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# Installing Oracle9*i* RAC on IBM @server x360 with FAStT700 running RedHat AS 2.1

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Many thanks to :

Oracle/IBM JSC team IBM/Oracle ICC team





# Installing Oracle 9.2 RAC on x360 and FAStT700 with RedHat Advanced Server 2.1

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# THE AIM OF THIS DOCUMENT

The aim of this document is to provide help to install Oracle9*i* Real Application Clusters on IBM eServer x360 with FAStT700 running Red Hat Advanced Server 2.1 through a description of the different steps necessary to run Oracle9*i* RAC. In this document, we take into account the specifics of the IBM xSeries hardware, and give you the necessary information to successfully install Oracle9*i* RAC on IBM xSeries.

The information contained in this paper resulted from:

- Oracle and IBM documentation
- Installation runs of Oracle9*i* RAC
- Certification work done on this cluster
- Workshop experiences done in the Oracle/IBM Joint Solutions Center
- Contributions from Oracle and IBM specialists.

Please also refer to Oracle documentations for more information. (http://docs.us.oracle.com).

- Oracle9*i* Installation Guide Release 9.2.0.1 for UNIX Systems
- Oracle9i Administrator's Reference 9.2.0.1 for UNIX Systems
- Oracle9i Release Notes Release 2 (9.2.0.1.0) for Linux Intel
- Oracle9i Online Generic Documentation CD-ROM Installation and Usage Notes
- Oracle9*i* Real Application Clusters Installation and Configuration
- Oracle Enterprise Manager Configuration Guide

#### IMPORTANT:

Once the hardware is configured and the environment ready, the installation of the Oracle product is identical on all Linux platforms. We have based this installation procedure on the document "Step-By-Step Installation of RAC on Linux" from Metalink. We have illustrated it with the screen shots from our labs.

Sections from "Hardware cabling and Firmware" to "Configuring the storage" are xSeries and RedHat specifics.

Sections from "Installing the Cluster Manager" to 'Creating a Cluster Database" come from "Step-By-Step Installation of RAC on Linux" from Metalink.

Your comments are important for us. We want our technical papers to be as helpful as possible. Please send us your comments about this document to the Oracle/IBM Joint Solutions Center.

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# PLANNING THE INSTALLATION

Get the RedHat Advanced Server 2.1 CDs

Get the IBM ServeRAID 4.84 Support CD

Search and download the BIOS/drivers from http://www.pc.ibm.com:

- •IBM eServer xSeries 360 Flash BIOS Update version 1.03
- •IBM eServer xSeries 360 Diagnostic Flash Update version 3.00
- •Servers Fibre Channel Solutions: IBM FAStT Host Adapter BIOS version 1.76
- Servers and Fibre Channel Solutions IBM FAStT Host Adapter failover device driver version 6.0 for Linux
- •Fibre Channel Solutions IBM FAStT Storage Manager version 8.21 Fibre Channel Controller firmware
- Fibre Channel Solutions IBM FAStT Storage Manager version 8.21 for Red Hat Linux
- Fibre Channel Solutions IBM FAStT MSJ Diagnostic and Configuration Utility version 2.0 release 33 for Linux

Search and download the documentation from http://www.pc.ibm.com:

IBM eServer xSeries 360 - Installing Red Hat Advanced Server Linux v2.1

Search and download the Redbooks/Redpapers from http://www.redbooks.ibm.com:

- Implementing IBM eServer xSeries SANs, REDP0416
- Implementing Oracle9i RAC with Linux on IBM eServer xSeries servers, REDP0410

Get Oracle9i R2 Enterprise Edition CDs (they can also be downloaded from http://technet.oracle.com)





# HARDWARE CABLING AND FIRMWARE

### **HARDWARE CONFIGURATION**

Check the hardware configuration with the xSeries Oracle9i RAC Configuration Guide.

### CABLING

The chart below shows a 2 nodes configuration.

Also, there are redundant SAN switches (2109 S16). The redundancy is not mandatory but it increases the availability of the cluster (check the "Implementing IBM eServer xSeries SANs" Redbook for more information on SAN configurations).



### FIRMWARE

Here are the minimum levels of firmware/BIOS for the different hardware parts (Check the latest supported level on http://www.pc.ibm.com):

- x360 BIOS: 1.03
- ServeRaid BIOS: 4.84
- FAStT FC-2 HBA BIOS: 1.76
- FAStT700 firmware:

Check the readme of the downloaded files for the upgrade process. See the "PLANNING THE INSTALLATION" section for the downloads.

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Also check the <u>Implementing IBM eServer xSeries SANs</u> Redbook for more information on the FAStT firmware upgrade.

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### **OPERATING SYSTEM SETUP**

This chapter will guide you through the steps for the post-installation of RedHat Advanced Server to take in account the specifics of the IBM xSeries cluster.

After you have installed RedHat Advanced Server 2.1 on all nodes (check the installation procedure "IBM eServer xSeries 360 - Installing Red Hat Advanced Server Linux v2.1" from <u>http://www.pc.ibm.com</u>), follow these steps on each nodes in the cluster:

- 1. Install the Enterprise kernel:
  - mount the 1st CDROM of RHAS, as root run: rpm -U /mnt/cdrom/RedHat/RPMS/kernel-enterprise-2.4.9-e.3.i686.rpm
- Change the Grub configuration to have the Enterprise kernel loaded as the default: edit /boot/grub/grub.conf, the Enterprise kernel is the first kernel entry in the file, the entry default has to be set to 0.

```
default=0
timeout=10
splashimage=(hd0,0)/grub/splash.xpm.gz
title Red Hat Linux (2.4.9-e.3enterprise)
   root (hd0,0)
   kernel /vmlinuz-2.4.9-e.3enterprise ro root=/dev/sdb5
   initrd /initrd-2.4.9-e.3enterprise.img
title Red Hat Linux Advanced Server (2.4.9-e.3smp)
   root (hd0,0)
   kernel /vmlinuz-2.4.9-e.3smp ro root=/dev/sdb5
   initrd /initrd-2.4.9-e.3smp.img
title Red Hat Linux Advanced Server-up (2.4.9-e.3)
   root (hd0,0)
   kernel /vmlinuz-2.4.9-e.3 ro root=/dev/sdb5
   initrd /initrd-2.4.9-e.3.img
```

grub.conf

Note: The Summit kernel is required if you are installing an xSeries 440. To install the Summit kernel, mount the 1st CDROM of RHAS and run the following command as root: rpm -U /mnt/cdrom/RedHat/RPMS/kernel-summit-2.4.9-e.3.i686.rpm

Change the Grub configuration to load the Summit kernel by default. Edit /boot/grub/grub.conf, the Summit kernel is the first kernel entry in the file. Set the entry default to **0**.

```
default=0
timeout=10
splashimage=(hd0,0)/grub/splash.xpm.gz
title Red Hat Linux (2.4.9-e.3summit)
        root (hd0,0)
        kernel /vmlinuz-2.4.9-e.3summit ro root=/dev/sda3
        initrd /initrd-2.4.9-e.3summit.img
title Red Hat Linux Advanced Server (2.4.9-e.3enterprise)
        root (hd0,0)
        kernel /vmlinuz-2.4.9-e.3enterprise ro root=/dev/sda3
        initrd /initrd-2.4.9-e.3enterprise.img
    grub.conf
```

If you use LILO and not GRUB as the boot loader, edit /etc/lilo.conf, and as root run lilo afterwards.





