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## Vortrag 1C09 Was gibt es Neues bei EMC<sup>2</sup>

Ralf Sczepanski EMC Deutschland GmbH

- Architecture
- Performance
- Availability
- Functionality
- Economics

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### Agenda

- ILM
- Symmetrix Update
- Clariion Update
- EMC Software Update

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# Information Lifecycle Management

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## Key Challenges of Information Management

<b>Information growth is relentless</b>	<b>1</b> Scaling infrastructure within \$\$\$ constraints
<b>Information is more strategic than ever</b>	<b>2</b> Scaling resources to <i>manage complexity</i>
<b>Information changes in value over time</b>	<b>3</b> <i>Access, availability, and protection</i> of critical information assets
	<b>4</b> Reducing risk of <i>non-compliance</i>
	<b>5</b> Ability to <i>prioritize information</i> management based on data value

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## Information Lifecycle Management Definition

### Information Lifecycle Management

*A strategy for proactive management of information that is:*

1. Business-centric
2. Unified across all data
3. Policy-based
4. Heterogeneous
5. Aligned with data value

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## Information Lifecycle Management Process

```
graph LR; A["Classify  
data / applications  
based on business  
rules"] --> B["Implement  
policies with  
information  
management tools"]; B --> C["Manage  
storage  
environment"]; C --> D["Tier  
storage resources  
to align with data  
classes"]; subgraph Frame; A; B; C; D; end; Frame --- AUTOMATED; Frame --- FLEXIBLE;
```

**Classify**  
data / applications based on business rules

**Implement**  
policies with information management tools

**Manage**  
storage environment

**Tier**  
storage resources to align with data classes

**AUTOMATED**

**FLEXIBLE**

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## Information Lifecycle Management Requirements

- Application Services**  
*Availability*
- Content Services**  
*Access*
- Data Management Services**  
*Continuity and Migration*
- Data Delivery Services**  
*Mobility and Transparency*
- Platform Services**  
*Specialization*

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## Information Lifecycle Management Offerings

Services	Storage Management	Information Management Software <i>Content Management</i> <i>Data Management</i>
		Infrastructure Software
		Networked Storage Platforms

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### EMC/LEGATO/Documentum: Software Portfolio

Enterprise SRM	Storage Resource Management	ControlCenter Family / VisualSAN / VisualSRM			
	Storage Infrastructure Software	Distributed filesystem	Celerra HighRoad		
		Volume management and virtualization	PowerPath Volume Manager		
		Application monitoring and availability (clustering)	Application Availability Manager / Co-Standby Server		
		Network load balancing	PowerPath		
		On-board replication	SRDF / TimeFinder / SnapView / MirrorView / SAN Copy		
		Server-based replication	RepliStor		
Information Management Software	Data Management Software	Backup and recovery	EDM	NetWorker	
		Media management	AlphaStor		
		Replication management	Replication Manager / Symmetrix Data Mobility Manager		
	Content Management Software	HSM and archive	Avalon	DiskXtender / ArchiveXtender	
		Document management	Application-Xtender	Content Server, Content Intelligence Services, Content Services for Applications / Workflow Mgr	
		Records management	Records Manager, Records Services for e-mail		
		Digital asset management	Content Server, Rich Media Services		
		Collaboration	OnCourse	eRoom / Real-Time Services	
		Compliance / message management	EmailXtender	Doc Control Manager / CXPharma	
		Web content management	Content Exchange Services / Web Publisher		

■ EMC ■ LEGATO ■ Documentum

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<\$10K
>\$3M

### Scalable, Best-of-Breed Platforms

*“Consolidation with DMX has helped us reduce storage costs by almost 80%.”*  
— EarthLink

*“Centera and CLARiiON are the foundation for our business continuity strategy.”*  
— Rogers Medical

## EMC's Networked Storage Platforms

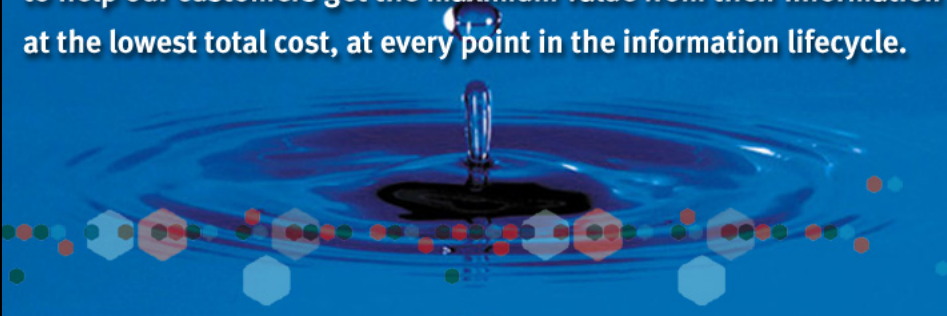
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**EMC's Vision**

To create the ultimate information lifecycle management company...  
to help our customers get the maximum value from their information  
at the lowest total cost, at every point in the information lifecycle.



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**Symmetrix DMX 2**

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## EMC's ILM Offerings

**STORAGE MANAGEMENT**  
ControlCenter  
Visual






**OPEN SOFTWARE**

**INFORMATION MANAGEMENT**  
Documentum D5 Family, LEGATO NetWorker and Xtender Families, Replication Manager


**INFRASTRUCTURE SOFTWARE**  
PowerPath

**NETWORKED STORAGE PLATFORMS**

**PLATFORM SOFTWARE**  
SnapView, TimeFinder Families – Local Replication  
MirrorView, SRDF Families – Remote Replication

CLARIION	SYMMETRIX	CONNECTRIX	NS/CELERRA	CENTERA
 SAN and NAS Both FC and ATA	 SAN and NAS High End	 SAN	 NAS	 CAS

**SERVICES, SOLUTIONS, PARTNERS**



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## Symmetrix DMX: High-End Storage Defined

### High-End Requirements

- Non-disruptive everything
  - Upgrades, operation, and service
- Predictable performance
  - Sustained, burst, replication
- Replicate any amount, any time, anywhere
  - Replicate any amount data, across any distance, without impact to service levels
- Flexible scalability
  - Capacity, performance, connectivity, workloads
- Manage service levels
  - Centralized management of the storage environment



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## Symmetrix Q1/2004 Announcement

- For all Symmetrix DMX Systems:
  - 32 GB Global Memory Directors
    - Doubles maximum global memory on all DMX system (up to 256GB on DMX2000/3000)
    - Memory requirement can be configured with fewer directors
  - 73 GB 15,000 rpm disk drives
    - 30% reduction in response time
- Enginuity 5670+ Service Release (5670.66.62)
  - Native RAID 5, with Symmetrix Optimizer support
  - Customer-proven NDU – *unmatched by any competitor!*
- Symmetrix DMX-2 Configurations
  - Premium-priced performance option for all DMX series systems
    - 2x faster processors on Fibre and MPCD directors
  - DMX-2 directors cannot be intermixed with DMX directors
    - Exception is ESCON
  - Data-in-place upgrade will be offered to DMX installed base
    - Requires off-line swap-out of all directors

