# 1

# Oracle Clusterware Installation and Configuration

# Objectives

After completing this lesson, you should be able to:

- Describe the installation of Oracle RAC 11*g*
- Perform RAC preinstallation tasks
- Perform cluster setup tasks
- Install Oracle Clusterware

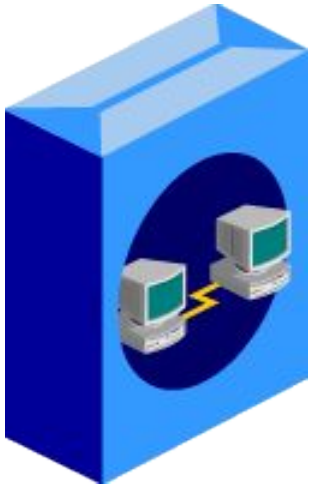
# Oracle RAC 11*g* Installation

**Oracle RAC 11*g* incorporates a two-phase installation process:**

- **Phase one installs Oracle Clusterware.**
- **Phase two installs the Oracle Database 11*g* software with RAC.**

# Oracle RAC 11*g* Installation: Outline

1. Complete preinstallation tasks:
   - Hardware requirements
   - Software requirements
   - Environment configuration, kernel parameters, and so on
2. Perform Oracle Clusterware installation.
3. Perform ASM installation.
4. Perform Oracle Database 11*g* software installation.
5. Install EM agent on cluster nodes if using Grid Control.
6. Perform cluster database creation.
7. Complete postinstallation tasks.



# Windows and UNIX Installation Differences

- Startup and shutdown services
- Environment variables
- DBA account for database administrators
- Account for running OUI

# Preinstallation Tasks

- Check system requirements.
- Check software requirements.
- Check kernel parameters.
- Create groups and users.
- Perform cluster setup.

# Hardware Requirements

- At least 1 GB of physical memory is needed.

```
# grep MemTotal /proc/meminfo
MemTotal:        1126400 kB
```

- A minimum of 1 GB of swap space is required.

```
# grep SwapTotal /proc/meminfo
SwapTotal:      1566328 kB
```

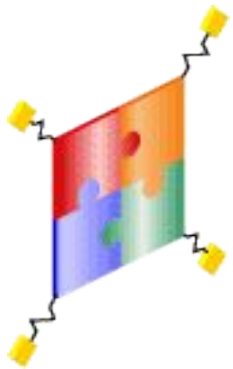
- The `/tmp` directory should be at least 400 MB.

```
# df -k /tmp
Filesystem   1K-blocks      Used Available Use%
/dev/sda6      6198556   3137920   2745756  54%
```

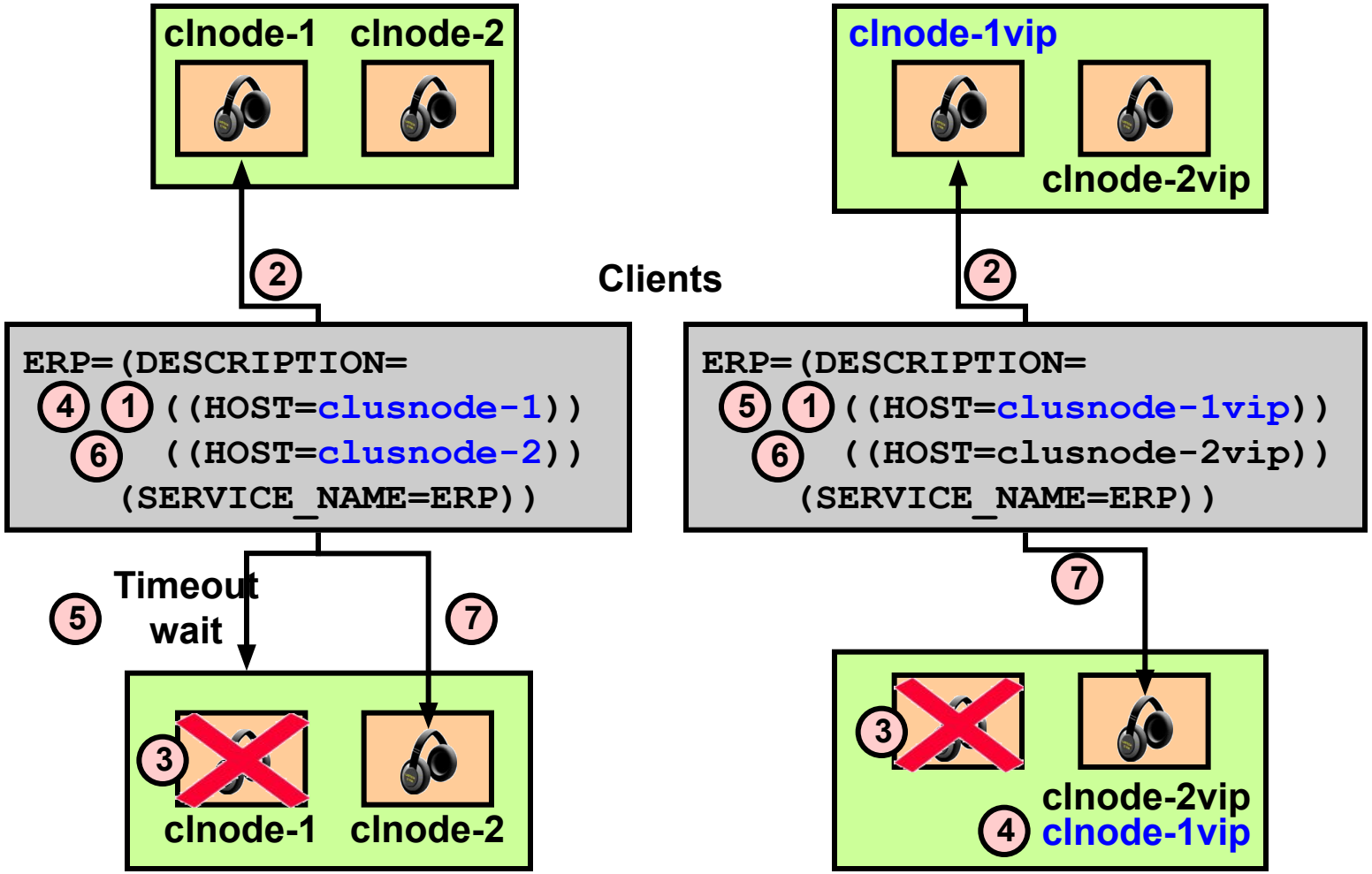
- The Oracle Database 11*g* software requires up to 4 GB of disk space.

