WHITE PAPER

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Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

While NetWare Peripheral Architecture (NWPA) specification and generic Novell drivers have been available for some time, not all NetWare/intraNetWare environments have accepted and migrated to the new architecture. Compaq drivers and support are currently available for NWPA. As the advantages available through new technology continue to grow, and NWPA matures, the decision NOT to migrate must be examined carefully. Soon, the decision to remain with the former standard, Device Drive Functional Specification (DDFS), and use new releases of intraNetWare, will not be an option. Future versions of NetWare, intraNetWare, and intraNetWare for Small Businesses will not support DDFS.

In this paper, the benefits of migrating to, and a detailed explanation of the installation process for supported NetWare versions is provided. Some short-term and long-term compromises are examined, and limitations and alternatives on some Compaq hardware and feature loss are explored. This paper specifically addresses the issues of:

- *NWPA and its Advantages*
- *Why Users should Migrate*
- *What is Lost in Migration*

Migration Paths to Novell's NWPA
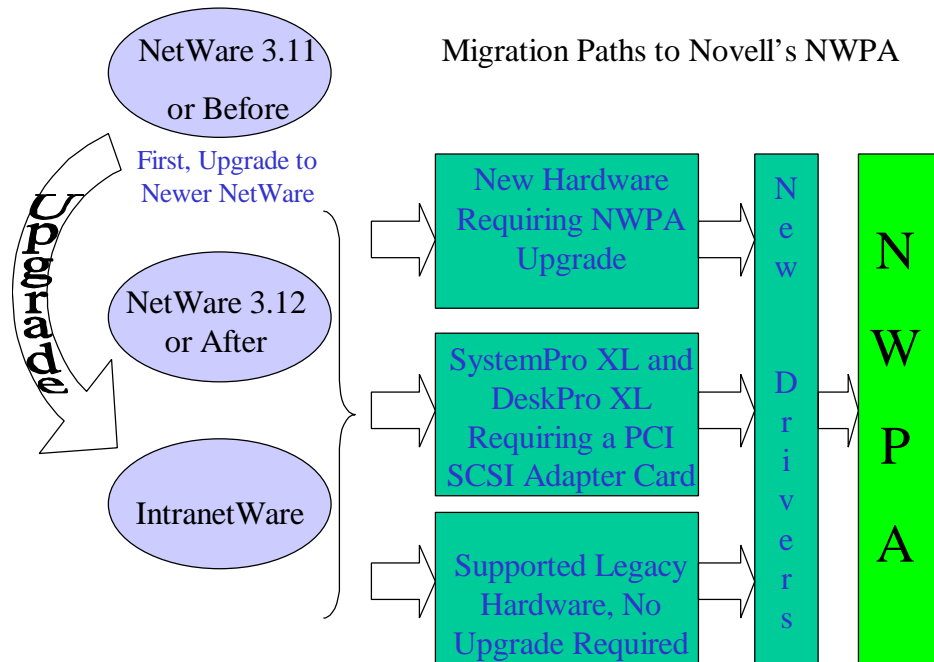
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Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

NWPA INTRODUCTION

NetWare Peripheral Architecture (NWPA) is the Novell designated replacement for the legacy Device Driver Functional Specification (DDFS). The DDFS is the original design specification for storage device drivers developed by Novell.

> NOTE: These legacy DDFS based storage device drivers can be recognized by the .DSK filename extension.

As more sophisticated and demanding hardware/software features have been developed, it has become evident that DDFS will not be able to support them and has actually become a bottleneck. NWPA has been developed to resolve these limitations. As a layered and more flexible architecture, NWPA is looking to the future. In addition, there is virtually no performance difference between the two architectures.

New features and hardware will be supported only with the NWPA drivers. Furthermore, Novell is phasing out support for the DDFS drivers and will only support the new driver architecture, NWPA, in future Novell releases. Compaq currently has NWPA drivers, which work on NetWare 3.12, 4.10, intraNetWare, and intraNetWare for Small Business. The migration for these environments is now possible. However NetWare 3.11 and earlier versions do not support the NWPA standard. These older environments must first be upgraded to a newer version of NetWare or intraNetWare to take advantage of NWPA style drivers.

Many new features and technologies are available with NWPA drivers. For example:

- **Instance Unloading of Drivers**. Device driver unloading now allows the unloading of a device driver associated with a single slot. Under DDFS, when a change to a running server environment is desired, you must: first, unload the device driver (this means unloading <u>ALL</u> instances of the device driver); second, re-load with the same, original data, all of the unchanged instances of the driver; third, make the changes to the single changed instance of the driver under maintenance. This resulted in a wide service outage to all controllers controlled by the driver. With the new NWPA selective instance unloading, a single instance of a device controller is unloaded, and then reloaded with the changes. This is done without causing a wider outage of service to other controllers.

- **PCI Hot-Plug Support**. NWPA is specifically designed to support this technology. When a Network Interface Card (NIC), disk drive, disk controller, or even a fan goes down, it can be removed and replaced while the system is still running. There is no need to power the server down to perform the replacement, when a change is desired or a failure occurs. The layering of the NWPA design enables the many needed services to cleanly implement this functionally. Messages are sent from the where an alert is detected to where it is handled. This messaging is not supported with the DDFS architecture. With PCI Hot-Plug, the failed hardware is simply removed and replaced. This functionality, sometimes referred to as 'hot swapping', is available not just on devices, but also on controllers. Currently, the hot-swap is limited to identical replacements, but the ability to perform hot-adds is a near term enhancement.

