que',
        subscriber     => subscriber,
        rule           => 'tab.user_data.extract(''/ORDER_TYP/ORDERTYPE/
                              text()'').getStringVal()=''RUSH''');

END;
```

Visual Basic (OO4O): Example Code

This functionality is currently not available.

Java (JDBC): Example Code

```
public static void addRuleBasedSubscribers(Connection db_conn)
{

    AQSession         aq_sess;
    AQQueue           bookedorders_q;
    String            rule;
    AQAgent           agt1, agt2, agt3;

    try
    {
        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

        bookedorders_q = aq_sess.getQueue("OE", "OE_booked_orders_que");

        /* Add a rule-based subscriber for West Shipping -
           West Shipping handles Western region U.S. orders,
           Rush Western region orders are handled by East Shipping: */

        agt1 = new AQAgent("West_Shipping", "WS.WS_bookedorders_que");

        rule = "tab.user_data.orderregion = 'WESTERN' AND " +
               "tab.user_data.ordertype != 'RUSH'";

        bookedorders_q.addSubscriber(agt1, rule);

        /*  Add a rule-based subscriber for East Shipping -
            East shipping handles all Eastern region orders,
            East shipping also handles all U.S. rush orders: */

        agt2 = new AQAgent("East_Shipping", "ES.ES_bookedorders_que");
        rule = "tab.user_data.orderregion = 'EASTERN' OR " +
```

```
                "(tab.user_data.ordertype = 'RUSH' AND " +
                "tab.user_data.customer.country = 'USA')";

        bookedorders_q.addSubscriber(agt2, rule);

        /*  Add a rule-based subscriber for Overseas Shipping
            Intl Shipping handles all non-U.S. orders: */

        agt3 = new AQAgent("Overseas_Shipping", "OS.OS_bookedorders_que");
        rule = "tab.user_data.orderregion = 'INTERNATIONAL'";

        bookedorders_q.addSubscriber(agt3, rule);
    }
    catch (Exception ex)
    {
        System.out.println("Exception: " + ex);
    }
}
```

Listen Capability

Advanced Queuing can monitor multiple queues for messages with a single call, LISTEN. An application can use LISTEN to wait for messages for multiple subscriptions. It can also be used by gateway applications to monitor multiple queues. If the LISTEN call returns successfully, a dequeue must be used to retrieve the message (see "Listening to One or More Single-Consumer Queues" on page 11-23.

Without the LISTEN call, an application which sought to dequeue from a set of queues would have to continuously poll the queues to determine if there were a message. Alternatively, you could design your application to have a separate dequeue process for each queue. However, if there are long periods with no traffic in any of the queues, these approaches will create unacceptable overhead. The LISTEN call is well suited for such applications.

Note that when there are messages for multiple agents in the agent list, LISTEN returns with the first agent for whom there is a message. In that sense LISTEN is not 'fair' in monitoring the queues. The application designer must keep this in mind when using the call. To prevent one agent from 'starving' other agents for messages, the application can change the order of the agents in the agent list.

Scenario

In the customer service component of the BooksOnLine example, messages from different databases arrive in the customer service queues, indicating the state of the message. The customer service application monitors the queues and whenever there is a message about a customer order, it updates the order status in the `order_status_table`. The application uses the `listen` call to monitor the different queues. Whenever there is a message in any of the queues, it dequeues the message and updates the order status accordingly.

PL/SQL (DBMS_AQADM Package): Example Code

```
CODE (in tkaqdocd.sql)

/* Update the status of the order in the order status table: */
CREATE OR REPLACE PROCEDURE update_status(
                                new_status    IN VARCHAR2,
                                order_msg     IN BOLADM.ORDER_TYP)
IS
 old_status    VARCHAR2(30);
 dummy         NUMBER;
BEGIN

  BEGIN
    /* Query old status from the table: */
    SELECT st.status INTO old_status FROM order_status_table st
       WHERE st.customer_order.orderno = order_msg.orderno;

  /* Status can be 'BOOKED_ORDER', 'SHIPPED_ORDER', 'BACK_ORDER'
     and   'BILLED_ORDER': */

   IF new_status = 'SHIPPED_ORDER' THEN
      IF old_status = 'BILLED_ORDER' THEN
        return;             /* message about a previous state */
      END IF;
   ELSIF new_status = 'BACK_ORDER' THEN
      IF old_status = 'SHIPPED_ORDER' OR old_status = 'BILLED_ORDER' THEN
        return;             /* message about a previous state */
      END IF;
   END IF;

   /* Update the order status:  */
     UPDATE order_status_table st
        SET st.customer_order = order_msg, st.status = new_status;
```

```
   COMMIT;

  EXCEPTION
  WHEN OTHERS  THEN     /* change to no data found */
    /* First update for the order: */
    INSERT INTO order_status_table(customer_order, status)
    VALUES (order_msg, new_status);
    COMMIT;

  END;
END;
/


/* Dequeues message from 'QUEUE' for 'CONSUMER': */
CREATE OR REPLACE PROCEDURE DEQUEUE_MESSAGE(
                         queue      IN   VARCHAR2,
                         consumer   IN   VARCHAR2,
                         message    OUT  BOLADM.order_typ)
IS

dopt                     dbms_aq.dequeue_options_t;
mprop                    dbms_aq.message_properties_t;
deq_msgid                RAW(16);
BEGIN
  dopt.dequeue_mode := dbms_aq.REMOVE;
  dopt.navigation := dbms_aq.FIRST_MESSAGE;
  dopt.consumer_name := consumer;

  dbms_aq.dequeue(
                queue_name => queue,
                dequeue_options => dopt,
                message_properties => mprop,
                payload => message,
                msgid => deq_msgid);
  commit;
END;
/

/* Monitor the queues in the customer service databse for 'time' seconds: */
 CREATE OR REPLACE PROCEDURE MONITOR_STATUS_QUEUE(time  IN  NUMBER)
IS
  agent_w_message   aq$_agent;
  agent_list        dbms_aq.agent_list_t;
  wait_time         INTEGER := 120;
```

```
  no_message        EXCEPTION;
  pragma EXCEPTION_INIT(no_message, -25254);
  order_msg         boladm.order_typ;
  new_status        VARCHAR2(30);
  monitor           BOOLEAN := TRUE;
  begin_time        NUMBER;
  end_time          NUMBER;
BEGIN

 begin_time :=  dbms_utility.get_time;
 WHILE (monitor)
 LOOP
 BEGIN

  /* Construct the waiters list: */
  agent_list(1) := aq$_agent('BILLED_ORDER', 'CS_billedorders_que', NULL);
  agent_list(2) := aq$_agent('SHIPPED_ORDER', 'CS_shippedorders_que',
NULL);
  agent_list(3) := aq$_agent('BACK_ORDER', 'CS_backorders_que', NULL);
  agent_list(4) := aq$_agent('Booked_ORDER', 'CS_bookedorders_que', NULL);

   /* Wait for order status messages: */
   dbms_aq.listen(agent_list, wait_time, agent_w_message);

   dbms_output.put_line('Agent' || agent_w_message.name || ' Address '||
agent_w_message.address);
   /* Dequeue the message from the queue: */
   dequeue_message(agent_w_message.address, agent_w_message.name, order_msg);

   /* Update the status of the order depending on the type of the message,
    * the name of the agent contains the new state: */
   update_status(agent_w_message.name, order_msg);

  /* Exit if we have been working long enough: */
   end_time := dbms_utility.get_time;
   IF  (end_time - begin_time > time)   THEN
     EXIT;
   END IF;

  EXCEPTION
  WHEN  no_message  THEN
    dbms_output.put_line('No messages in the past 2 minutes');
       end_time := dbms_utility.get_time;
    /* Exit if we have done enough work: */
    IF  (end_time - begin_time > time)   THEN
```

```
      EXIT;
    END IF;
  END;

  END LOOP;
END;
/
```

Visual Basic (OO4O): Example Code

Feature not currently available.

Java (JDBC): Example Code

```
public static void monitor_status_queue(Connection db_conn)
{
    AQSession         aq_sess;
    AQAgent[]         agt_list = null;
    AQAgent           ret_agt  = null;
    Order             deq_order;
    AQDequeueOption   deq_option;
    AQQueue           orders_q;
    AQMessage         message;
    AQObjectPayload   obj_payload;
    String            owner = null;
    String            queue_name = null;
    int               idx = 0;

    try
    {
        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

/* Construct the waiters list: */
agt_list = new AQAgent[4];

agt_list[0] = new AQAgent("BILLED_ORDER", "CS_billedorders_que", 0);
agt_list[1] = new AQAgent("SHIPPED_ORDER", "CS_shippedorders_que", 0);
agt_list[2] = new AQAgent("BACK_ORDER", "CS_backorders_que", 0);
agt_list[3] = new AQAgent("BOOKED_ORDER", "CS_bookedorders_que", 0);

/* Wait for order status messages for 120 seconds: */
ret_agt = aq_sess.listen(agt_list, 120);

System.out.println("Message available for agent: " +
   ret_agt.getName()  + "   "  + ret_agt.getAddress());
```

```
/* Get owner, queue where message is available */
idx = ret_agt.getAddress().indexOf(".");

if(idx != -1)
{
  owner = ret_agt.getAddress().substring(0, idx);
  queue_name = ret_agt.getAddress().substring(idx + 1);

/* Dequeue the message */
deq_option = new AQDequeueOption();

deq_option.setConsumerName(ret_agt.getName());
deq_option.setWaitTime(1);

orders_q = aq_sess.getQueue(owner, queue_name);

/* Dequeue the message */
message = orders_q.dequeue(deq_option, Order.getFactory());

obj_payload = message.getObjectPayload();

deq_order = (Order)(obj_payload.getPayloadData());

   System.out.println("Order number " + deq_order.getOrderno() + " retrieved");

   }
   catch (AQException aqex)
   {
   System.out.println("Exception-1: " + aqex);
   }
   catch (Exception ex)
   {
    System.out.println("Exception-2: " + ex);
    }

}
```

Message Transformation During Dequeue

Continuing the scenario introduced in "Message Format Transformation" on page 8-6 and "Message Transformation During Enqueue" on page 8-54, the queues in the OE schema are of payload type `OE.orders_typ` and the queues in the WS schema are of payload type `WS.orders_typ_sh`.

Scenario

At dequeue time, an application can move messages from `OE_booked_orders_topic` to the `WS_booked_orders_topic` by using a selection criteria on dequeue to dequeue only orders with `order_region` "`WESTERN`" and `order_type` not equal to "`RUSH.`" At the same time, the transformation is applied and the order in the `ws.order_typ_sh` type is retrieved. Then the message is enqueued into the `WS.ws_booked_orders` queue.

PL/SQL (DBMS_AQ Package): Example Code

```
CREATE OR REPLACE PROCEDURE   fwd_message_to_ws_shipping AS

  enq_opt   dbms_aq.enqueue_options_t;
  deq_opt   dbms_aq.dequeue_options_t;
  msg_prp   dbms_aq.message_properties_t;
  booked_order WS.order_typ_sh;
BEGIN

/* First dequeue the message from OE booked orders topic */
    deq_opt.transformation := 'OE.OE2WS';
    deq_opt.condition := 'tab.user_data.order_region = ''WESTERN'' and tab.user_
data.order_type != ''RUSH''';

    dbms_aq.dequeue('OE.oe_bookedorders_topic', deq_opt,
                     msg_prp, booked_order);

/* enqueue the message in the WS booked orders topic */
    msg_prp.recipient_list(0) := aq$_agent('West_shipping', null, null);

    dbms_aq.enqueue('WS.ws_bookedorders_topic',
                     enq_opt, msg_prp, booked_order);

END;
```

Visual Basic (OO4O): Example Code

No example is provided with this release.

Java (JDBC): Example Code

No example is provided with this release.

Dequeue Using the AQ XML Servlet

You can perform dequeue requests over the Internet using SOAP. See Chapter 17, "Internet Access to Advanced Queuing" for more information on receiving AQ messages using SOAP.

In the BooksOnline scenario, assume that the East shipping application receives AQ messages with a correlation identifier 'RUSH' over the Internet. The dequeue request will have the following format:

```
<?xml version="1.0"?>
<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>
        <AQXmlReceive xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <consumer_options>
            <destination>ES_ES_bookedorders_que</destination>
            <consumer_name>East_Shipping</consumer_name>
            <wait_time>0</wait_time>
            <selector>
                 <correlation>RUSH</correlation>
            </selector>
          </consumer_options>

          <AQXmlCommit/>

        </AQXmlReceive>
      </Body>
</Envelope>
```

Asynchronous Notifications

This feature allows clients to receive notifications for messages of interest. It supports multiple mechanisms to receive notifications. Clients can receive notifications procedurally using PL/SQL, JMS, or OCI callback functions, or clients can receive notifications through e-mail or HTTP post.

For persistent queues, notifications contain only the message properties, except for JMS notifications. Clients have to explicitly dequeue to receive the message. In JMS, the dequeue is done as part of the notifications and hence explicit dequeue is not required. For nonpersistent queues, the message is delivered as part of the notification.

Clients can also specify the presentation for notifications as either `RAW` or `XML`.

Scenario

In the BooksOnLine application, a customer can request Fed-Ex shipping (priority 1), priority air shipping (priority 2), or regular ground shipping (priority 3).

The shipping application then ships the orders according to the user's request. It is of interest to BooksOnLine to find out how many requests of each shipping type come in each day. The application uses asynchronous notification facility for this purpose. It registers for notification on the `WS.WS_bookedorders_que`. When it is notified of new message in the queue, it updates the count for the appropriate shipping type depending on the priority of the message.

Visual Basic (OO4O): Example Code

Refer to the Visual Basic online help, "Monitoring Messages".

Java (JDBC): Example Code

This feature is not supported by the Java API.

C (OCI): Example Code

This example illustrates the use of OCIRegister. At the shipping site, an OCI client program keeps track of how many orders were made for each of the shipping types, FEDEX, AIR and GROUND. The priority field of the message enables us to determine the type of shipping desired.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <oci.h>
#ifdef WIN32COMMON
#define sleep(x)   Sleep(1000*(x))
#endif
static text *username = (text *) "WS";
static text *password = (text *) "WS";

static OCIEnv *envhp;
static OCIServer *srvhp;
static OCIError *errhp;
static OCISvcCtx *svchp;

static void checkerr(/*_ OCIError *errhp, sword status _*/);

struct ship_data
{
```

```
  ub4  fedex;
  ub4  air;
  ub4  ground;
};

typedef struct ship_data ship_data;

int main(/*_ int argc, char *argv[] _*/);


/* Notify callback: */
ub4 notifyCB(ctx, subscrhp, pay, payl, desc, mode)
dvoid *ctx;
LNOCISubscription *subscrhp;
dvoid *pay;
ub4    payl;
dvoid *desc;
ub4    mode;
{
 text                *subname;
 ub4                 size;
 ship_data           *ship_stats = (ship_data *)ctx;
 text                *queue;
 text                *consumer;
 OCIRaw              *msgid;
 ub4                 priority;
 OCIAQMsgProperties  *msgprop;

 OCIAttrGet((dvoid *)subscrhp, OCI_HTYPE_SUBSCRIPTION,
                             (dvoid *)&subname, &size,
                             OCI_ATTR_SUBSCR_NAME, errhp);

 /* Extract the attributes from the AQ descriptor.
    Queue name: */
 OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&queue, &size,
           OCI_ATTR_QUEUE_NAME, errhp);

 /* Consumer name: */
 OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&consumer, &size,
           OCI_ATTR_CONSUMER_NAME, errhp);

 /* Msgid: */
 OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&msgid, &size,
           OCI_ATTR_NFY_MSGID, errhp);
```

```
  /* Message properties: */
  OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&msgprop, &size,
             OCI_ATTR_MSG_PROP, errhp);

  /* Get priority from message properties: */
  checkerr(errhp, OCIAttrGet(msgprop, OCI_DTYPE_AQMSG_PROPERTIES,
                              (dvoid *)&priority, 0,
                              OCI_ATTR_PRIORITY, errhp));

   switch (priority)
   {
   case 1:  ship_stats->fedex++;
            break;
   case 2 : ship_stats->air++;
            break;
   case 3:  ship_stats->ground++;
            break;
   default:
            printf(" Error priority %d", priority);
   }
}


int main(argc, argv)
int argc;
char *argv[];
{
  OCISession *authp = (OCISession *) 0;
  OCISubscription *subscrhp[8];
  ub4 namespace = OCI_SUBSCR_NAMESPACE_AQ;
  ship_data  ctx = {0,0,0};
  ub4 sleep_time = 0;

  printf("Initializing OCI Process\n");

  /* Initialize OCI environment with OCI_EVENTS flag set: */
  (void) OCIInitialize((ub4) OCI_EVENTS|OCI_OBJECT, (dvoid *)0,
                       (dvoid * (*)(dvoid *, size_t)) 0,
                       (dvoid * (*)(dvoid *, dvoid *, size_t))0,
                       (void (*)(dvoid *, dvoid *)) 0 );

  printf("Initialization successful\n");

  printf("Initializing OCI Env\n");
  (void) OCIEnvInit( (OCIEnv **) &envhp, OCI_DEFAULT, (size_t) 0, (dvoid **) 0
```

```
);
  printf("Initialization successful\n");

  checkerr(errhp, OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &errhp, OCI_HTYPE_
ERROR,
                   (size_t) 0, (dvoid **) 0));

  checkerr(errhp, OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &srvhp, OCI_HTYPE_
SERVER,
                   (size_t) 0, (dvoid **) 0));

  checkerr(errhp, OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &svchp, OCI_HTYPE_
SVCCTX,
                   (size_t) 0, (dvoid **) 0));


  printf("connecting to server\n");
  checkerr(errhp, OCIServerAttach( srvhp, errhp, (text *)"inst1_alias",
           strlen("inst1_alias"), (ub4) OCI_DEFAULT));
  printf("connect successful\n");

  /* Set attribute server context in the service context: */
  checkerr(errhp, OCIAttrSet( (dvoid *) svchp, OCI_HTYPE_SVCCTX, (dvoid *)srvhp,
                    (ub4) 0, OCI_ATTR_SERVER, (OCIError *) errhp));

  checkerr(errhp, OCIHandleAlloc((dvoid *) envhp, (dvoid **)&authp,
                       (ub4) OCI_HTYPE_SESSION, (size_t) 0, (dvoid **) 0));

  /* Set username and password in the session handle: */
  checkerr(errhp, OCIAttrSet((dvoid *) authp, (ub4) OCI_HTYPE_SESSION,
                  (dvoid *) username, (ub4) strlen((char *)username),
                  (ub4) OCI_ATTR_USERNAME, errhp));

  checkerr(errhp, OCIAttrSet((dvoid *) authp, (ub4) OCI_HTYPE_SESSION,
                  (dvoid *) password, (ub4) strlen((char *)password),
                  (ub4) OCI_ATTR_PASSWORD, errhp));

  /* Begin session: */
  checkerr(errhp, OCISessionBegin ( svchp,  errhp, authp, OCI_CRED_RDBMS,
                          (ub4) OCI_DEFAULT));

  (void) OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX,
                   (dvoid *) authp, (ub4) 0,
                   (ub4) OCI_ATTR_SESSION, errhp);
```

```
  /* Register for notification: */
  printf("allocating subscription handle\n");
  subscrhp[0] = (OCISubscription *)0;
  (void) OCIHandleAlloc((dvoid *) envhp, (dvoid **)&subscrhp[0],
                        (ub4) OCI_HTYPE_SUBSCRIPTION,
                        (size_t) 0, (dvoid **) 0);

  printf("setting subscription name\n");
  (void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) "WS.WS_BOOKEDORDERS_QUE:BOOKED_ORDERS",
                (ub4) strlen("WS.WS_BOOKEDORDERS_QUE:BOOKED_ORDERS"),
                (ub4) OCI_ATTR_SUBSCR_NAME, errhp);

  printf("setting subscription callback\n");
  (void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) notifyCB, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_CALLBACK, errhp);

 (void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *)&ctx, (ub4)sizeof(ctx),
                (ub4) OCI_ATTR_SUBSCR_CTX, errhp);

  printf("setting subscription namespace\n");
  (void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) &namespace, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_NAMESPACE, errhp);

  printf("Registering \n");
  checkerr(errhp, OCISubscriptionRegister(svchp, subscrhp, 1, errhp,
                                        OCI_DEFAULT));

  sleep_time = (ub4)atoi(argv[1]);
  printf ("waiting for %d s", sleep_time);
  sleep(sleep_time);

  printf("Exiting");
  exit(0);
}

void checkerr(errhp, status)
LNOCIError *errhp;
sword status;
{
  text errbuf[512];
```

```
  sb4 errcode = 0;

  switch (status)
  {
  case OCI_SUCCESS:
    break;
  case OCI_SUCCESS_WITH_INFO:
    (void) printf("Error - OCI_SUCCESS_WITH_INFO\n");
    break;
  case OCI_NEED_DATA:
    (void) printf("Error - OCI_NEED_DATA\n");
    break;
  case OCI_NO_DATA:
    (void) printf("Error - OCI_NODATA\n");
    break;
  case OCI_ERROR:
    (void) OCIErrorGet((dvoid *)errhp, (ub4) 1, (text *) NULL, &errcode,
                        errbuf, (ub4) sizeof(errbuf), OCI_HTYPE_ERROR);
    (void) printf("Error - %.*s\n", 512, errbuf);
    break;
  case OCI_INVALID_HANDLE:
    (void) printf("Error - OCI_INVALID_HANDLE\n");
    break;
  case OCI_STILL_EXECUTING:
    (void) printf("Error - OCI_STILL_EXECUTE\n");
    break;
  case OCI_CONTINUE:
    (void) printf("Error - OCI_CONTINUE\n");
    break;
  default:
    break;
  }
}
```

PL/SQL (DBMS_AQ package): Example Code

This example illustrates the use of the DBMS_AQ.REGISTER procedure.

In the BooksOnline scenario, assume that we want a PL/SQL callback `WS.notifyCB()` to be invoked when the subscriber `BOOKED_ORDER` receives a message in the `WS.WS_BOOKED_ORDERS_QUE` queue. In addition, we want to send an e-mail to `john@company.com` when an order is enqueued in the queue for subscriber `BOOKED_ORDERS`. Also assume that we want to invoke the servlet `http://xyz.company.com/servlets/NofifyServlet`. This can be done as follows:

First define a PL/SQL procedure that will be invoked on notification.

```
connect ws/ws;
set echo on;
set serveroutput on;

-- notifyCB callback
create or replace procedure notifyCB(
  context raw, reginfo sys.aq$_reg_info, descr sys.aq$_descriptor,
  payload raw, payloadl number)
AS
  dequeue_options   DBMS_AQ.dequeue_options_t;
  message_properies DBMS_AQ.message_properties_t;
  message_handle    RAW(16);
  message           BOLADM.order_typ;
BEGIN
  -- get the consumer name and msg_id from the descriptor
  dequeue_options.msgid := descr.msg_id;
  dequeue_options.consumer_name := descr.consumer_name;

  -- Dequeue the message
  DBMS_AQ.DEQUEUE(queue_name => descr.queue_name,
                  dequeue_options => dequeue_options,
                  message_properties => message_properties,
                  payload => message,
                  msgid => message_handle);

  commit;

  DBMS_OUTPUT.PUTLINE('Received Order: ' || message.orderno);

END;
/
```

The PL/SQL procedure, e-mail address, and HTTP URL can be registered as follows:

```
connect ws/ws;
set echo on;
set serveroutput on;

DECLARE
  reginfo1    sys.aq$_reg_info;
  reginfo2    sys.aq$_reg_info;
  reginfo3    sys.aq$_reg_info;
  reginfolist  sys.aq$_reg_info_list;
```

```
BEGIN
   -- register for the pl/sql procedure notifyCB to be called on notification
  reginfo1 := sys.aq$_reg_info('WS.WS_BOOKEDORDERS_QUE:BOOKED_ORDERS',
                    DBMS_AQ.NAMESPACE_AQ, 'plsql://WS.notifyCB',
                    HEXTORAW('FF'));

  -- register for an e-mail to be sent to john@company.com on notification
  reginfo2 := sys.aq$_reg_info('WS.WS_BOOKEDORDERS_QUE:BOOKED_ORDERS',
                         DBMS_AQ.NAMESPACE_AQ, 'mailto://john@company.com',
                           HEXTORAW('FF'));

  -- register for an HTTP servlet to be invoked for notification
  reginfo3 := sys.aq$_reg_info('WS.WS_BOOKEDORDERS_QUE:BOOKED_ORDERS',
                         DBMS_AQ.NAMESPACE_AQ,
                         'http://xyz.oracle.com/servlets/NotifyServlet',
                           HEXTORAW('FF'));

  -- Create the registration info list
  reginfolist := sys.aq$_reg_info_list(reginfo1);
  reginfolist.EXTEND;
  reginfolist(2) := reginfo2;

  reginfolist.EXTEND;
  reginfolist(3) := reginfo3;

-- do the registration
  sys.dbms_aq.register(reginfolist, 3);

END;
```

Registering for Notifications Using the AQ XML Servlet

Clients can register for AQ notifications over the Internet. See Chapter 17, "Internet Access to Advanced Queuing" for more information on registering for AQ notifications using SOAP.

The register request has the following format:

```
?xml version="1.0"?>
<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>

        <AQXmlRegister xmlns = "http://ns.oracle.com/AQ/schemas/access">
```

```
            <register_options>
              <destination>WS.WS_BOOKEDORDERS_QUE</destination>
              <consumer_name>BOOKED_ORDERS</consumer_name>
              <notify_url>mailto://john@company.com</notify_url>
            </register_options>

            <AQXmlCommit/>
          </AQXmlRegister>
        </Body>
</Envelope>
```

The e-mail notification sent to `john@company.com` will have the following format:

```
<?xml version="1.0"?>
<Envelope xmlns="http://www.oracle.com/schemas/IDAP/envelope">
    <Body>
        <AQXmlNotification xmlns="http://www.oracle.com/schemas/AQ/access">
            <notification_options>
                <destination>WS.WS_BOOKEDORDERS_QUE</destination>
            </notification_options>
            <message_set>
                <message>
                    <message_header>
                       <message_id>81128B6AC46D4B15E03408002092AA15</message_id>
                       <correlation>RUSH</correlation>
                       <priority>1</priority>
                       <delivery_count>0</delivery_count>
                       <sender_id>
                            <agent_name>john</agent_name>
                       </sender_id>
                       <message_state>0</message_state>
                    </message_header>
                </message>
            </message_set>
        </AQXmlNotification>
    </Body>
</Envelope>
```

Propagation Features

In this section, the following topics are discussed:

- Propagation
- Propagation Scheduling

- Scenario
- Enhanced Propagation Scheduling Capabilities
- Exception Handling During Propagation
- Message Format Transformation During Propagation

Propagation

This feature allows applications to communicate with each other without being connected to the same database or to the same queue. Messages can be propagated from one queue to another. The destination queue can be located in the same database or in a remote database. Propagation is performed by job queue background processes. Propagation to the remote queue uses database links over Oracle Net Services or HTTP(S).

The propagation feature is used as follows. First one or more subscribers are defined for the queue from which messages are to be propagated (see "Subscriptions and Recipient Lists" on page 8-36). Second, a schedule is defined for each destination where messages are to be propagated from the queue. Enqueued messages will be propagated and automatically available for dequeuing at the destination queues.

For propagation over the Internet, you must specify the remote Internet user in the database link. The remote Internet user must have privileges to enqueue in the destination queue.

Note that two or more `job_queue` background processes must be running to use propagation. This is in addition to the number of `job_queue` background processes needed for handling non-propagation related jobs. Also, if you want to deploy remote propagation, you must ensure that the database link specified for the schedule is valid and have proper privileges for enqueuing into the destination queue. For more information about the administrative commands for managing propagation schedules, see "Propagation Scheduling" on page 8-108.

Propagation also has mechanisms for handling failure. For example, if the database link specified is invalid, then the appropriate error message is reported.

Finally, propagation provides detailed statistics about the messages propagated and the schedule itself. This information can be used to properly tune the schedules for best performance. See "Enhanced Propagation Scheduling Capabilities" for a discussion of the failure handling and error reporting facilities of propagation and propagation statistics.

Propagation Scheduling

A propagation schedule is defined for a pair of source and destination queues. If a queue has messages to be propagated to several queues, a schedule has to be defined for each of the destination queues. A schedule indicates the time frame during which messages can be propagated from the source queue. This time frame may depend on a number of factors such as network traffic, load at source database, load at destination database, and so on. The schedule therefore has to be tailored for the specific source and destination. When a schedule is created, a job is automatically submitted to the `job_queue` facility to handle propagation.

The administrative calls for propagation scheduling provide flexibility for managing the schedules (see "Scheduling a Queue Propagation" in Chapter 9, "Administrative Interface"). The duration or propagation window parameter of a schedule specifies the time frame during which propagation has to take place. If the duration is unspecified, the time frame is an infinite single window. If a window has to be repeated periodically, a finite duration is specified along with a `next_time` function that defines the periodic interval between successive windows.

The latency parameter for a schedule is relevant only when a queue does not have any messages to be propagated. This parameter specifies the time interval within which a queue has to be rechecked for messages. Note that if the latency is less than 5 seconds, then the `job_queue_interval` parameter for the job queue processes should be less than or equal to the latency parameter.

The propagation schedules defined for a queue can be changed or dropped at anytime during the life of the queue. In addition there are calls for temporarily disabling a schedule (instead of dropping the schedule) and enabling a disabled schedule. A schedule is active when messages are being propagated in that schedule. All the administrative calls can be made irrespective of whether the schedule is active or not. If a schedule is active, it will take a few seconds for the calls to be executed.

Scenario

In the BooksOnLine example, messages in the `OE_bookedorders_que` are propagated to different shipping sites. The following example code illustrates the various administrative calls available for specifying and managing schedules. It also shows the calls for enqueuing messages into the source queue and for dequeuing the messages at the destination site. The catalog view `USER_QUEUE_SCHEDULES` provides all information relevant to a schedule (see "Selecting Propagation Schedules in User Schema" in Chapter 10, "Administrative Interface: Views").

PL/SQL (DBMS_AQADM Package): Example Code

```
CONNECT OE/OE;

/* Schedule Propagation from bookedorders_que to shipping: */
EXECUTE dbms_aqadm.schedule_propagation( \
   queue_name      => 'OE.OE_bookedorders_que');

/* Check if a schedule has been created: */
SELECT * FROM user_queue_schedules;

/* Enqueue some orders into OE_bookedorders_que: */
EXECUTE BOLADM.order_enq('My First   Book', 1, 1001, 'CA', 'USA', \
   'WESTERN', 'NORMAL');
EXECUTE BOLADM.order_enq('My Second  Book', 2, 1002, 'NY', 'USA', \
   'EASTERN', 'NORMAL');
EXECUTE BOLADM.order_enq('My Third   Book', 3, 1003, '',   'Canada', \
   'INTERNATIONAL', 'NORMAL');
EXECUTE BOLADM.order_enq('My Fourth  Book', 4, 1004, 'NV', 'USA', \
   'WESTERN', 'RUSH');
EXECUTE BOLADM.order_enq('My Fifth   Book', 5, 1005, 'MA', 'USA', \
   'EASTERN', 'RUSH');
EXECUTE BOLADM.order_enq('My Sixth   Book', 6, 1006, ''  , 'UK', \
   'INTERNATIONAL', 'NORMAL');
EXECUTE BOLADM.order_enq('My Seventh Book', 7, 1007, '',   'Canada', \
   'INTERNATIONAL', 'RUSH');
EXECUTE BOLADM.order_enq('My Eighth  Book', 8, 1008, '',   'Mexico', \
   'INTERNATIONAL', 'NORMAL');
EXECUTE BOLADM.order_enq('My Ninth   Book', 9, 1009, 'CA', 'USA', \
   'WESTERN', 'RUSH');
EXECUTE BOLADM.order_enq('My Tenth   Book', 8, 1010, ''  , 'UK', \
   'INTERNATIONAL', 'NORMAL');
EXECUTE BOLADM.order_enq('My Last    Book', 7, 1011, ''  , 'Mexico', \
   'INTERNATIONAL', 'NORMAL');

/* Wait for propagation to happen: */
EXECUTE dbms_lock.sleep(100);

/* Connect to shipping sites and check propagated messages: */
CONNECT WS/WS;
set serveroutput on;

/*  Dequeue all booked orders for West_Shipping: */
EXECUTE BOLADM.shipping_bookedorder_deq('West_Shipping', DBMS_AQ.REMOVE);
```

```
CONNECT ES/ES;
SET SERVEROUTPUT ON;

/* Dequeue all remaining booked orders (normal order) for East_Shipping: */
EXECUTE BOLADM.shipping_bookedorder_deq('East_Shipping', DBMS_AQ.REMOVE);

CONNECT OS/OS;
SET SERVEROUTPUT ON;

/* Dequeue all international North American orders for Overseas_Shipping: */
EXECUTE BOLADM.get_northamerican_orders('Overseas_Shipping');

/* Dequeue rest of the booked orders for Overseas_Shipping: */
EXECUTE BOLADM.shipping_bookedorder_deq('Overseas_Shipping', DBMS_AQ.REMOVE);

/* Disable propagation schedule for booked orders
EXECUTE dbms_aqadm.disable_propagation_schedule(   \
   queue_name   => 'OE_bookedorders_que');

/* Wait for some time for call to be effected: */
EXECUTE dbms_lock.sleep(30);

/*  Check if the schedule has been disabled: */
SELECT schedule_disabled FROM user_queue_schedules;

/* Alter propagation schedule for booked orders to execute every
   15 mins (900 seconds) for a window duration of 300 seconds: */
EXECUTE dbms_aqadm.alter_propagation_schedule( \
   queue_name     => 'OE_bookedorders_que', \
   duration       => 300, \
   next_time      => 'SYSDATE + 900/86400',\
   latency        => 25);

/* Wait for some time for call to be effected: */
EXECUTE dbms_lock.sleep(30);

/*  Check if the schedule parameters have changed: */
SELECT next_time, latency, propagation_window FROM user_queue_schedules;

/* Enable propagation schedule for booked orders:
EXECUTE dbms_aqadm.enable_propagation_schedule( \
   queue_name     => 'OE_bookedorders_que');

/* Wait for some time for call to be effected: */
EXECUTE dbms_lock.sleep(30);
```

```
/* Check if the schedule has been enabled: */
SELECT schedule_disabled FROM user_queue_schedules;

/* Unschedule propagation for booked orders: */
EXECUTE dbms_aqadm.unschedule_propagation(   \
   queue_name      => 'OE.OE_bookedorders_que');

/* Wait for some time for call to be effected: */
EXECUTE dbms_lock.sleep(30);

/*  Check if the schedule has been dropped
SELECT *  FROM user_queue_schedules;
```

Visual Basic (OO4O): Example Code

This functionality is currently not available.

Java (JDBC): Example Code

No example is provided with this release.

Propagation of Messages with LOB Attributes

Large Objects can be propagated using AQ using two methods:

- Propagation from RAW queues. In RAW queues the message payload is stored as a Binary Large Object (BLOB). This allows users to store up to 32KB of data when using the PL/SQL interface and as much data as can be contiguously allocated by the client when using OCI. This method is supported by all releases after 8.0.4 inclusive.
- Propagation from Object queues with LOB attributes. The user can populate the LOB and read from the LOB using Oracle's LOB handling routines. The LOB attributes can be BLOBs or CLOBs (not NCLOBs). If the attribute is a CLOB AQ will automatically perform any necessary characterset conversion between the source queue and the destination queue. This method is supported by all releases from 8.1.3 inclusive.

See Also: *Oracle9i Application Developer's Guide* - *Large Objects (LOBs)*

Note that AQ does not support propagation from Object queues that have BFILE or REF attributes in the payload.

Scenario

In the BooksOnLine application, the company may wish to send promotional coupons along with the book orders. These coupons are generated depending on the content of the order, and other customer preferences. The coupons are images generated from some multimedia database, and are stored as `LOB`s.

When the order information is sent to the shipping warehouses, the coupon contents are also sent to the warehouses. In the following code, `order_typ` is enhanced to contain a coupon attribute of LOB type. The code demonstrates how the `LOB` contents are inserted into the message that is enqueued into `OE_bookedorders_que` when an order is placed. The message payload is first constructed with an empty `LOB`. The place holder (`LOB` locator) information is obtained from the queue table and is then used in conjunction with the `LOB` manipulation routines, such as DBMS_LOB.WRITE(), to fill the LOB contents. The example has additional examples regarding for enqueue and dequeue of messages with LOBs as part the payload.

A `COMMIT` is issued only after the LOB contents are filled in with the appropriate image data. Propagation automatically takes care of moving the LOB contents along with the rest of the message contents. The following code also shows a dequeue at the destination queue for reading the LOB contents from the propagated message. The LOB contents are read into a buffer that can be sent to a printer for printing the coupon.

PL/SQL (DBMS_AQADM Package): Example Code

```
/* Enhance the type order_typ to contain coupon field (lob field): */
CREATE OR REPLACE TYPE order_typ AS OBJECT (
        orderno         NUMBER,
        status          VARCHAR2(30),
        ordertype       VARCHAR2(30),
        orderregion     VARCHAR2(30),
        customer        customer_typ,
        paymentmethod   VARCHAR2(30),
        items           orderitemlist_vartyp,
        total           NUMBER,
        coupon          BLOB);
/

/* lob_loc is a variable of type BLOB,
   buffer is a variable of type RAW,
```

```
   length is a variable of type NUMBER. */

/* Complete the order data and perform the enqueue using the order_enq()
   procedure: */
dbms_aq.enqueue('OE.OE_bookedorders_que', enqopt, msgprop,
                OE_enq_order_data, enq_msgid);

/* Get the lob locator in the queue table after enqueue: */
SELECT t.user_data.coupon INTO lob_loc
FROM   OE.OE_orders_pr_mqtab t
WHERE  t.msgid = enq_msgid;

/* Generate a sample LOB of 100 bytes: */
buffer := hextoraw(rpad('FF',100,'FF'));

/* Fill in the lob using LOB routines in the dbms_lob package: */
dbms_lob.write(lob_loc, 90, 1, buffer);

/* Issue a commit only after filling in lob contents: */
COMMIT;

/* Sleep until propagation is complete: */

/* Perform dequeue at the Western Shipping warehouse: */
dbms_aq.dequeue(
        queue_name         => qname,
        dequeue_options    => dopt,
        message_properties => mprop,
        payload            => deq_order_data,
        msgid              => deq_msgid);

/* Get the LOB locator after dequeue: */
lob_loc := deq_order_data.coupon;

/* Get the length of the LOB: */
length := dbms_lob.getlength(lob_loc);

/* Read the LOB contents into the buffer: */
dbms_lob.read(lob_loc, length, 1, buffer);
```

Visual Basic (OO4O): Example Code

This functionality is not available currently.

Java (JDBC): Example Code

No example is provided with this release.

Enhanced Propagation Scheduling Capabilities

Detailed information about the schedules can be obtained from the catalog views defined for propagation. Information about active schedules—such as the name of the background process handling that schedule, the SID (session, serial number) for the session handling the propagation and the Oracle instance handling a schedule (relevant if Real Application Clusters are being used)—can be obtained from the catalog views. The same catalog views also provide information about the previous successful execution of a schedule (last successful propagation of message) and the next execution of the schedule.

For each schedule, detailed propagation statistics are maintained:

- The total number of messages propagated in a schedule
- Total number of bytes propagated in a schedule
- Maximum number of messages propagated in a window
- Maximum number of bytes propagated in a window
- Average number of messages propagated in a window
- Average size of propagated messages
- Average time to propagated a message

This includes the total number of messages propagated in a schedule, total number of bytes propagated in a schedule, maximum number of messages propagated in a window, maximum number of bytes propagated in a window, average number of messages propagated in a window, average size of propagated messages and the average time to propagated a message. These statistics have been designed to provide useful information to the queue administrators for tuning the schedules such that maximum efficiency can be achieved.

Propagation has built-in support for handling failures and reporting errors. For example, if the specified database link is invalid, the remote database is unavailable, or if the remote queue is not enabled for enqueuing, then the appropriate error message is reported. Propagation uses an exponential backoff scheme for retrying propagation from a schedule that encountered a failure.

If a schedule continuously encounters failures, the first retry happens after 30 seconds, the second after 60 seconds, the third after 120 seconds and so forth. If the retry time is beyond the expiration time of the current window, the next retry is attempted at the start time of the next window. A maximum of 16 retry attempts is made, after which the schedule is automatically disabled. When a schedule is disabled automatically due to failures, the relevant information is written into the alert log.

A check for scheduling failures indicates:

- How many successive failures were encountered
- The error message indicating the cause for the failure
- The time at which the last failure was encountered

By examining this information, a queue administrator can fix the failure and enable the schedule. During a retry, if propagation is successful, the number of failures is reset to 0.

Propagation has support built-in for Oracle Real Application Clusters and is transparent to the user and the queue administrator. The job that handles propagation is submitted to the same instance as the owner of the queue table where the queue resides.

If there is a failure at an instance and the queue table that stores the queue is migrated to a different instance, the propagation job is also migrated to the new instance. This will minimize pinging between instances and thus offer better performance. Propagation has been designed to handle any number of concurrent schedules. Note that the number of job queue processes is limited to a maximum of 1000, and some of these may be used to handle nonpropagation-related jobs. Hence, propagation has built-in support for multitasking and load balancing.

The propagation algorithms are designed such that multiple schedules can be handled by a single snapshot (job_queue) process. The propagation load on a `job_queue` process can be skewed based on the arrival rate of messages in the different source queues.

If one process is overburdened with several active schedules while another is less loaded with many passive schedules, propagation automatically re-distributes the schedules so they are loaded uniformly.

Scenario

In the BooksOnLine example, the `OE_bookedorders_que` is a busy queue since messages in it are propagated to different shipping sites. The following example code illustrates the calls supported by enhanced propagation scheduling for error checking and schedule monitoring.

PL/SQL (DBMS_AQADM Package): Example Code

```
CONNECT OE/OE;

/*  get averages
select avg_time, avg_number, avg_size from user_queue_schedules;

/*  get totals
select total_time, total_number, total_bytes from user_queue_schedules;

/*  get maximums for a window
select max_number, max_bytes from user_queue_schedules;

/*  get current status information of schedule
select process_name, session_id, instance, schedule_disabled
   from user_queue_schedules;

/*  get information about last and next execution
select last_run_date, last_run_time, next_run_date, next_run_time
   from user_queue_schedules;

/*  get last error information if any
select failures, last_error_msg, last_error_date, last_error_time
   from user_queue_schedules;
```

Visual Basic (OO4O): Example Code

This functionality is currently not available.

Java (JDBC): Example Code

No example is provided with this release.

Exception Handling During Propagation

When system errors such as a network failure occur, Advanced Queuing continues to attempt to propagate messages using an exponential backoff algorithm. In some situations that indicate application errors, AQ will mark messages as `UNDELIVERABLE` if there is an error in propagating the message.

Examples of such errors are when the remote queue does not exist or when there is a type mismatch between the source queue and the remote queue. In such situations users must query the `DBA_SCHEDULES` view to determine the last error that occurred during propagation to a particular destination. The trace files in the `$ORACLE_HOME/log` directory can provide additional information about the error.

Scenario

In the BooksOnLine example, the `ES_bookedorders_que` in the Eastern Shipping region is stopped intentionally using the stop_queue() call. After a short while the propagation schedule for `OE_bookedorders_que` will display an error indicating that the remote queue ES_bookedorders_que is disabled for enqueuing. When the `ES_bookedorders_que` is started using the `start_queue`() call, propagation to that queue resumes and there is no error message associated with schedule for `OE_bookedorders_que`.

PL/SQL (DBMS_AQADM Package): Example Code

```
/*  Intentionally stop the eastern shipping queue : */
connect BOLADM/BOLADM
EXECUTE dbms_aqadm.stop_queue(queue_name => 'ES.ES_bookedorders_que');

/* Wait for some time before error shows up in dba_queue_schedules: */
EXECUTE dbms_lock.sleep(100);

/* This query will return an ORA-25207 enqueue failed error: */
SELECT qname, last_error_msg from dba_queue_schedules;

/* Start the eastern shipping queue: */
EXECUTE dbms_aqadm.start_queue(queue_name => 'ES.ES_bookedorders_que');

/* Wait for Propagation to resume for eastern shipping queue: */
EXECUTE dbms_lock.sleep(100);

/* This query will indicate that there are no errors with propagation:
SELECT qname, last_error_msg from dba_queue_schedules;
```

Visual Basic (OO4O): Example Code

This functionality is handled by the database.

Java (JDBC): Example Code

No example is provided with this release.

Message Format Transformation During Propagation

At propagation time, a transformation can be specified when adding a rule-based subscriber to `OE_bookedorders_topic` for Western shipping orders. The transformation is applied to the orders, transforming them to the `WS.order_typ_sh` type before propagating them to `WS_bookedorders_topic`.

PL/SQL (DBMS_AQADM Package): Example Code

```
declare
subscriber     sys.aq$_agent;
begin
  subscriber :=sys.aq$_agent('West_Shipping','WS.WS_bookedorders_topic',null);
  dbms_aqadm.add_subscriber(queue_name => 'OE.OE_bookedorders_topic',
       subscriber     => subscriber,
       rule           => 'tab.user_data.orderregion =''WESTERN''
                           AND tab.user_data.ordertype != ''RUSH''',
       transformation => 'OE.OE2WS');
end;
```

Visual Basic (OO4O): Example Code

No example is provided with this release.

Java (JDBC): Example Code

No example is provided with this release.

Propagation Using HTTP

In Oracle9*i*, you can set up Advanced Queuing propagation over HTTP and HTTPS (HTTP over SSL). HTTP propagation uses the Internet access infrastructure and requires that the AQ servlet that connects to the destination database be deployed. The database link must be created with the connect string indicating the Web server address and port and indicating HTTP as the protocol. The source database must be created for running Java and XML. Otherwise, the setup for HTTP propagation is more or less the same as Oracle Net Services (formerly Net8) propagation.

Scenario

In the BooksOnLine example, messages in the `OE_bookedorders_que` are propagated to different shipping sites. For the purpose of this scenario, the Western Shipping application is running on another database, `'dest-db'` and we will propagate to `WS_bookedorders_que`.

Propagation Setup

1. Deploy the AQ Servlet.

   HTTP propagation depends on Internet access to the destination database. Create a class `AQPropServlet` that extends the AQxmlServlet.

   ```
   import java.io.*;
   ```

```
import javax.servlet.*;
import javax.servlet.http.*;
import oracle.AQ.*;
import oracle.AQ.xml.*;
import java.sql.*;
import oracle.jms.*;
import javax.jms.*;
import java.io.*;
import oracle.jdbc.pool.*;

/* This is an AQ Propagation Servlet. */
public class AQPropServlet extends oracle.AQ.xml.AQxmlServlet

/* getDBDrv - specify the database to which the servlet will connect */
public AQxmlDataSource createAQDataSource() throws AQxmlException
{
  AQxmlDataSource  db_drv = null;
  db_drv = new AQxmlDataSource("aqadm", "aqadm", "dest-db", "dest-host",
      5521);
    return db_drv;
  }

  public void init()
  {
      try {
        AQxmlDataSource axds = this.createAQDataSource();
        setAQDataSource(axds) ;
        setSessionMaxInactiveTime(180) ;

      } catch (Exception e) {
         System.err.println("Error in init : " +e) ;
      }
  }
}
```

This servlet must connect to the destination database. The servlet must be deployed on the Web server in the path `aqserv/servlet`. In Oracle9*i*, the propagation servlet name and deployment path are fixed; that is, they must be `AQPropServlet` and `aqserv/servlet`, respectively.

Assume that the Web server host and port are `webdest.oracle.com` and `8081`, respectively.

2. Create the database link dba.

- Specify HTTP as the protocol.
- Specify the username and password that will be used for authentication with the Web server/servlet runner as the host and port of the Web server running the AQ servlet.

For this example, the connect string of the database link should be as follows:

```
(DESCRIPTION=(ADDRESS=(PROTOCOL=http)(HOST=webdest.oracle.com)(PORT=8081))
```

If SSL is used, then specify HTTPS as the protocol in the connect string.

Create the database link as follows:

```
create public database link dba connect to john identified by welcome
using
'(DESCRIPTION=(ADDRESS=(PROTOCOL=http)(HOST=webdest.oracle.com)(PORT=8081))'
;
```

If SSL is used, then specify HTTPS as the protocol in the connect string.

Create the database link as follows:

```
create public database link dba connect to john identified by welcome
using
'(DESCRIPTION=(ADDRESS=(PROTOCOL=http)(HOST=webdest.oracle.com)(PORT=8081))'
;
```

Here `john` is the AQ HTTP agent used to access the AQ (propagation) servlet. `Welcome` is the password used to authenticate with the Web server.

3. Make sure that the AQ HTTP agent, John, is authorized to perform AQ operations. Do the following at the destination database.

   a. Register the AQ agent.

   ```
   dbms_aqadm.create_aq_agent(agent_name => 'John', enable_http => true);
   ```

   b. Map the AQ agent to a database user.

   ```
   dbms_aqadm.enable_db_access(agent_name =>'John', db_username =>'CBADM')'
   ```

4. Set up the remote subscription to `OE.OE_bookedorders_que`.

   ```
   execute dbms_aqadm.add_subscriber('OE.OE_bookedorders_que',
   aq$_agent(null, 'WS.WS_bookedorders_que', null));
   ```

5. Start propagation by calling `dbms_aqdm.schedule_propagation` at the source database.

```
dbms_aqadm.schedule_propagation('OE.OE_bookedorders_que', 'dba');
```

All other propagation administration APIs work the same for HTTP propagation. Use the propagation view, `DBA_QUEUE_SCHEDULES`, to check the propagation statistics for propagation schedules using HTTP.

9

Administrative Interface

This chapter describes the administrative interface to Oracle Advanced Queuing. We discuss each operation (such as "Creating a Queue Table") in terms of a use case by that name. Each use case is laid out as follows:

- ***Use case figure***. A figure that depicts the use case.
- ***Purpose***. The purpose of this use case.
- ***Usage Notes.*** Guidelines to assist implementation.
- ***Syntax***. The main syntax used to perform this activity.
- ***Examples***. Examples in each programmatic environment which illustrate the use case.

Use Case Model: Administrative Interface — Basic Operations

Table 9–1, "Use Case Model: Administrative Interface — Basic Operations" indicates with a **+** where examples are provided for specific use cases and in which programmatic environment.

The table refers to programmatic environments with the following abbreviations:

- **P** — PL/SQL using the DBMS_AQADM and DBMS_AQ packages
- **V** — Visual Basic using OO4O (Oracle Objects for OLE)
- **J** — Java (native AQ) using JDBC (Java Database Connectivity)
- **JMS** — Java (JMS standard) using JDBC (Java Database Connectivity)

Table 9–1 Use Case Model: Administrative Interface — Basic Operations

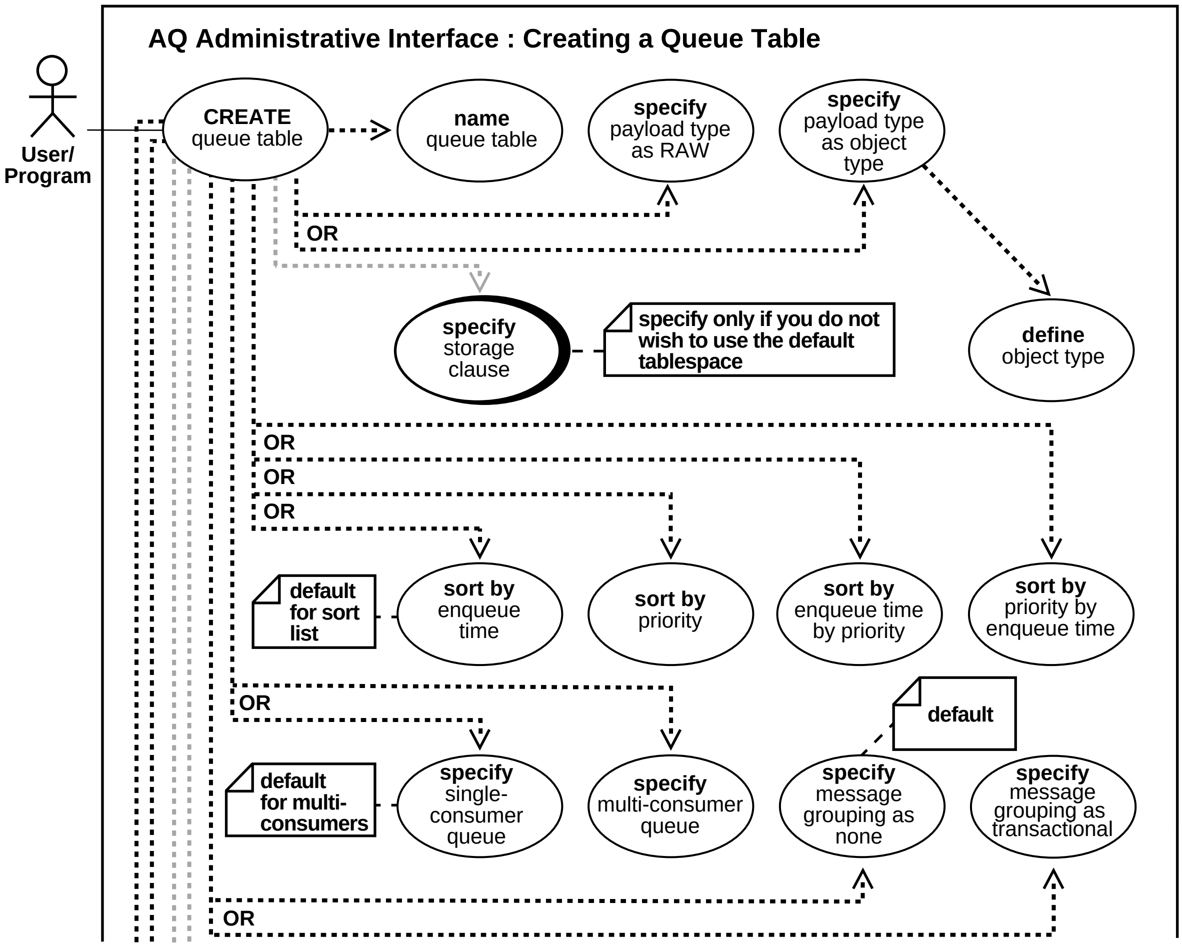
Use Case	P	V	J	JMS
Creating a Queue Table on page 9-4	+	+	+	-
Creating a Queue Table [Set Storage Clause] on page 9-12	+	-	+	-
Altering a Queue Table on page 9-14	+	-	+	-
Dropping a Queue Table on page 9-17	+	-	+	-
Creating a Queue on page 9-20	+	-	+	-
Creating a Nonpersistent Queue on page 9-26	+	-	-	-
Altering a Queue on page 9-28	+	-	+	-
Dropping a Queue on page 9-31	+	-	+	-
Creating a Transformation on page 9-34	+	-	-	-
Modifying a Transformation on page 9-37	+	-	-	-
Applying a Transformation on page 9-39	+	-	-	-
Dropping a Transformation on page 9-40	+	-	-	-
Starting a Queue on page 9-42	+	-	+	-
Stopping a Queue on page 9-45	+	-	+	-
Granting System Privilege on page 9-48	+	-	+	-
Revoking System Privilege on page 9-51	+	-	-	-
Granting Queue Privilege on page 9-53	+	-	+	-
Revoking Queue Privilege on page 9-55	+	-	+	-

Table 9–1 Use Case Model: Administrative Interface — Basic Operations

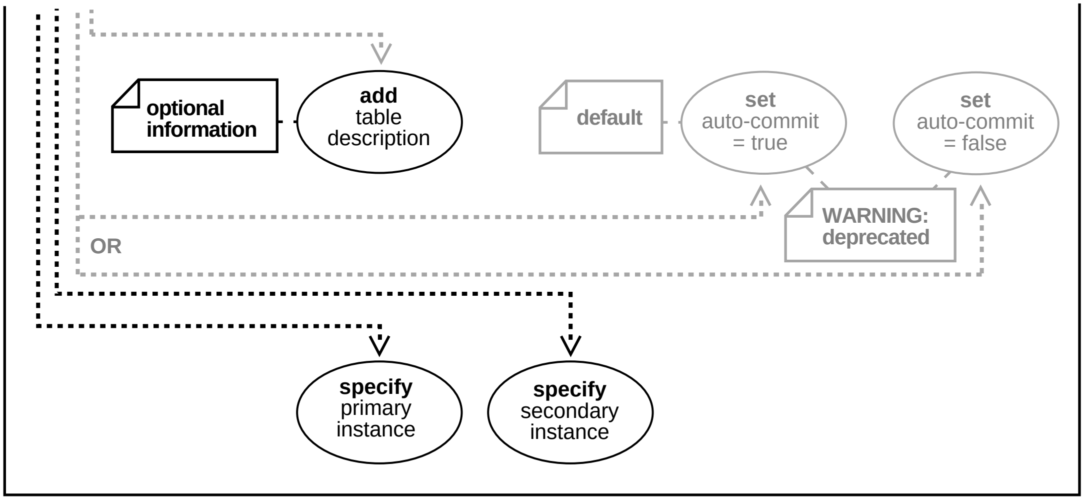
Use Case	P	V	J	JMS
Adding a Subscriber on page 9-58	+	-	+	-
Altering a Subscriber on page 9-64	+	-	+	-
Removing a Subscriber on page 9-68	+	-	+	-
Scheduling a Queue Propagation on page 9-71	+	-	+	-
Unscheduling a Queue Propagation on page 9-75	+	-	+	-
Verifying a Queue Type on page 9-78	+	-	-	-
Altering a Propagation Schedule on page 9-81	+	-	+	-
Enabling a Propagation Schedule on page 9-84	+	-	+	-
Disabling a Propagation Schedule on page 9-87	+	-	+	-
Creating an AQ Agent on page 9-90	+	-	-	-
Altering an AQ Agent on page 9-92	+	-	-	-
Dropping an AQ Agent on page 9-94	+	-	-	-
Enabling Database Access on page 9-96	+	-	-	-
Disabling Database Access on page 9-98	+	-	-	-
Adding an Alias to the LDAP Server on page 9-100	+	-	-	-
Removing an Alias from the LDAP Server on page 9-102	+	-	-	-

Creating a Queue Table

Figure 9–1 Creating a Queue Table



continued on next page



See Also:

- Table 9–1 for a list of adminstrative interface basic operations
- "Creating a Queue Table [Set Storage Clause]" on page 9-12

Purpose

Create a queue table for messages of a predefined type.

Usage Notes

- Queue names and queue table names are converted to upper case. Mixed case (upper and lower case together) is not supported.
- The sort keys for dequeue ordering, if any, need to be defined at table creation time. The following objects are created at this time:
  - The default exception queue associated with the queue table called `aq$_<queue_table_name>_e`.

    - A read-only view which is used by AQ applications for querying queue data called aq$<queue_table_name>.
    - An index for the queue monitor operations called aq$_<queue_table_name>_t.
    - An index or an index organized table (IOT) in the case of multiple consumer queues for dequeue operations called aq$_<queue_table_name>_i.
- For 8.1-compatible multiconsumer queue tables, the following additional objects are created:
    - A table called aq$_<queue_table_name>_s. This table stores information about the subscribers.
    - A table called aq$_<queue_table_name>_r. This table stores information about rules on subscriptions.
    - An index organized table (IOT) called aq$_<queue_table_name>_h. This table stores the dequeue history data.
- `CLOB`, `BLOB,` or `BFILE` objects are valid in an AQ message. You can propagate these object types using AQ propagation with Oracle since release 8.1.x. To enqueue an object type that has an `LOB`, you must first set the `LOB_attribute` to `EMPTY_BLOB`() and perform the enqueue. You can then select the `LOB` locator that was generated from the queue table's view and use the standard `LOB` operations. See the *Oracle9i Application Developer's Guide* - *Large Objects (LOBs)* for more information.
- You can specify and modify the primary_instance and secondary_instance only in 8.1 compatible mode.
- You cannot specify a secondary instance unless there is a primary instance.
- When a queue, queue table, or subscriber is created, modified, or dropped, and if GLOBAL_TOPIC_ENABLED = TRUE, a corresponding LDAP entry is also created.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.CREATE_QUEUE_TABLE`

- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ *createQueueTable*

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.:

- PL/SQL (DBMS_AQADM Package): Creating a Queue Table on page 9-7
- VB (OO4O): Creating a Queue Table on page 9-9
- Java (JDBC): Creating a Queue Table on page 9-9

PL/SQL (DBMS_AQADM Package): Creating a Queue Table

Note: You may need to set up the following data structures for certain examples to work:

```
CONNECT system/manager;
DROP USER aqadm CASCADE;
GRANT CONNECT, RESOURCE TO aqadm;
CREATE USER aqadm IDENTIFIED BY aqadm;
GRANT EXECUTE ON DBMS_AQADM TO aqadm;
GRANT Aq_administrator_role TO aqadm;
DROP USER aq CASCADE;
CREATE USER aq IDENTIFIED BY aq;
GRANT CONNECT, RESOURCE TO aq;
GRANT EXECUTE ON dbms_aq TO aq;
```

Creating a queue table for queues containing messages of object type

```
CREATE type aq.Message_typ as object (
   Subject                 VARCHAR2(30),
   Text                    VARCHAR2(80));

/* Note: if you do not stipulate a schema, you default to the user's schema. */
EXECUTE dbms_aqadm.create_queue_table (
   Queue_table             => 'aq.ObjMsgs_qtab',
   Queue_payload_type      => 'aq.Message_typ');
```

Creating a queue table for queues containing messages of RAW type

```
EXECUTE dbms_aqadm.create_queue_table (
   Queue_table             => 'aq.RawMsgs_qtab',
```

```
   Queue_payload_type     => 'RAW');
```

Creating a queue table for queues containing messages of XMLType

```
execute dbms_aqadm.create_queue_table(
        queue_table     => 'OS_orders_pr_mqtab',
        comment         => 'Overseas Shipping MultiConsumer Orders queue table',
        multiple_consumers  => TRUE,
        queue_payload_type  => 'SYS.XMLType',
        compatible          => '8.1');
```

Creating a queue table for prioritized messages

```
EXECUTE dbms_aqadm.create_queue_table (
   Queue_table            => 'aq.PriorityMsgs_qtab',
   Sort_list              => 'PRIORITY,ENQ_TIME',
   Queue_payload_type     => 'aq.Message_typ');
```

Creating a queue table for multiple consumers

```
EXECUTE dbms_aqadm.create_queue_table (
   Queue_table            => 'aq.MultiConsumerMsgs_qtab',
   Multiple_consumers     => TRUE,
   Queue_payload_type     => 'aq.Message_typ');
```

Creating a queue table for multiple consumers compatible with 8.1

```
EXECUTE dbms_aqadm.create_queue_table (
   Queue_table            => 'aq.Multiconsumermsgs8_1qtab',
   Multiple_consumers     =>  TRUE,
   Compatible             => '8.1',
   Queue_payload_type     => 'aq.Message_typ');
```

Creating a queue table in a specified tablespace

```
EXECUTE dbms_aqadm.create_queue_table(
        queue_table        => 'aq.aq_tbsMsg_qtab',
        queue_payload_type => 'aq.Message_typ',
        storage_clause     => 'tablespace aq_tbs');
```

Creating a queue table with freelists or freelist groups

```
BEGIN
```

```
dbms_aqadm.create_queue_table (
queue_table=> 'AQ_ADMIN.TEST',
queue_payload_type=> 'RAW',
storage_clause=> 'STORAGE (FREELISTS 4 FREELIST GROUPS 2)',
compatible => '8.1');
COMMIT;
END;
```

VB (OO4O): Creating a Queue Table

OO4O uses database functionality for this operation.

Java (JDBC): Creating a Queue Table

Examples depicting how to create a queue table using Java follow.

Note: You may need to set up the following data structures for certain examples to work:

```
CONNECT system/manager;
DROP USER aqadm CASCADE;
CREATE USER aqadm IDENTIFIED BY aqadm;
GRANT CONNECT, RESOURCE TO aqadm;
GRANT EXECUTE ON DBMS_AQADM TO aqadm;
GRANT Aq_administrator_role TO aqadm;
DROP USER aq CASCADE;
CREATE USER aq IDENTIFIED BY aq;
GRANT CONNECT, RESOURCE TO aq;
GRANT EXECUTE ON dbms_aq TO aq;

CREATE type aq.Message_typ as object (
   Subject               VARCHAR2(30),
   Text                  VARCHAR2(80));
```

Creating a queue table for queues containing messages of object type

```
public static void example(AQSession aq_sess) throws AQException
{
    AQQueueTableProperty     qtable_prop;
    AQQueueProperty          queue_prop;
    AQQueueTable             q_table;
    AQQueue                  queue;

    /* Create a AQQueueTableProperty object (payload type Message_typ): */
    qtable_prop = new AQQueueTableProperty("AQ.MESSAGE_TYP");
```

```
    /* Create a queue table in aq schema */
    q_table = aq_sess.createQueueTable ("aq", "ObjMsgs_qtab", qtable_prop);

    System.out.println("Successfully created ObjMsgs_qtab in aq schema");
}
```

Creating a queue table for queues containing messages of RAW type

```
public static void example(AQSession aq_sess) throws AQException
{
    AQQueueTableProperty     qtable_prop;
    AQQueueProperty          queue_prop;
    AQQueueTable             q_table;
    AQQueue                  queue;

    /* Create a AQQueueTableProperty object (payload type RAW): */
    qtable_prop = new AQQueueTableProperty("RAW");

    /* Create a queue table in aq schema */
    q_table = aq_sess.createQueueTable ("aq", "RawMsgs_qtab", qtable_prop);

    System.out.println("Successfully created RawMsgs_qtab in aq schema");
}


3. Create a queue table for multiple consumers and prioritized messages

public static void example(AQSession aq_sess) throws AQException
{
    AQQueueTableProperty     qtable_prop;
    AQQueueProperty          queue_prop;
    AQQueueTable             q_table;
    AQQueue                  queue;

    qtable_prop = new AQQueueTableProperty("RAW");

    /* Enable multiple consumers */
    qtable_prop.setMultiConsumer(true);
    qtable_prop.setCompatible("8.1");

    /* Specify sort order as priority,enqueue_time */
    qtable_prop.setSortOrder("PRIORITY,ENQ_TIME");

    /* Create a queue table in aq schema */
```

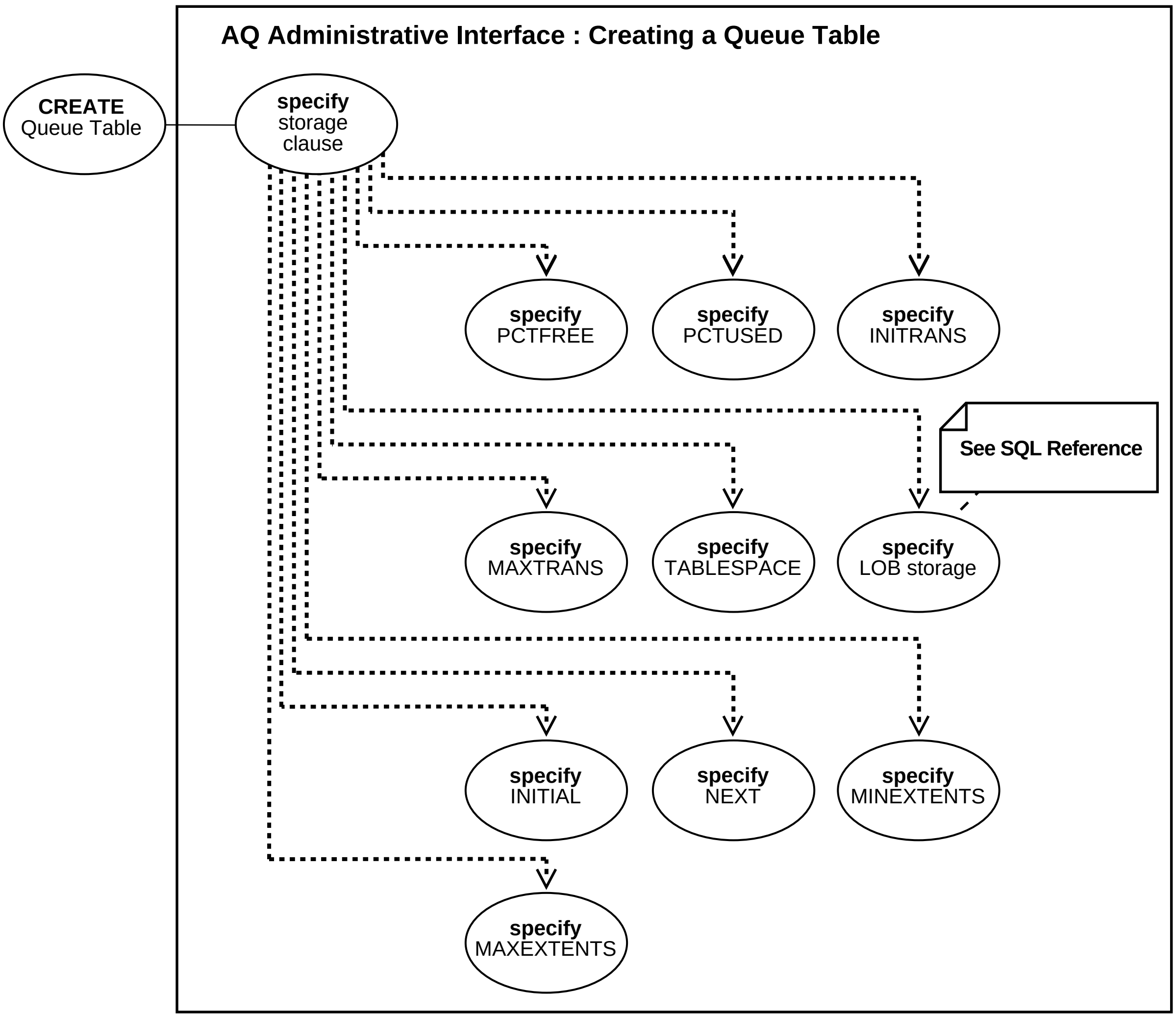
```
    q_table = aq_sess.createQueueTable ("aq", "PriorityMsgs_qtab",
qtable_prop);

    System.out.println("Successfully created PriorityMsgs_qtab in aq schema");
}
```

Creating a queue table in specified tablespace

```
public static void example(AQSession aq_sess) throws AQException
{
    AQQueueTableProperty     qtable_prop;
    AQQueueProperty          queue_prop;
    AQQueueTable             q_table;
    AQQueue                  queue;

    /* Create a AQQueueTableProperty object (payload type Message_typ): */
    qtable_prop = new AQQueueTableProperty("AQ.MESSAGE_TYP");

    /* Specify tablespace for queue table */
    qtable_prop.setStorageClause("tablespace aq_tbs");

    /* Create a queue table in aq schema */
    q_table = aq_sess.createQueueTable ("aq", "aq_tbsMsg_qtab", qtable_prop);
}
```

Creating a Queue Table [Set Storage Clause]

Figure 9–2 Creating a Queue Table [Set Storage Clause]



See Also: Table 9–1 for a list of adminstrative interface basic operations

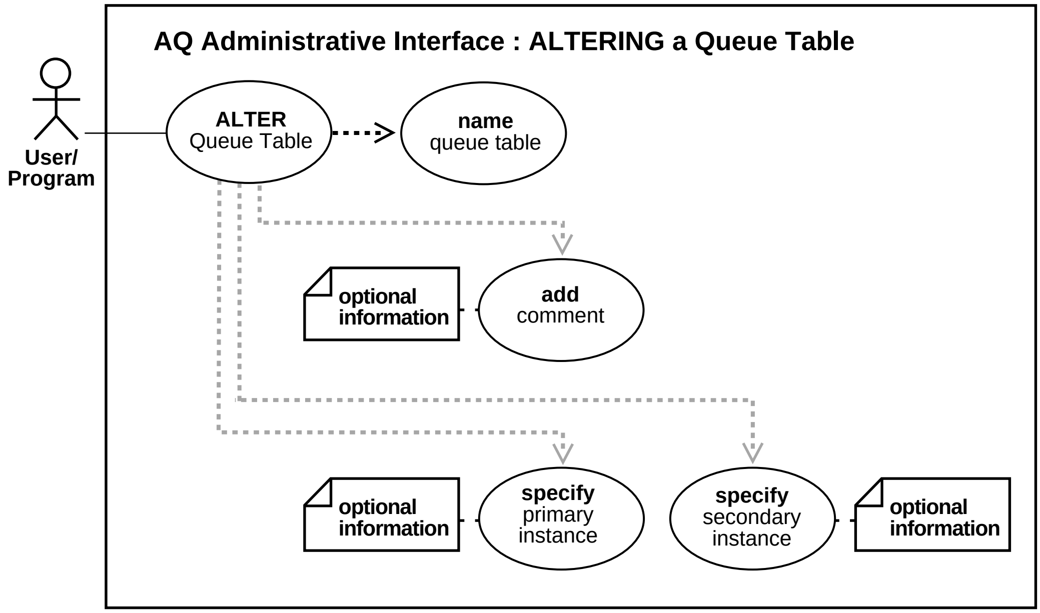
Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.CREATE_QUEUE_TABLE`
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ *createQueueTable*

Altering a Queue Table

Figure 9–3 Altering a Queue Table



> **See Also:** Table 9–1 for a list of adminstrative interface basic operations

Purpose

Alter the existing properties of a queue table.

Usage Notes

When a queue, queue table, or subscriber is created, modified, or dropped, and if `GLOBAL_TOPIC_ENABLED = TRUE`, a corresponding LDAP entry is also created.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.ALTER_QUEUE_TABLE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ,alterQueue

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments.

- PL/SQL (DBMS_AQADM Package): Altering a Queue Table on page 9-15
- VB (OO4O): Example not provided.
- Java (JDBC): Altering a Queue Table on page 9-15

PL/SQL (DBMS_AQADM Package): Altering a Queue Table

```
/* Altering the table to change the primary, secondary instances for queue owner
(only applies to Real Application Clusters environments). The primary instance
is the instance number of the primary owner of the queue table. The secondary
instance is the instance number of the secondary owner of the queue table. */
 EXECUTE dbms_aqadm.alter_queue_table (
   Queue_table          => 'aq.ObjMsgs_qtab',
   Primary_instance     => 3,
   Secondary_instance   => 2);

/* Altering the table to change the comment for a queue table: */
EXECUTE dbms_aqadm.alter_queue_table (
   Queue_table          => 'aq.ObjMsgs_qtab',
   Comment              => 'revised usage for queue table');

/* Altering the table to change the comment for a queue table and use
nonrepudiation: */
EXECUTE dbms_aqadm.alter_queue_table (
   Queue_table          => 'aq.ObjMsgs_qtab',
   Comment              => 'revised usage for queue table',
```

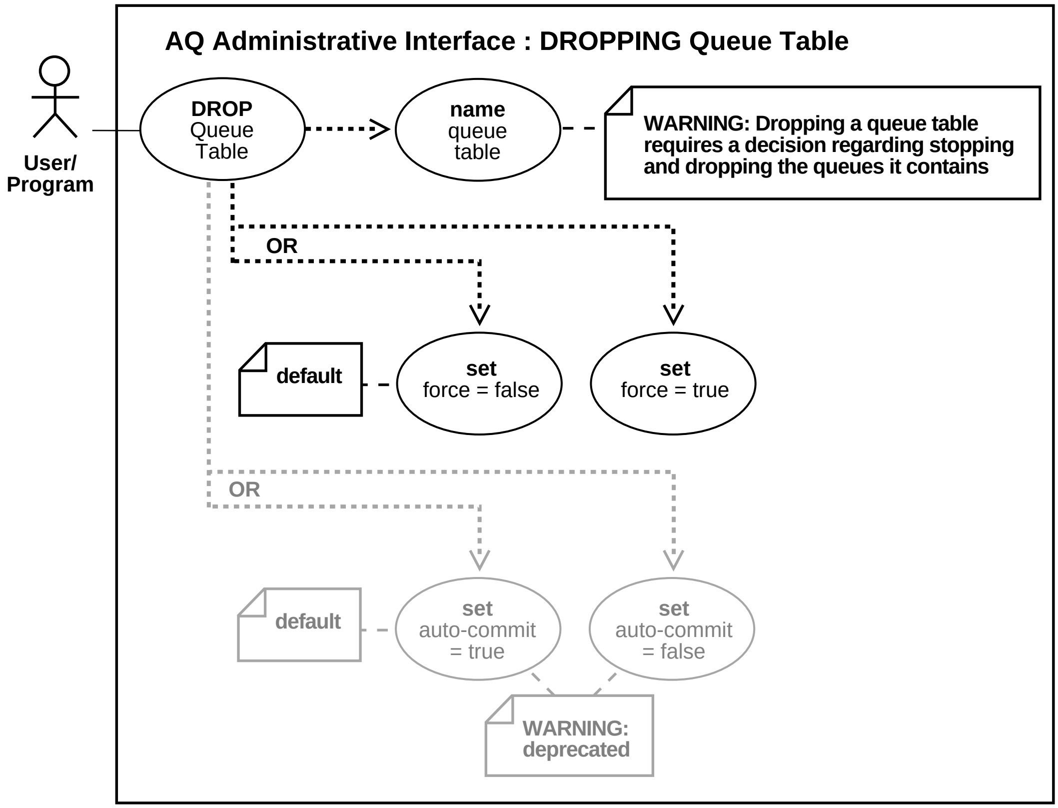
Java (JDBC): Altering a Queue Table

```
/* Alter a queue table */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueueTableProperty    qtable_prop;
```

```
        AQQueueTable            q_table;

        q_table = aq_sess.getQueueTable ("aq", "ObjMsgs_qtab");

        /* Get queue table properties: */
        qtable_prop = q_table.getProperty();

        /* Alter the queue table comment and instance affinity */
        q_table.alter("altered queue table", 3, 2);
}
```

Dropping a Queue Table

Figure 9–4 Dropping a Queue Table



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Drop an existing queue table. Note that you must stop and drop all the queues in a queue tables before the queue table can be dropped. You must do this explicitly unless the `force` option is used in which case this done automatically.

Usage Notes

When a queue, queue table, or subscriber is created, modified, or dropped, and if `GLOBAL_TOPIC_ENABLED = TRUE`, a corresponding LDAP entry is also created or dropped.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_AQADM.DROP_QUEUE_TABLE` procedure.
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ AQQueueTable.drop

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments.

- PL/SQL (DBMS_AQADM Package): Dropping a Queue Table on page 9-18
- VB (OO4O): Example not provided.
- Java (JDBC): Dropping a Queue Table on page 9-19

PL/SQL (DBMS_AQADM Package): Dropping a Queue Table

```
/* Drop the queue table (for which all queues have been previously dropped by
   the user) */
EXECUTE dbms_aqadm.drop_queue_table (
   queue_table        => 'aq.Objmsgs_qtab');
```

> **Caution:** You may need to set up or drop data structures for certain examples to work.

```
/* Drop the queue table and force all queues to be stopped and dropped by the
   system */
EXECUTE dbms_aqadm.drop_queue_table (
   queue_table        => 'aq.Objmsgs_qtab',
```

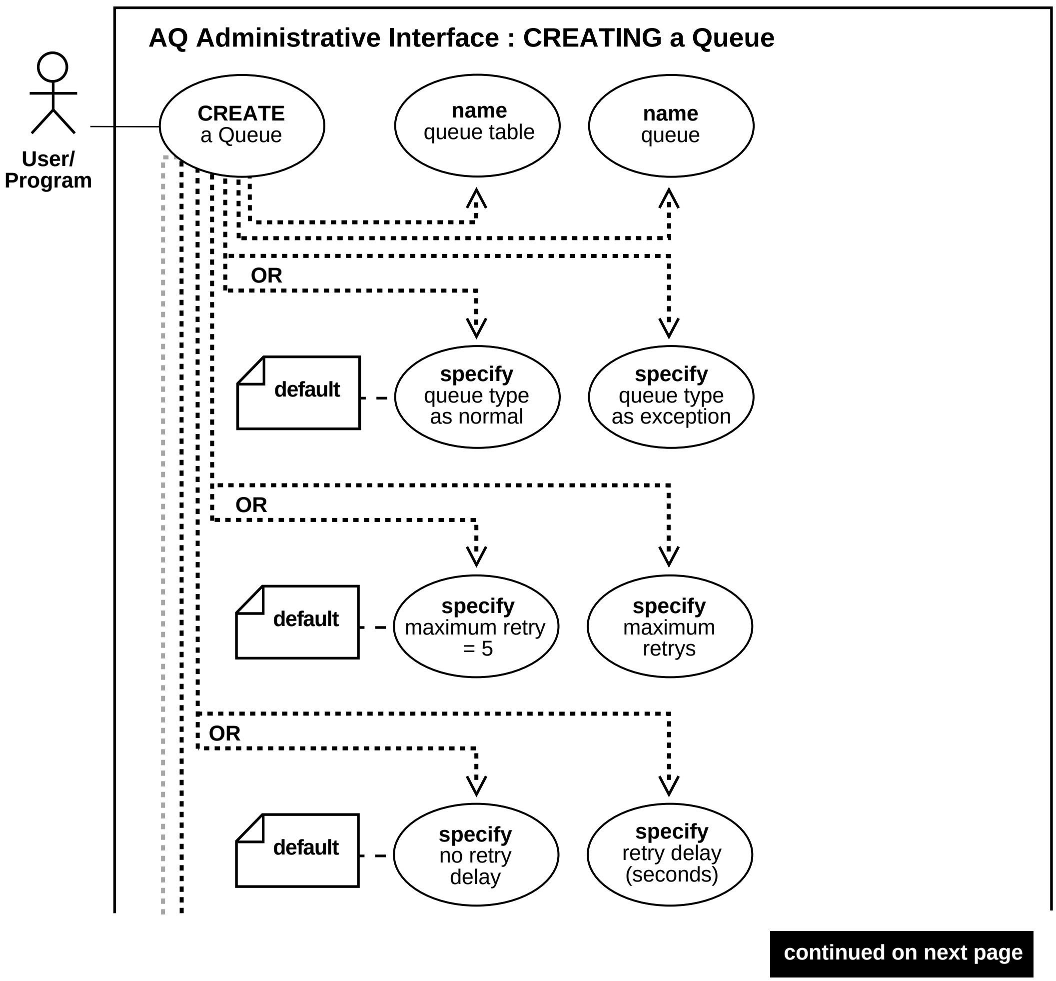
```
   force              => TRUE);
```

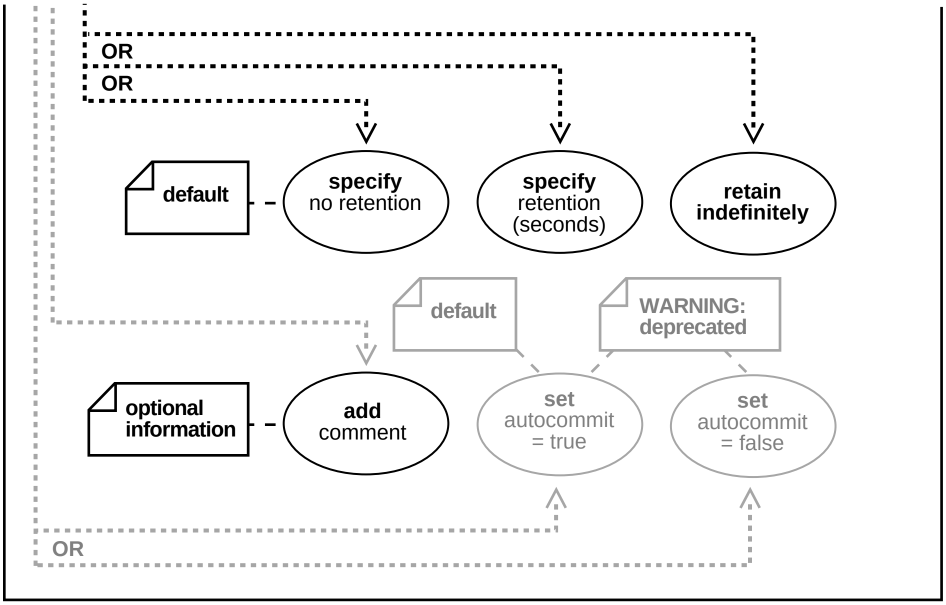
Java (JDBC): Dropping a Queue Table

```
/* Drop a queue table - for which all queues have already been dropped by
   the user */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueueTable           q_table;

     q_table = aq_sess.getQueueTable ("aq", "ObjMsgs_qtab");

     /* Drop the queue table*/
     q_table.drop(false);
     System.out.println("Successful drop");
}


/* Drop the queue table (and force all queues to be stopped and dropped by
   the user */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueueTable           q_table;

     q_table = aq_sess.getQueueTable ("aq", "ObjMsgs_qtab");

     /* Drop the queue table (and automatically drop all queues inside it */
     q_table.drop(true);
     System.out.println("Successful drop");
}
```

Creating a Queue

Figure 9–5 Creating a Queue





See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Create a queue in the specified queue table.

Usage Notes

- Queue names and queue table names are converted to upper case. Mixed case (upper and lower case together) is not supported.
- All queue names must be unique within a schema. Once a queue is created with `CREATE_QUEUE`, it can be enabled by calling `START_QUEUE`. By default, the queue is created with both enqueue and dequeue disabled.
- To view retained messages, you can either dequeue by message ID or use SQL.
- When a queue, queue table, or subscriber is created and if GLOBAL_TOPIC_ENABLED = TRUE, a corresponding LDAP entry is also created.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_AQADM.CREATE_QUEUE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, CreateQueue

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments.

- PL/SQL (DBMS_AQADM Package): Dropping a Queue Table on page 9-18
- VB (OO4O): Example not provided.
- Java (JDBC): Dropping a Queue Table on page 9-19

PL/SQL (DBMS_AQADM): Creating a Queue

Caution: You may need to set up or drop data structures for certain examples to work.

Creating a queue within a queue table for messages of object type

```
/* Create a message type: */
CREATE type aq.Message_typ as object (
   Subject     VARCHAR2(30),
   Text        VARCHAR2(80));

/* Create a object type queue table and queue: */
EXECUTE dbms_aqadm.create_queue_table (
   Queue_table        => 'aq.ObjMsgs_qtab',
   Queue_payload_type => 'aq.Message_typ');

EXECUTE dbms_aqadm.create_queue (
   Queue_name         =>  'msg_queue',
   Queue_table        => 'aq.ObjMsgs_qtab');
```

Creating a queue within a queue table for messages of RAW type

```
/* Create a RAW type queue table and queue: */
EXECUTE dbms_aqadm.create_queue_table (
   Queue_table          => 'aq.RawMsgs_qtab',
   Queue_payload_type   => 'RAW');

/* Create queue: */
EXECUTE dbms_aqadm.create_queue (
   Queue_name          => 'raw_msg_queue',
   Queue_table         => 'aq.RawMsgs_qtab');
  Create a prioritized message queue table and queue

/* Create a queue table for priortized messages: */
EXECUTE dbms_aqadm.create_queue_table (
   Queue_table        => 'aq.PriorityMsgs_qtab',
   Sort_list          => 'PRIORITY,ENQ_TIME',
   Queue_payload_type => 'aq.Message_typ');
/* Create queue: */
EXECUTE dbms_aqadm.create_queue (
   Queue_name         => 'priority_msg_queue',
   Queue_table        => 'aq.PriorityMsgs_qtab');
```

Creating a queue table and queue for multiple consumers

```
/* Create a queue table for multi-consumers: */
EXECUTE dbms_aqadm.create_queue_table (
   queue_table        => 'aq.MultiConsumerMsgs_qtab',
   Multiple_consumers => TRUE,
   Queue_payload_type => 'aq.Message_typ');

/* Create queue: */
EXECUTE dbms_aqadm.create_queue (
   Queue_name         => 'MultiConsumerMsg_queue',
   Queue_table        => 'aq.MultiConsumerMsgs_qtab');
```

Creating a queue table and queue to demonstrate propagation

```
/* Create queue: */
EXECUTE dbms_aqadm.create_queue (
   Queue_name        => 'AnotherMsg_queue',
   queue_table       => 'aq.MultiConsumerMsgs_qtab');
```

Creating a queue table and queue for multiple consumers compatible with 8.1

```
/* Create a queue table for multi-consumers compatible with Release 8.1: */
```

```
EXECUTE dbms_aqadm.create_queue_table (
   Queue_table        => 'aq.MultiConsumerMsgs81_qtab',
   Multiple_consumers => TRUE,
   Compatible         => '8.1',
   Queue_payload_type => 'aq.Message_typ');

EXECUTE dbms_aqadm.create_queue (
   Queue_name         => 'MultiConsumerMsg81_queue',
   Queue_table        => 'aq.MultiConsumerMsgs81_qtab');
```

Java (JDBC): Creating a Queue

Creating a queue within a queue table for messages of object type

```
public static void example(AQSession aq_sess) throws AQException
{
     AQQueueProperty         queue_prop;
     AQQueueTable            q_table;
     AQQueue                 queue;

     q_table = aq_sess.getQueueTable ("aq", "ObjMsgs_qtab");

     /* Create a new AQQueueProperty object: */
     queue_prop = new AQQueueProperty();

     queue = aq_sess.createQueue (q_table, "msg_queue", queue_prop);
     System.out.println("Successful createQueue");

}
```

Creating a queue within a queue table for messages of raw type

```
public static void example(AQSession aq_sess) throws AQException
{
     AQQueueProperty         queue_prop;
     AQQueueTable            q_table;
     AQQueue                 queue;

     q_table = aq_sess.getQueueTable ("aq", "RawMsgs_qtab");

     /* Create a new AQQueueProperty object: */
     queue_prop = new AQQueueProperty();

     queue = aq_sess.createQueue (q_table, "msg_queue", queue_prop);
     System.out.println("Successful createQueue");
```

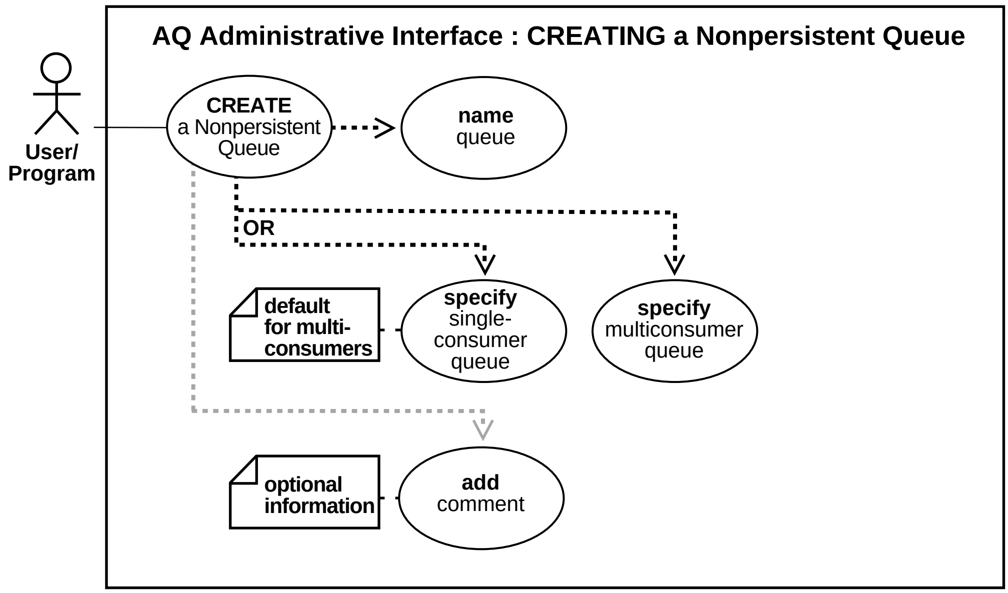
```
}
```

Creating a multiconsumer queue with prioritized messages

```
public static void example(AQSession aq_sess) throws AQException
{
     AQQueueTableProperty    qtable_prop;
     AQQueueProperty         queue_prop;
     AQQueueTable            q_table;
     AQQueue                 queue;
     AQAgent                 agent;

     qtable_prop = new AQQueueTableProperty("RAW");
     qtable_prop.setMultiConsumer(true);

     qtable_prop.setSortOrder("priority,enq_time");
     q_table = aq_sess.createQueueTable ("aq", "PriorityMsgs_qtab",
qtable_prop);

     queue_prop = new AQQueueProperty();
     queue = aq_sess.createQueue (q_table, "priority_msg_queue", queue_prop);

}
```

Creating a Nonpersistent Queue

Figure 9–6 Creating a Nonpersistent Queue



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Create a nonpersistent queue.

Usage Notes

The queue may be either single-consumer or multiconsumer queue. All queue names must be unique within a schema. The queues are created in a 8.1 compatible system-created queue table (`AQ$_MEM_SC` or `AQ$_MEM_MC`) in the same schema as that specified by the queue name. If the queue name does not specify a schema name, the queue is created in the login user's schema. Once a queue is created with `CREATE_NP_QUEUE`, it can be enabled by calling `START_QUEUE`. By default, the queue is created with both enqueue and dequeue disabled.

You can enqueue RAW and Object Type (ADT) messages into a nonpersistent queue. You cannot dequeue from a nonpersistent queue. The only way to retrieve a message from a nonpersistent queue is by using the OCI notification mechanism (see Registering for Notification on page 11-55).

You cannot invoke the `listen` call on a nonpersistent queue (see "Listening to One or More Single-Consumer Queues" on page 11-23).

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.CREATE_NP_QUEUE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): There is no applicable syntax reference for this use case

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments.

- PL/SQL (DBMS_AQADM Package): Dropping a Queue Table on page 9-18
- VB (OO4O): Example not provided.
- Java (JDBC): Dropping a Queue Table on page 9-19

PL/SQL (DBMS_AQADM): Creating a Nonpersistent Queue

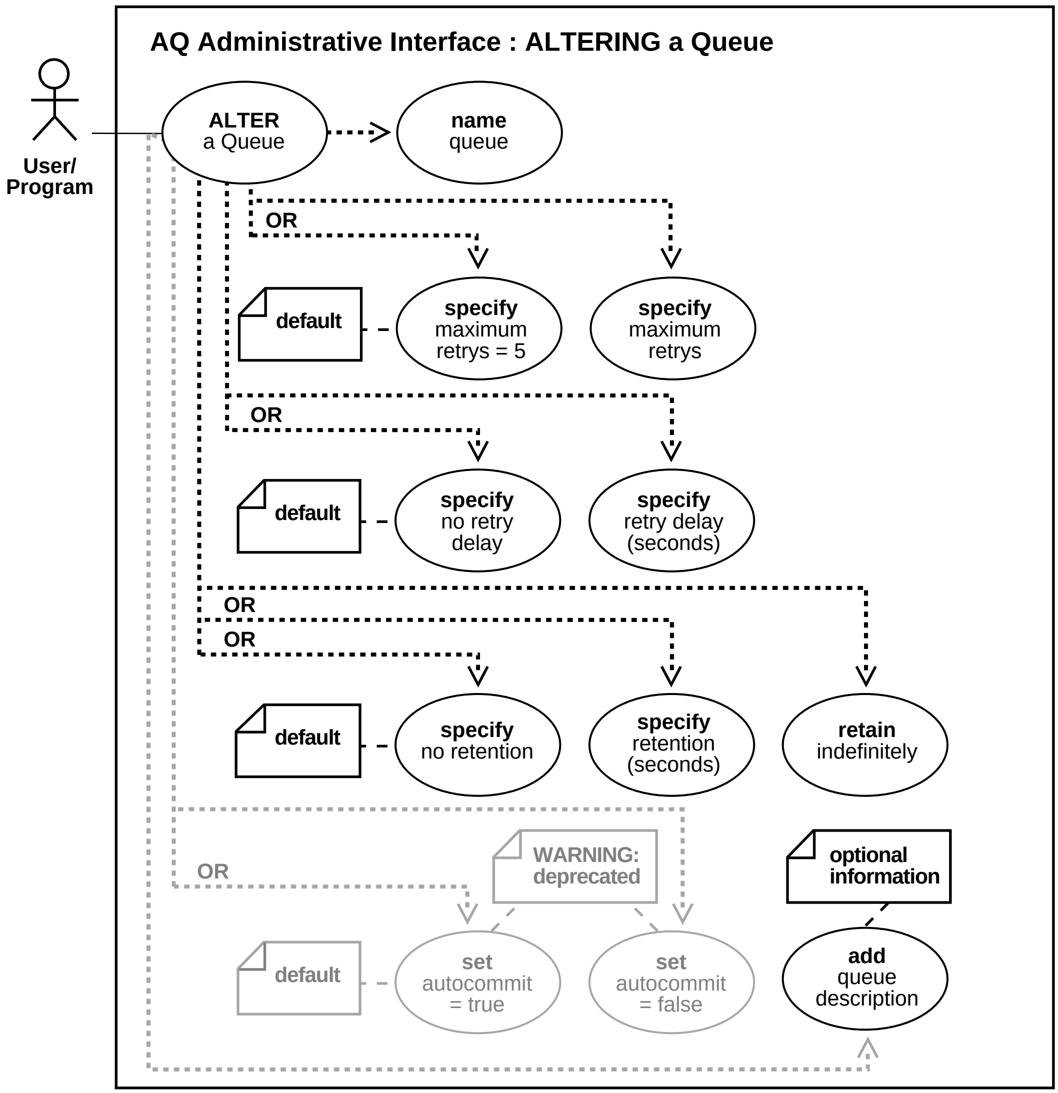
```
/* Create a nonpersistent single-consumer queue (Note: this is not preceded by
   creation of a queue table) */
EXECUTE dbms_aqadm.create_np_queue(
   Queue_name           => 'Singleconsumersmsg_npque',
   Multiple_consumers   => FALSE);

/* Create a nonpersistent multi-consumer queue (Note: this is not preceded by
   creation of a queue table) */
EXECUTE dbms_aqadm.create_np_queue(
   Queue_name           => 'Multiconsumersmsg_npque',
   Multiple_consumers   => TRUE);
```

Java (JDBC): Creating a Nonpersistent Queue

Feature not available through Java API.

Altering a Queue

Figure 9–7 Altering a Queue



> **See Also:** Table 9–1 for a list of adminstrative interface basic operations

Purpose

Alter existing properties of a queue. Only max_retries, comment, retry_delay, and retention_time can be altered.

Usage Notes

To view retained messages, you can either dequeue by message ID or use SQL.

When a queue, queue table, or subscriber is created, modified, or dropped, and if `GLOBAL_TOPIC_ENABLED = TRUE`, a corresponding LDAP entry is also created.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.ALTER_QUEUE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, alter

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Altering a Queue on page 9-29
- VB (OO4O): Example not provided.
- Java (JDBC): Altering a Queue on page 9-30

PL/SQL (DBMS_AQADM): Altering a Queue

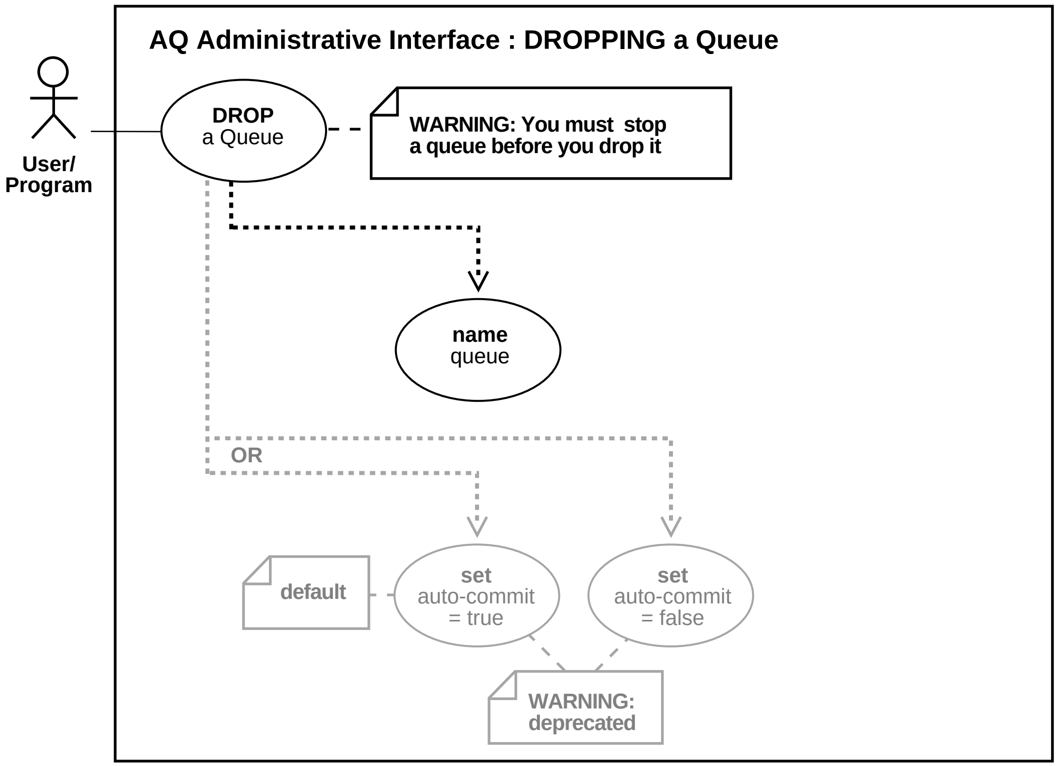
```
/* Alter queue to change retention time, saving messages for 1 day after
   dequeueing:  */
EXECUTE dbms_aqadm.alter_queue (
   queue_name        => 'aq.Anothermsg_queue',
   retention_time    => 86400);
```

Java (JDBC): Altering a Queue

```
/* Alter a queue to change retention time, saving messages for 1 day
   after dequeuing */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueueProperty         queue_prop;
     AQQueue                 queue;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "Anothermsg_queue");

     /* Create a new AQQueueProperty object: */
     queue_prop = new AQQueueProperty();

     /* Change retention time to 1 day */
     queue_prop.setRetentionTime(new Double(86400));

     /* Alter the queue */
     queue.alterQueue(queue_prop);

}
```

Dropping a Queue

Figure 9–8 Dropping a Queue



> **See Also:** Table 9–1 for a list of adminstrative interface basic operations

Purpose

Drops an existing queue. `DROP_QUEUE` is not allowed unless `STOP_QUEUE` has been called to disable the queue for both enqueuing and dequeuing. All the queue data is deleted as part of the drop operation.

Usage Notes

When a queue, queue table, or subscriber is created, modified, or dropped, and if GLOBAL_TOPIC_ENABLED = TRUE, a corresponding LDAP entry is also created.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_AQADM.DROP_QUEUE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, dropQueue

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Dropping a Queue on page 9-32
- VB (OO4O): Example not provided.
- Java (JDBC): Dropping a Queue on page 9-33

PL/SQL (DBMS_AQADM): Dropping a Queue

Dropping a Standard Queue

```
/* Stop the queue preparatory to dropping it (a queue may be dropped only after
   it has been succesfully stopped for enqueing and dequeing): */
EXECUTE dbms_aqadm.stop_queue (
   Queue_name        => 'aq.Msg_queue');

/* Drop queue: */
EXECUTE dbms_aqadm.drop_queue (
   Queue_name         => 'aq.Msg_queue');
```

Dropping a Nonpersistent Queue

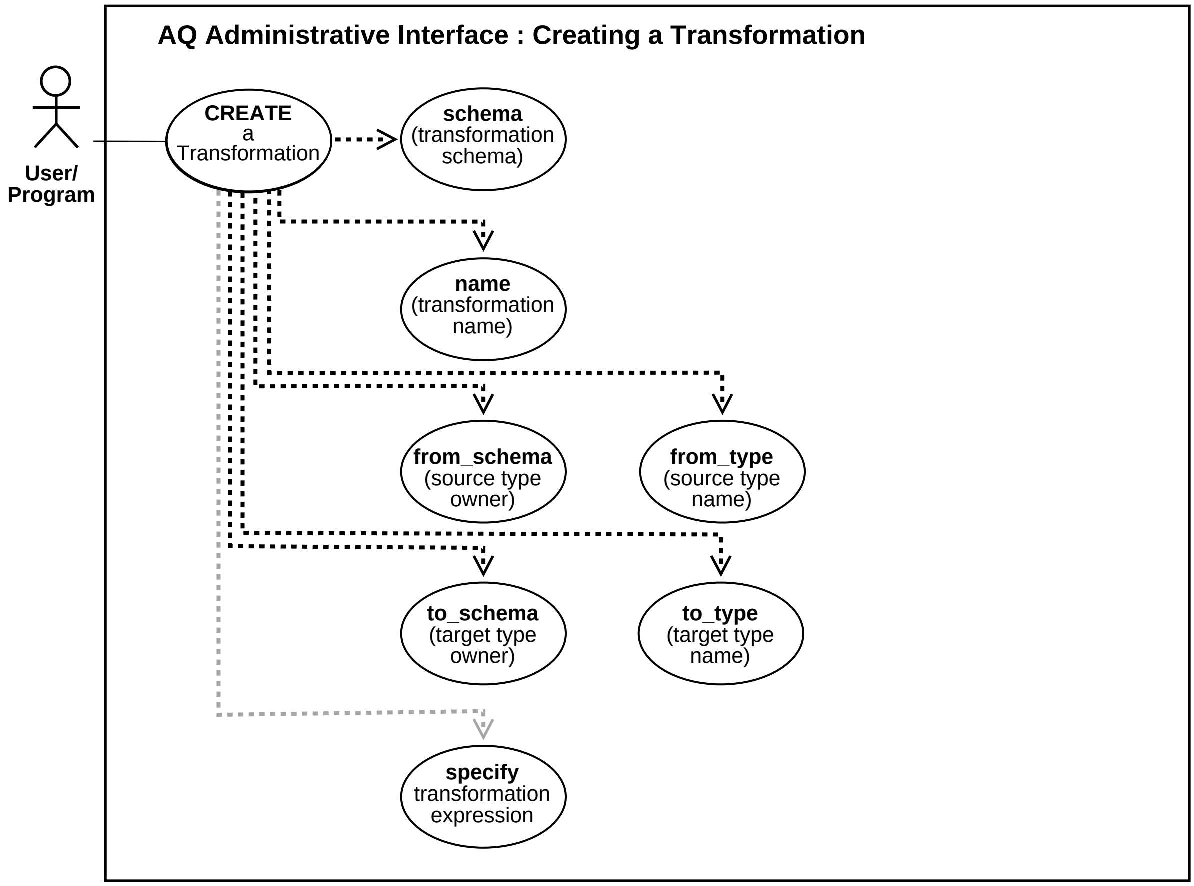
```
EXECUTE DBMS_AQADM.DROP_QUEUE( queue_name => 'Nonpersistent_singleconsumerq1');
EXECUTE DBMS_AQADM.DROP_QUEUE( queue_name => 'Nonpersistent_multiconsumerq1');
```

Java (JDBC): Dropping a Queue

```
/* Drop a queue */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue                queue;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "Msg_queue");

     /* Stop the queue first */
     queue.stop(true);

     /* Drop the queue */
     queue.drop();
}
```

Creating a Transformation

Figure 9–9 Creating a Transformation



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Creates a message format transformation. The transformation must be a SQL function with input type `from_type`, returning an object of type `to_type`. It can also be a SQL expression of type `to_type`, referring to `from_type`. All references to `from_type` must be of the form `source.user_data`.

Usage Notes

To use this feature, you must be granted execute privileges on `dbms_transform`. You must also have execute privileges on the user-defined types that are the source and destination types of the transformation, and have execute privileges on any PL/SQL function being used in the transformation function. The transformation cannot write the database state (that is, perform DML) or commit or rollback the current transaction.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_TRANSFORM.CREATE_TRANSFORMATION` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Creating a Transformation on page 9-35
- VB (OO4O): Example not provided.
- Java (JDBC): none

PL/SQL (DBMS_AQADM): Creating a Transformation

```
dbms_transform.create_transformation(schema => 'scott',
    name           => 'test_transf', from_schema => 'scott',
    from_type      => 'type1', to_schema => 'scott',
    to_type        => 'type2',
    transformation => 'scott.trans_func(source.user_data)');
```

Or you can do the following:

```
dbms_transform.create_transformation(schema => 'scott',
    name           => 'test_transf',
    from_schema    => 'scott',
    from_type      => 'type1,
```

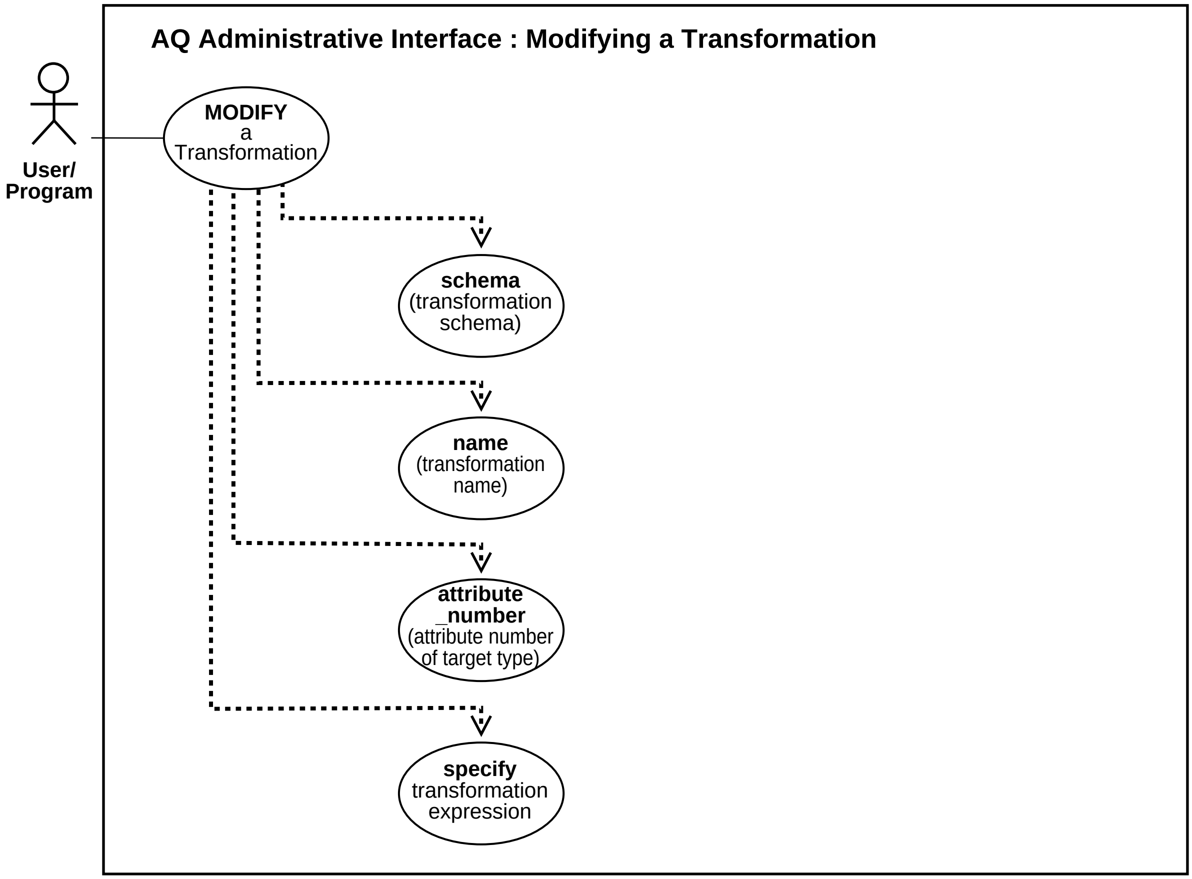
```
to_schema      => 'scott',
to_type        => 'type2',
transformation => 'scott.type2(source.user_data.attr2,
    source.user_data.attr1)');
```

Java (JDBC)

No example is provided with this release.

Modifying a Transformation

Figure 9–10 Modifying a Transformation



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

This feature is used to change the transformation function and to specify transformations for each attribute of the target type. If the attribute number 0 is specified, then the transformation expression singularly defines the transformation from the source to target types. All references to `from_type` must be of the form `source.user_data`. All references to the attributes of the source type must be prefixed by `source.user_data`.

Usage Notes

To use this feature, you must be granted execute privileges on `dbms_transform`. You must also have execute privileges on the user-defined types that are the source and destination types of the transformation, and have execute privileges on any PL/SQL function being used in the transformation function.

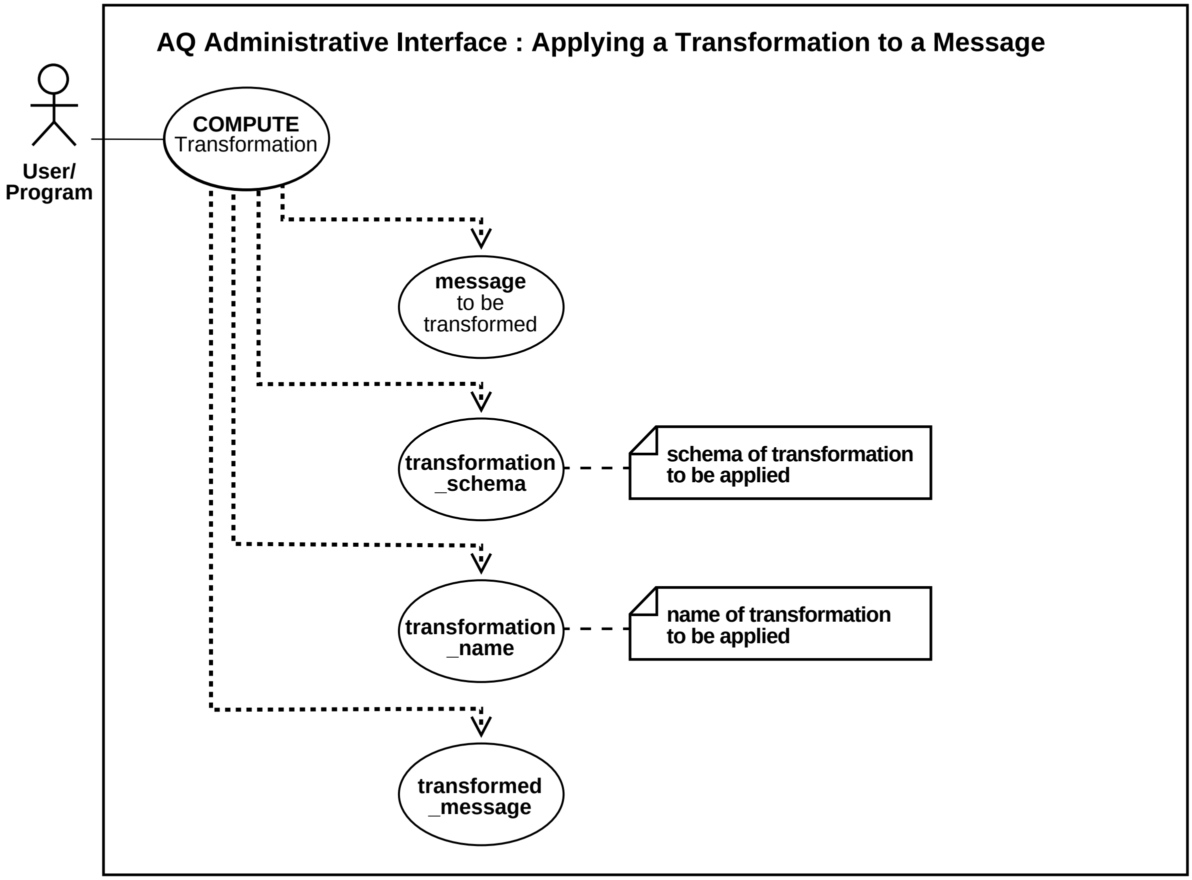
Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_TRANSFORM.MODIFY` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*

Applying a Transformation

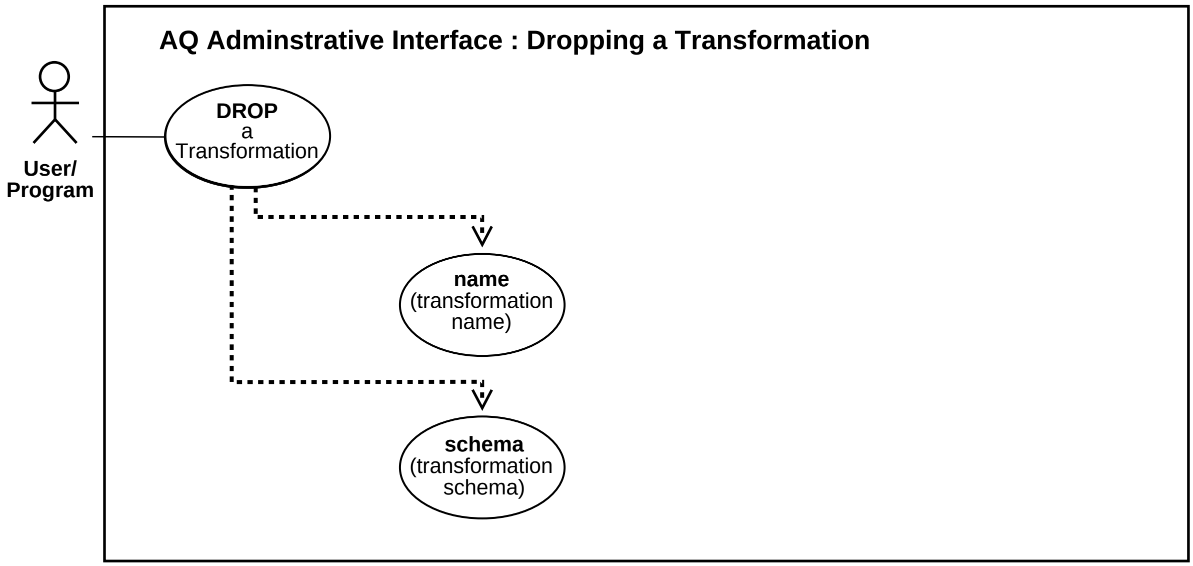
Figure 9–11 Applying a Transformation



See Also: Table 9–1 for a list of adminstrative interface basic operations

Dropping a Transformation

Figure 9–12 Dropping a Transformation



> **See Also:** Table 9–1 for a list of adminstrative interface basic operations

Purpose

To drop a transformation.

Usage Notes

To use this feature, you must be granted execute privileges on `dbms_transform`. You must also have execute privileges on the user-defined types that are the source and destination types of the transformation, and have execute privileges on any PL/SQL function being used in the transformation function.

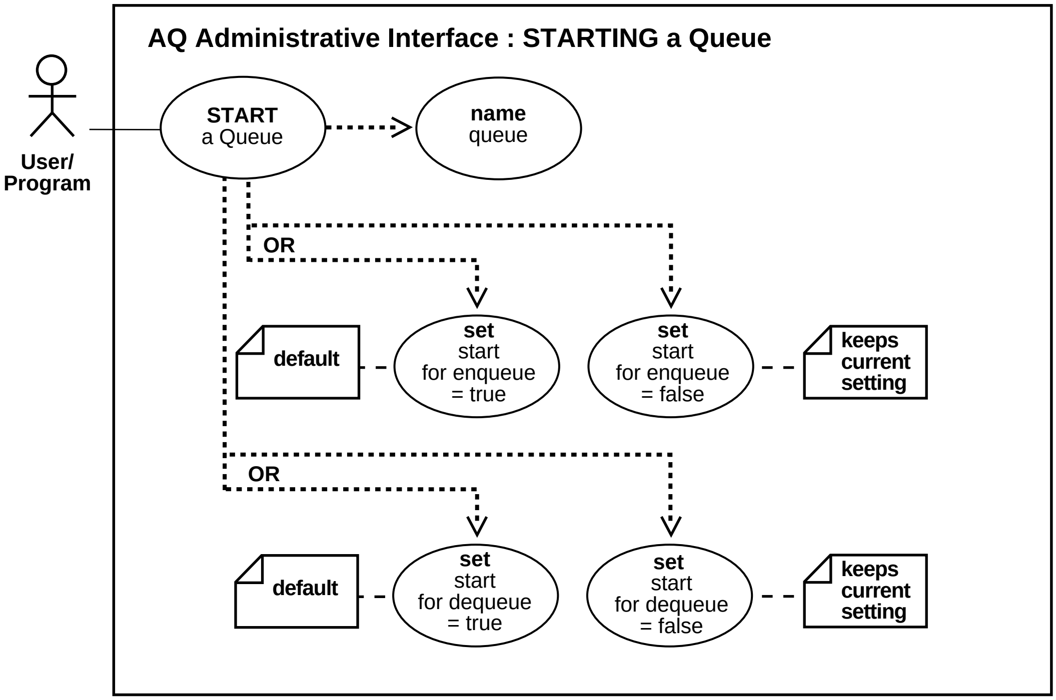
Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_TRANSFORM.DROP` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*

Starting a Queue

Figure 9–13 Starting a Queue



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Enables the specified queue for enqueuing or dequeueing.

Usage Notes

After creating a queue the administrator must use `START_QUEUE` to enable the queue. The default is to enable it for both `ENQUEUE` and `DEQUEUE`. Only dequeue operations are allowed on an exception queue. This operation takes effect when the call completes and does not have any transactional characteristics.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_AQADM.START_QUEUE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, AQQueueAdmin.start

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM Package): Starting a Queue on page 9-43
- VB (OO4O): Example not provided.
- Java (JDBC): Starting a Queue on page 9-44

PL/SQL (DBMS_AQADM Package): Starting a Queue

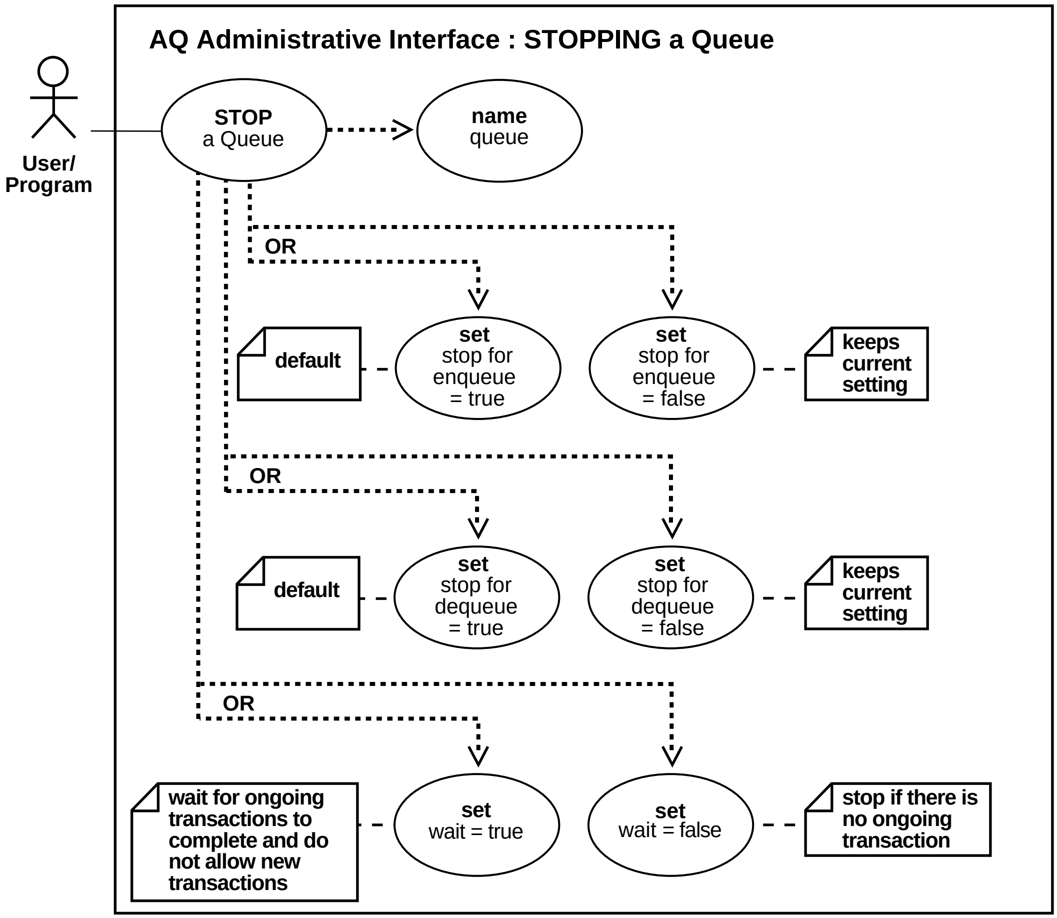
```
/* Start a queue and enable both enqueue and dequeue: */
EXECUTE dbms_aqadm.start_queue (
   queue_name         => 'Msg_queue');

/* Start a previously stopped queue for dequeue only */
EXECUTE dbms_aqadm.start_queue (
   queue_name         => 'aq.msg_queue',
   dequeue            => TRUE,
   enqueue            => FALSE);
```

Java (JDBC): Starting a Queue

```
/* Start a queue - enable both enqueue and dequeue */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue                  queue;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "Msg_queue");

     /* Enable enqueue and dequeue */
     queue.start();
}


/* Start a previously stopped queue for dequeue only */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue                  queue;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "Msg_queue");

     /* Enable enqueue and dequeue */
     queue.start(false, true);
}
```

Stopping a Queue

Figure 9–14 Stopping a Queue



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Disables enqueuing or dequeuing on the specified queue.

Usage Notes

By default, this call disables both ENQUEUEs or DEQUEUEs. A queue cannot be stopped if there are outstanding transactions against the queue. This operation takes effect when the call completes and does not have any transactional characteristics.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* DBMS_AQADM.STOP_QUEUE procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ*)* AQQueueAdmin.stop

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Stopping a Queue on page 9-46
- VB (OO4O): Example not provided.
- Java (JDBC): Stopping a Queue on page 9-47

PL/SQL (DBMS_AQADM): Stopping a Queue

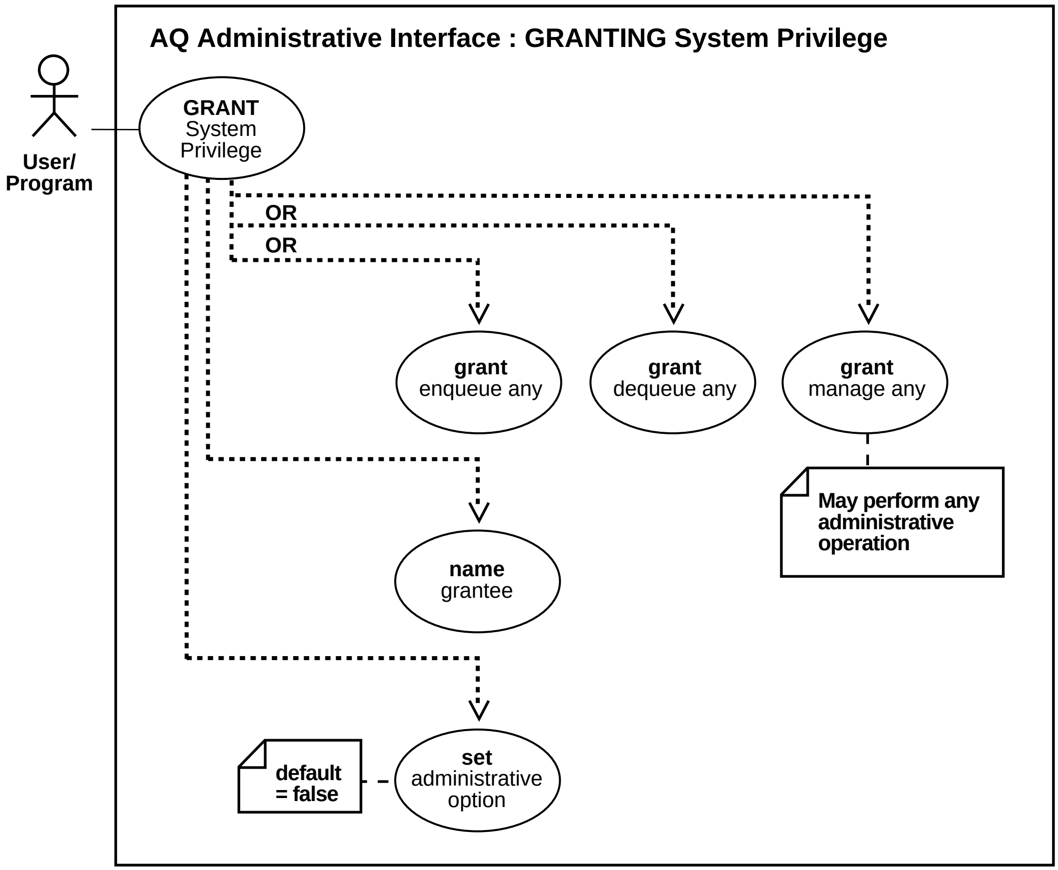
```
/* Stop the queue: */
EXECUTE dbms_aqadm.stop_queue (
   queue_name        => 'aq.Msg_queue');
```

Java (JDBC): Stopping a Queue

```
/* Stop a queue - wait for oustanding transactions */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue                  queue;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "Msg_queue");

     /* Enable enqueue and dequeue */
     queue.stop(true);
}
```

Granting System Privilege

Figure 9–15 Granting System Privilege



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

To grant AQ system privileges to users and roles. The privileges are ENQUEUE_ANY, DEQUEUE_ANY, MANAGE_ANY. Initially, only SYS and SYSTEM can use this procedure successfully.

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.GRANT_SYSTEM_PRIVILEGE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): There is no applicable syntax reference for this use case

Usage Notes

Not applicable.

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Granting System Privilege on page 9-49
- VB (OO4O): Example not provided.
- Java (JDBC): Granting System Privilege on page 9-50

PL/SQL (DBMS_AQADM): Granting System Privilege

```
/* User AQADM grants the rights to enqueue and dequeue to ANY queues: */
```

> **Note:** You may need to set up the following data structures for certain examples to work:
>
> ```
> CONNECT system/manager;
> CREATE USER aqadm IDENTIFIED BY aqadm;
> GRANT CONNECT, RESOURCE TO aqadm;
> GRANT EXECUTE ON DBMS_AQADM TO aqadm;
> GRANT Aq_administrator_role TO aqadm;
> ```

```
CONNECT aqadm/aqadm;
EXECUTE DBMS_AQADM.GRANT_SYSTEM_PRIVILEGE(
   privilege          =>    'ENQUEUE_ANY',
   grantee            =>    'Jones',
   admin_option       =>     FALSE);
EXECUTE DBMS_AQADM.GRANT_SYSTEM_PRIVILEGE(
```

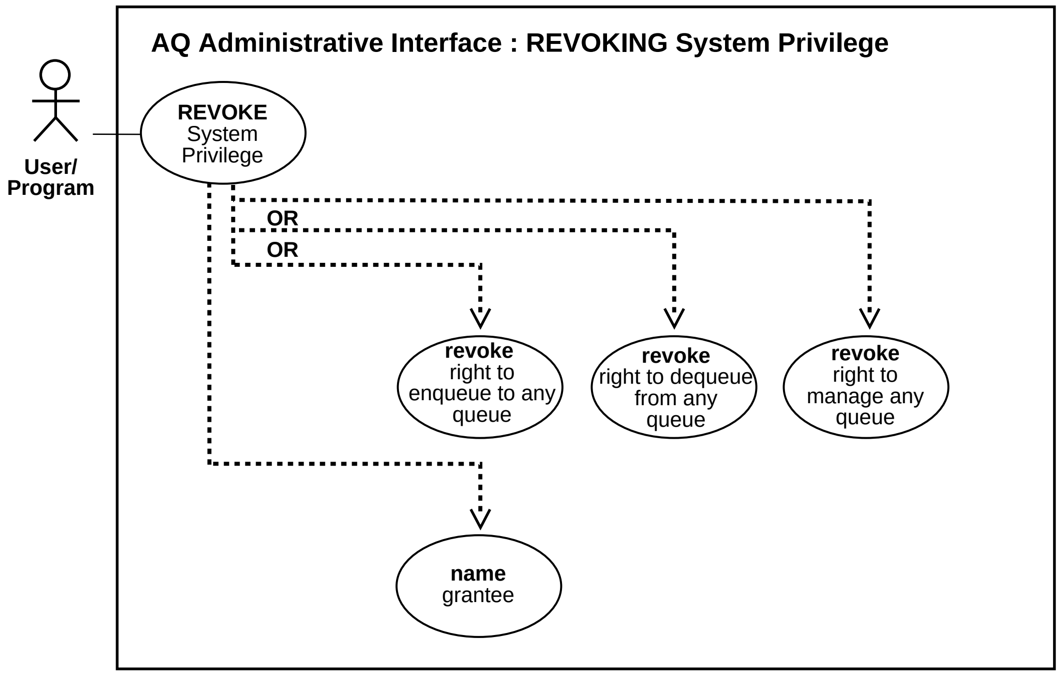
```
privilege          =>     'DEQUEUE_ANY',
grantee            =>     'Jones',
admin_option       =>      FALSE);
```

Java (JDBC): Granting System Privilege

Feature not available through Java API

Revoking System Privilege

Figure 9–16 Revoking System Privilege



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

To revoke AQ system privileges from users and roles. The privileges are `ENQUEUE_ANY`, `DEQUEUE_ANY` and `MANAGE_ANY`. The `ADMIN` option for a system privilege cannot be selectively revoked.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_AQADM.REVOKE_SYSTEM_PRIVILEGE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): There is no applicable syntax reference for this use case

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

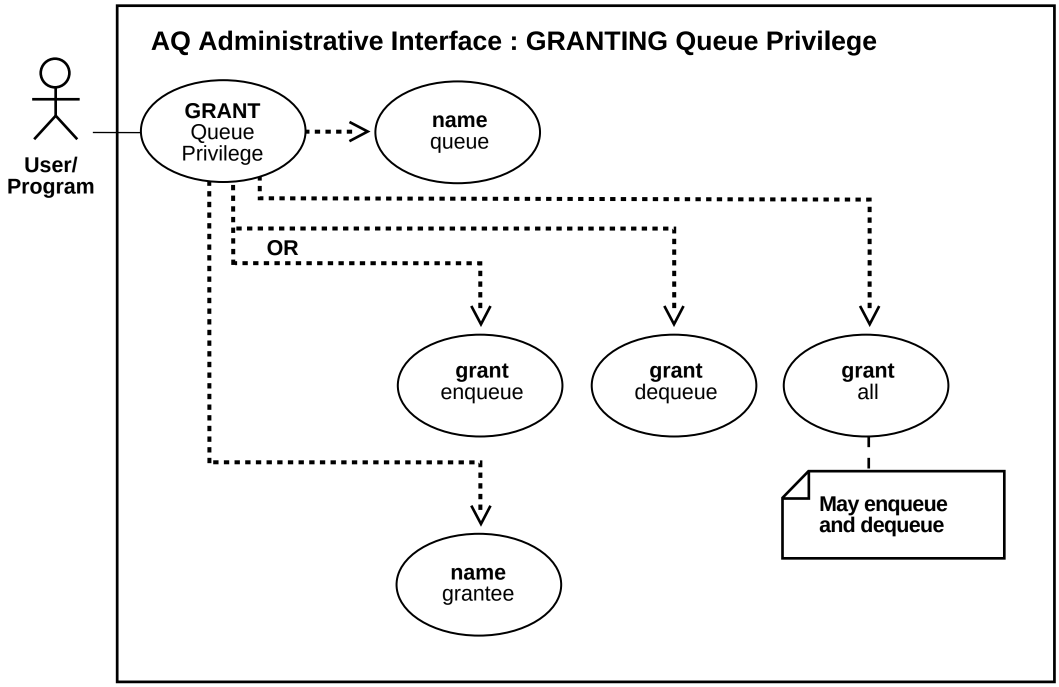
- Using PL/SQL (DBMS_AQADM): Revoking System Privilege on page 9-52
- VB (OO4O): Example not provided.
- Java (JDBC): Example not provided.

Using PL/SQL (DBMS_AQADM): Revoking System Privilege

```
/* To revoke the DEQUEUE_ANY system privilege from Jones. */
CONNECT system/manager;
   execute DBMS_AQADM.REVOKE_SYSTEM_PRIVILEGE(privilege=>'DEQUEUE_ANY',
                              grantee=>'Jones');
```

Granting Queue Privilege

Figure 9–17 Granting Queue Privilege



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

To grant privileges on a queue to users and roles. The privileges are `ENQUEUE` or `DEQUEUE`. Initially, only the queue table owner can use this procedure to grant privileges on the queues.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_AQADM.GRANT_QUEUE_PRIVILEGE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, grantQueuePrivilege

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Granting Queue Privilege on page 9-54
- VB (OO4O): Example not provided.
- Java (JDBC): Granting Queue Privilege on page 9-54

PL/SQL (DBMS_AQADM): Granting Queue Privilege

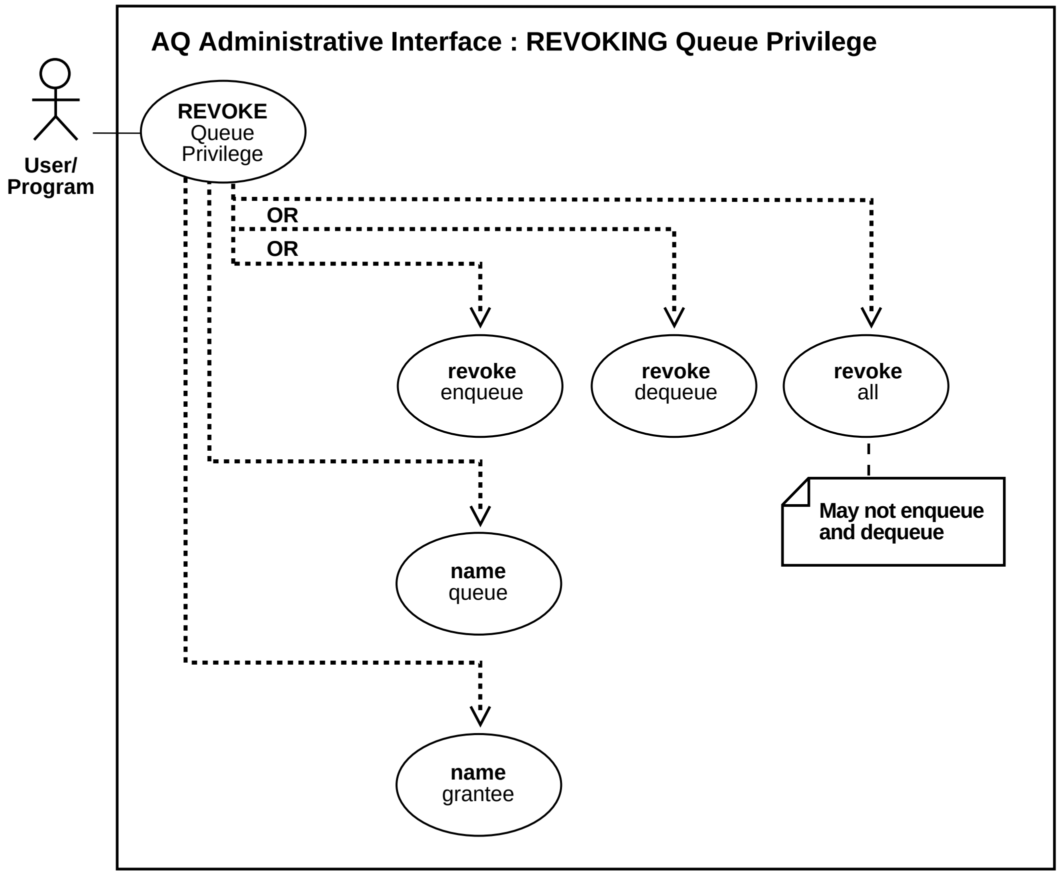
```
/* User grants the access right for both enqueue and dequeue rights using
   DBMS_AQADM.GRANT. */
EXECUTE DBMS_AQADM.GRANT_QUEUE_PRIVILEGE (
   privilege     =>     'ALL',
   queue_name    =>     'aq.multiconsumermsg81_queue',
   grantee       =>     'Jones',
   grant_option  =>      TRUE);
```

Java (JDBC): Granting Queue Privilege

```
/* Grant enqueue and dequeue privileges on queue to user 'Jones' */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue                  queue;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "multiconsumermsg81_queue");
     /* Enable enqueue and dequeue */
     queue.grantQueuePrivilege("ALL", "Jones", true);
}
```

Revoking Queue Privilege

Figure 9–18 Revoking Queue Privilege



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

To revoke privileges on a queue from users and roles. The privileges are `ENQUEUE` or `DEQUEUE`.

Usage Notes

To revoke a privilege, the revoker must be the original grantor of the privilege. The privileges propagated through the GRANT option are revoked if the grantor's privileges are revoked.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, DBMS_AQADM.REVOKE_QUEUE_PRIVILEGE procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, revokeQueuePrivledge

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Revoking Queue Privilege on page 9-56
- VB (OO4O): Example not provided.
- Java (JDBC): Revoking Queue Privilege on page 9-56

PL/SQL (DBMS_AQADM): Revoking Queue Privilege

```
/* User can revoke the dequeue right of a grantee on a specific queue
   leaving the grantee with only the enqueue right: */
CONNECT scott/tiger;
EXECUTE DBMS_AQADM.REVOKE_QUEUE_PRIVILEGE(
   privilege     =>     'DEQUEUE',
   queue_name    =>     'scott.ScottMsgs_queue',
   grantee       =>     'Jones');
```

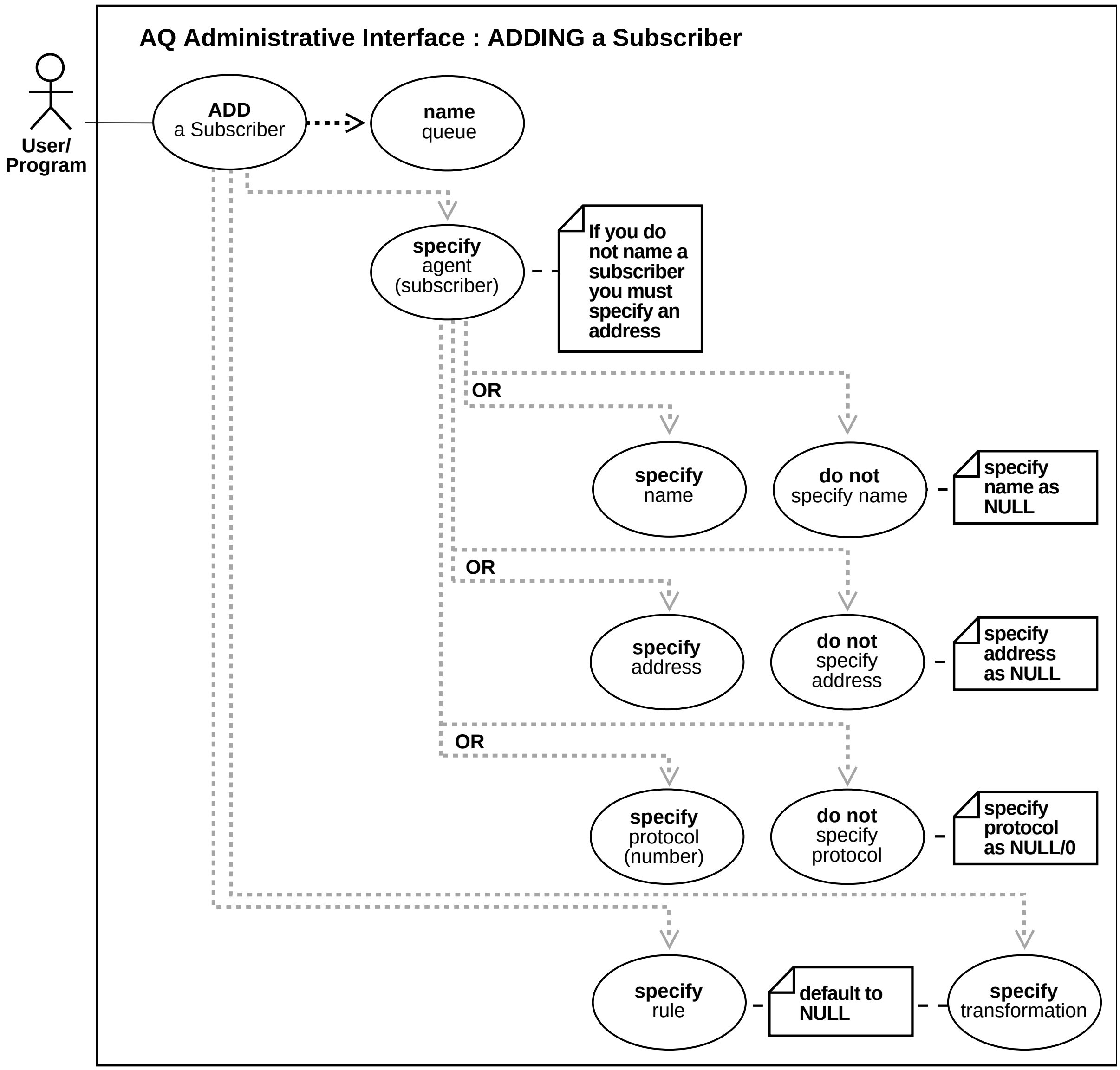
Java (JDBC): Revoking Queue Privilege

```
/* User can revoke the dequeue right of a grantee on a specific
   queue, leaving only the enqueue right */
public static void example(AQSession aq_sess) throws AQException
{
```

```
        AQQueue                  queue;

        /* Get the queue object */
        queue = aq_sess.getQueue("SCOTT", "ScottMsgs_queue");

        /* Enable enqueue and dequeue */
        queue.revokeQueuePrivilege("DEQUEUE", "Jones");
    }
```

Adding a Subscriber

Figure 9–19 Adding a Subscribe



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Adds a default subscriber to a queue.

Usage Note

- A program can enqueue messages to a specific list of recipients or to the default list of subscribers. This operation will only succeed on queues that allow multiple consumers. This operation takes effect immediately and the containing transaction is committed. Enqueue requests that are executed after the completion of this call will reflect the new behavior.
- Note that any string within the rule has to be quoted as follows:

  ```
  rule   => 'PRIORITY <= 3 AND CORRID =  ''FROM JAPAN'''
  ```

  Note that these are all single quotation marks.
- When a queue, queue table, or subscriber is created and if GLOBAL_TOPIC_ENABLED = TRUE, a corresponding LDAP entry is also created.
- Specify the name of the transformation to be applied during dequeue or propagation. The transformation must be created using the `DBMS_TRANSFORM` package. (See the*Oracle9i Supplied PL/SQL Packages and Types Reference* for more information.)
- For queues that contain payloads with XMLType attributes, you can specify rules that contain operators such as `XMLType.existsNode()` and `XMLType.extract()`.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.ADD_SUBSCRIBER` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, addSubscriber

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Adding Subscriber on page 9-60
- VB (OO4O): Example not provided.
- Java (JDBC): Adding a Subscriber on page 9-60

PL/SQL (DBMS_AQADM): Adding Subscriber

```
/* Anonymous PL/SQL block for adding a subscriber at a designated queue in a
designated schema at a database link: */
DECLARE
   subscriber          sys.aq$_agent;
BEGIN
   subscriber := sys.aq$_agent ('subscriber1', 'aq2.msg_queue2@london', null);
   DBMS_AQADM.ADD_SUBSCRIBER(
      queue_name          => 'aq.multi_queue',
      subscriber          =>  subscriber);
 END;

/* Add a subscriber with a rule: */
DECLARE
   subscriber       sys.aq$_agent;
BEGIN
   subscriber := sys.aq$_agent('subscriber2', 'aq2.msg_queue2@london', null);
   DBMS_AQADM.ADD_SUBSCRIBER(
      queue_name          =>   'aq.multi_queue',
      subscriber          =>    subscriber,
      rule                =>    'priority < 2');
END;
```

Add a Subscriber and Specify a Transformation

```
/* Add a subscriber with a rule and specify a transformation */
DECLARE
   subscriber       sys.aq$_agent;
BEGIN
   subscriber := sys.aq$_agent('subscriber2', 'aq2.msg_queue2@london', null);
   DBMS_AQADM.ADD_SUBSCRIBER(
      queue_name          =>   'aq.multi_queue',
      subscriber          =>    subscriber,
      transformation      => 'AQ.msg_map');
```

```
/* Where the transformation was created as */
EXECUTE DBMS_TRANSFORM.CREATE_TRANSFORMATION
 ( schema => 'AQ',
   name => 'msg_map',
   from_schema => 'AQ',
   from_type => 'purchase_order1',
   to_schema => 'AQ',
   to_type => 'purchase_order2',
   transformation => 'AQ.transform_PO(source.user_data)');
END;
```

PL/SQL (DBMS_AQADM): Adding a Rule-Based Subscriber

```
DECLARE
   subscriber          sys.aq$_agent;
BEGIN
   subscriber :=  sys.aq$_agent('East_Shipping','ES.ES_bookedorders_que',null);
   DBMS_AQADM.ADD_SUBSCRIBER(
      queue_name           => 'OE.OE_bookedorders_que',
      subscriber           => subscriber,
      rule                 => 'tab.user_data.orderregion =  ''EASTERN'' OR
                              (tab.user_data.ordertype =  ''RUSH'' AND
                               tab.user_data.customer.country = ''USA'') ');
END;

/* Add a rule-based subscriber for Overseas Shipping */
DECLARE
  subscriber     aq$_agent;
BEGIN
  subscriber := aq$_agent('Overseas_DHL', null, null);

  dbms_aqadm.add_subscriber(
        queue_name     => 'OS.OS_bookedorders_que',
        subscriber     => subscriber,
        rule           => 'tab.user_data.xdata.extract(''/ORDER_
TYP/ORDERTYPE/text()'').getStringVal()=''RUSH''');

END;
```

Java (JDBC): Adding a Subscriber

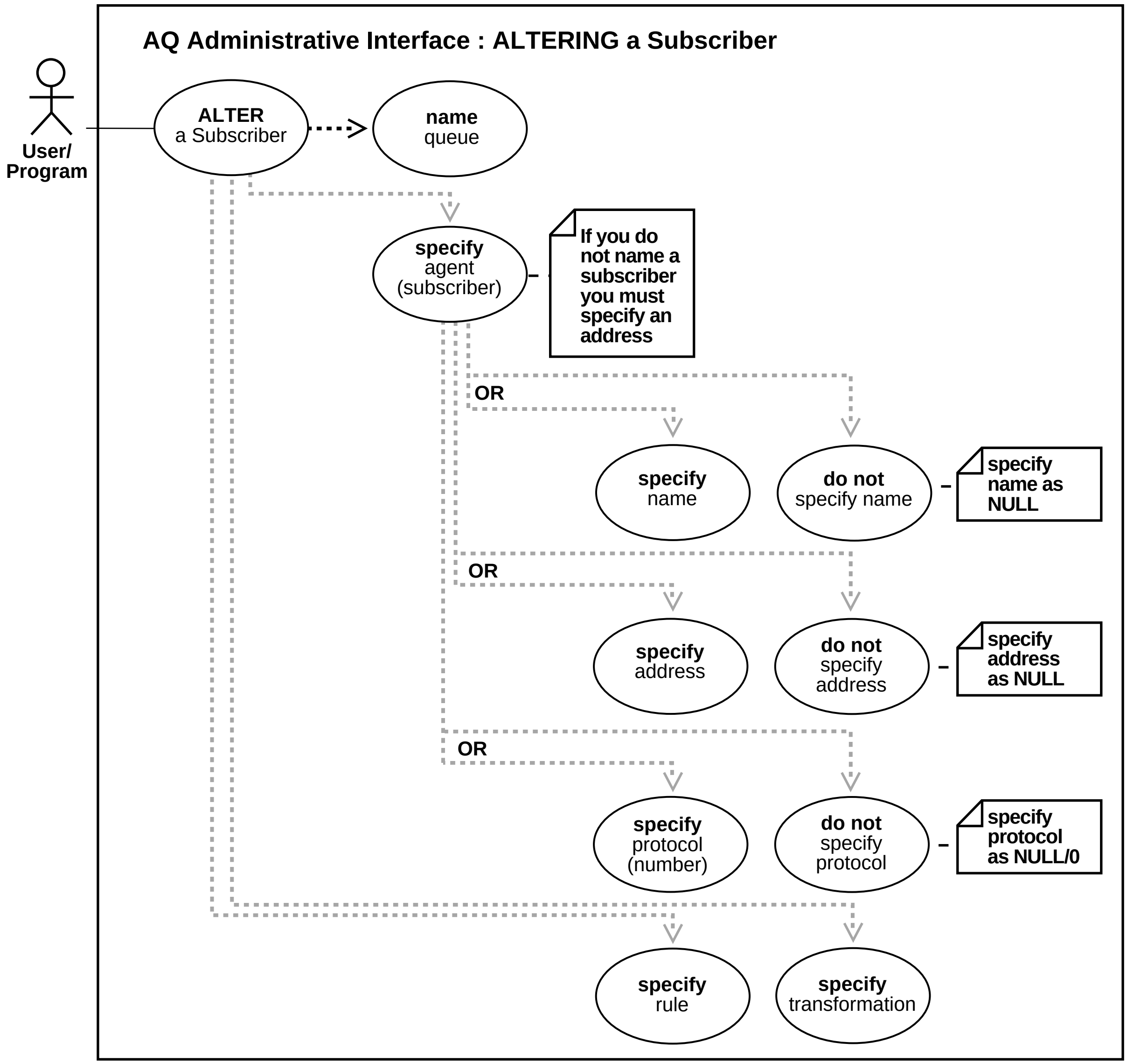
```
/* Setup */
public static void setup(AQSession aq_sess) throws AQException
{
     AQQueueTableProperty    qtable_prop;
     AQQueueProperty         queue_prop;
```

```
        AQQueueTable            q_table;
        AQQueue                 queue;

        /* Create a AQQueueTable property object */
        qtable_prop = new AQQueueTableProperty("AQ.MESSAGE_TYP");
        qtable_prop.setMultiConsumer(true);

        q_table = aq_sess.createQueueTable ("aq", "multi_qtab", qtable_prop);

        /* Create a new AQQueueProperty object: */
        queue_prop = new AQQueueProperty();
        queue = aq_sess.createQueue (q_table, "multi_queue", queue_prop);

   }

   /* Add subscribers to a queue */
   public static void example(AQSession aq_sess) throws AQException
   {
        AQQueue         queue;
        AQAgent         agent1;
        AQAgent         agent2;

        /* Get the queue object */
        queue = aq_sess.getQueue("AQ", "multi_queue");

        /* add a subscriber */
        agent1 = new AQAgent("subscriber1", "aq2.msg_queue2@london");
        queue.addSubscriber(agent1, null);

        /* add a subscriber with a rule */
        agent2 = new AQAgent("subscriber2", "aq2.msg_queue2@london");

        queue.addSubscriber(agent2, "priority < 2");
   }

   /* Add a subscriber with a rule */
   public static void example(AQSession aq_sess) throws AQException
   {
        AQQueue         queue;
        AQAgent         agent1;

        /* Get the queue object */
        queue = aq_sess.getQueue("OE", "OE_bookedorders_que");

        /* add a subscriber */
```

```
     agent1 = new AQAgent("East_Shipping", "ES.ES_bookedorders_que");

     queue.addSubscriber(agent1,
"tab.user_data.orderregion='EASTERN' OR " +
"(tab.user_data.ordertype='RUSH' AND " +
"tab.user_data.customer.country='USA')");
}
```

Altering a Subscriber

Figure 9–20 Altering a Subscriber



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Alter existing properties of a subscriber to a specified queue. Only the rule can be altered.

Usage Notes

The rule, the transformation, or both can be altered. If you only alter one of the attributes, the rule, or the transformation of the subscriber, specify the existing value of the other attribute to the alter call.

When a queue, queue table, or subscriber is created, modified, or dropped, and if GLOBAL_TOPIC_ENABLED = TRUE, a corresponding LDAP entry is also created.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.ALTER_SUBSCRIBER` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, alterSubscriber

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Altering Subscriber on page 9-66
- VB (OO4O): Example not provided.
- Java (JDBC): Altering a Subscriber on page 9-67

PL/SQL (DBMS_AQADM): Altering Subscriber

Note: You may need to set up the following data structures for certain examples to work:

```
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE (
   queue_table          => 'aq.multi_qtab',
   multiple_consumers   => TRUE,
   queue_payload_type   => 'aq.message_typ',
   compatible           => '8.1.5');
EXECUTE DBMS_AQADM.CREATE_QUEUE (
   queue_name           =>  'multi_queue',
   queue_table          => 'aq.multi_qtab');
```

```
/* Add a subscriber with a rule: */
DECLARE
   subscriber       sys.aq$_agent;
BEGIN
   subscriber := sys.aq$_agent('SUBSCRIBER1', 'aq2.msg_queue2@london', null);
   DBMS_AQADM.ADD_SUBSCRIBER(
      queue_name         =>    'aq.msg_queue',
      subscriber         =>     subscriber,
      rule               =>    'priority < 2');
END;
/* Change rule for subscriber: */
DECLARE
   subscriber          sys.aq$_agent;
BEGIN
   subscriber := sys.aq$_agent('SUBSCRIBER1', 'aq2.msg_queue2@london', null);
   DBMS_AQADM.ALTER_SUBSCRIBER(
      queue_name         =>    'aq.msg_queue',
      subscriber         =>     subscriber,
      rule              =>     'priority = 1');
END;
```

Add a Subscriber with a Transformation

```
/* Add a subscriber with transformation */
EXECUTE DBMS_AQADM.ADD_SUBSCRIBER
   ('aq.msg_queue',
     aq$_agent('subscriber1',
        'aq2.msg_queue2@london',
            null),
```

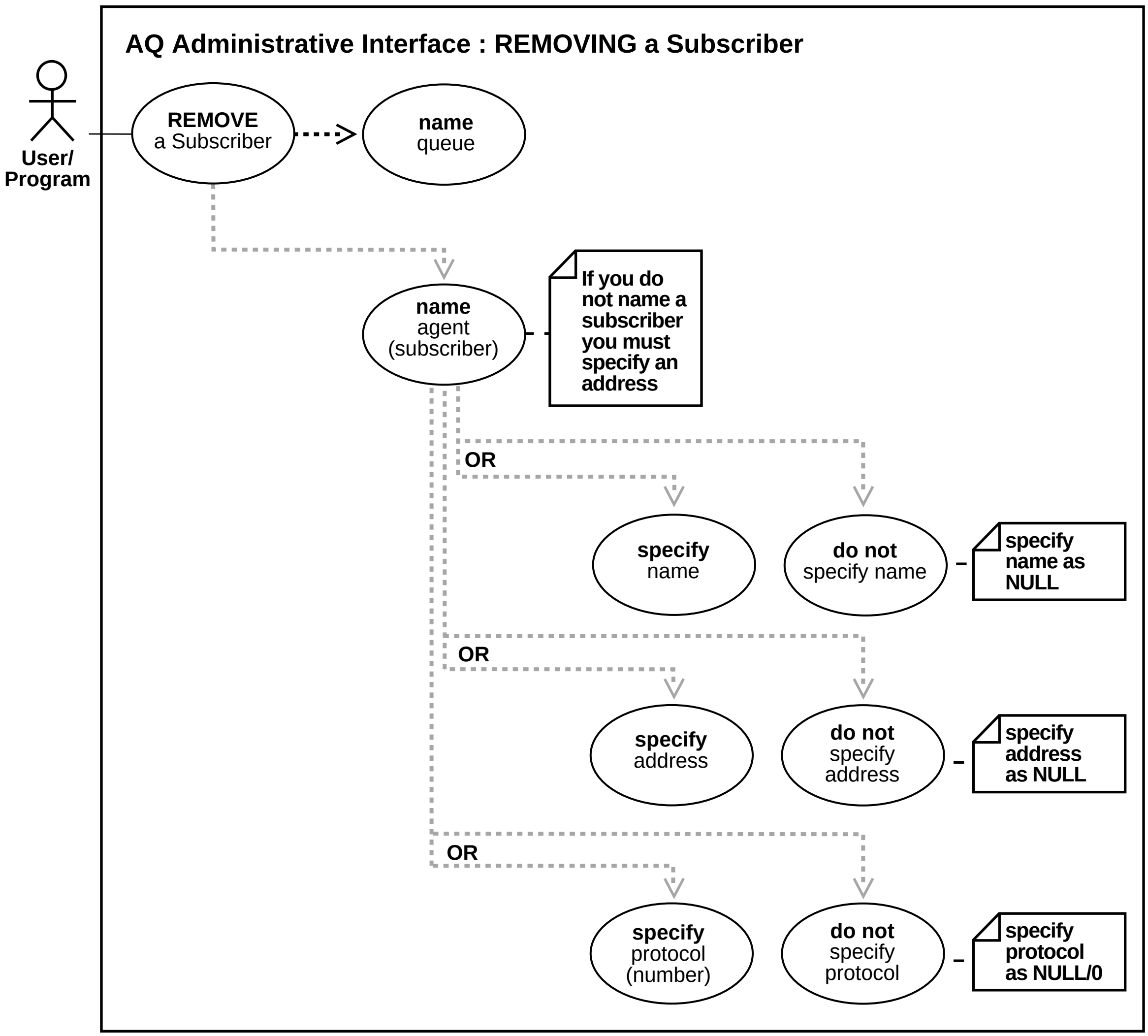
```
'AQ.MSG_MAP1');
/* Alter the subscriber*/
EXECUTE DBMS_AQADM.ALTER_SUBSCRIBER
   ('aq.msg_queue',
     aq$_agent ('subscriber1',
      'aq2.msg_queue2@london',
                null),
       'AQ.MSG.MAP2');
```

Java (JDBC): Altering a Subscriber

```
/* Alter the rule for a subscriber */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue         queue;
     AQAgent         agent1;
     AQAgent         agent2;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "multi_queue");

     /* add a subscriber */
     agent1 = new AQAgent("subscriber1", "aq2.msg_queue2@london");

     queue.alterSubscriber(agent1, "priority=1");
}
```

Removing a Subscriber

Figure 9–21 Removing a Subscriber



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Remove a default subscriber from a queue.

Usage Notes

This operation takes effect immediately and the containing transaction is committed. All references to the subscriber in existing messages are removed as part of the operation.

When a queue, queue table, or subscriber is created, modified, or dropped, and if `GLOBAL_TOPIC_ENABLED = TRUE`, a corresponding LDAP entry is also created.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.REMOVE_SUBSCRIBER` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ*)* removeSubscriber

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments.

Examples in the following programmatic environments are provided:

- PL/SQL (DBMS_AQADM): Removing Subscriber on page 9-69
- VB (OO4O): Example not provided.
- Java (JDBC): Removing a Subscriber on page 9-70

PL/SQL (DBMS_AQADM): Removing Subscriber

```
DECLARE
   subscriber       sys.aq$_agent;
BEGIN
   subscriber := sys.aq$_agent('subscriber1','aq2.msg_queue2', NULL);
   DBMS_AQADM.REMOVE_SUBSCRIBER(
      queue_name => 'aq.multi_queue',
```

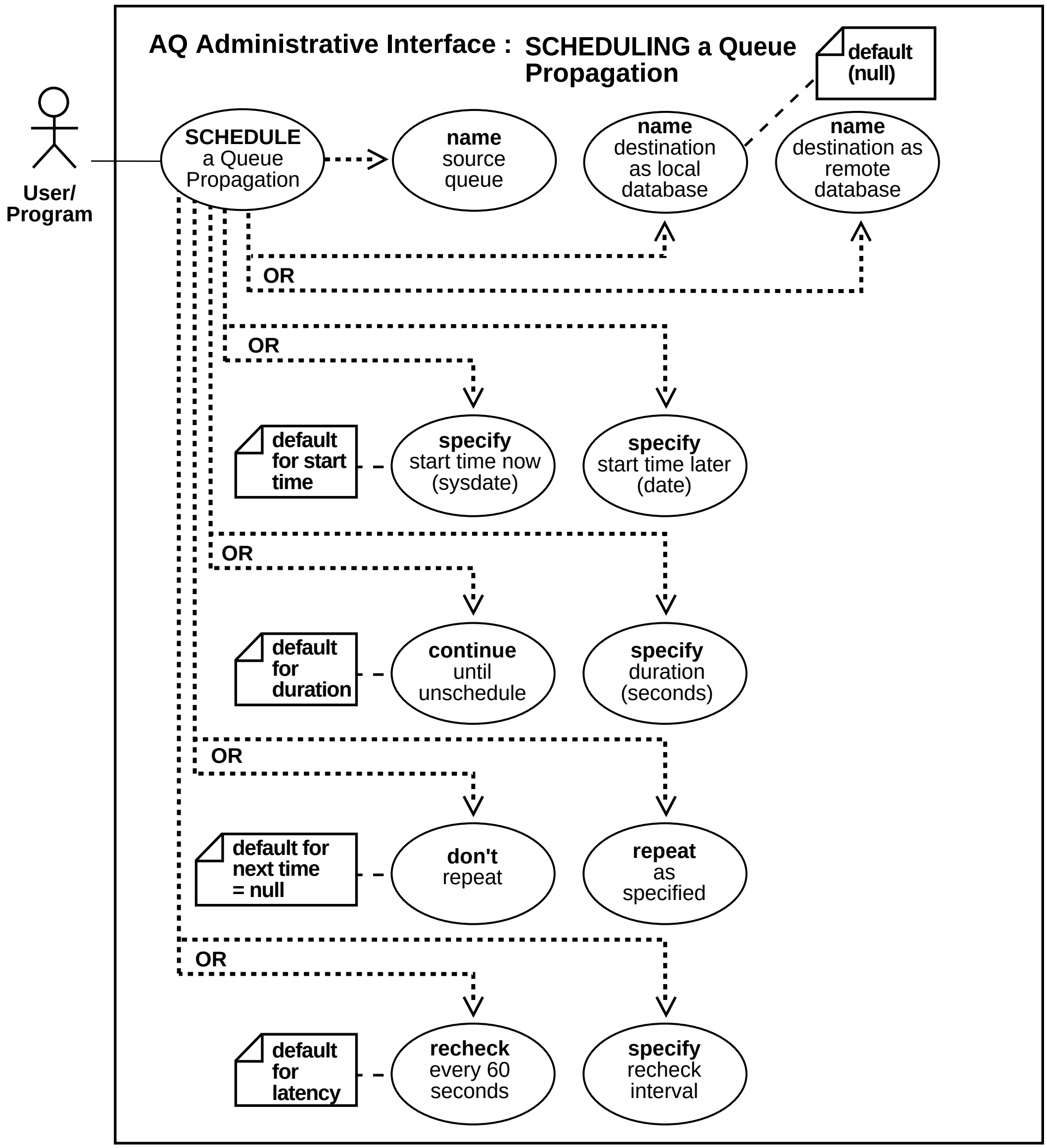
```
      subscriber => subscriber);
END;
```

Java (JDBC): Removing a Subscriber

```
/* Remove a subscriber */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue         queue;
     AQAgent         agent1;
     AQAgent         agent2;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "multi_queue");

     /* add a subscriber */
     agent1 = new AQAgent("subscriber1", "aq2.msg_queue2@london");

     queue.removeSubscriber(agent1);
}
```

Scheduling a Queue Propagation

Figure 9–22 Scheduling a Queue Propagation



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Schedule propagation of messages from a queue to a destination identified by a specific dblink.

Usage Notes

Messages may also be propagated to other queues in the same database by specifying a `NULL` destination. If a message has multiple recipients at the same destination in either the same or different queues the message will be propagated to all of them at the same time.

See Chapter 17, "Internet Access to Advanced Queuing" for information on propagating messages over HTTP or HTTPS.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_AQADM.SCHEDULE_PROPAGATION` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, schedulePropagation

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Scheduling a Queue Propagation on page 9-73
- VB (OO4O): Example not provided.
- Java (JDBC): Scheduling a Queue Propagation on page 9-73

PL/SQL (DBMS_AQADM): Scheduling a Queue Propagation

Note: You may need to set up the following data structures for certain examples to work:

```
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE (
   queue_table        => 'aq.objmsgs_qtab',
   queue_payload_type => 'aq.message_typ',
   multiple_consumers => TRUE);
EXECUTE DBMS_AQADM.CREATE_QUEUE (
   queue_name         => 'aq.q1def',
   queue_table        => 'aq.objmsgs_qtab');
```

Scheduling a Propagation from a Queue to other Queues in the Same Database

```
/* Schedule propagation from queue aq.q1def to other queues in the same
   database  */
EXECUTE DBMS_AQADM.SCHEDULE_PROPAGATION(
   Queue_name    =>    'aq.q1def');
```

Scheduling a Propagation from a Queue to other Queues in Another Database

```
/* Schedule a propagation from queue aq.q1def to other queues in another
   database */
EXECUTE DBMS_AQADM.SCHEDULE_PROPAGATION(
   Queue_name    =>    'aq.q1def',
   Destination   =>    'another_db.world');
```

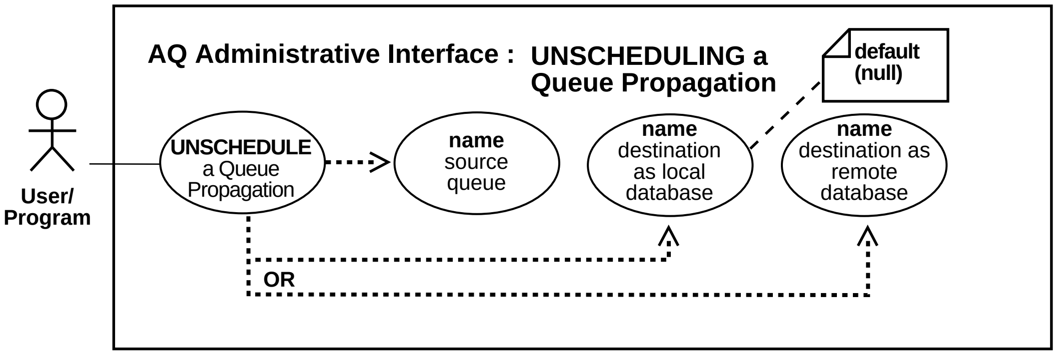
Java (JDBC): Scheduling a Queue Propagation

```
/* Setup  */
public static void setup(AQSession aq_sess) throws AQException
{
     AQQueueTableProperty    qtable_prop;
     AQQueueProperty         queue_prop;
     AQQueueTable            q_table;
     AQQueue                 queue;

     qtable_prop = new AQQueueTableProperty("AQ.MESSAGE_TYP");
     qtable_prop.setMultiConsumer(true);

     q_table = aq_sess.createQueueTable ("aq", "objmsgs_qtab", qtable_prop);
```

```
        /* Create a new AQQueueProperty object: */
        queue_prop = new AQQueueProperty();
        queue = aq_sess.createQueue (q_table, "q1def", queue_prop);
}

/* Schedule propagation from a queue to other queues in the same database */
public static void example(AQSession aq_sess) throws AQException
{
        AQQueue          queue;
        AQAgent          agent1;
        AQAgent          agent2;

        /* Get the queue object */
        queue = aq_sess.getQueue("AQ", "q1def");

        queue.schedulePropagation(null, null, null, null, null);
}

/* Schedule propagation from a queue to other queues in another database */
public static void example(AQSession aq_sess) throws AQException
{
        AQQueue          queue;
        AQAgent          agent1;
        AQAgent          agent2;

        /* Get the queue object */
        queue = aq_sess.getQueue("AQ", "q1def");

        queue.schedulePropagation("another_db.world", null, null, null, null);
}
```

Unscheduling a Queue Propagation

Figure 9–23 Unscheduling a Queue Propagation



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Unscheduled previously scheduled propagation of messages from a queue to a destination identified by a specific `dblink`.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.UNSCHEDULE_PROPAGATION` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ*)* schedulePropagation

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Unscheduling a Propagation on page 9-76
- VB (OO4O): Example not provided.
- Java (JDBC): Unscheduling a Queue propagation on page 9-76

PL/SQL (DBMS_AQADM): Unscheduling a Propagation

Unscheduling Propagation from Queue To Other Queues in the Same Database

```
/* Unschedule propagation from queue aq.q1def to other queues in the same
   database */
EXECUTE DBMS_AQADM.UNSCHEDULE_PROPAGATION(queue_name => 'aq.q1def');
```

Unscheduling Propagation from a Queue to other Queues in Another Database

```
/* Unschedule propagation from queue aq.q1def to other queues in another
   database reached by the database link another_db.world */
EXECUTE DBMS_AQADM.UNSCHEDULE_PROPAGATION(
   Queue_name     =>   'aq.q1def',
   Destination    =>   'another_db.world');
```

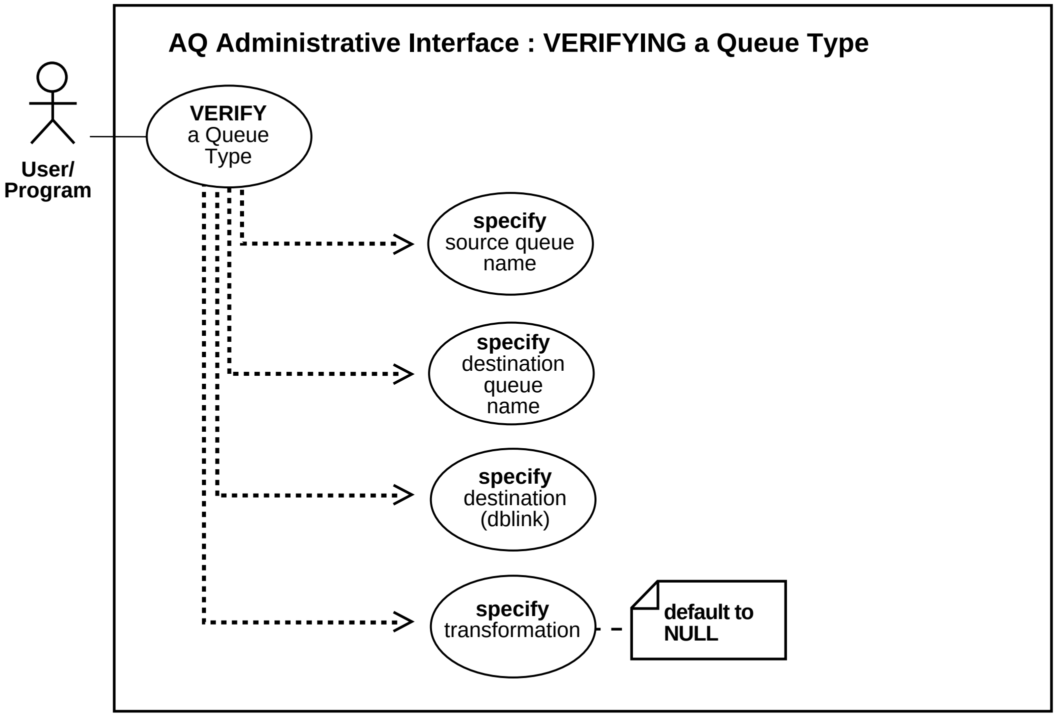
Java (JDBC): Unscheduling a Queue propagation

```
/* Unschedule propagation from a queue to other queues in the same database */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue         queue;
     AQAgent         agent1;
     AQAgent         agent2;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "q1def");

     queue.unschedulePropagation(null);
}

/* Unschedule propagation from a queue to other queues in another database */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue         queue;
```

```
    AQAgent          agent1;
    AQAgent          agent2;

    /* Get the queue object */
    queue = aq_sess.getQueue("AQ", "q1def");

    queue.unschedulePropagation("another_db.world");
}
```

Verifying a Queue Type

Figure 9–24 Verifying a Queue Type



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Verify that the source and destination queues have identical types. The result of the verification is stored in `sys.aq$_Message_types tables`, overwriting all previous output of this command.

Usage Notes

If the source and destination queues do not have identical types and a transformation was specified, the transformation must map the source queue type to the destination queue type.

