

DIRECT ATTACHED STORAGE vs. NETWORK ATTACHED STORAGE

In today's digital society, businesses of all sizes depend on data. Whether it is financial, inventory, sales, marketing, email or any other type, having continuous access to data is essential for business survival. In developing a storage strategy, there are a number of factors to consider, including capacity requirements, budget, available IT staff resources, scalability and performance. A variety of storage architectures are available to complement the various approaches for backing-up, archiving and protecting one's data. Each, of course, has advantages and disadvantages. This technical brief explores the advantages and disadvantages of direct attached storage (DAS) and network attached storage (NAS).

Direct attached storage can often provide a viable storage and backup solution for small businesses. However, larger businesses that require several servers to store data need a more robust solution. For them, NAS products targeted to the business market present a more viable solution. And in some business environments, a blend of these architectures is often the right solution.

DAS – Direct Attached Storage

Direct attached storage is commonly referred to as DAS. Direct attached storage was the first networked storage architecture and continues in wide use today. As the name suggests, it is an architecture in which the storage device is directly attached to a server (or a client, in most cases with consumer DAS devices). The storage device may include one or more drives built into a server and, with an appropriate HBA (host bus adapter), may be configured as a RAID (Redundant Array of Inexpensive Disks) array.

One advantage of DAS storage is its low initial cost. An initial investment in a server with built-in storage can meet the needs of a small organization for a period of time. But as data is added and the need for storage capacity increases, the server has to be taken out of service to add additional drives. DAS expansion generally requires the expertise of an IT professional, which means either staffing someone or taking on the expense of a consultant.

A key disadvantage of DAS storage is its limited scalability. A Host Bus Adaptor can only support a limited number of drives. For environments with stringent up-time requirements, or for environments with rapidly increasing storage requirements, DAS may not be the right choice.

With DAS storage architecture, clients must connect directly to the server that contains the storage in order to access the data. If the server should be down for maintenance, installation of new hardware or application of operating system patches, or if it becomes infected with viruses, clients would not be able to access shared data.

In addition to serving files, servers are often used to run applications such as email, financial accounting packages, and database applications. Each of these applications requires block-level access (the ability to access blocks of data within a file, such as a specific record or field within a database), rather than file-level access (the ability to access entire data files, such as a spreadsheet or word processing file). A DAS storage solution is ideal for these applications, as the server's operating system does provide both block-level access as well as file-level access for clients. However, performance may become an issue when the server is running multiple applications in addition to serving files.

Server-based DAS storage can be the right answer for small enterprises that are running one or only a few servers. However, as the number of servers increases, the complexity of managing storage on multiple servers can escalate rapidly. This, in turn could lead to increased IT costs.

NAS – Network Attached Storage

Network attached storage devices are specialized storage devices that are dedicated to serving files on a network. A typical NAS is a completely self-contained appliance with its own operating system, storage and a management interface. Rather than connecting to a server through a host bus adapter, a NAS simply connects to the server through into an existing Ethernet network. Most NAS products targeted to small and medium-sized businesses feature one or more Gigabit Ethernet ports to ensure high levels of performance.

One of the main advantages of a NAS storage solution is its simplicity of setup. Many NAS products ship with pre-installed disks that allow non-IT personnel, guided by setup wizards, to quickly add storage to a network—often in less than 15 minutes. Since the NAS adds storage by simply attaching to the network rather than to a server, there is no server downtime.

Often, NAS products use Linux as the operating system, eliminating the licensing costs associated with Windows or Unix-based servers. The Linux kernel, stored in flash memory on the device, rarely has to be patched and is less vulnerable to viruses. This eliminates the down-time associated with patch installation and anti-virus updates for servers using general purpose operating systems. In addition, NAS products support both CIFS, as well as NFS, file systems and are completely compatible with Windows, Mac, and Linux and UNIX clients. No specialized IT experience is required to ensure cross platform compatibility.

Advances in both NAS and disk technology have made NAS storage an attractive, cost-effective alternative to the more expensive Storage Area Networks (SANs) that are favored by larger enterprises.

Currently, the inexpensive SATA drives used in many NAS products have capacities of up to 2 Terabytes, so 4 drive/8 Terabyte configurations are fairly standard. Yet for the simplicity of configuration, NAS products targeted at small to medium enterprises possess the features to seamlessly blend into an existing environment as they provide high data availability. Some of these features include:

- *Active Directory support:* Many NAS products support Active Directory. This allows the NAS to be easily designated as a storage device if the business is using Active Directory.
- *Multiple gigabit Ethernet ports:* NAS products designed for the enterprise have at least one gigabit Ethernet port, and many have two. The gigabit ports ensure that the network connection will not be a performance bottleneck. A second port can be used to provide additional network capacity into and out of the NAS, or as a failover if the primary port should fail.
- *RAID support:* RAID technology is commonly used to provide fault tolerance in a disk system by storing information across multiple disks. Should a disk fail, depending on the RAID level, the data will not be lost. Here is a brief listing of the common RAID levels:
 - *RAID 0:* RAID 0 improves performance by “striping” data across two or more drives. Performance improves, but if any of the drives fail, all data is lost
 - *RAID 1:* Data is “mirrored” by writing copies of the same file to two or more drives, essentially creating a real time backup.
 - *RAID 5:* Data is striped across three or more disks, along with parity information needed for recovery. If a single drive fails, the missing data can be recreated from the data and parity

information on the remaining good drives. If more than one drive fails in a RAID 5 configuration, however, the data will be lost.

- *RAID 6*: Data is striped across multiple four or more drives and uses a dual parity information system so that data will not be lost even if two drives fail.
- *RAID 10*: RAID 10 combines RAID 0, which stripes the data across drives, and RAID 1, which mirrors the drive contents. RAID 10 requires a minimum of four drives to provide a storage system that can withstand multiple failures.
- *Hot Swappable Hard Drives*: If a drive fails in a NAS that has “hot swappable” capabilities, the failed drive can be removed and replaced with a new drive without powering down the system. RAID systems restore their fault tolerance by rebuilding the array as a background task after a defective drive has been replaced. In any RAID configuration except RAID 0, clients will retain access to their data even as the process takes place.
- *Data Replication*: Some NAS products support “share-level replication” with other compatible NAS products. With share level replication, folders from one NAS device can be automatically and immediately backed up to another NAS device on the network, providing yet another layer of data redundancy to ensure that no data is lost.
- *iSCSI*: In the past, NAS products provided only file level access, and were used primarily for serving client requests for files such as spreadsheets and word processed documents. With the installation of software called an iSCSI initiator, a server can use a designated iSCSI target as though it were directly attached storage. Today, many NAS products support iSCSI, an IP-based standard protocol used for linking storage devices. iSCSI-capable NAS products allow for some of all of the storage capacity to be designated as an iSCSI target. The server, rather than using a [SCSI](#) host bus adapter, uses its Ethernet connection to communicate with the iSCSI storage target. Thus, and iSCSI enabled NAS can provide block level access to a server in a different physical location. Since iSCSI operates over an existing network infrastructure, no specialized additional cabling is required such as would be found in a Fiber Channel SAN. Current NAS implementation of iSCSI also allows multiple servers to share iSCSI NAS-based storage.

Direct attached and network attached storage is available today to solve the majority of customers’ storage needs, from consumer to large business. Buffalo has one of the most comprehensive lineups of storage devices ranging in capacity and price points to solve the needs of just about any application. Buffalo’s legendary reliability and decades of experience in the storage business combined with high-value products makes Buffalo the easy choice for your storage needs.

For more information, visit www.buffalotech.com.