

Technical White Paper

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Novell® Open Enterprise Server 2 vs. Windows* Server

Costs and Benefit Considerations When Migrating from NetWare®

Novell.

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Upgrade or Migrate?

The bottom line is that a move from NetWare to Windows Server 2008 will not only fail even to achieve feature parity, but since it is an unknown quantity, such a move opens the door to significant potential risks.

† *Actual results will vary from customer to customer based on individual customer's unique circumstances.*

As Novell customers consider moving their NetWare® environments to Linux* on Novell® Open Enterprise Server 2, some indicate that since they are planning to migrate, they feel they should consider all of their migration options. Typically, these other migration options revolve around either Microsoft* Windows* 2003 or Windows 2008. To assist customers in considering their migration options, this paper outlines key aspects that should be factored into decisions regarding whether to upgrade to Novell Open Enterprise Server 2 on Linux or to a Windows Server offering.

The key factors addressed in this study include the effort in planning and deployment, training needs, operational efficiency gains or losses, comparative cost savings and expenses, and potential risks†. The results of the study are derived from actual customer experiences, research conducted by Novell Consulting®, and discussions held with resellers that deploy both Novell and Microsoft server platforms. Keep in mind that throughout this paper, we focus our discussion on Novell Open Enterprise Server 2.

General Windows Server 2008 Considerations

Much has been said in the press about the recent release of Windows Server 2008, but the truth is that not much is known about the new Microsoft offering. Will it provide an increase in the level of security, stability, and performance that Microsoft customers hope for? Will it be a step forward from Windows Server 2003 or simply meet the status quo? Perhaps it will be similar to the Windows Vista* release, which in many customers' minds is actually a step backwards. Will it even come close to meeting the high satisfaction levels and expectations that Novell

customers enjoy, let alone the added cost savings and operational efficiencies that can be derived from a move from NetWare to Novell Open Enterprise Server 2 on Linux? It's simply too early to make many factual conclusions about Windows Server 2008.

However, many analysts believe that companies will take a year and a half or more after the release of Windows Server 2008 to conduct pilot tests, verify compatibility with their applications, build new image libraries, and train their staff. These pre-deployment exercises will keep most organizations from deploying the new Microsoft server offering until at least until 2009. Still, it's believed that the complete migration process will likely take years after that, especially for larger businesses that have hundreds of geographically distributed servers that would be affected by such a migration.

Additionally, comparing Novell Open Enterprise Server 2 against what is known about Windows Server 2008, Novell Open Enterprise Server 2 is more mature and has a built-in feature set that will not even be matched by Windows Server 2008, including (but not limited to):

- *Dynamic Storage Technology*
- *Virtualization and Paravirtualization*
- *User Self-service Features*

The bottom line is that a move from NetWare to Windows Server 2008 will not only fail even to achieve feature parity, but since it is an unknown quantity, such a move opens the door to significant potential risks. In regards to the cost, time and effort required to migrate to Windows Server 2008, organizations should expect to see similar results as to what is

outlined in the following sections that cover migrating to Windows Server 2003.

Migrating to Windows Server 2003

A significant cost and effort is required to migrate to Windows Server 2003 versus upgrading from NetWare to Novell Open Enterprise Server 2 on Linux. Much of the additional cost is related to substantial increases in hardware investments required for the Windows Server platform. Additional costs will be required for training administrators and helpdesk personnel. The actual effort involved in making the move to Windows Server is dramatically larger due to the fact that most of the migration processes are manual as opposed to the automated processes available for moving from NetWare to Novell Open Enterprise Server running Linux.

Increased Server Hardware Investment

According to solution providers who work both with Novell and Microsoft platforms, the maximum user-threshold recommended for a Windows file and print server is about 750 users, however many enterprises run far fewer users per box: our partners and consultants have seen 350 as a common use case. Conversely, a single machine running Novell Open Enterprise Server on Linux can easily support 1,000 users, and has an upper threshold of around 2,000. This means from just a file and print standpoint, you can expect at least a 33-percent investment increase in server hardware when moving to a Windows Server environment. However, that investment increases even more when the hardware requirements for hosting Microsoft-based network services are taken into consideration.

A significant cost and effort is required to migrate to Windows Server 2003 versus upgrading from NetWare to Novell Open Enterprise Server 2 on Linux. Much of the additional cost is related to substantial increases in hardware investments required for the Windows Server platform.