Note: The `sys.aq$_message_types` table can have multiple entries for the same source queue, destination queue, and dblink, but with different transformations.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.VERIFY_QUEUE_TYPES` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): There is no applicable syntax reference for this use case

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Verifying a Queue Type on page 9-79
- VB (OO4O): Example not provided.
- Java (JDBC): none

PL/SQL (DBMS_AQADM): Verifying a Queue Type

Note: You may need to set up the following data structures for certain examples to work:

```
EXECUTE DBMS_AQADM.CREATE_QUEUE (
   queue_name         => 'aq.q2def',
   queue_table        => 'aq.objmsgs_qtab');
```

```
/*  Verify if the source and destination queues have the same type. The
    function has the side effect of inserting/updating the entry for the source
    and destination queues in the dictionary table AQ$_MESSAGE_TYPES */
DECLARE
rc       BINARY_INTEGER;
```

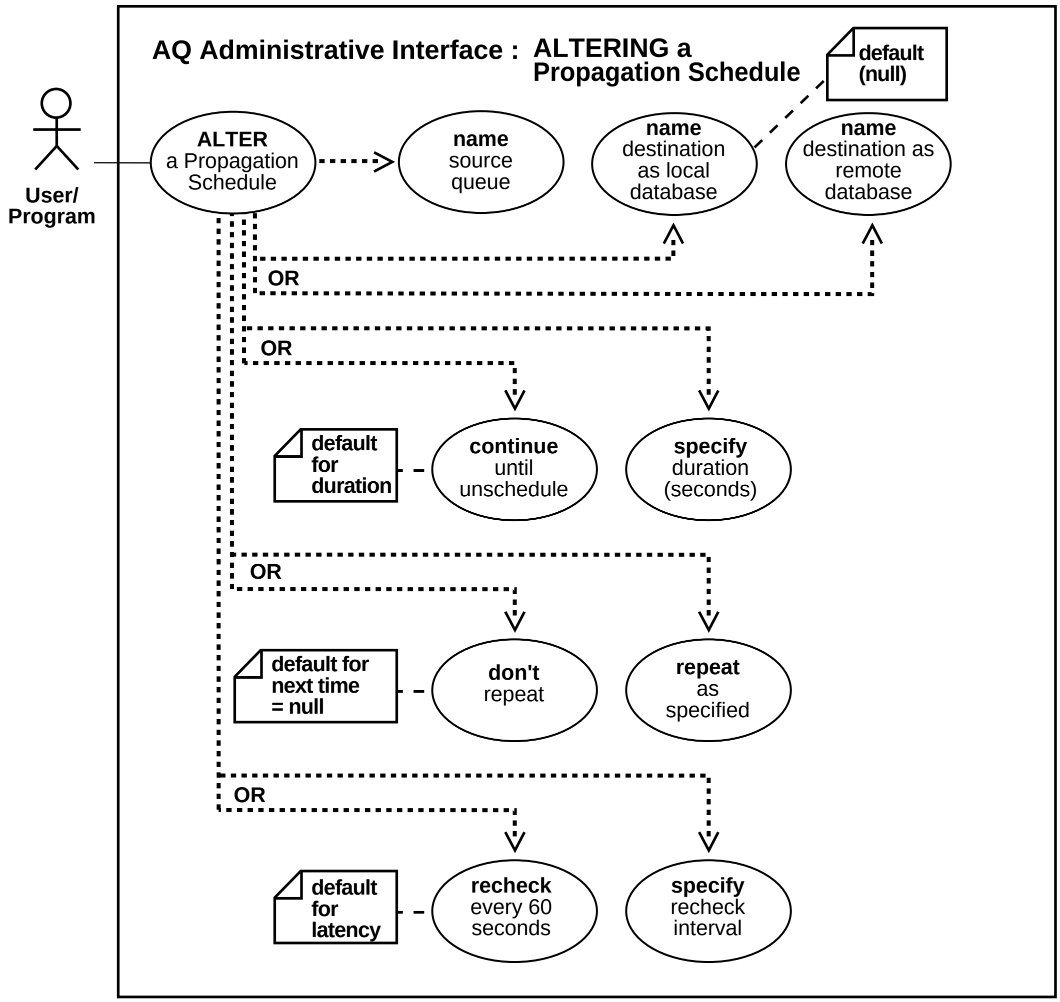
```
BEGIN
/* Verify if the queues aquser.q1def and aquser.q2def in the local database
   have the same payload type */
   DBMS_AQADM.VERIFY_QUEUE_TYPES(
      src_queue_name  => 'aq.q1def',
      dest_queue_name => 'aq.q2def',
      rc              => rc);
   DBMS_OUTPUT.PUT_LINE(rc);
END;
```

Java (JDBC): Verifying a Queue type

Feature not available through Java API

Altering a Propagation Schedule

Figure 9–25 Altering a Propagation Schedule



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

To alter parameters for a propagation schedule.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_AQADM.ALTER_PROPAGATION_SCHEDULE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ*)* alterPropagationSchedule

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Altering a Propagation Schedule on page 9-82
- VB (OO4O): Example not provided.
- PL/SQL (DBMS_AQADM): Altering a Propagation Schedule on page 9-83

PL/SQL (DBMS_AQADM): Altering a Propagation Schedule

Altering a Schedule from a Queue to Other Queues in the Same Database

```
/* Alter schedule from queue aq.q1def to other queues in the same database */
EXECUTE DBMS_AQADM.ALTER_PROPAGATION_SCHEDULE(
   Queue_name     =>    'aq.q1def',
   Duration       =>    '2000',
   Next_time      =>    'SYSDATE + 3600/86400',
   Latency        =>    '32');
```

Altering a Schedule from a Queue to Other Queues in Another Database

```
/* Alter schedule from queue aq.q1def to other queues in another database
```

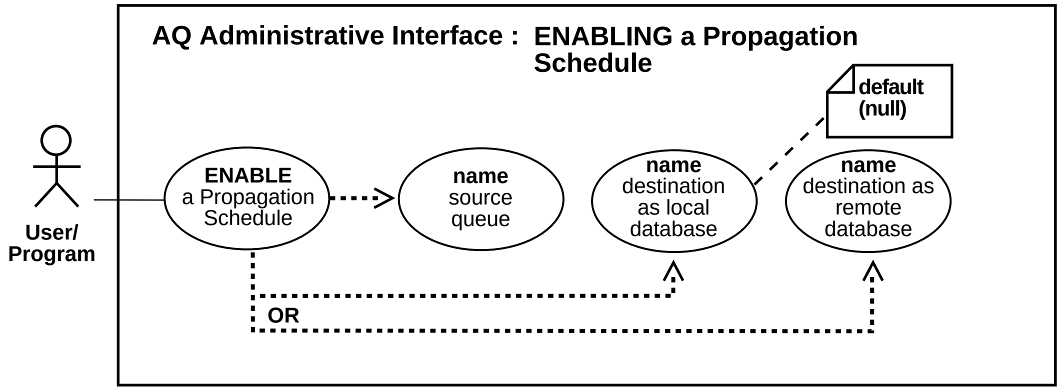
```
reached by the database link another_db.world */
EXECUTE DBMS_AQADM.ALTER_PROPAGATION_SCHEDULE(
   Queue_name    =>    'aq.q1def',
   Destination   =>    'another_db.world',
   Duration      =>    '2000',
   Next_time     =>    'SYSDATE + 3600/86400',
   Latency       =>    '32');
```

Java (JDBC): Altering a Propagation Schedule

```
/* Alter propagation schedule from a queue to other queues
   in the same database */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue         queue;
     AQAgent         agent1;
     AQAgent         agent2;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "q1def");

     queue.alterPropagationSchedule(null, new Double(2000),
   "SYSDATE + 3600/86400", new Double(32));
}

/* Unschedule propagation from a queue to other queues in another database */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue         queue;
     AQAgent         agent1;
     AQAgent         agent2;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "q1def");

     queue.alterPropagationSchedule("another_db.world", new Double(2000),
   "SYSDATE + 3600/86400", new Double(32));
}
```

Enabling a Propagation Schedule

Figure 9–26 Enabling a Propagation Schedule



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

To enable a previously disabled propagation schedule.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.ENABLE_PROPAGATION_SCHEDULE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, enablePropagationSchedule

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Enabling a Propagation on page 9-85
- VB (OO4O): Example not provided.
- Java (JDBC): Enabling a Propagation Schedule on page 9-85

PL/SQL (DBMS_AQADM): Enabling a Propagation

Enabling Propagation from a Queue to Other Queues in the Same Database

```
/* Enable propagation from queue aq.q1def to other queues in the same
   database */
EXECUTE DBMS_AQADM.ENABLE_PROPAGATION_SCHEDULE(
   Queue_name    =>    'aq.q1def');
```

Enabling Propagation from a Queue to Queues in Another Database

```
/* Enable propagation from queue aq.q1def to other queues in another
  database reached by the database link another_db.world */
EXECUTE DBMS_AQADM.ENABLE_PROPAGATION_SCHEDULE(
   Queue_name     =>     'aq.q1def',
   Destination    =>     'another_db.world');
```

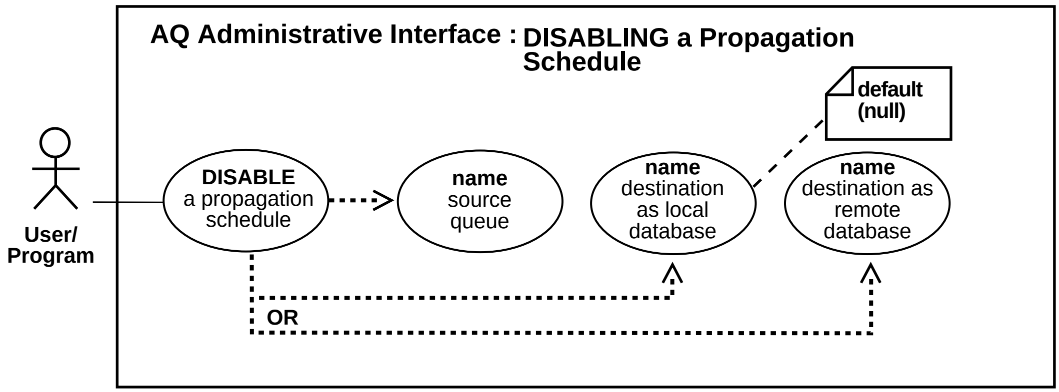
Java (JDBC): Enabling a Propagation Schedule

```
/* Enable propagation from a queue to other queues in the same database */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue         queue;
     AQAgent         agent1;
     AQAgent         agent2;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "q1def");

     queue.enablePropagationSchedule(null);
}

/* Enable propagation from a queue to other queues in another database */
public static void example(AQSession aq_sess) throws AQException
```

```
{
     AQQueue         queue;
     AQAgent         agent1;
     AQAgent         agent2;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "q1def");

     queue.enablePropagationSchedule("another_db.world");
}
```

Disabling a Propagation Schedule

Figure 9–27 Disabling a Propagation Schedule



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

To disable a previously enabled propagation schedule.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.DISABLE_PROPAGATION_SCHEDULE` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ) disablePropagationSchedule

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL (DBMS_AQADM): Enabling a Propagation on page 9-85
- VB (OO4O): Example not provided.
- Java (JDBC): Enabling a Propagation Schedule on page 9-85

PL/SQL (DBMS_AQADM): Disabling a Propagation

Enabling Propagation from a Queue to Other Queues in the Same Database

```
/* Disable a propagation from queue aq.q1def to other queues in the same
   database */
EXECUTE DBMS_AQADM.DISABLE_PROPAGATION_SCHEDULE(
   Queue_name    =>   'aq.q1def');
```

Enabling Propagation from a Queue to Queues in Another Database

```
/* Disable a propagation from queue aq.q1def to other queues in another
  database reached by the database link another_db.world */
EXECUTE DBMS_AQADM.DISABLE_PROPAGATION_SCHEDULE(
   Queue_name     =>    'aq.q1def',
   Destination    =>    'another_db.world');
```

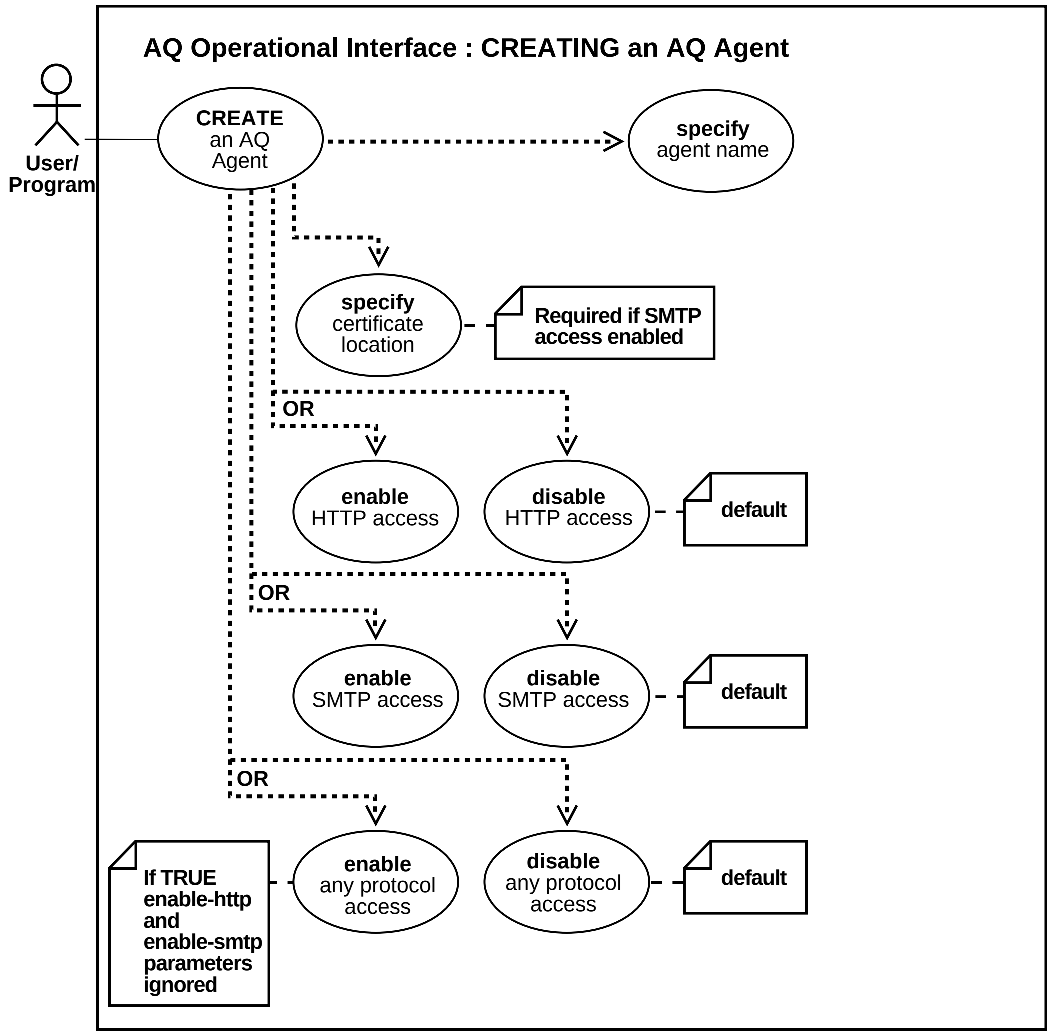
Java (JDBC): Disabling a Propagation Schedule

```
/* Disable propagation from a queue to other queues in the same database */
public static void example(AQSession aq_sess) throws AQException
{
     AQQueue         queue;
     AQAgent         agent1;
     AQAgent         agent2;

     /* Get the queue object */
     queue = aq_sess.getQueue("AQ", "q1def");

     queue.disablePropagationSchedule(null);
}

/* Disable propagation from a queue to other queues in another database */
public static void example(AQSession aq_sess) throws AQException
{
```

```
        AQQueue          queue;
        AQAgent          agent1;
        AQAgent          agent2;

        /* Get the queue object */
        queue = aq_sess.getQueue("AQ", "q1def");

        queue.disablePropagationSchedule("another_db.world");
    }
```

Creating an AQ Agent

Figure 9–28 Creating an AQ Agent



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Registers an agent for AQ Internet access using HTTP / SMTP protocols.

Usage Notes

The `SYS.AQ$INTERNET_USERS` view has a list of all AQ Internet agents.

When an AQ agent is created, altered, or dropped, an LDAP entry is created for the agent if the following are true:

- `GLOBAL_TOPIC_ENABLED` = `TRUE`
- `certificate_location` is specified
- The user is registered for SMTP access

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL / SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.CREATE_AQ_AGENT` procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ

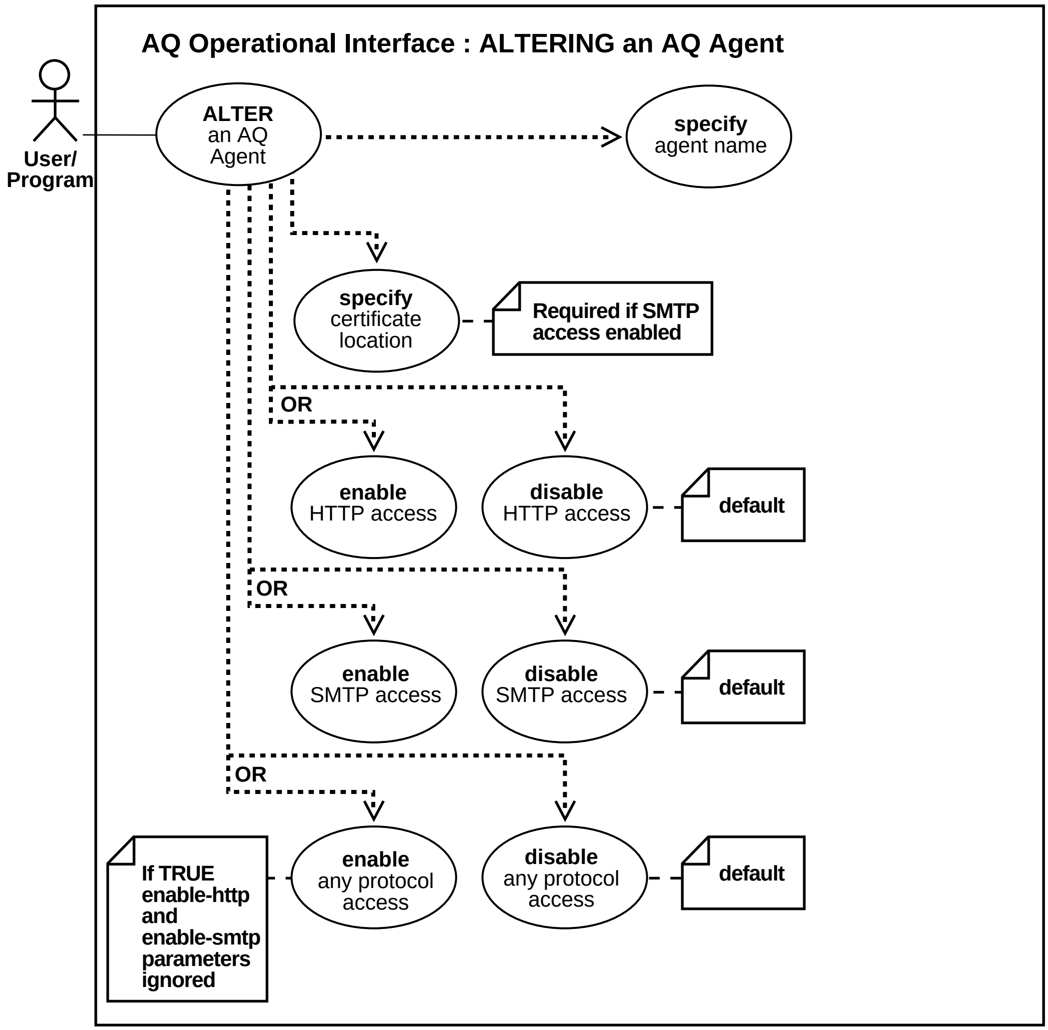
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL / SQL: Example not provided.
- VB (OO4O): Example not provided.
- Java (JDBC): Example not provided.

Altering an AQ Agent

Figure 9–29 Altering an AQ Agent



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Alters an agent registered for AQ Internet access.

Usage Notes

When an AQ agent is created, altered, or dropped, an LDAP entry is created for the agent if the following are true:

- `GLOBAL_TOPIC_ENABLED` = `TRUE`
- `certificate_location` is specified
- The user is registered for SMTP access

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.ALTER_AQ_AGENT` Procedure

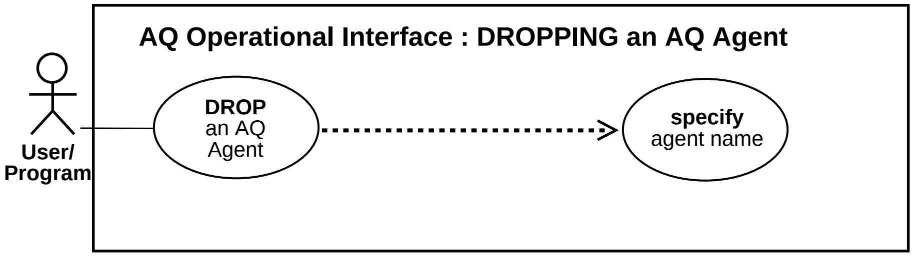
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL: Example not provided.
- VB (OO4O): Example not provided.
- Java (JDBC): Example not provided.

Dropping an AQ Agent

Figure 9–30 Dropping an AQ Agent



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Drops an agent that was previously registered for AQ Internet access.

Usage Notes

When an AQ agent is created, altered, or dropped, an LDAP entry is created for the agent if the following are true:

- `GLOBAL_TOPIC_ENABLED` = `TRUE`
- `certificate_location` is specified
- The user is registered for SMTP access

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.DROP_AQ_AGENT` Procedure

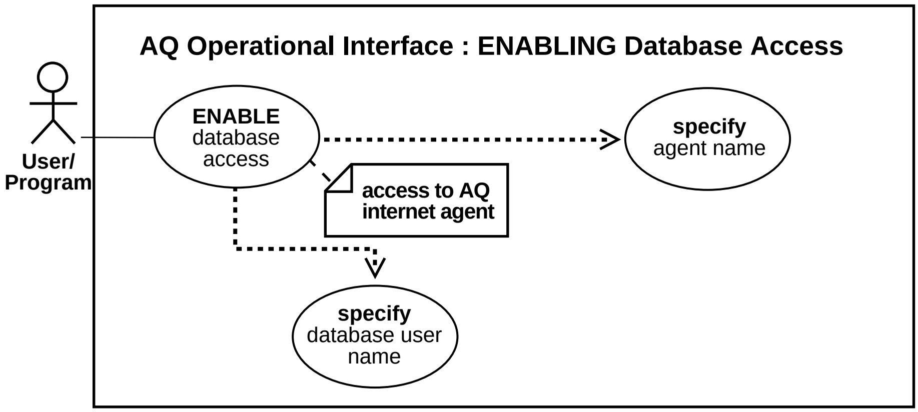
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL: Example not provided.
- VB (OO4O): Example not provided.
- Java (JDBC): Example not provided.

Enabling Database Access

Figure 9–31 Enabling Database Access



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Grants an AQ Internet agent the privileges of a specific database user. The AQ Internet agent should have been previously created using the `CREATE_AQ_AGENT` procedure.

Usage Notes

The `SYS.AQ$INTERNET_USERS` view has a list of all AQ Internet agents and the names of the database users whose privileges are granted to them.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.ENABLE_DB_ACCESS` Procedure

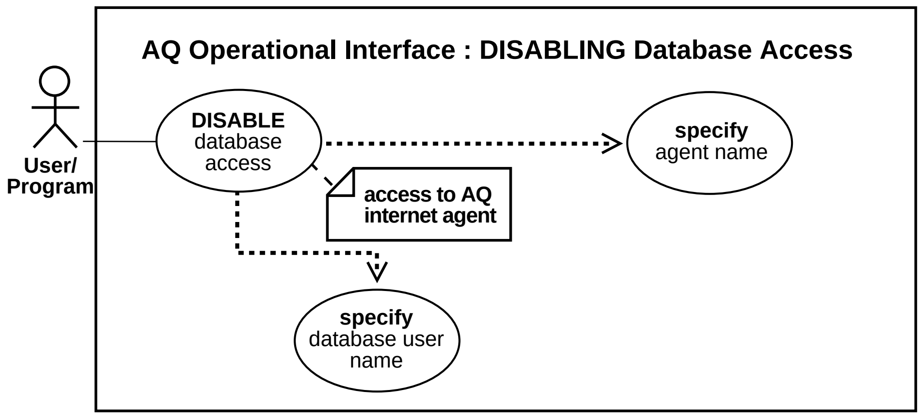
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL: Example not provided.
- VB (OO4O): Example not provided.
- Java (JDBC): Example not provided.

Disabling Database Access

Figure 9–32 Disabling Database Access



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

Revokes the privileges of a specific database user from an AQ Internet agent. The AQ Internet agent should have been previously granted those privileges using the `ENABLE_DB_ACCESS` procedure.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_AQADM.DISABLE_DB_ACCESS` Procedure

Examples

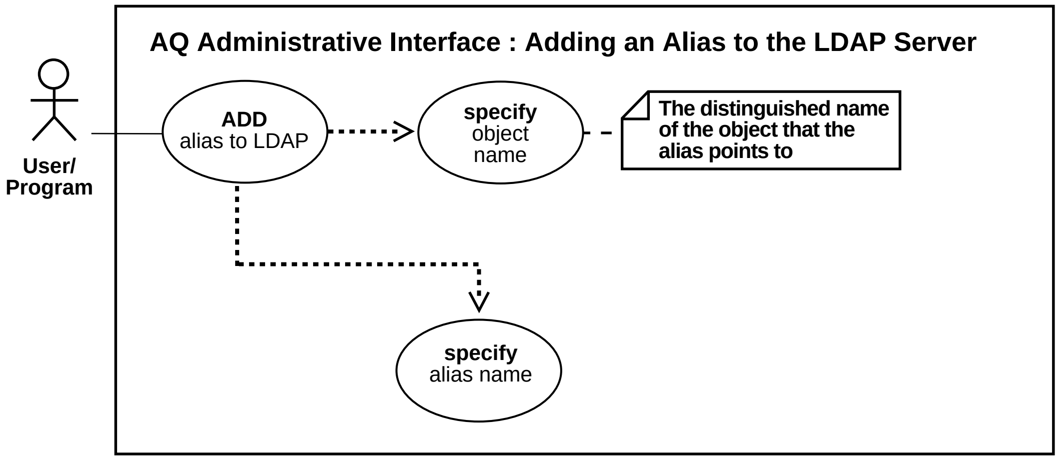
See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL: Example not provided.

- VB (OO4O): Example not provided.
- Java (JDBC): Example not provided.

Adding an Alias to the LDAP Server

Figure 9–33 Adding an Alias to the LDAP Server



See Also: Table 9–1 for a list of adminstrative interface basic operations

Purpose

To add an alias to the LDAP server.

Usage Notes

This call takes the name of an alias and the distinguished name of an AQ object in LDAP, and creates the alias that points to the AQ object. The alias is placed immediately under the distinguished name of the database server. The object to which the alias points can be a queue, an agent, or a connection factory.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_AQADM.ADD_ALIAS_TO_LDAP` Procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case

- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ

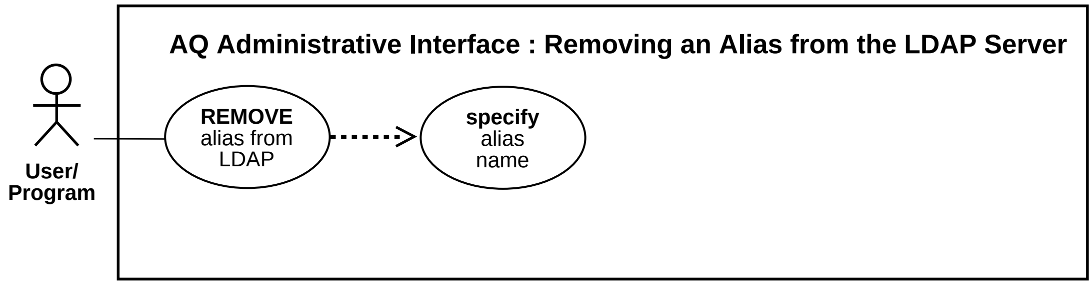
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL: Example not provided.
- VB (OO4O): Example not provided.
- Java (JDBC): Example not provided.

Removing an Alias from the LDAP Server

Figure 9–34 Removing an Alias from the LDAP Server



> **See Also:** Table 9–1 for a list of adminstrative interface basic operations

Purpose

To remove an alias from the LDAP server.

Usage Notes

This call takes the name of an alias as the argument, and removes the alias entry in the LDAP server. It is assumed that the alias is placed immediately under the database server in the LDAP directory.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQADM Package): *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_AQADM.DEL_ALIAS_FROM_LDAP` Procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples are provided in the following programmatic environments:

- PL/SQL: Example not provided.
- VB (OO4O): Example not provided.
- Java (JDBC): Example not provided.

10

Administrative Interface: Views

In this chapter we discuss each operation (such as "Selecting All Queue Tables in Database") in terms of a use case by that name. Table 10–1 summarizes the use cases.

Use cases are laid out as follows:

- ***Use case figure***. We describe the administrative interface with respect to views in terms of a hybrid of use cases and state diagrams. That is, we describe each view as a use case in terms of the operations that represents it (such as "Selecting All Queue Tables in Database"). We describe each view as a state diagram in that each attribute of the view is represented as a possible state of the view, the implication being that any attribute (column) can be visible or invisible.
- ***Syntax***. The syntax used to perform this activity.

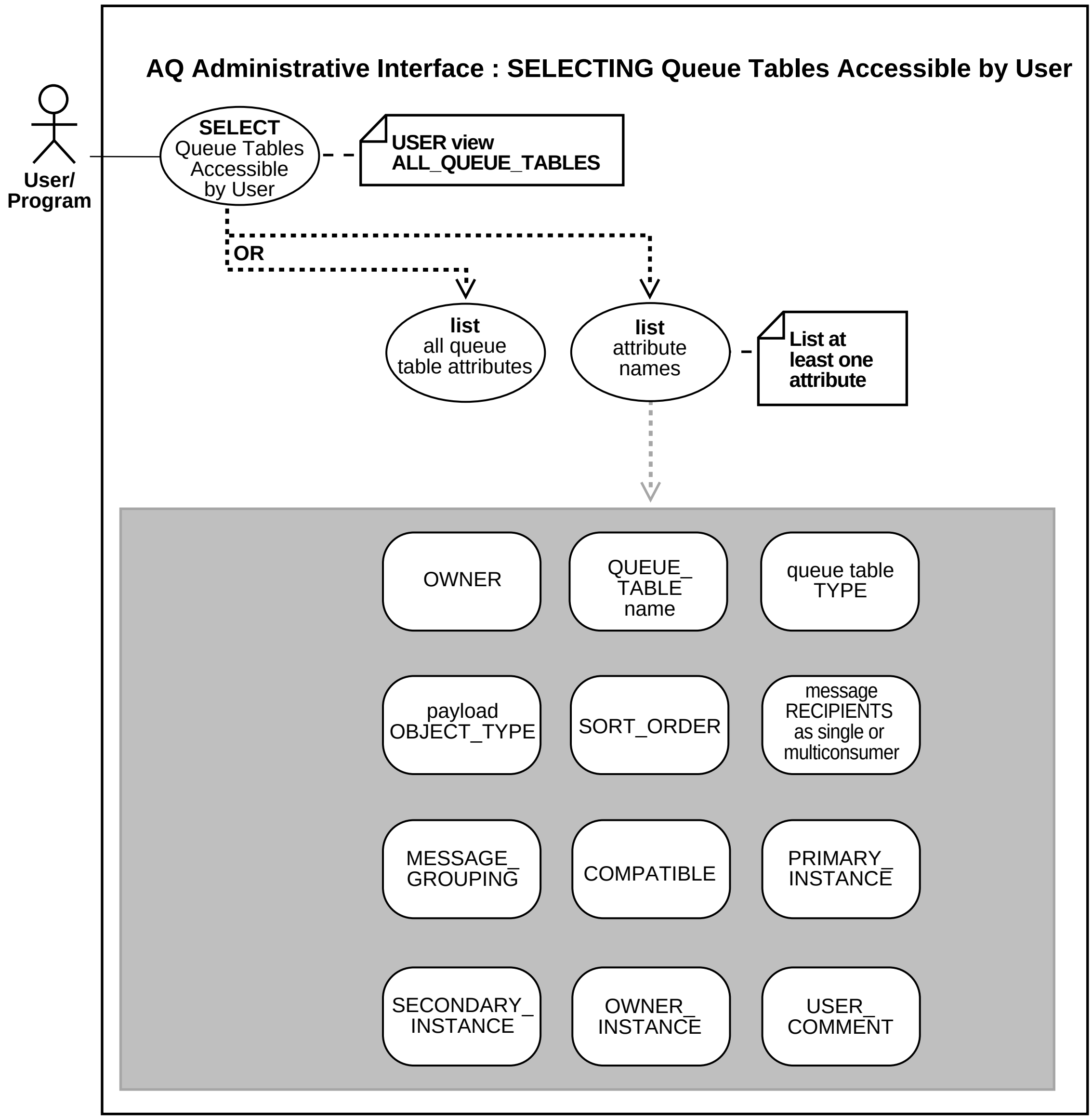
Use Case Model: Administrative Interface—Views

Table 10–1 Use Case Model: Administrative Interface—Views

Use Case	Name of View
Selecting All Queue Tables in Database on page 10-3	DBA_QUEUE_TABLES
Selecting User Queue Tables on page 10-5	ALL_QUEUE_TABLES
Selecting All Queues in Database on page 10-7	DBA_QUEUES
Selecting All Propagation Schedules on page 10-9	DBA_QUEUE_SCHEDULES
Selecting Queues for Which User Has Any Privilege on page 10-13	ALL_QUEUES
Selecting Queues for Which User Has Queue Privilege on page 10-15	QUEUE_PRIVILEGES
Selecting Messages in Queue Table on page 10-17	AQ$<name of queue table>
Selecting Queue Tables in User Schema on page 10-21	USER_QUEUE_TABLES
Selecting Queues In User Schema on page 10-23	USER_QUEUES
Selecting Propagation Schedules in User Schema on page 10-25	USER_QUEUE_SCHEDULES
Selecting Queue Subscribers on page 10-29	AQ$<name of queue table>_S
Selecting Queue Subscribers and Their Rules on page 10-31	AQ$<name of queue table>_R
Selecting the Number of Messages in Different States for the Whole Database on page 10-33	GV$AQ
Selecting the Number of Messages in Different States for Specific Instances on page 10-35	V$AQ
Selecting the AQ Agents Registered for Internet Access on page 10-37	AQ$INTERNET_USERS
Selecting User Transformations on page 10-38	USER_TRANSFORMATIONS
Selecting User Transformation Functions on page 10-39	USER_ATTRIBUTE_TRANSFORMATIONS
Selecting All Transformations on page 10-39	DBA_TRANSFORMATIONS
Selecting All Transformation Functions on page 10-41	DBA_ATTRIBUTE_TRANSFORMATIONS

Selecting All Queue Tables in Database

Figure 10–1 Selecting All Queue Tables in Database



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

DBA_QUEUE_TABLES

Purpose

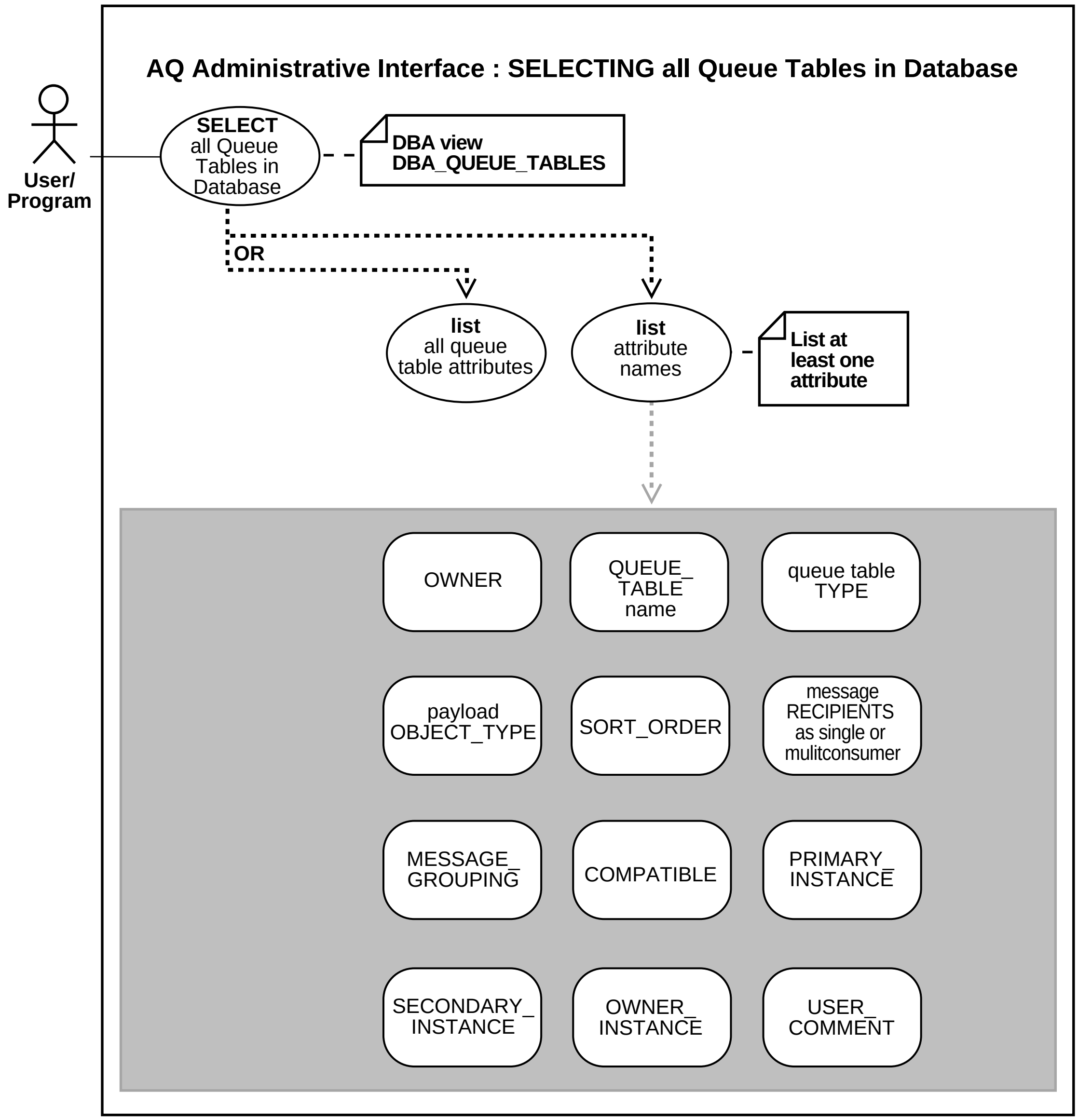
This view describes the names and types of all queue tables created in the database.

Table 10–2 DBA_QUEUE_TABLES

Column Name & Description	Null?	Type
OWNER—queue table schema	-	VARCHAR2(30)
QUEUE_TABLE—queue table name	-	VARCHAR2(30)
TYPE—payload type	-	VARCHAR2(7)
OBJECT_TYPE—name of object type, if any	-	VARCHAR2(61)
SORT_ORDER—user specified sort order	-	VARCHAR2(22)
RECIPIENTS—SINGLE or MULTIPLE	-	VARCHAR2(8)
MESSAGE_GROUPING—NONE or TRANSACTIONAL	-	VARCHAR2(13)
COMPATIBLE—indicates the lowest version with which the queue table is compatible	-	VARCHAR2(5)
PRIMARY_INSTANCE—indicates which instance is the primary owner of the queue table; a value of 0 indicates that there is no primary owner	-	NUMBER
SECONDARY_INSTANCE—indicates which owner is the secondary owner of the queue table; this instance becomes the owner of the queue table if the primary owner is not up; a value of 0 indicates that there is no secondary owner	-	NUMBER
OWNER_INSTANCE—indicates which instance currently owns the queue table	-	NUMBER
USER_COMMENT—user comment for the queue table	-	VARCHAR2(50)

Selecting User Queue Tables

Figure 10–2 Selecting User Queue Tables



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

ALL_QUEUE_TABLES

Purpose

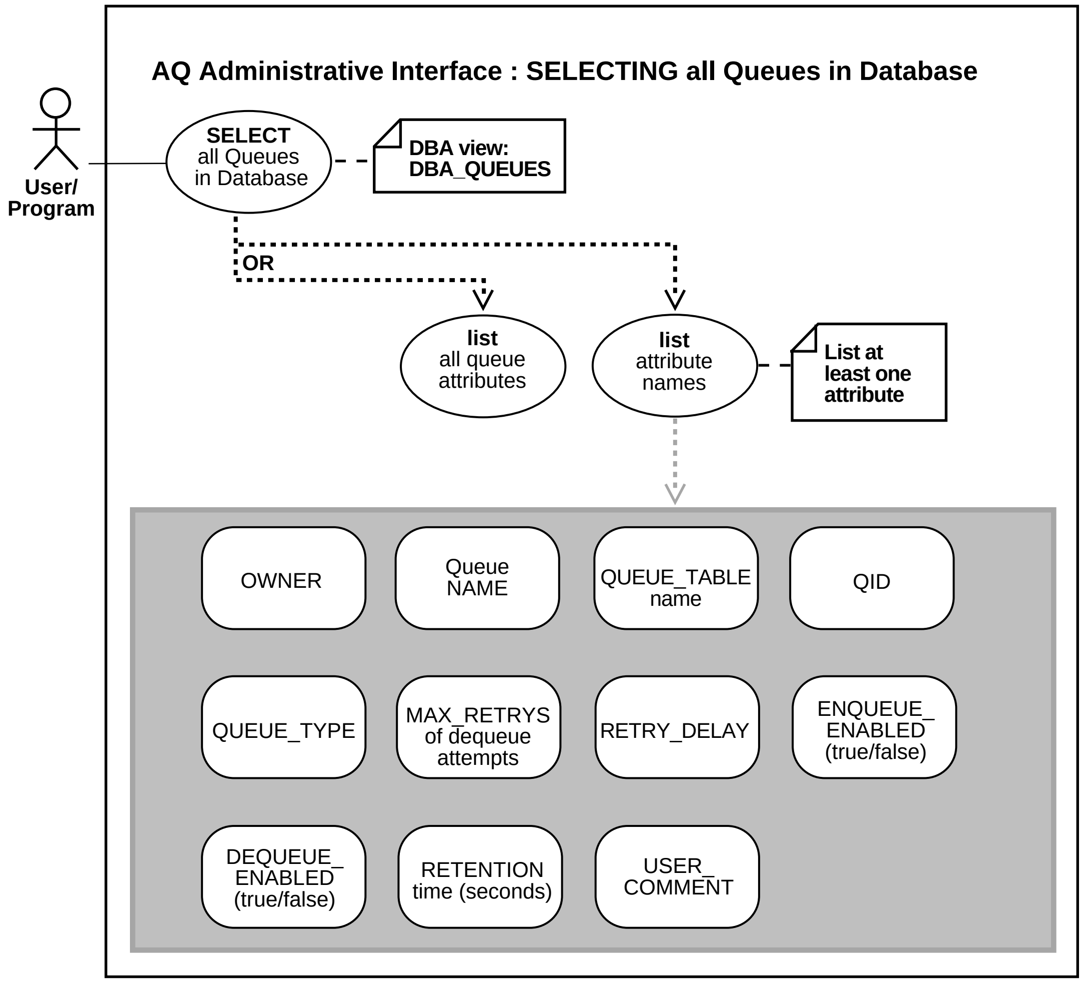
This view describes queue tables accessible to a user.

Table 10–3 DBA_QUEUE_TABLES

Column Name & Description	Null?	Type
OWNER—owner of the queue table	-	VARCHAR2(30)
QUEUE_TABLE—queue table name	-	VARCHAR2(30)
TYPE—payload type	-	VARCHAR2(7)
OBJECT_TYPE—object type, if any	-	VARCHAR2(61)
SORT_ORDER—user-specified sort order	-	VARCHAR2(22)
RECIPIENTS—SINGLE or MULTIPLE recipient queue	-	VARCHAR2(8)
MESSAGE_GROUPING—NONE or TRANSACTIONAL	-	VARCHAR2(13)
COMPATIBLE—indicates the lowest version with which the queue table is compatible	-	VARCHAR2(5)
PRIMARY_INSTANCE—indicates which instance is the primary owner of the queue table; a value of 0 indicates that there is no primary owner	-	NUMBER
SECONDARY_INSTANCE—indicates which owner is the secondary owner of the queue table; this instance becomes the owner of the queue table if the primary owner is not up; a value of 0 indicates that there is no secondary owner	-	NUMBER
OWNER_INSTANCE—indicates which instance currently owns the queue table	-	NUMBER
USER_COMMENT—user comment for the queue table	-	VARCHAR2(50)

Selecting All Queues in Database

Figure 10–3 Selecting All Queues in Database



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

DBA_QUEUES

Purpose

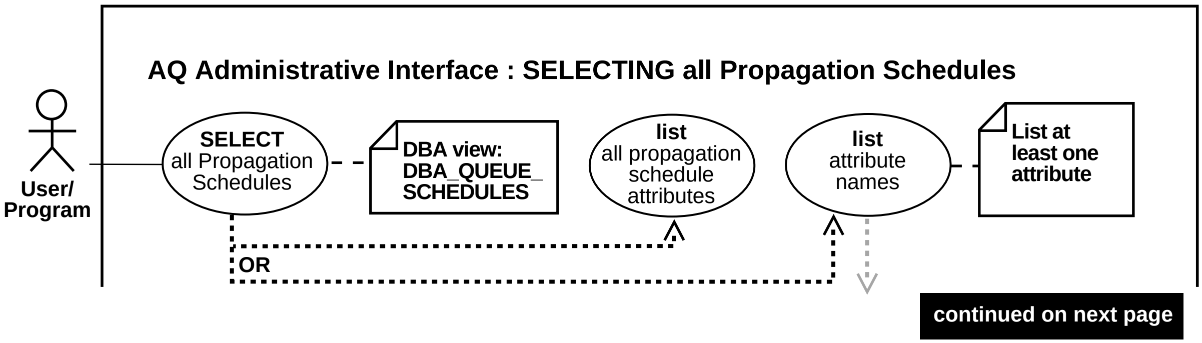
Users can specify operational characteristics for individual queues. DBA_QUEUES contains the view which contains relevant information for every queue in a database.

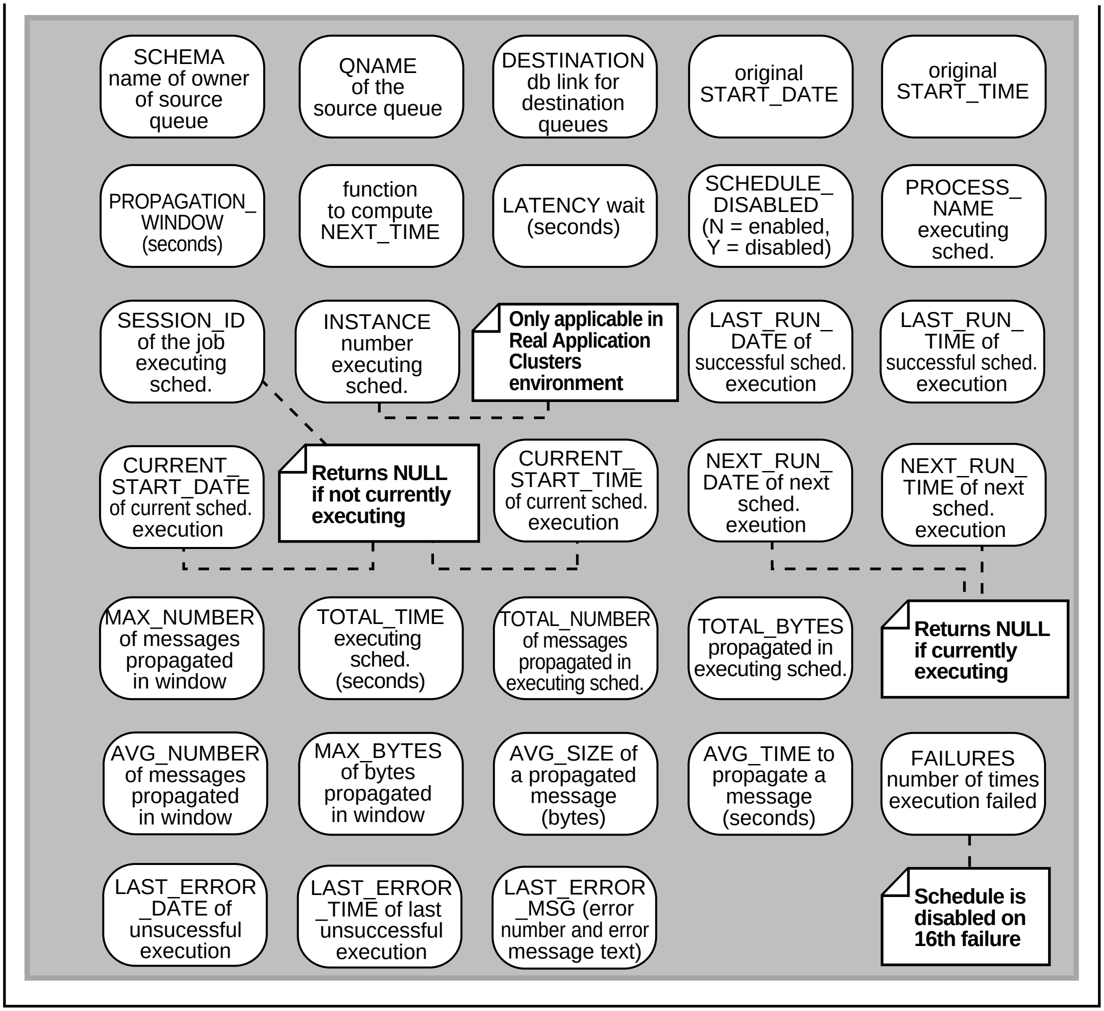
Table 10–4 DBA_QUEUES

Column Name & Description	Null?	Type
OWNER—queue schema name	NOT NULL	VARCHAR2(30)
NAME—queue name	NOT NULL	VARCHAR2(30)
QUEUE_TABLE—queue table where this queue resides	NOT NULL	VARCHAR2(30)
QID—unique queue identifier	NOT NULL	NUMBER
QUEUE_TYPE—queue type	-	VARCHAR2(15)
MAX_RETRIES—number of dequeue attempts allowed	-	NUMBER
RETRY_DELAY—number of seconds before retry can be attempted	-	NUMBER
ENQUEUE_ENABLED—YES / NO	-	VARCHAR2(7)
DEQUEUE_ENABLED—YES / NO	-	VARCHAR2(7)
RETENTION—number of seconds message is retained after dequeue	-	VARCHAR2(40)
USER_COMMENT—user comment for the queue	-	VARCHAR2(50)

Selecting All Propagation Schedules

Figure 10–4 Selecting All Propagation Schedules





See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

DBA_QUEUE_SCHEDULES

Purpose

This view describes the current schedules for propagating messages.

Table 10–5 DBA_QUEUE_SCHEDULES

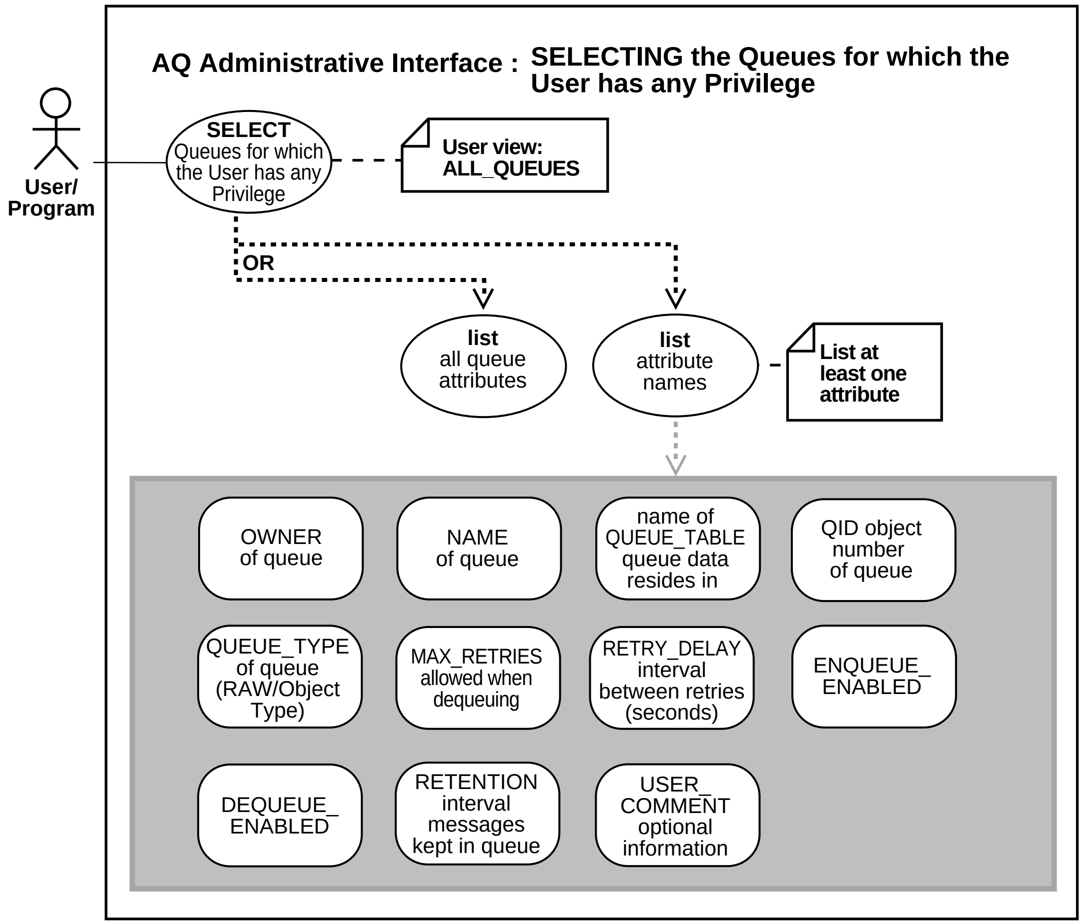
Column Name & Description	Null?	Type
SCHEMA—schema name for the source queue	NOT NULL	VARCHAR2(30)
QNAME—source queue name	NOT NULL	VARCHAR2(30)
DESTINATION—destination name, currently limited to be a DBLINK name	NOT NULL	VARCHAR2(128)
START_DATE—date to start propagation in the default date format	-	DATE
START_TIME—time of day at which to start propagation in HH:MI:SS format	-	VARCHAR2(8)
PROPAGATION_WINDOW—duration in seconds for the propagation window	-	NUMBER
NEXT_TIME—function to compute the start of the next propagation window	-	VARCHAR2(200)
LATENCY—maximum wait time to propagate a message during the propagation window.	-	NUMBER
SCHEDULE_DISABLED—N if enabled Y if disabled and schedule will not be executed	-	VARCHAR(1)
PROCESS_NAME—The name of the SNP background process executing this schedule. NULL if not currently executing	-	VARCHAR2(8)
SESSION_ID—The session ID (SID, SERIAL#) of the job executing this schedule. NULL if not currently executing	-	NUMBER
INSTANCE—The Real Application Clusters instance number executing this schedule	-	NUMBER
LAST_RUN_DATE—The date on the last successful execution	-	DATE
LAST_RUN_TIME—The time of the last successful execution in HH:MI:SS format	-	VARCHAR2(8)
CURRENT_START_DATE—Date at which the current window of this schedule was started	-	DATE

Table 10–5 (Cont.) DBA_QUEUE_SCHEDULES

Column Name & Description	Null?	Type
CURRENT_START_TIME—Time of day at which the current window of this schedule was started in HH:MI:SS format	-	VARCHAR2(8)
NEXT_RUN_DATE—Date at which the next window of this schedule will be started	-	DATE
NEXT_RUN_TIME—Time of day at which the next window of this schedule will be started in HH:MI:SS format	-	VARCHAR2(8)
TOTAL_TIME—Total time in seconds spent in propagating messages from the schedule	-	NUMBER
TOTAL_NUMBER—Total number of messages propagated in this schedule	-	NUMBER
TOTAL_BYTES—Total number of bytes propagated in this schedule	-	NUMBER
MAX_NUMBER—The maximum number of messages propagated in a propagation window	-	NUMBER
MAX_BYTES—The maximum number of bytes propagated in a propagation window	-	NUMBER
AVG_NUMBER—The average number of messages propagated in a propagation window	-	NUMBER
AVG_SIZE—The average size of a propagated message in bytes	-	NUMBER
AVG_TIME—The average time, in seconds, to propagate a message	-	NUMBER
FAILURES—The number of times the execution failed. If 16, the schedule will be disabled	-	NUMBER
LAST_ERROR_DATE—The date of the last unsuccessful execution	-	DATE
LAST_ERROR_TIME—The time of the last unsuccessful execution	-	VARCHAR2(8)
LAST_ERROR_MSG—The error number and error message text of the last unsuccessful execution	-	VARCHAR2(4000)

Selecting Queues for Which User Has Any Privilege

Figure 10–5 Selecting Queues for Which the User Has Any Privilege



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

ALL_QUEUES

Purpose

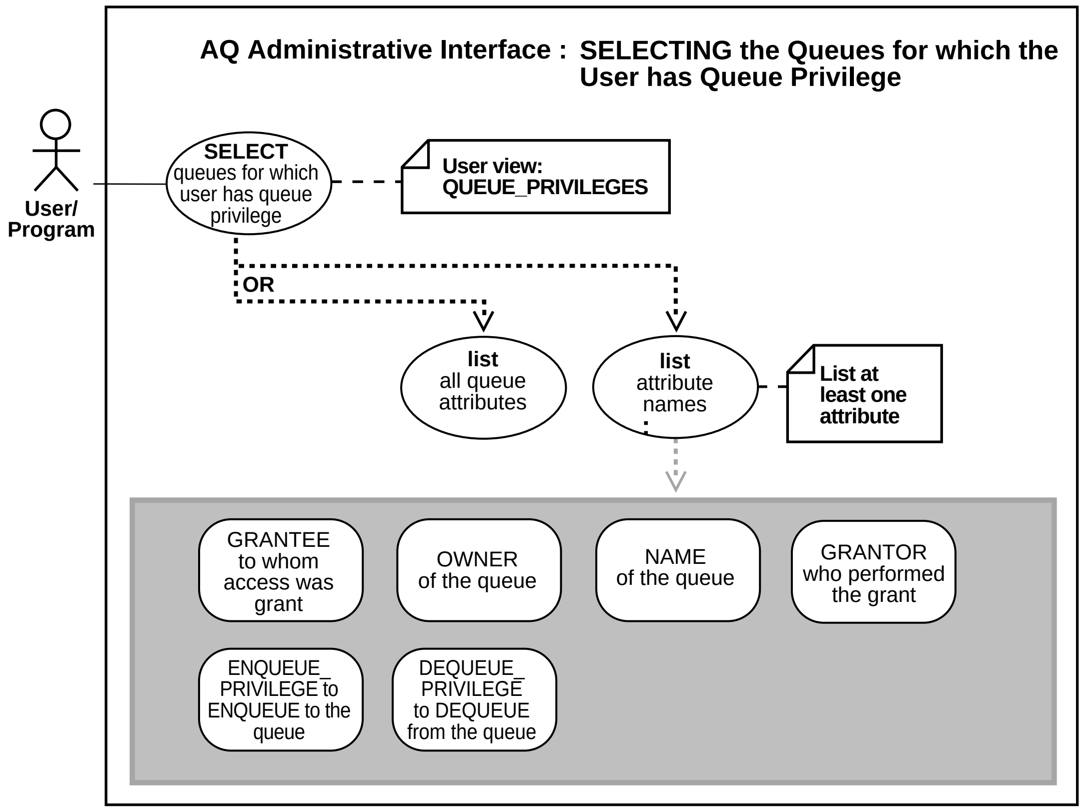
This view describes all queues accessible to the user.

Table 10–6 ALL_QUEUES

Column Name & Description	Null?	Type
OWNER—Owner of the queue	NOT NULL	VARCHAR2(30)
NAME—Name of the queue	NOT NULL	VARCHAR2(30)
QUEUE_TABLE—Name of the table the queue data resides in	NOT NULL	VARCHAR2(30)
QID—Object number of the queue	NOT NULL	NUMBER
QUEUE_TYPE—Type of the queue	-	VARCHAR2(15)
MAX_RETRIES—Maximum number of retries allowed when dequeuing from the queue	-	NUMBER
RETRY_DELAY—Time interval between retries	-	NUMBER
ENQUEUE_ENABLED—Queue is enabled for enqueue	-	VARCHAR2(7)
DEQUEUE_ENABLED—Queue is enabled for dequeue	-	VARCHAR2(7)
RETENTION—Time interval processed messages retained in the queue	-	VARCHAR2(40)
USER_COMMENT—User specified comment	-	VARCHAR2(50)

Selecting Queues for Which User Has Queue Privilege

Figure 10–6 Selecting Queues for Which the User Has Queue Privilege



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

QUEUE_PRIVILEGES

Purpose

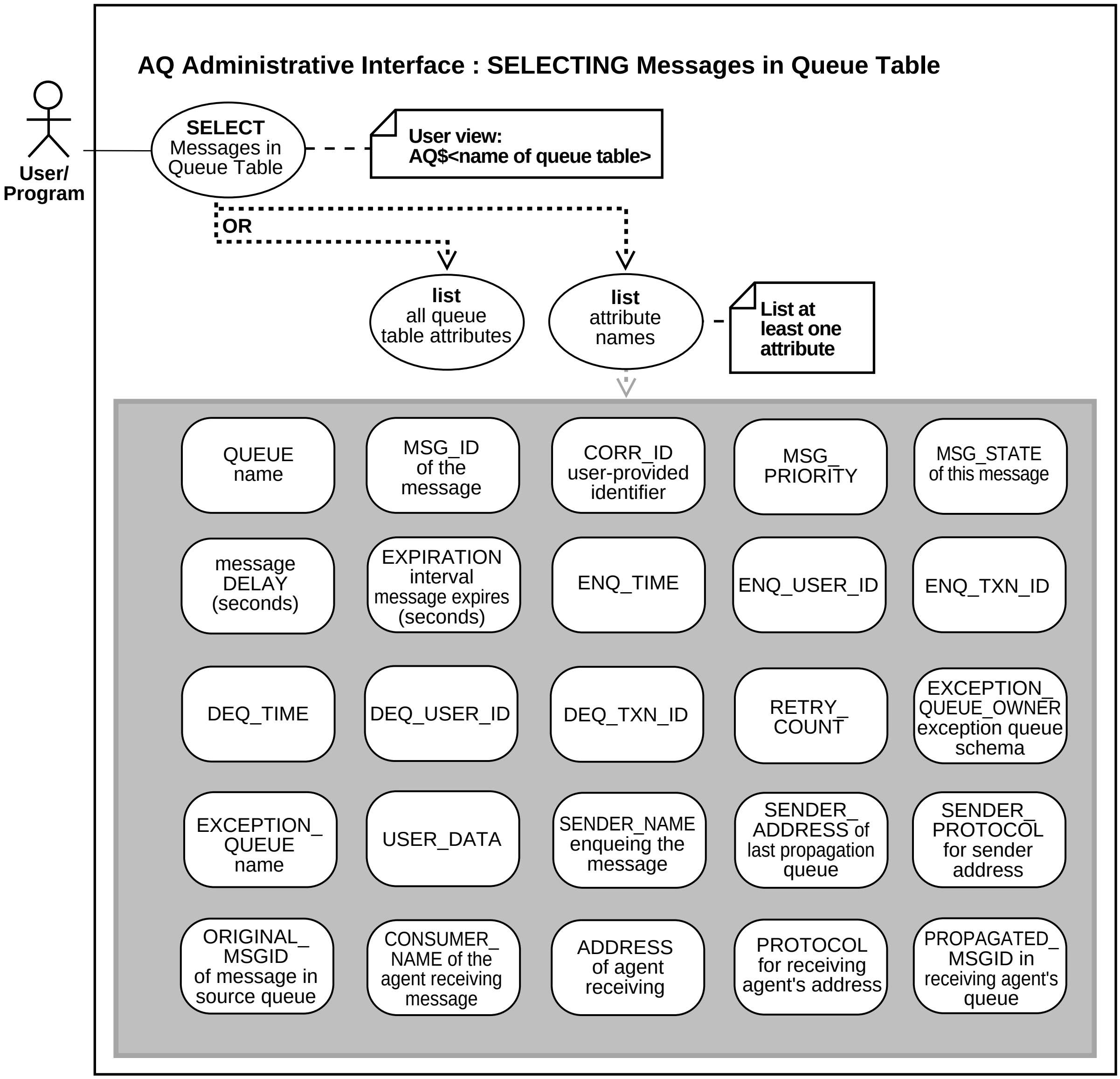
This view describes queues for which the user is the grantor, or grantee, or owner, or an enabled role or the queue is granted to PUBLIC.

Table 10–7 QUEUE_PRIVILEGES

Column Name & Description	Null?	Type
GRANTEE—Name of the user to whom access was granted	NOT NULL	VARCHAR2(30)
OWNER—Owner of the queue	NOT NULL	VARCHAR2(30)
NAME—Name of the queue	NOT NULL	VARCHAR2(30)
GRANTOR—Name of the user who performed the grant	NOT NULL	VARCHAR2(30)
ENQUEUE_PRIVILEGE—Permission to enqueue to the queue	-	NUMBER(1 if granted, 0 if not)
DEQUEUE_PRIVILEGE—Permission to dequeue to the queue	-	NUMBER(1 if granted, 0 if not)

Selecting Messages in Queue Table

Figure 10–7 Selecting Messages in Queue Table



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

Select messages in Queue Table.

Purpose

This view describes the queue table in which message data is stored. This view is automatically created with each queue table and should be used for querying the queue data. The dequeue history data (time, user identification and transaction identification) is only valid for single consumer queues.

Table 10–8 View for Selecting Messages in a Queue Table

Column Name & Description	Null?	Type
QUEUE—queue name	-	VARCHAR2(30)
MSG_ID—unique identifier of the message	-	RAW(16)
CORR_ID—user-provided correlation identifier	-	VARCHAR2(128)
MSG_PRIORITY—message priority	-	NUMBER
MSG_STATE—state of this message	-	VARCHAR2(9)
DELAY—number of seconds the message is delayed	-	DATE
EXPIRATION—number of seconds in which the message will expire after being READY	-	NUMBER
ENQ_TIME— enqueue time	-	DATE
ENQ_USER_ID—enqueue user id	-	NUMBER
ENQ_TXN_ID—enqueue transaction id	NOT NULL	VARCHAR2(30)
DEQ_TIME—dequeue time	-	DATE
DEQ_USER_ID—dequeue user id	-	NUMBER
DEQ_TXN_ID—dequeue transaction id	-	VARCHAR2(30)
RETRY_COUNT—number of retries	-	NUMBER
EXCEPTION_QUEUE_OWNER—exception queue schema	-	VARCHAR2(30)
EXCEPTION_QUEUE—exception queue name	-	VARCHAR2(30)

Table 10–8 (Cont.) View for Selecting Messages in a Queue Table

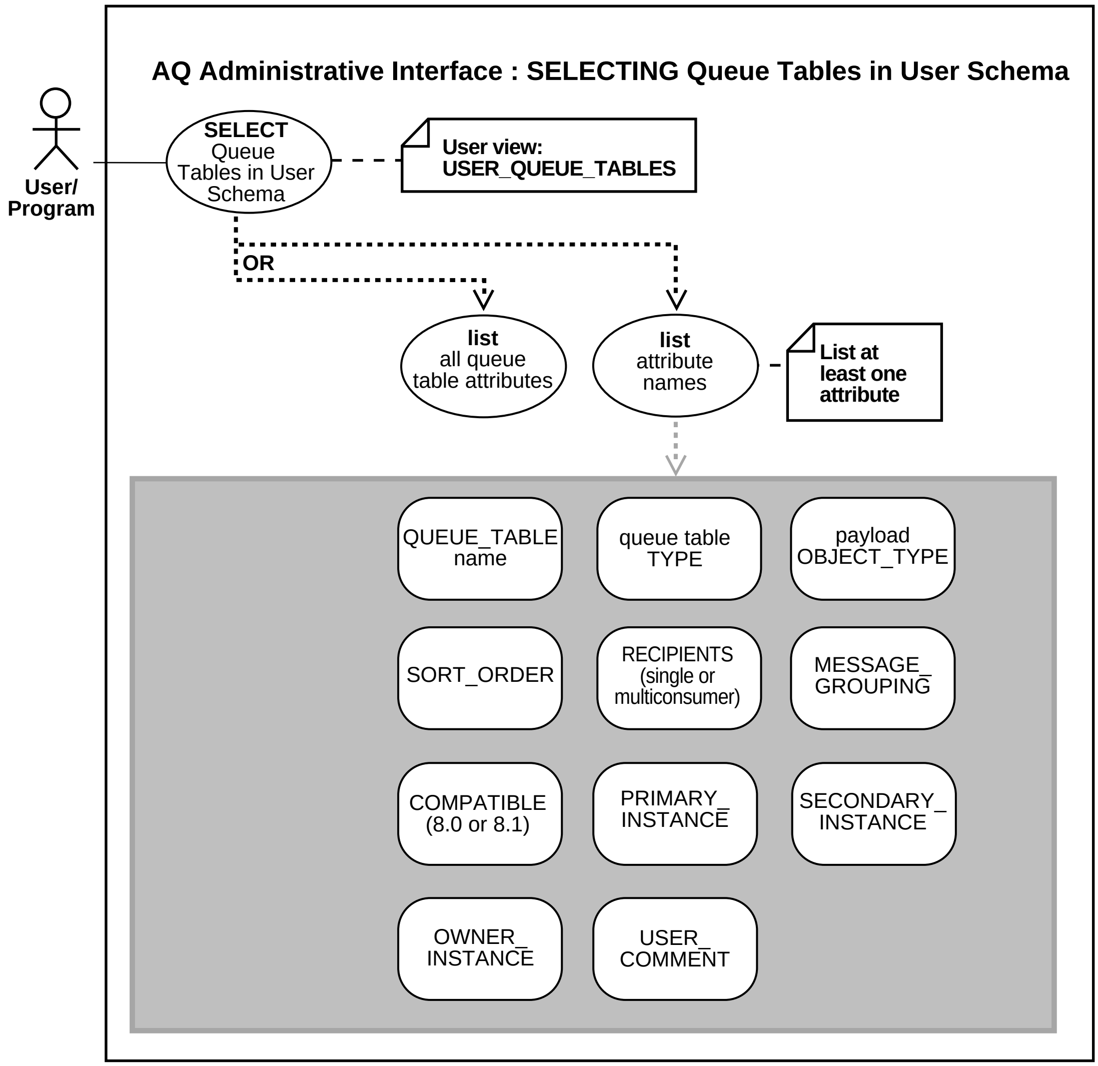
Column Name & Description	Null?	Type
USER_DATA—user data	-	BLOB
SENDER_NAME—name of the Agent enqueuing the message (valid only for 8.1-compatible queue tables)	-	VARCHAR2(30)
SENDER_ADDRESS—queue name and database name of the source (last propagating) queue; the database name is not specified if the source queue is in the local database (valid only for 8.1-compatible queue tables)	-	VARCHAR2(1024)
SENDER_PROTOCOL—protocol for sender address, reserved for future use (valid only for 8.1-compatible queue tables)	-	NUMBER
ORIGINAL_MSGID—message id of the message in the source queue (valid only for 8.1-compatible queue tables)	-	RAW(16)
CONSUMER_NAME—name of the Agent receiving the message (valid ONLY for 8.1-compatible MULTICONSUMER queue tables)	-	VARCHAR2(30)
ADDRESS—address (queue name and database link name) of the agent receiving the message.The database link name is not specified if the address is in the local database. The address is NULL if the receiving agent is local to the queue (valid ONLY for 8.1-compatible multiconsumer queue tables)	-	VARCHAR2(1024)
PROTOCOL—protocol for receiving agent’s address (valid only for 8.1-compatible queue tables)	-	NUMBER
PROPAGATED_MSGID—message id of the message in the receiving agent’s queue (valid only for 8.1-compatible queue tables)	NULL	RAW(16)
ORIGINAL_QUEUE_NAME—name of the queue the message came from	-	-
ORIGINAL_QUEUE_OWNER—owner of the queue the message came from	-	-

Table 10–8 (Cont.) View for Selecting Messages in a Queue Table

Column Name & Description	Null?	Type
EXPIRATION_REASON—the reason the message came into the exception queue. Possible values are TIME_EXPIRATION (message expired after the specified expired time), MAX_RETRY_EXCEEDED (max. retry count was exceeded), and PROPAGATION_FAILURE (message became undeliverable during propagation)	-	-

Selecting Queue Tables in User Schema

Figure 10–8 Selecting Queue Tables in User Schema



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

USER_QUEUE_TABLES

Syntax

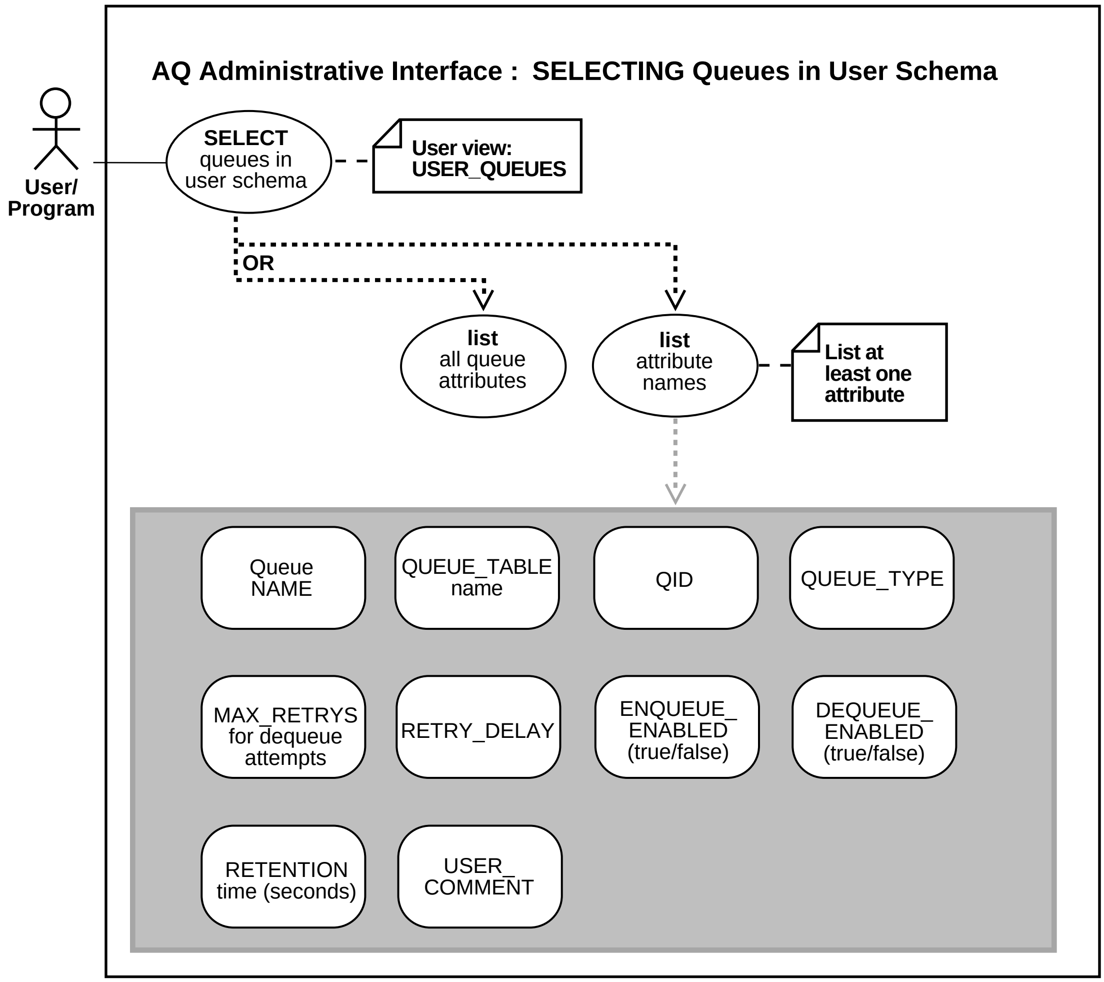
This view is the same as DBA_QUEUE_TABLES with the exception that it only shows queue tables in the user's schema. It does not contain a column for OWNER.

Table 10–9 USER_QUEUE_TABLES

Column Name & Description	Null?	Type
QUEUE_TABLE—queue table name	-	VARCHAR2(30)
TYPE—payload type	-	VARCHAR2(7)
OBJECT_TYPE—name of object type, if any	-	VARCHAR2(61)
SORT_ORDER—user specified sort order	-	VARCHAR2(22)
RECIPIENTS—SINGLE or MULTIPLE	-	VARCHAR2(8)
MESSAGE_GROUPING—NONE or TRANSACTIONAL	-	VARCHAR2(13)
COMPATIBLE—indicates the lowest version with which the queue table is compatible	-	VARCHAR2(5)
PRIMARY_INSTANCE—indicates which instance is the primary owner of the queue table; a value of 0 indicates that there is no primary owner	-	NUMBER
SECONDARY_INSTANCE—indicates which owner is the secondary owner of the queue table; this instance becomes the owner of the queue table if the primary owner is not up; a value of 0 indicates that there is no secondary owner	-	NUMBER
OWNER_INSTANCE—indicates which instance currently owns the queue table	-	NUMBER
USER_COMMENT—user comment for the queue table	-	VARCHAR2(50)

Selecting Queues In User Schema

Figure 10–9 Selecting Queues in User Schema



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

USER_QUEUES

Purpose

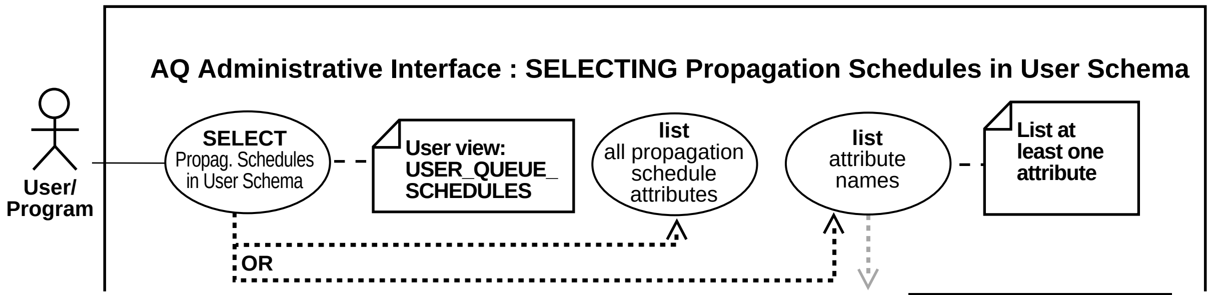
This view is the same as DBA_QUEUES with the exception that it only shows queues in the user's schema.

Table 10–10 USER_QUEUES

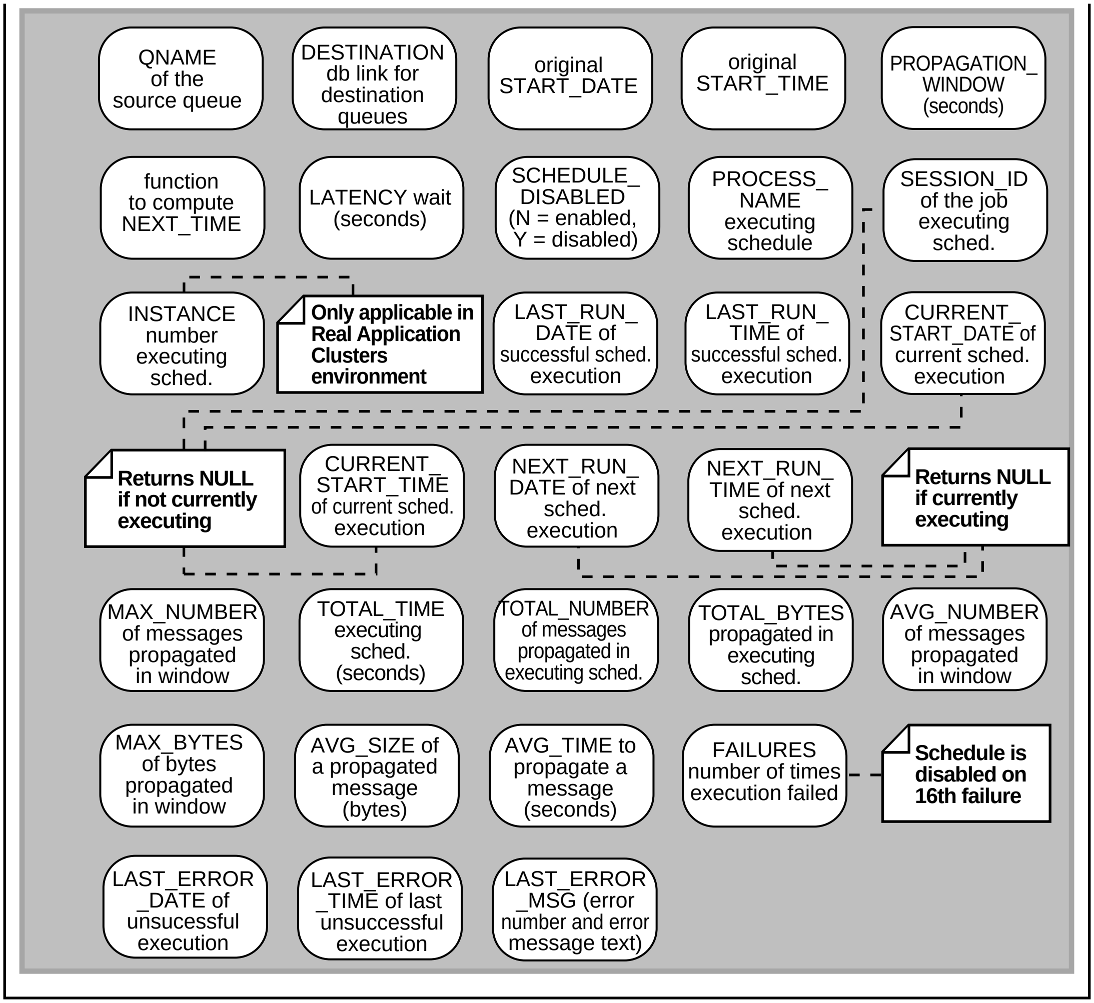
Column Name & Description	Null?	Type
NAME—queue name	NOT NULL	VARCHAR2(30)
QUEUE_TABLE—queue table where this queue resides	NOT NULL	VARCHAR2(30)
QID—unique queue identifier	NOT NULL	NUMBER
QUEUE_TYPE—queue type	-	VARCHAR2(15)
MAX_RETRIES—number of dequeue attempts allowed	-	NUMBER
RETRY_DELAY—number of seconds before retry can be attempted	-	NUMBER
ENQUEUE_ENABLED—YES / NO	-	VARCHAR2(7)
DEQUEUE_ENABLED—YES / NO	-	VARCHAR2(7)
RETENTION—number of seconds message is retained after dequeue	-	VARCHAR2(40)
USER_COMMENT—user comment for the queue	-	VARCHAR2(50)

Selecting Propagation Schedules in User Schema

Figure 10–10 Selecting Propagation Schedules in User Schema



continued on next page



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

USER_QUEUE_SCHEDULES

Purpose

Table 10–11 USER_QUEUE_SCHEDULES

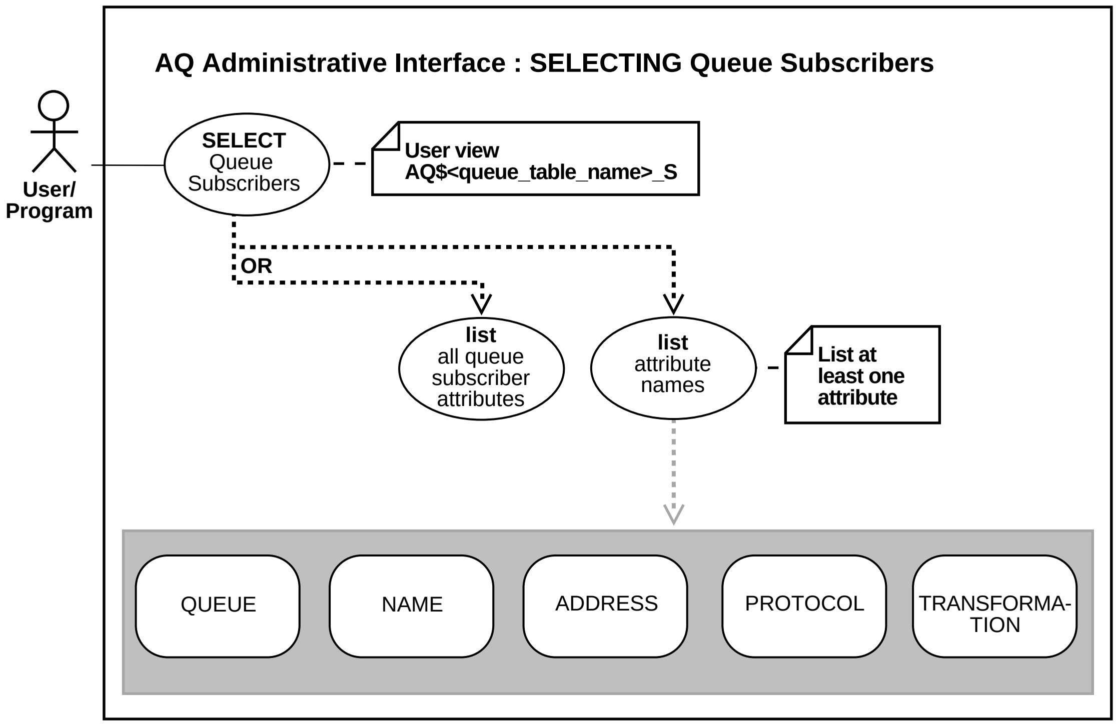
Column Name & Description	Null?	Type
QNAME—source queue name	NOT NULL	VARCHAR2(30)
DESTINATION—destination name, currently limited to be a DBLINK name	NOT NULL	VARCHAR2(128)
START_DATE—date to start propagation in the default date format	-	DATE
START_TIME—time of day at which to start propagation in HH:MI:SS format	-	VARCHAR2(8)
PROPAGATION_WINDOW—duration in seconds for the propagation window	-	NUMBER
NEXT_TIME—function to compute the start of the next propagation window	-	VARCHAR2(200)
LATENCY—maximum wait time to propagate a message during the propagation window.	-	NUMBER
SCHEDULE_DISABLED—N if enabled Y if disabled and schedule will not be executed	-	VARCHAR(1)
PROCESS_NAME—The name of the SNP background process executing this schedule. NULL if not currently executing	-	VARCHAR2(8)
SESSION_ID—The session ID (SID, SERIAL#) of the job executing this schedule. NULL if not currently executing	-	VARCHAR2(82)
INSTANCE—The Real Application Clusters instance number executing this schedule	-	NUMBER
LAST_RUN_DATE—The date on the last successful execution	-	DATE
LAST_RUN_TIME—The time of the last successful execution in HH:MI:SS format	-	VARCHAR2(8)
CURRENT_START_DATE—Date at which the current window of this schedule was started	-	DATE
CURRENT_START_TIME—Time of day at which the current window of this schedule was started in HH:MI:SS format	-	VARCHAR2(8)

Table 10–11 (Cont.) USER_QUEUE_SCHEDULES

Column Name & Description	Null?	Type
NEXT_RUN_DATE—Date at which the next window of this schedule will be started	-	DATE
NEXT_RUN_TIME—Time of day at which the next window of this schedule will be started in HH:MI:SS format	-	VARCHAR2(8)
TOTAL_TIME—Total time in seconds spent in propagating messages from the schedule	-	NUMBER
TOTAL_NUMBER—Total number of messages propagated in this schedule	-	NUMBER
TOTAL_BYTES—Total number of bytes propagated in this schedule	-	NUMBER
MAX_NUMBER—The maximum number of messages propagated in a propagation window	-	NUMBER
MAX_BYTES—The maximum number of bytes propagated in a propagation window	-	NUMBER
AVG_NUMBER—The average number of messages propagated in a propagation window	-	NUMBER
AVG_SIZE—The average size of a propagated message in bytes	-	NUMBER
AVG_TIME—The average time, in seconds, to propagate a message	-	NUMBER
FAILURES—The number of times the execution failed. If 16, the schedule will be disabled	-	NUMBER
LAST_ERROR_DATE—The date of the last unsuccessful execution	-	DATE
LAST_ERROR_TIME—The time of the last unsuccessful execution	-	VARCHAR2(8)
LAST_ERROR_MSG—The error number and error message text of the last unsuccessful execution	-	VARCHAR2(4000)

Selecting Queue Subscribers

Figure 10–11 Selecting Queue Subscribers



> **See Also:** Table 10–1 for a list of views in the adminstrative interface

Name of View

`AQ$<queue_table_name>_S`

Purpose

This is a view of all the subscribers for all the queues in any given queue table. This view is generated when the queue table is created and is called `aq$<queue_table_name>_s`. This view is used to query subscribers for any or all the queues in this queue table. Note that this view is only created for 8.1-compatible queue tables. This view also displays the transformation for the subscriber if it was created with one.

Table 10–12 AQ$<queue_table_name>_S

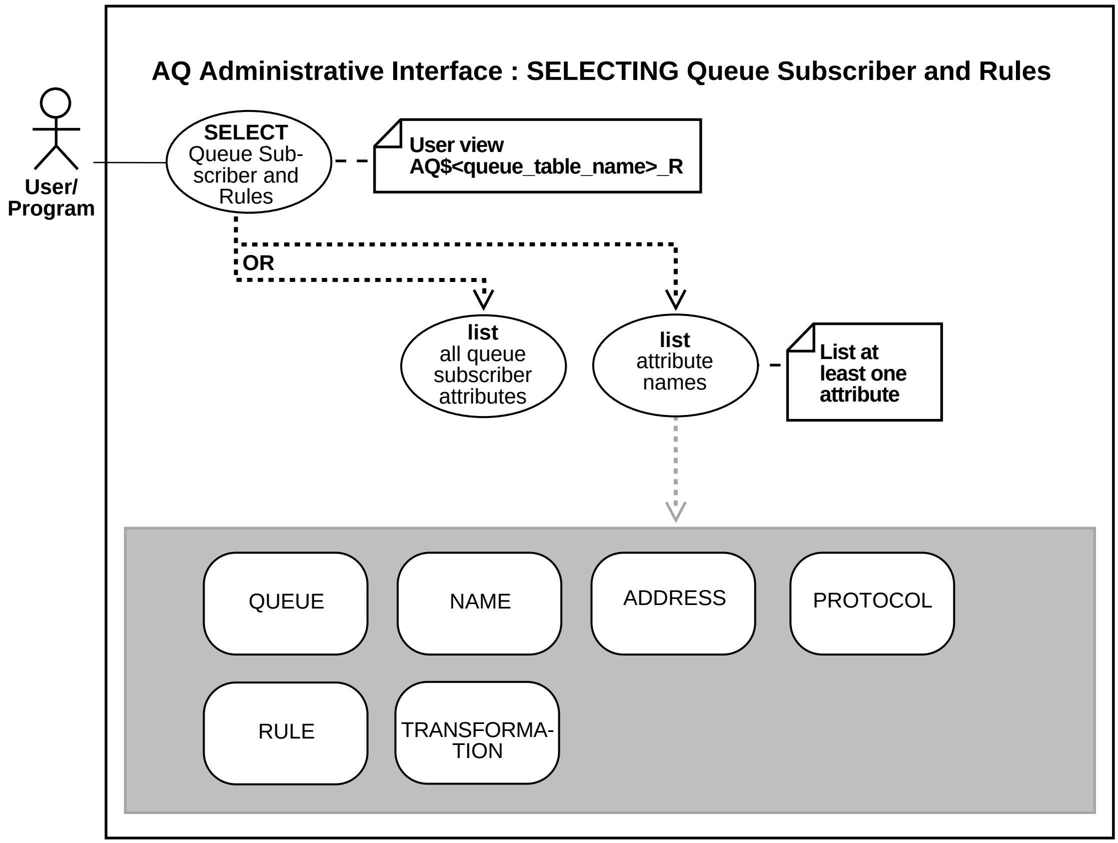
Column Name & Description	Null?	Type
`QUEUE`—name of Queue for which subscriber is defined	`NOT NULL`	`VARCHAR2(30)`
`NAME`—name of Agent	-	`VARCHAR2(30)`
`ADDRESS`—address of Agent	-	`VARCHAR2(1024)`
`PROTOCOL`—protocol of Agent	-	`NUMBER`
`TRANSFORMATION`—the name of the transformation can be null	-	`VARCHAR2(61)`

Usage Notes

For queues created in 8.1-compatible queue tables, this view provides functionality that is equivalent to the `dbms_aqadm.queue_subscribers()` procedure. For these queues, it is recommended that the view be used instead of this procedure to view queue subscribers.

Selecting Queue Subscribers and Their Rules

Figure 10–12 Selecting Queue Subscribers and their Rules



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

`AQ$<queue_table_name>_R`

Purpose

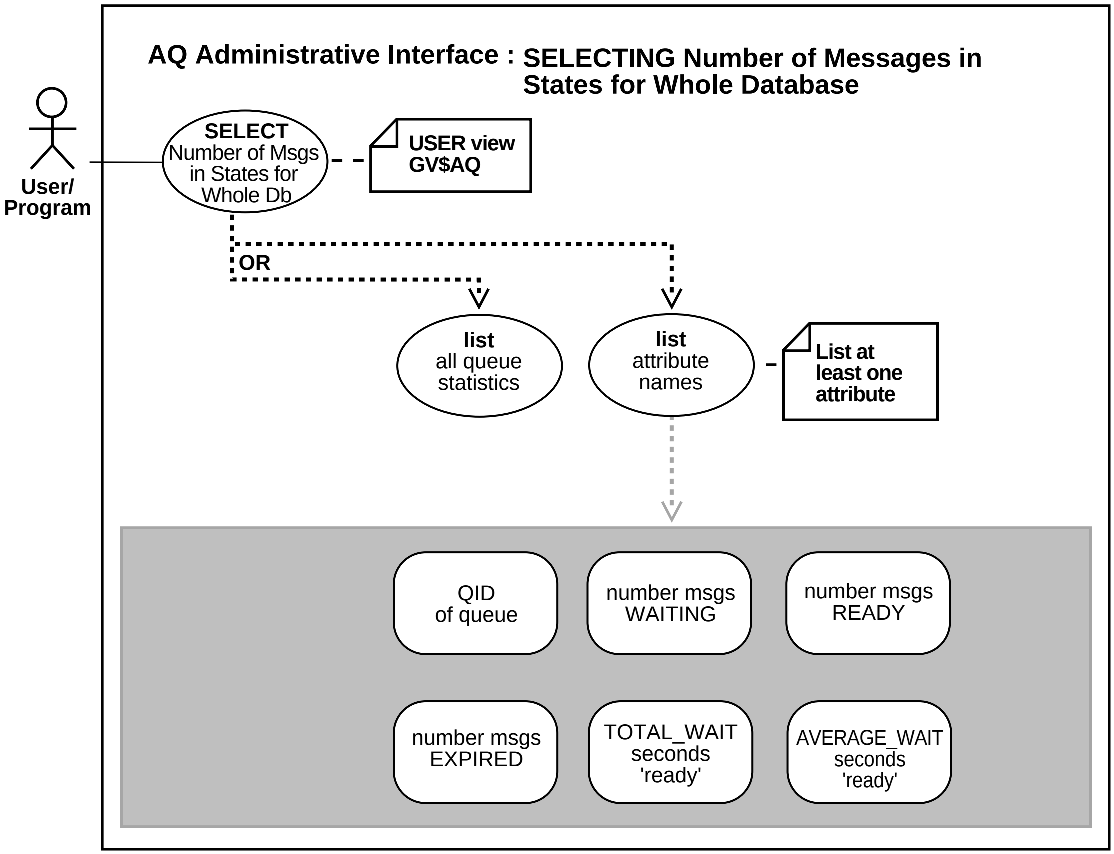
This view displays only the rule based subscribers for all queues in a given queue table including the text of the rule defined by each subscriber. This is a view of subscribers with rules defined on any queues of a given queue table. This view is generated when the queue table is created and is called aq$<queue_table_name>_r. It is used to query subscribers for any or all the queues in this queue table. Note that this view is only created for 8.1-compatible queue tables. The view will also display the transformation for the subscriber if one was specified.

Table 10–13 AQ$<queue_table_name>_R

Column Name & Description	Null?	Type
QUEUE—name of Queue for which subscriber is defined	NOT NULL	VARCHAR2(30)
NAME—name of Agent	-	VARCHAR2(30)
ADDRESS—address of Agent	-	VARCHAR2(1024)
PROTOCOL—protocol of Agent	-	NUMBER
RULE—text of defined rule	-	VARCHAR2(30)
TRANSFORMATION—name of transformation specified, can be null	-	VARCHAR2(61)

Selecting the Number of Messages in Different States for the Whole Database

Figure 10–13 Selecting the Number of Messages in Different States for the Whole Database



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

GV$AQ

Purpose

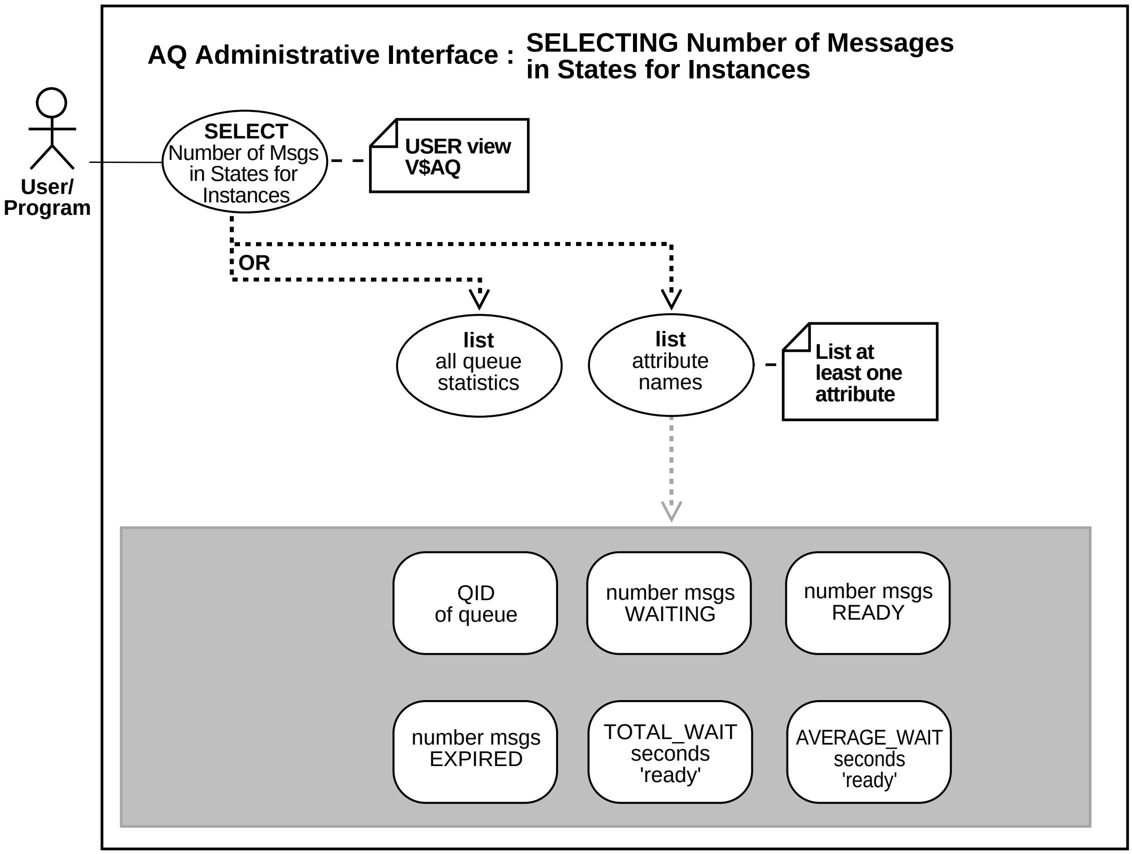
Provides information about the number of messages in different states for the whole database.

Table 10–14 AQ$<queue_table_name>_R

Column Name & Description	Null?	Type
QID—the identity of the queue. This is the same as the qid in user_queues and dba_queues.	-	NUMBER
WAITING—the number of messages in the state 'WAITING'.	-	NUMBER
READY—the number of messages in state 'READY'.	-	NUMBER
EXPIRED—the number of messages in state 'EXPIRED'.	-	NUMBER
TOTAL_WAIT—the number of seconds for which messages in the queue have been waiting in state 'READY'	-	NUMBER
AVERAGE_WAIT—the average number of seconds a message in state 'READY' has been waiting to be dequeued.	-	NUMBER

Selecting the Number of Messages in Different States for Specific Instances

Figure 10–14 Selecting the Number of Messages in Different States for Specific Instances



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

V$AQ

Purpose

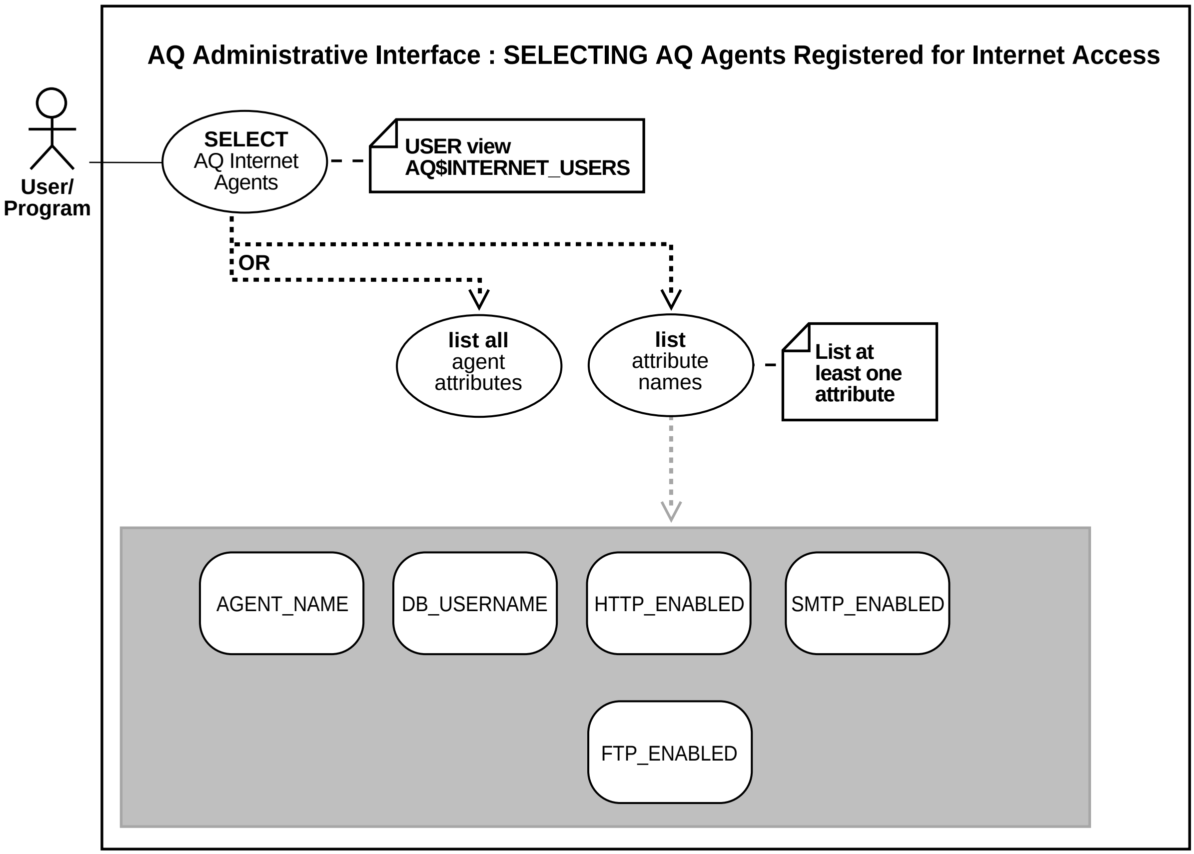
Provides information about the number of messages in different states for specific instances.

Table 10–15 AQ$<queue_table_name>_R

Column Name & Description	Null?	Type
QID — the identity of the queue. This is the same as the qid in user_queues and dba_queues.	-	NUMBER
WAITING — the number of messages in the state 'WAITING'.	-	NUMBER
READY — the number of messages in state 'READY'.	-	NUMBER
EXPIRED — the number of messages in state 'EXPIRED'.	-	NUMBER
TOTAL_WAIT — the number of seconds for which messages in the queue have been waiting in state 'READY'	-	NUMBER
AVERAGE_WAIT — the average number of seconds a message in state 'READY' has been waiting to be dequeued.	-	NUMBER

Selecting the AQ Agents Registered for Internet Access

Figure 10–15 Selecting the AQ Agents Registered for Internet Access



See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

AQ$INTERNET_USERS

Purpose

Provides information about the agents registered for Internet access to AQ. It also provides the list of database users that each Internet agent maps to.

Table 10–16 AQ$INTERNET_USERS

Column Name & Description	Null?	Type
AGENT_NAME—the name of the AQ Internet agent	NOT NULL	VARCHAR2(30)
DB_USERNAME—the name of the database user that this Internet agent maps to	NOT NULL	VARCHAR2(30)
HTTP_ENABLED—indicates whether this agent is allowed to access AQ through HTTP. Has a value of YES or NO	-	VARCHAR2(4)
SMTP_ENABLED—indicates whether this agent is allowed to access AQ through SMTP. Has a value of YES or NO	-	VARCHAR2(4)
FTP_ENABLED—indicates whether this agent is allowed to access AQ through FTP. Always has a value of NO in current release	-	VARCHAR2(4)

Selecting User Transformations

See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

USER_TRANSFORMATIONS

Purpose

This view displays all the transformations owned by the user. To view the transformation definition, query USER_ATTRIBUTE_TRANSFORMATIONS.

Table 10–17 USER_TRANSFORMATIONS

Column Name & Description	Null?	Type
TRANSFORMATION_ID—unique id for the transformation	-	NUMBER
NAME—transformation name	-	VARCHAR2(30)

Table 10–17 USER_TRANSFORMATIONS

Column Name & Description	Null?	Type
FROM_TYPE—source type name	-	VARCHAR2(61)
TO_TYPE—target type name	-	VARCHAR2(61)

Selecting User Transformation Functions

See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

USER_ATTRIBUTE_TRANSFORMATIONS

Purpose

This view displays the transformation functions for all the transformations of the user.

Table 10–18 USER_ATTRIBUTE_TRANSFORMATIONS

Column Name & Description	Null?	Type
TRANSFORMATION_ID—unique id of the transformation	-	NUMBER
NAME—transformation name	-	VARCHAR2(30)
FROM_TYPE—source type name	-	VARCHAR2(61)
TO_TYPE— target type name	-	VARCHAR2(61)
ATTRIBUTE—target type attribute number	-	NUMBER
ATRIBUTE_ TRANSFORMATION—transformation function for the attribute	-	VARCHAR2(4000)

Selecting All Transformations

See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

DBA_TRANSFORMATIONS

Purpose

This view displays all the transformations in the database. These transformations can be specified with Advanced Queue operations like enqueue, dequeue and subscribe to automatically integrate transformations in AQ messaging. This view is accessible only to users having DBA privileges.

Table 10–19 DBA_TRANSFORMATIONS

Column Name & Description	Null?	Type
TRANSFORMATION_ID—unique identifier for the transformation	-	NUMBER
OWNER—owning user of the transformation	-	VARCHAR2(30)
NAME— transformation name	-	VARCHAR2(30)
FROM_TYPE—source type name	-	VARCHAR2(61)
TO_TYPE—target type name	-	VARCHAR2(61)
Namespace—one for transformations created by the Oracle transformation engine. Transformations from third party-transformation engines are in different namespaces.	-	-
From_type_schema—owning user of the source type	-	-
From_type_name—source type of the transformation	-	-
To_type_Schema—owning user of the destination type	-	-
To_type_name—destination type of the transformation. The transformation takes an object of the source type and returns an object of the destination type.	-	-
Transformation_type—type of the transformation. Values: SQL and XSL	-	-
Attribute_Name—attribute name of the destination type for which the transformation is being specified.	-	-

Table 10–19 DBA_TRANSFORMATIONS

Column Name & Description	Null?	Type
Transformation_Expression—canbeaSQL expression, P/LSQL function, or an XSL document	-	-
Comment—user-specified comment.	-	-

Selecting All Transformation Functions

See Also: Table 10–1 for a list of views in the adminstrative interface

Name of View

DBA_ATTRIBUTE_TRANSFORMATIONS

Purpose

This view displays the transformation functions for all the transformations in the database.

Table 10–20 DBA_ATTRIBUTE_TRANSFORMATIONS

Column Name & Description	Null?	Type
TRANSFORMATION_ID—unique id of the transformation	-	NUMBER
OWNER— transformation owner	-	VARCHAR2(30)
NAME—transformation name	-	VARCHAR2(30)
FROM_TYPE— source type name	-	VARCHAR2(61)
TO_TYPE— target type name	-	VARCHAR2(61)
ATTRIBUTE— target type attribute number	-	NUMBER
ATRIBUTE_ TRANSFORMATION—transformation function for the attribute	-	VARCHAR2(4000)

11

Operational Interface: Basic Operations

In this chapter we describe the operational interface to Oracle Advanced Queuing in terms of use cases. That is, we discuss each operation (such as "Enqueue a Message") as a use case by that name. The table listing all the use cases is provided at the head of the chapter (see "Use Case Model: Operational Interface — Basic Operations" on page 11-2).

A summary figure, "Use Case Diagram: Operational Interface — Basic Operations", locates all the use cases in a single drawing. If you are using the HTML version of this document, you can use this figure to navigate to the use case in which you are interested by clicking on the relevant use case title.

Each use case is laid out as follows:

- ***Use case figure***. A figure that depicts the use case.
- ***Purpose***. The purpose of this use case.
- ***Usage Notes.*** Guidelines to assist implementation.
- ***Syntax***. The main syntax used to perform this activity.
- ***Examples***. Examples in each programmatic environment which illustrate the use case.

Use Case Model: Operational Interface — Basic Operations

Table 11–1, " Use Case Model: Operational Interface" indicates with a **+** where examples are provided for specific use cases and in which programmatic environment.

The table refers to programmatic environments with the following abbreviations:

- **P** — PL/SQL using the DBMS_AQADM and DBMS_AQ packages
- **O** — C using OCI (Oracle Call Interface)
- **V** — Visual Basic using OO4O (Oracle Objects for OLE)
- **J** — Java (native AQ) using JDBC (Java Database Connectivity)
- **JM** — Java (JMS standard) using JDBC (Java Database Connectivity)

Table 11–1 Use Case Model: Operational Interface

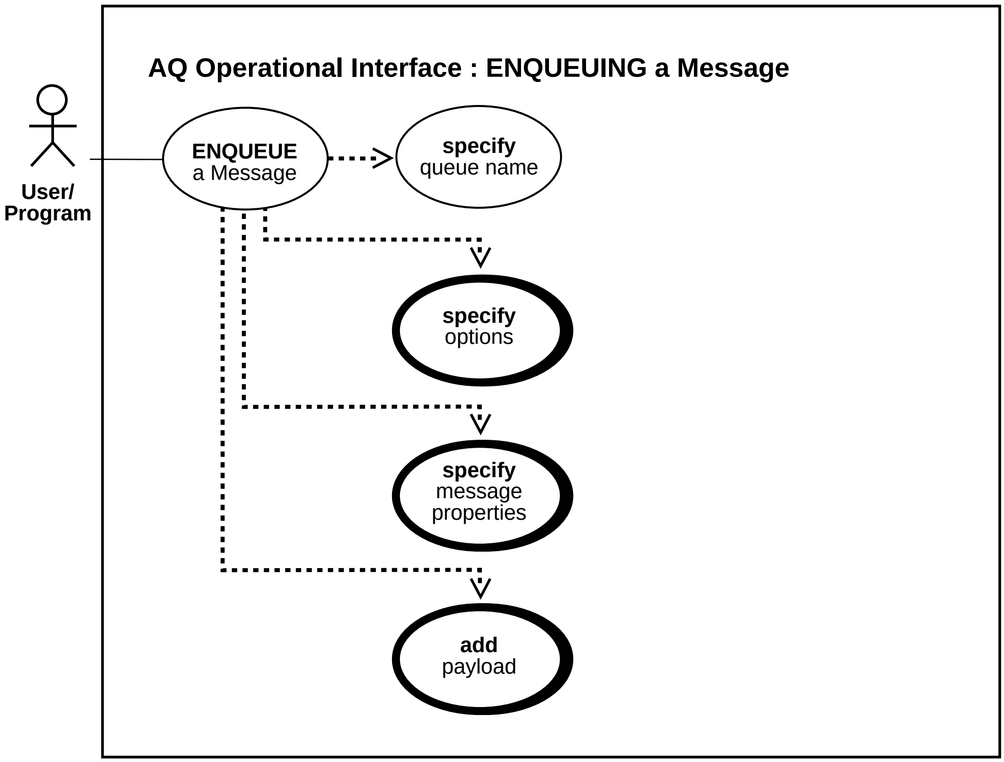
Use Case	P	O	V	J	JM
Enqueuing a Message on page 11-4	-	-	-	-	-
Enqueuing a Message [Specify Options] on page 11-6	+	-	+	-	+
Enqueuing a Message [Specify Message Properties] on page 11-9	+	-	+	-	+
Enqueuing a Message [Specify Message Properties [Specify Sender ID]] on page 11-12	+	-	+	-	+
Enqueuing a Message [Add Payload] on page 11-14	+	-	+	-	+
Listening to One or More Single-Consumer Queues on page 11-23	+	+	+	-	-
Listening to One or More Multiconsumer Queues on page 11-35	+	+	+	-	-
Dequeuing a Message on page 11-44	-	-	-	-	-
Dequeuing a Message from a Single-Consumer Queue [SpecifyOptions] on page 11-47	+	-	+	-	+
Dequeuing a Message from a Multiconsumer Queue [Specify Options] on page 11-52	+	-	+	-	+
Registering for Notification on page 11-55	-	-	-	-	-
Registering for Notification [Specifying Subscription Name—Single-Consumer Queue] on page 11-58	-	+	-	-	-
Registering for Notification [Specifying Subscription Name—Multiconsumer Queue] on page 11-59	-	+	-	-	-

Table 11–1 (Cont.) Use Case Model: Operational Interface

Use Case	P	O	V	J	JM
Posting for Subscriber Notification on page 11-66	+	+	-	-	-
Adding an Agent to the LDAP Server on page 11-69	-	-	-	-	-
Removing an Agent from the LDAP Server on page 11-71	-	-	-	-	-

Enqueuing a Message

Figure 11–1 Enqueuing a Message



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Enqueuing a Message [Specify Options]" on page 11-6
- "Enqueuing a Message [Specify Message Properties]" on page 11-9
- "Enqueuing a Message [Specify Message Properties [Specify Sender ID]]" on page 11-12
- "Enqueuing a Message [Add Payload]" on page 11-14

Purpose

Adds a message to the specified queue.

Usage Notes

If a message is enqueued to a multiconsumer queue with no recipient and the queue has no subscribers (or rule-based subscribers that match this message), then the Oracle error ORA 24033 is raised. This is a warning that the message will be discarded since there are no recipients or subscribers to whom it can be delivered.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): *Oracle9i Supplied PL/SQL Packages and Types Reference* DBMS_AQ, ENQUEUE procedure
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*,oracle.jms, AQOracleQueue.enque

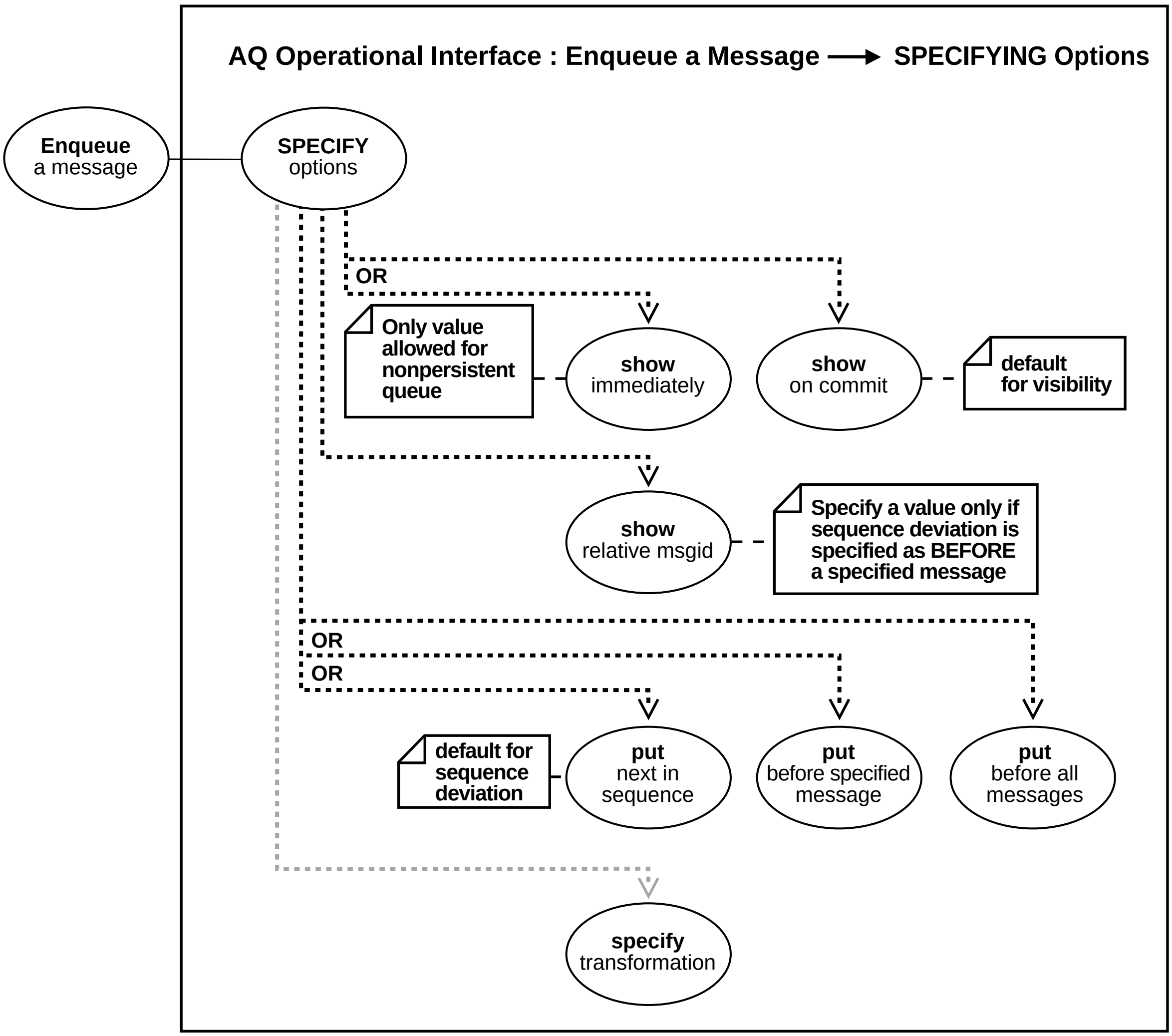
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples in the following programmatic environments are provided:

- PL/SQL (DBMS_AQ Package): Enqueue of Object Type Messages on page 11-16
- Java (JDBC): Enqueue a message (add payload) on page 11-18
- Visual Basic (OO4O): Enqueue a message on page 11-21

Enqueuing a Message [Specify Options]

Figure 11–2 Enqueuing a Message [Specify Options]



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Enqueuing a Message" on page 11-4
- "Enqueuing a Message [Specify Message Properties]" on page 11-9
- "Enqueuing a Message [Specify Message Properties [Specify Sender ID]]" on page 11-12
- "Enqueuing a Message [Add Payload]" on page 11-14

Purpose

To specify the options available for the enqueue operation.

Usage Notes

Do not use the `immediate` option when you want to use LOB locators since LOB locators are valid only for the duration of the transaction. As the `immediate` option automatically commits the transaction, your locator will not be valid.

- The `sequence deviation` parameter in enqueue options can be used to change the order of processing between two messages. The identity of the other message, if any, is specified by the enqueue options parameter relative msgid. The relationship is identified by the `sequence deviation` parameter.

  Specifying `sequence deviation` for a message introduces some restrictions for the delay and priority values that can be specified for this message. The delay of this message has to be less than or equal to the delay of the message before which this message is to be enqueued. The priority of this message has to be greater than or equal to the priority of the message before which this message is to be enqueued.
- The visibility option must be immediate for non-persistent queues.
- Only local recipients are supported are supported for non-persistent queues.
- If a transformation is specified, it will be applied to the message before enqueuing it to the queue. The transformation must map the message into an object whose type is the ADT type of the queue.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): *Oracle9i Supplied PL/SQL Packages and Types Reference* DBMS_AQ, ENQUEUE Procedure
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*,oracle.jms, AQ Enqueue Option

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples in the following programmatic environments are provided:

- PL/SQL (DBMS_AQ Package): Enqueue of Object Type Messages on page 11-16
- Java (JDBC): Enqueue a message (add payload) on page 11-18
- Visual Basic (OO4O): Enqueue a message on page 11-21

Enqueuing a Message [Specify Message Properties]

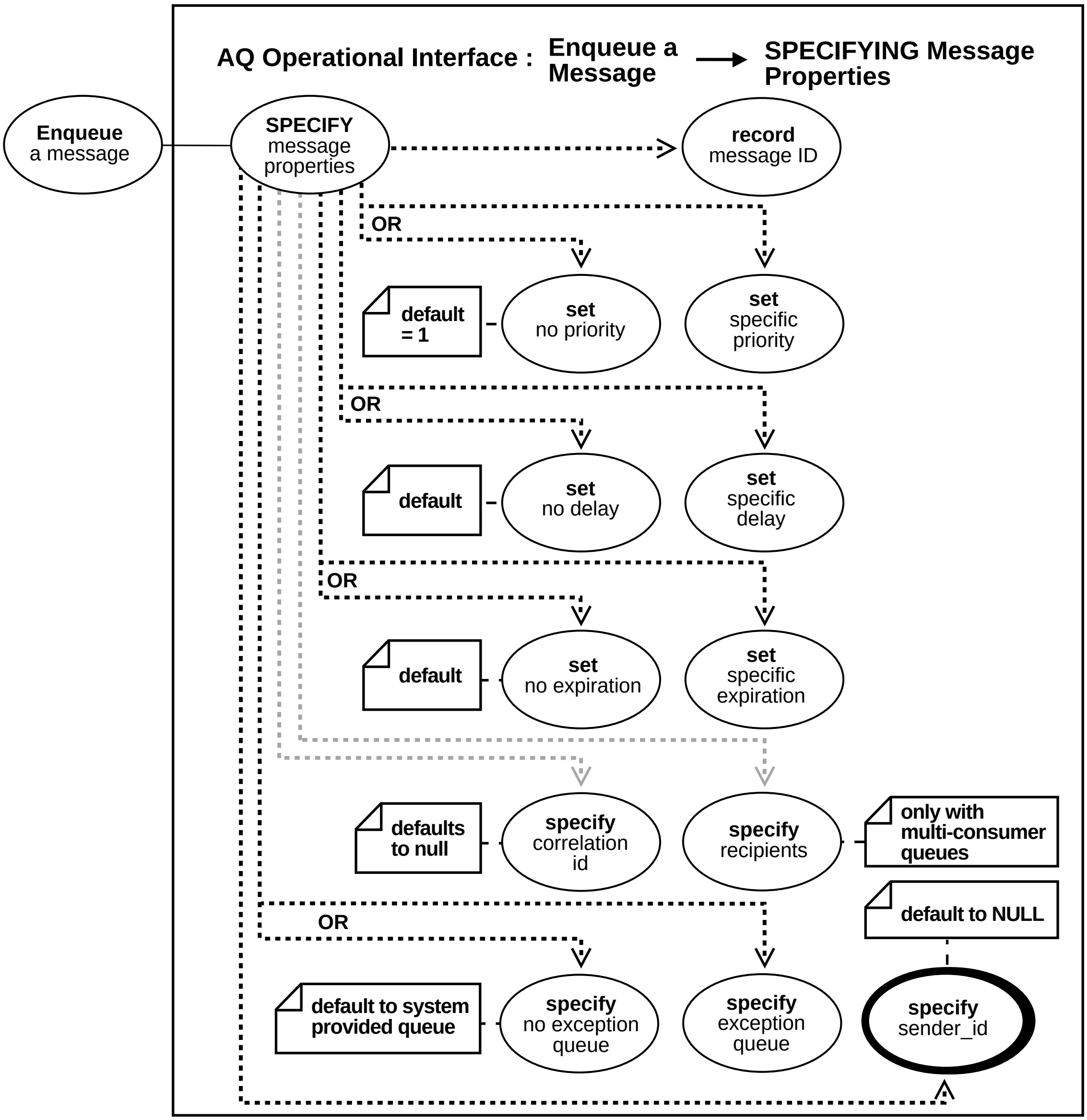


Figure 11–3 Enqueuing a Message [Specify Message Properties]

See Also:

- Table 11–1 for a list of operational interface basic operations
- "Enqueuing a Message" on page 11-4
- "Enqueuing a Message [Specify Options]" on page 11-6
- "Enqueuing a Message [Specify Message Properties [Specify Sender ID]]" on page 11-12
- "Enqueuing a Message [Add Payload]" on page 11-14

Purpose

The *Message Properties* describe the information that is used by AQ to manage individual messages. These are set at enqueue time and their values are returned at dequeue time.

Usage Notes

- To view messages in a waiting or processed state, you can either dequeue or browse by message ID, or use SELECT statements.
- Message delay and expiration are enforced by the queue monitor (QMN) background processes. You should remember to start the QMN processes for the database if you intend to use the delay and expiration features of AQ.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): *Oracle9i Supplied PL/SQL Packages and Types Reference* DBMS_AQ, ENQUEUE procedure
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*,oracle.jms, AQMessageProperty

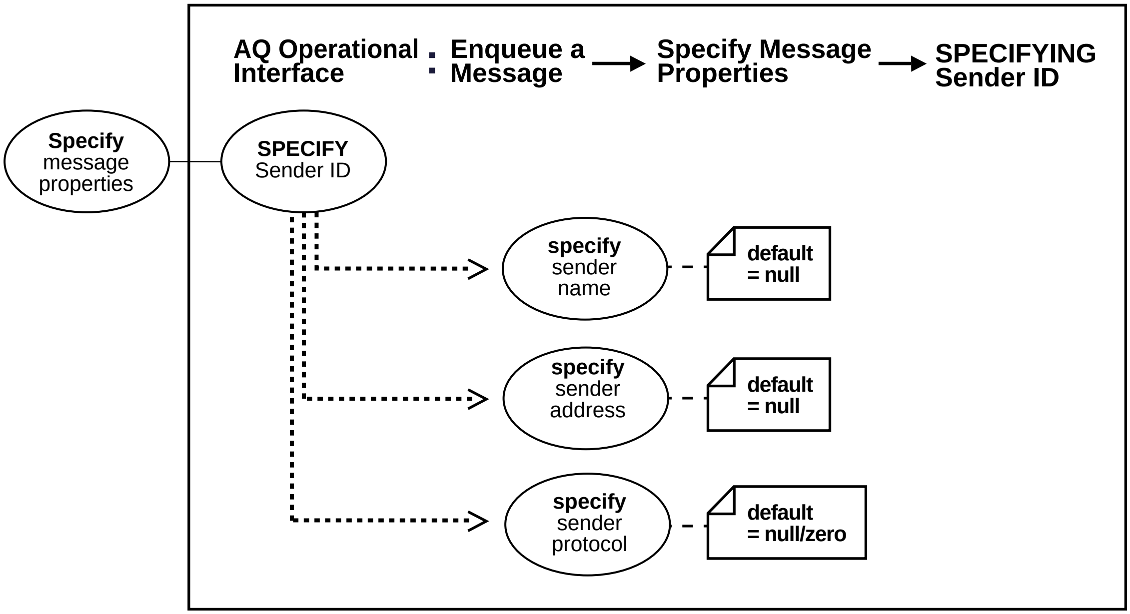
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples in the following programmatic environments are provided:

- PL/SQL (DBMS_AQ Package): Enqueue of Object Type Messages on page 11-16
- Java (JDBC): Enqueue a message (add payload) on page 11-18
- Visual Basic (OO4O): Enqueue a message on page 11-21

Enqueuing a Message [Specify Message Properties [Specify Sender ID]]

Figure 11–4 Enqueuing a Message [Specify Message Properties [Specify Sender ID]]



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Enqueuing a Message" on page 11-4
- "Enqueuing a Message [Specify Options]" on page 11-6
- "Enqueuing a Message [Specify Message Properties]" on page 11-9
- "Enqueuing a Message [Add Payload]" on page 11-14

Purpose

To identify the sender (producer) of a message.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): *Oracle9i Supplied PL/SQL Packages and Types Reference* DBMS_AQ, ENQUEUE procedure
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*,oracle.jms, AQMessageProperty.setsender

For more information about Agent see:

- "Agent Type (aq$_agent)" on page 2-3

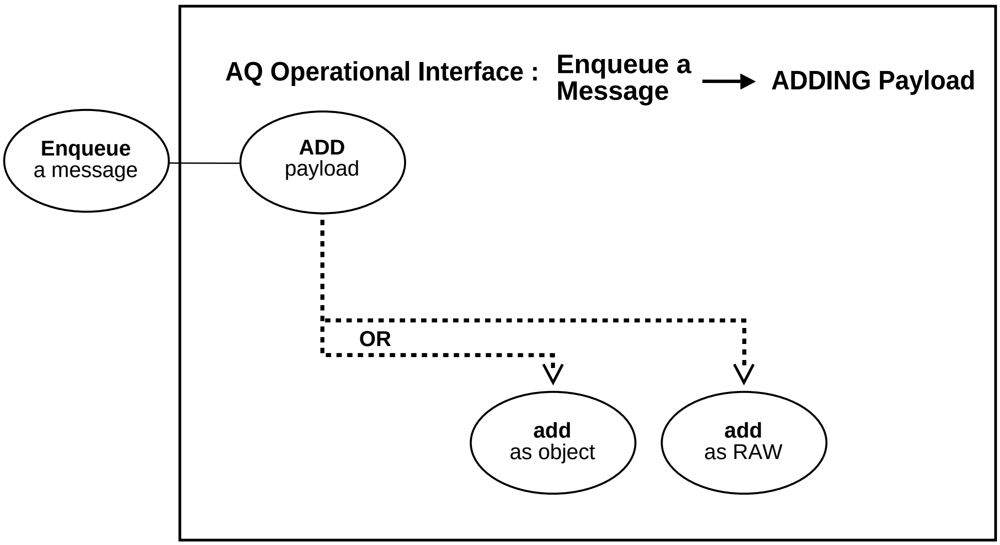
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples in the following programmatic environments are provided:

- PL/SQL (DBMS_AQ Package): Enqueue of Object Type Messages on page 11-16
- Java (JDBC): Enqueue a message (add payload) on page 11-18
- Visual Basic (OO4O): Enqueue a message on page 11-21

Enqueuing a Message [Add Payload]

Figure 11–5 Enqueuing a Message [Add Payload]



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Enqueuing a Message" on page 11-4
- "Enqueuing a Message [Specify Options]" on page 11-6
- "Enqueuing a Message [Specify Message Properties]" on page 11-9
- "Enqueuing a Message [Specify Message Properties [Specify Sender ID]]" on page 11-12

Usage Notes

To store a payload of type `RAW`, AQ will create a queue table with `LOB` column as the payload repository. The maximum size of the payload is determined by which programmatic environment you use to access AQ. For PL/SQL, Java and precompilers the limit is 32K; for the OCI the limit is 4G.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): *Oracle9i Supplied PL/SQL Packages and Types Reference* DBMS_AQ, ENQUEUE procedure
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*,oracle.jms, AQOracleQueue.enque

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples in the following programmatic environments are provided:

- PL/SQL (DBMS_AQ Package): Enqueue of Object Type Messages on page 11-16
- Java (JDBC): Enqueue a message (add payload) on page 11-18

- Visual Basic (OO4O): Enqueue a message on page 11-21

PL/SQL (DBMS_AQ Package): Enqueue of Object Type Messages

Note: You may need to set up the following data structures for certain examples to work:

```
CONNECT system/manager
CREATE USER aq IDENTIFIED BY aq;
GRANT Aq_administrator_role TO aq;
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE (
   Queue_table            =>  'aq.objmsgs_qtab',
   Queue_payload_type     =>  'aq.message_typ');
EXECUTE DBMS_AQADM.CREATE_QUEUE (
   Queue_name            =>  'aq.msg_queue',
   Queue_table           =>  'aq.objmsgs_qtab');
EXECUTE DBMS_AQADM.START_QUEUE (
   Queue_name         => 'aq.msg_queue',
   Enqueue            => TRUE);
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE (
   Queue_table            => 'aq.prioritymsgs_qtab',
   Sort_list              => 'PRIORITY,ENQ_TIME',
   Queue_payload_type     => 'aq.message_typ');
EXECUTE DBMS_AQADM.CREATE_QUEUE (
   Queue_name             => 'aq.priority_msg_queue',
   Queue_table            => 'aq.prioritymsgs_qtab');
EXECUTE DBMS_AQADM.START_QUEUE (
   Queue_name             => 'aq.priority_msg_queue',
   Enqueue                => TRUE);
```

Enqueue a Single Message and Specify the Queue Name and Payload

```
/* Enqueue to msg_queue: */
DECLARE
   Enqueue_options      DBMS_AQ.enqueue_options_t;
   Message_properties   DBMS_AQ.message_properties_t;
   Message_handle       RAW(16);
   Message              aq.message_typ;

BEGIN
   Message := aq.message_typ('NORMAL MESSAGE',
      'enqueued to msg_queue first.');
```

```
   DBMS_AQ.ENQUEUE(queue_name => 'msg_queue',
   Enqueue_options            => enqueue_options,
   Message_properties         => message_properties,
   Payload                    => message,
   Msgid                      => message_handle);

   COMMIT;
END;
```

Enqueue a Single Message and Specify the Priority

```
/* The queue name priority_msg_queue is defined as an object type queue table.
   The payload object type is message. The schema of the queue is aq.  */

 /* Enqueue a message with priority 30: */
DECLARE
   Enqueue_options       dbms_aq.enqueue_options_t;
   Message_properties    dbms_aq.message_properties_t;
   Message_handle        RAW(16);
   Message               aq.Message_typ;

BEGIN
   Message := Message_typ('PRIORITY MESSAGE', 'enqued at priority 30.');

   message_properties.priority := 30;

   DBMS_AQ.ENQUEUE(queue_name => 'priority_msg_queue',
   enqueue_options            => enqueue_options,
   message_properties         => message_properties,
   payload                    => message,
   msgid                      => message_handle);

   COMMIT;
END;
```

Enqueue a Single Message and Specify a Transformation

```
/* Enqueue to msg_queue: */
DECLARE
   Enqueue_options     DBMS_AQ.enqueue_options_t;
   Message_properties  DBMS_AQ.message_properties_t;
   Message_handle      RAW(16);
   Message             aq.message_typ;

BEGIN
```

```
   Message := aq.message_typ('NORMAL MESSAGE',
      'enqueued to msg_queue first.');

   DBMS_AQ.ENQUEUE(queue_name => 'msg_queue',
   Enqueue_options            => enqueue_options,
   Message_properties         => message_properties,
   transformation             => 'AQ.MSG_MAP',
   Payload                    => message,
   Msgid                      => message_handle);

   COMMIT;
END;
```

Where MSG_MAP was created as follows:

```
BEGIN
   DBMS.TRANSFORM.CREATE_TRANSFORMATION
   (
      schema => 'AQ',
      name =>   'MSG_MAP',
      from_schema => 'AQ',
      from_type => 'PO_ORDER1',
      to_schema => 'AQ',
      to_type => 'PO_ORDER2',
      transformation => 'AQ.MAP_PO_ORDER (source.user_data)'),
END;
```

Java (JDBC): Enqueue a message (add payload)

```
/* Setup  */
connect system/manager
create user aq identified by aq;
grant aq_administrator_role to aq;

public static void setup(AQSession aq_sess) throws AQException
{
     AQQueueTableProperty    qtable_prop;
     AQQueueProperty         queue_prop;
     AQQueueTable            q_table;
     AQQueue                 queue;
     AQAgent                 agent;

     qtable_prop = new AQQueueTableProperty("RAW");

     q_table = aq_sess.createQueueTable ("aq", "rawmsgs_qtab", qtable_prop);
```

```
     queue_prop = new AQQueueProperty();
     queue = aq_sess.createQueue (q_table, "msg_queue", queue_prop);

     queue.start();

     qtable_prop = new AQQueueTableProperty("RAW");
     qtable_prop.setMultiConsumer(true);

     qtable_prop.setSortOrder("priority,enq_time");
     q_table = aq_sess.createQueueTable ("aq", "rawmsgs_qtab2",
    qtable_prop);

     queue_prop = new AQQueueProperty();
     queue = aq_sess.createQueue (q_table, "priority_msg_queue", queue_prop);

     queue.start();

     agent = new AQAgent("subscriber1", null);

     queue.addSubscriber(agent, null);
}


/* Enqueue a message */
public static void example(AQSession aq_sess) throws AQException, SQLException
{
     AQQueue                   queue;
     AQMessage                 message;
     AQRawPayload              raw_payload;
     AQEnqueueOption           enq_option;
     String                    test_data = "new message";
     byte[]                    b_array;
     Connection                db_conn;

     db_conn = ((AQOracleSession)aq_sess).getDBConnection();

     /* Get a handle to the queue */
     queue = aq_sess.getQueue ("aq", "msg_queue");

     /* Create a message to contain raw payload: */
     message = queue.createMessage();

     /* Get handle to the AQRawPayload object and populate it with raw data: */
     b_array = test_data.getBytes();
```

```
        raw_payload = message.getRawPayload();

        raw_payload.setStream(b_array, b_array.length);

        /* Create a AQEnqueueOption object with default options: */
        enq_option = new AQEnqueueOption();

        /* Enqueue the message: */
        queue.enqueue(enq_option, message);

        db_conn.commit();
    }


    /* Enqueue a message with priority = 5 */
    public static void example(AQSession aq_sess) throws AQException, SQLException
    {
        AQQueue                  queue;
        AQMessage                message;
        AQMessageProperty        msg_prop;
        AQRawPayload             raw_payload;
        AQEnqueueOption          enq_option;
        String                   test_data = "priority message";
        byte[]                   b_array;
        Connection               db_conn;

        db_conn = ((AQOracleSession)aq_sess).getDBConnection();

        /* Get a handle to the queue */
        queue = aq_sess.getQueue ("aq", "msg_queue");

        /* Create a message to contain raw payload: */
        message = queue.createMessage();

        /* Get Message property */
        msg_prop = message.getMessageProperty();

        /* Set priority */
        msg_prop.setPriority(5);

        /* Get handle to the AQRawPayload object and populate it with raw data: */
        b_array = test_data.getBytes();

        raw_payload = message.getRawPayload();
```

```
     raw_payload.setStream(b_array, b_array.length);

     /* Create a AQEnqueueOption object with default options: */
     enq_option = new AQEnqueueOption();

     /* Enqueue the message: */
     queue.enqueue(enq_option, message);

     db_conn.commit();
}
```

Visual Basic (OO4O): Enqueue a message

Enqueuing messages of type objects

```
'Prepare the message. MESSAGE_TYPE is a user defined type
' in the "AQ" schema
Set OraMsg = Q.AQMsg(1, "MESSAGE_TYPE")
Set OraObj = DB.CreateOraObject("MESSAGE_TYPE")

OraObj("subject").Value = "Greetings from OO4O"
OraObj("text").Value = "Text of a message originated from OO4O"

Set OraMsg.Value = OraObj
Msgid = Q.Enqueue
```

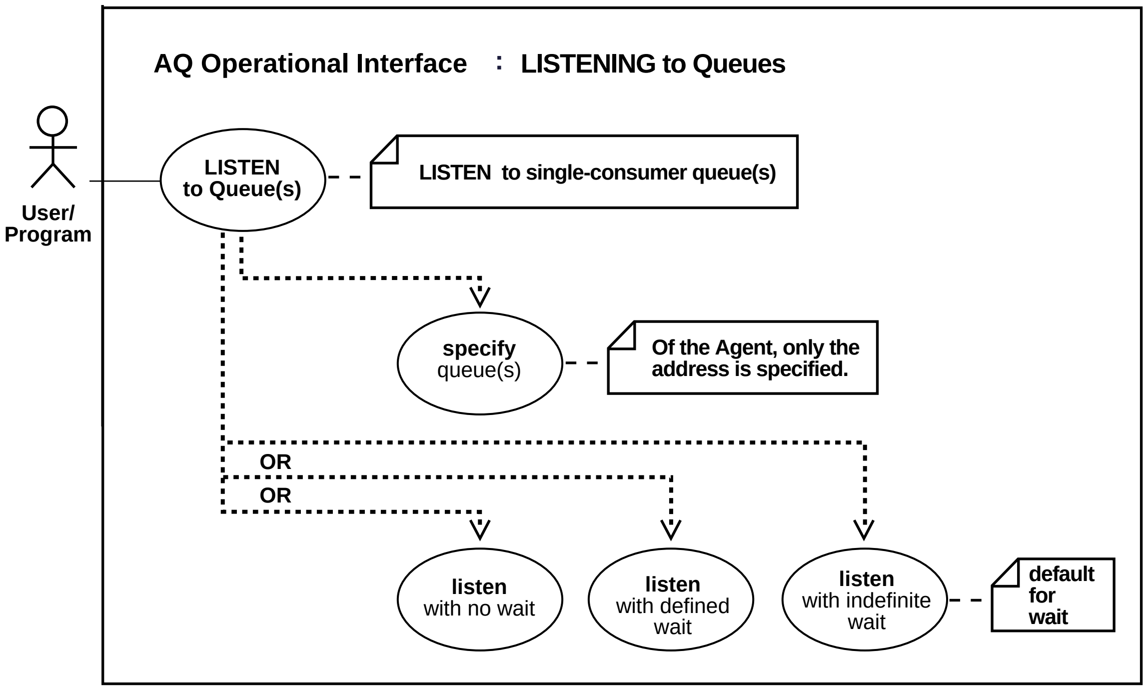
Enqueuing messages of type RAW

```
'Create an OraAQ object for the queue "DBQ"
Dim Q as object
Dim Msg as object
Dim OraSession as object
Dim DB as object

Set OraSession = CreateObject("OracleInProcServer.XOraSession")
Set OraDatabase = OraSession.OpenDatabase(mydb, “scott/tiger" 0&)
Set Q = DB.CreateAQ("DBQ")

'Get a reference to the AQMsg object
Set Msg = Q.AQMsg
Msg.Value = "Enqueue the first message to a RAW queue."

'Enqueue the message
Q.Enqueue()

'Enqueue another message.
```

```
Msg.Value = "Another message"
Q.Enqueue()

'Enqueue a message with nondefault properties.
Msg.Priority = ORAQMSG_HIGH_PRIORITY
Msg.Delay = 5
Msg.Value = "Urgent message"
Q.Enqueue()
Msg.Value = "The visibility option used in the enqueue call is
             ORAAQ_ENQ_IMMEDIATE"
Q.Visible = ORAAQ_ENQ_IMMEDIATE
Msgid = Q.Enqueue

'Enqueue Ahead of message Msgid_1
Msg.Value = "First Message to test Relative Message id"
Msg.Correlation = "RELATIVE_MESSAGE_ID"

Msgid_1 = Q.Enqueue
Msg.Value = "Second message to test RELATIVE_MESSAGE_ID is queued
             ahead of the First Message "
OraAq.relmsgid = Msgid_1
Msgid = Q.Enqueue
```

Listening to One or More Single-Consumer Queues

Figure 11–6 Listening to One or More Single-Consumer Queues



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Listening to One or More Multiconsumer Queues" on page 11-35

Usage Notes

The call takes a list of agents as an argument. You specify the queue to be monitored in the address field of each agent listed. You also must specify the name of the agent when monitoring multiconsumer queues. For single-consumer queues, an agent name must not be specified. Only local queues are supported as addresses. Protocol is reserved for future use.

This is a blocking call that returns when there is a message ready for consumption for an agent in the list. If there are messages for more than one agent, only the first agent listed is returned. If there are no messages found when the wait time expires, an error is raised.

A successful return from the `listen` call is only an indication that there is a message for one of the listed agents in one the specified queues. The interested agent must still dequeue the relevant message.

Note that you cannot call `listen` on nonpersistent queues.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): *Oracle9i Supplied PL/SQL Packages and Types Reference* DBMS_AQ, LISTEN procedure
- C (OCI): *Oracle Call Interface Programmer's Guide* Relational Functions, LNOCIAQListen
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ Object > Monitoring Messages
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*, AQSession.listen

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples in the following programmatic environments are provided:

- PL/SQL (DBMS_AQ Package): Listen to Queues on page 11-24
- Java (JDBC): Listen to Queues
- C (OCI): Listen to Single-Consumer Queues on page 11-26

PL/SQL (DBMS_AQ Package): Listen to Queues

```
/* The listen call allows you to monitor a list of queues for messages for
   specific agents. You need to have dequeue privileges for all the queues
   you wish to monitor. */
```

Listen to Single-Consumer Queue (Timeout of Zero).

```
DECLARE
   Agent_w_msg      aq$_agent;
   My_agent_list    dbms_aq.agent_list_t;

BEGIN
   /* NOTE:  MCQ1, MCQ2, MCQ3 are multiconsumer queues  in SCOTT's schema
   *        SCQ1, SCQ2, SCQ3 are single-consumer queues in SCOTT's schema
   */

   Qlist(1):= aq$_agent(NULL, 'scott.SCQ1',  NULL);
   Qlist(2):= aq$_agent(NULL, 'SCQ2', NULL);
   Qlist(3):= aq$_agent(NULL, 'SCQ3', NULL);

   /* Listen with a time-out of zero: */
   DBMS_AQ.LISTEN(
      Agent_list   =>   My_agent_list,
      Wait         =>   0,
      Agent        =>   agent_w_msg);
   DBMS_OUTPUT.PUT_LINE('Message in Queue :- ' ||  agent_w_msg.address);
   DBMS_OUTPUT.PUT_LINE('');
END;
```

Java (JDBC): Listen to Queues

```
public static void monitor_status_queue(Connection db_conn)
{
    AQSession          aq_sess;
    AQAgent[]          agt_list = null;
    AQAgent            ret_agt  = null;

    try
    {
        /* Create an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);

/* Construct the waiters list: */
agt_list = new AQAgent[3];

agt_list[0] = new AQAgent(null, "scott.SCQ1",0);
agt_list[1] = new AQAgent (null, "SCQ2",0);
agt_list[2] = new AQAgent (null, "SCQ3",0);

/* Wait for order status messages for 120 seconds: */
```

```
ret_agt = aq_sess.listen(agt_list, 120);

System.out.println("Message available for agent: " +
   ret_agt.getName()  + "   "  + ret_agt.getAddress());

    }
    catch (AQException aqex)
    {
System.out.println("Exception-1: " + aqex);
    }
    catch (Exception ex)
    {
        System.out.println("Exception-2: " + ex);
    }

}
```

C (OCI): Listen to Single-Consumer Queues

Listening for Single-Consumer Queues with Zero Timeout

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <oci.h>

static void checkerr(errhp, status)
LNOCIError *errhp;
sword status;
{
    text errbuf[512];
    ub4 buflen;
    sb4 errcode;

    switch (status)
    {
   case OCI_SUCCESS:
       break;
   case OCI_SUCCESS_WITH_INFO:
       printf("Error - OCI_SUCCESS_WITH_INFO\n");
       break;
   case OCI_NEED_DATA:
       printf("Error - OCI_NEED_DATA\n");
       break;
   case OCI_NO_DATA:
```

```
        printf("Error - OCI_NO_DATA\n");
        break;
    case OCI_ERROR:
        OCIErrorGet ((dvoid *) errhp, (ub4) 1, (text *) NULL, &errcode,
        errbuf, (ub4) sizeof(errbuf), (ub4) OCI_HTYPE_ERROR);
        printf("Error - %s\n", errbuf);
        break;
    case OCI_INVALID_HANDLE:
        printf("Error - OCI_INVALID_HANDLE\n");
        break;
    case OCI_STILL_EXECUTING:
        printf("Error - OCI_STILL_EXECUTE\n");
        break;
    case OCI_CONTINUE:
        printf("Error - OCI_CONTINUE\n");
        break;
    default:
    break;
     }
}

/* set agent into descriptor */
void SetAgent(agent, appname, queue,errhp)

LNOCIAQAgent  *agent;
text        *appname;
text        *queue;
LNOCIError    *errhp;
{

  OCIAttrSet(agent, OCI_DTYPE_AQAGENT,
     appname ? (dvoid *)appname : (dvoid *)"",
     appname ? strlen((const char *)appname) : 0,
        OCI_ATTR_AGENT_NAME, errhp);

  OCIAttrSet(agent, OCI_DTYPE_AQAGENT,
     queue ? (dvoid *)queue : (dvoid *)"",
     queue ? strlen((const char *)queue) : 0,
        OCI_ATTR_AGENT_ADDRESS, errhp);

  printf("Set agent name to %s\n", appname ? (char *)appname : "NULL");
  printf("Set agent address to %s\n", queue ? (char *)queue : "NULL");
}

/* get agent from descriptor */
```

```
void GetAgent(agent, errhp)
LNOCIAQAgent *agent;
LNOCIError   *errhp;
{
text      *appname;
text      *queue;
ub4       appsz;
ub4       queuesz;

  if (!agent )
  {
    printf("agent was NULL \n");
    return;
  }
  checkerr(errhp, OCIAttrGet(agent, OCI_DTYPE_AQAGENT,
     (dvoid *)&appname, &appsz, OCI_ATTR_AGENT_NAME, errhp));
  checkerr(errhp, OCIAttrGet(agent, OCI_DTYPE_AQAGENT,
     (dvoid *)&queue, &queuesz, OCI_ATTR_AGENT_ADDRESS, errhp));
  if (!appsz)
     printf("agent name: NULL\n");
  else printf("agent name: %.*s\n", appsz, (char *)appname);
  if (!queuesz)
     printf("agent address: NULL\n");
  else printf("agent address: %.*s\n", queuesz, (char *)queue);
}

int main()
{
  OCIEnv *envhp;
  OCIServer *srvhp;
  OCIError *errhp;
  OCISvcCtx *svchp;
  OCISession *usrhp;
  OCIAQAgent *agent_list[3];
  OCIAQAgent *agent = (OCIAQAgent *)0;
  /* added next 2 121598 */
  int i;

 /* Standard OCI Initialization */

  OCIInitialize((ub4) OCI_OBJECT, (dvoid *)0,  (dvoid * (*)()) 0,
     (dvoid * (*)()) 0,  (void (*)()) 0 );

  OCIHandleAlloc( (dvoid *) NULL, (dvoid **) &envhp,
             (ub4) OCI_HTYPE_ENV, 0, (dvoid **) 0);
```

```
OCIEnvInit( &envhp, (ub4) OCI_DEFAULT, 0, (dvoid **) 0);

OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
   0, (dvoid **) 0);

OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
   0, (dvoid **) 0);

OCIServerAttach( srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
   0, (dvoid **) 0);

/* set attribute server context in the service context */
OCIAttrSet( (dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
   (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);

/* allocate a user context handle */
OCIHandleAlloc((dvoid *)envhp, (dvoid **)&usrhp, (ub4) OCI_HTYPE_SESSION,
    (size_t) 0, (dvoid **) 0);

/* allocate a user context handle */
OCIHandleAlloc((dvoid *)envhp, (dvoid **)&usrhp, (ub4) OCI_HTYPE_SESSION,
   (size_t) 0, (dvoid **) 0);

OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
   (dvoid *)"scott", (ub4)strlen("scott"), OCI_ATTR_USERNAME, errhp);

OCIAttrSet((dvoid *) usrhp, (ub4) OCI_HTYPE_SESSION,
    (dvoid *) "tiger", (ub4) strlen("tiger"),
    (ub4) OCI_ATTR_PASSWORD, errhp);

OCISessionBegin (svchp, errhp, usrhp, OCI_CRED_RDBMS, OCI_DEFAULT);

OCIAttrSet((dvoid *)svchp, (ub4)OCI_HTYPE_SVCCTX,
   (dvoid *)usrhp, (ub4)0, OCI_ATTR_SESSION, errhp);

/* AQ LISTEN Initialization - allocate agent handles */
for (i = 0; i < 3; i++)
{
   agent_list[i] = (OCIAQAgent *)0;
   OCIDescriptorAlloc(envhp, (dvoid **)&agent_list[i],
       OCI_DTYPE_AQAGENT, 0, (dvoid **)0);
}
```

```
  /*
   *   SCQ1, SCQ2, SCQ3 are single-consumer queues in SCOTT's schema
   */

  SetAgent(agent_list[0], (text *)0, "SCOTT.SCQ1", errhp);
  SetAgent(agent_list[1], (text *)0, "SCOTT.SCQ2", errhp);
  SetAgent(agent_list[2], (text *)0, "SCOTT.SCQ3", errhp);

  checkerr(errhp,OCIAQListen(svchp, errhp, agent_list, 3, 0, &agent, 0));

  printf("MESSAGE for :- \n");
  GetAgent(agent, errhp);
  printf("\n");

}
```

Listening for Single-Consumer Queues with Timeout of 120 Seconds

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <oci.h>

static void checkerr(errhp, status)
LNOCIError *errhp;
sword status;
{
    text errbuf[512];
    ub4 buflen;
    sb4 errcode;

    switch (status)
    {
   case OCI_SUCCESS:
       break;
   case OCI_SUCCESS_WITH_INFO:
       printf("Error - OCI_SUCCESS_WITH_INFO\n");
       break;
   case OCI_NEED_DATA:
       printf("Error - OCI_NEED_DATA\n");
       break;
   case OCI_NO_DATA:
       printf("Error - OCI_NO_DATA\n");
```

```
        break;
    case OCI_ERROR:
        OCIErrorGet ((dvoid *) errhp, (ub4) 1, (text *) NULL, &errcode,
        errbuf, (ub4) sizeof(errbuf), (ub4) OCI_HTYPE_ERROR);
        printf("Error - %s\n", errbuf);
        break;
    case OCI_INVALID_HANDLE:
        printf("Error - OCI_INVALID_HANDLE\n");
        break;
    case OCI_STILL_EXECUTING:
        printf("Error - OCI_STILL_EXECUTE\n");
        break;
    case OCI_CONTINUE:
        printf("Error - OCI_CONTINUE\n");
        break;
    default:
    break;
     }
}

/* set agent into descriptor */
/* void SetAgent(agent, appname, queue) */
void SetAgent(agent, appname, queue,errhp)

LNOCIAQAgent  *agent;
text        *appname;
text        *queue;
LNOCIError    *errhp;
{

  OCIAttrSet(agent, OCI_DTYPE_AQAGENT,
     appname ? (dvoid *)appname : (dvoid *)"",
     appname ? strlen((const char *)appname) : 0,
        OCI_ATTR_AGENT_NAME, errhp);

  OCIAttrSet(agent, OCI_DTYPE_AQAGENT,
     queue ? (dvoid *)queue : (dvoid *)"",
     queue ? strlen((const char *)queue) : 0,
        OCI_ATTR_AGENT_ADDRESS, errhp);

  printf("Set agent name to %s\n", appname ? (char *)appname : "NULL");
  printf("Set agent address to %s\n", queue ? (char *)queue : "NULL");
}

/* get agent from descriptor */
```

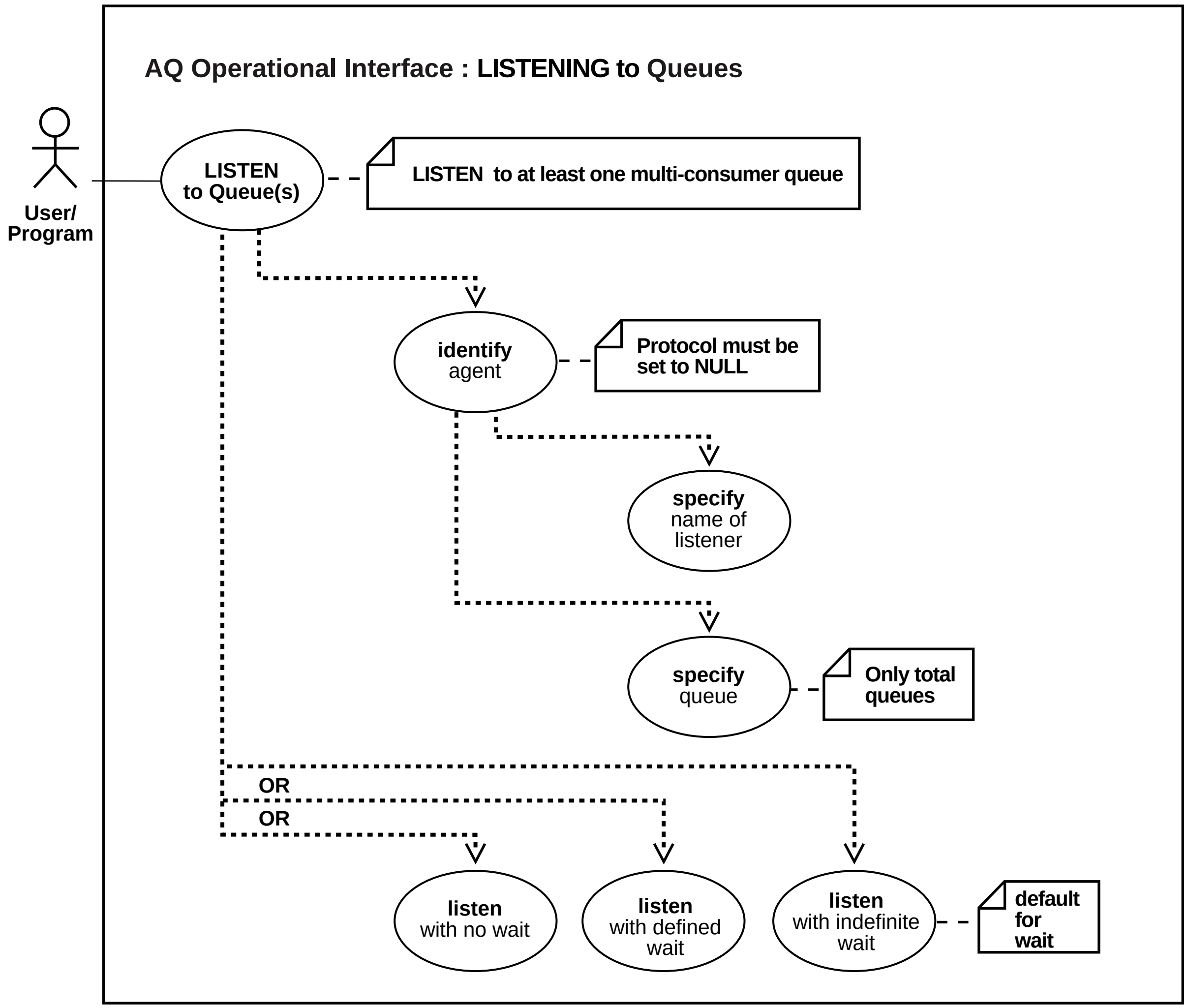
```
void GetAgent(agent, errhp)
LNOCIAQAgent *agent;
LNOCIError   *errhp;
{
text      *appname;
text      *queue;
ub4       appsz;
ub4       queuesz;

  if (!agent )
  {
    printf("agent was NULL \n");
    return;
  }
  checkerr(errhp, OCIAttrGet(agent, OCI_DTYPE_AQAGENT,
     (dvoid *)&appname, &appsz, OCI_ATTR_AGENT_NAME, errhp));
  checkerr(errhp, OCIAttrGet(agent, OCI_DTYPE_AQAGENT,
     (dvoid *)&queue, &queuesz, OCI_ATTR_AGENT_ADDRESS, errhp));
  if (!appsz)
     printf("agent name: NULL\n");
  else printf("agent name: %.*s\n", appsz, (char *)appname);
  if (!queuesz)
     printf("agent address: NULL\n");
  else printf("agent address: %.*s\n", queuesz, (char *)queue);
}

int main()
{
  OCIEnv *envhp;
  OCIServer *srvhp;
  OCIError *errhp;
  OCISvcCtx *svchp;
  OCISession *usrhp;
  OCIAQAgent *agent_list[3];
  OCIAQAgent *agent = (OCIAQAgent *)0;
  /* added next 2 121598 */
  int i;

 /* Standard OCI Initialization */

  OCIInitialize((ub4) OCI_OBJECT, (dvoid *)0,  (dvoid * (*)()) 0,
     (dvoid * (*)()) 0,  (void (*)()) 0 );

  OCIHandleAlloc( (dvoid *) NULL, (dvoid **) &envhp,
             (ub4) OCI_HTYPE_ENV, 0, (dvoid **) 0);
```

```
OCIEnvInit( &envhp, (ub4) OCI_DEFAULT, 0, (dvoid **) 0);

OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
   0, (dvoid **) 0);

OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
   0, (dvoid **) 0);

OCIServerAttach( srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
   0, (dvoid **) 0);

/* set attribute server context in the service context */
OCIAttrSet( (dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
   (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);

/* allocate a user context handle */
OCIHandleAlloc((dvoid *)envhp, (dvoid **)&usrhp, (ub4) OCI_HTYPE_SESSION,
    (size_t) 0, (dvoid **) 0);

/* allocate a user context handle */
OCIHandleAlloc((dvoid *)envhp, (dvoid **)&usrhp, (ub4) OCI_HTYPE_SESSION,
   (size_t) 0, (dvoid **) 0);

OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
   (dvoid *)"scott", (ub4)strlen("scott"), OCI_ATTR_USERNAME, errhp);

OCIAttrSet((dvoid *) usrhp, (ub4) OCI_HTYPE_SESSION,
    (dvoid *) "tiger", (ub4) strlen("tiger"),
    (ub4) OCI_ATTR_PASSWORD, errhp);

OCISessionBegin (svchp, errhp, usrhp, OCI_CRED_RDBMS, OCI_DEFAULT);

OCIAttrSet((dvoid *)svchp, (ub4)OCI_HTYPE_SVCCTX,
   (dvoid *)usrhp, (ub4)0, OCI_ATTR_SESSION, errhp);

/* AQ LISTEN Initialization - allocate agent handles */
for (i = 0; i < 3; i++)
{
   agent_list[i] = (OCIAQAgent *)0;
   OCIDescriptorAlloc(envhp, (dvoid **)&agent_list[i],
       OCI_DTYPE_AQAGENT, 0, (dvoid **)0);
}
```

```
  /*
   *   SCQ1, SCQ2, SCQ3 are single-consumer queues in SCOTT's schema
   */

  SetAgent(agent_list[0], (text *)0, "SCOTT.SCQ1", errhp);
  SetAgent(agent_list[1], (text *)0, "SCOTT.SCQ2", errhp);
  SetAgent(agent_list[2], (text *)0, "SCOTT.SCQ3", errhp);

  checkerr(errhp,OCIAQListen(svchp, errhp, agent_list, 3, 120, &agent, 0));

  printf("MESSAGE for :- \n");
  GetAgent(agent, errhp);
  printf("\n");

}
```

Listening to One or More Multiconsumer Queues

Figure 11–7 Listening to One or More Multiconsumer Queues



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Listening to One or More Single-Consumer Queues" on page 11-23

Usage Notes

See the usage notes in "Listening to One or More Single-Consumer Queues" on page 11-23.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): *Oracle9i Supplied PL/SQL Packages and Types Reference* DBMS_AQ, LISTEN procedure
- C (OCI): *Oracle Call Interface Programmer's Guide* Relational Functions, LNOCIAQListen
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ Object > Monitoring Messages
- Feature not available through the Java API

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples in the following programmatic environments are provided:

- PL/SQL (DBMS_AQ Package): Listen to Queues on page 11-37
- C (OCI): Listen to Multiconsumer Queues on page 11-38

PL/SQL (DBMS_AQ Package): Listen to Queues

```
/* The listen call allows you to monitor a list of queues for messages for
   specific agents. You need to have dequeue privileges for all the queues
   you wish to monitor. */
```

Listen to Multiconsumer Queue (Timeout of Zero).

```
DECLARE
   Agent_w_msg      aq$_agent;
   My_agent_list    dbms_aq.agent_list_t;

BEGIN
   /* NOTE:  MCQ1, MCQ2, MCQ3 are multiconsumer queues  in SCOTT's schema
   *        SCQ1, SCQ2, SCQ3 are single-consumer queues in SCOTT's schema
   */
    Qlist(1):= aq$_agent('agent1', 'MCQ1',  NULL);
    Qlist(2):= aq$_agent('agent2', 'scott.MCQ2', NULL);
    Qlist(3):= aq$_agent('agent3', 'scott.MCQ3', NULL);

   /* Listen with a time-out of zero: */
   DBMS_AQ.LISTEN(
      agent_list   =>    My_agent_list,
      wait         =>    0,
      agent        =>    agent_w_msg);
   DBMS_OUTPUT.PUT_LINE('Message in Queue :- ' ||  agent_w_msg.address);
   DBMS_OUTPUT.PUT_LINE('');
END;
   /
```

Listen to Mixture of Multiconsumer Queues (Timeout 100 Seconds).

```
DECLARE
   Agent_w_msg      aq$_agent;
   My_agent_list    dbms_aq.agent_list_t;

BEGIN
```

```
/* NOTE:  MCQ1, MCQ2, MCQ3 are multiconsumer queues  in SCOTT's schema
 *        SCQ1, SCQ2, SCQ3 are single-consumer queues in SCOTT's schema
 */
Qlist(1):= aq$_agent('agent1', 'MCQ1',  NULL);
Qlist(2):= aq$_agent(NULL, 'scott.SQ1', NULL);
Qlist(3):= aq$_agent('agent3', 'scott.MCQ3', NULL);
/* Listen with a time-out of 100 seconds */
DBMS_AQ.LISTEN(
   Agent_list   =>   My_agent_list,
   Wait         =>   100,
   Agent        =>    agent_w_msg);
   DBMS_OUTPUT.PUT_LINE('Message in Queue :- ' ||  agent_w_msg.address
                        || 'for agent' || agent_w_msg.name);
   DBMS_OUTPUT.PUT_LINE('');
END;
/
```

C (OCI): Listen to Multiconsumer Queues

Listening to Multiconsumer Queues with a Zero Timeout, a Timeout of 120 Seconds, and a Timeout of 100 Seconds

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <oci.h>

static void checkerr(errhp, status)
LNOCIError *errhp;
sword status;
{
    text errbuf[512];
    ub4 buflen;
    sb4 errcode;

    switch (status)
    {
   case OCI_SUCCESS:
       break;
   case OCI_SUCCESS_WITH_INFO:
       printf("Error - OCI_SUCCESS_WITH_INFO\n");
       break;
   case OCI_NEED_DATA:
       printf("Error - OCI_NEED_DATA\n");
       break;
```

```
   case OCI_NO_DATA:
       printf("Error - OCI_NO_DATA\n");
       break;
   case OCI_ERROR:
       OCIErrorGet ((dvoid *) errhp, (ub4) 1, (text *) NULL, &errcode,
       errbuf, (ub4) sizeof(errbuf), (ub4) OCI_HTYPE_ERROR);
       printf("Error - %s\n", errbuf);
       break;
   case OCI_INVALID_HANDLE:
       printf("Error - OCI_INVALID_HANDLE\n");
       break;
   case OCI_STILL_EXECUTING:
       printf("Error - OCI_STILL_EXECUTE\n");
       break;
   case OCI_CONTINUE:
       printf("Error - OCI_CONTINUE\n");
       break;
   default:
   break;
    }
}

void SetAgent(OCIAQAgent *agent,
         text       *appname,
         text       *queue,
         OCIError   *errhp,
         OCIEnv     *envhp);

void GetAgent(OCIAQAgent *agent,
         OCIError   *errhp);

/*------------------------------------------------------------------*/
/* OCI Listen examples for multiconsumers                         */
/*                                                                  */
void SetAgent(agent, appname, queue, errhp)
LNOCIAQAgent    *agent;
text          *appname;
text          *queue;
LNOCIError      *errhp;
{
  OCIAttrSet(agent,
        OCI_DTYPE_AQAGENT,
        appname ? (dvoid *)appname : (dvoid *)"",
        appname ? strlen((const char *)appname) : 0,
             OCI_ATTR_AGENT_NAME,
```

```
        errhp);

  OCIAttrSet(agent,
        OCI_DTYPE_AQAGENT,
        queue ? (dvoid *)queue : (dvoid *)"",
        queue ? strlen((const char *)queue) : 0,
             OCI_ATTR_AGENT_ADDRESS,
        errhp);

  printf("Set agent name to %s\n", appname ? (char *)appname : "NULL");
  printf("Set agent address to %s\n", queue ? (char *)queue : "NULL");
}

/* get agent from descriptor */
void GetAgent(agent, errhp)
LNOCIAQAgent *agent;
LNOCIError   *errhp;
{
   text      *appname;
   text      *queue;
   ub4       appsz;
   ub4       queuesz;

   if (!agent )
  {
     printf("agent was NULL \n");
     return;
  }
  checkerr(errhp, OCIAttrGet(agent, OCI_DTYPE_AQAGENT,
     (dvoid *)&appname, &appsz, OCI_ATTR_AGENT_NAME, errhp));
  checkerr(errhp, OCIAttrGet(agent, OCI_DTYPE_AQAGENT,
     (dvoid *)&queue, &queuesz, OCI_ATTR_AGENT_ADDRESS, errhp));
  if (!appsz)
     printf("agent name: NULL\n");
  else printf("agent name: %.*s\n", appsz, (char *)appname);
  if (!queuesz)
     printf("agent address: NULL\n");
  else printf("agent address: %.*s\n", queuesz, (char *)queue);
}

/* main from AQ Listen to multiconsumer Queues */

/*  int main() */
int main(char *argv, int argc)
{
```

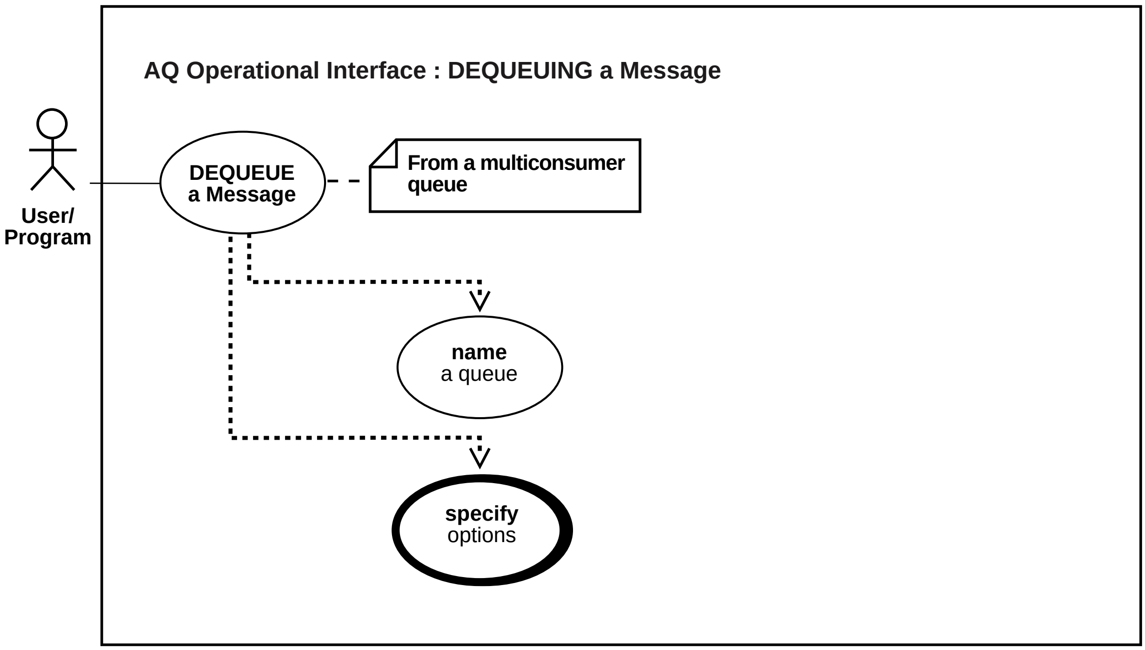
```
   OCIEnv     *envhp;
   OCIServer  *srvhp;
   OCIError   *errhp;
   OCISvcCtx  *svchp;
   OCISession *usrhp;
   OCIAQAgent *agent_list[3];
   OCIAQAgent *agent;
   int         i;

/* Standard OCI Initialization */

 OCIInitialize((ub4) OCI_OBJECT,
     (dvoid *)0,
     (dvoid * (*)()) 0,
     (dvoid * (*)()) 0,
     (void (*)()) 0 );

 OCIHandleAlloc( (dvoid *) NULL, (dvoid **) &envhp, (ub4) OCI_HTYPE_ENV,
    0, (dvoid **) 0);

 OCIEnvInit( &envhp, (ub4) OCI_DEFAULT, 0, (dvoid **)0);

 OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
    0, (dvoid **) 0);

 OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
    0, (dvoid **) 0);

 OCIServerAttach( srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

 OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
    0, (dvoid **) 0);

 /* set attribute server context in the service context */
 OCIAttrSet( (dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
    (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);

  /* allocate a user context handle */
 OCIHandleAlloc((dvoid *)envhp, (dvoid **)&usrhp, (ub4) OCI_HTYPE_SESSION,
    (size_t) 0, (dvoid **) 0);

  /* allocate a user context handle */
 OCIHandleAlloc((dvoid *)envhp, (dvoid **)&usrhp, (ub4) OCI_HTYPE_SESSION,
    (size_t) 0, (dvoid **) 0);
```

```
OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
   (dvoid *)"scott", (ub4)strlen("scott"), OCI_ATTR_USERNAME, errhp);


 OCIAttrSet((dvoid *) usrhp, (ub4) OCI_HTYPE_SESSION,
    (dvoid *) "tiger", (ub4) strlen("tiger"),
    (ub4) OCI_ATTR_PASSWORD, errhp);

OCISessionBegin (svchp, errhp, usrhp, OCI_CRED_RDBMS, OCI_DEFAULT);

OCIAttrSet((dvoid *)svchp, (ub4)OCI_HTYPE_SVCCTX,
   (dvoid *)usrhp, (ub4)0, OCI_ATTR_SESSION, errhp);

/* AQ LISTEN Initialization - allocate agent handles */
for (i = 0; i < 3; i++)
{
   OCIDescriptorAlloc(envhp, (dvoid **)&agent_list[i],
       OCI_DTYPE_AQAGENT, 0, (dvoid **)0);
}

/*
 *  MCQ1, MCQ2, MCQ3 are multiconsumer queues in SCOTT's schema
 */
/* Listening to Multiconsumer Queues with Zero Timeout */

SetAgent(agent_list[0], "app1", "MCQ1", errhp);
SetAgent(agent_list[1], "app2", "MCQ2", errhp);
SetAgent(agent_list[2], "app3", "MCQ3", errhp);

checkerr(errhp, OCIAQListen(svchp, errhp, agent_list, 3, 0, &agent, 0));

printf("MESSAGE for :- \n");
GetAgent(agent, errhp);
printf("\n");


/* Listening to Multiconsumer Queues with Timeout of 120 Seconds */

SetAgent(agent_list[0], "app1", "SCOTT.MCQ1", errhp);
SetAgent(agent_list[1], "app2", "SCOTT.MCQ2", errhp);
SetAgent(agent_list[2], "app3", "SCOTT.MCQ3", errhp);

checkerr(errhp, OCIAQListen(svchp, errhp, agent_list, 3, 120, &agent, 0));
```

```
  printf("MESSAGE for :- \n");
  GetAgent(agent, errhp);
  printf("\n");


  /* Listening to a Mixture of Single and Multiconsumer Queues
   * with a Timeout of 100 Seconds
   */

  SetAgent(agent_list[0], "app1", "SCOTT.MCQ1", errhp);
  SetAgent(agent_list[1], "app2", "SCOTT.MCQ2", errhp);
  SetAgent(agent_list[2], (text *)0, "SCOTT.SCQ3", errhp);

  checkerr(errhp, OCIAQListen(svchp, errhp, agent_list, 3, 100, &agent, 0));

  printf("MESSAGE for :- \n");
  GetAgent(agent, errhp);
  printf("\n");

