# Networked Storage — A Buyer's Guide to Pain Relief

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## Management Summary

Fast data growth and increasing reliance on information technology have left many businesses with an over-burdened storage infrastructure. It may function, but not at an optimal level. **A business assumes a number of risks and costs by continuing with the status quo.** Consider the following:

- Do you often worry that your data is not sufficiently protected from disaster or data corruption? Could you recover? In a complete and timely fashion?
- Do you know the status of your backup operations? Are they inconsistent? Is the backup window too short?
- Is data growth becoming harder to manage?
- Do storage management activities consume too much of your administrators' valuable time?
- Are your new applications taking too long to roll out?
- Is it difficult to add storage capacity or migrate data between servers?
- Does storage downtime interfere with the business – causing lost opportunities, frustrated users, and irate managers?
- Do you know how well your storage is utilized? If so, is it low (e.g., below 70%)?

In short, your current infrastructure may be a liability to your organization – by costing too much, by putting essential information at risk, or by negatively affecting productivity. The good news is that the problem can be solved. **Networked storage combined with advanced software is an effective solution to many of the information storage challenges that businesses face.**

Networked storage represents a different approach than traditional direct-attach configurations. It separates storage from servers and consolidates it on a network with broad accessibility. *Storage area networks* (SAN) provide block-level access for dedicated applications. *Networked-attached storage* (NAS) provides file sharing over an IP network using standard protocols. A third, emerging category of *object storage* is useful for long-term, online archiving with guaranteed authenticity. While each approach is optimized for different purposes, they all enhance the value and effect of software like point-in-time copy, remote mirroring, and centralized management. **The net result is a storage infrastructure with greater simplicity, cost-effectiveness, and data availability.**

While most large enterprises already enjoy the benefits of networked storage, many small- and medium-sized businesses (SMBs) have not yet made the leap. **The technology is mature, and now may be a good time to consider it, especially if you are feeling the pains of data growth.** Read on for a closer look.

## The Pains of DAS

Many businesses still use traditional direct-attach storage (DAS). With this architecture, each server has its own storage – either internal or directly attached with a cable. This may work fine for a single server, **but the limitations of DAS become apparent when IT infrastructure scales.** As applications and servers proliferate, it creates many disconnected and dispersed islands of data. Administrative tasks like adding or reallocating capacity and general maintenance are performed for each server and its captive storage. There is no leverage, so skilled storage administrators spend a lot of valuable (and costly) time doing the same thing over and over again. This has a negative impact on storage total cost of ownership[1] (TCO). It is also more difficult to adequately backup and protect data in this kind of fragmented environment. Backup jobs may fail or not be performed frequently enough, creating a risk of data loss. System recovery in the event of a disaster, or even just restoring a file, can take hours or days. Furthermore, spare or "overhead" capacity cannot be shared among servers, so more storage than necessary is purchased.

Without software features like point-in-time copy, remote mirroring, etc., applications are more likely to experience downtime due to a system failure, disaster, or even just from performing administrative tasks. For instance, all of the following activities can cause significant downtime: capacity expansion, backups, data migration, application testing, and data warehouse loading. **In short, the traditional approach to storage can be costly, complex, and disruptive, especially as the environment scales.**

The increasing relevance of storage magnifies this problem. Nowadays, information flow is essential to ongoing business operations. For instance, the productivity of a call center would nearly cease if storage unavailability caused data to be inaccessible. The same applies to a hospital or R&D lab or procurement department. No matter how big or small, an enterprise must effectively manage storage availability and performance

to keep the organization running.

Furthermore, storage is also a moving target because servers are added and data keeps accumulating. It is simply a byproduct of the Information Age that enterprises must deal with more and more data. **So, the challenges above only compound with time.**

## Networked Storage Provides Relief

**Networked storage was invented to address the limitations of DAS.** With this approach, storage is separated from servers, consolidated on a network (physically and/or logically), and made broadly accessible to many servers, applications and users. It is more flexible and dynamic. Management and data protection are simpler, utilization is higher, and total cost of ownership is lower. (*More on this later.*) There are multiple categories of networked storage, and each is optimized for specific purposes: SAN, NAS and Object Storage.

