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Prepared by:
Network Storage Solutions
Hewlett Packard Company

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DtS Data Migration to the MSA1000 – NetWare Environments

***Abstract:** This white paper outlines step-by-step procedures for data migration from Direct Attach Storage on Smart Array Controllers, RA4100, and RA4100 Clusters to the MSA1000.*

DtS Architecture Data Migration

Direct Attach Storage (DAS) to SAN (DtS) architecture is an exclusive Hewlett Packard feature that provides a quick and easy way to migrate stored data protected by Smart Array and RA 4100 controllers to a StorageWorks MSA1000 storage system.

Data stored on one-inch universal disk drives (Ultra2 and Ultra3) using newer Smart Array controllers and data stored on RA4100 storage systems can be migrated to the StorageWorks MSA1000. Following a step-wise procedure, you simply remove the drives from the older systems and insert them into the MSA1000. Existing data, RAID sets, and configuration information will remain intact allowing data migration to be completed in minutes, not hours.

Key features and benefits of DtS architecture include:

- Instant consolidation of DAS into a SAN environment
- DtS creates an upgrade path from Smart Array and RA4100 controlled drives and data to a SAN environment
- Simple redeployment of DAS to SAN environment for growth management and capacity utilization
- Supports up to 42 drives and 32 volumes

HP Array Controllers that support DtS are:

Smart Array 3100ES
Smart Array 3200
Smart Array 4200
Smart Array 4250ES
Smart Array 431
Smart Array 5i
Smart Array 532
Smart Array 5312
Smart Array 5300
RA 4100 Controllers

Notice

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Migrating Data from Smart Array controllers, RA4100, and RA4100 Clusters

The following steps illustrate the migration from direct attached storage to the Hewlett Packard StorageWorks MSA1000 – all controlled by the same Host server.

IMPORTANT: It is recommended that you record the current configuration of all arrays and note which drives are part of each array prior to performing the migration. If you need to fall back to your former configuration, you will be required to re-enter all array and volume information.

Installation Notes and Prerequisites:

Hardware: As the HP FCA2210 HBA is an industry standard PCI adapter; it should work in all PCI compliant slots, regardless of server vendor. During the qualification and testing phase for both the Hewlett Packard FCA2210 HBA and the HP Modular SAN Array 1000, several vendor hardware platforms were tested - including server models from IBM, and Dell. Refer to the compatibility matrix for more details on multi-vendor x86 platform support.

Software: Minimum Operating System levels for the host computers are: Novell NetWare 5.1 with service pack 5 and Novell NetWare 6.0 with service pack 2.

Refer to the Appendix for more detailed information on Migration Prerequisites and Migrations Limitations.

Migration Steps from a Smart Array Controller or RA4100 to the MSA1000:

These steps will cover migrating **Data drives only** from a Smart Array controller or RA4100 to the MSA1000. These steps will also apply to migrating an RA4100 NetWare cluster to the MSA1000. Notes are placed in the steps below where applicable for clusters. Smart Array controlled Boot drive migrations will be covered in the next section.

1. Back up and verify all data on the drives to be migrated to tape or disk.
2. Note and record the current configuration of all arrays/volumes and record which drives are part of which array. This can be done in Array Controller Utility (ACU) by highlighting one of the arrays/volumes and recording the drive positions in the chassis (Note: ACU will flash the lights of a full array, a volume, or an individual drives depending on which item is selected in the GUI interface, making it easier to record the information).
3. If Secure Path 3.0b for NetWare is installed, this software must be removed. After a successful migration, Secure Path can be re-installed, but **ONLY** the new version (currently Secure Path 3.0c for NetWare) is supported with the MSA1000.
4. Down the server that has the Smart Array or RA4100 storage that is to be migrated.
(NOTE: If bringing down a cluster, perform the prescribed procedure for downing a NetWare cluster).

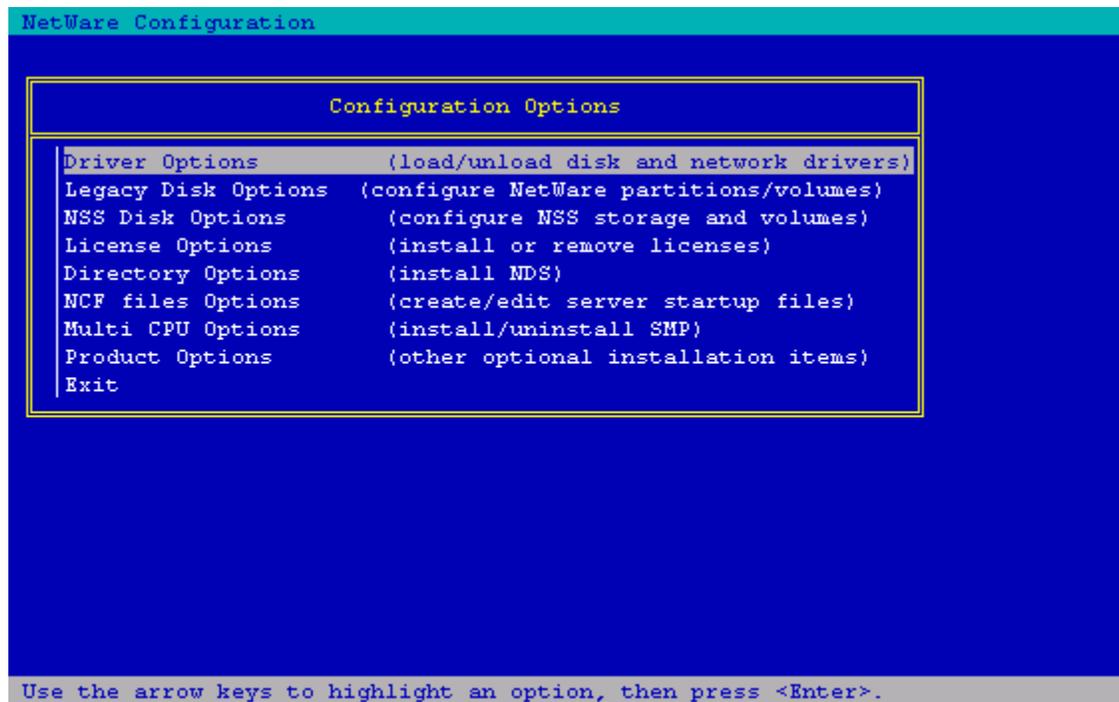
5. Install the FCA2210 HBA in a server slot and attach the fiber optic interconnect component for appropriate communication to the MSA1000. Interconnect drawings are shown on the *StorageWorks Modular SAN Array 1000 Installation Overview* poster that was shipped with the MSA1000. Ensure that all interconnect components are in place for proper communication from the FCA2210 to the MSA1000.

(NOTE: For clusters, steps 5-20 will have to be carried out for each server in the cluster).

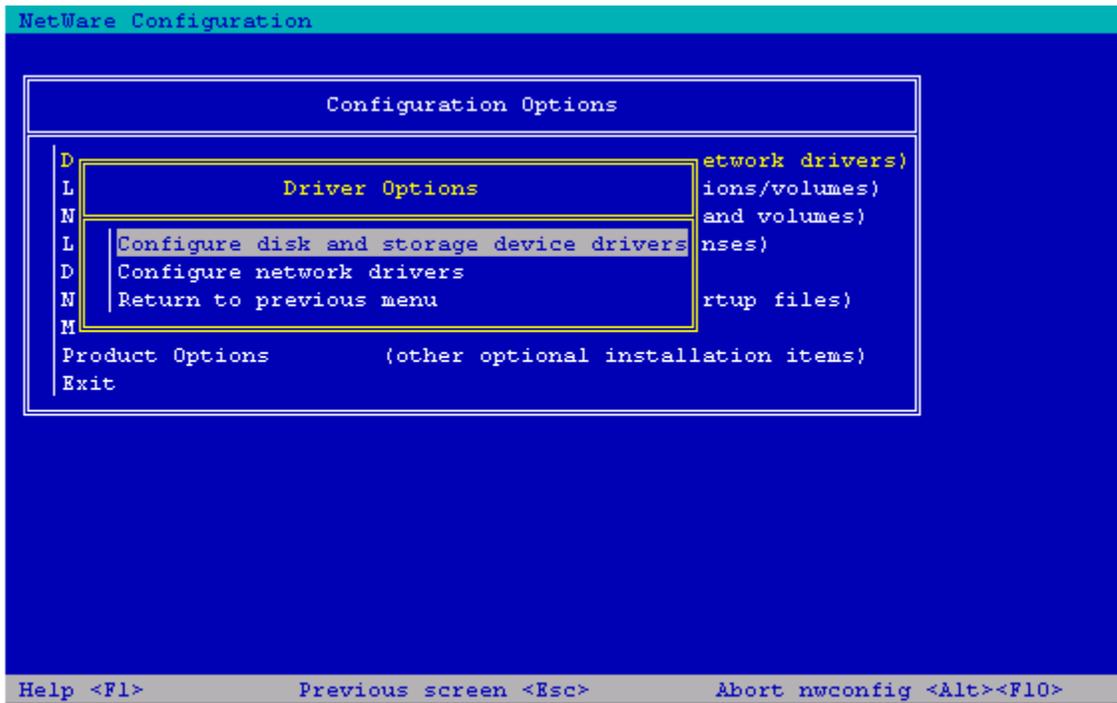
6. Power on your server and run the server vendor's BIOS setup utility. Use the BIOS setup utility to perform the vendor-specific tasks required to install the adapter (if applicable). Save the configuration, and perform a reboot of the server.
7. On reboot, let the server load the NetWare operating system. Mount the MSA1000 Support Software CD for NetWare / Linux (for HBA drivers).
8. To install the NetWare drivers for the HBA, load the NetWare program NWCONFIG:

```
TEST1:load NWCONFIG_
```

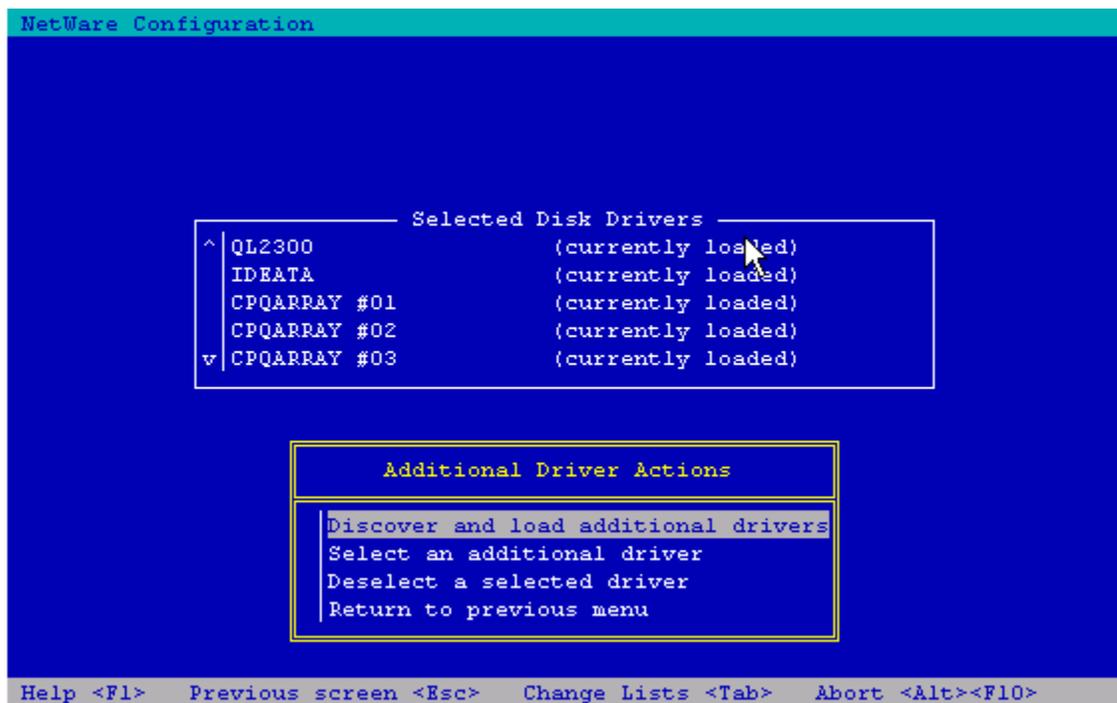
9. Select "Driver options" from the main menu.