}
```

Dequeuing a Message

Figure 11–8 Dequeuing a Message



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Dequeuing a Message from a Single-Consumer Queue [SpecifyOptions]" on page 11-47
- "Dequeuing a Message from a Multiconsumer Queue [Specify Options]" on page 11-52

Purpose

Dequeues a message from the specified queue.

Usage Notes

Search criteria and dequeue order for messages:

- The search criteria for messages to be dequeued is determined by the *consumer name*, *msgid* and *correlation* parameters in the dequeue options. Msgid uniquely identifies the message to be dequeued. Correlation identifiers are application-defined identifiers that are not interpreted by AQ.
- Only messages in the `READY` state are dequeued unless a msgid is specified.
- The dequeue order is determined by the values specified at the time the queue table is created unless overridden by the msgid and correlation id in dequeue options.
- The database consistent read mechanism is applicable for queue operations. For example, a `BROWSE` call may not see a message that is enqueued after the beginning of the browsing transaction.

Navigating through a queue

The default `NAVIGATION` parameter during dequeue is `NEXT MESSAGE`. This means that subsequent dequeues will retrieve the messages from the queue based on the snapshot obtained in the first dequeue. In particular, a message that is enqueued after the first dequeue command will be processed only after processing all the remaining messages in the queue. This is usually sufficient when all the messages have already been enqueued into the queue, or when the queue does not have a priority-based ordering. However, applications must use the `FIRST MESSAGE` navigation option when the first message in the queue needs to be processed by every dequeue command. This usually becomes necessary when a higher priority message arrives in the queue while messages already-enqueued are being processed.

Note: It may also be more efficient to use the `FIRST MESSAGE` navigation option when there are messages being concurrently enqueued. If the `FIRST MESSAGE` option is not specified, AQ will have to continually generate the snapshot as of the first dequeue command, leading to poor performance. If the `FIRST MESSAGE` option is specified, AQ will use a new snapshot for every dequeue command.

Dequeue by Message Grouping

- Messages enqueued in the same transaction into a queue that has been enabled for message grouping will form a group. If only one message is enqueued in the transaction, this will effectively form a group of one message. There is no upper limit to the number of messages that can be grouped in a single transaction.
- In queues that have not been enabled for message grouping, a dequeue in `LOCKED` or `REMOVE` mode locks only a single message. By contrast, a dequeue operation that seeks to dequeue a message that is part of a group will lock the entire group. This is useful when all the messages in a group need to be processed as an atomic unit.
- When all the messages in a group have been dequeued, the dequeue returns an error indicating that all messages in the group have been processed. The application can then use the `NEXT TRANSACTION` to start dequeuing messages from the next available group. In the event that no groups are available, the dequeue will time-out after the specified `WAIT` period.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): *Oracle9i Supplied PL/SQL Packages and Types Reference* DBMS_AQ, DEQUEUE procedure
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*,oracle.jms, AQOracleQueue.dequeue

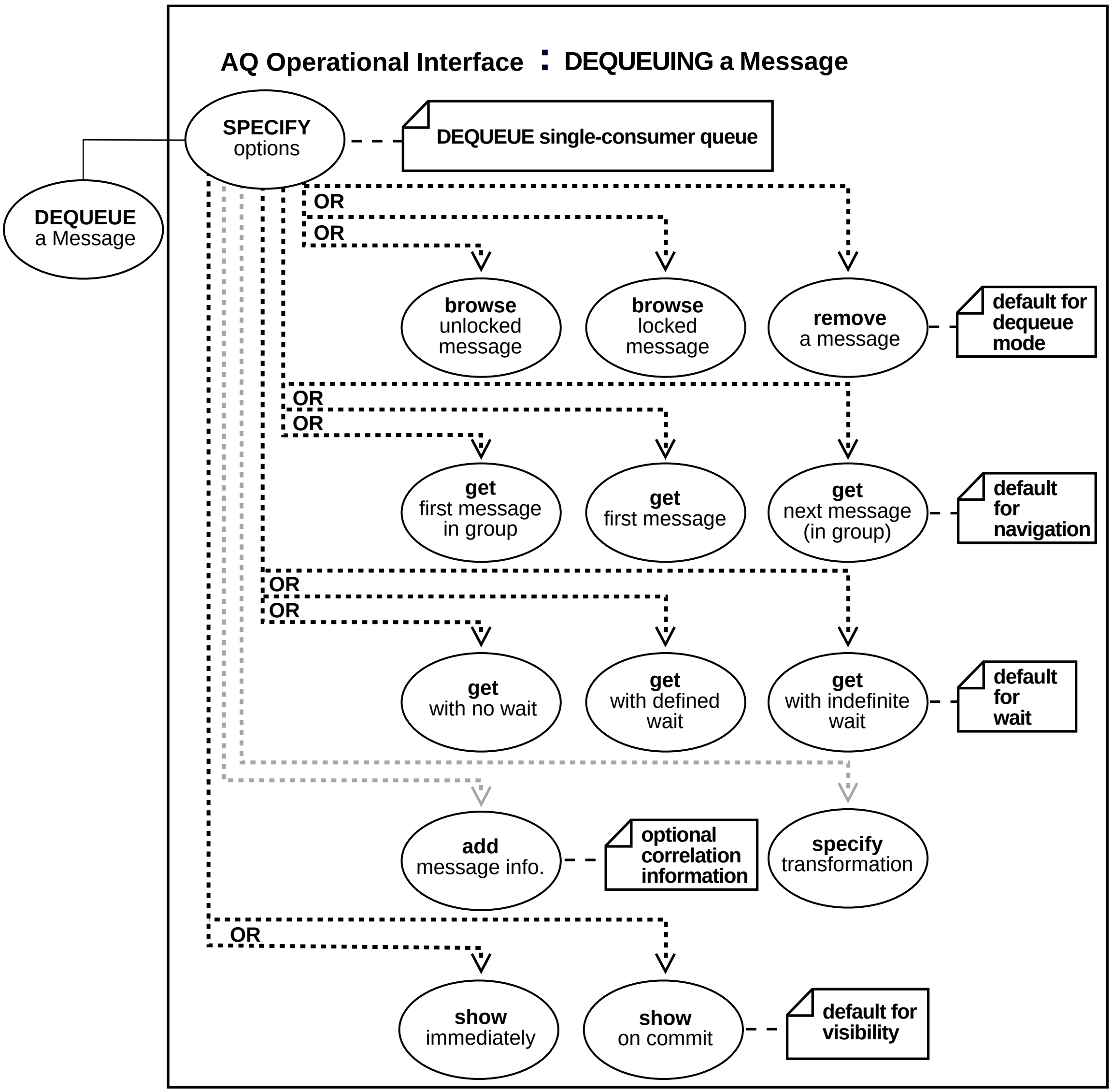
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples in the following programmatic environments are provided:

- PL/SQL (DBMS_AQ Package): Dequeue of Object Type Messages on page 11-49
- Java (JDBC): Dequeue a message from a single-consumer queue (specify options) on page 11-49
- Visual Basic (OO4O): Dequeue a message on page 11-50

Dequeuing a Message from a Single-Consumer Queue [SpecifyOptions]

Figure 11–9 Dequeuing a Message from a Single-Consumer Queue



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Dequeuing a Message" on page 11-44
- "Dequeuing a Message from a Multiconsumer Queue [Specify Options]" on page 11-52

Purpose

To specify the options available for the dequeue operation.

Usage Notes

Typically, you expect the consumer of messages to access messages using the dequeue interface. You can view processed messages or messages still to be processed by browsing by message id or by using SELECTs.

The transformation, if specified, is applied before returning the message to the caller. The transformation should be defined to map the queue ADT type to the return type desired by the caller.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): *Oracle9i Supplied PL/SQL Packages and Types Reference* DBMS_AQ, DEQUEUE procedure
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*,oracle.jms, AQDequeueOption

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples in the following programmatic environments are provided:

- PL/SQL (DBMS_AQ Package): Dequeue of Object Type Messages on page 11-49
- Java (JDBC): Dequeue a message from a single-consumer queue (specify options) on page 11-49
- Visual Basic (OO4O): Dequeue a message on page 11-50

PL/SQL (DBMS_AQ Package): Dequeue of Object Type Messages

```
/* Dequeue from msg_queue: */
DECLARE
dequeue_options     dbms_aq.dequeue_options_t;
message_properties  dbms_aq.message_properties_t;
message_handle      RAW(16);
message             aq.message_typ;

BEGIN
   DBMS_AQ.DEQUEUE(
      queue_name          =>      'msg_queue',
      dequeue_options      =>     dequeue_options,
      message_properties  =>      message_properties,
      payload             =>      message,
      msgid               =>      message_handle);

   DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
                                    ' ... ' || message.text );
   COMMIT;
END;
```

Java (JDBC): Dequeue a message from a single-consumer queue (specify options)

```
/* Dequeue a message with correlation id = 'RUSH' */
public static void example(AQSession aq_sess) throws AQException, SQLException
{
     AQQueue                  queue;
     AQMessage                message;
     AQRawPayload             raw_payload;
     AQDequeueOption          deq_option;
     byte[]                   b_array;
     Connection               db_conn;
```

```
     db_conn = ((AQOracleSession)aq_sess).getDBConnection();

     queue = aq_sess.getQueue ("aq", "msg_queue");

     /* Create a AQDequeueOption object with default options: */
     deq_option = new AQDequeueOption();

     deq_option.setCorrelation("RUSH");

     /* Dequeue a message */
     message = queue.dequeue(deq_option);

     System.out.println("Successful dequeue");

     /* Retrieve raw data from the message: */
     raw_payload = message.getRawPayload();

     b_array = raw_payload.getBytes();

     db_conn.commit();
}
```

Visual Basic (OO4O): Dequeue a message

Dequeuing messages of RAW type

```
 'Dequeue the first message available
Q.Dequeue()
Set Msg = Q.QMsg

'Display the message content
MsgBox Msg.Value

'Dequeue the first message available without removing it
' from the queue
Q.DequeueMode = ORAAQ_DEQ_BROWSE

'Dequeue the first message with the correlation identifier
' equal to "RELATIVE_MSG_ID"
Q.Navigation = ORAAQ_DQ_FIRST_MSG
Q.correlate = "RELATIVE_MESSAGE_ID"
Q.Dequeue

'Dequeue the next message with the correlation identifier
```

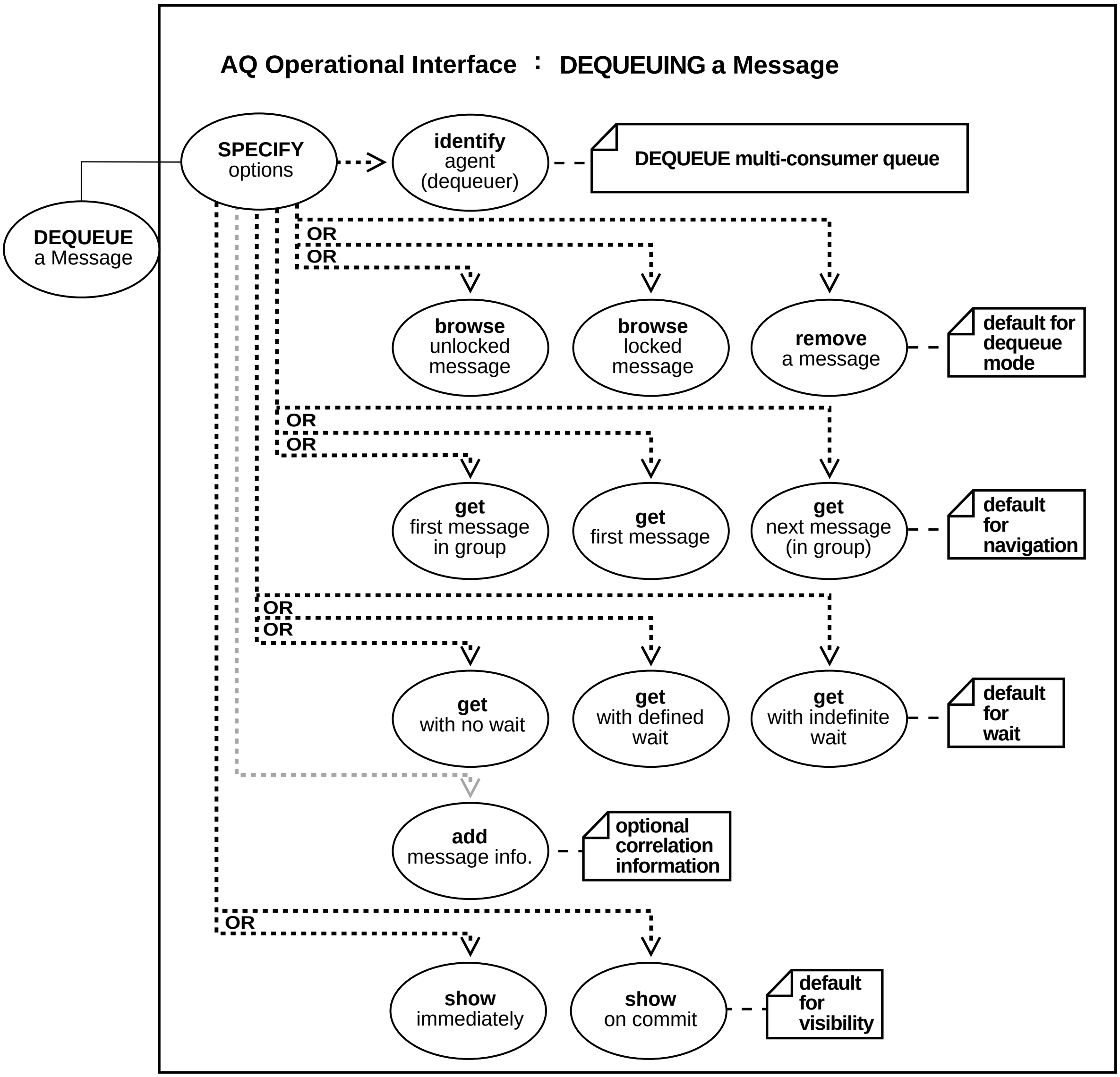
```
' of "RELATIVE_MSG_ID"
Q.Navigation = ORAAQ_DQ_NEXT_MSG
Q.Dequeue()

'Dequeue the first high priority message
Msg.Priority = ORAQMSG_HIGH_PRIORITY
Q.Dequeue()

'Dequeue the message enqueued with message id of Msgid_1
Q.DequeueMsgid = Msgid_1
Q.Dequeue()

'Dequeue the message meant for "ANDY"
Q.consumer = "ANDY"
Q.Dequeue()

'Return immediately if there is no message on the queue
Q.wait = ORAAQ_DQ_NOWAIT
Q.Dequeue()
```

Dequeuing messages of Oracle object type

```
Set OraObj = DB.CreateOraObject("MESSAGE_TYPE")
Set QMsg = Q.AQMsg(1, "MESSAGE_TYPE")

'Dequeue the first message available without removing it
Q.Dequeue()
OraObj = QMsg.Value

'Display the subject and data
MsgBox OraObj!subject & OraObj!Data
```

Dequeuing a Message from a Multiconsumer Queue [Specify Options]

Figure 11–10 Dequeuing a Message from a Multiconsumer Queue



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Dequeuing a Message" on page 11-44
- "Dequeuing a Message from a Single-Consumer Queue [SpecifyOptions]" on page 11-47

Purpose

To specify the options available for the dequeue operation.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): *Oracle9i Supplied PL/SQL Packages and Types Reference* DBMS_AQ, DEQUEUE procedure
- Visual Basic (OO4O): There is no applicable syntax reference for this use case
- Java (JDBC): *Oracle9i Supplied Java Packages Reference*,oracle.jms, AQDequeOption

Examples

Examples in the following programmatic environments are provided:

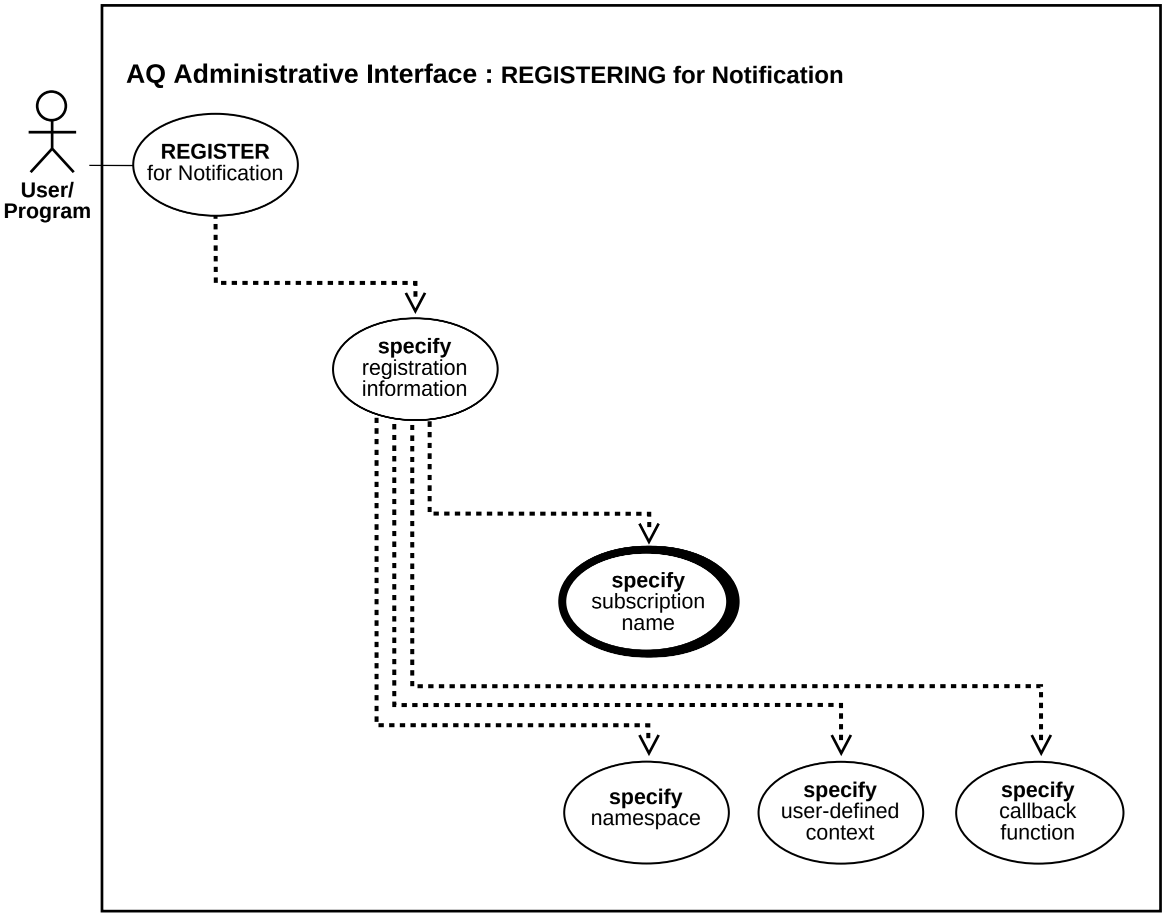
- Java (JDBC): Dequeue a message from a multiconsumer queue (specify options) on page 11-54

Java (JDBC): Dequeue a message from a multiconsumer queue (specify options)

```
/* Dequeue a message for subscriber1 in browse mode*/
public static void example(AQSession aq_sess) throws AQException, SQLException
{
     AQQueue                  queue;
     AQMessage                message;
     AQRawPayload             raw_payload;
     AQDequeueOption          deq_option;
     byte[]                   b_array;
     Connection               db_conn;

     db_conn = ((AQOracleSession)aq_sess).getDBConnection();

     queue = aq_sess.getQueue ("aq", "priority_msg_queue");

     /* Create a AQDequeueOption object with default options: */
     deq_option = new AQDequeueOption();

     /* Set dequeue mode to BROWSE */
     deq_option.setDequeueMode(AQDequeueOption.DEQUEUE_BROWSE);

     /* Dequeue messages for subscriber1 */
     deq_option.setConsumerName("subscriber1");

     /* Dequeue a message: */
     message = queue.dequeue(deq_option);

     System.out.println("Successful dequeue");

     /* Retrieve raw data from the message: */
     raw_payload = message.getRawPayload();

     b_array = raw_payload.getBytes();

     db_conn.commit();
}
```

Registering for Notification

Figure 11–11 Registering for Notification



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Registering for Notification [Specifying Subscription Name—Single-Consumer Queue]" on page 11-58
- "Registering for Notification [Specifying Subscription Name—Multiconsumer Queue]" on page 11-59

Purpose

To register a callback for message notification.

Usage Notes

- This call is invoked for registration to a subscription which identifies the subscription name of interest and the associated callback to be invoked. Interest in several subscriptions can be registered at one time.
- This interface is only valid for the asynchronous mode of message delivery. In this mode, a subscriber issues a registration call which specifies a callback. When messages are received that match the subscription criteria, the callback is invoked. The callback may then issue an explicit `message_receive` (dequeue) to retrieve the message.
- The user must specify a subscription handle at registration time with the namespace attribute set to `LNOCI_SUBSCR_NAMESPACE_AQ`.
- The subscription name is the string '`schema.queue`' if the registration is for a single-consumer queue and '`schema.queue:consumer_name`' if the registration is for a multiconsumer queues.
- Related Functions: `LNOCIAQListen`(), `LNOCISubscriptionDisable`(), `LNOCISubscriptionEnable`(), `LNOCISubscriptionUnRegister`()

For more information about the OCI operation `Register for Notification` see:

- *Oracle Call Interface Programmer's Guide*

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): Not available.
- C (OCI): *Oracle Call Interface Programmer's Guide* LNOCI Programming Advanced Topics, Publish-Subscribe Notification
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ Object > Monitoring Messages
- Java (JDBC): Not available.

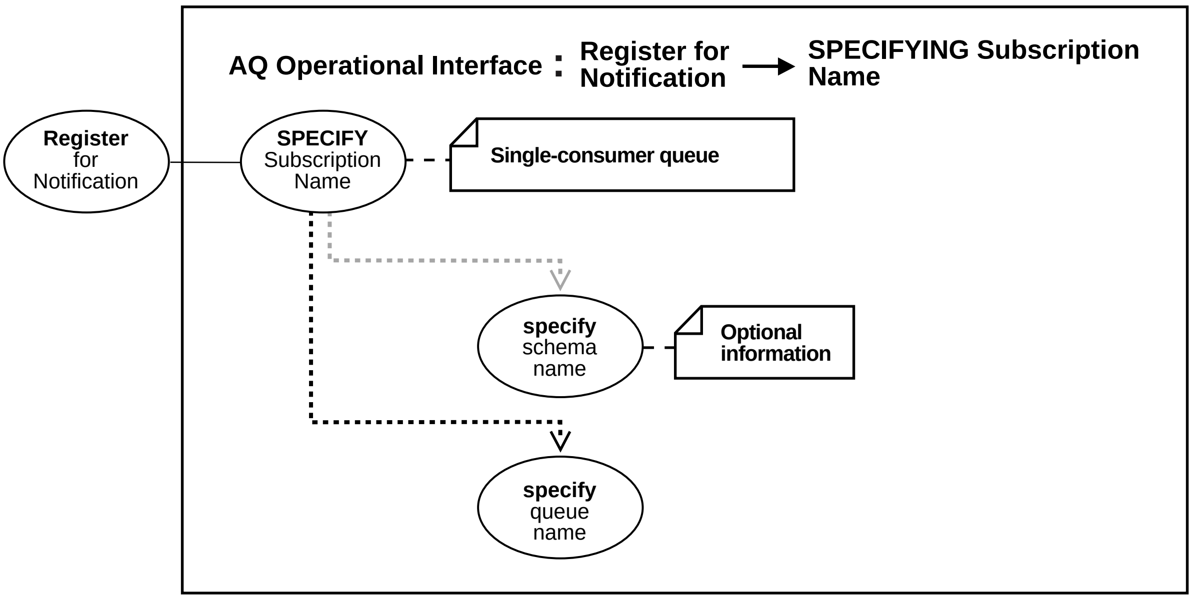
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Examples in the following programmatic environments are provided:

- C (OCI): Register for Notifications For Single-Consumer and Multiconsumer Queries on page 11-60

Registering for Notification [Specifying Subscription Name—Single-Consumer Queue]

Figure 11–12 Specifying Subscription Name—Single-Consumer Queue

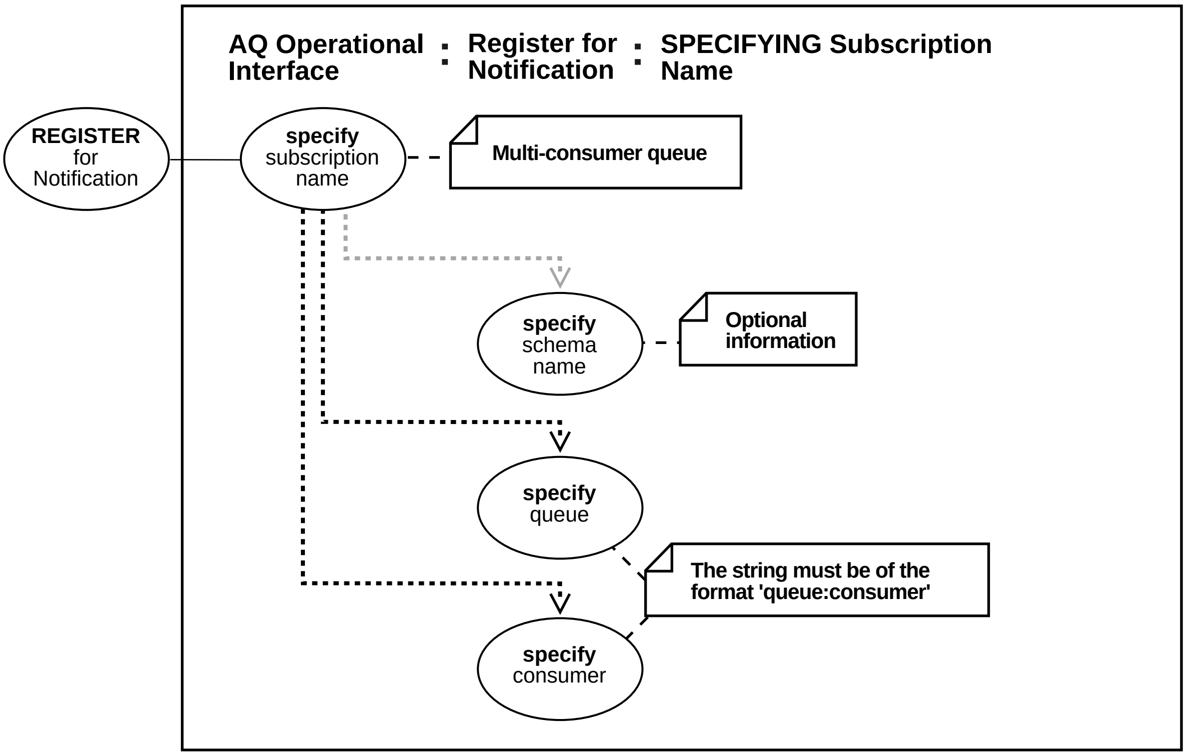


See Also:

- Table 11–1 for a list of operational interface basic operations
- "Registering for Notification" on page 11-55
- "Registering for Notification [Specifying Subscription Name—Multiconsumer Queue]" on page 11-59

Registering for Notification [Specifying Subscription Name—Multiconsumer Queue]

Figure 11–13 Specifying Subscription Name - Multiconsumer Queue



See Also:

- Table 11–1 for a list of operational interface basic operations
- "Registering for Notification" on page 11-55
- "Registering for Notification [Specifying Subscription Name—Single-Consumer Queue]" on page 11-58

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): Not available.
- C (OCI): *Oracle Call Interface Programmer's Guide* LNOCI Programming Advanced Topics, Publish-Subscribe Notification
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): From Help Topics, Contents tab, select OO4O Automation Server > OBJECTS > OraAQ Object > Monitoring Messages
- Java (JDBC): Not available.

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

C (OCI): Register for Notifications For Single-Consumer and Multiconsumer Queries

```
/* OCIRegister can be used by the client to register to receive notifications
   when messages are enqueued into non-persistent and normal queues. */
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <oci.h>


static OCIEnv     *envhp;
static OCIServer  *srvhp;
static OCIError   *errhp;
static OCISvcCtx  *svchp;


/* The callback that gets invoked on notification */
ub4 notifyCB(ctx, subscrhp, pay, payl, desc, mode)
dvoid *ctx;
LNOCISubscription *subscrhp;      /* subscription handle */
dvoid           *pay;           /* payload  */
ub4              payl;          /* payload length */
dvoid           *desc;          /* the AQ notification descriptor */
ub4              mode;
```

```
{
 text               *subname;
 ub4                 size;
 ub4                *number = (ub4 *)ctx;
 text               *queue;
 text               *consumer;
 OCIRaw             *msgid;
 OCIAQMsgProperties  *msgprop;

  (*number)++;

  /* Get the subscription name */
  OCIAttrGet((dvoid *)subscrhp, OCI_HTYPE_SUBSCRIPTION,
                             (dvoid *)&subname, &size,
                             OCI_ATTR_SUBSCR_NAME, errhp);
 printf("got notification number %d for %.*s  %d  \n",
         *number, size, subname, payl);

 /* Get the queue name from the AQ notify descriptor */
 OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&queue, &size,
             OCI_ATTR_QUEUE_NAME, errhp);

 /* Get the consumer name for which this notification was received */
 OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&consumer, &size,
       OCI_ATTR_CONSUMER_NAME, errhp);

 /* Get the message id of the message for which we were notified */
 OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&msgid, &size,
       OCI_ATTR_NFY_MSGID, errhp);

 /* Get the message properties of the message for which we were notified */
 OCIAttrGet(desc, OCI_DTYPE_AQNFY_DESCRIPTOR, (dvoid *)&msgprop, &size,
       OCI_ATTR_MSG_PROP, errhp);

}


int main(argc, argv)
int argc;
char *argv[];
{
  OCISession *authp = (OCISession *) 0;

  /* The subscription handles */
  OCISubscription *subscrhp[5];
```

```
/* Registrations are for AQ namespace */
ub4 namespace = OCI_SUBSCR_NAMESPACE_AQ;

/* The context fot the callback */
ub4 ctx[5] = {0,0,0,0,0};

printf("Initializing OCI Process\n");

/* The OCI Process Environment must be initialized  with OCI_EVENTS */
/* OCI_OBJECT flag is set to enable us dequeue */
(void) OCIInitialize((ub4) OCI_EVENTS|OCI_OBJECT, (dvoid *)0,
                     (dvoid * (*)(dvoid *, size_t)) 0,
                     (dvoid * (*)(dvoid *, dvoid *, size_t))0,
                     (void (*)(dvoid *, dvoid *)) 0 );

printf("Initialization successful\n");

/* The standard OCI setup */
printf("Initializing OCI Env\n");
(void) OCIEnvInit((OCIEnv **) &envhp, OCI_DEFAULT, (size_t) 0,
              (dvoid **) 0 );

(void) OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &errhp, OCI_HTYPE_ERROR,
                 (size_t) 0, (dvoid **) 0);

/* Server contexts */
(void) OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &srvhp, OCI_HTYPE_SERVER,
                 (size_t) 0, (dvoid **) 0);

(void) OCIHandleAlloc( (dvoid *) envhp, (dvoid **) &svchp, OCI_HTYPE_SVCCTX,
                 (size_t) 0, (dvoid **) 0);


printf("connecting to server\n");
(void) OCIServerAttach( srvhp, errhp, (text *)"", strlen(""), 0);
printf("connect successful\n");

/* Set attribute server context in the service context */
(void) OCIAttrSet( (dvoid *) svchp, OCI_HTYPE_SVCCTX, (dvoid *)srvhp,
        (ub4) 0, OCI_ATTR_SERVER, (OCIError *) errhp);

(void) OCIHandleAlloc((dvoid *) envhp, (dvoid **)&authp,
           (ub4) OCI_HTYPE_SESSION, (size_t) 0, (dvoid **) 0);
```

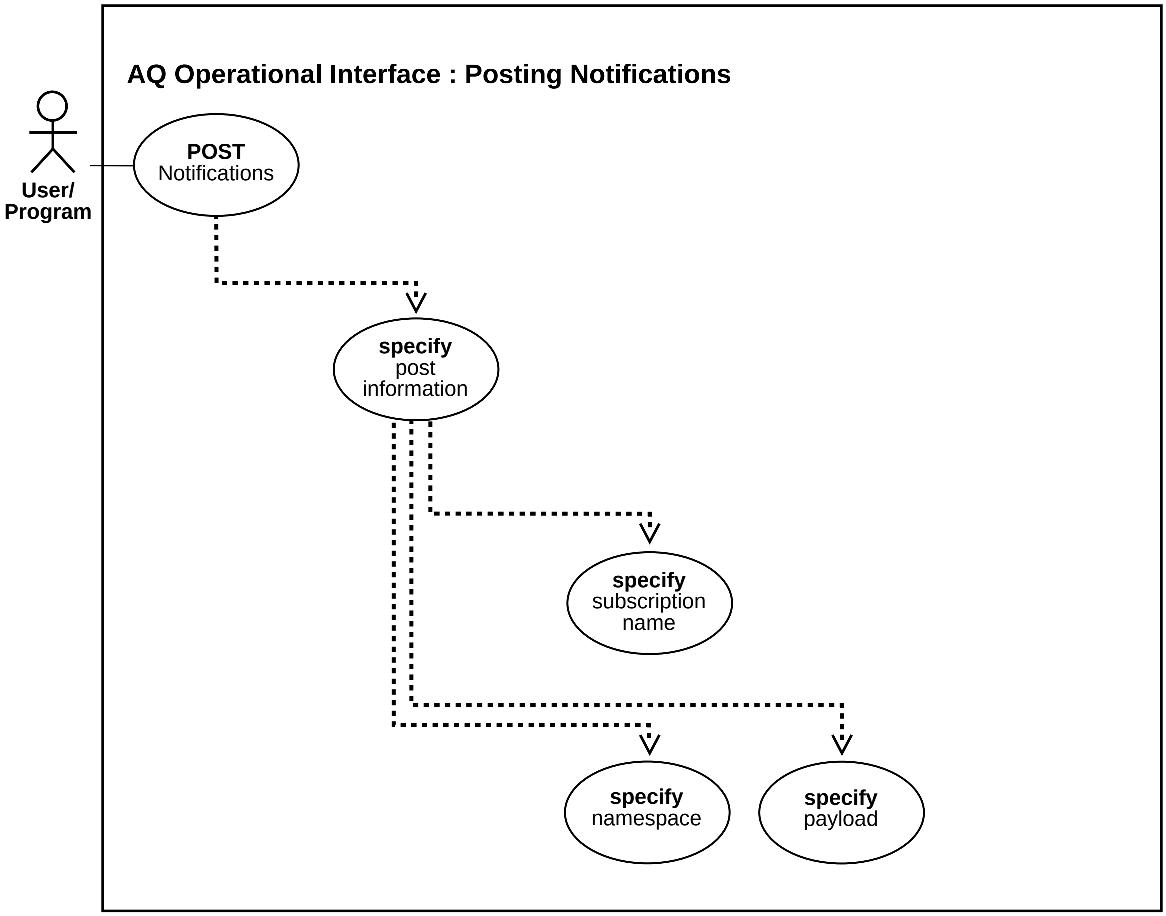
```
 (void) OCIAttrSet((dvoid *) authp, (ub4) OCI_HTYPE_SESSION,
               (dvoid *) "scott", (ub4) strlen("scott"),
               (ub4) OCI_ATTR_USERNAME, errhp);

 (void) OCIAttrSet((dvoid *) authp, (ub4) OCI_HTYPE_SESSION,
               (dvoid *) "tiger", (ub4) strlen("tiger"),
               (ub4) OCI_ATTR_PASSWORD, errhp);

 checkerr(errhp, OCISessionBegin ( svchp,  errhp, authp, OCI_CRED_RDBMS,
         (ub4) OCI_DEFAULT));

 (void) OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX,
                 (dvoid *) authp, (ub4) 0,
                 (ub4) OCI_ATTR_SESSION, errhp);

/* Setting the subscription handle for notification on
   a NORMAL single-consumer queue */
 printf("allocating subscription handle\n");
 subscrhp[0] = (OCISubscription *)0;
 (void) OCIHandleAlloc((dvoid *) envhp, (dvoid **)&subscrhp[0],
        (ub4) OCI_HTYPE_SUBSCRIPTION,
        (size_t) 0, (dvoid **) 0);

 printf("setting subscription name\n");
 (void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
              (dvoid *) "SCOTT.SCQ1", (ub4) strlen("SCOTT.SCQ1"),
              (ub4) OCI_ATTR_SUBSCR_NAME, errhp);

 printf("setting subscription callback\n");
 (void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
               (dvoid *) notifyCB, (ub4) 0,
               (ub4) OCI_ATTR_SUBSCR_CALLBACK, errhp);

printf("setting subscription context \n");
(void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *)&ctx[0], (ub4)sizeof(ctx[0]),
                (ub4) OCI_ATTR_SUBSCR_CTX, errhp);

 printf("setting subscription namespace\n");
 (void) OCIAttrSet((dvoid *) subscrhp[0], (ub4) OCI_HTYPE_SUBSCRIPTION,
               (dvoid *) &namespace, (ub4) 0,
               (ub4) OCI_ATTR_SUBSCR_NAMESPACE, errhp);

/* Setting the subscription handle for notification on a NORMAL multiconsumer
   consumer queue */
```

```
 subscrhp[1] = (OCISubscription *)0;
 (void) OCIHandleAlloc((dvoid *) envhp, (dvoid **)&subscrhp[1],
        (ub4) OCI_HTYPE_SUBSCRIPTION,
        (size_t) 0, (dvoid **) 0);

 (void) OCIAttrSet((dvoid *) subscrhp[1], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) "SCOTT.MCQ1:APP1",
                (ub4) strlen("SCOTT.MCQ1:APP1"),
                (ub4) OCI_ATTR_SUBSCR_NAME, errhp);

 (void) OCIAttrSet((dvoid *) subscrhp[1], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) notifyCB, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_CALLBACK, errhp);

 (void) OCIAttrSet((dvoid *) subscrhp[1], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *)&ctx[1], (ub4)sizeof(ctx[1]),
                (ub4) OCI_ATTR_SUBSCR_CTX, errhp);

 (void) OCIAttrSet((dvoid *) subscrhp[1], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) &namespace, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_NAMESPACE, errhp);


/* Setting the subscription handle for notification on a non-persistent
  single-consumer queue */
 subscrhp[2] = (OCISubscription *)0;
 (void) OCIHandleAlloc((dvoid *) envhp, (dvoid **)&subscrhp[2],
        (ub4) OCI_HTYPE_SUBSCRIPTION,
        (size_t) 0, (dvoid **) 0);

 (void) OCIAttrSet((dvoid *) subscrhp[2], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) "SCOTT.NP_SCQ1",
                (ub4) strlen("SCOTT.NP_SCQ1"),
                (ub4) OCI_ATTR_SUBSCR_NAME, errhp);

 (void) OCIAttrSet((dvoid *) subscrhp[2], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) notifyCB, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_CALLBACK, errhp);

 (void) OCIAttrSet((dvoid *) subscrhp[2], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *)&ctx[2], (ub4)sizeof(ctx[2]),
                (ub4) OCI_ATTR_SUBSCR_CTX, errhp);

 (void) OCIAttrSet((dvoid *) subscrhp[2], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) &namespace, (ub4) 0,
```

```
                (ub4) OCI_ATTR_SUBSCR_NAMESPACE, errhp);


 /* Setting the subscription handle for notification on
    a non-persistent multi consumer queue */
 /* Waiting on user specified recipient */
  subscrhp[3] = (OCISubscription *)0;
  (void) OCIHandleAlloc((dvoid *) envhp, (dvoid **)&subscrhp[3],
         (ub4) OCI_HTYPE_SUBSCRIPTION,
         (size_t) 0, (dvoid **) 0);

  (void) OCIAttrSet((dvoid *) subscrhp[3], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) "SCOTT.NP_MCQ1",
                (ub4) strlen("SCOTT.NP_MCQ1"),
                (ub4) OCI_ATTR_SUBSCR_NAME, errhp);

  (void) OCIAttrSet((dvoid *) subscrhp[3], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) notifyCB, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_CALLBACK, errhp);

 (void) OCIAttrSet((dvoid *) subscrhp[3], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *)&ctx[3], (ub4)sizeof(ctx[3]),
                (ub4) OCI_ATTR_SUBSCR_CTX, errhp);

  (void) OCIAttrSet((dvoid *) subscrhp[3], (ub4) OCI_HTYPE_SUBSCRIPTION,
                (dvoid *) &namespace, (ub4) 0,
                (ub4) OCI_ATTR_SUBSCR_NAMESPACE, errhp);


  printf("Registering for all the subscriptiosn \n");
  checkerr(errhp, OCISubscriptionRegister(svchp, subscrhp, 4, errhp,
                OCI_DEFAULT));

  printf("Waiting for notifcations \n");

  /* wait for minutes for notifications */
  sleep(300);

  printf("Exiting\n");
}
```

Posting for Subscriber Notification

Figure 11–14 Posting for Subscriber Notification



See Also: Table 11–1 for a list of operational interface basic operations

Purpose

To post to a list of anonymous subscriptions so clients registered for the subscription get notifications.

Usage Notes

Several subscriptions can be posted to at one time. Posting to a subscription involves identifying the subscription name and the payload, if desired. It is possible for no payload to be associated with this call. This call provides a best-effort guarantee. A notification goes to registered clients at most once.

This call is primarily used for lightweight notification and is useful in the case of several system events. If an application needs more rigid guarantees, it can use AQ functionality by enqueuing to a queue.

When using OCI, the user must specify a subscription handle at registration time with the namespace attribute set to `OCI_SUBSCR_NAMESPACE_ANONYMOUS`.

When using PL/SQL, the namespace attribute in `aq$_post_info` must be set to `DBMS_AQ.NAMESPACE_ANONYMOUS`.

Related functions: `LNOCIAQListen(), OCISvcCtxToLda(), LNOCISubscriptionEnable(), OCISubscriptionRegister(), LNOCISubscriptionUnRegister(), dbms_aq.register, dbms_aq.unregister.`

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): `POST` procedure.
- C (OCI): *Oracle Call Interface Programmer's Guide* LNOCI Programming Advanced Topics, Publish-Subscribe Notification
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): Not supported.
- Java (JDBC): Not supported.

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

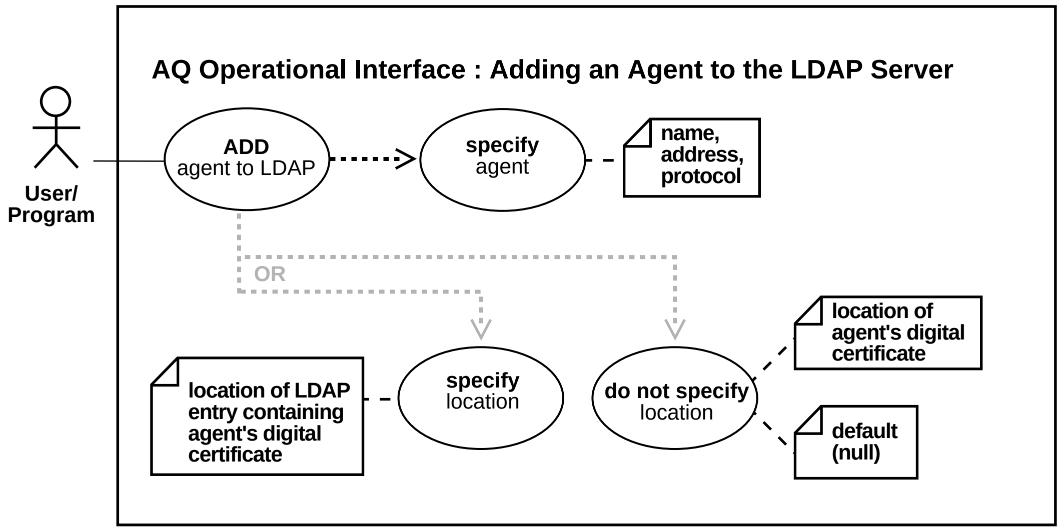
PL/SQL (DBMS_AQ Package): Post of Object-Type Messages

```
-- Register for notification
DECLARE
  reginfo             sys.aq$_reg_info;
```

```
  reginfolist         sys.aq$_reg_info_list;

BEGIN
  -- Register for anonymous subscription PUBSUB1.ANONSTR, consumer_name ADMIN
  -- The PL/SQL callback pubsub1.mycallbk will be invoked
  -- when a notification is received
  reginfo := sys.aq$_reg_info('PUBSUB1.ANONSTR:ADMIN',
     DBMS_AQ.NAMESPACE_ANONYMOUS,
      'plsql://PUBSUB1.mycallbk', HEXTORAW('FF'));

  reginfolist := sys.aq$_reg_info_list(reginfo);

  sys.dbms_aq.register(reginfolist, 1);

  commit;
END;
/

-- Post to an anonymous subscription
DECLARE

  postinfo            sys.aq$_post_info;
  postinfolist        sys.aq$_post_info_list;

BEGIN

  -- Post to the anonymous subscription PUBSUB1.ANONSTR, consumer_name ADMIN
  postinfo := sys.aq$_post_info('PUBSUB1.ANONSTR:ADMIN',0,HEXTORAW('FF'));
  postinfolist := sys.aq$_post_info_list(postinfo);

  sys.dbms_aq.post(postinfolist, 1);

  commit;

END;
/
```

Adding an Agent to the LDAP Server

Figure 11–15 Adding an Agent to LDAP



See Also: Table 11–1 for a list of operational interface basic operations

Purpose

To add an agent to the LDAP server.

Usage Notes

This call takes an agent and an optional certificate location as the arguments, and adds the agent entry to the LDAP server. The certificate location parameter is the distinguished name of the LDAP entry that contains the digital certificate which the agent will use. If the agent does not have a digital certificate, this parameter will be defaulted to null.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

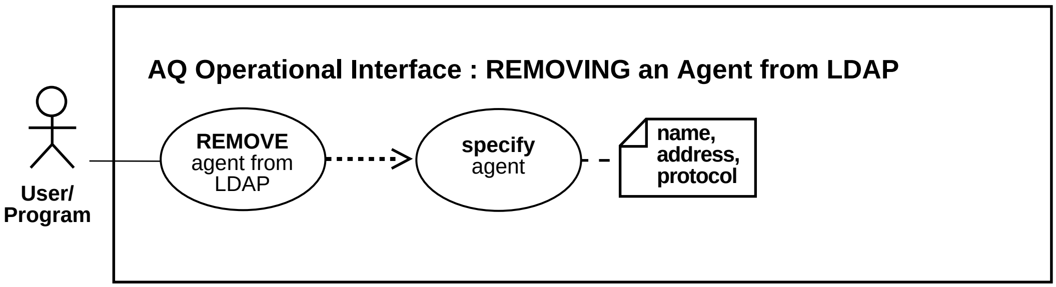
- PL/SQL (DBMS_AQ Package): `BIND_AGENT` procedure.
- C (OCI): *Oracle Call Interface Programmer's Guide* LNOCI Programming Advanced Topics
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): Not supported.
- Java (JDBC): Not supported.

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

Removing an Agent from the LDAP Server

Figure 11–16 Removing an Agent from LDAP



See Also: Table 11–1 for a list of operational interface basic operations

Purpose

To remove an agent from the LDAP server.

Usage notes

This call takes an agent as the argument, and removes the corresponding agent entry in the LDAP server.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- PL/SQL (DBMS_AQ Package): `UNBIND_AGENT` procedure.
- C (OCI): *Oracle Call Interface Programmer's Guide* LNOCI Programming Advanced Topics
- Visual Basic (OO4O) (Oracle Objects for OLE (OO4O) Online Help): Not supported.
- Java (JDBC): Not supported.

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

12

Creating Applications Using JMS

In Chapter 1, "Introduction to Oracle Advanced Queuing" we described a messaging system for an imaginary company, `BooksOnLine`. In this chapter we consider the features of the Oracle JMS interface to AQ in the context of a sample application based on that scenario. This chapter contains these topics:

A Sample Application Using JMS

The operations of a large bookseller, `BooksOnLine`, are based on an online book ordering system that automates activities across the various departments involved in the entire sale process. The front end of the system is an order entry application where new orders are entered. These incoming orders are processed by an order processing application that validates and records the order. Shipping departments located at regional warehouses are then responsible for ensuring that these orders are shipped in a timely fashion. There are three regional warehouses: one serving the East Region, one serving the West Region, and a third warehouse for shipping International orders. Once an order has been shipped, the order information is routed to a central billing department that handles payment processing. The customer service department, located at its own site, is responsible for maintaining order status and handling inquiries about orders.

In Chapter 1 we outlined a messaging system for an imaginary company, `BooksOnLine`. In this chapter we consider the features of the JMS interface to AQ in the context of a sample application based on that scenario. This sample application has been devised for the sole purpose of demonstrating the features of Oracle AQ. Our aim in creating this integrated scenario is to make it easier to grasp the possibilities of this technology by locating our explanations within a single context. However, it is not possible within the scope of a single relatively small code sample to demonstrate every possible application of AQ.

General Features of JMS

The following topics are discussed in this section:

- J2EE Compliance
- JMS Connection and Session
- JMS Destinations - Queue and Topic
- System-Level Access Control in JMS
- Destination-Level Access Control in JMS
- Retention and Message History in JMS
- Supporting Oracle Real Application Clusters in JMS
- Supporting Statistics Views in JMS
- Structured Payload / Message Types in JMS

J2EE Compliance

In release 9.2, Oracle JMS conforms to the Sun Microsystems JMS 1.0.2b standard. You can define the J2EE compliance mode for an OJMS client at run time. For compliance, set the Java property `"oracle.jms.j2eeCompliant"` to `TRUE` as a command line option. For noncompliance, do nothing. `FALSE` is the default value.

New features in release 9.2 support J2EE compliance and are also available in the noncompliant mode. These include support for:

- Nontransacted sessions
- Nondurable subscribers
- Temporary queues and topics
- Nonpersistent delivery mode
- Multiple JMS messages types on a single JMS queue or topic (using AQ queues of the `AQ$_JMS_MESSAGE` type)
- The `noLocal` option for durable subscribers

> **See Also:** *Java Message Service Specification*, version 1.0.2b, published by Sun Microsystems, Inc.

Features of `JMSPriority`, `JMSExpiration`, and nondurable subscribers vary depending on which mode you use.

JMSPriority

`JMSPriority` values depend on whether you are running the default, noncompliant mode or the compliant mode, in which you set the compliance flag to `TRUE`:

- In noncompliant mode, `java.lang.Integer.MAX_VALUE` is the lowest priority, `java.lang.Integer.MIN_VALUE` is the highest priority, and `1` is the default priority.
- In compliant mode, `0` is the lowest priority, `9` is the highest priority, and `4` is the default priority.

JMSExpiration

`JMSExpiration` values depend on whether you are running the default, noncompliant mode or the compliant mode, in which you set the compliance flag to `TRUE:`

- In noncompliant mode, the `JMSExpiration` header value is the sum of the enqueue time and the time-to-live, as specified in the JMS specification when a message is enqueued. When a message is received, the duration of the expiration (not the expiration time) is returned. If a message never expires, `-1` is returned.
- In compliant mode, the `JMSExpiration` header value in a dequeued message is the sum of the JMS time stamp when the message was enqueued (Greenwich Mean Time, in milliseconds) and the time-to live (in milliseconds). If a message never expires, `0` is returned.

Durable Subscribers

Durable subscriber behavior, when subscribers use the same name, depends on whether you are running the default, noncompliant mode or the compliant mode, in which you set the compliance flag to `TRUE`.

- In noncompliant mode, two durable TopicSubscribers with the same name can be active against two different topics.
- In compliant mode, durable subscribers with the same name are not allowed. The following cases can occur:

  Case 1—If two subscribers use the same name and are created against the same topic, but the selector used for each subscriber is different, then the underlying AQ subscription is altered using the internal `DBMS_AQJMS.ALTER_SUBSCRIBER()` call.

  Case 2—If two subscribers use the same name and are created against two different topics, and:

  - If the client that uses the same subscription name also originally created the subscription name, then the existing subscription is dropped and the new subscription is created.
  - If a *different* client (a client that did not originate the subscription name) uses an existing subscription name, then the subscription is not dropped and an error is thrown. Since it is not known if the subscription was created by JMS or PL/SQL, the subscription on the other topic should not be dropped.

JMS Connection and Session

Connection Factory

A `ConnectionFactory` encapsulates a set of connection configuration parameters that has been defined by an administrator. A client uses it to create a **Connection** with a JMS provider. In this case Oracle JMS, Oracle8*i* is the JMS Provider.

There are two types of `ConnectionFactory` objects

- `QueueConnectionFactory`
- `TopicConnectionFactory`

ConnectionFactory objects can be obtained in one of the following ways

1. Static methods in AQjmsFactory
2. Java Naming and Directory Interface (JNDI) Lookup from a LDAP directory server

Using AQjmsFactory to Obtain ConnectionFactory Objects

`The AQjmsFactory` class can be used to obtain a handle to `Queue/Topic ConnectionFactory` objects.

- To obtain a `QueueConnectionFactory`, use the `AQjmsFactory.getQueueConnectionFactory()` method

  The queue connection factory can be created using hostname, port number, SID driver or by using JDBC URL and properties.

- To obtain a `TopicConnectionFactory`, use the `AQjmsFactory.getTopicConnectionFactory()` method

  The topic connection factory can be created using hostname, port number, SID driver or by using JDBC URL and properties.

Example

```
public static void get_Factory() throws JMSException
{
  QueueConnectionFactory    qc_fact   = null;
 /* get queue connection factory for database "aqdb", host "sun-123", port
    5521,  driver "thin" */
 qc_fact = AQjmsFactory.getQueueConnectionFactory("sun-123", "aqdb", 5521,
                                                             "thin");
}
```

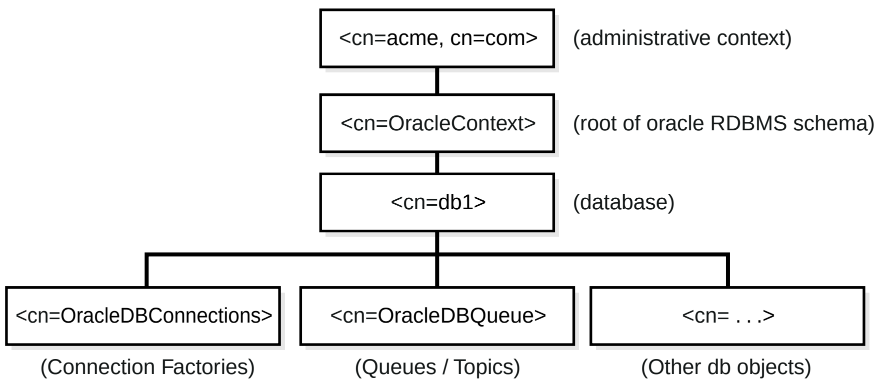
Using JNDI to Look Up ConnectionFactory Objects

ConnectionFactory objects can be registered in an LDAP server by a JMS administrator.

The following setup is required to enable JNDI lookup in JMS:

1. When the Oracle9i server is installed, the database must be registered with the LDAP server. This can be done using the Database Configuration Assistant (DBCA).

   AQ entries in the LDAP server have the following structure:



   Connection Factory information is stored under <cn=OracleDBConnections>, while topics and queues are stored under <cn=OracleDBQueues>

2. The `GLOBAL_TOPIC_ENABLED` system parameter for the database must be set to `TRUE`. This ensures that all queues and topics created in AQ are automatically registered with the LDAP server.

   This parameter can be set by using

   ```
   ALTER SYSTEM SET GLOBAL_TOPICS_ENABLED = TRUE
   ```

3. After the database has been setup to use an LDAP server, the JMS administrator can register QueueConnectionFactory and TopicConnectionFactory objects in LDAP by using the `AQjmsFactory.registerConnectionFactory()` method.

   The registration can be done in one of the following ways:

   - Connect directly to the LDAP server - The user must have the `GLOBAL_AQ_USER_ROLE` to register connection factories in LDAP

To connect directly to LDAP, the parameters for the registerConnectionFactory method include the LDAP context, the name of the Queue/Topic ConnectionFactory, hostname, database SID, port number, JDBC driver (thin or oci8) and factory type (queue or topic).

- Connect to LDAP through the database server - the user can log on to the Oracle9i database first and then have the database update the LDAP entry. The user that logs on to the database must have the `AQ_ADMINISTRATOR_ROLE` to perform this operation.

  To connect directly to LDAP through the database server, the parameters for the registerConnectionFactory method include a JDBC connection (to a user having AQ_ADMINISTRATOR_ROLE), the name of the Queue/Topic ConnectionFactory, hostname, database SID, port number, JDBC driver (thin or oci8) and factory type (queue or topic).

After the Connection Factory objects have been registered in LDAP by a JMS administrator, they can be looked up by using JNDI

Example

Lets say the JMS administrator wants to register a order entry queue connection factory, `oe_queue_factory`. In LDAP, it can be registered as follows:

```
public static void register_Factory_in_LDAP() throws Exception
{
    Hashtable env = new Hashtable(5, 0.75f);
    env.put(Context.INITIAL_CONTEXT_FACTORY, AQjmsConstants.INIT_CTX_FACTORY);

    // aqldapserv is your LDAP host and 389 is your port
    env.put(Context.PROVIDER_URL, "ldap://aqldapserv:389);

    // now authentication info
    // username/password scheme, user is OE, password is OE
    env.put(Context.SECURITY_AUTHENTICATION, "simple");
    env.put(Context.SECURITY_PRINCIPAL, "cn=oe,cn=users,cn=acme,cn=com");
    env.put(Context.SECURITY_CREDENTIALS, "oe");

    /* register queue connection factory for database "aqdb", host "sun-123",
       port 5521,  driver "thin" */
    AQjmsFactory.registerConnectionFactory(env, "oe_queue_factory", "sun-123",
                                           "aqdb", 5521, "thin", "queue");
   }
```

After order entry, queue connection factory `oe_queue_factory` has been registered in LDAP; it can be looked up as follows:

```
public static void get_Factory_from_LDAP() throws Exception
{
    Hashtable env = new Hashtable(5, 0.75f);
    env.put(Context.INITIAL_CONTEXT_FACTORY, AQjmsConstants.INIT_CTX_FACTORY);

    // aqldapserv is your LDAP host and 389 is your port
    env.put(Context.PROVIDER_URL, "ldap://aqldapserv:389);

    // now authentication info
    // username/password scheme, user is OE, password is OE
    env.put(Context.SECURITY_AUTHENTICATION, "simple");
    env.put(Context.SECURITY_PRINCIPAL, "cn=oe,cn=users,cn=acme,cn=com");
    env.put(Context.SECURITY_CREDENTIALS, "oe");

    DirContext inictx = new InitialDirContext(env);
    // initialize context with the distinguished name of the database server
    inictx=(DirContext)inictx.lookup("cn=db1,cn=OracleContext,cn=acme,cn=com");

    //go to the connection factory holder cn=OraclDBConnections
    DirContext connctx = (DirContext)inictx.lookup("cn=OracleDBConnections");

    // get connection factory "oe_queue_factory"
    QueueConnectionFactory qc_fact =
                  (QueueConnectionFactory)connctx.lookup("cn=oe_queue_factory");
}
```

Connection

A JMS Connection is a client’s active connection to its JMS provider. A Connection performs several critical services:

- Encapsulates either an open connection or a pool of connections with a JMS provider
- Typically represents an open TCP/IP socket (or a set of open sockets) between a client and a provider’s service daemon
- Provides a structure for authenticating clients at the time of its creation
- Creates Sessions
- Provides Connection metadata
- Supports an optional ExceptionListener

A JMS `Connection` to the database can be created by invoking `createQueueConnection() or createTopicConnection()` and passing the parameters username and password on the `QueueConnectionFactory` and `TopicConnectionFactory` object respectively.

Connection Setup

A JMS client typically creates a `Connection`, `Session` and a number of `MessageProducers` and `MessageConsumers`. In the current version only one open session for each connection is allowed, except in the following cases:

- If the JDBC oci8 driver is used to create the JMS Connection
- If the user provides an OracleOCIConnectionPool instance during JMS Connection creation

When a Connection is created it is in stopped mode. In this state no messages can be delivered to it. It is typical to leave the Connection in stopped mode until setup is complete. At that point the Connection's `start()` method is called and messages begin arriving at the Connection's consumers. This setup convention minimizes any client confusion that may result from asynchronous message delivery while the client is still in the process of setup.

It is possible to start a Connection and to perform setup subsequently. Clients that do this must be prepared to handle asynchronous message delivery while they are still in the process of setting up. A `MessageProducer` can send messages while a Connection is stopped.

Some of the methods that are supported on the Connection object are

- `start()` - start, or restart, a Connection's delivery of incoming messages.
- `stop()` - Used to temporarily stop a Connection's delivery of incoming messages. When stopped, delivery to all the Connection's message consumers is inhibited. Also, synchronous receive's block and messages are not delivered to message listener
- `close()` - close the JMS session and release all associated resources
- `createQueueSession(true, 0)` - create a queue session
- `createTopicSession (true, 0)` - create a topic session
- `setExceptionListener (ExceptionListener)` - set an exception listener for the connection. This allows a client to be asynchronously notified of a problem. Some connections only consume messages so they have no other way to learn the connection has failed.

- `getExceptionListener()` - get the ExceptionListener for this connection.

Session

A Connection is a factory for Sessions that use its underlying connection to a JMS provider for producing and consuming messages. A JMS Session is a single threaded context for producing and consuming messages. Although it may allocate provider resources outside the Java virtual machine, it is considered a light-weight JMS object.

A Session serves several purposes:

- Constitutes a factory for its `MessageProducer`s and `MessageConsumers`.
- Provides a way to get a handle to a destination objects (queues/topics)
- Supplies provider-optimized message factories
- Supports a single series of transactions that combines work spanning this session's Producers and Consumers, organizing these into atomic units.
- Defines a serial order for the messages it consumes and the messages it produces.
- Serializes execution of `MessageListener`s registered with it.

When you use the OCI JDBC driver, you can create multiple sessions for each connection. When you use other JDBC drivers, only one session can be created from one connection.

Because a provider may allocate some resources on behalf of a session outside the JVM, clients should close them when they are not needed. Relying on garbage collection to eventually reclaim these resources may not be timely enough. The same is true for the `MessageProducers` and `MessageConsumer`s created by a session.

Methods on the Session object include:

- `commit()` - commits all messages performed in this transaction and releases locks currently held
- `rollback()` - rollsback any messages done in the transaction and release locks currently held
- `close()` - closes the session
- `getDBConnection()` - gets a handle to the underlying JDBC connection. This handle can be used to perform other SQL DML operations as part of the same session. The method is Oracle JMS specific.

- `acknowledge()` - acknowledges message receipt in a nontransacted session
- `recover()` - restarts message delivery in a nontransacted session. In effect, the series of delivered messages in the session are reset to the point after the last acknowledged message.

The following are some of the extensions to JMS made by Oracle. The `Session` object has to be cast to `AQjmsSession` to use any of the extensions.

- `QueueTables` and Queues, Topics can be created from the Session object
- `createQueueTable()` - creates a queue table
- `getQueueTable()` - gets a handle to an existing queue table
- `createQueue()` - creates a queue
- `getQueue()` - gets a handle to an existing queue
- `createTopic()` - creates a topic
- `getTopic()` - gets a handle to an existing topic

The following code illustrates how some of the preceding calls are used.

Example Code

```
public static void bol_example(String ora_sid, String host, int port,
                               String driver)
{

 QueueConnectionFactory    qc_fact   = null;
 QueueConnection           q_conn    = null;
 QueueSession              q_sess    = null;
 AQQueueTableProperty      qt_prop   = null;
 AQQueueTable              q_table   = null;
 AQjmsDestinationProperty  dest_prop = null;
 Queue                     queue     = null;
 BytesMessage              bytes_msg = null;

 try
 {
   /* get queue connection factory */
   qc_fact = AQjmsFactory.getQueueConnectionFactory(host, ora_sid,
                   port, driver);

   /* create queue connection */
   q_conn = qc_fact.createQueueConnection("boluser", "boluser");
```

```
    /* create queue session */
    q_sess = q_conn.createQueueSession(true, Session.CLIENT_ACKNOWLEDGE);

    /* start the queue connection */
    q_conn.start();

    qt_prop = new AQQueueTableProperty("SYS.AQ$_JMS_BYTES_MESSAGE");

    /* create a queue table */
    q_table = ((AQjmsSession)q_sess).createQueueTable("boluser",
                                                      "bol_ship_queue_table",
                                                      qt_prop);

    dest_prop = new AQjmsDestinationProperty();

    /* create a queue */
    queue = ((AQjmsSession)q_sess).createQueue(q_table, "bol_ship_queue",
                                                dest_prop);

    /* start the queue */
    ((AQjmsDestination)queue).start(q_sess, true, true);

    /* create a bytes message */
    bytes_msg = q_sess.createBytesMessage();

    /* close session */
    q_sess.close();

    /* close connection */
    q_conn.close();
  }
  catch (Exception ex)
  {
    System.out.println("Exception: " + ex);
  }
}
```

JMS Destinations - Queue and Topic

A `Destination` is an object a client uses to specify the destination where it sends messages, and the source from which it receives messages.

There are two types of destination objects - Queue and Topic. In AQ, these map to a <schema>.<queue> at a specific database. Queue maps to a single-consumer queue in AQ and Topic maps to multiconsumer queue in AQ.

Destination objects can be obtained in one of the following ways:

1. Using domain specific methods in the JMS Session
2. Java Naming and Directory Interface (JNDI) Lookup from a LDAP directory server

Using a JMS Session to Obtain Destination Objects

Destination objects are created from a Session object using domain specific session methods.

- AQjmsSession.getQueue(queue_owner, queue_name)- this method can be used to get a handle to a JMS queue
- AQjmsSession.getTopic(topic_owner, topic_name)- this method can be used to get a handle to a JMS topic

Example Code

In the BooksOnline application, new orders are to be sent to the neworders_queue in OE schema. After creating a JMS connection and session, we can get a handle to the queue as follows

```
public Queue get_queue_example(QueueSession jms_session)
{
   QueueSender   sender;
   Queue         queue = null;

   try
   {
       /* get a handle to the OE.oe_new_orders queue */
       queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");
   }
   catch (JMSException ex){
      System.out.println("Exception: " + ex); }
   return queue;
}
```

Using JNDI to Look Up Destination Objects

As described in "Connection Factory" on page 12-5, the database can be configured to register schema objects with an LDAP server. If a database has been configured to use LDAP and the GLOBAL_TOPIC_ENABLED parameter has been set to TRUE, then all JMS queues and topics are automatically registered with the LDAP server when they are created.

The administrator can also create aliases to the queues and topics registered in LDAP using the `DBMS_AQAQDM.add_alias_to_ldap` PL/SQL procedure.

Queues and topics that are registered in LDAP can be looked up through JNDI using the queue/topic name or one of their aliases.

Example Code

Lets say we have a new orders queue OE.OE_neworders_que stored in LDAP, it can be looked up as follows:

```
public static void get_Factory_from_LDAP() throws Exception
{
    Hashtable env = new Hashtable(5, 0.75f);
    env.put(Context.INITIAL_CONTEXT_FACTORY, AQjmsConstants.INIT_CTX_FACTORY);

    // aqldapserv is your LDAP host and 389 is your port
    env.put(Context.PROVIDER_URL, "ldap://aqldapserv:389);

    // now authentication info
    // username/password scheme, user is OE, password is OE
    env.put(Context.SECURITY_AUTHENTICATION, "simple");
    env.put(Context.SECURITY_PRINCIPAL, "cn=oe,cn=users,cn=acme,cn=com");
    env.put(Context.SECURITY_CREDENTIALS, "oe");

    DirContext inictx = new InitialDirContext(env);
    // initialize context with the distinguished name of the database server
    inictx=(DirContext)inictx.lookup("cn=db1,cn=OracleContext,cn=acme,cn=com");

   // go to the destination holder
    DirContext destctx = (DirContext)inictx.lookup("cn=OracleDBQueues");

    // get the destination OE.OE_new_orders queue
    Queue myqueue = (Queue)destctx.lookup("cn=OE.OE_new_orders_que");

}
```

Methods on the Destination Object include:

- `alter()` - alters a queue or topic
- `schedulePropagation()` - schedules propagation from a source to a destination
- `unschedulePropagation()` - unschedules a previously scheduled propagation
- `enablePropagationSchedule ()` - enable a propagation schedule
- `disablePropagationSchedule ()` - disable a propagation schedule
- `start()` - starts a queue or a topic. The queue can be started for enqueue or dequeue. The topic can be started for publish or subscribe.
- `stop()` - stops a queue or a topic. The queue is stopped for enqueue or dequeue. The topic is stopped for publish or subscribe.
- `drop()` - drops a queue or a topic

Example Code

```
public static void setup_example(TopicSession t_sess)
{
  AQQueueTableProperty     qt_prop   = null;
  AQQueueTable             q_table   = null;
  AQjmsDestinationProperty dest_prop = null;
  Topic                    topic     = null;
  TopicConnection          t_conn    = null;

  try
  {
    qt_prop = new AQQueueTableProperty("SYS.AQ$_JMS_BYTES_MESSAGE");
    /* create a queue table */
    q_table = ((AQjmsSession)t_sess).createQueueTable("boluser",
                         "bol_ship_queue_table",
                         qt_prop);
    dest_prop = new AQjmsDestinationProperty();
    /* create a topic */
    topic = ((AQjmsSession)t_sess).createTopic(q_table, "bol_ship_queue",
                       dest_prop);

    /* start the topic */
    ((AQjmsDestination)topic).start(t_sess, true, true);

    /* schedule propagation from topic "boluser" to the destination
      dblink "dba" */
```

```
    ((AQjmsDestination)topic).schedulePropagation(t_sess, "dba", null,
                   null, null, null);
    /*
       some processing done here
    */
    /* Unschedule propagation */
    ((AQjmsDestination)topic).unschedulePropagation(t_sess, "dba");
    /* stop the topic */
    ((AQjmsDestination)topic).stop(t_sess, true, true, true);
    /* drop topic */
    ((AQjmsDestination)topic).drop(t_sess);
     /* drop queue table */
    q_table.drop(true);
     /* close session */
    t_sess.close();
    /* close connection */
    t_conn.close();
  }
  catch(Exception ex)
  {
    System.out.println("Exception: " + ex);
  }
}
```

System-Level Access Control in JMS

Oracle8*i* supports system-level access control for all queuing operations. This feature allows an application designer or DBA to create users as queue administrators. A queue/topic administrator can invoke all JMS interface (both administration and operation) on any queue in the database. This simplifies the administrative work since all administrative scripts for the queues in a database can be managed under one schema. For more information, see "Oracle Enterprise Manager Support" on page 4-8.

Example Scenario and Code

In the BooksOnLine (BOL) application, the DBA creates `BOLADM`, the `BooksOnLine` Administrator account, as the queue administrator of the database. This allows `BOLADM` to create, drop, manage, and monitor any queues in the database.If you decide to create PL/SQL packages in the BOLADM schema that can be used by any applications to enqueue or dequeue, then you should also grant `BOLADM` the `ENQUEUE_ANY` and `DEQUEUE_ANY` system privilege.

```
CREATE USER BOLADM IDENTIFIED BY BOLADM; GRANT CONNECT, RESOURCE, aq_
administrator_role TO BOLADM;
((AQjmsSession)t_sess).grantSystemPrivilege("ENQUEUE_ANY", "BOLADM", false);
((AQjmsSession)t_sess).grantSystemPrivilege("DEQUEUE_ANY", "BOLADM", false)
;where t_sess is the session object.
```

In the application, AQ propagators populate messages from the OE (Order Entry) schema to WS (Western Sales), ES (Eastern Sales) and OS (Worldwide Sales) schemas. The WS, ES and OS schemas in turn populate messages to CB (Customer Billing) and CS (Customer Service) schemas. Hence the OE, WS, ES and OS schemas all host queues that serve as the source queues for the propagators.

When messages arrive at the destination queues, sessions based on the source queue schema name are used for enqueuing the newly arrived messages into the destination queues. This means that you need to grant schemas of the source queues enqueue privileges to the destination queues.

To simplify administration, all schemas that host a source queue in the BooksOnLine application are granted the `ENQUEUE_ANY` system privilege.

```
((AQjmsSession)t_sess).grantSystemPrivilege("ENQUEUE_ANY", "OE", false);
((AQjmsSession)t_sess).grantSystemPrivilege("ENQUEUE_ANY", "WS", false);
((AQjmsSession)t_sess).grantSystemPrivilege("ENQUEUE_ANY", "ES", false);
((AQjmsSession)t_sess).grantSystemPrivilege("ENQUEUE_ANY", "OS", false);
where t_sess is the session object
```

To propagate to a remote destination queue, the login user (specified in the database link in the address field of the agent structure) should either be granted the 'ENQUEUE ANY' privilege, or be granted the rights to enqueue to the destination queue. However, you do not need to grant any explicit privileges if the login user in the database link also owns the queue tables at the destination.

Destination-Level Access Control in JMS

Oracle8*i* supports queue/topic level access control for enqueue and dequeue operations. This feature allows the application designer to protect queues/topics created in one schema from applications running in other schemas. You need to grant only minimal access privileges to the applications that run outside the queue/topic's schema. The supported access privileges on a queue/topic are `ENQUEUE`, `DEQUEUE` and `ALL`. For more information see "Oracle Enterprise Manager Support" in Chapter 4, "Managing AQ".

Example Scenario and Code

The BooksOnLine application processes customer billings in its `CB` and `CBADM` schemas. CB (Customer Billing) schema hosts the customer billing application, and the `CBADM` schema hosts all related billing data stored as queue tables. To protect the billing data, the billing application and the billing data reside in different schemas. The billing application is allowed only to dequeue messages from `CBADM_shippedorders_topic`, the shipped order topic. It processes the messages, and then enqueues new messages into `CBADM_billedorders_topic`, the billed order topic.

To protect the queues from other illegal operations from the application, the following two grant calls are made:

```
/* Grant dequeue privilege on the shipped orders queue to the Customer
   Billing application. The CB application retrieves orders that are shipped
   but not billed from the shipped orders queue. */

((AQjmsDestination)cbadm_shippedorders_topic).grantTopicPrivilege(t_sess,
"DEQUEUE", "CB", false);
where t_sess is the session

/* Grant enqueue privilege on the billed orders queue to Customer Billing
   application.The CB application is allowed to put billed orders into this
   queue after processing the orders. */

((AQjmsDestination)cbadm_billedorders_topic).grantTopicPrivilege(t_sess,
"ENQUEUE", "CB", false);
```

Retention and Message History in JMS

AQ allows users retain messages in the queue table. This means that SQL can then be used to query these message for analysis. Messages are often related to each other. For example, if a message is produced as a result of the consumption of another message, the two are related. As the application designer, you may want to keep track of such relationships. Along with retention and message identifiers, AQ lets you automatically create message journals, also called tracking journals or event journals. Taken together -- retention, message identifiers and SQL queries -- make it possible to build powerful message warehouses.

Example Scenario and Code

Let us suppose that the shipping application needs to determine the average processing times of orders. This includes the time the order has to wait in the backed_order topic. Specifying the retention as `TRUE` for the shipping queues and specifying the order number in the correlation field of the message, SQL queries can be written to determine the wait time for orders in the shipping application.

For simplicity, we will only analyze orders that have already been processed. The processing time for an order in the shipping application is the difference between the enqueue time in the `WS_bookedorders_topic` and the enqueue time in the `WS_shipped_orders_topic`.

```
SELECT  SUM(SO.enq_time - BO.enq_time) / count (*) AVG_PRCS_TIME
   FROM WS.AQ$WS_orders_pr_mqtab BO , WS.AQ$WS_orders_mqtab SO
   WHERE SO.msg_state = 'PROCESSED' and BO.msg_state = 'PROCESSED'
   AND SO.corr_id = BO.corr_id and SO.queue = 'WS_shippedorders_topic';

/* Average waiting time in the backed order queue: */
SELECT SUM(BACK.deq_time - BACK.enq_time)/count (*) AVG_BACK_TIME
   FROM WS.AQ$WS_orders_mqtab BACK
   WHERE BACK.msg_state = 'PROCESSED' AND BACK.queue = 'WS_backorders_topic';
```

Supporting Oracle Real Application Clusters in JMS

Oracle Real Application Clusters can be used to improve AQ performance by allowing different queues to be managed by different instances. You do this by specifying different instance affinities (preferences) for the queue tables that store the queues. This allows queue operations (enqueue/dequeue) or topic operations (publish/subscribe) on different queues or topics to occur in parallel.

The AQ queue monitor process continuously monitors the instance affinities of the queue tables. The queue monitor assigns ownership of a queue table to the specified primary instance if it is available, failing which it assigns it to the specified secondary instance.

If the owner instance of a queue table terminates, the queue monitor changes ownership to a suitable instance such as the secondary instance.

AQ propagation is able to make use of Real Application Clusters, although it is transparent to the user. The affinities for jobs submitted on behalf of the propagation schedules are set to the same values as that of the affinities of the respective queue tables. Thus, a job_queue_process associated with the owner instance of a queue table will be handling the propagation from queues stored in that queue table thereby minimizing pinging. Additional discussion on this topic can be found under AQ propagation scheduling (see "Scheduling a Queue Propagation"in Chapter 9, "Administrative Interface"and *Oracle9i Real Application Clusters Setup and Configuration*.)

Example Scenario and Code

In the BooksOnLine example, operations on the OE_neworders_que and booked_order_topic at the order entry (OE) site can be made faster if the two topics are associated with different instances. This is done by creating the topics in different queue tables and specifying different affinities for the queue tables in the CreateQueueTable() command.

In the example, the queue table OE_orders_sqtab stores queue OE_neworders_que and the primary and secondary are instances 1 and 2 respectively. For queue table OE_orders_mqtab stores queue booked_order_topic and the primary and secondary are instances 2 and 1 respectively. The objective is to let instances 1 & 2 manage the two queues in parallel. By default, only one instance is available. In this case the owner instances of both queue tables will be set to instance1. However, if Oracle Real Application Clusters are set up correctly and both instances 1 and 2 are available, then queue table OE_orders_sqtab will be owned by instance 1 and the other queue table will be owned by instance 2. The primary and secondary instance specification of a queue table can be changed dynamically using the alter_queue_table() command as shown in the example that follows. Information about the primary, secondary and owner instance of a queue table can be obtained by querying the view USER_QUEUE_TABLES. See "Selecting Queue Tables in User Schema" in Chapter 10, "Administrative Interface: Views".

```
/* Create queue tables, topics for OE */

/* createing a queue table to hold queues */
qt_prop = new AQQueueTableProperty("SYS.AQ$_JMS_OBJECT_MESSAGE");
qt_prop.setPrimaryInstance(1);
qt_prop.setSecondaryInstance(2);
q_table = createQueueTable("OE", "OE_orders_sqtab", qt_prop);

/* creating a queue table to hold topics */
qt1_prop = new AQQueueTableProperty("SYS.AQ$_JMS_OBJECT_MESSAGE");
qt1_prop.setMultiConsumer(TRUE);
qt1_prop.setPrimaryInstance(2);
qt1_prop.setSecondaryInstance(1);
q_table1 = createQueueTable("OE", "OE_orders_mqtab", qt1_prop);

dest_prop = new AQjmsDestinationProperty();
queue = ((AQjmsSession)q_sess).createQueue(q_table. "OE_neworders_que",
                                           dest_prop);

dest_prop1 = new AQjmsDestinationProperty();
topic = ((AQjmsSession)q_sess).createTopic(q_table1, "OE_bookedorders_topic",
                                           dest_prop1);
```

```
/* Check instance affinity of OE queue tables from AQ administrative view: */
SELECT queue_table, primary_instance, secondary_instance, owner_instance
FROM user_queue_tables;

/* Alter Instance Affinity of OE queue tables */
q_table.alter("OE_orders_sqtab", 2, 1);
q_table1.alter("OE_orders_mqtabl", 1, 2);
```

Supporting Statistics Views in JMS

Each instance keeps its own AQ statistics information in its own System Global Area (SGA), and does not have knowledge of the statistics gathered by other instances. Then, when a GV$AQ view is queried by an instance, all other instances funnel their AQ statistics information to the instance issuing the query.

Example Scenario and Code

The gv$view can be queried at any time to see the number of messages in waiting, ready or expired state. The view also displays the average number of seconds messages have been waiting to be processed. The order processing application can use this to dynamically tune the number of order-processing processes. See Chapter , "Selecting the Number of Messages in Different States for the Whole Database" in Chapter 10, "Administrative Interface: Views".

```
CONNECT oe/oe

/* Count the number as messages and the average time for which the messages
   have been waiting: */
SELECT READY, AVERAGE_WAIT
FROM gv$aq Stats, user_queues Qs
WHERE Stats.qid = Qs.qid and Qs.Name = 'OE_neworders_que';
```

Structured Payload/Message Types in JMS

JMS Messages are composed of the following parts:

- Header - All messages support the same set of header fields. Header fields contain values used by both clients and providers to identify and route messages
- Properties - In addition to the standard header fields, you can add optional header fields to a message

  - Standard properties - JMS defines some standard properties that are in effect, optional header fields.
  - Provider specific properties - every JMS provider can add certain provider-specific properties to a message
  - Application-specific properties - this provides a mechanism for adding application specific header fields to a message
- Body - this is the message payload. JMS defines various types of message payloads, and a type that can store JMS messages of any or all JMS-specified message types.

Message Headers

You can use a header-only JMS message. A message body is not required. The message header contains the following fields:

- `JMSDestination` - this field contains the destination to which the message is sent. In AQ this would correspond to the destination queue/topic.
- `JMSDeliveryMode` - JMS supports two modes of message delivery - `PERSISTENT` (where messages are logged to stable storage) and `NON_PERSISTENT` (messages not logged). Oracle AQ supports persistent message delivery.
- `JMSMessageID` - this value uniquely identifies a message in a provider. All message ids must begin with ID:.
- `JMSTimeStamp` - contains the time the message was handed over to the provider to be sent. This maps to AQ message enqueue time.
- `JMSCorrelationID` - this field can be used by a client to link one message with another.
- `JMSReplyTo` - this field contains a Destination supplied by a client when a message is sent. Clients can use the following types to specify the `ReplyTo` destination: `oracle.jms.AQjmsAgent`; `javax.jms.Queue`; `javax.jms.Topic`.
- `JMSType` - this field contains a message type identifier supplied by a client at send time. For portability it is recommended that the `JMSType` be symbolic values.
- `JMSExpiration` - In non-J2EE compliance mode, the `JMSExpiration` header value is the sum of the enqueue time and the time-to-live. In compliant mode, the `JMSExpiration` header value in a dequeued message is the sum of the

JMS time stamp when the message was enqueued (Greenwich Mean Time, in milliseconds) and the time-to live (in milliseconds). Refer to "J2EE Compliance" on page 12-3 for more information.

- `JMSPriority` - This field contains the priority of the message. In J2EE-compliance mode, the permitted values for priority are `0`–`9`, with `9` the highest priority and `4` the default, in conformance with Sun Microsystem's JMS 1.0.2b standard. Noncompliant mode is the default. Refer to "J2EE Compliance" on page 12-3 for more information. JMS permits an administrator to configure JMS to override the client-specified values for `JMSDeliveryMode`, `JMSExpiration` and `JMSPriority`.

Message Properties

Properties are a mechanism to add optional header fields to a message. Properties allow a client, using message selectors, to have a JMS provider select messages on its behalf using application-specific criteria. Property names are Strings and values can be: boolean, byte, short, int, long, float, double, and string.

JMS-defined properties begin with `"JMSX"`.

- `JMSXUserID` - The identity of the user sending the message.
- `JMSXAppID` - this is the identity of the application sending the message.
- `JMSXDeliveryCount` - the number of message delivery attempts.
- `JMSXGroupid` - this field is set by the client refers to the identity of the message group, this message is a part of.
- `JMSXGroupSeq` - the sequence number of a message within a group.
- `JMSXRcvTimeStamp` - the time the message was delivered to the consumer (dequeue time)
- `JMSXState` - message state set by provider. Message can be `WAITING`, `READY`, `EXPIRED` or `RETAINED`

Oracle JMS specific properties begin with `JMS_Oracle`. The following properties are Oracle-specific:

- `JMS_OracleExcpQ` - queue name to send the message to if it cannot be delivered to the original destination. Only Destinations of type EXCEPTION can be specified in the `JMS_OracleExcpQ` property.
- `JMS_OracleDelay` - time in seconds to delay the delivery of the message. This may affect the order if message delivery

- `JMS_OracleOriginalMessageId` - if the messages are propagated from one destination to another, this property is set to the message id of the message in the source. If the message is not propagated, this property has the same value as the `JMSMessageId`.

A client can add additional header fields to a message by defining properties. These properties can then be used in message selectors to select specific messages.

JMS properties or header fields are set either explicitly by the client or automatically by the JMS provider (these are generally read-only). Some JMS properties are set using the parameters specified send and receive operations.

Table 12–1 Message Header Fields

Message Header Field	Type	Set by	Use
`JMSDestination`	`Destination`	Set by JMS after `Send` Method has completed	The destination to which the message is sent
`JMSDeliveryMode`	`int`	Set by JMS after `Send` Method has completed	The delivery mode -`PERSISTENT`
`JMSExpiration`	`long`	Set by JMS after Send Method has completed	The expiration time can be specified for a Message Producer or can be explicitly specified during each send or publish
`JMSPriority`	`int`	Set by JMS after `Send` Method has completed	Message's priority can be specified for a Message Producer or can be explicitly specified during each send or publish
`JMSMessageID`	`String`	Set by JMS after `Send` Method has completed	A value that uniquely identifies each message sent by the provider
`JMSTimeStamp`	`long`	Set by JMS after `Send` Method has completed	The time a message is handed to a provider to be sent
`JMSCorrelationID`	`String`	Set by JMS client	A field that can be used to link one message with another

Table 12–1 Message Header Fields

Message Header	Type	Set by	Use
JMSReplyTo	Destination	Set by JMS client	A destination set by the client, where a reply to the message should be sent. Should be specified as AQjsAgent, javax.jms.Queue, or javax.jms.Topic types
JMSType	String	Set by JMS client	Message type identifier
JMSRedelivered	boolean	Set by JMS provider	The message probably was delivered earlier but the client did not acknowledge it at that time

Table 12–2 JMS Defined Message Properties

JMS Defined Message Property	Type	Set by	Use
JMSXUserID	String	Set by JMS after Send Method has completed	The identity of the user sending the message
JMSAppID	String	Set by JMS after Send Method has completed	The identity of the application sending the message
JMSDeliveryCount	int	Set by JMS after Receive Method has completed	The number of message delivery attempts; the first is 1, second is 2,...
JMSXGroupID	String	Set by JMS client	The identity of the message group the message is a part of
JMSXGroupSeq	int	Set by JMS client	The sequence number of the message within the group first message is 1, second message is 2...
JMSXRcvTimeStamp	String	Set by JMS after Receive Method has completed	The time that JMS delivered the message to the consumer
JMSXState	int	Set by JMS Provider	Message state set by provider

Table 12–3 Oracle Defined Message Properties

Header Field/Property	Type	Set by	Use
`JMS_OracleExcpQ`	`String`	Set by JMS Client	Specifies the name of the exception queue
`JMS_OracleDelay`	`int`	Set by JMS Client	Specifies the time (seconds) after which the message should become available to the consumers
`JMS_OracleOriginalMessageID`	`String`	Set by JMS Provider	Specifies the message id of the message in source when the messages are propagated from one destination to another

Message Body

JMS provides five forms of message body:

- **StreamMessage -** a message whose body contains a stream of Java primitive values. It is filled and read sequentially.
- **BytesMessage -** a message whose body contains a stream of uninterpeted bytes. This message type is for directly encoding a body to match an existing message format.
- **MapMessage -** a message whose body contains a set of name-value pairs. Names are strings and values are Java primitive types. The entries can be accessed sequentially by enumerator or randomly by name.
- **TextMessage -** a message whose body contains a `java.lang.String.`
- **ObjectMessage -** a message that contains a serializable Java object.
- **ADTmessage -** a message whose body contains an Oracle ADT type object (AdtMessage type has been added in Oracle JMS).

The AQ$_JMS_MESSAGE Type

This type can store JMS messages of all the JMS-specified message types: `JMSStream`, `JMSBytes`, `JMSMap`, `JMSText`, and `JMSObject`. You can create a queue table of `AQ$_JMS_MESSAGE` type, but use any message type.

Stream Message

A StreamMessage is used to send a stream of Java primitives. It is filled and read sequentially. It inherits from Message and adds a stream message body. Its methods are based largely on those found in `java.io.DataInputStream` and `java.io.DataOutputStream`.

The primitive types can be read or written explicitly using methods for each type. They may also be read or written generically as objects. To use Stream Messages, create the queue table with the `SYS.AQ$_JMS_STREAM_MESSAGE` or `AQ$_JMS_MESSAGE` payload types.

Stream messages support the following conversion table. A value written as the row type can be read as the column type.

Table 12–4 Stream Message Conversion

	boolean	byte	short	char	int	long	float	double	String	byte[]
boolean	X	-	-	-	-	-	-	-	X	-
byte	-	X	X	-	X	X	-	-	X	-
short	-	-	X	-	X	X	-	-	X	-
char	-	-	-	X	-	-	-	-	X	-
int	-	-	-	-	X	X	-	-	X	-
long	-	-	-	-	-	X	-	-	X	-
float	-	-	-	-	-	-	X	X	X	-
double	-	-	-	-	-	-	-	X	X	-
String	X	X	X	X	X	X	X	X	X	-
byte[]	-	-	-	-	-	-	-	-	-	X

Bytes Message

A BytesMessage is used to send a message containing a stream of uninterpreted bytes. It inherits Message and adds a bytes message body. The receiver of the message supplies the interpretation of the bytes. Its methods are based largely on those found in `java.io.DataInputStream` and `java.io.DataOutputStream`.

This message type is for client encoding of existing message formats. If possible, one of the other self-defining message types should be used instead.

The primitive types can be written explicitly using methods for each type. They may also be written generically as objects. To use Bytes Messages, create the queue table with SYS.AQ$_JMS_BYTES_MESSAGE or AQ$_JMS_MESSAGE payload types.

Map Message

A MapMessage is used to send a set of name-value pairs where names are Strings and values are Java primitive types. The entries can be accessed sequentially or randomly by name. The order of the entries is undefined. It inherits from Message and adds a map message body. The primitive types can be read or written explicitly using methods for each type. They may also be read or written generically as objects.

To use Map Messages, create the queue table with the SYS.AQ$_JMS_MAP_MESSAGE or AQ$_JMS_MESSAGE payload types. Map messages support the following conversion table. A value written as the row type can be read as the column type.

Table 12–5 Map Message Conversion

	boolean	byte	short	char	int	long	float	double	String	byte[]
boolean	X	-	-	-	-	-	-	-	X	-
byte	-	X	X	-	X	X	-	-	X	-
short	-	-	X	-	X	X	-	-	X	-
char	-	-	-	X	-	-	-	-	X	-
int	-	-	-	-	X	X	-	-	X	-
long	-	-	-	-	-	X	-	-	X	-
float	-	-	-	-	-	-	X	X	X	-
double	-	-	-	-	-	-	-	X	X	-
String	X	X	X	X	X	X	X	X	X	-
byte[]	-	-	-	-	-	-	-	-	-	X

Text Message

A TextMessage is used to send a message containing a `java.lang.StringBuffer`. It inherits from `Message` and adds a text message body. The text information can be read or written using methods `getText()` and `setText(...)`. To use Text Messages, create the queue table with the SYS.AQ$_JMS_TEXT_MESSAGE or AQ$_JMS_MESSAGE payload types.

Object Message

An ObjectMessage is used to send a message that contains a serializable Java object. It inherits from Message and adds a body containing a single Java reference. Only serializable Java objects can be used. If a collection of Java objects must be sent, one of the collection classes provided in JDK 1.2 can be used. The objects can be read or written using the methods `getObject()` and `setObject(...)`.To use Object Messages, create the queue table with the `SYS.AQ$_JMS_OBJECT_MESSAGE` or `AQ$_JMS_MESSAGE` payload types.

Example Code

```
public void enqueue_new_orders(QueueSession jms_session, BolOrder new_order)
{
   QueueSender   sender;
   Queue         queue;
   ObjectMessage obj_message;

   try
   {
       /* get a handle to the new_orders queue */
       queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");
       sender = jms_session.createSender(queue);
       obj_message = jms_session.createObjectMessage();
       obj_message.setJMSCorrelationID("RUSH");
       obj_message.setObject(new_order);
       jms_session.commit();
    }
    catch (JMSException ex)
    {
      System.out.println("Exception: " + ex);
    }

}
```

AdtMessage

An AdtMessage is used to send a message that contains a Java object that maps to an Oracle Object type. These objects inherit from `Message` and add a body containing a Java object that implements the `CustomDatum` or `ORAData` interface.

> **See Also:** *Oracle9i Java Developer's Guide* for information about the `CustomDatum` and `ORAData` interfaces

To use AdtMessage, create the queue table with payload type as the Oracle Object Type. The AdtMessage payload can be read and written using the `getAdtPayload` and `setAdtPayload` methods.

You can also use an AdtMessage to send messages to queues of type `SYS.XMLType`. You must use the `oracle.xdb.XMLType` class to create the message.

Using Message Properties with Different Message Types

- JMS Properties that can be set by client using the `setProperty` call:
  - On `StreamMessage`, `BytesMessage`, `ObjectMessage`, `TextMessage`, `MapMessage -`

    `JMSXAppID`

    `JMSXGroupID`

    `JMSXGroupSeq`

    `JMS_OracleExcpQ`

    `JMS_OracleDelay`
  - On AdtMessage

    `JMS_OracleExcpQ`

    `JMS_OracleDelay`
- JMS Properties that can be obtained by client using the `getProperty` call
  - On `StreamMessage`, `BytesMessage`, `ObjectMessage`, `TextMessage`, `MapMessage`

    `JMSXuserID`

    `JMSXAppID`

    `JMSXDeliveryCount`

    `JMSXGroupID`

    `JMSXGroupSeq`

    `JMSXRecvTimeStamp`

    `JMSXState`

    `JMS_OracleExcpQ`

`JMS_OracleDelay`

`JMS_OracleOriginalMessageID`

- On AdtMessage

  `JMSXDeliveryCount`

  `JMSXRecvTimeStamp`

  `JMSXState`

  `JMS_OracleExcpQ`

  `JMS_OracleDelay`

- JMS Properties / Header_fields that can be included in a Message Selector
  - For `QueueReceiver`, `TopicSubscriber and TopicReceiver` on queues containing JMS type payloads, any SQL92 where clause of a string that contains

    `JMSPriority` `(int)`

    `JMSCorrelationID` `(String)`

    `JMSMessageID` `(String) -` only for QueueReceiver and TopicReceiver

    `JMSTimestamp` `(Date)`

    `JMSType` `(String)`

    `JMSXUserID` `(String)`

    `JMSXAppID` `(String)`

    `JMSXGroupID` `(String)`

    `JMSXGroupSeq` `(int)`

    Any user-defined property in JMS message
  - For `QueueReceiver`, `TopicSubscriber and TopicReceiver` on queues containing ADT payloads, use AQ rule syntax for any SQL92 where clause of string that contains
    - `corrid`
    - `priority`
    - `tab.user_data.<adt_field_name>`

Payload Used by JMS Examples

```
/*
 *  BooksOrder - payload for BooksOnline example
 *
 */

import java.lang.*;
import java.io.*;
import java.util.*;

public class BolOrder implements Serializable
{

  int             orderno;
  String          status;
  String          type;
  String          region;
  BolCustomer     customer;
  String          paymentmethod;
  BolOrderItem[]  itemlist;
  String          ccnumber;
  Date            orderdate;

  public BolOrder(int orderno, BolCustomer customer)
  {
    this.customer   = customer;
    this.orderno    = orderno;
  }

  public int getOrderNo()
  {
    return orderno;
  }

  public String getStatus()
  {
    return status;
  }


  public void setStatus(String new_status)
  {
    status = new_status;
  }
```

```
public String getRegion()
{
  return region;
}


public void setRegion(String region)
{
  this.region = region;
}

public BolCustomer getCustomer()
{
  return customer;
}


public String getPaymentmethod()
{
  return paymentmethod;
}

public void setPaymentmethod(String paymentmethod)
{
  this.paymentmethod = paymentmethod;
}

public BolOrderItem[] getItemList()
{
  return itemlist;
}

public void setItemList(BolOrderItem[] itemlist)
{
  this.itemlist = itemlist;
}

public String getCCnumber()
{
  return ccnumber;
}

public void setCCnumber(String ccnumber)
```

```
  {
    this.ccnumber = ccnumber;
  }

  public Date getOrderDate()
  {
    return orderdate;
  }

  public void setOrderDate(Date orderdate)
  {
    this.orderdate = orderdate;
  }

}

/*
 *  BolOrderItem - order item type  for BooksOnline example
 *
 */

import java.lang.*;
import java.io.*;
import java.util.*;

public class BolOrderItem implements Serializable
{

  BolBook     item;
  int         quantity;

  public BolOrderItem(BolBook book, int quantity)
  {
    item          = book;
    this.quantity = quantity;

  }

  public BolBook getItem()
  {
    return item;
  }

  public int getQuantity()
  {
```

```
    return quantity;
  }
}


/*
 *  BolBook - book type  for BooksOnline example
 *
 */

import java.lang.*;
import java.io.*;
import java.util.*;

public class BolBook implements Serializable
{

  String    title;
  String    authors;
  String    isbn;
  float     price;

  public BolBook(String title)
  {
    this.title   = title;
  }

  public BolBook(String title, String authors, String isbn, float price)
  {
    this.title   = title;
    this.authors = authors;
    this.isbn    = isbn;
    this.price   = price;

  }

  public String getISBN()
  {
    return isbn;
  }

  public String getTitle()
  {
    return title;
  }
```

```
  public String getAuthors()
  {
    return authors;
  }

  public float getPrice()
  {
    return price;
  }

}
/*
 *  BolCustomer - customer type  for BooksOnline example
 *
 */

import java.lang.*;
import java.io.*;
import java.util.*;

public class BolCustomer implements Serializable
{

  int          custno;
  String       custid;
  String       name;
  String       street;
  String       city;
  String       state;
  int          zip;
  String       country;

  public BolCustomer(int custno, String name)
  {

    this.custno  = custno;
    this.name    = name;
  }

  public BolCustomer(int custno, String custid, String name, String  street,
           String city, String state, int zip, String country)
  {

    this.custno  = custno;
```

```
  this.custid  = custid;
  this.name    = name;
  this.street  = street;
  this.city    = city;
  this.state   = state;
  this.zip     = zip;
  this.country = country;

}

public int getCustomerNo()
{
  return custno;
}

public String getCustomerId()
{
  return custid;
}

public String getName()
{
  return name;
}

public String getStreet()
{
  return street;
}

public String getCity()
{
  return city;
}

public String getState()
{
  return state;
}

public int getZipcode()
{
  return zip;
}
```

```
    public String getCountry()
    {
      return country;
    }
  }
```

JMS Point-to-Point Model Features

- Queues
- Queue Sender
- Queue Receiver
- Queue Browser

Queues

In the point-to-point model, clients exchange messages using queues - from one point to another. These queues are used by message producers and consumers to send and receive messages.

An administrator creates single-consumer queues by means of the `createQueue` method in `AQjmsSession`. A client may obtain a handle to a previously created queue using the `getQueue` method on `AQjmsSession`.

These queues are described as **single-consumer queues** because a message can be consumed by only a single consumer. Put another way: a message can be consumed exactly once. This raises the question: What happens when there are multiple processes or operating system threads concurrently dequeuing from the same queue? Since a locked message cannot be dequeued by a process other than the one that has created the lock, each process will dequeue the first unlocked message at the head of the queue.

Before using a queue, the queue needs to be enabled for enqueue/dequeue using start call in `AQjmsDestination`.

After processing, the message is removed if the retention time of the queue is 0, or is retained for a specified retention time. As long as the message is retained, it can be either

- queried using SQL on the queue table view, or
- dequeued using a `QueueBrowser` and specifying the message ID of the processed message.

Queue Sender

A client uses a QueueSender to send messages to a queue. A QueueSender is created by passing a queue to a session's createSender method. A client also has the option of creating a QueueSender without supplying a queue. In that case a queue must be specified on every send operation.

A client can specify a default delivery mode, priority and time-to-live for all messages sent by the QueueSender. Alternatively, the client can define these options on a per message basis.

Example Code

In the BooksOnline application, new orders are to be sent to the new_orders_queue. After creating a JMS connection and session, we create a sender:

```
public void enqueue_new_orders(QueueSession jms_session, BolOrder new_order)
{
   QueueSender   sender;
   Queue         queue;
   ObjectMessage obj_message;

   try
   {
       /* get a handle to the new_orders queue */
       queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");
       sender = jms_session.createSender(queue);
       obj_message = jms_session.createObjectMessage();
       obj_message.setJMSCorrelationID("RUSH");
       obj_message.setObject(new_order);
       sender.send(obj_message);
       jms_session.commit();
    }
    catch (JMSException ex)
    {
      System.out.println("Exception: " + ex);
    }
}
```

Queue Receiver

A client uses a QueueReceiver to receive messages from a queue. A QueueReceiver is created using the session's createQueueReceiver method. A QueueReceiver can be created with a message selector. This allows the client to restrict messages delivered to the consumer to those that match the selector.

The selector for queues containing payloads of type `TextMessage`, `StreamMessage`, `BytesMessage`, `ObjectMessage`, `MapMessage` can contain any expression that has a combination of one or more of the following:

- `JMSMessageID ='ID:23452345'` to retrieve messages that have a specified message ID (all message IDs being prefixed with ID:)
- JMS Message header fields or properties:

  ```
  JMSPriority < 3 AND JMSCorrelationID = 'Fiction'
  ```

  ```
  JMSCorrelationID LIKE 'RE%'
  ```

- User-defined message properties:

  ```
  color IN ('RED', BLUE', 'GREEN') AND price < 30000
  ```

For queues containing `AdtMessages` the selector must be a SQL expression on the message payload contents or message ID or priority or correlation ID.

- Selector on message id - to retrieve messages that have a specific message ID

  `msgid` = '23434556566767676'

  Note: in this case message IDs must NOT be prefixed with 'ID:'

- Selector on priority or correlation is specified as follows

  ```
  priority < 3 AND corrid = 'Fiction'
  ```

- Selector on message payload is specified as follows

  ```
  tab.user_data.color = 'GREEN' AND tab.user_data.price < 30000
  ```

Example Scenario and Code

In the BOL application, new orders are retrieved from the `new_orders_queue`. These orders are then published to the `OE.OE_bookedorders_topic`. After creating a JMS connection and session, you create a receiver to receive messages:

```
public void get_new_orders(QueueSession jms_session)
{
 QueueReceiver   receiver;
 Queue           queue;
 ObjectMessage   obj_message;
 BolOrder        new_order;
 BolCustomer     customer;
 String          state;
 String          cust_name;
```

```
    try
    {

      /* get a handle to the new_orders queue */
      queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");

      receiver = jms_session.createReceiver(queue);

      for(;;)
      {
        /* wait for a message to show up in the queue */
        obj_message = (ObjectMessage)receiver.receive(10);

        new_order = (BolOrder)obj_message.getObject();

        customer = new_order.getCustomer();
        state    = customer.getState();

        obj_message.clearBody();

        /* determine customer region and assign a shipping region*/
     if((state.equals("CA")) || (state.equals("TX")) ||
      (state.equals("WA")) || (state.equals("NV")))
     obj_message.setStringProperty("Region", "WESTERN");
        else
     obj_message.setStringProperty("Region", "EASTERN");

        cust_name = new_order.getCustomer().getName();

        obj_message.setStringProperty("Customer", cust_name);

     if(obj_message.getJMSCorrelationID().equals("RUSH"))
     book_rush_order(obj_message);
     else
     book_new_order(obj_message);

        jms_session.commit();
      }
    }
    catch (JMSException ex)
    {
      System.out.println("Exception: " + ex);
    }
}
```

Queue Browser

A client uses a `QueueBrowser` to view messages on a queue without removing them. The browser methods return a `java.util.Enumeration` that is used to scan the queue's messages. The first call to `nextElement` gets a snapshot of the queue. A `QueueBrowser` may also optionally lock messages as it is scanning them. This is similar to a "`SELECT ... for UPDATE`" command on the message. This prevents other consumers from removing the message while they are being scanned.

A `QueueBrowser` can also be created with a message selector. This allows the client to restrict messages delivered to the browser to those that match the selector.

The selector for queues containing payloads of type `TextMessage`, `StreamMessage`, `BytesMessage`, `ObjectMessage`, `MapMessage` can contain any expression that has a combination of one or more of the following:

- `JMSMessageID ='ID:23452345'` to retrieve messages that have a specified message ID (all message IDs being prefixed with ID:)
- JMS Message header fields or properties:

  ```
  JMSPriority < 3 AND JMSCorrelationID = 'Fiction'
  ```

  ```
  JMSCorrelationID LIKE 'RE%'
  ```

- User-defined message properties:

  ```
  color IN ('RED', BLUE', 'GREEN') AND price < 30000
  ```

For queues containing `AdtMessages` the selector must be a SQL expression on the message payload contents or messageID or priority or correlationID.

- Selector on message id - to retrieve messages that have a specific messageID

  `msgid` = '23434556566767676'

  Note: in this case message IDs must NOT be prefixed with 'ID:'

- Selector on priority or correlation is specified as follows

  ```
  priority < 3 AND corrid = 'Fiction'
  ```

- Selector on message payload is specified as follows

  ```
  tab.user_data.color = 'GREEN' AND tab.user_data.price < 30000
  ```

Example Scenario and Code

In the BooksOnline application, new orders are put into the new_orders_queue. A client can then browse selected messages.

```
public void browse_rush_orders(QueueSession jms_session)
{
   QueueBrowser    browser;
   Queue           queue;
   ObjectMessage   obj_message;
   BolOrder        new_order;
   Enumeration     messages;
   String          customer_name;

   try
   {
     /* get a handle to the new_orders queue */
     queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");

     /* create a Browser to look at RUSH orders in USA */
     browser = jms_session.createBrowser(queue,
                          "JMSCorrelationID = 'RUSH' and country = 'USA' ");

     for (messages = browser.getEnumeration() ; messages.hasMoreElements() ;)
     {
       obj_message = (ObjectMessage)messages.nextElement();

       new_order = (BolOrder)obj_message.getObject();

       customer_name = new_order.getCustomer().getName();
       System.out.println("Customer " +  customer_name +
           " has placed a RUSH order");
     }

     browser.close();
   }
   catch (Exception ex)
   {
     System.out.println("Exception " + ex);
   }
}
```

JMS Publish-Subscribe Model Features

The following topics are discussed in this section:

Topic

JMS has various features that allow you to develop an application based on a publish-subscribe model. The aim of this application model is to enable flexible and dynamic communication between applications functioning as publishers and applications playing the role of subscribers. The specific design point is that the applications playing these different roles should be decoupled in their communication.They should interact based on messages and message content.

In distributing messages, publisher applications do not have to explicitly handle or manage message recipients. This allows for the dynamic addition of new subscriber applications to receive messages without changing any publisher application logic. Subscriber applications receive messages based on message content without regard to which publisher applications are sending messages. This allows the dynamic addition of subscriber applications without changing any subscriber application logic. Subscriber applications specify interest by defining a rule-based subscription on message properties or the message content of a topic. The system automatically routes messages by computing recipients for published messages using the rule-based subscriptions.

In the Publish-Subscribe model, messages are published to and received from topics. A topic is created using the `CreateTopic` method in an AQjmsSession. A client may obtain a handle to a previously-created Topic using the getTopic method in AQjmsSession.

You use the publish-subscribe model of communication in JMS by taking the following steps:

- Enable enqueue/dequeue on the Topic using the start call in AQjmsDestination.
- Set up one or more topics to hold messages. These topics should represent an area or subject of interest. For example, a topic can be used to represent billed orders.

- Create a set of **Durable Subscribers**. Each subscriber may specify a selector that represents a specification (selects) for the messages that the subscriber wishes to receive. A null selector indicates that the subscriber wishes to receive all messages published on the topic
- Subscribers may be local or remote. Local subscribers are durable subscribers defined on the same topic on which the message is published. Remote subscribers are other topics, or recipients on other topics that are defined as subscribers to a particular queue. In order to use remote subscribers, you must set up **propagation** between the two local and remote topic. For details on propagation, see: Chapter 9, "Administrative Interface".
- Create `TopicPublishers` using the session's `createPublisher` method Messages are published using the `publish` call. Messages may be published to all subscribers to the topic or to a specified subset of recipients on the topic
- Subscribers may receive messages on the topic by using the `receive` method
- Subscribers may also receive messages asynchronously by using **Message Listeners**. The concepts of **Remote Subscribers** and **Propagation** are Oracle extensions to JMS.

Example Scenario

In the BooksOnline application all booked orders are published to the `OE_bookedorders_topic`. Orders for customers in the eastern region are routed to the `ES.ES_bookedorders_topic` and those for the western region are routed to the `WS.WS_bookedorders_topic`. There is also another application that subscribes to the `OE_bookedorders_topic` to track messages for some important customers. Refer to the code examples in the following sections.

Durable Subscriber

Durable Subscribers are instituted in either of the following ways:

- A client uses the session's `createDurableSubscriber` method to create durable subscribers.
- A `DurableSubscriber` is be created with a message selector. This allows the client to restrict messages delivered to the subscriber to those that match the selector.

The selector for topics containing payloads of type `TextMessage`, `StreamMessage`, `BytesMessage`, `ObjectMessage`, `MapMessage` can contain any expression that has a combination of one or more of the following:

- JMS Message header fields or properties:

  ```
  JMSPriority < 3 AND JMSCorrelationID = 'Fiction'
  ```

- User-defined message properties:

  ```
  color IN ('RED', BLUE', 'GREEN') AND price < 30000
  ```

For topics containing `AdtMessages` the selector must be a SQL expression on the message payload contents or priority or `correlationID`.

- Selector on priority or correlation is specified as follows

  ```
  priority < 3 AND corrid = 'Fiction'
  ```

- Selector on message payload is specified as follows

  ```
  tab.user_data.color = 'GREEN' AND tab.user_data.price < 30000
  ```

The syntax for the selector is described in detail in *Oracle9i Supplied Java Packages Reference*, `createDurableSubscriber`.

Remote subscribers are defined using the `createRemoteSubscriber` call.The remote subscriber may be a specific consumer at the remote topic or all subscribers at the remote topic

A remote subscriber is defined using the `AQjmsAgent` structure. An `AQjmsAgent` consists of a name and address. The name refers to the consumer_name at the remote topic. The address refers to the remote topic:

```
<schema>.<topic_name>[@dblink]
```

- To publish messages to a particular consumer at the remote topic, the `subscription_name` of the recipient at the remote topic must be specified in the name field of `AQjmsAgent`. The remote topic must be specified in the address field of `AQjmsAgent`.
- To publish messages to all subscribers of the remote topic, the name field of `AQjmsAgent` must be set to null. The remote topic must be specified in the address field of `AQjmsAgent`.

In the BooksOnline application there is one local subscriber `SUBS1` and two remote subscribers -

- `West_Shipping` at the remote topic `WS.WS_bookedorders_topic`
- `East_Shipping` at `ES.ES_booked_orders_topic`

Example Code

```
public void create_booked_orders_subscribers(TopicSession jms_session)
{
   Topic            topic;
   TopicSubscriber  tsubs;
   AQjmsAgent       agt_east;
   AQjmsAgent       agt_west;

   try
   {

     /* get a handle to the OE_bookedorders_topic */
     topic = ((AQjmsSession)jms_session).getTopic("OE",
                    "OR_bookedorders_topic");


     /* Create local subscriber - to track messages for some customers */
     tsubs = jms_session.createDurableSubscriber(topic, "SUBS1",
             "JMSPriority < 3 AND Customer = 'MARTIN'",
                   false);

     /* Create remote subscribers in the western and eastern region */
     agt_west = new AQjmsAgent("West_Shipping", "WS.WS_bookedorders_topic");

     ((AQjmsSession)jms_session).createRemoteSubscriber(topic, agt_west,
                     "Region = 'WESTERN'");

     agt_east = new AQjmsAgent("East_Shipping", "ES.ES_bookedorders_topic");

     ((AQjmsSession)jms_session).createRemoteSubscriber(topic, agt_east,
                     "Region = 'EASTERN'");

     /* schedule propagation between bookedorders_topic and
   WS_bookedorders_topic, ES.ES_bookedorders_topic */
     ((AQjmsDestination)topic).schedulePropagation(jms_session,
                      "WS.WS_bookedorders_topic",
                         null, null, null, null);

     ((AQjmsDestination)topic).schedulePropagation(jms_session,
                   "ES.ES_bookedorders_topic",
                      null, null, null, null);
   }
   catch (Exception ex)
   {
```

```
      System.out.println("Exception " + ex);
   }

}
```

Topic Publisher

Messages are published using `TopicPublisher`:

A `TopicPublisher` is created by passing a Topic to a session's `createPublisher` method. A client also has the option of creating a `TopicPublisher` without supplying a `Topic`. In this case, a `Topic` must be specified on every publish operation. A client can specify a default delivery mode, priority and time-to-live for all messages sent by the `TopicPublisher`. It can also specify these options on a per message basis.

Example Scenario and Code

In the BooksOnline application, booked orders are published to the `OE.OE_bookedorders_topic`

```
public void book_new_order(TopicSession jms_session, ObjectMessage obj_message)
{
   TopicPublisher  publisher;
   Topic           topic;

   try
   {
     /* get a handle to the booked_orders topic */
     topic = ((AQjmsSession) jms_session).getTopic("OE",
                     "OE_bookedorders_topic");

     publisher = jms_session.createPublisher(topic);

     publisher.publish(topic, obj_message);

     jms_session.commit();
   }
   catch (JMSException ex)
   {
     System.out.println("Exception: " + ex);
   }

}
```

In the BooksOnline application, each shipping region receives messages from the corresponding booked orders topic (`WS_bookedorder_topic` or `ES_bookedorder_topic`). The local subscriber `SUBS1` receives messages from the `OE_booked_orders_topic`.

```
public void get_martins_orders(TopicSession jms_session)
{
   Topic             topic;
   TopicSubscriber   tsubs;
   ObjectMessage     obj_message;
   BolCustomer       customer;
   BolOrder          new_order;
   String            state;
   int               i = 0;

   try
   {
     /* get a handle to the OE_bookedorders_topic */
     topic = ((AQjmsSession)jms_session).getTopic("OE",
                  "OE_bookedorders_topic");

     /* Create local subscriber - to track messages for some customers */
     tsubs = jms_session.createDurableSubscriber(topic, "SUBS1",
                "JMSPriority < 3 AND Customer = 'MARTIN'",
                   false);

     /* process 10 messages */
     for(i=0; i<10; i++)
     {
       /* wait for a message to show up in the topic */
       obj_message = (ObjectMessage)tsubs.receive(10);

       new_order = (BolOrder)obj_message.getObject();

       customer = new_order.getCustomer();
       state    = customer.getState();

       System.out.println("Order: " + i + " for customer " +
           customer.getName());
       jms_session.commit();
     }
   }
   catch (Exception ex)
   {
     System.out.println("Exception " + ex);
```

```
   }
}
```

Recipient Lists

In the JMS publish-subscribe model, clients can specify explicit recipient lists instead of having messages sent to all the subscribers of the topic. These recipients may or may not be existing subscribers of the topic. The recipient list overrides the subscription list on the topic for this message. The concept of recipient lists is an Oracle extension to JMS.

Example Scenario and Code

Suppose we want to send high priority messages only to `SUBS1` and `Fedex_Shipping` in the Eastern region instead of publishing them to all the subscribers of the `OE_bookedorders_topic`:

```
public void book_rush_order(TopicSession jms_session,
             ObjectMessage obj_message)
{

   TopicPublisher  publisher;
   Topic           topic;
   AQjmsAgent[]    recp_list = new AQjmsAgent[2];

   try
   {
     /* get a handle to the booked_orders topic */
     topic = ((AQjmsSession) jms_session).getTopic("OE",
                     "OE_bookedorders_topic");

     publisher = jms_session.createPublisher(null);

     recp_list[0] = new AQjmsAgent("SUBS1", null);
     recp_list[1] = new AQjmsAgent("Fedex_Shipping",
               "ES.ES_bookedorders_topic");

     publisher.setPriority (1);
     ((AQjmsTopicPublisher)publisher).publish(topic, obj_message, recp_list);

     jms_session.commit();

   }
   catch (Exception ex)
   {
```

```
      System.out.println("Exception: " + ex);
    }
}
```

TopicReceiver

If the recipient name is explicitly specified in the recipient list, but that recipient is not a subscriber to the queue, then messages sent to it can be received by creating a `TopicReceiver`. `TopicReceiver` is an Oracle extension to JMS.

A `TopicReceiver` can also be created with a message selector. This allows the client to restrict messages delivered to the recipient to those that match the selector.

The syntax for the selector for `TopicReceiver` is the same as that for QueueReceiver.

Example Scenario and Code

```
public void ship_rush_orders(TopicSession jms_session)
{
   Topic            topic;
   TopicReceiver    trec;
   ObjectMessage    obj_message;
   BolCustomer      customer;
   BolOrder         new_order;
   String           state;
   int              i = 0;

   try
   {
     /* get a handle to the OE_bookedorders_topic */
     topic = ((AQjmsSession)jms_session).getTopic("ES",
                  "ES_bookedorders_topic");

     /* Create local subscriber - to track messages for some customers */
     trec = ((AQjmsSession)jms_session).createTopicReceiver(topic,
                       "Fedex_Shipping",
                       null);

     /* process 10 messages */
     for(i = 0; i < 10; i++)
     {
       /* wait for a message to show up in the topic */
       obj_message = (ObjectMessage)trec.receive(10);
```

```
      new_order = (BolOrder)obj_message.getObject();

      customer = new_order.getCustomer();
      state    = customer.getState();

      System.out.println("Rush Order for customer " +
          customer.getName());
      jms_session.commit();
    }
  }
  catch (Exception ex)
  {
    System.out.println("Exception ex: " + ex);
  }
}
```

For remote subscribers - if the subscriber name at the remote topic has explicitly been specified in the `createRemoteSubscriber` call, then to receive a message, we can use `TopicReceivers`

```
public void get_westernregion_booked_orders(TopicSession jms_session)
{
  Topic            topic;
  TopicReceiver    trec;
  ObjectMessage    obj_message;
  BolCustomer      customer;
  BolOrder         new_order;
  String           state;
  int              i = 0;

  try
  {
    /* get a handle to the WS_bookedorders_topic */
    topic = ((AQjmsSession)jms_session).getTopic("WS",
                  "WS_bookedorders_topic");

    /* Create local subscriber - to track messages for some customers */
    trec = ((AQjmsSession)jms_session).createTopicReceiver(topic,
                       "West_Shipping",
                       null);

    /* process 10 messages */
    for(i = 0; i < 10; i++)
    {
      /* wait for a message to show up in the topic */
```

```
        obj_message = (ObjectMessage)trec.receive(10);

        new_order = (BolOrder)obj_message.getObject();

        customer = new_order.getCustomer();
        state    = customer.getState();

        System.out.println("Received Order for customer " +
            customer.getName());
        jms_session.commit();
      }
    }
    catch (Exception ex)
    {
      System.out.println("Exception ex: " + ex);
    }

}
```

If the subscriber name is not specified in the `createRemoteSubscriber` call, clients have to use durable subscribers at the remote site to receive messages.

Topic Browser

A client uses a TopicBrowser to view messages on a topic without removing them. The browser methods return a `java.util.Enumeration` that is used to scan the topic's messages. The first call to `nextElement` gets a snapshot of the topic. A TopicBrowser may also optionally lock messages as it is scanning them. This is similar to a `SELECT ... for UPDATE` command on the message. This prevents other consumers from removing the message while they are being scanned.

A TopicBrowser can also be created with a message selector. This allows the client to restrict messages delivered to the browser to those that match the selector.

The selector for the TopicBrowser can take any of the following forms:

- `JMSMessageID ='ID:23452345'` to retrieve messages that have a specified message ID (all message IDs are prefixed with `ID:`)
- JMS Message header fields or properties:

  ```
  JMSPriority < 3 AND JMSCorrelationID = 'Fiction'
  JMSCorrelationID LIKE 'RE%'
  ```

- User-defined message properties:

```
color IN ('RED', BLUE', 'GREEN') AND price < 30000
```

For topics containing `AdtMessages`, the selector must be a SQL expression on the message payload contents or messageID or priority or correlationID.

- Selector on message id - to retrieve messages that have a specific messageID

  `msgid = '23434556566767676'`

  Note: in this case message IDs must NOT be prefixed with `ID:`

  Selector on priority or correlation is specified as follows:

  ```
  priority < 3 AND corrid = 'Fiction'
  ```

- Selector on message payload is specified as follows:

  ```
  tab.user_data.color = 'GREEN' AND tab.user_data.price < 30000
  ```

As with any consumer for topics, only durable subscribers are allowed

to create topic browsers.

TopicBrowsers also support a purge feature. This allows a client using a topic browser to discard all messages that have been seen during the current browse operation on the topic. A purge is equivalent to a destructive receive of all of the seen messages (as if performed using a TopicSubscriber).

For the purpose of a purge, a message is considered seen if it has been returned to the client using a call to the `nextElement()` operation on the `java.lang.Enumeration` for the topic browser. Messages that have not yet been seen by the client will not be discarded during a purge. A purge operation may be performed multiple times on the same topic browser.

As with all other JMS messaging operations, the effect of a purge becomes stable when the JMS session used to create the TopicBrowser is committed. If the operations on the session are rolled back, the effects of the purge operation are also undone.

Example Scenario and Code

In the BooksOnline application, all booked orders are published to the `OE_booked_orders_topic`. A client can then browse selected messages.

```
import oracle.jms.TopicBrowser;
// ...
public void browse_rush_orders(TopicSession jms_session)
{
```

```
    TopicBrowser    browser;
    Topic           topic;
    ObjectMessage   obj_message;
    BolOrder        new_order;
    Enumeration     messages;
    String          customer_name;

    try
    {
        /* get a handle to the OE_booked_orders_topic topic */
        topic = ((AQjmsSession) jms_session).getTopic("OE",
            "OE_booked_orders_topic");

        /* create a Browser to look at RUSH orders */
        browser = jms_session.createBrowser(
            topic, "SUBS1", "JMSCorrelationID = 'RUSH'");

        int count = 0;
        for (messages = browser.getEnumeration() ; messages.hasMoreElements() ;)
        {
            obj_message = (ObjectMessage)messages.nextElement();
            new_order = (BolOrder)obj_message.getObject();

            customer_name = new_order.getCustomer().getName();
            System.out.println("Customer " +  customer_name +
                " has placed a RUSH order");

            ++count;
        }

        /* purge messages seen during this browse if there are too many */
        if (count > 100)
        {
            browser.purgeSeen();
        }

        browser.close();
    }
    catch (Exception ex)
    {
    System.out.println("Exception " + ex);
    }
}
```

JMS Message Producer Features

- Priority and Ordering of Messages
- Time Specification - Delay
- Time Specification - Expiration
- Message Grouping

Priority and Ordering of Messages

The message ordering dictates the order in which messages will be received from a queue or topic. The ordering method is specified when the queue table for the queue or topic is created (see "Creating a Queue Table" in Chapter 9, "Administrative Interface"). Currently, AQ supports ordering on two of the message attributes:

- Priority
- Enqueue time

When combined, they lead to four possible ways of ordering:

FIFO Ordering of Messages If enqueue time was chosen as the ordering criteria, then messages are received in the order of the enqueue time. The enqueue time is assigned to the message by AQ at message publish/send time. This is also the default ordering.

Priority Ordering of Messages If priority ordering is chosen, each message will be assigned a priority. Priority can be specified as a message property at publish/send time by the Message Producer. The messages will be received in the order of the priorities assigned.

First-In, First-Out (FIFO) Priority Ordering A FIFO-priority topic/queue can also be created by specifying both the priority and the enqueue time as the sort order of the messages. A FIFO-priority topic/queue behaves like a priority queue, except if two messages are assigned the same priority, they will be received in the order of their enqueue time.

Enqueue Time Followed by Priority Messages with the same enqueue time will be received according to their priorities. If the ordering criteria of two message is the same, then the order they are received is indeterminate. However, AQ does ensure that messages send/published in the same session with the same ordering criteria will be received in the order they were sent.

Example Scenario and Code

Using the BooksOnLine application, a customer can request one of the following:

- FedEx shipping (priority 3)
- Priority air shipping (priority 2)
- Regular ground shipping (priority 1)

Priority can be specified at the Message Producer level using the `setPriority` call, or during the send or publish call. The latter overrides the former.

The Order Entry application uses a FIFO queue to store new orders. New orders are processed by the order entry application and published to the booked orders topic. The order entry application will retrieve messages from the new orders queue in the order of their enqueue time. It uses a FIFO-priority topic to store booked orders. Booked orders are propagated to the regional booked orders topics. At each region, orders in these regional booked orders topics are processed in the order of the shipping priorities. The following calls create the FIFO-priority topic for the Order Entry application to store booked orders.

```
public static void createPriorityTopic(TopicSession jms_session)
{
    AQQueueTableProperty       qt_prop;
    AQQueueTable               pr_qtable;
    AQjmsDestinationProperty   dest_prop;
    Topic                      bookedorders_topic;

    try
    {

   /* Create a priority queue table for OE */
   qt_prop = new AQQueueTableProperty("SYS.AQ$_JMS_OBJECT_MESSAGE");
   qt_prop.setComment("Order Entry Priority " +
             "MultiConsumer Orders queue table");
   qt_prop.setCompatible("8.1");
   qt_prop.setMultiConsumer(true);

   /* Set a FIFO-priority order */
   qt_prop.setSortOrder("priority, enq_time");

   pr_qtable = ((AQjmsSession)jms_session).createQueueTable("OE",
                  "OE_orders_pr_mqtab", qt_prop);

   /* Create a Queue in this queue table */
   dest_prop = new AQjmsDestinationProperty();
```

```
   bookedorders_topic =((AQjmsSession)jms_session).createTopic(pr_qtable,
              "OE_bookedorders_topic", dest_prop);

   /* Enable enqueue and dequeue on the topic */
   ((AQjmsDestination)bookedorders_topic).start(jms_session, true, true);

    }
    catch (Exception ex)
    {
   System.out.println("Exception: " + ex);
    }
}

/* When an order arrives, the order entry application can use the following
   procedure to publish the order into its booked orders topic. A shipping
   priority is specified for each order: */
public static void order_enqueue(TopicSession jms_session, String book_title,
             int book_qty, int order_num, int cust_no,
             String cust_name, int ship_priority,
             String cust_state, String cust_country,
             String cust_order_type)
{
    BolOrder          order;
    BolCustomer       cust_data;
    BolBook           book_data;
    BolOrderItem[]    item_list;
    Topic             topic;
    ObjectMessage     obj_message;
    TopicPublisher    tpub;

    try
    {
      book_data = new BolBook(book_title);
      cust_data = new BolCustomer(cust_no, cust_name);

      order = new BolOrder(order_num, cust_data);

      item_list = new BolOrderItem[1];
      item_list[0] = new BolOrderItem(book_data, book_qty);

      order.setItemList(item_list);

      /* get a handle to the OE bookedorders_topic */
      topic = ((AQjmsSession)jms_session).getTopic("OE",
```

```
                    "OE_bookedorders_topic");

      /* Create the topic publisher */
      tpub = jms_session.createPublisher(topic);

      obj_message = jms_session.createObjectMessage();
      obj_message.setObject(order);

      /* Send message - specify priority */
      tpub.publish(topic, obj_message, DeliveryMode.PERSISTENT,
         ship_priority,0);

      jms_session.commit();
    }
    catch (Exception ex)
    {
      System.out.println("Exception ex: " + ex);
    }
}
```

Time Specification - Delay

Messages can be sent / published to a queue / topic with **Delay**. The delay represents a time interval after which the message becomes available to the Message Consumer. A message specified with a delay is in a waiting state until the delay expires and the message becomes available. Delay for a message is specified as message property (JMS_OracleDelay). This property is not specified in the JMS standard. It is an AQ extension to JMS message properties.

Delay processing requires the AQ background process, the queue monitor to be started. Note also that receiving by `msgid` overrides the delay specification.

Example Scenario and Code

In the BooksOnLine application, delay can be used to implement deferred billing. The billing application defines a queue in which shipped orders that are not billed immediately are placed with a delay. For example, a certain class of customer accounts, such as corporate customers, may not be billed for 15 days. The billing application dequeues incoming shipped order messages (from the shipped orders queue) and if the order is for a corporate customer, this order is enqueued into a deferred billing queue with a delay. Delay works similarly for publish, though a scenario has not been provided.

```
public static void defer_billing(QueueSession jms_session,
```

```
             BolOrder deferred_order)
{
    Queue             def_bill_q;
    ObjectMessage     obj_message;
    QueueSender       qsender;

    try
    {
   /* get a handle to the deferred billing queue */
   def_bill_q = ((AQjmsSession)jms_session).getQueue("CBADM",
                 "deferbilling_que");

   /* Create the QueueSender */
   qsender = jms_session.createSender(def_bill_q);

   obj_message = jms_session.createObjectMessage();
   obj_message.setObject(deferred_order);

   /* Set Delay as 15 days
    * Delay is specified in seconds
         */
   obj_message.setIntProperty("JMS_OracleDelay", 15*60*60*24);

   qsender.send(obj_message);

   jms_session.commit();

    }
    catch (Exception ex)
    {
   System.out.println("Exception " + ex);
    }

}
```

Time Specification - Expiration

Producers of messages can specify expiration limits, or Time-to-Live (coded as `TimeToLive`) for messages. This defines the period of time the message is available for a Message Consumer.

Time-to-Live can be specified at send / publish time or using the set `TimeToLive` method of a Message Producer, with the former overriding the latter. Note that the AQ background process, the queue monitor must be running to implement Time-to-Live.

Example Scenario

In the BooksOnLine application, `TimeToLive` can be used to control the amount of time that is allowed to process a back order. The shipping application places orders for books that are not available on a back order topic. If the shipping policy is that all back orders must be shipped within a week, then messages can be published into the back order topic with an expiration of one week. In this case, any back orders that are not processed within one week are moved to the exception topic with the message state set to `EXPIRED`. This can be used to flag any orders that have not been shipped according to the back order shipping policy.

Example Code

```
/* Re-enqueue a back order into a back_order Topic and set a timeToLive of
   7 days;
   All back orders must be processed in 7 days or they are moved to the
   exception queue */
public static void requeue_back_order(TopicSession jms_session,
                  String sale_region, BolOrder back_order)
{
    Topic             back_order_topic;
    ObjectMessage     obj_message;
    TopicPublisher    tpub;
    long              timetolive;

    try
    {
   /* Look up a back order topic based on the region */
   if(sale_region.equals("WEST"))
   {
       back_order_topic = ((AQjmsSession)jms_session).getTopic("WS",
                     "WS_backorders_topic");
   }
   else if(sale_region.equals("EAST"))
   {
       back_order_topic = ((AQjmsSession)jms_session).getTopic("ES",
                     "ES_backorders_topic");
   }
   else
   {
       back_order_topic = ((AQjmsSession)jms_session).getTopic("OS",
                     "OS_backorders_topic");
   }

   obj_message = jms_session.createObjectMessage();
```

```
   obj_message.setObject(back_order);

   tpub = jms_session.createPublisher(null);


   /* Set message expiration to 7 days: */
   timetolive = 7*60*60*24*1000;          // specified in  milliseconds


   /* Publish the message */
   tpub.publish(back_order_topic, obj_message, DeliveryMode.PERSISTENT,
           1, timetolive);


   jms_session.commit();
    }
    catch (Exception ex)
    {
   System.out.println("Exception :" + ex);
    }
}
```

Message Grouping

Messages belonging to a queue/topic can be grouped to form a set that can only be consumed by one consumer at a time. This requires the queue/topic be created in a queue table that is enabled for transactional message grouping (see "Creating a Queue Table", Chapter 9, "Administrative Interface"). All messages belonging to a group have to be created in the same transaction and all messages created in one transaction belong to the same group. Using this feature, you can segment a complex message into simple messages. This is an AQ extension and not part of the JMS specification.

For example, messages directed to a queue containing invoices could be constructed as a group of messages starting with the header message, followed by messages representing details, followed by the trailer message. Message grouping is also very useful if the message payload contains complex large objects such as images and video that can be segmented into smaller objects.

The general message properties (priority, delay, expiration) for the messages in a group are determined solely by the message properties specified for the first message (head) of the group irrespective of which properties are specified for subsequent messages in the group.

The message grouping property is preserved across propagation. However, it is important to note that the destination topic to which messages have to be propagated must also be enabled for transactional grouping. There are also some restrictions you need to keep in mind if the message grouping property is to be preserved while dequeuing messages from a queue enabled for transactional grouping (see “Dequeue Methods" and "Modes of Dequeuing" for additional information).

Example Scenario

In the BooksOnLine application, message grouping can be used to handle new orders. Each order contains a number of books ordered one by one in succession. Items ordered over the Web exhibit similar behavior.

In the example that follows, each `send` corresponds to an individual book that is part of an order, and the group/transaction represents a complete order. Only the first message contains customer information. Note that the `OE_neworders_que` is defined in the queue table `OE_orders_sqtab` which has been enabled for transactional grouping.

Example Code

```
public static void createMsgGroupQueueTable(QueueSession jms_session)
{
    AQQueueTableProperty        sqt_prop;
    AQQueueTable                sq_table;
    AQjmsDestinationProperty    dest_prop;
    Queue                       neworders_q;

    try
    {
   /* Create a single-consumer orders queue table
         * with message grouping = TRANSACTIONAL
         */
   sqt_prop = new AQQueueTableProperty("BOLADM.order_typ");
   sqt_prop.setComment("Order Entry Single-Consumer Orders queue table");
   sqt_prop.setCompatible("8.1");
   sqt_prop.setMessageGrouping(AQQueueTableProperty.TRANSACTIONAL);

   sq_table = ((AQjmsSession)jms_session).createQueueTable("OE",
                  "OE_orders_sqtab", sqt_prop);

   /* Create new orders queue for OE */
   dest_prop = new AQjmsDestinationProperty();
   neworders_q = ((AQjmsSession)jms_session).createQueue(sq_table,
```

```
                                  "OE_neworders_que",
                              dest_prop);

          }
          catch (Exception ex)
          {
         System.out.println("Exception: " + ex);
          }
      }

      /* This method send an order to the specified queue */
      public static void enqueue_order(QueueSession jms_session, Queue queue,
                        int order_num, String cust_name, int cust_id,
                   int book_qty, String book_title)
      {
         QueueSender        sender;
         ObjectMessage      obj_message;
         BolOrder           order;
         BolCustomer        cust_data=null;
         BolBook            book_data;
         BolOrderItem[]     item_list;

         try
         {
           book_data = new BolBook(book_title);

           if(cust_name != null)
           {
             cust_data = new BolCustomer(cust_id, cust_name);
           }

           order = new BolOrder(order_num, cust_data);

           item_list = new BolOrderItem[1];
           item_list[0] = new BolOrderItem(book_data, book_qty);

           order.setItemList(item_list);


           sender = jms_session.createSender(queue);

           obj_message = jms_session.createObjectMessage();

           obj_message.setObject(order);
```

```
      sender.send(obj_message);
    }
    catch (Exception ex)
    {
      System.out.println("Exception ex: " + ex);
    }
}

/* Enqueue groups of orders */
public static void enqueue_order_groups(QueueSession jms_session)
{
  Queue neworders_q;

  try
  {
    neworders_q = ((AQjmsSession)jms_session).getQueue("OE",
                         "OE_neworders_que");

    /* Enqueue first group */
    enqueue_order(jms_session, neworders_q, 1, "John", 1000, 2,
        "John's first book");

    enqueue_order(jms_session, neworders_q, 1, null, 0, 1,
        "John's second book");

    jms_session.commit();

    /* Enqueue second group */
    enqueue_order(jms_session, neworders_q, 2, "Mary", 1001, 1,
        "Mary's first book");

    enqueue_order(jms_session, neworders_q, 2, null, 0, 1,
        "Mary's second book");

    enqueue_order(jms_session, neworders_q, 2, null, 0, 1,
        "Mary's third book");

    jms_session.commit();

    /* Enqueue third group */
    enqueue_order(jms_session, neworders_q, 3, "Scott", 1002, 1,
        "Scott's first book");

    enqueue_order(jms_session, neworders_q, 3, null, 0, 2,
        "Scott's second book");
```

```
        enqueue_order(jms_session, neworders_q, 3, null, 0, 2,
            "Scott's third book");

        jms_session.commit();
      }
      catch (Exception ex)
      {
        System.out.println("Exception ex: " + ex);
      }

    }
```

JMS Message Consumer Features

- Receiving Messages
- Message Navigation in Receive
- Modes for Receiving Messages
- Retry With Delay Interval
- Asynchronously Receiving Message Using Message Listener
- AQ Exception Handling

Receiving Messages

A JMS application can receive messages by creating a message consumer. Messages can be received synchronously using the `receive` call or an synchronously using a Message Listener.

There are three modes of receive,

- block until a message arrives for a consumer
- block for a maximum of the specified time
- nonblocking

Example Code: Block Until a Message Arrives

```
public BolOrder get_new_order1(QueueSession jms_session)
    {
      Queue              queue;
      QueueReceiver      qrec;
```

```
      ObjectMessage    obj_message;
      BolCustomer      customer;
      BolOrder         new_order = null;
      String           state;

      try
      {
      /* get a handle to the new_orders queue */
       queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");

       qrec = jms_session.createReceiver(queue);

       /* wait for a message to show up in the queue */
       obj_message = (ObjectMessage)qrec.receive();

       new_order = (BolOrder)obj_message.getObject();

       customer = new_order.getCustomer();
       state    = customer.getState();

       System.out.println("Order:  for customer " +
                           customer.getName());

      }
      catch (JMSException ex)
      {
        System.out.println("Exception: " + ex);
      }
      return new_order;

   }
```

Example: Block for a Maximum of 60 Seconds

```
public BolOrder get_new_order2(QueueSession jms_session)
    {
      Queue            queue;
      QueueReceiver    qrec;
      ObjectMessage    obj_message;
      BolCustomer      customer;
      BolOrder         new_order = null;
      String           state;

      try
      {
```

```
          /* get a handle to the new_orders queue */
     queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");

     qrec = jms_session.createReceiver(queue);

     /* wait for 60 seconds for a message to show up in the queue */
     obj_message = (ObjectMessage)qrec.receive(60000);

     new_order = (BolOrder)obj_message.getObject();

     customer = new_order.getCustomer();
     state    = customer.getState();

     System.out.println("Order:  for customer " +
                        customer.getName());

    }
    catch (JMSException ex)
    {
      System.out.println("Exception: " + ex);
    }
    return new_order;

 }
```

Example Code: Nonblocking

```
public BolOrder poll_new_order3(QueueSession jms_session)
    {
      Queue            queue;
      QueueReceiver    qrec;
      ObjectMessage    obj_message;
      BolCustomer      customer;
      BolOrder         new_order = null;
      String           state;

      try
      {
            /* get a handle to the new_orders queue */
       queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");

       qrec = jms_session.createReceiver(queue);

       /* check for a message to show in the queue */
       obj_message = (ObjectMessage)qrec.receiveNoWait();
```

```
         new_order = (BolOrder)obj_message.getObject();

         customer = new_order.getCustomer();
         state    = customer.getState();

         System.out.println("Order:  for customer " +
                            customer.getName());

        }
        catch (JMSException ex)
        {
          System.out.println("Exception: " + ex);
        }
        return new_order;

     }
```

Message Navigation in Receive

When a consumer does the first receive in its session, its gets the first message in the queue or topic. Subsequent receives get the next message, and so on. The default behavior works well for FIFO queues and topics, but not for priority ordered queues. If a high priority message arrives for the consumer, this client program will not receive the message until it has cleared the messages that were already there for it.

To provide the consumer a better control in navigating the queue for its messages, the AQ navigation modes are made available to it as JMS extensions. These modes can be set at the `TopicSubscriber`, `QueueReceiver` or the `TopicReceiver`.

- `FIRST_MESSAGE` resets the consumer's position to the beginning of the queue. This is a useful mode for priority ordered queues as it allows the consumer to remove the message on the top of the queue.
- `NEXT_MESSAGE` get the message after the established position of the consumer. For example, a `NEXT_MESSAGE` issued after the position is at the fourth message, will get the second message in the queue. This is the default behavior.

For transaction grouping

- `FIRST_MESSAGE` resets the consumer's position to the beginning of the queue
- `NEXT_MESSAGE` sets the position to the next message in the same transaction.

- NEXT_TRANSACTION sets the position to the first message in the next transaction.

Note that the transaction grouping property may be negated if messages are received in the following ways:

- Receive specifying a correlation identifier in the selector,
- Receive by specifying a message identifier in the selector,
- Committing before all the messages of a transaction group have been received.

If in navigating through the queue, the program reaches the end of the queue while using the NEXT_MESSAGE or NEXT_TRANSACTION option, and you have specified a blocking receive, then the navigating position is automatically changed to the beginning of the queue.

By default, a QueueReceiver, Topic Receiver, or TopicSubscriber uses FIRST_MESSAGE for the first receive call, and NEXT_MESSAGE for the subsequent receive calls.

Example Scenario

The get_new_orders() procedure retrieves orders from the OE_neworders_que. Each transaction refers to an order, and each message corresponds to an individual book in that order. The get_orders() procedure loops through the messages to retrieve the book orders. It resets the position to the beginning of the queue using the FIRST_MESSAGE option before the first receive. It then uses the next message navigation option to retrieve the next book (message) of an order (transaction). If it gets an exception indicating all message in the current group/transaction have been fetched, it changes the navigation option to next transaction and get the first book of the next order. It then changes the navigation option back to next message for fetching subsequent messages in the same transaction. This is repeated until all orders (transactions) have been fetched.

Example Code

```
public void get_new_orders(QueueSession jms_session)
    {
      Queue             queue;
      QueueReceiver     qrec;
      ObjectMessage     obj_message;
      BolCustomer       customer;
      BolOrder          new_order;
      String            state;
```

```
      int              new_orders = 1;

      try
      {

         /* get a handle to the new_orders queue */
         queue = ((AQjmsSession) jms_session).getQueue("OE","OE_neworders_que");
         qrec = jms_session.createReceiver(queue);

    /* set navigation to first message */

((AQjmsTopicSubscriber)qrec).setNavigationMode(AQjmsConstants.NAVIGATION_FIRST_
MESSAGE);

        while(new_orders != 0)
        {
          try{

             /* wait for a message to show up in the topic */
             obj_message = (ObjectMessage)qrec.receiveNoWait();

             if (obj_message != null)   /* no more orders in the queue */
             {
               System.out.println(" No more orders ");
               new_orders = 0;
             }
             new_order = (BolOrder)obj_message.getObject();
             customer = new_order.getCustomer();
             state    = customer.getState();

             System.out.println("Order: for customer " +
                                customer.getName());

            /* Now get the next message */

((AQjmsTopicSubscriber)qrec).setNavigationMode(AQjmsConstants.NAVIGATION_NEXT_
MESSAGE);

          }catch(AQjmsException ex)
          {  if (ex.getErrorNumber() == 25235)
             {
               System.out.println("End of transaction group");

((AQjmsTopicSubscriber)qrec).setNavigationMode(AQjmsConstants.NAVIGATION_NEXT_
TRANSACTION);
```

```
              }
              else
                throw ex;
           }
         }
      }catch (JMSException ex)
      {
         System.out.println("Exception: " + ex);
       }
    }
```

Modes for Receiving Messages

For Point-to-Point Mode

Aside from the normal `receive`, which allows the dequeuing client to delete the message from the queue, JMS provides an interface that allows the JMS client to Browse its messages in the queue. A `QueueBrowser` can be created using the `createBrowser` method from `QueueSession`.

If a message is browsed, it remains available for further processing. Note that after a message has been browsed there is no guarantee that the message will be available to the JMS session again as a `receive` call from a concurrent session might remove the message.

To prevent a viewed message from being removed by a concurrent JMS client, you can view the message in the locked mode. To do this, you need to create a `QueueBrowser` with the locked mode using the AQ extension to the JMS interface.The lock on the message with a browser with locked mode is released when the session performs a commit or a rollback.

To remove the message viewed by a `QueueBrowser`, the session must create a `QueueReceiver` and use the `JMSmesssageID` as the selector.

Example Code

Refer to the `QueueBrowser` Example in Point-to-Point features

Remove-No-Data

The `MessageConsumer` can remove the message from the queue or topic without retrieving the message using the `receiveNoData` call. This is useful when the application has already examined the message, perhaps using the `QueueBrowser`.

This mode allows the JMS client to avoid the overhead of retrieving the payload from the database, which can be substantial for a large message.

Example Scenario and Code

In the following scenario from the BooksOnLine example, international orders destined to Mexico and Canada are to be processed separately due to trade policies and carrier discounts. Hence, a message is viewed in the locked mode (so no other concurrent user removes the message) using the `QueueBrowser` and the customer country (message payload) is checked. If the customer country is Mexico or Canada the message be deleted from the queue using the remove with no data (since the payload is already known) mode. Alternatively, the lock on the message is released by the `commit` call. Note that the receive call uses the message identifier obtained from the locked mode `browse`.

```
public void process_international_orders(QueueSession jms_session)
 {
  QueueBrowser    browser;
  Queue           queue;
  ObjectMessage   obj_message;
  BolOrder        new_order;
  Enumeration     messages;
  String          customer_name;
  String          customer_country;
  QueueReceiver   qrec;
  String          msg_sel;

  try
  {
    /* get a handle to the new_orders queue */
    queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");

    /* create a Browser to look at RUSH orders */
    browser = ((AQjmsSession)jms_session).createBrowser(queue, null, true);

    for (messages = browser.getEnumeration() ; messages.hasMoreElements() ;)
    {
      obj_message = (ObjectMessage)messages.nextElement();

      new_order = (BolOrder)obj_message.getObject();

      customer_name = new_order.getCustomer().getName();

      customer_country = new_order.getCustomer().getCountry();
```

```
      if (customer_country equals ("Canada") || customer_country equals (
"Mexico"))
      {
        System.out.println("Order for Canada or Mexico");
        msg_sel = "JMSMessageID = '" + obj_message. getJMSMessageID()+ "'";
        qrec = jms_session.createReceiver(queue, msg_sel);
        ((AQjmsQueueReceiver)qrec).receiveNoData();
      }
    }
  }catch (JMSException ex)
   { System.out.println("Exception " + ex);

   }
 }
```

Retry With Delay Interval

Max Retries

If the transaction receiving the message from a queue/topic fails, it is regarded as an unsuccessful attempt to remove the message. AQ records the number of failed attempts to remove the message in the message history.

In addition, it also allows the application to specify at the queue/topic level, the maximum number of retries supported on messages. If the number of failed attempts to remove a message exceed this number, the message is moved to the exception queue and is no longer available to applications.

Retry Delay

If the transaction receiving a message aborted, this could be because of a 'bad' condition, for example, an order that could not be fulfilled because there were insufficient books in stock. Since inventory updates are made every 12 hours, it makes sense to `retry` after that time. If an order was not filled after 4 attempts, this could indicates there is a problem.

AQ allows users to specify a `retry_delay` along with `max_retries`. This means that a message that has undergone a failed attempt at retrieving will remain visible in the queue for dequeue after '`retry_delay`' interval. Until then it will be in the '`WAITING`' state. The AQ background process, the time manager enforces the retry delay property.

The maximum retries and retry delay are properties of the queue/topic which can be set when the queue/topic is created or using the alter method on the queue/topic. The default value for MAX_RETRIES is 5.

Example Scenario and Code

If an order cannot be filled because of insufficient inventory, the transaction processing the order is aborted. The `booked_orders` topic is set up with `max_retries` = 4 and `retry_delay` = 12 hours.Thus, if an order is not filled up in two days, it is moved to an exception queue.

```
public BolOrder process_booked_order(TopicSession jms_session)
  {
    Topic            topic;
    TopicSubscriber  tsubs;
    ObjectMessage    obj_message;
    BolCustomer      customer;
    BolOrder         booked_order = null;
    String           country;
    int              i = 0;

    try
    {
      /* get a handle to the OE_bookedorders_topic */
      topic = ((AQjmsSession)jms_session).getTopic("WS",
                                             "WS_bookedorders_topic");

      /* Create local subscriber - to track messages for Western Region  */
      tsubs = jms_session.createDurableSubscriber(topic, "SUBS1",
                                 "Region = 'Western' ",
                                             false);

       /* wait for a message to show up in the topic */
       obj_message = (ObjectMessage)tsubs.receive(10);

       booked_order = (BolOrder)obj_message.getObject();

       customer = booked_order.getCustomer();
       country    = customer.getCountry();

       if (country == "US")
       {
          jms_session.commit();
       }
       else
```

```
      {
         jms_session.rollback();
         booked_order = null;
      }
   }catch (JMSException ex)
   { System.out.println("Exception " + ex) ;}

    return booked_order;
  }
```

Asynchronously Receiving Message Using Message Listener

Message Listener for a Message Consumer

The JMS client can receive messages asynchronously by setting the `MessageListener` using the `setMessageListener` method available with the Consumer.

When a message arrives for the message consumer, the `onMessage` method of the message listener is invoked with the message. The message listener can commit or abort the receipt of the message. The message listener will not receive messages if the JMS `Connection` has been stopped. The `receive` call must not be used to receive messages once the message listener has been set for the consumer.

Example

The application processing the new orders queue can be set up for asynchronously receiving messages from the queue.

```
 public class OrderListener implements MessageListener
   {
      QueueSession   the_sess;

      /* constructor */
      OrderListener(QueueSession  my_sess)
      {
        the_sess = my_sess;
      }

      /* message listener interface */
      public void onMessage(Message m)
      {
        ObjectMessage    obj_msg;
        BolCustomer      customer;
        BolOrder         new_order = null;
```

```
      try {
        /* cast to JMS Object Message */
        obj_msg = (ObjectMessage)m;

        /*  Print some useful information */
        new_order = (BolOrder)obj_msg.getObject();
        customer = new_order.getCustomer();
        System.out.println("Order:  for customer " +  customer.getName());

        /* call the process order method
        * NOTE: we are assuming it is defined elsewhere
        * /
        process_order(new_order);

        /* commit the asynchronous receipt of the message */
         the_sess.commit();
      }catch (JMSException ex)
      { System.out.println("Exception " + ex) ;}

    }
}

   public void setListener1(QueueSession jms_session)
  {
    Queue            queue;
    QueueReceiver    qrec;
    MessageListener  ourListener;

    try
    {
     /* get a handle to the new_orders queue */
     queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");

     /* create a queue receiver */
     qrec = jms_session.createReceiver(queue);

     /* create the message listener */
     ourListener = new OrderListener(jms_session);

     /* set the message listener for the receiver */
     qrec.setMessageListener(ourListener);
    }
    catch (JMSException ex)
    {
```

```
        System.out.println("Exception: " + ex);
      }
   }
```

Message Listener for All Consumers on a Session

The JMS client can receive messages asynchronously for all the consumers of the session by setting the `MessageListener` at the session.

When a message arrives for any of the message consumers of the session, the `onMessage` method of the message listener is invoked with the message. The message listener can commit or abort the receipt of the message. The message listener will not receive messages if the JMS connection has been stopped. No other mode for receiving messages must be used in the session once the message listener has been set.

Example Scenario and Code

In the customer service component of the BooksOnLine example, messages from different databases arrive at the customer service topics, indicating the state of the order. The customer service application monitors the topics and whenever there is a message about a customer order, it updates the order status in the `order_status_table`. The application uses the session listener to monitor the different topics. Whenever there is a message in any of the topics, the `onMessage` method of the session `MessageListener` is invoked.

```
/* define our message listener class */
   public class CustomerListener implements MessageListener
   {
      TopicSession   the_sess;

      /* constructor */
      CustomerListener(TopicSession  my_sess)
      {
        the_sess = my_sess;
      }

      /* message listener interface */
      public void onMessage(Message m)
      {
        ObjectMessage    obj_msg;
        BolCustomer      customer;
        BolOrder         new_order = null;

        try
```

```
  {
         /* cast to JMS Object Message */
         obj_msg = (ObjectMessage)m;

         /*  Print some useful information */
         new_order = (BolOrder)obj_msg.getObject();
         customer = new_order.getCustomer();
         System.out.println("Order:  for customer " +  customer.getName());

         /* call the update status method
          * NOTE: we are assuming it is defined elsewhere
          * /
         update_status(new_order, new_order.getStatus());

         /* commit the asynchronous receipt of the message */
         the_sess.commit();
     }catch (JMSException ex)
     {
       System.out.println("Exception: " + ex);
     }
  }

}
public void  monitor_status_topics(TopicSession jms_session)
 {
   Topic[]             topic = new Topic[4];
   TopicSubscriber[]   tsubs= new TopicSubscriber[4];

   try
   {
     /* get a handle to the OE_bookedorders_topic */
     topic[0] = ((AQjmsSession)jms_session).getTopic("CS",
                                             "CS_bookedorders_topic");
     tsubs[0] = jms_session.createDurableSubscriber(topic[0], "BOOKED_ORDER");

     topic[1] = ((AQjmsSession)jms_session).getTopic("CS",
                                             "CS_billedorders_topic");
     tsubs[1] = jms_session.createDurableSubscriber(topic[1], "BILLED_ORDER");

     topic[2] = ((AQjmsSession)jms_session).getTopic("CS",
                                             "CS_backdorders_topic");
     tsubs[2] = jms_session.createDurableSubscriber(topic[2], "BACKED_ORDER");

     topic[3] = ((AQjmsSession)jms_session).getTopic("CS",
                                             "CS_shippedorders_topic");
```

```
        tsubs[3] = jms_session.createDurableSubscriber(topic[3], "SHIPPED_ORDER");

        MessageListener  mL = new CustomerListener(jms_session);

        /* set the session's message listener */
        jms_session.setMessageListener(mL);

      }catch(JMSException ex)
       { System.out.println("Exception: " + ex); }
    }
```

AQ Exception Handling

AQ provides four integrated mechanisms to support exception handling in applications: `EXCEPTION_QUEUES`, `EXPIRATION`, `MAX_RETRIES` and `RETRY_DELAY`.

An `exception_queue` is a repository for all expired or unserviceable messages. Applications cannot directly enqueue into exception queues. However, an application that intends to handle these expired or unserviceable messages can receive / remove them from the exception queue.

To retrieve messages from exception queues, the JMS client must use the point-to-point interface.The exception queue for messages intended for a topic must be created in a queue table with multiple consumers enabled. Like any other queue, the exception queue must be enabled for receiving messages using the start method in the `AQOracleQueue` class. You will get an exception if you try to enable it for enqueue.

The exception queue is a provider (Oracle) specific message property called `"JMS_OracleExcpQ"` that can be set with the message before sending / publishing it. If an exception queue is not specified, the default exception queue is used. If the queue / topic is created in a queue table, say QTAB, the default exception queue will be called `AQ$_QTAB_E`. The default exception queue is automatically created when the queue table is created.

Messages are moved to the exception queues by AQ under the following conditions:

- The message is not being dequeued within the specified `timeToLive`. For messages intended for more than one subscriber, the message will be moved to the exception queue if one or more of the intended recipients is not able to dequeue the message within the specified `timeToLive`. If the `timeToLive` was not specified for the message, (either in the `publish` or `send` call, or as the publisher or sender), it will never expire.

- The message was received successfully. However, because of an error while processing the message, the application aborts the transaction that performed the `receive`. The message is returned to the queue/topic and will be available for any applications that are waiting to receive messages. Since this was a failed attempt to receive the message, its retry count is updated.

  If the retry count of the message exceeds the maximum value specified for the queue/topic where it resides, it is moved to the exception queue. When a message has multiple subscribers, then the message is moved to the exception queue only when all the recipients of the message have exceeded the retry limit.

  A receive is considered rolled back or undone if the application aborts the entire transaction, or if it rolls back to a savepoint that was taken before the receive.

- The client program successfully received a message but terminated before committing the transaction.

Example Scenarios

The section retry with delay interval has an example with `MAX_RETRIES`. In the BooksOnLine application, the business rule for each shipping region is that an order will be placed in a back order queue if the order cannot be filled immediately. The back order application will try to fill the order once a day. If the order cannot be filled within 7 days, it is placed in an exception queue for special processing. We implement this using the Time-to-Live property of messages in conjunction with exception queues.

1. *Create the exception queue* `WS_back_order_exp_que`

```
public void create_excp_que(TopicSession jms_session)
    {
      AQQueueTable     q_table;
      Queue            excpq;

      try {
         /* create the exception queue in the queue table with multiple
          * consumer flag true
          */
          q_table = ((AQjmsSession)jms_session).getQueueTable("WS", "WS_orders_
mqtab");

          AQjmsDestinationProperty dest_prop = new AQjmsDestinationProperty();

          dest_prop.setQueueType(AQjmsDestinationProperty.EXCEPTION_QUEUE);
     excpq = ((AQjmsSession)jms_session).createQueue(q_table,
                               "WS_back_orders_excp_que",
```

```
                        dest_prop);
          /* start the exception queue for receiving (dequeuing) messages only
*/
          ((AQjmsDestination)excpq).start(jms_session, false, true);

          }
      catch (JMSException ex)
      { System.out.println("Exception  " + ex); }
    }
```

2. *Publish message on back orders queue with exception queue set to* WS_back_orders_excp_que

```
 public static void requeue_back_order(TopicSession jms_session,
                  String sale_region, BolOrder back_order)
 {
    Topic              back_order_topic;
    ObjectMessage      obj_message;
    TopicPublisher     tpub;
    long               timetolive;

    try
    {
   back_order_topic = ((AQjmsSession)jms_session).getTopic("WS",
                      "WS_backorders_topic");
   obj_message = jms_session.createObjectMessage();
   obj_message.setObject(back_order);

        /* set exception queue */
        obj_message.setStringProperty("JMS_OracleExcpQ", "WS.WS_back_orders_
excp_que");

   tpub = jms_session.createPublisher(null);

   /* Set message expiration to 7 days: */
   timetolive = 7*60*60*24*1000;          // specified in  milliseconds

    /* Publish the message */
   tpub.publish(back_order_topic, obj_message, DeliveryMode.PERSISTENT,
           1, timetolive);
   jms_session.commit();
    }
    catch (Exception ex)
    {
   System.out.println("Exception :" + ex);
```

```
    }
}
```

3. *Receive expired messages from the exception queue using the point-to-point interface*

```
public BolOrder get_expired_order(QueueSession jms_session)
   {
      Queue            queue;
      QueueReceiver    qrec;
      ObjectMessage    obj_message;
      BolCustomer      customer;
      BolOrder         exp_order = null;

      try
      {
      /* get a handle to the exception queue */
       queue = ((AQjmsSession) jms_session).getQueue("WS", "WS_back_orders_excp_
que");

       qrec = jms_session.createReceiver(queue);

       /* wait for a message to show up in the queue */
       obj_message = (ObjectMessage)qrec.receive();

       exp_order = (BolOrder)obj_message.getObject();

       customer = exp_order.getCustomer();

       System.out.println("Expired Order:  for customer " +
                          customer.getName());

      }
      catch (JMSException ex)
      {
        System.out.println("Exception: " + ex);
      }
      return exp_order;
   }
```

JMS Propagation

- Remote Subscribers
- Scheduling Propagation

- Enhanced Propagation Scheduling Capabilities
- Exception Handling During Propagation

Remote Subscribers

This feature enables applications to communicate with each other without having to be connected to the same database.

AQ allows a remote subscriber, that is a subscriber at another database, to subscribe to a topic. When a message published to the topic meets the criterion of the remote subscriber, AQ will automatically propagate the message to the queue/topic at the remote database specified for the remote subscriber.

The snapshot (`job_queue`) background process performs propagation. Propagation is performed using database links and Oracle Net Services.

There are two ways to implement remote subscribers:

- The `createRemoteSubscriber` method can be used to create a remote subscriber to/on the topic. The remote subscriber is specified as an instance of the class `AQjmsAgent`.
- The `AQjmsAgent` has a name and an address. The address consists of a queue/topic and the database link (dblink) to the database of the subscriber.

There are two kinds of remote subscribers:

Case 1 The remote subscriber is a topic. This occurs when no name is specified for the remote subscriber in the `AQjmsAgent` object and the address is a topic. The message satisfying the subscriber's subscription is propagated to the remote topic. The propagated message is now available to all the subscriptions of the remote topic that it satisfies.

Case 2 Specify a specific remote recipient for the message. The remote subscription can be for a particular consumer at the remote database. If the name of the remote recipient is specified (in the `AQjmsAgent` object), then the message satisfying the subscription is propagated to the remote database for that recipient only. The recipient at the remote database uses the `TopicReceiver` interface to retrieve its messages. The remote subscription can also be for a point-to-point queue

Example Scenario for Case 1

Assume the order entry application and Western region shipping application are on different databases, `db1` and `db2`. Further assume that there is a dblink `dblink_` oe_ws from database db1, the order entry database, to the western shipping database db2. The WS_bookedorders_topic at db2 is a remote subscriber to the OE_bookedorders_topic in db1.

Example Scenario for Case 2

Assume the order entry application and Western region shipping application are on different databases, db1 and db2. Further assume that there is a dblink dblink_oe_ws from the local order entry database db1 to the western shipping database db2. The agent "Priority" at WS_bookedorders_topic in db2 is a remote subscriber to the OE_bookedorders_topic in db1. Messages propagated to the WS_bookedorders_topic are for "Priority" only.

```
public void remote_subscriber(TopicSession jms_session)
   {
     Topic            topic;
     ObjectMessage    obj_message;
     AQjmsAgent       remote_sub;

    try
    {
      /* get a handle to the OE_bookedorders_topic */
      topic = ((AQjmsSession)jms_session).getTopic("OE",
                                                  "OE_bookedorders_topic");
      /* create the remote subscriber, name unspecified  and address
       * the topic WS_booked_orders_topic at db2
       */
      remote_sub = new AQjmsAgent(null, "WS.WS_bookedorders_topic@dblink_oe_
ws");

      /* subscribe for western region orders */
      ((AQjmsSession)jms_session).createRemoteSubscriber(topic, remote_sub,
"Region = 'Western' ");
    }
    catch (JMSException ex)
    { System.out.println("Exception :" + ex); }
    catch (java.sql.SQLException  ex1)
    {System.out.println("SQL Exception :" + ex1); }
  }
```

Database db2 - shipping database: The WS_booked_orders_topic has two subscribers, one for priority shipping and the other normal. The messages from the Order Entry database are propagated to the Shipping database and delivered to the correct subscriber. Priority orders have a message priority of 1.

```
public void  get_priority_messages(TopicSession jms_session)
   {
     Topic             topic;
     TopicSubscriber   tsubs;
     ObjectMessage     obj_message;
     BolCustomer       customer;
     BolOrder          booked_order;

    try
    {
      /* get a handle to the OE_bookedorders_topic */
      topic = ((AQjmsSession)jms_session).getTopic("WS",
                                                   "WS_bookedorders_topic");

       /* Create local subscriber - for priority messages */
      tsubs = jms_session.createDurableSubscriber(topic, "PRIORITY",
                                   " JMSPriority = 1 ", false);

      obj_message = (ObjectMessage) tsubs.receive();

      booked_order = (BolOrder)obj_message.getObject();
      customer = booked_order.getCustomer();
      System.out.println("Priority Order:  for customer " +
customer.getName());

      jms_session.commit();
    }
    catch (JMSException ex)
    { System.out.println("Exception :" + ex); }
  }

  public void  get_normal_messages(TopicSession jms_session)
   {
     Topic             topic;
     TopicSubscriber   tsubs;
     ObjectMessage     obj_message;
     BolCustomer       customer;
     BolOrder          booked_order;

    try
    {
      /* get a handle to the OE_bookedorders_topic */
      topic = ((AQjmsSession)jms_session).getTopic("WS",
                                                   "WS_bookedorders_topic");
```

```
         /* Create local subscriber - for priority messages */
        tsubs = jms_session.createDurableSubscriber(topic, "PRIORITY",
                                 " JMSPriority > 1 ", false);

        obj_message = (ObjectMessage) tsubs.receive();

        booked_order = (BolOrder)obj_message.getObject();
        customer = booked_order.getCustomer();
        System.out.println("Normal Order:  for customer " +  customer.getName());

        jms_session.commit();
      }
      catch (JMSException ex)
      { System.out.println("Exception :" + ex); }
    }


public void remote_subscriber1(TopicSession jms_session)
   {
     Topic            topic;
     ObjectMessage    obj_message;
     AQjmsAgent       remote_sub;

      try
      {
        /* get a handle to the OE_bookedorders_topic */
        topic = ((AQjmsSession)jms_session).getTopic("OE",
                                                  "OE_bookedorders_topic");
        /* create the remote subscriber, name "Priority"  and address
         * the topic WS_booked_orders_topic at db2
         */
        remote_sub = new AQjmsAgent("Priority", "WS.WS_bookedorders_topic@dblink_
oe_ws");

        /* subscribe for western region orders */
        ((AQjmsSession)jms_session).createRemoteSubscriber(topic, remote_sub,
"Region = 'Western' ");
      }
      catch (JMSException ex)
      { System.out.println("Exception :" + ex); }
      catch (java.sql.SQLException  ex1)
      {System.out.println("SQL Exception :" + ex1); }
    }
```

```
   Remote database:
   database db2 - Western Shipping database.
/* get messages for subscriber priority */
   public void  get_priority_messages1(TopicSession jms_session)
   {
     Topic            topic;
     TopicReceiver    trecs;
     ObjectMessage    obj_message;
     BolCustomer      customer;
     BolOrder         booked_order;

    try
    {
      /* get a handle to the OE_bookedorders_topic */
      topic = ((AQjmsSession)jms_session).getTopic("WS",
                                             "WS_bookedorders_topic");

      /* create a local receiver "Priority" for the remote subscription
       * to WS_bookedorders_topic
       */
     trecs = ((AQjmsSession)jms_session).createTopicReceiver(topic, "Priority",
null);

      obj_message = (ObjectMessage) trecs.receive();

      booked_order = (BolOrder)obj_message.getObject();
      customer = booked_order.getCustomer();
      System.out.println("Priority Order:  for customer " +
customer.getName());

      jms_session.commit();
    }
    catch (JMSException ex)
    { System.out.println("Exception :" + ex); }
  }
```

Scheduling Propagation

Propagation must be scheduled using the `schedule_propagation` method for every topic from which messages are propagated to target destination databases.

A schedule indicates the time frame during which messages can be propagated from the source topic. This time frame may depend on a number of factors such as network traffic, load at source database, load at destination database, and so on. The schedule therefore has to be tailored for the specific source and destination.

When a schedule is created, a job is automatically submitted to the `job_queue` facility to handle propagation.

The administrative calls for propagation scheduling provide great flexibility for managing the schedules (see "Scheduling a Queue Propagation", Chapter 9, "Administrative Interface"). The duration or propagation window parameter of a schedule specifies the time frame during which propagation has to take place. If the duration is unspecified then the time frame is an infinite single window. If a window has to be repeated periodically then a finite duration is specified along with a `next_time` function that defines the periodic interval between successive windows.

The latency parameter for a schedule is relevant only when a queue does not have any messages to be propagated. This parameter specifies the time interval within which a queue has to be rechecked for messages. Note that if the latency parameter is to be enforced, then the `job_queue_interval` parameter for the `job_queue_processes` should be less than or equal to the latency parameter. The propagation schedules defined for a queue can be changed or dropped at anytime during the life of the queue. In addition there are calls for temporarily disabling a schedule (instead of dropping the schedule) and enabling a disabled schedule. A schedule is active when messages are being propagated in that schedule. All the administrative calls can be made irrespective of whether the schedule is active or not. If a schedule is active then it will take a few seconds for the calls to be executed.

Job queue processes must be started for propagation to take place. At least 2 job queue processes must be started. The dblinks to the destination database must also be valid. The source and destination topics of the propagation must be of the same message type. The remote topic must be enabled for enqueue. The user of the dblink must also have enqueue privileges to the remote topic.

Example Code

```
 public void  schedule_propagation(TopicSession jms_session)
  {
     Topic            topic;

    try
    {
      /* get a handle to the OE_bookedorders_topic */
      topic = ((AQjmsSession)jms_session).getTopic("WS",
                                                "WS_bookedorders_topic");

      /* Schedule propagation immediately with duration of 5 minutes and latency
20 sec */
```

```
    ((AQjmsDestination)topic).schedulePropagation(jms_session, "dba", null,
                                  new Double(5*60), null, new Double(20));
  }catch (JMSException ex)
  {System.out.println("Exception: " + ex);}
}

Propagation schedule parameters can also be altered.


/* alter duration to 10 minutes and latency to zero */
public void  alter_propagation(TopicSession jms_session)
{
   Topic            topic;
  try
  {
    /* get a handle to the OE_bookedorders_topic */
    topic = ((AQjmsSession)jms_session).getTopic("WS",
                                              "WS_bookedorders_topic");

    /* Schedule propagation immediately with duration of 5 minutes and latency
20 sec */
  ((AQjmsDestination)topic).alterPropagationSchedule(jms_session, "dba",
                    new Double(10*60), null, new Double(0));
  }catch (JMSException ex)
  {System.out.println("Exception: " + ex);}
}
```

Enhanced Propagation Scheduling Capabilities

Detailed information about the schedules can be obtained from the catalog views defined for propagation. Information about active schedules—such as the name of the background process handling that schedule, the SID (session, serial number) for the session handling the propagation and the Oracle instance handling a schedule (relevant if Real Application Clusters are being used)—can be obtained from the catalog views. The same catalog views also provide information about the previous successful execution of a schedule (last successful propagation of message) and the next execution of the schedule.

For each schedule, detailed propagation statistics are maintained:

- The total number of messages propagated in a schedule
- Total number of bytes propagated in a schedule
- Maximum number of messages propagated in a window

- Maximum number of bytes propagated in a window
- Average number of messages propagated in a window
- Average size of propagated messages
- Average time to propagated a message

These statistics have been designed to provide useful information to the queue administrators for tuning the schedules such that maximum efficiency can be achieved.

Propagation has built-in support for handling failures and reporting errors. For example, if the database link specified is invalid, or the remote database is unavailable, or the remote topic/queue is not enabled for enqueuing, then the appropriate error message is reported. Propagation uses an exponential backoff scheme for retrying propagation from a schedule that encountered a failure. If a schedule continuously encounters failures, the first retry happens after 30 seconds, the second after 60 seconds, the third after 120 seconds and so forth. If the retry time is beyond the expiration time of the current window then the next retry is attempted at the start time of the next window.

A maximum of 16 retry attempts are made after which the schedule is automatically disabled. When a schedule is disabled automatically due to failures, the relevant information is written into the alert log. At anytime it is possible to check if there were failures encountered by a schedule and if so how many successive failure were encountered, the error message indicating the cause for the failure and the time at which the last failure was encountered. By examining this information, an administrator can fix the failure and enable the schedule.

During a retry if propagation is successful then the number of failures is reset to 0. Propagation has built-in support for Real Application Clusters and is transparent to the user and the administrator. The job that handles propagation is submitted to the same instance as the owner of the queue table where the source topic resides. If at anytime there is a failure at an instance and the queue table that stores the topic is migrated to a different instance, the propagation job is also automatically migrated to the new instance. This will minimize the pinging between instances and thus offer better performance. Propagation has been designed to handle any number of concurrent schedules.

Note that the number of `job_queue_processes` is limited to a maximum of 36 and some of these may be used to handle non-propagation related jobs.Hence, propagation has built in support for multi-tasking and load balancing. The propagation algorithms are designed such that multiple schedules can be handled by a single snapshot (`job_queue`) process. The propagation load on a `job_queue` processes can be skewed based on the arrival rate of messages in the different source topics. If one process is overburdened with several active schedules while another is less loaded with many passive schedules, propagation automatically re-distributes the schedules among the processes such that they are loaded uniformly.

Example Scenario

In the BooksOnLine example, the `OE_bookedorders_topic` is busy since messages in it are propagated to different shipping sites. The following example code illustrates the calls supported by enhanced propagation scheduling for error checking and schedule monitoring.

Example Code

```
CONNECT OE/OE;
/*  get averages
select avg_time, avg_number, avg_size from user_queue_schedules;

/*  get totals
select total_time, total_number, total_bytes from user_queue_schedules;

/*  get maximums for a window
select max_number, max_bytes from user_queue_schedules;

/*  get current status information of schedule
select process_name, session_id, instance, schedule_disabled
   from user_queue_schedules;

/*  get information about last and next execution
select last_run_date, last_run_time, next_run_date, next_run_time
   from user_queue_schedules;

/*  get last error information if any
select failures, last_error_msg, last_error_date, last_error_time
   from user_queue_schedules;
```

Exception Handling During Propagation

When a system errors such as a network failure occurs, AQ will continue to attempt to propagate messages using an exponential back-off algorithm. In some situations that indicate application errors AQ will mark messages as `UNDELIVERABLE` if there is an error in propagating the message.

Examples of such errors are when the remote queue/topic does not exist or when there is a type mismatch between the source queue/topic and the remote queue/topic.In such situations users must query the `DBA_SCHEDULES` view to determine the last error that occurred during propagation to a particular destination.The trace files in the `$ORACLE_HOME`/log directory can provide additional information about the error.

Message Transformation with JMS AQ

The following topics are discussed in this section:

- Defining Message Transformations
- Sending Messages to a Destination Using a Transformation
- Receiving Messages from a Destination Using a Transformation
- Specifying Transformations for Topic Subscribers
- Specifying Transformations for Remote Subscribers

Defining Message Transformations

Transformations can be defined to map messages of one format to another. Transformations are useful when applications that use different formats to represent the same information have to be integrated. Transformations can be SQL expressions and PLSQL functions.

The transformations can be created using the DBMS_TRANSFORM.create_transformation procedure. Transformation can be specified for the following operations:

- Sending a message to a queue or topic
- Receiving a message from a queue, or topic
- Creating a Topic Subscriber
- Creating a Remote Subscriber. This will enable propagation of messages between Topics of different formats.

The Message Transformation feature is an AQ extension to the standard JMS interface.

Example Scenario

In the BooksOnLine example, we will consider the order entry and shipping applications. For these examples, we will use topics with ADT type payloads.

Example Code

Assume that the Order entry topic `OE.OE_bookedorders_topic` has a payload of type `OE.OE_ORDER`.

```
create or replace TYPE OE_order as OBJECT (
             orderno          NUMBER,
             status           VARCHAR2(30),
             ordertype        VARCHAR2(30),
             orderregion      VARCHAR2(30),
             customer         CUSTOMER_TYP,
             paymentmethod    VARCHAR2(30),
             creditcard#      VARCHAR2(30);
             items            ORDERITEMLIST_VARTYP,
             order_date       DATE,
             total            NUMBER);
```

The Western Shipping topic `WS_bookedorders_topic` has payload of type `WS.WS_ORDER`:

```
create or replace TYPE WS_Order AS OBJECT (
       customer_name   VARCHAR2(100),
       address         VARCHAR2(1000),
       city            VARCHAR2(1000),
       state           VARCHAR2(1000),
       country         VARCHAR2(1000),
       zipcode         VARCHAR2(1000),
       orderno         NUMBER,
       status          VARCHAR2(30),
       ordertype       VARCHAR2(30),
       items           ORDERITEMLIST_VARTYP,
       order_date      VARCHAR2(10));
```

The java classes (that implement the CustomDatum interface) can be generated for these types using the Jpublisher utility.

We will define a transformation that defines the mapping from OE.OE_Order to WS.WS_ORDER as:

```
execute dbms_transform.create_transformation(
schema => 'OE',
        name => 'OE2WS',
```

```
    from_schema => 'OE,
    from_type => 'OE_order',
    to_schema => 'WS',
    to_type => 'WS_order',
    transformation => 'OE_order(source.user_data.customer.name, \
        source.user_data.customer.street, \
        source.user_data.customer.city, \
        source.user_data.customer.state, \
        source.user_data.customer.country, \
        source.user_data.customer.zipcode, \
        source.user_data.customer.country, \
        source.user_data.orderno, \
        source.user_data.status, \
        source.user_data.ordertype, \
        source.user_date.items, \
        TO_CHAR(source.user_date.order_date, 'MM:DD:YYYY'))');
```

Sending Messages to a Destination Using a Transformation

A transformation can be supplied when sending / publishing a message to a queue / topic. The transformation will be applied before putting the message into the queue / topic.

The application can specify a transformation using the `setTransformation` interface in the `AQjmsQueueSender` and `AQjmsTopicPublisher` interfaces.

Example Code

Lets say that the orders that are processed by the order entry application should be published to the WS_bookedorders_topic.

The transformation OE2WS (defined in the previous section) is supplied so that the messages are inserted into the topic in the correct format.

