Unified Storage Solution for Video Surveillance

Today, Video Surveillance is being driven by new requirements for higher resolution, longer retention times, and the need to implement new technologies, such as video analytics, augmented reality, and cloud storage.

IP Video Surveillance offers superior benefits but single, proprietary storage vendor solutions can inhibit your video surveillance from incorporating new technologies, integrating best of breed solutions, and maintaining investments in your current solution. Today, most organizations can benefit from a flexible, open enterprise storage solution.

The Challenges

The industry is evolving. Presently, we are seeing transitions such as CCTV to IP networks, DVR to NVRs, and local storage to combinations of local, shared, or remote storage. The growth of video data brings increased storage administration needs as both effort and cost are expanding. In addition, archiving must accommodate an ever increasing amount of data so storage systems must be able to expand capacity as needed, without an extensive hardware/software overhaul.

Another area of concern is with data integrity. The amount of data is increasing exponentially and the retention time is increasing significantly. Issues such as bit rot, phantom writes, misdirected reads/writes, parity errors, driver bugs, and accidental overwrites are just a few additional hurdles.

Hard drive failures are the number one cause of equipment failure with security video. A drive failure can put all recorded data, from any number of cameras, at risk.

Inflexible allocation of bandwidth is another issue because it is difficult to automate many standard functions, such as:

- Archiving at night when bandwidth is available.
- Recording at higher resolution when data is critical and at lower resolution for all other data.

Also, we know that with 99% write traffic, if an NVR / DVR / camera cannot store video, then video frames can be lost.

So, with storage accounting for 30% or more of the total cost of a video surveillance solution, we must consider how to maintain current investments and scale for future requirements such as:

- MPEG 4, great for live viewing but may benefit from additional storage capacity and compression.
- H.264, same as MPEG 4 but less robust, so need additional bandwidth to ensure that frames are not dropped.
- JPEG2000, provides multiple resolutions from a single frame, so may warrant event-specific service levels and use more storage capacity on demand.

Other areas of concern include:

- Data reliability and data consistency.
- Control cost, provide performance, and simplify administration given the growing collaborative environment of event handling and the complexity of case creation.
- Future proof your video surveillance solution with the use of SSD technologies or applications, such as video search, augmented reality, and cloud storage, without being locked in to a single vendor.

Solution Overview

Software is the Key

- SGI NAS combines data management functionalities, storage and disk management, and volume and file system management into one system. Single console administration.
- SGI NAS abstracts the physical storage, allowing for use of industry standard hardware
- Provides RAID data protection, unlimited snapshots and clones, and deduplication and compression.
- Provides local and remote replication, integrates into existing networks.
- Aligns storage resources with the level of speed, capacity, and safety needed.

Data Integrity Always is Maintained

Data is protected from all forms of corruptions, with guaranteed end-to-end data integrity from when it is first written to when it is accessed, no matter how long it is stored.

Flexible Streaming Formats

SGI NAS enables end users to get the most from video surveillance, whether using H.264, MPEG4, JPEG, MJPEG, JPEG2000, or combinations of these streaming standards.

The Hybrid Storage Pool (HSP) provides the bandwidth requirements for multiple H.264, MPEG 4, and JPEG streams or to take advantage of the multi-resolution features of JPEG2000 frames.

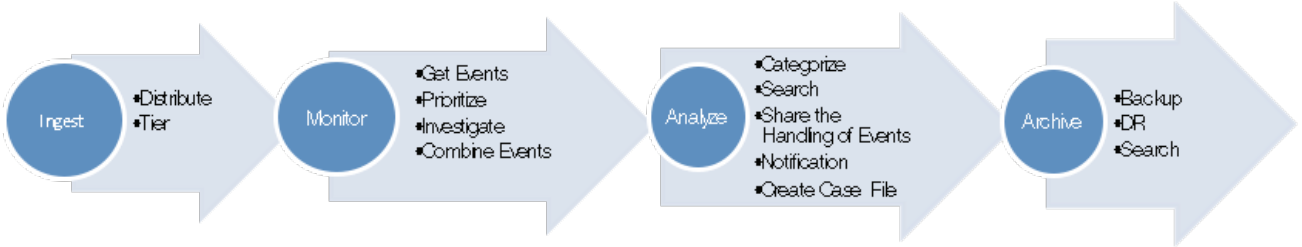
The HSP effectively creates a class of services to help implement automatic event handling using a combination of multiple bandwidths with multiple storage targets. This is required to effectively support augmented reality, video search, and video analytics applications.

Optimal Workflow for Video Surveillance Storage

SGI NAS Storage provides the features needed to optimize the activities associated with your workflow in order to obtain the full benefits from a video surveillance solution. Below, we lay out the basic workflow of a video surveillance solution, from ingesting the data to the final steps of backup, archiving, and disaster recovery.

In the following table below, we can see the features and the benefits that a unified storage solution for video surveillance presents.

Activity	Feature	Benefits
Ingest	Protected Writes Clustering Dynamic Scalability	Accelerated Write Performance Decreases likelihood of frames being dropped by allowing data to be written to physical storage independently of releasing the ap- plication on the server for continued processing. Protects Against Service Loss: Provides Load Balancing Prevents data from multiple cameras/ NVRs being lost by automatically streaming to multiple targets and multiple sites. Add bigger drive, in real time; pool automatically addresses striping and increases capacity.
Monitor	VDEV & ZPOOL	Class of Service (COS) Creates multiple storage pools from any combination of storage (JBOD, SSD, HDD) based on performance, cost, and COS criteria, thereby ensuring high priority events obtain appropriate resources (i.e., bandwidth, capacity, replication).
Analyze	Unlimited Snapshots, Auto-Sync, Auto-Tier, Auto CDP, Integrated Indexing	Multiple Copies, Multiple Locations Without impact on the system, the solution replicates complete copies or only the changes based on your rules. Integrated Search All data is indexed automatically so you can search for files within snapshots.
Archive	Copy On Write 256-Bit Checksum Auto Scrub	End-to-end Data Integrity No bit rot; no phantom writes; no misdirected reads/writes; no DMA parity errors; no driver bugs; no accidental overwrites. Self-healing Checksums for metadata, user data, and additional copies of the data blocks are created. By comparing this information, any corruption is identified and self-heals the errors. Data and Metadata Integrity Checks Periodically force the checking of checksums.



