

Technical Report: Novell NetWare™ Migration to Windows® Server 2003

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TECHNICAL REPORT

Network Appliance, a pioneer and industry leader in data storage technology, helps organizations understand and meet complex technical challenges with advanced storage solutions and global data management strategies.

Abstract

This document provides an overview of migrating from Novell NetWare to Microsoft® Windows Server 2003, with the focus on zero disruption to end users. This document assumes that the reader is familiar with both the Novell NetWare and the Windows Server 2003 network operating systems.

The information provided here should be considered a place to start rather than a thorough discussion of all possible alternatives or a complete roadmap for the migration.

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Novell NetWare Migration to Windows Server 2003

In the 1980s, the name *Novell* was synonymous with fast, reliable file sharing. Its flagship NetWare product became the de facto standard for enterprise file sharing in personal computer networks.

Much has changed since then, resulting in companies often finding themselves in a political line of attack in choosing between Novell and Microsoft as they make strategic decisions for their future.

Novell insists NetWare 6.5 isn't the end of NetWare. However, NetWare 6.5 will indeed be the last operating system that customers can buy under that brand name. And the Novell next-generation operating system—Open Enterprise Server (OES), which includes NetWare and Linux® kernels—will represent a radical departure from the NetWare that has been an industry staple for 20 years.

No matter which operating system customers choose, change will happen—whether that will be to run a heterogeneous environment or to focus primarily on one OS. This document focuses primarily on migration to Windows, but if the migration is from an early version of NetWare to Novell Open Enterprise Server, the key migration steps will basically be the same.

Note: Many customers take a phased migration approach. This usually starts with migrating their NetWare applications to either Suse Linux or Windows, while keeping their NetWare file and print servers. This also provides a structured migration, utilizing the investment made in Novell software, as most Novell products can run cross-platform on NetWare, Linux, and Windows.

Planning the Migration

Making a decision to change operating systems involves many ramifications for your business and isn't always straightforward. Therefore careful planning is suggested so that the transition addresses not only your immediate goals but also your long-term strategy. While Windows NT® shares many similarities with Windows 2003, migrating from NetWare to Windows is quite another matter. Many companies, Microsoft and Network Appliance among them, provide excellent professional consulting and training services to help you with your migration.

NetApp ConsultingEdge Services (<http://www.netapp.com/support/consultingedge.html>) offers consulting engagements that range from strategy and discovery to requirements assessment and from planning and design to implementation. These offerings help you assess current and future strategies and your organization's readiness to move to Windows 2003, provide information about how to best approach a migration, and help implement migration plans.

Creating a Clear Vision

Before you can migrate to a new Windows Server 2003 Active Directory environment you must determine what that environment will look like and develop a migration strategy to get there.

A Vision for the Solution

The vision starts with a business problem. This problem should be the driving factor in your investigating migration to Windows Server 2003.

Common business drivers for migrating from Novell NetWare to Windows Server 2003 include the following:

- Political or senior management decision. Many companies make the decision of which OS to purchase based on where the industry appears to be going.
- Difficulty of upgrade to new Novell NetWare version. Organizations with existing versions of Novell will have to build the Linux infrastructure and then migrate to the new version.
- Multiple operating systems in one environment. Pure Novell environments are rare. Increasingly Windows 2000 or Windows 2003 has already been introduced into Novell environments to host applications and services. With the change to the base Novell operating system, maintaining Novell and Linux along with Windows increases administrative and training requirements. In addition, resource availability becomes an issue, because it is difficult to find engineers who are well versed in all three operating systems.

Windows Server 2003 Design

Determine the software version and the hardware configuration that will be used for Windows Server 2003. In addition, before deploying the servers in a test environment, consider the use of third-party applications. The design of the system and the servers should take into account any data protection software (backup, antivirus, etc.) that you decide to use.