```
public void ship_booked_orders(TopicSession    jms_session,
                               AQjmsADTMessage adt_message)
{
       TopicPublisher  publisher;
       Topic           topic;

       try
       {
         /* get a handle to the WS_bookedorders_topic */
         topic = ((AQjmsSession)jms_session).getTopic("WS",
                                                      "WS_bookedorders_topic");
```

```
          publisher = jms_session.createPublisher(topic);

          /* set the transformation in the publisher */
         ((AQjmsTopicPublisher)publisher).setTransformation("OE2WS");

          publisher.publish(topic, adt_message);

        }
        catch (JMSException ex)
        {
           System.out.println("Exception :" ex);
        }
}
```

Receiving Messages from a Destination Using a Transformation

A transformation can be applied when receiving a message from a queue or topic. The transformation will be applied to the message before returning it to JMS application.

The transformation can be specified using `setTransformation()` interface of the `AQjmsQueueReceiver, AQjmsTopicSubscriber` and `AQjmsTopicReceiver`.

Example Code

Lets say the Western Shipping application retrieves messages from the OE_bookedorders_topic. It specifies the transformation 'OE2WS' to retrieve the message as the WS_order ADT.

Lets say that the WSOrder Java class has been generated by Jpublisher to map to the Oracle Object WS.WS_order

```
public AQjmsAdtMessage retrieve_booked_orders(TopicSession jms_session)
       AQjmsTopicReceiver  receiver;
       Topic               topic;
       Message             msg = null;

       try
       {
         /* get a handle to the OE_bookedorders_topic */
         topic = ((AQjmsSession)jms_session).getTopic("OE",
                     "OE_bookedorders_topic");

         /* Create a receiver for WShip */
```

```
          receiver = ((AQjmsSession)jms_session).createTopicReceiver(topic,
                                       "WShip, null, WSOrder.getFactory());

          /* set the transformation in the publisher */
          receiver.setTransformation("OE2WS");

          msg = receiver.receive(10);
        }
        catch (JMSException ex)
        {
           System.out.println("Exception :" ex);
        }

        return (AQjmsAdtMessage)msg;
}
```

Specifying Transformations for Topic Subscribers

A transformation can also be specified when creating Topic Subscribers using the `CreateDurableSubscriber` call. The transformation is applied to the retrieved message before returning it to the subscriber. If the subscriber specified in the `CreateDurableSubscriber` already exists, it's transformation is set to the specified transformation.

Example Code

The Western Shipping application subscribes to the OE_bookedorders_topic with the transformation 'OE2WS'. This transformation is applied to the messages and the returned message is of Oracle Object type WS.WS_orders.

Lets say that the WSOrder java class has been generated by Jpublisher to map to the Oracle Object WS.WS_order:

```
public AQjmsAdtMessage retrieve_booked_orders(TopicSession jms_session)
{
        TopicSubscriber      subscriber;
        Topic                topic;
        AQjmsAdtMessage      msg = null;

        try
        {
          /* get a handle to the OE_bookedorders_topic */
          topic = ((AQjmsSession)jms_session).getTopic("OE",
                                                 "OE_bookedorders_topic");
```

```
            /* create a subscriber with the transformation OE2WS */
            subs = ((AQjmsSession)jms_session).createDurableSubscriber(topic,
                    'WShip', null, false, WSOrder.getFactory(), "OE2WS");

            msg = subscriber.receive(10);
        }
        catch (JMSException ex)
        {
            System.out.println("Exception :" ex);
        }

        return (AQjmsAdtMessage)msg;
}
```

Specifying Transformations for Remote Subscribers

AQ allows a remote subscriber, that is a subscriber at another database, to subscribe to a topic.

Transformations can be specified when creating remote subscribers using the `createRemoteSubscriber`. This enables propagation of messages between Topics of different formats. When a message published at a topic meets the criterion of a remote subscriber, AQ will automatically propagate the message to the queue/topic at the remote database specified for the remote subscriber. If a transformation is also specified, AQ will apply the transformation to the message before propagating it to the queue/topic at the remote database.

Example Code

A remote subscriber is created at the OE.OE_bookedorders_topic so that messages are automatically propagated to the WS.WS_bookedorders_topic. The transformation OE2WS is specified when creating the remote subscriber so that the messages reaching the WS_bookedorders_topic have the correct format.

Lets say that the WSOrder java class has been generated by Jpublisher to map to the Oracle Object WS.WS_order

```
public void create_remote_sub(TopicSession jms_session)
{
     AQjmsAgent          subscriber;
     Topic               topic;

     try
     {
       /* get a handle to the OE_bookedorders_topic */
```

```
        topic = ((AQjmsSession)jms_session).getTopic("OE",
                                              "OE_bookedorders_topic");

        subscriber = new AQjmsAgent("WShip", "WS.WS_bookedorders_topic");

        ((AQjmsSession )jms_session).createRemoteSubscriber(topic,
                             subscriber, null, WSOrder.getFactory(),"OE2WS");
      }
      catch (JMSException ex)
      {
        System.out.println("Exception :" ex);
      }
}
```

13

JMS Administrative Interface: Basic Operations

In this chapter we describe the administrative interface to Oracle Advanced Queuing in terms of use cases. That is, we discuss each operation (such as "Creating a Queue Table") as a use case by that name. A table listing all the use cases is provided at the head of the chapter (see Use Case Model: JMS Administrative Interface — Basic Operations on page 13-2).

A summary figure, "Use Case Diagram: Administrator's Interface — Basic Operations", locates all the use cases in a single drawing. If you are using the HTML version of this document, you can use this figure to navigate to the use case in which you are interested, by clicking on the relevant use case title.

Each use case is laid out as follows:

- ***Use case figure***. A figure that depicts the use case.
- ***Purpose***. The purpose of this use case.
- ***Usage Notes.*** Guidelines to assist implementation.
- ***Syntax***. The main syntax used to perform this activity.
- ***Examples***. Examples in each programmatic environment which illustrate the use case.

Use Case Model: JMS Administrative Interface — Basic Operations

Table 13–1 Use Case Model: JMS Administrative Interface — Basic Operations

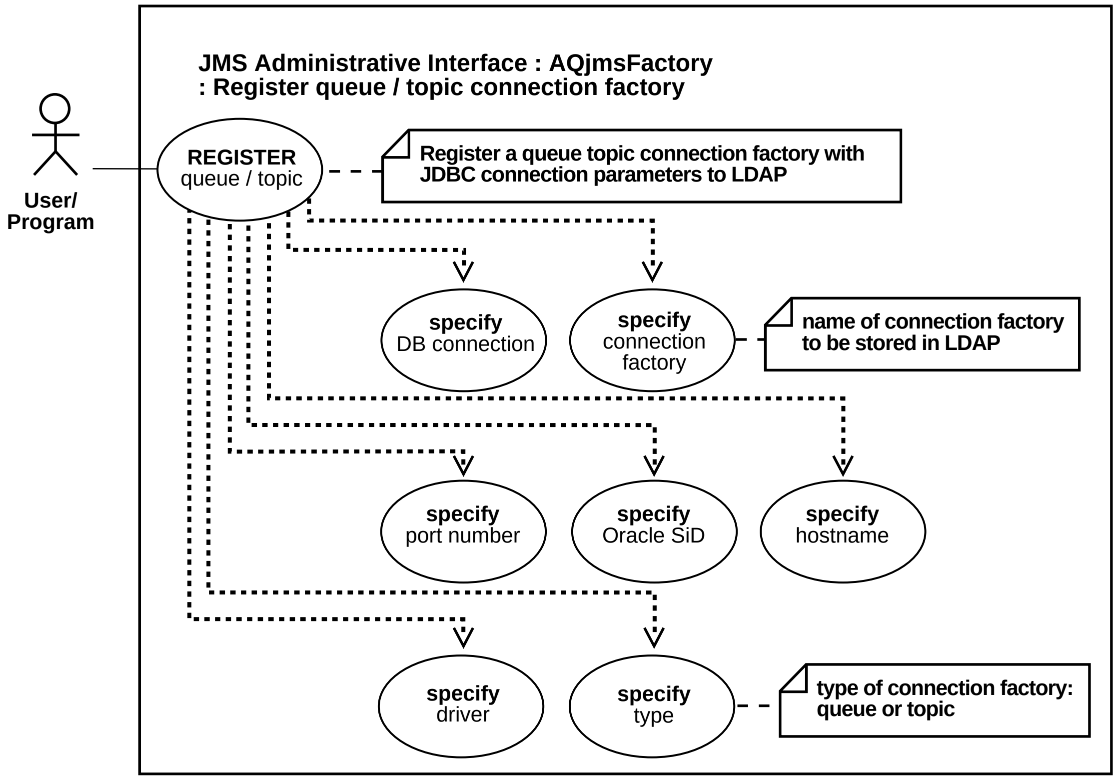
Use Case
Registering a Queue/Topic Connection Factory Through the Database—with JDBC Connection Parameters on page 13-4
Registering a Queue/Topic Connection Factory Through the Database—with a JDBC URL on page 13-6
Registering a Queue/Topic Connection Factory Through LDAP—with JDBC Connection Parameters on page 13-8
Registering a Queue/Topic Connection Factory Through LDAP—with a JDBC URL on page 13-11
Unregistering a Queue/Topic Connection Factory in LDAP Through the Database on page 13-13
Unregistering a Queue/Topic Connection Factory in LDAP Through LDAP on page 13-15
Getting a Queue Connection Factory with JDBC URL on page 13-17
Getting a Queue Connection Factory with JDBC Connection Parameters on page 13-19
Getting a Topic Connection Factory with JDBC URL on page 13-21
Getting a Topic Connection Factory with JDBC Connection Parameters on page 13-23
Getting a Queue/Topic Connection Factory in LDAP on page 13-25
Getting a Queue/Topic in LDAP on page 13-27
Creating a Queue Table on page 13-28
Creating a Queue Table [Specify Queue Table Property] on page 13-30
Getting a Queue Table on page 13-31
Specifying Destination Properties on page 13-33
Creating a Queue—Point-to-Point on page 13-35
Creating a Topic—Publish-Subscribe on page 13-37
Granting System Privileges on page 13-39
Revoking System Privileges on page 13-40
Granting Topic Privileges—Publish-Subscribe on page 13-42
Revoking Topic Privileges—Publish-Subscribe on page 13-44
Granting Queue Privileges—Point-to-Point on page 13-46
Revoking Queue Privileges—Point-to-Point on page 13-48

Table 13–1 (Cont.) Use Case Model: JMS Administrative Interface — Basic Operations

Use Case
Starting a Destination on page 13-50
Stopping a Destination on page 13-52
Altering a Destination on page 13-54
Dropping a Destination on page 13-56
Scheduling a Propagation on page 13-57
Enabling a Propagation Schedule on page 13-59
Altering a Propagation Schedule on page 13-61
Disabling a Propagation Schedule on page 13-63
Unscheduling a Propagation on page 13-64

Registering a Queue/Topic Connection Factory Through the Database—with JDBC Connection Parameters

Figure 13–1 Registering Through the Database with JDBC Connection Parameters



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsFactory" on page B-49
- "Registering a Queue/Topic Connection Factory Through the Database—with a JDBC URL" on page 13-6

Purpose

Register a queue / topic connection factory through the database with JDBC connection parameters to LDAP.

Usage Notes

`registerConnectionFactory` is a static method. To successfully register the connection factory, the DB connection passed to `registerConnectionFactory` must be granted `AQ_ADMINISTRATOR_ROLE`. After registration, look up the connection factory using JNDI.

Syntax

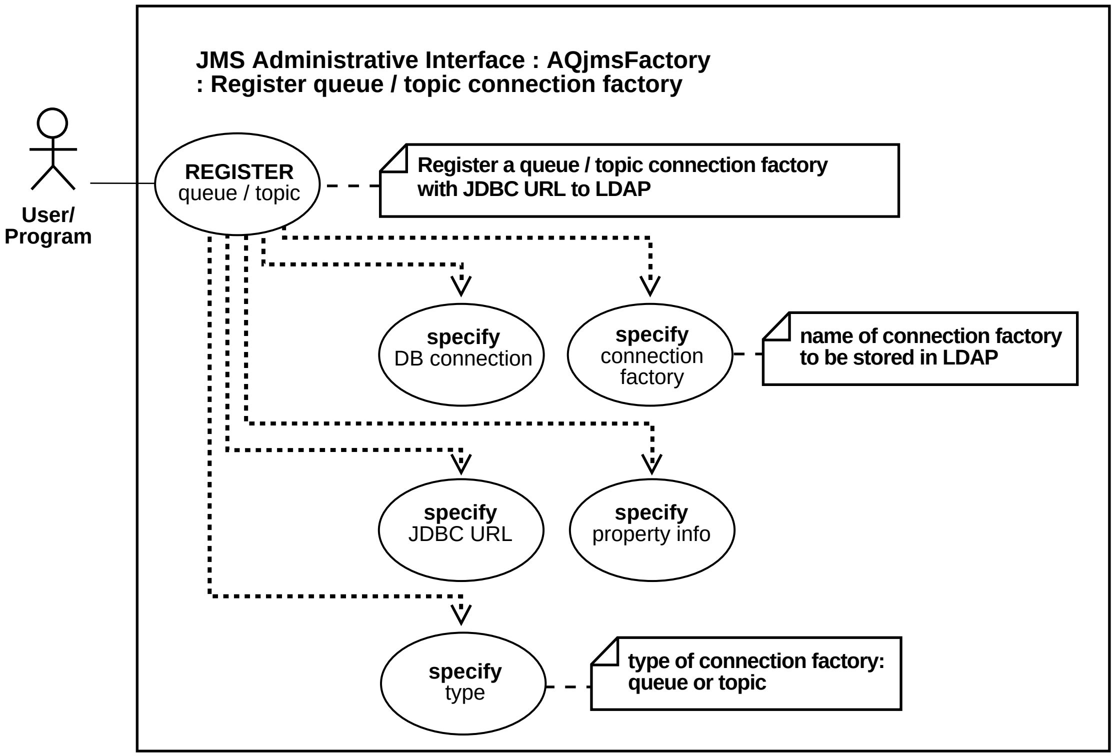
See Java (JDBC): *Oracle9i Supplied Java Packages Reference*, oracle.jms, AQjmsFactory.registerConnectionFactory.

Example

```
String              url;
java.sql.connection  db_conn;

url = "jdbc:oracle:thin:@sun-123:1521:db1";
db_conn = DriverManager.getConnection(url, "scott", "tiger");
AQjmsFactory.registerConnectionFactory(db_conn, "queue_conn1", "sun-123",
  "db1", 1521, "thin", "queue");
```

Registering a Queue/Topic Connection Factory Through the Database—with a JDBC URL

Figure 13–2 Registering Through the Database with a JDBC URL



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsFactory" on page B-49
- "Registering a Queue/Topic Connection Factory Through the Database—with JDBC Connection Parameters" on page 13-4

Purpose

Register a queue / topic connection factory through the database with a JDBC URL to LDAP.

Usage Notes

`registerConnectionFactory` is a static method. To successfully register the connection factory, the DB connection passed to `registerConnectionFactory` must be granted `AQ_ADMINISTRATOR_ROLE`. After registration, look up the connection factory using JNDI.

Syntax

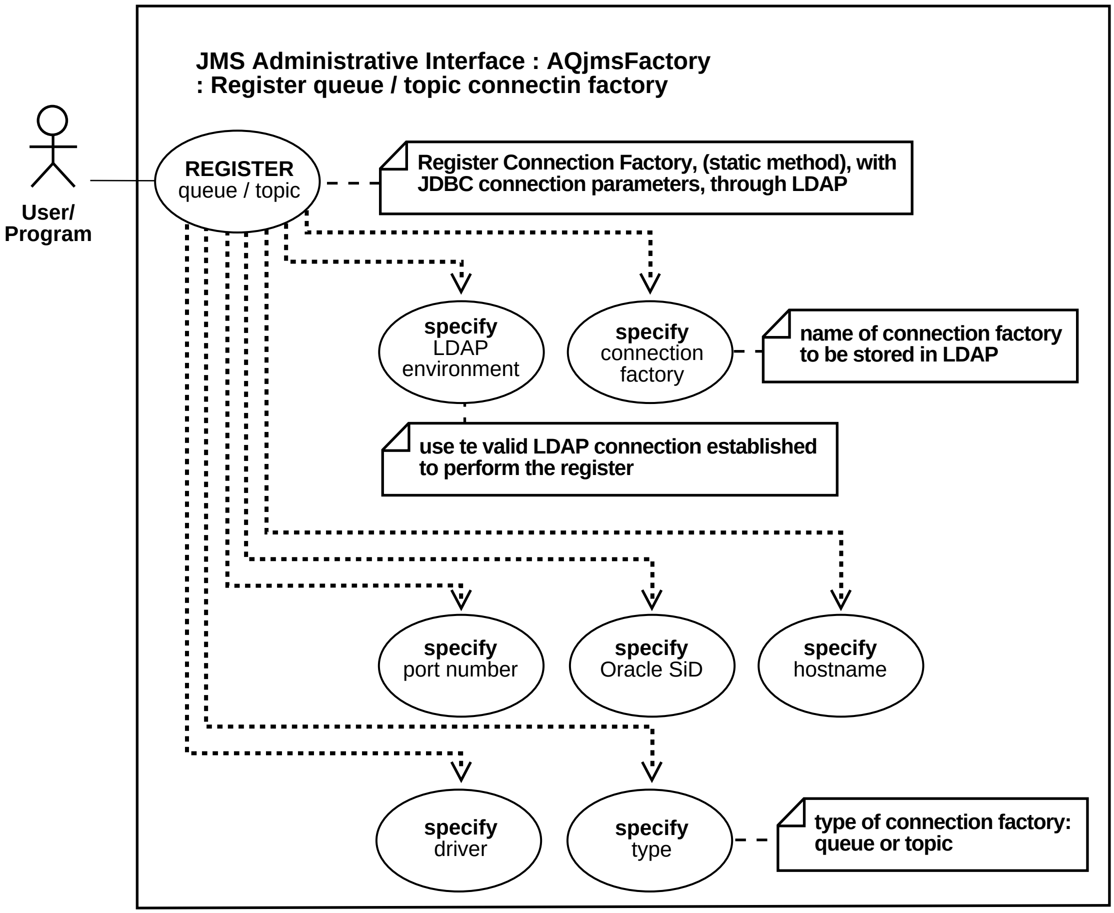
See Java (JDBC): *Oracle9i Supplied Java Packages Reference*, oracle.jms, AQjmsFactory.registerConnectionFactory.

Example

```
String                        url;
java.sql.connection           db_conn;

url = "jdbc:oracle:thin:@sun-123:1521:db1";
db_conn = DriverManager.getConnection(url, "scott", "tiger");
AQjmsFactory.registerConnectionFactory(db_conn, "topic_conn1", url,
   null, "topic");
```

Registering a Queue/Topic Connection Factory Through LDAP—with JDBC Connection Parameters

Figure 13–3 Registering Through LDAP with JDBC Connection Parameters



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsFactory" on page B-49
- "Registering a Queue/Topic Connection Factory Through LDAP—with a JDBC URL" on page 13-11

Purpose

Register a queue/topic connection factory through LDAP with JDBC connection parameters to LDAP.

Usage Notes

`registerConnectionFactory` is a static method. To successfully register the connection factory, the hashtable passed to `registerConnectionFactory` must contain all the information to establish a valid connection to the LDAP server. Furthermore, the connection must have write access to the connection factory entries in the LDAP server (which requires the LDAP user to be either the database itself or be granted `global_aq_user_role`). After registration, look up the connection factory using JNDI.

Syntax

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsFactory.registerConnectionFactory.

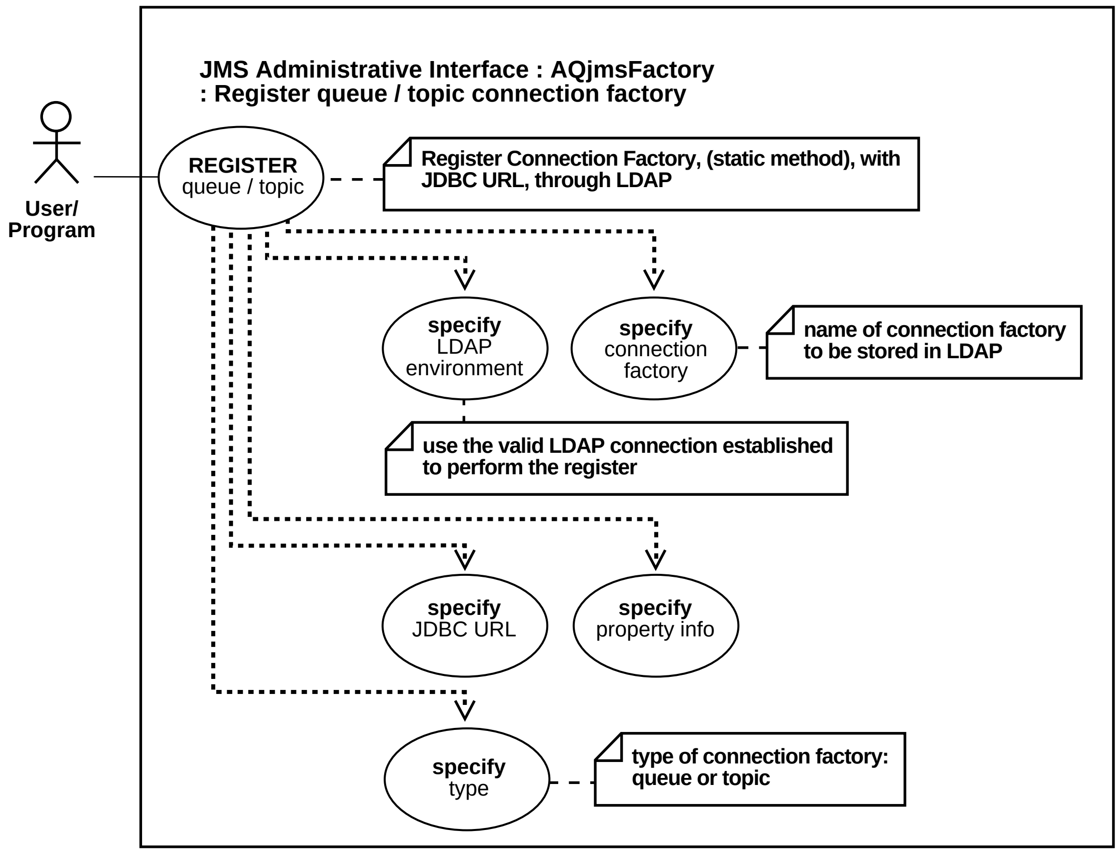
Example

```
Hashtable            env = new Hashtable(5, 0.75f);
/* the following statements set in hashtable env:
   * service provider package
   * the URL of the ldap server
   * the distinguished name of the database server
   * the authentication method (simple)
   * the LDAP user name
   * the LDAP user password
*/
env.put(Context.INITIAL_CONTEXT_FACTORY, "com.sun.jndi.ldap.LdapCtxFactory");
env.put(Context.PROVIDER_URL, "ldap://sun-456:389");
env.put("searchbase", "cn=db1,cn=Oraclecontext,cn=acme,cn=com");
env.put(Context.SECURITY_AUTHENTICATION, "simple");
env.put(Context.SECURITY_PRINCIPAL, "cn=db1aqadmin,cn=acme,cn=com");
```

```
env.put(Context.SECURITY_CREDENTIALS, "welcome");

AQjmsFactory.registerConnectionFactory(env, "queue_conn1", "sun-123",
  "db1", 1521, "thin", "queue");
```

Registering a Queue/Topic Connection Factory Through LDAP—with a JDBC URL

Figure 13–4 Registering Through LDAP with a JDBC URL



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsFactory" on page B-49
- "Registering a Queue/Topic Connection Factory Through LDAP—with JDBC Connection Parameters" on page 13-8

Purpose

Register a queue/topic connection factory through LDAP with JDBC connection parameters to LDAP.

Usage Notes

`registerConnectionFactory` is a static method. To successfully register the connection factory, the hashtable passed to `registerConnectionFactory` must contain all the information to establish a valid connection to the LDAP server. Furthermore, the connection must have write access to the connection factory entries in the LDAP server (which requires the LDAP user to be either the database itself or be granted `global_aq_user_role`). After registration, look up the connection factory using JNDI.

Syntax

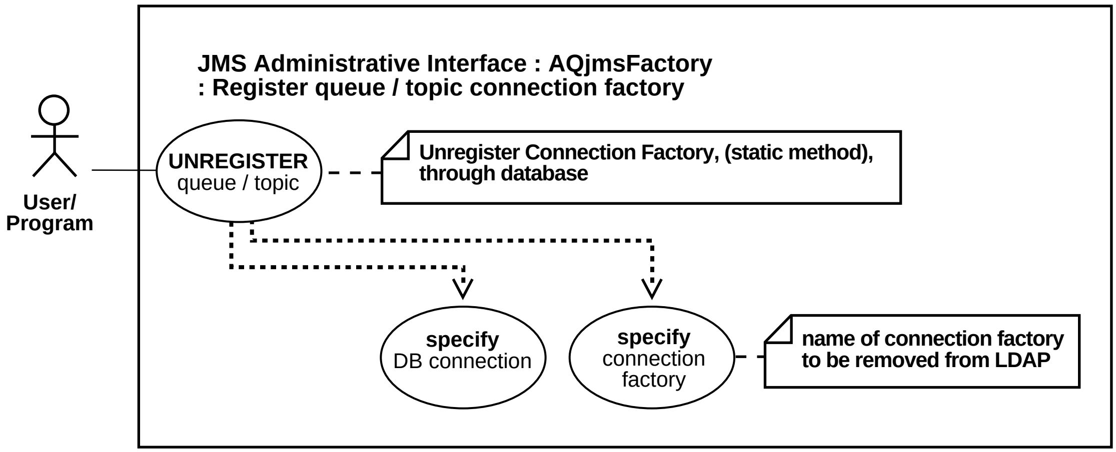
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsFactory.registerConnectionFactory.

Example

```
String              url;
Hashtable           env = new Hashtable(5, 0.75f);

/* the following statements set in hashtable env:
   * service provider package
   * the URL of the ldap server
   * the distinguished name of the database server
   * the authentication method (simple)
   * the LDAP user name
   * the LDAP user password
*/
env.put(Context.INITIAL_CONTEXT_FACTORY, "com.sun.jndi.ldap.LdapCtxFactory");
env.put(Context.PROVIDER_URL, "ldap://sun-456:389");
env.put("searchbase", "cn=db1,cn=Oraclecontext,cn=acme,cn=com");
env.put(Context.SECURITY_AUTHENTICATION, "simple");
env.put(Context.SECURITY_PRINCIPAL, "cn=db1aqadmin,cn=acme,cn=com");
env.put(Context.SECURITY_CREDENTIALS, "welcome");
url = "jdbc:oracle:thin:@sun-123:1521:db1";
AQjmsFactory.registerConnectionFactory(env, "topic_conn1", url, null, "topic");
```

Unregistering a Queue/Topic Connection Factory in LDAP Through the Database

Figure 13–5 Unregistering a Queue/Topic Connection Factory in LDAP Through the Database



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsFactory" on page B-49
- "Unregistering a Queue/Topic Connection Factory in LDAP Through LDAP" on page 13-15

Purpose

Unregister a queue/topic connection factory in LDAP.

Usage Notes

`unregisterConnectionFactory` is a static method. To successfully unregister the connection factory, the DB connection passed to `unregisterConnectionFactory` must be granted `AQ_ADMINISTRATOR_ROLE`.

Syntax

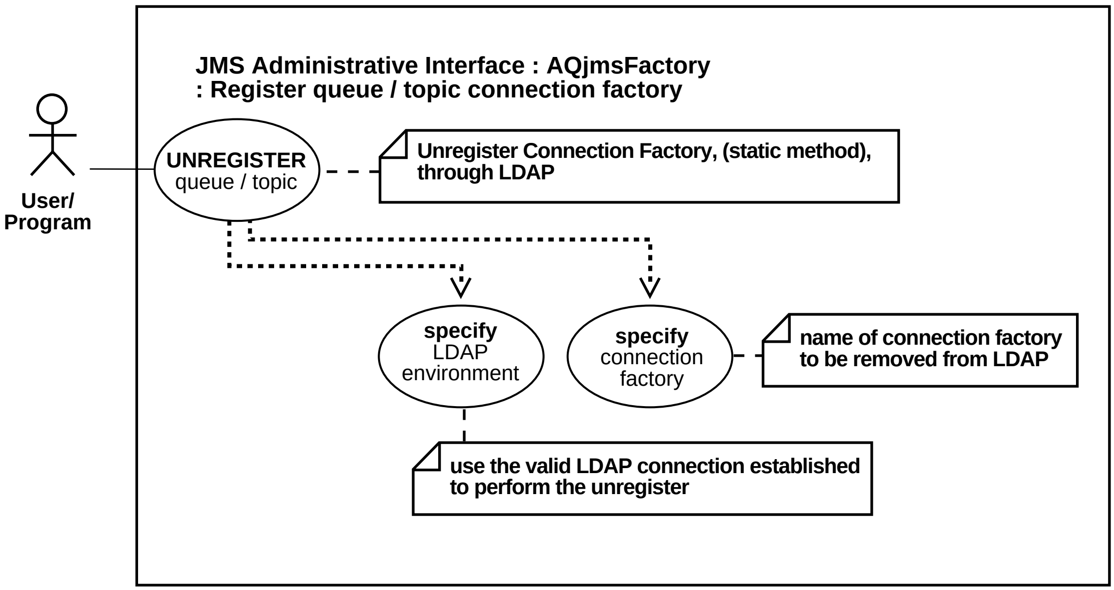
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsFactory.unregisterConnectionFactory.

Example

```
String              url;
java.sql.connection  db_conn;

url = "jdbc:oracle:thin:@sun-123:1521:db1";
db_conn = DriverManager.getConnection(url, "scott", "tiger");
AQjmsFactory.unregisterConnectionFactory(db_conn, "topic_conn1");
```

Unregistering a Queue/Topic Connection Factory in LDAP Through LDAP

Figure 13–6 Unregistering a Queue/Topic Connection Factory in LDAP Through LDAP



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsFactory" on page B-49
- "Unregistering a Queue/Topic Connection Factory in LDAP Through the Database" on page 13-13

Purpose

Register a queue/topic connection factory in LDAP.

Usage Notes

`unregisterConnectionFactory` is a static method. To successfully unregister the connection factory, the hashtable passed to `unregisterConnectionFactory` must contain all the information to establish a valid connection to the LDAP server. Furthermore, the connection must have write access to the connection factory entries in the LDAP server (which requires the LDAP user to be either the database itself or be granted `global_aq_user_role`).

Syntax

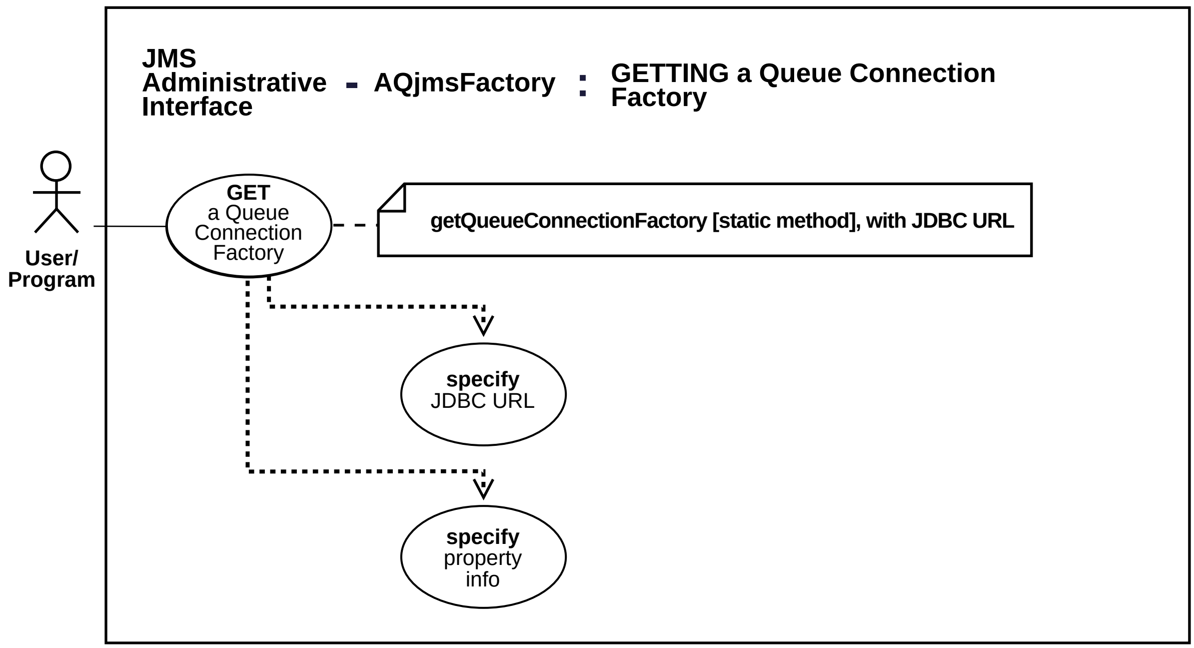
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsFactory.unregisterConnectionFactory.

Example

```
String              url;
Hashtable           env = new Hashtable(5, 0.75f);

/* the following statements set in hashtable env:
   * service provider package
   * the URL of the ldap server
   * the distinguished name of the database server
   * the authentication method (simple)
   * the LDAP user name
   * the LDAP user password
*/

env.put(Context.INITIAL_CONTEXT_FACTORY, "com.sun.jndi.ldap.LdapCtxFactory");
env.put(Context.PROVIDER_URL, "ldap://sun-456:389");
env.put("searchbase", "cn=db1,cn=Oraclecontext,cn=acme,cn=com");
env.put(Context.SECURITY_AUTHENTICATION, "simple");
env.put(Context.SECURITY_PRINCIPAL, "cn=db1aqadmin,cn=acme,cn=com");
env.put(Context.SECURITY_CREDENTIALS, "welcome");
url = "jdbc:oracle:thin:@sun-123:1521:db1";
AQjmsFactory.unregisterConnectionFactory(env, "queue_conn1");
```

Getting a Queue Connection Factory with JDBC URL

Figure 13–7 Getting a Queue Connection Factory with JDBC Connection



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsFactory" on page B-49
- "Getting a Queue Connection Factory with JDBC Connection Parameters" on page 13-19

Purpose

Get a Queue Connection Factory with JDBC URL

Usage Notes

getQueueConnectionFactory is a static method.

Syntax

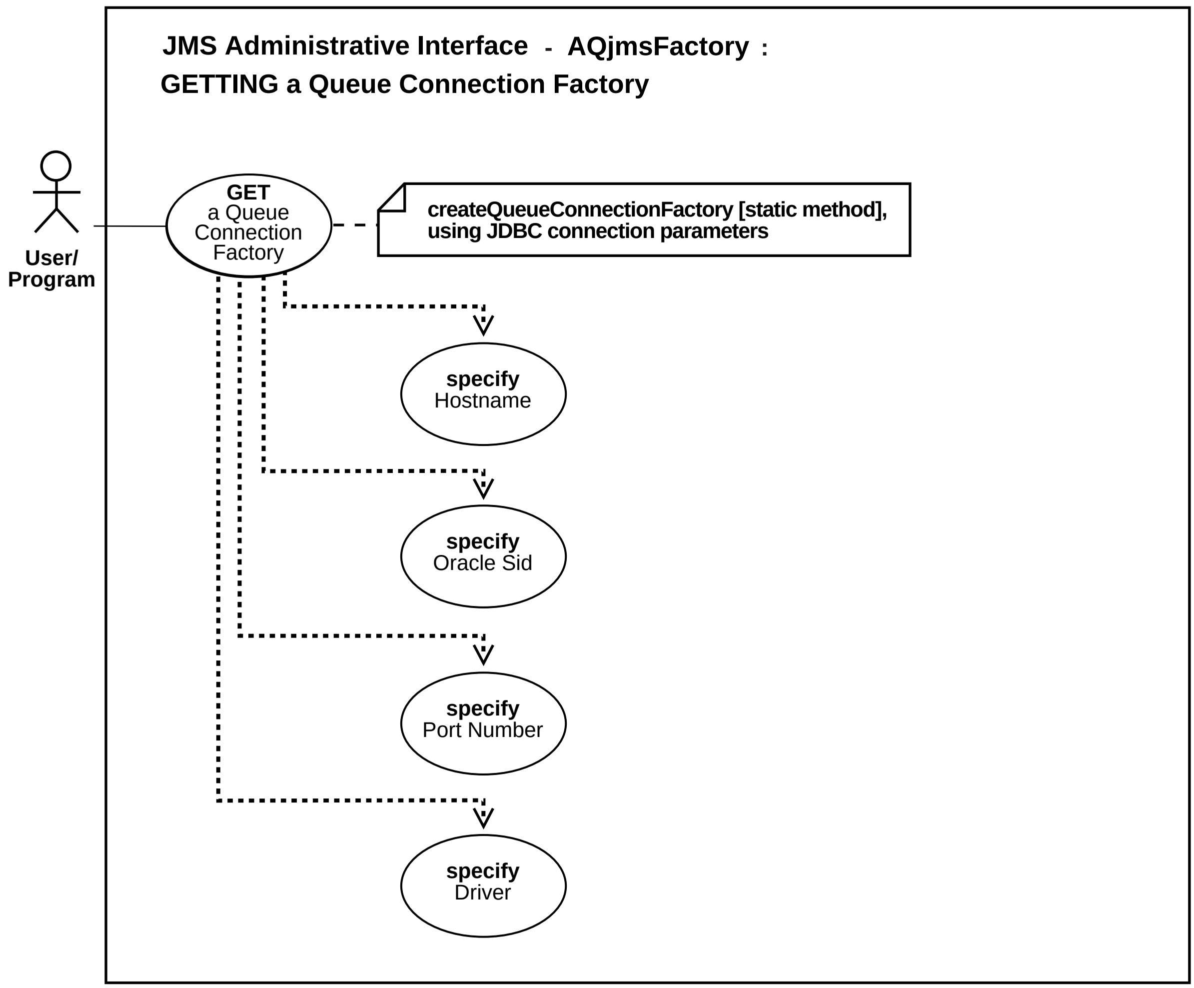
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsFactory.getQueueConnectionFactory

Example

```
String      url          = "jdbc:oracle:oci8:internal/oracle"
Properties  info         = new Properties();
QueueConnectionFactory   qc_fact;

info.put("internal_logon", "sysdba");
qc_fact = AQjmsFactory.getQueueConnectionFactory(url, info);
```

Getting a Queue Connection Factory with JDBC Connection Parameters

Figure 13–8 Getting a Queue Connection Factory with JDBC Connection Parameters



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsFactory" on page B-49
- "Getting a Queue Connection Factory with JDBC URL" on page 13-17

Purpose

Get a Queue Connection Factory with JDBC Connection Parameters

Usage Notes

getQueueConnectionFactory is a static method.

Syntax

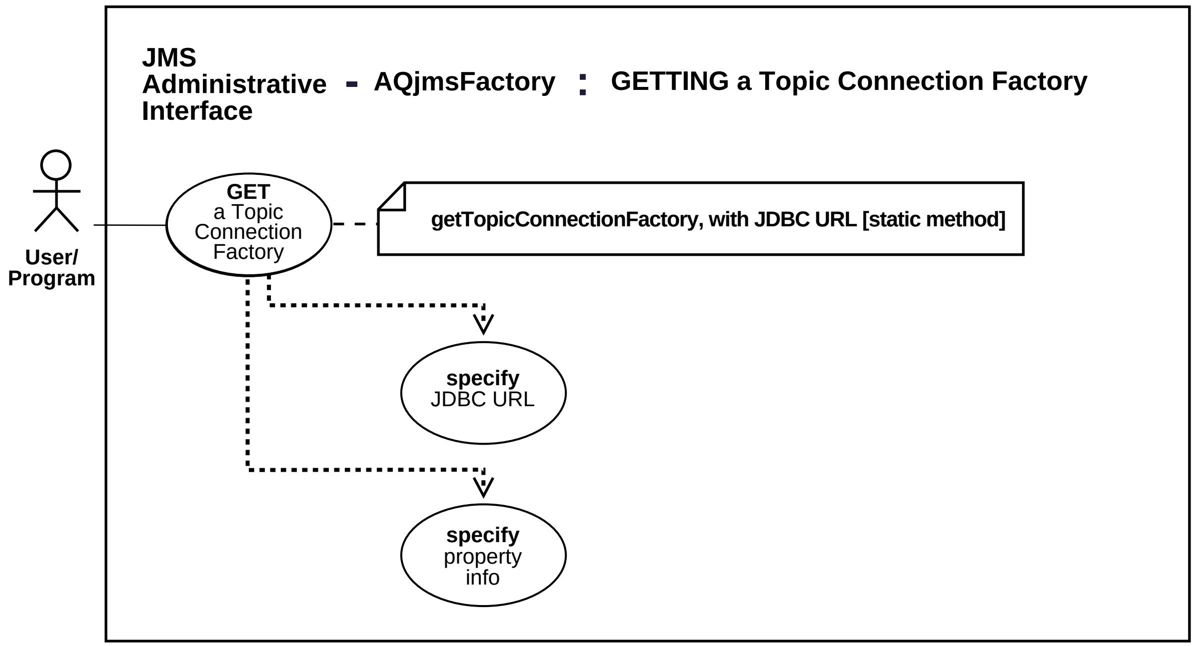
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsFactory.getQueueConnectionFactory

Example

```
String      host         = "dlsun";
String      ora_sid      = "rdbms8i"
String      driver       = "thin";
int         port         = 5521;
QueueConnectionFactory   qc_fact;

qc_fact = AQjmsFactory.getQueueConnectionFactory(host, ora_sid, port, driver);
```

Getting a Topic Connection Factory with JDBC URL

Figure 13–9 Getting a Topic Connection Factory with JDBC URL



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsFactory" on page B-49
- "Getting a Topic Connection Factory with JDBC Connection Parameters" on page 13-23

Purpose

Get a Topic Connection Factory with a JDBC URL.

Usage Notes

getTopicConnectionFactory is a static method.

Syntax

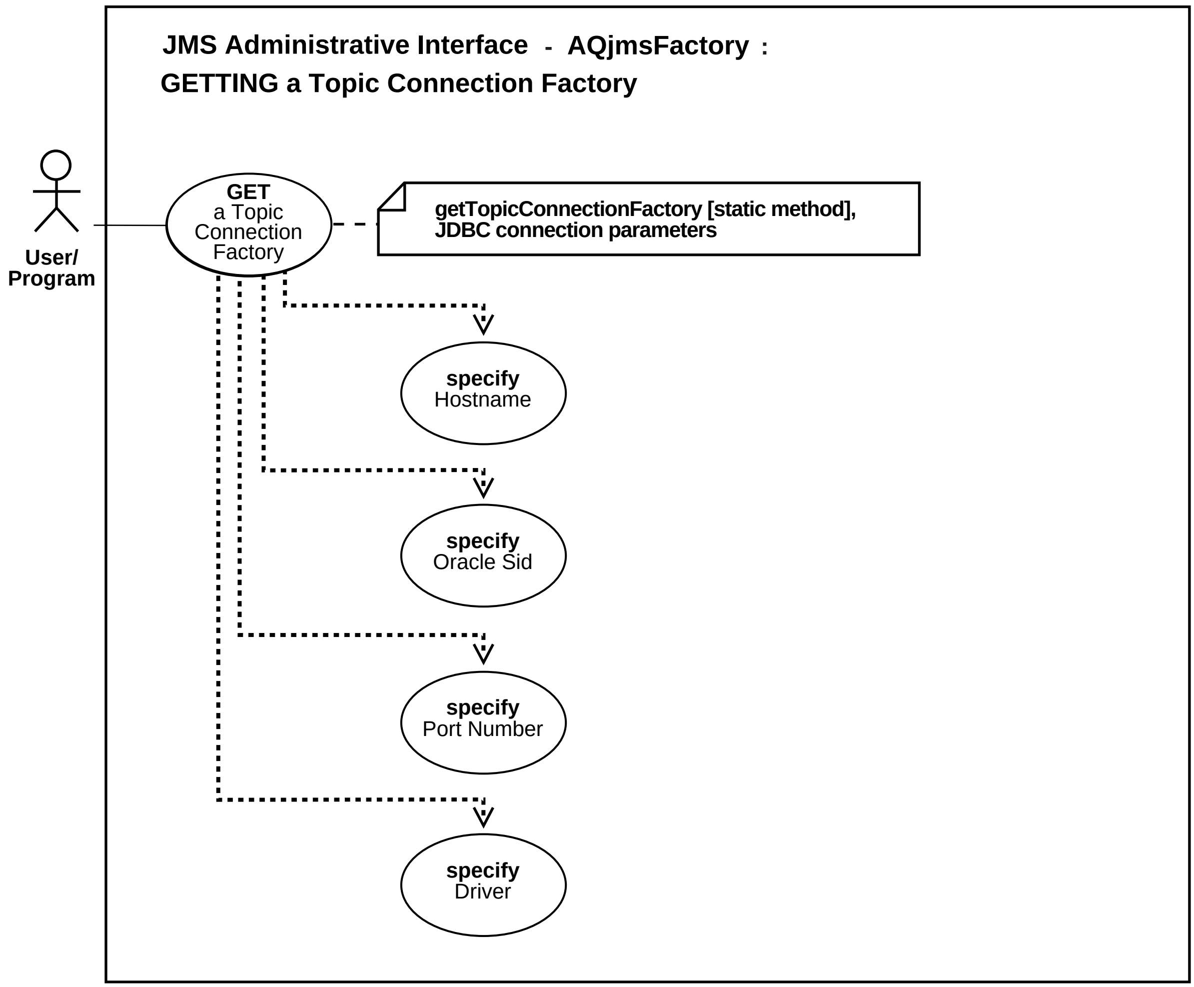
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsFactory.getTopicConnectionFactory

Example

```
String      url          = "jdbc:oracle:oci8:internal/oracle"
Properties  info         = new Properties();
TopicConnectionFactory   tc_fact;

info.put("internal_logon", "sysdba");
tc_fact = AQjmsFactory.getTopicConnectionFactory(url, info);
```

Getting a Topic Connection Factory with JDBC Connection Parameters

Figure 13–10 Getting a Topic Connection Factory with JDBC Connection Parameters



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsFactory" on page B-49
- "Getting a Topic Connection Factory with JDBC URL" on page 13-21

Usage Note

getTopicConnectionFactory is a Static Method.

Purpose

Get a topic connection factory with JDBC connection parameters.

Syntax

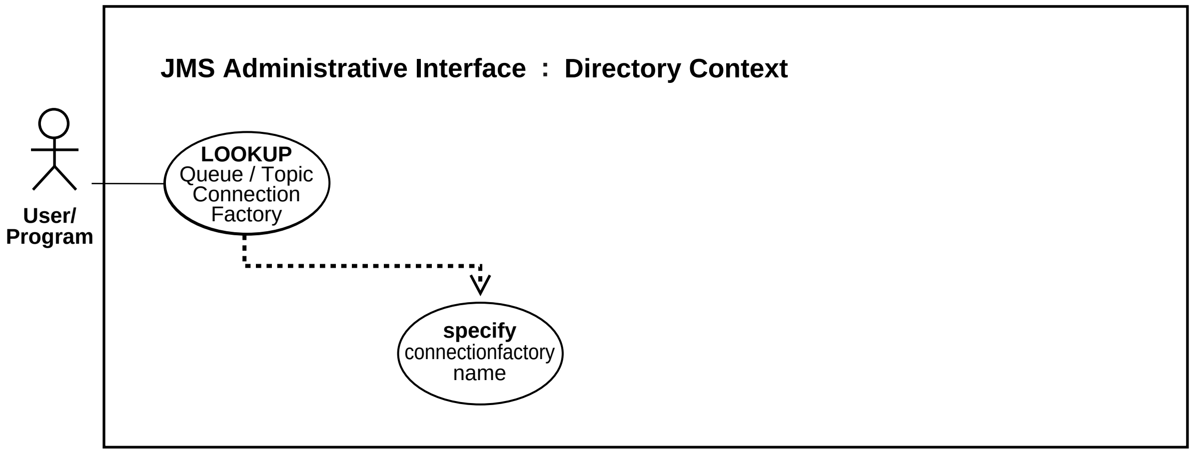
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsFactory.getTopicConnectionFactory

Example

```
String      host         = "dlsun";
String      ora_sid      = "rdbms8i"
String      driver       = "thin";
int         port         = 5521;
TopicConnectionFactory   tc_fact;

tc_fact = AQjmsFactory.getTopicConnectionFactory(host, ora_sid, port, driver);
```

Getting a Queue/Topic Connection Factory in LDAP

Figure 13–11 Getting a Queue/Topic Connection Factory in LDAP



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations

Purpose

Get a queue/topic connection factory from LDAP.

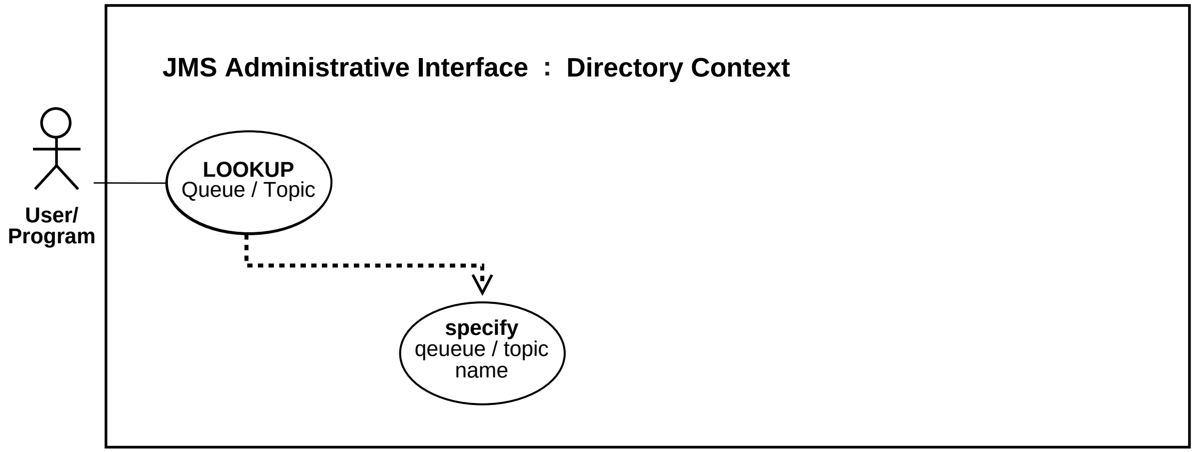
Example

```
Hashtable              env = new Hashtable(5, 0.75f);
DirContext             ctx;
queueConnectionFactory qc_fact;

/* the following statements set in hashtable env:
   * service provider package
   * the URL of the ldap server
   * the distinguished name of the database server
   * the authentication method (simple)
   * the LDAP user name
   * the LDAP user password
*/
env.put(Context.INITIAL_CONTEXT_FACTORY, "com.sun.jndi.ldap.LdapCtxFactory");
```

```
env.put(Context.PROVIDER_URL, "ldap://sun-456:389");
env.put(Context.SECURITY_AUTHENTICATION, "simple");
env.put(Context.SECURITY_PRINCIPAL, "cn=db1aquser1,cn=acme,cn=com");
env.put(Context.SECURITY_CREDENTIALS, "welcome");

ctx = new InitialDirContext(env);
ctx =
(DirContext)ctx.lookup("cn=OracleDBConnections,cn=db1,cn=Oraclecontext,cn=acme,c
n=com");
qc_fact = (queueConnectionFactory)ctx.lookup("cn=queue_conn1");
```

Getting a Queue/Topic in LDAP

Figure 13–12 Getting a Queue/Topic in LDAP



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations

Purpose

Get a queue/topic from LDAP.

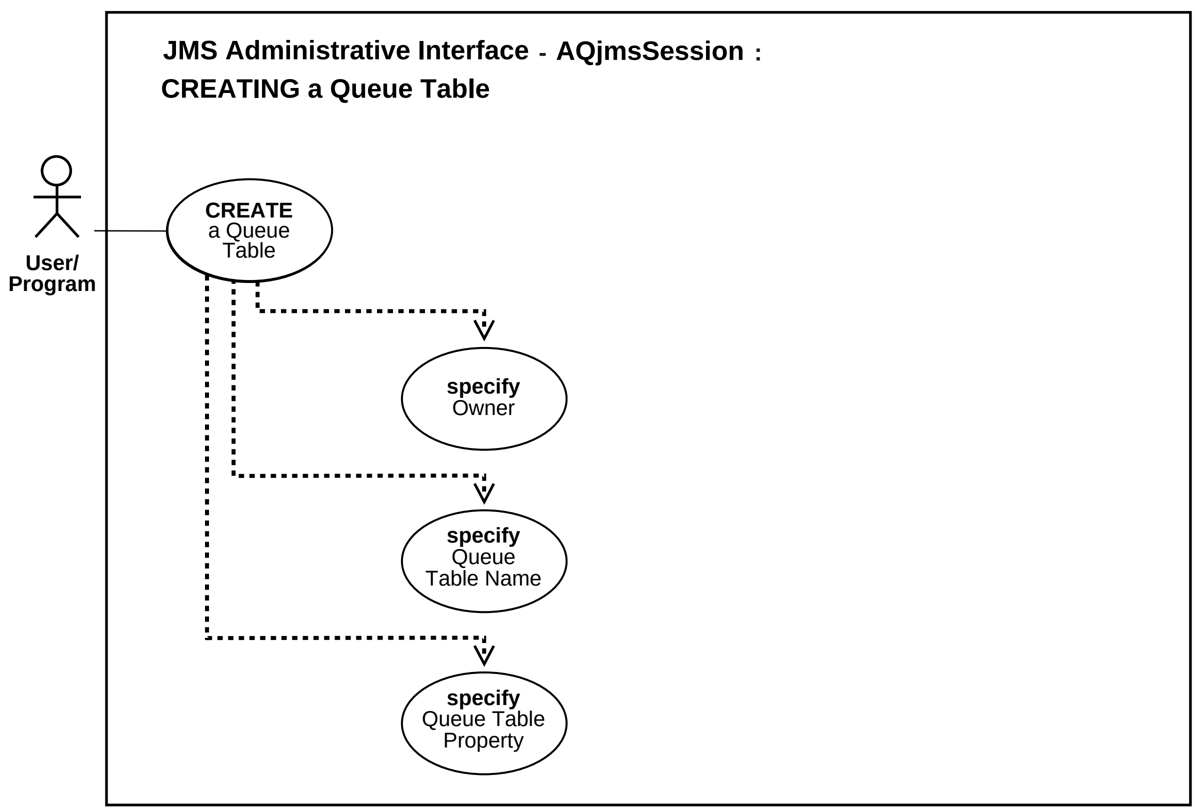
Example

```
Hashtable               env = new Hashtable(5, 0.75f);
DirContext              ctx;
topic                   topic_1;

/* the following statements set in hashtable env:
   * service provider package
   * the URL of the ldap server
   * the distinguished name of the database server
   * the authentication method (simple)
   * the LDAP user name
   * the LDAP user password
*/
env.put(Context.INITIAL_CONTEXT_FACTORY, "com.sun.jndi.ldap.LdapCtxFactory");
```

```
env.put(Context.PROVIDER_URL, "ldap://sun-456:389");
env.put(Context.SECURITY_AUTHENTICATION, "simple");
env.put(Context.SECURITY_PRINCIPAL, "cn=db1aquser1,cn=acme,cn=com");
env.put(Context.SECURITY_CREDENTIALS, "welcome");

ctx = new InitialDirContext(env);
ctx =
(DirContext)ctx.lookup("cn=OracleDBQueues,cn=db1,cn=Oraclecontext,cn=acme,cn=com
");
topic_1 = (topic)ctx.lookup("cn=topic_1");
```

Creating a Queue Table

Figure 13–13 Creating a Queue Table



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Creating a Queue Table [Specify Queue Table Property]" on page 13-30

Purpose

Create a queue table.

Usage Notes

CLOB, BLOB, BFILE objects are valid attributes for an AQ object type load. However, only CLOB and BLOB can be propagated using AQ propagation in Oracle8*i* and after.

Syntax

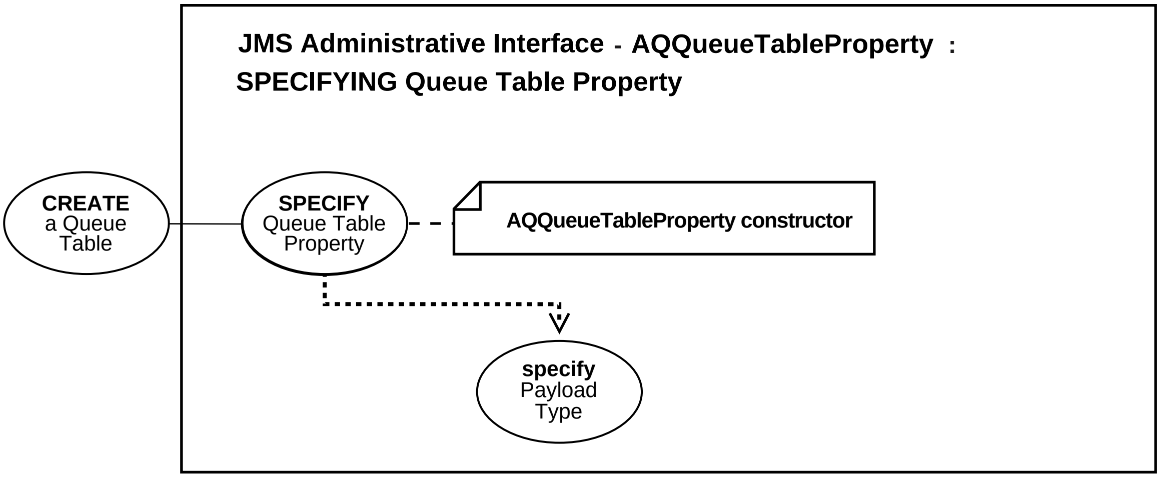
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createQueueTable

Example

```
QueueSession              q_sess     = null;
AQQueueTable              q_table    = null;
AQQueueTableProperty      qt_prop    = null;

qt_prop = new AQQueueTableProperty("SYS.AQ$_JMS_BYTES_MESSAGE");
  q_table = ((AQjmsSession)q_sess).createQueueTable("boluser",
  "bol_ship_queue_table", qt_prop);
```

Creating a Queue Table [Specify Queue Table Property]

Figure 13–14 Creating a Queue Table [Specify Queue Table Property]



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.AQ.AQQueueTableProperty" on page B-58
- "Creating a Queue Table" on page 13-28

Purpose

Specify queue table properties

Usage Notes

Not applicable.

Syntax

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.AQ, AQQueueTableProperty

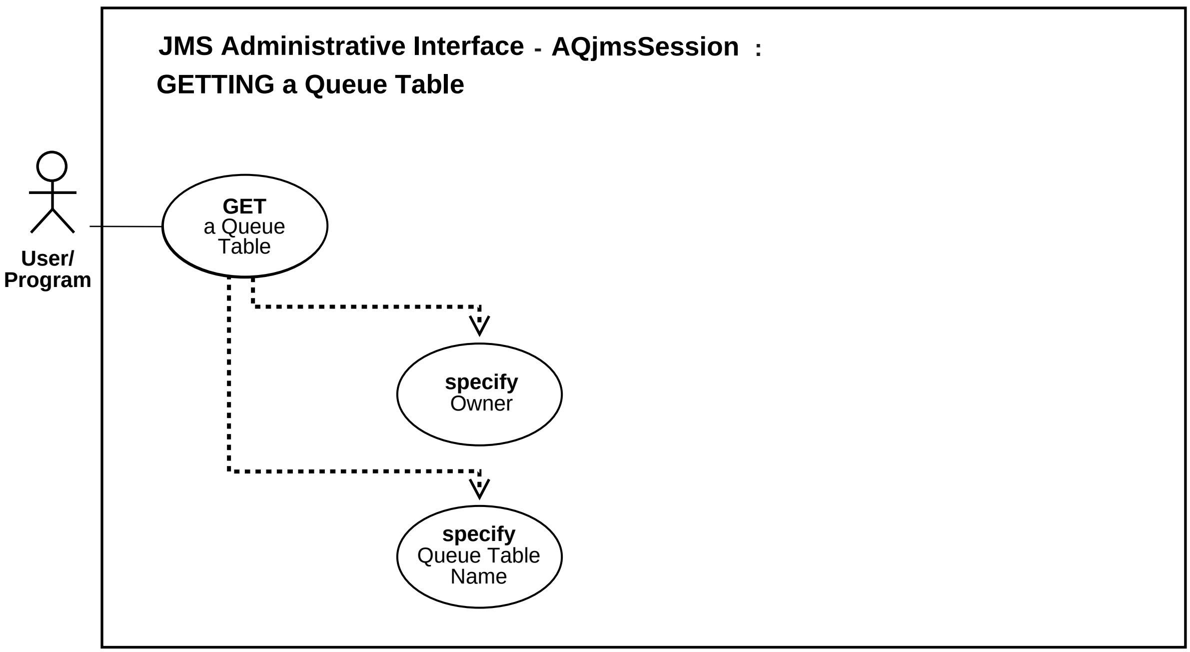
Example

```
QueueSession              q_sess    = null;
```

```
AQQueueTable              q_table   = null;
AQQueueTableProperty      qt_prop   = null;

qt_prop = new AQQueueTableProperty("SYS.AQ$_JMS_BYTES_MESSAGE");
q_table = ((AQjmsSession)q_sess).createQueueTable("boluser",
   "bol_ship_queue_table", qt_prop);
```

Getting a Queue Table

Figure 13–15 Getting Queue Table



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Get a queue table.

Usage Notes

If the caller that opened the connection is not the owner of the queue table, the caller must have AQ enqueue/dequeue privileges on queues/topics in the queue table. Otherwise the queue-table will not be returned.

Syntax

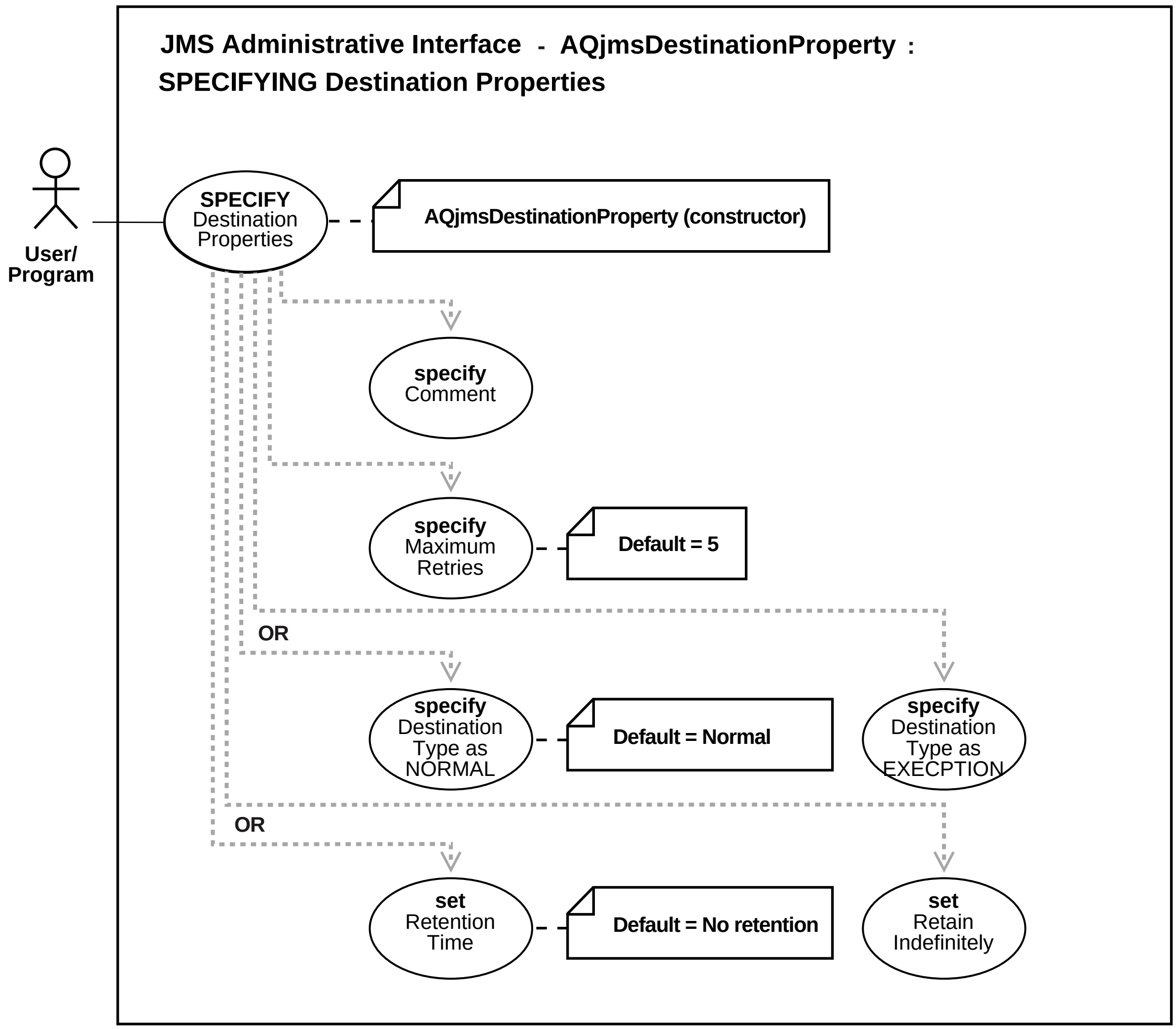
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.getQueueTable

Example

```
QueueSession                q_sess;
AQQueueTable                q_table;

 q_table = ((AQjmsSession)q_sess).getQueueTable("boluser",
"bol_ship_queue_table");
```

Specifying Destination Properties

Figure 13–16 Specifying Destination Properties



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestinationProperty" on page B-48

Purpose

Specify destination properties.

Usage Notes

Not applicable.

Syntax

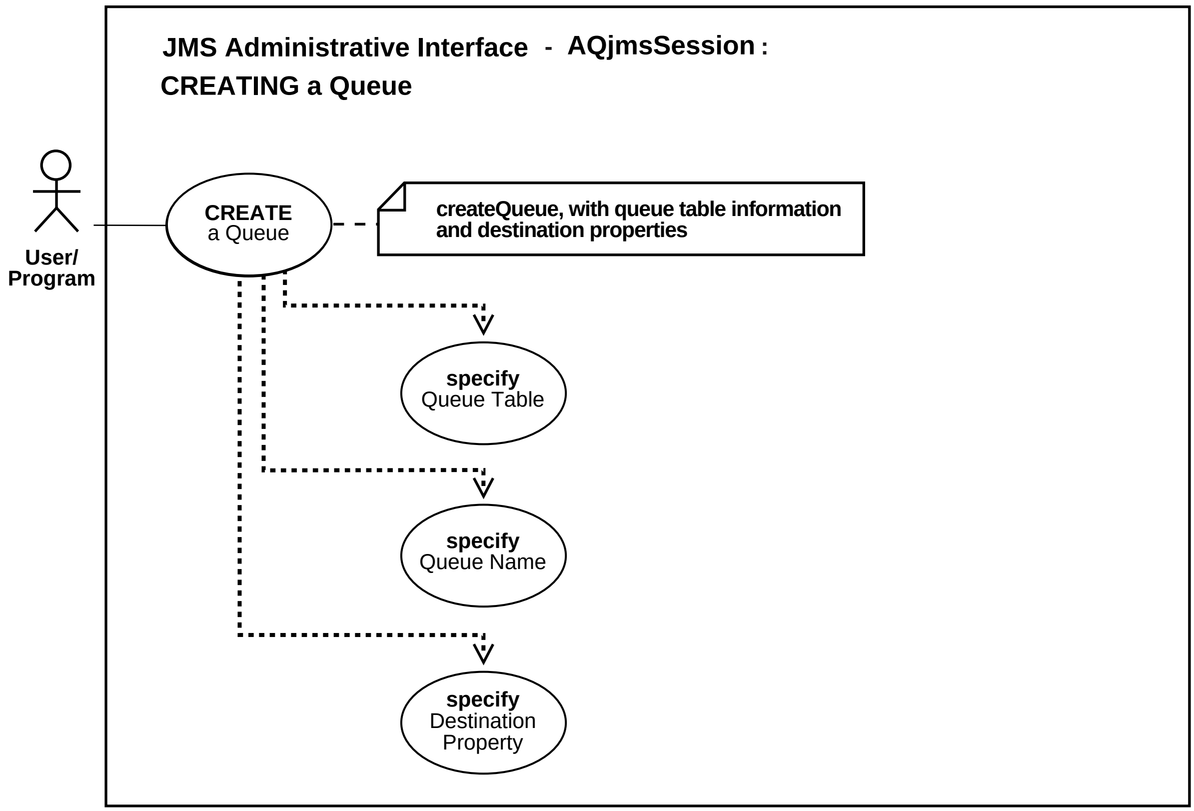
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestinationProperty

Example

No example is provided with this release.

Creating a Queue—Point-to-Point

Figure 13–17 Creating a Queue—Point-to-Point



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Create a queue in a specified queue table.

Usage Notes

The queue table in which a queue is created has to be a single-consumer queue table.

Syntax

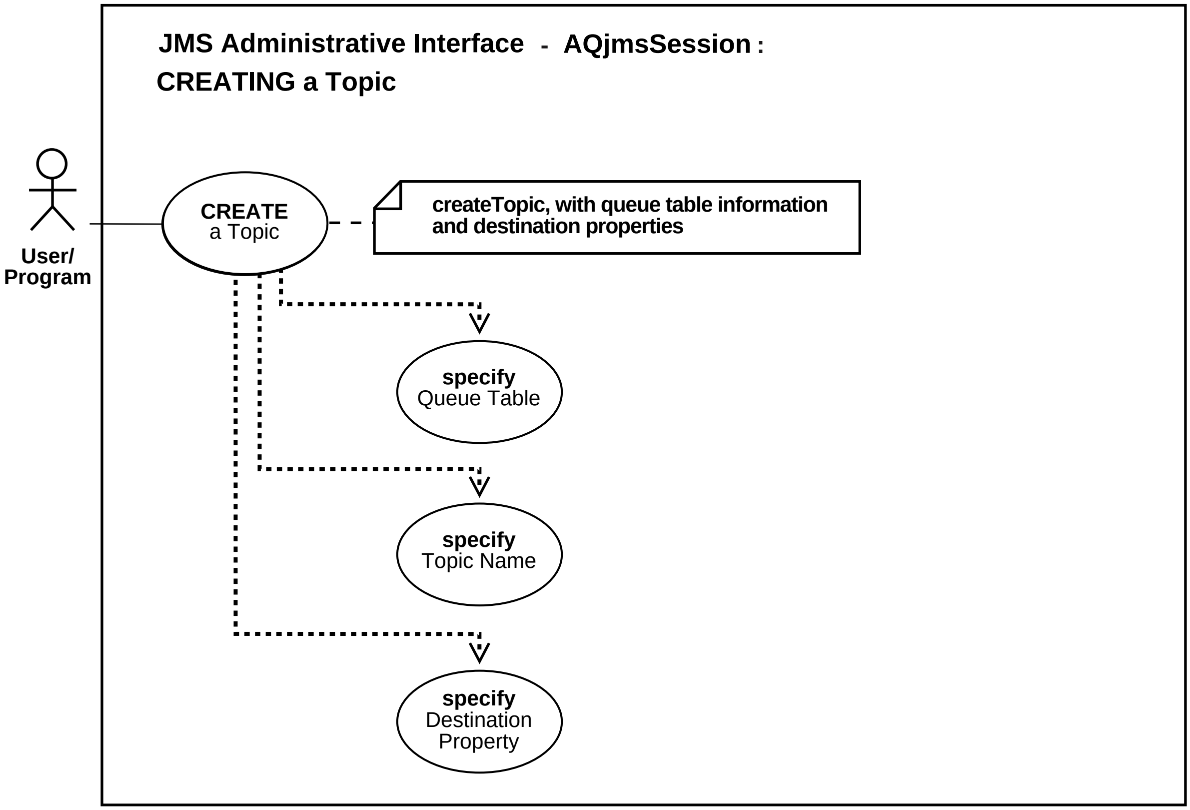
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createQueue

Example

```
QueueSession              q_sess;
AQQueueTable              q_table;
AqjmsDestinationProperty dest_prop;
Queue                     queue;

queue = ((AQjmsSession)q_sess).createQueue(q_table, "jms_q1", dest_prop);
```

Creating a Topic—Publish-Subscribe

Figure 13–18 Creating a Topic—Publish-Subscribe



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Create a topic in the publish-subscribe model.

Usage Notes

Not applicable.

Syntax

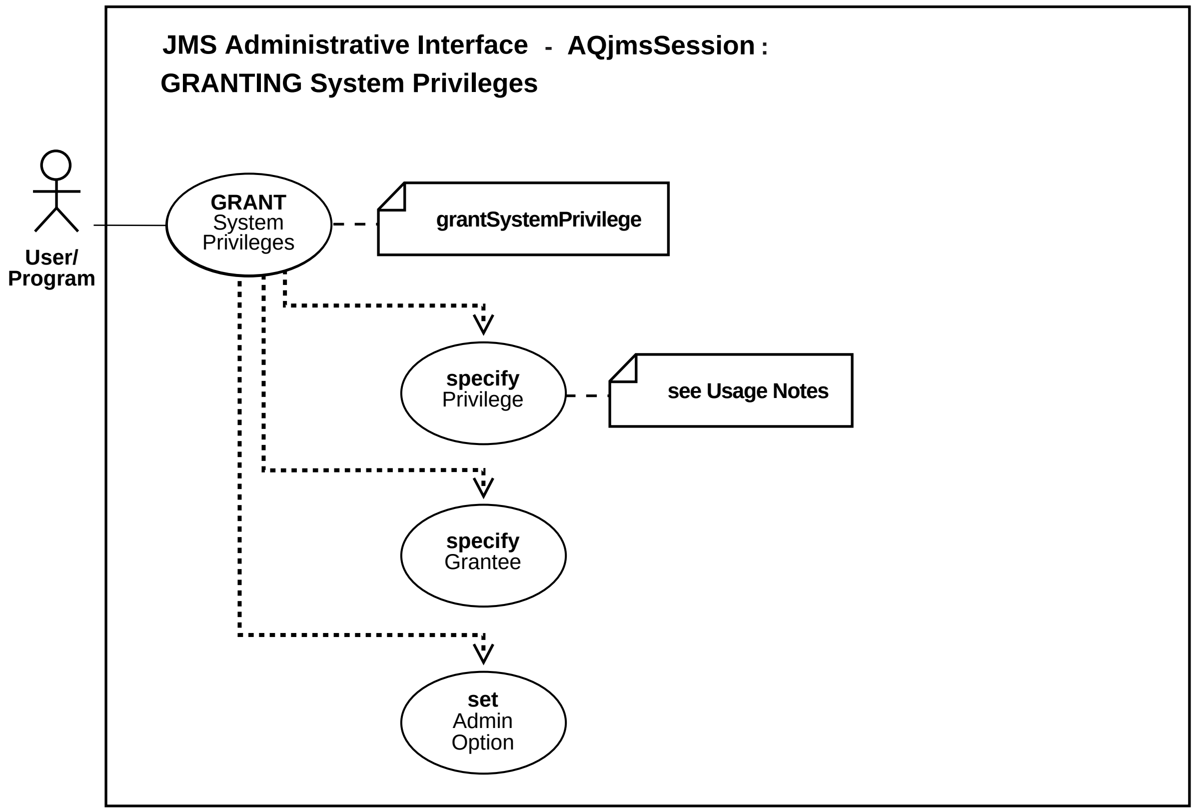
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createTopic

Example

```
TopicSession              t_sess;
AQQueueTable              q_table;
AqjmsDestinationProperty dest_prop;
Topic                     topic;

topic = ((AQjmsSessa)t_sess).createTopic(q_table, "jms_t1", dest_prop);
```

Granting System Privileges

Figure 13–19 Granting System Privileges



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Grant AQ system privileges to a user/roles.

Usage Notes

Initially only SYS and SYSTEM can use this procedure successfully.

The privileges are ENQUEUE_ANY, DEQUEUE_ANY and MANAGE_ANY.

Syntax

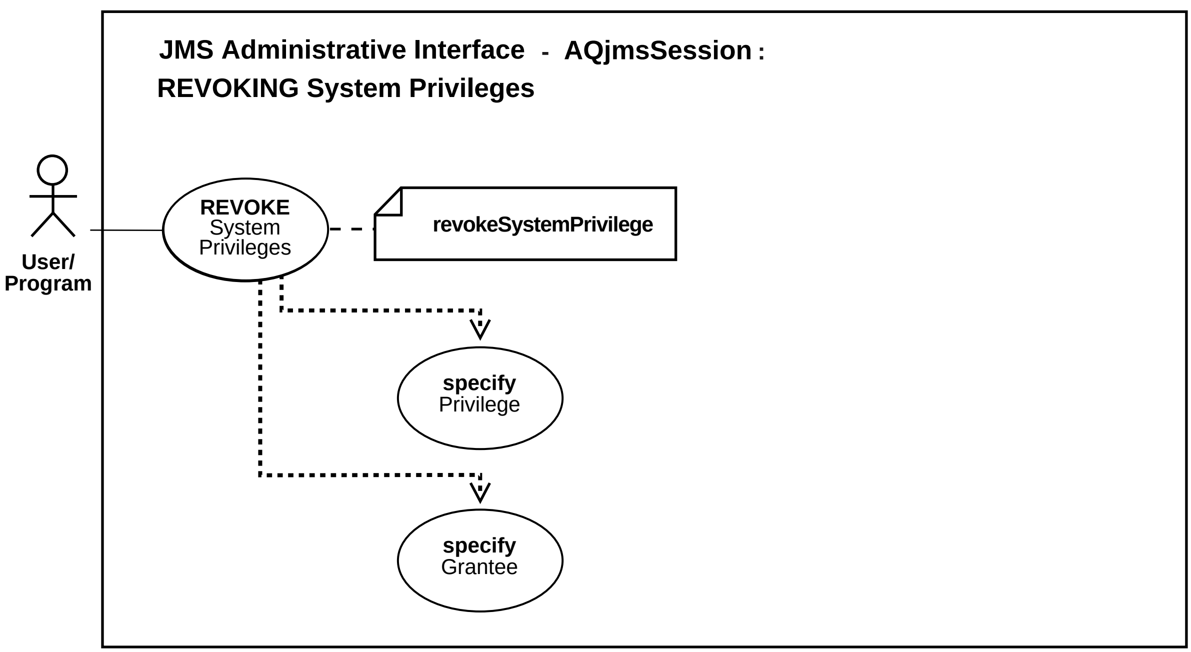
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.grantSystemPrivilege

Example

```
TopicSession                t_sess;

((AQjmsSession)t_sess).grantSystemPrivilege("ENQUEUE_ANY", "scott", false);
```

Revoking System Privileges

Figure 13–20 Revoking System Privileges



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Revoke AQ system privileges from user/roles.

Usage Notes

The privileges are `ENQUEUE_ANY`, `DEQUEUE_ANY`, and `MANAGE_ANY`.

Syntax

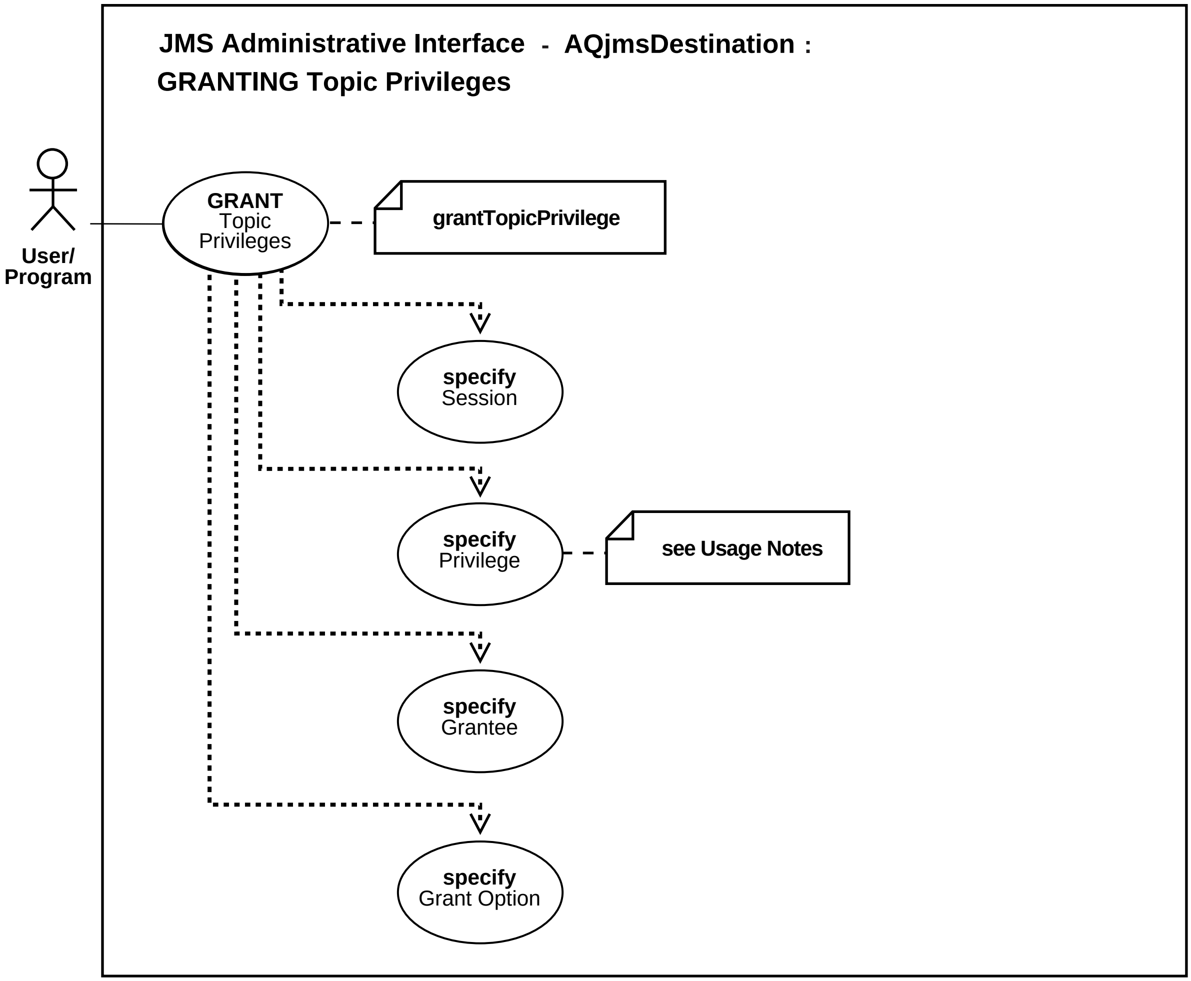
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.revokeSystemPrivilege

Example

```
TopicSession             t_sess;

((AQjmsSession)t_sess).revokeSystemPrivilege("ENQUEUE_ANY", "scott");
```

Granting Topic Privileges—Publish-Subscribe

Figure 13–21 Granting Topic Privileges—Publish-Subscribe



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Grant a topic privilege in the publish-subscribe model.

Usage Notes

The privileges are ENQUEUE, DEQUEUE and ALL. ALL means both. Initially only the queue table owner can use this procedure to grant privileges on the topic.

Syntax

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.grantTopicPrivilege

Example

```
TopicSession              t_sess;
Topic                     topic;

((AQjmsDestination)topic).grantTopicPrivilege(t_sess, "ENQUEUE", "scott",
false);
```

Revoking Topic Privileges—Publish-Subscribe

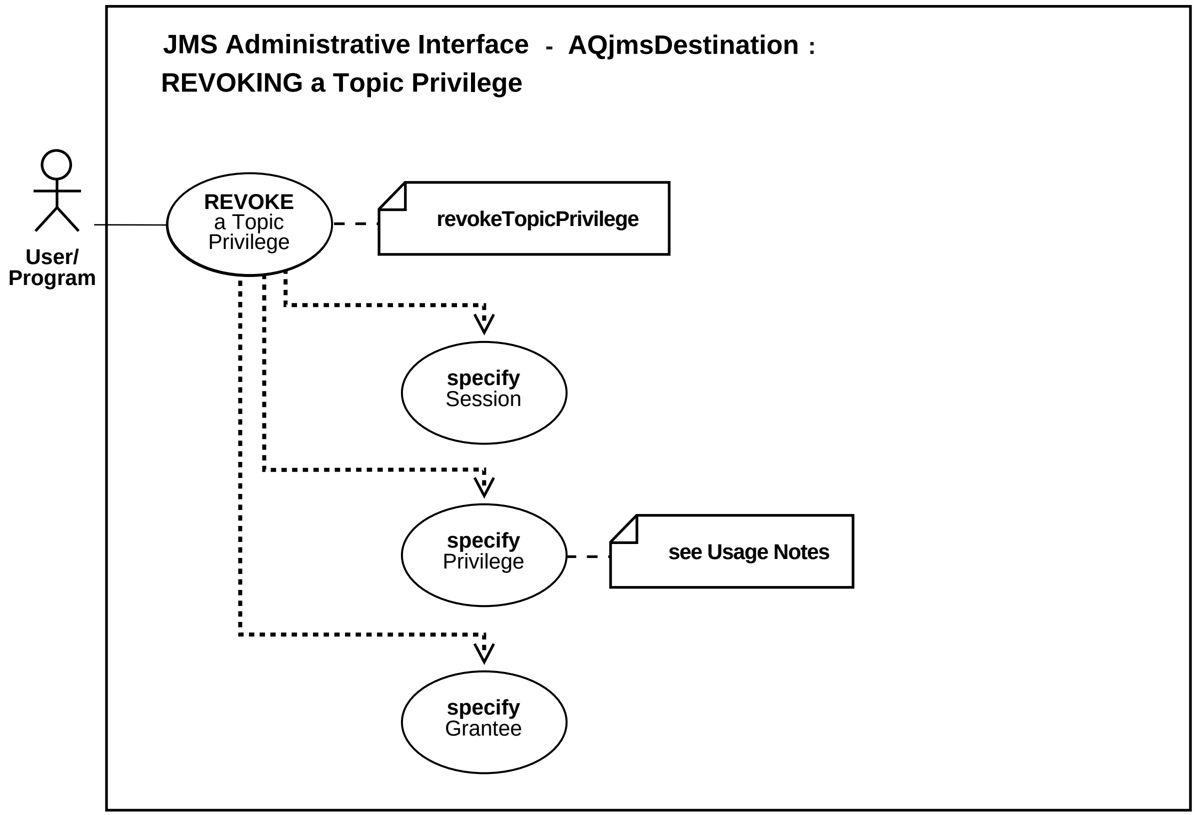


Figure 13–22 Revoking Topic Privileges—Publish-Subscribe

See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Revoke a topic privilege in the publish-subscribe model

Usage Notes

The privileges are `ENQUEUE`, `DEQUEUE`, and `ALL`. `ALL` means both.

Syntax

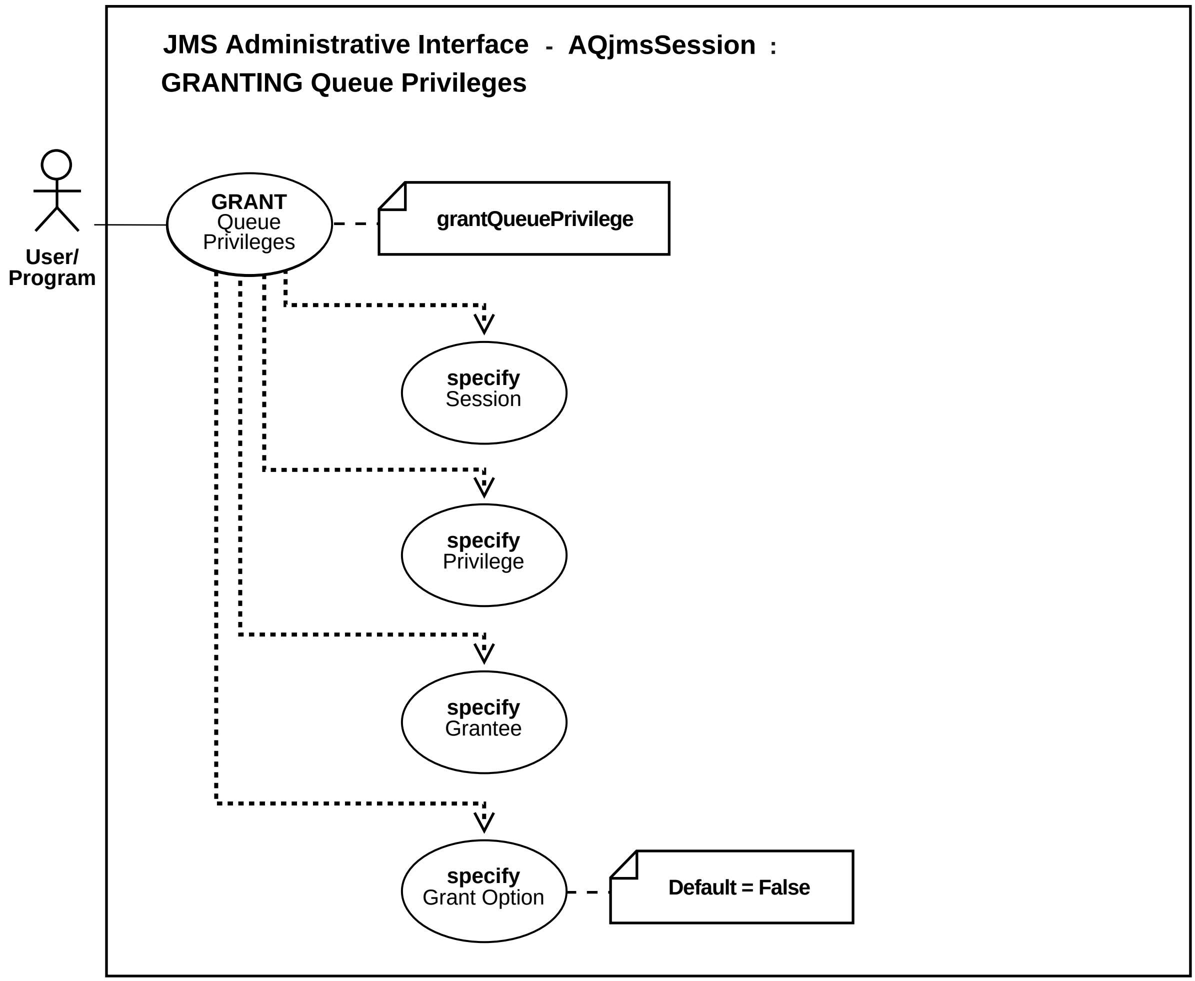
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.revokeTopicPrivilege

Example

```
TopicSession              t_sess;
Topic                     topic;

((AQjmsDestination)topic).revokeTopicPrivilege(t_sess, "ENQUEUE", "scott");
```

Granting Queue Privileges—Point-to-Point

Figure 13–23 Granting Queue Privileges—Point-to-Point



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Grant a queue privilege in the point-to-point model

Usage Notes

The privileges are `ENQUEUE`, `DEQUEUE` and `ALL`. `ALL` means both. Initially only the queue table owner can use this procedure to grant privileges on the queue.

Syntax

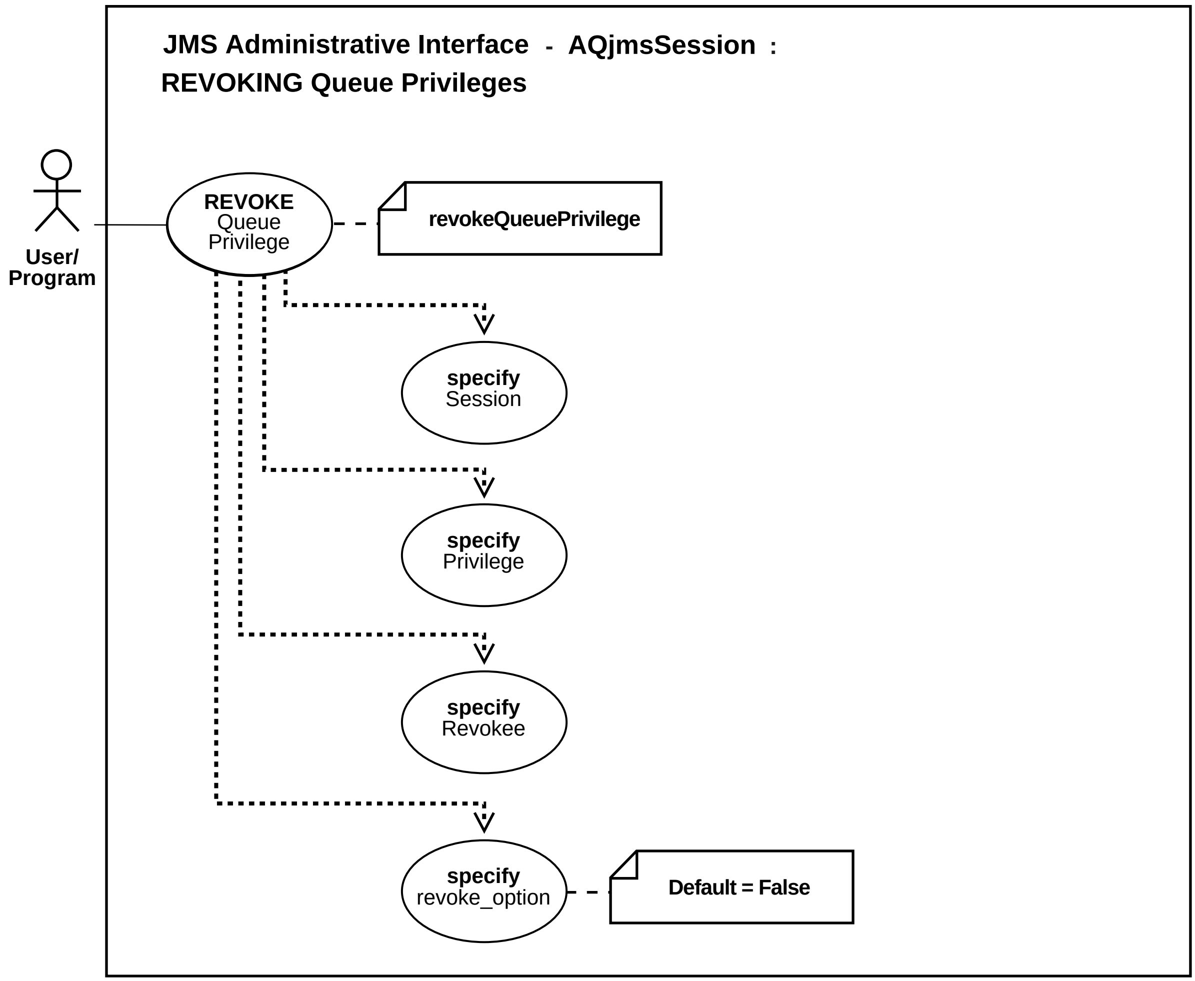
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.grantQueuePrivilege

Example

```
QueueSession              q_sess;
Queue                     queue;

((AQjmsDestination)queue).grantQueuePrivilege(q_sess, "ENQUEUE", "scott",
false);
```

Revoking Queue Privileges—Point-to-Point

Figure 13–24 Revoking Queue Privileges—Point-to-Point



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Revoke queue privilege in the point-to-point model

Usage Notes

The privileges are ENQUEUE, DEQUEUE and ALL. ALL means both. To revoke a privilege, the revoker must be the original grantor of the privilege. The privileges propagated through the GRANT option are revoked if the grantors privilege is also revoked.

Syntax

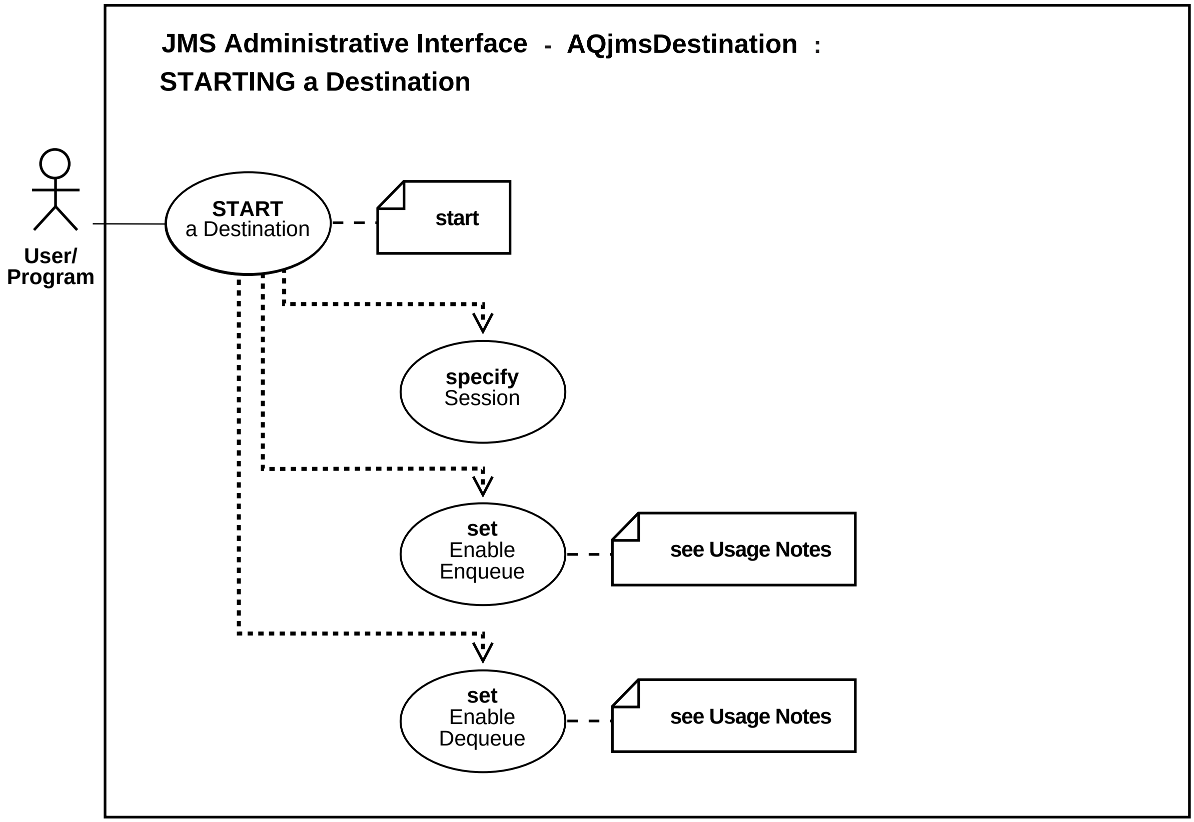
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.revokeQueuePrivilege

Example

```
QueueSession                q_sess;
Queue                       queue;

((AQjmsDestination)queue).revokeQueuePrivilege(q_sess, "ENQUEUE", "scott");
```

Starting a Destination

Figure 13–25 Starting a Destination



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Start a destination.

Usage Notes

After creating a destination, the administrator must use the start method to enable the destination. If Enable Enqueue is set to TRUE, then the destination is enabled for enqueue. If Enable Enqueue is set to FALSE, then the destination is disabled for enqueue. Similarly, if Enable Dequeue is set to TRUE, then the destination is enabled for dequeue. If Enable Dequeue is set to FALSE, the destination is disabled for dequeue.

Syntax

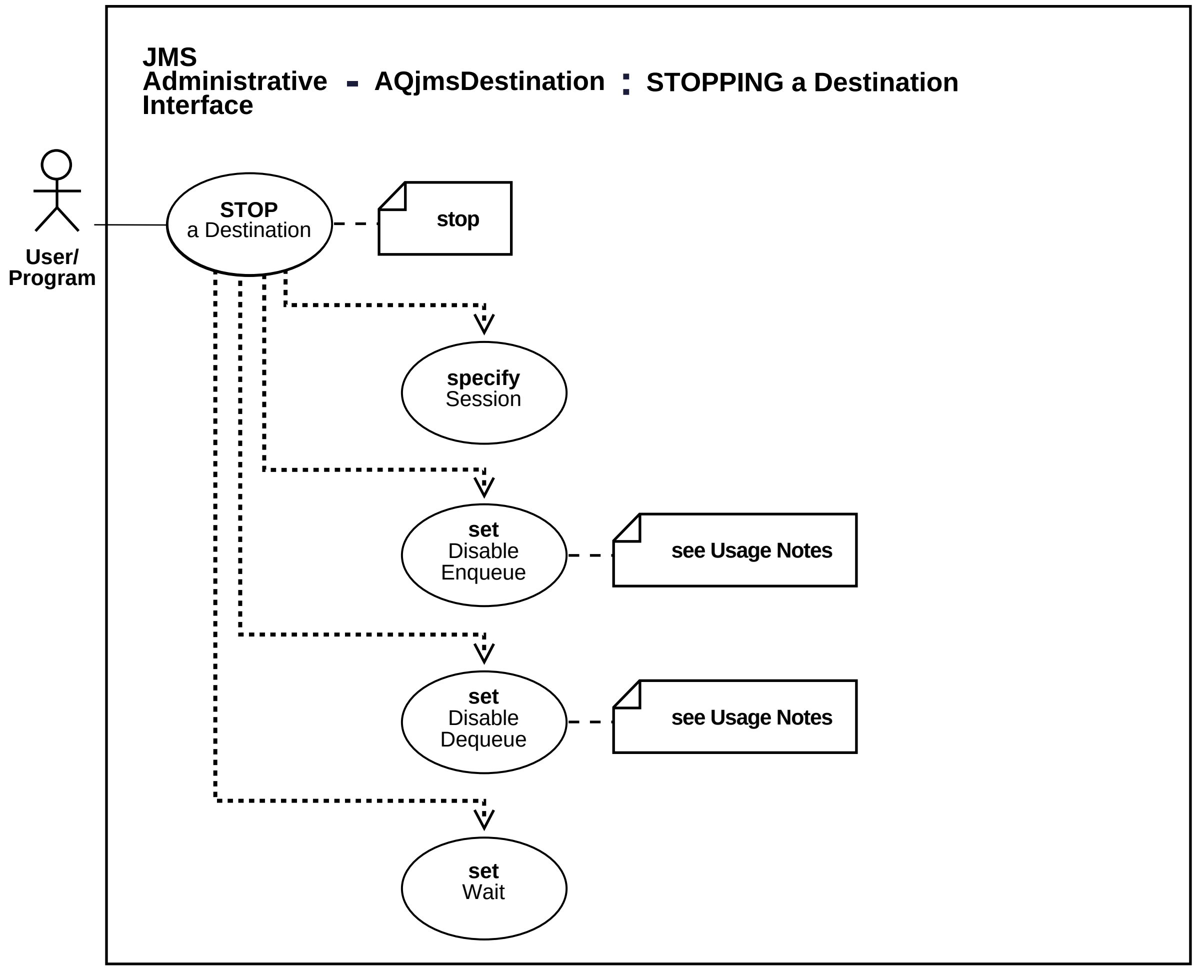
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.start

Example

```
TopicSession t_sess;
QueueSession q_sess;
Topic        topic;
Queue        queue;

(AQjmsDestination)topic.start(t_sess, true, true);
(AQjmsDestination)queue.start(q_sess, true, true);
```

Stopping a Destination

Figure 13–26 Stopping a Destination



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Stop a destination.

Usage Notes

If Disable Dequeue is set to TRUE, then the destination is disabled for dequeue. If Disable dequeue is set to FALSE, then the current setting is not altered. Similarly if Disable Enqueue set to TRUE, then the destination is disabled for enqueue. If Disable Enqueue is set to FALSE, then the current setting is not altered.

Syntax

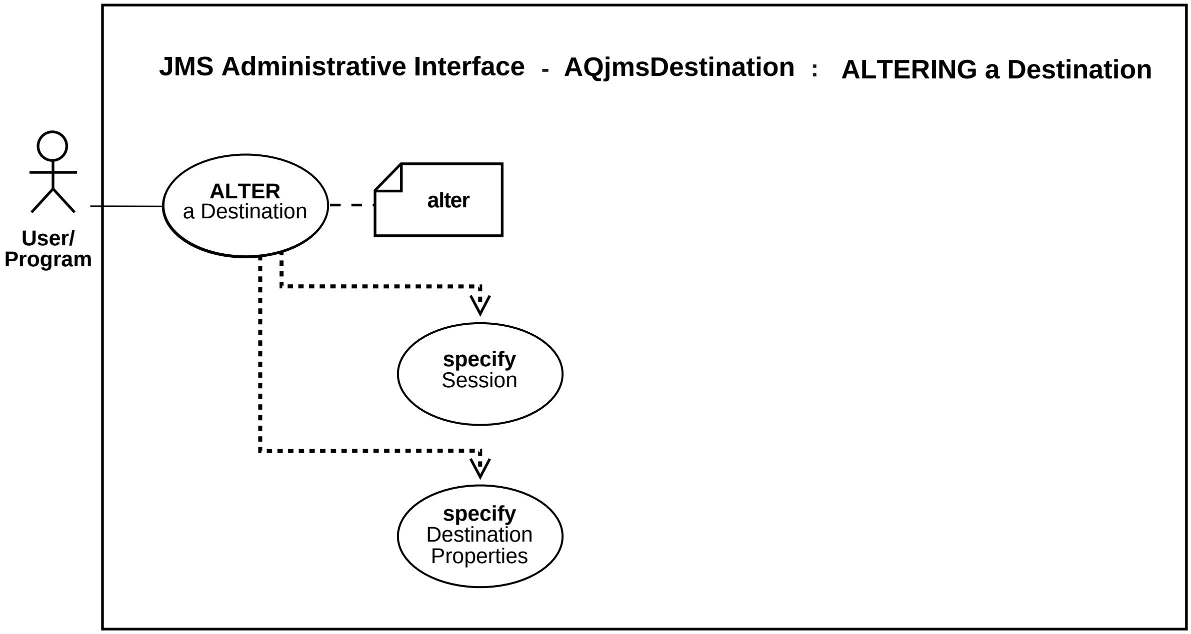
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.stop

Example

```
TopicSession t_sess;
Topic        topic;

((AQjmsDestination)topic).stop(t_sess, true, false);
```

Altering a Destination

Figure 13–27 Altering a Destination



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Alter a destination.

Usage Notes

Not applicable.

Syntax

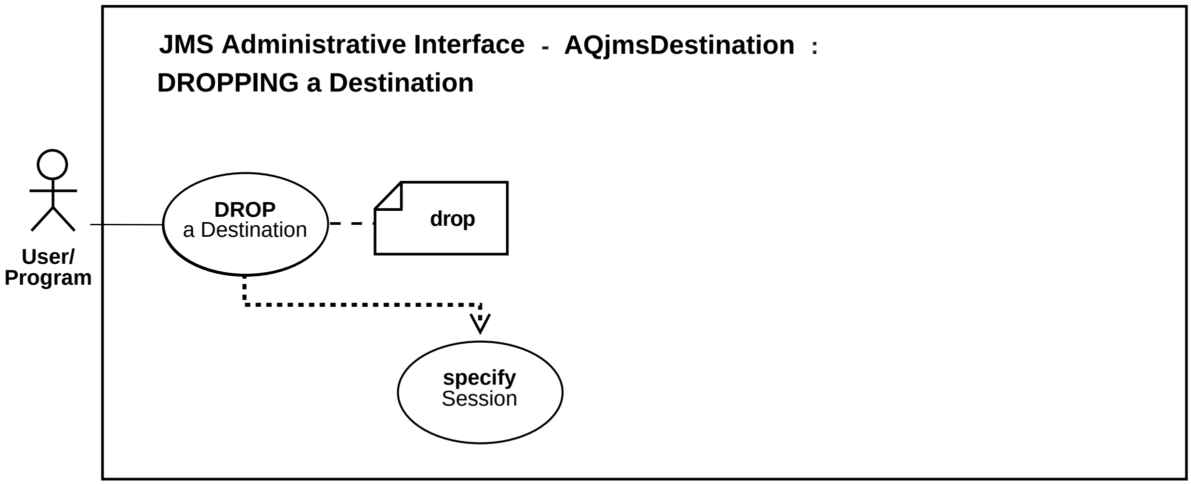
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.alter

Example

```
QueueSession q_sess;
Queue        queue;
TopicSession t_sess;
Topic        topic;

AQjmsDestionationProperty dest_prop1, dest_prop2;

((AQjmsDestination)queue).alter(dest_prop1);
((AQjmsDestination)topic).alter(dest_prop2);
```

Dropping a Destination

Figure 13–28 Dropping a Destination



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Drop a destination.

Usage Notes

Not applicable.

Syntax

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.drop

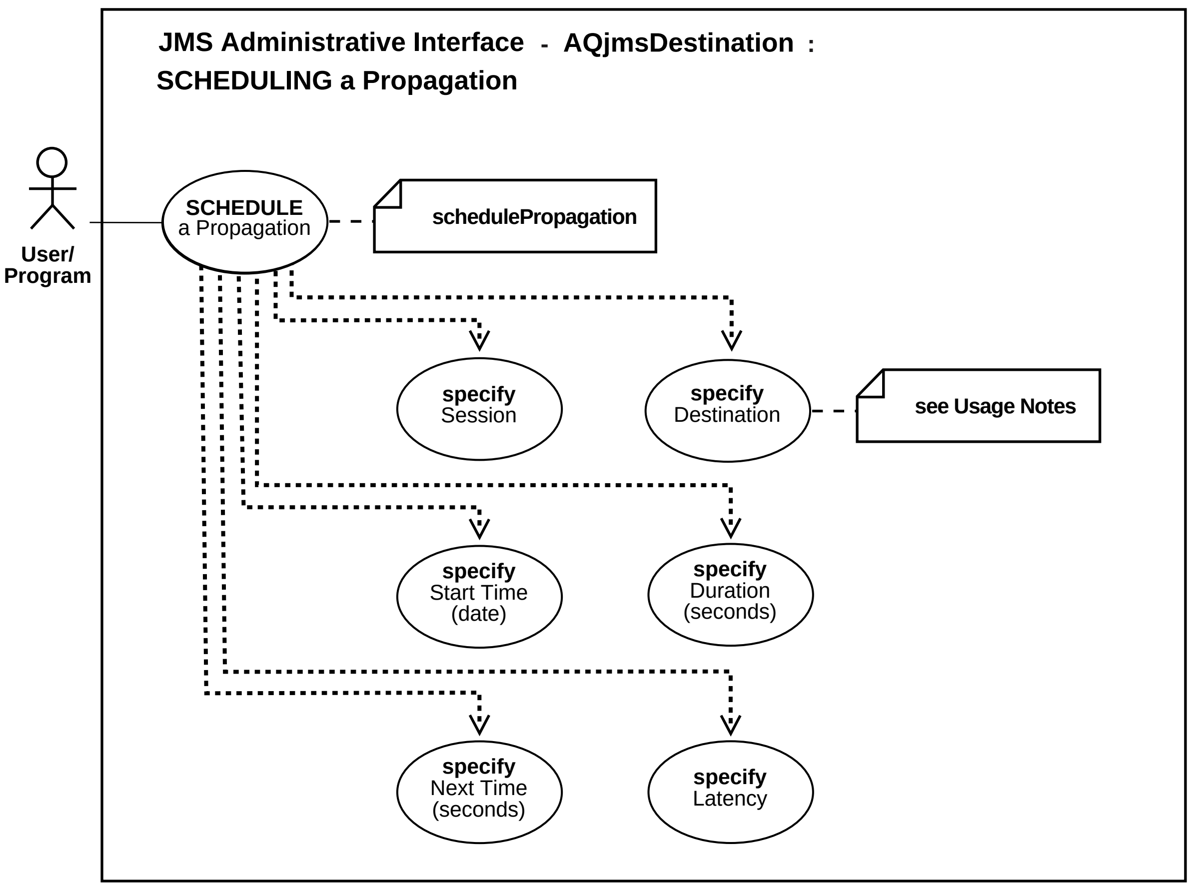
Example

```
QueueSession q_sess;
Queue        queue;
```

```
TopicSession t_sess;
Topic        topic;

((AQjmsDestionation)queue).drop(q_sess);
((AQjmsDestionation)topic).drop(t_sess);
```

Scheduling a Propagation

Figure 13–29 Scheduling a Propagation



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Schedule a Propagation

Usage Notes

Messages can be propagated to other topics in the same database by specifying a NULL destination. If the message has multiple recipients at the same destination in either the same or different queues the message will be propagated to all of them at the same time.

Syntax

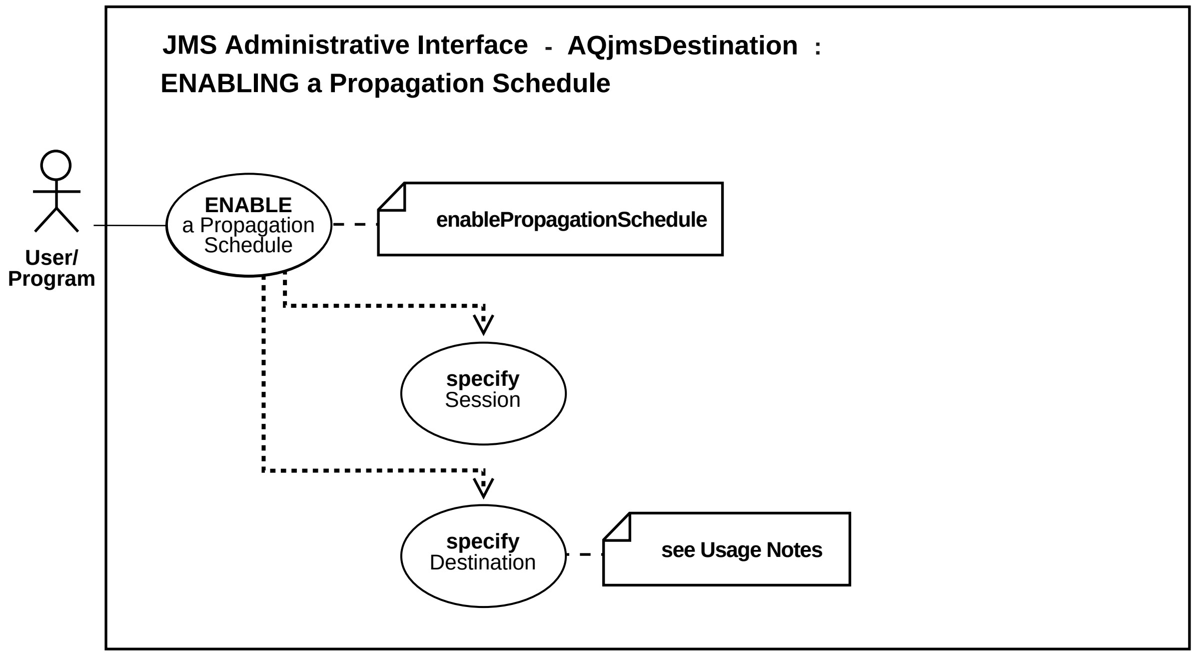
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.schedulePropagation

Example

```
TopicSession t_sess;
Topic        topic;

((AQjmsDestination)topic).schedulePropagation(t_sess, null, null, null, null,
new Double(0));
```

Enabling a Propagation Schedule

Figure 13–30 Enabling a Propagation Schedule



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Enable a Propagation Schedule

Usage Notes

NULL destination indicates that the propagation is to the local database.

Syntax

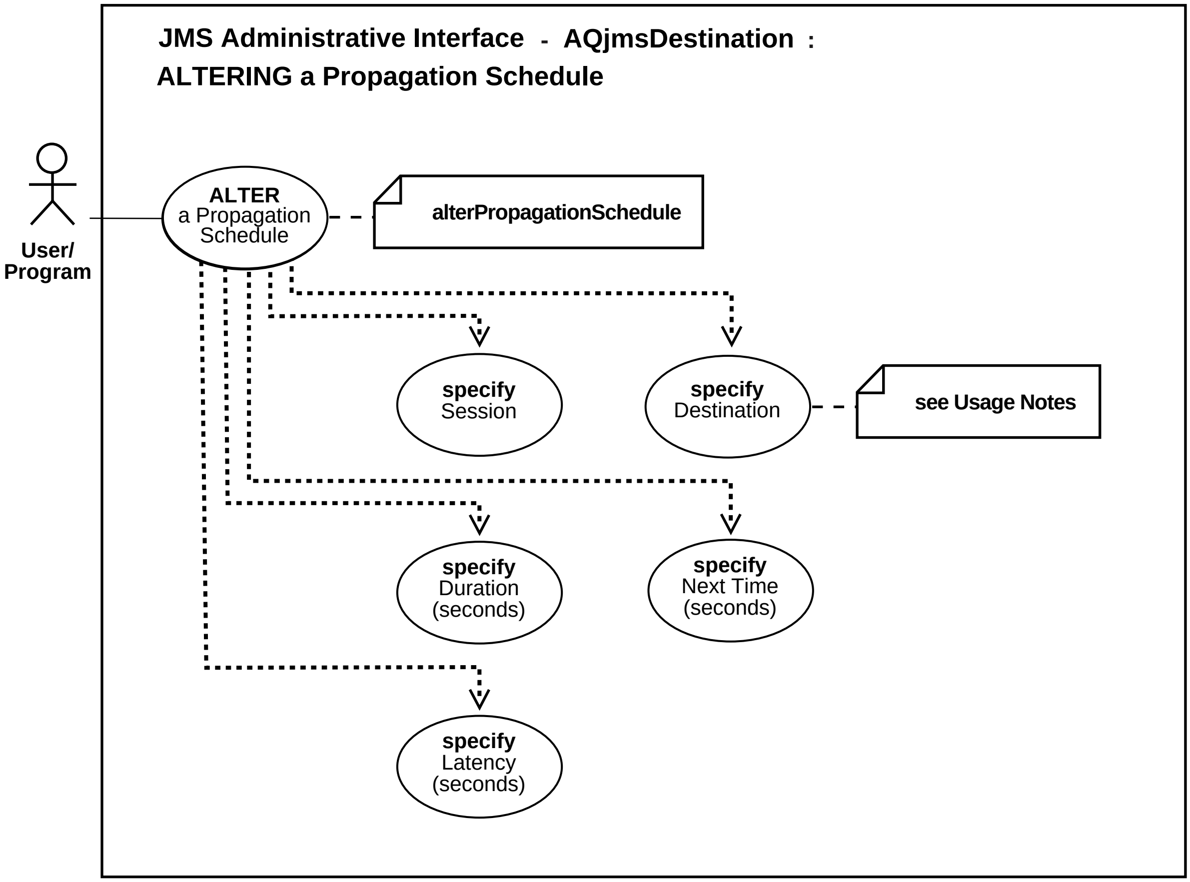
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.enablePropagationSchedule

Example

```
TopicSession             t_sess;
Topic                    topic;

 ((AQjmsDestination)topic).enablePropagationSchedule(t_sess, "dbs1");
```

Altering a Propagation Schedule

Figure 13–31 Altering a Propagation Schedule



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Alter a propagation schedule.

Usage Notes

NULL destination indicates that the propagation is to the local database

Syntax

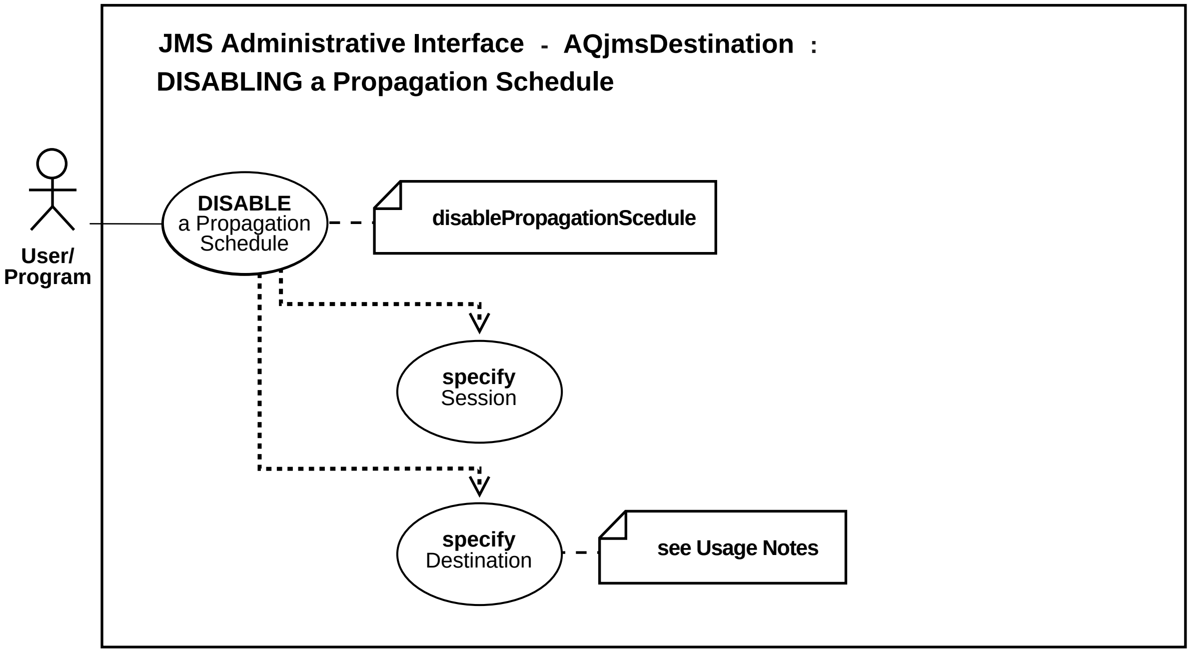
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.alterPropagationSchedule

Example

```
TopicSession              t_sess;
Topic                     topic;

 ((AQjmsDestination)topic).alterPropagationSchedule(t_sess, null, 30, null, new
Double(30));
```

Disabling a Propagation Schedule

Figure 13–32 Disabling a Propagation Schedule



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Disable a propagation schedule.

Usage Notes

`NULL` destination indicates that the propagation is to the local database

Syntax

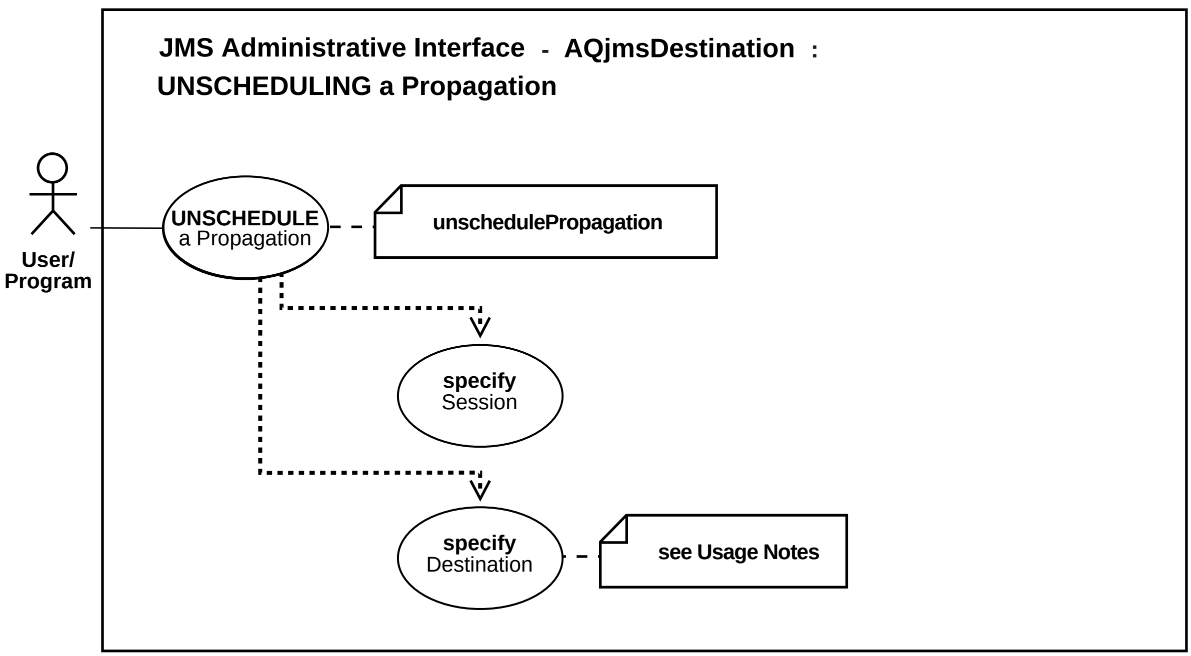
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.disablePropagationSchedule

Example

```
TopicSession             t_sess;
Topic                    topic;

 ((AQjmsDestination)topic).disablePropagationSchedule(t_sess, "dbs1");
```

Unscheduling a Propagation

Figure 13–33 Unscheduling a Propagation



See Also:

- Table 13–1 for a list of JMS administrative interface basic operations
- "Class - oracle.jms.AQjmsDestination" on page B-47

Purpose

Unschedule a propagation.

Usage Notes

Unschedule a previously scheduled propagation.

Syntax

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsDestination.unschedulePropagation

Example

```
TopicSession   t_sess;
Topic          topic;

((AQjmsDestination)topic).unschedulePropagation(t_sess, "dbs1");
```

14

JMS Operational Interface: Basic Operations (Point-to-Point)

In this chapter we describe the operational interface to Oracle Advanced Queuing in terms of use cases. That is, we discuss each operation (such as "Creating a Queue Sender") as a use case by that name. The table listing all the use cases is provided at the head of the chapter (see "Use Case Model: Operational Interface — Basic Operations" on page 14-2).

A summary figure, "Use Case Diagram: Operational Interface — Basic Operations", locates all the use cases in a single drawing. If you are using the HTML version of this document, you can use this figure to navigate to the use case that interests you by clicking on the relevant use case title.

Each use case is laid out as follows:

- ***Use case figure***. A figure that depicts the use case.
- ***Purpose***. The purpose of this use case.
- ***Usage Notes.*** Guidelines to assist implementation.
- ***Syntax***. The main syntax used to perform this activity.
- ***Examples***. Examples in each programmatic environment that illustrate the use case.

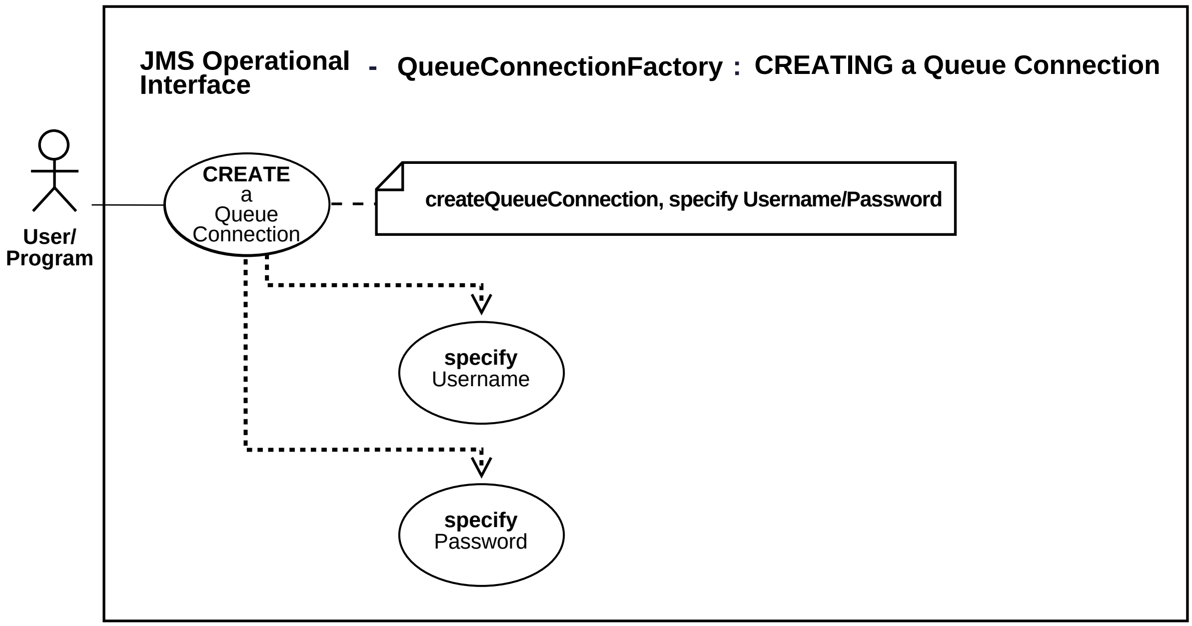
Use Case Model: Operational Interface — Basic Operations

Table 14–1 Use Case Model: Operational Interface — Basic Operations

Use Case
Creating a Queue Connection with Username/Password on page 14-3
Creating a Queue Connection with an Open JDBC Connection on page 14-4
Creating a Queue Connection with Default Connection Factory Parameters on page 14-6
Creating a Queue Connection with an Open OracleOCIConnection Pool on page 14-7
Creating a Queue Session on page 14-9
Creating a Queue Sender on page 14-10
Sending a Message Using a Queue Sender with Default Send Options on page 14-11
Sending Messages Using a Queue Sender by Specifying Send Options on page 14-13
Creating a Queue Browser for Queues with Text, Stream, Objects, Bytes or Map Messages on page 14-15
Creating a Queue Browser for Queues with Text, Stream, Objects, Bytes, Map Messages, Locking Messages on page 14-17
Creating a Queue Browser for Queues of Oracle Object Type (ADT) Messages on page 14-19
Creating a Queue Browser for Queues of Oracle Object Type (ADT) Messages, Locking Messages While Browsing on page 14-21
Browsing Messages Using a Queue Browser on page 14-23
Creating a Queue Receiver for Queues of Standard JMS Type Messages on page 14-25
Creating a Queue Receiver for Queues of Oracle Object Type (ADT) Messages on page 14-27
Creating a Queue Connection with an Open OracleOCIConnection Pool on page 14-29

Creating a Queue Connection with Username/Password

Figure 14–1 Creating a Queue Connection with Username/Password



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Interface - javax.jms.QueueConnectionFactory" on page B-32
- "Creating a Queue Connection with an Open JDBC Connection" on page 14-4
- "Creating a Queue Connection with Default Connection Factory Parameters" on page 14-6
- "Creating a Queue Connection with an Open OracleOCIConnection Pool" on page 14-7

Purpose

Create a queue connection with username/password.

Usage Notes

Not applicable.

Syntax

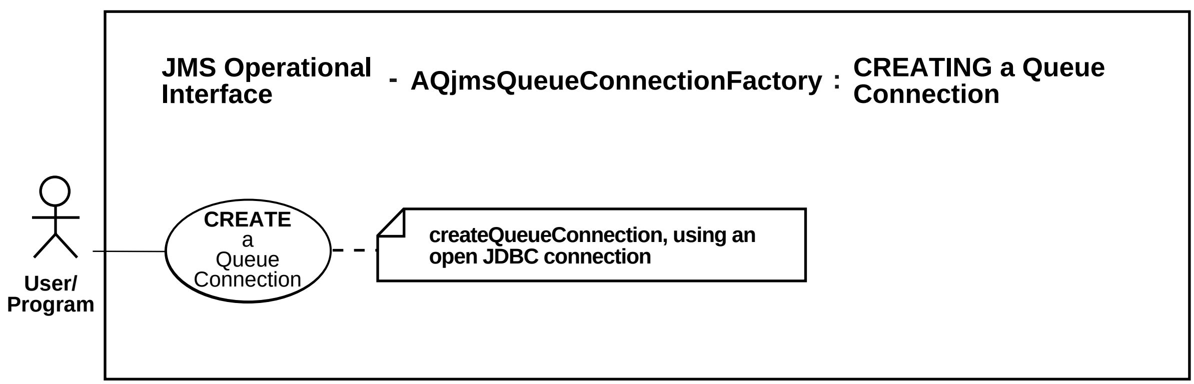
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsQueueConnectionFactory.createQueueConnection

Example

```
QueueConnectionFactory qc_fact =
AQjmsFactory.getQueueConnectionFactory("sun123", "oratest", 5521, "thin");
/* Create a queue connection using a username/password */
QueueConnection qc_conn = qc_fact.createQueueConnection("jmsuser", "jmsuser");
```

Creating a Queue Connection with an Open JDBC Connection

Figure 14–2 Creating a Queue Connection with an Open JDBC Connection



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Class - oracle.jms.AQjmsQueueConnectionFactory" on page B-52
- "Creating a Queue Connection with Username/Password" on page 14-3
- "Creating a Queue Connection with Default Connection Factory Parameters" on page 14-6
- "Creating a Queue Connection with an Open OracleOCIConnection Pool" on page 14-7

Purpose

Create a queue connection with an open JDBC connection.

Usage Notes

This is a static method.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsQueueConnectionFactory.createQueueConnection

Example 1

This method may be used if the user wants to use an existing JDBC connection (say from a connection pool) for JMS operations. In this case JMS will not open a new connection, but instead use the supplied JDBC connection to create the JMS QueueConnection object.

```
Connection db_conn;     /* previously opened JDBC connection */
 QueueConnection qc_conn = AQjmsQueueConnectionFactory.createQueueConnection(db_
conn);
```

Example 2

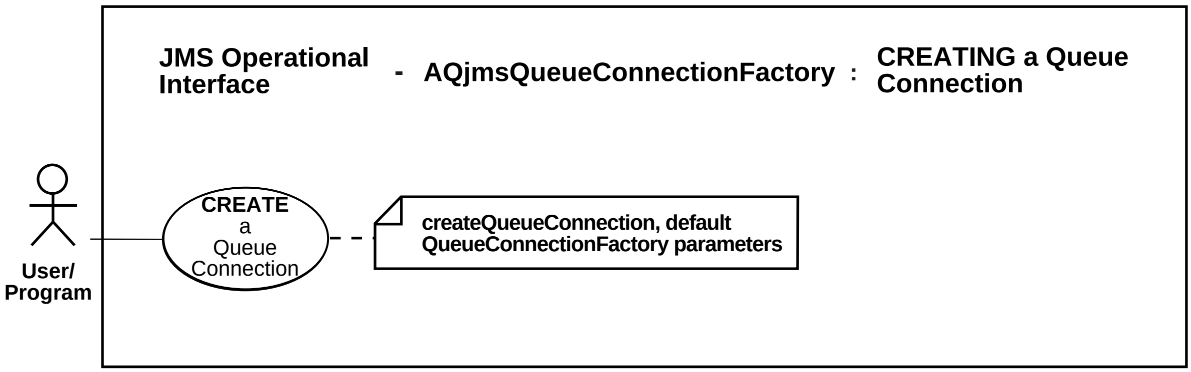
This method is the only way to create a JMS QueueConnection when using JMS from java stored procedures inside the database (JDBC Server driver)

```
OracleDriver ora = new OracleDriver();
QueueConnection qc_conn =
```

```
AQjmsQueueConnectionFactory.createQueueConnection(ora.defaultConnection());
```

Creating a Queue Connection with Default Connection Factory Parameters

Figure 14–3 Creating a Connection with Default Connection Factory Parameters



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Class - oracle.jms.AQjmsQueueConnectionFactory" on page B-52
- "Creating a Queue Connection with Username/Password" on page 14-3
- "Creating a Queue Connection with an Open JDBC Connection" on page 14-4
- "Creating a Queue Connection with an Open OracleOCIConnection Pool" on page 14-7

Purpose

Create a queue connection with default connection factory parameters.

Usage Notes

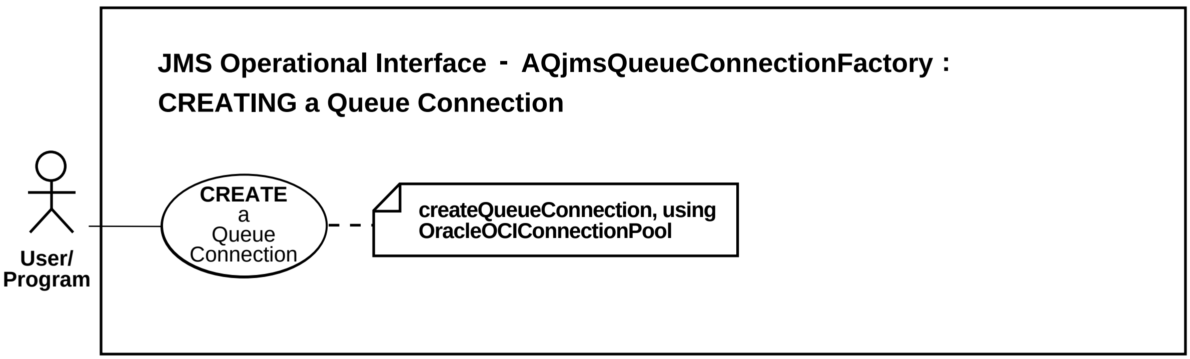
The QueueConnectionFactory properties must contain a default username and password: otherwise, this method will throw a JMSException.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsQueueConnectionFactory.createQueueConnection

Creating a Queue Connection with an Open OracleOCIConnection Pool

Figure 14–4 Creating a Queue Connection with an Open OracleOCIConnectionPool



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Class - oracle.jms.AQjmsQueueConnectionFactory" on page B-52
- "Creating a Queue Connection with Username/Password" on page 14-3
- "Creating a Queue Connection with an Open JDBC Connection" on page 14-4
- "Creating a Queue Connection with Default Connection Factory Parameters" on page 14-6

Purpose

Create a queue connection with an open OracleOCIConnectionPool.

Usage notes

This is a static method.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsQueueConnectionFactory.createQueueConnection

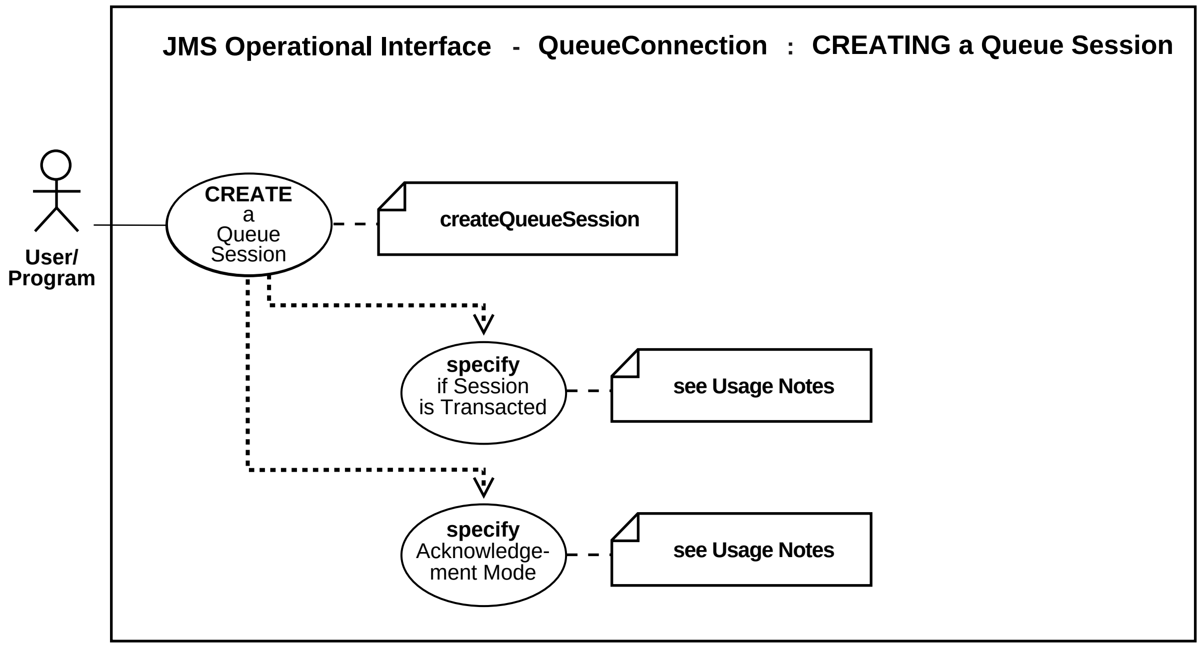
Example

This method may be used if the user wants to use an existing `OracleOCIConnectionPool` instance for JMS operations. In this case JMS will not open an new `OracleOCIConnectionPool` instance, but instead use the supplied `OracleOCIConnectionPool` instance to create the JMS QueueConnection object.

```
OracleOCIConnectionPool cpool; /* previously created OracleOCIConnectionPool */
QueueConnection qc_conn =
AQjmsQueueConnectionFactory.createQueueConnection(cpool);
```

Creating a Queue Session

Figure 14–5 Creating a Queue Session



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Interface - javax.jms.QueueConnection" on page B-32

Purpose

Create a queue session.

Usage Notes

Transacted and nontransacted sessions are supported.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsConnection.createQueueSession

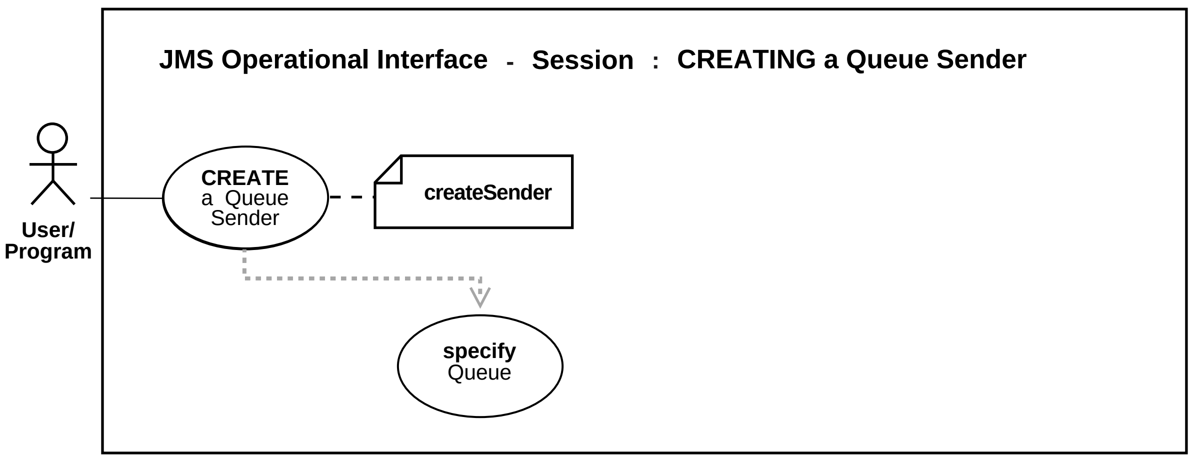
Example

For a transacted session:

```
QueueConnection qc_conn;
QueueSession  q_sess = qc_conn.createQueueSession(true, 0);
```

Creating a Queue Sender

Figure 14–6 Creating a Queue Sender



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Interface - javax.jms.Session" on page B-34

Purpose

Create a queue sender.

Usage Notes

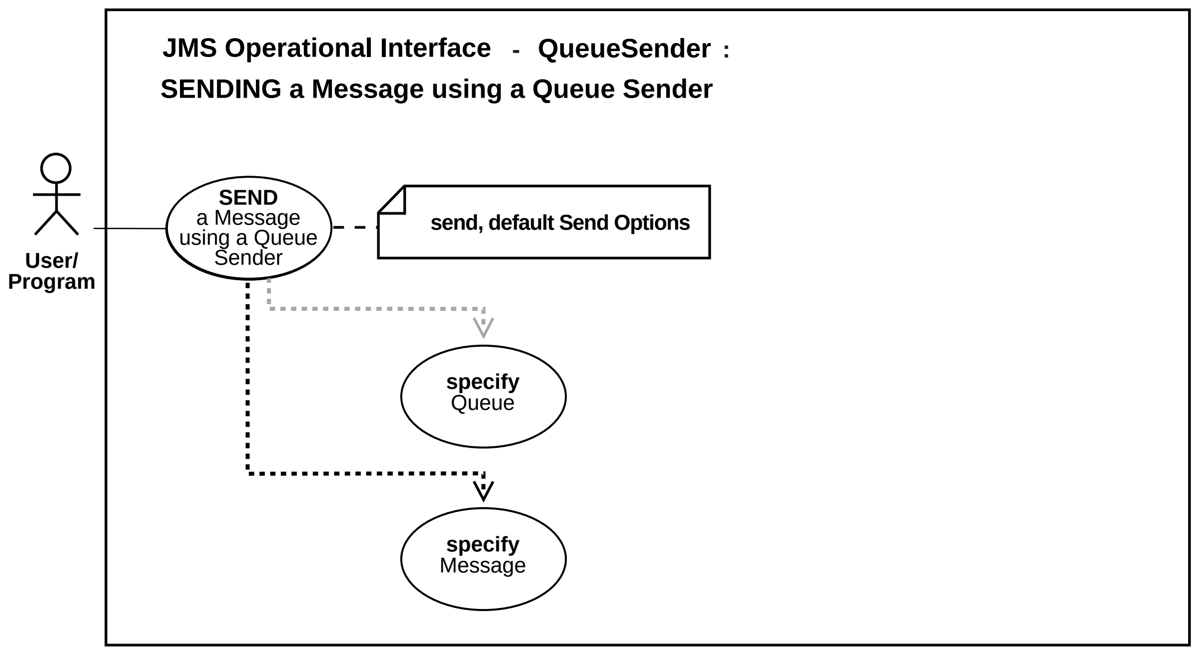
If a sender is created without a default Queue, then the destination Queue will have to be specified on every send operation.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createSender

Sending a Message Using a Queue Sender with Default Send Options

Figure 14–7 Sending a Message Using a Queue Sender with Default Send Options



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Interface - javax.jms.QueueSender" on page B-33

Purpose

Send a message using a queue sender with default send options.

Usage Notes

If the QueueSender has been created with a default queue, then the queue parameter may not necessarily be supplied in the send call. If a queue is specified in the send operation, then this value will override the default queue of the QueueSender.

If the QueueSender has been created without a default queue, then the queue parameter must be specified in every send call.

This send operation uses default values for message priority (1) and timeToLive (infinite).

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsQueueSender.send

Example

Example1

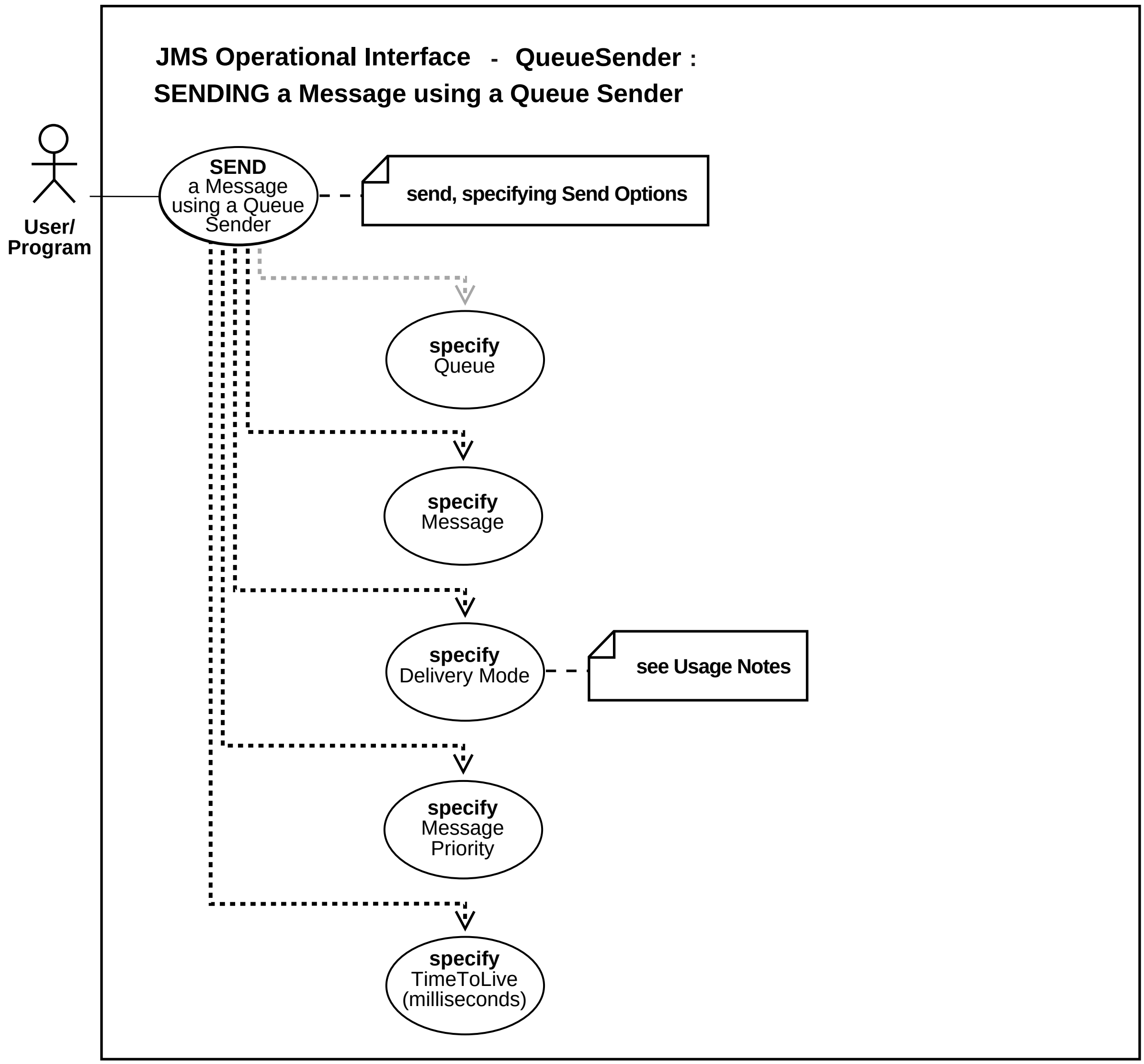
```
/* Create a sender to send messages to any queue */
QueueSession  jms_sess;
QueueSender  sender1;
TextMessage  message;
sender1 = jms_sess.createSender(null);
sender1.send(queue, message);
```

Example2

```
/* Create a sender to send messages to a specific queue */
QueueSession jms_sess;
QueueSender sender2;
Queue   billed_orders_que;
TextMessage  message;
sender2 = jms_sess.createSender(billed_orders_que);
sender2.send(queue, message);
```

Sending Messages Using a Queue Sender by Specifying Send Options

Figure 14–8 Sending Messages Using a Queue Sender by Specifying Send Options



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Interface - javax.jms.QueueSender" on page B-33

Purpose

Send messages using a queue sender by specifying send options.

Usage Notes

If the QueueSender has been created with a default queue, then the queue parameter may not necessarily be supplied in the send call. If a queue is specified in the send operation, then this value will override the default queue of the QueueSender.

If the QueueSender has been created without a default queue, then the queue parameter must be specified in every send call.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsQueueSender.send

Example

Example1

```
/* Create a sender to send messages to any queue */
/* Send a message to new_orders_que with priority 2 and timetoLive 100000
   milliseconds */
QueueSession  jms_sess;
QueueSender  sender1;
TextMessage mesg;
Queue   new_orders_que
sender1 = jms_sess.createSender(null);
sender1.send(new_orders_que, mesg, DeliveryMode.PERSISTENT, 2, 100000);
```

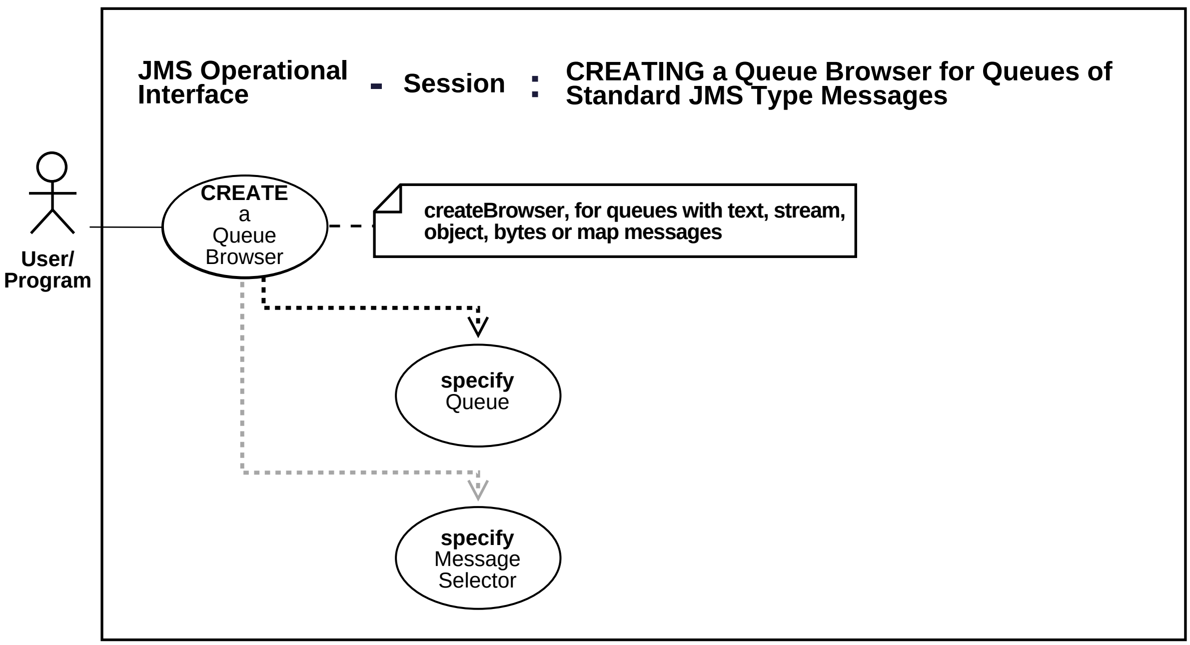
Example2

```
/* Create a sender to send messages to a specific  queue */
/* Send a message with priority 1 and timetoLive 400000 milliseconds */
QueueSession jms_sess;
QueueSender sender2;
```

```
Queue   billed_orders_que;
TextMessage mesg;
sender2 = jms_sess.createSender(billed_orders_que);
sender2.send(mesg, DeliveryMode.PERSISTENT, 1, 400000);
```

Creating a Queue Browser for Queues with Text, Stream, Objects, Bytes or Map Messages

Figure 14–9 Creating a Queue Browser for Queues with Text, Stream, Objects, Bytes or Map Messages



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Interface - javax.jms.Session" on page B-34

Purpose

Create a queue browser for queues with text, stream, objects, bytes or map messages.

Usage Notes

To retrieve messages that match certain criteria, the selector for the QueueBrowser can be any expression that has a combination of one or more of the following:

- `JMSMessageID = 'ID:23452345'` to retrieve messages that have a specified message ID
- JMS Message header fields or properties:

  `JMSPriority < 3 AND JMSCorrelationID = 'Fiction'`

- User defined message properties:

  `color IN ('RED', BLUE', 'GREEN') AND price < 30000`

All message IDs must be prefixed with "ID:"

Use methods in java.util.Enumeration to go through list of messages.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createBrowser

Example

Example1

```
/* Create a browser without a selector */
QueueSession    jms_session;
QueueBrowser    browser;
Queue           queue;

browser = jms_session.createBrowser(queue);
```

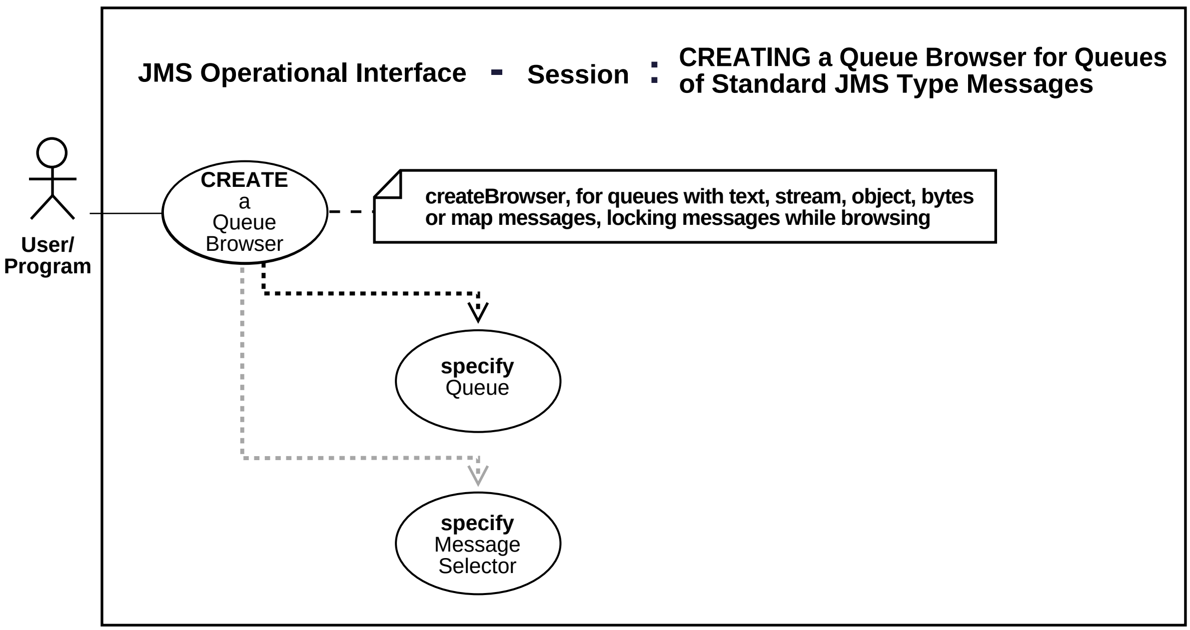
Example2

```
/* Create a browser for queues with a specified selector */
QueueSession    jms_session;
QueueBrowser    browser;
Queue           queue;
```

```
/* create a Browser to look at messages with correlationID = RUSH  */
browser = jms_session.createBrowser(queue, "JMSCorrelationID = 'RUSH'");
```

Creating a Queue Browser for Queues with Text, Stream, Objects, Bytes, Map Messages, Locking Messages

Figure 14–10 Creating a Queue Browser for Queues with Text, Stream, Objects, Bytes or Map Messages, Locking Messages While Browsing



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Interface - javax.jms.Session" on page B-34

Purpose

Create a queue browser for queues with text, stream, objects, bytes or map messages, locking messages while browsing.

Usage Notes

If locked parameter is specified as true, messages are locked as they are browsed. Hence these messages cannot be removed by other consumers until the browsing session ends the transaction

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createBrowser

Example

Example1

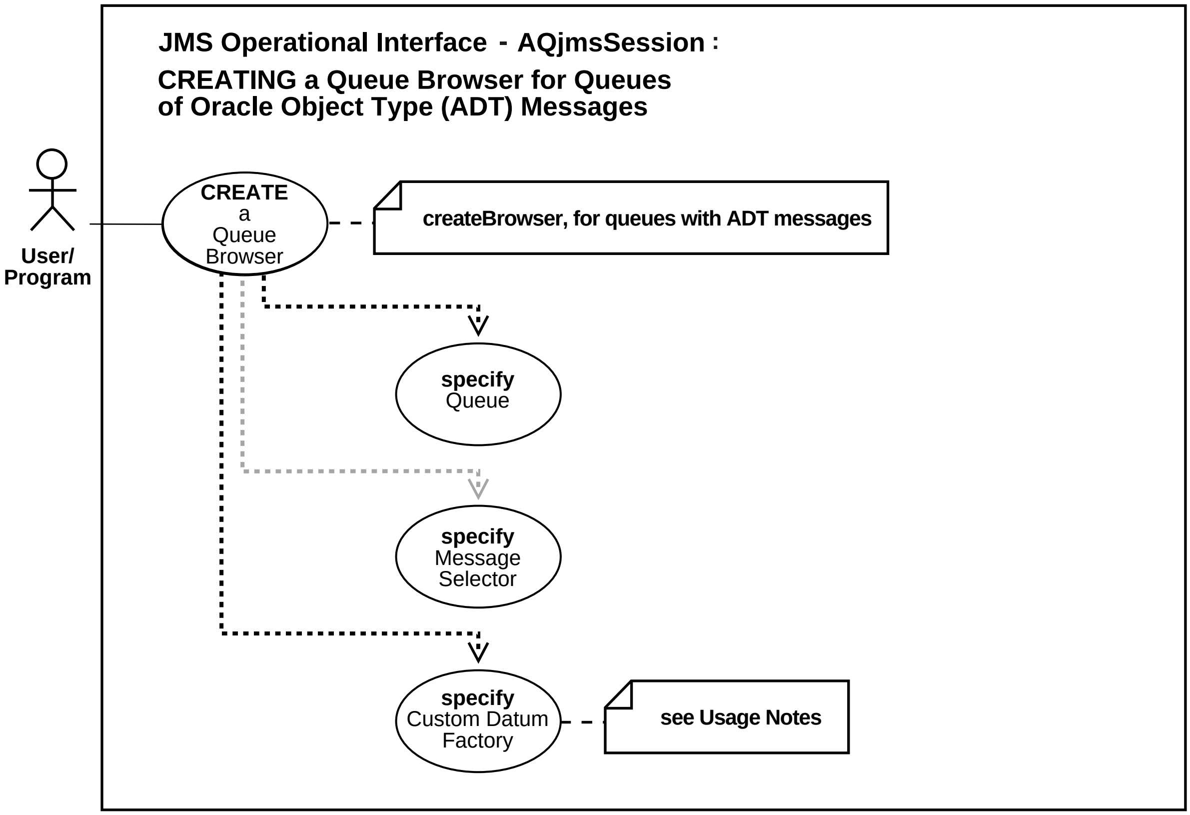
```
/* Create a browser without a selector */
QueueSession    jms_session;
QueueBrowser    browser;
Queue           queue;

browser = jms_session.createBrowser(queue, null, true);
```

Example2

```
/* Create a browser for queues with a specified selector */
QueueSession    jms_session;
QueueBrowser    browser;
Queue           queue;

/* create a Browser to look at messages with
correlationID = RUSH in lock mode */

browser = jms_session.createBrowser(queue, "JMSCorrelationID = 'RUSH'", true);
```

Creating a Queue Browser for Queues of Oracle Object Type (ADT) Messages

Figure 14–11 Creating a Queue Browser for Queues of Oracle Object Type (ADT) Messages



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Create a queue browser for queues of Oracle object type (ADT) messages.

Usage Notes

For queues containing `AdtMessages` the selector for QueueBrowser can be a SQL expression on the message payload contents or messageID or priority or correlationID.

- Selector on message id - to retrieve messages that have a specific messageID

  `msgid` = ’23434556566767676’

  Note: in this case message IDs must NOT be prefixed with ’ID:’

- Selector on priority or correlation is specified as follows

  `priority < 3 AND corrid = ’Fiction’`

- Selector on message payload is specified as follows

  `tab.user_data.color = ’GREEN’ AND tab.user_data.price < 30000`

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createBrowser

Example

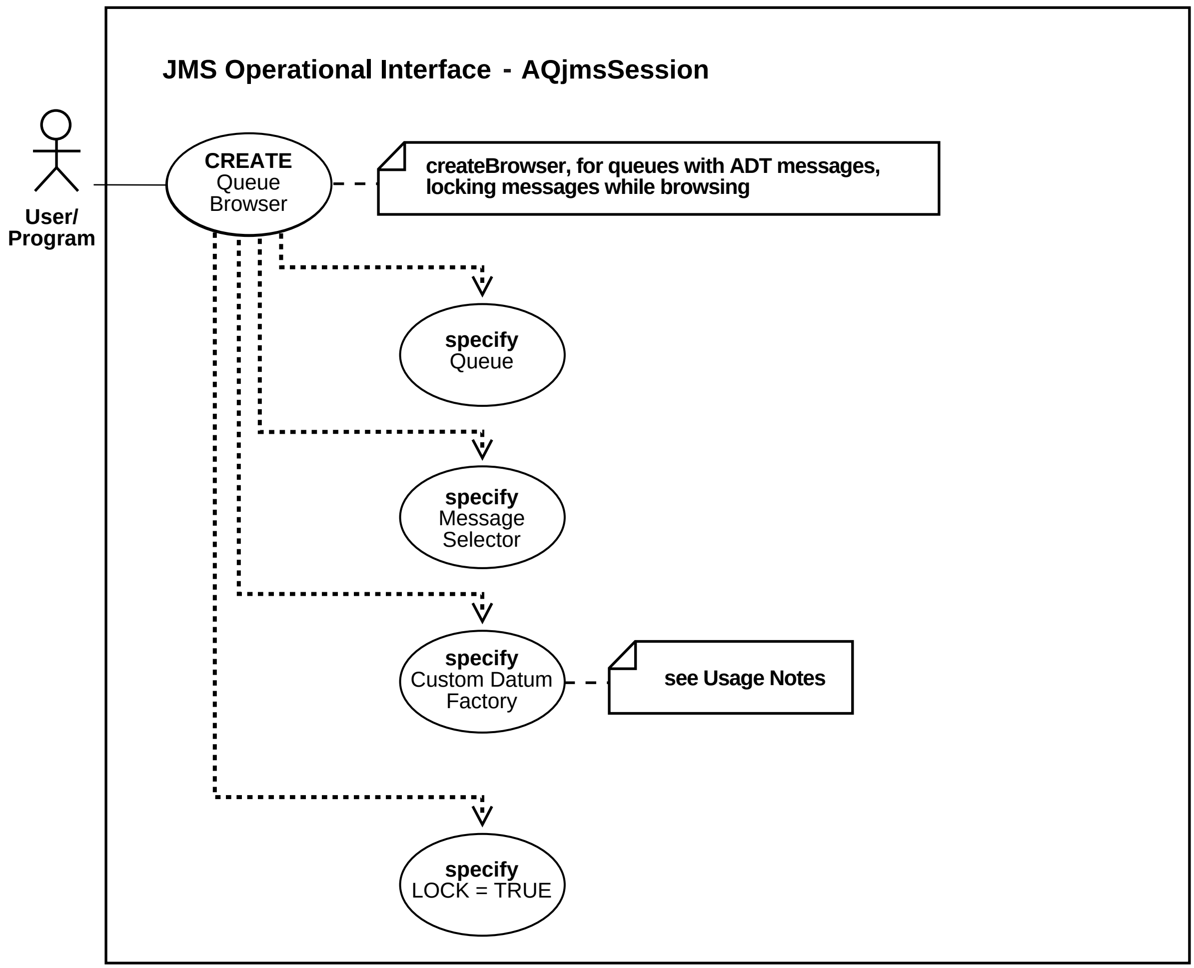
The CustomDatum factory for a particular java class that maps to the SQL ADT payload can be obtained using the `getFactory` static method.

Assume the Queue - test_queue has payload of type `SCOTT.EMPLOYEE` and the java class that is generated by Jpublisher for this ADT is called Employee. The Employee class implements the CustomDatum interface. The CustomDatumFactory for this class can be obtained by using the Employee.getFactory() method.

```
 /* Create a browser for a Queue with Adt messages of type EMPLOYEE*/
QueueSession jms_session
QueueBrowser browser;
Queue        test_queue;

browser = ((AQjmsSession)jms_session).createBrowser(test_queue,
                                       "corrid='EXPRESS'", Employee.getFactory());
```

Creating a Queue Browser for Queues of Oracle Object Type (ADT) Messages, Locking Messages While Browsing

Figure 14–12 Creating a Queue Browser for Queues of Oracle Object Type (ADT) Messages, Locking Messages While Browsing



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Create a queue browser for queues of Oracle object type (ADT) messages, locking messages while browsing.

Usage Notes

Not applicable.

Syntax

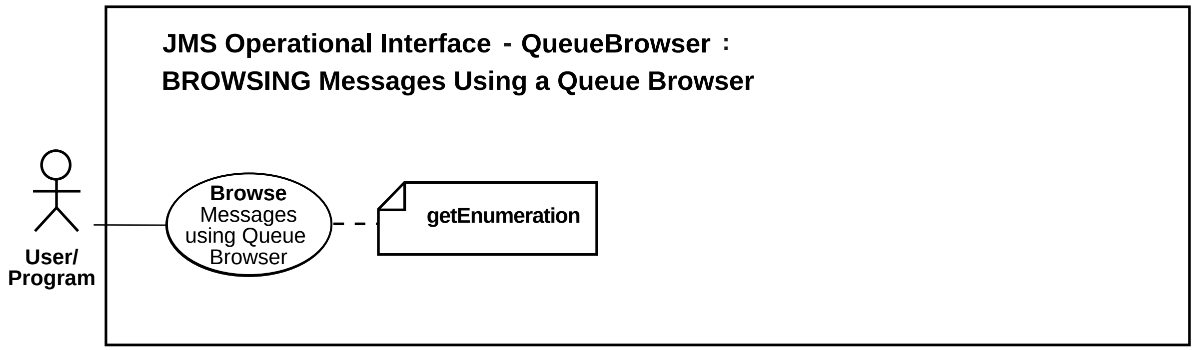
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createBrowser

Example

```
 /* Create a browser for a Queue with Adt messages of type EMPLOYEE* in lock
mode/
QueueSession jms_session
QueueBrowser browser;
Queue        test_queue;

browser = ((AQjmsSession)jms_session).createBrowser(test_queue, null,
Employee.getFactory(), true);
```

Browsing Messages Using a Queue Browser

Figure 14–13 Browsing Messages Using a Queue Browser



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Interface - javax.jms.QueueBrowser" on page B-31

Purpose

Browse messages using a queue browser.

Usage Notes

Use methods in java.util.Enumeration to go through the list of messages.

Syntax

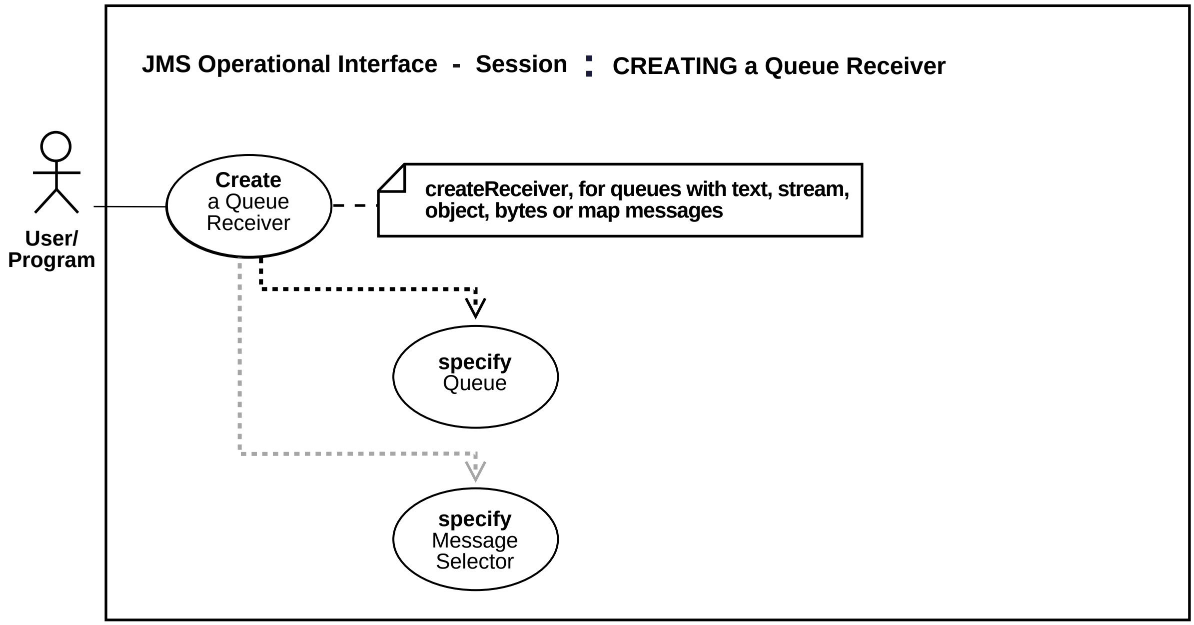
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsQueueBrowser

Example

```
/* Create a browser for queues with a specified selector */
public void browse_rush_orders(QueueSession jms_session)
{
   QueueBrowser    browser;
   Queue           queue;
   ObjectMessage   obj_message
   BolOrder        new_order;
   Enumeration     messages;

   /* get a handle to the new_orders queue */
   queue = ((AQjmsSession) jms_session).getQueue("OE", "OE_neworders_que");

   /* create a Browser to look at RUSH orders */
   browser = jms_session.createBrowser(queue, "JMSCorrelationID = 'RUSH'");

   /* Browse through the messages */
   for (messages = browser.elements() ; message.hasMoreElements() ;)
   {
     obj_message = (ObjectMessage)message.nextElement();
   }
}
```

Creating a Queue Receiver for Queues of Standard JMS Type Messages

Figure 14–14 Creating a Queue Receiver for Queues of Standard JMS Type Messages



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Interface - javax.jms.Session" on page B-34

Purpose

Create a queue receiver for queues of standard JMS type messages.

Usage Notes

The selector for the QueueReceiver can be any expression that has a combination of one or more of the following:

- `JMSMessageID = 'ID:23452345'` to retrieve messages that have a specified message ID

- JMS Message header fields or properties:

  `JMSPriority < 3 AND JMSCorrelationID = 'Fiction'`

- User defined message properties:

  `color IN ('RED', BLUE', 'GREEN') AND price < 30000`

All message IDs must be prefixed with "ID:"

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createReceiver

Example

Example1

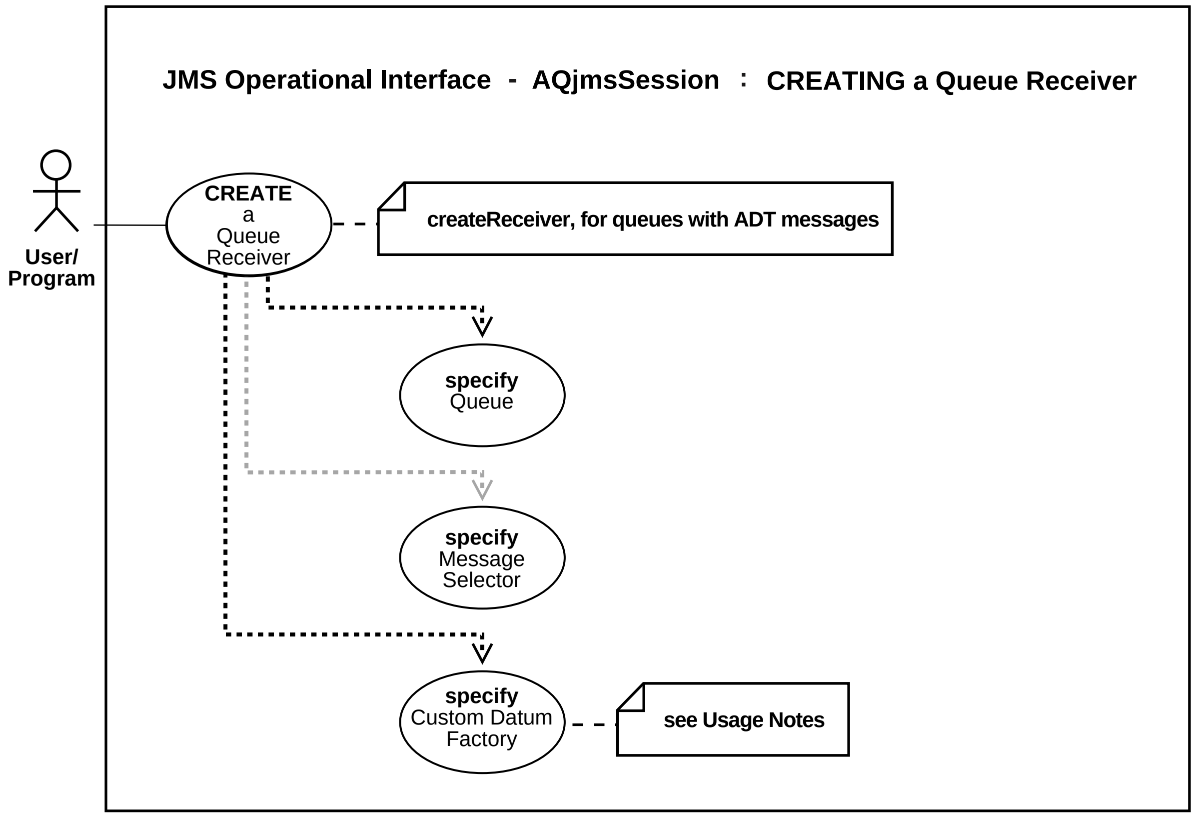
```
/* Create a receiver without a selector */
QueueSession    jms_session
QueueReceiver   receiver;
Queue           queue;

receiver = jms_session.createReceiver(queue);
```

Example2

```
/* Create a receiver for queues with a specified selector */
QueueSession    jms_session;
QueueReceiver   receiver;
Queue           queue;

/* create a Receiver to receive messages with correlationID starting with EXP
*/
browser = jms_session.createReceiver(queue, "JMSCorrelationID LIKE 'EXP%'");
```

Creating a Queue Receiver for Queues of Oracle Object Type (ADT) Messages

Figure 14–15 Creating a Queue Receiver for Queues of Oracle Object Type (ADT) Messages



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Create a queue receiver for queues of Oracle object type (ADT) messages.

Usage Notes

The CustomDatum factory for a particular java class that maps to the SQL ADT payload can be obtained using the `getFactory` static method.

For queues containing `AdtMessages` the selector for QueueReceiver can be a SQL expression on the message payload contents or messageID or priority or correlationID.

- Selector on message id - to retrieve messages that have a specific messageID

  `msgid = '23434556566767676'`

  Note: in this case message IDs must NOT be prefixed with 'ID:'

- Selector on priority or correlation is specified as follows

  `priority < 3 AND corrid = 'Fiction'`

- Selector on message payload is specified as follows

  `tab.user_data.color = 'GREEN' AND tab.user_data.price < 30000`

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createReceiver

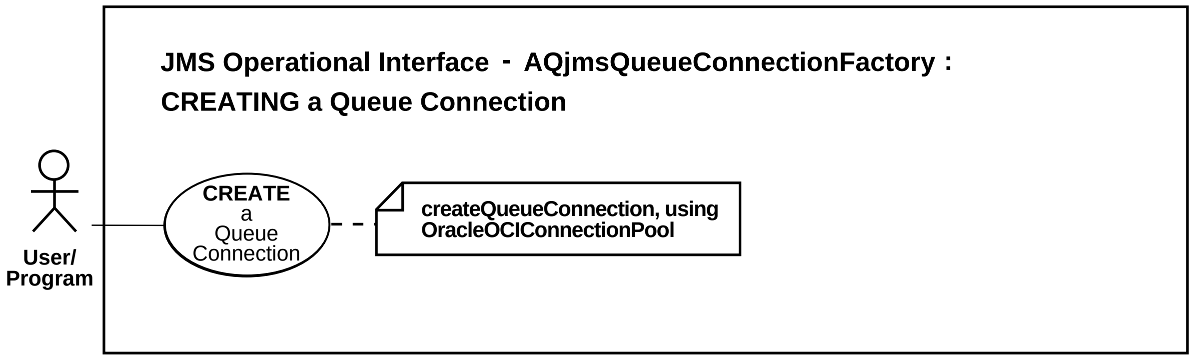
Example

Assume the Queue - test_queue has payload of type SCOTT.EMPLOYEE and the java class that is generated by Jpublisher for this ADT is called Employee. The Employee class implements the CustomDatum interface. The CustomDatumFactory for this class can be obtained by using the Employee.getFactory() method.