### SAN

A *storage area network* **(SAN) provides access to consolidated, block-level storage over a dedicated network. It connects servers and storage arrays.** Most SANs today are based on Fibre Channel (FC) technology, a high-performance, low-latency interconnect with long cabling distances and practically infinite connectivity.[2]

SANs are typically used for providing dedicated storage to applications. Storage capacity, whether from many arrays or only one, is partitioned and securely mapped to individual servers or server clusters. The applications that use the capacity can be anything: database management systems, messaging, ERP, CRM, business intelligence, file servers, NAS gateways, and so forth. SANs are especially well-suited for applications that require speed and low latency, like transaction processing. By offloading storage traffic to a separate network, a SAN also facilitates advanced features like data replication, remote mirroring, centralized

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[1] Total cost of ownership (TCO) = acquisition cost + operating costs – residual value at end of life.

[2] See *Fibre Channel – The Defending Champion Has Staying Power* in **The Clipper Group Explorer** dated December 14, 2001, at www.clipper.com/research/TCG2001012.pdf.

backup, and redundant paths to storage.[3] Compared to other forms of networked storage, a SAN's relative advantage includes fast, tunable performance and secure, dedicated storage provisioning.

## NAS

***Network-attached storage* (NAS) is a specialized server that is dedicated to serving files on an IP network, such as a LAN.** NAS supports standard network file system protocols like CIFS and NFS and allows multiple, heterogeneous servers and PCs (e.g., Windows, Unix, Linux) to access and share files concurrently. A NAS solution can be an integrated platform that includes its own disks, or it can be a gateway that connects to DAS- or SAN-attached storage on the back end. A gateway can be part of a converged SAN/NAS solution that delivers greater synergy and value than separate SAN and NAS infrastructures.

Like SANs, NAS enables storage consolidation, though at the file-system level. It is also faster than a general-purpose file server and typically offers advanced features like point-in-time copy, remote mirroring, redundant components for failover, and backup integration. NAS is often used for file sharing and collaboration applications like CAD/CAM, software development, Web serving, and general file storage and retrieval.

## Object Storage

**A third, emerging category called *object storage* targets long-term, online archival of fixed content on an IP network.** Fixed content is unchanging data kept for its reference value, such as e-mails, photos, audio, video, scientific measurements, medical images, and so forth. This class of data is growing quickly, and many enterprises have a need to store large quantities in an inexpensive and easily- and immediately-accessible manner.

Object storage helps meet this requirement by allowing applications to retrieve data objects simply by presenting a unique digital identifier. It goes a step further than NAS and eliminates the need to mount file systems and

track directory structures. This makes it easier for an application to store and retrieve large amounts of content. It can also eliminate data duplication, which consumes unnecessary capacity, and ensure data authenticity.

## Storage Complements

SAN, NAS, and object storage are complementary technologies, each serving different but important roles in the arena of networked storage: SAN for fast, dedicated block-level storage; NAS for file sharing; and object storage for long-term archival of fixed content. **In any given situation, application requirements are the primary determinant of the most appropriate technology.** There is overlap between them, which leaves room for a particular solution's merits and an IT department's particular preferences. However, their respective roles are clear[4], by and large, and many businesses will use more than one form to satisfy their spectrum of storage requirements.

## Advanced Storage Software

Networked storage is also a superior foundation for deploying advanced software features that improve availability and/or performance. **The network acts as a lever or amplifier that enhances the software's value and effect.** Consider the following:

- **Tape backup** – A SAN allows data to be backed up centrally over a high-speed, dedicated network. As a result, tape backups are faster, more consistent, and easier to manage. This alleviates the problem of a shrinking backup window, and allows IT administrators to sleep better knowing that mission-critical data is more secure.

- **Point-in-time copy** – This feature works in conjunction with networked storage to deliver *non-disruptive* tape backups, data warehouse loading, and application testing over a network. Production applications continue running while these processes happen in the background. These data copies can also be used to roll back to a prior point in time in case of corruption or

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[3] See *Business Continuity Goes Better With SANs – The 3 R's of Resilience* in **The Clipper Group Explorer** dated January 25, 2002, at www.clipper.com/research/TCG2002003.pdf.

