

Appendix A: Oracle Setup for the Model Repository

IN THIS APPENDIX

This appendix discusses the following topics:

- Oracle RDBMS Install Basics
- Supported Oracle Versions
- Oracle RDBMS Hardware Requirements
- Required Operating System Packages and Patches
- Opware-Installed Oracle vs. a Standard Oracle RDBMS
- Pre-Oracle Universal Installer Tasks
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This appendix explains how to install, configure, and maintain an Oracle database to support the Opware Model Repository.

Oracle RDBMS Install Basics

The Model Repository (truth) is an Opware core component that stores information in an Oracle database.

Opware SAS provides an Oracle version 10g database that you can use the Opware Installer to create. You can also use an existing Oracle database, or an Oracle database you create using the Oracle Universal Installer. Note that, you will need to configure these databases to support the Opware Model Repository.

The process for installing Oracle and the Model Repository has the following three major steps:

- 1** Install the Oracle RDBMS software.
- 2** Create the Oracle database (instance).
- 3** Install the Model Repository.

You can perform both Steps 1 and 2 by using the Opware Installer or by using the Oracle Universal Installer. You can perform Step 3 only by using the Opware Installer. Not that, the Oracle database must be created before you install the Model Repository, whether you use the Opware Installer to install and create the database or use the Oracle Universal Installer.

Oracle RDBMS Install using the Opware Installer

The Opware Installer performs steps 1 and 2 as a single procedure, installing Oracle version 10g. If you intend to perform steps 1 and 2 using the Opware Installer, see “Opware-Installed Oracle vs. a Standard Oracle RDBMS” on page 222.

Oracle RDBMS Install using a Standard Oracle Installation

If you intend not to use the Opware Installer but rather use the Oracle Universal Installer, or use an existing Oracle database, then you should read the following sections:

- “Pre-Oracle Universal Installer Tasks” on page 226
- “Manually Creating the Oracle Database” on page 228
- “Post-Create the Oracle RDBMS Tasks” on page 232

Supported Oracle Versions

Support for the Model Repository is limited to certain versions of Oracle running on certain versions of operating systems. Table A-1 lists the supported Oracle versions.

Table A-1: Supported Oracle Versions for Model Repository

ORACLE EDITION	VERSIONS
Oracle Standard Edition	9.2.0.4 9.2.0.6 9.2.0.7 9.2.0.8 10.2.0.2
Oracle Standard Edition One	10.2.0.2
Oracle Enterprise Edition	9.2.0.4 9.2.0.6 9.2.0.7 9.2.0.8 10.2.0.2



Oracle version 9.2.0.5 is not supported with Opware SAS.

To be supported on the Model Repository, the Oracle versions listed in Table A-1 are limited to the operating systems listed in Table A-2.

Table A-2: Supported Operating Systems for Model Repository

SUPPORTED OPERATING SYSTEMS FOR MODEL REPOSITORY	VERSIONS	ARCHITECTURE
Sun Solaris	Solaris 8 Solaris 9 Solaris 10	Sun SPARC Sun SPARC Sun SPARC
Red Hat Linux	Red Hat Enterprise Linux 3 AS	32 bit x86

Table A-2: Supported Operating Systems for Model Repository

SUPPORTED OPERATING SYSTEMS FOR MODEL REPOSITORY	VERSIONS	ARCHITECTURE
Red Hat Linux	Red Hat Enterprise Linux 4 AS	64 bit x86

Multiple Oracle Versions and Multimaster Cores

For the database export to succeed during the installation of a multimaster core, the version of the target (slave) database cannot be 9.x if the version of the source (master) database is 10.x. Table A-3 lists these allowed version combinations.

Table A-3: Database Versions Allowed for Multimaster

SOURCE DB VERSION	TARGET DB VERSION	ALLOWED?
9	9	Y
9	10	Y
10	9	N
10	10	Y

Oracle RDBMS Hardware Requirements

The server that will run the Oracle database for the Model Repository has the following hardware requirements.

Physical Memory and Swap Space

Oracle requires at least 1024 MB of physical RAM. The amount of swap space required depends on the size of the physical RAM, as shown in Table A-4.

Table A-4: RAM and Swap Space

SIZE OF RAM (MB)	SWAP SPACE REQUIRED (MB)
1024 - 2048	1.5 times the size of RAM
2094 - 8192	equal to size of RAM
more than 8192	9

Temporary Disk Space

The Oracle Universal Installer (OUI) requires up to 400 MB free space in the `/tmp` directory.

Permanent Disk Space

The amount of disk space required depends on the Oracle edition and the number of servers managed by Opware SAS, as listed in Table A-5.

Table A-5: Database Versions Allowed for Multimaster

ORACLE EDITION	DISK SPACE REQUIRED BY ORACLE RDBMS SOFTWARE (GB)	ADDITIONAL DISK SPACE (FOR DATA AND INDEX TABLESPACES) REQUIRED FOR EVERY 1000 SERVERS MANAGED BY SAS (GB)
Enterprise	2.0	3.1
Standard	1.5	3.1

See *Tablespace Sizes* in Chapter 2, on page 48.

For the disk space requirements of an upgrade, see the *Opware[®] SAS Upgrade Guide*.

Hostname Setup

You need to be able to ping the database server hostname. To verify this, enter the following command:

```
ping <hostname>
```

or, on the database server, enter the following command:

```
hostname
```

If the hostname is not set up correctly, Oracle will not start up and you will encounter the following error:

```
ORA-00600: internal error code, arguments: [keltnfy-ldmInit],  
[46], [1], [], [], [], [], []
```

Required Operating System Packages and Patches

The following sections list the packages and patches required by the Oracle 10g database. The Opware Installer checks for these packages and patches before installing the Oracle database.



If you create the database using the Oracle Universal Installer rather than the Opware Installer, you must check for these packages and patches manually.

