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Solutions for the adaptive enterprise.



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# HP NonStop servers now connect to the HP StorageWorks XP Disk Array family and to storage area networks

HP NonStop S-series servers can now participate in enterprise-wide storage area networks (SANs) and economically deliver unique levels of data integrity, continuous availability, and business continuity for critical enterprise applications. The HP StorageWorks XP disk array family meets the stringent HP NonStop server requirements for mission-critical capabilities.

HP NonStop enterprise storage comprises the hardware and software products that enable HP NonStop servers to connect to the HP StorageWorks XP Disk Array family. The XP disk arrays meet the stringent HP NonStop server requirements for continuous availability, scalability, and mission-critical capabilities.

Connection to HP NonStop enterprise storage requires the new HP NonStop modular I/O subsystem—the I/O Adapter Modular Enclosure (IOAME), Modular Cabinet, and the new high-speed Fibre Channel ServerNet Adapter (FCSA).

## Enterprise storage: key benefits

The most important benefits of external enterprise storage arrays connected to HP NonStop servers are:

- Improved data integrity with HP NonStop end-to-end disk checksum
- Large storage capacity and pooling of unused capacity for better storage utilization
- Flexible and dynamic storage capacity and reallocation
- Reliability using redundant caches and RAID
- Improved performance provided by:
  - Large, redundant I/O caches on the enterprise storage array
  - Distribution of hot spots (load balancing)
- Lower cost of storage for very large databases
- Improved performance provided by Fibre Channel speed and large storage I/O caches
- Easier storage administration and centralized management
- Extremely large storage capacity and seamless growth
- Ability to participate in SANs

# HP NonStop enterprise storage: product summary

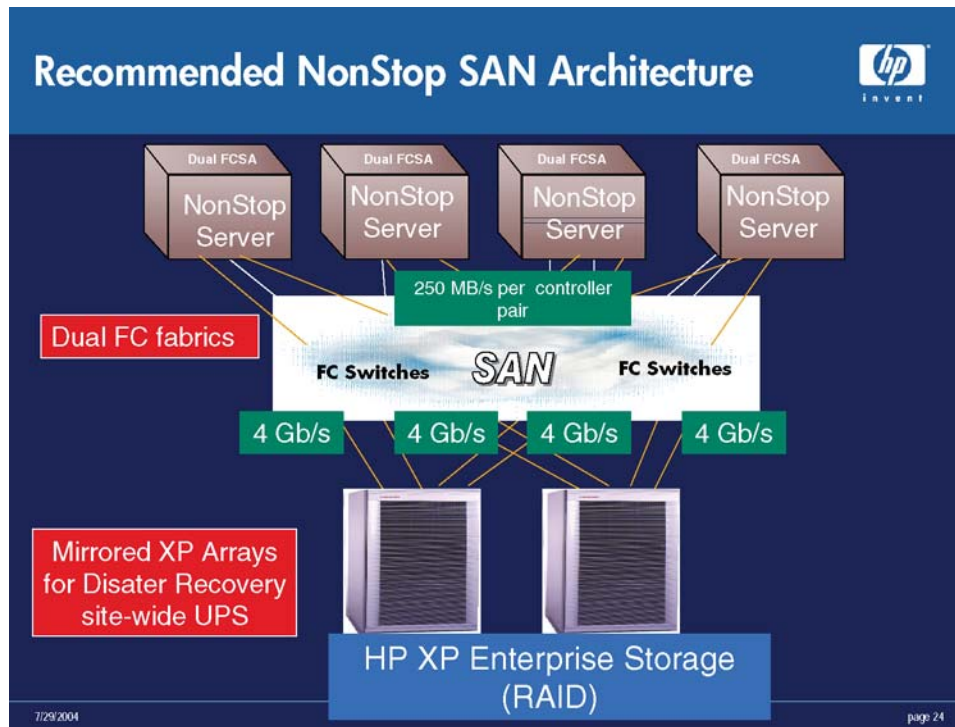
- An HP NonStop server connection to enterprise storage requires the HP NonStop modular I/O subsystem, which consists of:
  - IOAME, which houses up to 10 adapters
  - High-speed FCSA
- HP NonStop servers connect to XP disk arrays in point-to-point and in switched Fibre Channel topologies.
- HP NonStop servers can participate in SANs with other HP NonStop servers and other HP and third-party servers.
- HP NonStop servers can connect to the following enterprise disk arrays:
  - HP StorageWorks XP128 Disk Array
  - HP StorageWorks XP1024 Disk Array
- HP NonStop S76000, S86000, and higher servers can connect to enterprise storage.
- HP NonStop data integrity uses a new, improved disk checksum mechanism while supporting a standard 512-byte disk sector size.
- Both structured (for example, SQL and ENSCRIBE) and unstructured files (for example, text, audit, and swap) are supported on enterprise storage.
- Online and offline migration of data from existing internal disk storage to enterprise storage is provided.
- Connection to SAN storage requires the FCSA in the new IOAME.
- To ensure the HP NonStop fundamentals, HP NonStop enterprise storage supports completely redundant FCSAs and Fibre Channel SAN fabrics and requires a site-wide uninterrupted power supply (UPS).

