Contents

Lab 1 – Server Hardware Planning

Lab 2 – Shared Storage Hardware Planning

Lab 3 – Configuring the Shared Storage System

Lab 4 – Installing SANworks Secure Path by Compaq Without Clustering

Lab 5 – Installing Novell Cluster Services

Lab 6 – Using Novell ConsoleOne to Manage Novell Cluster Services

Lab 7 – Configuring NSS Shared Storage

Lab 8 – Creating Cluster-Enabled Volumes

Lab 9 – Establishing Storage Data Path Redundancy with SANworks Secure Path by Compaq

Lab 10 – Cluster-Enable and Test the DHCP Server

Lab 11 – Clustering Novell GroupWise 6

Lab 12 – Troubleshooting Novell Cluster Services on Compaq ProLiant Clusters

Appendix A – Configuring the StorageWorks RA4x00 Storage Array by Compaq

Appendix B – Configuring the StorageWorks MA8000/EMA12000 Storage Array by Compaq

Appendix C – Configuring the ProLiant CL380 Packaged Cluster Solution

Objectives

After completing this lab, you should be able to:

■   Use the resources discussed in the previous modules to select the appropriate server solution for your cluster implementation.

■   Calculate the physical requirements for new cluster server nodes needed by an organization.

■   Determine which Compaq ProLiant servers meet the hardware requirements for the cluster to be constructed.

▲   **Note**
The hardware-planning chart in this section is a sample. It is intended to teach a process, not to provide specific information about application sizing. Some of the values that have been put in the chart are not necessarily accurate.

Requirements

There are no additional hardware or software requirements for this lab.

Exercise 1 — Scenario

Your Management Information Systems (MIS) director has asked you to provide a clustered solution for the company's mission-critical data. The solution must include a recommendation for Compaq ProLiant servers, storage arrays, and interconnections needed. Using the ProLiant server information from the student guide, determine which servers meet the hardware requirements for the clustered applications.

Take the following information into account as you plan:

- Your company currently has 375 employees.

- Staffing could increase by as much as 30% over the next two years.

- Email is mission-critical to the corporation.

- Message traffic tends to contain large attachments.

- The server room has a limited amount of floor space available.

- Additional hard disk space must be available for management applications and utilities that you will need.

Optimal Boot Partition size is calculated by adding the size of the boot partition (minimum 75MB) to the amount of server memory (for example 128MB); this equals 203MB as the minimum boot partition.

The disk must also have enough available space outside the boot partition to accommodate the SYS volume. A large number of NetWare products are installed on the SYS volume, so you must have enough available disk space to accommodate NetWare and the products to be installed.

Exercise 2 — Capacity Planning

Answer each of the following questions and fill in the hardware planning worksheet. Decide which server or servers meet your hardware needs. Use the notes column to list relevant information such as a formula or application name.

1. Approximate amount of disk space needed by NetWare 6 and NCS.

    ....

2. How much memory does NetWare 6 need?

    ....

3. What applications will be on the server?

    ....

Hardware Planning Worksheet — Server Section

	Disk Space (min)	Memory Usage (min)	Notes
Boot partition	100MB local storage	N/A	
NetWare 6 and NCS	1GB local storage	128MB	
Application 1 (GroupWise)	500MB local storage	128MB	
Application 2 (Oracle8)	1GB local storage	128MB	
Application 3 (Netscape Server)	500MB local storage	64MB	
Management tools	500MB local storage	64MB	
Total			

▲ **Note**
Some applications consume local and shared storage. This lab is focused on local storage needs.

Objectives

After completing this lab, you should be able to:

■   Plan an appropriate external storage solution for the cluster.

■   Determine how much storage is necessary for business applications and data volumes.

■   Determine what RAID level is desired for fault tolerance.

■   Calculate the amount of storage necessary to support the desired RAID level.

Requirements

There are no additional hardware or software requirements for this lab.

Exercise — Scenario

A possible solution to the problem posed in Lab 1, *Server Hardware Planning*, is the Compaq ProLiant DL380 Generation 2 (G2). This server supports more than 109.2GB of internal storage, and more than 1GB of memory.

Your Management Information Services (MIS) director has accepted the ProLiant DL380 G2 server solution and wants to add shared storage. Answer the following questions to help determine the appropriate storage array for your solution.

1. What type of RAID protection is needed?

    ....

2. How much logical space is required for the GroupWise data on the shared storage array? Assume 40MB of data for each user.

    ....

3. How much physical space do you need to provide sufficient logical space for GroupWise?

    ....

Configuring the Shared Storage System
Lab 3

Objectives

In this lab, you will:

■ Configure the shared storage subsystem with appropriate RAID sets.

■ Establish disk partitions used for cluster resources.

Requirements

To complete this lab, you will need:

■ One or more of the following storage subsystems:

- RA4100 (requires CPQONLIN.NLM)

- Compaq Smart Array Cluster Storage (requires CPQONLIN.NLM)

- RA/MA8000 or ESA/EMA12000 require StorageWorks Command Console (SWCC) or Command Line Interpreter (CLI)

- CR3500 Shared SCSI Storage (requires CR3500 Array Configuration Utility)

■ Maintenance cable (for CR3500 and MA8000 only).

■ Compaq universal hard disk drives.

■ Fibre Channel host bus adapters (HBAs) (not necessary for packaged cluster solutions).

■ Fibre Channel Arbitrated Loop (FC-AL) or Fibre Channel Switched Fabric (FC-SW) interconnect components (not necessary for packaged cluster solutions).

Configuration

Unless otherwise indicated by your instructor, the servers have been previously configured in the following manner:

■ NetWare 6 with Support Pack 1

■ Compaq Support Paq for Novell NetWare from the SmartStart and Support Software CD 5.3 or greater

■ CPQFC.HAM 2.52 or greater (Fibre Channel solutions only)

■ Non-redundant HA/N100 configuration (pre-wired for HA/N200 or HA/N500)

■ The appropriate utilities either have been previously loaded on your systems or are available from your instructor. To configure the storage subsystem, use the appropriate utility for the selected storage enclosure to do the following:

  • Configure disk partitions to be used for cluster resources and shared volumes. For this purpose, assign a separate logical unit number (LUN) for each application resource. In actual practice, one of two approaches is taken. In both cases, each highly available resource will have its own disk space.

  • Create separate LUNs for each resource using the appropriate configuration utility. This is the approach that will be used in this course. Also, this approach would be used if Selective Storage Presentation (SSP) were deployed.

▲ **Note**
SSP will not be used in this lab.

You will be performing the following operations:

- Create specified LUNs for later use with Novell Storage Services (NSS) partitioning. The partitions will be used later to create highly available resources.

- Allocate at least 15–25MB of free space to be used for the cluster services partition.

  - The cluster services partition is used by Novell Cluster Services to implement a quorum arbitration scheme. In the quorum arbitration scheme, each server writes a status signature to a disk segment reserved for that purpose. If the cluster-interconnect heartbeat for a server is delayed because of heavy network traffic, the other cluster servers check the quorum status signature periodically to determine whether that server is operational.

  - The Novell Cluster Services installation procedure automatically allocates one cylinder on one drive of the shared storage for the cluster services partition.

▲ Note

The previous requirement for the SBD partition was 10–25MB. However, more space is required for drives that are larger than 10GB. For a practical application, reserve at least 15MB for currently shipping drives which are no smaller than 18GB.

When configuring the storage subsystem, consider the following:

■ For added fault tolerance, you can allocate an additional 15–25MB of free space for a redundant cluster services partition.

▲ **Note**
It is not necessary to carve out separate LUNs for the SBD. It is done in this lab as an exercise to demonstrate one method of deploying the solution.

■ Allocate additional partitions for future use.

■ Select appropriate RAID levels and hot spares. Use RAID 1 or RAID 5 for fault tolerance in shared storage.

The following diagram shows an example of shared storage allocation.

Physical Drive 1   **Physical Drive 2**   **Physical Drive 3**

Logical Drive 1 – SBD

Logical Drive 2 – SBD Mirror

Logical Drive 3

Shared Storage Allocation Example
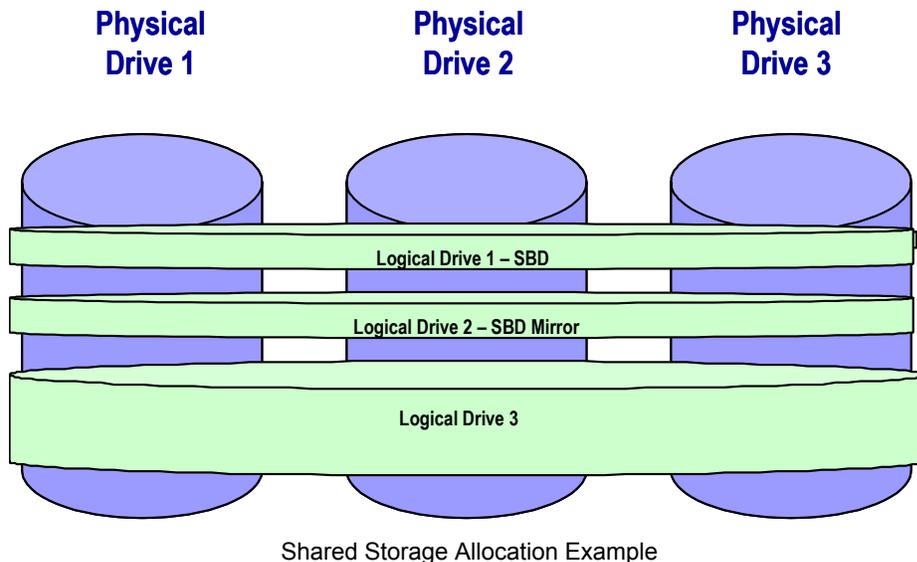
Exercise — Creating Logical Drives

To create new logical drives:

1. Shut down and power off all cluster server nodes.

    ! **Important**

    If using a Fibre Channel configuration, there are two Fibre Channel interconnects. Do **not** alter their power configuration at this time. One interconnect should remain powered off so that the cluster can begin in a base configuration.

2. Power on the storage subsystem if it is not already powered on. Wait for it to fully initialize.

3. Power on the cluster server that contains the master replica of the Novell eDirectory Service (NDS) tree (Node 1). After you have configured the storage array, you can power on each of the other servers in the cluster one at a time and ensure that each server is capable of recognizing the newly configured storage.

    ▲ **Note**

    If you are unsure as to which server contains the Master NDS Replica, use the NDSMGR32 utility, ConsoleOne, or Remote Manager to verify.

4. Use the appropriate storage array configuration utility to configure the storage arrays with the following LUNs.

Resource Use	Approximate Logical Drive Size (MB)
Logical Drive 1	20
Logical Drive 2	20
Logical Drive 3 (Remaining Space)	4096 or greater

If you are unfamiliar with the procedures for creating arrays and logical drives with your assigned storage system, refer to Lab Appendices A through C for more detailed information. The material in the appendices is provided for reference only. The exact procedures will not necessarily match requirements for this exercise.

The following table outlines the available types of storage resources and their corresponding array configuration utilities.

Compaq Storage Array	Driver	Array Configuration Utility	Default Utility Location
CR3500	CPQSCSI.HAM	CR3500 Array Configuration Utility	SmartStart and Support Software CD in the *CR3500* directory
Smart Array Cluster Storage Controller	CPQRAID.HAM	CPQONLIN.NLM or offline Array Configuration Utility	Compaq Smart Array Cluster Storage Support Software CD or SmartStart and Support Software CD
RA4x00	CPQFC.HAM	CPQONLIN.NLM or offline Array Configuration Utility	SmartStart and Support Software CD
RA/MA8000 or ESA/ EMA12000	CPQFC.HAM	CLI or SWCC	ACS v8.5 or 8.6 for the HSG80 Controller for CLI or the *RA/MA8000; ESA/EMA12000 Fibre Solution Software v8.5B for Novell NetWare* platform kit or later

Installing SANworks Secure Path by Compaq Without Clustering
Lab 4

Objectives

After completing this lab, you should be able to:

■ Create Redundant Fibre Channel I/O links.

■ Inject Simulated Hardware Failures

■ Install and configure Secure Path for NetWare host software

■ Install the Secure Path Manager

■ Test Secure Path software and compare the raw multipath driver functionality to using the Secure Path for NetWare Utility.

Requirements

To complete this lab, you will need:

■ Redundant Fibre Channel hardware.

■ Multipath capable driver support.

■ *SANworks* Secure Path for NetWare 3.0a or *SANworks* Secure Path for NetWare for the RA4100 by Compaq.

■ RA4000 controller firmware 2.58 or later.

■ ACS 8.5F or 8.6F (if using HSG80 controller).

Configuration

For the purpose of this lab, redundant hardware has already been preinstalled in your cluster servers. However, your backup Fibre Channel Arbitrated Loop (FC-AL) hub, switch, or switched fabric is not currently active because there is no power to the secondary Fibre Channel interconnect device.

> ▲ **Note**
> This lab is not applicable if you are clustering with the Compaq packaged cluster solutions, CL380 or the ProLiant DL380 G2 Packaged Cluster Solution.

Use the Compaq Array Configuration Utility (ACU), the Command Line Interpreter (CLI), or the StorageWorks Command Console (SWCC) to verify:

- Firmware revision

- Redundant configuration with one controller active and the other in standby or active mode

> ▲ **Note**
> Active/active controller modes can only be achieved with HSG80 controllers.

Exercise 1 — Enabling Redundant Configuration Using Multipath Driver Support

1. Apply power to the redundant Fibre Channel interconnect.

   Within 6 to10 minutes the Compaq multipath CPQFC driver will recognize that the secondary path is active, and it will instruct the standby HBA to ignite its lasers.

2. After a few minutes, switch to CPQONLIN (if using the RA4x00) and verify that one HBA is connected to an active controller and the other is connected to a controller in standby mode.

3. What message indicates that an HBA is connected to an active controller?

   ....

   ....

Exercise 2 — Injecting Simulated Hardware Failures

1. Unplug a Fibre Channel cable from the active controller – RA4000 Controller (Controller 0) or the top HSG80.

2. Use the CPQONLIN, CLI, or SWCC utilities to determine if the storage array is still accessible. If it is, you have successfully introduced redundant components to make your storage system more highly available. This demonstrates the ability of the multipath driver to fail over from one path to another in the event of a hardware failure.

3. Repair the broken Fibre Channel segment by plugging the Fibre Channel cable back in.

Exercise 3 — Installing and Configuring Secure Path for NetWare Host Software

The Secure Path software is made up of the Novell NetWare Secure Path Agent and the CPQFC.HAM driver running at the server. The Secure Path Manager (SPM) runs on a remote Microsoft Windows NT or Windows 2000 client.

> **!**
>
> **Important**
>
> Each server accessing the shared storage must have Secure Path installed to ensure proper operation of the utility.

In this exercise, you will be installing SANworks Secure Path for NetWare on each of the servers connected to the shared storage system. Ensure that the targeted systems have at least two host bus adapters (HBAs) installed and that they are powered up.

> **!**
>
> **Important**
>
> The SANworks Secure Path for NetWare host software must be installed before the SPM client software is installed because the client needs an agent to contact.

Configuring the Server HOSTS File

The HOSTS file must be edited to add the network host names and client names to **all** servers and clients that will be using Secure Path. This enables client lookup for authorization to access the Secure Path hosts through the agent software.

1. Use the local server text editor *EDIT.NLM* to modify the server HOSTS file. From the server command console, enter `EDIT SYS:ETC/HOSTS`.

2. Add the client name and IP address and save the HOSTS file to activate it.

3. Repeat steps 1 through 2 for the other server nodes.

> **▲**
>
> **Note**
>
> Although not used in this lab, DNS can be used instead of the HOSTS file.

Installing SANworks Secure Path

1. Starting with Node1, insert the Secure Path CD and enter the NetWare console command `CDROM`. After the CD has been mounted, issue the `Volume` command. The CD should have a volume label of NWSPV30. If this is not visible, mount the volume by issuing the command `Mount NWSPV30`.

▲ **Note**
If the volume title is different for the Secure Path CD provided to you, use the appropriate volume label.
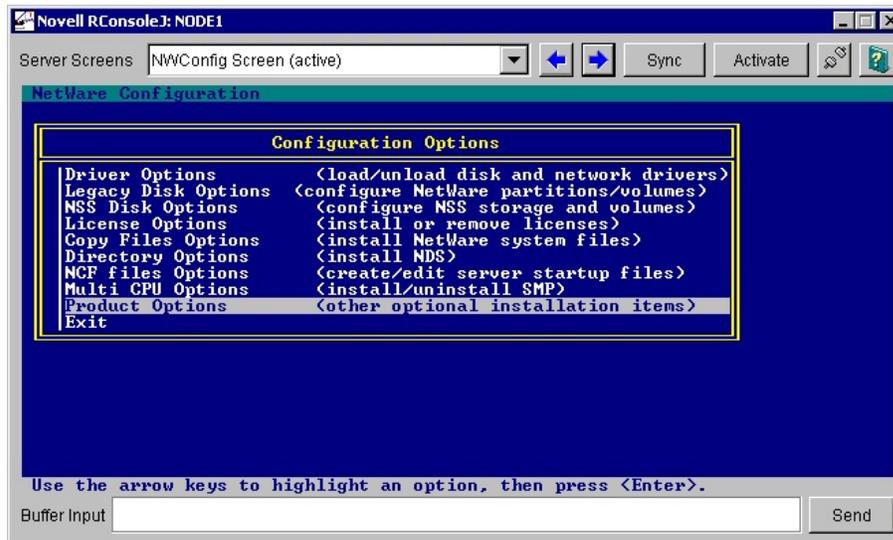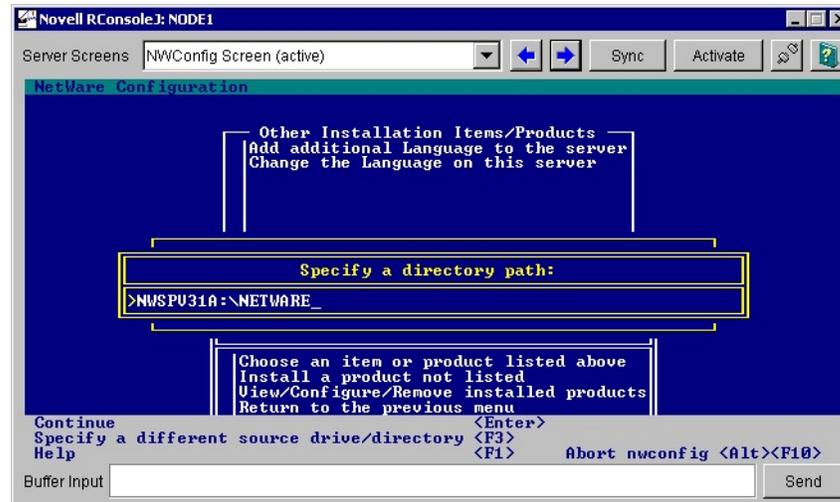
2. Load NWCONFIG and select *Product Options*. Use F3 to specify the installation path of NWSPV30:\NETWARE. The screen will switch to the Secure Path installation program. That program will check the HAM and other drivers, and then start installing files.

    ▲ Note

    Your instructor might have previously installed the appropriate HAM driver. If so, a brief message indicating that the current driver is acceptable will display. If the HAM driver needs to be upgraded, the new driver will be copied to the appropriate partitions. You will need to unload the old driver and reload the updated driver.

3. Exit the Product Options screen when the installation is complete.
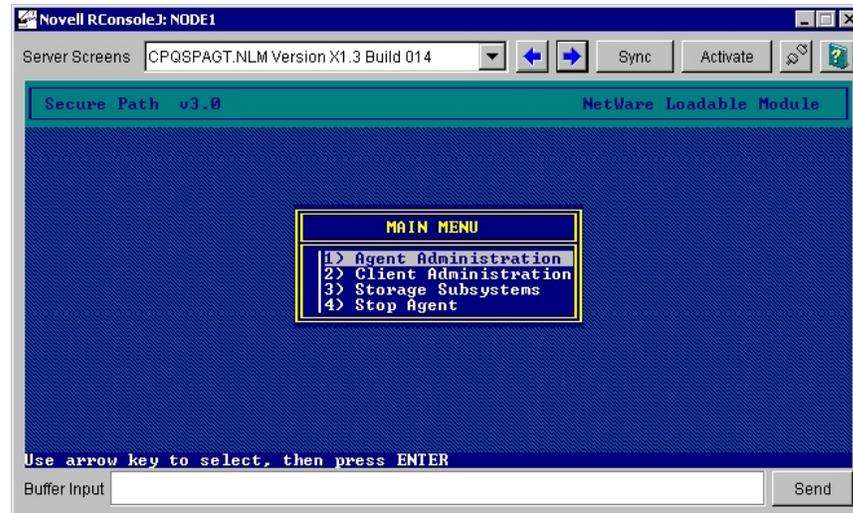
4.   The agent file CPQSPAGT.NLM is loaded. If it does not automatically load, then manually load CPQSPAGT.NLM. Move to the Secure Path V3.0 NetWare Loadable Module screen which will have the following options form the Main Menu:

- Agent Administration

- Client Administration

- Storage Subsystems

- Stop Agent

5.   The installation for the server is now complete. Select *Agent Administration* → *Change Password* to set a password that authorizes remote stations to access this unit. Use the password "Compaq."

6.   Escape out and ensure the following:

- Load Distribution is DISABLED

- Path Verification is ENABLED

- Auto Failback is ENABLED

▲   **Note**
Auto Failback functions for a failed data path and not a failed controller.

7.   Select *Client Administration* → *Add a Client* to add all client machines that need access to SPM. Enter client name and IP address in the following space:

....

....

▲   **Note**
This entry, along with the password entry, gives the client access to SPM. This entry is case sensitive and must match the client's HOSTS file entry.

Any changes to the SP Agent will require that the NLM be stopped and restarted for the changes to become active.

8.   Verify that the entry to load CPQSPAGT.NLM has been placed into the AUTOEXEC.NCF file.

9.   Repeat steps 1 through 8 for the other server nodes.

Exercise 4 — Installing the Secure Path Manager

The Secure Path Manager (SPM) is deployed on a Windows NT or Windows 2000 client to monitor and manage a Secure Path environment. SPM displays information about the state of RAID storage systems and I/O paths configured for high-availability storage access. The SPM sets various properties, policies, and modes associated with a managed storage profile. SPM will automatically detect and indicate path failures as well as provide the capability to move RAID array storagesets across controller pairs.

Installing Client Software

1. Modify the client's local HOSTS file so that it includes all the node names in the cluster. The HOSTS file is located in the folder of path: winnt/system32/drivers/etc for Windows NT and Windows 2000.

2. From the Secure Path/Windows folder, select *Setup* → *Yes* → *Next* → *Yes* → *Next* → *Next* to select the default path of: C:\Program Files\Compaq\SecurePath
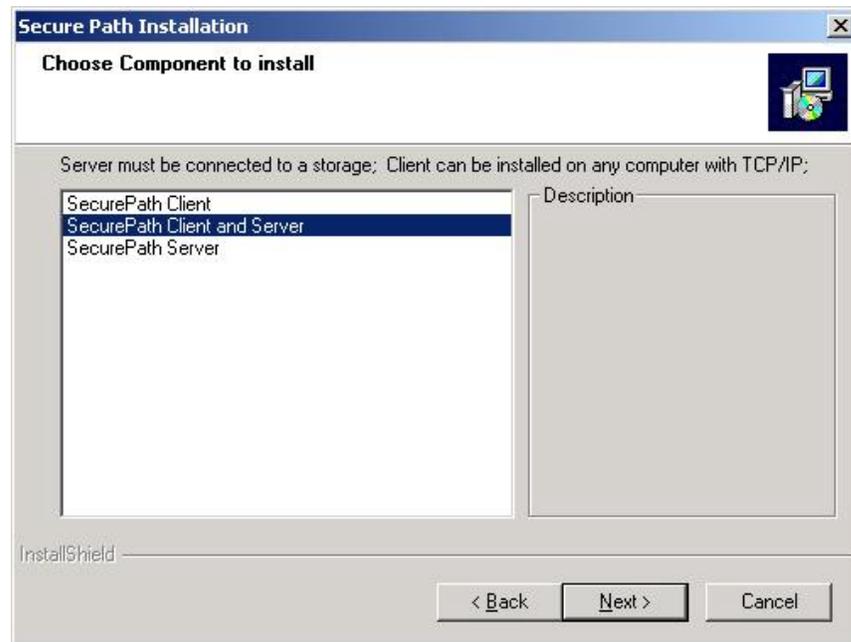
3. At the Choose Component to install screen, select *SecurePath Client* and click *Next* → *Next* → *Next* → *Finish*.

> **Important**
> You must select SecurePath Client and **not** SecurePath Client and Server. The latter option is not used for the NetWare environment. The screen shot shows the default selection.

Configuring SPM Software

1. Launch SPM by clicking its icon.
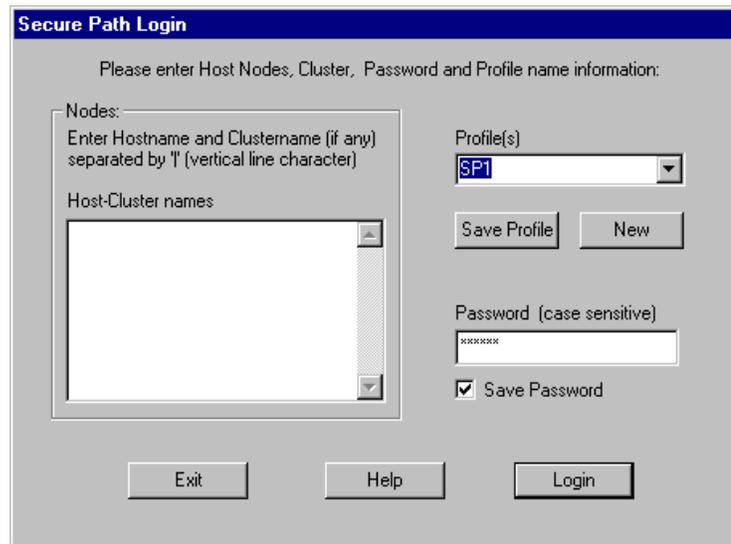
2. Define the SPM Storage Profile in the Nodes screen by entering each of the nodes names with the syntax of ServerName. This syntax reflects the node name and cluster name separated by a hyphen.

    > **!** **Important**
    >
    > Because SPM uses the hyphen to distinguish between node (Host) name and cluster name, hyphens must **not** be used in node names.

3. Enter a unique name for the profile and save it.

4. Specify the same password that you set on each of your server nodes with *Agent Administration* and save it. The password should be "Compaq."

5. After setting up and saving your profile, log in to SPM.

Managing Storagesets and Paths, and Monitoring Host Connections

After successfully logging in with the SPM, you should see a server icon representing each of the server nodes. The node name will be on top of the icon.

SPM monitors connection status for each active host that is a member of the current storage profile. SPM indicates a loss of connection to a host with a red "X." This loss could be because the node is down, or because the Secure Path Agent is no longer running on that node.

From the left pane of the screen, click a storage system and expand the listing of LUNs under that controller. Right-clicking to:

- Move a storageset from one controller to the other.

- Make a path Alternate.

- Make a path Preferred.

- Change the Preferred path.

- Make a path Offline.

- Make a path Online.

- Verify a path.

- Repair a path (manual fail back).

▲ **Note**

Not all features are available for all types of controllers. For the RA4000 array controller, if you move one disk from one controller to the other, all the disks will move because the controllers are always either in active or standby modes, but never active/active.

For the HSG80 controllers, dragging disk devices between the two paths enables load balancing for each controller path. Remember to change the associated Preferred path on the HSG80 controller when you do this (for instance, SET D1 PREF = OTHER). Otherwise, the next time the server is restarted, the previous Preferred path unit setting will take precedence and place your disk back in its original path.

How many controllers can you see and how many devices are attached to each controller?

....

Exercise 5 — Testing the Secure Path Software

1. Unplug the Fibre Channel cable connected to the HBA, which is connected to the active controller of the shared storage system. The SPM graphical user interface (GUI) shows that the LUNs have now been failed over to the alternate controller.

2. Repair the broken Fibre Channel segment by plugging the cable back in. With Auto Fail Back enabled, the LUNs should fail back to the other controller and HBA.

Objectives

After completing this lab, you should be able to:

- Prepare for a Novell Cluster Services (NCS) Installation
- Install NCS 1.6

Requirements

To complete this lab, you will need:

- NWDEPLOY utility from NetWare 6 CD.
- Novell Client32 software deployed on client to execute NWDEPLOY.
- Minimum of two NetWare servers with minimum 256MB of memory each (512MB recommended for failing over multiple applications to the same server).
- Servers should be pre-configured with drivers from SmartStart 5.3 or later.
- NetWare 6 running on each server and all servers are in the same eDirector tree.
- At least one local disk device for SYS: volume on each server.
- Shared storage configured with RAID 1 or 5.
- 15–25MB of free space for the cluster partition.
- Pre-wired Fibre Channel storage hubs or switches.
- All servers are networked, configured with IP, and within the same IP subnet.
- Documented IP addresses for the cluster and each of the highly available resources.

Exercise 1 — Preparing for NCS Installation

Before installing NCS, have no Novell eDirectory Services (NDS) or time synchronization errors present. To achieve this goal, execute DSREPAIR on each of the nodes until there are no errors present.

1. At server command of Node1 console enter *DSREPAIR → Unattended full repair*.

2. After the repairs are complete, note how many errors are present. Press *Enter* to view the log file. Press *Esc* to log out of the log file editor.

3. If there are still errors present, repeat steps 1 and 2. If there are no errors, proceed to step 4.

4. Repeat steps 1 through 3 for the remaining server nodes.

5. When all nodes are error free, proceed to Exercise 2.

Exercise 2 — Installing NCS

The NCS installation program directs you through the steps required to install the NCS software on the cluster servers. To run the NCS installation program:

1. If you have not already done so, log in from the client workstation with administrator privileges.

   ▲ **Note**

   All admin accounts have the following assigned parameters:
   - Tree = **CPQ**
   - Context = **NCS**
   - Password = **compaq**

2. Insert the NetWare Operating System CD in the CD-ROM drive and locate the NetWare Deployment Manager program (NWDEPLOY.EXE) in the root directory of the CD or locate the NWDEPLOY utility in the ClassPaq folder.

3. Run NWDEPLOY.EXE. The first screen of the NetWare Deployment Manager displays.
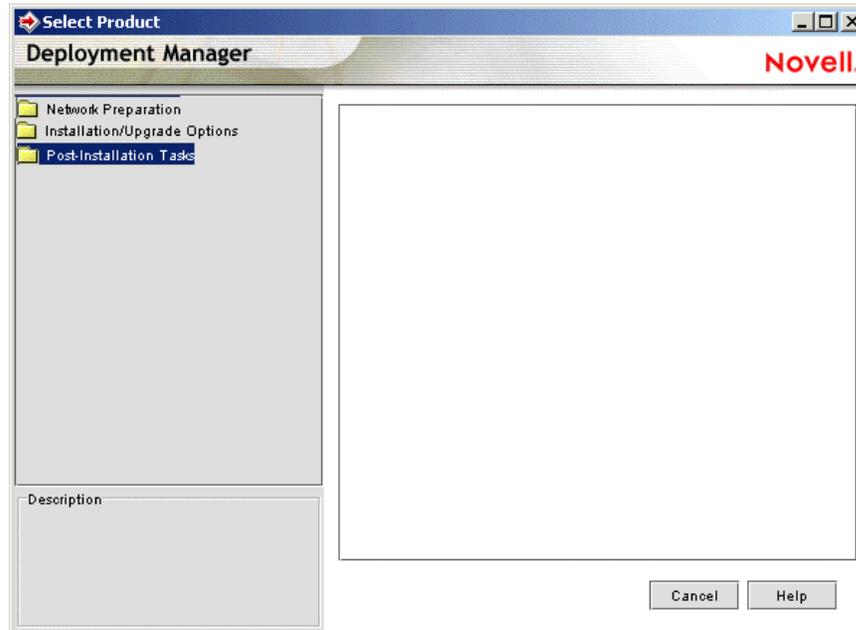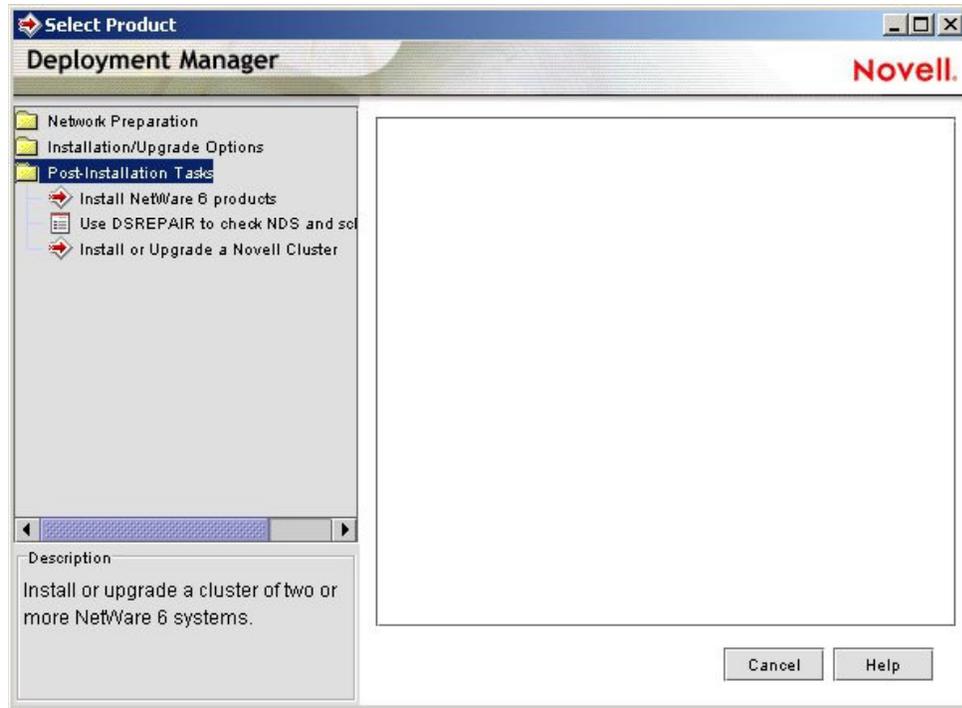
4.   Double-click the Post-Installation Tasks folder.

5.   Click Install or Upgrade a Novell Cluster. The Welcome screen displays.
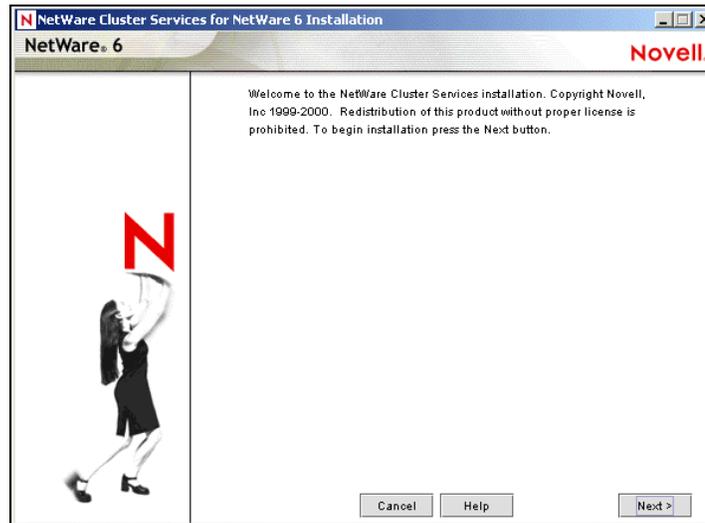
6.   Click *Next*. The NCS Action screen displays.
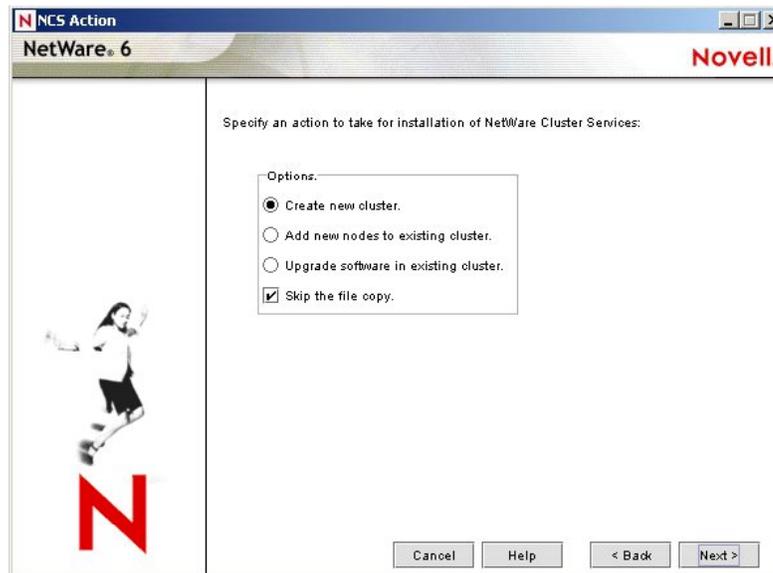
7.   Select *Create a new cluster*.

Note

▲   The Skip the file copy option can be used if NCS files have already been copied to cluster nodes. Otherwise, do not select this option. This option is enabled by default because the cluster files are copied to NetWare 6 servers during installation of the operating system.

