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Hitachi TagmaStore™ Adaptable Modular Storage and Workgroup Modular Storage

Novell® NetWare® Host Installation Guide

MK-95DF732-00

Trademarks

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Document Revision Level

Revision	Date	Description
MK-95DF732-00	February 2006	Initial release

Source Documents for this Revision

- *Hitachi Freedom Storage™ Thunder 9500™ V Series Novell® NetWare® Host Installation Guide* (MK-92DF637-02).
- HDS review of this document.

Preface

The Hitachi *AMS and WMS Novell® NetWare® Host Installation Guide* describes and provides instructions for configuring the devices on the Hitachi AMS and WMS array subsystem for operation with the Novell® NetWare® operating system. This document assumes that:

- The user has a background in data processing and understands direct-access storage device subsystems and their basic functions,
- The user is familiar with the Hitachi AMS and WMS array subsystem, and
- The user is familiar with the NetWare® operating system, the NetWare® server, and the fibre-channel adapters.

Notes:

- Please refer to the *Hitachi TagmaStore™ Adaptable Modular Storage 200™ User and Reference Guide* (MK-95DF713) and the *Hitachi TagmaStore™ Adaptable Modular Storage 500™ User and Reference Guide* (MK-95DF714) for further information on the Hitachi AMS and WMS array subsystems.
- For further information on the Novell® NetWare® operating system, please consult the Novell® NetWare® online help and/or user documentation, or contact Novell® technical support.

Notice: The use of Hitachi AMS and WMS array subsystems and all other Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems

Microcode Version

This document applies to the Hitachi TagmaStore™ Adaptable Modular Storage™ and Workgroup Modular Storage microcode versions 0730/A and higher.

Convention for Storage Capacity Values

Storage capacity values for logical units (LUs) in this document are calculated based on the following values:

1 KB (kilobyte) = 1,024 bytes
1 MB (megabyte) = $1,024^2$ bytes
1 GB (gigabyte) = $1,024^3$ bytes
1 TB (terabyte) = $1,024^4$ bytes

Referenced Documents

Hitachi Data Systems documentation:

- *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500 V User's Guide for CLI,* MK-92DF603
- *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500 V User's Guide for GUI,* MK-92DF603
- *Hitachi Freedom Storage™ Thunder 9570 V User and Reference Guide,* MK-92DF630
- *Hitachi Freedom Storage™ Thunder 9530 V User and Reference Guide,* MK-92DF631

Novell® documentation:

- Novell® TID 10066813
- Novell® Storage Services Administration Guide for NetWare® 6.5

Comments

Please send us your comments on this document. Make sure to include the document title, number, and revision. Please refer to specific section(s) and paragraph(s) whenever possible.

- **E-mail:** doc.comments@hds.com
- **Fax:** 858-695-1186
- **Mail:**
  Technical Writing, M/S 35-10
  Hitachi Data Systems
  10277 Scripps Ranch Blvd.
  San Diego, CA 92131

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Chapter 1 AMS and WMS NetWare® Configuration Overview

1.1 AMS and WMS Novell® NetWare® Configuration

This document describes the requirements and procedures for connecting the AMS and WMS subsystem to a Novell® NetWare® system and configuring the new AMS and WMS devices for operation with the NetWare® operating system.

Configuration of the AMS and WMS disk devices for NetWare® operations includes:

- Verifying new device recognition (see section 3.1)
- Creating NSS Volume Partition (see sections 3.2 and 3.3)
- Creating NSS Pool (see sections 3.2 and 3.3)
- Assigning NSS volume to NSS Pool (see sections 3.2 and 3.3)
- Verifying client access (see section 3.4)

Note on the term "SCSI disk": The AMS and WMS logical devices are defined to the host as SCSI disk devices, whether the interface is SCSI or fibre-channel.

1.2 AMS and WMS Subsystem

The Hitachi AMS and WMS subsystem is a high-performance, medium-capacity storage array with added features designed to increase data accessibility and enable continuous user data access. The architecture of the AMS and WMS subsystem enables the user to scale the subsystem to meet a wide range of capacity and performance requirements. The AMS and WMS subsystem provides connectivity to most open systems through a standard fibre-channel interface.

For further information on the AMS and WMS subsystem, please refer to the *Hitachi TagmaStore™ Adaptable Modular Storage 200™ User and Reference Guide* (MK-95DF713) and the *Hitachi TagmaStore™ Adaptable Modular Storage 500™ User and Reference Guide* (MK-95DF714),or contact your Hitachi Data Systems account team.

Chapter 2 Preparing for New Device Configuration

2.1 Configuration Requirements

The requirements for the AMS and WMS subsystems Novell® NetWare® configuration are:

- **Hitachi AMS and WMS subsystems**

  The Resource Manager for AMS and WMS software is required to configure the fibre-channel (FC) ports.

  Note: The availability of AMS and WMS features and functions depends on the level of microcode installed on the AMS and WMS subsystems.

- **Novell® NetWare® PC server**

  Please refer to the Novell® NetWare® user documentation for PC server hardware and configuration requirements.

- **Novell® NetWare® server operating system versions 5.1, 6.0, 6.5**.

  Novell® recommends installing the latest Support Packs for NetWare® v6.5.

  Important Note: At this time, NetWare v6.5 Sp4a is the latest release. NetWare® v5.1 SP8 and NetWare® v6.0 SP5 are now EOL (end of life). Novell® will not release any more support packs for both NetWare v5.1 and NetWare v6.0. Client component: Novell® Client for Windows NT®/2000/XP V4.91 Sp2.

  Novell® recommends using NSS (Novell® Storage Services) in a SAN environment. See *Novell® TID 10066813* at http://support.novell.com/search/kb_index.jsp. (NSS is the default file system on Novell® NetWare® v6.0 and NetWare® v6.5.)

  If NetWare® Traditional files system (also referred to as Legacy Files System) is required, ensure that it is only accessed by one system at a time. Use explicit mount, fabric zoning, and/or LUN security to protect these volumes. See *Novell® TID 10066813* for more information on the use of NetWare® traditional files system in a SAN.

  Notes:

  – For the latest information on NetWare® version support, please contact your Hitachi Data Systems account team.

  – The NetWare® administrator password is required during AMS and WMS device configuration.

- **Fibre-channel adapters**

  Make sure to install all utilities, tools, and drivers that come with the adapter(s).

  The AMS 500 subsystem supports full-speed (1, 2 and 4 Gb/s), shortwave, non-OFC (open fibre control) optical fibre-channel interface and multimode optical cables with SC and/or LC connectors.

  Important Note: Do not connect any OFC-type fibre-channel interface to the AMS 500 subsystem.

The AMS 200 / WMS 100 subsystem supports full-speed (1, 2 Gb/s), shortwave, non-OFC (open fibre control) optical fibre-channel interface and multimode optical cables with SC and/or LC connectors.

Important Note: Do not connect any OFC-type fibre-channel interface to the AMS 200 / WMS 100 subsystem.

4 Gb/s is supported in a upgrade package for both AMS 200 /WMS 100.

2.2 Installing AMS and WMS Subsystems

The AMS and WMS subsystem comes with all hardware and cabling required for installation. Installation of the AMS and WMS subsystem involves the following activities:

Hardware installation. Perform hardware installation as specified in Hitachi Data Systems' documentation and Hitachi, Ltd. source documentation. Follow all precautions and procedures in this documentation. Check all specifications to ensure proper installation and configuration. Hardware installation includes:

- Assembling all hardware and cabling.
- Upgrading to the latest microcode level.
- Creating RAID groups and LUNs and formatting LUNs using the Resource Manager AMS and WMS software. For information and instructions on using Resource Manager, please refer to the *Hitachi Thunder 9500™ V Series Resource Manager User's Guide for GUI* (MK-91DF605).
- Installing the fibre-channel adapters and cabling.

  AMS and WMS FC Port: The fibre topology parameters for each AMS and WMS subsystem fibre-channel port depend on the type of device to which the AMS and WMS subsystem port is connected. Determine the topology parameters supported by the device, and set your topology accordingly (see section 2.2.1).

  Notes:

  - Each controller on the AMS 200 / WMS 100 has either 2 arbitrary loop ports or 1 fabric port. If Fabric is selected, then other port is disabled.
  - Each controller on the AMS 500 has both 2 arbitrary loop ports or 2 fabric ports. A combination of arbitrary loop and fabric is allowed.

2.2.1 Setting Host-specific Parameters for AMS and WMS Subsystem Ports

The AMS and WMS subsystem ports must be configured for the connected operating system.

Fibre Topology. You need to configure the AMS and WMS subsystem FC ports to define the fibre topology parameters and port addresses (see Table 2.1). The AMS and WMS subsystem supports up to 512 LUs and 128 host groups per port (with 256 LUs mapping per host group). You will select the appropriate settings for each AMS and WMS subsystem FC port based on the device to which the port is connected. Determine the topology parameters supported by the device, and set your topology accordingly.

Note: If you plan to connect different types of servers to the AMS and WMS subsystem via the same fabric switch, you must use either **zoning** on the switch or the Hitachi SANtinel™ (LUN security/LUN Management) on the AMS and WMS subsystem, or a combination of both.

Port address. In fabric environments, the port addresses are assigned automatically by fabric switch port number and are not controlled by the AMS and WMS subsystem port settings. In FC arbitrated-loop (FCAL) environments, the port addresses are set by entering an AL-PA (arbitrated-loop physical address, or loop ID, or port address). The host communicates with the devices comprising the loop with 8-bit AL-PA. See Table 2.1.

Table 2.1 shows the available AMS and WMS subsystem AL-PA values ringing from 01 to EF. Fibre-channel protocol uses the AL-PAs to communicate on the fibre-channel link , but the software driver of the platform host adapter translates the AL-PA value assigned to the AMS and WMS subsystem port to a SCSI TID.

Table 2.1 Available AL-PA Values

EF	CD	B2	98	72	55	3A	25
E8	CC	B1	97	71	54	39	23
E4	CB	AE	90	6E	53	36	1F
E2	CA	AD	8F	6D	52	35	1E
E1	C9	AC	88	6C	51	34	1D
E0	C7	AB	84	6B	4E	33	1B
DC	C6	AA	82	6A	4D	32	18
DA	C5	A9	81	69	4C	31	17
D9	C3	A7	80	67	4B	2E	10
D6	BC	A6	7C	66	4A	2D	0F
D5	BA	A5	7A	65	49	2C	08
D4	B9	A3	79	63	47	2B	04
D3	B6	9F	76	5C	46	2A	02
D2	B5	9E	75	5A	45	29	01
D1	B4	9D	74	59	43	27	
CE	B3	9B	73	56	3C	26	

2.2.2 Setting Advanced Features in QLogic® Fibre Channel Adapter Card

To see LUNs greater than 8, set LUN range to match number of LUNS to be assigned to storage fibre ports when under QLogic's Advance Adapter Settings.

To use a 2 Gb/s transfer rate on QLogic's HBAs (older Bios 1.30 and below), select **Extended Firmware Features** in the BIOS, and set rate to **2 – auto select** instead of the default rate of 1Gb.

2.2.3 Verifying Host Fibre-Channel Adapter Installation

Before the AMS and WMS subsystem is connected to the Novell® system, you must verify the FC adapter installation. To ensure that the host fibre configuration is correct, you will verify recognition of the FCA and the FCA driver.

To verify the fibre-channel host configuration:

1. Boot-up Novell® server, and make sure that all existing devices are powered on and properly connected to the Novell® system.
2. Display the host configuration using the NetWare® command **`List storage adapters`** on the console screen of your Novell® server. Ensure that your storage LUNs are shown underneath each listed fibre adapter. Verify that the number of LUNs assigned to the storage port is correct. If this information is not displayed, the host environment may not be configured properly.

   Note: For information on the HBA-specific text displayed on screen, please refer to the README.TXT driver file or the user documentation for that HBA.

2.3 Connecting the AMS and WMS Subsystem to a Novell® System

The AMS and WMS subsystem comes with all the hardware and cabling required for connection to the host system(s). Connection of the AMS and WMS subsystem involves the following activities:

1. Verify subsystem installation. Verify that the status of the fibre/SCSI adapters and LUNs is NORMAL. Using the DAMP program, select **Settings** under the menu, and then **Configuration.** Select the **Fiber Channel** tab.

   The Topology information line's current value should be **LinkUp F_port Connected** if your storage system is connected through a switch. Verify also that the transfer rate is acceptable. The maximum transfer rate is 2 Gbps on AMS 200 /WMS 100. (see Figure 2.1). Future upgrade releases will allow for 4 Gbps transfer rate on the AMS200 / WMS 100. The maximum transfer rate for the AMS 500 is 4 Gbps (see Figure 2.2).

2. Connect the AMS and WMS subsystem to the Novell® system. Install the fibre-channel cables between the AMS and WMS subsystem subsystem and the Novell® system.