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## Symmetrix DMX Series Architectural Specifications

**Direct Matrix Interconnect**

- Up to 128 direct paths from directors and memory
- Up to 64 GB/s data bandwidth
- Up to 6.4 GB/s message bandwidth

**Dynamic Global Memory**

- Up to 256 GB global memory
- 500 MB/s per memory region
- Up to 32 memory regions

**Enginuity Operating Environment**

- Continuous availability
- Performance optimization
- Advanced management
- Foundation for powerful functionality
- Integrated SMI-S compliance

**Processing Power**

- Up to 116 PowerPC processors
- Four processors per director (1 GHz or 500 MHz)

**High-Performance Back End**

- Up to 64 2 Gb/s Fibre Channel paths
- Up to 12.8 GB/s maximum bandwidth
- RAID 1, RAID 5, Parity RAID data protection options

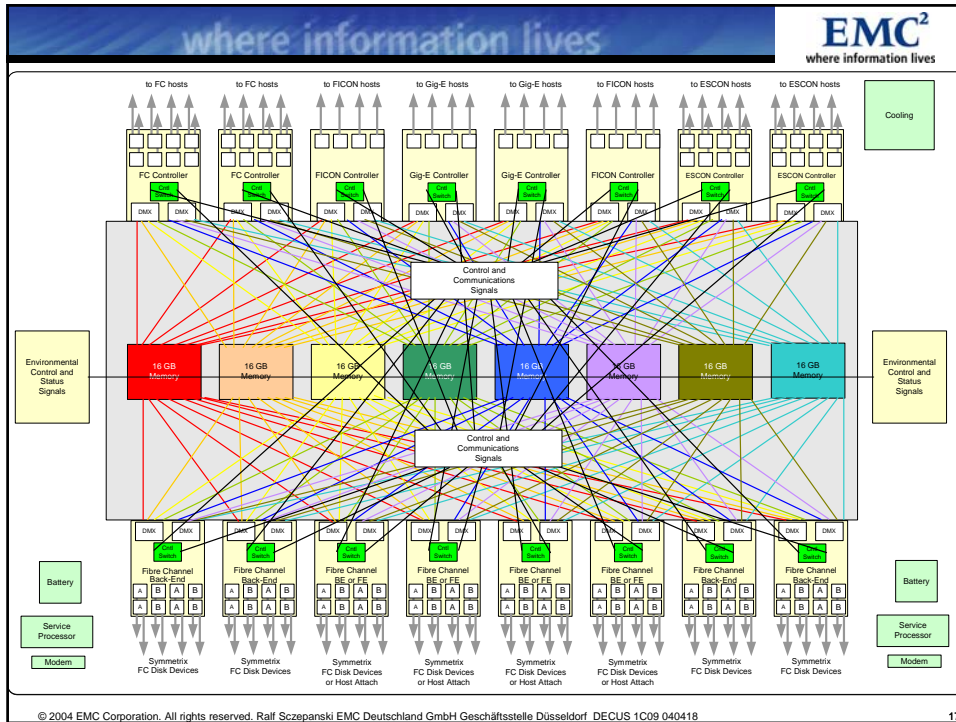
**Fault-Tolerant Design**

- Non-disruptive upgrades and non-disruptive operations
- TMR-MV memory logic
- 2(N+1) power redundancy
- Integrated battery backup
- Dual ported disks


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## Symmetrix DMX Series Enterprise Connectivity




- 2 Gb Fibre Channel**
  - UNIX, Windows, Netware, Linux, IBM iSeries
  - Direct and SAN attach, SRDF links
- ESCON**
  - Mainframe and SRDF links
- 2 Gb FICON**
  - High performance for mainframe
- Native Gigabit Ethernet**
  - For SRDF replication
  - Supports compression
- Native iSCSI**
  - Industry's first high-end implementation
- NAS gateway**
  - Celerra CNS
  - NS700G NAS gateway

**The E-Lab Promise:**  
We conduct the industry's most comprehensive interoperability testing, to give you the highest level of interoperability assurance. And we support every configuration we qualify—no disclaimers, no excuses.

<http://www.emc.com/horizontal/interoperability/index.jsp>

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## Symmetrix DMX Series

### Integrated Storage Arrays

#### Symmetrix DMX1000/DMX1000-M2

- Up to 48 host connections (Fibre Channel, ESCON, FICON, Gigabit Ethernet, iSCSI)
- Up to 128 GB Global Memory
- 16 2 Gb/s Fibre Channel back-end loops
- Supports up to 144 drives (21 TB)

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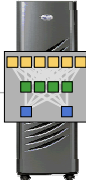
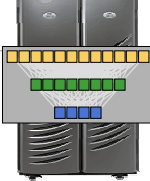
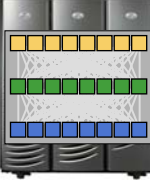
#### Symmetrix DMX2000/DMX2000-M2

- Up to 96 host connections (Fibre Channel, ESCON, FICON, Gigabit Ethernet, iSCSI)
- Up to 256 GB Global Memory
- 32 2 Gb/s Fibre Channel back-end loops
- Supports up to 288 drives (42 TB)

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#### Symmetrix DMX3000/DMX3000-M2


- Up to 64 host connections (Fibre Channel, ESCON, FICON, Gigabit Ethernet, iSCSI)
- Up to 256 GB Global Memory
- 64 2 Gb/s Fibre Channel back-end loops
- Supports up to 576 drives (84 TB)

**M2 Models provide two-times the processing power**

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## Symmetrix DMX Series

### Ultra-Performance Models



#### Symmetrix DMX1000-P2

- Up to 32 host connections (Fibre Channel, ESCON, FICON, Gigabit Ethernet, iSCSI)
- Up to 128 GB Global Memory
- 32 2 Gb/s Fibre Channel back-end loops
- Supports up to 144 drives (21 TB)

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#### Symmetrix DMX2000-P2

- Up to 64 host connections (Fibre Channel, ESCON, FICON, Gigabit Ethernet, iSCSI)
- Up to 256 GB Global Memory
- 64 2 Gb/s Fibre Channel back-end loops
- Supports up to 288 drives (42 TB)

### P Models for Ultra Performance

- 2x back-end disk directors and disk channels
- Half as many drives per channel
- Ideal for heavy sequential I/O workloads

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## Engenuity Operating Environment

### Industry's Most Trusted Storage Operating Environment

- Continuous availability
  - Non-disruptive operations and upgrades
- Data integrity
  - End-to-end monitoring
  - End-to-end protection
- Performance optimization
  - Dynamic Mirror Service Policy
  - Quality of Service Prioritization
  - Workload optimization
  - Burst optimization
- Advanced management
  - EMC ControlCenter
  - Platform-independent APIs and CLIs
  - Integrated SMI-S compliance
- Foundation for powerful functionality
  - TimeFinder and SRDF families
  - ControlCenter's Symmetrix Optimizer