8.   Click *Next*. The NCS Cluster Selection screen displays.
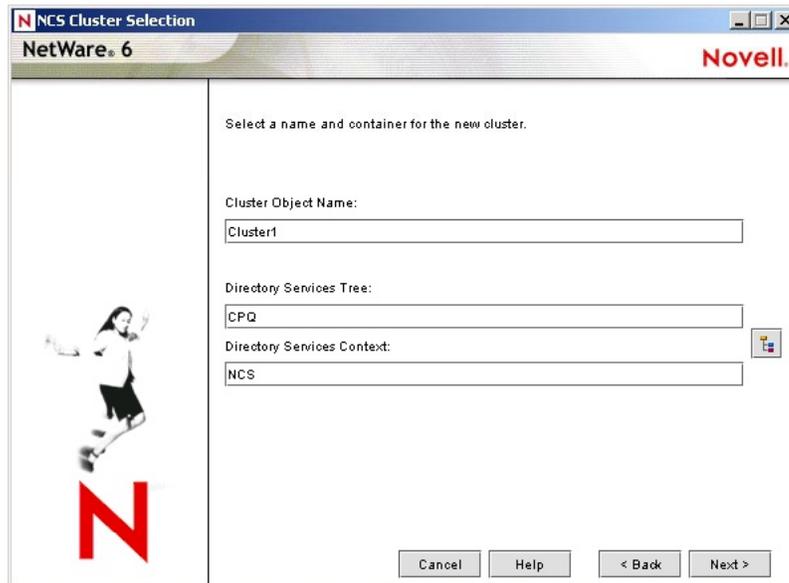
9.   Enter the following cluster object properties:

   • Cluster Object Name: **Cluster1**

   • Directory Services Tree: **CPQ**

   • Directory Services Context: **NCS**

After this step, the NDS Schema is extended with the new cluster container object.

10. Click *Next*. The NCS Cluster Node Modification screen displays.
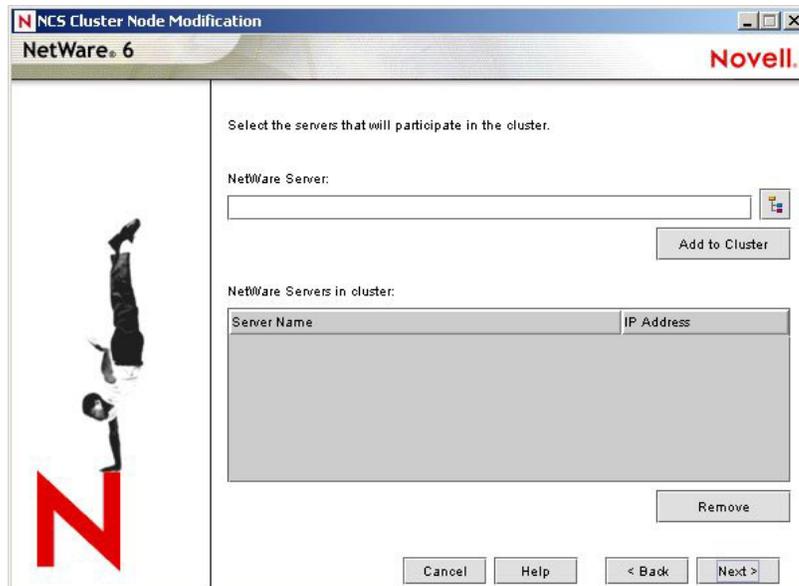
11. On the NCS Cluster Node Modification screen, use one of the following methods to specify the Node1 and Node2 servers that will form the cluster:

- For each server, type the server name in the NetWare Server field and click Add to Cluster.

- Click the browse icon next to the NetWare Server field to open a browser window similar to the following. Select one or more servers in the right-hand pane and click *Add*. The added servers displays in the Selected Items field at the bottom of the screen. Click *OK*.
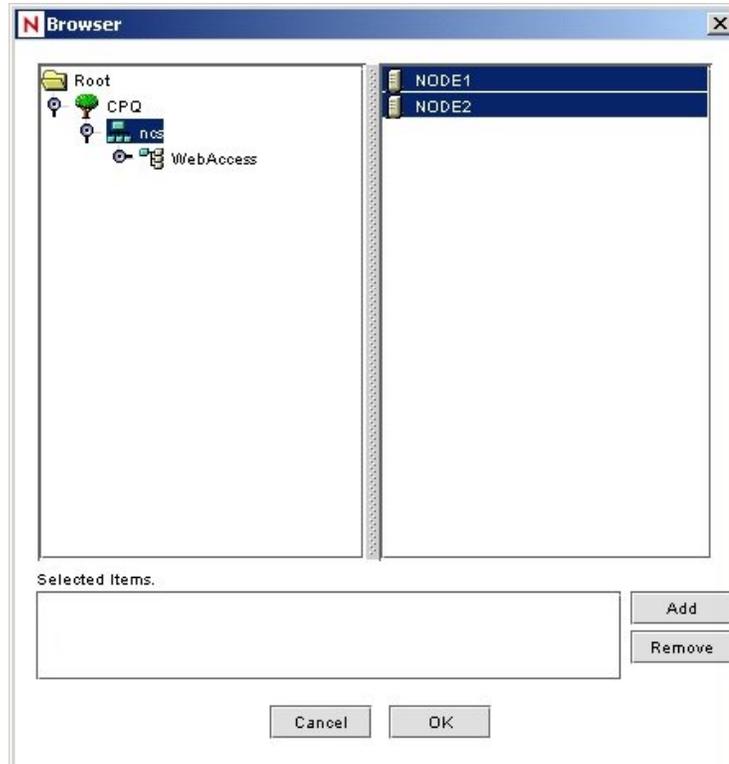
Note

NCS 1.6 supports the selection of multiple servers for addition to the cluster.

NCS automatically detects the IP address of the server. This IP address will be used for the cluster interconnect.

If the server has more than one IP address, the following window displays, asking you to select an IP address.
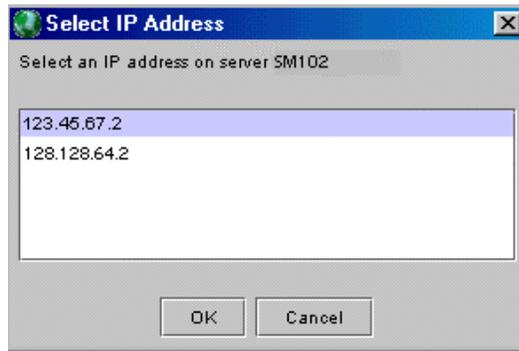
If this window displays, select the correct IP address and click *OK*. You can select either the same IP address used for the public LAN link or a different IP address for a dedicated cluster interconnect. You will only have one IP Address from which to select in this lab.

▲ **Note**

All cluster IP addresses must be on the same subnet.

The new server is added to the NetWare Servers in cluster list on the NCS Cluster Node Modification screen. The list also shows the IP address of each server.
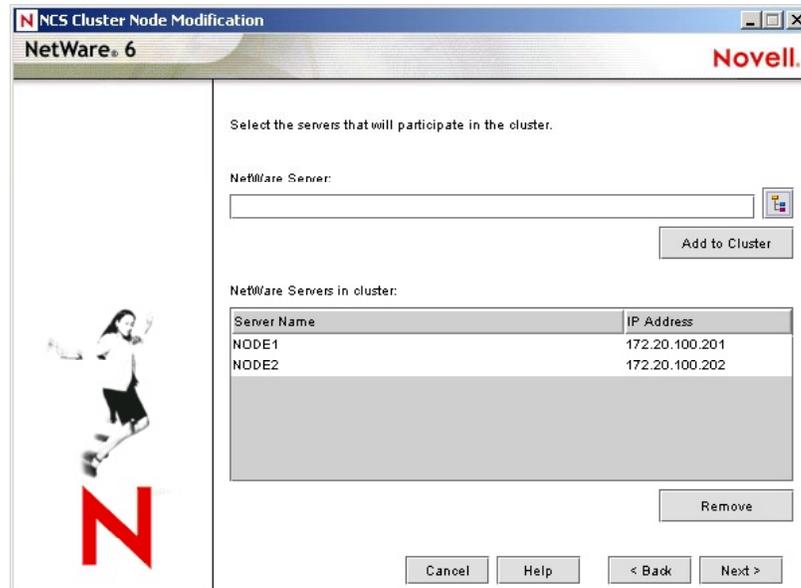
12. If all cluster nodes have not been selected, repeat step 11 for each node to be added to the cluster.

13. Click *Next* when you have added all servers. The Cluster IP Address Selection screen displays.

14. Enter the cluster IP address *172.20.100.200*. This address will be the Master Cluster IP Address and is unique for each cluster in the tree.

▲ **Note**
The cluster IP address is separate from the server IP addresses and is required for certain application programs to get cluster alerts. NetWare Remote Manager also requires a cluster IP address.

The cluster IP address is bound to the master node and remains with the master node regardless of which server is the master node.

15. Click *Next*. The NCS Shared Media Selection screen displays. Use this screen to allocate the cluster services partition.
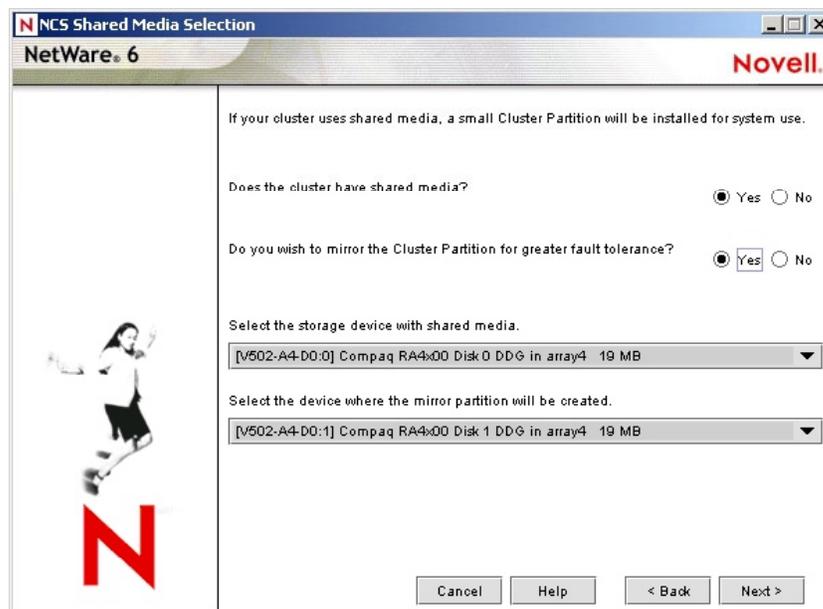
▲ **Note**
The NCS installation procedure automatically allocates at least 15-25 MB of free space to be used for the cluster services partition. The cluster services partition is used by NCS on all cluster servers to implement a quorum arbitration scheme. In the quorum arbitration scheme, each server writes a status signature to a disk segment reserved for that purpose. If the cluster interconnect heartbeat for a server is delayed because of heavy network traffic, then the quorum status signature is checked periodically by the other cluster servers to determine whether that server is operational.

For added fault tolerance, you can allocate an additional 15–25MB of free space for a redundant cluster services partition.

16. On the NCS Shared Media Selection screen:

    a. Select *Yes* next to "Does the cluster have shared media?"

    b. For greater fault tolerance, select the option to mirror the cluster services partition.

    c. From the first pull-down list, select the storage device for the shared media.

    d. If you selected the option to mirror the cluster services partition, select from the second pull-down list the device where the mirror partition is to be allocated.

▲ **Note**
If no shared media is detected, check all shared storage connections. Ensure that the desired partitions are free of any previous data.

17. Click *Next*. The Start Clustering screen displays.
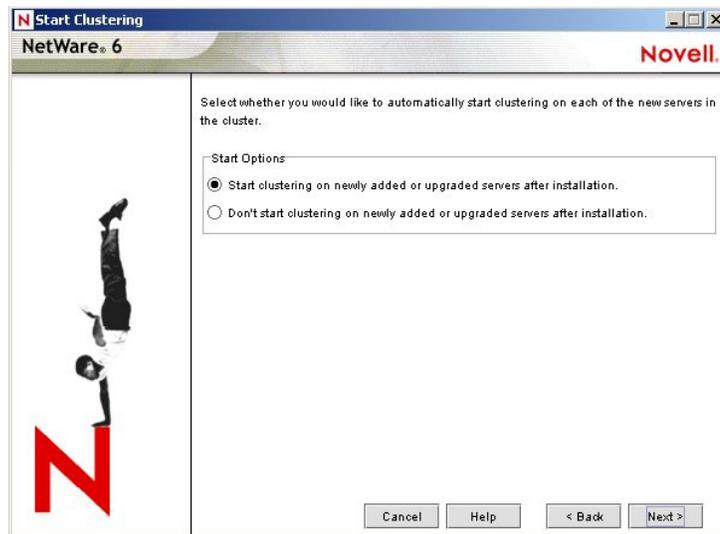
18. Select the option to Start clustering on newly added or upgraded servers after installation.

19. Click *Next*. If more than two nodes are to be installed, the Licenses screen displays. For a 2-node cluster, this screen does not display since NetWare 6 includes licenses for a 2-node cluster. No more than two licenses are installed in this lab, so this screen will not display.
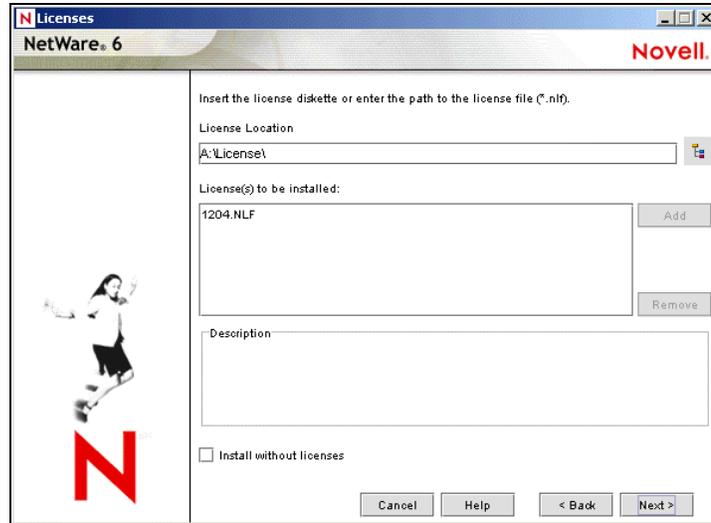
20. When the Summary screen displays, click *Finish*.
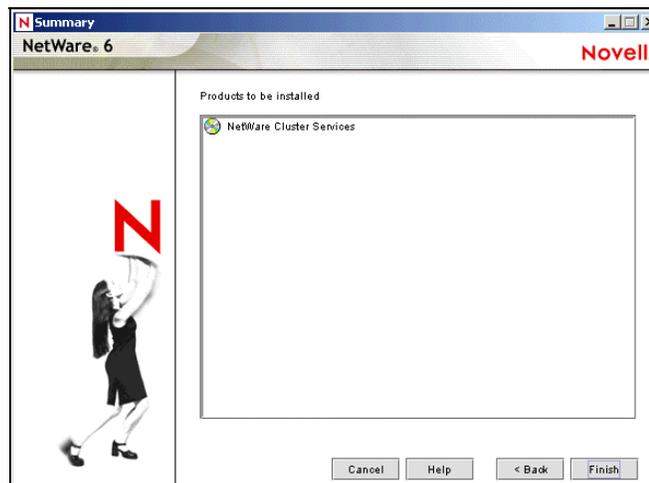
The Install program creates a new cluster and configures NCS and the licenses you specified on the cluster servers.

This completes the NCS installation procedure. NCS will start automatically. Select either *View* or *Close* for the Readme file option. If View is selected, remember to close it after viewing the document.

21. The NWDEPLOY screen displays. Exit NWDEPLOY by selecting *Cancel* →
    Yes.

    When NCS is started, the following server console screen displays, showing
    the nodes in the cluster and indicating that the cluster is active.
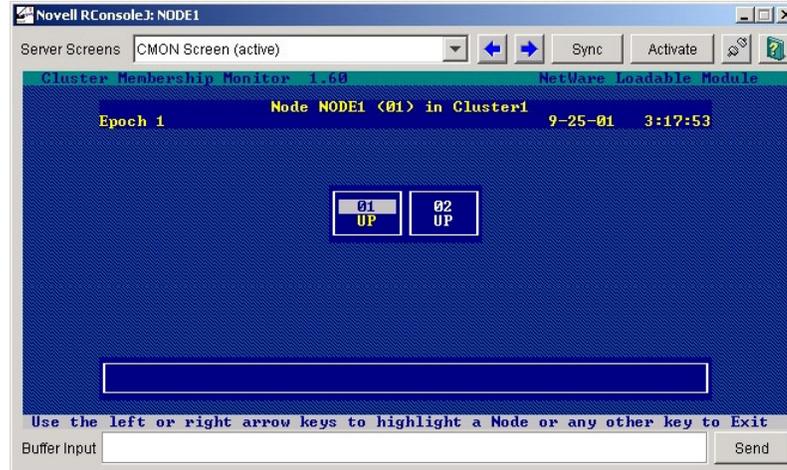
22. Ensure that the client is logged in and run ConsoleOne from the following
    directory:

    sys:public\mgmt\consoleone\1.2\bin\consoleone.exe

Using Novell ConsoleOne to Manage Novell Cluster Services
Lab 6

Objectives

After completing this lab, In this lab, you should be able to:

- Use ConsoleOne views to manage Novell Cluster Services (NCS).

- Configure cluster properties using ConsoleOne.

- View the Split-Brain Detection Process.

- Change the cluster Master IP address

Requirements

To complete this lab, you will need ConsoleOne 1.3.2 or later files with the NCS snapin.

Configuration

ConsoleOne is a Java-based graphical user interface (GUI) used to monitor and manage NetWare 6 and NCS 1.6. It allows remote management of the cluster from any workstation that has access to Novell eDirectory Services (NDS). ConsoleOne features an HTML cluster-wide event log for node and resource status.

You can install ConsoleOne on any client workstation (or on multiple workstations).

Compaq recommends that the client machine used to manage the cluster be at least 300MHz or higher and have at least 90MB of memory.

▲ **Note**

You can also run ConsoleOne on a cluster server from the X Server Graphical Console. ConsoleOne, with the cluster snapin, is automatically installed with NetWare 6 servers.

Unless otherwise indicated by your instructor, for the purposes of this lab exercise, ConsoleOne 1.3.2 or later has already been installed on your lab workstation along with the NCS snapin.

Exercise 1 – Examine ConsoleOne Views

1. Start ConsoleOne by double-clicking the ConsoleOne icon on the Windows desktop. This displays the ConsoleOne main screen; where all the NDS objects in the tree can be revealed.
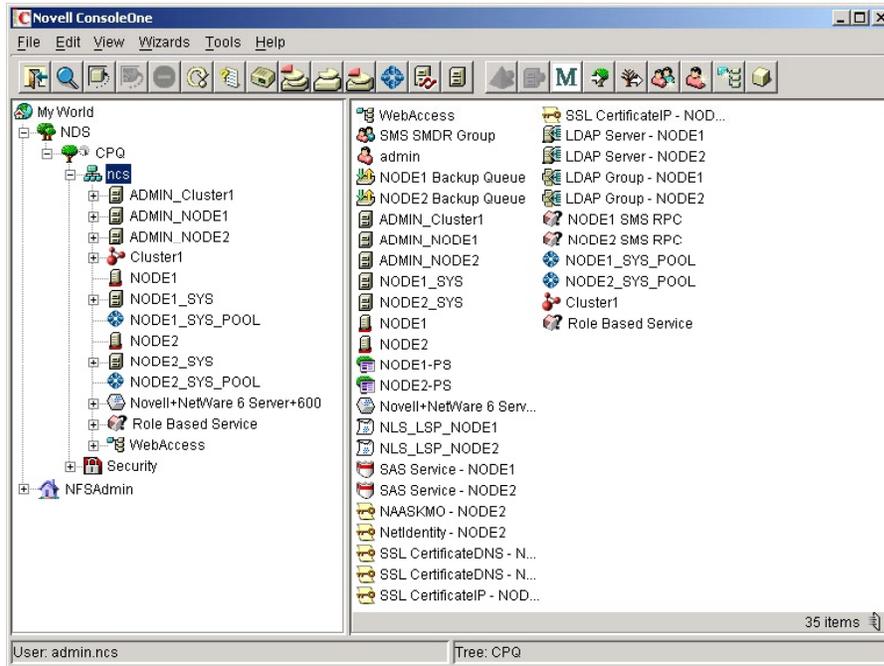
ConsoleOne provides three views from which you can manage your cluster: Cluster State view, Console view, and Partition and Replica view.

2. To open a view, select the cluster object in the directory tree in the left-hand pane. The Console view will display by default.

▲   **Note**
    The cluster object is the one with three attached red balls to represent NCS.

The Console view shows the cluster servers, resources, and templates. From this screen, you can view and change cluster and resource properties, and create clustered volumes. The following is an example of the Console view.
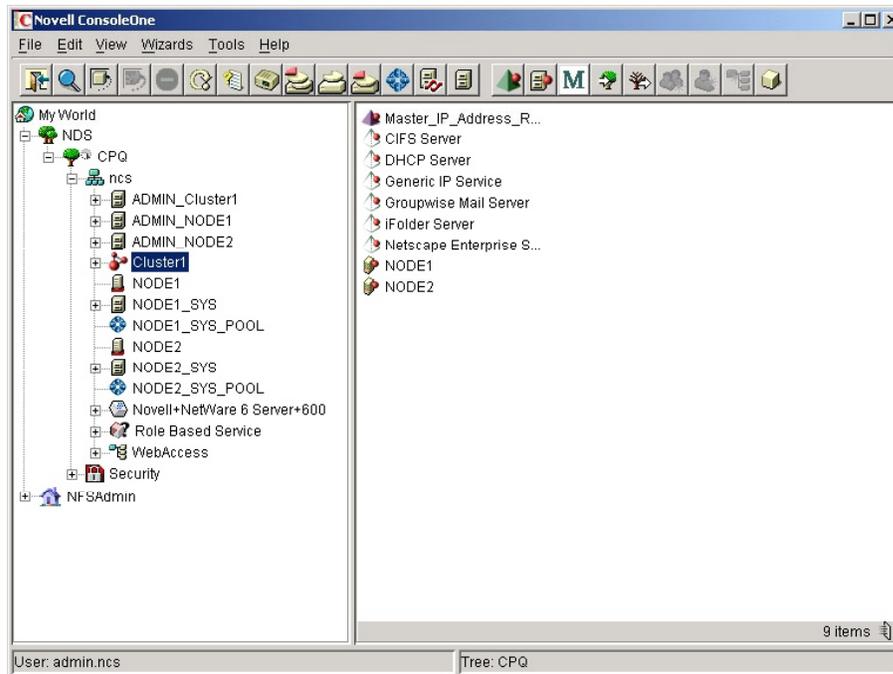
3. Select *View → Cluster State View*.

The Cluster State view displays information about the status of servers and resources. It shows you which volumes and services are running on each server in the cluster as well as the state (Offline, Running, and so on) of the volume or service. The following is an example of the Cluster State view.
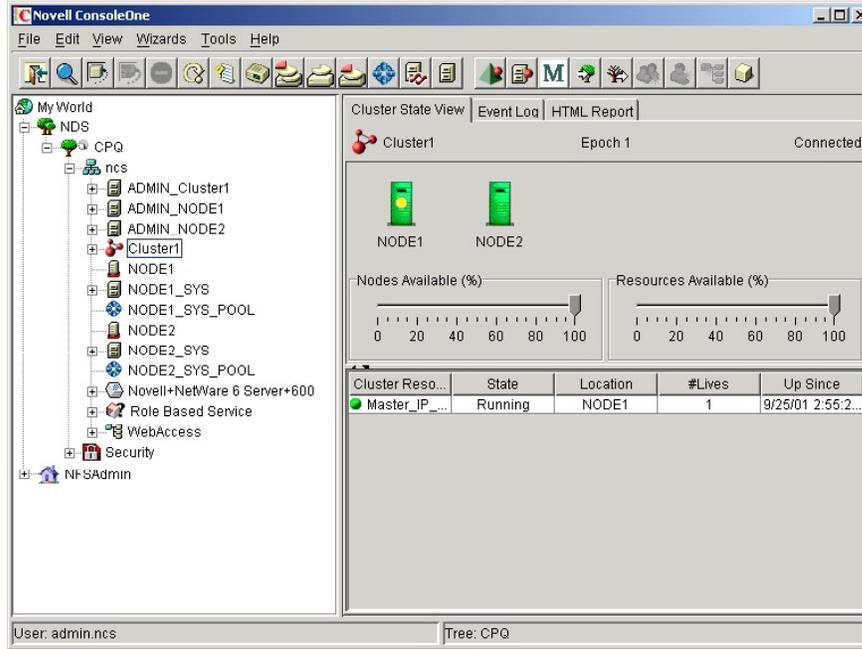
4.   Select the CPQ object from the left pane.

5.   Select *View → Partition and Replica View*.

The Partition and Replica view shows the state of the replicas.
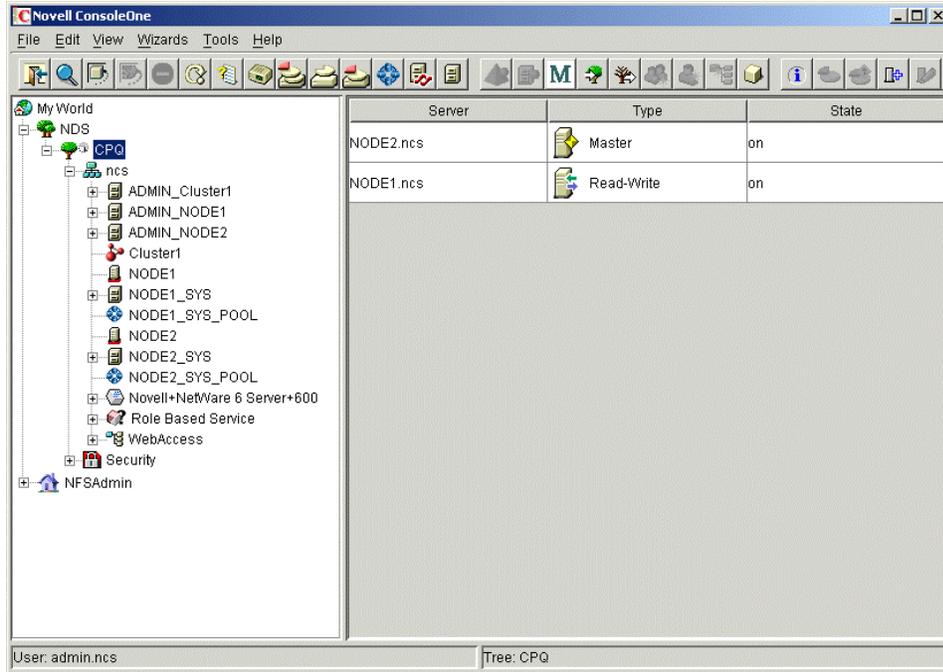
Exercise 2 — Configuring Cluster Properties

In this exercise, use ConsoleOne to set NCS cluster membership and communication properties.

Configuring Cluster Membership Properties

Because your cluster contains only two nodes, and you will be restarting both nodes often during the remaining labs, increasing the timeout period will allow enough time for the second node to restart after the first node has been started. This prevents potential errors during the remaining labs.

1. In the directory tree of the left pane, right-click the cluster object and select *Properties*. This will open the Cluster Object property sheet.

2. Click the *Quorum* tab.

3. Verify that the Membership property is set to 2, which is the number of nodes that must be running in the cluster before resources will start to load.

4. The Timeout property configures the amount of time to wait for the number of servers defined in the membership field to be up and running. Set this to two minutes (120 seconds).

5. Click *OK*. To activate the changes, restart all nodes.

> ▲ **Note**
> The Timeout Trigger is one property that forces a node reboot for a changed value to take effect.

6. After all cluster nodes have been restarted, proceed to the Configuring Cluster Communication Properties section.

Configuring Cluster Communication Properties

You have asked your network analyst to examine the network traffic on the LAN in which the cluster resides. The analyst reports that an unknown problem with the Ethernet switch through which the cluster is connected to the LAN is causing the switch to spontaneously reset itself periodically.

The reset takes a maximum of 25 seconds to complete. Until this problem can be corrected, you need to configure your cluster to avoid failing over because of these periodic errors.

1. Log back in and launch ConsoleOne.

2. In the directory tree overview, right-click the cluster object and select *Properties*.

3. Click the *Protocol* tab.

4. Change one or more of the following properties to achieve the desired configuration:

    -   **Heartbeat** — The amount of time between transmits for all nodes in the cluster except the master

    -   **Tolerance** — The amount of time the master node gives all other nodes in the cluster to signal that they are alive

    -   **Master Watchdog** — The amount of time between transmits for the master node in the cluster

    -   **Slave Watchdog** — The amount of time the master node has to signal that it is alive

Which properties did you change, and what values did you choose?

....

....

....

....

....

Exercise 3 – View Split-Brain Detection Process

This exercise shows the timing of the split-brain detection process.

1. Switch to the Console screens for each of the two servers.

2. Disconnect the network cable for Node2 at the Ethernet hub; then watch what happens at both server consoles.

    What message displays on the Node2 console?

    ....

    ....

    Approximately how long does it take before this message displays?

    ....

3. On Node1, switch to the Cluster Monitor (CMON) screen and use the left and right arrow keys to highlight each node. Read the node information in the dialog box at the bottom of the screen.

4. From the ConsoleOne Cluster State view, click the *Event Log* tab and note the Cluster Event log entries for Node2.

5. Reconnect the LAN cable to Node2.

6. At the abend screen on Node2, enter *X*.

7. Restart the server by entering SERVER.

8. Use CMON on Node1 to verify that Node2 has rejoined the cluster.

9. At Node2, switch to the Console screen.

10. After NetWare is running normally on Node2, power off Node2.

11. Switch to the Logger screen of Node1 and read the console messages.

12. Change to the CMON screen and note the states of the cluster nodes.

13. Power on Node2.

14. From the Node1 CMON screen, watch for a message indicating that Node2 has rejoined the cluster.

15. From the Cluster State view of ConsoleOne, verify that both cluster nodes are available to run clustered services.

Exercise 4 – Changing a Cluster Master IP Address

The Cluster IP address is assigned when you install Novell Cluster Services. The Cluster IP address normally does need to be changed, but can be if needed.

The default cluster port number is 7023, and is automatically assigned when the cluster is created. The cluster port number does not need to be changed unless a conflict is created by another resource using the same port number. If there is a port number conflict, change the Port number to any other value that does not cause a conflict.

To view or edit the Cluster IP address and port number using ConsoleOne:
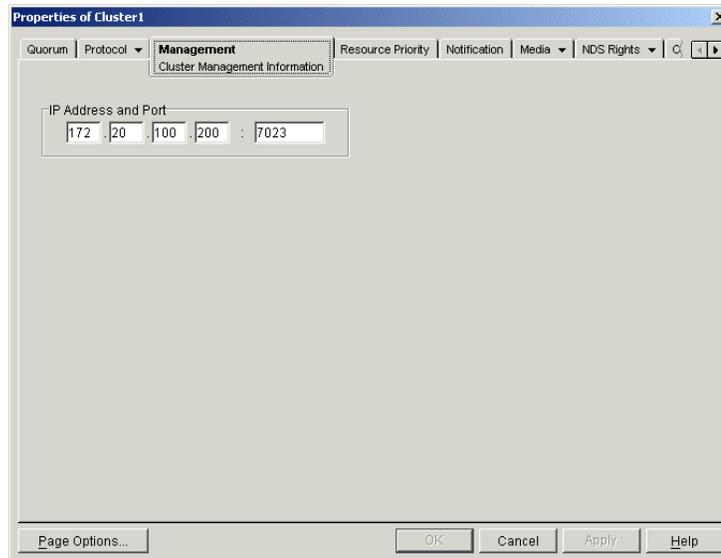
1.   Right click the *cluster object*.

2.   Select *Properties.*

3.   On the Cluster Object property page, select the *Management tab*.

To view or edit the Cluster IP address and Port number using NetWare Remote Manager:
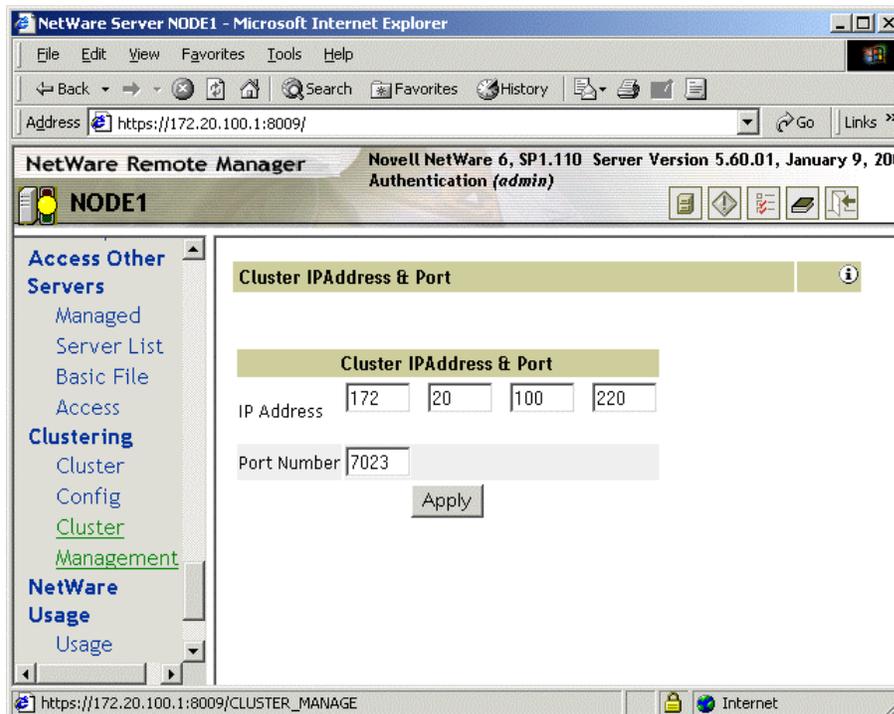
1. On the left column under the Clustering section, click *Cluster Config*.

2. Select the Cluster object name.

3. Click *IP Address*.

   Number+IP Address specifies the cluster node number and IP address for the selected node. If the cluster node number or IP address changes for the selected node, the new information is not automatically updated in eDirectory.

4. Change the cluster Master IP address to *172.20.100.205* and click *Apply* to update the information in eDirectory.

Objectives

After the installation of NCS, the shared storage must be configured. After completing this lab, you should be able to:

■   Create shared disk partitions.

■   Create NSS pools.

■   Create NSS volumes.

■   Manage storage with Novell Remote Manager (NRM)

Requirements

To complete this lab, you will need:

■   Available storage within the shared storage system.

■   Novell ConsoleOne 1.3.2 or Remote Manager utility.

▲   **Note**
It is a good practice to perform disk maintenance from a consistent server. In this lab, disk maintenance will be performed consistently from server Node1, unless otherwise specified.

Exercise 1 — Create Shared Disk Partitions with ConsoleOne

1. Start ConsoleOne.
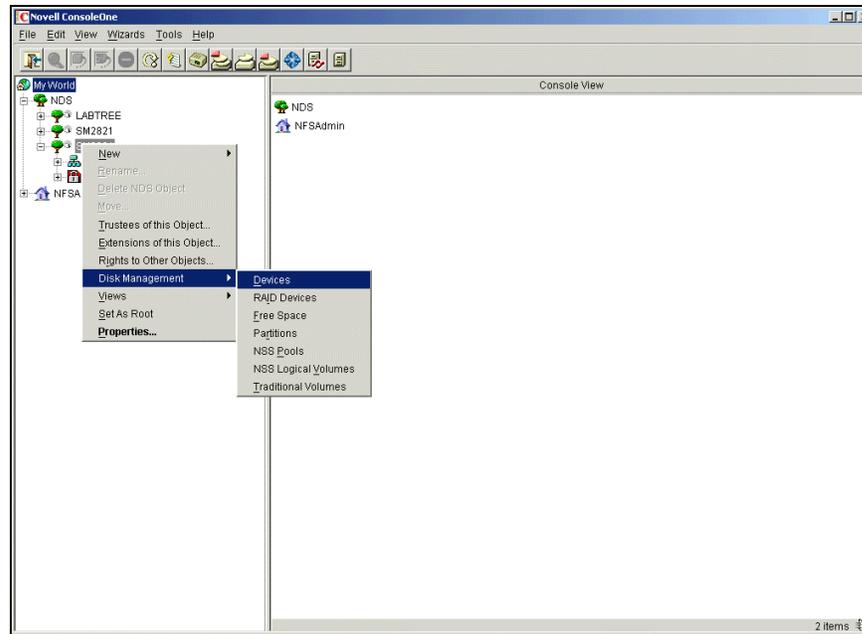
2. On the main ConsoleOne screen, right-click the NDS tree where the cluster object resides and select *Disk Management → Devices* from the pop-up menu.

3. Enter the NDS tree and context, and specify a server name. Then click *OK*.
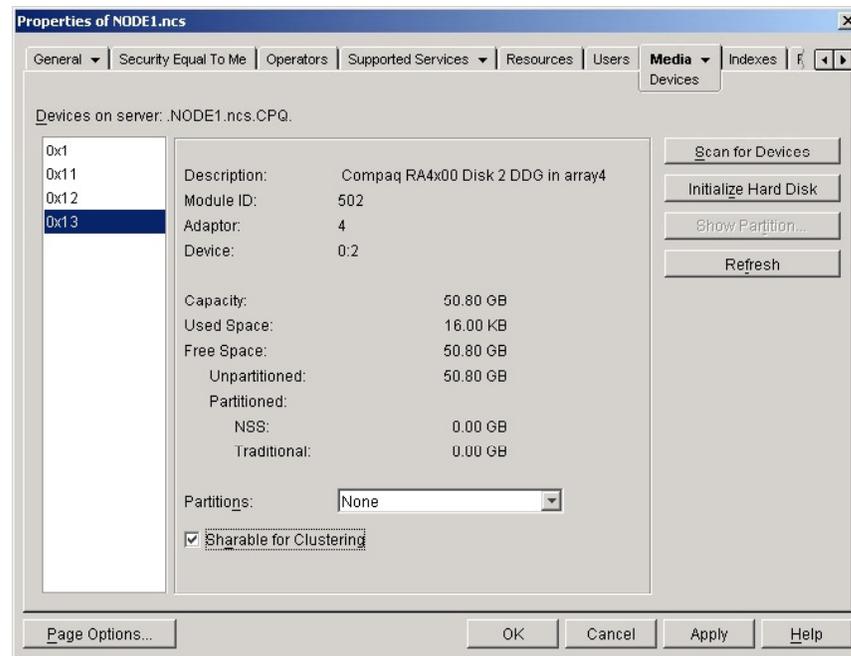
4. On the Properties page, click the *Media* tab → *Devices*, and highlight the device on which the partition is to be created. This will be the largest available logical drive. Ensure that the Sharable for Clustering flag option is set. Then click *OK*.