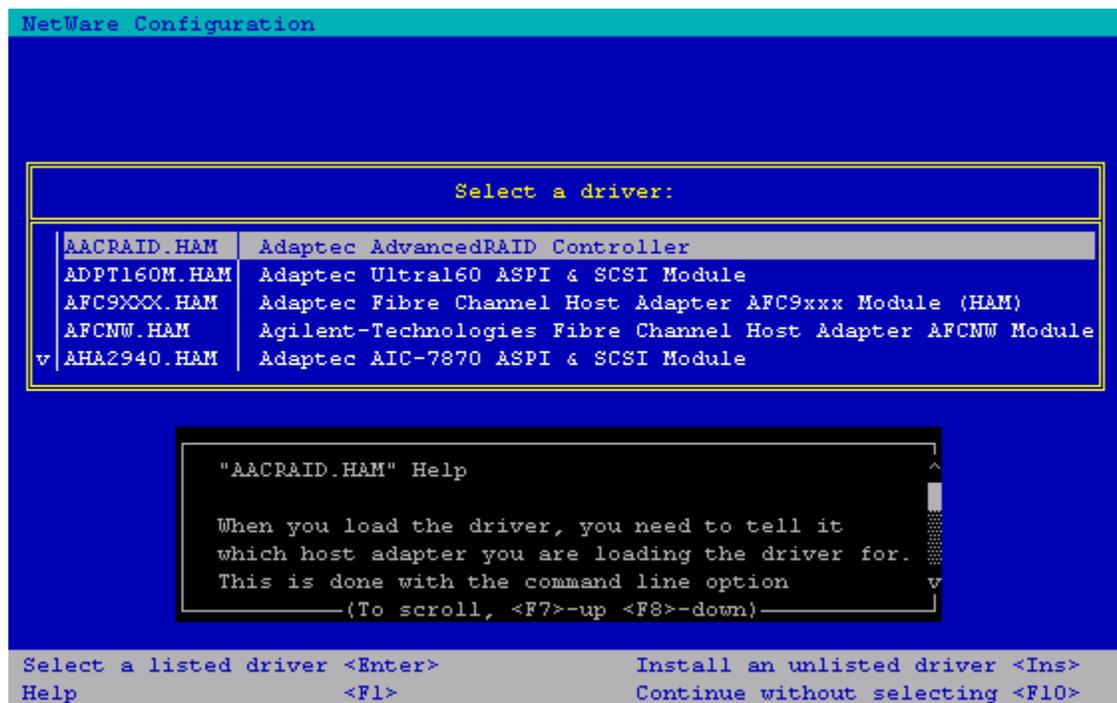
10. Select "Configure disk and storage device drivers".



11. Select "Select an additional driver".

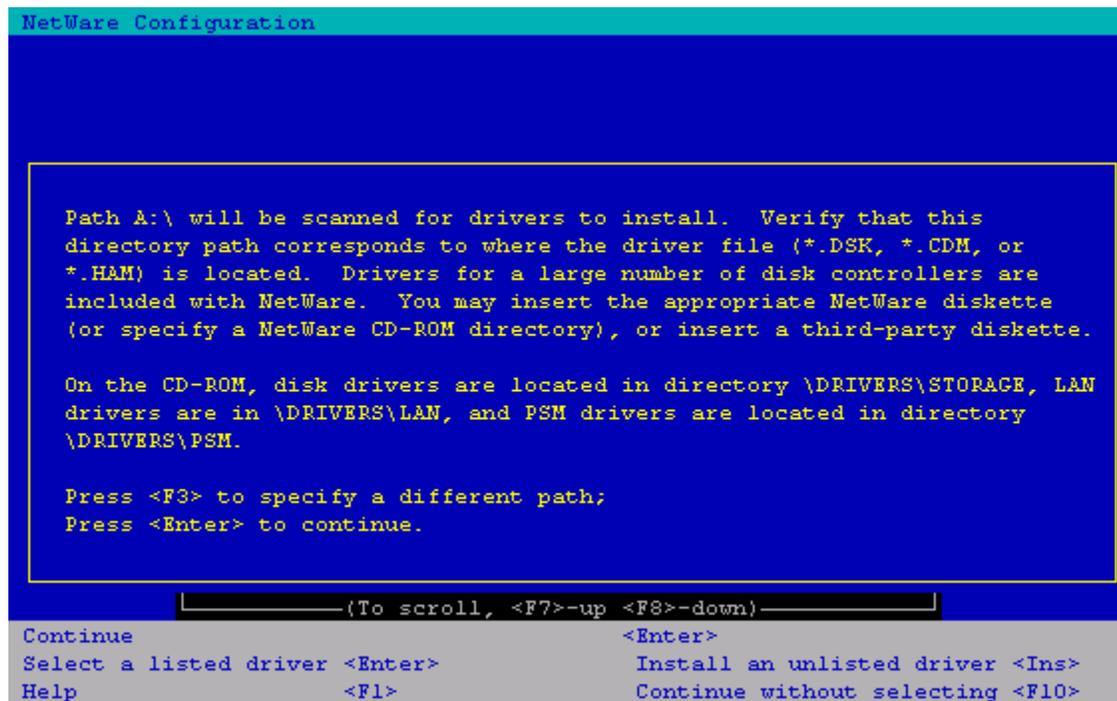


12. Press <Insert> to install an unlisted driver.

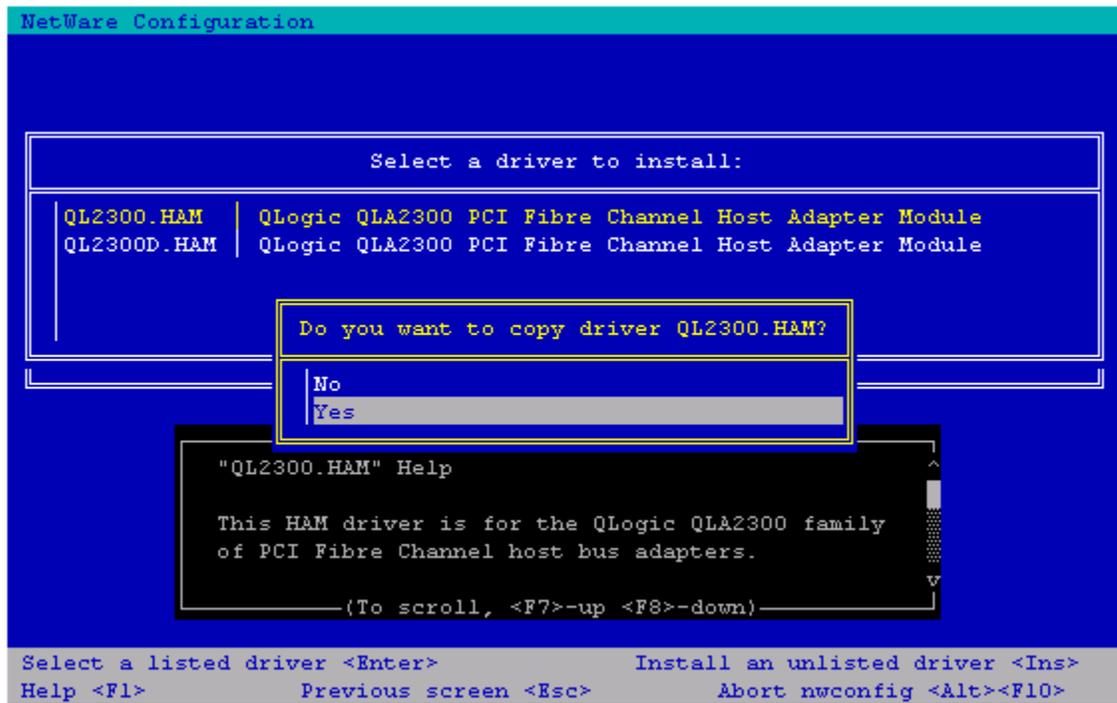


13. Press <F3> to specify the path to the HAM driver. The path to specify is
HPSSCD100:\HBA\NetWare\drivers

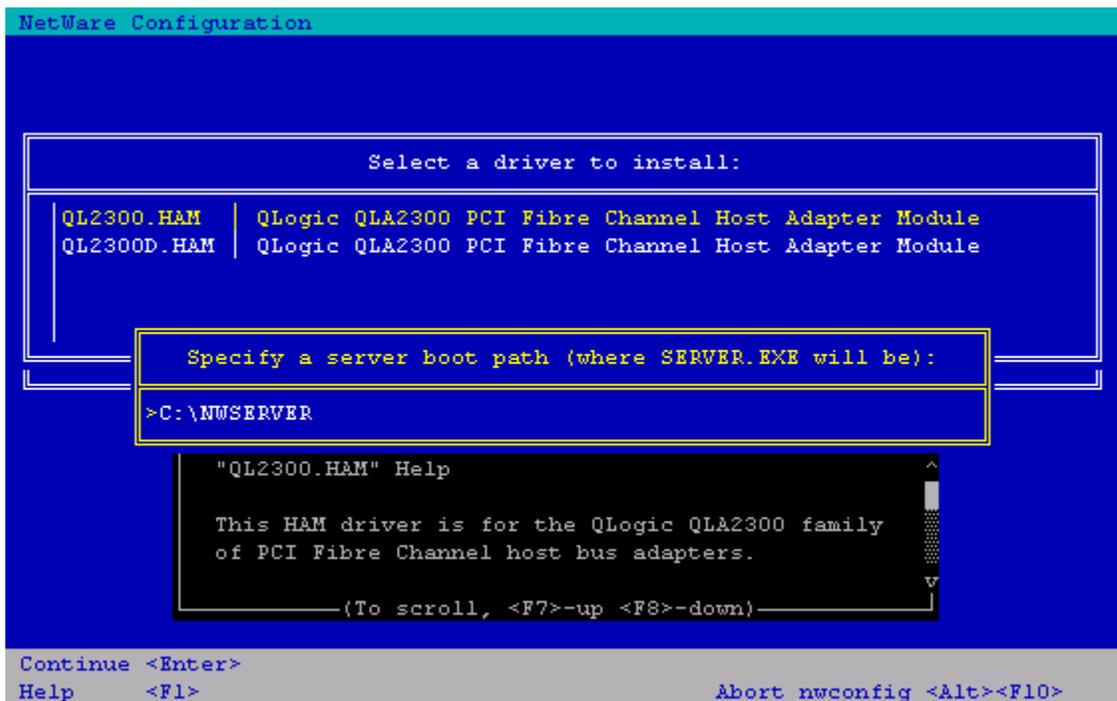
(HPSSCD100 is the volume name of the MSA1000 Support Software CD for NetWare / Linux)