Typical Workflow for Video Surveillance

Data Integrity

Copy-on-Write (COW)

SGI NAS has a copy on- write (COW) file system, creating a new block for each operation instead of overwriting the original data block like traditional file systems. This provides end-end data integrity.

256-bit Checksum (Self-healing)

SGI NAS has a transactional, object- based, 128-bit file system supporting unlimited storage capacity.

As a unique feature, it calculates the checksums of metadata, user data, and additional copies of data-blocks (i.e., ditto blocks) per data set. Utilizing this information, the system is capable of identifying data corruption and correcting the errors.

Ditto Blocks

Ditto blocks create multiple copies of data and metadata. This does not replace mirroring but can be in addition to mirroring.

Single, Double, or Triple Parity

SGI NAS supports software-RAID mirror (RAID-1), RAIDZ (similar to RAID-5), RAIDZ-2 (similar to RAID-6), and RAIDZ-3). This provides up to a three-way protection of your data.

RAID Controller Not Needed

SGI NAS does not rely on disk reporting read errors and does not trust either side of the mirror data on read. Checksums validate the data.

Auto-Scrub

Periodically reads data to force check sum verification (i.e., if read bad data— then fetch good data—repair bad data).

Performance

Read / Write

SGI NAS's read / write cache technology ensures access to active data is accelerated significantly, speeding access by a factor of 10 or better compared to traditional spinning disks.

Read / write caches can leverage SSDs without creating another storage tier. This allows the end user to control workloads by dynamically adding read / write caches. Compared to traditional spinning disks, data access is faster by a factor of 10 or better.

Protected Write

Write operations can be accelerated when data is written to the physical devices independently of releasing the application on the server for continued processing.

When better write performance is desired, a separate log device (or multiple devices) can be added.

Striping

Data is stripped across all drives in the pool, thereby providing load balancing as well as increased performance. If bigger or more drives are added to the pool, capacity and striping is adjusted automatically.

VDEV / Zpool

Class of service can be implemented by grouping virtual devices within the HSP. Scalability is automatic just by adding virtual devices of the same size or larger.

The VDEV and Zpool manages the level of speed / size / safety that is needed

Data Reliability

Auto-CDP (Automated Continuous Data Protection)

Schedule synchronous, real time, remote, block-level replication over an IP network (i.e., remote Mirroring). Volumes can be mirrored seamlessly between geographically distant appliances providing security against site failures.

Auto-Sync

Schedule asynchronous replication between two different SGI NAS appliances and provide deduplication. This includes data and metadata.

Auto-Tier

Schedule replication of a source to a destination: The destination can have different policies, such as retention or expiration polices.

Auto-Snap

Schedule automatic, periodic creation of snapshots: Due to copy on- write (creating a new block for each operation instead of overwriting the original data block like traditional file systems), snapshots are inherent and created immediately without any impact on the system.

The recovery point objective (RPO) value for data backup with snapshots is almost zero. The recovery time objective (RTO) value also moves to almost zero.

HA Clustering

Clustering provides high-availability of services, applications, and business processes. In addition, clustering provides load balancing and horizontal scalability of services.

Management

Dynamic Scalability

The HSP can be grown or expanded while online by adding drives or replacing smaller drives with larger drives.

Powerful Management

SGI NAS combines data management functionalities, storage and disk management, volume management, and file system management into one system. You accomplish administration with fewer instructions than a Traditional Proprietary storage system.

The result is that administration is faster, easier, and cheaper.

Future Proofing Your Investment

128 Bit File System

Provides unlimited capacity. You can add devices and types of devices for capacity without concerns for number of attributes or number of files. You can address pools of 256 billion terabytes in size.

Device Abstraction

The HSP can utilize a wide variety of storage technologies including combinations of JBODs, HHDs, SSDs and new technologies are easily added to existing systems, thereby protecting your technology investment.

Vendor Independence

SGI NAS is built on Open Source technology and supports industry standard protocols.

Why Choose SGI NAS?

SGI NAS, built upon ZFS technology, runs on industry standard x86 servers, and provides NAS and SAN capabilities, including support for CIFS, NFS, iSCSI, and Fibre Channel storage access.

In addition, SGI NAS enables you to protect data through a range of backup and replication capabilities, including unlimited snapshots and clones. It also allows synchronization to multiple destinations, thereby allowing site-to-site replications across disparate destinations.

SGI NAS provides hardware- independent, open, unified storage management at a fraction of the cost of legacy systems, allowing for high- efficiency scalability while eliminating costly vendor lock-in.

SGI NAS licensing is based on total storage, not the number or speed of processors or the amount of RAM. New or faster network interfaces can be added to improve client performance without incurring additional storage licensing costs. This allows a company to start small and grow as capacity requirements increase.

SGI has more than 4000 customers worldwide using SGI NAS to manage storage in JBOD, NAS, SAN, and SSD configurations. Together with our partners, SGI can provide ultimate flexibility, support, and performance requirements for your data storage needs. If you are looking into storage solutions, or if your present storage configurations are outdated, pricey, hard to use, or just plain unreliable, call us. We can help.

Global Sales and Support: sgi.com/global