

WHITE PAPER

NAS Helps Customers Address File Storage Growth

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IN THIS WHITE PAPER

This white paper examines how many organizations are currently addressing storage and management needs to support the growing amount of file-level activity pervasive in most enterprise organizations. The paper then identifies pain points associated with the current solutions, takes a closer look at network-attached storage (NAS), and focuses on Sun Microsystems' new NAS solutions and the benefits to be gained by customers.

SITUATION OVERVIEW

Introduction

Today's businesses are digitized, online, and growing. Organizations of all sizes continue to generate increasing amounts of data, largely because of a growing number of applications and users generating and accessing data. The productivity and viability of organizations are becoming ever more reliant on the ability to store, organize, and share this business information.

One of the largest areas of growth, especially within enterprise organizations, is expected to be in file-level services, with activity related to file-based data continuing to grow as organizations:

- ☒ Increasingly rely on digitization of data and business information in the form of files
- ☒ Experience growing numbers of users generating and/or accessing the files
- ☒ Demand the ability to share files in an efficient manner to improve productivity or help achieve business goals
- ☒ Generate larger files with continuing advancements in application features, graphics, and processor power
- ☒ Generate more files, particularly as a result of increased email activity and collaboration
- ☒ Address business governance and regulatory compliance, which will increase and complicate the retention of business information, forcing IT managers to develop ways to save more (or all) files generated for longer periods of time

Enterprise organizations have had several options from which to choose in addressing their file-level needs. For most, the deployment of general-purpose servers (GPSs) to accommodate file sharing remains the most widely adopted method. Organizations that are capable of making more strategic investments to consolidate or reduce management complexity rely on alternative solutions such as advanced file systems or NAS.

As a result of growing file-related activity, CIOs and IT managers are constantly looking for methods to store and manage their business information in the most efficient and cost-effective manner possible. With respect to file-level data, the increased amount of activity will continue to add to the existing stress of IT budgets and resources. Many administrators are looking to optimize the value of their IT infrastructures by leveraging fewer suppliers that can deliver as much end-to-end value as possible in attempts to achieve a total IT or storage solution.

As data storage and organization continue to grow in importance, suppliers that are capable of addressing storage capabilities in the context of an organization's overall IT environment can help to maximize a customer's investment. Systems vendors that offer servers, storage, and associated software and services to provide a broader range of full solutions are best positioned to offer more end-to-end capability to customers. One such company is Sun Microsystems, whose recent investment in NAS products has increased its breadth of offerings to help customers address a wide variety of file-based and overall storage needs.

Typical Architectures to Address File-Level Storage Needs

General-Purpose Servers

General-purpose servers represent the most widely adopted choice among end users to address their file-level storage needs. GPSs can be deployed for a variety of workloads, including network file sharing. IDC estimates that approximately \$5.1 billion was spent in 2005 on general-purpose servers deployed for the function of network file sharing.

These servers are typically deployed with internal hard disk drives to facilitate file-level storage, and they are typically based on Windows, Unix, or Linux operating systems. Each server has a separate file system that uses a single type of protocol for sharing files over the network (typically CIFS for Windows servers and NFS for Unix or Linux servers). The scalability of the internal, direct-attached storage (DAS) is typically contained within each individual server.

A GPS with internal DAS remains the most widely deployed file-sharing solution for several reasons:

- Customers are loyal to existing channels of IT infrastructure. In most cases, they will tend to be loyal to one or several of the larger server vendors that have traditionally focused on server-based solutions.

- ☒ Many organizations might perceive the notion of migrating to a new storage architecture as costly or complex.
- ☒ Many organizations may be unaware of alternative solutions, such as NAS. In some cases, customer loyalty could actually be the result of indifference or ignorance to alternative architectures.

Customer Pain Points Regarding GPS Solutions

The increase in files in organizations is placing stress on administrators and infrastructure to accommodate the growth. For many organizations that have already deployed GPSs for general file sharing, the typical reaction to increasing file-level storage capacity or activity is either to undergo disruptive upgrades to hard drives or to deploy additional file servers to accommodate an increase in capacity or performance in an effort to serve files efficiently to all users and applications.

