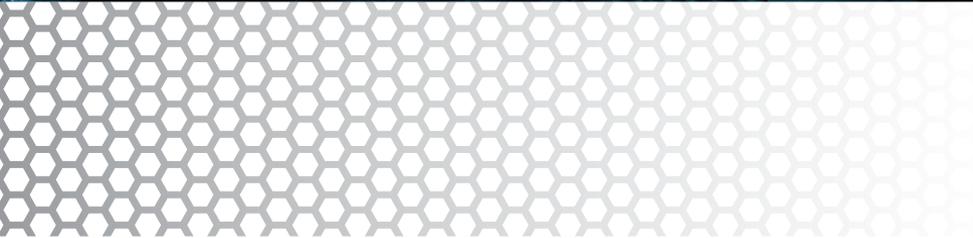
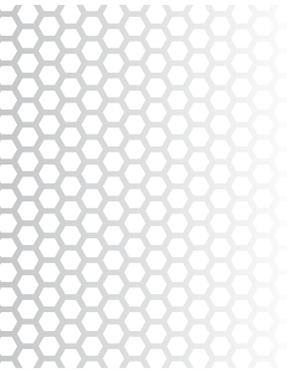


# Storage Area Networks

Meeting the Needs of Big Data and  
Major Infrastructure Surveillance Systems



# Introduction



Data storage has come a long way. Magnetic tape was first invented back in 1951, triggering a data storage revolution. By the mid-50s, IBM had invented the first-ever hard drive, which took up almost an entire room – back then, big was beautiful.

But as the technologies we use have advanced, so too have the volume and complexity of data produced and that has forced a rethink in data storage. Bigger is no longer better and ‘compression innovation’ has dominated the industry.

Combining minimal footprint with increased capacity has been the holy grail of data storage development for many years.

The surveillance solutions industry is no exception to this rule. From video tapes to hard drives, data storage technology has needed to continually develop and evolve to cope with increasing amounts of information generated from surveillance systems. This is no longer restricted to purely visual data outputs. Because third-party systems integration has become more advanced and prevalent in surveillance, data from security, operational, and emergency systems

for an entire site (or multiple sites) is now often collated, monitored, and controlled through surveillance management platforms.

The era of ‘Big Data’ has arrived. But what exactly is the best way to store it? All that information has to go somewhere. It also has to be of evidential quality and safe from unauthorized access, yet be readily accessible and helpful to authorized personnel. Mindful of the increasing number of sectors with large-scale or federated site surveillance demands – the data storage checklist just gets longer and longer.

One particular type of solution receiving increasing levels of attention is Storage Area Networks (SANs). But what exactly is a SAN and when is it worth considering? This white paper is designed to address these questions by looking more closely at the pros and cons that SANs have to offer.

## Storage: The Here and Now

Before looking more closely at SANs, it is important to understand how things work now, so we first need to look at Direct Attached Storage (DAS) and Network Attached Storage (NAS).

### DAS

DAS devices are primarily designed to offer attached storage per specific drive/server. It is a simplistic but effective solution for specific but restricted storage needs. DAS is also comparatively low-cost.

However, DAS is not part of a storage network, as is the case with NAS/SAN. DAS devices therefore operate independently of each other which, though useful in some instances, means that information is isolated.

Though DAS can be, and is, used for sizeable systems – usually involving a serial attached SCSI (SAS) cable and dedicated hardware RAID card – the fact it is not networked makes scaling systems up beyond their original scope a challenge.

### NAS

NAS devices are dedicated to data storage and sharing. They perform the simple task of supplying file-based data storage to other devices on a LAN. Importantly, they can be added to a network with no impact on system infrastructure (no potential data loss and no need for system downtime or extensive reconfiguration). This enables storage to be easily scaled up or down in line with changing surveillance needs. For this reason,

Network Attached Storage (NAS) systems are also referred to as Scale-Out Network Attached Storage systems.