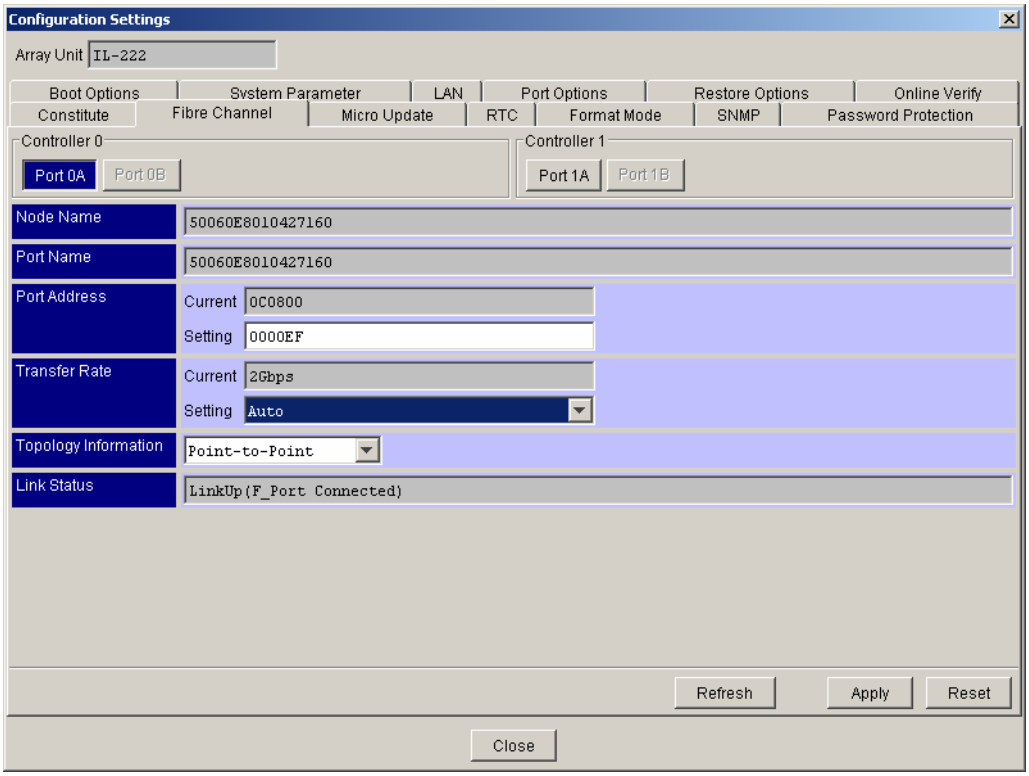

Figure 2.1 Verifying Subsystem Installation AMS 200 / WMS 100

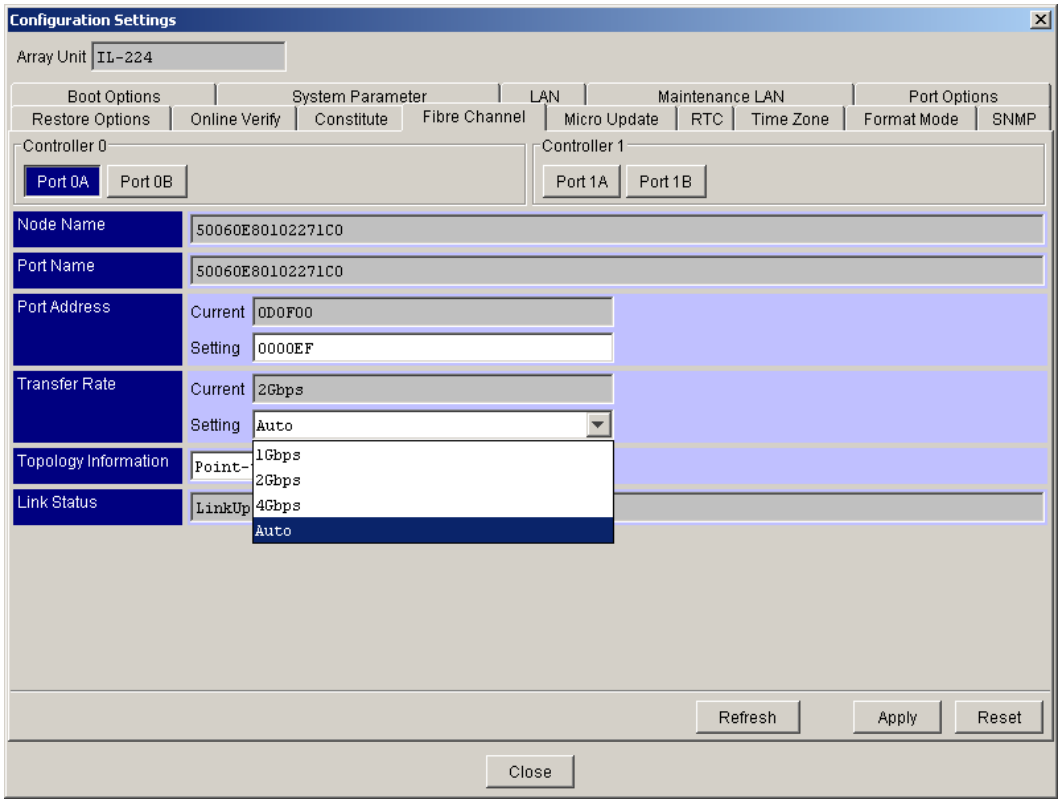

Figure 2.2 Verifying Subsystem Installation AMS 500

2.4 Configuring Host Fibre-channel Adapters

After setting the disk and device parameters and setting and recognizing the LUs, you are ready to configure the FC adapter(s) connected to the AMS and WMS subsystem. The host bus adapters (HBAs) have many configuration options, so make sure that you have read the applicable help pages and user documentation for each adapter.

The queue depth requirements for the AMS and WMS subsystem devices are specified in Table 2.2.

Table 2.2 Queue Depth Requirements for AMS and WMS Subsystem Devices

Parameter	Requirement
Queue depth per LU	≤ 32
Queue depth per port	≤ 512

Note: To optimize the I/O performance of the AMS and WMS subsystem devices, you may adjust the queue depth for the AMS and WMS subsystem devices as needed (within the specified range).

2.5 Rebooting the Novell® System

After setting the disk and device parameters, setting and recognizing the LUs, and configuring the HBAs, you are ready to reboot the Novell® System. To reboot, type the following commands on the console screen of your Novell® server: **`Restart server`** (Application restart, Faster restart) or **`Reset server`** (warm server re-boot).

Chapter 3 Configuring AMS and WMS Subsystem Devices

After AMS and WMS subsystem installation has been completed and new device recognition has been verified, the devices on the newly installed AMS and WMS subsystem subsystem are ready to be configured for use. Configuration of the AMS and WMS subsystem devices is performed by the user and requires administrator access to the NetWare® system. The activities involved in configuring the AMS and WMS subsystem devices are:

- Verifying new device recognition (see section 3.1)
- Creating the NSS disk partitions (see sections 3.2 and 3.3)
- Creating NSS Pools on NetWare® (see sections 3.2 and 3.3)
- Assigning the new NSS Volumes to NSS Pools (see sections 3.2 and 3.3)
- Completed NSS Volume(see sections 3.2 and 3.3)
- Verifying client access (see section 3.4)

Note on the term "SCSI disk": The AMS and WMS subsystem logical devices are defined to the host as SCSI disk devices, even though the interface is fibre-channel.

3.1 Verifying New Device Recognition

The first step in configuring the newly installed AMS and WMS subsystem devices is to verify that the NetWare® system recognizes the new devices. You will display the device information using the `LIST STORAGE ADAPTERS` command and verify that the system recognizes the AMS and WMS subsystem devices. You will also record the device number which is used during disk partitioning and volume creation.

To verify that the NetWare® system recognizes the new AMS and WMS subsystem devices:

1. If you just finished loading the device driver, you are already at the server console. If not, go to the NetWare® directory, and enter SERVER to get to the server console.
2. At the server console, enter `LIST STORAGE ADAPTERS` to display all disk devices (use the **Pause** key as needed). The device number and device type are displayed for each device.
3. Record the device number for each new device. This information will be used during disk partitioning and volume creation.
4. Verify that all of the new AMS and WMS subsystem devices are listed. If any devices are not listed, see section 5.1 for troubleshooting information.

3.2 Creating NSS Volumes on NetWare® v6.0

After verifying new device recognition, the next step in configuring the new AMS and WMS subsystem devices is to create NSS partitions on them. (NSS is Novell's latest file system for NetWare® which stands for Novell® Storage Services.)

NSS uses free space from multiple storage devices that enables you to create unlimited volumes and to store up to 8 trillion files in a single volume (up to 8 terabytes in size). With NSS, you may mount up to 255 volumes simultaneously. Note that NSS loads **Name Space: DOS, MAC, NFS, LONG** by default.

NSS uses storage pools. A storage pool is a specified amount of space you obtain from all your storage devices. All NSS logical volumes are placed into storage pools so you do not have to limit the number of volumes in a partition.

3.2.1 Installing Novell® Client on a Windows® Workstation 2000/XP

The following is an example of installing the Novell® Client on a Windows® Workstation 2000/XP.

Download the latest Novell's client software for Windows® Workstation 2000/XP (v4.91 sp2) from: http://download.novell.com. Double-click the application and select the appropriate network adapter.

Notes:

- Novell's Windows® 2000/XP client software must be installed before the installation of ConsoleOne®.
- Novell's ConsoleOne® Utility software is the preferred method of creating, modifying, and deleting pools and NSS Volumes on NetWare® v6.0. Install the latest ConsoleOne® on a Windows® workstation, available for download from Novell's Web site: http://download.novell.com. Version 1.3.6e. (As of this writing, Console v1.3.6e is also supported on Linux® and Solaris™, with no Novell® software required.)

Alternatively, you may run ConsoleOne® from the mapped public directory. After logging in to the Novell® Server, the Public directory is usually mapped to drive Z.

Example: Server_Name\SYS'(Z)

Double-click on **/mgmt/ConsoleOne/1.2/bin/ConsoleOne.exe** to start the ConsoleOne® application: /mgmt/ConsoleOne/1.2/bin/ConsoleOne.exe.

Notes:

- The latest version of ConsoleOne® becomes available automatically when you log on to a NetWare® server. If you are on a Novell® Windows® client, however, you must install the standalone version of ConsoleOne®.
- You may also run ConsoleOne® on the server. **Startx.ncf** is the file that initiates the Java based server application. This file is usually added during installation but may be commented out.

Figure 3.1 through Figure 3.16 show the sequence of screens displayed on the Microsoft® Windows® Workstation 2000/XP running NetWare® Client Windows® 2000/XP during the disk partitioning process.

Notes:

- Do not create a partition on a disk device that will be accessed as a raw device. For example, Novell's Cluster Service Split Brain partition and some database applications use raw devices.
- If Novell's Multi-Path feature is required, please see chapter 4 to activate this feature before continuing on in creating NSS volumes.

To create disk partitions on the new SCSI disk devices:

1. At the Windows® workstation, double-click the ConsoleOne® icon to load the management software (see Figure 3.1).
2. On the ConsoleOne® screen, select server's **Properties**, and Select **Media** to access the NetWare® disk options (see Figure 3.2).

   You may also initialize your media by selecting the LUN and clicking **Initialize Hard Disk** (see Figure 3.3 and Figure 3.4).

   WARNING: Doing this will erase all data from the LUN. LUNs may only be initialized individually.

3. Select the **Partition Properties** tab under the **Media** tab to work with the devices (see Figure 3.5).
4. On the **Partition Option** screen (see Figure 3.6), select **New**.

   A **Create a new partition** window appears (see Figure 3.7).

   The Create a new partition window lists the devices by device number. The device numbers should be recorded. Note that the default selection for **Partition** type is NSS. (This screen also has selection for Mirror and automatically creates a mirror group for you. If you create another partition with the same size and you want to mirror it, select the previous mirror group from the other LUN.) The **Hot Fix** option is already selected and may be de-selected at this time.

5. Select the device and desired size to be partitioned, and click **OK**.
6. You now need to create a new NSS Pool. Under the **Media** tab, select NSS Pools. Select the **New** option, and enter a name for the pool (see Figure 3.9).
7. Assign the pool to a selected NSS partition (see Figure 3.10).

   If a selection is made on an unassigned partition, a warning message will appear. Make a default NSS partition with a minimum hot fix size of 100K and mirror object.

8. A **Create Pool – Attribute information** page will appear (see Figure 3.11).

   The default selection is **Activate on Creation**.

9. Select the **NSS Logical Volumes** tab (see Figure 3.12).

10. Select the **New** tab and the **Create a new Logical Volume** screen appears (see Figure 3.13). Enter a name for the volume and select **Next**.

    You can create a logical volume from an existing pool or from free space.

11. Select the name of the pool created from step 9 (see Figure 3.14). Enter a volume quota or make a selection on **Allow volume quota to grow to the pool size**.

    The last selection is usually made for convenience.

12. A **Create Logical Volume – Attribute Information** screen appears (see Figure 3.15). The defaults settings are: Backup, Salvage Files, and On Creation (Activate, Mount). This will activate the pool and mount the volume upon selecting the **Finish** button.

    A Properties panel appears to confirm the creation of a new NSS volume (see Figure 3.16).

13. Type `Volumes` on the console screen of the NetWare® server to verify that the NSS volume was created from the last step (see Figure 3.17).

