SYBASE®

Quick Start Guide for Oracle to Oracle Replication

Sybase® Data Integration Suite

1.1

[Windows, UNIX, and Linux]

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Contents

About This Book

This document provides step-by-step procedures for setting up a Sybase replication system for Oracle using the Replication subcomponents of the Sybase® Data Integration (DI) Suite, namely Replication Server®, Enterprise Connect™ Data Access, and Replication Agent™.

Completing the configuration tasks described in this guide, will let you successfully replicate changes from a primary Oracle data server to a replicate Oracle data server.

Note Use the procedures specified in this guide only for demonstration or testing purposes; they may not be suitable for production.

Audience

This book is for anyone who needs to set up and manage a Sybase replication system that uses Oracle as the primary and replicate data server. This may include:

- Database administrators
- Network administrators
- System administrators

How to use this book

This book is organized as follows:

- Chapter 1, “Oracle to Oracle Replication” provides an overview of the replication components and summarizes the tasks involved in setting up a replication system for Oracle. It also outlines the requirements for preparing your environment before you begin to install and configure each component.
- Chapter 2, “Setting up the Replication System” describes how to install and configure a replication system for Oracle.

Related documents

You can see the following documents for more information.

Sybase Data Integration Suite To learn more about Sybase Data Integration Suite 1.1, refer to the following documents:

- *Sybase Data Integration Suite Overview Guide* for more information on Sybase Replication and its subcomponents.

- *Sybase Data Integration Suite Installation Guide* for detailed information about installing the Sybase Replication component of the DI Suite.

Replication Agent To learn more about Sybase Replication Agent 15.0, refer to the following documents:

- *Sybase Replication Agent Installation Guide* for information on installing the Sybase Replication Agent.
- *Sybase Replication Agent Reference Manual* for information about all Replication Agent commands and configuration parameters, including syntax, examples, and detailed command usage notes.
- *Sybase Replication Agent Primary Database Guide* for detailed, database-specific information about each non-Sybase database that is supported by the Sybase Replication Agent.
- *Sybase Replication Agent Administration Guide* for an overview of the Sybase Replication Agent, information about configuring and administering Replication Agent instances, and information about configuring the other components in a Sybase replication system.
- *Sybase Replication Agent Release Bulletin* for last-minute information that was too late to be included in the books.

Replication Server To learn more about Sybase Replication Server 15.0.1, refer to the following documents:

- *Replication Server Design Guide* for an introduction to basic transaction replication concepts and Sybase replication technology.
- *Replication Server Heterogeneous Replication Guide* for detailed information about configuring Replication Server and implementing a Sybase replication system with Oracle databases.

Enterprise Connect Data Access To learn more about ECDA 12.6.1, refer to the following documents:

- *Enterprise Connect Data Access Option for Oracle Server Administration and User's Guide* for information on how to configure DirectConnect™ for Oracle.
- *Enterprise Connect Data Access and Mainframe Connect Server Administration Guide for DirectConnect* for information on how to use a Sybase DirectConnect server.
- *Enterprise Connect Data Access Options User's Guide for Access Services* for information on how to configure a DirectConnect access service.

Other sources of information

Use the Sybase Getting Started CD, the SyBooks™ CD, and the Sybase Product Manuals Web site to learn more about your product:

- The Getting Started CD contains release bulletins and installation guides in PDF format, and may also contain other documents or updated information not included on the SyBooks CD. It is included with your software. To read or print documents on the Getting Started CD, you need Adobe Acrobat Reader, which you can download at no charge from the Adobe Web site using a link provided on the CD.
- The SyBooks CD contains product manuals and is included with your software. The Eclipse-based SyBooks browser allows you to access the manuals in an easy-to-use, HTML-based format.

  Some documentation may be provided in PDF format, which you can access through the PDF directory on the SyBooks CD. To read or print the PDF files, you need Adobe Acrobat Reader.

  Refer to the *SyBooks Installation Guide* on the Getting Started CD, or the *README.txt* file on the SyBooks CD for instructions on installing and starting SyBooks.
- The Sybase Product Manuals Web site is an online version of the SyBooks CD that you can access using a standard Web browser. In addition to product manuals, you will find links to EBFs/Maintenance, Technical Documents, Case Management, Solved Cases, newsgroups, and the Sybase Developer Network.

  To access the Sybase Product Manuals Web site, go to Product Manuals at http://www.sybase.com/support/manuals/.

Sybase certifications on the Web

Technical documentation at the Sybase Web site is updated frequently.

❖ **Finding the latest information on product certifications**

1. Point your Web browser to Technical Documents at http://www.sybase.com/support/techdocs/.
2. Click Certification Report.
3. In the Certification Report filter select a product, platform, and timeframe and then click Go.
4. Click a Certification Report title to display the report.

❖ **Finding the latest information on component certifications**

1. Point your Web browser to Availability and Certification Reports at http://certification.sybase.com/.

2 Either select the product family and product under Search by Base Product; or select the platform and product under Search by Platform.

3 Select Search to display the availability and certification report for the selection.

❖ **Creating a personalized view of the Sybase Web site (including support pages)**

Set up a MySybase profile. MySybase is a free service that allows you to create a personalized view of Sybase Web pages.

1 Point your Web browser to Technical Documents at http://www.sybase.com/support/techdocs/.

2 Click MySybase and create a MySybase profile.

Sybase EBFs and software maintenance

❖ **Finding the latest information on EBFs and software maintenance**

1 Point your Web browser to the Sybase Support Page at http://www.sybase.com/support.

2 Select EBFs/Maintenance. If prompted, enter your MySybase user name and password.

3 Select a product.

4 Specify a time frame and click Go. A list of EBF/Maintenance releases is displayed.

Padlock icons indicate that you do not have download authorization for certain EBF/Maintenance releases because you are not registered as a Technical Support Contact. If you have not registered, but have valid information provided by your Sybase representative or through your support contract, click Edit Roles to add the "Technical Support Contact" role to your MySybase profile.

5 Click the Info icon to display the EBF/Maintenance report, or click the product description to download the software.

Conventions

The formatting conventions used in this guide are:

Formatting example	Indicates
command names and method names	When used in descriptive text, this font indicates keywords such as: • Command names used in descriptive text • C++ and Java method or class names used in descriptive text • Java package names used in descriptive text
myCounter variable *Server.log* *myfile.txt*	Italic font indicates: • Program variables • Parts of input text that must be substituted • Directory and file names
File | Save	Menu names and menu items are displayed in plain text. The vertical bar shows you how to navigate menu selections. For example, File | Save indicates "select Save from the File menu."
create table table created	Monospace font indicates: • Information that you enter on a command line or as program text. • Example output fragments

Accessibility features

This document is available in an HTML version that is specialized for accessibility. You can navigate the HTML with an adaptive technology such as a screen reader, or view it with a screen enlarger.