    ▲ Note
    If the OK button is grayed out, de-select the Sharable for Clustering flag option and then reselect it.
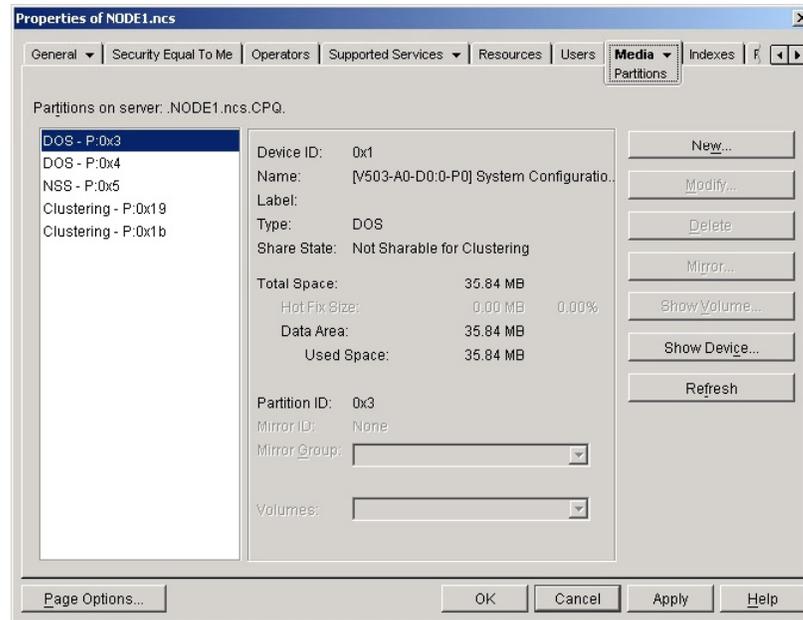
5.   Click the *Media* tab → *Partitions*. The Create a new partition screen displays.
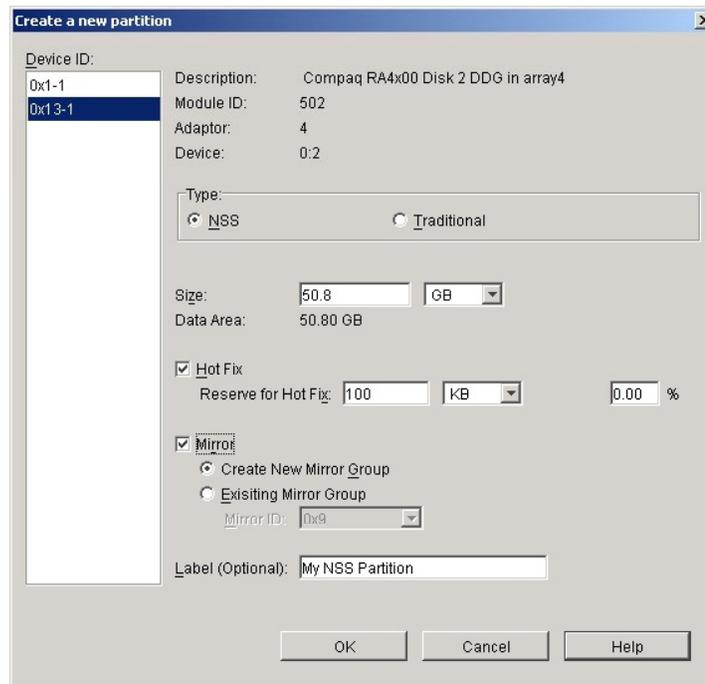
6.   Click the *New* button and then select the device on which to create the partition. This should be the same device selected in step 4.

7. Ensure that the partition type is NSS.

8. Enter a size of 10GB for the partition size.

9. Enter a Label of MyPartition1 in the optional label field.

10. If the Hot Fix and Mirror options are selected, deselect them. Deselecting one of them will automatically cause the other to be deselected.

> ▲ **Note**
>
> The only reason that the Hot Fix and Mirror options are deselected here is because they are not needed in a Compaq hardware based RAID environment. Leaving them selected causes no problems or performance degradation.

11. Click *OK → Apply* to create the partition.

12. Repeat steps 6–11 to create the following partition:

    •   Partition Name: **MyPartition2**

    •   Partition Size: **2GB**

13. Close the Properties page and proceed to Exercise 2.

> ▲ **Note**
>
> If sufficient disk space is not available, use smaller partition sizes. Do not make partition sizes smaller than 2GB for this lab.

Exercise 2 – Create NSS Storage Pools with ConsoleOne

The storage pools feature in NSS provides more flexibility in planning and configuring shared storage to work with NCS. Multiple cluster-enabled volumes can now be part of a single cluster resource, and volumes can dynamically grow as needed to take advantage of free disk space.

Storage pools must be created before creating cluster-enabled volumes.

To create a storage pool:

1. On the management client, start ConsoleOne if it is not already running. On the ConsoleOne main screen, right-click the server object and choose *Disk Management* → *NSS Pools* from the pop-up menu.
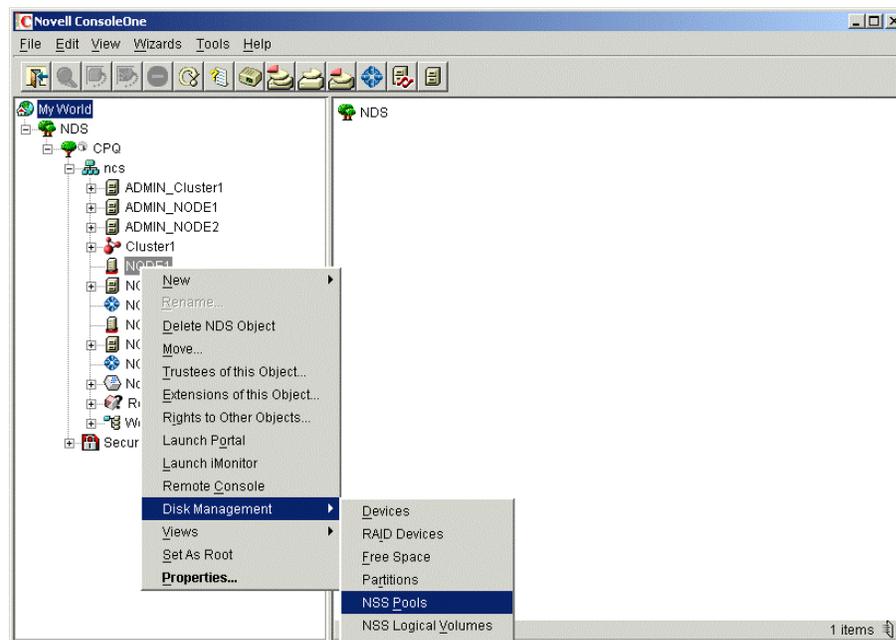
2. The NSS Disk Administration screen displays.
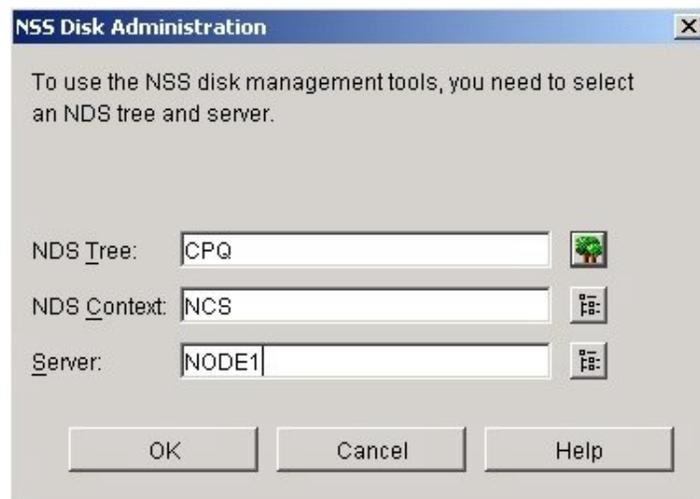
3. Enter the NDS tree name, context name, and the name of the server through which you will access the shared storage. The Properties page displays.
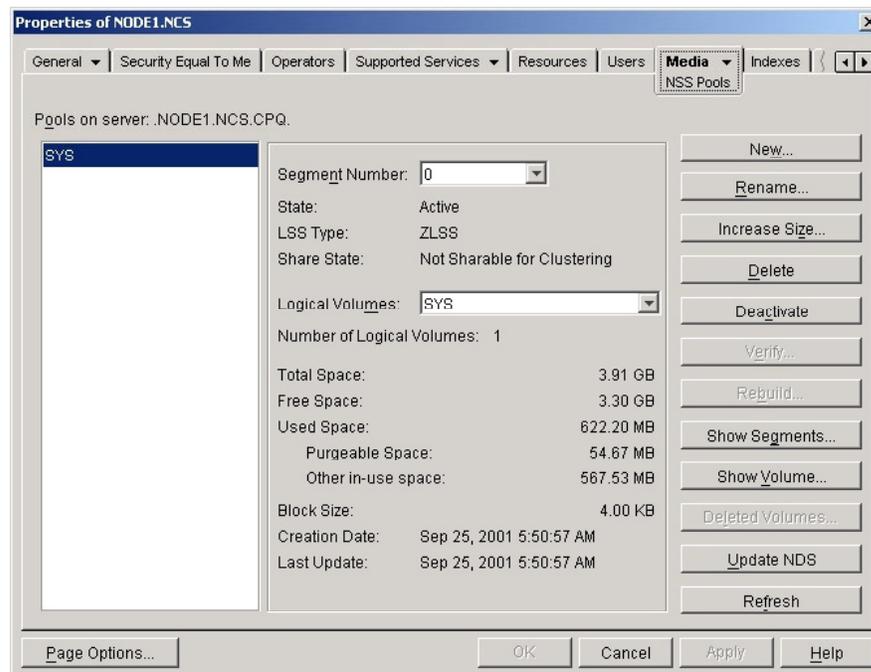
4. Click the *Media* tab → *NSS Pools,* and click *New*. The Create a New Pool screen displays.
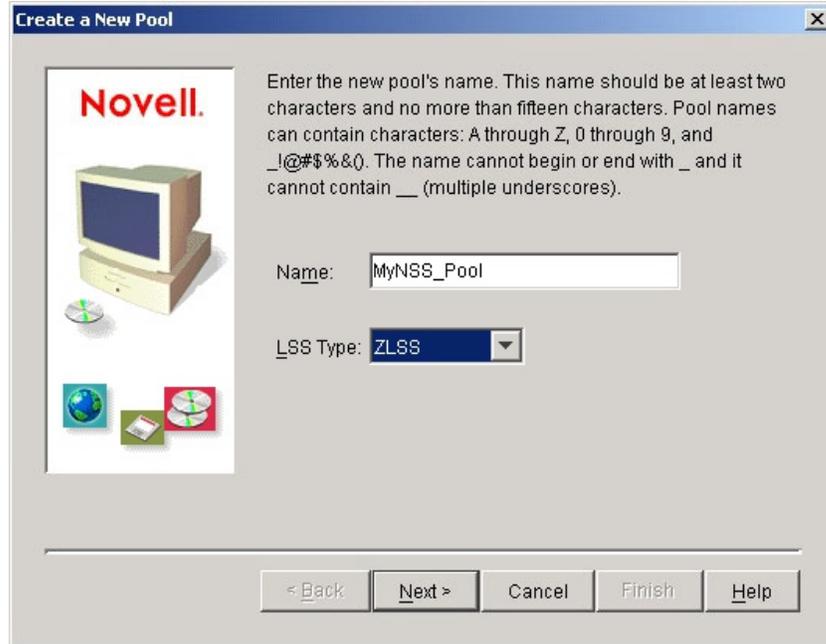
5. Enter MYNSS_Pool in the Name field for the new storage pool. Leave the LSS Type field unchanged. ZLSS is the default pool type and should be the type used with NCS. Click *Next*. The Storage Information screen displays.
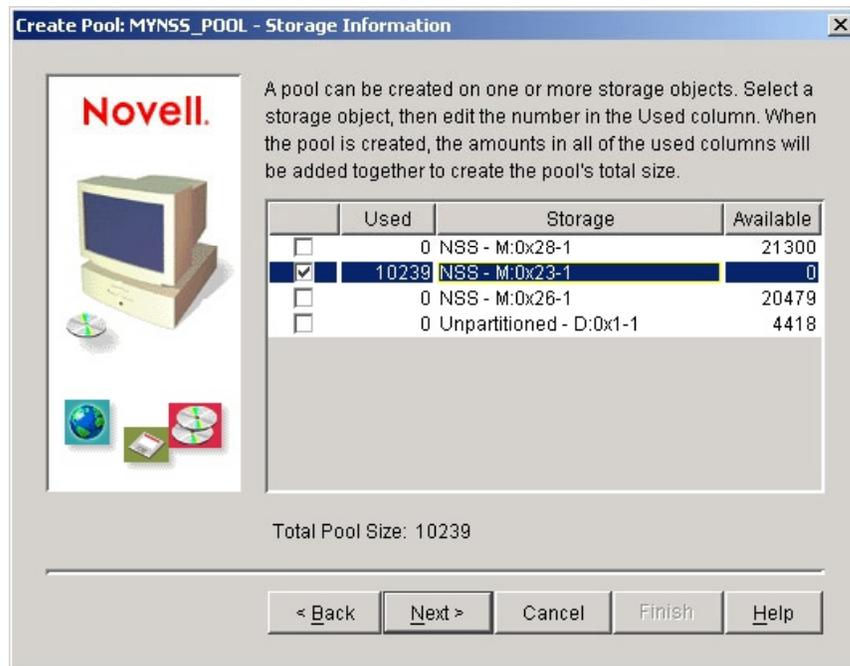
6. Select a storage partition that is approximately 10GB to be used for the pool, then click *Next*.

The Attribute Information screen displays, showing the type and size of the pool you are creating. If necessary, you can go back and change these attributes.

The Activate on Creation option is selected by default. This option causes the pool to be activated as soon as it is created. If you deselect this option, you will need to manually activate the pool later before it can be used.
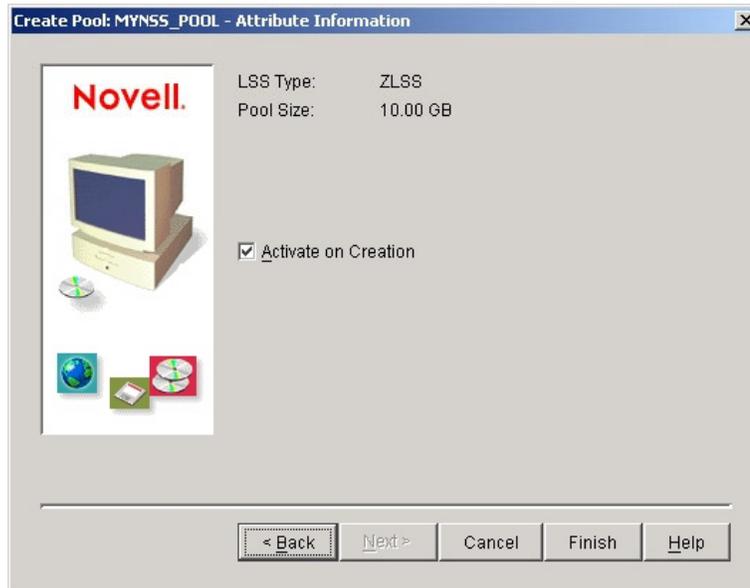
7. Click *Finish*. The storage pool is created and you are returned to the Properties page, which shows the pool just created (in this case, MyNSS_Pool).
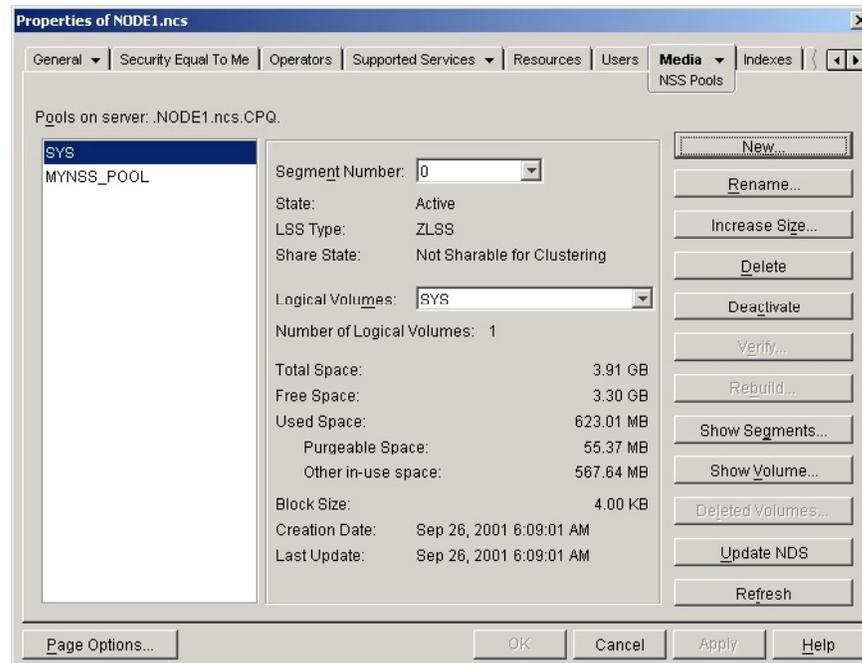
8. Repeat steps 4–7 to create a pool with the following characteristics:

- Pool Name: **GroupWisePool**

- Pool Size: **2GB**

9. When completed, the following pool properties should be present.
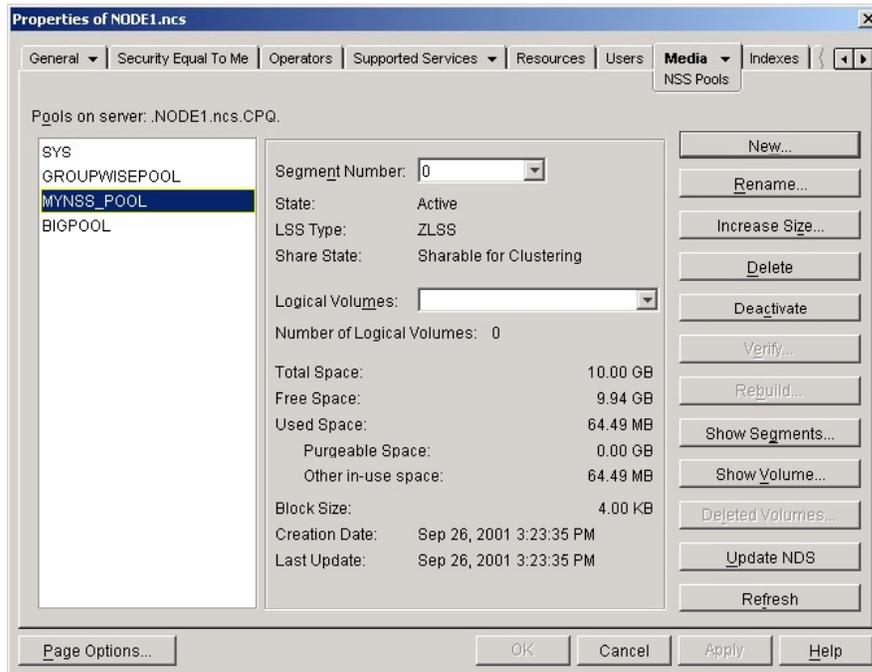
10. Close the Properties page and proceed to creating NSS Volumes on the pool for use by the cluster.

Exercise 3 – Create NSS Volumes with ConsoleOne

You can create multiple volumes on NSS storage pools. To create an NSS volume:

1. In ConsoleOne, access the Properties page of Node1.
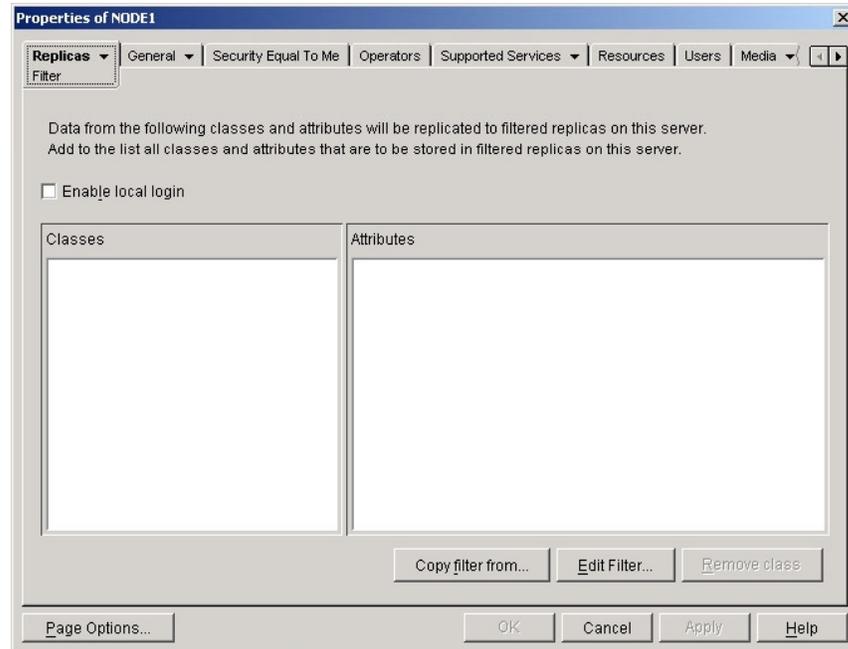
2. Click the *Media* tab → *NSS Logical Volumes*.
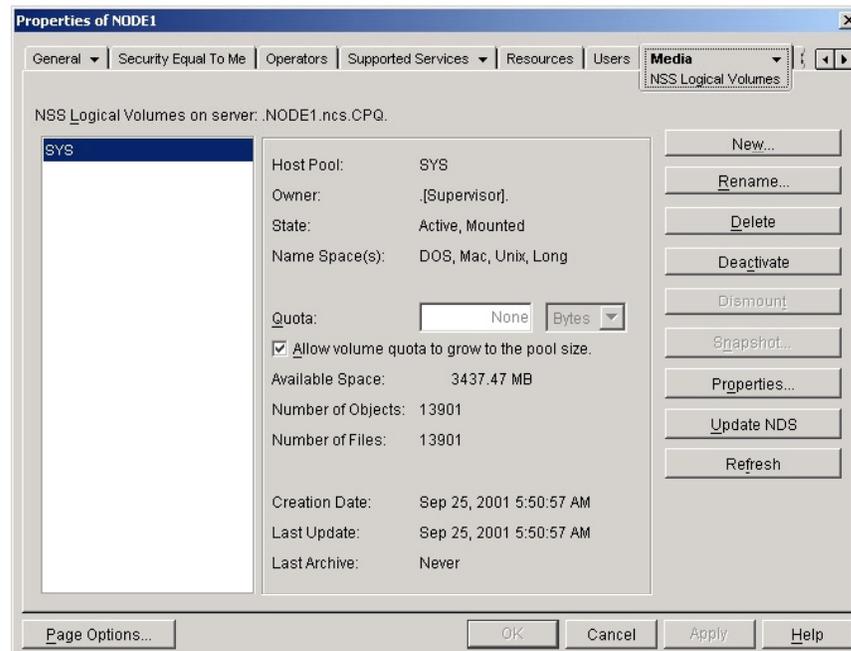
3.   Click *New*. The Create a New Logical Volume screen displays.
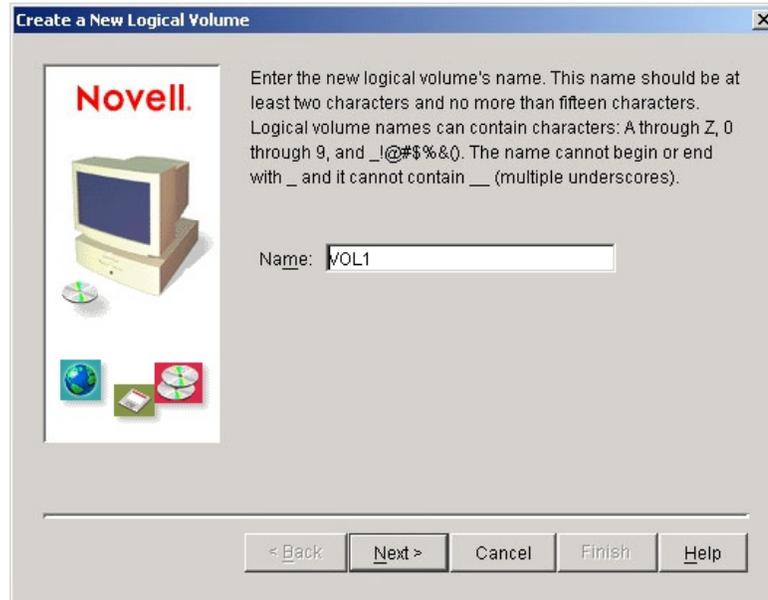
4.   Enter the name VOL1 for the new volume and click *Next*. The Storage
     Information screen displays.
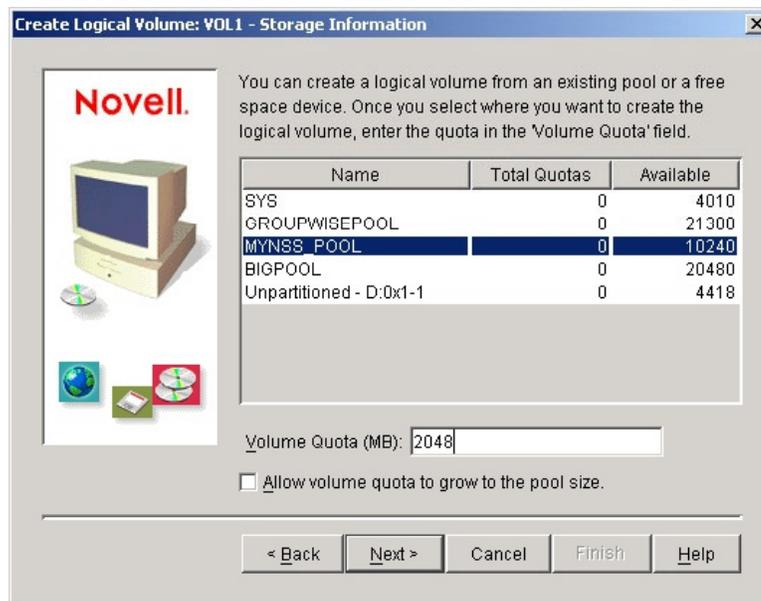
5.   Highlight the storage pool where you want the volume to reside.

6.   Enter a maximum volume size of 2048MB in the Volume Quota (MB) field.

> ▲ **Note**
> In actual applications, either a fixed quota for the volume in the Volume Quota
> (MB) field or the Allow volume quota to grow to the pool size option would be
> selected. The quota is the maximum possible size of the volume. If you are
> creating more than one volume per pool, specify a quota for each volume
> rather than allowing the multiple volumes to grow to the pool size.

7. Click *Next*. The Attribute Information screen displays, showing the attribute
   settings of the volume. If necessary, you can go back and change these
    attributes. Accept the default selections.
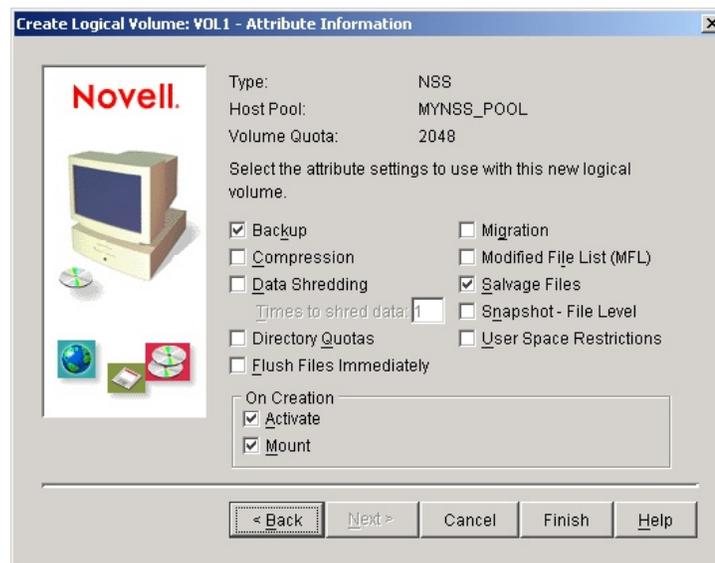
8. Click *Finish* to create the volume.

9. When the volume is created, the Properties page shows the new volume and its attributes.
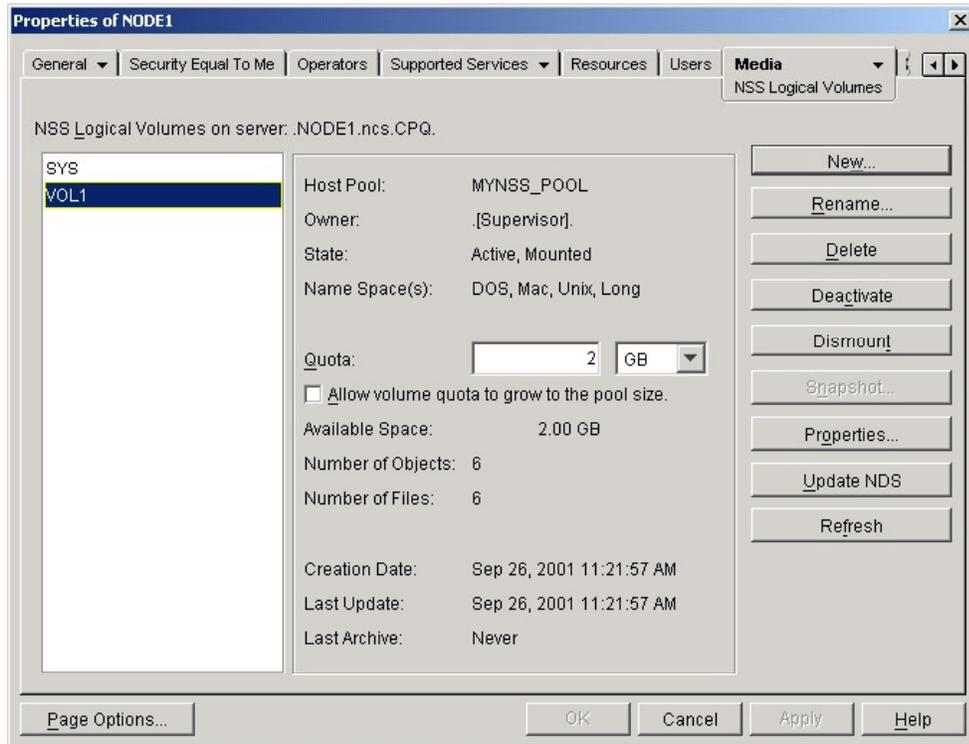
10. This completes the procedure for creating an NSS volume. Repeat these steps until all of the following volumes are created.

Resource Name	Pool name	Approximate Logical Drive Size (MB)
VOL1	MYNSS_POOL	2048
VOL2	MYNSS_POOL	2048
GPW	GROUPWISEPOOL	Allow volume quota to grow to pool size

11. After you have created NSS volumes, close the properties screen.

Configuring NSS Shared Storage

Exercise 4 – Managing Storage with Novell Remote Manager

This exercise shows an alternative method to ConsoleOne for managing NSS storage.

1. Access the console of the management PC. To launch Novell Remote Manager for Node2, open a web browser and enter the following URL: http://172.20.100.202:8008 or use an IP address provided by your instructor.

2. Log in as **admin** with a password of **compaq**.
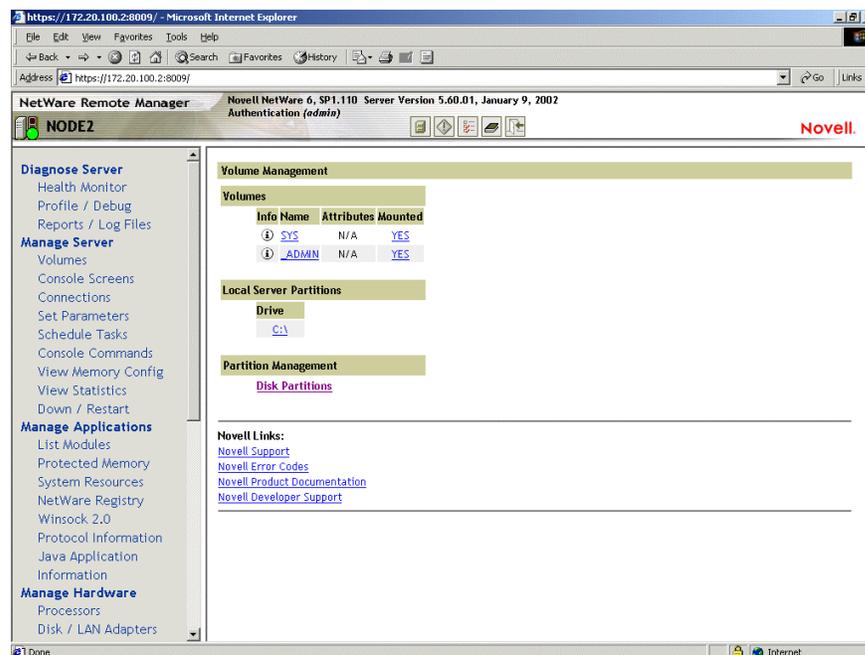
3. From the left pane, select *Manage Server → Volumes*.

4. To access the Server Disk Partition Operations screen, from the right pane, select *Disk Partitions*.
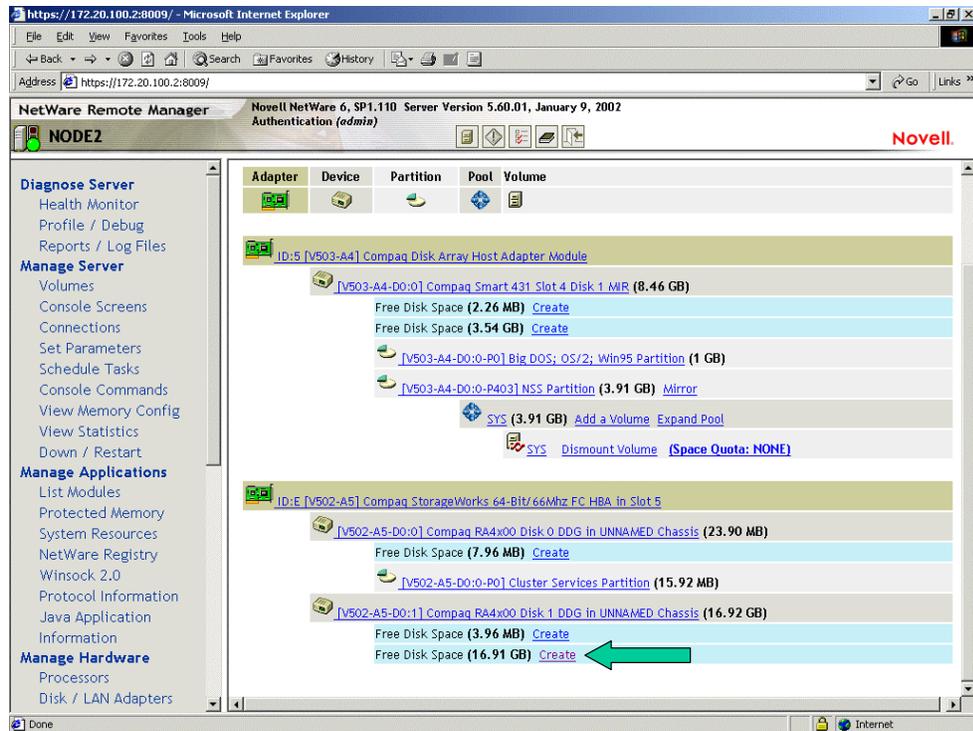
5.   Next to the Free Disk Space line, select *Create* → *Create a New Pool and Volume* and specify the following parameters:

•   Pool Size: 3096

•   Pool Name: BigPool

•   Volume Name: BigVol
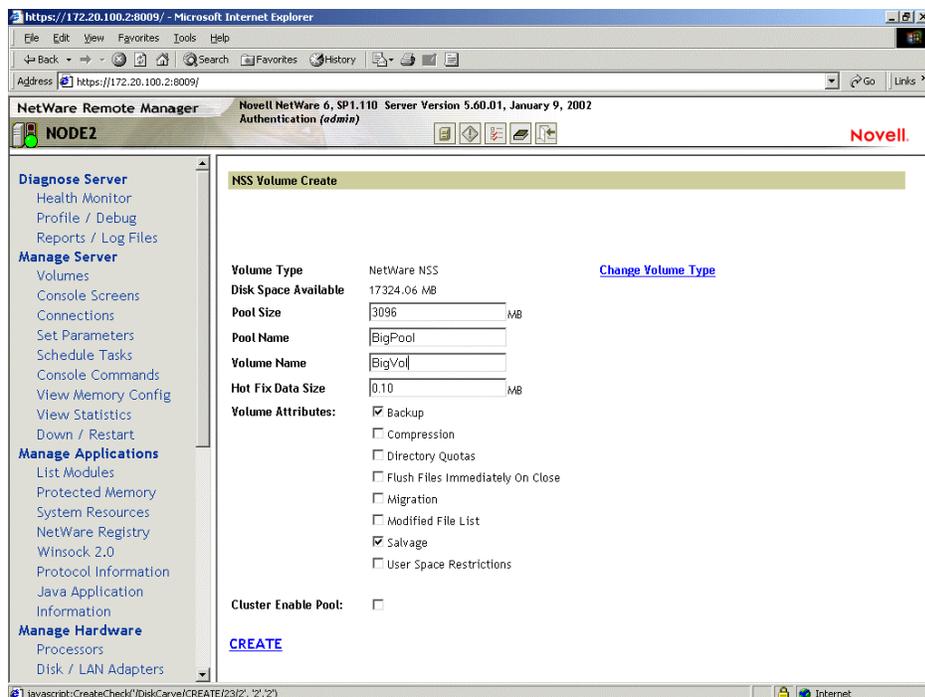
6.   Select *Create → OK → OK*.

