



Deploying Oracle 10g on Red Hat Enterprise Linux v.3

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Abstract

This document examines how enterprise-class databases may be deployed in grid environments using Red Hat Enterprise Linux v.3 and Oracle10g Database. An overview of the status of Red Hat Enterprise Linux v.3 as a platform for Oracle products is provided. Current benchmarks demonstrating significant performance enhancements running Oracle Database 10g on Red Hat Enterprise Linux v.3 are discussed. The document concludes with a tutorial outlining the steps required to install Red Hat Enterprise Linux AS v.3 and Oracle10g Database.

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Introduction

Computational grids enable system resources across distributed clusters to be shared and presented as a single source for computing applications. Grid computing was introduced in research environments as a powerful way to use clusters for assimilations, biotechnical computations, and statistical number crunching. The technology is now moving toward a foundation solution for general business applications that run in clustered environments. Technologies created by both hardware and software vendors give enterprises more computing power to meet user demand for application services.

Red Hat and Oracle are two software vendors with leading solutions in the grid computing space. Red Hat Enterprise Linux is a core component of most enterprise IT environments and an infrastructure standard in the Oracle database space. The Red Hat/Oracle partnership is also a core component in grid environments. Firms such as AOL, Amazon, and LLNL have found that Red Hat Enterprise Linux clusters prove themselves time and again with regard to performance, reliability, security, and impressive Total Cost of Ownership (TCO) advantages.

The Red Hat/Oracle partnership has strengthened as the respective companies' product lines have evolved. Red Hat and Oracle testing teams collaborated to create communication channels for efficient engineering exchanges that resulted in joint kernel development for specific areas of Red Hat Enterprise Linux v.3. For example, Red Hat engineered approximately 50 enhancements for Red Hat Enterprise Linux v.3 that are directly related to improving performance scalability and stability with Oracle's entire product stack. Red Hat's relationship with Oracle includes a joint support offering which means Red Hat Enterprise Linux customers will have both Oracle and Red Hat available for assistance should the need arise.

Oracle Product Availability on Red Hat Enterprise Linux v.3

Oracle releases two versions of its database simultaneously with releases of Red Hat Enterprise Linux. In addition, Oracle has released a select set of additional application components, as illustrated below:





Product	Release
Oracle Database 10g	Release 10.1.0.2
Oracle9i and Oracle9i RAC Database	Oracle9i Database Release 2 Enterprise Edition (9.2.0.1.0)
Oracle8i Database	Oracle8i Enterprise Edition Release 3 (8.1.7.0.1)
Oracle 10g Application Server	Release 9.0.4
Oracle9i AS Application Server	Release 2 v9.0.2
OracleE-Business Suite	Release 11.5.7
Oracle Collaboration Suite	Release 9.4.0.2

Table 1. Oracle Products Supporting Red Hat Enterprise Linux

For updated Oracle products certified for Red Hat Enterprise Linux v.3, please refer to the following web application:

http://www.redhat.com/apps/isv_catalog

World Record Performance

As of December 9, 2003, Red Hat Enterprise Linux running Oracle Database 10g holds the world record TPC-C performance benchmark result. The audited figures were: 1,184,893.38 tpmC at \$5.52/tpmC.

The benchmark was achieved with Red Hat Enterprise Linux v.3 running on a 16 node HP Integrity rx5670 Itanium cluster (each node being quad CPU with 48GB memory). The database was Oracle 10g with Real Application Clusters. The storage contained over 2000 disks with a total capacity of 93TB. The application server tier included 80 dual CPU Xeon HP ProLiant DL360G3 systems. The total configuration cost was \$6.5M. For complete results please refer to:

http://tpc.org/tpch/results/tpch_price_perf_results.asp?resulttype=all&version=2%¤cyID=1

This benchmark proves the outstanding performance, scalability, and cost effectiveness of Red Hat Enterprise Linux v.3. The benchmark further demonstrates that Red Hat Enterprise Linux running Oracle 10g is 50% faster than the best Windows 2003 result, and 98% faster than the best Solaris result. Statistics like these confirm the partnership's success in addressing user demand for database services in grid computing environments. Obvious performance gains represented by these benchmark are the reason more and more companies are turning to Linux solutions for their grid computing projects.