```
/* Create a receiver for a Queue with Adt messages of type EMPLOYEE*/
QueueSession jms_session
QueueReceiver receiver;
Queue         test_queue;

browser = ((AQjmsSession)jms_session).createReceiver(test_queue,
"JMSCorrelationID = 'MANAGER', Employee.getFactory());
```

Creating a Queue Connection with an Open OracleOCIConnection Pool

Figure 14–16 Creating a Queue Connection with an Open OracleOCIConnectionPool



See Also:

- Table 14–1 for a list of JMS operational interface basic operations
- "Class - oracle.jms.AQjmsQueueConnectionFactory" on page B-52

Purpose

Create a queue connection with an open OracleOCIConnectionPool.

Usage notes

This is a static method.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsQueueConnectionFactory.createQueueConnection

Example

This method may be used if the user wants to use an existing `OracleOCIConnectionPool` instance for JMS operations. In this case JMS will not open an new `OracleOCIConnectionPool` instance, but instead use the supplied `OracleOCIConnectionPool` instance to create the JMS QueueConnection object.

```
OracleOCIConnectionPool cpool; /* previously created OracleOCIConnectionPool */
QueueConnection qc_conn =
AQjmsQueueConnectionFactory.createQueueConnection(cpool);
Connection db_conn;     /* previously opened JDBC connection */
 QueueConnection qc_conn = AQjmsQueueConnectionFactory.createQueueConnection(db_
conn);
```

15

JMS Operational Interface: Basic Operations (Publish-Subscribe)

In this chapter we describe the operational interface (publish-subscribe) to Oracle Advanced Queuing in terms of use cases. That is, we discuss each operation (such as "Publish a Message") as a use case by that name. The table listing all the use cases is provided at the head of the chapter (see "Use Case Model: Operational Interface — Basic Operations" on page 14-2).

A summary figure, "Use Case Diagram: Operational Interface — Basic Operations", locates all the use cases in single drawing. If you are using the HTML version of this document, you can use this figure to navigate to the use case that interests you by clicking on the relevant use case title.

The individual use cases are themselves laid out as follows:

Each use case is laid out as follows:

- ***Use case figure***. A figure that depicts the use case.
- ***Purpose***. The purpose of this use case.
- ***Usage Notes.*** Guidelines to assist implementation.
- ***Syntax***. The main syntax used to perform this activity.
- ***Examples***. Examples in each programmatic environment that illustrate the use case.

Use Case Model: JMS Operational Interface — Basic Operations (Publish-Subscribe)

Table 15–1 JMS Operational Interface—Basic Operations (Publish-Subscribe)

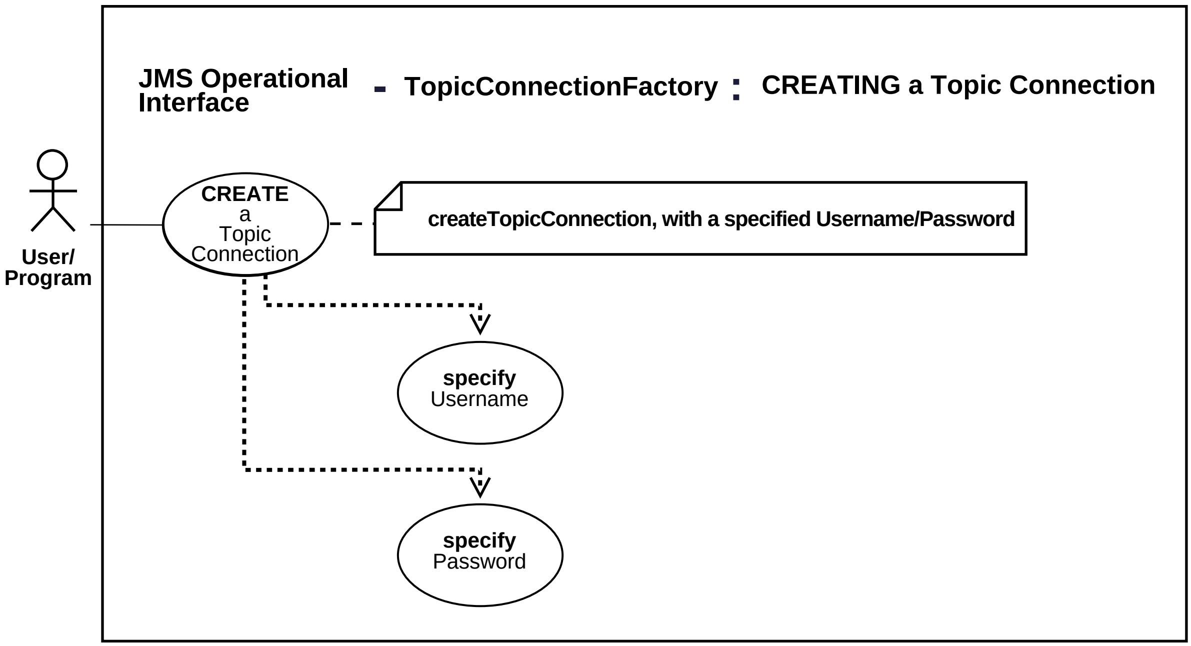
Use Case
Creating a Topic Connection with Username/Password on page 15-4
Creating a Topic Connection with Open JDBC Connection on page 15-5
Creating a Topic Connection with Default Connection Factory Parameters on page 15-7
Creating a Topic Connection with an Open OracleOCIConnectionPool on page 15-8
Creating a Topic Session on page 15-10
Creating a Topic Publisher on page 15-11
Publishing a Message Using a Topic Publisher—with Minimal Specification on page 15-12
Publishing a Message Using a Topic Publisher—Specifying Correlation and Delay on page 15-15
Publishing a Message Using a Topic Publisher—Specifying Priority and Time-To-Live on page 15-18
Publishing a Message Using a Topic Publisher—Specifying a Recipient List Overriding Topic Subscribers on page 15-21
Creating a Durable Subscriber for a JMS Topic without Selector on page 15-24
Creating a Durable Subscriber for a JMS Topic with Selector on page 15-26
Creating a Durable Subscriber for an ADT Topic without Selector on page 15-29
Creating a Durable Subscriber for an ADT Topic with Selector on page 15-31
Creating a Remote Subscriber for Topics of JMS Messages on page 15-34
Creating a Remote Subscriber for Topics of Oracle Object Type (ADT) Messages on page 15-37
Unsubscribing a Durable Subscription for a Local Subscriber on page 15-40
Unsubscribing a Durable Subscription for a Remote Subscriber on page 15-42
Creating a Topic Receiver for a Topic of Standard JMS Type Messages on page 15-44
Creating a Topic Receiver for a Topic of Oracle Object Type (ADT) Messages on page 15-46
Creating a Topic Browser for Topics with Text, Stream, Objects, Bytes or Map Messages on page 15-48
Creating a Topic Browser for Topics with Text, Stream, Objects, Bytes, Map Messages, Locking Messages While Browsing on page 15-50

Table 15–1 (Cont.) JMS Operational Interface—Basic Operations (Publish-Subscribe)

Use Case
Creating a Topic Browser for Topics of Oracle Object Type (ADT) Messages on page 15-52
Creating a Topic Browser for Topics of Oracle Object Type (ADT) Messages, Locking Messages While Browsing on page 15-55
Browsing Messages Using a Topic Browser on page 15-57

Creating a Topic Connection with Username/Password

Figure 15–1 Publish-Subscribe—Creating a Topic Connection with Username/Password



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.TopicConnectionFactory" on page B-38
- "Creating a Topic Connection with Open JDBC Connection" on page 15-5
- "Creating a Topic Connection with Default Connection Factory Parameters" on page 15-7
- "Creating a Topic Connection with an Open OracleOCIConnectionPool" on page 15-8

Purpose

Create a topic connection with username/password

Usage Notes

Not applicable.

Syntax

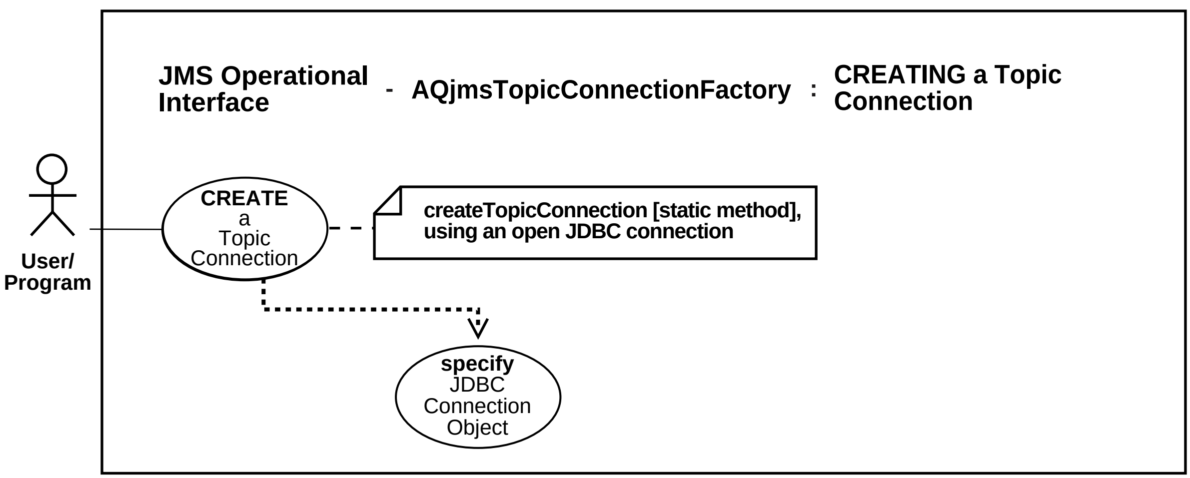
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsTopicConnectionFactory.createTopicConnection

Example

```
 TopicConnectionFactory tc_fact =
AQjmsFactory.getTopicConnectionFactory("sun123", "oratest", 5521, "thin");
/* Create a topic connection using a username/password */
TopicConnection tc_conn = tc_fact.createTopicConnection("jmsuser", "jmsuser");
```

Creating a Topic Connection with Open JDBC Connection

Figure 15–2 Publish-Subscribe—Creating a Topic Connection with Open JDBC Connection



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsTopicConnectionFactory" on page B-55
- "Creating a Topic Connection with Username/Password" on page 15-4
- "Creating a Topic Connection with Default Connection Factory Parameters" on page 15-7
- "Creating a Topic Connection with an Open OracleOCIConnectionPool" on page 15-8

Purpose

Create a topic connection with open JDBC connection.

Usage Notes

Not applicable.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsTopicConnectionFactory.createTopicConnection

Example 1

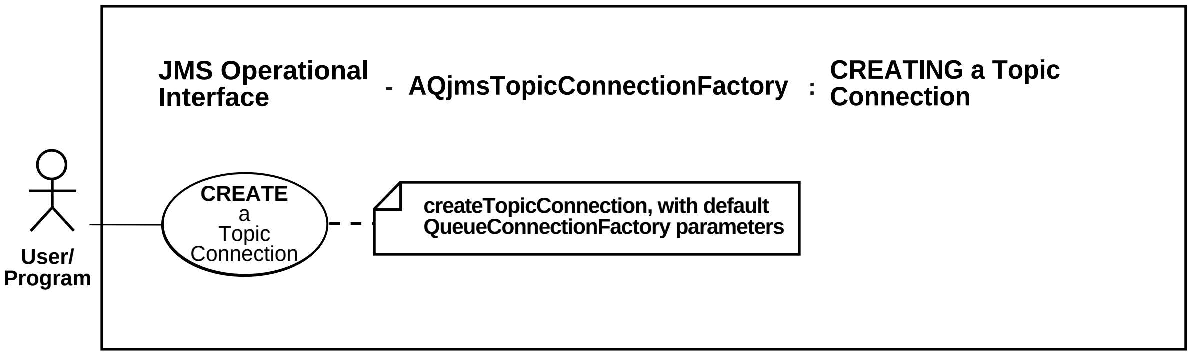
```
Connection db_conn;   /*previously opened JDBC connection */
TopicConnection tc_conn = AQjmsTopicConnectionFactory.createTopicConnection(db_
conn);
```

Example 2

```
OracleDriver ora = new OracleDriver();
TopicConnection tc_conn =
AQjmsTopicConnectionFactory.createTopicConnection(ora.defaultConnection());
```

Creating a Topic Connection with Default Connection Factory Parameters

Figure 15–3 Publish-Subscribe—Creating a Topic Connection with Default Connection Factory Parameters



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsTopicConnectionFactory" on page B-55
- "Creating a Topic Connection with Username/Password" on page 15-4
- "Creating a Topic Connection with Open JDBC Connection" on page 15-5
- "Creating a Topic Connection with an Open OracleOCIConnectionPool" on page 15-8

Purpose

Create a topic connection with default connection factory parameters.

Usage Notes

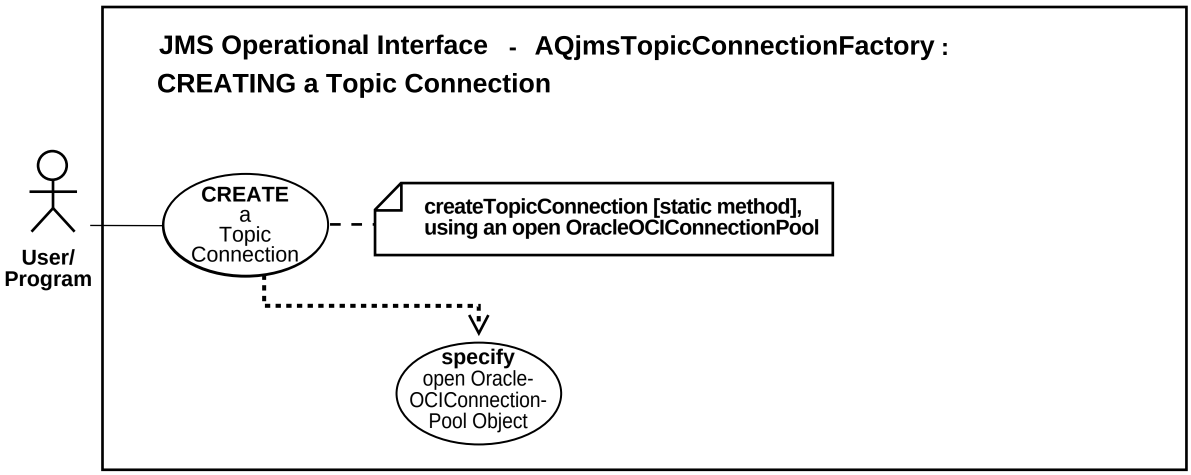
Not applicable.

Syntax

- Java (JDBC): *X*,oracle.jms, AQjmsTopicConnectionFactory.createTopicConnection

Creating a Topic Connection with an Open OracleOCIConnectionPool

Figure 15–4 Publish-Subscribe—Creating a Topic Connection with an Open OracleOCIConnectionPool



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsTopicConnectionFactory" on page B-55
- "Creating a Topic Connection with Username / Password" on page 15-4
- "Creating a Topic Connection with Open JDBC Connection" on page 15-5
- "Creating a Topic Connection with Default Connection Factory Parameters" on page 15-7

Purpose

Create a topic connection with an open `OracleOCIConnectionPool`.

Usage notes

This is a static method.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsTopicConnectionFactory.createTopicConnection

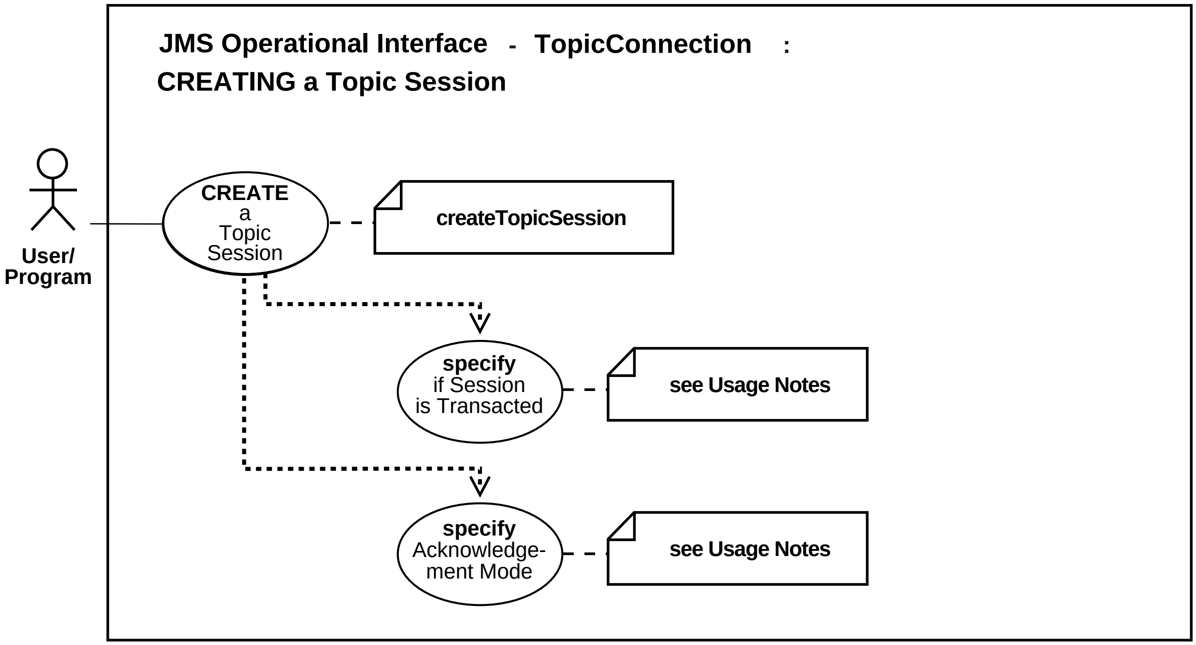
Example

This method may be used if the user wants to use an existing `OracleOCIConnectionPool` instance for JMS operations. In this case JMS will not open an new `OracleOCIConnectionPool` instance, but instead use the supplied `OracleOCIConnectionPool` instance to create the JMS TopicConnection object.

```
OracleOCIConnectionPool cpool; /* previously created OracleOCIConnectionPool */
TopicConnection tc_conn =
AQjmsTopicConnectionFactory.createTopicConnection(cpool);
```

Creating a Topic Session

Figure 15–5 Publish-Subscribe—Creating a Topic Session



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.TopicConnection" on page B-37

Purpose

Create a topic session.

Usage Notes

Not applicable.

Syntax

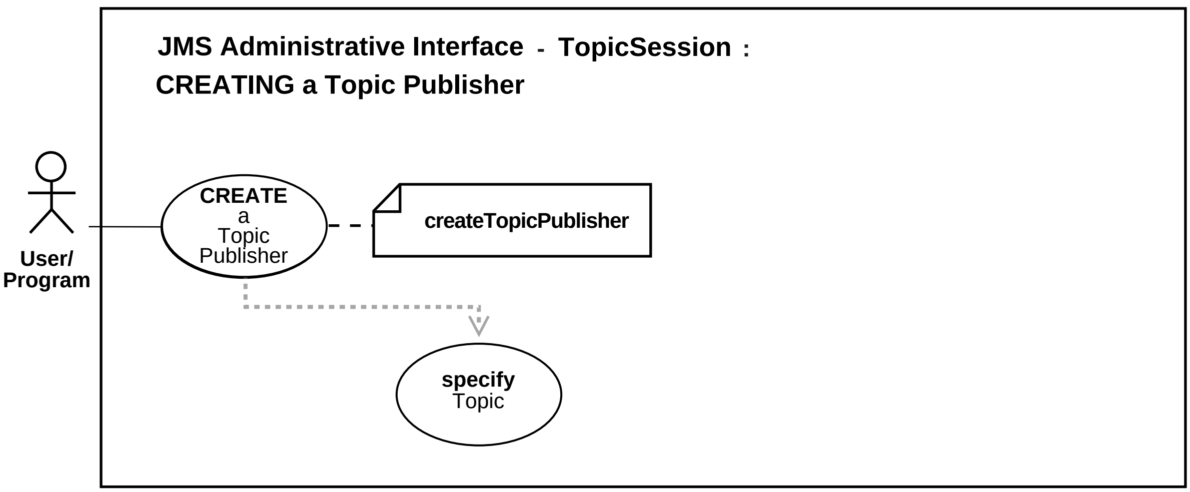
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsConnection.createTopicSession

Example

```
TopicConnection tc_conn;
TopicSession t_sess = tc_conn.createTopicSession(true,0);
```

Creating a Topic Publisher

Figure 15–6 Publish-Subscribe—Creating a Topic Publisher



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.TopicSession" on page B-39

Purpose

Create a topic publisher.

Usage Notes

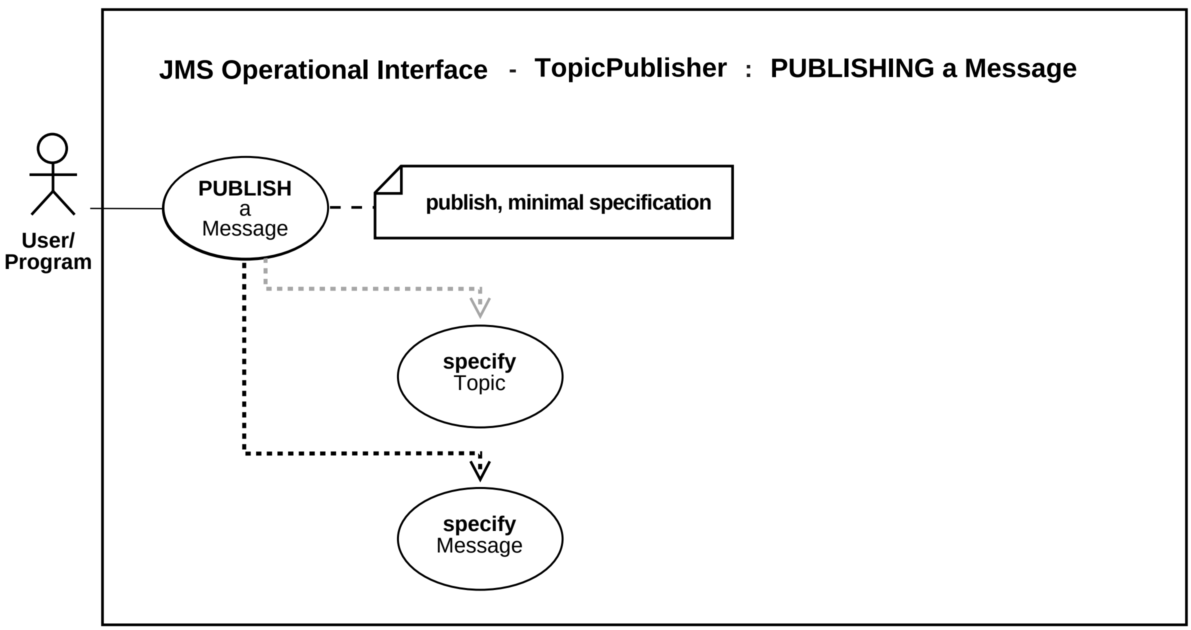
Not applicable.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createPublisher

Publishing a Message Using a Topic Publisher—with Minimal Specification

Figure 15–7 Publish-Subscribe—Publishing a Message with Minimal Specification



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.TopicPublisher" on page B-38
- "Publishing a Message Using a Topic Publisher—Specifying Correlation and Delay" on page 15-15
- "Publishing a Message Using a Topic Publisher—Specifying Priority and Time-To-Live" on page 15-18
- "Publishing a Message Using a Topic Publisher—Specifying a Recipient List Overriding Topic Subscribers" on page 15-21

Purpose

Publish a message with minimal specification.

Usage Notes

If the Topic Publisher has been created with a default topic, then the topic parameter may not be specified in the publish call. If a topic is specified in the send operation, then that value will override the default in the TopicPublisher. If the TopicPublisher has been created without a default topic, then the topic must be specified with the publish. The TopicPublisher uses the default values for message priority (1) and timeToLive (infinite).

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsTopicPublisher.publish

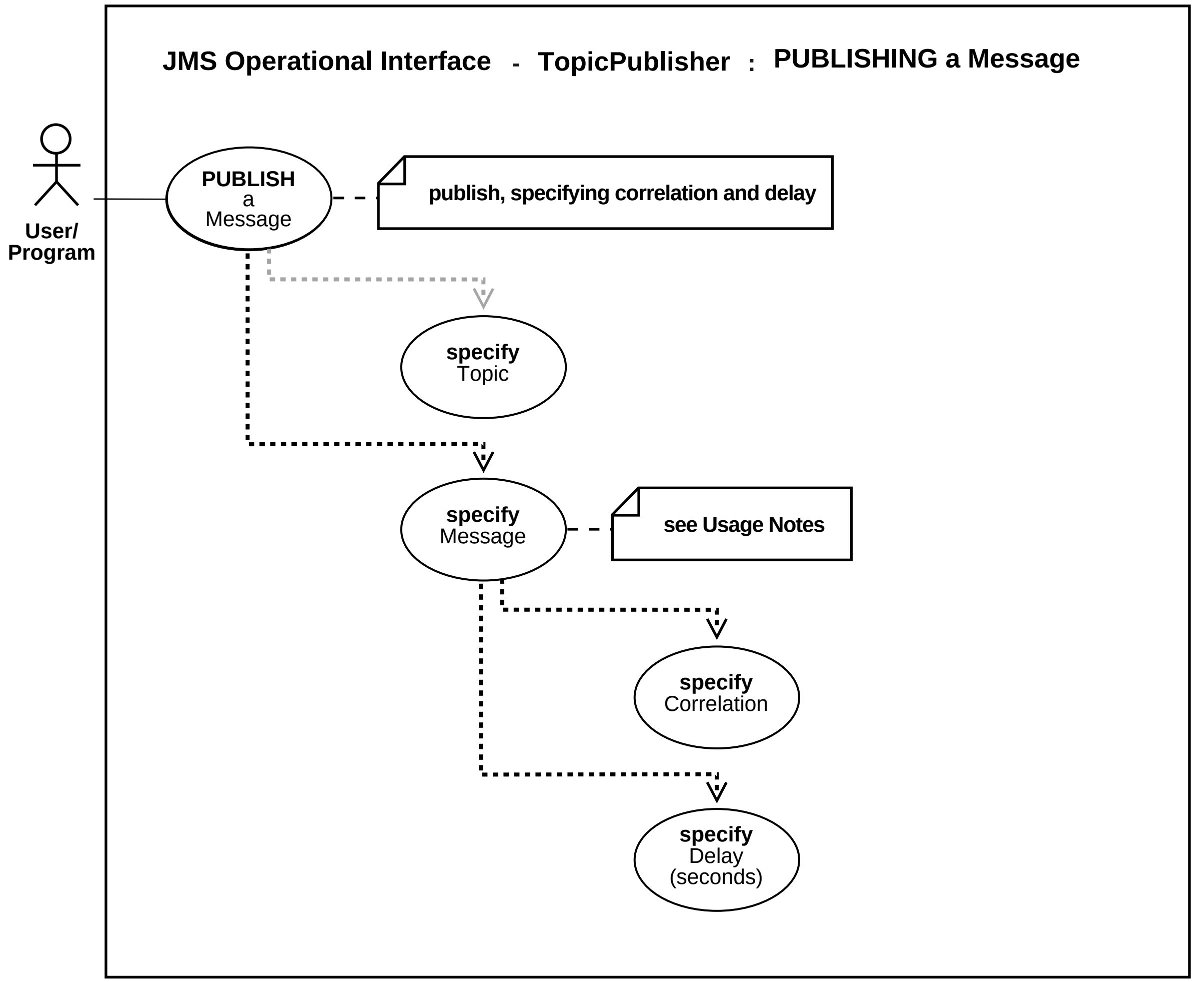
Example

```
Example 1 - publish specifying topic

TopicConnectionFactory     tc_fact   = null;
TopicConnection            t_conn    = null;
TopicSession               jms_sess;
TopicPublisher             publisher1;
Topic                      shipped_orders;
int                        myport = 5521;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory('MYHOSTNAME',
```

```
                                                    'MYSID', myport, 'oci8');
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

/* create topic publisher */
publisher1 = jms_sess.createPublisher(null);

/* get topic object */
shipped_orders = ((AQjmsSession )jms_sess).getTopic('WS', 'Shipped_Orders_
Topic');

/* create text message */
TextMessage     jms_sess.createTextMessage();

/* publish specifying the topic */
publisher1.publish(shipped_orders, text_message);

Example 2 - publish without specifying topic

TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              jms_sess;
TopicPublisher            publisher1;
Topic                     shipped_orders;
int                       myport = 5521;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                    "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");

/* create topic session */
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

/* get shipped orders topic */
shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");
publisher1 = jms_sess.createPublisher(shipped_orders);

/* create text message */
TextMessage     jms_sess.createTextMessage();

/* publish without specifying the topic */
publisher1.publish(text_message);
```

Publishing a Message Using a Topic Publisher—Specifying Correlation and Delay

Figure 15–8 Publish-Subscribe—Publishing a Message Specifying Correlation and Delay



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.TopicPublisher" on page B-38
- "Publishing a Message Using a Topic Publisher—with Minimal Specification" on page 15-12
- "Publishing a Message Using a Topic Publisher—Specifying Priority and Time-To-Live" on page 15-18
- "Publishing a Message Using a Topic Publisher—Specifying a Recipient List Overriding Topic Subscribers" on page 15-21

Purpose

Publish a message specifying correlation and delay.

Usage Notes

The publisher can set the message properties like delay and correlation before publishing.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsTopicPublisher.publish()

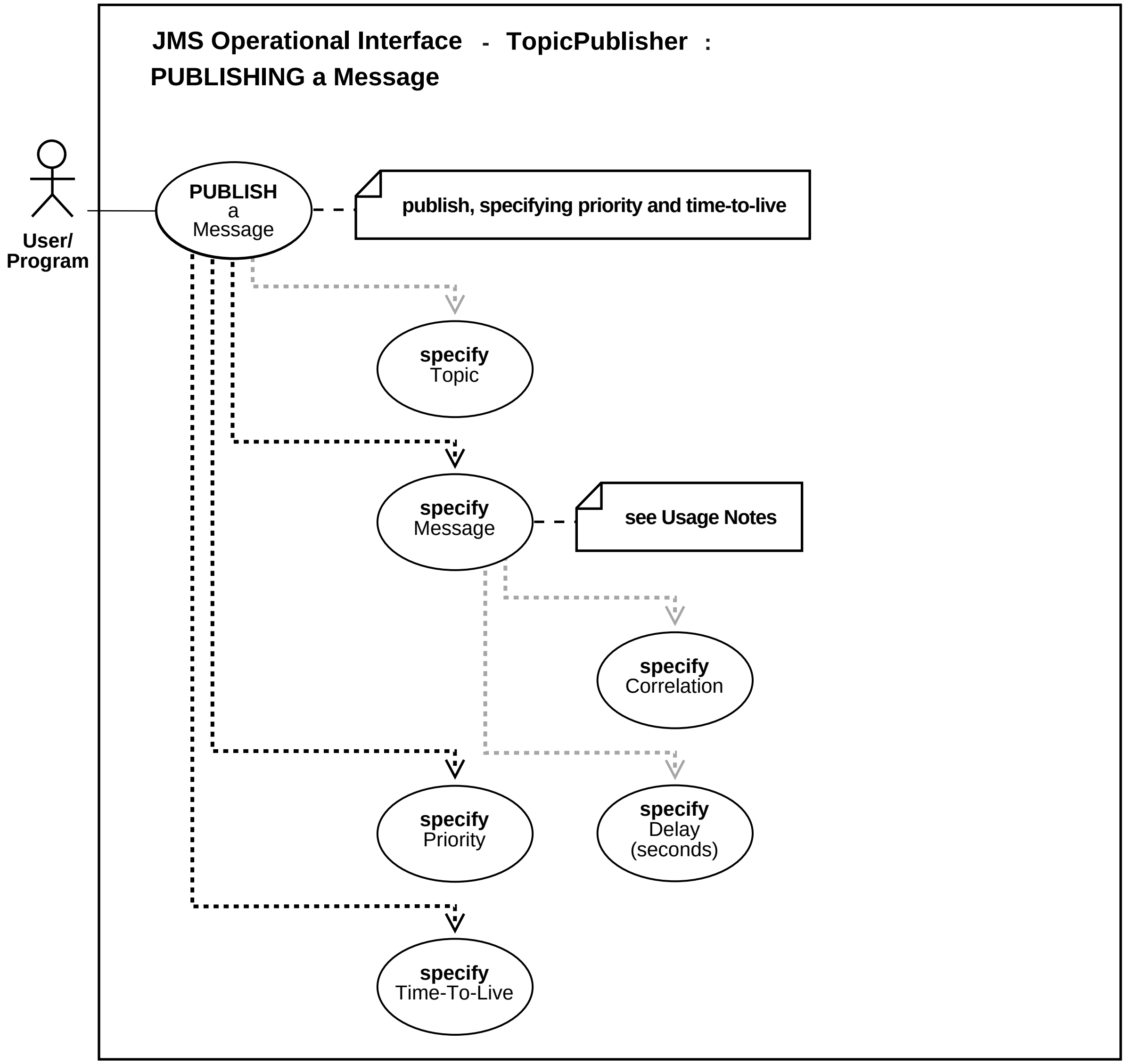
Example

```
 Example 1 - publish specifying delay, correlation

TopicConnectionFactory     tc_fact   = null;
TopicConnection            t_conn    = null;
TopicSession               jms_sess;
TopicPublisher             publisher1;
Topic                      shipped_orders;
int                        myport = 5521;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);
```

```
shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");
publisher1 = jms_sess.createPublisher(shipped_orders);

/* create text message */
TextMessage     jms_sess.createTextMessage();

/* Set correlation and delay */

/* set correlation */
jms_sess.setJMSCorrelationID("FOO");

/* set delay of 30 seconds */
jms_sess.setLongProperty("JMS_OracleDelay", 30);

/* publish  */
publisher1.publish(text_message);
```

Publishing a Message Using a Topic Publisher—Specifying Priority and Time-To-Live

Figure 15–9 Publish-Subscribe—Publishing Messages Specifying Priority and Time-To-Live



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.TopicPublisher" on page B-38
- "Publishing a Message Using a Topic Publisher—with Minimal Specification" on page 15-12
- "Publishing a Message Using a Topic Publisher—Specifying Correlation and Delay" on page 15-15
- "Publishing a Message Using a Topic Publisher—Specifying a Recipient List Overriding Topic Subscribers" on page 15-21

Purpose

Publish a message specifying priority and time-to-live.

Usage Notes

The priority, and timeToLive of the message can be specified with the publish call. The only delivery mode supported for this release is PERSISTENT.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsTopicPublisher.publish

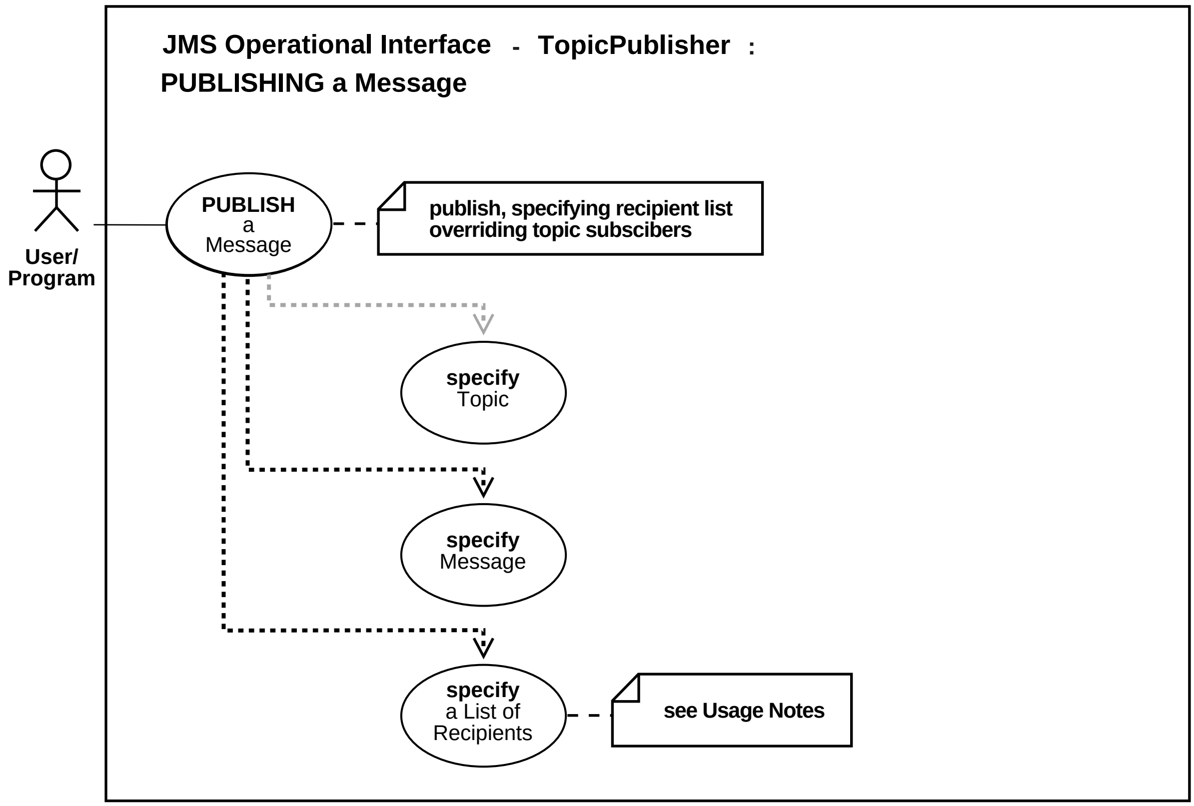
Example

```
 Example 1 - publish specifying priority, timeToLive

TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              jms_sess;
TopicPublisher            publisher1;
Topic                     shipped_orders;
int                       myport = 5521;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);
```

```
shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");
publisher1 = jms_sess.createPublisher(shipped_orders);

/* create text message */
TextMessage     jms_sess.createTextMessage();

/* publish  message with priority 1 and time to live 200 seconds */
publisher1.publish(text_message, DeliveryMode.PERSISTENT, 1, 200000);
```

Publishing a Message Using a Topic Publisher—Specifying a Recipient List Overriding Topic Subscribers

Figure 15–10 Publish-Subscribe—Publishing a Message Specifying a Recipient List Overriding Topic Subscribers



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.TopicPublisher" on page B-38
- "Publishing a Message Using a Topic Publisher—with Minimal Specification" on page 15-12
- "Publishing a Message Using a Topic Publisher—Specifying Correlation and Delay" on page 15-15
- "Publishing a Message Using a Topic Publisher—Specifying Priority and Time-To-Live" on page 15-18

Purpose

Publish a messages specifying a recipient list overriding topic subscribers.

Usage Notes

The subscription list of the topic can be overridden by specifying the recipient list with the publish call.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsTopicPublisher.publish

Example

```
 Example 1 - publish specifying priority, timeToLive

TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              jms_sess;
TopicPublisher            publisher1;
Topic                     shipped_orders;
int                       myport = 5521;
AQjmsAgent[]              recipList;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);
```

```
shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");
publisher1 = jms_sess.createPublisher(shipped_orders);

/* create text message */
TextMessage     jms_sess.createTextMessage();

/* create two receivers */
recipList = new AQjmsAgent[2];

recipList[0] = new AQjmsAgent("ES", "ES.shipped_orders_topic",
                           AQAgent.DEFAULT_AGENT_PROTOCOL);

recipList[1] = new AQjmsAgent("WS", "WS.shipped_orders_topic",
                           AQAgent.DEFAULT_AGENT_PROTOCOL);

/* publish  message specifying a recipient list */
publisher1.publish(text_message, recipList);
```

Creating a Durable Subscriber for a JMS Topic without Selector

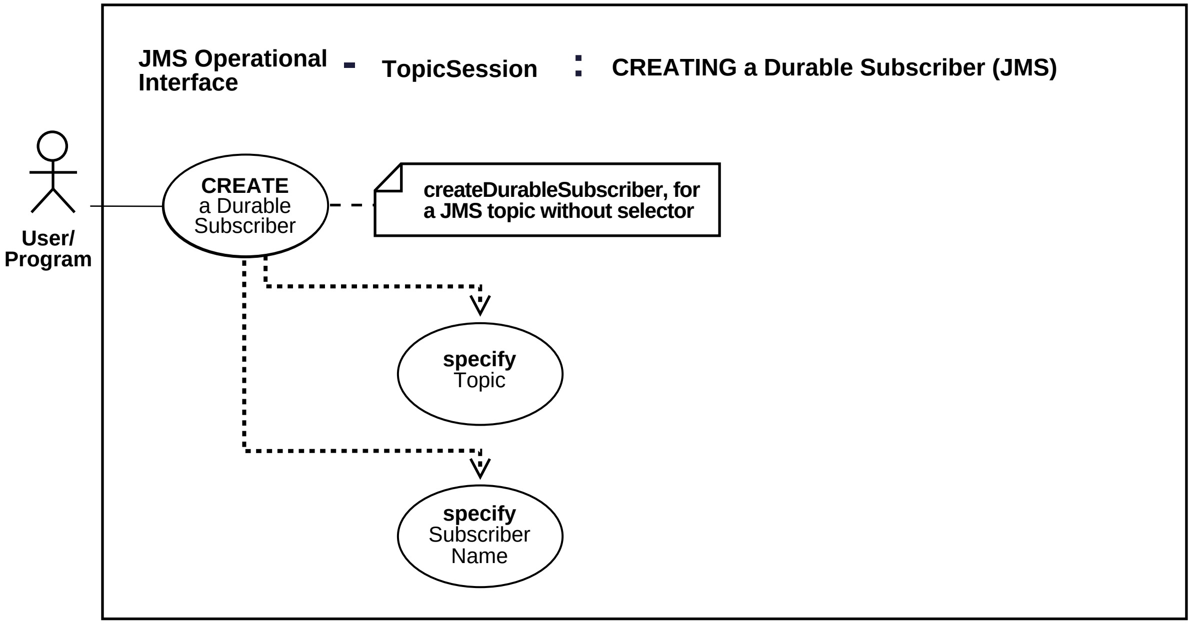


Figure 15–11 Publish-Subscribe—Creating a Durable Subscriber for JMS Topic without Selector

See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.TopicSession" on page B-39
- "Creating a Durable Subscriber for a JMS Topic with Selector" on page 15-26

Purpose

Create a durable subscriber for a JMS topic without selector.

Usage Notes

The subscriber name and JMS topic need to be specified to create a durable subscriber. An unsubscribe call is needed to end the subscription to the topic.

Syntax

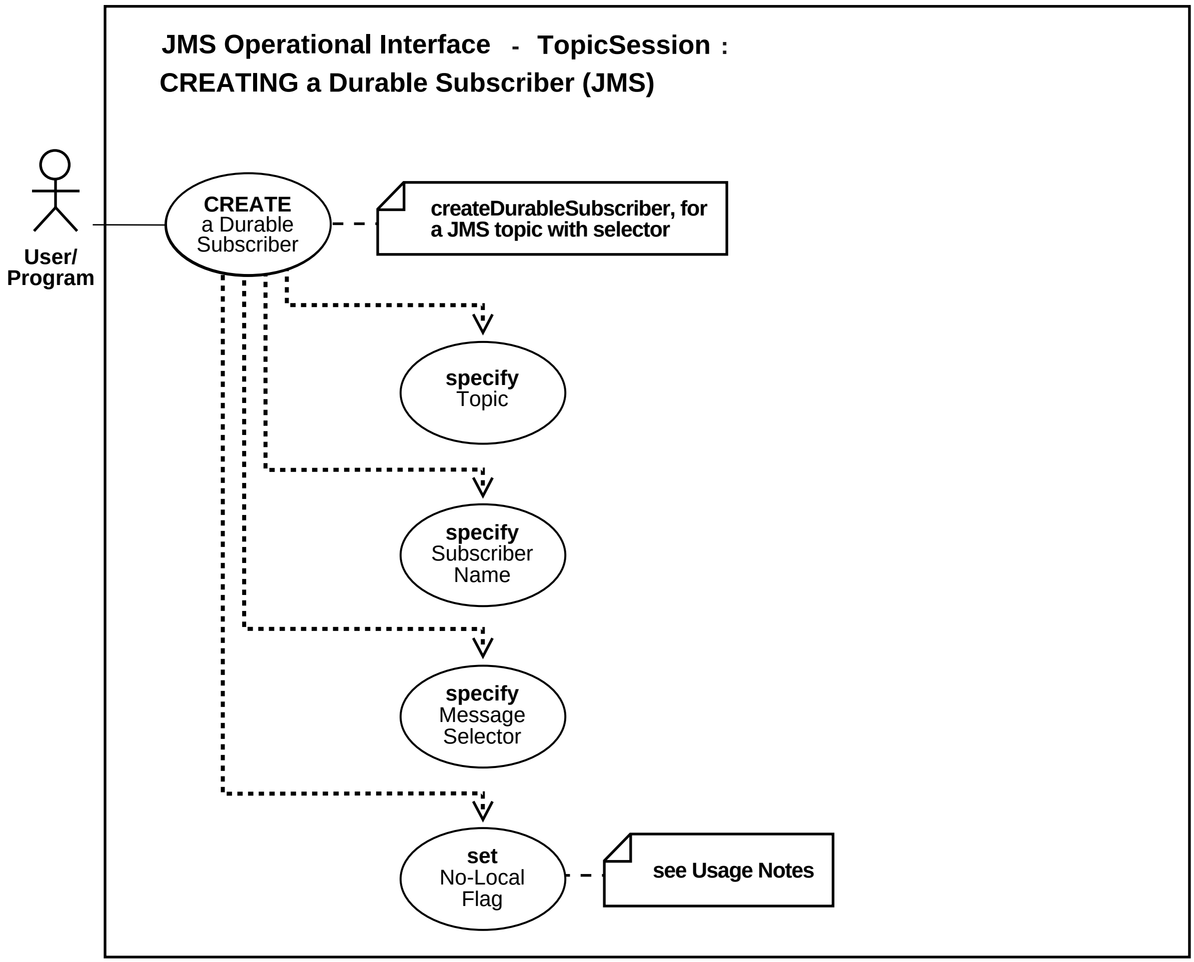
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.CreateDurableSubscriber

Example

```
TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              jms_sess;
TopicSubscriber           subscriber1;
Topic                     shipped_orders;
int                       myport = 5521;
AQjmsAgent[]              recipList;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");
/* create a durable subscriber on the shipped_orders topic*/
subscriber1 = jms_sess.createDurableSubscriber(shipped_orders,
'WesternShipping');
```

Creating a Durable Subscriber for a JMS Topic with Selector

Figure 15–12 Publish-Subscribe—Creating a Durable Subscriber for a JMS Topic with Selector



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.TopicSession" on page B-39
- "Creating a Durable Subscriber for a JMS Topic without Selector" on page 15-24

Purpose

Create a durable subscriber for a jms topic with selector.

Usage Notes

The client creates a durable subscriber by specifying a subscriber name and JMS topic. Optionally, a message selector can be specified. Only messages with properties matching the message selector expression are delivered to the subscriber. The selector value may be null. The selector can contain any SQL92 expression that has a combination of one or more of the following:

- JMS Message header fields or properties: JMSPriority (int), JMSCorrelationID (string), JMSType (string), JMSXUserID (string), JMSXAppID (string), JMSXGroupID (string) JMSXGroupSeq (int)

  For example:

  ```
  JMSPriority < 3 AND JMSCorrelationID = 'Fiction'
  ```

- User defined message properties

  For example:

  ```
  color IN ('RED', BLUE', 'GREEN') AND price < 30000
  ```

Operators allowed are:

- logical operators in precedence order NOT, AND, OR comparison operators
- =, >, >=, <, <=, <>, ! (both <> and ! can be used for not equal)
- arithmetic operators in precedence order +,- unary, *, /, +,-
- identifier [NOT] IN (string-literal1, string-literal2, ..)
- arithmetic-expr1 [NOT] BETWEEN arithmetic-expr2 and arithmetic-expr3
- identifier [NOT] LIKE pattern-value [ESCAPE escape-character]

- pattern-value is a string literal where % refers to any sequence of
- characters and _ refers to any single character. The optional
- escape-character is used to escape the special meaning of the
- '_' and '%' in pattern-value
- identifier IS [NOT] NULL

A client can change an existing durable subscription by creating a durable TopicSubscriber with the same name and a different message selector. An unsubscribe call is needed to end the subscription to the topic.

Syntax

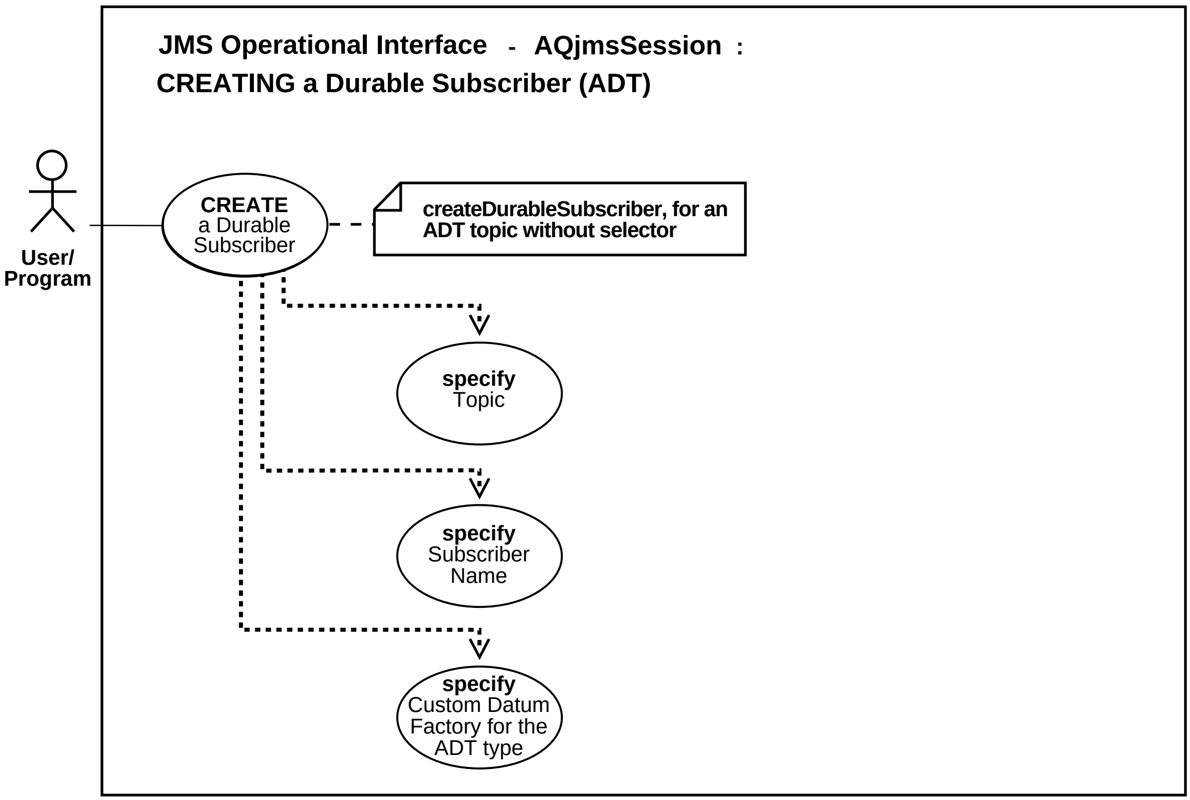
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsTopicPublisher.publish

Example

```
Example 1 - subscribe specifying selector

TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              jms_sess;
TopicSubscriber           subscriber1;
Topic                     shipped_orders;
int                       myport = 5521;
AQjmsAgent[]              recipList;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");

/* create a subscriber */
/*  with condition on JMSPriority and user property 'Region' */
subscriber1 = jms_sess.createDurableSubscriber(shipped_orders,
'WesternShipping',
                                "JMSPriority > 2 and Region like 'Western%'",
false);
```

Creating a Durable Subscriber for an ADT Topic without Selector

Figure 15–13 Publish-Subscribe—Creating a Durable Subscriber for an ADT Topic without Selector



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Creating a Durable Subscriber for an ADT Topic with Selector" on page 15-31

Purpose

Create a durable subscriber for an ADT topic without selector.

Usage Notes

To create a durable subscriber for a Topic of Oracle Object type, the client needs to specify the CustomDatumFactory for the Oracle Object Type in addition to the Topic and subscriber name.

Syntax

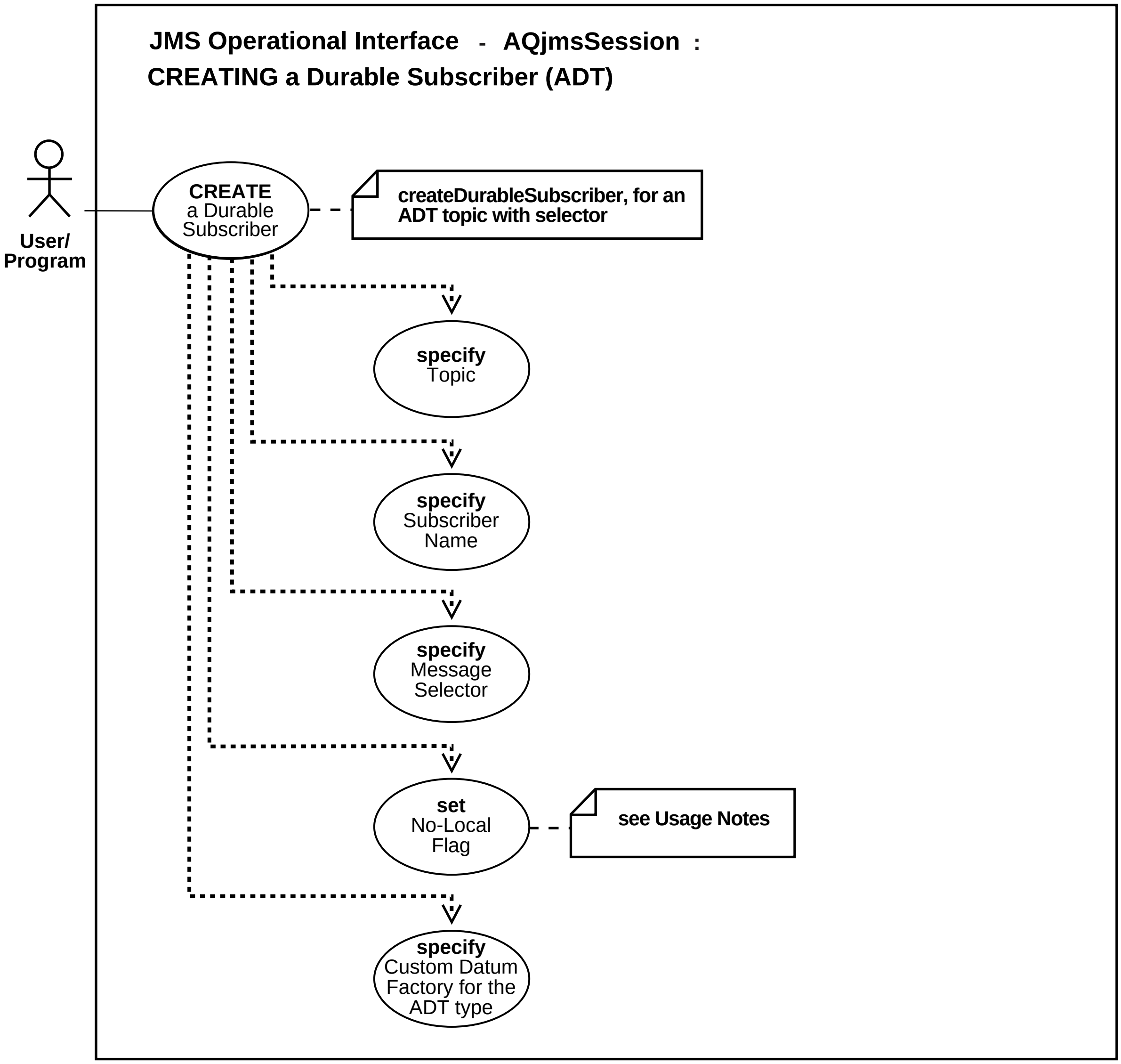
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createDurableSubscriber

Example

```
 subscribe to an ADT queue

TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              t_sess    = null;
TopicSession              jms_sess;
TopicSubscriber           subscriber1;
Topic                     shipped_orders;
int                       my[port = 5521;
AQjmsAgent[]              recipList;
/* the java mapping of the oracle object type created by J Publisher */
ADTMessage                message;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");

/* create a subscriber, specifying the correct CustomDatumFactory */
subscriber1 = jms_sess.createDurableSubscriber(shipped_orders,
'WesternShipping', AQjmsAgent.getFactory());
```

Creating a Durable Subscriber for an ADT Topic with Selector

Figure 15–14 Publish-Subscribe—Creating a Durable Subscriber for an ADT Topic with Selector



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Creating a Durable Subscriber for an ADT Topic without Selector" on page 15-29

Purpose

Create a durable subscriber for an ADT topic with selector.

Usage Notes

To create a durable subscriber for a Topic of Oracle Object type, the client needs to specify the CustomDatumFactory for the Oracle Object Type in addition to the Topic and subscriber name.

Optionally, a message selector may be specified. Only messages matching the selector will be delivered to the subscriber.

ADT messages do not contain any user defined properties. However, the selector can be used to select messages based on priority or correlation id or attribute values of the message payload

The syntax for the selector for queues containing ADT messages is different from the syntax for selectors on queues containing standard JMS payloads (text, stream, object, bytes, map)

The selector is similar to the AQ rules syntax

a. Selector on priority or correlation is specified as follows

For example.:- priority > 3 AND corrid = 'Fiction'

b. Selector on message payload is specified as follows. The attribute

name must be prefixed with tab.user_data.

For example:-

tab.user_data.color = 'GREEN' AND tab.user_data.price < 30000

Syntax

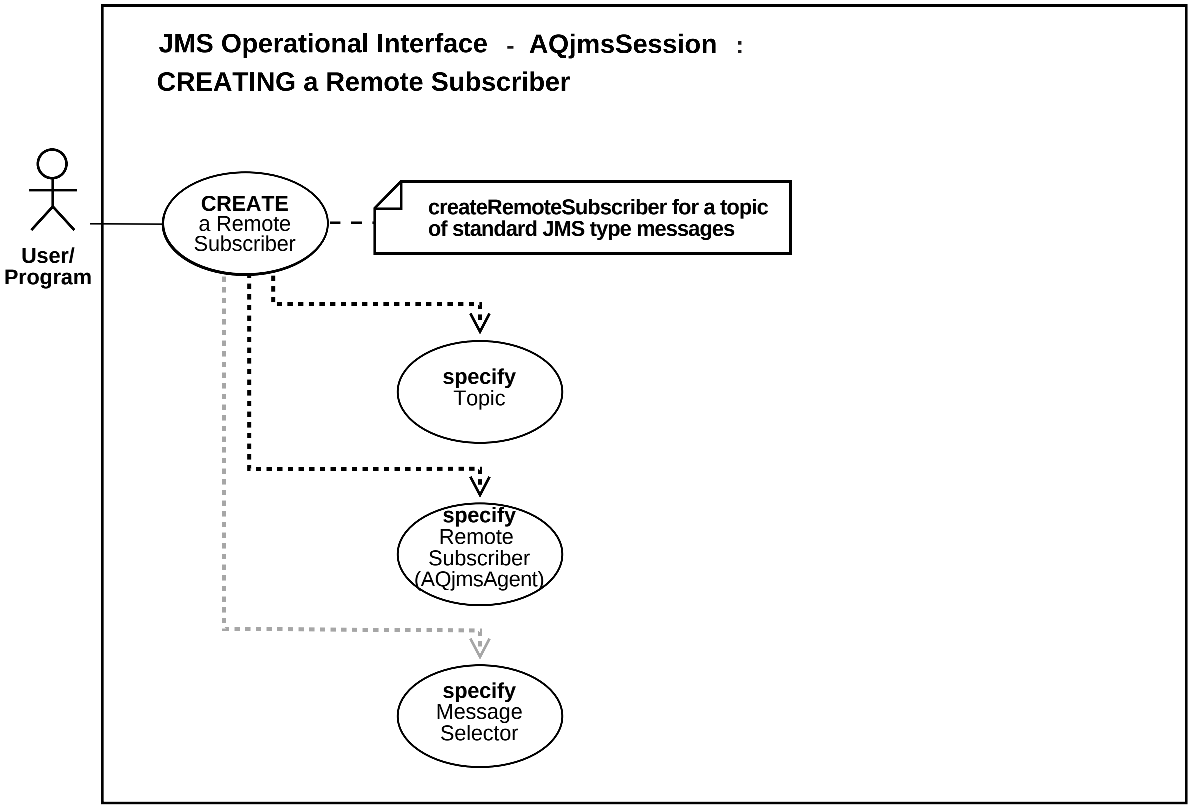
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createDurableSubscriber

Example

```
TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              jms_sess;
TopicSubscriber           subscriber1;
Topic                     shipped_orders;
int                       myport = 5521;
AQjmsAgent[]              recipList;
/* the java mapping of the oracle object type created by J Publisher */
ADTMessage                message;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");

/* create a subscriber, specifying the correct CustomDatumFactory  and selector
*/
subscriber1 = jms_sess.createDurableSubscriber(shipped_orders,
"WesternShipping", " priority > 1 and tab.user_data.region like 'WESTERN %'",
false, ADTMessage.getFactory());
```

Creating a Remote Subscriber for Topics of JMS Messages

Figure 15–15 Publish-Subscribe—Creating a Remote Subscriber for Topics of Standard JMS Type Messages



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Creating a Remote Subscriber for Topics of Oracle Object Type (ADT) Messages" on page 15-37

Purpose

Create a remote subscriber for topics of jms messages without selector.

Usage Notes

AQ allows topics to have remote subscribers, for example, subscribers at other topics in the same or different database. In order to use remote subscribers, you must set up propagation between the local and remote topic.

Remote subscribers may be a specific consumer at the remote topic or all subscribers at the remote topic. A remote subscriber is defined using the AQjmsAgent structure. An AQjmsAgent consists of a name and address. The name refers to the consumer_name at the remote topic. The address refers to the remote topic - the syntax is (schema).(topic_name)[@dblink].

a) To publish messages to a particular consumer at the remote topic, the subscription_name of the recipient at the remote topic must be specified in the name field of AQjmsAgent. The remote topic must be specified in the address field of AQjmsAgent

b) To publish messages to all subscribers of the remote topic, the name field of AQjmsAgent must be set to null. The remote topic must be specified in the address field of AQjmsAgent

A message selector can also be specified. Only messages that satisfy the selector are delivered to the remote subscriber. The message selector can be null. The syntax for the selector is the same as that for createDurableSubscriber. The selector can be null.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createRemoteSubscriber

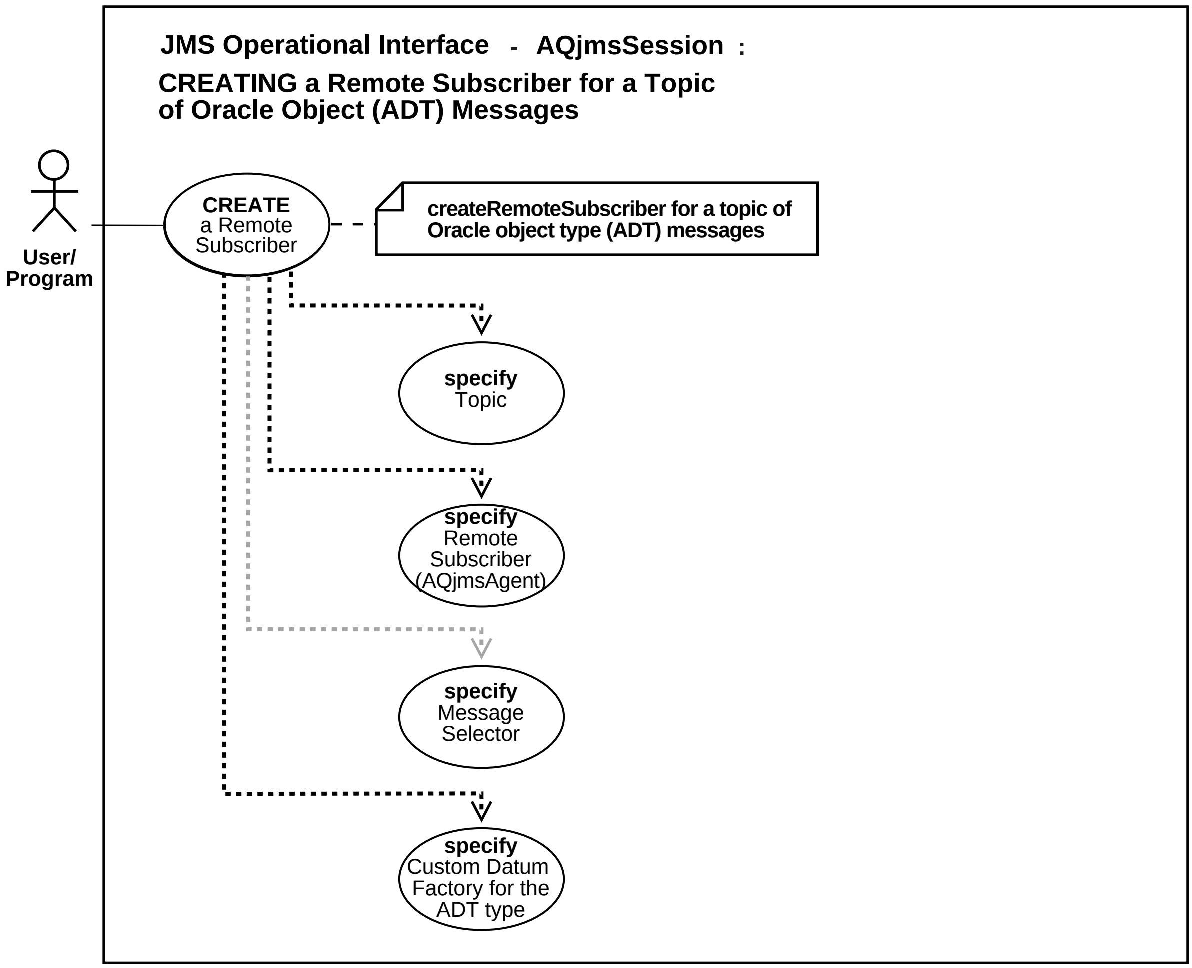
Example

```
TopicConnectionFactory     tc_fact   = null;
TopicConnection            t_conn    = null;
TopicSession               t_sess    = null;
TopicSession               jms_sess;
TopicSubscriber            subscriber1;
Topic                      shipped_orders;
int                        my[port = 5521;
AQjmsAgent                 remoteAgent;

/* create connection and session */
```

```
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");

remoteAgent = new AQjmsAgent("WesternRegion", "WS.shipped_orders_topic", null);

/* create a remote subscriber (selector is null )*/
subscriber1 = ((AQjmsSession)jms_sess).createRemoteSubscriber(shipped_orders,
    remoteAgent, null);
```

Creating a Remote Subscriber for Topics of Oracle Object Type (ADT) Messages

Figure 15–16 Publish-Subscribe—Creating a Remote Subscriber for Topics of Oracle Object Type (ADT) Messages



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Creating a Remote Subscriber for Topics of JMS Messages" on page 15-34

Purpose

Create a remote subscriber for topics of oracle object type (ADT) messages.

Usage Notes

AQ allows topics to have remote subscribers, for example, subscribers at other topics in the same or different database. In order to use remote subscribers, you must set up propagation between the local and remote topic.

Remote subscribers may be a specific consumer at the remote topic or all subscribers at the remote topic. A remote subscriber is defined using the AQjmsAgent structure.

An AQjmsAgent consists of a name and address. The name refers to the consumer_name at the remote topic. The address refers to the remote topic - the syntax is (schema).(topic_name)[@dblink].

a) To publish messages to a particular consumer at the remote topic, the subscription_name of the recipient at the remote topic must be specified in the name field of AQjmsAgent. The remote topic must be specified in the address field of AQjmsAgent

b) To publish messages to all subscribers of the remote topic, the name field of AQjmsAgent must be set to null. The remote topic must be specified in the address field of AQjmsAgent

The CustomDatumFactory of the Oracle Object type of the Topic must be specified. A message selector can also be specified. Only messages that satisfy the selector are delivered to the remote subscriber. The message selector can be null. The syntax for message selector is that same as that for createDurableSubscriber with Topics of ADT type messages. The message selector may be null.

Syntax

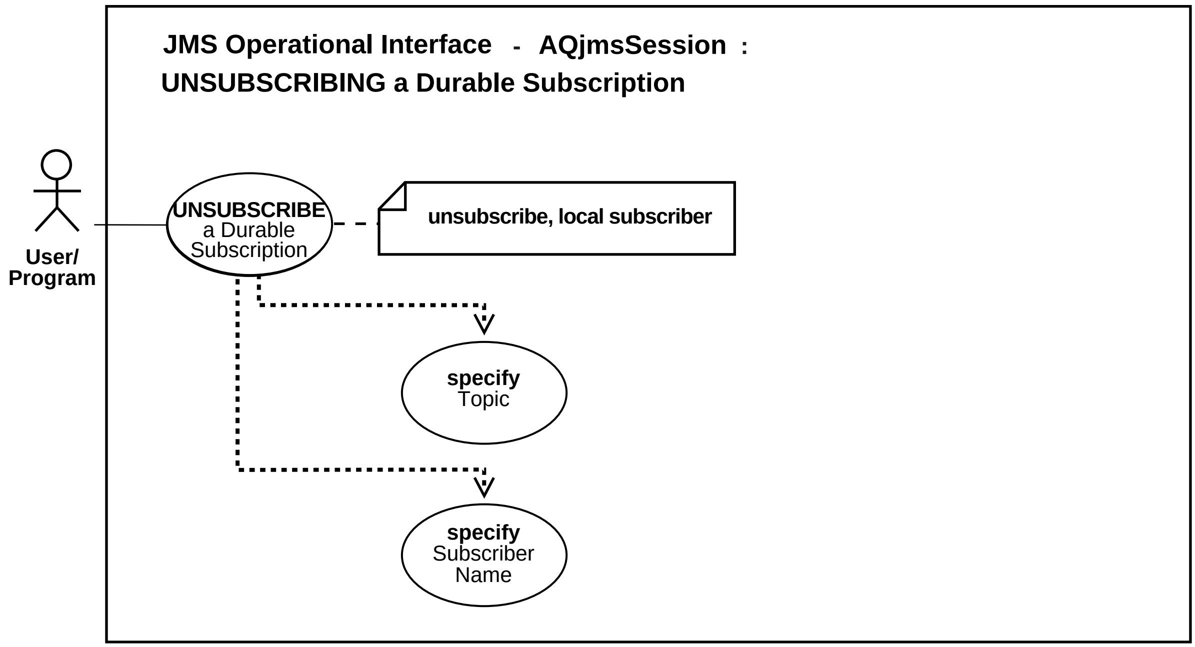
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createRemoteSubscriber

Example

```
TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              t_sess    = null;
TopicSession              jms_sess;
TopicSubscriber           subscriber1;
Topic                     shipped_orders;
int                       my[port = 5521;
AQjmsAgent                remoteAgent;
ADTMessage                message;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
"MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");

/* create Topic session */
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

/* get the Shipped order topic */
shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");
/* create a remote agent */
remoteAgent = new AQjmsAgent("WesternRegion", "WS.shipped_orders_topic", null);

/* create a remote subscriber  with null selector*/
subscriber1=((AQjmsSession)jms_sess).createRemoteSubscriber(shipped_orders,
remoteAgent, null, message.getFactory);
```

Unsubscribing a Durable Subscription for a Local Subscriber

Figure 15–17 Publish-Subscribe—Unsubscribing a Durable Subscription for a Local Subscriber



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Unsubscribing a Durable Subscription for a Remote Subscriber" on page 15-42

Purpose

Unsubscribe a durable subscription for a local subscriber.

Usage Notes

Unsubscribe a durable subscription that has been created by a client on the specified topic.

Syntax

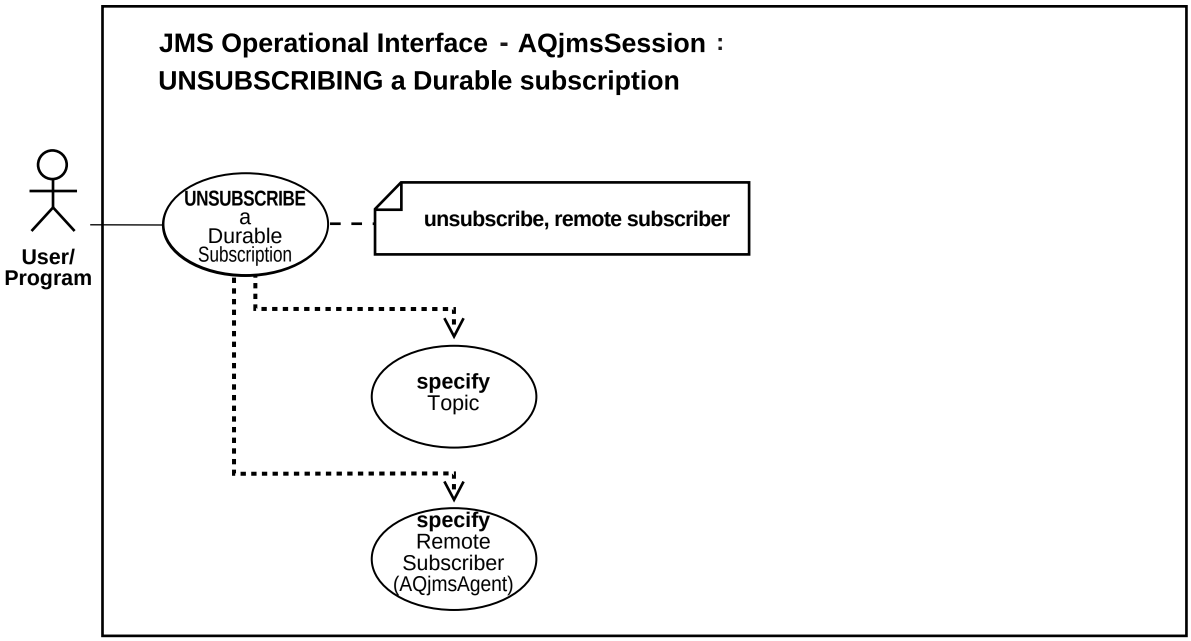
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.unsubscribe

Example

```
TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              jms_sess;
TopicSubscriber           subscriber1;
Topic                     shipped_orders;
int                       myport = 5521;
AQjmsAgent[]              recipList;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");
/* unsusbcribe "WesternShipping" from shipped_orders */
jms_sess.unsubscribe(shipped_orders, "WesternShipping");
```

Unsubscribing a Durable Subscription for a Remote Subscriber

Figure 15–18 Publish-Subscribe—Unsubscribing a Durable Subscription for a Remote Subscriber



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Unsubscribing a Durable Subscription for a Local Subscriber" on page 15-40

Purpose

Unsubscribe a durable subscription for a remote subscriber.

Usage Notes

Not applicable.

Syntax

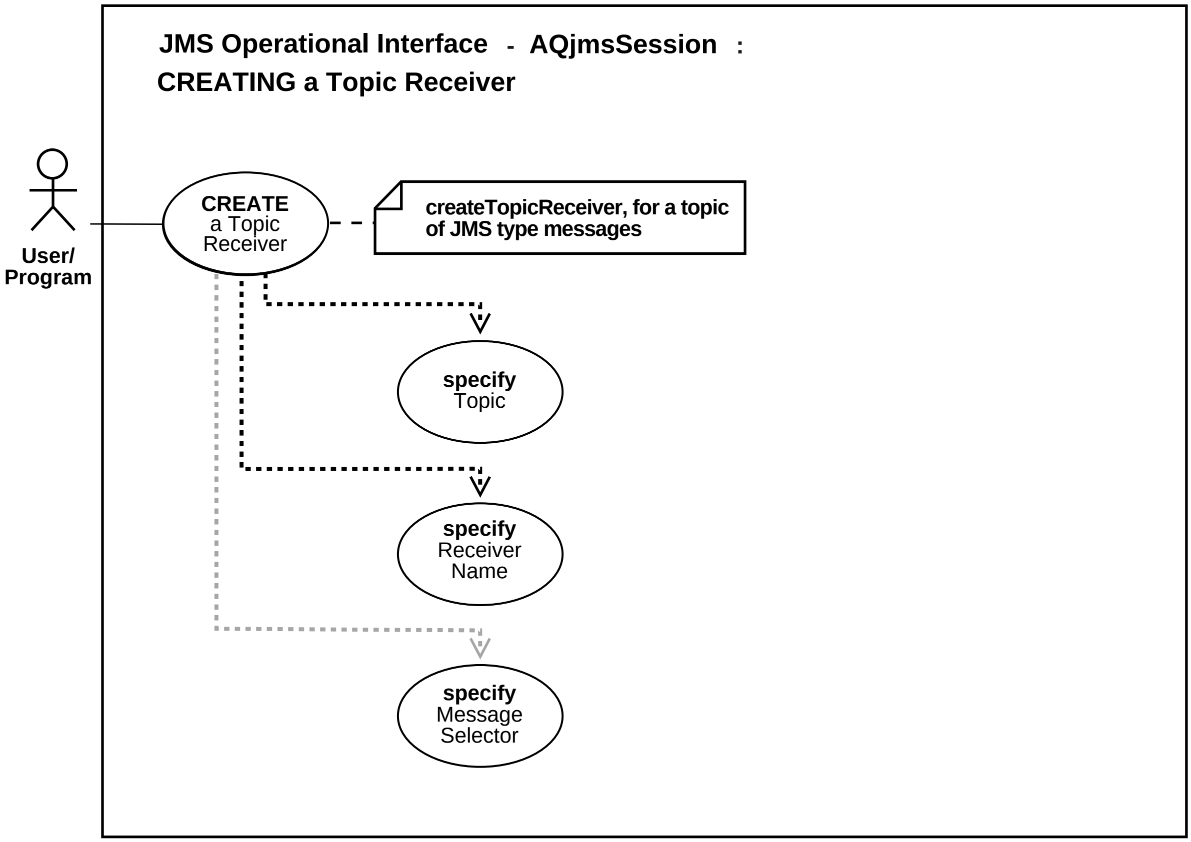
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.unsubscribe

Example

```
TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              t_sess    = null;
TopicSession              jms_sess;
Topic                     shipped_orders;
int                       myport = 5521;
AQjmsAgent                remoteAgent;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("OE", "Shipped_Orders_
Topic");

remoteAgent = new AQjmsAgent("WS", "WS.Shipped_Orders_Topic", null);

/* unsubscribe the remote agent from shipped_orders */
((AQjmsSession)jms_sess).unsubscribe(shipped_orders, remoteAgent);
```

Creating a Topic Receiver for a Topic of Standard JMS Type Messages

Figure 15–19 Publish-Subscribe—Creating a Topic Receiver for a Topic of Standard JMS Type Messages



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Creating a Topic Receiver for a Topic of Oracle Object Type (ADT) Messages" on page 15-46

Purpose

Create a topic receiver for a topic of standard jms type messages.

Usage Notes

AQ allows messages to be sent to specified recipients. These receivers may or may not be subscribers of the topic. If the receiver is not a subscriber to the topic, it will receive only those messages that are explicitly addressed to it.

This method must be used order to create a TopicReceiver object for consumers that are not 'Durable Subscribers'.A message selector can be specified. The syntax for the message selector is the same as that of a QueueReceiver for a queue of standard JMS type messages.

Syntax

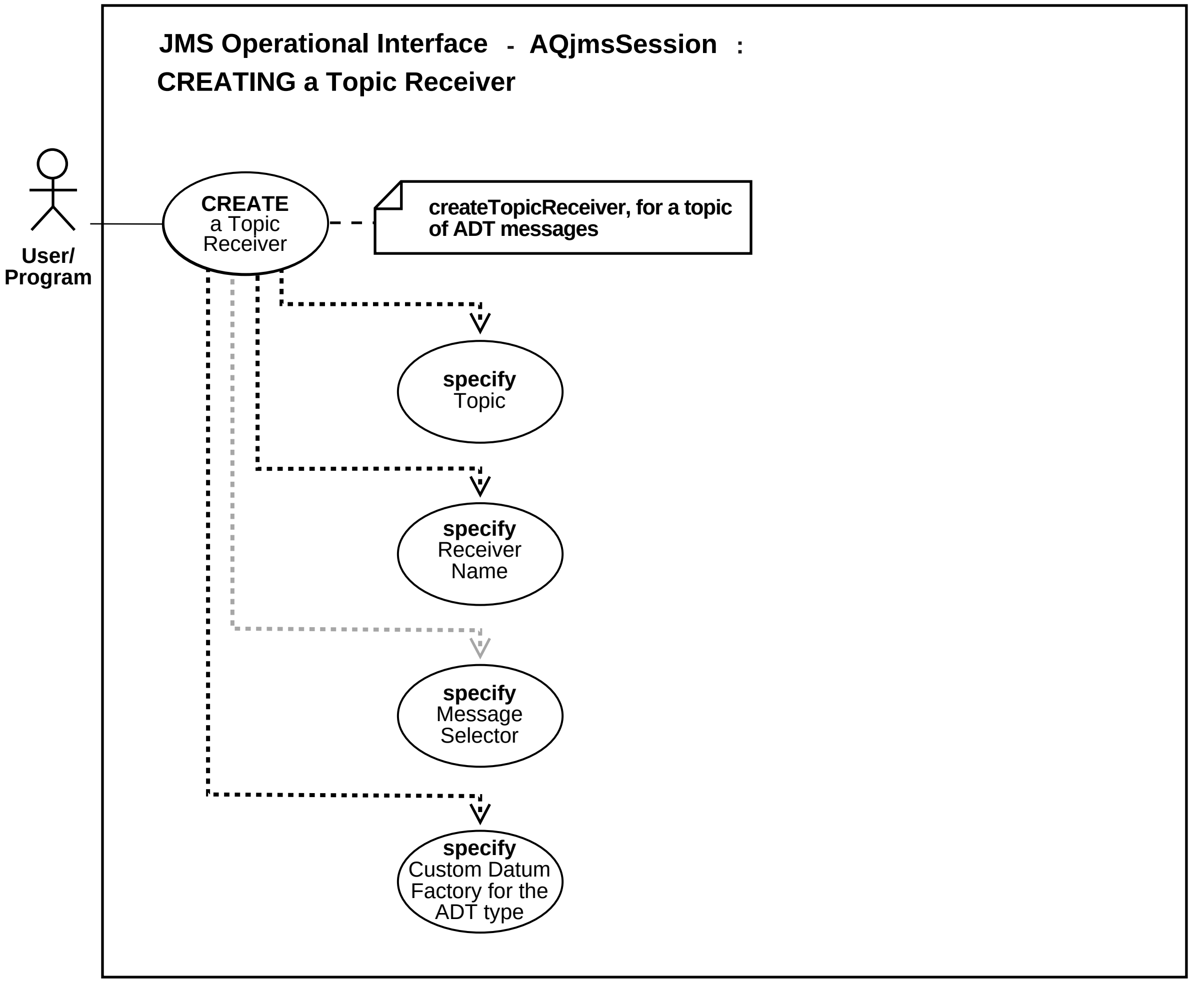
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createTopicReceiver

Example

```
 TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              t_sess    = null;
TopicSession              jms_sess;
Topic                     shipped_orders;
int                       myport = 5521;
TopicReceiver             receiver;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("WS", "Shipped_Orders_
Topic");

receiver = ((AQjmsSession)jms_sess).createTopicReceiver(shipped_orders,
"WesternRegion", null);
```

Creating a Topic Receiver for a Topic of Oracle Object Type (ADT) Messages

Figure 15–20 Publish-Subscribe—Creating a Topic Receiver for a Topic of Oracle Object Type (ADT) Messages



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Creating a Topic Receiver for a Topic of Standard JMS Type Messages" on page 15-44

Purpose

Create a topic receiver for a topic of ADT messages with selector.

Usage Notes

AQ allows messages to be sent to all subscribers of a topic or to specified recipients. These receivers may or may not be subscribers of the topic. If the receiver is not a subscriber to the topic, it will receive only those messages that are explicitly addressed to it.

This method must be used order to create a TopicReceiver object for consumers that are not 'Durable Subscribers'. The CustomDatumFactory of the Oracle Object type of the queue must be specified. A message selector can also be specified. This can be null. The syntax for the message selector is the same as that of a QueueReceiver for queues with ADT messages.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createTopicReceiver

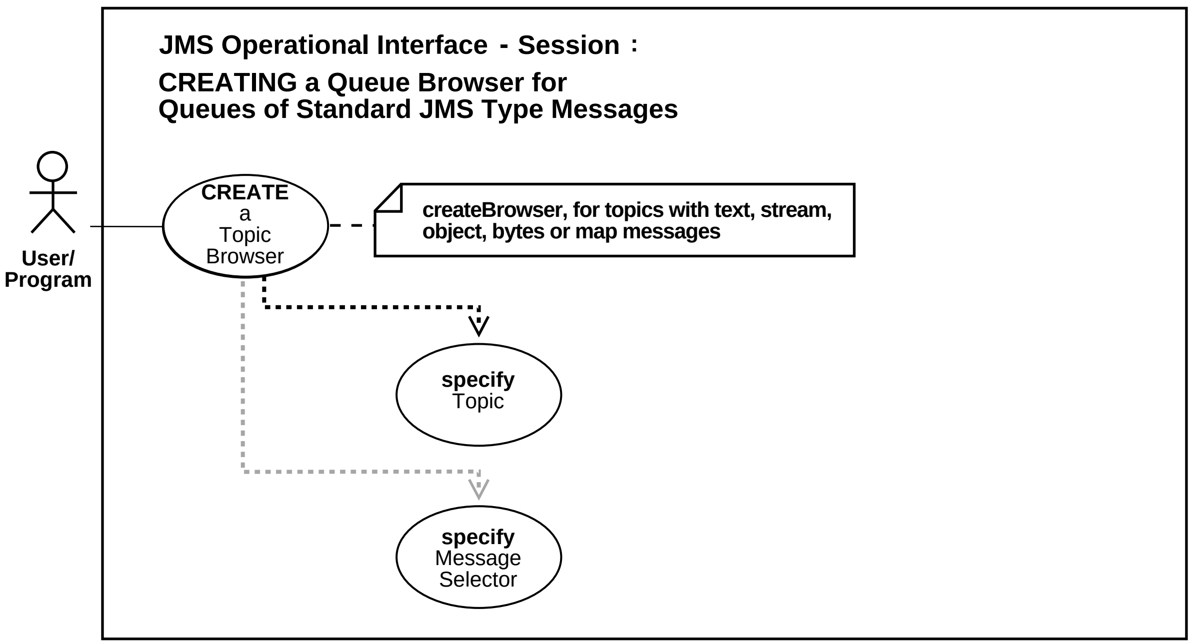
Example

```
TopicConnectionFactory     tc_fact    = null;
TopicConnection            t_conn     = null;
TopicSession               t_sess     = null;
TopicSession               jms_sess;
Topic                      shipped_orders;
int                        myport = 5521;
TopicReceiver              receiver;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
```

```
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("WS", "Shipped_Orders_
Topic");

receiver = ((AQjmsSession)jms_sess).createTopicReceiver(shipped_orders,
"WesternRegion", null);
```

Creating a Topic Browser for Topics with Text, Stream, Objects, Bytes or Map Messages

Figure 15–21 Creating a Topic Browser for Topics with Text, Stream, Objects, Bytes or Map Messages



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.Session" on page B-34
- "Creating a Topic Browser for Topics with Text, Stream, Objects, Bytes, Map Messages, Locking Messages While Browsing" on page 15-50

Purpose

Create a topic browser for topics with text, stream, objects, bytes, or map messages.

Usage Notes

To retrieve messages that have a certain correlationID, the selector for the TopicBrowser can be one of the following:

- `JMSMessageID = 'ID:23452345'` to retrieve messages that have a specified message ID
- JMS Message header fields or properties:

  ```
  JMSPriority < 3 AND JMSCorrelationID = 'Fiction'
  ```

- User defined message properties:

  ```
  color IN ('RED', BLUE', 'GREEN') AND price < 30000
  ```

All message IDs must be prefixed with "ID:". Use methods in `java.util.Enumeration` to go through a list of messages.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createBrowser

Example

Example 1

```
/* Create a browser without a selector */
TopicSession    jms_session;
TopicBrowser    browser;
Topic           topic;
```

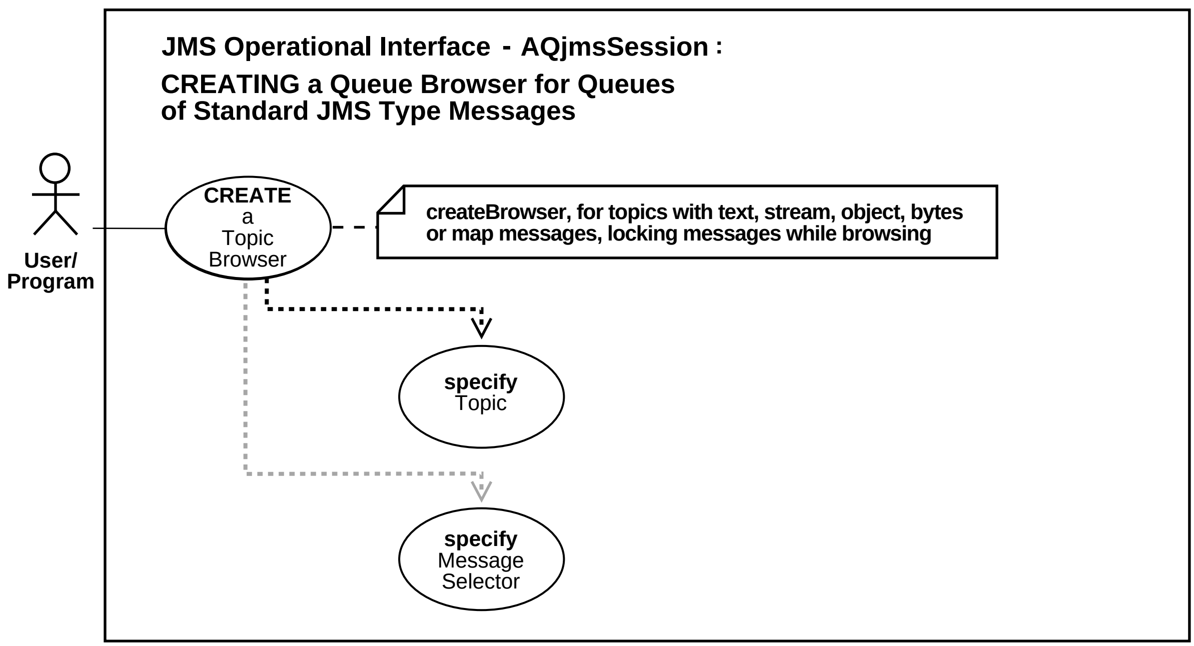
```
browser = ((AQjmsSession) jms_session).createBrowser(topic, "SUBS1");
```

Example2

```
/* Create a browser for topics with a specified selector */
TopicSession    jms_session;
TopicBrowser    browser;
Topic           topic;

/* create a Browser to look at messages with correlationID = RUSH  */
browser = ((AQjmsSession) jms_session).createBrowser(topic, "SUBS1",
    "JMSCorrelationID = 'RUSH'");
```

Creating a Topic Browser for Topics with Text, Stream, Objects, Bytes, Map Messages, Locking Messages While Browsing

Figure 15–22 Creating a Topic Browser for Topics with Text, Stream, Objects, Bytes or Map Messages, Locking Messages While Browsing



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Interface - javax.jms.Session" on page B-34
- "Creating a Topic Browser for Topics with Text, Stream, Objects, Bytes or Map Messages" on page 15-48

Purpose

Create a topic browser for topics with text, stream, objects, bytes or map messages, locking messages while browsing.

Usage Notes

If a locked parameter is specified as true, messages are locked as they are browsed. Hence these messages cannot be removed by other consumers until the browsing session ends the transaction.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createBrowser

Example

Example 1

```
/* Create a browser without a selector */
TopicSession    jms_session;
TopicBrowser    browser;
Topic           topic;

browser = ((AQjmsSession) jms_session).createBrowser(topic,
    "SUBS1", true);
```

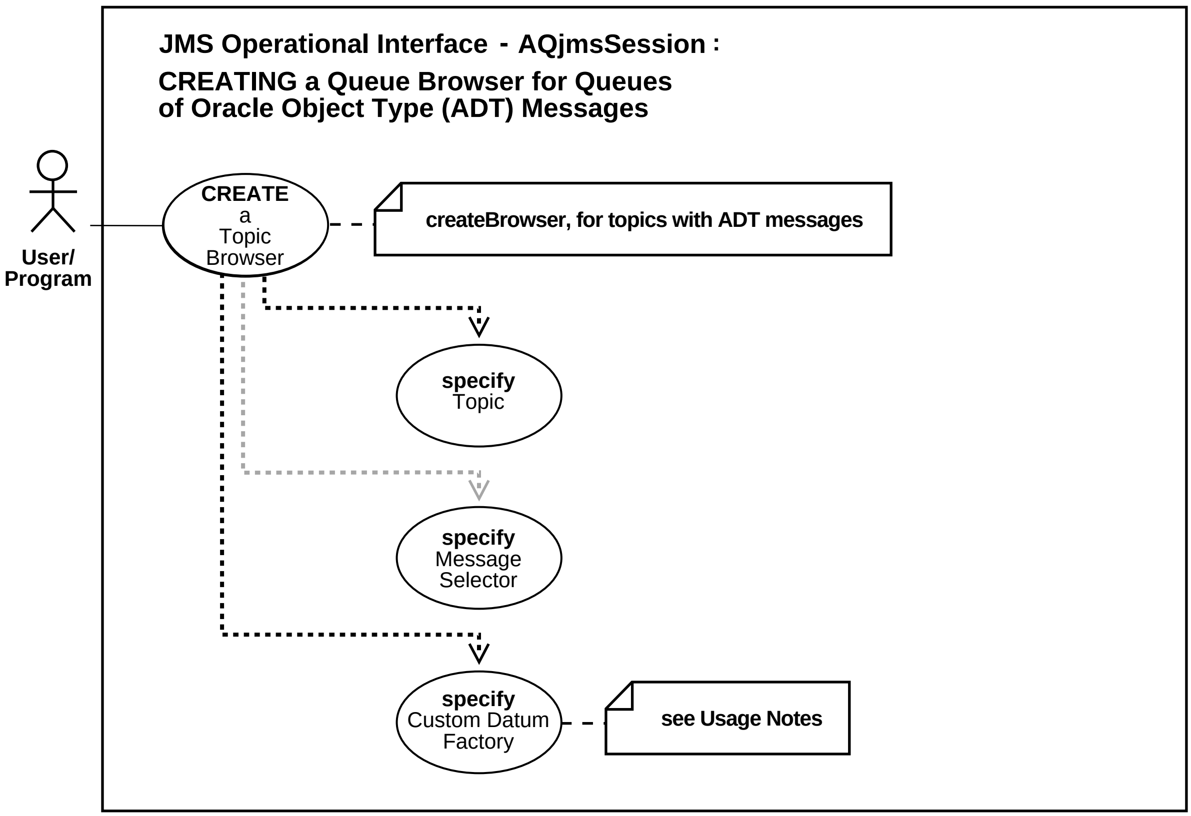
Example 2

```
/* Create a browser for topics with a specified selector */
TopicSession    jms_session;
TopicBrowser    browser;
Topic           topic;

/* create a Browser to look at messages with correlationID = RUSH in
```

```
lock mode */

browser = ((AQjmsSession) jms_session).createBrowser(topic,
    "SUBS1", "JMSCorrelationID = 'RUSH'", true);
```

Creating a Topic Browser for Topics of Oracle Object Type (ADT) Messages

Figure 15–23 Creating a Topic Browser for Topics of Oracle Object Type (ADT) Messages



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Creating a Topic Browser for Topics of Oracle Object Type (ADT) Messages, Locking Messages While Browsing" on page 15-55

Purpose

Create a topic browser for topics of Oracle object type (ADT) messages.

Usage Notes

For topics containing `AdtMessages,` the selector for TopicBrowser can be a SQL expression on the message payload contents or messageID or priority or correlationID.

- Selector on message id - to retrieve messages that have a specific messageID

  `msgid` = '23434556566767676'

  Note: in this case message IDs must NOT be prefixed with "ID:"

- Selector on priority or correlation is specified as follows:

  `priority < 3 AND corrid = 'Fiction'`

- Selector on message payload is specified as follows:

  `tab.user_data.color = 'GREEN' AND tab.user_data.price < 30000`

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createBrowser

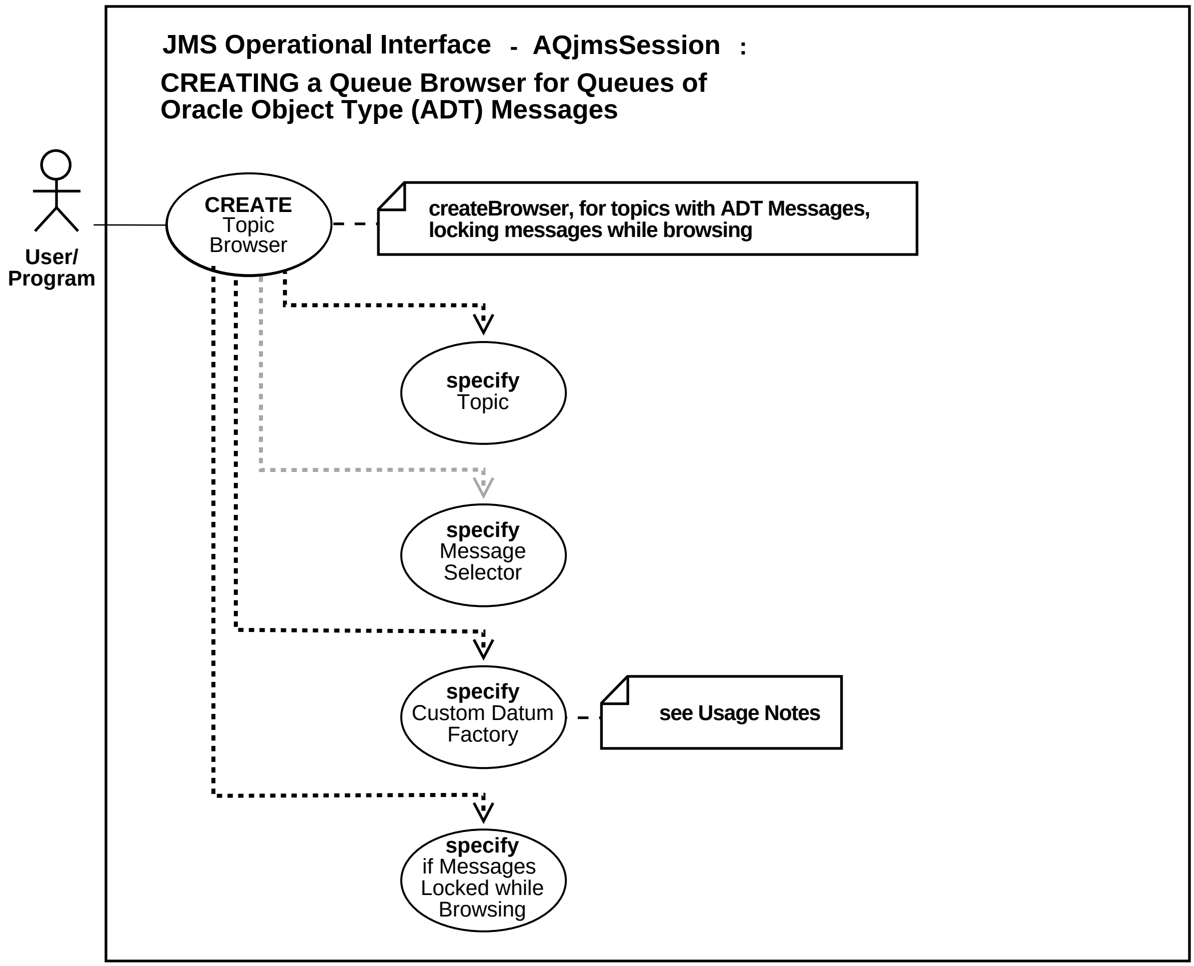
Example

The CustomDatum factory for a particular Java class that maps to the SQL ADT payload can be obtained using the `getFactory` static method. Assume the `Topic - test_topic` has payload of type `SCOTT.EMPLOYEE` and the Java class that is generated by Jpublisher for this ADT is called `Employee`. The Employee class implements the CustomDatum interface. The `CustomDatumFactory` for this class can be obtained by using the `Employee.getFactory()` method.

```
/* Create a browser for a Topic with Adt messages of type EMPLOYEE*/
TopicSession jms_session
TopicBrowser browser;
Topic        test_topic;

browser = ((AQjmsSession) jms_session).createBrowser(test_topic,
    "SUBS1", Employee.getFactory());
```

Creating a Topic Browser for Topics of Oracle Object Type (ADT) Messages, Locking Messages While Browsing

Figure 15–24 Creating a Topic Browser for Topics of Oracle Object Type (ADT) Messages, Locking Messages while Browsing



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53
- "Creating a Topic Browser for Topics of Oracle Object Type (ADT) Messages" on page 15-52

Purpose

Create a topic browser for topics of Oracle object type (ADT) messages, locking messages while browsing.

Usage Notes

Not applicable.

Syntax

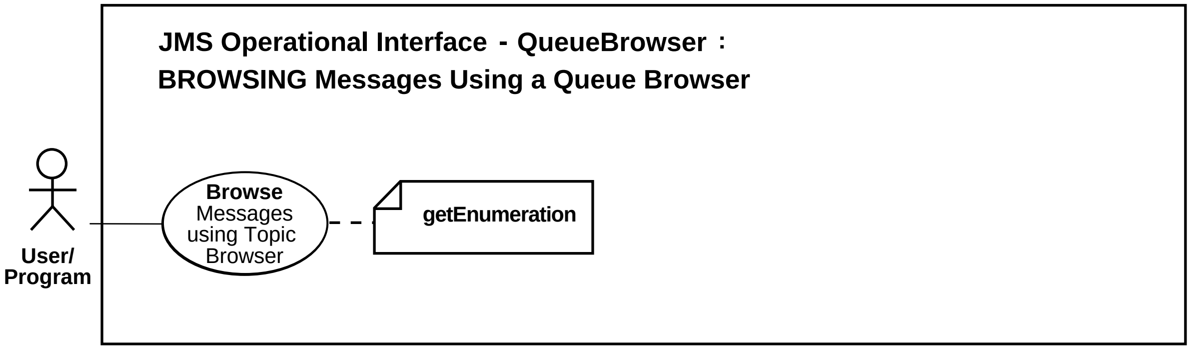
Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createBrowser

Example

```
/* Create a browser for a Topic with ADT messages of type EMPLOYEE* in
lock mode/
TopicSession jms_session
TopicBrowser browser;
Topic        test_topic;

browser = ((AQjmsSession) jms_session).createBrowser(test_topic,
    "SUBS1", Employee.getFactory(), true);
```

Browsing Messages Using a Topic Browser

Figure 15–25 Browsing Messages Using a Topic Browser



See Also:

- Table 15–1 for a list of publish-subscribe basic operations in the JMS operational interface
- "Class - oracle.jms.AQjmsTopicBrowser" on page B-59

Purpose

Browse messages using a topic browser.

Usage Notes

Use methods in `java.util.Enumeration` to go through the list of messages. Use the method `purgeSeen` in TopicBrowser to purge messages that have been seen during the current browse.

Syntax

Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, TopicBrowser, AQjmsTopicBrowser

Example

```
/* Create a browser for topics with a specified selector */
public void browse_rush_orders(TopicSession jms_session)
{
    TopicBrowser    browser;
```

```
    Topic           topic;
    ObjectMessage   obj_message
    BolOrder        new_order;
    Enumeration     messages;

    /* get a handle to the new_orders topic */
    topic = ((AQjmsSession) jms_session).getTopic("OE", "OE_bookedorders_
topic");

    /* create a Browser to look at RUSH orders */
    browser = ((AQjmsSession) jms_session).createBrowser(topic,
        "SUBS1", "JMSCorrelationID = 'RUSH'");

    /* Browse through the messages */
    for (messages = browser.elements() ; message.hasMoreElements() ;)
    {
        obj_message = (ObjectMessage)message.nextElement();
    }

    /* Purge messages seen during this browse */
    browser.purgeSeen();
}
```

16

JMS Operational Interface: Basic Operations (Shared Interfaces)

In this chapter we describe the operational interface (shared interfaces) to Oracle Advanced Queuing in terms of use cases. That is, we discuss each operation (such as "Enqueue a Message") as a use case by that name. The table listing all the use cases is provided at the head of the chapter (see " Use Case Model: Operational Interface — Basic Operations (Shared Interfaces)" on page 16-2).

A summary figure, "Use Case Diagram: Operational Interface — Basic Operations", locates all the use cases in a single drawing. If you are using the HTML version of this document, you can use this figure to navigate to the use case that interests you by clicking on the relevant use case title.

Each use case is laid out as follows:

- ***Use case figure***. A figure that depicts the use case.
- ***Purpose***. The purpose of this use case.
- ***Usage Notes.*** Guidelines to assist implementation.
- ***Syntax***. The main syntax used to perform this activity.
- ***Examples***. Examples in each programmatic environment that illustrate the use case.

Use Case Model: JMS Operational Interface — Basic Operations (Shared Interfaces)

Table 16–1 Use Case Model: Operational Interface — Basic Operations (Shared Interfaces)

Use Case
Starting a JMS Connection on page 16-5
Getting the JMS Connection from a Session on page 16-6
Committing All Operations in a Session on page 16-7
Rolling Back All Operations in a Session on page 16-8
Getting the Underlying JDBC Connection from a JMS Session on page 16-10
Getting the Underlying OracleOCIConnectionPool from a JMS Connection on page 16-11
Creating a Bytes Message on page 16-12
Creating a Map Message on page 16-13
Creating a Stream Message on page 16-15
Creating an Object Message on page 16-16
Creating a Text Message on page 16-17
Creating a JMS Message on page 16-19
Creating a JMS Message (Header Only) on page 16-20
Creating an ADT Message on page 16-21
Specifying Message Correlation ID on page 16-23
Specifying JMS Message Property on page 16-25
Specifying JMS Message Property as Boolean on page 16-27
Specifying JMS Message Property as String on page 16-29
Specifying JMS Message Property as Int on page 16-31
Specifying JMS Message Property as Double on page 16-33
Specifying JMS Message Property as Float on page 16-35
Specifying JMS Message Property as Byte on page 16-37
Specifying JMS Message Property as Long on page 16-39
Specifying JMS Message Property as Short on page 16-41

Table 16–1 (Cont.) Use Case Model: Operational Interface — Basic Operations (Shared Interfaces)

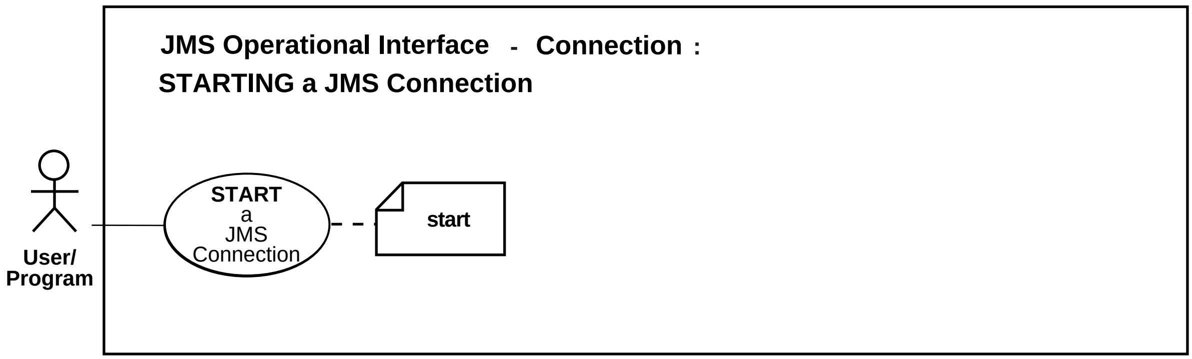
Use Case
Specifying JMS Message Property as Object on page 16-43
Setting Default TimeToLive for All Messages Sent by a Message Producer on page 16-45
Setting Default Priority for All Messages Sent by a Message Producer on page 16-46
Creating an AQjms Agent on page 16-48
Receiving a Message Synchronously Using a Message Consumer by Specifying Timeout on page 16-50
Receiving a Message Synchronously Using a Message Consumer Without Waiting on page 16-52
Specifying the Navigation Mode for Receiving Messages on page 16-53
Specifying a Message Listener to Receive a Message Asynchronously at the Message Consumer on page 16-55
Specifying a Message Listener to Receive a Message Asynchronously at the Session on page 16-58
Getting the Correlation ID of a Message on page 16-59
Getting the Message ID of a Message as Bytes on page 16-60
Getting the Message ID of a Message as a String on page 16-61
Getting the JMS Message Property on page 16-63
Getting the JMS Message Property as a Boolean on page 16-64
Getting the JMS Message Property as a String on page 16-66
Getting the JMS Message Property as Int on page 16-68
Getting the JMS Message Property as Double on page 16-70
Getting the JMS Message Property as Float on page 16-71
Getting the JMS Message Property as Byte on page 16-73
Getting the JMS Message Property as Long on page 16-74
Getting the JMS Message Property as Short on page 16-76
Getting the JMS Message Property as Object on page 16-76
Closing a Message Producer on page 16-79
Closing a Message Consumer on page 16-80
Stopping a JMS Connection on page 16-81
Closing a JMS Session on page 16-82
Closing a JMS Connection on page 16-83

Table 16–1 (Cont.) Use Case Model: Operational Interface — Basic Operations (Shared Interfaces)

Use Case
Getting the Error Code for the JMS Exception on page 16-84
Getting the Error Number for the JMS Exception on page 16-85
Getting the Error Message for the JMS Exception on page 16-86
Getting the Exception Linked to the JMS Exception on page 16-88
Printing the Stack Trace for the JMS Exception on page 16-89
Setting the Exception Listener on page 16-90
Getting the Exception Listener on page 16-91
Setting the Ping Period for the Exception Listener on page 16-93
Getting the Ping Period for the Exception Listener on page 16-94

Starting a JMS Connection

Figure 16–1 Starting a JMS Connection



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Connection" on page B-24

Purpose

Start a JMS Connection for receiving messages.

Usage Notes

The start method is used to start (or restart) the connection's delivery of incoming messages.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- See Java (JDBC): *Oracle9i Supplied Java Packages Reference*, oracle.jms AQjmsConnection.start

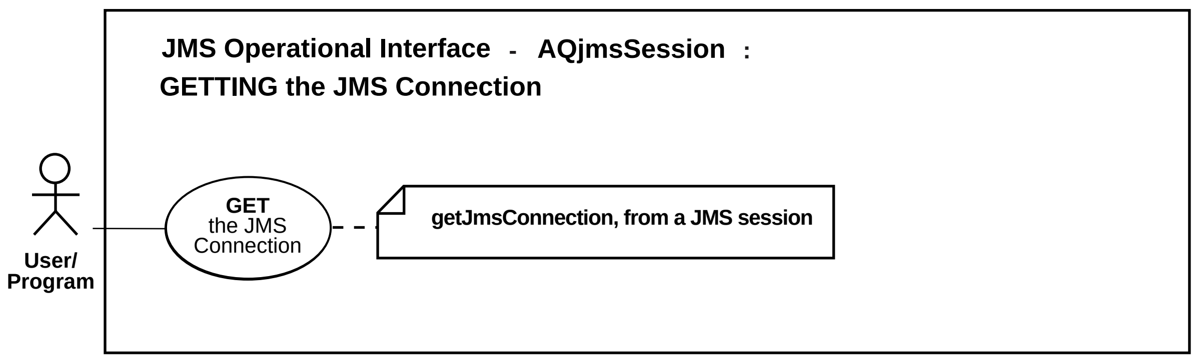
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the JMS Connection from a Session

Figure 16–2 Getting the JMS Connection from a Session



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Get the JMS Connection from a Session

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.getJmsConnection

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Committing All Operations in a Session

Figure 16–3 Committing All Operations in a Session

See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Session" on page B-34

Purpose

Commit All Operations in a Session

Usage Notes

This method commits all JMS and SQL operations performed in this session.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

- See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.commit

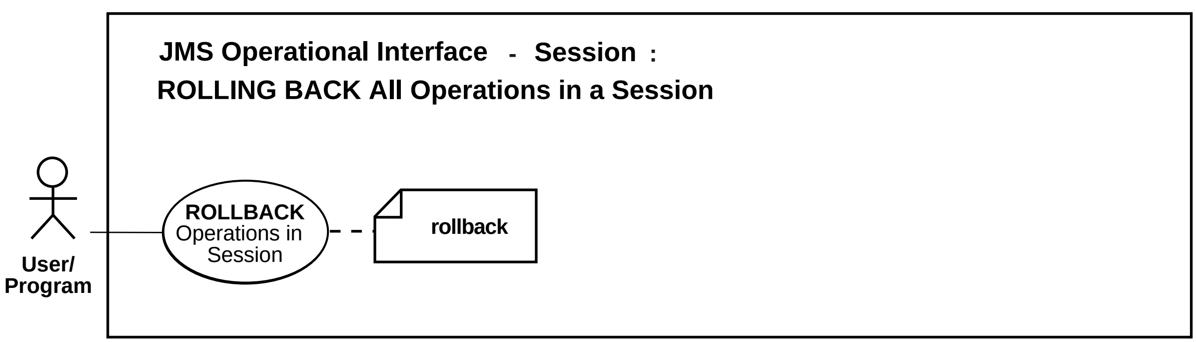
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Rolling Back All Operations in a Session

Figure 16–4 Rolling Back All Operations in a Session



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Session" on page B-34

Purpose

Rollback All Operations in a Session

Usage Notes

This method aborts all JMS and SQL operations performed in this session.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.rollback

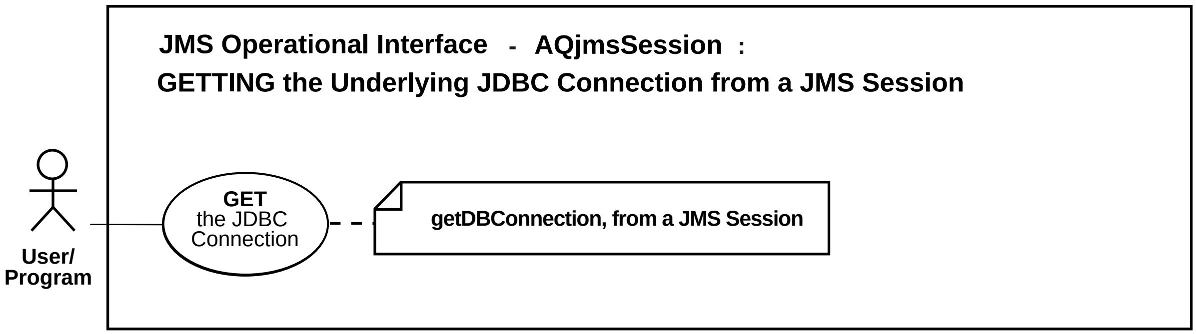
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the Underlying JDBC Connection from a JMS Session

Figure 16–5 Getting the Underlying JDBC Connection from a JMS Session



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Get the Underlying JDBC Connection from a JMS session

Usage Notes

This method is used to obtain the underlying JDBC connection from a JMS session. The JDBC connection may be used to perform SQL operations as part of the same transaction that the JMS operations are done.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.getDBConnection

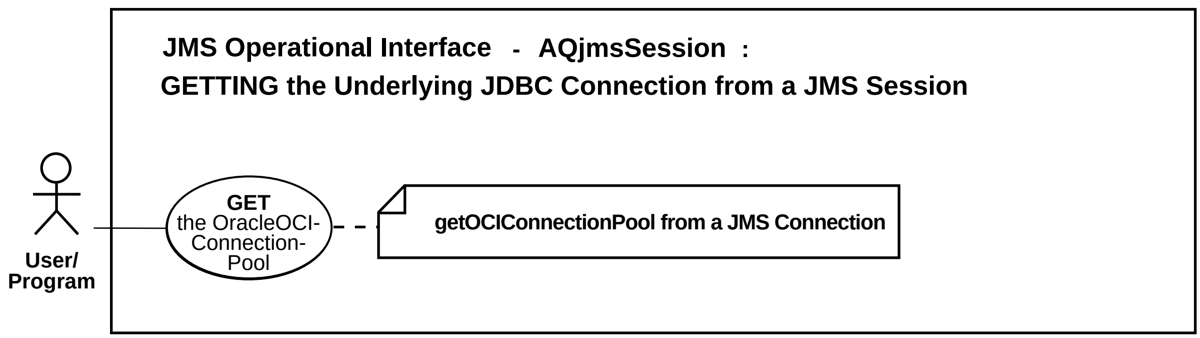
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

```
java.sql.Connection db_conn;
QueueSession     jms_sess;
db_conn = ((AQjmsSession)jms_sess).getDBConnection();
```

Getting the Underlying OracleOCIConnectionPool from a JMS Connection

Figure 16–6 Getting the Underlying OracleOCIConnectionPool from a JMS Connection



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Get the underlying `OracleOCIConnectionPool` from a JMS connection.

Usage Notes

This method is used to obtain the underlying `OracleOCIConnectionPool` instance from a JMS connection. The settings of the `OracleOCIConnectionPool` instance may be tuned by the user depending on the connection usage, for example, the number of sessions the user wants to create using the given connection. The user should not, however, close the `OracleOCIConnectionPool` instance being used by the JMS connection.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

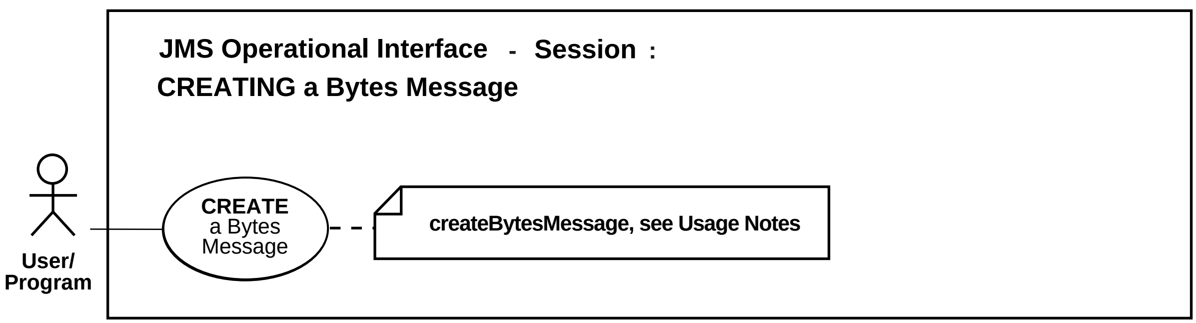
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsConnection.getOCIConnectionPool

Examples

```
oracle.jdbc.pool.OracleOCIConnectionPool cpool;
QueueConnection jms_conn;
cpool = ((AQjmsConnection)jms_conn).getOCIConnectionPool();
```

Creating a Bytes Message

Figure 16–7 Creating a Bytes Message



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Session" on page B-34

Purpose

Create a Bytes Message

Usage Notes

This method can be used only if the queue table that contains the destination queue/topic was created with the `SYS.AQ$_JMS_BYTES_MESSAGE` or `AQ$_JMS_MESSAGE` payload types.

Refer to Java Packages Reference for methods used to populate a BytesMessage.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createBytesMessage

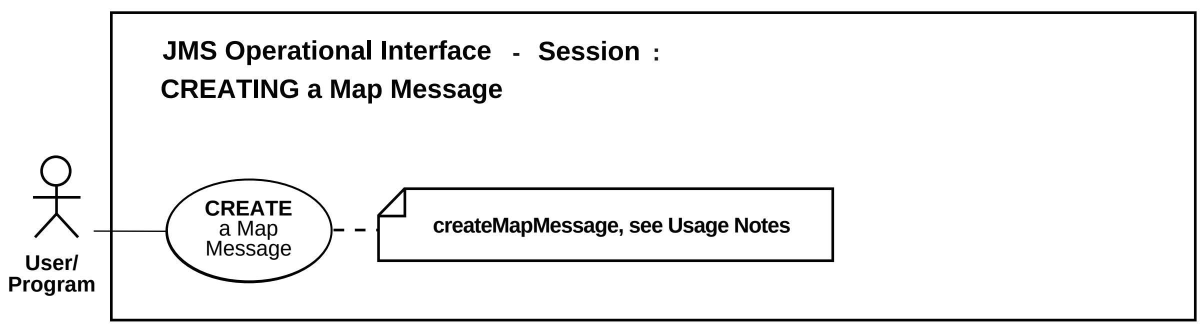
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Creating a Map Message

Figure 16–8 Creating a Map Message



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Session" on page B-34

Purpose

Create a Map Message

Usage Notes

This method can be used only if the queue table that contains the destination queue/topic was created with the `SYS.AQ$_JMS_MAP_MESSAGE` or `AQ$_JMS_MESSAGE` payload types.

Refer to Java Packages Reference for methods used to populate a MapMessage.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createMapMessage

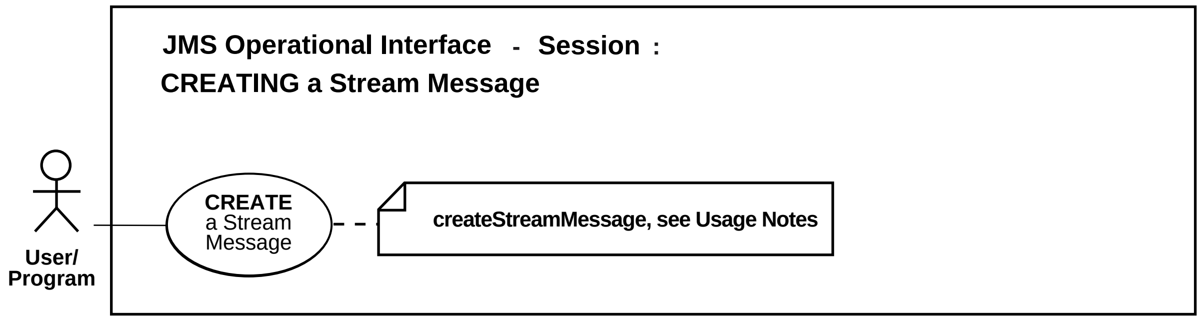
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Creating a Stream Message

Figure 16–9 Creating a Stream Message



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Session" on page B-34

Purpose

Create a Stream Message

Usage Notes

This method can be used only if the queue table that contains the destination queue/topic was created with the `SYS.AQ$_JMS_STREAM_MESSAGE` or `AQ$_JMS_MESSAGE` payload types.

Refer to Java Packages Reference for methods used to populate a StreamMessage.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createStreamMessage

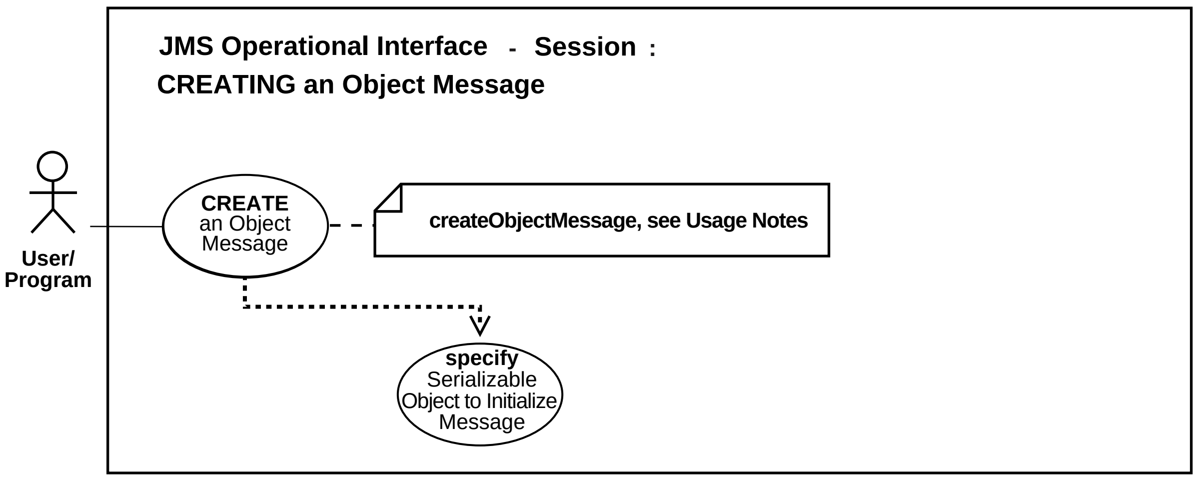
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Creating an Object Message

Figure 16–10 Creating an Object Message



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Session" on page B-34

Purpose

Create an Object Message

Usage Notes

This method can be used only if the queue table that contains the destination queue/topic was created with the `SYS.AQ$_JMS_OBJECT_MESSAGE` or `AQ$_JMS_MESSAGE` payload types.

Refer to Java Packages Reference for methods used to populate a ObjectMessage.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createObjectMessage

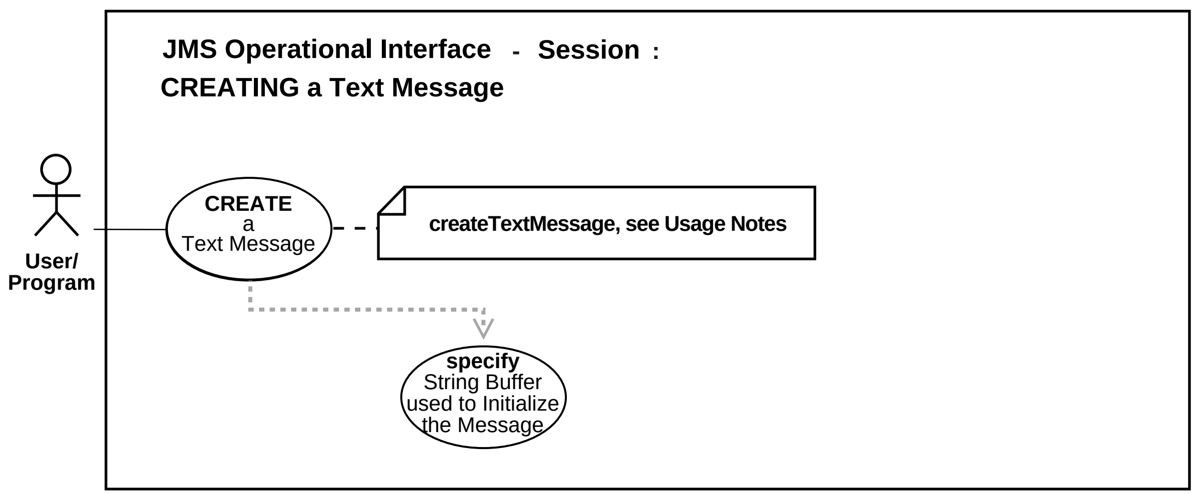
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Creating a Text Message

Figure 16–11 Creating a Text Message



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Session" on page B-34

Purpose

Create a Text Message

Usage Notes

This method can be used only if the queue table that contains the destination queue/topic was created with the `SYS.AQ$_JMS_TEXT_MESSAGE` or `AQ$_JMS_MESSAGE` payload types.

Refer to Java Packages Reference for methods used to populate a Text Message.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

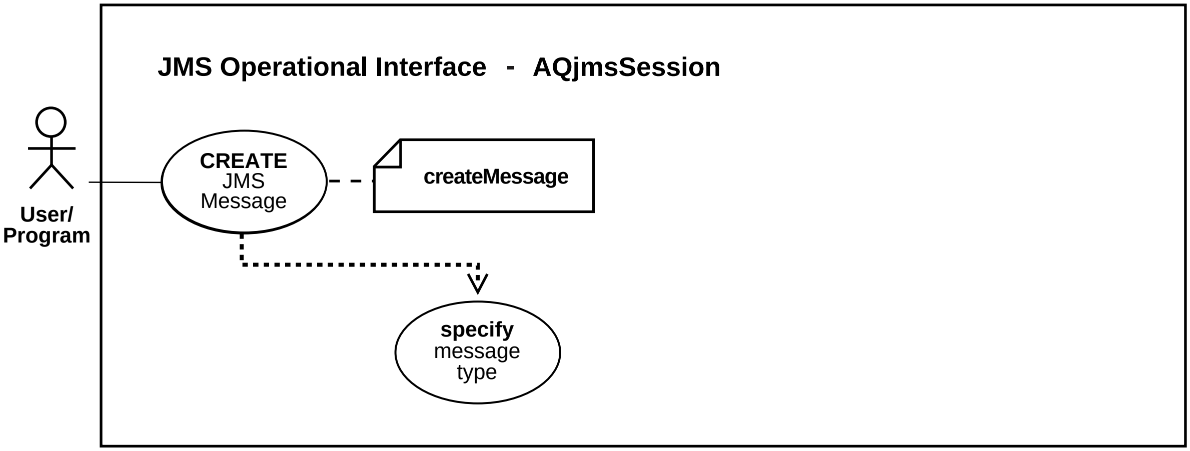
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createTextMessage

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

Creating a JMS Message

Figure 16–12 Creating a JMS Message



Purpose

Create a JMS message

Usage Notes

Use this ADT to store any or all of the JMS message types: bytes messages (`JMSBytes`), map messages (`JMSMap`), stream messages (`JMSStream`), object messages (`JMSObject`), or text messages (`JMSText`).

You can use the `AQ$_JMS_MESSAGE` construct message to construct messages of different types. The message type must be one of the following:

- `DBMS_AQ.JMS_TEXT_MESSAGE`
- `DBMS_AQ.JMS_OBJECT_MESSAGE`
- `DBMS_AQ.JMS_MAP_MESSAGE`
- `DBMS_AQ.JMS_BYTES_MESSAGE`
- `DBMS_AQ.JMS_STREAM_MESSAGE`

> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference* for more information on JMS types.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createMessage

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

Creating a JMS Message (Header Only)

Figure 16–13 Creating a JMS Message (Header Only)

Purpose

Create a header-only JMS message

Usage Notes

Use this ADT to store any or all of the JMS message types: bytes messages (`JMSBytes`), map messages (`JMSMap`), stream messages (`JMSStream`), object messages (`JMSObject`), or text messages (`JMSText`).

> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference* for more information on JMS types.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

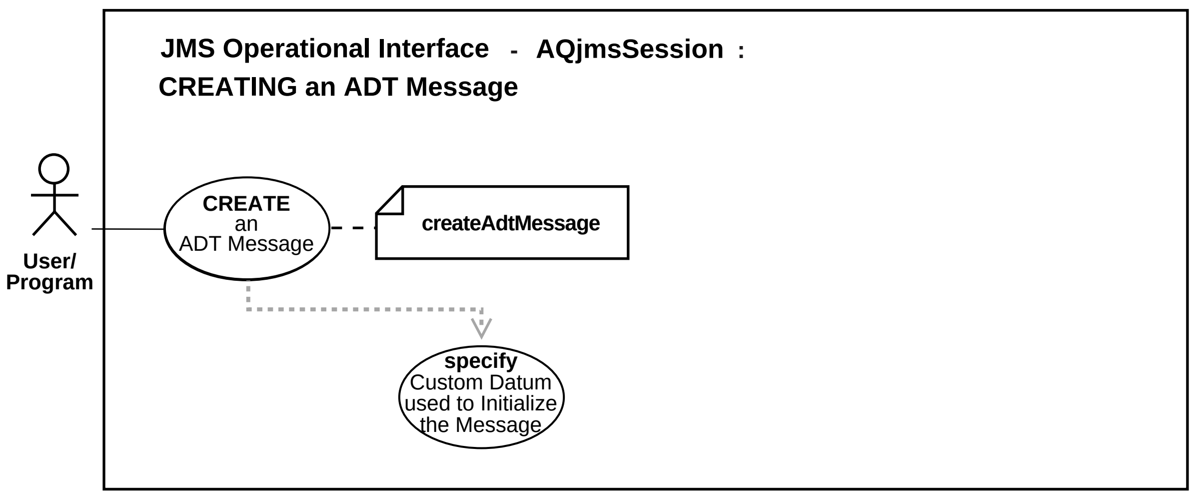
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createMessage

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

Creating an ADT Message

Figure 16–14 Creating an ADT Message



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Class - oracle.jms.AQjmsSession" on page B-53

Purpose

Create an ADT Message

Usage Notes

This method can be used only if the queue table that contains the queue/topic was created with an Oracle ADT payload_type (not one of the SYS.AQ$_JMS* types).

An ADT message must be populated with an object that implements the CustomDatum interface. This object must be the java mapping of the SQL ADT defined as the payload for the queue/topic. Java classes corresponding to SQL ADTs may be generated using the Jpublisher tool. Please refer to the JDBC documentation for details on CustomDatum interface and Jpublisher.

Refer to Java Packages Reference for methods used to populate `AdtMessage`.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.createAdtMessage

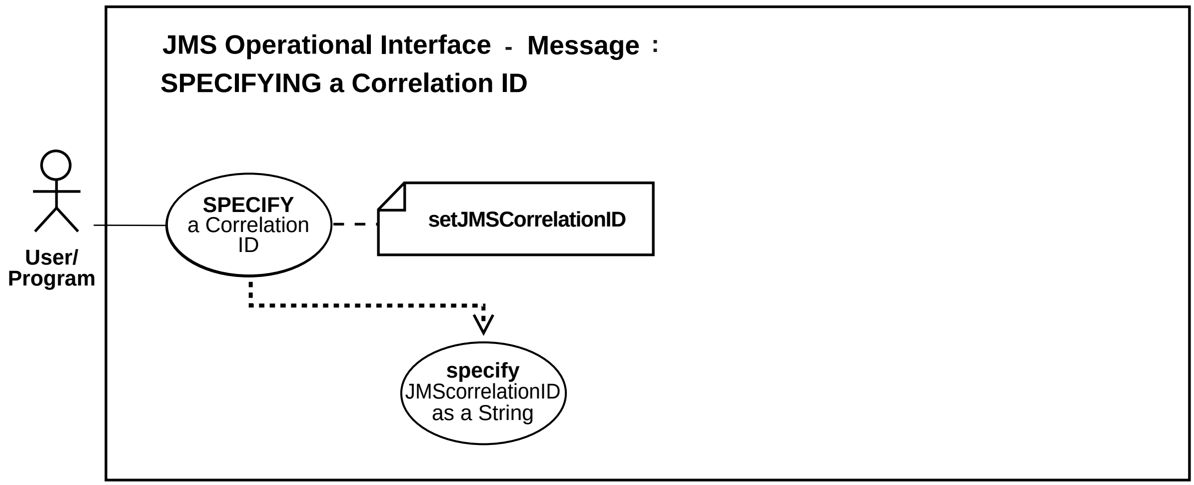
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available f.nctions in each programmatic environment.

- No example is provided with this release.

Specifying Message Correlation ID

Figure 16–15 Specifying Message Correlation ID



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27

Purpose

Specify message correlation ID.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.setJMSCorrelationID

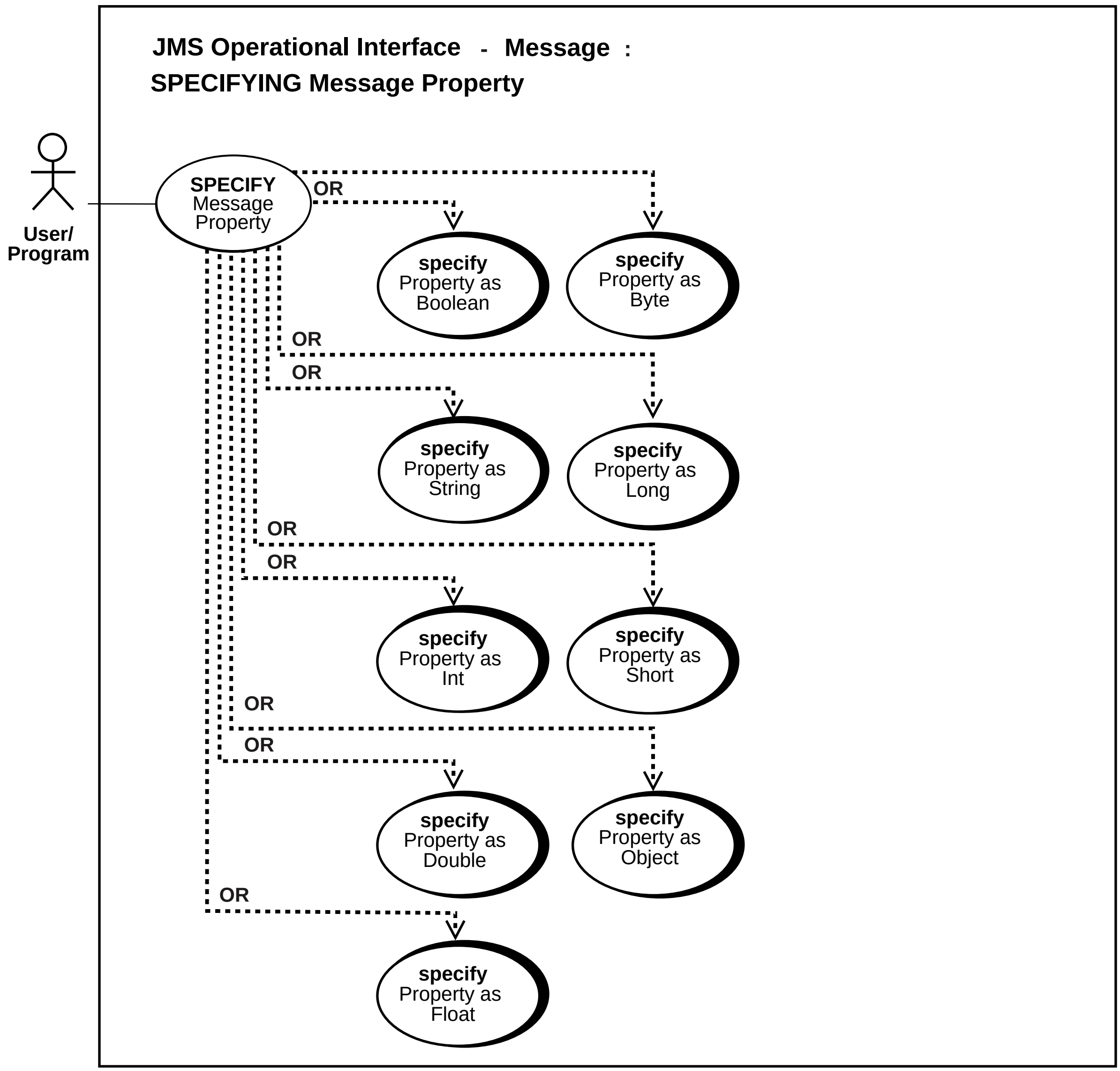
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Specifying JMS Message Property

Figure 16–16 Specifying JMS Message Property



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Specifying JMS Message Property as Boolean" on page 16-27
- "Specifying JMS Message Property as String" on page 16-29
- "Specifying JMS Message Property as Int" on page 16-31
- "Specifying JMS Message Property as Double" on page 16-33
- "Specifying JMS Message Property as Float" on page 16-35
- "Specifying JMS Message Property as Byte" on page 16-37
- "Specifying JMS Message Property as Long" on page 16-39
- "Specifying JMS Message Property as Short" on page 16-41
- "Specifying JMS Message Property as Object" on page 16-43

Usage Notes

Property names starting with JMS are provider specific. User-defined properties cannot start with JMS.

The following provider properties may be set by clients using Text, Stream, Object, Bytes or Map Message:

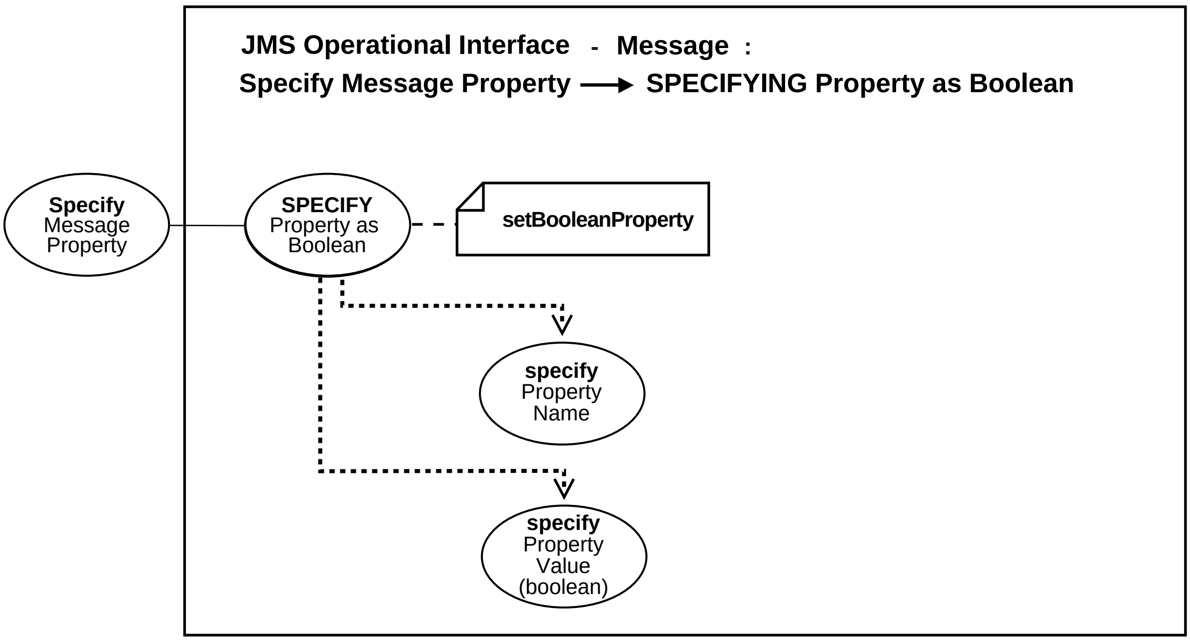
- JMSXAppID (String)
- JMSXGroupID (string)
- JMSXGroupSeq (int)
- JMS_OracleExcpQ (String) - exception queue
- JMS_OracleDelay (int) - message delay (seconds)

The following properties may be set on AdtMessage

- JMS_OracleExcpQ (String) - exception queue - specified as "<schema>.queue_name"
- JMS_OracleDelay (int) - message delay (seconds)

Specifying JMS Message Property as Boolean

Figure 16–17 Specifying Message Property as Boolean



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Specifying JMS Message Property" on page 16-25
- "Specifying JMS Message Property as String" on page 16-29
- "Specifying JMS Message Property as Int" on page 16-31
- "Specifying JMS Message Property as Double" on page 16-33
- "Specifying JMS Message Property as Float" on page 16-35
- "Specifying JMS Message Property as Byte" on page 16-37
- "Specifying JMS Message Property as Long" on page 16-39
- "Specifying JMS Message Property as Short" on page 16-41
- "Specifying JMS Message Property as Object" on page 16-43

Purpose

Specify Message Property as Boolean

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.setBooleanProperty

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Specifying JMS Message Property as String

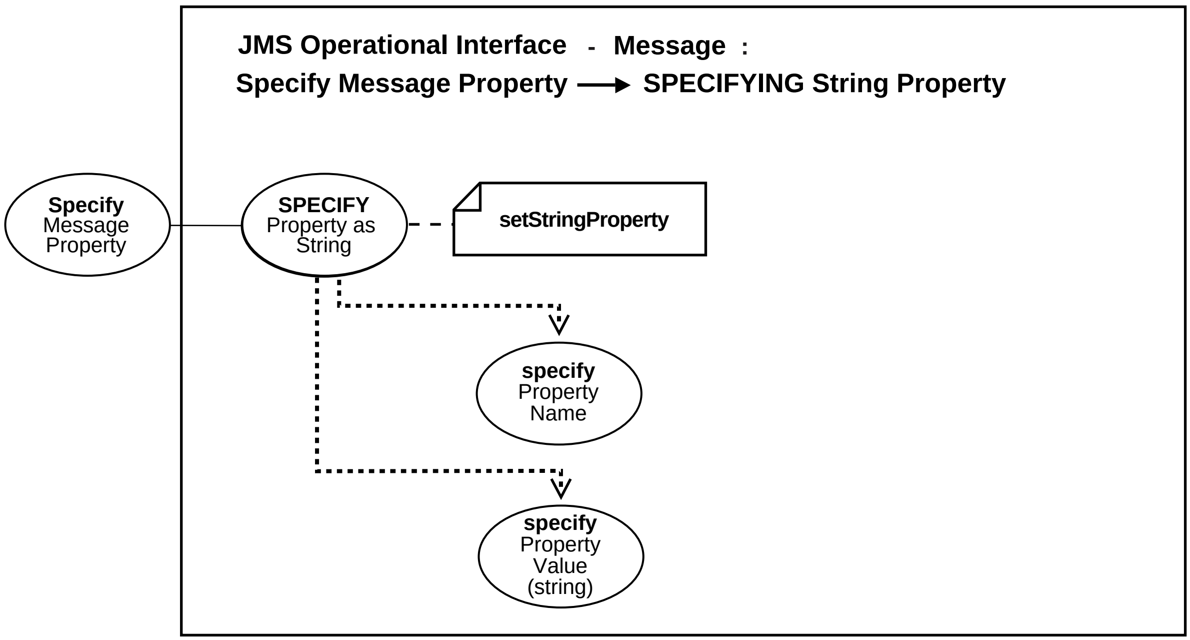


Figure 16–18 Specifying Message Property as String

See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Specifying JMS Message Property" on page 16-25
- "Specifying JMS Message Property as Boolean" on page 16-27
- "Specifying JMS Message Property as Int" on page 16-31
- "Specifying JMS Message Property as Double" on page 16-33
- "Specifying JMS Message Property as Float" on page 16-35
- "Specifying JMS Message Property as Byte" on page 16-37
- "Specifying JMS Message Property as Long" on page 16-39
- "Specifying JMS Message Property as Short" on page 16-41
- "Specifying JMS Message Property as Object" on page 16-43

Purpose

Specify Message Property as String

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.setStringProperty

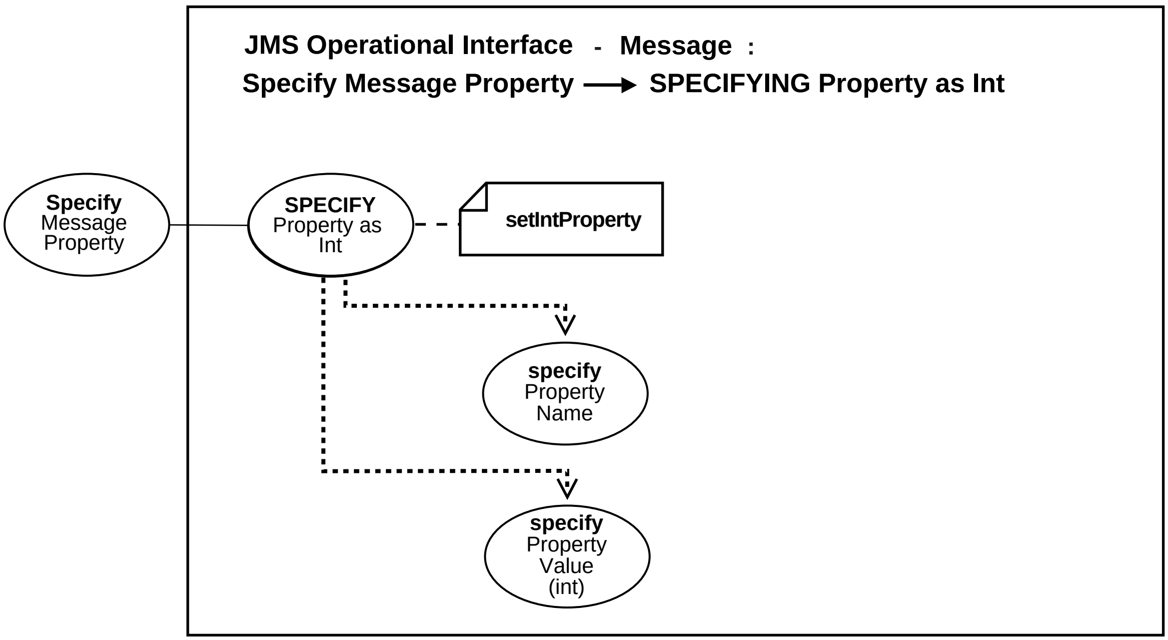
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Specifying JMS Message Property as Int

Figure 16–19 Specifying Message Property as Int



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Specifying JMS Message Property" on page 16-25
- "Specifying JMS Message Property as Boolean" on page 16-27
- "Specifying JMS Message Property as String" on page 16-29
- "Specifying JMS Message Property as Double" on page 16-33
- "Specifying JMS Message Property as Float" on page 16-35
- "Specifying JMS Message Property as Byte" on page 16-37
- "Specifying JMS Message Property as Long" on page 16-39
- "Specifying JMS Message Property as Short" on page 16-41
- "Specifying JMS Message Property as Object" on page 16-43

Purpose

Specify Message Property as Int

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.setIntProperty

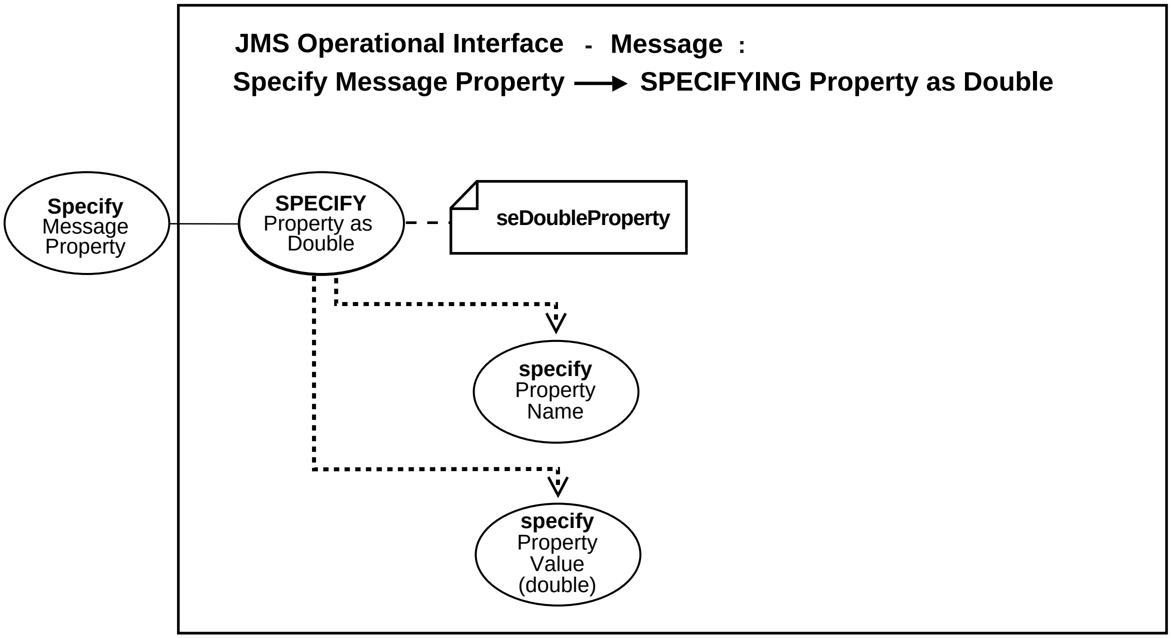
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Specifying JMS Message Property as Double

Figure 16–20 Specifying Message Property as Double



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Specifying JMS Message Property" on page 16-25
- "Specifying JMS Message Property as Boolean" on page 16-27
- "Specifying JMS Message Property as String" on page 16-29
- "Specifying JMS Message Property as Int" on page 16-31
- "Specifying JMS Message Property as Float" on page 16-35
- "Specifying JMS Message Property as Byte" on page 16-37
- "Specifying JMS Message Property as Long" on page 16-39
- "Specifying JMS Message Property as Short" on page 16-41
- "Specifying JMS Message Property as Object" on page 16-43

Purpose

Specify Message Property as Double

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.setDoubleProperty

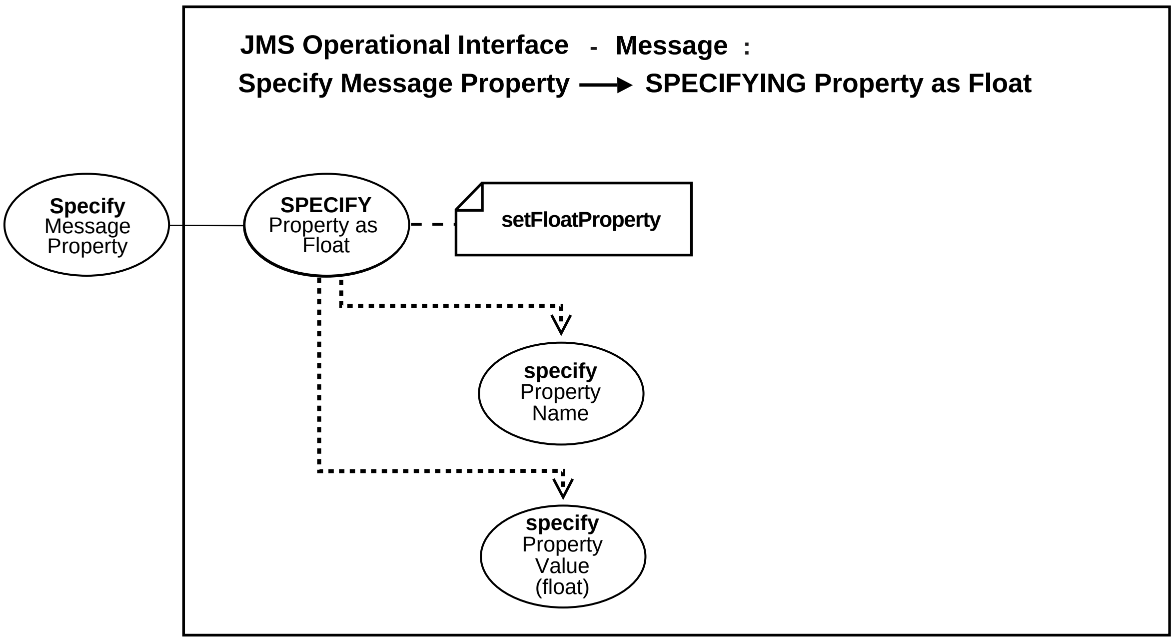
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Specifying JMS Message Property as Float

Figure 16–21 Specifying Message Property as Float



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Specifying JMS Message Property" on page 16-25
- "Specifying JMS Message Property as Boolean" on page 16-27
- "Specifying JMS Message Property as String" on page 16-29
- "Specifying JMS Message Property as Int" on page 16-31
- "Specifying JMS Message Property as Double" on page 16-33
- "Specifying JMS Message Property as Byte" on page 16-37
- "Specifying JMS Message Property as Long" on page 16-39
- "Specifying JMS Message Property as Short" on page 16-41
- "Specifying JMS Message Property as Object" on page 16-43

Purpose

Specify Message Property as Float

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.setFloatProperty

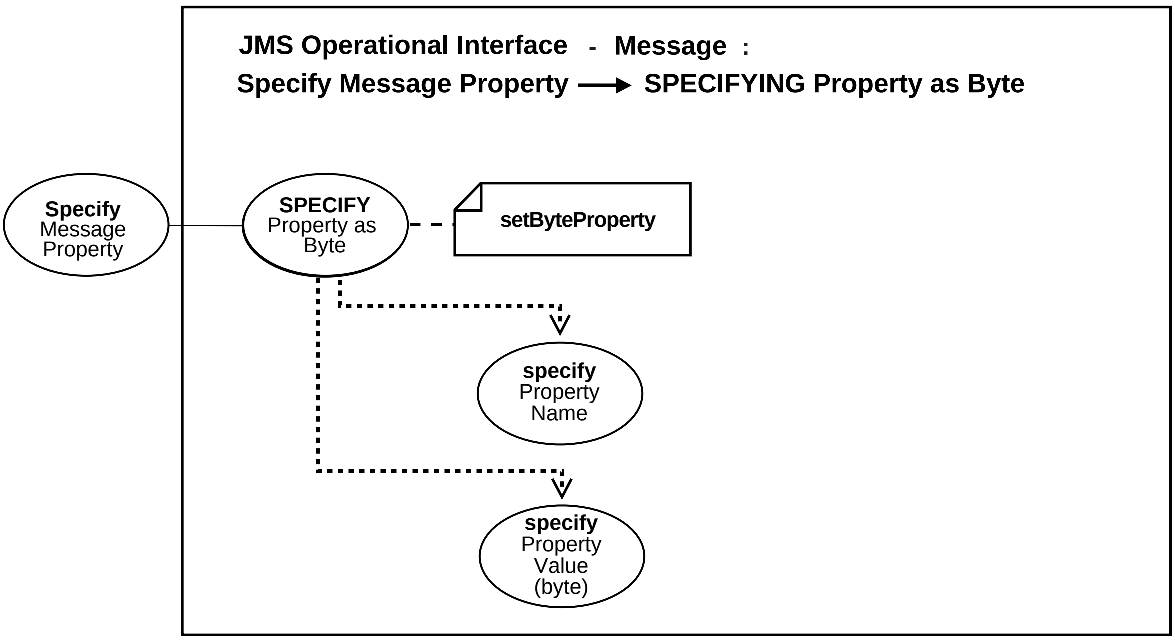
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Specifying JMS Message Property as Byte

Figure 16–22 Specifying Message Property as Byte



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Specifying JMS Message Property" on page 16-25
- "Specifying JMS Message Property as Boolean" on page 16-27
- "Specifying JMS Message Property as String" on page 16-29
- "Specifying JMS Message Property as Int" on page 16-31
- "Specifying JMS Message Property as Double" on page 16-33
- "Specifying JMS Message Property as Float" on page 16-35
- "Specifying JMS Message Property as Long" on page 16-39
- "Specifying JMS Message Property as Short" on page 16-41
- "Specifying JMS Message Property as Object" on page 16-43

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.setByteProperty

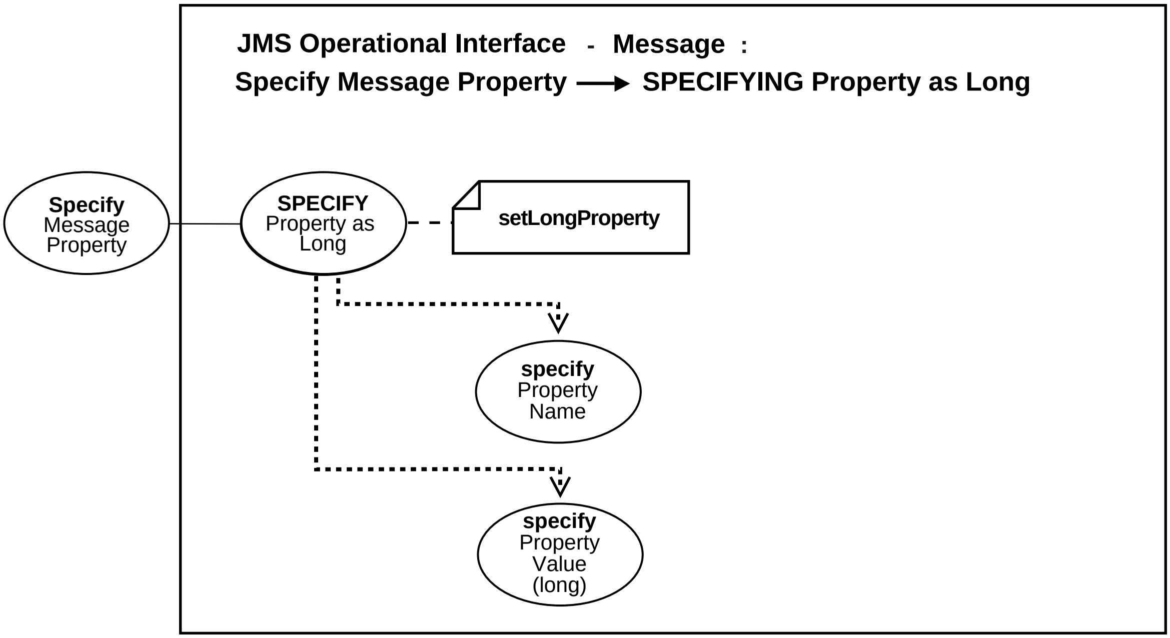
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Specifying JMS Message Property as Long

Figure 16–23 Use Case Diagram: Specifying Message Property as Long



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Specifying JMS Message Property" on page 16-25
- "Specifying JMS Message Property as Boolean" on page 16-27
- "Specifying JMS Message Property as String" on page 16-29
- "Specifying JMS Message Property as Int" on page 16-31
- "Specifying JMS Message Property as Double" on page 16-33
- "Specifying JMS Message Property as Float" on page 16-35
- "Specifying JMS Message Property as Byte" on page 16-37
- "Specifying JMS Message Property as Short" on page 16-41
- "Specifying JMS Message Property as Object" on page 16-43

Purpose

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.setLongProperty

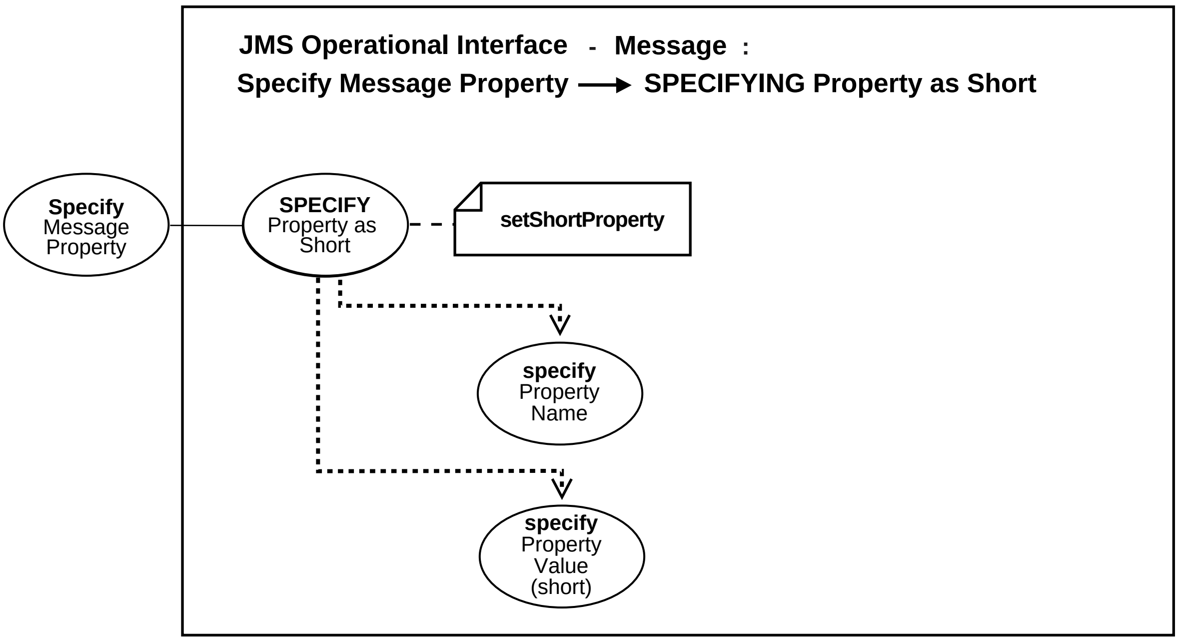
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Specifying JMS Message Property as Short

Figure 16–24 Specifying Message Property as Short



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Specifying JMS Message Property" on page 16-25
- "Specifying JMS Message Property as Boolean" on page 16-27
- "Specifying JMS Message Property as String" on page 16-29
- "Specifying JMS Message Property as Int" on page 16-31
- "Specifying JMS Message Property as Double" on page 16-33
- "Specifying JMS Message Property as Float" on page 16-35
- "Specifying JMS Message Property as Byte" on page 16-37
- "Specifying JMS Message Property as Long" on page 16-39
- "Specifying JMS Message Property as Object" on page 16-43

Purpose

Specify Message Property as Short

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.setShortProperty

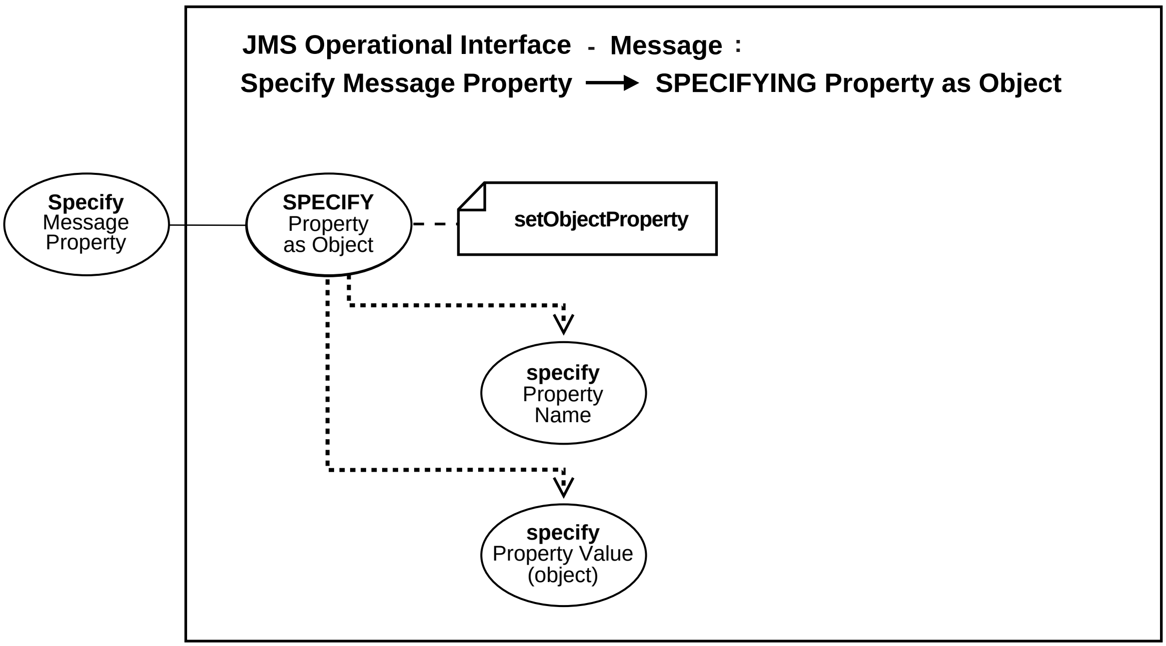
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Specifying JMS Message Property as Object

Figure 16–25 Specifying Message Property as Object



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Specifying JMS Message Property" on page 16-25
- "Specifying JMS Message Property as Boolean" on page 16-27
- "Specifying JMS Message Property as String" on page 16-29
- "Specifying JMS Message Property as Int" on page 16-31
- "Specifying JMS Message Property as Double" on page 16-33
- "Specifying JMS Message Property as Float" on page 16-35
- "Specifying JMS Message Property as Byte" on page 16-37
- "Specifying JMS Message Property as Long" on page 16-39
- "Specifying JMS Message Property as Short" on page 16-41

Purpose

Specify Message Property as Object

Usage Notes

Only objectified primitive values supported - Boolean, Byte, Short, Integer, Long, Float, Double and String.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.setObjectProperty

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Setting Default TimeToLive for All Messages Sent by a Message Producer

Figure 16–26 Setting Default TimeToLive for All Messages Sent by a MessageProducer

See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.MessageProducer" on page B-30

Purpose

Set Default TimeToLive for All Messages Sent by a Message Producer

Usage Notes

TimetoLive is specified in milliseconds. It is calculated after the message is in ready state (i.e after message delay has taken effect).

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsProducer.setTimeToLive

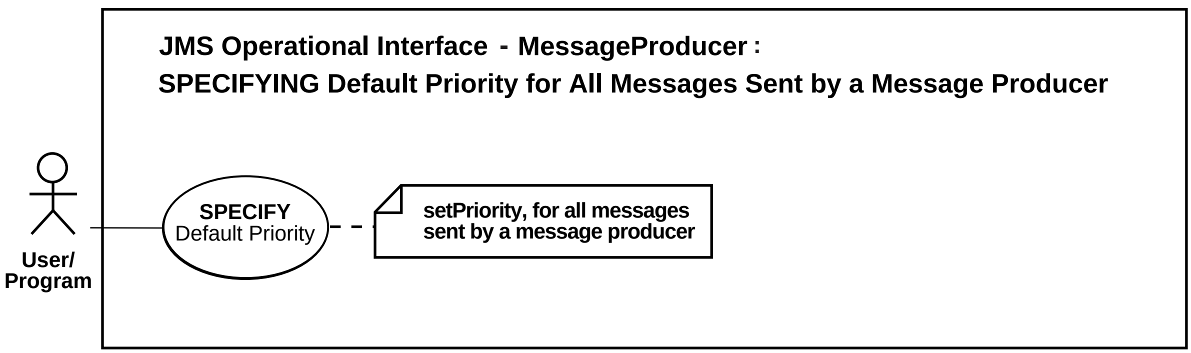
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

```
/* Set default timeToLive value to 100000 milliseconds for all messages sent by
the QueueSender*/
QueueSender sender;
sender.setTimeToLive(100000);
```

Setting Default Priority for All Messages Sent by a Message Producer

Figure 16–27 Setting Default Priority for All Messages Sent by a Message Producer



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.MessageProducer" on page B-30

Purpose

Set Default Priority for All Messages Sent by a Message Producer

Usage Notes

Priority values can be any integer. A smaller number indicates higher priority.

If a priority value is explicitly specified during the send operation, it overrides the producer’s default value set by this method.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsProducer.setPriority

Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

Example 1

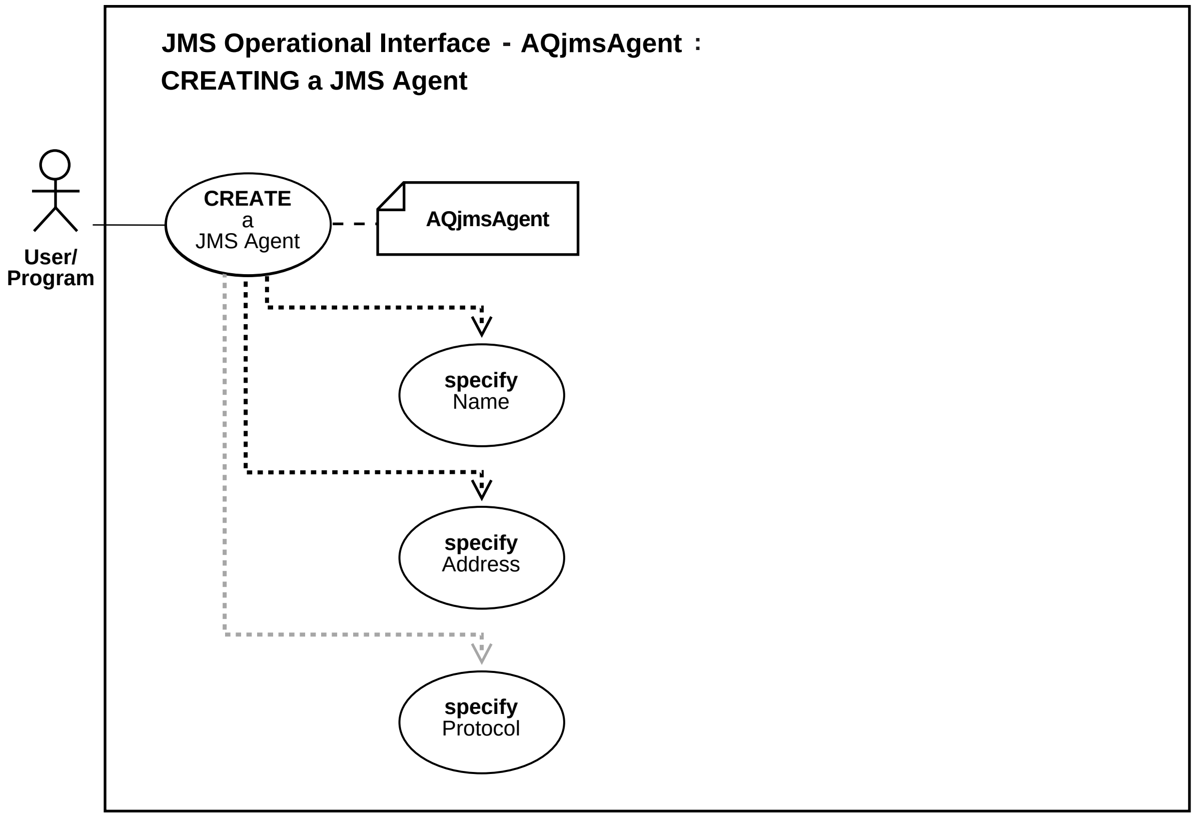
```
/* Set default priority value to 2 for all messages sent by the QueueSender*/
QueueSender sender;
sender.setPriority(2);
```

Example 2

```
/* Set default priority value to 2 for all messages sent by the TopicPublisher*/
TopicPublisher publisher;
publisher.setPriority(1);
```

Creating an AQjms Agent

Figure 16–28 Creating an AQjmsAgent



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Class - oracle.jms.AQjmsAgent" on page B-45

Purpose

Create an AQjms Agent

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsAgent

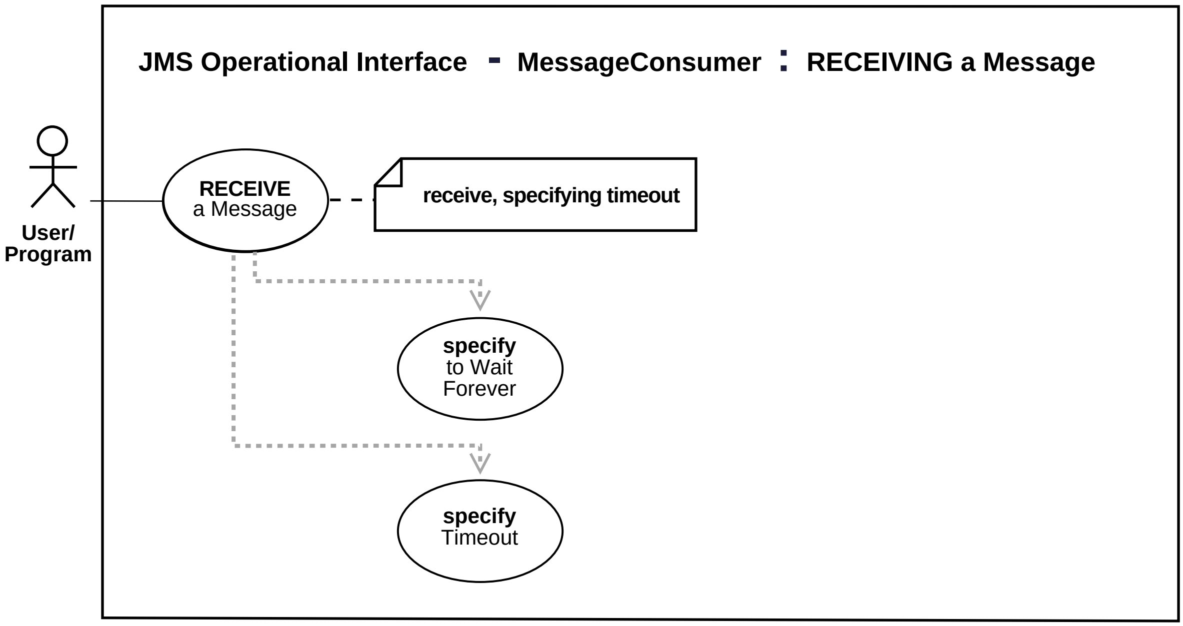
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Receiving a Message Synchronously Using a Message Consumer by Specifying Timeout

Figure 16–29 Receiving a Message Using a Message Consumer by Specifying Timeout



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.MessageConsumer" on page B-29
- "Receiving a Message Synchronously Using a Message Consumer Without Waiting" on page 16-52

Purpose

Receive a Message Using a Message Consumer by Specifying Timeout

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsConsumer.receive

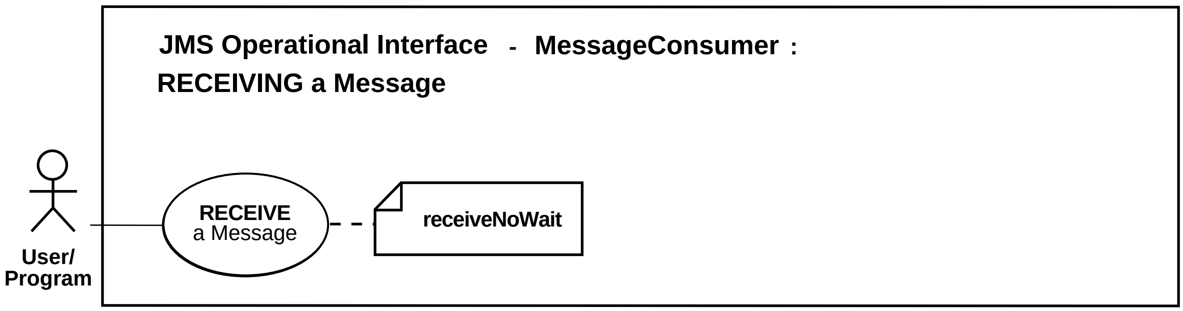
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

