Oracle® Services for Microsoft Transaction Server
Developer's Guide
12c Release 1 (12.1) for Microsoft Windows
E18595-02

May 2013
Contents

Preface .......................................................................................................................................................... vii
  Audience .................................................................................................................................................. vii
  Documentation Accessibility .................................................................................................................. vii
  Related Documents ............................................................................................................................... vii
  Conventions .......................................................................................................................................... viii

Changes in This Release for Oracle Services for Microsoft Transaction Server Developer's Guide ................................................................................................................................. ix
  Changes in Oracle Database 12c Release 1 (12.1).................................................................................... ix

1 Using Microsoft Transaction Server with Oracle Database
  Microsoft Transaction Server Overview .............................................................................................. 1-1
  Microsoft Transaction Server and Oracle Integration Overview ...................................................... 1-1
    Oracle Services for Microsoft Transaction Server Support for DTC .............................................. 1-2
    Distributed Transactions on Real Application Clusters (Oracle RAC) ........................................... 1-2
    Promotable Local Transactions ....................................................................................................... 1-2
    Read-Committed and Serializable Transactions ............................................................................ 1-3
  Getting Started with Microsoft Transaction Server and Oracle ....................................................... 1-3

2 Installing Oracle Services for Microsoft Transaction Server
  Installation Introduction ...................................................................................................................... 2-1
  Installation Requirements for Microsoft Transaction Server .......................................................... 2-2
    Oracle Products ............................................................................................................................... 2-2
    Non-Oracle Products ...................................................................................................................... 2-2
  Using Oracle Services for MTS with Oracle Data Provider for .NET, Managed Driver .............. 2-2
  Manually Creating an Oracle MTS Recovery Service ......................................................................... 2-3

3 Managing Recovery Scenarios
  Microsoft Transaction Server Configuration Requirements ............................................................ 3-1
  Microsoft Transaction Server Transaction Recovery Overview ....................................................... 3-1
  Scheduling Automatic Microsoft Transaction Server Transaction Recovery .............................. 3-2
    Creating an Access Control List (ACL) ............................................................................................. 3-2
    Configuring Automatic Transaction Recovery ............................................................................. 3-3
    Setting and Starting Up Database Job-Queue Processes ............................................................... 3-3
4 Programming with Microsoft Transaction Server and an Oracle Database

COM Component Integration in a Transaction ................................................................. 4-1
Microsoft Transaction Server Application Development .............................................. 4-3
  Microsoft Transaction Server Component Registration ........................................... 4-4
  Types of Registration Components ......................................................................... 4-4
  Registration of Components .................................................................................... 4-4
  Microsoft Transaction Server-Coordinated Component Transaction ...................... 4-4
  Microsoft DTC-Coordinated Component Transaction .............................................. 4-5
OCI Integration with Microsoft Transaction Server .................................................... 4-6
  Integrating COM Components ............................................................................... 4-7
    COM Components Running in an MTS-Coordinated Transaction ......................... 4-7
    Non-Transactional COM Components Running with OCI Connection Pooling ....... 4-7
  COM Components Using MS DTC and OCI Connection Pooling ............................. 4-8
  COM Components Using MS DTC and Nonpooling OCI Connection ....................... 4-8
Using OCI Functions .................................................................................................... 4-8
  OraMTSSvcGet() ..................................................................................................... 4-9
  OraMTSSvcRel() ..................................................................................................... 4-11
  OraMTSSvcEnlist() ................................................................................................. 4-11
  OraMTSSvcEnlistEx() ............................................................................................. 4-12
  OraMTSEnlCtxGet() ................................................................................................ 4-13
  OraMTSEnlCtxRel() ............................................................................................... 4-14
  OraMTSJoinTxn() ................................................................................................... 4-15
  OraMTSTransTest() .................................................................................................. 4-15
  OraMTSSvcGet() ..................................................................................................... 4-16
ODBC Integration with Microsoft Transaction Server Overview .................................. 4-16
  Setting the Connection Attribute ......................................................................... 4-16
  Using Oracle ODBC Driver ................................................................................... 4-17
  Using Microsoft Oracle ODBC Driver .................................................................. 4-18

5 Tuning Microsoft Transaction Server Performance

Improving Microsoft Transaction Server Application Performance .......................... 5-1
Managing Microsoft Transaction Server Connections .............................................. 5-1
  Connection Pooling Registry Parameters .............................................................. 5-1
Increasing the Transaction Timeout Parameter .......................................................... 5-3
Changing Initialization Parameter Settings ................................................................. 5-3
Additional Parameters ............................................................................................... 5-4
Starting MSDTC ......................................................................................................... 5-4

6 Troubleshooting Oracle Microsoft Transaction Server

Tracking OraMTS Performance ................................................................................... 6-1
Correcting Oracle Net Changes that Impact Connection Pooling ............................... 6-2
Designing an Application that Uses Multiple Databases ............................................ 6-2
This manual explains how to install, configure, use, and administer Oracle Services for Microsoft Transaction Server that apply to operating systems. It covers the features of Oracle Database software that apply to the Windows 2000, Windows XP, and Windows Server 2003 operating systems.

This preface contains these topics:

- **Audience**
- **Documentation Accessibility**
- **Related Documents**
- **Conventions**

**Audience**

This guide is intended for anyone who performs the following tasks:

- Uses **component object model (COM)** components with Microsoft Transaction Server
- Registers COM components as transactional and has Microsoft Transaction Server control the transaction
- Uses client-side connection pooling in Microsoft Transaction Server
- Uses .NET applications with Oracle Services for Microsoft Transaction Server to access Oracle Database instances.

**Documentation Accessibility**


**Access to Oracle Support**


**Related Documents**

For more information, see these Oracle resources:
For information about Oracle error messages, see *Oracle Database Error Messages*. Once you find the specific range, you can search for the specific message. When connected to the Internet, you can search for a specific error message using the error message search feature of the Oracle online documentation.

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

To download free release notes, installation documentation, white papers, or other collateral, please visit the Oracle Technology Network (OTN)

http://www.oracle.com/technetwork/index.html

For the latest version of the Oracle documentation, including this guide, visit


## Conventions

The following text conventions are used in this document:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>boldface</strong></td>
<td>Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.</td>
</tr>
<tr>
<td><em>italic</em></td>
<td>Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.</td>
</tr>
<tr>
<td>monospace</td>
<td>Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.</td>
</tr>
</tbody>
</table>
Changes in This Release for Oracle Services for Microsoft Transaction Server Developer's Guide

This preface contains:
- Changes in Oracle Database 12c Release 1 (12.1)

Changes in Oracle Database 12c Release 1 (12.1)

The following are changes in Oracle Services for Microsoft Transaction Server Developer's Guide for Oracle Database 12c Release 1 (12.1).

New Features

The following features are new in this release:
- OraMTS Services Run as Oracle Home User

OraMTS services now operate as a specified, lower privileged user (the Oracle Home User). A utility is provided for cases where the service must be created manually rather than by the installer. Each Oracle Home now has its own OraMTS service.

See Also: "Manually Creating an Oracle MTS Recovery Service" on page 2-3.
Using Microsoft Transaction Server with Oracle Database

This chapter describes Microsoft Transaction Server and Oracle Database integration. This chapter contains these topics:

- Microsoft Transaction Server Overview
- Microsoft Transaction Server and Oracle Integration Overview
- Getting Started with Microsoft Transaction Server and Oracle

Microsoft Transaction Server Overview

Microsoft Transaction Server is a proprietary component object model (COM) transaction processing system that runs on an Internet or network server. Microsoft Transaction Server deploys and manages application and database transaction requests on behalf of a client computer. Microsoft Transaction Server provides:

- ActiveX/distributed component object model (DCOM) programming model to develop distributed applications and a runtime environment in which to deploy these applications.
- Atomicity, Consistency, Isolation, and Durability (ACID) properties for components in transactions.
- Access to performance-enhancing features such as component caching and database connection pooling.

Microsoft Transaction Server is a component of the three-tiered, server-centric architecture model. This model lets you separate the presentation, business logic, and data elements of applications onto different computers connected in a network. Microsoft Transaction Server functionality is also implemented in COM+ and Enterprise Services. Oracle Services for Microsoft Transaction Server, or OraMTS, support Microsoft Transaction Server, COM+, and Enterprise Services.

See Also: Microsoft documentation for additional information about Microsoft Transaction Server

Microsoft Transaction Server and Oracle Integration Overview

Without any special integration, you can deploy applications that were created using Win32, Win64, COM, or Microsoft .NET with a Microsoft Transaction Server that connects to an Oracle Database. To use either of the following features, however, you must install Oracle Services for Microsoft Transaction Server (OraMTS):...
Register the Win32, Win64, COM or .NET application as transactional and have Microsoft Transaction Server control the transaction. You can do this by using the Properties dialog box of the component in the Microsoft Management Console Explorer.

Use client-side connection pooling in Microsoft Transaction Server.

After you have installed Oracle Services for Microsoft Transaction Server, an Oracle MTS Recovery Service is also automatically installed on the same computer. The Oracle MTS Recovery Service helps in the recovery of in-doubt transactions left in Oracle Database instances that originated from this computer. On each connected database:

- Create the Microsoft Transaction Server administrator user account.
- Schedule a database-level transaction recovery job.

This enables the database to participate in Microsoft Transaction Server-started transactions.

Create the COM component with any of the following Oracle products:

- Oracle Data Provider for .NET (ODP.NET).
- Oracle Open Database Connectivity (ODBC) Driver
- Oracle Provider for OLE DB
- Oracle Call Interface (OCI)

Oracle Services for Microsoft Transaction Server Support for DTC

Oracle Services for Microsoft Transaction Server works with Microsoft Distributed Transaction Coordinator (DTC), which is part of the Windows operating system. DTC implements a two-phase commit protocol that makes sure that the transaction outcome is consistent across all data resources involved in a transaction.

Distributed Transactions on Real Application Clusters (Oracle RAC)

With Oracle Database Release 11.1, the database now redirect all the branches of a distributed transaction to a single Oracle RAC instance automatically. Previously developers needed to manually manage this process, individually redirecting all the branches to a single Oracle RAC instance.

See Also: Oracle Real Application Clusters Administration and Deployment Guide to learn more about distributed transactions in Real Application Clusters.

Promotable Local Transactions

Promotable local transactions allow all transactions to remain local until more than one database is brought into the transaction, at which point, they are promoted to distributed transactions.

The flexibility of the promotable transaction feature ensures more efficient resource usage for transactional applications. Distributed transactions require significant overhead versus local transactions. Therefore, local transactions are preferred if only one database is used. At design-time, it may not be known when transactions are local or distributed. Prior to this feature, developers always had to use distributed transactions, even if local ones occurred most of the time, leading to unnecessary resource usage.
This feature is supported with Oracle Database 11g Release 1 and higher. Earlier database versions and other resource managers can participate in a promotable transaction as long as the first connection is to an Oracle Database 11g Release 1 data source or higher.

See Also: Oracle Data Provider for .NET Developer’s Guide for Microsoft Windows for more information on System.Transactions support

Read-Committed and Serializable Transactions
Oracle Services for Microsoft Transaction Server supports distributed transactions set to a serializable or read-committed isolation level.

Getting Started with Microsoft Transaction Server and Oracle
You are now ready to use Microsoft Transaction Server with a database. To get started quickly, follow these steps:

1. Install the Oracle and Microsoft products required for Microsoft Transaction Server and database integration.
   See Chapter 2, "Installing Oracle Services for Microsoft Transaction Server".
2. Create the Microsoft Transaction Server administrator user account.
   See Chapter 3, "Managing Recovery Scenarios".
3. Schedule a Microsoft Transaction Server transaction recovery job.
   See Chapter 3, "Managing Recovery Scenarios".
4. Create Microsoft Transaction Server-hosted applications.
   See Chapter 4, "Programming with Microsoft Transaction Server and an Oracle Database" for instructions on using OCI, Oracle ODBC Driver, or Oracle Provider for OLE DB with COM-based applications.
5. Learn about using Microsoft Transaction Server on the different Windows operating systems.
Installing Oracle Services for Microsoft Transaction Server

This chapter describes installation requirements for the Microsoft Transaction Server and Oracle Database environment.