NAS systems will typically be supplied as part of a complete surveillance solution and are usually managed and serviced by the surveillance department. The flexibility they offer, particularly in terms of guarding the integrity of the surveillance system, while also ensuring legal compliance with evidential data storage requirements, has made them a popular choice.

But in a changing market, exploring options is essential, and it's this process that has led to an alternative data storage route for surveillance gaining traction – Storage Area Networks.

## What is a Storage Area Network?

So why is a Storage Area Network (SAN) different to DAS/NAS? As already mentioned, the main difference between SAN and DAS is that DAS is not networked. DAS is ideal when data only needs to be accessed by a single server, but beyond this has limitations.

NAS, however, is networked. So what are the main differences here?

In simple terms, where NAS attaches file-based storage to an existing network, SAN offers increased block storage capacity via a separate network that can be accessed via a server.

As block storage suggests, SAN consists of an array of disk drives (a

block) in a self-contained unit. In large enterprises, SANs serve as pools of storage for the servers in the network.

The file storage versus block storage differentiation is an important one, as while operating systems using NAS will effectively see a file server, those using SAN block storage will purely see separate storage space – effectively a disk. Both offer a route to centralized data storage. So why is SAN becoming more common on the surveillance market?

There are a number of factors in play but one reason is data transfer speeds. Until recently, limitations in the speed of data transfer - via both cabled and

wireless connections – restricted the potential for SAN to be used to capture and store surveillance system data. However, improved capabilities in this respect mean such restrictions are no longer an issue.

But as referenced earlier, interest in SAN has really been driven by an evolving market place. As surveillance solutions have become more complex, and moved from the realm of 'security only' to 'complete site management', interest in alternative data storage options has understandably evolved too.

## Some Key Features of SAN

- **Handles Big Data.** The amount of video data produced by more advanced surveillance cameras, including HD and 4K-enabled systems, has increased dramatically. Storage solutions therefore need to offer maximum capacity using minimal space. SAN has evolved to meet these demands.
- **Simplifies management/maintenance processes.** Compared to managing disks attached to each server, as is the case with Network Attached Storage, SANs can enable easier system administration. Treating all storage as a single resource makes disk maintenance and routine replication easier to schedule and control.
- **Offers strong system resiliency.** To support disaster recovery, redundant SANs are deployed in separate locations, each a copy of the other. This minimizes any chance of data loss. Also, some SANs perform backup procedures without any processing overhead at the host computers.
- **Is fast.** The SAN transfers data between servers and disks at the same fast peripheral channel speeds as if directly attached.
- **Is suitable for scale.** Applications tend to be large-scale systems in critical infrastructure environments including airports, oil & gas and marine industry facilities. Gaming industry operators are also increasingly likely to adopt the SAN solution for surveillance data storage due to the scope, scale, and complexity of their surveillance operations.
- **SAN is priced accordingly.** Typically, the minimum investment in a SAN-based system would be around several times the investment required for a NAS-based solution, although it is likely that the gap between the expense of a NAS and SAN system will decrease as technology infrastructure costs fall.

## Is SAN Better than DAS/NAS?

Data storage needs are individual to each application so there is no right or wrong option. That said, there are important similarities/differences to be aware of in order to make informed decisions regarding data storage for a surveillance solution. For example:

- Whereas extensive planning is required to set up SAN and in many cases NAS, the “plug and play” nature of DAS makes it simpler to install and much less expensive. But DAS does lead to information isolation which, in a system integration setting, is not ideal.
- Unlike a NAS system, individual storage nodes within a SAN do not have their own control settings – they are not single pieces of equipment that could work as standalone entities.
- When setting up a NAS system, each storage device is independent. In expanding the storage capabilities of a SAN, an operator is expanding the storage capabilities of a single piece of equipment with one set of controls.
- NAS and SAN systems are generally deployed in a secure ‘bunker-style’ setting, ensuring that they can be protected from physical attack and natural disaster.
- Access to data can be controlled in both the case of a NAS and SAN deployment. Steps are generally taken to limit physical access: both NAS and SAN servers require a sufficient number of access cards. Typically, only authorized people are able to gain access to a server.
- NAS and SAN tend to occupy a similar footprint and are similar in terms of components.

