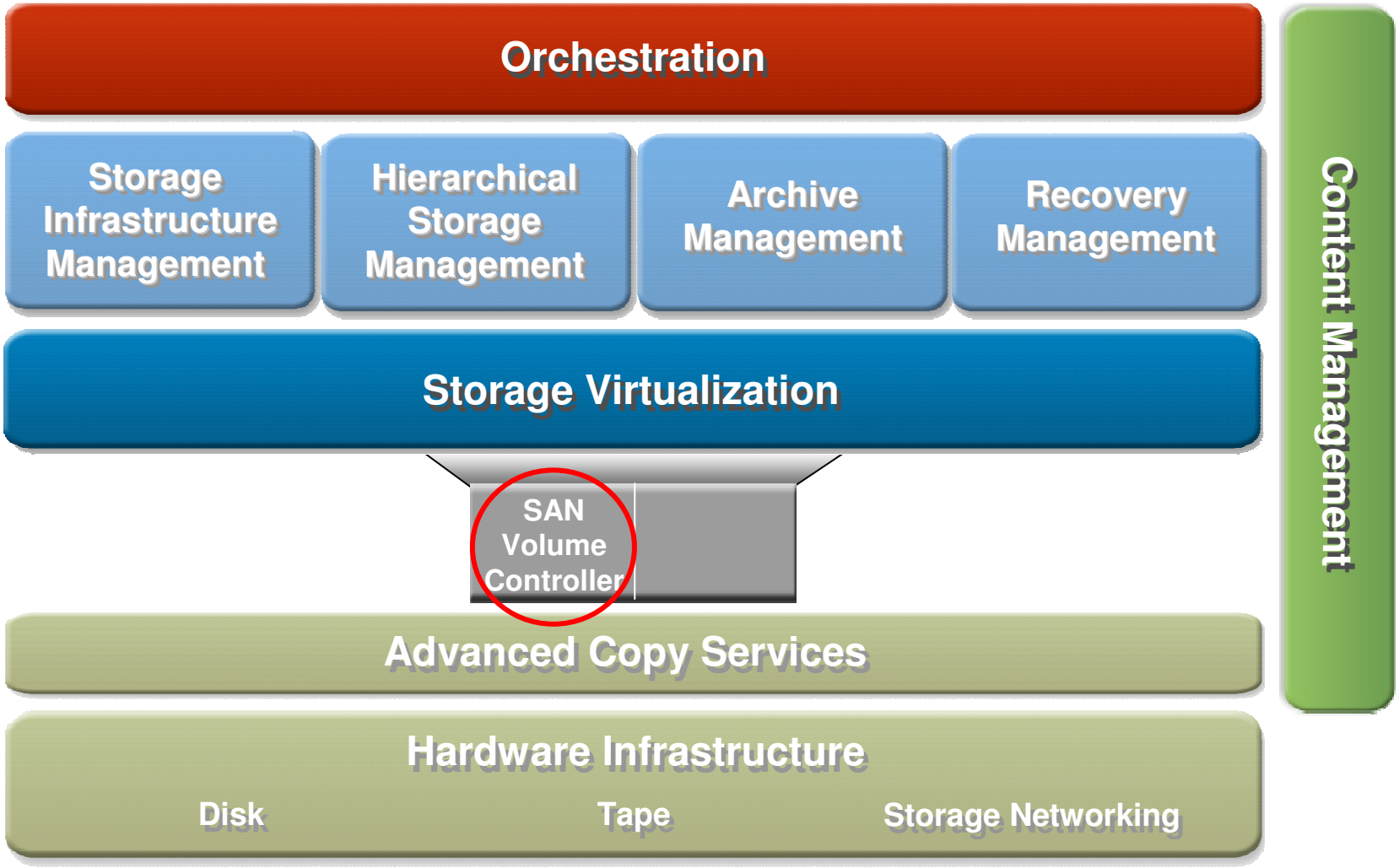
IBM TotalStorage®

IBM System Storage™ SAN Volume Controller Overview

ON DEMAND BUSINESS

IBM TotalStorage

Taking steps toward an On Demand storage environment

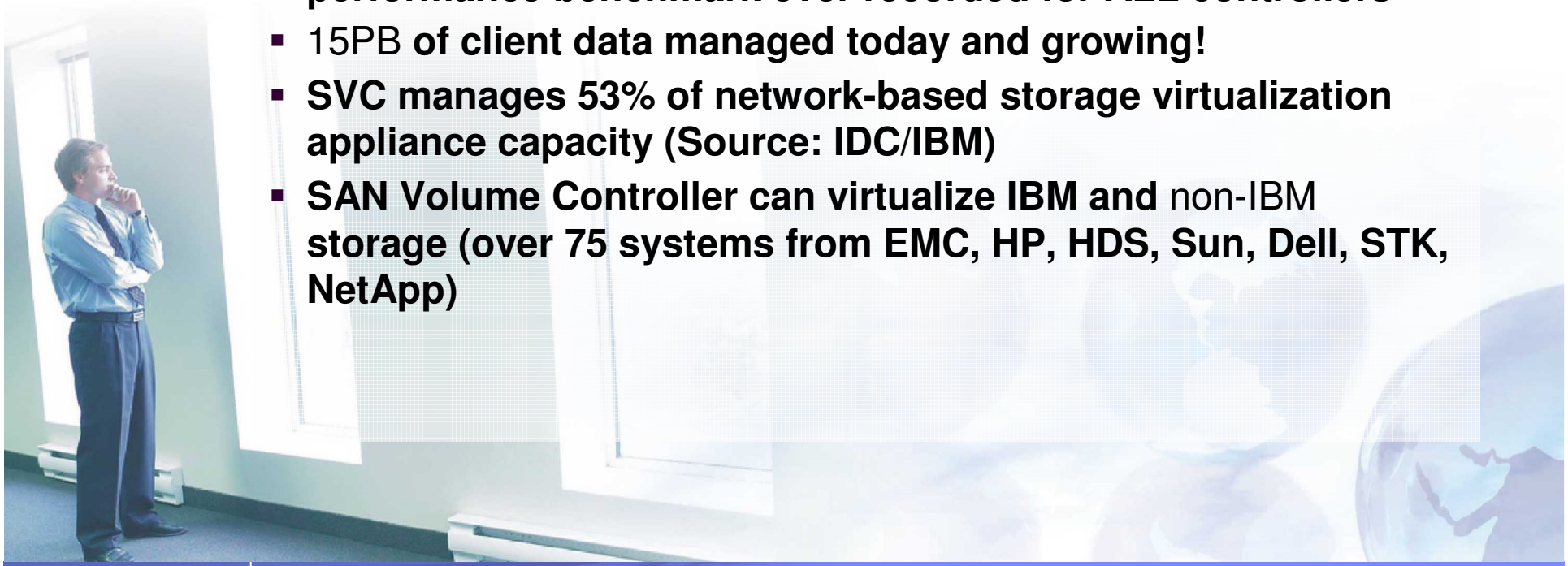


Value of the TotalStorage SAN Volume Controller

- Improve the flexibility of the disk storage infrastructure
- Results
  - **Improved Application Availability**
    - Eliminate many of the causes of storage-related downtime
    - Create a common platform and API for volume Point-in-time and Remote copy services
  - **Optimized Storage Resource Utilization**
    - Aggregate smaller islands of spare disk capacity and transparently reallocate to new servers or applications
  - **Enhanced Storage Personnel Productivity**
    - Create a single point of control, administration and security for disk volumes
    - Move, add or change physical disks without requiring application outages

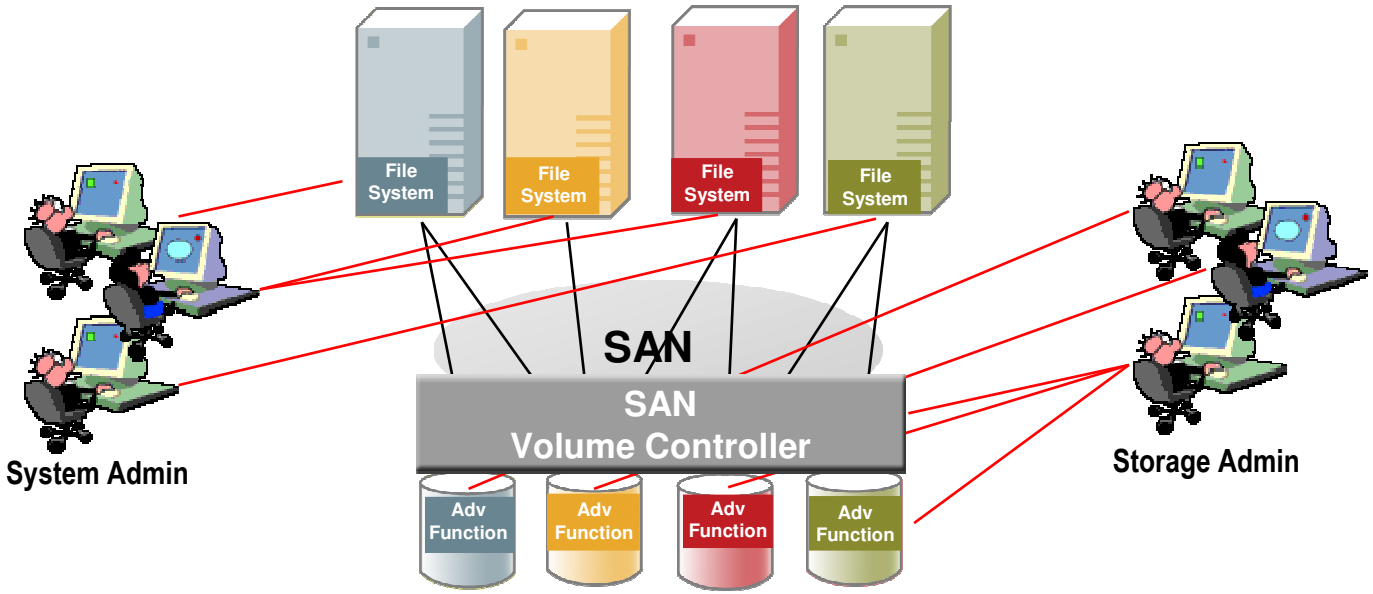
SVC: Did You Know?