This chapter contains these topics:

- Installation Introduction
- Installation Requirements for Microsoft Transaction Server
- Using Oracle Services for MTS with Oracle Data Provider for .NET, Managed Driver
- Manually Creating an Oracle MTS Recovery Service

Installation Introduction

You can install OraMTS as part of the Oracle Database Client. OraMTS service will be created for the Oracle Home you installed. Beginning in Oracle 12c, each Oracle Home has its own OraMTS recovery Windows service. Also, beginning in Oracle 12c, the OraMTS service runs as the Oracle Home user.

Oracle Home User is the owner of Oracle Services that run from Oracle Home and cannot be changed after installation. It can be a Windows built-in account or a Windows User Account. For enhanced security, Oracle recommends choosing the standard Windows User Account as Oracle Home User for Oracle Database installations rather than a Windows built-in account. The primary purpose of Oracle Home User is to run Windows services with Windows User Account. However, this user account (Oracle Home User) must be a low-privileged user account that should not be used for database administration. This ensures that Oracle Database services running under Oracle Home User have only the minimal privileges required to run Oracle products. The Windows User Account can be a Local User, a Domain User, or a Managed Services Account.

In some cases, such as a software-only install, clone cycles, or an AddNode operation on the database, you may need to manually create the OraMTS service. For more information, see "Manually Creating an Oracle MTS Recovery Service" on page 2-3.

See Also: Oracle Database Platform Guide for Microsoft Windows

This section describes the Oracle and non-Oracle products you must install for OraMTS. Additional installation requirements include:
For Oracle Data Provider for .NET (ODP.NET) cluster configurations (or any failover configuration), install Microsoft Transaction Server on the node running the Microsoft Distributed Transaction Coordinator (MS DTC) component. This ensures that the Oracle MTS Recovery Service migrates with the client application during failover. You can configure this when scheduling recovery transactions.

Installation Requirements for Microsoft Transaction Server

The Windows computer where Microsoft Transaction Server is installed has the following product requirements:

Oracle Products

- OraMTS
- Oracle Database Client, included automatically with the OraMTS installation.
- A data access driver that uses Oracle Services for MTS, such as:
  - Oracle Data Provider for .NET (ODP.NET)
  - Oracle Open Database Connectivity (ODBC) Driver
  - Oracle Provider for OLE DB
  - Oracle Call Interface (OCI)
- Access to an Oracle Database 10g Release 2 or higher version

Non-Oracle Products

- Windows operating system
- Microsoft Distributed Transaction Coordinator, which is part of the Windows operating system

Using Oracle Services for MTS with Oracle Data Provider for .NET, Managed Driver

Oracle Data Provider for .NET, Managed Driver is a fully managed data provider consisting of 100% native .NET code introduced with Oracle Database 12c. ODP.NET, Managed Driver incorporates Oracle Services for MTS entire enlistment and commit functionality, within Oracle.ManagedDataAccessDTC.dll installed with the managed driver, allowing those functions to execute using managed code. The Oracle Services for MTS recovery service remains unmanaged.

The Oracle.ManagedDataAccessDTC.dll must be deployed with Oracle.ManagedDataAccess.dll for any ODP.NET, Managed Driver applications using distributed transactions. It can run alongside the unmanaged Oracle Services for
Manually Creating an Oracle MTS Recovery Service

Starting with Oracle Database 12c, Oracle Database on Windows software includes the oramtsctl.exe utility to enable manual creation of the OraMTS recovery service. Because ODP.NET, Managed Driver does not automatically create the OraMTS recovery service, running this utility creates the service. When run, the service will be created for the current Oracle home and runs as the Oracle Home User.

If ODP.NET, Managed Driver can access an existing OraMTS recovery service running on the same computer or another computer, it is not necessary to run this utility.

To manually create an Oracle MTS Recovery Service:

1. Install an Oracle Database.
2. Open the command prompt.
3. Run this command:

   oramtsctl -new

To delete an Oracle MTS Recovery Service run:

   oramtsctl -delete

Usage

   oramtsctl <-new|-delete|-start|-stop|-status|-config|-passwd|-trace|-trcdir>
   [-host <hostname|IP_address> ...]
   [-port <number>]
   [-ip <IP_address>]
   [-dtchost <DTC_hostname>]
   [-cluster <on|off>]
   [-default]
-new
   Create and start a new Oracle1MTSRecoveryService service.

-delete [Oracle_home_directory]
   Delete Oracle1MTSRecoveryService of current home or specified home.

-start
   Start Oracle1MTSRecoveryService service.

-stop
   Stop Oracle1MTSRecoveryService service.

-status
   Query Oracle1MTSRecoveryService service status.

-config [-port <number>] [-ip <IP_address>] [-dtchost <DTC_hostname>]
   [-cluster <on|off>] [-default]
   Show or set Oracle1MTSRecoveryService service configuration.
   Use -default to reset Oracle1MTSRecoveryService configuration.

-passwd
   Update Oracle1MTSRecoveryService service user password.

-trace [0-5]
   Show traces or set trace level. Set level 0 to turn off tracing.

-trcdir [trace_directory]
   Show or set trace directory.

-host <hostname|IP_address> ...
   Execute operation on host(s) identified by name(s) or IP address(es).
   Local host is used if option not specified.

-port <number>
   Execute -new or -config with this option to specify a service port.
   Service port is configured automatically if option not specified.

-ip <IP_address>
   Execute -new or -config with this option to specify an IP address.

-default
   Execute -new or -config with this option to set default configuration.

Examples:
Install the service with automatic configuration:
oramtsctl -new

Install the service on port 2032:
oramtsctl -new -port 2032

Configure the service to use port 2033:
oramtsctl -config -port 2033

Update the service user password:
oramtsctl -passwd

Install the service on several hosts and use uniform port 2033:
oramtsctl -new -host host1 host2.domain.com host3 -port 2033
Managing Recovery Scenarios

This chapter describes how to create and schedule Microsoft Transaction Server-related Oracle transaction recovery.

This chapter contains these topics:

- Microsoft Transaction Server Configuration Requirements
- Microsoft Transaction Server Transaction Recovery Overview
- Scheduling Automatic Microsoft Transaction Server Transaction Recovery
- Viewing Microsoft Transaction Server In-Doubt Transactions
- Modifying Registry Values for Oracle Fail Safe Configurations

Microsoft Transaction Server Configuration Requirements

You must configure the Microsoft Transaction Server and Oracle Database environments after installing or migrating Oracle Services for Microsoft Transaction Server (OraMTS).

Configuration is not required on the Windows computer if a Microsoft Transaction Server is installed on a computer.

To configure the Microsoft Transaction Server, perform the following tasks on the computer where the Oracle Database is installed:

1. Run the oramtsadmin.sql script against the database to create the Microsoft Transaction Server administrative user account (the default username is mtssys).
2. Schedule automatic transaction recovery.
   
   See "Scheduling Automatic Microsoft Transaction Server Transaction Recovery" on page 3-2
3. If you have an Oracle Fail Safe configuration, modify the registry values before or after running the oramtsadmin.sql script.
   
   See "Modifying Registry Values for Oracle Fail Safe Configurations" on page 3-6.

Microsoft Transaction Server Transaction Recovery Overview

Distributed transaction capabilities are required to use Microsoft Transaction Server with Oracle database. Microsoft Transaction Server-related Oracle transactions become in-doubt transactions when any of the following fail:

- Microsoft Transaction Server application
Network

Microsoft Distributed Transaction Coordinator (MS DTC)

An Oracle MTS Recovery Service resolves in-doubt transactions on the computer that started the failed transaction. An Oracle MTS Recovery Service is automatically installed with Oracle Services For Microsoft Transaction Server. Only one Oracle MTS Recovery Service can be installed for each computer. A scheduled recovery job on each Microsoft Transaction Server-enabled database permits the Oracle MTS Recovery Service to resolve in-doubt transactions.

The Oracle MTS Recovery Service resolves an in-doubt Microsoft Transaction Server transaction in the following order:

1. The DBMS recovery job detects an in-doubt MTS-related transaction.
2. The DBMS recovery job extracts the recovery service's endpoint address from the XID of the in-doubt transaction and requests the recovery service for the outcome of the MTS/MS DTC transaction.
3. The recovery service requests its MS DTC for transaction outcome.
4. The recovery service reports transaction outcome to the DBMS job process.
5. The DBMS recovery job commits or terminates the in-doubt transaction.

Scheduling Automatic Microsoft Transaction Server Transaction Recovery

OraMTS uses server-based recovery to resolve in-doubt transactions originated by MSDTC. To do this, the OraMTS administrator must be able to access the Windows middle-tier node through UTL_HTTP. oramtsadmin.sql grants execute privileges on UTL_HTTP to the OraMTS administrator, as shown in "Configuring Automatic Transaction Recovery" on page 3-3

Note: Starting with Oracle version 11g, the DBA needs to create an access control list (ACL) as shown in "Creating an Access Control List (ACL)" on page 3-2.

Creating an Access Control List (ACL)

For Oracle database version 11g and later, the DBA must create an access control list (ACL) that grants the OraMTS administrator the privilege to make out-bound HTTP connections. Example 3–1 demonstrates this:

Example 3–1 Creating an ACL List and Adding OraMTS Administrator to it

BEGIN
-- Create the new ACL, naming it 'OraMTSadmin.xml', with a description.
-- This provides the OraMTS administrative user e.g. MTSADMIN user FOO
-- the privilege to connect
DBMS_NETWORK_ACL_ADMIN.CREATE_ACL('OraMTSadmin.xml',
   'Allow usage to the UTL network packages',
   'FOO', TRUE, 'connect');
-- Now grant privilege to resolve DNS names to the OraMTS administrative user
DBMS_NETWORK_ACL_ADMIN.ADD_PRIVILEGE('OraMTSadmin.xml',
   'FOO', TRUE, 'resolve');
-- Specify which hosts this ACL applies to, in this case we are allowing
-- access to all hosts. if one knew the list of all Windows middle-tier,
-- these could be added one by one.
DBMS_NETWORK_ACL_ADMIN.ASSIGN_ACL('OraMTSadmin.xml','*');
Configuring Automatic Transaction Recovery

Automatic transaction recovery is performed by scheduling a database job. A database job for in-doubt transactions must be scheduled for each database participating in Microsoft Transaction Server transactions.

Transaction recovery is configured by running the oramtsadmin.sql script, which triggers utl_oramts.sql and prvtoramts.plb scripts to create the PL/SQL package utl_oramts. The database view oramts_2pc_pending is also created to show in-doubt transactions related to Microsoft Transaction Server transactions.

The oramtsadmin.sql script:

- Creates the Microsoft Transaction Server administrator user account.
- Automatically schedules database jobs for transaction recovery every one minute.
- When the database job is run, it checks for unresolved global transactions in the database that are related to Microsoft Transaction Server. Information in the transaction identifiers (XIDs) of the in-doubt transactions identifies the computer on which the transaction was started. The Oracle MTS Recovery Service on that computer resolves the transaction.
- Schedules post-recovery cleanup every half hour.

Schedule automatic transaction recovery in the database by performing these tasks:

- Setting and Starting Up Database Job-Queue Processes
- Creating and Scheduling Automatic Transaction Recovery

Setting and Starting Up Database Job-Queue Processes

The JOB_QUEUE_PROCESSES initialization parameter specifies the maximum number of job slaves started on an instance.

To set and start up job-queue processes:

1. Ensure that you have SYSDBA privileges.
2. Go to the computer on which the Oracle Database is installed.
3. Start SQL*Plus:
   
   C:\> sqlplus /NOLOG

4. Connect to the database as SYSDBA:
   
   SQL> CONNECT / AS SYSDBA

5. Set the JOB_QUEUE_PROCESSES initialization parameter:
   
   JOB_QUEUE_PROCESSES = 1

   The default value for this parameter is 0. Set this parameter to a value greater than 1 if there are many destinations to which to propagate the messages.

6. Shut down the Oracle Database:
   
   SQL> SHUTDOWN

7. Restart the Oracle Database:
Creating and Scheduling Automatic Transaction Recovery

The oramtsadmin.sql script creates the Microsoft Transaction Server administrator user account with the default username mtssys. The Microsoft Transaction Server transaction recovery jobs run under the administrator user account.

