





The New Entry Level Storage Family: Modular Smart Array



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EMEA ISS SNI
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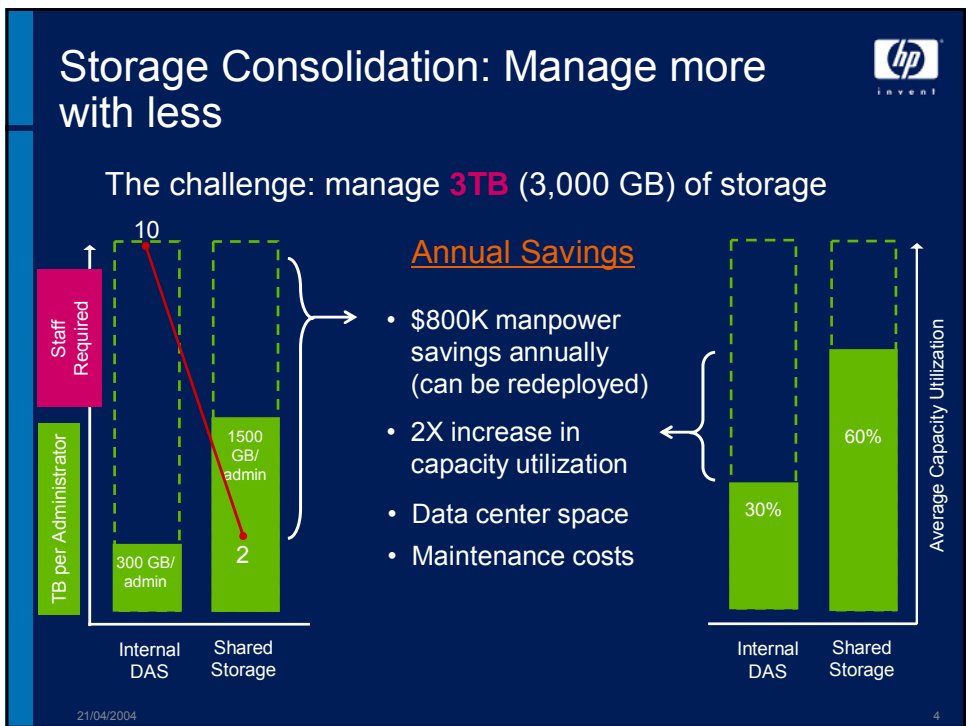
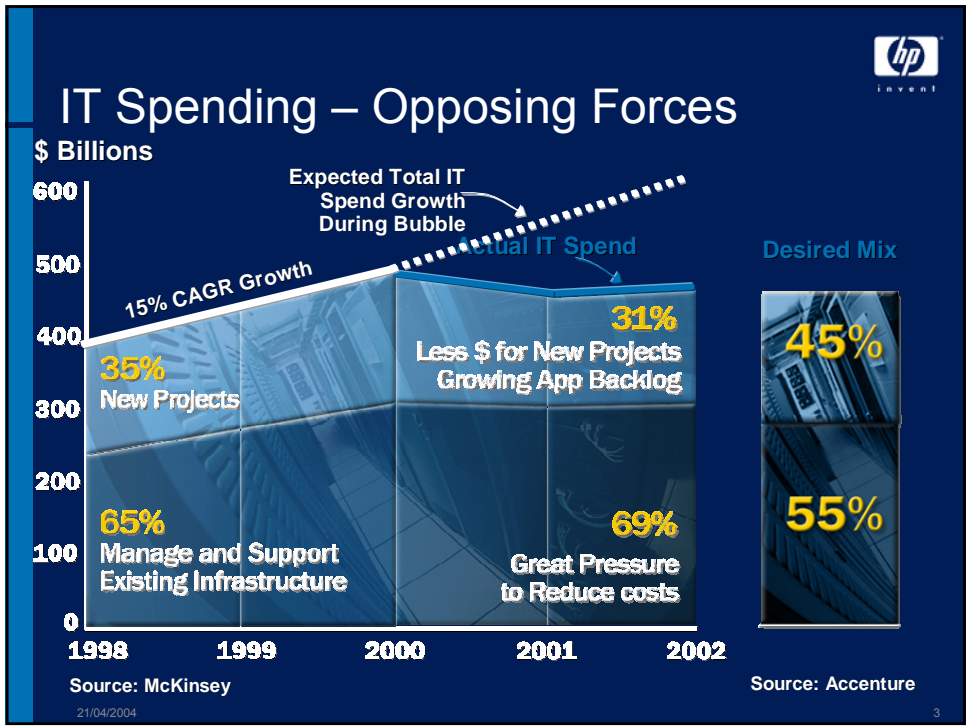