- **IBM has** 40 years experience **in virtualization technologies**
- **SAN Volume Controller has more than** 2,000 **clients, over** 110 **references, and is entering its fourth year of market acceptance**
- **SAN Volume Controller delivers the** FASTEST **storage performance benchmark ever recorded for ALL controllers**
- 15PB **of client data managed today and growing!**
- **SVC manages 53% of network-based storage virtualization appliance capacity (Source: IDC/IBM)**
- **SAN Volume Controller can virtualize IBM and** non-IBM **storage (over 75 systems from EMC, HP, HDS, Sun, Dell, STK, NetApp)**



The Problem: SAN's have improved flexibility – Issues remain

Volume, Storage Management Issues	File, Data Management Issues
• Storage capacity is isolated in SAN islands • Low capacity utilization, difficult to pool volumes • SAN islands require unique mgmt interfaces • Server downtime required to add/replace arrays, manage LUNs, migrate volumes • Copy services are unique to each storage array	• File tasks must be done on each server • Difficult to migrate applications to other servers • Application downtime required for FS changes • No single view/access to files or data • Cannot pool files based on Quality of Service



SAN Volume Controller Delivers Value

Reduces the cost and complexity of managing storage

- **Creates tiers of storage**
- **Enables multi-vendor strategies**

Improves business continuity

- **Move data without interrupting applications**
- **Allocate more storage to applications automatically**

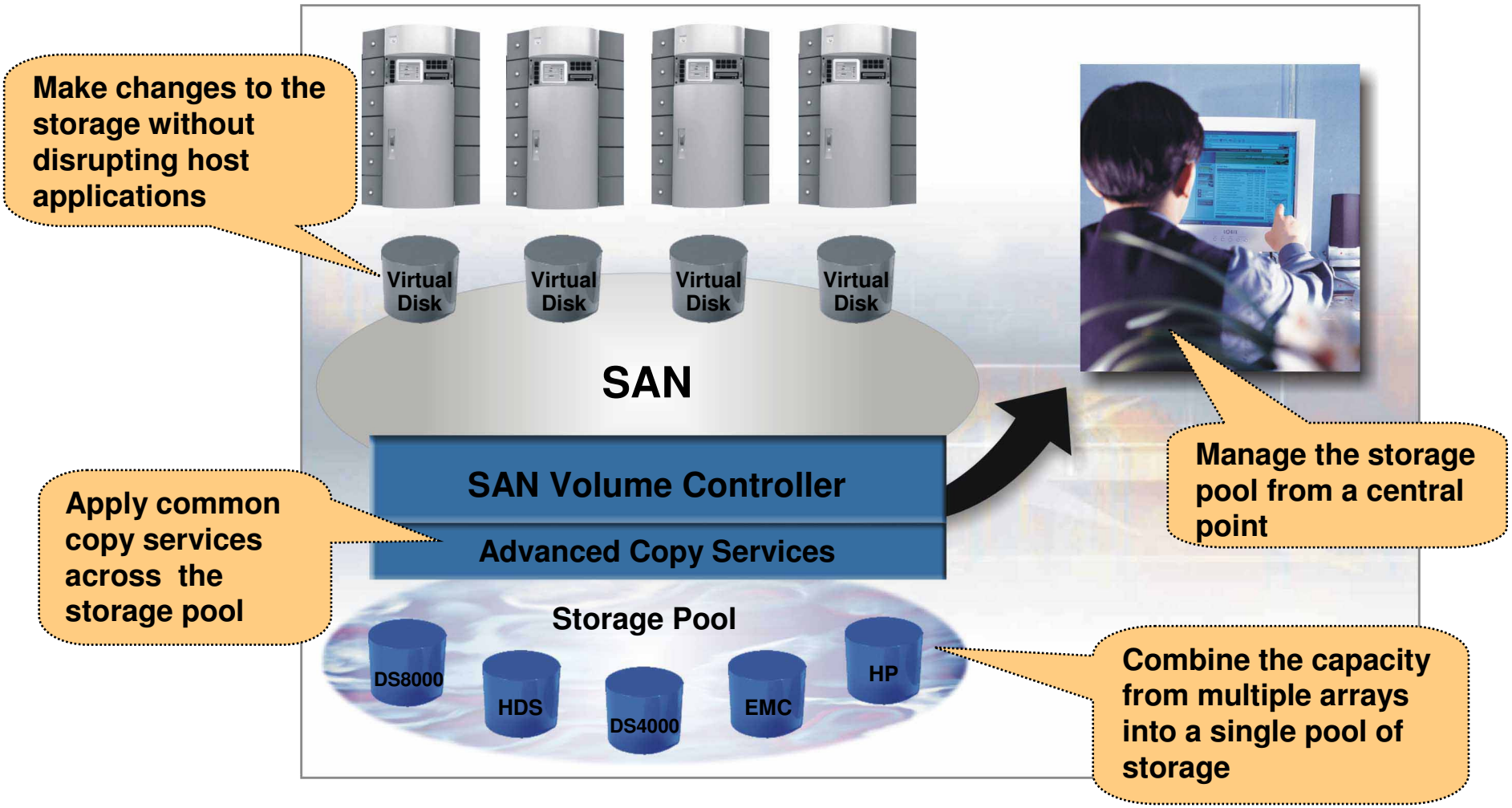
Improves storage utilization

- **Combines storage capacity into a single resource – from multiple vendors**
- **Manage storage as a business resource, not as separate boxes**

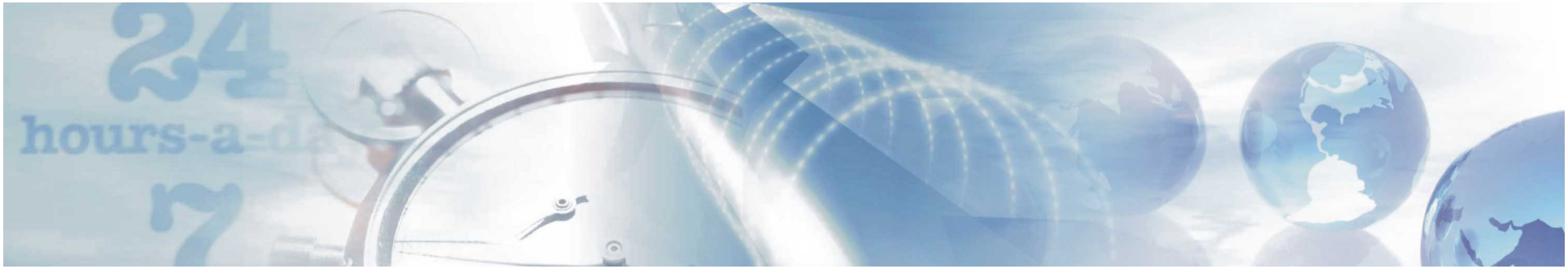
Improves personnel productivity

- **Manage a single storage resource from a central point**

Flexible Storage Infrastructure with SAN Volume Controller



SVC Delivers Availability, Performance, and Scalability



It's resilient and highly available

- **We designed and built SVC with the resiliency of a storage controller**
- **SVC now supports *non-disruptive* firmware updates and *hardware* maintenance on the disk arrays to further increase its availability**
- **SVC has over three years experience with customer implementations**

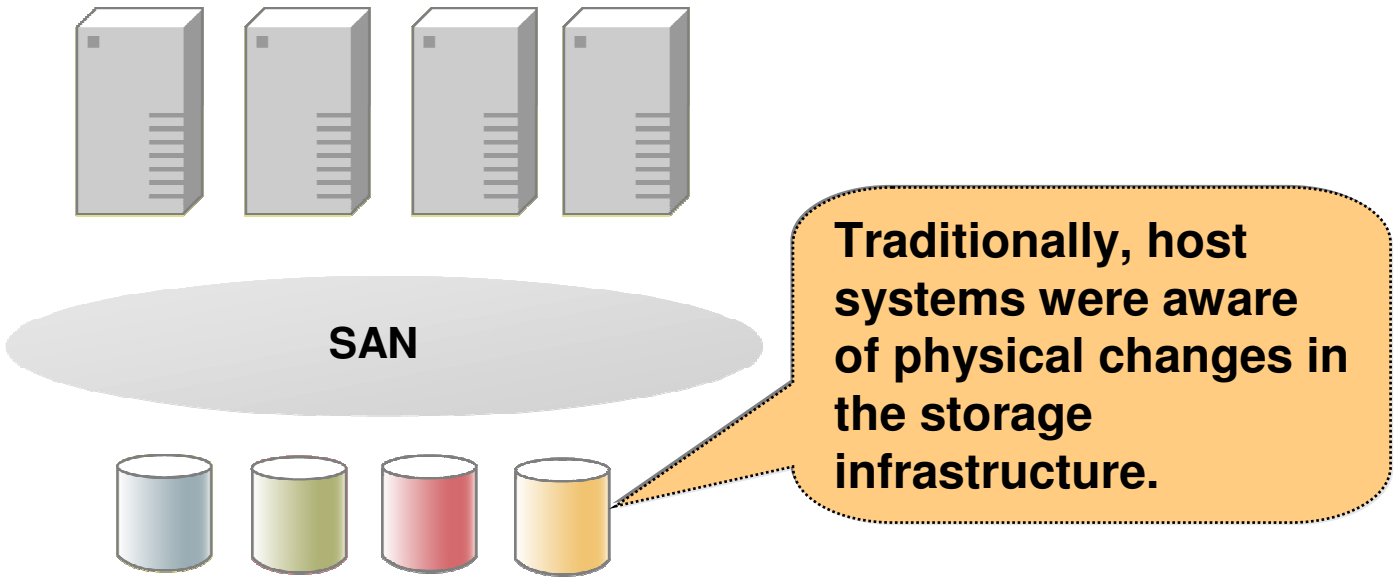
It has the *fastest* benchmark of any controller

- **SVC has the *fastest* SPC-1 benchmark EVER submitted (155K IOPS)**
- **SVC has the *fastest* SPC-2 benchmark EVER submitted (3.5 GBPS)**
- **Many references quote significant performance improvements (up to 10X faster)**

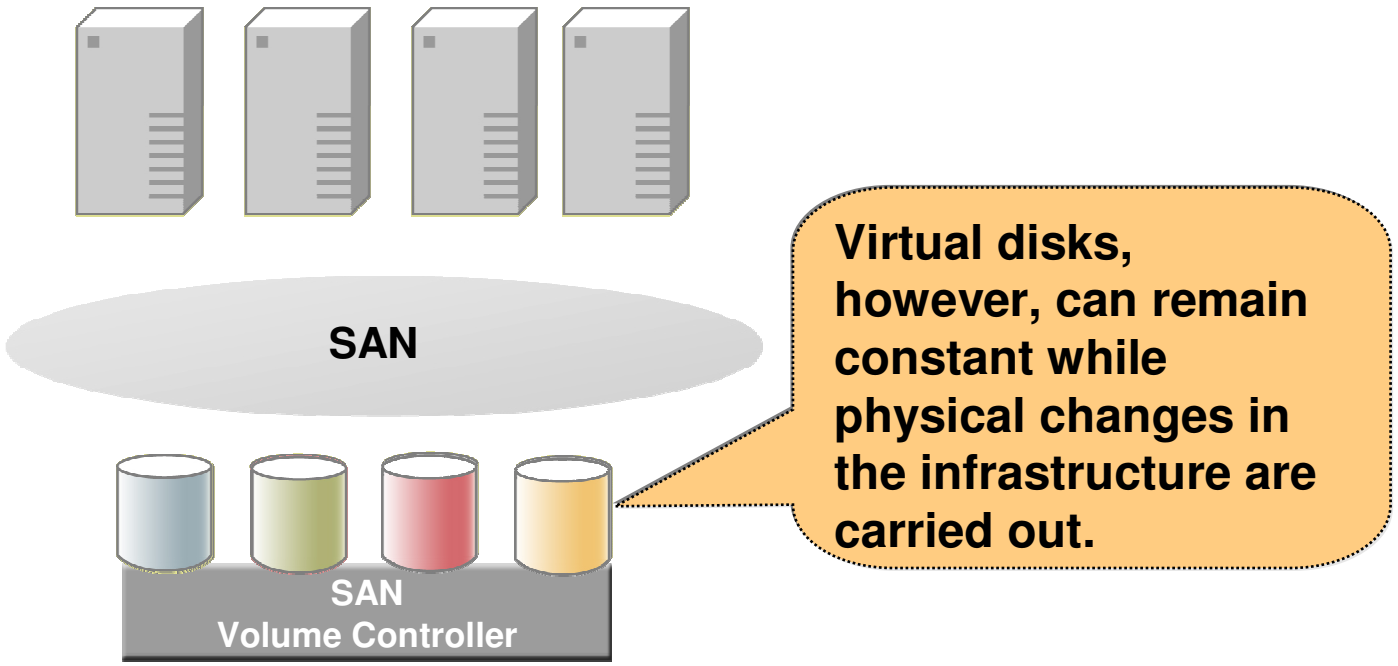
It scales to manage large environments

- **SVC scales from very small configurations (1TB) to large enterprises (> 500TBs) and growing !**
- **SVC now manages over 15PB of production storage worldwide**