Engenuity

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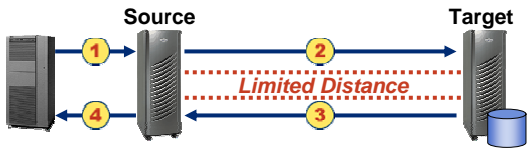
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## Symmetrix Remote Data Facility

### The Most Comprehensive Remote Replication Family of Products

#### SRDF/S


- No data exposure
- Some performance impact
- Limited distance



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#### SRDF/A

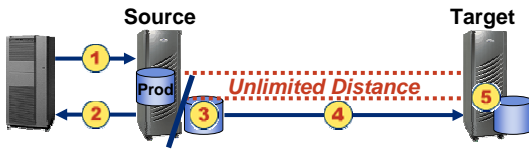
- Predictable RPO
- No performance impact
- Unlimited distance



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#### SRDF/AR

- Predictable RPO
- No performance impact
- Multi-hop support



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## EMC TimeFinder and EMC Snap

**EMC TimeFinder**

- Full volume copies
- Requires 100% source capacity
- Applications access volumes independently

**EMC Snap**

- Pointer-based "images"
- Requires ~30% source capacity
- Applications share access to volumes

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## Introducing Native RAID 5 on Symmetrix DMX

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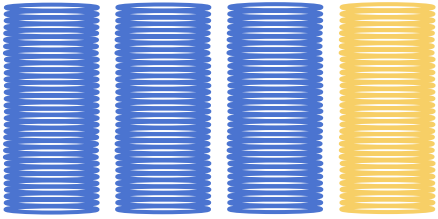
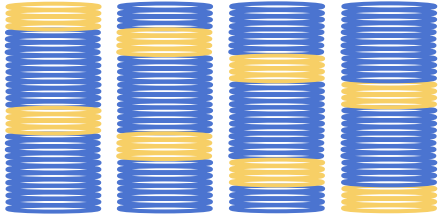
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## Parity RAID vs. RAID 5 – A visual comparison

- Parity RAID 3+1
  - Stripe Size = Hypervolume
  - Optimum performance achieved by rotating Hypervolumes across spindles (manually)

- RAID 5 3+1
  - Stripe Size = 4 Tracks
    - 4x32=128KB Open Systems
    - 4x57=228KB Mainframe
  - Data blocks striped across the RAID group members
  - Parity blocks rotate across the RAID group members


Data	
Parity	

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## New EMC CLARiiON CX Series

**More Power, More Scalability, More Functionality**



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## CLARiiON CX: Mid-tier Storage Leader

- Proven architecture
  - 12-year track record of innovation
  - Over 175,000 units sold
- Data and application availability
  - Advanced data integrity features
  - NDU—hardware and software
- Robust family of replication products
  - Local: full volume AND snapshot
  - Remote: synchronous AND asynchronous
  - Data movement between multi-vendor arrays
- Powerful management tools
  - Browser-based: manage from anywhere, anytime
  - Open, standards based interface
- Affordable
  - Modular: pay-as-you-grow
  - Cost-effective ATA technology




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## CLARiiON CX Platforms


### CLARiiON CX300—Workgroup Storage

- 50K IOPS and 680 MB/s bandwidth
- Four front-end connections, two back-end disk connections
- Supports up to 60 drives (Fibre Drives: 36 GB / 73 GB / 146 GB / ATA: 250 GB)
- 2 GB cache standard




### CLARiiON CX500—Departmental Storage

- 120K IOPS and 760 MB/s bandwidth
- Four front-end connections, four back-end disk connections
- Supports up to 120 drives (Fibre Drives: 36 GB / 73 GB / 146 GB; ATA: 250 GB)
- 4 GB cache standard



### CLARiiON CX700—Data Center Storage

- 200K IOPS and 1,520 MB/s bandwidth
- Eight front-end connections, eight back-end disk connections
- Supports up to 240 drives (Fibre Drives: 36 GB / 73 GB / 146 GB; ATA: 250 GB)
- 8 GB cache standard



*Environmental simplicity and investment protection*

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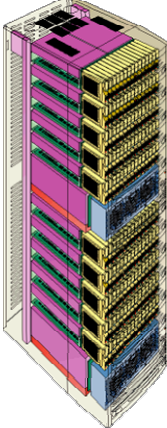
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## CLARiiON Hardware Architecture

### Delivering Data and Application Availability

- Fully redundant architecture
  - Dual storage processors
  - Power, cooling, data paths, SPS
  - Non-stop operation
  - Online software upgrades
  - Online hardware changes
- Continuous diagnostics
  - Data and system
  - CLARAlert Phone Home
- Advanced data integrity
  - Mirrored write cache
  - De-stage write cache to DISK upon power failure
  - SNiiFFER: Sector inspection utility



- No single points of failure
- Tiered capacity
  - 36 GB / 15K, 73 GB / 15K, 73 GB / 10K, 146 GB / 10K
  - 320 GB ATA
- From five to 240 disks
- Flexibility
  - Mix drive types
  - Mix RAID levels
  - RAID levels 0, 1, 1+0, 3, 5
- Up to 8 GB tunable cache
- Dual I/O paths with non-disruptive failover

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## CLARiiON CX300

### Performance

- 50,000 IOPS
- 680 MB per second

### Scalability

- 512 LUNs per CX300
- Scalable to 60 drives (SAN / direct attach / switchless cluster)
- 2 GB cache memory
- Easy "data-in-place" upgrade to CX500 or CX700

### Connectivity

- 64 HA hosts per CX300
- Hosts: Windows, Linux, NetWare, Solaris, (IBM AIX and HP-UX in Q2 '04)
- Four front-end 2 Gb Fibre Channel host ports
- Two back-end 2 Gb Fibre Channel disk ports