Server Hardware *without Virtualization*

	Users/Server	1,000 Users	5,000 Users	10,000 Users
Windows Server 2003				
File and print, DHCP	750	2	7	14
Active Directory, DNS	1,000	1	5	10
Exchange Back-end	400	3	13	25
Exchange Front-end	10,000	1	1	1
SMS	1,000	1	5	10
Total number of servers		8	31	60
5-yr. TCO per server (excluding software)		\$21,600	\$21,600	\$21,600
Total server cost		\$172,800	\$669,600	\$1,296,000
Novell Open Enterprise Server 2				
File and print	1,000	1	5	10
Novell GroupWise mailboxes, POs	4,000	1	2	3
Novell GroupWise MTA, SMTP Gateway	8,000	0	1	2
Novell ZENworks	1,000	1	5	10
Total number of servers		3	13	25
5-yr. TCO per server (excluding software)		\$21,600	\$21,600	\$21,600
Total server cost		\$64,800	\$280,800	\$540,000
Hardware cost savings with Novell Open Enterprise Server 2		\$108,000	\$388,800	\$756,000
Percent reduction in hardware costs		63%	58%	58%

Figure 1

Due to conflicts and resource contentions, many of the services in a Windows Server 2003 environment must run in isolation from each other. To support services for file and print, directory, e-mail, desktop and server management, and edge services in a Windows Server environment with clustering, from five to eight servers are required as a baseline:

- **Active Directory* and DNS with redundancy**—*Minimum one server; recommended two servers*
- **File and print, and DHCP**—*Minimum one server; recommended two servers*
- **Exchange (back-end)**—*Minimum one server; recommended two servers*
- **Exchange (front-end)**—*Recommended one server*
- **SMS**—*Recommended one server*

The comparable network services in a Novell Open Enterprise Server environment not only have the ability to run on a single machine, but running all the needed network services on a single machine is a common usage scenario for enterprises with 1000 users or less running Novell Open Enterprise Server. Larger organizations will typically have a separate server for Novell GroupWise® and a separate server for Novell ZENworks®, which raises the hardware count to only three machines versus the minimum of eight servers required for Windows Server 2003.

Based on an estimated total cost of ownership of \$20,700 per server over a five-year period, which we illustrate later in this paper, in a 1,000-user Windows Server 2003 environment, with a single server supporting a maximum of 750 users, an organization

Server Hardware with Virtualization

	Users/Server	1,000 Users	5,000 Users	10,000 Users
Windows Server 2003				
File and print, DHCP	750	2	7	14
Active Directory, DNS	1,000	1	5	10
Exchange Back-end	400	3	13	25
Exchange Front-end	10,000	1	1	1
SMS	1,000	1	5	10
Total number of servers		8	31	60
5-yr. TCO per server (excluding software)		\$21,600	\$21,600	\$21,600
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Novell Open Enterprise Server 2				
File and print	1,000	1	5	10
Novell GroupWise mailboxes, POs	4,000	1	2	3
Novell GroupWise MTA, SMTP Gateway	8,000	0	1	2
Novell ZENworks	1,000	1	5	10
Total number of virtual servers		3	13	25
Server consolidation ratio		4	4	4
Total number of physical servers		1	4	7
5-yr. TCO per server (excluding software)		\$21,600	\$21,600	\$21,600
Total server cost		\$21,600	\$86,400	\$151,200
Hardware cost savings with Novell Open Enterprise Server 2		\$151,200	\$583,200	\$1,144,800
Percent reduction in hardware costs		88%	87%	88%

Figure 2

could expect to pay \$165,600 in acquisition and maintenance costs. In a conservative comparison, a 1,000-user Novell Open Enterprise Server environment running Linux would cost \$62,100. This represents a 63-percent savings in hardware acquisition and maintenance costs for Novell Open Enterprise Server (see Figure 1).

For a 10,000-user environment, the costs increase to \$1,242,000 for Windows Server versus \$517,500 for a Novell Open Enterprise Server environment. These cost differences increase even more substantially when server virtualization is introduced, with Novell Open Enterprise Server in both a 1,000 and 10,000-user environment delivering 88-percent savings in an organization’s hardware investments (see Figure 2; virtualization is discussed in more detail below).

SAN Duplication and Storage Space Doubling

If there is a SAN in the NetWare environment, plan on even more hardware expenses to migrate to Windows Server 2003. One might think to migrate a SAN to Windows, one can simply create a smaller array on the SAN, migrate a portion to the Windows side and then decommission it on the NetWare side, repeating the process until it’s completely moved. Unfortunately, in most cases this is not possible.

When migrating a SAN to Windows Server 2003, one complete logical unit number (LUN) must be migrated at a time. Most organizations set up their SANs as a single LUN, therefore it is necessary to migrate the entire SAN all at once. This means before migration, a fully functional source and target SAN must exist. This likely requires the purchase and installation of a completely new SAN as the target for an organization’s SAN migration.

Based on cost figures from the Storage Performance Council, an average acquisition cost per gigabyte for a SAN is \$125. For a 10-terabyte SAN that equates to a minimum one-time acquisition cost of \$1,250,000 (see Figure 3). These acquisition costs do not include the additional costs associated with deployment and space requirements.

