

DBA: Linux

Installing Oracle Database 10g Release 2 on Linux x86

(RHEL4 and SLES9 covered)

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Learn the basics of installing Oracle Database 10g Release 2 on Red Hat Enterprise Linux or Novell SUSE Enterprise Linux, from the bare metal up (for evaluation purposes only).

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TAGS

[linux](#), [database](#), [installation](#), [All](#)

Overview

The guide provides a walkthrough of installing an Oracle Database 10g Release 2 database on commodity hardware for the purpose of evaluation. If you are new to Linux and/or Oracle, this guide is for you. It starts with the basics and walks you through an installation of Oracle Database 10g Release 2 from the bare metal up.

This guide will take the approach of offering the easiest paths, with the fewest number of steps for

accomplishing a task. This approach often means making configuration choices that would be inappropriate for anything other than an evaluation. For that reason, this guide is not appropriate for building production-quality environments, nor does it reflect best practices.

The Linux distributions certified for Oracle Database 10g Release 2 are:

- Oracle Enterprise Linux 5 (OEL5)
- Oracle Enterprise Linux 4 (OEL4)
- Red Hat Enterprise Linux 5 (RHEL5)
- Red Hat Enterprise Linux 4 (RHEL4)
- Red Hat Enterprise Linux 3 (RHEL3)
- Novell SUSE Linux Enterprise Server 10 (SLES10)
- Novell SUSE Linux Enterprise Server 9 (SLES9)
- Asianux 2.0
- Asianux 1.0

We will cover the RHEL4 and SLES9 distributions only here.

Please note that as an alternative Novell offers the orarun package for installation of SLES9 and Oracle. To use that method instead of the one described here, refer to [this Novell-supplied install guide](#).

This guide is divided into four parts: Part I covers the installation of the Linux operating system, Part II covers configuring Linux for Oracle, Part III discusses the essentials of installing the Oracle Database, and Part IV covers creating additional filesystems and [Automatic Storage Management \(ASM\)](#) a new storage option in Oracle Database 10g that greatly simplifies storage administration and management. The Appendix provides information to help you get started using your new database including how to access the database interactively and how to stop and start the database and related services.

Part I: Installing Linux

This guide assumes a server with the following hardware:

- 800MHz Pentium III CPU
- 1024MB of RAM
- SCSI host adapter (Ultra SCSI 160)
- Four SCSI disk drives (1 x 9GB + 3 x 36GB)
- One 100Base-T Ethernet adapter

Your hardware does not have to match this in order to use this guide. All that is necessary for a basic database install is a single CPU, 1024MB of RAM, and one disk drive (IDE, SCSI, or FireWire) with at least 7GB of free space.

Now, let's walk through the process of installing the Linux operating system on a server. The

instructions assume a fresh install of Linux (as opposed to an upgrade), that the server will be dedicated to Oracle, and that no other operating systems or data are on the server.

RHEL4

Oracle Database 10g Release 2 is certified to run the base release of RHEL4 (Advanced Server and Enterprise Server) without updates. If you have update CDs, you can use the boot CD from the update instead of the boot CD from the base release to automatically apply all updates during the installation. All updates from Red Hat are supported by Oracle.

The easiest and fastest way to apply the updates for a fresh install of Linux is to perform the install by using the update CDs. If Linux is already installed or you don't have the updates on CDs, they can be applied through RHN. Because this guide is designed for a fresh Linux install, you'll use the update CDs.

1. Boot the server using the first CD.
 - o You may need to change your BIOS settings to allow booting from the CD.
2. The boot screen appears with the `boot:` prompt at the bottom of the screen.
 - o Select **Enter** to continue with a graphical install on the console. (For other installation methods and options, refer to the [Red Hat Installation Guide](#).)
 - o The installer scans your hardware, briefly displays the Red Hat splash screen, and then begins a series of screen prompts.
3. Language Selection
 - o Accept the default.
4. Keyboard Configuration
 - o Accept the default.
5. Welcome Screen
 - o Click on **Next**.
6. Disk Partitioning Setup
 - o A thorough treatment of disk partitioning is beyond the scope of this guide, which assumes that you are familiar with disk partitioning methods.

(WARNING: Improperly partitioning a disk is one of the surest and fastest ways to **wipe out everything on your hard disk**. If you are unsure how to proceed, stop and get help, or you will risk losing data!)

This guide uses the following partitioning scheme, with ext3 for each filesystem:

The 9GB disk on the first controller (`/dev/sda`) will hold all Linux and Oracle software and contains the following partitions:

- 100MB /boot partition

- 1,500MB swap partition^o Set this to at least twice the amount of RAM in the system but to no more than 2GB. (Thirty-two-bit systems do not support swap files larger than 2GB.) If you need more than 2GB of swap space, create multiple swap partitions.

- 7,150MB root partition^o This partition will be used for everything, including /usr,

/tmp, /var, /opt, /home, and more. This approach is purely to simplify installation for the purposes of this guide. A more robust partitioning scheme would separate these directories onto separate filesystems.

7. Boot Loader Configuration
 - Accept the default.
8. Network Configuration
 - It is usually best to configure database servers with a static IP address. To do so, click on **Edit** .
 - A pop-up window appears. Uncheck the **Configure using DHCP** box, and enter the IP Address and Netmask for the server. Be sure that **Activate on boot** is checked, and click on **OK** .
 - In the Hostname box, select **manually** and enter the hostname.
 - In the Miscellaneous Settings box, enter the remaining network settings.
9. Firewall Configuration
 - For the purposes of this walk-through, no firewall is configured. Select **No firewall**
 - Select Disabled on the "Enable SELinux" drop down list.
 - Click on Proceed when the "Warning - No Firewall" window appears.
10. Additional Language Support
 - Accept the default.
11. Time Zone Selection
 - Choose the time settings that are appropriate for your area. Setting the system clock to UTC is usually a good practice for servers. To do so, click on **System clock uses UTC**.
12. Set Root Password
 - Enter a password for root, and enter it again to confirm.
13. Package Installation Defaults
 - Select **Customize software packages to be installed**.
14. Package Group Selection
 - Select only the package sets shown here and leave all others unselected.
 - Desktop
 - X Window System
 - Gnome
 - Applications
 - Graphical Internet (optional)
 - Servers
 - Do not select anything in this group.
 - Development
 - Development Tools
 - System
 - Administration Tools
 - System Tools
 - Add the package 'sysstat' by clicking on the Details link and selecting "sysstat - The sar an iostat system monitoring commands." from the Optional Packages list.
 - Miscellaneous