Sybase Data Integration Suite documentation has been tested for compliance with U.S. government Section 508 Accessibility requirements. Documents that comply with Section 508 generally also meet non-U.S. accessibility guidelines, such as the World Wide Web Consortium (W3C) guidelines for Web sites.

Note You might need to configure your accessibility tool for optimal use. Some screen readers pronounce text based on its case; for example, they pronounce ALL UPPERCASE TEXT as initials, and MixedCase Text as words. You might find it helpful to configure your tool to announce syntax conventions. Consult the documentation for your tool.

For information about how Sybase supports accessibility, see Sybase Accessibility at http://www.sybase.com/accessibility. The Sybase Accessibility site includes links to information on Section 508 and W3C standards.

If you need help

Each Sybase installation that has purchased a support contract has one or more designated people who are authorized to contact Sybase Technical Support. If you cannot resolve a problem using the manuals or online help, please have the designated person contact Sybase Technical Support or the Sybase subsidiary in your area.

CHAPTER 1

Oracle to Oracle Replication

This chapter is an introduction to the components required to implement a Sybase replication system using Oracle, and an overview of the tasks involved.

Overview

The major components required to implement a replication system are:

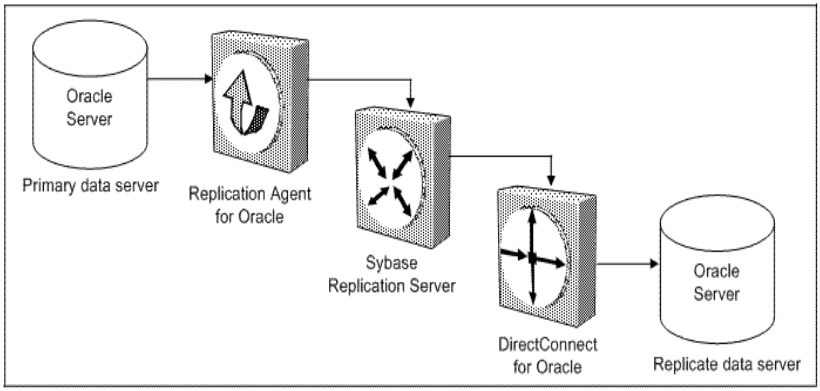
- A primary Oracle data server
- A replicate Oracle data server
- The Sybase Replication component of DI Suite and its subcomponents, namely:
  - Replication Agent
  - Replication Server
  - Enterprise Connect Data Access (ECDA) Option for Oracle (also referred to as DirectConnect for Oracle (DCO))

Note The Sybase Replication subcomponents will hereafter be referred to as replication components.

For more information on the Sybase Replication component and its subcomponents, see the *Sybase Data Integration Suite Overview Guide*.

Figure 1-1 illustrates a Sybase replication system with Oracle servers as the primary and replicate data servers, showing the flow of data between them, through Replication Agent, Replication Server, and Enterprise Connect Data Access database gateway.

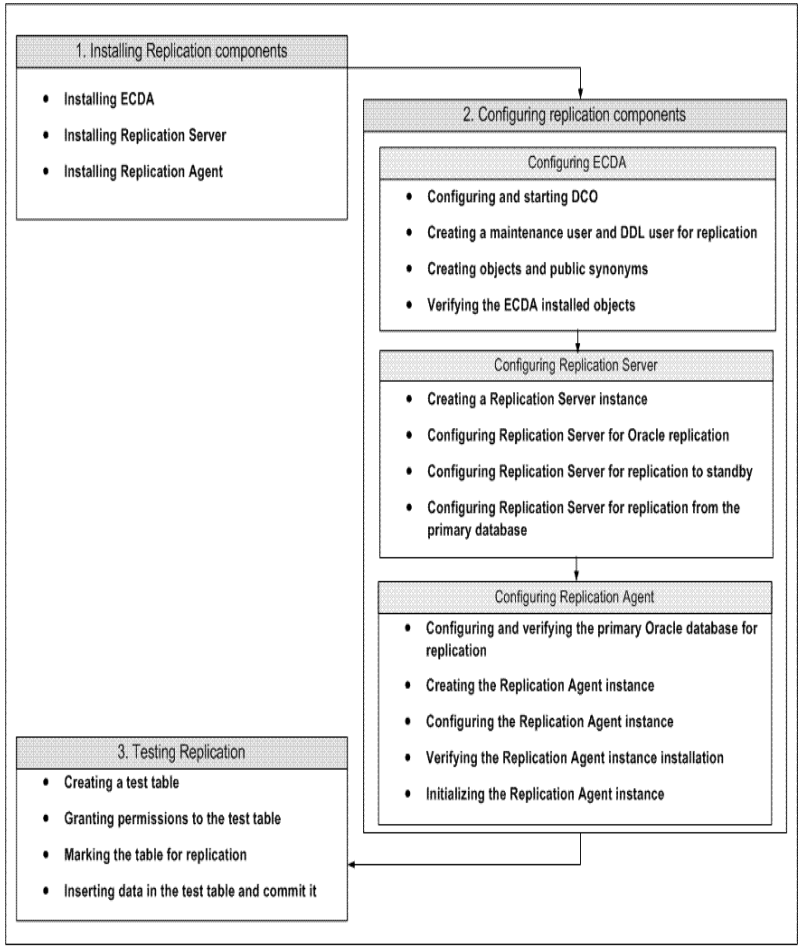
Figure 1-1: Sybase replication system with Oracle data servers



Setup summary

Figure 1-2 provides a graphical representation of the tasks involved in setting up a replication system.

Figure 1-2: Steps to set up a replication environment



For detailed instructions on each of the tasks, see Chapter 2, “Setting up the Replication System.”

Before you begin

Before you begin setting up the replication system, make sure that:

- You are familiar with Oracle data servers and have an understanding of Sybase replication.
- You have obtained the license for the Sybase Replication component of DI Suite.
- Oracle Enterprise Edition version 9.2.0.1.0, to serve as the source (primary) database from which Replication Agent will replicate transactions, is installed.
- Oracle Enterprise Edition version 9.2.0.1.0, to host the Replication Server RSSD and the target (replicate) database, is installed.
- Oracle thin JDBC driver for Oracle 9i and JDK 1.4 is installed.
- The machine identified for installation of replication components has a DVD drive, since the installation media for DI Suite is DVD.
- TCP/IP connectivity is available.
- Any OS patches required for Java 1.4.2 have been installed.
- The target computer on which you are installing the replication components, meets the following memory and disk space requirements:

  Windows:

Component	Memory (RAM)	Disk space
Replication Server	512MB	380MB
ECDA	512MB	440MB
Replication Agent	128MB	160MB

  UNIX:

Components	Memory (RAM)	Disk space
Replication Server	512MB	520MB
ECDA	256MB	700MB
Replication Agent	128MB	210MB

Linux:

Components	Memory (RAM)	Disk space
Replication Server	512MB	400MB
ECDA	256MB	590MB
Replication Agent	128MB	250MB

CHAPTER 2

Setting up the Replication System

This chapter provides instructions for installing and configuring the replication components in the replication system.

