Oracle Procedural Gateway® for WebSphere MQ

Installation and User's Guide,

10*g* Release 2 (10.2) for Windows

B16216-01

August 2005

ORACLE®

Oracle Procedural Gateway for WebSphere MQ Installation and User's Guide, 10*g* Release 2 (10.2) for Windows

B16216-01

Primary Author: Maitreyee Chaliha

Contributing Author: Li-Te Chen

Contents

8 Gateway Running Environment

A The PGM, PGM_UTL8, and PGM_SUP Packages

Preface

Oracle Procedural Gateway and Tools for WebSphere MQ provides access to WebSphere MQ services.

Audience

This guide is intended for anyone responsible for installing, configuring, or administering the Oracle Procedural Gateway for WebSphere MQ. It is also for developers writing applications that access message queuing systems, particularly those who need to access queues owned by both WebSphere MQ and other non-Oracle message queuing systems as well as queues owned by Oracle Advanced Queuing (AQ).

Read this guide if you are responsible for tasks such as:

- Administering the gateway
- Setting up gateway security
- Using the gateway
- Diagnosing gateway errors

Before using this guide, you must understand the fundamentals of your operating system, the procedural gateways, PL/SQL, the Oracle server, and WebSphere MQ software before using this guide to install, configure, or administer the gateway.

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. Accessibility standards will continue to evolve over time, and Oracle 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 more information, visit the Oracle Accessibility Program Web site at

`http://www.oracle.com/accessibility/`

Accessibility of Code Examples in Documentation

Screen readers 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, some screen readers may not always read a line of text that consists solely of a bracket or brace.

Accessibility of Links to External Web Sites in Documentation

This documentation may contain links to Web sites of other companies or organizations that Oracle does not own or control. Oracle neither evaluates nor makes any representations regarding the accessibility of these Web sites.

TTY Access to Oracle Support Services

Oracle provides dedicated Text Telephone (TTY) access to Oracle Support Services within the United States of America 24 hours a day, seven days a week. For TTY support, call 800.446.2398.

Product Name

The complete name for this product is Oracle Procedural Gateway and Tools for WebSphere MQ, also called PG4MQ.

Conventions

The following text conventions are used in this guide:

Convention	Description
`monospace`	Monospace type indicates commands, codes, URL, and text user enters.
italics	Italic type indicates variables, including variable portions of file names. It is also used for emphasis and for book titles.
UPPERCASE	Uppercase letters indicate Structured Query Language (SQL) reserved words, initialization parameters, and environment variables.
Bold	Bold type indicates screen names and fields.
SQL*Plus prompts	The SQL*Plus prompt, SQL>, appears in SQL statement and SQL*Plus command examples. Enter your response at the prompt. Do not enter the text of the prompt, "SQL>", in your response.

Examples of input and output for the gateway and Oracle environment are shown in a special font:

```
C:\> mkdir \ORACLE\your_name
```

All output is shown as it appears. For input, the list of conventions and their meanings are as follows:

- `example text`: Words or phrases, such as `mkdir` and `ORACLE`, must be entered exactly as spelled and in the letter case shown. In this example, `mkdir` must be entered in lowercase letters and `ORACLE` in uppercase letters.
- *italic text*: Italicized uppercase or lowercase, such as *your_name*, indicates that you must substitute a word or phrase, such as the actual directory name.
- **`BOLD text`** or ***`bold italic TEXT`***: Bold words or phrases refer to a file or directory structure, such as a directory, path, or file ID.
- ... : Ellipses indicate that the preceding item can be repeated. You can enter an arbitrary number of similar items.

- { }: Curly braces indicate that one of the enclosed arguments is required. Do not enter the braces themselves.
- |: Vertical lines separate choices.
- [ ]: Square brackets enclose optional clauses from which you can choose one or none. Do not enter the brackets themselves.

Other punctuation, such as commas, quotation marks or the pipe symbol (|) must be entered as shown unless otherwise specified. Directory names, file IDs, and so on appear in the required letter case in examples. The same convention is used when these names appear in text, and the names are highlighted in **bold**. The use of *italics* indicates that those portions of a file ID that appear in *italics* can vary.

Gateway commands, file IDs reserved words, MS-DOS commands, keywords, and environment variables appear in uppercase in examples and text. Reserved words must always be entered as shown; they have reserved meanings within the Oracle system.

Related Publications

See the *Oracle Database Heterogeneous Connectivity Administrator's Guide 10g Release 2 (10.2)* for information common to all procedural gateways, including important information about functions, parameters, and error messages.

Related Documents

The guide includes references to the following documents:

Oracle Call Interface Programmer's Guide

Oracle Database Administrator's Guide

Oracle Database Error Messages

Oracle Database Reference

Oracle Database Utilities

Oracle Database Heterogeneous Connectivity Administrator's Guide 10g Release 2 (10.2)

Oracle Database Net Services Administrator's Guide

Oracle Database Net Services Reference

Oracle Database SQL Reference

Oracle Database PL/SQL Packages and Types Reference

Oracle Database PL/SQL User's Guide and Reference

Oracle Procedural Gateway Visual Workbench for WebSphere MQ Installation and User's Guide for Microsoft Windows (32-Bit)

1

Introduction

This chapter provides an overview of message queuing, WebSphere MQ, and the role of the gateway when accessing WebSphere MQ queues. It contains the following sections:

Introduction to Message Queuing

Message queuing enables distributed applications to communicate asynchronously by sending messages between the applications. The messages from the sending application are stored in a queue and are retrieved by the receiving application. The applications send or receive messages through a queue by sending a request to the message queuing system. Sending and receiving applications can use the same or different message queuing system , enabling the message queuing system to handle the forwarding of the messages from the sender queue to the recipient queue.

Queued messages can be stored at intermediate nodes until the system is ready to forward them to the next node. At the destination node, the messages are stored in a queue until the receiving application retrieves them from the queue. Message delivery is guaranteed even if the network or application fails. This provides for a reliable communication channel between applications.

The complexity and details of the underlying model (of storing and forwarding messages between different environments) are handled by the message queuing system. By maintaining this level of abstraction, distributed applications can be developed without the need to worry about the details of how the information is transported.

Because the sending and receiving applications operate independently of one another, the sending application is less dependent on the availability of the remote application, the network between them, and the system on which the receiving application runs. This leads to a higher level of availability for the participating applications.

Messages and message queue operations can be configured by the applications to operate in specific modes. For example, a sending application can specify that queued messages should survive system crashes. As another example, the receiving application can specify a maximum waiting period for a receiving operation from a queue (in case no messages are available yet on the receiving queue).

Introduction to WebSphere MQ

WebSphere MQ is a message queuing system based on the model of message queue clients and message queue servers. The applications run either on the server node where the queue manager and queues reside, or on a remote client node. Applications can send or retrieve messages only from queues owned by the queue manager to which they are connected.

WebSphere MQ Terms

The following table describes WebSphere MQ terms used in this guide.

Term	Description
Message queues	Storage areas for messages exchanged between applications.
Message queue interface (MQI)	An application programming interface (API) for applications that want to send or receive messages through WebSphere MQ queues.
WebSphere MQ client configuration	A WebSphere MQ configuration where the queue manager and message queues are located on a different (remote) system or node than the application software. Client applications connect to the remote queue manager using IBM software that provides the necessary networking software to connect to the remote queue manager.
WebSphere MQ server configuration	A WebSphere MQ configuration where the queue manager and message queues are located on the same (local) system or node as the application software. Client applications connect to the local queue manager using MQI.
Queue manager	A WebSphere MQ feature that provides the message queuing facilities that applications use. It manages the queue definitions, configuration tables, and message queues. The queue manager also forwards messages from the sender queue to the remote recipient queues.
Triggers	A WebSphere MQ feature that enables an application to be started automatically when a message event, such as the arrival of a message, occurs. Triggers can be used to invoke programs or transactions. For example, a trigger could cause an Oracle application to call the gateway to retrieve a WebSphere MQ message and process it.

Introduction to the Gateway

The Oracle Procedural Gateway for WebSphere MQ enables Oracle applications to integrate with other WebSphere MQ applications. Oracle applications can send messages to other WebSphere MQ applications or receive messages from them. With the gateway, Oracle applications access WebSphere MQ message queues through remote procedure call (RPC) processing.

The gateway extends the RPC facilities that are available with the Oracle server and enables any client application to use PL/SQL to access messages in WebSphere MQ queues. The gateway provides PL/SQL procedures that are translated by the gateway into MQI calls. These procedures resemble the calls and types of MQI, but they are adapted to take full advantage of the transaction integration with the Oracle integrating server. For more information about these procedures, refer toAppendix A .

Through WebSphere MQ, the gateway communicates with any other WebSphere MQ systems on various platforms, including mainframes, UNIX, Microsoft Windows, and other desktop environments. The gateway does not require any Oracle software on the

remote system. The gateway integrates with existing WebSphere MQ applications without any changes to those applications and enables users to exploit their investment in these applications while providing them with the ability to maximize on the benefits of message-oriented systems.

The gateway also provides a way to integrate these existing WebSphere MQ applications with new technology areas, such as network computing. Any Oracle application can invoke PL/SQL procedures, including applications that use the Oracle Application Server 10*g*.

Developing Gateway Applications

If you are developing applications that access WebSphere MQ through the gateway, use the Oracle Visual Workbench for Oracle Procedural Gateways for WebSphere MQ. Oracle Visual Workbench enables you to define an interface for accessing WebSphere MQ and define how to convert message data thaty is sent or retrieved from WebSphere MQ queues.

Oracle Visual Workbench generates PL/SQL code for the interface and data conversion. This generated code is called the message interface package (MIP). The MIP provides the underlying code to interact with the gateway, performs message data conversion, and provides an easy-to-use interface for Oracle applications to exchange messages with remote WebSphere MQ applications.

> **See Also:** Refer to the *Oracle Procedural Gateway Visual Workbench for WebSphere MQ Installation and User's Guide for Microsoft Windows (32-Bit)* for more information about Visual Workbench.

When necessary, the generated MIP code can be modified to use WebSphere MQ functions that are not supported by Visual Workbench or to enhance message data conversions. Refer to Appendix A and Appendix B for more information about modifying the generated MIP code.

Gateway Terms

The following table describes gateway terms used in this guide.

Term	Description
Gateway initialization file	A file containing parameters that determine the running of the gateway.
Gateway remote procedures	Remote procedures implemented by the gateway. These procedures are used to invoke WebSphere MQ operations.
MIP (Message interface package)	An Oracle PL/SQL package generated by Oracle Visual Workbench that serves as an interface between an existing WebSphere MQ application and an Oracle application. The MIP performs any necessary data conversion and invokes the gateway RPCs to perform appropriate WebSphere MQ operations. Refer to the *Oracle Procedural Gateway Visual Workbench for WebSphere MQ Installation and User's Guide for Microsoft Windows (32-Bit)* for more information about the generated packages.
Oracle integrating server	Any Oracle server that communicates with the gateway. Oracle applications do not communicate directly with the gateway. Instead, they run PL/SQL code at an Oracle integrating server to invoke the gateway procedures. The Oracle integrating server can be on the same system as the gateway or on a different system.

Term	Description
Production Oracle server	As used in this guide, the production server refers to any Oracle server that you use for production, for actual business and not for testing.
PL/SQL stored procedure	A compiled PL/SQL procedure that is stored in the Oracle integrating server or is included with the gateway.
Remote procedure call	A programming call that invokes a program on a system in response to a request from another system.
Oracle Visual Workbench	An abbreviated term for the Oracle Visual Workbench for Oracle Procedural Gateways for WebSphere MQ.

Advantages of Using the Gateway

Using the gateway to access WebSphere MQ provides the following advantages:

- Transactional support

  The gateway and the Oracle integrating server enable WebSphere MQ operations and Oracle integrating server updates to be performed in a coordinated fashion. Oracle two-phase commit protection is extended to the WebSphere MQ environment without any special programming.

- Fast remote procedures

  The remote procedures implemented by the gateway are optimized for efficient processing of WebSphere MQ requests.

  The remote procedures to the gateway and WebSphere MQ are an optimized PL/SQL package that is precompiled in the gateway. Because there are no additional software layers on the target system, overhead is minimized.

- Location transparency

  Client applications need not be on a specific operating system. For example, your Oracle application can send WebSphere MQ messages to an application on IBM MVS. If the receiving application is moved to a different platform, then you do not need to change the platform of your Oracle application.

- Flexible interface

  Using the MIPs generated by the Visual Workbench, you can use the gateway to interface with the existing procedural logic or to integrate new procedural logic into an Oracle integrating server environment.

- Oracle integrating server integration

  The integration of the Oracle integrating server with the gateway enables you to benefit from existing and future Oracle features.

- Wide selection of tools

  The gateway supports any tool or application that supports PL/SQL. This includes applications built with traditional Oracle tools, such as Oracle Developer, or applications built for intranet or Internet environments supported by Oracle Application Server 10*g*. The gateway also works with packaged Oracle applications, such as Oracle Financials, and many third-party tools, such as Visual Basic, PowerBuilder, and Lotus Notes.

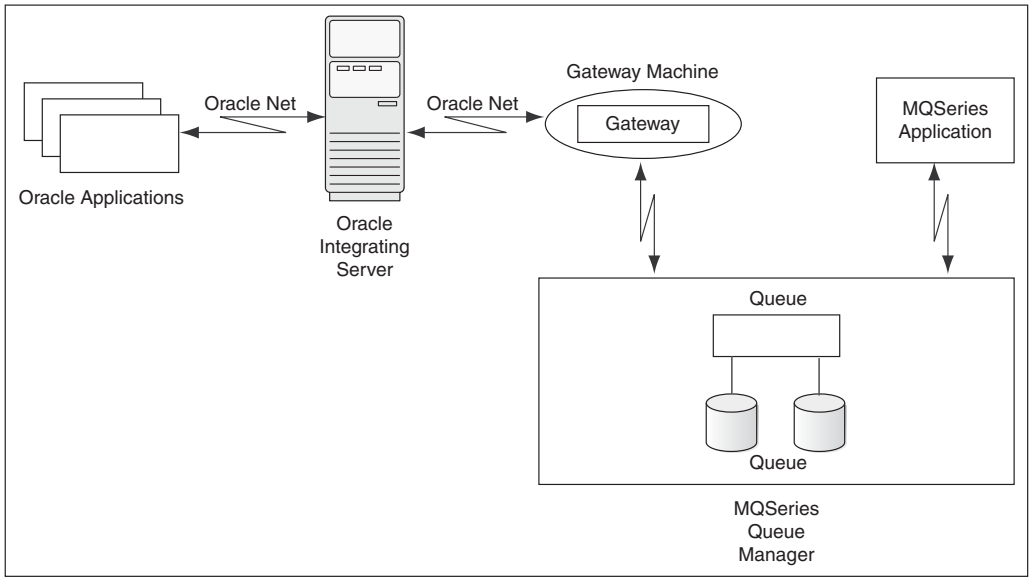
- Security

The gateway is compatible with the WebSphere MQ security authorization mechanism.

Gateway Architecture

Figure 1–1 shows the components of the gateway architecture.

Figure 1–1 Components of the Gateway Architecture



Component Descriptions

This section describes components of the gateway architecture.

Oracle Applications

Oracle applications connect to an Oracle integrating server. They send data to and receive data from WebSphere MQ queues by invoking the gateway RPCs.

Oracle Integrating Server

Oracle applications do not connect directly to the gateway, but connect indirectly through an Oracle integrating server. The Oracle integrating server communicates with a gateway in the normal Oracle server-to-server manner using Oracle Net. The gateway is a single process and does not start background processes. On UNIX platforms, a gateway process is started for each user session.

Oracle Net

Oracle Net provides client to server and server-to-gateway communication. It enables an Oracle application to communicate with the Oracle integrating server, and it enables the Oracle integrating server to communicate with the gateway.

If the Oracle integrating server is not on the same system as the gateway, then you must install the correct Oracle networking software on the platform where the Oracle integrating server is installed.

Gateway

Oracle applications invoke the RPCs that are implemented by the gateway with PL/SQL. The gateway procedures map these RPCs to WebSphere MQ MQI calls to perform the corresponding WebSphere MQ operation.

The gateway is accessed through the Oracle integrating server by using a database link name created by an Oracle `CREATE DATABASE LINK` statement. The database link is the construct used to identify Oracle integrating server databases.

WebSphere MQ Queue Manager

The WebSphere MQ server is where the WebSphere MQ queue manager and message queue are located. The WebSphere MQ server might, or might not, be on the same system as the gateway.

WebSphere MQ Application

WebSphere MQ applications connect directly to the WebSphere MQ queue manager by using WebSphere MQ MQI calls to perform the corresponding WebSphere MQ operation.

Gateway Structure

The gateway has some of the same components as an Oracle integrating server. The following components are included:

- A directory where the gateway software is installed
- A system identifier (SID)
- An initialization file similar to the Oracle integrating server initialization parameter file

The gateway does not have control, redo, or database files, nor does it have the full set of subdirectories and other files associated with an Oracle integrating server.

Gateway Operation

The gateway is not started in the same way as the Oracle integrating server. It has no background processes and does not require a management utility such as Oracle Enterprise Manager. Each Oracle integrating server user session that accesses a gateway creates an independent process on the host system that runs the gateway.

Communication

All communication between the Oracle integrating server, gateway, and WebSphere MQ queues is handled through RPC calls to the gateway. The PL/SQL code to do these calls is automatically generated by the Visual Workbench. For more information about communication between the gateway, the Oracle integrating server, and WebSphere MQ, refer to Appendix A or the *Oracle Procedural Gateway Visual Workbench for WebSphere MQ Installation and User's Guide for Microsoft Windows (32-Bit).*

2

Release Information

This chapter contains information that is specific to this release of the gateway. It contains the following sections:

Changes and Enhancements

The following changes and enhancements apply to all releases of the 10*g* Release 2 (10.2) gateway products.

Changes and Enhancements for 10*g* Release 2 (10.2)

The following sections describe the changes and enhancements included in this release.

Oracle Server Dependencies

This release of the Oracle Procedural Gateway and Tools for WebSphere MQ requires the latest released patch set for Oracle Database 10*g* Release 2 (10.2), or for the Oracle database release that you are using.

Changes and Enhancements for 10*g* Release 2 (10.2)

The following changes and enhancements are for the previous release of the Oracle10*g* gateway products.

Support for Large Data Buffers

The PL/SQL RAW data type limitation is 32 KB (32767 bytes). For large loads, you must use the TABLE OF RAWS data type. For more information about support for large data buffers, refer to Appendix A.

PG4MQ Data Types

The following table provides information about Procedural Gateway for WebSphere MQ (PG4MQ) data types.

Data Type	V401	V804	V817 and V901	Oracle10*g* Release 2
MQOD	PGM.MQOD@dblink	PGM.MQOD	PGM.MQOD	PGM.MQOD
MQMD	PGM.MQMD@dblink	PGM.MQMD	PGM.MQMD	PGM.MQMD

Data Type	V401	V804	V817 and V901	Oracle10*g* Release 2
MQPMO	PGM.MQPMO@dblink	PGM.MQPMO	PGM.MQPMO	PGM.MQPMO
MQGMO	PGM.MQGMO@dblink	PGM.MQGMO	PGM.MQGMO	PGM.MQGMO
MQODRAW	NA	PGM.MQODRAW	PGM8.MQODRAW	NA
MQMDRAW	NA	PGM.MQMDRAW	PGM8.MQMDRAW	NA
MQPMORAW	NA	PGM.MQPMORAW	PGM8.MQPMORAW	NA
MQGMORAW	NA	PGM.MQGMORAW	PGM8.MQGMORAW	NA

PGM_UTL Procedures

The following table provides information about PGM_UTL procedures.

Procedure	V401	V804	V817 and V901	Oracle10*g* Release 2
TO_RAW	NA	PGM_UTL.TO_RAW	PGM_UTL8.TO_RAW	PGM.TO_RAW
RAW_TO_MQMD	NA	PGM_UTL.RAW_TO_MQMD	PGM_UTL8.RAW_TO_ MQMD	PGM.RAW_TO_MQMD
RAW_TO_MQPMO	NA	PGM_UTL.RAW_TO_ MQPMO	PGM_UTL8.RAW_TO_ MQPMO	PGM.RAW_TO_MQPMO
RAW_TO_MQGMO	NA	PGM_UTL.RAW_TO_ MQGMO	PGM_UTL8.RAW_TO_ MQGMO	PGM.RAW_TO_MQGMO

Note: For Oracle10*g* Release (10.2), the PGM.TO_RAW, PGM.RAW_ TO_MQMD, PGM.RAW_TO_MQPMO, and PGM.RAW_TO_ MQGMO procedures are added for backward compatibility.

PG4MQ API Prototype Changes

The following table provides information about PG4MQ application programming interface changes.

API	V401 Arguments	V804 Arguments	V817 & V901 Arguments	10g Release 2 Arguments
MQOPEN	(MQOD,INT,INT)	(RAW,INT,INT)	(RAW,INT,INT)	(PGM.MQOD,INT,I NT)
MQPUT	(INT,MQMD,MQPMO,RAW)	(INT,RAW,RAW,RAW)	(INT,RAW,RAW,RAW)	(INT,PGM.MQMD,P GM_MQPMO,RAW) or (INT, PGM.MQMD, PGM_ MQPMO, PGM.MQPUT_ BUFFER)
MQGET	(INT,MQMD,MQGMO,RAW)	(INT,RAW,RAW,RAW)	(INT,RAW,RAW,RAW)	(INT,PGM.MQMD,P GM_MQGMO,RAW) or (INT, PGM.MQMD, PGM.MQGMO, PGM_ MQGET_BUFFER)
MQCLOSE	(INT,INT)	(INT,INT)	(INT,INT)	(INT,INT)

Refer to Appendix A for the details of APIs.