### Array Software

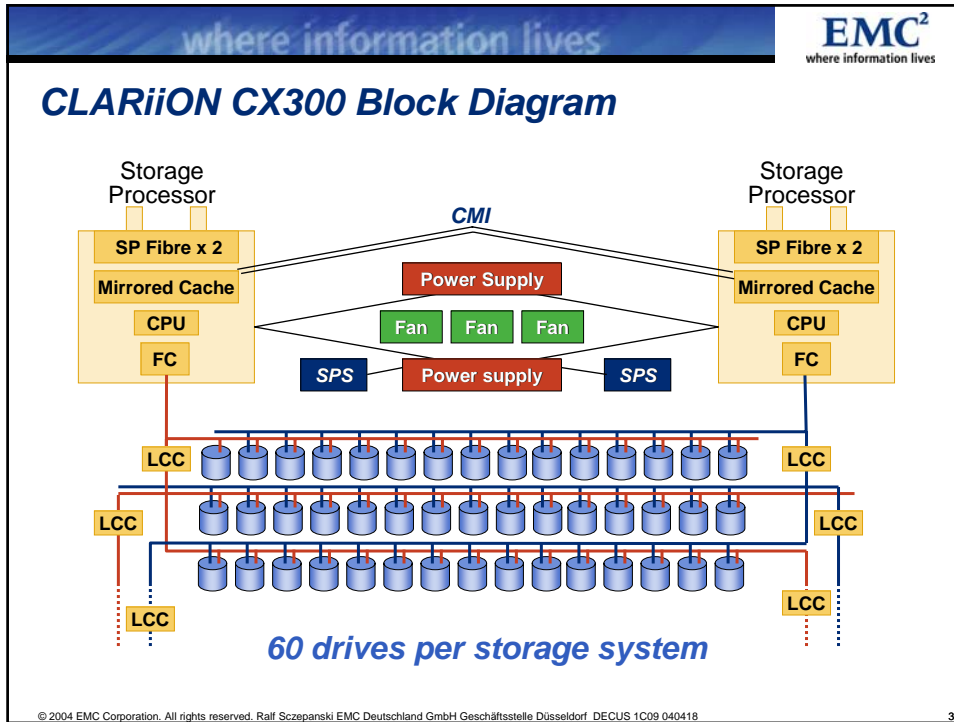
- Navisphere Manager, SnapView with snapshots and BCVs



**Workgroup**

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The table compares the performance and capacity of the EMC CX200 and the new CX300 storage arrays. The CX300 offers significant improvements in IOPS, data transfer rates, cache size, number of drives, capacity, LUNs, and high-availability hosts compared to the CX200.

	CX200	CX300	Benefit of New Array
<b>IOPS</b>	40,000	50,000	25% Faster
<b>MB/sec to Disk</b>	200	360	80% Faster
<b>Cache</b>	1 GB	2 GB	2x
<b># of Drives</b>	30	60	2x
<b>Capacity **</b>	5.9 TB	13.4 TB	Over 2x
<b>LUNs</b>	256	512	2x
<b>HA Hosts</b>	15	64	Over 4x
<b>Host Attac</b>	Intel	Intel, Unix	Solaris, AIX, HP-UX Attach
<b>Replication</b>	None	SnapView	Local Replication

\*\* Assumes 250 GB ATA drives

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## CLARiiON CX500

**Performance**

- Four 1.6 GHz CPUs
- 4 GB cache memory
- 120,000 IOPS
- 760 MB per second

**Scalability**

- 1024 LUNs per CX500
- Scalable to 120 drives (SAN / direct attach / switchless cluster)
- Easy “data-in-place” upgrade to CX700

**Connectivity**

- 128 HA hosts per CX500
- Hosts: Windows, Linux, NetWare, Solaris, IBM AIX, HP-UX, HP TRU64
- Four front-end 2 Gb Fibre Channel host ports
- Four back-end 2 Gb Fibre Channel disk ports

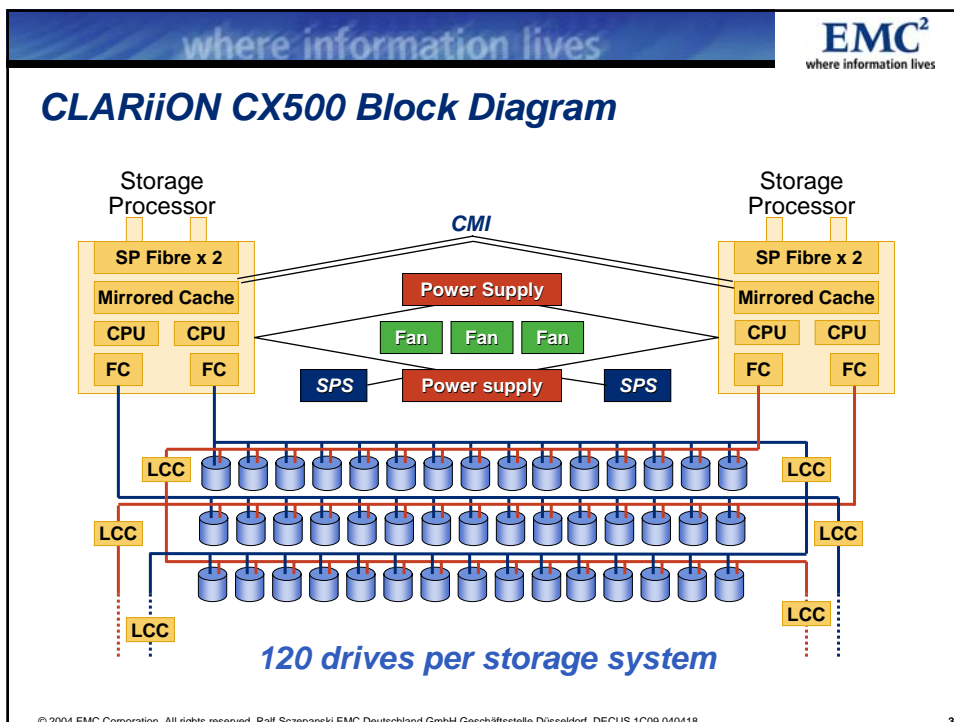
**Array Software**

- Navisphere Manager, SnapView, MirrorView, SAN Copy



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### CX400 vs new CX500

	<b>CX400</b>	<b>CX500</b>	<b>Benefit of New Array</b>
<b>IOPS</b>	60,000	120,000	100% Faster
<b>MB/sec to Disk</b>	460	675	45% Faster
<b>Cache</b>	2 GB	4 GB	2x
<b># of Drives</b>	60	120	2x
<b>Capacity **</b>	13.4	28.4 TB	Over 2x
<b>LUNs</b>	512	1024	2x
<b>HA Hosts</b>	64	128	2x
<b>Host Attach</b>	All	All	
<b>Replication</b>	All	All	

\*\* Assumes 250 GB ATA drives

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### CLARiiON CX700

**Performance**

- Four 3 GHz CPUs
- 8 GB cache memory
- 200,000 IOPS
- 1,520 MB per second

**Scalability**


- 2048 LUNs per CX700
- Scalable to 240 drives (SAN / direct attach / switchless cluster)

**Connectivity**

- 256 HA hosts per CX700
- Hosts: Windows, Linux, NetWare, Solaris, IBM AIX, HP-UX, HP TRU64
- Eight front-end 2 Gb Fibre Channel host ports
- Eight back-end 2 Gb Fibre Channel disk ports

