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What's New in NetWare 4.1

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NetWare 4.1 includes enhancements in a wide variety of areas, bringing improved performance and simplified administration. Chief among these enhanced areas are NetWare Directory Services, utilities, storage, fault tolerance, messaging, and NetWare for Macintosh. This AppNote details many of these new features and also references other documents that contain comprehensive information.

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Introduction

NetWare 4.1 contains many significant updates that those purchasing the product need to know about. The features listed here are in addition to the enhancements included with NetWare 4.02. For NetWare 4.1, all of the following have been updated:

- Operating System
- Directory Services
- Installation
- NetWare Administrator
- Utilities
- SMS and Storage
- SFT III
- MHS Services
- OS/2 Support
- NetWare for Macintosh
- Routing

This AppNote is intended only to summarize the new features of NetWare 4.1. Therefore, the lists included in this AppNote are not necessarily comprehensive. For more information on these enhancements, see the

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documentation accompanying the product.

Operating System

For NetWare 4.1, the operating system development team concentrated on making the operating system more robust and stable by fixing bugs and optimizing code. Because of the emphasis on making the operating system as robust as possible, a limited number of new features were added. New features include the following:

1. The operating system now includes Unicode support with a conversion table in the OS to allow multiple languages.
2. CONFIG.NLM was opened so that NLMs can register themselves through event notification. Any NLMs thus registered will be displayed when CONFIG is run.
3. Support for the Pentium 4MB page is on by default. This can improve performance, depending on the applications and tasks being run. Non-Pentium machines function as before.
4. The operating system can automatically detect PCI and PCMCIA bus systems.

Directory Services

NetWare Directory Services (NDS) for NetWare 4.1 has been greatly enhanced with new management features, additional tools, more flexibility, and stringent testing to ensure reliability.

The following primary features have been added to NDS for NetWare 4.1.

Abort Partition

You can abort partition and replica operations if you run into problems, such as when a server goes down permanently during the operation or when other network problems make it impossible to complete the operation.

Bindery Context Path

The Bindery Context Path is now configurable so that a server can have multiple bindery contexts set in a path. The first bindery context in the path is the default. You can change the bindery context path using the SET console command.

DS Modules

DSLOADER, DSMERGE, and DSREPAIR offer the following features:

DSLOADER. DSLOADER is bound into the NetWare 4.1 operating system and loads NDS from SYS:SYSTEM when the server starts. It allows you to unload and reload NDS while the server stays up.

DSMERGE. DSMERGE is a new utility that lets you merge two Directory trees into a single tree. With this utility, you no longer have to wait for the entire company to decide on a tree structure. You can create separate trees from different organizations and merge those trees later if desired. DSMERGE also lets you rename a tree to verify that all servers in the tree are responding properly, and to view time synchronization information.

DSREPAIR. DSREPAIR, the utility used for repairing problems with a Directory tree, has been enhanced to handle more types of problems and has an easier-to-use C-Worthy interface.

Enhanced Cache

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This area includes Entry Cache and ID Cache.

Entry Cache. This cache provides access control for calculating rights and resolving names within the Directory.

ID Cache. NDS keeps a cache of objects to be synchronized. This greatly speeds synchronization, especially in larger containers, because NDS does not scan those containers to see if you have modified objects.

Filtering

Search filtering and time filtering offer key NDS capabilities:

Search Filtering. Clients can filter searches by Base Class, RDN (name), Modification Time, and Containers within the Directory.

Time Filtering. This feature allows you to read and list objects that are filtered by time stamp and provides the base to synchronize with other directories, address books, or directories.

Large Internet Packet

The NDS Client now supports Large Internet Packet (LIP), which improves traffic performance during synchronization.

MHS/AFP Interoperability

Several objects have been added to support Message Handling Service (MHS) and AppleTalk Filing Protocol (AFP), allowing administrators to more easily manage objects for these products in the Directory.