▲   **Note**

There is an option to Cluster Enable Pool. This option will not function properly unless NetWare 6 Support Pack 1 is installed.
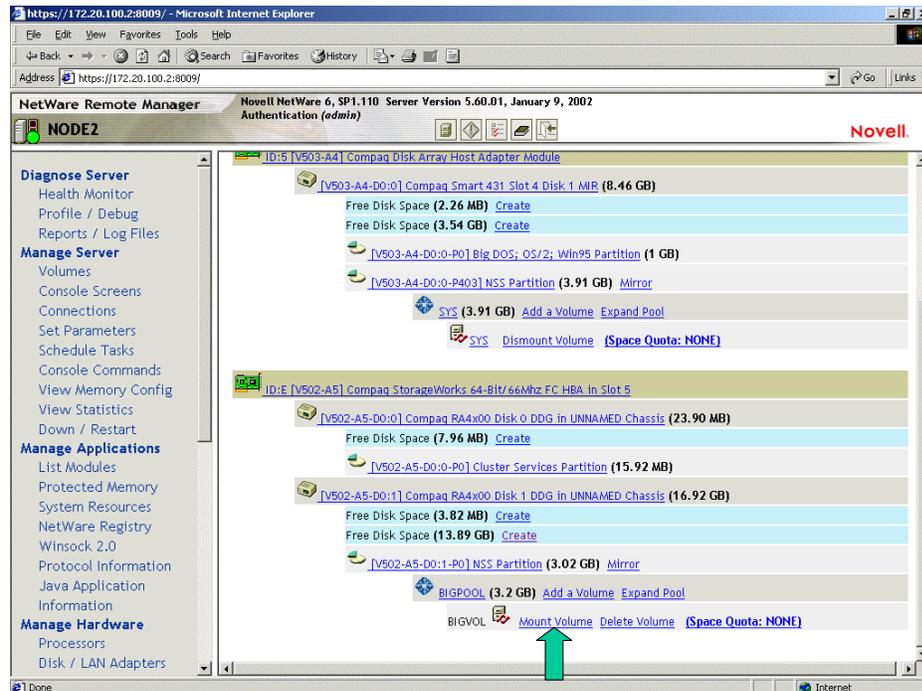
7.   To mount the new volume, browse to the bottom of the Novell Remote Manager screen and locate the new volume. Select *Mount Volume → OK*.

▲   **Note**

The Allow volume quota to grow to pool size option has been selected by default for this volume.

Cluster-enabled volumes for higher availability may now be created.

Creating Cluster-Enabled Volumes
Lab 8

Objectives

After the shared storage is configured, highly available file storage resources can be created. After completing this lab, you should be able to:

■ Create cluster-enabled volumes.

■ Migrate cluster-enabled volumes.

■ Attach to cluster-enabled volumes.

Requirements

To complete this lab, you will need:

■ Previously configured shared storage.

■ Novell ConsoleOne 1.3.2 or Remote Manager utility.

Exercise 1 — Create Cluster-Enabled NSS Volume

To cluster-enable a volume:

1. On the ConsoleOne main screen, locate and select the cluster object.
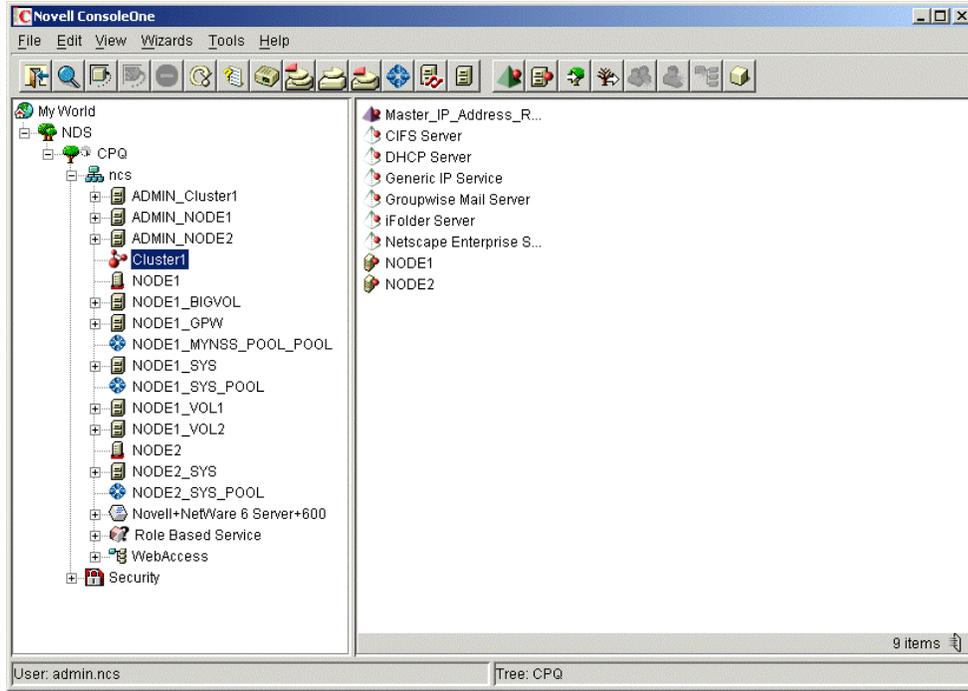
2. Click *File → New → Cluster → Cluster Volume*.
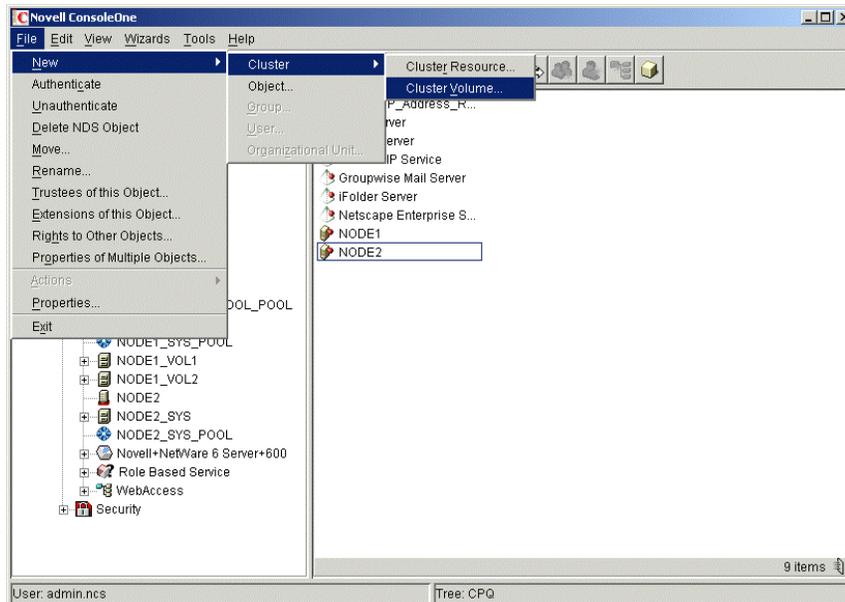
▲ **Note**
If the Cluster Volume option is grayed, ensure that the pools are active and that eDirectory is properly updated with the current NSS Pool information by selecting *Properties* → *Media* → *Update NDS* for the MYNSS_Pool pool. Also, ensure that all volumes to be cluster-enabled are active and flagged as sharable for clustering. This is accomplished by selecting *Media* → *NSS Logical Volumes*. Then select a volume and the Properties tab for that volume and enable the Sharable for Clustering attribute.

3.   The New Cluster Volume screen will display.

4. Browse and select the NODE1_VOL1 volume on the shared disk system to cluster-enable. Click *OK*.
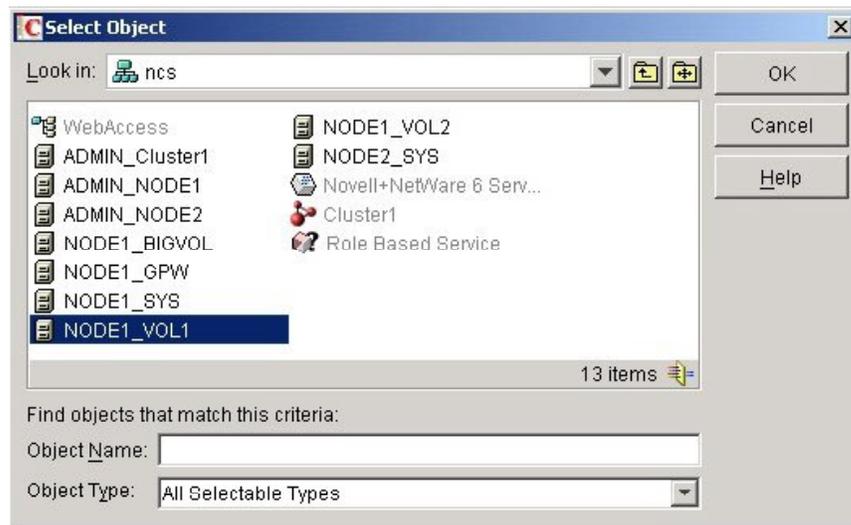
5. Enter the IP address 172.20.100.11 for the VOL1 resource.

6. Ensure the following are selected

- Online Resource after Create option to cause the volume to automatically mount after it is created.

- Define Additional Properties to set Start, Failover, and Failback modes.

7. Do not click *Create* at this time.

By default, the name of the virtual server object is automatically created using the convention:

Cluster Object Name_+Cluster Enabled Pool Name+_Server

in all capitalized letters. Similarly, the cluster-enabled volume object is automatically created using the convention:

Cluster Name_Volume Name

▲ **Note**
The cluster name for a cluster-enabled volume is not necessarily capitalized.

Using NCS 1.6, these virtual cluster object names can be altered. This enables the administrator to assign names that:

■ Do not have potential conflicts with some DNS servers.

■ Are tailored to fit corporate naming conventions.

■ Are more easily referenced within script files or from console command line prompts.

▲ **Note**

If you are cluster-enabling a volume in a pool that has already been cluster-enabled, the virtual server object has already been created. In this case, you cannot change the virtual server object name.

New Cluster Volume

Volume

NODE1_VOL1.ncs

IP Address

172 . 20 . 100 . 11

Virtual Server Name

Virtual_Server1

Cluster Volume Name

Virtual_VOL1

☑ Online Resource after Create

☑ Define Additional Properties

Create   Cancel   Help
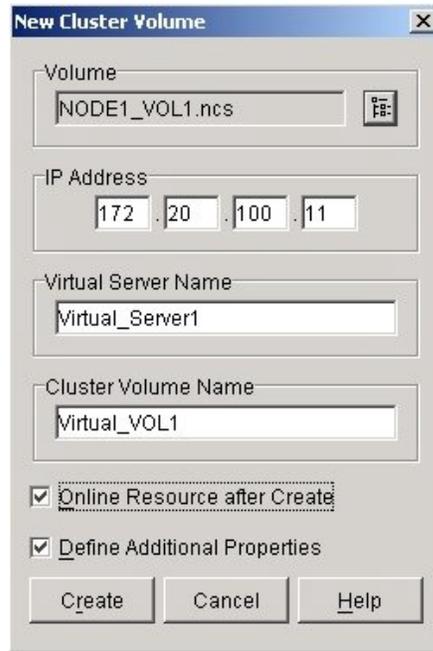
8. Change the virtual cluster object names to the following

- Virtual Server Name: **Virtual_Server1**

- Cluster Volume Name: **Virtual_VOL1**

9. Click *Create* to create the cluster volume.

What is the Cluster Resource IP Address?

....

10. Review the Cluster Resource Load and Unload Scripts.

11. Ensure the following Cluster Resource Policies:

- Start Mode: **Auto**

- Failover Mode: **Auto**

- Failback Mode: **Auto**

To which nodes is this virtual server resource currently assigned?

....

....

Which of the two nodes will have the primary responsibility of loading this resource?

☐   Node1

☐   Node2

12.   Click *OK* to close the properties screen.

13.   Notice that both the virtual server and the virtual volume objects now display in the eDirectory.
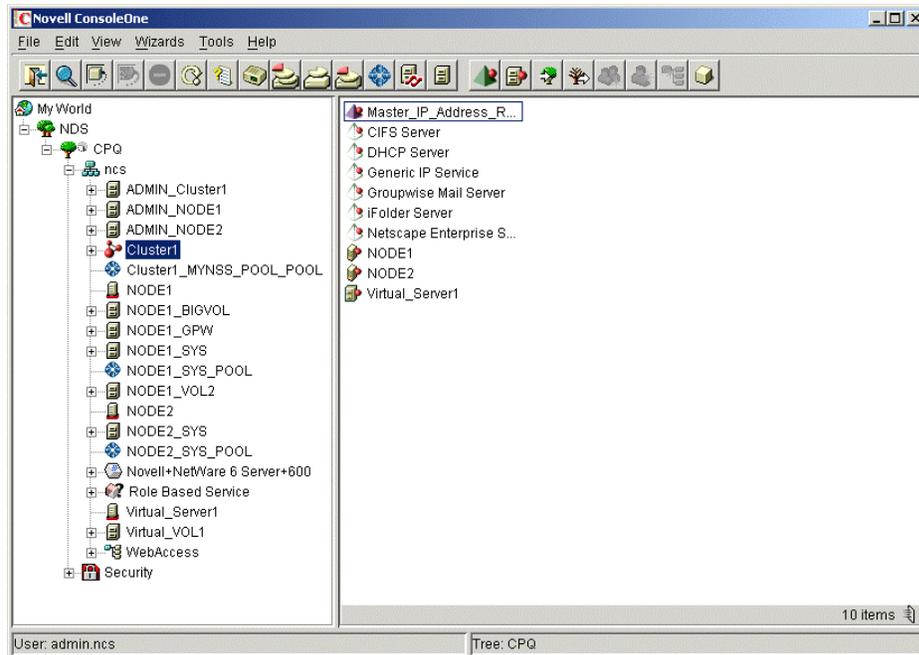
The pool will automatically come online and activate.

14.   Select the cluster object.
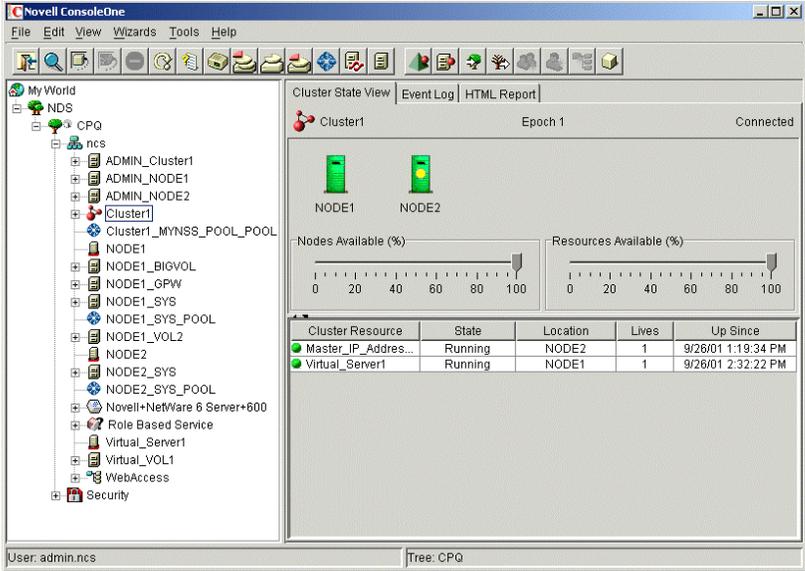
15. Select *View → Cluster State View*.

16. Repeat steps 1–9 for the remaining cluster-enabled volumes. Use the following values.

Volume Name	Virtual Server Name	Virtual Volume Name	IP Address	Failback Mode
VOL1	Viirtual_Server1	Virtual_VOL1	172.20.100.11	AUTO
VOL2	Viirtual_Server1	Virtual_VOL2	172.20.100.12	Disable
BigVol	Virtual_BigSvr	Virtual_BigVOL	172.20.100.13	AUTO
GPW	Virtual_Mail	Virtual_GRPW6	172.20.100.30	AUTO

17. Can the VOL2 IP address be modified? If not, why?

    ....

    ....

18. Is the failback mode modifiable for VOL2? If so, how is this different from the IP address?

    ....

    ....

    ....
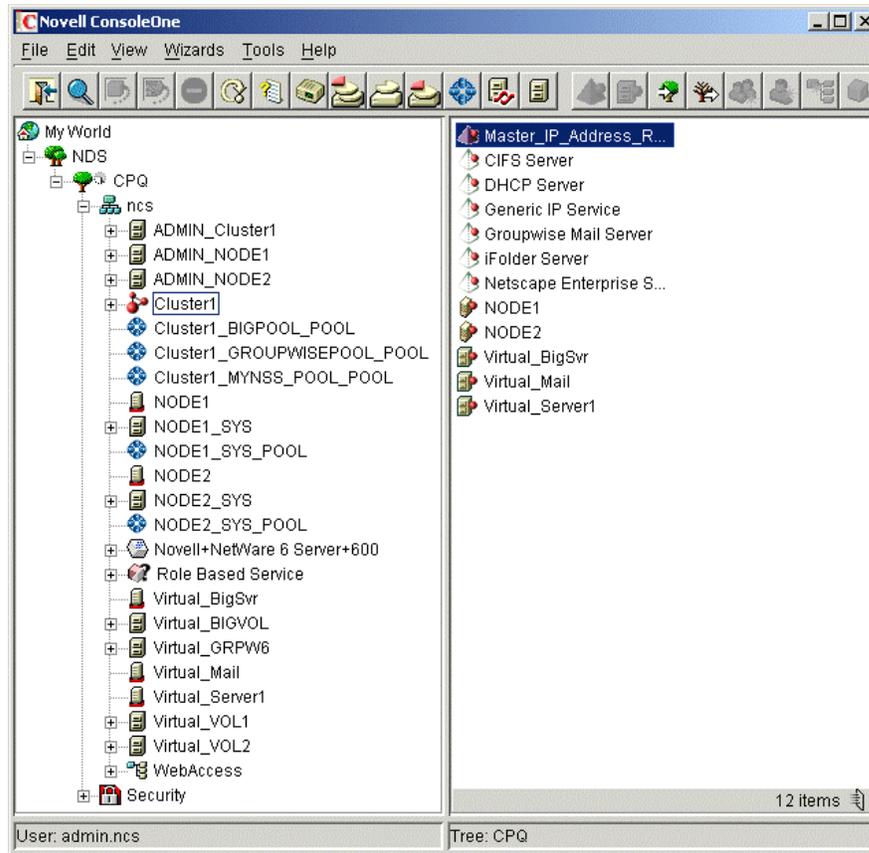
19. In the right pane, how does the virtual server icon differ from the physical server icon?

....

....

20. In the right pane, how do server cluster node icons differ from resource icons?

....

....
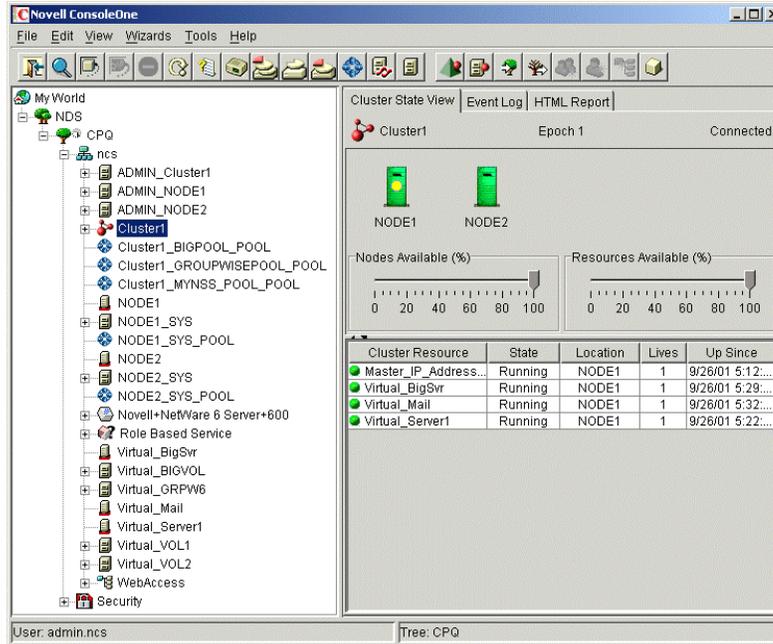
This completes the procedure to cluster enable a volume. The Cluster State view in ConsoleOne shows the storage pools and volumes that currently exist on the cluster.

Exercise 2 — Migrating Volumes

In this exercise, you will migrate the cluster-enabled volume you created to the other node. This tests the cluster installation. During normal operations, this procedure can be used to dynamically reallocate volumes amongst the nodes in the cluster.

1. Using the ConsoleOne Cluster State view, click the cluster resource name *Virtual_Server1*. Select the other node (Node2) and click *Migrate*.
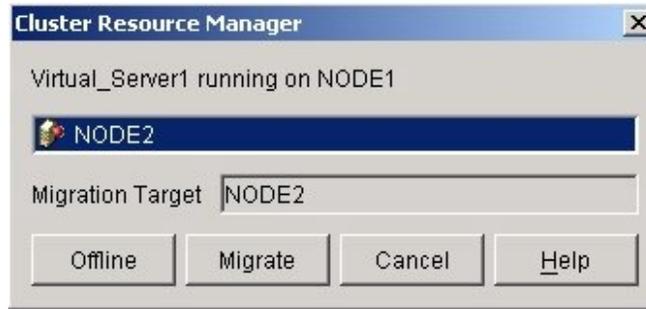
2. The Cluster State view will indicate that the volume migration was successful by ending in a Running state on Node2.
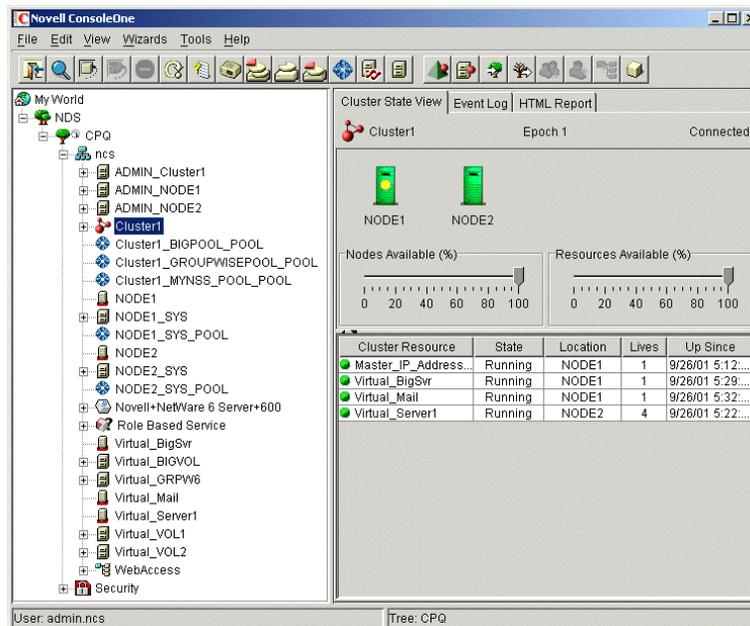
Exercise 3 – Attaching to the Cluster-Enabled Volume

1. Use either the Microsoft Map Network Drive or the Novell Map Network Drive command to connect to *\\cpq\ncs\virtual_vol1*.

2. Copy the entire *c:\winnt\system32* directory to the VOL1.

    ▲ **Note**
    There will eventually be a share violation since some files will be in use. The violation is acceptable. The point of this exercise is to place some files on to the share.

3. Migrate the Virtual_Server1 resource back to Node1.

4. Ensure that the volume's files are still available by opening the previously established drive share.

    Was your mapping still in tact after the migration?

    ....

    ▲ **Note**
    If there is a separate monitor attached to your cluster servers, you can view the failover process from the console. The node that owned the resource before migration will indicate that the IP address is being deleted, and that the volume is being deactivated. The node the resource is being failed over to will indicate that the volume is being activated, and the IP address for the resource is being added to the target node.

The next step injects a failure while copying a file to the cluster-enabled volume.

5. Copy the entire *ClassPaq\GroupWise6* directory to VOL1 again.

6. While the files copy, migrate the cluster resource using ConsoleOne.

Observe that even though ownership of the virtual NCP server advertisement has been switched from one cluster node to another, the availability of the resource remains in tact.

▲ **Note**
Since Microsoft Win9x clients maintain file state information, the copy process would only momentarily be interrupted at the introduction of the fault. Windows NT or Windows 2000 clients do not maintain file state information, so at the introduction of a fault, they will halt their operation. They will reconnect to the file share, but the copy process will be aborted.

Establishing Storage Data Path Redundancy with SANworks Secure Path by Compaq
Lab 9

Objectives

After completing this lab, you should be able to:

- Create a Secure Path Manager (SPM)

- Test the installation of Secure Path Software.

Requirements

To complete this lab, you will need:

- Completion of Lab 4.

- Redundant Fibre Channel hardware.

- Multipath driver support.

- SANworks Secure Path for NetWare v3.0 by Compaq.

- Smart Fibre Array firmware 2.58 or later (if using the RA4x00).

- ACS 8.5F or 8.6F (if using HSG80).

Configuration

For the purposes of this workshop, redundant hardware has already been preinstalled into your cluster servers. However, your backup Fibre Channel interconnect is not currently active because there is no power to the secondary interconnect device.

Use the Compaq Online Array Configuration Utility, Command Line Interpreter (CLI), or the StorageWorks Command Console (SWCC) to verify:

- Firmware revision

- Redundant configuration with one controller active and the other in standby or active mode

   ▲ **Note**
   Active/active controller modes can only be achieved with HSG80 controllers.

Exercise 1 — Creating a Secure Path Manager Cluster Profile

In this exercise, you will create a new profile to reflect the clustered environment.

Configuring SPM Software

1.   Launch Secure Path Manager by clicking its icon.

2.   Define the new SPM Storage Profile in the Nodes screen by entering each node name with the syntax of: ServerName-ClusterName. This syntax reflects the node name and cluster name separated by a hyphen.

> **!**
>
> **Important**
> Because SPM uses the hyphen to distinguish between node name and cluster name, it is important that hyphens are **not** used in node names.

3.   Enter a unique name for the profile and save it.

4.   Specify the same password that you set on each of your server nodes with Agent Administration and save it. The password should be "Compaq."

5.   After setting up and saving your profile, log on to SPM.

Exercise 2 — Testing the Secure Path Software

1. Delete the GroupWise folder from the cluster-enabled volume.

2. Re-copy the folder from the Management PC to the cluster-enabled share.

3. While the files copy, unplug the power to the hub or switch connected to the active controller.

Observe that the file continues to copy and that Novell Cluster Service (NCS) does not detect a failure. Therefore, NCS does not attempt to fail over the resource. The SPM graphical user interface (GUI) shows that the logical unit numbers (LUNs) have now been failed over to the alternate controller.

4. Repair the broken Fibre Channel segment by plugging the power back in.

5. With Auto Fail Back enabled, fail back the LUNs to the other controller.

Cluster-Enable and Test the DHCP Server
Lab 10

Objectives

After completing this lab, you should be able to:

- Configure DHCP using iManage.

- Cluster-enable an existing DHCP server.

- Test the effect on a Windows 2000 workstation of migrating the DHCP resource.

Requirements

To complete this lab you will need:

- Existing NCS 1.6 cluster.

- Access to the Nwdeploy utility.

Exercise 1 – Installing DHCP
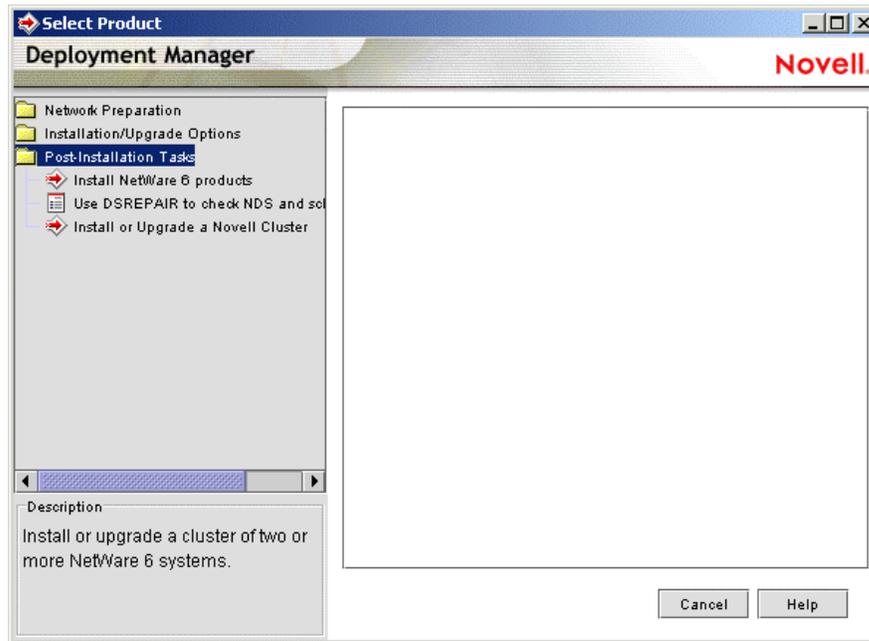
1. Launch NWDEPLOY and select *Post Installation Tasks → Install NetWare 6 products*.
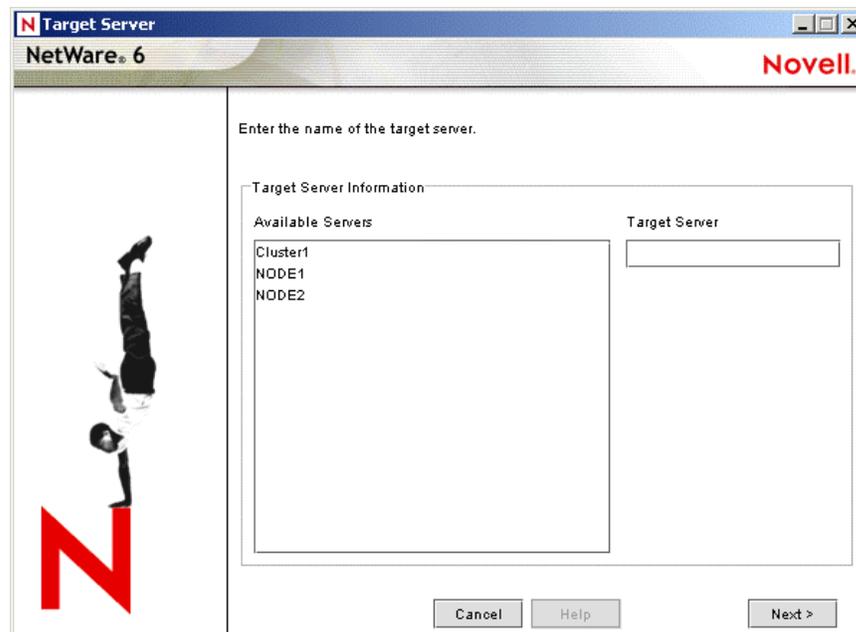
2. From the Target Server screen, select *Node1 → Next*.

3.   At the Login Dialog screen, enter the following information.

Specify Login Information for Node1	Value
User Name:	admin
User Password:	compaq
Tree:	CPQ
User Context:	ncs
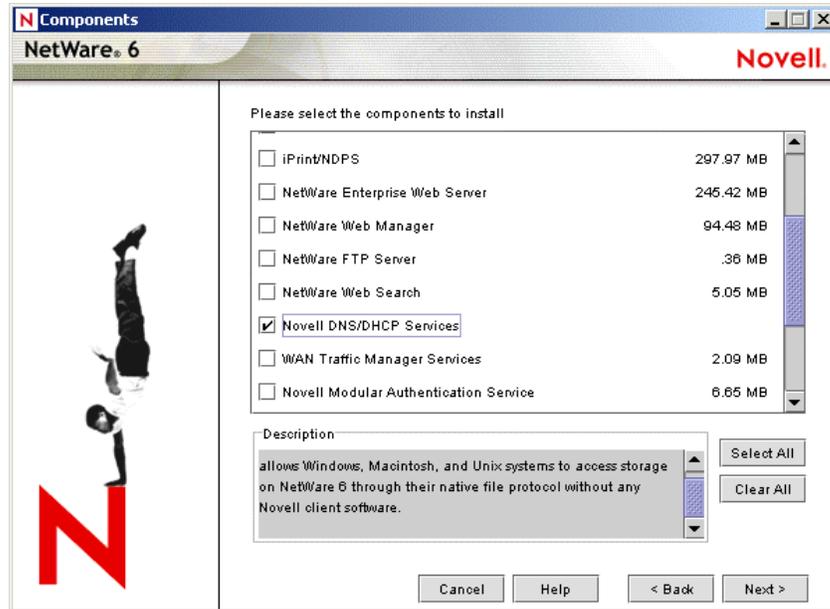
4.   At the Components screen, select *Clear All*.
5.   Select *Novell DNS/DHCP Services* → *Next* to validate the component selection.
6.   Select *Finish* at the Summary screen.
7.   Select *Close* to complete the installation.
8.   When execution returns to the NWDEPLOY screen, repeat steps 1–7 for Node2. Exit the NWDEPLOY utility when finished.

Exercise 2 – Configuring DHCP using iManage

The DHCP server will be configured during this exercise on one of the server nodes. The DHCP configuration information will be read from the eDirectory for the other server nodes.

1.   Launch the browser at the management workstation.
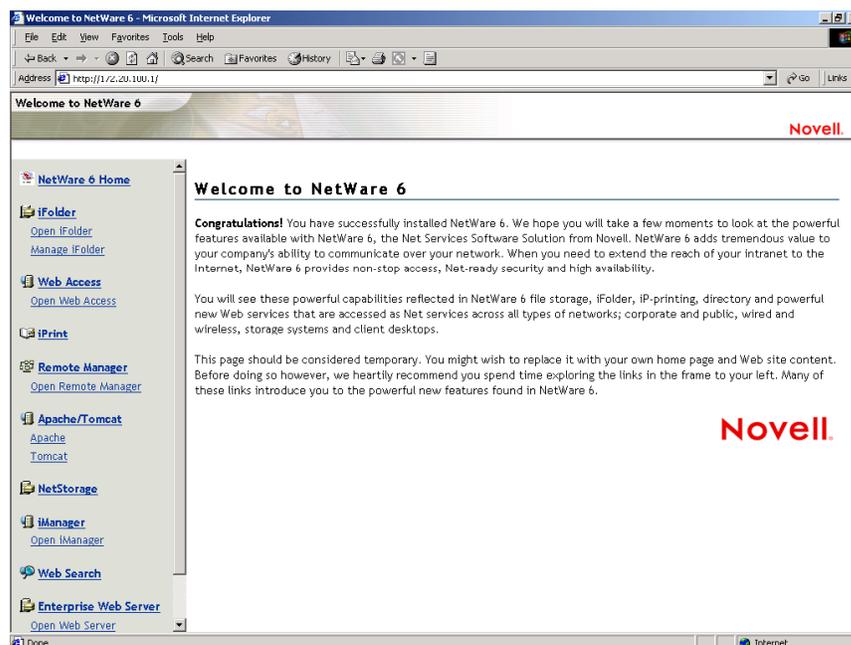
2.   Access the NetWare 6 Welcome Page by entering the URL http://172.20.100.201 for Node1.