- Do not select anything in this group.
 - Click on Next to proceed.
- 15. Installing Packages
 - Software will be copied to the hard disk and installed. Change disks as prompted.
- 16. Congratulations
 - Remove the installation media from the system, and click on **Reboot** .
- 17. The system automatically reboots and presents a new welcome screen.
 - Click on **Next**.
- 18. License Agreement
 - Read the license agreement. If you agree to the terms, select **Yes, I agree to the License Agreement** and click on **Next**.
- 19. Date and Time
 - Set the Date and Time.
 - If you want to use an NTP server (recommended), select **Enable Network Time Protocol** and enter the name of the NTP server.
- 20. Display
 - Accept the defaults or change as required.
- 21. Red Hat Login
 - Enter your Red Hat Network login and password or create a new one.
- 22. System User
 - Create an account for yourself.
 - Do not create an account for oracle at this time. Creating the oracle account is covered later in this section.
- 23. Additional CDs
 - Click on Next.
- 24. Finish Setup
 - Click on Next.
- 25. A graphical login screen appears.
- 26. Congratulations! Your RHEL4 software is now installed.

Verifying Your Installation

Required kernel version: 2.6.9-5.0.5.EL This kernel, or any of the kernels supplied in updates, works with Oracle Database 10g Release 2 .

Check your kernel version by running the following command:

```
uname -r
```

Ex:

```
# uname -r
2.6.9-22.ELsmp
```

Once you've completed the steps above, all of the packages required for Oracle Database 10g Release 2 will have been installed. Verify this using the example below.

Required package versions (or later):

- binutils-2.15.92.0.2-10.EL4
- compat-db-4.1.25-9
- control-center-2.8.0-12
- gcc-3.4.3-9.EL4
- gcc-c++-3.4.3-9.EL4
- glibc-2.3.4-2
- glibc-common-2.3.4-2
- gnome-libs-1.4.1.2.90-44.1
- libstdc++-3.4.3-9.EL4
- libstdc++-devel-3.4.3-9.EL4
- make-3.80-5
- pdksh-5.2.14-30
- sysstat-5.0.5-1
- xscreensaver-4.18-5.rhel4.2
- libaio-0.3.96
- openmotif21-2.1.30-11.RHEL4.2 (Required only to install Oracle demos. Installation of Oracle demos is not covered by this guide.)

To see which versions of these packages are installed on your system, run the following command:

```
rpm -q binutils compat-db control-center gcc gcc-c++ glibc glibc-common \
gnome-libs libstdc++ libstdc++-devel make pdksh sysstat xscreensaver libaio
openmotif21
```

Ex:

```
# rpm -q binutils compat-db control-center gcc gcc-c++ glibc glibc-common \
> gnome-libs libstdc++ libstdc++-devel make pdksh sysstat xscreensaver libaio
openmotif21
binutils-2.15.92.0.2-15
compat-db-4.1.25-9
control-center-2.8.0-12.rhel4.2
gcc-3.4.4-2
gcc-c++-3.4.4-2
glibc-2.3.4-2.13
glibc-common-2.3.4-2.13
gnome-libs-1.4.1.2.90-44.1
libstdc++-3.4.4-2
libstdc++-devel-3.4.4-2
make-3.80-5
pdksh-5.2.14-30.3
sysstat-5.0.5-1
xscreensaver-4.18-5.rhel4.9
libaio-0.3.103-3
openmotif21-2.1.30-11.RHEL4.4
```

guide, we will install on the SLES9 base release.

1. Boot the server, using the SLES9 CD.
 - o You may need to change your BIOS settings to allow booting from the CD.
2. The Novell SLES installation screen appears.
 - o Select **Installation**.
 - o The installer scans your hardware and presents the YaST interface.
3. Language Selection
 - o Accept the license agreement.
 - o Accept the default, **English (US)**.
4. Installation Settings
 - o Select **New Installation**.
5. Partitioning
 - o A thorough treatment of disk partitioning is beyond the scope of this guide, which assumes that you are familiar with disk partitioning methods.

(WARNING: Improperly partitioning a disk is one of the surest and fastest ways to **wipe out everything on your hard disk**. If you are unsure how to proceed, stop and get help, or you will risk losing data!)

This guide uses the following partitioning scheme, with ext3 for each filesystem:

The 9GB disk on the first controller (/dev/sda) will hold all Linux and Oracle software and contains the following partitions:

- 100MB /boot partition
- 1,500MB swap partition^o Set this to at least twice the amount of RAM in the system but to no more than 2GB. (Thirty-two-bit systems do not support swap files larger than 2GB.) If you need more than 2GB of swap space, create multiple swap partitions.
- 7,150MB root partition^o this partition will be used for everything, including /usr, /tmp, /var, /opt, /home, and more. This approach is purely to simplify installation for the purposes of this guide. A more robust partitioning scheme would separate these directories onto separate filesystems.

6. Software
 - o Click on the link for **Software**.
 - o The Software Selection screen appears.
 - o Click on **Detailed Selection**.
 - o The left-hand window displays a list of software selections. Click on the box next to each selection to select/deselect it.
 - o Select the following software (this is the recommended set; all others should be deselected):
 - Basis Runtime System
 - YaST
 - Linux Tools
 - Help & Support Documentation
 - Graphical Base System