```
TopicConnectionFactory     tc_fact   = null;
TopicConnection            t_conn    = null;
TopicSession               t_sess    = null;
TopicSession               jms_sess;
Topic                      shipped_orders;
int                        myport = 5521;

/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");

t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("WS",
"Shipped_Orders_Topic");

/* create a subscriber, specifying the correct CustomDatumFactory  and
selector */
subscriber1 = jms_sess.createDurableSubscriber(shipped_orders,
'WesternShipping',
             " priority > 1 and tab.user_data.region like 'WESTERN %'",
              false,AQjmsAgent.getFactory());

/* receive, blocking for 30 seconds if there were no messages */
Message = subscriber.receive(30000);
```

Receiving a Message Synchronously Using a Message Consumer Without Waiting

Figure 16–30 Receiving a Message Using a Message Consumer Without Waiting



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.MessageConsumer" on page B-29
- "Receiving a Message Synchronously Using a Message Consumer by Specifying Timeout" on page 16-50

Purpose

Receive a Message Using a Message Consumer Without Waiting

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsConsumer.receiveNoWait

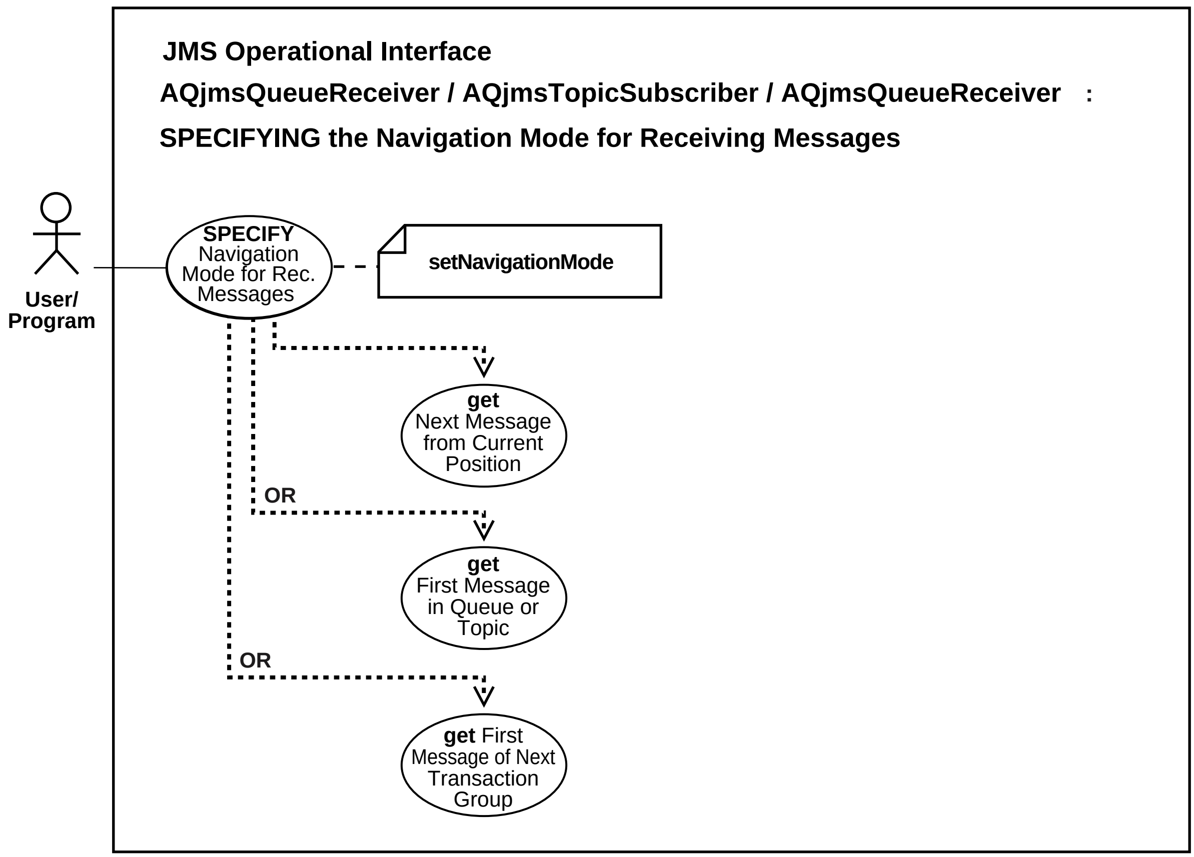
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Specifying the Navigation Mode for Receiving Messages

Figure 16–31 Specifying the Navigation Mode for Receiving Messages



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - oracle.jms.AQjmsQueueReceiver" on page B-42
- "Interface - oracle.jms.AQjmsTopicSubscriber" on page B-44
- "Interface - oracle.jms.AQjmsTopicReceiver" on page B-44

Purpose

Specify the navigation mode for receiving messages.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsQueueReceiver.setNavigationMode, AQjmsTopicReceiver.setNavigationMode, AQjmsTopicSubscriber.setNavigationMode

Examples

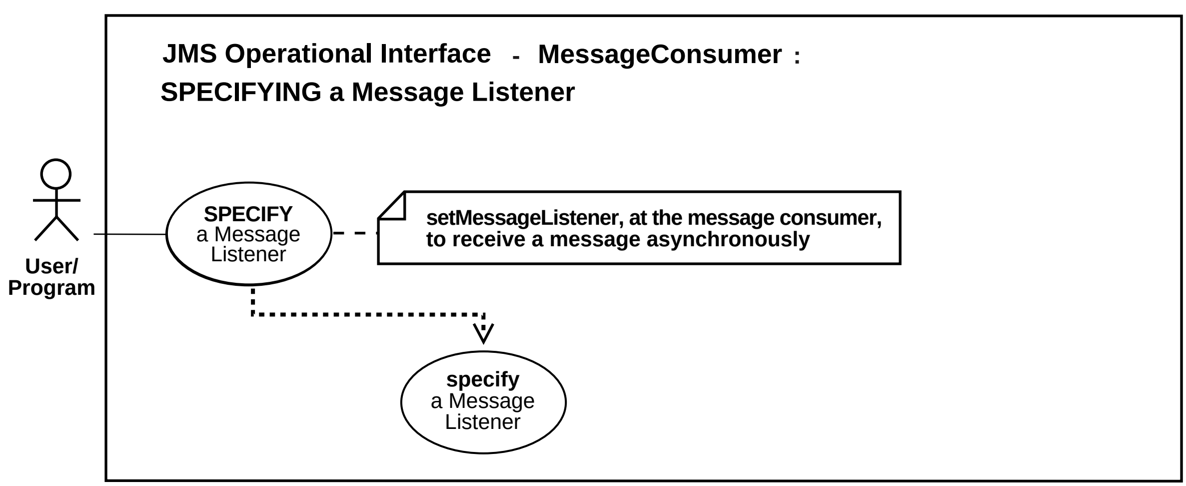
See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

```
TopicConnectionFactory     tc_fact   = null;
TopicConnection            t_conn    = null;
TopicSession               t_sess    = null;
TopicSession               jms_sess;
Topic                      shipped_orders;
int                        myport = 5521;

/* create connection and session */

tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
```

```
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("WS",
"Shipped_Orders_Topic");
/* create a subscriber, specifying the correct CustomDatumFactory  and
selector */

subscriber1 = jms_sess.createDurableSubscriber(shipped_orders,
'WesternShipping',
                 " priority > 1 and tab.user_data.region like 'WESTERN %'",
                   false,AQjmsAgent.getFactory());

subscriber1.setNavigationMode(AQjmsConstants.NAVIGATION_FIRST_MESSAGE);

/* get message for the subscriber, returning immediately if there was no
message */
Message = subscriber.receive();
```

Specifying a Message Listener to Receive a Message Asynchronously at the Message Consumer

Figure 16–32 Specifying a Message Listener at the Message Consumer



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.MessageConsumer" on page B-29
- "Specifying a Message Listener to Receive a Message Asynchronously at the Session" on page 16-58

Purpose

Specify a Message Listener at the Message Consumer

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsConsumer.setMessageListener

Examples

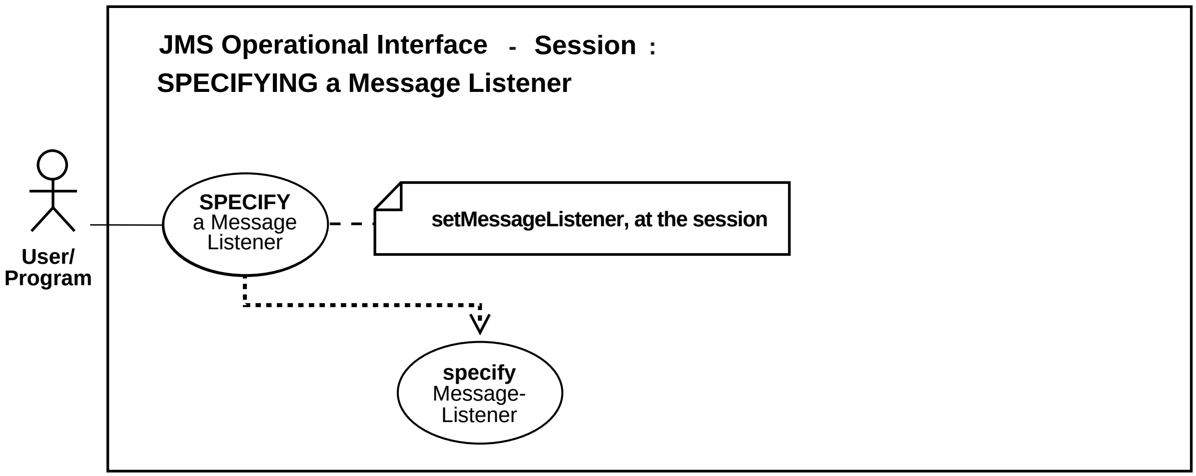
See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

```
TopicConnectionFactory    tc_fact   = null;
TopicConnection           t_conn    = null;
TopicSession              t_sess    = null;
TopicSession              jms_sess;
Topic                     shipped_orders;
int                       myport = 5521;
MessageListener           mLis = null;
/* create connection and session */
tc_fact = AQjmsFactory.getTopicConnectionFactory("MYHOSTNAME",
                                                  "MYSID", myport, "oci8");
t_conn = tc_fact.createTopicConnection("jmstopic", "jmstopic");
jms_sess = t_conn.createTopicSession(true, Session.CLIENT_ACKNOWLEDGE);

shipped_orders = ((AQjmsSession )jms_sess).getTopic("WS",
"Shipped_Orders_Topic");
```

```
/* create a subscriber, specifying the correct CustomDatumFactory  and
selector */
subscriber1 = jms_sess.createDurableSubscriber(shipped_orders,
'WesternShipping',
        " priority > 1 and tab.user_data.region like 'WESTERN %'",
         false,AQjmsAgent.getFactory());

mLis = new myListener(jms_sess, "foo");
/* get message for the subscriber, returning immediately if there was no
message */
subscriber.setMessageListener(mLis);

The definition of the myListener class
import oracle.AQ.*;
import oracle.jms.*;
import javax.jms.*;
import java.lang.*;
import java.util.*;
public class myListener implements MessageListener
{
   TopicSession   mySess;
   String         myName;

   /* constructor */
   myListener(TopicSession t_sess, String t_name)
   {
      mySess = t_sess;
      myName = t_name;
   }

   public onMessage(Message m)
   {
      System.out.println("Retrieved message with correlation: " ||
m.getJMSCorrelationID());

      try{
        /* commit the dequeue */
        mySession.commit();
      } catch (java.sql.SQLException e)
      {System.out.println("SQL Exception on commit"); }

   }

}
```

Specifying a Message Listener to Receive a Message Asynchronously at the Session

Figure 16–33 Specifying a Message Listener at the Session



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Session" on page B-34
- "Specifying a Message Listener to Receive a Message Asynchronously at the Message Consumer" on page 16-55

Purpose

Specify a Message Listener at the Session

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.setMessageListener

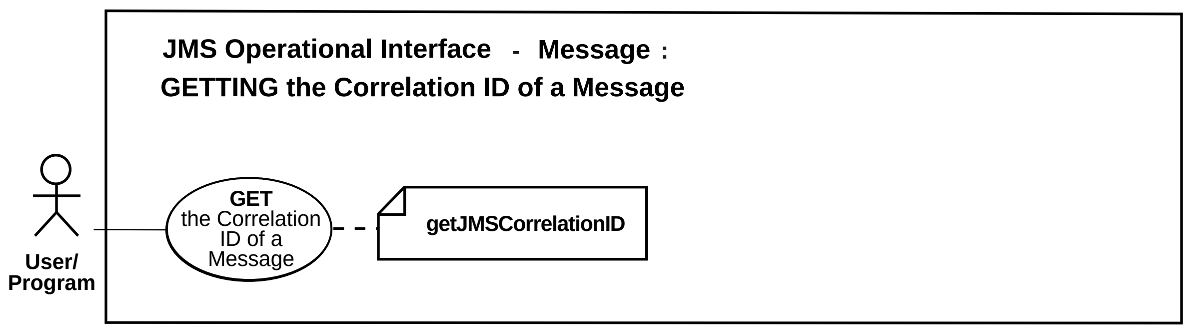
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the Correlation ID of a Message

Figure 16–34 Getting the Correlation ID of a Message



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27

Purpose

Get the Correlation ID of a Message

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getJMSCorrelationID

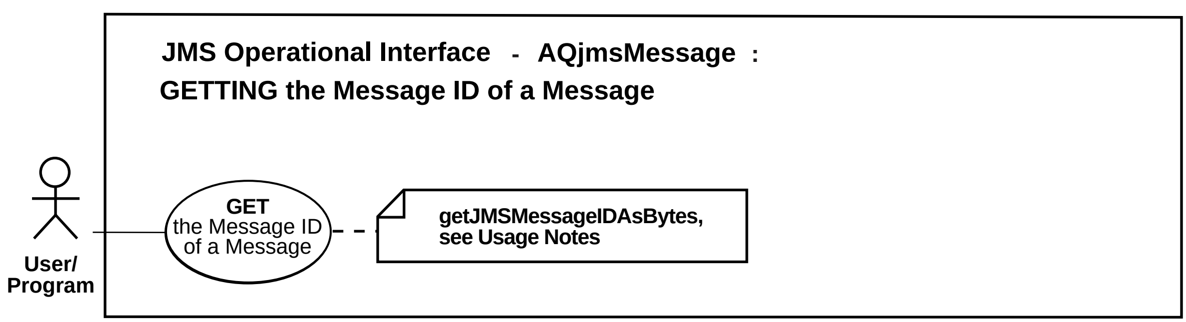
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the Message ID of a Message as Bytes

Figure 16–35 Getting the Message ID of a Message as Bytes



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Class - oracle.jms.AQjmsMessage" on page B-50
- "Getting the Message ID of a Message as a String" on page 16-61

Purpose
Get the Message ID of a Message as Bytes

Usage Notes
Not applicable.

Syntax
See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

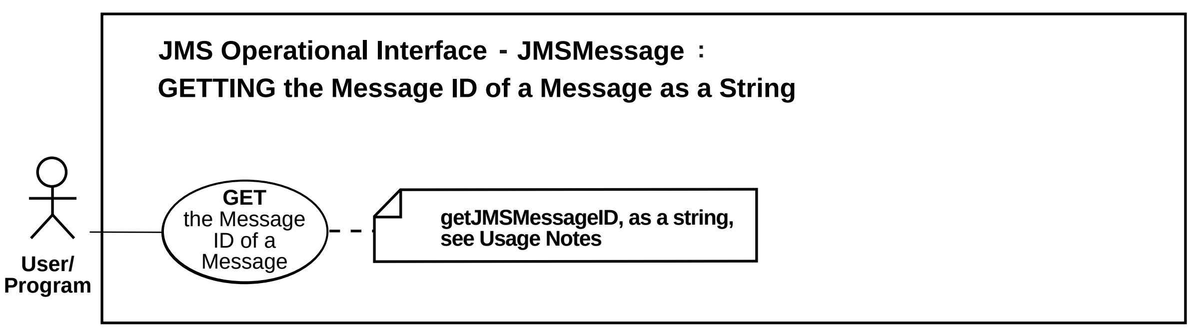
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getJMSMessageID

Examples
See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the Message ID of a Message as a String

Figure 16–36 Getting the Message ID of a Message as a String



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the Message ID of a Message as Bytes" on page 16-60

Purpose

Get the Message ID of a Message as String

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getJMSMessageID

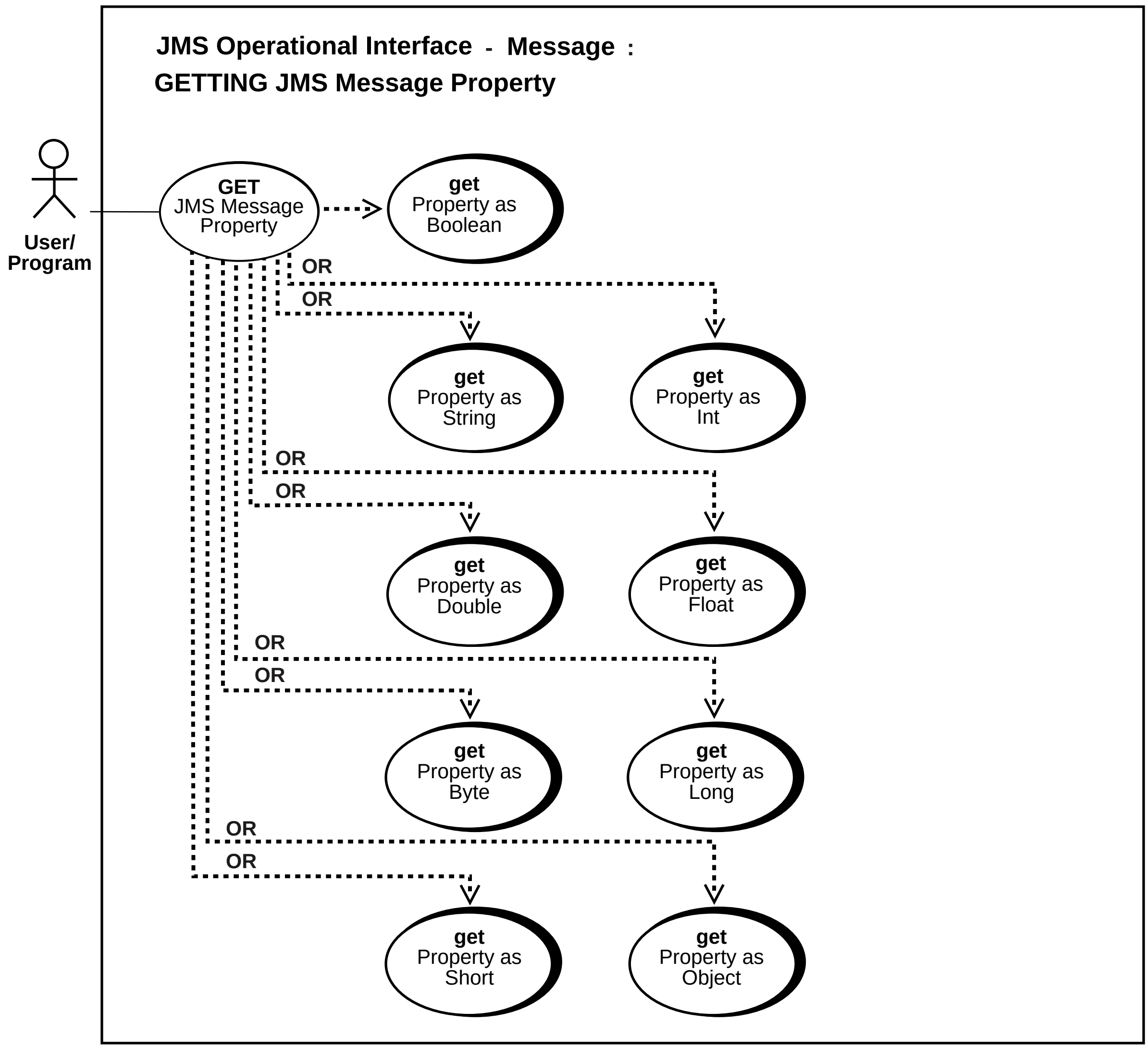
Examples

See Chapter 3, "AQ Programmatic Environments"for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the JMS Message Property

Figure 16–37 Getting the JMS Message Property

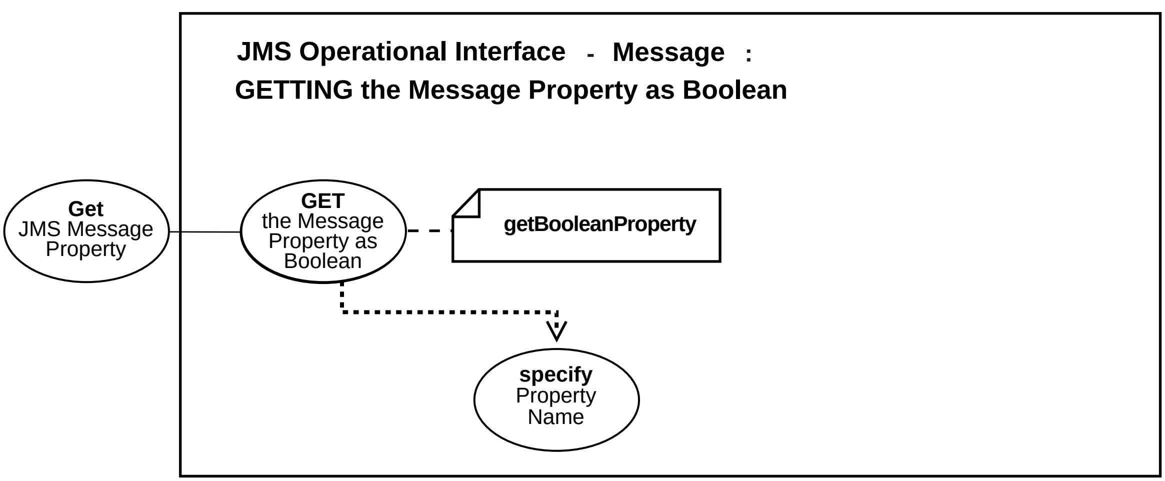


See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the JMS Message Property as a Boolean" on page 16-64
- "Getting the JMS Message Property as a String" on page 16-66
- "Getting the JMS Message Property as Int" on page 16-68
- "Getting the JMS Message Property as Double" on page 16-70
- "Getting the JMS Message Property as Float" on page 16-71
- "Getting the JMS Message Property as Byte" on page 16-73
- "Getting the JMS Message Property as Long" on page 16-74
- "Getting the JMS Message Property as Short" on page 16-76
- "Getting the JMS Message Property as Object" on page 16-77

Getting the JMS Message Property as a Boolean

Figure 16–38 Getting the Message Property as a Boolean



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the JMS Message Property" on page 16-63
- "Getting the JMS Message Property as a String" on page 16-66
- "Getting the JMS Message Property as Int" on page 16-68
- "Getting the JMS Message Property as Double" on page 16-70
- "Getting the JMS Message Property as Float" on page 16-71
- "Getting the JMS Message Property as Byte" on page 16-73
- "Getting the JMS Message Property as Long" on page 16-74
- "Getting the JMS Message Property as Short" on page 16-76
- "Getting the JMS Message Property as Object" on page 16-77

Purpose

Get the Message Property as a Boolean

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getBooleanProperty

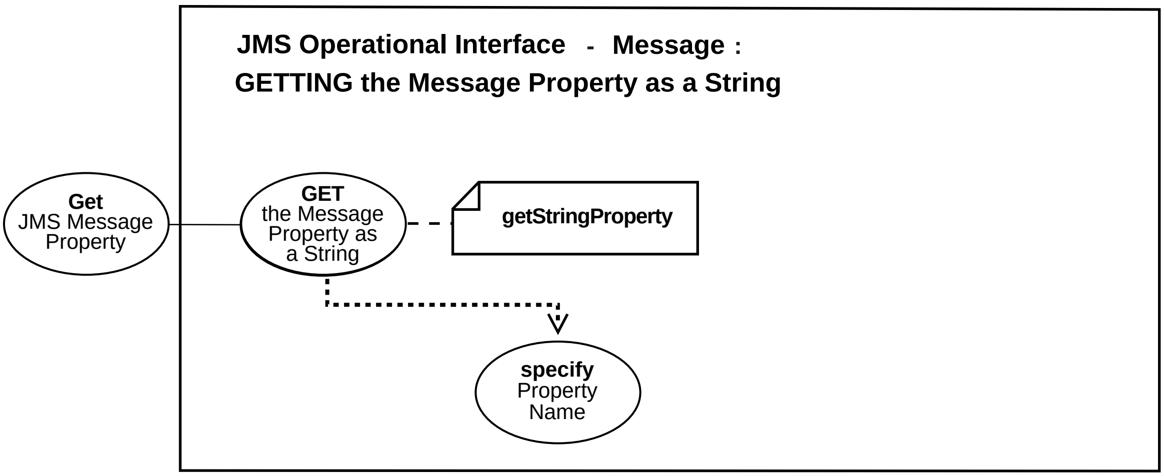
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the JMS Message Property as a String

Figure 16–39 Getting the Message Property as a String



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the JMS Message Property" on page 16-63
- "Getting the JMS Message Property as a Boolean" on page 16-64
- "Getting the JMS Message Property as Int" on page 16-68
- "Getting the JMS Message Property as Double" on page 16-70
- "Getting the JMS Message Property as Float" on page 16-71
- "Getting the JMS Message Property as Byte" on page 16-73
- "Getting the JMS Message Property as Long" on page 16-74
- "Getting the JMS Message Property as Short" on page 16-76
- "Getting the JMS Message Property as Object" on page 16-77

Purpose

Get the Message Property as a String

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getStringProperty

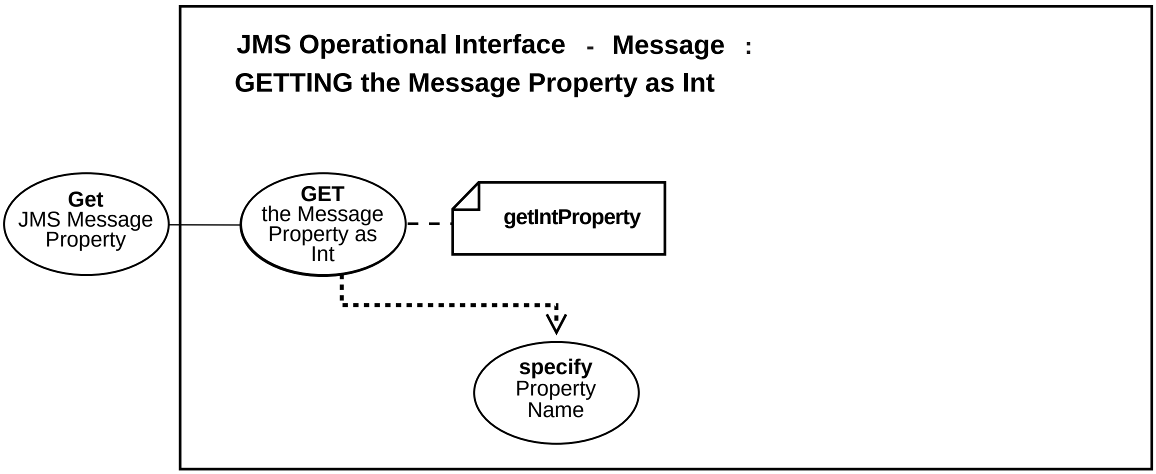
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

```
TextMessage message;

message.setStringProperty("JMS_OracleExcpQ", "scott.text_ecxcp_queue"); /*set
exception queue for message*/

message.setStringProperty("color", "red"); /*set user-defined property - color
*/
```

Getting the JMS Message Property as Int

Figure 16–40 Getting the Message Property as Int



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the JMS Message Property" on page 16-63
- "Getting the JMS Message Property as a Boolean" on page 16-64
- "Getting the JMS Message Property as a String" on page 16-66
- "Getting the JMS Message Property as Double" on page 16-70
- "Getting the JMS Message Property as Float" on page 16-71
- "Getting the JMS Message Property as Byte" on page 16-73
- "Getting the JMS Message Property as Long" on page 16-74
- "Getting the JMS Message Property as Short" on page 16-76
- "Getting the JMS Message Property as Object" on page 16-77

Purpose

Get the Message Property as Int

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getIntProperty

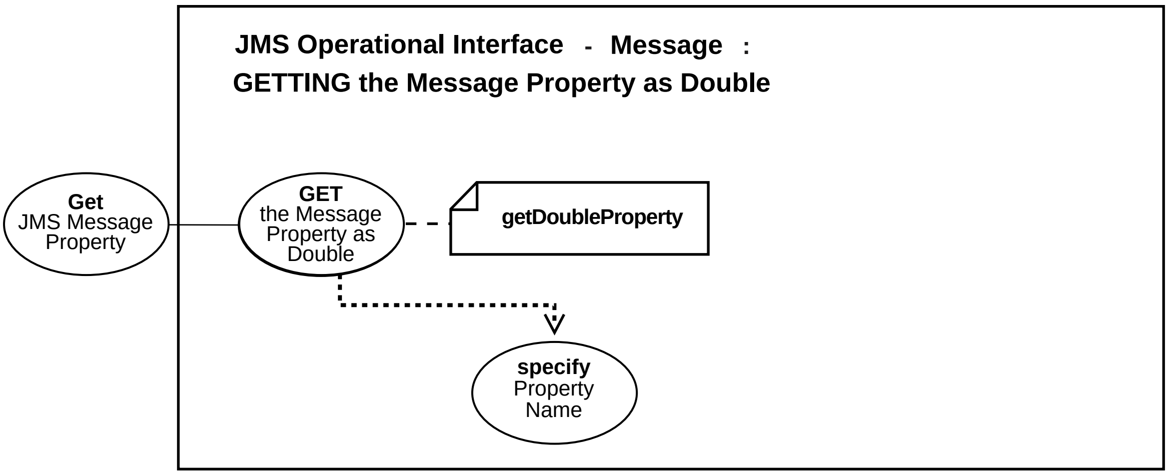
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

```
StreamMessage message;
message.setIntProperty("MMS_OracleDelay", 10); /*set message delay to 10
seconds*/

message.setIntProperty("empid", 1000); /*set user-defined property - empId*/
```

Getting the JMS Message Property as Double

Figure 16–41 Getting the Message Property as Double



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the JMS Message Property" on page 16-63
- "Getting the JMS Message Property as a Boolean" on page 16-64
- "Getting the JMS Message Property as a String" on page 16-66
- "Getting the JMS Message Property as Int" on page 16-68
- "Getting the JMS Message Property as Float" on page 16-71
- "Getting the JMS Message Property as Byte" on page 16-73
- "Getting the JMS Message Property as Long" on page 16-74
- "Getting the JMS Message Property as Short" on page 16-76
- "Getting the JMS Message Property as Object" on page 16-77

Purpose

Get the Message Property as Double

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getDoubleProperty

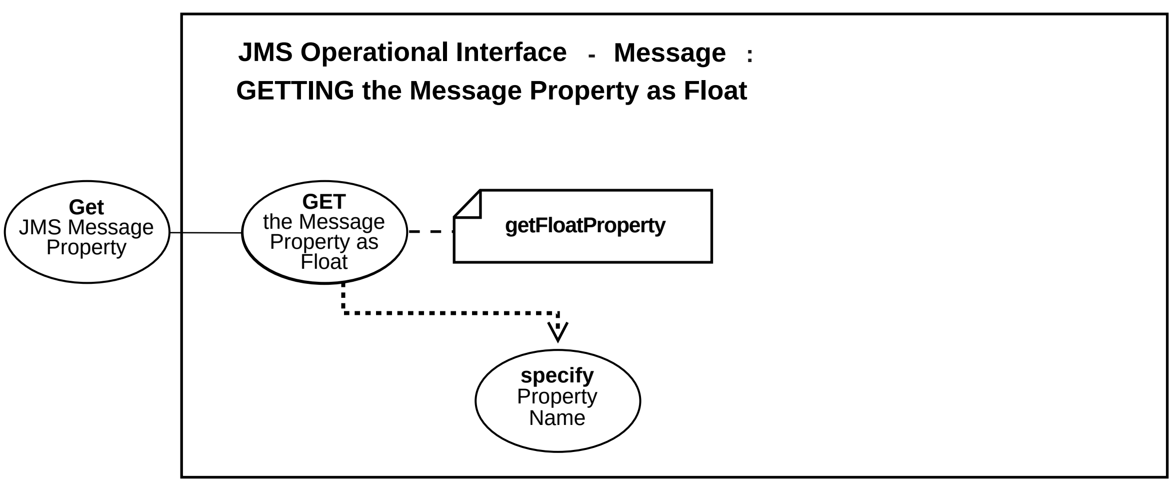
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the JMS Message Property as Float

Figure 16–42 Getting the Message Property as Float



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the JMS Message Property" on page 16-63
- "Getting the JMS Message Property as a Boolean" on page 16-64
- "Getting the JMS Message Property as a String" on page 16-66
- "Getting the JMS Message Property as Int" on page 16-68
- "Getting the JMS Message Property as Double" on page 16-70
- "Getting the JMS Message Property as Byte" on page 16-73
- "Getting the JMS Message Property as Long" on page 16-74
- "Getting the JMS Message Property as Short" on page 16-76
- "Getting the JMS Message Property as Object" on page 16-77

Purpose

Get the Message Property as Float

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getFloatProperty

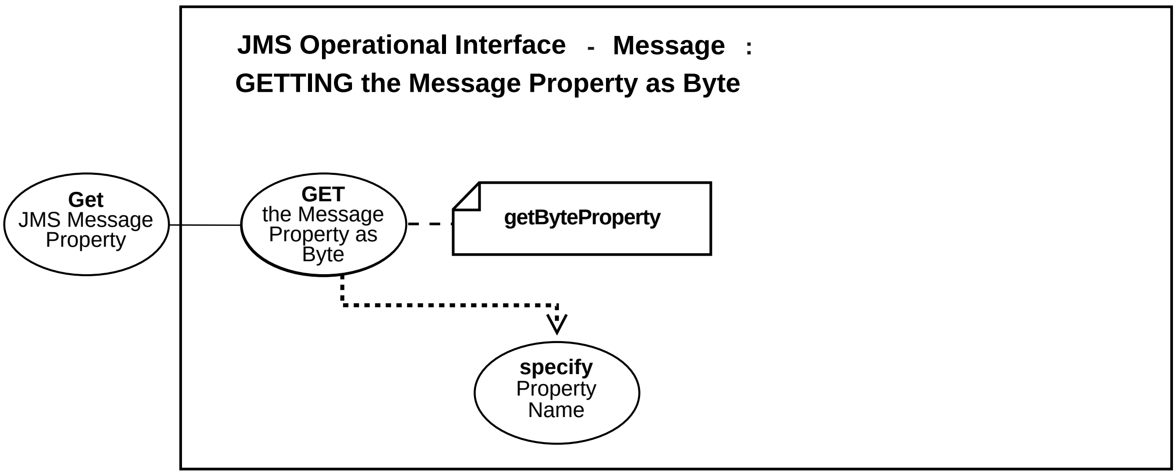
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the JMS Message Property as Byte

Figure 16–43 Getting the Message Property as Byte



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the JMS Message Property" on page 16-63
- "Getting the JMS Message Property as a Boolean" on page 16-64
- "Getting the JMS Message Property as a String" on page 16-66
- "Getting the JMS Message Property as Int" on page 16-68
- "Getting the JMS Message Property as Double" on page 16-70
- "Getting the JMS Message Property as Float" on page 16-71
- "Getting the JMS Message Property as Long" on page 16-74
- "Getting the JMS Message Property as Short" on page 16-76
- "Getting the JMS Message Property as Object" on page 16-77

Purpose

Get the Message Property as Byte

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getByteProperty

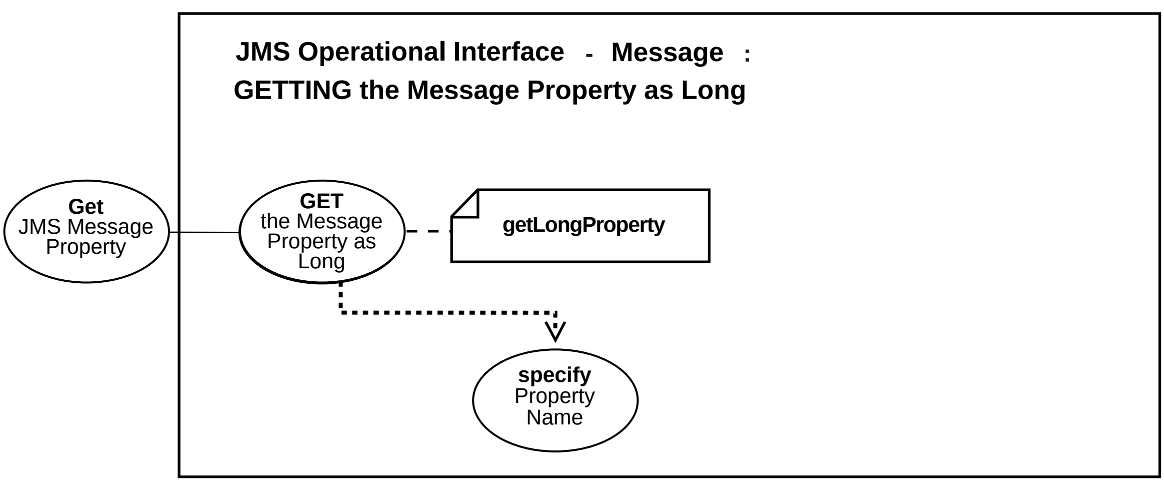
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the JMS Message Property as Long

Figure 16–44 Getting the Message Property as Long



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the JMS Message Property" on page 16-63
- "Getting the JMS Message Property as a Boolean" on page 16-64
- "Getting the JMS Message Property as a String" on page 16-66
- "Getting the JMS Message Property as Int" on page 16-68
- "Getting the JMS Message Property as Double" on page 16-70
- "Getting the JMS Message Property as Float" on page 16-71
- "Getting the JMS Message Property as Byte" on page 16-73
- "Getting the JMS Message Property as Short" on page 16-76
- "Getting the JMS Message Property as Object" on page 16-77

Purpose

Get the Message Property as Long.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getLongProperty

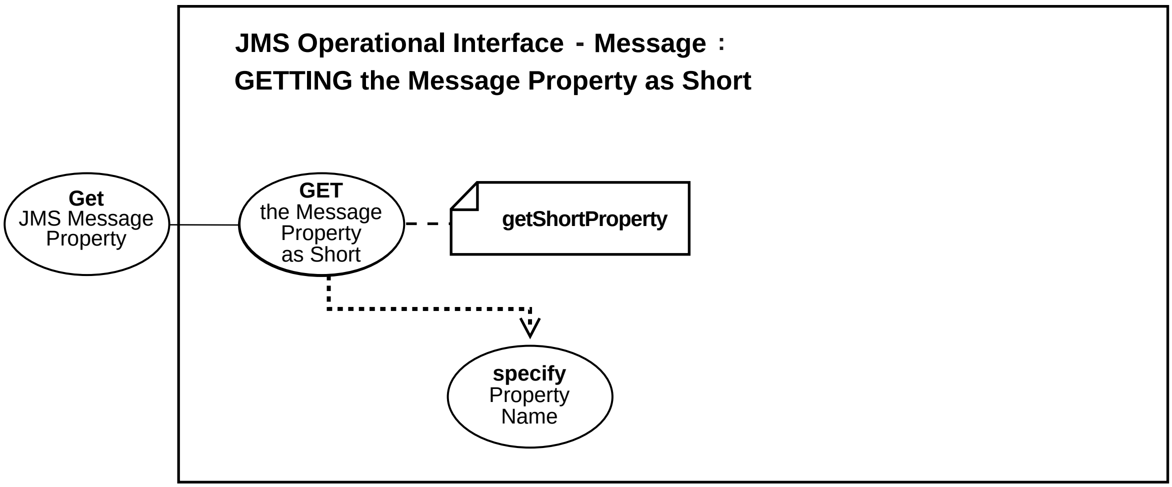
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the JMS Message Property as Short

Figure 16–45 Getting the Message Property as Short



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the JMS Message Property" on page 16-63
- "Getting the JMS Message Property as a Boolean" on page 16-64
- "Getting the JMS Message Property as a String" on page 16-66
- "Getting the JMS Message Property as Int" on page 16-68
- "Getting the JMS Message Property as Double" on page 16-70
- "Getting the JMS Message Property as Float" on page 16-71
- "Getting the JMS Message Property as Byte" on page 16-73
- "Getting the JMS Message Property as Long" on page 16-74
- "Getting the JMS Message Property as Object" on page 16-77

Purpose
Get the Message Property as Short

Usage Notes
Not applicable.

Syntax
See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

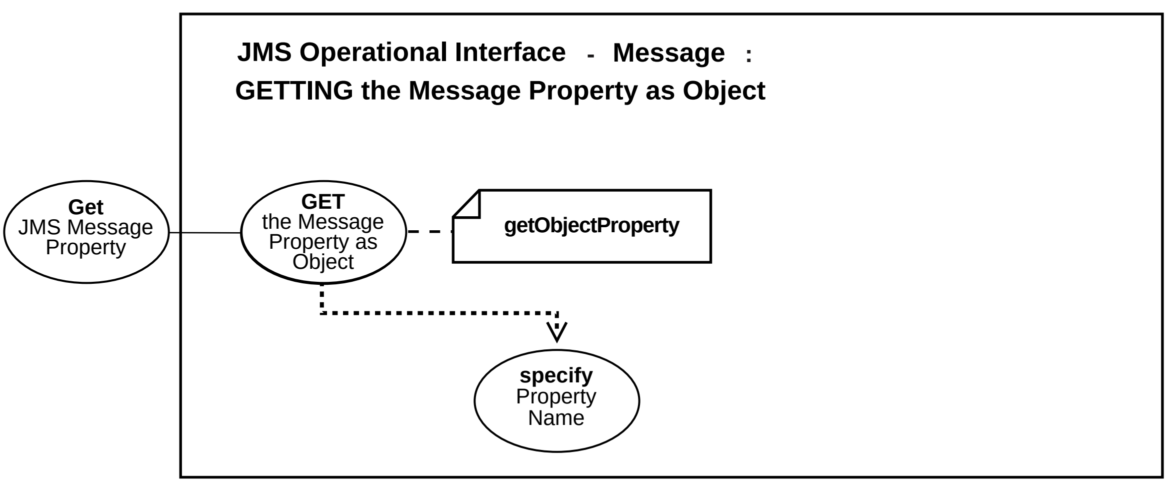
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getShortProperty

Examples
See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the JMS Message Property as Object

Figure 16–46 Getting the Message Property as Object



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Message" on page B-27
- "Getting the JMS Message Property" on page 16-63
- "Getting the JMS Message Property as a Boolean" on page 16-64
- "Getting the JMS Message Property as a String" on page 16-66
- "Getting the JMS Message Property as Int" on page 16-68
- "Getting the JMS Message Property as Double" on page 16-70
- "Getting the JMS Message Property as Float" on page 16-71
- "Getting the JMS Message Property as Byte" on page 16-73
- "Getting the JMS Message Property as Long" on page 16-74
- "Getting the JMS Message Property as Short" on page 16-76

Purpose

Get the Message Property as Object

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsMessage.getObjectProperty

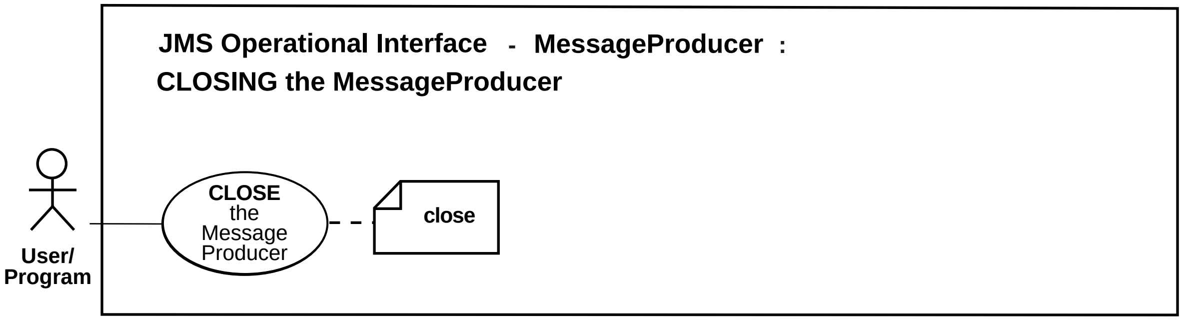
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

```
TextMessage message;
message.setObjectProperty("empid", new Integer(1000);
```

Closing a Message Producer

Figure 16–47 Closing a Message Producer



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.MessageProducer" on page B-30

Purpose

Close a Message Producer

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsProducer.close

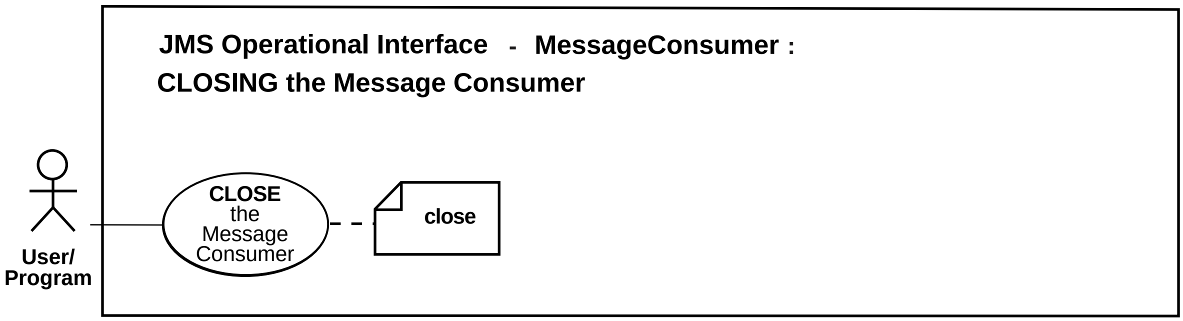
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Closing a Message Consumer

Figure 16–48 Closing a Message Consumer



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.MessageConsumer" on page B-29

Purpose

Close a Message Consumer

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsConsumer.close

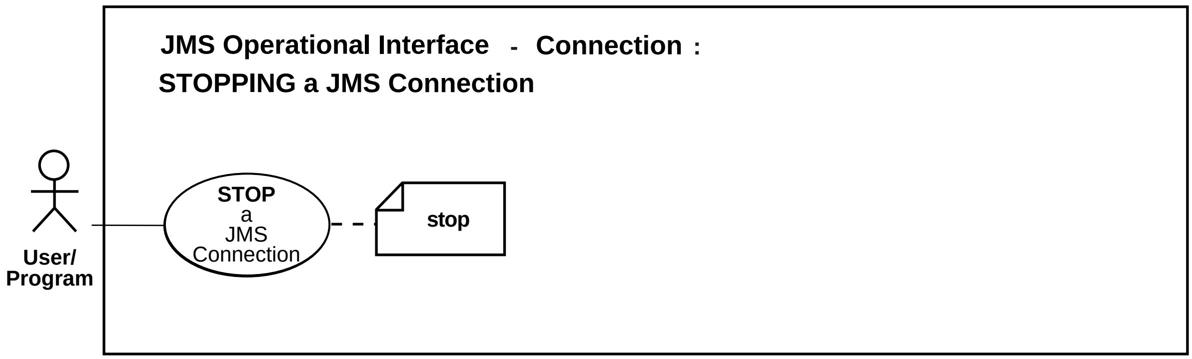
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Stopping a JMS Connection

Figure 16–49 Stopping a JMS Connection



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Connection" on page B-24

Purpose

Stop a JMS Connection

Usage Notes

This method is used to temporarily stop a Connection's delivery of incoming messages.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsConnection.stop

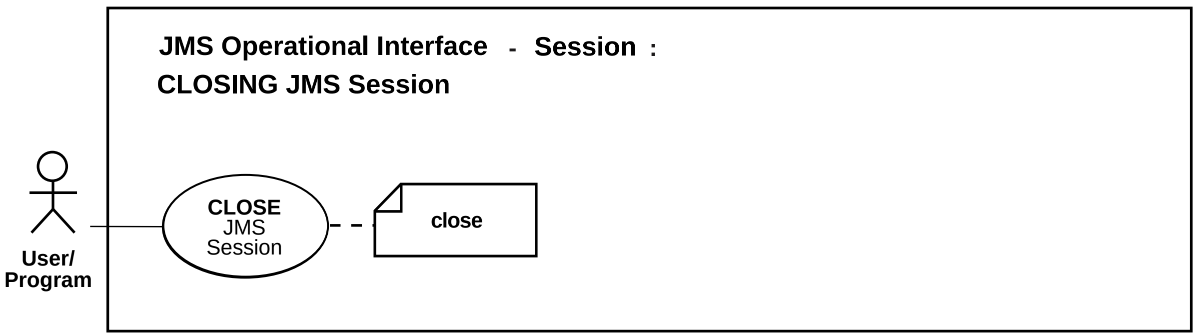
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Closing a JMS Session

Figure 16–50 Closing a JMS Session



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Session" on page B-34

Purpose

Close a JMS Session

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsSession.close

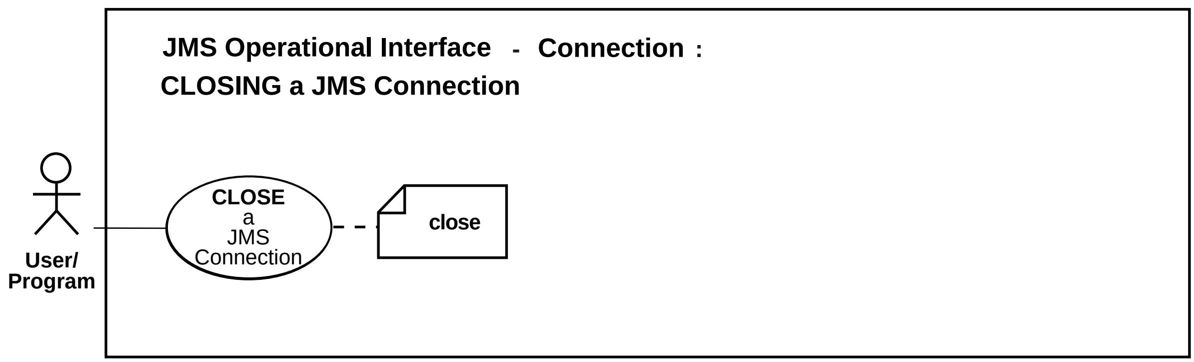
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Closing a JMS Connection

Figure 16–51 Closing a JMS Connection



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Connection" on page B-24

Purpose

Close a JMS Connection

Usage Notes

This method closes the connection and releases all resources allocated on behalf of the connection. Since the JMS provider typically allocates significant resources outside the JVM on behalf of a Connection, clients should close them when they are not needed. Relying on garbage collection to eventually reclaim these resources may not be timely enough.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsConnection.close

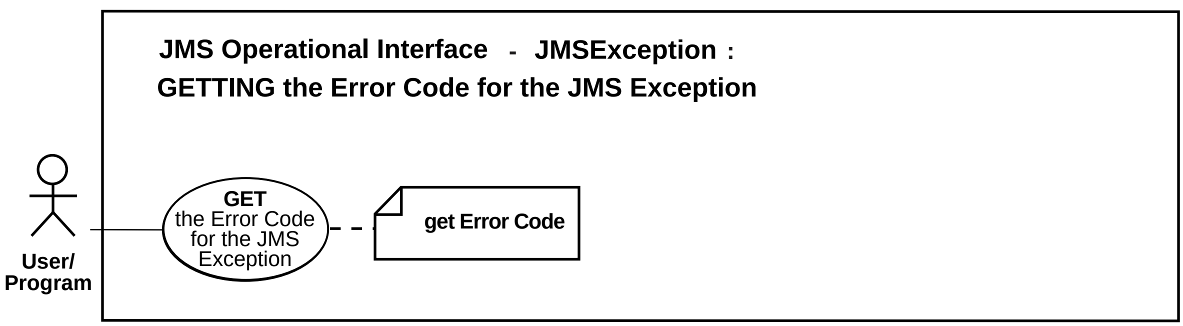
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the Error Code for the JMS Exception

Figure 16–52 Getting the Error Code for the JMS Exception



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Exception javax.jms.JMSException" on page B-40

Purpose

Get the Error Code for the JMS Exception

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsException.getErrorCode

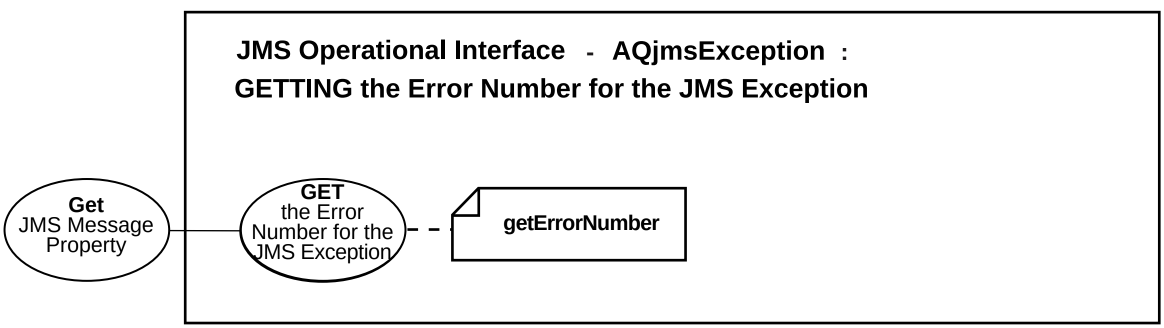
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the Error Number for the JMS Exception

Figure 16–53 Getting the Error Number for the JMS Exception



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Exception oracle.jms.AQjmsException" on page B-56

Purpose
Get the Error Number for the JMS Exception

Usage Notes
Not applicable.

Syntax
See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

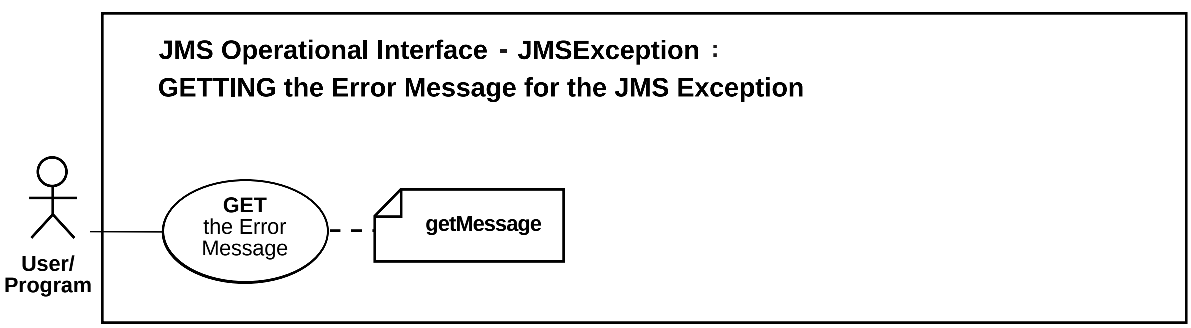
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsException.getErrorNumber

Examples
See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the Error Message for the JMS Exception

Figure 16–54 Getting the Error Message for the JMS Exception



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Exception javax.jms.JMSException" on page B-40

Purpose

Get the Error Message for the JMS Exception

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsException.getMessage

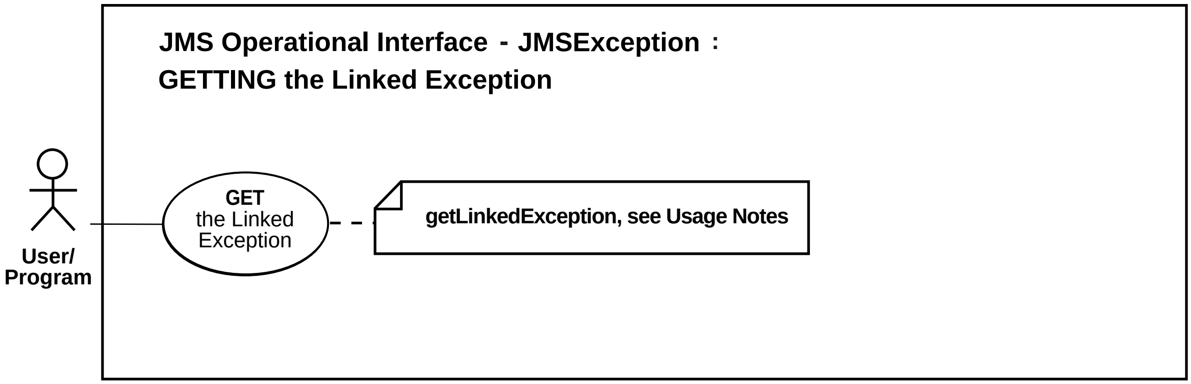
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Getting the Exception Linked to the JMS Exception

Figure 16–55 Getting the Exception Linked to the JMS Exception



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Exception javax.jms.JMSException" on page B-40

Purpose

Get the Exception Linked to the JMS Exception

Usage Notes

This method is used to get the Exception linked to this JMS exception. In general, this contains the SQL Exception raised by the database.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsException.getLinkedException

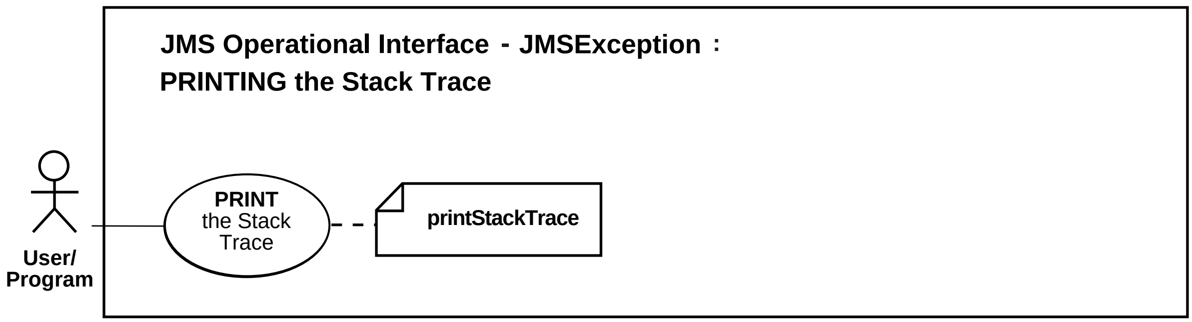
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Printing the Stack Trace for the JMS Exception

Figure 16–56 Printing the Stack Trace for the JMS Exception



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Exception javax.jms.JMSException" on page B-40

Purpose

Print the Stack Trace for the JMS Exception

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms, AQjmsException.printStackTrace

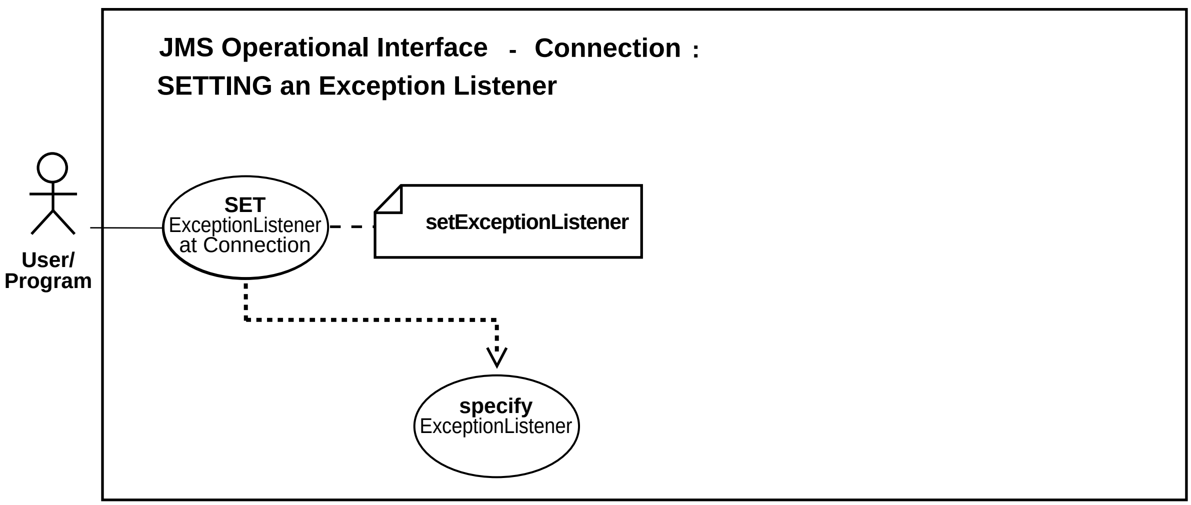
Examples

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment.

- No example is provided with this release.

Setting the Exception Listener

Figure 16–57 Setting the Exception Listener



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Connection" on page B-24

Purpose

Specify an Exception Listener for the connection.

Usage Notes

If a serious problem is detected for the connection, the connection's ExceptionListener, if one has been registered, will be informed. This is done by calling the listener's `onException()` method, passing it a `JMSException` describing the problem. This allows a JMS client to be asynchronously notified of a problem. Some connections only consume messages, so they have no other way to learn the connection has failed.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

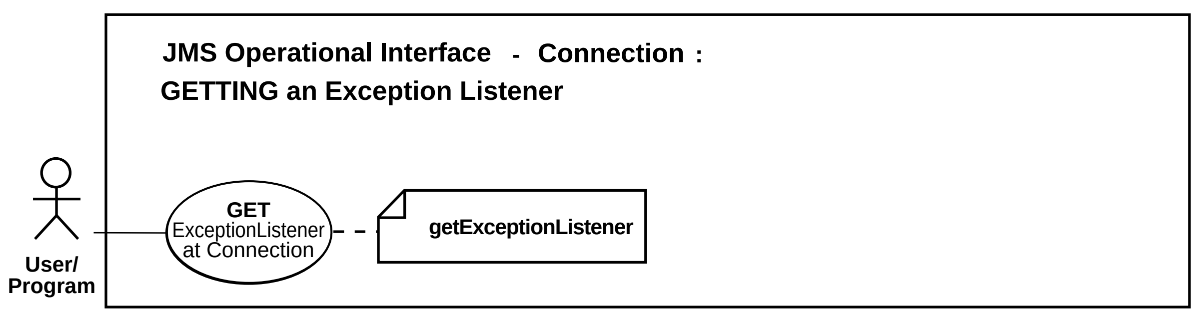
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms AQjmsConnection.setExceptionListener

Examples

```
//register an exception listener
Connection jms_connection;
jms_connection.setExceptionListener(
    new ExceptionListener() {
        public void onException (JMSException jmsException) {
            System.out.println("JMS-EXCEPTION: " + jmsException.toString());
        }
    };
  );
```

Getting the Exception Listener

Figure 16–58 Getting the Exception Listener



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Connection" on page B-24

Purpose

Get the Exception Listener for the connection.

Usage Notes

Not applicable.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

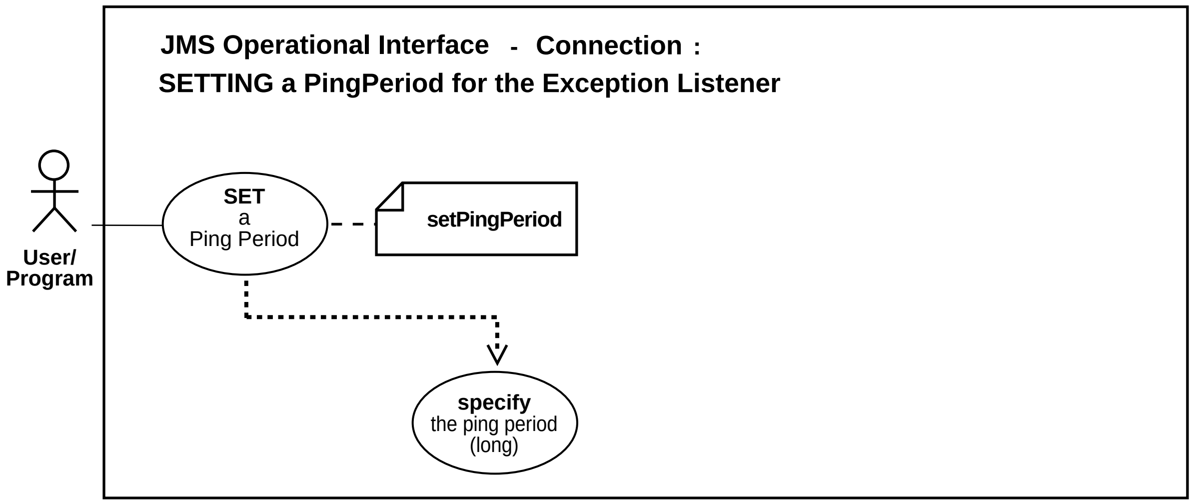
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms AQjmsConnection.getExceptionListener

Examples

```
//Get the exception listener
Connection jms_connection;
ExceptionListener el = jms_connection.getExceptionListener();
```

Setting the Ping Period for the Exception Listener

Figure 16–59 Setting the Ping Period for the Exception Listener



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Connection" on page B-24

Purpose

Specify the ping period for the Exception Listener.

Usage Notes

If an exception listener is set for the connection, the connection pings the database periodically to ensure that the database is accessible. The period is specified in milliseconds. The default value is 2 minutes. If an exception listener is not set for the connection, the database is not pinged. This method can be called before or after the exception listener is set.

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

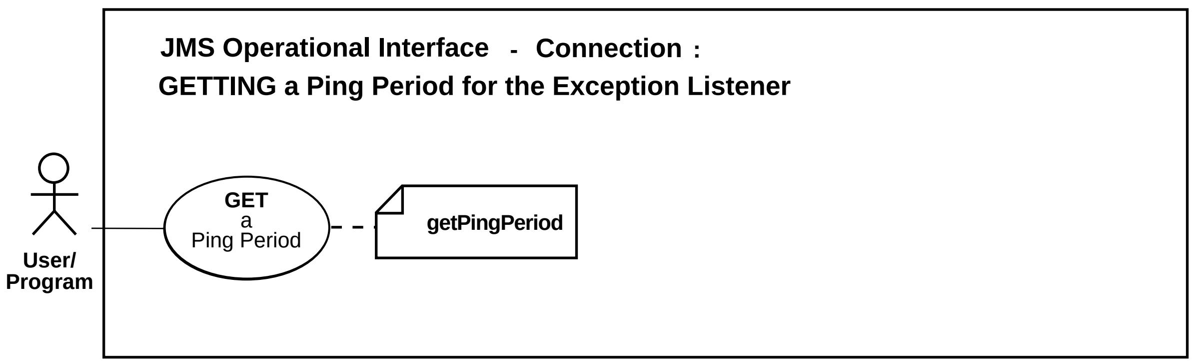
See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms AQjmsConnection.setPingPeriod

Examples

```
//set the ping period to 4 minutes
Connection jms_connection;
jms_connection.setPingPeriod(4*60*1000);
```

Getting the Ping Period for the Exception Listener

Figure 16–60 Getting the Ping Period for the Exception Listener



See Also:

- Table 16–1 for a list of basic operations in the JMS shared operational interface
- "Interface - javax.jms.Connection" on page B-24

Purpose

Get the ping period for the Exception Listener.

Usage Notes

If an exception listener is set for the connection, the connection pings the database periodically to ensure that the database is accessible. The period is specified in milliseconds. The default value is 2 minutes. If an exception listener is not set for the connection, the database is not pinged. This method will return the value of the period set by the last call to `setPingPeriod`. If `setPingPeriod` was never called, then the default value is returned

Syntax

See Chapter 3, "AQ Programmatic Environments" for a list of available functions in each programmatic environment. Use the following syntax references for each programmatic environment:

See Java (JDBC): *Oracle9i Supplied Java Packages Reference* oracle.jms AQjmsConnection.getPingPeriod

Examples

```
//get the ping period
Connection jms_connection;
long pp = jms_connection.getPingPeriod();
```

17

Internet Access to Advanced Queuing

You can access AQ over the Internet by using Simple Object Access Protocol (SOAP). Internet Data Access Presentation (IDAP) is the SOAP specification for AQ operations. IDAP defines XML message structure for the body of the SOAP request. An IDAP-structured message is transmitted over the Internet using transport protocols such as HTTP or SMTP.

This chapter discusses the following topics:

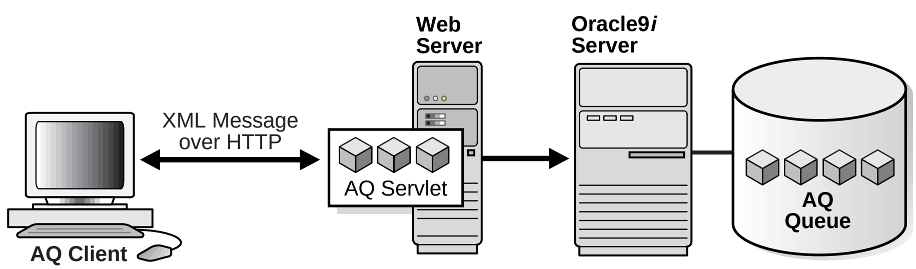
Overview of Advanced Queuing Operations Over the Internet

Figure 17–1 shows the architecture for performing AQ operations over HTTP. The major components are:

- The AQ client program
- The Web server / ServletRunner hosting the AQ servlet
- The Oracle database server

The AQ client program sends XML messages (conforming to IDAP) to the AQ servlet. Any HTTP client, for example Web browsers, can be used. The Web server / ServletRunner hosting the AQ servlet interprets the incoming XML messages. Examples include Apache / Jserv or Tomcat. The AQ servlet connects to the Oracle database server and performs operations on the users' queues.

Figure 17–1 Architecture for Performing AQ Operations Using HTTP



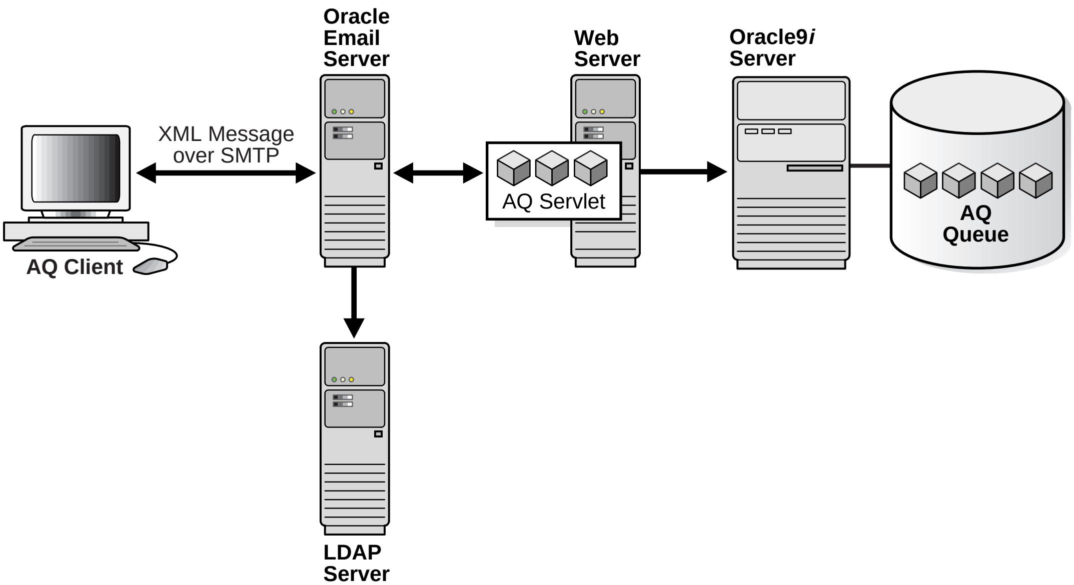
See "Using HTTP to Access the AQ XML Servlet" and "Using HTTP and HTTPS for Advanced Queuing Propagation" on page 17-62 for details.

Figure 17–2 shows additional components in the architecture for sending AQ messages over SMTP:

- E-mail server
- LDAP server (Oracle Internet Directory)

The e-mail server verifies client signatures using certificates stored in LDAP and then routes the request to the AQ servlet.

Figure 17–2 Architecture for Performing AQ Operations Using SMTP



See "Using SMTP to Access the AQ Servlet" on page 17-65 for more details.

The Internet Data Access Presentation (IDAP)

The Internet Data Access Presentation (IDAP) uses the Content-Type of `text/xml` to specify the body of the SOAP request. XML provides the presentation for IDAP request and response messages as follows:

- All request and response tags are scoped in the SOAP namespace.
- AQ operations are scoped in the IDAP namespace.
- The sender includes namespaces in IDAP elements and attributes in the SOAP body.
- The receiver processes SOAP messages that have correct namespaces; for the requests with incorrect namespaces, the receiver returns an invalid request error.
- The SOAP namespace has the value `http://schemas.xmlsoap.org/soap/envelope/`

- The IDAP namespace has the value `http://ns.oracle.com/AQ/schemas/access`

SOAP Message Structure

SOAP structures a message request or response as follows:

- SOAP envelope (the root or top element in an XML tree))
- SOAP header (first element under the root)
- SOAP body (the AQ XML document)

The SOAP Envelope

The tag of this root element is `SOAP:Envelope`. SOAP defines a global attribute `SOAP:encodingStyle` that indicates serialization rules used instead of those described by the SOAP specification. This attribute may appear on any element and is scoped to that element and all child elements not themselves containing such an attribute. Omitting `SOAP:encodingStyle` means that type specification has been followed (unless overridden by a parent element).

The SOAP envelope also contains namespace declarations and additional attributes, provided they are namespace qualified. Additional namespace-qualified subelements can follow the body.

SOAP Headers

The tag of this first element under the root is `SOAP:Header`. A SOAP header passes necessary information, such as the transaction ID, with the request. The header is encoded as a child of the `SOAP:Envelope` XML element. Headers are identified by the name element and are namespace-qualified. A header entry is encoded as an embedded element.

The SOAP Body

The SOAP body, tagged `SOAP:Body`, contains a first subelement whose name is the method name. This method request element contains elements for each input and output parameter. The element names are the parameter names. The body also contains `SOAP:Fault`, indicating information about an error.

For performing AQ operations, the SOAP body must contain an AQ XML document. The AQ XML document has the namespace `http://ns.oracle.com/AQ/schemas/access`

SOAP Method Invocation

A method invocation is performed by creating the request header and body and processing the returned response header and body. The request and response headers can consist of standard transport protocol-specific and extended headers.

In the case of SMTP (e-mail), the method invocation can be done by the filter interface of the e-mail server, which invokes a Java method with the e-mail-message-body as argument. This results in remote invocation of the `POST` method on the AQ servlet. The response is e-mailed directly to the recipient specified in the reply of the message. The response header can contain SMTP-protocol-related headers also.

HTTP Headers

The `POST` method within the HTTP request header performs the SOAP method invocation. The request should include the header `SOAPMethodName,` whose value indicates the method to be invoked on the target. The value consists of a URI followed by a "#", followed by a method name (which must not include the "#" character), as follows:

```
SOAPMethodName: http://ns.oracle.com/AQ/schemas/access#AQXmlSend
```

The URI used for the interface must match the implied or specified namespace qualification of the method name element in the `SOAP:Body` part of the payload.

Method Invocation Body

SOAP method invocation consists of a method request and optionally a method response. The SOAP method request and method response are an HTTP request and response, respectively, whose content is an XML document that consists of the root and mandatory body elements. This XML document is referred to as the SOAP payload in the rest of this chapter.

The SOAP payload is defined as follows:

- The SOAP root element is the top element in the XML tree.
- The SOAP payload headers contain additional information that must travel with the request.
- The method request is represented as an XML element with additional elements for parameters. It is the first child of the `SOAP:Body` element. This request can be one of the AQ XML client requests described in the next section.

- The response is the return value or an error or exception that is passed back to the client.

At the receiving site, a request can have one of the following outcomes:

a. The HTTP infrastructure on the receiving site is able to receive and process the request.

b. The HTTP infrastructure on the receiving site cannot receive and process the request.

c. The SOAP infrastructure on the receiving site is able to decode the input parameters, dispatch to an appropriate server indicated by the server address, and invoke an application-level function corresponding semantically to the method indicated in the method request.

d. The SOAP infrastructure on the receiving site cannot decode the input parameters, dispatch to an appropriate server indicated by the server address, and invoke an application-level function corresponding semantically to the interface or method indicated in the method request.

In (a), the HTTP infrastructure passes the headers and body to the SOAP infrastructure. In (b), the result is an HTTP response containing an HTTP error in the status field and no XML body. In (c), the result of the method request consists of a response or error. In (d), the result of the method is an error that prevented the dispatching infrastructure on the receiving side from successful completion. In (c) and (d), additional message headers may for extensibility again be present in the results of the request.

Results from a Method Request

The results of the request are to be provided in the form of a request-response. The HTTP response must be of Content-Type `text/xml`. A SOAP result indicates success and an error indicates failure. The method response will never contain both a result and an error.

IDAP Documents

The body of a SOAP message is an IDAP message. This XML document has the namespace `http://ns.oracle.com/AQ/schemas/access`. This body represents:

- Client requests for enqueue, dequeue, and registration
- Server responses to client requests for enqueue, dequeue, and registration

- Notifications from the server to the client

Note: AQ Internet Access is supported only for 8.1-style queues. 8.0-style queues cannot be accessed using IDAP.

Client Requests for Enqueue

Client requests for enqueue—`SEND` and `PUBLISH` requests—use the following methods:

- `AQXmlSend`—to enqueue to a single-consumer queue
- `AQXmlPublish`—to enqueue to multiconsumer queues/topics

`AQXmlSend` and `AQXmlPublish` take the arguments and argument attributes shown in Table 17–1. Required arguments are shown in bold.

Table 17–1 Client Requests for Enqueue—Arguments and Attributes for AQXmlSend and AQXmlPublish

Argument	Attribute
`producer_options`	**`destination`**—specify the queue/topic to which messages are to be sent. The destination element has an attribute `lookup_type` which determines how the destination element value is interpreted ■ `DATABASE (default)`—destination is interpreted as `schema.queue_name` ■ `LDAP`—the LDAP server is used to resolve the destination
-	`visibility` ■ `ON_COMMIT`—The enqueue is part of the current transaction. The operation is complete when the transaction commits. This is the default case. ■ `IMMEDIATE`—effects of the enqueue are visible immediately after the request is completed. The enqueue is not part of the current transaction. The operation constitutes a transaction on its own.
-	`transformation`—the PL/SQL transformation to be invoked before the message is enqueued
`message_set`—contains one or more messages.	Each message consists of a `message_header` and `message_payload`
■ `message_header`	`message_id`—unique identifier of the message, supplied during dequeue
-	`correlation`—correlation identifier of the message

Table 17–1 Client Requests for Enqueue—Arguments and Attributes for AQXmlSend and AQXmlPublish

Argument	Attribute
-	`expiration`—duration in seconds that a message is available for dequeuing. This parameter is an offset from the delay. By default messages never expire. If the message is not dequeued before it expires, then it is moved to the exception queue in the `EXPIRED` state
-	`delay`—duration in seconds after which a message is available for processing
-	`priority`—the priority of the message. A smaller number indicates higher priority. The priority can be any number, including negative numbers.
-	**`sender_id`**—the application-specified identifier ■ `agent_name, address, protocol` ■ `agent_alias`—if specified, resolves to a name, address, protocol using LDAP
-	`recipient_list`—list of recipients; overrides the default subscriber list. Each recipient consists of: ■ `agent_name, address, protocol` ■ `agent_alias`—if specified, resolves to a name, address, protocol using LDAP
-	`message_state`— state of the message is filled in automatically during dequeue `0`: The message is ready to be processed. `1`: The message delay has not yet been reached. `2`: The message has been processed and is retained. `3`: The message has been moved to the exception queue.
-	`exception_queue`—in case of exceptions the name of the queue to which the message is moved if it cannot be processed successfully. Messages are moved in two cases: The number of unsuccessful dequeue attempts has exceeded `max_retries` or the message has expired. All messages in the exception queue are in the `EXPIRED` state. The default is the exception queue associated with the queue table. If the exception queue specified does not exist at the time of the move, then the message is moved to the default exception queue associated with the queue table, and a warning is logged in the alert file. If the default exception queue is used, then the parameter returns a `NULL` value at dequeue time.
■ **`message_payload`**	this can have different sub-elements based on the payload type of the destination queue/topic. The different payload types are described in the next section
`AQXmlCommit`	this is an empty element—if specified, the user transaction is committed at the end of the request

Message Payloads

AQ supports messages of the following types:

- RAW
- Oracle object (ADT)
- Java Messaging Service (JMS) types:
  - Text message
  - Map message
  - Bytes message
  - Object message

All these types of queues can be accessed using SOAP. If the queue holds messages in RAW, Oracle object, or JMS format, XML payloads are transformed to the appropriate internal format during enqueue and stored in the queue. During dequeue, when messages are obtained from queues containing messages in any of the preceding formats, they are converted to XML before being sent to the client.

The message payload type depends on the type of the queue on which the operation is being performed. A discussion of the queue types follows:

RAW Queues The contents of RAW queues are raw bytes. The user must supply the hex representation of the message payload in the XML message. For example, `<raw>023f4523</raw>`.

Oracle object (ADT) type queues For ADT queues that are not JMS queues (that is, they are not type `AQ$_JMS_*`), the type of the payload depends on the type specified while creating the queue table that holds the queue. The XML specified here must map to the SQL type of the payload for the queue table.

> **See Also:** *Oracle9i XML Database Developer's Guide* - *Oracle XML DB* for details on mapping SQL types to XML

Example Assume the queue is defined to be of type `EMP_TYP`, which has the following structure:

```
create or replace type emp_typ as object (
     empno NUMBER(4),
     ename VARCHAR2(10),
     job VARCHAR2(9),
     mgr NUMBER(4),
```

```
hiredate DATE,
sal   NUMBER(7,2),
comm  NUMBER(7,2)
deptno NUMBER(2));
```

The corresponding XML representation is:

```
<EMP_TYP>
  <EMPNO>1111</EMPNO>
  <ENAME>Mary</ENAME>
  <MGR>5000</MGR>
  <HIREDATE>1996-01-01 0:0:0</HIREDATE>
  <SAL>10000</SAL>
  <COMM>100.12</COMM>
  <DEPTNO>60</DEPTNO>
</EMP_TYP>
```

JMS Type Queues/Topics For queues with JMS types (that is, those with payloads of type `AQ$_JMS_*`), there are four different XML elements, depending on the JMS type. IDAP supports queues/topics with the following JMS types: TextMessage, MapMessage, BytesMessage and ObjectMessage. JMS queues with payload type StreamMessage are not supported through IDAP.

The JMS types and XML components are shown in Table 17-2. The distinct XML element for each JMS type is shown in its respective column.

Table 17–2 JMS Types and XML Components: Payload Types Used for Queues/Topics

AQ$_JMS_TEXT_ MESSAGE	AQ$_JMS_MAP_ MESSAGE	AQ$_JMS_BYTES_ MESSAGE	AQ$_JMS_OBJECT_ MESSAGE
`jms_text_message`	**`jms_map_message`**	**`jms_bytes_message`**	**`jms_object_message`**
`oracle_jms_properties`	`oracle_jms_properties`	`oracle_jms_properties`	`oracle_jms_properties`
`user_properties`	`user_properties`	`user_properties`	`user_properties`
`text_data`—string representing the text payload	**`map_data`**—set of name-value pairs called items, consisting of: ■ `name` ■ `int_value` or `string_value` or `long_value` or `double_value` or `boolean_value` or `float_value` or `short_value` or `byte_value`	**`bytes_data`**—hex representation of the payload bytes	**`ser_object_data`**—hex representation of the serialized object

Required elements are shown in **bold** in Table 17–2.

All JMS messages consist of the following common elements:

- `oracle_jms_properties`, which consists of
  - `type`—type of the message
  - `reply_to`—consists of an `agent_name`, `address`, and `protocol`
  - `userid`—supplied by AQ; client cannot specify
  - `appid`—application identifier
  - `groupid`—group identifier
  - `group_sequence`—sequence within the group identified by `group_id`
  - `timestamp`—the time the message was sent, which cannot be specified during enqueue. It is automatically populated in a message that is dequeued.

  - `recv_timestamp`—the time the message was received

- `user_properties`—in addition to the preceding predefined properties, users can also specify their own message properties as name-value pairs. The `user_properties` consists of a list of property elements. Each property is a name-value pair consisting of the following:

  - `name`—property name
  - `int_value`—integer property value or

    `string_value`—string property value or

    `long_value`—long property value or

    `double_value`—double property value or

    `boolean_value`—boolean property value or

    `float_value`— float property value or

    `short_value`—short property value or

    `byte_value`—byte property value or

The following examples show enqueue requests using the different message and queue types.

Enqueue Request Example—Sending an ADT Message to a Single-Consumer Queue

The queue `QS.NEW_ORDER_QUE` has a payload of type `ORDER_TYP`.

```
<?xml version="1.0"?>
  <Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
     <Body>
       <AQXmlSend xmlns = "http://ns.oracle.com/AQ/schemas/access">
         <producer_options>
           <destination>QS.NEW_ORDERS_QUE</destination>
         </producer_options>

         <message_set>
           <message_count>1</message_count>

           <message>
             <message_number>1</message_number>

             <message_header>
               <correlation>ORDER1</correlation>
```

```
  <sender_id>
    <agent_name>scott</agent_name>
  </sender_id>
</message_header>

<message_payload>

 <ORDER_TYP>
        <ORDERNO>100</ORDERNO>
        <STATUS>NEW</STATUS>
        <ORDERTYPE>URGENT</ORDERTYPE>
        <ORDERREGION>EAST</ORDERREGION>
        <CUSTOMER>
           <CUSTNO>1001233</CUSTNO>
           <CUSTID>MA1234555623212</CUSTID>
           <NAME>AMERICAN EXPRESS</NAME>
           <STREET>EXPRESS STREET</STREET>
           <CITY>REDWOOD CITY</CITY>
           <STATE>CA</STATE>
           <ZIP>94065</ZIP>
           <COUNTRY>USA</COUNTRY>
        </CUSTOMER>
        <PAYMENTMETHOD>CREDIT</PAYMENTMETHOD>
        <ITEMS>
           <ITEMS_ITEM>
              <QUANTITY>10</QUANTITY>
              <ITEM>
                 <TITLE>Perl</TITLE>
                 <AUTHORS>Randal</AUTHORS>
                 <ISBN>ISBN20200</ISBN>
                 <PRICE>19</PRICE>
              </ITEM>
              <SUBTOTAL>190</SUBTOTAL>
           </ITEMS_ITEM>
           <ITEMS_ITEM>
              <QUANTITY>20</QUANTITY>
              <ITEM>
                 <TITLE>XML</TITLE>
                 <AUTHORS>Micheal</AUTHORS>
                 <ISBN>ISBN20212</ISBN>
                 <PRICE>59</PRICE>
              </ITEM>
              <SUBTOTAL>590</SUBTOTAL>
           </ITEMS_ITEM>
        </ITEMS>
```

```
                    <CCNUMBER>NUMBER01</CCNUMBER>
                    <ORDER_DATE>2000-08-23 0:0:0</ORDER_DATE>
              </ORDER_TYP>
            </message_payload>
           </message>
         </message_set>
       </AQXmlSend>
     </Body>
</Envelope>
```

Enqueue Request Example—Publishing an ADT Message to a Multiconsumer Queue

The multiconsumer queue `AQUSER.EMP_TOPIC` has a payload of type `EMP_TYP`. `EMP_TYP` has the following structure:

```
 create or replace type emp_typ as object (
     empno NUMBER(4),
     ename VARCHAR2(10),
     job VARCHAR2(9),
     mgr NUMBER(4),
     hiredate DATE,
     sal   NUMBER(7,2),
     comm  NUMBER(7,2)
     deptno NUMBER(2));
```

A `PUBLISH` request has the following format:

```
<?xml version="1.0"?>
<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">

      <Body>
        <AQXmlPublish xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <producer_options>
            <destination>AQUSER.EMP_TOPIC</destination>
          </producer_options>

              <message_set>
                <message_count>1</message_count>

                <message>
                  <message_number>1</message_number>

                  <message_header>
                     <correlation>NEWEMP</correlation>
                     <sender_id>
```

```
                <agent_name>scott</agent_name>
              </sender_id>
            </message_header>

            <message_payload>
            <EMP_TYP>
              <EMPNO>1111</EMPNO>
              <ENAME>Mary</ENAME>
              <MGR>5000</MGR>
              <HIREDATE>1996-01-01 0:0:0</HIREDATE>
              <SAL>10000</SAL>
              <COMM>100.12</COMM>
              <DEPTNO>60</DEPTNO>
            </EMP_TYP>
           </message_payload>
          </message>
        </message_set>
      </AQXmlPublish>
    </Body>
</Envelope>
```

Enqueue Request Example—Sending a Message to a JMS Queue

The JMS queue `AQUSER.JMS_TEXTQ` has payload type JMS Text message (SYS.AQ$_JMS_TEXT_MESSAGE). The send request has the following format:

```
<?xml version="1.0"?>
<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>

        <AQXmlSend xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <producer_options>
            <destination>AQUSER.JMS_TEXTQ</destination>
          </producer_options>

          <message_set>
            <message_count>1</message_count>

            <message>
              <message_number>1</message_number>

              <message_header>
                <correlation>text_msg</correlation>
                  <sender_id>
                     <agent_name>john</agent_name>
```

```
                    </sender_id>
                </message_header>

                <message_payload>

                <jms_text_message>
                  <oracle_jms_properties>
                   <appid>AQProduct</appid>
                   <groupid>AQ</groupid>
                  </oracle_jms_properties>

                  <user_properties>
                    <property>
                      <name>Country</name>
                      <string_value>USA</string_value>
                    </property>
                    <property>
                       <name>State</name>
                      <string_value>California</string_value>
                    </property>
                   </user_properties>

                   <text_data>All things bright and beautiful</text_data>
                 </jms_text_message>
               </message_payload>
              </message>
            </message_set>
          </AQXmlSend>
        </Body>
</Envelope>
```

Enqueue Request Example—Publishing a Message to a JMS Topic

The JMS topic `AQUSER.JMS_MAP_TOPIC` has payload type JMS Map message (`SYS.AQ$_JMS_MAP_MESSAGE`). The publish request has the following format:

```
<?xml version="1.0"?>

<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>

        <AQXmlPublish xmlns = "http://ns.oracle.com/AQ/schemas/access">

          <producer_options>
            <destination>AQUSER.JMS_MAP_TOPIC</destination>
```

```
</producer_options>

<message_set>
  <message_count>1</message_count>

  <message>
    <message_number>1</message_number>

    <message_header>
        <correlation>toyota</correlation>
        <sender_id >
           <agent_name>john</agent_name>
        </sender_id>
        <recipient_list>
           <recipient>
              <agent_name>scott</agent_name>
           </recipient>
           <recipient>
              <agent_name>aquser</agent_name>
           </recipient>
           <recipient>
              <agent_name>jmsuser</agent_name>
           </recipient>
        </recipient_list>
    </message_header>

    <message_payload>

      <jms_map_message>
        <oracle_jms_properties>
          <reply_to>
             <agent_name>oracle</agent_name>
          </reply_to>
         <groupid>AQ</groupid>
       </oracle_jms_properties>

       <user_properties>
         <property>
           <name>Country</name>
           <string_value>USA</string_value>
         </property>
         <property>
           <name>State</name>
           <string_value>California</string_value>
         </property>
```

```
                    </user_properties>

                   <map_data>
                    <item>
                     <name>Car</name>
                     <string_value>Toyota</string_value>
                    </item>
                    <item>
                      <name>Color</name>
                      <string_value>Blue</string_value>
                    </item>
                    <item>
                      <name>Price</name>
                      <int_value>20000</int_value>
                    </item>
                  </map_data>
                 </jms_map_message>
               </message_payload>
              </message>
            </message_set>
           </AQXmlPublish>
      </Body>
</Envelope>
```

Enqueue Request Example—Sending a Message to a Queue with a RAW Payload

The queue `AQUSER.RAW_MSGQ` has a payload of type RAW. The `SEND` request has the following format:

```
<?xml version="1.0"?>
   <Envelope  xmlns =  "http://schemas.xmlsoap.org/soap/envelope/">
   <Body>
      <AQXmlSend xmlns = "http://ns.oracle.com/AQ/schemas/access">
        <producer_options>
          <destination>AQUSER.RAW_MSGQ</destination>
        </producer_options>
        <message_set>
          <message_count>1</message_count>

          <message>
             <message_number>1</message_number>

                 <message_header>
                   <correlation>TKAXAS11</correlation>
                   <sender_id>
```

```
                      <agent_name>scott</agent_name>
                   </sender_id>
                 </message_header>
                 <message_payload>

<RAW>426C6F622064617461202D20626C6F622064617461202D20626C6F6220646174612042 6C6F6
22064617461202D20626C6F622064617461202D20626C6F6220646174612042 6</RAW>
                 </message_payload>
               </message>
            </message_set>
          </AQXmlSend>
      </Body>
</Envelope>
```

Enqueue Request Example—Sending/Publishing and Committing the Transaction

```
<?xml version="1.0"?>
<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">

      <Body>
        <AQXmlPublish xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <producer_options>
            <destination>AQUSER.EMP_TOPIC</destination>
          </producer_options>

          <message_set>
            <message_count>1</message_count>

            <message>
              <message_number>1</message_number>

              <message_header>
          <correlation>NEWEMP</correlation>
          <sender_id>
             <agent_name>scott</agent_name>
          </sender_id>
              </message_header>

              <message_payload>
                <EMP_TYP>
                  <EMPNO>1111</EMPNO>
                  <ENAME>Mary</ENAME>
                  <MGR>5000</MGR>
                  <HIREDATE>1996-01-01 0:0:0</HIREDATE>
```

```
                    <SAL>10000</SAL>
                    <COMM>100.12</COMM>
                    <DEPTNO>60</DEPTNO>
                 </EMP_TYP>
               </message_payload>
              </message>
            </message_set>

          <AQXmlCommit/>

          </AQXmlPublish>
        </Body>
</Envelope>
```

Client Requests for Dequeue

Client requests for dequeue use the `AQXmlReceive` method, which takes the arguments and argument attributes shown in Table 17–3. Required arguments are shown in bold.

Table 17–3 Client Requests for Dequeue—Arguments and Attributes for AQXmlReceive

Argument	Attribute
consumer_options	**destination**—specify the queue/topic from which messages are to be received. The destination element has an attribute lookup_type which determines how the destination element value is interpreted ■ DATABASE (default)—destination is interpreted as schema.queue_name ■ LDAP—the LDAP server is used to resolve the destination
-	consumer_name—Name of the consumer. Only those messages matching the consumer name are accessed. If a queue is not set up for multiple consumers, then this field should not be specified
-	wait_time—the time (in seconds) to wait if there is currently no message available which matches the search criteria
-	selector—criteria used to select the message, specified as one of: ■ correlation—the correlation identifier of the message to be dequeued. ■ message_id— the message identifier of the message to be dequeued ■ condition—dequeue message that satisfy this condition. A condition is specified as a Boolean expression using syntax similar to the WHERE clause of a SQL query. This Boolean expression can include conditions on message properties, user data properties (object payloads only), and PL/SQL or SQL functions (as specified in the where clause of a SQL query). Message properties include priority, corrid and other columns in the queue table To specify dequeue conditions on a message payload (object payload), use attributes of the object type in clauses. You must prefix each attribute with tab.user_data as a qualifier to indicate the specific column of the queue table that stores the payload. The deq_condition parameter cannot exceed 4000 characters.
-	visibility ■ ON_COMMIT (default)—The dequeue is part of the current transaction. The operation is complete when the transaction commits. ■ IMMEDIATE—effects of the dequeue are visible immediately after the request is completed. The dequeue is not part of the current transaction. The operation constitutes a transaction on its own.

Table 17–3 Client Requests for Dequeue—Arguments and Attributes for AQXmlReceive

Argument	Attribute
-	`dequeue_mode`—Specifies the locking behavior associated with the dequeue. The dequeue_mode can be specified as one of: ■ `REMOVE` (default): Read the message and update or delete it. This is the default. The message can be retained in the queue table based on the retention properties. ■ `BROWSE`: Read the message without acquiring any lock on the message. This is equivalent to a select statement. ■ `LOCKED`: Read and obtain a write lock on the message. The lock lasts for the duration of the transaction. This is equivalent to a select for update statement.
-	`navigation_mode`—Specifies the position of the message that will be retrieved. First, the position is determined. Second, the search criterion is applied. Finally, the message is retrieved. The navigation_mode can be specified as one of: ■ `FIRST_MESSAGE`: Retrieves the first message which is available and matches the search criteria. This resets the position to the beginning of the queue. ■ `NEXT_MESSAGE (default)`: Retrieve the next message which is available and matches the search criteria. If the previous message belongs to a message group, then AQ retrieves the next available message which matches the search criteria and belongs to the message group. This is the default. ■ `NEXT_TRANSACTION`: Skip the remainder of the current transaction group (if any) and retrieve the first message of the next transaction group. This option can only be used if message grouping is enabled for the current queue.
-	`transformation`—the PL/SQL transformation to be invoked after the message is dequeued
`AQXmlCommit`	this is an empty element—if specified, the user transaction is committed at the end of the request

The following examples show dequeue requests using different attributes of `AQXmlReceive`.

Dequeue Request Example—Receiving Messages from a Single-Consumer Queue

Using the single-consumer queue `QS.NEW_ORDERS_QUE`, the receive request has the following format:

```
<?xml version="1.0"?>

<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>
        <AQXmlReceive xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <consumer_options>
            <destination>QS.NEW_ORDERS_QUE</destination>
            <wait_time>0</wait_time>
          </consumer_options>
        </AQXmlReceive>
      </Body>
</Envelope>
```

Dequeue Request Example—Receiving Messages from a Multiconsumer Queue

Using the multiconsumer queue AQUSER.EMP_TOPIC with subscriber APP1, the receive request has the following format:

```
<?xml version="1.0"?>
<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>
        <AQXmlReceive xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <consumer_options>
            <destination>AQUSER.EMP_TOPIC</destination>
            <consumer_name>APP1</consumer_name>
            <wait_time>0</wait_time>
            <navigation_mode>FIRST_MESSAGE</navigation_mode>
          </consumer_options>
        </AQXmlReceive>
      </Body>
</Envelope>
```

Dequeue Request Example—Receiving Messages from a Specific Correlation ID

Using the single consumer queue QS.NEW_ORDERS_QUE, to receive messages with correlation ID NEW, the receive request has the following format:

```
<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>
        <AQXmlReceive xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <consumer_options>
            <destination>QS.NEW_ORDERS_QUE</destination>
            <wait_time>0</wait_time>
            <selector>
                 <correlation>NEW</correlation>
            </selector>
```

```
          </consumer_options>
        </AQXmlReceive>
      </Body>
</Envelope>
```

Dequeue Request Example—Receiving Messages that Satisfy a Specific Condition

Using the multiconsumer queue `AQUSER.EMP_TOPIC` with subscriber `APP1` and condition `deptno=60`, the receive request has the following format:

```
<?xml version="1.0"?>
<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>
        <AQXmlReceive xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <consumer_options>
            <destination>AQUSER.EMP_TOPIC</destination>
            <consumer_name>APP1</consumer_name>
            <wait_time>0</wait_time>
            <selector>
                 <condition>tab.user_data.deptno=60</condition>
            </selector>
          </consumer_options>
        </AQXmlReceive>
      </Body>
</Envelope>
```

Dequeue Request Example—Receiving Messages and Committing

In the dequeue request examples, if you include `AQXmlCommit` at the end of the `RECEIVE` request, the transaction is committed upon completion of the operation. In "Dequeue Request Example—Receiving Messages from a Multiconsumer Queue" on page 17-23, the receive request can include the commit flag as follows:

```
 <?xml version="1.0"?>

<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>
        <AQXmlReceive xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <consumer_options>
            <destination>QS.NEW_ORDERS_QUE</destination>
            <wait_time>0</wait_time>
          </consumer_options>

          <AQXmlCommit/>
```

```
        </AQXmlReceive>
      </Body>
</Envelope>
```

Dequeue Request Example—Browsing Messages

Messages are dequeued in REMOVE mode by default. To receive messages from QS.NEW_ORDERS_QUE in BROWSE mode, modify the receive request as follows:

```
<?xml version="1.0"?>

<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>
        <AQXmlReceive xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <consumer_options>
            <destination>QS.NEW_ORDERS_QUE</destination>
            <wait_time>0</wait_time>
            <dequeue_mode>BROWSE</dequeue_mode>
          </consumer_options>
         </AQXmlReceive>
      </Body>
</Envelope>
```

Client Requests for Registration

Client requests for registration use the AQXmlRegister method, which takes the arguments and argument attributes shown in Table 17–4. Required arguments are shown in bold.

Table 17–4 Client Registration—Arguments and Attributes for AQXmlRegister

Argument	Attribute
register_options	**destination**—specify the queue or topic on which notifications are registered. The destination element has an attribute lookup_type which determines how the destination element value is interpreted ▪ DATABASE (default)—destination is interpreted as schema.queue_name ▪ LDAP—the LDAP server is used to resolve the destination
-	consumer_name—the consumer name for multiconsumer queues or topics. For single consumer queues, this parameter must not be specified
-	**notify_url**—where notification is sent when a message is enqueued. The form can be http://<url> or mailto://<email address> or plsql://<pl/sql procedure>.

Register Request Example—Registering for Notification at an E-mail Address

To notify an e-mail address of messages enqueued for consumer APP1 in queue AQUSER.EMP_TOPIC, the register request has the following format:

```
<?xml version="1.0"?>
<Envelope xmlns= "http://schemas.xmlsoap.org/soap/envelope/">
      <Body>

        <AQXmlRegister xmlns = "http://ns.oracle.com/AQ/schemas/access">

          <register_options>
            <destination>AQUSER.EMP_TOPIC</destination>
            <consumer_name>APP1</consumer_name>
            <notify_url>mailto:app1@hotmail.com</notify_url>
          </register_options>

          <AQXmlCommit/>

        </AQXmlRegister>
      </Body>
</Envelope>
```

Client Requests to Commit a Transaction

A request to commit all actions performed by the user in a session uses the AQXmlCommit method.

Commit Request Example

A commit request has the following format.

```
<?xml version="1.0"?>
<Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
   <Body>
      <AQXmlCommit xmlns="http://ns.oracle.com/AQ/schemas/access"/>
   </Body>
</Envelope>
```

Client Requests to Rollback a Transaction

A request to roll back all actions performed by the user in a session uses the AQXmlRollback method. Actions performed with IMMEDIATE visibility are not rolled back.

Rollback Request Example

A rollback request has the following format:

```
<?xml version="1.0"?>
<Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
   <Body>
      <AQXmlRollback xmlns="http://ns.oracle.com/AQ/schemas/access"/>
   </Body>
</Envelope>
```

Server Response to Enqueue

The response to an enqueue request to a single-consumer queue uses the `AQXmlSendResponse` method. The components of the response are shown in Table 17–5.

Table 17–5 Server Response to an Enqueue to a Single-Consumer Queue (AQXmlSendResponse)

Response	Attribute
`status_response`	`status_code`—indicates success (0) or failure (-1) `error_code`—Oracle code for the error `error_message`—description of the error
`send_result`	`destination`—where the message was sent `message_id`—identifier for every message sent

Server Request Example—Enqueuing a Single Message to a Single-Consumer Queue

The result of a `SEND` request to the single consumer queue `QS.NEW_ORDERS_QUE` has the following format:

```
<?xml version = '1.0'?>
<Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
   <Body>
      <AQXmlSendResponse xmlns="http://ns.oracle.com/AQ/schemas/access">
         <status_response>
            <status_code>0</status_code>
         </status_response>
         <send_result>
            <destination>QS.NEW_ORDERS_QUE</destination>
            <message_id>12341234123412341234</message_id>
         </send_result>
      </AQXmlSendResponse>
```

```
   </Body>
</Envelope>
```

The response to an enqueue request to a multiconsumer queue or topic uses the `AQXmlPublishResponse` method. The components of the response are shown in Table 17–6.

Table 17–6 Server Response to an Enqueue to a Multiconsumer Queue or Topic (AQXmlPublishResponse)

Response	Attribute
`status_response`	`status_code`—indicates success (0) or failure (-1) `error_code`—Oracle code for the error `error_message`—description of the error
`publish_result`	`destination`—where the message was sent `message_id`—identifier for every message sent

Server Request Example—Enqueuing to a Multiconsumer Queue

The result of a `SEND` request to the multiconsumer queue `AQUSER.EMP_TOPIC` has the following format:

```
<?xml version = '1.0'?>
<Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
   <Body>
      <AQXmlPublishResponse xmlns="http://ns.oracle.com/AQ/schemas/access">
         <status_response>
            <status_code>0</status_code>
         </status_response>
         <publish_result>
            <destination>AQUSER.EMP_TOPIC</destination>
            <message_id>23434435435456546546546546</message_id>
         </publish_result>
      </AQXmlPublishResponse>
   </Body>
</Envelope>
```

Server Response to a Dequeue Request

The response to a dequeue request uses the `AQXmlReceiveResponse` method. The components of the response are shown in Table 17–7.

Table 17–7 Server Response to a Dequeue from a Queue or Topic (AQXmlReceiveResponse)

Response	Attribute
`status_response`	`status_code`—indicates success (0) or failure (-1) `error_code`—Oracle code for the error `error_message`—description of the error
`receive_result`	`destination`—where the message was sent `message_set`—the set of messages dequeued

Dequeue Response Example—Receiving Messages from an ADT Queue (AQXmlReceiveResponse)

The result of a `RECEIVE` request on the queue `AQUSER.EMP_TOPIC` with a payload of type `EMP_TYP` has the following format:

```
<?xml version = '1.0'?>
<Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
   <Body>
      <AQXmlReceiveResponse xmlns="http://ns.oracle.com/AQ/schemas/access">
         <status_response>
            <status_code>0</status_code>
         </status_response>
         <receive_result>
            <destination>AQUSER.EMP_TOPIC</destination>
            <message_set>
               <message_count>1</message_count>
               <message>
                  <message_number>1</message_number>
                  <message_header>
                     <message_id>1234344545565667</message_id>
                     <correlation>TKAXAP10</correlation>
                     <priority>1</priority>
                     <delivery_count>0</delivery_count>
                     <sender_id>
                        <agent_name>scott</agent_name>
                     </sender_id>
                     <message_state>0</message_state>
                  </message_header>
                  <message_payload>
                    <EMP_TYP>
                      <EMPNO>1111</EMPNO>
                      <ENAME>Mary</ENAME>
                      <MGR>5000</MGR>
```

```
                      <HIREDATE>1996-01-01 0:0:0</HIREDATE>
                      <SAL>10000</SAL>
                      <COMM>100.12</COMM>
                      <DEPTNO>60</DEPTNO>
                    </EMP_TYP>
                 </message_payload>
               </message>
            </message_set>
         </receive_result>
      </AQXmlReceiveResponse>
   </Body>
</Envelope>
```

Dequeue Response Example—Receiving Messages from a JMS Queue

The result of a RECEIVE request on a queue with a payload of type JMS Text message has the following format:

```
<?xml version = '1.0'?>
<Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
<Body>
      <AQXmlReceiveResponse xmlns="http://ns.oracle.com/AQ/schemas/access">
         <status_response>
            <status_code>0</status_code>
         </status_response>
         <receive_result>
            <destination>AQUSER.JMS_TEXTQ</destination>
            <message_set>
               <message_count>1</message_count>
               <message>
                  <message_number>1</message_number>
                  <message_header>
                     <message_id>12233435454656567</message_id>
                     <correlation>TKAXAP01</correlation>
                     <delay>0</delay>
                     <priority>1</priority>
                     <message_state>0</message_state>
                     <sender_id>
                        <agent_name>scott</agent_name>
                     </sender_id>
                  </message_header>
                  <message_payload>
                     <jms_text_message>
                        <oracle_jms_properties>
                           <reply_to>
```

```
                    <agent_name>oracle</agent_name>
                    <address>redwoodshores</address>
                    <protocol>100</protocol>
                 </reply_to>
                 <userid>AQUSER</userid>
                 <appid>AQProduct</appid>
                 <groupid>AQ</groupid>
                 <timestamp>01-12-2000</timestamp>
                 <recv_timestamp>12-12-2000</recv_timestamp>
              </oracle_jms_properties>
              <user_properties>
                 <property>
                    <name>Country</name>
                    <string_value>USA</string_value>
                 </property>
                 <property>
                    <name>State</name>
                    <string_value>California</string_value>
                 </property>
              </user_properties>
              <text_data>All things bright and beautiful</text_data>
           </jms_text_message>
        </message_payload>
     </message>
   </message_set>
  </receive_result>
 </AQXmlReceiveResponse>
</Body>
</Envelope>
```

Server Response to a Register Request

The response to a register request uses the `AQXmlRegisterResponse` method, which consists of `status_response`. (See Table 17–7 for a description of `status_response`.)

Commit Response

The response to a commit request uses the AQXmlCommitResponse method, which consists of `status_response`. (See Table 17–7 for a description of `status_response`.)

Example

The response to a commit request has the following format:

```
<?xml version = '1.0'?>
<Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
   <Body>
      <AQXmlCommitResponse xmlns="http://ns.oracle.com/AQ/schemas/access">
         <status_response>
            <status_code>0</status_code>
         </status_response>
      </AQXmlCommitResponse>
   </Body>
</Envelope>
```

Rollback Response

The response to a rollback request uses the `AQXmlRollbackResponse` method, which consists of `status_response`. (See Table 17–7 for a description of `status_response`.)

Notification

When an event for which a client has registered occurs, a notification is sent to the client at the URL specified in the `REGISTER` request. `AQXmlNotification` consists of:

- `notification_options`, which has
  - `destination`—the destination queue/topic on which the event occurred
  - `consumer_name`—in case of multiconsumer queues/topics, this refers to the consumer name for which the event occurred
- `message_set`—the set of message properties.

Response in Case of Error

In case of an error in any of the preceding requests, a `FAULT` is generated. The `FAULT` element consists of:

- `faultcode` - error code for fault
- `faultstring` - indicates a client error or a server error. A client error means that the request is not valid. Server error indicates that the AQ servlet has not been set up correctly
- `detail`, which consists of
  - `status_response`

Example

A `FAULT` message has the following format:

```
<?xml version = '1.0'?>
<Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
   <Body>
      <Fault xmlns="http://schemas.xmlsoap.org/soap/envelope/">
         <faultcode>100</faultcode>
         <faultstring>Server Fault</faultstring>
         <detail>
            <status_response>
               <status_code>-1</status_code>
               <error_code>410</error_code>
               <error_message>JMS-410: XML SQL Excetpion
ORA-24031: invalid value, OWNER_NAME should be non-NULL
ORA-06512: at "SYS.DBMS_AQJMS", line 177
ORA-06512: at line 1
</error_message>
            </status_response>
         </detail>
      </Fault>
   </Body>
</Envelope>
```

SOAP and AQ XML Schemas

IDAP exposes the SOAP schema and the AQ XML schema to the client. All documents sent are validated against these schemas:

- SOAP schema—`http://schemas.xmlsoap.org/soap/envelope/`
- AQ XML schema—`http://ns.oracle.com/AQ/schemas/access`

The SOAP Schema

The SOAP schema describes the structure of a document: envelope, header, and body.

```
<?xml version='1.0'?>
<!-- XML Schema for SOAP v 1.1 Envelope -->
<schema xmlns='http://www.w3.org/2001/XMLSchema'
        xmlns:tns='http://schemas.xmlsoap.org/soap/envelope/'
        targetNamespace='http://schemas.xmlsoap.org/soap/envelope/'>

  <!-- SOAP envelope, header and body -->
```

```
<element name="Envelope" type="tns:Envelope"/>
<complexType name='Envelope'>
 <sequence>
  <element ref='tns:Header' minOccurs='0'/>
  <element ref='tns:Body' minOccurs='1'/>
  <any minOccurs='0' maxOccurs='*'/>
 </sequence>
  <anyAttribute/>
</complexType>

<element name="Header" type="tns:Header"/>
<complexType name='Header'>
 <sequence>
  <any minOccurs='0' maxOccurs='*'/>
 </sequence>
  <anyAttribute/>
</complexType>

<element name="Body" type="tns:Body"/>
<complexType name='Body'>
 <sequence>
  <any minOccurs='0' maxOccurs='*'/>
 </sequence>
  <anyAttribute/>
</complexType>

<!-- Global Attributes.  The following attributes are intended
     to be usable via qualified attribute names on any complex type
     referencing them.  -->

<attribute name="mustUnderstand" type="tns:mutype" use="optional" value="0"/>
</attribute>

<simpleType  name="mutype">
   <restriction base="string">
<enumeration value="0"/>
      <enumeration value="1"/>
   </restriction>
</simpleType>

<attribute name='actor' type='anyURI'/>

<!-- 'encodingStyle' indicates any canonicalization conventions followed
     in the contents of the containing element.  For example, the value
```

```
      'http://schemas.xmlsoap.org/soap/encoding/' indicates
      the pattern described in SOAP specification. -->

  <simpleType name='encodingStyle'>
    <list itemType='anyURI'/>
  </simpleType>
  <attributeGroup name='encodingStyle'>
    <attribute name='encodingStyle' type='tns:encodingStyle'/>
  </attributeGroup>

  <!-- SOAP fault reporting structure -->
  <complexType name='Fault' final='extension'>
   <sequence>
    <element name='faultcode' type='QName'/>
    <element name='faultstring' type='string'/>
    <element name='faultactor' type='anyURI' minOccurs='0'/>
    <element name='detail' type='tns:detail' minOccurs='0'/>
   </sequence>
  </complexType>

  <complexType name='detail'>
   <sequence>
    <any minOccurs='0' maxOccurs='*'/>
   </sequence>
    <anyAttribute/>
  </complexType>

</schema>
```

IDAP Schema

The IDAP schema describes the contents of the IDAP body for Internet access to AQ features.

```
<?xml version="1.0"?>

<!-- ****************** AQ xml schema  ****************** -->

<schema xmlns = "http://www.w3.org/2001/XMLSchema"
        targetNamespace = "http://ns.oracle.com/AQ/schemas/access"
        xmlns:aq = "http://ns.oracle.com/AQ/schemas/access"
        xmlns:xsd = "http://www.w3.org/2001/XMLSchema">

<import namespace = "http://schemas.xmlsoap.org/soap/envelope/"
        schemaLocation = "soap_env.xsd" />
```

```
<!-- ****************** AQ xml client operations  ****************** -->

   <element name="AQXmlSend">
      <complexType mixed="true">
        <sequence>
           <element ref="aq:producer_options" minOccurs="1" maxOccurs="1" />
           <element ref="aq:message_set" minOccurs="1" maxOccurs="1"/>
           <element ref="aq:AQXmlCommit" minOccurs="0" maxOccurs="1"/>
        </sequence>
      </complexType>
    </element>

   <element name="AQXmlPublish">
      <complexType mixed="true">
        <sequence>
           <element ref="aq:producer_options" minOccurs="1" maxOccurs="1" />
           <element ref="aq:message_set" minOccurs="1" maxOccurs="1"/>
           <element ref="aq:AQXmlCommit" minOccurs="0" maxOccurs="1"/>
        </sequence>
      </complexType>
    </element>


   <element name="AQXmlReceive">
      <complexType mixed="true">
        <sequence>
           <element ref="aq:consumer_options" minOccurs="1" maxOccurs="1" />
           <element ref="aq:AQXmlCommit" minOccurs="0" maxOccurs="1"/>
        </sequence>
      </complexType>
   </element>


   <element name="AQXmlRegister">
      <complexType mixed="true">
        <sequence>
           <element ref="aq:register_options" minOccurs="1" maxOccurs="1" />
           <element ref="aq:AQXmlCommit" minOccurs="0" maxOccurs="1"/>
        </sequence>
      </complexType>
   </element>
```

```
<element name="AQXmlCommit">
   <complexType>
   </complexType>
</element>

<element name="AQXmlRollback">
   <complexType>
   </complexType>
</element>



<!-- ****************** AQ xml server responses  ****************** -->

<element name="AQXmlSendResponse">
   <complexType mixed="true">
     <sequence>
        <element ref="aq:status_response" minOccurs="1" maxOccurs="1"/>
        <element ref="aq:send_result" minOccurs="0" maxOccurs="1"/>
     </sequence>
   </complexType>
 </element>

<element name="AQXmlPublishResponse">
   <complexType mixed="true">
     <sequence>
        <element ref="aq:status_response" minOccurs="1" maxOccurs="1"/>
        <element ref="aq:publish_result" minOccurs="0" maxOccurs="1"/>
     </sequence>
   </complexType>
 </element>


<element name="AQXmlReceiveResponse">
   <complexType mixed="true">
     <sequence>
        <element ref="aq:status_response" minOccurs="1" maxOccurs="1"/>
        <element ref="aq:receive_result" minOccurs="0" maxOccurs="1"/>
     </sequence>
   </complexType>
 </element>


<element name="AQXmlRegisterResponse">
   <complexType mixed="true">
```

```
      <sequence>
         <element ref="aq:status_response" minOccurs="1" maxOccurs="1"/>
      </sequence>
    </complexType>
  </element>

 <element name="AQXmlCommitResponse">
    <complexType mixed="true">
      <sequence>
         <element ref="aq:status_response" minOccurs="1" maxOccurs="1"/>
      </sequence>
    </complexType>
  </element>

 <element name="AQXmlRollbackResponse">
    <complexType mixed="true">
      <sequence>
         <element ref="aq:status_response" minOccurs="1" maxOccurs="1"/>
      </sequence>
    </complexType>
  </element>


 <element name="destination">
   <complexType>
    <simpleContent>
      <extension base='string'>
        <attribute name="lookup_type" type="aq:dest_lookup_type"
         default="DATABASE"/>
      </extension>
   </simpleContent>
 </complexType>
 </element>

 <!-- **** destination lookup type ******* -->
 <!-- lookup_type can be specified to either lookup LDAP or use  -->
 <simpleType name="dest_lookup_type">
  <restriction base="string">
    <enumeration value="DATABASE"/>
    <enumeration value="LDAP"/>
   </restriction>
  </simpleType>

 <!-- ***************** Producer Options ***************** -->
 <element name="producer_options">
```

```
        <complexType mixed="true">
          <sequence>
          <element ref="aq:destination" minOccurs="1" maxOccurs="1"/>
          <element ref="aq:visibility" minOccurs="0" maxOccurs="1"/>
          <element ref="aq:transformation" minOccurs="0" maxOccurs="1"/>
          </sequence>
        </complexType>
      </element>

    <!-- ****************** Consumer Options ****************** -->
    <element name="consumer_options">
        <complexType mixed="true">
         <sequence>
          <element ref="aq:destination" minOccurs="1" maxOccurs="1"/>
          <element ref="aq:consumer_name" minOccurs="0" maxOccurs="1"/>
          <element ref="aq:wait_time" minOccurs="0" maxOccurs="1"/>
          <element ref="aq:selector" minOccurs="0" maxOccurs="1"/>
          <element ref="aq:batch_size" minOccurs="0" maxOccurs="1"/>
          <element ref="aq:visibility" minOccurs="0" maxOccurs="1"/>
          <element ref="aq:dequeue_mode" minOccurs="0" maxOccurs="1"/>
          <element ref="aq:navigation_mode" minOccurs="0" maxOccurs="1"/>
          <element ref="aq:transformation" minOccurs="0" maxOccurs="1"/>
          </sequence>
         </complexType>
      </element>


    <!-- ****************** Register Options ****************** -->
    <element name="register_options">
        <complexType mixed="true">
          <sequence>
          <element ref="aq:destination" minOccurs="1" maxOccurs="1"/>
          <element ref="aq:consumer_name" minOccurs="0" maxOccurs="1"/>
          <element ref="aq:notify_url" minOccurs="1" maxOccurs="1"/>
          </sequence>
        </complexType>
      </element>

    <element name="recipient_list">
      <complexType mixed="true">
        <sequence>
<element ref="aq:recipient" minOccurs="1" maxOccurs="*"/>
        </sequence>
      </complexType>
    </element>
```

```
<!-- ***************** Message Set ************************ -->
<element name="message_set">
   <complexType mixed="true">
    <sequence>
     <element ref="aq:message_count" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:message" minOccurs="0" maxOccurs="*"/>
    </sequence>
   </complexType>
</element>


<!-- ***************** Message ************************ -->
<element name="message">
   <complexType mixed="true">
    <sequence>
     <element ref="aq:message_number" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:message_header" minOccurs="1" maxOccurs="1"/>
     <element ref="aq:message_payload" minOccurs="0" maxOccurs="1"/>
    </sequence>
   </complexType>
</element>


<!-- ***************** Message header ***************** -->
<element name="message_header">
   <complexType mixed="true">
    <sequence>
     <element ref="aq:message_id" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:correlation" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:delay" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:expiration" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:priority" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:delivery_count" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:sender_id" minOccurs="1" maxOccurs="1"/>
     <element ref="aq:recipient_list" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:message_state" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:exception_queue" minOccurs="0" maxOccurs="1"/>
   </sequence>
  </complexType>
 </element>


<!-- ***************** Oracle JMS properties ***************** -->
```

```
<element name="oracle_jms_properties">
   <complexType mixed="true">
    <sequence>
     <element ref="aq:type" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:reply_to" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:userid" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:appid" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:groupid" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:group_sequence" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:timestamp" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:recv_timestamp" minOccurs="0" maxOccurs="1"/>
    </sequence>
   </complexType>
 </element>


<!-- ****************** Message payload ****************** -->
<element name="message_payload">
  <complexType>
     <choice>
       <element ref="aq:raw" minOccurs="0" maxOccurs="1"/>
       <element ref="aq:jms_text_message" minOccurs="0" maxOccurs="1"/>
       <element ref="aq:jms_map_message" minOccurs="0" maxOccurs="1"/>
       <element ref="aq:jms_bytes_message" minOccurs="0" maxOccurs="1"/>
       <element ref="aq:jms_object_message" minOccurs="0" maxOccurs="1"/>
  <any minOccurs="0" maxOccurs="*" processContents="skip"/>
     </choice>
  </complexType>
</element>


<!-- ****************** User-defined properties ****************** -->
<element name="user_properties">
   <complexType mixed="true">
     <sequence>
     <element ref="aq:property" minOccurs="0" maxOccurs="*"/>
     </sequence>
   </complexType>
</element>

<!-- ****************** Property  ****************** -->
<element name="property">
   <complexType mixed="true">
     <sequence>
 <element ref="aq:name" minOccurs="1" maxOccurs="1"/>
```

```
 <choice>
   <element ref="aq:int_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:string_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:long_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:double_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:boolean_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:float_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:short_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:byte_value" minOccurs="1" maxOccurs="1"/>
 </choice>
     </sequence>
   </complexType>
 </element>


<!-- ****************** Status response ****************** -->
<element name="status_response">
   <complexType mixed="true">
    <sequence>
     <element ref="aq:acknowledge" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:status_code" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:error_code" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:error_message" minOccurs="0" maxOccurs="1"/>
    </sequence>
   </complexType>
</element>


<!-- ****************** Send result ****************** -->
<element name="send_result">
   <complexType mixed="true">
    <sequence>
     <element ref="aq:destination" minOccurs="1" maxOccurs="1"/>
     <element ref="aq:message_id" minOccurs="0" maxOccurs="*"/>
   </sequence>
   </complexType>
</element>

<!-- ****************** Publish result ****************** -->
<element name="publish_result">
   <complexType mixed="true">
    <sequence>
     <element ref="aq:destination" minOccurs="1" maxOccurs="1"/>
     <element ref="aq:message_id" minOccurs="0" maxOccurs="*"/>
    </sequence>
```

```
   </complexType>
</element>


<!-- ****************** Receive result ****************** -->
<element name="receive_result">
   <complexType mixed="true">
    <sequence>
     <element ref="aq:destination" minOccurs="1" maxOccurs="1"/>
     <element ref="aq:message_set" minOccurs="0" maxOccurs="*"/>
    </sequence>
   </complexType>
</element>


<!-- ****************** Notification *************************** -->
<element name="notification_options">
   <complexType mixed="true">
    <sequence>
     <element ref="aq:destination" minOccurs="1" maxOccurs="1"/>
     <element ref="aq:consumer_name" minOccurs="1" maxOccurs="1"/>
    </sequence>
   </complexType>
</element>


<element name="priority" type="integer"/>
<element name="expiration" type="integer"/>
<element name="consumer_name" type="string"/>
<element name="wait_time" type="integer"/>
<element name="batch_size" type="integer"/>

<element name="notify_url" type="string"/>
<element name="message_id" type="string"/>
<element name="message_state" type="string"/>


<element name="message_number" type="integer"/>
<element name="message_count" type="integer"/>

<element name="correlation" type="string"/>
<element name="delay" type="integer"/>
<element name="delivery_count" type="integer"/>
<element name="exception_queue" type="string"/>
<element name="agent_alias" type="string"/>
```

```
<element name="type" type="string"/>
<element name="userid" type="string"/>
<element name="appid" type="string"/>
<element name="groupid" type="string"/>
<element name="group_sequence" type="integer"/>
<element name="timestamp" type="date"/>
<element name="recv_timestamp" type="date"/>

<element name="recipient">
  <complexType>
    <choice>
      <sequence>
        <element ref="aq:agent_name" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:address" minOccurs="0" maxOccurs="1"/>
        <element ref="aq:protocol" minOccurs="0" maxOccurs="1"/>
      </sequence>
      <element ref="aq:agent_alias" minOccurs="1" maxOccurs="1"/>
    </choice>
  </complexType>
</element>


<element name="sender_id">
  <complexType>
    <choice>
      <sequence>
        <element ref="aq:agent_name" minOccurs="0" maxOccurs="1"/>
     <element ref="aq:address" minOccurs="0" maxOccurs="1"/>
        <element ref="aq:protocol" minOccurs="0" maxOccurs="1"/>
      </sequence>
      <element ref="aq:agent_alias" minOccurs="1" maxOccurs="1"/>
    </choice>
  </complexType>
</element>


<element name="reply_to">
  <complexType>
    <choice>
      <sequence>
        <element ref="aq:agent_name" minOccurs="1" maxOccurs="1"/>
     <element ref="aq:address" minOccurs="0" maxOccurs="1"/>
        <element ref="aq:protocol" minOccurs="0" maxOccurs="1"/>
      </sequence>
```

```
          <element ref="aq:agent_alias" minOccurs="1" maxOccurs="1"/>
        </choice>
      </complexType>
    </element>


    <element name="selector">
      <complexType>
<choice>
           <element ref="aq:correlation" minOccurs="0" maxOccurs="1"/>
           <element ref="aq:message_id" minOccurs="0" maxOccurs="1"/>
           <element ref="aq:condition" minOccurs="0" maxOccurs="1"/>
         </choice>
      </complexType>
    </element>


    <element name="condition" type="string"/>

    <element name="visibility">
     <simpleType>
      <restriction base="string">
       <enumeration value="ON_COMMIT"/>
       <enumeration value="IMMEDIATE"/>
      </restriction>
     </simpleType>
     </element>

    <simpleType name="del_mode_type">
      <restriction base="string">
       <enumeration value="PERSISTENT"/>
       <enumeration value="NONPERSISTENT"/>
      </restriction>
     </simpleType>

    <element name="dequeue_mode">
    <simpleType>
     <restriction base="string">
       <enumeration value="BROWSE"/>
       <enumeration value="LOCKED"/>
       <enumeration value="REMOVE"/>
       <enumeration value="REMOVE_NODATA"/>
     </restriction>
     </simpleType>
    </element>
```

```
<element name="navigation_mode">
<simpleType>
 <restriction base="string">
   <enumeration value="FIRST_MESSAGE"/>
   <enumeration value="NEXT_MESSAGE"/>
   <enumeration value="NEXT_TRANSACTION"/>
 </restriction>
 </simpleType>
</element>

<element name="transformation" type="string"/>

<element name="acknowledge">
  <complexType>
  </complexType>
</element>
<element name="status_code" type="string"/>
<element name="error_code" type="string"/>
<element name="error_message" type="string"/>

<element name="name" type="string"/>
<element name="int_value" type="integer"/>
<element name="string_value" type="string"/>
<element name="long_value" type="long"/>
<element name="double_value" type="double"/>
<element name="boolean_value" type="boolean"/>
<element name="float_value" type="float"/>
<element name="short_value" type="short"/>
<element name="byte_value" type="byte"/>

<element name="agent_name" type="string"/>
<element name="address" type="string"/>
<element name="protocol" type="integer"/>


<!-- ****************** RAW message *********************** -->
<element name="raw" type="string"/>


<!-- ****************** JMS text message ****************** -->
<element name="jms_text_message">
   <complexType mixed="true">
    <sequence>
     <element ref="aq:oracle_jms_properties" minOccurs="0" maxOccurs="1"/>
```

```
      <element ref="aq:user_properties" minOccurs="0" maxOccurs="1"/>
      <element ref="aq:text_data" minOccurs="1" maxOccurs="1"/>
    </sequence>
    </complexType>
</element>

<element name="text_data" type="string"/>


<!-- ****************** JMS map message ****************** -->
<element name="jms_map_message">
    <complexType mixed="true">
     <sequence>
      <element ref="aq:oracle_jms_properties" minOccurs="0" maxOccurs="1"/>
      <element ref="aq:user_properties" minOccurs="0" maxOccurs="1"/>
      <element ref="aq:map_data" minOccurs="1" maxOccurs="1"/>
     </sequence>
    </complexType>
</element>

<!-- ****************** Map data ****************** -->
<element name="map_data">
    <complexType mixed="true">
      <sequence>
      <element ref="aq:item" minOccurs="0" maxOccurs="*"/>
      </sequence>
    </complexType>
</element>

<!-- ****************** Map Item  ****************** -->
<element name="item">
    <complexType mixed="true">
      <sequence>
 <element ref="aq:name" minOccurs="1" maxOccurs="1"/>
 <choice>
   <element ref="aq:int_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:string_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:long_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:double_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:boolean_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:float_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:short_value" minOccurs="1" maxOccurs="1"/>
   <element ref="aq:byte_value" minOccurs="1" maxOccurs="1"/>
 </choice>
      </sequence>
```

```
      </complexType>
    </element>


   <!-- ***************** JMS bytes message ***************** -->
   <element name="jms_bytes_message">
      <complexType mixed="true">
       <sequence>
        <element ref="aq:oracle_jms_properties" minOccurs="0" maxOccurs="1"/>
        <element ref="aq:user_properties" minOccurs="0" maxOccurs="1"/>
        <element ref="aq:bytes_data" minOccurs="1" maxOccurs="1"/>
       </sequence>
      </complexType>
   </element>

   <element name="bytes_data" type="string"/>


   <!-- ***************** JMS object message ***************** -->
   <element name="jms_object_message">
      <complexType mixed="true">
        <sequence>
        <element ref="aq:oracle_jms_properties" minOccurs="0" maxOccurs="1"/>
        <element ref="aq:user_properties" minOccurs="0" maxOccurs="1"/>
        <element ref="aq:ser_object_data" minOccurs="1" maxOccurs="1"/>
        </sequence>
      </complexType>
   </element>

   <element name="ser_object_data" type="string"/>

</schema>
```

Deploying the AQ XML Servlet

The AQ XML servlet is a Java class that extends the `oracle.AQ.xml.AQxmlServlet` class. The `AQxmlServlet` class extends the `javax.servlet.http.HttpServlet` class.

Note: Demos for the AQ XML servlet can be found in `$ORACLE_HOME/rdbms/demo/`. Check the `aqxmlREADME.txt` file for details.

The AQ XML Servlet accepts requests with Content-Type `"text/xml"` or `application/x-www-form-urlencoded`. When the Content-Type request is set to `application/x-www-form-urlencoded`, you must set the parameter name to `aqxmldoc` and the value must be the URL-encoded AQ XML document.

Creating the AQ XML Servlet Class

The AQ servlet creates a JDBC OCI connection pool to connect to the Oracle9i server. The `init()` method of the servlet must specify an `AQxmlDataSource` object that encapsulates the database connection parameters and the username and password. See the *Oracle9i Supplied Java Packages Reference* for information on the `AQxmlDataSource` class.

The user specified in the AQxmlDataSource is the AQ servlet `super-user.` This user must have `CREATE SESSION` privilege and `EXECUTE` privilege on the `DBMS_AQIN` package.

Example:

Create a user `AQADM` as the AQ servlet superuser as follows:

```
connect sys/change_on_install as sysdba;
grant connect, resource to aqadm identified by aqadm;
grant create session to aqadm;
grant execute on dbms_aqjms to aqadm;
```

A sample servlet can be created using this superuser as follows:

```
import javax.servlet.*;
import javax.servlet.http.*;
import oracle.AQ.xml.*;

/**
 * This is a sample AQ Servlet.
 */
public class AQTestServlet extends oracle.AQ.xml.AQxmlServlet
{

  /* The init method must be overloaded to specify the AQxmlDataSource */
  public void init()
  {
      AQxmlDataSource  db_drv = null;

      try
      {
```

```
        /* Create data source with username, password, sid, host, port */
        db_drv = new AQxmlDataSource("AQADM", "AQADM", "test_db", "sun-248",
"5521");

        this.setAQDataSource(db_drv);
      }
      catch (Exception ex)
      {
         System.out.println("Exception in init: " + ex);
      }
}
```

The superclass `oracle.AQ.xml.AQxmlServlet` implements the `doPost()` and `doGet()` methods in `javax.servlet.http.HttpServlet.` The `doPost()` method handles incoming SOAP requests and performs the requested AQ operations.

Note: The example assumes that the AQ servlet is installed in a Web server that implements Javasoft's Servlet2.2 specification (such as Tomcat 3.1). For a Web server that implements the Servlet 2.0 specification (such as Apache Jserv), you should extend the `oracle.AQ.xml.AQxmlServlet20` class instead of the `AQxmlServlet` class and override the appropriate write() method.

Compiling the AQ XML Servlet

The AQ servlet can be deployed with any Web server or servlet-runner that implements Javasoft's Servlet2.0 or Servlet2.2 interfaces (for example, Apache Jserv or Tomcat). Note the following considerations:

- Because the servlet uses JDBC OCI drivers to connect to the Oracle9*i* server, the Oracle9*i* client libraries must be installed on the machine hosting the servlet, as follows:

  The `LD_LIBRARY_PATH` must contain `$ORACLE_HOME/lib`

- The servlet can be compiled using JDK 1.1.x or JDK 1.2.x libraries.
  - For JDK 1.1.x, the `CLASSPATH` must contain:

    ```
    $ORACLE_HOME/jdbc/lib/classes111.zip
    $ORACLE_HOME/jdbc/lib/jta.zip
    $ORACLE_HOME/jdbc/lib/nls_charset11.zip
    $ORACLE_HOME/jdbc/lib/jndi.zip
    ```

```
$ORACLE_HOME/lib/lclasses11.zip
$ORACLE_HOME/lib/xmlparserv2.jar
$ORACLE_HOME/lib/xschema.jar
$ORACLE HOME/rdbms/jlib/aqapi11.jar
$ORACLE_HOME/rdbms/jlib/jmscommon.jar
$ORACLE_HOME/rdbms/jlib/aqxml.jar
$ORACLE_HOME/rdbms/jlib/xsu111.jar
$ORACLE_HOME/jis/lib/servlet.jar
```

- For JDK 1.2.x, the `CLASSPATH` must contain:

```
$ORACLE_HOME/jdbc/lib/classes12.zip
$ORACLE_HOME/jdbc/lib/jta.zip
$ORACLE_HOME/jdbc/lib/nls_charset12.zip
$ORACLE_HOME/jdbc/lib/jndi.zip
$ORACLE_HOME/lib/lclasses12.zip
$ORACLE_HOME/lib/xmlparserv2.jar
$ORACLE_HOME/lib/xschema.jar
$ORACLE_HOME/rdbms/jlib/aqapi.jar
$ORACLE_HOME/rdbms/jlib/jmscommon.jar
$ORACLE_HOME/rdbms/jlib/aqxml.jar
$ORACLE_HOME/rdbms/jlib/xsu12.jar
$ORACLE_HOME/jis/lib/servlet.jar
```

- After setting the `CLASSPATH`, compile the servlet using `javac` or any other Java compiler.

Note: If you are using the AQ XML Servlet or the AQ JMS API with JDK1.2, versions 1.2.2_05a or higher, you must turn off the JIT compiler. Set `JAVA_COMPILER = none` to avoid problems in multithreaded applications.

User Authentication

After the servlet is installed, the Web server must be configured to authenticate all users that send `POST` requests to the AQ servlet. The AQ servlet allows only authenticated users to access the servlet. If the user is not authenticated, an error is returned by the servlet.

The Web server can be configured in multiple ways to restrict access. Some of the common techniques are basic authentication (username/password) over SSL and client certificates. Consult your Web server documentation to see how you can restrict access to servlets.

Using HTTP

In the context of the AQ servlet, the user name that is used to connect to the Web server is known as the AQ HTTP agent or AQ Internet user.

Example: In Apache, the following can be used to restrict access (using basic authentication) to servlets installed under `aqserv/servlet`. In this example, all users sending `POST` requests to the servlet are authenticated using the `users` file in `/apache/htdocs/userdb`.

```
<Location /aqserv/servlet>
  <Limit POST>
    AuthName "AQ restricted stuff"
    AuthType Basic
    AuthUserFile /apache/htdocs/userdb/users
    require valid-user
  </Limit>
</Location>
```

User Authorization

After authenticating the users who connect to the AQ servlet, you establish which operations the users are authorized to perform by doing the following:

1. Register the AQ agent for Internet access.
2. Map the AQ agent to one or more database users.

Registering the AQ Agent

To register the AQ agent for Internet access, use `DBMS_AQADM.CREATE_AQ_AGENT`. The `CREATE_AQ_AGENT` procedure takes an `agent_name.` You specify which protocols the user can use to access the servlet—HTTP, SMTP, or both. For agents accessing the AQ servlet using SMTP, an LDAP `certificate_location` must also be specified. See "Setup for Receiving AQ XML Requests Using SMTP (E-mail)" on page 17-55 for more information.

Example

Create an AQ agent `JOHN` to access the AQ servlet using HTTP.

```
DBMS_AQADM.CREATE_AQ_AGENT(agent_name => 'JOHN', enable_http => true);
```

The procedures `ALTER_AQ_AGENT` and `DROP_AQ_AGENT` for altering and dropping AQ agents function similarly to `CREATE_AQ_AGENT`. These procedures are documented in the *Oracle9i Supplied PL/SQL Packages and Types Reference*.

Mapping the AQ Agent to Database Users

To map an AQ agent to one or more database users, use DBMS_AQADM.ENABLE_DB_ACCESS. With the ENABLE_DB_ACCESS procedure, you give an AQ agent the privileges of a particular database user. This allows the agent to access all queues that are visible to the database users to which the agent is mapped.

Example

Map the AQ Internet agent JOHN to database users OE (overseas shipping) and CBADM (customer billing administrator).

```
DBMS_AQADM.ENABLE_DB_ACCESS(agent_name =>'JOHN', db_username => 'OE');
DBMS_AQADM.ENABLE_DB_ACCESS(agent_name =>'JOHN', db_username => 'CBADM');
```

Database Sessions

When the user sends a POST request to the servlet, the servlet parses the request to determine which queue/topic the user is trying to access. Accordingly, the AQ servlet creates a database session as one of the database users (db_user) that maps to the AQ agent. The db_user selected has privileges to access the queue specified in the request.

Example

AQ agent JOHN sends an enqueue request to OE.OE_NEW_ORDERS_QUE. The servlet sees that JOHN can map to db_users OE and CBADM. Since OE.OE_NEW_ORDERS_QUE is in the OE schema, it does a CREATE SESSION as OE to perform the requested operation.

The AQ servlet creates a connection pool to the Oracle server using the AQ servlet super-user. This super-user creates sessions on behalf of db_users that the AQ Internet agent maps to. Hence the super-user must have privileges to create proxy sessions for all the users specified in the ENABLE_DB_ACCESS call. See "Creating the AQ XML Servlet Class" on page 17-49 for how to create the AQ servlet super-user.

The AQ servlet super-user can be granted CREATE PROXY session privileges as follows:

```
connect sys/change_on_install as sysdba
rem grant super-user AQADM privileges to create proxy sessions as OE
alter user OE grant CONNECT THROUGH AQADM;

rem grant super-user AQADM privileges to create proxy sessions as CBADM
alter user CBADM grant CONNECT THROUGH AQADM;
```

If an AQ Internet agent is mapped to more than one `db_user`, then all the `db_users` must have the `FORCE ANY TRANSACTION` privilege:

```
grant FORCE ANY TRANSACTION to OE;
grant FORCE ANY TRANSACTION to CBADM;
```

To disable the mapping between an agent and a database user, use `DBMS_AQADM.DISABLE_DB_ACCESS`.

The `SYSTEM.AQ$INTERNET_USERS` view lists AQ agents, the protocols they are enabled for, and the mapping between AQ agents and database users. Example entries in this view are shown in Table 17–8.

Table 17–8 The SYSTEM.AQ$INTERNET_USERS View

agent_name	db_username	http_enabled	smtp_enabled
scott	cbadmin	YES	NO
scott	buyer	YES	NO
aqadmin	OE	YES	YES
aqadmin	seller	YES	YES
bookstore	-	NO	YES

Using an LDAP Server with an AQ XML Servlet

An LDAP server is required if:

- The AQ agent is accessing the AQ servlet using SMTP. (See "Setup for Receiving AQ XML Requests Using SMTP (E-mail)" on page 17-55 for details.)
- The `lookup_type` destination attribute is specified as LDAP. In this case the destination name is resolved to a `schema.queue_name` using the LDAP server.
- You use `agent_alias` instead of `(agent_name, address, protocol)`. If an `agent_alias` is specified in a client request, it is resolved to `agent_name, address, protocol` using the LDAP server.

The LDAP context must be specified by the `setLDAPContext(DirContext)` call, as follows:

```
public void init()
{
```

```
        Hashtable env = new Hashtable(5, 0.75f);
        AQxmlDataSource  db_drv = null;

        try
        {
            /* Create data source with username, password, sid, host, port */
            db_drv = new AQxmlDataSource("AQADM", "AQADM", "test_db",
                                         "sun-248", "5521");
            this.setAQDataSource(db_drv);

            env.put(Context.INITIAL_CONTEXT_FACTORY,
                    "com.sun.jndi.ldap.LdapCtxFactory");
            env.put(Context.PROVIDER_URL, "ldap://yow:389");
            env.put(SEARCHBASE, "cn=server1,cn=dbservers,cn=wei");
            env.put(Context.SECURITY_AUTHENTICATION, "simple");
            env.put(Context.SECURITY_PRINCIPAL, "cn=orcladmin");
            env.put(Context.SECURITY_CREDENTIALS, "welcome");

            DirContext inictx = new InitialDirContext(env);
            String searchbase = (String)env.get("server_dn");
            lctx = (DirContext)inictx.lookup(searchbase);

            // Set up LDAP context
            setLdapContext(lctx);

            // Set the EMAIL server address (if any)
            setEmailServerAddr("144.25.186.236");
        }
        catch (Exception ex)
        {
           System.err.println("Servlet init exception: " +ex) ;
        }
    }
```

Setup for Receiving AQ XML Requests Using SMTP (E-mail)

You must set up the database, Web server, LDAP server, and e-mail server to receive AQ XML requests using SMTP.

Database and LDAP Server Setup

To store AQ agents in the LDAP server, the database must be registered to the LDAP server using the Database Configuration Assistant (DBCA), and the value of `GLOBAL_TOPIC_ENABLED` must be set to `TRUE` (default is `FALSE`; reset using `alter system set global_topic_enabled=TRUE`).

To create AQ agents that can access the servlet using SMTP, use the DBMS_AQADM.CREATE_AQ_AGENT procedure.

Example

Create an AQ agent for the appl application to access the AQ servlet using SMTP and the digital certificate of the application owner, Kurt:

```
DBMS_AQADM.CREATE_AQ_AGENT(
   agent_name => 'appl',
   enable_http => true,
   enable_smtp => true,
   certificate_location => 'cn=kurt,cn=acme,cn=com');
```

The certificate_location parameter is required to authenticate the appl application when a message is received.

Web Server Setup

1. Establish a user called ORACLE_SMTP_AGENT on the Web server that is allowed to access the AQ servlet.

   The Oracle e-mail server will connect to the servlet using user ORACLE_SMTP_AGENT.

2. Specify the e-mail server host name or the IP address in the servlet's init( ) method.

   Use setEmailServerHost(hostname) or setEmailServerAddr(ip_address)in the AQxmlServlet to do this.

   Example: Specify the e-mail server host as follows:

   ```
   setEmailServerAddr("144.25.186.236");  or
   setEmailServerHost("email-srv.us.oracle.com");
   ```

3. Set up an LDAP context in the servlet, as described in "Using an LDAP Server with an AQ XML Servlet" on page 17-54.

   The LDAP server is used to retrieve certificates for the AQ agent and verify the signature in the incoming message.

E-mail Server Setup

Internet access to AQ using SMTP requires Oracle Email Server 5.5. Do the following:

1. Check that DBMS_AQST is installed on the e-mail server.

2. Create an e-mail account for the destination database, that is, the database against which AQ operations are to be performed using the AQ servlet.

   See Also: *Oracle eMail Server 5.5 Administration Guide* for how to create an e-mail account on the e-mail server.

3. Set up an e-mail rule for the destination database e-mail account so that it can handle AQ XML client requests by sending them to the AQ servlet.

   The following information is required:

   - The e-mail account of the destination database, for example, `'aqdb1'`;
   - The password of the e-mail account, for example, `'welcome'`
   - The domain in which this e-mail account resides, for example, `'acme.com'`
   - The complete e-mail address of the destination e-mail address, for example, `'aqdb1@acme.com'`
   - The name of the destination database, for example, `'aqdb1'`
   - The URL of the destination database servlet, for example,

     ```
     http://aq-sun.us.oracle.com:8000/aqserv/servlet/AQTestServlet
     ```

   - The user name and password to access the destination database servlet (user name is `ORACLE_SMTP_AGENT`; password is established in "Web Server Setup" on page 17-56).
   - The host and port for LDAP lookup. For example, `host=ldaphost`, `port=389.`
   - The base distinguished name (DN) for LDAP lookup, that is, the DN of the destination database in the LDAP server, for example, `'cn=aqdb1, cn=oraclecontext,cn=acme,cn=com'`.
   - The login DN and password for LDAP lookup, for example NULL for anonymous binds.

4. Register the rule using `dbms_aqst`:

```
declare
   status binary_integer;
begin
   status := dbms_aqst.register_db(
      'aqdb1', -- email user account for aqdb1
```

```
        'welcome', -- email user password
        'acme.com', -- email user domain
        'aqdb1@acme.com', -- complete email address
        'aqdb1', -- name of destination database
        'http://aq-sun:8000/aqserv/servlet/AQTestServlet', -- URL to access
the destination database servlet
        'welcome', -- password of ORACLE_SMTP_AGENT
        'ldaphost', -- LDAP host for lookup client certificates
        '389', -- LDAP port for LDAP lookup
        'cn=aqdb1,cn=oraclecontext,cn=acme,cn=com', -- base DN of LDAP lookup
        NULL, NULL -- anonymous bind
        );
    dbms_output.put_line('register DB status: ' || status);
end;
```

5. Make sure the operation returns status 0.

After the setup is complete, an AQ agent can send e-mail messages to the database e-mail address to perform AQ operations. The AQ operations should be constructed according to IDAP, signed using the Oracle e-mail S/MIME toolkit, and sent as a binary attachment with the name including `IDAP_MESSAGE`.

Using HTTP to Access the AQ XML Servlet

The procedures for an AQ client to make a request to the AQ servlet using HTTP and for the AQ servlet to process the request are as follows:

AQ Client Request to the AQ Servlet Using HTTP

1. The client opens an HTTP(S) connection to the server.

   For example,
   `https://aq.us.oracle.com:8000/aqserv/servlet/AQTestServlet`

   This opens a connection to port 8000 on `aq.us.oracle.com.`

2. The client logs in to the server by either:

   - HTTP basic authentication (with or without SSL)
   - SSL certificate-based client authentication

3. The client constructs the XML message representing the Send, Publish, Receive or Register request.

   Example:

   ```
   <?xml version="1.0"?>
   ```

```
<Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
      <Body>

        <AQXmlSend  xmlns = "http://ns.oracle.com/AQ/schemas/access">
          <producer_options>
            <destination>OE.OE_NEW_ORDERS_QUE</destination>
          </producer_options>

          <message_set>
            <message_count>1</message_count>
            <message>
              <message_number>1</message_number>
              <message_header>
                 <correlation>XML_ADT_SINGLE_ENQ</correlation>
                 <sender_id>
                     <agent_name>john</agent_name>
                 </sender_id>
              </message_header>
              <message_payload>
              <ORDER_TYP>
                     <ORDERNO>100</ORDERNO>
                     <STATUS>NEW</STATUS>
                     <ORDERTYPE>NORMAL</ORDERTYPE>
                     <ORDERREGION>EAST</ORDERREGION>
                     <CUSTOMER>
                        <CUSTNO>1001233</CUSTNO>
                        <CUSTID>JOHN</CUSTID>
                        <NAME>AMERICAN EXPRESS</NAME>
                        <STREET>EXPRESS STREET</STREET>
                        <CITY>REDWOOD CITY</CITY>
                        <STATE>CA</STATE>
                        <ZIP>94065</ZIP>
                        <COUNTRY>USA</COUNTRY>
                     </CUSTOMER>
                     <PAYMENTMETHOD>CREDIT</PAYMENTMETHOD>
                     <ITEMS>
                        <ITEMS_ITEM>
                           <QUANTITY>10</QUANTITY>
                           <ITEM>
                              <TITLE>Perl</TITLE>
                              <AUTHORS>Randal</AUTHORS>
                              <ISBN>ISBN20200</ISBN>
                              <PRICE>19</PRICE>
                           </ITEM>
                           <SUBTOTAL>190</SUBTOTAL>
```

```
                    </ITEMS_ITEM>
                  </ITEMS>
                 <CCNUMBER>NUMBER01</CCNUMBER>
                 <ORDER_DATE>2000-08-23 0:0:0</ORDER_DATE>
              </ORDER_TYP>
            </message_payload>
           </message>
         </message_set>
         </AQXmlSend>
     </Body>
</Envelope>
```

4. The client sends an HTTP POST to the servlet at the remote server.

   See the $ORACLE_HOME/demo directory for sample code of POST requests using HTTP.

AQ Servlet Processes a Request Using HTTP

1. The server accepts the client HTTP(S) connection.
2. The server authenticates the user (AQ agent) specified by the client.
3. The server receives the POST request.
4. The AQ servlet is invoked.

   If this is the first request being serviced by this servlet, the servlet is initialized—its init() method is invoked. The init () method creates a connection pool to the Oracle server using the AQxmlDataSource parameters (SID, host, port, AQ servlet super-user name, password) provided by the client.

5. The servlet processes the message as follows:

   - If this is the first request from this client, a new HTTP session is created. The XML message is parsed and its contents are validated. If a session ID is passed by the client in the HTTP headers, then this operation is performed in the context of that session. This is described in detail in the next section.
   - The servlet determines which object (queue and topic) the agent is trying to perform operations on:

     For example, in the client request (step 3 in "AQ Client Request to the AQ Servlet Using HTTP"), the agent JOHN is trying to access OE.OE_NEW_ORDERS_QUE.
   - The servlet looks through the list of database users that map to this AQ agent (using the AQ$INTERNET_USERS view). If any one of these db_

users has privileges to access the queue/topic specified in the request, the AQ servlet super-user creates a session on behalf of this db_user.

For example, where the agent JOHN is mapped to the database user OE using the DBMS_AQADM.ENABLE_DB_ACCESS call, the servlet will create a session for the agent JOHN with the privileges of database user OE. (See "Mapping the AQ Agent to Database Users" for information on ENABLE_DB_ACCESS.)

- A new database transaction is started if no transaction is active in the HTTP session. Subsequent requests in the session will be part of the same transaction until an explicit COMMIT or ROLLBACK request is made.
- The requested operation (SEND/PUBLISH/RECEIVE/REGISTER/COMMIT/ROLLBACK) is performed.
- The response is formatted as an XML message and sent back the client.

  For example, the response for the preceding request may be as follows:

```
 <Envelope xmlns="http://schemas.xmlsoap.org/soap/envelope/">
   <Body>
      <AQXmlSendResponse xmlns="http://ns.oracle.com/AQ/schemas/access">
         <status_response>
            <status_code>0</status_code>
         </status_response>
         <send_result>
            <destination>OE.OE_NEW_ORDERS_QUE</destination>
            <message_id>12341234123412341234123412341234</message_id>
         </send_result>
      </AQXmlSendResponse>
   </Body>
</Envelope>
```

- The response also includes the session id in the HTTP headers as a cookie. For example, Tomcat sends back session IDs as JSESSIONID=239454ds2343. If the operation does not commit the transaction, the transaction will remain active until an explicit commit/rollback call is received. The effects of the transaction are visible only after it is committed. If the transaction remains inactive for 120 seconds, it is automatically aborted.

User Sessions and Transactions

After a client is authenticated and connects to the AQ servlet, an HTTP session is created on behalf of the user. The first request in the session also implicitly starts a new database transaction. This transaction remains open until it is explicitly committed or aborted. The responses from the servlet includes the session ID in the HTTP headers as cookies.

If the client wishes to continue work in the same transaction, it must include this HTTP header containing the session ID cookie in subsequent requests. This is automatically done by most Web browsers. However, if you are using a Java or C client to post requests, this has to be done programmatically. An example of a Java program used to post requests as part of the same session is given in `$ORACLE_HOME/demo` directory.

An explicit commit or rollback must be issued to end the transaction. The commit or rollback requests can also be included as part of other AQ operations (`Send, Publish, Receive, Register`).

Each HTTP session has a default timeout of 120 seconds. If the user does not commit or rollback the transaction in 120 seconds after the last request that session, the transaction is automatically aborted. This timeout can be modified in the init() method of the servlet by using `setSessionMaxInactiveTime()`. See "Customizing the AQ Servlet" on page 17-65 for more information.

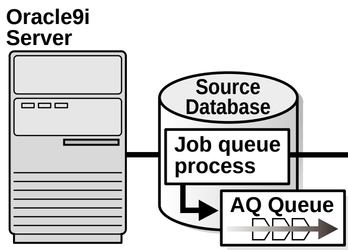
Using HTTP and HTTPS for Advanced Queuing Propagation

Using Advanced Queuing propagation in Oracle9*i*, you can propagate over HTTP and HTTPS (HTTP over SSL) instead of Oracle Net Services (formerly Net8). HTTP, unlike Oracle Net Services, is easy to configure for firewalls.

High-Level Architecture

HTTP AQ propagation uses the infrastructure for Internet access to AQ as its basis. The background process doing propagation pushes messages to an AQ Servlet that enqueues them into the destination database, as shown in Figure 17–3.

Figure 17–3 HTTP Advanced Queuing Propagation



Since HTTP propagation is different from Net Services in only the transport, most of the setup is the same as for Net Services propagation. The additional steps and differences are outlined in the following section.

Setting Up for HTTP Propagation (and the Differences from Net Services Propagation)

1. The dblink at the source database must be created differently. The connect string should specify the protocol as HTTP and specify the host and port of the Web server running the AQ servlet. The username and password of the dblink will be used for authentication with the Web server/servlet runner.
2. An AQ servlet that connects to the destination database should be deployed.
3. The source database must be enabled for running Java and XML.

The rest of the steps for propagation remain the same. The administrator must use dbms_aqadm.schedule_propagation to start propagation. Propagation can be disabled with the dbms_aqadm.disable_propagation_schedule and re-enabled using dbms_aqadm.enable_propagation_schedule. The background processes, the job queue processes propagate the messages to the destination database.The job_ queue_processes parameters must be at least 2 for propagation to take place.

Any application can be easily set up to use AQ HTTP propagation without any change to the existing code, by following steps 1-3. Similarly an application using AQ http propagation can easily switch back to Net Services propagation just by re-creating the dblink with a Net Services connection string, without any other changes.

Setting Up for AQ propagation over HTTP

1. The source database must be created for running Java and XML.

2. Create the dblink with protocol as HTTP and the host and port of the Web server running the AQ servlet, with the username and password for authentication with the webserver / servlet runner.

   For example, if the webserver is running on the machine `webdest.oracle.com` and listening for requests on port 8081, then the connect string of the database is as follows:

   ```
   (DESCRIPTION=(ADDRESS=(PROTOCOL=http)(HOST=webdest.oracle.com)(PORT=8081))
   ```

   If SSL is used, then specify HTTPS as the protocol in the connect string.

   The database link is created as follows:

   ```
   create public database link dba connect to john identified by welcome using
   '(DESCRIPTION=(ADDRESS=(PROTOCOL=http)(HOST=webdest.oracle.com)(PORT=8081))'
   ;
   ```

   Where user `john` with password `welcome` is used to authenticate with the Web server and is also known by the term AQ HTTP agent.

3. You can optionally set a proxy to use for all HTTP requests from the database. Use the `UTL_HTTP.SET_PROXY` procedure, as described in *Oracle9i Supplied PL/SQL Packages and Types Reference*.

4. If HTTP over SSL is used, then a database wallet must be created for the source database. The wallet must be open for the duration of propagation. If HTTPS is used for propagation, communication between the source database and the AQ servlet is encrypted and the HTTPS server is authenticated with the source database. The database uses the database link username-password to authenticate itself with the HTTPS server.

5. Deploy the AQ Servlet.

   Create a class AQPropServlet that extends AQxmlServlet as described in [create the AQ XML Servlet Class]. This servlet must connect to the destination database. The servlet must be deployed on the Web server in the path `aqserv/servlet.`

   In Oracle9*i*, the propagation servlet name and deployment path are fixed; that is, they must be `AQPropServlet` and the servlet, respectively.

6. Make sure that the AQ HTTP agent (John) is authorized to perform AQ operations. This is done at the destination database:

   a. Register the AQ agent as follows:

      ```
      dbms_aqadm.create_aq_agent(agent_name => 'John', enable_http => true);
      ```

b. Map the AQ agent to a database user as follows:

```
dbms_aqadm.enable_db_access(agent_name =>'John', db_username =>'CBADM')'
```

7. Start propagation at the source site by calling:

```
dbms_aqdm.schedule_propagation.
dbms_aqadm.schedule_propagation('src_queue', 'dba');
```

Using SMTP to Access the AQ Servlet

The general procedure for an AQ client to make a request to the AQ servlet using SMTP is as follows:

1. The client creates a message with the AQ XML client request. The client signs the message with its private key using the Oracle S/MIME toolkit.
2. The client names the message with a substring, `IDAP_MESSAGE`, and sends it as a binary attachment to the database e-mail address.
3. The e-mail server receives the message.
4. The e-mail server triggers the rule registered for the database e-mail address, which does the following:
   a. Connects to the LDAP server and retrieves the certificate of the sending AQ agent
   b. Verifies the signature of the message
   c. Connects to the Web server as user `ORACLE_SMTP_AGENT` if authentication succeeds, and sends an `HTTP POST` message containing the client request

The procedure for the AQ servlet to process a request is described in "AQ Servlet Processes a Request Using HTTP" on page 17-60. When the servlet sends a response, the e-mail server sends an e-mail message containing the XML response to the address specified in the reply-to field of the original e-mail message.

Customizing the AQ Servlet

The oracle.AQ.xml.AQxmlServlet provides the API to set the connection pool size, session timeout, style sheet, and callbacks before and after AQ operations.

Setting the Connection Pool Size

The AQ data source is used the specify the backend database to which the servlet connects to perform AQ operations. It contains the database SID, host name, listener port and the username/password of the AQ servlet super-user.

The data source is represented by the `AQxmlDataSource` class, which can be set using the `setAQDataSource` method in the servlet. See the *Oracle9i Supplied Java Packages Reference* for more information.

The AQ data source creates a pool of connections to the database server. By default the maximum size of the pool is set to 50 and the minimum is set to 1. The number of connections in the pool grows and shrinks dynamically based on the number of incoming requests. If you want to change the maximum limit on the number of connections, you must specify a cache size using the `AQxmlDataSource.setCacheSize(size)` method.

Setting the Session Timeout

After a client is authenticated and connects to the AQ servlet, an HTTP session is created on behalf of the user. The first request in the session also implicitly starts a new database transaction. This transaction remains open until it is explicitly committed or aborted.

Each HTTP session has a default timeout of 120 seconds. If the user does not commit or rollback the transaction in 120 seconds after the last request that session, the transaction is automatically aborted. This timeout can be specified in the init() method of the servlet by using `setSessionMaxInactiveTime()` method.

The servlet is initialized as follows:

```
public class AQTestServlet extends oracle.AQ.xml.AQxmlServlet
{
  /* The init method must be overloaded to specify the AQxmlDataSource */
  public void init()
  {
      AQxmlDataSource  db_drv = null;

      try
      {
        /* Create data source with username, password, sid, host, port */
        db_drv = new AQxmlDataSource("AQADM", "AQADM",
                                     "test_db", "sun-248", "5521");

        /* Set the minimum cache size to 10 connections */
```

```
            db_drv.getCacheSize(10);

            this.setAQDataSource(db_drv);

            /* Set the transaction timeout to 180 seconds */
            this.setSessionMaxInactiveTime(180);
        }
        catch (Exception ex)
        {
            System.out.println("Exception in init: " + ex);
        }
}
```

Setting the Style Sheet for All Responses from the Servlet

The AQ servlet sends back responses in XML. The servlet administrator can specify a style sheet that is to be set for all responses sent back from this servlet. This can be done by invoking the `setStyleSheet(type,href)` or the `setStyleSheetProcessingInstr(proc_instr) in init()` method of the servlet.

For example, to include the following style sheet instruction for all responses, do the following:

```
<?xml-stylesheet type="text/xsl"
href="http://sun-248/stylesheets/bookOrder.xsl"?>
```

The servlet is initialized as follows:

```
public class AQTestServlet extends oracle.AQ.xml.AQxmlServlet
{
  /* The init method must be overloaded to specify the AQxmlDataSource */
  public void init()
  {
      AQxmlDataSource  db_drv = null;

      try
      {
        /* Create data source with username, password, sid, host, port */
        db_drv = new AQxmlDataSource("AQADM", "AQADM",
                                     "test_db", "sun-248", "5521");

        this.setAQDataSource(db_drv);

        /* Set the bookOrder.xsl style sheet for all responses */
```

```
        setStyleSheet("text/xsl",
"http://sun-248:8000/stylesheets/bookOrder.xsl");
      }
      catch (Exception ex)
      {
          System.out.println("Exception in init: " + ex);
      }
}
```

Callbacks Before and After AQ Operations

Using the AQ servlet, you can register callbacks that will be invoked before and after AQ operations are performed. This allows users to perform AQ and non-AQ operations in the same transaction.

To receive callbacks, users register an object that implements the `oracle.AQ.xml.AQxmlCallback` interface. The `AQxmlCallback` interface has the following methods:

```
public interface AQxmlCallback
{

  /** Callback invoked before any AQ operations are performed by the servlet */
  public void beforeAQOperation(HttpServletRequest request, HttpServletResponse
response,
                                AQxmlCallbackContext ctx);

  /** Callback invoked after any AQ operations are performed by the servlet */
  public void afterAQOperation(HttpServletRequest request, HttpServletResponse
response,
                                AQxmlCallbackContext ctx);
}
```

The callbacks are passed in the HTTP request and response streams and an `AQxmlCallbackContext` object. The object has the following methods:

- `The java.sql.Connection getDBConnection()` method gives a handle to the database connection that is used by the servlet for performing AQ operations. Users can perform other SQL operations in the callback functions using this connection object.
- Note that you cannot call `close(), commit()` or `rollback() methods` on this connection object.
- `org.w3c.org.Document parseRequestStream()` gives a DOM document representing the parsed request stream.

- The `void setStyleSheet(String type,String href)` method allows the user to set the style sheet for a particular call. So instead of specifying a single style sheet for all responses from this servlet, users can set style sheets for specific responses.

  The style sheet specified in the callback overrides the style sheet (if any) specified for the servlet in the `init()` method

Example

Before any AQ operation in the servlet, you want to insert a row in the EMP table. Do this by creating a callback class and associating it with a particular servlet as follows:

```
import javax.servlet.*;
import javax.servlet.http.*;
import oracle.AQ.xml.*;
import java.sql.*;
import javax.jms.*;

/**
 * This is a sample AQ Servlet callback
 */
public class TestCallback implements oracle.AQ.xml.AQxmlCallback
{

   /** Callback invoked before any AQ operations are performed by the servlet */
  public void beforeAQOperation(HttpServletRequest request, HttpServletResponse
response,
       AQxmlCallbackContext ctx)
  {
      Connection conn = null;
      System.out.println("Entering BeforeAQ Callback ...");

      try
      {
            // Get the connection object from the callback context
            conn = ctx.getDBConnection();

            // Insert value in the EMP table
            PreparedStatement pstmt =
            conn.prepareStatement ("insert into EMP (EMPNO, ENAME) values (100,
'HARRY')");
            pstmt.execute ();
            pstmt.close();
```

```
      }
      catch (Exception ex)
      {
          System.out.println("Exception ex: " + ex);
      }
  }

  /** Callback invoked after any AQ operations are performed by the servlet */
  public void afterAQOperation(HttpServletRequest request, HttpServletResponse
response,
      AQxmlCallbackContext ctx)
  {
      System.out.println("Entering afterAQ Callback ...");

      try
      {
         // Set style sheet for response
         ctx.setStyleSheetProcessingInstr(
                "type='text/xsl href='http://sun-248/AQ/xslt23.html'");

      }
      catch (Exception aq_ex)
      {
           System.out.println("Exception: " + ex);

      }
  }
}

/* Sample AQ servlet - using user-defined callbacks */
public class AQTestServlet extends oracle.AQ.xml.AQxmlServlet
{

  /* The init method must be overloaded to specify the AQxmlDataSource */
  public void init()
  {
      AQxmlDataSource  db_drv = null;
      AQxmlCallback    serv_cbk  = new TestCallback();

      try
      {
        /* Create data source with username, password, sid, host, port */
        db_drv = new AQxmlDataSource("AQADM", "AQADM", "test_db", "sun-248",
"5521");
```

```
            this.setAQDataSource(db_drv);

            /* Set Callback */
            setUserCallback(serv_cbk);

          }
          catch (Exception ex)
          {
              System.out.println("Exception in init: " + ex);
          }
    }
```

18

Messaging Gateway

Messaging Gateway, an Oracle9*i* Advanced Queuing feature, enables communication between applications based on non-Oracle messaging systems and Oracle's Advanced Queuing (AQ) feature. Advanced Queuing provides the propagation between two AQ queues to enable e-business (HTTP via IDAP). Messaging Gateway extends that propagation to legacy applications based on non-Oracle messaging systems.

Because Messaging Gateway is integrated with Advanced Queuing and Oracle9*i*, it offers fully transactional and secure message delivery. Messaging Gateway guarantees that messages are delivered once and only once between AQ and non-Oracle messaging systems that support persistence. The AQ-like PL/SQL interface provides an easy-to-learn administrative API, especially for developers already proficient in using AQ.

This release of Messaging Gateway supports the integration of Oracle9*i* Advanced Queuing with IBM MQSeries 5.1- and MQSeries 5.2-based applications.

This chapter discusses the following topics:

Messaging Gateway Functionality

Messaging Gateway provides the following functionality:

- Extends AQ message propagation

  Messaging Gateway propagates messages between Advanced Queuing and non-Oracle messaging systems. Messages sent by Advanced Queuing applications can be received by non-Oracle message system applications. Conversely, messages published by non-Oracle message system applications can be consumed by Advanced Queuing applications.

- Native message format support

  Messaging Gateway supports the native message formats of messaging systems. AQ messages can have `RAW` or any ADT payload. MQSeries messages can be `TEXT` or byte messages of any type. This enables integration of existing applications of messaging systems.

- Message conversion

  Messaging Gateway facilitates message conversion between AQ messages and non-Oracle message system messages. Messages are converted through either automatic message conversion routines provided by Messaging Gateway or customized message transformation functions that you provide.

- Integration with the Oracle database

  Messaging Gateway is managed through an AQ-like PL/SQL interface. Configuration information is stored in Oracle database tables. Message propagation is carried out by an external process of the Oracle database server.

- Guaranteed message delivery

  Messaging Gateway guarantees that persistent messages are propagated exactly once if both the message system at the propagation source and the message system at the propagation destination support transactions.

  If messages are not persistent or the transaction is not supported by the messaging systems at the propagation source and propagation destination, at-most-once propagation is guaranteed.

- Security support

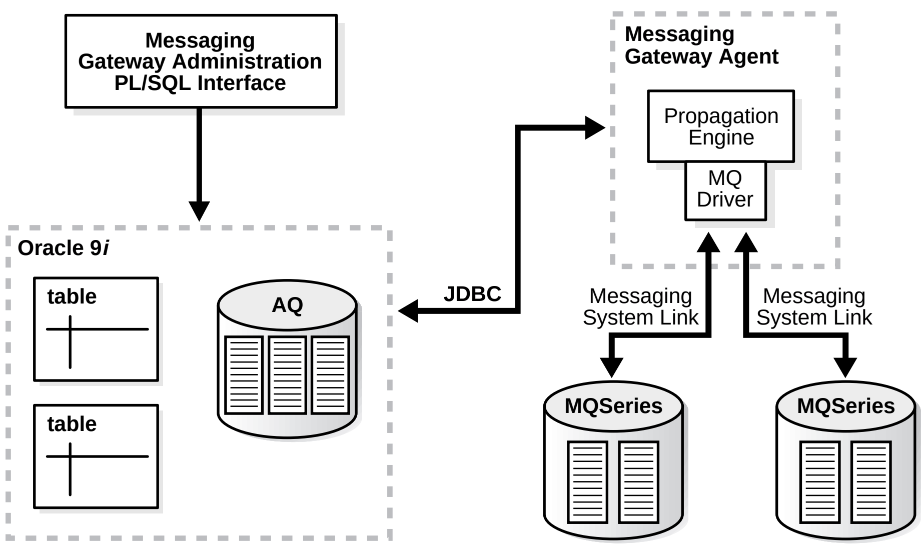
  Messaging Gateway supports client authentication of Oracle database and non-Oracle messaging systems.

For Oracle database administrators to control access to the tables, views, and procedures created by the gateway, Messaging Gateway defines two roles, `MGW_ADMINISTRATOR_ROLE` and `MGW_AGENT_ROLE`, for gateway administration and propagation processing. Refer to "Loading Database Objects into the Database" on page 18-7, "Creating a Messaging Gateway Administration User" on page 18-11, and "Creating a Messaging Gateway Agent User" on page 18-11.

Messaging Gateway Architecture

Messaging Gateway has the following main components: an administration package named `DBMS_MGWADM` for gateway configuration and management, and a gateway agent that processes propagation, as shown in Figure 18–1. The gateway agent consists of a propagation engine and a set of drivers that communicate with non-Oracle messaging systems.

Figure 18–1 Messaging Gateway Architecture



Administration Package

The Messaging Gateway administration package, `DBMS_MGWADM`, provides an interface for gateway administrators to manage the gateway agent, set up propagation, and monitor propagation processing.

Through the administration package, you configure the gateway agent with the proper user name, password, and database connect string of the Oracle database in order for the agent to create connections to the database. You can also call procedures in the package to assign the maximum number of database connections and the size of the memory heap to the agent.

For the gateway agent to propagate messages to and from a non-Oracle messaging system, a messaging system link, which represents a communication channel between the agent and the non-Oracle messaging system, must be created using the administration package. Multiple messaging system links can be configured in the agent.

All non-Oracle queues that are involved in propagation must be registered using the administration package. Registering a non-Oracle queue in the gateway configuration does not create the physical queue in the non-Oracle messaging system, but only records information about the queue, such as the messaging system link to access it, its native name, and its domain (queue or topic). The physical queue must be created through the administration interfaces of the non-Oracle messaging system.

With messaging system links and non-Oracle queues configured, you can create propagation jobs to set up message propagation. A propagation job in Messaging Gateway consists of a propagation subscriber and a propagation schedule. A propagation subscriber is created to define the source queue and the destination queue of a propagation job. You manipulate the propagation schedule associated with the propagation job to control when the propagation job is processed.

Messaging Gateway provides database views for gateway administrators to query and check the current configuration information, the gateway agent running status, and the propagation job status and statistics.

Gateway configuration can be changed independent of whether the gateway agent is running or shut down. If the agent is running, the administration procedures send notifications to the agent for configuration changes. The agent will dynamically alter its configuration for most configuration changes, although some require that the agent be shut down and restarted before they take effect. All the procedures in the administration package are serialized to guarantee that the gateway agent receives notifications for the configuration changes in the same order they are made.

> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference* for more information on `DBMS_MGWADM`

Gateway Agent

The gateway agent schedules and processes propagation jobs. The agent executes in an external process of the Oracle database server. The agent is started and terminated by calling the `STARTUP` and `SHUTDOWN` procedures in the administration package. Like all external processes of Oracle database server, the agent runs only when the database server that it resides in is up and running.

The agent contains a propagation engine and a set of drivers for the non-Oracle messaging systems. The multithreaded propagation engine fairly schedules propagation jobs and provides parallel interjob and intrajob propagation processing. A polling thread in the agent periodically polls the source queues of enabled propagation jobs and wakes up worker threads to process propagation jobs if messages are available. The drivers in the gateway agent are instantiated when messaging links are created. The drivers run as clients of messaging systems for all messaging operations.

The agent writes log messages into its log files, which contain information about agent configuration, agent status, actions taken by the agent upon receiving dynamic notifications, status of propagation jobs, and all error messages.

Propagation Processing Overview

You create propagation jobs to set up message propagation. A propagation job conceptually consists of a propagation subscriber and a propagation schedule.

After a propagation subscriber is created, the gateway creates a subscription on the propagation source if the source is a topic (publish-subscribe). The gateway moves all messages that are published to the topic after the subscriber is created. If the propagation source is a point-to-point queue, the gateway moves all messages in the queue to the destination.

A propagation job is not processed until an associated propagation schedule is created. The gateway agent processes enabled propagation jobs. Disabling a propagation job stops the transfer of messages from the source queue to the destination queue, but does not stop subscription.

When a propagation job is processed, messages are dequeued in priority order from the source queue and enqueued to the destination queue. If a message fails to be converted from the source format to the destination format, the message is moved to the exception queue. Messages that have expired in a propagation source queue are not propagated to the destination queue.

Using Messaging Gateway, you can specify a propagation message selector for a propagation job if the source messaging system of the propagation job supports message selectors. Only messages satisfying the message selector are propagated.

If a propagation job runs into failures during processing, the agent retries up to 16 times in an exponential backoff scheme before disabling the job.

When a message is propagated, it is converted from its native format in the source messaging system to its native format in the destination messaging system. The gateway provides automatic message conversions between simple and commonly used message formats. You can provide your own message transformation functions for customized message conversions.

> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference* for information on `DBMS_TRANSFORM`

Setting Up Messaging Gateway

This section describes the steps for loading and setting up Messaging Gateway.

Oracle9*i* Database Prerequisites

In the `init<sid>.ora` file, where `<sid>` is the Oracle system ID of the database instance used for Messaging Gateway, the following parameters must be specified:

- At least one job queue process must be specified:

  ```
  JOB_QUEUE_PROCESSES = <num_of_processes>
  ```

- At least one AQ time monitoring process must be specified:

  ```
  AQ_TM_PROCESSES = <num_of_processes>
  ```

Non-Oracle Messaging System Prerequisites

Install the non-Oracle messaging system before loading and setting up Messaging Gateway. Messaging Gateway uses the shared libraries and Java class files of the non-Oracle system.

Loading and Setup Tasks

You must do the following procedures before Messaging Gateway can run. These tasks apply to both Unix and Windows NT, except where "Windows NT Only" or "Unix Only" is indicated.

1. Loading Database Objects into the Database
2. Modifying listener.ora for the External Procedure
3. Modifying tnsnames.ora for the External Procedure
4. Modifying the mgw.ora Initialization File
5. Creating a Messaging Gateway Administration User
6. Creating a Messaging Gateway Agent User
7. Configuring Messaging Gateway Connection Information

Loading Database Objects into the Database

Using SQL*Plus, run `catmgw.sql`, located in the `$ORACLE_HOME/mgw/admin` directory. Run as user: `SYS` as `SYSDBA.`

The SQL script `catmgw.sql` loads the necessary database objects for Messaging Gateway, including roles, tables, views, object types, and the PL/SQL packages. It creates public synonyms for Messaging Gateway PL/SQL packages and types. It creates two roles, `MGW_ADMINISTRATOR_ROLE` and `MGW_AGENT_ROLE,` with certain privileges granted. It also creates a library alias for the agent's external procedure. All objects are owned by `SYS`.

Modifying listener.ora for the External Procedure

Windows NT Only: You can ignore this step. Static service information for the listener is not necessary on Windows NT.

You must modify `listener.ora` so that the Messaging Gateway PL/SQL package can call the external procedure.

1. In `listener.ora`, verify that the default IPC protocol address for the external procedures is set.

Protocol Address for the External Procedure: Example

```
LISTENER = (ADDRESS_LIST=
(ADDRESS=(PROTOCOL=IPC)(KEY=EXTPROC))
       .
       .
       .
```

2. In `listener.ora`, add static service information for the listener in step 1. This involves setting a `SID_DESC` for the listener. Within the `SID_DESC`, the

following parameters are important to Messaging Gateway and must be specified according to your own situation.

a. `SID_NAME:` provide the SID that is specified in the net service name in `tnsnames.ora,` for example, "mgwextproc".

b. `ORACLE_HOME:` provide your `ORACLE_HOME` directory.

c. `PROGRAM:` provide the name of the external procedure agent, which is `"extproc".`

d. `ENVS:` set up the `LD_LIBRARY_PATH` environment needed for the external procedure to run.

   The `LD_LIBRARY_PATH` must contain the following paths:

   `[ORACLE_HOME]/jdk/jre/lib/[PLATFORM_TYPE]`

   `[ORACLE_HOME]/lib`

   Replace the bracketed item with the appropriate, spelled-out value (using `$ORACLE_HOME` does not work, for example). `PLATFORM_TYPE` is your platform type, for example, `sparc`.

Example 5 Adding Static Service Information for the Listener: Example

```
# Add a SID_DESC
SID_LIST_LISTENER= (SID_LIST=
(SID_DESC =
   (SID_NAME= mgwextproc)
   (ENVS="LD_LIBRARY_PATH=/private/oracle/orcl9i/jdk/jre/lib/
      sparc:/private/oracle/orcl9i/lib")
   (ORACLE_HOME=/private/oracle/orcl9i)
   (PROGRAM = extproc))
      .
      .
      .
```

Modifying tnsnames.ora for the External Procedure

Windows NT Only: You can ignore this step.

For the external procedure, configure a net service name `MGW_AGENT` in `tnsnames.ora` whose connect descriptor matches the information configured in `listener.ora`. The net service name must be `MGW_AGENT` (this value is fixed). The `KEY` value must match the `KEY` value specified for the IPC protocol in `listener.ora`. The SID value must match the value specified for `SID_NAME` of the `SID_DESC` entry in `listener.ora`.

Modifying tnsnames.ora: Example

```
MGW_AGENT =
(DESCRIPTION=
   (ADDRESS_LIST= (ADDRESS= (PROTOCOL=IPC)(KEY=EXTPROC)))
   (CONNECT_DATA= (SID=mgwextproc) (PRESENTATION=RO)))
```

Modifying the mgw.ora Initialization File

The Messaging Gateway initialization file `$ORACLE_HOME/mgw/admin/mgw.ora` is a `TEXT` file that the gateway external procedure uses to get initialization parameters to start the agent. Copy `$ORACLE_HOME/mgw/admin/sample_mgw.ora` to `mgw.ora` and modify it according to your situation.

The following procedure sets environment variables and other parameters:

1. Set environment variables for the external procedure to start the gateway agent.

   a. Set the following environment variables:

      Unix Only: Set `LD_LIBRARY_PATH.` Replace the brackets with appropriate, spelled-out values (using `$ORACLE_HOME` does not work, for example). `PLATFORM_TYPE` is your platform type, for example, `sparc`.

      `LD_LIBRARY_PATH` must contain at least the following paths:

      * `[ORACLE_HOME]/jdk/jre/lib/[PLATFORM_TYPE]`
      * `[ORACLE_HOME]/rdbms/lib`
      * `[ORACLE_HOME]/oracle/lib`
      * `[ORACLE_HOME]/mgw/lib`
      * Any additional libraries needed for the Messaging Gateway agent to access non-Oracle messaging systems, for example, the MQSeries libraries must be included in `LD_LIBRARY_PATH`.

      Windows NT Only: Set the `MGW_PRE_PATH` variable. Its value is the path to the `jvm.dll` library. For JDK resources, use the JDK package under %ORACLE_HOME%. For example, if `%ORACLE_HOME%` is D:\oracle, then add a line such as:

      ```
      set MGW_PRE_PATH = D:\oracle\jdk\jre\bin\classic
      ```

      This varible is prepended to the path inherited by the Messaging Gateway agent process.

b. Set CLASSPATH. (Windows NT users must set CLASSPATH using Windows NT path syntax.)

   CLASSPATH must contain at least the following. Replace the brackets with appropriate, spelled-out values (using $ORACLE_HOME does not work, for example).

   * Messaging Gateway classes:

     [ORACLE_HOME]/mgw/classes/mgw.jar

   * JDK internationalization classes: [ORACLE_HOME]/jdk/jre/lib/i18n.jar
   * JDK runtime classes: [ORACLE_HOME]/jdk/jre/lib/rt.jar
   * Oracle JDBC classes: [ORACLE_HOME]/jdbc/lib/classes12.zip
   * Oracle internationalization classes: [ORACLE_HOME]/jdbc/lib/nls_charset12.zip
   * [ORACLE_HOME]/sqlj/lib/translator.zip
   * [ORACLE_HOME]/sqlj/lib/runtime12.zip
   * Any additional classes needed for Messaging Gateway to access non-Oracle messaging systems, for example, MQSeries classes

2. Set the log_directory and log_level parameters.

   Setting these parameters is not required. They influence the logging of Messaging Gateway. If they are not set, the default values are used. For log_directory, the default value is $ORACLE_HOME/mgw/log. For log_level, the default value is 0 for basic logging.

3. Set the oracle_sid parameter.

   Set the oracle_sid parameter in mgw.ora to avoid providing the database connect string when configuring Messaging Gateway connection information. Refer to "Configuring Messaging Gateway Connection Information" on page 18-11.

The mgw.ora File: Example

```
#an example of mgw.ora file
log_directory=/private/mgwlog
log_level=2
set CLASSPATH=<proper value>
set LD_LIBRARY_PATH=<proper value>
```

Creating a Messaging Gateway Administration User

To perform gateway administration work, a database user with MGW_ADMINISTRATOR_ROLE privileges must be created.

Creating an Administration User: Example

```
CREATE USER <admin_user> IDENTIFED BY <admin_password>;
GRANT CONNECT, RESOURCE to <admin_user>;
GRANT MGW_ADMINISTRATOR_ROLE to <admin_user>;
```

Creating a Messaging Gateway Agent User

To establish the gateway agent's connection back to the database, a database user with MGW_AGENT_ROLE privileges must be created.

Creating an Agent User: Example

```
CREATE USER <agent_user> IDENTIFED BY <agent_password>;
GRANT CONNECT, RESOURCE to <agent_user>;
GRANT MGW_AGENT_ROLE to <agent_user>;
```

Configuring Messaging Gateway Connection Information

After the agent user is created, the administration user uses DBMS_MGWADM.DB_CONNECT_INFO to configure Messaging Gateway with the user name, password, and database connect string used by the gateway agent to connect back to database. Use the agent user name and password that are created in "Creating an Agent User: Example" on page 18-11. The database connect string parameter can be set to either a new service name in tnsnames.ora (with IPC protocol for better performance) or null. If null, the oracle_sid parameter must be set in mgw.ora.

For release 9.2, always specify a nonnull value for the database connect string parameter when calling DBMS_MGW_DB_CONNECT_INFO( ).

Using DBMS_MGWADM.DB_CONNECT_INFO: Example

```
connect <admin_user>/<admin_password>
exec dbms_mgwadm.db_connect_info('<agent_user>','<agent_password>', '<agent_
database>');
```

Setup Verification

The following procedure verifies the installation and includes a simple startup and shutdown of the Messaging Gateway agent.

1. Start the database listeners.

   Start the listener for the external procedure and other listeners for the regular database connection.

2. Test the database connect string for the gateway agent user.

   Run `sqlplus <agent_user>/<agent_password>@<agent_database>`.

   If successful, the gateway agent is able to connect to the database.

3. Start the gateway agent.

   a. Connect as `<admin_user>` and call `DBMS_MGWADM.STARTUP` to start the gateway agent.

   b. Using the `MGW_GATEWAY` view, wait for `AGENT_STATUS` to change to `RUNNING` and `AGENT_PING` to change to `REACHABLE`.

4. Shut down the gateway agent.

   a. Connect as `<admin_user>` and call `DBMS_MGWADM.SHUTDOWN`.

   b. Using the `MGW_GATEWAY` view, wait for `AGENT_STATUS` to change to `NOT_STARTED`.

Unloading Messaging Gateway

To unload Messaging Gateway, do the following:

1. Shut down Messaging Gateway.

2. Remove any user-created queues whose payload is a Messaging Gateway canonical type (for example, `MGW_BASIC_MSG_T`).

3. Using SQL*Plus, as user `SYS` as `SYSDBA`, run `catnomgw.sql`, located in the `$ORACLE_HOME/mgw/admin` directory.

   This drops the database objects used by Messaging Gateway, including the roles, tables, views, packages, object types, and synonyms.

4. Remove entries for Messaging Gateway created in `listener.ora` and `tnsnames.ora`.

Working with Messaging Gateway

After Messaging Gateway is loaded and set up, it is ready to be configured and run. This chapter describes how to configure, start, and stop Messaging Gateway. It also describes how to monitor the Messaging Gateway agent. An example configuration is provided to illustrate propagating messages from an AQ queue with payload type RAW to an MQSeries queue. All commands in the examples must be run as a user who has been granted MGW_ADMINISTRATOR_ROLE, except for the commands to create transformations.

Managing the Messaging Gateway Agent

The Messaging Gateway agent runs as a process external to the database. To access Advanced Queuing and the Messaging Gateway administration packages, the Messaging Gateway agent needs to establish connections back to the database.

Before starting, configuration information must be registered, including information used to connect to the database and set resource limits.

Configuration

The DBMS_MGWADM.DB_CONNECT_INFO procedure is used to configure Messaging Gateway with the name and password of the user that the Messaging Gateway agent will use for database connections, and the database connect string used to make the connection. The user must have been granted MGW_AGENT_ROLE before the Messaging Gateway agent can be started. If the database connect string is not specified, local connections are used by the Messaging Gateway agent.

You can also call DBMS_MGWADM.DB_CONNECT_INFO to set new connection information when the Messaging Gateway agent is running.

Setting New Connection Information: Example

```
SQL> exec dbms_mgwadm.db_connect_info('mgwagent', 'mgwagent_password',
'mydatabase')
```

The maximum number of connections in a connection pool available for the Messaging Gateway agent to connect to the database and the heap size, in megabytes, of the Messaging Gateway agent process can be set using DBMS_MGWADM.ALTER_AGENT. The number of connections in the connection pool can impact performance. The default values are 1 connection and 64 MB of memory.

The following sets the number of database connections to 2 and the heap size to 64M.

