



IBM® TotalStorage®

A close-up photograph of a pen nib, showing the fine lines of the nib and the surrounding skin, is positioned on the left side of the slide.

zSeries Conference G23 - IBM TotalStorage® Portfolio Part 2

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Agenda

Part 1 - Session G22

Overview

Strategy

DS Family

Tape Solutions (3590, 3592, LTO, 3494, 3584 and VTS)

Part 2 - Session G23

Storage Networking

DFSMS

Virtualization

Storage Management

SAN Fabric Switch Marketplace



- IBM Best of Brand Vendor Strategy
 - Limited SAN switch interoperability and strong switch brand loyalty fragment market
 - SAN infrastructure ownership is key to storage vendor device/software sales
 - Support for integrated fabric extensions and advanced intelligence
 - SNIA Open standards and interoperability leadership

- IBM offers end-to-end SAN solutions with thee leading vendors
 - Brocade is entry and midrange switch market leader
 - McDATA is enterprise director market leader
 - Cisco is SAN and IP network consolidation market leader

SAN: What's New

- **July 26, 2005 Announcements**
- IBM TotalStorage SAN b-type (Brocade) family**
 - **SAN256B (2109-M48) enterprise director**
Scalable from 16 to 256 ports
1, 2, 4 Gbps; 16 and 32-port blades
 - **SAN16B-2 (2005-B16) entry SMB switch**
1, 2, 4 Gbps; 8, 12, 16 ports
 - **SAN16B-2 Express Model (200516B) for xSeries**
 - **FICON CUP features and FICON support**
SAN256B director and SAN32B-2 switch
- IBM TotalStorage SAN m-type (McDATA) family**
 - **SAN16M-2 (2026-416) entry SMB switch**
1, 2, 4 Gbps; 8, 12, 16 ports
 - **SAN32M-2 (2026-432) midrange SMB switch**
1, 2, 4 Gbps; 16, 24, 32 ports
FICON CUP feature and FICON support
 - **SAN04M-R (2027-R04) cost-effective SAN router**
Two 1, 2 Gbps FC & two Gigabit Ethernet ports
Metro and global continuity solutions

SAN256B



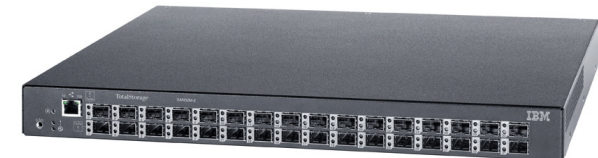
SAN16B-2, SAN16B-2 Express Model



SAN16M-2, SAN16M-2 Express Model



SAN32M-2, SAN32M-2 Express Model



SAN04M-R



Entry SMB Switch Portfolio



SAN16B-2 (2005-B16, PN200516)
8, 12, 16 ports, 4 Gbps
www.ibm.com/totalstorage/san/b-type



IBM SAN16M-2 (2026-416, PN 202616E)
4/8/12 ports, 2 Gbps ports
www.ibm.com/totalstorage/san/m-type

White Space Opportunity
First-time SAN buyers



SAN Switch H08 (2005-H08, PN2005H08)
4-8 ports, 2 Gbps
www.ibm.com/totalstorage/san/b-type



IBM SAN12M-1 (2026-E12, PN 202612E)
4/8/12 ports, 2 Gbps ports
www.ibm.com/totalstorage/san/m-type



Storage Switch L10 (PN2006L10)
4-10 ports, 1 or 2 Gbps
www.ibm.com/storage/2006

- **Integrated, simple storage consolidation and data protection solutions**
 - Homogenous Windows/Linux servers
 - IBM® eServer™ xSeries® Server sales channels
 - IBM TotalStorage DS4000 (FAStT) and LTO storage
 - Designed to provide high availability with dual fabric deployment

Midrange SMB 4 Gbps Switch Portfolio

SAN Upgrade Opportunity
4Gbps, SAN extension

IBM TotalStorage b-type (Brocade) switches



IBM SAN16B-2 (2005-B16 PN 200516B) **IBM SAN32B-2** (2005-B32 PN 200532B)
8, 12, 16 ports, 4 Gbps **FICON**
ibm.com/totalstorage/san/b-type ibm.com/totalstorage/san/b-type

