

Hitachi Data Systems Solutions for Video Surveillance

Reference Architecture Guide

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Executive Summary

Video surveillance is the fastest growing segment of the security industry. With the threat of terrorism, federal, state and local governments are devoting greater resources to video surveillance. Corporations face the same issues as governments, such as industrial espionage, sabotage or theft. For loss prevention, retail businesses invest in storewide security cameras. Governments and corporations find video surveillance is a vital segment of their security solutions.

Hitachi Data Systems provides integrated video surveillance; we offer a one-vendor solution for any enterprise's security efforts. The advantages of turning to a single provider for video surveillance requirements is that you have a single vendor supporting all of the solution's components rather than having to contact a myriad of providers to enable the full solution. In addition, as a single provider, we provide an integrated design for simpler administration and lower cost of ownership.

This Reference Architecture Guide was created to provide you with information regarding the benefits for selecting the Hitachi Data Systems solutions for video surveillance. In addition, this document explains the solution's infrastructure.

Video Surveillance for Government

Video surveillance is a necessary component of government security solutions. The Department of Homeland Security, for example, invests heavily in infrastructure surveillance to assist in averting terrorist attacks. This requires video surveillance deployments at crucial infrastructure sites, such as:

- Airports
- Seaports
- Dams
- Nuclear facilities

Video Surveillance for Retail

There is a direct correlation between economic downturns and increased retail theft. The downturn has retailers concerned about increased shoplifting and robberies. Video surveillance cameras provide information on traffic patterns in stores. In addition, video surveillance helps retailers gauge customer interest in specific displays, thereby resulting in increased sales.

Video Surveillance for Schools

Schools are concerned about making their facilities safe for their students and staff. Video surveillance with a physical security presence helps provide that security. In addition, school districts are concerned about liability claims. Transportation companies also use video surveillance to provide evidence to dispute liability claims.

Trends in Video Surveillance

Convergence of Physical Security and Video Surveillance

Traditional physical security individuals, known as “the guns and badges people,” have little connection to IT departments. However, the current trend shows a convergence of physical security staff and IP video surveillance.

Video Surveillance Evolution

The evolution of video surveillance networks is moving from a pure analog to a hybrid analog with a gradual increase in the number of pure IP deployments. There is increased adoption of IP camera technology and the video surveillance industry moving away from analog technology. Consolidation of the IT network infrastructure will happen by replacing analog with IP encoders taking full advantage of the IT network.

This will move the network data recorder capability to the server, enabling increased bandwidth, throughput, scalability and performance. This increases a company’s ability to use their existing networks. This will bring the storage capability from the edge to the core of the network, allowing quicker and easier access to stored archived data.

Video Surveillance Growth

The boom in IP storage is happening despite improved analog compression schemes. And the growing number of megapixel and high definition cameras is forcing customers to increase drastically their storage capacity and overall storage capabilities.

The growth in managed services continues with video surveillance and physical security information management (PSIM) solution providers making real inroads. ABI Research believes that growth in the enterprise market will be followed by telecommunications and professional services companies broadening their managed service offerings.

To deal with the increasing amount of real time video content, more powerful processors, on servers and storage are required.

The Need for Video Surveillance

Hitachi Data Systems solutions for video surveillance can support a wide range of organizations.

- U.S. Federal
 - Department of Homeland Security (DHS)
 - Department of Defense (DOD)
 - Department of Justice (DOJ)
- Local and State Government
- Education
- Hospitality

- Gaming
- Resorts
- Retail
- Banking and Finance

Technology Trends

Megapixel and high definition cameras are being supported with the H.264 encryption scheme. For real time video displays, organizations must improve their server processors and increase their storage capacity. This is where Hitachi Data Systems solutions for video surveillance can prove very effective for your organization.

High Function Video

We understand the increasing need for panoramic cameras, especially, to provide security at infrastructure sites.

Analytics

We continue to progress in increasing the effectiveness of analytic software, which centers on use of artificial intelligence so software learns rather than relies on preprogrammed algorithms.

Faster Processing

We continue to develop faster chips, resulting in more intelligence at the edge of the network.

The long-term trend will be towards a balanced approach with both core and edge processing as part of a deployment and specific requirements of the analytic software.

Why Choose Hitachi Data Systems Solutions for Video Surveillance?

The common shortfall of video surveillance solution providers is they must use multiple technology manufacturers for their deliverable solution. Hitachi develops and delivers all the technology required for your video surveillance solution. The Hitachi Data Systems solutions for video surveillance converge surveillance operations and are simple to acquire, deploy and manage. Each solution is customized, certified and optimized to meet your organization's needs. We use a building block approach, and the solutions are upgradeable in place.

Solution Overview

Key Solution Components

Hitachi Data Systems offers a full suite of products for any surveillance system. Hitachi provides:

- Proven camera offerings that are price competitive with recognized and advanced functionally; camera technology that is integrated with the storage management system
- Storage management environment that supports edge technology

- Network infrastructure that can carry a potentially large number of real time video streams without packet drop and that can power the surveillance cameras over the wire
- Storage system that supports back-end archival or tape management architectures
- Blade server technology that can scale and support video management software
- Video management software

Figure 1 shows the stack architecture of Hitachi Data Systems solutions for video surveillance.