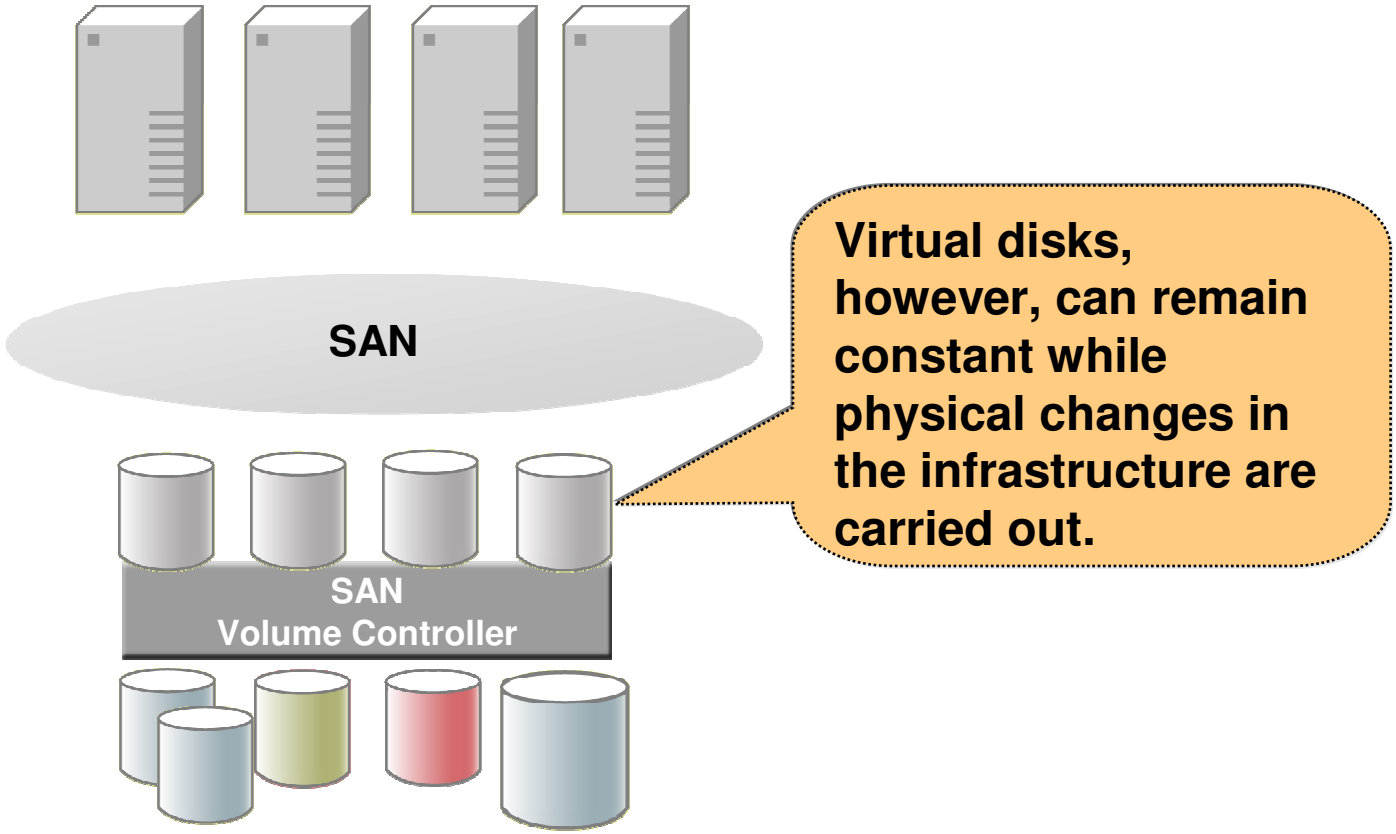
Virtualize the Disks



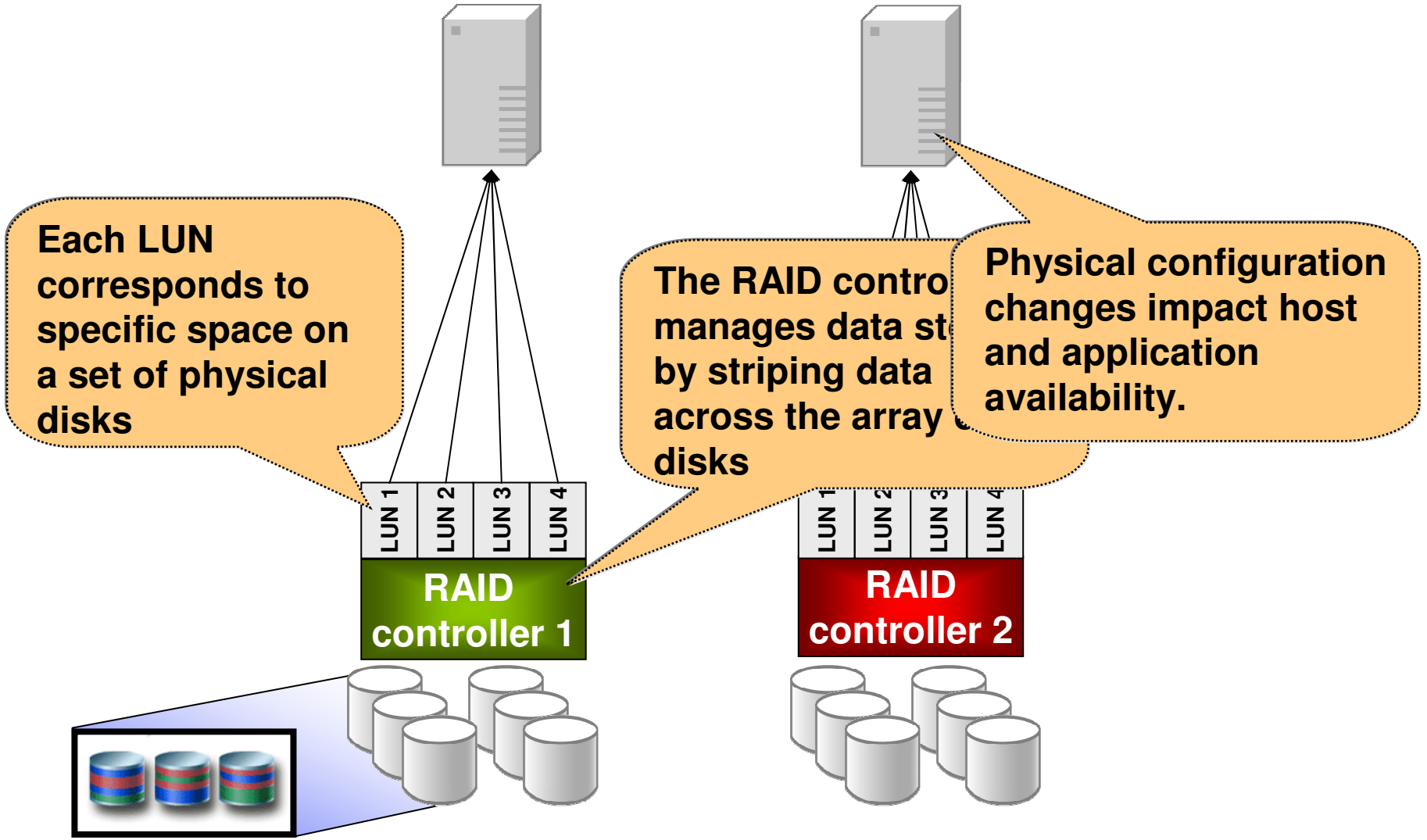
Virtualize the Disks



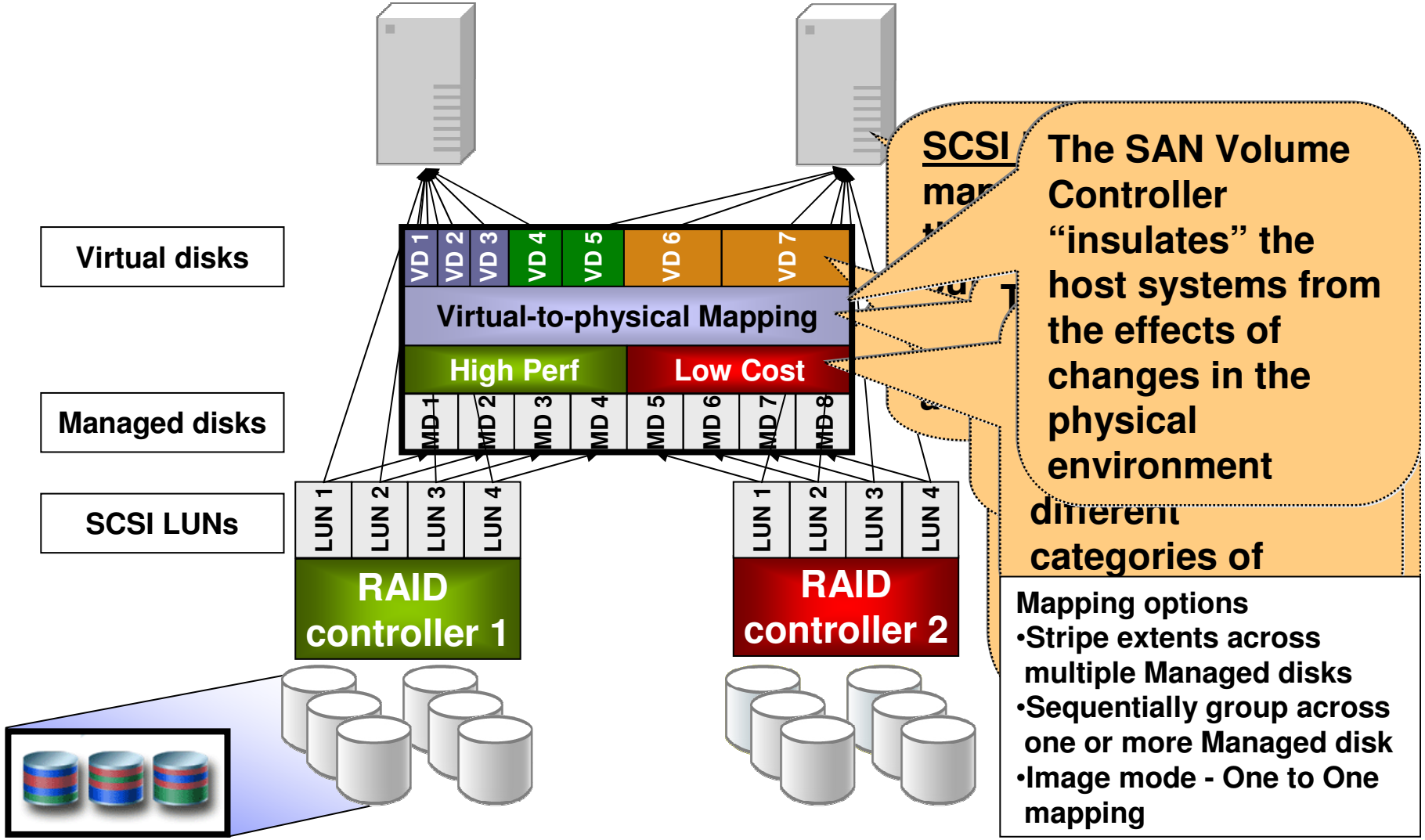
Virtualize the Disks



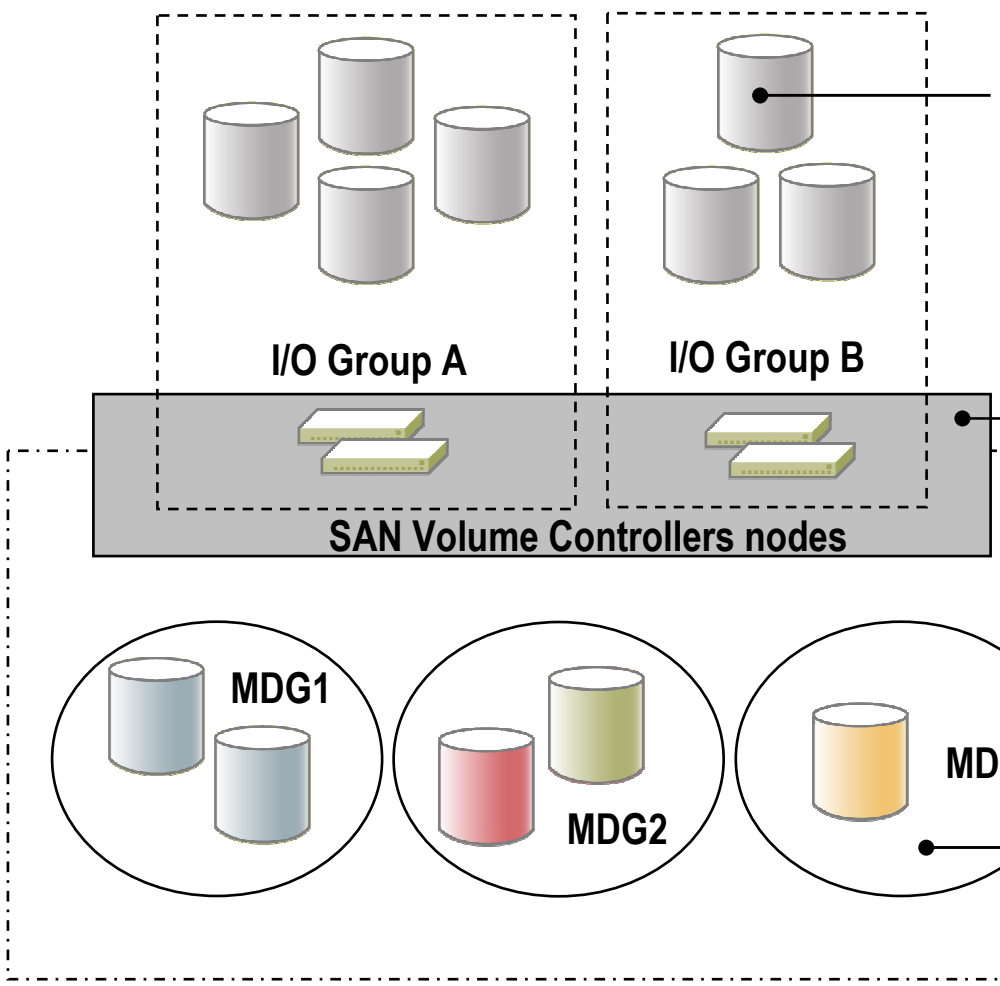
Traditional RAID Controllers



IBM TotalStorage SAN Volume Controller



SAN Volume Controller - Terminology