Required Packages for RedHat Enterprise Linux AS3 32 bit x86

The following packages are required for Oracle 10g on Linux AS3 32 bit x86. These packages must be the versions listed or higher.

```
make-3.79.1
gcc-3.2.3-34
glibc-2.3.2-95.20
compat-db-4.0.14-5
compat-gcc-7.3-2.96.128
compat-gcc-c++-7.3-2.96.128
compat-libstdc++-7.3-2.96.128
compat-libstdc++-devel-7.3-2.96.128
openmotif21-2.1.30-8
setarch-1.3-1
libaio-0.3.96-5
```

Required Packages for RedHat Enterprise Linux AS4 64 bit x86

The following packages are required for Oracle 10g on Linux AS4 64 bit x86. These packages must be the versions listed or higher.

```
binutils-2.15.92.0.2-13.0.0.0.2.x86_64
compat-db-4.1.25-9.i386.rpm
compat-db-4.1.25-9.x86_64.rpm
compat-libstdc++-33-3.2.3-47.3.x86_64.rpm
compat-libstdc++-33-3.2.3-47.3.i386.rpm
control-center-2.8.0-12.x86_64.rpm
gcc-3.4.3-22.1.x86_64.rpm
gcc-c++-3.4.3-22.1.x86_64.rpm
glibc-2.3.4-2.9.i686.rpm
glibc-2.3.4-2.9.x86_64.rpm
glibc-common-2.3.4-2.9.x86_64.rpm
glibc-devel-2.3.4-2.9.x86_64.rpm
glibc-devel-2.3.4-2.9.i386.rpm
glibc-headers-2.3.4-2.9.x86_64.rpm
```

```

glibc-kernheaders-2.4-9.1.87.x86_64.rpm
gnome-libs-1.4.1.2.90-44.1.x86_64
libaio-0.3.103-3.i386.rpm
libaio-0.3.103-3.x86_64.rpm
libgcc-3.4.3-22.1.i386.rpm
libstdc++-3.4.3-22.1.x86_64
libstdc++-devel-3.4.3-22.1.x86_64
make-3.80-5.x86_64.rpm
pdksh-5.2.14-30.x86_64.rpm
sysstat-5.0.5-1.x86_64.rpm
xorg-x11-deprecated-libs-6.8.2-1.EL.13.6.i386.rpm
xscreensaver-4.18-5.rhel4.2.x86_64.rpm

```

To verify whether these rpms are installed on the OS, enter the following command:

```

rpm -q --qf '%{NAME}-%{VERSION}-%{RELEASE} (%{ARCH})\n'
<rpm_name>

```

Required Packages for Solaris 8, 9, and 10

Solaris 8, 9 and 10 must have the following packages:

```

SUNWarc
SUNWbash
SUNWbtool
SUNWhea
SUNWlibm
SUNWlibms
SUNWsprt
SUNWtoo
SUNWilof
SUNWxfnt
SUNWilcs
SUNWsprx (only for Solaris 8 and Solaris 9)
SUNWi15cs
SUNWpool (only for Solaris 10)
SUNWpoolr (only for Solaris 10)
SUNWmfrun (only for Solaris 10)

```

Required Patches for Solaris 8

Solaris 8 must have the following patches (or later):

```

108528-23: SunOS 5.8: kernel update patch
108652-66: X11 6.4.1: Xsun patch
108773-18: SunOS 5.8: IIIM and X I/O Method patch
108921-16: CDE 1.4: dtwm patch
108940-53: Motif 1.2.7 and 2.1.1: Runtime lib. patch for
Solaris 8
108987-13: SunOS 5.8: Patch for patchadd and patchrm

```

```
108989-02: /usr/kernel/sys/acctctl & /.../exacctsyz patch
108993-18: SunOS 5.8: LDAP2 client, libc, libthread ... lib.
patch
109147-24: SunOS 5.8: linker patch
110386-03: SunOS 5.8: RBAC Feature Patch
111023-02: SunOS 5.8: /kernel/fs/mntfs and ... sparcv9/mntfs
111111-03: SunOS 5.8: /usr/bin/nawk patch
111308-03: SunOS 5.8: /usr/lib/libmtmalloc.so.1 patch
111310-01: SunOS 5.8: /usr/lib/libdhcagent.so.1 patch
112396-02: SunOS 5.8: /usr/bin/fgrep patch
111721-04: SunOS 5.8: Math Library (libm) patch
112003-03: SunOS 5.8: Unable to load fontset in 64-bit
Solaris 8 iso-1 or iso-15
```

Required Patches for Solaris 9

Solaris 9 must have the following patches (or later):

```
112233-11: SunOS 5.9: Kernel Patch
111722-04: SunOS 5.9: Math Library (libm) patch
```

Required Patches for Solaris 10

When Oracle 10.2 is installed on T2000 hardware with the Solaris 10 operating system, the Opware Installer hangs during the installation of the Model Repository. The Oracle alert.log includes errors, such as the following:

```
MMNL absent for 28552 secs; Foregrounds taking over
Wed Aug  2 12:45:57 2006
MMNL absent for 28853 secs; Foregrounds taking over
Wed Aug  2 12:50:57 2006
MMNL absent for 29151 secs; Foregrounds taking over
```

Customers should look at Bug 6385446 from Sun Microsystems and apply Patches 118833-18, 119578-24 and 119254-24 as per:

```
http://sunsolve.sun.com/search/document.do?assetkey=1-26-102289-1
```

Opware-Installed Oracle vs. a Standard Oracle RDBMS

An Oracle database created by the Opware Installer differs in certain ways from a database installed using the Oracle Universal Installer, this section explains those differences.

Opware Installer Changes to Database Configuration and Files

When the Opware Installer installs the Oracle RDBMS software and creates the database, it makes the following changes:

- Creates the Unix user `oracle` locally in `/etc/passwd`.
- Creates the Unix groups `dba` and `oinstall` locally in `/etc/group`.
- Sets the `$ORACLE_HOME` environment variable to the following directory:


```
/u01/app/oracle/product/10.2.0/db_1
```
- Sets the `$ORACLE_SID` environment variable to `truth`.
- Gets the service name (TNS name) from the Opware Installer interview (`truth.servicename` prompt) and inserts it into the `tnsnames.ora` file in `$ORACLE_HOME/network/admin` and `/var/opt/oracle`. The Opware Installer changes the value of the `host` parameter to the value returned by the Unix `hostname` command.

- Creates the data and index files under the following directories:

```
/u01/oradata/truth
/u02/oradata/truth
/u03/oradata/truth
```

The system administrator can configure the `/u01`, `/u02`, `/u03` directories before installing the Oracle RDBMS software.

