Session 3418:
Meeting New Business Challenges with Serial Storage

HP WORLD 2004
Solutions and Technology Conference & Expo

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Agenda

- Today's Business Challenge

- Diverging Requirements

- Serial Technology Solves the Problem

- Improve Data Center Efficiency to Lower Cost

- Q&A

Agenda

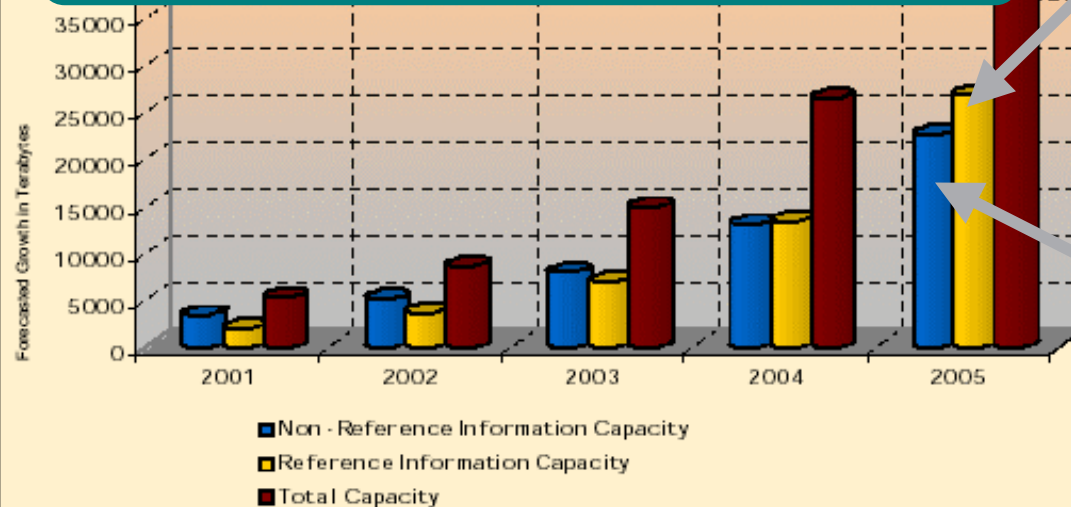- **Today's Business Challenge**

- Diverging Requirements
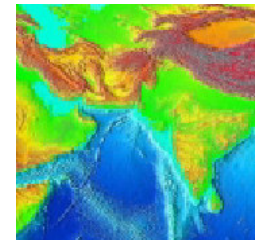
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Consumption of Storage Grows
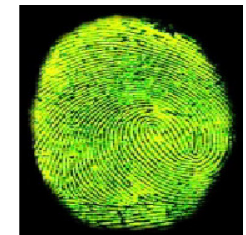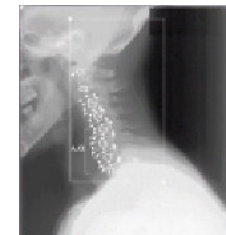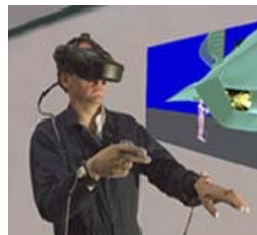
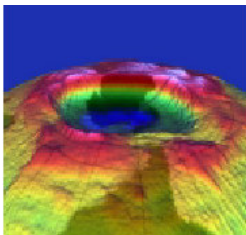**Differing performance requirements drive product segmentation**

Reference Data 92% CAGR

Transactional Data 60% CAGR

- Non - Reference Information Capacity
- Reference Information Capacity
- Total Capacity
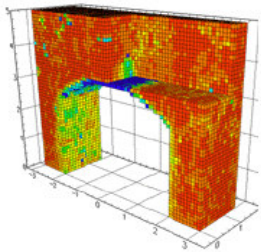
Changing Regulatory Environment

External forces are tightening regulatory requirements resulting in immediate retrieval of corporate data, ie email or financial

4 significant regulations drive data retention:
1. Sarbanes-Oxley
2. Health Insurance Portability and Accountability Act (HIPAA)
3. Grahams-Leach-Bliley
4. US Patriot Act

•New data storage and retention policies are forcing data center managers to comply with new policies while running a 24 x 7 operation