IBM TotalStorage m-type (McDATA) switches



IBM SAN16M-2 (2026-416 PN 202616E) **IBM SAN32M-2** (2026-432 PN 202632E)
8, 12, 16 ports, 4 Gbps **FICON**
ibm.com/totalstorage/san/m-type ibm.com/totalstorage/san/m-type

Cisco MDS 9000 switches



Cisco 9120/40 (2061-020/040)
4-20/40 FC ports, 2 Gbps
(4/8 target/16; 32 host optimized)
www.ibm.com/storage/cisco

Cisco 9216i (2062-D1A/D1H)
14/16/32/48 FC ports, 2 Gbps
2/4/8 GbE IP storage ports
www.ibm.com/storage/cisco

- Designed to offer integrated, **scalable**, **high availability** *IBM Virtualization* family solutions
- Heterogeneous** Windows, Linux, iSeries, UNIX servers
 - xSeries®, iSeries, pSeries® Server™ sales channels
 - IBM DS4000 (FASTt), DS6000, DS8000, LTO and ETS storage

Technology Upgrade Opportunity
SAN Consolidation & extension

IBM Director Portfolio

NEW



IBM SAN256B
256 FC/FICON , 2, 4 Gb ports
ibm.com/totalstorage/san/b-type



IBM M14 (2109-M14)
32-128 FC/FICON 2 Gb ports
ibm.com/totalstorage/san/b-type

NEW



IBM SAN256M
256 FC/FICON 2 Gb ports
10Gbps ISL ports
ibm.com/totalstorage/san/m-type



IBM SAN140M (2027-140)
16-140 FC/FICON 2 Gb ports
ibm.com/totalstorage/san/m-type



IBM SAN256N (2045-N16)
32-256 FC/FICON 2Gb ports
10Gbps ISL ports
ibm.com/totalstorage/san/n-type

NEW

McDATA/CNT roadmap
final enhancements in
firmware R1.5



Cisco 9606 (2062-D04/-T04)
14,16-128 FC/FICON 2 Gb ports
Three 2+14, 4 or 8 IPS Modules
www.ibm.com/storage/cisco



Cisco 9509 (2062-D07/-T07)
28, 32-224 FC/FICON 2 Gb ports
Five 2+14, 4 or 8 IPS Modules
www.ibm.com/storage/cisco

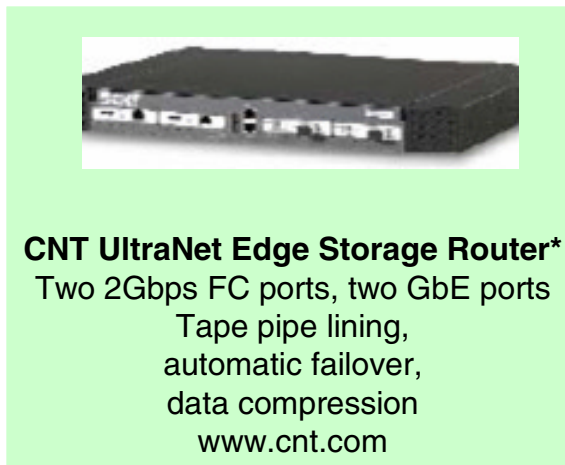
- **Designed to provide high availability and scalability and intelligent software to help simplify management of complex, integrated enterprise SANs**
- **Heterogeneous Windows, Linux, iSeries, UNIX and mainframe servers**
 - xSeries, iSeries, pSeries, zSeries Server sales channels
 - IBM DS4000, DS6000, DS8000, LTO and ETS storage

IBM WAN and SAN Routing and Intelligent Fabrics



NEW

Cisco Multiprotocol Services
 Fourteen 2 FC, two GbE ports
 iSCSI Gateway
 FCIP Tunneling w/compression
 Inter-VSAN routing
www.ibm.com/storage/cisco