- In the `/$ORACLE_HOME/network/admin/listener.ora` file, changes the value of the `host` parameter to the value returned by the Unix `hostname` command.

The listener is password protected and OS authenticated. (The default password is `opsware`.) It listens on port 1521.

- Creates the `/etc/init.d/opsware-oracle` script, which you can use to start up and shut down the database and listener.

This script is linked to corresponding scripts in the `/etc/rc*.d` directories.

- For Solaris 8 and 9, modifies `/etc/system` and asks the user to reboot the sever.
- For Solaris 10 and Linux, you are not required to reboot the server.

Database Parameter Value Differences

When it creates the Oracle database, the Opware Installer sets the values for parameters in various files. This section lists the parameters set by the Opware Installer that can be changed without adversely affecting Opware SAS.

Kernel Parameter Differences in RedHat Enterprise Linux 3 AS and RedHat Enterprise Linux 4 AS

This section identifies the kernel parameters you can change for Linux 3 AS (32 bits) and Linux 4 AS (64 bits).

You can change values for the following parameters in `/etc/sysctl.conf`:

```
kernel.shmmax=2147483648
kernel.shmall=2097152
kernel.shmmni=4096
kernel.sem=256 32000 256 256 (for Linux 3 AS, 32 bits)
kernel.sem=250 32000 100 128 (for Linux 4 AS, 64 bits)
net.core.rmem_default=262144
net.core.wmem_default=262144
net.core.rmem_max=262144
net.core.wmem_max=262144
fs.file-max=65536f
net.ipv4.ip_local_port_range=1024 65000
```

You can change values for the following parameters in `/etc/security/limits.conf`:

```
oracle soft nofile 4096
oracle hard nofile 63536
oracle soft nproc 2047
oracle hard nproc 16384
```

You can change values for the following parameters in `/etc/pam.d/login`:

```
session required /lib/security/pam_limits.so (for Linux 3
AS, 32 bits)
session required pam_limits.so
```

Kernel Parameter differences in Solaris 8 and 9

The following parameters are set by the Opware Installer in `/etc/system`:

```
forceload: sys/shmsys
forceload: sys/semsys
forceload: sys/msgsys
set shmsys:shminfo_shmmax=2147483648
set shmsys:shminfo_shmmin=1
set shmsys:shminfo_shmmni=100
```

```

set shmsys:shminfo_shmseg=10
set semsys:seminfo_semmns=2058
set semsys:seminfo_semmsl=256
set semsys:seminfo_semmni=100
set semsys:seminfo_semvmx=32767
set noexec_user_stack=1

```

You can change values for the following parameters in `/etc/system`:

```

set shmsys:shminfo_shmmin=1
set shmsys:shminfo_shmmni=100
set shmsys:shminfo_shmseg=10
set semsys:seminfo_semmns=2058
set semsys:seminfo_semmsl=256
set semsys:seminfo_semmni=100
set semsys:seminfo_semvmx=32767
set noexec_user_stack=1

```

You can increase the value for the following parameter in `/etc/system`:

```

set shmsys:shminfo_shmmax=2147483648

```

You can remove the following parameters in `/etc/system`:

```

forceload: sys/shmsys
forceload: sys/semsys
forceload: sys/msgsys

```

Kernel Parameter Differences in Solaris 10

To change a kernel parameter for Solaris 10, perform the following steps:

1 Enter `set noexec_user_stack=1` in `/etc/system`.

2 Run the following commands:

```

projadd -U oracle -K "project.max-shm-
memory=(priv,2048MB,deny) " user.oracle

```

```

projmod -s -K "project.max-sem-ids=(priv,100,deny) "
user.oracle

```

```

projmod -s -K "process.max-sem-nsems=(priv,256,deny) "
user.oracle

```

```

projmod -s -K "project.max-shm-ids=(priv,100,deny) "
user.oracle

```

```

echo "oracle::::project=user.oracle" >> /etc/user_attr

```

3 Use the vi editor for `/etc/project` and `/etc/user_attr` to verify the changes made in step 2.

Differences in `init.ora`

You can increase values for the following parameters in `init.ora`:

```
db_cache_size=629145600
shared_pool_size=262144000
java_pool_size=52428800
large_pool_size=52428800
log_buffer=1048576
```

Location of Additional Oracle Data Files

If you want to add data files to a database created with the Opware Installer, you can add them to the following directories:

```
/u01/oradata/truth
/u02/oradata/truth
/u03/oradata/truth
```

Pre-Oracle Universal Installer Tasks



If you create the database with the Opware Installer, you do not need to perform the tasks in this section.

This section discusses the prerequisites for an installation of the Oracle RDBMS using the Oracle Universal Installer for use with Opware SAS. For more detailed information about installing Oracle, see the *Oracle Installation Guide* for your operating system. Each operating system and Oracle version has a different guide. The Oracle documentation is available at the following URL:

```
http://www.oracle.com/technology/documentation/index.html
```

Before installing the Oracle RDBMS software, perform the following steps:

- 1** Verify that the server has the software listed in “Required Operating System Packages and Patches” on page 220.

- 2** Download and unzip the sample files.

The sample files are available in the support area of the Opware, Inc. web site at www.opware.com. See “Sample Scripts and Configuration Files” on page 228.

- 3** Set the kernel parameters.

The easiest way to set these parameters is by copying and editing the following sample files:

```
kernel_params_redhat.txt  
kernel_params_solaris.txt
```

These two files contain instructions, Unix commands, and lines of text for configuration files.

- 4** Create the required Unix users and groups by running the following commands. (If you use a directory different than `/u01/app/oracle`, modify the commands accordingly):

```
mkdir -p /u01/app/oracle  
groupadd oinstall  
groupadd dba  
groupadd dboper  
useradd -g oinstall -G dba \  
-d /u01/app/oracle -s /usr/bin/sh oracle  
chown oracle:oinstall /u01/app/oracle
```

- 5** Set the environment variables for the `oracle` user.

The easiest way to set these variables is by copying and editing the following sample files:

```
bash_profile  
profile
```

Now you should be ready to install the Oracle RDBMS. For instructions, see the *Oracle Installation Guide* for your operating system.

Manually Creating the Oracle Database

If you create the database with the Opware Installer, you do not need to perform the tasks in this section.

