Abstract

Consolidating servers to place the organization's workload onto a smaller number of network attached storage (NAS) devices based on Windows Storage Server 2003 is an increasingly popular concept; however, it can be difficult to gather hard data to make the business case for doing so. This paper describes a process that allows you to gather the necessary data to build a business case to get sponsorship for server consolidation projects.
Introduction

As organizations attempt to keep up with ever growing storage requirements, the need for proactive management and tools has become evident to all. The default storage solution for many organization has been to just add more storage. This method provides a simple and relatively cheap (at least initially) solution. But many organizations have reached the critical management threshold where storage is consuming a larger and larger percentage of the IT budget.

Very few companies have a long-term data management strategy or any kind of organized storage plan. The result? Companies are now struggling with the headaches of unnecessarily large server counts: increased hardware maintenance and support expenses, high maintenance and support overhead, increased software license costs, and needless administrative workload.

What is driving companies to examine and solve this problem now? Estimates from the META Group indicate that organizations typically spend $5-7 on maintenance and lifecycle support for every $1 of hardware purchased. In other words, disk space is cheap, but the cost of managing the data stored on it is not. What's more, there does not appear to be any immediate relief in sight; META Group is predicting that most companies will experience an average of 40-60 percent storage growth throughout 2003, while in the same timeframe, their IT budgets will shrink 3-5 percent. The gap between these two growth rates is driving companies to identify steps they can take that will reduce storage management costs while optimizing their current environment.

Consolidating servers to place the organization’s workload onto a smaller number of network attached storage (NAS) devices based on Windows® Storage Server 2003 is an increasingly popular concept, but it can be difficult to gather hard data to make the business case for doing so. This paper describes a process that allows you to gather the necessary data to build a business case to get sponsorship for server consolidation projects.
**Why Consolidate?**

Over the last 20 years, most IT organizations have evolved from providing highly centralized, mainframe-based services to providing services by deploying many decentralized servers in various physical locations. This change makes sense because it allowed the provision of service to move “near” the users who needed it. Unfortunately, this model also had some undesirable results: too many servers, each of which requires maintenance, software licenses, support, and administration.

**Market Trends**

With the incredible growth in hardware capacity (and corresponding reductions in unit costs for processing power, network bandwidth, and storage), it is now cost-effective to combine data from multiple small servers and replace them with a smaller number of more scalable servers. Hardware manufacturers have little incentive to sell workgroup/departmental servers on a one-for-one replacement basis; instead, they are focusing much of their product development and marketing effort on larger, more powerful (and more lucrative) servers that are well-suited for consolidation. These large-scale devices are dedicated for file serving, and they offer higher availability and better performance at very affordable prices. This provides companies with the option to reduce the number of file servers in the network and reduce overall storage management costs significantly.

One other current trend to consider is the deployment of these dedicated devices as part of a migration to Active Directory® or Exchange 2000/2003. Many companies will benefit from immediate TCO reduction if they can reduce the number of storage solutions in the environment and take advantage of more powerful operating systems, increasing the number of user logons per device.

**Business and Technical Drivers for Consolidation**

There are five primary drivers behind most server consolidation projects. These drivers influence when consolidation occurs, how it’s performed, how much has to be budgeted for the work, and how long it takes to complete. The five drivers are:

1. **Reducing operating costs.** Cost reduction is usually the initial factor that drives the start of consolidation projects. Costs can be reduced by lowering the number of servers that have to be purchased, installed, and maintained; this reduction lowers both acquisition and ongoing maintenance costs for server capacity. The Gartner Group has reported data showing that boosting the user count from 75/server to 300/server (a 4:1 consolidation) lowers per-server total cost of ownership (TCO) by 44 percent. The scalability of Windows Storage Server 2003 means that many organizations can consolidate at higher ratios (above 12:1 in some cases), further lowering TCO.

2. **Improving network performance.** Reducing the number of servers can improve overall network performance by reducing the amount of replication and communication traffic between servers. In addition, upgrading to purpose-built Windows Storage Server hardware usually provides better network throughput, because these devices are engineered specifically for network performance. In particular, most vendors include Gigabit Ethernet as part of their Windows Storage Server devices, providing up to 10 times the throughput of existing 100 megabits per second (Mbps) local area networks (LANs).