Slow Reaction to Compliance Initiatives

Jan'04 IDC Survey

15%

35%

50%

- Taken No Action
- Learning or Planning Compliance
- Investing to Become Compliant
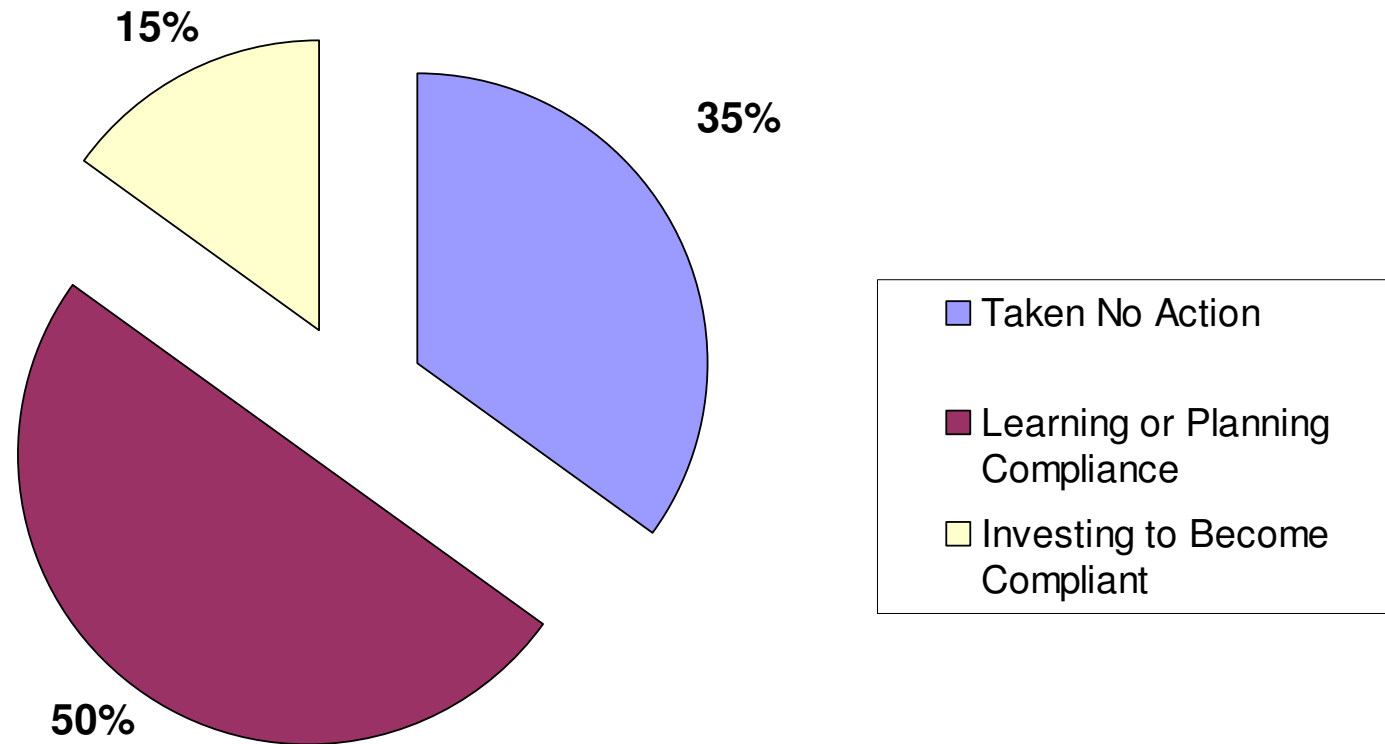
Source: Jan'04 IDC Survey of 400 companies

- 35% of surveyed companies have taken no action to comply

Acute Focus on Cost

Traditionally

• Management of hardware was greatest concern

New Awareness

• Ever increasing focus on reducing data center costs by:

– consolidating locations, personnel and hardware

– utilizing rack optimized hardware to consolidate space

– improving I/O density per cubic foot of space (IOPS-per-U)

Consolidation is Top-of-Mind

**Importance of consolidation
of server / storage hardware**

Somewhat
12%

Not very
3%

Absolutely
Critical
23%

Very
29%
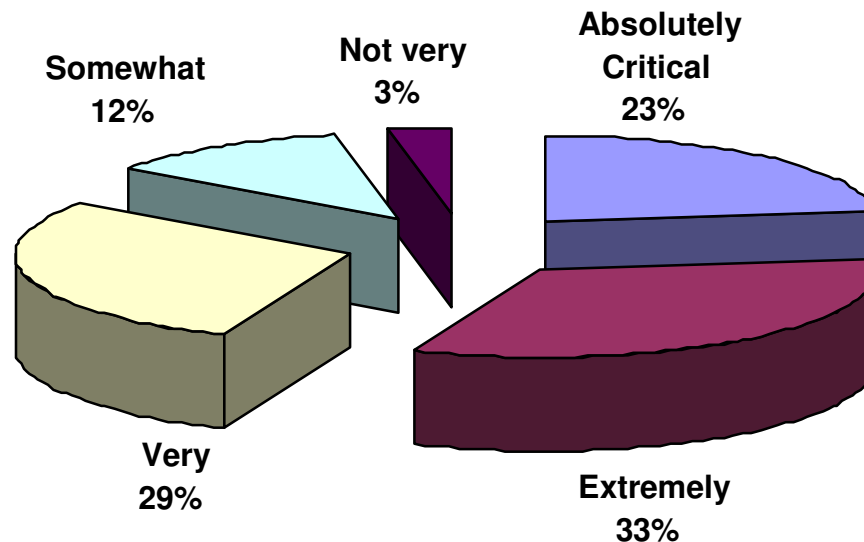
Extremely
33%

Source: Intelliquest Survey Fortune 1000 Data Centers

- Fortune 1000 Data Centers are looking to simplify
- 85% stated server and storage consolidation very, extremely or absolutely critical