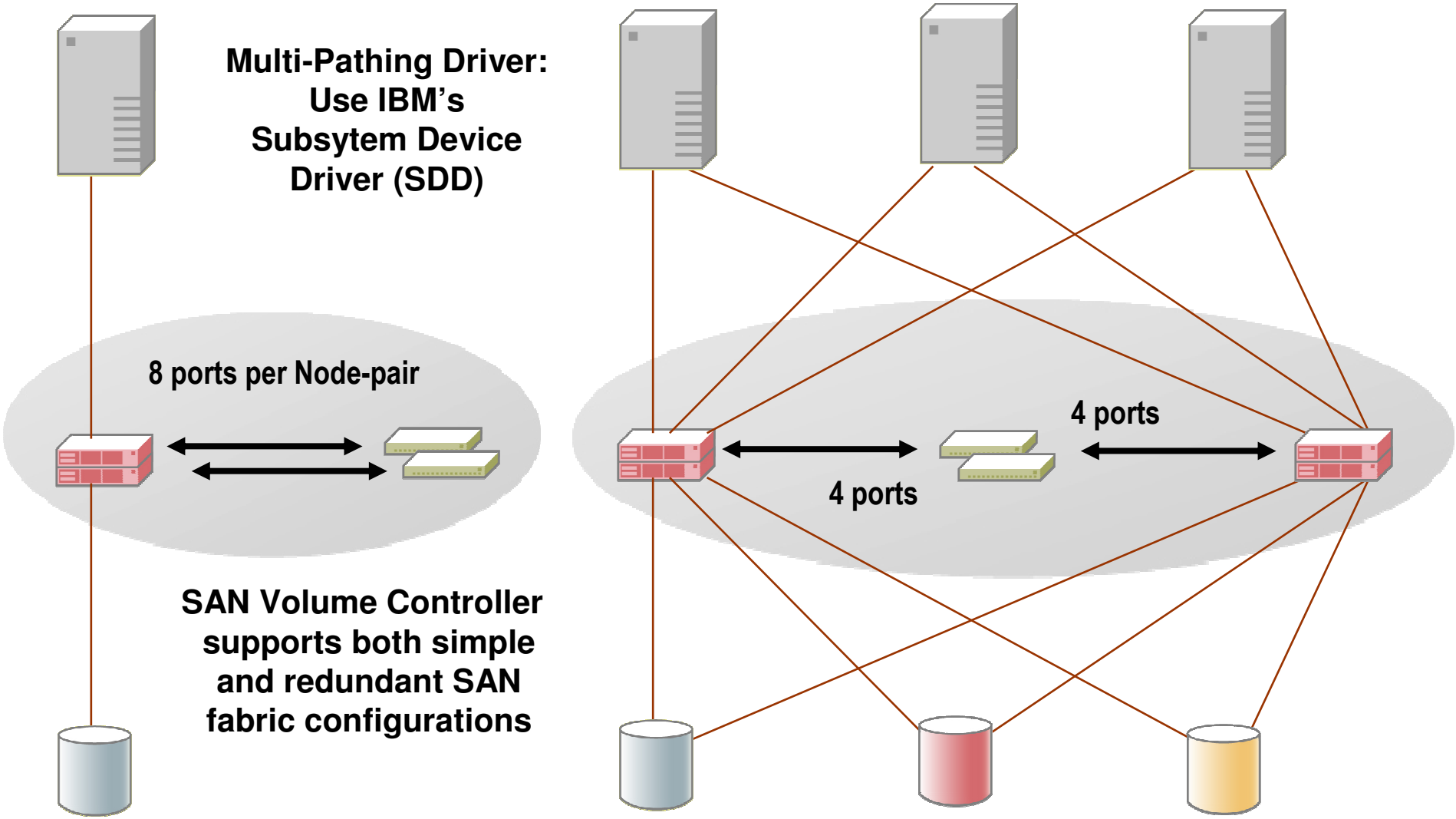


Virtual Disks:
Max 4096 disks total (16MB – 2TB each)
Each virtual disk assigned to:
- Specific Node-pair
- Specific Managed Disk Group

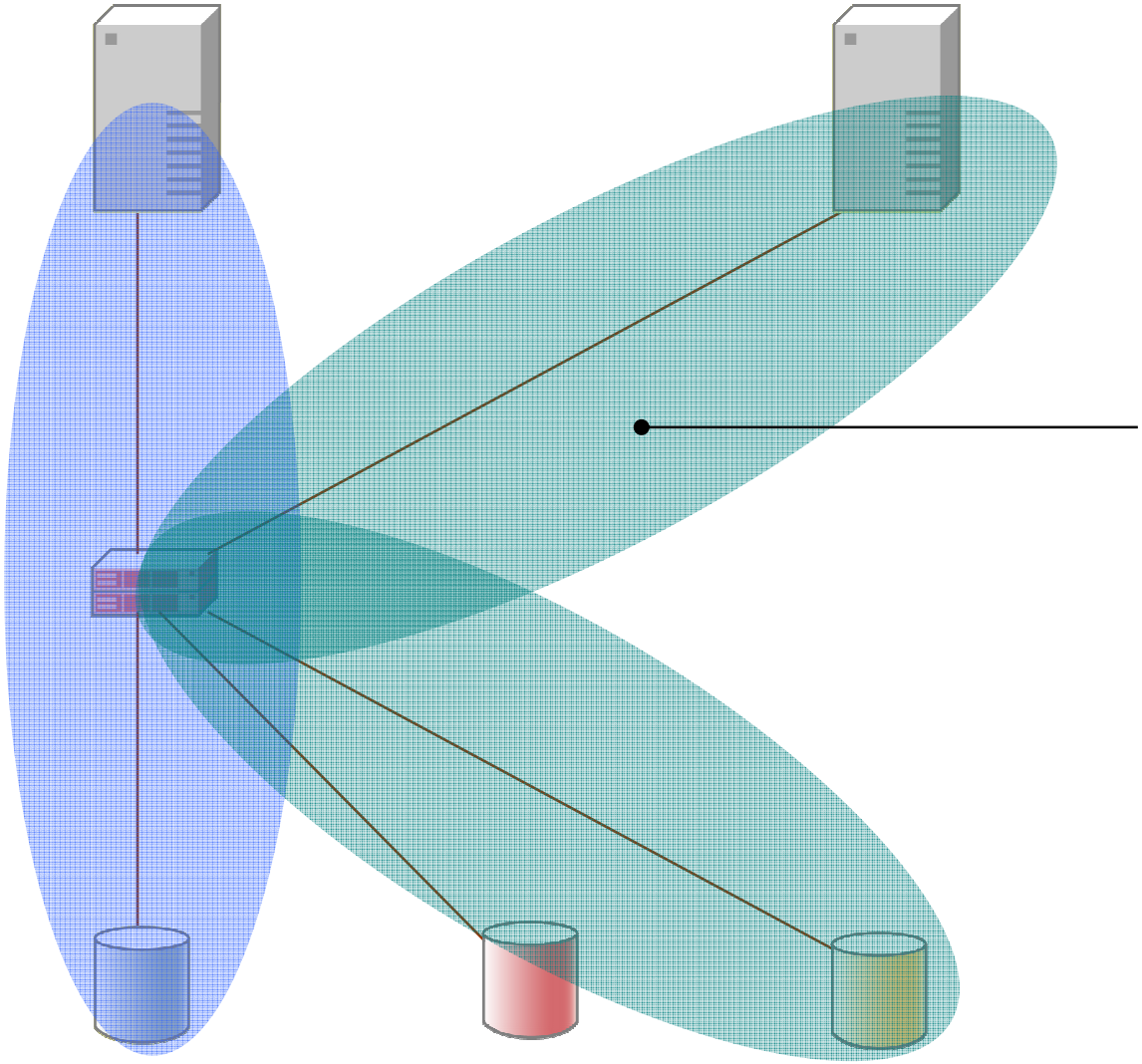
Cluster:
- Max 4 Node-pairs (8 Nodes total)

Managed Disks:
- Select LUNs from up to 64 physical disk subsystems
- Max 128 Managed Disk Groups
- Max 128 LUNs per group