NetSync

NetSync is a set of NLMs that allow you to manage user and group objects on a NetWare 3 server using the NetWare Administrator utility from a NetWare 4 network. NetSync provides a central point of administration for a mixed network, without disrupting or changing the NetWare 3 users' working environments. It also allows network supervisors to manage all servers centrally and preserve users' environments while migrating NetWare 3 servers to NetWare 4.1 one at a time.

Partitioning

NetWare 4 partition operations are more reliable and have greater capabilities.

Move Partition (also known as Move Subtree) is a new feature of Partition Manager that allows you to move an entire branch of your tree easily to a different location in the tree.

Partition Manager now has features to abort operations, move a subtree, synchronize a replica from all other replicas, and/or allow one replica to synchronize to all other replicas.

Placing Aliases

You can leave an alias in place when you move a subtree or rename a container. These operations are transparent to NDS users.

Renaming a Container

With NetWare 4.1 you can rename a container within the tree if the name is too long, too short, or incorrect. You can thus change container names as your company changes.

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Rename subtree allows you to rename a container object. This can be done either using NetWare Administrator or NETADMIN.

Restrict Sync

This SET command allows you to state what versions of NDS you want and do not want synchronized within the tree.

Setting Parameters

NetWare 4 allows you to control synchronization, background processes, and other functions, such as the following:

`NDS trace to screen = ON/OFF` (default is Off)

Installation

The installations of NetWare 4.1 has been enhanced in the following ways:

1. The installation for both SFT III and NetWare for OS/2 have been integrated with the regular NetWare 4.1 install. Both have also been simplified.
2. INSTALL.NLM now has a simplified installation option that includes the simplified NDS install from NetWare 4.02, plus additional simplified features. The supervisor can install NetWare 4.1 on a server in less than half an hour.
3. An administrator can now uninstall NDS to remove an irreparable NDS or install NDS into a different container.
4. Server-to-server installation is now available. This option lets you choose the path from which to install, and the install runs without losing the connection with the other server.
5. You can now load and bind TCP/IP and AppleTalk protocols in the Custom Installation option. The products that use these protocols can then be installed later in the Product Options menu of INSTALL.NLM (using PINSTALL).
6. INSTALL.NLM auto-detects the Ethernet frame type currently being used (802.2 or 802.3).

File Checking

During the file copying process, when existing or newer version files (for .NLM, .DSK, and .LAN files) are located, a prompt appears indicating the existence of the file on the server.

Options are then displayed on the screen that allow you to choose the following actions: continue and overwrite the file, do not overwrite, always overwrite, never overwrite, or abort copying.

NetWare Administrator

A number of enhancements have been made to the NetWare Administrator (NETADMIN and NWAdmin) utilities. This section lists the major improvements.

Browser

Browser improvements include the following:

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- The ability to handle approximately 40,000 objects (requires a minimum of 16 MB of memory on the server).
- The "Include" dialog has been enhanced to allow viewing objects by name, as well as by class.
- The new "Sort by Object Class" dialog allows the reordering of the sequence of object classes displayed in the browser.
- "Save Settings on Exit" feature preserves opened browsers with their positions.
- The "Find" feature allows the user to find objects quickly by simply beginning to type the name of the object.
- Users can print the contents of a browser.
- Users can choose to view the trustee rights of an actual alias object itself, or of the object that the alias references.

Files and Directories

A new Find feature in the "Rights to Files and Directories" details page allows users to select a context and view an object's file system rights for all volumes found in that context, or in subordinate contexts. In addition, files and directory object details now display NFS information for volumes.

Print Layout Page

The Print Layout page provides a visual snapshot of the printing layout for a particular container object or print server.

Salvage

Salvage dialog can display a significantly larger number of files for salvage or purge, limited by available memory. Users can also cancel the retrieval of a file while it is being salvaged.