Sample Scripts and Configuration Files

Opware, Inc. provides a bundle of sample files for you to copy and edit. Referenced throughout the instructions in this document, the sample files include SQL scripts, database configuration files, and kernel parameter settings.

The sample files are available in the support area of the Opware, Inc. web site at www.opware.com.

The following list summarizes the sample scripts and configuration files:

- **truth.sh**: A shell script that creates directories and then launches the `truth.sql` script.
- **truth.sql**: Prompts for passwords of the `SYS` and `SYSTEM` users and then launches the remainder of the SQL scripts in this list.
- **CreateDB.sql**: Creates a database with the UTF8 character set (as required by Opware SAS), the data and index files, the default temporary tablespace, the undo tablespace, and the log files.
- **CreateDBFiles.sql**: Creates the following tablespaces that are required by Opware SAS:

```
LCREP_DATA  
LCREP_INDX  
TRUTH_DATA  
TRUTH_INDX  
AAA_DATA  
AAA_INDX  
AUDIT_DATA  
AUDIT_INDX
```

See Table 2-6 on page 48 for additional tablespace sizing information.

- **CreateDBCatalog.sql**: Runs Oracle scripts to create data system catalog objects.
- **JServer.sql**: Sets up the Oracle Java environment.
- **CreateAdditionalDBFiles.sql**: Adds data and index files to certain tablespaces and allocates additional disk space. This script is optional, but recommended.

- **CreateUserOpware_Admin.sql**: Creates the `opware_admin` database user and grants permissions (privileges) to this user (required by Opware SAS).
- **postDBCreation.sql**: Creates the `spfile` from the `pfile` (parameter file).
- **init.ora**: Contains initialization parameters for the database. See “Required and Suggested Parameters for init.ora” on page 230.
- **tnsnames.ora**: Enables resolution of database names used internally by Opware SAS.
- **listener.ora**: Contains configuration parameters for the listener. Opware SAS requires the listener to listen on port 1521.
- **bash_profile**: Sets environment variables and sets shell limits for the `oracle` Unix user.
- **profile**: Sets environment variables for the `oracle` Unix user.
- **kernel_params_redhat.txt**: Contains kernel parameters for RedHat Enterprise Linux 3 AS.
- **kernel_params_solaris.txt**: Contains kernel parameters for Solaris 8, 9, and 10.
- **opware-oracle**: A script residing in `/etc/init.d` that starts up and shuts down the database and listener.

Note that the `/etc/init.d/opware-sas` script, which starts and stops the SAS components, does not start and stop the database and listener. For more information on the `opware-sas` script, see the *Opware[®] SAS Administration Guide*.

- **Export-Import**: A directory that contains parameter files and instructions for performing full database exports and imports.

Required and Suggested Parameters for init.ora

For Opware SAS, the following `init.ora` entries are either suggested or required:

```
sga_max_size >=1GB
db_cache_size>=629145600
shared_pool_size>=262144000
java_pool_size>=52428800
large_pool_size>=52428800
log_buffer>=1048576
db_block_size>=8192
open_cursors >=300
session_cached_cursors=50
job_queue_processes >=10
nls_length_semantics=CHAR
nls_sort=GENERIC_M
processes >=1024
sessions >=1152
pga_aggregate_target >=104857600
workarea_size_policy=auto
change remote_login_passwordfile=SHARED
undo_management=AUTO (Suggested)
undo_tablespace=UNDO (Suggested)
query_rewrite_integrity=TRUSTED
query_rewrite_enabled=true
optimizer_mode=choose (for 9i) or all_rows (for 10g)
optimizer_index_cost_adj=20
optimizer_index_caching=80
cursor_sharing=SIMILAR, value can be set to
SIMILAR(preferred) or EXACT (recommended only if you
encounter Oracle Bug No. 3102053)
recyclebin=OFF (Suggested, for Oracle 10g only)
```

A bug in Oracle10g regarding DML containing inline views and certain types of subqueries causes Oracle to throw an ORA-00600 exception. Until the bug is fixed in Oracle 10g, the workaround is the following entry in `init.ora`:

```
_complex_view_merging = false
```

File Location Values in the Sample Scripts

In the sample scripts and configuration files, `ORACLE_HOME` environment variable is set to the following value:

```
/u01/app/oracle/product/10.2.0/db_1
```

The sample `init.ora` file has the following settings for files:

```
db_create_file_dest=/u01/oradata/truth
```



```
db_create_online_log_dest_1=/u02/oradata/truth
db_create_online_log_dest_2=/u03/oradata/truth

control_files=(/u02/oradata/truth/control01.ctl,/u03/
oradata/truth/control02.ctl)
```

If your organization has policies that do not match these settings, then you should modify the sample files accordingly.

Creating the Database with the Sample Scripts

To create the database with the sample scripts, perform the following steps:

- 1** Download and unzip the sample files.

The sample files are available in the support area of the Opware, Inc. web site at www.opware.com. See “Sample Scripts and Configuration Files” on page 228.

- 2** Log in to the server as the Unix user `oracle`.

- 3** Copy the sample `init.ora` file to the following directory:

```
$ORACLE_BASE/admin/truth/create
```

- 4** Examine the sample SQL scripts that you will run in step 6. If necessary, edit the scripts to conform to your organization's policies.

- 5** Log on to the server as the `oracle` user and change the mode of the sample `truth.sh` script:

```
chmod 755 truth.sh
```

- 6** To launch the sample SQL scripts that create the database, run the `truth.sh` script:

```
./truth.sh
```

- 7** After the scripts launched by `truth.sh` complete, check the log files in the following directory:

```
$ORACLE_HOME/assistants/dbca/logs
```

Post-Create the Oracle RDBMS Tasks

If you create the database with the Opware Installer, you do not need to perform the tasks in this section, except for step 1.