Installing the replication components

You can install the Sybase Replication subcomponents, namely, Replication Server, Replication Agent and ECDA, using the setup program provided in your DI Suite installation media, or you can download and extract the DI Suite component images from the SPDC Web site at http://sybase.subscribenet.com. This guide discusses how to install the subcomponents using the installation media.

For information on how to install from the SPDC, see the *Sybase Data Integration Suite Installation Guide* for your platform.

Installation guidelines

While installing the replication components, keep the following guidelines in mind:

For Replication Agent:

- Install Replication Agent for Oracle on a server where it can directly access the Oracle redo logs and the archived redo logs.
- Install one Replication Agent per database, and configure it for the Oracle database to which you want to connect.

For Replication Server:

- Allocate a disk partition of at least 20MB for each Replication Server you are installing. You can add more partitions later, if necessary. Check each partition to make sure it is available and has write permissions.

  Allocate the entire partition to the Replication Server. If you allocate only a portion of the partition to Replication Server, you cannot use the remainder for any other purpose.

For ECDA:

- Before installing the ECDA component for a target database, make sure the connectivity between the machine that will host the DirectConnect server and the target database is set up.
- Install ECDA on the same server as the replicate databases. This eliminates a network hop and improves performance.

Installation procedure

1 Insert the DI Suite installation media.

  - Windows – the setup program should start automatically. If it does not, select Run from the Windows Start menu and browse to *setup.exe*.
  - UNIX and Linux – open a command line and enter:

    ```
    /cdrom/setup
    ```

  The Welcome window displays. Click Next.

2 Select the geographic location where you are installing. Read the End-user License and Copyright Agreement. Select “I agree to the terms of the Sybase license for the install location specified” and click Next.

3 On the Sybase Software Asset Management License Server window, provide the Sybase Replication component license.

You can either click Browse to select the license file, or copy and paste the license information directly in the license pane. Alternatively, if you have a previously deployed license server, enter the host name of the machine where the license server is running, and the port number, if the port number you are using is not the default.

Click Next.

4 If the license you provided is correct, the Sybase Replication component appears highlighted, and the installer displays a message that a license was found for this component. In case of an incorrect license, the Sybase Replication component will not appear highlighted. To provide the correct license, return to the previous window. Click Next.

5 Specify the installation directory.

a Click Browse to select a directory, click Next to accept the default directory, or enter a different directory name where you want to install the components. On Windows, the default directory is *C:\sybase*, and on UNIX and Linux, the default directory is */opt/sybase*.

Sybase recommends that you install the components into the *Sybase* directory, if one already exists on your machine.

Note Make sure that the installation directory name does not have non-ASCII characters, or spaces.

b If the installation directory you specified already exists, and contains an earlier installation, you see:

```
You have chosen to install into an existing
directory. Any older versions of the products you
choose to install that are detected in this
directory will be replaced.

Do you want to continue with installation into
this directory?
```

Click Yes to replace any previous installation in this directory.

If the installation directory you specify does not exist, you see:

```
The directory does not exist. Do you want to
create it?
```

Click Yes. By default, the installer installs the components in the *%SYBASE%* directory on Windows, and in the *$SYBASE* directory on UNIX and Linux, if it exists. If you proceed to install in a new directory, the existing Sybase products may not work properly. Click No to go back and change the directory. Click Yes to proceed.

6 Select Sybase Replication and click Next.

7 Select Custom and click Next.

8 A list of Sybase Replication subcomponents display. Unselect:

- IBM DB2
- Microsoft SQL Server

Note If you select the Sybase Data Services Administrator (DSA) option, the centralized management console for administration of the replication components is installed. You can administer the replication components in DSA with GUI-based server managers, such as Replication Manager and DirectConnect Managers that are accessible via Sybase Central plug-ins. See *Sybase Data Integration Suite Overview Guide* for more information on DSA.

Click Next.

9 The SySAM notification window prompts you to configure the DI Suite for e-mail notification. When configuration is enabled, you receive information about license management events that require attention. Select Yes and either accept the default values that are supplied, or enter new values for:

- SMTP server host name
- SMTP server port number
- Sender e-mail
- Recipient e-mail
- Message severity for e-mail alerts

If you choose not to have e-mail alerts or severity messages logged, select No. Click Next.

10 The installer displays the selections you have made. Review the information, and click Next.

11 If the software is installed successfully, a final window appears, indicating a successful installation. Click Finish to exit the installer.

You can now begin to configure the components in your replication system.

Configuring the replication components

This section describes the tasks you must perform to configure each of the replication component in the replication system.

Configuring ECDA

Configuring ECDA Option for Oracle involves:

1 Configuring and starting DCO

2 Creating a maintenance user and DDL user for replication

3 Creating objects and public synonyms

4 Verifying the ECDA installed objects

Configuring and starting DCO

Before you begin to create and configure a DirectConnect instance, make sure that:

- You have made a copy of the existing *tnsnames.ora* file, currently being used to connect to Oracle, and placed it in a temporary file location.
- The Oracle connect string is available.
- The name for a valid Oracle account, which will be the administrator for DCO, is available.
- The number of the unused port to be used by DirectConnect for Oracle is available.

❖ **Creating and configuring a DirectConnect instance**

1 Create a DirectConnect instance.

- Windows – navigate to the *%SYBASE%\DCO-12_6\install* directory and execute the *DCOConfig.bat* file.
- UNIX and Linux – navigate to the *$SYBASE/DCO-12_6/install* directory and execute *DCOConfig* script.

2 Enter the server name for DirectConnect for Oracle.

3 Enter an unused port on the machine on which DCO will be listening.

4 Enter a valid DirectConnect for Oracle administrator name.

5 Enter the Oracle connection string as previously defined in the *tnsnames.ora* file.

6 Enter the path (including the file name) to the previously defined temporary location of the *tnsnames.ora* file.

7 If you want *DCOConfig* to add this server as a Windows service, you must select "Y," then enter a unique Windows Service name on the machine.

8 On Windows, the DirectConnect instance now automatically starts in a separate window.

On UNIX and Linux, the DirectConnect instance starts as a separate process and you can view the output of the process in the same window from which you executed *DCOConfig*.

Note In the window where the DirectConnect for Oracle is started, this message appears when the DirectConnect for Oracle is started from *DCOConfig*, and can be ignored.

```
Option [traceflags] not found in configuration file
'<path to configuration file>'. Generating new
configuration file.
```

Creating a maintenance user and DDL user for replication

This section explains how to create a maintenance user and a DDL user in Oracle.