3. Change the modules order of the devices:

edit /etc/modules.conf. The ServeRaid adapter driver, ipc, has to be the first scsi module to be loaded, it is mapped to SCSIXXXX. The FAStT adapter comes after, it is mapped to SCSIXXX1, the others are mapped to SCSIXXX2, SCSIXXX3, etc.

append the following line to enable up to 32 SCSI devices per adapter:

```
options scsi_mod max_scsi_luns=32
alias parport_lowlevel parport_pc
alias eth0 eepro100
alias eth1 e1000
alias scsi_hostadapter ips
alias scsi_hostadapter1 qla2300
alias scsi_hostadapter2 qla2300
alias usb-controller usb-ohci
options scsi_mod max_scsi_luns=32
modules.conf
```

4. Configure the network:

Stop the network service with the command: service network stop The motherboard Ethernet device is used for the public LAN. To configure this device, edit /etc/sysconfig/network-scripts/ifcfg-eth0.

```
DEVICE=eth0
BOOTPROTO=static
ONBOOT=yes
IPADDR=10.10.180.1
NETMASK=255.255.255.0
```

/etc/sysconfig/network -scripts/ifcfg-eth0

The Fiber Channel Gigabit Ethernet device is used for the private LAN. To configure this device, edit /etc/sysconfig/network-scripts/ifcfg-eth1.

```
DEVICE=eth1
ONBOOT=yes
BOOTPROTO=static
IPADDR=1.1.1.1
NETMASK=255.255.255.0
```

/etc/sysconfig/network -scripts/ifcfg-eth1

5. Install the necessary packages to recompile the FAStT adapter driver. Mount the 1st CDROM of RHAS:

rpm -U /mnt/cdrom/RedHat/RPMS/kernel-header-2.4.9-e.3.i386.rpm Mount the 2nd CDROM of RHAS:

```
rpm -U /mnt/cdrom/RedHat/RPMS/binutils-2.11.90.0.8-12.i386.rpm
```

```
rpm -U /mnt/cdrom/RedHat/RPMS/glibc-devel-2.2.4-26.i386.rpm
```

rpm -U /mnt/cdrom/RedHat/RPMS/cpp-2.96-108.1.i386.rpm

rpm -U /mnt/cdrom/RedHat/RPMS/gcc-2.96-108.1.i386.rpm

rpm -U /mnt/cdrom/RedHat/RPMS/kernel-source-2.4.9-e.3.i386.rpm 6. Recompile the FAStT adapter driver. (Note: If you are installing an xSeries 440, replace

"enterprise" with "summit" in the following steps.)

```
cd /usr/src/linux-2.4
cp ./configs/kernel-2.4.9-i686-enterprise.config .config
make dep
cd /root
Untar the IBM FAStT Host Adapter failover device driver version 6.0 for Linux.
tar xvfz 0103.tgz
The iXXXX will be created:
cd iXXXX
```

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./libinstall
./drvsetup
make all SMP=1
Replace the existing drivers:

cp qla\*.o /lib/modules/2.4.9-e.3enterprise/kernel/drivers/addon/qla2200/

Recreate the initial RAM disk:

rm /boot/initrd-2.4.9-e.3enterprise.img

mkinitrd /boot/initrd-2.4.9-e.3enterprise.img 2.4.9-e.3enterprise

- 7. Reboot the server.
- 8. Configure the Hosts file.

Edit /etc/hosts. The hosts name are mapped to the public LAN addresses. The int-<hosts name> are mapped to the private LAN addresses.

x360r1 x360r2 int-x360r1 int-x360r2

/etc/hosts

9. Configure the hosts equivalence.

Add the public and private hosts name to the /etc/hosts.equiv file.

```
x360r1
x360r2
int-x360r1
int-x360r2
```

/etc/hosts.equiv

10. Make the rlogin and rsh services started automatically.

```
chkconfig -level 3 rlogin on
     chkconfig -level 4 rlogin on
     chkconfig -level 5 rlogin on
     chkconfig -level 3 rsh on
     chkconfig -level 4 rsh on
     chkconfig -level 5 rsh on
11. Create the Oracle user.
    mkdir /oracle
    addgroup dba
     adduser -G dba -g disk -h /oracle oracle
  Edit the profile for the Oracle user /oracle/.bash_profile.
  # .bash_profile
  # Get the aliases and functions
  if [ -f ~/.bashrc ]; then
           . ~/.bashrc
  fi
  # User specific environment and startup programs
  PATH=$PATH:$HOME/bin
  export PATH
  unset USERNAME
  export ORACLE_BASE=/oracle
```



```
export ORACLE_HOME=$ORACLE_BASE/92
export ORACLE_TERM=xterm
export TNS_ADMIN=$ORACLE_HOME/network/admin
export ORA_NLS33=$ORACLE_HOME/ocommon/nls/admin/data
export PATH=$PATH:$ORACLE_HOME/bin
export
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$ORACLE_HOME/lib:$ORACLE_HOME/oracm/l
ib
export
CLASSPATH=$ORACLE_HOME/jre:$ORACLE_HOME/jlib:$ORACLE_HOME/rdbms/jlib:$
ORACLE_HOME/network/jlib
export THREADS_FLAG=native
```

export ORACLE\_SID=DB1 /oracle/.bash\_profile

```
Change ownership for the oracle directory.
chown oracle:dba /oracle
```

```
Make sure the raw devices can be read and written by the group disk.
chown root:disk /dev/raw/raw*
```

12. Create the Oracle script to be started automatically at boot time.

```
Edit /etc/init.d/oracle, and fill it as below
```

```
#!/bin/bash
#
# chkconfig: - 92 35
\# description: Load and unload Oracle parameters. \backslash
start() {
    echo -n $"Load Oracle parameters: "
    export SEMMSL=100
    export SEMMNS=1024
    export SEMOPM=100
    export SEMMNI=100
    echo $SEMMSL $SEMMNS $SEMOPM $ SEMMNI > /proc/sys/kernel/sem
    export SHMMAX=2147483648
    echo $SHMMAX > /proc/sys/kernel/shmmax
}
stop() {
    echo -n $"Unload Oracle parameters: "
}
# See how we were called.
case "$1" in
 start)
        start
        ;;
  stop)
        stop
        ;;
 restart | reload)
        stop
        start
```





```
;;
condrestart)
;;
status)
;;
*)
echo $"Usage: $0 {start|stop|restart|condrestart|status}"
exit 1
esac
```

/etc/init.d/oracle

Make the script start automatically at runlevel 3. chkconfig -level 3 oracle on

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### **CONFIGURING THE STORAGE**

### SOFTWARE INSTALLATION

Install the IBM FAStT Storage Manager version 8.21 for Red Hat Linux. This will allow you to configure the FAStT700 storage.

To use this program, run as root: SMclient

Install IBM FAStT MSJ Diagnostic and Configuration Utility version 2.0 release 33. This will allow you to monitor the FAStT adapters behavior. Install the agent and the GUI tool.

To start the agent, run as root: service glremote start

To use the program, run as root: /opt/FAStT\_MSJ/FAStT

### STORAGE USAGE RECOMMANDATIONS FOR ORACLE DATAFILES

Oracle9*i* RAC stores the datafiles in raw devices.

There is one thing you have to keep in mind when configuring and using Oracle9*i* RAC with Red Hat. With AS 2.1, you should not use LVM. **Red Hat does not support LVM**.