Search

Users can now search for all properties in the schema. They can also save and re-use search queries by using the Save or Open options in the Search dialog, or by dragging a saved query from the Windows File Manager to the Search dialog.

Utilities

The NetWare utilities have been upgraded in a variety of ways:

1. Improved security for Remote Console password
2. Internetworking NLMs that enable multiprotocol routing have been added. Using these NLMs, you can configure IPX, AppleTalk, and TCP/IP communication protocols. 3. Command line and C-Worthy based utilities now have the "/ver" option, which documents not only the utility version, but the version of the message and Unicode files it requires.
4. UIMPORT's new features include MHS support, a set volume restrictions option, a change home directory option, and the ability to change context during an import operation.
5. Login now requires less workstation memory.

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6. Command line utilities support Personal NetWare Connections, where appropriate.
7. FILER and NDIR support NFS.
8. A new utility, NPATH, lets you view the search sequence that NetWare uses to find message files, allowing you to determine why a workstation can't find a particular file or why it's finding an incorrect version of a file.
9. A new utility, NCUPDATE, runs from within a login script to update the NET.CFG default context field after a Directory Services container has been renamed or moved.
10. Clients can use typeful and typeless names, preventing ambiguity. (Typeless naming does not require the O=, OU=, and CN= portion of an object's name.)

SMS and Storage

Storage Management System (SMS) enhancements include improvements to SBACKUP, various TSAs, and SMDR.

SBACKUP

With NetWare 4.1, the following features have been added to SBACKUP:

- Tape format/retention option
- Calendar time included in log files
- F10 key consistency
- Tape reselection option
- Completion message included for delayed backup operations
- Simplified restore menus and simplified user interface (UI)
- Support for full pathnames for TSA-NDS selection lists
- Ability to write media that is compliant with System Independent Data Format (SIDF)

TSAs

Enhancements related to Target Service Agents (TSAs) include the following:

- All server TSAs retain namespace data if file is renamed.
- TSA-400 includes a new modify bit for extended attributes (EAs), trustees, and other non-data attributes. It also provides SMS notification of changes to an attribute within a file.
- TSA-400 includes backup data migration keys.
- NDS TSA offers selective restore.
- TSA-DOS utility offers configuration capabilities.

SMDR

The Storage Management Data Requester (SMDR) now runs SMS applications in a Ring 3 domain. SMDR

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also runs with SFT III.

Storage

General storage enhancements include the following:

- Support for future magazines and changers (SDI). This broadens changer device support.
- Support for System Independent Data Format (SIDF)-compliant media
- NFS support in CDROM.NLM
- NetWare Peripheral Architecture (NPA), which allows for broader driver support for host adapters and connected hardware devices. (At the same time, existing drivers still work with 4.1.)
- Host Adapter Modules (HAMs) and Custom Device Module (CDM). The HAM drives the host adapter hardware, and the CDM drives hardware devices attached to a host adapter bus.
- HCSS multi-drive autochanger support and performance enhancements (more efficient jukebox retrieval, significant decrease in import time, and parameters that let you customize the system).

SFT III 4.1

NetWare SFT III 4.1 (which requires a separate license diskette, in addition to the regular 4.1 license) includes several enhancements, such as the following:

- Added protocol support
- Group/user notification upon server failure
- Streamlined installation
- Alternate/backup mirrored server links (MSLs)
- .NCF changes
- SET parameter name changes
- Log file control
- Default memory of 5 MB

Added Protocol Support

SFT III 4.1 includes enhanced support for both TCP/IP and AppleTalk.

TCP/IP. TCP/IP clients switch over when a server fails (protocol stack loads and runs in the MSEngine).

AppleTalk. Macintosh clients switch over when a server fails (protocol stack loads and runs in the MSEngine).

Group/User Notification Upon Server Failure

Instead of broadcasting to every attached user when a server failure occurs, SFT III uses the group or username specified in the new SET command (discussed below). The broadcast goes to the specified user or any members of the specified group who are attached when the failure occurs. Error messages about the reason for the switchover still go the appropriate file server log files.