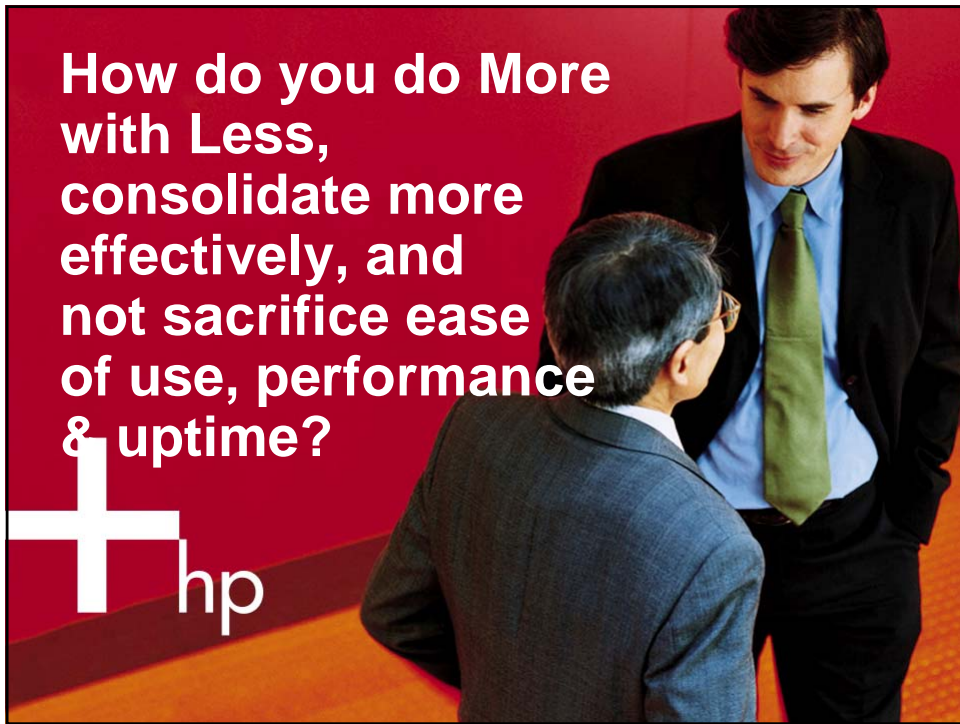
Key Trends and Challenges





- Increasing End User Support**
 - 32% of all data loss from human error
 - 80% of backup tapes fail to recover a file
 - 61% of intranet sites updated manually
- Proliferation of Servers and Storage**
 - Enterprise data storage doubling each year
 - 30% utilization of NT4 direct-attached storage
 - \$1.00 storage = \$3.00-5.00 management costs
- The Demand for 24x7 Availability and Better Security**
 - Downtime costs \$100,000-\$1m/hour, +50% past 10 years
 - Security breaches cost up to \$2m per organization
 - 80% of end user files on individual desktop hard drives

Sources: Gartner Group, Enterprise Storage Group, and others






**How do you do More
with Less,
consolidate more
effectively, and
not sacrifice ease
of use, performance
& uptime?**



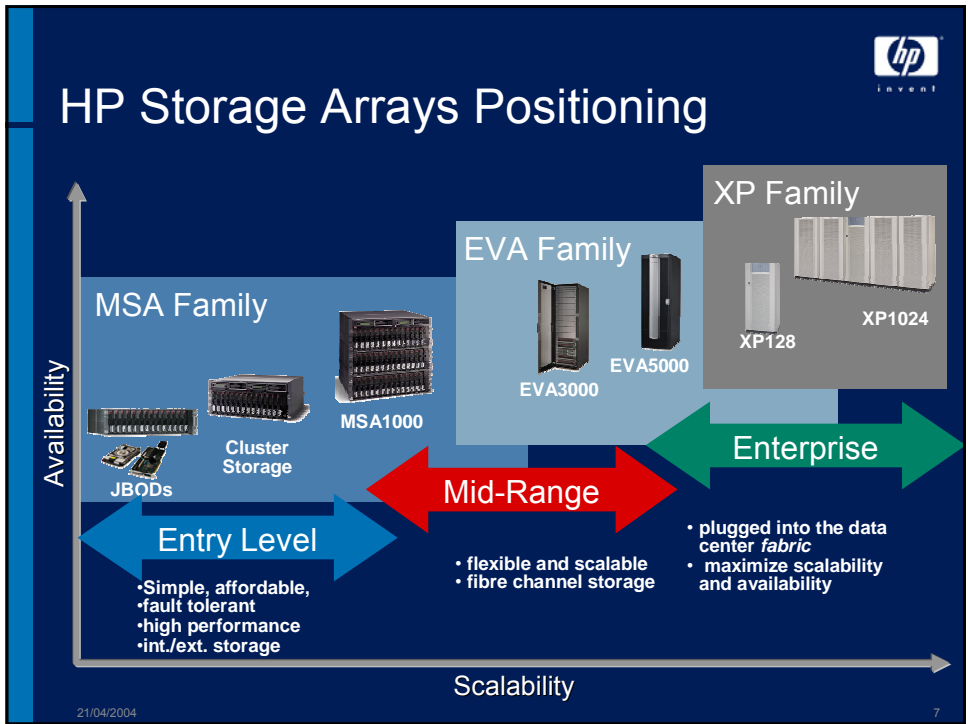
**Think
OUTSIDE the box:**

**Modular Smart
Array**

Simple, Affordable, Entry Level
Storage for Performance &
Consolidation



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Modular Smart Array 1000
Simple, Affordable **Fibre Channel SAN**

Simplicity Delivered

- Add servers as needed
- Add tape backup
- Add additional storage enclosures
- Add more disk drives

Cost Effective

- Consolidated Storage
- Integrated Backup and Restore
- ACU (Array Configuration Utility)
- Selective Storage Presentation

Data Security Assured


- Redundant Controllers, Power Supplies & Fan
- Option for redundant data paths
- Advanced Data Guarding
- Microsoft, Novell, and Linux Clustering

High Performance

- 2Gb Fibre Channel Infrastructure
- Up to 42 drive spindles for high I/Os
- Up to 1GB Battery Backed Cache

DtS Technology Embedded / Use MSA30 for Expansion!

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Modular Smart Array 500


Simple, Affordable **Direct Attached or Shared Storage**

Cost Effective

- Attaches to embedded Smart Array 5i Controller or 2nd channel on SA-532
- Everything included: cables, documentation,...

Simplicity Delivered

- Familiar Direct Attached Setup
- ACU (Array Configuration Utility)
- Takes advantage of OS clustering functionality



Data Security Assured


- Redundant controllers, power supplies & fan
- Option for redundant data paths
- Advanced Data Guarding
- Microsoft, Novell, and Linux Clustering

High Performance

- Ultra160 Smart Array Controllers
- Up to 512MB Battery Backed Cache
- Multi-path IO – load balancing

Conversion Path to Fibre Channel SAN – DtS Technology

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Modular Smart Array 30


Simple, Affordable **Direct Attached Storage**

Cost Effective

- Competitively priced JBOD
- Everything included: cables, documentation,...