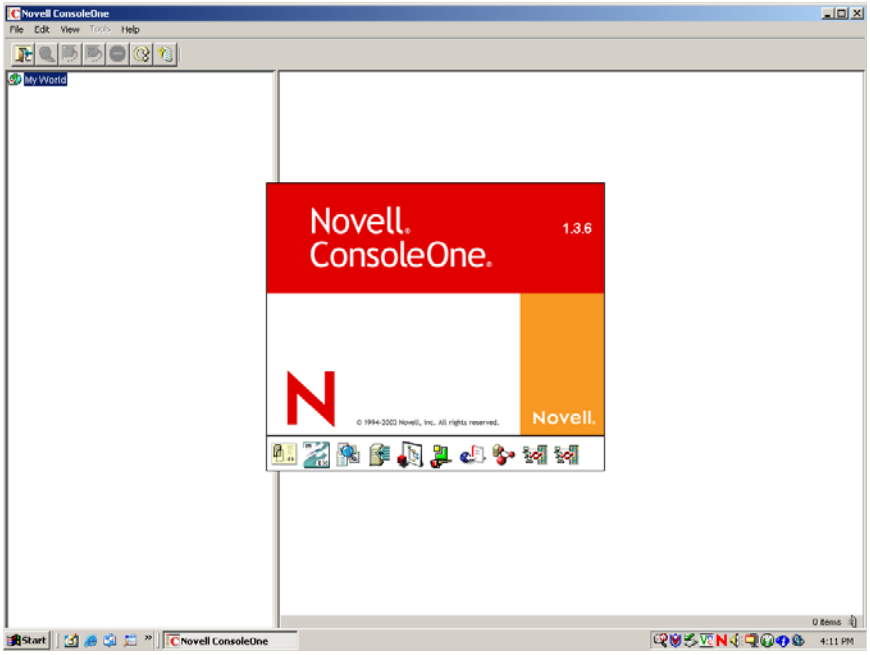

Figure 3.1 Starting ConsoleOne® NetWare® Software

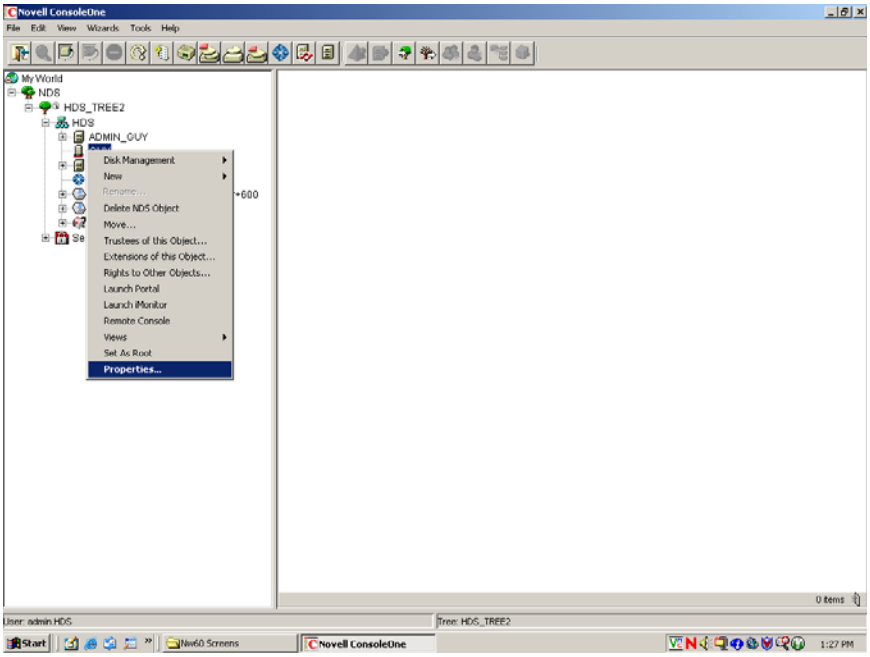

Figure 3.2 Selecting Server Properties

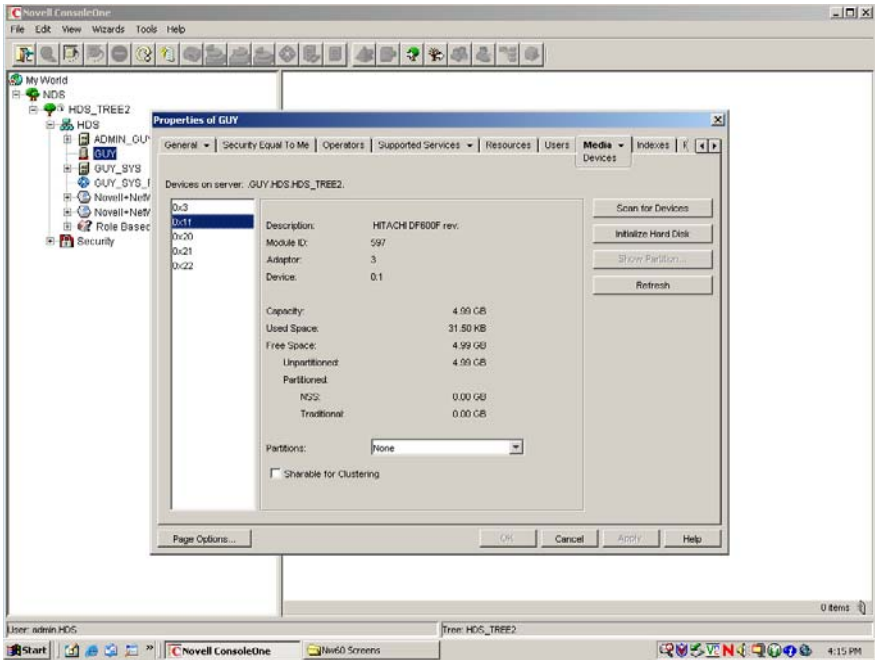

Figure 3.3 Selecting LUN Device

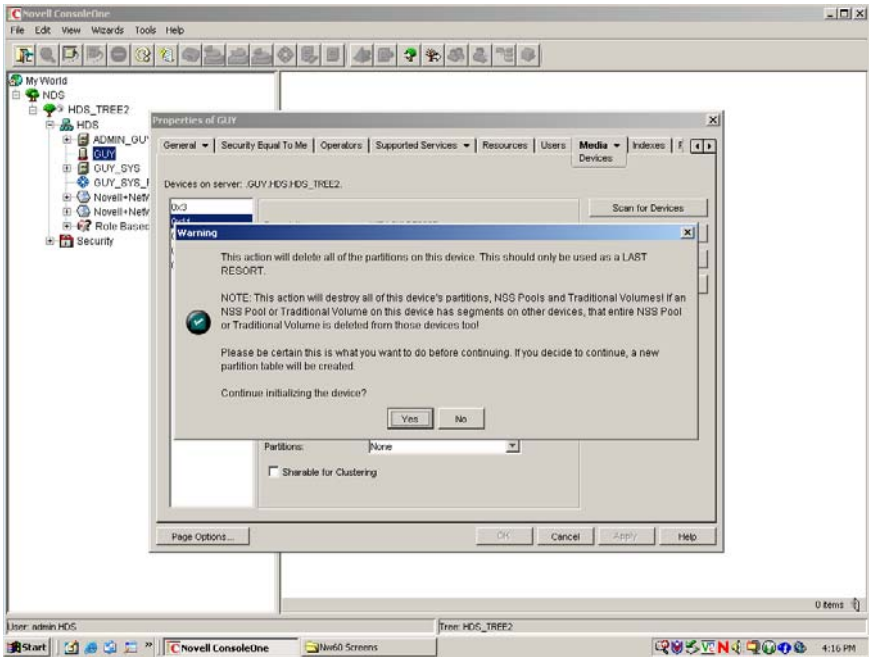

Figure 3.4 Initializing Media Device Screen

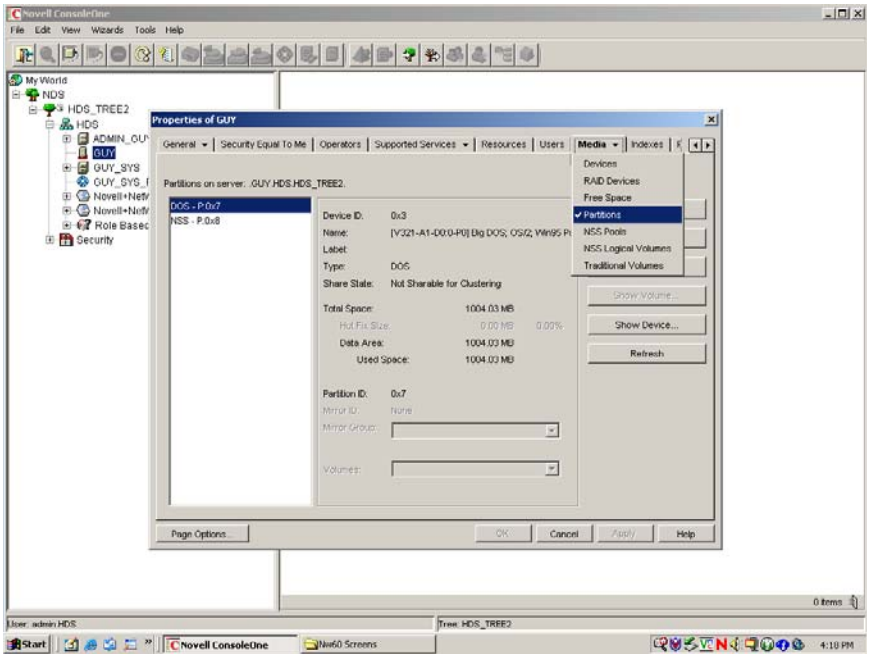

Figure 3.5 Selecting Partition Tab

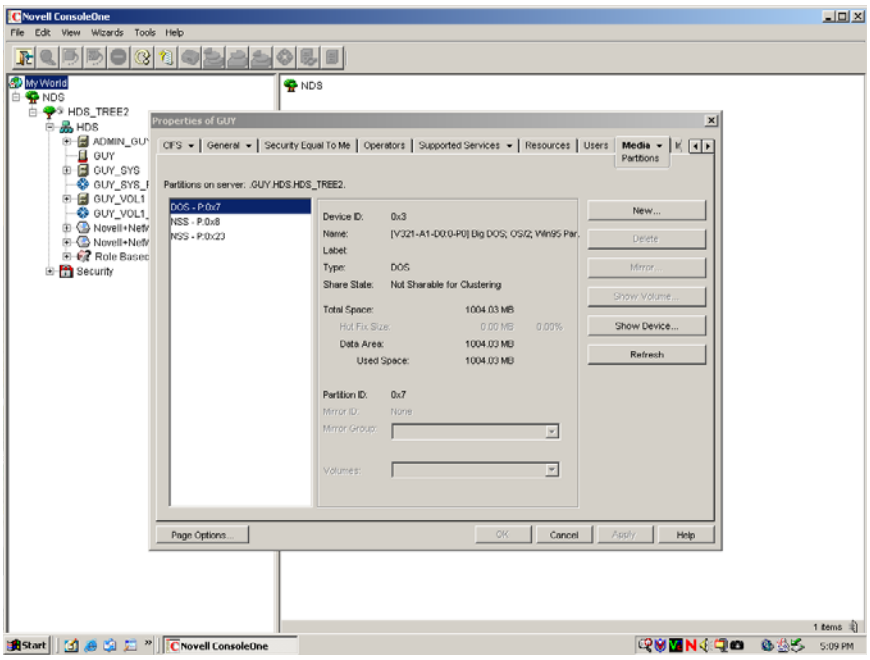

Figure 3.6 Selecting New to Create a New NSS Disk Partition

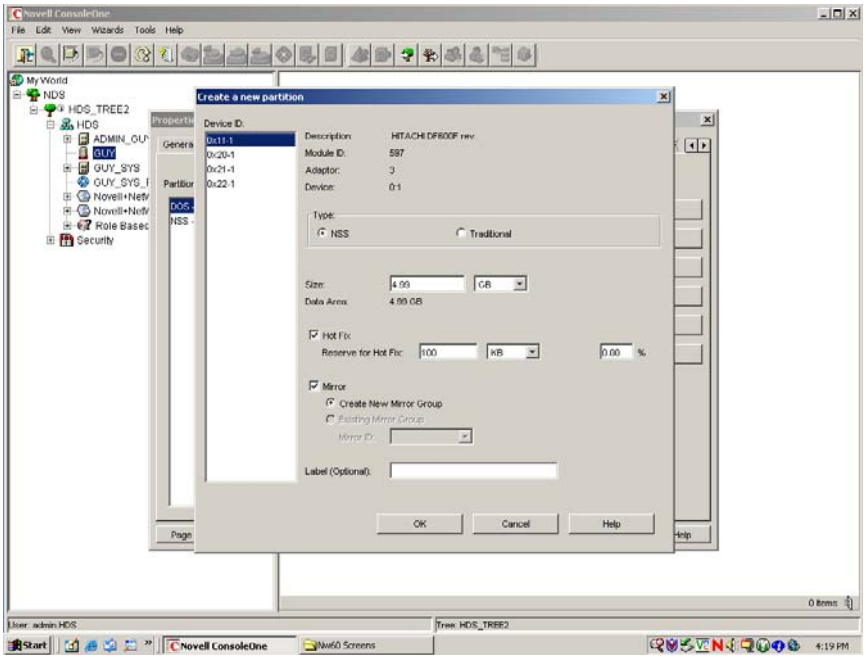

Figure 3.7 Continuing to Create a New NSS Disk Partition

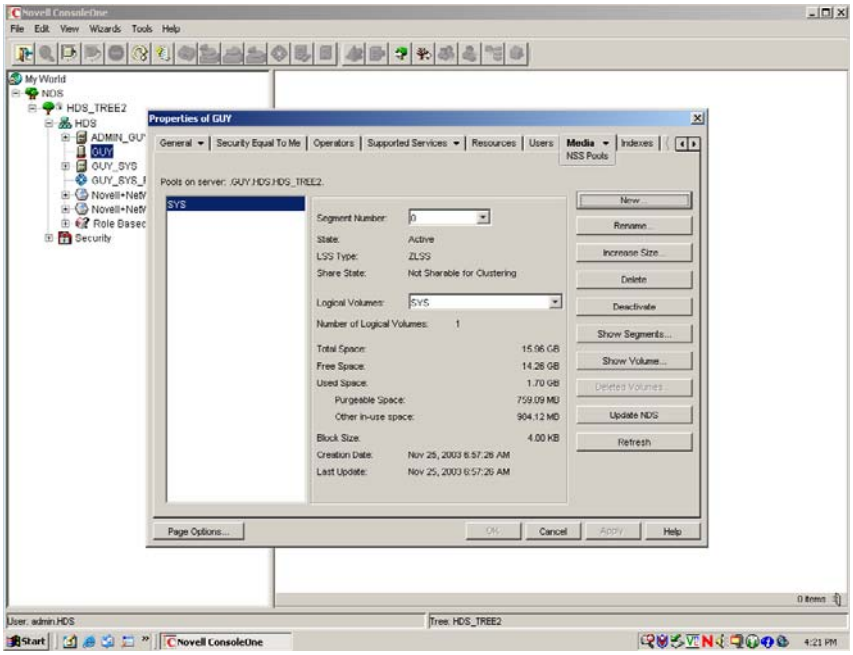

Figure 3.8 Selecting NSS Pools Tab

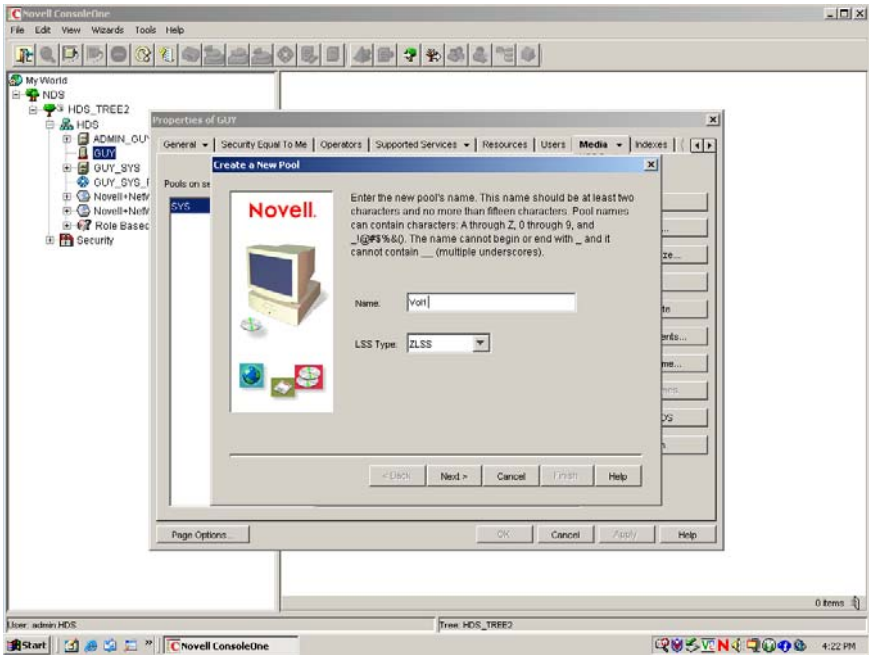

Figure 3.9 Entering Pool Name to Create NSS Pool

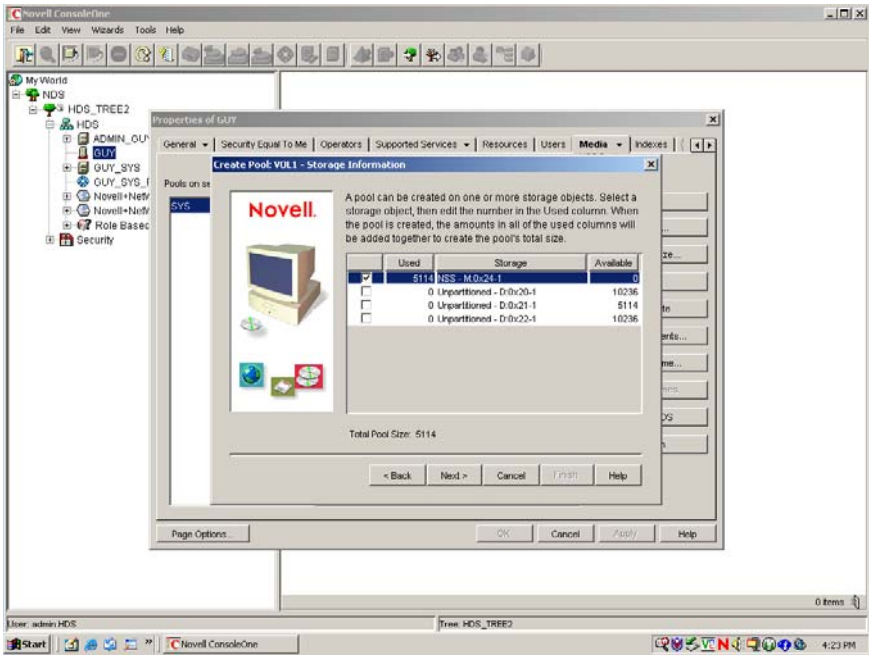

Figure 3.10 Assigning NSS Pool to Selected NSS Partition Object

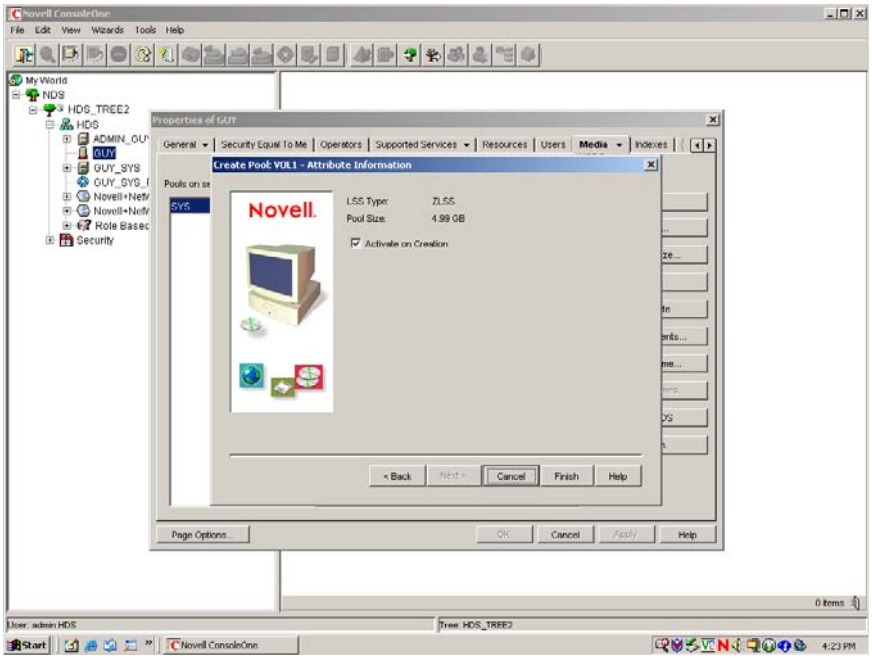

Figure 3.11 Selecting Finish to Activate NSS Pool upon Creation

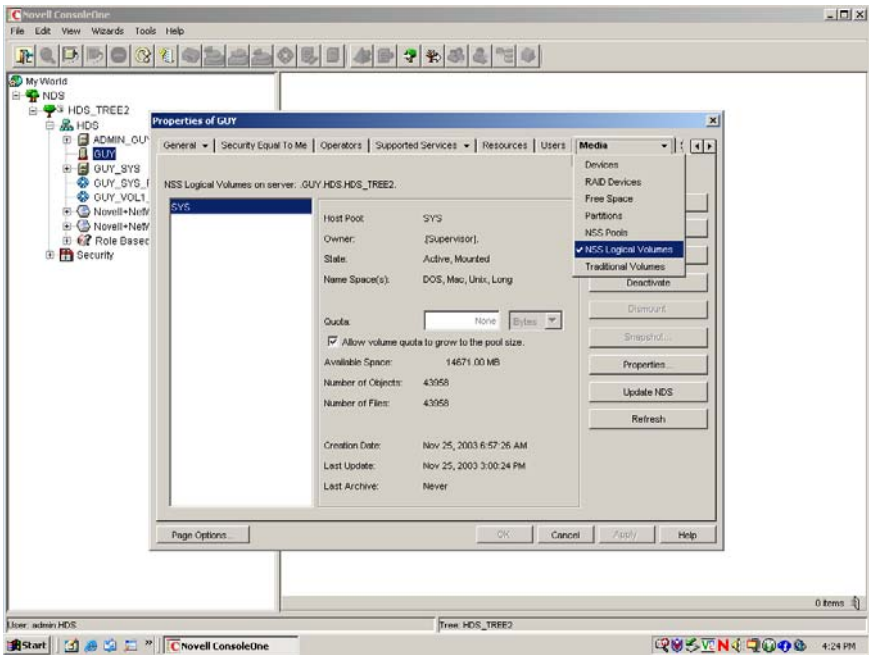

Figure 3.12 Selecting NSS Logical Volume Tab

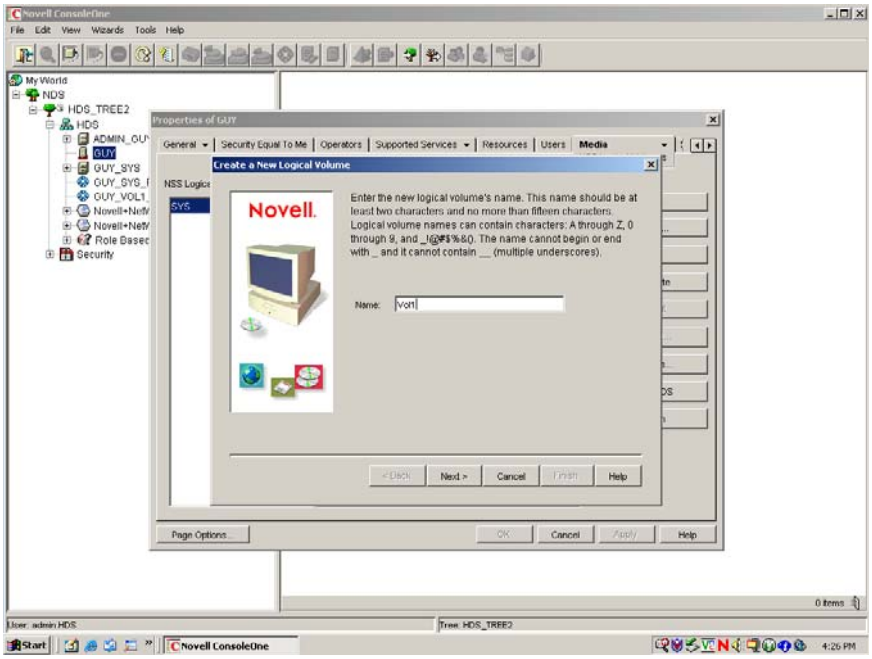

Figure 3.13 Entering NSS Volume Name to Create NSS Volume

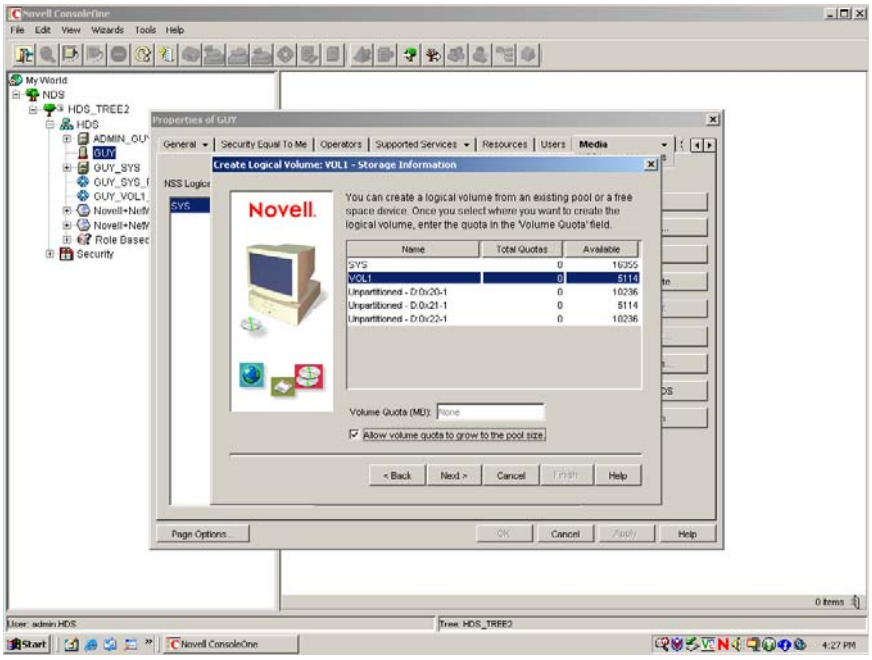

Figure 3.14 Assigning NSS Pool to NSS Volume

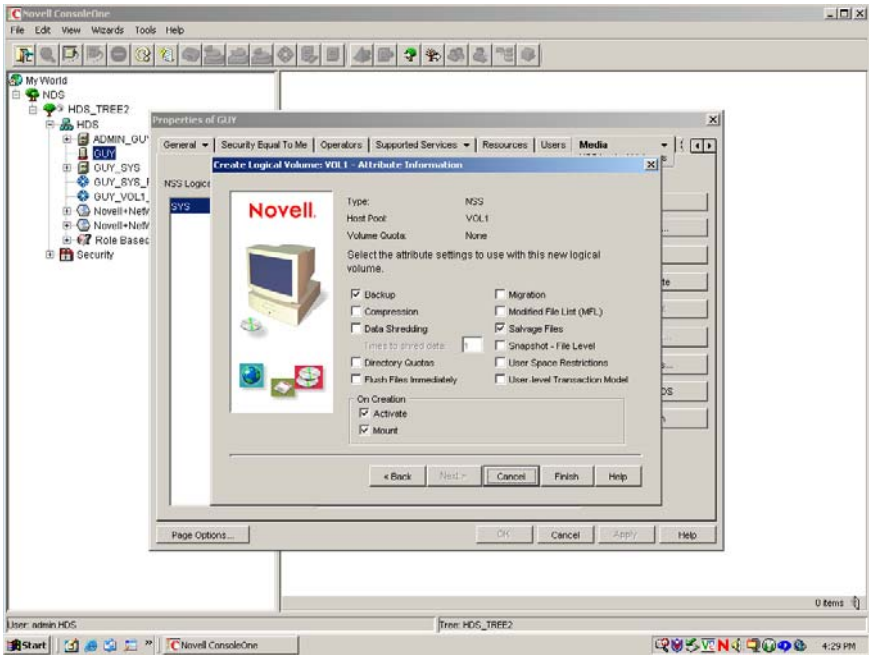

Figure 3.15 Selecting NSS Volume Attribute

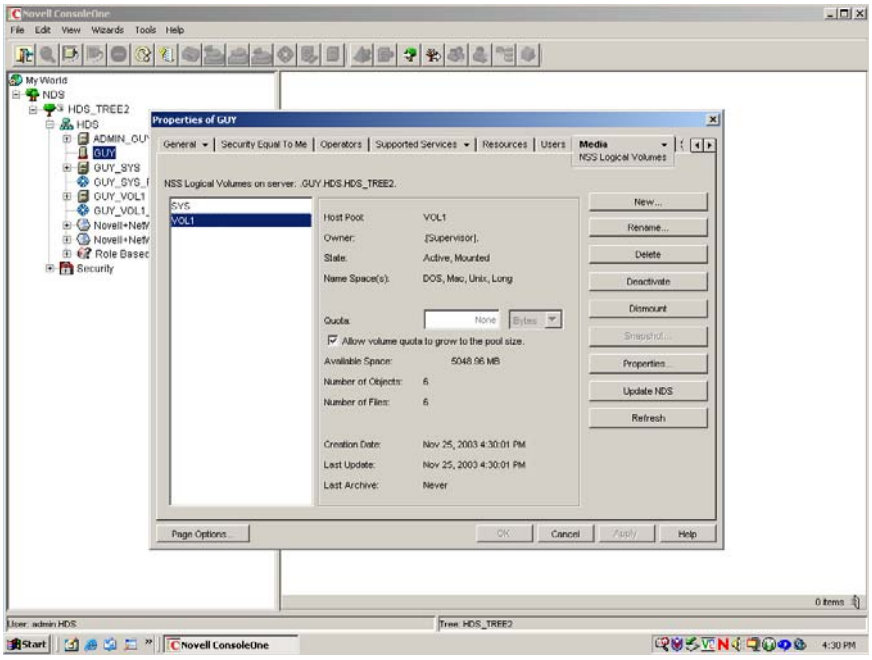

Figure 3.16 Completing NSS Volume

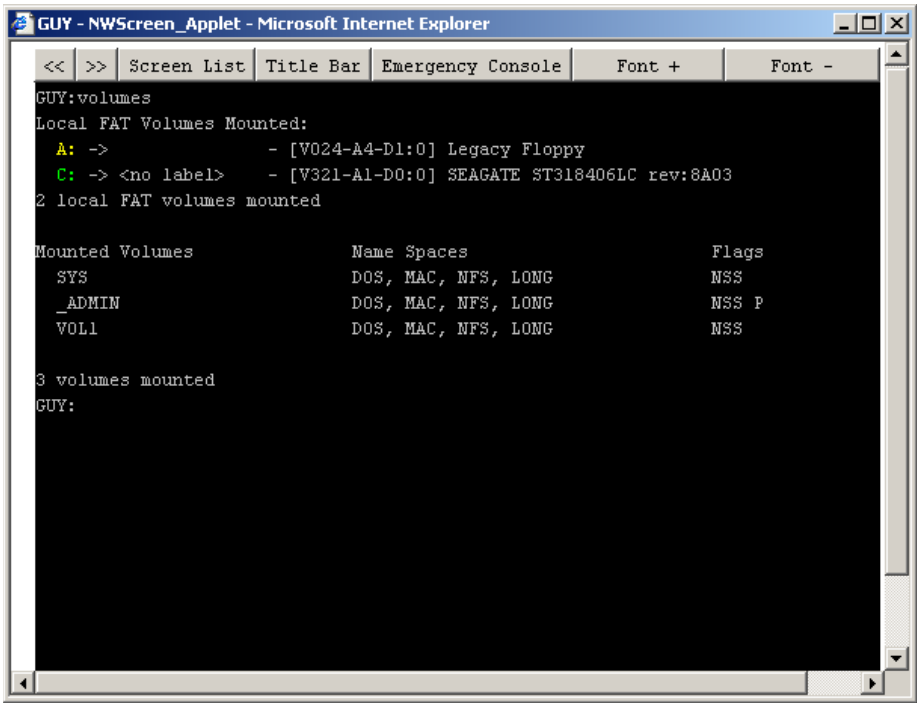

Figure 3.17 Confirming Mounted Volume

3.3 Creating NSS Volumes on NetWare® v6.5 and Above

NSS uses free space from multiple storage devices. You may create unlimited volumes and store up to 8 trillion files in a single volume (up to 8 terabytes in size). NSS is a 64-bit file system that can manage a virtually unlimited number of file objects.

The logical volumes you create on NSS storage pools are called NSS volumes. You may specify a maximum volume quota or you may allow the volume to grow dynamically to the size of a pool it belongs to. You may add any number of volumes to a storage pool.

Important note about Pools:

- Pools can span multiple devices.