3. **Improving security.** Reducing the number of servers improves security by lowering the number of systems that have to be maintained and patched. In addition, physical security
can be improved by moving the servers to a more secure physical space instead of their distributed departmental or workgroup locations. Consolidated servers may also offer services such as the Windows Encrypting File System (EFS) that often aren't available on other NAS or storage area network (SAN) hardware.

4. **Easing business continuance planning.** When critical data are widely distributed on multiple servers, it's difficult to develop and execute business continuance plans and maintain a cost-efficient model. These plans depend on knowing which critical items exist, where they're located, and how they are protected—all of which, in turn, depend on being able to effectively audit and manage them.

5. **Enabling better capacity planning and data management.** Most aspects of capacity planning and data management get easier as the number of servers with stored data decreases. It becomes feasible for administration teams to provide the same service levels with fewer devices if they use the right tools. This in turn frees up their time for activities such as trending server growth and predicting capacity requirements, identifying and handling junk data, performing data load balancing, planning for upgrades, tracking inventory, performing backups, and offloading unused data. This transforms storage management from a reactive process to a proactive one, making it possible to maintain an optimized environment while keeping storage management costs in check.

**Benefits of Windows Storage Server 2003**

The Windows Storage Server 2003 platform is perfect for server and data consolidation projects; it's designed to offer low storage costs and high scalability. Windows Storage Server devices have some key advantages over ordinary file servers. Figure 1 shows a sample consolidation.

![Figure 1: Consolidating multiple file servers onto a single Windows Storage Server 2003 device](image)

**Lower Storage Costs**

With Windows Storage Server 2003 units, you get dedicated file servers without the additional (and expensive) baggage included with conventional servers. Windows Storage Server devices offer significantly lower acquisition and maintenance costs over their lifetime, not just at purchase time; clients attaching to Windows Storage Server devices don’t need client access licenses (CALs). Storage purchase costs can be as low as $0.02/MB ($2/GB).

**Reliable and Available**

The Windows Storage Server 2003 software is tuned for fast network performance and high reliability. Hardware manufacturers supplement this robustness with hardware features such as hot-swappable disk drives and redundant power supplies. Windows Storage Server devices can be clustered, and they offer replication services to make distributed copies of critical data across multiple servers. You can choose from single- or dual-processor servers with 100 Mbps or Gigabit Ethernet connections; some vendors offer optional high-
performance caching redundant array of independent disks (RAID) controllers to further boost disk throughput.

**Easy To Deploy and Manage**

Windows Storage Server 2003 devices offer industry-leading ease of deployment and management. Building on Microsoft’s work in making Windows deployments simpler and more straightforward, Windows Storage Server servers offer pre-configured solutions with browser-based configuration tools. In many cases, installation is a simple matter of plugging in the device, telling it what domain to join, and moving files to it.

The Windows Storage Server platform is one of the hardware solutions to include a storage resource management (SRM) solution. The Storage Manager component provides the following user, directory, and volume-based disk quotas and file type management:

- **Disk quota management** enables administrators to place ceilings on the amount of data individuals or groups can store on corporate resources. By placing limitations on the amount of data that can be stored on network drives, users must assume responsibility for regular reviews and clean up of their own data, or face the time when they will no longer be able to store more files without removing what is no longer required. Many companies have placed quota management on message systems, limiting the size of a mailbox. Users are prevented from sending new messages until the mailbox is reduced in size, either through archiving, purging, or another method. It is a similar process with data quota management and a concept that users are not unfamiliar with given the messaging system example.

- **File type management functionality** lets administrators create rules that determine what types of files users are permitted to store on corporate resources. This enables pro-active management in that inappropriate file types, such as games, movies, and MP3 music files, can be prevented from wasting corporate disk space in the first place. This helps ensure that only business-related files are stored on corporate resources and leads to a cost effective storage management policy and environment.

Storage Manager also provides a wealth of reporting and filtering features that make it possible to keep tabs on how much space is being used, who’s using it, and what’s being stored there. This ongoing analysis process complements the data you can obtain from FastLane® Consolidator by giving you quick information on quota utilization and disk consumption.

