



# Storage Consolidation

## A Business Value Analysis

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### **EXECUTIVE SUMMARY**

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Storage consolidation makes good business sense. It can help companies dramatically reduce the high maintenance cost of proliferated storage, more fully utilize storage assets, and improve the quality of storage services that IT offers to the enterprise.

This good news arrives at a time when many IT organizations are striving to satisfy both the demand from their customers for more storage and the demand from CFOs to reduce cost. Migration to a consolidated storage architecture will allow IT to provision more storage for less cost.

Efficient and flexible storage systems have a direct impact on key business indicators. Top-line revenue is enhanced when IT can provision storage quickly to applications that support new product offerings, better supply chain management, and quality customer care. Consolidated storage systems reduce indirect costs, which are well known to be onerous in IT infrastructure investments. These systems are designed to provide the availability and scalability that keep enterprise business systems up and running through periods of growth and retreat.

Enterprises facing the decision to begin a consolidation effort should be encouraged to find that consolidation technologies are maturing. However, these technologies are not just for early adopters and enterprises with mammoth storage needs. Options for storage consolidation, including working with outsource providers, come in all sizes.

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## INTRODUCTION

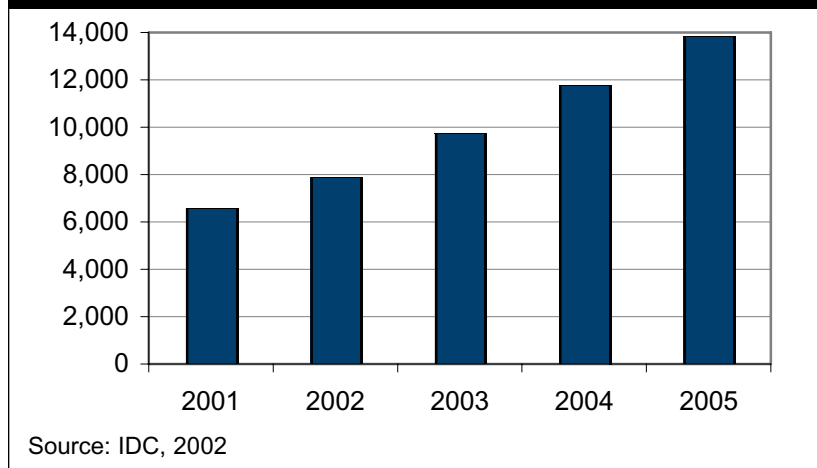
Storage consolidation is the pooling and provisioning of shared storage resources. Rather than directly attach storage devices to each server and workstation, a network provides access to storage, which is allocated on an as-needed basis. Additional resources can be provided when, for example, a seasonal increase in a customer care application requires them. These resources can be returned to the pool when demand lessens. Managing storage is accomplished at a console, not with a screwdriver.

Driven by the proliferation of low-cost servers and personal workstations, small islands of storage permeate many of today's organizations. Storage proliferation has proven costly to organizations as IT staffs increase efforts to locate, back up, repair, and manage hundreds or even thousands of distributed storage devices. Utilization levels are typically low because storage administrators often overprovision storage to avoid the high cost of system downtime that is needed to install additional storage components. Enterprise demand for increased storage capacity remains high as more and richer data is collected in the everyday process of conducting business.

Storage consolidation technologies are ready to be put to use. In Geoffrey Moore's technology life cycle, the days of the early adopters are over and the early majority is moving to consolidate. While standardization efforts continue, vendors have viable strategies for interoperation and multivendor solutions are common.

Market size and growth estimates for key components of consolidated storage underscore the claim that the migration to consolidated storage is well under way. IDC's research shows that the worldwide market for storage area networks (SANs), a major component of consolidated storage, reached nearly \$8 billion in 2002. IDC believes that the market will reach \$13.8 billion by 2005, as Figure 1 shows.