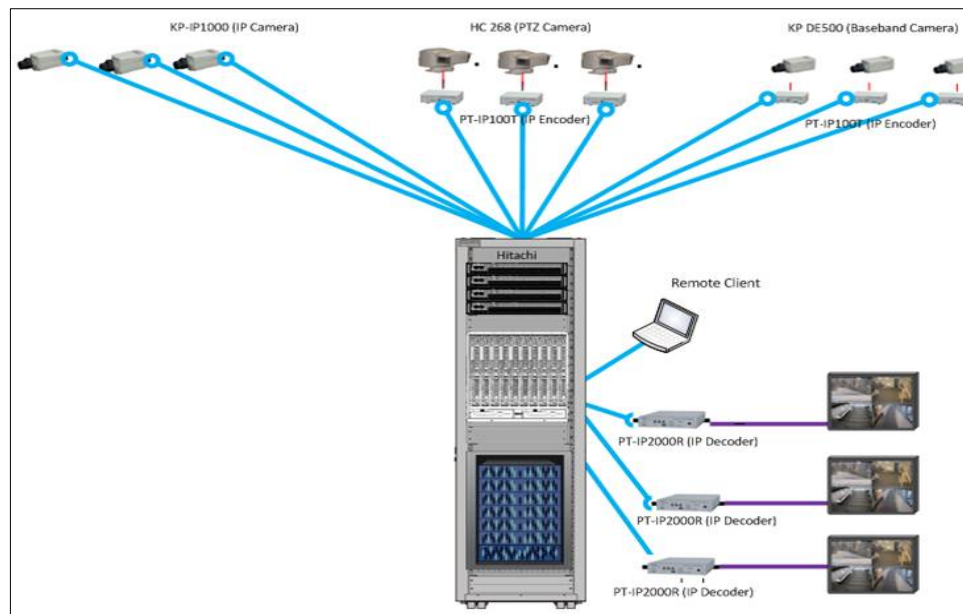


Figure 1. Hitachi Data Systems Solutions for Video Surveillance — Reference Architecture

Hardware Components

The following are the components that make up the converged Hitachi Data Systems solutions for video surveillance.

Hitachi Camera

The Hitachi PTZ (point, tilt and zoom) EM-CCD camera or the PTZ IP cameras are high-performance cameras with the following features:

- Super-high-sensitivity camera that makes the invisible visible
- High definition and megapixel camera
- Standard IP with various compression
- Intelligent sensor with high accuracy
- IP encoder and decoder for hybrid system
- Intelligent camera analytics
- Integrated management software

Hitachi Adaptable Modular Storage 2000 Family

The Adaptable Modular Storage (AMS) 2000 family is a proven and reliable component of Hitachi Data Systems solutions for video surveillance. The AMS 2000 family:

- Is an enterprise-class storage in a midrange package
- Is server virtualization ready
- Has an active-active controller that is ideal for virtualization
- Is integrated with vCenter for consolidated monitoring
- With VMware vStorage APIs for Array Integration (VAAI) is enabled for better performance and higher virtual machine density

Storage Performance Council Testing

The Hitachi AMS 2000 family is the Storage Performance Council (SPC-1) benchmark leader for all midrange storage. The AMS 2000 family is unequalled in performance.

Table 1 shows the SPC-1 performance results for midrange storage systems. The leading values are presented in red.

Table 1. Storage Performance Council Results for Midrange Storage Performance

	Hitachi Data Systems			IBM			NetApp
Model	AMS 2100	AMS 2300	AMS 2500	DS5020	DS5300	V7000	FAS3170
Controller Type	Symmetric	Symmetric	Symmetric	Asymmetric	Asymmetric	Asymmetric	Asymmetric
SPC-1 IOPS	31,498.58	42,502.61	89,491.81	26,090.03	62,243.63	56,210.85	60,515.34
Price/Performance	\$5.85/IOP	\$6.96/IOP	\$6.71/IOP	\$7.49/IOP	\$11.76/IOP	\$7.24/IOP	\$10.01/IOP
SPC-1 Sustainability Rate (Throughput MB/s)	258MB/s	350MB/s	735MB/s	214MB/s	511MB/s	463MB/s	497MB/s
Average Response Time (50% Load Point)	2.67ms	2.70ms	2.88ms	3.91ms	2.95ms	4.19ms	4.16ms
Average Response Time (100% Load Point)	8.15ms	6.33ms	8.98ms	10.49ms	14.37ms	10.8ms	20.8ms

Performance scales as capacity is added, and offers the low cost and high performance 2TB SAS disk option.

Uninterrupted Data Storage Access

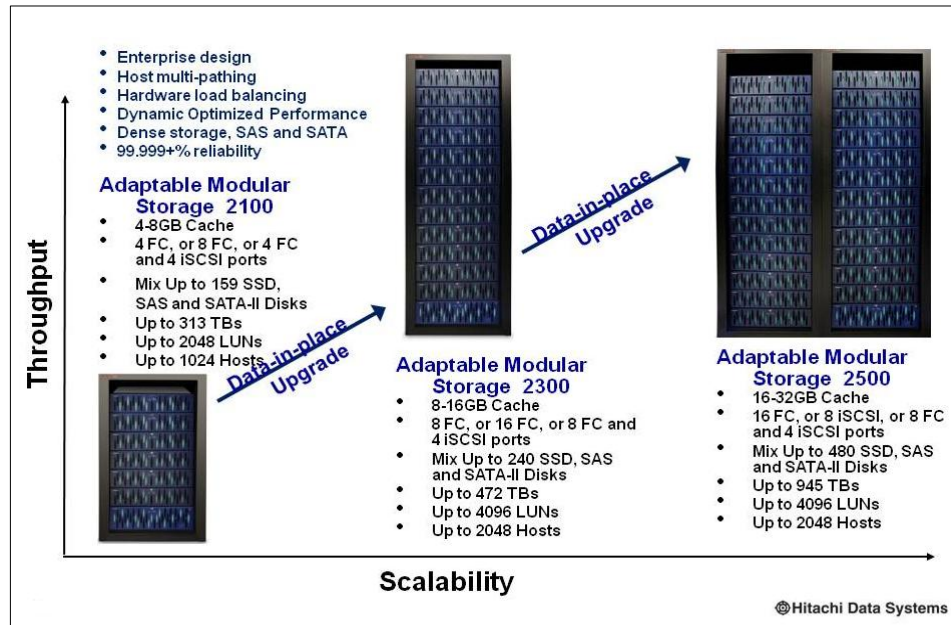
AMS systems are fully redundant with hot swappable components for 99.999% data availability. AMS system firmware can be upgraded while running normal operations.