- GNOME System
 - C/C++ Compiler and Tools
 - Analyzing Tools
 - o It is recommended that the following items not be installed, as they may conflict with Oracle products providing the same service:
 - Simple Webserver
 - Authentication Server (NIS, LDAP, Kerberos)
7. Time Zone
 - o Set your time zone.
 8. Click on **Accept**.
 9. A warning box appears. Click on **Yes, install** when ready to proceed.
 10. Change CDs as prompted by the installer.
 11. Confirm Hardware Detection
 - o Network Cards ó Click on **OK**.
 12. Password for "root." the system administrator.
 - o Enter the root password and repeat to confirm.
 13. Configure your network interface(s), and click on **Next** when ready to proceed.
 - o Static IP addresses are recommended for servers.
 - o There is no need to configure printers, modems, ISDN adapters, or sound in order to build a database.
 14. Test Internet Connection
 - o There is no need to connect to the Internet to download release notes or Linux updates. Select **No, Skip This Test**.
 15. Service Configuration
 - o There is no need to configure CA Management or OpenLDAP Server. Select **Skip Configuration**.
 16. User Authentication Method
 - o Select **Local(/etc/passwd)**.
 17. Add a New Local User
 - o Create an account for yourself. Do not create the oracle account at this time; we'll do that later.
 18. Release Notes
 - o Click on Next
 19. Hardware Configuration
 - o Confirm Hardware Detection ó Graphics Cards ó click on **Continue**.
 - o There is no need to configure sound cards for a database ó click on **Skip**.
 - o If the graphics card and monitor have been successfully detected, click on **Next**. Otherwise, click on the Graphics Cards link and enter the correct information.
 20. Installation Completed
 - o Click on **Finish**.
 21. Congratulations! Your SLES9 software is now installed.

Verifying Your Installation

If you've completed the steps above, you should have all the packages and updates required for Oracle Database 10g Release 2. However, you can take the steps below to verify your installation.

Required kernel version: 2.6.5-7.97 (or later)

Check your kernel version by running the following command:

```
uname -r
```

Ex:

```
# uname -r  
2.6.5-7.97-smp
```

Other required package versions (or later):

- binutils-2.15.90.0.1.1-32.5
- gcc-3.3.3-43.24
- gcc-c++-3.3.3-43.24
- glibc-2.3.3-98.28
- gnome-libs-1.4.1.7-671.1
- libstdc++-3.3.3-43.24
- libstdc++-devel-3.3.3-43.24
- make-3.80-184.1
- pdksh-5.2.14-780.1
- sysstat-5.0.1-35.1
- xscreensaver-4.16-2.6
- libaio-0.3.98

To see which versions of these packages are installed on your system, run the following command as root:

```
rpm -q binutils gcc gcc-c++ glibc gnome-libs libstdc++ libstdc++-devel make \  
pdksh sysstat xscreensaver libaio
```

Ex:

```
# rpm -q binutils gcc gcc-c++ glibc gnome-libs libstdc++ libstdc++-devel make \  
> pdksh sysstat xscreensaver libaio  
binutils-2.15.90.0.1.1-32.10  
gcc-3.3.3-43.34  
gcc-c++-3.3.3-43.34  
glibc-2.3.3-98.47  
gnome-libs-1.4.1.7-671.1  
libstdc++-3.3.3-43.34  
libstdc++-devel-3.3.3-43.34  
make-3.80-184.1  
pdksh-5.2.14-780.7  
sysstat-5.0.1-35.4  
xscreensaver-4.16-2.6  
libaio-0.3.102-1.2
```

If any of the package versions on your system are missing or the versions are earlier than those specified above, you can download and install the updates from the [Novell SUSE Linux Portal](#).

Now that the Linux software is installed, you need to configure it for Oracle. This section walks through the steps required to configure Linux for Oracle Database 10g Release 2.

Verifying System Requirements

To verify that your system meets the minimum requirements for an Oracle Database 10g Release 2 database, log in as root and run the commands below.

To check the amount of RAM and swap space available, run this:

```
grep MemTotal /proc/meminfo
grep SwapTotal /proc/meminfo
```

Ex:

```
# grep MemTotal /proc/meminfo
MemTotal: 1034680 kB
# grep SwapTotal /proc/meminfo
SwapTotal: 1534196 kB
```

The minimum RAM required is 1024MB, and the minimum required swap space is 1GB. Swap space should be twice the amount of RAM for systems with 2GB of RAM or less and between one and two times the amount of RAM for systems with more than 2GB.

You also need 2.5GB of available disk space for the Oracle Database 10g Release 2 software and another 1.2GB for the database. The /tmp directory needs at least 400MB of free space. To check the available disk space on your system, run the following command:

```
df -h
```

Ex:

```
# df -h
Filesystem Size Used Avail Use% Mounted on
/dev/sda3 6.8G 1.3G 5.2G 20% /
/dev/sda1 99M 17M 77M 18% /boot
```

The example shows that the /tmp directory does not have its own filesystem. (It's part of the root filesystem for this guide.) With 5.2 GB available, the root filesystem has just enough space for the installation ($2.5 + 1.2 + 0.4 = 4.1$ GB) with a little room left over.

Create the Oracle Groups and User Account

Next, create the Linux groups and user account that will be used to install and maintain the Oracle Database 10g Release 2 software. The user account will be called oracle, and the groups will be oinstall and dba. Execute the following commands as root:

```
/usr/sbin/groupadd oinstall
/usr/sbin/groupadd dba
/usr/sbin/useradd -m -g oinstall -G dba oracle
id oracle
```

```
Ex:
# /usr/sbin/groupadd oinstall
# /usr/sbin/groupadd dba
# /usr/sbin/useradd -m -g oinstall -G dba oracle
# id oracle
uid=501(oracle) gid=502(oinstall) groups=502(oinstall),503(dba)
```

Set the password on the oracle account:

```
passwd oracle
```

```
Ex:
# passwd oracle
Changing password for user oracle.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
```

Create Directories

Now create directories to store the Oracle Database 10g Release 2 software and the database files. This guide adheres to the Optimal Flexible Architecture (OFA) for the naming conventions used in creating the directory structure. For more information on OFA standards, see [Appendix C](#) of the [Oracle Database Installation Guide 10g Release 2 \(10.2\) for Linux x86](#).

The following assumes that the directories are being created in the root filesystem. This is done for the sake of simplicity and is not recommended as a general practice. These directories would normally be created as separate filesystems.