**Figure 1: Worldwide Storage Area Network Market Revenue, 2001–2005 (\$M)**



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## **BUSINESS DRIVERS FOR STORAGE CONSOLIDATION**

Consolidating storage makes good business sense. The logic is straightforward. IT systems have an increasingly direct impact on basic business indicators, such as top-line revenue and customer satisfaction, and depend on reliable and flexible storage systems. For most enterprises, the business case for consolidating storage is compelling. It allows companies to:

- Improve top-line revenue
- Provide a better return on IT investment
- Reduce indirect and overall costs

### **Top-Line Revenue**

Launching new products or services today means deploying IT systems to support them. As a result, bringing IT systems online is in the critical path to gaining new sources of revenue. Just as packaged software expedites system development, so does consolidated storage.

In a modern datacenter, storage can be provisioned as a utility — like power or cooling. Thus, line-of-business managers can know the price of storage data, which they need to build their business models. IT systems developers can focus on software and server issues without concern for procuring storage. Storage, when consolidated, is part of the shared IT infrastructure, like backbone networking, and can be supplied on demand.

### **Better Return on IT Investment**

IDC believes the first benefit of consolidated storage to emerge will be improved utilization of storage capacity, due to its flexibility. With server attached storage, resources are often stranded; consolidated storage provides the opportunity to use a higher percentage of disk capacity.

Tape libraries, which should be a part of every consolidated storage plan, will be in position to provide longer-term, lower-cost backup and archival services as needed. Consolidated storage systems will incorporate subsystems and components from multiple vendors, thus avoiding lock-in at the array, tape library, and switch levels.

The architecture and instrumentation of consolidated storage support varying quality of service (QoS) levels. Storage managers will be able to provision storage capacity with dedicated network bandwidth and latency to provide availability, performance, and data recovery as needed by each business application.

Line-of-business managers and storage managers will develop service level agreements (SLAs) that provide cheaper storage for those applications that do not need megabit-per-second bandwidth, millisecond latencies, and 99.999% availability. The ability to adjust QoS, both to high levels for demanding applications and to lower levels when less is needed, will be one of the most important benefits of consolidation.

## Reduced Direct and Indirect Costs

The direct cost per megabyte of server attached storage is less than the direct cost per megabyte of consolidated storage, but when indirect costs are included, consolidated storage is generally less expensive. The most important indirect cost savings is derived from increased management leverage — that is, the ability of fewer people to manage a great deal more storage capacity.

Storage consolidation leads to companies' supporting fewer storage devices and having fewer manual management actions for each. Over time, software functions promise hands-off, policy-based, automated storage operation. Consolidated storage systems reduce other indirect costs by taking up less facilities space and improving data access and distribution, issues that have plagued server attached and workstation attached storage architectures for years.

### Case Study: Geographic Data Technology

Geographic Data Technology (GDT) supplies a database of streets and addresses that is a key enabler of location-based applications. GDT customers use the database for applications such as map and direction services (e.g., MapQuest or Microsoft Expedia on the Web) and dispatch services (e.g., Sears delivery and service personnel use GDT data for routing). The company ([www.geographic.com](http://www.geographic.com)) was formed in 1980 and has subsidiaries in Canada and South America.

For the past nine years, GDT Director of IT Wayne St. Jacques, along with partner HP, has guided a consolidation process focused on improving application efficiency by consolidating databases and storage.

"The move to a consolidated storage architecture was incremental," according to St. Jacques. "First, we combined multiple databases into a single Oracle database supported by an HP 9000 enterprise server." Response times for the company's 200+ editors improved to 30 seconds, and subsequently to 2.9 seconds, on average. Availability and performance improved substantially as St. Jacques brought an HP storage area network (SAN) utilizing an HP SureStore XP Disk Array into production.

The SAN has been resilient to component failures. For example, when HP recognized a drive failure in the SAN, HP service personnel showed up immediately and made the hot-swap repair without any downtime. HP's SAN and XP Disk Array solution enabled high-speed data moving and I/O bandwidth for making copies and for providing flexible access control to workstations.

## Summary

Consolidation creates a pool of centralized storage resources that use network technologies to provide data to servers and workstations as needed. The centralized storage system, which may consist of both new and legacy devices, becomes the setting in which managers can gain economies of scale, provision storage capacity and performance appropriately to servers, migrate data to offline media, and protect data with backup, replication, and archiving.