❖ Creating a maintenance user in Oracle

The maintenance user is a valid Oracle user that the Replication Server uses to apply commands to the standby Oracle database. Sybase Replication Server requires one maintenance user to be defined for each connection. Do not use the same name as the DCO Admin Account Name used in configuring DCO. To create a maintenance user:

1 Using SQLPLUS, connect to the standby database and enter:

```
create user maintuser identified by password;
```

2 Grant dba and create session permissions to the maintenance user, who must have the highest privilege of all users who have data or work that will be replicated.

❖ Creating a DDL user in Oracle

To replicate DDL, you must create a special user with "DDL" permissions at the standby Oracle database. This user cannot be the same as either the maintenance user or the owner of the objects at the primary site. To create a DDL user in Oracle:

1 Using SQLPLUS, connect to the Oracle standby database and enter:

```
create user DDLuser identified by password;
```

Note The value for the *ddl_username* must not be the same as the value of the maintenance user defined in Replication Server for the standby connection.

2 Grant dba and create session permissions to the DDL user.

3 Grant permissions to the DDL user, who must have privileges to perform DDL activities that can include create user, create, alter, drop procedures, indexes, tables and any DDL command issued on the correct database.

Note This user ID must have authority in the standby database to issue ALTER SESSION SET CURRENT_SCHEMA= user for any user that can create DDL in the primary database.

Creating objects and public synonyms

Create the rs_info table and rs_lastcommit tables in the Oracle database as follows:

- Windows – sign on to Oracle through DCO as the maintenance user and enter:

```
isql –Umaintuser –Ppassword –SDCOServer -i
%SYBASE%\RAX-15_0\scripts\
hds_oracle_new_setup_for_replicate.sql
```

- UNIX and Linux – sign on to Oracle through DCO as the maintenance user (assuming that the maintenance user that you created has the resource role to create tables) and enter:

```
isql –Umaintuser –Ppassword –SDCOServer -i
$SYBASE/RAX-15_0/scripts/
hds_oracle_new_setup_for_replicate.sql
```

  where *DCOServer* is the name of the DCO server.

Note You may receive a ORA-00942 message that a table or view does not exist. Ignore the message.

These scripts create the rs_info table and rs_lastcommit tables.

Verifying the ECDA installed objects

1 Set the environment variables.

- Windows – navigate to the *%SYBASE%\DCO-12_6* directory and set the environment variables by executing the *DCO_SYBASE.bat* file.
- UNIX and Linux – navigate to the *$SYBASE/DCO-12_6* directory and set the environment variables by sourcing the *DCO_SYBASE.csh* file.

2 Use isql to log in to Oracle through DirectConnect as *maintuser*.

- To verify whether the rs_info table has been created successfully:

```
isql –Umaintuser –Ppassword –SDCOServer
select * from rs_info
go
```

Note *DCOServer* is the name of the DCO server.

The following is returned:

```
RSKEY RSVAL
------------------- ----------------

charset_name iso_1
sortorder_name bin_iso_1
(2 rows affected)
```

- To verify whether the rs_lastcommit table has been created successfully:

```
isql –Umaintuser –Ppassword –SDCOServer
select * from rs_lastcommit
go
```

Note *DCOServer* is the name of the DCO server.

The following is returned:

```
ORIGIN  ORIGIN_QID SECONDARY_QID ORIGIN_TIME
DEST_COMMIT_TIME
------------------- ------------------
------------------- ------------------
(0 rows affected)
```

If the ECDA objects are not installed successfully, no results are displayed, and you will encounter an error message.

3 Exit isql.

Configuring Replication Server

Configuring Replication Server includes:

1 Creating a Replication Server instance.

2 Configuring Replication Server for Oracle replication.

3 Configuring Replication Server for replication to standby.

4 Configuring Replication Server for replication from the primary database.

Creating a Replication Server instance

Create and start the sample Replication Server:

- Windows – at the command prompt, enter:

```
%SYBASE%\REP-15_0\install\rs_init -r
%SYBASE%\REP-15_0\samp_repserver\SAMPLE_RS.res
```

- UNIX and Linux – at the command line, enter:

```
$SYBASE/REP-15_0/install/rs_init -r
$SYBASE/REP-15_0/samp_repserver/SAMPLE_RS.res
```

Note If you encounter a problem starting the sample Replication Server using the above command, you can run the *RUN_SAMPLE_RS.bat* file available under the *%SYBASE%\REP-15_0\samp_repserver* directory on Windows, and the *RUN_SAMPLE_RS* script, available under the *$SYBASE/REP-15_0/samp_repserver* directory on UNIX and Linux. See the *Sybase Replication Server Installation Guide* for your platform for more information.

Configuring Replication Server for Oracle replication

This section describes the configuration tasks for configuring Replication Server for Oracle.

❖ Applying heterogeneous datatype support (HDS) scripts to RSSD

Prepare the Replication Server RSSD for replication to an Oracle database. To apply HDS support scripts to RSSD:

1 Set the environment variables.

   - Windows – navigate to the *%SYBASE%* directory of your Replication Server installation and set the environment variables by executing *SYBASE.bat*.
   - UNIX and Linux – navigate to the *$SYBASE* directory and set the environment variables by sourcing *SYBASE.csh.*

2 Change to this directory:

   - Windows – *%SYBASE%\REP-15_0\scripts*
   - UNIX and Linux – *$SYBASE/REP-15_0/scripts*

3 Load the following scripts into the RSSD:

```
isql -U SAMPLE_RS_RSSD_prim -P SAMPLE_RS_RSSD_prim_ps –SSAMPLE_RS_ERSSD
–ihds_clt_ase_to_oracle.sql -DSAMPLE_RS_ERSSD

isql -U SAMPLE_RS_RSSD_prim -P SAMPLE_RS_RSSD_prim_ps –SSAMPLE_RS_ERSSD
–ihds_oracle_udds.sql -DSAMPLE_RS_ERSSD

isql -U SAMPLE_RS_RSSD_prim -P SAMPLE_RS_RSSD_prim_ps –SSAMPLE_RS_ERSSD
–ihds_oracle_funcstrings.sql -DSAMPLE_RS_ERSSD
```

Note The message "ASA -157 cannot convert to a timestamp" is displayed. You can ignore this message.

4 Change to this directory:

- Windows – *%SYBASE%\RAX-15_0\scripts*
- UNIX and Linux – *$SYBASE/RAX-15_0/scripts*

5 Load the following script into the RSSD:

```
isql -U SAMPLE_RS_RSSD_prim -P SAMPLE_RS_RSSD_prim_ps –SSAMPLE_RS_ERSSD
–ihds_oracle_new_udds.sql -DSAMPLE_RS_ERSSD
```

6 Shut down Replication Server:

```
isql –Usa –P –SSAMPLE_RS
shutdown
go
```

7 Navigate to this directory:

- Windows – *%SYBASE%\REP-15_0\samp_repserver*
- UNIX and Linux – *$SYBASE/REP-15_0/samp_repserver*

8 Run the *RUN_SAMPLE_RS.bat* file on Windows, and the *RUN_SAMPLE_RS* script on UNIX and Linux, to start the SAMPLE_RS Replication Server.