- **Modularity of Design**. With the layered design of NWPA, when a new device that works on an existing controller is added to a system, only the new device driver needs to be added. None of the other device drivers that use the same adapter need to be changed. This allows for the addition of new hardware without the disruption of existing matched hardware-software pairings. Fewer changes mean greater stability with less likelihood of unforeseen or unwanted side- effects. Two examples of adding new hardware are:

1. The addition of a new brand of a feature rich CD-ROM drive to an existing SCSI bus. Only the new driver is needed to support the new hardware, all of the other drivers on the system are left as they are.

2. Similarly, with an IDE interface supporting a hard disk, the addition of the same feature rich CD-ROM drive only requires the CD-ROM drive and its driver. In both of these cases, only the new hardware and driver are added, no further disruption of the system is required.

- **Fibre Channel Storage**. This is a new technology that is only supported with the new NWPA drivers. Fibre Channel Storage is a much larger capacity and more robust disk data storage technology. Fibre refers to the optical fiber that connects the server's controller card to the hub/disk array. In some instances, the "fibre" may actually be a metal wire connection. The disks are not located in the server box, but in a separate box with its own power and cooling. The real advantages of this technology are:(1) the ability of the disks to be located both locally and remotely (up to 10 km of fibre, 6.2 miles); and (2) the number of disks drives supported in a fully populated FC is 48 drives. For additional information, please see the Compaq Technology Brief, "Strategic Direction for Compaq Fibre Channel-Attached Storage" available on the Compaq Web Site (http://www.compaq.com).

- **IDE Devices**. Support of hard disks and of CD-ROM drives for IDE is now available with NWPA. The layered design of NWPA allows the IDE device drivers to share common code in the adapter module and yet provide different functionality to the connected devices. Under the DDFS, two IDE devices can share the IDE port, but there is contention and both of the drivers must contain code to insure the contention is properly resolved. Many IDE board manufacturers simply avoid this issue of contention by recommending NOT running an IDE hard drive and IDE-CD on the same channel.

- **Layering of Design**. Layering and separation of function within NWPA allows a reflection into the software world of the real-world's single common controller with different devices. This is illustrated in Figure 2. When software abstractions more closely model the real world, fewer problems are introduced. For NWPA this means each unique supported device has a unique Custom Device Module (CDM), but shares a single copy of the Host Adapter Module (HAM). The HAM controls arbitration for the controller, while the individual CDMs provide the unique and distinct functionality associated with the devices, without introducing the coding complexity that usually causes software problems. NWPA's tighter coupling of the real hardware world and the internal software world has real design advantages. These become apparent to the outside world through reduced complexity and enhanced reliability. For example: when new devices that use the same type of controller can be added without modification to the existing device drivers; and through the next two items, independent development and simpler interfaces.

- **Independent Development**. Each component in the NWPA architecture can be developed independently due to clearly defined interfaces. This allows developers to concentrate their efforts on their respective component. The IDE hard disk drive developer, for instance, does not need to learn anything about the IDE CD driver, nor the CD device itself. This modular, less complex environment will result in cleaner more reliable drivers.

- **Simpler Interface**. While the modularity within the NWPA design specification mainly effects software designers and developers, there are real benefits visible to users. The modularity introduced by NWPA has moved some of the complexity of writing DDFS drivers into NWPA itself, thereby simplifying NWPA device drivers. A simpler Application Program Interface (API) to the NWPA makes driver development easier. This will speed driver development, testing, and deployment cycles. The net result being more reliable and easily maintained drivers, with fewer logical connections to other software to create side effects.

Figures 1 and 2 present the architectures of NWPA and DDFS.

Table 1 presents a decision matrix for migration to NWPA based of the following discussion.

NetWare environments running version 3.11 or earlier that wish to have new NWPA server components (both hardware and software), must migrate to a newer version of the NetWare OS, that supports the NWPA architecture, before they can take advantage of enhanced features associated with NWPA. If your network contains new NWPA nodes that support the new features, the older NetWare nodes on the network can access the new hardware through these NWPA nodes, without migrating. Compaq recommends upgrading older NetWare environments, before a forced upgrade is required after a hardware failure. When older hardware fails, an identical replacement may not be available or economic. The new replacement hardware can force a migration to the new architecture without adequate preparation. Evaluate the risks and update your contingency plans appropriately. Having the newer NWPA software ready and in place can ease the transition to new hardware and software drivers. For a more detailed look at risk analysis, please see "Enterprise-Wide Contingency Planning", a Compaq TechNote available on the Compaq Web Site (http://www.compaq.com).

TABLE 1: DECISION MATRIX FOR SERVER MIGRATION TO NWPA

Situation	Migration Action
New hardware acquired for an existing server, such as Fibre Channel Storage System.	The server MUST migrate. If the server is one of number local servers, only the server that actually contains the new hardware must migrate. Other nodes will be able to access the new hardware through the upgraded server.
SystemPro XL or DeskPro XL with integrated SCSI controller.	These may migrate, but require the disabling of the on-board SCSI controller and obtaining a PCI-SCSI controller and NWPA device drivers. Controllers are listed under supported hardware, below.
We wish to avoid any risk associated with an upgrade.	The server may remain with the current level of software. Compaq strongly recommends putting contingency plans in place and evaluating risks associated with hardware failures and a forced migration to NWPA.
New Server.	Start with NWPA.
We wish to take advantage of new technologies such as the instance unloading of drivers or PCI Hot Plug.	The server must migrate. This feature is only available with NWPA.

Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

INSTALLATION OVERVIEW

The installation of NWPA consists of copying the correct files from the distribution media to the proper path locations on your server. The selection of which files to copy and where they must be stored depends upon the version of NetWare you are using, and which devices and services your server supports. For the areas of NWPA support, peripheral support, disk array support, and operating system support, each set of files required is listed separately in the sections that follow, showing patch, device and feature dependencies. Installation or migration may be accomplished in one of three ways: a complete new installation using SmartStart and selecting the NWPA option; an automated upgrade to NWPA accomplished by running the installation scripts; or by copying each file manually.
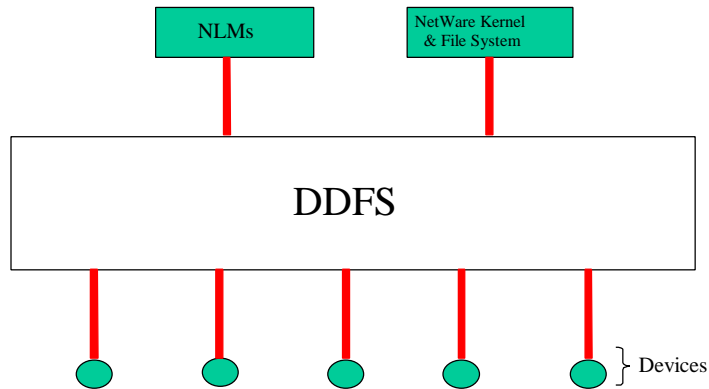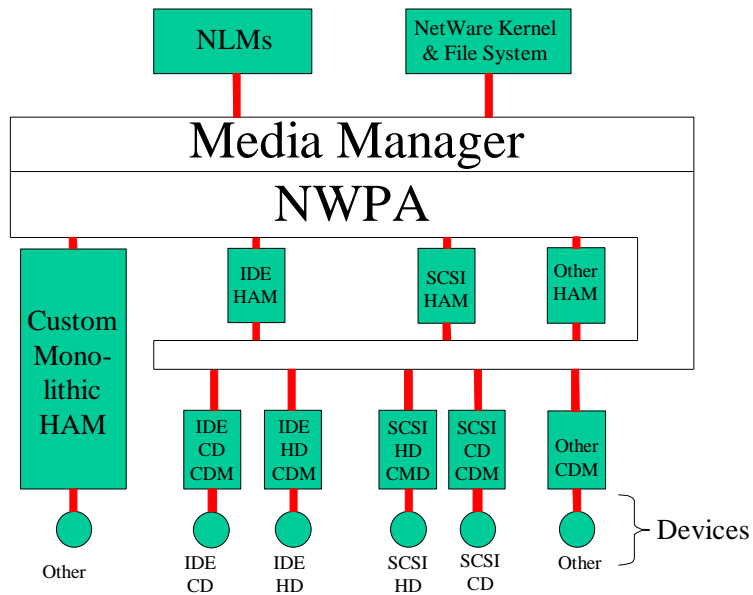

Figure 1 (Above): DDFS Architecture
Figure 2 (Below): NWPA Architecture

Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

HARDWARE

Supported Hardware

In this section, various Compaq platforms and related hardware issues are discussed. Drivers are written to recognize and work with chipsets used on the adapter cards and in embedded systems. The cards are therefore identified first by the chipset used, and then by the part number(s) for the board. Two part numbers are typically given:

- The option-part number, which is used to order the complete kit: adapter card, rails, screws, and associated literature and hardware.

- The spares-part number, which is used to order only the adapter card.

The NWPA storage drivers run on any Compaq server platform that is running NetWare/intraNetWare v3.12 or greater. The CPQSCSI.HAM (Host Adapter Module) supports all of Compaq's PCI adapters based on the following chipsets: 53c710, 53c810, 53c825, 53c826, 53c875, and EISA adapters (including those integrated on Compaq server products). The following controllers are supported:

- Compaq 32-bit Fast-SCSI-2 Controller (53c710 based)

    ? Standup EISA adapter - part numbers, Spares 142040-001; options 142013-001

    ? Integrated in ProLiant 1000, 2000, 4000, ProSignia and ProSignia VS Servers

- Compaq Fast-SCSI-2/P Controller (53c810 based) Integrated in ProSignia 300 and ProSignia 500 Servers

- Compaq 32-Bit Fast-Wide SCSI-2/P Controller (53c825 based)

    ? Standup PCI adapter – part numbers, Spares 194754-001, 199633-001; Options 194753-001, 199533-001.