Heterogeneous Services Architecture

This release of Oracle Procedural Gateway for WebSphere MQ uses the Oracle Heterogeneous Services external procedure component within the Oracle10*g* server.

> **See Also:** Refer to *Oracle Database Application Developer's Guide - Fundamentals* for more information.

Performance Enhancements

Oracle Procedural Gateway for WebSphere MQ contains several internal performance enhancements. This product has shown major improvements in response time and CPU utilization for all relevant address spaces for a variety of workloads compared to version 4 gateways. The actual performance improvement at your site might vary, depending on your installation type and workload.

New PG4MQ Packages

PGM and PGM_UTL8 packages are new in this release. These packages provide new features as well as ensure backward compatibility. Refer toMigration Tips on page A-4 for details of upgrading your existing PL/SQL application programs to use Oracle10*g* PG4MQ features.

New PG4MQ Deployment Scripts

The following scripts are new in this release:

- pgm.sql
- `pgmobj.sql`
- `pgmdeploy.sql`
- `pgmundeploy.sql`

The gateway procedures in the PGM package are defined in `pgm.sql` and PGM_MQ* data type definitions used by the procedures are defined in `pgmobj.sql`. For complete information about PGM package, PG4MQ gateway procedures, and data type definitions, refer to Appendix A.

Large Payload Support

PG4MQ 10*g* Release 2 (10.2) supports large payloads or messages longer than 32767 bytes. For more information, refer to the `putlongsample.sql` and `getlongsample.sql` sample programs installed with the PG4MQ.

Database Link and Alias Library

A connection to the gateway is established through a database link. From PG4MQ 10*g* release 2 and later, this database link is no longer associated with each PG4MQ gateway procedural call (for example, `PGM.MQPUT@dblink`). From 10*g* release 2 and later, it needs to be defined only once in the `MQOD` data type used by `MQOPEN`, and this database link is registered in the object handle returned by the `MQOPEN` call. Refer to the sample programs installed with the gateway for details. By default, a public database link, `pg4mqdepdblink`, is created with your default SID when PG4MQ deployment scripts are executed.

Known Restrictions for 10*g* Release 2

The following restriction is known to exist for this release.

Customizing LOG_DESTINATION

There is a known issue when customizing the gateway initialization file for gateway tracing for MS windows platform. When customizing the path name of `LOG_DESTINATION`, the delimiter must be double backslashes. For example:

```
LOG_DESTINATION=C:\\oracle\\product\\10.2.0\\pg4mqs\\pg4mq\\log\\pg4mqs.log
```

> **Note:** If `LOG_DESTINATION` is not defined for MS windows platform, a default name is used and the log is created in *`ORACLE_HOME`*`\pg4mq\trace` directory

Customizing deployment script pgmobj.sql

There is a known issue when customizing the gateway deployment script pgmobj.sql for MS windows platform. When defining the path name of libpg4mq, the delimiter must be backslashes. For example create or replace library libpg4mq as:

```
CREATE OR REPLACE LIBRARY libpg4mq as
'C:\oracle\product\10.2.0\pg4mqs\bin\orapg4mqs.dll' transactional
```

or

```
CREATE OR REPLACE LIBRARY libpg4mq as '$ORACLE_HOME\bin\orapg4mqs.dll'
transactional
```

Known Problems for 10*g* Release 2

The problems documented in this section are specific to the Oracle Procedural Gateway for WebSphere MQ and are known to exist in this release of the product. These problems will be fixed in a future release. If you have any questions or concerns about these problems, contact Oracle Support Services.

A current list of problems is available online. Contact your local Oracle office for information about accessing this online information.

3

Requirements

This chapter provides information about the hardware and software required for the installation of Oracle Procedural Gateway for WebSphere MQ and the recommended online documentation. It contains the following sections:

Hardware Requirements

The following table contains the hardware requirements for Oracle Procedural Gateway for WebSphere MQ.

Hardware Items	Required for MS Windows XP Systems	Required for MS Windows 2003 Systems
CPU	Intel Pentium III or compatible	Intel Pentium or compatible
Disk Space	300 MB	300 MB
Memory	256 MB	256 MB

Software Requirements

The following table contains the software requirements for Oracle Procedural Gateway for WebSphere MQ.

Platform	Requirement	WebSphere MQ Server Software
MS Windows XP Professional	MS Windows XP Professional version 2002 The latest service pack for your operating sytem, MS Windows XP Prpfessional (Service Pack 2)	When the gateway resides on the same system as the WebSphere MQ server software, or when the gateway resides on a different system than the WebSphere MQ server software, WebSphere MQ version 5.2 or later is required on the gateway system.
MS Windows 2003 Systems	MS Windows 2003, Version 2003 The latest service pack for your operating system, MS Windows 2000 (Service Pack 1)	When the gateway resides on the same system as the WebSphere MQ server software, or when the gateway resides on a different system than the WebSphere MQ server software, WebSphere MQ version 5.2 or later is required on the gateway system.

Oracle Integrating Server

The Oracle server that acts as the Oracle integrating server requires the latest patch set for Oracle Database 10*g* Release 2 (10.2).

Recommended Documentation

In addition to the documentation that is included with the gateway software, the following Oracle publications are recommended:

- *Oracle Procedural Gateway Visual Workbench for WebSphere MQ Installation and User's Guide for Microsoft Windows (32-Bit)*
- *Oracle Database PL/SQL User's Guide and Reference*
- *Oracle Database Net Services Administrator's Guide*
- *Oracle Database Net Services Reference*

Documentation is available from the following Web sites:

`http://metalink.oracle.com`

`http://docs.oracle.com`

4

Preinstallation

This chapter guides you through the basic concepts and preinstallation steps for Oracle Procedural Gateway for WebSphere MQ. It contains the following sections:

Preinstallation Tasks

Before starting the gateway installation process, perform the actions described in this section for WebSphere MQ and Oracle software.

WebSphere MQ Software

Perform the following steps to check for WebSphere MQ software:

1. Determine where the WebSphere MQ queue manager is running.
   - Local System

     If the WebSphere MQ queue manager runs on a local system, then the queue manager runs on the same system where you intend to install the gateway product set.
   - Remote System

     If the WebSphere MQ queue manager runs on a remote system, then the queue manager runs on a different system, not the system where you intend to install the gateway product set.
2. Verify that the WebSphere MQ software is already installed. If the WebSphere MQ server software is installed on a different system than the gateway, then the WebSphere MQ client software must be installed on the gateway system.
3. Identify the name of the WebSphere MQ queue manager.
4. Identify the WebSphere MQ client channel definition.

If the queue manager is installed on a different system than the gateway, then the WebSphere MQ client software is used to access the remote queue manager. A channel definition is required for this configuration.

ORACLE_HOME

ORACLE_HOME is the root directory in which Oracle software is installed.

Throughout this book, *ORACLE_HOME* is used to refer to the home directory of the Procedural Gateway for WebSphere MQ, unless stated otherwise.

Caution: Donot install Oracle Transparent Gateway for DRDA in an *ORACLE_HOME* directory containing other Oracle products, including the database. Such an installation could overwrite shared components, causing the products to malfunction.

About Oracle Universal Installer

Oracle Procedural Gateway for WebSphere MQ uses Oracle Universal Installer to configure environment variables and install components. The installer guides you through each step of the installation process, so you can choose configuration options for a customized product.

The Oracle Universal Installer includes features that perform the following tasks:

- Explore and provide installation options for products
- Detect pre-set environment variables and configuration settings
- Set environment variables and configuration during installation
- Uninstall products

oraInventory Directory

The Oracle Universal Installer creates the `oraInventory` directory the first time that it is run on your system. The `oraInventory` directory keeps an inventory of the products that the installer installs on your system as well as other installation information. If you have previously installed Oracle products, then you might already have an `oraInventory` directory.

- The user running the Oracle Universal Installer must have permission to write to the `oraInventory` directory and all its files. This is required to run the installer.
- The latest log file is `C:\Program Files\Oracle\Inventory\logs\installActions.log`. Log file names of previous installation sessions are in the following format:

  `installActions`*`datetime`*`.log`.
- Do not delete or manually alter the `oraInventory` directory or its contents. Doing this can prevent the Oracle Universal Installer from locating the products that you have installed on your system.

Starting Oracle Universal Installer

Perform the following steps to launch Oracle Universal Installer, which installs Oracle Procedural Gateway for WebSphere MQ:

1. Start your system and select MS Windows from the operating system Loader option. Log in to your MS Windows system as a member of the Administrators group.
2. If you are installing the gateway for the first time, ensure there is sufficient space on the disk where you are installing the gateway as specified in the Hardware Requirements on page 3-1.
3. Before installing the software, stop all Oracle NT Services that are running:

a. From the Start menu, go to Setting, then Control Panel, and then click **Services**. A list of all NT services is displayed.

b. Select an Oracle NT service (these services begin with Oracle).

c. Click **Stop**.

d. Continue to select and stop all Oracle NT services until all active Oracle NT Services are stopped.

4. Load the installation media and start the Oracle Universal Installer.

This launches Oracle Universal Installer using which you can install Oracle Procedural Gateway for WebSphere MQ.

5

Installation

This chapter guides you through the installation of the Enterprise Edition of Oracle Procedural Gateway for WebSphere MQ. It contains the following sections:

Installation

The first screen that is presented by the Oracle Universal Installer is the Welcome screen. To continue with the installation, click **Next**.

Stepping Through the Oracle Universal Installer

Oracle Universal Installer is a menu-driven utility that guides you through the installation of the gateway by prompting you with action items. The action items and the sequence in which they appear depend on your platform.

Table 5–1describes the installation procedure of Procedural Gateway and Tools for WebSphere MQ using Oracle Universal Installer

Table 5–1 Installation Procedure using Oracle Universal Installer

Screen	Response
Welcome	Click **Next**.
File Locations	The Source section of the screen is where you specify the source location that the Oracle Universal Installer must use to install WebSphere MQ. You need not edit the file specification in the Path field. The default setting for this field points to the installer file on your WebSphere MQ installation media. The Path field in the Destination section of the File Locations screen is where you specify the destination for your installation. You need not edit the path specification in the Path field. The default setting for this field points to `ORACLE_HOME`. After you set the fields in the File Locations screen as necessary, click **Next** to continue. After loading the necessary information from the installation media, the Oracle Universal Installer displays the Available Products screen.
Available Products	Select **Oracle Database 10*g*** and click **Next** to continue. The Oracle Universal Installer displays the Installation Types screen.
Installation Types	Select **Custom** and click **Next** to continue. The Oracle Universal Installer displays the Available Product Components screen.

Table 5–1 (Cont.) Installation Procedure using Oracle Universal Installer

Screen	Response
Available Product Components	Use the check boxes to indicate the product components that you want to install. By default, all the available components are selected for you. You need to deselect the components that you do not want by clicking on the check boxes. Click **Next** to continue, and the Oracle Universal Installer displays the Where is the WebSphere MQ Queue Manager Installed ? screen.
Where is the WebSphere MQ Queue Manager Installed ?	Select **Local** if the MQM runs on the same system as the gateway, or select **Remote** if the MQM runs on a different system than the gateway. Click **Next** to continue.
Local WebSphere MQ Queue Manager Name Screen	If you choose Local for your MQM in the Where is the WebSphere MQ Queue Manager Installed? screen, then the Local WebSphere MQ Queue Manger Name screen is displayed. Type in the local WebSphere MQ queue manager name in the Queue Manager field. Click **Next** to continue, and the Oracle Universal Installer displays the Summary screen.
Remote WebSphere MQ Queue Manager Name Screen	If you choose Remote for your MQM in the Where is the WebSphere MQ Queue Manager Installed? screen, then the Remote WebSphere MQ Queue Manager Name screen is displayed. Enter the name for the remote WebSphere queue manger in the Queue Manager field, and also enter the WebSphere MQ channel name in the Channel field. For information about server connection channels, refer to the IBM publication about WebSphere MQ Clients, or ask your WebSphere MQ system administrator for the channel definition of the queue manager to which you want the gateway to connect. The definition syntax is: `CHANNEL_NAME/PROTOCOL/`*`server_address`*`[(port)]` where `CHANNEL_NAME` and `PROTOCOL` must be uppercase, *`server_address`* is the TCP/IP host name of the server. The port value is optional and is the TCP/IP port number that the server is on. If you do not provide a port number, then WebSphere MQ uses the port number that is specified in the `QM.INI` file. If no value is specified in the `QM.INI` file, then WebSphere MQ uses the port number that is identified in the TCP/IP services file for the WebSphere MQ service name. If this entry in the services file does not exist, then the default value of `1414` is used. It is important that the port number that is used by the client and the port number that is used by the server listener program be the same. For example: `CHANNEL1/TCP/Sales` Click **Next** to continue. The Oracle Universal Installer displays the Summary screen.
Installation Summary	The Installation Summary screen enables you to review a tree list of options and components for this installation. Click **Install** to display the Installation Status screen.
Installation Status	The Installation Status screen shows the status of the installation as it proceeds, as well as the location of the Oracle Universal Installer log file for this installation session. Be patient as the Oracle Universal Installer processes the software installation. Depending on the CPU and hard drive in your system, the installation process might take some time to be completed.

Table 5–1 (Cont.) Installation Procedure using Oracle Universal Installer

Screen	Response
End of Installation	The final screen of the Oracle Universal Installer is the End of Installation screen. Assuming that your installation was successful, you can click **Exit** to exit the installer.

6

Uninstallation and Reinstallation

This chapter guides you through the uninstallation and reinstallation options for Oracle Procedural Gateway for WebSphere MQ. It contains the following sections:

Uninstallation

The following steps guide you through the uninstallation process for Oracle Procedural Gateway for WebSphere MQ. This process is divided into two parts:

Uninstalling Using Oracle Universal Installer

Perform the following steps to uninstall Oracle Procedural Gateway for WebSphere MQ.

Uninstalling Oracle Procedural Gateway for WebSphere MQ

To uninstall Oracle Procedural Gateway for WebSphere MQ, perform the following steps:

1. Start the Oracle Universal Installer. For information about starting the installer, refer to About Oracle Universal Installer on page 4-2.

   When Oracle Universal Installer starts, the Welcome screen is displayed. Click **Deinstall Products**.

   The Welcome screen provides information about Oracle Universal Installer.

   The Oracle Universal Installer provides you with two ways to uninstall products:

   - **Deinstall Products**: Uninstall individual components or the entire product.
   - **Installed Products**: View currently installed products, and uninstall individual components or the entire product.

2. Review all installed components, and select the ones you want to uninstall. Click **Remove**.

   The Inventory screen appears when you click **Deinstall Products** on the Welcome screen, or **Installed Products** on any screen.

The Inventory screen displays all the components that are installed in the Oracle home directory.

The following buttons appear on the Inventory screen:

- **Help**: Access detailed information about the functionality of the Inventory screen.
- **Remove**: Uninstall all checked components from the Oracle home directory.
- **Save As**: Save the inventory as text. A file browser dialog box pops up when you click **Save As**. Accept a file name and the complete inventory list as displayed by the inventory screen is logged into this file as text.
- **Close**: Quit the Inventory screen.
- **Location**: View the full location path of the selected component.

Note: The plus sign (+) sign before a product name indicates that there are more components and files installed within that particular product. Click it to view dependent components. If you choose to remove a product or component, then all of its dependent components and files are also uninstalled.

If you want to uninstall Oracle Procedural Gateway for WebSphere MQ completely, select the box displayed before the product name. It is listed subsequent to the *ORACLE_HOME* name.

Note: If you uninstall a product or component, then all of its dependent components and files are also uninstalled.

---

3. Verify the components selected for uninstallation, and click **Yes**.

   The Confirmation screen lists all the components selected for uninstallation in the previous step. Scroll down the screen to verify selected components.

   The following buttons appear on the Confirmation screen:

   - **Help**: Access detailed information about the functionality of the Confirmation screen.
   - **Yes**: Start uninstallation of listed components.
   - **No**: Return to the Inventory screen. Listed components are not removed from *ORACLE_HOME*.

4. Monitor the uninstallation process.

   The Remove Progress Bar screen appears when you click **Remove**. The Oracle Universal Installer detects all components chosen for uninstallation from the Inventory screen and removes them fromthe Oracle home.

   - **Cancel**: To discontinue the uninstallation process.

Note: If you uninstall a product or component, then all of its dependent components and files are also uninstalled.

Reinstallation

To reinstall Oracle Procedural Gateway for WebSphere MQ over the same version, remove, and then reinstall the product. Also refer to Uninstalling Oracle Procedural Gateway for WebSphere MQ on page 6-1.

7

Configuration

After installing the gateway, follow the instructions in this chapter to configure the gateway. This chapter contains the following sections:

Configuration Overview

The gateway works with several components and products to communicate between the Oracle server and WebSphere MQ queues:

- Oracle Net

  The gateway and the integrating server communicate using Oracle Net in a server-to-server manner. You must configure both the gateway and the integrating server to have Oracle Net communication enabled by configuring the `tnsnames.ora` and `listener.ora` files.

- Gateway initialization files and parameters

  The gateway has initialization files and parameters that you must customize for your installation. For example, you must choose your gateway system identifier (SID) and provide other information, such as the gateway log file destination.

Configuring the Gateway

The gateway is installed and preconfigured using default values for the gateway SID, directory names, file names, and gateway parameter settings. The default SID values are:

- `pg4mqs`

  This is the default SID that is used when the gateway resides on the same system as the WebSphere MQ software.

- `pg4mqc`

  This is the default SID that is used when the gateway resides on a different system than the WebSphere MQ software. In this case, the gateway functions as a remote WebSphere MQ client.

A basic gateway initialization file is also installed, and values in this file are set based on the information you enter during the installation phase.

Using the Gateway with the Default Values

If you are configuring one gateway instance, and if you have no need to change any of the default values, then most of the gateway configuration process is completed by Oracle Universal Installer. In this case, perform the following actions:

- Skip all steps under Changing Default Values on page 7-2.
- Skip Step 1: Configure the Oracle Net TNS Listener for the Gateway on page 7-4
- Begin with Step 2: Stop and start the TNS listener for the Gateway on page 7-6, and continue to the end of the chapter.

Using the Gateway Without the Default Values

If multiple instances of the gateway are being configured, or to modify the default values set during the installation phases, then begin with the steps under Changing Default Values on page 7-2 and continue to the end of the chapter.

Changing Default Values

When changing default values, choose a gateway SID and customize the gateway initialization file.

Step 1: Choose a System ID for the Gateway

The gateway SID is a string of 1 to 64 alphanumeric characters that identifies a gateway instance. The SID is used in the gateway boot file and as part of the file name for the gateway parameter file. Choose a SID different from the default SID and different from `pg4mqs` and `pg4mqc`.

You need a distinct gateway instance and SID for each queue manager you want to access. If you want to access two different queue managers, then you need two gateway SIDs, one for each instance of the gateway. If you have one queue manager and want to access it sometimes with one set of gateway parameter settings and at other times with different gateway parameter settings, then you can do this by having multiple gateway SIDs for one queue manager.

Step 2: Customize the gateway initialization file

The gateway initialization file (`init`*`sid`*`.ora`) supports all procedural gateway initialization parameters described in the *Oracle Open Gateway Guide for SQL-Based and Procedural Gateways* and in Appendix C, "Gateway Initialization Parameters". The initialization file must be available when the gateway is started.

During installation, a default initialization file is created in *`ORACLE_HOME`*`\pg4mq\admin\init`*`sid`*`.ora`, where *`sid`* is the default SID of `pg4mqs` or `pg4mqc`. If you chose an SID other than the default, then rename this file using the SID you chose in Step 1: Choose a System ID for the Gateway. Customize the default initialization file as necessary.

The following entries might appear in an initialization file:

```
LOG_DESTINATION=log_file
QUEUE_MANAGER=manager_name
AUTHORIZATION_MODEL=auth_model
TRANSACTION_MODEL=tx_model
TRANSACTION_LOG_QUEUE=tx_queue_name
TRANSACTION_RECOVERY_USER=rec_user
TRANSACTION_RECOVERY_PASSWORD=rec_password
TRACE_LEVEL=0
MQSERVER=channel
MQCCSID=character_set
```

In this file:

- *log_file* specifies the full path name of the gateway log file.
- *manager_name* is the name of the WebSphere MQ queue manager to access.
- *auth_model* is the authorization model to use. The default is RELAXED.
- *tx_model* is the transaction model to use. The default value is SINGLE_SITE.
- *tx_queue_name* is the name of the queue for logging transaction IDs for distributed transactions. This is used only when *tx_model* is set to COMMIT_CONFIRM.
- *rec_user* specifies the user name that the gateway uses to start recovery of a distributed transaction. This is used only when *auth_model* is set to STRICT and tx_model is set to COMMIT_CONFIRM.
- *rec_password* specifies the password of the user name that the gateway uses to start recovery of a distributed transaction.
- *channel* specifies the location of the WebSphere MQ server and the communication method to use. The channel format is:

  channel_name/connection_type/hostname [(port_number)]

  For example:

  ```
  MQSERVER=CHAN9/TCP/dolphin(1425)
  ```

- *character_set* specifies the coded character set number used by the gateway when communicating with the WebSphere MQ queue manager. This is an optional parameter.

  This parameter is set only if the system that is running the WebSphere MQ queue manager uses a different encoding scheme than the system that runs the gateway. When set, the value of *character_set* is used by the WebSphere MQ client software on the gateway system to convert the data.

  Refer to IBM publications for more information.

See Chapter 8, "Gateway Running Environment"for more information on transaction and security models.