Datacenter Overhaul Featuring NAS

IDC spoke with Ahmet Oner, vice president of IS at Chuck E. Cheese (CEC) Entertainment Corporation. Currently, CEC has 475 stores in the United States; each store is equipped with point-of-sale (POS) systems that are connected to company headquarters via a WAN. The company was saddled with an outdated datacenter that no longer met its storage needs.

Prior to its upgrade, CEC had 40–50 servers, each equipped with dedicated storage. Each server required individual management, leading to inefficiency in resource deployment. Frequently, the company would experience significant downtime when an HDD in a server failed. Additionally, as the HDDs were older, CEC would also have to go to the used market to find replacement drives. As such, the current system was not cost-effective.

While looking to add storage to satisfy the growing needs of the company, Oner considered several options to improve upon his outdated architecture. "I wanted flexibility and scalability to meet our needs for at least the next four years," Oner said. In addition, Oner had a specific budget to work within and wanted to ensure he purchased a solution that entailed straightforward installation. "Sun was a single vendor that could provide a complete solution, and they offered an attractive price," he said. Oner went on to say that a single vendor was a key element for him. "Otherwise, with partners, they point fingers at one another when something goes wrong. This way, Sun, and only Sun, will handle any issues."

Today, CEC deploys a Central Storage Array. A Sun StorageTek NAS Appliance is positioned at the front end of the system and is available for file sharing. Oner cited redundancy and efficiency as key elements of the new environment, adding, "There is no single path of failure." Overall, he has been very pleased with his decision to buy Sun NAS and storage products.

Many times, the storage capacities or performance capabilities of general-purpose servers are inadequate, especially as organizations grow over time. Upgrading individual servers by manually replacing the drives with larger drives is extremely disruptive and involves considerable time and effort on the part of IT or storage administrators. Along with taking servers offline during the upgrade, administrators are subject to the complexities of manually reconfiguring and rebooting each server.

Eventually, when maximum capacities or performance is reached, additional servers are added to increase file-level services. This proliferation of multiple devices leads to:

- ☒ Increased complexity of architecture
- ☒ Increased use of resources and higher cost to manage multiple devices and multiple file systems
- ☒ Increased backup activity and complexity
- ☒ Multiple devices for multiple user environments (multiple operating systems)
- ☒ Increased licensing costs for each server added

Network-Attached Storage and Benefits over GPS Solutions

NAS is a disk storage system that attaches directly to the user network and contains its own file system, which has been optimized to store and share files. NAS is a mature technology that has found success among users wishing to consolidate their file-level services, typically consolidating from multiple general-purpose servers.

IDC estimates that the NAS market will grow from \$2.1 billion in 2005 to about \$3.4 billion by 2009, representing a robust 12.9% CAGR. NAS provides many of the following typical benefits over GPS solutions:

- ☒ **Ease of use and dedicated purpose.** NAS is designed to be easier to deploy and manage than GPS file-sharing solutions. It is a storage system architected and optimized to store, share, and manage files.
- ☒ **Multiprotocol file sharing.** Most NAS solutions support multiprotocol environments simultaneously, unlike general-purpose servers, which are each dedicated to a single operating system. Typical environments supported include Windows (via CIFS protocol) and Unix/Linux (via NFS protocol).
- ☒ **Greater capacity and scalability.** Higher initial capacity points can provide consolidation of storage and management into fewer devices. Further, NAS is typically architected to scale capacity external to the initial deployed NAS device, greatly enabling the ability to scale even further as capacity needs to amplify.
- ☒ **Greater performance.** Because NAS devices are purpose-built for file sharing, they typically provide greater performance compared with their GPS counterparts.
- ☒ **Lower licensing costs.** NAS typically allows for the consolidation of multiple GPSs and, therefore, potentially lowers costs associated with fewer server licenses.

Customer Requirements

The aggressive data growth that many enterprise organizations face can be debilitating, especially if the installed infrastructure is not capable of providing IT or storage managers with the tools needed to accommodate growth. Organizations are looking for ways to store, manage, archive, and retrieve all files in the most efficient and cost-effective manner possible. For companies facing the proliferation of GPSs, the notions of lower cost of ownership, simplified management, and improved business productivity will be unrealized.