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In addition to broadcasting server failure messages, the notification feature also notifies users or groups when a disk drive fails for any reason. A message is also printed to the server console (but not broadcast) every 30 minutes stating that a disk failure has occurred and mirroring is no longer active.

Streamlined Installation

The SFT III installation procedure has changed significantly from the 3.11 version. The documentation covers the following types of installations:

Initial installation. The install from scratch begins with a DOS front end (INSTALL.BAT), which prompts the administrator through MSL selection and activation and the creation of three diskettes with the minimal file set needed for the second server. The install program automatically goes into INSTALL.NLM when the server is activated.

Converting SFT III 3.11 to SFT III 4.1. This option preserves and re-uses all partition information engine names and numbers and automatically moves the LAN and disk driver LOAD commands to their recommended locations in the new .NCF file scheme.

Upgrading NetWare 4.1 to SFT III. This option is identical to the initial installation procedure, but without installing NetWare 4.1 first. Nothing needs to be set up on the second server, since the install program sets up partitions and mirroring automatically and even makes adjustments to memory alignment if necessary.

Alternate/Backup MSLs

SFT III 4.1 allows for the use of more than one MSL per server. At any given time, when the server is active, only one MSL is being used, with any others in a standby mode in case the active MSL fails. The CONFIG command at the IOEngine console shows the status of any MSLs that are loaded, such as Active or Standby.

The MSLs should be loaded in order of preference, at the end of the IOAUTO.NCF file; the first-loaded MSL is always used unless it continues to fail. Any additional MSLs are loaded and then monitored during normal operation to make sure they are ready to take over if the active one fails. This monitoring involves essentially no performance overhead.

If one of the standby MSLs fails, a message is sent to the console and the log file. If the active MSL fails, the secondary server restarts, and when it comes back up the OS will reload and retry the preferred MSL, then the second, and so on, until a functional MSL is found.

SFT III 4.1 allows for a maximum of 8 MSLs per server. Each MSL must be cabled properly for automatic takeover; the standby MSL cannot be used as LAN adapter.

.NCF Changes

The SFT III .NCF files are executed in the same sequence as in 3.11, but several changes have been made to the files themselves.

You can use INSTALL.NLM to view and edit these files, and you can cut and paste between files. It is advisable to move LAN driver load commands from IOSTART.NCF to IOAUTO.NCF and LAN drivers from the DOS partition to the SYS volume.

The INETCFG.NLM utility modifies the SFT III .NCF files correctly but puts LAN driver load commands into a separate file (INIT.SYS) that is called from IOAUTO.NCF. It is also okay to have these commands (to load and bind LAN drivers) directly in IOAUTO.NCF. Do not modify the INIT.SYS file created by INETCFG.NLM.

IOSTART.NCF. This file runs first when you type `MSERVER`; it includes the IOEngine name and number, SET parameters (list those for adjusting memory first), disk driver load commands, and the MSL driver load

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command (the last item in the file).

MSTART.NCF. This file includes SET parameters that must be set at startup and is executed when you type `ACTIVATE SERVER`.

MSAUTO.NCF. This file includes the MSEngine name and number, SET parameters, and mount commands for volumes. Load any NLMs that run in the MSEngine here.

IOAUTO.NCF. This file always executes, even the first time the server is activated. Load LAN drivers here, from the SYS volume. Also include any NLMs that need to be in the IOEngine but need an active MSEngine (and mounted volume) to load.

SET Parameter Name Changes

For consistency, clarity, and international enabling, the following SET parameters are named differently than in NetWare 3.11.