    ? Integrated in ProLiant 1500, 5000 Servers

- Compaq 32-Bit Fast-Wide SCSI-2/E Controller (53c825 based)

    ? Standup EISA adapter –part numbers, Spares 199634-001, 194752-001; Options 142290-001, 194751-001

    ? Integrated in ProLiant 4500 Servers

- Compaq Wide-Ultra SCSI Controller (53c875 based)

    ? Standup PCI adapter –part numbers, spares 247399-001, 272515-001; options 185250-001, 272514-001

    ? Integrated in ProLiant 800, 2500, and 6000 Servers

- Compaq Dual Channel Wide-Ultra SCSI-3 Controller (53c876 based)

The CPQARRAY.HAM (Host Adapter Module) supports the following controllers:

- Compaq SCSI Managed Array Technology (SMART) Controller – part number 142130-001

- Compaq SMART-2 Array Controller – part numbers /P 194754-001; /E 194752-001

- Compaq SMART-2SL Array Controller – 242776-B21

- Compaq 32-Bit Intelligent Drive Array (IDA) Controller – Part numbers, Spares 116807-001; Options 116576-001

- Compaq 32-Bit IDA-2 Controller – Part numbers, Spares 136898-001; Options 136868-001

Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

• Compaq 32-Bit IDA Expansion Controller – part numbers, spares 124526-001; options 124463-001

Non-Supported Hardware

• The SystemPro XL and DeskPro XL contain an integral SCSI controller that is NOT supported by the Compaq NWPA SCSI drivers. These systems should not plan to migrate with these integrated controllers to the NWPA, but should disable the onboard controller and replace it with a Compaq PCI SCSI adapter card and matched SCSI NWPA driver.

SUPPORT

NWPA Support Files

Next, we will look at the various support files that you will need for your environment. Each of the versions of NetWare and their requirements are presented in matrix form in Table 2, which allows for the convenient lookup and contrast of these requirements. The associated patches are presented in Table 3. The NWPA support files are located in the \NWPA directory of the Novell Support Software Storage Diskette (NSSD). These files are required for IDE, SCSI Array, and Fibre Channel support of the NWPA architecture.

TABLE 2: NLMS

Novell OS Version			
3.12	4.10	4.11	SFT-III
NWPA.NLM	NWPA.NLM	NWPA.NLM	NWPALOAD.NLM
NWPALOAD.NLM	NWPALOAD.NLM	NWPALOAD.NLM	NBI.NLM
NBI31X.NLM	NBI.NLM	NBI.NLM	NWPAMS.NLM
PM312.NLM			NWPAIO.NLM
NPAPATCH.NLM			

After installation, these files are stored in the server OS subdirectory of the DOS partition. With the exception of PM312.NLM and NPAPATCH.NLM, all files are auto-loaded when the required HAM (IDEATA.HAM, CPQSCSI.HAM, CPQARRAY.HAM, or CPQFC.HAM) is loaded. On NetWare 3.12 servers, PM312.NLM and NPAPATCH.NLM must be loaded first in the STARTUP.NCF file with PM312.NLM preceding NPAPATCH.NLM. Both NetWare 3.12 and 4.1x servers require that LOADer patches are applied. Compaq recommends that the current NetWare patch kits be applied to these servers prior to using NWPA drivers. See the NWPA Installation section for more information on loading NWPA support files.

TABLE 3: CURRENT NOVELL PATCHES

Novell OS Version			
3.12	4.10	4.11	SFT-III
312PTA.EXE	410PT7.EXE	IWSP3.EXE	(combined in other patch)

NOTE: NetWare versions 3.11 or earlier do not support Media Manager; therefore, they do not support NWPA drivers.

Peripheral Support

Novell generic device drivers and Compaq specific device drivers provide support for various peripherals. As a rule, Compaq supplied files all start with the prefix "CPQ". For example, "CPQARRAY.HAM" is an example of a Compaq supplied file.

Novell Support

Novell provides generic NWPA device drivers for Compaq server components. Table 4 lists these drivers:

Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

TABLE 4: PERIPHERAL SUPPORT

Device	Novell Driver
SCSI Tape Drives	SCSI2TP.CDM
IDE CD-ROM Drives	IDECD.CDM
SCSI CD-ROM Drives	SCSICD.CDM
IDE Hard Drives	IDEHD.CDM
SCSI Hard Drives	SCSIHD.CDM
ASPI	NWASPI.CDM

IDE Support

IDE device support is provided by NWPA drivers, which are located in the \IDE directory of the NSSD. NWPA drivers require support files located in the \NWPA directory of the NSSD. These files are presented in Table 5.

TABLE 5: IDE SUPPORT

Driver	Description
IDEATA.HAM	This Novell provided Host Adapter Module provides support for IDE controllers.
IDECD.CDM	This Novell provided NWPA Custom Adapter Module provides the driver support for IDE CD-ROM devices. This device driver, along with IDEATA.HAM, may be used with any NetWare application that uses the NWPA Media Manager Interface to communicate with devices such as CDROM.NLM.
IDEHD.CDM	This Novell provided NWPA Custom Device Module provides the driver support for IDE disk drives.

Software Support

Software support is presented with an overview of the component parts, followed by a discussion of the dependencies associated with these features, a migration option, installation, issues, and lastly a summary. The migration for each version of Novell's NetWare operating system is presented separately. When you begin to install the migration file set for NWPA, make sure that you find and use the section that corresponds to your environment. Each of these sections is different. In general, the installation process consists of getting the products installed and then applying the latest patches, before using the device drivers. [The OS patches are available on Novell NetWare, via CompuServe, or the World Wide Web at http://www.novell.com or http://support.novell.com.]