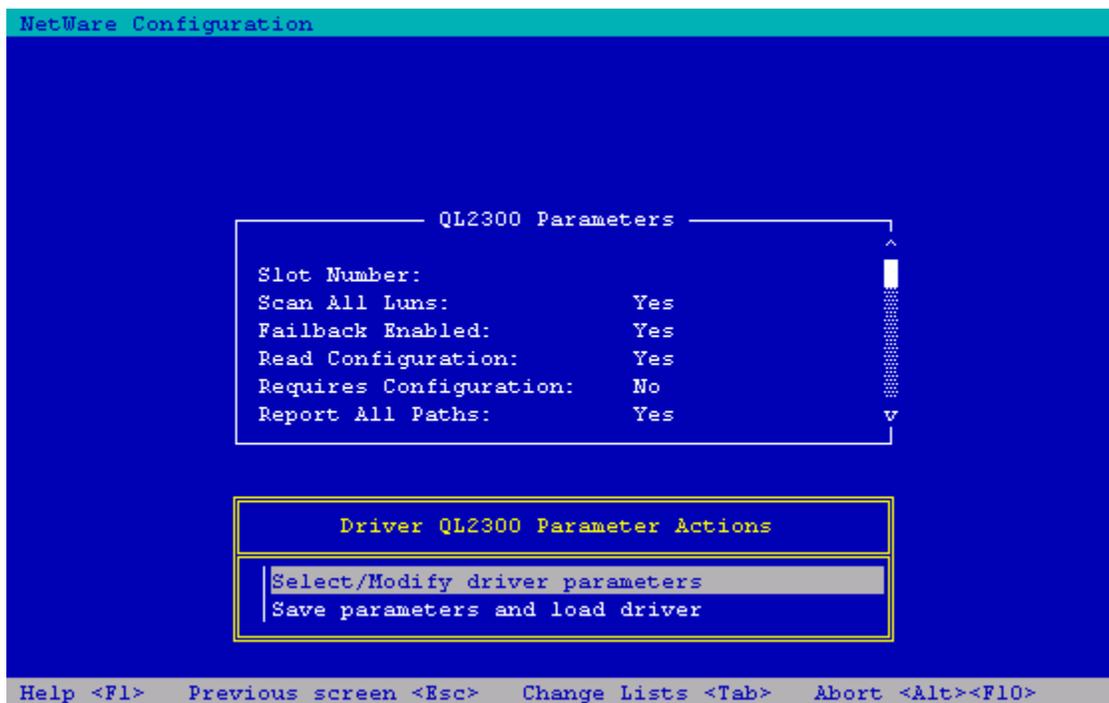
14. Press <Enter> to select the QLogic HAM driver and select "Yes" to copy the driver from the CD to the server directory (for both the .HAM and .DDI file)



15. Specify the path where you want the drivers to be copied to.



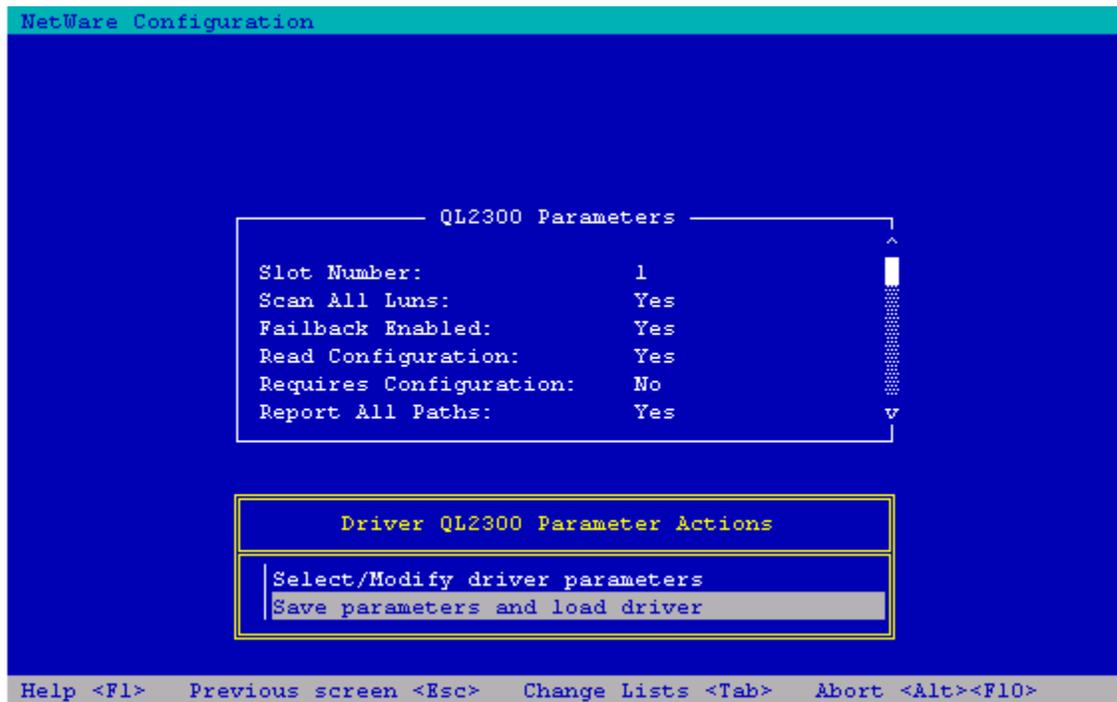
16. Choose “Select/Modify driver parameters”, and press Enter.



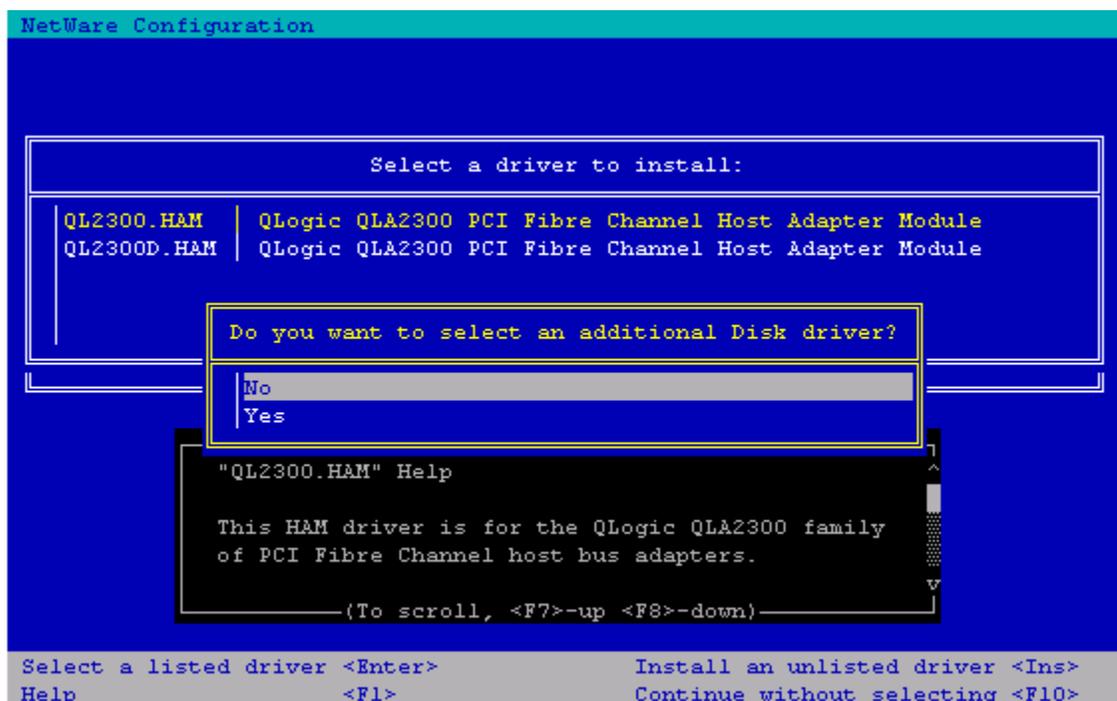
17. Add the slot number (this corresponds to the numbered PCI slot that the HBA was installed in).



18. Press Escape, select “Save parameters and load driver”



19. When asked, “Do you want to select an additional Disk driver?”, select “No” and press Enter.



20. Exit from the NWCONFIG utility, down the NetWare server, and then power it off.
21. Migrate the drives from the Smart Array controller or RA4100 to the MSA1000. It is important to note that **all drives** controlled by the Smart Array controller or RA4100 must be migrated to the MSA1000. Drive order is not important although it is recommended that drives be moved to the same bay position in the new unit. Note and record the locations of the drives and their corresponding arrays in case that information is needed for later use.
22. Make sure all drives are fully seated in the MSA1000 and power it on. When the startup process of the MSA1000 is complete, the following message displays:
“01 COMPAQ MSA1000 STARTUP COMPLETE”
23. Scroll back through the messages on the MSA1000 display and verify that the number of volumes (arrays) you intended to migrate is detected. This can be verified by the message:
“120 Configured Volumes: X” (where X is the number of volumes migrated/detected)
24. After the MSA1000 reports the correct number of migrated volumes, power on your NetWare server and let it load the operating system.

(NOTE: In a cluster, bring up the primary server first. Once this NetWare server can access the volumes correctly, bring up the remaining servers in the cluster).
25. After the server loads, check to ensure that all the NetWare volumes migrated

At the server prompt, type:

VOLUME – this will display the volumes that are mounted

LIST STORAGE ADAPTERS – this will display a list of registered storage adapters and the devices they drive

All drives previously controlled by the Smart Array or RA4100 controller are now being controlled by the MSA1000.

Boot Drive Migration Steps (Smart Array controller to the MSA1000):

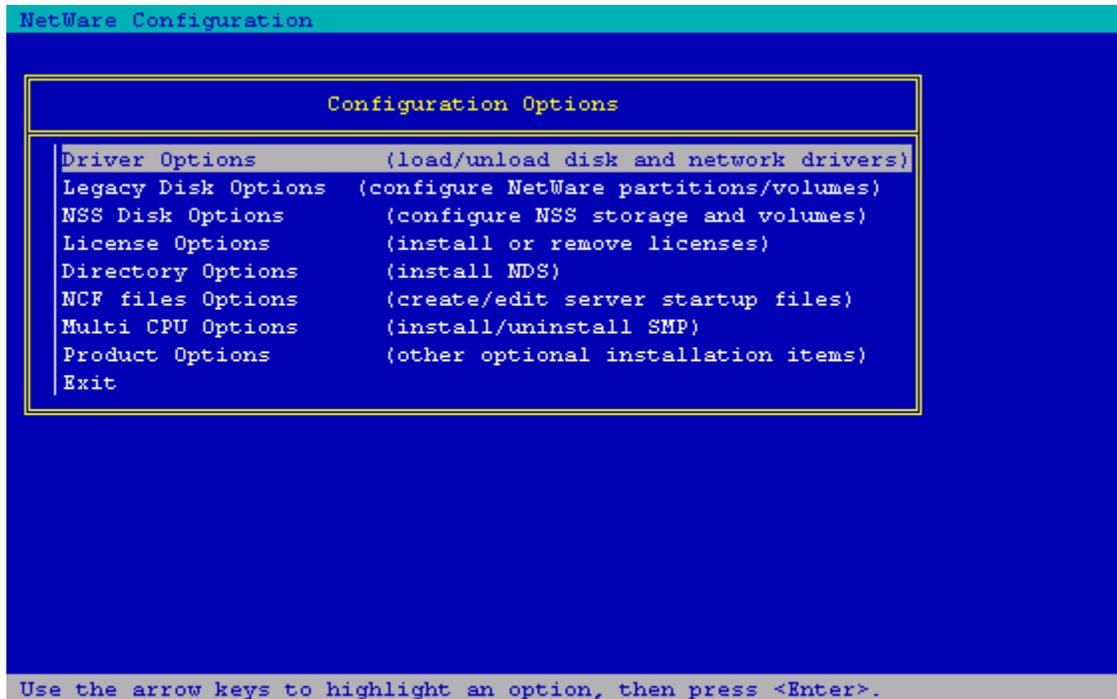
It is possible to also migrate NetWare boot drives to the MSA1000. While the MSA1000 supports external / SAN boot, please check with your Operating System vendor for any possible issues with an externally / SAN booted operating system.

The following steps assume that the MSA1000 you are migrating to is a new install, and currently does not support any volumes for other servers.