Automated Administration

Dynamic provisioning automates capacity growth management. Dynamic load balancing automatically resolves bottlenecks that rob performance.

Adaptable Modular Storage 2000 Family

Figure 2 portrays the AMS 2000 family.



FC (Fibre Channel)—SSD (Solid State Disk)

Figure 2. Hitachi Adaptable Modular Storage 2000 Family Systems

AMS High-Density for Large-Scale Capacity

Hitachi AMS 2000 family has high-density for large-scale capacity: The AMS 2000 family:

- Reduces data center floor space consumption
- Stores nearly 1PB of data in a single rack
- 2TB of SAS 7200 RPM
- 450GB 15K RPM
- 600GB 15K RPM
- Up to 38 high-performance disks
- Up to 48 high-capacity disks
-

Benefits for Video Surveillance with AMS 2000 Family Data Storage

Hitachi Data Systems solutions for video surveillance with the AMS 2000 family offer the following benefits:

- Best price for performance ratio
- Highest storage reliability
- Best density
- Easiest to manage
- Best protection against image loss

Hitachi Compute Blade 320

Hitachi Data Systems provides Hitachi Compute Blade 320 for the Hitachi Data Systems solutions for video surveillance. Figure 3 shows the Compute Blade 320 design.

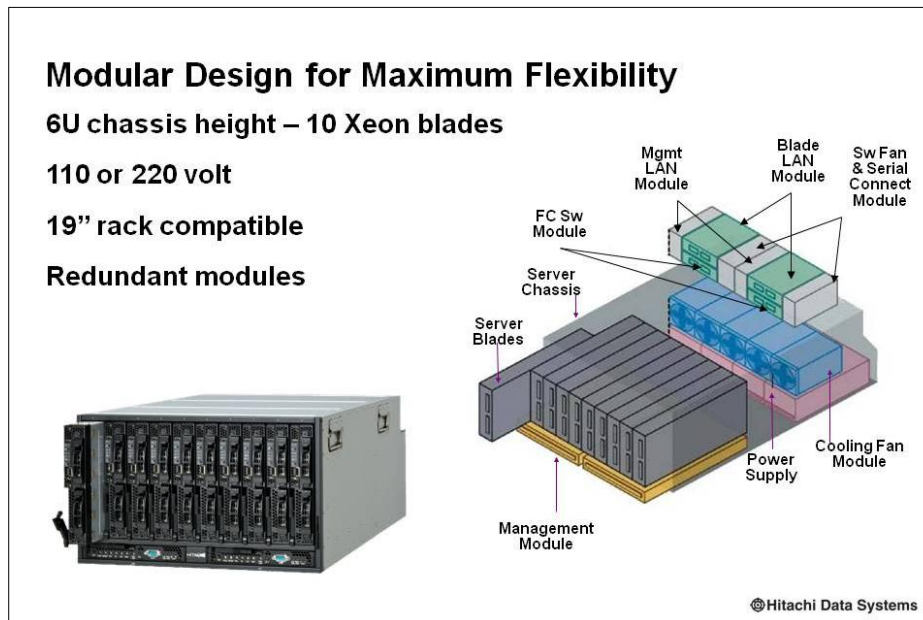


Figure 3. Hitachi

Compute Blade 320 Design

Compute Blade 320 Features

The Compute Blade 320 offers the following features:

- Compact, powerful and a flexible platform
- An optional 110-volt power option; just plug it right in
- The lightest, most mobile 6U system on the market
- Installation and start-up in minutes, not hours
- Up to 10 two-socket, dual-core or quad-core servers in a single 6U chassis
- Up to 840 cores in a 42U rack
- Embedded Hitachi logical partitioning (LPAR) virtualization
- Multiple blade options for workload flexibility
- Sixty percent space savings compared to rack-mount
- Faultless reliability
- Hot-swap components, redundant switch and management modules, N+1 and fully redundant power supplies, N+M automated server blade failover
- BSMS Centralized management;
- Multiple chassis management
- On-board Web interface

- IP-KVM switch
- Virtual media

Compute Blade 320 Density Advantage

The Compute Blade 320 density advantages are:

- Up to 70 servers in the same space as 42 1U servers
- Up to 840 cores per 42U rack

Perfect for Video Surveillance Environments

The Compute Blade is perfect for video surveillance environments. The Compute Blade 320 offers:

- Automated failover
- Compact and modular
- Easy deployment
- Exceptional speed
- Loaded with compute power
- Lower power draw than rack mount server solutions
- Simple administration
- Small footprint
- Virtualization

Brocade IP Switch

Brocade partnered with Hitachi Data Systems to provide a scalable storage solution that meet the growing capacity, performance and data storage requirements of the new video surveillance infrastructure.