- Pools can contain multiple volumes.
- Volumes cannot span more than one pool.
- Volume quotas can be set to grow dynamically to the size of the pool, but they cannot exceed the size of the pool.

With NetWare® v6.5 and above, Novell® utilizes web-based NetWare® utilities. These utilities are used to manage partitions, pools, and volumes. iManager is the preferred utility but the Remote Manager also has the ability to work with NSS, ISCSI, and Traditional File System. Server console screens may be shown from Remote Manager. These 2 utilities are web based. NSS Menu / NSSMU is a system console utility.

3.3.1 Server Configuration Requirements

At least one NetWare® v6.5 SP3 or above server in the same tree needs the Server management option type installed. This option is available during the server's installation, and installs the iManager v2.0 and the Novell® ConsoleOne® 1.3.6e network administration software. It is recommended by Novell that all NetWare servers are updated to the same support pack.

Notes:

- The following screen shots for imanager were taken from NetWare v6.5 Sp4a.
- If Novell's Multi-Path feature is required, refer to Chapter 4 to activate this feature before creating NSS volumes.

To Use iManager to assign the new SCSI disk devices to volumes, complete the following steps:

1. From any workstation that has a browser, log in to the server hosting the management software. https://server_ip_address/nps//servlet/portalservice.

Figure 3.18 Typical Response when Initiating iManager

In the example shown in Figure 3.18, security certification has not been added to your web browser. RootCert.der certification file may be found in the /public directory.

2. Click **Yes** to continue. The iManager login screen appears. Enter Admin (for Username), and a Password (Installation Password). (See Figure 3.20.)
3. The iManager opening screen appears (see Figure 3.21). On the left pane, select **Storage**, then **Devices** (see Figure 3.22).
4. Walk the tree to locate a preferred NetWare® server (see Figure 3.23). Select a NetWare® server icon (see Figure 3.24).