> **See Also:** Refer to *Oracle Database Net Services Administrator's Guide* and *Oracle Database Net Services Reference* for additional information

Configuring Oracle Net for the Gateway

The gateway requires Oracle Net to provide transparent data access to and from the Oracle integrating server. Oracle Net uses the TNS listener to receive incoming

connections from an Oracle Net client. In the case of the gateway, the TNS listener listens for incoming requests from the Oracle integrating server. For the TNS listener to listen for the gateway, information about the gateway must be added to the TNS listener configuration file (`listener.ora`). This file is located in the *`ORACLE_HOME`*`\network\admin` directory by default, where *`ORACLE_HOME`* is the directory under which the gateway is installed. The default values in this file are set for you during the installation process by Oracle Universal Installer.

Using Oracle Net with Default Gateway Values

If you are configuring one gateway instance, and if you donot need to change any of the default values, then no further configuration related to the gateway is necessary for Oracle Net. Perform only "Step 2: Stop and start the TNS listener for the Gateway" on page 7-6.

Using Oracle Net When Changing the Default Gateway Values

If you intend to use the Oracle Net listener for multiple gateway instances, or if you need to modify some of the default values set during the installation phase, then perform Step 1 and Step 2 in this section.

In Step 1, you add gateway information or change default information in the `listener.ora` file in the gateway directory *`ORACLE_HOME`*`\network\admin`.

Step 1: Configure the Oracle Net TNS Listener for the Gateway

Two entries must be added to the `listener.ora` file:

- A list of Oracle Net addresses for the TNS listener to listen on
- The gateway process that the TNS listener should start in response to incoming connection requests

> **Note:** The TNS listener and the gateway must reside on the same node. If you already have a TNS listener running on the node, then you make the changes suggested in Steps 1 and 2 to your existing `listener.ora` and `tnsnames.ora` files.
>
> After making the changes, you can reload the changes by running the `reload` command in the `lsnrctl` utility without shutting down the TNS listener.

Specifying Oracle Net Addresses for the TNS Listener

If you are using Oracle Net and the TCP/IP protocol adapter, then the syntax of an entry in the `listener.ora` file is:

```
LISTENER=
  (ADDRESS_LIST=
      (ADDRESS=
          (PROTOCOL=TCP)
          (HOST=host_name)
          (PORT=port_number)
       )
  )
```

In this entry:

- *`host_name`* is the name of the system where the gateway is installed.

- *port_number* specifies the IP port number used by the TNS listener. If you have other listeners running on *host_name*, such as the listener of an Oracle integrating server on the same system, then the value of *port_number* must be different from the other listener port numbers.

If you are using Oracle Net and the interprocess socket call (IPC) protocol adapter, the syntax of the entry in `listener.ora` file is:

```
LISTENER=
  (ADDRESS_LIST=
     (ADDRESS=
         (PROTOCOL=IPC)
         (KEY=key_name)
     )
   )
```

In this entry:

- `IPC` specifies that the protocol used for connections is IPC.
- *key_name* is the unique user-defined service name.

Entry for the Gateway

To configure the TNS listener to listen for a gateway instance in incoming connection requests, add an entry to the `listener.ora` file using the following syntax:

```
SID_LIST_LISTENER=
   (SID_LIST=
      (SID_DESC=
          (SID_NAME=gateway_sid)
          (ORACLE_HOME=gateway_directory)
          (PROGRAM=driver)
       )
    )
```

In this entry:

- *gateway_sid* specifies the SID of the gateway and matches the gateway SID specified in the connect descriptor entry in the `tnsnames.ora` file. Refer to Configuring Oracle Net for Oracle Integrating Server on page 7-7.
- *gateway_directory* specifies the gateway directory in which the gateway software resides.
- *driver* is the name of the gateway executable file. If the gateway uses a local WebSphere MQ server, then the file name is `pg4mqs`. The file name is `pg4mqc` if the gateway is run as a WebSphere MQ client to access a remote WebSphere MQ server.

When you add an entry for multiple gateway instances, add the entry to the existing `SID_LIST` syntax:

```
SID_LIST_LISTENER=
 (SID_LIST=
      (SID_DESC=.
                .
                .
      )
      (SID_DESC=.
                .
                .
      )
```

```
      (SID_DESC=
          (SID_NAME=gateway_sid)
          (ORACLE_HOME=gateway_directory)
          (PROGRAM=driver)
       )
  )
```

The following is an example of an entry made to the `listener.ora` file:

```
(SID_DESC =
         (SID_NAME=pg4mqs)
         (ORACLE_HOME=C:\oracle\app\oracle\product\pg4mq)
         (PROGRAM=pg4mqs)
)
```

Refer to *Oracle Database Net Services Administrator's Guide* and *Oracle Database Net Services Reference* for more information about changing `listener.ora`.

Step 2: Stop and start the TNS listener for the Gateway

The TNS listener must be started or reloaded to initiate the new settings.

> **Note:** If you already have a TNS listener running on the Oracle integrating server where the gateway is installed, then you must make changes to your existing `listener.ora` and `tnsnames.ora` files. After making the changes, you can reload the changes by running the `reload` command in the `lsnrctl` utility without shutting down the TNS listener.
>
> Refer to the Note in "Step 1: Configure the Oracle Net TNS Listener for the Gateway".

- Set the gateway directory name:

  ```
  > set TNS_ADMIN=ORACLE_HOME\network\admin
  ```

  ORACLE_HOME specifies the directory where the gateway software is installed.

- If the listener is already running, then use the `lsnrctl` command to reload the listener with the new settings:

  ```
  > ./lsnrctl reload your_listener_name
  ```

- Check the status of the listener with the new settings:

  ```
  > ./lsnrctl status listener_name
  ```

  The following is an example of the output from a `lsnrctl` status check:

  ```
  Connecting to (ADDRESS=(PROTOCOL=IPC)(KEY=ORAIPC))
  STATUS of the LISTENER
  ------------------------
  Alias                     LISTENER
  Version                   TNSLSNR for Solaris: version 10.2.0 - Production
  Start Date                21-AUG-04 18:16:10
  Uptime                    0 days 0 hr. 2 min. 19 sec
  Trace Level               off
  Security                  OFF
  SNMP                      OFF
  Listener Parameter File
  C:\oracle\app\oracle\product\pg4mqs\network\admin\listener.ora
  ```

```
Listener Log File
C:\oracl\app\oracle\product\pg4mqs\network\log\listener.log
Services Summary...
  pg4mqs            has 1 service handler(s)
The command completed successfully
```

In this example , `pg4mqs` is the default SID value that was assigned during installation. You can use any valid ID for the SID, or keep the default.

Note: You must use the same SID value in the `tnsnames.ora` file, the `listener.ora` file, and the `GATEWAY_SID` environment variable in the gateway initialization file for each gateway instance being configured.

Configuring Oracle Net for Oracle Integrating Server

Any Oracle application that has access to an Oracle integrating server can also access WebSphere MQ through the gateway. Before you use the gateway to access WebSphere MQ, you must configure the Oracle integrating server so that it can communicate with the gateway by using Oracle Net. To configure the server, add connect descriptors to the `tnsnames.ora` file.

Any Oracle integrating server that accesses the gateway needs a service name entry or a connect descriptor name entry in the `tnsnames.ora` file on the server to tell the Oracle integrating server how to make connections. This file, by default, is located in the *`ORACLE_HOME`*`\network\admin` directory, where *`ORACLE_HOME`* is the directory in which the Oracle integrating server is installed. The `tnsnames.ora` file is required by the Oracle integrating server that is accessing the gateway, and not by the gateway itself.Refer to Configuration Overview and to Configuring the Gateway on page 7-1

> **See Also:** Refer to *Oracle Database Net Services Administrator's Guide* and *Oracle Database Net Services Reference* for more information about changing the `tnsnames.ora` file.

Using Gateway Default Values

The Oracle Universal Installer creates and preconfigures a `tnsnames.ora` file in the *`ORACLE_HOME`*`\network\admin` directory, where *`ORACLE_HOME`* is the directory in which the gateway software is installed. If you use the default values, and if you do not need to configure additional gateway instances, then you can append the contents of this file to the `tnsnames.ora` file of each Oracle integrating server that accesses the gateway.

Changing Gateway Default Values

If you need to change some of the default settings, use the examples in this section to guide you.

TCP/IP Example

An Oracle integrating server accesses the gateway using Oracle Net and the TCP/IP protocol adapter. The syntax of the connect descriptor entry in `tnsnames.ora` is:

```
tns_name_entry=
  (DESCRIPTION=
     (ADDRESS=
          (PROTOCOL=TCP)
```

```
            (HOST=host_name)
            (PORT=port_number)
       )
       (CONNECT_DATA=
       (SID=gateway_sid)
       )
       (HS=OK)
)
```

In this example:

- *tns_name_entry* is the *tns_name_entry* of the CREATE DATABASE LINK statement. Refer to "Creating Database Links" on page 7-10 for more information.
- TCP specifies that the protocol used for connections is TCP/IP.
- *port_number* is the port number used by the Oracle Net TNS listener that listens for the gateway. This port number can be found in the listener.ora file that is used by the TNS listener. Refer to Specifying Oracle Net Addresses for the TNS Listener on page 7-4.
- *host_name* specifies the system on which the gateway is running. The TNS listener host name can be found in the listener.ora file used by the TNS listener that listens for the gateway. Refer to Specifying Oracle Net Addresses for the TNS Listener on page 7-4.
- *gateway_sid* specifies the SID of the gateway and matches the SID specified in the listener.ora file of the TNS listener that listens for the gateway.

IPC Example

An Oracle integrating server accesses the gateway using Oracle Net and the IPC protocol adapter. The syntax of the connect descriptor entry in tnsnames.ora is:

```
tns_name_entry=
    (DESCRIPTION=
        (ADDRESS=
        (PROTOCOL=IPC)
        (KEY=key_name)
    )
    (CONNECT_DATA=
        (SID=gateway_sid)
    )
     (HS=OK)
  )
```

In this example:

- *tns_name_entry* is the *tns_name_entry* of the CREATE DATABASE LINK statement. Refer to "Creating Database Links" on page 7-10 for more information.
- IPC specifies that the protocol used for connections is IPC.
- *key_name* is the service name.
- *gateway_sid* specifies the SID of the gateway and matches the SID specified in the listener.ora file of the TNS listener that is listening for the gateway.

Creating a Transaction Log Queue

When the TRANSACTION_MODEL parameter in the gateway initialization file is set to COMMIT_CONFIRM to enable distributed transactions, then an additional configuration step is required to perform the following tasks:

- Create a WebSphere MQ queue.
- Set the TRANSACTION_LOG_QUEUE, TRANSACTION_RECOVERY_USER, and TRANSACTION_RECOVERY_PASSWORD parameters in the gateway initialization file.

Refer to Commit-Confirm Transactions on page 8-5 for more information about the commit-confirm transaction model and Appendix C, "Gateway Initialization Parameters" on page C-1 for information about the TRANSACTION_LOG_QUEUE, TRANSACTION_RECOVERY_USER, and TRANSACTION_RECOVERY_PASSWORD parameters.

> **See Also:** Refer to IBM publications for information about creating and configuring a queue

For the gateway to recover distributed transactions, a recovery account and queue must be set up in the queue manager by the WebSphere MQ system administrator. This account must be a valid WebSphere MQ user, and it must have authorization to access the recovery queue. Refer to Authorization for WebSphere MQ Objects on page 8-2 for more information about access privileges.

The gateway uses the recovery queue to check the status of failed transactions that were started at the queue manager by the gateway and were logged in this queue. The information in this queue is vital to the recovery process and must not be used, accessed, or updated except by the gateway.

Administering the Database Links Alias Library

A connection to the gateway is established through a database link when it is first used in an Oracle session. In this context, *connection* refers to the connection between the Oracle integrating server and the gateway. The connection persists until the Oracle session ends. Another session or user can access the same database link and get a distinct connection to the gateway and the queue manager.

Database links are active for the duration of a gateway session. To close a database link during a session, use the ALTER SESSION statement. .

> **See Also:** Refer to the *Oracle Database Administrator's Guide* for more information about using database links

Using Database Links

An alias library is a schema object that represents a library in PL/SQL. Procedural Gateway for WebSphere MQ 10*g* release 2 uses an alias library to access the shared library installed with Procedural Gateway for WebSphere MQ. To create the alias library, you must have the CREATE LIBRARY privelege. The alias library used by Procedural Gateway for WebSphere MQ is libpg4mq and is defined in the pgmobj.sql script, which is created when the Procedural Gateway for WebSphere MQ deployment scripts are executed.

Creating Database Links

To create a database link, use the CREATE DATABASE LINK statement.The CONNECT TO clause specifies the WebSphere MQ user ID and password when the security model is defined as STRICT with the AUTHORIZATION_MODEL parameter. If you do not include the CONNECT TO clause, then the current user ID and password are used.

When the AUTHORIZATION_MODEL parameter is set to RELAXED, you need not specify a user ID and password because the Oracle integrating server uses the user ID and password of the user account that started the TNS listener for the gateway. If you specify a user ID and password with the CONNECT TO clause, then the Oracle integrating server and gateway ignore those values. Refer to Security Models on page 8-1 for more information.The USING clause points to a connect descriptor in the tnsnames.ora file.

The syntax of CREATE DATABASE LINK is as follows:

```
CREATE [PUBLIC] DATABASE LINK dblink [CONNECT TO userid IDENTIFIED
             BY password] USING 'tns_name_entry';
```

where:

- *dblink* is the database link name.
- *userid* is the user ID used to establish a session at the queue manager. It is only used when AUTHORIZATION_MODEL is set to STRICT in the init*sid*.ora file. The user ID must be authorized to access all WebSphere MQ objects and database links referenced in PL/SQL command.

  The *userid* must be in the password file on the system on which WebSphere MQ and the gateway are installed. Otherwise, the userid must be published in the Microsoft Windows Domain when WebSphere MQ and the gateway are installed on different systems. If *userid* contains lowercase letters or nonalphanumeric characters, then you must enclose *userid* in quotation marks ("). Refer to your WebSphere MQ documentation for more information about *userid*.
- *password* is the password used to establish a session at the queue manager. It is used only when AUTHORIZATION_MODEL is set to STRICT in the init*sid*.ora file.

  The *password* must be in the password file on the system on which WebSphere MQ and the gateway are installed. Otherwise, the *password* must be published in the Microsoft Windows Domain when WebSphere MQ and the gateway are installed on different computers.

  If *password* contains lowercase letters or nonalphanumeric characters, then surround *password* with quotation marks(").
- *tns_name_entry* is the Oracle Net TNS connect descriptor name specified in the *tnsnames.ora* file.

Dropping Database Links

You can drop a database link with the DROP DATABASE LINK statement. For example, to drop the database link named dblink, enter:

```
DROP [PUBLIC] DATABASE LINK dblink;
```

A database link should not be dropped if it is required to resolve an in-doubt distributed transaction that is in doubt.

Examining Available Database Links

The data dictionary of each database stores the definitions of all the database links in that database. The `USER_DB_LINKS` view shows the database links that are defined for a user. The `ALL_DB_LINKS` data dictionary views show all the defined database links.

Limiting the Number of Active Database Links

You can limit the number of connections from a user process to remote databases with the `OPEN_LINKS` parameter. This parameter controls the number of remote connections that any single user process can use with a single user session.

Creating Alias Library

Create the Procedural Gateway for WebSphere MQ alias library, `libpg4mq`, by using the PG4MQ deployment scripts. During the installation, the appropriate shared library name is defined in *ORACLE_HOME*`\pg4mq\admin\deploy\pgmobj.sql` based on the Procedural Gateway for WebSphere MQ model you choose.

For a remote model, the `orapg4mqc.dll` shared library is used. For example:

```
CREATE OR REPLACE LIBRARY libpg4mq AS 'ORACLE_HOME\lib\orapg4mqc.dll'
transactional;
```

For a local model, the `orapg4mqs.dll` shared library is used. For example:

```
CREATE OR RELPLACE LIBRARY libpg4mq AS 'ORACLE_HOME\lib\orapg4mqs.dll'
transactional;
```

Dropping Alias Library

Use the undeploy scripts to drop the `libpg4mq` Procedural Gateway for WebSphere MQ alias library.

Installing the Oracle Visual Workbench Repository

Install the Visual Workbench repository by following the steps in this section.

You can skip installing the Visual Workbench repository if you do not plan to use the Visual Workbench, or if you are preparing your production Oracle server where you do not need a Visual Workbench repository, but instead need a Procedural Gateway for WebSphere MQ deployment. Refer to the Preparing the Production Oracle Server on page 7-15 for details.

Preinstallation Tasks

The following steps describe the preinstallation tasks.

Step 1: Choose a Repository Server

A repository server is an Oracle integrating server on which the Visual Workbench repository is installed.

Step 2: Locate the Installation Scripts

The Visual Workbench repository installation scripts are installed with the Visual Workbench. If the repository is to be installed on the same system as the Visual Workbench, then your repository server already has all the required installation scripts. Proceed to step 3.

1. Create a directory on the repository server to be the script directory. For example:

```
> md ORACLE_HOME\pg4mq\admin\repo
```

2. Use a file transfer program to transfer the repository zip file (`repos`*`XXX`*`.zip`, where *`XXX`* is the release number) or move all script files with the `.sql` suffix from the script file directory (*`ORACLE_HOME`*`\pg4mqvwb\server\admin`) on the Visual Workbench system to the script file directory on the repository server system.

Step 3: Upgrade the Visual Workbench Repository

Upgrade your existing Visual Workbench repository installation scripts by copying the `pgm`*`xxx`*`.sql` files installed with the Oracle10*g* release2 Procedural Gateway for WebSphere MQ in the *`ORACLE_HOME`*`\pg4mq\admin\deploy` directory to the script file directory on the repository server system.

Step 4: Ensure that the UTL_RAW Package Is Installed

All data mapping packages generated by the Visual Workbench use the `UTL_RAW` package, which provides routines for manipulating raw data.

From SQL*Plus, issue the following statement as the user `SYS`:

```
SQL> DESCRIBE UTL_RAW
```

If the `DESCRIBE` statement is successful, then your repository server already has `UTL_RAW` installed, and you can proceed to Step 4. If the `DESCRIBE` statement fails, then install `UTL_RAW`.

From SQL*Plus, as user `SYS`, run the `utlraw.sql` and `prvtrawb.plb` scripts that are in the *`ORACLE_HOME`*`\rdbms\admin` directory. You must run the `utlraw.sql` script first.

```
SQL> @utlraw.sql
SQL> @prvtrawb.plb
```

Step 5: Ensure that the DBMS_OUTPUT Package Is Enabled

The sample programs and installation verification programs on the installation media use the standard `DBMS_OUTPUT` package.

From SQL*Plus, issue the following statement as the `SYS` user:

```
SQL> DESCRIBE DBMS_OUTPUT
```

If the `DESCRIBE` statement is successful, then your repository server has `DBMS_OUTPUT` installed, and you can proceed to Step 6.

If the `DESCRIBE` statement fails, then install `DBMS_OUTPUT`.

> **See Also:** Refer to *Oracle Database Administrator's Guide* for more information

Step 6: Create a Database Link

Create a database link on your Oracle Production System Server to access the Oracle Procedural Gateway for WebSphere MQ.

If you do not already have a database link, then refer to Administering the Database Links Alias Library on page 7-9 for more information about creating database links.

Visual Workbench Repository Installation Tasks

Use `pgvwbrepos.sql` to install the Visual Workbench repository on Oracle10*g*. To run `pgvwbrepos.sql`, ensure that you are currently in the *`ORACLE_HOME`*`\pg4mq\admin\repo` directory, and then enter the following command:

```
sqlplus /nolog @pgvwbrepos.sql
```

> **Note:** If you are installing the Visual Workbench repository on Oracle8*i* or older, then you must use `pgvwbrepos8.sql`. All the examples in this section are provided with the assumption that you are installing on Oracle9*i* and later.

The script takes you through the following steps:

Step 1: Enter the Database Connection Information

Use the default value of `LOCAL` by pressing **Enter**.Next, you are prompted to enter the passwords for the `SYSTEM` and `SYS` accounts of the Oracle integrating server. Press **Enter** after entering each password.

The script stops if any of the information is incorrect. Verify the information before rerunning the script.

Step 2: Check for Existing Workbench Repository

The script checks for an existing Visual Workbench repository and for the data dictionary. If neither is found, then the script proceeds to Step 3.

If the data dictionary exists, then the script stops. Choose another Oracle integrating server and rerun the script, starting at "Step 1: Choose a Repository Server" on page 7-11.

If a Visual Workbench repository exists, then the script gives you the following options:

- Upgrade the existing private repository to public status and proceed to Step 3 .
- Replace the existing repository with the new private repository and proceed to Step 3 .
- Stop the script.

Step 3: Check for Required PL/SQL Packages

The script checks for the existence of the `UTL_RAW`, `DBMS_OUTPUT`, and `DBMS_PIPE` packages on the Oracle integrating server. If this software exists, then the script proceeds to Step 4 .

The script stops if this software does not exist. Refer to your Oracle integrating server Database Administrator's Guide about the missing software. After the software is installed, rerun the script.

Step 4: Install the UTL_PG Package

The script checks for the existence of the UTL_PG package. If it does not exist, then the UTL_PG package is installed. The script then proceeds to Step 5.

If UTL_PG exists, then you are prompted to reinstall it. Press **Enter** to reinstall UTL_PG.

Step 5: Create the Administrative User and All Repository Tables

This step creates the administrative user for the Visual Workbench repository as PGMADMIN with the initial password of PGMADMIN. This user owns all objects in the repository.

After this step, a private Visual Workbench repository, which includes the PGM_SUP, PGM_BQM, and PGM_UTL8 packages, is created in the Oracle integrating server, which only the PGMADMIN user can access.

Step 6: Create Public Synonyms and Development Roles

This is an optional step to change the private access privileges of the Visual Workbench repository. The private status enables only the PGMADMIN user to have access to the repository. If you enter N and press **Enter**, then the repository retains its private status.

A public status enables the granting of access privileges to other users besides PGMADMIN. If you want to give the repository public status, then enter Y and press **Enter**.