SAN Volume Controller - Connections



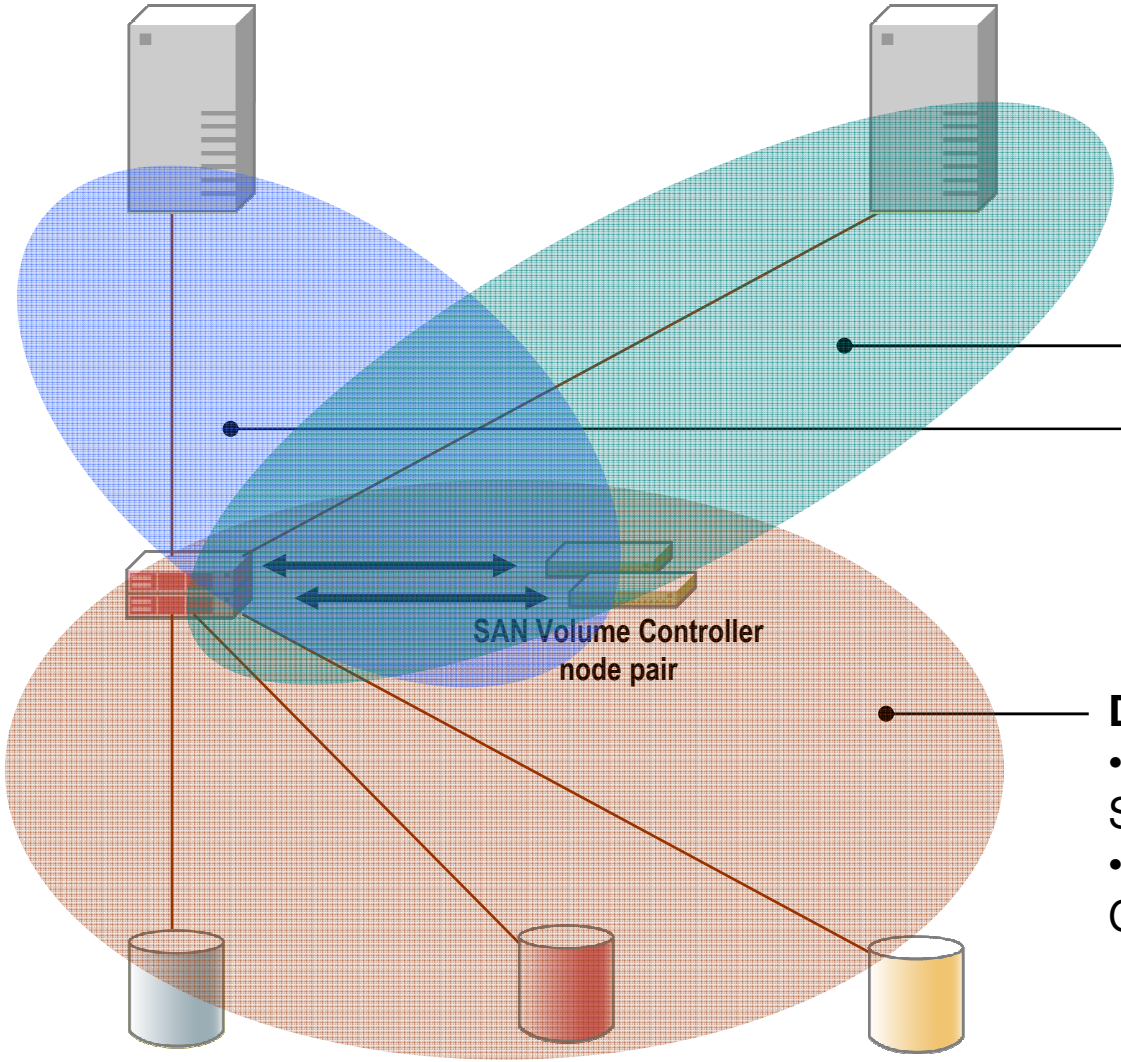
SAN Volume Controller - Zoning



Traditionally, host systems are zoned to the disks they are allowed to talk to.

But with the SAN Volume Controller…

SAN Volume Controller - Zoning



Host Zones:
•Hosts are zoned only to SAN Volume Controller.

•They see only the Virtual Disks they are allowed to talk to.

Device Zone:
•Devices are zoned only to the SAN Volume Controller.
•They see the SAN Volume Controller as their connected host.

SAN Volume Controller – Virtual Disk Modes

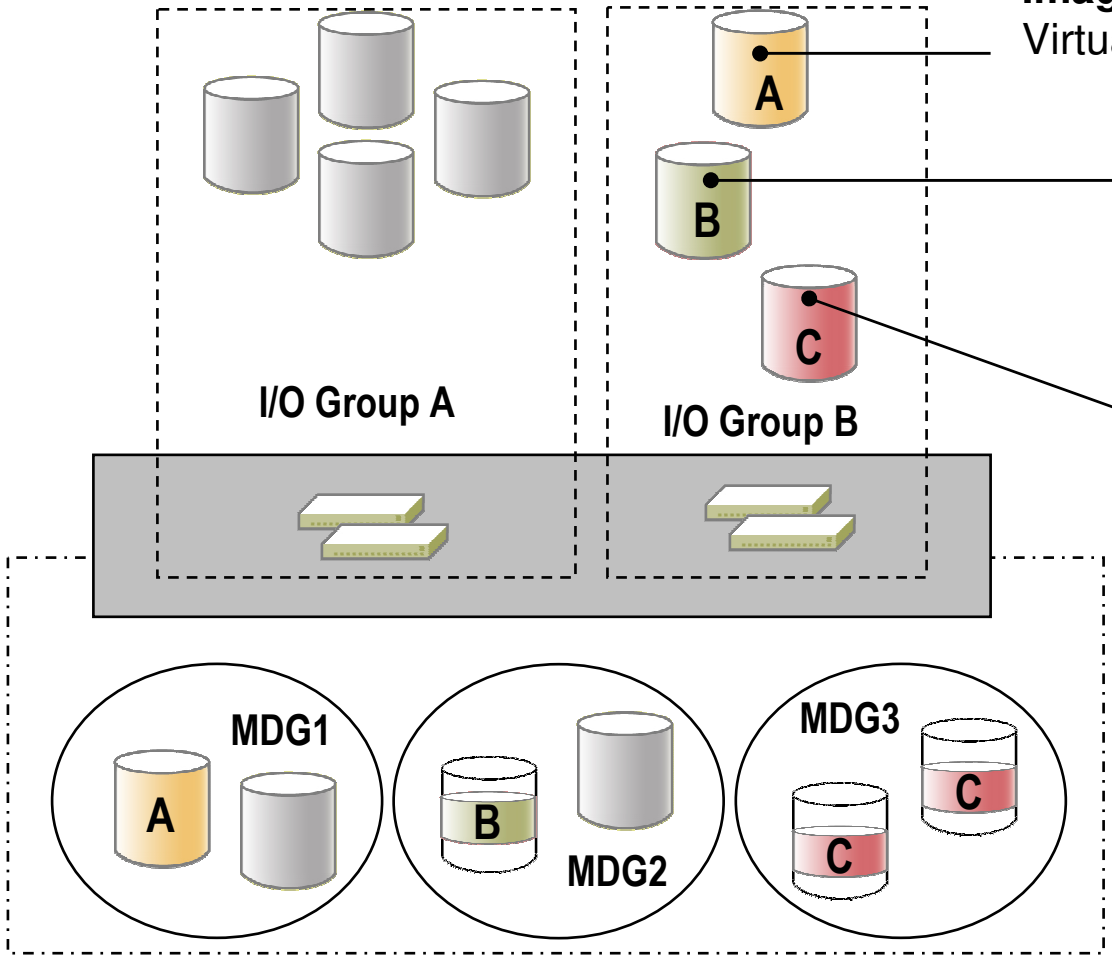


Image Mode:
Virtual Disk = Physical LUN

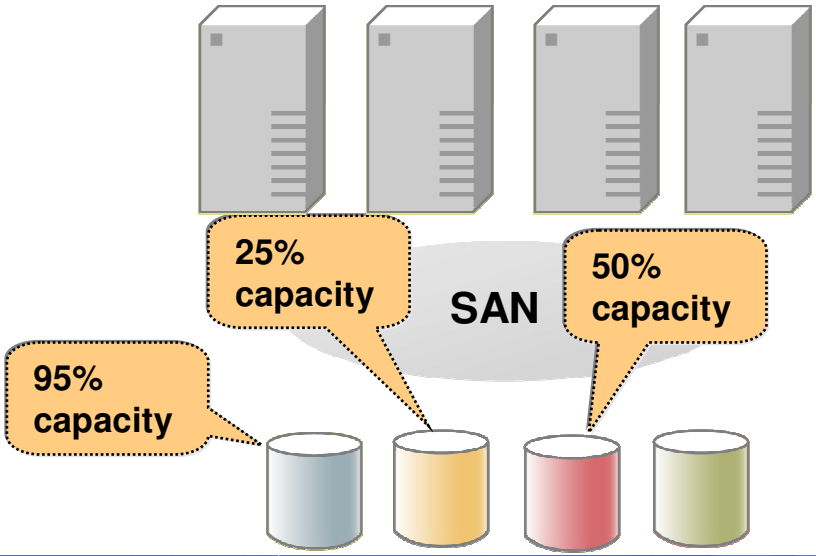
Sequential Mode:
Virtual Disk mapped sequentially to a portion of a managed disk

Striped Mode:
Virtual Disk striped across multiple managed disks

Optimized Storage Resource Utilization

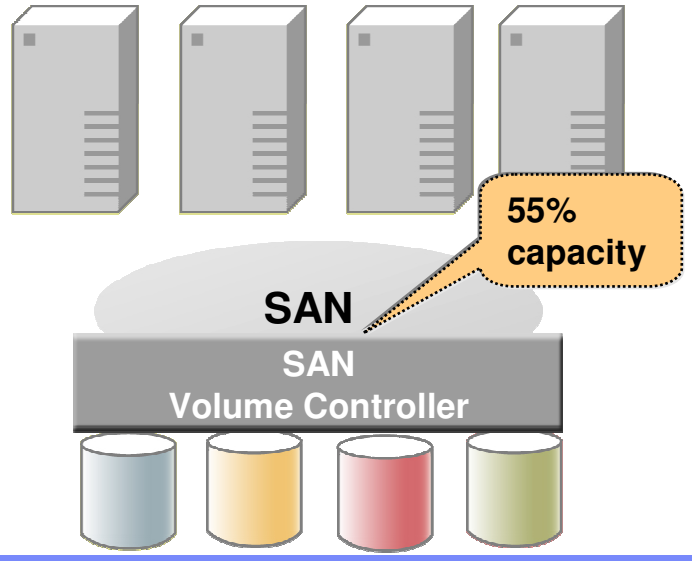
Traditional SAN

- Shared physical network
- Limited capacity sharing
- Capacity purchased for, and owned by individual processors
- Poor capacity utilization



SAN Volume Controller

- Hosts own “virtual” disks
- Capacity can be more easily reallocated
- Capacity purchases can be deferred until the physical capacity of the SAN reaches a trigger point.



Improved Application Availability

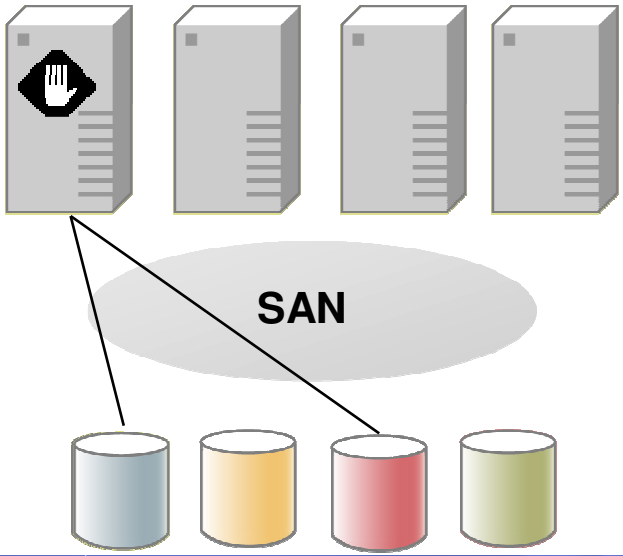
Traditional SAN

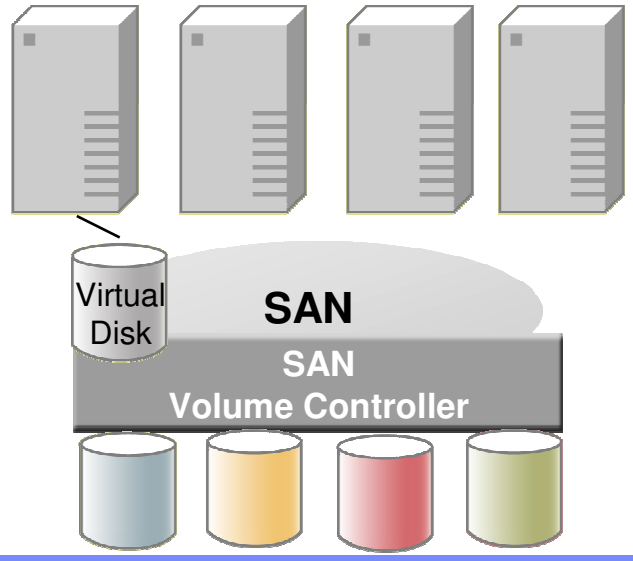
1. Stop the application
2. Move data
3. Re-establish host connections
4. Start application

SAN Volume Controller

1. Move data

- Host systems and applications are not affected.