# Network Requirements

- Each node must have at least two network adapters.
- Each public network adapter must support TCP/IP.
- The interconnect adapter must support User Datagram Protocol (UDP).
- The host name and IP address associated with the public interface must be registered in the domain name service (DNS) or the `/etc/hosts` file.



# Virtual IP Addresses and RAC



# RAC Network Software Requirements

- **Supported interconnect software protocols are required:**
  - **TCP/IP**
  - **UDP**
  - **Reliable Data Gram**
- **Token Ring is *not* supported on AIX platforms.**

# Package Requirements

- Package versions are checked by the `cluvfy` utility.
- For example, required packages and versions for Red Hat 4.0 and Oracle Enterprise Linux 4 include:
  - `glibc-2.3.4-2.25`
  - `glibc-common-2.3.4.2-25`
  - `glibc-devel-2.3.4.2-25`
  - `gcc-3.4.6-3`
  - `gcc-c++-3.4.6-3`
  - `libaio-0.3.105-2`
  - `libaio-devel-0.3.105-2`
  - `libstdc++-3.4.6-3.1`
  - `make-3.80-6`
  - `sysstat-5.0.5-11`

# Required UNIX Groups and Users

- Create an `oracle` user, a `dba`, and an `oinstall` group on each node:

```
# groupadd -g 500 oinstall
# groupadd -g 501 dba
# useradd -u 500 -d /home/oracle -g "oinstall" \
  -G "dba" -m  -s /bin/bash oracle
```

- Verify the existence of the `nobody` nonprivileged user:

```
# grep nobody /etc/passwd
Nobody:x:99:99:Nobody:/:/sbin/nobody
```

# oracle User Environment

- Set umask to 022.
- Set the DISPLAY environment variable.
- Set the ORACLE_BASE environment variable.
- Set the TMP and TMPDIR variables, if needed.

```
$ cd
$ vi .bash_profile
umask 022
ORACLE_BASE=/u01/app/oracle; export ORACLE_BASE
TMP=/u01/mytmp; export TMP
TMPDIR=$TMP; export TMPDIR
```

# User Shell Limits

- Add the following lines to the `/etc/security/limits.conf` file:

```
*       soft    nproc     2047
*       hard    nproc     16384
*       soft    nofile    1024
*       hard    nofile    65536
```

- Add the following line to the `/etc/pam.d/login` file:

```
session     required
/lib/security/pam_limits.so
```

# Configuring for Remote Installation

To configure Secure Shell:

1. Create the public and private keys on all nodes:

```
[vx0044]$ /usr/bin/ssh-keygen -t dsa
[vx0045]$ /usr/bin/ssh-keygen -t dsa
```

2. Concatenate `id_dsa.pub` from all nodes into the `authorized_keys` file on the first node:

```
[vx0044]$ ssh vx0044 "cat ~/.ssh/id_dsa.pub" >> \
~/.ssh/authorized_keys
[vx0044]$ ssh vx0045 "cat ~/.ssh/id_dsa.pub" >> \
~/.ssh/authorized_keys
```

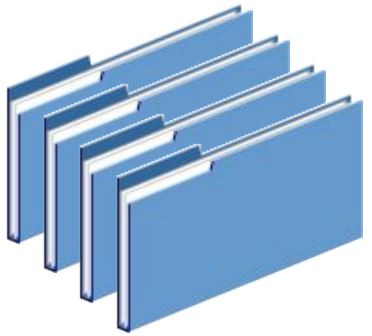
3. Copy the `authorized_keys` file to the other nodes:

```
[vx0044]$ scp ~/.ssh/authorized_keys vx0045:/home/oracle/.ssh/
```

# Required Directories for the Oracle Database Software

**You must identify five directories for the Oracle database software:**

- **Oracle base directory**
- **Oracle inventory directory**
- **Oracle Clusterware home directory**
- **Oracle home directory for the database**
- **Oracle home directory for ASM**



# Linux Operating System Parameters

| Parameter | Value | File |
|---|---|---|
| semmsl | 250 | /proc/sys/kernel/sem |
| semmns | 32000 | /proc/sys/kernel/sem |
| semopm | 100 | /proc/sys/kernel/sem |
| semmni | 128 | /proc/sys/kernel/sem |
| shmall | 2097152 | /proc/sys/kernel/shmall |
| shmmax | ½ physical memory | /proc/sys/kernel/shmmax |
| shmmni | 4096 | /proc/sys/kernel/shmmni |
| file-max | 65536 | /proc/sys/fs/file-max |
| rmem_max | 4194304 | /proc/sys/net/core/rmem_max |
| rmem_default | 4194304 | /proc/sys/net/core/rmem_default |
| wmem_max | 262144 | /proc/sys/net/core/wmem_max |
| wmem_default | 262144 | /proc/sys/net/core/wmem_default |

# Cluster Setup Tasks

1. View the Certifications by Product section at http://metalink.oracle.com/.
2. Verify your high-speed interconnects.
3. Determine the shared storage (disk) option for your system:
   - OCFS or other shared file system solution
   - Raw devices
   - ASM

   *ASM cannot be used for the OCR and Voting Disk files!*
4. Install the necessary operating system patches.