Tutorial: Deploying Oracle 10g on Red Hat Enterprise Linux v.3 AS

This Tutorial Assumes:

- The user is installing Oracle 10g without RAC.
- The system has at least 512MB of RAM.
- The system has Swap space at least twice the size of RAM.
- The system has at least 2.5 GB of disk space available for Oracle 10g.
- The system has at least 400 MB of free space in the /tmp directory.

The Database

The database used in this tutorial is Oracle10g Database Release (10.1.0.2). To simplify the installation process outlined here, install a single instance database without the RAC or Red Hat Cluster Manager clustering capabilities. Standard sample Oracle tables are used for all data sources rather than custom tables and records.

The Database Version

Oracle Database 10g Release 2 (10.1.0.2)

Oracle Product Availability on Red Hat Enterprise Linux v.3

Oracle10g is available for free download under a special developer license from: <http://otn.oracle.com>

The Operating System Version

Red Hat Enterprise Linux AS v.3 Update 2 or later

The Hardware

Red Hat Enterprise Linux is most frequently deployed on x86-compatible systems that provide increased performance at significantly lower cost. The hardware used for this configuration is represented in the table below:

	x86 Configuration
CPU type	2.7GHz Xeon
CPU count	2
RAM	2GB
Local Disk	2 @ 73GB
System Size	1U

Table 3. Hardware Configurations



The Installation Plan

Installation and configuration will occur in this order:

1. Install Red Hat Enterprise Linux AS v.3
2. Configure and update the operating system
3. Install and configure Oracle Database 10g

Install Red Hat Enterprise Linux AS v.3

If necessary, please refer to the installation manual for the target system architecture at:

<http://www.redhat.com/docs/manuals/enterprise/>

Most system administrators find the graphical installation program for Red Hat Enterprise Linux AS straightforward and intuitive. This tutorial uses the graphic installation interface and the default values. Instances where this is not the case are noted.

Start by placing CD #1 in the system's CD-ROM drive, and rebooting. Select the default graphical installation program by pressing **[Enter]** at the boot: prompt.

The graphical installation program guides the user through the installation. Follow the instructions below by clicking the **Next** button after the fields on each screen until they are properly completed. In most circumstances it is safe to accept the defaults because the installer will automatically select the best values. However, in specific environments the default values may not be appropriate and should be properly adjusted.

Welcome Screen- Click **Next**.

Language Selection - Accept the defaults. Click **Next**.

Keyboard Configuration - Accept the defaults. Click **Next**.

Mouse Configuration - Accept the defaults. Click **Next**.

Disk Partitioning Setup – For simplicity sake, this tutorial used the 'Automatically Partition with Disk Druid' option. Those that wish to create a customized partition table should Select **Manually partition with Disk Druid**. The following minimum partitions are recommended:



Partition	Type	Size
/boot	ext3	150 MB
swap	swap	2x physical RAM, minimum of 1024 MB
/	ext3	5GB
/tmp	ext3	1GB
/var	ext3	1GB
/home	ext3	4GB (this should be large enough to hold the three Oracle10g installation CD _s)
/u01	ext3	6GB(fill to maximum allowable size)

Table 4. Recommended Partitions

Boot Loader Configuration - Accept the defaults. Click **Next**.

Boot Loader Password Configuration - Accept the defaults. Click **Next**.

Network Configuration - Accept the defaults. Click **Next**.

Firewall Configuration - Select No firewall. Click **Next**.

Additional Language Support - Accept the defaults. Click **Next**.

Time Zone Selection - Choose the time zone that is appropriate for the location of the system. If the system's clock is set to UTC time, select **System clock uses UTC**. Click **Next**.

Account Configuration - Enter a root password. Click **Next**.

Package Group Selection - Choose **Customize the Set of Packages** to be Installed. Select the **Everything** install if you are not sure which package groups to choose. If you are selecting custom package groups, make sure the following are included:

- X Window System
- Gnome Desktop Environment
- Graphical Internet
- Server Configuration Tools
- Development Tools
- Legacy Software Development
- Administrative Tools

Installing Packages - At this point, the installation program installs the packages that have been selected. A screen will display the status of each package as it is installed, along with a tally of total packages, installed packages, and packages to be installed.