Changing Storage Landscape

today: Fibre Channel

Mission critical Network storage

Parallel SCSI

tomorrow: SAS and small form factor HDD

Mission critical high density storage

Mission critical server storage

Parallel ATA

today: SATA

Near line or reference data

Lowest cost Server storage
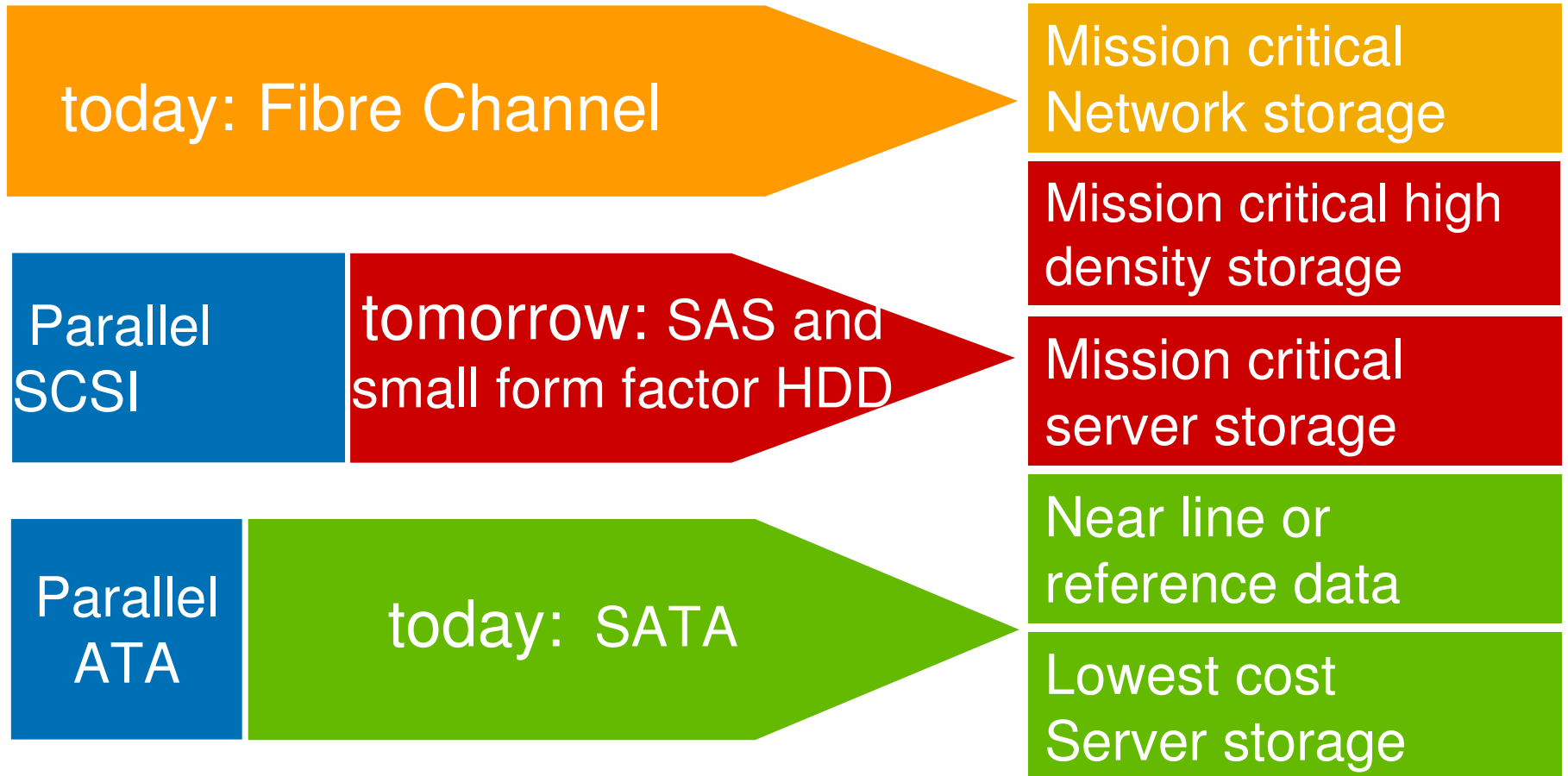
- Sophisticated business requirements are moving us away from "One Size Fits All"