The new parameter names are listed below, with the old names in parentheses:

- MSL Error Wait Time (Mirrored Server Comm ACK Wait Time Out)
- Secondary Take Over Wait Time (Secondary Take Over Delay Amount)
- MSL Deadlock Wait Time (Comm Deadlock Detect Wait Time)
- Extra MSL Checking (Check Server to Server Comm)
- Primary Server MSL Deadlock Recovery Option (Primary Server Comm Deadlock Recovery Option)
- Secondary Server MSL Deadlock Recovery Option (Secondary Server Comm Deadlock Recovery Option)
- MSEngine Outputs Different Recovery Option (MSEngine Outputs Different)
- Primary Server MSL Consistency Error Recovery Option (Primary Server Comm Consistency Recovery Option)
- Secondary Server MSL Consistency Error Recovery Option (Secondary Server Comm Consistency Recovery Option)
- Primary Server MSL Send Blocked Recovery Option (Primary Server Comm Driver Stuck Recovery Option)
- Secondary Server MSL Send Blocked Recovery Option (Secondary Server Comm Driver Stuck Recovery Option)
- Primary Server MSL Hardware Failure Recovery Option (Primary Server Comm Hardware Failure Recovery Option)
- Secondary Server MSL Hardware Failure Recovery Option (Secondary Server Comm Hardware Failure Recovery Option)
- Notify All Users of Mirrored Server Synchronization (Notify Users of Mirrored Server Synchronization)
- Server Failure Notification Name (Notify Users of Mirrored Server Failures)

Log File Control

With SFT III 4.1, you can use SET parameters to limit the size of log files.

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Status Dump File. Use this command to limit the size of the Status Dump File:

```
SET STATUS DUMP FILE OVERFLOW SIZE = (size in bytes)
```

This is the maximum size for MSSTATUS.DMP before action is taken.

```
SET STATUS DUMP FILE STATE = (0,1, or 2)
```

The values for this SET parameter have the following meanings:

0 Take no action if file exceeds overflow size

1 Delete log file if it exceeds overflow size (default)

2 Rename log file if it exceeds overflow size (file is renamed MSTATUS.000, then .001, .002, etc.)

IOEngine Error Log File. Use this command to limit the size of the IOEngine Error Log File:

```
SET IOENGINE ERROR LOG FILE OVERFLOW SIZE = (size in bytes)
```

This is the maximum size for IO$LOG.ERR before action is taken.

```
SET IOENGINE ERROR LOG FILE STATUS = (0,1, or 2)
```

The values for this SET parameter have the following meanings:

0 Take no action if file exceeds overflow size

1 Delete log file if it exceeds overflow size (default)

2 Rename log file if it exceeds overflow size (file is renamed IO$LOG.000, then .001, .002, etc.)

Default Memory of 5 MB

The default IOEngine memory size has changed from 2 MB to 5 MB. The 4.1 Install program actually tries to adjust the IOEngine size automatically, within certain limits, so that it ends up taking about 25 percent of the total RAM.

If you use the SET parameters to adjust the IOEngine size, put the appropriate commands near the beginning of the IOSTART.NCF, right after the IOEngine name and number.

Other SFT III Enhancements

The following are among other SFT III enhancements:

- Added support for CD-ROM in SFT III
- Support for DOMAIN.NLM, providing memory protection in both engines.
- Added shim to support DAI calls in SFT III; IODAI40 and MSDAI40 are the module names.
- SFT III-specific alerts handled correctly and fully instrumented for Net Management.
- Dual-Processor drivers written for 3.11 SFT III also work correctly for 4.1 SFT III.
- ServMan now handles all SFT III-specific SET parameters correctly.
- TimeSync works correctly with SFT III.

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- Adjusted default settings for Test Mode (generates server failures every 3 minutes).

MHS Services for NetWare 4

With NetWare 4.1, Novell is for the first time including a version of NetWare MHS that uses NDS as its native messaging directory. Administrators benefit from being able to manage both messaging and NetWare users from NetWare 4's NetWare Administrator utility, while users benefit from a single, unified address book and support for essential messaging applications.