LVM brings manageability and flexibility in the storage management, but it is not required to have Oracle9*i* RAC running.

#### Limitations for raw devices creation

Each LUN of the SAN storage is seen in Linux as the disk device.

A disk device can be partitioned.

A partition is mapped to a raw device.

Each disk device can be partitioned in a maximum of 3 primary partitions and 1 extended partition containing 10 logical partitions.

Therefore, for each LUN in the SAN you can only have 13 raw devices.

This has to be taken in account when you configure the SAN storage. When you create a LUN, you have to remember that you will be able to create only 13 raw devices out of it. You will not be able to put all the datafiles of the database on one huge LUN.

For example, if you need 15 datafiles for the data in your database, you will have to create 2 LUNs.

#### Creating raw devices

Use the *fdisk* utility to create partitions on the disk devices. Create 3 primary partitions and one extended partition, and afterwards create up to 10 logical partitions in the extended partitions.

These partitions will be seen in Linux as block devices (/dev/sdb1, /dev/sdb2, /dev/sdb3, /dev/sdb5 ...). To be able to use these fresh partitions, the FAStT adapter driver has to be reloaded with the commands below that you have to run as root:

rmmod qla2300

modprobe qla2300

To use the partitions as raw devices, you have to map the block devices to the raw devices. For this, fill in the file /etc/sysconfig/rawdevices as shown below:

```
# raw device bindings
# format: <rawdev> <major> <minor>
# <rawdev> <blockdev>
# example: /dev/raw/rawl /dev/sdal
# /dev/raw/raw2 8 5
/dev/raw/raw1 /dev/sdo1
/dev/raw/raw2 /dev/sdo2
/dev/raw/raw3 /dev/sdo5
/dev/raw/raw4 /dev/sdo6
```

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/dev/raw/raw5	/dev/sdo7
/dev/raw/raw6	/dev/sdo8
/dev/raw/raw7	/dev/sdo9
/dev/raw/raw8	/dev/sdo10
/dev/raw/raw9	/dev/sdoll
/dev/raw/raw10	/dev/sdp5
/dev/raw/raw11	/dev/sdp6
/dev/raw/raw12	/dev/sdp7
/dev/raw/raw13	/dev/sdp8
/dev/raw/raw14	/dev/sdp9
/dev/raw/raw15	/dev/sdp10
/dev/raw/raw16	/dev/sdp11

Start the rawdevices service to load the raw devices configuration, for this run the following command as root:

service rawdevices start

We recommend to start this service automatically in runlevel 3 (4 and 5). Use the following command: chkconfig --level 3 rawdevices on

#### Adding datafiles when the database is online

If you add a partition with *fdisk* or create a new LUN on the SAN storage, you have to reload the FAStT adapter driver. This means you lose the disk access for some time, and therefore the database instance on the server has to be shutdown.

To maximize database availability, it is recommended to create some spare partitions to use them in the future as new datafiles.

When you run out of new partitions, for each node in the cluster, you will have to shutdown the instance, reload the FAStT adapter driver and restart the instance. This has to be done one node after another, in order to have the database always online.

### **STORAGE CONFIGURATION**

In order to configure the storage and to create the raw devices, draw a table like the following one. This will help you to determine how to configure the SAN storage, how many LUN you have to create, what size to give the LUNs, and it will help you to remember the purpose of each raw device.

The first column is the array you have to create on the FAStT, the second is the LUN name in the array, the third is the description of the datafile that will be put in the raw device, the fourth is the size of the datafile, the fifth is the block device created with fdisk, and the sixth is the raw device name.

RAC raw device	es				
Array name	LUN	Database file	size	Block device	Raw device
RAC	R1	quorum	110 MB	/dev/sdo1	/dev/raw/raw1
RAC	R1	srvm	110 MB	/dev/sdo2	/dev/raw/raw2
Database raw d	evices				
Array name	LUN	Database file	size	Block device	Raw device
Data	D1	SPFILE	5 MB	/dev/sdo5	/dev/raw/raw3
Data	D1	SYSTEM	400 M	3 /dev/s	do6
/dev/r	aw/raw4				
Data	D1	USERS	120 MB	/dev/sdo7	/dev/raw/raw5
Data	D1	TOOLS	12 MB	/dev/sdo8	/dev/raw/raw6
Data	D2	TEMP	110 MB	/dev/sdo9	/dev/raw/raw7
Data	D2	Control file 1	110 MB	/dev/sdo10	/dev/raw/raw8
Data	D2	Control file 2	110 MB	/dev/sdo11	/dev/raw/raw9
Index	l1	INDEX	70 MB	/dev/sdp5	/dev/raw/raw10
Redo	R1	Redo log Thread 1 Group 1	120 MB	/dev/sdp6	/dev/raw/raw11
Redo	R1	Redo log Thread 1 Group 2	120 MB	/dev/sdp7	/dev/raw/raw12
Redo	R1	Redo log Thread 2 Group 1	120 MB	/dev/sdp8	/dev/raw/raw13
Redo	R1	Redo log Thread 2 Group 2	120 MB	/dev/sdp9	/dev/raw/raw14
Undo	U1	Undo tablespace Thread 1	312 MB	/dev/sdp10	/dev/raw/raw15



#### Undo U1 Undo tablespace Thread 2 312 MB

/dev/sdp11

/dev/raw/raw16

Configure the FAStT storage with the IBM Storage Manager client (*SMclient*), follow the instructions in the <u>Implementing IBM eServer xSeries SANs</u> Redbook.

Follow the instructions from the previous section to create the partitions and the raw devices.



# INSTALLING THE CLUSTER MANAGER

First of all you must install the Cluster Manager, which will let you perform the installation of Oracle Database on every node on your cluster. You can easily install Cluster Manager using the Oracle Universal Installer that come with each Oracle product.

Follow these procedures to use the Oracle Universal Installer to install the Oracle Cluster Manager and the Real Application Clusters software. Oracle 9i RAC is supplied on multiple CD-ROM disks, so you must keep all the CDs mounted or available for the installer. During the installation process it may be necessary to switch between the CD-ROMs. Oracle Universal Installer will manage the switching between CDs and ask you for the CD-ROM location if necessary.

To install the Oracle Real Application Clusters Software, you should perform the following operations:

First of all, you should mount as root user at least the first CD-ROM. If you mount all the CDs on a directory if will be easier to switch from each CD. We will follow this procedure with a locally mounted CD-ROM, but you could do it with NFS (or equivalent) mounted media.

Allow the oracle user access to the X Window System server. To do so, do "xhost +" as root user and then log in as the "oracle" user with the "su - oracle" command.

Make sure your display is set with "export DISPLAY=:0" (or "setenv DISPLAY :0"). We used VNC while writing this document, so on the next captured screen you will see the \$DISPLAY variable set to ":1" because it was our active display. Remember that the oracle user may not be able to access the screen if this variable is not correctly set.