SAN Migration Costs

SAN cost per GB acquisition cost	\$125
TBs required	10
One-time migration cost	\$1,250,000

Figure 3

In addition to the acquisition costs associated with just migrating a SAN to Windows Server 2003, organizations should expect additional costs to meet the basic storage requirement for Windows Server 2003. Based on discussions with customers and solution providers, moving data from NSS volumes to NTFS volumes on Windows Server can result in a doubling of storage hardware requirements.

Manual versus Automated Migration

In addition to the increased hardware investments required for a migration to Windows Server, there is also a significant increase in the time investment in making the move, when compared to what is required for an upgrade to Novell Open Enterprise Server 2. Migrating to Novell Open Enterprise Server 2 is a straightforward and highly automated process, which is completely transparent to the user. However, the majority of the processes for migrating to Windows Server 2003 are manual and often require end-user interactions before they can be finalized.

For example, moving Novell eDirectory™ accounts to Linux on Novell Open Enterprise Server 2 requires some minimal prep work

(i.e., performing health checks, bringing trees up-to-date, etc.) followed by an automated synchronization process. However, to move those user accounts to Active Directory requires significant upfront planning and design of the Active Directory Domain structure. The actual process to move accounts from eDirectory to Active Directory is primarily a manual and considerably time-consuming operation. In order for Windows computers to access resources on a Windows server, each desktop will have to be visited by an administrator in order for them to login and join an Active Directory forest. Plus, users will have to manually reset their own passwords as well as being retrained on new login, printing and file access procedures.

Moving directory services is not the only category where there is extreme disparity in the effort required to migrate to the two different targets. Moving a NetWare NSS storage volume on SAN to Linux is a simple matter of dismounting it on NetWare and then mounting it on Linux. However, as previously mentioned, migrating a SAN to Windows Server 2003 requires the purchase and installation of a duplicate SAN before the migration process can begin. Plus, that new SAN will likely require a doubling of disk space due to NTFS requirements. Novell Storage Services features a complex file trustee system that allows users to inherit rights from groups, other users and roles in eDirectory. As data is moved from NSS to Windows NTFS, this entire inherited rights system is lost and will need to be manually reinstated within the confines of the NTFS rights model.

Some manual migration efforts for Windows Server 2003 will include the need to touch every workstation in an organization, removing the Novell Client™ and recreating printer profiles. These tasks will also require an update to all desktop and laptop images accordingly.

Additionally, moving to Windows Server will require a complete redeployment of the disaster recovery and disaster contingency infrastructure. Whereas with Novell Open Enterprise Server 2, NetWare and Linux servers can co-exist in Novell Cluster Services™, allowing for a “rolling upgrade” with no service interruption.

The bottom line is that the majority of the services that must be migrated from NetWare to Windows Server 2003 will require considerable manual effort. However, the migration of those services to Novell Open Enterprise Server 2 running Linux requires relatively minimal effort due to the fact that most operations are automated (see *Figure 4*).

Additionally, the high effort needed for a Windows Server 2003 migration not only requires a substantial investment in time and resources, but its highly manual aspects introduce significant risks into the process (see *Figure 5*). Manual processes are inherently subject to an increase in human errors, while automation tends to minimize errors and their associated impacts.

Additional Training Investment

Whether migrating to Windows Server 2003 or Novell Open Enterprise Server 2 on Linux, network administrators will require some level of additional training. The degree of required training will vary from organization to organization depending on each administrator’s relative previous experience with Windows Server and Linux.

For helpdesk technicians or administrators, organizations moving to Novell Open Enterprise Server 2 running Linux should require basically no additional training once deployment is complete since the same management tools (e.g., DFS, DNS, Novell eDirectory, Novell iPrint) that they had been using previously to support users will be

Migration Effort

NetWare Components	Open Enterprise Server 2 Migration to Novell	Migration to Windows 2003
File Systems and Data		
NSS	○	●
NWFS (Traditional)	○	◐
Trustee Assignments	○	◐
Windows Shares (CIFS)	○	◐
DAS data	○	●
NAS/SAN data	●	●
NCP	○	N/A
DFS	○	◐
Archive/Versioning	○	◐
User Accounts and Profiles		
eDirectory: User Accounts	○	◐
eDirectory: Passwords	○	◐
Workstation: Printer Profiles	●	◐
Workstation: User Profiles	●	◐
Workstation: Client	●	●
QuickFinder	●	N/A
Services		
DHCP	○	○
DNS	○	○
FTP	○	○
Novell iPrint	○	◐
NTP/Timesync	○	●
Cluster Services	○	◐
NetStorage	○	N/A
SLP	○	◐
Novell iManager	○	N/A
Remote Manager	○	N/A
Novell GroupWise	○	◐

Legend: ● Low Effort (Best) ← ○ → High Effort (Worst)