- To further ensure the HP NonStop fundamentals, some functions are still handled by the HP NonStop server, rather than by the enterprise storage system. For example, backup and restore and disaster recovery are handled by the HP NonStop host; HP NonStop Transaction Management Facility (TMF) and Remote Database Facility (RDF) are required to preserve transactional consistency.
- The XP disk arrays are enhanced, tested, sold, and supported by HP.
- Design and operational guidelines, site preparation, installation, support, and consulting services are available from HP to ensure fault-tolerant SAN configurations and preserve the HP NonStop continuous availability requirements.

## HP NonStop enterprise storage features

- SAN connectivity
- Storage virtualization
- Fibre Channel standard compliance
- Enhanced data integrity: new checksum
- RAID capability
- Enterprise storage management
- Modular I/O subsystem
- ServerNet Connection Services (SCS)
- IOAME enclosure
- High-performance FCSA

Fig 1.



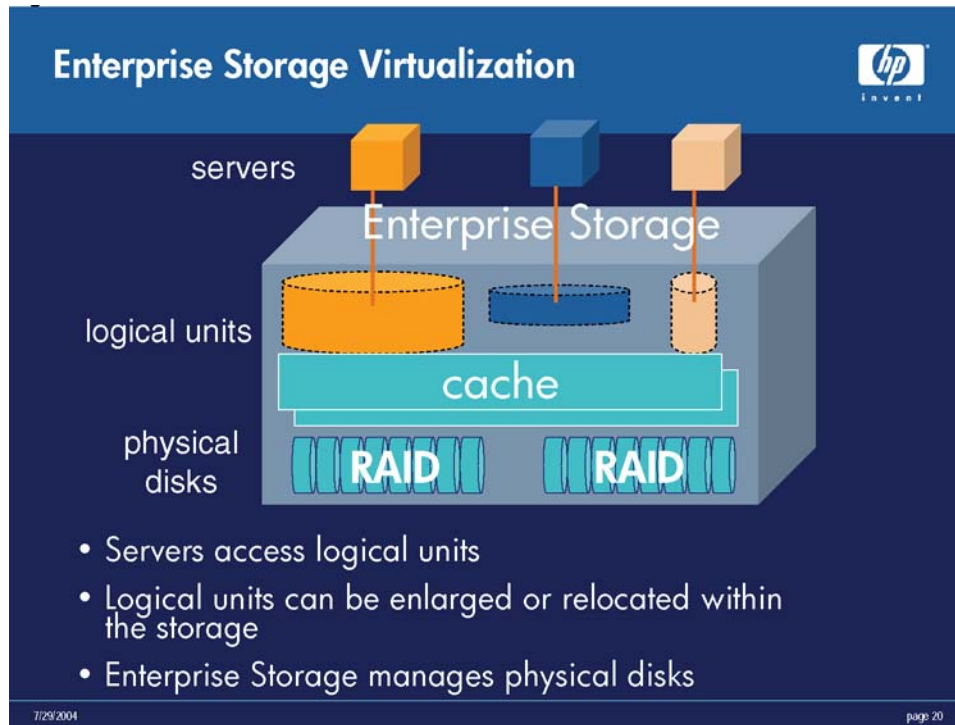
## SAN connectivity

A SAN is the network that connects storage devices, such as disks and tapes, to host servers. SANs commonly use Fibre Channel technology as the networking infrastructure. What differentiates SANs is the concept that all of the storage can be consolidated into one large "storage area" that allows centralized (simplified) management and any-to-any connectivity between host servers and storage. SANs are also used to implement high availability storage enterprise-wide.

A key benefit SANs deliver is cost saving derived from reduced storage management. For example, a pool of storage can be shared by a group of servers and managed more efficiently. Users aggregate storage in a SAN to achieve longer-term cost savings by procuring additional storage for the network from different vendors.

To preserve the HP NonStop fundamentals, including continuous availability, all Fibre Channel SAN devices and paths must be redundant as shown in Figure 1.

Fig 2.



## Storage virtualization

Storage virtualization allows disks to be aggregated, subdivided, and parceled out to SAN nodes in virtual storage units of any size, instead of using physical units. Disks with varying capacities can be mixed and matched without wasting disk space. The servers connected to the SAN do not deal directly with the physical disks. Instead, they connect to virtual disks, or logical units (LUs), and can only perform I/O on the LUs.