   All available AMS and WMS subsystem devices will be shown as shown in Figure 3.26. Note the **Description**, **Device**, and **Capacity**. Verify that this is correct storage device. At this time, you may initialize the devices.

5. Select a device, then **Initialize Disk**. A warning screen will pop-up as shown in Figure 3.19.

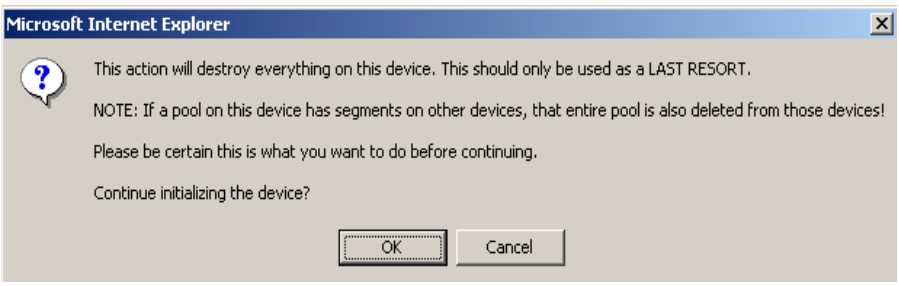

Figure 3.19 Warning Screen

6. Select **Multipath** to see both paths of the selected device. (see Figure 3.26). Priorities may be set at this time but is not required. Default settings are acceptable until the user requires different priorities between paths.
7. Pools are always created before volumes. For this example, we'll create the NSS volumes, and then another screen will ask us to create a pool.
8. Select the **Volumes** tab in the far left panel to go to Volume management (see Figure 3.27).
9. Select the **New** tab to create a volume, and then enter the new name (see Figure 3.28).
10. On the **New Volume** screen, select **New Pool** (see Figure 3.29). Enter the new pool name. For simplicity, the volume name and pool name is the same. In this example, the pool name **(Vol1)** is the same name as the volume **(Vol1)**(see Figure 3.30).
11. Next select the device and the amount of space for pool. Note that the devices are not necessarily in SCSI ID order. Leave **Activate on Creation** checked (see Figure 3.31). Select **Finish**.
12. Select the Pool and volume quota. Select **Allow volume quota to grow to the pool size** (see Figure 3.32). **Select Next>>**.
13. The **Volume Attribute information** screen appears, as shown in Figure 3.33.
14. You may select the defaults or change them. The following defaults are checked: Backup and Salvage Files. **On Creation: Activate Volume** and **Mount Volume**.
15. Select **Finish** to complete the volume creation.
16. Repeat steps (4) through (11) until you have assigned all new AMS and WMS subsystem devices to volumes.
17. The newly created volume shows up under **Volume Management** screen, as shown in Figure 3.34. The State should be **Active, Mounted**.
18. Verify mounted volumes on the server console by typing `volumes` on the server console, as shown in Figure 3.35.