# Verifying Cluster Setup with `cluvfy`

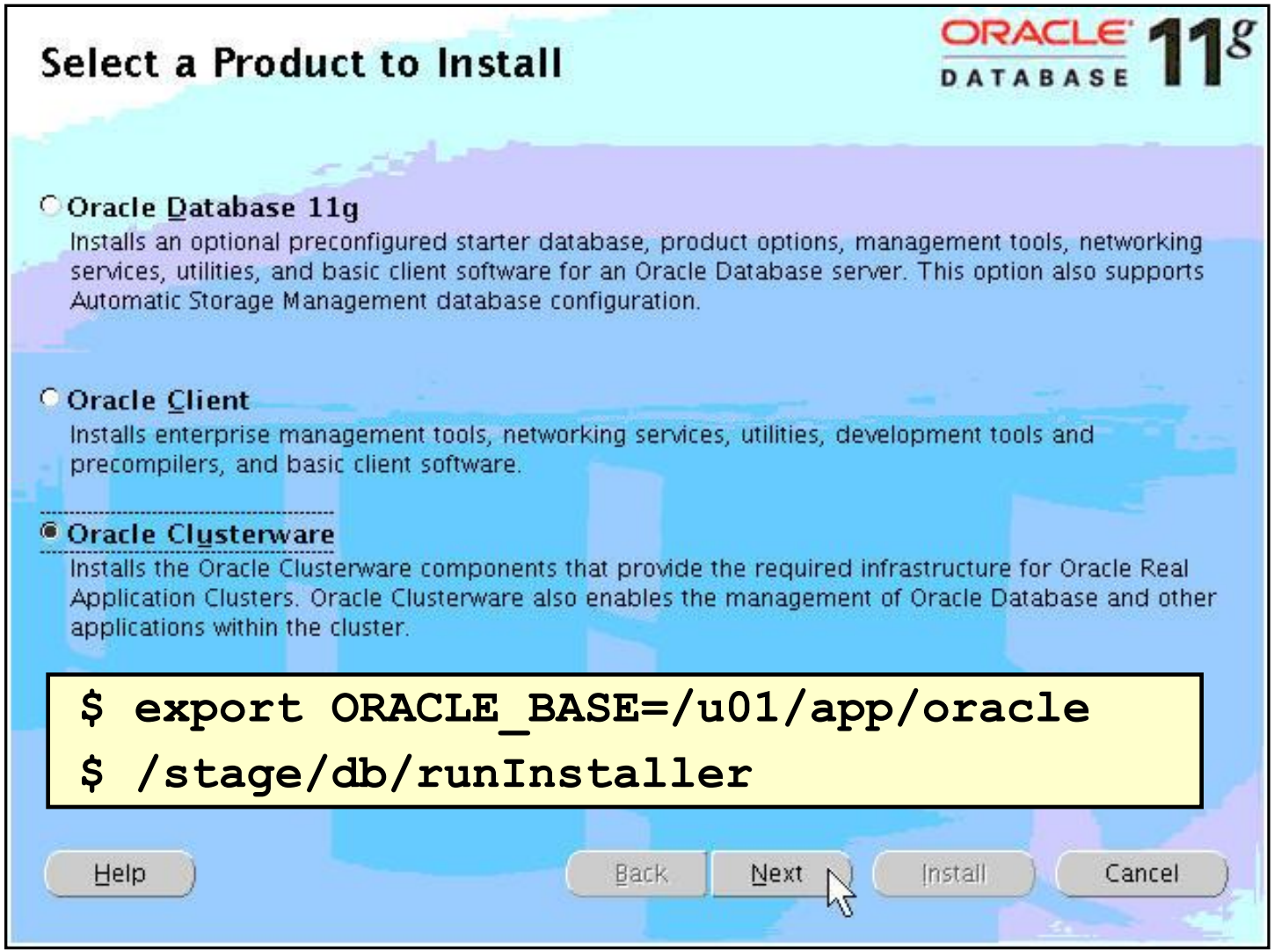
- **Install the `cvuqdisk` rpm required for `cluvfy`:**

```
# su root
# cd /stage/db/rpm
# export CVUQDISK_GRP=dba
# rpm -iv cvuqdisk-1.0.1-1.rpm
```

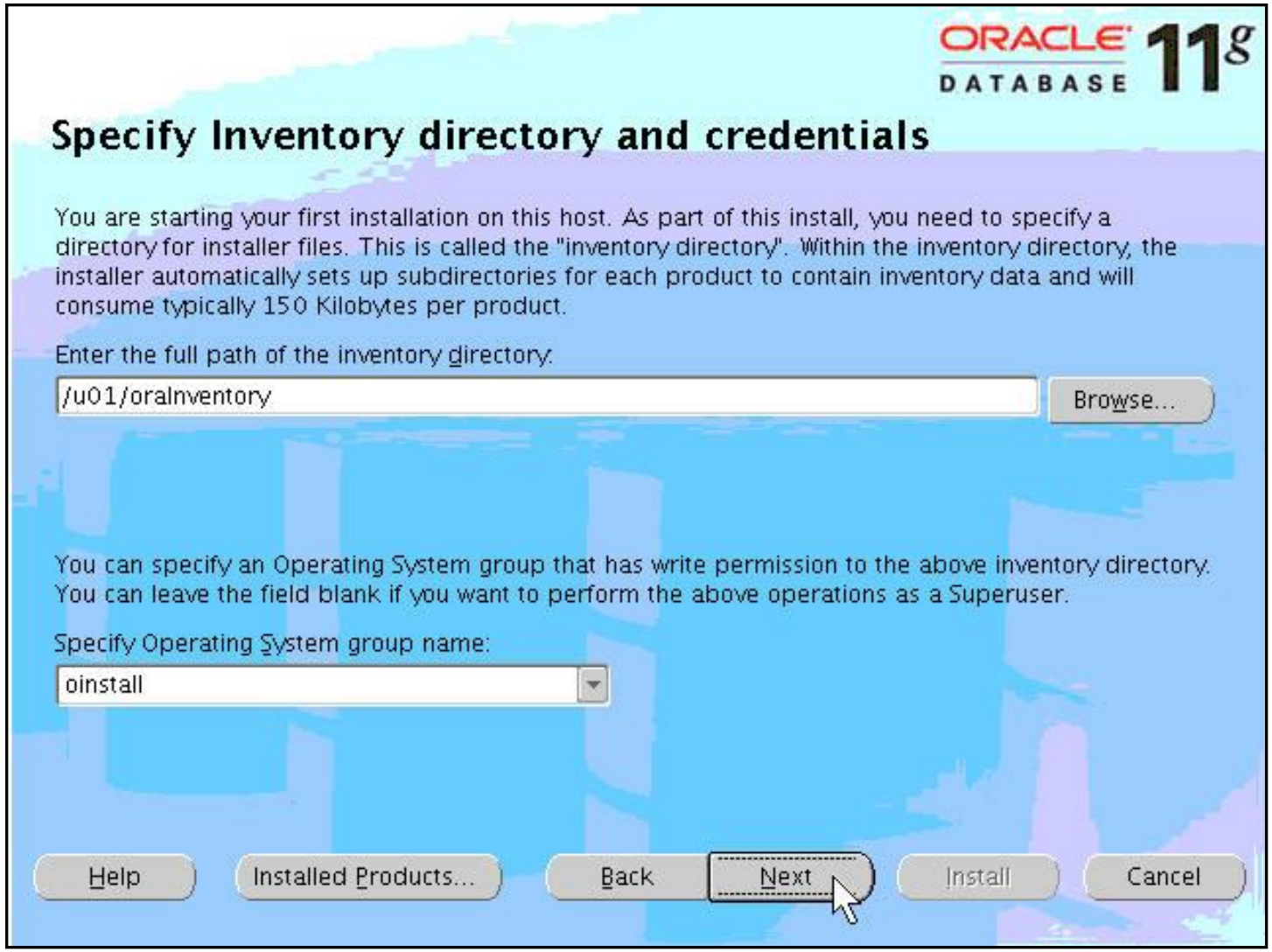
- **Run the `cluvfy` utility as `oracle` as shown below:**

```
# cd /stage/db
./runcluvfy.sh stage -post hwos -n all -verbose
```