3.   From the left pane, select *Open iManager* to launch iManage. If there is an error opening the page, map directly to iManager by using the following URL: http://172.20.100.201:2200/eMFrame/iManager.html.
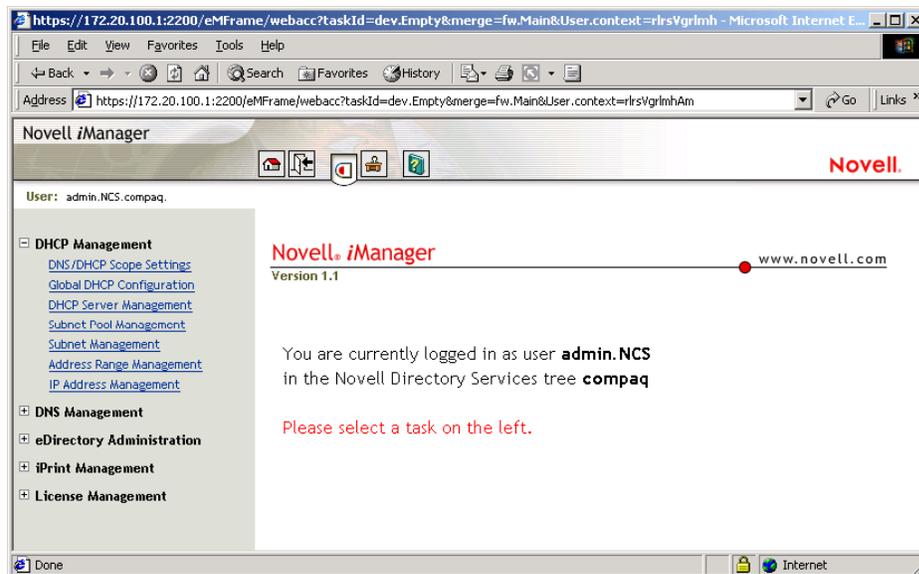
4.   Log in to iManager, and from the left pane, select the *DHCP Management* →
      DNS/DHCP Scope Settings.
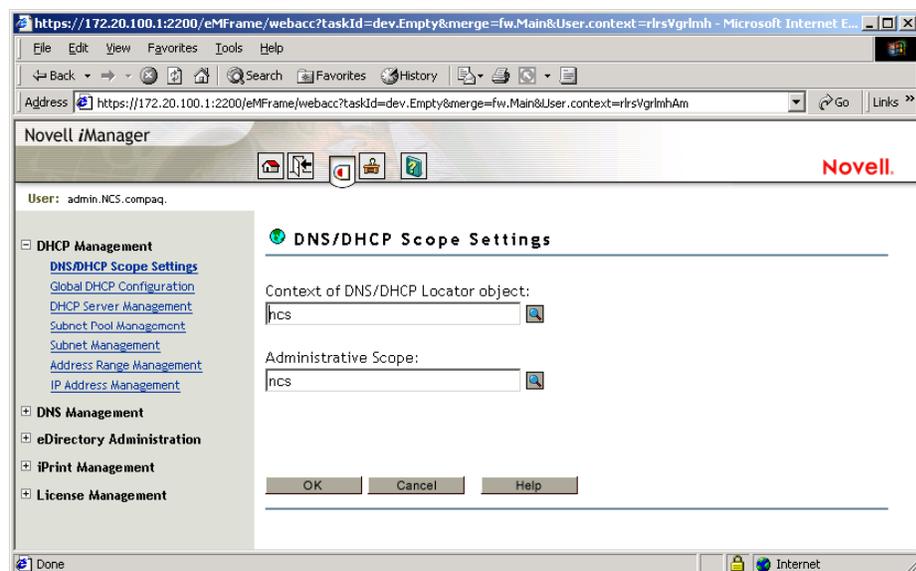
5.   Specify *ncs* as the context for both the DNS/DHCP Locator object and the
      Administrative scope. Select *OK* → *OK*.

6.   From the left pane, select *DHCP Server Management* → *Create Server* →
      OK.

7.   From the right pane, browse to locate Node1 and select *Create* → *OK*.

8.   From the left pane, select *Subnet Pool Management* → *Create Subnet Pool*
      → *OK*.

9. In the right pane, specify the following information:

   - Subnet Pool Name: **LabPool**

   - Select eDirectory Context: **ncs**

10. Select *Create → OK*.

11. From the left pane, select *Subnet Management → Create Subnet → OK* to begin the process of creating a subnet. Specify the following information.

Create Subnet Options	Values
Enter Subnet Name:	Sub1
Enter eDirectory Context:	ncs
Enter Subnet IP Address:	172.20.0.0
Enter Subnet Mask:	255.255.0.0
Select Default DHCP Server:	Node1

12. Select *OK* to acknowledge the creation of the subnet.

13. From the left pane, select *Address Range Management → Create Address Range → OK*.

14. Specify the subnet created in step 11, *Sub1*.

15. Specify a range object name of *Range1*.

16. Specify a range between 172.20.100.150 and 172.20.100.160, then select *Create → OK*.

17. From the console screen of Node1 enter the command `load DHCPSRVR – D2`.

▲ **Note**
The **–D2** switch is used to enable the DHCP console screen.

18. The new DHCP server can be started/stopped by selecting the *DHCP Server Management* section and selecting *Start/Stop Server* from the drop–down list.

19. Select Node1 from the list.

20. Select *OK → Start* to load the service. Wait for the service to load.

21. After the notification that the start of the service is complete, select *OK*.

Exercise 3 – Cluster-Enable the DHCP Server

The DHCP lease information is stored within the eDirectory. For this reason a shared volume is not needed for a cluster-enabled DHCP server resource. The previously installed DHCP server will be cluster-enabled in this exercise.

1. Open and authenticate to the NetWare Remote Manager using the IP address of https:\\172.20.100.201:8009.

2. From the left panel under Clustering, select *Cluster Config*.

3. In the right panel, scroll to the bottom and select *New Cluster Resource* → *DHCP Server*.

4. Enter *DHCP* in the Resource Name text box. The DHCP Server is the name of the cluster resource template used to create the DHCP resource.

5. Select the *Define Additional Properties* check box, then select *Apply*.

6. Modify the Load script to edit the Cluster command with the following:

    *   CLUSTER DHCP CN=NODE1.O=NCS.T=CPQ

    *   DHCPSRVR –d2

7. Select *Apply* to save the changes.

8. At the console of Node1, ensure that the DHCPSRVR is not running by entering the command `UNLOAD DHCPSRVR`.

9. Bring the DHCP resource online:

    a. In the left panel, select *Cluster Management* to display the Cluster Status view. The DHCP resource is now added to the Cluster Resource list with an "Offline" status message displayed.

    b. Select *DHCP* → *Node1* → *Online*.

    c. From the refresh drop-down list, select *2 seconds* → *Begin Refresh*. The Offline status message is replaced by "Loading" then "Running" messages.

Exercise 4 – Migrating the DHCP Resource

The steps in this exercise are used to test the effect of the DHCP resource migration on a Windows 2000 workstation.

1. At the Windows 2000 workstation, make sure the IP address for the workstation is selected automatically:

    a. Right-click *My Network Places → Properties*,

    b. Right-click *Local Area Connection → Properties*.

    c. Select *Internet Protocol (TCP/IP) → Properties*.

    d. Ensure that *Obtain an IP address automatically* is selected.

    e. Close the open dialogs by selecting *OK*.

2. Close the Network and Dial-up Connections window.

3. At the Windows 2000 workstation, select *Start → Run → cmd* to launch a command prompt.

4. At the command prompt, enter `IPCONFIG /RELEASE → IPCONFIG /RENEW`.

5. Enter *IPCONFIG /ALL*. Record the following:

    *   IP Address: _____
    *   DHCP Server: _____

6. From the consoles of Node1 and Node2, access the Logger screen.

7. From the NetWare Remote Manager at the Windows 2000 workstation, migrate the DHCP resource from Node1 to Node2 and begin Refresh every 2 seconds.

8. From the console of Node1, check the Logger screen for new messages. The Unload script commands for the DHCP cluster resource should terminate the DHCP server running on Node1.

9. From the Windows 2000 command prompt, enter `IPCONFIG /RELEASE` after the migration is complete. Next, enter `IPCONFIG /RENEW`.

10. At the command prompt, enter `IPCONFIG /ALL` and compare the IP addresses in the IP configuration information with those recorded in step 5.

11. Close the command prompt by entering `EXIT`.

Clustering Novell GroupWise 6
Lab 11

Objectives

After completing this lab, you should be able to:

- Activate and mount Novell Storage Services (NSS) volumes.

- Install Novell GroupWise 6 on each node of the cluster.

- Configure the GroupWise home directory.

- Modify the GroupWise NSS cluster-enabled volume resource to load GroupWise services.

Requirements

To complete this lab, you will need:

- Novell GroupWise 6 CD-ROM or file repository.

- Virtual IP address assigned to your GroupWise installation.

- Cluster-enabled Virtual_GRPW6 volume that is started and running on Node1.

▲ **Note**
There are multiple ways to install GroupWise 6 within a clustered environment. The method used in this lab is only one such method and is not meant in any way to be the authoritative method for the installation of the product.

INTERNET For more information on installing applications within an NCS environment, refer to the documentation of the vendor or visit: www.novell.com/documentation.

Exercise 1 — Mounting NSS Volumes

Before mounting NSS volumes, keep in mind the following:

- The Domain directory and the Post Office directory must be located on the shared storage volume.

- The access mode for the Post Office is client/server only.

- The Message Transfer Agent (MTA) links to the Post Office through a TCP/IP connection to the Post Office Agent (POA).

- The POA and the MTA use the same IP address.

- The Autoexec.NCF file should **not** be updated during the GroupWise Agent installation process because the loading and unloading of the mail services will be controlled by the Load/Unload script properties of the cluster.

- The GroupWise Agent must be installed on all nodes of the cluster that can host GroupWise.

- The POA and MTA startup files must be edited to reflect the correct path to the home directory. The path to the home directory follows the convention /home-NSSVol_name:\directory. For example, if your NSS volume name is GPW and your Post Office directory is podir, the correct home path is /home-gpw\podir. This also applies to the MTA startup file.

At Node1, the Virtual_GRPW6 cluster-enabled volume is modified to load the GroupWise 6 MTA and POA agents.

▲ **Note**
The GroupWise Mail Server template will not be used in this exercise. This exercise uses a preferred method of installation offered by Novell Consulting Services and Novell engineering.
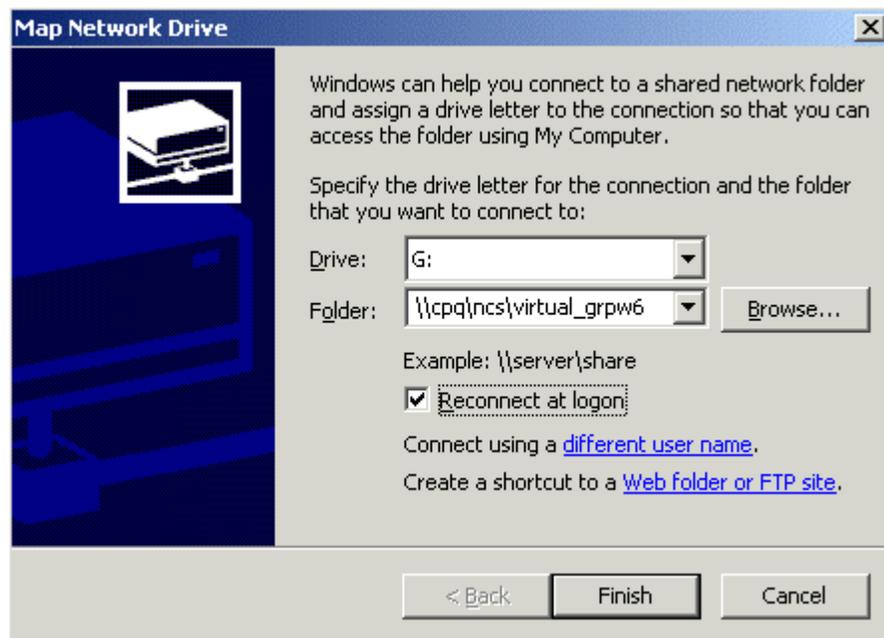
1. Map a network drive G: to the Virtual_GRPW6 volume. The mapping should be done by browsing through the virtual server or using the full UNC path name, ensuring that the UNC path through the cluster-enabled volume is being used. This only has to be performed on a single node.

2. Create a directory on the Virtual_GPRW6 volume called SYSTEM. This will be substituted later for the SYS:SYSTEM directory for GroupWise.

3. Create several new users using ConsoleOne. You will add these users to the GroupWise system during installation. This addition will enable you to send email to different users to test the connections. User names may be selected at random.

4. Exit ConsoleOne.

Exercise 2 — Installing GroupWise

1.   Browse the GroupWise6 folder under ClassPaq to the install file. Double-click *Setup.exe*.
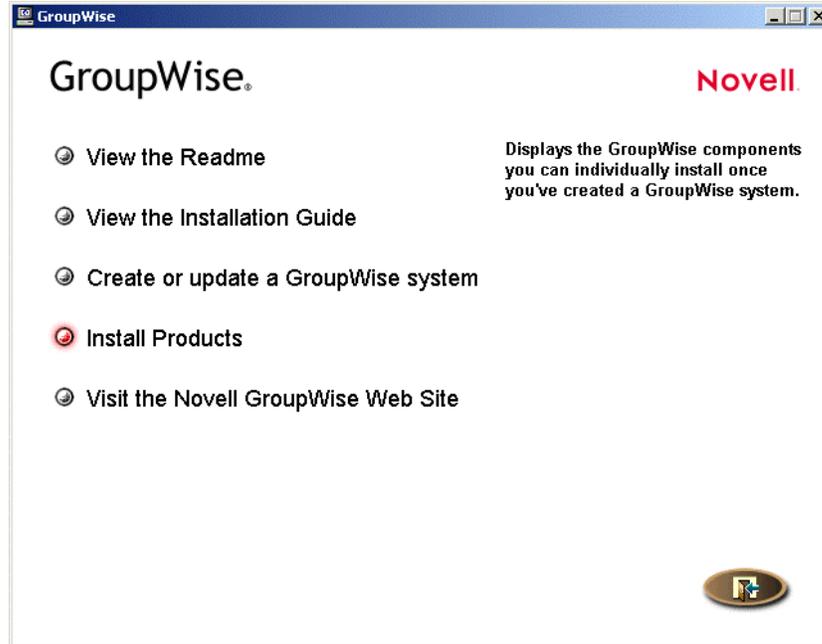
2.   The Novell GroupWise 6 screen displays. Select *Install Products →
      GroupWise Administration → Install GroupWise Administration → Yes*.
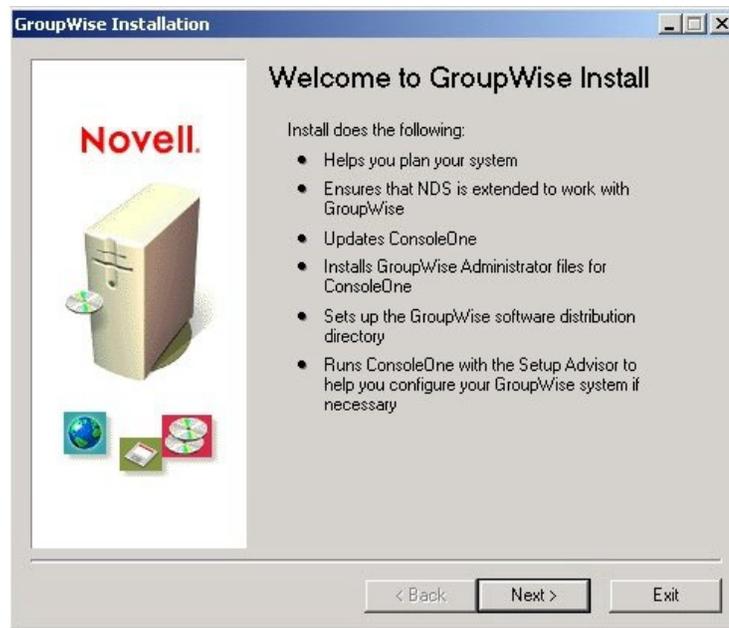
3.   The Welcome screen displays. Click *Next → Next.* You will **not** select the option to Plan your system for this exercise. Verify that the Create a new system or update an existing system option is selected. Click *Next*.

4.   The Select Tree dialog box displays. Select the CPQ tree. Click *Next* to extend the NDS schema. Then select *Next → Next*.

5.   The Select Language screen displays. English-USA is selected by default. Click *Next*.

6.   At the ConsoleOne Path screen, ensure that the correct path for ConsoleOne files is displayed.
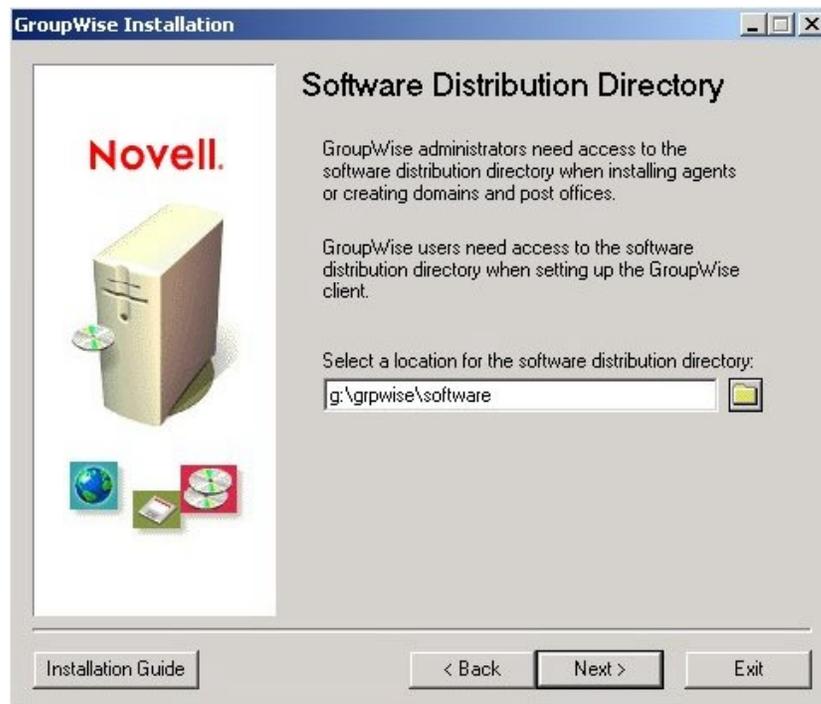
7. The Software Distribution Directory screen displays. At the Select a location for the… field enter `G:\grpwise\software` for the location and click *Next*.
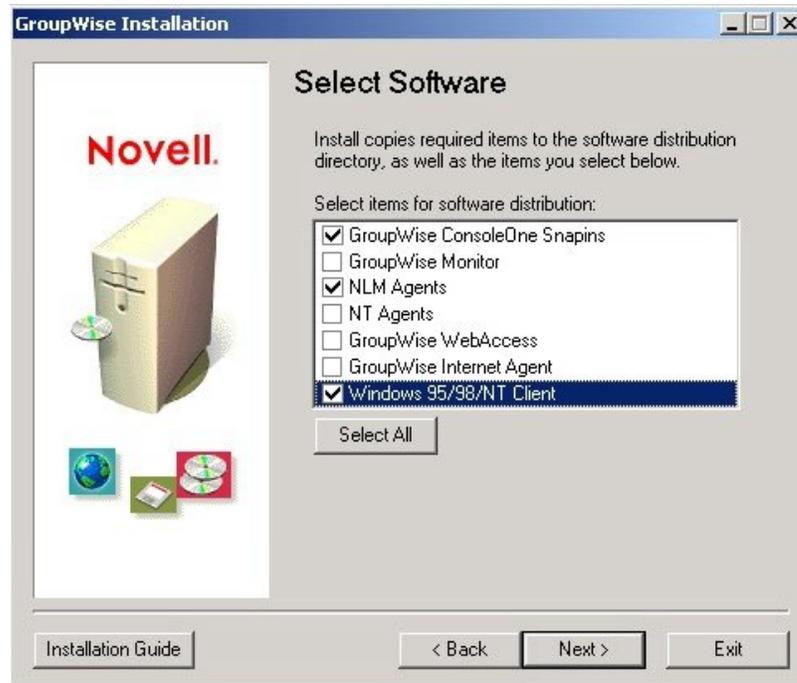
8. Ensure that the following options are selected:

    *   GroupWise ConsoleOne Snapins
    *   NLM Agents
    *   Windows 95/98/NT/ Client

9. No other options should be selected at this time. Click *Next*.

10. The Ready To Install screen displays; click *Install* to begin installation.
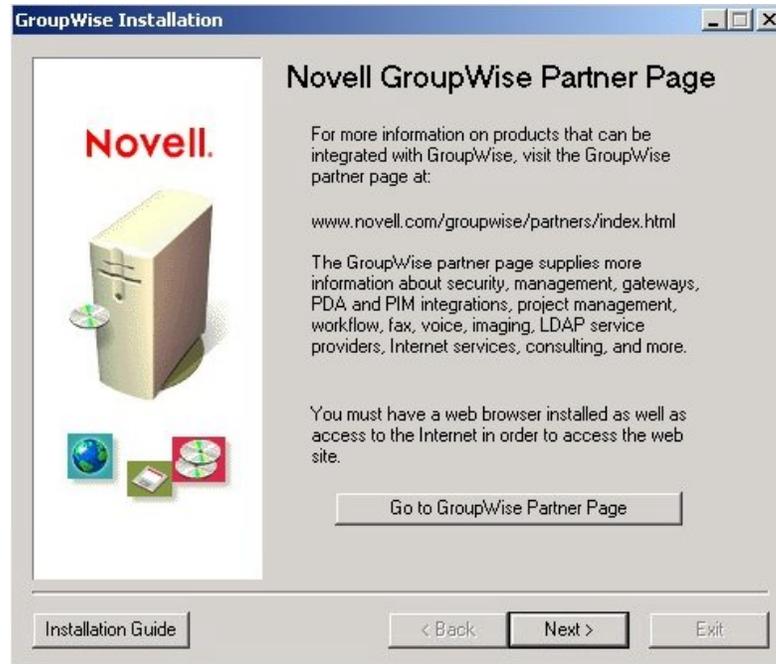
11. The Novell GroupWise Partner screen displays. Click *Next* to continue.
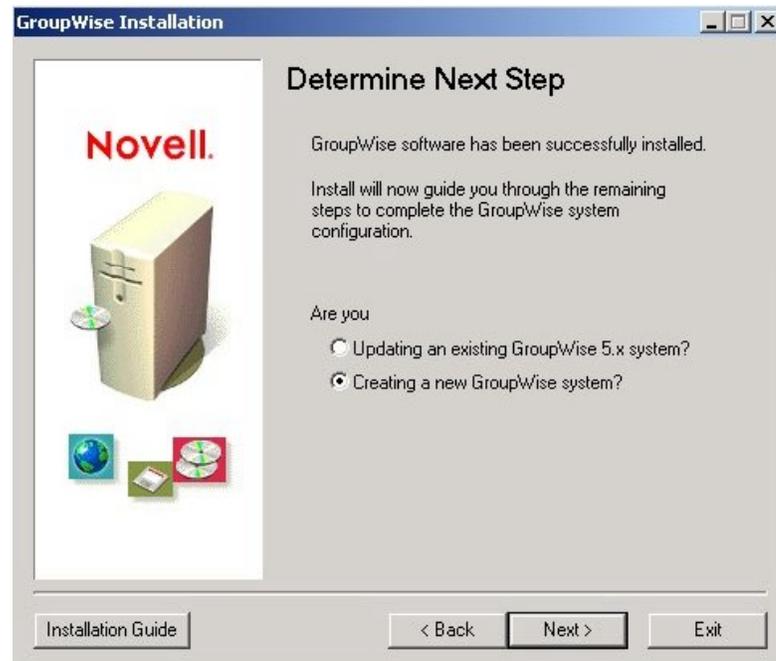
12. The Determine Next Step screen displays. Select the Creating a new GroupWise system? option and click *Next → Run*. You will now have the opportunity to start the GroupWise Setup Advisor to configure the system.
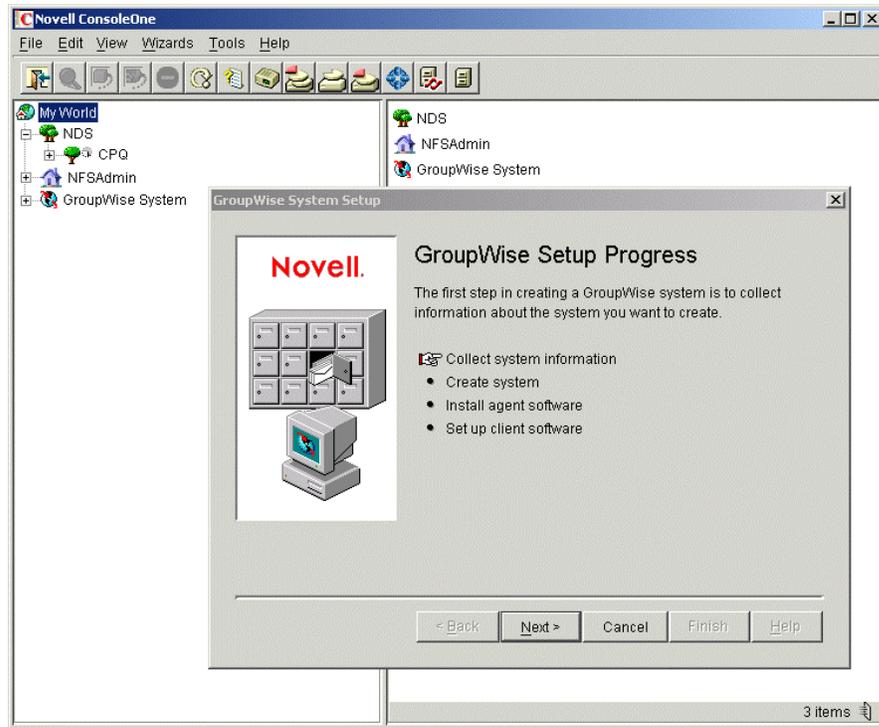
13. At the GroupWise Setup Progress screen, select *Next → Next → Next* to proceed to the System Name screen.

14. Use the following configuration parameters.

Item	Configuration Parameters
NDS Tree	CPQ
System Name	CPQGW
Domain Name	GWCLSTR
Domain Directory	G:\domdir
Domain Context	NCS (must select with the browse button)
Domain Language	English – US (or appropriate language support)
Time Zone	Applicable Time Zone
Post Office	GroupPO
Post Office Directory	G:\podir
Post Office Context	NCS
Post Office Language	Applicable Language
Post Office Time Zone	Applicable Timezone
Post Office Access Method	Client/server access only
Post Office Link	TCP/IP link
POA Network Address (The POA delivers messages to users' mailboxes.)	
TCP/IP Address	172.20.100.30 (Static IP Address assigned to volume)
Client/Server Port	1677
Message Transfer Port	7101
HTTP Port	7181
MTA Network Address (Routes messages between domains, post offices, and gateways.)	
TCP/IP Address	172.20.100.30 (Static IP Address assigned to volume)
Message Transfer Port	7100
HTTP Port	7180
Post Office Users	
Add	Select users created in earlier exercise, including *Admin* account.
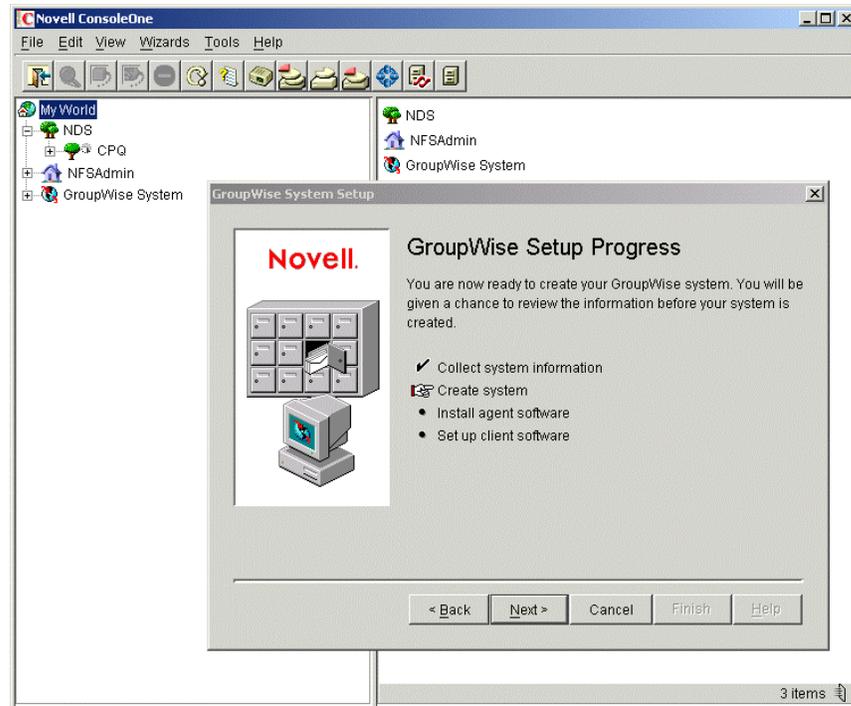
15. The GroupWise Setup Progress (Create System) screen displays. Click *Next* → *Next*. Files will copy and post office will form. The Please Wait screen displays to indicate that the installation is complete. Click *Next*.

16. Click *Next (Install Agent Software)* → *Next (Installation Platform = NetWare)*.

17. At the Installation Path screen, select the path g:\system as the path for GroupWise agent software and ensure that the Configure GroupWise agents for clustering option is selected. Click *Next*.

18. The Web Console Information screen displays. Deselect Enable web console.
Click *Next → Next (Language) → Install (Summary screen).*
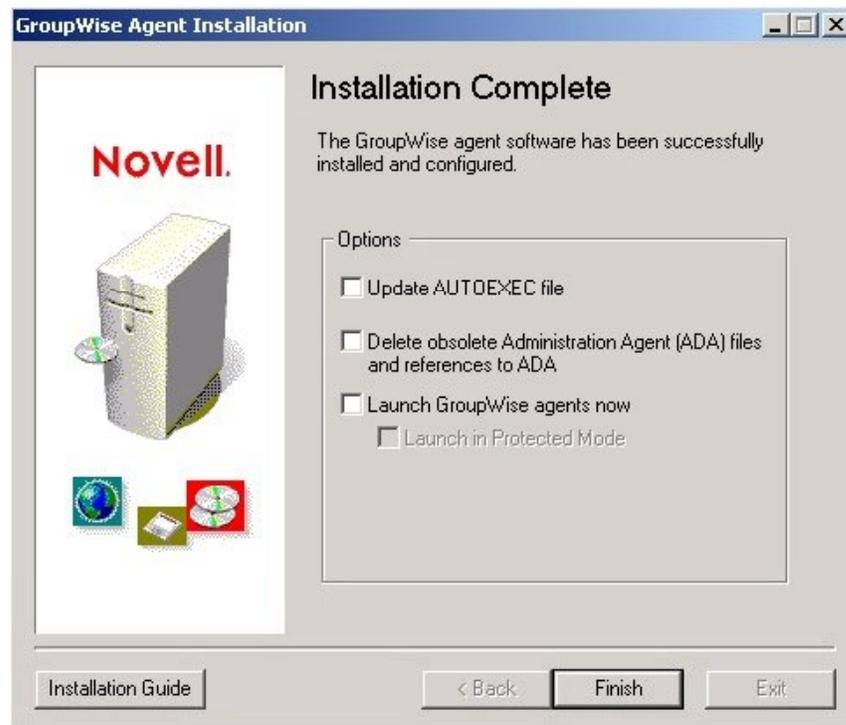
19. The Installation Complete screen displays. Deselect the Update AUTOEXEC file and GroupWise agents now options. Click *Finish → Next.*

▲ **Note**

The AUTOEXEC.NCF file should not be modified to auto-start the GRPWISE.NCF file. This is because it is desired to launch GroupWise from within a cluster resource load script.

20. Select the appropriate language, then select *OK*.

21. GroupWise 6 requires the Windows Messaging System. If is not already installed on your system, follow the prompts to install it. The system will need to restart. If it is installed on your system, proceed to step 23.

22. When Windows comes back up, log in as admin. The GroupWise Setup program will continue. Select the appropriate language and click *OK*. At the Welcome screen, click *Next*.

23. The ConsoleOne screen may display briefly, then the Setup Options screen displays. Click *Next (Standard Install)→ Next → Next (Destination Directory)*.

24. Ensure that only the GroupWise option is selected. Deselect the GroupWise Tip of the Day, and Internet Browser Mail Integration options. Click *Next → Next*.

25. The GroupWise Notify option does not need to be selected. Select *Next → Next → Next → Next* to start the file copy process.

26. A file copy and installation progress screen displays. After the process is complete, the View Readme File and Launch GroupWise Now screen displays. Deselect both options. Click *Finish.*

27. If necessary, close ConsoleOne and exit the GroupWise installer.

Exercise 3 — Configuring the GroupWise Home Directory

As mentioned in the beginning of this lab, you must verify the configuration path to the POA and MTA home directories. The home directories reside on the shared storage. Configuring the paths allows GroupWise to find the Post Office directory and the Domain directory when a server fails over.

During the GroupWise Agents portion of the installation, you selected the G:\System directory to contain the agent software.

During the process that installed the agents, the POA and MTA startup files were created. These startup files include a path statement pointing to the Post Office directory and the Domain directory on the shared storage volume. The startup files need to be configured for an NCS environment by modifying the path statement.

To correctly identify the path statement, the MTA and POA startup files on the shared storage must be edited. Editing the POA and MTA startup files can be performed from the server console using the built-in text editor or from a workstation using any generic text editor.

1.   Use any text editor to edit the G:\System\GROUPPO.POA file. This will open the post office file.

2.   Scroll down to the Post Office Directory entry and verify that the following path is present:
     /home-GPW:\podir\

3.   After the POA startup file has been edited, save your changes. After saving, navigate to the G:\System directory, and browse to the MTA startup file. If your Primary Domain name is GWCLSTR, the startup file will be GWCLSTR.MTA. After you have selected the MTA startup file, open it for editing.

4.   This file is similar to the POA, except that it points to the Domain directory instead of the Post Office directory. Verify that the following path is present:
     /home-GPW:\domdir

5.   Exit the Edit program.
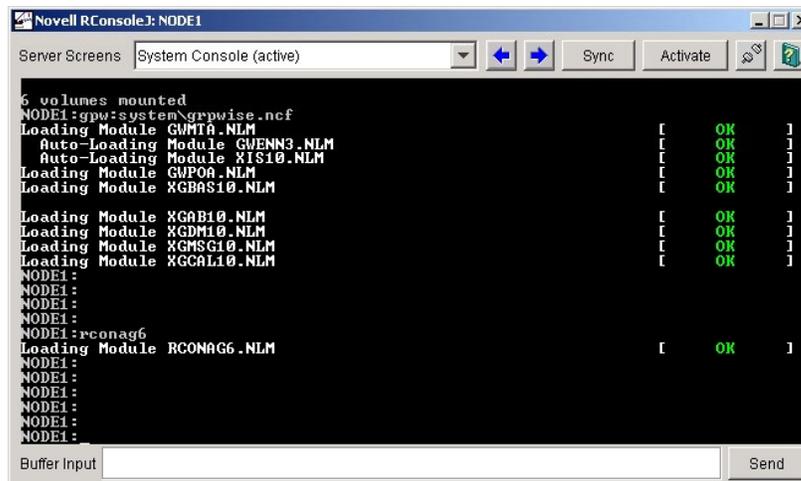
6. At the server console for Node1, execute `GPW:SYSTEM\grpwise.ncf`.

7. At the desktop, launch *GroupWise*.
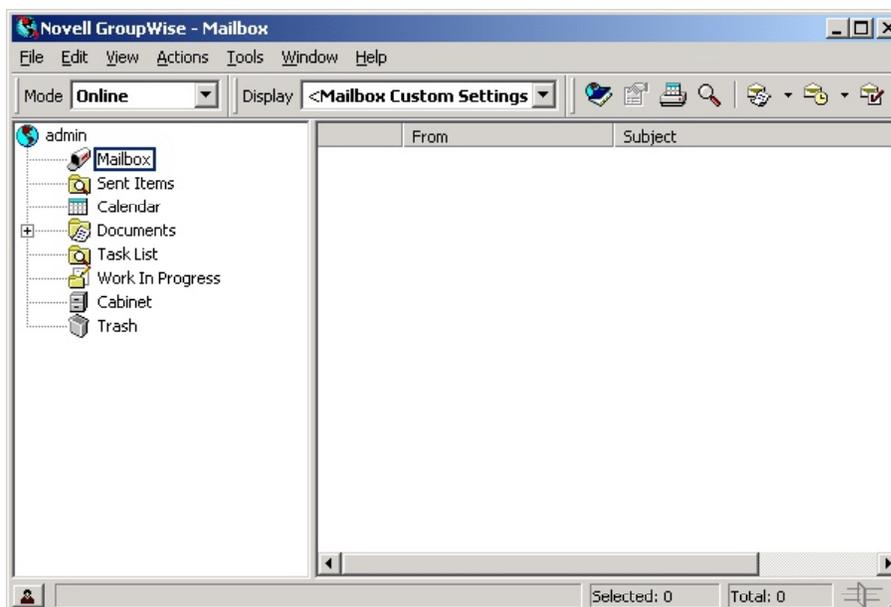
8. The GroupWise Startup screen displays and proceeds directly to the GroupWise-Mailbox screen. Because you are currently logged in as Admin, this is the mailbox for the admin user.

▲ **Note**

Another startup screen **might** prompt you for information. If so, enter the USERID, Password, TCPIP address and Port. Type one of the user names you created earlier, its password, the IP address of the POA and MTA, and the default POA port of 1677. Click *OK*. If this screen does not display, proceed.

9.   Send a test message to the Admin account. If it is received, the system is working properly. Exit the GroupWise client and close any readme files or tips screens before proceeding.

You have just completed the installation of your GroupWise system. On the console for Node1, the MTA and POA screens should be active and displaying the status of the Domain and Post Office that were just created.

Exercise 4 — Modifying the GroupWise NSS Cluster-Enabled Volume Resource to load GroupWise Services

1. Before configuring the VIRTUAL_GRPW6 NSS cluster-enabled volume as a cluster resource in ConsoleOne, perform the following steps:

    a. At the server console for Node1, shut down the MTA and POA on Node1 by moving to the POA and MTA screens and pressing F7 to **Exit** the system and unload the following NLMs:

    ◆   Gwmta

    ◆   Gwpoa
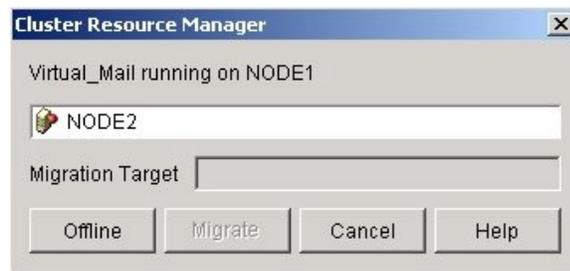
    b. Use ConsoleOne to put the Virtual_Mail resource in an Offline state to disable the cluster-enabled volume.