Active Directory is a necessary and fundamental component of any Windows Server 2003 implementation. You can use Windows built-in tools to set up Active Directory. This table covers the key elements for consideration for a successful migration to Active Directory.	
Architecture	Determine the Active Directory Forest and Domain Design. Options include a Single Forest/Single Domain Model, a Single Forest/Multiple Domain Model, a Multiple Forest Model, or a combination environment.
	Functional Levels in Windows Server 2003 Active Directory. This decision is based on the needs of your organization, such as whether you have a Windows 2000 or Windows NT 4.0 domain controller. When making changes, always begin at the root and work your way down the domain design.
	Will there be any Namespace issues? When shares are migrated from Novell NetWare to the target server, the paths of the migrated files are changed. Novell offers a free utility, Alias Katharsis Application, which will remap application links and shortcuts. (http://www.novell.com/coolsolutions/tools/1029.html)
Networking	Active Directory revolves around and is inseparable from Domain Name System (DNS), so the decision of where to host DNS is one of the most important ones to make.
	Many modern networks include components that rely on Windows Internet Naming Service (WINS), including down-level (pre-Windows 2000) clients, legacy applications, and even some Microsoft services such as Distributed File System (DFS) that use NetBIOS resolution by default.
	DHCP can be configured to allow for the server service to update the dynamic DNS record for the client if the client is unable to perform the update itself.

Configuration	Active Directory Site and Replication Topology Layout. NetApp filers, NearStore®, and NetCache® all use sites to discover which servers to communicate with for CIFS.
	Determine the placement of domain controllers in Windows Server 2003, because it is the critical factor to improving the communication response time from an Active Directory query.
	LAN and WAN links. One factor to consider when you plan directory synchronization before migration is how server locations affect network traffic. If Active Directory and NetWare information exists on servers in the same location, migration traffic will be inconsequential. If the Active Directory and NetWare servers are physically separated across a low bandwidth, migration traffic may have more impact.
Management	Group Policy Objects (GPOs) are a system introduced with Active Directory. It is important to review the current use of policies in your organization and create a plan for either replicating the existing policy set using GPOs or modifying the existing requirements and implementing the new set of requirements
	Login scripts are used extensively to control various aspects of the user experience in a NetWare environment. However, because NetWare uses a proprietary scripting language to provide login scripts, migration to batch file-based Active Directory login scripts requires careful planning. This is an excellent opportunity to review current login scripts for accuracy and relevance before design.
	Determine the security requirements that must be replicated in the new environment and the tools or features necessary to accomplish the required level of security.
Workstations	Removal of the Novell 32-bit Client:
	<ol style="list-style-type: none"> 1. Create a script to uninstall the client and then join the Windows 2003 domain. It can be implemented through a batch file, Group Policy Object, or a login script. 2. If desired, the Novell Client32 may be either removed at a later time or left until the desktop is refreshed. As long as the Novell Client32 remains on the machine, you will need to maintain a NetWare authentication mechanism so the user can log in without any error messages. Although it will be Active Directory that provides the network login functions, should a user turn off the 'Workstation Only' switch, the Novell Client32 will then look for an eDirectory authentication source.

Migration Tools

While there are a number of tools available to assist with the migration from NetWare to Windows, this guide focuses on two tools, Microsoft Services for NetWare 5.03 (SfN) and Novell Nsure Identity Manager 2.02 (NIM).

Microsoft Services for NetWare. Microsoft Services for NetWare enables migration, synchronization, and interoperability with Novell NetWare networks. This enables network managers and technical staff to integrate computers running Windows Server 2003 into a NetWare network to facilitate migration and/or coexistence. To enhance interoperability with NetWare networks, Services for NetWare includes Microsoft Directory Synchronization Services (MSDSS) and the File Migration Utility (FMU).

Microsoft Directory Synchronization Services. MSDSS is a tool used for two-way synchronization of directory information stored in the Active Directory and NDS (Novell Directory Services). The one drawback of MSDSS is that it does not synchronize user's passwords, as passwords are encrypted and stored in different formats in the Windows and Novell operating system directories. MSDSS has the option to create new passwords for each user synchronized between Active Directory and NetWare. As most customers do not wish to cause user disruptions in sending out a default new password, this article focuses on using Novell's Nsure Identity Manager (NIM). NIM provides all the migration features of MSDSS as well as providing full password synchronization.

File Migration Utility. The File Migration Utility (FMU) provides a central management console to automatically manage the migration of files from NetWare servers to Windows 2003 servers.