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Moving Beyond Capacity

End-user requirements are changing

- Historically… storage performance and interface choice was **capacity driven**

- Today… The performance and interface choice is driven by **customer requirements…**
  - IOPS performance
  - reliability
  - application
  - capacity
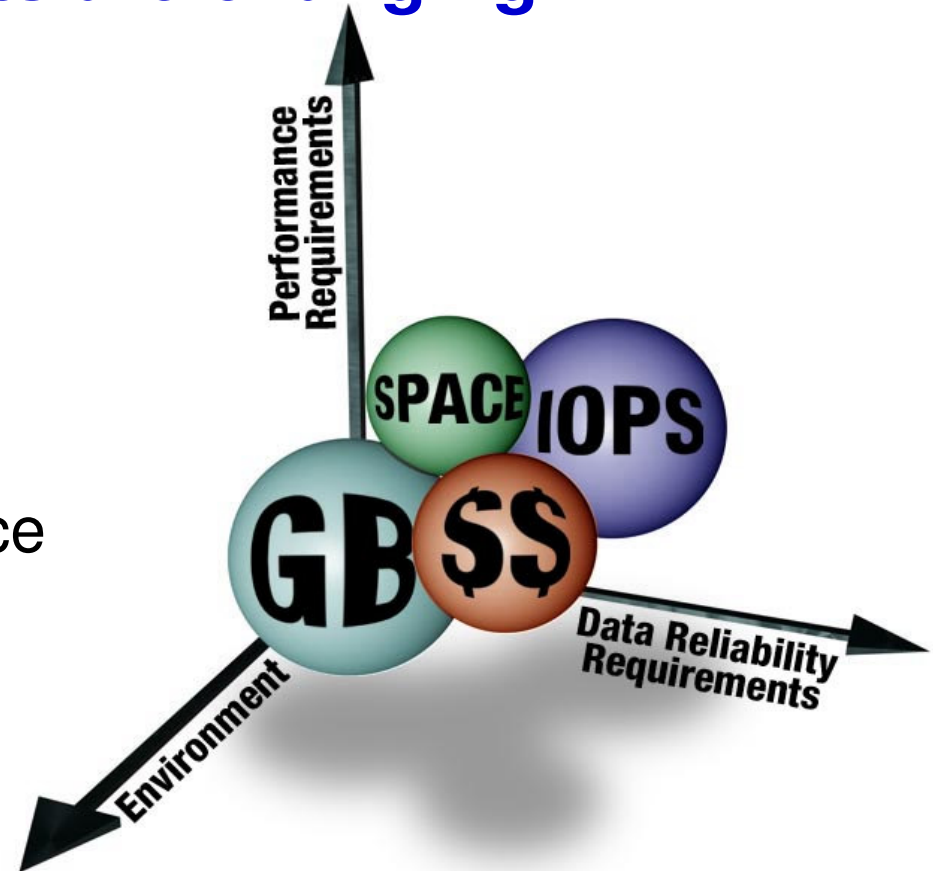
Enterprise Capacity / Drive Trend

Trending Capacity / Drive Offered

Max Capacity 15K

Max Capacity Small Form Factor (SFF)