    ▲   **Note**

    Because the POA and MTA databases have just been shut down, a GroupWise Administrator message may display indicating that the database cannot be found. Ignore this message and select *Cancel → Close*.
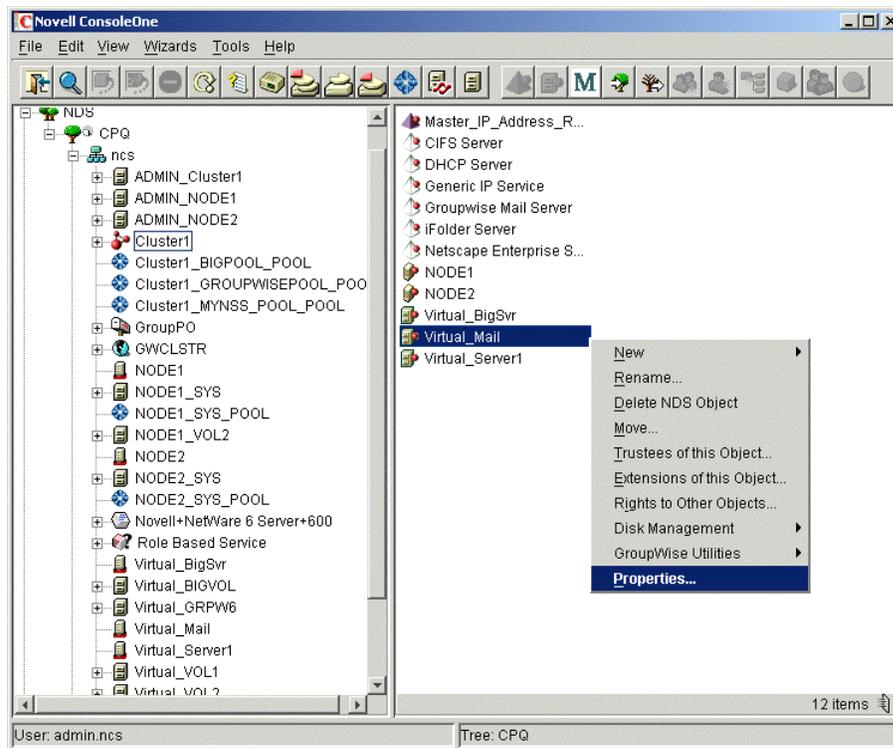
2.   Use the ConsoleOne Console View to select the Virtual_Mail cluster
      resource object. Right-click on that object and select Properties.

3. Edit the load script to look like the following:
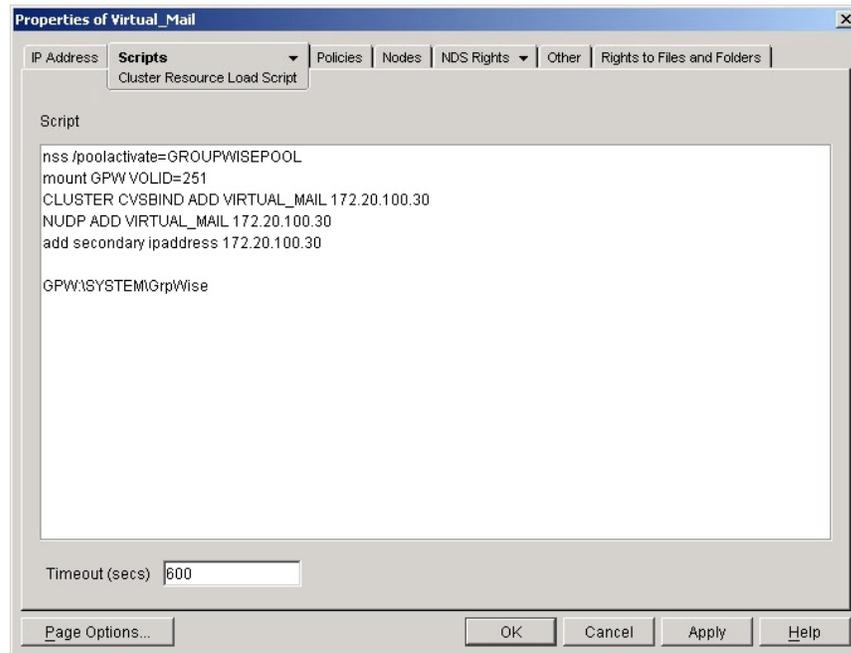
The Load script activates the NSS volume and mounts it, then adds the secondary IP address defined for the GroupWise Mail Server, and launches GroupWise.
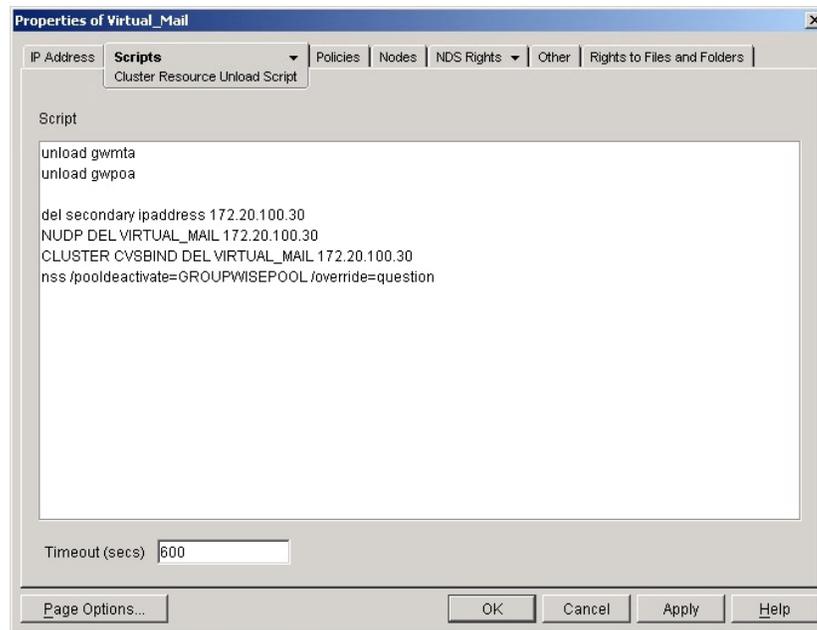
4. Click the *Unload* tab. Edit this script to look like the preceding example.

    This script unloads the MTA and POA modules, which shuts down GroupWise, dismounts and deactivates the NSS volume, and deletes the secondary IP address used for the GroupWise clustered resource.

5. Click the *Policies* tab. Ensure that the Start and Failover modes are set to Auto, and the FailBack mode is set to Disabled.

6. Click the *Nodes* tab. Ensure that all desired servers in your cluster displays in the assigned column. The assignment sequence is shown from top to bottom. For example, if the list displays Node1 before Node2, Node1 is the first assigned server or primary owner of the cluster resource. Exit the Properties screen by selecting *OK*.

7. ConsoleOne displays in the Console View mode. Click the View item on the menu. Select Cluster State view.
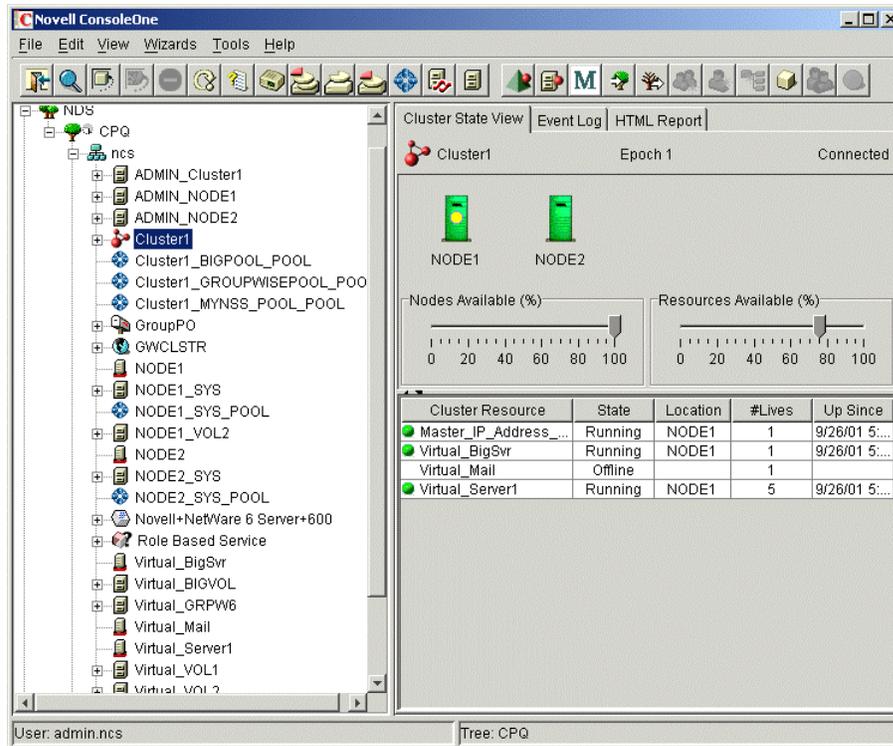
8. A graphical representation of your cluster displays. The GroupWise resource displays as offline or NDS Sync in the lower right pane. Click the *Virtual_Mail* resource name once.

▲ **Note**

If the State indicates NDS Sync for more than a minute, you might need to reset one of the server nodes.

Check the server console to ensure that the Post Office and Domain are open. ConsoleOne only indicates that the cluster volume or resource is online, not whether the application or server is actually functioning properly.
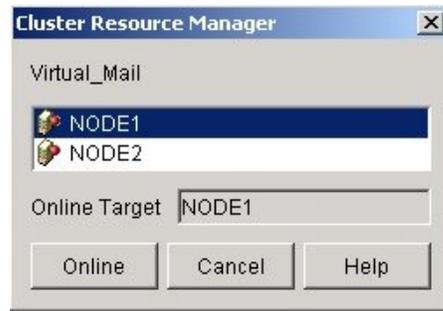
9. The Cluster Resource Manager displays. Select Node1 and click the *Online* button to load the GroupWise Resource, which is monitored on the server console. After the Resource is loaded, ConsoleOne shows it as online.

10. After you have verified that the Post Office and Domain are open and running on the node, click the *GroupWise* resource entry from the Cluster State View in ConsoleOne. The Cluster Resource Manager displays, indicating which server controls the resource, and the servers that are available to which to migrate.

11. Click the name of Node2 and click *Migrate*. The clustered resource should migrate over to the other clustered node. After the resource reaches a Running state on the other node, proceed to the next step.

12. On the Management Workstation, double-click the *GroupWise* icon on the Desktop. The Novell GroupWise splash screen displays and the GroupWise startup screen displays. This will attempt to connect to the Post Office automatically.

> ▲ **Note**
> Another startup screen might ask you for the USERID, Password, TCP/IP address, and Port you want to log in to. Enter one of the user names you created earlier, its password, the IP address of the POA and MTA, and the default POA port of 1677. Click *OK*. If you are not asked for this information, you will enter in to the mailbox of the currently logged in user.

13. The GroupWise mailbox for the user should display. From this user's mailbox create a new mail message for one of the other users you created earlier. Click *Send* while watching the GroupWise POA screen on the server console. You should see the message being transferred on the server console.

14. Exit GroupWise.

15. Using ConsoleOne, migrate the GroupWise cluster resource.

16. After the resource is launched, ensure that the Post Office and Domain NLMs are both running.

17. Log in as the user you sent mail to in step 13. The IP address and port should display correctly.

18. On the management workstation, double-click the GroupWise icon. The mail you sent should be there.

19. Reply to the user but attach the *Workshop.RTF* file to the email. Carbon Copy the current user on the reply.

20. Immediately after sending the message, use ConsoleOne to migrate the GroupWise resource.

21. After the resource has been successfully migrated, verify that the target user has received the email with the attachment despite the injection of the fault.

You have now successfully installed and clustered the GroupWise application. You can continue to experiment fault injections while sending email with GroupWise. Some sample fault injections include:

- Pull GBICs

- Pull Fibre Channel cable

- Shut down the server node currently running GroupWise

Troubleshooting Novell Cluster Services on Compaq ProLiant Clusters
Lab 12

Objective

After completing this lab, you should be able to troubleshoot some problems that might arise in a clustered environment.

Requirement

To complete this lab you will need:

- A Compaq ProLiant cluster.

- Compaq Array Configuration Utility (ACU) or appropriate storage configuration utility.

- Access to appropriate troubleshooting tools.

Exercise — Troubleshooting ProLiant Clusters

The instructor will give you an extended break. During this break, the instructor will introduce problems into your cluster. Do not re-enter the classroom during the break.

The type and number of problems introduced into the working clusters will vary. Each group will have at least two errors to locate.

After returning to the classroom, you will work with your assigned lab group to troubleshoot your cluster. You must restore the cluster to a fully functional state, and report the problems to the instructor for verification. You should also be able to use ACU to show the array configuration of your cluster to the instructor.

> ▲ **Note**
> During the troubleshooting process, course participants are not allowed to reinstall the operating system or NCS unless directed to do so by the instructor.

In the following table, record all errors introduced into the working cluster and how those errors were resolved.

Error	How Resolved

Objective

The primary objective of this section is to illustrate the steps necessary to configure the RA4000/RA4100 storage subsystem.

Requirements

To complete this lab, you will need:

- RA4000/RA4100 storage subsystem with dual RA4000 controllers.

- CPQONLIN.NLM array configuration utility.

- 66MHz/64-bit PCI-to-Fibre Channel adapter.

- Fibre Channel interconnect components

  - Fibre Channel Arbitrated Loop (FCAL) hub

  - FCAL loop-switch

  - SAN Switch 8/16

This lab is not intended to provide step-by-step instructions on configuring the RA4x00 storage subsystem.

Exercise — Creating Logical Drives for the RA4x00

To create new logical arrays:

1.   Shut down and power off all cluster servers.

> ▲   **Note**
> There are two storage Fibre Channel interconnects. Do **not** alter their power configuration at this time. One interconnect should remain powered off so that the cluster can begin with a base configuration.

2.   Power on the storage subsystem if it is not already powered on. Wait for it to fully initialize.

3.   Power on the cluster servers one at a time, starting with the server that contains the master replica Novell Directory Services (NDS) tree (node 1).

4.   On a cluster server, enter CPQONLIN to start the Compaq Online Configuration Utility.
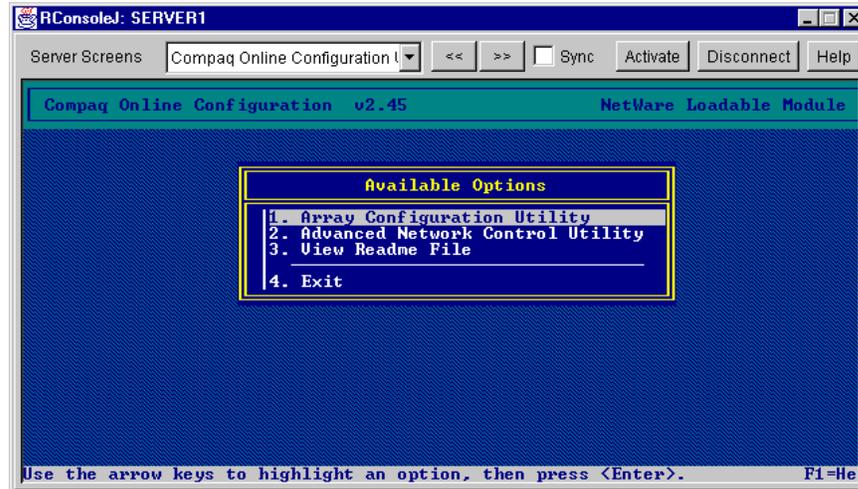
5.   In the Available Options box, select *Array Configuration Utility* and press *Enter*.
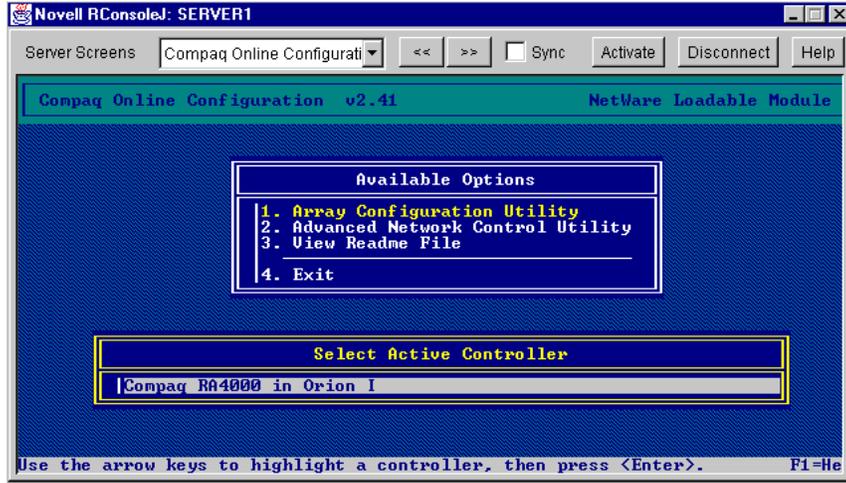
6.   From the list of active array controllers, select an RA4000 controller in the storage subsystem you are configuring. The storage subsystem is identified by a name assigned during the SmartStart configuration; Orion I in the example screen. Then press *Enter***.**

> ▲ **Note**
>
> In redundant Fibre Channel loop configurations, the Fibre Channel arrays will automatically find the new redundant path; therefore, no additional configuration steps need to be performed. Ensure that you use the correct array controller firmware (2.58) on all array controllers, as specified in the *Compaq ProLiant Cluster for NetWare 5 Certification Matrix* at the website **http://www.compaq.com/highavailability.**
>
> Use CPQONLIN or Compaq Insight Manager to find the version of the firmware on the array controllers RA4x00 only.

7. A box showing the drives in the storage subsystem displays. The drives have not yet been assigned to a logical array.
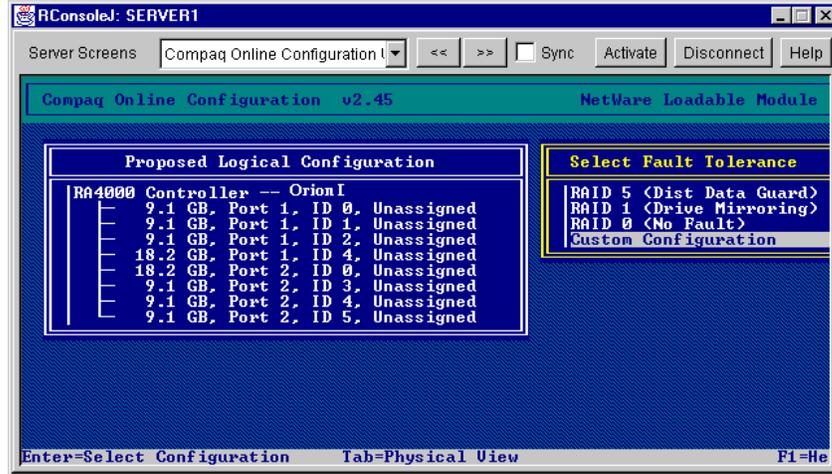
8. In the Select Fault Tolerance box, select *Custom Configuration* and press *Enter*.
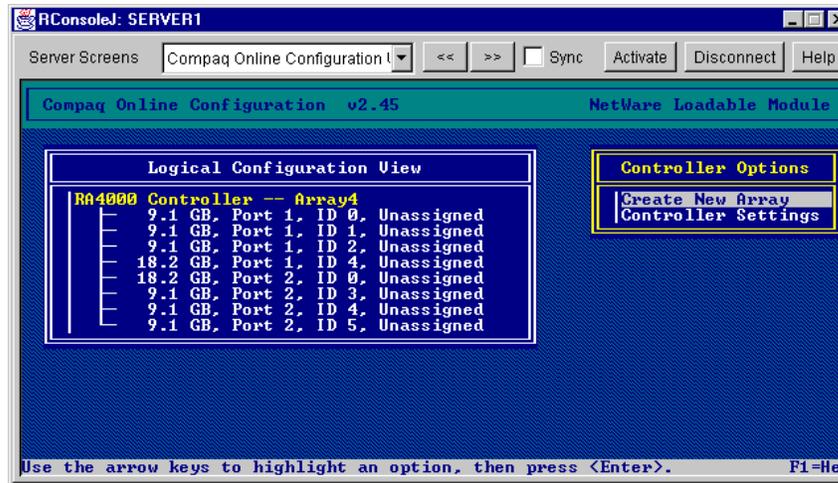
7. In the Controller Options box, select *Create New Array* and press *Enter*.

9.   This creates a new logical array.
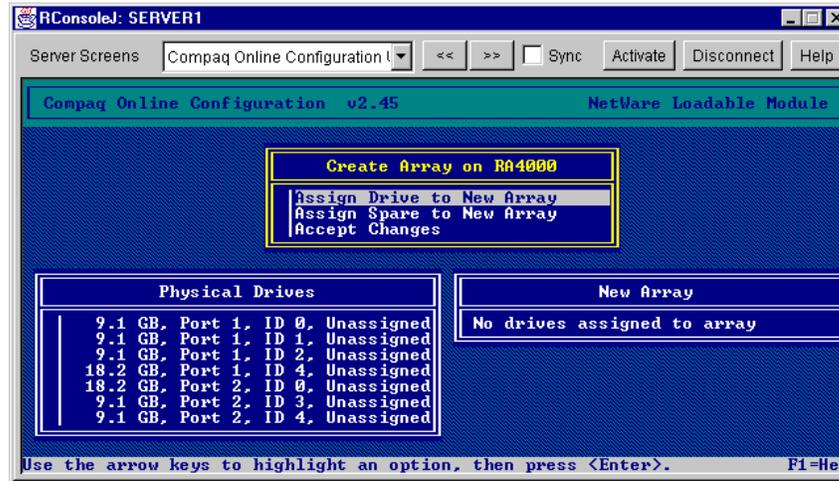
10.   Assign physical drives to the array by selecting *Assign Drive to New Array* and highlighting drives in the Physical Drives list. The drives you assign to the new array displays in the New Array box.
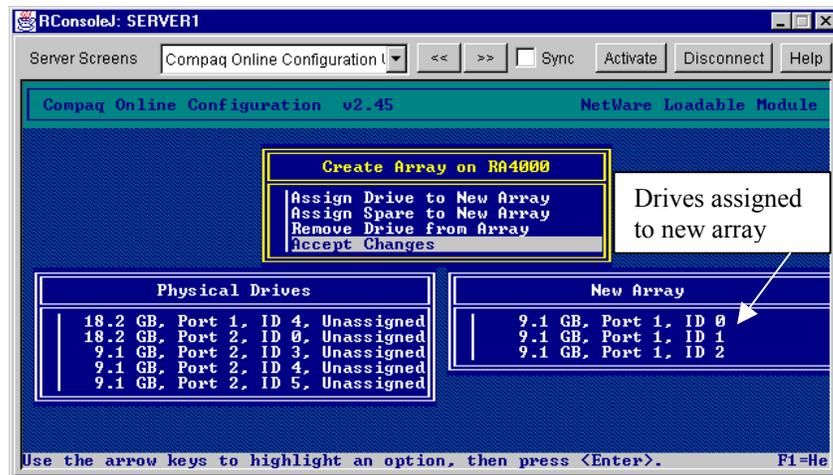
11. When finished assigning drives to the new array, select *Accept Changes* and press *Enter*. Create the following logical drives at RAID level 5:

Resource Use (Names to be applied later. They are listed here for informational purposes only.)	Approximate Logical Drive Size (MB)
Split Brain Detector (SBD)	20
Split Brain Detector (SBD)	20
Cluster-Enabled Volume NSSVOL1	1024
Cluster-Enabled Volume NSSVOL2	1024
Netscape Enterprise Server Resource (optional)	1024
GroupWise Resource	1024
Oracle	2048 or greater
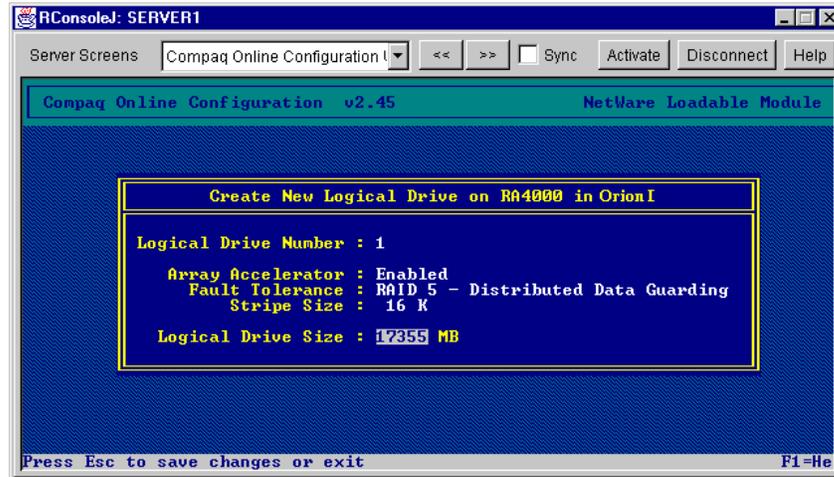
12. Enter the desired RAIDset options. The options are Array Accelerator, Fault Tolerance (RAID level), Stripe Size, and Logical Drive Size. Press *Esc* to save your entries.
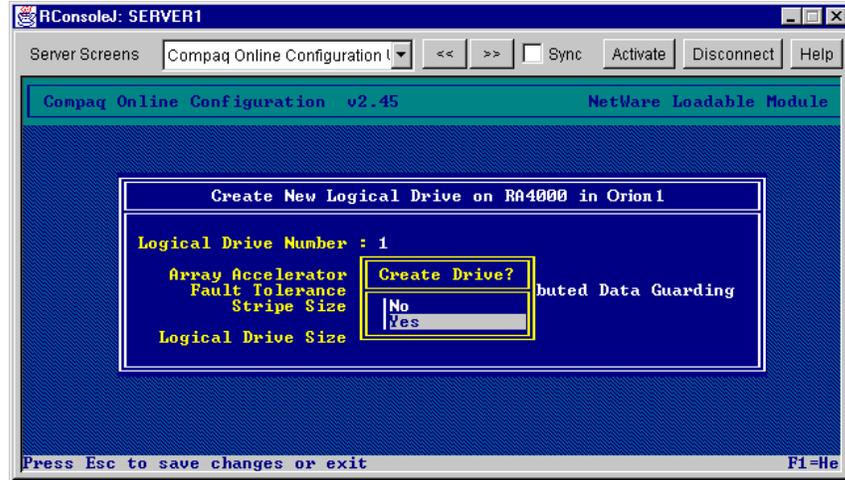
13. Select *Yes* when asked if you want to create a logical drive. The Array Configuration Utility displays the following warning:
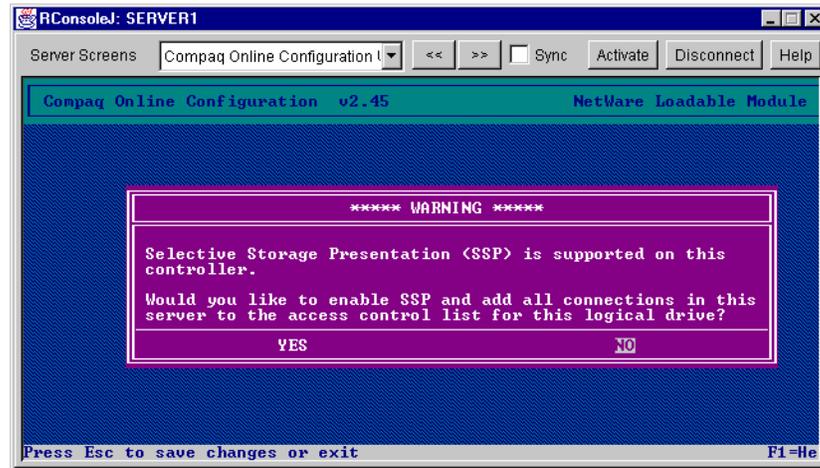
14. Select *No*.

15. The configuration utility displays a summary of the new configuration, showing the logical drives and the settings you have established.
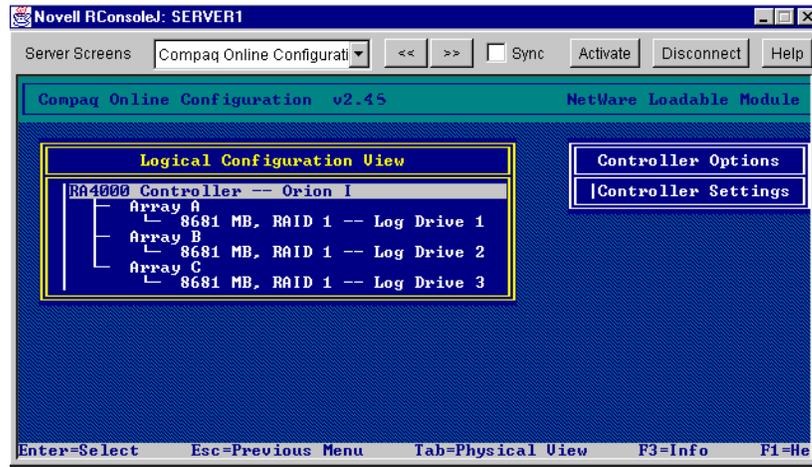
16. Exit the CPQONLIN utility and restart all cluster servers one at a time. This completes the array configuration procedure.

▲ **Note**
Compaq recommends that all disk configurations be performed from the same server.

After the configuration is complete, check to ensure that the cluster servers recognize the same drives and free space on the storage subsystem and that the disk partitions are valid. You can perform this check by using the NWCONFIG utility:

17. Start the NWCONFIG utility.

18. On the first screen, select *Standard Disk Options* and press *Enter*.

19. On the next screen, select *Modify Disk Partitions* and press *Enter*. Confirm the array configuration on the resulting display.

```
Novell RConsoleJ: SERVER1                                          _ □ ✕

Server Screens    NWConfig Screen (active)  ▼    <<    >>   ☐ Sync    Activate   Disconnect   Help

NetWare  Configuration

                        Configuration Options
    ┌─────────────────────────────────────────┬────────────────────┐
    │D│         Available Disk Options         │d network drivers〉 │
    │S│                                         │artitions/volumes〉 │
    │N│ │Modify disk partitions and Hot Fix    │ge and volumes〉    │
    │L│ │Mirror/Unmirror disk partitions       │icenses〉           │
    └─────────────────────────────────────────┴────────────────────┘
    ┌─────────────────────────────────────────────────────────────┐
    │                    Available Devices                          │
    │ Device #1 [V500-A0-D0:0] Compaq 53C876 Slot 0 Port 1 ID 0 COMPAQ MAB3091│
    │ Device #D [V502-A3-D0:0] Compaq RA4000 Disk 0 MIR in Orion I  │
    │ Device #E [V502-A3-D0:1] Compaq RA4000 Disk 1 MIR in Orion I  │
    │ Device #F [V502-A3-D0:2] Compaq RA4000 Disk 2 MIR in Orion I  │
    └─────────────────────────────────────────────────────────────┘


Highlight a disk drive and press <Enter>.
Press <Esc> to return to the previous menu.
```

▲ **Note**

You should also check each logical disk device to ensure that they are usable by NetWare. Ensure that the device shows up in the Available Devices screen.

The disk drives used in the logical arrays should be clear of any data. If the drives were previously used or were taken from another system, use the Initialize Disk option to remove any pre-existing data from the drives.

20. You can also view details about attached storage devices by entering a LIST DEVICES command at the system console prompt to display a screen similar to the following.

20. You can also view details about attached storage devices by entering a LIST DEVICES command at the system console prompt to display a screen similar to the following.

Objective

After completing this lab, you should be able to set HSG80 controller parameters.

Requirements

To complete this lab, you will need:

■ RA8000 or MA8000 storage subsystem.

■ Two HSG80 controllers not configured for redundancy.

■ Client computer.

■ Windows 2000 Professional.

■ HyperTerminal.

■ HSG80 maintenance cable.

Exercise 1 — Communicating with the RAID Controller

This section of the lab will show you how to connect the controller to the host computer and establish communication between them.

Checklist

On completion of each exercise, have your instructor verify that you have performed it successfully by examining this checklist. Mark off the following as you are able to:

❑ Establish a CLI session with an HSG80 array controller.

❑ Configure an HSG80 controller for operation within an arbitrated loop or switched fabric environment.

❑ Configure dual HSG80 array controllers for multibus and transparent failover mode.

❑ Successfully power down an HSG80-based storage subsystem.

Verifying Serial Cable Installation

A DB9 female to an RJ12 serial cable will connect the array controller to the client computer system. The RJ12 end of the cable connects to the maintenance terminal port of the HSG80 controller.

▲ **Note**
There is only one RJ12 port per controller.

The other end of the cable (DB9) can be connected to any available COM port on the client station.

Starting Up HyperTerminal

A Command Line Interpreter (CLI) session can run through any of the following terminal emulation software:

- Terminal

- KeaTerm

- HyperTerminal

- VT

- UNIX tip program

You will use HyperTerminal in this lab exercise.

1. Start HyperTerminal by following the file path *Start → Programs → Accessories → HyperTerminal → HyperTerminal*.

2. A Connection Description dialogue box displays. Enter a name for the new connection in the text box and select an appropriate icon. Enter *StorageX* where X represents the number of your lab station. Select *OK*.

3. A Connect To dialogue box displays. Select the appropriate COM port in the drop-down list box located at the bottom of the dialogue box. This is the port on your client station that the maintenance cable is attached to. Select *OK*.

4. You should now see a dialogue box called COMx Properties where "x" represents the COM port that you selected in the last step. Set the parameters in this dialogue as follows.

- Bits per second = 9600

- Data Bits = 8

- Parity = None

- Stop Bits = 1

- Flow Control = Hardware

▲ **Note**

Under the file path *File → Properties → Settings → Emulation,* set the emulation to VT100. If this setting is incorrect, the user could be unable to use the *Delete* key to correct mistakes in the command line.

5.   After these settings have been verified, select *OK*.

6.   Press *Enter* twice. HyperTerminal will respond with a prompt, for example
     `HSG80>`. This indicates that communication with the controller has been
     established.

     If HyperTerminal does not respond with a prompt and only a blinking cursor
     displays after pressing *Enter* several times, you must disconnect from
     HyperTerminal. Do this by clicking the *Disconnect* choice under the Call
     menu.

     a.   Check to see if the correct COM port has been selected. To do so,
          follow the path *File → Properties → Connect*. Verify that the controller
          is active (a green restart button should flash.) Then, verify that the cable
          is properly attached and the communications settings are 9600, 8, None,
          1, and Hardware. Do this by following the path *File → Properties →
          Configure*.

     b.   If these settings are correct and there is still no connection, try setting
          the baud rate to 19200. If communication continues to fail, reset the
          baud rate to 9600.

     c.   If two controllers are installed in the storage system, try communicating
          with the other controller.

     If, after trying these solutions, communication is still not established, please
     see the instructor.

Establishing Controller and Other Basic Settings

Help and Basic Settings

1. To get help from the HSG controller using the *?,* use the following commands.

   a. Enter *?*. This will show all commands currently available.

   b. Add *?*. This will get help at a lower level.

   c. Enter the following commands:

      ```
      ADD DISK ?

      ADD DISK DISK10000

      ADD DISK DISK10000 5 ?

      SHOW ?
      ```

The following CLI keyboard shortcut keys are available.

Shortcut Keys	Function
Up Arrow/Down Arrow	Step back and forth through the most recent CLI commands
Left Arrow/Right Arrow	Move the cursor left or right in the command line
Ctrl + E	Move the cursor to the end of the line
Ctrl + H or Backspace	Move the cursor to the beginning of the line
Ctrl + A	Toggle between insert and overstrike
Ctrl + R	Recall contents of the current command line

2. Use the `SHOW` command to display the configuration settings of the controller.

   ```
   SHOW THIS FULL
   ```

   What is the port topology of the controller you are viewing? Write the topology type in the space provided below.

   ▲ **Note**
   The four valid settings for topology are `LOOP_SOFT` (arbitrate for an `AL_PA`, `LOOP_HARD` (assign a hard-coded `AL_PA`), FABRIC (for switched fabric) and `OFFLINE` (do not partake in the arbitrated loop or fabric). The port topology can be changed with the following commands:
   ```
   SET THIS PORT_1_TOPOLOGY=LOOP_SOFT
   SET THIS PORT_1_TOPOLOGY=LOOP_HARD
   SET THIS PORT_1_TOPOLOGY=FABRIC
   SET THIS PORT_1_TOPOLOGY=OFFLINE
   ```

3. Set the time on the controller by entering:

```
SET THIS TIME = ?
```

This will show the time format. Go ahead and set the time for the controller.

4. Set the Cache Flush Timer on the controller to 10 by entering:

```
SET THIS CACHE_FLUSH_TIMER=10
```

5. Set the HSZ prompt by entering:

```
SET THIS PROMPT="HSG80->"
```

6. Set the Allocation Class to zero by entering:

```
SET THIS allocation_class=0
```

▲ **Note**
Windows NT does **not** use this setting. It is, however, used by OpenVMS and Digital Unix in response to SCSI inquiry commands. It is a means for those operating systems to identify controller pairs uniquely.

7. Set the EMU parameters by entering:

```
SHOW EMU
SET EMU FANSPEED = HIGH
SET EMU FANSPEED = AUTO
```

Establishing Transparent and Multibus Failover Mode

By default, the controllers ship from the factory in transparent failover mode. To set the controllers to transparent failover mode, you simply enter whichever of the following is the source of the correct information.

```
SET FAILOVER COPY = THIS
```

To get into multibus failover mode you must first get the controllers out of transparent failover mode.

```
SET NOFAILOVER
```

▲ **Note**
The NOFAILOVER command can be entered from either controller.