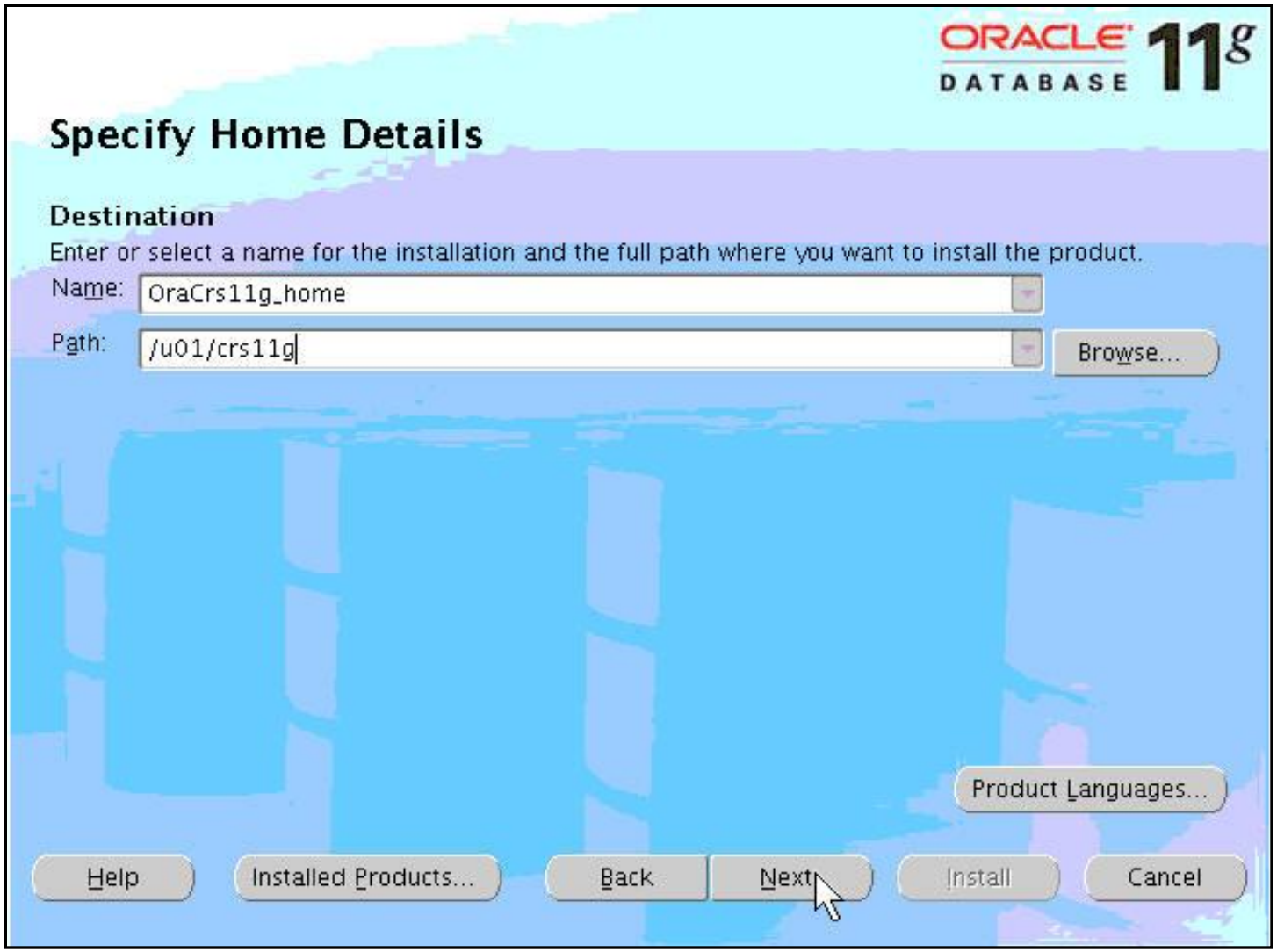
# Installing Oracle Clusterware



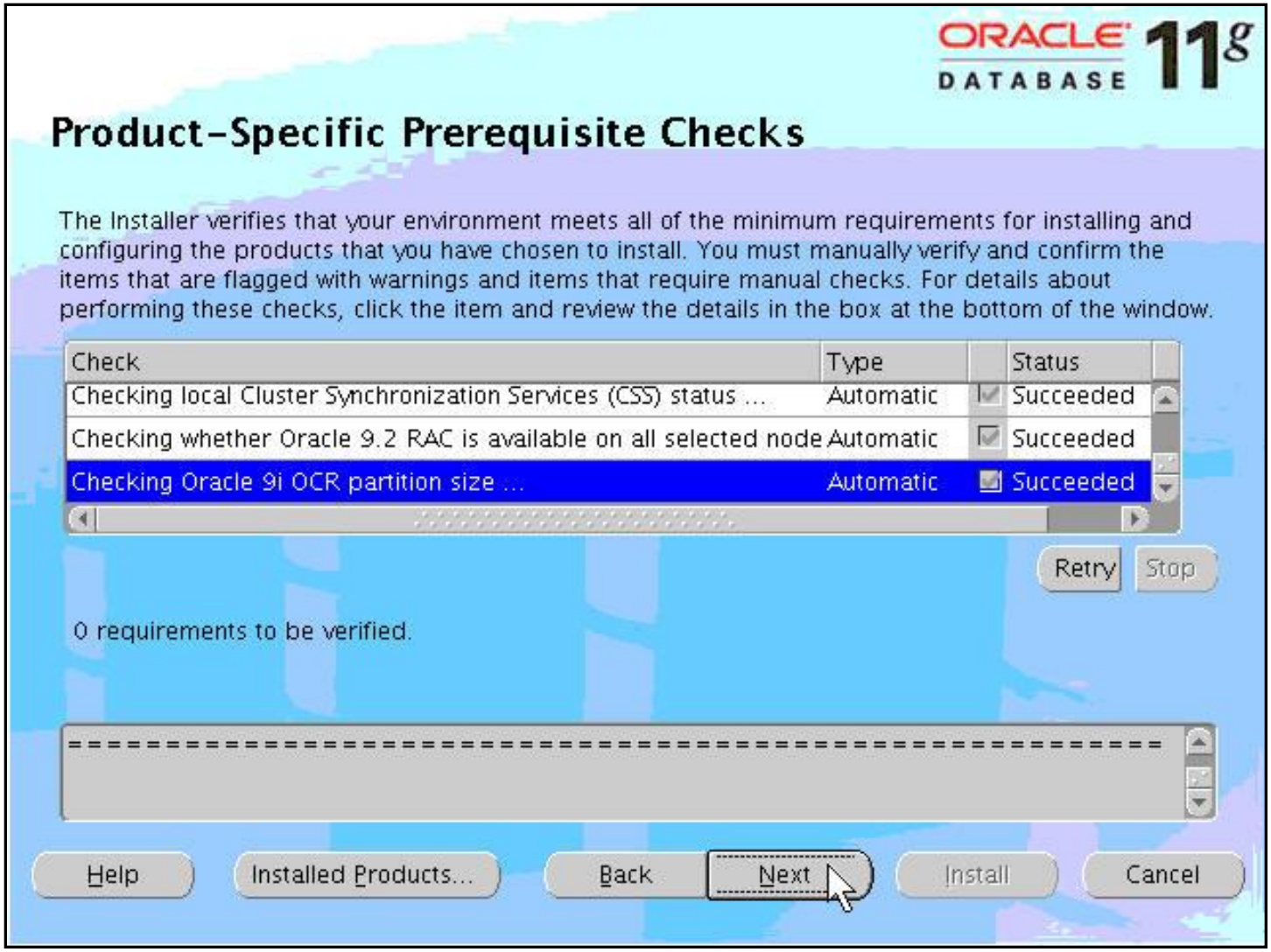
# Specifying the Inventory Directory



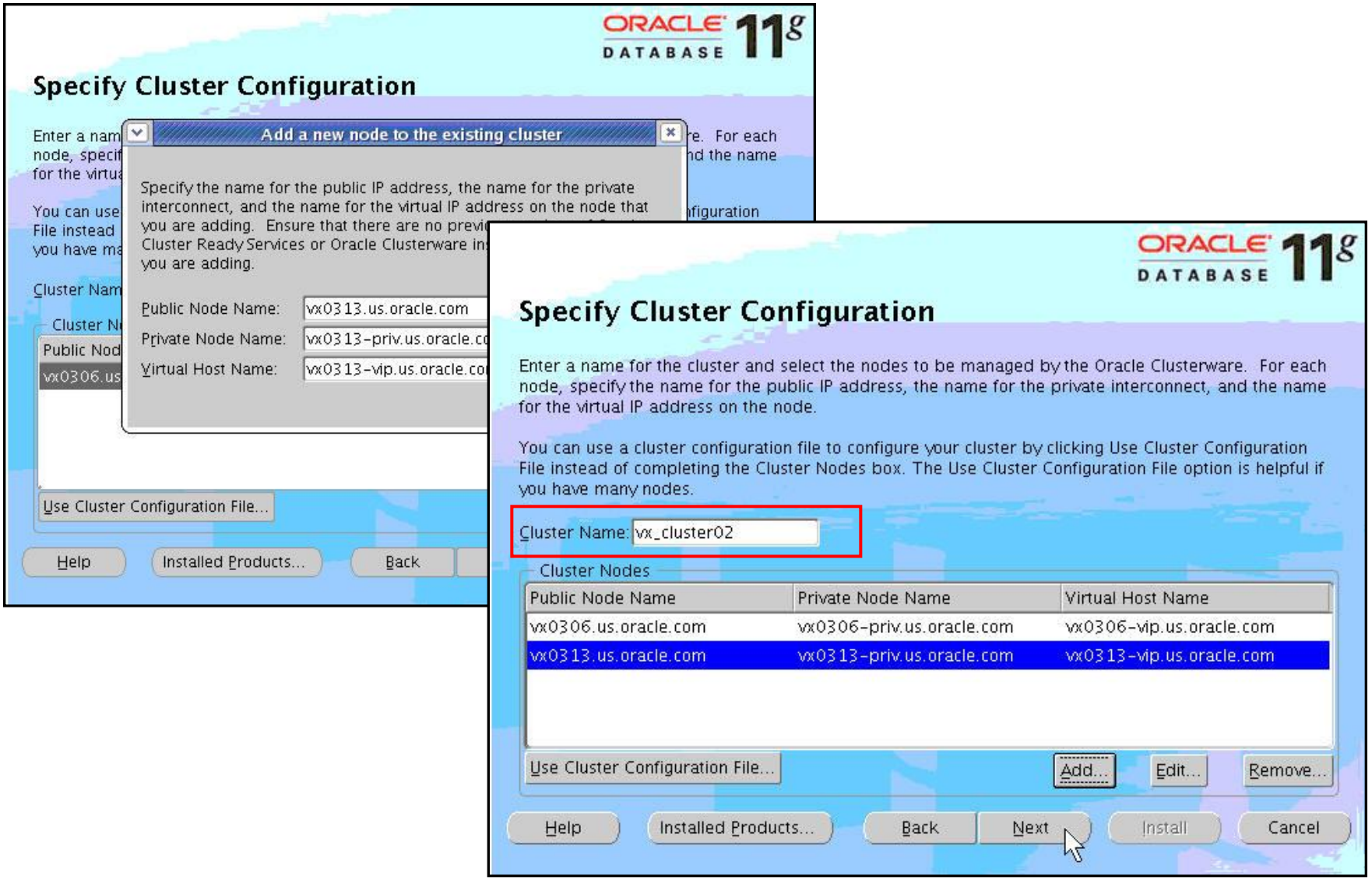
# Specify Home Details



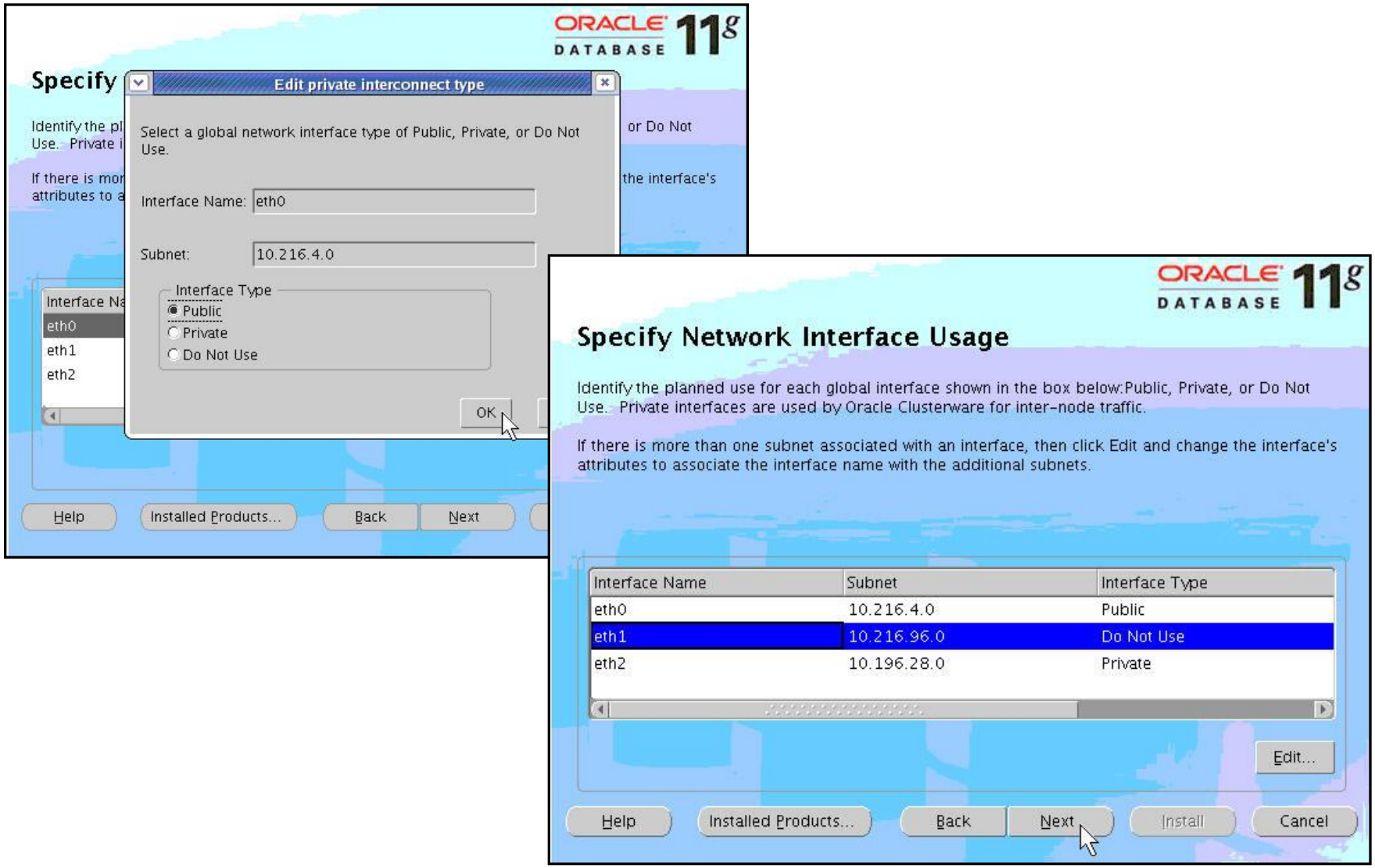
# Product-Specific Prerequisite Checks



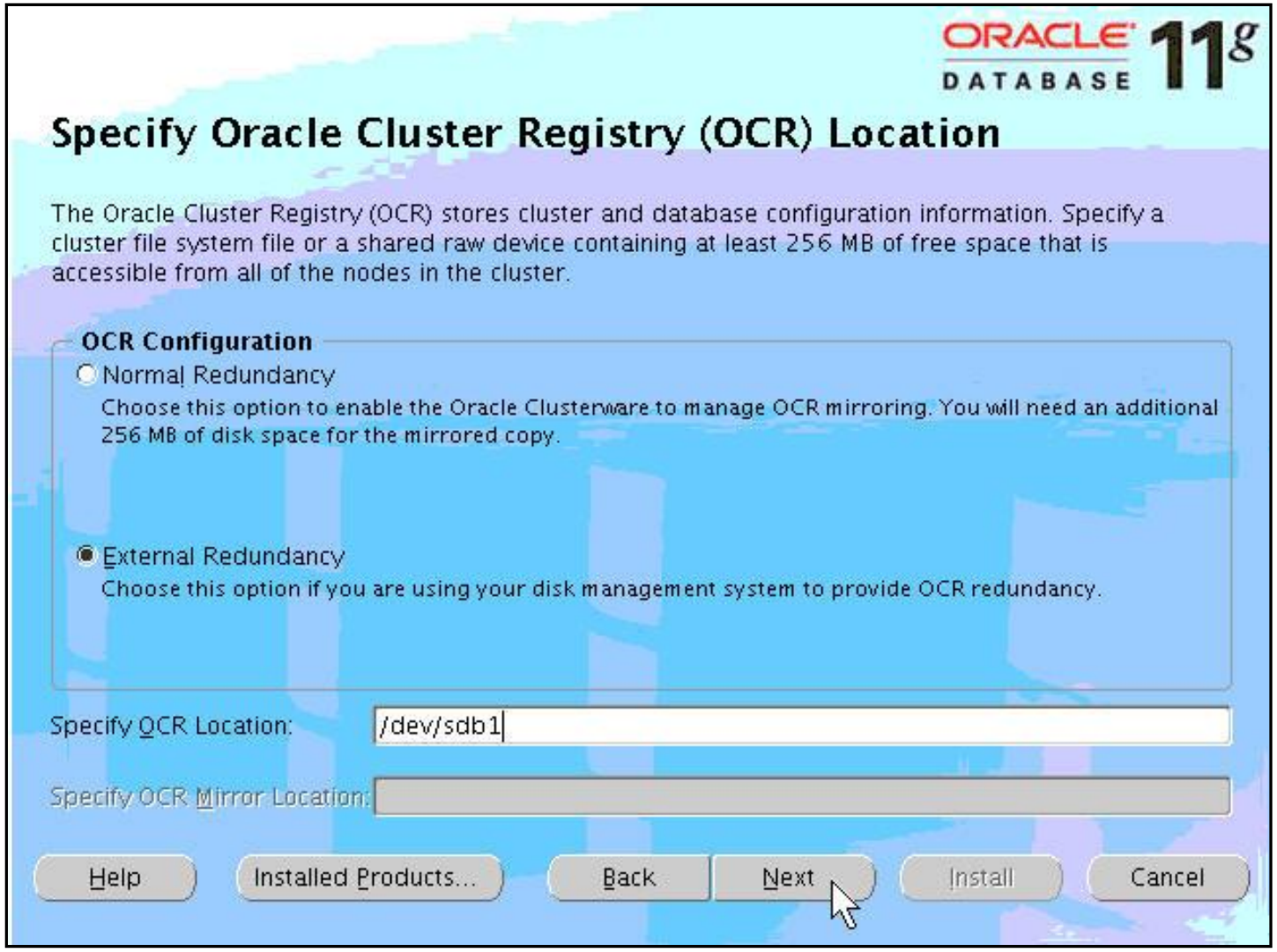
# Cluster Configuration



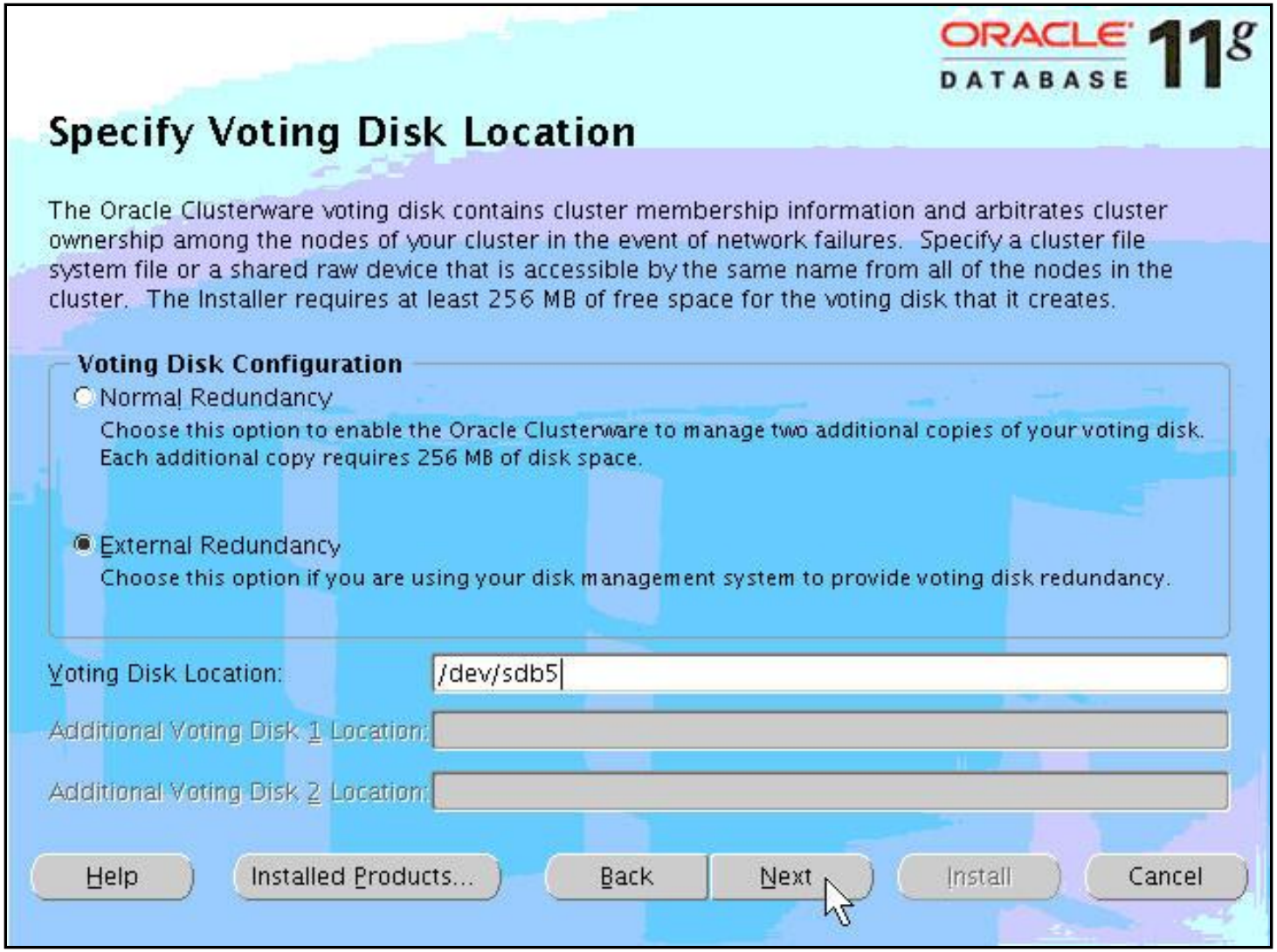
# Private Interconnect Enforcement



# Oracle Cluster Registry File

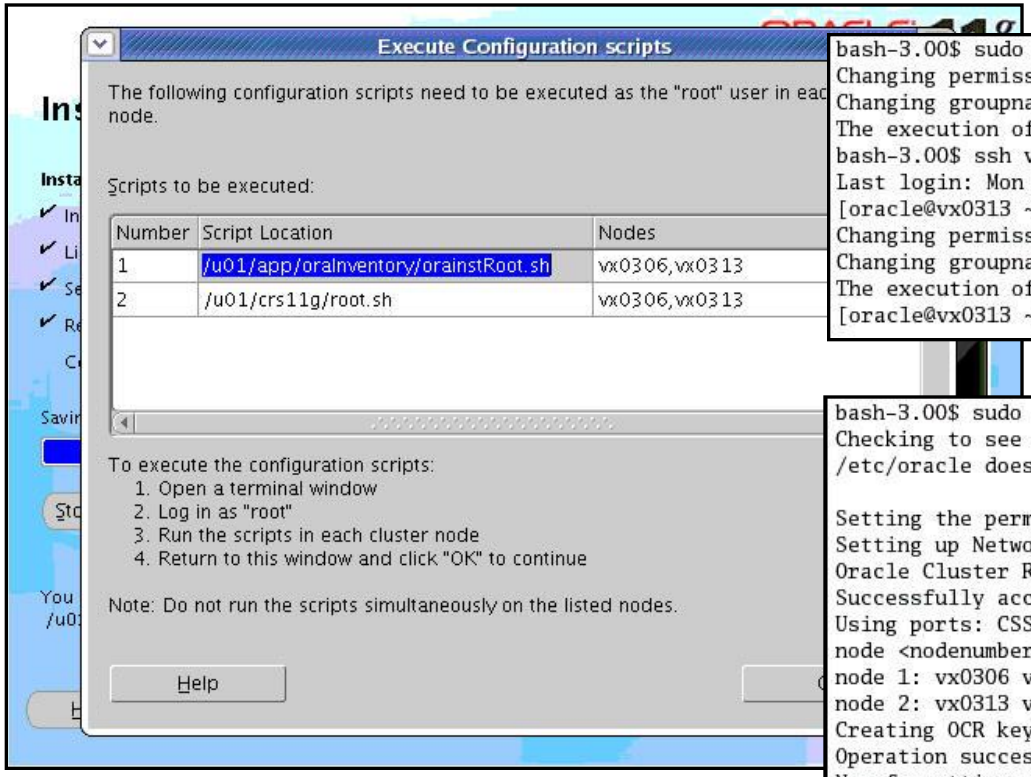


# Voting Disk File



# Summary and Install

# Run Configuration Scripts on All Nodes




```