Users who choose to make more strategic investments that either leverage existing pools of storage or provide the ability to consolidate multiprotocol access into fewer pools can greatly reduce complexity, improve performance, and benefit from ease of management, all leading to overall lower cost of ownership and lower price-performance of the storage solution.

Customers desire consolidated solutions that offer:

- ☒ **Simplicity** to lessen the strain on administrators, given that storage capacities will grow while resource budgets will remain relatively static
- ☒ **Lower licensing costs** due to lower number of products deployed
- ☒ **Flexibility** that enables the ability to leverage existing pools of storage and/or make use of multiple tiers of storage to align the business value of data with the appropriate level of storage performance and reliability, ultimately improving cost
- ☒ **Scalability** of capacity and performance to ensure investment protection as organizations attempt to address the tremendous growth of file-level data
- ☒ **Nondisruptive and reliable** solutions that provide the ability to scale without taking down systems or that decrease risk due to higher reliability
- ☒ **Turnkey** solutions that integrate multiple facets of an overall solution from a single supplier or at least as few suppliers as possible
- ☒ **Integration** with third-party software to enhance solution benefits and address higher application layers with respect to content management or regulatory compliance

Sun StorageTek Network-Attached Storage Appliances

One solution on the market today that is helping customers address many desired requirements of enterprise file sharing comes from Sun Microsystems and its line of NAS products.

Sun offers three NAS products, each of which employs hardware-based RAID (0, 1, 5) and can simultaneously support users among multiple platforms, including Windows, Unix, and Linux via the included CIFS (SMB), NFS (v2 and v3), and FTP protocols.

In addition, each NAS appliance offers iSCSI support as a target for the Microsoft Software iSCSI initiator.

The products are as follows:

- ☒ **Sun StorageTek 5220 NAS Appliance**, which scales up to 24TB of raw Serial ATA (SATA) RAID-protected storage
- ☒ **Sun StorageTek 5320 NAS Appliance**, which offers the ability to cluster and mix Fibre Channel (FC) and SATA drives, scaling up to 134TB (FC) or 224TB (SATA) raw capacity
- ☒ **Sun StorageTek 5320 NAS Gateway System**, which offers the separation of the NAS file system from the back-end storage, enabling flexibility to apply file-level services to existing or complementary pools of storage area networks (SANs)
- ☒ **Sun StorageTek Compliance Archiving System**, which combines the Sun StorageTek NAS Appliance with the Sun StorageTek Compliance Archiving Software to prevent intentional or accidental destruction or alteration of the data stored until its assigned retention date has been met. The StorageTek Compliance Archiving System has been evaluated as meeting the stringent requirements for data storage as defined by SEC Rule 240.17a-4.

History of File-Level Services

Sun has a long history of providing file-level services to enterprise and high-performance computing environments. The company was an early pioneer in the development of Unix and TCP/IP networking protocols. In the early 1980s, Sun developed the Network File System (NFS) and since then has developed other advanced file systems.

Sun StorageTek QFS shared file system software provides high-performance file sharing among servers deployed in a SAN environment, while the StorageTek SAM-FS file system provides archiving capabilities to help manage and protect file-level data.

While Sun's QFS enhances the ability for customers to address file-level storage while leveraging a SAN architecture, the company has introduced its line of NAS solutions to provide a broader choice of options. For many customers, a Sun StorageTek NAS Appliance provides an easier, cost-effective method to store and manage growing amounts of files.

Customer Benefits of Sun NAS

Capacity and Scaling

A single Sun StorageTek NAS Appliance scales well beyond the typical internal DAS capacities of most general-purpose servers (which are typically under 1TB). Sun StorageTek NAS Appliance helps to address customers' consolidation requirements and can dramatically simplify an organization's file-data landscape by reducing the number of devices necessary to facilitate a given organization's file-level demands. This capability in turn can help reduce capital costs and lower management costs as well.

Hardware RAID

Hardware RAID used in the line of Sun StorageTek NAS Appliances can provide increased performance for organizations to handle increased file-level activity. The RAID firmware is executed on a dedicated processor, which does not share resources of or interfere with the CPU(s) of the NAS appliance itself, which runs the operating and file system. This can greatly improve the performance of the RAID functionality and the overall NAS device. Conversely, the performance of software-based RAID is dependent on the appliance CPU processor performance and load on the system.