After the Repository is Created

After creating the Visual Workbench repository, there is one optional step, granting development privileges for the Visual Workbench repository to users.

To permit users other than the PGMADMIN user to perform development operations on the Visual Workbench repository, PGMADMIN must grant them the necessary privileges. To do this, perform the following:

- Ensure that the repository has a public status. It has public status if you create it by using Step 1 through Step 6 of the pgvwbrepos.sql script. If you did not use Step 6, then rerun the script. When you get to Step 2 of the script, enter A at the prompt to upgrade the private repository to public status.
- Use SQL*Plus to connect to the repository as the PGMADMIN user and grant the PGMDEV role to each user. For example:

```
SQL> GRANT PGMDEV TO SCOTT;
```

Uninstall the Visual Workbench Repository

To uninstall a Visual Workbench repository on Oracle10*g*, use the repository script pgvwbremove.sql. To run this script, ensure that you are currently under the Oracle integrating server *ORACLE_HOME*\pg4mq\admin\repo directory (where you copied the scripts), and then enter the following command:

```
sqlplus /nolog @pgvwbremove.sql
```

> **Note:** If you are uninstalling the Visual Workbench repository on Oracle8*i* or earlier, then you need to use `pgvwbremove8.sql`. All the examples in this section are provided with the assumption that you are installing on Oracle9*i* and later.

The script takes you through the following steps:

Step 1: Enter the Database Connection Information

Use the default value of `LOCAL` by pressing **Enter**. Next, you are prompted to enter the passwords for the `SYSTEM`, `SYS`, and `PGMADMIN` accounts of the Oracle integrating server. Press **Enter** after entering each password.

The script stops if any of the information is incorrect. Verify the information before rerunning the script.

Step 2: Check for Existing Workbench Repository

Enter `Y` and press **Enter** for the prompt to remove public synonyms and development roles. This returns the repository to private status. You can exit the script now by entering `N` and pressing **Enter**, or you can proceed to the next prompt under this step.

If you are certain you want to remove the private repository, then enter `Y` and press **Enter**. The script removes all the repository tables and related packages.

Preparing the Production Oracle Server

These preparations include preparing, installing, and removing PL/SQL packages on the production server.

Introduction

Before you can compile MIPs on a production Oracle server, the following PL/SQL packages must be present on the production Oracle server:

- `DBMS_PIPE`, `DBMS_OUTPUT`, and `UTL_RAW`

  These packages are shipped with each Oracle server and are typically preinstalled.

- `PGM`, `PGM_BQM`, `PGM_SUP`, and `UTL_PG`

  These packages are shipped with your Oracle Procedural Gateway for Message Queuing. They are installed during the creation process of the Visual Workbench repository. Do not execute deployment script on the Oracle server with an installed Visual Workbench repository. If the Oracle server used for the repository is different from the Oracle server used in the production environment, then you must install these packages on the production Oracle server.

This section describes how to run the following:

- `pgmdeploy.sql`

  A deployment script that is used to verify the existence of the required PL/SQL packages and install them if they do not exist on the production Oracle server.

- `pgmundeploy.sql`

  A script that is used to remove the PL/SQL packages from a production Oracle server.

Verifying and Installing PL/SQL Packages

To install the necessary PL/SQL packages, perform the following actions:

1. Locate the necessary scripts:
   - `pgm.sql`
   - `pgmbqm.sql`
   - `pgmdeploy.sql`
   - `pgmsup.sql`
   - `pgmundeploy.sql`
   - `prvtpg.sql`
   - `utlpg.sql`

   These scripts are installed with the gateway, in the *ORACLE_HOME*`\pg4mq\admin\deploy` directory, where *ORACLE_HOME* is the gateway home directory.
2. If your production Oracle server is on a system that is different from the gateway, then use a file transfer method, such as FTP, to transfer files to the `ORACLE_HOME\pg4mq\admin\deploy` directory, where *ORACLE_HOME* is the gateway home directory on your gateway system. On your production Oracle server system, change the directory to the directory containing the deployment scripts that you transferred and skip to Step 4.
3. If your production Oracle server is on the same system as the gateway, then change the directory to `ORACLE_HOME\pg4mq\admin\deploy`, where ORACLE_HOME is the gateway home directory.
4. Run the deployment script by entering:

   ```
   $ sqlplus /nolog @pgmdeploy.sql
   ```

5. At the script prompt: Enter the connect string for the Oracle server... [LOCAL], press [Return] to use the default value of `LOCAL`.
6. At the script prompt Enter the following required Oracle server password, enter the password of the `SYS` account.

After the script verifies the `SYS` account password, it connects to the production Oracle server. The script verifies and reports on which PL/SQL packages are installed there:

- If any of the Oracle server packages DBMS_OUTPUT, DBMS_PIPE or UTL_RAW are missing, the script stops. Have your DBA install the missing packages and re-run the deployment script.
- If any of the Oracle packages PGM, PGM_BQM, PGM_SUP, and UTL_PG are missing, the script installs them on the production Oracle server.

Removing the PL/SQL Packages

You can remove the PL/SQL packages that were installed by the `pgmdeploy.sql` script if, for example, none of your applications in the production environment uses a MIP. To remove these packages, perform the following steps:

1. On your production Oracle server system, change to the directory containing the deployment scripts by entering the following command:

```
> cd ORACLE_HOME\pg4mq\admin\deploy
```

2. Run the script by entering:

```
> sqlplus /nolog @pgmundeploy.sql
```

3. At the script prompt: Enter the connect string for the Oracle server... [LOCAL], press [Return] to use the default of LOCAL.
4. At the script prompt, enter the required Oracle server passwords, enter the password of the SYS account.

After the script verifies the SYS account password, it connects to the production Oracle server and removes the packages installed by the `pgmdeploy.sql` script.

After the `pgmundeploy.sql` script completes successfully, applications on the production Oracle server fail if they attempt to reference any of the MIPs that are compiled there.

8

Gateway Running Environment

This chapter describes the gateway running environment. It contains the following sections:

Security Models

WebSphere MQ has its own authorization mechanism. Applications are enabled to perform certain operations on queues or queue managers only when their effective user ID has authorization for each operation. The effective user ID, typically the operating system user, depends on the WebSphere MQ environment and the platform it runs on.

The effective user ID in an Oracle environment is not dependent on an operating system account or the platform. Because of this difference, the gateway provides two authorization models for Oracle applications to work with WebSphere MQ:

- Relaxed
- Strict

Although Oracle and operating system user IDs can be longer than 12 characters, the length of user IDs used for either model cannot exceed 12 characters. Oracle user accounts do not have a minimum number of characters required for their passwords, but some platforms and operating systems do. Take their requirements into consideration when deciding on a password or user ID.

The authorization model is configured with the `AUTHORIZATION_MODEL` parameter in the gateway initialization file. Refer to Appendix C, "Gateway Initialization Parameters" on page C-1 for more information about the `AUTHORIZATION_MODEL` parameter.

Relaxed Model

This model discards the Oracle user name and password. The authorizations granted to the effective user ID of the gateway by the queue manager are the only associations an Oracle application has. For example, if the gateway user ID is granted permission to open or read messages, or place messages on a queue, then all Oracle applications that access the gateway can request those operations.

The effective user ID is determined by how the gateway runs:

- If the gateway runs as an MQI client application, then the user ID is determined by the MQI channel definition.

  See Also: Refer to IBM publications for more information about channel definitions

- If the gateway runs as an MQI server application, then the effective user ID of the gateway is the user account that starts the Oracle Net listener and has authorization to all the WebSphere MQ objects that the Oracle application wants to access. Refer to Authorization for WebSphere MQ Objects on page 8-2 for more information.

Oracle does not recommend using the relaxed model, unless your application has minimal security requirements.

Strict Model

This model uses the Oracle user ID and password provided in the `CREATE DATABASE LINK` statement when a database link is created, or the current Oracle user ID and password if none was provided with the `CREATE DATABASE LINK` statement.

The Oracle user ID:

- Must match a user account for the system that runs the gateway and for the system that runs the WebSphere MQ queue manager
- Must have authorization for all the accessed WebSphere MQ objects. Refer to Authorization for WebSphere MQ Objects on page 8-2 for more information.

The authorization process to verify the Oracle user ID and password varies, depending on how the gateway runs.

Authorization Process for a WebSphere MQ Server Application

If the gateway runs as a WebSphere MQ server application, then the authorization process checks the user ID and password against the local or network password file. If they match, then the gateway performs a `SET-UID` for the user ID and continues to run under this user ID. Further, WebSphere MQ authorization checks happen for this user ID.

Authorization Process for a WebSphere MQ Client Application

If the gateway runs as a WebSphere MQ client application, then the authorization process checks the user ID and password against the local or network password file. If they match, then the `MQ_USER_ID` and `MQ_PASSWORD` WebSphere MQ environment variables are set to the values of the user ID and password. If the channel definition specifies the `MCAUSER` WebSphere MQ environment variable as blank characters, then WebSphere MQ authorization checks are performed for the user ID.

If `MCAUSER` is set, not set, or security exits are defined for the MQI channel, then these override the gateway efforts.

See Also: Refer to IBM publications for more information about WebSphere MQ environment variables

Authorization for WebSphere MQ Objects

The effective user ID for the relaxed model and the Oracle user ID for the strict model require the WebSphere MQ authorizations described in Table 8–1.

Table 8–1 WebSphere MQ Access Authorization

Type of Access	WebSphere MQ Authorization Keywords	Alternate WebSphere MQ Authorization Keywords
Permission to access the WebSphere MQ queue manager	`all` or `allmqi`	`connect` `setid`

Permission to send messages to a WebSphere MQ queue	`all` or `allmqi`	`passall`
		`passid`
		`put`
		`setid`

Permission to receive messages from a WebSphere MQ queue	`all` or `allmqi`	`browse`
		`get`
		`passall`
		`passid`
		`setid`

See Also: Refer to IBM publications for more information about WebSphere MQ authorizations

Transaction Support

Transactions from an Oracle application that use he gateway and invoke WebSphere MQ message queue operations are managed by the transaction coordinator at the Oracle server where the transaction originates.

Non-Oracle Data Sources and Distributed Transactions

When an Oracle distributed database contains a gateway, the gateway must be properly configured to take part in a distributed transaction. The outcome of a distributed transaction involving a gateway should be that all participating sites roll back or commit their parts of the distributed transaction. All participating sites, including gateway sites, that are updated during a distributed transaction must be protected against failure and must be able to take part in the two-phase commit mechanism.

A gateway that updates a target system as part of a distributed transaction must be able to take part in the automatic recovery mechanism, which might require that recovery information be recorded in transaction memory at the target system.If a SQL-based gateway is involved in a distributed transaction, then the distributed database must be in a consistent state after the distributed transaction is committed.

A procedural gateway or a SQL-based gateway with the procedural option translates remote procedure calls into target system calls. From the viewpoint of the Oracle transaction model, the gateway is like an Oracle server executing a PL/SQL block containing SQL statements that are used to access an Oracle database.

For a procedural gateway, it is unknown if a target system call alters data. To ensure the consistency of a distributed database, it must be assumed that a procedural gateway updates the target system. Accordingly, all remote procedure calls sent to a procedural gateway take part in a distributed transaction and must be protected by the two-phase commit protocol. For example, you could issue the following SQL*Plus statements:

```
EXECUTE REMOTE_PROC@FACTORY;
INSERT INTO DEBIT@FINANCE
ROLLBACK;
```

In this example, `REMOTE_PROC` is a remote procedure call to access a procedural gateway, `DEBIT` is an Oracle table residing in an Oracle database, and `FACTORY` and `FINANCE` are database links used to access the remote sites.

Transaction Capability Types

When gateways are involved in a distributed transaction, the transaction capabilities of the non-Oracle data source determine whether the data source can participate in two-phase commit operations or distributed transactions.

Depending on the capabilities of the non-Oracle data source, transactions can be classified into one of the following transaction types:

Type	Description
Read-only	During a distributed transaction, the gateway provides read-only access to the data source, so the gateway can only be queried. Read-only transactions are used for target systems that use the presumed-commit model or do not support rollback mechanisms.
Single-site	During a distributed transaction, the target system is read-only (other sites can be updated) or the only site that can be updated (can participate in remote transactions). Single-site is used for target systems that support rollback, commit, and presumed-abort, but cannot prepare or commit-confirm because they have no distributed transaction memory. Transaction memory is the ability to remember what happened during and after a distributed transaction.
Commit-confirm	The gateway is a partial partner in the Oracle transaction mode. During a distributed transaction in which it is updated, the gateway must be the commit point site. Commit-confirm is used for target systems that support rollback, commit, presumed-abort, and commit-confirm, but do not support prepare. The commit-confirm capability requires distributed transaction memory.
Two-phase commit	The gateway is a partial partner in the Oracle transaction model. During a distributed transaction, the gateway cannot be the commit point site. Two-phase commit is used for target systems that support rollback, commit, presumed-abort, and prepare, but do not support commit-confirm, because they have no distributed transaction memory.
Two-phase commit-commit confirm	The gateway is a full partner in the Oracle transaction model. During a distributed transaction, the gateway can be the commit point site, depending on the commit point strength defined in the gateway initialization file. This transaction type is used for target systems that support a full two-phased commit transaction model. That is, the target system supports rollback, commit, presumed-abort, prepare, and commit-confirm.

Transaction Capability Types of Procedural Gateway for WebSphere MQ

Transactions from an Oracle application (that invoke WebSphere MQ message queue operations and that are using the gateway) are managed by the Oracle transaction coordinator at the Oracle server where the transaction originates. The procedural gateway for WebSphere MQ provides the following transaction types:

- Single-site
- Commit-confirm

Single-Site Transactions

Single-site transactions are supported for all WebSphere MQ environments and platforms. Single-Site means that the gateway can participate in a transaction only when queues belonging to the same WebSphere MQ queue manager are updated. An Oracle application can select, but not update, data on any Oracle database within the same transaction that sends a message to, or receives a message from, a WebSphere MQ queue. To update objects in the Oracle database, the transaction involving the WebSphere MQ queue should first be committed or rolled back.

This default mode of the gateway is implemented using WebSphere MQ single-phase, where the queue manager acts as the synchronizing point coordinator.

Commit-Confirm Transactions

Commit-Confirm transactions are an enhanced form of single-site transaction and is supported for all WebSphere MQ environments and platforms. Commit-confirm means that the gateway can participate in transactions when queues belonging to the same WebSphere MQ queue manager are updated and, at the same time, any number of Oracle databases can be updated. Only one gateway with the commit-confirm model can join the distributed transaction because the gateway operates as the focal point of the transaction. To apply changes to queues of more than one queue manager, updates applied to one queue manager need to be committed before a new transaction is started for the next queue manager.

As with single-site transactions, commit-confirm transactions are implemented using WebSphere MQ single-phase, but it requires a dedicated recovery queue at the queue manager to log the transaction ID. At commit time, the gateway places a message in this queue with the message ID set to the Oracle transaction ID. After the gateway calls the queue manager to commit the transaction, the extra message on the transaction log queue becomes part of the overall transaction. This makes it possible to determine the outcome of the transaction in case of system failure, enabling the gateway to recover a failed transaction. When a transaction completes successfully, the gateway removes the associated message from the queue.

The WebSphere MQ administrator must create a reserved queue at the queue manager. The name of this queue is specified in the gateway initialization file with the `TRANSACTION_LOG_QUEUE` parameter. All Oracle users that access WebSphere MQ through the gateway should have full authorization for this queue. The transaction log queue is reserved for transaction logging only and must not be used, accessed, or updated other than by the gateway. When a system failure occurs, the Oracle recovery process checks the transaction log queue to determine the recovery strategy.

Two gateway initialization parameters, `TRANSACTION_RECOVERY_USER` and `TRANSACTION_RECOVERY_PASSWORD`, are set in the gateway initialization file to specify the user ID and password for recovery purposes. When set, the gateway uses this user ID and password combination for recovery work. The recovery user ID should have full authorization for the transaction log queue.

Refer to Appendix C, "Gateway Initialization Parameters" for more information about configuring the gateway for commit-confirm transactions.

Troubleshooting

This section includes messages, error codes, gateway tracing, and gateway operations.

Message and Error Code Processing

The gateway architecture includes a number of components. Any of these components can detect and report an error condition while processing PL/SQL code. An error condition can be complex, involving error codes and supporting data from multiple components. In all cases, the Oracle application receives a single Oracle error code on which to act.

Error conditions are represented in the following ways:

- Errors from the Oracle integrating server

  Messages from the Oracle integrating server are in the format ORA-*xxxxx* or PLS-*xxxxx*, where *xxxxx* is a code number. ORA-*xxxxx* is followed by text explaining the error code.

  For example:

  ```
  PLS-00306: wrong number or types of arguments in call to 'MQOPEN'
  ORA-06550: line7, column 3:
  PL/SQL: Statement ignored
  ```

  > **See Also:** Refer to the *Oracle Database Error Messages* for explanations of these errors.

- Gateway and WebSphere MQ errors

  When possible, a WebSphere MQ error code is converted to an Oracle error code. If that is not possible, then the Oracle error ORA-29400 with the corresponding WebSphere MQ error code is returned. Refer to Common Error Codes on page 8-7 for more information.

  Example:

  ```
  ORA-29400: data cartridge error
  MQI MQCONNX failed. completion code=2, reason code=2058
  ```

  > **Note:** Because the Oracle integrating server distinguishes only between a successful or failed outcome of all user operations, MQI calls that return a warning are reported as a successful operation.

Interpreting Gateway Messages

Error codes are generally accompanied by additional message text, other than the text associated with the Oracle message number. The additional text includes details about the error.

Gateway messages have the following format:

```
ORA-nnnnn:error_message_text
gateway_message_line
```

where:

- nnnn is an Oracle error number.
- *error_message_text* is the text of the message associated with the error.
- *gateway_message_line* is additional message text generated by the gateway.

Common Error Codes

The error conditions that are described in this section are common error conditions that an application might receive while using the gateway. However, this section does not cover all error situations.

ORA-01017: invalid username/password; logon denied

Cause: Invalid username or password

Action: Specify a valid username and password.

ORA-29400: The WebSphere MQ MQI call "call_name" fails with reason code mqi_code

Cause: An MQI call to a WebSphere MQ queue manager failed. The gateway could not complete the current operation.

Action: If *call_name* is MQOPEN and *mqi_code* is 2035, then do the following:

- If the gateway is configured for the relaxed security model, then use the WebSphere MQ administrative command interface to grant sufficient message privileges to the user account that started the Oracle Net listener. These privileges enable the user to send and receive messages for the specified WebSphere MQ queue.
- If the gateway is configured for the strict security model, use the WebSphere MQ administrative command interface to grant message privileges to the user name specified in the CREATE DATABASE LINK statement. If no user name was specified in the CREATE DATABASE LINK statement, then the privileges are granted to the current Oracle user ID. These privileges enable the user to send and receive messages for the specified WebSphere MQ queue.

If *call_name* is MQOPEN, and if *mqi_code* is 2085, then verify that the queue that is specified on the WebSphere MQ profile exists at the WebSphere MQ queue manager that you are trying to access and that the queue name is correctly spelled in the correct letter case.

> **See Also:** Refer to IBM publications for more information on *mqi_codes* other than 2035 and 2085

Gateway Tracing

The gateway has a trace feature for testing and debugging purposes. The trace feature collects information about the gateway running environment, MQI calls, and parameter values of the MQI calls. The amount of trace data to collect is based on the tracing level selected with the TRACE_LEVEL parameter. Refer to Appendix C, "Gateway Initialization Parameters" for more information about enabling tracing.

> **Note:** Do not enable tracing when your application is running in a production environment because it reduces gateway performance.

The trace data is written to the directory and file specified by the LOG_DESTINATION parameter.

LOG_DESTINATION PARAMETER

This is a gateway initialization parameter.

Gateway: SQL-based and procedural

Default value: The default value is `SID_agt_PID.trc`

Range of values: None

Syntax: `LOG_DESTINATION = log_file`

Parameter Description

`LOG_DESTINATION = log_file`

`LOG_DESTINATION` specifies the file name or directory where the gateway writes logging information. When `log_file` already exists, logging information is written to the end of file.

If you do not specify `LOG_DESTINATION`, then the default log file is created each time that the gateway starts up.

Verifying Gateway Operation

If your application cannot connect to the gateway, then rerun the application with the gateway trace feature enabled. If no trace information is written to the log file specified by `LOG_DESTINATION`, or if the log file is not created at all, then verify that:

- The Oracle Net configuration for the gateway and the Oracle integrating server is set up properly (refer to "Configuring Oracle Net for the Gateway" on page 7-3)
- A database link exist between the Oracle integrating server and the gateway ("Administering the Database Links Alias Library" on page 7-9)

If the Oracle Net configuration and database link are set up correctly, then check the operation of the gateway with the `test.sql` script:

1. Change directory to the gateway sample directory by entering:

2. Using an editor, modify the `test.sql` script as follows:
   a. Specify the database link name that you created for the gateway. To do this, replace the characters `@pg4mq` with `@dblink`, where *`dblink`* is the name you chose when the database link was created.
   b. Replace the characters *`YOUR_QUEUE_NAME`* with a valid WebSphere MQ queue name.
3. Using SQL*Plus, connect to your Oracle integrating server as a valid user.
4. Run `test.sql`, a script that sends and retrieves a message from a WebSphere MQ queue. A successful completion displays the following output:

```
SQL> @test.sql
message put on queue = 10203040506070809000
MQPUT: CorrelId length = 24
MQPUT: MsgId length = 24
MQPUT returned with reason code 0
MQGET returned with reason code 0
message read back = 10203040506070809000
```

An unsuccessful test displays the following output:

```
SQL> @test.sql
message put on queue = 10203040506070809000
Error: Procedural Gateway for WebSphere MQ verification script failed.
```

```
ORA-29400: data cartridge error
MQI MQOPEN failed. completion code=2, reason code=2085
```

A

The PGM, PGM_UTL8, and PGM_SUP Packages

Use the Visual Workbench when developing applications that access WebSphere MQ through the gateway. The Visual Workbench defines an interface for accessing WebSphere MQ and automatically generates the PL/SQL code (the MIP) for Oracle applications to interface with the gateway. Refer to the *Oracle Procedural Gateway Visual Workbench for WebSphere MQ Installation and User's Guide for Microsoft Windows (32-Bit)* for more information about Visual Workbench.