MHS Services for NetWare 4 provides a store-and-forward message transfer service to NetWare 4 networks. It is fully integrated with NDS and NetWare 4.1 utilities such as NWAdmin and UIMPORT.

MHS Services is not NetWare Global MHS ported to NetWare 4.1. Rather, it is a new, highly tuned MHS engine specifically designed for NetWare 4.1.

MHS Services for NetWare 4 is compatible with SMF71, CMC, VIM, and Simple MAPI and allows applications compatible with these APIs to exchange electronic mail, share calendars, schedule facilities, and perform many other tasks.

In addition, MHS services supports existing NetWare MHS applications, MS Mail for Windows, and Windows-based mail-enabled applications including file managers, word processors, and spreadsheets.

MHS Services includes FirstMail, a starter E-mail application from Novell. Both the DOS and Windows versions are included.

Key features of MHS Services include the following:

- Full integration with NDS and NetWare 4 administration utilities
- NDS Alias object support for addressing mail to users
- SMF71 support
- Support for implicit distribution lists using Group and Organizational Role objects
- Support for explicit distribution lists using Distribution List object
- MHSCON, a server-based utility that offers event monitoring, statistics gathering, and message flow control
- Installation that is fully integrated with standard NetWare installation
- SFT III compatibility

MHS.NLM

MHS.NLM is the key module that provides MHS services. It is a multithreaded NLM that performs message routing and delivery. MHS.NLM uses MHSLIB.NLM, so both must be loaded to activate a messaging server.

MHSCON.NLM

MHSCON is an NLM-based utility that includes options for handling messages, event logs, statistics, and configuration. (MHSCON is similar to the Admin utility used with Basic MHS in NetWare 3.12. The differences are that MHSCON has more functionality and is run from the server console rather than a workstation.) To run MHSCON, type the following at the file server console:

```
LOAD MHSCON
```

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MHS-Specific Objects

MHS Services relies heavily upon the functionality of NDS. During the initial installation of MHS Services, default Messaging Server and Message Routing Group objects are created in NDS. Two other objects, the External Entity and the Distribution List, add functionality to MHS Services. These are all new MHS-specific objects in the NDS base schema.

Other objects, such as the NDS User and Group objects, have been modified to include MHS attributes. For example, various objects now include a Mailbox Location and Mailbox ID.

MHS makes use of and relies completely on NDS access control for its own access control. The rights specified for MHS-related objects includes both rights to NDS objects and rights to NetWare directories/files.

Messaging Server. The Messaging Server object enables messaging services. This object identifies the location of the MHS message directory structure (the \mhs subdirectory) serviced by the messaging server, and identifies the Server on which the Messaging Server software runs.

Message Routing Groups. The Message Routing Group object is used to represent a group or cluster of Messaging Servers which communicate directly with each other for transferring messages. The Message Routing Group is analogous to the Global MHS "pipeline" and is an effective object class.

External Entity. The External Entity object class is used to represent a non-native NDS object. It is used to store information about non-NDS users with which MHS Services users communicate.

Distribution List. A Distribution List is used by MHS Services to facilitate addressing multiple mailboxes and reduce inter-server traffic. Unlike membership with a Group object, membership with a Distribution List object does not automatically imply security equivalence. Unlike a Group, a Distribution List can be a member of another list so as to support nested distribution lists. The Distribution List object class is used to represent an unordered set of names. Distribution List is an effective object class.

OS/2 Support

Enhancements to OS/2 support include the following:

NetWare Requester for OS/2

The NetWare Client for OS/2 software enables OS/2 workstations to connect to NetWare networks. OS/2 client workstations offer connectivity to NetWare 4 NDS and use of NetWare IPX/SPX and NetBIOS as well as Named Pipes support.

NetWare Requester for OS/2 has been upgraded as follows:

- SFT III support
- VMBoot support
- VIPX.SYS (for OS/2 2.0) Awareness in NWIPXSPX.DLL for Windows
- First Login drive availability
- NWTOOLS to support more than three printers

NetWare Server for OS/2

These features are now included in NetWare 4.1 for OS/2:

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1. There are two memory sharing options for determining how NetWare and OS/2 share memory: manual memory sharing and automatic memory sharing.

