

## SME SOLUTIONS



# Solution Brief

## **STORAGE SOLUTIONS SOLUTION BRIEF**

With the increasing amount of information being collected in digital format, there is often a shortage of available storage capacity. Even more important is the risk of a hard drive crash which will incur high costs in system installation and data recovery. The good news is that the price of storage is steadily decreasing and more options for adding storage are readily available.

This solution brief outlines options for IT departments when exploring various storage solutions.

## Executive Summary

With the ever increasing amount of information being collected in digital format, and the increasing size of files due to increased use of multimedia such as audio and video, there is often a shortage of available storage capacity. Of even more importance is the potentially devastating event of a hard drive crash which could result in loss of data or high costs of recovering the data, and a large amount of time to reinstall the operating system, applications, and settings.

The good news is that the price of storage is steadily decreasing, thus it is increasingly affordable for today's businesses to add additional external storage solutions for data storage, sharing, and backup. This document is designed to provide information to assist in the decision of which types of storage solutions to deploy in different environments.

## Storage Solutions

The various storage solutions provide varying combinations of price, speed, capacity, redundancy, and ease of use. Even within a single storage solution category there are products ranging from low to high end that offer varying combinations of the features listed above. However, this document will focus on the main offerings for each type of solution. External storage solutions can be classified in four main types: Direct Attached Storage (DAS), Network Attached Storage (NAS), Storage Area Network (SAN), and Tape Backup.

### Direct Attached Storage (DAS)

Direct attached storage devices connect directly to a computer using interfaces like USB, FireWire, parallel, or SCSI. Storage can be in the form of hard drives, CD-Rs, DVD-Rs, flash disks, or tapes. DAS devices are meant to allow a computer to back up information to the device, and thus do not easily adapt to providing backup for multiple computers on a network simultaneously, or for sharing files among networked computers. The only way to share the device is to move the media

itself to another computer, or share it through the connected computer, both of which are complicated to set up and manage, especially if multiple DAS devices are involved.

DAS devices are generally the cheapest storage solution in terms of cost per gigabyte (GB) when dealing with capacities under 1 terabyte (TB) or 1,000 GB. DAS devices are also fairly easy to install, especially if they use the newer plug-and-play interfaces like USB and FireWire. The main disadvantages for most DAS devices is the complexity to set up file sharing, the lack of redundancy, and difficulty in scaling to meet larger storage demands.

System backup, which allows the entire operating system of a computer to be backed up along with the data to allow for quick recovery in the event of a hard drive failure is typically unavailable with these units, though high-end units include software that facilitate this feature, and third-party software is also available to perform backups.

DAS devices transfer data at the file level as opposed to the block level, which results in slower performance and the inability to update parts of a large file (e.g. a database file).

DAS devices are ideal for backing up non-critical data from one or two computers which do not require a lot of storage space.

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### Direct Attached Storage (DAS)

Price	Low
Capacity	Low
Speed	Slow
Ease of use	Easy

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### Main Types of Storage Solutions

1. Direct Attached Storage (DAS)
2. Network Attached Storage (NAS)
3. Storage Area Network (SAN)
4. Tape Backup

## Network Attached Storage (NAS)

Network attached storage devices have a built-in Ethernet port for connection to a local area network (LAN). They can be compared to direct attached storage in the same manner as a networked printer can be compared to a local printer. It is a quick and easy way to add additional storage space that is directly accessible from anywhere on the network to allow users on the network to access the storage directly, in order to share files with other users, and to back up important files.

NAS devices are usually more expensive than DAS devices due to the addition of the network interface and the extra software that is required to run the different services on the device like a web server, FTP server, and network shared folders. There is a very broad range of NAS devices, from desktop units that contain a single hard drive, to rackmount units that are stackable up to hundreds of hard drives.

The two main defining factors for storage are:

- **Single vs multiple hard drive support:** Units that only contain one hard drive do not allow for redundancy features such as RAID (redundant array of inexpensive disks), while units that support multiple hard drives usually support RAID redundancy.
- **iSCSI support:** Traditionally, NAS devices use file level data transfer like the DAS devices. However, iSCSI technology allows NAS devices to do block level transfers to other iSCSI compatible devices, thus gaining the benefits of block level transfers while maintaining the ease of use of NAS devices.

The limitations of NAS devices are caused by the fact that they share the company's LAN infrastructure. Therefore, data being sent to the NAS will congest the company's LAN, and also traffic on the LAN will affect the speed of data being sent to the NAS. Due to this limitation, NAS devices are not designed for time-critical backups or for backing up data-intensive applications such as heavily loaded mail servers, web servers, or database servers.