Brocade IP switches offer:

- Higher resolution for clearer video
- Increased retention period of video data
- Integration of the surveillance infrastructure with IT's network
- Lower total cost of ownership

Figure 4 portrays the Brocade switch infrastructure.

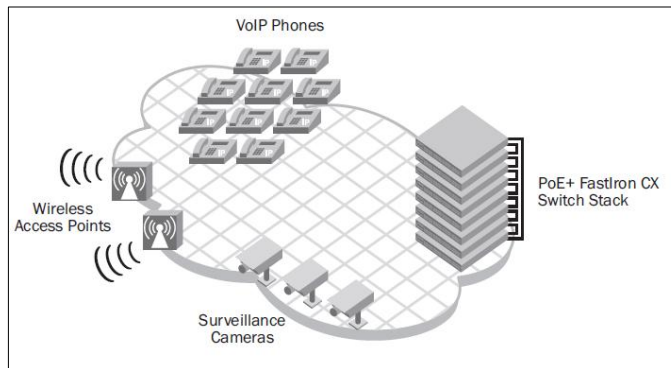


Figure 4. Brocade Switch Infrastructure

Hitachi VMnex™ Software

Hitachi's VMnex keeps data secure with role-based access, system auditing, and data and system security.

Role Based Access Control

- System management access based on one of three roles: account administrator, storage administrator or auditor
- Unique login and password for each user
- Active Directory integration in conjunction with Hitachi Command Suite 7.0

System Audit Logging

- Records all system changes and all power ups and downs
- Sends all changes to Syslog server
- Enables IT managers to meet compliance requirements including auditable trails

Data and System Security

- Self-encrypting drive option
- Communication between management software and systems is SSL/TLS encrypted
- Maintenance ports support IPv6 security specs
- All AMS 2000 systems meet Common Criteria EAL2 Certification

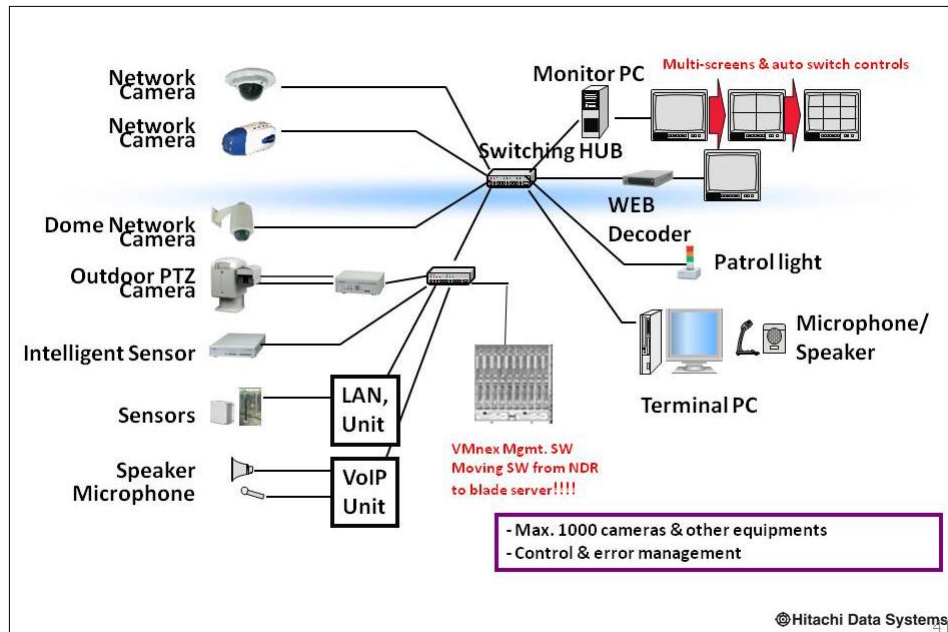
Hitachi Data Systems offers a full suite of software products for additional image protection options.

Hitachi ShadowImage® Replication in-system software's full volume clone and Hitachi Copy-on-Write Snapshot software (point in time or PIT) contain:

- ShadowImage full volume clones per source – 8 maximum
- ShadowImage command devices – 128 maximum
- ShadowImage copy requests per AMS 2500 – 2047 maximum
- Copy-on-Write Snapshots number of snapshots per source – 32 maximum

- Copy-on-Write Snapshot command devices – 128 maximum
- Copy-on-Write Snapshot PIT snapshots per AMS 2500 – 2046 maximum
- Reverse resynchronization
- Instant snap restore
- Auto I/O switch on double or triple drive fail
- High density storage for large-scale capacity

Figure 5 shows an overview of the VMnex software.