Configuring Replication Server for replication to standby

This section describes the required configurations for Replication Server for replication to the standby Oracle data server.

❖ **Creating a Replication Server connection to standby database**

1 Navigate to this directory:

- Windows – *%SYBASE%\RAX-15_0\scripts*
- UNIX and Linux – *$SYBASE/RAX-15_0/scripts*

2 Execute the following scripts to create the Oracle error class:

```
isql –Usa –P –SSAMPLE_RS -i oracle_create_error_class_1_rs.sql

isql -U SAMPLE_RS_RSSD_prim -P SAMPLE_RS_RSSD_prim_ps
–SSAMPLE_RS_ERSSD –i oracle_create_error_class_2_rssd.sql
-DSAMPLE_RS_ERSSD

isql –Usa –P –SSAMPLE_RS -i oracle_create_error_class_3_rs.sql
```

Note The oracle_error_class_1_rs.sql and oracle_error_class_3_rs.sql scripts are executed to the Replication Server. The oracle_error_class_2_rssd.sql script is executed in the RSSD.

3 Make a copy of the *oracle_create_rs_standby_connection.sql* script:

```
cp oracle_create_rs_standby_connection.sql
my_oracle_create_rs_standby_connection.sql
```

4 Before executing the my_oracle_create_rs_standby_connection.sql script against your Replication Server, change all occurrences of value *{rds}.{rdb}* to the name of the connection that Replication Server will use to connect to DirectConnect for Oracle, where:

- *rds* is the DCO Server name.
- *rdb* is any valid identifier. Sybase recommends that you use the Oracle SID name.
- *rs_maint_user* and *rs_maint_user_pwd* are the maintuser and password created in DirectConnect for Oracle, in step 1 of “Configuring ECDA” on page 11.
- *maintuser* and *password* are the user name and password created in DCO.

For example:

```
create connection to DCOServer.oratest2
set error class oracle_error_class
set function string class rs_oracle_function_class
set username maintuser
set password "password"
set batch to "off"
go
```

Note In the above example, *password* is a RepServer reserved word and therefore, must be enclosed in double quotes.

5 Create the connection to the standby database:

```
isql –Usa –P –SSAMPLE_RS -i my_oracle_create_rs_standby_connection.sql
```

6 To verify the Replication Server connection to the standby database, log in to SAMPLE_RS and verify the Replication Server connection to the standby database:

```
isql –Usa –P –SSAMPLE_RS

admin who

go
```

You should see a message returned for the DSI connection *{rds}.{rdb}*. Verify that the status is "Awaiting Message" or "Awaiting Command."

7 Exit isql.

Configuring Replication Server for replication from the primary database

This section describes the configuration steps required for replication from the primary database. It includes:

- Creating a Replication Server connection to the primary database
- Creating a database replication definition
- Creating the database replication subscription

❖ Creating a Replication Server connection to the primary database

1 Make sure you are in this directory:

- Windows – *%SYBASE%\RAX-15_0\scripts*
- UNIX and Linux – *$SYBASE/RAX-15_0/scripts*

2 Make a copy of the oracle_create_rs_primary_connection.sql script:

```
cp oracle_create_rs_primary_connection.sql
my_oracle_create_rs_primary_connection.sql
```

3 Before executing the my_oracle_create_rs_primary_connection.sql script against your Replication Server, change all occurrences of value *{pds}.{pdb}* to the name of the Replication Server connection used to connect to Oracle, where:

- *pds* is rs_source_ds. For example: "NY."
- *pdb* is rs_source_db. For example: "NYora92."

4 Change *sys* and *sys_pwd* to the user ID and password of the Oracle user who will have permission to apply DML operations against all user tables that will be replicated, where:

- *sys* is the user ID of the Oracle user (sys).
- *sys_pwd* is the password of the Oracle user (change_on_install).

Note This user must be a valid user in the Oracle database.

The following command creates a Replication Server connection to the primary database example:

```
create connection to NY.NYora92
set error class rs_sqlserver_error_class
set function string class rs_oracle_function_class
set username sys
set password change_on_install
with log transfer on, dsi_suspended
go
```

5 Execute the script in Replication Server:

```
isql –Usa –P –SSAMPLE_RS -i my_oracle_create_rs_primary_connection.sql
```

A message is displayed that indicates the Replication Server connection to the primary database is created.

❖ **Creating a database replication definition**

1 Navigate to this directory:

- Windows – *%SYBASE%\RAX-15_0\scripts*
- UNIX and Linux – *$SYBASE/RAX-15_0/scripts*

2 Make a copy of the oracle_create_rs_db_repdef.sql script:

```
cp oracle_create_rs_db_repdef.sql
my_oracle_create_rs_db_repdef.sq
```

3 Before executing the my_oracle_create_rs_db_repdef.sql script, change the value of "*{pds}.{pdb}*" to the name of the connection string you defined for the primary database, where:

- *pds* is rs_source_ds. For example: "NY."
- *pdb* is rs_source_db. For example: "NYora92."

This is a database replication definition example:

```
create database replication definition NY_repdef1
with primary at NY.NYora92
replicate DDL
go
```

4 Connect to the Replication Server and enter:

```
isql -Usa -P –SSAMPLE_RS -i my_oracle_create_rs_db_repdef.sql
```

A message is displayed that indicates the database replication definition is created.

❖ **Creating the database replication subscription**

1 Make a copy of the oracle_create_rs_db_sub.sql script:

```
cp oracle_create_rs_db_sub.sql
my_oracle_create_rs_db_sub.sql
```

2 Before executing the my_oracle_create_rs_db_sub.sql script, change the "*{pds}.{pdb}*" and "*{rds}.{rdb}*"to the appropriate connection name, where:

- *pds* is *rs_source_ds*. For example: "NY."
- *pdb* is *rs_source_db*. For example: "NYora92."
- *rds* is the DCO Server name (DCOServer).
- *rdb* is any valid identifier, however, Sybase recommended that you use the Oracle SID name.

The following is a create database replication subscription example:

```
create subscription NY_sub1
for database replication definition NY_repdef1
with primary at NY.NYora92
with replicate at DCOServer.oratest2
```

```
without materialization
go
```

3 Connect to Replication Server and execute:

```
isql -Usa -P –SSAMPLE_RS -i my_oracle_create_rs_db_sub.sql
```

A message is displayed that indicates the subscription is in the process of being created.