FMU reduces the time and cost of migration by copying NetWare files and their associated permissions to one or more Windows 2003 servers. It preserves the permissions and ACL (Access Control List) associated with each file it copies. Through granular mapping support, files and the rights they have inherited or been assigned in NetWare are calculated and maintained in the Windows 2003 network, preserving security and minimizing the time-consuming process of reassigning file rights and permissions. FMU supports both the TCP/IP and IPX/SPX protocols to allow the migration of NetWare files and their permissions.

Novell Nsure Identity Manager Password Synchronization

Novell Nsure Identity Manager 2.02, formerly known as DirXML, Novell Account Manager, and NDS for NT, is a data-sharing and synchronization solution. When data from one system changes, the DirXML (eDirectory eXtensible Markup Language) engine detects and propagates these changes to other connected entities based on the business rules a customer defines.

Nsure Identity Manager Password Synchronization offers

- Bidirectional password synchronization
- Enforcement of Password Policies on connected systems
- E-mail notification when synchronization fails
- The ability to check password synchronization status for a user

A fully functioning 90-day evaluation version may be downloaded, along with documentation and pricing from: <http://www.novell.com/products/nsureidentitymanager/>.

Understanding Organizational Units, Groups, and Rights

Both NDS and Active Directory use OUs, but they have important functional differences. One major difference is the role that OUs play—or do not play—in security:

Novell Directory Service OUs. In NDS, you use an OU for partitioning and for security. An NDS OU is a security principal that can be associated with a network resource (such as a file). A user who is a member of an NDS OU is automatically granted access rights to any resource that lists the OU as an entity permitted to have those rights. For example, everyone who is a member of the Marketing OU—from the group assistant to the product manager—can access a file that has the Marketing OU listed in its ACL.

Active Directory OUs and Security Groups. By contrast, you use Active Directory OUs for delegation of administration and for applying group policies, but they are not security principals. In the Windows Server 2003 operating system, Active Directory user and computer accounts and groups are security principals. The benefit of Active Directory group-based (rather than NDS OU-based) security is that Active Directory makes organizational restructuring easier—administrators do not have to reset security permissions every time changes are made to the organizational hierarchy.

Printing Considerations

Larger NetWare environments typically use HP JetDirect print services or a similar product that enables clients to send documents to the printer. Smaller environments often use NetWare queue-based print services. If you have not migrated NetWare print servers, workstations can continue to use either of these print services to access printers on NetWare servers. Therefore you should not uninstall them until you do migrate NetWare print servers.

Novell iPrint provides controlled access to printers using existing Internet connections not requiring the Novell client. If your environment utilizes iPrint rather than NDPS or Print Queues, you can use the Alias Katharsis Application utility to replace the iPrint registry settings with Windows printer shares. (<http://www.novell.com/coolsolutions/tools/1029.html>)

Novell ZENworks for Desktops (ZfD) provides transparent, automated conversion from Print Queues, Novell Distributed Print Services (NDPS), or iPrint to Windows printing. Another third-party product, Printer Properties Pro <http://www.printerpropertiespro.com>, may be used for advanced printer management, beyond what ZfD provides.