Similar to DAS devices, system backup is usually not supported natively by the device, but instead requires additional third party software to implement the feature.

NAS devices are designed for backing up critical and non-critical data from several networked computers, and sharing files among computers in a LAN. They are ideal for small businesses that cannot afford a SAN solution, and when deployed in departments or branch offices where it is not economical to install a SAN network.

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### Network Attached Storage (NAS)

Price	Medium
Capacity	Medium
Speed	Medium
Ease of use	Moderate

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## Storage Area Network (SAN)

Storage area networks consist of SAN storage devices operating on a network that is separate from a company's LAN. In order to support the high rate of transfer of SAN devices, SAN networks usually consist of fiber channel (FC) technology. Fiber channel uses fiber optic cable to connect devices together instead of the usual copper used in Ethernet networks.

The benefit of using fiber channel is that it provides a dedicated, high speed network for all of the data going between the storage devices and the servers. The disadvantage is the high cost and complication of installing a whole other network, including devices such as interface cards to go into the servers, network switches, and gateways, not to mention the actual storage devices themselves.

Unlike NAS and DAS devices, SAN devices use block-level transfers so they are ideal for large, constantly running applications such as databases and web servers.

SAN devices provide excellent data transfer speeds without congesting the company's LAN due to the separate network. However, due to their high cost, they are typically only used

in head offices for providing backup and extra storage for back-end servers, and not for workstations or in branch offices.

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### Storage Area Network (SAN)

Price	High
Capacity	High
Speed	Very Fast
Ease of use	Difficult

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### Tape Backup

Tape backup can be implemented in any of the forms above, directly attached to a computer, attached to a network, or as part of a SAN network. The main difference between tapes and hard drives is in their application. Tape devices are designed to archive files for long periods of time, typically from servers, whereas hard drives are meant for short-term data storage and data sharing.

For archiving, tapes are usually filled with data, then removed and stored in a secure location and a new tape is used for new backups. To save money, tapes can also be reused after a period of time, depending on a

company's archiving policies. Although the initial cost of a tape solution is higher than a hard disk based solution, the relatively low cost of each individual tape reduces the overall cost once multiple tapes are used. The disadvantage of tapes is the slow data transfer rates, especially when retrieving data from a tape. And because each individual tape generally has less storage capacity than a hard disk, it is possible that the tape containing the data has already been put into storage, further increasing the time and effort required to retrieve the data.

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### Tape Backup

Price	Low-High
Capacity	High
Speed	Varies
Ease of use	Varies

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### Comparison Table

The following table contains a summary of the features of each solution. The entries are based on the general principles of each storage type, though there may be individual products in each group that implement special features which differs from the chart below.

Feature	DAS	NAS	SAN	Tape
<b>Price</b>	Low	Medium	High	Low-High
<b>Capacity</b>	Low	Medium	High	High
<b>Redundancy</b>	No <sup>(1)</sup>	RAID	RAID	No
<b>File Sharing</b>	Moderate	Easy	Complicated	Varies
<b>Speed</b>	Slow	Medium	Very Fast	Varies
<b>Transfer Type</b>	File	File <sup>(2)</sup>	Block	File
<b>Maintenance</b>	Low	Medium	Medium	High
<b>Scalability</b>	Difficult	Easy	Easy	Easy
<b>Ease of Installation</b>	Easy	Moderate	Difficult	Varies

<sup>(1)</sup> Some high end DAS solutions offer RAID redundancy.

<sup>(2)</sup> iSCSI technology allows for block level transfer over local area networks.

## **BāSS™: Backup and Storage Server**

freedom9's freeStor product line includes the unique BBMR (backup and bare metal recovery) feature which allows users to perform a system backup to the device, including operating system files and system settings, without purchasing third-party software. In the event of a hard drive failure, the computer can be restored to its original settings by doing a simple restore from the freeStor device as opposed to the complicated and time consuming process of reinstalling the operating system, the applications, system settings, and recovering the data. In addition, should the system be corrupted or compromised (e.g. infected by spyware or viruses), the computer can boot up cleanly from an image saved on the NAS before the infection, and then the problems can be fixed directly on the local computer.

## **Summary**

External storage provides an affordable and manageable solution to a company's ever-growing demand for storage space. Depending on the application, one or more of the storage types covered in this document can be deployed to provide the optimal solution.

freedom9's freeStor line of BāSS™ devices provide both basic file sharing and advanced system backup through its unique BBMR feature, which makes it an ideal solution for file sharing and system backup in a small office or department, or part of a larger solution when used in combination with tape or SAN devices.

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