Issue the following commands as root:

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

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

Configuring the Linux Kernel Parameters

The Linux kernel is a wonderful thing. Unlike most other *NIX systems, Linux allows modification of most kernel parameters while the system is up and running. There's no need to reboot the system after making kernel parameter changes. Oracle Database 10g Release 2 requires the kernel parameter settings shown below. The values given are minimums, so if your system uses a larger value, don't change it.

```
kernel.shmall = 2097152
kernel.shmmax = 536870912
```

```
kernel.shmmni = 4096
kernel.sem = 250 32000 100 128
fs.file-max = 65536
net.ipv4.ip_local_port_range = 1024 65000
net.core.rmem_default=262144
net.core.wmem_default=262144
net.core.rmem_max=262144
net.core.wmem_max=262144
```

If you're following along and have just installed Linux, the kernel parameters will all be at their default values and you can just cut and paste the following commands while logged in as root.

```
cat >> /etc/sysctl.conf <<EOF
kernel.shmall = 2097152
kernel.shmmax = 536870912
kernel.shmmni = 4096
kernel.sem = 250 32000 100 128
fs.file-max = 65536
net.ipv4.ip_local_port_range = 1024 65000
net.core.rmem_default=262144
net.core.wmem_default=262144
net.core.rmem_max=262144
net.core.wmem_max=262144
EOF
/sbin/sysctl -p
```

Ex:

```
# cat >> /etc/sysctl.conf <<EOF
> kernel.shmall = 2097152
> kernel.shmmax = 536870912
> kernel.shmmni = 4096
> kernel.sem = 250 32000 100 128
> fs.file-max = 65536
> net.ipv4.ip_local_port_range = 1024 65000
> EOF
# /sbin/sysctl -p
net.ipv4.ip_forward = 0
net.ipv4.conf.default.rp_filter = 1
net.ipv4.conf.default.accept_source_route = 0
kernel.sysrq = 0
kernel.core_uses_pid = 1
kernel.shmall = 2097152
kernel.shmmax = 536870912
kernel.shmmni = 4096
kernel.sem = 250 32000 100 128
fs.file-max = 65536
net.ipv4.ip_local_port_range = 1024 65000
net.core.rmem_default = 262144
net.core.wmem_default = 262144
net.core.rmem_max = 262144
net.core.wmem_max = 262144
```

Run the following commands as root to verify your settings:

```
/sbin/sysctl -a | grep shm
/sbin/sysctl -a | grep sem
/sbin/sysctl -a | grep file-max
/sbin/sysctl -a | grep ip_local_port_range
/sbin/sysctl -a | grep rmem_default
/sbin/sysctl -a | grep rmem_max
/sbin/sysctl -a | grep wmem_default
/sbin/sysctl -a | grep wmem_max
```

Ex:

```
# /sbin/sysctl -a | grep shm
kernel.shmmni = 4096
kernel.shmall = 2097152
kernel.shmmax = 536870912
kernel.shm-use-bigpages = 0
# /sbin/sysctl -a | grep sem
kernel.sem = 250 32000 100 128
# /sbin/sysctl -a | grep file-max
fs.file-max = 65536
# /sbin/sysctl -a | grep ip_local_port_range
net.ipv4.ip_local_port_range = 1024 65000
# /sbin/sysctl -a | grep rmem_default
net.core.rmem_default = 262144
# /sbin/sysctl -a | grep rmem_max
net.core.rmem_max = 262144
# /sbin/sysctl -a | grep wmem_default
net.core.wmem_default = 262144
# /sbin/sysctl -a | grep wmem_max
net.core.wmem_max = 262144
```

For Novell SUSE Linux releases, use the following to ensure that the system reads the `/etc/sysctl.conf` file at boot time:

```
/sbin/chkconfig boot.sysctl on
```

Setting Shell Limits for the oracle User

Oracle recommends setting limits on the number of processes and open files each Linux account may use. To make these changes, cut and paste the following commands as root:

```
cat >> /etc/security/limits.conf <<EOF
oracle soft nproc 2047
oracle hard nproc 16384
oracle soft nofile 1024
oracle hard nofile 65536
EOF

cat >> /etc/pam.d/login <<EOF
session required /lib/security/pam_limits.so
EOF
```

For RHEL4, use the following:

```
cat >> /etc/profile <<EOF
if [ \${USER} = "oracle" ]; then
  if [ \${SHELL} = "/bin/ksh" ]; then
    ulimit -p 16384
    ulimit -n 65536
  else
    ulimit -u 16384 -n 65536
  fi
  umask 022
fi
EOF
```

```
cat >> /etc/csh.login <<EOF
if ( \${USER} == "oracle" ) then
  limit maxproc 16384
  limit descriptors 65536
  umask 022
endif
EOF
```

For SLES 9, use the following:

```
cat >> /etc/profile.local <<EOF
if [ \${USER} = "oracle" ]; then
  if [ \${SHELL} = "/bin/ksh" ]; then
    ulimit -p 16384
    ulimit -n 65536
  else
    ulimit -u 16384 -n 65536
  fi
  umask 022
fi
EOF
```

```
cat >> /etc/csh.login.local <<EOF
if ( \${USER} == "oracle" ) then
  limit maxproc 16384
  limit descriptors 65536
  umask 022
endif
EOF
```

Part III: Installing Oracle

Oracle Database 10g Release 2 can be downloaded from OTN. Oracle offers a development and testing license free of charge. However, no support is provided and the license does not permit production use. A full description of the license agreement is available on OTN.

The easiest way to make the Oracle Database 10g Release 2 distribution media available on your server is to download them directly to the server.

Use the graphical login to log in as oracle.

Create a directory to contain the Oracle Database 10g Release 2 distribution:

```
mkdir 10gR2_db
```

To download Oracle Database 10g Release 2 from OTN, point your browser (Firefox works well) to <http://www.oracle.com/technology/software/products/database/oracle10g/htdocs/10201linuxsoft.html>. Fill out the Eligibility Export Restrictions page, and read the OTN License agreement. If you agree with the restrictions and the license agreement, click on **I Accept**.

Click on the 10201_database_linux32.zip link, and save the file in the directory you created for this purpose (10gR2_db) if you have not already logged in to OTN, you may be prompted to do so at this point.

Unzip and extract the file:

```
cd 10gR2_db
unzip 10201_database_linux32.zip
```

Install the Software and Create a Database

Log in using the oracle account.

Change directory to the location where you extracted the Oracle Database 10g Release 2 software.

Ex:

```
$ cd $HOME/10gR2_db
```

Change directory to Disk1.