Figure 4

Migration Risk

NetWare Components	Open Enterprise Server 2 Migration to Novell	Migration to Windows 2003
File Systems and Data		
NSS	●	○
NWFS (Traditional)	●	○
Trustee Assignments	●	◐
Windows Shares (CIFS)	●	○
DAS data	○	○
NAS/SAN data	●	○
NCP	○	N/A
DFS	○	◐
Archive/Versioning	●	○
User Accounts and Profiles		
eDirectory: User Accounts	●	○
eDirectory: Passwords	●	●
Workstation: Printer Profiles	●	◐
Workstation: User Profiles	●	◐
Workstation: Client	●	●
QuickFinder		N/A
Services		
DHCP	●	◐
DNS	●	◐
FTP	●	◐
Novell iPrint	●	○
NTP/Timesync	●	●
Cluster Services	○	◐
NetStorage	●	N/A
SLP	●	●
Novell iManager	○	N/A
Remote Manager	●	N/A
Novell GroupWise	●	○

Legend: ● Low Effort (Best) ← ○ → High Effort (Worst)

Figure 5

Some manual migration efforts for Windows Server 2003 will include the need to touch every workstation in an organization, removing the Novell client and recreating printer profiles. These tasks will also require an update to all desktop and laptop images accordingly.

carried over. In fact, they can continue to administer Open Enterprise Server 2 with the familiar management tools they value: Novell iManager and Novell Remote Manager. Novell has even identified a short list of command translations from NetWare to Linux in order for administrators to easily accomplish a familiar task that requires a new command.

However, helpdesk agent training will potentially be required for organizations moving to Windows Server 2003, depending on the previous Windows experience of the helpdesk agents in the organization. If their sole experience has been supporting the Netware environment, they will need to be re-trained to support Windows Server 2003.

Training will not be required for end-users in a Novell Open Enterprise Server 2 environment since there will be no difference in their desktop look and feel, how they authenticate to the system, or how they access files and applications. However, end-users moving to a Windows Server 2003 will need to be provided instructions and support to learn how to authenticate to the network and access their files and applications using Windows Server.

Depending on an organization's actual training requirements, the need for training on Windows Server 2003 can be significant (see Figure 6). While there are expected training requirements for administrators on Novell Open Enterprise Server 2, overall training needs are expected to be lower than what would be needed for Windows Server 2003.

Higher Planning and Deployment Effort

Due to the complexity and significant risk factors associated with migrating to Windows Server, it will require considerable more time and effort to plan and deploy compared to what is required for moving to Novell Open Enterprise Server 2. Customers and partners say that the time to plan a migration from NetWare to Windows Server will take at least twice as long as planning an upgrade to Open Enterprise Server; and that the deployment of Windows Server will take up to eight times as long as deployment of Open Enterprise Server. Further increasing the planning and implementation costs will be the likely need to augment an organization's IT staff with additional personnel that has more experience in Windows Server environments and migrations.

A move from NetWare to Windows Server will provide feature parity at best, and in some areas, loss of operational efficiencies and increases in administrative overhead.

Cost of Training

	1,000 Users	5,000 Users	10,000 Users
Calls per user per month	1.36	1.36	1.36
Total calls per month	1,360	6,800	13,600
Calls per agent per month	924	924	924
Number of agents	2	8	15
Burdened agent salary cost (per day)	\$262	\$262	\$262
Training days per agent	10	10	10
Training salary cost	\$5,240	\$20,960	\$39,300
Cost per student-day of training	\$450	\$450	\$450
Training delivery cost	\$9,000	\$36,000	\$67,500
Total cost of training	\$14,240	\$56,960	\$106,800

Figure 6

Novell Open Enterprise Server Delivers Major Cost Savings and Operational Efficiencies

When considering whether to migrate to Novell Open Enterprise Server 2 or to a Windows Server offering, organizations need to consider more than just migration costs and efforts. They need to examine what they actually gain or lose in terms of business benefit and system functionality. A move from NetWare to Windows Server will provide feature parity at best, and in some areas, loss of operational efficiencies and increases in administrative overhead. However, updating to Novell Open Enterprise Server 2 running Linux provides significant operational and cost-saving gains, especially in the following areas:

- *Storage*
- *Server Consolidation*
- *User Self Service*

Storage: Savings and Efficiencies through Shadow Volumes

Storage capacity requirements have grown exponentially over the past few years and will continue to expand. Some of this growth can be attributed to industry and government regulations that demand certain data be maintained for extended periods of time, while other factors simply include changes in users' work habits and the varying needs of businesses fueled by a digital economy. It's no longer uncommon to find enterprises with terabytes of unstructured data (i.e., documents, spreadsheets, photos, videos, mp3s, presentations, text files, etc.) taking up valuable storage space.