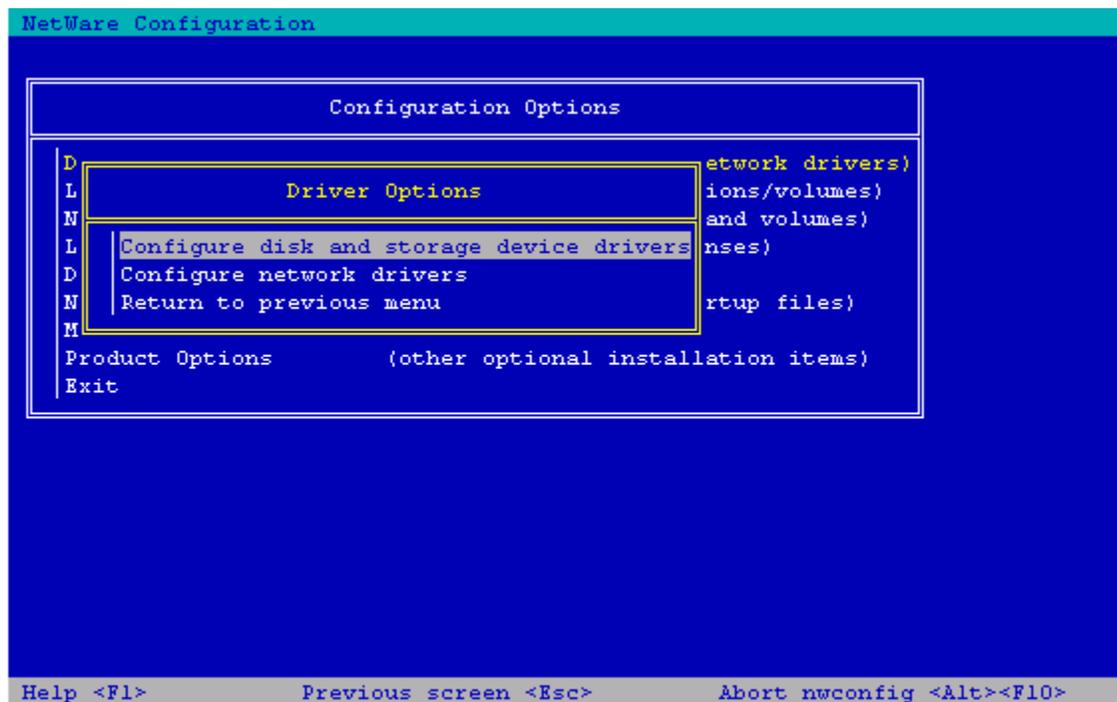
1. Back up and verify all data on the drives to be migrated to tape or disk.
2. Note and record the current configuration of all arrays/volumes and record which drives are part of which array. This can be done in Array Controller Utility (ACU) by highlighting one of the arrays/volumes and recording the drive positions in the chassis (Note: ACU will flash the lights of a full array, a volume, or an individual drives depending on which item is selected in the GUI interface, making it easier to record the information).
3. If Secure Path 3.0b for NetWare is installed, this software must be removed. After a successful migration, Secure Path can be re-installed, but **ONLY** the new version (currently Secure Path 3.0c for NetWare) is supported with the MSA1000.
4. Down the server that has the Smart Array storage that is to be migrated.
5. Install the FCA2210 HBA in a server slot and attach the fiber optic interconnect component for appropriate communication to the MSA1000. Interconnect drawings are shown on the *StorageWorks Modular SAN Array 1000 Installation Overview* poster which shipped with the equipment. Ensure that all interconnect components are in place for proper communication from the FCA2210 to the MSA1000.
6. Power on your server and run the server vendor's BIOS setup utility. Use the BIOS setup utility to perform the vendor-specific tasks required to install the adapter (if applicable). Save the configuration, and perform a reboot of the server.
7. Let the NetWare OS load, then install the HBA drivers.
8. To install the NetWare drivers for the HBA, load the NetWare program NWCONFIG:

```
TEST1:load NWCONFIG_
```

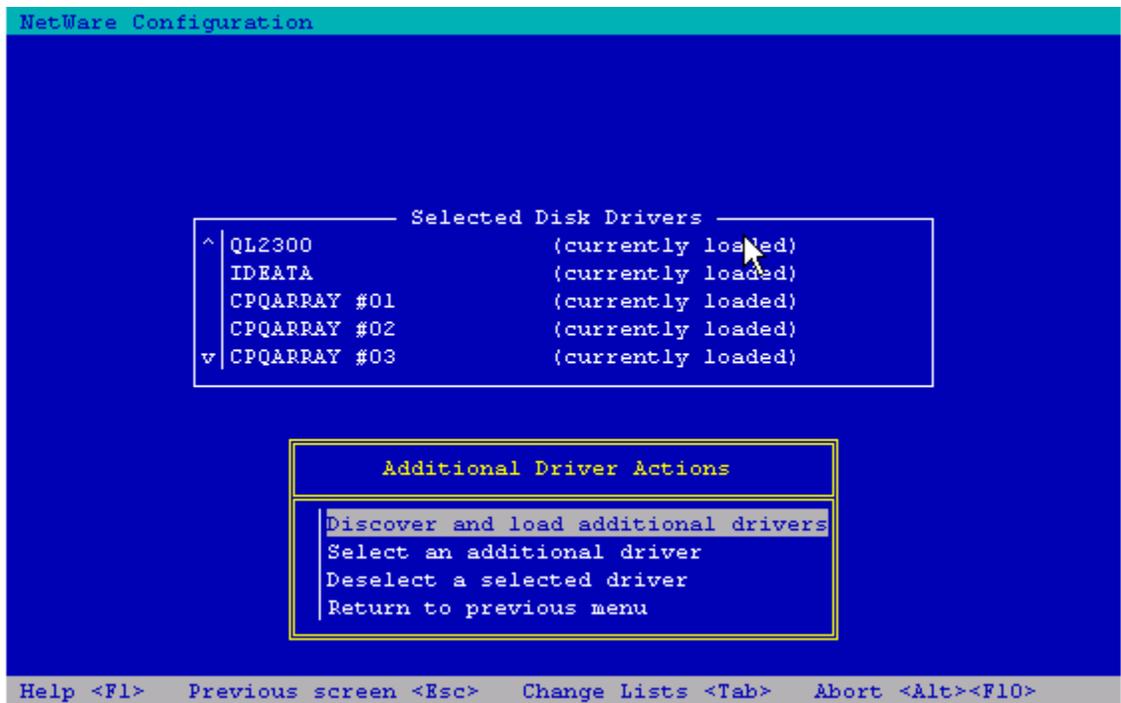
9. Select "Driver options" from the main menu.



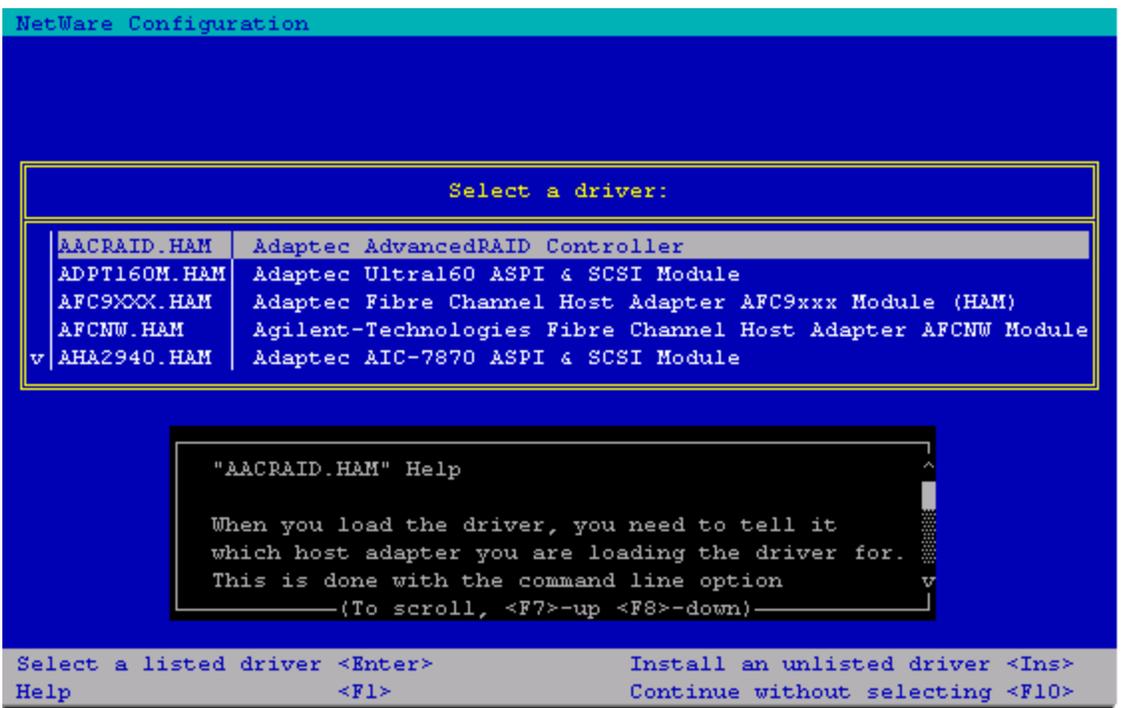
10. Select "Configure disk and storage device drivers".