**Enterprise Integration**

Windows Storage Server devices are designed to seamlessly integrate into enterprise networks of any size. This integration comes from two fundamental design principles:

- **Complete Windows integration.** Windows Storage Server devices are full members of your Active Directory infrastructure. They can be targets of security policies and Group Policy Objects, just as with conventional servers. This provides a consistent security and management framework. Windows Storage Server devices also support key security services, including Kerberos authentication and the IP Security (IPsec) protocol extensions. The anti-virus, maintenance, and backup utilities you’ve already bought can run on Windows Storage Server servers, preserving your infrastructure investment.

- **Complete support for heterogeneous networks.** Windows Storage Server devices support the industry-standard common Internet file system (CIFS) protocol, and they can be managed with browser-based tools so that no Windows infrastructure is required to use them. Windows Storage Server devices also support Novell NetWare clients, Macintosh clients through AppleTalk or TCP/IP, and UNIX/Linux clients through NFS or CIFS. For these clients, Windows Storage Server devices appear as native file servers that are seamlessly integrated with the client OS.
**Wide Range of Hardware Choices**

More than 30 of the world’s leading hardware manufacturers are members of Microsoft’s OEM partner program for Windows Storage Server, including Dell, HP, Iomega, and NEC. This diversity gives you the ability to pick the right hardware performance and cost levels for your needs, and because Windows Storage Server devices look like Windows servers on the network, moving up to larger servers when necessary is easy.

**Benefits of FastLane Consolidator**

Most administrators don’t realize it, but migrating data between file servers is a complex process. A proper consolidation will migrate data and shares from one server to another while preserving security on files and folders and allowing users to work with their data whenever they need it. Quest’s FastLane Consolidator product eases this process by providing an all-in-one solution that addresses the biggest requirements for migrations:

- The Storage Analyzer provides data analytics required for project planning and assisting with ongoing data administration activities. These reports identify where and how storage is being used so that administrators can effectively plan a migration thatdelivers the best possible consolidation.
- The data migration component moves data online. Users never lose the ability to work with their network files even as they are being moved. Migrations can be scheduled to launch and sync at specified times, and the amount of network bandwidth used during the migration can be controlled. Delta-based synchronizations ensure that only the changes are re-migrated. Files, folders, and shares can be migrated, and their security and access information (including the “last accessed” timestamp) are preserved.
- Built-in utilities automatically update users’ desktops and profiles so that their working environment remains seamless. This removes the need for administrators to make visits to individual workstations to perform these updates manually, saving time and money.

![Diagram of FastLane Consolidator](image)

*Figure 2: FastLane Consolidator automates the process of migrating data and security from file servers to centralized storage*
Figure 2 shows a sample of how FastLane Consolidator can be deployed. The product is installed on a “database” server. All migration and storage metrics information is stored centrally on this device, usually in a SQL database. The migration component leverages small DCOM agents which, according to best practice, are deployed to both the “source” server – where data is being migrated from, and the “target” Windows Storage Server 2003 device. Deploying the optional DCOM agents ensures a direct data migration path between the two storage devices, reducing network drag and bandwidth waste. It also ensure optimal performance. The Storage Analyzer component of FastLane Consolidator is agentless.

The inability to deliver any one of these three requirements means the introduction of manual scripts or processes. These ad hoc components have three drawbacks: they add to the time to complete the project, they increase costs, and they introduce risk of error. The work necessary for migration may seem simple at first, but even updating user desktops is a potential minefield. A complete desktop update means correcting items such as OLE links, drive mappings, and desktop shortcuts so users have no trouble accessing data from the new storage device.

FastLane Consolidator also provides another important benefit: the ability to monitor the effects of a consolidation after it has taken place. Even after the initial consolidation, administrators need to be diligent about maintaining the optimized environment they’ve consolidated. This means that they need to perform periodic reviews of network data usage so they can plan capacity, identify and recover wasted space, move home directories, offload unused data, and perform other housekeeping tasks. Some of these activities lead them back to consolidation-related changes. This ongoing process is made much easier by a combination of tools; FastLane Consolidator complements quota management and policy enforcement tools to make this ongoing assessment and monitoring work smoothly.

**Making the Business Case for Consolidation**

The technical and cost saving benefits of deploying Windows Storage Server 2003 and performing server consolidation as part of your data management strategy are clear. However, the next hurdle in implementing a consolidation project is getting your consolidation project funded. Making the business case justification for a consolidation project is more complex than it may appear.