The MIP uses definitions from the `PGM`, `PGM_UTL8`, and `PGM_SUP` packages. When necessary, you can alter the MIP to include WebSphere MQ functions that are not supported by Visual Workbench. This is done with the definitions and procedures from the `PGM`, `PGM_UTL8`, and `PGM_SUP` packages.

The `PGM`, `PGM_UTL8`, and the `PGM_SUP` packages are installed when the Visual Workbench repository or the Procedural Gateway for MQ deployment environment is created. For more information, refer to Installing the Oracle Visual Workbench Repository on page 7-11 and Preparing the Production Oracle Server on page 7-15.

This appendix discusses the `PGM`, `PGM_UTIL8`, and `PGM_SUP` packages in the following sections:

PGM Package, PG4MQ Gateway Procedures, and Data Type Defintions

The gateway procedures and type definitions of the PGM package are modeled after the WebSphere MQ MQI calls. For all the relevant calls and structures found in MQI, a corresponding counterpart exists in PGM and the associated data type definitions exist in `pgmobj.sql`. The gateway procedures and PGM type definitions are named the same as their MQI counterparts. However, the data types of arguments or structure fields are changed into corresponding PL/SQL data types.

Using these procedures and type definitions in an Oracle application is very similar to writing a WebSphere MQ application. The fields of all PGM type definitions are initialized. These initialization values are based on default values defined by MQI.

Use of gateway procedures and PGM type definitions requires extensive knowledge of MQI and WebSphere MQ programming in general. These procedures and records follow the MQI flow-chart, semantics, and syntax rules.

The PGM package is installed when the Visual Workbench repository or the PG4MQ deployment environment is created and is granted public access. It has no schema because the gateway omits all schema names when describing or executing a procedure. No schema qualifiers need to be prefixed to the names of the procedures and type definitions.

For complete information about writing WebSphere MQ applications and using MQI calls, refer to the IBM *MQSeries Application Programming Reference*.

Summary of Procedures and Type Definitions

The gateway procedures and PGM provide the following procedures and type definitions:

Table A–1 Procedures and Type Definitions

Procedure	Procedure Purpose	Type Definitions Used by the Procedure
MQOPEN	Opens a queue.	PGM.MQOD and PGM.MQOH
MQPUT	Sends a message to the queue that was opened by MQOPEN.	PGM.MQMD PGM.MQOH PGM.MQPMO
	Sends a message longer than 32767 bytes to the queue.	PGM.MQMD PGM.MQOH PGM.MQPMO PGM.MQPUT_BFFER
MQGET	Retrieves or scans a message from the queue that was opened by MQOPEN.	PGM.MQMD PGM.MQOH PGM.MQGMO
	Sends a message longer than 32767 bytes to the queue.	PGM.MQMD PGM.MQOH PGM.MQGMO PGM.MQGET_BFFER
MQCLOSE	Closes the queue that was opened by MQOPEN.	Does not use a type definition.

Procedure Conventions

The gateway procedures are described in alphabetical order in this appendix. The type definitions are described with the procedures that use them. Only type definition fields that can be changed are described. Other fields equivalent to MQI fields are left out because they are reserved for WebSphere MQ, are not supported by the gateway, or contain values that should not be changed.

A procedure's definition is shown using the IBM argument names associated with the equivalent MQI call. For example:

```
MQGET(hobj, mqmd, mqgmo, msg)
```

You can use your own names for these arguments if you code the arguments in the order shown in the definition. For example,

```
MQGET(handle, descript, get_options, message);
```

where:

- *handle* is your name for the first argument specified in the definition as hobj.
- *descript* is your name for the second argument specified in the definition as mqmd.
- *get_options* is your name for the third argument specified in the definition as mqgmo.
- *message* is your name for the fourth argument specified in the definition as msg.

For more information about PL/SQL, refer to the *Oracle Database PL/SQL User's Guide and Reference*.

MQI Calls Performed by the Gateway

The following MQI calls have no equivalent procedures in the gateway because the Oracle integrating server and the gateway automatically perform the functions of these MQI calls:

- MQBACK

  Transaction control is handled by the Oracle transaction coordinator. The Oracle application does not need to invoke a separate MQBACK call to undo the changes sent to WebSphere MQ.

- MQCONN

  A connection to a queue manager is established by the Oracle integrating server and the gateway whenever an Oracle application refers to a gateway procedure. The database link name that is used when calling the gateway procedure determines which queue manager the gateway connects to.

- MQCMIT

  Transaction control is handled by the Oracle transaction coordinator. An Oracle application does not need to invoke a separate MQCMIT call to commit the changes sent to WebSphere MQ.

- MQDISC

  Connections to a queue manager are closed by the Oracle integrating server and gateway. An Oracle application does not need to close the connection with the queue manager. Ending the current Oracle session or dropping the database link causes the queue manager connection to end.

Unsupported MQI Calls

The following MQI calls are not supported by the gateway:

- MQINQ
- MQPUT1
- MQSET

Migration Tips

This section provides information about how to upgrade Oracle9*i* PG4MQ and existing customized PL/SQL application programs to use Oracle Procedural Gateway for WebSphere MQ features.

PG4MQ data types and RPC API prototypes are changed to meet the requirements of the gateway infrastructure.

When upgrading PG4MQ to Oracle 10*g* release 2, Oracle recommends that you install the newer version of PG4MQ on a separate development Oracle system. After you have finished with system configuration and testing, transfer all the COBOL copy books and regenerate and recompile MIPs using the VWB (Visual Workbench). For customized codes, make necessary changes and recompile.

Migrating PG4MQ Releases 8 and 9 PL/SQL Applications

To migrate releases 8 and 9 PL/SQL applications:

1. In PL/SQL declarative section, remove `dblink` references from the following PG4MQ data types:
   - PGM8.MQOD
   - PGM8.MQMD
   - PGM8.MQPMO
   - PGM8.MQGMO

   Then remove all the PGM8.MQ*RAW data types:
   - PGM8.MQODRAW
   - PGM8.MQMDRAW
   - PGM8.MQPMORAW
   - PGM8.MQGMORAW
2. In PL/SQL declarative section, change the data type of the handle(s) of the queue(s) (the third argument of PGM.MQOPEN()) from BINARY_INTEGER to PGM.MQOH and replace the package name PGM8 with PGM.

   Change the data type of the handles of the queue (the third argument of PGM.MQOPEN()) from BINARY_INTEGER to PGM.MQOH.

   For example, for V8 and V9 change the following data types to those listed for Oracle 10*g*:

```
objdesc    PGM8.MQOD;
msgdesc    PGM8.MQMD;
putmsgopts PGM8.MQPMO;
getmsgopts PGM8.MQGMO;
hobj       BINARY_INTEGER;
mqodRaw    PGM8.MQODRAW;
mqmdRaw    PGM8.MQMDRAW;
mqpmoRaw   PGM8.MQPMORAW;
mqgmoRaw   PGM8.MQGMORAW;
```

   For Oracle 10*g* release 2:

```
objdesc     PGM.MQOD;
msgdesc     PGM.MQMD;
putmsgopts  PGM.MQPMO;
getmsgopts  PGM.MQGMO;
```

```
hobj        PGM.MQOH;
```

3. In the PL/SQL executable section, remove `dblink` references from the following PG4MQ procedures:

```
PGM8.MQOPEN@dblink()
PGM8.MQPUT@dblink()
PGM8.MQGET@dblink()
PGM8.MQCLOSE@dblink()
```

   Then define the `dblink` in the new PGM.MQOD type where the object queue name is defined.

   For example, for version 8 and 9:

```
objdesc.objectname := 'QUEUE1';
```

   For Oracle 10*g* release 2:

```
objdesc.objectname := 'QUEUE1';
objdesc.dblinkname := 'dblink';
```

4. If necessary, change the package name PGM8 of all PG4MQ procedures to PGM.

   For example, for version 8 and 9:

```
PGM8.MQOPEN@dblink();
PGM8.MQPUT@dblink();
PGM8.MQGET@dblink();
PGM8.MQCLOSE@dblink();
```

   For Oracle 10*g* release 2:

```
PGM.MQOPEN();
PGM.MQPUT();
PGM.MQGET();
PGM.MQCLOSE();
```

5. In the PL/SQL executable section, remove all statements starting with PGM_UTL8.RAW_TO_*, remove all PGM_UTL8.TO_RAW statements, and replace all references to the MQ*RAW data types with their matching MQ* data types in the following PG4MQ procedures:

   - PGM.MQOPEN();
   - PGM.MQPUT();
   - PGM.MQGET();
   - PGM.MQCLOSE();

   For example, for versions 8 and 9:

```
mqodRaw := PGM_UTL8.TO_RAW(objdesc);
PGM8.MQOPEN@dblink(mqodRaw, options, hobj);
objdesc := PGM_UTL8.RAW_TO_MQMD(mqodRaw);
mqmdRaw := PGM_UTL8.TO_RAW(msgdesc);
mqpmoRaw := PGM_UTL8.TO_RAW(putmsgopts);
PGM8.MQPUT@dblink(hobj, mqmdRaw, mqpmoRaw, putbuffer);
putmsgopts := PGM_UTL8.RAW_TO_MQPMO(mqpmoRaw);
msgdesc := PGM_UTL8.RAW_TO_MQMD(mqmdRaw);

mqmdRaw := PGM_UTL8.TO_RAW(msgdesc);
mqgmoRaw := PGM_UTL8.TO_RAW(getmsgopts);
PGM8.MQGET@dblink(hobj, mqmdRaw, mqgmoRaw, putbuffer);
```

```
getmsgopts := PGM_UTL8.RAW_TO_MQGMO(mqgmoRaw);
msgdesc := PGM_UTL8.RAW_TO_MQMD(mqmdRaw);
```

For Oracle 10*g* release 2:

```
PGM.MQOPEN(objdesc, options, hobj);
PGM.MQPUT(hobj, msgdesc, putmsgopts, putbuffer);
PGM.MQGET(hobj, msgdesc, getmsgopts, getbuffer);
```

6. In PL/SQL executable section, clean up all statements referencing the old MQ*RAW data types.

Migrating PG4MQ Release 4.0.1.*.* PL/SQL Applications

To migrate applications:

1. In the PL/SQL declarative section, remove `dblink` references from the following PG4MQ data types:
   - PGM.MQOD
   - PGM.MQMD
   - PGM.MQPMO
   - PGM.MQGMO
2. In the PL/SQL executable section, remove `dblink` references from the following PG4MQ procedures and define the `dblink` in the new PGM.MQOD object where the object queue name is defined:
   - PGM.MQOPEN@dblink()
   - PGM.MQPUT@dblink()
   - PGM.MQGET@dblink()
   - PGM.MQCLOSE@dblink()

   For example, for version 4:

```
PGM.MQOPEN@dblink(objdesc, options, hobj);
objdesc.objectname :='QUEUE1';
PGM.MQPUT@dblink(hobj, msgdesc, putmsgopts, putbuffer);
PGM.MQGET@dblink(hobj, msgdesc, getmsgopts, putbuffer);
PGM.MQCLOSE@dblink(hobj, options);
```

MQCLOSE Procedure

MQCLOSE closes a queue. On return, the queue handle is invalid and your application must reopen the queue with another call to MQOPEN before issuing another MQPUT, MQGET, or MQCLOSE call to the queue.

MQCLOSE differs from MQI calls in the following ways:

- The connection handle argument is omitted from MQCLOSE because the gateway automatically takes care of managing queue manager connections.
- The MQI completion code is not included in the procedure argument list. When a gateway procedure fails because the corresponding MQI call failed, then an Oracle error message is returned to the caller.

- The MQI reason code is not included in the procedure argument list. When the corresponding MQI call for a gateway procedure returns a reason code, then the reason code is included in the Oracle error message returned to the caller.

Definition

```
MQCLOSE(hobj, options)
```

where:

- *hobj* contains the handle for the queue to close. The handle was returned by a previous call to MQOPEN. This input argument is a new PGM.MQOH object in Oracle 10*g* release 2.
- *options* specifies the close action. Use PGM_SUP.MQCO_NONE or the other PGM_SUP constants for a close option. Refer to "MQCLOSE Values" on page A-24. This input argument is PL/SQL data type BINARY_INTEGER.

Example

Using your own variable names when arguments are in the required order:

```
MQCLOSE(handle, close_options);
```

MQGET Procedure

MQGET retrieves a message from a queue. The queue must already be open from a previous call to MQOPEN with the PGM_SUP.MQOO_INPUT_AS_Q_DEF (or an equivalent option) option set. Retrieved messages for this form of MQGET must be shorter than 32767 bytes.

MQGET differs from MQI calls in the following ways:

1. The connection handle argument is omitted from MQGET because the gateway automatically takes care of managing queue manager connections.
2. The MQI completion code is not included in the procedure's argument list. When a gateway procedure fails because the corresponding MQI call failed, then an Oracle error message is returned to the caller.
3. The MQI reason code is not included in the procedure's argument list. When the corresponding MQI call for a gateway procedure returns a reason code, then the reason code is included in the Oracle error message that was returned to the caller.
4. The `msg` length argument is not included in the procedure's argument list because the Oracle integrating server and the gateway automatically keep track of the message data length.

Definition

```
MQGET(hobj, mqmd, mqgmo, msg)
```

where:

- *hobj* contains the handle for the queue to open. The handle is returned by a previous call to MQOPEN. This input argument is a new PGM.MQOH object in Oracle 10*g* release 2.
- *mqmd* is used on input to describe the attributes of the message being retrieved. Use the fields of the PGM.MQMD object type definition to describe these attributes.

On output, mqmd contains information about how the request was processed. The queue manager sets some of the PGM.MQMD object fields on return.

This input and output argument is PL/SQL PGM.MQMD data type. For the details of PGM.MQMD, refer to "PGM.MQMD Type Definition" on page A-10.

- *mqgmo*is used on input to describe the option values that control the retrieve request. Use the fields of the PGM.MQGMO object type definition to describe these options.

  On output, the queue manager sets some of the PGM.MQGMO object fields on return.

  This input and output argument is PL/SQL PGM.MQGMO data type. For the details of the PGM.MQGMO object, refer to "PGM.MQGMO Type Definition" on page A-13.

- *msg* contains the retrieved message. This output argument is PL/SQL the RAW data type or PGM.MQGET_BUFFER.

Examples

1. Using your own variable names when arguments are in the required order:

```
MQGET(handle, descript, opts, message);
```

2. The following example, which is provided as a sample with the gateway , reads all messages from a WebSphere MQ queue. For more information, refer to the IBM publication referring to WebSphere MQ Application Programming.

Example A–1 getsample.sql

```
--
-- Copyright Oracle, 2005 All Rights Reserved.
--
-- NAME
--   getsample.sql
--
-- DESCRIPTION
--
--   Specify the database link name you created for the gateway. To do this,
--   replace the database link name 'YOUR_DBLINK_NAME' with the dblink name
--   you chose when the database link was created.
--
--   This script performs a test run for the WebSphere MQ gateway. In this
--   script the queuename is 'YOUR_QUEUE_NAME', replace it with a valid
--   queue name at the queue manager the gateway is configured for.
--
-- NOTES
--   Run the script from the SQL*Plus command line.
--
--   Make the sure the user is granted 'EXECUTE' on package dbms_output
--

SET SERVEROUTPUT ON
DECLARE

    objdesc      PGM.MQOD;
    msgDesc      PGM.MQMD;
    getOptions   PGM.MQGMO;
    objectHandle PGM.MQOH;
    message      raw(32767);
```

```
BEGIN

    objdesc.OBJECTNAME := 'QUEUE1';
    objdesc.DBLINKNAME := 'pg4mqdepdblink';

    -- Open the queue 'YOUR_QUEUE_NAME' for reading.

    PGM.MQOPEN(objdesc, PGM_SUP.MQOO_INPUT_AS_Q_DEF, objectHandle);

    -- Get all messages from the queue.

    WHILE TRUE LOOP

        -- Reset msgid and correlid to get the next message.

        msgDesc.MSGID := PGM_SUP.MQMI_NONE;
        msgDesc.CORRELID := PGM_SUP.MQCI_NONE;

        PGM.MQGET(objectHandle, msgDesc, getOptions, message);

        -- Process the message....
        DBMS_OUTPUT.PUT_LINE('message read back = ' || rawtohex(message));

 END LOOP;

EXCEPTION

      WHEN PGM_SUP.NO_MORE_MESSAGES THEN

          DBMS_OUTPUT.PUT_LINE('Warning: No more message found on the queue');

          -- Close the queue again.

          PGM.MQCLOSE(objectHandle, PGM_SUP.MQCO_NONE);

      WHEN OTHERS THEN

          -- Re-raise the error;

          DBMS_OUTPUT.PUT_LINE('Error: Procedural Gateway for WebSphere MQ
 verification script failed.');
          DBMS_OUTPUT.PUT_LINE(SQLERRM);
 raise;

END;
/
```

Notes:

- The PL/SQL block fails if the exception clause is left out. In that case, the error code `PGM_SUP.NO_MORE_MESSAGES` is raised.
- The MSGID and CORRELID fields that are used for MQGET are set after each call to MQGET. If they are not reset at each cycle, then MQGET checks for the next message that has the same identifiers as the last read operation, which usually do not exist. The PL/SQL block would only read one message.

PGM.MQMD Type Definition

PGM.MQMD specifies the control information that accompanies a message when it travels between the sending and receiving applications. It also contains information about how the message is handled by the queue manager or by the receiving application. PGM.MQMD describes the attributes of the message being retrieved.

You can use the default values for PGM.MQMD fields or change the fields for your application requirements. For example, to change a field value:

```
mqmd.field_name := field_value;
```

where:

- *mqmd* is the PGM.MQMD object data type and it describes the attributes of the message being retrieved
- *field_name* is a field name of the PGM.MQMD object type definition. You can set as many fields as necessary. Refer to Table A–2 for field names and descriptions.
- *field_value* is the value to assign to *field_name*. You can specify a value or use a PGM_SUP constant to assign a value.

Table A–2 PGM.MQMD Object Fields

Field Name	Description	PL/SQL Datatype	Initial Value
REPORT	Enables the application that sends a message to specify which report message (or messages) should be created by the queue manager when an expected or unexpected event occurs. Use a PGM_SUP constant to assign a value. Refer to "REPORT Field" on page A-22.	RAW(4)	PGM_SUP.MQRO_NONE
MSGTYPE	Specifies the message type: reply message, report message, or normal message (datagram). Use a PGM_SUP constant to assign a value. Refer to "MSGTYPE Field" on page A-21.	BINARY_INTEGER	PGM_SUP.MQMT_DATAGRAM
EXPIRY	Specifies the amount of time that a message stays in a queue. The expiration period is in tenths of a second, and is set by the sending application. Use a PGM_SUP constant to assign a value. Refer to "EXPIRY Field" on page A-21.	BINARY_INTEGER	PGM_SUP.QMEI_UNLIMITED
FEEDBACK	Used with the REPORT field to indicate the kind of report. Use a PGM_SUP constant to assign a value. Refer to "FEEDBACK Field" on page A-21.	BINARY_INTEGER	PGM_SUP.MQFB_NONE
ENCODING	Used for numeric values in the message data. Use a PGM_SUP constant to assign a value. Refer to "ENCODING Field" on page A-20.	RAW(4)	PGM_SUP.MQENC_NATIVE

Table A–2 (Cont.) PGM.MQMD Object Fields

Field Name	Description	PL/SQL Datatype	Initial Value
CODEDCHARSETID	Specifies the coded character set identifier of the characters in the message. Use a PGM_SUP constant to assign a value. Refer to "CODEDCHARSETID Field" on page A-20.	BINARY_INTEGER	`PGM_SUP.MQCCSI_DEFAULT`
FORMAT	A free format name used to inform the receiver about the contents of the message. Specify a format or use a PGM_SUP constant. Refer to "FORMAT Field" on page A-21.	CHAR(8)	`PGM_SUP.MQFMT_NONE`
PRIORITY	Specifies message priority. Specify a value greater than or equal to 0 (zero is the lowest priority), or use a PGM_SUP constant. Refer to "PRIORITY Field" on page A-22.	BINARY_INTEGER	`PGM_SUP.MQPRI_PRIORITY_AS_Q_DEF`
PERSISTENCE	An input field for the sending application. Persistent messages survive when a queue manager is restarted. Non-persistent messages and messages in temporary queues are lost when a queue manager is restarted. Specify the desired persistence with a PGM_SUP constant. Refer to "PERSISTENCE Field" on page A-22.	BINARY_INTEGER	`PGM_SUP.MQPER_PERSISTENCE_AS_Q_DEF`
MSGID	Specifies the message identifier of the message to be retrieve (when receiving a message). If no value is specified when a sending a message (PGM_SUP.MQMI_NONE), then the queue manager assigns a unique value.	RAW(24)	PGM_SUP.MQMI_NONE
CORRELID	Specifies the correlation identifier for the message to retrieve when receiving a message (refer to the `MSGID` field). When sending a message, specify any value, or use PGM_SUP.MQCI_NONE if the message does not require a correlation ID.	RAW(24)	PGM_SUP.MQCI_NONE
BACKOUTCOUNT	An output field for the MQGET procedure. It indicates the number of times a message was placed back on a queue because of a rollback operation.	BINARY_INTEGER	`Zero`
REPLYTOQ	Specifies the name of the reply-to queue. This is an input field for MQPUT and enables the sending application to indicate where reply messages should be sent. It is also an output field for MQGET and tells the receiving application where to send a reply.	CHAR(48)	`NULL`

Table A–2 (Cont.) PGM.MQMD Object Fields

Field Name	Description	PL/SQL Datatype	Initial Value
REPLYTOQMGR	Specifies the queue manager to which the reply message or report should be sent. This is an input field for MQPUT and an output field for MQGET.	CHAR(48)	`NULL`
USERIDENTIFIER	An output field for receiving applications. It identifies the user that sent the message. Sending applications can specify a user on input if the CONTEXT field for the `mqpmo` argument of MQPUT was set to PGM_SUP.MQPMO_SET_IDENTITY_CONTEXT or to PGM_SUP.MQPMO_SET_ALL_CONTEXT.	CHAR(12)	`NULL`
ACCOUNTINGTOKEN	Used to transfer accounting information between applications. Sending applications provide accounting information or use PGM_SUP.MQACT_NONE to specify that no accounting information is included.	CHAR(32)	`PGM_SUP.MQACT_NONE`
APPLIDENTITYDATA	Specifies more information to send along with the message to help the receiving application provide more information about the message or its sender.	CHAR(32)	`NULL`
PUTAPPLTYPE	Describes the kind of application that placed the message on the queue. Use a PGM_SUP constant to assign a value. Refer to "PUTAPPLTYPE Field" on page A-22.	BINARY_INTEGER	`PGM.MQAT_NO_CONTEXT`
PUTAPPLNAME	Specifies the name of the application that placed the message on the queue. Sending applications specify a name or let the queue manager fill in this field. This is an output field for receiving applications.	CHAR(28)	`NULL`

Table A–2 (Cont.) PGM.MQMD Object Fields

Field Name	Description	PL/SQL Datatype	Initial Value
PUTDATE	Specifies the date on which a message was placed on the queue. Sending applications can set a date or let the queue manager take care of it. The date format used by the queue manager is YYYYMMDD. This is an output field for receiving applications.	CHAR(8)	NULL
PUTTIME	Specifies the time that a message was placed on the queue. Sending applications can set a time or let the queue manager take care of it. The time format that is used by the queue manager is HHMMSSTH. This is an output field for receiving applications.	CHAR(8)	NULL
APPLORIGINDATA	Used by the sending application to add information to the message about the message origin. This is an output field for receiving applications.	CHAR(4)	NULL

PGM.MQGMO Type Definition

Use PGM.MQGMO to specify option and control information about how the message is retrieved from a queue. An example of using "PGM.MQGMO Type Definition" on page A-13.