bash-3.00$ sudo /u01/app/oraInventory/orainstRoot.sh
Changing permissions of /u01/app/oraInventory to 770.
Changing groupname of /u01/app/oraInventory to oinstall.
The execution of the script is complete
bash-3.00$ ssh vx0313
Last login: Mon Nov  5 11:16:26 2007 from vx0306.us.oracle.com
[oracle@vx0313 ~]$ sudo /u01/app/oraInventory/orainstRoot.sh
Changing permissions of /u01/app/oraInventory to 770.
Changing groupname of /u01/app/oraInventory to oinstall.
The execution of the script is complete
[oracle@vx0313 ~]$
```

```
bash-3.00$ sudo /u01/crs11g/root.sh
Checking to see if Oracle CRS stack is already configured
/etc/oracle does not exist. Creating it now.

Setting the permissions on OCR backup directory
Setting up Network socket directories
Oracle Cluster Registry configuration upgraded successfully
Successfully accumulated necessary OCR keys.
Using ports: CSS=49895 CRS=49896 EVMC=49898 and EVMR=49897.
node <nodenumber>: <nodename> <private interconnect name> <hostname>
node 1: vx0306 vx0306-priv vx0306
node 2: vx0313 vx0313-priv vx0313
Creating OCR keys for user 'root', privgrp 'root'..
Operation successful.
Now formatting voting device: /dev/sdb5
Format of 1 voting devices complete.