Graphical Interface (X) Configuration - Accept the defaults. Click **Next**.

Monitor Configuration - Accept the defaults. Click **Next**.

Customize Graphics Configuration – Choose **Graphical**. Click **Next**.

The installation of Red Hat Enterprise Linux AS v.3 is now complete. Reboot the system and select the latest enterprise kernel (kernel--2.4.21-15ELsmp) which is used on SMP systems with up to 16 GB of RAM. Systems with more than 16GB of RAM should use the hugemem kernel.

Configure and Update the Operating System

When the system boots into the graphic interface for the first time, the user is dropped into the Red Hat setup agent. The Setup Agent gives the user the opportunity to configure the system basics prior to logging into the system for the first time. Perform the following minimal steps:

Welcome Screen - Click **Next**.

License Agreement - Select **Yes**. Click **Next**.

Date and Time - Set the date and time. Click **Next**.

User Account - Create a user named oracle and set a password. Click **Next**.

Sound Card-If there is no sound card on the system, this step will not occur. If you have a sound card on the system, play a test sound to verify the card is working. Click **Next**.

Red Hat Network- RHN is used to update the system with the latest errata from Red Hat. The errata releases contain important bug fixes and security updates that should be applied to all production systems. Update the system at this time to make sure the latest kernel, bug fixes and security advisories have been applied. If you wish to update the system at a later date, this can be accomplished using the up2date command as root. Click **Next**.

The Red Hat Network Configuration main menu will start.

Select the **General** tab-Accept the defaults. Click **Next**.

Select the **Retrieval/Installation** tab-Accept the defaults. Click **Next**.



The kernel errata updates are disabled by default to give system administrators complete control over the kernel update process for production systems. This will have to be changed to make sure the latest kernel is on the system prior to installing Oracle 10g.

Select the **Package Exceptions** tab. Highlight the kernel in the **Package Skip List** and Click **Remove**. Click **OK**.

Next, add the Red Hat Inc. public key to your GPG keyring. Select **Yes**.

Review the Privacy Statement. Click **Forward**.

The next step is the login screen where the user should create an account or use an existing account. A new account was created for this tutorial.

Note: The Red Hat Network Provisioning Module provides the ability to use Kickstart and Activation keys so that the installation and RHN registration process can be done non-interactively (see <http://rhn.redhat.com> for more details).

Next register the system profile. This step entails creating a profile for the system that includes hardware specifications and existing packages.

Accept the hardware defaults. Click **Forward**.

Accept the package defaults. Click **Forward**.

Click **Forward** to send the profiling information to RHN.

After the profile has been created and sent to RHN, confirm that this system is subscribed to the Red Hat Enterprise Linux v.3 AS channel for the architecture you are using.

The next step is to select the available packages for installation. Check the **Select All Packages** box and click **Forward**.

A progress dialog box will appear while the system tests the package sets and resolves any dependencies. Accept any dependency recommendations from the update agent (if this step does not occur it means there are no dependencies). Click **Forward**.

The up2date tool will now retrieve the packages you have selected and install them on your system.

Note: The up2date tool is extremely customizable. Packages do not have to be immediately installed and can additionally be



directed to another location for download. See the man page for `up2date` for more information.

For more information on using Red Hat Network, visit <http://rhn.redhat.com>.

Now that the system has been updated, finish configuring the system with the Red Hat Setup Agent.

*Additional CDs - Click **Next**.*

*Finish Setup - Click **Next**.*

The system should be rebooted at this time because a kernel errata was applied during the update process. After the system boots, log in as the oracle user. After X windows starts, open two terminals by right clicking on the desktop and selecting the **New Terminal** option. Keep the first terminal login as the oracle user. In the second terminal type

```
su -
```

and enter the root password to change to the root user.

Configure the Network

It is critical that the network configuration for the operating system is correct because Oracle Database 10g is a networked service. The actions performed here must all be performed while logged into the operating system as the root user in the terminal previously created.