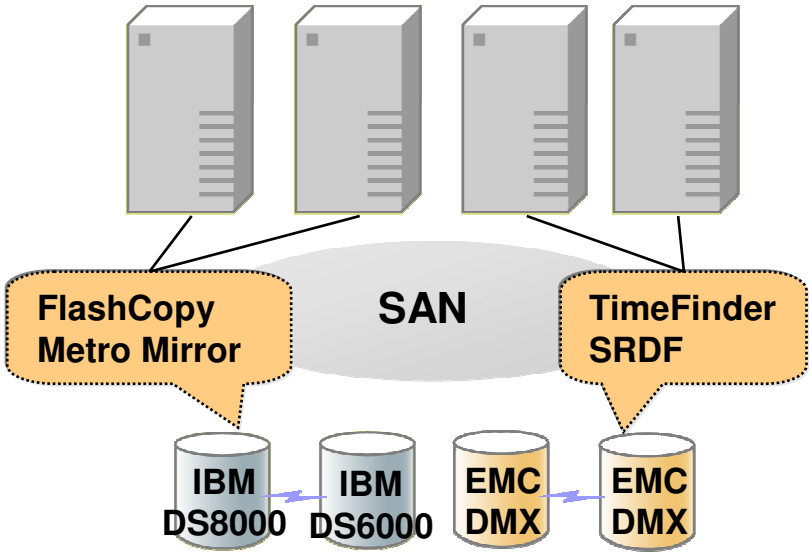




Reduced Cost and Improved Flexibility for Replication Services

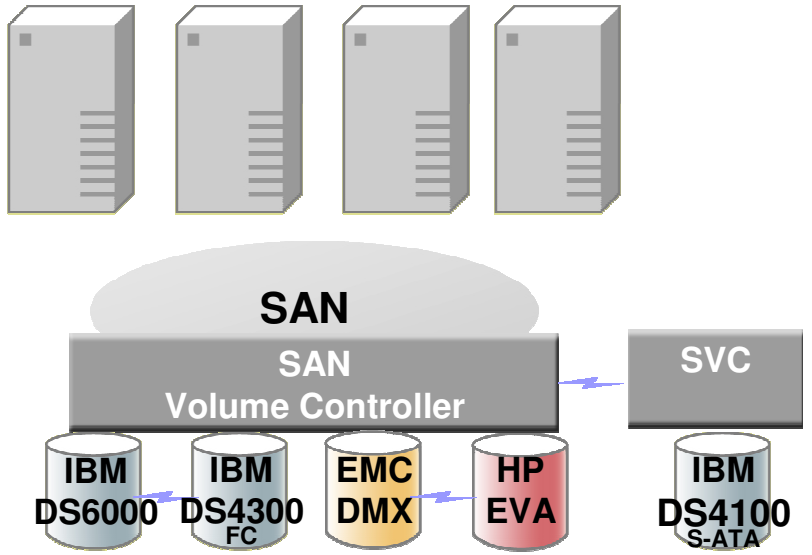
Traditional SAN

- Replication service API's differ by vendor, making it difficult to integrate applications
- Lower-cost disks offer primitive, or no replication services

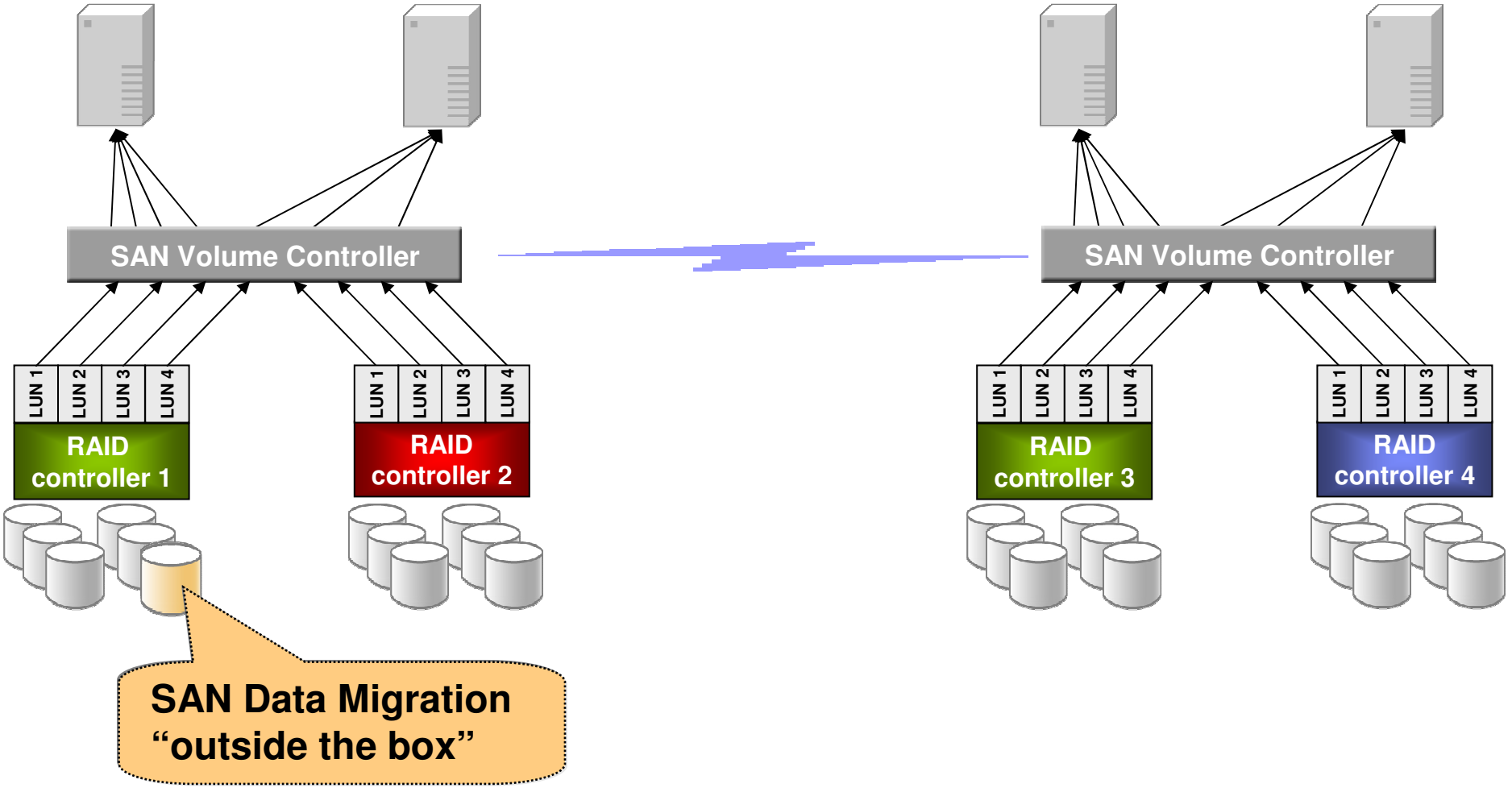


SAN Volume Controller

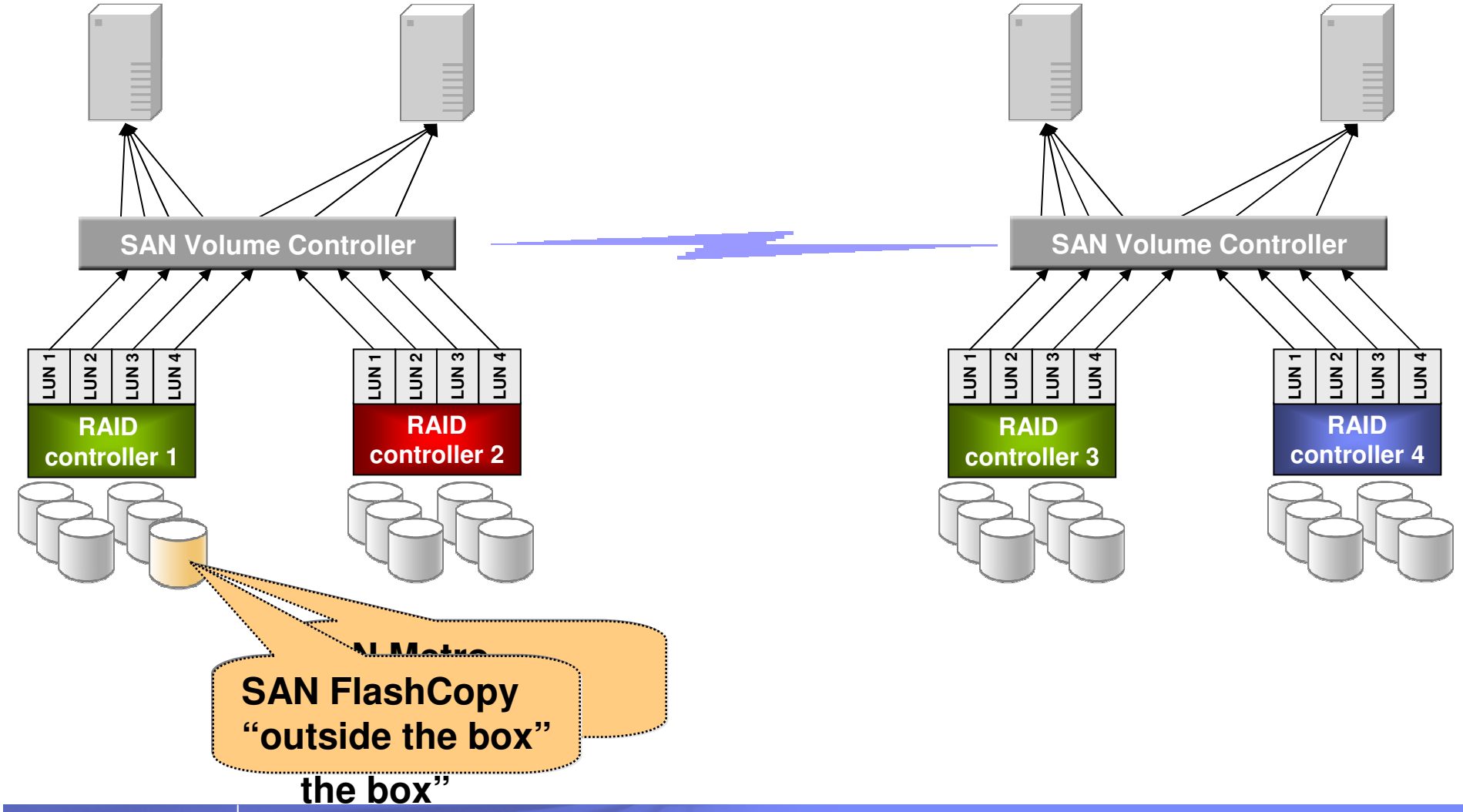
- Common replication API, SAN-wide, that does not change as storage hardware changes
- Replication targets can be on lower-cost disks, reducing the overall cost of exploiting replication services