SCSI Support

NWPA SCSI device support is available and is located in the \SCSI directory of the NSSD. NWPA drivers require support files located in the \NWPA directory of NSSD. These files are presented in Table 6.

Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

TABLE 6: SCSI SUPPORT

Driver	Description
CPQSHD.CDM	This is the Compaq provided NWPA Custom Device Module for SCSI disk drives and ProLiant storage boxes
NWASPI.CDM	This Novell provided NWPA Custom Device Module provides ASPI support for SCSI devices.
SCSI2TP.CDM	This Novell provided NWPA Custom Device Module provides support for many (but not all) Compaq tape devices connected to SCSI-2 Controllers for SBACKUP support.
SCSICD.CDM	This Novell provided NWPA Custom Device Module provides driver support for CD-ROM devices connected to Compaq SCSI-2 Controllers. This device driver may be used with any NetWare application that uses the NWPA Media Manager Interface to communicate with devices such as CDROM.NLM.
SCSIHD.CDM	This Novell provided Custom Device Module provides Novell generic driver support for SCSI devices. You should use the Compaq provided Custom Device Module (CPQSHD.CDM) instead.
CPQSCSI.HAM	This Compaq provided NWPA Host Adapter Module to support Compaq 32-Bit SCSI-2 Controllers.

Drive Array Support

Compaq Array Controller support is provided by NWPA drivers, which are located in the \DRV_ARRY directory of the NSSD. NWPA drivers require support files located in the \NWPA directory of the NSSD. This file is presented in Table 7:

TABLE 7: DRIVE ARRAY SUPPORT

Driver	Description
CPQARRAY.HAM	This NWPA Host Adapter Module provides driver support for Compaq array controllers. This driver provides functionality of both a HAM and a CDM, so a separate CDM is not necessary.

Operating System Support

NetWare 3.12, 4.10, intraNetWare, and intraNetWare for Small Business

This section presents the operating system files in Table 8, showing the requirements based on the type of peripheral support, and the version of the environment.

> NOTE: NetWare versions 3.11 or earlier do not support Media Manager; therefore, they do not support NWPA drivers.

Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

TABLE 8: OPERATING SYSTEM SUPPORT

Controller/Device	NetWare 3.11	NetWare 3.12 through 4.1x	Future Operating Systems
SCSI Controllers	CPQS710.DSK	CPQSCSI.HAM or CPQS710.DSK	CPQSCSI.HAM
SCSI Disk	CPQSDISK.DSK	CPQSHD.CDM or CPQSDISK.DSK	CPQSHD.CDM
SCSI CD	CPQSCD.DSK	SCSICD.CDM or CPQSCD.DSK	SCSICD.CDM
SCSI Tape (SBACKUP)	CPQSTAPE.DSK	SCSI2TP.CDM or CPQSTAPE.DSK	SCSI2TP.CDM
ASPI Support	CPQSAPSI.NLM	NWASPI.NLM or CPQSAPSI.NLM	NWASPI.NLM
IDE Controllers	ISADISK.DSK or IDE.DSK	IDEATA.HAM, ISADISK.DSK, or IDE.DSK	IDEATA.HAM
IDE Disk	Combined in ISADISK.DSK or IDE.DSK	IDEHD.CDM	IDEHD.CDM
IDE CD	N/A	IDECD.CDM	IDECD.CDM
Array Controllers	CPQDA386.DSK	CPQARRAY.HAM or CPQDA386.DSK	CPQARRAY.HAM

Note: At the time of publication, Compaq NWPA SCSI and array drivers were only supported on intraNetWare/NetWare 4.11. Later, support will be added for NetWare 3.12 and NetWare 4.10. This does not apply to NWPA IDE support.

Dependencies Associated with Existing Features

The intraNetWare server that will contain the NWPA storage drivers must have the NWPA support files loaded on it. In the case of NetWare 3.12, NetWare 4.10, and NetWare 4.11 (which needs a new SMP and loader), the latest patch available from the Novell Web Site must be installed on the server in order to allow it to support NWPA. Once the patch is installed, the Compaq supplied NWPA drivers must be installed and loaded. The support files necessary for loading the NWPA storage drivers are NWPA.NLM, NBI.NLM, and if using event logging, NEB.NLM.

Mixing NWPA Drivers with DDFS Drivers

My old server works and I want to avoid the risk of upgrading. Are there any options?

Many NetWare customers are wary of making changes to a working NetWare environment. For this reason, Compaq provides a compatibility path on which customers with NWPA level OS can run:

- NWPA drivers,

- DDFS drivers, and

- a mixture of both NWPA and DDFS drivers

SmartStart, versions 3.40 and beyond, will install either the NWPA drivers (the default) or DDFS drivers. DDFS and NWPA SCSI drivers cannot be loaded on the same server, even with different adapters. The same is true for array drivers. You must choose only one of these drivers' styles. It is possible, however, to use NWPA array drivers with DDFS SCSI drivers or DDFS array drivers

Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

with NWPA SCSI drivers. This mixing of driver modes is not possible with Fibre Channel Storage, which is only supported by the NWPA drivers. This compatibility path requires a NWPA compatible version of the operating system.

Compaq will continue to provide bug fixes for the DDFS style drivers, however support for new hardware will typically only be found in the NWPA drivers.