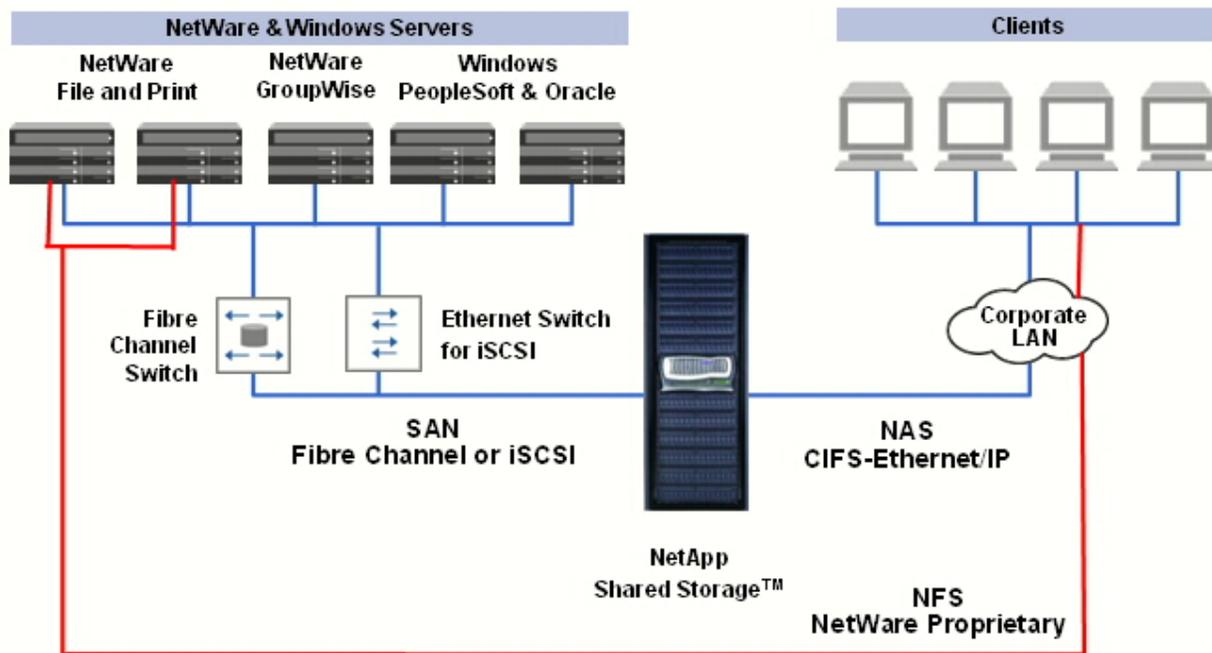
Storage Planning



Customers require storage solutions that simplify storage management without compromise, allowing change without chaos and growth without limits. As a result, many customers choose Network Appliance™ technology because of its ability to simplify data management while providing unified storage.

Due to the large amounts of storage that a single NetApp storage solution can handle, it is not uncommon to find multiple servers connected to a single storage array.

One important factor in using a NetApp storage solution is the ability to seamlessly connect multiple protocols. The administrator may choose to allow the clients to connect directly to the storage array, or indirectly to the storage array through the server. The configuration deployed usually depends on both the security environment and which protocols will be used.



Whether consolidating servers or migrating from one operating system to another, keep in mind that the storage used for Novell is always formatted as a block (LUN) of space and seen as one file per block by another operating system. If NetWare was clustered, each block may be accessed by any of the NetWare servers. But the block cannot be mounted (or brought online) in another operating system, or on a nonclustered NetWare server due to the way in which the block is formatted.

For example, suppose you have 500 users on one Novell server for file and print. If you adhered to the best practices for creating blocks, you created a minimum of three.

Block A (LUN0) - NDPS = 200MB—for queue-based, NDPS and iPrint printing

Block B (LUN1) - HOME = 2TB—1.5GB for users' home directories, plus room for growth

Block C (LUN2) - PUBLIC = 2 TB—for shared files, groups, etc.

When planning the migration, look at the actual space being utilized, and then ensure that you have at least this amount of space available on the destination to perform the migration. Also take into account that if the data is compressed, NetWare will decompress the data before copying or moving it. This can significantly slow down the migration.

NetWare to Windows Server 2003 Migration Checklist

Refer to this checklist for a quick guide to preparing and performing a migration.

Analyze and Evaluate Existing Environment Phase

Identify network components and systems to be migrated

- Diagram and identify all network components, including hardware and software.
- Identify all types of information stored on the network, including its owners, users, locations, and associated security settings.
- Identify all Novell services-dependent software, e.g., DHCP, DNS, ZENworks for Desktops, Apache.
- Determine the systems and version(s) of NetWare to be migrated.
Note: The root partition of NDS must be running eDirectory 8.6.2 or higher for Nsure Identity Manager (NIM) to function.
- Review WAN/LAN links and their available bandwidth.
- Plan for future hardware, software, and network bandwidth needs.
- Analyze the current and future namespace design.