[4] See *SAN versus NAS – The Holy War Not Worth Fighting* in **The Clipper Group Explorer** dated September 27, 2000, at www.clipper.com/research/TCG2000001.pdf.

accidental deletion – for faster recovery of applications or individual files.

- **Remote mirroring** – A dedicated, high-speed network is also useful for mirroring application data to a remote site. It allows for fast recovery in the event of a local disaster.

- **Multi-pathing** – A network can offer redundant connections between servers and storage. Load balancing and failover software uses these paths to increase performance and availability.

### *A Mainstream Market*

In fact, the market for networked storage is growing quickly and is undergoing widespread adoption. It will soon be the dominant form of storage sold, if not already. SAN and NAS in particular have been around for many years and are proven, mature technologies. Prices have come down and most interoperability issues have been resolved. Management software largely masks the complexities of networking. Though most large enterprises have deployed networked storage, the majority of SMBs have not yet made the transition. **If you are struggling with outdated DAS configurations, it may be time to have a close look at the benefits that networked storage can deliver. The benefits of storage consolidation are real and immediate.**

## Benefits to the Business

Though specific benefits vary according to a solution's architecture and features, networked storage in general offers these important categories of business benefits:

- **Minimize storage acquisition costs** – A consolidated pool of storage allows capacity to be readily shared and reallocated among servers, minimizing the amount of unused, "overhead" capacity and improving utilization. It also allows servers and storage to be scaled separately, so adding server capacity does not require upgrading storage, and vice-versa.

- **Protection and availability of enterprise data** – By turbo-charging storage software, networked storage helps protect critical information and keep it continuously available to support business processes.

- **Lower storage operating costs through simplified management** – This is a major benefit because the cost of managing storage over its useful life can be several-to-many times its acquisition cost. With networked storage, common tasks like scaling capacity and migrating data can be performed faster and easier, especially if using centralized management tools. This empowers each administrator to handle a much higher quantity of storage, with mundane but time-consuming tasks now automated. Furthermore, storage functionality that is based in the array or network saves the hassle and license costs of running data management software on every application server, especially in a heterogeneous environment.

- **Enhance business productivity** – Storage is a basic enabler of all applications, which in turn support business processes and broader corporate objectives. By delivering an improve quality of storage service, networked storage can have a positive effect all the way up the business chain, ultimately impacting productivity. For instance, an administrator can replace a failed application server, pointing it to the same networked volume or file system the original server used – no need for lengthy tape backups or restores. Downtime is minimized; workers keep working; and the business keeps humming.

## Vendor Considerations

When considering networked storage solutions, you will want to find a vendor who can meet your data storage requirements – today and tomorrow. **Below are a number of vendor characteristics to consider. Some may be more important than others, depending on your particular needs:**

- **Reliability and a proven track record** – A vendor's successful history in networked storage products is a positive indicator of its ability to be a long-term storage partner. It may go without saying, but established vendors tend to be less risky since they are more durable and more likely to be supported by third-party hardware and software providers. Moreover, ongoing investment in R&D and innovation is also a positive indicator of future competitiveness.

## Case in Point: *Blue Rhino*

### Storage Blues

When Mick Gunter joined Blue Rhino of Winston-Salem, North Carolina as IT Director in 2000, the situation in the data center was relatively average. There were 10 servers running a variety of applications on Windows NT/2000, including Microsoft Exchange, SQL, General Ledger, Office, an imaging solution, and proprietary applications. The servers had internal and direct-attached SCSI storage, totaling 200 GB of data. **But "average" turned "painful" as data requirements exploded.**

Today, Blue Rhino is the leading provider of branded propane cylinder exchange services – that is, tanks for barbecue grills plus related items. It distributes through more than 27,000 retail locations, including the retail giant Wal-Mart, and relies heavily on electronic supply-chain management. Blue Rhino's revenues grew from $70 million in 2000 to $200 million in 2002. Corporate data grew even faster during this period, rapidly approaching 2 TB. Good problems to have from a business perspective, though it presented major challenges for Gunter and his small staff.