INSTALLATION

Installing NWPA Storage Support

This section describes the steps required for the installation and configuration of NWPA drivers on servers running NetWare 4.11, NetWare 3.12 and NetWare 4.11 SFT-III. Before installing the NWPA drivers, be sure to load the latest operating system (OS) patches. [The OS patches are available on Novell NetWare via CompuServe or the World Wide Web at http://www.novell.com or http://support.novell.com.] These patch kits are designed to correct known OS-specific problems, as well as provide support for newly developed and enhanced drivers.

NetWare 4.11 and SFT-III NWPA Installation

To install the necessary drivers for NWPA support on NetWare 4.11 and NetWare 4.11 SFT-III servers, follow these steps:

1. Load the INSTALL.NLM module from the server console prompt.

2. Select *Product Options* from the main menu.

3. Choose *Install a product not listed* from the Other Installation Actions options.

4. Insure that NSSD Disk 1 is in drive A and press Enter to confirm the location of the product as well as the location of SERVER.EXE.

5. Choose *NWPA Storage Support from Compaq* from the list of products to copy the NWPA support files to the DOS server directory and the SYS:SYSTEM volume.

6. Press F10 to begin the installation process, and specify the server boot path (the location of SERVER.EXE).

7. Follow the instructions on the screen inserting the required NSSD disk when prompted.

8. When the installation is complete, restart the server.

> NOTE: With intraNetWare SFT-III, all HAMs are loaded in the IOEngine (IOSTARTUP.NCF) and all CDMs are loaded in the MSEngine (MSTARTUP.NCF).

Compaq recommends that the latest NetWare patch kit, available from Novell at http://www.novell.com or http://support.novell.com, be applied to these servers prior to using NWPA drivers.

NetWare 4.11 SFT-III Only

Edit the IOSTART.NCF file for each I/O engine to include the necessary support files and drivers. In the following two lines, the underlined portions are the full pathnames, as supplied by SmartStart. If you are not using SmartStart, your path name will replace this underlined text.

LOAD C:\NWSERVER\PATCHES\SFTIII\MS\START\PM410

PMLOAD C:\NWSERVER\PATCHES\SFTIII\IO\START

NWPALOAD.NLM will auto-load the required SFT-III support files, NWPAMS.NLM and NWPAIO.NLM, when the HAM module is loaded.

NetWare 3.12 NWPA Installation

The latest NetWare patch kit available from Novell, at http://www.novell.com or http://support.novell.com, must be applied to these servers prior to using NWPA drivers.

1. Down the server.

2. Ensure that NSSD Disk 1 is in drive A and "CD" (change directory) to the \NWPA directory. [CD \NWPA]

3. Run the batch file, NWPA_312.BAT and include the server's boot directory as the parameter. For example At the A:\NWPA> prompt, type:

   NWPA_312 C:\SERVER.312

4. Modify the STARTUP.NCF file to include the following command lines (only if you have not already installed the latest patch kit):

In the following two lines, the underlined portions are the full pathname as supplied by SmartStart. If you are not using SmartStart, your path name will replace this underlined text.

LOAD C:\SERVER.312\PATCHES\PM312

PMLOAD C:\SERVER.312\PATCHES

INSTALLATION TOPICS WITH NWPA

In this section, the issues associated with each environment are discussed and solutions presented.

SFT-III

Under SFT-III, if a custom .HAM is loaded (one with both .HAM and .CDM functionality), and there are no other .HAMs loaded, then there will be no .CDMs loaded. CPQARRAY.HAM is one of these custom .HAMs. As a result, in this configuration the autoloading of NWPAMS.NLM simply does not occur. If NWPAMS.NLM is not loaded, the device drivers are not visible.

Solution:

For customers loading only the CPQARRAY.HAM, modify MSSTART.NCF by adding this line: "LOAD NWPAMS.nlm".

At the time of publication, with SFT-III, NWPA's Autoload misbehaves. The "/naload" switch is ignored and the files are always autoloaded.

SCSIHD.CDM Binding Issues

There are two issues concerning SCSIHD.CDM binding for NetWare 3.12 and 4.10:

NetWare 3.12

NetWare 3.12 does not ship with any HAMs or CDMs. During the STARTUP.NCF process, when CPQSCSI.HAM is loaded, NWPA autoloads the generic CDMs including SCSIHD.CDM. Prior to NSSD v3.10, the NWPA_312.BAT file did not install SCSIHD.CDM, which caused NWPA to display alerts about not finding SCSIHD.CDM. This does not affect functionality because CPQSHD.CDM will bind to the disk devices, but still displays warning messages on the console.

Solution:

NWPA_312.BAT on NSSD v3.10 or later corrects this issue.

NetWare 4.10

In NWPA, if two CDMs register at the same level, the CDM that gets "first crack" at binding to the devices is the CDM that is loaded LAST. SCSIHD.CDM v1.04b that ships with NetWare 4.10 incorrectly registers itself, while CPQSHD.CDM correctly registers itself. In Compaq's startup.ncf file, CPQSHD.CDM is loaded before the HAM. When the HAM is loaded, NWPA "autoloads" the GENERIC CDMs, i.e. SCSIHD.CDM (and in this case the old version 1.04b, since the newer version 1.05 did not get loaded), and since it loaded last, binds to the disk devices.