NDR (Hitachi Network Digital Recorder)—SW (Software)

Figure 5. VMnex Software Overview

Solution Design

The Hitachi Data Systems solutions for video surveillance comprise the following:

19" 42u Rack Mountable Solution

Figure 6 shows the video surveillance solution rack view

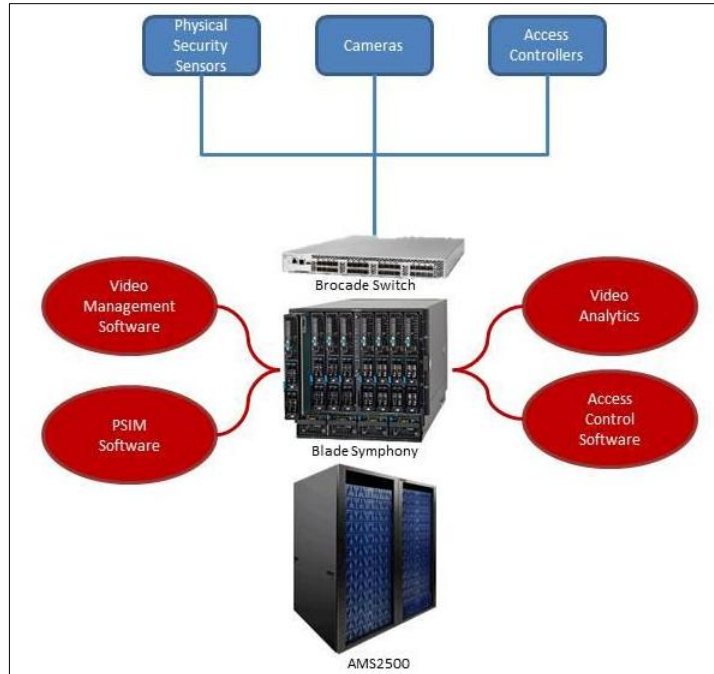


Figure 6. Rack View of Hitachi Data Systems Solutions for Video Surveillance

The Hitachi 19" 42u rack:

- Reduces width 20% from Hitachi Universal Storage Platform® V
- 14U control chassis cabled from the rear
- Fan thermal control has three levels to reduce noise

Hitachi Cameras

A line of IP and super-high-sensitivity cameras that come in a compact body with pan, tilt and zoom (PTZ) capability as desired. The high-sensitivity cameras are more than 1000 times more sensitive than conventional cameras, and include newly developed digital noise reduction (DNR). Enclosures that are highly resistant to environmental conditions, such as temperature and wind also are available.

Brocade IP Switch FCX648S-HPoE

High-performance Enterprise-class Stackable Switches for the Network Edge

The Brocade FCX series of switches provides new levels of performance, scalability and flexibility required for today's enterprise campus and data center networks. With advanced capabilities, these switches deliver performance and intelligence to the network edge in a flexible 1U form factor that helps reduce infrastructure and administrative costs. Designed for wire-speed and nonblocking performance, FCX series switches include 24- and 48-port models, in both Power over Ethernet (PoE) and non-PoE versions. Utilizing Brocade IronStack PoE models to support the emerging Power over Ethernet Plus (PoE+) standard can deliver up to 30 watts of power to edge devices, enabling next-generation enterprise applications. FCX648S-HPOE 48 10/100/1000Mb/sec PoE+ ports, two 16 gigabit Ethernet (GbE) stacking ports, one power supply and advanced Layer 2 switching and enterprise Layer 3 features. These switches support Hitachi 500 and 1000 camera configuration systems. Power over Ethernet Support is essential for deployment of IP camera based systems, especially for switches that aggregate data from cameras at the edge. The FCX series offer several key capabilities that make it a perfect fit to deliver the network infrastructure for a video surveillance solution.

- The FCX supports PoE+, enabling the switch to deliver up to 30 watts of power to connected devices. This is perfect to deliver to the pan, tilt and zoom surveillance cameras all the power they need to operate and this eliminates the need and cost of bringing power to the cameras separately.
- With up to 48 x 1GbE ports and a nonblocking architecture, the switch can accommodate all the network traffic generated by the video stream coming from the connected cameras without dropping packets.
- With 2 x 10GbE uplinks ports, the switch can aggregate the video stream traffic from all directly connected cameras and forward it to the next hop without packet loss.
- The FCX supports Layers 2 and 3 automatically, with dynamic honoring of quality of service (QoS) to ensure proper prioritization of the real time video traffic across the network and concurrent support for both real time traffic and data intensive transactional applications. Brocade networking solutions are built to deliver QoS without the need for manual configuration. This eliminates both the work in defining complex QoS configurations and the possibility that the configuration will be incorrect.
- Always-on Reliability: The FCX offers integrated, redundant, hot-swappable AC power supplies; Brocade provides a fully redundant internal power management that includes internal, hot-swappable power supplies that are redundant and load sharing, and power upgradability with no system impact.
- Stackability: Leveraging IronStack technology, up to eight FCX series switches can be stacked into a single logical switch providing simple and robust expandability for future growth at the network edge. This stacked switch has only a single IP address to simplify management. When new members are added to the stack, they automatically inherit the stack's existing configuration file, enabling true plug-and-play network expansion. Brocade stacking technology delivers high availability, performing real time state synchronization across the stack and enabling instantaneous hitless failover to a standby controller, should the master stack controller fail. Additionally, stack members can be hot inserted and hot removed with no interruption of service.

Hitachi VMnex Video Management Software (VMS)

Hitachi VMnex software supports the management, recording and control of up to 1000 cameras and other devices, such as sensors and PTZ controls. Extensive error management is part of the software capability. The graphical interface is organized along the lines of system management, sensor controls, recording operation, monitor display and error management. Live and recorded videos from any camera may be viewed at the operator's discretion. In the future, multiple instances of VMnex may be managed in a single console for consolidated operations (see Figure 7).

Hitachi Video or Network Digital Recorder (NDR) Software

There are several internal instances of NDR modules managed by the master server, the VMnex VMS. With the solution that HDS is proposing we are using the Hitachi Compute Blade 320 for this capability.

Hitachi Analytics, Similar Face Search

This will available in future systems. Similar face search is currently under development and may be demonstrated. Third-party video analytics also may be hosted on Hitachi Compute Blades.