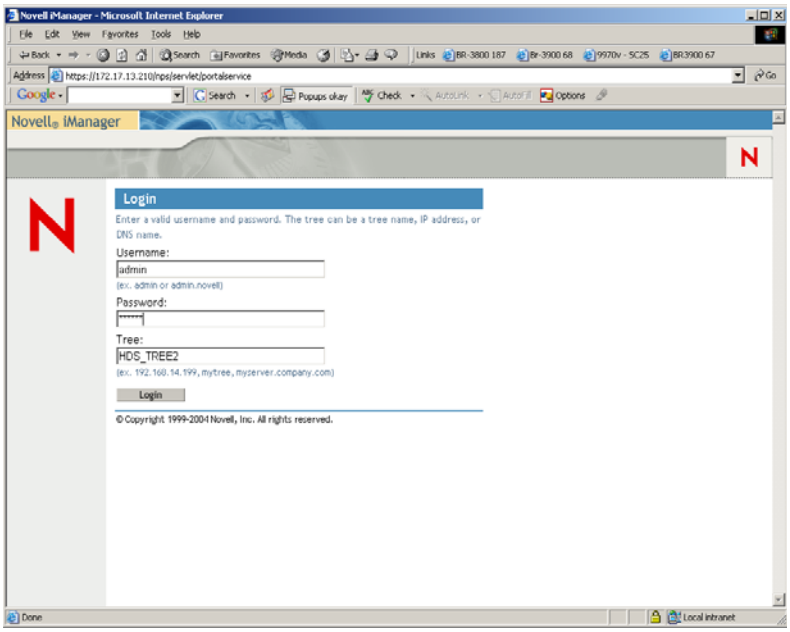

Figure 3.20 iManager NetWare® Management Web Application Login Screen

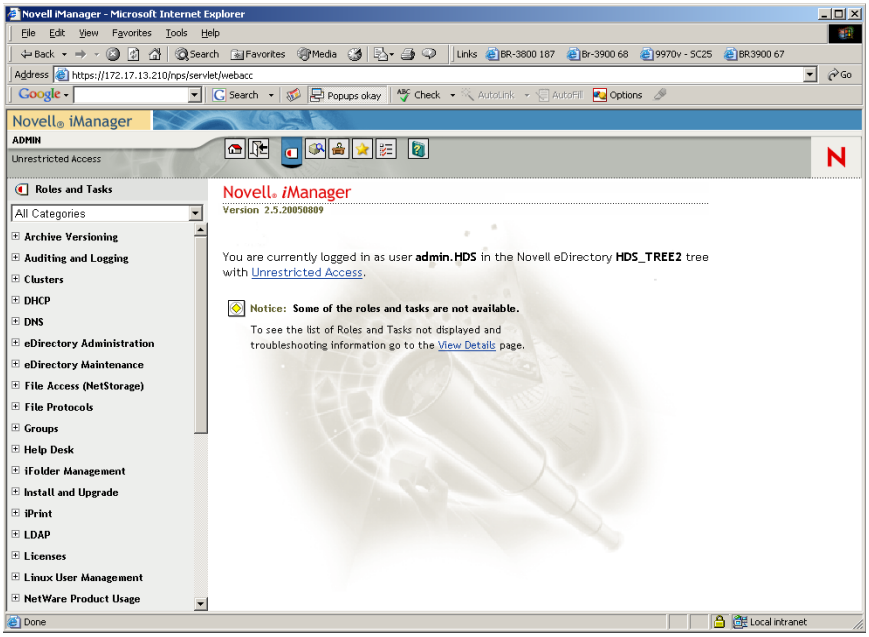

Figure 3.21 iManager Main Screen

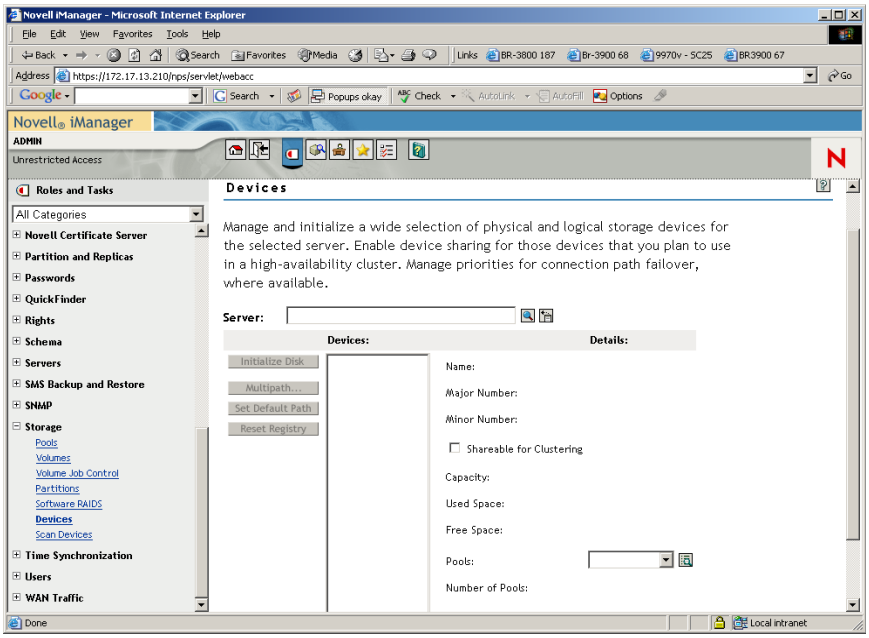

Figure 3.22 Selecting Storage and Device

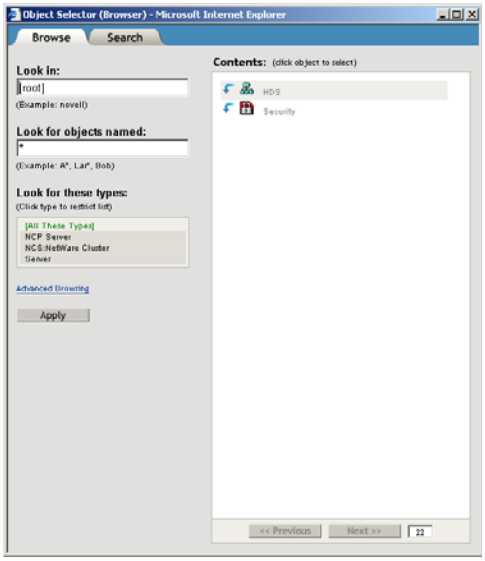

Figure 3.23 Walking the Tree and Selecting Server

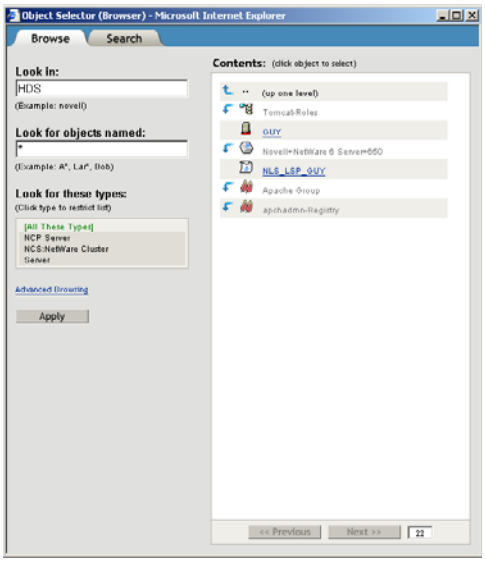

Figure 3.24 Selecting Server Icon

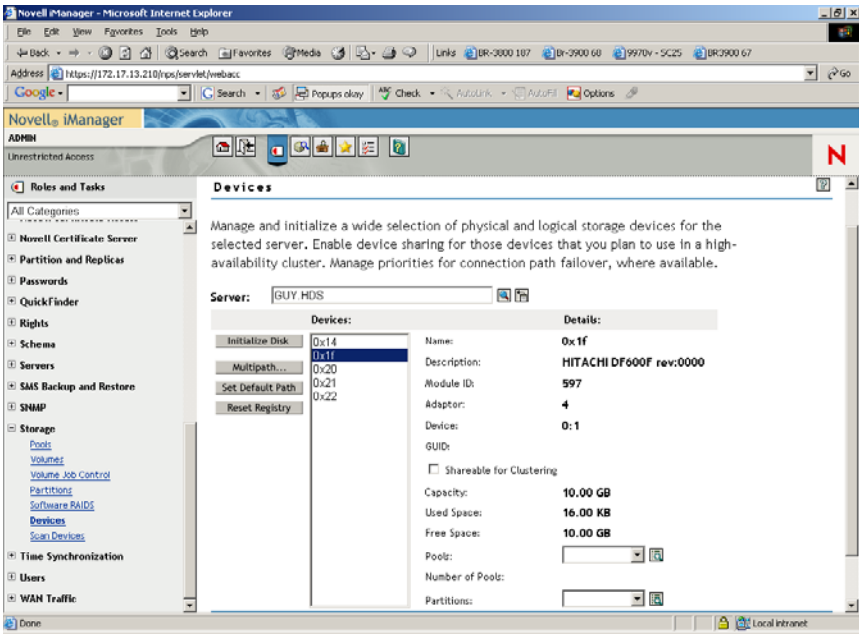

Figure 3.25 Selecting Devices

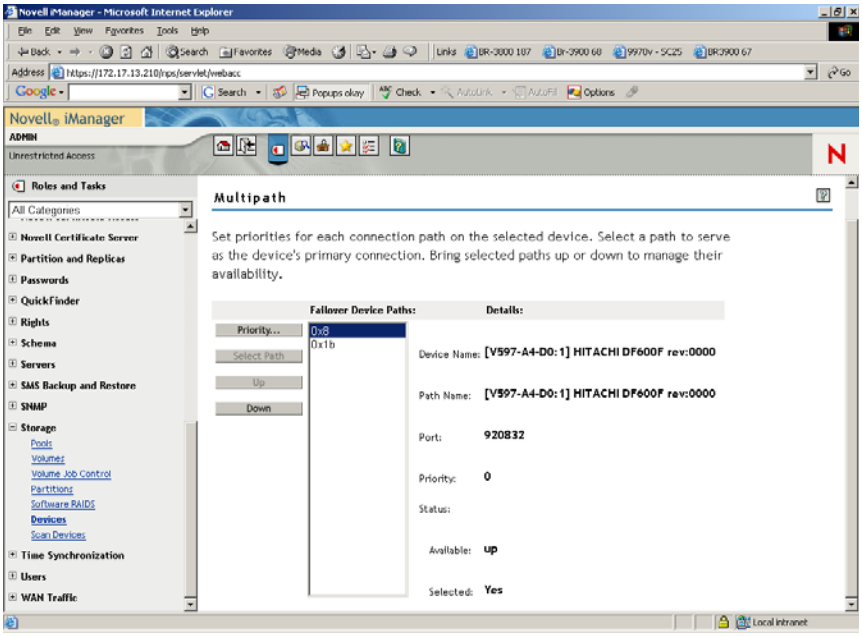

Figure 3.26 Selecting Path to Set Priorities in Multi-Path

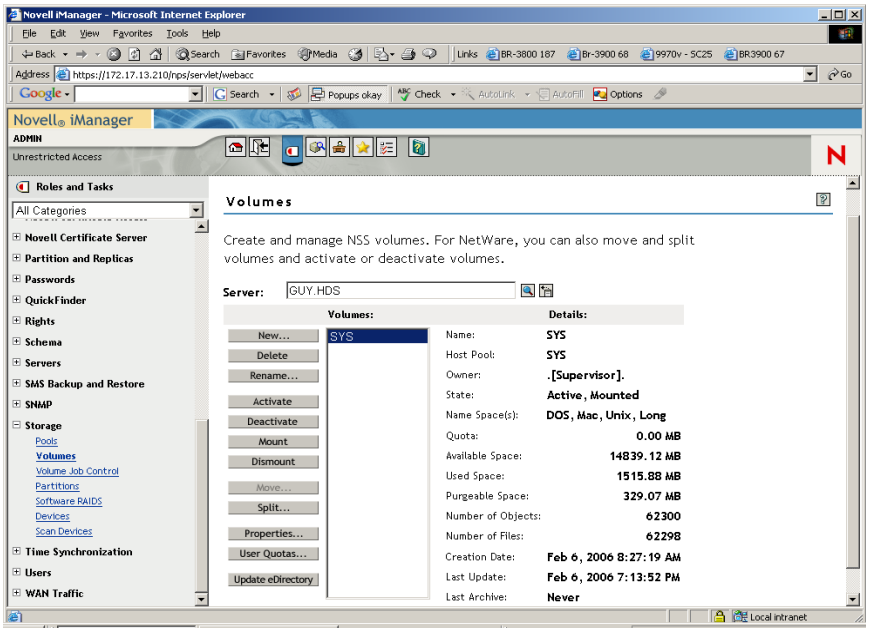

Figure 3.27 Creating an NSS Volume

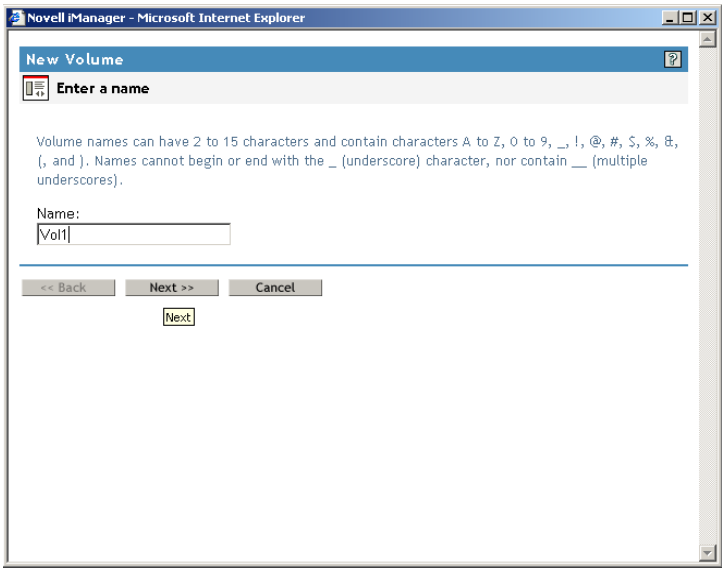

Figure 3.28 Entering Name of an NSS Volume

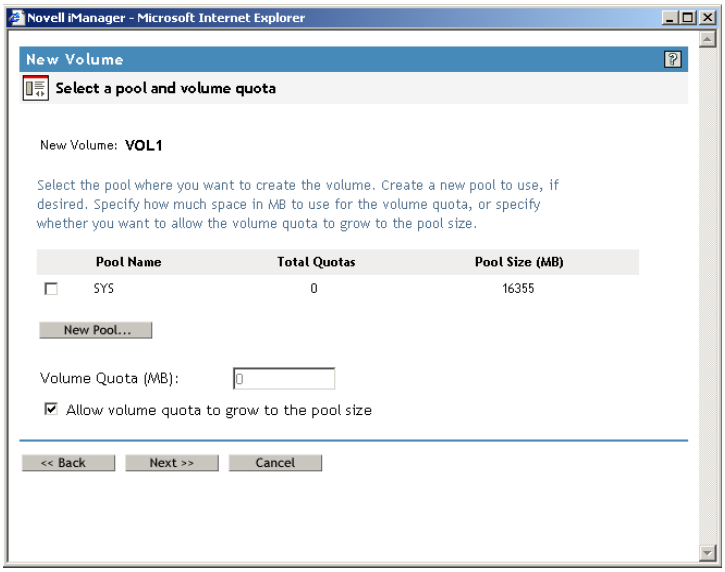

Figure 3.29 New Volume Screen, Selecting New Pool

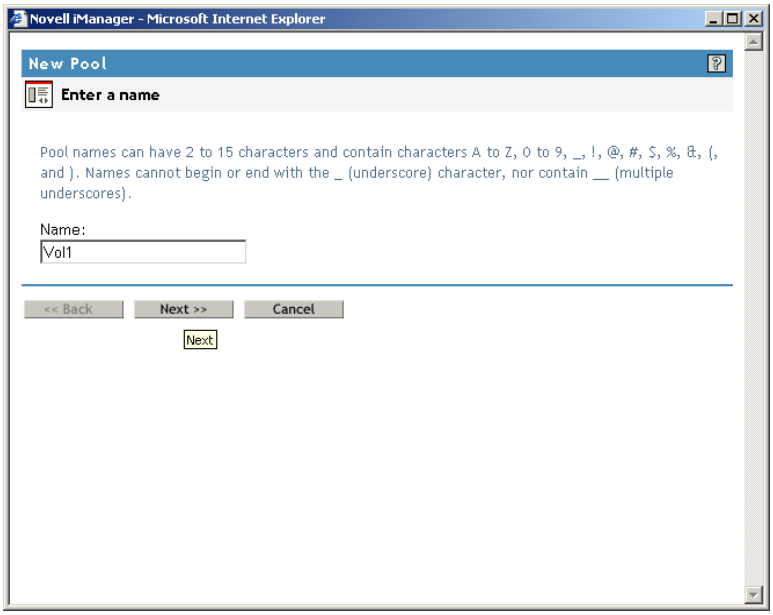

Figure 3.30 Entering a Pool Name

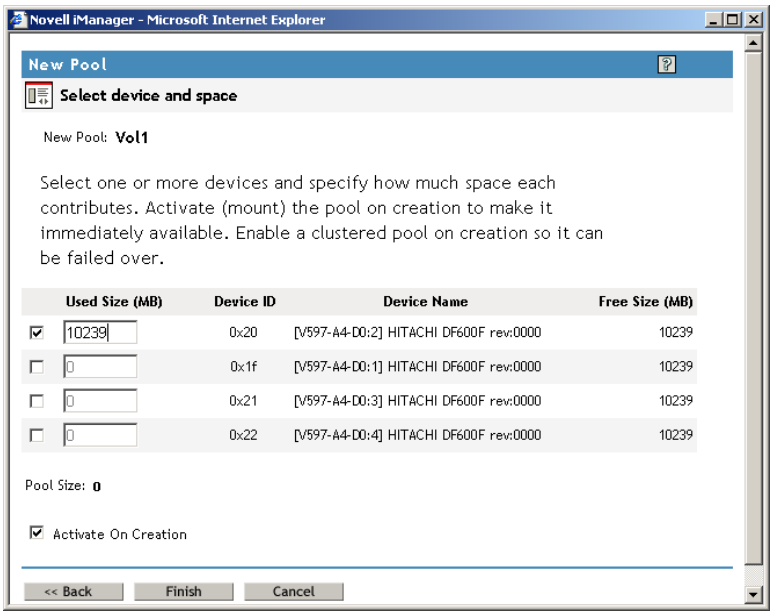

Figure 3.31 Selecting Device and Amount of Space for Pool

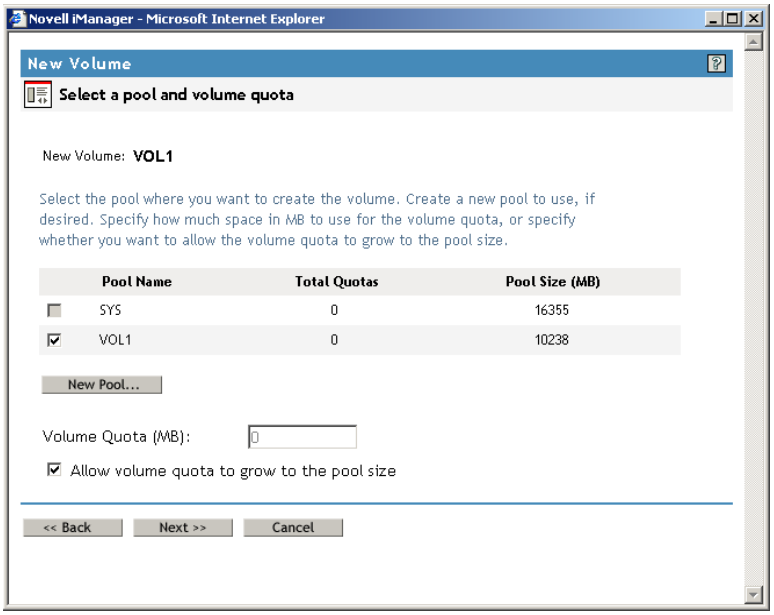

Figure 3.32 Selecting Pool and Volume Quota

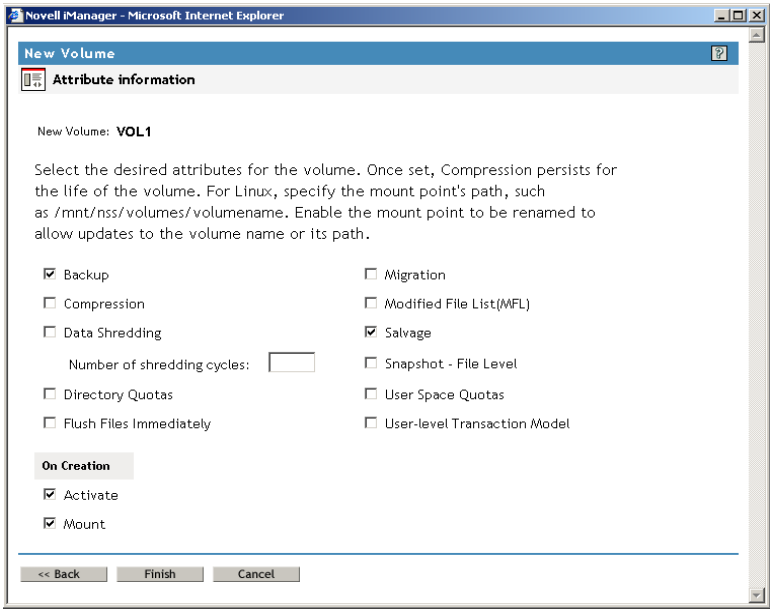

Figure 3.33 Selecting New Volume Attributes

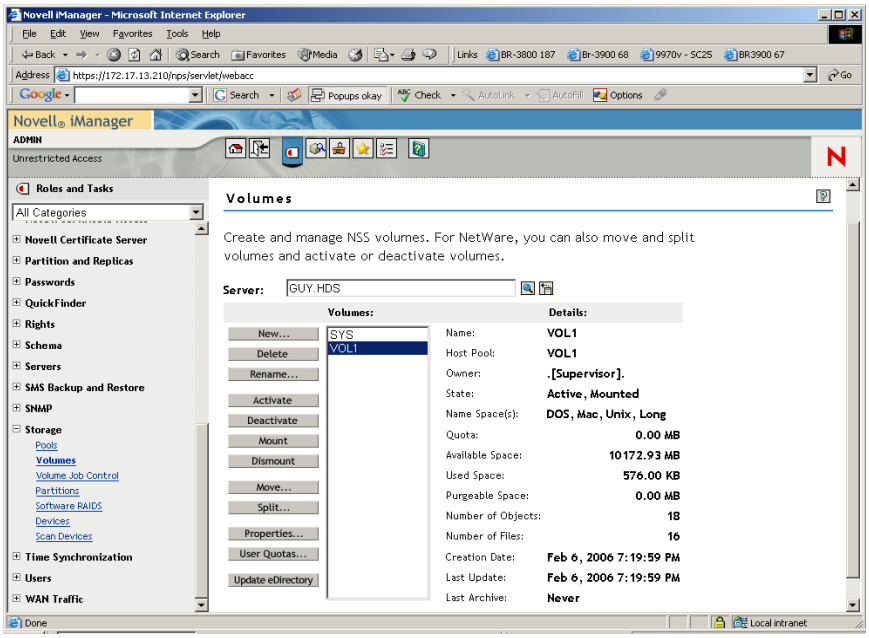

Figure 3.34 Confirming Completion of a NSS Volume

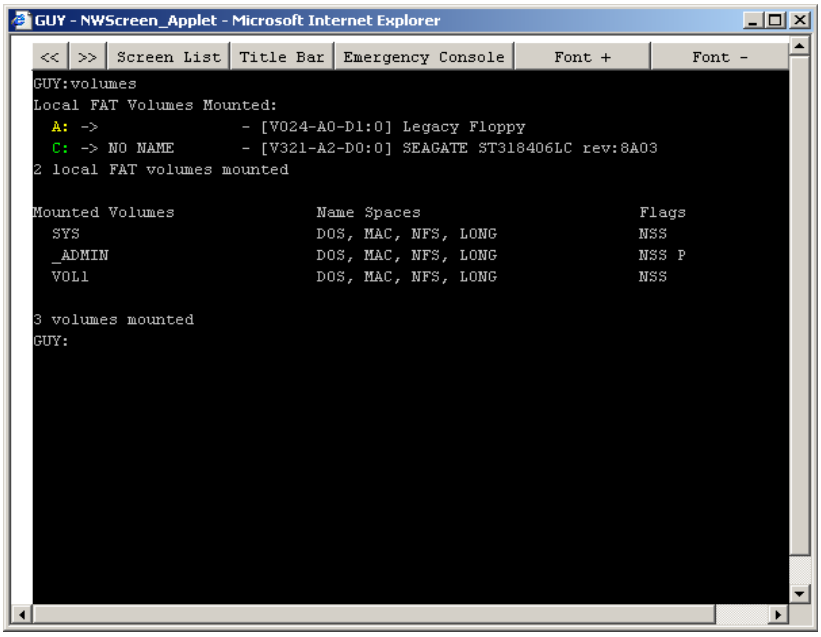

Figure 3.35 Verifying Mounted Volume

3.4 Verifying Client Access

The last step in new device configuration is to verify that the NetWare® clients can access the new volumes. To verify this access, complete the following steps:

1. From a Windows® workstation running Novell® client software, logon to the NetWare® server. Select Novell® **Map Network drive** by right clicking the **N** on the bottom right toolbar and walk the tree to the desired volume. Add additional Novell® Map drives as required.
2. Copy an existing file onto each new volume.
3. Verify that the file was copied successfully. If not, see Chapter 5 for troubleshooting instructions.

Chapter 4 Configuring Novell's NSS Advanced Features

4.1 Overview of Novell's Multi-Path Feature

Novell's Multi-Path is a fault tolerance high-availability storage solution that supports multiple, redundant I/O paths between its server and its external storage devices. This feature is only available if you have multiple interconnect paths available in your server-to-storage configuration. This NSS Multi-Path feature allows you to dynamically manage paths based on priorities. A single path acts as a primary (active path), while the other paths act as failover paths. Novell® ***only*** supports Active/Passive Multi-path Configuration, and does not support load balancing at this time.

Multi-Path is also supported under Novell® cluster services. This feature can be active even NetWare® cluster services is installed. Novell® Multi-Path feature is supported in fibre channel environments. For automatic path recovery, please see section 4.4.

Notes:

- Novell® does not support load balancing at this time.
- If a path becomes unavailable, ensure that path is physically restored and then issue the **`scan for new devices`** and **`scan all LUNs`**, commands on the console screen to restore path.

Path priority may be set if needed. It is not required, however, to set path priorities. Novell® defaults are typically fine for most installations. Path priority for both paths are set to 0 (See figure 4.5). In this example, both paths have the same priorities. Novell® sets the active path by the first adapter or slot number that loads the HBA driver.