A shift to a consolidated storage architecture can be linked to critical business values, such as improved top-line revenue, better return on IT investments, and reduced indirect and overall costs.

### Case Study: Geographic Data Technology (Continued)

"With the XP Disk Array and HP Business Copy software, replica copies of the database can be prepared in 2 hours, not 20, which makes the preparation of our extracts into different products [customers may want a county, a state, or a region] much easier," said St. Jacques.

"We went from a 24-hour copy of a 400GB database to a 2-hour synchronization of data from one instance to another; and what that means to the GDT employee is faster throughput, access to the product throughout the day versus waiting 24 hours to be able to produce product, and a timely deliverable to our customers," he said. "This allows us to produce our products faster and to perform more edits per hour; and the average number of edits GDT is producing now is over a million and a half to 2 million a month."

GDT's backup process also improved significantly with the use of the HP SAN. "Now, with the HP SureStore Tape Library, we're able to meet all our backup needs in a 24-hour period, going from 2 to 3 terabytes backed up per night to anywhere from 8 to 12 terabytes of information being backed up per night. HP's XP Disk Array emerged as the top choice on both price and performance criteria," said St. Jacques.

"The promises of consolidation have been achieved at GDT," St. Jacques concluded, "and HP's product and service offerings have helped us achieve those promises." GDT has achieved significant performance improvements, greater availability, savings due to centralized management, and the ability to ship multiple versions of product on a timely and reliable basis. As a result, the company gets its product to customers faster and gets faster time to revenue.

## **BUSINESS REQUIREMENTS AND TECHNICAL CAPABILITIES**

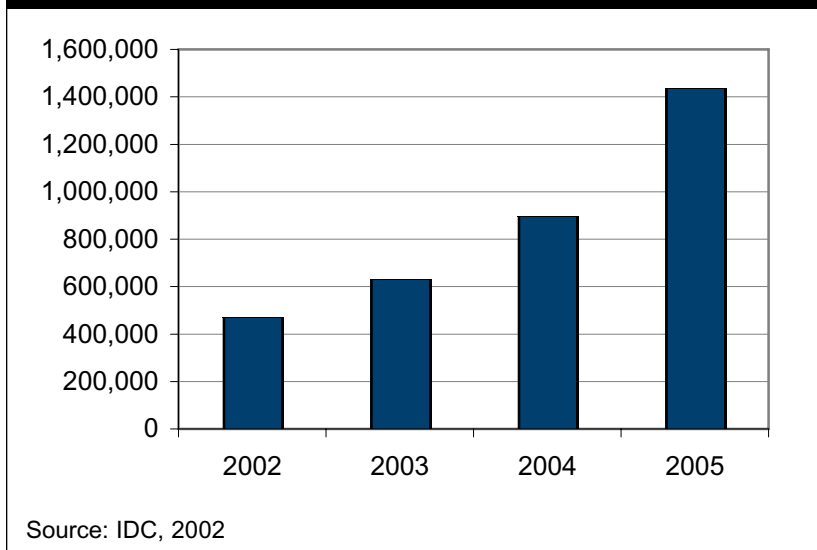
Business requirements are stressing storage capabilities in four fundamental ways: scalable capacity, availability, accessibility, and manageability. We review the business drivers for each of these storage capabilities and examine how these capabilities are enhanced when storage is consolidated.

### **Scalable Capacity**

Demand for storage capacity continues to grow as enterprises accumulate more data. Building supply chain management and enriched customer care applications, for example, creates entirely new categories of data, some developed within the enterprise and some imported from trading partners. Email and file attachments are another growing storage need, particularly with regard to the speed and ease of distribution of larger files.

Driven by increased demand, the storage market is growing rapidly. Figure 2 shows IDC's estimates for the total worldwide disk storage systems market through 2005. Measured by terabytes of storage, the market will increase at a compound annual growth rate of 38.7% from 2002 to 2005. Enterprises will buy nearly .5 million terabytes of storage in 2002 and slightly more than 1.4 million terabytes in 2005.