```
SQL> exec dbms_mgwadm.alter_agent(2, 64)
```

You can alter the maximum number of connections when the Messaging Gateway agent is running, but the value can only be increased. The maximum memory cannot be altered when Messaging Gateway is running. Entering a value of `NULL` does not alter the maximum memory attribute.

The following example, when executed with the Messaging Gateway agent running, updates the maximum number of connections to 3. The maximum memory is unchanged.

```
SQL> exec dbms_mgwadm.alter_agent(3, NULL)
```

Startup and Shutdown

After Messaging Gateway is installed and configured, start it as follows:

```
SQL> exec dbms_mgwadm.startup
```

You can determine the status of the Messaging Gateway agent by using the `MGW_GATEWAY` view and by monitoring the log file. Refer to "Monitoring the Messaging Gateway Log File" on page 18-26.

Monitor the Messaging Gateway agent using the `MGW_GATEWAY` view as follows:

```
SQL> select * from mgw_gateway;

AGENT_STATUS  AGENT_PING  AGENT_JOB  AGENT_USER  AGENT_DATABASE  LAST_ERRO
--------------------------------------------------------------------------
RUNNING       REACHABLE   213        MGWAGENT


(Continued) LAST_ERR  LAST_ERROR_MSG  MAX_CONNECTIONS  MAX_MEMORY
            -----------------------------------------------------
                                      3                64
```

When Messaging Gateway has completed initialization, the `AGENT_STATUS` column shows the value `RUNNING` and the `AGENT_PING` column shows the value `REACHABLE`.

The first column, `AGENT_STATUS`, shows the status of the gateway agent. This column has the following possible values: `NOT_STARTED`, `START_SCHEDULED`, `INITIALIZING`, `STARTING`, `RUNNING`, and `SHUTTING_DOWN`. The second column, `AGENT_PING`, pings the Messaging Gateway agent. Its value is either `REACHABLE` or `UNREACHABLE`. The columns `LAST_ERROR_MSG`, `LAST_ERROR_DATE`, and `LAST_ERROR_TIME` give valuable information if an error in starting or running the Messaging Gateway agent occurs.

> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_MGWADM`, for database view information

The following command shuts down the Messaging Gateway agent:

```
SQL> exec dbms_mgwadm.shutdown
```

When Messaging Gateway completes the shutdown procedure, the `AGENT_STATUS` column indicates `NOT_STARTED`.

By monitoring the `MGW_GATEWAY` view and the log file, you can determine the success of the shutdown procedure. If problems occur during shutdown or unexpected events occur that leave the Messaging Gateway administration in an inconsistent state, you can reset status information, as follows:

```
SQL> exec dbms_mgwadm.cleanup_gateway(dbms_gmwadm.CLEAN_STARTUP_STATE)
```

The Messaging Gateway agent process must *not* be running when this command is executed.

Configuring Messaging Gateway Links

You can use SQL scripts to configure Messaging Gateway, as illustrated in the following script examples. Full examples are found in the samples directory of the Messaging Gateway installation.

Creating a Messaging Gateway Link

A Messaging Gateway link is a set of connection information to a non-Oracle messaging system. It is used whenever a connection is needed for either messaging or administrative work.

You can set the following information for a link to an MQSeries queue manager: the queue manager name, channel, host, port, username, and password for an MQSeries client connection. Log queues for inbound or outbound propagation must also be set for use by the Messaging Gateway agent in guaranteeing exactly-once delivery. The two queues can refer to the same physical queue, but better performance is achieved if they refer to different physical queues.

An `options` argument, a set of {name, value} pairs, both of which are strings, represents arguments specific to a non-Oracle messaging system interface. For MQSeries-recognized property names, these include:

- `'MQ_ccsid'` for the corresponding `MQEnvironment.CCSID` property
- `'MQ_SendExit'` for `MQEnvironment.SEND_EXIT`
- `'MQ_ReceiveExit'` for `MQEnvironment.RECEIVE_EXIT`

- `'MQ_SecurityExit'` for `MQEnvironment.SECURITY_EXIT`

The following example configures a Messaging Gateway link to an MQSeries queue manager. The link is named `'mqlink'` and is configured to use the MQSeries queue manager `'my.queue.manager'` on host `'myhost.mydomain'` and port `1414`, using MQSeries channel `'mychannel'`. This example also uses the options parameter to register an MQSeries `SendExit` class. The class `'mySendExit'` must be in the classpath of the Messaging Gateway agent (set in the `mgw.ora` file). Refer to "Modifying the mgw.ora Initialization File" on page 18-9 for information on setting the classpath of the Messaging Gateway agent.

> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_MGWADM`, for information on MQSeries system properties and supported options

```
declare
  v_options sys.mgw_properties;
  v_prop    sys.mgw_mqseries_properties;
begin
  -- Set options.
  -- Specify an MQSeries send exit class 'mySendExit' to be associated with the
queue.
  v_options := sys.mgw_properties(sys.mgw_property('MQ_SendExit', 'mySendExit''))
);

  -- set certain MQSeries properties used for MQSeries
  v_prop := sys.mgw_mqseries_properties.construct();

  v_prop.max_connections := 1;
  v_prop.username := 'mqm';             -- username given to queue manager
  v_prop.password := 'mqm';             -- password given to queue manager
  v_prop.hostname := 'myhost.mydomain'  -- hostname for queue manager host
  v_prop.port     := 1414;              -- port (1414 is MQSeries default)
  v_prop.channel  := 'mychannel';       -- MQSeries channel name
  v_prop.outbound_log_queue := 'mylogq';    -- name of MQSeries queue to be
                                            -- used for MGW logging on
                                            -- outbound jobs.
  v_prop.queue_manager := 'my.queue.manager';  -- queue manager name

  dbms_mgwadm.create_msgsystem_link(
      linkname => 'mqlink',       -- link name
      properties => v_prop,       -- MQSeries driver properties
      options => v_options );     -- options
```

```
end;
```

Messaging Gateway does not impose a restriction on the number of links that you can configure.

Altering a Messaging Gateway Link

Some link information can be altered. For an MQSeries link, the `max_connections`, `username`, `password`, `inbound_log_queue`, and `outbound_log_queue` properties can be altered after creation. In the following example, the `'mqlink'` link created in "Creating a Messaging Gateway Link" is altered so that the `max_connections` and `password` properties are changed.

If the type of a property is `VARCHAR2`, a value of `DBMS_MGWADM.NO_CHANGE` leaves the property unchanged. For properties of other types, a value of `NULL` leaves the property unchanged. Use the `mgw_mqseries_properties.alter_construct` function when altering an MQSeries link. This sets the appropriate values automatically. Then set the values that need to be changed.

```
declare
  v_options sys.mgw_properties;
  v_prop    sys.mgw_mqseries_properties;
begin

  -- Alter certain MQSeries properties used for MQSeries.
  v_prop := sys.mgw_mqseries_properties.alter_construct();

  v_prop.max_connections := 2;         -- max_connections increased
  v_prop.password := 'newpasswd';      -- change password given to queue manager

 dbms_mgwadm.alter_msgsystem_link(
      linkname => 'mqlink',    -- link name
      properties => v_prop,    -- MQSeries driver properties
                               -- options will not be changed
      comment => 'link to queue manager, my.queue.manager. on my.host ');
                               -- add comment
end;
```

You can alter link information when the Messaging Gateway agent is running or when it is not.

> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference,* `DBMS_MGWADM`, for restrictions on changes when the Messaging Gateway agent is running

Removing a Messaging Gateway Link

You can remove a Messaging Gateway link to a non-Oracle messaging system only if all registered queues associated with this link have already been removed.

```
begin
    dbms_mgwadm.remove_msgsystem_link('mqlink');
end;
```

The link can be removed whether or not the Messaging Gateway agent is running.

Monitoring the Status of a Messaging Gateway Link

The `MGW_LINKS` view can be used to check which links have been configured. It lists the name and link type (which non-Oracle messaging system it applies to). To check configured link information, non-Oracle messaging system-specific views are available. For MQSeries, the `MGW_MQSERIES_LINKS` view has columns for most configurable information.

Checking Link Information: Example

```
SQL> select * from MGW_LINKS;

LINK_NAME   LINK_TYPE   LINK_COMMENT
-------------------------------------
MQLINK      MQSERIES


SQL> select link_name, queue_manager, channel, hostname from MGW_MQSERIES_LINKS;

LINK_NAME   QUEUE_MANAGER      CHANNEL     HOSTNAME
----------------------------------------------------------
MQLINK      my.queue.manager   mychannel   myhost.mydomain
```

Registering Non-Oracle Messaging System Queues

All non-Oracle messaging system queues involved in propagation must be registered through the Messaging Gateway administration interface. Messaging Gateway does not create non-Oracle queues; it only uses the configured information to access them.

Registering a Non-Oracle Queue

The following information is used to register a non-Oracle queue:

- The Messaging Gateway link name used to connect to the non-Oracle messaging system

- The native name of the non-Oracle queue (its name in the non-Oracle messaging system)
- Whether it is a queue (point-to-point) or topic (publish-subscribe)
- A set of options specific to the non-Oracle messaging system. These options are a set of {name, value} pairs, both of which are strings.

For MQSeries the only option is `‘MQ_openOptions’`. This property corresponds to the openOptions argument of the MQSeries Base Java `MQQueueManager.accessQueue` method. If not specified, the value of `openOptions` defaults to `MQC.MQOO_OUTPUT` on enqueue and `MQC.MQOO_INPUT_SHARED` on dequeue.

```
-- Registering non-Oracle queue
--
declare
  v_options sys.mgw_properties;
begin
  -- No options set for this foreign queue. Below is a sample of how one would
be set.
  -- v_options := sys.mgw_properties(sys.mgw_property(‘MQ_openOptions’,
‘2066’));

  -- Register the queue
  dbms_mgwadm.register_foreign_queue(
      name           => 'destq',                      -- MGW non-Oracle queue name
      linkname       => 'mqlink',                     -- name of link to use
      provider_queue => 'my_mq_queue',                -- name of MQSeries queue
      domain         => dbms_mgwadm.DOMAIN_QUEUE,     -- single consumer queue
      options        => v_options);
end;
```

The domain parameter is set to `DBMS_MGWADM.DOMAIN_QUEUE` for point-to-point queues and `DBMS_MGWADM.DOMAIN_TOPIC` for publish-subscribe queues. Only point-to-point queues are supported for MQSeries.

Altering a Registered Queue

After a non-Oracle queue is configured and registered, it cannot be altered. The registration information must be deleted and re-created.

Unregistering a Non-Oracle Queue

A non-Oracle queue can be unregistered only if there are no subscribers or schedules referencing it.

Unregistering a Queue: Example

```
begin
   dbms_mwgadm.unregister_foreign_queue('destq', 'mqlink');
end;
```

Monitoring the Status of a Registered Non-Oracle Queue

You can use the MGW_FOREIGN_QUEUES view to check which non-Oracle queues are registered.

Checking Which Queues Are Registered: Example

```
SQL> select name, link_name, provider_queue from MGW_FOREIGN_QUEUES;

NAME    LINK_NAME    PROVIDER_QUEUE
-----------------------------------
DESTQ   MQLINK       my_mq_queue
```

AQ Queues

You do not need to register AQ queues. When AQ queues are referenced, Messaging Gateway accesses them directly.

Configuring Propagation Jobs

Propagating messages from one queue to another queue requires a propagation job. A propagation job consists of a propagation subscriber and a propagation schedule, hereafter called a subscriber and a schedule. The subscriber specifies the source and destination queues, while the schedule specifies when the propagation job is processed. A subscriber without an associated schedule is not processed. For a schedule to be associated with a subscriber, it must have the same propagation source and propagation destination.

A Messaging Gateway subscriber does not necessarily correspond to a subscriber in a non-Oracle messaging system, unless that system has such a notion. Note that a Messaging Gateway subscriber for an AQ queue is not the same thing as an AQ subscriber on that queue. However, creating a Messaging Gateway subscriber results in the creation of a corresponding AQ subscriber.

> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference*, DBMS_MGWADM, for information on adding subscribers

Creating a Messaging Gateway Subscriber

A Messaging Gateway subscriber consists of the following information:

- The propagation type (inbound or outbound)
- The source queue
- The destination queue
- An optional selection rule
- An optional transformation name
- An optional exception queue

Creating a Messaging Gateway Subscriber: Example

```
begin
  dbms_mgwadm.add_subscriber(
     subscriber_id    => 'sub_aq2mq',          -- MGW subscriber name
     propagation_type => dbms_mgwadm.outbound_propagation, -- outbound propaga
     queue_name       => 'mgwuser.srcq',       -- AQ queue name (source queue)
     destination      => 'destq@mqlink');      -- MGW foreign queue with link
                                               --(destination queue)
end;
```

This example does not specify a subscriber rule for selecting messages when dequeuing from the AQ queue. Refer to "Using Transformations" on page 18-23 for an example in which a transformation is specified.

Creating Messaging Gateway Schedules

A Messaging Gateway schedule must be configured for a propagation job to be processed. The schedule determines when the propagation of messages occurs. In release 9.2, a schedule is used only for enabling and disabling propagation jobs. The scheduling parameters are not used in release 9.2.

Creating a Propagation Schedule: Example

```
begin
  dbms_mgwadm.schedule_propagation(
    schedule_id      =>  'sch_aq2mq',                   -- schedule name
    propagation_type => dbms_mgwadm.outbound_propagation, -- outbound propaga
    source           => 'mgwuser.srcq',                 -- AQ queue name
    destination      => 'destq@mqlink');          -- MGW foreign queue with link
end;
```

Enabling and Disabling Propagation Jobs

When a schedule is created, it is in an enabled state. This means that if there is an associated subscriber, the corresponding propagation job will be active. That is, it will be polling for messages in the source queue. To disable (or enable) a propagation job, the associated schedule must be disabled (or enabled).

The following examples disable and enable the schedule `‘sch_aq2mq’`.

```
begin
    dbms_mgwadm.disable_propagation_schedule(‘sch_aq2mq’);
end;

begin
    dbms_mgwadm.enable_propagation_schedule(‘sch_aq2mq’);
end;
```

Resetting Propagation Jobs

When a problem occurs in propagation, the Messaging Gateway agent retries the failed operation up to 16 times before the propagation job stops. To restart the propagation job with the error count reset to zero, use the `reset_subscriber( )` procedure.

Restarting a Propagation Job: Example

```
begin
    dbms_mgwadm.reset_subscriber(‘sub_aq2mq’);
end;
```

Altering Subscribers and Schedules

The following parameters can be altered after the subscriber is created: the selection rule, the transformation, and the exception queue. The value `DBMS_MGWADM.NO_CHANGE` indicates that the value of the parameter has not changed.

Altering Subscribers and Schedules: Example

```
begin
  dbms_mgwadm.alter_subscriber(
    subscriber_id   => 'sub_aq2mq',            -- MGW subscriber name
    rule            => dbms_mgwadm.NO_CHANGE,  -- selection rule not changed
                                               -- not used with MQSeries
    transformation  => dbms_mgwadm.NO_CHANGE,  -- transformation invoked on
                                               -- dequeue not changed
    exception_queue => ‘mgwuser.my_ex_queue’); -- register exception
                                               -- queue: same type as source
```

```
end;
```

Subscribers and schedules can be altered whether or not the Messaging Gateway agent is running.

Removing Subscribers and Schedules

In general, you should remove subscribers when the Messaging Gateway agent is running so that it can perform cleanup activities such as cleaning log queues and removing non-Oracle messaging system subscribers.

Removing a Schedule and Subscriber: Example

```
begin
    dbms_mgwadm.unschedule_propagation('sch_aq2mq');
end;

begin
    dbms_mgwadm.remove_subscriber('sub_aq2mq', dbms_mgwadm.NO_FORCE);
end;
```

The second argument specifies whether this procedure should succeed even if the gateway is not able to perform all cleanup actions pertaining to this subscriber. Valid values are `DBMS_MGWADM.NO_FORCE` and `DBMS_MGWADM.FORCE`. If `DBMS_MGWADM.NO_FORCE` is specified, and the Messaging Gateway agent is not running, the subscriber is placed in a `DELETE_PENDING` state. Cleanup actions will occur when the Messaging Gateway agent is started. If `DBMS_MGWADM.FORCE` is specified, the procedure will succeed, although all cleanup actions may not be done.

Selection Rules

A selection rule specifies an optional subscriber rule for selecting which messages are dequeued from the messaging system. For Advanced Queuing, the rule corresponds to the AQ subscriber rule. Selection rules are not used for MQSeries.

Using Transformations

Many applications of Messaging Gateway require you to provide a transformation. For Messaging Gateway to propagate messages from an AQ queue with an arbitrary ADT payload, a mapping must be provided to a Messaging Gateway canonical ADT. Likewise, for Messaging Gateway to propagate messages to an AQ queue with an arbitrary ADT payload, a mapping must be provided from a Messaging Gateway canonical ADT. This is the job of the transformation. A transformation registered with an outbound subscriber is invoked by AQ when

Messaging Gateway dequeues from the AQ source queue during propagation. A transformation registered with an inbound subscriber is invoked by Advanced Queuing when Messaging Gateway enqueues to the AQ destination queue during propagation.

For example, `trans_sampleadt_to_mgw_basic` is a stored procedure representing a transformation function with the following signature:

Transformation Function Signature: Example

```
FUNCTION trans_sampleadt_to_mgw_basic(in_msg IN mgwuser.sampleADT)
RETURN sys.mgw_basic_msg_t;
```

Create a transformation using `DBMS_TRANSFORM.CREATE` as follows:

```
begin
  dbms_transform.create_transformation(
        schema         => 'mgwuser',
        name           => 'sample_adt_to_mgw_basic',
        from_schema    => 'mgwuser',
        from_type      => 'sampleadt',
        to_schema      => 'sys',
        to_type        => 'mgw_basic_msg_t',
        transformation => 'mgwuser.trans_sampleadt_to_mgw_basic(user_data)');
end;
```

Once created, this transformation can be registered with Messaging Gateway when creating a subscriber.

```
begin
  dbms_mgwadm.add_subscriber(
    subscriber_id    => 'sub_aq2mq',                      -- MGW subscriber name
    propagation_type => dbms_mgwadm.outbound_propagation, -- outbound propaga
    queue_name       => 'mgwuser.srcq',         -- AQ queue name (source queue)
    destination      =>'destq@mqlink',          -- MGW foreign queue with link
                                                -- (destination queue)
    transformation => 'mgwuser.sample_adt_to_mgw_basic');  -- transformation
                                                           -- invoked on dequeue
end;
```

Exception Queues

The exception queue stores messages for which conversion has failed. This queue must be on the same messaging system as the propagation source queue. If specified, a message for which conversion fails is moved to the exception queue instead of the destination queue. If a subscriber does not have an exception queue specified, the propagation job stops when message conversion fails.

For outbound propagation, the exception queue must refer to an already existing AQ queue. The payload type of the source and exception queue must match. The exception queue must be created as a queue type of `NORMAL_QUEUE` rather than `EXCEPTION_QUEUE`.

For inbound propagation, the exception queue must be a registered non-Oracle messaging system queue, and the source and exception queues must use the same messaging system link.

Monitoring Propagation Jobs

You can use the `MGW_SUBSCRIBERS` view to check the existing configuration of subscribers and to monitor the status of propagation jobs. In addition to the configured information, columns in the view indicate the total number of messages propagated for the job (since the Messaging Gateway agent started), the number of propagation failures, the status of the propagation job, and error information.

The subscriber status value of `ENABLED` indicates that the subscriber is enabled. (Note that this does not mean that the propagation job is enabled. For a propagation job to be enabled, both the subscriber and an associated schedule must be enabled). `DELETE_PENDING` indicates that subscriber removal is pending. This can occur when `DBMS_MGWADM.REMOVE_SUBSCRIBER` is called, but certain cleanup tasks pertaining to this subscriber are still outstanding. In release 9.2, a subscriber’s status is always `ENABLED` unless it is `DELETE_PENDING`.

Error information includes the number of delivery failures, last error message, the last error date, and the last error time. If the number of failures reaches 16, propagation stops. Refer to "Resetting Propagation Jobs" on page 18-22.

Checking Propagated Messages: Example

```
SQL> select subscriber_id, queue_name, propagated_msgs, exceptionq_msgs from
mgw_subscribers;

SUBSCRIBER_ID     QUEUE_NAME     PROPAGATED_MSGS     EXCEPTIONQ_MSGS
--------------------------------------------------------------------
SUB_AQ2MQ         MGWUSER.SRCQ   1014                10
```

Checking for Errors: Example

```
SQL> select queue_name, failures, last_error_msg from mgw_subscribers where
subscriber_id = ‘SUB_AQ2MQ’;
```

```
QUEUE_NAME     FAILURES    LAST_ERROR_MSG
-----------------------------------------
MGWUSER.SRCQ   0
```

You can use the MGW_SCHEDULES view to check which schedules are configured and which are enabled.

Checking for Configured and Enabled Schedules: Example

```
SQL> select schedule_id, schedule_disabled from MGW_SCHEDULES;

SCHEDULE_ID    SCH
------------------
SCH_AQ2MQ      N
(N = not disabled; that is, enabled)
```

Monitoring the Messaging Gateway Log File

Messaging Gateway agent status, history, and errors are recorded in the Messaging Gateway log file. By default, it is located in the $ORACLE_HOME/mgw/log directory. You should monitor the log file because it is where both updates and errors are reported. A different log file is created each time the Messaging Gateway agent is started.

Sample Log File

The following sample log file shows the Messaging Gateway agent starting. Tracing information and errors are logged to this file.

```
Mon Sep 10 10:27:35 2001
  MGW  C-Bootstrap  0  process-id=4313
Bootstrap program starting
Mon Sep 10 10:27:36 2001
  MGW  C-Bootstrap  0  process-id=4313
JVM created -- heapsize = 64
>>2001-09-10 10:27:38  MGW  AdminMgr  0 LOG
Connecting to database using connect string = jdbc:oracle:oci8:@
>>2001-09-10 10:27:55  MGW  Engine  0 1
Agent is initializing...
>>2001-09-10 10:27:56  MGW  MQD  0 LOG
Creating MQSeries messaging link:
  link          : MQLINK
  queue manager : mars.queue.manager
  channel       : kbchannel
```

```
  host          : pdsun-dev10.us.oracle.com
  port          : 1414
  user          :
  connections   : 1
  inbound logQ  :
  outbound logQ : kblogqueue
>>2001-09-10 10:27:56  MGW  AQD  0 LOG
Creating AQ messaging link:
  link          : oracleMgwAq
  database      :
  user          : MGWAGENT
  connections   : 10
  inbound logQ  : sys.mgw_recv_log
  outbound logQ : sys.mgw_send_log
>>2001-09-10 10:27:56  MGW  Engine  0 7
Queue DESTQ@MQLINK has been registered.
>>2001-09-10 10:27:56  MGW  Engine  0 9
Propagation Schedule SCH_AQ2MQ has been added.
>>2001-09-10 10:27:56  MGW  Engine  0 13
MGW subscriber SUB_AQ2MQ has been created.
>>2001-09-10 10:27:56  MGW  Engine  0 18
MGW subscriber SUB_AQ2MQ has been activated.
>>2001-09-10 10:27:56  MGW  Engine  0 13
MGW subscriber SUB_AQ2MQ(MGWUSER.SRCQ --> DESTQ@MQLINK) has been created.
>>2001-09-10 10:27:56  MGW  Engine  0 2
Agent is up and running.
```

When configuration information is read at startup time or when dynamic configuration occurs, the information is written to the log. In the sample log file you can see that a link, a registered foreign queue, a subscriber, and a schedule have been created. The log shows that the subscriber has been activated. Any errors also appear in the log. The last line indicates that the Messaging Gateway agent is up and running.

Converting Messages

Messaging Gateway converts the native message format of the source messaging system to the native message format of the destination messaging system during propagation. Messaging Gateway uses canonical types and an AQ-centric model for the conversion.

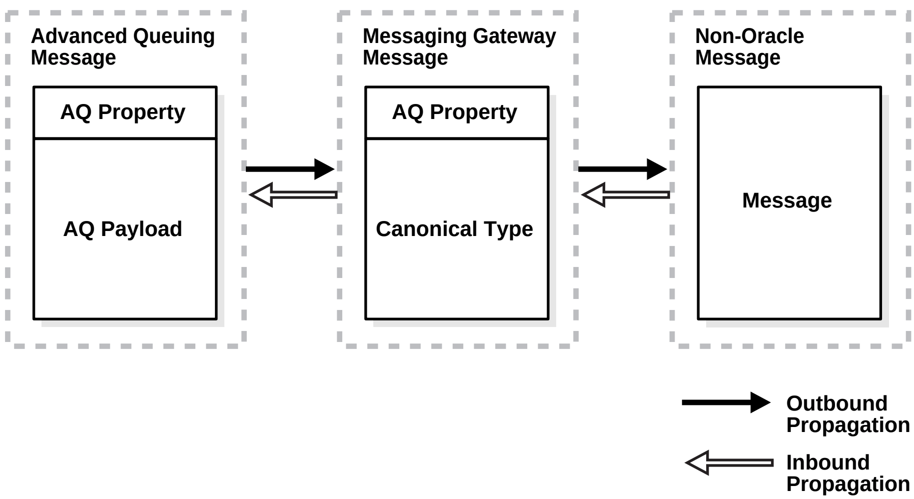
The Message Conversion Process

When a message is propagated by the gateway, the message is converted from the native format of the source queue to the native format of the destination queue.

A native message contains a message header and a message body. The header contains the fixed header fields that all messages in a messaging system have, such as message properties in Advanced Queuing and the fixed header in MQSeries. The body contains message contents, such as the AQ payload and the MQSeries message body. Messaging Gateway converts both message header and message body components.

Message conversion is done in two stages, as shown in Figure 18–2. A message is converted from the native format of the source queue to the gateway internal message format first, and then from the internal message format to the native format of the destination queue.

Figure 18–2 Message Conversion



The gateway agent uses an internal message format consisting of a header that is the same as the AQ message properties and a body that is an object of the gateway canonical types.

Messaging Gateway Canonical Types

Messaging Gateway defines canonical types to support message conversion between Advanced Queuing and non-Oracle messaging systems. A canonical type is a message type representation in the form of a PL/SQL abstract data type (ADT) in the Oracle9*i* database. In release 9.2, the canonical type `MGW_BASIC_MSG_T` supports conversion between Advanced Queuing and MQSeries.

`MGW_BASIC_MSG_T` is used to represent messages that have a message header and a `TEXT` or `RAW` (bytes) message body. The message header is represented as a set of {name,value} pairs, which are objects of the `MGW_NAME_VALUE_T` type.

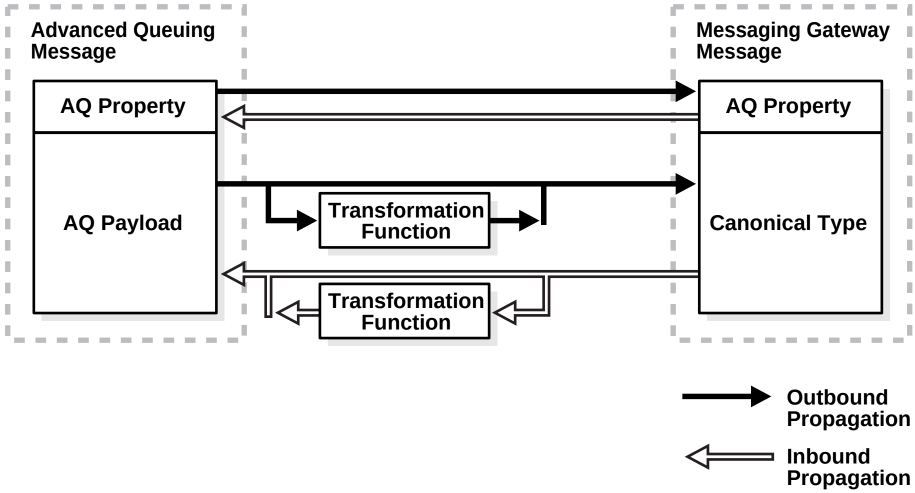
> **See Also:** *Oracle9i Supplied PL/SQL Packages and Types Reference*, `DBMS_MGWMSG`, for
>
> - Syntax and attribute information for `MGW_BASIC_MSG_T`
> - Syntax and attribute information for `MGW_NAME_VALUE_T`
> - A list of constants for the `MGW_NAME_VALUE_T` value types
> - Helper routines for `MGW_NAME_VALUE_ARRAY_T`

Message Conversion for Advanced Queuing

Native AQ messages consist of AQ message properties and a message payload of either `RAW` or a user-defined ADT type.

The Messaging Gateway agent converts messages between the native AQ message format and the internal message format. Figure 18–3 illustrates the message conversion performed by the AQ driver.

Figure 18–3 AQ Message Conversion



For outbound propagation, after dequeuing a message from an AQ queue, the gateway agent constructs an internal message by mapping the AQ message properties of the AQ message to the AQ message properties of the internal message and converting the AQ payload to an object of the canonical type.

For inbound propagation, after receiving an internal message from a non-Oracle driver, the gateway agent converts the canonical message to the AQ payload and then enqueues a message with that payload and the internal AQ message properties.

The agent can directly enqueue and dequeue messages with a payload of `RAW` or `SYS.MGW_BASIC_MSG_T` to and from AQ queues. The agent provides automatic mapping between the two payload types and the canonical type. For a payload type other than `RAW` or `SYS.MGW_BASIC_MSG_T` type, a user-supplied transformation must be provided for conversion between the AQ payload type and the canonical type.

In general, for outbound propagation, the AQ payload type or output of a user-supplied transformation must be either `RAW` or `SYS.MGW_BASIC_MSG_T`. For inbound propagation, the AQ payload or input type of a user-supplied transformation must be either `RAW` or `SYS.MGW_BASIC_MSG_T`.

Converting RAW AQ Payload Types

For outbound propagation, the following rules apply:

- An AQ payload of type RAW is always mapped to an MGW_BASIC_MSG_T canonical message with a RAW body. MGW_BASIC_MSG_T.header is set to NULL. This never results in a message conversion failure.

For inbound propagation, the following rules apply:

- An MGW_BASIC_MSG_T canonical message is mapped as follows:
  - For a RAW body of size <= 32k, the RAW body is mapped directly to the RAW payload. This never results in a message conversion failure.
  - For a RAW body of size > 32k, message conversion fails.
  - For a TEXT body, message conversion fails.
  - For a canonical message with both a TEXT and RAW body, message conversion fails.

Converting MGW_BASIC_MSG_T AQ Payload Types

For outbound propagation, the following rules apply:

- An AQ payload of type SYS.MGW_BASIC_MSG_T is always mapped to an MGW_BASIC_MSG_T canonical message.
- For a RAW body, if both small and large values are set, message conversion fails.
- For a TEXT body, if both small and large values are set, message conversion fails.

For inbound propagation, the following rules apply:

- An MGW_BASIC_MSG_T canonical message is mapped directly. This never results in a message conversion failure.

Using Transformations

Messaging Gateway can use AQ message transformation to convert between an AQ queue payload and a gateway canonical type. After a transformation is created using the DBMS_TRANSFORM package, a Messaging Gateway administrator can use DBMS_MGWADM.ADD_SUBSCRIBER and DBMS_MGWADM.ALTER_SUBSCRIBER to configure a gateway subscriber to use the transformation.

For outbound propagation, the transformation is invoked when the gateway agent dequeues messages from the AQ queue. For inbound propagation, the transformation is invoked when the gateway agent enqueues messages to the AQ queue.

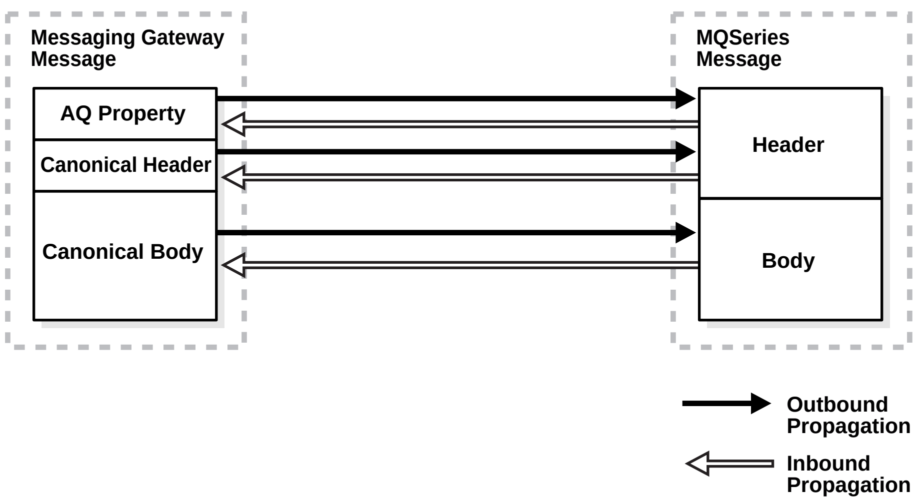
The transformation is always in the context of the gateway agent, which means that the gateway agent user must have execute privileges on the transformation function and the AQ payload type. This can be accomplished by granting the EXECUTE privilege to PUBLIC, or by granting the EXECUTE privilege directly to the gateway agent user.

Message Conversion for MQSeries

The Messaging Gateway MQSeries driver converts between the internal message format and the MQSeries native message format. MQSeries native messages consist of a fixed message header and a message body. The message body is treated as either a TEXT value or RAW (bytes) value.

Figure 18–4 illustrates the message conversion performed by the MQSeries driver. For outbound propagation, the driver maps the AQ message properties and canonical message to a native message having a fixed header and message body. For inbound propagation, the driver maps a native message to a set of AQ message properties and a canonical message.

Figure 18–4 MQSeries Message Conversion



For outbound propagation, an MGW_BASIC_MSG_T canonical message is mapped to an MQSeries native message as follows:

- The MQSeries fixed header fields are based on the internal AQ message properties and the MGW_BASIC_MSG_T.header attribute of the canonical message.

  Refer to Table 18–1 for the default mapping for certain MQSeries header fields based on the AQ message properties, if a value is not specified.

  The driver looks in MGW_BASIC_MSG_T.header for the {name,value} pairs described in Table 18–4 and, for each one found, uses that value for the MQSeries header field. Any {name,value} pairs with an unrecognized name or incorrect value type are ignored.
- If the canonical message has a TEXT body, the MQSeries *format* header field is set to MQFMT_STRING and the message body is set to the TEXT value.
- If the canonical message has a RAW body, the MQSeries *format* header field is set to "MGW_Byte" and the message body is set to the RAW value.
- If the canonical message has both a TEXT and RAW body, message conversion fails.
- If the canonical message has neither a TEXT nor RAW body, no message body is set and the MQSeries format header field is MQFMT_NONE.

For inbound propagation, the MQSeries native message is mapped to an MGW_BASIC_MSG_T canonical message as follows:

- Specific MQSeries header fields are mapped to AQ message properties as described in Table 18–1.
- The MGW_BASIC_MSG_T.header attribute of the canonical message is set to {name,value} pairs based on the MQSeries header fields, as described in Table 18–4.
- If the MQSeries *format* header field is MQFMT_STRING, the MQSeries message body is treated as TEXT and its value is mapped to MGW_BASIC_MSG_T.text_body. For any other *format* value, the message body is treated as RAW and its value is mapped to MGW_BASIC_MSG_T.raw_body.

Message Header Conversions

Messaging Gateway provides default mappings between AQ message properties and non-Oracle message header fields that have a counterpart in AQ message properties with the same semantics. Where Messaging Gateway does not provide a mapping, the message header fields are set to a default value, usually the default value defined by the messaging system.

Messaging Gateway defines {name, value} pairs for AQ message properties and the header fields of non-Oracle messaging systems to convert native message headers and allow users to override the default values. The {name, value} pairs are called header properties. Whether or not you can access the header properties for a given propagation job depends on the messaging systems involved and the AQ payload type or transformation.

Default Message Header Mapping

Table 18–1 describes the default mapping between AQ message properties and MQSeries header fields. (Refer to "Notes on Table 18–1" on page 18-34 for an explanation of the numbers in parentheses.)

Table 18–1 Default Mapping Between AQ Message Properties and MQSeries Header Fields

AQ Message Property	MQSeries Header Field	Outbound Mapping (AQ Value to MQSeries Value)	Inbound Mapping (MQSeries Value to AQ Value)
`priority`	`priority`	AQ values `0,1,2,3,4,5,6, 7,8,9` are mapped respectively to MQSeries values `9,8,7,6,5,4,3,2, 1,0`	MQSeries values `0,1,2,3, 4,5,6,7,8,9` are mapped respectively to AQ values `9,8,7,6,5,4,3,2,1,0`
		AQ values < `0` are mapped as MQSeries value 9	
		AQ values >=`10` are mapped to MQSeries value 0	
`expiration`	`expiry`	Time unit is mapped to tenths of a second (1)	Time unit is mapped to seconds (1)
		AQ value `NEVER` is mapped to `MQEI_UNLIMITED`	`MQEI_UNLIMITED` is mapped to `NEVER`

Notes on Table 18–1

1. For outbound propagation, the AQ expiration value is used to calculate the remaining time-to-live because the AQ expiration value represents the expiration time specified when the message is enqueued. For inbound propagation, a direct mapping is done because the MQSeries expiration value already represents the remaining time-to-live.

Advanced Queuing Header Properties

Table 18–2 defines the Messaging Gateway {name,value} pairs used to describe the AQ message properties. The header property names for the AQ properties are prefixed with "MGW_AQ_".

When a message is dequeued from an AQ queue, the AQ driver generates {name,value} pairs based on the dequeued message header. When a message is enqueued, the AQ driver sets the AQ message properties from {name,value} pairs for these properties.

Table 18–2 Messaging Gateway Names for AQ Message Properties

MGW Name MGW_NAME_VALUE_T.name	MGW Type MGW_NAME_VALUE_T.type	AQ Message Property	Used For
"MGW_AQ_priority"	INTEGER_VALUE	priority	Enqueue Dequeue
"MGW_AQ_expiration"	INTEGER_VALUE	expiration	Enqueue Dequeue
"MGW_AQ_delay"	INTEGER_VALUE	delay	Enqueue Dequeue
"MGW_AQ_correlation"	TEXT_VALUE (size 128)	correlation	Enqueue Dequeue
"MGW_AQ_exception_queue"	TEXT_VALUE (size 61)	exception_queue	Enqueue Dequeue
"MGW_AQ_enqueue_time"	DATE_VALUE	enqueue_time	Dequeue
"MGW_AQ_original_msgid"	RAW_VALUE (size 16)	original_msgid	Dequeue

When a message is enqueued to an AQ queue, the AQ driver sets the default values for the AQ message properties that have no default mappings (refer to Table 18–1). Corresponding header properties are set as shown in Table 18–3.

Table 18–3 AQ Message Property Default Values

AQ Message Property Name	Default Value
priority	1
expiration	NEVER

Table 18–3 AQ Message Property Default Values

AQ Message Property Name	Default Value
delay	NO_DELAY
correlation	NULL
exception_queue	NULL

MQSeries Header Properties

This section describes the message properties supported for the MQSeries messaging system. Table 18–4 defines the Messaging Gateway {name,value} pairs used to describe the MQSeries header properties. (Refer to "Notes on Table 18–4" on page 18-38 for an explanation of the numbers in parentheses.) The Messaging Gateway names for the MQSeries properties are prefixed with "MGW_MQ_".

When a message is dequeued from the MQSeries messaging system, the MQSeries driver generates {name,value} pairs based on the dequeued message header and stores them in the header part of the canonical message of the MGW_BASIC_MSG_T type. When a message is enqueued to MQSeries, the MQSeries driver sets the message header and enqueue options from {name,value} pairs for these properties stored in the header part of the MGW_BASIC_MSG_T canonical message.

Table 18–4 Messaging Gateway Names for MQSeries Header Values

Messaging Gateway Name mgw_name_value_t.NAME	Messaging Gateway Type MGW_NAME_VALUE_T.type	MQSeries Property Name	Used For
"MGW_MQ_priority"	INTEGER_VALUE	priority	Enqueue, Dequeue
"MGW_MQ_expiry"	INTEGER_VALUE	expiry	Enqueue, Dequeue
"MGW_MQ_correlationId"	RAW_VALUE (size 24)	correlationId	Enqueue (1), Dequeue
"MGW_MQ_persistence"	INTEGER_VALUE	persistence	Dequeue
"MGW_MQ_report"	INTEGER_VALUE	report	Enqueue (1), Dequeue
"MGW_MQ_messageType"	INTEGER_VALUE	messageType	Enqueue, Dequeue
"MGW_MQ_feedback"	INTEGER_VALUE	feedback	Enqueue, Dequeue

Table 18–4 Messaging Gateway Names for MQSeries Header Values

Messaging Gateway Name mgw_name_value_t.NAME	Messaging Gateway Type MGW_NAME_VALUE_T.type	MQSeries Property Name	Used For
"MGW_MQ_encoding"	INTEGER_VALUE	encoding	Enqueue, Dequeue
"MGW_MQ_characterSet"	INTEGER_VALUE	characterSet	Enqueue, Dequeue
"MGW_MQ_format"	TEXT_VALUE (size 8)	format	Enqueue (1), Dequeue
"MGW_MQ_backoutCount"	INTEGER_VALUE	backoutCount	Dequeue
"MGW_MQ_replyToQueueName"	TEXT_VALUE (size 48)	replyToQueueName	Enqueue, Dequeue
"MGW_MQ_replyToQueueManagerName"	TEXT_VALUE (size 48)	replyToQueueManagerName	Enqueue, Dequeue
"MGW_MQ_userId"	TEXT_VALUE (size 12)	userId	Enqueue, Dequeue
"MGW_MQ_accountingToken"	RAW_VALUE (size 32)	accountingToken	Enqueue (1), Dequeue
"MGW_MQ_applicationIdData"	TEXT_VALUE (size 32)	applicationIdData	Enqueue (1), Dequeue
"MGW_MQ_putApplicationType"	INTEGER_VALUE	putApplicationType	Enqueue (1), Dequeue
"MGW_MQ_putApplicationName"	TEXT_VALUE (size 28)	putApplicationName	Enqueue (1), Dequeue
"MGW_MQ_putDateTime"	DATE_VALUE	putDateTime	Dequeue
"MGW_MQ_applicationOriginData"	TEXT_VALUE (size 4)	applicationOriginData	Enqueue (1), Dequeue
"MGW_MQ_groupId"	RAW_VALUE (size 24)	groupId	Enqueue (1), Dequeue
"MGW_MQ_messageSequenceNumber"	INTEGER_VALUE	messageSequenceNumber	Enqueue, Dequeue
"MGW_MQ_offset"	INTEGER_VALUE	offset	Enqueue, Dequeue

Table 18–4 Messaging Gateway Names for MQSeries Header Values

Messaging Gateway Name mgw_name_value_t.NAME	Messaging Gateway Type MGW_NAME_VALUE_T.type	MQSeries Property Name	Used For
"MGW_MQ_messageFlags"	INTEGER_VALUE	messageFlags	Enqueue, Dequeue
"MGW_MQ_originalLength"	INTEGER_VALUE	originalLength	Enqueue, Dequeue
"MGW_MQ_putMessageOptions"	INTEGER_VALUE	putMessageOptions (2)	Enqueue (1)

Notes on Table 18–4

1. This use is subject to MQSeries restrictions. For example, if MGW_MQ_accountingToken is set for an outgoing message, MQSeries overrides its value unless MGW_MQ_putMessageOptions is set to the MQSeries constant MQPMD_SET_ALL_CONTEXT.

2. MGW_MQ_putMessageOptions is used as the putMessageOptions argument to the MQSeries Base Java Queue.put() method. It is not part of the MQSeries header information and therefore is not an actual message property.

   The value for the openOptions argument of the MQSeries Base Java MQQueueManager.accessQueue method is specified when the MQSeries queue is registered using the DBMS_MGWADM.REGISTER_FOREIGN_QUEUE call. Dependencies may exist between the two. For instance, for MGW_MQ_putMessageOptions to include MQPMD_SET_ALL_CONTEXT, the MQ_openMessageOptions queue option must include MQOO_SET_CONTEXT.

The gateway agent adds the value MQPMO_SYNCPOINT to any value that you can specify.

Table 18–5 describes the default values set by the gateway agent for the MQSeries message header when a message is enqueued in an MQSeries queue. For all other header fields, the gateway agent does not set a default value.

Table 18–5 MQSeries Header Default Values

MQSeries Property Name	Default Value
messageType	MQMT_DATAGRAM

Table 18–5 MQSeries Header Default Values

MQSeries Property Name	Default Value
`putMessageOption`	`MQPMO_SYNCPOINT` will always be added; refer to (2) in "Notes on Table 18–4" on page 18-38.

Using Header Properties: Examples

The following propagation scenarios exemplify the use of header properties.

Using MGW_BASIC_MSG_T for Outbound Propagation: Example

Consider an outbound propagation job from an AQ queue to an MQSeries queue. Because the MQSeries driver supports only the `MGW_BASIC_MSG_T` type, the propagation job must be configured so that the AQ driver converts the AQ payload to an `MGW_BASIC_MSG_T` canonical message. To accomplish this, either the source queue payload type must be `SYS.MGW_BASIC_MSG_T`, or a transformation whose output (to) type is `SYS.MGW_BASIC_MSG_T` must be supplied.

For outbound propagation, use the `MGW_BASIC_MSG_T.header` attribute to specify native message header properties that are used when the message is enqueued to the destination queue. In this example, it will contain {name,value} pairs for MQSeries header properties, as described in Table 18–4.

Although the AQ driver generates {name,value} pairs for the AQ message properties (refer to Table 18–2), the information is lost because the MQSeries message format does not allow you to specify user-defined message property information.

Using MGW_BASIC_MSG_T for Inbound Propagation: Example

For an inbound propagation job from an MQSeries queue to an AQ queue, the MQSeries driver always converts its native message to an `MGW_BASIC_MSG_T` canonical message. Therefore, the propagation job should be configured so that the AQ driver converts the canonical message to a `SYS.MGW_BASIC_MSG_T` payload type. To accomplish this, either the destination queue payload type must be `SYS.MGW_BASIC_MSG_T`, or a transformation whose input (from) type is `SYS.MGW_BASIC_MSG_T` must be supplied.

When used for inbound propagation, the `MGW_BASIC_MSG_T.header` attribute contains {name,value} pairs for the native message header properties of the message dequeued from the source queue. In this example, it will contain {name,value} pairs for MQSeries header properties, as described in Table 18–4.

Because the MQSeries native message format does not allow you to specify user-defined message property information, you cannot specify values that the gateway MQSeries driver interprets as values to use for AQ message properties. As a result, the AQ message properties of the message enqueued to the destination queue are based on the default mappings described in Table 18–1 and the default values for the remaining (nonmapped) AQ properties.

Using XML Message Propagation: Examples

This section provides examples of how to set up propagation between AQ queues with ADT payloads and foreign queues using XML messages.

The messages to propagate in the examples are book orders. The payload type of the AQ queue, `AQ_book_orders`, is `book_order_typ`. The foreign queue, `FQ_book_orders`, is capable of storing XML documents.

The following PL/SQL script creates entities in the Oracle database for the two inbound and outbound propagation examples that follow. Assume that the script is run by database user `mgwuser`.

```
-- create the type book_order_typ
CREATE OR REPLACE TYPE book_order_typ AS OBJECT
(
  order_no            number,
  book_name        varchar2(100),
  book_isbn          varchar2(15),
  book_amount     number,
  payment             varchar2(30),
  ship_addr           varchar2(160),
  order_date         date
);
/
 -- grant privilege to PUBLIC
GRANT EXECUTE ON book_order_typ to PUBLIC;

BEGIN
    -- create queue table
    dbms_aqadm.create_queue_table(
                   queue_table              => 'book_order_qtab',
                   queue_payload_type => 'book_order_typ',
                   multiple_consumers  => TRUE,
                   compatible               => '8.1');

    -- create the queue
    dbms_aqadm.create_queue(
```

```
                   queue_name => 'AQ_book_orders',
                   queue_table => 'book_order_qtab');

    -- start the queue
    dbms_aqadm.start_queue('AQ_book_orders');
END;
/
```

The message system link called `fqlink`, which connects to a third-party messaging system, should be created by calling `dbms_mgwadm.create_msgsystem_link( )`. The foreign queue, `FQ_book_orders`, of the third-party messaging system should be registered by calling `dbms_mgwadm.register_foreign_queue( )`.

Propagating Outbound XML Messages: Example

This example sets up propagation to move book order messages from the AQ queue, `AQ_book_orders`, to the foreign queue, `FQ_book_orders`, in the form of XML documents. Users can use the package `DBMS_XMLSCHEMA` to generate an XML schema from the ADT `book_order_typ` to parse and process the XML messages at the third-party messaging system side.

The following script defines a function and a transformation to convert an AQ book order message to an XML document that is stored in an object of the canonical type `sys.mgw_basic_msg_t`. Run the script as user `mgwuser`.

```
-- create a transformation function
CREATE OR REPLACE FUNCTION fnc_order2basic (book_order IN book_order_typ)
   RETURN sys.mgw_basic_msg_t
   IS
       v_xml   XMLType;
       v_text   varchar(2000);    -- assume book orders in XML document
                                  -- are less than 2000 char long.
       v_basic sys.mgw_basic_msg_t;

   BEGIN
       -- create a XMLType object from the book_order
       v_xml  := XMLType.createXML(book_order, null, null);

       -- convert the XMLType object to XML document (text)
       v_text := v_xml.getStringVal();

       -- store the XML document in a mgw_basic_msg_t obejct
       v_basic := sys.mgw_basic_msg_t.construct;
       v_basic.text_body := sys.mgw_text_value_t(v_text, null);
```

```
        return v_basic;
    END fnc_order2basic;
                /

-- grant execute privilege to PUBLIC in order for the agent to be able to call
it
GRANT EXECUTE on fnc_order2basic to PUBLIC;

-- create a transformation with the function
BEGIN
  dbms_transform.create_transformation(
    schema          => 'mgwuser',
    name             => 'order2basic',
    from_schema => 'mgwuser',
    from_type      => 'book_order_typ',
    to_schema     => 'sys',
    to_type          =>'mgw_basic_msg_t',
    transformation => 'mgwuser.fnc_order2basic(source.user_data)');
END;
/
```

Run the following script as a user that has `MGW_ADMINSTRATOR_ROLE` privilege to create an outbound propagation job.

```
-- create an outbound propagation with the transformation
BEGIN
    dbms_mgwadm.add_subscriber(
      subscriber_id        => 'sub_aq2fq',
      propagation_type => dbms_mgwadm.outbound_propagation,
      queue_name          => 'mgwuser.AQ_book_orders',
      destination            => 'FQ_book_orders@fqlink',
      transformation      => 'mgwuser.order2basic');

    dbms_mgwadm.schedule_propagation(
      schedule_id            => 'sch_aq2fq',
      propagation_type  => dbms_mgwadm.outbound_propagation,
      source                      => 'mgwuser.AQ_book_orders',
      destination             => 'mgwuser.order2basic');
END;
/
```

After the preceding scripts run successfully, all book order messages sent to the AQ queue are propagated to the third-party queue as XML documents conforming to the XML schema associated with the PL/SQL type `book_order_typ`.

Propagating Inbound XML Messages: Example

This example sets up propagation to move book orders, which are XML documents conforming to the XML schema associated with the PL/SQL type `book_order_typ`, from the foreign queue, `FQ_book_orders`, to the AQ queue, `AQ_book_orders`. Users should use the package `DBMS_XMLSCHEMA` to generate XML schema from the ADT `book_order_typ` to generate valid XML book order messages.

The following script defines a function and a transformation to convert a book order in the form of an XML document stored in an object of the canonical type `sys.mgw_basic_msg_t` to an object of ADT `book_order_typ`. Run the script as `mgwuser`.

```
-- create a transformation function
CREATE OR REPLACE  FUNCTION fnc_basic2order(basic IN sys.mgw_basic_msg_t)
   RETURN book_order_typ
   IS
       v_xml     XMLType;
       v_text     varchar(2000);    -- assume book orders in XML document
                                                  -- are less than 2000 char
long
       v_order   book_order_typ;
   BEGIN
       v_text := basic.text_body.small_value;

       v_xml := XMLType.createXML(v_text);

       v_xml.toObject(v_order);

       return v_order;
   END fnc_basic2order;
/

-- grant execute privilege to PUBLIC in order for the agent to be able to call
it
GRANT EXECUTE on fnc_basic2order to PUBLIC;

               -- create a transformation with the function
BEGIN
  dbms_transform.create_transformation(
    schema           => 'mgwuser',
    name              => 'basic2order',
    from_schema => 'sys',
    from_type      => 'mgw_basic_msg_t',
    to_schema     => 'mgwuser',
```

```
    to_type          => 'book_order_typ',
    transformation => 'mgwuser.fnc_basic2order(source.user_data)');
END;
/
```

Run the following script as a user with `MGW_ADMINSTRATOR_ROLE` privilege to create an inbound propagation job.

```
-- create an inbound propagation with the transformation
BEGIN
     dbms_mgwadm.add_subscriber(
      subscriber_id       => 'sub_fq2aq',
      propagation_type => dbms_mgwadm.inbound_propagation,
      queue_name         => 'FQ_book_orders@fqlink'',
      destination           => 'mgwuser.AQ_book_orders',
      transformation     => 'mgwuser.basic2order');

-- create a schedule for the inbound propagation
     dbms_mgwadm.schedule_propagation(
       schedule_id          => 'sch_fq2aq',
       propagation_type  => dbms_mgwadm.inbound_propagation,
       source                  => 'FQ_book_orders@fqlink',
       destination            => 'mgwuser.AQ_book_orders');
END;
/
```

After the preceding scripts run successfully, all book order messages sent to the third-party queue as XML documents conforming to the XML schema associated with the PL/SQL type `book_order_typ` are propagated to the AQ queue.

The mgw.ora Initialization File

Messaging Gateway can get additional initialization information from a text file that is read when the Messaging Gateway agent starts. This initialization file is optional, although it is recommended for setting the environment needed by the Messaging Gateway agent. For example, it may be easier to use the initialization file to set the library path and classpath since these typically need to include paths for shared libraries and Java classes needed to access the Oracle database as well as the non-Oracle messaging systems.

Name: `mgw.ora`

Location: `<ORACLE_HOME>/mgw/admin`

File Contents

The Messaging Gateway initialization file contains lines for setting initialization parameters, environment variables, and Java properties. Each entity must be specified on one line; it is not possible, for example, for an initialization parameter specification to span multiple lines. Leading whitespace is trimmed in all cases.

Note: Any example that follows must consist of only one line in the initialization file, though in this document it may appear otherwise.

- Initialization parameters. The initialization parameters are typically specified by lines having a "`<name>=<value><NL>`" format where <name> represents the parameter name, `<value>` represents its value and <NL> represents a new line. Example: `log_level = 0`
- Environment variables. Environment variables such as `CLASSPATH` and `LD_LIBRARY_PATH` are set so the Messaging Gateway agent can find the required libraries, shared objects, Java classes, and so on. Environment variables are specified by lines having a `"set <env var>= <value><NL>"` or `"setenv <env var>=<value><NL>"` format where `<env var>` represents the name of the environment variable to set, `<value>` represents the value of the environment variable, and `<NL>` represents a new line. For example: `set classpath = /myOracleHome/mgw/lib/mgw.jar:<plus_other_required_files>`
- Java properties. Java properties can be set when creating the JVM of the Messaging Gateway agent. Java properties are specified by lines having a `"setJavaProp <prop name>=<value><NL>"` format where `<prop name>` represents the name of the Java property to set, `<value>` represents the value of the Java property, and `<NL>` represents a new line character. For example: `setJavaProp java.compiler = none`
- A comment line is designated with a # character as the first character of the line.

Initialization Parameters

log_directory

Usage: Specifies the directory where the Messaging Gateway log/trace file will be created.

Format: `log_directory = <value>`

Default: <ORACLE_HOME>/mgw/log

Example: log_directory = /private/mgwlog

log_level

Usage: Specifies the level of logging detail recorded by the Messaging Gateway agent. The logging level can be dynamically changed by the dbms_mgwadm.set_log_level API while the agent is running. It is recommended that log level 0 be used at all times.

Format: log_level = <value>

Values:

0 for basic logging; equivalent to dbms_mgwadm.BASIC_LOGGING

1 for lite tracing; equivalent to dbms_mgwadm.TRACE_LITE_LOGGING

2 for high tracing; equivalent to dbms_mgwadm.TRACE_HIGH_LOGGING

3 for debug tracing; equivalent to dbms_mgwadm.TRACE_DEBUG_LOGGING

Default: basic logging (0)

Example: log_level = 0

Environment Variables

Since the Messaging Gateway process environment is not under the direct control of the user, certain environment variables should be set using the initialization file. They are set using the set parameter as described in "Modifying the mgw.ora Initialization File" on page 18-9. The environment variables currently used by the Messaging Gateway agent are CLASSPATH, LD_LIBRARY_PATH, MGW_PRE_PATH, and ORACLE_SID.

Each of the following examples must consist of only one line in the initialization file, although in this document it may appear otherwise.

CLASSPATH

Usage: Used by the Java Virtual Machine to find Java classes needed by the MGW agent.

Format: `set CLASSPATH=<value>`

Example: The following example indicates classes that must be included for Messaging Gateway propagation between Oracle AQ and MQSeries.

```
set CLASSPATH =
/myOracleHome/jdbc/lib/classes12.zip:/myOracleHome/jdk/jre/lib/i18n.jar:/myOracl
eHome/jdk/jre/lib/rt.jar:/myOracleHome/sqlj/lib/runtime12.zip/myOracleHome/sqlj/
lib/translator.zip:/myOracleHome/jdbc/lib/nls_
charset12.zip:/myOracleHome/mgw/classes/mgw.jar:/opt/mqm/java/lib/com.ibm.mq.jar
:/opt/mqm/java/lib
```

LD_LIBRARY_PATH

Usage: Used by the MGW process to find external libraries. Not needed for WINDOWS NT.

Format: set LD_LIBRARY_PATH=<value>

Example: The following example indicates paths to libraries that may be needed by the Messaging Gateway for propagation between Oracle AQ and MQSeries

```
set LD_LIBRARY_PATH =
/myOracleHome/jdk/jre/lib/sparc:/myOracleHome/rdbms/ib:/myOracleHome/lib:/opt/mq
m/java/lib
```

MGW_PRE_PATH

Usage: Appended to the front of the path inherited by the Messaging Gateway process. For WINDOWS NT, this variable must be set to indicate where the library `jvm.dll` is found. It is not currently necessary for other operating systems.

Format: `set MGW_PRE_PATH=<value>`

Example: The following example indicates where the library may be found.

```
set MGW_PRE_PATH=\myOracleHome\jdk\jre\bin\classic
```

ORACLE_SID

Usage: May be used when a service name is not specified when configuring the Messaging Gateway.

Format: `set ORACLE_SID=<value>`

Example: `set ORACLE_SID=my_sid`

Java Properties

None are currently used.

A

Oracle Advanced Queuing by Example

In this appendix we provide examples of operations using different programmatic environments:

- Creating Queue Tables and Queues
  - Creating a Queue Table and Queue of Object Type
  - Creating a Queue Table and Queue of Raw Type
  - Creating a Prioritized Message Queue Table and Queue
  - Creating a Multiconsumer Queue Table and Queue
  - Creating a Queue to Demonstrate Propagation
  - Setting Up Java AQ Examples
  - Creating an Java AQ Session
  - Creating a Queue Table and Queue Using Java
  - Creating a Queue and Start Enqueue/Dequeue Using Java
  - Creating a Multiconsumer Queue and Add Subscribers Using Java
- Enqueuing and Dequeuing Messages
  - Enqueuing and Dequeuing of Object Type Messages Using PL/SQL
  - Enqueuing and Dequeuing of Object Type Messages Using Pro*C/C++
  - Enqueuing and Dequeuing of Object Type Messages Using OCI
  - Enqueuing and Dequeuing of Object Type Messages (CustomDatum interface) Using Java

Creating Queue Tables and Queues

Note: You may need to set up the following data structures for certain examples to work:

```
CONNECT system/manager;
DROP USER aqadm CASCADE;
GRANT CONNECT, RESOURCE TO aqadm;
CREATE USER aqadm IDENTIFIED BY aqadm;
GRANT EXECUTE ON DBMS_AQADM TO aqadm;
GRANT Aq_administrator_role TO aqadm;
DROP USER aq CASCADE;
CREATE USER aq IDENTIFIED BY aq;
GRANT CONNECT, RESOURCE TO aq;
GRANT EXECUTE ON dbms_aq TO aq;
```

Creating a Queue Table and Queue of Object Type

```
/* Creating a message type: */
CREATE type aq.Message_typ as object (
subject     VARCHAR2(30),
text        VARCHAR2(80));

/* Creating a object type queue table and queue: */
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE (
queue_table        => 'aq.objmsgs80_qtab',
queue_payload_type => 'aq.Message_typ');

EXECUTE DBMS_AQADM.CREATE_QUEUE (
queue_name         => 'msg_queue',
queue_table        => 'aq.objmsgs80_qtab');

EXECUTE DBMS_AQADM.START_QUEUE (
queue_name         => 'msg_queue');
```

Creating a Queue Table and Queue of Raw Type

```
/* Creating a RAW type queue table and queue: */
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE (
queue_table          => 'aq.RawMsgs_qtab',
queue_payload_type   => 'RAW');

EXECUTE DBMS_AQADM.CREATE_QUEUE (
queue_name          => 'raw_msg_queue',
queue_table         => 'aq.RawMsgs_qtab');

EXECUTE DBMS_AQADM.START_QUEUE (
queue_name          => 'raw_msg_queue');
```

Creating a Prioritized Message Queue Table and Queue

```
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE (
queue_table        => 'aq.priority_msg',
sort_list          => 'PRIORITY,ENQ_TIME',
queue_payload_type => 'aq.Message_typ');

EXECUTE DBMS_AQADM.CREATE_QUEUE (
queue_name         => 'priority_msg_queue',
queue_table        => 'aq.priority_msg');

EXECUTE DBMS_AQADM.START_QUEUE (
queue_name         => 'priority_msg_queue');
```

Creating a Multiconsumer Queue Table and Queue

```
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE (
queue_table        => 'aq.MultiConsumerMsgs_qtab',
multiple_consumers => TRUE,
queue_payload_type => 'aq.Message_typ');

EXECUTE DBMS_AQADM.CREATE_QUEUE (
queue_name         => 'msg_queue_multiple',
queue_table        => 'aq.MultiConsumerMsgs_qtab');

EXECUTE DBMS_AQADM.START_QUEUE (
queue_name         => 'msg_queue_multiple');
```

Creating a Queue to Demonstrate Propagation

```
EXECUTE DBMS_AQADM.CREATE_QUEUE (
queue_name        => 'another_msg_queue',
queue_table       => 'aq.MultiConsumerMsgs_qtab');

EXECUTE DBMS_AQADM.START_QUEUE (
queue_name         => 'another_msg_queue');
```

Setting Up Java AQ Examples

```
CONNECT system/manager

DROP USER aqjava CASCADE;
GRANT CONNECT, RESOURCE, AQ_ADMINISTRATOR_ROLE TO aqjava IDENTIFIED BY aqjava;
GRANT EXECUTE ON DBMS_AQADM TO aqjava;
GRANT EXECUTE ON DBMS_AQ TO aqjava;
CONNECT aqjava/aqjava

/* Set up main class from which we will call subsequent examples and handle
   exceptions: */
import java.sql.*;
import oracle.AQ.*;

public class test_aqjava
{
   public static void main(String args[])
   {
      AQSession  aq_sess = null;
      try
      {
         aq_sess = createSession(args);

        /* now run the test: */
        runTest(aq_sess);
      }
      catch (Exception ex)
      {
         System.out.println("Exception-1: " + ex);
         ex.printStackTrace();
      }
   }
}
```

Creating an Java AQ Session

```
/* Creating an Java AQ Session for the 'aqjava' user as shown in the
   AQDriverManager section above: */
 public static AQSession createSession(String args[])
  {
     Connection db_conn;
     AQSession  aq_sess = null;

     try
     {

        Class.forName("oracle.jdbc.driver.OracleDriver");
        /* your actual hostname, port number, and SID will
        vary from what follows. Here we use 'dlsun736,' '5521,'
        and 'test,' respectively: */

        db_conn =
                 DriverManager.getConnection(
                 "jdbc:oracle:thin:@dlsun736:5521:test",
                 "aqjava", "aqjava");

        System.out.println("JDBC Connection opened ");
        db_conn.setAutoCommit(false);

        /* Load the Oracle8i AQ driver: */
        Class.forName("oracle.AQ.AQOracleDriver");

        /* Creating an AQ Session: */
        aq_sess = AQDriverManager.createAQSession(db_conn);
        System.out.println("Successfully created AQSession ");
     }
     catch (Exception ex)
     {
        System.out.println("Exception: " + ex);
        ex.printStackTrace();
     }
     return aq_sess;
  }
```

Creating a Queue Table and Queue Using Java

```
public static void runTest(AQSession aq_sess) throws AQException
{
    AQQueueTableProperty     qtable_prop;
    AQQueueProperty          queue_prop;
    AQQueueTable             q_table;
    AQQueue                  queue;

    /* Creating a AQQueueTableProperty object (payload type - RAW): */
    qtable_prop = new AQQueueTableProperty("RAW");

    /* Creating a queue table called aq_table1 in aqjava schema: */
    q_table = aq_sess.createQueueTable ("aqjava", "aq_table1", qtable_prop);
    System.out.println("Successfully created aq_table1 in aqjava schema");

    /* Creating a new AQQueueProperty object */
    queue_prop = new AQQueueProperty();

    /* Creating a queue called aq_queue1 in aq_table1: */
    queue = aq_sess.createQueue (q_table, "aq_queue1", queue_prop);
    System.out.println("Successfully created aq_queue1 in aq_table1");
}

/* Get a handle to an existing queue table and queue: */
public static void runTest(AQSession aq_sess) throws AQException
{
    AQQueueTable            q_table;
    AQQueue                 queue;

    /* Get a handle to queue table - aq_table1 in aqjava schema: */
    q_table = aq_sess.getQueueTable ("aqjava", "aq_table1");
    System.out.println("Successful getQueueTable");

    /* Get a handle to a queue - aq_queue1 in aqjava schema: */
    queue = aq_sess.getQueue ("aqjava", "aq_queue1");
    System.out.println("Successful getQueue");
}
```

Creating a Queue and Start Enqueue/Dequeue Using Java

```
{
     AQQueueTableProperty    qtable_prop;
     AQQueueProperty         queue_prop;
     AQQueueTable            q_table;
     AQQueue                 queue;

     /* Creating a AQQueueTable property object (payload type - RAW): */
     qtable_prop = new AQQueueTableProperty("RAW");
    qtable_prop.setCompatible("8.1");

     /* Creating a queue table called aq_table3 in aqjava schema: */
     q_table = aq_sess.createQueueTable ("aqjava", "aq_table3", qtable_prop);
     System.out.println("Successful createQueueTable");

     /* Creating a new AQQueueProperty object: */
     queue_prop = new AQQueueProperty();

     /* Creating a queue called aq_queue3 in aq_table3: */
     queue = aq_sess.createQueue (q_table, "aq_queue3", queue_prop);
     System.out.println("Successful createQueue");

     /* Enable enqueue/dequeue on this queue: */
     queue.start();
     System.out.println("Successful start queue");

     /* Grant enqueue_any privilege on this queue to user scott: */
     queue.grantQueuePrivilege("ENQUEUE", "scott");
     System.out.println("Successful grantQueuePrivilege");
}
```

Creating a Multiconsumer Queue and Add Subscribers Using Java

```
public static void runTest(AQSession aq_sess) throws AQException
{
     AQQueueTableProperty    qtable_prop;
     AQQueueProperty         queue_prop;
     AQQueueTable            q_table;
     AQQueue                 queue;
     AQAgent                  subs1, subs2;

     /* Creating a AQQueueTable property object (payload type - RAW): */
     qtable_prop = new AQQueueTableProperty("RAW");
     System.out.println("Successful setCompatible");
```

```
        /* Set multiconsumer flag to true: */
        qtable_prop.setMultiConsumer(true);

        /* Creating a queue table called aq_table4 in aqjava schema: */
        q_table = aq_sess.createQueueTable ("aqjava", "aq_table4", qtable_prop);
        System.out.println("Successful createQueueTable");

        /* Creating a new AQQueueProperty object: */
        queue_prop = new AQQueueProperty();
        /* Creating a queue called aq_queue4 in aq_table4 */
        queue = aq_sess.createQueue (q_table, "aq_queue4", queue_prop);
        System.out.println("Successful createQueue");

        /* Enable enqueue/dequeue on this queue: */
        queue.start();
        System.out.println("Successful start queue");

        /* Add subscribers to this queue: */
        subs1 = new AQAgent("GREEN", null, 0);
        subs2 = new AQAgent("BLUE", null, 0);

        queue.addSubscriber(subs1, null); /* no rule   */
        System.out.println("Successful addSubscriber 1");

        queue.addSubscriber(subs2, "priority < 2"); /* with rule */
        System.out.println("Successful addSubscriber 2");
    }
```

Enqueuing and Dequeuing Of Messages

Enqueuing and Dequeuing of Object Type Messages Using PL/SQL

To enqueue a single message without any other parameters specify the queue name and the payload.

```
/* Enqueue to msg_queue: */
DECLARE
   enqueue_options     dbms_aq.enqueue_options_t;
   message_properties  dbms_aq.message_properties_t;
   message_handle      RAW(16);
   message             aq.message_typ;

BEGIN
   message := message_typ('NORMAL MESSAGE',
   'enqueued to msg_queue first.');

   dbms_aq.enqueue(queue_name => 'msg_queue',
         enqueue_options      => enqueue_options,
         message_properties   => message_properties,
         payload              => message,
         msgid                => message_handle);

   COMMIT;

/* Dequeue from msg_queue: */
DECLARE
   dequeue_options     dbms_aq.dequeue_options_t;
   message_properties  dbms_aq.message_properties_t;
   message_handle      RAW(16);
   message             aq.message_typ;

BEGIN
   DBMS_AQ.DEQUEUE(queue_name => 'msg_queue',
           dequeue_options    => dequeue_options,
           message_properties => message_properties,
           payload            => message,
           msgid              => message_handle);

   DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
                                    ' ... ' || message.text );
   COMMIT;
END;
```

Enqueuing and Dequeuing of Object Type Messages Using Pro*C/C++

Note: You may need to set up data structures similar to the following for certain examples to work:

```
$ cat >> message.typ
case=lower
type aq.message_typ
$
$ ott userid=aq/aq intyp=message.typ outtyp=message_o.typ \
code=c hfile=demo.h
$
$ proc intyp=message_o.typ iname=<program name> \
config=<config file> SQLCHECK=SEMANTICS userid=aq/aq
```

```
#include  <stdio.h>
#include  <string.h>
#include  <sqlca.h>
#include  <sql2oci.h>
/* The header file generated by processing
object type 'aq.Message_typ': */
#include  "pceg.h"

void sql_error(msg)
char *msg;
{
EXEC SQL WHENEVER SQLERROR CONTINUE;
printf("%s\n", msg);
printf("\n% .800s \n", sqlca.sqlerrm.sqlerrmc);
EXEC SQL ROLLBACK WORK RELEASE;
exit(1);
}

main()
{
Message_typ     *message = (Message_typ*)0;  /* payload */
message_type_ind *imsg;              /*payload indicator*/
char             user[60]="aq/AQ";  /* user logon password */
char             subject[30];  /* components of the */
char             txt[80];      /* payload type */

/* ENQUEUE and DEQUEUE to an OBJECT QUEUE */

/*  Connect to database: */
```

```
EXEC SQL CONNECT :user;

/* On an oracle error print the error number :*/
EXEC SQL WHENEVER SQLERROR DO sql_error("Oracle Error :");

/* Allocate memory for the host variable from the object cache : */
EXEC SQL ALLOCATE :message;

/* ENQUEUE */

strcpy(subject, "NORMAL ENQUEUE");
strcpy(txt, "The Enqueue was done through PLSQL embedded in PROC");

/* Initialize the components of message : */
EXEC SQL OBJECT SET subject, text OF  :message TO :subject, :txt;

/* Embedded PLSQL call to the AQ enqueue procedure : */
EXEC SQL EXECUTE
DECLARE
message_properties   dbms_aq.message_properties_t;
enqueue_options      dbms_aq.enqueue_options_t;
msgid                RAW(16);
BEGIN
/* Bind the host variable 'message' to the payload: */
dbms_aq.enqueue(queue_name => 'msg_queue',
message_properties => message_properties,
enqueue_options => enqueue_options,
payload => :message:imsg,    /* indicator has to be specified */
msgid => msgid);
END;
END-EXEC;
/* Commit work */
EXEC SQL COMMIT;

printf("Enqueued Message \n");
printf("Subject  :%s\n",subject);
printf("Text     :%s\n",txt);

/* Dequeue */

/* Embedded PLSQL call to the AQ dequeue procedure : */
EXEC SQL EXECUTE
DECLARE
message_properties  dbms_aq.message_properties_t;
dequeue_options     dbms_aq.dequeue_options_t;
```

```
msgid              RAW(16);
BEGIN
/* Return the payload into the host variable 'message':  */
dbms_aq.dequeue(queue_name => 'msg_queue',
message_properties => message_properties,
dequeue_options => dequeue_options,
payload => :message,
msgid => msgid);
END;
END-EXEC;
 /* Commit work :*/
EXEC SQL COMMIT;

/* Extract the components of message: */
EXEC SQL OBJECT GET SUBJECT,TEXT FROM :message INTO :subject,:txt;

printf("Dequeued Message \n");
printf("Subject  :%s\n",subject);
printf("Text     :%s\n",txt);
}
```

Enqueuing and Dequeuing of Object Type Messages Using OCI

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <oci.h>

struct message
{
  OCIString   *subject;
  OCIString   *data;
};
typedef struct message message;

struct null_message
{
  OCIInd    null_adt;
  OCIInd    null_subject;
  OCIInd    null_data;
};
typedef struct null_message null_message;

int main()
```

```
{
  OCIEnv       *envhp;
  OCIServer    *srvhp;
  OCIError     *errhp;
  OCISvcCtx    *svchp;
  dvoid        *tmp;
  OCIType      *mesg_tdo = (OCIType *) 0;
  message      msg;
  null_message nmsg;
  message      *mesg     = &msg;
  null_message *nmesg    = &nmsg;
  message      *deqmesg  = (message *)0;
  null_message *ndeqmesg = (null_message *)0;

  OCIInitialize((ub4) OCI_OBJECT, (dvoid *)0,  (dvoid * (*)()) 0,
               (dvoid * (*)()) 0,  (void (*)()) 0 );

  OCIHandleAlloc((dvoid *) NULL, (dvoid **) &envhp, (ub4) OCI_HTYPE_ENV,
                52, (dvoid **) &tmp);

  OCIEnvInit(&envhp, (ub4) OCI_DEFAULT, 21, (dvoid **) &tmp  );

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
                52, (dvoid **) &tmp);
  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
                52, (dvoid **) &tmp);

  OCIServerAttach(srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
                52, (dvoid **) &tmp);

  OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
      (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);

  OCILogon(envhp, errhp, &svchp, "AQ", strlen("AQ"), "AQ", strlen("AQ"), 0, 0);

  /* Obtain TDO of message_typ */
  OCITypeByName(envhp, errhp, svchp, (CONST text *)"AQ", strlen("AQ"),
               (CONST text *)"MESSAGE_TYP", strlen("MESSAGE_TYP"),
               (text *)0, 0, OCI_DURATION_SESSION, OCI_TYPEGET_ALL, &mesg_tdo);

  /* Prepare the message payload */
  mesg->subject = (OCIString *)0;
  mesg->data = (OCIString *)0;
```

```
  OCIStringAssignText(envhp, errhp,
                      (CONST text *)"NORMAL MESSAGE", strlen("NORMAL MESSAGE"),
                       &mesg->subject);


  OCIStringAssignText(envhp, errhp,
                      (CONST text *)"OCI ENQUEUE", strlen("OCI ENQUEUE"),
                      &mesg->data);
  nmesg->null_adt = nmesg->null_subject = nmesg->null_data = OCI_IND_NOTNULL;

  /* Enqueue into the msg_queue */
  OCIAQEnq(svchp, errhp, (CONST text *)"msg_queue", 0, 0,
           mesg_tdo, (dvoid **)&mesg, (dvoid **)&nmesg, 0, 0);
  OCITransCommit(svchp, errhp, (ub4) 0);

  /* Dequeue from the msg_queue */
  OCIAQDeq(svchp, errhp, (CONST text *)"msg_queue", 0, 0,
           mesg_tdo, (dvoid **)&deqmesg, (dvoid **)&ndeqmesg, 0, 0);
  printf("Subject: %s\n", OCIStringPtr(envhp, deqmesg->subject));
  printf("Text: %s\n", OCIStringPtr(envhp, deqmesg->data));
  OCITransCommit(svchp, errhp, (ub4) 0);
}
```

Enqueuing and Dequeuing of Object Type Messages (CustomDatum interface) Using Java

To enqueue and dequeue of object type messages follow the lettered steps:

a. Create the SQL type for the Queue Payload

```
connect aquser/aquser
create type ADDRESS as object (street VARCHAR (30), city VARCHAR(30));
create type PERSON as object (name VARCHAR (30), home ADDRESS);
```

b. Generate the java class that maps to the PERSON ADT and implements the CustomDatum interface (using Jpublisher tool)

```
jpub -user=aquser/aquser -sql=ADDRESS,PERSON -case=mixed -usertypes=oracle
-methods=false  -compatible=CustomDatum
This creates two classes - PERSON.java and ADDRESS.java corresponding to the
PERSON and ADDRESS Adt types.
```

c. Create the queue table and queue with ADT payload

d. Enqueue and dequeue messages containing object payloads

```
public static void AQObjectPayloadTest(AQSession aq_sess)
       throws AQException, SQLException, ClassNotFoundException
  {
    Connection           db_conn   = null;
    AQQueue              queue     = null;
    AQMessage            message   = null;
    AQObjectPayload      payload   = null;
    AQEnqueueOption      eq_option = null;
    AQDequeueOption      dq_option = null;
    PERSON           pers = null;
    PERSON           pers2= null;
    ADDRESS          addr = null;

    db_conn = ((AQOracleSession)aq_sess).getDBConnection();


    queue = aq_sess.getQueue("aquser", "test_queue2");


    /* Enable enqueue/dequeue on this queue */
    queue.start();

    /* Enqueue a message in test_queue2 */
    message = queue.createMessage();

    pers = new PERSON();
    pers.setName("John");
    addr = new ADDRESS();
    addr.setStreet("500 Easy Street");
    addr.setCity("San Francisco");
    pers.setHome(addr);

    payload = message.getObjectPayload();
    payload.setPayloadData(pers);
    eq_option = new AQEnqueueOption();

    /* Enqueue a message into test_queue2 */
    queue.enqueue(eq_option, message);

    db_conn.commit();

    /* Dequeue a message from test_queue2 */
    dq_option = new AQDequeueOption();
    message = ((AQOracleQueue)queue).dequeue(dq_option, PERSON.getFactory());
```

```
    payload = message.getObjectPayload();
    pers2 = (PERSON) payload.getPayloadData();

    System.out.println("Object data retrieved:  [PERSON]");
    System.out.println("Name:   " + pers2.getName());
    System.out.println("Address ");
    System.out.println("Street: " + pers2.getHome().getStreet());
    System.out.println("City:   " + pers2.getHome().getCity());

    db_conn.commit();
  }
```

Enqueuing and Dequeuing of Object Type Messages (using SQLData interface) Using Java

To enqueue and dequeue of object type messages follow the lettered steps:

a. Create the SQL type for the Queue Payload

```
connect aquser/aquser
create type EMPLOYEE as object (empname VARCHAR (50), empno INTEGER);
```

b. Creating a java class that maps to the EMPLOYEE ADT and implements the SQLData interface. This class can also be generated using JPublisher using the following syntax

```
jpub -user=aquser/aquser -sql=EMPLOYEE -case=mixed -usertypes=jdbc
-methods=false

import java.sql.*;
import oracle.jdbc2.*;

public class Employee implements SQLData
{
  private String sql_type;
  public String empName;
  public int empNo;
  public Employee()
  {}
  public Employee (String sql_type, String empName, int empNo)
  {
    this.sql_type = sql_type;
    this.empName = empName;
```

```
    this.empNo = empNo;
  }

  ////// implements SQLData //////
  public String getSQLTypeName() throws SQLException
  { return sql_type;
  }
  public void readSQL(SQLInput stream, String typeName)
    throws SQLException
  {
    sql_type = typeName;
    empName = stream.readString();
    empNo = stream.readInt();
  }

  public void writeSQL(SQLOutput stream)
    throws SQLException
  {
    stream.writeString(empName);
    stream.writeInt(empNo);
  }

  public String toString()
  {
String ret_str = "";
    ret_str += "[Employee]\n";
    ret_str += "Name: " + empName + "\n";
    ret_str += "Number: " + empNo + "\n";

    return ret_str;
  }
}
```

c. Create the queue table and queue with ADT payload

```
public static void createEmployeeObjQueue(AQSession aq_sess)
       throws AQException
  {
    AQQueueTableProperty qt_prop   = null;
    AQQueueProperty      q_prop    = null;
    AQQueueTable         q_table   = null;
    AQQueue              queue     = null;

    /* Message payload type is aquser.EMPLOYEE */
    qt_prop = new AQQueueTableProperty("AQUSER.EMPLOYEE");
```

```
    qt_prop.setComment("queue-table1");

    /* Creating aQTable1 */
    System.out.println("\nCreate QueueTable: [aqtable1]");
    q_table = aq_sess.createQueueTable("aquser", "aqtable1", qt_prop);

    /* Create test_queue1 */
    q_prop = new AQQueueProperty();
    queue = q_table.createQueue("test_queue1", q_prop);

    /* Enable enqueue/dequeue on this queue */
    queue.start();
  }
```

d. Enqueue and dequeue messages containing object payloads

```
public static void AQObjectPayloadTest2(AQSession aq_sess)
       throws AQException, SQLException, ClassNotFoundException
  {
    Connection          db_conn   = null;
    AQQueue             queue     = null;
    AQMessage           message   = null;
    AQObjectPayload     payload   = null;
    AQEnqueueOption     eq_option = null;
    AQDequeueOption     dq_option = null;
    Employee            emp  = null;
    Employee            emp2 = null;
    Hashtable           map;

    db_conn = ((AQOracleSession)aq_sess).getDBConnection();

    /* Get the Queue object */
    queue = aq_sess.getQueue("aquser", "test_queue1");

    /* Register Employee class (corresponding to EMPLOYEE Adt)
     * in the connection type map
     */
    try
    {
      map  = (java.util.Hashtable)(((OracleConnection)db_conn).getTypeMap());
      map.put("AQUSER.EMPLOYEE", Class.forName("Employee"));
    }
    catch(Exception ex)
    {
      System.out.println("Error registering type: " + ex);
```

```
  }

  /* Enqueue a message in test_queue1 */
  message = queue.createMessage();
  emp = new Employee("AQUSER.EMPLOYEE", "Mark", 1007);

  /* Set the object payload */
  payload = message.getObjectPayload();
  payload.setPayloadData(emp);

  /* Enqueue a message into test_queue1*/
  eq_option = new AQEnqueueOption();
  queue.enqueue(eq_option, message);
  db_conn.commit();


  /* Dequeue a message from test_queue1 */
  dq_option = new AQDequeueOption();

  message = queue.dequeue(dq_option, Class.forName("Employee"));
  payload = message.getObjectPayload();
  emp2 = (Employee) payload.getPayloadData();
  System.out.println("\nObject data retrieved:  [EMPLOYEE]");
  System.out.println("Name  : " + emp2.empName);
  System.out.println("EmpId : " + emp2.empNo);

  db_conn.commit();
}
```

Enqueuing and Dequeuing of RAW Type Messages Using PL/SQL

```
DECLARE
   enqueue_options     dbms_aq.enqueue_options_t;
   message_properties  dbms_aq.message_properties_t;
   message_handle      RAW(16);
   message             RAW(4096);

BEGIN
   message :=  HEXTORAW(RPAD('FF',4095,'FF'));
   DBMS_AQ.ENQUEUE(queue_name => 'raw_msg_queue',
           enqueue_options    => enqueue_options,
           message_properties => message_properties,
                     payload  => message,
                      msgid   => message_handle);
```

```
   COMMIT;
END;

/* Dequeue from raw_msg_queue: */
/* Dequeue from raw_msg_queue: */
DECLARE
   dequeue_options     DBMS_AQ.dequeue_options_t;
   message_properties  DBMS_AQ.message_properties_t;
   message_handle      RAW(16);
   message             RAW(4096);

BEGIN
   DBMS_AQ.DEQUEUE(queue_name => 'raw_msg_queue',
           dequeue_options    => dequeue_options,
           message_properties => message_properties,
           payload            => message,
           msgid              => message_handle);

   COMMIT;
END;
```

Enqueuing and Dequeuing of RAW Type Messages Using Pro*C/C++

Note: You may need to set up data structures similar to the following for certain examples to work:

```
$ cat >> message.typ
case=lower
type aq.message_typ
$
$ ott userid=aq/aq intyp=message.typ outtyp=message_o.typ \
code=c hfile=demo.h
$
$ proc intyp=message_o.typ iname=<program name> \
config=<config file> SQLCHECK=SEMANTICS userid=aq/aq
```

```
#include  <stdio.h>
#include  <string.h>
#include  <sqlca.h>
#include  <sql2oci.h>
```

```
void sql_error(msg)
char *msg;
{
EXEC SQL WHENEVER SQLERROR CONTINUE;
printf("%s\n", msg);
printf("\n% .800s \n", sqlca.sqlerrm.sqlerrmc);
EXEC SQL ROLLBACK WORK RELEASE;
exit(1);
}

main()
{
LNOCIEnv         *oeh;   /* OCI Env handle */
LNOCIError       *err;   /* OCI Err handle */
LNOCIRaw         *message= (OCIRaw*)0;   /* payload */
ub1            message_txt[100];   /* data for payload */
char           user[60]="aq/AQ";   /* user logon password */
int            status;   /* returns status of the OCI call */

/* Enqueue and dequeue to a RAW queue */

/* Connect to database: */
EXEC SQL CONNECT :user;

/* On an oracle error print the error number: */
EXEC SQL WHENEVER SQLERROR DO sql_error("Oracle Error :");

/* Get the OCI Env handle: */
if (SQLEnvGet(SQL_SINGLE_RCTX, &oeh) != OCI_SUCCESS)
{
printf(" error in SQLEnvGet \n");
exit(1);
}
/* Get the OCI Error handle: */
if (status = OCIHandleAlloc((dvoid *)oeh, (dvoid **)&err,
(ub4)OCI_HTYPE_ERROR, (ub4)0, (dvoid **)0))
{
printf(" error in OCIHandleAlloc %d \n", status);
exit(1);
}

/* Enqueue */
/* The bytes to be put into the raw payload:*/
strcpy(message_txt, "Enqueue to a Raw payload queue ");
```

```
/* Assign bytes to the OCIRaw pointer :
Memory needs to be allocated explicitly to OCIRaw*: */
if (status=OCIRawAssignBytes(oeh, err, message_txt, 100,
 &message))
{
printf(" error in  OCIRawAssignBytes  %d \n", status);
exit(1);
}

/*  Embedded PLSQL call to the AQ enqueue procedure : */
EXEC SQL EXECUTE
DECLARE
message_properties   dbms_aq.message_properties_t;
enqueue_options      dbms_aq.enqueue_options_t;
msgid                RAW(16);
BEGIN
/* Bind the host variable message to the raw payload: */
dbms_aq.enqueue(queue_name => 'raw_msg_queue',
message_properties => message_properties,
enqueue_options => enqueue_options,
payload => :message,
msgid => msgid);
END;
END-EXEC;
/* Commit work: */
EXEC SQL COMMIT;

/* Dequeue */
/*  Embedded PLSQL call to the AQ dequeue procedure :*/
EXEC SQL EXECUTE
DECLARE
message_properties  dbms_aq.message_properties_t;
dequeue_options     dbms_aq.dequeue_options_t;
msgid               RAW(16);
BEGIN
/* Return the raw payload into the host variable 'message':*/
dbms_aq.dequeue(queue_name => 'raw_msg_queue',
message_properties => message_properties,
dequeue_options => dequeue_options,
payload => :message,
msgid => msgid);
END;
END-EXEC;
/* Commit work: */
EXEC SQL COMMIT;
```

```
}
```

Enqueuing and Dequeuing of RAW Type Messages Using OCI

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <oci.h>

int main()
{
  OCIEnv        *envhp;
  OCIServer     *srvhp;
  OCIError      *errhp;
  OCISvcCtx     *svchp;
  dvoid         *tmp;
  OCIType       *mesg_tdo = (OCIType *) 0;
  char          msg_text[100];
  OCIRaw        *mesg = (OCIRaw *)0;
  OCIRaw        *deqmesg = (OCIRaw *)0;
  OCIInd        ind = 0;
  dvoid         *indptr = (dvoid *)&ind;
  int           i;

  OCIInitialize((ub4) OCI_OBJECT, (dvoid *)0,  (dvoid * (*)()) 0,
              (dvoid * (*)()) 0,  (void (*)()) 0 );

  OCIHandleAlloc((dvoid *) NULL, (dvoid **) &envhp, (ub4) OCI_HTYPE_ENV,
               52, (dvoid **) &tmp);

  OCIEnvInit( &envhp, (ub4) OCI_DEFAULT, 21, (dvoid **) &tmp  );

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
               52, (dvoid **) &tmp);
  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
               52, (dvoid **) &tmp);

  OCIServerAttach(srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
               52, (dvoid **) &tmp);

  OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
           (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);
```

```
  OCILogon(envhp, errhp, &svchp, "AQ", strlen("AQ"), "AQ", strlen("AQ"), 0, 0);

  /* Obtain the TDO of the RAW data type */
  OCITypeByName(envhp, errhp, svchp, (CONST text *)"AQADM", strlen("AQADM"),
              (CONST text *)"RAW", strlen("RAW"),
              (text *)0, 0, OCI_DURATION_SESSION, OCI_TYPEGET_ALL, &mesg_tdo);

  /* Prepare the message payload */
  strcpy(msg_text, "Enqueue to a RAW queue");
  OCIRawAssignBytes(envhp, errhp, msg_text, strlen(msg_text), &mesg);

  /* Enqueue the message into raw_msg_queue */
  OCIAQEnq(svchp, errhp, (CONST text *)"raw_msg_queue", 0, 0,
        mesg_tdo, (dvoid **)&mesg, (dvoid **)&indptr, 0, 0);
  OCITransCommit(svchp, errhp, (ub4) 0);

  /* Dequeue the same message into C variable deqmesg */
  OCIAQDeq(svchp, errhp, (CONST text *)"raw_msg_queue", 0, 0,
         mesg_tdo, (dvoid **)&deqmesg, (dvoid **)&indptr, 0, 0);
  for (i = 0; i < OCIRawSize(envhp, deqmesg); i++)
    printf("%c", *(OCIRawPtr(envhp, deqmesg) + i));
  OCITransCommit(svchp, errhp, (ub4) 0);
}
```

Enqueue of RAW Messages using Java

```
public static void runTest(AQSession aq_sess) throws AQException
{
     AQQueueTable             q_table;
     AQQueue                  queue;
     AQMessage                message;
     AQRawPayload             raw_payload;
     AQEnqueueOption          enq_option;
     String                   test_data = "new message";
     byte[]                   b_array;
     Connection               db_conn;

     db_conn = ((AQOracleSession)aq_sess).getDBConnection();

     /* Get a handle to queue table - aq_table4 in aqjava schema: */
     q_table = aq_sess.getQueueTable ("aqjava", "aq_table4");
     System.out.println("Successful getQueueTable");
```

```
        /* Get a handle to a queue - aq_queue4 in aquser schema: */
        queue = aq_sess.getQueue ("aqjava", "aq_queue4");
        System.out.println("Successful getQueue");

        /* Creating a message to contain raw payload: */
        message = queue.createMessage();

        /* Get handle to the AQRawPayload object and populate it with raw data: */
        b_array = test_data.getBytes();

        raw_payload = message.getRawPayload();

        raw_payload.setStream(b_array, b_array.length);

        /* Creating a AQEnqueueOption object with default options: */
        enq_option = new AQEnqueueOption();
        /* Enqueue the message: */
        queue.enqueue(enq_option, message);

        db_conn.commit();
    }
```

Dequeue of Messages Using Java

```
      public static void runTest(AQSession aq_sess) throws AQException
    {
        AQQueueTable            q_table;
        AQQueue                 queue;
        AQMessage               message;
        AQRawPayload            raw_payload;
        AQEnqueueOption         enq_option;
        String                  test_data = "new message";
        AQDequeueOption         deq_option;
        byte[]                  b_array;
        Connection              db_conn;

        db_conn = ((AQOracleSession)aq_sess).getDBConnection();

        /* Get a handle to queue table - aq_table4 in aqjava schema: */
        q_table = aq_sess.getQueueTable ("aqjava", "aq_table4");
        System.out.println("Successful getQueueTable");

        /* Get a handle to a queue - aq_queue4 in aquser schema: */
        queue = aq_sess.getQueue ("aqjava", "aq_queue4");
```

```
        System.out.println("Successful getQueue");

        /* Creating a message to contain raw payload: */
        message = queue.createMessage();

        /* Get handle to the AQRawPayload object and populate it with raw data: */
        b_array = test_data.getBytes();

        raw_payload = message.getRawPayload();

        raw_payload.setStream(b_array, b_array.length);

        /* Creating a AQEnqueueOption object with default options: */
        enq_option = new AQEnqueueOption();

        /* Enqueue the message: */
        queue.enqueue(enq_option, message);
        System.out.println("Successful enqueue");

        db_conn.commit();

        /* Creating a AQDequeueOption object with default options: */
        deq_option = new AQDequeueOption();

        /* Dequeue a message: */
        message = queue.dequeue(deq_option);
        System.out.println("Successful dequeue");

        /* Retrieve raw data from the message: */
        raw_payload = message.getRawPayload();

        b_array = raw_payload.getBytes();

        db_conn.commit();
    }
```

Dequeue of Messages in Browse Mode Using Java

```
      public static void runTest(AQSession aq_sess) throws AQException
    {
         AQQueueTable            q_table;
         AQQueueTable            q_table;
         AQQueue                 queue;
         AQMessage               message;
```

```
AQRawPayload             raw_payload;
AQEnqueueOption          enq_option;
String                   test_data = "new message";
AQDequeueOption          deq_option;
byte[]                    b_array;
Connection               db_conn;

db_conn = ((AQOracleSession)aq_sess).getDBConnection();

/* Get a handle to queue table - aq_table4 in aqjava schema: */
q_table = aq_sess.getQueueTable ("aqjava", "aq_table4");
System.out.println("Successful getQueueTable");

/* Get a handle to a queue - aq_queue4 in aquser schema: */
queue = aq_sess.getQueue ("aqjava", "aq_queue4");
System.out.println("Successful getQueue");

/* Creating a message to contain raw payload: */
message = queue.createMessage();

/* Get handle to the AQRawPayload object and populate it with raw data: */
b_array = test_data.getBytes();

raw_payload = message.getRawPayload();

raw_payload.setStream(b_array, b_array.length);

/* Creating a AQEnqueueOption object with default options: */
enq_option = new AQEnqueueOption();

/* Enqueue the message: */
queue.enqueue(enq_option, message);
System.out.println("Successful enqueue");

db_conn.commit();

/* Creating a AQDequeueOption object with default options: */
deq_option = new AQDequeueOption();

/* Set dequeue mode to BROWSE: */
deq_option.setDequeueMode(AQDequeueOption.DEQUEUE_BROWSE);

/* Set wait time to 10 seconds: */
deq_option.setWaitTime(10);
```

```
        /* Dequeue a message: */
        message = queue.dequeue(deq_option);

        /* Retrieve raw data from the message: */
        raw_payload = message.getRawPayload();
        b_array = raw_payload.getBytes();

        String ret_value = new String(b_array);
        System.out.println("Dequeued message: " + ret_value);

        db_conn.commit();
}
```

Enqueuing and Dequeuing of Messages by Priority Using PL/SQL

When two messages are enqued with the same priority, the message which was enqued earlier will be dequeued first. However, if two messages are of different priorities, the message with the lower value (higher priority) will be dequeued first.

```
/* Enqueue two messages with priority 30 and 5: */
DECLARE
   enqueue_options     dbms_aq.enqueue_options_t;
   message_properties  dbms_aq.message_properties_t;
   message_handle      RAW(16);
   message             aq.message_typ;

BEGIN
   message := message_typ('PRIORITY MESSAGE',
   'enqued at priority 30.');

   message_properties.priority := 30;

   DBMS_AQ.ENQUEUE(queue_name => 'priority_msg_queue',
           enqueue_options    => enqueue_options,
           message_properties => message_properties,
           payload            => message,
           msgid              => message_handle);

   message := message_typ('PRIORITY MESSAGE',
   'Enqueued at priority 5.');

   message_properties.priority := 5;
```

```
   DBMS_AQ.ENQUEUE(queue_name => 'priority_msg_queue',
           enqueue_options    => enqueue_options,
           message_properties => message_properties,
           payload            => message,
           msgid              => message_handle);
END;

/* Dequeue from priority queue: */
DECLARE
   dequeue_options     DBMS_AQ.dequeue_options_t;
   message_properties  DBMS_AQ.message_properties_t;
   message_handle      RAW(16);
   message             aq.message_typ;

BEGIN
   DBMS_AQ.DEQUEUE(queue_name  => 'priority_msg_queue',
         dequeue_options       => dequeue_options,
         message_properties    => message_properties,
         payload               => message,
         msgid                 => message_handle);

   DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
   ' ... ' || message.text );

   COMMIT;

   DBMS_AQ.DEQUEUE(queue_name => 'priority_msg_queue',
         dequeue_options      => dequeue_options,
         message_properties   => message_properties,
         payload              => message,
         msgid                => message_handle);

   DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
   ' ... ' || message.text );
   COMMIT;
END;

/* On return, the second message with priority set to 5 will be retrieved before
the message with priority set to 30 since priority takes precedence over enqueue
time. */
```

Enqueue of Messages with Priority Using Java

```
public static void runTest(AQSession aq_sess) throws AQException
{
    AQQueueTable            q_table;
    AQQueue                 queue;
    AQMessage               message;
    AQMessageProperty       m_property;
    AQRawPayload            raw_payload;
    AQEnqueueOption         enq_option;
    String                  test_data;
    byte[]                  b_array;
    Connection              db_conn;

    db_conn = ((AQOracleSession)aq_sess).getDBConnection();

    /* Get a handle to queue table - aq_table4 in aqjava schema: */
    qtable = aq_sess.getQueueTable ("aqjava", "aq_table4");
    System.out.println("Successful getQueueTable");

    /* Get a handle to a queue - aq_queue4 in aqjava schema: */
    queue = aq_sess.getQueue ("aqjava", "aq_queue4");
    System.out.println("Successful getQueue");

    /* Enqueue 5 messages with priorities with different priorities: */
    for (int i = 0; i < 5; i++ )
      {
        /* Creating a message to contain raw payload: */
        message = queue.createMessage();

        test_data = "Small_message_" + (i+1);      /* some test data */

        /* Get a handle to the AQRawPayload object and
           populate it with raw data: */
        b_array = test_data.getBytes();

        raw_payload = message.getRawPayload();

        raw_payload.setStream(b_array, b_array.length);

        /* Set message priority: */
       m_property = message.getMessageProperty();

       if( i < 2)
          m_property.setPriority(2);
```

```
            else
               m_property.setPriority(3);

            /* Creating a AQEnqueueOption object with default options: */
            enq_option = new AQEnqueueOption();

            /* Enqueue the message: */
           queue.enqueue(enq_option, message);
           System.out.println("Successful enqueue");
       }

       db_conn.commit();
  }
```

Dequeue of Messages after Preview by Criterion Using PL/SQL

An application can preview messages in browse mode or locked mode without deleting the message. The message of interest can then be removed from the queue.

```
/* Enqueue 6 messages to msg_queue
— GREEN, GREEN, YELLOW, VIOLET, BLUE, RED */

DECLARE
   enqueue_options     DBMS_AQ.enqueue_options_t;
   message_properties  DBMS_AQ.message_properties_t;
   message_handle      RAW(16);
   message             aq.message_typ;

BEGIN
   message := message_typ('GREEN',
   'GREEN enqueued to msg_queue first.');

   DBMS_AQ.ENQUEUE(queue_name => 'msg_queue',
         enqueue_options      => enqueue_options,
         message_properties   => message_properties,
         payload              => message,
         msgid                => message_handle);

   message := message_typ('GREEN',
   'GREEN also enqueued to msg_queue second.');

   DBMS_AQ.ENQUEUE(queue_name => 'msg_queue',
         enqueue_options      => enqueue_options,
         message_properties   => message_properties,
```

```
            payload              => message,
            msgid                => message_handle);

      message := message_typ('YELLOW',
      'YELLOW enqueued to msg_queue third.');

      DBMS_AQ.ENQUEUE(queue_name => 'msg_queue',
            enqueue_options      => enqueue_options,
            message_properties   => message_properties,
            payload              => message,
            msgid                => message_handle);

      DBMS_OUTPUT.PUT_LINE ('Message handle: ' || message_handle);

      message := message_typ('VIOLET',
      'VIOLET enqueued to msg_queue fourth.');

      DBMS_AQ.ENQUEUE(queue_name => 'msg_queue',
            enqueue_options      => enqueue_options,
            message_properties   => message_properties,
            payload              => message,
            msgid                => message_handle);

      message := message_typ('BLUE',
      'BLUE enqueued to msg_queue fifth.');

      DBMS_AQ.ENQUEUE(queue_name => 'msg_queue',
            enqueue_options      => enqueue_options,
            message_properties   => message_properties,
            payload              => message,
            msgid                => message_handle);

      message := message_typ('RED',
      'RED enqueued to msg_queue sixth.');

      DBMS_AQ.ENQUEUE(queue_name => 'msg_queue',
            enqueue_options      => enqueue_options,
            message_properties   => message_properties,
            payload              => message,
            msgid                => message_handle);

      COMMIT;
   END;

   /* Dequeue in BROWSE mode until RED is found,
```

```
and remove RED from queue: */
DECLARE
   dequeue_options     DBMS_AQ.dequeue_options_t;
   message_properties  DBMS_AQ.message_properties_t;
   message_handle      RAW(16);
   message             aq.message_typ;

BEGIN
   dequeue_options.dequeue_mode := DBMS_AQ.BROWSE;

   LOOP
      DBMS_AQ.DEQUEUE(queue_name          => 'msg_queue',
                      dequeue_options    => dequeue_options,
                      message_properties => message_properties,
                      payload            => message,
                      msgid              => message_handle);

      DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
                                   ' ... ' || message.text );

      EXIT WHEN message.subject = 'RED';

   END LOOP;

   dequeue_options.dequeue_mode := DBMS_AQ.REMOVE;
   dequeue_options.msgid        := message_handle;

   DBMS_AQ.DEQUEUE(queue_name => 'msg_queue',
           dequeue_options    => dequeue_options,
           message_properties => message_properties,
           payload            => message,
           msgid              => message_handle);

   DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
   ' ... ' || message.text );

   COMMIT;
END;

/* Dequeue in LOCKED mode until BLUE is found,
and remove BLUE from queue: */
DECLARE
dequeue_options     dbms_aq.dequeue_options_t;
message_properties  dbms_aq.message_properties_t;
message_handle      RAW(16);
```

```
message              aq.message_typ;

BEGIN
dequeue_options.dequeue_mode := dbms_aq.LOCKED;

      LOOP

dbms_aq.dequeue(queue_name => 'msg_queue',
                 dequeue_options    => dequeue_options,
                 message_properties => message_properties,
                 payload            => message,
                 msgid              => message_handle);

dbms_output.put_line ('Message: ' || message.subject ||
          ' ... ' || message.text );

EXIT WHEN message.subject = 'BLUE';
      END LOOP;

dequeue_options.dequeue_mode := dbms_aq.REMOVE;
dequeue_options.msgid        := message_handle;

dbms_aq.dequeue(queue_name => 'msg_queue',
dequeue_options      => dequeue_options,
message_properties   => message_properties,
payload              => message,
msgid => message_handle);

DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
' ... ' || message.text );

      COMMIT;
END;
```

Enqueuing and Dequeuing of Messages with Time Delay and Expiration Using PL/SQL

Note: Expiration is calculated from the earliest dequeue time. So, if an application wants a message to be dequeued no earlier than a week from now, but no later than 3 weeks from now, this requires setting the expiration time for 2 weeks. This scenario is described in the following code segment.

```
/* Enqueue message for delayed availability: */
DECLARE
enqueue_options     dbms_aq.enqueue_options_t;
message_properties  dbms_aq.message_properties_t;
message_handle      RAW(16);
message             aq.Message_typ;

BEGIN
message := Message_typ('DELAYED',
'This message is delayed one week.');
message_properties.delay := 7*24*60*60;
message_properties.expiration := 2*7*24*60*60;

dbms_aq.enqueue(queue_name => 'msg_queue',
enqueue_options      => enqueue_options,
message_properties   => message_properties,
payload            => message,
msgid              => message_handle);

      COMMIT;
END;
```

Enqueuing and Dequeuing of Messages by Correlation and Message ID Using Pro*C/C++

Note: You may need to set up data structures similar to the following for certain examples to work:

```
$ cat >> message.typ
case=lower
type aq.message_typ
$
$ ott userid=aq/aq intyp=message.typ outtyp=message_o.typ \
code=c hfile=demo.h
$
$ proc intyp=message_o.typ iname=<program name> \
config=<config file> SQLCHECK=SEMANTICS userid=aq/aq
```

```
#include  <stdio.h>
#include  <string.h>
#include  <sqlca.h>
#include  <sql2oci.h>
/* The header file generated by processing
object type 'aq.Message_typ': */
#include  "pceg.h"

void sql_error(msg)
char *msg;
{
EXEC SQL WHENEVER SQLERROR CONTINUE;
printf("%s\n", msg);
printf("\n% .800s \n", sqlca.sqlerrm.sqlerrmc);
EXEC SQL ROLLBACK WORK RELEASE;
exit(1);
}

main()
{
LNOCIEnv            *oeh;  /* OCI Env Handle */
LNOCIError          *err;  /* OCI Error Handle */
Message_typ      *message = (Message_typ*)0; /* queue  payload */
message_type_ind *imsg;              /*payload indicator*/
LNOCIRaw            *msgid = (OCIRaw*)0;  /* message id */
ub1               msgmem[16]="";  /* memory for msgid */
char              user[60]="aq/AQ";  /* user login password */
```

```
char              subject[30];  /* components of */
char              txt[80];  /* Message_typ */
char              correlation1[30];  /* message correlation  */
char              correlation2[30];
int               status;  /* code returned by the OCI calls */

/* Dequeue by correlation and msgid */

/* Connect to the database: */
EXEC SQL CONNECT :user;
EXEC SQL WHENEVER SQLERROR DO sql_error("Oracle Error :");

/* Allocate space in the object cache for the host variable: */
EXEC SQL ALLOCATE :message;

/* Get the OCI Env handle: */
if (SQLEnvGet(SQL_SINGLE_RCTX, &oeh) != OCI_SUCCESS)
{
 printf(" error in SQLEnvGet \n");
 exit(1);
}
/* Get the OCI Error handle: */
if (status = OCIHandleAlloc((dvoid *)oeh, (dvoid **)&err,
(ub4)OCI_HTYPE_ERROR, (ub4)0, (dvoid **)0))
{
printf(" error in OCIHandleAlloc %d \n", status);
exit(1);
}


/* Assign memory for msgid:
Memory needs to be allocated explicitly to OCIRaw*: */
if (status=OCIRawAssignBytes(oeh, err, msgmem, 16, &msgid))
{
printf(" error in  OCIRawAssignBytes  %d \n", status);
exit(1);
}

/* First enqueue */

strcpy(correlation1, "1st message");
strcpy(subject, "NORMAL ENQUEUE1");
strcpy(txt, "The Enqueue was done through PLSQL embedded in PROC");

/* Initialize the components of message: */
```

```
EXEC SQL OJECT SET subject, text OF :message TO :subject, :txt;

/* Embedded PLSQL call to the AQ enqueue procedure: */
EXEC SQL EXECUTE
DECLARE
message_properties   dbms_aq.message_properties_t;
enqueue_options      dbms_aq.enqueue_options_t;
BEGIN
/* Bind the host variable 'correlation1': to message correlation*/
message_properties.correlation := :correlation1;

/* Bind the host variable 'message' to payload and
 return message id into host variable 'msgid': */
dbms_aq.enqueue(queue_name => 'msg_queue',
message_properties => message_properties,
enqueue_options => enqueue_options,
payload => :message:imsg,    /* indicator has to be specified */
msgid => :msgid);
END;
END-EXEC;
/* Commit work: */
EXEC SQL COMMIT;

printf("Enqueued Message \n");
printf("Subject  :%s\n",subject);
printf("Text     :%s\n",txt);

/* Second enqueue */

strcpy(correlation2, "2nd message");
strcpy(subject, "NORMAL ENQUEUE2");
strcpy(txt, "The Enqueue was done through PLSQL embedded in PROC");

/* Initialize the components of message: */
EXEC SQL OBJECT SET subject, text OF :messsage TO :subject,:txt;

/* Embedded PLSQL call to the AQ enqueue procedure: */
EXEC SQL EXECUTE
DECLARE
message_properties   dbms_aq.message_properties_t;
enqueue_options      dbms_aq.enqueue_options_t;
msgid                RAW(16);
BEGIN
/* Bind the host variable 'correlation2':  to message correlaiton */
message_properties.correlation := :correlation2;
```

```
/* Bind the host variable 'message': to payload */
dbms_aq.enqueue(queue_name => 'msg_queue',
message_properties => message_properties,
enqueue_options => enqueue_options,
payload => :message,
msgid => msgid);
END;
END-EXEC;
/* Commit work: */
EXEC SQL COMMIT;
printf("Enqueued Message \n");
printf("Subject  :%s\n",subject);
printf("Text     :%s\n",txt);

/* First dequeue - by  correlation */

EXEC SQL EXECUTE
DECLARE
message_properties  dbms_aq.message_properties_t;
dequeue_options     dbms_aq.dequeue_options_t;
msgid               RAW(16);
BEGIN
/* Dequeue by  correlation in host variable 'correlation2': */
dequeue_options.correlation := :correlation2;

/* Return the payload into host variable 'message': */
dbms_aq.dequeue(queue_name => 'msg_queue',
message_properties => message_properties,
dequeue_options => dequeue_options,
payload => :message,
msgid => msgid);
END;
END-EXEC;
/* Commit work : */
EXEC SQL COMMIT;

/* Extract the values of the components of message: */
EXEC SQL OBJECT GET subject, text FROM :message INTO :subject,:txt;

printf("Dequeued Message \n");
printf("Subject  :%s\n",subject);
printf("Text     :%s\n",txt);

/* SECOND DEQUEUE - by MSGID  */
```

```
EXEC SQL EXECUTE
DECLARE
message_properties  dbms_aq.message_properties_t;
dequeue_options     dbms_aq.dequeue_options_t;
msgid               RAW(16);
BEGIN
/* Dequeue by msgid in host variable 'msgid': */
dequeue_options.msgid := :msgid;

/* Return the payload into host variable 'message':  */
dbms_aq.dequeue(queue_name => 'msg_queue',
message_properties => message_properties,
dequeue_options => dequeue_options,
payload => :message,
msgid => msgid);
END;
END-EXEC;
/* Commit work: */
EXEC SQL COMMIT;
}
```

Enqueuing and Dequeuing of Messages by Correlation and Message ID Using OCI

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <oci.h>

struct message
{
  OCIString   *subject;
  OCIString   *data;
};
typedef struct message message;

struct null_message
{
  OCIInd    null_adt;
  OCIInd    null_subject;
  OCIInd    null_data;
};
typedef struct null_message null_message;
```

```
int main()
{
  OCIEnv       *envhp;
  OCIServer    *srvhp;
  OCIError     *errhp;
  OCISvcCtx    *svchp;
  dvoid        *tmp;
  OCIType      *mesg_tdo = (OCIType *) 0;
  message      msg;
  null_message nmsg;
  message      *mesg     = &msg;
  null_message *nmesg    = &nmsg;
  message      *deqmesg  = (message *)0;
  null_message *ndeqmesg = (null_message *)0;

  OCIInitialize((ub4) OCI_OBJECT, (dvoid *)0,  (dvoid * (*)()) 0,
              (dvoid * (*)()) 0,  (void (*)()) 0 );

  OCIHandleAlloc((dvoid *) NULL, (dvoid **) &envhp, (ub4) OCI_HTYPE_ENV,
               52, (dvoid **) &tmp);

  OCIEnvInit( &envhp, (ub4) OCI_DEFAULT, 21, (dvoid **) &tmp  );

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
               52, (dvoid **) &tmp);
  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
               52, (dvoid **) &tmp);

  OCIServerAttach(srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
               52, (dvoid **) &tmp);

  OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
           (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);

  OCILogon(envhp, errhp, &svchp, "AQ", strlen("AQ"), "AQ", strlen("AQ"), 0, 0);

  /* Obtain TDO of message_typ */
  OCITypeByName(envhp, errhp, svchp, (CONST text *)"AQ", strlen("AQ"),
              (CONST text *)"MESSAGE_TYP", strlen("MESSAGE_TYP"),
              (text *)0, 0, OCI_DURATION_SESSION, OCI_TYPEGET_ALL, &mesg_tdo);

  /* Prepare the message payload */
  mesg->subject = (OCIString *)0;
```

```
  mesg->data = (OCIString *)0;
  OCIStringAssignText(envhp, errhp,
                      (CONST text *)"NORMAL MESSAGE", strlen("NORMAL MESSAGE"),
                      &mesg->subject);
  OCIStringAssignText(envhp, errhp,
                      (CONST text *)"OCI ENQUEUE", strlen("OCI ENQUEUE"),
                      &mesg->data);
  nmesg->null_adt = nmesg->null_subject = nmesg->null_data = OCI_IND_NOTNULL;

  /* Enqueue into the msg_queue */
  OCIAQEnq(svchp, errhp, (CONST text *)"msg_queue", 0, 0,
           mesg_tdo, (dvoid **)&mesg, (dvoid **)&nmesg, 0, 0);
  OCITransCommit(svchp, errhp, (ub4) 0);

  /* Dequeue from the msg_queue */
  OCIAQDeq(svchp, errhp, (CONST text *)"msg_queue", 0, 0,
           mesg_tdo, (dvoid **)&deqmesg, (dvoid **)&ndeqmesg, 0, 0);
  printf("Subject: %s\n", OCIStringPtr(envhp, deqmesg->subject));
  printf("Text: %s\n", OCIStringPtr(envhp, deqmesg->data));
  OCITransCommit(svchp, errhp, (ub4) 0);
}
```

Enqueuing and Dequeuing of Messages to/from a Multiconsumer Queue Using PL/SQL

```
/* Create subscriber list: */
DECLARE
   subscriber aq$_agent;

   /* Add subscribers RED and GREEN to the suscriber list: */
BEGIN
   subscriber := aq$_agent('RED', NULL, NULL);
   DBMS_AQADM.ADD_SUBSCRIBER(queue_name => 'msg_queue_multiple',
   subscriber => subscriber);

   subscriber := aq$_agent('GREEN', NULL, NULL);
   DBMS_AQADM.ADD_SUBSCRIBER(queue_name => 'msg_queue_multiple',
   subscriber => subscriber);
END;

DECLARE
   enqueue_options     DBMS_AQ.enqueue_options_t;
   message_properties  DBMS_AQ.message_properties_t;
```

```
   recipients          DBMS_AQ.aq$_recipient_list_t;
   message_handle      RAW(16);
   message             aq.message_typ;

   /* Enqueue MESSAGE 1 for subscribers to the queue
   i.e. for RED and GREEN: */
BEGIN
   message := message_typ('MESSAGE 1',
   'This message is queued for queue subscribers.');

   DBMS_AQ.ENQUEUE(queue_name => 'msg_queue_multiple',
   enqueue_options    => enqueue_options,
   message_properties => message_properties,
   payload            => message,
   msgid              => message_handle);

   /* Enqueue MESSAGE 2 for specified recipients i.e. for RED and BLUE.*/
   message := message_typ('MESSAGE 2',
   'This message is queued for two recipients.');
   recipients(1) := aq$_agent('RED', NULL, NULL);
   recipients(2) := aq$_agent('BLUE', NULL, NULL);
   message_properties.recipient_list := recipients;

   DBMS_AQ.ENQUEUE(queue_name => 'msg_queue_multiple',
           enqueue_options    => enqueue_options,
           message_properties => message_properties,
           payload            => message,
           msgid              => message_handle);

   COMMIT;
END;
```

Note that RED is both a subscriber to the queue, as well as being a specified recipient of MESSAGE 2. By contrast, GREEN is only a subscriber to those messages in the queue (in this case, MESSAGE) for which no recipients have been specified. BLUE, while not a subscriber to the queue, is nevertheless specified to receive MESSAGE 2.

```
/* Dequeue messages from msg_queue_multiple: */
DECLARE
   dequeue_options     DBMS_AQ.dequeue_options_t;
   message_properties  DBMS_AQ.message_properties_t;
   message_handle      RAW(16);
   message             aq.message_typ;
   no_messages         exception;
```

```
   pragma exception_init (no_messages, -25228);

BEGIN

   dequeue_options.wait := DBMS_AQ.NO_WAIT;
   BEGIN
   /* Consumer BLUE will get MESSAGE 2: */
   dequeue_options.consumer_name := 'BLUE';
   dequeue_options.navigation := FIRST_MESSAGE;

   LOOP

   DBMS_AQ.DEQUEUE(queue_name   => 'msg_queue_multiple',
            dequeue_options    => dequeue_options,
            message_properties => message_properties,
            payload            => message,
            msgid              => message_handle);

      DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
            ' ... ' || message.text );
      dequeue_options.navigation := NEXT_MESSAGE;

   END LOOP;
   EXCEPTION
   WHEN no_messages THEN
   DBMS_OUTPUT.PUT_LINE ('No more messages for BLUE');
   COMMIT;
END;

BEGIN
/* Consumer RED will get MESSAGE 1 and MESSAGE 2: */
   dequeue_options.consumer_name := 'RED';
dequeue_options.navigation := DBMS_AQ.FIRST_MESSAGE
   LOOP
      DBMS_AQ.DEQUEUE(queue_name   => 'msg_queue_multiple',
               dequeue_options    => dequeue_options,
               message_properties => message_properties,
               payload            => message,
               msgid              => message_handle);

      DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
                                   ' ... ' || message.text );
      dequeue_options.navigation := NEXT_MESSAGE;
   END LOOP;
   EXCEPTION
```

```
   WHEN no_messages THEN
      DBMS_OUTPUT.PUT_LINE ('No more messages for RED');
   COMMIT;
END;

BEGIN
   /* Consumer GREEN will get MESSAGE 1: */
   dequeue_options.consumer_name := 'GREEN';
   dequeue_options.navigation := FIRST_MESSAGE;
   LOOP
      DBMS_AQ.DEQUEUE(queue_name   => 'msg_queue_multiple',
                dequeue_options    => dequeue_options,
                message_properties => message_properties,
                payload            => message,
                msgid              => message_handle);

      DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
          ' ... ' || message.text );
      dequeue_options.navigation := NEXT_MESSAGE;
   END LOOP;
   EXCEPTION
   WHEN no_messages THEN
      DBMS_OUTPUT.PUT_LINE ('No more messages for GREEN');
   COMMIT;
END;
```

Enqueuing and Dequeuing of Messages to/from a Multiconsumer Queue using OCI

Note: You may need to set up the following data structures for certain examples to work:

```
CONNECT aqadm/aqadm
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE(
   queue_table        => 'aq.qtable_multi',
   multiple_consumers => true,
   queue_payload_type => 'aq.message_typ');
EXECUTE DBMS_AQADM.START_QUEUE('aq.msg_queue_multiple');
CONNECT aq/aq
```

```
#include <stdio.h>
#include <stdlib.h>
```

```
#include <string.h>
#include <oci.h>

struct message
{
  OCIString   *subject;
  OCIString   *data;
};
typedef struct message message;

struct null_message
{
  OCIInd    null_adt;
  OCIInd    null_subject;
  OCIInd    null_data;
};
typedef struct null_message null_message;

int main()
{
  OCIEnv                *envhp;
  OCIServer             *srvhp;
  OCIError              *errhp;
  OCISvcCtx             *svchp;
  dvoid                 *tmp;
  OCIType               *mesg_tdo = (OCIType *) 0;
  message               msg;
  null_message          nmsg;
  message               *mesg = &msg;
  null_message          *nmesg = &nmsg;
  message               *deqmesg = (message *)0;
  null_message          *ndeqmesg = (null_message *)0;
  OCIAQMsgProperties    *msgprop = (OCIAQMsgProperties *)0;
  OCIAQAgent            *agents[2];
  OCIAQDeqOptions       *deqopt = (OCIAQDeqOptions *)0;
  ub4                   wait = OCI_DEQ_NO_WAIT;
  ub4                   navigation = OCI_DEQ_FIRST_MSG;

  OCIInitialize((ub4) OCI_OBJECT, (dvoid *)0,  (dvoid * (*)()) 0,
              (dvoid * (*)()) 0,  (void (*)()) 0 );



  OCIHandleAlloc((dvoid *) NULL, (dvoid **) &envhp, (ub4) OCI_HTYPE_ENV,
               52, (dvoid **) &tmp);
```

```
OCIEnvInit( &envhp, (ub4) OCI_DEFAULT, 21, (dvoid **) &tmp  );

OCIHandleAlloc((dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
               52, (dvoid **) &tmp);
OCIHandleAlloc((dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
               52, (dvoid **) &tmp);

OCIServerAttach(srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

OCIHandleAlloc((dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
               52, (dvoid **) &tmp);

OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
           (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);

OCILogon(envhp, errhp, &svchp, "AQ", strlen("AQ"), "AQ", strlen("AQ"), 0, 0);

/* Obtain TDO of message_typ */
OCITypeByName(envhp, errhp, svchp, (CONST text *)"AQ", strlen("AQ"),
             (CONST text *)"MESSAGE_TYP", strlen("MESSAGE_TYP"),
             (text *)0, 0, OCI_DURATION_SESSION, OCI_TYPEGET_ALL, &mesg_tdo);

/* Prepare the message payload */
mesg->subject = (OCIString *)0;
mesg->data = (OCIString *)0;
OCIStringAssignText(envhp, errhp,
                    (CONST text *)"MESSAGE 1", strlen("MESSAGE 1"),
                    &mesg->subject);
OCIStringAssignText(envhp, errhp,
                   (CONST text *)"mesg for queue subscribers",
                   strlen("mesg for queue subscribers"), &mesg->data);
nmesg->null_adt = nmesg->null_subject = nmesg->null_data = OCI_IND_NOTNULL;

/* Enqueue MESSAGE 1 for subscribers to the queue i.e. for RED and GREEN */
OCIAQEnq(svchp, errhp, (CONST text *)"msg_queue_multiple", 0, 0,
         mesg_tdo, (dvoid **)&mesg, (dvoid **)&nmesg, 0, 0);

/* Enqueue MESSAGE 2 for specified recipients i.e. for RED and BLUE */
/* prepare message payload */
OCIStringAssignText(envhp, errhp,
                    (CONST text *)"MESSAGE 2", strlen("MESSAGE 2"),
                    &mesg->subject);
OCIStringAssignText(envhp, errhp,
     (CONST text *)"mesg for two recipients",
```

```
     strlen("mesg for two recipients"), &mesg->data);

/* Allocate AQ message properties and agent descriptors */
OCIDescriptorAlloc(envhp, (dvoid **)&msgprop,
                   OCI_DTYPE_AQMSG_PROPERTIES, 0, (dvoid **)0);
OCIDescriptorAlloc(envhp, (dvoid **)&agents[0],
                   OCI_DTYPE_AQAGENT, 0, (dvoid **)0);
OCIDescriptorAlloc(envhp, (dvoid **)&agents[1],
                   OCI_DTYPE_AQAGENT, 0, (dvoid **)0);

/* Prepare the recipient list, RED and BLUE */
OCIAttrSet(agents[0], OCI_DTYPE_AQAGENT, "RED", strlen("RED"),
           OCI_ATTR_AGENT_NAME, errhp);
OCIAttrSet(agents[1], OCI_DTYPE_AQAGENT, "BLUE", strlen("BLUE"),
           OCI_ATTR_AGENT_NAME, errhp);
OCIAttrSet(msgprop, OCI_DTYPE_AQMSG_PROPERTIES, (dvoid *)agents, 2,
           OCI_ATTR_RECIPIENT_LIST, errhp);

OCIAQEnq(svchp, errhp, (CONST text *)"msg_queue_multiple", 0, msgprop,
         mesg_tdo, (dvoid **)&mesg, (dvoid **)&nmesg, 0, 0);

OCITransCommit(svchp, errhp, (ub4) 0);

/* Now dequeue the messages using different consumer names */
/* Allocate dequeue options descriptor to set the dequeue options */
OCIDescriptorAlloc(envhp, (dvoid **)&deqopt, OCI_DTYPE_AQDEQ_OPTIONS, 0,
                   (dvoid **)0);

/* Set wait parameter to NO_WAIT so that the dequeue returns immediately */
OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS, (dvoid *)&wait, 0,
           OCI_ATTR_WAIT, errhp);

/* Set navigation to FIRST_MESSAGE so that the dequeue resets the position */
/* after a new consumer_name is set in the dequeue options           */
OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS, (dvoid *)&navigation, 0,
           OCI_ATTR_NAVIGATION, errhp);

/* Dequeue from the msg_queue_multiple as consumer BLUE */
OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS, (dvoid *)"BLUE", strlen("BLUE"),
           OCI_ATTR_CONSUMER_NAME, errhp);

while (OCIAQDeq(svchp, errhp, (CONST text *)"msg_queue_multiple", deqopt, 0,
                mesg_tdo, (dvoid **)&deqmesg, (dvoid **)&ndeqmesg, 0, 0)
                == OCI_SUCCESS)
{
```

```
    printf("Subject: %s\n", OCIStringPtr(envhp, deqmesg->subject));
    printf("Text: %s\n", OCIStringPtr(envhp, deqmesg->data));
  }
  OCITransCommit(svchp, errhp, (ub4) 0);

  /* Dequeue from the msg_queue_multiple as consumer RED */
  OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS, (dvoid *)"RED", strlen("RED"),
        OCI_ATTR_CONSUMER_NAME, errhp);
  while (OCIAQDeq(svchp, errhp, (CONST text *)"msg_queue_multiple", deqopt, 0,
    mesg_tdo, (dvoid **)&deqmesg, (dvoid **)&ndeqmesg, 0, 0)
    == OCI_SUCCESS)
  {
    printf("Subject: %s\n", OCIStringPtr(envhp, deqmesg->subject));
    printf("Text: %s\n", OCIStringPtr(envhp, deqmesg->data));
  }
  OCITransCommit(svchp, errhp, (ub4) 0);

  /* Dequeue from the msg_queue_multiple as consumer GREEN */
  OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS,(dvoid *)"GREEN",strlen("GREEN"),
        OCI_ATTR_CONSUMER_NAME, errhp);
  while (OCIAQDeq(svchp, errhp, (CONST text *)"msg_queue_multiple", deqopt, 0,
    mesg_tdo, (dvoid **)&deqmesg, (dvoid **)&ndeqmesg, 0, 0)
    == OCI_SUCCESS)
  {
    printf("Subject: %s\n", OCIStringPtr(envhp, deqmesg->subject));
    printf("Text: %s\n", OCIStringPtr(envhp, deqmesg->data));
  }
  OCITransCommit(svchp, errhp, (ub4) 0);
}
```

Enqueuing and Dequeuing of Messages Using Message Grouping Using PL/SQL

```
CONNECT aq/aq

EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE (
   queue_table          => 'aq.msggroup',
   queue_payload_type   => 'aq.message_typ',
   message_grouping     => DBMS_AQADM.TRANSACTIONAL);

EXECUTE DBMS_AQADM.CREATE_QUEUE(
   queue_name      => 'msggroup_queue',
   queue_table     => 'aq.msggroup');

EXECUTE DBMS_AQADM.START_QUEUE(
```

```
   queue_name => 'msggroup_queue');

/* Enqueue three messages in each transaction */
DECLARE
   enqueue_options     DBMS_AQ.enqueue_options_t;
   message_properties  DBMS_AQ.message_properties_t;
   message_handle      RAW(16);
   message             aq.message_typ;

BEGIN

  /* Loop through three times, committing after every iteration */
  FOR txnno in 1..3 LOOP

    /* Loop through three times, enqueuing each iteration */
    FOR mesgno in 1..3 LOOP
      message := message_typ('GROUP#' || txnno,
               'Message#' || mesgno ||  ' in group' || txnno);

      DBMS_AQ.ENQUEUE(queue_name         => 'msggroup_queue',
                  enqueue_options        => enqueue_options,
                  message_properties     => message_properties,
                  payload                => message,
                  msgid                  => message_handle);
    END LOOP;
    /* Commit the transaction */
    COMMIT;
  END LOOP;
END;

/* Now dequeue the messages as groups */
DECLARE
   dequeue_options     DBMS_AQ.dequeue_options_t;
   message_properties  DBMS_AQ.message_properties_t;
   message_handle      RAW(16);
   message             aq.message_typ;

   no_messages   exception;
   end_of_group  exception;

   PRAGMA EXCEPTION_INIT (no_messages, -25228);
   PRAGMA EXCEPTION_INIT (end_of_group, -25235);

BEGIN
   dequeue_options.wait       := DBMS_AQ.NO_WAIT;
```

```
      dequeue_options.navigation := DBMS_AQ.FIRST_MESSAGE;

      LOOP
         BEGIN
         DBMS_AQ.DEQUEUE(queue_name   => 'msggroup_queue',
                    dequeue_options    => dequeue_options,
                    message_properties => message_properties,
                    payload            => message,
                    msgid              => message_handle);

        DBMS_OUTPUT.PUT_LINE ('Message: ' || message.subject ||
              ' ... ' || message.text );

        dequeue_options.navigation := DBMS_AQ.NEXT_MESSAGE;

        EXCEPTION
          WHEN end_of_group THEN
            DBMS_OUTPUT.PUT_LINE ('Finished processing a group of messages');
            COMMIT;
            dequeue_options.navigation := DBMS_AQ.NEXT_TRANSACTION;
        END;
      END LOOP;
      EXCEPTION
        WHEN no_messages THEN
          DBMS_OUTPUT.PUT_LINE ('No more messages');
   END;
```

Enqueuing and Dequeuing Object Type Messages That Contain LOB Attributes Using PL/SQL

```
/* Create the message payload object type with one or more LOB attributes. On
   enqueue, set the LOB attribute to EMPTY_BLOB. After the enqueue completes,
   before you commit your transaction. Select the LOB attribute from the
   user_data column of the queue table or queue table view. You can now
   use the LOB interfaces (which are available through both OCI and PL/SQL) to
   write the LOB data to the queue.  On dequeue, the message payload
   will contain the LOB locator. You can use this LOB locator after
   the dequeue, but before you commit your transaction, to read the LOB data.
 */
/* Setup the accounts: */

connect system/manager
```

```
CREATE USER aqadm IDENTIFIED BY aqadm;
GRANT CONNECT, RESOURCE TO aqadm;
GRANT aq_administrator_role TO aqadm;

CREATE USER aq IDENTIFIED BY aq;
GRANT CONNECT, RESOURCE TO aq;
GRANT EXECUTE ON DBMS_AQ TO aq;
CREATE TYPE aq.message AS OBJECT(id      NUMBER,
                                 subject VARCHAR2(100),
                                 data    BLOB,
                                 trailer NUMBER);
CREATE TABLESPACE aq_tbs DATAFILE 'aq.dbs' SIZE 2M REUSE;


/* create the queue table, queues and start the queue: */

CONNECT aqadm/aqadm
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE(
   queue_table        => 'aq.qt1',
   queue_payload_type => 'aq.message');
EXECUTE DBMS_AQADM.CREATE_QUEUE(
   queue_name  => 'aq.queue1',
   queue_table =>  'aq.qt1');
EXECUTE DBMS_AQADM.START_QUEUE(queue_name => 'aq.queue1');

/* End set up: */

/* Enqueue of Large data types: */

CONNECT aq/aq
CREATE OR REPLACE PROCEDURE blobenqueue(msgno IN NUMBER) AS
enq_userdata aq.message;
enq_msgid    RAW(16);
enqopt       DBMS_AQ.enqueue_options_t;
msgprop      DBMS_AQ.message_properties_t;
lob_loc      BLOB;
buffer       RAW(4096);

BEGIN

   buffer := HEXTORAW(RPAD('FF', 4096, 'FF'));
   enq_userdata := aq.message(msgno, 'Large Lob data', EMPTY_BLOB(), msgno);
   DBMS_AQ.ENQUEUE('aq.queue1', enqopt, msgprop, enq_userdata, enq_msgid);

   --select the lob locator for the queue table
```

```
   SELECT t.user_data.data INTO lob_loc
      FROM qt1 t
      WHERE t.msgid = enq_msgid;

   DBMS_LOB.WRITE(lob_loc, 2000, 1, buffer );
   COMMIT;
END;

/* Dequeue lob data: */

CREATE OR REPLACE PROCEDURE blobdequeue AS
   dequeue_options    DBMS_AQ.dequeue_options_t;
   message_properties DBMS_AQ.message_properties_t;
   mid                RAW(16);
   pload              aq.message;
   lob_loc            BLOB;
   amount             BINARY_INTEGER;
   buffer             RAW(4096);

BEGIN
   DBMS_AQ.DEQUEUE('aq.queue1', dequeue_options, message_properties,
                   pload, mid);
   lob_loc := pload.data;

   -- read the lob data info buffer
   amount := 2000;
   DBMS_LOB.READ(lob_loc, amount, 1, buffer);
   DBMS_OUTPUT.PUT_LINE('Amount of data read: '||amount);
   COMMIT;
END;

/* Do the enqueues and dequeues: */
 SET SERVEROUTPUT ON

BEGIN
   FOR i IN 1..5 LOOP
      blobenqueue(i);
   END LOOP;
END;

BEGIN
   FOR i IN 1..5 LOOP
     blobdequeue();
   END LOOP;
END;
```

Enqueuing and Dequeuing Object Type Messages That Contain LOB Attributes Using Java

1. Create the message type (ADT with CLOB and blob)

```
connect aquser/aquser

create type LobMessage as object(id        NUMBER,
                              subject   varchar2(100),
                              data      blob,
                              cdata     clob,
                              trailer   number);
```

2. Create the queue table and queue

```
connect aquser/aquser
execute dbms_aqadm.create_queue_table(
          queue_table => 'qt_adt',
          queue_payload_type => 'LOBMESSAGE',
          comment => 'single-consumer, default sort ordering, ADT Message',
          compatible => '8.1.0'
        );

execute dbms_aqadm.create_queue(
          queue_name  => 'q1_adt',
          queue_table => 'qt_adt'
        );

execute dbms_aqadm.start_queue(queue_name => 'q1_adt');
```

3. Run jpublisher to generate the java class that maps to the LobMessage

```
   Oracle object type

   jpub -user=aquser/aquser -sql=LobMessage -case=mixed -methods=false
-usertypes=oracle -compatible=CustomDatum
```

4. Enqueuing and Dequeuing Messages

```
  public static void runTest(AQSession aq_sess)
  {
```

```
Connection              db_conn   = null;
AQEnqueueOption         eq_option = null;
AQDequeueOption         dq_option = null;
AQQueue                 queue1    = null;
AQMessage               adt_msg   = null;
AQMessage               adt_msg2  = null;
AQObjectPayload         sPayload  = null;
AQObjectPayload         sPayload2 = null;
LobMessage              sPayl     = null;
LobMessage              sPayl2    = null;
AQObjectPayload         rPayload  = null;
LobMessage              rPayl     = null;
byte[]                  smsgid;
AQMessage               rMessage  = null;
int                     i         = 0;
int                     j         = 0;
int                     id        = 0;
boolean                 more      = false;
byte[]                  b_array;
char[]                  c_array;
String                  mStr      = null;
BLOB                    b1        = null;
CLOB                    c1        = null;
BLOB                    b2        = null;
CLOB                    c2        = null;
BLOB                    b3        = null;
CLOB                    c3        = null;
int                     b_len     = 0;
int                     c_len     = 0;
OracleCallableStatement blob_stmt0= null;
OracleCallableStatement clob_stmt0= null;
OracleResultSet         rset0     = null;
OracleResultSet         rset1     = null;
OracleCallableStatement blob_stmt = null;
OracleResultSet         rset2     = null;
OracleCallableStatement clob_stmt = null;
OracleResultSet         rset3     = null;

try
{

 db_conn = ((AQOracleSession)aq_sess).getDBConnection();

 queue1  = aq_sess.getQueue("aquser", "q1_adt");
```

```
b_array = new byte[5000];
c_array = new char[5000];
for (i = 0; i < 5000; i++)
{
   b_array[i] = 67;
   c_array[i] = 'c';
}
sPayl = new LobMessage();


System.out.println("Enqueue Long messages");

eq_option = new AQEnqueueOption();

/* Enqueue messages with LOB attributes */
for ( i = 0; i < 10; i++)
{
  adt_msg = queue1.createMessage();

  sPayload = adt_msg.getObjectPayload();

  /*  Get Empty BLOB handle */
  blob_stmt0 = (OracleCallableStatement)db_conn.prepareCall(
                "select empty_blob() from dual");
  rset0 = (OracleResultSet) blob_stmt0.executeQuery ();
  try
  {
    if (rset0.next())
    {
      b1 = (oracle.sql.BLOB)rset0.getBlob(1);
    }
    if (b1 == null)
    {
      System.out.println("select empty_blob() from dual failed");
    }
  }
  catch (Exception ex)
  {
    System.out.println("Exception during select from dual " + ex);
    ex.printStackTrace();
  }

/*  Get Empty CLOB handle */
  clob_stmt0 = (OracleCallableStatement)db_conn.prepareCall(
```

```
              "select empty_clob() from dual");
rset1 = (OracleResultSet) clob_stmt0.executeQuery ();
try
{
  if (rset1.next())
  {
    c1 = (oracle.sql.CLOB)rset1.getClob(1);
  }
  if (c1 == null)
  {
    System.out.println("select empty_clob() from dual failed");
  }
}
catch (Exception ex)
{
  System.out.println("Exception2 during select from dual " + ex);
  ex.printStackTrace();
}
id = i+1;
mStr = "Message #" + id;
sPayl.setId(new BigDecimal(id));
sPayl.setTrailer(new BigDecimal(id));
sPayl.setSubject(mStr);
sPayl.setData(b1);
sPayl.setCdata(c1);

/* Set Object Payload data */
sPayload.setPayloadData(sPayl);

/* Enqueue the message */
queue1.enqueue(eq_option, adt_msg);
System.out.println("Enqueued Message: " + id );
smsgid = adt_msg.getMessageId();

/*
 * Note: The message is initially enqueued with an EMPTY BLOB and CLOB
 * After enqueuing the message, we need to get the lob locators and
 * then populate the LOBs
 */
blob_stmt = (OracleCallableStatement)db_conn.prepareCall(
      "SELECT user_data FROM qt_adt where msgid = ?");
blob_stmt.setBytes(1,smsgid);
rset2 = (OracleResultSet) blob_stmt.executeQuery ();
try
{
```

```
  if (rset2.next())
  {
    /* Get message contents */
    sPayl2 = (LobMessage)rset2.getCustomDatum(1,
                    ((CustomDatumFactory)LobMessage.getFactory()));

    /* Get BLOB locator */
    b2 = sPayl2.getData();

    /* Popuate the BLOB */
    if (b2 == null)
    {
       System.out.println("Blob select null");
    }
    if ((i % 3) == 0)
    {
      b_len = b2.putBytes(1000,b_array);
    }
    else
    {
      b_len = b2.putBytes(1,b_array);
    }

    /* Get CLOB locator */
    c2 = sPayl2.getCdata();

    /* Populate the CLOB */
    if (c2 == null)
    {
       System.out.println("Clob select null");
    }
    if ((i % 4) == 0)
    {
      c_len = c2.putChars(2500,c_array);
    }
    else
    {
      c_len = c2.putChars(1,c_array);
    }
  }
}
catch (Exception ex)
{
  System.out.println("Blob or Clob exception: " + ex);
}
```

```
     }

     Thread.sleep(30000);


    // dequeue messages
    dq_option = new AQDequeueOption();
    dq_option.setWaitTime(AQDequeueOption.WAIT_NONE);


    for (i = 0 ; i < 10 ; i++)
    {
      /* Dequeue the message */
       adt_msg2 = ((AQOracleQueue)queue1).dequeue(dq_option,
                                           LobMessage.getFactory());

       /* Get payload containing LOB data */
       rPayload = adt_msg2.getObjectPayload();
       rPayl = (LobMessage) rPayload.getPayloadData();

       System.out.println("\n  Message: #" + (i+1));
       System.out.println("    Id: " + rPayl.getId());
       System.out.println("    Subject: " + rPayl.getSubject());

       /* Get BLOB data */
       b3 = rPayl.getData();
       System.out.println("    " + b3.length() + " bytes of data");

       /* Get CLOB data */
       c3 = rPayl.getCdata();
       System.out.println("    " + c3.length() + " chars of data");
       System.out.println("    Trailer: " + rPayl.getTrailer());
       db_conn.commit();
    }


   }
   catch (java.sql.SQLException sql_ex)
   {
     System.out.println("SQL Exception: " + sql_ex);
     sql_ex.printStackTrace();
   }
   catch (Exception ex)
   {
```

```
        System.out.println("Exception-2: " + ex);
        ex.printStackTrace();
      }

    }
```

Propagation

Caution: You may need to create queues or queue tables, or start or enable queues, for certain examples to work:

Enqueue of Messages for remote subscribers/recipients to a Multiconsumer Queue and Propagation Scheduling Using PL/SQL

```
/* Create subscriber list: */
DECLARE
   subscriber aq$_agent;

   /* Add subscribers RED and GREEN with different addresses  to the suscriber
    list: */
BEGIN
   BEGIN
      /* Add subscriber RED that will dequeue messages from another_msg_queue
      queue in the same datatbase */
      subscriber := aq$_agent('RED', 'another_msg_queue', NULL);
      DBMS_AQADM.ADD_SUBSCRIBER(queue_name => 'msg_queue_multiple',
      subscriber => subscriber);

      /* Schedule propagation from msg_queue_multiple to other queues in the
      same
      database: */
      DBMS_AQADM.SCHEDULE_PROPAGATION(queue_name => 'msg_queue_multiple');

      /* Add subscriber GREEN that will dequeue messages from the msg_queue
      queue
      in another database reached by the database link another_db.world */
      subscriber := aq$_agent('GREEN', 'msg_queue@another_db.world', NULL);
      DBMS_AQADM.ADD_SUBSCRIBER(queue_name => 'msg_queue_multiple',
      subscriber => subscriber);

      /* Schedule propagation from msg_queue_multiple to other queues in the
      database "another_database": */
```

```
   END;
   BEGIN
      DBMS_AQADM.SCHEDULE_PROPAGATION(queue_name => 'msg_queue_multiple',
      destination  => 'another_db.world');
   END;
END;

DECLARE
   enqueue_options     DBMS_AQ.enqueue_options_t;
   message_properties  DBMS_AQ.message_properties_t;
   recipients          DBMS_AQ.aq$_recipient_list_t;
   message_handle      RAW(16);
   message             aq.message_typ;

/* Enqueue MESSAGE 1 for subscribers to the queue
i.e. for RED at address another_msg_queue and GREEN at address msg_
queue@another_db.world: */
BEGIN
   message := message_typ('MESSAGE 1',
   'This message is queued for queue subscribers.');

   DBMS_AQ.ENQUEUE(queue_name => 'msg_queue_multiple',
           enqueue_options    => enqueue_options,
           message_properties => message_properties,
           payload            => message,
           msgid              => message_handle);

   /* Enqueue MESSAGE 2 for specified recipients i.e. for RED at address
   another_msg_queue and BLUE.*/
   message := message_typ('MESSAGE 2',
   'This message is queued for two recipients.');
   recipients(1) := aq$_agent('RED', 'another_msg_queue', NULL);
   recipients(2) := aq$_agent('BLUE', NULL, NULL);
   message_properties.recipient_list := recipients;

   DBMS_AQ.ENQUEUE(queue_name => 'msg_queue_multiple',
           enqueue_options    => enqueue_options,
           message_properties => message_properties,
           payload            => message,
           msgid              => message_handle);

   COMMIT;
END;
```

Note: RED at address another_msg_queue is both a subscriber to the queue, as well as being a specified recipient of MESSAGE 2. By contrast, GREEN at address msg_queue@another_db.world is only a subscriber to those messages in the queue (in this case, MESSAGE 1) for which no recipients have been specified. BLUE, while not a subscriber to the queue, is nevertheless specified to receive MESSAGE 2.

Managing Propagation From One Queue To Other Queues In The Same Database Using PL/SQL

```
/* Schedule propagation from queue q1def to other queues in the same database */
EXECUTE DBMS_AQADM.SCHEDULE_PROPAGATION(queue_name => 'q1def');

/* Disable propagation from queue q1def to other queues in the same
database */
EXECUTE DBMS_AQADM.DISABLE_PROPAGATION_SCHEDULE(
   queue_name => 'q1def');

/* Alter schedule from queue q1def to other queues in the same database */
EXECUTE DBMS_AQADM.ALTER_PROPAGATION_SCHEDULE(
   queue_name => 'q1def',
   duration   => '2000',
   next_time  => 'SYSDATE + 3600/86400',
   latency    => '32');

/* Enable propagation from queue q1def to other queues in the same database */
EXECUTE DBMS_AQADM.ENABLE_PROPAGATION_SCHEDULE(
   queue_name => 'q1def');

/* Unschedule propagation from queue q1def to other queues in the same database
*/
EXECUTE DBMS_AQADM.UNSCHEDULE_PROPAGATION(
   queue_name => 'q1def');
```

Manage Propagation From One Queue To Other Queues In Another Database Using PL/SQL

```
/* Schedule propagation from queue q1def to other queues in another  database
reached by the database link another_db.world  */
EXECUTE DBMS_AQADM.SCHEDULE_PROPAGATION(
```

```
   queue_name   => 'q1def',
   destination  => 'another_db.world');

/* Disable propagation from queue q1def to other queues in another database
reached by the database link another_db.world */
EXECUTE DBMS_AQADM.DISABLE_PROPAGATION_SCHEDULE(
   queue_name  => 'q1def',
   destination => 'another_db.world');

/* Alter schedule from queue q1def to other queues in another database  reached
by the database link another_db.world  */
EXECUTE DBMS_AQADM.ALTER_PROPAGATION_SCHEDULE(
   queue_name  => 'q1def',
   destination => 'another_db.world',
   duration    => '2000',
   next_time   => 'SYSDATE +  3600/86400',
   latency     => '32');

/* Enable propagation from queue q1def to other queues in another  database
reached by the database link another_db.world */
EXECUTE DBMS_AQADM.ENABLE_PROPAGATION_SCHEDULE(
   queue_name  => 'q1def',
   destination => 'another_db.world');

/* Unschedule propagation from queue q1def to other queues in another  database
reached by the database link another_db.world */
EXECUTE DBMS_AQADM.UNSCHEDULE_PROPAGATION(
   queue_name  => 'q1def',
   destination => 'another_db.world');
```

Unscheduling Propagation Using PL/SQL

```
/* Unschedule propagation from msg_queue_multiple to the destination another_
db.world */
EXECUTE DBMS_AQADM.UNSCHEDULE_PROPAGATION(
   queue_name => 'msg_queue_multiple',
   destination => 'another_db.world');
```

For additional examples of Alter Propagation, Enable Propagation and Disable Propagation, see:

- "Example: Alter a Propagation Schedule Using PL/SQL (DBMS_AQADM)" on page 9-76
- "Example: Enable a Propagation Using PL/SQL (DBMS_AQADM)" on page 9-79
- "Example: Disable a Propagation Using PL/SQL (DBMS_AQADM)" on page 82

Dropping AQ Objects

Caution: You may need to create queues or queue tables, or start, stop, or enable queues, for certain examples to work:

```
/* Cleans up all objects related to the object type: */
CONNECT aq/aq

EXECUTE DBMS_AQADM.STOP_QUEUE (
   queue_name => 'msg_queue');

EXECUTE DBMS_AQADM.DROP_QUEUE (
   queue_name => 'msg_queue');

EXECUTE DBMS_AQADM.DROP_QUEUE_TABLE (
   queue_table => 'aq.objmsgs80_qtab');

/* Cleans up all objects related to the RAW type: */
EXECUTE DBMS_AQADM.STOP_QUEUE (
   queue_name      => 'raw_msg_queue');

EXECUTE DBMS_AQADM.DROP_QUEUE (
   queue_name      => 'raw_msg_queue');

EXECUTE DBMS_AQADM.DROP_QUEUE_TABLE (
   queue_table => 'aq.RawMsgs_qtab');

/* Cleans up all objects related to the priority queue: */
EXECUTE DBMS_AQADM.STOP_QUEUE (
   queue_name     => 'priority_msg_queue');
```

```
EXECUTE DBMS_AQADM.DROP_QUEUE (
   queue_name     => 'priority_msg_queue');

EXECUTE DBMS_AQADM.DROP_QUEUE_TABLE (
   queue_table   => 'aq.priority_msg');

/* Cleans up all objects related to the multiple-consumer queue: */
EXECUTE DBMS_AQADM.STOP_QUEUE (
   queue_name  => 'msg_queue_multiple');

EXECUTE DBMS_AQADM.DROP_QUEUE (
   queue_name  => 'msg_queue_multiple');

EXECUTE DBMS_AQADM.DROP_QUEUE_TABLE (
   queue_table => 'aq.MultiConsumerMsgs_qtab');

DROP TYPE aq.message_typ;
```

Revoking Roles and Privileges

```
CONNECT sys/change_on_install
DROP USER aq;
```

Deploying AQ with XA

Note: You may need to set up the following data structures for certain examples to work:

```
CONNECT system/manager;
DROP USER aqadm CASCADE;
GRANT CONNECT, RESOURCE TO aqadm;
CREATE USER aqadm IDENTIFIED BY aqadm;
GRANT EXECUTE ON DBMS_AQADM TO aqadm;
GRANT Aq_administrator_role TO aqadm;
DROP USER aq CASCADE;
CREATE USER aq IDENTIFIED BY aq;
GRANT CONNECT, RESOURCE TO aq;
GRANT EXECUTE ON dbms_aq TO aq;
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE(
   queue_table => 'aq.qtable',
   queue_payload_type => 'RAW');

EXECUTE DBMS_AQADM.CREATE_QUEUE(
   queue_name => 'aq.aqsqueue',
   queue_table => 'aq.qtable');

EXECUTE DBMS_AQADM.START_QUEUE(queue_name =>
'aq.aqsqueue');
```

```
/*
 * The program uses the XA interface to enqueue 100 messages and then
 * dequeue them.
 * Login: aq/aq
 * Requires: AQ_USER_ROLE to be granted to aq
 *        a RAW queue called "aqsqueue" to be created in aqs schema
 *        (above steps can be performed by running aqaq.sql)
 * Message Format: Msgno: [0-1000] HELLO, WORLD!
 * Author: schandra@us.oracle.com
 */

#ifndef OCI_ORACLE
#include <oci.h>
#endif

#include <xa.h>
```

```
/* XA open string */
char xaoinfo[] =  "oracle_xa+ACC=P/AQ/AQ+SESTM=30+Objects=T";

/* template for generating XA XIDs */
XID  xidtempl = { 0x1e0a0a1e, 12, 8, "GTRID001BQual001" };

/* Pointer to Oracle XA function table */
extern struct xa_switch_t xaosw;                        /* Oracle XA switch */
static struct xa_switch_t *xafunc = &xaosw;

/* dummy stubs for ax_reg and ax_unreg */
int ax_reg(rmid, xid, flags)
int  rmid;
XID *xid;
long flags;
{
  xid->formatID = -1;
  return 0;
}

int ax_unreg(rmid, flags)
int     rmid;
long    flags;
{
  return 0;
}

/* generate an XID */
void xidgen(xid, serialno)
XID *xid;
int  serialno;
{
  char seq [11];

  sprintf(seq, "%d", serialno);
  memcpy((void *)xid, (void *)&xidtempl, sizeof(XID));
  strncpy((&xid->data[5]), seq, 3);
}

/* check if XA operation succeeded */
#define checkXAerr(action, funcname)    \
    if ((action) != XA_OK)        \
    {                  \
      printf("%s failed!\n", funcname);   \
      exit(-1);            \
```

```
    } else

/* check if OCI operation succeeded */
static void checkOCIerr(errhp, status)
LNOCIError *errhp;
sword      status;
{
  text errbuf[512];
  ub4 buflen;
  sb4 errcode;

  if (status == OCI_SUCCESS) return;

  if (status == OCI_ERROR)
  {
    OCIErrorGet((dvoid *) errhp, 1, (text *)0, &errcode, errbuf,
      (ub4)sizeof(errbuf), OCI_HTYPE_ERROR);
    printf("Error - %s\n", errbuf);
  }
  else
    printf("Error - %d\n", status);
  exit (-1);
}


void main(argc, argv)
int    argc;
char **argv;
{
  int         msgno = 0;             /* message being enqueued */
  OCIEnv       *envhp;               /* OCI environment handle */
  OCIError     *errhp;               /* OCI Error handle */
  OCISvcCtx    *svchp;                  /* OCI Service handle */
  char      message[128];              /* message buffer */
  ub4      mesglen;            /* length of message */
  OCIRaw       *rawmesg = (OCIRaw *)0;       /* message in OCI RAW format */
  OCIInd      ind = 0;                 /* OCI null indicator */
  dvoid          *indptr = (dvoid *)&ind;       /* null indicator pointer */
  OCIType      *mesg_tdo = (OCIType *) 0;         /* TDO for RAW datatype */
  XID      xid;                /* XA's global transaction id */
  ub4      i;                      /* array index */

  checkXAerr(xafunc->xa_open_entry(xaoinfo, 1, TMNOFLAGS), "xaoopen");

  svchp = xaoSvcCtx((text *)0);           /* get service handle from XA */
```

```
envhp = xaoEnv((text *)0);          /* get enviornment handle from XA */

if (!svchp || !envhp)
{
  printf("Unable to obtain OCI Handles from XA!\n");
  exit (-1);
}

OCIHandleAlloc((dvoid *)envhp, (dvoid **)&errhp,
     OCI_HTYPE_ERROR, 0, (dvoid **)0);  /* allocate error handle */

/* enqueue 1000 messages, 1 message per XA transaction */
for (msgno = 0; msgno < 1000; msgno++)
{
  sprintf((const char *)message, "Msgno: %d, Hello, World!", msgno);
  mesglen = (ub4)strlen((const char *)message);
  xidgen(&xid, msgno);                 /* generate an XA xid */

  checkXAerr(xafunc->xa_start_entry(&xid, 1, TMNOFLAGS), "xaostart");

  checkOCIerr(errhp, OCIRawAssignBytes(envhp, errhp, (ub1 *)message, mesglen,
             &rawmesg));

  if (!mesg_tdo)          /* get Type descriptor (TDO) for RAW type */
    checkOCIerr(errhp, OCITypeByName(envhp, errhp, svchp,
                    (CONST text *)"AQADM", strlen("AQADM"),
                     (CONST text *)"RAW", strlen("RAW"),
                 (text *)0, 0, OCI_DURATION_SESSION,
                 OCI_TYPEGET_ALL, &mesg_tdo));

  checkOCIerr(errhp, OCIAQEnq(svchp, errhp, (CONST text *)"aqsqueue",
            0, 0, mesg_tdo, (dvoid **)&rawmesg, &indptr,
        0, 0));

  checkXAerr(xafunc->xa_end_entry(&xid, 1, TMSUCCESS), "xaoend");
  checkXAerr(xafunc->xa_commit_entry(&xid, 1, TMONEPHASE), "xaocommit");
  printf("%s Enqueued\n", message);
}

/* dequeue 1000 messages within one XA transaction */
xidgen(&xid, msgno);                         /* generate an XA xid */
checkXAerr(xafunc->xa_start_entry(&xid, 1, TMNOFLAGS), "xaostart");
for (msgno = 0; msgno < 1000; msgno++)
{
  checkOCIerr(errhp, OCIAQDeq(svchp, errhp, (CONST text *)"aqsqueue",
```

```
             0, 0, mesg_tdo, (dvoid **)&rawmesg, &indptr,
            0, 0));
    if (ind)
      printf("Null Raw Message");
    else
      for (i = 0; i < OCIRawSize(envhp, rawmesg); i++)
   printf("%c", *(OCIRawPtr(envhp, rawmesg) + i));
    printf("\n");

  }
  checkXAerr(xafunc->xa_end_entry(&xid, 1, TMSUCCESS), "xaoend");
  checkXAerr(xafunc->xa_commit_entry(&xid, 1, TMONEPHASE), "xaocommit");
}
```

AQ and Memory Usage

Create_types.sql: Create Payload Types and Queues in Scott's Schema

Note: You may need to set up data structures for certain examples to work, such as:

```
/* Create_types.sql */
CONNECT system/manager
GRANT AQ_ADMINISTRATOR_ROLE, AQ_USER_ROLE TO scott;
CONNECT scott/tiger
CREATE TYPE MESSAGE AS OBJECT (id NUMBER, data VARCHAR2(80));
EXECUTE DBMS_AQADM.CREATE_QUEUE_TABLE(
   queue_table        => 'qt',
   queue_payload_type => 'message');
EXECUTE DBMS_AQADM.CREATE_QUEUE('msgqueue', 'qt');
EXECUTE DBMS_AQADM.START_QUEUE('msgqueue');
```

Enqueuing Messages (Free Memory After Every Call) Using OCI

This program, `enqnoreuse.c`, dequeues each line of text from a queue '`msgqueue`' that has been created in scott's schema using *create_types.sql*. Messages are enqueued using `enqnoreuse.c` or `enqreuse.c` (see below). If there are no messages, it waits for 60 seconds before timing out. In this program, the dequeue subroutine does not reuse client side objects' memory. It allocates the required memory before dequeue and frees it after the dequeue is complete.

```
#ifndef OCI_ORACLE
```

```
#include <oci.h>
#endif

#include <stdio.h>

static void checkerr(OCIError *errhp, sword status);
static void deqmesg(text *buf, ub4 *buflen);

LNOCIEnv       *envhp;
LNOCIError     *errhp;
LNOCISvcCtx    *svchp;

struct message
{
  OCINumber    id;
  OCIString   *data;
};
typedef struct message message;

struct null_message
{
  OCIInd    null_adt;
  OCIInd    null_id;
  OCIInd    null_data;
};
typedef struct null_message null_message;

static void deqmesg(buf, buflen)
text  *buf;
ub4   *buflen;
{
  OCIType         *mesgtdo = (OCIType *)0;   /* type descr of SCOTT.MESSAGE */
  message         *mesg    = (dvoid *)0;     /* instance of SCOTT.MESSAGE */
  null_message    *mesgind = (dvoid *)0;     /* null indicator */
  OCIAQDeqOptions *deqopt  = (OCIAQDeqOptions *)0;
  ub4              wait    = 60;             /* timeout after 60 seconds */
  ub4              navigation = OCI_DEQ_FIRST_MSG;/* always get head of q */


  /* Get the type descriptor object for the type SCOTT.MESSAGE: */
  checkerr(errhp, OCITypeByName(envhp, errhp, svchp,
           (CONST text *)"SCOTT", strlen("SCOTT"),
           (CONST text *)"MESSAGE", strlen("MESSAGE"),
           (text *)0, 0, OCI_DURATION_SESSION,
           OCI_TYPEGET_ALL, &mesgtdo));
```

```
  /* Allocate an instance of SCOTT.MESSAGE, and get its null indicator: */
  checkerr(errhp, OCIObjectNew(envhp, errhp, svchp, OCI_TYPECODE_OBJECT,
           mesgtdo, (dvoid *)0, OCI_DURATION_SESSION,
           TRUE, (dvoid **)&mesg));
  checkerr(errhp, OCIObjectGetInd(envhp, errhp, (dvoid *)mesg,
           (dvoid **)&mesgind));

  /* Allocate a descriptor for dequeue options and set wait time, navigation: */
  checkerr(errhp, OCIDescriptorAlloc(envhp, (dvoid **)&deqopt,
           OCI_DTYPE_AQDEQ_OPTIONS, 0, (dvoid **)0));
  checkerr(errhp, OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS,
           (dvoid *)&wait, 0, OCI_ATTR_WAIT, errhp));
  checkerr(errhp, OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS,
           (dvoid *)&navigation, 0,
           OCI_ATTR_NAVIGATION, errhp));

  /* Dequeue the message and commit: */
  checkerr(errhp, OCIAQDeq(svchp, errhp, (CONST text *)"msgqueue",
           deqopt, 0, mesgtdo, (dvoid **)&mesg,
           (dvoid **)&mesgind, 0, 0));

  checkerr(errhp, OCITransCommit(svchp, errhp, (ub4) 0));

  /* Copy the message payload text into the user buffer: */
  if (mesgind->null_data)
    *buflen = 0;
  else
    memcpy((dvoid *)buf, (dvoid *)OCIStringPtr(envhp, mesg->data),
           (size_t)(*buflen = OCIStringSize(envhp, mesg->data)));

  /* Free the dequeue options descriptor: */
  checkerr(errhp, OCIDescriptorFree((dvoid *)deqopt, OCI_DTYPE_AQDEQ_OPTIONS));

  /* Free the memory for the objects: */
  Checkerr(errhp, OCIObjectFree(envhp, errhp, (dvoid *)mesg,
           OCI_OBJECTFREE_FORCE));
}                            /* end deqmesg */

void main()
{
  OCIServer     *srvhp;
  OCISession    *usrhp;
  dvoid         *tmp;
  text           buf[80];                /* payload text */
```

```
  ub4            buflen;

  OCIInitialize((ub4) OCI_OBJECT, (dvoid *)0,  (dvoid * (*)()) 0,
                (dvoid * (*)()) 0,  (void (*)()) 0 );

  OCIHandleAlloc((dvoid *) NULL, (dvoid **) &envhp, (ub4) OCI_HTYPE_ENV,
                 52, (dvoid **) &tmp);

  OCIEnvInit( &envhp, (ub4) OCI_DEFAULT, 21, (dvoid **) &tmp  );

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
                 52, (dvoid **) &tmp);
  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
                 52, (dvoid **) &tmp);

  OCIServerAttach(srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
                 52, (dvoid **) &tmp);

  /* Set attribute server context in the service context: */
  OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
             (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);

  /* Allocate a user context handle: */
  OCIHandleAlloc((dvoid *)envhp, (dvoid **)&usrhp, (ub4) OCI_HTYPE_SESSION,
                 (size_t) 0, (dvoid **) 0);

  OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
             (dvoid *)"scott", (ub4)strlen("scott"), OCI_ATTR_USERNAME, errhp);

  OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
             (dvoid *)"tiger", (ub4)strlen("tiger"), OCI_ATTR_PASSWORD, errhp);

  checkerr(errhp, OCISessionBegin (svchp, errhp, usrhp, OCI_CRED_RDBMS,
           OCI_DEFAULT));

  OCIAttrSet((dvoid *)svchp, (ub4)OCI_HTYPE_SVCCTX,
             (dvoid *)usrhp, (ub4)0, OCI_ATTR_SESSION, errhp);

  do {
    deqmesg(buf, &buflen);
    printf("%.*s\n", buflen, buf);
  } while(1);
}                         /* end main */
```

```
static void checkerr(errhp, status)
LNOCIError  *errhp;
sword      status;
{
  text errbuf[512];
  ub4  buflen;
  sb4 errcode;

  if (status == OCI_SUCCESS) return;

  switch (status)
  {
  case OCI_ERROR:
    OCIErrorGet ((dvoid *) errhp, (ub4) 1, (text *) NULL, &errcode,
                 errbuf, (ub4) sizeof(errbuf), (ub4) OCI_HTYPE_ERROR);
    printf("Error - %s\n", errbuf);
    break;
  case OCI_INVALID_HANDLE:
    printf("Error - OCI_INVALID_HANDLE\n");
    break;
  default:
    printf("Error - %d\n", status);
    break;
  }
  exit(-1);
}                          /* end checkerr */
```

Enqueuing Messages (Reuse Memory) Using OCI

This program, `enqreuse.c`, enqueues each line of text into a queue 'msgqueue' that has been created in scott's schema by executing `create_types.sql`. Each line of text entered by the user is stored in the queue until user enters `EOF`. In this program the enqueue subroutine reuses the memory for the message payload, as well as the AQ message properties descriptor.

```
#ifndef OCI_ORACLE
#include <oci.h>
#endif

#include <stdio.h>

static void checkerr(OCIError *errhp, sword status);
static void enqmesg(ub4 msgno, text *buf);
```

```
struct message
{
  OCINumber     id;
  OCIString    *data;
};
typedef struct message message;

struct null_message
{
  OCIInd    null_adt;
  OCIInd    null_id;
  OCIInd    null_data;
};
typedef struct null_message null_message;

/* Global data reused on calls to enqueue: */
LNOCIEnv            *envhp;
LNOCIError          *errhp;
LNOCISvcCtx         *svchp;
message            msg;
null_message       nmsg;
LNOCIAQMsgProperties *msgprop;

static void enqmesg(msgno, buf)
ub4     msgno;
text   *buf;
{
  OCIType          *mesgtdo = (OCIType *)0; /* type descr of SCOTT.MESSAGE */
  message          *mesg = &msg;            /* instance of SCOTT.MESSAGE */
  null_message     *mesgind = &nmsg;        /* null indicator */
  text              corrid[128];            /* correlation identifier */

  /* Get the type descriptor object for the type SCOTT.MESSAGE: */
  checkerr(errhp, OCITypeByName(envhp, errhp, svchp,
           (CONST text *)"SCOTT", strlen("SCOTT"),
           (CONST text *)"MESSAGE", strlen("MESSAGE"),
           (text *)0, 0, OCI_DURATION_SESSION,
           OCI_TYPEGET_ALL, &mesgtdo));

  /* Fill in the attributes of SCOTT.MESSAGE: */
  checkerr(errhp, OCINumberFromInt(errhp, &msgno, sizeof(ub4), 0, &mesg->id));
  checkerr(errhp, OCIStringAssignText(envhp, errhp, buf, strlen(buf),
           &mesg->data));
  mesgind->null_adt = mesgind->null_id = mesgind->null_data = 0;
```

```
  /* Set the correlation id in the message properties descriptor: */
  sprintf((char *)corrid, "Msg#: %d", msgno);
  checkerr(errhp, OCIAttrSet(msgprop, OCI_DTYPE_AQMSG_PROPERTIES,
           (dvoid *)&corrid, strlen(corrid),
           OCI_ATTR_CORRELATION, errhp));

  /* Enqueue the message and commit: */
  checkerr(errhp, OCIAQEnq(svchp, errhp, (CONST text *)"msgqueue",
           0, msgprop, mesgtdo, (dvoid **)&mesg,
           (dvoid **)&mesgind, 0, 0));

  checkerr(errhp, OCITransCommit(svchp, errhp, (ub4) 0));
}                           /* end enqmesg */

void main()
{
  OCIServer    *srvhp;
  OCISession   *usrhp;
  dvoid        *tmp;
  text          buf[80];                /* user supplied text */
  int           msgno = 0;

  OCIInitialize((ub4) OCI_OBJECT, (dvoid *)0,  (dvoid * (*)()) 0,
              (dvoid * (*)()) 0,  (void (*)()) 0 );

  OCIHandleAlloc((dvoid *) NULL, (dvoid **) &envhp, (ub4) OCI_HTYPE_ENV,
               52, (dvoid **) &tmp);

  OCIEnvInit( &envhp, (ub4) OCI_DEFAULT, 21, (dvoid **) &tmp  );

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
               52, (dvoid **) &tmp);
  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
               52, (dvoid **) &tmp);

  OCIServerAttach(srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
               52, (dvoid **) &tmp);

  /* Set attribute server context in the service context: */
  OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
           (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);

  /* Allocate a user context handle: */
```

```
  OCIHandleAlloc((dvoid *)envhp, (dvoid **)&usrhp, (ub4) OCI_HTYPE_SESSION,
                (size_t) 0, (dvoid **) 0);

  OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
             (dvoid *)"scott", (ub4)strlen("scott"), OCI_ATTR_USERNAME, errhp);

  OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
             (dvoid *)"tiger", (ub4)strlen("tiger"), OCI_ATTR_PASSWORD, errhp);

  checkerr(errhp, OCISessionBegin (svchp, errhp, usrhp, OCI_CRED_RDBMS,
           OCI_DEFAULT));

  OCIAttrSet((dvoid *)svchp, (ub4)OCI_HTYPE_SVCCTX,
             (dvoid *)usrhp, (ub4)0, OCI_ATTR_SESSION, errhp);

  /* Allocate a message properties descriptor to fill in correlation id :*/
  checkerr(errhp, OCIDescriptorAlloc(envhp, (dvoid **)&msgprop,
           OCI_DTYPE_AQMSG_PROPERTIES,
           0, (dvoid **)0));
  do {
    printf("Enter a line of text (max 80 chars):");
    if (!gets((char *)buf))
      break;
    enqmesg((ub4)msgno++, buf);
  } while(1);

  /* Free the message properties descriptor: */
  checkerr(errhp, OCIDescriptorFree((dvoid *)msgprop,
           OCI_DTYPE_AQMSG_PROPERTIES));

}                            /* end main */

static void checkerr(errhp, status)
LNOCIError   *errhp;
sword       status;
{
  text errbuf[512];
  ub4  buflen;
  sb4  errcode;

  if (status == OCI_SUCCESS) return;

  switch (status)
  {
  case OCI_ERROR:
```

```
    OCIErrorGet ((dvoid *) errhp, (ub4) 1, (text *) NULL, &errcode,
                 errbuf, (ub4) sizeof(errbuf), (ub4) OCI_HTYPE_ERROR);
    printf("Error - %s\n", errbuf);
    break;
  case OCI_INVALID_HANDLE:
    printf("Error - OCI_INVALID_HANDLE\n");
    break;
  default:
    printf("Error - %d\n", status);
    break;
  }
  exit(-1);
}                          /* end checkerr */
```

Dequeuing Messages (Free Memory After Every Call) Using OCI

This program, deqnoreuse.c, dequeues each line of text from a queue 'msgqueue' that has been created in scott's schema by executing create_types.sql. Messages are enqueued using enqnoreuse or enqreuse. If there are no messages, it waits for 60 seconds before timing out. In this program the dequeue subroutine does not reuse client side objects' memory. It allocates the required memory before dequeue and frees it after the dequeue is complete.

```
#ifndef OCI_ORACLE
#include <oci.h>
#endif

#include <stdio.h>

static void checkerr(OCIError *errhp, sword status);
static void deqmesg(text *buf, ub4 *buflen);

LNOCIEnv       *envhp;
LNOCIError     *errhp;
LNOCISvcCtx    *svchp;

struct message
{
  OCINumber     id;
  OCIString    *data;
};
typedef struct message message;

struct null_message
{
```

```
  OCIInd    null_adt;
  OCIInd    null_id;
  OCIInd    null_data;
};
typedef struct null_message null_message;

static void deqmesg(buf, buflen)
text      *buf;
ub4       *buflen;
{
  OCIType          *mesgtdo = (OCIType *)0;  /* type descr of SCOTT.MESSAGE */
  message          *mesg = (dvoid *)0;       /* instance of SCOTT.MESSAGE */
  null_message     *mesgind   = (dvoid *)0;       /* null indicator */
  OCIAQDeqOptions  *deqopt    = (OCIAQDeqOptions *)0;
  ub4               wait      = 60;               /* timeout after 60 seconds */
  ub4              navigation = OCI_DEQ_FIRST_MSG;/* always get head of q */

   /* Get the type descriptor object for the type SCOTT.MESSAGE: */
  checkerr(errhp, OCITypeByName(envhp, errhp, svchp,
           (CONST text *)"SCOTT", strlen("SCOTT"),
           (CONST text *)"MESSAGE", strlen("MESSAGE"),
           (text *)0, 0, OCI_DURATION_SESSION,
           OCI_TYPEGET_ALL, &mesgtdo));

  /* Allocate an instance of SCOTT.MESSAGE, and get its null indicator: */
  checkerr(errhp, OCIObjectNew(envhp, errhp, svchp, OCI_TYPECODE_OBJECT,
           mesgtdo, (dvoid *)0, OCI_DURATION_SESSION,
           TRUE, (dvoid **)&mesg));
  checkerr(errhp, OCIObjectGetInd(envhp, errhp, (dvoid *)mesg,
           (dvoid **)&mesgind));

  /* Allocate a descriptor for dequeue options and set wait time, navigation: */
  checkerr(errhp, OCIDescriptorAlloc(envhp, (dvoid **)&deqopt,
           OCI_DTYPE_AQDEQ_OPTIONS, 0, (dvoid **)0));
  checkerr(errhp, OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS,
           (dvoid *)&wait, 0, OCI_ATTR_WAIT, errhp));
  checkerr(errhp, OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS,
           (dvoid *)&navigation, 0,
           OCI_ATTR_NAVIGATION, errhp));

  /* Dequeue the message and commit: */
  checkerr(errhp, OCIAQDeq(svchp, errhp, (CONST text *)"msgqueue",
           deqopt, 0, mesgtdo, (dvoid **)&mesg,
           (dvoid **)&mesgind, 0, 0));
```

```
  checkerr(errhp, OCITransCommit(svchp, errhp, (ub4) 0));

  /* Copy the message payload text into the user buffer: */
  if (mesgind->null_data)
    *buflen = 0;
  else
    memcpy((dvoid *)buf, (dvoid *)OCIStringPtr(envhp, mesg->data),
           (size_t)(*buflen = OCIStringSize(envhp, mesg->data)));

  /* Free the dequeue options descriptor: */
  checkerr(errhp, OCIDescriptorFree((dvoid *)deqopt, OCI_DTYPE_AQDEQ_OPTIONS));

  /* Free the memory for the objects: */
  checkerr(errhp, OCIObjectFree(envhp, errhp, (dvoid *)mesg,
           OCI_OBJECTFREE_FORCE));
}                                       /* end deqmesg */

void main()
{
  OCIServer    *srvhp;
  OCISession   *usrhp;
  dvoid        *tmp;
  text          buf[80];                /* payload text */
  ub4           buflen;

  OCIInitialize((ub4) OCI_OBJECT, (dvoid *)0,  (dvoid * (*)()) 0,
                (dvoid * (*)()) 0,  (void (*)()) 0 );

  OCIHandleAlloc((dvoid *) NULL, (dvoid **) &envhp, (ub4) OCI_HTYPE_ENV,
                 52, (dvoid **) &tmp);

  OCIEnvInit( &envhp, (ub4) OCI_DEFAULT, 21, (dvoid **) &tmp  );

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
                 52, (dvoid **) &tmp);
  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
                 52, (dvoid **) &tmp);

  OCIServerAttach(srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
                 52, (dvoid **) &tmp);

  /* Set attribute server context in the service context: */
  OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
```

```
          (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);

  /* Allocate a user context handle: */
  OCIHandleAlloc((dvoid *)envhp, (dvoid **)&usrhp, (ub4) OCI_HTYPE_SESSION,
               (size_t) 0, (dvoid **) 0);

  OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
          (dvoid *)"scott", (ub4)strlen("scott"), OCI_ATTR_USERNAME, errhp);

  OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
          (dvoid *)"tiger", (ub4)strlen("tiger"), OCI_ATTR_PASSWORD, errhp);

  checkerr(errhp, OCISessionBegin (svchp, errhp, usrhp, OCI_CRED_RDBMS,
         OCI_DEFAULT));

  OCIAttrSet((dvoid *)svchp, (ub4)OCI_HTYPE_SVCCTX,
          (dvoid *)usrhp, (ub4)0, OCI_ATTR_SESSION, errhp);

  do {
    deqmesg(buf, &buflen);
    printf("%.*s\n", buflen, buf);
  } while(1);
}                        /* end main */

static void checkerr(errhp, status)
LNOCIError   *errhp;
sword      status;
{
  text errbuf[512];
  ub4  buflen;
  sb4  errcode;

  if (status == OCI_SUCCESS) return;

  switch (status)
  {
  case OCI_ERROR:
    OCIErrorGet ((dvoid *) errhp, (ub4) 1, (text *) NULL, &errcode,
                errbuf, (ub4) sizeof(errbuf), (ub4) OCI_HTYPE_ERROR);
    printf("Error - %s\n", errbuf);
    break;
  case OCI_INVALID_HANDLE:
    printf("Error - OCI_INVALID_HANDLE\n");
    break;
  default:
```

```
    printf("Error - %d\n", status);
    break;
  }
  exit(-1);
}                          /* end checkerr */
```

Dequeuing Messages (Reuse Memory) Using OCI

This program, `deqreuse.c`, dequeues each line of text from a queue '`msgqueue`' that has been created in scott's schema by executing `create_types.sql`. Messages are enqueued using `enqnoreuse.c` or `enqreuse.c`. If there are no messages, it waits for 60 seconds before timing out. In this program, the dequeue subroutine reuses client side objects' memory between invocation of `LNOCIAQDeq`. During the first call to `LNOCIAQDeq`, OCI automatically allocates the memory for the message payload. During subsequent calls to `LNOCIAQDeq`, the same payload pointers are passed and OCI will automatically resize the payload memory if necessary.

```
#ifndef OCI_ORACLE
#include <oci.h>
#endif

#include <stdio.h>

static void checkerr(OCIError *errhp, sword status);
static void deqmesg(text *buf, ub4 *buflen);

struct message
{
  OCINumber    id;
  OCIString   *data;
};
typedef struct message message;

struct null_message
{
  OCIInd    null_adt;
  OCIInd    null_id;
  OCIInd    null_data;
};
typedef struct null_message null_message;

/* Global data reused on calls to enqueue: */
LNOCIEnv          *envhp;
```

```
LNOCIError        *errhp;
LNOCISvcCtx       *svchp;
LNOCIAQDeqOptions *deqopt;
message         *mesg = (message *)0;
null_message    *mesgind = (null_message *)0;

static void deqmesg(buf, buflen)
text       *buf;
ub4        *buflen;
{

  OCIType        *mesgtdo    = (OCIType *)0; /* type descr of SCOTT.MESSAGE */
  ub4             wait       = 60;           /* timeout after 60 seconds */
  ub4             navigation = OCI_DEQ_FIRST_MSG;/* always get head of q */

  /* Get the type descriptor object for the type SCOTT.MESSAGE: */
  checkerr(errhp, OCITypeByName(envhp, errhp, svchp,
           (CONST text *)"SCOTT", strlen("SCOTT"),
           (CONST text *)"MESSAGE", strlen("MESSAGE"),
           (text *)0, 0, OCI_DURATION_SESSION,
           OCI_TYPEGET_ALL, &mesgtdo));

  /* Set wait time, navigation in dequeue options: */
  checkerr(errhp, OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS,
           (dvoid *)&wait, 0, OCI_ATTR_WAIT, errhp));
  checkerr(errhp, OCIAttrSet(deqopt, OCI_DTYPE_AQDEQ_OPTIONS,
           (dvoid *)&navigation, 0,
           OCI_ATTR_NAVIGATION, errhp));

  /*
   * Dequeue the message and commit. The memory for the payload will be
   * automatically allocated/resized by OCI:
   */
  checkerr(errhp, OCIAQDeq(svchp, errhp, (CONST text *)"msgqueue",
           deqopt, 0, mesgtdo, (dvoid **)&mesg,
           (dvoid **)&mesgind, 0, 0));

  checkerr(errhp, OCITransCommit(svchp, errhp, (ub4) 0));

  /* Copy the message payload text into the user buffer: */
  if (mesgind->null_data)
    *buflen = 0;
  else
    memcpy((dvoid *)buf, (dvoid *)OCIStringPtr(envhp, mesg->data),
           (size_t)(*buflen = OCIStringSize(envhp, mesg->data)));
```

```
}                            /* end deqmesg */

void main()
{
  OCIServer    *srvhp;
  OCISession   *usrhp;
  dvoid        *tmp;
  text          buf[80];                /* payload text */
  ub4           buflen;

  OCIInitialize((ub4) OCI_OBJECT, (dvoid *)0,  (dvoid * (*)()) 0,
                (dvoid * (*)()) 0,  (void (*)()) 0 );

  OCIHandleAlloc((dvoid *) NULL, (dvoid **) &envhp, (ub4) OCI_HTYPE_ENV,
                 52, (dvoid **) &tmp);

  OCIEnvInit( &envhp, (ub4) OCI_DEFAULT, 21, (dvoid **) &tmp  );

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &errhp, (ub4) OCI_HTYPE_ERROR,
                 52, (dvoid **) &tmp);
  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &srvhp, (ub4) OCI_HTYPE_SERVER,
                 52, (dvoid **) &tmp);

  OCIServerAttach(srvhp, errhp, (text *) 0, (sb4) 0, (ub4) OCI_DEFAULT);

  OCIHandleAlloc((dvoid *) envhp, (dvoid **) &svchp, (ub4) OCI_HTYPE_SVCCTX,
                 52, (dvoid **) &tmp);

  /* set attribute server context in the service context */
  OCIAttrSet((dvoid *) svchp, (ub4) OCI_HTYPE_SVCCTX, (dvoid *)srvhp, (ub4) 0,
            (ub4) OCI_ATTR_SERVER, (OCIError *) errhp);

  /* allocate a user context handle */
  OCIHandleAlloc((dvoid *)envhp, (dvoid **)&usrhp, (ub4) OCI_HTYPE_SESSION,
                 (size_t) 0, (dvoid **) 0);

  OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
            (dvoid *)"scott", (ub4)strlen("scott"), OCI_ATTR_USERNAME, errhp);

  OCIAttrSet((dvoid *)usrhp, (ub4)OCI_HTYPE_SESSION,
            (dvoid *)"tiger", (ub4)strlen("tiger"), OCI_ATTR_PASSWORD, errhp);

  checkerr(errhp, OCISessionBegin (svchp, errhp, usrhp, OCI_CRED_RDBMS,
          OCI_DEFAULT));
```

```
  OCIAttrSet((dvoid *)svchp, (ub4)OCI_HTYPE_SVCCTX,
             (dvoid *)usrhp, (ub4)0, OCI_ATTR_SESSION, errhp);

  /* allocate the dequeue options descriptor */
  checkerr(errhp, OCIDescriptorAlloc(envhp, (dvoid **)&deqopt,
           OCI_DTYPE_AQDEQ_OPTIONS, 0, (dvoid **)0));

  do {
    deqmesg(buf, &buflen);
    printf("%.*s\n", buflen, buf);
  } while(1);

  /*
   * This program never reaches this point as the dequeue timesout & exits.
   * If it does reach here, it will be a good place to free the dequeue
   * options descriptor using OCIDescriptorFree and free the memory allocated
   * by OCI for the payload using OCIObjectFree
   */
}                         /* end main */

static void checkerr(errhp, status)
LNOCIError *errhp;
sword      status;
{
  text errbuf[512];
  ub4  buflen;
  sb4  errcode;

  if (status == OCI_SUCCESS) return;

  switch (status)
  {
  case OCI_ERROR:
    OCIErrorGet ((dvoid *) errhp, (ub4) 1, (text *) NULL, &errcode,
                 errbuf, (ub4) sizeof(errbuf), (ub4) OCI_HTYPE_ERROR);
    printf("Error - %s\n", errbuf);
    break;
  case OCI_INVALID_HANDLE:
    printf("Error - OCI_INVALID_HANDLE\n");
    break;
  default:
    printf("Error - %d\n", status);
    break;
  }
  exit(-1);
```

```
}                              /* end checkerr */
```

B

Oracle JMS Interfaces, Classes, and Exceptions

This chapter discusses the JMS interfaces, classes, and exceptions shown in Table B–1.