**Array Software**

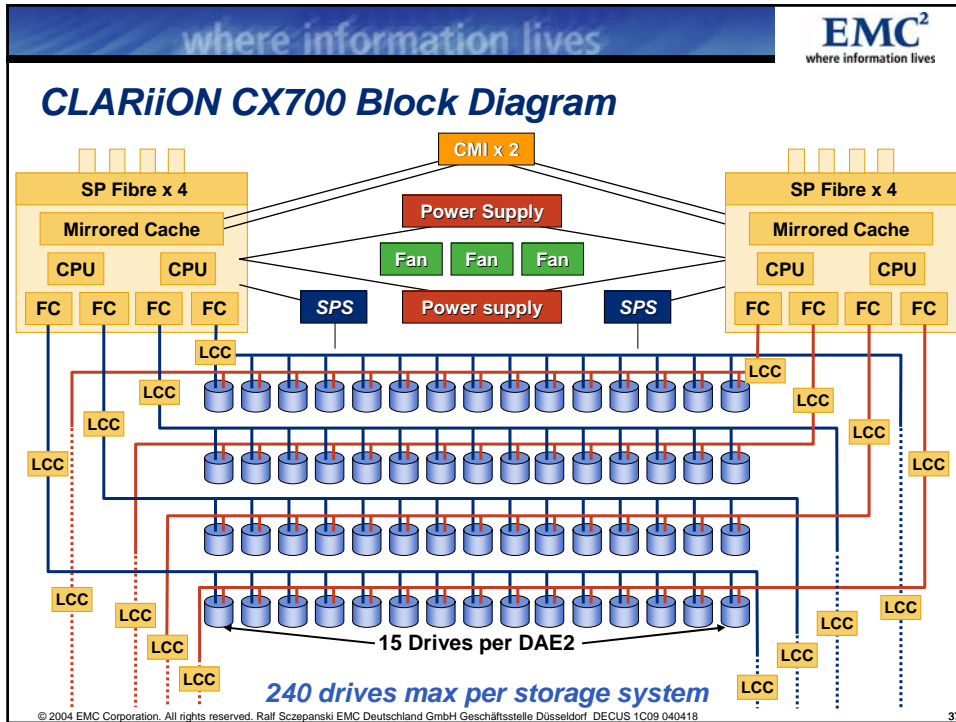
- Navisphere Manager, SnapView, MirrorView, SAN Copy



Data Center

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**CX600 vs new CX700**

	CX600	CX700	Benefit of New Array
<b>IOPS</b>	150,000	200,000	33% Faster
<b>MB/sec to Disk</b>	720	1300	80% Faster
<b>Cache</b>	4/8 GB	8 GB	Up to 2x
<b>Back End Ports</b>	4	8	2x, near linear scaling to 240 drives
<b># of Drives</b>	240	240	No Change
<b>Capacity **</b>	58.4	58.4	No Change
<b>LUNs</b>	1024	2048	2x
<b>HA Hosts</b>	128	256	2x
<b>Host Attach</b>	All	All	
<b>Replication</b>	All	All	

\*\* Assumes 250 GB ATA drives

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## Value of CX Series Upgrade

### Scale As You Grow

**Re-use Existing CLARiiON Assets**

- More processing power
- More consolidation
- More functionality
- Same user interface

CLARiiON CX200  
CLARiiON CX300  
CLARiiON CX400  
CLARiiON CX500  
CLARiiON CX600  
CLARiiON CX700

**All this with data-in-place upgrades!**

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## EMC's CLARiiON Software

### Managing, Consolidating, and Protecting Your Information Assets

**VisualSRM**  
*Storage Resource Management for files and applications*

**VisualSAN**  
*Network, configuration, and performance management of SANs*

**PowerPath**  
*Management for data paths and user volumes*

Applications  
Oracle SAP Exchange  
Windows UNIX

Servers

NAS Gateway

SAN

CX300 CX500 CX700

Other

Storage Arrays

**Navisphere Management Suites**  
*Management for CLARiiON storage arrays and applications*

**FLARE**  
*CLARiiON platform operating environment and application for consolidation*

**SnapView, MirrorView, and SAN Copy**  
*CLARiiON platform applications for backup, recovery, and data mobility*

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## SnapView

### Creates Point-in-Time, Full-Volume Copies on High-Speed Disk

- **Faster backup**
  - Seconds to create backup copy
  - Applications stay online
    - Exchange, SQL Server, Oracle...
- **Faster recovery**
  - Instant restore
  - Easily select from multiple backups
- **Easy to implement**
  - Wizard-based setup
  - Qualified with all major operating systems and applications
- **Easy to use**
  - Simple Navisphere management
  - Automation through CLI
- **Cost effective**
  - Choice of full or space-saving pointer copies
  - Choice of Fibre Channel or low-cost ATA drives

**High-speed, disk-based backup**

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## MirrorView: Advanced Business Protection

### Robust, Manageable, Affordable

- Powerful replication technology from the information industry leader: EMC
- Robust technology
  - Synchronous
  - Asynchronous option planned for Q2 '04
  - Flexible topologies
- Manageable
  - Navisphere Management Suites for easy setup and management
  - Integrated with local replication (SnapView)
- Affordable
  - Cost-effective CLARiiON storage platform
  - Can utilize ATA technology
- Backed by EMC service and support
  - Design and Implementation Services

**Synchronous Mirroring**

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## SAN Copy

### Multi-Vendor, High-Speed Data Mobility

**Fast**

- Uses the SAN to make copies
- Full or incremental copies
- Bi-directional
- No server impact

**Simple**

- Uses Navisphere or CLI to manage
- No additional hardware

**Open**

- EMC CLARiiON, Symmetrix
- IBM FASTT, ESS E20\*
- HPQ EVA, MA, EMA, MSA1000
- Sun StorEdge T3

\* available in Q2 '04

The diagram illustrates the SAN Copy architecture. A central 'Central Data Center' contains several storage arrays. Two remote sites, 'London' and 'Atlanta', are shown with their own storage arrays. Bidirectional arrows indicate data movement between the central data center and both remote sites. The central data center arrays are labeled with 'Data' in yellow, blue, and red. The remote sites also have arrays labeled 'Data' in blue and red.