Data Security Assured

- Redundant power supplies and fans
- Advanced Data Guarding



Simplicity Delivered

- Familiar Direct Attached Setup
- ACU (Array Configuration Utility)
- Universal Hard Drives


High Performance

- Deployed w/Ultra320 Smart Array Controllers
- Up to 512MB Battery Backed Cache

Deploy as expansion storage for the MSA1000

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Modular Smart Array Family *Common Usage Models*




The slide illustrates four common usage models for the Modular Smart Array Family:


- Direct Server Connection:** A server is connected directly to a storage array.
Simple Cost Effective
- Cluster or recovery server:** Two servers are connected to a shared storage array.
Simple 2-Node Cluster
- Shared SCSI storage:** Four servers are connected to a shared storage array.
4 Node Storage sharing
- Shared SAN storage:** Multiple servers are connected to a shared storage array via a SAN.
SAN with clusters an/or consolidated storage

Compaq confidential

Consistent Management reduces TCO





- **Array Configuration Utility (ACU)**
 - Provides a graphical view and wizards for array configuration
 - Supports on-line configuration
- **Selective Storage Presentation (SSP)**
 - Built-in to controller firmware and controlled via ACU
 - Allows setting of access rights between LUN and hosts
- **System Insight Manager (SIM)**
 - Powerful storage, server and server option management tool
 - Monitor storage from a remote central location
 - Full access from anywhere via Browser interface



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The MSA family value proposition



Investment Protection

- DAS-to-SAN Migration
- Central Management ProLiant server and storage

Reliability

- Data protected with RAID ADG (5DP)
- End-to-end redundancy

Scalability



- Modular, scales up to 6TB
- Simple storage consolidation

High Performance

- Smart Array Architecture
- Consistent TPC benchmark leadership

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Storage Area Networks advantages from storage consolidation



better disk capacity utilization

- average utilization in a DAS environment < 50%
- manage with less people (efficiency boost of up to 10x)

significantly shorter backup windows

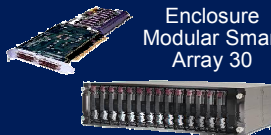
- drives and tape on the same storage network
- reduced LAN traffic

flexible environment for future growth


- add storage, switches, tape to the SAN while applications run
- as much redundancy as desired

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Modular Smart Array Seamless Data/Drive Migration



Smart Array plus Enclosure Modular Smart Array 30



Smart Array PCI RAID




Integrated Smart Array 5i

four easy steps to a SAN:


1. set up new SAN array.
2. move existing drives.
3. turn on servers and array.
4. create LUN security and GO!

- Universal disks migrate from DAS to cluster storage or SAN
- Smart Array generational consistency to migrate data
- ACU Ensures that
 - Data is preserved
 - No restore required
 - RAID level is maintained
 - Storage admin training re-used

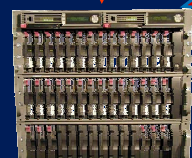
Modular Smart Array 500
Remote & Distributed Environments



Conversion to the SAN



DtS




Modular Smart Array 1000
Departmental/Data Center

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HP StorageWorks MSA Family positioning

Availability




MSA30

- External storage which teams up with SA controller embedded in server
- Scalability to multiple TB by cascading MSA30s
- Support on ProLiant x86, IA64 and Alpha platforms
- Host based virtualization*



MSA500

- Storage consolidation up to 4 servers via SCSI (SSP)
- Full redundancy with up to 2 array controllers
- Server clustering
- Scalability to 2TB
- Heterogeneous support on ProLiant x86 platforms
- Host based virtualization* and remote replication**



MSA1000

- Enhanced storage consolidation in a FC SAN (SSP)
- No Single-point of failure with up to 2 array controllers
- Multiple server clustering
- Expandability with MSA30 /scalability to 6TB
- Heterogeneous support on ProLiant x86, IA64 and Alpha
- Host based virtualization* and remote replication**

Scalability / Connectivity


*virtual replicator
**storage mirroring

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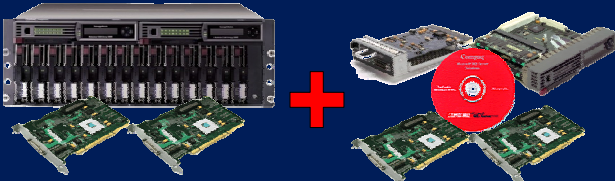


The MSA500 Purchase Process

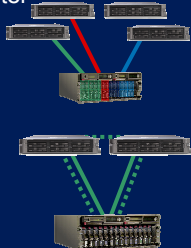
Packaged Bundles in 3 SKUs or less



Everything you need for a simple 2-node cluster



Everything you need for 4-node shared storage or Multipath 2-node cluster



MSA500 Starter Kit:

- MSA500 Enclosure
- 1 MSA500 Controller
- 2 Host Adapters
- Redundant Power Supplies
- Redundant Fans
- 2-6 ft. SCSI Cables
- 1 Ethernet Cable
- Configuration & Monitoring Software

MSA500 High Availability Kit:

- 1 MSA500 Controller
- 2 Host Adapters
- 4-port IO Module
- Smart Array Multipath Software
- 2-6 ft. SCSI Cables

Fully Redundant Storage System


Add cache memory, drives, and servers

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The MSA1000 Purchase Process