Tracking and managing storage on every server took a lot of time, and adding capacity was both disruptive and labor-intensive. Application response times suffered. Storage was not transferable between servers, so capacity remained idle and unused. The process to refresh a database for application development took a full 8 to 10 hours. It involved stopping the production application, backing it up to tape, and reloading the development platform. Tape backup was also a source of concern because of a growing backup window and long time-to-restore. **In short, Blue Rhino's business success created a storage problem that needed fixing.**

### Networked Storage Delivers

To solve this data dilemma, Gunter looked at SAN solutions from several major vendors. He wanted a fast, highly-available storage array that could start small, in terms of capacity and entry price, and then scale over time to 10+ TB without a forklift upgrade. A track record of product evolution and upgradeability was an important factor. Gunter's small IT staff made it necessary to have centralized management. Finally, he was also looking for a solid line of software features that they could "grow into" over time.

Gunter narrowed it down to a single vendor, sold the idea to his CFO, and purchased a midrange, SAN-attached storage array containing 1.2 TB of capacity. The solution included a FC switch connected to 8 servers, point-in-time copy, and GUI-based software management. The snapshot capability was especially a hit because it allowed the IT department to make copies for non-disruptive backup, refreshing a development database, month-end reporting, and fast file recovery.

Blue Rhino's new SAN delivered vast improvements. It virtually eliminated storage outages. Storage management activities were cut by 75%, saving the expense of hiring additional headcount. The time to refresh a database fell from 10 hours to only minutes, accelerating the application development cycle. Daily snapshots ensured clean tape backups and allowed fast file recovery from disk. Storage consolidation on a SAN also facilitated server consolidation, saving costs on the processing side, as well. All in all, it was a shrewd decision.

Looking forward, Gunter plans to connect additional servers to the SAN and add redundant connections per server for high availability. He would eventually like to deploy remote mirroring for business continuity purposes. And of course, Blue Rhino will also need to periodically add capacity to keep up with its fast data growth. **Having made a smart investment in networked storage, Gunter feels confident about meeting the company's data requirements today and in the future.**

- **A broad storage line with SAN, NAS, converged SAN/NAS, and possibly object storage solutions that can meet a broad set of requirements** – A single data center may need block-level storage access, file sharing, online archiving, etc. Even if your requirements are relatively narrow today, they are likely to broaden in the future.

- **Performance and availability to meet application requirements** – Advanced software features can play an important role in storage performance and availability. Again, even if you don't need these features today, you may want to add them at some point in the future.

- **Solutions that start small in capacity and price and scale up in a non-disruptive, pay-as-you-grow fashion** – This is especially relevant to SMBs that do not have the budget to invest in a major solution upfront.

- **Ability to deliver a complete solution** with professional services, not just pieces and parts – SMBs usually have neither the time nor resources to do in-house integration and testing.

- **Interoperability with and support of your existing IT environment** – This can include cooperative support agreements with others vendors and/or a single point of accountability.

- **Easy implementation and management** – It should not be too difficult or take too long to deploy. Centralized management software (that ideally handles the end-to-end data path[5]) eases administration and operating costs[6].

- **Reasonable pricing** – You get what you pay for, of course, but make sure the value is there.

## Conclusion

Storage is a balancing act between meeting/exceeding business requirements and keeping costs of ownership at a reasonable level. Due to the relative expense and importance of storage in a modern business, it is worth taking the time to do it right. **Networked storage, especially in conjunction with advanced software features, offers a better and more cost-effective way to store data than traditional DAS. After several years of development and maturity, it is a proven solution for many of the storage aches and pains that SMBs experience today.**

In addition, the reality of never-ending data growth means that storage infrastructure has to evolve and scale over time. It is certainly not a static entity. **Deploying a solid, though flexible, foundation of networked storage would be a smart move for meeting your businesses' storage requirements – today and tomorrow.**

[5] See *Storage Is Not Just a Box Anymore – Managing the Data Path* in **The Clipper Group Explorer** at www.clipper.com/research/TCG2003013.pdf.
[6] For more details, see **The Clipper Group Explorer** entitled *Storage Resource Management – Conducting a Symphony of Storage* at www.clipper.com/research/TCG2002024.pdf.

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