Solution:

SCSIHD.CDM (provided by Novell) is available and included on the IntraNetWare PCI PCI Hot Plug Supplement. Installing this latest SCSIHD.CDM driver should "fix" both problems.

CPQSHD.CDM Binding Issues

CPQSHD.CDM will only bind to those SCSI disks that are managed by Compaq HAMs.

CD-ROM Drivers

CD-ROM driver support is provided by Novell through the generic CDM. Latest releases must be obtained from Novell.

Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

Symmetric Multi-Processor (SMP)

NWPA has been designed by Novell to use the Platform Specific Module, PSM, (and therefore APICs) to provide interrupt services for respective devices. The server masks all protected-mode interrupt sources before it transitions to real mode, where DOS (c: drive and floppy access) activity takes place. One of the consequences of the current setup is that protected mode interrupts are masked before the NWPA drivers have an opportunity to complete any pending input/output (IO) activity. This may stifle an NWPA driver while waiting for an interrupt to occur and complete a pending IO.

The array HAM is particularly sensitive because there is always a pending IO. The result is that the system gets "sick" and may hang when real mode activity is attempted.

Solution:

Installing the latest Support Pack (Version 3.0 at the time of writing) from Novell with an updated SMP.NLM and loader patch will allow NWPA drivers under SMP to receive interrupts before a real-mode transition occurs, thus fixing the problem.

Autoload

NWPA will automatically load CDMs and HAMs whenever they are needed. You can disable this feature by using the command line option /naload when NWPA.NLM is loaded in the STARTUP.NCF file. Note that with SFT-III, autoloading misbehaves (See SFT-III section).

Monitor and Performance Data

NWPA SCSI drivers no longer maintain monitor and performance data in non-volatile memory (disk). Data stored by DDFS drivers will be lost if you upgrade to NWPA SCSI drivers. This performance information for NWPA drivers is only for the current session in volatile memory (RAM) and does not span longer intervals.

Compaq PCI SCSI Controller Conflict

In a NetWare 3.12 Server, with a Compaq 32-bit Fast-SCSI-2 Controller (710) and a Compaq PCI SCSI Controller (875, 876, or 825), if the loader patch has not been installed, the CPQSCSI.HAM only sees the 710 controller and not the PCI SCSI Controller.

Solution:

Applying the latest patch from Novell (currently 312PTA.EXE) will correct the problem.

Cheyenne AS 6.1 and Other ASPI SCSI Tape Support

Tip: Cheyenne's URL for latest versions:

http://www.cheyenne.com/ CheyTech/Download/patch es/techptch/html

Cheyenne ARCserve (AS) 6.1 has been found to have a problem when it is run with the default SCSI2TP.CDM still loaded. The problem is caused by both the default CDM and the ARCserve driver attempting to control the tape at the same time. The tape drive receives commands from both paths and corrupts backup tapes being produced by rewinding or repositioning. This problem should be common to all ASPI tape drives.

Solution:

This is a two step fix. First, rename SCSI2TP.CDM to a SCSI2TP.SAV. This file is located in the SYS:SYSTEM directory or C: partition where SERVER.exe is located. Second, insure the ASPIBD.nlm is at least a build number of 78. The build numbers of ASPIBD.nlm installed from the ARCserve 6.1 Service Pack for NetWare from 3/97 is 78, and from 6/97 is 88. Either of these versions will properly support the Compaq's CPQSCSI.HAM driver.

Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

PCI Hot Plug Support and Removing Adapters

On ProLiant 6500 and ProLiant 7000PCI, when removing an adapter that has the NWPA storage driver loaded, the driver normally automatically unloads for that adapter. However, if NWPA.NLM was loaded before NEB.NLM, the driver does not automatically unload and the Novell Configuration Manager Console (NCMCON) displays the following message:

Driver for adapter in Slot # is currently loaded. Unload driver and select REMOVE again.

Solution:

Edit the STARTUP.NCF file to ensure that NWPA.NLM is loaded after NEB.NLM. Place any lines that autoload NWPA.NLM after the load statement for NEB.NLM. Loading any Host Adapter Modules (*.HAM) will cause NWPA.NLM to autoload.

COMPAQ INSIGHT MANAGEMENT AGENT SUPPORT

Prior to NWPA, Compaq Insight Management Agent support for Compaq SCSI and Array Controllers was available via a single SNMP Agent called CPQDSKSA.NLM. In order to support NWPA, this monolithic agent was broken into modular SNMP agents that monitor a specific type of controller. Additionally, since multiple types of controllers can be attached to similar storage boxes, there is an SNMP agent for storage boxes that instruments data for each of the controller specific agents. The following describes the NWPA Agent components:

- CPQSCSA.NLM (Compaq Insight Management SCSI Subsystem Agent) This Agent provides SNMP support for controllers and devices, which are attached to Compaq SCSI controllers which are running NWPA drivers.

- CPQDASA.NLM (Compaq Insight Management Array Subsystem Agent) This Agent provides SNMP support for controllers and devices, which are attached to Compaq Array controllers which are running NWPA drivers.

- CPQFCASA.NLM (Compaq Insight Management Fibre Subsystem Agent) This Agent provides SNMP support for controllers and devices, which are attached to Compaq Fibre Channel controllers which are running NWPA drivers.