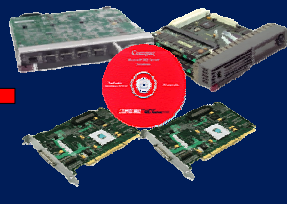
Packaged Bundles in 3 SKUs or less

Everything you need for a simple SAN



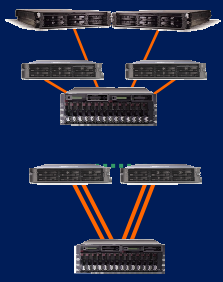
MSA1000 Starter Kit:
 MSA1000 Enclosure
 1 MSA1000 Controller
 2 Host Adapters
 1 FC SAN Switch 8
 Redundant Power Supplies
 Redundant Fans
 2-5m FC Cables
 1 Ethernet Cable
 Configuration & Monitoring Software

+



MSA1000 High Availability Kit:
 1 MSA1000 Controller
 2 Host Adapters
 1 FC SAN Switch 8
 SecurePath Multipath Software
 2-5m FC Cables

=



Fully Redundant SAN

Add Servers, enclosures, cache memory, drives, and servers

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Even: Packaged Clusters!

- Two ProLiant DL380 Gx servers (cluster nodes)
- MSA 500 or MSA1000 (shared storage)
- Sturdy, recyclable configuration fixtures
- Easy to connect SCSI and network cables or Fibre Cables
- Tool-less rails
- Easy to order, single part number, single box




DL380 Servers

+



MSA 500 or MSA 1000

→



DL380 packaged cluster



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MSA1000 Options



Base Unit:
 1 MSA1000 Controller
 Redundant Power Supplies
 Dual Power Cords
 Installation & Configuration Software
 1 copy of SANworks Virtual Replicator

FC I/O module
 Redundant Fans
 Documentation




 Modular Smart Array 30
 Capacity Expansion


 Enterprise Backup Solution
 LAN-Free Backup and Restore


 HA/F100 & HA/F200
 High Availability Cluster Kits


 Openview Secure Path
 Redundant Data Path Software


 OpenView Virtual Replicator
 Snapshot Backup & Restore


 OpenView Storage Mirroring
 Data Replication


 Fibre Channel Switch 8


 Redundant MSA1000 Controller


 Fibre Channel Host Bus Adapters


 256MB Battery Backed Cache


 Universal SCSI Hard Drives


 Care Pack Offerings
 3 Year 9x5
 3 year 24x7

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MSA500 Storage Options



Base Unit:
 1 MSA500 Controller
 Documentation
 Redundant Power Supplies
 Redundant Fans
 2-6 ft. SCSI Cables
 1 Ethernet Cable
 Installation and Configuration Software




 Smart Array Multipath Software

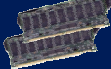

 OpenView Storage Mirroring



 OpenView Virtual Replicator


 Care Pack Offerings
 3 Year 9x5
 3 year 24x7


 4-Port Shared Storage Module


 MSA500 Controller


 256MB Battery Backed Cache


 Host Adapter:
 Embedded Smart Array 5i or
 Smart Array 532 Controller


 Universal SCSI Hard Drives

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NEW MSA30
OpenView Storage
Mirroring Kit

Making OS Migration easier



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Why Migrate to Windows Server 2003?

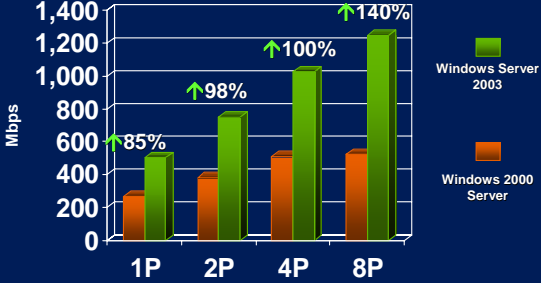


Consolidate Windows NT and Netware file servers to fewer Windows Servers

Performance & Scalability

- Improved Performance
- Improved Scalability
- Support for New Scalable Hardware

Over 2x Faster File Server – File Server



Configuration	Windows 2000 Server (Mbps)	Windows Server 2003 (Mbps)	Improvement (%)
1P	~280	~500	85%
2P	~400	~780	98%
4P	~550	~1100	100%
8P	~550	~1200	140%


Net Bench™ Benchmark

HP ProLiant DL760, 700 MHz Pentium III Xeon, 4 GB RAM,
Windows 2000 clients with Windows 2000 Server,
Windows XP SP2 with Windows Server 2003


Performance & Scale

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Open View Storage Mirroring

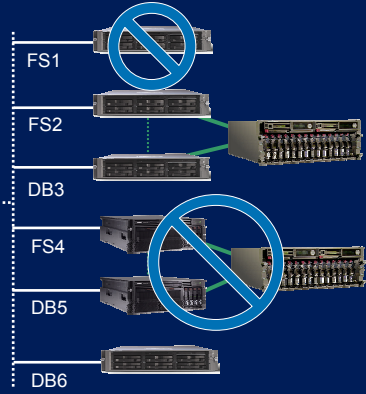


- Asynchronous data replication
- High availability server failover
- Offsite disaster recovery
- Back up and restore (disk to disk to tape)
- Data migration for seamless deployment of new servers



FS1
FS4
DB5


Remote sites

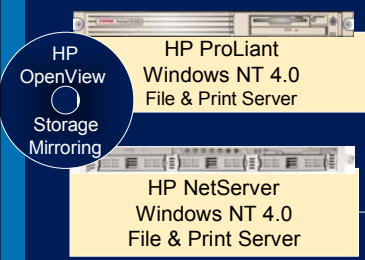


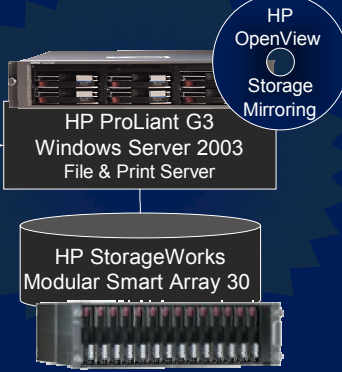
- Windows based software
- Works with existing network or remote connection

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How the MSA30 OpenView Storage Mirroring Kit Works – OS Migration Example.