The basic concept behind consolidation is simple to explain: reducing the number of file servers into the network by deploying dedicated Windows Storage Server solutions and consolidating legacy data reduces the amount of hardware, software license, maintenance, support, and administration costs. As a result, storage management costs are reduced. These benefits are often synergistic; for example, when Continental Airlines consolidated onto Windows Storage Server devices, they were simultaneously able to double the amount of available storage while dropping their server count by 70 percent.

However, the challenge lies in how you calculate the potential savings—especially if you do not have a good handle on your current storage situation.

In terms of consolidation projects, it would be easy to start factoring in “hidden” or “soft dollar” costs or savings. While these are important considerations, they can require more time and effort than is needed. By keeping your justification simple and well-supported, you can more than justify the business case for consolidation if you can provide the following information:

- What is the cost of maintaining the current infrastructure and the data on it versus investing in Windows Storage Server and performing a consolidation? Conversely, you could take the approach of calculating expecting TCO savings as a result of having consolidated and calculate the time of cost recovery.
- How much can be saved by recovering wasted disk space currently housing unused data such as temporary, unused, orphaned, duplicate, or inappropriate files?
• How long will it take to consolidate?

These questions pose a conundrum: the answers to these questions provide the business case justification, but without visibility into utilization and usage of your current storage situation, how do you get them?
Gathering Initial Requirements

The first step in building a business case for consolidation is to identify the requirements that the consolidation is designed to satisfy. These requirements should identify why you’re consolidating, which resources are candidates for consolidation, and what objective measures will be used to determine whether the consolidation is successful or not.

Requirements for Consolidation

The key drivers for consolidation were described earlier in this paper; they often map to requirements in business case justification because they all represent desirable benefits. In particular, key requirements often cited to support consolidation plans include a desire to reduce TCO for file and print servers. TCO reduction can come from the following sources:

- Reducing purchase, lease, and upkeep costs by reducing the physical server count
- Reducing the physical space and infrastructure footprint for a given capacity by moving to denser or more powerful servers
- Lowering administrative overhead by combining existing workloads onto a smaller number of more manageable servers.

Determining What Can Be Consolidated

Any business justification for consolidation must include a discussion of which servers or resources are being consolidated, and what form they’ll take once consolidated. This phase of the justification process normally focuses on identifying which resources exist and answering questions including:

- How many file servers do I have? Where are they physically located?
- How much direct-attached storage does each server have? What percentage of that storage is currently used?
- How much are we paying for these servers, including purchase or lease payments and maintenance or support contracts? Make sure that this includes the cost of administering the servers, because that’s a part of the TCO.
- What other ancillary costs, such as leased or co-located floor space, are associated with these servers?

While cost is the most common factor in deciding what can be consolidated, physical location, maintenance cost, network connectivity, and access patterns all play a role. For example, organizations with file servers in multiple branch offices might decide to consolidate onto a small number of centralized servers to provide better stability and recoverability, even though that might require adding bandwidth between the branches and the central office.

When determining what can be consolidated, keep in mind that consolidating provides improved storage resource utilization. Many direct-attached servers have wasted space that’s not being used by the department or workgroup that owns the server; with Windows Storage Server 2003 servers, storage can be pooled and allocated as needed, leading to greater allocation efficiency and less wasted space.

Selecting Objective Measures

The objective measures chosen for a particular business justification will vary: in a cost-sensitive environment, cost reduction is probably the most significant measure, but for
environments where reliability, network usage, or other factors are very important, other
measures may be more important.

The key to selecting acceptable measures is to find measures that satisfy the following two
characteristics:

- **Quantitative.** For example, a consolidation objective might be to reduce the amount of
  unused space per server below 15 percent of each server's total space. That's a good
  measure, because it can be objectively measured. An objective of "Reduce the
  amount of unused space" is not as useful, because there's no easy way to tell whether
  the objective is being precisely met or not.

- **Measurable.** Even quantitative measurements are no good if they cannot actually be
  measured. For this reason, many consolidation justifications depend on
  measurements of storage utilization, efficiency, and availability, all of which can be
  measured on both the existing and new systems.