You can use the default values for PGM.MQGMO fields or change the fields for your application requirements. For example, to change a field value:

```
mqgmo.field_name := field_value
```

where:

- mqgmo the PGM.MQGMO object data type, and it specifies option and control information about how the message is retrieved from a queue.
- field_name is a field name of the PGM.MQGMO type definition. You can set as many fields as necessary. Refer to Table A–3 for names and field descriptions.
- field_value is the value to assign to *field_name*. You can specify a value or use a PGM_SUP constant to assign a value.

Table A–3 PGM.MQGMO Fields

Field Name	Description	PL/SQL Datatype	Initial Value
OPTIONS	Specifies options to control the MQGET procedure. Add one or more PGM_SUP constants to set it. Refer to "OPTIONS Field" on page A-19.	BINARY_INTEGER	`PGM.MQGMO_SYNCPOINT` (Messages that are retrieved from the queue are coordinated by the Oracle transaction coordinator.)
WAITINTERVAL	Specifies the maximum time in milliseconds that MQGET waits for a message to arrive in the queue. `WAITINTERVAL` should be equal to or greater than zero, or set to the value of PGM_SUP.MQWI_UNLIMITED (unlimited wait interval).	BINARY_INTEGER	`Zero`
RESOLVEDQNAME	Contains the resolved name of the destination queue from which the message was retrieved. This is an output field set by the queue manager upon return from the call.	CHAR(48)	`NULL`

MQOPEN Procedure

MQOPEN establishes access to a queue. Depending on the mode selected to open the queue, an application can issue subsequent MQPUT, MQGET, or MQCLOSE calls.

MQOPEN differs from MQI calls in the following ways:

1. The connection handle argument is omitted from MQOPEN because the gateway automatically takes care of managing queue manager connections.
2. The MQI completion code is not included in the procedure argument list. When a gateway procedure fails because the corresponding MQI call failed, then an Oracle error message is returned to the caller.
3. The MQI reason code is not included in the procedure argument list. Then the corresponding MQI call for a gateway procedure returns a reason code, then the reason code is included in the Oracle error message that is returned to the caller.

Definition

```
MQOPEN(mqod, options, hobj)
```

where:

- `mqod` specifies the queue to open. Use the fields of the PGM.MQOD type definition to descrbe these attributes.

  On output, the queue manager sets some of the PGM.MQOD object fields on return.

  This input and output argument is PL/SQL PGM.MQOD data type. For the details of PGM.MQOD, refer to "PGM.MQOD Type Definition" on page A-15.

- options specifies the kind of open. Refer to "MQOPEN Values" on page A-24.

  This input argument is PL/SQL data type BINARY_INTEGER.

- hobj contains the handle of the queue after the queue is opened and becomes an input argument for subsequent PGM calls. The queue handle remains valid until one of the following conditions occur:
  - the queue is closed by a call to MQCLOSE
  - the current transaction is made permanent by a COMMIT or ROLLBACK command
  - the Oracle user session is ended by a DISCONNECT command

  This output argument is PGM.MQOH.

Example

Using your own variable names when arguments are in the required order:

```
MQOPEN and(descript, open_options, handle);
```

PGM.MQOD Type Definition

PGM.MQOD is used to define the object to open.

You can use the default values for PGM.MQOD fields or change the fields for your application requirements. For example, to change a field value:

```
mqod.field_name := field_value
```

where:

- `mqod` is the PGM.MQOD data type and specifies the object to open.
- field_name is a field name of the PGM.MQOD type definition. You can set as many fields as necessary. Refer to Table A–4 for field names and descriptions.
- field_value is the value to assign to *`field_name`*. You can specify a value or use a `PGM_SUP` constant to assign a value.

Table A–4 PGM.MQOD Object Fields

Field Name	Description	PL/SQL Datatype	Initial Value
OBJECTTYPE	Specifies the object to open. Use a PGM_SUP constant to assign a value. Refer to "OBJECTTYPE Field" on page A-23.	BINARY_INTEGER	`PGM_SUP.MQOT_Q(queue)`
DBLINKNAME	Specifies the database link name.	CHAR(64)	`NULL`
OBJECTNAME	Specifies the local name of the object as defined by the queue manager.	CHAR(48)	`NULL`

Table A–4 (Cont.) PGM.MQOD Object Fields

Field Name	Description	PL/SQL Datatype	Initial Value
OBJECTQMGRNAME	Specifies the name of the queue manager for the object defined by OBJECTNAME. Leave OBJECTQMGRNAME set to null values because the gateway supports only the opening of objects at the connected queue.	CHAR(48)	NULL
DYNAMICQNAME	Is ignored unless the OBJECTNAME field specifies the name of a model queue. When a model queue is involved, then this field specifies the name of the dynamic queue to be created at the queue manager to which the gateway is connected.	CHAR(48)	AMQ.*
ALTERNATEUSERID	If the options argument of MQOPEN is set to the value of PGM_SUP.MQOO_ALTERNATE_USER_AUTHORITY, then this field specifies the alternate user ID which the queue manager uses to check the authorization for the queue being opened.	CHAR(12)	NULL

MQPUT Procedure

MQPUT sends a message to a queue. The queue must already be open by a previous call to MQOPEN with its options argument set to the value of PGM_SUP.MQOO_OUTPUT.

MQPUT differs from MQI calls as follows:

1. The connection handle argument is omitted from MQPUT because the gateway automatically takes care of managing queue manager connections.
2. The MQI completion code is not included in the procedure argument list. When a gateway procedure fails because the corresponding MQI call failed, then an Oracle error message is returned to the caller.
3. The MQI reason code is not included in the procedure argument list. When the corresponding MQI call for a gateway procedure returns a reason code, then the reason code is included in the Oracle error message returned to the caller.
4. The msg length argument is not included in the procedure argument list because the Oracle integrating server and the gateway automatically keep track of the message data length.

Definition

```
MQPUT(hobj, mqmd, mqpmo, msg)
```

where:

- hobj contains the handle for the queue to send the message to. The handle is returned by a previous call to MQOPEN. This input argument is a new PGM.MQOH in Oracle10*g* release 2.
- mqmd is used on input to describe the attributes of the message being retrieved. Use the fields of the PGM.MQMD type definition to describe these attributes.

On output, mqmd contains information about how the request was processed. The queue manager sets some of the PGM.MQMD fields on return.

This input and output argument is a PGM.MQMD. For the details of PGM.MQMD, refer to "PGM.MQMD Type Definition" on page A-10.

- mqpmo is used on input to describe the option values that control the put request. Use the fields of the PGM.MQPMO type definition to describe these options.

  On output, the queue manager sets some of the PGM.MQPMO fields on return.

  This input and output argument is PGM.MQPMO. For the details of PGM.MQPMO, refer to "PGM.MQPMO Type Definition" on page A-18.

- msg contains the message to send. This input argument is PL/SQL the RAW data type or PGM.MQPUT_BUFFER

Examples

1. Using your own variable names when arguments are in the required order:

```
MQPUT(handle, descript, options, message);
```

2. The following sample, which is provided as a sample with the gateway , sends a message shorter than 32 767 bytes:

Example A–2 putsample.sql

```
--
-- Copyright Oracle, 2005 All Rights Reserved.
--
-- NAME
--   putsample.sql
--
-- DESCRIPTION
--
--   Specify the database link name you created for the gateway. To do this,
--   replace the database link name 'YOUR_DBLINK_NAME' with the dblink name
--   you chose when the database link was created.
--
--   This script performs a test run for the WebSphere MQ gateway. In this
--   script the queuename is 'YOUR_QUEUE_NAME', replace it with a valid
--   queue name at the queue manager the gateway is configured for.
--
-- NOTES
--   Run the script from the SQL*Plus command line.
--
--   Make the sure the user is granted 'EXECUTE' on package dbms_output
--

SET SERVEROUTPUT ON

DECLARE
    objdesc      PGM.MQOD;
    msgDesc      PGM.MQMD;
    putOptions   PGM.MQPMO;
    objectHandle PGM.MQOH;
    message      raw(255);

BEGIN
```

```
    objdesc.OBJECTNAME := 'QUEUE1';
    objdesc.DBLINKNAME := 'pg4mqdepdblink';

    -- Open the queue 'YOUR_QUEUE_NAME' for sending.

    PGM.MQOPEN(objdesc, PGM_SUP.MQOO_OUTPUT, objectHandle);

    -- Put the message buffer on the queue.

    message := '01020304050607080900';

    PGM.MQPUT(objectHandle, msgDesc, putOptions, message);

    -- Print the message we are putting on the queue

    dbms_output.put_line('message put on queue = ' || rawtohex(message));

    -- Close the queue again.

    PGM.MQCLOSE(objectHandle, PGM_SUP.MQCO_NONE);

EXCEPTION

    -- something else went wrong.. tell the user.

    WHEN OTHERS THEN
        DBMS_OUTPUT.PUT_LINE('Error: Procedural Gateway for WebSphere MQ
 verification script failed.');
        DBMS_OUTPUT.PUT_LINE(SQLERRM);
        PGM.MQCLOSE(objectHandle, PGM_SUP.MQCO_NONE);

END;
/
```

PGM.MQPMO Type Definition

PGM.MQPMO is used to define the `mqpmo` argument of MQPUT. It specifies option and control information for processing a message.

You can use the default values for PGM.MQPMO fields or change the fields for the application requirements. For example, to change a field value:

`mqpmo.`*`field_name`* `:=` *`field_value`*

where:

- mqpmo is the PGM.MQPMO data type and specifies option and control information about how the message is processed and put into a queue.
- field_name is a field name of the PGM.MQPMO type definition. You can set as many fields as necessary. Refer to Table A–5 for field names and descriptions.
- field_value is the value to assign to *`field_name`*. You can specify a value or use a `PGM_SUP` constant to assign a value.

Table A–5 PGM.MQPMO Fields

Field Name	Description	PL/SQL Datatype	Initial Value
OPTIONS	Specifies options to control the MQPUT procedure. The field is set by adding one or more of the PGM_SUP definitions. Refer to "OPTIONS Field" on page A-23.	BINARY_INTEGER	PGM.MQPMO_SYNCPOINT (Messages placed on the queue are coordinated by the Oracle transaction coordinator.)
CONTEXT	Specifies the object handle of the input queue. It is only used when the OPTIONS field has the bit PGM_SUP.MQPMO_PASS_IDENTITY_CONTEXT or the bit PGM_SUP.MQPMO_PASS_ALL_CONTEXT set.	BINARY_INTEGER	Zero
RESOLVEDQNAME	Contains the resolved name of the destination queue. This is an output field set by the queue manager on return.	CHAR(48)	NULL
RESOLVEDQMGRNAME	Contains the resolved name of the queue manager for the queue name returned in the RESOLVEDQNAME field. This is an output field set by the queue manager on return.	CHAR(48)	NULL

PGM_SUP Package

PGM_SUP contains constant and exception definitions to use with the gateway procedures and PGM type definitions. Using these values requires extensive knowledge of MQI and WebSphere MQ programming in general. These definitions follow the MQI definition rules. For complete information about writing WebSphere MQ applications, refer to the IBM *MQSeries Application Programming Reference*.

PGM.MQGMO Values

The following sections provide information about PGM.MQGMO values.

OPTIONS Field

```
MQGMO_NO_WAIT                constant binary_integer := 0;
MQGMO_NONE                   constant binary_integer := 0;
MQGMO_WAIT                   constant binary_integer := 1;
MQGMO_SYNCPOINT              constant binary_integer := 2;
MQGMO_NO_SYNCPOINT           constant binary_integer := 4;
MQGMO_SET_SIGNAL             constant binary_integer := 8;
MQGMO_BROWSE_FIRST           constant binary_integer := 16;
MQGMO_BROWSE_NEXT            constant binary_integer := 32;
MQGMO_ACCEPT_TRUNCATED_MSG   constant binary_integer := 64;
MQGMO_MARK_SKIP_BACKOUT      constant binary_integer := 128;
MQGMO_MSG_UNDER_CURSOR       constant binary_integer := 256;
MQGMO_LOCK                   constant binary_integer := 512;
MQGMO_UNLOCK                 constant binary_integer := 1024;
MQGMO_BROWSE_MSG_UNDER_CURSOR constant binary_integer := 2048;
MQGMO_SYNCPOINT_IF_PERSISTENT constant binary_integer := 4096;
MQGMO_FAIL_IF_QUIESCING      constant binary_integer := 8192;
MQGMO_CONVERT                constant binary_integer := 16384;
MQGMO_LOGICAL_ORDER          constant binary_integer := 32768;
```

```
MQGMO_COMPLETE_MSG            constant binary_integer := 65536;
MQGMO_ALL_MSGS_AVAILABLE      constant binary_integer := 131072;
MQGMO_ALL_SEGMENTS_AVAILABLE  constant binary_integer := 262144;
```

VERSION Field

```
MQGMO_VERSION_1                constant binary_integer := 1;
MQGMO_CURRENT_VERSION          constant binary_integer := 1;
MQGMO_VERSION_2                constant binary_integer := 2;
MQGMO_VERSION_3                constant binary_integer := 3;
```

MATCHOPTIONS Field

```
MQMO_DEFAULT                   constant binary_integer := 3;
MQMO_NONE                      constant binary_integer := 0;
MQMO_MATCH_MSG_ID              constant binary_integer := 1;
MQMO_MATCH_CORREL_ID           constant binary_integer := 2;
MQMO_MATCH_GROUP_ID            constant binary_integer := 4;
MQMO_MATCH_MSG_SEQ_NUMBER      constant binary_integer := 8;
MQMO_MATCH_OFFSET              constant binary_integer := 16;
MQMO_MATCH_MSG_TOKEN           constant binary_integer := 32;
```

WAITINTERVAL

```
PGM_SUP.MQWI_UNLIMITED CONSTANT BINARY_INTEGER := -1;
PGM_SUP.MQWI_UNITS     CONSTANT BINARY_INTEGER := 1000;
```

PGM.MQMD Values

The following sections provide information about PGM.MQOD values.

CODEDCHARSETID Field

```
PGM_SUP.MQCCSI_DEFAULT  CONSTANT BINARY_INTEGER := 0;
PGM_SUP.MQCCSI_Q_MGR    CONSTANT BINARY_INTEGER := 0;
PGM_SUP.MQCCSI_EMBEDDED CONSTANT BINARY_INTEGER := -1;
```

ENCODING Field

```
PGM_SUP.
MQENC_NATIVE
  CONSTANT RAW(4) := '00000111';
```

ENCODING Field, Values for Binary Integers

```
PGM_SUP.MQENC_INTEGER_UNDEFINED CONSTANT RAW(4) := '00000000';
PGM_SUP.MQENC_INTEGER_NORMAL    CONSTANT RAW(4) := '00000001';
PGM_SUP.MQENC_INTEGER_REVERSED  CONSTANT RAW(4) := '00000002';
```

ENCODING Field, Values for Floating Point Numbers

```
PGM_SUP.MQENC_FLOAT_UNDEFINED     CONSTANT RAW(4) := '00000000';
PGM_SUP.MQENC_FLOAT_IEEE_NORMAL   CONSTANT RAW(4) := '00000100';
PGM_SUP.MQENC_FLOAT_IEEE_REVERSED CONSTANT RAW(4) := '00000200';
PGM_SUP.MQENC_FLOAT_S390          CONSTANT RAW(4) := '00000300';
```

ENCODING Field, Mask Values

```
PGM_SUP.MQENC_INTEGER_MASK  CONSTANT RAW(4) := '0000000f';
PGM_SUP.MQENC_DECIMAL_MASK  CONSTANT RAW(4) := '000000f0';
PGM_SUP.MQENC_FLOAT_MASK    CONSTANT RAW(4) := '00000f00';
PGM_SUP.MQENC_RESERVED_MASK CONSTANT RAW(4) := 'fffff000';
```

ENCODING Field, Values for Packed Decimal Integers

```
PGM_SUP.MQENC_DECIMAL_UNDEFINED CONSTANT RAW(4) := '00000000';
PGM_SUP.MQENC_DECIMAL_NORMAL    CONSTANT RAW(4) := '00000010';
PGM_SUP.MQENC_DECIMAL_REVERSED  CONSTANT RAW(4) := '00000020';
```

EXPIRY Field

```
PGM_SUP.MQEI_UNLIMITED   CONSTANT BINARY_INTEGER := -1;
PGM_SUP.MQEI_MIN_EXPIRY  CONSTANT BINARY_INTEGER := 0;
PGM_SUP.MQEI_UNITS       CONSTANT BINARY_INTEGER := 10;
```

FEEDBACK Field

```
PGM_SUP.MQFB_NONE                   CONSTANT BINARY_INTEGER := 0;
PGM_SUP.MQFB_SYSTEM_FIRST           CONSTANT BINARY_INTEGER := 1;
PGM_SUP.MQFB_EXPIRATION             CONSTANT BINARY_INTEGER := 258;
PGM_SUP.MQFB_COA                    CONSTANT BINARY_INTEGER := 259;
PGM_SUP.MQFB_COD                    CONSTANT BINARY_INTEGER := 260;
PGM_SUP.MQFB_QUIT                   CONSTANT BINARY_INTEGER := 256;
PGM_SUP.MQFB_CHANNEL_COMPLETED      CONSTANT BINARY_INTEGER := 262;
PGM_SUP.MQFB_CHANNEL_FAIL_RETRY     CONSTANT BINARY_INTEGER := 263;
PGM_SUP.MQFB_CHANNEL_FAIL           CONSTANT BINARY_INTEGER := 264;
PGM_SUP.MQFB_APPL_CANNOT_BE_STARTED CONSTANT BINARY_INTEGER := 265;
PGM_SUP.MQFB_TM_ERROR               CONSTANT BINARY_INTEGER := 266;
PGM_SUP.MQFB_APPL_TYPE_ERROR        CONSTANT BINARY_INTEGER := 267;
PGM_SUP.MQFB_STOPPED_BY_MSG_EXIT    CONSTANT BINARY_INTEGER := 268;
PGM_SUP.MQFB_XMIT_Q_MSG_ERROR       CONSTANT BINARY_INTEGER := 271;
PGM_SUP.MQFB_SYSTEM_LAST            CONSTANT BINARY_INTEGER := 65535;
PGM_SUP.MQFB_APPL_FIRST             CONSTANT BINARY_INTEGER := 65536;
PGM_SUP.MQFB_APPL_LAST              CONSTANT BINARY_INTEGER := 999999999;
```

FORMAT Field

```
MQFMT_NONE               constant char(8) := '        ';
MQFMT_ADMIN              constant char(8) := 'MQADMIN ';
MQFMT_CHANNEL_COMPLETED  constant char(8) := 'MQCHCOM ';
MQFMT_CICS               constant char(8) := 'MQCICS  ';
MQFMT_COMMAND_1          constant char(8) := 'MQCMD1  ';
MQFMT_COMMAND_2          constant char(8) := 'MQCMD2  ';
MQFMT_DEAD_LETTER_HEADER constant char(8) := 'MQDEAD  ';
MQFMT_DIST_HEADER        constant char(8) := 'MQHDIST ';
MQFMT_EVENT              constant char(8) := 'MQEVENT ';
MQFMT_IMS                constant char(8) := 'MQIMS   ';
MQFMT_IMS_VAR_STRING     constant char(8) := 'MQIMSVS ';
MQFMT_MD_EXTENTION       constant char(8) := 'MQHMDE  ';
MQFMT_PCF                constant char(8) := 'MQPCF   ';
MQFMT_REF_MSG_HEADER     constant char(8) := 'MQHREF  ';
MQFMT_STRING             constant char(8) := 'MQSTR   ';
MQFMT_TRIGGER            constant char(8) := 'MQTRIG  ';
MQFMT_WORK_INFO_HEADER   constant char(8) := 'MQHWIH  ';
MQFMT_XMIT_Q_HEADER      constant char(8) := 'MQXMIT  ';
```