Average Capacity / Drive Demanded by End-User

Capacity

Today
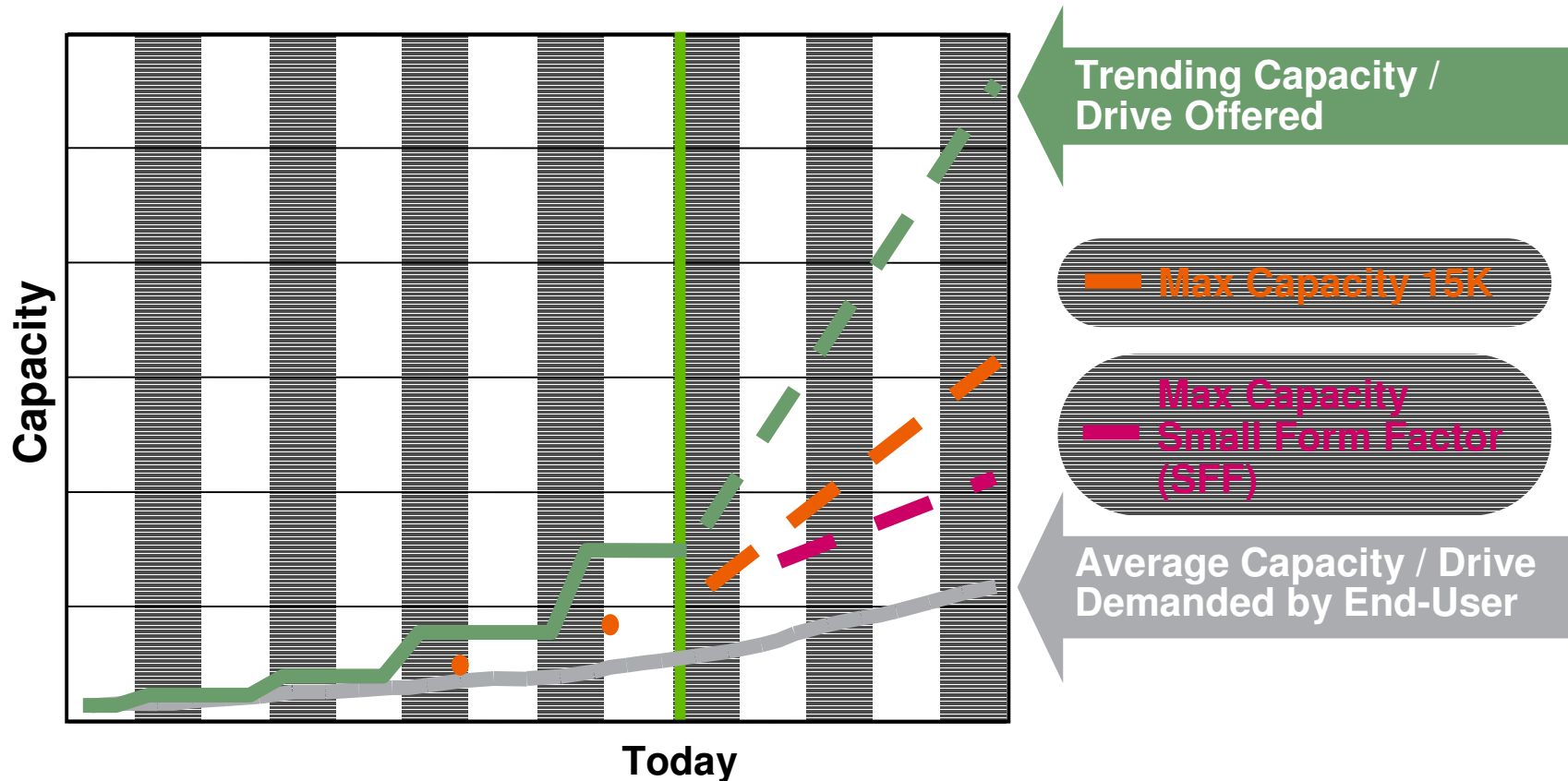
Efficiency and economics drive volume market to 15K and SFF

Pools of Storage

Cost of ownership is becoming an operations and infrastructure challenge

Transactional   **Reference Data**   **Staging and spooling**   **Archive**

*IT Managers are increasingly viewing data resources as "**Pools of Storage**" with differing characteristics to meet a range of application and cost requirements*

Market Segmentation Model

	Description
Networked Storage	
Server Storage	Mission Critical Enterprise
High Density Storage	
Fixed Content/Near-line/Tape	Non-mission Critical Enterprise
Low Cost Server	
PC Commercial	
PC Consumer	Personal Computer
Notebook	
PVR	
Gaming/Audio/Other	Consumer Electronics
Handheld	

- In general, storage is entering a "mature" partition of the lifecycle continuum

HDD Market Segmentation

Networked Server High Density Storage	Mission Critical Storage
Critical To Customers	• Transactional Performance • Guaranteed Availability • Mission Critical Reliability
Driving Metrics	• IOPS per GB (Performance/Cap.) • IOPS per U (Performance Density)
Platforms For Products	FC, SAS, SCSI 10K - 15K RPM Access time: < 5.7ms Duty Cycle: 24 x 7x 365

HDD Market Segmentation

Near-line or Reference data Low Cost Server	Non-mission Critical Enterprise
Critical To Customers	• Sequential Performance • High Capacity • 9-5, 5 days a week reliability
Driving Metrics	• $ per GB (TB solutions) • $ per GB (Small Capacities; Cost)
Platforms For Products	Near-line or Reference data & Low Cost Server SATA, ATA 7.2K RPM Access time: < 13ms Duty Cycle: 8 to 10 hours, 5 days a week

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Existing Disk Interconnects Need to Change

- Signaling rates going **faster** than parallel architectures can support.

- Box densities are getting **smaller**
  - Blades servers gaining momentum
  - Disks are transitioning from 3.5" to 2.5"
  - Desktop and laptops continue shrinking
  - Existing connectors are too big!
  - Disk drives are required to consume less power to ease cooling

- Semiconductor process technologies are changing to <5V voltage requirements
  - ATA and SCSI requires a 5V tolerant process

Serial Architecture is the Solution

- Today's Businesses Require More from the IT Infrastructure

  - Greater Scalability

    - Greater physical device addressing range

    - Connection to out-of-box storage, greater I/O cable length

- Greater Device Flexibility

- Support for Serial Attached SCSI and Serial ATA devices

- Highest reliability and availability

  - More extensive error recovery techniques

  - Multi-initiator (simultaneous access) + Dual-active port support

What is Serial Attached SCSI (SAS)