**Figure 2: Worldwide Disk Storage Systems Market Terabytes Shipped, 2002–2005**



Networked storage is the primary architecture for consolidated storage. For guaranteed high performance, a pool of storage devices is connected to a set of servers with a dedicated network. Additional storage devices can be added to the pool of storage and allocated to servers without the need to bring down applications or install additional disks connected to servers. Data is supplied to servers in blocks, just as it would be if the storage were attached directly to the servers.

The pool of storage devices can also supply files of data to workstations and servers. File services are ordinarily provided by a file server serving files to users across a shared network and calling for blocks of data from the storage pool across a dedicated network.

### Case Study: TELUS Corporation

TELUS Corporation is one of Canada's leading providers of data, IP, and voice and wireless communications services. TELUS provides and integrates a full range of communications products and services that connect Canadians to the world.

Rob Bolivar is manager of enterprise system solutions at the TELUS datacenters in Edmonton, Alberta. A primary focus of Bolivar's attention is an SAP transactional system that handles all of TELUS' internal support and supplies products to serve its customers.

"Access to critical services and support for our estores must be readily available," according to Bolivar. TELUS estimates the direct cost of downtime to be \$94,214 per hour. "This cost is directly related to the number of TELUS staff that cannot do their work if there were a system outage," Bolivar said. Other indirect costs, such as the ability to ship material and deploy technicians, would make this cost even higher.

The heart of TELUS' business continuance plan is a pair of datacenters located several kilometers apart. Initially, the SAP application was engineered to run at each of the datacenters. Data sets are mirrored between centers and, in the event of a centerwide failure, all of the SAP processing is transferred to the alternate site. Regular testing indicates that failover takes about 20 minutes, which is an acceptable time period for TELUS operations.

Using the SAP design as a model, Bolivar's staff has pushed business continuance plans into other key IT systems. Email, for example, is replicated between datacenters with Microsoft Exchange servers running at each site. Business processes and IT staff skills are divided between the sites as well.

"HP has been a partner throughout the business continuity process," said Bolivar. "Their expertise with SAP was an important contribution early on. Products like MC/Serviceguard are key components in our datacenters. We use Information Technology Outsourcing (ITO) monitoring services from HP on an ongoing basis. ITO has become our sentinel for what is going on in our IT environments."

## **Availability**

Modern businesses are always available for business. Access to data must increasingly be constant, and the traditional overnight and weekend windows for maintenance and backup have nearly vanished. As businesses deploy work teams around the globe, all hours are business hours. eCommerce and customer care applications demand storage systems that are highly available. The inability to access data brings business to a halt.

Consolidated storage system components are engineered for availability. Both storage devices and switches have redundant power supplies, and storage arrays have spare drives, thus extending reliability and availability to a high degree. Software monitors all components and alerts service personnel and IT managers when component failures have occurred. Hot-swappable components can be replaced without the need to take down a storage network or storage system.

## **Accessibility**

A long-term goal for many businesses is the better use of information across the enterprise. Rather than deal with isolated islands of data trapped within departments of accounting, operations, marketing, or engineering, the modern enterprise intends to exploit information across business functions. Marketing teams need accurate data from inventory management systems, and engineering design groups would operate better with access to customer complaints about current products.

In the near term, and as the consolidation process gains a foothold, enterprises will discover that it is easier to share data. Storage managers will find that preparing a snapshot of quarterly inventory data for use by researchers in the marketing department, for example, is a simpler task. Rather than replicate data, managers will simply open data access permission to multiple servers.

In the longer term (i.e., 2–5 years), IDC believes that pools of consolidated storage will provide a new opportunity for enterprise middleware to move from expensive application servers to dedicated gateway appliances directly attached to the storage pool. This possibility will stop the increasing use of servers as data movers for integrated computer applications that require specialized presentations of the same data. Thus, the expensive application servers will be available for maximum application performance.

## **Manageability**

Consolidation leads to simpler management of storage device pools. Rather than manage the capacity of each storage array, for example, storage managers can manage the consolidated storage system as a whole. Access software, cognizant of available resources, will allocate storage as required, thus alleviating the need for storage managers to attend to individual storage devices.