The oramtsadmin.sql script runs the utl_oramts.sql script to grant the following privileges and roles to the administrator user account:

- CREATE SESSION role
- SELECT_CATALOG_ROLE role
- FORCE_ANY_TRANSACTION privilege
- DBMS_JOBS package, on which EXECUTE privileges are granted
- DBMS_TRANSACTION package, on which EXECUTE privileges are granted

To create and schedule automatic transaction recovery:

1. Ensure that you have SYSDBA privileges.
2. Log on to the computer where the Oracle Database is installed.
3. Start SQL*Plus:
   
   C:\> sqlplus /NOLOG

4. Connect to the database as SYSDBA:
   
   SQL> CONNECT / AS SYSDBA

5. Run the oramtsadmin.sql script:
   
   SQL> @ORACLE_BASE\ORACLE_HOME\orams\admin\oramtsadmin.sql;

   You are prompted for the Microsoft Transaction Server administrator username and password. You can accept the default username of mtssys and password of mtssys, or change them.

6. If you did change the password in step 5, you can change it using this script:
   
   SQL> ALTER USER USERNAME IDENTIFIED BY new_password;

   To change the username after completing this task, drop the user, rerun the oramtsadmin.sql script, and specify a different username when prompted.

7. Exit SQL*Plus:
   
   SQL> EXIT

A single PL/SQL package, utl_oramts, is created in the Microsoft Transaction Server administrator's schema. utl_oramts exposes these public procedures and creates this view:

- utl_oramts.show_indoubt Procedure
- utl_oramts.recover_automatic Procedure
- utl_oramts.forget_RMs Procedure
oramts_2pc_pending View

util_oramts.show_indoubt Procedure Use this procedure to view Microsoft Transaction Server in-doubt transactions in the database. This procedure uses the dbms_output package to display results.

Description This procedure requires SERVEROUTPUT set to ON.

SQL> SET SERVEROUTPUT ON

SQL> EXECUTE utl_oramts.show_indoubt;

The following information appears:

===============================================
currently indoubt transactions
===============================================
formatid   : 21255235
gtrid      : C2229A505904974D81FB7316B1471259000000000
bqual      : 5B86A685CD294AA20335839110829C01000000000901944700050
local txid : 142.11.202
tx state   : prepared
protocol   : HTTP
database   : middletier-1@foo.com:2030

===============================================
formatid   : 21255235
gtrid      : 259DF9C8DFC5574F8876F0DF4E15CCAD00000000
bqual      : 2C8DCED5B9816244BA2B73CC013EEB87E010000000901944700050
local txid : 2.18.185
tx state   : prepared
protocol   : HTTP
database   : middletier-2@foo.com:2030

util_oramts.recover_automatic Procedure This procedure is run by the transaction recovery job. An automatic database job is scheduled for utl_oramts.recover_automatic. When the job is run, it checks for unresolved global transactions in the database that are related to Microsoft Transaction Server. Information in the XIDs of the in-doubt transactions identifies the computer on which the transaction started. The Oracle MTS Recovery Service is contacted and resolves the transactions.

util_oramts.forget_RMs Procedure Use this procedure to request the transaction manager (MS DTC) to forget resolved transactions. This procedure is run by the post-recovery cleanup job.

oramts_2pc_pending View The view oramts_2pc_pending is created by executing oramtsadmin.sql. oramts_2pc_pending shows in-doubt transactions in the database. This view consists of the following columns:

Formatid This is the formatid of the global transaction in the database.

global_transaction_id This is the transaction identifier of the Oracle global transaction corresponding to the Microsoft Transaction Server transaction. In fact, this is the globally unique identifier (GUID) of the Microsoft Transaction Server transaction.

branch_id This shows the branch identifier of the Oracle transaction. A single Microsoft Transaction Server transaction can have multiple Oracle global transactions. This depends on the number of Microsoft Transaction Server/COM+ components that
span the same Microsoft Transaction Server transaction. All these transactions have the small global transaction identifier, but different branch identifiers.

**local_tx_id**  A local Oracle transaction corresponds to each Microsoft Transaction Server transaction. This column shows the identifier corresponding to this local transaction.

**state**  This shows the state of the transaction: pending, heuristically committed, heuristically terminated, and so on.

**protocol**  This is the protocol that the transaction recovery job in the database uses to communicate with the Oracle MTS Recovery Service.

**endpoint**  This is the endpoint of the Windows computer on which the Microsoft Transaction Server transaction originated. For HTTP connections, this translates to a hostname and port number.

### Viewing Microsoft Transaction Server In-Doubt Transactions

To view Microsoft Transaction Server–related in-doubt transactions in the database, use SQL*Plus to query the view `oramts_2pc_pending`:

1. Start SQL*Plus with the Microsoft Transaction Server administrator user account:
   
   C:\> sqlplus mtsadmin_user/ mtsadmin_password

2. Enter the following command:
   
   SQL> SELECT * FROM oramts_2pc_pending;

   This displays the computer on which the in-doubt transaction originated.

### Modifying Registry Values for Oracle Fail Safe Configurations

In typical configurations, the MS DTC and Oracle MTS Recovery Service run on the same computer. This ensures that the required information for transaction recovery is available to the Oracle-Microsoft Transaction Server integration layer.

In configurations where the Microsoft Transaction Server application is part of a Windows cluster (for example, the application can fail over to another node or host in the cluster), the MS DTC runs as a cluster-wide resource. All cluster nodes use a single instance of the MS DTC running on any cluster node.

If you have an Oracle Fail Safe configuration, make sure the following registry information is replicated on all nodes in the cluster participating in Microsoft Transaction Server transactions:

To modify registry values for Oracle Fail Safe configurations:

1. Go to the computer on which the MS DTC and Oracle MTS Recovery Service are installed.

2. Start the registry from the command prompt:
   
   C:\> regedit32

   The Registry Editor window appears.

3. Go to `HKEY_LOCAL_MACHINE\Software\Oracle\OracleMTSRecoveryService`.

4. Copy the registry information appearing here to all nodes in the cluster.
5. Reboot the computer on which you added the key.
Programming with Microsoft Transaction Server and an Oracle Database

This chapter describes how to program with Microsoft Transaction Server and an Oracle Database.

This chapter contains these topics:

- COM Component Integration in a Transaction
- Microsoft Transaction Server Application Development
- OCI Integration with Microsoft Transaction Server
- ODBC Integration with Microsoft Transaction Server Overview

OraMTS also provides integration with Oracle Provider for OLE DB, and Oracle Data Provider for .NET.

See Also:

- Oracle Provider for OLE DB Developer’s Guide for Microsoft Windows for information on using Oracle Provider for OLE DB with MTS
- Oracle Data Provider for .NET Developer’s Guide for Microsoft Windows for information on using Oracle Data Provider for .NET with MTS

COM Component Integration in a Transaction

The focal point of the transaction process is a component of Microsoft Transaction Server called Microsoft Distributed Transaction Coordinator (MS DTC). When a client computer starts a business method on a transactional component, Microsoft Transaction Server begins a transaction coordinated by the MS DTC. The Oracle connection pooling layer enables the database to act as a resource manager (RM) in the MS DTC-coordinated transaction. Figure 4–1 illustrates this transactional model.
**Figure 4–1 Component Integration in a Transaction**

**Client Computer** The client computer activates the application components on the MTS Application Server through a Web browser or through the component object model (COM) / distributed component object model (DCOM).

**MTS Application Server** The MTS application server consists of the services that the Windows operating service provides to host transactional application components that a client computer can activate, either indirectly through a Web browser or directly through the component object model (COM) / distributed component object model (DCOM). In response to client requests, the application server invokes the COM components. The invocations are performed within the scope of transactions where required.

**Transactional Application Logic COM Components** Three primary responsibilities:

- Embed the business logic. If a component is transactional, Microsoft Transaction Server starts a transaction for every method invocation on that component.
- Acquire pooled connections to a Oracle Database through the Oracle resource dispenser and Oracle Call Interface (OCI), Oracle Open Database Connectivity (ODBC) Driver, or Oracle Provider for OLE DB.
- Decide the outcome of the operation by notifying Microsoft Transaction Server of its decision to commit or terminate the changes to all RMs.
Oracle ODBC Driver, Oracle Provider for OLE DB, and OCI  Two primary responsibilities:

- Obtain a service context to the Oracle Database through the OCI connection pooling component.
- Provide connection pooling resources, if necessary (through Oracle Provider for OLE DB or Oracle ODBC Driver). The Oracle ODBC Driver provides pooled ODBC connections. Oracle Provider for OLE DB provides pooled data source objects.

OCI Connection Pool  Three primary responsibilities:

- Enlists the RM (Oracle Database) in the component’s Microsoft Transaction Server transaction.
- Starts an Oracle global transaction corresponding to the Microsoft Transaction Server transaction of which the component is a part.
- Acts as a resource dispenser to perform client-side connection pooling.

Oracle Net  Provides connectivity in distributed, heterogeneous computing environments.

Oracle MTS Recovery Service  Recovers in-doubt Oracle transactions that originated from the host computer and are related to the Microsoft Transaction Server.

Database Recovery Job  Detects in-doubt DTC transactions. This job extracts the recovery service’s endpoint address in the in-doubt transaction’s XID and then requests the outcome of the Microsoft DTC transaction from the recovery service. Ultimately, the job will commit or terminate the in-doubt transaction when it receives the transaction’s outcome.

Microsoft DTC  Microsoft Distributed Transaction Coordinator is part of Microsoft Transaction Server and has two primary responsibilities:

- Commits and terminates transactions using the two-phase commit protocol.
- Monitors transactions that require recovery. Multiple MS DTCs can be involved in a single transaction. When a transactional Microsoft Transaction Server component on computer A invokes another transactional Microsoft Transaction Server component on computer B, a connection is opened between the MS DTC on computer A and the MS DTC on computer B. When the root MS DTC commits or terminates a transaction, it sends the request through all involved MS DTCs. The transaction request is then passed to the OCI connection pooling/Microsoft Transaction Server integration, which sends it to the database.

Oracle Database  Acts as an RM for Microsoft Transaction Server. This is the database on which the client transaction request is performed.

Microsoft Transaction Server Application Development

OCI connection pooling is used to coordinate a transaction in nearly all application programming interfaces. This section describes how transactions are registered and how OCI connection pooling coordinates them.
Microsoft Transaction Server Component Registration

Application components that run in the Microsoft Transaction Server environment are created as dynamic link libraries (DLLs). Application components are registered with Microsoft Transaction Server using the Microsoft Transaction Server Explorer graphical user interface (GUI) tool.

Types of Registration Components

When you register the application component, you mark it as one of the following types:

- **Requires a Transaction** The component must run in a transaction. If the transaction does not currently exist, Microsoft Transaction Server automatically creates a new transaction for each method invocation on the component.

- **Supports a Transaction** The component can run within the client's transaction. When a new component is created, its context inherits the transaction from the context of the invoking client. If the client does not have a transaction, the new context is also created without one.

- **Requires a New Transaction** The component must run within its own transaction. Microsoft Transaction Server automatically creates a new transaction for each method invocation on the component.

- **Does Not Support Transactions** The component does not run within a transaction. Each method invocation on the component is performed without a surrounding transaction, regardless of whether the invoking client includes a transaction.

Registration of Components

How you register an application component determines if it runs in a Microsoft Transaction Server-coordinated transaction.

- If the application component **runs** in a Microsoft Transaction Server-coordinated transaction, the OCI connection pooling is always used and Microsoft Transaction Server and its MS DTC component coordinate the creation, startup, management, and commitment phases of the transaction. Microsoft Transaction Server ensures that all changes made by the component are committed if the transaction succeeds, or are terminated if the transaction fails.

- If the application component **does not run** in a Microsoft Transaction Server-coordinated transaction, the component runs in a Microsoft Transaction Server environment, but the databases that it accesses may or may not take part in MS DTC-coordinated transactions. If the transaction is not MS DTC-coordinated, the client application must create, start, manage, and commit the transaction. OCI connection pooling may be used, depending upon the interface accessing the database (such as Oracle Provider for OLE DB, Oracle ODBC Driver, or others).

Microsoft Transaction Server-Coordinated Component Transaction

This section describes how OCI connection pooling, Microsoft Transaction Server, and MS DTC operate with application components in a Microsoft Transaction Server-coordinated transaction environment.

1. The client API (one of Oracle ODBC Driver, OCI, ODP.NET or Oracle Provider for OLE DB) calls OCI function `OraMTSSvcGet()` to obtain a service context from the OCI connection pooling component.

2. The OCI connection pooling component enlists the transaction that will be coordinated by the MS DTC component of Microsoft Transaction Server.
The OCI service and environment handles are returned to client applications.

3. The client application:
   ■ Performs the database operations.
   ■ Calls OCI function `OraMTSSvcRel()` to release the OCI pooling connection obtained at the beginning of the transaction.
   ■ Calls `SetComplete` (to commit database operations) or `SetAbort` (to terminate database operations) on the Microsoft Transaction Server context object associated with the component.