According to industry analysts, storage represents 19 percent of overall hardware IT spending, with the contributing factors to these costs including the difficulty in addressing frequent hardware refreshes, storage management complexity, wasted costs associated

with unused storage portions, and storage silos. These same analysts assert that the answer to these challenges lie in the ability for storage virtualization technologies to lower hardware costs and provide a more effective approach to storage tiering.

While neither Windows Server 2003 nor Windows Server 2008 offer a storage virtualization solution, storage virtualization is inherent to Novell Open Enterprise Server 2 with its Dynamic Storage Technology feature.

The way that storage virtualization works in Novell Open Enterprise Server 2 is that it creates two independent partitions (or "tiers") for users' unstructured data. It stores data that has been recently created or accessed on a primary partition, typically located on high-performance disk storage devices, such as a SAN. According to policies custom-defined by the organization, it dynamically moves less active data to a secondary partition (or "shadow volume") that would likely reside on less expensive storage. When any inactive data is accessed or modified, it dynamically moves back to the primary partition according to defined policy. While these two partitions exist independently on separate storage devices, the view of the end user remains a single, familiar volume from which he or she can access files.

According to research conducted among a sampling of Novell customers, approximately 80 percent of an organization's unstructured data is stale, meaning that it has not been touched for six months or more. Dynamic Storage Technology from Novell can automatically migrate that 80 percent to less expensive storage, while keeping the other 20 percent on higher performing storage. Another use case is to spin up a new SAN while leaving the old data on the old volume, but accessible to users without an onerous data migration.

When Dynamic Storage Technology from Novell shifts data between high-end and lower cost storage devices, it is completely transparent to users. Regardless of where the data actually resides, to users it appears to be located just where they originally stored it and they can access it just the same as always. There is no need for de-migration of data as required in hierarchical storage management (HSM) solutions. Also, it doesn't require any user training or special software on the client like other storage virtualization solutions require.

There are two main benefits that organizations can expect to realize as a direct consequence of leveraging storage virtualization in Novell Open Enterprise Server 2:

- *Significantly lower storage costs*
- *Dramatically improved backup efficiency*

Lower Storage Costs

Without storage virtualization, it's cost-prohibitive for users or administrators to separate most of their stale data from their fresh data. So, they simply store the fresh and stale together. This means that stale data takes up valuable space on expensive storage resources. Dynamic Storage Technology enables the dynamic and transparent movement of data to the most appropriate and cost-effective storage location.

By providing the ability to dynamically optimize how data is stored, Dynamic Storage Technology makes it easy to put stale and less-important data on less expensive storage, while reserving more expensive high-performing and highly available storage for fresh and critical data.

Based on data from SAN benchmark reports from the Storage Performance Council combined with average industry pricing data for DAS devices, expecting a 76-percent reduction in storage costs is not unreasonable in organizations where 20 percent of their unstructured data is active and 80 percent is inactive. By example, this means that a company with 10 terabytes of total data can save \$2,280,000 over five years by taking advantage of the storage virtualization technology inherent to Novell Open Enterprise Server 2 (see Figure 7).

Improved Backup Efficiencies

With the vast amounts of data that organizations have in their storage repositories, backup processes often exceed available backup windows. One Novell customer with an 8 terabyte volume indicated that it takes them three and a half days just to run an incremental backup. Most of the processing time is spent by the backup program parsing through all of the files to figure out what was actually modified and needs to be backed up.

Savings with Dynamic Storage Technology

Percent of unstructured data:	
Active	20%
Stale	80%
Primary storage cost per GB per month	\$5.00
Secondary storage cost per GB per month	\$0.25
Average cost per GB per month	\$1.20
Percentage reduction in storage costs	76%
Five year savings for 10 TB	\$2,280,000
Typical backup processing time per TB (in minutes)	120

Figure 7

Some customers utilize backup solutions that can deliver higher performance than that, but still in those instances it's not uncommon for backup processes to extend beyond after-hours into regular working and production hours.

By segregating critical, fresh data away from stale data, storage virtualization enables a significant reduction in backup times. Even though Dynamic Storage Technology presents users with a virtual overlay of both primary and secondary volumes, for backup purposes administrators can deal with those physical volumes separately.

For example, if Dynamic Storage Technology moves 80 percent of data to a secondary volume, administrators can schedule backups of the secondary volume to occur less frequently since the data there rarely changes. The 20 percent of data that is active and resides on the primary volume can be backed up more regularly, and in a fraction of the time. Likewise, in the case of a disaster, restore times will be much faster, since the 20 percent of data that resides on the primary volume and has a higher demand for access can be restored first.