Table B–1 Interfaces, Classes, and Exceptions

Interface / Class / Exception
Oracle JMSClasses (part 1) on page B-5
Oracle JMS Classes (part 2) on page B-7
Oracle JMS Classes (part 3) on page B-8
Oracle JMS Classes (part 4) on page B-9
Oracle JMS Classes (part 5) on page B-10
Oracle JMS Classes (part 6) on page B-11
Oracle JMS Classes (part 7) on page B-14
Oracle JMS Classes (part 8) on page B-16
Oracle JMS Classes (part 9) on page B-18
Oracle JMS Classes (part 10) on page B-20
Interface - javax.jms.BytesMessage on page B-22
Interface - javax.jms.Connection on page B-24
Interface - javax.jms.ConnectionFactory on page B-24
Interface - javax.jms.ConnectionMetaData on page B-25
Interface - javax.jms.DeliveryMode on page B-25

Table B–1 (Cont.) Interfaces, Classes, and Exceptions

Interface / Class / Exception
Interface - javax.jms.Destination on page B-26
Interface - javax.jms.MapMessage on page B-26
Interface - javax.jms.Message on page B-27
Interface - javax.jms.MessageConsumer on page B-29
Interface - javax.jms.MessageListener on page B-30
Interface - javax.jms.MessageProducer on page B-30
Interface - javax.jms.ObjectMessage on page B-31
Interface - javax.jms.Queue on page B-31
Interface - javax.jms.QueueBrowser on page B-31
Interface - javax.jms.QueueConnection on page B-32
Interface - javax.jms.QueueConnectionFactory on page B-32
Interface - javax.jms.QueueReceiver on page B-33
Interface - javax.jms.QueueSender on page B-33
Interface - javax.jms.QueueSession on page B-34
Interface - javax.jms.Session on page B-34
Interface - javax.jms.StreamMessage on page B-36
Interface - javax.jms.TextMessage on page B-37
Interface - javax.jms.Topic on page B-37
Interface - javax.jms.TopicConnection on page B-37
Interface - javax.jms.TopicConnectionFactory on page B-38
Interface - javax.jms.TopicPublisher on page B-38
Interface - javax.jms.TopicSession on page B-39
Interface - javax.jms.TopicSubscriber on page B-39
Exception javax.jms.InvalidDestinationException on page B-40
Exception javax.jms.InvalidSelectorException on page B-40
Exception javax.jms.JMSException on page B-40
Exception javax.jms.MessageEOFException on page B-41

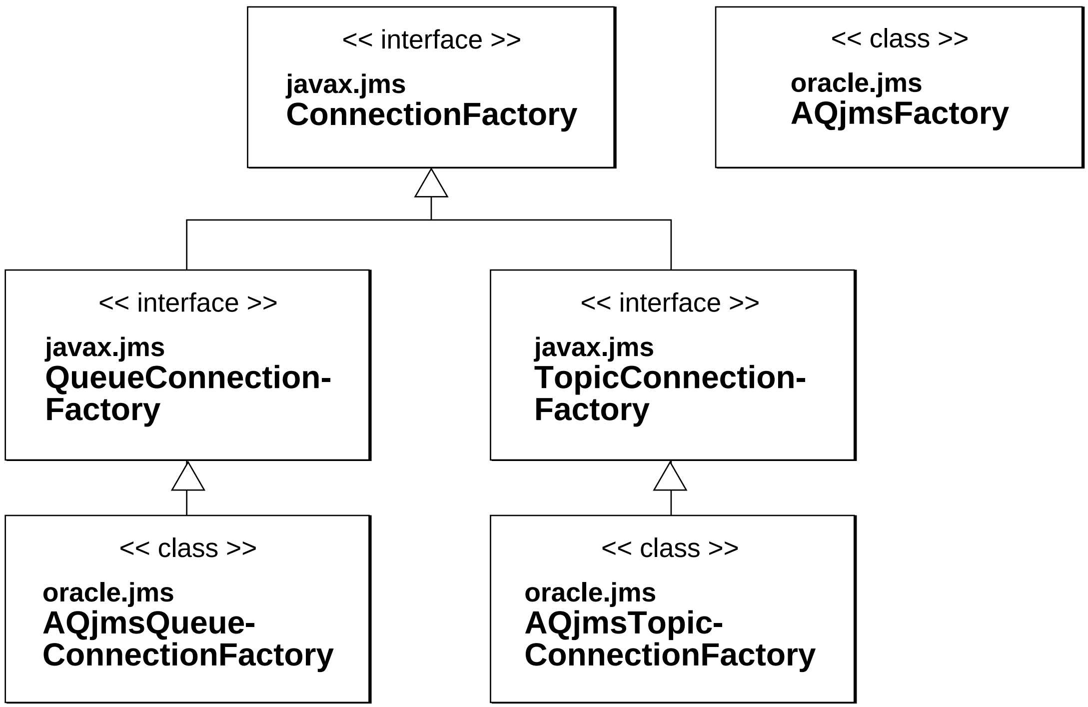
Table B–1 (Cont.) Interfaces, Classes, and Exceptions

Table B–1 (Cont.) Interfaces, Classes, and Exceptions

Interface / Class / Exception
Class - oracle.jms.AQjmsSession on page B-53
Class - oracle.jms.AQjmsStreamMessage on page B-55
Class - oracle.jms.AQjmsTextMessage on page B-55
Class - oracle.jms.AQjmsTopicConnectionFactory on page B-55
Exception oracle.jms.AQjmsInvalidDestinationException on page B-56
Exception oracle.jms.AQjmsInvalidSelectorException on page B-56
Exception oracle.jms.AQjmsMessageEOFException on page B-57
Exception oracle.jms.AQjmsMessageFormatException on page B-57
Exception oracle.jms.AQjmsMessageNotReadableException on page B-57
Exception oracle.jms.AQjmsMesssageNotWriteableException on page B-57
Interface - oracle.AQ.AQQueueTable on page B-57
Class - oracle.AQ.AQQueueTableProperty on page B-58
Interface - oracle.jms.TopicBrowser on page B-59
Class - oracle.jms.AQjmsTopicBrowser on page B-59

Oracle JMSClasses (part 1)

Figure B–1 Class Diagram: Oracle Class Classes (part 1)

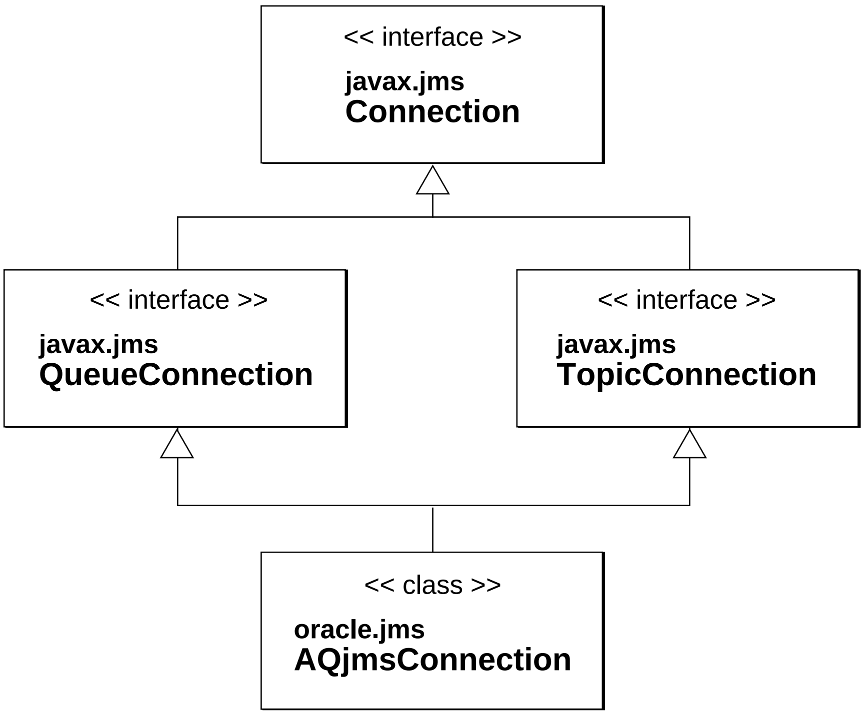


See Also:

- "Interface - javax.jms.ConnectionFactory" on page B-24
- "Class - oracle.jms.AQjmsFactory"
- "Interface - javax.jms.QueueConnectionFactory" on page B-32
- "Interface - javax.jms.TopicConnectionFactory" on page B-38
- "Class - oracle.jms.AQjmsQueueConnectionFactory" on page B-52
- "Class - oracle.jms.AQjmsTopicConnectionFactory" on page B-55

Oracle JMS Classes (part 2)

Figure B–2 Class Diagram: Oracle Class Classes (part 2)

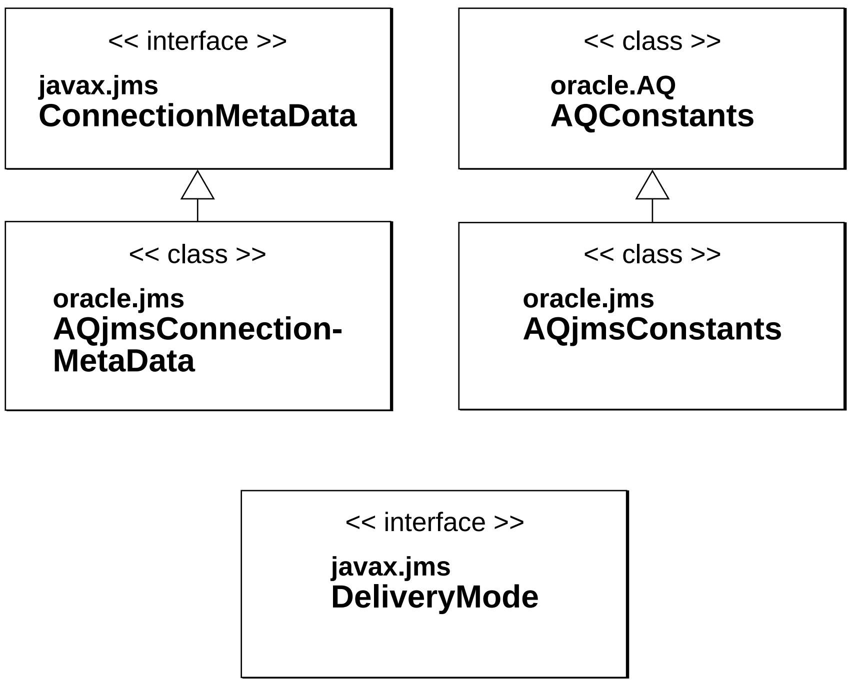


See Also:

- "Interface - javax.jms.Connection" on page B-24
- "Interface - javax.jms.QueueConnection" on page B-32
- "Interface - javax.jms.TopicConnection" on page B-37
- "Class - oracle.jms.AQjmsConnection" on page B-46

Oracle JMS Classes (part 3)

Figure B–3 Class Diagram: Oracle Class Classes (part 3)

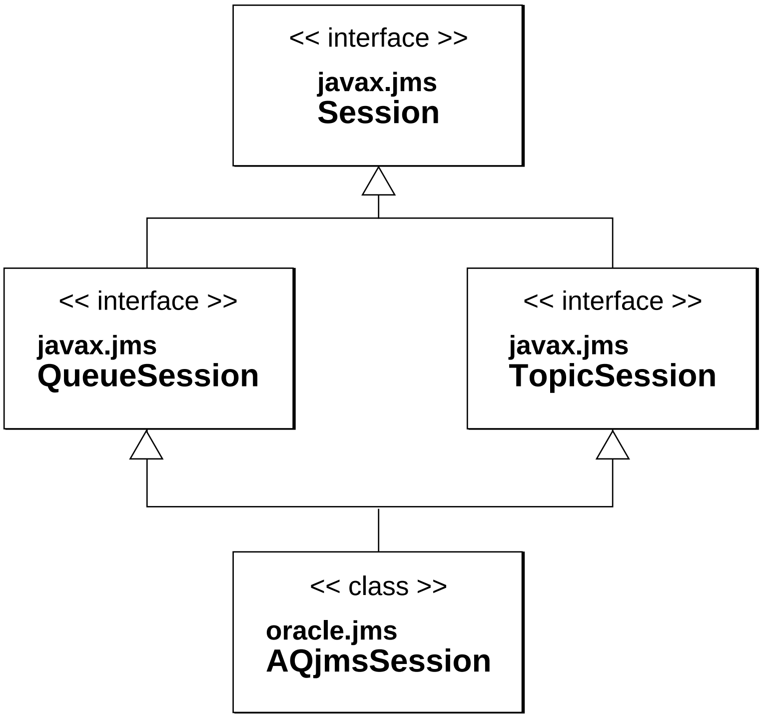


See Also:

- "Interface - javax.jms.ConnectionMetaData" on page B-25
- "Interface - oracle.jms.AQjmsConnectionMetadata" on page B-46
- "Class - oracle.jms.AQjmsConstants" on page B-46
- "Interface - javax.jms.DeliveryMode" on page B-25

Oracle JMS Classes (part 4)

Figure B–4 Class Diagram: Oracle Class Classes (part 4)

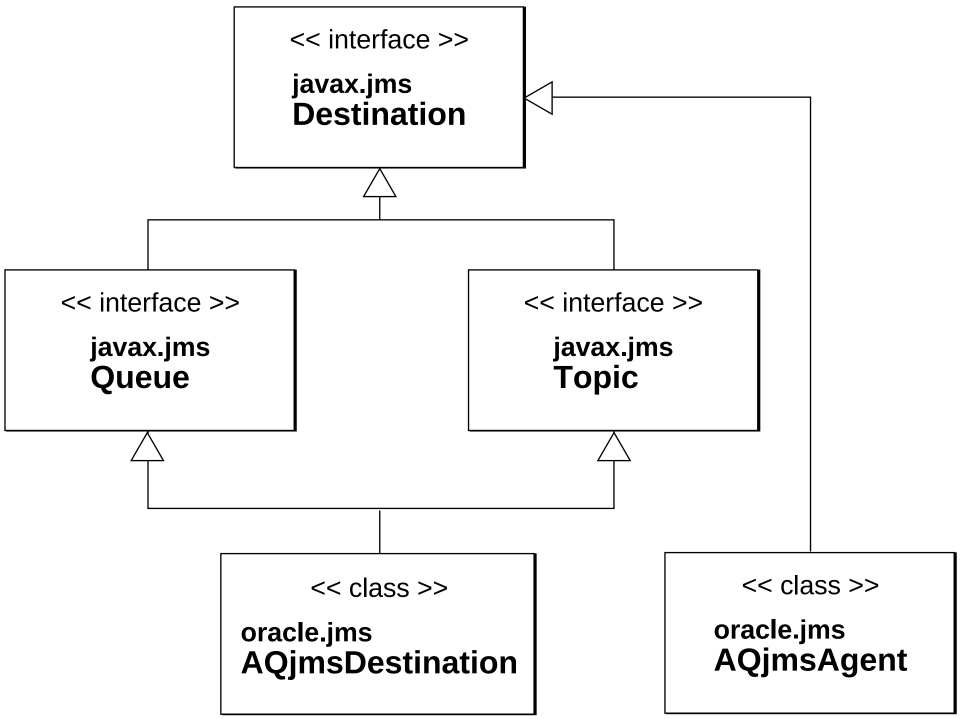


See Also:

- "Interface - javax.jms.Session" on page B-34
- "Interface - javax.jms.QueueSession" on page B-34
- "Interface - javax.jms.TopicSession" on page B-39
- "Class - oracle.jms.AQjmsSession" on page B-53

Oracle JMS Classes (part 5)

Figure B–5 Class Diagram: Oracle Class Classes (part 5)

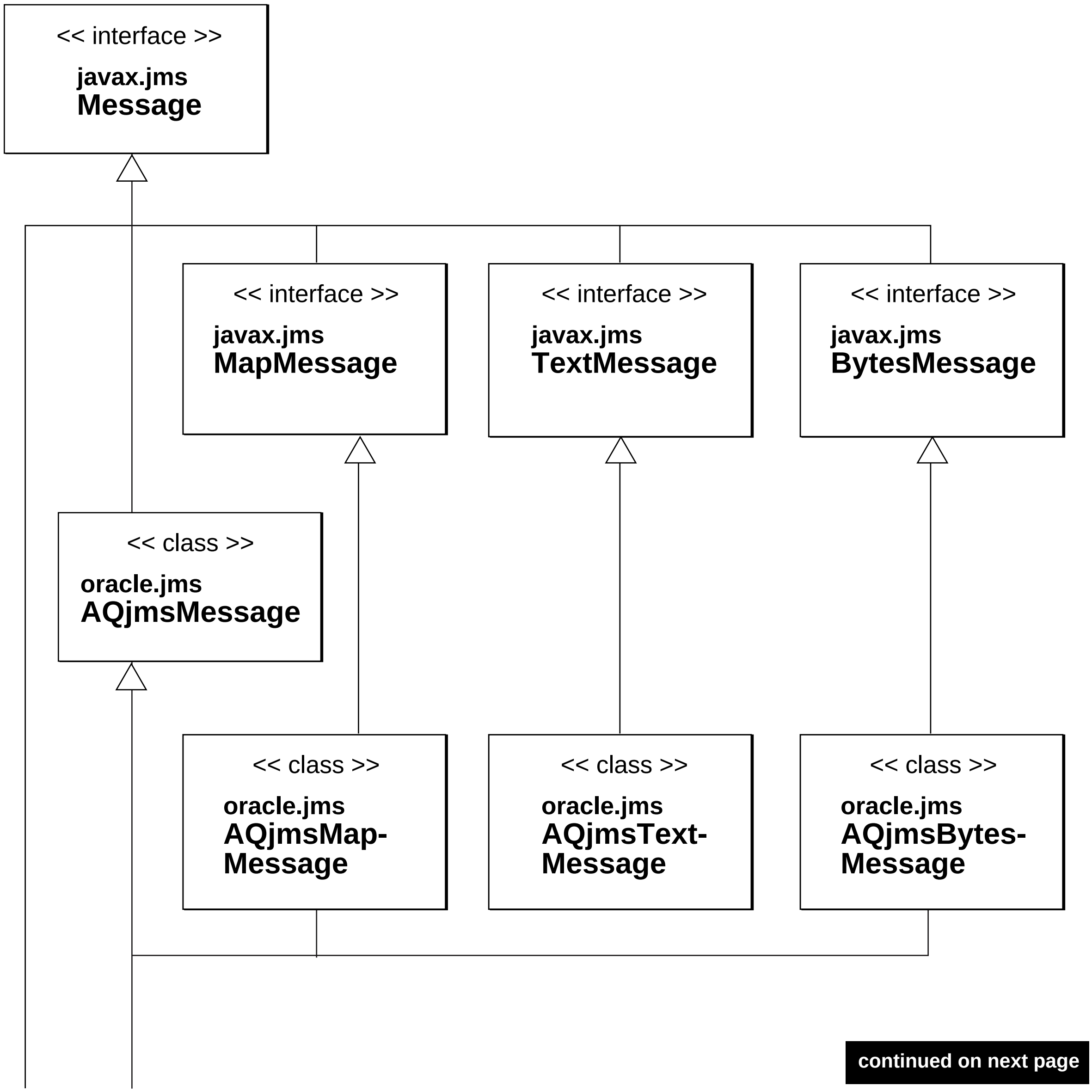


See Also:

- "Interface - javax.jms.Destination" on page B-26
- "Interface - javax.jms.Queue" on page B-31
- "Interface - javax.jms.Topic" on page B-37
- "Class - oracle.jms.AQjmsDestination" on page B-47
- "Class - oracle.jms.AQjmsAgent" on page B-45

Oracle JMS Classes (part 6)

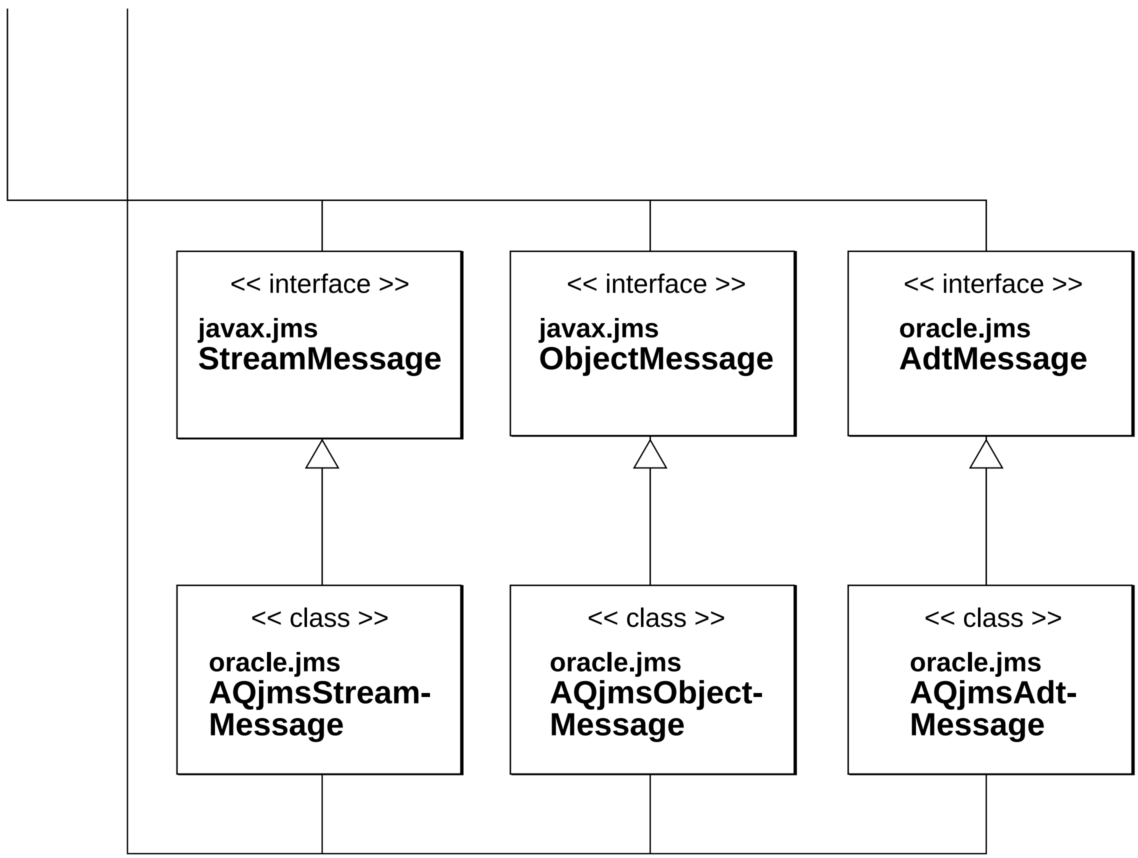
Figure B–6 Class Diagram: Oracle Class Classes (part 6)



continued on next page

Oracle JMS Classes (part 6 continued)

Figure B–7 Class Diagram: Oracle Class Classes (part 8)

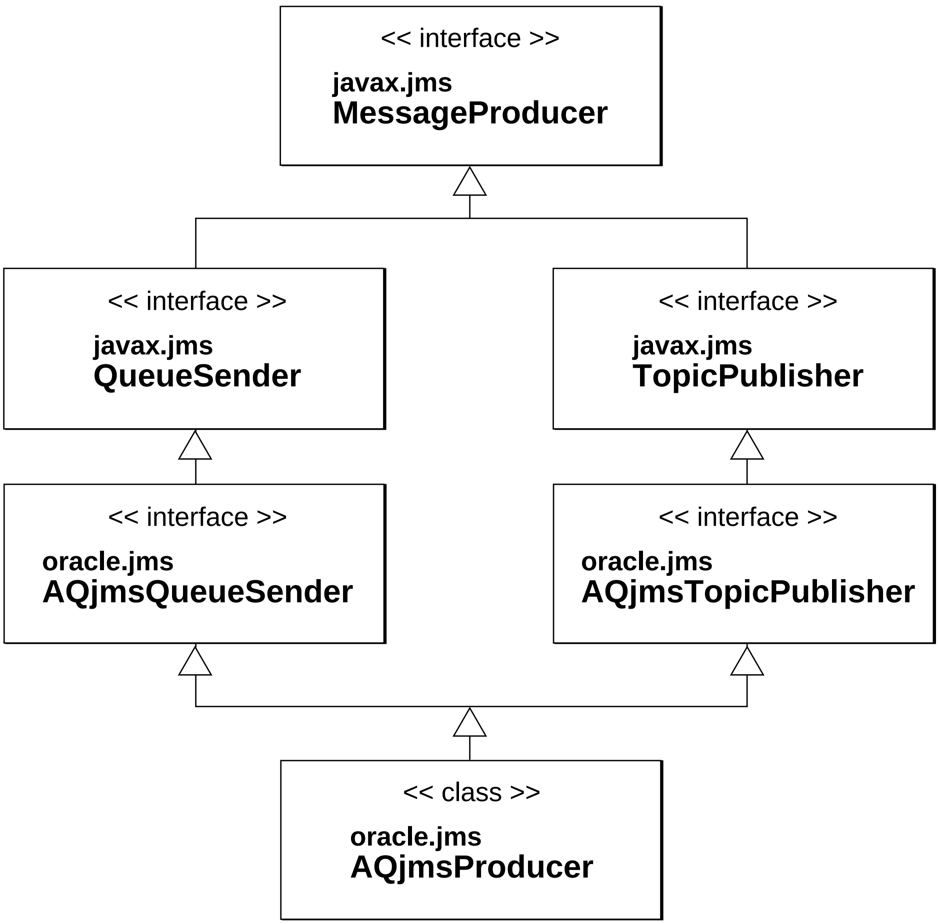


See Also:

- "Interface - javax.jms.Message" on page B-27
- "Interface - javax.jms.MapMessage" on page B-26
- "Interface - javax.jms.TextMessage" on page B-37
- "Interface - javax.jms.BytesMessage" on page B-22
- "Class - oracle.jms.AQjmsMessage" on page B-50
- "Class - oracle.jms.AQjmsMapMessage" on page B-50
- "Class - oracle.jms.AQjmsTextMessage" on page B-55
- "Class - oracle.jms.AQjmsBytesMessage" on page B-45
- "Interface - javax.jms.StreamMessage" on page B-36
- "Interface - javax.jms.ObjectMessage" on page B-31
- "Interface - oracle.jms.AdtMessage" on page B-42
- "Class - oracle.jms.AQjmsStreamMessage" on page B-55
- "Class - oracle.jms.AQjmsObjectMessage" on page B-51
- "Class - oracle.jms.AQjmsAdtMessage" on page B-44

Oracle JMS Classes (part 7)

Figure B–8 Class Diagram: Oracle Class Classes (part 7)

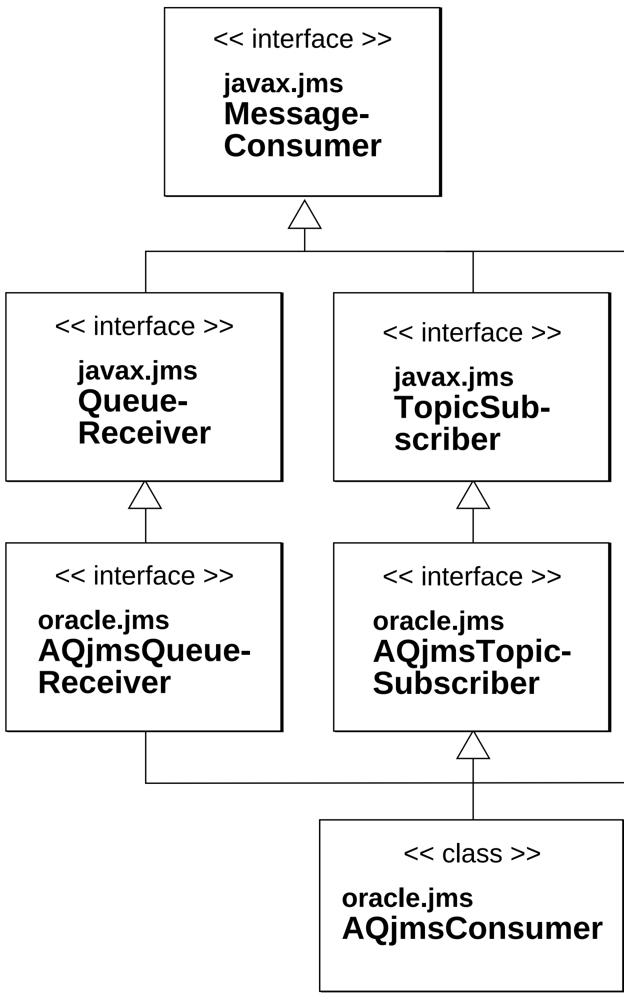


See Also:

- "Interface - javax.jms.MessageProducer" on page B-30
- "Interface - javax.jms.QueueSender" on page B-33
- "Interface - javax.jms.TopicPublisher" on page B-38
- "Interface - oracle.jms.AQjmsQueueSender" on page B-43
- "Interface - oracle.jms.AQjmsTopicPublisher" on page B-43
- "Class - oracle.jms.AQjmsProducer" on page B-52

Oracle JMS Classes (part 8)

Figure B–9 Class Diagram: Oracle Class Classes (part 8)

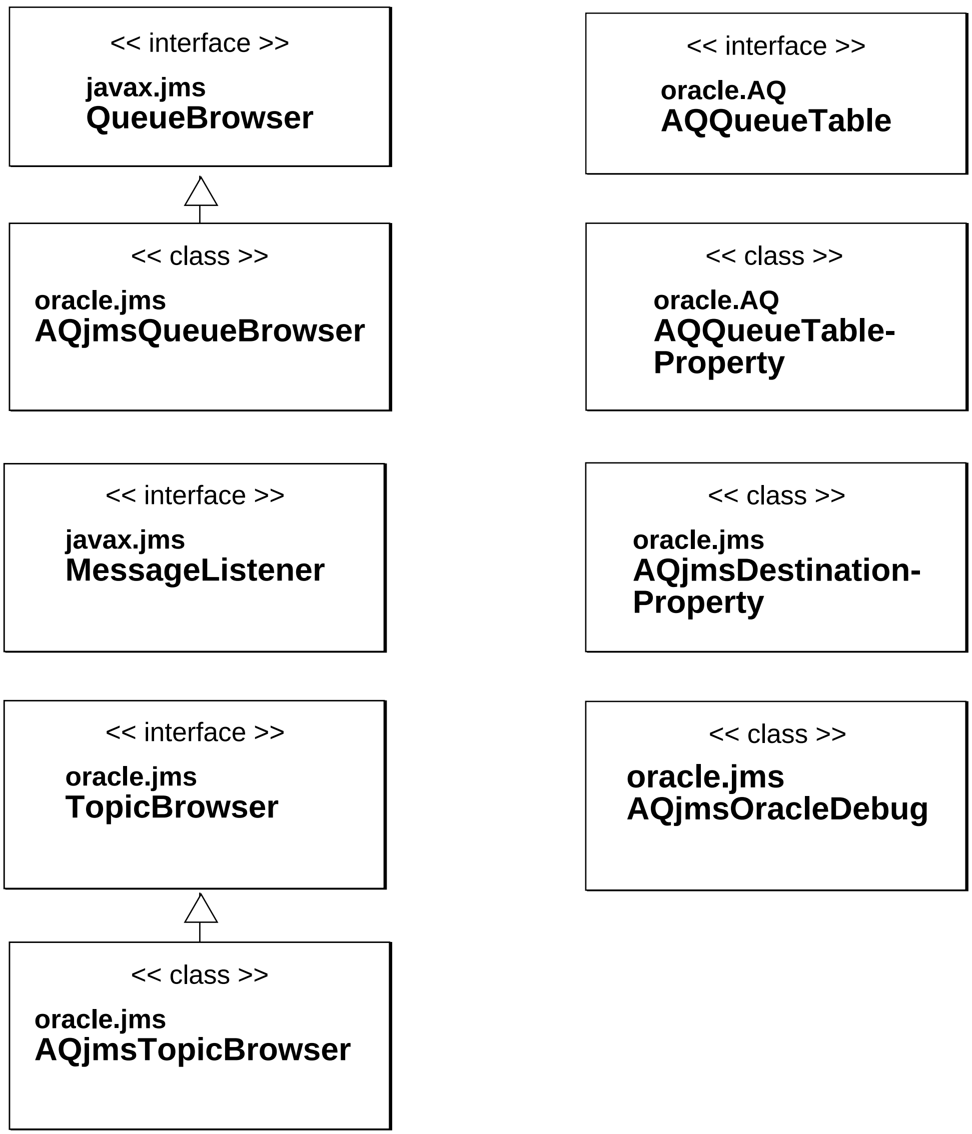


See Also:

- "Interface - javax.jms.MessageConsumer" on page B-29
- "Interface - javax.jms.QueueReceiver" on page B-33
- "Interface - javax.jms.TopicSubscriber" on page B-39
- "Interface - oracle.jms.TopicReceiver" on page B-43
- "Interface - oracle.jms.AQjmsQueueReceiver" on page B-42
- "Interface - oracle.jms.AQjmsTopicSubscriber" on page B-44
- "Interface - oracle.jms.AQjmsTopicReceiver" on page B-44
- "Interface - oracle.jms.AQjmsConsumer" on page B-47

Oracle JMS Classes (part 9)

Figure B–10 Class Diagram: Oracle Class Classes (part 9)

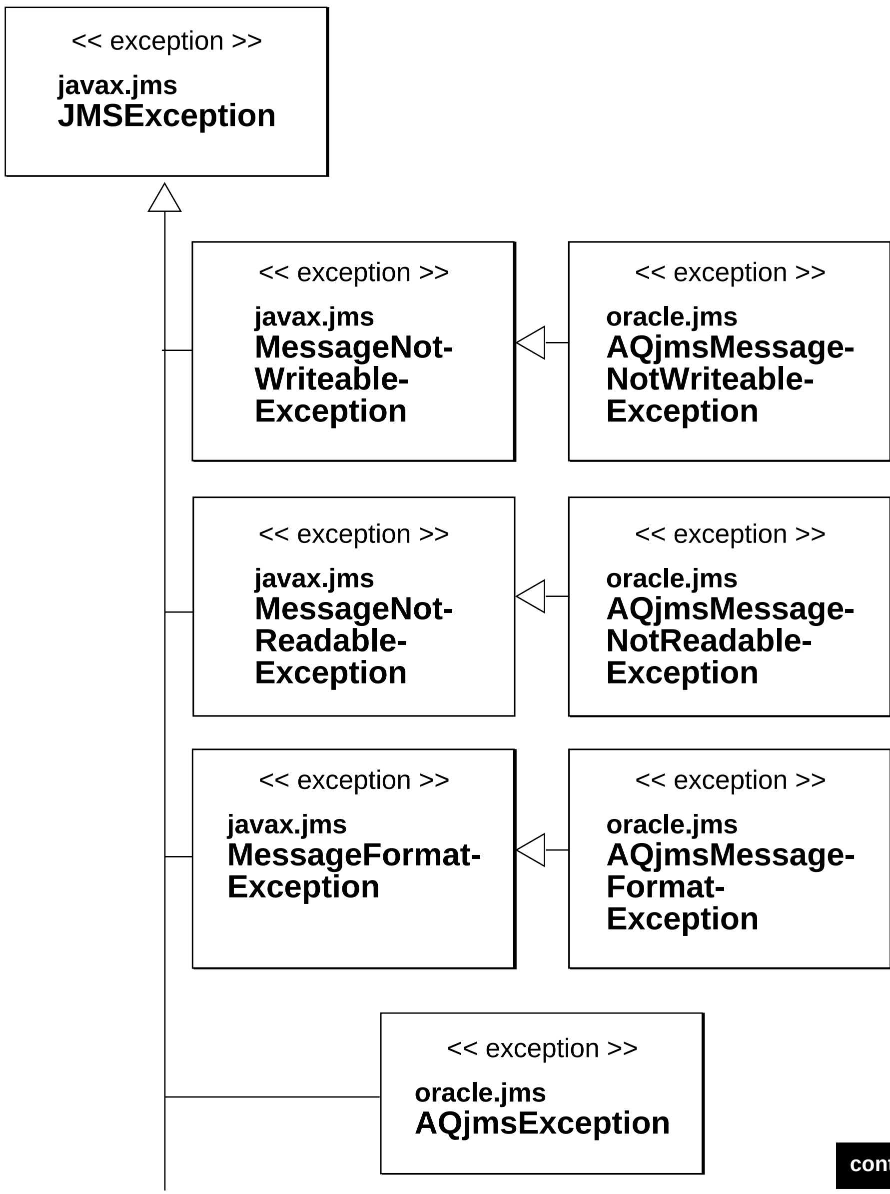


See Also:

- "Interface - javax.jms.QueueBrowser" on page B-31
- "Class - oracle.jms.AQjmsQueueBrowser" on page B-52
- "Interface - javax.jms.MessageListener" on page B-30
- "Interface - oracle.jms.TopicBrowser" on page B-59
- "Class - oracle.jms.AQjmsTopicBrowser" on page B-59
- "Interface - oracle.AQ.AQQueueTable" on page B-57
- "Class - oracle.AQ.AQQueueTableProperty" on page B-58
- "Class - oracle.jms.AQjmsDestinationProperty" on page B-48
- "Class - oracle.jms.AQjmsOracleDebug" on page B-51

Oracle JMS Classes (part 10)

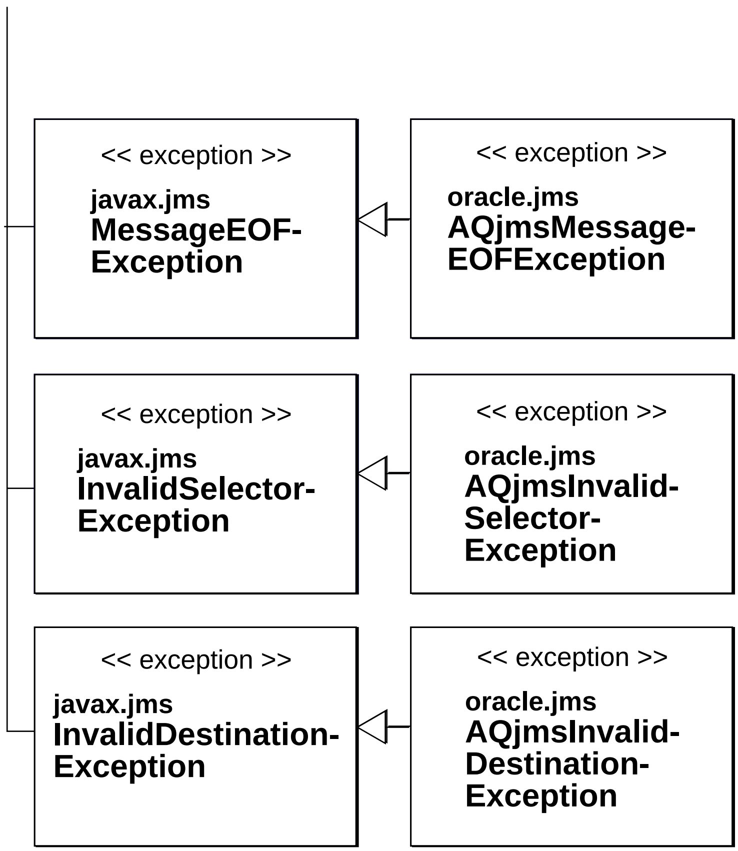
Figure B–11 Class Diagram: Oracle Class Classes (part 10)



continued on next page

Oracle JMS Classes (part 10 continued)

Figure B–12 Class Diagram: Oracle Class Classes (part 8)



See Also:

- "Exception javax.jms.JMSException" on page B-40
- "Exception javax.jms.MesageNotWriteableException" on page B-42
- "Exception oracle.jms.AQjmsMesssageNotWriteableException" on page B-57
- "Exception javax.jms.MessageNotReadableException" on page B-42
- "Exception oracle.jms.AQjmsMessageNotReadableException" on page B-57
- "Exception javax.jms.MessageFormatException" on page B-41
- "Exception oracle.jms.AQjmsMessageFormatException" on page B-57
- "Exception oracle.jms.AQjmsException" on page B-56
- "Exception javax.jms.MessageEOFException" on page B-41
- "Exception oracle.jms.AQjmsMessageEOFException" on page B-57
- "Exception javax.jms.InvalidSelectorException" on page B-40
- "Exception oracle.jms.AQjmsInvalidSelectorException" on page B-56
- "Exception javax.jms.InvalidDestinationException" on page B-40
- "Exception oracle.jms.AQjmsInvalidDestinationException" on page B-56

Interfaces, Classes, and Exceptions

Interface - javax.jms.BytesMessage

<< interface >>

javax.jms.BytesMessage

<< methods >>

readBoolean()

readByte()

readBytes(byte[])

readBytes(byte[], int)

readChar()

readDouble()

readFloat()

readInt()

readLong()

readShort()

readUnsignedByte()

readUnsignedShort()

readUTF()

reset()

writeBoolean(boolean)

writeByte(byte)

writeBytes(byte[])

writeBytes(byte[], int, int)

writeChar(char)

writeDouble(double)

writeFloat(float)

writeInt(int)

writeLong(long)

writeObject(Object)

writeShort(short)

writeUTF(String)

See Also: "Oracle JMS Classes (part 6)" on page B-11

Interface - javax.jms.Connection

<< interface >>

javax.jms.Connection

<< methods >>

close()

getClientID()

getMetaData()

start()

stop()

getExceptionListener()

setExceptionListener(ExceptionListener)

See Also:

- "Oracle JMS Classes (part 2)" on page B-7

Use Cases:

- Starting a JMS Connection
- Stopping a JMS Connection
- Closing a JMS Connection

Interface - javax.jms.ConnectionFactory

<< interface >>

javax.jms.ConnectionFactory

See Also:

- "Oracle JMSClasses (part 1)" on page B-5

Use Cases:

- Creating a Queue Connection with Username/Password
- Creating a Queue Connection with an Open JDBC Connection

Interface - javax.jms.ConnectionMetaData

<< interface >>

javax.jms.ConnectionMetaData

<< methods >>

getJMSMajorVersion()

getJMSMinorVersion()

getJMSProviderName()

getJMSVersion()

getProviderMajorVersion()

getProviderMinorVersion()

getProviderVersion()

See Also: "Oracle JMS Classes (part 3)" on page B-8

Interface - javax.jms.DeliveryMode

<< interface >>

javax.jms.DeliveryMode

<< constants >>

NON_PERSISTENT (not currently supported)

PERSISTENT

See Also: "Oracle JMS Classes (part 3)" on page B-8

Interface - javax.jms.Destination

<< interface >>

javax.jms.Destination

See Also: "Oracle JMS Classes (part 5)" on page B-10

Interface - javax.jms.MapMessage

<< interface >>

javax.jms.MapMessage

<< methods >>

getBoolean(String)

getByte(String)

getBytes(String)

getChar(String)

getDouble(String)

getFloat(String)

getInt(String)

getLong(String)

getMapNames()

getObject(String)

getShort(String)

getString(String)

itemExists(String)

setBoolean(String, boolean)

setByte(String, byte)

setBytes(String, byte[])

setBytes(String, byte[], int, int)

setChar(String, char)

setDouble(String, double)

setFloat(String, float)

setInt(String, int)

setLong(String, long)

setObject(String, Object)

setShort(String, short)

setString(String, String)

See Also: "Oracle JMS Classes (part 6)" on page B-11

Interface - javax.jms.Message

<< interface >>

javax.jms.Message

<< methods >>

clearBody()

clearProperties()

getBooleanProperty(String)

getByteProperty(String)

getDoubleProperty(String)

getFloatProperty(String)

getIntProperty(String)

getJMSCorrelationID()

getJMSCorrelationIDAsBytes()

getJMSDeliveryMode()

getJMSDestination()

getJMSExpiration()

getJMSMessageID()

getJMSPriority()

getJMSReplyTo()

getJMSTimestamp()

getJMSType()

getLongProperty(String)

getObjectProperty(String)

getPropertyNames()

getShortProperty(String)

getStringProperty(String)

propertyExists(String)

setBooleanProperty(String, boolean)

setByteProperty(String, byte)

<< methods >>

setDoubleProperty(String, double)

setFloatProperty(String, float)

setIntProperty(String, int)

setJMSCorrelationID(String)

setJMSCorrelation(IDAsBytes(byte[])

setJMSReplyTo(Destination)

setJMSType(String)

setLongProperty(String, long)

setObjectProperty(String, Object)

setShortProperty(String, short)

setStringProperty(String, String)

See Also:

- "Oracle JMSClasses (part 1)" on page B-5

Use Cases:

- Specifying Message Correlation ID
- Specifying JMS Message Property
- Specifying JMS Message Property as Boolean
- Specifying JMS Message Property as String
- Specifying JMS Message Property as Int
- Specifying JMS Message Property as Double
- Specifying JMS Message Property as Float
- Specifying JMS Message Property as Byte
- Specifying JMS Message Property as Long
- Specifying JMS Message Property as Object

Interface - javax.jms.MessageConsumer

<< interface >>

javax.jms.MessageConsumer

<< methods >>

close()

getMessageListener()

getMessageSelector()

receive()

receive(long)

receiveNoWait()

setMessageListener(MessageListener)

See Also:

- "Oracle JMS Classes (part 8)" on page B-16

Use Cases:

- Receiving a Message Synchronously Using a Message Consumer by Specifying Timeout
- Receiving a Message Synchronously Using a Message Consumer Without Waiting

Interface - javax.jms.MessageListener

<< interface >>

javax.jms.MessageListener

<< methods >>

onMessage(Message)

See Also: "Oracle JMS Classes (part 9)" on page B-18

Interface - javax.jms.MessageProducer

<< interface >>

javax.jms.MessageProducer

<< methods >>

close()

getDeliveryMode()

getDisableMessageID()

getPriority()

getTimeToLive()

setDisableMessageID(boolean)

setPriority(int)

setTimeToLive(int)

See Also:

- "Oracle JMS Classes (part 7)" on page B-14

Use Cases:

- Setting Default TimeToLive for All Messages Sent by a Message Producer
- Setting Default Priority for All Messages Sent by a Message Producer

Interface - javax.jms.ObjectMessage

<< interface >>

javax.jms.bjectMessage

<< methods >>

getObject()

setObject(Serializable)

See Also: "Oracle JMS Classes (part 6 continued)" on page B-12

Interface - javax.jms.Queue

<< interface >>

javax.jms.Queue

<< methods >>

getQueueName()

toString()

See Also: "Oracle JMS Classes (part 9)" on page B-18

Interface - javax.jms.QueueBrowser

<< interface >>

javax.jms.Queue Browser

<< methods >>

close()

getEnumeration()

getMessageSelector()

getQueue()

See Also: "Oracle JMS Classes (part 9)" on page B-18

Interface - javax.jms.QueueConnection

<< interface >>

javax.jms.QueueConnection

<< methods >>

createQueueSession(boolean, int)

See Also:

- "Oracle JMS Classes (part 2)" on page B-7
- Use Case: Creating a Queue Session

Interface - javax.jms.QueueConnectionFactory

<< interface >>

javax.jms.QueueConnectionFactory

<< methods >>

createQueueConnection()

createQueueConnection(String, String)

See Also:

- "Oracle JMSClasses (part 1)" on page B-5

Use Cases:

- "Creating a Queue Connection with Username/Password" on page 14-3
- "Creating a Queue Connection with an Open JDBC Connection" on page 14-4
- "Creating a Queue Connection with Default Connection Factory Parameters" on page 14-6
- "Creating a Queue Connection with an Open OracleOCIConnection Pool" on page 14-7

Interface - javax.jms.QueueReceiver

<< interface >>

javax.jms.QueueReceiver

<< methods >>

getQueue()

See Also: "Oracle JMS Classes (part 8)" on page B-16

Interface - javax.jms.QueueSender

<< interface >>

javax.jms.QueueSender

<< methods >>

getQueue()

send(Message)

send(Message, int, int, long)

send(Queue, Message)

send(Queue, Message, int, int, long)

See Also:

- "Oracle JMS Classes (part 7)" on page B-14

Use Cases:

- Creating a Queue Sender
- Sending a Message Using a Queue Sender with Default Send Options
- Sending a Message Using a Queue Sender with Default Send Options

Interface - javax.jms.QueueSession

<< interface >>

javax.jms.QueueSession

<< methods >>

createBrowser(Queue)

createBrowser(Queue, String)

createQueue(String)

createReceiver(Queue)

createReceiver(Queue, String)

createSender(Queue)

See Also: "Oracle JMS Classes (part 4)" on page B-9

Interface - javax.jms.Session

<< interface >>

javax.jms.Session

<< constants >>

AUTO_ACKNOWLEDGE

CLIENT_ACKNOWLEDGE

DUPS_OK_ACKNOWLEDGE

<< methods >>

close()

commit()

createBytesMessage()

createMapMessage()

createMessage()

createObjectMessage()

createObjectMessage(Serializable)

createStreamMessage()

createTextMessage()

createTextMessage(StringBuffer)

getMessageListener()

getTransacted()

rollback()

setMessageListener(MessageListener)

See Also: "Oracle JMS Classes (part 4)" on page B-9

Refer to the following use cases:

- "Creating a Queue Sender" on page 14-10
- "Creating a Queue Browser for Queues with Text, Stream, Objects, Bytes or Map Messages"
- "Creating a Queue Receiver for Queues of Standard JMS Type Messages"
- "Creating a Queue Connection with an Open JDBC Connection"
- "Creating a Map Message" on page 16-13
- "Creating a Stream Message" on page 16-15
- Creating an Object Message on page 16-16
- "Creating a Text Message" on page 16-17

Interface - javax.jms.StreamMessage

<< interface >>

javax.jms.StreamMessage

<< methods >>

readBoolean()

readByte()

readBytes(byte[])

readChar()

readDouble()

readFloat()

readInt()

readLong()

readObject()

readShort()

readString()

reset()

writeBoolean(boolean)

writeByte(byte)

writeBytes(byte[])

writeBytes(byte[], int, int)

writeChar(char)

writeDouble(double)

writeFloat(float)

writeInt(int)

writeLong(long)

writeObject(Object)

writeShort(short)

writeString(String)

See Also: "Oracle JMS Classes (part 6 continued)" on page B-12

Interface - javax.jms.TextMessage

<< interface >>

javax.jms.TextMessage

<< methods >>

getText()

setText(String)

See Also: "Oracle JMS Classes (part 6)" on page B-11

Interface - javax.jms.Topic

<< interface >>

javax.jms.Topic

<< methods >>

getTopicName()

toString()

See Also: "Oracle JMS Classes (part 5)" on page B-10

Interface - javax.jms.TopicConnection

<< interface >>

javax.jms.TopicConnection

<< methods >>

createTopicSession(boolean, int)

See Also:

- "Oracle JMS Classes (part 2)" on page B-7
- Use Case: Creating a Topic Connection with Username/Password on page 15-4

Interface - javax.jms.TopicConnectionFactory

<< interface >>

javax.jms.TopicConnectionFactory

<< methods >>

createTopicConnection()

createTopicConnection(String, String)

See Also: "Oracle JMSClasses (part 1)" on page B-5

Interface - javax.jms.TopicPublisher

<< interface >>

javax.jms.TopicPublisher

<< methods >>

getTopic()

publish(Message)

publish(Message, int, int, long)

publish(Topic, Message)

publish(Topic, Message, int, int, long)

See Also:

- "Oracle JMS Classes (part 7)" on page B-14

Use Cases:

- Publishing a Message Using a Topic Publisher—with Minimal Specification
- Publishing a Message Using a Topic Publisher—Specifying Correlation and Delay
- Publishing a Message Using a Topic Publisher—Specifying Priority and Time-To-Live
- Publishing a Message Using a Topic Publisher—Specifying a Recipient List Overriding Topic Subscribers

Interface - javax.jms.TopicSession

<< interface >>

javax.jms.TopicSession

<< methods >>

createDurableSubscriber(Topic, String)

createDurableSubscriber(Topic, String, String, boolean)

createPublisher(Topic)

See Also:

- "Oracle JMS Classes (part 4)" on page B-14

Use Cases:

- Creating a Durable Subscriber for a JMS Topic without Selector
- Creating a Durable Subscriber for a JMS Topic with Selector

Interface - javax.jms.TopicSubscriber

<< interface >>

javax.jms.TopicSubscriber

<< methods >>

getNoLocal()

getTopic()

See Also: "Oracle JMS Classes (part 8)" on page B-16

Exception javax.jms.InvalidDestinationException

<< exception >>

javax.jms.InvalidDestination-Exception

<< constructors >>

InvalidDestinationException(String)

InvalidDestinationException(String, String)

See Also: "Oracle JMS Classes (part 10 continued)" on page B-21

Exception javax.jms.InvalidSelectorException

<< exception >>

javax.jms.InvalidSelector-Exception

<< constructors >>

InvalidSelectorException(String)

InvalidSelectorException(String, String)

See Also: "Oracle JMS Classes (part 10 continued)" on page B-21

Exception javax.jms.JMSException

<< exception >>

javax.jms.JMSException

<< constructors >>

JMSException(String)

JMSException(String, String)

<< methods >>

getErrorCode()

getLinkedException()

setLinkedException(Exception)

See Also:

- "Oracle JMS Classes (part 10)" on page B-20

Use Cases:

- Getting the Error Code for the JMS Exception
- Getting the Error Message for the JMS Exception
- Getting the Exception Linked to the JMS Exception
- Printing the Stack Trace for the JMS Exception

Exception javax.jms.MessageEOFException

<< exception >>

javax.jms.MessageEOFException

<< constructors >>

MessageEOFException(String)

MessageEOFException(String, String)

See Also: "Oracle JMS Classes (part 10 continued)" on page B-21

Exception javax.jms.MessageFormatException

<< exception >>

javax.jms.MessageFormatException

<< constructors >>

MessageFormatException(String)

MessageFormatException(String, String)

See Also: "Oracle JMS Classes (part 10)" on page B-20

Exception javax.jms.MessageNotReadableException

<< exception >>

javax.jms.MessageNotReadable-Exception

<< constructors >>

MessageNotReadableException(String)

MessageNotReadableException(String, String)

See Also: "Oracle JMS Classes (part 10)" on page B-20

Exception javax.jms.MesageNotWriteableException

<< exception >>

javax.jms.MessageNotWriteable-Exception

<< constructors >>

MessageNotWriteableException(String)

MessageNotWriteableException(String, String)

See Also: "Oracle JMS Classes (part 10)" on page B-20

Interface - oracle.jms.AdtMessage

<< interface >>

oracle.jms.AdtMessage

<< methods >>

getAdtPayload()

setAdtPayload(CustomDatum)

See Also: "Oracle JMS Classes (part 6 continued)" on page B-12

Interface - oracle.jms.AQjmsQueueReceiver

<< interface >>

oracle.jms.AQjmsQueueReceiver

<< methods >>

getNavigationMode()

receiveNoData()

receiveNoData(long)

setNavigationMode(int)

See Also:

- "Oracle JMS Classes (part 8)" on page B-16
- Use Case: Specifying the Navigation Mode for Receiving Messages

Interface - oracle.jms.AQjmsQueueSender

<< interface >>

oracle.jms.AQjmsQueueSender

See Also: "Oracle JMS Classes (part 7)" on page B-14

Interface - oracle.jms.AQjmsTopicPublisher

<< interface >>

oracle.jms.AQjmsTopicPublisher

<< methods >>

publish(Message, AQjmsAgent[])

publish(Message, AQjmsAgent[], int, int, long)

publish(Topic, Message, AQjmsAgent[])

publish(Topic, Message, AQjmsAgent[], int, int, long)

See Also: "Oracle JMS Classes (part 7)" on page B-14

Interface - oracle.jms.TopicReceiver

<< interface >>

oracle.jms.AQjmsTopicReceiver

<< methods >>

getNavigationMode()

receiveNoData()

receiveNoData(long)

setNavigationMode(int)

See Also: "Oracle JMS Classes (part 8)" on page B-16

Interface - oracle.jms.AQjmsTopicSubscriber

<< interface >>

oracle.jms.AQjmsTopicSubscriber

<< methods >>

getNavigationMode()

receiveNoData()

receiveNoData(long)

setNavigationMode(int)

See Also: "Oracle JMS Classes (part 8)" on page B-16

Interface - oracle.jms.AQjmsTopicReceiver

<< interface >>

oracle.jms.TopicReceiver

<< methods >>

getTopic()

See Also: "Oracle JMS Classes (part 8)" on page B-16

Class - oracle.jms.AQjmsAdtMessage

<< class >>

oracle.jms.AQjmsAdtMessage

<< methods >>

getAdtPayload()

setAdtPayload(CustomDatum)

See Also: "Oracle JMS Classes (part 6 continued)" on page B-12

Class - oracle.jms.AQjmsAgent

<< class >>

oracle.jms.AQjmsAgent

<< constructors >>

AQjmsAgent(String, String)

AQjmsAgent(String, String, int)

<< methods >>

getAddress()

getName()

getProtocol()

setAddress(String)

setName(String)

setProtocol(int)

toString()

See Also:

- "Oracle JMS Classes (part 5)" on page B-10
- Use Case: Creating an AQjms Agent

Class - oracle.jms.AQjmsBytesMessage

<< class >>

oracle.jms.AQjmsBytesMessage

See Also: "Oracle JMS Classes (part 6)" on page B-11

Class - oracle.jms.AQjmsConnection

<< class >>

oracle.jms.AQjmsConnection

<< methods >>

getCurrentJmsSession()

getOCIConnectionPool()

> **See Also:** "Oracle JMS Classes (part 2)" on page B-7

Interface - oracle.jms.AQjmsConnectionMetadata

<< interface >>

oracle.jms.AQjmsConnectionMeta-Data

> **See Also:** "Oracle JMS Classes (part 3)" on page B-8

Class - oracle.jms.AQjmsConstants

<< class >>

oracle.jms.AQjmsConstants

<< constants >>

EXCEPTION

NAVIGATION_FIRST_MESSAGE

NAVIGATION_NEXT_MESSAGE

NAVIGATION_NEXT_

TRANSACTION

NONE

NORMAL

STATE_EXPIRED

STATE_PROCESSED

STATE_READY

STATE_WAITING

TRANSACTIONAL

WAIT_FOREVER

WAIT_NONE

See Also: "Oracle JMS Classes (part 3)" on page B-8

Interface - oracle.jms.AQjmsConsumer

<< interface >>

oracle.jms.AQjmsConsumer

See Also: "Oracle JMS Classes (part 8)" on page B-16

Class - oracle.jms.AQjmsDestination

<< class >>

oracle.jms.AQjmsDestination

<< methods >>

alter(Session, AQjmsDestinationProperty)

alterPropagationSchedule(Session, String, Double, String, Double)

disablePropagationSchedule(Session, String)

drop(Session)

enablePropagationSchedule(Session, String)

getCompleteName()

getCompleteTableName()

getQueueName()

getQueueOwner()

getTopicName()

getTopicOwner()

grantQueuePrivilege(Session, String, String, boolean) grantTopicPrivilege(Session, String, String, boolean)

revokeQueuePrivilege(Session, String, String)

<< methods >>

revokeTopicPrivilege(Session, String, String)

schedulePropagation(Session, String, Date, Double, String, Double)

start(Session, boolean, boolean)

stop(Session, boolean, boolean, boolean)

toString()

unschedulePropagation(Session, String)

See Also: "Oracle JMS Classes (part 5)" on page B-10

Refer to the following use cases:

- Granting Topic Privileges—Publish-Subscribe
- Starting a Destination
- Stopping a Destination
- Altering a Destination
- Dropping a Destination
- Scheduling a Propagation
- Enabling a Propagation Schedule
- Altering a Propagation Schedule
- Disabling a Propagation Schedule
- Unscheduling a Propagation

Class - oracle.jms.AQjmsDestinationProperty

<< class >>

oracle.jms.AQjmsDestinationProperty

<< constants >>

EXCEPTION_QUEUE

INFINITE

NORMAL_QUEUE

<< constructors >>

AQjmsDestinationProperty()

<< methods >>

getComment()

getMaxRetries()

getQueueType()

getRetentionTime()

getRetryInterval()

setComment(java.lang.String qt_comment)

setMaxRetries(int retries)

setMaxRetries(java.lang.Integer retries)

setQueueType(int q_type)

setRetentionTime(double r_time)

setRetentionTime(java.lang.Double r_time)

setRetryInterval(double interval)

setRetryInterval(java.lang.Double interval)

toString()

See Also:

- "Oracle JMS Classes (part 9)" on page B-18
- Use Cases: Specifying Destination Properties

Class - oracle.jms.AQjmsFactory

<< class >>

oracle.jms.AQjmsFactory

<< static >>

getQueueConnectionFactory(String, Properties)

getQueueConnectionFactory(String, String, int, String)

getTopicConnectionFactory(String, Properties)

getTopicConnectionFactory(String, String, int, String)

See Also:

- "Oracle JMSClasses (part 1)" on page B-5

Use Cases:

- Getting a Queue Connection Factory with JDBC URL
- Getting a Queue Connection Factory with JDBC Connection Parameters
- Getting a Topic Connection Factory with JDBC URL
- Getting a Topic Connection Factory with JDBC Connection Parameters

Class - oracle.jms.AQjmsMapMessage

<< class >>

oracle.jms.AQjmsMapMessage

See Also: "Oracle JMS Classes (part 6)" on page B-11

Class - oracle.jms.AQjmsMessage

<< class >>

oracle.jms.AQjmsMessage

<< methods >>

getJMSMessageIDAsBytes()

getSenderID()

setSenderID(AQjmsAgent)

See Also:

- "Oracle JMS Classes (part 6)" on page B-11

Use Cases:

- Getting the Message ID of a Message as Bytes

Class - oracle.jms.AQjmsObjectMessage

<< class >>

oracle.jms.AQjmsObjectMessage

See Also: "Oracle JMS Classes (part 6 continued)" on page B-12

Class - oracle.jms.AQjmsOracleDebug

<< class >>

oracle.jms.AQjmsOracleDebug

<< constants >>

AQ_ORA_TR1

AQ_ORA_TR2

AQ_ORA_TR3

AQ_ORA_TR4

AQ_ORA_TR5

<< methods >>

getLogStream()

setLogStream(OutputStream)

setTraceLevel(int)

See Also: "Oracle JMS Classes (part 9)" on page B-18

Class - oracle.jms.AQjmsProducer

<< class >>

oracle.jms.AQjmsProducer

See Also: "Oracle JMS Classes (part 7)" on page B-14

Class - oracle.jms.AQjmsQueueBrowser

<< class >>

oracle.jms.AQjmsQueueBrowser

See Also:

- "Oracle JMS Classes (part 9)" on page B-18
- Use Case: Browsing Messages Using a Queue Browser

Class - oracle.jms.AQjmsQueueConnectionFactory

<< class >>

oracle.jmsAQjmsQueueConnection-Factory

<< static >>

createQueueConnection(Connection)

createQueueConnection(OracleOCIConnectionPool)

<< methods >>

createQueueConnection()

createQueueConnection(String, String)

See Also:

- "Oracle JMSClasses (part 1)" on page B-5
- Use Case: Creating a Queue Connection with Default Connection Factory Parameters

Class - oracle.jms.AQjmsSession

<< class >>

oracle.jms.AQjmsSession

<< methods >>

createAdtMessage()

createAdtMessage(CustomDatum)

createBrowser(Queue, CustomDatumFactory)

createBrowser(Queue, String, boolean)

createBrowser(Queue, String, CustomDatumFactory)

createBrowser(Queue, String, CustomDatumFactory, boolean)

createBrowser(Topic, String)

createBrowser(Topic, String, boolean)

createBrowser(Topic, String, CustomDatumFactory)

createBrowser(Topic, String, CustomDatumFactory, boolean)

createBrowser(Topic, String, String)

createBrowser(Topic, String, String, boolean)

createBrowser(Topic, String, String, CustomDatumFactory)

createBrowser(Topic, String, String, CustomDatumFactory, boolean)

createDurableSubscriber(Topic, String, CustomDatumFactory)

createDurableSubscriber(Topic, String, String, boolean, CustomDatumFactory)

createQueue(AQQueueTable, String, AQjmsDestinationProperty)

createQueueTable(String, String, AQQueueTableProperty)

createReceiver(Queue, CustomDatumFactory)

createReceiver(Queue, String, CustomDatumFactory)

createRemoteSubscriber(Topic, AQjmsAgent, String)

createRemoteSubscriber(Topic, AQjmsAgent, String, CustomDatumFactory)

createTopic(AQQueueTable, String, AQjmsDestinationProperty) createTopicReceiver(Topic, String, String)

createTopicReceiver(Topic, String, String, CustomDatumFactory)

getDBConnection()

getJmsConnection()

getQueue(String, String)

getQueueTable(String, String)

getTopic(String, String)

grantSystemPrivilege(String, String, boolean)

revokeSystemPrivilege(String, String)

unsubscribe(Topic, AQjmsAgent)

unsubscribe(Topic, String)

See Also: "Oracle JMS Classes (part 4)" on page B-9

Use Cases

Creating a Queue Table

Getting a Queue Table

Creating a Topic—Publish-Subscribe

Granting System Privileges

Revoking System Privileges

Granting Queue Privileges—Point-to-Point

Revoking Queue Privileges—Point-to-Point

Creating a Queue Browser for Queues of Oracle Object Type (ADT) Messages

Creating a Queue Browser for Queues of Oracle Object Type (ADT) Messages

Creating a Queue Browser for Queues of Oracle Object Type (ADT) Messages, Locking Messages While Browsing

Creating a Queue Receiver for Queues of Oracle Object Type (ADT) Messages

Creating a Durable Subscriber for an ADT Topic without Selector

Creating a Durable Subscriber for an ADT Topic with Selector

Creating a Remote Subscriber for Topics of JMS Messages

Creating a Remote Subscriber for Topics of Oracle Object Type (ADT) Messages

Unsubscribing a Durable Subscription for a Local Subscriber

Unsubscribing a Durable Subscription for a Remote Subscriber

Creating a Topic Receiver for a Topic of Standard JMS Type Messages

Creating a Topic Receiver for a Topic of Oracle Object Type (ADT) Messages

Getting the JMS Connection from a Session

Getting the Underlying JDBC Connection from a JMS Session

Creating an ADT Message

Class - oracle.jms.AQjmsStreamMessage

<< class >>

oracle.jms.AQjmsStreamMessage

See Also: "Oracle JMS Classes (part 6 continued)" on page B-12

Class - oracle.jms.AQjmsTextMessage

<< class >>

oracle.jms.AQjmsTextMessage

See Also: "Oracle JMS Classes (part 6)" on page B-11

Class - oracle.jms.AQjmsTopicConnectionFactory

<< class >>

oracle.jms.AQjmsTopicConnection-Factory

<< static >>

createTopicConnection(Connection)

createTopicConnection(OracleOCIConnectionPool)

<< methods >>

createTopicConnection()

createTopicConnection(String, String)

See Also:

- "Oracle JMSClasses (part 1)" on page B-5

Use Cases:

- Creating a Topic Connection with Open JDBC Connection
- Creating a Topic Connection with Default Connection Factory Parameters

Exception oracle.jms.AQjmsException

<< exception >>

oracle.jms.AQjmsException

<< methods >>

getErrorNumber()

See Also:

- "Oracle JMS Classes (part 10)" on page B-20

Use Cases:

- Getting the Error Number for the JMS Exception

Exception oracle.jms.AQjmsInvalidDestinationException

<< exception >>

oracle.jms.AQjmsInvalidDestination-Exception

See Also: "Oracle JMS Classes (part 10 continued)" on page B-21

Exception oracle.jms.AQjmsInvalidSelectorException

<< exception >>

oracle.jms.AQjmsInvalidSelector-Exception

See Also: "Oracle JMS Classes (part 10 continued)" on page B-21

Exception oracle.jms.AQjmsMessageEOFException

<< exception >>

oracle.jms.AQjmsMessageEOF-Exception

See Also: "Oracle JMS Classes (part 10 continued)" on page B-21

Exception oracle.jms.AQjmsMessageFormatException

<< exception >>

oracle.jms.AQjmsMessageFormatException

See Also: "Oracle JMS Classes (part 10)" on page B-20

Exception oracle.jms.AQjmsMessageNotReadableException

<< exception >>

oracle.jms.AQjmsMessageNotReadableException

See Also: "Oracle JMS Classes (part 10)" on page B-20

Exception oracle.jms.AQjmsMesssageNotWriteableException

<< exception >>

oracle.jms.AQjmsMessageNotWriteableException

See Also: "Oracle JMS Classes (part 10)" on page B-20

Interface - oracle.AQ.AQQueueTable

<< interface >>

oracle.AQ.AQQueueTable

<< methods >>

alter(java.lang.String comment)

alter(java.lang.String comment, int primary_instance, int secondary_instance)

drop(boolean force)

getName()

getOwner()

getProperty()

See Also: "Oracle JMS Classes (part 9)" on page B-18

Class - oracle.AQ.AQQueueTableProperty

<< class >>

oracle.AQ.AQQueueTableProperty

<< constants >>

NONE

TRANSACTIONAL

<< constructors >>

AQQueueTableProperty(java.lang.String p_type)

<< methods >>

getComment()

getCompatible()

getMessageGrouping()

getPayloadType()

getPrimaryInstance()

getSecondaryInstance()

getSortOrder()

isMulticonsumerEnabled()

setComment(java.lang.String qt_comment)

setCompatible(java.lang.String qt_compatible)

setMessageGrouping(int message_grouping)

setMultiConsumer(boolean enable)

setPayloadType(java.lang.String p_type)

setPrimaryInstance(int inst)

setSecondaryInstance(int inst)

setSortOrder(java.lang.String s_order)

setStorageClause(java.lang.String s_clause)

toString()

See Also:

- "Oracle JMS Classes (part 9)" on page B-18
- Use Case: Creating a Queue Table [Specify Queue Table Property]

Interface - oracle.jms.TopicBrowser

<< interface >>

oracle.jms.TopicBrowser

<< methods >>

close()

get Enumeration()

getTopic()

getMessageSelector()

purgeSeen()

See Also: "Oracle JMS Classes (part 9)" on page B-18

Class - oracle.jms.AQjmsTopicBrowser

<< class >>

oracle.jms.AQjmsTopicBrowser

See Also: "Oracle JMS Classes (part 9)" on page B-18

C

Scripts for Implementing BooksOnLine

This Appendix contains the following scripts:

- tkaqdoca.sql: Script to Create Users, Objects, Queue Tables, Queues & Subscribers
- tkaqdocd.sql: Examples of Administrative and Operational Interfaces
- tkaqdoce.sql: Operational Examples
- tkaqdocp.sql: Examples of Operational Interfaces
- tkaqdocc.sql: Clean-Up Script

tkaqdoca.sql: Script to Create Users, Objects, Queue Tables, Queues & Subscribers

```
Rem $Header: tkaqdoca.sql 26-jan-99.17:50:37 aquser1 Exp $
Rem
Rem tkaqdoca.sql
Rem
Rem  Copyright (c) Oracle Corporation 1998, 1999. All Rights Reserved.
Rem
Rem    NAME
Rem      tkaqdoca.sql - TKAQ DOCumentation Admin examples file

Rem Set up a queue admin account and individual accounts for each application
Rem
connect system/manager
set serveroutput on;
set echo on;

Rem Create a common admin account for all BooksOnLine applications
Rem
create user BOLADM identified by BOLADM;
grant connect, resource, aq_administrator_role to BOLADM;
grant execute on dbms_aq to BOLADM;
grant execute on dbms_aqadm to BOLADM;
execute dbms_aqadm.grant_system_privilege('ENQUEUE_ANY','BOLADM',FALSE);
execute dbms_aqadm.grant_system_privilege('DEQUEUE_ANY','BOLADM',FALSE);

Rem Create the application schemas and grant appropriate permission
Rem to all schemas

Rem Create an account for Order Entry
create user OE identified by OE;
grant connect, resource to OE;
grant execute on dbms_aq to OE;
grant execute on dbms_aqadm to OE;

Rem Create an account for WR Shipping
create user WS identified by WS;
grant connect, resource to WS;
grant execute on dbms_aq to WS;
grant execute on dbms_aqadm to WS;

Rem Create an account for ER Shipping
create user ES identified by ES;
grant connect, resource to ES;
```

```
grant execute on dbms_aq to ES;
grant execute on dbms_aqadm to ES;

Rem Create an account for Overseas Shipping
create user OS identified by OS;
grant connect, resource to OS;
grant execute on dbms_aq to OS;
grant execute on dbms_aqadm to OS;

Rem Create an account for Customer Billing
Rem Customer Billing, for security reason, has an admin schema that
Rem hosts all the queue tables and an application schema from where
Rem the application runs.
create user CBADM identified by CBADM;
grant connect, resource to CBADM;
grant execute on dbms_aq to CBADM;
grant execute on dbms_aqadm to CBADM;

create user CB identified by CB;
grant connect, resource to CB;
grant execute on dbms_aq to CB;
grant execute on dbms_aqadm to CB;

Rem Create an account for Customer Service
create user CS identified by CS;
grant connect, resource to CS;
grant execute on dbms_aq to CS;
grant execute on dbms_aqadm to CS;


Rem All object types are created in the administrator schema.
Rem All application schemas that host any propagation source
Rem queues are given the ENQUEUE_ANY system level privilege
Rem allowing the application schemas to enqueue to the destination
Rem queue.
Rem
connect BOLADM/BOLADM;

Rem Create objects

create or replace type customer_typ as object (
        custno          number,
        name            varchar2(100),
        street          varchar2(100),
        city            varchar2(30),
```

```
        state           varchar2(2),
        zip             number,
        country         varchar2(100));
/

create or replace type book_typ as object (
        title           varchar2(100),
        authors         varchar2(100),
        ISBN            number,
        price           number);
/

create or replace type orderitem_typ as object (
        quantity        number,
        item            book_typ,
        subtotal        number);
/

create or replace type orderitemlist_vartyp as varray (20) of orderitem_typ;
/

create or replace type order_typ as object (
        orderno         number,
        status          varchar2(30),
        ordertype       varchar2(30),
        orderregion     varchar2(30),
        customer        customer_typ,
        paymentmethod   varchar2(30),
        items           orderitemlist_vartyp,
        total           number);
/

grant execute on order_typ to OE;
grant execute on orderitemlist_vartyp to OE;
grant execute on orderitem_typ to OE;
grant execute on book_typ to OE;
grant execute on customer_typ to OE;
execute dbms_aqadm.grant_system_privilege('ENQUEUE_ANY','OE',FALSE);

grant execute on order_typ to WS;
grant execute on orderitemlist_vartyp to WS;
grant execute on orderitem_typ to WS;
grant execute on book_typ to WS;
grant execute on customer_typ to WS;
execute dbms_aqadm.grant_system_privilege('ENQUEUE_ANY','WS',FALSE);
```

```
grant execute on order_typ to ES;
grant execute on orderitemlist_vartyp to ES;
grant execute on orderitem_typ to ES;
grant execute on book_typ to ES;
grant execute on customer_typ to ES;
execute dbms_aqadm.grant_system_privilege('ENQUEUE_ANY','ES',FALSE);

grant execute on order_typ to OS;
grant execute on orderitemlist_vartyp to OS;
grant execute on orderitem_typ to OS;
grant execute on book_typ to OS;
grant execute on customer_typ to OS;
execute dbms_aqadm.grant_system_privilege('ENQUEUE_ANY','OS',FALSE);

grant execute on order_typ to CBADM;
grant execute on orderitemlist_vartyp to CBADM;
grant execute on orderitem_typ to CBADM;
grant execute on book_typ to CBADM;
grant execute on customer_typ to CBADM;

grant execute on order_typ to CB;
grant execute on orderitemlist_vartyp to CB;
grant execute on orderitem_typ to CB;
grant execute on book_typ to CB;
grant execute on customer_typ to CB;

grant execute on order_typ to CS;
grant execute on orderitemlist_vartyp to CS;
grant execute on orderitem_typ to CS;
grant execute on book_typ to CS;
grant execute on customer_typ to CS;

Rem Create queue tables, queues for OE
Rem
connect OE/OE;
begin
dbms_aqadm.create_queue_table(
        queue_table => 'OE_orders_sqtab',
        comment => 'Order Entry Single Consumer Orders queue table',
        queue_payload_type => 'BOLADM.order_typ',
        message_grouping => DBMS_AQADM.TRANSACTIONAL,
        compatible => '8.1',
        primary_instance => 1,
        secondary_instance => 2);
```

```
end;
/

Rem Create a priority queue table for OE
begin
dbms_aqadm.create_queue_table(
        queue_table => 'OE_orders_pr_mqtab',
        sort_list =>'priority,enq_time',
        comment => 'Order Entry Priority MultiConsumer Orders queue table',
        multiple_consumers => TRUE,
        queue_payload_type => 'BOLADM.order_typ',
        compatible => '8.1',
        primary_instance => 2,
        secondary_instance => 1);
end;
/

begin
dbms_aqadm.create_queue (
        queue_name              => 'OE_neworders_que',
        queue_table             => 'OE_orders_sqtab');
end;
/

begin
dbms_aqadm.create_queue (
        queue_name              => 'OE_bookedorders_que',
        queue_table             => 'OE_orders_pr_mqtab');
end;
/

Rem Orders in OE_bookedorders_que are being propagated to WS_bookedorders_que,
Rem ES_bookedorders_que and OS_bookedorders_que according to the region
Rem the books are shipped to.  At the time an order is placed, the customer
Rem can request Fed-ex shipping (priority 1), priority air shipping (priority
Rem 2) and ground shipping (priority 3).  A priority queue is created in
Rem each region, the shipping applications will dequeue from these priority
Rem queues according to the orders' shipping priorities, processes the orders
Rem and enqueue the processed orders into
Rem the shipped_orders queues or the back_orders queues.  Both the shipped_
Rem orders queues and the back_orders queues are FIFO queues. However,
Rem orders put into the back_orders_queues are enqueued with delay time
Rem set to 1 day, so that each order in the back_order_queues is processed
Rem only once a day until the shipment is filled.
```

```
Rem Create queue tables, queues for WS Shipping
connect WS/WS;

Rem Create a priority queue table for WS shipping
begin
dbms_aqadm.create_queue_table(
        queue_table => 'WS_orders_pr_mqtab',
        sort_list =>'priority,enq_time',
        comment => 'West Shipping Priority MultiConsumer Orders queue table',
        multiple_consumers => TRUE,
        queue_payload_type => 'BOLADM.order_typ',
        compatible => '8.1');
end;
/

Rem Create a FIFO queue tables for WS shipping
begin
dbms_aqadm.create_queue_table(
        queue_table => 'WS_orders_mqtab',
        comment => 'West Shipping Multi Consumer Orders queue table',
        multiple_consumers => TRUE,
        queue_payload_type => 'BOLADM.order_typ',
        compatible => '8.1');
end;
/

Rem Booked orders are stored in the priority queue table
begin
dbms_aqadm.create_queue (
        queue_name              => 'WS_bookedorders_que',
        queue_table             => 'WS_orders_pr_mqtab');
end;
/

Rem Shipped orders and back orders are stored in the FIFO queue table
begin
dbms_aqadm.create_queue (
        queue_name              => 'WS_shippedorders_que',
        queue_table             => 'WS_orders_mqtab');
end;
/


begin
dbms_aqadm.create_queue (
```

```
        queue_name              => 'WS_backorders_que',
        queue_table             => 'WS_orders_mqtab');
end;
/

Rem
Rem  In order to test history, set retention to 1 DAY for the queues
Rem  in WS

begin
dbms_aqadm.alter_queue(
         queue_name => 'WS_bookedorders_que',
         retention_time => 86400);
end;
/

begin
dbms_aqadm.alter_queue(
         queue_name => 'WS_shippedorders_que',
         retention_time => 86400);
end;
/

begin
dbms_aqadm.alter_queue(
         queue_name => 'WS_backorders_que',
         retention_time => 86400);
end;
/


Rem Create queue tables, queues for ES Shipping
connect ES/ES;

Rem Create a priority queue table for ES shipping
begin
dbms_aqadm.create_queue_table(
        queue_table => 'ES_orders_mqtab',
        comment => 'East Shipping Multi Consumer Orders queue table',
        multiple_consumers => TRUE,
        queue_payload_type => 'BOLADM.order_typ',
        compatible => '8.1');
end;
/
```

```
Rem Create a FIFO queue tables for ES shipping
begin
dbms_aqadm.create_queue_table(
        queue_table => 'ES_orders_pr_mqtab',
        sort_list =>'priority,enq_time',
        comment => 'East Shipping Priority Multi Consumer Orders queue table',
        multiple_consumers => TRUE,
        queue_payload_type => 'BOLADM.order_typ',
        compatible => '8.1');
end;
/

Rem Booked orders are stored in the priority queue table
begin
dbms_aqadm.create_queue (
        queue_name              => 'ES_bookedorders_que',
        queue_table             => 'ES_orders_pr_mqtab');
end;
/

Rem Shipped orders and back orders are stored in the FIFO queue table
begin
dbms_aqadm.create_queue (
        queue_name              => 'ES_shippedorders_que',
        queue_table             => 'ES_orders_mqtab');
end;
/

begin
dbms_aqadm.create_queue (
        queue_name              => 'ES_backorders_que',
        queue_table             => 'ES_orders_mqtab');
end;
/


Rem Create queue tables, queues for Overseas Shipping
connect OS/OS;

Rem Create a priority queue table for OS shipping
begin
dbms_aqadm.create_queue_table(
        queue_table => 'OS_orders_pr_mqtab',
        sort_list =>'priority,enq_time',
        comment => 'Overseas Shipping Priority MultiConsumer Orders queue
```

```
table',
        multiple_consumers => TRUE,
        queue_payload_type => 'BOLADM.order_typ',
        compatible => '8.1');
end;
/

Rem Create a FIFO queue tables for OS shipping
begin
dbms_aqadm.create_queue_table(
        queue_table => 'OS_orders_mqtab',
        comment => 'Overseas Shipping Multi Consumer Orders queue table',
        multiple_consumers => TRUE,
        queue_payload_type => 'BOLADM.order_typ',
        compatible => '8.1');
end;
/

Rem Booked orders are stored in the priority queue table
begin
dbms_aqadm.create_queue (
        queue_name              => 'OS_bookedorders_que',
        queue_table             => 'OS_orders_pr_mqtab');
end;
/

Rem Shipped orders and back orders are stored in the FIFO queue table
begin
dbms_aqadm.create_queue (
        queue_name              => 'OS_shippedorders_que',
        queue_table             => 'OS_orders_mqtab');
end;
/

begin
dbms_aqadm.create_queue (
        queue_name              => 'OS_backorders_que',
        queue_table             => 'OS_orders_mqtab');
end;
/


Rem Create queue tables, queues for Customer Billing
connect CBADM/CBADM;
begin
```

```
dbms_aqadm.create_queue_table(
        queue_table => 'CBADM_orders_sqtab',
        comment => 'Customer Billing Single Consumer Orders queue table',
        queue_payload_type => 'BOLADM.order_typ',
        compatible => '8.1');

dbms_aqadm.create_queue_table(
        queue_table => 'CBADM_orders_mqtab',
        comment => 'Customer Billing Multi Consumer Service queue table',
        multiple_consumers => TRUE,
        queue_payload_type => 'BOLADM.order_typ',
        compatible => '8.1');

dbms_aqadm.create_queue (
        queue_name              => 'CBADM_shippedorders_que',
        queue_table             => 'CBADM_orders_sqtab');

end;
/

Rem Grant dequeue privilege on the shopped orders queue to the Customer Billing
Rem application.  The CB application retrieves shipped orders (not billed yet)
Rem from the shopped orders queue.
execute dbms_aqadm.grant_queue_privilege('DEQUEUE', 'CBADM_shippedorders_que',
'CB', FALSE);

begin
dbms_aqadm.create_queue (
        queue_name              => 'CBADM_billedorders_que',
        queue_table             => 'CBADM_orders_mqtab');
end;
/

Rem Grant enqueue privilege on the billed orders queue to Customer Billing
Rem application.  The CB application is allowed to put billed orders into
Rem this queue.
execute dbms_aqadm.grant_queue_privilege('ENQUEUE', 'CBADM_billedorders_que',
'CB', FALSE);


Rem Customer support tracks the state of the customer request in the system
Rem
Rem At any point, customer request can be in one of the following states
Rem  A. BOOKED  B. SHIPPED  C. BACKED   D. BILLED
Rem  Given the order number the customer support will return the state
```

```
Rem  the order is in. This state is maintained in the order_status_table

connect CS/CS;

CREATE TABLE Order_Status_Table(customer_order       boladm.order_typ,
                                status               varchar2(30));

Rem Create queue tables, queues for Customer Service

begin
dbms_aqadm.create_queue_table(
        queue_table => 'CS_order_status_qt',
        comment => 'Customer Status multi consumer queue table',
        multiple_consumers => TRUE,
        queue_payload_type => 'BOLADM.order_typ',
        compatible => '8.1');

dbms_aqadm.create_queue (
        queue_name              => 'CS_bookedorders_que',
        queue_table             => 'CS_order_status_qt');

dbms_aqadm.create_queue (
        queue_name              => 'CS_backorders_que',
        queue_table             => 'CS_order_status_qt');

dbms_aqadm.create_queue (
        queue_name              => 'CS_shippedorders_que',
        queue_table             => 'CS_order_status_qt');

dbms_aqadm.create_queue (
        queue_name              => 'CS_billedorders_que',
        queue_table             => 'CS_order_status_qt');

end;
/

Rem Create the Subscribers for OE queues
Rem Add the Subscribers for the OE booked_orders queue

connect OE/OE;

Rem Add a rule-based subscriber for West Shipping
Rem West Shipping handles Western region US orders
Rem Rush Western region orders are handled by East Shipping
declare
```

```
  subscriber     aq$_agent;
begin
  subscriber := aq$_agent('West_Shipping', 'WS.WS_bookedorders_que', null);
  dbms_aqadm.add_subscriber(queue_name => 'OE.OE_bookedorders_que',
                            subscriber => subscriber,
                            rule       => 'tab.user_data.orderregion =
''WESTERN'' AND tab.user_data.ordertype != ''RUSH''');
end;
/

Rem Add a rule-based subscriber for East Shipping
Rem East shipping handles all Eastern region orders
Rem East shipping also handles all US rush orders
declare
  subscriber     aq$_agent;
begin
  subscriber := aq$_agent('East_Shipping', 'ES.ES_bookedorders_que', null);
  dbms_aqadm.add_subscriber(queue_name => 'OE.OE_bookedorders_que',
                            subscriber => subscriber,
                            rule       => 'tab.user_data.orderregion =
''EASTERN'' OR (tab.user_data.ordertype = ''RUSH'' AND tab.user_
data.customer.country = ''USA'') ');
end;
/

Rem Add a rule-based subscriber for Overseas Shipping
Rem Intl Shipping handles all non-US orders
declare
  subscriber     aq$_agent;
begin
  subscriber := aq$_agent('Overseas_Shipping', 'OS.OS_bookedorders_que', null);
  dbms_aqadm.add_subscriber(queue_name => 'OE.OE_bookedorders_que',
                            subscriber => subscriber,
                            rule       => 'tab.user_data.orderregion =
''INTERNATIONAL''');
end;
/

Rem Add the Customer Service order queues as a subscribers to the
Rem corresponding queues  in OrderEntry, Shipping and Billing

declare
  subscriber     aq$_agent;
begin
  /* Subscribe to the booked orders queue */
```

```
  subscriber := aq$_agent('BOOKED_ORDER', 'CS.CS_bookedorders_que', null);
  dbms_aqadm.add_subscriber(queue_name => 'OE.OE_bookedorders_que',
                            subscriber => subscriber);
end;
/


connect WS/WS;

declare
  subscriber     aq$_agent;
begin
  /* Subscribe to the WS back orders queue */
  subscriber := aq$_agent('BACK_ORDER', 'CS.CS_backorders_que', null);
  dbms_aqadm.add_subscriber(queue_name => 'WS.WS_backorders_que',
                            subscriber => subscriber);
end;
/

declare
  subscriber     aq$_agent;
begin
  /* Subscribe to the WS shipped orders queue */
  subscriber := aq$_agent('SHIPPED_ORDER', 'CS.CS_shippedorders_que', null);
  dbms_aqadm.add_subscriber(queue_name => 'WS.WS_shippedorders_que',
                            subscriber => subscriber);
end;
/

connect CBADM/CBADM;
declare
  subscriber     aq$_agent;
begin
  /* Subscribe to the BILLING billed orders queue */
  subscriber := aq$_agent('BILLED_ORDER', 'CS.CS_billedorders_que', null);
  dbms_aqadm.add_subscriber(queue_name => 'CBADM.CBADM_billedorders_que',
                            subscriber => subscriber);

end;
/


Rem
Rem BOLADM will Start all the queues
Rem
```

```
connect BOLADM/BOLADM
execute dbms_aqadm.start_queue(queue_name => 'OE.OE_neworders_que');
execute dbms_aqadm.start_queue(queue_name => 'OE.OE_bookedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'WS.WS_bookedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'WS.WS_shippedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'WS.WS_backorders_que');
execute dbms_aqadm.start_queue(queue_name => 'ES.ES_bookedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'ES.ES_shippedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'ES.ES_backorders_que');
execute dbms_aqadm.start_queue(queue_name => 'OS.OS_bookedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'OS.OS_shippedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'OS.OS_backorders_que');
execute dbms_aqadm.start_queue(queue_name => 'CBADM.CBADM_shippedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'CBADM.CBADM_billedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'CS.CS_bookedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'CS.CS_backorders_que');
execute dbms_aqadm.start_queue(queue_name => 'CS.CS_shippedorders_que');
execute dbms_aqadm.start_queue(queue_name => 'CS.CS_billedorders_que');

connect system/manager

Rem
Rem Start job_queue_processes to handle AQ propagation
Rem

alter system set job_queue_processes=4;
```

tkaqdocd.sql: Examples of Administrative and Operational Interfaces

```
Rem
Rem $Header: tkaqdocd.sql 26-jan-99.17:51:23 aquser1 Exp $
Rem
Rem tkaqdocd.sql
Rem
Rem  Copyright (c) Oracle Corporation 1998, 1999. All Rights Reserved.
Rem
Rem    NAME
Rem      tkaqdocd.sql - <one-line expansion of the name>
Rem
Rem    DESCRIPTION
Rem      <short description of component this file declares/defines>
Rem
Rem    NOTES
Rem      <other useful comments, qualifications, etc.>
Rem
Rem


Rem
Rem  Schedule propagation for the shipping, billing, order entry queues
Rem

connect OE/OE;

execute dbms_aqadm.schedule_propagation(queue_name => 'OE.OE_bookedorders_que');

connect WS/WS;
execute dbms_aqadm.schedule_propagation(queue_name => 'WS.WS_backorders_que');
execute dbms_aqadm.schedule_propagation(queue_name => 'WS.WS_shippedorders_
que');

connect CBADM/CBADM;
execute dbms_aqadm.schedule_propagation(queue_name => 'CBADM.CBADM_billedorders_
que');


Rem
Rem   Customer service application
Rem
Rem   This application monitors the status queue for messages and updates
Rem   the Order_Status table.
```

```
connect CS/CS

Rem
Rem  Dequeus messages from the 'queue' for 'consumer'

CREATE OR REPLACE PROCEDURE DEQUEUE_MESSAGE(
                         queue      IN   VARCHAR2,
                         consumer   IN   VARCHAR2,
                         message    OUT  BOLADM.order_typ)
IS

dopt                     dbms_aq.dequeue_options_t;
mprop                    dbms_aq.message_properties_t;
deq_msgid                raw(16);
BEGIN
  dopt.dequeue_mode := dbms_aq.REMOVE;
  dopt.navigation := dbms_aq.FIRST_MESSAGE;
  dopt.consumer_name := consumer;

  dbms_aq.dequeue(
                queue_name => queue,
                dequeue_options => dopt,
                message_properties => mprop,
                payload => message,
                msgid => deq_msgid);
  commit;
END;
/



Rem
Rem  Updates the status of the order in the status table
Rem

CREATE OR REPLACE PROCEDURE update_status(
                                new_status    IN VARCHAR2,
                                order_msg    IN BOLADM.ORDER_TYP)
IS
 old_status    VARCHAR2(30);
 dummy         NUMBER;
BEGIN

  BEGIN
```

```
     /* query old status from the table */
     SELECT st.status INTO old_status from order_status_table st
        where st.customer_order.orderno = order_msg.orderno;

   /* Status can be 'BOOKED_ORDER', 'SHIPPED_ORDER', 'BACK_ORDER'
    *          and   'BILLED_ORDER'
    */

    IF new_status = 'SHIPPED_ORDER' THEN
       IF old_status = 'BILLED_ORDER' THEN
         return;             /* message about a previous state */
       END IF;
    ELSIF new_status = 'BACK_ORDER' THEN
       IF old_status = 'SHIPPED_ORDER' OR old_status = 'BILLED_ORDER' THEN
         return;             /* message about a previous state */
       END IF;
    END IF;

    /* update the order status  */
      UPDATE order_status_table st
         SET st.customer_order = order_msg, st.status = new_status
         where st.customer_order.orderno = order_msg.orderno;

    COMMIT;

   EXCEPTION
   WHEN OTHERS  THEN     /* change to no data found */
     /* first update for the order */
     INSERT INTO order_status_table(customer_order, status)
     VALUES (order_msg, new_status);
     COMMIT;

   END;
 END;
 /


 Rem
 Rem  Monitors the customer service queues for 'time' seconds
 Rem

  CREATE OR REPLACE PROCEDURE MONITOR_STATUS_QUEUE(time  IN  NUMBER)
 IS
   agent_w_message   aq$_agent;
   agent_list        dbms_aq.agent_list_t;
```

```
  wait_time         INTEGER := 120;
  no_message        EXCEPTION;
  pragma EXCEPTION_INIT(no_message, -25254);
  order_msg         boladm.order_typ;
  new_status        VARCHAR2(30);
  monitor           BOOLEAN := TRUE;
  begin_time        number;
  end_time          number;
BEGIN

 begin_time :=  dbms_utility.get_time;
 WHILE (monitor)
 LOOP
 BEGIN
  agent_list(1) := aq$_agent('BILLED_ORDER', 'CS_billedorders_que', NULL);
  agent_list(2) := aq$_agent('SHIPPED_ORDER', 'CS_shippedorders_que', NULL);
  agent_list(3) := aq$_agent('BACK_ORDER', 'CS_backorders_que', NULL);
  agent_list(4) := aq$_agent('Booked_ORDER', 'CS_bookedorders_que', NULL);

   /* wait for order status messages */
   dbms_aq.listen(agent_list, wait_time, agent_w_message);

   dbms_output.put_line('Agent' || agent_w_message.name || ' Address '|| agent_
w_message.address);
   /* dequeue the message from the queue */
   dequeue_message(agent_w_message.address, agent_w_message.name, order_msg);

   /* update the status of the order depending on the type of the message
    * the name of the agent contains the new state
    */
   update_status(agent_w_message.name, order_msg);

  /* exit if we have been working long enough */
   end_time := dbms_utility.get_time;
   IF  (end_time - begin_time > time)   THEN
     EXIT;
   END IF;

  EXCEPTION
  WHEN  no_message  THEN
    dbms_output.put_line('No messages in the past 2 minutes');
       end_time := dbms_utility.get_time;
    /* exit if we have done enough work */
    IF  (end_time - begin_time > time)   THEN
      EXIT;
```

```
    END IF;
  END;

  END LOOP;
END;
/




Rem
Rem   History queries
Rem

Rem
Rem   Average processing time for messages in western shipping:
Rem   Difference between the ship- time and book-time for the order
Rem
Rem   NOTE: we assume that order id is the correlation identifier
Rem         Only processed messages are considered.

Connect WS/WS


SELECT  SUM(SO.enq_time - BO.enq_time) / count (*) AVG_PRCS_TIME
 FROM WS.AQ$WS_orders_pr_mqtab BO , WS.AQ$WS_orders_mqtab SO
 WHERE SO.msg_state = 'PROCESSED' and BO.msg_state = 'PROCESSED'
 AND SO.corr_id = BO.corr_id and SO.queue = 'WS_shippedorders_que';


Rem
Rem  Average backed up time (again only processed messages are considered
Rem

SELECT SUM(BACK.deq_time - BACK.enq_time)/count (*) AVG_BACK_TIME
  FROM WS.AQ$WS_orders_mqtab BACK
  WHERE BACK.msg_state = 'PROCESSED' and BACK.queue = 'WS_backorders_que';
```

tkaqdoce.sql: Operational Examples

```
Rem
Rem $Header: tkaqdoce.sql 26-jan-99.17:51:28 aquser1 Exp $
Rem
Rem tkaqdocl.sql
Rem
Rem  Copyright (c) Oracle Corporation 1998, 1999. All Rights Reserved.
Rem


set echo on

Rem ==================================================================
Rem        Demonstrate enqueuing a backorder with delay time set
Rem        to 1 day.  This will guarantee that each backorder will
Rem        be processed only once a day until the order is filled.
Rem ==================================================================

Rem Create a package that enqueue with delay set to one day
connect BOLADM/BOLADM
create or replace procedure requeue_unfilled_order(sale_region varchar2,
                                                   backorder order_typ)
as
  back_order_queue_name    varchar2(62);
  enqopt                   dbms_aq.enqueue_options_t;
  msgprop                  dbms_aq.message_properties_t;
  enq_msgid                raw(16);
begin
  -- Choose a back order queue based the the region
  IF sale_region = 'WEST' THEN
    back_order_queue_name := 'WS.WS_backorders_que';
  ELSIF sale_region = 'EAST' THEN
    back_order_queue_name := 'ES.ES_backorders_que';
  ELSE
    back_order_queue_name := 'OS.OS_backorders_que';
  END IF;

  -- Enqueue the order with delay time set to 1 day
  msgprop.delay := 60*60*24;
  dbms_aq.enqueue(back_order_queue_name, enqopt, msgprop,
                  backorder, enq_msgid);
end;
```

tkaqdocp.sql: Examples of Operational Interfaces

```
Rem
Rem $Header: tkaqdocp.sql 26-jan-99.17:50:54 aquser1 Exp $
Rem
Rem tkaqdocp.sql
Rem
Rem  Copyright (c) Oracle Corporation 1998, 1999. All Rights Reserved.
Rem
Rem    NAME
Rem      tkaqdocp.sql - <one-line expansion of the name>
Rem

set echo on;

Rem =====================================================================
Rem        Illustrating Support for Real Application Clusters
Rem =====================================================================

Rem Login into OE account
connect OE/OE;
set serveroutput on;

Rem check instance affinity of OE queue tables from AQ administrative view

select queue_table, primary_instance, secondary_instance, owner_instance
from user_queue_tables;

Rem alter instance affinity of OE queue tables

begin
dbms_aqadm.alter_queue_table(
        queue_table => 'OE.OE_orders_sqtab',
        primary_instance => 2,
        secondary_instance => 1);
end;
/

begin
dbms_aqadm.alter_queue_table(
        queue_table => 'OE.OE_orders_pr_mqtab',
        primary_instance => 1,
        secondary_instance => 2);
end;
/
```

```
Rem check instance affinity of OE queue tables from AQ administrative view

select queue_table, primary_instance, secondary_instance, owner_instance
from user_queue_tables;

Rem ==================================================================
Rem                       Illustrating Propagation Scheduling
Rem ==================================================================

Rem Login into OE account

set echo on;
connect OE/OE;
set serveroutput on;

Rem
Rem Schedule Propagation from bookedorders_que to shipping
Rem

execute dbms_aqadm.schedule_propagation(queue_name => 'OE.OE_bookedorders_que');

Rem Login into boladm account
set echo on;
connect boladm/boladm;
set serveroutput on;

Rem create a procedure to enqueue an order
create or replace procedure order_enq(book_title   in varchar2,
                                      book_qty     in number,
                                      order_num    in number,
                                      shipping_priority in number,
                                      cust_state   in varchar2,
                                      cust_country in varchar2,
                                      cust_region  in varchar2,
                                      cust_ord_typ in varchar2) as

OE_enq_order_data        BOLADM.order_typ;
OE_enq_cust_data         BOLADM.customer_typ;
OE_enq_book_data         BOLADM.book_typ;
OE_enq_item_data         BOLADM.orderitem_typ;
OE_enq_item_list         BOLADM.orderitemlist_vartyp;
enqopt                   dbms_aq.enqueue_options_t;
msgprop                  dbms_aq.message_properties_t;
enq_msgid                raw(16);
```

```
begin

        msgprop.correlation := cust_ord_typ;
        OE_enq_cust_data := BOLADM.customer_typ(NULL, NULL, NULL, NULL,
                                cust_state, NULL, cust_country);
        OE_enq_book_data := BOLADM.book_typ(book_title, NULL, NULL, NULL);
        OE_enq_item_data := BOLADM.orderitem_typ(book_qty,
                                OE_enq_book_data, NULL);
        OE_enq_item_list := BOLADM.orderitemlist_vartyp(
                                BOLADM.orderitem_typ(book_qty,
                                OE_enq_book_data, NULL));
        OE_enq_order_data := BOLADM.order_typ(order_num, NULL,
                                cust_ord_typ, cust_region,
                                OE_enq_cust_data, NULL,
                                OE_enq_item_list, NULL);

        -- Put the shipping priority into message property before
        -- enqueueing the message
        msgprop.priority := shipping_priority;
        dbms_aq.enqueue('OE.OE_bookedorders_que', enqopt, msgprop,
                        OE_enq_order_data, enq_msgid);
end;
/

show errors;

grant execute on order_enq to OE;

Rem now create a procedure to dequeue booked orders for shipment processing
create or replace procedure shipping_bookedorder_deq(
                                        consumer in varchar2,
                                        deqmode in binary_integer) as

deq_cust_data           BOLADM.customer_typ;
deq_book_data           BOLADM.book_typ;
deq_item_data           BOLADM.orderitem_typ;
deq_msgid               RAW(16);
dopt                    dbms_aq.dequeue_options_t;
mprop                   dbms_aq.message_properties_t;
deq_order_data          BOLADM.order_typ;
qname                   varchar2(30);
no_messages             exception;
pragma exception_init   (no_messages, -25228);
new_orders              BOOLEAN := TRUE;
```

```
begin

        dopt.consumer_name := consumer;
        dopt.wait := DBMS_AQ.NO_WAIT;
        dopt.dequeue_mode := deqmode;
        dopt.navigation := dbms_aq.FIRST_MESSAGE;

        IF (consumer = 'West_Shipping') THEN
                qname := 'WS.WS_bookedorders_que';
        ELSIF (consumer = 'East_Shipping') THEN
                qname := 'ES.ES_bookedorders_que';
        ELSE
                qname := 'OS.OS_bookedorders_que';
        END IF;

        WHILE (new_orders) LOOP
          BEGIN
            dbms_aq.dequeue(
                queue_name => qname,
                dequeue_options => dopt,
                message_properties => mprop,
                payload => deq_order_data,
                msgid => deq_msgid);

            deq_item_data := deq_order_data.items(1);
            deq_book_data := deq_item_data.item;
            deq_cust_data := deq_order_data.customer;

            dbms_output.put_line(' **** next booked order **** ');
            dbms_output.put_line('order_num: ' || deq_order_data.orderno ||
                        ' book_title: ' || deq_book_data.title ||
                        ' quantity: ' || deq_item_data.quantity);
            dbms_output.put_line('ship_state: ' || deq_cust_data.state ||
                        ' ship_country: ' || deq_cust_data.country ||
                        ' ship_order_type: ' || deq_order_data.ordertype);
            dopt.navigation := dbms_aq.NEXT_MESSAGE;
          EXCEPTION
            WHEN no_messages THEN
                 dbms_output.put_line (' ---- NO MORE BOOKED ORDERS ---- ');
                 new_orders := FALSE;
          END;
        END LOOP;

end;
```

```
/
show errors;

Rem now create a procedure to dequeue rush orders for shipment
create or replace procedure get_rushtitles(consumer in varchar2) as

deq_cust_data           BOLADM.customer_typ;
deq_book_data           BOLADM.book_typ;
deq_item_data           BOLADM.orderitem_typ;
deq_msgid               RAW(16);
dopt                    dbms_aq.dequeue_options_t;
mprop                   dbms_aq.message_properties_t;
deq_order_data          BOLADM.order_typ;
qname                   varchar2(30);
no_messages             exception;
pragma exception_init   (no_messages, -25228);
new_orders              BOOLEAN := TRUE;

begin

        dopt.consumer_name := consumer;
        dopt.wait := 1;
        dopt.correlation := 'RUSH';

        IF (consumer = 'West_Shipping') THEN
                qname := 'WS.WS_bookedorders_que';
        ELSIF (consumer = 'East_Shipping') THEN
                qname := 'ES.ES_bookedorders_que';
        ELSE
                qname := 'OS.OS_bookedorders_que';
        END IF;

        WHILE (new_orders) LOOP
          BEGIN
            dbms_aq.dequeue(
                queue_name => qname,
                dequeue_options => dopt,
                message_properties => mprop,
                payload => deq_order_data,
                msgid => deq_msgid);

            deq_item_data := deq_order_data.items(1);
            deq_book_data := deq_item_data.item;

            dbms_output.put_line(' rushorder book_title: ' ||
```

```
                                deq_book_data.title ||
                        ' quantity: ' || deq_item_data.quantity);
          EXCEPTION
            WHEN no_messages THEN
                 dbms_output.put_line (' ---- NO MORE RUSH TITLES ---- ');
                 new_orders := FALSE;
          END;
        END LOOP;

end;
/
show errors;

Rem now create a procedure to dequeue orders for handling North American
Rem orders
create or replace procedure get_northamerican_orders as

deq_cust_data            BOLADM.customer_typ;
deq_book_data            BOLADM.book_typ;
deq_item_data            BOLADM.orderitem_typ;
deq_msgid                RAW(16);
dopt                     dbms_aq.dequeue_options_t;
mprop                    dbms_aq.message_properties_t;
deq_order_data           BOLADM.order_typ;
deq_order_nodata         BOLADM.order_typ;
qname                    varchar2(30);
no_messages              exception;
pragma exception_init    (no_messages, -25228);
new_orders               BOOLEAN := TRUE;

begin

        dopt.consumer_name := 'Overseas_Shipping';
        dopt.wait := DBMS_AQ.NO_WAIT;
        dopt.navigation := dbms_aq.FIRST_MESSAGE;
        dopt.dequeue_mode := DBMS_AQ.LOCKED;

        qname := 'OS.OS_bookedorders_que';

        WHILE (new_orders) LOOP
          BEGIN
            dbms_aq.dequeue(
                queue_name => qname,
                dequeue_options => dopt,
                message_properties => mprop,
```

```
                    payload => deq_order_data,
                    msgid => deq_msgid);

                deq_item_data := deq_order_data.items(1);
                deq_book_data := deq_item_data.item;
                deq_cust_data := deq_order_data.customer;

                IF (deq_cust_data.country = 'Canada' OR
                    deq_cust_data.country = 'Mexico' ) THEN

                    dopt.dequeue_mode := dbms_aq.REMOVE_NODATA;
                    dopt.msgid := deq_msgid;
                    dbms_aq.dequeue(
                            queue_name => qname,
                            dequeue_options => dopt,
                            message_properties => mprop,
                            payload => deq_order_nodata,
                            msgid => deq_msgid);

                    dbms_output.put_line(' **** next booked order **** ');
                    dbms_output.put_line('order_no: ' || deq_order_data.orderno ||
                            ' book_title: ' || deq_book_data.title ||
                            ' quantity: ' || deq_item_data.quantity);
                    dbms_output.put_line('ship_state: ' || deq_cust_data.state ||
                            ' ship_country: ' || deq_cust_data.country ||
                            ' ship_order_type: ' || deq_order_data.ordertype);

                END IF;

                commit;
                dopt.dequeue_mode := DBMS_AQ.LOCKED;
                dopt.msgid := NULL;
                dopt.navigation := dbms_aq.NEXT_MESSAGE;
              EXCEPTION
                WHEN no_messages THEN
                     dbms_output.put_line (' ---- NO MORE BOOKED ORDERS ---- ');
                     new_orders := FALSE;
              END;
            END LOOP;

    end;
    /
    show errors;

    grant execute on shipping_bookedorder_deq to WS;
```

```
grant execute on shipping_bookedorder_deq to ES;
grant execute on shipping_bookedorder_deq to OS;
grant execute on shipping_bookedorder_deq to CS;

grant execute on get_rushtitles to ES;

grant execute on get_northamerican_orders to OS;

Rem Login into OE account
connect OE/OE;
set serveroutput on;

Rem
Rem Enqueue some orders into OE_bookedorders_que
Rem

execute BOLADM.order_enq('My First   Book', 1, 1001, 3,'CA', 'USA', 'WESTERN',
'NORMAL');
execute BOLADM.order_enq('My Second  Book', 2, 1002, 3,'NY', 'USA', 'EASTERN',
'NORMAL');
execute BOLADM.order_enq('My Third   Book', 3, 1003, 3, '',   'Canada',
'INTERNATIONAL', 'NORMAL');
execute BOLADM.order_enq('My Fourth  Book', 4, 1004, 2, 'NV', 'USA', 'WESTERN',
'RUSH');
execute BOLADM.order_enq('My Fifth   Book', 5, 1005, 2, 'MA', 'USA', 'EASTERN',
'RUSH');
execute BOLADM.order_enq('My Sixth   Book', 6, 1006, 3,''  , 'UK',
'INTERNATIONAL', 'NORMAL');
execute BOLADM.order_enq('My Seventh Book', 7, 1007, 1,'',   'Canada',
'INTERNATIONAL', 'RUSH');
execute BOLADM.order_enq('My Eighth  Book', 8, 1008, 3,'',   'Mexico',
'INTERNATIONAL', 'NORMAL');
execute BOLADM.order_enq('My Ninth   Book', 9, 1009, 1, 'CA', 'USA', 'WESTERN',
'RUSH');
execute BOLADM.order_enq('My Tenth   Book', 8, 1010, 3, ''  , 'UK',
'INTERNATIONAL', 'NORMAL');
execute BOLADM.order_enq('My Last    Book', 7, 1011, 3, ''  , 'Mexico',
'INTERNATIONAL', 'NORMAL');
commit;
/

Rem
Rem Wait for Propagation to Complete
Rem
```

```
execute dbms_lock.sleep(100);

Rem ==================================================================
Rem                  Illustrating Dequeue Modes/Methods
Rem ==================================================================


connect WS/WS;
set serveroutput on;

Rem Dequeue all booked orders for West_Shipping
execute BOLADM.shipping_bookedorder_deq('West_Shipping', DBMS_AQ.REMOVE);
commit;
/

connect ES/ES;
set serveroutput on;

Rem Browse all booked orders for East_Shipping
execute BOLADM.shipping_bookedorder_deq('East_Shipping', DBMS_AQ.BROWSE);

Rem Dequeue all rush order titles for East_Shipping
execute BOLADM.get_rushtitles('East_Shipping');
commit;
/

Rem Dequeue all remaining booked orders (normal order) for East_Shipping
execute BOLADM.shipping_bookedorder_deq('East_Shipping', DBMS_AQ.REMOVE);
commit;
/

connect OS/OS;
set serveroutput on;

Rem Dequeue all international North American orders for Overseas_Shipping
execute BOLADM.get_northamerican_orders;
commit;
/

Rem Dequeue rest of the booked orders for Overseas_Shipping
execute BOLADM.shipping_bookedorder_deq('Overseas_Shipping', DBMS_AQ.REMOVE);
commit;
/
```

```
Rem ====================================================================
Rem           Illustrating Enhanced Propagation Capabilities
Rem ====================================================================

connect OE/OE;
set serveroutput on;

Rem
Rem Get propagation schedule information & statistics
Rem

Rem get averages
select avg_time, avg_number, avg_size from user_queue_schedules;

Rem get totals
select total_time, total_number, total_bytes from user_queue_schedules;

Rem get status information of schedule (present only when active)
select process_name, session_id, instance, schedule_disabled
        from user_queue_schedules;

Rem get information about last and next execution
select last_run_date, last_run_time, next_run_date, next_run_time
        from user_queue_schedules;

Rem get last error information if any
select failures, last_error_msg, last_error_date, last_error_time
        from user_queue_schedules;

Rem disable propagation schedule for booked orders

execute dbms_aqadm.disable_propagation_schedule(queue_name => 'OE_bookedorders_
que');
execute dbms_lock.sleep(30);
select schedule_disabled from user_queue_schedules;

Rem alter propagation schedule for booked orders to execute every
Rem 15 mins (900 seconds) for a window duration of 300 seconds

begin
dbms_aqadm.alter_propagation_schedule(
        queue_name => 'OE_bookedorders_que',
        duration => 300,
        next_time => 'SYSDATE + 900/86400',
        latency => 25);
```

```
end;
/

execute dbms_lock.sleep(30);
select next_time, latency, propagation_window from user_queue_schedules;

Rem enable propagation schedule for booked orders

execute dbms_aqadm.enable_propagation_schedule(queue_name => 'OE_bookedorders_
que');
execute dbms_lock.sleep(30);
select schedule_disabled from user_queue_schedules;

Rem unschedule propagation for booked orders

execute dbms_aqadm.unschedule_propagation(queue_name => 'OE.OE_bookedorders_
que');

set echo on;

Rem ==================================================================
Rem                       Illustrating Message Grouping
Rem ==================================================================

Rem Login into boladm account
set echo on;
connect boladm/boladm;
set serveroutput on;

Rem now create a procedure to handle order entry
create or replace procedure new_order_enq(book_title   in varchar2,
                                          book_qty     in number,
                                          order_num    in number,
                                          cust_state   in varchar2) as

OE_enq_order_data        BOLADM.order_typ;
OE_enq_cust_data         BOLADM.customer_typ;
OE_enq_book_data         BOLADM.book_typ;
OE_enq_item_data         BOLADM.orderitem_typ;
OE_enq_item_list         BOLADM.orderitemlist_vartyp;
enqopt                   dbms_aq.enqueue_options_t;
msgprop                  dbms_aq.message_properties_t;
enq_msgid                raw(16);

begin
```

```
        OE_enq_cust_data := BOLADM.customer_typ(NULL, NULL, NULL, NULL,
                                cust_state, NULL, NULL);
        OE_enq_book_data := BOLADM.book_typ(book_title, NULL, NULL, NULL);
        OE_enq_item_data := BOLADM.orderitem_typ(book_qty,
                                OE_enq_book_data, NULL);
        OE_enq_item_list := BOLADM.orderitemlist_vartyp(
                                BOLADM.orderitem_typ(book_qty,
                                OE_enq_book_data, NULL));
        OE_enq_order_data := BOLADM.order_typ(order_num, NULL,
                                NULL, NULL,
                                OE_enq_cust_data, NULL,
                                OE_enq_item_list, NULL);
        dbms_aq.enqueue('OE.OE_neworders_que', enqopt, msgprop,
                        OE_enq_order_data, enq_msgid);
end;
/
show errors;

Rem now create a procedure to handle order enqueue
create or replace procedure same_order_enq(book_title   in varchar2,
                                           book_qty     in number) as

OE_enq_order_data       BOLADM.order_typ;
OE_enq_book_data        BOLADM.book_typ;
OE_enq_item_data        BOLADM.orderitem_typ;
OE_enq_item_list        BOLADM.orderitemlist_vartyp;
enqopt                  dbms_aq.enqueue_options_t;
msgprop                 dbms_aq.message_properties_t;
enq_msgid               raw(16);

begin

        OE_enq_book_data := BOLADM.book_typ(book_title, NULL, NULL, NULL);
        OE_enq_item_data := BOLADM.orderitem_typ(book_qty,
                                OE_enq_book_data, NULL);
        OE_enq_item_list := BOLADM.orderitemlist_vartyp(
                                BOLADM.orderitem_typ(book_qty,
                                OE_enq_book_data, NULL));
        OE_enq_order_data := BOLADM.order_typ(NULL, NULL,
                                NULL, NULL,
                                NULL, NULL,
                                OE_enq_item_list, NULL);
        dbms_aq.enqueue('OE.OE_neworders_que', enqopt, msgprop,
                        OE_enq_order_data, enq_msgid);
```

```
end;
/
show errors;

grant execute on new_order_enq to OE;
grant execute on same_order_enq to OE;

Rem now create a procedure to get new orders by dequeuing
create or replace procedure get_new_orders as

deq_cust_data            BOLADM.customer_typ;
deq_book_data            BOLADM.book_typ;
deq_item_data            BOLADM.orderitem_typ;
deq_msgid                RAW(16);
dopt                     dbms_aq.dequeue_options_t;
mprop                    dbms_aq.message_properties_t;
deq_order_data           BOLADM.order_typ;
qname                    varchar2(30);
no_messages              exception;
end_of_group             exception;
pragma exception_init    (no_messages, -25228);
pragma exception_init    (end_of_group, -25235);
new_orders               BOOLEAN := TRUE;

begin

        dopt.wait := 1;
        dopt.navigation := DBMS_AQ.FIRST_MESSAGE;
        qname := 'OE.OE_neworders_que';
        WHILE (new_orders) LOOP
          BEGIN
            LOOP
                BEGIN
                    dbms_aq.dequeue(
                        queue_name => qname,
                        dequeue_options => dopt,
                        message_properties => mprop,
                        payload => deq_order_data,
                        msgid => deq_msgid);

                    deq_item_data := deq_order_data.items(1);
                    deq_book_data := deq_item_data.item;
                    deq_cust_data := deq_order_data.customer;

                    IF (deq_cust_data IS NOT NULL) THEN
```

```
                    dbms_output.put_line(' **** NEXT ORDER **** ');
                    dbms_output.put_line('order_num: ' ||
                              deq_order_data.orderno);
                    dbms_output.put_line('ship_state: ' ||
                              deq_cust_data.state);
                  END IF;
                  dbms_output.put_line(' ---- next book ---- ');
                  dbms_output.put_line(' book_title: ' ||
                              deq_book_data.title ||
                              ' quantity: ' || deq_item_data.quantity);
              EXCEPTION
                  WHEN end_of_group THEN
                    dbms_output.put_line ('*** END OF ORDER ***');
                    commit;
                    dopt.navigation := DBMS_AQ.NEXT_TRANSACTION;
              END;
          END LOOP;
        EXCEPTION
          WHEN no_messages THEN
               dbms_output.put_line (' ---- NO MORE NEW ORDERS ---- ');
               new_orders := FALSE;
        END;
      END LOOP;

end;
/

show errors;

grant execute on get_new_orders to OE;

Rem Login into OE account
connect OE/OE;
set serveroutput on;

Rem
Rem Enqueue some orders using message grouping into OE_neworders_que
Rem

Rem First Order
execute BOLADM.new_order_enq('My First   Book', 1, 1001, 'CA');
execute BOLADM.same_order_enq('My Second  Book', 2);
commit;
/
```

```
Rem Second Order
execute BOLADM.new_order_enq('My Third   Book', 1, 1002, 'WA');
commit;
/

Rem Third Order
execute BOLADM.new_order_enq('My Fourth  Book', 1, 1003, 'NV');
execute BOLADM.same_order_enq('My Fifth   Book', 3);
execute BOLADM.same_order_enq('My Sixth   Book', 2);
commit;
/

Rem Fourth Order
execute BOLADM.new_order_enq('My Seventh Book', 1, 1004, 'MA');
execute BOLADM.same_order_enq('My Eighth  Book', 3);
execute BOLADM.same_order_enq('My Ninth   Book', 2);
commit;
/

Rem
Rem Dequeue the neworders
Rem

execute BOLADM.get_new_orders;
```

tkaqdocc.sql: Clean-Up Script

```
Rem
Rem $Header: tkaqdocc.sql 26-jan-99.17:51:05 aquser1 Exp $
Rem
Rem tkaqdocc.sql
Rem
Rem  Copyright (c) Oracle Corporation 1998, 1999. All Rights Reserved.
Rem
Rem    NAME
Rem      tkaqdocc.sql - <one-line expansion of the name>
Rem

set echo on;
connect system/manager
set serveroutput on;

drop user WS cascade;
drop user ES cascade;
drop user OS cascade;
drop user CB cascade;
drop user CBADM cascade;
drop user CS cascade;
drop user OE cascade;
drop user boladm cascade;
```

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JMS and AQ XML Servlet Error Messages

A list of error messages is provided to aid you in troubleshooting problems.

JMS Error Messages

JMS-101 Invalid delivery mode (string)

Cause: The delivery mode is not supported

Action: The valid delivery mode is AQjmsConstants.PERSISTENT

JMS-102 Feature not supported (string)

Cause: This feature is not supported in the current release

Action: Self-explanatory

JMS-104 Message Payload must be specified

Cause: The message payload was null

Action: Specify a non-null payload for the message

JMS-105 Agent must be specified

Cause: AQjmsAgent object was null

Action: Specify a valid AQjmsAgent representing the remote subscriber

JMS-106 Cannot have more than one open Session on a JMSConnection

Cause: There is already one open JMS session on the connection. Cannot have more than one open session on a connection

Action: Close the open session and then open a new one

JMS-107 Operation not allowed on (string)

Cause: The specified operation is not allowed on this object

Action: Self-explanatory

JMS-108 Messages of type (string) not allowed with Destinations containing payload of type (string)

Cause: There was a mismatch between the message type being used and the payload type specified for the destination

Action: Use the message type that maps to the payload specified for the queue table that contains this destination

JMS-109 Class not found: (string)

Cause: The specified class was not found

Action: Make sure your `CLASSPATH` contains the class

JMS-110 Property (string) not writeable

Cause: An attempt was made to update a read-only message header field or property

Action: Self-explanatory

JMS-111 Connection must be specified

Cause: The connection object was null

Action: Specify a non-null JDBC connection

JMS-112 Connection is invalid

Cause: The JDBC connection is invalid

Action: Specify a non-null oracle JDBC connection

JMS-113 Connection is in stopped state

Cause: An attempt was made to receive messages on a connection that is in stopped state

Action: Start the connection

JMS-114 Connection is closed

Cause: An attempt was made to use a Connection that has been closed

Action: Create a new connection

JMS-115 Consumer is closed

Cause: An attempt was mode to use a Consumer that has been closed

Action: Create a new Message Consumer

JMS-116 Subscriber name must be specified

Cause: Subscriber name was null

Action: Specify a non-null subscription name

JMS-117 Conversion failed - invalid property type

Cause: An error occurred while converting the property to the requested type

Action: Use the method corresponding to the property data type to retrieve it

JMS-119 Invalid Property value

Cause: The property value specified is invalid

Action: Use the appropriate type of value for the property being set

JMS-120 Dequeue failed

Cause: An error occurred while receiving the message

Action: See message inside the JMSException and linked SQLException for more information

JMS-121 DestinationProperty must be specified

Cause: A null AQjmsDestinationProperty was specified while creating a queue/topic

Action: Specify a non-null AQjmsDestinationProperty for the destination

JMS-122 Internal error (string)

Cause: Internal error occurred

Action: Call Support

JMS-123 Interval must be at least (integer) seconds

Cause: An invalid interval was specified

Action: The interval must be greater than 30 seconds

JMS-124 Invalid Dequeue mode

Cause: Invalid dequeue mode was specified

Action: Valid Dequeue modes are AQConstants.DEQUEUE_BROWSE, AQConstants.DEQUEUE_REMOVE, AQConstants.DEQUEUE_LOCKED, AQConstants.DEQUEUE_REMOVE_NODATA

JMS-125 Invalid Queue specified

Cause: An invalid Queue object was specified

Action: Specify a valid Queue handle

JMS-126 Invalid Topic specified

Cause: An invalid Topic object was specified

Action: Specify a valid Topic handle

JMS-127 Invalid Destination

Cause: An invalid destination object was specified

Action: Specify a valid destination (Queue/Topic) object

JMS-128 Invalid Navigation mode

Cause: An invalid navigation mode was specified

Action: The valid navigation modes are AQjmsConstants.NAVIGATION_ FIRST_MESSAGE, AQjmsConstants.NAVIGATION_NEXT_MESSAGE, AQjmsConstants.NAVIGATION_NEXT_TRANSACTION

JMS-129 Invalid Payload type

Cause: There was a mismatch between the message type being used and the payload type specified for the destination

Action: Use the message type that maps to the payload specified for the queue table that contains this destination. For ADT messages, use the appropriate CustomDatum factory to create the message consumer

JMS-130 JMS queue cannot be multi-consumer enabled

Cause: An attempt was made to get a AQ multi-consumer queue as a JMS queue

Action: JMS queues cannot be multi-consumer enabled

JMS-131 Session is closed

Cause: An attempt was made to use a session that has been closed

Action: Open a new session

JMS-132 Maximum number of properties (integer) exceeded

Cause: Maximum number of user defined properties for the message has been exceeded

Action: Self-explanatory

JMS-133 Message must be specified

Cause: Message specified was null

Action: Specify a non-null message

JMS-134 Name must be specified

Cause: Queue or Queue table Name specified was null

Action: Specify a non-null name

JMS-135 Driver (string) not supported

Cause: The specified driver is not supported

Action: Valid drivers are oci8 and thin. To use the kprb driver get the kprb connection using getDefaultConnection() and use the static createTopicConnection and createQueueConnection methods

JMS-136 Payload factory can only be specified for destinations with ADT payloads

Cause: A CustomDatumFactory was specified for consumers on destinations not containing ADT payloads

Action: This field must be set to null for destinations containing payloads of type SYS.AQ$_JMS_TEXT_MESSAGE, SYS.AQ$_JMS_BYTES_MESSAGE, SYS.AQ$_JMS_MAP_MESSAGE, SYS.AQ$_JMS_OBJECT_MESSAGE, SYS.AQ$_JMS_STREAM_MESSAGE

JMS-137 Payload factory must be specified for destinations with ADT payloads

Cause: CustomDatumFactory was not specified for destinations containing ADT payloads

Action: For destinations containing ADT messages, a CustomDatumFactory for a java class that maps to the SQL ADT type of the destination must be specified

JMS-138 Producer is closed

Cause: An attempt was made to use a producer that has been closed

Action: Create a new Message Producer

JMS-139 Property name must be specified

Cause: Property name was null

Action: Specify a non-null property name

JMS-140 Invalid System property

Cause: Invalid system property name specified.

Action: Specify one of the valid JMS system properties

JMS-142 JMS topic must be created in multi-consumer enabled queue tables

Cause: An attempt was made to create a JMS topic in a single-consumer queue table

Action: JMS topics can only be created in queue tables that are multi-consumer enabled

JMS-143 Queue must be specified

Cause: Null queue was specified

Action: Specify a non-null queue

JMS-144 JMS queue cannot be created in multiconsumer enabled queue tables

Cause: An attempt was made to create a JMS queue in a multi-consumer queue table

Action: JMS queues can only be created in queue tables that are not multi-consumer enabled

JMS-145 Invalid recipient list

Cause: The recipient list specified was empty

Action: Specify a recipient list with at least one recipient

JMS-146 Registration failed

Cause: An error occurred while registering the type in the type map

Action: Self-explanatory

JMS-147 Invalid ReplyTo destination type

Cause: The ReplyTo destination object type is invalid

Action: The ReplyTo destination must be of type AQjmsAgent

JMS-148 Property name size exceeded

Cause: The property name is greater than the maximum size

Action: Specify a property name that is less than 100 characters

JMS-149 Subscriber must be specified

Cause: Subscriber specified was null

Action: Specify a non-null subscriber

JMS-150 Property not supported

Cause: An attempt was made to use a property that is not supported

Action: Self-explanatory

JMS-151 Topics cannot be of type EXCEPTION

Cause: Topics cannot be of type AQjmsConstants.EXCEPTION

Action: Specify topics to be of type AQjmsConstants.NORMAL

JMS-153 Invalid System property type

Cause: The type of the value specified does not match the type defined for the system property being set

Action: Use the correct type for the setting the system property

JMS-154 Invalid value for sequence deviation

Cause: The sequence deviation is invalid

Action: Valid values are AQEnqueueOption.DEVIATION_BEFORE, AQEnqueueOption.DEVIATION_TOP

JMS-155 AQ Exception (string)

Cause: An error occurred in the AQ java layer

Action: See the message inside the JMSException and the linked exception for more information

JMS-156 Invalid Class (string)

Cause: Class specified is invalid

Action: Make sure your CLASSPATH has the specified class

JMS-157 IO Exception (string)

Cause: IO exception

Action: See message is JMSException for details

JMS-158 SQL Exception (string)

Cause: SQL Exception

Action: See message inside linked SQLException for details

JMS-159 Invalid selector (string)

Cause: The selector specified is either invalid or too long

Action: Check the syntax of the selector

JMS-160 EOF Exception (string)

Cause: EOF exception occurred while reading the byte stream

Action: Self-explanatory

JMS-161 MessageFormat Exception: (string)

Cause: An error occurred while converting the stream data to specified type

Action: Check the type of data expected on the stream and use the appropriate read method

JMS-162 Message not Readable

Cause: Message is in write-only mode

Action: Call the reset method to make the message readable

JMS-163 Message not Writeable

Cause: Message is in read-only mode

Action: Use the clearBody method to make the message writeable

JMS-164 No such element

Cause: Element with specified name was not found in the map message

Action: Self-explanatory

JMS-165 Maximum size of property value exceeded

Cause: The property value exceeded the maximum length allowed

Action: Values for JMS defined properties can be a maximum of length of 100, Values for User defined properties can have a maximum length of 2000

JMS-166 Topic must be specified

Cause: Topic specified was null

Action: Specify a non-null topic

JMS-167 Payload factory or Sql_data_class must be specified

Cause: Payload factory or Sql_data_class not specified for queues containing object payloads

Action: Specify a CustomDatumFactory or the SQLData class of the java object that maps to the ADT type defined for the queue.

JMS-168 Cannot specify both payload factory and sql_data_class

Cause: Both CustomDatumFactory and SQLData class were specified during dequeue

Action: Specify either the CustomDatumFactory or the SQLData class of the java object that maps to the ADT type defined for the queue.

JMS-169 Sql_data_class cannot be null

Cause: SQLData class specified is null

Action: Specify the SQLData class that maps to the ADT type defined for the queue

JMS-171 Message is not defined to contain (string)

Cause: Invalid payload type in message

Action: Check if the queue is defined to contain RAW or OBJECT payloads and use the appropriate payload type in the message

JMS-172 More than one queue table matches query (string)

Cause: More than one queue table matches the query

Action: Specify both owner and queue table name

JMS-173 Queue Table (string) not found

Cause: The specified queue table was not found

Action: Specify a valid queue table

JMS-174 Class must be specified for queues with object payloads\n. Use dequeue(deq_option,payload_fact) or dequeue(deq_option, sql_data_cl)

Cause: This dequeue method cannot be used to dequeue from queues with OBJECT payloads

Action: Use the either dequeue(deq_option, payload_fact) or dequeue(deq_option, sql_data_cl)

JMS-175 DequeueOption must be specified

Cause: DequeueOption specified is null

Action: Specify a non-null dequeue option

JMS-176 EnqueueOption must be specified

Cause: EnqueueOption specified is null

Action: Specify a non-null enqueue option

JMS-177 Invalid payload type: Use dequeue(deq_option) for raw payload queues

Cause: This method cannot be used to dequeue from queues with RAW payload

Action: Use the dequeue(deq_option) method

JMS-178 Invalid Queue name - (string)

Cause: The queue name specified is null or invalid

Action: Specify a queue name that is not null. The queue name must not be qualified with the schema name. The schema name must be specified as the value of the owner parameter

JMS-179 Invalid Queue Table name - (string)

Cause: The queue table name specified is null or invalid

Action: Specify a queue table name that is not null. The queue table name must not be qualified with the schema name. The schema name must be specified as the value of the owner parameter

JMS-180 Invalid Queue Type

Cause: Queue type is invalid

Action: Valid types are AQConstants.NORMAL or AQConstants.EXCEPTION

JMS-181 Invalid value for wait_time

Cause: Invalid value for wait type

Action: Wait time can be AQDequeueOption.WAIT_FOREVER, AQDequeueOption.WAIT_NONE or any value greater than 0

JMS-182 More than one queue matches query

Cause: More than one queue matches query

Action: Specify both the owner and name of the queue

JMS-183 No AQ driver registered

Cause: No AQDriver registered

Action: Make sure that the AQ java driver is registered. Use Class.forName("oracle.AQ.AQOracleDriver")

JMS-184 Queue object is invalid

Cause: The queue object is invalid

Action: The underlying JDBC connection may have been closed. Get the queue handle again

JMS-185 QueueProperty must be specified

Cause: AQQueueProperty specified is null

Action: Specify a non-null AQQueueProperty

JMS-186 QueueTableProperty must be specified

Cause: QueueTableProperty specified is null

Action: Specify a non-null AQQueueTableProperty

JMS-187 Queue Table must be specified

Cause: Queue Table specified is null

Action: Specify a non-null queue table

JMS-188 QueueTable object is invalid

Cause: The queue table object is invalid

Action: The underlying JDBC connection may have been closed. Get the queue table handle again

JMS-189 Byte array too small

Cause: The byte array given is too small to hold the data requested

Action: Specify a byte array that is large enough to hold the data requested or reduce the length requested

JMS-190 Queue (string) not found

Cause: The specified queue was not found

Action: Specify a valid queue

JMS-191 sql_data_cl must be a class that implements SQLData interface

Cause: The class specified does not support the java.sql.SQLData interface

Action: Self-explanatory

JMS-192 Invalid Visibility value

Cause: Visibility value specified is invalid

Action: Valid values areAQConstants.VISIBILITY_ONCOMMIT, AQConstants.VISIBILITY_IMMEDIATE

JMS-193 JMS queues cannot contain payload of type RAW

Cause: An attempt was made to create a JMS queue with RAW payload

Action: JMS queues/topics cannot contain RAW payload

JMS-194 Session object is invalid

Cause: Session object is invalid

Action: The underlying JDBC connection may have been closed. Create a new session

JMS-195 Invalid object type: object must implement CustomDatum or SQLData interface

Cause: Invalid object type specified

Action: Object must implement CustomDatum or SQLData interface

JMS-196 Cannot have more than one open QueueBrowser for the same destination on a JMS Session

Cause: There is already an open QueueBrowser for this queue on this session

Action: There cannot be more than one queue browser for the same queue in a particular session. Close the existing QueueBrowser and then open a new one

JMS-197 Agent address must be specified for remote subscriber

Cause: Address field is null for remote subscriber

Action: The address field must contain the fully qualified name of the remote topic

JMS-198 Invalid operation: Privileged message listener set for the Session

Cause: The client tried to use a message consumer to receive messages when the session message listener was set.

Action: Use the session's message listener to consume messages. The consumer's methods for receiving messages must not be used.

JMS-199 Registration for notification failed

Cause: Listener Registration failed

Action: See error message in linked Exception for details

JMS-200 Destination must be specified

Cause: Destination is null

Action: Specify a non-null destination

JMS-201 All Recipients in recipient_list must be specified

Cause: One or more elements in the recipient list are null

Action: All AQjmsAgents in the recipient list must be specified

JMS-202 Unregister for asynchronous receipt of messages failed

Cause: An error occurred while removing the registration of the consumer with the database for asynchronous receipt

Action: Check error message in linked exception for details

JMS-203 Payload Factory must be specified

Cause: Null Payload Factory was specified

Action: Specify a non null payload factory

JMS-204 An error occurred in the AQ JNI layer

Cause: JNI Error

Action: Check error message in linked exception for details

JMS-205 Naming Exception

Cause: Naming exception

Action: Check error message in linked exception for details

JMS-206 XA Exception XAError-{0} :: OracleError-{1}

Cause: An error occurred in the XA layer

Action: See the message inside the linked XAException for more information

JMS-207 JMS Exception {0}

Cause: An error occurred in the JMS layer

Action: See the message inside the linked JMSException for more information

JMS-208 XML SQL Exception

Cause: An error occurred in the XML SQL layer

Action: See the message inside the linked AQxmlException for more information

JMS-209 XML SAX Exception

Cause: An error occurred in the XML SAX layer

Action: See the message inside the linked AQxmlException for more information

JMS-210 XML Parse Exception

Cause: An error occurred in the XML Parser layer

Action: See the message inside the linked AQxmlException for more information

JMS-220 Connection no longer available

Cause: Connection to the database no longer available.

Action: Comment: This may happen if the database/network/machine is not accessible. This may be a transient failure.

JMS-221 Free physical database connection unavailable in connection pool

Cause: A free physical database connection was not available in the OCI connection pool in order to perform the specified operation.

Action: Try performing the operation later

AQ XML Servlet Error Messages

JMS-400 Destination name must be specified

Cause: A null Destination name was specified

Action: Specify a non-null destination name

JMS-402 Class not found: {0}

Cause: The specified class was not found

Action: Make sure your CLASSPATH contains the class specified in the error message

JMS-403 IO Exception {0}

Cause: IO exception

Action: See the message inside the linked AQxmlException for more information

JMS-404 XML Parse Exception

Cause: An error occurred in the XML Parser layer

Action: See the message inside the linked AQxmlException for more information

JMS-405 XML SAX Exception

Cause: An error occurred in the XML SAX layer

Action: See the message inside the linked AQxmlException for more information

JMS-406 JMS Exception {0}

Cause: An error occurred in the JMS layer

Action: See the message inside the linked JMSException for more information

JMS-407 Operation not allowed on {0}

Cause: The specified operation is not allowed on this object

Action: Check that the user performing the operation has the required privileges

JMS-408 Conversion failed - invalid property type

Cause: An error occurred while converting the property to the requested type

Action: Use the method corresponding to the property data type to retrieve it

JMS-409 No such element

Cause: Element with specified name was not found in the map message

Action: Specify a valid element name

JMS-410 XML SQL Exception

Cause: An error occurred in the JDBC SQL layer

Action: See the message inside the linked SQLException for more information

JMS-411 Payload body cannot be null

Cause: An invalid body string or document was specified

Action: Specify a non-null body string or document for the payload

JMS-412 Byte conversion failed

Cause: An invalid username/password was specified

Action: Specify a non-null username and password

JMS-413 Autocommit not allowed for operation

Cause: The autocommit flag cannot be set for this operation

Action: Do not set the autocommit flag

JMS-414 Destination owner must be specified

Cause: A null Destination owner was specified

Action: Specify a non-null destination name

JMS-415 Invalid Visibility value

Cause: Visibility value specified is invalid

Action: Valid values are AQxmlConstants.VISIBILITY_ONCOMMIT, AQxml-Constants.VISIBILITY_IMMEDIATE

JMS-416 Invalid Dequeue mode

Cause: Invalid dequeue mode was specified

Action: Valid Dequeue modes are AQxmlConstants.DEQUEUE_BROWSE, AQxmlConstants.DEQUEUE_REMOVE, AQxmlConstants.DEQUEUE_LOCKED, AQxmlConstants.DEQUEUE_REMOVE_NODATA

JMS-417 Invalid Navigation mode

Cause: An invalid navigation mode was specified

Action: The valid navigation modes are:
AQxmlConstants.NAVIGATION_FIRST_MESSAGE
AQxmlConstants.NAVIGATION_NEXT_MESSAGE
AQxmlConstants.NAVIGATION_NEXT_TRANSACTION

JMS-418 Invalid value for wait_time

Cause: Invalid value for wait type

Action: Wait time can be AQDequeueOption.WAIT_FOREVER, AQDequeueOption.WAIT_NONE, or any value greater than 0

JMS-419 Invalid ConnectionPoolDataSource

Cause: A null or invalid ConnectionPoolDataSource was specified

Action: Specify a valid OracleConnectionPoolDataSource object with the correct URL and user/password

JMS-420 Invalid value for cache_size

Cause: An invalid cache_size was specified

Action: Cache size must be greater than 0

JMS-421 Invalid value for cache_scheme

Cause: An invalid cache scheme was specified

Action: The valid cache schemes are:
OracleConnectionCacheImpl.DYNAMIC_SCHEME
OracleConnectionCacheImpl.FIXED_WAIT_SCHEME

JMS-422 Invalid tag - {0}

Cause: An invalid tag was encountered in the XML document

Action: Verify that the XML document conforms to the AQ schema

JMS-423 Invalid value

Cause: An invalid value was specified

Action: Verify that the value specified in the XML document conforms to those specified in the AQ schema

JMS-424 Invalid message header

Cause: The message header specified is null or invalid

Action: Specify a valid message header

JMS-425 Property name must be specified

Cause: Property name was null

Action: Specify a non-null property name

JMS-426 Property does not exist

Cause: Invalid property name specified. The property does not exist

Action: The property does not exist

JMS-427 Subscriber name must be specified

Cause: Subscriber name was null

Action: Specify a non-null subscription name

JMS-428 Valid message must be specified

Cause: Message was null

Action: Specify a non-null message

JMS-429 Register Option must be specified

Cause: Register option is null

Action: Specify a non-null Register Option

JMS-430 Database Link must be specified

Cause: DB Link is null

Action: Specify a non-null Register Option

JMS-431 Sequence Number must be specified

Cause: Register option is null

Action: Specify a non-null Register Option

JMS-432 Status must be specified

Cause: Status option is null

Action: Specify a non-null Register Option

JMS-433 User not authenticated

Cause: User is not authenticated

Action: Check that the user was authenticated by the webserver before connecting to the Servlet

JMS-434 Invalid data source

Cause: Data source is null or invalid

Action: Specify a valid data source for connecting to the database

JMS-435 Invalid schema location

Cause: Schema location is null or invalid

Action: Specify a valid URL for the schema

JMS-436 AQ Exception

Cause: An error occurred in the AQ java layer

Action: See the message inside the AQxmlException and the linked exception for more information

JMS-437 Invalid Destination

Cause: An invalid destination object was specified

Action: Specify a valid destination (Queue/Topic) object

JMS-438 AQ agent {0} not mapped to a valid database user

Cause: The AQ agent specified does not map to a database user which has privileges to perform the requested operation

Action: Use dbms_aqadm.enable_db_access to map the agent to a database user with the required queue privileges

JMS-439 Invalid schema document

Cause: The schema document specified is not valid

Action: Specify a valid URL for the schema document

JMS-440 Invalid operations - agent {0} maps to more than one database user

Cause: The AQ agent mapped to more than one database user in the same session

Action: Map the AQ agent to only one database user. Check the `aq$internet_users` view for database users that map to this agent.

E

Unified Modeling Language Diagrams

The Unified Modeling Language (UML) use case diagrams in this manual present a representation of the technology used in Advanced Queuing. A brief explanation of use case diagrams and UML notation follows.

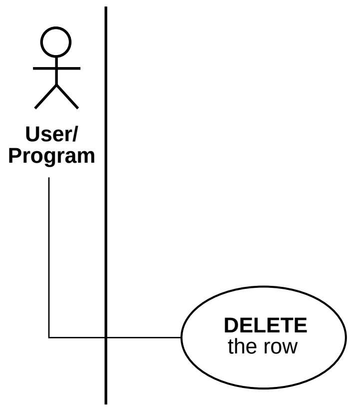
This chapter discusses the following topics:

- Use Case Diagrams
- State Diagrams

Use Case Diagrams

In a use case diagram, the primary use case is instigated by an actor (stickman), which can be a human user, an application, or a subprogram. The actor is connected to the primary use case, which is depicted as an oval (bubble) enclosing the use case action, as shown in Figure E–1.

Figure E–1 A Primary Use Case



Primary use cases may require other operations to complete them. In Figure E–2,

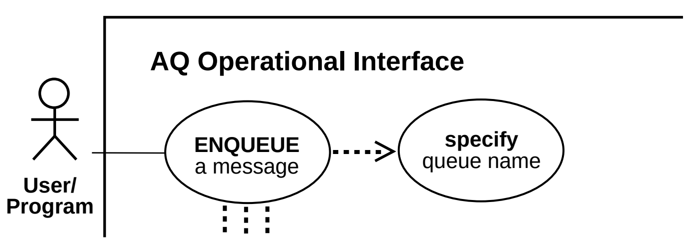
- **`specify`** `queue name`

is one of the suboperations, or secondary use cases, needed to complete

- **`ENQUEUE`** `a message`

The downward lines from the primary use case lead to the other required operations (not shown).

Figure E–2 A Primary Use Case with Suboperations



As shown in Figure E–3, a secondary use case with a drop shadow expands into its own use case diagram, thus making it easier to:

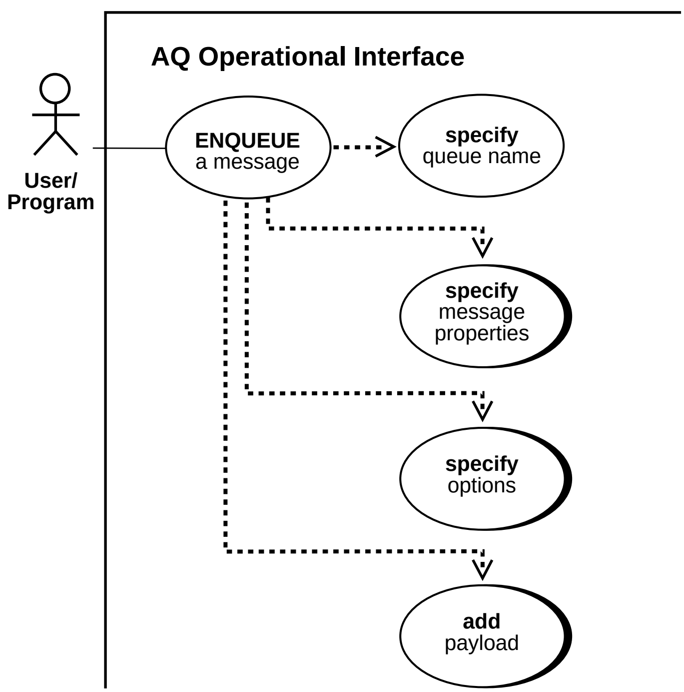
- Understand the logic of the operation
- Continue a complex operation across multiple pages

In this example

- **`specify`** `message properties`
- **`specify`** `options`
- **`add`** `payload`

are all expanded in separate use case diagrams.

Figure E–3 A Use Case Diagram with Drop Shadows Representing Secondary Use Cases



The diagram fragment in Figure E–4 shows an expanded use case diagram. While the standard diagram has the actor as the initiator, here the use case itself is the point of departure for the suboperation. In this example, the expanded view of

- **add** payload

represents a constituent operation of

- **ENQUEUE** a message

Figure E–4 The Expanded Use Case Diagram

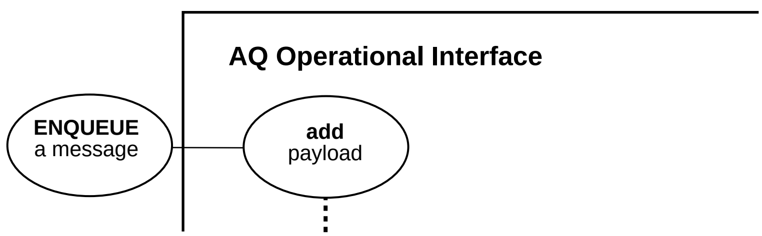
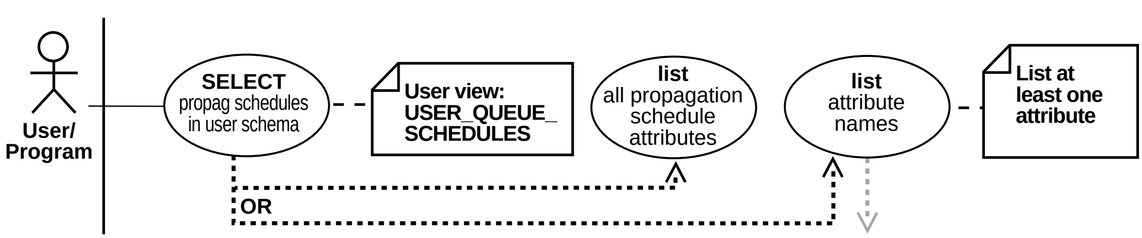


Figure E–5 shows how note boxes are used:

- Note boxes can present an alternative name. In this case, the action SELECT propagation schedules in the user schema is represented by the view USER_QUEUE_SCHEDULES.
- Note boxes can qualify the use case action. In this case, the list attribute names action is qualified by the note that you must list at least one attribute if you do not list all the attributes of the propagation schedule.

Figure E–5 Note Boxes



The dotted arrow in the use case diagram indicates dependency. In Figure E–6

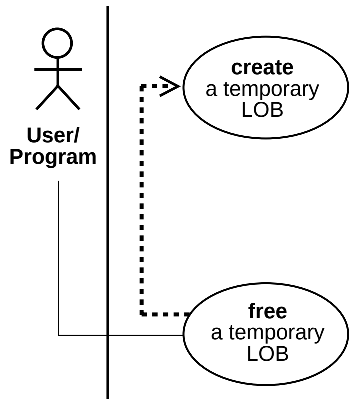
- **free** a temporary LOB

requires that you first

- **`create`** `a temporary LOB`

The target of the arrow shows the operation that must be performed first.

Figure E–6 Dependencies



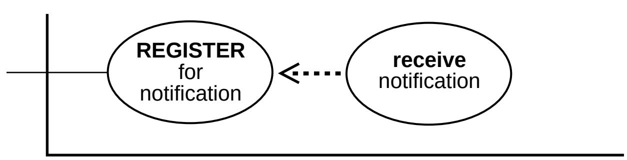
Use cases and their suboperations can be linked in complex relationships. In the example in Figure E–7, you must first

- **`REGISTER`** `for notification`

to later

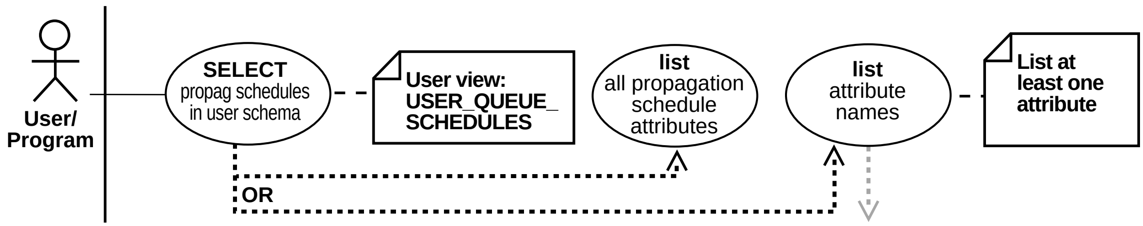
- **`receive`** `a notification`

Figure E–7 Use Case and Suboperation Relationships



In Figure E–8, the branching paths of an `OR` condition are shown. In invoking the view, you can choose to list all the attributes or view one or more attributes. The grayed arrow indicates that you can stipulate which attributes you want to view.

Figure E–8 The Branching Paths of an OR Condition



In Figure E–9, the black dashed line and arrow indicate that the targeted operation is required. The gray dashed line and arrow indicate that the targeted operation is optional. In this example, executing

- **`write`** `append`

on a LOB requires that you first

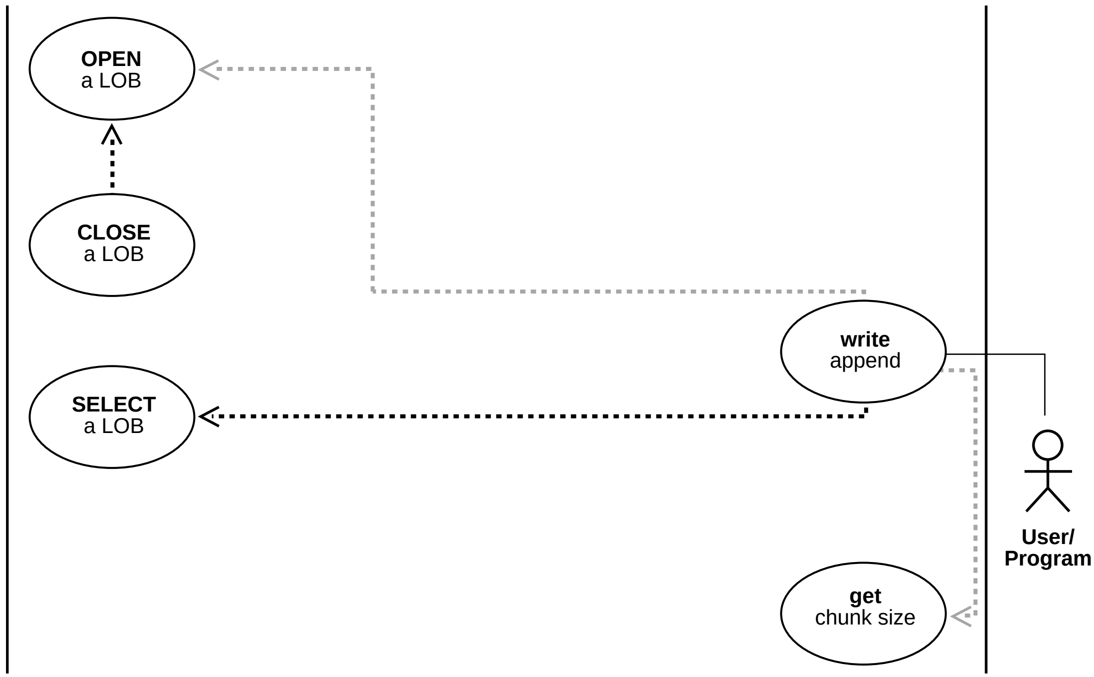
- **`SELECT`** `a LOB`

You may optionally choose to

- **`OPEN`** `a LOB or get chunk size`

The diagram shows that if you open a LOB, you must also close it.

Figure E–9 Required and Optional Operations

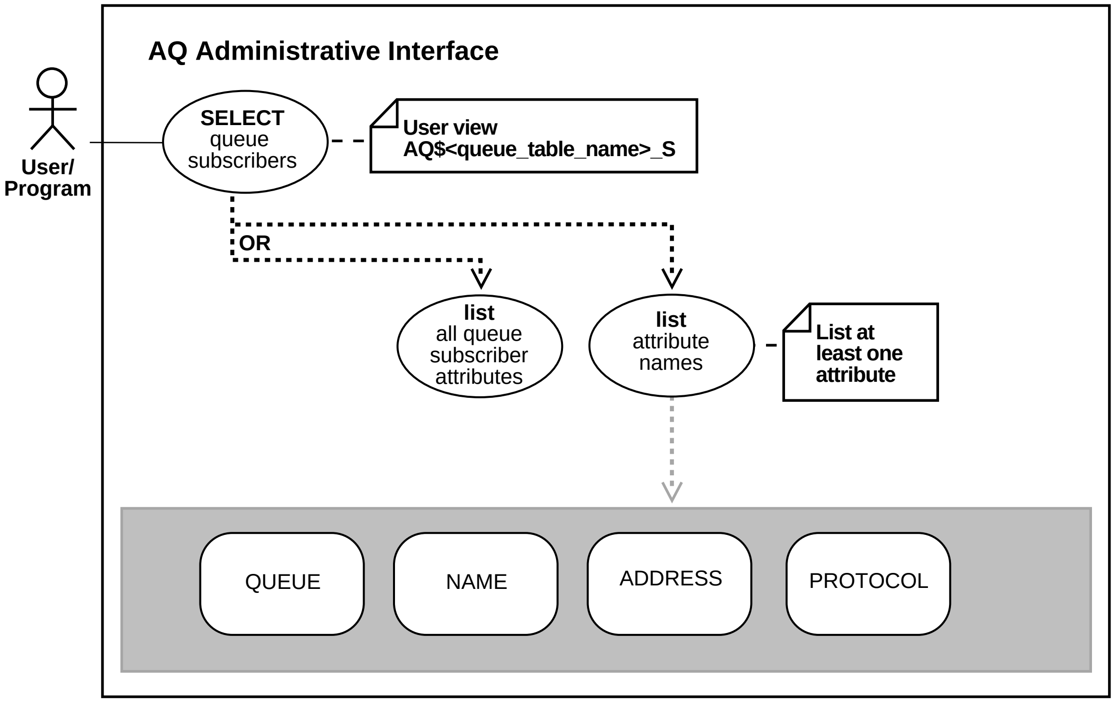


State Diagrams

A state diagram presents the attributes of a view. Attributes of a view have two states—visible or invisible. In this example, a state diagram (the Queue, Name, Address, and Protocol boxes in the gray area at the bottom of the figure) is added below a use case diagram to show all the attributes of the view.

Figure E–10 shows that the view is for querying queue subscribers. You can stipulate one attribute, some combination of the four attributes, or all four attributes.

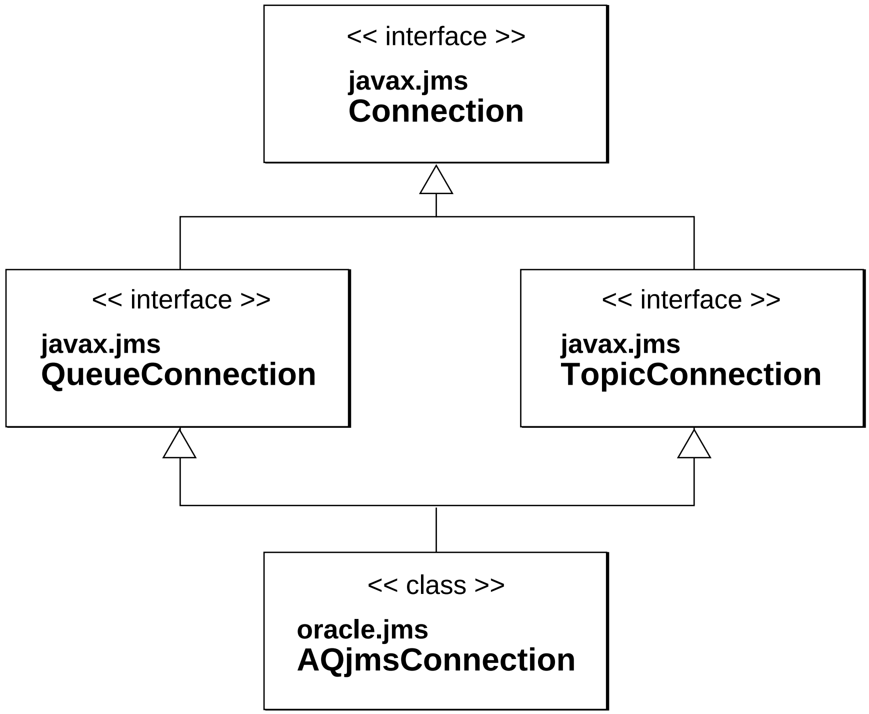
Figure E–10 Use Case and State Diagram to Show Attributes of a View



The class diagram in Figure E–11 shows:

- Whether classes, interfaces, and exceptions are entailed in the interrelationship by means of the <<>>, stereotype, such as **<<interface>>**
- The name of the package in which the class is found, such as **oracle.jms**
- The name of the class, such as **AQjmsConnection**

Figure E–11 A Class Diagram Representing Classes, Interfaces, and Exceptions



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