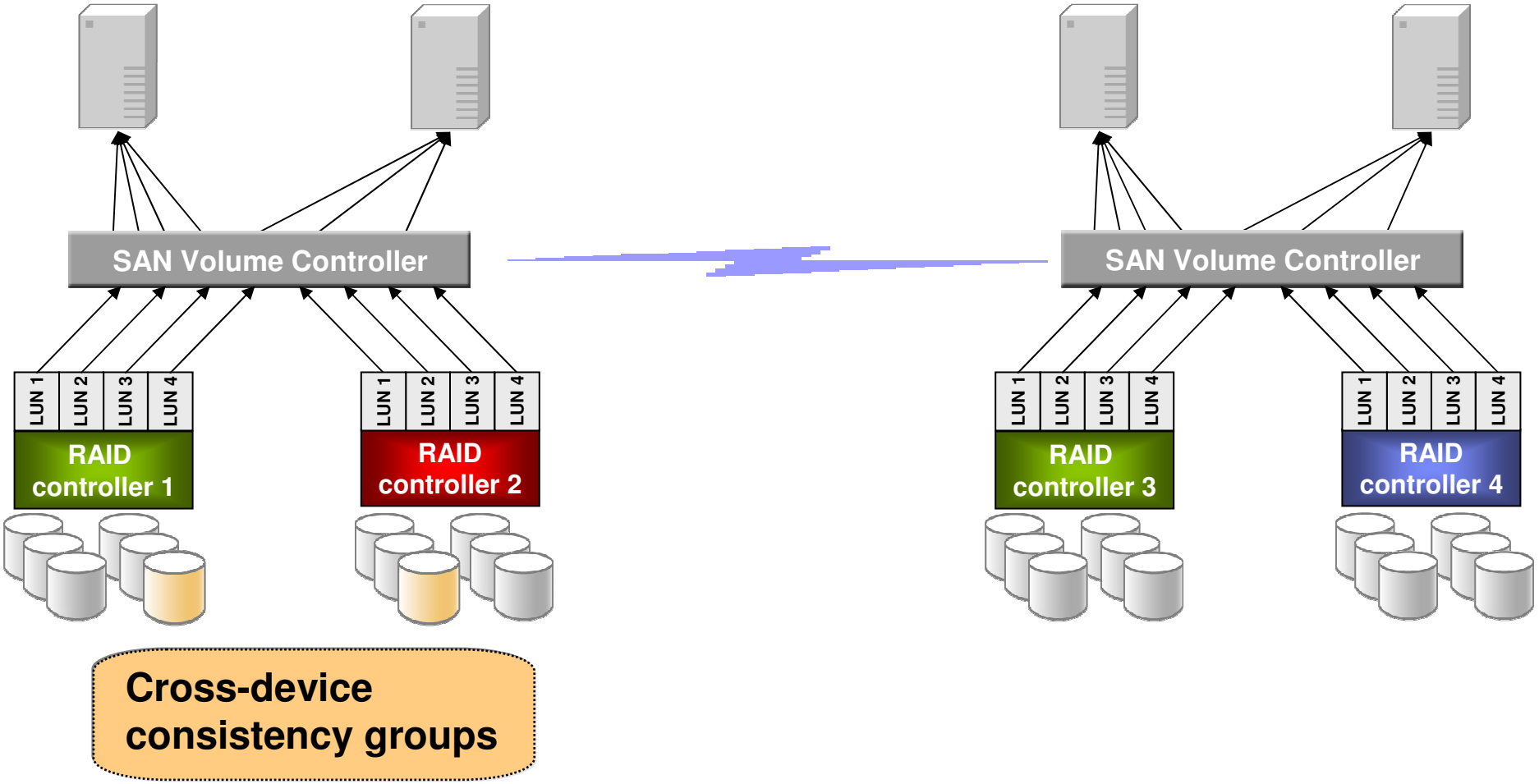
TotalStorage SAN Volume Controller Copy Services



TotalStorage SAN Volume Controller Copy Services



TotalStorage SAN Volume Controller Copy Services



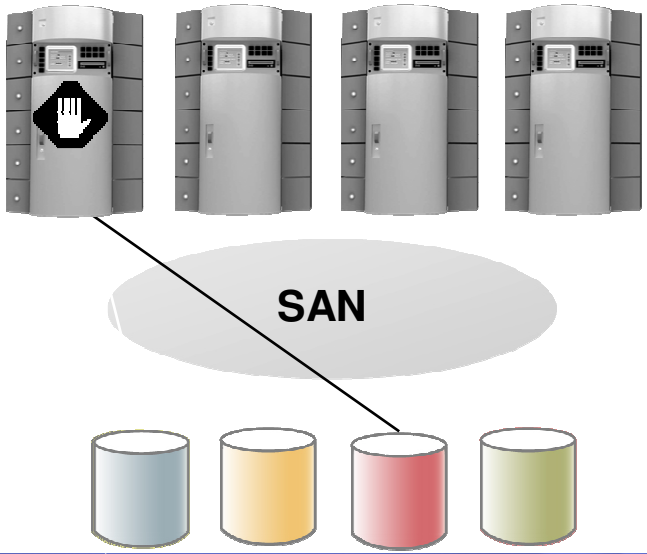
Non-disruptive Data Migration with SAN Volume Controller

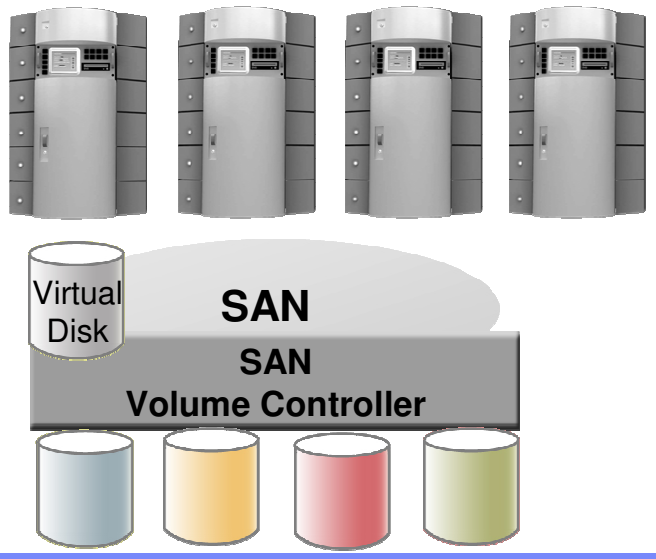
Traditional SAN

1. **Stop applications**
2. **Move data**
3. **Re-establish host connections**
4. **Restart applications**

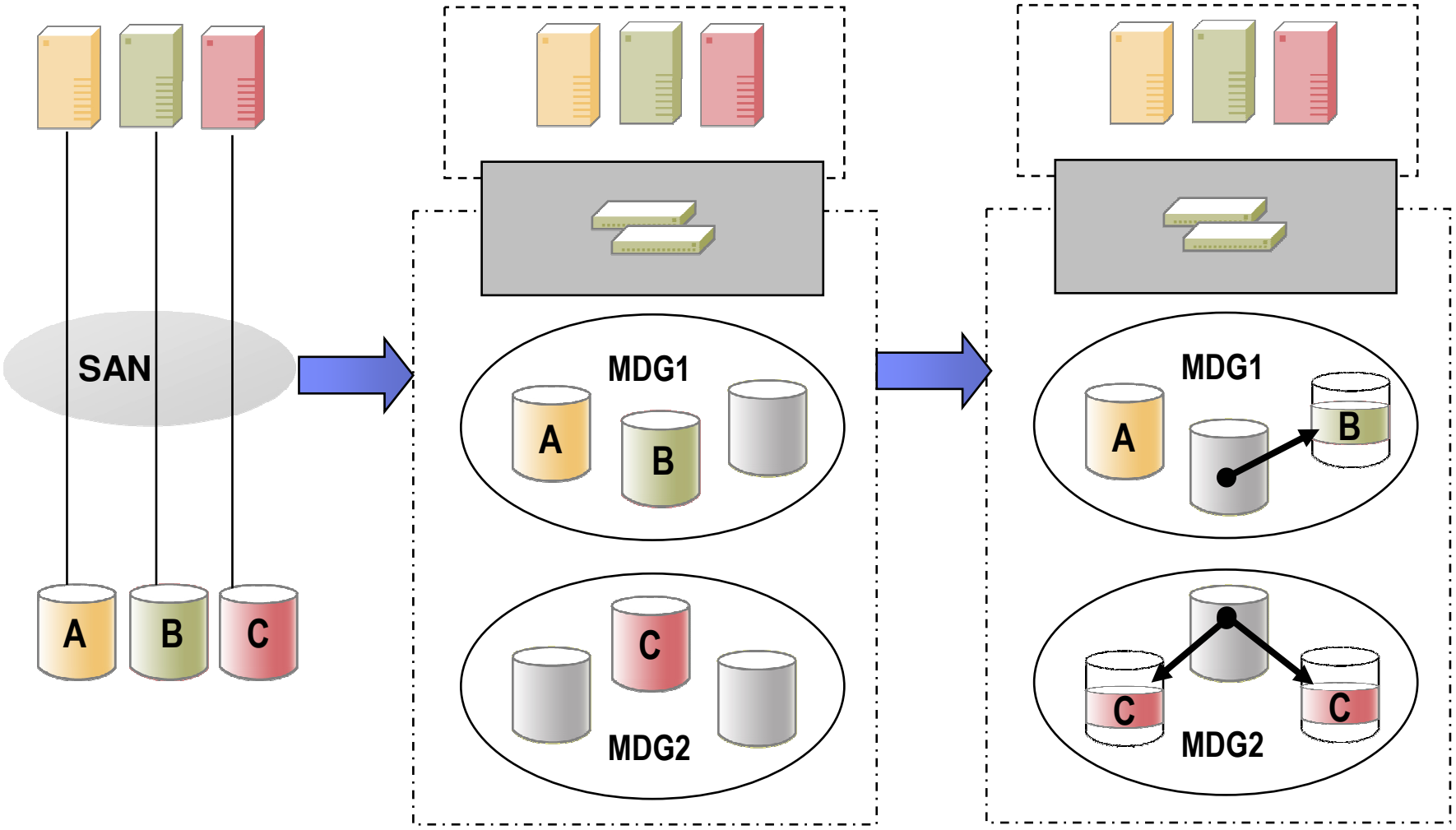
SAN Volume Controller

1. **Move data**
   Host systems and applications are not affected.





SAN Volume Controller – Migration



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SVC Performance

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Latest SAN Volume Controller SPC-1 Benchmark – Ver 3.1

SPC-1 Results

Tested Storage Configuration (TSC) Name:	**IBM TotalStorage SAN Volume Controller 3.1**
Metric	*Reported Result*
SPC-1 IOPS	**155,519.47**
SPC-1 Price-Performance	**$12.76/SPC-1 IOPS**
Total ASU Capacity	**12,216.796 GB**
Data Protection Level	**Mirroring**
Total TSC Price (including three-year maintenance)	**$1,983,784.74**

http://www.storageperformance.org/results/a00043-r1_IBM_SPC1_executive-summary.pdf

Key Points:

- SVC delivers the highest results **EVER** posted in this industry-recognized storage performance test
  - SVC is 50% better than the next closest disk array
  - SVC (155,519 IOPS) + DS8000 (101,101 IOPS) lead the industry in virtualization and disk array performance benchmarks

SPC-2 Benchmark

- Newest addition to the Storage Performance Council Benchmarks
- Composite of three workloads to measure sequential performance
  - Large file processing – scientific and large-scale financial processing
  - Large database queries – data mining and business intelligence
  - Video on demand – streaming movies to end users
- SVC posted the highest results in this industry-recognized storage performance test
  - SVC (3.517 GB/s) + DS8300 (3.217 GB/s) lead the industry in this new benchmark

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Automating SAN Volume Controller Management

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TPC Enhances SAN Volume Controller

Asset and Capacity Reporting

- **Physical characteristics such as the manufacturer, model, serial number, capacity, etc.**
- **Show the allocated and free capacity of every SVC on the network**