Seamless, Real-Time File Migration

An added benefit that Dynamic Storage Technology provides is its ability to provide on-demand and in-place migration of files from NetWare 6.5 SP7 to Novell Open Enterprise Server 2 running Linux. The solution has an "On Access" setting that allows automatic movement of files from secondary storage to primary storage upon access. With this setting enabled, administrators simply configure the target Linux volume as primary storage and the source NetWare volume as secondary storage. Every time a user accesses a file, the solution will automatically and transparently move the file to the Linux volume. Not only does this allow the migration

of files without system downtime or restricting file access, but the most frequently accessed files can be moved first.

The bottom line is that Dynamic Storage Technology from Novell optimizes storage resources based on actual data usage in a manner that can result in significant operational efficiencies, as well as savings of millions of dollars in storage acquisition and management costs. This feature, inherent to Open Enterprise Server 2, cannot be found in any other operating system.

Savings through Server Consolidation and Server Virtualization

An earlier section of this paper discussed how a move from NetWare to Windows Server can result in a tripling of required server hardware. As stated, part of this increase is due to the need for server isolation for Windows services. A secondary aspect of this increase is due to the inability of Windows Server to support as many users as NetWare. In short, Windows requires more server power than NetWare. However, due to the efficiencies in the Linux kernel, Novell Open Enterprise Server 2 requires even less server power than either Windows Server or NetWare.

The efficient usage of server power in Novell Open Enterprise Server results in lower overall server utilization, which translates into organizations being able to either save on their hardware investments by using less expensive hardware or by taking advantage of the excess server utilization through server consolidation.

In a Windows Server environment, higher server utilization levels limit its server consolidation potential. But an even more limiting factor for consolidation of Windows Server is that most of its services must run in isolation of each other. While server virtualization could address this shortcoming, Microsoft does not

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provide virtualization with Windows Server 2003. Microsoft does promise to offer server virtualization for Windows Server 2008 later this year, but it will likely require at least an additional year or more of extensive testing and service packs after its release before most organizations will feel comfortable deploying it.

Server virtualization is available in Novell Open Enterprise Server 2 today and has been part of the SUSE® Linux Enterprise Server distribution since July 2006. Server virtualization in Novell Open Enterprise Server offers customers a variety of benefits, including the ability to:

- Lower costs through server consolidation
- Run paravirtualized NetWare
- Take advantage of workload balancing and isolation

Server Consolidation Savings

When organizations combine the one-time acquisition cost of a server with its ongoing maintenance, power, and space costs, a typical low-end server will cost an organization about \$20,700 over a five-year period (see Figure 8). For an organization with 100 physical servers, that results in a cost of \$2,070,000 over five years.

Based on interviews conducted with Novell customers, server utilization in enterprise environments ranged from five to 40 percent. With continuing increases in hardware processing power combined with the increased server efficiencies offered by Linux, it's not unreasonable to expect to see server utilizations in Novell Open Enterprise Server drop even lower than that average of 12.5 percent. With that in mind, most organizations can likely take advantage of server virtualization in Novell Open Enterprise Server to deploy five or more virtual servers on a single physical server. For an organization with 100 physical servers, this level of server consolidation can produce a savings of \$1,552,500 over five years (see Figure 9).

It will not be uncommon for some organizations to achieve significantly higher levels of consolidation, resulting in even greater savings. As a case in point, one Novell customer, a large communications provider, has defined an architecture to replace a mix of more than 100 NetWare and Windows Server 2003 servers with a six-node cluster of Novell Open Enterprise Server 2 running Linux.

Paravirtualized NetWare

In addition to the full virtualization capabilities inherent to Novell Open Enterprise Server 2, it also includes a paravirtualized version of NetWare 6.5 SP7 that has been enhanced to recognize when it is running as a virtual machine. Paravirtualization enables NetWare to interact even more efficiently with the virtual machine layer and the physical server hosting it. The paravirtualized version of NetWare is still the same NetWare that organizations have known and trusted for years. It's simply operating in a new environment that presents opportunities and capabilities that haven't been available before.

Running NetWare in a virtualized environment on top of Novell Open Enterprise Server

Cost of a Physical Server

	One Time	Annual Recurring
Hardware	\$4,000	\$1,000
Admin Labor		
Admin hourly cost	\$52	
Physical server install hours	12	
Installation cost	\$624	
Physical server admin hours/yr.	30	
Server admin cost		\$1,560
Power		
Server power (kW-Hr)	0.30	
HVAC, UPS, lighting (kW-Hr)	0.30	
Total power per server	0.60	
Cost per kW-Hr	\$0.10	
Hours per year	8,760	
Power cost per server per yr.		\$526
Data Center Facilities		
Square feet per server	1	
Cost per square foot/yr.	\$310	
Facility cost per year		\$310
Totals	\$4,624	\$3,396
5-year Total Cost	\$4,624	\$16,980
5-year TCO per server excluding software	\$21,600	

Figure 8

enables organizations to continue to take advantage of the NetWare-specific applications and skill sets that their businesses rely on. An added benefit is that businesses can run NetWare while also taking advantage of the latest and greatest hardware available in the market. In its paravirtualized environment, NetWare is not 32-bit bound. Instead, it can take full advantage of the performance gains

and energy savings provided by 64-bit processors. Additionally, as a paravirtualized guest, virtualized NetWare utilizes virtual drivers, while the Linux host takes care of any physical driver requirements. This means that virtualized NetWare automatically inherits the vast and growing base of driver support for the latest hardware technologies enjoyed by SUSE Linux Enterprise Server.