1. Configure new HP ProLiant server with Windows Server 2003 and application(s)
2. Mirror data with HP OpenView Storage Mirroring
 - From older HP, Dell, or IBM systems
 - To new HP ProLiant with HP MSA Storage
3. Move users to new server – or – break the mirror, users


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Coming in May!
Modular Smart Array
Family Update



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Modular Smart Array 500 G2



What's NEW!

- 4-node clustering support
- 2X Performance Increase
- 5X Drive Rebuild Acceleration
- Ultra320 SCSI
- 256MB Cache Standard


- **High performance**
 - Multipath I/O - load balancing
 - Ultra320 Smart Array Controllers
 - Up to 512MB battery backed cache
- **High availability**
 - Multipath IO – HBA & cable redundancy
 - Redundant controllers
 - Redundant power supplies & fan
 - Advanced Data Guarding (RAID ADG)
 - Pre-failure warranty
- **Zero cost connectivity**
 - Everything included: SA-642 adapters, cables, documentation
- **DtS conversion path to FC SAN**
 - Expand up to 6TB storage
 - Up to 16 host support

Easy to deploy

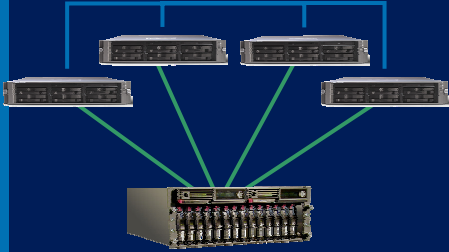
- Familiar Smart Array setup
- ACU (Array Configuration Utility)
- Packaged Cluster Option

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NEW Supported Configurations

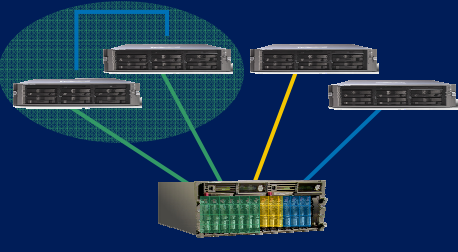


4-Node Cluster



- Single path
- Microsoft Windows Server 2003, Enterprise Edition


Mixed Clustering & Shared Storage



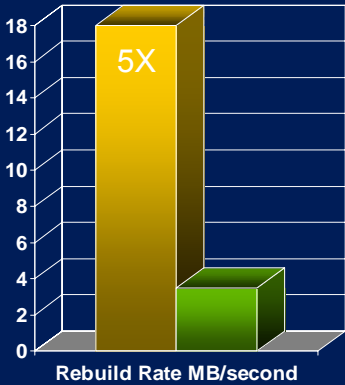
- Up to 4 hosts
- Selective Storage Presentation (SSP)
- Supports up to 32 LUNs

Compaq confidential

Accelerated Drive Rebuild



- *NEW* Rapid Drive Rebuild Technology
- 5X increased drive rebuild rate
- 32 minutes to rebuild 36.4 GB
- Faster rebuilds = higher availability
- Flexible rebuild priority configuration settings
 - Low, Medium, & High
- Test Configuration:
 - MSA500 G2: 15K rpm Ultra320 SCSI disk drives
 - MSA500: 15K rpm Ultra160 SCSI disk drives
 - 14 Disk Drives, Single Volume, RAID 5
 - Default rebuild priority (Medium) / No background IO activity

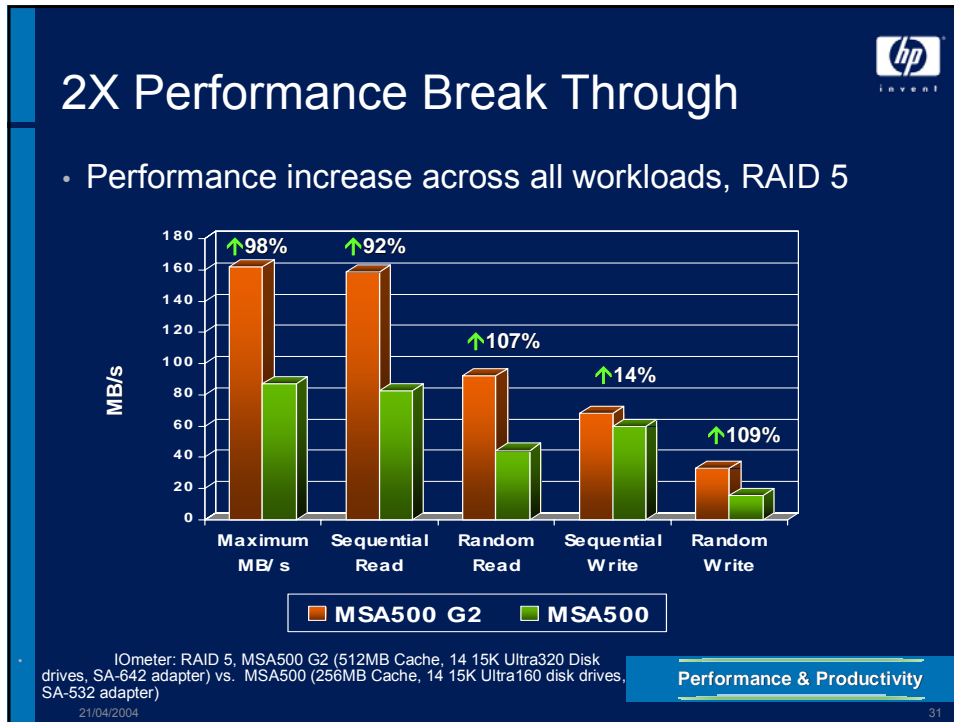


Rebuild Rate MB/second

■ MSA500 G2 ■ MSA500

Performance & Availability

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MSA30 G2

- Support for New I/O module for MSA30 (Integrity only)
- Allows JBOD clustering support (multi-initiator module) for Integrity Servers (IPF and PA-RISC), Linux and HP-UX)
- No ProLiant or Alphaserver support
- Universal drives & U320 support – competitive requirement
- Support on HBA only
 - LSI 1010 (U160)
 - LSI 1030 (U320)
- GS3 • Clustering NOT supported with Smart Array controllers
- Cost savings as result of leveraged sheet metal from MSA30 (5K extra units a year = economies of scale)