## Feature Comparison

In essence, the benefits/drawbacks of choosing SAN, DAS, or NAS will vary by specific application, budget, and of course application requirements in terms of data viewing and retrieval. The following grid provides a brief summary of examples as an 'at-a-glance' guide in the context of Network Video Recording.

FEATURE	DAS	NAS	SAN
 <b>Complexity of Installation</b>	● Low	● Medium	● High
 <b>Scalability</b>	● High <sup>1</sup>	● High <sup>1</sup>	● High
 <b>Retrieval Speed</b>	● High	● Medium	● High
 <b>Resilience</b>	● Medium <sup>2</sup>	● Medium <sup>2</sup>	● High
 <b>Infrastructure Complexity</b>	● Low	● Low	● High
 <b>Cost</b>	● Low	● Medium	● High

<sup>1</sup> Infrastructure will need to support ability to scale.

<sup>2</sup> DAS and NAS can have 'high' resilience when deployed with a VMS host that has built-in failover capability and redundant hosts. For NAS, redundant NAS units are also required for increased resilience.

● Highly beneficial  
 ● Moderately beneficial  
 ● Less beneficial

## New Data Storage Solutions Require Additional Security Considerations

Direct and Network Attached Storage systems have benefited from years of development in terms of protecting them against internal and external data attack.

Government legislation varies depending on the geographic location of a deployment but in order for video to be presented in court, surveillance system operators need to prove it has not been tampered with and that the evidence chain is intact.

Operators need to ascertain who might have looked at video surveillance footage and why.

The good news is that it is now possible for steps to be taken to ensure that a SAN deployment enjoys the same level of reliability, security, and integrity that DAS and NAS systems have attained.

## Don't Forget...Cloud Storage is Also Coming on Stream



Though most debate around data storage concentrates on DAS or NAS v SAN, they are not the only 'horses in the race'.

Issues relating to security and data bandwidth have so far restricted the adoption of cloud-based surveillance data storage to all but the smallest surveillance installations, and typically those with only one or two cameras. But advances in cloud-computing capabilities, coupled with a growing appetite for remote data access and improved bandwidth capacities, are only going to increase the use of cloud-based data storage for many purposes, including surveillance data.

And this will offer some important benefits, not least reduced expenditure on physical storage hardware and the ability to upload and retrieve data from multiple locations.

However, increased uptake of cloud-based storage will rely in part on the trust that organizations are able to place in cloud-based storage providers. For surveillance operators, ascertaining the amount of downtime a cloud-based data storage provider experiences is likely to be the most pressing consideration. It will also be vital for operators seeking storage for sensitive surveillance data to conduct their own security audit.

## Big Data is Only Going to Get Bigger

Whether choosing DAS, NAS, or SAN, the one inescapable consideration is that Big Data is only going to get bigger. More powerful video cameras offering increased picture resolution are now coming on-stream, with 4K cameras already beginning to take over from HD cameras in some markets. Such advances make sense as more capable cameras will be able to capture data from a wider area, reducing the need for so many individual cameras to be in use. However, data storage demands are only going to increase as a result. Systems that can accommodate these demands while also offering reliability and flexibility will ultimately prevail.

When it comes to selecting a storage solution for surveillance there is no right or wrong answer.

Surveillance systems providers, with experience of developing multi-industry solutions of all sizes and levels of complexity, know how to develop tailored solutions that incorporate any of the options discussed here.

The main take-away here is that when it comes to storage, one size definitely does not fit all. The key is to evaluate the needs of the system on an individual, case-by-case basis and choose a solution from that vantage point.

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**Synectics**  
 sales@synecticsglobal.com  
 synecticsglobal.com



**Americas Asia Europe Middle East United Kingdom**