11. Select "Select an additional driver".

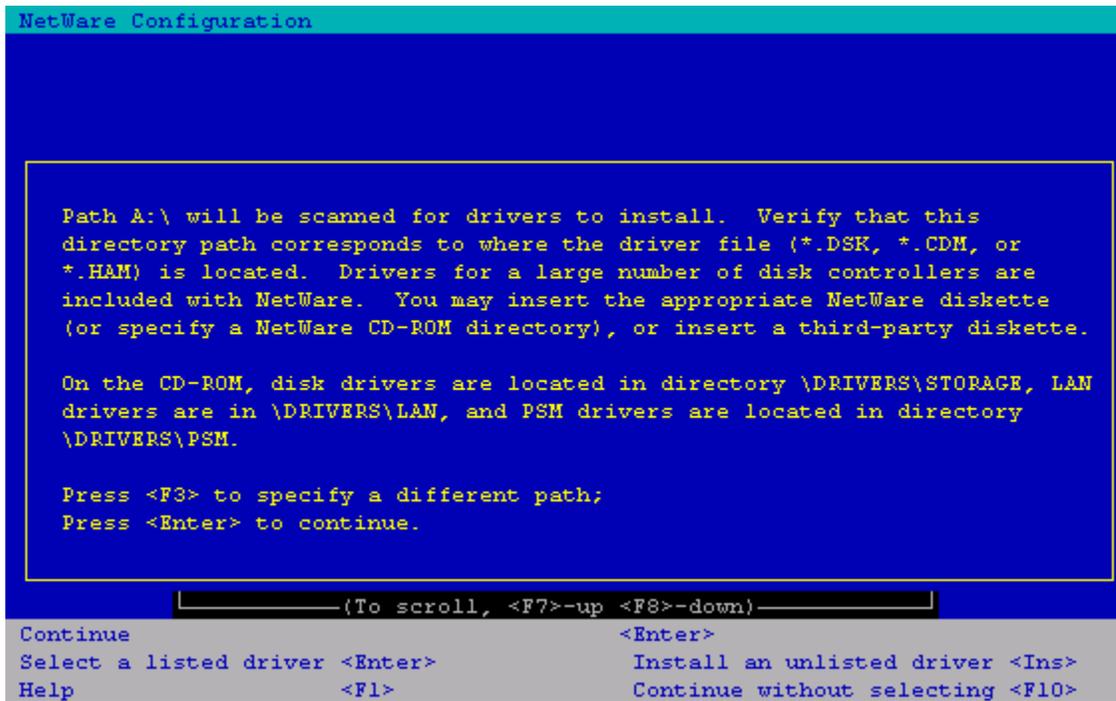


12. Press <Insert> to install an unlisted driver.

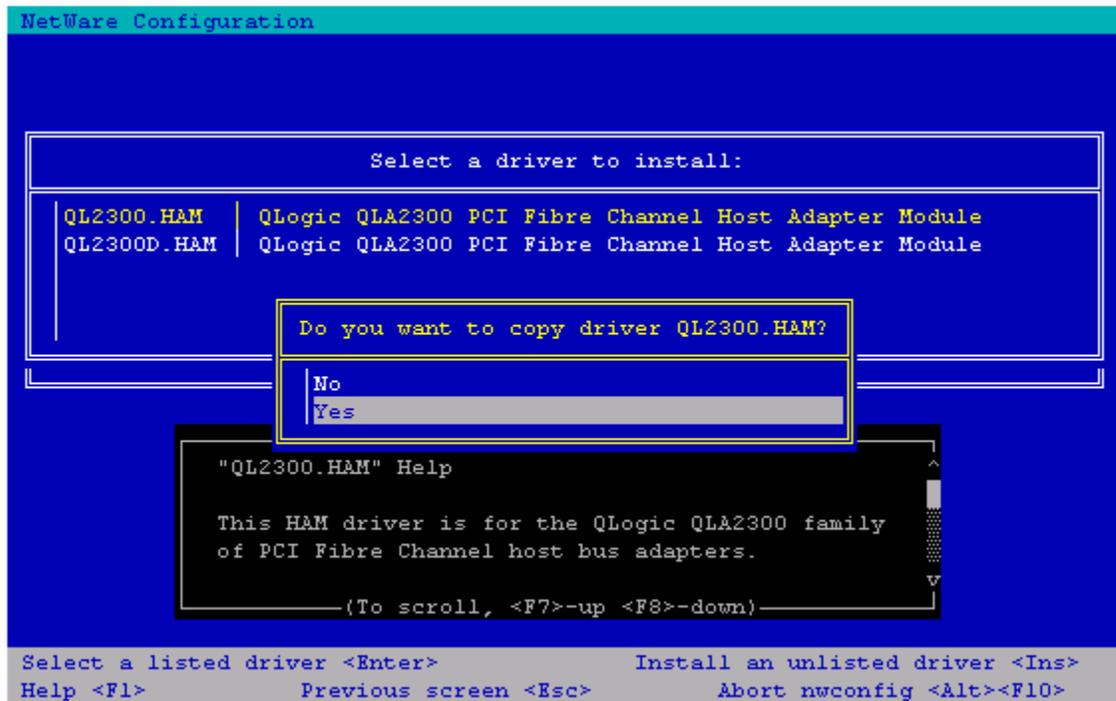


13. Press <F3> to specify the path to the HAM driver. The path to specify is HPSSCD100:\HBA\NetWare\drivers

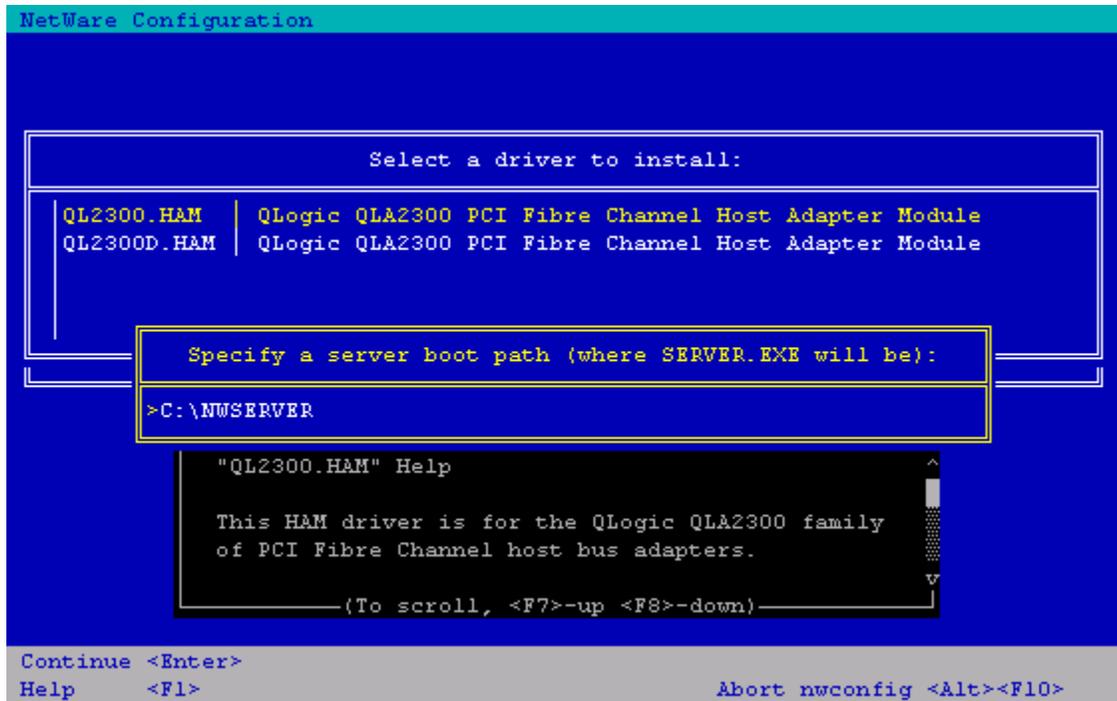
(HPSSCD100 is the volume name of the MSA1000 Support Software CD for NetWare / Linux)



14. Press <Enter> to select the QLogic HAM driver and select "Yes" to copy the driver from the CD to the server directory (for both the .HAM and .DDI file)



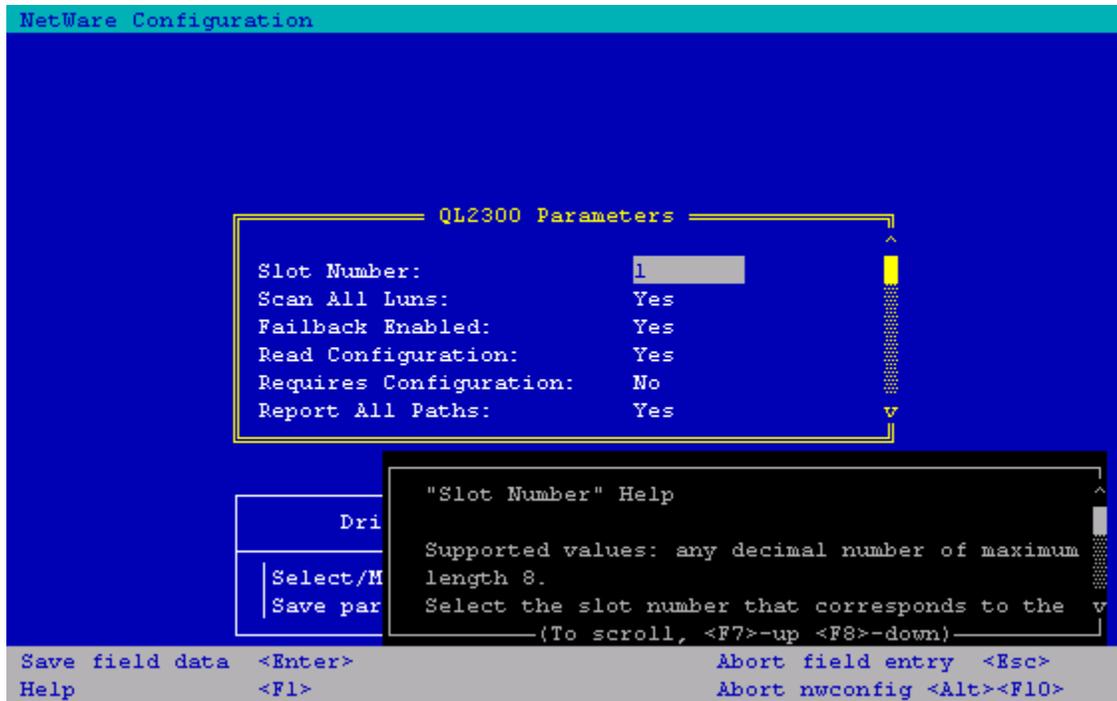
15. Specify the path where you want the drivers to be copied to.



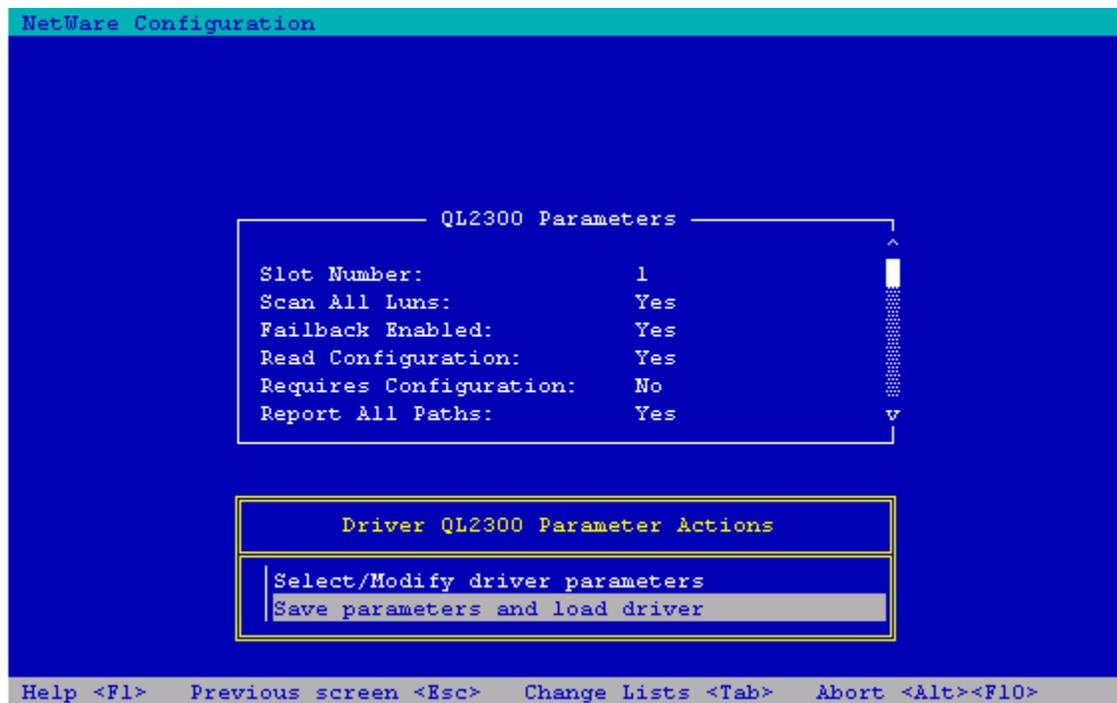
16. Choose “Select/Modify driver parameters”, and press Enter.



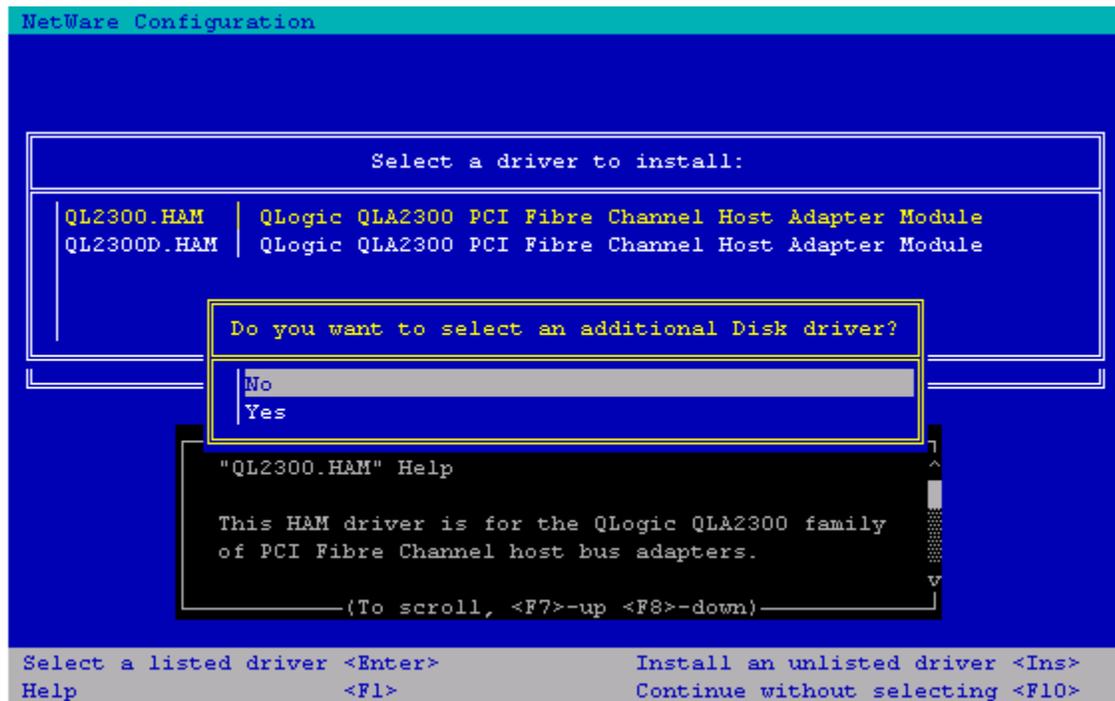
17. Add the slot number (this corresponds to the numbered PCI slot that the HBA was installed in).