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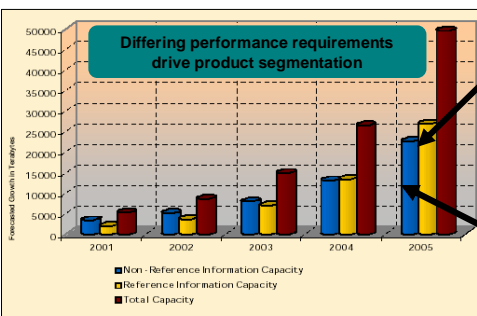
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GS3 What does "support on HBA only" mean.
We require Southern Cross to be support on both RAID and non-RAID HBAs as is DS2300. Note.
MI will not be supported via RAID card.
Graham Smith; 20.08.2003

And what is the next big challenge for the generation of MSA Storage?




Explosive Growth of Reference Data

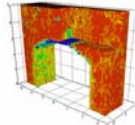
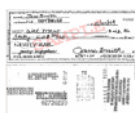


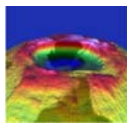
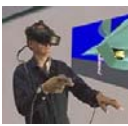

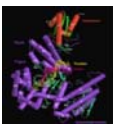

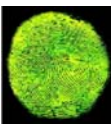



Year	Non-Reference Information Capacity (TB)	Reference Information Capacity (TB)	Total Capacity (TB)
2001	~5,000	~2,000	~7,000
2002	~8,000	~4,000	~12,000
2003	~12,000	~8,000	~20,000
2004	~18,000	~15,000	~33,000
2005	~25,000	~28,000	~53,000

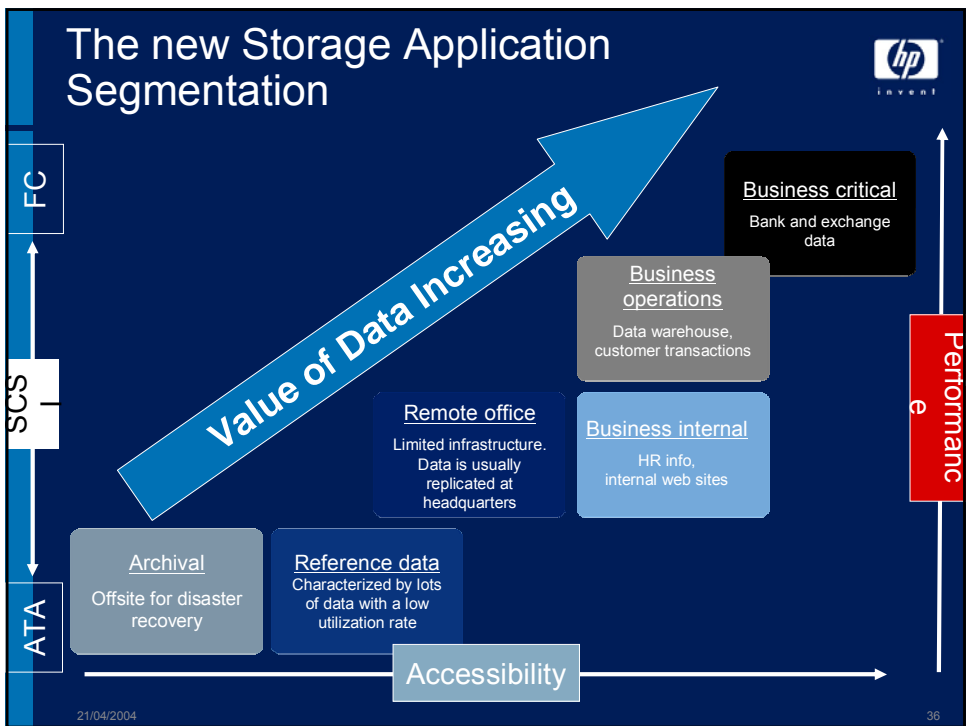
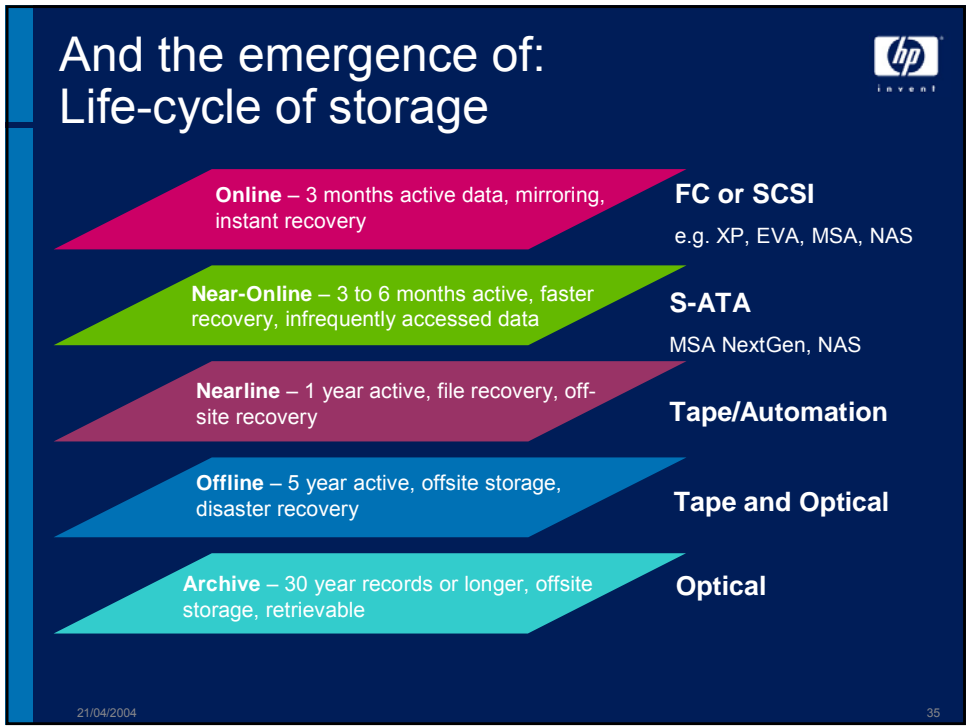
Differing performance requirements drive product segmentation