Then you can launch the Oracle Universal Installer with "<cdrom\_mount\_point>/runInstaller" or "./runInstaller" from where you have mounted the CD-ROM. As we have mounted our CD-ROM on the /mnt/cdrom directory, we run the installation script from there as shown on the next figure.



orac	:le@x3	60r1:/m	nt/cdro	m							×
File	Edit	Setting	s He	lp							
drwxr-	-xr-x	2 r	oot	root	4096	Jun	21	2001	initrd		
drwxr-	-xr-x	ör 2r	100 100	root	4096 16384	Sep Sen	9 4	16:10	110 lost+found		
drwxr-	-xr-x	2 r	oot	root	4096	Aug	29	2001	nisc		
drwxr-	-xr-x	5 r	oot	root	4096	Sep	5	17:21	mt		
drwxr-	-xr-x	3 r	oot,	root	4096	Sep	4	16:18	opt		
drwxr-	-xr-x	20 91 p	racie oot	aba poot	4096	Sep	10 a	14:06	oracte		
drwxr-	-8	12 r	oot	root	4096	Sep	10	15:30	root		
drwxr-	-xr-x	2 r	oot	root	4096	Sep	4	16:19	sbin		
drwxru	wxrwt	<u>8</u> r	oot	root	4096	Sep	10	10:45	tap		
drwxr-	-xr-x	15 r	oot	root	4096	Sep	4	16:13	usr	57	
Consel	-Xr-X La@uZe	20 r 30p1 /1	100 50 Ø	root /mot/cdpox	4096	ъер	4	10:18	van	1	
[orac]	le@x36	0r1 cd	rom1\$	11	I						
total	18										
drwxr-	-xr-x	62	840	562	2048	May	14	02:46	doc		
-rwxr-	-xr-x	12	840	562 562	5688 2048	May	14	02:46	index.htm		
drwxr-	-xr-x	42	.040 1840		2048	Mau	14	02:46	loto		
drwxr-	-xr-x	22	840	562	2048	May	14	22:23	response		
-rwxr-	-xr-x	1 2	840	562	1163	May	14	02:46	runInstaller		
drwxr-	-xn-x	7 2	840	,562	2048	May	14	03:30	stage		_
[orac]	LE@X3F	Wr1 cd	rom]\$	,/runinst	aller						

You can also copy the contents of the CDs in the stage directory onto the hard disks, so that you will not be prompted to switch the CD in the CDRom drive. Use a directory structure as follows: /<mount point>/Disk1, /<mount point>/Disk2, /<mount point>/Disk3

#### Welcome screen.

The Oracle Universal Installer loads the Java Runtime Environment (you may receive some messages on your terminal window regarding the fonts but this is normal, because if the Java Runtime Environment does not find all the fonts it needs, then it substitutes them with others), and then shows you a welcome screen like the one you can see on the next capture:



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Click "Next" to go to the next screen.

#### Inventory Location screen.

You will be prompted for the Inventory Location if this is the first time that you have started the Oracle Universal Installer on your system. The Inventory Location is the base directory into which Oracle Universal Installer will place the files needed to keep your Oracle installations centralized and up to date. The Oracle Inventory definition can be found in the file /etc/oraInst.loc. On this screen, which looks like the image you can see on the next capture, accept the default values and then click "OK" to continue. If you choose another file location, keep in mind you should be consistent about this location on the future.



UNIX Group screen.

The next screen will prompt you for the UNIX group that the oracle user will use during the installation. This value should be "dba" or "oinstall" if you followed this document to install Oracle 9i RAC, or if you use the Step by Step procedure from Oracle that is available at Metalink's site. So, enter "oinstall" and once again, simply click on "Next" to continue. This screen will look like this:





Shell script as root.

You will be then prompted to execute a shell script as root user. This script is located at "/tmp/oraInst.sh" and you must execute it in order for the installer to work properly.

Oracle Universal Installer
Certain actions need to be performed with root privileges before the install can continue. These actions are stored in a Bourne Shell script called /tmp/orainstRoot.sh.
Please execute the /tmp/orainstRoot.sh script now from another window and then press "Continue" to continue the install.
Help Continue Cancel Continue

### File locations screen.

Once the shell script is executed, you click "OK" and the File Location screen should appear. This screen asks you for some information about the source and destination paths for you installations. Do not change the source location. For the destination location, verify that the value that you have pre-





selected is the one you typed on the "ORACLE\_HOME" variable that you configured on previous steps. Once you verified that all the values are OK, then click on "Next" to continue. This screen will look like this:

Oracle U	niversal Installer. File Locations	
Source	e	
Enter th	e full path of the file representing the product(s) you want to install:	
Path: 7	/mnt/cdrom/stage/products.jar	Browse
Enter or Name:	select an Oracle Home name and its full path: OUIHome	
Path:	/oracle/92	Browse)
	About Oracle Un	iversal Installer
Exit	t Help Installed Products Previous	Next
DACI	<b>-</b>	

### Product Selection screen.

The next screen will show you the different products you can install from the CDs. Select "Oracle Cluster Manager" and click "Next" to start the installation of the Cluster Manager. The screen you will see is this one:







Public nodes information screen.

Oracle Universal Installer needs to know the public names or public IP addresses of the nodes of your cluster. This screen will let you introduce your node names. These nodes must be available from each other for the Oracle Universal Installer to configure the Real Application Clusters properly. In our case, we used two IBM eServer xSeries model 360 named " $x_{360r1}$ " and " $x_{360r2}$ ". The next capture show this configuration screen.

Oracle Universal I	nstaller: Public Node Information	_ = ×
Public No	ode Information	
Please enter the	public node names in the network	
Public Node 1:	x360r1	
Rublic Node 2:		
Public Node 2.	X35072	
Public Node 3:		
Public Node 4:		
Public Node 5:		
Public Node 6:		
Public Node 7:		
Exit	Help Installed Products Previous Next	
ORACLE		





### Private node information screen

On the next screen configure the Private Node addresses that will be used for the interconnect between the different nodes of your cluster. This screen is like this:

Oracle Universal In	staller: Private Node Information	
Drivota N	ada Information	
Privale N	oue information	
Please enter the p	private node names in the network	
Briveta Nada 1		
Private Noue 1.	lint-x360r1	
Private Node 2:	int-x360r2	
Private Node 3:		
Private Node 4:		
Private Node 5:		
Private Node 6:		
Private Node 7:		1988 (1998) - 1998 (1998) - 1998 (1998) - 1998 (1998) - 1998 (1998) - 1998 (1998) - 1998 (1998) - 1998 (1998) -
		and the second
Exit	Help	Previous Next
	incip instance inources	TICTIOUS NCAL

#### Watchdog parameter screen

The next screen asks you for the watchdog parameters. Simply accept the default value (60000) and click "Next" to continue.





Quorum Disk Information

Enter the full name of the raw device you have created for the node monitor for the Quorum disk information. In this case, our quorum device will be /dev/raw/raw1, but do not forget to change it, because your configuration may be different. Click Next to continue.

Oracle Universal Installer: Quo	rum Disk Information		
Quorum Disk I	nformation		
Enter the Quorum Disk Info	ormation		
Quorum Disk Information	/dev/raw/raw1		
		2.	
			*
		1100	
	a sea a second a seco		
			K X
Exit Help	Installed Products	Previous	Next
ORACLE		and a strategy of the strategy	





#### Summary Screen

The next screen is the summary one. Simply press Install.



#### Cluster Manager Installation screen

You will now briefly get a progress window followed by the end of installation screen. Click Exit. and confirm by clicking Yes.

Oracle Universal Installer: Install				_ = ×
Install				
Installation in progress				
Link pending				
link penang				
Statement Statement				
0%	- June Market			
(Cancel)				
You can find a log of this install sessio /oracle/orainventory/logs/installActio	n at: ns2002-09-10_03-!	52-43PM.log		
	tanini i ta ana			X
Exit Help In	talled Products	Previ	ious Next	
ORACLE		ALL OF A STREET		•







Once this screen is shown, you can click Exit and confirm with Yes. Please, verify that you have successfully installed the Cluster Manager on each node.