Hitachi Compute Blade 320

The blade servers provide the performance and scalability needed to scale the surveillance system to support from 150 to 1000 edge devices (cameras). They have very tight coupling with Hitachi Adaptable

Modular Storage. Direct-attached Fibre Channel connection is used to connect with the AMS system(s). A SAN implementation also may be used. Alternatively, HDS may provide an iSCSI option in the future.

Hitachi Modular Storage

Hitachi Data Systems provides the AMS systems to support the performance and scalability required for the Hitachi video management and recording application. Up to 500 to 1000

High-level Infrastructure

Architectural Benefits

The infrastructure design for Hitachi Data Systems solutions for video surveillance has many advantages compared to the design offered by other vendors. Figure 7 depicts the solution's high-level infrastructure.

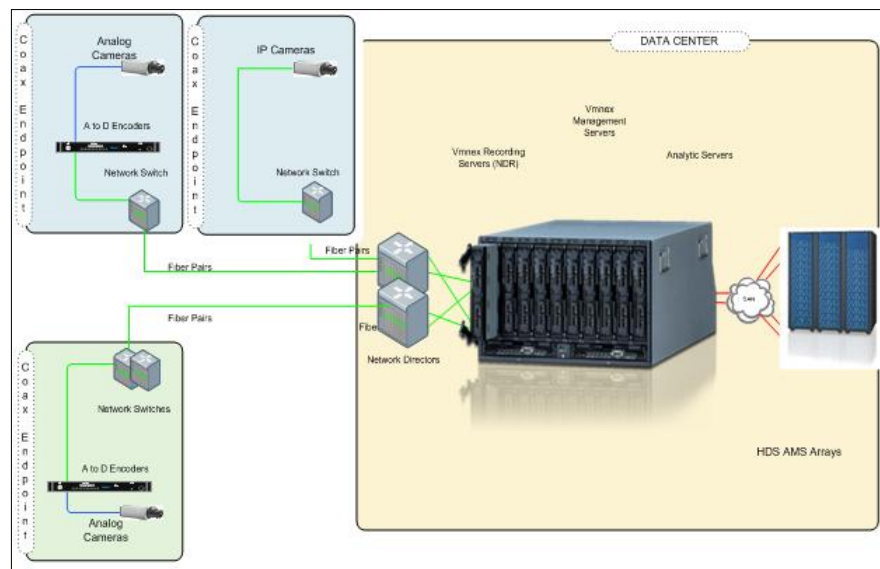


Figure 7. High-level Infrastructure Design for Hitachi Data Systems Solutions for Video Surveillance

This integrated infrastructure offers benefits that are not available from other vendors. The Hitachi advantage is that we are the only vendor you will need for all video surveillance solution components; other solutions use multiple vendors and require component support from each vendor. Following are the components that compose Hitachi Data Systems solutions for video surveillance.

Hitachi Adaptable Modular Storage 2000 Family Benefits

These scalable storage systems can manage many of your extremely complex tasks and give you operational efficiencies and performance.

The AMS 2000 family systems offer the following benefits:

- 99.999% data availability
- Remote monitoring of infrastructure for 24/7 diagnostics and problem detection
- Optional volume replication within the storage system

- Audit logging tracks all system changes
- No single point of failure and mirrored cache with battery backup
- Hot swappable and redundant components
- High capacity, low power consumption drives
- Dynamic load balancing controller automatically reduces controller bottlenecks
- Wizard-based installation and configuration that provide administrative efficiencies
- Single-pane-of-glass centralization and management of multiple systems
- Data retention utility software that protects data from overwrites or erasures over the long term

Hitachi Compute Blade 320 Benefits

Hitachi Compute Blade 320 supports up to 10 blades and stands 6U high. It delivers a combination of compute density and enterprise-class reliability that far exceeds the capabilities of rack-mount servers and other blade servers.

Hitachi Compute Blade 320 offers the following benefits:

- Highly scalable dense blades
- Optional 110 volt power option that eases deployment
- Up to 560 cores in a standard 42U rack (up to 10 two-socket dual or quad core server modules per 6U chassis)
- Simplified cabling
- Hot-swappable and redundant components
- Lower power draw than standard servers
- Built-in networking and SAN capabilities
- Built on industry standards
- 6U chassis that can support a mix of dual or quad core blades, providing significant flexibility
- Chassis that is designed to support next-generation processors

Brocade Fastiron CX648S PoE Network Switches Benefits

The Brocade FCX648S PoE network switches offer:

- 99.999% availability
- Stackable Layer 2 or Layer 3 switches
- Expandable to 384 ports for growth
- Redundant design with hot swappable components

Hitachi Adaptable Modular Storage Architecture

The Hitachi Adaptable Modular Storage 2500 consists of two controllers, either 16GB or 32GB of cache, and two choices of host port types with up to 16 ports total. At the core of each AMS 2500 controller there is a 10th-generation Hitachi direct coupled transistor logic (DCTL) processor (a high-performance RAID and DMA engine) and an Intel Core Duo Xeon processor with dual cores (X and Y).

Cache

The memory bandwidth between each DCTL-H processor and its local cache is 8GB/sec. The AMS 2500 has two banks of cache (with two DIMM slots) per controller, so total cache will be either 16GB (2GB DIMMs) or 32GB (4GB DIMMs). There are two 2GB/sec intercontroller communications busses between the DCTL processors for commands and communications, maintenance operations and duplexed (mirrored) cache operations.