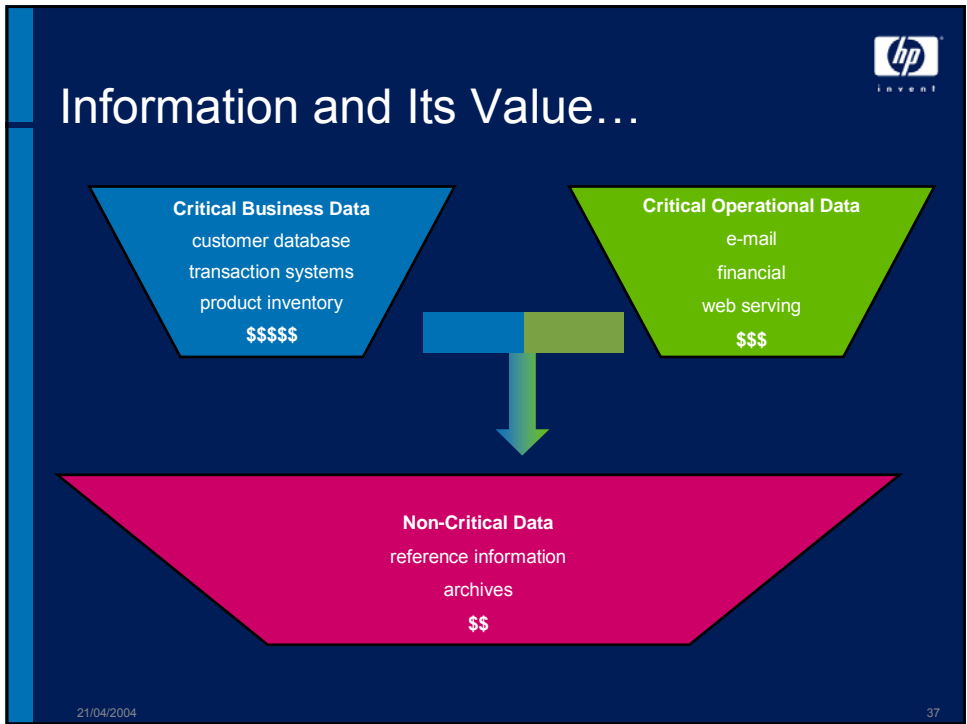
- Reference Data 92% CAGR
- Transactional Data 60% CAGR

- Reference data is growing at 92% CAGR compared to 60% for non-reference
- By 2005 reference data will exceed non-reference data
- Characteristics: data typically doesn't change with time
- Source: Enterprise Storage Group

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**Next Generation
Modular Smart Array**


The Serial Technology Revolution
begins...










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“50/50” - The Value Proposition


“What value classification is your data?”



‘Data is Data’	Data Value Varies	
 XP \$35/GB 20TB = \$700K	 XP \$35/GB 10TB = \$350K (50% active)	+ MSA NextGen \$3/GB 10TB=\$30K (50% reference)
		
 EVA \$25/GB 10TB = \$250K	 EVA \$25/GB 5TB = \$125K (50% active)	+ MSA NextGen \$3/GB 5TB=\$15K (50% reference)
		
 MSA1000 \$15/GB 5TB=\$75K	 MSA1000 \$15/GB 2.5TB=\$38K (50% active)	+ MSA NextGen \$3/GB 2.5TB=\$7.5K (50% reference)
		

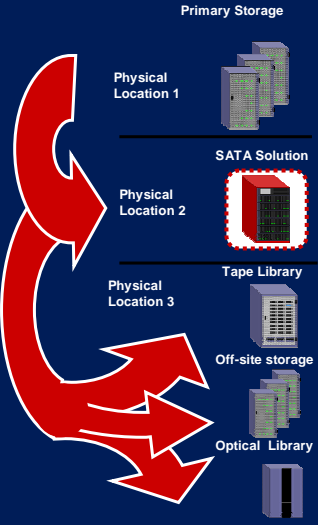
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Disk-2-Disk Backup & Restore



Three scenarios:

1. Backup and incremental backup's to MSA drive array then backup off-line to tape or optical, on/off-site
2. Full backup to tape then incremental backup to MSA drive array
3. Backup and restore to/from MSA drive array only (not recommended for full data protection solution)




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But all drives are not the same are they?




+

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No, there is more to the system, than just the interface!"