- SAS is the next evolution of the SCSI interface

- SAS combines best-of-class attributes

  - Parallel SCSI (command set)

  - Fibre Channel (frame formats)

  - SATA (physical characteristics)

- SAS expanders provide scalability beyond SCSI and SATA today

- Ideal for transactional data storage in enterprise environments

SAS is a Point-to-Point Interface

Write

At the same time

Read

2 Channel Controller

HBA

Power Supply
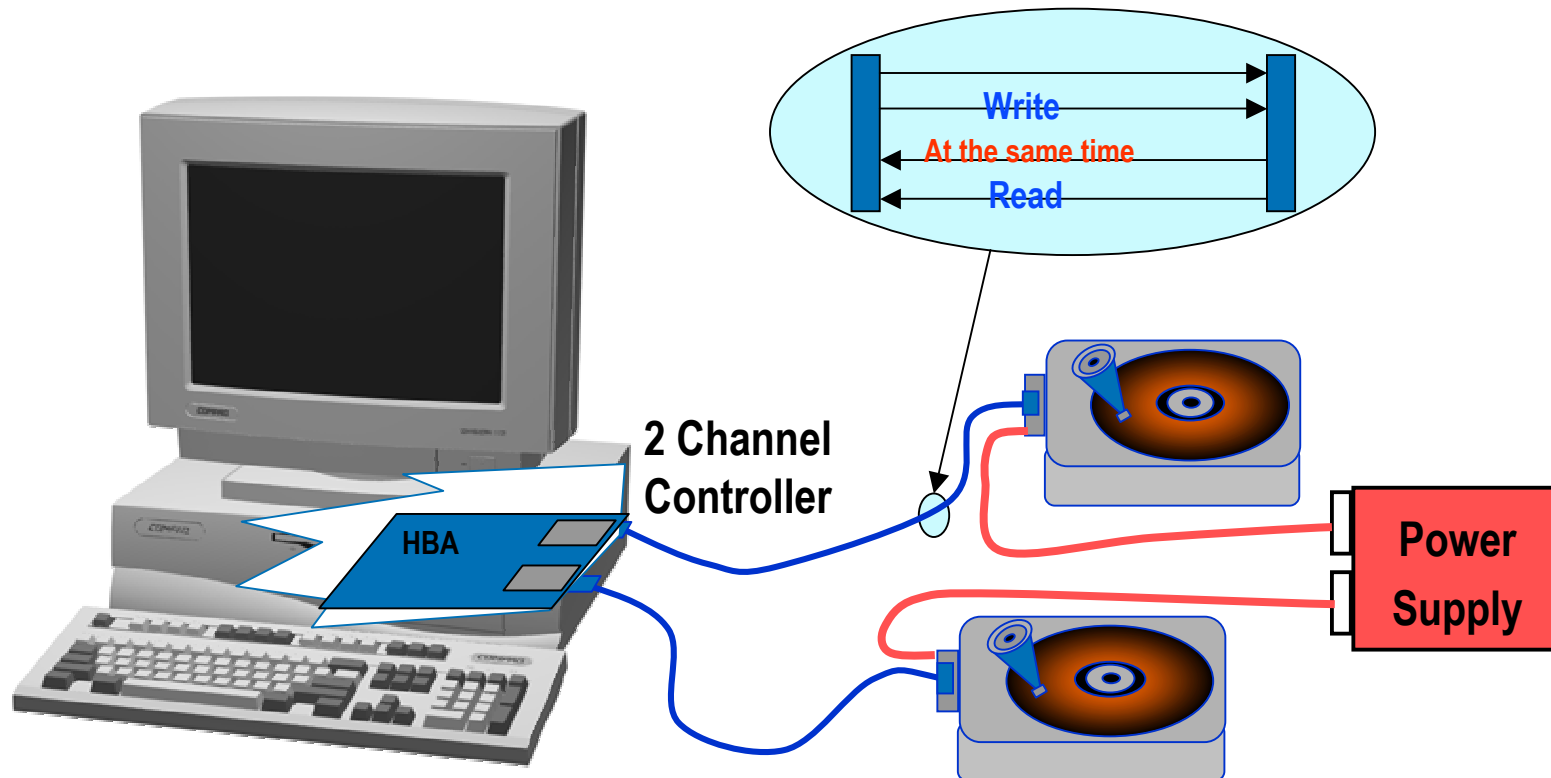
- Single or multi-channel HBA connected to individual drives.
- Drives normally installed in the same cabinet as the HBA or in a JBOD
- Each port has 4 data wires, 2 output and 2 input (differential)
- Full Duplex capability on Data/Data and Command/Data