Startup will be queued to init within 30 seconds.
Adding daemons to inittab
Expecting the CRS daemons to be up within 600 seconds.
Cluster Synchronization Services is active on these nodes.
        vx0306
Cluster Synchronization Services is inactive on these nodes.
        vx0313
Local node checking complete. Run root.sh on remaining nodes to start CRS daemon
s.
bash-3.00$
```

# End of Installation

# Verifying the Oracle Clusterware Installation

- Check for Oracle Clusterware processes with the `ps` command.
- Check the Oracle Clusterware startup entries in the `/etc/inittab` file.

```
# cat /etc/inittab
# Run xdm in runlevel 5
x:5:respawn:/etc/X11/prefdm -nodaemon
h1:35:respawn:/etc/init.d/init.evmd run >/dev/null
2>&1 </dev/null
h2:35:respawn:/etc/init.d/init.cssd fatal >/dev/null
2>&1 </dev/null
h3:35:respawn:/etc/init.d/init.crsd run >/dev/null
2>&1 </dev/null
```

# Summary

In this lesson, you should have learned how to:

- Describe the installation of Oracle RAC 11*g*
- Perform RAC preinstallation tasks
- Perform cluster setup tasks
- Install Oracle Clusterware

# Practice 1: Overview

This practice covers the following topics:

- Performing initial cluster configuration
- Installing Oracle Clusterware