In addition, the use of hardware RAID allows for the scaling of storage performance by adding additional RAID controllers as the storage capacity scales. Sun preconfigures disk shelves for upgrades, which, when connected to the existing system, are automatically recognized by the NAS operating system and provide a smoother and nondisruptive method for scaling capacity and RAID performance when compared with the use of software-based RAID. The Sun StorageTek 5320 NAS Appliance can currently scale to 448 drives behind a maximum of 8 dual RAID controller units, each with up to 1GB of cache.

Music Supply Company Uses Sun to Increase Efficiency

IDC spoke with Jeff Whitmore, director of IT at Ernie Ball Inc., one of the world's leading manufacturers of electric guitars, basses, guitar strings, and accessories. Strings and accessories are available in more than 5,500 music stores throughout the United States. The company also exports to 68 countries. With 80 network users spread over two locations, the company wanted to provide shared storage to each user's Sun Ray client that would provide maximum operational efficiency at a low cost.

Whitmore chose to deploy a Sun StorageTek NAS Appliance at each location. The units mainly support the company's ERP system, but additional value is achieved by also supporting user directory file services (e.g., spreadsheet and word processing applications). In addition, the NAS products serve as targets for backup, specifically for email and directory services. Ultimately, the Sun StorageTek NAS units are backed up to tape via conventional backup software.

Whitmore has been extremely pleased with the ease of use and reliability of Sun's StorageTek NAS. Initial installation two years ago took less than one hour, and units have not failed since. In addition, Whitmore also cited the comfort level that comes from having a single vendor providing an overall solution. Also, in regard to scalability, Whitmore expects Sun's StorageTek NAS solution to fit the bill for the foreseeable future.

Gateway Opens Up New Opportunities

The Sun StorageTek 5320 NAS Gateway option provides the ability to leverage existing pools of storage — namely, the existing installed based of Sun storage arrays, including the Sun StorageTek 6130 and 6920, and the entire 9900 series, including the Sun StorageTek 9970, 9980, 9985, and 9990. This greatly enhances the ability for existing Sun SAN customers to deploy file-level services using NAS technology on top of their existing investments. It also allows for new customers to deploy complementary systems that combine SAN storage with NAS capabilities.

In addition, the Sun StorageTek 5320 (delivered either as an appliance or as a gateway) offers multiple types of storage and protocol access under common management tools. File-level data is achieved via delivery of data through NAS (CIFS and NFS) protocols, while block-level data can be delivered via either iSCSI (IP-based) or FC SAN (FC-based). The ability to offer direct FC block-level connection via the back-end storage array(s) enables performance levels appropriate for direct SAN capabilities. Customers looking to leverage SAN access to complement the NAS functionality can do so without having to pass data through the NAS file system, which could encumber performance.

Multiple Tiers Allow Fine-Tuning and Cost Savings

The Sun StorageTek 5320 also offers the capability to mix and match FC (performance-oriented) or SATA (capacity-oriented) drives. This provides customers with multiple tiers of storage, under a single management console, that offer the flexibility to store business data of varying importance on different levels of storage. This capability allows IT managers to fine-tune and match the capacity, performance, and cost of the storage with the business value or importance of the file-level data.

For example, consider an IT manager who has two applications; one is mission-critical to the viability of the organization, the other is of secondary importance (such as replicated, backup, or nearline storage). While Fibre Channel would be the logical choice if the manager had only one hard drive option from which to choose and store both applications, this would be overkill for the secondary application. By choosing multiple tiers of storage, the manager could save costs by fine-tuning and deploying less expensive SATA drives for the secondary application.

Sun's NAS Licensing Structure

Sun offers a system-based licensing model (versus a capacity-based or combination thereof) for its Sun StorageTek NAS Appliances. For those organizations experiencing or anticipating tremendous data growth, Sun's licensing model can help to keep costs at bay.

This pricing model can be key for organizations to grow their file-level capacities without adversely adding cost. The advantage is twofold: First, by virtue of the consolidation that is enabled by Sun's NAS products (versus GPS solutions), customers will need to deploy fewer devices to satisfy file-related activity. The fact that Sun's licensing model is based on number of systems will help to reduce costs. Second, as organizations' file-level needs or capacity grows, they can add storage (by purchasing the extra disks to scale capacity) without additional licensing costs or penalties for increased capacity.