FastLane Consolidator’s Storage Analyzer includes a number of pre-defined reports that
present storage utilization data in an easily understandable format. This data can be used as
the basis for objective measures.
Completing Your Consolidation Plan

Once you’ve identified the requirements that your consolidation must satisfy, you’re ready to begin gathering quantitative data that can be used to support your requirements and to provide a baseline set of measurements. This baseline will help you determine if your consolidation was successful or if it needs further alterations.

Completing your consolidation plan requires a complete analysis of the current storage situation. This poses a two-pronged problem. First, in the current economic climate, only those projects showing considerable return on investment (ROI) are getting funded. Additionally, business managers have high expectations with respect to the delivery time of the ROI. Simply put, projects that do not show significant ROI within a 12-month timeframe will not get funded. Second, the actual task of performing the online migration of data and data security, including shares, permissions, ownership, and other attributes, is more complex than it appears, particularly because this activity should have no impact on business operations.

The goal of this section is to point out information and arguments you need to make the business case justification for your consolidation project, and, equally importantly, to discuss how you can obtain them.

Performing a Server Utilization Review

Typically project or administration teams break out project requirements into at least two categories, with costing done against each. The first category, network infrastructure, deals with the number of servers, the volume of disk space used and available, and the volume of junk data currently in the network. The volume of junk data is important to be able to calculate. Most companies will want to handle this as part of the consolidation. The ability to easily identify duplicate, orphaned, inappropriate, or unused data through deletion, archiving, or offloading represents an immediate and significant cost saving.

The second category, hidden costs or savings, defines elements that may produce a soft saving or hidden cost depending on whether you are reviewing the current storage situation or forecasting the advantages of the consolidation route. For example, if a company is consolidating servers, the company should factor in the cost of investing in a software solution to automate the migration versus the cost of manually trying to migrate the legacy data.

For clarity, it helps to further divide these elements into two sections: one charts network device and data variables and the other lists other considerations. Unless administrators have a very good understanding of the current storage situation, it is very difficult to be able to assign these values; instead of guessing, the best approach is to gather the data using reporting tools.

Performing a Storage Utilization Review

Consolidation offers another opportunity to reduce storage cost and overhead by removing unnecessary or unused data from primary storage. During a consolidation, administrators can offload or delete duplicate, orphaned, inappropriate, or unused data; by doing so prior to the actual consolidation, it’s easy to optimize storage usage to avoid wasting space on unneeded materials.

The storage utilization review is an opportunity to examine the data stored on the organization’s servers. The review is designed to answer a series of questions:

- How much data is stored on the servers? Where is it located? Who owns it?
• When was the last time the data was accessed? Does it change often, or is it static?
• How much of the stored material is duplicate data? How much is data that you don’t want or need to keep?
• What could the company save by recovering wasted space as part of a consolidation project?

This review can be conducted with the aid of the Storage Analyzer component of FastLane Consolidator. Storage Analyzer can perform detailed analysis on Windows servers and their storage resources. It provides a variety of graphical reports, including a summary view that shows utilization information at the enterprise level (Figure 3).

![Figure 3: Storage Analyzer produces easy-to-understand summary reports](image)

Storage Analyzer also provides a variety of more detailed reports, including reports that cover individual servers’ utilization (Figure 4) and storage usage by individual accounts.
Figure 4: Individual servers can be reported on as well

Figure 5: Storage Analyzer reports on each user's storage consumption
Performing a Rationalization Review

The rationalization review phase is important because it provides a sanity check for the consolidation justification. The goal of the review is to compare the existing measures against the expected measures for the new systems, and then compare them to assess whether the proposed consolidation is likely to meet the objectives. The rationalization review process begins by identifying which specific requirements will be reviewed; for a typical migration, this might include requirements related to TCO reduction.

The next step is to provide a list of data items for each requirement. These data items might include pricing and expense information, usage data from the Storage Analyzer tool, duration information for backup and restore processes, or other items that help quantify the potential benefits of consolidation.

The next-to-last step is to estimate the change in objective measures likely as the result of consolidation. For example, a cost-driven consolidation would require information on the acquisition and setup cost of the Windows Storage Server 2003 servers that replace the conventional servers. Any estimate must of course include the estimated cost and time requirements for a consolidation.