After the controllers have been taken out of their default, dual-redundant (transparent) configuration, they can be reconfigured for multibus operation. To configure the controllers for multibus operation;

```
SET MULTIBUS_FAILOVER COPY = THIS
```

This will configure the controllers for multibus failover mode, based on the configuration of the controller you are currently attached to.

```
SET NOMULTIBUS_FAILOVER
```

This will return to transparent failover mode from multibus failover mode;

```
SET FAILOVER COPY=THIS
```

This will return the controllers to transparent failover mode, based on the configuration stored controller you are currently attached to.

▲ **Note**
When changing the redundancy options for the controllers, the other controller will automatically shut down when the redundancy settings are changed. Ensure that the other controller has restarted before attempting to resume the reconfiguration procedure.

The following graphic is a depiction of each failover mode. In the transparent mode, the only units that can be seen out of port 1 are D0 through D99. The only units that can be seen out of port 2 are units D100 through D199. In the multibus mode, all units (D0 through D199) can be seen out of both host ports.

Transparent Failover

	Units D00-D99	Units D100-D199	
Controller A (SCSI ID 7)	Port 1 Active	Port 2 Standby	
Controller B (SCSI ID 6)	Port 1 Standby	Port 2 Active	

Multiple-Bus Failover

	Units D00-D199	Units D00-D199	
Controller A (SCSI ID 7)	Port 1 Active	Port 2 Active	
Controller B (SCSI ID 6)	Port 1 Active	Port 2 Active	

Powering Off the System

If the controllers have been shut down cleanly, the OCP Reset button is solid green and the three port indicators nearest the OCP Reset button are solid green. If this unit needs to be shipped, the ECBs should be shut down. Depressing the button labeled *Shut Off* for several seconds accomplishes this.

Before the HSG80s, shutdown was achieved by entering the command `SHUTDOWN OTHER` followed by `SHUTDOWN THIS`. Although the HSG80s still have and use the `SHUTDOWN` command, `POWEROFF` enables you to accomplish the same task with one command instead of two.

The BATTERY_ON switch instructs the subsystem to leave the cache module power on. The default is BATTERY_OFF. In either case, the ECB will **not** be shut off. You need to push the ECB Shut Off switch to disable the battery shipping the subsystem.

▲ **Note**
There is no ECB Shut Off switch on the M2200 controller shelf.

After the `POWEROFF` command has been issued, all units go into a write-through caching state until the time specified in the Seconds switch. After this time has elapsed, there is an orderly rundown of units followed by a shutdown of both controllers. Then the DC power is powered off.

1. Enter `POWEROFF SECONDS = 5 BATTERY_ON`.

2. Wait for the subsystem to shut down. After the system shuts down, restart both controllers by depressing the EMU reset buttons.

You have now completed this lab exercise. Please inform your instructor that you have finished.

Exercise 2 — Configuring the Storage System with CLI

Objective

After completing this exercise, you will be able to create and manage different types of storage containers.

Requirements

To complete this exercise, you will need:

- MA/RA8000 storage subsystem

- 2 HSG80 controllers configured as follows:

  - Dual redundancy (transparent failover mode)

  - Mirrored cache mode

  - Port one on the top controller and port two on the bottom controller attached to a hub or switch

- Six hot-plug universal hard drives or disk storage building blocks (SBBs) installed in drive cabinet

Checklist

On completion of each lab exercise, have your instructor verify that you have performed it successfully by examining this checklist. Mark off the following as you are able to:

- ❑ Add disk devices

- ❑ Create different container types—specifically RAIDsets, MIRRORsets, and striped mirrorsets.

Checking for Previous Configurations

Before beginning this lab, verify that no controller storage set configuration information exists. If it does, this information should be deleted in the following order: units, containers, and devices.

Deleting All Units

7. Enter SHOW UNIT **T**o obtain existing unit numbers.

8. Enter DELETE D100 **T**o delete existing units listed under the LUN column. D100 is presented as an example. In class, you would need to delete whatever units were displayed after typing the SHOW UNIT command.

Deleting All Storage Containers

9. Enter SHOW STORAGE to obtain existing storage containers.

10. Enter DELETE M0 to delete existing storage containers listed under the Name column. In this example, M0 is the name of the storage container. In this lab, you will need to delete whatever storage containers were displayed after entering the SHOW STORAGE command.

Deleting All Devices

To delete devices:

11. Enter Show Disks to view existing device containers. No Devices should be displayed.

12. Enter DELETE DISK10000 to delete existing device containers listed under the *Name* column. You will need to delete each disk device individually

Verifying LUN, Container, and Device Removal

For verifications:

13. Enter SHOW UNIT. No LUNs should be displayed.

14. Enter SHOW DEVICE. No disk devices should be displayed.

15. Enter SHOW STORAGE. No storage containers should be displayed. You might see two containers named Failedset and Spareset. These are placeholders. They should not contain any disk devices.

▲ **Note**
Again, the preceding steps should **not** be necessary. They are listed in the unlikely event that the storage subsystem was not properly 'refreshed' prior to class. However, knowledge of the various uses of the SHOW command is useful.

Using the CONFIG Utility

1. Enter `RUN CONFIG`.

    ▲ **Note**
    This utility will automatically configure all devices currently seen by the controller. It will scan all SCSI buses looking for disk devices, and then create internal reference names such as DISK10000. This utility will **not** remove any devices that were previously configured but no longer exist.

2. Enter `SHOW DISK`. At minimum, `DISK10000, DISK20000, DISK30000,` and `DISK40000` should display.

Exercise 3 — Using StorageWorks Command Console to Complete Configuration of Storage System

Objectives

After completing this exercise, you will be able to:

■   Understand how to install StorageWorks Command Console (SWCC) agent and client software.

■   Explain how to establish the three types of connections to the subsystem.

■   Describe how to configure and maintain a remote subsystem through the SWCC graphical user interface (GUI).

■   Create a virtual disk using the SWCC Storage Window.

Requirements

To complete this exercise, you will need:

■   1 MA/RA8000 storage subsystem

■   2 HSG80 controllers configured with dual redundancy (transparent failover mode)

■   At least one disk device installed in drive cabinet

■   At least one LUN (D1) created beforehand

■   1 host running NetWare 5.1 SP2 with one 64-bit Compaq Fibre Channel Host adapter

■   One client station running Windows 2000 Professional with the following installed:

   •   Fibre channel cables

   •   At least one fibre channel interconnect device

Your instructor can provide you with the location of SWCC software. Write this location in the space provided below:

....

Client and server can communicate through TCP/IP on the classroom LAN. Record the IP addresses of your client and server in the space provided below:

....

Checklist

Upon completion of each exercise, have your instructor verify that you have performed it successfully. Check the following list as you are able to:

☐ Install the client and agent components of SWCC.

☐ View an HSG80-based storage system through SWCC through serial, SCSI, and network configurations.

☐ Create a virtual disk using the SWCC Storage Window application.

Configuring Hardware and Physical Connections

Your lab station should be configured as shown in the following diagram:
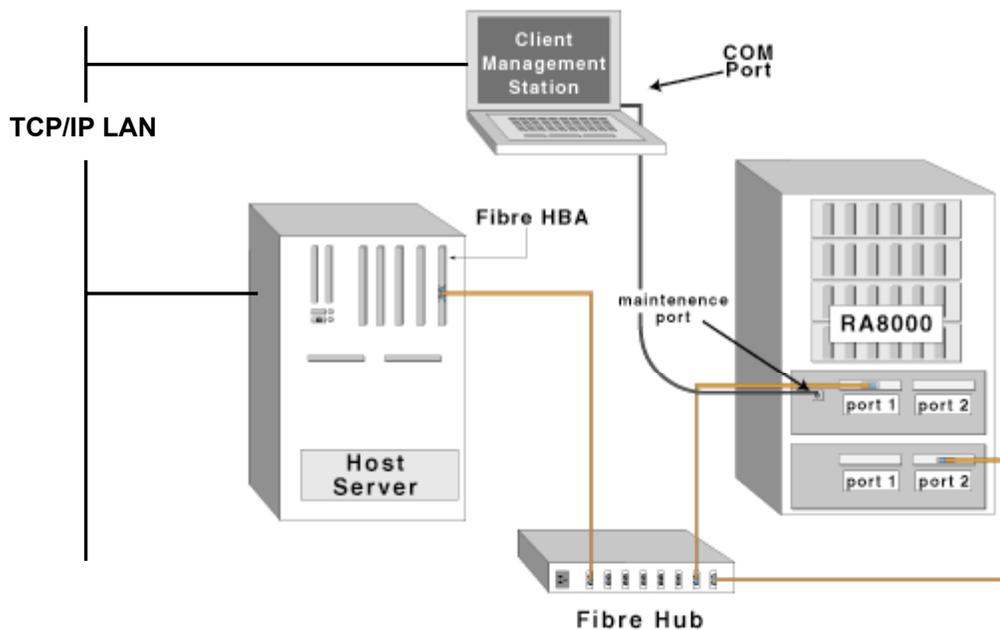
Verify the following:

■ The Fiber Channel cables are properly seated.

■ The controller's ACS version is appropriate for the topology you are using. For example, if you are using ACS8.5P, you will not be able to conduct this lab within an arbitrated loop topology.

▲ **Note**
This lab can be run in either FC-SW or FC-AL environments. If you have any questions regarding the use of a FC switch or hub, please ask your instructor for assistance.

- A maintenance cable connects your client station (or server) to the top HSG80 array controller.

- HBA device and drivers are loaded and are functioning properly.

Installing the MA/RA8000 NetWare SWCC Agent Configurator

1. Attach with administrative rights to the server to which you wish to install the agent.

2. From the *RA8000_NW\SWCC\NETWARE_AGENT*, launch *SETUP.EXE* → *Next*.

3. Enter the name of the desired server node.

Configuring the Agent Services

4. On the NetWare console, enter *load HSG80CFG*.

5. Select *Edit Client List* → *INS* and enter the name of the client from which commands will be received.

6. Select *Modify* for client priviledges, and *Both* for monitor mode.

7. Enter a password for the client.

8. Save and exit the HSG80CFG information.

9. To load the NetWare SWCC Agents, enter the following at the server console:

```
Load RAIDCDM

Load STEAM
```

10. The management console (Command Console Client) can now connect to the array.

▲ **Note**
Ensure that the *SYS:ETC/HOSTS* file has been edited with the name of the management PC, or that DNS is enabled.

Installing the Command Console Client

11. On the platform kit CD, move to the folder:
    drive_letter:\SWCC\Client\hsg80_intel

12. Choose *Intel client* then double-click on *Setup*.

13. Follow instructions in the *Setup* program to complete the installation.

14. The management console is now prepared to connect to the SWCC agent running on the server node.

Using SWCC CLI Window Through A Serial Connection

Opening the SWCC CLI Window

15. Follow the path: *Start* → *Programs* → *Command Console* → *CLI Window*.

16. Select *Serial* communication type, the appropriate COM port setting, and a baud rate of 9600. Click *Connect* and wait for the CLI window to display.
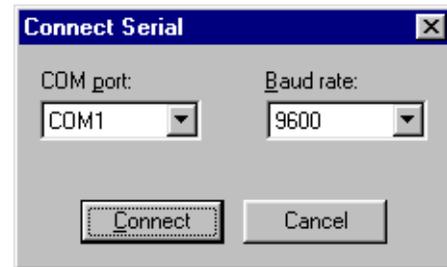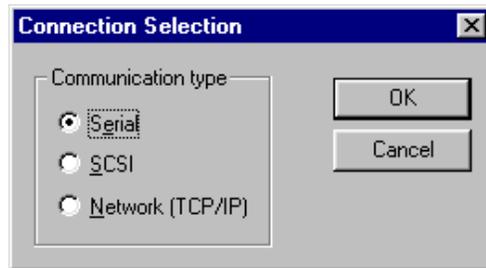
17. Enter SHO THI FUL to show the controller's configuration.

18. Enter SHO UNI FUL to verify the existence of the communications LUN.

19. Exit from the CLI Window.

▲ **Note**
There are a few limitations of the SWCC CLI window. First, RUN commands can not be initiated through this interface—they must be performed through a maintenance terminal port. However, the CLI window does have type-ahead capabilities.

⚠ **Warning**
If a HyperTerminal session is running and you attempt to run SWCC Client in serial mode, it will not work. Although the serial session begins, nothing happens when you enter CLI commands.

•

# Using the SWCC CLI Window Through a Network (TCP/IP) Connection

Opening the SWCC Client Window

1. Select *Start → Programs → Command Consolev2.0 → CLI Window*.

▲ **Note**
The only other Connection Selection for the CLI Window is SCSI. To use the SCSI connection, you need to be running the SWCC Client software directly from the server attached to your storage subsystem. Then pick any drive letter associated with a LUN configured behind the controllers to start the CLI session.

2. Select *Network (TCP/IP) Communication type* and click *OK*.
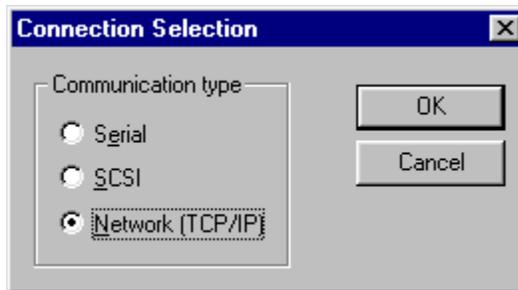
3. Enter the computer name or IP address of the server that is running the HS Agent in your lab station. Click *Detect Subsystems*. The subsystem information should display in the space provided. Click *Connect*.
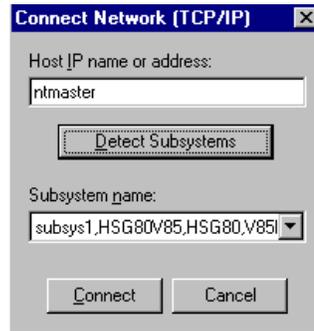
▲ **Note**
Do not manually enter a subsystem name. If this field remains blank after you have selected Detect Subsystems, you will have to troubleshoot your installation. See the "Troubleshooting SWCC" section located in the appendix of this lab guide.

4. You will now see the SWCC CLI window. Enter some simple CLI commands to demonstrate the funcationality of this application.

5. Enter `SHO THI FUL` to display the controller's configuration. The CLI window will respond with the following security check:

▲ **Note**

Notice that this dialog box did not display when we were using a maintenance cable plugged into the array controller.

6. Enter the password you assigned when installing the Agent and click *OK* to see the results of your query.

7. When the connection has been verified, exit the CLI session.

Using the SWCC HSG80 Storage Window Through TCP/IP

> ▲ **Note**
> The HSG80 Storage window only allows a user to access one storage subsystem at a time. Like the CLI window, it can also be opened using a serial or SCSI cable.

Opening the HSG80 Storage Window

1. On your client station, follow the path: Start → Programs → Command Console → StorageWorks CC HSG80ACS8.5

2. Select *Network (TCP/IP) Communication type* and click *OK*.

> ▲ **Note**
> You could use the serial connection here if you had a serial cable connected between the computer and the storage subsystem. You could also use the SCSI connection if you were running the SWCC Client directly from the server that was attached to your storage subsystem.

3. Enter the computer name or IP address of the server that is currently running the HS Agent.

4. Click *Detect Subsystems*. The Client will search the server (using TCP/IP) for a running agent and list any subsystems it finds running behind that Agent. It will display similar to the following graphic:
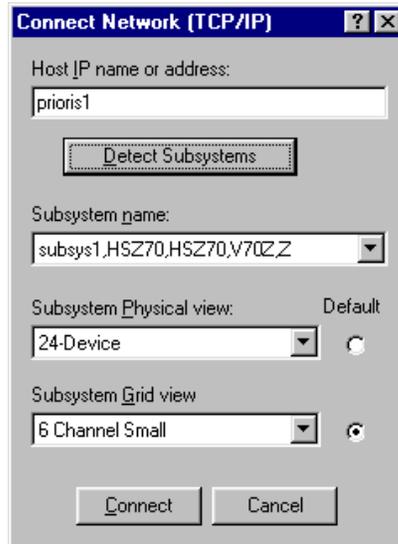
For the purpose of this lab, the Subsystem Physical View will be left at "24-Device" and the Subsystem Grid View will be "6 Channel Small". Click *Connect* and wait for the subsystem to be scanned.

5. The client, working through the agent, will scan the subsystem and acquire data from the controller. The subsystem is presented in a Grid view based upon your selection in the last dialog box. Use the *View* pull-down menu to verify that the current view is the Grid view.
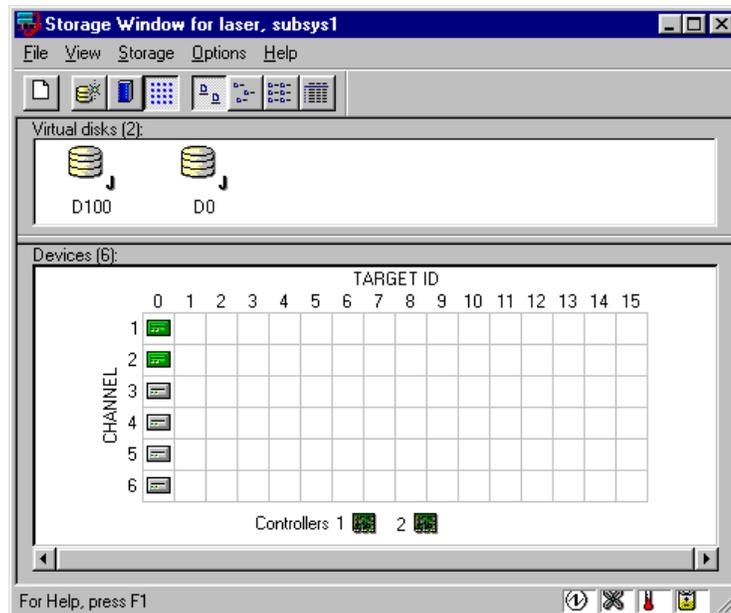
6. The Communications LUN is listed under the virtual disks area (SWCC refers to LUNs as virtual disks) at the top of the display. The grid Devices display identifies the disks that are members of virtual disks by highlighting them in bright green.

Using the Storage Window

7. Double-click one of the green highlighted disk devices in the grid.

8. Click each of the tabs in the pop-up window (*General, Membership,* and *Support Information*) to see the details gathered by the Command Console Client. Identify the transfer rate and the firmware revision for the drive and write this information in the space provided below.

....

9. Click *OK* to close the Properties window.

10. Double-click the *Controllers 1* icon at the bottom of the grid and click through the tabs (*General, Host Port, Cache*, and *Communications LUN*) to see the current settings for the first controller.
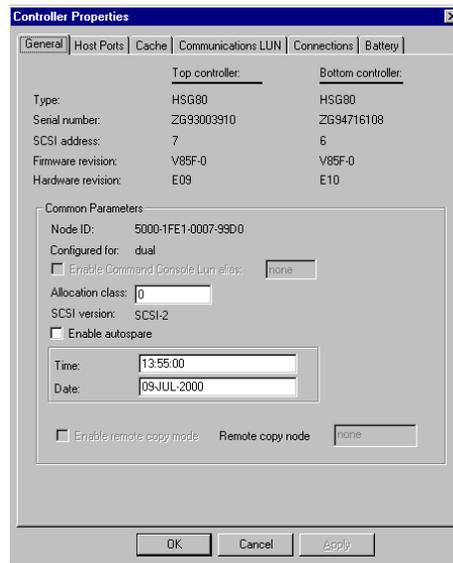
11. Locate the Port ID for port one on the top controller. Record the value in the space provided below.

....

12. Click *OK* to close the Controller Properties window.

13. Click any LUN in the virtual disk window and notice how the devices associated with that LUN are outlined within the grid.

14. Change the views of the Virtual Disks by using the last four buttons on the Storage Window toolbar.

15. Use the Cabinet icon in the toolbar to change from Grid view to Cabinet view.

16. Close and exit the HSZ Storage Window.

HSG80 Storage Window Menus

This section briefly outlines the menu options available in the HSG80 Storage window. Experiment with any that are of particular interest. Move to the next section if you are familiar with all the menu items.

▲ **Note**
You can right-click any device in the Virtual Disks window or Devices window to get additional menu choices for that device. For example, right-clicking on a disk device allows you to mark that device as a spare, remove it from being a spare, locate it, or get the properties of it.

17. The first menu item is *File* as shown here. Selecting *New* will close the current HSG80 Storage window session and prompt you to start a new one. Also, there is a Close menu item that will close the current HSG80 Storage window applet.
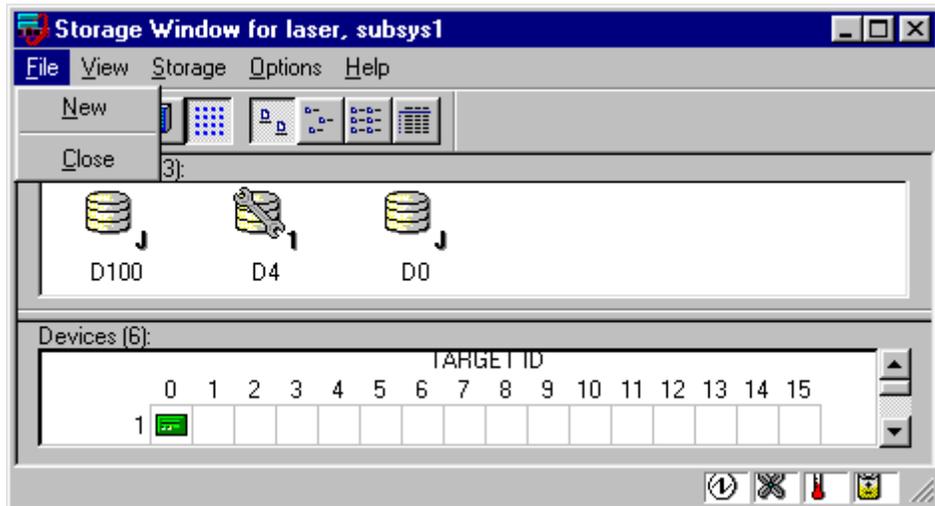
18.   The second menu item is *View*.
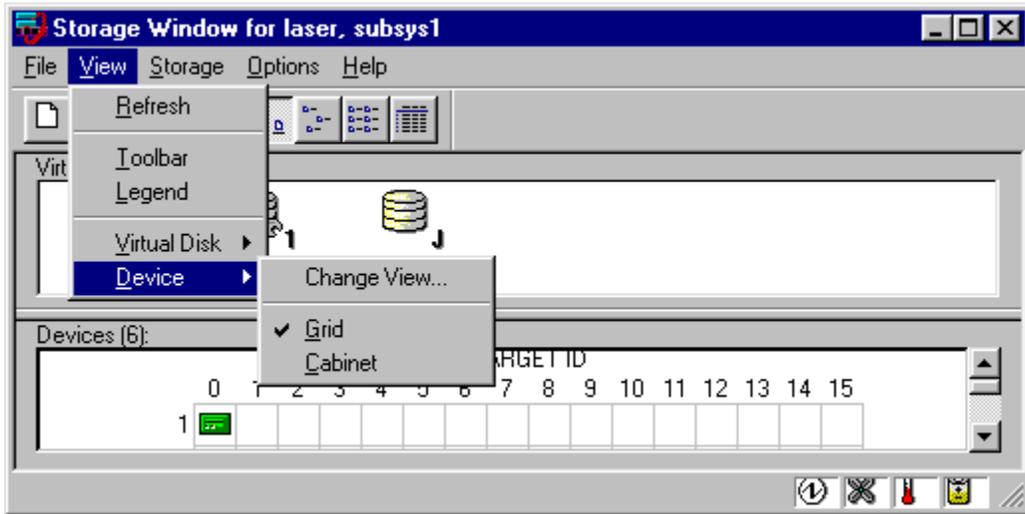
19.   The Virtual Disk submenu looks as follows:
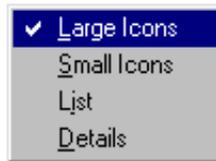
Option	Function
Refresh	Rescans your subsystem for the latest information
Toolbar	Toggles whether your Toolbar is showing
Legend	Shows all pertinent legend information (for example, what each icon means)
Virtual Disk	Shows the submenu as displayed in the preceding graphic; allows you to choose between the four different Virtual Disk views available
Device	Shows the submenu shown in the preceding graphic, which allows you to change the Device view from Grid to Cabinet or from Cabinet to Grid, and also to change the entire look of the view (for example, it allows you to change whether you are looking at a 7-, 24-, 48-, or 72-device storage subsystem)

27. The third menu item is *Storage*.
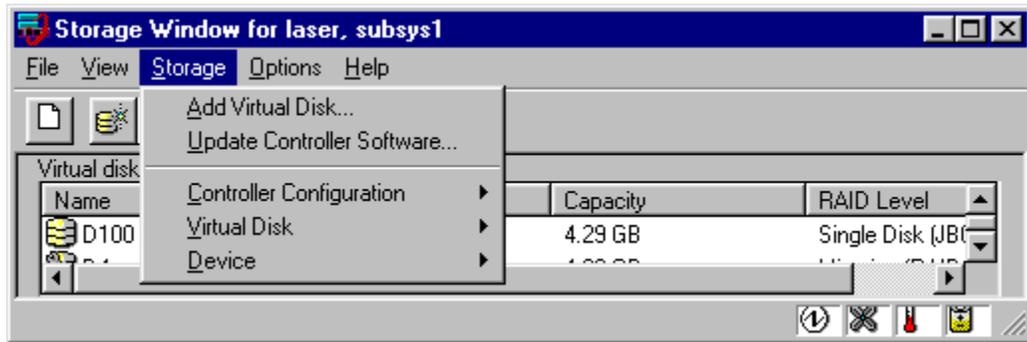
28. The submenus for *Storage* are:
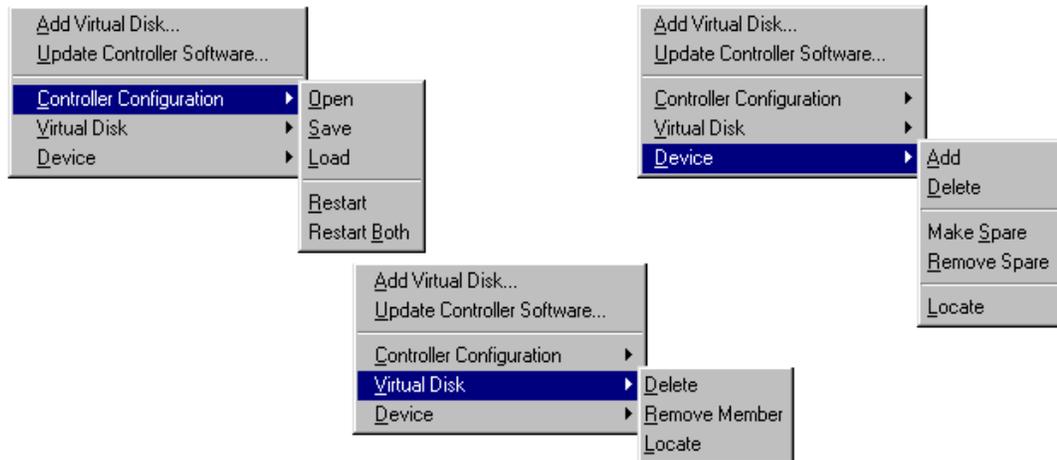
Option	Function
Add virtual disk	Starts the 5-step Add Virtual Disk Wizard for adding LUNs (RAIDsets, mirrorsets, JBODs, and so forth).
Update controller software	Loads a new ACS version over your existing PCMCIA card, or loads a patch for your current ACS version. When entered, you will be prompted for the location of an .img or patch text file.
Open	Opens an existing controller configuration file for viewing.
Save	Saves the current controller configuration to a file of your choice.
Load	Loads the controllers from a saved configuration file. NOTE: When loading from the configuration file, you will be prompted to answer whether this is a new installation. If it is new, initialization of all storage containers will take place. Be careful because initialization can cause customer data loss.
Restart	Restarts the controller selected in the Device window.
Restart both	Restarts both controllers.
Delete	Deletes any selected virtual disk. A virtual disk will need to be selected before this will work. Enter *Yes/No* to continue after you select this menu item.
Remove member	Removes any selected member from a virtual disk (this is how to reduce a RAID or mirror set). Again, a device member will have to be selected **before** this menu item will work.
Locate	Makes the selected virtual disks members flash their fault indicators. You must click *OK* to stop the locate command.
Add	Scans the subsystem for any newly installed disk devices.
Delete	Deletes any selected disk device.
Make spare	Causes the selected disk device to go into the spare set.
Remove spare	Causes the selected disk device to be removed from the spare set.
Locate	Makes the selected disk device flash its fault indicator.

29. The fourth menu item is *Options* as shown here. Under *Security,* the option to *View Only* or *Make Changes* is available. *View Only* will lock the current Storage window session and disables making changes unless you have the proper password. *Make Changes* prompts you for the current password, thereby unlocking the current Storage window session.
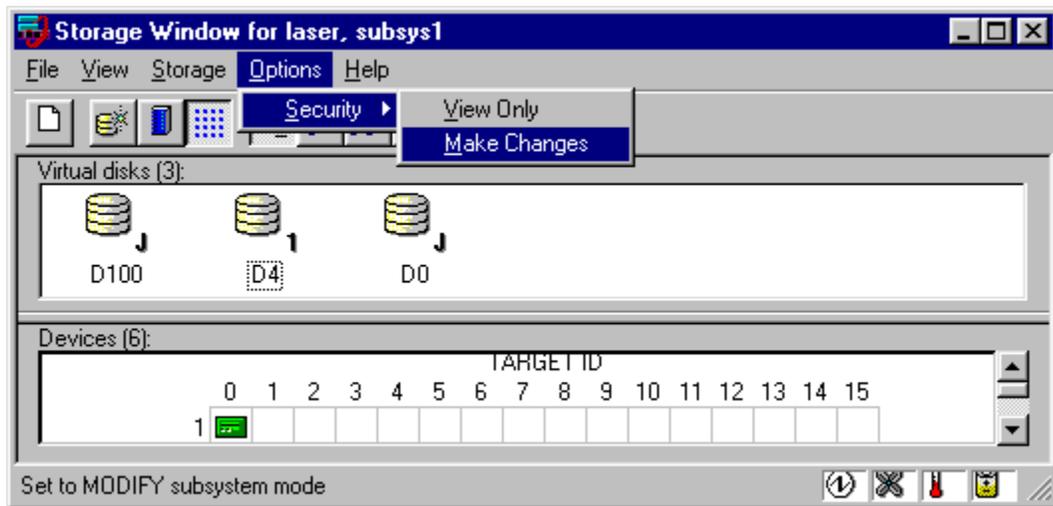

30. The fifth menu item is *Help*. It gives the standard help item information.

Creating a New Virtual Disk with SWCC

Storage containers (sometimes referred to as virtual disks) can be created through either the CLI, or through SWCC. In this section of you will create a new virtual disk using the SWCC Storage window.

1. Select *Storage → Add Virtual Disk.* Step 1 of the Add Virtual Disk Wizard displays. The Add Virtual Disk Wizard consists of five steps.
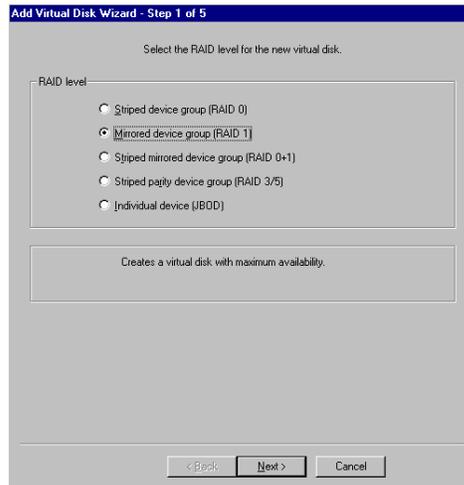
2. In the first step, you are prompted to select a RAID level. For this exercise, select *Mirrored Device Group (RAID 1).* Click *Next*.

3. A screen displays prompting you to select the disk devices that you wish to include in the new virtual disk. Select any two disk devices, and they display. Click *Next*.
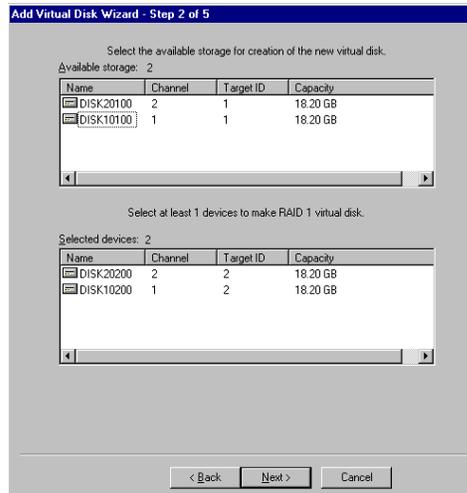
4. A screen displays, prompting you to select the maximum capacity of the virtual disk you are installing. We will use the default value for this lab exercise. Click *Next*.
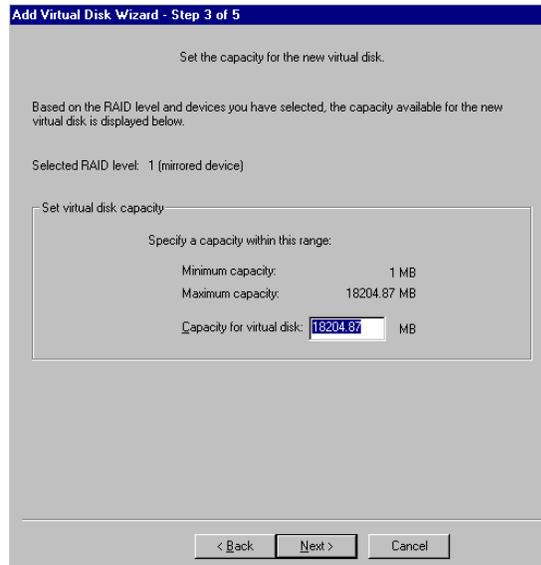
5.   Step 4 of the Add Virtual Disk Wizard displays. This step provides the opportunity to set a wide range of parameters.
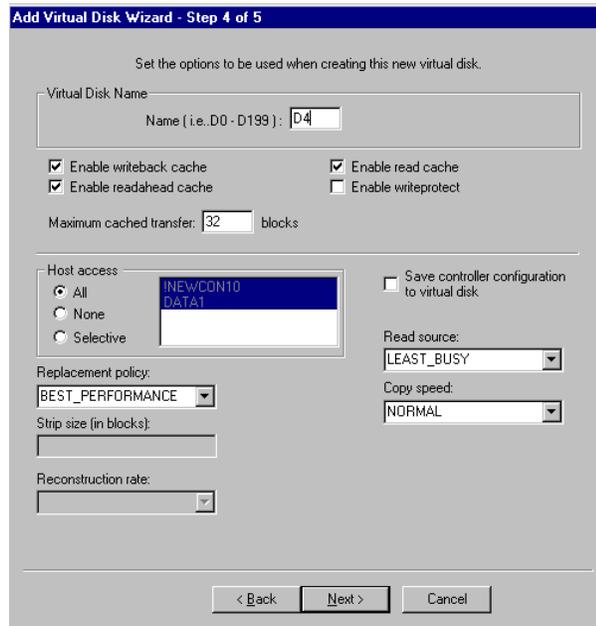
a.   For this exercise, we will assign the name "D4" to the new virtual disk by entering *D4* in the appropriate text box.

b.   In the space provided, write down three of the drive parameters that displays in this window.

....

c.   Write down the CLI commands required to implement the parameters you listed above.

....

....

d.   Click *Next* to continue.

6. The fifth step in the Add Virtual Disk Wizard allows you to review the configuration settings for the virtual disk you are about to create. If these settings are correct, click *Finish*. If they are not correct, click *Back* and make the necessary changes.

7. The wizard will close and the system will scan for the virtual disk you have just added. The new drives should display in the Storage window. The green highlight indicates that they are now part of a virtual disk.

Using the SWCC Navigation Window

Opening the SWCC Command Console Navigation Window

1. Follow the path *Start* → *Programs* → *Command Console* → *StorageWorks Command Console.* This opens the Command Console Navigation Window, which is designed to allow you to manage many storage subsystems over a network.

2. Follow the path *File* → *Add System.* An Add System window displays.

3. Enter the name or IP address of the server and click *Apply.* Because there is only one host and subsystem in your lab station, click *Close* when the window displays again.

▲ **Note**

If there are multiple storage subsystems to monitor, continue to *Add Systems* until they have all been registered. This is one of the major purposes of using StorageWorks Command Console (the other being pager notification of subsystem errors).

In the preceding graphic, there are four subsystem status icons at the bottom. From left to right, these icons indicate *unknown*, *good*, *warning*, and *failed* subsystem status states. Using these indicators, you can learn the remote subsystem status state. The numbers next to each status icon dictate how many subsystems being monitored are currently in that state.

4. In the main window, click the host name of the system to reveal its subsystem name. Double-click the *Storage Subsystem* icon to expand the CLI window and Storage window options.

5. Double-click the *Storage Window* icon to open the HSG80ACS8.5 Storage window.

Objectives

After completing this lab, you should be able to:

- Use the CR3500 Configuration Utility to upgrade controller firmware and configure RAID sets.

- Use Compaq SmartStart to install and configure Novell NetWare with supporting Compaq drivers and utilities.

- Identify modules installed by the SmartStart process loaded during the NetWare startup.

- Replace a failed controller.

- Upgrade from a single to a dual controller configuration.