#### Starting Cluster Manager

The next step is to start the Cluster Manager. This service has to run on each node of the cluster to install RAC.

To do so, go as <code>oracle</code> user to <code>\$ORACLE\_HOME</code> on each node of your cluster and create the <code>\$ORACLE\_HOME/oracm/log</code> directory.

Make sure the watchdog device /dev/watchdog exists on each of the nodes. If not, create it with the following commands, run them as root:

mkdev /dev/watchdog c 10 130
chmod 600 /dev/watchdog

Then, log in as root on each node and run:

export ORACLE\_HOME=/oracle/product/9.2.0
\$ORACLE\_HOME/oracm/bin/ocmstart.sh

This will start the <code>watchdogd</code> daemon and the <code>oracm</code> process, which corresponds to the Cluster Manager. Verify you have started it on each node with the <code>ps</code> command and check the oracm log:  $\$  SORACLE\_HOME/oracm/log/cm.log





# **ORACLE9i DATABASE INSTALLATION**

#### Installing Oracle9i

Start the Oracle Universal Installer again. If you click Next on the Welcome screen you will be prompted for the cluster nodes on which you would like to install the Database. This is because the Oracle Universal Installer detects the Cluster Manager. The screen would look like this:

Oracle Universal Installer: Cluster Node Selection	- 🗆 X
Cluster Node Selection	
The local Node : "x360r1" will always be selected. Please select any additional nodes	
x360r2	
Exit Help Installed Products Previous Next	
ORACLE	

Select all the nodes you would like to be on your cluster and click Next to continue. The next screen is the File Location Screen that we have already mentioned. Click on Next and continue.

#### Products Screen

Select from on the Available Products screen the "Oracle Database" and click Next to continue as shown on the figure.





Oracle Universal Installer: Available Products		_ 🗆 🛛
Available Products		
Select a product to install.		
🖲 Oracle9i Database 9.2.0.1.0 👘		
Installs an optional pre-configured starter database, product o networking services, utilities and basic client software for an C	ptions, management Pracle database serv	t tools, er.
O Oracle9i Client 9.2.0.1.0		
Installs enterprise management tools, networking services, uti precompilers and basic client software.	lities, development	tools and
O Oracle9i Management and Integration 9.2.0.1.0		
Installs the management server, management tools, Oracle Int Server, networking services, utilities and basic client software.	ernet Directory, Ora	cle Integration
O Oracle Cluster Manager 9.2.0.1.0		
Oracle Cluster Manager, Release 9.2.0.1.0 for Linux Intel		
	X X	Contrato Citta
and a second	Produ	ct Languages
Exit Help Installed Products	Previous	Next
ORACLE		

This will start the Oracle Database installation on each node of your cluster.

### Installation Type screen.

The next screen is the Installation Type. Select the Custom option in order to have full control of each element you will install. Note that this Custom option refers to the Database installation, but not the configuration.





#### Components Selection Screen

On this screen, you can configure what elements will be installed. For a Real Application Cluster configuration, please be sure you install at least the Oracle Database, Real Application Clusters, Partitioning and Netlistener components and then click Next to start installation. If you need some additional components for your database, select them on this screen

Oracle Universal Installer: Available Product Components Available Product Components Oracle9i Database The following are components that you can install as part	of Oracle9i Database, Whi	L D X
these components do you want to install?		
Components	Install Status	A
P Ø Oracle9i Database 9.2.0.1.0	New Install	
☑ Oracle9i 9.2.0.1.0	New Install	
🕞 🖬 Enterprise Edition Options 9.2.0.1.0	New Install	
Oracle Advanced Security 9.2.0.1.0	New Install	
🖉 Oracle9i Real Application Clusters 9.2.0.1.0	New Install	
Oracle Partitioning 9.2.0.1.0	New Install	
☑ Oracle Spatial 9.2.0.1.0	New Install	1.00
🗹 Legato Networker Single Server 6. 1. 0. 0. 0	New Install	
□ Oracle Label Security 9.2.0.1.0	Not Installed	
☑ Oracle OLAP 9.2.0.1.0	New Install	
🗹 Oracle Data Mining 9.2.0.1.0	New Install	
🕞 🗹 Oracle Net Services 9.2.0.1.0	New Install	- 10
Show all components including required dependencies	Provine	Next
ORACLE	Picerious	

#### Component Location Screen

This screen gives information about the components locations. Do not modify the values and click Next.







Shared Configuration File screen

You will also be prompted for the raw device where you will have the shared configuration of your cluster. Enter your value and click Next to continue.







#### Group Selection screen

Then, select the group you will need for your database operator and administrator. Usually, these values are set to "dba", but verify that you have put there the group that you will use. Click Next to continue.

Oracle Universal Installer: Privileged Operatir	ng System Groups 📃 🗖 🗙
Privileged Operating S	System Groups
SYSDBA and SYSOPER privileges are requ authentication. These are granted throu; OSOPER, respectively, and the dba group another group used, enter the names of used for OSDBA and OSOPER.	ired to create a database using operating system (OS) gh membership in the UNIX groups OSDBA and b is usually used for this purpose. If you would like the UNIX groups of which you are a member, to be
Database Administrator (OSDBA) Group	dba
Database Operator (OSOPER) Group	dba
	and the second sec
Exit Help Install	ed Products
ORACLE	

#### Database Creation screen

You will then be prompted for database creation. We will not create it right now, so select "No" and then Next to continue. If you wish to create a database during the installation, you should select "Yes" and follow the configuration steps. We will create the database later.







#### Summary Screen

This latest screen shows you the configuration you have made. Verify it and if you need to add something else, you can always go back by clicking on "Back". If everything is OK, click "Install" to start the installation procedure.







#### Installation screen

During the installation process, you will see a screen like this one:

Oracle Universal Installer: Install			
Install			
Installing RDBMS Required S 9.2.0.1.0	upport Files		
Link pending			
Copying oraus.msb			
4%			
Cancel			
			X X X X
You can find a log of this install	session at: Actions2002-09-12, 11-15-0	MAM Ing	
yoracleyoraniyencoryyrogsyniscar	Actions2002-03-12_11-13-0		
Exit Help	Installed Products	Previous	Next
ORACLE			

You may be prompted for another CD-ROM. If it this your situation, umount the CD-ROM, change it, and then mount the CD-ROM you have been asked for.



Then the installation procedure will continue.





Once all the CDs are installed on the first node, the Oracle Universal Installer will install the software on each node on your cluster. Then, you will be prompted for a shell script execution. Do it on each node by accepting the default values and press OK to continue.

Setup Privil	eges	
	A configuration script needs to before installation can proceed. window up, go run /oracle/92/r x360r1,x360r2, from another wi back here and click OK to contir	be run as root Please leave this oot.sh as root on ndow, then come tue.
	•	OK

Then the configuration procedure will start. First, the Oracle Universal Installer will automatically configure the cluster and then ask you to configure the network. We will configure the listeners later, so you can cancel the network configuration procedure and confirm by clicking Yes.





You will get an error screen because we cancelled the network configuration. Accept the error by clicking OK and Next to finish the installation.