Setting path priorities requires that the SAN engineer has extensive knowledge of Novell's NetWare® Multi-path capabilities. For further information, please refer to the Novell® document, *Novell® Storage Services Administration Guide for NetWare® 6.5.* Click **Select**, and then **Using Multiple I/O Paths for fault Tolerance**, for further information:

http://www.novell.com/documentation/nw65/index.html?page=/documentation/nw65/nss_enu/data/hn0r5fzo.html#bktitle

4.2 Configuration Requirements for Multi-Path

Note: Novell® supports Multi-Path natively on the following Support Packs: NetWare® v5.1 SP8, NetWare® v6.0 SP5, and NetWare® v6.5 SP3 and above.

Install at least two fibre channel HBAs in a server interconnected to the same set of LUNs. The fibre channel type can either be arbitrated-loop or fabric point-to-point. The same LUNs typically would be programmed on 2 difference ports on 2 different controllers of the AMS and WMS subsystem (***for example:*** 0A and 1A; 0B and 1B).

QLogic® QL2300.Ham Novell® drivers must include the following parameters in order for Novell®'s Multi-Path operate correctly. Typically, these settings can be set upon initial installation of QLogic's Novell® drivers as in the example `Load QL2300.Ham /Luns /Portnames /AllPaths`. These options are basically turning off QLogic's feature set so that Novell®'s Multi-Path can work properly. For further information, please refer to QLogic's README.TXT file.

Note: Add /PORTNAMES /ALLPATHS to the QLogic® driver. During initial installation, these option's defaults are set to **No**. Set both options to **Yes** to disable QLogic's multi-path features so that Novell®'s Multi-Path feature will operate.

For Emulex® LPFC: Emulex's Novell® HAM drivers have a few parameters that must be activated. During installation, activate the following: **Activate multi-lun support:** No (Default) Select **YES**. **Number of Luns per device:** (this appears after selecting **Yes** to the previous question) enter **16** or the number of luns assigned to ports. Select a higher number if more than 8 LUNs are assigned to a Hitachi storage port. Accept all other defaults (***for example:*** Load LPFC.Ham /Luns /Max_luns=16 /RCSNZONE=1).

Notes*:*

- For NetWare v5.1 Sp8, NetWare v6.0 Sp5, and NetWare v6.5 Sp3, use the latest SCSIHD.CDM v3.03 or above for full support on Multi-Path.
- For NetWare v6.0 SP5 multi-path support, Novell Patch **mm60SP5.EXE** must be installed (refer to Novell's TID 2972597).

4.3 Activating NetWare's Multi-Path Feature

Activating NetWare's Multi-Path feature involves changing the server's set parameters. These parameters are selected from within Novell's "**monitor**" application on the server's console screen. These procedures are valid on all versions of NetWare® running the latest server packs. To activate Multi-Path, complete the following steps:

1. Verify that both paths are active by typing, **`List storage adapters`** on the server's console screen, as shown in Figure 4.1.
2. On the server's console screen, type `Monitor` (Load Monitor is no longer required)(see Figure 4.2).
3. Select **Set Server Parameters** under available options.
4. Select **Disk** under **Select a parameter category** (see Figure 4.3)
5. Scroll down to **Multi-Path Support OFF**. Default is OFF. Select **On** to activate feature (see Figure 4.4).

   Changes will take effect only after the server has been restarted.
6. After server reboot, verify that Multi-Path is activated by typing **`List failover devices`** (see Figure 4.5).