MSGTYPE Field

```
PGM_SUP.MQMT_SYSTEM_FIRST CONSTANT BINARY_INTEGER := 1;
PGM_SUP.MQMT_REQUEST      CONSTANT BINARY_INTEGER := 1;
PGM_SUP.MQMT_REPLY        CONSTANT BINARY_INTEGER := 2;
PGM_SUP.MQMT_DATAGRAM     CONSTANT BINARY_INTEGER := 8;
PGM_SUP.MQMT_REPORT       CONSTANT BINARY_INTEGER := 4;
PGM_SUP.MQMT_SYSTEM_LAST  CONSTANT BINARY_INTEGER := 65535;
PGM_SUP.MQMT_APPL_FIRST   CONSTANT BINARY_INTEGER := 65536;
```

```
PGM_SUP.MQMT_APPL_LAST    CONSTANT BINARY_INTEGER := 999999999;
```

PERSISTENCE Field

```
PGM_SUP.MQPER_PERSISTENT           CONSTANT BINARY_INTEGER := 1;
PGM_SUP.MQPER_NOT_PERSISTENT       CONSTANT BINARY_INTEGER := 0;
PGM_SUP.MQPER_PERSISTENCE_AS_Q_DEF CONSTANT BINARY_INTEGER := 2;
```

PRIORITY Field

```
PGM_SUP.MQPRI_PRIORITY_AS_Q_DEF CONSTANT BINARY_INTEGER := -1;
PGM_SUP.MQPRI_MIN_PRIORITY      CONSTANT BINARY_INTEGER := 0;
PGM_SUP.MQPRI_MAX_PRIORITY      CONSTANT BINARY_INTEGER := 9;
```

PUTAPPLTYPE Field

```
MQAT_UNKNOWN     constant binary_integer := -1;
MQAT_NO_CONTEXT  constant binary_integer := 0;
MQAT_CICS        constant binary_integer := 1;
MQAT_MVS         constant binary_integer := 2;
MQAT_OS390       constant binary_integer := 2;
MQAT_IMS         constant binary_integer := 3;
MQAT_OS2         constant binary_integer := 4;
MQAT_DOS         constant binary_integer := 5;
MQAT_AIX         constant binary_integer := 6;
MQAT_UNIX        constant binary_integer := 6;
MQAT_QMGR        constant binary_integer := 7;
MQAT_OS400       constant binary_integer := 8;
MQAT_WINDOWS     constant binary_integer := 9;
MQAT_CICS_VSE    constant binary_integer := 10;
MQAT_WINDOWS_NT  constant binary_integer := 11;
MQAT_VMS         constant binary_integer := 12;
MQAT_GUARDIAN    constant binary_integer := 13;
MQAT_NSK         constant binary_integer := 13;
MQAT_VOS         constant binary_integer := 14;
MQAT_IMS_BRIDGE  constant binary_integer := 19;
MQAT_XCF         constant binary_integer := 20;
MQAT_CICS_BRIDGE constant binary_integer := 21;
MQAT_NOTES_AGENT constant binary_integer := 22;
MQAT_USER_FIRST  constant binary_integer := 65536;
MQAT_USER_LAST   constant binary_integer := 999999999;
MQAT_DEFAULT     constant binary_integer := 6;
```

REPORT Field

```
MQRO_NEW_MSG_ID                constant raw(4) := '00000000';
MQRO_COPY_MSG_ID_TO_CORREL_ID  constant raw(4) := '00000000';
MQRO_DEAD_LETTER_Q             constant raw(4) := '00000000';
MQRO_NONE                      constant raw(4) := '00000000';
MQRO_PAN                       constant raw(4) := '00000001';
MQRO_NAN                       constant raw(4) := '00000002';
MQRO_PASS_CORREL_ID            constant raw(4) := '00000040';
MQRO_PASS_MSG_ID               constant raw(4) := '00000080';
MQRO_COA                       constant raw(4) := '00000100';
MQRO_COA_WITH_DATA             constant raw(4) := '00000300';
MQRO_COA_WITH_FULL_DATA        constant raw(4) := '00000700';
MQRO_COD                       constant raw(4) := '00000800';
MQRO_COD_WITH_DATA             constant raw(4) := '00001800';
MQRO_COD_WITH_FULL_DATA        constant raw(4) := '00003800';
MQRO_EXPIRATION                constant raw(4) := '00200000';
```

```
MQRO_EXPIRATION_WITH_DATA      constant raw(4) := '00600000';
MQRO_EXPIRATION_WITH_FULL_DATA constant raw(4) := '00E00000';
MQRO_EXCEPTION                 constant raw(4) := '01000000';
MQRO_EXCEPTION_WITH_DATA       constant raw(4) := '03000000';
MQRO_EXCEPTION_WITH_FULL_DATA  constant raw(4) := '07000000';
MQRO_DISCARD_MSG               constant raw(4) := '08000000';
```

VERSION Field

```
MQMD_VERSION_1               constant binary_integer := 1;
MQMD_VERSION_2               constant binary_integer := 2;
MQMD_CURRENT_VERSION         constant binary_integer := 2;
```

Report Field, Mask Values

```
PGM_SUP.MQRO_REJECT_UNSUP_MASK         CONSTANT RAW(4) := '101c0000';
PGM_SUP.MQRO_ACCEPT_UNSUP_MASK         CONSTANT RAW(4) := 'efe000ff';
PGM_SUP.MQRO_ACCEPT_UNSUP_IF_XMIT_MASK CONSTANT RAW(4) := '0003ff00';
```

PGM.MQOD Values

The following sections provide information about PGM.MQOD values.

OBJECTTYPE Field

```
PGM_SUP.MQOT_Q       CONSTANT BINARY_INTEGER := 1;
PGM_SUP.MQOT_PROCESS CONSTANT BINARY_INTEGER := 3;
PGM_SUP.MQOT_Q_MGR   CONSTANT BINARY_INTEGER := 5;
PGM_SUP.MQOT_CHANNEL CONSTANT BINARY_INTEGER := 6;
```

OBJECTTYPE Field, Extended Values

```
MQOT_ALL               constant binary_integer := 1001;
MQOT_ALIAS_Q           constant binary_integer := 1002;
MQOT_MODEL_Q           constant binary_integer := 1003;
MQOT_LOCAL_Q           constant binary_integer := 1004;
MQOT_REMOTE_Q          constant binary_integer := 1005;
MQOT_SENDER_CHANNEL    constant binary_integer := 1007;
MQOT_SERVER_CHANNEL    constant binary_integer := 1008;
MQOT_REQUESTER_CHANNEL constant binary_integer := 1009;
MQOT_RECEIVER_CHANNEL  constant binary_integer := 1010;
MQOT_CURRENT_CHANNEL   constant binary_integer := 1011;
MQOT_SAVED_CHANNEL     constant binary_integer := 1012;
MQOT_SVRCONN_CHANNEL   constant binary_integer := 1013;
MQOT_CLNTCONN_CHANNEL  constant binary_integer := 1014;
```

VERSION Field

```
MQOD_VERSION_1               constant binary_integer := 1;
MQOD_VERSION_2               constant binary_integer := 2;
MQOD_CURRENT_VERSION         constant binary_integer := 2;
```

PGM.MQPMO Values

The following sections provide information about PGM.MQPMO values.

OPTIONS Field

```
MQPMO_NONE                    constant binary_integer := 0;
MQPMO_SYNCPOINT               constant binary_integer := 2;
MQPMO_NO_SYNCPOINT            constant binary_integer := 4;
```

```
MQPMO_DEFAULT_CONTEXT          constant binary_integer := 32;
MQPMO_NEW_MSG_ID               constant binary_integer := 64;
MQPMO_NEW_CORREL_ID            constant binary_integer := 128;
MQPMO_PASS_IDENTITY_CONTEXT    constant binary_integer := 256;
MQPMO_PASS_ALL_CONTEXT         constant binary_integer := 512;
MQPMO_SET_IDENTITY_CONTEXT     constant binary_integer := 1024;
MQPMO_SET_ALL_CONTEXT          constant binary_integer := 2048;
MQPMO_ALTERNATE_USER_AUTHORITY constant binary_integer := 4096;
MQPMO_FAIL_IF_QUIESCING        constant binary_integer := 8192;
MQPMO_NO_CONTEXT               constant binary_integer := 16384;
MQPMO_LOGICAL_ORDER            constant binary_integer := 32768;
```

VERSION Field

```
MQPMO_VERSION_1                constant binary_integer := 1;
MQPMO_VERSION_2                constant binary_integer := 2;
MQPMO_CURRENT_VERSION          constant binary_integer := 2;
```

MQCLOSE Values

The following sections provide information about MQCLOSE values.

hobj Argument

```
PGM_SUP.MQHO_UNUSABLE_HOBJ CONSTANT BINARY_INTEGER := -1;
```

options Argument

```
PGM_SUP.MQCO_NONE         CONSTANT BINARY_INTEGER := 0;
PGM_SUP.MQCO_DELETE       CONSTANT BINARY_INTEGER := 1;
PGM_SUP.MQCO_DELETE_PURGE CONSTANT BINARY_INTEGER := 2;
```

MQOPEN Values

The following sections provide information about MQOPEN values.

options Argument

```
MQOO_BIND_AS_Q_DEF             constant binary_integer := 0;
MQOO_INPUT_AS_Q_DEF            constant binary_integer := 1;
MQOO_INPUT_SHARED              constant binary_integer := 2;
MQOO_INPUT_EXCLUSIVE           constant binary_integer := 4;
MQOO_BROWSE                    constant binary_integer := 8;
MQOO_OUTPUT                    constant binary_integer := 16;
MQOO_INQUIRE                   constant binary_integer := 32;
MQOO_SET                       constant binary_integer := 64;
MQOO_SAVE_ALL_CONTEXT          constant binary_integer := 128;
MQOO_PASS_IDENTITY_CONTEXT     constant binary_integer := 256;
MQOO_PASS_ALL_CONTEXT          constant binary_integer := 512;
MQOO_SET_IDENTITY_CONTEXT      constant binary_integer := 1024;
MQOO_SET_ALL_CONTEXT           constant binary_integer := 2048;
MQOO_ALTERNATE_USER_AUTHORITY constant binary_integer := 4096;
MQOO_FAIL_IF_QUIESCING         constant binary_integer := 8192;
MQOO_BIND_ON_OPEN              constant binary_integer := 16384;
MQOO_BIND_NOT_FIXED            constant binary_integer := 32768;
MQOO_RESOLVE_NAMES             constant binary_integer := 65536;
```

Maximum Lengths for Fields of PGM Type Definitions

These constants contain the maximum lengths permitted for fields used by the PGM Type Definitions. For example, the constant PGM_SUP.MQ_ACCOUNTING_TOKEN_LENGTH specifies that the maximum length for PGM.MQMD.ACCOUNTINGTOKEN is 32 characters.

```
MQ_ABEND_CODE_LENGTH         constant binary_integer :=  4;
MQ_ACCOUNTING_TOKEN_LENGTH   constant binary_integer :=  32;
MQ_APPL_IDENTITY_DATA_LENGTH constant binary_integer :=  32;
MQ_APPL_ORIGIN_DATA_LENGTH   constant binary_integer :=  4;
MQ_ATTENTION_ID_LENGTH       constant binary_integer :=  4;
MQ_AUTHENTICATOR_LENGTH      constant binary_integer :=  8;
MQ_CANCEL_CODE_LENGTH        constant binary_integer :=  4;
MQ_CLUSTER_NAME_LENGTH       constant binary_integer :=  48;
MQ_CORREL_ID_LENGTH          constant binary_integer :=  24;
MQ_CREATION_DATE_LENGTH      constant binary_integer :=  12;
MQ_CREATION_TIME_LENGTH      constant binary_integer :=  8;
MQ_DATE_LENGTH               constant binary_integer :=  12;
MQ_EXIT_NAME_LENGTH          constant binary_integer :=  128;
MQ_FACILITY_LENGTH           constant binary_integer :=  8;
MQ_FACILITY_LIKE_LENGTH      constant binary_integer :=  4;
MQ_FORMAT_LENGTH             constant binary_integer :=  8;
MQ_FUNCTION_LENGTH           constant binary_integer :=  4;
MQ_GROUP_ID_LENGTH           constant binary_integer :=  24;
MQ_LTERM_OVERRIDE_LENGTH     constant binary_integer :=  8;
MQ_MFS_MAP_NAME_LENGTH       constant binary_integer :=  8;
MQ_MSG_HEADER_LENGTH         constant binary_integer :=  4000;
MQ_MSG_ID_LENGTH             constant binary_integer :=  24;
MQ_MSG_TOKEN_LENGTH          constant binary_integer :=  16;
MQ_NAMELIST_DESC_LENGTH      constant binary_integer :=  64;
MQ_NAMELIST_NAME_LENGTH      constant binary_integer :=  48;
MQ_OBJECT_INSTANCE_ID_LENGTH constant binary_integer :=  24;
MQ_NAME_LENGTH               constant binary_integer :=  48;
MQ_PROCESS_APPL_ID_LENGTH    constant binary_integer :=  256;
MQ_PROCESS_DESC_LENGTH       constant binary_integer :=  64;
MQ_PROCESS_ENV_DATA_LENGTH   constant binary_integer :=  128;
MQ_PROCESS_NAME_LENGTH       constant binary_integer :=  48;
MQ_PROCESS_USER_DATA_LENGTH  constant binary_integer :=  128;
MQ_PUT_APPL_NAME_LENGTH      constant binary_integer :=  28;
MQ_PUT_DATE_LENGTH           constant binary_integer :=  8;
MQ_PUT_TIME_LENGTH           constant binary_integer :=  8;
MQ_Q_DESC_LENGTH             constant binary_integer :=  64;
MQ_Q_MGR_DESC_LENGTH         constant binary_integer :=  64;
MQ_Q_MGR_IDENTIFIER_LENGTH   constant binary_integer :=  48;
MQ_Q_MGR_NAME_LENGTH         constant binary_integer :=  48;
MQ_Q_NAME_LENGTH             constant binary_integer :=  48;
MQ_REMOTE_SYS_ID_LENGTH      constant binary_integer :=  4;
MQ_SERVICE_NAME_LENGTH       constant binary_integer :=  32;
MQ_SERVICE_STEP_LENGTH       constant binary_integer :=  8;
MQ_START_CODE_LENGTH         constant binary_integer :=  4;
MQ_STORAGE_CLASS_LENGTH      constant binary_integer :=  8;
MQ_TIME_LENGTH               constant binary_integer :=  8;
MQ_TRAN_INSTANCE_ID_LENGTH   constant binary_integer :=  16;
MQ_TRANSACTION_ID_LENGTH     constant binary_integer :=  4;
MQ_TP_NAME_LENGTH            constant binary_integer :=  64;
MQ_TRIGGER_DATA_LENGTH       constant binary_integer :=  64;
MQ_USER_ID_LENGTH            constant binary_integer :=  12;
```

Error Code Definitions

Error Codes -29400.

Error Code -29400: Data Cartridge Error

This error code indicates that the MQI opcode implemented in PG4MQ fails. Refer to IBM WebSphere reference manual for information about the cause by looking up the opcode and its completion code and reason code.

```
MQI opcode failed. completion code=xxxx. reason code=xxxx.
```

Example A–3 test.sql

```
--
-- Copyright Oracle, 2005 All Rights Reserved.
--
-- NAME
--   test.sql
--
-- DESCRIPTION
--
--   Specify the database link name you created for the gateway. To do this,
--   replace the database link name 'YOUR_DBLINK_NAME' with the dblink name
--   you chose when the database link was created.
--
--   This script performs a test run for the WebSphere MQ gateway. In this
--   script the queuename is 'YOUR_QUEUE_NAME', replace queuename with
--   a valid queue name at the queue manager the gateway is configured
--   for.
--
--   First the script puts a raw message of 10 bytes on the specified
--   queue.
--
--   When successfully completed the put operation, the script does a
--   get on the same queue to read the message back.
--
--   The contents of both messages put and retrieved from the queue are
--   printed to standard out for verification by the user.
--
-- NOTES
--   Run the script from the SQL*Plus command line.
--
--   Make the sure the user is granted 'EXECUTE' on package dbms_output
--

set serveroutput on

declare

  objdesc    PGM.MQOD;
  hobj       PGM.MQOH;
  msgdesc    PGM.MQMD;
  putmsgopts PGM.MQPMO;
  getmsgopts PGM.MQGMO;
  options    binary_integer;
  putbuffer  raw(10) := '10203040506070809000';
  getbuffer  raw(10);

begin
```

```
--
-- Print the message we are putting on the queue
--

dbms_output.put_line('message put on queue = ' || rawtohex(putbuffer));

--
-- Specify queue name and dblink name (replace with proper names).
--
objdesc.objectname := 'YOUR_QUEUE_NAME';
objdesc.dblinkname := 'YOUR_DBLINK_NAME';

--
-- Specify a put operation.
--

options := pgm_sup.MQOO_OUTPUT;

--
-- Open the queue.
--

PGM.MQOPEN(objdesc, options, hobj);

--
-- Put the message buffer on the queue.
--

PGM.MQPUT(hobj, msgdesc, putmsgopts, putbuffer);

--
-- Define close options.
--

options := pgm_sup.MQCO_NONE;

--
-- Close queue.
--

PGM.MQCLOSE(hobj, options);

--
-- Specify a get operation.
--

options := pgm_sup.MQOO_INPUT_AS_Q_DEF;

--
-- Open queue.
--

PGM.MQOPEN(objdesc, options, hobj);

--
-- Get message from the queue.
--

getmsgopts.msglength := 10;
```

```
  PGM.MQGET(hobj, msgdesc, getmsgopts, getbuffer);

  --
  -- Define close options.
  --

  options := pgm_sup.MQCO_NONE;

  --
  -- Close the queue again.
  --

  PGM.MQCLOSE(hobj, options);

  --
  -- Print the result
  --

  dbms_output.put_line('message read back = ' || rawtohex(getbuffer));

exception

  --
  -- When no more messages... tell the user and close the queue.
  --

  when pgm_sup.NO_MORE_MESSAGES then
    dbms_output.put_line('Warning: No message found on the queue');
    options := pgm_sup.MQCO_NONE;
    PGM.MQCLOSE(hobj, options);

  --
  -- something else went wrong.. tell the user.
  --
  when others then
    dbms_output.put_line('Error: Procedural Gateway for WebSphere MQ verification
 script failed.');
    dbms_output.put_line(SQLERRM);

end;
/
```

B

UTL_RAW Package

Use the Oracle Visual Workbench for developing applications that access WebSphere MQ through the gateway. The Visual Workbench defines an interface for accessing WebSphere MQ and automatically generates the PL/SQL code (the MIP) for Oracle applications to interface with the gateway. Refer to the *Oracle Procedural Gateway Visual Workbench for WebSphere MQ Installation and User's Guide for Microsoft Windows (32-Bit)* for more information about Visual Workbench. This appendix includes the following sections:

Message Data Types

Messages sent to a WebSphere MQ queue or retrieved from a WebSphere MQ queue are transferred as untyped data by the MIP procedures. When data profiles are defined in the MIP, the MIP converts message data from Oracle data types to target data types that the receiving application understands. The message data is packed into a buffer of the `RAW` data type before being sent to the WebSphere MQ queue. The same conversion process applies when receiving a message. The MIP unpacks the message from the buffer and converts it to specified Oracle data types.

The MIP uses the functions of the `UTL_RAW` package to perform the message data conversions. The `UTL_RAW` package is a PL/SQL package that contains procedures for converting and packing message data, which is sent back and forth through the WebSphere MQ queues using the `RAW` data type and PL/SQL data types.

When necessary, you can enhance the message data conversions in the generated MIP with the `UTL_RAW` functions. When no data profiles are defined in the MIP, you can create your own data conversion procedures with `UTL_RAW` functions by calling these functions before sending a message and immediately after receiving a message.

The `UTL_RAW` package is not included with the gateway. It is shipped with each Oracle server. Refer to your Oracle DBA for information about installing the `UTL_RAW` package.

UTL_RAW Functions

The UTL_RAW functions are called with the following syntax:

```
UTL_RAW.function(arg1, arg2, ...)
```

The function name, arguments, their Oracle data types, and the return value data type are provided with each function description in this appendix. For ease of description,

the functions are described with PL/SQL syntax that shows the resulting function value placed in a variable as follows:

```
result := UTL_RAW.function(arg1, arg2, ...);
```

However, the function can also be used as a component in a PL/SQL expression. For example, the function takes two characters strings, "Hello" and "world !", converts them to raw message data with UTL_RAW.CAST_TO_RAW, concatenates them by using UTL_RAW.CONCAT, and then uses the gateway to send them to a WebSphere MQ queue. The same message is retrieved from the queue, converted to a character data type with UTL_RAW.CAST_TO_VARCHAR2, and then printed.

UTL_RAW.TO_RAW

PGM_UTL.TO_RAW converts values of PGM.MQOD, PGM.MQMD, PGM.MQPMO and PGM.MQGMO data type objects to into raw values.