After creating the database, but before installing the Model Repository with the Opware Installer, perform the following steps:

- 1** Create the `tnsnames.ora` file in the following directory:
`$ORACLE_HOME/network/admin`
Verify that the file conforms to the rules listed in “tnsnames.ora File Requirements” on page 233.
- 2** If it does not exist, create the following directory:
`mkdir -p /var/opt/oracle`
- 3** Create the following symbolic link:
`ln -s $ORACLE_HOME/network/admin/tnsnames.ora \`
`/var/opt/oracle/tnsnames.ora`
- 4** Make sure that the oracle Unix user has read-write permission on the `tnsnames.ora` file.
- 5** For RedHat Enterprise Linux 3 AS, create another symbolic link:
`ln -s /etc/oratab /var/opt/oracle/oratab`
- 6** Copy the sample `opsware-oracle` script to `/etc/init.d/`.
- 7** Link `/etc/init.d/opsware-oracle` to corresponding scripts in the `/etc/rc*` directories. For example:
`ln -s /etc/init.d/opsware-oracle \`
`/etc/rc0.d/K02opsware-oracle`
`ln -s /etc/init.d/opsware-oracle \`
`/etc/rc1.d/K02opsware-oracle`
`ln -s /etc/init.d/opsware-oracle \`
`/etc/rc2.d/S60opsware-oracle`
`ln -s /etc/init.d/opsware-oracle \`
`/etc/rcS.d/K02opsware-oracle`
- 8** Copy the sample `listener.ora` file to `$ORACLE_HOME/network/admin`.
- 9** In `listener.ora`, change the value of the `host` parameter to the host name of server running the database.

tnsnames.ora File Requirements

The `tnsnames.ora` file enables resolution of database names used internally by the core components. Opware SAS has the following requirements for the `tnsnames.ora` file:

- The file must reside in the following location:

```
/var/opt/oracle/tnsnames.ora
```

- If the core is installed across multiple servers, a copy of the file must reside on the servers running the following components:
 - Model Repository
 - Data Access Engine
 - Web Services Data Access Engine
 - Opware Command Center
 - Global File System
 - Model Repository Multimaster Component
- For a core installed on multiple servers, the directory path of the `tnsnames.ora` file must be the same on each server.
- In a standalone core, the `tnsnames.ora` file must contain an entry for the Model Repository, as in the following example:

```
truth =
  (DESCRIPTION=
    (ADDRESS=(HOST=magenta.opware.com) (PORT=1521)
    (PROTOCOL=tcp) )
    (CONNECT_DATA=(SERVICE_NAME=truth)))
```

tnsnames.ora: Multimaster Mesh Requirements

In a multimaster mesh, the `tnsnames.ora` file must be set up for a central and a non-central core using the following guidelines.

Central (source, master) Core

The `tnsnames.ora` file must contain an entry for its own Model Repository. The port number must be set to the port that is used by the Oracle listener process, such as 1521, 1526, and so on.

The `tnsnames.ora` file must also contain an entry that specifies the central core Gateway. This port is used by the Data Access Engine for multimaster traffic. The port number is derived from the following formula: (20000) + (facility ID of the non-central core).

Example: In the following example, the TNS service name of the central core is `orange_truth`, which runs on the host `orange.opsware.com`. The TNS name of the non-central core is `cyan_truth`, which has a facility ID of 556. Note that the entry for `cyan_truth` specifies `orange.opsware.com`, which is the host running the central core's Gateway.

```
orange_
truth=(DESCRIPTION=(ADDRESS=(HOST=orange.opsware.com) (PORT=1
521) (PROTOCOL=tcp) (CONNECT_DATA=(SERVICE_NAME=truth)))
cyan_
truth=(DESCRIPTION=(ADDRESS=(HOST=orange.opsware.com) (PORT=2
0556) (PROTOCOL=tcp) (CONNECT_DATA=(SERVICE_NAME=truth)))
```

Non-central (non-master) Core

The `tnsnames.ora` file must contain an entry for its own Model Repository. The port number must be set to that used by the Oracle listener process, such as 1521, 1526, and so on. The `tnsnames.ora` file does not require any entries for other cores in the mesh.

Example: In the following example, the TNS service name of the non-central core is `cyan_truth`, and the core runs on the host, `cyan.opsware.com`.

```
cyan_truth
=(DESCRIPTION=(ADDRESS=(HOST=cyan.opsware.com) (PORT=1521) (PR
OTOCOL=tcp) (CONNECT_DATA=(SERVICE_NAME=truth)))
```

Requirements for Enabling Oracle Daylight Saving Time (DST)

To enable Daylight Saving Time for the Oracle database, you must apply database tier patches. To apply these patches, perform the following steps:

- 1 Verify that your database is running on Oracle 9i or higher. If you are on an earlier database release, use one of the following MetaLink Notes to upgrade your database:

10gR2 Database: MetaLink Note 362203.1

9iR2 Database: MetaLink Note 216550.1

- 2 Use MetaLink Note 359145.1 to apply Oracle Database time zone fixes specific to your database version.

- 3 Use MetaLink Note 359145.1 to apply time zone fixes to the Oracle Java Virtual Machine (JVM) in the Oracle Database specific to your E-Business Suite database version.

Database Monitoring Strategy

Because the Model Repository is a critical component of Opware SAS, the DBA should implement a monitoring strategy. The DBA can write custom monitoring scripts or use third-party products.

This section contains example commands for monitoring the Oracle database used by the Model Repository. When issuing the commands shown in this section, you must be logged on to the server as the user `oracle`:

```
$ su - oracle
```

The SQL commands shown in this section are entered in the `sqlplus` command-line utility. To run `sqlplus`, log on as `oracle` and enter the following command:

```
$ sqlplus "/ as sysdba"
```

Verify that the Database Instances are Up and Responding

To verify that the Database Instances are up and running, perform the following steps:

- 1 Check to see if the Oracle processes are running by entering the following command:

```
ps -ef | grep ora_
```

This `ps` command should generate output similar to the following lines:

```
oracle 1883 1 0 Jul24 ? 00:00:00 ora_pmon_truth
oracle 1885 1 0 Jul24 ? 00:00:00 ora_psp0_truth
oracle 1887 1 0 Jul24 ? 00:00:00 ora_mman_truth
oracle 1891 1 0 Jul24 ? 00:00:45 ora_dbw0_truth
oracle 1895 1 0 Jul24 ? 00:01:11 ora_lgwr_truth
oracle 1897 1 0 Jul24 ? 00:00:02 ora_ckpt_truth
oracle 1899 1 0 Jul24 ? 00:00:24 ora_smon_truth
oracle 1901 1 0 Jul24 ? 00:00:00 ora_reco_truth
oracle 1903 1 0 Jul24 ? 00:00:02 ora_cjq0_truth
oracle 2391 1 0 Jul24 ? 00:00:00 ora_qmnc_truth
oracle 2513 1 0 Jul24 ? 00:00:00 ora_q000_truth
oracle 2515 1 0 Jul24 ? 00:00:00 ora_q001_truth
oracle 18837 1 0 03:04 ? 00:00:00 ora_mmon_truth
oracle 18839 1 0 03:04 ? 00:00:00 ora_mmln1_truth
oracle 25184 24635 0 21:35 pts/1 00:00:00 grep ora_
```