Oracle Univers	al Installer: Configuration Tools	_ <b>D</b> X
Configu	iration Tools	
The followi	Error 📃 🔍	
These tools : It is recomm Tool Na ✓ Oracle ( X Oracle f X Agent C	One or more tools have failed. It is recommended but not required that these tools succeed for this installation. You can now select these tools, read its details to examine why they failed, fix those problems, and retry them. Or, you can click "Next" to continue.	
	Retry	Ston
Details for An	Next Configuration Assistant	stop
Waiting t "Clock Monitor re Thread Alarm sys_thread	to be notified: k" (0x412a4e0c) gistry: owner "main" (0x8065ce8, 1 entry) 1 Q: d_t 0x412e6e0c [Timeout in 952ms]	
A AND AND A		
Exit	Help Installed Products Previous	Next
ORACLE	A CONTRACT OF	

The Oracle Universal Installer shows you the End of Installation screen and warns you that you have got some components that were not configured. This is normal, so exit the installer with Yes and you are done.





Post-installation Configuration

Some of the log directories may not have been created on all nodes during the installation. Make sure then that the following directories exist on each node:

- \$ORACLE\_HOME/rdbms/audit
- \$ORACLE\_HOME/rdbms/log
- \$ORACLE\_HOME/network/log

If they do not exist, please create them in order to have full logs on your system.

	orac	:le@x3	60r2:~/92		
F	ile	Edit	Settings	Help	
[a 7a	rac.	le@x36 16/97	i0r2 92]\$	pwd	
	naci naci naci naci	le@x36 le@x36 le@x36 le@x36	i0r2 92]\$ i0r2 92]\$ i0r2 92]\$ i0r2 92]\$	mkdir rdbms/audit mkdir rdbms/log mkdir network/log	
			ĵ	ζ	
					-

Cluster Manager configuration

We will now discuss how to configure the Cluster Manager, the Node Monitor and the SRVCTL configuration file.

First of all, launch the Global Services Daemon. You should also add it to your Oracle start-up script in order to have it running each time you start your machine.

p 33/ 53



As  $\tt oracle$  user, type <code>"gsdctl start"</code> on each node of your cluster to start the Global Services Daemon.

### Listeners configuration

Before the database creation we will create the listeners that we will use later and which will let us configure our database without problems. Make sure your "LANG" variable is not set by typing "unset LANG". Then you can start the Network Configuration Assistant. This tool is the one we stopped during the installation procedure. To start NCA, type "netca".

#### Welcome Screen

On this screen, select "Cli	uster Configuration" and click Next.
	Select the type of Oracle Net Services configuration: © Cluster configuration ← Single node configuration
Help	Hack Next S

#### Nodes Screen

Select all the nodes on your cluster and click Next.

Oracle Net Configuration Assistant: TO	DPSNodes
	Select the nodes to configure Nodes(s): x360r1 x360r2
	l Select all nodes Deselect all nodes
CancelHelp	<u>B</u> ack <u>Next ≫</u>





#### Listener Configuration screens

The next screen will offer you some configuration possibilities: Listener Configuration, Naming Method Configuration, Local Net service Name Configuration and Directory Usage Configuration. Select "Listener Configuration" and click Next.

Oracle Net Configuration	Assistant: Welcome	_ 🗆 X
	Welcome to the Oracle Net Configuration Assistant. This tool takes you through the following common configuration steps: Choose the configuration you would like to do: Listener configuration Naming Methods configuration Local Net Service Name configuration Directory Usage Configuration	
Lancel Help	Back Next S	

The Listener Configuration screen will appear. Select "Add" and click on Next to continue.

Oracle Net Conliguration Ass	Istani: Listener Conliguration, Listener
	For remote connections to be made to your Oracle database, you must configure a Oracle Net listener. The Oracle Net Configuration Assistant allows you to add, reconfigure, rename or delete a listener.
	Select what you want to do:
	@e Add
VEDIC	@ Reconfigure
	@ Delete
Ser and a series of the series	@ Rename
CancelHelp	S Back Next S

Now, accept the default name that the configuration assistant gives you and click Next again.



Oracle Net Configuration Assistan	t: Listener Configuration, Listener Name	_
	For remote connections to be made to your Oracle database you must have at least one Oracle Net listener. Enter the name of the listener you want to create: Listener name: LISTENER	
	🛞 Back 🛛 Next 🔊 🔪	

The next screen will let you choose between some network protocols. TCP/IP should be selected, but we will also add IPC support. Click on "IPC" and then on ">". To continue, click on Next.

Oracle Net Configuration Assista	nt: Listener Configuration, Select Protocols	
	You can configure the listener to accept connections over one or more protocols. Select which protocols you want to configure for this listener. Keep your configuration as simple as possible by configuring only the protocols you need. Available Protocols TCPS Selected Protocols TCP Selected Protocols Selected Protocols	
CancelHelp	S Back Next S	

You will be then prompted for the port number you would like to use. Accept the default port value (set to 1521) and go to the next screen clicking on Next.





The next screen is the IPC Configuration one. On this screen you will be asked to insert your database name as key and then click Next.

Oracle Net Configuration Assistant	: Listener Configuration, IPC Protocol	_ 0 >
	To communicate with the database using the IPC protocol, an IPC key value is required. Enter the key value for the database you want to access. IPC Key value: DATABASE	
CancelHelp	🔇 Back 🛛 Next 🕉	

This should create the listener. At this point, Oracle Universal Installer will ask you if you want to create another listener. Select "No" and click Next.





The Listener Configuration is now complete. You can now exit the Network Configuration Assistant unless you want to create another listener.

Oracle Net Configuration Assistant: Listener Configuration Done	
Listener configuration complete!	
CancelHelpS_BackNext 🕅	





# **CREATING A CLUSTER DATABASE**

For the database creation, we will use the DBCA tool. DBCA means Database Creation Assistant and it is a graphical tool that makes the database creation easier. It uses the Optimal Flexible Architecture (OFA). This means that DBCA creates the database files, including the default server parameter file, using standard file naming and file placement practices. In order to run DBCA, you must have the GSD daemon started. If not, please be sure you run it before starting database creation.

Verify that you have correctly configured all the shared disks for each tablespace (for non-cluster file system platforms) and then you can start database creation.

Oracle Corporation recommends that you use the DBCA to create your database. This is because the DBCA preconfigured databases optimize your environment to take advantage of Oracle9i features such as the server parameter file and automatic undo management. The DBCA also enables you to define arbitrary tablespaces as part of the database creation process. So even if you have datafile requirements that differ from those offered in one of the DBCA templates, use the DBCA. You can also execute user-specified scripts as part of the database creation process.

The Database Configuration Assistant (DBCA) makes use of a file, which is named mapping DBCA.cfg, that contains the raw device names for the system datafiles. You should create this file to suit your own tablespaces and associated raw devices and make sure it is owned by the oracle user. See below an example of the file.

```
spfile1=/dev/raw/raw3
system1=/dev/raw/raw4
users1=/dev/raw/raw5
tools1=/dev/raw/raw7
control1=/dev/raw/raw7
control2=/dev/raw/raw9
indx1=/dev/raw/raw10
redo1_1=/dev/raw/raw11
redo1_2=/dev/raw/raw13
redo2_1=/dev/raw/raw14
undotbs1=/dev/raw/raw15
undotbs2=/dev/raw/raw16
```

DBCAmapping.cfg

The location of this file is passed to DBCA by the variable DBCA\_RAW\_CONFIG. Set this varable with: export DBCA\_RAW\_CONFIG=~/mappingDBCA.cfg

Start DBCA with the "dbca" command. You will see a welcome screen that looks like this one:



Database Configuration Assist	ant : Welcome 📃 🗖 🗙
	Welcome to Database Configuration Assistant for Oracle Real Application Clusters. The Database Configuration Assistant enables you to create, configure or delete a database and manage database templates. It also enables you to add, delete or modify cluster database instances. What type of database would you like to create or administer? © Oracle cluster database C Oracle single instance database C Oracle single instance database
Cancel Help	Back Next 🦒

Select "Oracle Cluster Database" and click Next. The Operations screen will appear. Select "Create Database" and click Next.