The final step in the review is to compare the current and projected costs. For example, a consolidation whose chief objective is to reduce the TCO for file and print services would compare the TCO of the existing TCO against the implementation and consolidation costs and TCO of a Windows Storage Server solution to see how much money the organization could expect to save.

Optimizing Storage Resources

After the initial consolidation is complete, savvy administrators will realize the benefits of ongoing tuning of their storage resource usage. Reducing the number of file servers may allow more time to manage the remaining servers, especially if the reduction is combined with better storage management tools. Ongoing tasks include capacity planning, disk quota management, file type management, offloading unused data to nearby storage, moving users’ home directories as they move within the organization, and so on. These tasks never go away, so it’s important to plan and account for them as part of the ongoing consolidation process.

The Windows Storage Server platform includes the Storage Manager, a powerful management component that allows local or remote management of Windows Storage Server’s storage usage. When combined with the powerful analytical tools included in FastLane Consolidator, Windows Storage Server devices give administrators powerful storage management combined with low cost—a great combination for ongoing optimization.
A Typical Consolidation TCO Justification

While a complete consolidation business case is outside the scope of this paper, an example of the cost savings possible by consolidating onto Windows Storage Server 2003 hardware is useful. Blue Sky Airlines is a commercial passenger airline with operations at more than 70 cities throughout North America. Their current infrastructure has Windows NT® 4.0 file servers at each operations base and at headquarters; to support approximately 5,000 users, Blue Sky has 75 file servers with approximately 15 shares per server. Per-user disk quotes of 500 MB are in place, although most users use much less storage.

Blue Sky estimates that their yearly per-user TCO for their existing system is approximately $475, including hardware and software licensing and maintenance1. They want to determine the cost and scope of migrating from their existing environment to a centralized set of Windows Storage Server devices to give them lower TCO, easier management, and better reliability. Blue Sky begins their evaluation by identifying their overall goals. They want to reduce TCO by at least 10 percent, and they want to improve their storage utilization by at least 15 percent. With these goals in mind, they begin the justification process.

Because TCO reduction is their primary goal, they begin by attempting to quantify their existing TCO. One of Microsoft’s leading Windows Storage Server OEMs offers a free Web-based ROI and TCO calculator (available at http://www.dell.com/roi) that provides a personalized estimate of the storage solution’s projected benefits and costs. By using the calculator’s estimates of savings derived from increased availability, higher employee productivity, and reduced hardware costs, they’re able to estimate their TCO savings. The calculator indicates that their TCO could feasibly drop from $475/user/year to around $270/user/year—a 44 percent reduction! This is compelling enough to drive the evaluation forward.

The next step is estimating how much the migration itself will cost. Although this is a one-time cost, its cost and complexity make it a significant factor in deciding whether Blue Sky will move forward with consolidation or not. The second stage of the TCO calculator reveals that for Blue Sky’s 5000 users, 8400 folders, and 2.5 terabytes (TB) of server-attached storage, using FastLane Consolidator will reduce migration cost by almost 75 percent, even including the cost of the software (which can then be used for future optimization projects). By using the Storage Analyzer tool to examine their existing data prior to consolidation, Blue Sky discovers that approximately 15 percent of their existing data is duplicative, and another 10 percent of it is data such as personal MP3 files and games that can be removed. The net result: a 25 percent improvement in storage utilization, better uptime thanks to more robust hardware and the stability improvements in the Windows Storage Server platform, and lower overall TCO.

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1 In 2002, the Gartner Group estimated that the average TCO for departmental servers ranged from $435/user/year (for approximately 70 users/server) to $270/user/year (for 250 users/server).
Summary

Storage consolidation can simultaneously improve your storage utilization (saving you money) while reducing the number of servers you have to maintain (saving even more money). However, careful data gathering and planning will help make your consolidation plan more likely to be both funded and successful. Combining the storage management tools, scalability, and performance of Windows Storage Server devices with the advanced reporting, analysis, and migration tools in FastLane Consolidator gives you a straightforward, proven, cost-effective way to realize these savings.
Related Links

See the following resources for further information:

- Visit Quest Software on the Web at http://www.quest.com/
- Learn more about FastLane Consolidator at http://www.quest.com/fastlane/consolidator
- Check out the Storage Road Show Archive: http://www.winnetmag.com/seminars/NAS