- 2 Verify that the database status is `ACTIVE` by entering the following command in `sqlplus`:

```
select database_status from v$instance;
```
- 3 Verify that the open mode is `READ WRITE` by entering the following command in `sqlplus`:

```
select name, log_mode, open_mode from v$database;
```

Verify that the Datafiles are Online

To verify that the datafiles are online, in `sqlplus`, enter the following commands:

```
Col file_name format a50
Col status format a10
Set line 200
Select file_id, status, bytes, file_name from dba_data_files
order by tablespace_name;
```

The status should be `AVAILABLE` for all the data files.

Verify That the Listener is Running

To verify that the listener is running, perform the following steps:

- 1 Check to see if the Oracle listener processes are running by entering the following command:

```
ps -ef | grep tns
```

```
oracle      1762      1  0 Jul24 ?          00:00:01 /u01/app/
oracle/product/10.2.0/db_1/bin/tnslsnr LISTENER -inherit
oracle      25231 25189  0 21:39 pts/1      00:00:00 grep tns
```

- 2 Check the status of the listener with the `lsnrctl` command:

```
lsnrctl status
```

The listener should be listening on port 1521 with the TCP protocol, and should be handling the instance named `truth`. The `lsnrctl` command should generate output similar to the following lines:

```
. . .
Connecting to (ADDRESS=(PROTOCOL=tcp)
(HOST=perl.performance.qa.opsware.com) (PORT=1521))
. . .
Instance "truth", status READY, has 1 handler(s) for this
service...
```

- 3 Test connectivity to the instance from the Data Access Engine (`spin`) and Web Services Data Access Engine (`twist`) hosts by running the `tnsping` utility:

```
tnsping truth
```

The OK statement displayed by the `tnsping` utility confirms that the listener is up and can connect to the instance. The `tnsping` utility should generate output similar to the following lines:

```
. . .
Used parameter files:

Used HOSTNAME adapter to resolve the alias
Attempting to contact (DESCRIPTION=(CONNECT_DATA=(SERVICE_
NAME=truth.performance.qa.opsware.com)) (ADDRESS=(PROTOCOL=TC
P) (HOST=192.168.165.178) (PORT=1521)))
OK (0 msec)
```

```
Attempting to contact
(DESCRIPTION=(ADDRESS=(HOST=localhost) (PORT=1521) (PROTOCOL=t
cp)) (CONNECT_DATA=(SERVICE_NAME=truth)))
OK (0 msec)
```

As an alternative to running the `tnsping` utility in this step, you can check the connectivity by running `sqlplus` and connecting to the database instance with the service name (TNS alias), for example:

```
sqlplus myuser/mypass@truth
```

Examine the Log Files

To examine the log files, perform the following steps:

- 1** Look for errors in the `alert.log` file.

For each instance, locate the `alert.log` file in the background dump destination directory:

```
$ORACLE_BASE/admin/<SID>/bdump
```

Here is an example `bdump` directory for an instance with the `truth` SID:

```
/u01/app/oracle/admin/truth/bdump
```

- 2** Look for errors in the other log and trace files, located in the following directories:

```
$ORACLE_BASE/admin/<SID>/cdump
```

```
$ORACLE_BASE/admin/<SID>/adump
```

```
$ORACLE_BASE/admin/<SID>/udump
```

Check for Sufficient Free Disk Space in the Tablespaces

To check for sufficient disk space, perform the following steps:

- 1** Enter the following commands in `sqlplus`:

```

column dummy noprint
column pct_used format 999.9          heading "Pct|Used"
column name      format a16          heading "Tablespace Name"
column Kbytes    format 999,999,999  heading "Current|File
Size|MB"
column used      format 999,999,999  heading "Used MB "
column free      format 999,999,999  heading "Free MB"
column largest   format 999,999,999  heading
"Largest|Contiguous|MB"
column max_size  format 999,999,999  heading "Max
Possible|MB"
column pct_max_used format 999.999    heading
"Pct|Max|Used"
break   on report
compute sum of kbytes on report
compute sum of free on report
compute sum of used on report

select nvl(b.tablespace_name,
          nvl(a.tablespace_name, 'UNKOWN')) name,
       kbytes_alloc Kbytes,
       kbytes_alloc-nvl(kbytes_free,0) used,
       nvl(kbytes_free,0) free,
       ((kbytes_alloc-nvl(kbytes_free,0))/
        kbytes_alloc)*100 pct_used,
       nvl(largest,0) largest,
       nvl(kbytes_max,kbytes_alloc) Max_Size,
       ((kbytes_alloc-nvl(kbytes_free,0))/kbytes_max)*100
pct_max_used
from ( select sum(bytes)/1024/1024 Kbytes_free,
             max(bytes)/1024/1024 largest,
             tablespace_name
       from sys.dba_free_space
       group by tablespace_name ) a,
     ( select sum(bytes)/1024/1024 Kbytes_alloc,
             sum(decode(maxbytes,0,bytes,maxbytes))/1024/
1024 Kbytes_max,
             tablespace_name
       from sys.dba_data_files
       group by tablespace_name
       union all
       select sum(bytes)/1024/1024 Kbytes_alloc,
             sum(decode(maxbytes,0,bytes,maxbytes))/1024/
1024 Kbytes_max,
             tablespace_name
       from sys.dba_temp_files
       group by tablespace_name) b

```



```

where a.tablespace_name (+) = b.tablespace_name
order by 1
/

```

In the output generated by the preceding commands, compare the numbers under the `Used` and `Free` headings.

- 2** To list the existing data, index, and temp files, enter the following commands in `sqlplus`:

```

Select file_id, bytes, file_name from dba_data_files;
Select file_id, bytes, file_name from dba_temp_files;

```

- 3** If a tablespace has auto-extended to its maximum size and is running out of disk space, then add new data files by entering the `ALTER TABLESPACE` command in `sqlplus`.