4. MS DTC performs the two-phase commit protocol to prepare and commit or to terminate the transaction. This notifies the OCI connection pooling component and ends the transaction.

5. OCI connection pooling is notified and performs the necessary steps to complete phase one, the prepare phase, and phase two, the commit or terminate phase.

Microsoft DTC-Coordinated Component Transaction

This section describes how OCI connection pooling, Microsoft Transaction Server, and MS DTC operate with application components not running in a Microsoft Transaction Server-coordinated transaction, but using MS DTC.

1. The client application starts an MS DTC transaction and connects to the Oracle Database. The connection protocol follows one of the following scenarios:
   ■ Nonpooled OCI connections are obtained through OCI logon calls such as `OCIServerAttach()` and `OCISessionBegin()`. For these connections, the application calls `OraMTSEnlCtxGet()` to associate the OCI service context with a Microsoft Transaction Server enlistment context.
   ■ A connection pool is obtained by calling `OraMTSvcGet(...,ORAMTS_CFLG_NOIMPLICIT)`.

2. The client handles the context in one of the following scenarios:
   ■ For nonpooled connections, the client application passes in the enlistment context to `OraMTSJoinTxn()`.
   ■ For pooled connections, the client application passes the OCI service context into `OraMTSSvcEnlist()`.

3. The OCI connection pooling component enlists the connection, either pooled or nonpooled, in the transaction coordinated by the MS DTC component of Microsoft Transaction Server.

4. The client application then:
   ■ Performs database operations.
   ■ Calls `OraMTSSvcEnlist()` with a NULL transaction reference to de-enlist from an MS DTC coordinated transaction.
     For nonpooled connections, `OraMTSTxnJoin()` is invoked with a NULL transaction reference to perform the de-enlistment.
   ■ Calls `OraMTSSvcRel()` to release a pooled connection back to the pool.
     For nonpooled connections, the client calls `OraMTSEnlCtxRel()` to release the enlistment context and then logs off the database.
OCI Integration with Microsoft Transaction Server

Example 4–1 illustrates how you can integrate the MTS sever with OCI. The only change in code you must make involves obtaining and releasing the OCI service context handle. Both OCI service context handle and environment handle are acquired when you obtain a pooled OCI connection to the database by calling OraMTSSvcGet(). Include the oramts.h header and link with the oramts.lib library. When you are finished, call OCI function OraMTSSvcRel() to release the service context handle and environment handle. Using OraMTSSvcGet() enables you to receive connection pooling and implicit transaction support if you registered the application component to run in a Microsoft Transaction Server transaction.

Ensure that for each process, you call OCIInitialize at least once before executing any other OCI calls. This initializes the OCI process environment. In addition, you must pass it the OCI_Threaded flag. If you are using Microsoft Internet Information Server (IIS) and the components are being called as in-process libraries, then OCIInitialize is already called for you. The registry key ORAMTS_OCI_OBJ_MODE has been added. Set the value to 1 to initialize OCI in Object mode; otherwise OCI will initialize in the threaded mode.

Example 4–1  Integration of MTS and OCI

```c
#include <oci.h>
#include <oramts.h>
#include <xolehlp.h>
// other MTS relevant includes ...

// prototype for the error handler.
BOOL Chekerr(sword swOCIStat, OCIError *OCIErrh);

// MTS component method
HRESULT OCITestMethod()
{
    IObjectContext *pObjectContext = NULL;
    OCIEnv    *myenvh = NULL;
    OCISvcCtx *mysvch = NULL;
    OCIError  *myerrh = NULL;
    OCIStnt   *mystmh = NULL;
    DWORD      dwStat;
    HRESULT    hRes = S_OK;
    sword      swOCIStat;
    BOOL       bCommit = FALSE;
    char      *lpzStmt = "UPDATE EMP SET SAL = SAL + 1000";

    // Initialize the OCI environment first -- request OCI_Threaded
    OCIInitialize(OCI_Threaded, (dvoid*)NULL,NULL,NULL,NULL);
    // attempt to get a connection to the database through the resource dispenser
    OraMTSSvcGet(
        "hr","hr_password","finprod_db",&mysvch, &myenvh, ORAMTS_CFLG_ALLDEFAULT);
    // validate return status
    if(dwStat != ORAMTS_ERR_NOERROR)
```
{ printf("error: failed to obtain a connection to the database - %ld", dwStat);
    goto cleanup;
}

// successful logon and enlistment in the MTS transaction. allocate statement
// handles and other handles using the OCI environment handle myenvh ....
swOCIStat = OCIHandleAlloc(myenvh, (void *)&myerrh, OCI_HTYPE_ERROR, 0, NULL);
if (Checkerr(swOCIStat, myerrh)) goto cleanup;
swOCIStat = OCIHandleAlloc(myenvh, (void *)&mystmh, OCI_HTYPE_STMT, 0, NULL);
if (Checkerr(swOCIStat, myerrh)) goto cleanup;
// prepare a DML statement
OCIStmtPrepare(mystmh, myerrh, lpzStmt, lstrlen(lpzStmt), OCI_NTV_SYNTAX, OCI_DEFAULT)
    Checkerr(swOCIStat, myerrh);
// execute the statement -- ensure that AUTOCOMMIT is not requested.
OCIStmtExecute(mysvch, mystmh, myerrh, 1, 0, NULL, NULL, OCI_DEFAULT);
if (Checkerr(swOCIStat, myerrh)) goto cleanup;
// all's well so far choose to go for a commit
bCommit = TRUE;
cleanup:
    if (mystmh) OCIHandleFree((void*)mystmh, OCI_HTYPE_STMT);
    if (myerrh) OCIHandleFree((void*)myerrh, OCI_HTYPE_ERROR);
    if (mysvch) OraMTSSvcRel(mysvch);
    if (bCommit)
        pObjectContext->SetComplete();
    else
        pObjectContext->Abort();
    return(bCommit ? S_OK : E_FAIL);}

Integrating COM Components

There are several scenarios for integrating COM components. COM applications that are not hosted by the Microsoft Transaction Server environment, also known as standalone applications, cannot use declarative transactions through the Microsoft Transaction Server Explorer Microsoft Management Console, but they can use the last three of the scenario described.

COM Components Running in an MTS-Coordinated Transaction

COM components that are running in an MTS-coordinated transactions use OCI connection pooling to implicitly enlist the database in a transaction. The following pseudo-code listing illustrates the use of OCI functions:

OCIInitialize(OCI_THREADED, ...)
OraMTSSvcGet(..., &OCISvc, ..., ORAMTS_CFLAG_ALLDEFAULT)
...
OraMTSSvcRel(OCISvc)

Non-Transactional COM Components Running with OCI Connection Pooling

COM components that are marked as non-transactional and running in an MTS-coordinated transaction use OCI connection pooling do not enlist the database in a transaction. The following pseudo-code listing illustrates the use of OCI functions:

OCIInitialize(OCI_THREADED, ...)
OraMTSSvcGet(..., &OCISvc, ..., ORAMTS_CFLAG_NOIMPLICIT)
...
OraMTSSvcRel(OCISvc)
COM Components Using MS DTC and OCI Connection Pooling

COM components that are not running in an MTS-coordinated transaction use MS DTC with OCI connection pooling to explicitly enlist the database in a transaction. The following pseudo-code listing illustrates the use of OCI functions:

OCIInitialize(OCI_THREADED, ...)
DTCGetTransactionManager(...)
BeginTransaction(..., &transaction)
OraMTSSvcGet(..., &OCISvc, ..., ORAMTS_CFLAG_NOIMPLICIT)
OraMTSSvcEnlist(OCISvc, ..., transaction, ...)
...
OraMTSSvcEnlist(OCISvc, ..., NULL, ...)
OraMTSSvcRel(OCISvc)

COM Components Using MS DTC and Nonpooling OCI Connection

COM components that are not running in an MTS-coordinated transaction use MS DTC with a non-pooling OCI connection to explicitly enlist the database in a transaction. The following pseudo-code listing illustrates the use of OCI functions:

OCIInitialize(OCI_THREADED, ...)
OCI to get connected
OraMTSEnlCtxGet
DTCGetTransactionManager(...)
BeginTransaction(..., &transaction)
OraMTSJoinTxn (OCISvc, ..., transaction, ...)
...
OraMTSJoinTxn
...
OraMTSEnlCtxRel()
OCI to logoff

Using OCI Functions

This section details the OCI functions discussed earlier in this section. Table 4-1 summarizes these functions.

<table>
<thead>
<tr>
<th>OCI Function</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>OraMTSSvcGet() on page 4-9</td>
<td>Obtains a pooled connection from the OCI connection pool.</td>
</tr>
<tr>
<td>OraMTSSvcRel() on page 4-11</td>
<td>Releases a pooled OCI connection, OCI service context, back to the connection pool.</td>
</tr>
<tr>
<td>OraMTSSvcEnlist() on page 4-11</td>
<td>Enlists or de-enlists an OCI connection in a transaction coordinated by MS DTC.</td>
</tr>
<tr>
<td>OraMTSSvcEnlistEx() on page 4-12</td>
<td>Enlists an OCI connection or service context in an MS DTC transaction.</td>
</tr>
<tr>
<td>OraMTSEnlCtxGet() on page 4-13</td>
<td>Creates an enlistment context for a nonpooled OCI connection.</td>
</tr>
<tr>
<td>OraMTSEnlCtxRel() on page 4-14</td>
<td>Eliminates a previously set up enlistment context for a nonpooled OCI connection.</td>
</tr>
<tr>
<td>OraMTSJoinTxn() on page 4-14</td>
<td>Enlists a nonpooled OCI connection in an MS DTC transaction.</td>
</tr>
<tr>
<td>OraMTSTransTest() on page 4-15</td>
<td>Tests if you are running inside a Microsoft Transaction Server-started transaction.</td>
</tr>
</tbody>
</table>
OraMTSSvcGet()

Obtains a pooled connection, also known as an OCI service context, from the OCI connection pool. The pooled connection includes an OCI service context handle and an OCI environment handle.

Syntax

```c
DWORD OraMTSSvcGet(
    text*       lpUname,
    text*       lpPsswd,
    text*       lpDbnam,
    OCISvcCtx** pOCISvc,
    OCIEnv**    pOCIEnv,
    ub4         dwConFlgs);
```

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IN/OUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>lpUname</td>
<td>IN</td>
<td>Username for connecting to the Oracle Database</td>
</tr>
<tr>
<td>lpPsswd</td>
<td>IN</td>
<td>Password for the username</td>
</tr>
<tr>
<td>lpDbnam</td>
<td>IN</td>
<td>The net service name for connecting to the database (created with Oracle Net Manager or Oracle Net Configuration Assistant)</td>
</tr>
<tr>
<td>pOCISvc</td>
<td>OUT</td>
<td>Pointer to the OCI service context handle</td>
</tr>
<tr>
<td>pOCIEnv</td>
<td>OUT</td>
<td>Pointer to the OCI environment handle</td>
</tr>
</tbody>
</table>

Table 4–2  OraMTSSvcGet() Parameters
OCI Integration with Microsoft Transaction Server

Returns
Returns ORAMTSERR_NOERROR upon successful acquisition of an OCI pooling connection (OCI service context).