Configuring Replication Agent

Configuring Replication Agent involves:

1 Configuring and verifying the primary Oracle database for replication

2 Creating the Replication Agent instance

3 Configuring the Replication Agent instance

4 Verifying the Replication Agent instance installation

5 Initializing the Replication Agent instance

Configuring and verifying the primary Oracle database for replication

Before you install Replication Agent, configure the primary Oracle database for replication.

To ensure that the Oracle *redo* log data is not overwritten before it is read by the Replication Agent, you must complete the following tasks:

- Verifying the current archiving setting of the redo logs.
- Verifying the supplemental logging of primary key data.
- Creating an Oracle user and granting Oracle permissions.

❖ **Verifying the current archiving setting of the redo logs**

Redo logs are used by Oracle to maintain a log infrastructure. By default, this feature is off in an Oracle database instance. The steps described below will verify if the feature is turned-on and if not indicate how to switch-on the redo logging. This feature needs to be turned-on only on the primary database.

1 Use SQLPLUS to connect to Oracle as a system administrator.

2 From SQLPLUS, execute:

```
select log_mode from v$database;
```

- If the archive log is on, the result should be:

```
LOG_MODE
--------
ARCHIVELOG
```

3 To turn on log archiving, if necessary, execute:

```
shutdown;
startup mount;
alter database archivelog;
alter database open;
```

❖ **Verifying the supplemental logging of primary key data**

By default, Oracle does not log primary keys and unique indexes to its logging infrastructure. You must include the logging of these values for a successful replication of all table values. To verify whether this information is currently being recorded in the logging system:

1 Use SQLPLUS to connect to Oracle as a system administrator.

2 From SQLPLUS, execute:

```
SELECT SUPPLEMENTAL_LOG_DATA_PK,
SUPPLEMENTAL_LOG_DATA_UI FROM V$DATABASE;
```

If logging of primary key and unique index values is enabled, the return values should be:

```
SUP SUP

--- ---

YES YES
```

3 If the result is different, turn on supplemental logging by executing:

```
ALTER DATABASE ADD SUPPLEMENTAL LOG DATA (PRIMARY
KEY, UNIQUE INDEX) COLUMNS;
```

Creating an Oracle user and granting permissions

Create an Oracle database user for use by Replication Agent when connected to the primary database.

Note Permission to grant access to objects owned by "SYS" may require the command to be executed by an Oracle user with sysdba privileges.

Use SQLPLUS to connect to the primary database as a system administrator and run the following command to create an Oracle user named "RA_USER" with the password "sybase," and grant permissions to the user:

```
CREATE USER "RA_USER" PROFILE "DEFAULT" IDENTIFIED
BY "sybase" DEFAULT TABLESPACE "USERS" ACCOUNT
UNLOCK;
GRANT "CONNECT" TO "RA_USER";
GRANT "RESOURCE" TO "RA_USER";
GRANT "SELECT_CATALOG_ROLE" TO "RA_USER";
GRANT ALTER SESSION TO "RA_USER";
GRANT ALTER SYSTEM TO "RA_USER";
GRANT EXECUTE ON "SYS"."DBMS_FLASHBACK" TO
"RA_USER";
GRANT ALTER ANY PROCEDURE TO "RA_USER";
GRANT CREATE SESSION TO "RA_USER";
GRANT CREATE TABLE TO "RA_USER";
GRANT CREATE PROCEDURE TO "RA_USER";
GRANT CREATE PUBLIC SYNONYM TO "RA_USER";
GRANT DROP PUBLIC SYNONYM TO "RA_USER";
GRANT SELECT ON SYS.OBJ$ TO "RA_USER";
GRANT SELECT ON SYS.LOB$ TO "RA_USER";
GRANT SELECT ON SYS.COLLECTION$ TO "RA_USER";
GRANT CREATE SEQUENCE TO "RA_USER";
GRANT SELECT ON SYS.CON$ TO "RA_USER";
GRANT SELECT ON SYS.COLTYPE$ TO "RA_USER";
GRANT SELECT ON SYS.COL$ TO "RA_USER";
GRANT SELECT ON SYS.CDEF$ TO "RA_USER";
GRANT SELECT ON SYS.USER$ TO "RA_USER";
GRANT SELECT ON SYS.SEQ$ TO "RA_USER";
GRANT SELECT ON SYS.IND$ TO "RA_USER";
```

Verifying the roles of the Oracle user created for use by the Replication Agent

As described in the previous section, the following Oracle commands can be issued to validate the required Oracle settings.

Use SQLPLUS to run the following command as the new Oracle user:

```
sqlplus RA_USER/sybase
SQL*Plus: Release 10.2.0.1.0 - Production on Tue Mar
20 22:16:12 2007
Copyright (c) 1982, 2005, Oracle. All rights
reserved.
Connected to:
Oracle Database 10g Enterprise Edition Release
10.2.0.1.0 - Production
With the Partitioning, OLAP and Data Mining options
select GRANTED_ROLE from USER_ROLE_PRIVS;
GRANTED_ROLE
--------------------
CONNECT
RESOURCE
SELECT_CATALOG_ROLE
```

In addition, the user who starts the Replication Agent for Oracle instance must have read access to the Oracle redo log files and the Oracle archive directory that contains the archive log files to be accessed for replication. If the Replication Agent is configured to remove old archive files, the user must have update authority to the directory and the archive log files.

Creating the Replication Agent instance

A single installation of the Replication Agent can support replication from multiple databases, however, one Replication Agent instance is needed for each Oracle database to be replicated.

❖ **Preparing the Replication Agent instance**

1 Obtain the Oracle JDBC driver from Oracle and update the classpath environment variable.

To find the JDBC connection that communicates with the primary Oracle instance, locate the JDBC driver that was available when the Oracle release was originally created, usually found at:

- Windows – *%ORACLE_HOME%\jdbc\lib\ojdbc14.jar*
- UNIX and Linux – *$ORACLE_HOME/jdbc/lib/ojdbc14.jar*

Replication Agent may require a newer version of the JDBC driver, which you can obtain from Oracle at http://technet.oracle.com/software/tech/java/sqlj_jdbc/content.html.

2 Add the JDBC driver to the CLASSPATH environment variable. For example, you can append the existing CLASSPATH to the new JDBC driver and add the following command to the .login script of a UNIX and Linux user:

```
setenv CLASSPATH /path_name/ojdbc14.jar:$CLASSPATH
```

For a Windows user, add the following to the CLASSPATH environment variable:

```
setCLASSPATH=path_name\jdbc\lib\ojdbc14.jar;%CLASSPATH%
```

3 Record the Oracle connectivity details for the primary Oracle database. You can find these values from any machine where an Oracle SQLPLUS session can be used to connect to the desired Oracle instance. The ORACLE_SID is from the environment variable, %ORACLE_SID% (Windows) and $ORACLE_SID (UNIX and Linux).