18. Press Escape, select "Save parameters and load driver"



19. When asked, “Do you want to select an additional Disk driver?”, select “No” and press Enter.



20. Exit from the NWCONFIG utility, down the NetWare server, and perform a reboot.
21. As the server is rebooting, this screen will appear (press CTRL-Q to access the QLogic BIOS utility):

```

1152 MB Detected

COMPAQ System BIOS - P21 (08/03/2001)
Copyright 1982,2001 Compaq Computer Corporation. All rights reserved.

Processor 1 initialized at 1.0 GHz/133 MHz with 256 Kbyte Cache
Processor 2 initialized at 1.0 GHz/133 MHz with 256 Kbyte Cache

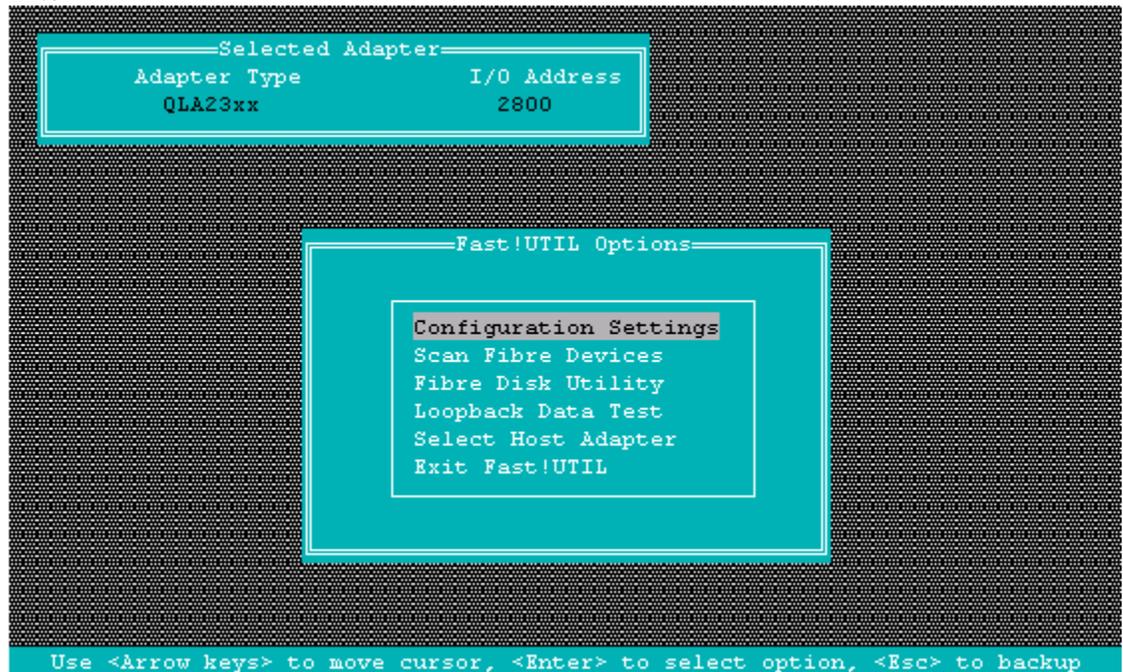
COMPAQ Integrated Smart Array Controller (ver 1.42)   0 Logical Drive(s)
1785-Slot 0 Drive Array Not Configured
      No Drives Detected

QLogic Corporation
QLA2312 PCI Fibre Channel ROM BIOS Version 1.29      Subsystem Vendor ID 0E11
Copyright (C) QLogic Corporation 1993-2002. All rights reserved.
www.qlogic.com

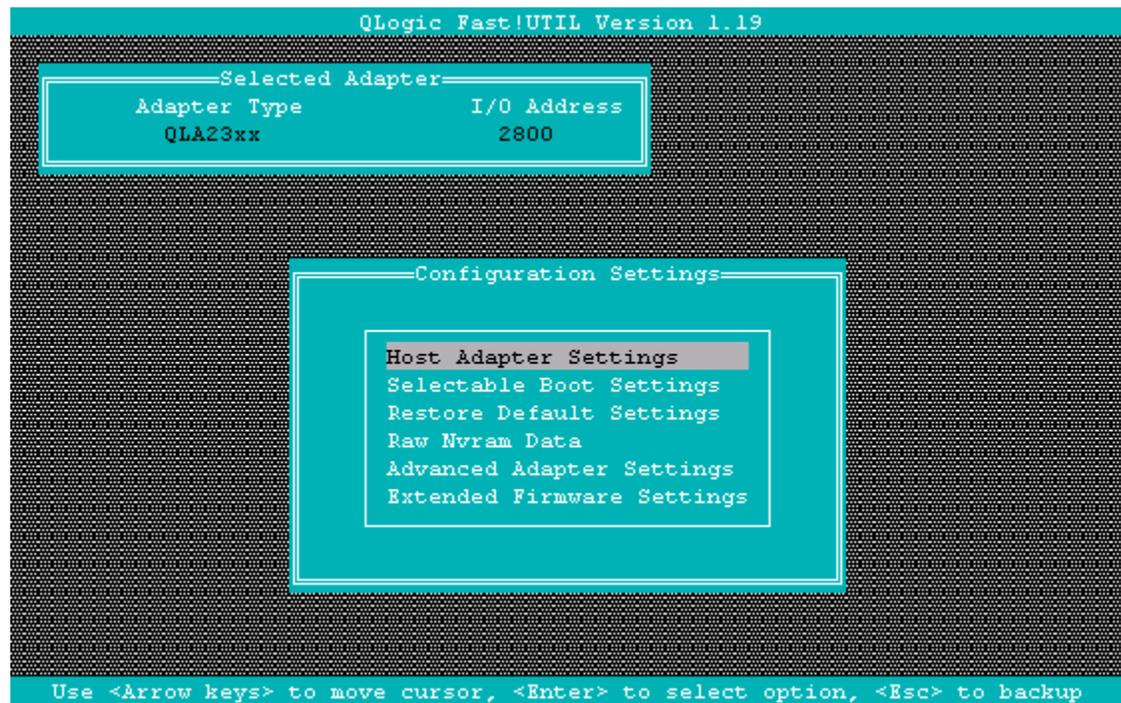
Press <CTRL-Q> for Fast!UTIL

```

22. At the QLogic main Menu, select Configuration Settings (default) and press Enter



23. Select the first option, Host Adapter Settings



24. By default, the Host Adapter BIOS is Disabled. Arrow down to Disabled, and press Enter to Enable.

```

-----Selected Adapter-----
Adapter Type      I/O Address
  QLA23xx         2800

-----Host Adapter Settings-----

BIOS Address:      CC000
BIOS Revision:     1.29
Adapter Serial Number: E40440
Interrupt Level:   3
Adapter Port Name: 210000E08B0678B8
Host Adapter BIOS: Disabled
Frame Size:        2048
Loop Reset Delay:  5
Adapter Hard Loop ID: Disabled
Hard Loop ID:      0
Spinup Delay:      Disabled

Use <Arrow keys> and <Enter> to change settings, <Esc> to exit

```

25. Once the BIOS is enabled, the options will look like this:

```

-----Selected Adapter-----
Adapter Type      I/O Address
  QLA23xx         2800

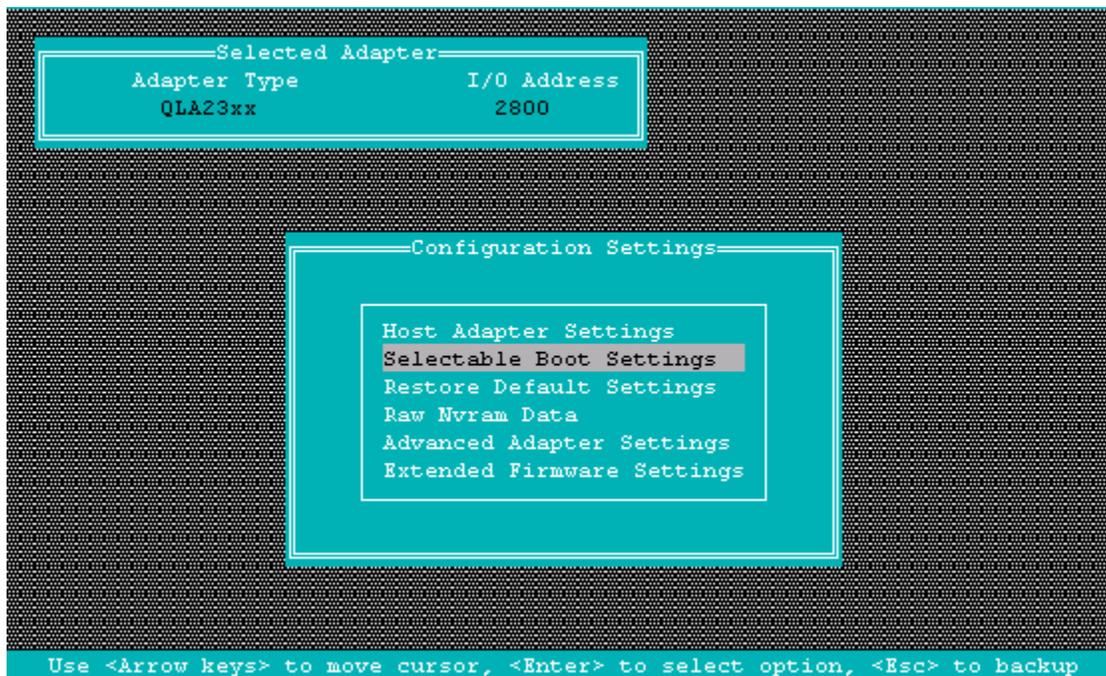
-----Host Adapter Settings-----

BIOS Address:      CC000
BIOS Revision:     1.29
Adapter Serial Number: E40440
Interrupt Level:   3
Adapter Port Name: 210000E08B0678B8
Host Adapter BIOS: Enabled
Frame Size:        2048
Loop Reset Delay:  5
Adapter Hard Loop ID: Disabled
Hard Loop ID:      0
Spinup Delay:      Disabled

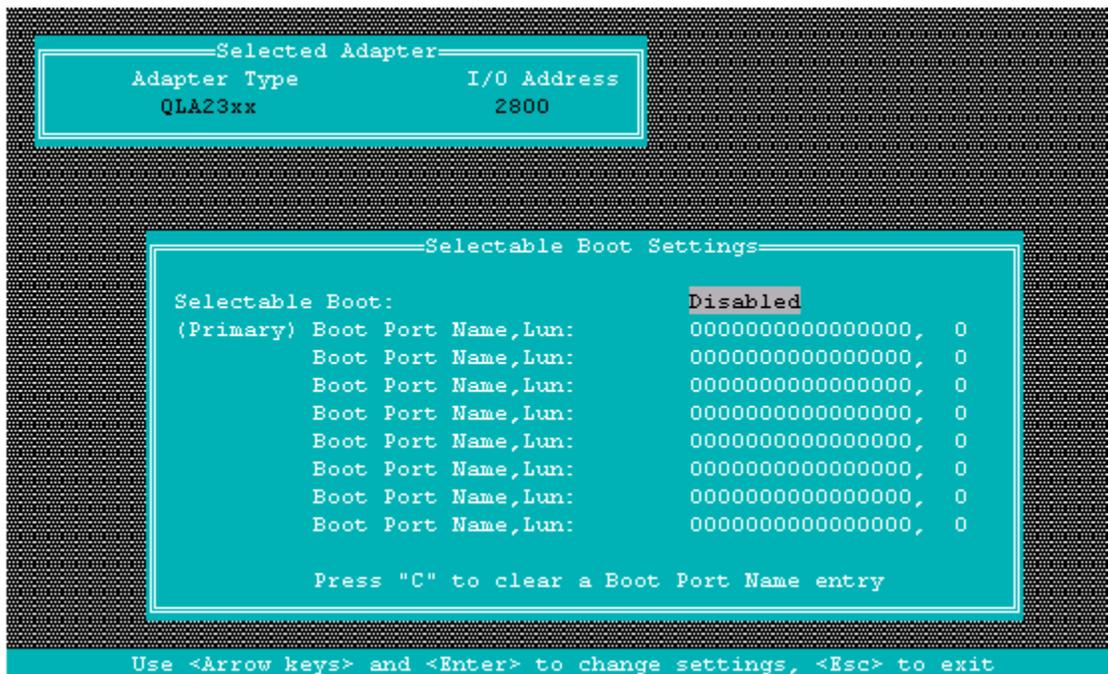
Use <Arrow keys> and <Enter> to change settings, <Esc> to exit