Usage Notes
- OraMTSSvcGet() returns a pooled OCI connection to the caller, enabling a database transaction using OCI to begin. Use OraMTSSvcGet() to implicitly enlist the OCI connection in a transaction coordinated by Microsoft Transaction Server. In this type of transaction, Microsoft Transaction Server controls the creation, startup, management, and commitment phases of the transaction through its MS DTC component.
- OraMTSSvcGet() also provides connection pooling without enlisting the Oracle Database in a Microsoft Transaction Server transaction. This is done by setting OraMTSSvcGet() as follows:
  
  OraMTSSvcGet(..., ORAMTS_CFLG_NOIMPLICIT)
  
- In all cases where OraMTSSvcGet() is used, you must always use OraMTSSvcRel() to release the connection when finished.
- Use the flags ORAMTS_CFLG_SYSDBALOGN and ORAMTS_CFLG_SYSOPRLOGN when connecting as SYSDBA and SYSOPER, respectively.
- To obtain a nonenlisted connection using the hr/hr_password account, call OraMTSSvcGet() as follows:

### Table 4–2 (Cont.) OraMTSSvcGet() Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IN/OUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dwConFlgs</td>
<td>IN</td>
<td>Connection flags. Possible values are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ORAMTS_CFLG_ALLDEFAULT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Obtains a pooled connection and enlists the connection in any Microsoft Transaction Server transaction, if one exists. If the component is nontransactional, no enlistment request is dispensed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ORAMTS_CFLG_NOIMPLICIT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Obtains a pooled connection, but does not enlist the resource in any Microsoft Transaction Server transaction even if the component is transactional. Use this flag if the component enlists the connection resource later using OraMTSSvcEnlist(). Prior to releasing a connection obtained in this fashion, the client must de-enlist the resource if enlisted.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ORAMTS_CFLG_UNIQUESRVR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Requests a single OCI session for each OCI Server. In this release, multiplexing is not supported. Therefore, this option is always used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ORAMTS_CFLG_SYSDBALOGN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use this flag if connecting as SYSDBA.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ORAMTS_CFLG_SYSOPRLOGN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use this flag if connecting as SYSOPER.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ORAMTS_CFLG_PRELIMAUTH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use this flag if connecting as the user INTERNAL to pre-Oracle9i databases. The INTERNAL account is no longer valid as of Oracle9i. Instead, log on with a SYSDBA or SYSOPER account using the ORAMTS_CFLG_SYSOPRLOGN or ORAMTS_CFLG_SYSDBALOGN flag.</td>
</tr>
</tbody>
</table>
OraMTSSvcGet("hr", "hr_password", "oracle", &OCISvc, &OCIEnv, ORAMTS_CFLG_ ALLDEFAULT | ORAMTS_CFLG_NOIMPLICIT);

- OraMTSSvcGet() does not support placing the username (lpUname), password (lpPsswd), and net service name syntax (lpDbname) together in the username argument (for example, hr/hr_password@prod_fin). Instead, the caller must fill in lpUname, lpPsswd, and lpDbname separately (as shown in the previous syntax example). Calling OraMTSSvcGet() with the username and password as NULL strings uses external authentication (operating system authentication) for the connection.

**OraMTSSvcRel()**

Releases a pooled OCI connection, OCI service context, back to the connection pool. Use this function to release connections that were acquired with OraMTSSvcGet().

**Syntax**

DWORD OraMTSSvcRel(OCISvcCtx* OCISvc);

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IN/OUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCISvc</td>
<td>IN</td>
<td>OCI service context for a pooled connection</td>
</tr>
</tbody>
</table>

**Returns**

Returns ORAMTSERR_NOERROR upon successful release of a pooled OCI connection.

**Usage Notes**

- An OCI pooled connection obtained through a previous call to OraMTSSvcGet() is released back to the connection pool. Once released back to the connection pool, the OCI service context, its environment handle, and all child handles are invalid.

- A nontransactional client component must explicitly call OCITransCommit() or OCITransAbort() prior to releasing a connection obtained through OraMTSSvcGet(..., ..., ORAMTS_CFLG_ALLDEFAULT) back to the pool. Otherwise, all changes made in that session are rolled back. A transaction component uses the SetComplete or SetAbort methods on its Microsoft Transaction Server object context.

- Components that have called OraMTSSvcGet(..., ..., ORAMTS_CFLG_NOIMPLICIT) to obtain a connection resource must first de-enlist the resource if enlisted. If the connection was enlisted explicitly, pTransaction->Commit() or pTransaction->Abort() must be called. Otherwise, OCITransCommit() or OCITransAbort() must be called before releasing the connection back to the pool.

**OraMTSSvcEnlist()**

Enlists or de-enlists an OCI connection in a transaction coordinated by MS DTC. Use this call to explicitly enlist pooled connections. Nonpooled connections must enlist with OraMTSJoinTxn().

**Syntax**

DWORD OraMTSSvcEnlist(
OCI Integration with Microsoft Transaction Server

Parameters

Table 4–4  OraMTSSvcEnlist() Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IN/OUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCISvc</td>
<td>IN</td>
<td>OCI service context for pooled connections obtained by calling OraMTSSvcGet()</td>
</tr>
<tr>
<td>OCIErr</td>
<td>IN/OUT</td>
<td>OCI error handle (ignored)</td>
</tr>
<tr>
<td>lpTrans</td>
<td>IN</td>
<td>Pointer to the MS DTC-controlled transaction in which to enlist. If NULL, the OCI connection is de-enlisted from the MS DTC-controlled transaction.</td>
</tr>
<tr>
<td>dwFlags</td>
<td>IN</td>
<td>Flag used for enlisting in a transaction. Use the ORAMTS_ENFLG_DEFAULT value. If enlisting, then start a new Oracle global transaction. If de-enlisting, then detach from any global Oracle transaction and delete the context object if the OCI service context represents a nonpooled connection.</td>
</tr>
</tbody>
</table>

Returns

Returns ORAMTSERR_NOERROR on success.

Usage Notes

- Use this call to explicitly enlist or de-enlist a pooled connection. For enlisting and de-enlisting nonpooled connections, use OraMTSSvcRel().

- OraMTSSvcEnlist() enlists (or de-enlists) pooled OCI connections obtained previously through OraMTSSvcGet() with the ORAMTS_CFLG_NOIMPLICIT flag and not yet released with OraMTSSvcRel(). The pooled OCI connections must be explicitly enlistable. When the transaction is complete, you must de-enlist OraMTSSvcEnlist(), passing NULL as the transaction pointer as follows:

  OraMTSSvcEnlist (OCISvc, OCIErr, NULL, ORAMTS_ENFLG_DEFAULT)

  You must use OraMTSSvcRel() to release the connection when done.

- Callers must allocate a connection, enlist the connection, perform work, de-enlist the connection, release the connection, and then attempt to commit or terminate.

OraMTSSvcEnlistEx()

Enlists an OCI connection or service context in an MS DTC transaction. Use this call only to explicitly enlist pooled connections. Nonpooled connections must enlist with OraMTSJoinTxn().

Syntax

DWORD OraMTSSvcEnlistEx(
  OCISvcCtx*  OCISvc,
  OCIErr*    OCIErr,
  void*      lpTrans,
  unsigned   dwFlags,
  char*      lpDBName);
**Parameters**

*Table 4–5  OraMTSSvcEnlistEx() Parameters*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IN/OUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCISvc</td>
<td>IN</td>
<td>OCI service context for pooled connections obtained by calling OraMTSSvcGet()</td>
</tr>
<tr>
<td>OCIErr</td>
<td>IN/OUT</td>
<td>OCI error handle (ignored)</td>
</tr>
<tr>
<td>lpTrans</td>
<td>IN</td>
<td>Pointer to the MS DTC-controlled transaction in which to enlist. If NULL, the OCI connection is de-enlisted from the MS DTC-controlled transaction.</td>
</tr>
<tr>
<td>dwFlags</td>
<td>IN</td>
<td>Flag used for enlisting in a transaction. Use the ORAMTS_ENFLG_DEFAULT value. If enlisting, then start a new Oracle global transaction. If de-enlisting, then detach from any global Oracle transaction and delete the context object if the OCI service context represents a nonpooled connection.</td>
</tr>
<tr>
<td>lpDBName</td>
<td>-</td>
<td>Net service name for connecting to the database (created with Oracle Net Manager or Oracle Net Configuration Assistant)</td>
</tr>
</tbody>
</table>

**Returns**

Returns ORAMTSERR_ILLEGAL_OPER.

**Usage Notes**

Use OraMTSSvcEnlistEx() for pooled connections or OraMTSJoinTxn() for nonpooled connections.

**OraMTSEnlCtxGet()**

Creates an enlistment context for a nonpooled OCI connection.

**Syntax**

```c
DWORD OraMTSEnlCtxGet(
    text*       lpUname,
    text*       lpPsswd,
    text*       lpDbnam,
    OCISvcCtx*  pOCISvc,
    OCIError*   pOCIErr,
    ub4         dwFlags,
    void**      pCtxt);
```

**Parameters**

*Table 4–6  OraMTSEnlCtxGet() Parameters*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IN/OUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>lpUname</td>
<td>IN</td>
<td>Username for connecting to the Oracle Database</td>
</tr>
<tr>
<td>lpPsswd</td>
<td>IN</td>
<td>Password for connecting to the Oracle Database</td>
</tr>
<tr>
<td>lpDbnam</td>
<td>IN</td>
<td>Net service name for connecting to a database</td>
</tr>
<tr>
<td>pOCISvc</td>
<td>IN</td>
<td>OCI service context for a nonpooled connection</td>
</tr>
<tr>
<td>pOCIErr</td>
<td>IN</td>
<td>OCI error handle</td>
</tr>
<tr>
<td>dwFlags</td>
<td>IN</td>
<td>Enlistment flags. The only value currently permitted is 0.</td>
</tr>
<tr>
<td>pCtxt</td>
<td>OUT</td>
<td>Enlistment context to be created</td>
</tr>
</tbody>
</table>
Returns

Returns ORAMTSERR_NOERROR on success.

Usage Notes

- This call sets up an enlistment context for a nonpooled connection. This call must be started just after the caller establishes the OCI connection to the database. Once created, this context can be passed into OraMTSJoinTxn() calls. Prior to deleting the OCI connection, OraMTSEnlCtxRel() must be called to delete the enlistment context.

- Callers must:
  - Allocate a nonpooled connection through OCI.
  - Create an enlistment context by calling OraMTSEnlCtxGet().
  - Enlist the connection by calling OraMTSJoinTxn().
  - Perform database work.
  - De-enlist the connection by calling OraMTSJoinTxn() with a NULL transaction pointer.
  - Attempt to commit or terminate work.
  - Release the enlistment context by calling OraMTSEnlCtxRel().
  - Release the nonpooled OCI connection and delete its associated OCI environment handle.

OraMTSEnlCtxRel()

Eliminates a previously set up enlistment context for a nonpooled OCI connection.

Syntax

`DWORD OraMTSEnlCtxRel(void* pCtxt);`

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IN/OUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pCtxt</td>
<td>IN</td>
<td>Enlistment context to eliminate</td>
</tr>
</tbody>
</table>

Returns

Returns ORAMTSERR_NOERROR on success.

Usage Notes

- Before dropping a nonpooled OCI connection, a client must call OraMTSEnlCtxRel() to eliminate any enlistment context it may have created for that connection. The enlistment context can maintain OCI handles allocated off the connection’s OCI environment handle. This makes it imperative that the environment handle is not deleted for the associated enlistment context.

OraMTSJoinTxn()

Enlists a nonpooled OCI connection in an MS DTC transaction.
**Syntax**

```c
DWORD OraMTSJoinTxn(void* pCtxt,
                    void* pTrans);
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pCtxt</td>
<td>Enlistment context for the OCI connection</td>
</tr>
<tr>
<td>pTrans</td>
<td>Reference to the MS DTC transaction object</td>
</tr>
</tbody>
</table>

**Returns**

Returns `ORAMTSERR_NOERROR` on success.

**Usage Notes**

- Clients use this call with nonpooled OCI connections to enlist connections in MS DTC-coordinated transactions. The client passes in the wide reference to the enlistment context representing the OCI connection, along with a reference to an MS DTC transaction object. If `pTrans` is `NULL`, the OCI connection is de-enlisted from any MS DTC transaction in which it is currently enlisted. You can enlist a previously-enlisted OCI connection in a different MS DTC transaction.

**OraMTSTransTest()**

Tests if you are running inside a Microsoft Transaction Server-started transaction.

**Syntax**

```c
BOOL OraMTSTransTest();
```

**Returns**

Returns `true` if running inside a Microsoft Transaction Server transaction.

**Usage Notes**

Microsoft Transaction Server transactional components use `OraMTSTransTest()` to check if a component is running within the context of a Microsoft Transaction Server transaction. Note that this call can only test Microsoft Transaction Server-started transactions. Transactions started by directly calling the MS DTC are not detected.

**OraMTSOCIErrGet()**

Retrieves the OCI error code and message text, if any, from the last `OraMTS` function operation, typically `OraMTSSvcGet()` or `OraMTSJoinTxn()`.

**Syntax**