Server consolidation (4:1 ratio)

	Physical Servers	Virtual Servers
Users per Server	100	25
5-year server TCO	\$21,600	\$21,600
Total server costs	\$2,160,000	\$540,000
Total 5-year savings (virtual vs. physical)		\$1,620,000

Figure 9

Paravirtualized NetWare can also play a role in helping migrate from NetWare to Linux. Since Novell Open Enterprise Server 2 allows the hosting of both Linux and NetWare as virtual machines on a single box, it provides the opportunity for a gradual move from NetWare to Linux. Organizations can continue to leverage existing NetWare-based services during the transition of the environment and IT skillsets to Linux.

Neither Windows Server 2003 nor Windows Server 2008 will be able to offer paravirtualized NetWare and its associated benefits.

Workload Balancing and Isolation

Without virtualization, workload isolation requires hardware inefficiencies; whereas, in a virtual environment, workload balancing can optimize server utilization. With the virtualization capabilities of Novell Open Enterprise Server 2, workloads can be isolated on virtual machines, without creating an extended physical footprint in the data center. With a single service running on a virtual machine, its underlying operating system only needs to have loaded the services and components required by that particular workgroup service, allowing the virtual machine to consume fewer resources and run more efficiently.

Workload isolation also provides an additional layer of protection for workgroup servers

such that if one service happens to crash, it won't be able to impact any of the other workgroup services running in separate virtual servers on that physical machine. In addition to workload isolation, server virtualization provides greater server management capability, with the ability to dynamically move virtual servers across physical servers as needed to balance workloads as organizational and IT demands change.

User Self Service

According to the Help Desk Institute (Building the Business Case for Identity Management Investment v2 by Burton Group, January 3, 2006), every time an end-user calls the helpdesk, it costs the organization \$25. If a desk-side visit is required, the cost rises to \$100 (see Figure 10). In addition to these hard costs, end-user productivity takes a significant hit every time a helpdesk call needs to be made. However, that productivity loss is not isolated to the user experiencing problems. Quite often users rely on help from their tech-savvy co-workers to resolve their problems rather than waiting on a response from the helpdesk. This peer-based support creates additional productivity losses and costs as users are kept from performing their assigned tasks. Furthermore, as users struggle to get issues resolved, their dissatisfaction percolates and rises up to their supervisors and managers, consuming their valuable time as well.

Helpdesk Savings from Self Service

Average helpdesk calls per user per month	1.36		
Cost per helpdesk call	\$ 25		
Cost per desk side visit	\$100		
Percent of calls requiring desk-side visit	25%		
Average cost per user per month	\$68		
Annual Savings from Self Service	1,000 Users	5,000 Users	10,000 Users
2-percent reduction in calls	\$16,320	\$ 81,600	\$163,200
5-percent reduction in calls	\$40,800	\$204,000	\$408,000
10-percent reduction in calls	\$81,600	\$408,000	\$816,000

Figure 10

When users are empowered to easily solve many of their problems on their own, helpdesk calls and desk side visits decrease and overall productivity of users, co-workers, and management increases. The strong user self-service features in NetWare provide users the tools they need to quickly and easily address a number of issues that would otherwise require helpdesk intervention. These same self-service tools have not only been carried over to Novell Open Enterprise Server 2 running on Linux, but in many instances they have been further enhanced to increase user productivity even further. Unfortunately, this level of user self service is not available in the Windows Server offerings.

Self-service File Management

Users of NetWare have long been able to take advantage of the self-service file management capabilities of Novell iFolder®. iFolder gives users a simple and secure storage solution that can increase their productivity, enabling them to back up, access and manage their personal files at anytime from anywhere. To take advantage of it, users simply save their files locally—as they always have—and then iFolder automatically updates the files on a network server and delivers them to the user's other machines. So, no matter where users work—from the office, home or on the road—they always have access to the files they need. They no longer need to e-mail files to themselves or save them to a disk. Their files stay up-to-date on all the machines they use.

Furthermore, Novell iFolder guarantees that desktop data is always backed up, and can be recovered by the end-user. This addresses the difficulty that many organizations have in attempting to backup desktop and laptop files on a regular basis. It also enables users to remain productive even if they experience a hard disk failure or lose a computer. They simply need to use a different computer and

they immediately have access to all their files. While iFolder is included and enhanced on Novell Open Enterprise Server 2, Windows Server 2003 has no comparable offering.