Disk arrays have large cache memory through which passes all data going to or from the storage devices. The array unit has sophisticated intelligence that manages the transfer of data between the cache and the physical disks.

## Fibre Channel standard compliance

Fibre Channel is a family of American National Standards Institute (ANSI) standards that was developed specifically to attach servers to storage in a variety of topologies, while addressing the needs for scalability, availability and distance. Key Fibre Channel attributes include:

- High performance and low latency
- A separate (usually switched) network

- Connection across campus and longer distances
- Network features that enables SAN attachment
- Adoption by major computer systems and storage manufacturers
- Adoption by large enterprise data centers for enterprise storage

Fibre Channel is the preferred interface for SANs. Compared to SCSI, Fibre Channel delivers faster data rates, supports a larger number of devices, and can be used over longer distances.

Fibre Channel supports:

- Fast data rates today at 2 Gb/s (The standard will support future speeds of 4 Gb/s and 10 Gb/s.)
- Long distances between Fibre Channel end points:
  - Point-to-point: 250 m
  - Fibre Channel switches: 10 Km; for longer distances, up to 100 Km with additional Fibre Channel switch options

In addition:

- Fibre Channel switched networks allow for any-to-any connectivity of servers and I/O devices.
- Fibre Channel networks can be dedicated, shared, or zoned. Zoning is a method of subdividing a SAN so that traffic within each zone is physically isolated from traffic outside the zone.
- Fibre Channel topologies include:
  - Fibre Channel Arbitrated Loop (FC-AL) for connecting physical disk drives
  - Point-to-point direct connection for enterprise storage for connecting Fibre Channel disk arrays that are not part of a SAN
  - Switched fabric for SAN for enterprise storage
- Switched Fibre Channel fabrics provide for redundancy, alternate path routing, and zoning. Redundant, independent Fibre Channel paths can be defined for fault tolerance.

## Enhanced HP NonStop data integrity: new checksum

For Fibre Channel disk storage, HP NonStop servers now support:

- Industry-standard disk sector size (512 bytes)
- Better protection provided by increased checksum size: 6- or 8-byte checksum
- Online data migration (Users can move their data from the old to the new checksum in a manner that is similar to performing an internal disk online capacity upgrade.)