Obtain host and port information from the file called *tnsnames.ora*, available at:

- Windows – *%ORACLE_HOME%\network\admin*
- UNIX and Linux – *$ORACLE_HOME/network/admin*

Record the following:

- Host name of the Oracle database that the TNS listener is operating on; %ORACLE_SID% on Windows, and $ORACLE_SID on UNIX and Linux.
- Port number the TNS listener is monitoring.
- ORACLE_SID value for the instance you wish to connect to.

4 (Optional) If your operating system has a Java 1.4.x compatible JRE or JDK installed, you can use Oracles isql demo items to verify Java 1.4.x, and to connect to Oracle using the JDBC driver and the connection information.

To perform this validation, see “Verifying a JDBC Client Installation” in the *Oracle JDBC Developer's Guide and Reference Guide*.

5 Obtain a local copy of the Oracle *timezone* file, so Replication Agent can correctly process the Oracle timestamp with timezone datatype.

Note This step is required only if the Replication Agent is on a machine (host) other than the Oracle host and does not have access to the Oracle *timezone* file.

There are two *timezone* files under the Oracle installation directory:

- The *timezone.dat* binary file is the default file that contains the most commonly used time zones, and is located at:
  - Windows – *%ORACLE_HOME%\oracore\zoneinfo*
  - UNIX and Linux – *$ORACLE_HOME/oracore/zoneinfo*
- The *timezlrg.dat* binary file contains a larger set of defined time zones, and is located at:
  - Windows – *%ORACLE_HOME%\oracore\zoneinfo*
  - UNIX and Linux – *$ORACLE_HOME/oracore/zoneinfo*

The Oracle instance uses the *timezone* file from the ORA_TZFILE environment variable. If ORA_TZFILE is not set, use the default *timezone* file.

Determine which *timezone* file is used by the primary Oracle instance and make a copy of that file available on the machine hosting the Replication Agent.

Note These files are platform dependent. You cannot use a *timezone* file from a little endian platform on a big endian platform, or visa versa.

6 Create and execute a new Replication Agent instance.

Note Be sure your CLASSPATH environment variable points to the correct Oracle JDBC driver before proceeding.

Using the Replication Agent ra_admin utility, create a new Replication Agent instance:

- Windows –

```
%SYBASE%\RAX-15_0\bin\ra_admin.bat -c myra -p
9030 -t oracle
```

- UNIX and Linux –

```
$SYBASE/RAX-15_0/bin/ra_admin.sh -c myra -p 9030
-t oracle
```

7 Navigate to the Replication Agent instance directory:

- Windows – *%SYBASE%\RAX-15_0\myra*
- UNIX and Linux – *$SYBASE/RAX-15_0/myra*

8 In the Replication Agent instance directory, invoke the *RUN* script to start the Replication Agent instance. For example:

```
./RUN_myra
```

Your Replication Agent for Oracle is now running.

Configuring the Replication Agent instance

This section includes:

- Updating the Replication Server interfaces files with the Replication Agent location.
- Configuring the Replication Agent instance.

Updating the Replication Server interfaces files with the Replication Agent location

1 Using dsedit, update the Replication Server interfaces file to include an entry for the Replication Agent location.

2 Verify the Replication Agent connection to Replication Server:

a Enter:

```
test_connection RS
go
```

The following is displayed:

```
Type Connection
---- ----------
RS succeeded
(1 row affected)
```

b If the result indicates a failure, either the server is not responding, or the connection properties (host, port, user, or password) are incorrect.

Verify the host and port configuration values, and manually log in to the Replication Server or RSSD as the configured user to determine which property is incorrectly defined. The server to manually log into will depend on the error in the log.

Configuring the Replication Agent instance

To configure the Replication Agent instance, use the configuration parameters described in Table 2-1.

Table 2-1: Configuration parameters

Parameter	Description	Values (for example)
instance name	Any valid name	myra
admin_port	Port number that Replication Agent will use	9030 (if in use, select a different port number)
ddl_username	User name that can execute DDL commands	DDLuser
ddl_password	Password created for *ddl_ username*	password (created previously)
pdb_include_archives	Enables or disables the use of Oracle archive log files	false
pdb_timezone_file	Path to the *pdb_timezone_file* directory that contains the archive *redo* log files	*/software/oracle/Ora9i/oracore /zoneinfo/timezone.dat*
pds_host_name	Machine (host) where Oracle is installed	crane
pds_port_number	Port number for Oracle	1521
pds_database_name	Windows – %ORACLE_SID% UNIX and Linux – $ORACLE_SID	testoral
pds_username	Same as created previously in step 1, page 6	RA_USER
pds_password	Password for *pds_username*	sybase
rs_charset	Character set of the Replication Server. The value defined for the *rs_charset* configuration parameter MUST match the character set of the Replication Server.	Windows – cp850 Unix and Linux – iso_1
rs_host_name	Machine where Replication Server is installed	crane
rs_port_number	Port where Replication Server is installed	11752

Parameter	Description	Values (for example)
rs_username	Replication Server user with CONNECT SOURCE and CREATE OBJECT capabilities	SAMPLE_RS_ra
rs_password	Password for *rs_username*	SAMPLE_RS_ra_ps
rs_source_ds	Valid name representing data server of Oracle primary database	NY
rs_source_db	Valid name representing database of Oracle primary database	NYora92
rssd_host_name	Machine where RSSD resides	crane
rssd_port_number	Port number where RSSD resides	11751
rssd_database_name	Database name for RSSD	SAMPLE_RS_ERSSD
rssd_username	Valid user for RSSD	SAMPLE_RS_RSSD_maint
rssd_password	Password for *rssd_username*	SAMPLE_RS_RSSD_maint_ps

1 Verify the connection to the Replication Agent:

   a Set the environment variables.

   - On Windows – navigate to the *%SYBASE%* directory and set the environment variables by executing the *SYBASE.bat* file.
   - On UNIX and Linux– navigate to the *$SYBASE* directory and set the environment variables by sourcing the *SYBASE.csh* file

   b Use isql to log in to Replication Agent:

```
isql –Usa –P –Smyra
```

2 Run the following commands to configure Replication Agent instance:

```
ra_config ddl_username,DDLuser
go

ra_config ddl_password,password
go

ra_config
pdb_timezone_file,/software/oracle/Ora9i/oracore/
zoneinfo/timezone.dat
go

ra_config pdb_include_archives,false
go

ra_config pds_host_name,crane
go

ra_config pds_port_number,1521
```

```
go

ra_config pds_database_name,testoral
go

ra_config pds_username,RA_USER
go

ra_config pds_password,sybase
go

ra_config rs_charset, iso_1
go

ra_config rs_host_name,crane
go

ra_config rs_port_number,11752
go

ra_config rs_username,SAMPLE_RS_ra
go

ra_config rs_password,SAMPLE_RS_ra_ps
go

ra_config rs_source_ds,NY
go

ra_config rs_source_db,NYora92
go

ra_config rssd_host_name,crane
go

ra_config rssd_port_number,11751
go

ra_config rssd_database_name,SAMPLE_RS_ERSSD
go

ra_config rssd_username,SAMPLE_RS_RSSD_maint
go

ra_config rssd_password,SAMPLE_RS_RSSD_maint_ps
go
```

3 Verify the Replication Agent connection to the primary Oracle database. Enter:

```
test_connection PDS
go
```

The following message appears:

```
Type Connection
---- ----------
PDS succeeded
(1 row affected)
```

If the result indicates a failure:

- The server is not responding, or
- The connection properties: host, port, pds_database_name usually oracle_sid, user, or password are incorrect.