```c
BOOL OraMTSOCIErrGet(DWORD* dwErr,
                      LPCHAR lpcEMsg,
                      DWORD* lpdLen);
```
Parameters

Table 4–9 OraMTSOCIErrGet() Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IN/OUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dwErr</td>
<td>-</td>
<td>Error code</td>
</tr>
<tr>
<td>lpcEMsg</td>
<td>-</td>
<td>Buffer for the error message, if any</td>
</tr>
<tr>
<td>lpdLen</td>
<td>-</td>
<td>Set to the actual number of message bytes</td>
</tr>
</tbody>
</table>

Returns

Returns true if an OCI error is encountered. Otherwise, false is returned. If true is returned and lpcEMsg and lpdLen are valid, and there is a stashed error message, up to lpdLen bytes are copied into lpcEMsg. lpdLen is set to the actual number of message bytes.

Usage Notes

Example 4–2 illustrates how OraMTSOCIErrGet() retrieves the OCI error code and OCI error message text, if any, from the last OraMTSSvc() operation on this thread.

Example 4–2 Retrieving the OCI Error Code and Message Text

DWORD dwStat = OraMTSSvcGet("hr",
   'invalid_password',
   'fin Prod',
   'db',
   &mysvch,
   &myenvh,
   ORAMTS_CFLG_ALLDEFAULT);

if (dwStat != ORAMTS_ERR_NOERROR)
{
    DWORD dwOCIErr;
    char errBuf[MAX_PATH];
    DWORD errBufLen = sizeof(errBuf);

    if (OraMTSOCIErrGet(&dwOCIErr, &errBuf, &errBufLen))
        printf("OCIError %d: %s\n");
}

ODBC Integration with Microsoft Transaction Server Overview

This section describes how to use Oracle ODBC Driver with Microsoft Transaction Server and a Oracle Database. No changes to OCI code are necessary for ODBC to operate successfully.

Setting the Connection Attribute

To use Microsoft Transaction Server with either Oracle ODBC Driver 11.1 or Microsoft Oracle ODBC driver, set the connection attribute using the SQLSetConnectAttr function to call the parameter SQL_ATTR_ENLIST_IN_DTC in the ODBC code. This enables you to receive connection pooling and implicit transaction support.
Using Oracle ODBC Driver

The ODBC Driver Manager distributed with ODBC 3.0 is a Resource Dispenser that supports connection pooling. Oracle ODBC Driver release 11.1 integrates with the ODBC 3.0 Driver Manager by supporting the SQLSetConnectAttr(...,..., SQL_ATTR_ENLIST_IN_DTC) call to enlist or de-enlist the ODBC connection used in MS DTC-coordinated transactions.

Use the Oracle ODBC Driver 11.1 with:

- Applications you develop
- The sample banking application that Microsoft provides with Microsoft Transaction Server.

To configure Oracle ODBC Driver, follow these steps:

1. Choose Start > Settings > Control Panel.
   The Control Panel window appears.
2. Double-click ODBC.
   The ODBC Data Source Administrator dialog box appears.
3. Choose the File DSN tab.
4. To make Oracle ODBC Driver work with Microsoft sample banking application demo, follow these steps. Otherwise, skip this step.
   - Back up Microsoft mtssamples.dsn file. This file is located in ROOTDRIVE\program files\common files\odbc\data sources.
   - Select mtssamples.dsn and click Remove.
   - Click Yes when prompted.
     This deletes the configuration file that enables the Microsoft Transaction Server sample application demo to use the Microsoft ODBC driver.
     If you don’t intend to use the demo, click Add to create a new File data source name (DSN).
     The Create New Data Source wizard appears.
5. Select Oracle in HOME_NAME.
6. Click Advanced.
7. Add the following information in the keywords and values field:
   
   $\text{SERVER=database\_alias}$
   $\text{USERNAME=hr}$
   $\text{PASSWORD=hr\_password}$
   
   where:
   - $\text{SERVER}$ is the The database alias used by the demo to access the database mtsdemo.
   - $\text{USERNAME}$ is the database username for this application, such as hr.
   - $\text{PASSWORD}$ is the database password for username hr.
     Verify that the hr schema contains the account and receipt tables.
8. Click OK.
9. Click Next to continue with the Create New Data Source wizard.
10. For the Microsoft sample application, enter `mtssamples.dsn` (Microsoft ODBC name). This name must exactly match the name you removed in Step 4. For applications you develop, enter the name of the DSN file that will be used.

11. Complete the remaining Create New Data Source wizard pages.

12. Click OK to exit the ODBC Data Source Administrator dialog box.

13. Exit the Control Panel window.

See Also:

Microsoft Transaction Server SDK for information

Using Microsoft Oracle ODBC Driver

As an alternative to the Oracle ODBC driver, you can use the Microsoft Oracle ODBC Driver. You should be aware that you would not be able to integrate with Oracle Provider for OLE DB and Oracle Data Provider for .NET if using the Microsoft driver. Also, you will not receive the performance benefits of the Oracle ODBC driver, API support for integration, or Oracle client support services.

After enabling the Microsoft Oracle ODBC Driver, perform these additional steps to configure the Microsoft Oracle ODBC Driver:

To configure the Microsoft Oracle ODBC Driver:

1. Install Oracle Required Support Files (RSF) and SQL*Net 2.3 or later on the computer where the Microsoft Oracle ODBC Driver is operating.

2. Run the `%ORACLE_BASE%\%ORACLE_HOME%\oramts\samples\sql\omtssamp.sql` script.

3. Use SQL*Net Easy Config to set up a database alias connection. This alias is used in the `mtssamples.dsn` file.

4. If you installed the RSFs in a home with Oracle Net installed, be sure to set the following registry parameter at `HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE`:

   `ORAOCI = ORA73.DLL`

See Also: "Setting Up MTS to Access Oracle" in the Microsoft Transaction Server online Help for instructions on enabling the Microsoft Oracle ODBC Driver.
This chapter provides Microsoft Transaction Server performance tuning information. This chapter contains these topics:

- Improving Microsoft Transaction Server Application Performance
- Managing Microsoft Transaction Server Connections
- Increasing the Transaction Timeout Parameter
- Changing Initialization Parameter Settings
- Additional Parameters
- Starting MSDTC

**Improving Microsoft Transaction Server Application Performance**

Optimizing the programming methods of your application improves its performance. For example, placing all code for a given transaction into one component object model (COM) component means you do not mark that component as transactional. This eliminates the overhead of going through Microsoft Transaction Server. You can subsequently use the Oracle commit or rollback functions to control that transaction in the component. If you are using the Oracle Call Interface (OCI), you can still use ORAMTSSvcGet(), but you can also use the ORAMTS_CFLG_NOIMPLICIT flag. If you are updating across two or more Oracle Database instances, use database links and connect to one database from the COM component.

**See Also:** "OCI Integration with Microsoft Transaction Server" for more information on using ORAMTSSvcGet()

**Managing Microsoft Transaction Server Connections**

When a .NET or COM component ends a session with the Oracle Database, the connection does not immediately terminate. Instead, it remains idle in a connection pool, where it is available for reuse by another component attempting a new connection to the Oracle Database.

**Connection Pooling Registry Parameters**

The idle period during which a connection is reusable reduces the resource costs associated with opening a new connection. The amount of time that the connection remains idle and available in the connection pool is determined by several registry
parameter settings. You can modify these parameters on the computers on which the client Microsoft Transaction Server components are installed, in the file `HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE\HOMEID`:

**ORAMTS_CONN_POOL_TIMEOUT**  The time, in seconds, that the connection remains idle and available for reuse in the client side connection pool, before timing out and being released. The default value of this parameter is 120 seconds.

**ORAMTS_SESS_TXNTIMETOLIVE**  The time, in seconds, that the connection established using `OraMTSSvcGet()` remains alive in the client side connection pool after being released by an `OraMTSSvcRel()` call. The sum of the `ORAMTS_CONN_POOL_TIMEOUT` and `ORAMTS_NET_CACHE_TIMEOUT` values determines the actual time before a connection terminates completely. The default value of this parameter is 120 seconds.

**ORAMTS_NET_CACHE_TIMEOUT**  The resource dispenser implemented inside Oracle Services for Microsoft Transaction Server establishes pooled connections to Oracle databases. When these connections are no longer in use, the user sessions are disconnected after the timeout specified by `ORAMTS_CONN_POOL_TIMEOUT`. However, the underlying Oracle Net connections are cached for the period specified by this parameter. After this time, expressed in milliseconds, a cached Oracle Net connection to the database will be terminated. The default value of this parameter is 120000 milliseconds. Oracle recommends setting this parameter to a higher value than the value for `ORAMTS_CONN_POOL_TIMEOUT`. The sum of the time periods specified for `ORAMTS_CONN_POOL_TIMEOUT` and `ORAMTS_NET_CACHE_TIMEOUT` determines the actual time before a connection terminates completely.

**ORAMTS_NET_CACHE_MAXFREE**  The maximum number of free server connections that should be maintained in the client-side connection pool at a given time. The default value of this parameter is 5.

**ORAMTS_OSCREDS_MATCH_LEVEL**  The level of Windows security checking implemented when the `OS_ROLES` initialization parameter in the `init.ora` file is `true`. When a user establishes a connection to the Oracle Database using the `CONNECT` command, the Windows username is associated with specific database roles and privileges. When the user disconnects, this connection becomes idle and available in the pool. When another user enters the `CONNECT` command, if the Windows username is identical to the one used by the first user, the second user can receive the same database roles and privileges as the first user. This is a considerable security concern, especially if the second user possesses only the `CREATE SESSION` and `RESOURCE` database roles but receives the `DBA` privileges of the first user.

By default, the `ORAMTS_OSCREDS_MATCH_LEVEL` parameter value is `OS_AUTH_LOGIN`, and Windows security checking is performed only if the username and password are `NULL`. The most secure setting for this parameter is `ALWAYS`, which ensures that Windows security checking is performed in all cases, and takes care of possible security breaches due to identical non-null Window usernames.

Because Windows security checking is a resource-intensive operation, you may wish to set the value of this parameter to `NEVER`. However, if you know that `OS_ROLES` is `true`, or if you use operating system-authenticated connections, you should avoid this option.
### Increasing the Transaction Timeout Parameter

If transaction requests are timing out before completing, the transaction timeout parameter may be set too low. Increase the transaction timeout parameter to ensure that transactions have enough time to complete.

To increase the transaction timeout parameter:

1. Go to the Windows computer on which Microsoft Transaction Server is installed.
2. From the Start menu, select Programs, then Administrative Tools, then Component Services.
   The Component Services window appears.
3. Double-click Console Root in the Component Services window so its tree structure expands.
6. Right-click My Computer.
   A menu appears with several options.
7. Choose Properties.
   The My Computer Properties dialog box appears.
8. Choose the Options tab.
9. Enter a value in the Transaction Timeout field and click OK.
   The transaction timeout value is increased. For most environments, 60 seconds may be enough. However, if the transaction is competing with numerous concurrent transactions, this value may be too low.

### Changing Initialization Parameter Settings

You may need to modify several initialization parameters to use the Oracle Database with Microsoft Transaction Server. The values you should set these parameters to are based on the database workload environment.

To verify initialization parameter file values, follow these steps:

1. Ensure that you have SYSDBA privileges.
2. Go to the computer on which the Oracle Database is installed.
3. Start SQL*Plus:
   ```
   C:\> sqlplus /NOLOG
   ```
4. Connect to the database as SYSDBA:
   ```
   SQL> CONNECT / AS SYSDBA
   ```
5. Check the value for the SESSIONS parameter:
   ```
   SQL> SHOW PARAMETER SESSIONS
   ```
6. Check the value for the PROCESSES parameter:
   ```
   SQL> SHOW PARAMETER PROCESSES
   ```
The current settings for both SESSIONS and PROCESSES parameters are typically appropriate for running the Microsoft application demo. For creating and deploying .NET or COM-based applications, the values for these parameters depend on the database environment's anticipated workload. For example, if you anticipate 100 concurrent connections to the Oracle Database, consider setting both values to 200 to accommodate a possible system overload. Ensure that you do not set these parameters too high, because they are resource-intensive.

**See Also:** Oracle Database Reference for information about these parameters.

7. Set the following initialization parameters to at least these values:
   - SESSIONS = 200 (or larger if anticipating heavier loads)
   - PROCESSES = 200 (or larger if anticipating heavier loads)

8. Shut down the Oracle Database:
   `SQL> SHUTDOWN`

9. Restart the Oracle Database:
   `SQL> STARTUP`

10. Exit SQL*Plus:
    `SQL> EXIT`

**Additional Parameters**

Use the registry variable ORAMTS_ABORT_MODE to control whether a new connection always performs an abort or whether the originally enlisted connection can be used to perform the abort, that is, whether the abort is synchronous or asynchronous.

By default, the originally enlisted connection performs transaction aborts (whenever possible).

**Registry variable:** ORAMTS_ABORT_MODE

Values:
- ORAMTS_ABORT_MODE_NEW_CONN_ONLY: Results in asynchronous aborts. A new connection to the database is opened for performing transaction aborts.
- Any other value implies the default behavior.

**Starting MSDTC**

The Microsoft Distributed Transaction Coordinator (MS DTC) must be running to enable communication with Oracle Services for Microsoft Transaction Server.

To start MS DTC, follow these steps:

1. On the computer where Microsoft Transaction Server is installed, from the Start menu, choose Programs, then Administrative Tools, then Component Services.
   The Component Services window appears.

2. In the Component Services Window, expand Component Services under the Console Root.

4. Right-click My Computer.  
   A menu with several options appears.
5. Choose **Start MSDTC**.  
   MS DTC starts.
This chapter provides information on troubleshooting Oracle Microsoft Transaction Server.

This chapter contains these topics:

- Tracking OraMTS Performance
- Correcting Oracle Net Changes that Impact Connection Pooling
- Designing an Application that Uses Multiple Databases
- Working with Different Types of Connection Pooling
- Working with In-Doubt Transactions
- Dropping the Microsoft Transaction Server Administrative User Account

**Tracking OraMTS Performance**

Trace files record information about OraMTS performance. This information includes:

- Any errors
- Enlistment requests and outcomes
- Prepare, commit, and terminate requests and their outcomes

Registry parameters handle tracing within oramts.dll, which performs the following tasks:

- It implements the API for integrating the Oracle Database with Microsoft Transaction Server.
- It works as a resource dispenser to provide pooled Oracle Call Interface (OCI) connections.
- It enables clients with nonpooled OCI connections to enlist in transactions started by Microsoft Distributed Transaction Coordinator (MS DTC).
- It communicates with OraMTS to enlist the Oracle Database in transactions started by MS DTC.

The MTS-based COM components can acquire connections to both dedicated and shared Oracle servers of a database. The components can then attempt to perform distributed updates, using data manipulation language, on another database using pre-existing database links between these databases. While the distributed updates from shared servers succeed, those from dedicated servers fail.
Registry parameters that handle tracing are automatically set in `\HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE\HOMEID` during the installation of OraMTS.

Restart all applications using OraMTS. Further, if you have modified parameters related to the tracing of the OracleMTSRecoveryService, restart the Windows service. Table 6–1 shows the range of `ORAMTS_CP_TRACE_LEVEL` trace values.

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Disables tracing. If the registry parameter is not set in the registry or as an environment variable, then tracing is disabled. This is equivalent to setting the level to 0.</td>
</tr>
<tr>
<td>1</td>
<td>Traces errors only</td>
</tr>
<tr>
<td>2</td>
<td>Traces important events in addition to errors</td>
</tr>
<tr>
<td>3</td>
<td>This level is not supported; if you set this parameter to 3, level 2 tracing is enabled.</td>
</tr>
<tr>
<td>4</td>
<td>Traces function entry/exit, important events, and errors</td>
</tr>
<tr>
<td>5</td>
<td>Traces reference counting function and constructor/destructor entry/exit</td>
</tr>
</tbody>
</table>

**Note:** The Oracle MTS Recovery Service also generates trace file output in the `ORACLE_BASE\ORACLE_HOME\oramts\trace` directory.

### Correcting Oracle Net Changes that Impact Connection Pooling

The connection pool provided by the OraMTS layer, `oramts.dll`, uses a connection’s net service name to identify pooled connections for an application. If changes are made to the net service name, and pooled connections are available, the application using the connection pool must be stopped and restarted. These changes can include altering the host or the database system identifier (SID) for the net service name in the `tnsnames.ora` file.

These changes ensure that all currently pooled connections corresponding to the old net service name are destroyed and any new pooled connections use the changes made to the net service name. This includes any application hosting Microsoft Transaction Server components.

To empty connection pools, perform the following:

- If the application is an out-of-process Microsoft Transaction Server component *(server package)*, run the following application:
  ```
  C:\> mtxstop
  ```
  This empties the connection pools.

- If the application is an in-process Microsoft Transaction Server component *(library package)*, terminate the application. This also empties the connection pool.

### Designing an Application that Uses Multiple Databases

Oracle clients can establish connections to a database in two ways:

- Typical Oracle clients establish connections to a database using a dedicated server configuration. In a dedicated server configuration, one client corresponds to one Oracle server process.
For scalability under heavy loads, Oracle clients have the option of using a shared server configuration. In a shared server configuration, a single Oracle server process can be shared by more than one client connection.

Microsoft Transaction Server communicates with the database through distributed transactions. In a dedicated server configuration, you cannot use distributed updates (data manipulation language statements across database links) from other databases. However, if the original connection to the database is established using shared server configurations, the distributed updates from other databases succeed.

To use data manipulation language statements in shared server configurations, set the following parameter in the tnsnames.ora file:

```
SERVER=dedicated
```

This forces the Oracle Net listener to provide a dedicated connection. Figure 6-1 shows this process.

*Figure 6–1  Distributed DML Statements from MTS Applications*

See Also: Oracle Database Net Services Administrator’s Guide

**Working with Different Types of Connection Pooling**

**Oracle Net Connection Pooling**  
Oracle Net connection pooling is a server-side feature that is implemented only if the Oracle Database is configured for shared server support. Oracle Net connection pooling enables you to minimize the number of
physical network connections to a shared server. This is achieved by sharing a dispatcher’s set of connections among multiple client processes.

**Microsoft Transaction Server Connection Pooling**  
Microsoft Transaction Server provides a resource pooling infrastructure that enables certain resources to be pooled, such as memory and database connections.

**OCI Connection Pooling**  
OCI connection pooling layer works with MTS resource pooling to provide pooled Oracle client/server sessions. The OCI connection pooling layer also caches Oracle Net connections to reduce client/server session setup time.

### Working with In-Doubt Transactions

Oracle uses distributed transactions in the following configurations:

- Distributed database configurations, such as distributed updates using database links
- External transaction managers, such as Tuxedo and MS DTC, for coordinating transaction outcome

The two-phase commit protocol completes these transactions. During phase one, the transaction manager (TM) requests the various resource managers involved in the TM’s transaction to prepare the underlying distributed transactions. In phase two, the TM determines whether it commits or terminates the transaction, and requests the resource managers to commit or terminate the underlying transaction. If a resource manager fails to receive the phase two notification, the underlying distributed transaction becomes in-doubt.

To integrate Oracle with Microsoft Transaction Server, distributed transactions are used in the database. Distributed transactions correspond to transactions coordinated by the MS DTC. A distributed transaction can become in-doubt when the transaction cannot commit or terminate (phase two of the two-phase commit). This occurs when the Microsoft Transaction Server application server process, database, or network fails.

**See Also:** Chapter 3, "Managing Recovery Scenarios"

### Dropping the Microsoft Transaction Server Administrative User Account

The Microsoft Transaction Server administrative user account is created by running the `oramtsadmin.sql` script. If you later change the database with which Microsoft Transaction Server is coordinating transactions, you can drop the administrative user account schema from the previous database.

To drop the Microsoft Transaction Server administrative user account:

1. Start SQL*Plus:
   ```bash
c:\> sqlplus /NOLOG
   ```
2. Connect to the database as SYSDBA:
   ```sql
   SQL> CONNECT / AS SYSDBA
   ```
3. Enter the following command to drop administrative user account schema:
   ```sql
   SQL> DROP USER mtsadmin_username CASCADE;
   ```

   where `mtadmin_username` is the Microsoft Transaction Server administrative user account (default is `mtssys`).
See Also:  See Chapter 3, "Managing Recovery Scenarios" for information on creating the Microsoft Transaction Server administrative user account for the new database.
Atomicity, Consistency, Isolation, and Durability (ACID)
ACID consists of the four primary attributes provided to any transaction by a transaction manager (also called a transaction manager).

component object model (COM)
A binary standard that enables objects to interact with other objects, regardless of the programming language in which each object was written.

distributed component object model (DCOM)
An extension of COM that enables objects to interact with other objects across a network.

data manipulation language
The category of SQL statements that query and update database data. Common DML statements are SELECT, INSERT, UPDATE, and DELETE.

JOB_QUEUE_PROCESSES
This initialization parameter specifies the maximum number of DBMS_JOB jobs and Oracle Scheduler (DBMS_SCHEDULER) jobs running concurrently on an instance. This parameter must be set to at least 1 to run Oracle Scheduler or DBMS_JOB jobs and to use database features that depend on these jobs.

listener.ora
A listener configuration file that identifies the following for a listener:

- Unique name
- Protocol addresses on which it accepts connection requests
- Services for which it is listening

Microsoft .NET
Microsoft .NET is a set of Microsoft software technologies used to connect information, people, systems, and devices through web services to each other and to larger applications over the Internet.

Microsoft application demo
An Oracle Call Interface (OCI) implementation of the Visual C++ Sample Bank package that ships with Microsoft Transaction Server on Windows.
Microsoft Distributed Transaction Coordinator (MS DTC)
The focal point of the transaction process is a component of Microsoft Transaction Server called Microsoft Distributed Transaction Coordinator (MS DTC).

Microsoft Transaction Server
A COM-based transaction processing system that runs on an Internet or network server.

mtssys
The default Microsoft Transaction Server administrator username. In releases prior to Oracle9i Database release 1 (9.0.1), this was the username for the OraMTS.

net service name
The name used by clients to identify an Oracle Net server and the specific system identifier (SID) or database for the Oracle Net connection. A net service name is mapped to a port number and protocol. A net service name is also known as a connect string, database alias, host string, or service name.

This also identifies the specific SID or database to which the connection is attaching, and not just the Oracle Net server.

OraMTS
Abbreviation for "Oracle Services for Microsoft Transaction Server".

Oracle Call Interface (OCI)
An application programming interface that enables you to manipulate data and schemas in a database. You compile and link an OCI program in the same way that you compile and link a nondatabase application. There is no requirement for a separate preprocessing or precompilation step.

Oracle Data Provider for .NET (ODP.NET)
Oracle Data Provider for .NET (ODP.NET) features optimized data access to the Oracle Database from a .NET environment. ODP.NET includes support for connection pooling, PL/SQL, LOBs, RefCursors, globalization/localization, proxy user authentication/ parameter array binding, named parameters, and safe type mapping between Oracle types and .NET types.

Oracle Fail Safe
Ensures that if a failure occurs on one cluster node, then the databases and applications running on that node fail over (move) automatically and quickly to a surviving node.

Oracle MTS Recovery Service
The Oracle MTS Recovery Service resolves in-doubt transactions on the computer that started the failed transaction. A scheduled recovery job for each Microsoft Transaction Server-enabled database lets the Oracle MTS Recovery Service resolve in-doubt transactions.

Oracle Open Database Connectivity (ODBC) Driver
Oracle ODBC Driver provides a standard interface that allows one application to access many different data sources. The application's source code does not have to be recompiled for each data source. A database driver links the application to a specific data source. A database driver is a dynamic link library that an application can invoke.
on demand to gain access to a particular data source. Therefore, the application can access any data source for which a database driver exists.

**Oracle Provider for OLE DB**

Interfaces that offer high performance and efficient access to Oracle data by applications, compilers, and other database components.

**Oracle Services for Microsoft Transaction Server (OraMTS)**

A component that provides full integration of the Oracle Database with Microsoft Transaction Server. This component enables you to develop and deploy COM-based applications using Microsoft Transaction Server.

**Optimal Flexible Architecture (OFA)**

A set of file naming and placement guidelines for Oracle software and databases.

**resource manager (RM)**

Microsoft Transaction Server enlists the database to act as a resource manager (RM) in the transaction process.

**SYSDBA**

A special database administration role that contains all system privileges with the **ADMIN OPTION** and the **SYSOPER** system privilege. SYSDBA also permits CREATE DATABASE actions and time-based recovery.

**SYSOPER**

A special database administration role that permits a database administrator to perform **STARTUP**, **SHUTDOWN**, **ALTER DATABASE OPEN/MOUNT**, **ALTER DATABASE BACKUP**, **ARCHIVE LOG**, and **RECOVER**, and includes the **RESTRICTED SESSION** privilege.

**tnsnames.ora**

A file that contains connect descriptors mapped to net service names. The file can be maintained centrally or locally for use by all or individual clients.

**transaction identifiers (XIDs)**

Identifies the client computer from which a transaction originated.
Index

A
administrator username
   dropping, 6-4
Microsoft Transaction Server, 3-4

C
Component Object Model (COM)
   marking components as transactional, 1-1
   programming with Oracle Call Interface and Microsoft Transaction Server, 4-6
   registering in a Microsoft Transaction Server environment, 4-4
   running in a Microsoft Transaction Server coordinated transaction, 4-4
   running in an MS DTC-coordinated transaction, 4-5
   using with Microsoft Oracle ODBC Driver, 4-18
   using with the Oracle ODBC Driver and Microsoft Transaction Server, 4-17
computer on which Microsoft Transaction Server is installed
   installation requirements, 2-2