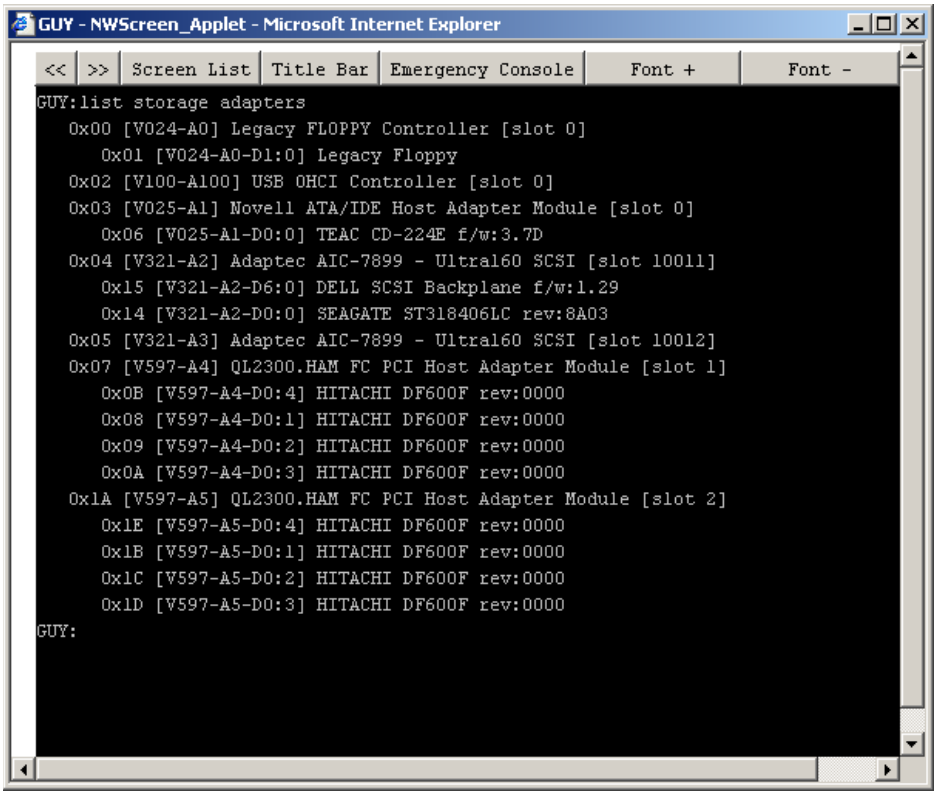

Figure 4.1 Verifying Both Paths are Active

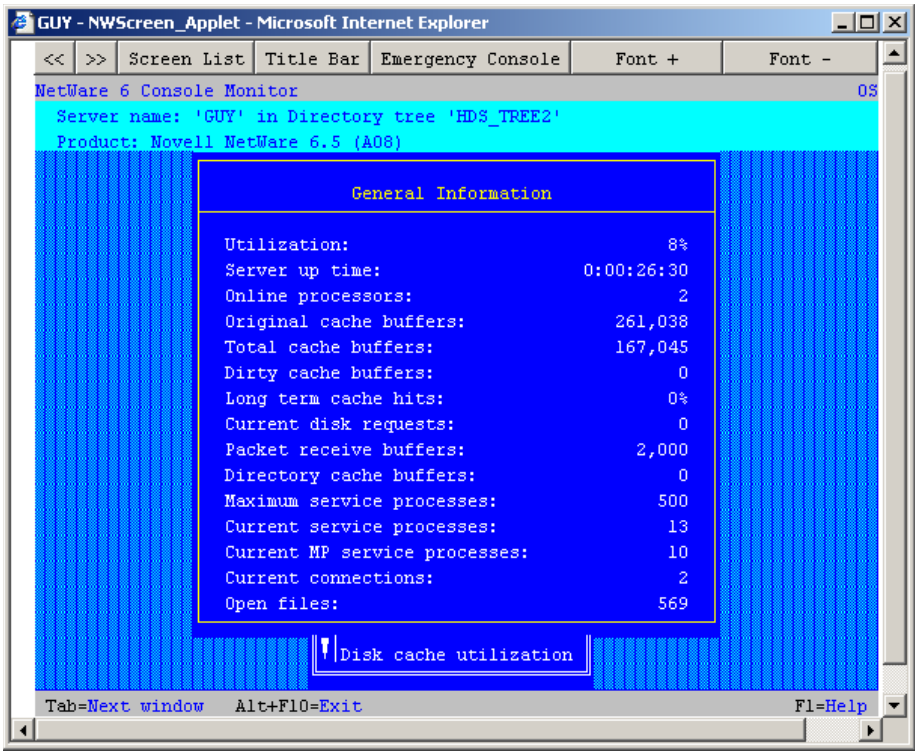

Figure 4.2 Load Monitor on Server Console Screen

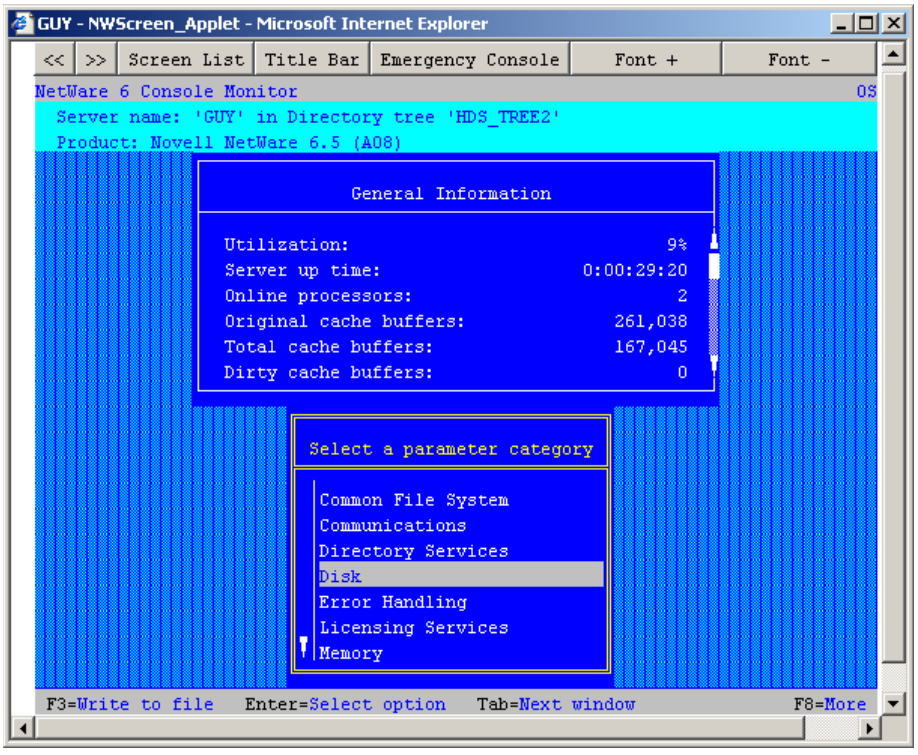

Figure 4.3 Selecting Disk under Parameter Category

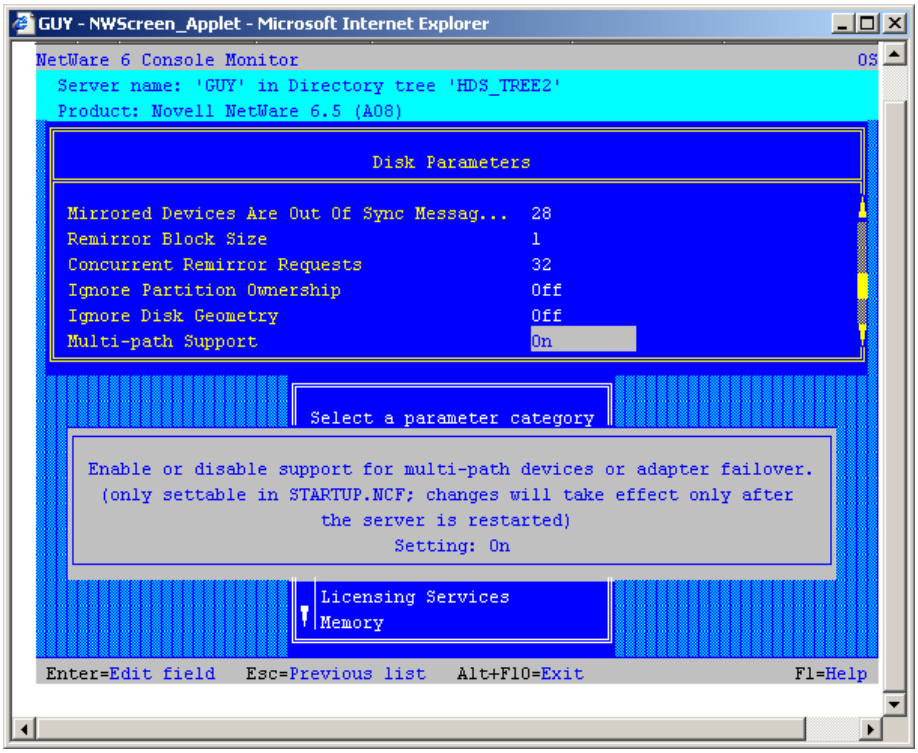

Figure 4.4 Selecting On under Disk Parameters to Activate Multi-Path

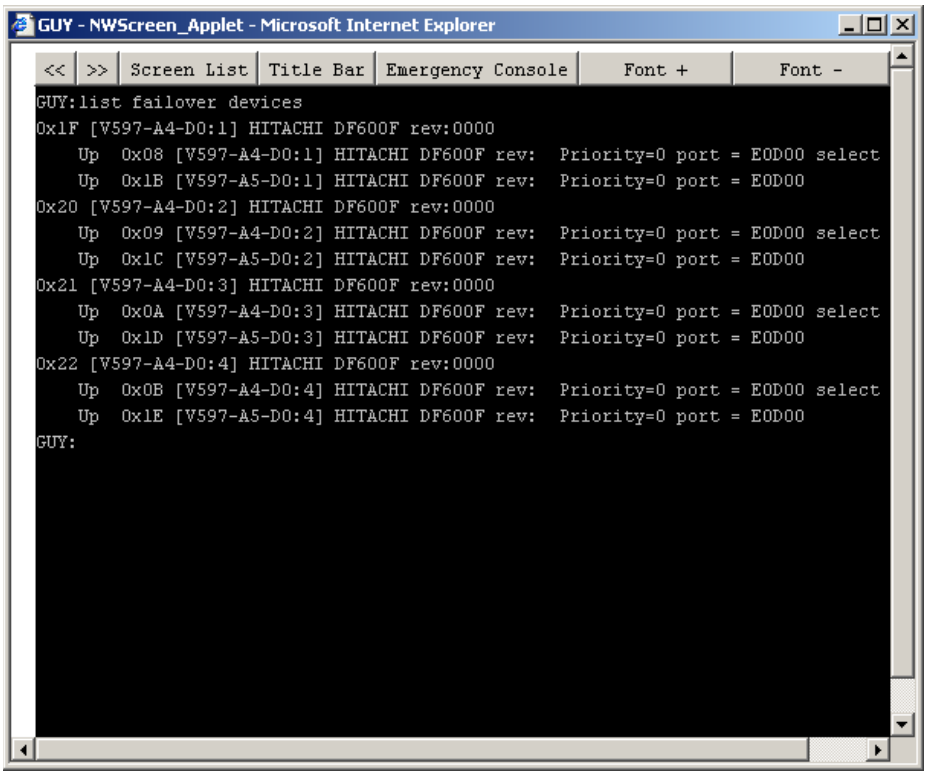

Figure 4.5 Verifying Multi-Path Activated

4.4 Activating NetWare's Automatic Path Recovery Feature

Novell® supports Asynchronous Event Notification (AEN) on the latest Support packs for NetWare®. NetWare® v5.1 (SP8), NetWare® v6.0 (SP5), NetWare® v6.5 (SP3) and above supports this feature. Basically, when a fibre event occurs, Ham (HBA Drivers) drivers automatically, report the loss of a LUN or the discovery of a new one even without active I/O. In effect, "scans for new devices" and "scan all LUNs." In the case for Multi-Path, any changes in the SAN environment will cause NetWare's media manager to issues these commands.

For example, in a multi-path environment, failover occurs from 1st path to the 2nd path due to fibre failure on Path 1. The 2nd path becomes the active path. When 1st path becomes available again, I/O is automatically redirect to 1st path. In effect, Path 1 again is the active path. This feature is called **Automatic Path Recovery**. This feature is useful if 1st path is the preferred path in your SAN environment.

To activate this feature, the following command line option must be added to the SCSIHD.CDM module: `Load SCSIHDS.CDM /AEN`.

Notes:

- This feature is officially supported natively on the following Novell® Support Packs: NetWare® v5.1 SP8, NetWare® v6.0 Sp5, and NetWare® v6.5 Sp3 and above.
- For NetWare v6.5 SP4a and above, asynchronous event notification (AEN) is **ON** by default.
- Check HiFIRE for the latest /AEN support of NetWare® versions for the AMS and WMS subsystem.

This switch can also be added during installation by completing the following steps:

1. Select **Modify**.
2. Under **Modify driver properties**, select **SCSIHD**.
3. Under SCSIHD properties, activate **Asynchronous event notification:off**.
4. Press **Enter** to select ON.

Novell's definition of /AEN (Asynchronous Event Notification*)* states "This driver will request immediate notification of device disappeared or device appeared. This is intended for hardware technology such as FC."

Note: This feature may not be appropriate in all SAN configurations since there may be times when only failover is appropriate. If it is not appropriate, failures on the primary path may continue and create endless failover/fallback situations until the actual failure in the primary path (select) is addressed.

Chapter 5 Troubleshooting

5.1 Troubleshooting

Table 5.1 lists potential error conditions during AMS and WMS subsystem Novell® NetWare® configuration and provides instructions for resolving each condition. If you are unable to resolve an error condition, please contact your Hitachi Data Systems representative or VAR for help, or call the Hitachi Data Systems Support Center for assistance.

Table 5.1 Troubleshooting

Error Condition	Recommended Action
The devices are not recognized by the system.	Make sure that the READY indicator lights on the AMS and WMS subsystem subsystem are ON. Make sure that the fibre-channel cables are correctly installed and firmly connected. Make sure that the fibre-channel adapter board(s) and driver(s) are properly installed.
The system hangs.	Verify the hardware configuration of the NetWare® server. For example, you may need to install the Ethernet network card into slot 9 in order for NetWare® to function properly on the HP® Netserver platform. Check your hardware platform for similar restrictions. Avoid sharing interrupts between cards (shared interrupts can be problematic). If interrupt sharing is required, then it should be done between cards of similar type (e.g., between several fibre host adapter cards). If problems persist, the user can also try: (1) Simplifying the firmware settings (e.g., disable disconnects) and/or the driver LOAD command parameters (e.g., disable multiple LUN support or tagged queuing), or (2) Loading a different version of the driver.

5.2 Calling the Support Center

If you need to call the Hitachi Data Systems Support Center, make sure to provide as much information about the problem as possible, including the circumstances surrounding the error or failure and the exact content of any error messages displayed on the host system(s).

The worldwide Hitachi Data Systems Support Centers are:

- Hitachi Data Systems North America/Latin America
  San Diego, California, USA
  1-800-446-0744
- Hitachi Data Systems Europe
  Contact Hitachi Data Systems Local Support
- Hitachi Data Systems Asia Pacific
  North Ryde, Australia
  011-61-2-9325-3300

Appendix A Acronyms and Abbreviations

AEN	asynchronous event notification
AL	arbitrated loop
AL-PA	arbitrated loop physical address
CU	control unit
FC	fibre-channel
FCA	fibre-channel adapter
HBA	host bus adapter
LU	logical unit
LUN	logical unit, logical unit number
NSS	Novell® Storage Services
OFC	open fibre control
PA	physical address
PC	personal computer system
RAID	redundant array of independent disks
SCSI	small computer system interface
TID	target ID