```

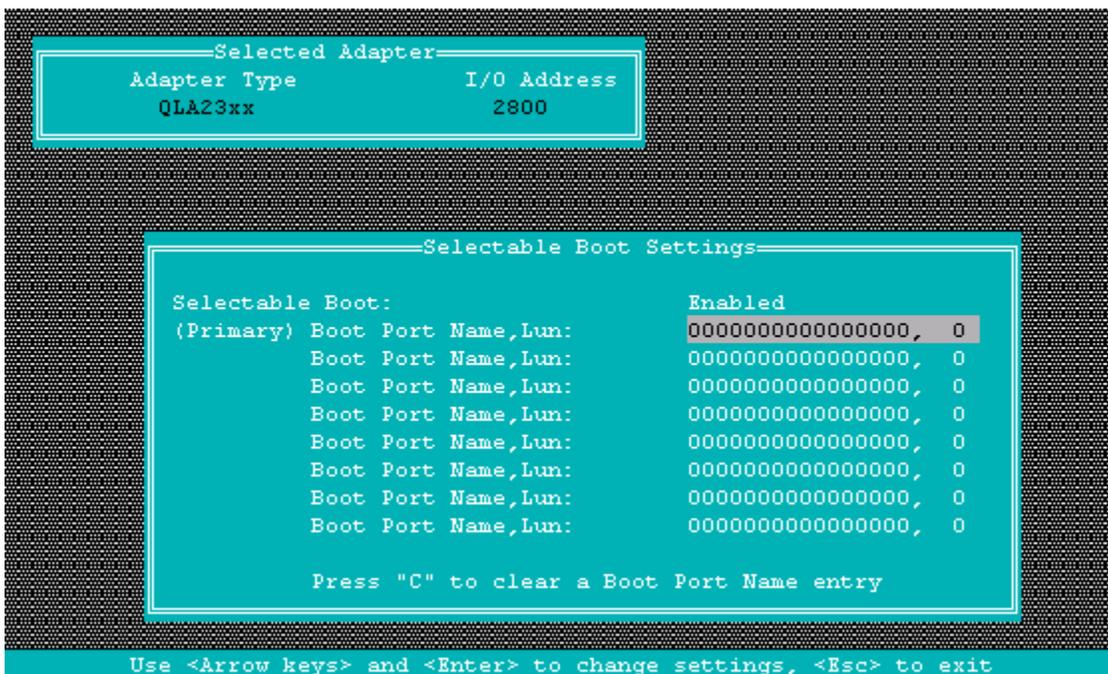
26. Press the Escape Key to back up one menu, and arrow down to Selectable Boot Settings, and press Enter to select it.



27. By default, the **Selectable Boot** option is **Disabled**. Press Enter to **Enable** it.



28. After enabling, it will look like this. Arrow down to **(Primary) Boot Port Name, Lun:**, and press Enter.



29. Next, you are presented with a list of devices found on the SAN. Note: If you do not see any devices listed, there is a fibre cabling problem that will need to be root caused. Arrow down to the MSA1000 that you want to boot from (In this example, we are showing to MSA1000's in the SAN). Once the correct MSA1000 is highlighted, press Enter.

```

-----Select Fibre Channel Device-----
ID      Vendor  Product          Rev    Port Name          Port ID
-----
128     No device present
129     COMPAQ  MSA1000         2.17  500805F300011131  011000
130     COMPAQ  MSA1000         2.17  500805F300011031  011100
131     No device present
132     No device present
133     No device present
134     No device present
135     No device present
136     No device present
137     No device present
138     No device present
139     No device present
140     No device present
141     No device present
142     No device present
143     No device present

Use <PageUp/PageDown> keys to display more devices

Use <Arrow keys> to move cursor, <Enter> to select option, <Esc> to backup

```

30. The next screen shot shows the available LUNs on the selected MSA1000 controller. Arrow down to the LUN that you want to boot from, and press Enter to select it.

```

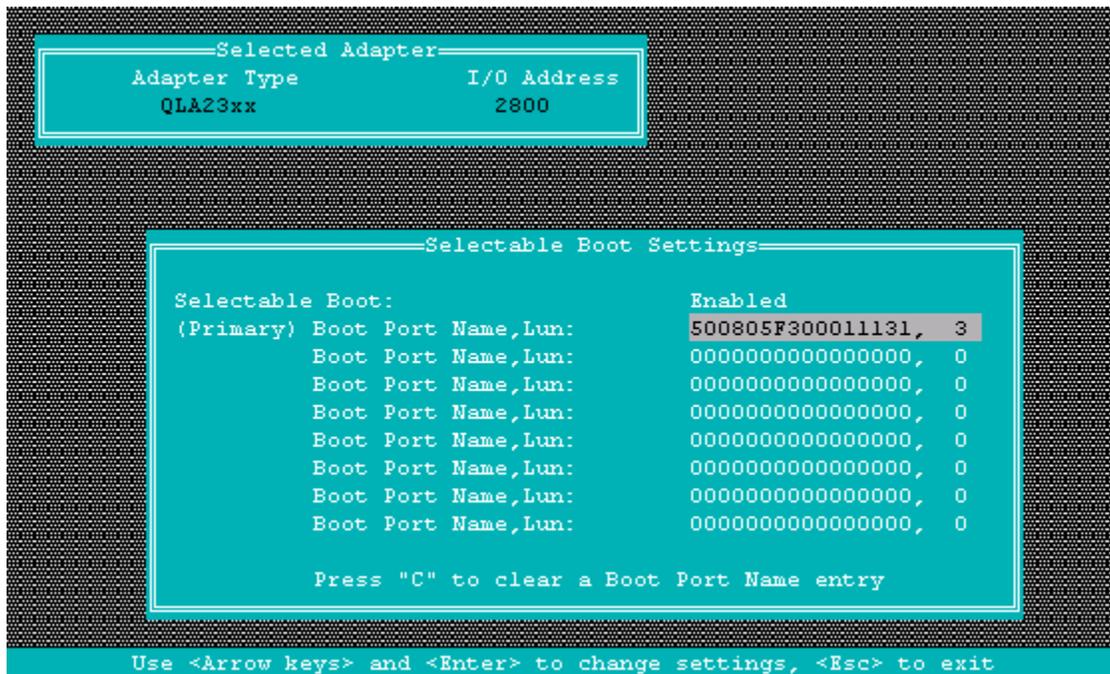
-----Select LUN-----
Selected device supports multiple units
LUN      Status
-----
0        Supported
1        Not supported
2        Not supported
3        Supported
4        Not supported
5        Not supported
6        Not supported
7        Not supported
8        Not supported
9        Not supported
10       Not supported
11       Not supported
12       Not supported
13       Not supported
14       Not supported
15       Not supported

Use <PageUp/PageDown> keys to display more devices

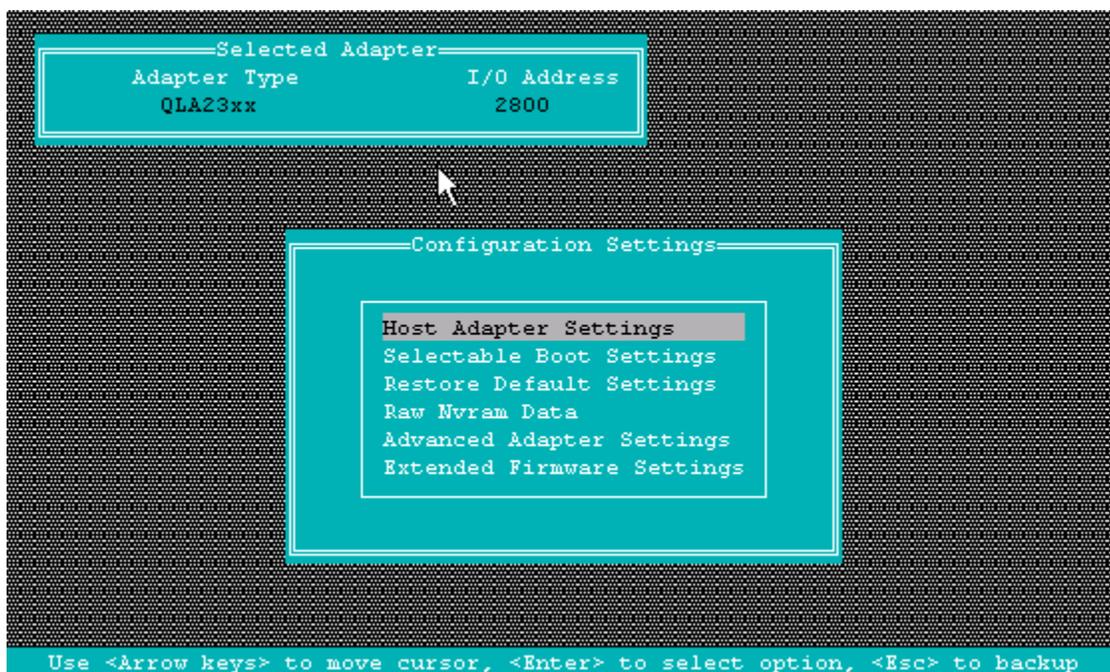
Use <Arrow keys> to move cursor, <Enter> to select option, <Esc> to backup

```

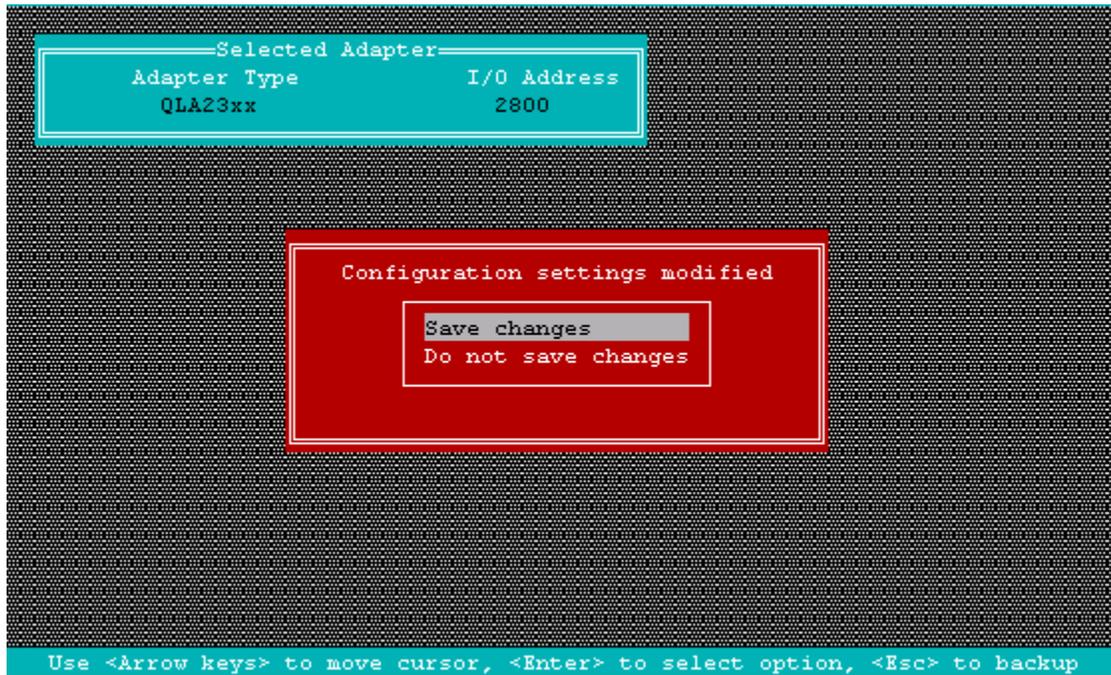
31. Once the boot LUN is selected, the screen will appear as follows:



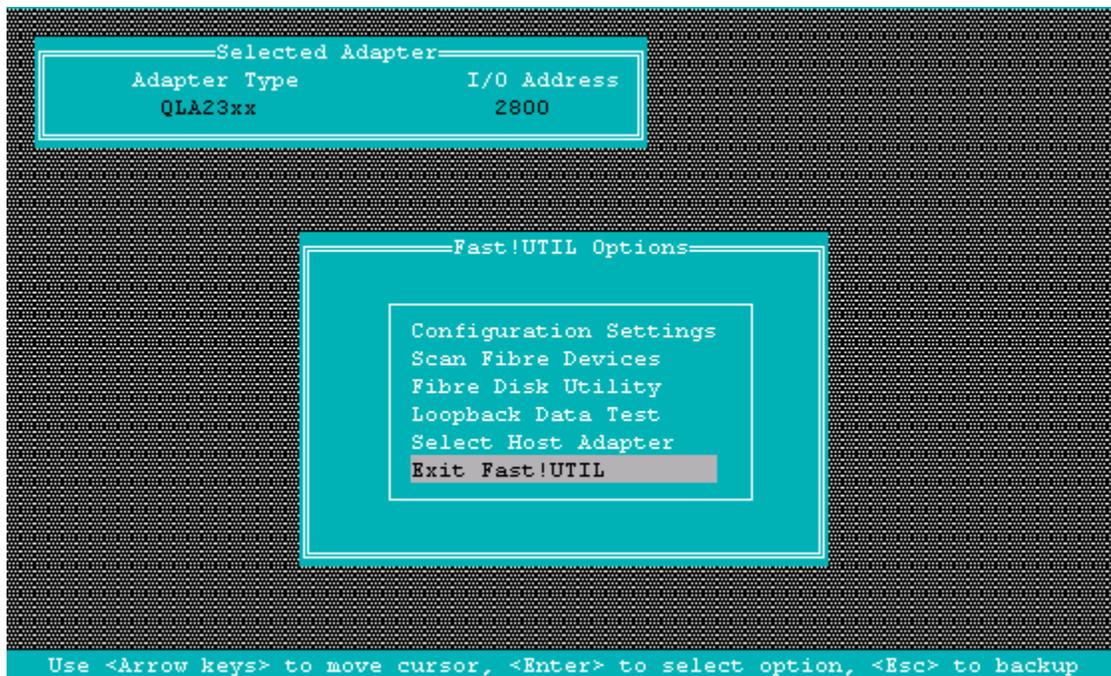
32. Press the escape to key to move up a menu.



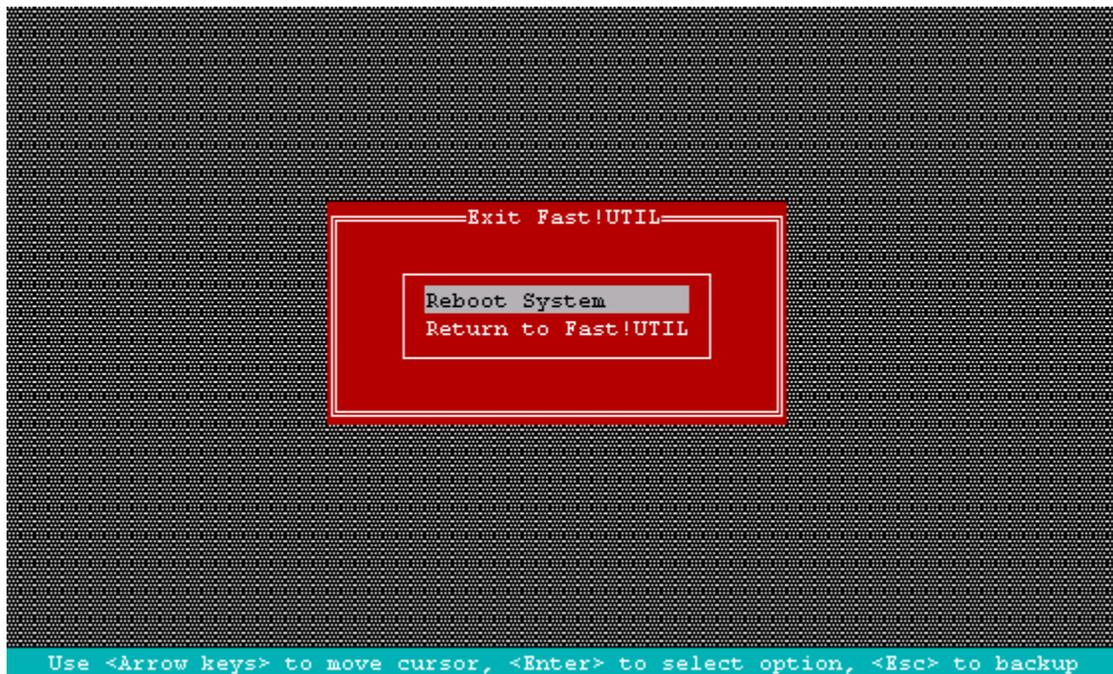
33. Press the escape key again. You will be presented with the following options. Press Enter to save changes.



34. Arrow down to the **Exit Fast!UTIL** option, and press Enter.



35. Select **Reboot System** (press Enter). This will cause a reboot of the server.



36. As the server is rebooting, you will see a screen that resembles the one below. Notice now that the QLogic adapter has now detected the presence of a Boot LUN.

```
Processor 2 initialized at 1.0 GHz/133 MHz with 256 Kbyte Cache

COMPAQ Integrated Smart Array Controller (ver 1.42) 0 Logical Drive(s)
1785-Slot 0 Drive Array Not Configured
No Drives Detected

QLogic Corporation
QLA2312 PCI Fibre Channel ROM BIOS Version 1.29 Subsystem Vendor ID 0E11
Copyright (C) QLogic Corporation 1993-2002. All rights reserved.
www.qlogic.com

Press <CTRL-Q> for Fast!UTIL
ISP2312 Firmware Version 3.01.12
QLogic adapter using IRQ number 3

-----
Drive Letter C: is Moved to Drive Letter D:
LOOP ID 129,3 is Installed As Drive C:

-----
Device Device Adapter Port Lun Vendor Product Product
Number Type Number ID Number ID ID Revision
80 Disk 0 011000 3 COMPAQ MSA1000 VOLUME 2.17
ROM BIOS Installed
```

The server should now boot from the drives originally located on the internal Smart Array controller, now controlled by the MSA1000 (boot from SAN).

Considerations

If multiple servers were accessing a single StorageWorks MSA1000, best practices would dictate that you enable SSP (Selective Storage Presentation). SSP is an access control feature that allows multiple hosts running multiple applications on the SAN to have controlled access to MSA1000 storage on the SAN. This selective access allows policies to be set to determine which servers can access which storage, down to a logical volume level. SSP can be configured through several methods: Command Line Interface (CLI), ACU, or ACU XE.

Appendix

Migration Prerequisites and Migration Limitations

- The Smart Array 5304 and 4200 controllers have 4 channels that can control up to 4 external chassis. While the MSA1000 also has 4 channels, only two are available externally, as two are used for the internal 14-drive shelf. For instance, if there is a single array on channel 1 and a single array on channel 2, and a third array that spans channels 3 and 4, the array that spans channel 3 and 4 will have to be migrated to a separate MSA1000. If you follow this method of migration, the MSA1000 may prompt you to **enable volumes (y/n)** and/or that MSA1000 may report that some drives/volumes are missing. Answer 'yes' to enabling the volumes and the migration will be complete. **Please Note: Once the drives have been migrated to the MSA1000, you cannot fall back to the Smart Array controller and have the controller recognize the array / volume structures. The RAID Information Service (RIS) will be overwritten by the MSA1000, and the Smart Array controller cannot interpret it to recreate the array and volume structure – ALL DATA WILL BE LOST.**
- All arrays and volumes controlled by either a Smart Array controller or an RA4100 controller must be moved during the migration process. The DtS Architecture does not support a partial migration. Furthermore, do not attempt an operating system upgrade during the migration. Perform the DtS Migration first, verify that all volumes are available, perform and verify another Full Backup, then proceed with the operating system upgrade.
- Do not attempt a migration if one of the disk drives is marked as "Failed". Replace the failed disk drive and allow the array to be rebuilt before performing the migration.
- Do not attempt a migration if there are unconfigured drives in either the MSA1000 or attached StorageWorks Enclosures (Model 4314R / 4354R). These drives must either be configured or removed from the chassis for the migration to occur successfully.
- If you are migrating from multiple Smart Array controllers or RA 4100's, migrate one Smart Array controller or RA 4100 at a time. Move the drives or the drive shelf, and power on the MSA1000. Ensure that the MSA1000 (after full power up) detects the appropriate number of volumes. Power down the MSA1000, and migrate the next set of Smart Array / RA 4100 controlled drives or drive shelf. Again ensure that the MSA1000 (after full power up) detects the appropriate number of migrated volumes. Please note and record drive and shelf location as well as array configurations (via ACU) before the migrations
- If migrating from an RA 4100 to the MSA1000, there will be two open drive slots. These slots can be filled with more drives, and a separate logical volume created on them.
- For cluster migrations, migrate the shared RA4100 storage first, and then migrate the Smart Array controlled drives (including boot drives), if you wish.
- If you have spare drives configured in your arrays, you may have to reassign the spare to your array (via ACU) after the migration procedure.
- In certain cases, Selective Storage Presentation (SSP) may have to be reconfigured when migrating from an RA4100 to the MSA1000.

Dual Bus vs. Single Bus Drive Enclosures

If you are migrating a dual bus drive enclosure that enclosure will occupy both external SCSI buses on the StorageWorks MSA1000. Please ensure which models you are migrating from and plan accordingly prior to the migration. Supported enclosures include the following models:

StorageWorks Enclosure Model 4314R (Maximum of two can be connected to the MSA1000)

190209-001

190209-B31 (Int'l)

190209-291 (Japan)

StorageWorks Enclosure Model 4354R (Maximum of one can be connected to the MSA1000)

190211-001

190211-B31 (Int'l)

190211-291 (Japan)

MSA1000 fallback to RA4100 or Smart Array controllers

Follow these steps to restore your former configurations (Smart Array controlled volumes or RA 4100 controlled volumes) from the MSA1000:

1. Power down the server.
2. Remove the FCA2210 HBA.
3. Replace the FCA2210 HBA with the legacy controller (either the StorageWorks 64-bit/66-Mhz Fibre Channel Host Adapter or the Smart Array controller).
4. Migrate the disk drives back to the legacy RA 4100 or Smart Array controller, taking care to restore the drives to their position prior to the migration.
5. Power up the server, and perform the steps necessary in the Server's BIOS utility (F10 Setup or equivalent).
6. On reboot and load of operating system, install the drivers required for the legacy controller.
7. You must reassign and recreate the Array and Volume information through Array Configuration Utility (ACU). **The legacy controller will not be able to read the restored Array and Volume information correctly. Therefore, you MUST enter the Array and Volume information EXACTLY as it was set up before the migration to the MSA1000 via ACU. This is why it is imperative that you note and record the Array information and Volume information PRIOR to performing the migration.**
8. A reboot of the server will be required.