Storage managers can also provide a higher service level and guaranteed network QoS with a switched, complex storage network that routes data to and from servers. For some applications, for example, those that manipulate rich-content data types (e.g., audio, video, and graphics), gigabit-per-second fabric routing can be provisioned. For traditional transactional applications, appropriate bandwidth and latency can be allocated and monitored within the fabric. Upgrading the capacity of a consolidated storage system means adding new network switches, storage arrays, or tape silos to the existing pool. The dedicated network, which can support different interfaces to old and new storage devices, allows new and older storage devices to interoperate.

Other software utilities will automate the process of replicating data for business continuity planning. Rules or policies for backup and restore procedures can be executed automatically and adjusted dynamically to provide greater resilience during periods of high demand.

### **Summary**

Storage technology evolution continues at a high rate. The datacenter is and will remain a multivendor and multigenerational environment with a mix of technologies that must be made to work together. IT organizations must invest in staff training to have the agility to keep up with new technologies and also maintain legacy skill sets for older technology not yet retired. A new caliber of storage system manager is required at a time when qualified staff members are hard to find and to retain.

Organizations are bracing themselves for the next generation of storage needs. When content commonly includes multimedia audio and video, for example, then storage systems will have to be even more flexible and scalable than they are today.

### **CHOOSING A CONSOLIDATION PARTNER**

Storage consolidation, as a process, consists of both products and services to effect a solution at each point of integration. IDC recommends that IT managers look for a supplier that understands the organization's specific environment and consolidated storage needs, products that are conducive to consolidation with a road map that anticipates future automated and policy-driven benefits, and a full range of consulting services — beyond storage — that starts at planning and requirements, continues through installation and certification, and includes uninterrupted remote monitoring, support, and, when needed, repair.

*IDC believes that consolidation is a necessary step toward a more secure and available data management strategy.*

## **OPPORTUNITIES AND CHALLENGES**

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Consolidated storage technologies provide an opportunity for IT managers to gain control over valuable corporate data, and IDC believes that consolidation is a necessary step toward a more secure and available data management strategy.

Storage consolidation does raise some new challenges, however. Finding the right balance between storage that is consolidated and direct attached storage is important. IDC believes that companies need to identify those applications for which direct attached storage is needed. For example:

- Some enterprise data may simply not have sufficient value to require consolidated storage. Data uniquely linked to a back-office process and currently written to a local disk and attached tape drive may not profit from a consolidated architecture that provides unnecessarily high availability, data sharing, and performance.
- Some enterprise servers and workstations may have intermittent network connections and cannot depend on data from a common store. The mobile worker's laptop and the retail outlet's point-of-sale price database may be better served by direct attached storage with replication to consolidated storage on a regular basis.

Consolidated storage systems may challenge existing business continuity plans because disruption to a datacenter has greater potential for widespread outages of business systems and loss of larger amounts of corporate data.

*IDC recommends incremental migration and believes that many IT organizations will need consulting services.*

Interoperability among applications and migration of applications to new architectures are well understood to be difficult for enterprises. IDC recommends that organizations undertake incremental migration to mitigate this risk. Moreover, we believe that many IT organizations will need consulting services in an area in which today's staff will not have sufficient experience or time to investigate all the requirements and potential pitfalls.

Consolidated storage technologies continue to evolve. Companies need to consider the capabilities of today's products as well as the road map to next-generation products when choosing products and technologies.

## **CONCLUSION**

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Enterprises need a consolidation strategy; otherwise, the management overhead and risk to enterprise data will continue to rise to unacceptable levels. IDC believes that the move to consolidate data is an incremental process. Often, consolidation is triggered by a highly demanding new application — for example, a Web services initiative demanding high availability and uncertain capacity requirements. As a consolidated storage infrastructure develops, other applications can be migrated. Other benefits, such as enterprisewide sharing of data and greater storage utilization, then begin to emerge.

IDC suggests that enterprises choose storage suppliers with care because consolidation projects require a strong partnership and level of presales and postsales support. Both current examples of successful implementations and a road map for the future are important criteria when choosing a storage supplier.

Over time, IDC believes that organizations will be able to demonstrate that significant benefits accrue due to the opportunities presented by consolidated storage systems.

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