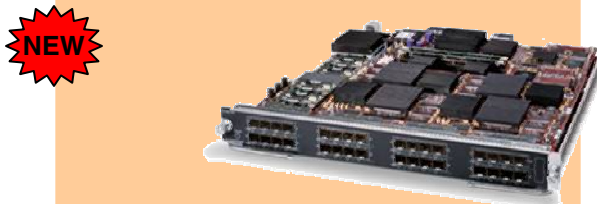


CNT UltraNet Edge Storage Router*
 Two 2Gbps FC ports, two GbE ports
 Tape pipe lining,
 automatic failover,
 data compression
www.cnt.com



NEW

IBM SAN16M-R SAN Router
 Twelve 2Gbps FC ports, four GbE ports
 iSCSI Gateway
 iFCP routing w/compression
 FC-FC SAN Routing
www.ibm.com/totalstorage/san/m-type



NEW

Cisco Storage Service Module
 32 FC ports and intelligent fabric
 support for DS4000 metro &
 SVC global mirroring
www.ibm.com/storage/cisco



NEW

IBM SAN16B-R SAN router
 8/16 ports, 2 Gbps or GbE
 iSCSI Gateway
 FCIP Tunneling
 FC-FC SAN Routing
www.ibm.com/totalstorage/san/b-type



NEW

IBM SAN04M-R SAN Router**
 Two 1Gbps FC ports, two GbE ports
 iSCSI Gateway
 iFCP routing w/compression
 FC-FC SAN Routing
www.mcdata.com

IBM and Network Appliance Alliance Overview

IBM and Network Appliance today announced a strategic storage relationship to drive information on demand solutions and to expand IBM's portfolio of storage solutions. The relationship includes:

- IBM and NetApp has entered into an OEM agreement that will enable IBM to sell IBM branded solutions including Hardware and software
- IBM Tivoli Storage Manager will become a preferred backup and recovery solution for NetApp products
- In addition, NetApp will position IBM as its preferred supplier of tape systems.
- Finally, the two companies are exploring additional strategic opportunities.



IBM & Network Appliance Announcement

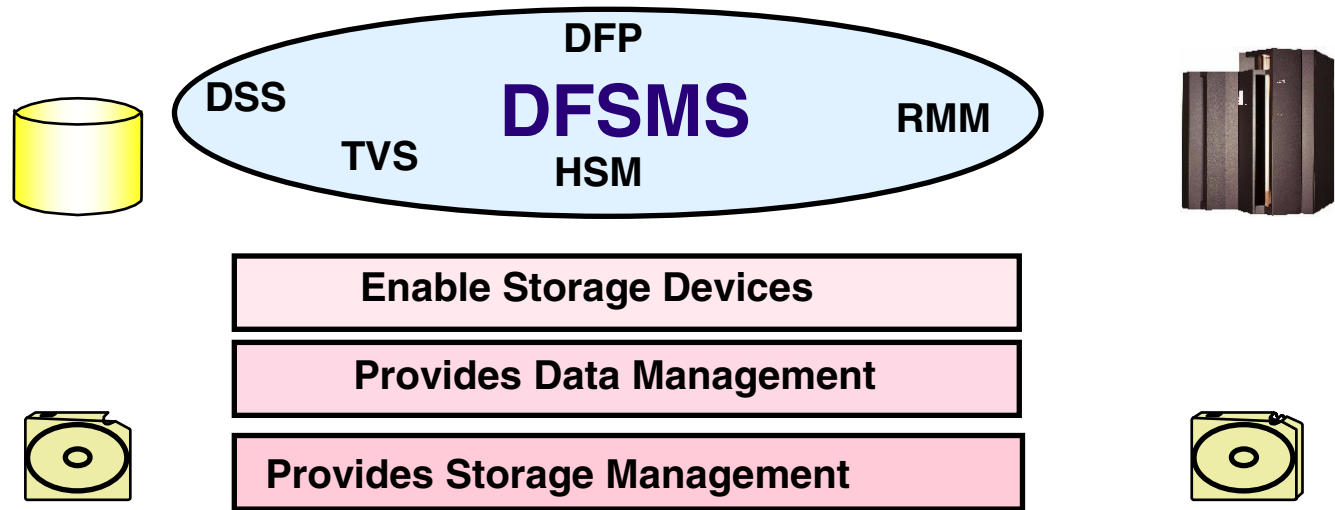
- **IBM and Network Appliance (NetApp) have announced an agreement that will allow IBM to OEM products from Network Appliance. Those Products include:**
 - **FASxxx product line**
 - Entry Level, midrange and enterprise offerings
 - Provides NAS functionality for both Windows and Unix environments
 - Compliments the future of IP SAN with iSCSI support
 - Compliments IBM's TotalStorage portfolio of SAN, Tape and Software solutions
 - **V-Filer product line**
 - Entry Level, midrange and enterprise offerings
 - Provides NAS gateway functionality for both Windows and Unix environments
 - Provides a bridge from the SAN networks to IP networks
 - Allows both file system and iSCSI access to fibre channel SAN networks
 - **Nearline products**
 - Provides a repository for medium/long term archival of data on disk
 - Provides extremely fast access to backup data in disaster recovery scenarios
 - Will compliment IBM's tape solutions for long term off-site archival of data
 - Provides data retention and regulatory compliance features for meeting new and existing industry and government regulations for retaining auditable data
- **This agreement allows IBM to provide our customers one of the most comprehensive and complete storage portfolios in the industry**
- **Products will be introduced in a staged roll-out beginning in 3Q05**