+

hp

Desktop and Enterprise Drives

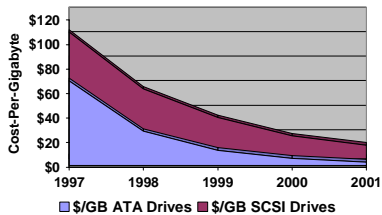
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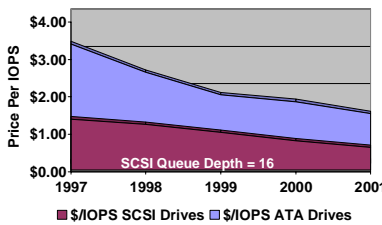
Two classes of disk drives: Built to meet two market requirements

- **ATA drives** are designed to meet the needs of PC and consumer applications:
 - Apps demand lowest cost per GB
 - Over the past 5 years, the price per GB of ATA drives has been less than half of SCSI drives
- **SCSI drives** are designed to meet the needs of mainstream servers, workstations, and RAID storage applications:
 - These apps require the lowest \$ per IOPS and high availability
 - Over the past five years, the \$ per IOPS of SCSI drives has been significantly less than ATA drives

ATA Disks: Best Cost-Per-Gigabyte




SCSI Disks: Best Price-For-Performance



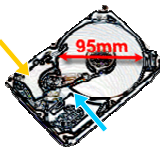
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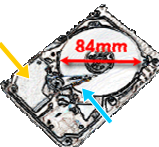
Disk Drive Design Trade-offs

7200 RPM HDD



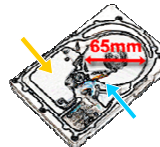
95mm

10K RPM HDD



84mm

15K RPM HDD



65mm

- RPM**
 - The higher the RPM, the better the access times due to lower rotational latency
 - The higher the RPM, the smaller the media size to maintain power consumption

Media Size

- Larger media provides greater capacity
- Larger media requires a lower maximum RPM to maintain rotational stability
- Larger media means longer seek times due to greater seek distances and smaller magnets

Actuator assembly

- The larger the actuator, the greater the seek time due to increased inertia


Actuator magnet

- The larger the magnet, the better the seek performance

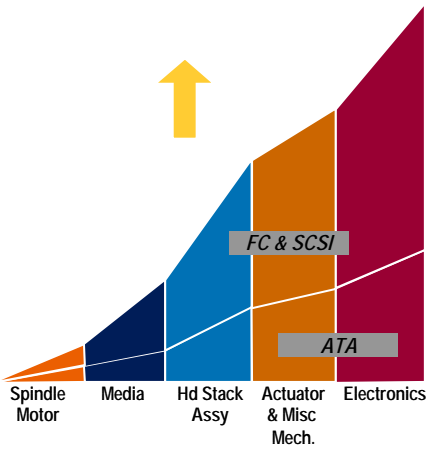
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More than Just an Interface: Desktop vs. Enterprise HDDs



Performance & Reliability



Electronics




Enterprise to Desktop Differences

Dual Processors
Perf. Optimization
Cmd. Sched. & RPS
Adv. Error Handling
Twice the Firmware

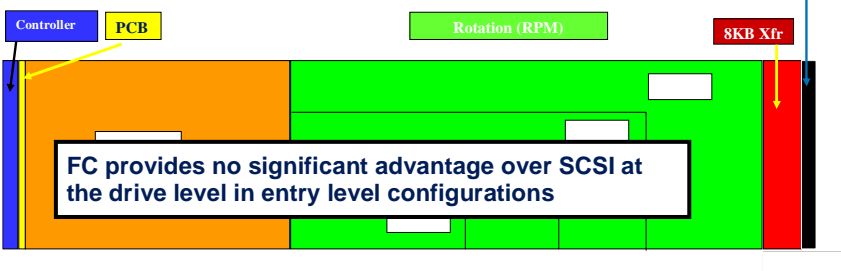
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Fibre Channel vs SCSI ??



- **FC has no significant advantage over SCSI for Entry Level Configurations!**
- → Performance (access time to data)
 - A Fibre Channel interface does not overcome the inherent mechanical latencies of a disk
 - 0.3% overall Performance Gain


SCSI Bus
 if this is an FC drive, this transfer time would be 1/2 of this black box. Less than 1% overall



FC provides no significant advantage over SCSI at the drive level in entry level configurations

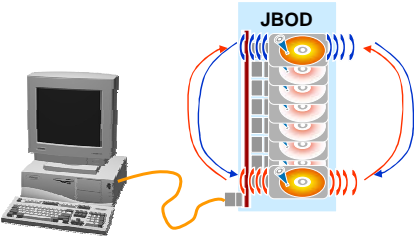
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Rotational Vibration: Enterprise drive reality!

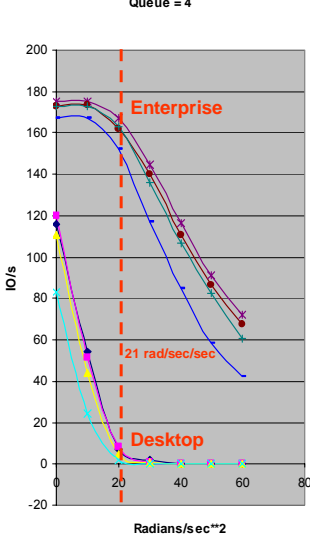


Mutual interference

- ◆ Increases the Seek time (track settle)
- ◆ Causes Actuator to Vibrate off track
 - Writes need to be aborted
 - Reads need to be retried



JBOD



Queue = 4

IO/s

Radians/sec²


Enterprise

Desktop

21 rad/sec/sec

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HDD Architecture: Key Take away



- **SCSI & FC – Enterprise Storage**
 - Performance & Reliability
 - 24x7 Reliability, 80-100% duty cycle
 - Performance & RV limiting features
- **ATA – Personal Storage**
 - Capacity & Cost
 - 8hrs @ 10% (moving to 30%) duty cycle
 - Lowest Cost for Bulk Storage
- **Serial = Scalability of Architecture**
 - SAS → SCSI reliability + serial scalability + greater performance
 - SATA → ATA reliability + serial scalability

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Any Questions??