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## SAN Copy Advanced Functionality

- CLARiiON systems capable of hosting SAN Copy:
  - Runs on CLARiiON CX700, CX500, CX600, CX400, and FC4700/FC4700-2 arrays
- Up to 4 TB-per-hour performance
  - Depends on configuration
- High speed copying of full volumes
  - Simultaneous push and pull (bidirectional) data movement supported
  - Full LUN copies to and from any supported array
- High speed copying of incremental changes to volumes
  - Copies only changes since last SAN Copy session
  - Changes can only be copied from a SAN Copy-hosted CLARiiON array to any supported target
- Local or unlimited distance
  - WAN via FC/IP conversion

**New**

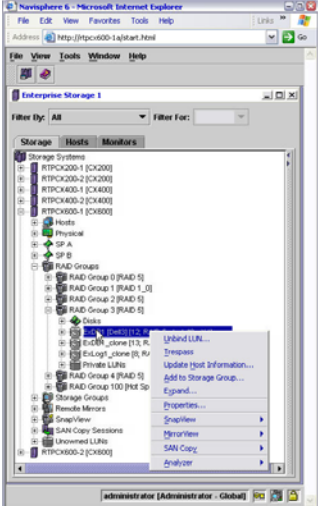
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## Navisphere Management Suites

### Secure, Easy-to-use, Browser-based Management Interface

- Delivers comprehensive, yet simplified management for any size storage environment
- Accessible via web-browser for use anywhere, anytime
- Simple, intuitive interface
- Serves as the management interface for Navisphere-managed applications: Navisphere Analyzer, SnapView, MirrorView, SAN Copy
- Security via SSL and strong user authentication for confidentiality and access control
- Supports host connections, LUN masking and automation via scripting with a CLI



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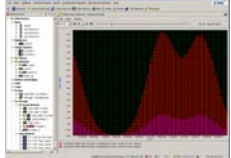
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## VisualSAN Management Software

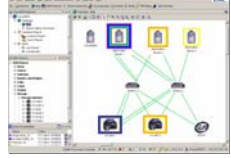
### Proactive Management for Storage Networks

- Modular
  - Network Manager
  - Configuration Manager
  - Performance Manager
- Functional
  - Unique and complementary set of SAN network management features
- Integrated
  - Modules build upon and integrated into VisualSAN Network Manager
  - CLARiiON integration
- Designed for mid-tier environments
  - Customer installable
  - Ease of use
  - Value pricing
- Advanced feature sets
  - Configuration and change management
  - Real-time and historical performance monitoring

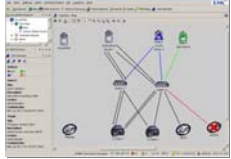
Performance Manager



Network Manager




Configuration Manager



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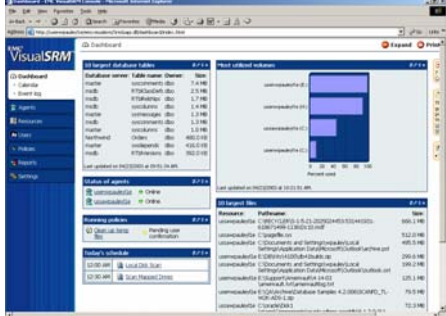
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## VisualSRM Management Software


### Proactive Storage Resource Management

- **Comprehensive**
  - Heterogeneous storage
  - Applications and file systems
  - Windows and UNIX
- **Flexible**
  - Web-based user interface
  - API and CLI
- **Automated**
  - Policy-driven storage management
  - Automated corrective actions
  - Automated reporting
  - Multi-level thresholds with action
- **Designed for mid-tier environments**
  - Customer installable
  - Ease of use
  - Value pricing
- **Makes storage more valuable**
  - Increase asset utilization
  - Lower overall costs



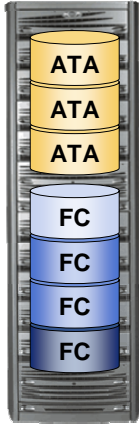
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## CLARiiON with ATA: High-Speed Backup and Restore

- **ATA disks**
  - Low-cost, desktop PC disk technology
  - Less performance than Fibre Channel disks
  - Ideal for bringing offline data online
- **CLARiiON with ATA**
  - ATA-based Disk Array Enclosure
  - Mix and match with Fibre Channel DAEs
  - All CLARiiON functionality and availability Day 1
- **ATA-specific enhancements**
  - Full qualification of backup applications with ATA disk
  - Lower cost SnapView and MirrorView targets
  - Replication Manager
- **EMC networked storage**
  - SAN and NAS support
  - ControlCenter Family support
  - EMC Services



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## ATA Disk: Technology Summary

**What are ATA disk drives?**

- ATA is acronym for “Advanced Technology Attachment”
- Low-cost, desktop PC disk technology
- Less performance / less cost than Fibre Channel disks

**Why ATA now?**

- Price:
  - Mass production / economies of scale and lower performance enables much lower drive costs vs. Fibre Channel
  - Narrows the price gap between disk and tape
- Reliability: MTBF is now high enough for enterprise uses
- Performance: transfer rates are now fast enough for some uses in enterprise environments

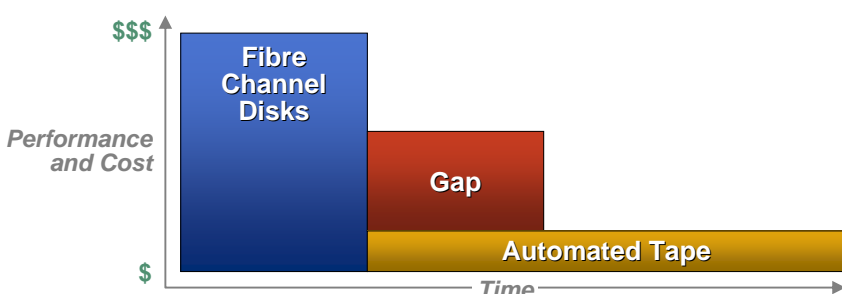


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## Service Level Choices

**Balance Performance Against Cost**



- Disk offers high service levels: high performance, high availability
- Tape offers low service levels: low performance, low availability

***Needed: higher service levels than tape at much lower cost than Fibre Channel disk***

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### Needed: A New Choice

Higher Service Levels than Tape, Lower Cost than Fibre Channel Disk

- ATA disk technology bridges the gap
- Enables more replication for business continuity
- Enables alternative to tape based processes