Start your favorite text editor as root and change the hostname in `/etc/sysconfig/network`. For the purposes of this document the hostname we will be using is **oracle1.example.com**.

```
NETWORKING=yes  
HOSTNAME=oracle1.example.com
```

Edit `/etc/hosts` and add the system's IP address and hostname in the same format below the loopback line that reads:

```
127.0.0.1 localhost.localdomain localhost
```

Inform the system of the hostname change by using the following command:

```
hostname oracle1.example.com
```

Add the following entries to `/etc/resolv.conf` to allow more time for name resolution to succeed (otherwise on busy systems, Oracle SQL*Net connections may fail):



```
options attempts:5  
options timeout:15
```

Package Verification

Use the root terminal to make sure several key compatibility packages are installed on the Red Hat Enterprise Linux AS v.3 system prior to installing Oracle Database 10g. Confirm that the following are installed by typing:

```
rpm -q packagename
```

for each of the following (example: rpm -q compat-gcc):

```
compat-gcc  
compat-libstdc++  
compat-gcc-c++  
compat-db  
make-3.79 or newer  
binutils-2.11.90.0.8-12 or newer  
gcc-3.2.3-2 or newer  
openmotif-2.2.2-16 or a newer  
setarch-1.3-1 or newer
```

If these packages are not present on the system use the up2date client to download and install them by typing:

```
up2date packagename
```

as the root user.

Tune Kernel Parameters

It will be necessary to optimize your system for the Oracle environment. Both Red Hat and Oracle recommend tuning kernel parameters as follows:

As root add the following lines to /etc/sysctl.conf:

```
# Disables packet forwarding  
net.ipv4.ip_forward = 0  
# Enables source route verification  
net.ipv4.conf.default.rp_filter = 1  
# Disables the magic-sysrq key  
kernel.sysrq = 0  
# Parameters for Oracle10g Release (10.1.0.2)  
kernel.sem = 250 32000 100 128  
kernel.shmmax = 2147483647  
kernel.shmmni = 4096  
kernel.shmall = 2097152  
fs.file-max = 65536  
net.ipv4.ip_local_port_range = 1024 65000
```

After editing the /etc/sysctl.cf file, run the command

```
sysctl -p
```



Create Oracle Users and Groups

Next add the appropriate users and groups required for the Oracle10g installation. Issue the following commands (while logged in as root):

```
groupadd dba
groupadd oper
groupadd oinstall
usermod -g oinstall -G dba,oper oracle
```

This modifies the oracle user created using the Setup Agent tool so the primary group is oinstall and secondary groups are dba and oper.

Create a directory for the Oracle Database 10g software :

```
mkdir -p /u01/app/oracle
chown -R oracle:oinstall /u01/app
chmod -R 775 /u01/app
```

Install and Configure Oracle Database 10g

Download the ship.db.cpio.gz file from the Oracle Technology Network:

<http://otn.oracle.com/software/products/database/oracle10g/index.html>

Once the file has been successfully downloaded to the oracle user's home directory, unzip and unpack the contents with the following commands:

```
gunzip ship.db.cpio.gz
cpio -idmv < ship.db.cpio
```

Next, set environment variables in /home/oracle/.bash_profile :

```
umask 022

PATH=/bin:/usr/bin:/usr/local/bin:/usr/X11R6/bin
LD_LIBRARY_PATH=/usr/lib:/usr/X11R6/lib

ORACLE_BASE=/u01/app/oracle
ORACLE_HOME=$ORACLE_BASE/product/10.1.0/db_1
ORACLE_SID=orcl
PATH=$ORACLE_HOME/bin:$PATH

export PATH LD_LIBRARY_PATH
export ORACLE_BASE ORACLE_HOME ORACLE_SID
```

As the oracle user, run the runInstaller script. It is located in the Disk1 directory that was created when the Oracle10g files were extracted. This will start the Oracle Installation.

```
cd /home/oracle/Disk1
./runInstaller
```



The Oracle Universal Installer will begin. Follow the instructions below to complete the installation.

Welcome - Click **Next** to continue.

Specify Inventory Directory and Credentials-- Accept the default Inventory Location (/u01/app/oracle/oraInventory) and click **Next**.