Serial Technology Benefits

Parallel
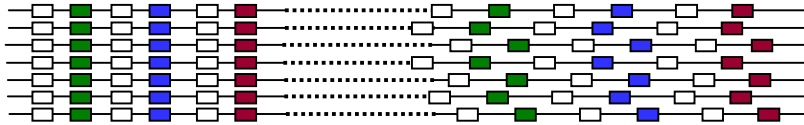
Serial

Technology Features	System Benefits
Embedded clock	Ease of design
Point-to-point topology	Dedicated, scalable throughput
Performance beyond ATA & SCSI	Improved overall bandwidth
Thin cables	Improved chassis air flow
Fewer signals	Simplified backplane routing

Serial Product Positioning

Serial ATA

- Low cost
- Single drive, single user focus

Serial Attached SCSI (SAS)

- Private, local peripheral attachment
- Parallel SCSI replacement
- Highly Scaleable

Fibre Channel

- Very high performance or large scale attachment
- SAN

Importance to the End User?

- Choice drives the heart of infrastructure
  - Customize storage by application and customer requirements
  - Provide industry leading flexibility as an industry standard
- Minimize costs (acquisition and Total Cost of Ownership)
  - Service pools of hardware can be minimized/standardized
  - Customers standardize infrastructure (electrical and physical connections)
  - SATA targets best cost per Gigabyte
  - SAS targets TCO
- Exceeding the customer requirement
  - Software compatibility with SCSI command set while scaling to meet performance and capacity requirements
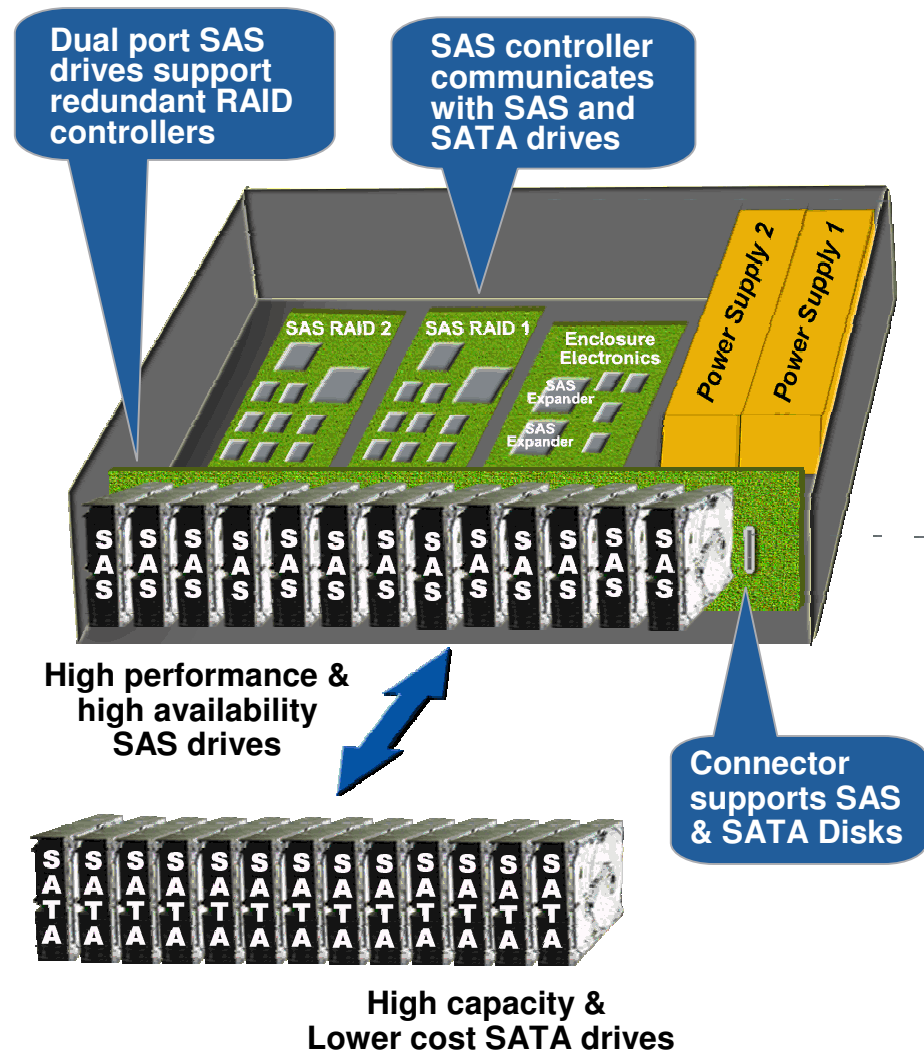
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Lower TCO Through Standardization