IBM TotalStorage DR550 Overview

- A comprehensive offering designed to provide non-rewriteable and non-erasable (WORM*) policy based storage management
- Autonomic policy based data migration
- Attaches to IP Network via secure access API
- Many redundant components for high availability
- Integrated Solution
 - Single or Dual node pSeries POWER5 Technology
 - Scales from 3.5 TB's to 56 TB's
 - Disk and tape combination scales to petabytes providing dramatically lower TCO
 - Deemed compliant with SEC 17a-4 by independent consultants

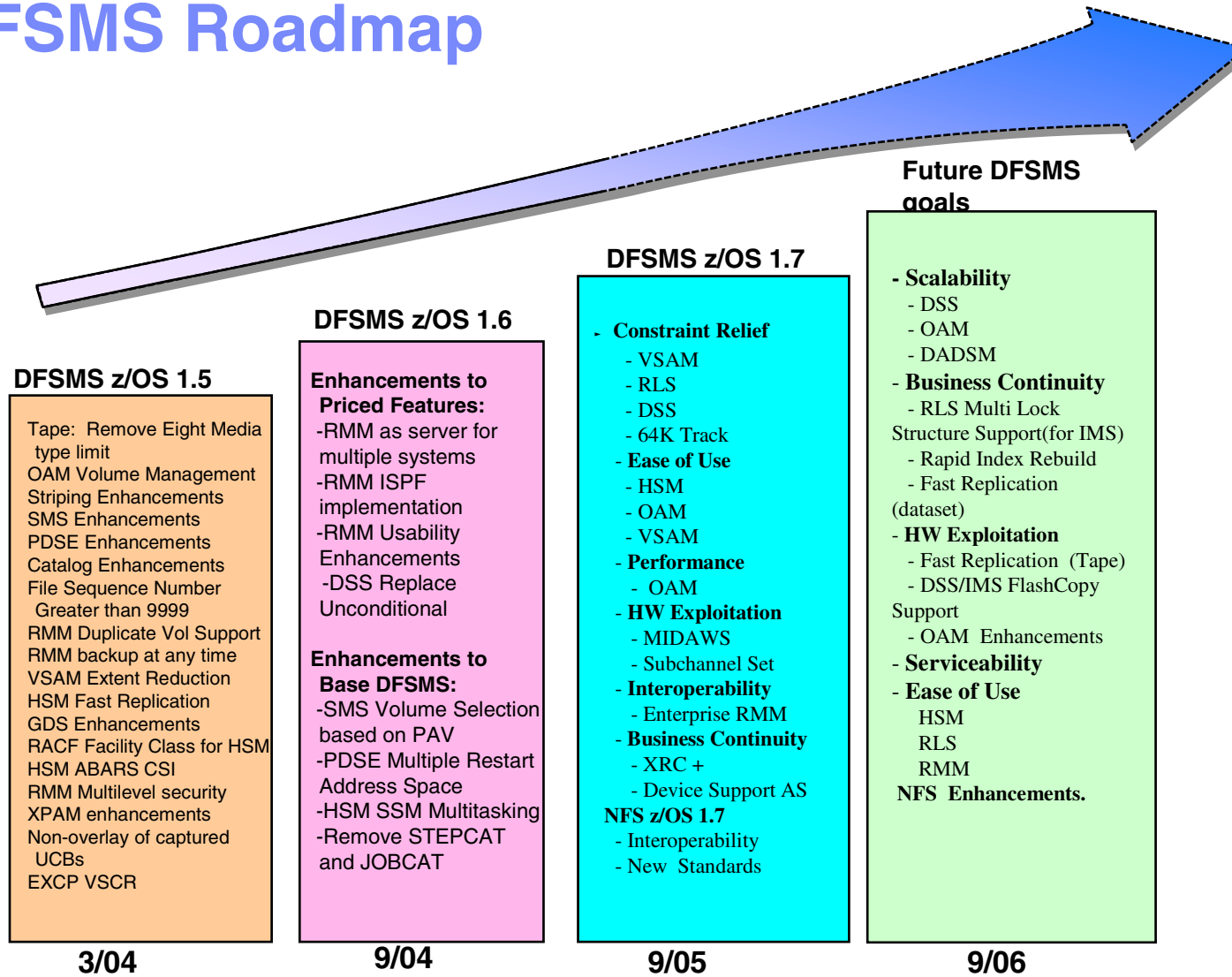


DFSMS - z/OS Storage Management



<u>Customer Requirements</u>	<u>Customer Benefits</u>
An automated, centralized, policy-based solution for storage management in the z/OS environment.	Enhances productivity of Storage Administrators, reducing people costs. Improves utilization of storage resources, reducing storage hardware costs.

DFSMS Roadmap



Scalability - DFSMS 1.7

- **Support for Sequential and EXCP data sets larger than 64K tracks**
 - Ability to utilize the larger disk volumes by creating single large data sets
 - Addition to existing support for Extended Format Sequential data sets >64K tracks
- **More than 255 VSAM Extents**
 - Reduce out-of-space type failures as data sets grow
 - Less need to redefine/reorganize data sets as they grow



Scalability - DFSMS 1.7

- **RLS 64-bit virtual**