Ex:

```
$ cd database
```

Start the Oracle Universal Installer.

```
$ ./runInstaller
```

1. Select Installation Method
 - o Select Basic Installation
 - o Oracle Home Location: /u01/app/oracle/product/10.2.0/db_1
 - o Installation Type: Enterprise Edition (1.3GB)
 - o UNIX DBA Group: oinstall
 - o Make sure Create Starter Database is checked
 - o Global Database Name: demo1
 - o Enter the Database Password and Confirm Password
 - o Click on Next
2. Specify Inventory Directory and Credentials

- Inventory Directory: /u01/app/oracle/oraInventory
 - Operating System group name: oinstall
 - Click on Next
3. Product-specific Prerequisite Checks
 - If you've been following the steps in this guide, all the checks should pass without difficulty. If one or more checks fail, correct the problem before proceeding.
 - Click on Next
 4. Summary
 - A summary of the products being installed is presented.
 - Click on **Install**.
 5. Configuration Assistants
 - The Oracle Net, Oracle Database, and iSQL*Plus configuration assistants will run automatically
 6. Execute Configuration Scripts
 - At the end of the installation, a pop up window will appear indicating scripts that need to be run as root. Login as root and run the indicated scripts.
 - Click on OK when finished.
 7. End of Installation
 - Make note of the URLs presented in the summary, and click on **Exit** when ready.
 8. Congratulations! Your new Oracle Database 10g Release 2 database is up and ready for use.

Part IV: Configuring Storage

The database we created in Part III used a single filesystem for disk storage. However, there are several other ways to configure storage for an Oracle database.

Part IV explores other methods of configuring disk storage for a database. In particular, it describes creating additional filesystems and using Automatic Storage Management (ASM). Use of raw devices and Oracle Cluster File System (OCFS) is covered in the next article in this series which walks through installing Oracle RAC Database 10g Release 2 on Linux x86.

Partition the Disks

In order to use either file systems or ASM, you must have unused disk partitions available. This section describes how to create the partitions that will be used for new file systems and for ASM.

WARNING: Improperly partitioning a disk is one of the surest and fastest ways to *wipe out everything on your hard disk*. If you are unsure how to proceed, stop and get help, or you will risk losing data.

This example uses /dev/sdb (an empty SCSI disk with no existing partitions) to create a single partition for the entire disk (36 GB).

```
Ex:  
# fdisk /dev/sdb
```


Device contains neither a valid DOS partition table, nor Sun, SGI or OSF disklabel

Building a new DOS disklabel. Changes will remain in memory only, until you decide to write them. After that, of course, the previous content won't be recoverable.

The number of cylinders for this disk is set to 4427. There is nothing wrong with that, but this is larger than 1024, and could in certain setups cause problems with:

- 1) software that runs at boot time (e.g., old versions of LILO)
- 2) booting and partitioning software from other OSs (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): p

Disk /dev/sdb: 255 heads, 63 sectors, 4427 cylinders
Units = cylinders of 16065 * 512 bytes

Device	Boot	Start	End	Blocks	Id	System
--------	------	-------	-----	--------	----	--------

Command (m for help): n

Command action

e extended

p primary partition (1-4)

p

Partition number (1-4): 1

First cylinder (1-4427, default 1):

Using default value 1

Last cylinder or +size or +sizeM or +sizeK (1-4427, default 4427):

Using default value 4427

Command (m for help): w

The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: If you have created or modified any DOS 6.x partitions, please see the fdisk manual page for additional information.

Syncing disks.

Now verify the new partition:

Ex:

```
# fdisk -l /dev/sdb
```

Disk /dev/sdb: 36.4 GB, 36420075008 bytes
255 heads, 63 sectors/track, 4427 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

Device	Boot	Start	End	Blocks	Id	System
/dev/sdb1	*	1	4427	35559846	83	Linux

Repeat the above steps for each disk to be partitioned. The following section on Filesystems uses a single disk partition, /dev/sdb1. The ASM example uses three partitions on three disks: /dev/sdb1, /dev/sdc1, and /dev/sdd1

Filesystems

Filesystems are the most widely used means of storing data file, redo logs, and control files for Oracle databases. Filesystems are easy to implement and require no third-party software to administer.

In most cases, filesystems are created during the initial installation of Linux. However, there are times when a new filesystem must be created after the initial installation, such as when a new disk drive is being installed.

This section describes building a new filesystem and using it in an Oracle database. Unless otherwise noted, all commands must be run as root.

Create the Filesystem

Use ext3 to create this new filesystem. Other filesystems work just as well, but ext3 offers the fastest recovery time in the event of a system crash.

Ex:

```
# mke2fs -j /dev/sdb1
mke2fs 1.26 (3-Feb-2002)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
4447744 inodes, 8889961 blocks
444498 blocks (5.00%) reserved for the super user
First data block=0
272 block groups
32768 blocks per group, 32768 fragments per group
16352 inodes per group
Superblock backups stored on blocks:
 32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632,
 2654208, 4096000, 7962624
```

```
Writing inode tables: done
```

```
Creating journal (8192 blocks): done
```

```
Writing superblocks and filesystem accounting information: done
```

This filesystem will be automatically checked every 23 mounts or 180 days, whichever comes first. Use tune2fs -c or -i to override.

Create the Mount Point

A filesystem must have a mount point, which is simply an empty directory where the new filesystem "attaches" to the system's directory tree. Mount points should be given names consistent with the Oracle Flexible Architecture (OFA) standard. For more information on OFA standards, see [Appendix C](#) of the *[Oracle Database Installation Guide 10g Release 2 \(10.2\) for Linux x86](#)*.

Because you have already created the /u01 directory in Part I, use /u02 for this example.

Ex:

```
# mkdir /u02
```

Add the New Filesystem to /etc/fstab

So that the new filesystem will be mounted automatically when the system boots, you need to add a line to the /etc/fstab file that describes the new filesystem and where to mount it. Add a line similar to the one below to /etc/fstab, using a text editor.

```
/dev/sdb1 /u02 ext3 defaults 1 1
```

Mount the New Filesystem

Mounting the filesystem makes it available for use. Until the filesystem is mounted, files cannot be stored in it. Use the following commands to mount the filesystem and verify that it is available.

```
mount /u02
df -h /u02
```

Ex:

```
# mount /u02
# df -h /u02
Filesystem Size Used Avail Use% Mounted on
/dev/sdb1 33G 33M 31G 1% /u02
```

Create Oracle Directories and Set Permissions

Now you create a directory to store your Oracle files. The directory name used in the example follows the OFA standard naming convention for a database with ORACLE_SID=demo1.

```
mkdir -p /u02/oradata/demo1
chown -R oracle:oinstall /u02/oradata
chmod -R 775 /u02/oradata
```

Create a New Tablespace in the New Filesystem

The new filesystem is ready for use. Next you create a new tablespace in the filesystem to store your database objects. Connect to the database as the SYSTEM user, and execute the CREATE TABLESPACE statement, specifying the data file in the new filesystem.