For example, assume a customer purchases a Sun StorageTek 5220 at a list price, for the initial system, of \$31,990. This system includes a base storage capacity of 4TB and CIFS, NFS, and iSCSI protocols. As the customer's organization grows, the capacity need increases to 8TB. The customer can upgrade the capacity for \$14,995, which is the cost of the hard disk drives only, but does not pay additional licensing costs associated with the increase in capacity.

Business Governance and Regulatory Compliance

Sun StorageTek Compliance Archiving Software, when deployed in conjunction with Sun StorageTek NAS solutions, allows customers to address two levels of compliance on a single platform:

- Mandatory or regulatory compliance (such as SEC 240.17a-4 or HIPAA)
- Advisory or business governance to enable best practices within the specific and internal guidelines of a particular organization

Similar to the scaling and cost benefits of the NAS licensing structure, the Sun StorageTek Compliance Archiving Software is sold per NAS device and is not capacity-based; therefore, customers can take full advantage of scaling their compliance-related data without increasing costs related to software licensing.

Sun's End-to-End Capabilities

Sun has the capability to help customers engaged in high-performance computing environments or larger enterprise organizations. In particular, Sun is capable of providing end-to-end solutions that include its own servers, various storage arrays including SAN and NAS, server and storage software, and services. Sun is not unique in this area, but this capability is limited to those server vendors that also sell external storage arrays, including both SAN and NAS products, and that have the ability to address both block- and file-based application needs. Further, Sun offers complete suites of storage and application software and services to complement the server and storage technology offerings.

Sun StorageTek NAS Appliances have also lent themselves to enable partnerships with many third-party software companies or ISVs, particularly in the following areas:

- Enterprise content management (ECM) to help customers manage the extreme growth of unstructured file-level data
- Global name space to enhance the scalability beyond the maximum of 224TB per single StorageTek 5320 NAS solution
- Business governance and/or regulatory compliance issues
- Backup and archive in conjunction with major backup software vendors to ensure a wide variety of choices to protect data while leveraging existing backup schemes (In addition, Sun has also developed APIs that allow customers to integrate its NAS products with existing backup and archive solutions and leverage existing investments.)

CHALLENGES/OPPORTUNITIES

Sun has many opportunities to help customers engage in more cost-effective and efficient ways to support enterprise file-level applications. However, Sun should pay attention to the following items and strive to address them on behalf of its existing and potential customers:

- ☒ As with all storage suppliers, Sun will need to continue to advance its technology in terms of capacity, performance, and scalability. Increased competition will not cease, especially in the area of file-level services, because many, if not all, suppliers have recognized the importance and opportunity that lie in supporting advanced technologies for file-level data storage.
- ☒ Sun will need to continue to add functionality and drive deeper value by internally developing or working with ISVs for even tighter integration between storage and applications. The company is well-positioned to advance this integration, but it will need to execute successful strategies to do so.
- ☒ The Sun StorageTek 5320 NAS Gateway is an ideal product to leverage the Sun installed base of SAN storage and enable file-level services via NAS. Sun must work internally and with other storage systems vendors to expand the list of qualified, external storage arrays to embark on new opportunities and gain more NAS footprint in the datacenter.

CONCLUSION

File-level activity will continue to garner increased attention from CIOs and IT/storage administrators as more users and new applications generate more and larger files. At the same time, administrators will look for new ways of supporting this increase in file-level data without increasing staff, complexity, or costs. For many organizations, this will include the deployment of external and shared file systems in the form of NAS.

Sun StorageTek NAS Appliances address many pain points that enterprise storage administrators face today. The scalability of Sun's hardware-based RAID, combined with its system-based licensing architecture, allows organizations to consolidate file-level services while enabling the ability to scale performance and capacity at a minimum cost. Multiple tiers of storage allow customers to align the value of their data with the appropriate performance and cost characteristics of the storage system. The single platform provides ease of use and management to administrators as they address a variety of needs in terms of compliance or business governance and multiprotocol attachment in terms of both block- and file-level storage.

Finally, Sun's long history of developing and offering file-level services, combined with its end-to-end capabilities as a full-service systems vendor, provides an excellent foundation upon which to offer its new NAS solutions.

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