Exercise 1 — Upgrading CR3500 Firmware with the CR3500 Configuration Utility

1. Connect the controller to a system running Microsoft Windows 95/98 or Windows NT/2000 using the serial connector on the back of the shared storage subsystem.
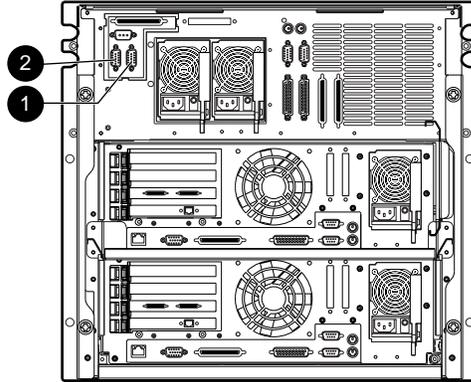
2)–Controller - 1 Connection (Top Controller)

1)–Controller - 2 Connection (Bottom Controller)

Note: If serial link is being used, both controllers should be connected to machine running the utility

2. Use a terminal program, such as HyperTerminal to connect.

3. Use the following settings to connect:

   a. Bit per second = 9600

   b. Data bit = 8

   a. Parity = None

   b. Stop bits = 1

   c. Flow control = XON / XOFF

4. Power on the shared storage area and press *Ctrl-C* to abort the controller start process.

5. Select *Option 2* to change the baud rate.

6. Select *Option 3* to set baud rait to 38400.

7. Change the baud rate on the terminal to match the controller's 38400 settings.

8. Disconnect and then reconnect the terminal service.

9. Press *Enter* to re-establish communication with the controller.

10. Select *Option 1* and press *Enter*.

11. Transfer the firmware file as a text file from the terminal service. The entire update should take approximately 15 minutes at 38400.

12. Select *Option 2* after the firmware update, and change the baud rate to 9600 by selecting *1*.

13. Change the baud rate to 9600 on the terminal service.

14. Disconnect and then reconnect the terminal service.

15. Press *Enter* to re-establish communication with the controller.

16. Select *Option 9* to restart the controller.

# Exercise 2 — Using the CR3500 Configuration Utility to Configure RAIDsets

1. Connect the Windows 95/98/NT system to the port labeled Controller 1 on the back of the shared storage area using a serial cable. Connect another serial cable from the Win95/NT system to the port labeled Controller 2 if you are using redundant controllers.

2. Insert the SmartStart CD into the system running Windows 95/NT.

3. Go to the CR3500 directory on the SmartStart CD from Windows Explorer, and run *SETUP.EXE*. This will install the CR3500 Configuration Utility.

4. Select *Start → Compaq System Tools → CR3500 Utility* to run the utility when the installation is finished.

5. Select *Serial* from the Connection window, and then click *OK*.
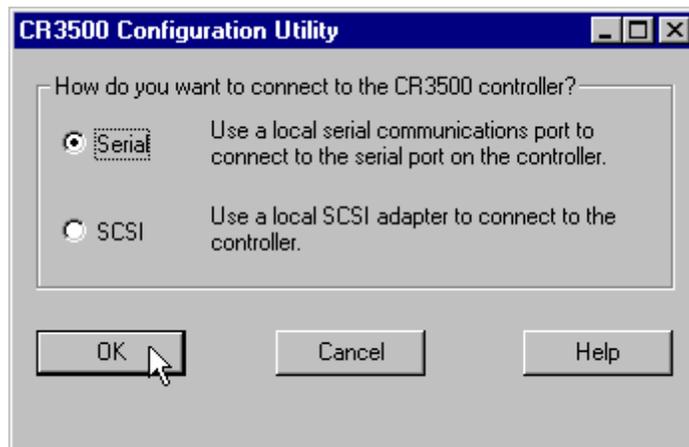
6. Choose the COM port (usually COM1) used to make the connection to the shared storage array. Click *Connect*. If you are using a dual controller setup, a second serial connection window will display and you must select the COM port (usually COM2) for the second controller. After clicking *Connect*, the main window displays.
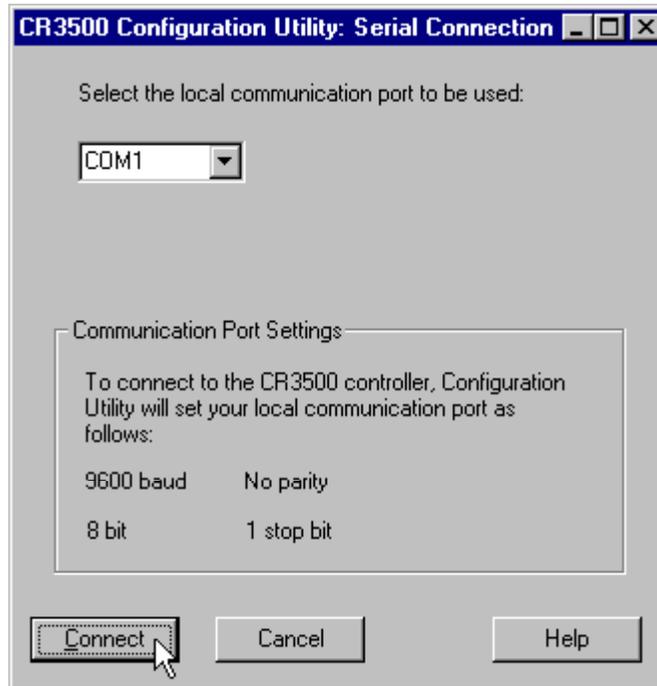
7. Select *Add Logical Drive* from the Storage pull-down menu. A six-step Wizard will assist you in adding a logical drive.

8. Select the RAID level for the new logical drive. Click *Next* to continue.
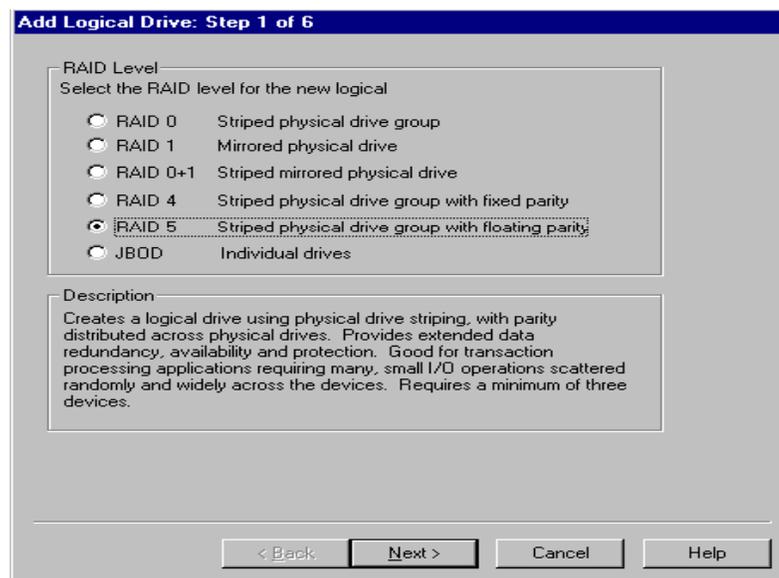
9. Select the physical drives for the new logical drive. The number of physical drives you choose will determine the amount of storage that will be available for the new logical drive. To select a physical drive, click an available physical drive and it will be added to the selected physical drive list. The *Next* button is disabled until the minimum number of disks is chosen.
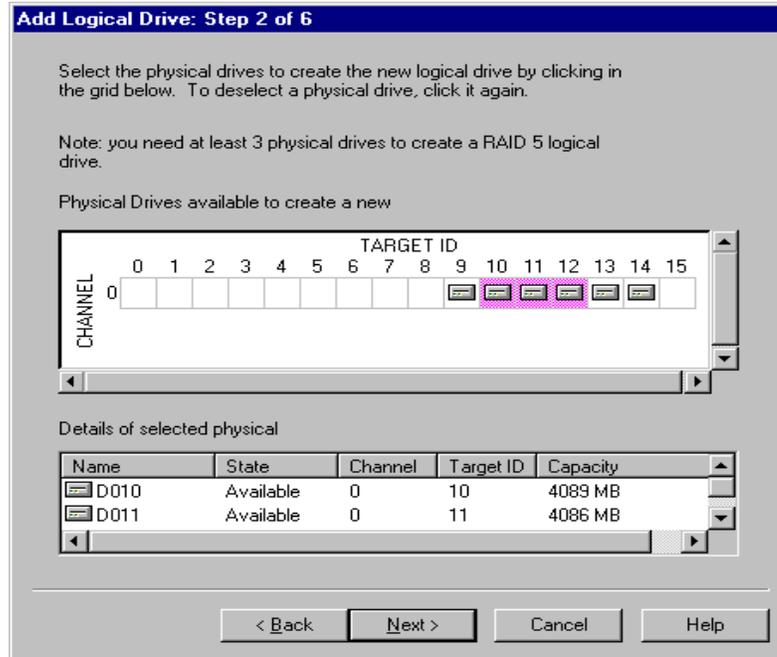
10. Add the capacity for the logical drive. Click *Add* to create a single logical drive using the total capacity available. The capacity remaining changes to 0. The new logical drive displays in the bottom window, along with its capacity size. Click *Next*.

11. To create more than one logical drive, enter a number less than the amount displaying in the Logical Drive Capacity window and click *Add*. The capacity remaining changes to reflect the new amount of capacity in use. Repeat this step if you want to create another logical drive, or click *Next* to continue.

Add Logical Drive: Step 3 of 6

Capacity

The capacity available for the new logical drive(s) is based on the RAID level and the physical drives you selected.

Total capacity:　　　8172　MB

Capacity in use:　　　4000　MB

Capacity remaining:　　4172　MB

Create up to 16 logical drives using the total capacity you selected. However, most operating systems recognize a limited number of logical drives; check your operating system documentation.

Logical drive 2 capacity: [4172]　　⊙ MB　　　[Add]
　　　　　　　　　　　　　　　　　○ GB

Logical Drive	Size
Logical drive 1	4000 MB

[Remove]

[< Back]　[Next >]　[Cancel]　[Help]

12. Define the strip size and the host port for the new logical drives. Click *Next* to continue. For more information on stripe size and host ports, refer to the Online Help.

Add Logical Drive: Step 4 of 6

Advanced Options

Strip size (blocks):　[256　▼]

Host port:　　　　　[0　▼]

[< Back]　[Next >]　[Cancel]　[Help]
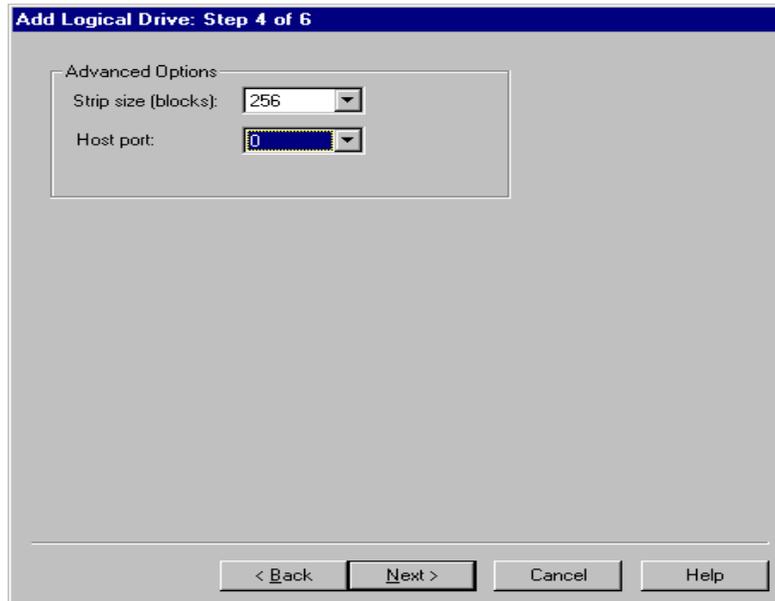
13. Select a Logical Unit Number (LUN) for the logical drive. The *Add Logical Drive: Step 5 of 6* screen also gives you the option of enabling the Writeback Cache to improve host performance. For more information on LUNs and Writeback Cache, refer to the Online Help.
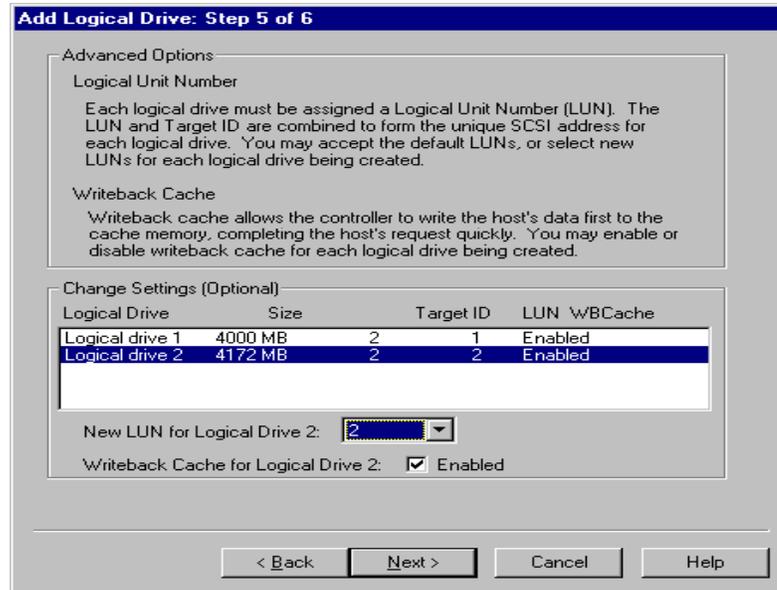
14. View a summary of the new logical drives. In this summary you will find the RAID level, capacity, cache options, and member physical drives that you selected for each new logical drive. If you are not satisfied with these characteristics, you can go back and make changes by clicking *Back*. If you are satisfied with the summary, click *Finish*. Click *OK* when informed that the logical drives are being initialized.

15. Save the existing configuration. From the Storage pull-down menu select *Controller* → *Configuration* → *Save*. The physical drives being configured will flash a red "X" while they are being configured.

Exercise 3 — Configuring Nodes

▲ **Note**

Except where noted, follow the instructions for the installation of both node 1 and node 2.

Using SmartStart to Install NetWare

To prepare the server for an installation of NetWare:

1. Insert the Compaq SmartStart CD into the CD-ROM drive and power on your system. Power on the server node being configured (first node 1, and then node 2). The language selection screen displays. The SmartStart program supports five languages.

2. Select the appropriate language. The country selection screen displays.

3. Select the appropriate country and keyboard style. Enter the date and time, then click *Next*. The System Settings Summary screen displays.

▲ **Note**

If your region uses Daylight Savings Time, check the box for that function.

4. Verify that your information is correct. Select *Back* to make corrections or *Continue* to proceed. The Compaq SmartStart screen displays.

5. Check the *I Agree* box on the SmartStart agreement screen, then click *OK*.

6.   Select one of the following paths:

- **Assisted Integration** — Walks you through the automated SmartStart process

- **Manual Configuration** — Allows manual configuration of the system

- **Replication** — Creates a server with the same configuration as the one previously created with SmartStart, using a Replication diskette made during the previous install
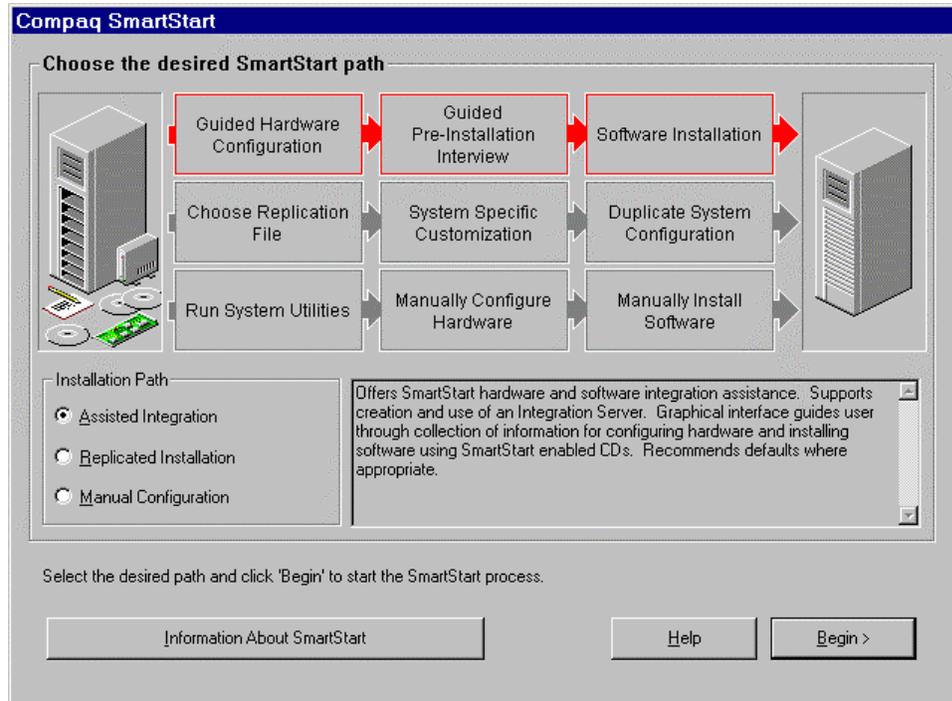
7. Select *Assisted Integration* → *Begin*.
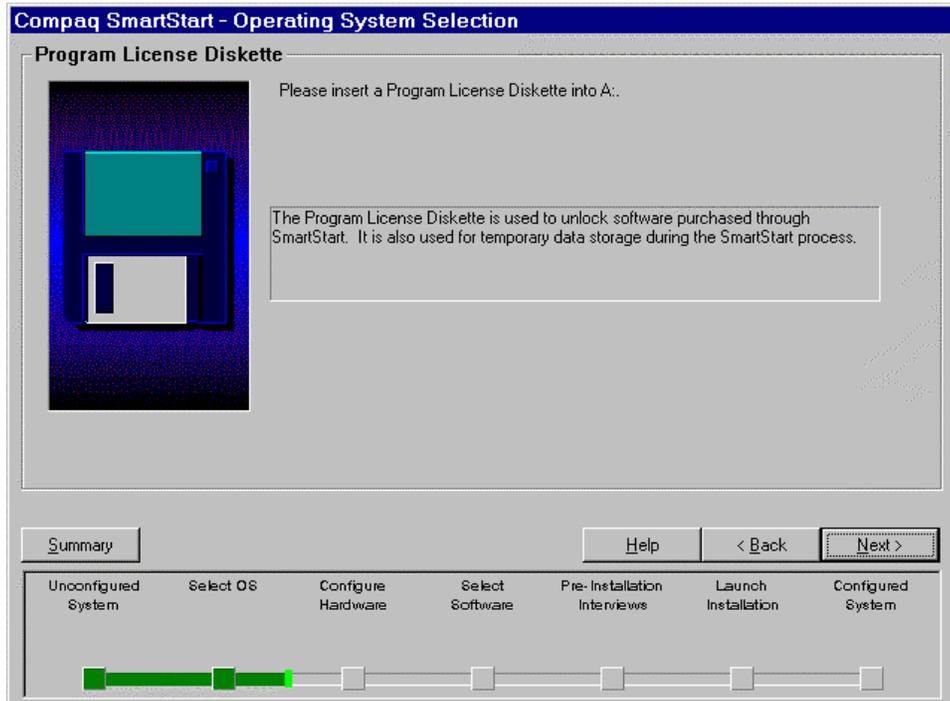
▲ **Note**
Beginning immediately after this screen, SmartStart allows the option of reviewing the summary of your installation decisions up to your current position in the SmartStart installation process. SmartStart also displays a navigation bar so that you can determine where you are in the SmartStart process.

8. Insert the Server Profile diskette in drive A: of the appropriate node and click *Next*.

9. Select *Next*. The Operating System Selection screen displays.

❗ **Important**
Do **not** remove the Compaq SmartStart CD from the CD-ROM drive or the Server Profile diskette from the diskette drive.

10. Select the "+" box next to the Novell folder to open it. The Novell software selection screen displays. You are given the option of installing several different operating systems, including NetWare for Small Business, NetWare, Novell Small Business Suite 5, NetWare 4.2, or NetWare 4.2 SMP.

11. Select *NetWare* → *Next* → *Continue*. The system configuration begins.

12. Follow the System Configuration prompts. SmartStart automatically configures the hardware based on the installed EISA or PCI boards and storage options.

13. Complete the following steps for node 1 only:

    a. Select Review or Modify Hardware settings → View or Edit Details.

    b. Scroll down to Dual Channel Wide Ultra2 SCSI Controller (port1).

    c. Highlight the SCSI ID option, press Enter, and change the ID to 6, and then press Enter.

    d. Press F10 to signify that the changes are complete.

    e. Scroll down and select Step 5: Save and Exit, and then press Enter.

    f. Press Enter to save the configuration and restart the computer.

    g. Scroll down and select Step 5: Save and Exit, and then press Enter.

    h. Press Enter to save the configuration and restart the computer.

14. Press *Enter* to save the configuration and continue with SmartStart.

15. Press *Enter* to restart the server and continue with the pre-installation interviews.

    The system restarts and SmartStart creates a system partition that allows you to run Compaq configuration, diagnostic, and maintenance utilities directly from the hard drive. The system will restart again to save the changes to the partition table.

Pre-Installation Interviews

At this point, SmartStart displays a summary of software to be installed.

1. Record the products and their sources in the following table from the "Summary of Software Products" list.

Product Name	Media Type (Source)

2. Select *Next* to continue. You will now be guided through the pre-installation interviews.

3. Select *Continue* on the Guided Pre-Installation Interview screen.

4. Select *Next* → *Next* → *Next* to configure the Automatic Server Recovery options. Do not change any options on these screens.

    ▲ **Note**
    If your server has a Remote Insight Board, you will need to select *Next* from several screens. Answer *Yes* to the question *Do you want to disable alerts?*

5. Configure the modem communication options if your server supports the Integrated Remote Console (IRC) feature (optional). Select *Next* to accept the default of not configuring IRC. This feature is disabled if the Remote Insight Board is installed.

6. Select *Continue* to end the Automatic Server Recovery (or Automatic Server Recovery and Integrated Remote Console) interview. The NetWare Configuration screen displays.

    ▲ **Note**
    If your server has an integrated network interface controller (NIC), you will have an opportunity to select the media connector. Accept the default 10/100Base-T option and select *Next*.

Configuring and Installing NetWare

At this point in the SmartStart process, you are asked to provide information used for the installation of the NetWare operating system.

SmartStart options allow for Typical or Custom installation.

1. Select *Next* in the NetWare Configuration screen.

2. Select *I would like to perform a Custom SmartStart Installation* → *Next*. The options available are:

   - I would like SmartStart to configure my DOS Partition.

   - I would like SmartStart to provide updated NSSD to the Novell installation process.

   - I would like SmartStart to provide information to the NetWare installation process.

   - I would like SmartStart to automatically launch the NetWare installation process.

   - I would like to create Support Software Diskettes.

3. Click *Next* to accept the defaults.

4. Insert the Novell license diskette into the appropriate drive A: when requested and click *OK* → *OK*.

5. Insert the Compaq SmartStart Server Profile disk when requested and click *OK*.

6. Specify a 175MB DOS partition and click *Next*. Then select *Continue* in the NetWare Configuration screen.

7. Select *Summary* from the Interviews Complete screen and verify that everything is the way you want it before continuing with the NetWare installation. Click at the bottom of the screen to return to SmartStart and then click *Continue*.

8. Click *Continue* in the Diskette Builder screen. SmartStart will display a Notice screen informing you that the system will restart to create and format the first disk partition.

9. Select *Continue*. The system will restart, create, and format the DOS partition. Files are copied from the SmartStart CD.

> ❗ **Important**
> Do **not** remove the Server Profile diskette at this time.

10. Select *Continue*. The system will restart, create, and format the DOS partition. Files are copied from the SmartStart CD.

11. Insert the NetWare Operating System CD and click *OK* to continue the installation. The system restarts and the operating system installation proceeds.

Configuring Storage

1. The C-Worthy Interface will detect device drivers including the new Platform Specific Module (PSM) cpqmpk, and various NetWare Peripheral Architecture (NWPA) drivers. Press *Enter* to select *Continue* through all driver selection process screens.

2. At the NetWare partition screen, select *Modify* and press *Enter* to create a NetWare partition and volume SYS. Modify the partition size parameters to create a 1GB NetWare partition and a 0-byte Hot Fix space size. Leave the remaining disk space unpartitioned for future expansion and NetWare Storage Services (NSS) volumes. Press *F10* to save your modified partition sizes. Select *Continue* and press *Enter*.

    The SmartStart NetWare installation process will copy files from the CD to the SYS volume. On completion of the file copy, the NetWare install wizard will launch the Java graphical user interface (GUI).

> ❗ **Important**
> If the error *cannot copy file NWPA.NLM* occurs, select C*ontinue copying with next file*. The file does get copied.

Setting Server Properties

1. Enter the server name NODE01 for node 1 and NODE02 for node 2. Click *Next*.


2. Accept the defaults (NetWare displays the current file system configuration, which enables the creation of additional volumes) by selecting *Next*. The Protocols screen displays.
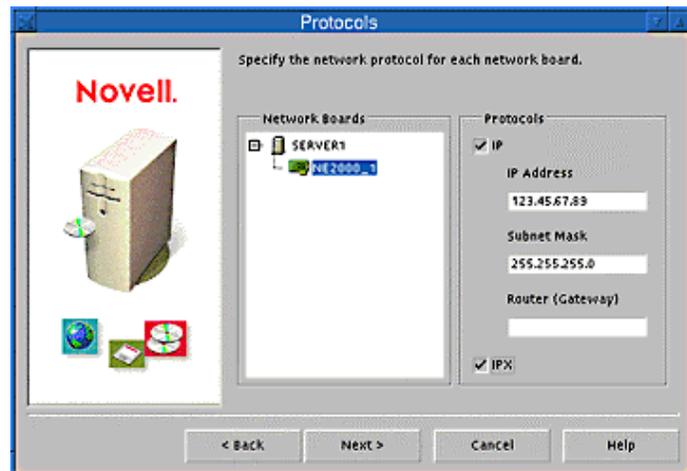
3. For node 1:

    a. Highlight the Compaq NetFlex Controller and configure the IP protocol with the following information. Click *IPX* to select it, and then click *Next*.

        1) Address — 172.20.10.1

        2) Mask — 255.255.255.0

        3) Gateway — No Gateway

    b. Highlight the next controller and configure the IP protocol with the following information. Click *IPX* to select it. and then click *Next*.

        1) Address — 172.20.100.1

        2) Mask — 255.255.255.0

        3) Gateway — No Gateway

4. For node 2:

    a. Highlight the Compaq NetFlex Controller and configure the IP protocol with the following information. Click *IPX* to select it, and then click *Next*.

        1) Address — 172.20.10.2

        2) Mask — 255.255.255.0

        3) Gateway — No Gateway

    b. Highlight the next controller and configure the IP protocol with the following information. Click *IPX* to select it, and then click *Next*.

        1) Address — 172.20.100.2

        2) Mask — 255.255.255.0

        3) Gateway — No Gateway

5. Select the appropriate time zone and daylight savings time information for your area in the Time Zone screen and click *Next*.

Installing NDS

1. Select *Create New NDS Tree* → *Next* for node 1.

2. Select *Install this server into an existing NDS tree* → *Next* for node 2.

3. Enter *LAB_TREE* in the Tree Name field.
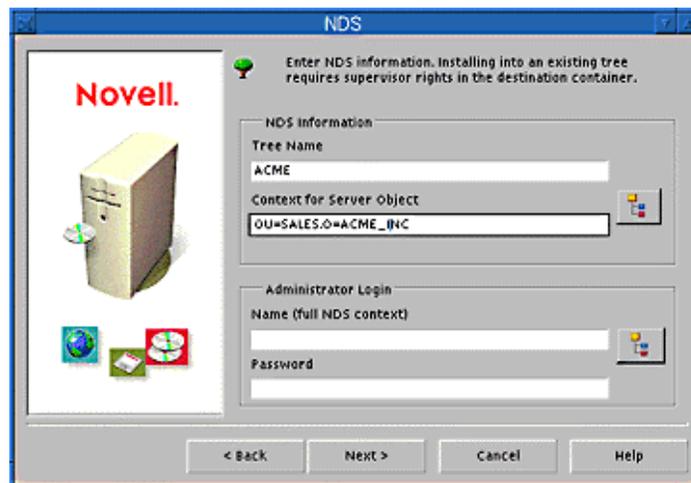
4. Enter *TRNG.COMPAQ* for server object context in the Context for Server Object field.

5. Click in the Admin Context field. The Admin context defaults to the server context.

6. In the Administrator Login field:

    a. For node 1 enter and confirm the admin password as *password*.

    b. For node 2, select browse and open folders until the admin user displays. Click *OK* to return to the NDS screen, and then enter the password as *password*.

7. Select *Next*.
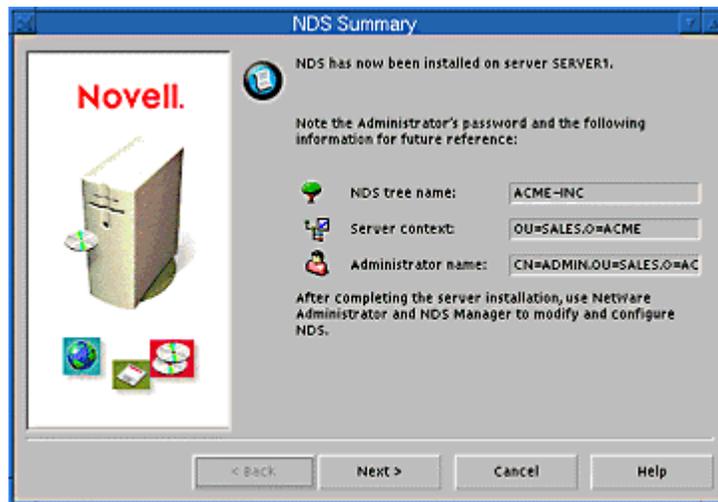
8. Confirm NDS configuration by selecting *Next*. The License screen displays.

9. Insert the license diskette or browse through the drop-down menu to enter the path to the license file (*.nlf).

10. Select *Next* to confirm license and proceed to the next step.

Installing Additional Products and Services

1. Review the Novell products available for installation with NetWare. List those that would be of interest to your environment. Notice that by default, the following additional products from Compaq are selected for installation (you must scroll down the list to see the Compaq products):

   a. Compaq Support Software for Novell Products

   b. Compaq Integration Maintenance Utility

   c. Compaq Management Agents for Servers

   d. Compaq Survey Utility

2. Select *Next*. The NSSD options screen displays a list of additional utilities from Compaq Support Software for Novell Products. Choose all of the options available from the selection screen. These can include:

   a. Compaq Server Health Support Driver

   b. Compaq Online Configuration Utility

   c. Compaq Integrated Management Log Viewer

   d. Compaq Remote Insight Management Agent

   e. Compaq Recovery Server Option

   f. Compaq Power Supply Utility

   g. Novell Support Software from Compaq Update Utility

3.   Select *Next*. PCI Hot Plug is configurable at this time.

4.   Select *Enable PCI Hot Plug* if your system supports PCI Hot Plug. If not, select *Next*.

5.   Select each option and click *Next* to continue.

6.   Accept the default community strings by selecting *Next* in the SNMP Parameter configuration screen. A summary screen displays for your review.

7.   Select *Finish*. NetWare will begin a file copy of the selected products.

8.   Insert the SmartStart CD when prompted.

9.   Insert the Management CD when prompted.

> ▲ **Note**
> If the either of the CDs is not recognized as being the correct one, click the browse icon, close the root folder, reopen the root folder, open the local files folder, select the CD and then click *OK*.

10. Click *OK* at the message "The installation of NetWare…"

11. Remove all media from the drives when prompted.

12. Click *Yes* to restart the computer when prompted.
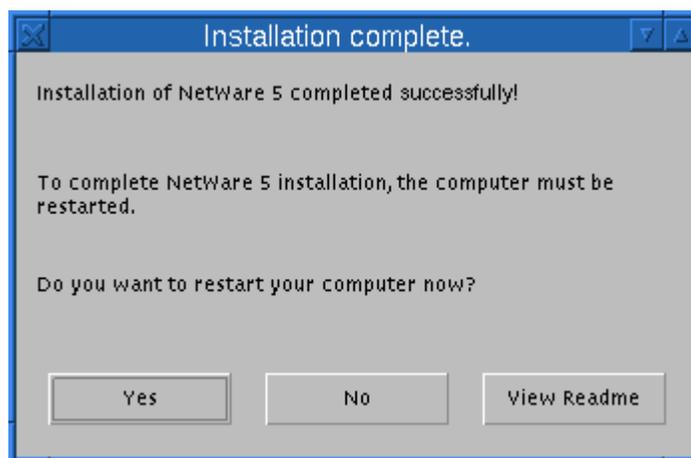
If this was node 2, your SmartStart installation of NetWare installation is complete.

> ! **Important**
> Before proceeding to the NetWare Cluster Services (NWCS) lab, ensure to install NetWare Service Pack 3a or Service Pack 4 on both nodes. Service Pack 3a is required for NWCS. Other applications might require additional Service packs-installations. See your application documentation for specific details.

Exercise 4 — Replacing a Failed Controller
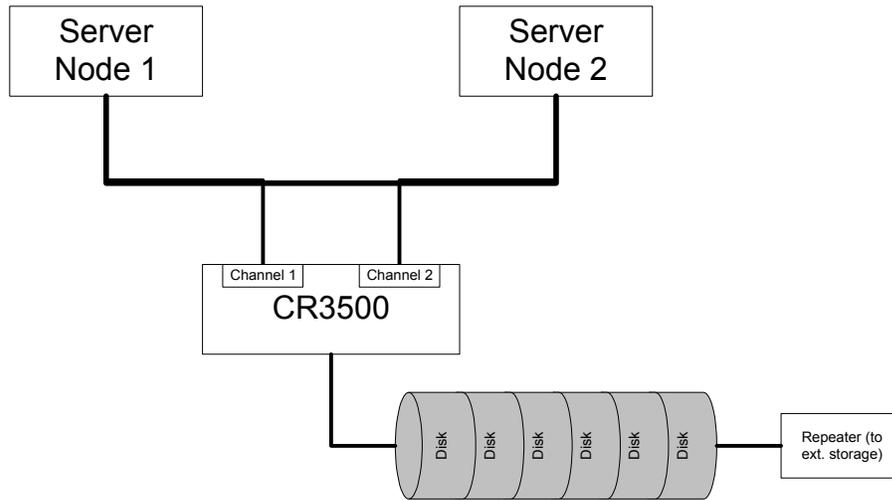
CL1850 Cluster Single Controller

1. Connect the Windows 95/98/NT system to the port labeled Controller 1 on the back of the shared storage area using a serial cable. Power down the failed controller.

2. Remove the failed controller.

3. Insert the new controller.

4. Select *Start → Compaq Utilities → CR3500 Configuration Utility.*

5. Select *Controller → Configuration → Restore* from the Storage pull-down menu.

⚠️ **Warning**
When restoring a configuration, the configuration being restored must exactly match the current hardware configuration.

Exercise 5 — Upgrading From a Single to a Dual Controller Configuration
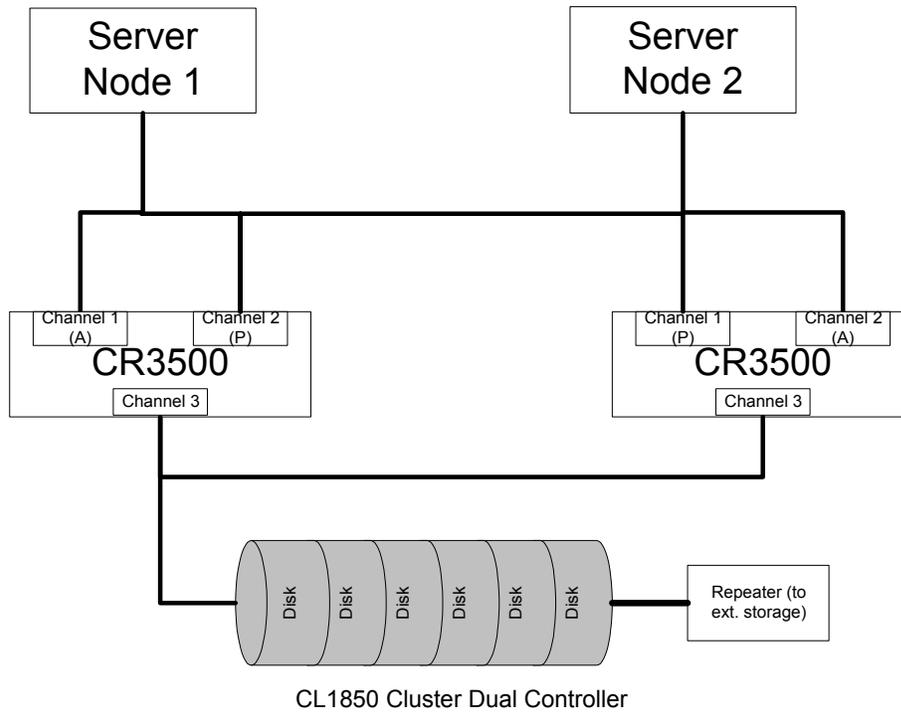

```
   ┌─────────────┐              ┌─────────────┐
   │   Server    │              │   Server    │
   │   Node 1    │              │   Node 2    │
   └─────────────┘              └─────────────┘
```

| Channel 1 (A) | Channel 2 (P) | Channel 1 (P) | Channel 2 (A) |

CR3500   CR3500

Channel 3   Channel 3

Disk Disk Disk Disk Disk Disk   Repeater (to ext. storage)

CL1850 Cluster Dual Controller

1. Connect the Windows 95/98/NT system to the port labeled Controller 1 on the back of the shared storage area using a serial cable. Start the CR3500 Configuration Utility.

2. Save the existing configuration. From the Storage pull-down menu, select *Controller* → *Configuration* → *Save*.

3. Suspend all I/O and power down the shared storage subsystem.

4. Install the second controller in the bottom controller slot of the shared storage subsystem.

5. Power up the shared storage subsystem.

6. Restore the controller configuration settings. From the Storage pull-down menu, select *Controller* → *Configuration* → *Restore*.