Ex:

```
$ sqlplus
```

```
SQL*Plus: Release 10.2.0.1.0 - Production on Sun Nov 27 15:50:50
2005
```

```
Copyright (c) 1982, 2005, Oracle. All rights reserved.
```

```
Enter user-name: system
```

```
Enter password:
```

```
Connected to:
```

```
Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 -
Production
```

```
With the Partitioning, OLAP and Data Mining options
```

```
SQL> create tablespace data1
  2  datafile '/u02/oradata/demo1/data1_01.dbf' size 100m
  3  extent management local
  4  segment space management auto;
```

```
Tablespace created.
```

Now you can use the new tablespace to store database objects such as tables and indexes.

Ex:

```
SQL> create table demotab (id number(5) not null primary key,
  2  name varchar2(50) not null,
  3  amount number(9,2))
  4  tablespace data1;
```

```
Table created.
```

Automatic Storage Management (ASM)

ASM was a new storage option introduced with Oracle Database 10gR1 that provides the services of a filesystem, logical volume manager, and software RAID in a platform-independent manner. ASM can stripe and mirror your disks, allow disks to be added or removed while the database is under load, and automatically balance I/O to remove "hot spots." It also supports direct and asynchronous I/O and implements the Oracle Data Manager API (simplified I/O system call interface) introduced in Oracle9i.

ASM is not a general-purpose filesystem and can be used only for Oracle data files, redo logs, and control files. Files in ASM can be created and named automatically by the database (by use of the Oracle Managed Files feature) or manually by the DBA. Because the files stored in ASM are not accessible to the operating system, the only way to perform backup and recovery operations on databases that use ASM files is through Recovery Manager (RMAN).

ASM is implemented as a separate Oracle instance that must be up if other databases are to be able to access it. Memory requirements for ASM are light: only 64 MB for most systems.

Installing ASM

On Linux platforms, ASM can use raw devices or devices managed via the ASMLib interface. Oracle recommends ASMLib over raw devices for ease-of-use and performance reasons. ASMLib 2.0 is available for [free download](#) from OTN. This section walks through the process of configuring a simple ASM instance by using ASMLib 2.0 and building a database that uses ASM for disk storage.

Determine Which Version of ASMLib You Need

ASMLib 2.0 is delivered as a set of three Linux packages:

- oracleasm-lib-2.0 - the ASM libraries
- oracleasm-support-2.0 - utilities needed to administer ASMLib
- oracleasm - a kernel module for the ASM library

Each Linux distribution has its own set of ASMLib 2.0 packages, and within each distribution, each kernel version has a corresponding oracleasm package. The following paragraphs describe how to determine which set of packages you need.

First, determine which kernel you are using by logging in as root and running the following command:

```
uname -rm
```

Ex:

```
# uname -rm  
2.6.9-22.ELsmp i686
```

The example shows that this is a 2.6.9-22 kernel for an SMP (multiprocessor) box using Intel i686 CPUs.

Use this information to find the correct ASMLib packages on OTN:

1. Point your Web browser to <http://www.oracle.com/technology/tech/linux/asmlib/index.html>
2. Select the link for your version of Linux.
3. Download the oracleasm-lib and oracleasm-support packages for your version of Linux
4. Download the oracleasm package corresponding to your kernel. In the example above, the

oracleasm-2.6.9-22.ELsmp-2.0.0-1.i686.rpm package was used.

Next, install the packages by executing the following command as root:

```
rpm -Uvh oracleasm-kernel_version-asmlib_version.cpu_type.rpm \  
oracleasmlib-asmlib_version.cpu_type.rpm \  
oracleasm-support-asmlib_version.cpu_type.rpm
```

Ex:

```
# rpm -Uvh \  
> oracleasm-2.6.9-22.ELsmp-2.0.0-1.i686.rpm \  
> oracleasmlib-2.0.1-1.i386.rpm \  
> oracleasm-support-2.0.1-1.i386.rpm  
Preparing...  
##### [100%]  
 1:oracleasm-support  
##### [ 33%]  
 2:oracleasm-2.6.9-  
22.ELsmp##### [ 67%]  
 3:oracleasmlib  
##### [100%]
```

Configuring ASMLib

Before using ASMLib, you must run a configuration script to prepare the driver. Run the following command as root, and answer the prompts as shown in the example below.

```
# /etc/init.d/oracleasm configure  
Configuring the Oracle ASM library driver.  
  
This will configure the on-boot properties of the Oracle ASM library  
driver. The following questions will determine whether the driver is  
loaded on boot and what permissions it will have. The current values  
will be shown in brackets ('[]'). Hitting <ENTER> without typing an  
answer will keep that current value. Ctrl-C will abort.  
  
Default user to own the driver interface []: oracle  
Default group to own the driver interface []: dba  
Start Oracle ASM library driver on boot (y/n) [n]: y  
Fix permissions of Oracle ASM disks on boot (y/n) [y]: y  
Writing Oracle ASM library driver configuration: [ OK ]  
Creating /dev/oracleasm mount point: [ OK ]  
Loading module "oracleasm": [ OK ]  
Mounting ASMLib driver filesystem: [ OK ]  
Scanning system for ASM disks: [ OK ]
```

Next you tell the ASM driver which disks you want it to use. Oracle recommends that each disk contain a single partition for the entire disk. See [Partitioning the Disks](#) at the beginning of this section for an example of creating disk partitions.

You mark disks for use by ASMLib by running the following command as root:

```
/etc/init.d/oracleasm createdisk DISK_NAME device_name
```

Tip: Enter the DISK_NAME in UPPERCASE letters.