In addition:

- All data on enterprise storage (structured and unstructured files, audit trails, and other structures) on the disk are protected by the new checksum.
- The new checksum mechanism is transparent to user applications, which requires no changes.

## RAID capability

RAID is the technique used by disk arrays to deliver desired levels of data availability, performance, and surface utilization.

Some of the physical disk capacity is used to store redundant information about the user data stored on the remaining disks. This redundant information enables regeneration of user data in the event that one of the disks in the array or the access path to it fails.

In RAID implementations:

- Mirroring is used to enhance online data availability by copying data on separate array disks and is called RAID 1.
- Parity-check data is distributed across the disks in the array and is called RAID 5.
- Disk striping increases online storage performance and is called RAID 0.
- Mirroring and parity RAID protection can be combined with data striping.
- RAID controllers are external to the server hosts.
- RAID levels can be combined, as in RAID 0/1.

## Enterprise storage management

HP StorageWorks Command View XP and the HP NonStop management system can be integrated into HP OpenView Network Node Manager and other enterprise management systems using Simple Network Management Protocol (SNMP). The HP NonStop server extends ease of management to thousands of CPUs accessing hundreds of terabytes of data.

HP NonStop system management is provided by Open Systems Manager (OSM):

- HP NonStop OSM manages the modular I/O components (IOAME and FCSA) and displays enterprise storage logical disks (LUs).
- The HP NonStop SCF configuration module provides new adapter type and attributes allowing the user to configure an FCSA.

The enterprise storage system manages the array logical and physical disks:

- Command View XP provides user-friendly, Web-based logical device management.
- Command View XP is a Web-based management platform for HP XP disk arrays that provides a common user interface for all XP disk array management applications.
- Using Command View XP, you can manage storage anytime, from anywhere.

## Modular I/O subsystem

The HP NonStop modular I/O subsystem is being introduced in the HP NonStop S-series servers and provides the first step in migrating to future HP NonStop Itanium servers.

The modular I/O subsystem:

- Allows independent technology updates and enables flexible, extensible configurations by allowing independent technology updates for both the S-series and future Itanium servers
- Is used for new Fibre Channel storage and LAN networking products
- Is supported in the current HP NonStop S-series systems S76000, S86000, and above

## SCS

The new SCS provides communication with the FCSAs across the ServerNet fabric. It is a new I/O software layer for the modular I/O subsystem that:

- Provides multipath ServerNet connection services
- Uses all available ServerNet paths
- Automatically recovers data transfer and paths
- Allows connection to the modular I/O hardware from all HP NonStop processors

## IOAME

The IOAME is the new subsystem that provides I/O for HP NonStop servers and:

- Supports up to 10 ServerNet adapters
- Supports serial ServerNet 2 and ServerNet 3
- Is 11U in height (1U = 1.75 inches)
- Can be mounted in 19-inch racks
- Provides X and Y ServerNet fabric interconnects
- Provides dual fabrics to all ServerNet adapters
- Provides switching services to and from ServerNet adapters
- Provides maintenance services to ServerNet adapters

## High-performance FCSA

### Key benefits

The most important benefits of the FCSA include:

- Conformance to the HP NonStop modular I/O subsystem (The FCSA adapter fits in one of the 10 IOAME slots.)
- Conformance to the Fibre Channel IEEE standard

- Dual 2-Gb/s Fibre Channel ports for redundant Fibre Channel fabric availability
- Dual 2.5-Gb/s ServerNet ports for redundant ServerNet fabric availability
- Dual FCSAs in different IOAME fault zones for availability
- Connection to existing HP NonStop S-series and future HP NonStop Intel® Itanium® servers through the IOAME
- Coexistence with other modular I/O ServerNet adapters in the modular I/O configurations
- Powerful processor on the FCSA base board and high-speed ServerNet paths that provide an interface from the PCI-X bus to the industry-standard, dual-ported Fibre Channel plug-in card

### Key features

The high-performance FCSA is a new generation of ServerNet I/O adapters that:

- Connects dual ServerNet fabrics to the PCI-X interface bus
- Provides dual Fibre Channel interfaces for Fibre Channel storage subsystems and devices
- Interfaces with the IOAME (The FCSA is not compatible with previous S-series I/O enclosures.)
- Is a Field Replaceable Unit (FRU)

The FCSA features include:

- A high-performance, powerful embedded RISC processor
- Very large number of concurrent I/Os
- High bandwidth I/O performance
- Two X and two Y ServerNet fabric connections (two redundant, complex, ServerNet-3 ports)
- Dual ServerNet-3 to PCI-X bridge ASICs
- Two 128-MB on-board memory buffers
- Industry standard Fibre Channel plug-in card
- Single PCI-X 1.0 expansion slot
- 64-bit, 100-MHz PCI
- Two 2-Gb/s Fibre Channel ports
- A common ServerNet I/O base board, which is also used for other adapters
- Common storage and networking code

# Modular I/O cabinet

The HP NonStop Modular Cabinet features:

- An industry-standard 19-inch rack
- 42U height
- HP NonStop Power Distribution Unit (PDU)
  - Two PDUs per cabinet
  - 14 outlets per PDU
  - Two fuses per outlet
  - Ceiling or floor power input
- Other components
  - Side panels
  - Stabilizer
  - Baying kit

# HP StorageWorks XP Disk Array family

The HP StorageWorks XP Disk Arrays are enterprise-class storage systems that deliver always-on reliability and availability for mission-critical applications for which downtime is not an option. XP disk arrays are designed for organizations that demand the most from their storage. Complete redundancy throughout the architecture provides no single-point-of-failure, and non-disruptive online upgrades ensure that data is always available.

The scalable design allows organizations to meet their capacity, performance, and heterogeneous connectivity needs today and tomorrow, without ever requiring a forklift upgrade. Outstanding levels of random and sequential performance are ideal for real-world workloads. Array-to-array local and remote data copying enables multisite disaster tolerance. World-class service and support meets the most demanding needs.

In a world where every business decision triggers an IT event, XP disk arrays enable an adaptive enterprise-one that can quickly capitalize on and manage change. The breadth of XP disk array capabilities enable organizations to demand more agility to adapt to real-time business needs, more value by ensuring information is protected and available, and more simplicity by reducing costs through consolidation and management efficiency.

# Enterprise storage summary

HP NonStop servers can participate in enterprise-wide SANs and derive the benefits of open storage such as:

- Lower cost per MB for very large databases
- Lower total cost of ownership provided by centralized management
- Improved performance
- Compliance to storage Fibre Channel standards
- "Better Together" offering: HP NonStop, HP storage, and HP service and support

Enterprise storage preserves the HP NonStop fundamentals, including the highest data integrity, continuous availability, and scalability required for real-time, business-critical applications.

**Table 1.** Enterprise storage:  
products required

## System requirements

Server	HP NonStop S-series server: S76000 and above
M8840	FCSA: minimum of two for fault tolerance
SE93	HP NonStop enterprise storage connectivity software
G06.24 or later	HP NonStop kernel operating system, Release Version Update (RVU)
M8311-XX(*)	Modular Cabinet
M8360-10	IOAME
M8200-24	Maintenance Switch
M8330-6	UPS for North America and Japan
M8330-6W	UPS for international locations
M8330-ERM	Ext. Runtime Module

(\*) For details of the five different power configurations for the Modular Cabinet, refer to the *HP NonStop S-series Servers Ordering and Configuration Guide*. For additional optional modular accessories and data cables, refer to the *HP NonStop S-series Servers Ordering and Configuration Guide*.

## For more information

- HP StorageWorks XP Disk Array family  
<http://www.hp.com/go/storage>
- HP NonStop servers  
<http://www.hp.com/go/nonstop>

To learn more about HP's offering, visit [www.hp.com](http://www.hp.com).

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5982-8940EN, 10/2004