Planning the Migration (Deployment) Phase

Create a migration plan and test lab

- Create an overall migration plan that will be tested in the lab.
- Determine tests to be performed, e.g., users, groups, files, and folder permissions; login scripts; print device conversion.
- Determine the success criteria for tests. If the migration is performed correctly, the only change users should see is the Windows domain login dialog box rather than the Novell eDirectory dialog box when they log in. Once logged in, the **N** will no longer be present in the Windows Taskbar.
- Create a test lab for design and migration testing.
Note: One option for accurate testing is to back up the production data and restore it in the lab to perform the tests against.

Perform a test migration

- Identify and obtain administrator accounts with sufficient permissions to successfully complete the migration.
- Decide who will be the migration administrators.
- Back up and test restoring the NetWare system and user data.
- Choose an installation location for NIM, preferably Windows Server 2003.
- Choose an installation location for File Migration Utility (may be the same server as used for NIM).
- Perform a test migration from NetWare to Windows Server 2003.
- Document any additional notes.
- Review and adjust migration plans as appropriate, e.g., creation of GPOs.

- Repeat a test migration to hone the process if necessary.
- Modify namespace design if necessary, i.e. changing OU layout.

Migration Phase

Migration steps

- Educate users and your help desk; inform them the Novell Client will be removed and logon authentication will be through the Windows client.
- Install and configure a Windows Server 2003 domain controller.
- Take a DIB (directory information base) backup of Novell Directory Services using DSRepair. At the NetWare console, run `DSRepair -$DU`, choose Advanced options, NDS archive:
 - Create NDS archive.
 - Restore NDS archive (with verification)—same server DIB taken from.
 - Restore NDS archive (without verification)—restore DIB to any server.
- If this is not a new Windows Active Directory, take a backup of Windows Active Directory using the built-in Microsoft backup tool.

Run `ntbackup`. Click the Advanced Mode link on the Backup or Restore Wizard. Click the Backup tab, and then select the box next to System State and any other items you would like to back up.

Note: You can only use old System State backups no older than 60 days, because of the Tombstone attributes involved. www.windowsitpro.com/Articles/Print.cfm?ArticleID=41576
- Install the Novell Client for Windows (version 4.9 or higher) on the Windows Server 2003 that will be used for the File Migration Utility. Choose to install with only the IP protocol if all NetWare servers are bound with the IP protocol, otherwise, choose IP and IPX combined.
- Install and run Novell Nsure Identity Manager (version 2.02 or higher).

You may install this on NetWare 6, NetWare 6.5, Windows XP, Windows 2000, or Windows 2003. The platform selected also requires that both Novell eDirectory 8.6.2 or higher and iManager 2.02 or higher be installed on the same machine.

NIM provides the ability to map the OUs from NDS to a new OU structure in AD if desired. This choice can affect your decision whether to duplicate the NDS namespace or to create a different Active Directory namespace.
- Install and run the File Migration Utility (must be installed on one of the Windows Server 2003).

When launching FMU, on the bottom of the opening screen 'Step 1- Mappings', turn on 'Allow step completion in any order' and then begin with 'Step 2 - Security Accounts' Step 1, which imports all the NetWare servers volumes. Windows server shares and OU can only be completed if you created a log file with MSDSS.
- Recreate shares to files and folders in Windows. NuView Virtual File Manager makes this task painless with the management GUI and built-in configuration wizards.
- Recreate login scripts and add appropriate group policy objects.

Novell has a free utility, xScript that exports users' personal scripts as well as container login scripts to a text file. xScript can be downloaded from www.novell.com/coololutions/tools/13701.html.

- Printers being utilized with Novell queue-based printing, NDPS, or iPrint need to be added with their appropriate rights to Windows

At this point, there has been zero user impact. Users are still accessing their files and printers from NetWare.

The steps taken to this point enable full OU, folder, file, ACL, group, user, and password synchronization.

The last four steps should first be done on a small controlled group of users to ensure that nothing was missed in your environment before full deployment.

- Run the Alias Katharsis Application utility to handle workstation shortcuts, application URLs, and NDPS or iPrint configurations.
- Configure all client computers to join the Windows Server 2003 domain. This can be accomplished with a Novell login script. When a user logs in, the workstation is transparently joined to the Active Directory domain.
- Uninstall Novell NetWare Client for Windows from workstations. If the machines have joined the AD domain, you can use a Group Policy Object to remove the client.
- Decommission NetWare server(s) once all resources, e.g., Printers and shortcuts, have been migrated and all NetWare clients are removed from user's machines.