Ex:

```
# /etc/init.d/oracleasm createdisk VOL1 /dev/sdb1
Marking disk "/dev/sdb1" as an ASM disk:           [ OK ]
# /etc/init.d/oracleasm createdisk VOL1 /dev/sdc1
Marking disk "/dev/sdc1" as an ASM disk:           [ OK ]
# /etc/init.d/oracleasm createdisk VOL1 /dev/sdd1
Marking disk "/dev/sdd1" as an ASM disk:           [ OK ]
```

Verify that ASMLib has marked the disks:

```
# /etc/init.d/oracleasm listdisks
VOL1
VOL2
VOL3
```

Create the ASM Instance

ASM runs as a separate Oracle instance which can be created and configured using the Oracle Universal Installer. Now that ASMLib is installed and the disks are marked for use, you can create an ASM instance.

Log in as oracle and start runInstaller:

```
$ ./runInstaller
```

1. Select Installation Method
 - o Select Advanced Installation
 - o Click on Next
2. Specify Inventory Directory and Credentials
 - o Inventory Directory: /u01/app/oracle/oraInventory
 - o Operating System group name: oinstall
 - o Click on Next
3. Select Installation Type
 - o Select Enterprise Edition
 - o Click on Next
4. Specify Home Details
 - o Name: OraDB10gASM
 - o Path: /u01/app/oracle/product/10.2.0/asm
Note: Oracle recommends using a different ORACLE_HOME for ASM than the ORACLE_HOME used for the database for ease of administration.
 - o Click on Next
5. Product-specific Prerequisite Checks

- If you've been following the steps in this guide, all the checks should pass without difficulty. If one or more checks fail, correct the problem before proceeding.
- Click on Next
- 6. Select Configuration Option
 - Select Configure Automatic Storage Management (ASM)
 - Enter the ASM SYS password and confirm
 - Click on Next
- 7. Configure Automatic Storage Management
 - Disk Group Name: DATA
 - Redundancy
 - **High** mirrors data twice.
 - **Normal** mirrors data once. This is the default.
 - **External** does not mirror data within ASM. This is typically used if an external RAID array is providing redundancy.
 - Add Disks

The disks you configured for use with ASMLib are listed as Candidate Disks. Select each disk you wish to include in the disk group.
 - Click on Next
- 8. Summary
 - A summary of the products being installed is presented.
 - Click on **Install**.
- 9. Execute Configuration Scripts
 - At the end of the installation, a pop up window will appear indicating scripts that need to be run as root. Login as root and run the indicated scripts.
 - Click on OK when finished.
- 10. Configuration Assistants
 - The Oracle Net, Oracle Database, and iSQL*Plus configuration assistants will run automatically
- 11. End of Installation
 - Make note of the URLs presented in the summary, and click on **Exit** when ready.
- 12. Congratulations! Your new Oracle ASM Instance is up and ready for use.

Create the Database

Once the ASM instance has been created, create a database that uses ASM for storage:

Log in as oracle and start runInstaller:

```
$ ./runInstaller
```

1. Select Installation Method
 - Select Advanced Installation
 - Click on Next
2. Select Installation Type
 - Select Enterprise Edition

- Click on Next
- 3. Specify Home Details
 - Name: OraDb10g_home1
 - Path: /u01/app/oracle/product/10.2.0/db_1
Note: Oracle recommends using a different ORACLE_HOME for the database than the ORACLE_HOME used for ASM.
 - Click on Next
- 4. Product-specific Prerequisite Checks
 - If you've been following the steps in this guide, all the checks should pass without difficulty. If one or more checks fail, correct the problem before proceeding.
 - Click on Next
- 5. Select Configuration Option
 - Select Create a Database
 - Click on Next
- 6. Select Database Configuration
 - Select General Purpose
 - Click on Next
- 7. Specify Database Configuration Options
 - Database Naming: Enter the Global Database Name and SID
 - Database Character Set: Accept the default
 - Database Examples: Select Create database with sample schemas
 - Click on Next
- 8. Select Database Management Option
 - Select Use Database Control for Database Management
 - Click on Next
- 9. Specify Database Storage Option
 - Select Automatic Storage Management (ASM)
 - Click on Next
- 10. Specify Backup and Recovery Options
 - Select Do not enable Automated backups
 - Click on Next
- 11. Select ASM Disk Group
 - Select the DATA disk group created in the previous section
 - Click on Next
- 12. Specify Database Schema Passwords
 - Select Use the same password for all the accounts
 - Enter the password and confirm
 - Click on Next
- 13. Summary
 - A summary of the products being installed is presented.
 - Click on **Install**.
- 14. Configuration Assistants
 - The Oracle Net, Oracle Database, and iSQL*Plus configuration assistants will run automatically
- 15. Execute Configuration Scripts
 - At the end of the installation, a pop up window will appear indicating scripts that need

- to be run as root. Login as root and run the indicated scripts.
 - o Click on OK when finished.
16. End of Installation
- o Make note of the URLs presented in the summary, and click on **Exit** when ready.
17. Congratulations! Your new Oracle Database is up and ready for use.

Conclusion

Now that your database is up and running, you can begin exploring the many new features offered in Oracle Database 10g Release 2. A great place to start is Oracle Enterprise Manager, which has been completely re-written with a crisp new Web-based interface. If you're unsure where to begin, the [Oracle Database Concepts 10g Release 2](#) and the [2-Day DBA Guide](#) will help familiarize you with your new database. OTN also has a number of guides designed to help you get the most out of Oracle Database 10g Release 2.

Appendix

Accessing the Database with SQL*Plus

Log into Linux as oracle. Set the environment.

Set the Oracle environment variables:

```
$ . oraenv
ORACLE_SID = [oracle] ? demo1
```

Run SQL*Plus:

```
$ sqlplus

SQL*Plus: Release 10.2.0.1.0 - Production on Sun Nov 27 15:40:29 2005

Copyright (c) 1982, 2005, Oracle. All rights reserved.

Enter user-name: / as sysdba

Connected to:
Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Production
With the Partitioning, OLAP and Data Mining options

SQL>
```

Using Oracle Enterprise Manager 10g Database Control

In a Web browser, connect to the URL provided during the installation.

Ex:

http://ds1.orademo.org:1158/em (You may have to use the IP address instead of the host name if your database server isn't in your DNS.)

User Name: SYS

Password: <The password you chose during installation>

Connect As: SYSDBA

Click on <Login>

The screenshot displays the Oracle Enterprise Manager 10g Database Control interface for a database instance named 'demo1'. The page is titled 'Database Instance: demo1' and shows various performance and configuration metrics.