Check the host and port configuration values, and manually log in to the primary Oracle database as the configured user to find which property is incorrectly defined.

Initializing the Replication Agent instance

This section describes the commands you must issue to initialize a Replication Agent instance.

❖ **Initializing the Replication Agent instance**

1 The pdb_xlog init command verifies that the primary Oracle database is correctly configured to provide archived logging and supplemental logging, and that the Oracle user ID used by the Replication Agent has the necessary permissions. In addition to creating objects in the database to support stored procedure replication, the pdb_xlog init command also initializes the Replication Agent System Database (RASD) by reading schema information, and redo log location information from the primary Oracle database.

To initialize the Replication Agent instance, run:

```
pdb_xlog init
go
```

A message appears indicating that the procedure was successful.

Note If this is a production setup, this step should coincide with creating the dump (copy) of data that is used to materialize the standby database.

2 Enable DDL replication for replicating DDL commands:

```
pdb_setrepddl enable
go
```

Note The default value of pdb_setrepddl is false.

3 The resume command places the Replication Agent in an active state, reading the Oracle redo log and sending commands to Replication Agent. Enter:

```
resume
go
```

If the Replication Agent successfully transfers to a replicating state, the following result is returned:

```
State Action
-----------------------------------
REPLICATING Ready to replicate data.
```

A returned state of ADMIN indicates that an error prevented the replicating state from being achieved. To determine the error, review the contents of the Replication Agent system log.

4 The ra_status command returns the state of the Replication Agent. It is good practice to verify that the Replication Agent remains in replication state, even after the resume command executes successfully.

To detect an error that occurred after replication start-up, execute:

```
ra_status
go
```

If the Replication Agent is in replicating state, ra_status returns:

```
State Action
------------ -------------------------
REPLICATING Ready to replicate data.
```

A returned state of ADMIN indicates that an error prevented the replicating state from being achieved. To determine the error, review the contents of the Replication Agent system log.

5 Validate that both primary and standby connections are active:

```
isql -Usa -P -SSAMPLE_RS
admin who
go
```

Note Be aware that:

- The DSI connection for the primary database connection is usually down because you are not replicating data back to the primary database.
- The Replication Agent connection, if established for the standby database connection, is usually down, because you are not replicating data from the standby database.

Do not proceed until admin who has similar status for threads to the following:

```
admin who
go
```

The following is displayed:

```
Spid Name State Info
---- ---------- ---------------
--------------------------------
13 DSI EXEC Awaiting Command 101(1)
SAMPLE_RS_ERSSD.SAMPLE_RS_ERSSD

9 DSI Awaiting Message 101
SAMPLE_RS_ERSSD.SAMPLE_RS_ERSSD

8 SQM Awaiting Message 101:0
SAMPLE_RS_ERSSD.SAMPLE_RS_ERSSD

54 DSI EXEC Awaiting Command 102(1)
DCOServer.oratest2

53 DSI Awaiting Message 102 DCOServer.oratest2

17 SQM Awaiting Message 102:0 DCOServer.oratest2DSI
EXEC Suspended 103(1) NY.NYora92

DSI Suspended 103 NY.NYora92

24 DIST Awaiting Wakeup 103 NY.NYora92
```

```
25 SQT Awaiting Wakeup 103:1 DIST NY.NYora92

23 SQM Awaiting Message 103:1 NY.NYora92

22 SQM Awaiting Message 103:0 NY.NYora92

62 REP AGENT Awaiting Command NY.NYora92
```

Testing replication

After you finish setting up the replication system, you can test replication.

1 Connect to the primary Oracle instance as a regular user. Make sure the regular user also exists in the replicate database.

2 Create a test table to replicate:

```
create table T1( a int, b char(10));
```

This statement is replicated by the user defined in the Replication Agent configuration parameter *ddl_user*. After the elapsed time referenced by the Replication Agent setting in scan_sleep_max, the T1 table should replicate to the target Oracle instance.

3 Grant permissions to any new or existing object to be replicated, so that the Replication Server maintenance user can update this table:

```
grant all on T1 to public;
```

This statement is also replicated to the standby database by the *ddl_user* defined in the Replication Agent configuration.

4 Connect to the the Replication Agent and run the following command to mark the table:

```
pdb_setreptable T1,mark
```

5 After the table is marked and the Replication Agent is in a Replicating state, insert test data into the test table and commit it.

By default, the work performed by the maintenance user of the primary connection is not replicated. The user ID used to insert transactions cannot be the same as the maintenance user defined in the primary connection. See “Configuring Replication Server for replication from the primary database” on page 19.

Replication Agent applies only committed transactions to a standby database. However, because Oracle expects a commit command to be issued, follow simple test commands with an explicit commit command:

```
insert into T1 values ( 42, 'foo' ) ;
commit;
```

6 Use your preferred Oracle query tool to examine the standby site for results and compare the contents of your test table from both the primary and standby sites.

Resetting the primary Oracle database for replication

In a test environment, you may occasionally need to reset the replication environment. Instead of deleting and re-creating a new Replication Agent instance, use this procedure to facilitate resetting the environment:

1 Protect your new environment from old log information by using the following command in the Replication Agent to archive all current *redo* log data:

```
pdb_xlog move_truncpt
```

Or, use the Oracle command:

```
SQL> alter system archive log current;
```

2 To retain marking and log device information, reinitialize the Replication Agent using pdb_xlog init with the force option, which forces the Replication Agent repository to be refreshed instead of overwritten:

```
pdb_xlog init,force
```

Note If you prefer to delete and replace all the information in the Replication Agent repository, issue the pdb_xlog remove command followed by a normal pdb_xlog init command (without the force option).

3 Zero-out the locator stored in Replication Server using the rs_zeroltm command. For example:

```
isql -USAMPLE_RS_RSSD_prim -PSAMPLE_RS_RSSD_prim_ps
-SSAMPLE_RS_ERSSD -DSAMPLE_RS_ERSSD


rs_zeroltm NY, NYora92
go
```

The following is displayed:

```
Locator has been reset to zero.
(return status = 0)
```

Congratulations! You have successfully replicated changes from a primary Oracle data server to the replicate Oracle data server.

Index

T

V