At this point a script called `oraInstRoot.sh` should be run as root. In the root terminal previously opened execute:

```
/u01/app/oracle/oraInventory/oraInstRoot.sh
```

After executing the script, click **Continue**.

Specify File Locations - Accept the default file and inventory locations. Click **Next**.

Select Installation Types - Select the default Installation Type (Enterprise Edition) and click **Next**.

Product Prerequisite Checks - All checks should have succeeded if the suggested configurations were completed. Click **Next**.

Select Database Configuration - Select the default Database Configuration (General Purpose) and click **Next**.

Specify Database Configuration Options - The default SID (`orcl`) should already be selected. For the Global Database Name, enter something like `SID.domain` (for example, `orcl.example.com`), then click **Next**.

Select Database Management Option - Select Use Database Control for Database Management and click **Next**.

Specify Database File Storage Options - Accept the default Database File Location (/u01/app/oracle/oradata/) and click **Next**.

Specify Backup and Recovery Options - Select whatever is appropriate for your environment. For this tutorial Automated Backups were not enabled. Click **Next**.

Specify Database Schema Passwords - Select whatever is appropriate for your environment. For this tutorial the same password was used for all accounts.

Summary - The Summary screen will appear. Click Install to begin the installation of the database software.



Install - During the installation, run the `root.sh` script as the root user after being prompted by the installer. To do this, execute the script in the open root terminal:

```
/u01/app/oracle/product/10.1.0/db_1/root.sh
```

After the script runs, click **OK**.

Configuration Assistants - Once the database server installation is complete, the Configuration Assistants screen appears. This will run through the following steps:

- iSQL*Plus Configuration Assistant
- Oracle Net Configuration Assistant
- Oracle Database Configuration Assistant (DBCA)

Note: The Database Configuration Assistant (DBCA) takes a while to start, so do not be concerned by the blank window that initially appears. If you encounter JRE related issues, the Configuration Assistant can be run after a JRE is installed by executing the following script as the oracle user:

```
/u01/app/oracle/product/10.1.0/db-1/bin/dbca
```

End of Installation- Oracle Database 10g has successfully been installed. Click **Exit** to exit the Oracle Universal Installer.

**For more information visit: www.redhat.com
or call 1-888-REDHAT1 or +1-919-754-3700**



Appendix: Console Solutions

Updating the system in Text Mode

Login into the system as root.

Configure the RHN-entitled database server to receive kernel updates by editing `/etc/sysconfig/rhn/up2date`. Find the line that reads:

```
pkgSkipList=kernel*;
```

and change it to:

```
pkgSkipList=;
```

Next, find the line that reads:

```
removeSkipList=kernel*;
```

and change it to:

```
removeSkipList=;
```

At this point, use RHN to update the system with the latest errata available from Red Hat. To do this, issue the following command on the system to be updated:

```
up2date -u
```

Using VNC

As root, execute the following commands:

```
chkconfig vncserver on
echo
"VNCSERVERS=\"1.oracle\"">>/etc/sysconfig/vncse
rvers
service vncserver start
su - oracle
vncserver :1
cd .vnc
mv xstartup xstartup.bak
touch xstartup
chmod 755 xstartup
echo "#\!/bin/sh" >> xstartup
echo "" >> xstartup

echo "# Uncomment the following two lines for
normal desktop:" >> xstartup

echo "# unset SESSION_MANAGER" >> xstartup

echo "# exec /etc/X11/xinit/xinitrc" >>
xstartup

echo "" >> xstartup

echo "[ -r $HOME/.Xresources ] && xrdp
$HOME/.Xresources" >> xstartup
```



```
echo "xsetroot -solid grey" >> xstartup
echo "vncconfig -iconic &" >> xstartup
echo "xhost localhost" >> xstartup
echo "PATH=\$PATH:/usr/local/bin" >> xstartup
echo "export PATH" >> xstartup
echo "xterm -geometry 80x24+10+10 -ls -title
\"\$VNCDESKTOP Desktop\" &" >> xstartup
echo "twm &" >> xstartup
```

Resources

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Installing Oracle 10g on Red Hat Enterprise Linux AS v.3.
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