General Information:

- Status: Up
- Up Since: Nov 27, 2005 7:00:41 PM PST
- Instance Name: demo1
- Version: 10.2.0.1.0
- Host: ds1.froboz.org
- Listener: LISTENER ds1.froboz.org
- ASM: +ASM ds1.froboz.org

Host CPU: A bar chart showing CPU usage for 'Other' and 'demo1' processes. The load is 0.14 and paging is 0.00. Maximum CPU usage is 2%.

Active Sessions: A bar chart showing session counts for 'Wait', 'User I/O', and 'CPU'.

SQL Response Time: A warning icon indicates 'Baseline is empty'. A 'Reset Baseline' button is available.

Diagnostic Summary:

- ADDM Findings: 0
- All Policy Violations: 7
- Alert Log: No ORA- errors

Space Summary:

- Database Size (GB): 0.845
- Problem Tablespaces: 0
- Segment Advisor: 0
- Recommendations: 0
- Space Violations: 0
- Dump Area Used (%): 77

High Availability:

- Instance Recovery Time (sec): 22
- Last Backup: n/a
- Usable Flash Recovery Area (%): 92.35
- Flashback Logging: Disabled

Alerts: A table with columns for Severity, Category, Name, Message, and Alert Triggered. It shows '(No alerts)'. There are 0 Critical and 0 Warning alerts.

Job Activity: Jobs scheduled to start no more than 7 days ago. Scheduled Executions: 0, Running Executions: 0, Suspended Executions: 0, Problem Executions: 0.

Related Links:

- Advisor Central
- All Metrics
- Jobs
- Alert History
- Blackouts
- Manage Metrics
- Alert Log Content
- iSQL*Plus
- Metric Baselines

Welcome to the world of Oracle Enterprise Manager 10g Database Control!

Starting and Stopping Oracle Enterprise Manager Database Control:

```
$ emctl start dbconsole  
$ emctl stop dbconsole
```

Accessing the Database Using iSQL*Plus

iSQL*Plus is a Web-based version of the venerable SQL*Plus interactive tool for accessing databases. To use iSQL*Plus, click on the iSQL*Plus link in the Related Links section of the OEM console or point your browser to the iSQL*Plus URL provided during installation.

Ex:

<http://ds1.orademo.org:5560/isqlplus> (You may have to use the IP address instead of the host name if your database server isn't in your DNS.)

User Name: SYSTEM

Password: <The password you chose during installation>

Click on <Login>.

Enter SQL commands in the Workspace box, and click on **Execute**.

ORACLE
iSQL*Plus

Logout Preferences Help

Workspace History

Connected as SYSTEM@demo1

Workspace

Enter SQL, PL/SQL and SQL*Plus statements. Clear

select * from user_objects;

Execute Load Script Save Script Cancel

OBJECT_NAME	SUBOBJECT_NAME	OBJECT_ID	DATA_OBJECT_ID	OBJECT_TYPE	CREATED	LAST_DDL_TIME	TIMESTAMP
SYSCATALOG		2563		SYNONYM	30-JUN-05	30-JUN-05	2005-06-30 19:11
CATALOG		2565		SYNONYM	30-JUN-05	30-JUN-05	2005-06-30 19:11
TAB		2567		SYNONYM	30-JUN-05	30-JUN-05	2005-06-30 19:11
CCL		2570		SYNONYM	30-JUN-05	30-JUN-05	2005-06-30 19:11
TABQUOTAS		2574		SYNONYM	30-JUN-05	30-JUN-05	2005-06-30 19:11
SYSFILES		2576		SYNONYM	30-JUN-05	30-JUN-05	2005-06-30 19:11
PUBLICSYN		2579		SYNONYM	30-JUN-05	30-JUN-05	2005-06-30 19:11
MVIEW\$_ADV_WORKLOAD		3621	3621	TABLE	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_WORKLOAD_PK		3622	3622	INDEX	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_WORKLOAD_IDX_01		3623	3623	INDEX	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_BASSETABLE		3624	3624	TABLE	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_BASSETABLE_IDX_01		3625	3625	INDEX	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_SQLDEPEND		3626	3626	TABLE	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_SQLDEPEND_IDX_01		3627	3627	INDEX	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_PRETTY		3628	3628	TABLE	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_PRETTY_IDX_01		3629	3629	INDEX	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_TEMP		3630	3630	TABLE	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_TEMP_IDX_01		3631	3631	INDEX	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_FILTER		3632	3632	TABLE	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_FILTER_PK		3633	3633	INDEX	30-JUN-05	30-JUN-05	2005-06-30 19:12
MVIEW\$_ADV_LOG		3634	3634	TABLE	30-JUN-05	30-JUN-05	2005-06-30 19:12

Starting and Stopping iSQL*Plus:

```
$ isqlplusctl start
$ isqlplusctl stop
```

Starting and Stopping the Listener:

The listener accepts connection requests from clients and creates connections to the database once the credentials have been authenticated. Before you can use OEM or iSQL*Plus, the listener must be up.

```
$ lsnrctl start
```

```
$ lsnrctl stop
```

Starting and Stopping the Database:

The easiest way to start and stop the database is from the OEM Console. To do that from the command line, use SQL*Plus while logged in as oracle, as follows:

Startup:

```
$ sqlplus
```

```
SQL*Plus: Release 10.2.0.1.0 - Production on Sun Nov 27 15:39:27 2005
```

```
Copyright (c) 1982, 2005, Oracle. All rights reserved.
```

```
Enter user-name: / as sysdba  
Connected to an idle instance.
```

```
SQL> startup  
ORACLE instance started.
```

```
Total System Global Area 285212672 bytes  
Fixed Size 1218968 bytes  
Variable Size 96470632 bytes  
Database Buffers 180355072 bytes  
Redo Buffers 7168000 bytes  
Database mounted.  
Database opened.
```

```
SQL> exit
```

Shutdown:

```
$ sqlplus
```

```
SQL*Plus: Release 10.2.0.1.0 - Production on Sun Nov 27 15:40:29 2005
```

```
Copyright (c) 1982, 2005, Oracle. All rights reserved.
```

```
Enter user-name: / as sysdba
```

```
Connected to:  
Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Production  
With the Partitioning, OLAP and Data Mining options
```

```
SQL> shutdown immediate  
Database closed.  
Database dismounted.  
ORACLE instance shut down.
```

```
SQL> exit
```

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