The following example commands add data files to four of the tablespaces. For a full list of tablespaces and data files, see the output generated by the commands in the preceding two steps.

```

ALTER TABLESPACE "AAA_DATA"
ADD DATAFILE '/u01/oradata/truth/aaa_data10.dbf'
SIZE 32M AUTOEXTEND ON NEXT 128M MAXSIZE 4000M ;

```

```

ALTER TABLESPACE "AAA_INDX"
ADD DATAFILE '/u02/oradata/truth/aaa_indx11.dbf'
SIZE 32M AUTOEXTEND ON NEXT 128M MAXSIZE 4000M ;

```

```

ALTER TABLESPACE "UNDO"
ADD DATAFILE '/u03/oradata/truth/undo12.dbf' SIZE 32M
AUTOEXTEND ON NEXT 128M MAXSIZE 4000M ;

```

```

ALTER TABLESPACE "TEMP" ADD
TEMPFILE '/u04/oradata/truth/temp14.dbf' SIZE 32M AUTOEXTEND
ON NEXT 128M MAXSIZE 4000M ;

```

Verify That the Jobs in `DBA_JOBS` Ran Successfully

When the Model Repository is installed, the Opware Installer sets up these jobs, which perform statistics and garbage collection. If these jobs do not run successfully, database performance will degrade.

To verify that the Jobs in `DBA_JOBS` ran successfully, perform the following steps:

- 1** To see if the jobs have run successfully, enter the following commands in `sqlplus`:

```
Col schema_user format a10
Col what format a50
Set line 200
Select job, schema_user, last_date, this_date, next_date,
broken, what from dba_jobs;
```

In the output generated from the preceding statement, the value of the "what" column indicates the type of job. If the value of "what" is DBMS_STATS* or GATHER_*, the job performs statistics collection. The jobs owned by 'GCADMIN' perform the garbage collection.

- 2** If you need to run the statistics and collection jobs manually, start by entering the following command in `sqlplus`:

```
grant create session to truth, aaa, lcrep;
```

To run the statistics collection jobs manually in `sqlplus`, enter `exec` commands similar to the example shown in this step.

If you copy and paste the following `exec` command examples, substitute the variables such as `schema_user_1` with the values of the `schema_user` column displayed by the preceding `select` statement. Substitute the variables such as `job_no_1` with the values of the `job` column displayed by the same `select` statement.

```
connect <schema_user_1>/<password>
exec dbms_job.run(<job_no_1>)
```

```
connect < schema_user_2>/<password>
exec dbms_job.run(<job_no_2>);
```

```
connect < schema_user_3>/<password>
exec dbms_job.run(<job_no_3>)
```

```
connect < schema_user_4>/<password>
exec dbms_job.run(<job_no_4>);
```

- 3** To run the garbage collection jobs manually, enter the following commands in `sqlplus`, substituting the job ID variables such as `job_no_1`:

```
grant create session to gadmin;
connect gadmin/<password_of_gadmin>
```

```
exec dbms_job.run(<job_no_1>);
exec dbms_job.run(<job_no_2>);
exec dbms_job.run(<job_no_3>);
exec dbms_job.run(<job_no_4>);
```

- 4** If you entered the `grant` command in step 2, enter the following command in `sqlplus`:
- ```
revoke create session from truth, aaa, lcrep;
```

### Monitor the `ERROR_INTERNAL_MSG` Table

The garbage collection jobs write exceptions to the `truth.ERROR_INTERNAL_MSG` table. Monitor this table daily for errors.

### Monitor Database Users

To monitor database users, perform the following steps:

- 1** To check the database users, enter the following command in `sqlplus`:
- ```
Select username, account_status, default_tablespace,
temporary_tablespace from dba_users;
```

The preceding `select` command should display the following users:

```
OPSWARE_PUBLIC_VIEWS
TRUTH
AAA_USER
LCREP
GCADMIN
TWIST
SPIN
AAA
OPSWARE_ADMIN
VAULT
```

(The `VAULT` user is for multimaster databases only.)

The `default_tablespace` of the Opware SAS users should not be `SYSTEM` or `SYSAUX`. The `temporary_tablespace` of all users should be `TEMP`.

- 2** If a database user listed in the preceding step has the `account_status` of `LOCKED`, then unlock the user by entering the following command in `sqlplus`:
- ```
ALTER USER <username> ACCOUNT UNLOCK;
```

## Troubleshooting System Diagnosis Errors

If an additional privilege (permission) has been made manually to the database, when Opware SAS performs a system diagnosis on the Data Access Engine, an error message might be generated. For example, if an additional grant has been made to the `truth.facilities` table, the following error appears:

Test Information

Test Name: Model Repository Schema

Description: Verifies that the Data Access Engine's version of the schema

matches the Model Repository's version.

Component device: Data Access Engine  
(spin.blue.qa.opware.com)

Test Results: The following tables differ between the Data Access Engine and the Model Repository: facilities.

To fix this problem, revoke the grant. For example, if you need to revoke a grant on the `truth.facilities` table, log on to the server with the database and enter the following commands:

```
su - oracle
sqlplus "/" as sysdba
grant create session to truth;
connect truth/<truth passwd>;
revoke select on truth.facilities from spin;
exit
sqlplus "/" as sysdba
revoke create session from truth;
```

## Garbage Collection

Opware SAS creates four Oracle jobs for garbage collection or for deleting the old data. For details about how these jobs are set up, see the Oracle Jobs section of the Opware SAS documentation.

By default, the garbage collection is run daily. The default values for retaining the data are as follows:

```
DAYS_WAY = 30 days
DAYS_TRAN = 7 days
DAYS_CHANGE_LOG = 180 days
DAYS_AUDIT_LOG = 180 days
```

These values can be read or updated in the `AUDIT_PARAMS` table. See Table A-6.



These values must be exactly the same for all the cores in a mesh.