Disks

The AMS 2500 has 32 SAS back-end disk paths controlled by the four SAS engines and up to 480 SAS, solid state disk (SSD) or SATA disks in the system. The disks may be any mixture of SAS, SSD or SATA disks that the AMS 2000 family supports. The 2500 supports up to 30 SSDs, which may be installed in any of the 15-disk enclosures (intermixed). The 2500 has no built-in 15-disk enclosure, but it can support up to 32 external 15-disk enclosures (RKAK) or up to 10 dense trays (RKAKX). Later in this document, Table 3 illustrates the enclosure and disk combinations available for all models.

There must be a minimum of four disks installed in the internal enclosure. A small region of hidden space on the first five internal disks (or four if you only have four in the internal enclosure) is used by the microcode in managing the system configuration images. These first five disks (slots 0-4) must be of the same type and size (SAS, SSD or SATA). Note that all disks in a storage system have the same small region reserved for size uniformity.

Tables of AMS Features and Limits

Tables 2 through 4 summarize various aspects of the Hitachi Adaptable Modular Storage 2000 family.

Table 2. Hitachi Adaptable Modular Storage 2000 Family — Configuration Details

<i>Maximum Configuration Limits</i>	<i>AMS 2100</i>	<i>AMS 2300</i>	<i>AMS 2500</i>
RAID Groups	50	75	75
LUNs	2048	4096	4096
Port I/O Request Limit (total queued operations)	512	512	512
Port Maximum Transfer Size	8MB	8MB	8MB
Maximum Attached Hosts through Fibre Channel Virtual Ports	1024	2048	2048
Maximum Attached Hosts through iSCSI Virtual Host Ports (256 per port)	1024	1024	2048
LUN Size	60TB	60TB	60TB
Spare Disks	15	30	30
Cache Partitions	16	32	32
Host World Wide Names per Port	128	128	128

Table 3. Hitachi Adaptable Modular Storage 2000 Family — Controller Details

<i>Controllers</i>	<i>AMS 2100</i>	<i>AMS 2300</i>	<i>AMS 2500</i>
Xeon CPU (per controller)			2GHz 2-core
Celeron CPU (per controller)	1.67GHz 1-core		
CPU RAM (per controller)	1Gb	1Gb	2Gb
Total Cache (GB)	4 or 8	8 or 16	16 or 32
RAID and DMA Engine ASIC	DCTL	DCTL	DCTL
Bus Type	PCIe 1.0	PCIe 1.0	PCIe 1.0
Disks (SAS and SATA II)	159	240	480
Disks (SSD)	15	15	30
SAS Links	16	16	32
8Gb Fibre Channel Ports	4-8	8-16	16
1Gb iSCSI ports replaces some Fibre Channel)	4	4	8

The cache size is determined by the use of either 2GB or 4GB DIMMs in the controllers. Only one type may be used so there are only two cache sizes available per system.

Table 4. Hitachi Adaptable Modular Storage 2000 Family — Back-end Details

<i>Back End</i>	<i>AMS 2100</i>	<i>AMS 2300</i>	<i>AMS 2500</i>
Disk Enclosures	8	16	32
<ul style="list-style-type: none"> ▪ Internal Controller 15 Disk Tray ▪ External Trays 	1	1	na
	7	15	32
Disks (SAS, SATA II, SSD)	159	240	480
<ul style="list-style-type: none"> ▪ Internal ▪ External 	4–15	4–15	na
	2–144	2–225	4–480
Maximum Disks (SSD)	15	15	30
SAS Links to the Disks (active)	16	16	32
Average Disks per SAS Link	10	15	15

Hitachi NAS Platform Architecture (Recommended)

Using Hitachi NAS Platform (HNAS), powered by BlueArc®, will offload the server managing the video files, allowing CCTV servers simultaneous access to the videos.

HNAS can accommodate 2PB of data per system. When coupled with Hitachi Data Discovery Suite (HDDS), HNAS will track all video files, in addition to the index being managed by the CCTV application.

HNAS provides automated file migration, based on criteria like creation date for Tier 2 storage, transparent from archiving servers.

Figure 8 depicts the HNAS file server topology.