configuration requirements
   on client computer, 3-1
   where Microsoft Transaction Server is installed, 3-1
   where Oracle Database is installed, 3-1
connection
   managing connection pooling, 5-1
   connection attribute setting with ODBC, 4-16
connection pooling
   client side registry parameters, 5-1
   emptying connection pools, 6-2
   managing connections, 5-1
   obtaining service handles, 4-9
   releasing connections, 4-11
   using OraMTSSvcGet() function, 4-9
CREATE SESSION role, 3-4
database job-queue processes
   starting, 3-3
DBMS_JOBS package, 3-4
DBMS_TRANSACTION package, 3-4
DCOM. See Distributed Component Object Model (DCOM)
differences with OraMTSJoinTxn() function, 4-13
Distributed Component Object Model (DCOM), 1-1
distributed transactions
   in-doubt, 6-4
   RAC support, 1-2
   support for serializable isolation level, 1-3
DML. See Data Manipulation Language (DML)

F
FORCE_ANY_TRANSACTION privilege, 3-4

G
getting started
   with Microsoft Transaction Server and an Oracle Database, 1-3

I
in-doubt transactions
   JOB_QUEUE_PROCESSES initialization parameter, 3-3
   resolving, 3-1
   scheduling automatic recovery, 3-2
   starting database job-queue processes, 3-3
   viewing, 3-6
initialization parameters
   JOB_QUEUE_PROCESSES, 3-3
   PROCESSES, 5-3
   SESSIONS, 5-3
installation requirements
   for computer on which Microsoft Transaction Server is installed, 2-2
   installation requirements
     for computer running Oracle Fail Safe, 2-1
     Microsoft Transaction Server, 2-1
     Oracle Database Client, 2-2
     Oracle ODBC Driver, 2-2
     Oracle Services for Microsoft Transaction
J
JOB_QUEUE_PROCESSES initialization parameter, 3-3

L
local transactions promoting, 1-2
Local User, Domain User, Managed Services Account, 2-1

M
Microsoft Distributed Transaction Coordinator (DTC), 1-2
Microsoft Distributed Transaction Coordinator (MS DTC)
COM components running in an MS DTC-coordinated transaction, 4-5
in a cluster, 3-6
starting, 5-4
Microsoft Transaction Server
benefits, 1-1
changing the administrator username, 3-4
COM components running in a transaction, 4-4
components running in an MS DTC-coordinated transaction, 4-5
creating the administrator user account, 3-4
definition, 1-1
going started with an Oracle Database, 1-3
installation requirements, 2-1
integration with an Oracle Database, 1-1
programming with Microsoft Oracle ODBC Driver, 4-16
programming with Oracle Call Interface, 4-6
programming with Oracle ODBC Driver, 4-16
registering COM components, 4-4
scheduling transaction recovery, 3-2
starting MS DTC, 5-4
using with Microsoft Oracle ODBC Driver, 4-18
using with the Oracle ODBC Driver, 4-17
MTS Recovery Service, 2-3
MTSSamples.dsn file
using with the Oracle ODBC Driver, 4-17
mtssys username
changing the password, 3-4
default administrator user account, 3-4
mtxstop.exe file
running, 6-2

N
net service name
changes that impact connection pool, 6-2
changes that impact connection pooling, 6-2
nonpooled Oracle Call Interface connection
OraMTSJJoinTxn function, 4-14

O
OCI_THREADED flag
passing, 4-6
OCIInitialize function
calling, 4-6
ODBC. See Open Database Connectivity (ODBC)
omtssamp.sql script, 4-18
Open Database Connectivity (ODBC)
configuring Microsoft Oracle ODBC Driver with Microsoft Transaction Server, 4-18
configuring the Oracle ODBC Driver with Microsoft Transaction Server, 4-17
Oracle ODBC Driver installation requirements, 2-2
programming with Microsoft Transaction Server, 4-16
setting the connection attribute, 4-16
using Microsoft Oracle ODBC Driver with Microsoft Transaction Server, 4-18
using the MTSSamples.dsn file with the Oracle ODBC Driver, 4-17
using the Oracle ODBC Driver with Microsoft Transaction Server, 4-17
using the SQL_ATTR_ENLIST_IN_DTC parameter, 4-16
using the SQLSetConnectAttr function, 4-16
Oracle Call Interface (OCI)
enlisting an MS DTC-coordinated transaction, 4-11
obtaining pooled or standard Oracle Call Interface connections, 4-12
obtaining pooled Oracle Call Interface connections, 4-10
OraMTSEnlCtxGet() function, 4-13
OraMTSEnlCtxGet() function parameters, 4-13
OraMTSJJoinTxn() function, 4-14
OraMTSOCIErrGet() function, 4-15
OraMTSOCIErrGet() function parameters, 4-16
OraMTSSvcEnlist() function, 4-11
OraMTSSvcEnlist() function parameters, 4-12
OraMTSSvcGet() function, 4-9
OraMTSSvcGet() function parameters, 4-9
OraMTSSvcRel() function, 4-11
programming with Microsoft Transaction Server, 4-6
releasing pooled Oracle Call Interface connections, 4-11
Oracle Database
changing init.ora file parameter settings, 5-3
integration with Microsoft Transaction server, 1-1
Oracle Database Client
installation requirements, 2-2
Oracle Fail Safe, 3-1, 3-6
installation requirements, 2-2
modifying registry parameters, 3-6
Oracle Home User, 2-1
Oracle MTS Recovery Service
resolving in-doubt transactions, 3-1
trace file output, 6-2
Oracle Recovery MTS Service, 2-3
Oracle Services for Microsoft Transaction, 3-1
Oracle Services for Microsoft Transaction Server installation requirements, 2-2
oramts_2pc_pending views, 3-5
ORAMTS_ABORT_MODE, 5-4
ORAMTS_CFLG_ALLDEFAULT flag description, 4-10
ORAMTS_CFLG_SYSDBALOGN flag description, 4-10
using, 4-10
ORAMTS_CFLG_SYSOPRLOGN flag description, 4-10
using, 4-10
ORAMTS_CONN_POOL_TIMEOUT registry parameter, 5-2
ORAMTS_ENFLG_DEFAULT flag description, 4-12, 4-13
ORAMTS_NET_CACHE_MAXFREE registry parameter, 5-2
ORAMTS_NET_CACHE_TIMEOUT registry parameter, 5-2
ORAMTS_OSCREDS_MATCH_LEVEL registry parameter, 5-2
oramtsadmin.sql script creating the Microsoft Transaction Server administrator user account, 3-4
creating the PL/SQL package, 3-4
oramts.dll file definition, 6-1
OraMTSEnlCtxGet() function Oracle Call Interface function, 4-13
OraMTSEnlCtxRel() function destroying a previously set up enlistment context, 4-14
parameters, 4-14
returning ORAMTSERR_NOERROR, 4-14
syntax, 4-14
ORAMTSERR_ILLEGAL_OPER returning upon acquiring a connection, 4-13
ORAMTSERR_ILLEGAL_OPER returning upon acquiring a connection, 4-13
ORAMTSERR_NOERROR returning upon acquiring a connection, 4-12, 4-15
returning upon obtaining a connection, 4-10
returning upon releasing a connection, 4-11
OraMTSJoinTxn() function enlisting a nonpooled Oracle Call Interface connection, 4-14
Oracle Call Interface function, 4-14
returning ORAMTSERR_NOERROR upon acquiring a connection, 4-15
syntax, 4-15
OraMTSOCIErrGet() function parameters, 4-16
retrieving the Oracle Call Interface error code, 4-15
syntax, 4-15
OraMTSSvcEnlist() function enlisting pooled or standard Oracle Call Interface connections, 4-12
Oracle Call Interface function, 4-11
ORAMTS_ENFLG_DEFAULT flag, 4-12, 4-13
parameters, 4-12
restrictions on use, 4-11
returning ORAMTSERR_NOERROR upon acquiring a connection, 4-12
syntax, 4-11
OraMTSSvcEnlistEx() function restrictions on use, 4-12
returning ORAMTSERR_ILLEGAL_OPER upon acquiring a connection, 4-13
syntax, 4-12
OraMTSSvcGet() function Oracle Call Interface function, 4-9
ORAMTS_CFLG_ALLDEFAULT flag, 4-10
ORAMTS_CFLG_SYSDBALOGN flag, 4-10
ORAMTS_CFLG_SYSOPRLOGN flag, 4-10
overview, 4-6
parameters, 4-9
responsibilities, 4-9
returning a pooled connection, 4-10
returning ORAMTSERR_NOERROR upon acquiring a connection, 4-10
syntax, 4-9
OraMTSSvcRel() function Oracle Call Interface function, 4-11
overview, 4-6
releasing a pooled connection, 4-11
returning ORAMTSERR_NOERROR upon releasing a connection, 4-11
syntax, 4-11
OraMTSTransTest() function syntax, 4-15
ORAOCI registry parameter setting, 4-18
P
packages
DBMS_JOBS, 3-4
DBMS_TRANSACTION, 3-4
passwords
changing for mtssys username, 3-4
pooled connection releasing, 4-11
privileges
FORCE_ANY_TRANSACTION, 3-4
of administrator user account, 3-4
utl_oramts.sql script, 3-4
PROCESSES initialization parameter changing the value, 5-3
programming methods
optimizing to improve performance, 5-1
promotable local transactions, 1-2
prvtoramts.plb file, 3-3
public procedures
exposing, 3-4
recover Automatic, 3-5
show indoubt, 3-5
utl_oramts.forget_RMs, 3-5

R

Real Application Clusters (RAC), 1-2
recover-automatic
  public procedure, 3-5
recovery
  of in-doubt transactions, 3-1
registry
  modifying values for Oracle Fail Safe
    configurations, 3-6
  trace file settings, 6-1
registry parameters
  modifying for Oracle Fail Safe, 3-6
ORAMTS_CONN_POOL_TIMEOUT, 5-2
ORAMTS_NET_CACHE_MAXFREE, 5-2
ORAMTS_NET_CACHE_TIMEOUT, 5-2
ORAMTS_OSCREDS_MATCH_LEVEL, 5-2
registry variables
  ORAMTS_ABORT_MODE, 5-4
roles
  CREATE SESSION, 3-4
  of administrator user account, 3-4
  SELECT_CATALOG_ROLE, 3-4

S

SELECT_CATALOG_ROLE role, 3-4
serializable transactions, 1-3
service handles, 4-9
Service Pack 5.0 or greater
  installation requirements, 2-2
SESSIONS initialization parameter
  changing the value, 5-3
shared server configurations, 6-3
show_in_doubt
  public procedure, 3-5

T

three-tiered architecture, 1-1
tsnames.ora file
  setting for shared server configurations, 6-3
trace files
  filename conventions, 6-1
  Oracle MTS Recovery Service, 6-2
  oramts.dll, 6-1
  registry settings, 6-1
  using, 6-1
transaction recovery
  JOB_QUEUE_PROCESSES initialization
    parameter, 3-3
  Oracle Fail Safe environment, 3-1
  overview, 3-1
  scheduling, 3-2
  starting database job-queue processes, 3-3
  troubleshooting, 3-6
transactions
  ensuring consistency across data resources, 1-2
  transparent RAC support of distributed

troubleshooting
  correcting Oracle Net changes that impact
    connection pooling, 6-2
  dropping the administrator user account, 6-4
  starting MS DTC, 5-4
  transaction recovery, 3-6
  using trace files, 6-1
  tuning
    change, 5-3
    managing connection pooling, 5-1
two-phase commit protocol, 6-4

U

utl_oramts PL/SQL package
  exposing public procedures, 3-4
utl_oramts.forget_RMs
  public procedure, 3-5
utl_oramts.sql script, 3-3
  privileges and roles granted, 3-4

V

views
  oramts_2pc_pending, 3-5

W

Windows User Account, 2-1