Configuration Reporting and Management

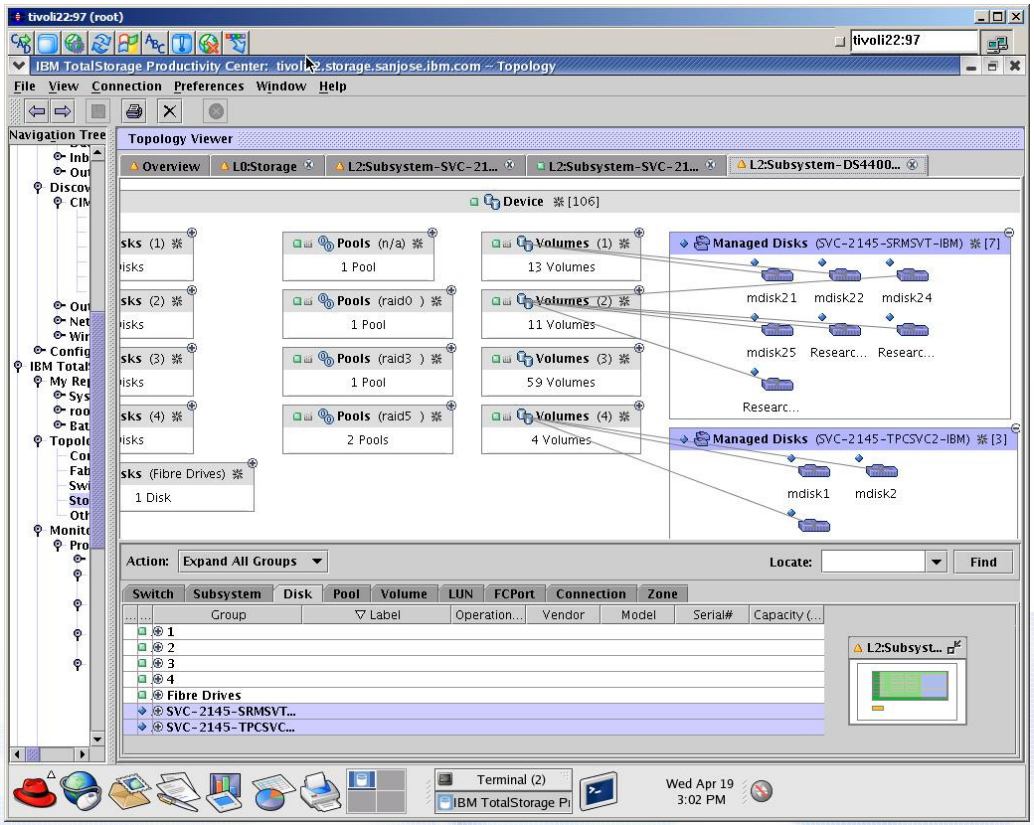
- **Reports on SVC's storage allocated to logical host volumes (which appear to hosts as disk drives) and the managed disks being used on the backside**
- **Display the physical managed disks behind what the host sees as a disk drive**
- **List all SVC volumes which have been allocated but aren't in use**
- **Show which hosts have access to a given SVC volume**
- **Show which hosts have access to a given disk drive (within the SVC)**
- **Show which SVC volume (and managed disks) a host has access to**
- **Discovery, Show the Storage Controllers (ex., ESS/DS4000) that provide volumes to SVC**

Performance Management

Basic and Automated Provisioning

Managing SAN Volume Controller with TPC

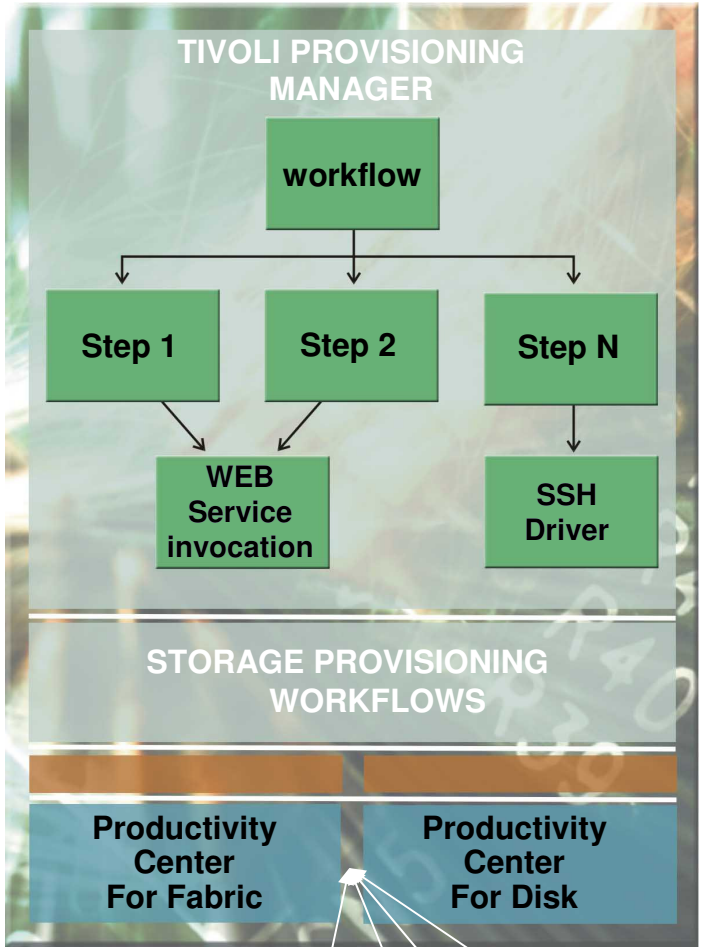
- Users can set thresholds for predefined performance metrics
  - Total Virtual Disk I/O Rate (I/O per sec per I/O group)
  - Total Virtual Disk Transfer Rate (MB per sec per I/O group)
  - Total Managed Disk IO Rate (I/O per sec per Mdisk group)
  - Total Managed Disk Transfer Rate (MB per sec per Mdisk group)
- Events can be sent to an SNMP manager or Tivoli Event Console
- Topology view shows SVC mDisk and maps to physical storage



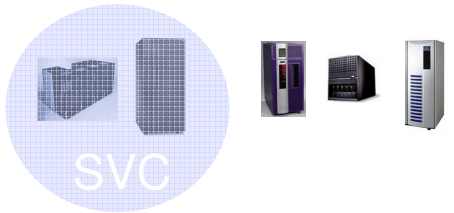
- Reporting on vDisk – mDisk – Backend Storage Volume Names

TotalStorage Productivity Center & Advanced Provisioning

- IBM TotalStorage Productivity Center with Advanced Provisioning provides storage capacity provisioning for:
  - DS8000 Series
  - DS6000 Series
  - ESS
  - DS4000 Series
  - SAN Volume Controller
  - SAN Fabric



Through automated storage workflows driven by Tivoli Provisioning Manager



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SAN Volume Controller Supported Environments

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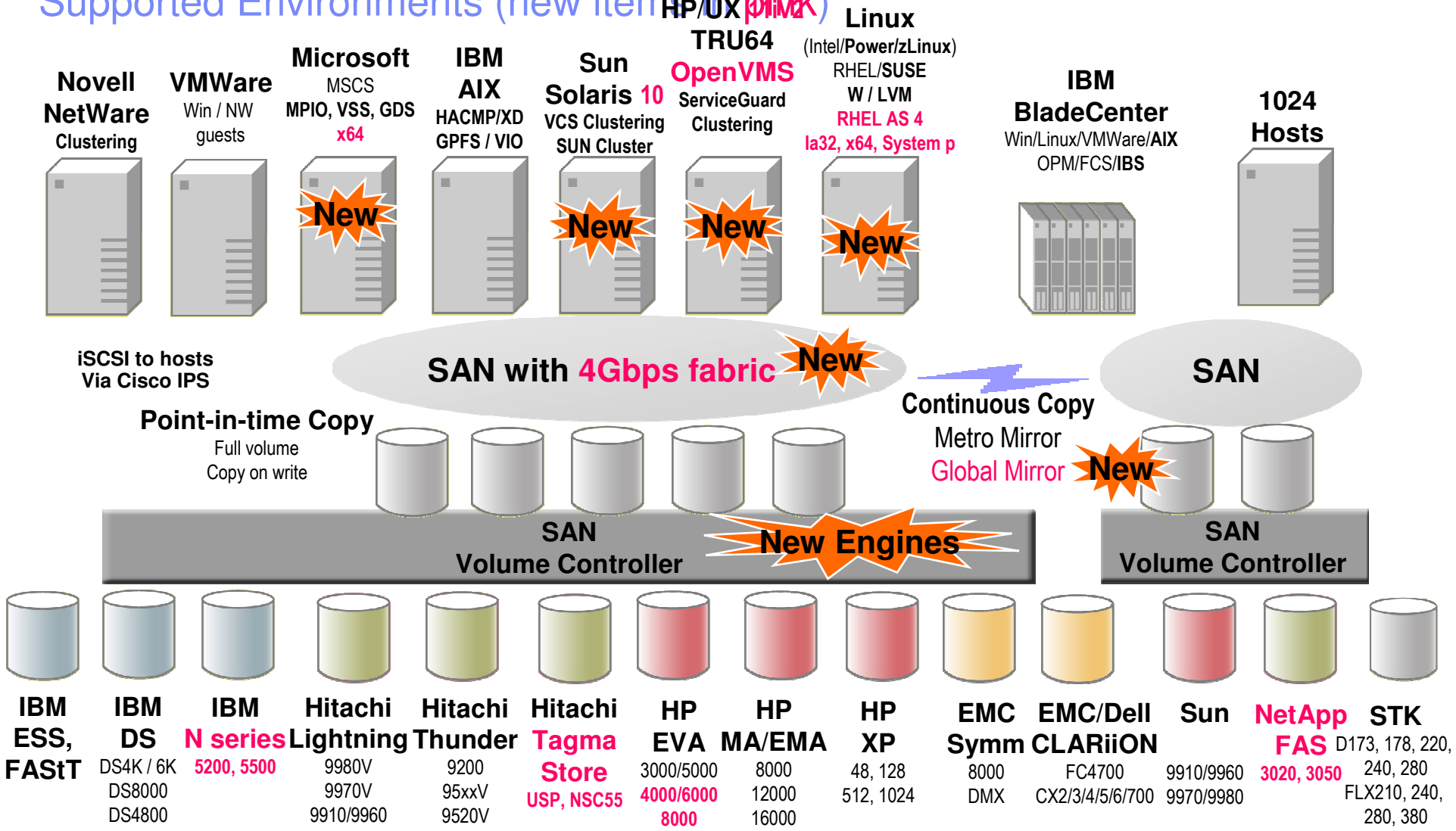
System Storage SAN Volume Controller Version 4.1

Supported Environments (new items in pink)



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Conclusion

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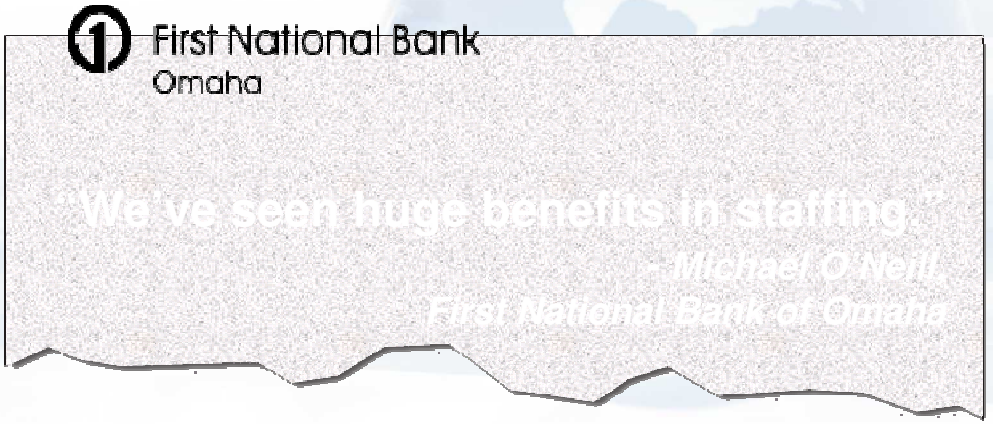
Key Requirements for Virtualized Disk Storage

With over 2000 clients to date, SAN Volume Controller delivers …

- Retain existing investments
- Implement with minimal disruption to applications
- Enable phased implementation

Virtualization is Real

- S s deployed in SVC available today help address c
  - Better utilization
  - Lower costs
  - Improved availability
- Four years' experience in deploying network-based virtualization systems
- Rapid adoption demonstrates attractiveness of solutions
  - 2,000 SVC clients world-wide managing over 15PB of data



SAN Volume Controller Value

Reduces the cost and complexity of managing storage	Improves business continuity	Improves storage utilization	Improves personnel productivity	Delivers high availability and performance
Creates tiers of storage and enables multi-vendor strategies	**Change storage without interrupting applications**	**Manage storage as a business resource, not as separate boxes**	**Manage a single storage resource from a central point**	**Demonstrated over three years' experience**

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