   Manual memory sharing allows you to allocate more or less memory to NetWare or OS/2 while the server is running. You determine the amount of memory each operating system needs.

   Automatic memory sharing determines the proper amounts of memory NetWare or OS/2 needs as the server is running.

2. The new CDROMSHR.DSK disk driver allows the NetWare Server for OS/2 to access CD-ROMs operating under OS/2.

NetWare for Macintosh

The NetWare for Macintosh product is comprised of server and client software components. There are three main features that distinguish NetWare for Macintosh 4.1 from previous versions: it provides NDS support for Macintosh workstations, is SFT III compatible and is double byte enabled. In addition, the AppleTalk Protocol Stack, Router, and configuration components have been moved out of the NetWare for Mac product. Those components are now supported by the MultiProtocol Router (MPR) group in San Jose and are part of their NetWare 4.1 product component definition set.

NetWare for Macintosh server components (NLMs) are grouped into the following functional areas: Product Installation Support, File Services, Print Services, and HFS CD-ROM support. NetWare for Mac server components are fully double byte enabled and will run under the 4.1 SFT III operating system. The NLMs are currently localized for French, German, Italian and Spanish. They will be localized for Korean, Japanese, simplified and traditional Chinese.

Product Installation Support

PINSTALL.NLM and ATCONFIG.NLM provide support for installation of the server and the client software. The following features have been added:

- Ability to install using a server-to-server connection
- Ability to install using a Remote Console (RCONSOLE.EXE, REMOTE.NLM) connection
- Ability to add the Macintosh name space to volumes
- Multiple language installation support including server and client components
- Ability to unpack the MacPac'ed client support file
- Improved SFT-III support
- AFP license installation support
- Multiple language support (internationalized)
- Miscellaneous user interface improvements

File Services

NetWare for Mac 4.1 file services are provided by AFP.NLM and AFPCON.NLM. File service related enhancements include the following:

- The number of connections allowed without the 1000-user license has been increased from 5 to 25.

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- 1000 user support is now enabled via a license installation instead of serializing the AFP.NLM at production time.
- Bugs in previous versions have been fixed.
- NDS is now fully supported.

Print Services

NetWare for Mac 4.1 print services are provided by ATPS.NLM, ATPSCON.NLM and ATXRP.NLM. The following features have been added:

ATPS.NLM.

- Full NDS Support in ATPS
- Enhanced Binary PostScript Support
- HP Printer Job Language (PJL) Support
- Enhanced Font Management
- Support for New Printers and Drivers

ATPSCON.NLM.

- Fully compatible with NetWare Directory Services.
- New menu to view and set font cache options.
- New feature to view, add or delete cached font files.
- New option to view archived printer logs.
- Selectable context and volume for queue creation.

ATXRP.NLM.

- More robust
- Better integration with PSERVER

HFS CD-ROM Support

HFS CD-ROM support in prior NetWare for Mac 4x versions was provided by HFSCDROM.NLM. In 4.1, HFSCD-ROM support is provided by two NLMs: HFSCD.NLM and HFSCDCON.NLM, allowing the operating system to support more controllers, drivers, and drives.

HFSCD.NLM controls the process of using the CD-ROM disks. HFSCDCON.NLM provides tools for menu-driven configuration and monitoring. Both NLMs are double-byte enabled.

NetWare for Mac 4.1 Client Software: MacNDS

MacNDS is new for 4.1. The MacNDS client software provides access to NetWare 4.1 NetWare Directory Services for Macintosh workstations running System 7.x operating systems. MacNDS does not provide Directory Services support for versions of NetWare for Mac prior to version 4.1, or on Macintosh workstations running System 6.