Configuration Assistan	n, otep i or a coperations	
S	elect the operation you want to perform © Create a database © Configure database options in a database © Delete a database C Manage Templates © Instance Management	
Lancel Help	··· Back Next	

You will be prompted for node selection. Select all the nodes that apply and click Next to continue.



Database Configuration Assist	ant, Step 2 of 9 : Node Selection	_ <b>D</b> X
	Select the nodes on which you want to create the cluster database. The "x360r1" will always be used, whether or not it is selected. x360r1 x360r2	local node Select All Deselect All
Cancel Help	🛞 Back Next N	)

If some of your nodes are missing, there is a cluster diagnostic tool called "Isnodes" which will let you know what nodes are active at this moment. Resolve the problem and try again the process from the beginning. In our tests, we used two nodes: "x360r1" and "x360r2", and "Isnodes" shows both of them.

oracle@x360r1:~		
File Edit Settings Help		
[oracle@x360r1 oracle]\$ lsnodes x360r1 x360r2 [oracle@x360r1 oracle]\$	I	

The next screen that you will see is the Database Templates one. All of the templates other than "New Database", include datafiles.

Select "New Database" and click Next.



Database Configuration Assis	tant, Step 3 of '	9 : Database Templates		_ <b>D</b> ×
	Select a tem	plate from the following list to c	rreate a database:	
	Select	Template Name		Includes Datafil
	0	Data Warehouse		Yes
	C	General Purpose		Yes
	C	Transaction Processing		Yes
	С (	New Database		No
Participation         Partin         Partit				
				Show Details
Help			≪ Back <u>N</u> ex	t S

This next screen is the Database Identification page. You should enter the Global Database Name (typically on the name.domain form) and the Oracle System Identifier (SID). The SID will identify an instance and DBCA will suggest you use the same name that you entered on the Database Name field. The SID identifier will be used on RAC databases as a prefix for the instance number.

Database Configuration Ass	istant, Step 4 of 8 : D	atabase Identification		_ <b>-</b> ×
	Specify the follo An Oracle9i data form "name.dom Global Database	wing database informa abase is uniquely identi aain". Name: DB	tion. fied by a Global Database Name	», typically of the
	A database is re instance is uniq database instan- number for each been entered for SID Prefix:	rerenced by an Oracle9 uely identified by an O e, the SID is comprised i instance that is autom you which you can ac DB	Instance on each cluster datab acle System Identifier (SID). For of a common prefix for the dat atically generated. A suggested lept or change to a value you pr	ase node. Each each cluster abase and a SID prefix has efer.
CancelHelp	J		_≪ Back Next ≶	کو ا



# Select "Dedicated Server Mode" on the Database Connection screen.

<ul> <li>Select the mode in which you want your database to operate by default :</li> <li>Dedicated Server Mode         For each client connection the database will allocate a resource dedicated to serving             only that client. Use this mode when the number of total client connections is             expected to be small or when clients will be making persistent, long-running             requests to the database.         </li> <li>C Shared Server Mode         Several client connections share a database-allocated pool of resources. Use this         mode when more than a small number of users need to connect to the database         simultaneously while efficiently utilizing system resources. The Oracle shared         server feature will be enabled.         Edit Shared Connections Parameters     </li> </ul>
 🛞 Back Next 🔊

You will be prompted for Database Features. Unselect all the options and continue by clicking on Next. Note: for a real database creation you may need to select one or more options on this screen.

Database Configuration Assistar	nt, Step 5 of 9 : Database Features	_ 🗆 X
Database Configuration Assistant	nt, Step 5 of 9 - Database Features Database Features [ Custom Scripts Select the features you want to configure for use in your database: □Oracle Spatia] □Oracle Ultra Search ©Oracle Label Security □Oracle Data Mining □Oracle OLAP □Example Schemas IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Ires
CancelHelp	<u>Sack</u>	

You can click on the "Standard database features" to add or remove some standard options. For this procedure, we deselected every standard option:





The next screen will let you configure the Initialization Parameters. On this screen you will see some tabular pages. Modify the memory setting if desired and then select the "File Locations" tab. The option "Create Persistent Initialization" is selected by default. The file name should point to the correct database link. Otherwise it will mean that you didn't set the DBCA\_RAW\_CONFIG correctly or the file contains errors. Verify all the configuration options according to your needs and make sure the listener values are set to the ones that you previously created. Then, click Next.

Database Configuration Assista	nt, Step 7 of 9 : Initialization I	Parameters		_ <b>=</b> ×
	Memory [Charact ⊂Typical Percentage of physica	er Sets DB Sizing al memory (7768 MB) fo	File Locations	Archive
	Database Type: Show distribution o @ Custom	f Memory	Data Wa	rehousing 🕞
	Shared Pool: Buffer Cache:	80 24	M Bytes	* *
	Large Pool: PGA:	8	M Bytes M Bytes M Bytes	v. v.
	Total Memory for Ora Total memory the empty par	icle: 256 M Bytes includes 40MB of Orac ameters , if any.	le Process Size and	the defaults for
	All Initialization Paramet	ers)	File Lo	ocation Variables
CancelHelp		< 	🖇 Back <u>N</u> ext	<u>&gt;</u>

DBCA now shows you the Database Storage Window. This screen will let you enter file names for each tablespace in your database. They should be pointing to the right raw device or database link. Make sure you correct the datafile sizes to the sizes that you have planned to use and remember that the datafile should be smaller than the raw device. Click Next when you're finished.



Database Configuration Assista	nt, Step 7 of 8 : Database Storage 📃 🗖 🗙
⊖ <mark>⊖Storage</mark> -∰Controlfile -⇔Datafiles	Database Storage
Bredo Log Groups	database creation. This page displays a tree listing and summary view (multi- column lists) to allow you to change and view the following objects:
	<ul> <li>Controlfiles</li> <li>Tablespaces</li> <li>Datafiles</li> <li>Rollback Segments</li> <li>Redo Log Groups</li> </ul>
	From any object type folder, click <b>Add</b> to create a new object. To delete an object, select the specific object from within the object type folder and click <b>Remove</b> .
	Important: If you select a seed database template, you will not be able to add or remove datafiles, tablespaces, or rollback segments. Selecting a seed template allows you to only change the following:
	<ul> <li>The name of the database</li> <li>Destination of the datafiles</li> <li>Controlfiles or log groups.</li> </ul>
Add Remove	File Location Variables
Lancel Help	S Back Next S

The Database Creation Options page is displayed. Ensure that the option Create Database is checked and click Finish.

Database Configuration Assistan	nt, Step 9 of 9 : Creation Options	_ <b>-</b> ×
Si	Select the following database creation options: Create Database Save as a Database Template Name: DB Description: Example DB for CookBook	
	Generate Database Creation Scripts Destination [/oracle/admin/DB/scripts Directory:	Browse
Help	<u>≪ B</u> ack Next >	Einish

The DBCA Summary window is displayed. Review this information and then click OK.