Another favorite NetWare user self-service tool available on Novell Open Enterprise Server 2 running Linux are Archive and Versioning Services. This feature provides a convenient and cost-effective way for individual users to instantly restore previous versions of modified, renamed or deleted files. The services archive interval-based file versions and then make them available for restoration based on the date of the file change or the user who modified the files. To restore a file, users simply view a list of the archived file versions and select the version they want. This eliminates the need for users to call an organization's helpdesk to recover lost files. While the Windows Server environment does offer some versioning capability, it is not as user-friendly or as easy to use as Archive and Versioning Services from Novell.

Self-service Printer Management

Printer installation can be a significant cause for desk side visits and calls to the helpdesk. Novell iPrint reduces these calls by making it easy for users to install printer drivers on their own machines. With its browser-based interface, users can simply choose from a list of available printers or use its floor-plan click and point interface to select a printer located on an office map. Once selected, the printer driver is automatically installed on the user machine and is ready to print.

While Novell iPrint comes with Novell Open Enterprise Server 2, Windows Server has no comparable offering. Even though Windows Vista does come with a dynamic printer installation capability that administrators can use to simplify printer installation, neither Windows Vista or Windows Server provide an easy way for users to set up their own

In 2007 Novell conducted a survey with customers that had made the move to Novell Open Enterprise Server running Linux, and the major consensus was that the move was much easier than they had expected.

network printers. Often Windows administrators rely on internally developed scripts in attempt to facilitate printer installation.

According to solution providers that support both Novell and Microsoft server environments, installing printers in a Windows Server environment is a routine but time consuming task that often requires desk side visits, in addition to over the phone helpdesk assistance. However, the user self-service tools in Novell Open Enterprise Server make it easy for users to have access to the printers they want when they want.

Making the Move to Novell Open Enterprise Server Easier

From an IT standpoint, no migration can ever be considered easy. However, as has been shown throughout this paper, moving from NetWare to Novell Open Enterprise Server running Linux is inherently easier than moving to Windows Server by a significant degree. Additionally, to allow customers to take advantage of all the benefits it has to offer, Novell is very focused on making it as simple and painless as possible to make the move to Linux with Novell Open Enterprise Server. In fact, in 2007 Novell conducted a survey with customers that had made the move to Novell Open Enterprise Server running Linux, and the major consensus was that the move was much easier than they had expected.

A key part of this focus has been on providing automated and easy-to-use utilities that automate the migration effort. Most of the

utilities come in two flavors—graphical interface wizards to simplify the effort or a command-line interface for greater control and flexibility—a combination of both utility types can be used. The migration tools have been designed to allow the migration of one service at a time, in order to test and evaluate its success before attempting to move the next service. This granular phased approach brings even more flexibility and control to transition from NetWare to Linux at the pace best suited for the individual organization.

Novell also provides a migration Web site (www.novell.com/oesmigration) that provides dynamic access to content from the Novell Open Enterprise Server Migration Support Forum and Cool Solutions Community, as well as collateral, documentation, articles, Web links and third-party resources. A key collateral piece available on this site is the Novell Open Enterprise Server 2 Best Practices Migration Guide, a living document which is derived from the experiences of Novell customers that have made the move, as well as insights from Novell consultants and field engineers involved with various migrations to Novell Open Enterprise Server running Linux. The Web site also provides access to a broad community of users willing to share their migration best practices.

The bottom line is that Novell is committed to making the transition from NetWare to Novell Open Enterprise Server on Linux as easy as possible, and is offering customers a wide array of resources to achieve that goal.

Leading the Way to Greater Infrastructure Efficiency

Compared to other server offerings, Novell leads the way with storage virtualization that enables a dramatic reduction in escalating storage costs. Its Dynamic Storage Technology also provides improved operational efficiencies to help optimize backup windows. Novell leads with server virtualization that brings

significant hardware savings through server consolidation, to continue to leverage mission-critical NetWare-specific applications, and to take advantage of workload isolation and workload balancing benefits. Novell leads with user self-service tools that reduce helpdesk costs and increase user productivity.

On the other hand, a move to any Windows Server offerings opens an organization up to significant increases in both immediate and ongoing IT costs, considerable degradation in operational efficiencies, loss of user productivity and exposure to a wide array of risks. When considering server migration options, organizations should look to the solution that leads to greater savings, higher efficiency,

more productivity, and minimized risks—Novell Open Enterprise Server 2 running Linux.

References

- *Burton Group*
- *Dell.com*
- *Help Desk Institute*
- *IBM.com*
- *Salary.com*
- *Storage Performance Council*
- *Novacoast*
- *Novell Consulting*

See Also:

Enck, John; Gartner. "NetWare Futures: Upgrade or Migrate?", April 24, 2008.

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