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MacNDS is fully double byte enabled. MacNDS is currently localized for French, German, Italian and Spanish. It will be localized for Korean, Japanese, simplified and traditional Chinese.

The MacNDS client software contains these main components:

MacNCP. MacNCP enables a Macintosh workstation to log in directly to a Directory Services tree and connect to any server in that tree without reentering your name and password for each server. It allows you to specify a preferred user name, Directory tree, and Directory context for DS logins.

NetWare UAM. The NetWare User Authentication Method enables a Macintosh workstation to log in to a NetWare network, change your password, or log in to Directory Services via MacNCP. In a non-Directory Services environment, the UAM allows for NetWare encryption and longer names and passwords, as well as the processing of expired passwords.

MacIPX. MacIPX enables a Macintosh to communicate on the network using the IPX/SPX family of protocols. MacIPX is required by MacNCP to access Directory Services.

NetWare Aliases. The NetWare Aliases extension enables you to create aliases to files and folders on NetWare servers. You can store the aliases on your Macintosh workstation and use it to quickly login to a server and open a frequently used file or other service.

The bindery based NetWare Tools for Macintosh which were provided in previous versions of the client software are no longer provided in 4.1. They will be provided in a separate product, NetWare for Macintosh Client 2.0.

Routing

Routing enhancements include the following:

1. AppleTalk Update-based Routing Protocol (AURP), which includes AppleTalk tunneling in TCP/IP and update-based routing through the tunnels.
2. BOOTPFWD.NLM (in the TCP/IP software), which enables the server to forward BOOTP requests/reply packets between the BOOTP server and BOOTP clients.
3. EGP (Exterior Gateway Protocol) support. EGP exchanges network reachability information between autonomous systems.
4. NLSP (NetWare Link Services Protocol), a link state routing protocol.
5. OSPF (Open Shortest Path First) router support.
6. RIP II (TCP/IP), an enhancement to RIP that includes the subnetwork mask in its routes.
7. Support for TCP/IP protocol stack at the client workstation to allow for easier integration of DOS and MS Windows workstations into Unix environments.

Other Key Features

This section lists other important enhancements that are also included with NetWare 4.1.

Network Management

Network management enhancements include the following:

- Notification from other groups of new alerts.

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- SFT III compatibility
- The SNMP (Simple Network Management Protocol) agent provides network information to any SNMP console including Novell's NetWare Management System (NMS).

DOS/Windows Client

These features have been added to the DOS/Windows Client:

- Connection time-out optimization
- Auto-reconnect feature that allows workstations to reconnect to the network after a connection is lost
- Support for mobile IPX client workstations added to the IPXODI.COM file. This support allows workstations to intelligently respond to error messages during lost hardware and software connections to the network.

DynaText Viewer

The DynaText viewer included with NetWare 4 offers all the functionality of the Novell ElectroText viewer provided in earlier versions of NetWare. The DynaText viewer also includes the following enhancements:

- Quicker response times for scrolling and searching
- An enhanced graphical user interface, including a toolbar
- Macintosh and UnixWare viewers
- Capability to insert public or private "sticky notes" and bookmarks into online manuals
- Inline graphics

Additive Licensing

Additive licensing allows any NetWare 4.1 license to be added to any other 4.1 license that may already exist on a server. This effectively allows customers to create any user count on any server in increments of five users. This does not require a change in part numbers for either new licenses or upgrade licenses. Each license will still be accounted for so that a customer could not use a license multiple times on the same network.

New Manuals

The following manuals have been added to the NetWare 4 documentation set:

- *New Features*
- *Upgrade*
- *Installing and Using NetSync*
- *Installing and Using Novell Online Documentation for NetWare 4.1*
- *Using MACNDS Client for NetWare 4*
- *NetWare IPX Router Reference*
- *NetWare AppleTalk Reference*

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- *Migrating an IPX Network to NLSP*
- *MHS Services for NetWare 4*

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