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### Backup to Disk

#### ATA Used for Backup and Restore

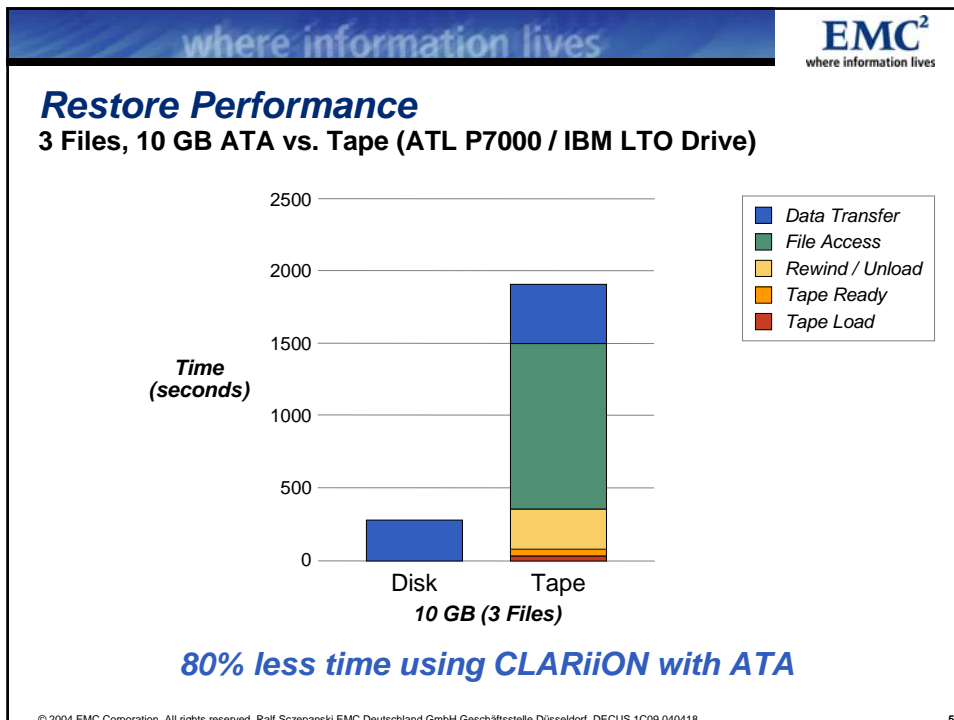
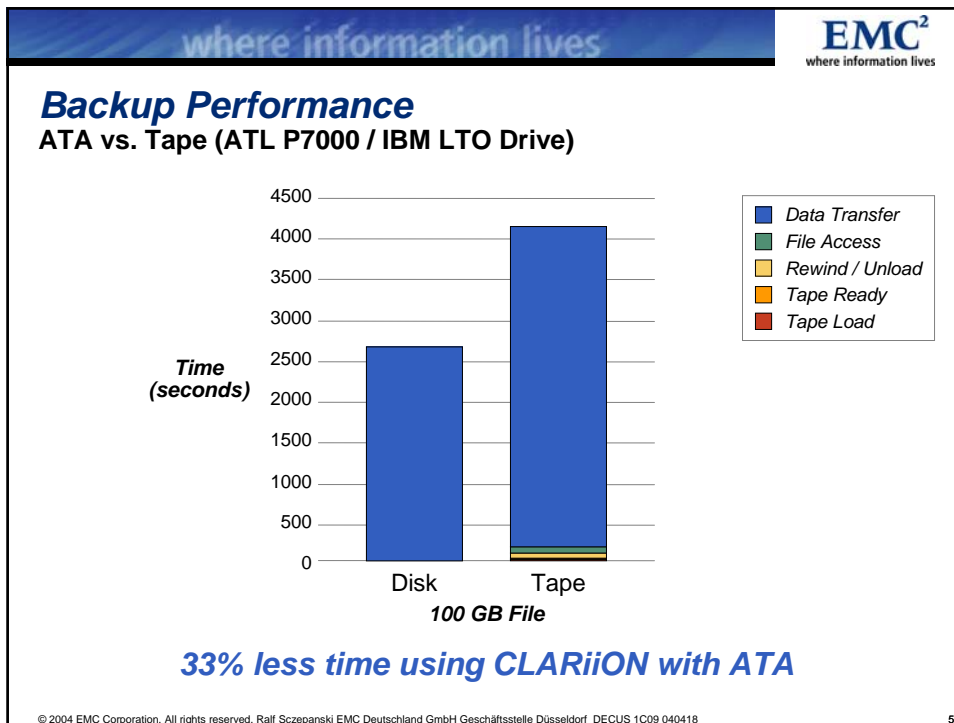
**How It Works:**

- Backup application reads / writes from disk instead of tape; backup and restore onsite to disk
  - Archive tape to remote offsite
  - Simplifies environment
- Tested and supported (minimum software rev)
  - EMC Data Manager V5.0
  - CA BrightStor ARCserve V9.0
  - CA BrightStor Enterprise V10.0
  - Legato NetWorker V6.0
  - VERITAS BackupExec VV8.6
  - VERITAS NetBackup V4.5
  - CommVault Galaxy V4.1
  - Tivoli Storage Manager

**Business Benefit:**

- High performance
  - 33% faster backup
  - 80% faster restore
  - Faster restore than tape emulation
- Availability
  - Sixth generation CLARiiON high availability architecture
  - RAID protection for data

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## EMC Offers the Complete Suite for Online Storage

- More data online offers more value from data
- More choice offers more optimal matching of system performance to application needs

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## EMC Storage Management Software

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### Automated Management of Multi-vendor Storage Resources

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## EMC Open Software

### Enabling Information Lifecycle Management

- Automate, virtualize, and optimize access to information at the right service level, cost, and level of compliance at every point in the information lifecycle
- Executing in three key areas:

Services

Storage Management

Content Management	Data Management
Infrastructure Software	
Networked Storage Platforms	

**Storage Management**  
*Automates* the management of multi-vendor storage resources

**Infrastructure Software**  
*Virtualizes* the storage infrastructure to enable seamless information mobility, device failover, and workload balancing

**Information Management Software**  
*Optimizes* the movement, placement, cataloging, and disposition of information based on business policies

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## IT Challenges Addressed by Storage Management

- Understanding what you have in your current environment:
  - How well is it utilized?
  - How well is it performing?
- Planning for changes in your environment
  - Deploying, re-deploying, consolidating
- Provisioning resources
  - Coordinating people and tools
- Manual, time-consuming, and error-prone processes

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## Storage Management: Automation

### Point Products: Manual

- Multiple point products
  - Separate consoles
- Individual, discrete management tasks
  - A lot of tools, people, time, and coordination required
- Manual and time-consuming
  - Spreadsheet management

### Integrated Solution: Automated

- Integrated suite of products
  - Single view
  - Single infrastructure
  - Multi-vendor approach
- Consolidate and automate common tasks
  - Reporting and monitoring
  - Planning and provisioning
  - Device management

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## EMC's Storage Management Solution: SRM Reporting and Monitoring

- Effectively utilize storage assets
  - Reallocate storage more efficiently and facilitate chargeback
  - Historical reports and trending
- Simplify the storage inventory management process
  - Helps track IT assets, which simplifies the handling of day to day operational tasks
- Perform performance analysis for planning and problem isolation
  - Correlates host, SAN, and array performance information
  - Automated expert advice on your specific environment
- Monitor storage infrastructure health, performance, and utilization end to end
  - Database, backup applications, servers, switches, and arrays

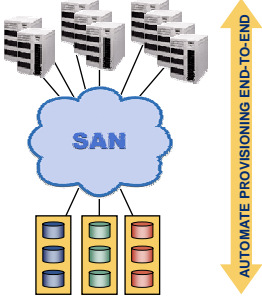
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### EMC's Storage Management Solution: Provisioning and Planning

- Automate SAN topology map display
  - Monitor SAN health and performance
- Centralize active SAN management
  - LUN masking and switch zoning
- Allocate storage based on business requirements automatically
  - Reduce provisioning errors
  - Meet time-to-provision SLAs
- Validate existing and proposed SAN environments
  - Eliminate compatibility issues
  - Accurately model "what if" scenarios on demand



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### EMC's Storage Management Solution: Device Management