- Lower Total Cost of Ownership (TCO) through standardization

- IT managers configure systems based on applications

  – SATA drives for Mid-line & Near-line applications

  – SAS drives for Online, transactional applications

Dual port SAS drives support redundant RAID controllers

SAS controller communicates with SAS and SATA drives

Power Supply 2

Power Supply 1

SAS RAID 2   SAS RAID 1   Enclosure Electronics

SAS Expander

SAS Expander

SAS

High performance & high availability SAS drives

Connector supports SAS & SATA Disks

SATA

High capacity & Lower cost SATA drives

# SAS Enables Mixed Online/Nearline Apps

Dual Port SAS drives for networked file storage

Dual port SAS drives for main stream, enterprise storage applications

SATA drives integrate disk to disk backup within the RAID array or server to shorten backup and restore times

Serial Attached SCSI will support mixed classes of disk drives within a single JBOD or RAID enclosure
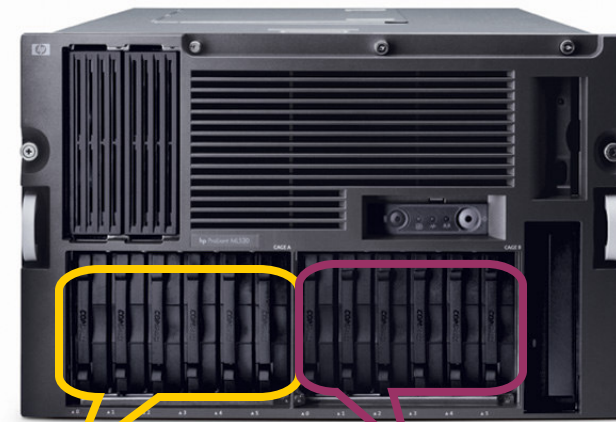
SAS drives

**SATA drives**

Enterprise Software Support

SAS deployment is simple / inexpensive

- SCSI command set is robust and stable
  - 20 years of investment and enhancements
  - Extensive IT management experience

- Entrenched software base
  - Management utilities
  - Broad operating system support

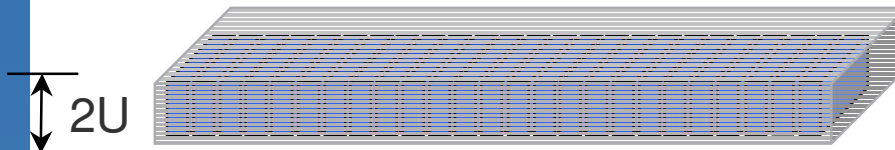- The SCSI protocol is pervasive in servers & enterprise storage
  - FC, iSCSI, IB…

SAS Creates Smaller Systems
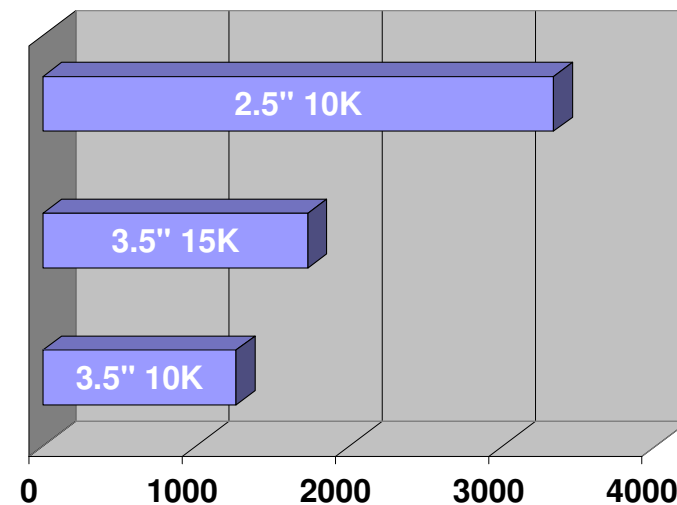
14 x 3.5" Drives in 3U

3U
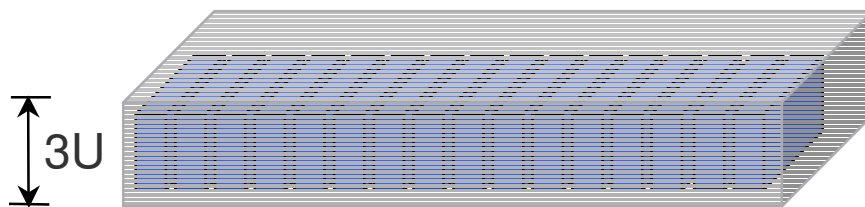
25 x 2.5" Drives in 2U

2U

- 2.5-inch SAS drives create higher density systems offering the fastest IOPS-per-U

- Smaller system sizes conserve costly data center space

- Typical data center cost = $500/ft^2 to over $1,000/ft^2

IOPS Per U

2.5" 10K			
3.5" 15K			
3.5" 10K			

0   1000   2000   3000   4000

SAS Helps Lowering TCO

SAS improves TCO by:

- Transacting more business and speeding end-user access to data

- Conserving data center space when smaller (SFF) systems are deployed

- Standardizing hardware allowing both disk drive types, SAS & SATA to reside in the same box

- Continuing to support the SCSI command set

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