---

To view the data, run the following sql command:

```
1* select name, value from audit_params
```

Table A-6: Garbage Collection Parameters

| NAME                 | VALUE     |
|----------------------|-----------|
| DAYS_WAY             | 30        |
| DAYS_TRAN            | 7         |
| DAYS_CHANGE_LOG      | 180       |
| LAST_DATE_WAY        | 07-OCT-06 |
| LAST_DATE_TRAN       | 30-OCT-06 |
| LAST_DATE_CHANGE_LOG | 10-MAY-06 |
| DAYS_AUDIT_LOG       | 180       |
| LAST_DATE_AUDIT_LOG  | 10-MAY-06 |

To update the data, run a sql command similar to the following example as user lcrep:

```
update audit_params set value=x where name = 'DAYS_AUDIT_LOG';
```

---

These values must be exactly the same for all the cores.

---



## Oracle Database Backup Methods

It is important that you back up the database on a regular basis. Be sure to use more than one backup method and to test your recovery process.

You can use the following methods to back up the Oracle database:

- **Export-Import:** An export extracts logical definitions and data from the database and writes the information to a file. Export-import does not support point-in-time recoveries. Do not use Export-Import as your only backup and recovery strategy.

See the information on the `Export-Import` subdirectory in “Sample Scripts and Configuration Files” on page 228.

- **Cold or Off-Line Backups:** This procedure shuts the database down and backs up all data, index, log, and control files. Cold or off-line backups do not support point-in-time recoveries.

- **Hot or Online Backups:** During these backups, the database must be available and in ARCHIVELOG mode. The tablespaces are set to backup mode. This procedure backs up tablespace files, control files, and archived redo log files. Hot or online backups support point-in-time recoveries.
- **RMAN Backups:** While the database is either off-line or on-line, use the `rman` utility to back up the database.

Regardless of your backup strategy, remember to back up all required Oracle software libraries, parameter files, password files, and so forth. If your database is in ARCHIVELOG mode, you also need to back up the archived log files.

For more information on backing up Oracle databases, see the following documents:

- *Oracle Database 2 Day DBA*
- *Oracle Database Concepts*
- *Oracle Database Administrator's Guide*

These guides are on the Oracle web site at the following URL:

<http://www.oracle.com/technology/documentation/index.html>

## Useful SQL

The following sql commands help you manage information in the Oracle database that the Model Repository uses.

### Locked and Unlocked User

A user in Oracle 10.2.0.2 will be locked out after ten unsuccessful logons.

To verify whether the user has been locked or unlocked, enter the following sql command:

```
select username, account_status from dba_users;
```

To unlock the user, enter the following sql command:

```
>ALTER USER <username> ACCOUNT UNLOCK;
```

### GATHER\_SYSTEM\_STATS

Sometimes the `GATHER_SYSTEM_STATS` job will be suspended. To remove this from 'AUTOGATHERING' mode, perform the following steps:

- 1 Select `PNAME, pval2` from `SYS.AUX_STATS$` where `pname = 'STATUS'` ; .

- 2** If the PVAL2 status is "AUTOGATHERING", run GATHER\_SYSTEM\_STATS with `gathering_mode= ('STOP') ;`.
- 3** Run your job `'exec dbms_job.run(xxx) ;`.

### **BIN\$ Objects**

If the Opware Installer discovers the existence of BIN\$ objects in the database, enter the following sql commands:

```
show parameter recyclebin;
SELECT owner,original_name,operation,type FROM dba_
recyclebin;
connect <owner>/password
purge recyclebin; or purge table BIN$xxx;
```

By default, `recyclebin` is set to OFF.

## **Model Repository Installation on a Remote Database Server**

To install or upgrade the Model Repository on a remote database server, perform the following steps:

- 1** Install the following on the server that will run the Opware Installer:
  1. Full Oracle client or Oracle instant client, depending on the Opware SAS version
  2. Set up the `tnsnames.ora` file to access the Truth/database
- 2** Set up the following on the Truth/database server:
  1. Log in as user `oracle`
  2. `cd $ORACLE_HOME/network/admin`
  3. Make sure that the `listener.ora` file has the following `SID_LIST_*` section:
 

```
SID_LIST_<your_listener_name> =
(SID_LIST =
(SID_DESC=
(SID_NAME=truth)
(ORACLE_HOME=<oracle_home>
```
  4. Make sure that the listener is started with the command:
 

```
lsnrctl start <your_listener_name>
```

## Troubleshooting Model Repository Installation

When you install or upgrade the Model Repository on a remote database server, Oracle gives the following error and the Opware Installer aborts:

```
Error: ORA-12526: TNS:listener: all appropriate instances are in
restricted mode
```

### Problem

When Opware SAS installs or upgrades the schema in the Oracle database, it puts the database in a "restricted mode". In Oracle 9i, users with "restricted session" privileges could connect to the remote database. In Oracle 10g, the standard listener will reject connections if the database is in a restricted mode. In Oracle 10g, a database administrator can only access the restricted instance locally from the machine that the instance is running on.

### Solution

In Oracle10g, if the listener has the `SID_LIST_*` paragraph in the `listener.ora` file, then the users with "restricted session" privilege are able to connect to a remote database, even if the database is in restricted more. If the `listener.ora` file does not have the `SID_LIST_*` paragraph, then the listener rejects the client connections and gives an `ORA-12526: TNS: listener: all appropriate instances are in restricted mode` error.

### Example: A listener.ora Entry

---

```
OPSCORE1 =
 (DESCRIPTION_LIST =
 (DESCRIPTION =
 (ADDRESS = (PROTOCOL = TCP) (HOST =
opscore1.mycompany.com) (PORT = 1521))
 (ADDRESS = (PROTOCOL = IPC) (KEY = EXTPROC0))
)
)

SID_LIST_OPSCORE1 =
 (SID_LIST =
 (SID_DESC=
 (SID_NAME=truth)
 (ORACLE_HOME=/u01/app/oracle/product/10.2.0/db_1)
)
 (SID_DESC =
 (SID_NAME = PLSExtProc)
 (ORACLE_HOME = /u01/app/oracle/product/10.2.0/db_1)
```



```
 (PROGRAM = extproc)
)
)
```

---

In this example, the listener alias is OPSCORE1.

To start, stop, or check the status of the listener, enter the following commands:

su- Oracle to the truth box

To start the listener, enter `lsnrctl start opscore1`.

To stop the listener, `Lsnrctl stop opscore1`.

To check the status of the listener, enter `lsnrctl status opscore1`.