Syntax

```
result := PGM_UTL.TO_RAW(input);
```

where:

- result is the variable that holds the output value of the function. It is of the RAW data type.
- input is the input value of the PGM.MQOD, PGM.MQMD, PGM.MQPMO, or PGM.MQGMO data type objects that is converted to raw data.

UTL_RAW.BIT_AND

UTL_RAW.BIT_AND performs a bitwise logical AND operation on two raw values. If the values have different lengths, then the AND operation is terminated after the last byte of the shorter of the two values. The unprocessed portion of the longer value is appended to the partial result to produce the final result. The length of the resulting value equals the longer of the two input values.

Syntax

```
result := UTL_RAW.BIT_AND(input1, input2);
```

where:

- result is the variable that holds the output value of the function. It is of the RAW data type. The value is null if *input1* or *input2* is null.
- input1 is an input value of the RAW data type to BIT-AND with *input2*.
- input2 is an input value of the RAW data type to BIT-AND with *input1*.

UTL_RAW.BIT_COMPLEMENT

UTL_RAW.BIT_COMPLEMENT performs a bitwise logical COMPLEMENT operation of a raw value. The length of the resulting value equals the length of the input value.

Syntax

```
result := UTL_RAW.BIT_COMPLEMENT(input);
```

where:

- result is the variable that holds the output value of the function. It is of the RAW data type. The value is null if *input* is null.
- input is an input value of the RAW data type on which to perform the COMPLEMENT operation.

UTL_RAW.BIT_OR

UTL_RAW.BIT_OR performs a bitwise logical OR operation of two raw values. If the values have different lengths, then the OR operation is terminated after the last byte of the shorter of the two values. The unprocessed portion of the longer value is appended to the partial result to produce the final result. The length of the resulting value equals the length of the longer of the two input values.

Syntax

```
result := UTL_RAW.BIT_OR(input1, input2);
```

where:

- result is the variable that holds the output value of the function. It is of the RAW data type. The value is null if *input1* or *input2* is null.
- input1 is an input value of the RAW data type to BIT-OR with *input2*.
- input2 is an input value of the RAW data type to BIT-OR with *input1*.

UTL_RAW.BIT_XOR

UTL_RAW.BIT_XOR performs a bitwise logical EXCLUSIVE OR operation on two raw values. If the values have different lengths, then the EXCLUSIVE OR operation is terminated after the last byte of the shorter of the two values. The unprocessed portion of the longer value is appended to the partial result to produce the final result. The length of the resulting value equals the lenght of longer of the two input values.

Syntax

```
result := UTL_RAW.BIT_XOR(input1, input2);
```

where:

- result is the output value of the function. It is of the RAW data type. The value is null if *input1* or *input2* is null.
- input1 is an input value of the RAW data type to BIT-XOR with *input2*.
- input2 is an input value of the RAW data type to BIT-XOR with *input1*.

UTL_RAW.CAST_TO_RAW

UTL_RAW.CAST_TO_RAW converts a value of the VARCHAR2 data type into a raw value with the same number of bytes. The input value is treated as if it were composed of single 8-bit bytes, not characters. Multibyte character boundaries are ignored. The data is not modified in any way, it is only changed to the RAW data type.

Syntax

```
result := UTL_RAW.CAST_TO_RAW(input);
```

where:

- result is the output value of the function. It is of the RAW data type. The value is null if *input* is null.
- input is the input value of the VARCHAR2 data type to convert to raw data.

UTL_RAW.CAST_TO_VARCHAR2

UTL_RAW.CAST_TO_VARCHAR2 converts a raw value into a value of the VARCHAR2 data type with the same number of data bytes. The result is treated as if it were composed of single 8-bit bytes, not characters. Multibyte character boundaries are ignored. The data is not modified in any way, it is only changed to the VARCHAR2 data type.

Syntax

```
result := UTL_RAW.CAST_TO_VARCHAR2(input);
```

where:

- result is the output value of the function. It is of the VARCHAR2 data type. The value is null if *input* is null.
- input is the input value of the RAW data type to convert to the VARCHAR2 data type.

UTL_RAW.COMPARE

UTL_RAW.COMPARE compares one raw value to another raw value. If they are identical, then UTL_RAW.COMPARE returns 0. If they are not identical, then COMPARE returns the position of the first byte that does not match. If the input values have different lengths, then the shorter input value is padded on the right by a value that you specify.

Syntax

```
result := UTL_RAW.COMPARE(input1, input2[, pad]);
```

where:

- result is the output value of the function. It is of the NUMBER data type. A value of 0 is returned if the values of *input1* and *input2* are null or identical or the position, numbered from 1, of the first mismatched byte.
- input1 is the first input value of the RAW data type to compare.
- input2 is the second input value of the RAW data type to compare.
- pad is a single-byte value used to pad the shorter input value. The default is X'00'.

UTL_RAW.CONCAT

UTL_RAW.CONCAT concatenates a set of up to 12 raw values into a single raw value. The values are appended together, left to right, in the order that they appear in the parameter list. Null input values are skipped, and the concatenation continues with the next non-null value.

If the sum of the lengths of the input values exceeds 32767 bytes, then a VALUE_ERROR exception is raised.

Syntax

```
result := UTL_RAW.CONCAT(input1, ...  input12);
```

where:

- result is the output value of the function. It is of the RAW data type.
- *input1 ... input12* are the input values of the RAW data type to concatenate.

UTL_RAW.CONVERT

UTL_RAW.CONVERT converts a raw value to a different character set. A VALUE_ERROR exception is raised for any of the following conditions:

- The input value is null or 0 in length
- One or both of the specified character sets is missing, null, or 0 in length
- The character set names are invalid or unsupported by the Oracle server

Syntax

```
result := UTL_RAW.CONVERT(input, new_charset, old_charset);
```

where:

- result is the output value of the function. It is of the RAW data type.
- input is the input value of the RAW data type to convert.
- new_charset is the national language support (NLS) character set to convert *input* to.
- old_charset is the NLS character set that the input currently uses.

UTL_RAW.COPIES

UTL_RAW.COPIES returns one or more copies of a value. The values are concatenated together. A VALUE_ERROR exception is raised for any of the following conditions:

- the input value is null or has a length of 0
- a negative number of copies is specified
- the length of the result exceeds 32767 bytes

Syntax

```
result := UTL_RAW.COPIES(input, number);
```

where:

- result is the output value of the function. It is of the RAW data type.
- input is a value of the RAW data type to copy.
- number is the number of times to copy input. It must be a positive value.

UTL_RAW.LENGTH

UTL_RAW.LENGTH returns the length, in bytes, of a raw value.

Syntax

```
result := UTL_RAW.LENGTH(input);
```

where:

- result is the output value of the function. It is of the NUMBER data type.
- input is the input value of the RAW data type to evaluate.

UTL_RAW.OVERLAY

UTL_RAW.OVERLAY replaces a portion of a raw value with a new string of raw data. If the new data is shorter than the length of the overlay area, then the new data is padded to make it long enough. If the new data is longer than the overlay area, then the extra bytes are ignored. If you specify an overlay area that exceeds the length of the input value, then the input value is extended according to the length specified. If you specify a starting position for the overlay area, which exceeds the length of the input value, then the input value is padded to the position specified, and then the input value is further extended with the new data.

A VALUE_ERROR exception is raised for any of the following conditions:

- The new data used to overlay the input value is null or has a length of 0
- The portion of the input value to overlay is not defined
- The length of the portion to overlay exceeds 32767 bytes
- The number of bytes to overlay is defined as less than 0
- The position within the input value to begin the overlay operation is defined as less than 1

Syntax

```
result := UTL_RAW.OVERLAY(new_bytes, input, position, length, pad);
```

where:

- result is the output value of the function. It is of the RAW data type.
- input is the input value of the RAW data type to overlay.
- new_bytes is the new value, a byte string of the RAW data type, to overlay the input with. Bytes are selected from *new_bytes* beginning with the leftmost byte.
- position is the position within input, numbered from 1, at which to begin overlaying. This value must be greater than 0. The default is 1.
- length is the number of bytes to overlay. This must be greater than, or equal to, 0. The default is the length of *new_bytes*.
- pad is a single-byte value used to pad when the length exceeds the overlay length or when *position* exceeds the length of *input*. The default is X'00'.

UTL_RAW.REVERSE

UTL_RAW.REVERSE reverses the byte sequence of a raw value from end-to-end. For example, this function reverses X'0102F3' to X'F30201' or xyz to zyx. The length of the resulting value is the same length as the input value. A VALUE_ERROR exception is raised if the input value is null or has a length of 0.

Syntax

```
result := UTL_RAW.REVERSE(input);
```

where:

- result is the output value of the function. It is of the RAW data type.

- input is the input value of the RAW data type to be reversed.

UTL_RAW.SUBSTR

UTL_RAW.SUBSTR removes bytes from a raw value. If you specify a positive number as the starting point for the bytes to remove, then SUBSTR counts from the beginning of the input value to find the first byte. If you specify a negative number, then UTL_RAW.SUBSTR counts backward from the end of the input value to find the first byte.

A VALUE_ERROR exception is raised for any of the following conditions:

- the position to begin the removal is specified as 0
- the number of bytes to remove is specified as less than 0

Syntax

```
result := UTL_RAW.SUBSTR(input, position[,length]);
```

where:

- result is the output value of the function. It is of the RAW data type. The value is the specified byte or bytes from *input*, or the value is a null value if *input* is null.
- input is the input value of the RAW data type from which a portion of its bytes is to be extracted.
- position is the byte position from which to start extraction. This value cannot be 0. If *position* is negative, then SUBSTR counts backward from the end of input.
- length is the number of bytes to extract from *input* after *position*. This value must be greater than 0. When not specified, all bytes to the end of input are returned.

UTL_RAW.TRANSLATE

UTL_RAW.TRANSLATE changes the value of some of the bytes in a raw value according to a scheme that you specify. Bytes in the input value are compared to a matching string, and when found to match, the byte at the same position in the replacement string is copied to the result. It is omitted from the result if the offset exceeds the length of the replacement string. Bytes in the input value that do not appear in the matching string are copied to the resulting value. Only the leftmost occurrence of a byte in the matching string is used, and subsequent duplicate occurrences are ignored.

If the matching string contains more bytes than the replacement string, then the extra bytes at the end of the matching string have no corresponding bytes in the replacement string. Any bytes in the input value that match such bytes are omitted from the resulting value.

A VALUE_ERROR exception is raised for any of the following conditions:

- The input value is null or has a length of 0
- The matching string is null or has a length of 0
- The replacement string is null or has a length of 0

Syntax

```
result := UTL_RAW.TRANSLATE(input, match, replace_bytes);
```

where:

- result is the output value of the function. It is of the RAW data type.
- input is the input value of the RAW data type to change.
- match specifies the byte codes to search for in *input* and to change to *replace_bytes*. It is of the RAW data type.
- replace_bytes specifies the byte codes that replace the codes specified by match. It is of the RAW data type.

UTL_RAW.TRANSLITERATE

UTL_RAW.TRANSLITERATE replaces all occurrences of any bytes in a matching string with the corresponding bytes of a replacement string. Bytes in the input value are compared to the matching string, and if they are not found, then they are copied unaltered to the resulting value. If they are found, then they are replaced in the resulting value by the byte at the same offset in the replacement string, or with the pad byte that you specify when the offset exceeds the length of the replacement string. Only the leftmost occurrence of a byte in the matching string is used. Subsequent duplicate occurrences are ignored. The result value of UTL_RAW.TRANSLITERATE is always the same length as the input value.

If the replacement string is shorter than the matching string, then the pad byte is placed in the resulting value when a selected matching string byte has no corresponding byte in the replacement string. A VALUE_ERROR exception is raised when the input value is null or has a length of 0.

Syntax

```
result := UTL_RAW.TRANSLITERATE (input, replace_bytes, match, pad);
```

where:

- result is the output value of the function. It is of the RAW data type.
- input is the input value of the RAW data type to change.
- replace_bytes specifies the byte codes to which corresponding bytes of *match* are changed. This value can be any length that is valid for the RAW data type. The default is a null value and effectively extends with *pad* to the length of match as necessary.
- match specifies the byte codes to match in *input*. The value can be any length that is valid for the RAW data type. The default is X'00' through X'FF'.
- pad is a single-byte value that is used to extend the length of *replace_bytes* when *replace_bytes* is shorter than *match*. The default is X'00'.

UTL_RAW.TRANSLITERATE differs from UTL_RAW.TRANSLATE in the following ways:

- Bytes in the input value that are undefined in the replacement string are padded with a value that you specify
- The resulting value is always the same length as the input value
- The raw values used for the matching and replacement strings have no default values
- Bytes in the input value that are undefined in the replacement string are omitted in the resulting value

- The resulting value can be shorter than the input value

UTL_RAW.XRANGE

UTL_RAW.XRANGE returns a raw value containing all valid one-byte codes within a range that you specify. If the starting byte value is greater than the ending byte value, then the succession of resulting bytes begin with the starting byte, wrapping from X'FF' to X'00', and end at the ending byte.

When specified, the values for the starting and ending bytes must be single-byte raw values.

Syntax

```
result := UTL_RAW.XRANGE(start, end);
```

where:

- result is the output value of the function. It is of the RAW data type.
- start is the one-byte code to start with. The default is X'00'.
- end is the one-byte code to end with. The default is X'FF'.

C

Gateway Initialization Parameters

The gateway has its own initialization parameters, which are described in this appendix, and supports the initialization parameters for procedural gateways.

This appendix contains the following sections:

Gateway initialization file

The gateway initialization file is called `init`*`sid`*`.ora`. A default initialization file is created in the directory *`ORACLE_HOME`*`\pg4mq\admin` during the installation of the Procedural Gateway for WebSphere MQ.

Gateway Parameters

This section describes gateway parameters, listing the default value, range of values, and the syntax for usage. This section describes the following parameters:

LOG_DESTINATION

The following table describes the `LOG_DESTINATION` parameter:

LOG_DESTINATION	Use
Syntax	`LOG_DESTINATION =` *`log_file`*
Default value	*`SID`*`_agt_`*`PID`*`.trc` (PID is the process ID of the gateway)
Range of values	None

LOG_DESTINATION specifies the full path name of the gateway log file.

AUTHORIZATION_MODEL

The following table describes how to use the AUTHORIZATION_MODEL parameter:

AUTHORIZATION_MODEL	Use
Syntax	AUTHORIZATION_MODEL = {RELAXED|STRICT}
Default value	RELAXED
Range of values	RELAXED or STRICT

AUTHORIZATION_MODEL defines the authorization model for the gateway user. The relaxed model specifies that authorizations that are granted to the effective user ID of the gateway by the queue manager are the only associations that an Oracle application has.

The strict model specifies that the Oracle user ID and password (that are provided when a database link is created), or the current user ID and password (when the Oracle user ID and password are not provided), should be checked against the local or network password file.

Refer to Security Models on page 8-1 for more information about effective user IDs.

QUEUE_MANAGER

The following table describes how to use the QUEUE_MANAGER parameter:

QUEUE_MANAGER	Use
Syntax	QUEUE_MANAGER = *manager_name*
Default value	None
Range of values	None

QUEUE_MANAGER, a required parameter, specifies the name of the queue manager that the gateway connects to at logon. The effective user ID of the gateway should have the correct user privileges or should be authorized to connect to this queue manager. Specify *manager_name* by using the following rules:

- 1 to 48 alphanumeric characters in length
- No leading or embedded blank characters
- Trailing blank characters are permitted

Refer to Security Models on page 8-1 for more information about effective user IDs.

TRACE_LEVEL

The following table describes how to use the TRACE_LEVEL parameter:

TRACE_LEVEL	Use
Syntax	TRACE_LEVEL = *level*
Default value	0
Range of values	0 to 7

TRACE_LEVEL controls whether tracing information is collected as the gateway runs. When set to collect information, the trace data is written to the log file that is specified by the LOG_DESTINATION parameter. Specify *level* as an integer from 0 to 3, which is the sum of the desired trace values. The following table describes the significance of these values:

Trace Level	Description
0	Specifies that no tracing is to be done.
1	Specifies that general tracing is to be done. This includes the user ID that is used to log on to the Websphere MQ queue manager, the name of the queue manager, the gateway transaction mode, security mode, and so on.
2	Specifies that tracing is to be done for all MQI calls that are issued by the gateway.
3	Specifies that tracing is to be done for all parameter values that are passed to, or received from, the MQI calls that were issued by the gateway.

See Also: Refer to IBM publications, for more information about MQI calls

TRANSACTION_LOG_QUEUE

The following table describes how to use TRANSACTION_LOG_QUEUE.

TRANSACTION_LOG_QUEUE	Description
Syntax	TRANSACTION_LOG_QUEUE = *tx_queue_name*
Default value	None
Range of values	None

TRANSACTION_LOG_QUEUE specifies the name of the queue for logging transaction IDs. Specify *tx_queue_name* using the following rules:

- 1 to 48 alphanumeric characters in length
- No leading or embedded blank characters
- Trailing blank characters are permitted

Refer to Creating a Transaction Log Queue on page 7-9 for more information.

TRANSACTION_MODEL

The following table describes how to use TRANSACTION_MODEL.

TRANSACTION_MODEL	Description
Syntax	TRANSACTION_MODEL = {COMMIT_CONFIRM | SINGLE_SITE}
Default value	SINGLE_SITE
Range of values	COMMIT_CONFIRM or SINGLE_SITE

TRANSACTION_MODEL defines the transaction mode of the gateway. Specify a value for TRANSACTION_MODEL as described in the following table:

Item	Description
COMMIT_CONFIRM	Specifies that the gateway can participate in transactions when queues belonging to the same WebSphere queue manager are updated. At the same time, any number of Oracle databases are updated. Only one gateway with the commit-confirm model can join the distributed transaction, because the gateway operates as the focal point of the transaction. When this value is specified, you must also set the RECOVERY_USER, RECOVERY_PASSWORD, and TRANSACTION_LOG_QUEUE parameters.
SINGLE_SITE	Specifies that the gateway can participate in a transaction only when queues belonging to the same WebSphere queue manager are updated. An Oracle application can select, but not update, data at any Oracle database within the same transaction that accesses WebSphere MQ.

TRANSACTION_RECOVERY_PASSWORD

The following table describes how to use TRANSACTION_RECOVERY_PASSWORD:

TRANSACTION_RECOVERY_PASSWORD	Description
Syntax	TRANSACTION_RECOVERY_PASSWORD = *rec_password* or TRANSACTION_RECOVERY_PASSWORD = *
Default value	*
Range of values	An asterisk (*), which indicates that the parameter must be encrypted, or any valid password

TRANSACTION_RECOVERY_PASSWORD specifies the password of the user that the gateway uses to start recovery of a transaction. The default value is set to an asterisk (*), and this asterisk indicates that the value of this parameter is stored in an encrypted form in a separate password file. To specify or change a valid password for encrypted gateway parameters, you need to use the tg4pwd gateway utility to do the work. For more information, refer to Using the tg4pwd Utility.

The TRANSACTION_RECOVERY_PASSWORD parameter is required only when TRANSACTION_MODEL is set to COMMIT_CONFIRM. Refer to Creating a Transaction Log Queue on page 7-9 for more information.

Passwords in the gateway initialization file

The gateway uses user IDs and passwords to access the information in the remote database on the WebSphere MQ server. Some user IDs and passwords must be defined in the gateway initialization file to handle functions such as resource recovery. In a security conscious environment, plain-text passwords are regarded as insecure when they are accessible in the Initialization File.

A new encryption feature has been added to the gateway to make such passwords more secure. The tg4pwd utility can be used to encrypt passwords that would normally be stored in the gateway initialization file. Using this feature is optional, but

highly recommended by Oracle. With this feature, passwords are no longer stored in the initialization file but are stored in a password file in an encrypted form. This makes the password information more secure. The following section describes how to use this feature.

Using the tg4pwd Utility

The `tg4pwd` utility is used to encrypt passwords that would normally be stored in the gateway initialization file. The utility works by reading the Initialization File and looks for parameters with a special value. This value is the asterisk (*). The asterisk indicates that the value of this parameter is stored in an encrypted form in another file. The following sample is a section of the initialization file with this value.

TRANSACTION_RECOVERY_PASSWORD=*

The initialization file is first edited to set the value of the parameter to the asterisk (*). Then the `tg4pwd` utility is run, specifying the gateway SID on the command line. The utility reads the initialization file and prompts the user to enter the values to be encrypted.

The syntax of this command is:

```
tg4pwd gateway_sid
```

In this command *gateway_sid* is the SID of the gateway.

The following is an example, assuming gateway SID is `pg4mqs`:

```
% tg4pwd pg4mqs
ORACLE Gateway Password Utility Constructing password file for
Gateway SID pg4mqs
Enter the value for TRANSACTION_RECOVERY_PASSWORD
welcome
%
```

In this example, the `TRANSACTION_RECOVERY_PASSWORD` parameter is identified as requiring encryption. The user enters the value (for example, `welcome`) and presses the **Enter** key. If more parameters require encryption, then you are prompted for their values. The encrypted data is stored in the directory.

Note: It is important that the *ORACLE_HOME* environment variable specifies the correct gateway home to ensure that the correct gateway initialization file is read.

TRANSACTION_RECOVERY_USER

The following table describes how to use the `TRANSACTION_RECOVERY_USER` parameter:

Item	Description
Syntax	`TRANSACTION_RECOVERY_USER = rec_user`
Default value	None.
Range of values	Any valid operating system user ID that is authorized by WebSphere MQ Manager (MQM)

`TRANSACTION_RECOVERY_USER` specifies the user name that the gateway uses to start the recovery of a transaction. This parameter is required only when

AUTHORIZATION_MODEL is set to STRICT, and TRANSACTION_MODEL is set to COMMIT_CONFIRM. Refer to Creating a Transaction Log Queue on page 7-9 for more information.

Index

G

I

L

M

O

P

Q

R

S

T

U

V

W