- Simplify and centralize configuration capabilities for EMC storage systems
  - Visual presentation of storage arrays
  - Centralize monitor and alerting
- Monitor and manage array-based replication functions
  - Local and remote
- Monitor, analyze, and automatically move highly active Symmetrix logical volumes to maintain optimal performance
  - Non-disruptive and transparent to servers and applications



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### **Storage Management Capabilities Roadmap: 2004**

- Service management
  - Policy management / workflow
  - Service-level reporting
  - Application correlation
- Advanced heterogeneity
  - SMI support
  - Depth of third-party management

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## Utilization Reporting

- Inefficiencies can be quickly identified

EMC<sup>2</sup> Reports Administration EMC ControlCenter StorageScope™ v5.1

Report Date: Aug 28, 2002 Time: 4:15 AM Layout: Brian B Test

**This host is using 1% of accessible capacity...**

Host	Vendor	Base - Used (GB)	Accessible - Total (GB)
losat200	Microsoft	3.66	9.49
losat201		0.00	0.00
losat204	Sun Microsystems	9.94	76.07
losat208	Microsoft	2.34	159.43
losbe132	IBM	5.52	10.36
losbe051	Sun Microsystems	9.34	65.81
losbe052	Microsoft	5.26	8.48
losbe053	Microsoft	5.80	9.44
losbe056	Microsoft	11.02	53.04
losbe059		0.00	0.00
losbe062			40.57
losbe071			49.72
losbe102	Hewlett-Packard	9.70	83.83
MVS7	IBM	0.00	214.14

**...while this host is using 65%**

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## Performance Reporting

EMC ControlCenter M/LA Performance View

System: 0010400001 (Revolution 12/1/2000 - 0:00:24.00) Logical Volumes


**Symmetrix volumes**

Host: 172.23.153.101 (Revolution 12/1/2000 - 0:00:24.00) Physical Device

**Associated host devices**

**Response times as seen by host**

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## Storage Provisioning

### Policy-based

**Storage Policy Editor - New Policy**

Policy Name:

Replica Class:

Use this Policy as default


Add to All SymAPI Device Groups

Description:

Storage Element's Attributes:

Storage Element	Storage Pool	Storage Type	Raid Level	Port Balancing	#Paths	Mapped Device Only	Zoned Storage Only	Zoning Type
Primary Device		Symmetrix	RAID_1	Host Based	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sort Zoning
Local Replica		Symmetrix	RAID_1	Host Based	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sort Zoning
Remote Replic		Symmetrix	RAID_1	Host Based	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sort Zoning

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## Planning

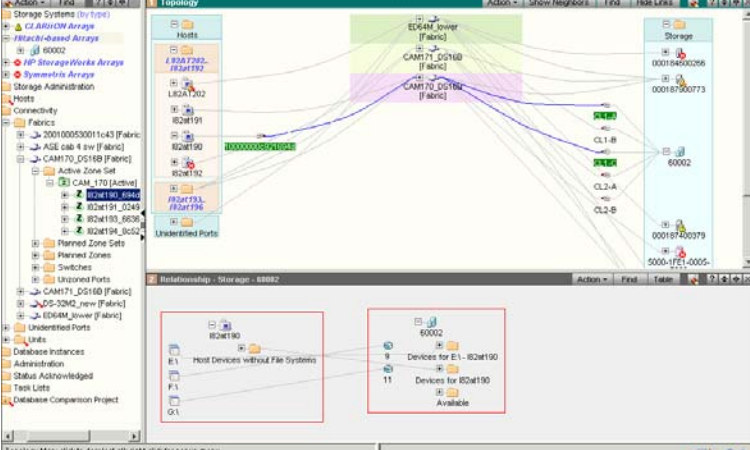
### Topology View

**EMC ControlCenter**

Storage Administration | Monitoring | Performance | Topology | Relationship | Performance | Alerts | Help

Storage Administration | Monitoring | Performance | Topology | Relationship | Performance | Alerts | Help

Topology



Relationship - Storage - 68892

Hosts: E1, F1, G1

Storage: 60002

Devices for E1 - 824190

Devices for 824190 Available

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## Device Management

### Automated Performance Tuning

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## Multi-Vendor Support Credentials

<p><b>Filesystems</b></p> <ul style="list-style-type: none"> <li>HP Tru64 UFS</li> <li>HP Tru64 AdvFS</li> <li>HP UX HFS</li> <li>IBM AIX JFS</li> <li>IBM z/OS</li> <li>Novell</li> <li>SUN Solaris USF</li> <li>VERITAS VxFS</li> <li>Windows NT FS</li> <li>Windows 2000 FS</li> </ul> <p><b>Backup</b></p> <ul style="list-style-type: none"> <li>Tivoli -TSM</li> <li>LEGATO NetWorker</li> <li>VERITAS NetBackup</li> </ul>	<p><b>Databases / Applications</b></p> <ul style="list-style-type: none"> <li>Oracle</li> <li>IBM DB2 MVS, DB2 UDB</li> <li>MS SQL Server</li> <li>Informix</li> <li>Sybase</li> <li><b>Exchange*</b></li> <li><b>SAP*</b></li> </ul>	<p><b>SAN Devices</b></p> <ul style="list-style-type: none"> <li>Brocade</li> <li>McDATA</li> <li>Cisco</li> <li>Qlogic</li> <li>Connectrix</li> <li>InRange</li> </ul> <p><b>NAS Devices</b></p> <ul style="list-style-type: none"> <li>EMC Celerra</li> <li>Network Appliance</li> </ul> <p><b>Volume Managers</b></p> <ul style="list-style-type: none"> <li>HP Tru64 LSM</li> <li>HP LVM</li> <li>HP/VERITAS VxVM</li> <li>IBM AIX LVM</li> <li>Solaris / VERITAS VxVM</li> <li>Windows NT</li> <li>Windows 2000</li> </ul>	<p><b>Standards</b></p> <ul style="list-style-type: none"> <li>SMI-S</li> </ul> <p><b>Mainframe Tape</b></p> <ul style="list-style-type: none"> <li>STK</li> <li>VTS</li> <li>CA-1</li> <li>RMM Tape Management Systems</li> </ul> <p><b>Storage</b></p> <ul style="list-style-type: none"> <li>EMC Symmetrix</li> <li>EMC CLARiiON</li> <li>HP StorageWorks</li> <li>HP XP256, XP512</li> <li>HDS 7700E, 9900</li> <li>IBM ESS and RVA</li> <li>Sun StorEdge 9900 Series</li> <li>JBOD</li> <li>Internal storage</li> </ul> <p><b>Frameworks</b></p> <ul style="list-style-type: none"> <li>CA Unicenter</li> <li>HP Openview</li> <li>Micromuse</li> <li>Tivoli Netview</li> <li>Microsoft MOM</li> <li>Any SNMP-based application</li> </ul>
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\* Supported by AutoAdvice

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