Remember that if users were on vacation or short-term leave, their machines will need to be modified before all NetWare servers can be removed.

Related Links

The following resources will help with migrating from NetWare to Windows Server 2003:

For links to technical and how-to content for Windows Server 2003, see Windows Server 2003 Resources, How-Tos, and Communities for the IT Pro at

www.microsoft.com/technet/prodtechnol/windowsserver2003.

For guidelines and recommended processes for designing and deploying Windows Server 2003 family technologies, see Microsoft Windows Server 2003 Deployment Kit at

www.microsoft.com/technet/prodtechnol/windowsserver2003/proddocs/datacenter/deployrk_overview.asp.

Windows Server 2003 Deployment Kit: Designing and Deploying Directory and Security Services

www.microsoft.com/downloads/details.aspx?FamilyID=6CDE6EE7-5DF1-4394-92ED-2147C3A9EBBE&displaylang=en#filelist

NetWare to Windows Server 2003 Migration Planning Guide

www.microsoft.com/windowsserver2003/techinfo/overview/sfnmig.msp

Microsoft Windows Services for NetWare 5.03 Overview

www.microsoft.com/windowsserver2003/techinfo/overview/sfncd.msp

How to Migrate or Deploy a Novell NetWare Environment to Windows

<http://support.microsoft.com/kb/q274279/>

Best Practices for Filer Installation

www.netapp.com/tech_library/ftp/3379.pdf#page=1

Free chats and Webcasts

www.microsoft.com/technet/community/chats

www.microsoft.com/technet/community/webcasts

List of newsgroups

www.microsoft.com/technet/community/newsgroups

Migration Products and Tools

The following lists the most common migration products and tools used by NetApp Professional Services and System Engineers.

	<p>www.avanade.com/solutions/section.aspx?id=1&parentID=1</p> <p>The Avanade platform migration solution helps customers smoothly migrate from non-Microsoft platforms such as NetWare to a solution based on the Microsoft Windows Server 2003 operating system. The solution also incorporates the implementation of Microsoft Active Directory to maintain system and user information in a common, centralized directory.</p>
	<p>www.ilg.com/ILG/Solutions/</p> <p>The Interlink proprietary delivery methodology, called Analysis, Design, and Implementation Methodology (ADIM), is the key to ensuring appropriate planning, identifying communication requirements, designing a solution to meet specific goals and objectives, and mitigating the risk of implementing the solution.</p>
	<p>www.unisys.com/index.htm</p> <p>Unisys offers a Windows migration solution that includes an extensive breadth of services, leading NetWare alternative server technology, and a low-risk migration methodology for migrating NetWare and Groupwise to the Windows and Exchange Server platforms.</p>
	<p>http://wm.quest.com/products/groupwisemigratorexchange/ms/</p> <p>Quest NDS Migrator is a comprehensive third-party solution that accelerates and simplifies migrations from Novell Directory Services to Active Directory. Quest NDS Migrator offers a project-based, step-by-step approach for migration.</p> <p>Quest NDS Migrator provides all the tools you require to migrate objects and data to Active Directory from a central console. The console allows you to access all of the Quest migration options, both pre- and post migration, and to schedule the data migration from Novell file servers to Microsoft file servers. In addition, Quest NDS Migrator provides a native view of both your NDS and Active Directory tree, allowing you to visualize the tree structure and better plan the migration of objects.</p>