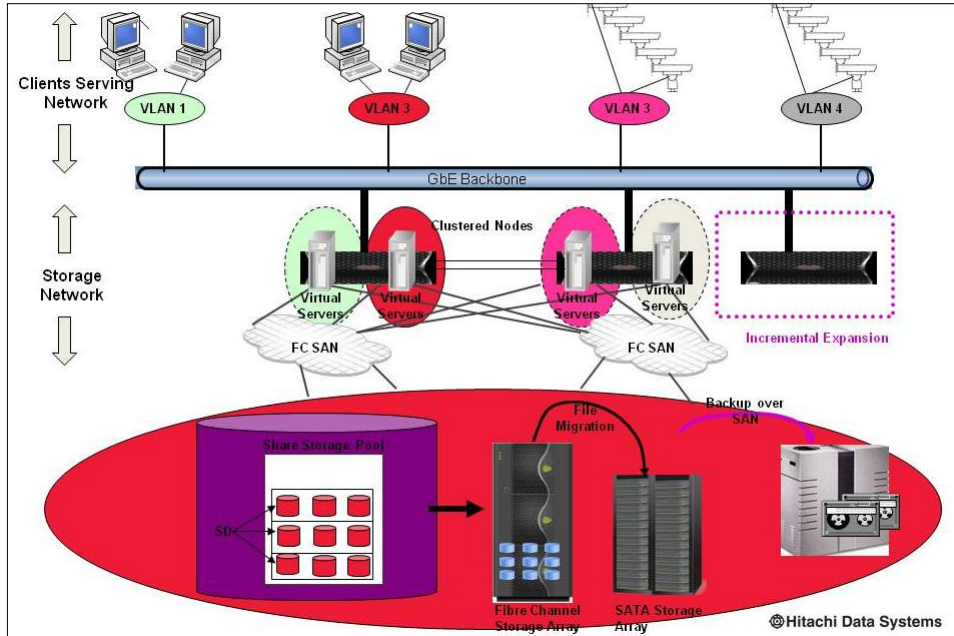


Figure 8. Hitachi NAS Platform File Server Topology

Archive Video Images for 180 Days

Video files can be stored on HNAS or a separate disk-based WORM (write once, read many) storage system. The Hitachi Content Platform (HCP) can be used to archive video images as objects with search and metadata describing the video files for searching. HCP offers an open interface using protocols such as http, NFS, CIFS and WebDAV.

SAN Architecture

The recommended SAN as used for Hitachi Data Systems solutions for video surveillance contains 13.8PB of storage (see Figure 9). The storage is provided by the Hitachi Universal Storage Platform V, which can consolidate and virtualize multiple midrange storage systems to achieve a single storage system supporting up to 247PB.

Without consolidation, the SAN environment would require a separate environment for each CCTV server. And 1.8PB would require multiple servers to handle so many file systems. Sometimes servers' CPU resources might not be able to handle large storage capacities, such as those running over 200TB. This will depend on operating system capability and server hardware resources.

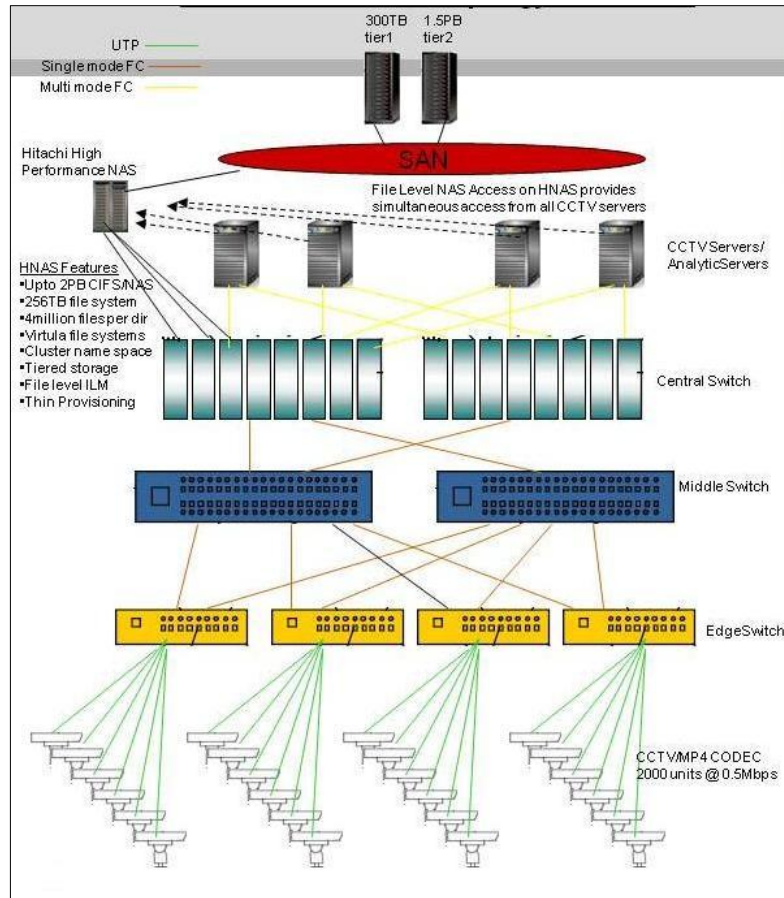


Figure 9. SAN Architecture for Hitachi Data Systems Solutions for Video Surveillance

Conclusion

This Reference Architecture Guide has covered the topics surrounding Hitachi Data Systems solutions for video surveillance. Building these solutions took extensive testing and design work, along with the support of third-party vendors.

The object of Hitachi Data Systems in developing these solutions was to offer customized video surveillance answers for enterprises. These solutions provide simplified planning, deployment and management by using hardware components from a single vendor. The solutions use integrated components:

- Hitachi super-high-sensitivity and IP cameras
- Hitachi VMnex (video management system for the next stage)
- Hitachi video or NDR software
- Hitachi Compute Blade 320
- Hitachi Adaptable Modular Storage 2500
- Brocade IP switches

Hitachi Data Systems solutions for video surveillance provide the perfect answers for any enterprise looking for a cost-effective, high-performance security solution.

Hitachi Data Systems Global Services team offers experienced storage consultants, proven methodologies and a comprehensive services portfolio to assist you in implementing Hitachi products and solutions in your environment. For more information, see the Hitachi Data Systems Global Services [web page](#).

Live and recorded product demonstrations are available for many Hitachi products. To schedule a live demonstration, contact a sales representative. To view a recorded demonstration, see the Hitachi Data Systems Corporate Resources [web page](#). Click the **Product Demos** tab for a list of available recorded demonstrations.

For more information about Hitachi products and services, contact your sales representative or channel partner or visit the Hitachi Data Systems [web site](#).

Appendix A: Feedback

Hitachi Data Systems welcomes your feedback. Please share your thoughts by sending an email message to SolutionLab@hds.com. Be sure to include the title of this white paper in your email message.

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