Database Configuration A	ssistant: Sum	mary	_ 0
cluster database will b Create database with c Generation of Templat Generating scripts for c	e created w 1b name "DB e "DB". :luster datab	ith following parameters. ". vase creation at "/oracle/admin/DB/scripts".	1994
		DR	1222
	Even	DD onlo DD for CookBook	
	EXdii	The DB for Cookbook	
Common Ont	ions		
oommore op o			_
Option Name	Selected		
Example Schemas	false		
Oracle Data Mining	false		
Oracle Intermedia	false		
Oracle JVM	false		
Oracle Label Security	false		
Oracle OLAP	false		
Oracle Spatial	false		
Oracle Text	false		
Oracle Ultra Search	false		
Oracle XML DB	false		
Initializa	tion F	Parameters	
			icost
			100%
		Save as an HI	ML file
	ok	Cancel) Helpj	

Once the Summary screen is closed using the OK option, DBCA begins to create the database according to the values specified. We selected to create a template and the scripts for manual creation, so that the DBCA will give us some screens when the work is done.

Database C	onfiguration Assistant 📃 🗖 🗙
Ŭ	The template "DB" creation completed.
	ОК
Database Co	nfiguration Assistant
<u>(</u>	The generation of the script "/oracle/admin/DB/scripts" is successful.
	Сок

Then, DBCA starts the database creation.





Once this step finished, you have successfully created the clustered database. It can now be accessed via Oracle SQL\*PLUS or other applications designed to work with an Oracle RAC database. You should make sure to execute your start-up scripts at system startup as root and the other as user oracle as shown in this document.





# **CREATING A DATABASE MANUALLY**

You can also create the databases manually. To do so, follow the next steps:

- on one node : srvctl add db -p <db\_name> -o <oracle\_home>
- for each instance of the database :

### srvctl add instance -p <db\_name> -i <SID> -n <node\_name>

(it is advised to set the SID to db\_name plus instance\_number)

- on each node, check the configuration : srvctl config -p <db\_name>
- on each node, create (or update) oratab file (in /etc directory) with the following line :

#### <db\_name>:<\$ORACLE\_HOME>:N

- create the udump, cdump and bdump directories.
- set the SID in .profile of oracle user
- create the init.ora file for each node. It is possible to prefix parameter which are local to the instance with the instance name. For example, thread, instance\_name, rollback\_segments...
   It is possible to create a spfile with "create spfile='/dev/rawspfile' from pfile=/.../init.ora".
- create the database creation script. You can use \$ORACLE\_HOME/srvm/clustdb.sql script as sample. The script must be adapted to your environment. Be careful, there are some errors in this file.
- you can create a password file. Under \$ORACLE\_HOME execute orapwd file=orapw password=###.
- as sysdba, execute the script.



# CONFIGURING HIGH AVAILABILITY AND LOAD BALANCING

#### LISTENER CONFIGURATION

The listener should be properly configured by **net ca** and **dbca** but it is worth checking that the contents of \$ORACLE\_HOME/network/admin/listener.ora are similar to those in the following listener.ora for the first instance:

```
LISTENER =
(DESCRIPTION_LIST =
(DESCRIPTION =
(ADDRESS_LIST =
(ADDRESS =(PROTOCOL =TCP)(HOST =test1)(PORT =1521))
)
)
)
SID_LIST_LISTENER =
(SID_LIST =
(SID_DESC =
(SID_NAME =PLSExtProc)
(ORACLE_HOME =/oracle/product/9.0.1)
(PROGRAM =extproc)
)
(SID_DESC =
(ORACLE_HOME =/oracle/product/9.0.1)
(SID_NAME = test1)
)
```

listener.ora for the first instance

#### **TNSNAMES CONFIGURATION**

```
LISTENERS_TEST =
(DESCRIPTION =
(ADDRESS_LIST =
(ADDRESS =(PROTOCOL =TCP)(HOST =x360r1)(PORT =1521))
(ADDRESS =(PROTOCOL =TCP)(HOST =x360r2)(PORT =1521))
)
)
TEST =
(DESCRIPTION =
(ADDRESS_LIST =
(ADDRESS =(PROTOCOL =TCP)(HOST =x360r1)(PORT =1521))
(ADDRESS =(PROTOCOL =TCP)(HOST =x360r2)(PORT =1521))
)
(FAILOVER =yes)
(LOAD_BALANCE =yes)
(CONNECT_DATA =
(SERVICE_NAME =TEST)
(FAILOVER_MODE=
(TYPE=SELECT)
(METHOD=BASIC)
(RETRIES=30)
(DELAY=1)
```

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```
)
)
)
TEST1 =
(DESCRIPTION =
(ADDRESS_LIST =
(ADDRESS =(PROTOCOL =TCP)(HOST =x360r1)(PORT =1521))
)
(CONNECT_DATA =
(SERVICE_NAME =TEST)
(INSTANCE_NAME =TEST1)
)
)
TEST2 =
(DESCRIPTION =
(ADDRESS_LIST =
(ADDRESS =(PROTOCOL =TCP)(HOST =x360r2)(PORT =1521))
)
(CONNECT_DATA =
(SERVICE_NAME =TEST)
(INSTANCE_NAME =TEST2)
)
```



## ADMINISTERING REAL APPLICATION CLUSTERS INSTANCES

Oracle Corporation recommends that you use SRVCTL to administer your Real Application Clusters Database environment. SRVCTL manages configuration information that is used by several Oracle tools.

Before using SRVCTL, ensure that your Global Services Daemon (GSD) is running. To use SRVCTL, you must have already created the configuration information for the database that you want to administer.

You must have done this either by using the Oracle Database Configuration Assistant (DBCA), or by using the srvctl add command. If you have followed the instructions in this document, dbca will have added your database and instances.

```
$ srvctl config database -d racdb1
racnodel racinst1 /oracle/product/9.2.0
racnode2 racinst2 /oracle/product/9.2.0
```

Examples of starting and stopping RAC follow:-

\$ srvctl start database -d racdb1
\$ srvctl status database -d arldb
Instance racinst1 is running on racnode1
Instance racinst2 is running on racnode2

\$ srvctl stop database -d racdb1 \$ srvctl status database -d arldb Instance racinst1 is not running on racnode1 Instance racinst2 is not running on racnode2

\$ srvctl start instance -d racdb1 -i racinst1
\$ srvctl status instance -d racdb1 -i racinst1
Instance racinst1 is running on racnode1

\$ srvctl status database -d arldb
Instance racinst1 is running on racnode1
Instance racinst2 is not running on racnode2

\$ srvctl stop instance -d racdb1 -i racinst1

For further information on srvctl see the Oracle9i Real Application Clusters Administration Release 1 (9.0.1) manual.





### REFERENCES

- Oracle9i Installation Guide for UNIX Systems: AIX-Based Systems, Compaq Tru64 UNK, HP 9000 Series HP-UX, Linux Intel and Sun SPARC Solaris
- Oracle9i Installation Checklist for Linux Intel
- Oracle9i Quick Installation Procedure for Linux Intel Part Number
- Oracle9i Real Application Clusters Installation and Configuration
- Oracle/IBM CookBook on installing Oracle 9i RAC on AIX
- Step-by-step Installation Guide from Oracle that is available on Metalink.



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