- CPQSSSA.NLM (Compaq Insight Management SCSI Storage Box Agent) This Agent provides SNMP support for storage boxes which are attached to Compaq controllers described above.

The SNMP storage agents derive their information primarily through the Compaq drivers. As such, if you are running DDFS style drivers (*.DSK), you will need to run the older DDFS style storage agent (CPQDSKSA.NLM). If you are running the NWPA style drivers (*.CDM, *.HAM), you will need to run the NWPA style agents described above. It is also important to recognize that you cannot mix and match the DDFS style storage agent (CPQDSKSA.NLM) with the NWPA style agents.

The first Agent release that supported NWPA was v3.40 (June 1997) and it is important to note that future storage related hardware is only supported via the new NWPA enabled agents described above. For the near term, Compaq will continue to provide support for older hardware that runs the pre-NWPA storage agent (CPQDSKSA.NLM).

CONCLUDING REMARKS

The following summarizes some of the major conclusions involved with the planned support of NWPA:

- NSSD for the near term will provide both NWPA and DDFS drivers

- NetWare versions 3.11 or earlier do not support Media Manager and, therefore, do not support NWPA drivers. To migrate from these legacy systems to NWPA, you must first update to a newer release of Novell's NetWare (post 3.12), intraNetWare, or intraNetWare for Small Business and then do the migration from DDFS to NWPA.

- Future storage hardware will most likely only be implemented into NWPA

- Make sure that the latest NWPA drivers reside on your system (either those on NSSD or the latest from Novell if newer than NSSD)

- The NSSD will allow the customer to manually edit the NCF files to run a mix of NWPA/NSSD drivers

APPENDIX A

LIST OF DRIVERS

File	Description
IDEATA.HAM	**NWPA IDE Host Adapter Module**
	This module provides support for IDE controllers.
IDECD.CDM	**NWPA IDE CD-ROM Device Driver**
	This module is the NWPA device module for IDE CD-ROM devices.
IDEHD.CDM	**NWPA IDE Disk Driver**
	This module is the NWPA device module for IDE disk devices.
CPQSHD.CDM	**Compaq NWPA SCSI Disk Driver**
	This module is the NWPA device module for Compaq 32-Bit SCSI-2 Controllers.
SCSI2TP.CDM	**Novell Generic Tape Custom Device Module**
	This NWPA module provides support for Compaq tape devices connected to SCSI-2 Controllers.
SCSICD.CDM	**NetWare 3.12/4.x CD-ROM for SCSI Host Adapter Modules**
	This NWPA module provides driver support for CD-ROM devices connected to Compaq SCSI-2 Controllers.
NWASPI.CDM	**Novell Interface for ASPI**
	This NWPA module provides ASPI support for SCSI devices.
CPQSCSI.HAM	**Compaq Ultra Fast-Wide SCSI-2 Host Adapter Module**
	This module is the NWPA device module for Compaq Ultra/Fast/Wide SCSI-2 Controllers.
CPQARRAY.HAM	**NWPA Array Controller Host Adapter Module**
	This NWPA module provides driver support for Compaq array controllers.

GLOSSARY

ASPI	Advanced SCSI Programming Interface. An enhanced SCSI command set.
Autoload	Autoloading occurs when referenced modules from within a module are detected and automatically loaded.
CDM	Under NWPA, device drivers are developed in two sections. Custom Device Module is the portion that addresses interfacing to the device itself. The second portion of the drive is the HAM, or Host Adapter Module
DDFS	Disk Drive Functional Specification is the original storage driver specification for Novell's operating systems. The NWPA is its replacement.
Disk Array	Disk reliability can be increased by grouping disks into a Disk Array. This array is treated as a single logical device. Information is stored on the individual disk in a variety of ways that will provide redundancy and high access.
EISA	Extended Industry Standard Adapter is one of the bus standards for the PC.
Fibre Channel	This specification is for a class of high reliability distributed storage system. The name comes from the fiber that may be used for communication.
HAM	Host Adapter Module is the portion of the NWPA driver architecture that interfaces with the adapter.
PCI Hot Plug	This is a new architecture that provides replacement of drives, adapters, and power supplies while the system is still running. There is no need to down and power off a server to perform these replacements.
IDE	Integrated Drive Electronics refers to a standard disk interface specification. The newer related standard is EIDE (for Extended IDE). EIDE handles both larger capacity and more drives that IDE. IDE also refers to a class of CD devices, these are also known as ATAPI or ATA.
ISA	Industry Standard Adapter is the bus that was originally on the AT. The original PC and XT bus is distinguished as the 8-bit ISA.
NLM	NetWare Loadable Module refers to the software modules written to be loadable by the Novell OS's.
NSSD	NetWare Support Software Diskettes is the media that Novell distributes their software on.
NWPA	NetWare Peripheral Architecture is the new storage functional specification that replaces the DDFS.
PCI	PCI is a high performance bus standard on the PC.
SCSI	Small Computer Systems Interface is a bus standard used primarily for disks and CD-ROM's on the PC.
SFT	System Fault Tolerant. This technology refers to the redundancy and reliability that can come from disk arrays.
SMP	Symmetric Multi-Processor. This refers to the ability to place multiple Pentium class processors in the same box and share the processing load among the array of CPU's.

Migrating to Novell's NetWare Peripheral Architecture (NWPA) Drivers

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