	<p>Windows Script Host provides two script engines, Visual Basic Scripting Edition and Microsoft JScript, which can be embedded into Windows Applications. It also provides an extensive array of supporting technologies that makes it easier to script Windows applications.</p> <p>Robocopy is a powerful version of the copy command with the capability of moving files, directories, and even whole drives from one destination to another. File attributes are not retained.</p> <p>SubInACL is a command-line tool that enables administrators to obtain security information about files, registry keys, and services, and transfer this information from user to user, from local or global group to group, and from domain to domain. For example, if a user has moved from one domain (DomainA) to another (DomainB), the administrator can replace DomainA\User with DomainB\User in the security information for the user's files. This gives the user access to the same files from the new domain.</p>
	<p>www.systemtools.com/hyena/</p> <p>Hyena is known throughout the industry as one of the top Windows management utilities available. Hyena includes full exporting and reporting options based on Microsoft Access, Exchange Server mailbox integration, and SMS and CITRIX.</p> <p>Hyena provides user management, server management, service monitoring and control, event management, job and task scheduling, printer management, disk and file administration, reporting, Active Directory integration, and remote control.</p>
	<p>www.pnltools.com/productinfo.asp?productid=48&refid=132</p> <p>Secure Copy permits seamless migration, allowing an administrator to copy files and directories on NTFS partitions while keeping the security intact, creating shares, and migrating local groups. All of this functionality is available in an easy-to-use GUI that keeps you updated on copy progress as well as any errors that may occur. Secure Copy also includes functionality such as differential copying, full command-line support, saving multiple jobs, and scheduling jobs to run after hours.</p>
	<p>www.mapistore.com/Exchange/Migration/Review_00279_index.html</p> <p>FastLane Migrator is the comprehensive solution for seamless, transparent migrations to Windows 2003. With a project-driven approach and an impressive array of features, FastLane Migrator prepares you for migration, guides you through the process, tracks changes, and facilitates updates and cleanup. FastLane Migrator also enables secure and flexible migrations for distributed networks.</p>

<p>fileACL</p>	<p>www.gbordier.com/gbtools/fileacl.htm</p> <p>FileACL allows you to automate ACL checking/enforcing/recovering, addressing ACL that are not addressed completely by either the Windows Server 2003 GUI, CACLS, or XCACLS.</p>
	<p>www.bindview.com</p> <p>Comprehensive migration tools to help make the transition to Windows Server 2003 and Microsoft Exchange while maintaining the integrity of identities and access control.</p>
	<p>www.nuview.com</p> <p>StorageX, also known as Virtual File Manager, provides administrators with policies that automate data and storage services, such as consolidated network data management, data migration and consolidation, business continuity, storage optimization, data lifecycle management, remote site data management, and data classification and reporting. At the core of StorageX is the Global Namespace, a logical representation of file system and storage devices that creates a unified view of data distributed across heterogeneous storage platforms. The combination of StorageX policies with the Global Namespace provides administrators with the ability to perform storage management tasks with no disruption or downtime to users.</p>
	<p>www.users.on.net/~njpayne/</p> <p>NWCOPY provides drag-and-drop software distribution and file synchronization for NetWare file servers. It allows distribution of files and directories to multiple NetWare file servers by simply dragging the selected files from File Manager or Explorer and dropping them on the NWCOPY window.</p>
	<p>http://forge.novell.com/modules/xfmod/project/?rsync</p> <p>RSYNC is an open source utility under a GNU-style license that has been ported from UNIX® to both NetWare and Windows.</p> <p>RSYNC is wonderful for data synchronization, as it only copies updated data from the source to the destination, using rolling checksums on both sides to determine which files need to be updated. If the data is already there, it won't be re-copied. RSYNC also updates the data at the block level, so that only the updated parts of a file are synchronized, rather than the whole file.</p> <p>A Windows version is available from http://www.itefix.no, allowing rapid file synchronization between NetWare and Windows.</p>

	<p>www.netapp.com/support/consultingedge.html</p> <p>ConsultingEdge, NetApp Professional Services offers flexible engagement models ranging from short, targeted workshops to complex implementations and ongoing on-site support. The NetApp teams draw on the combined expertise of hundreds of engagements representing best practices in mission-critical environments to tailor a solution to a customer's unique needs and requirements.</p>
	<p>www.kixtart.org/</p> <p>The KiXtart free-format scripting language has rich built-in functionality for easy scripting. It also supports COM (providing access to ADSI, ADO, WMI, etc.) and thus is easily extensible. Sample scripts for managing software on user computers, including scripts for installing, updating, and deleting software installed using Windows Installer can be found at www.microsoft.com/technet/scriptcenter/scripts/default.msp.</p>



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