 - Provides a solution to the VSAM RLS dataspace storage constraint problem by exploiting 64-bit addressable virtual storage. This enhancement will allow the continued growth of applications using VSAM RLS.

- **DFSMSdss: DSS Virtual Storage Constraint Relief**
 - This relief is provided by changing the type of channel programs used by DFSMSdss to a type that can reside above the 16 MB line. This will allow DFSMSdss to handle more volumes while processing data sets during COPY and DUMP operations.

- **DFSMSHsm: Extend TTOC record to support more than 330,000 data sets per volume**
 - Better support for high capacity tape

- **DFSMSHsm: Allow DFSMSHsm Journal to be greater than 64K track sequential data set**
 - Journal should not fill as quickly, reduces need to backup DFSMSHsm CDSs due to journal full condition



Performance - DFSMS 1.7

- OAM Immediate Recall to DB2
 - *This support is to implement the immediate recall of objects, currently residing on removable media, to DB2, for an installation specified number of days.*



Ease of Use - DFSMS 1.7 Functions

- **OAM Volume Management Stage 2**

- This enhancement builds on OAM Volume Management Stage 1 that was introduced in z/OS 1.5. Stage 2 provides a new exit, when a tape volume is expired and removed from the OAM object tape volume inventory, to notify the tape management system that the tape has expired and can be returned to the scratch pool. DFSMSrmm has also been enhanced to accept this notification. Stage 2 will also expand on the newly added RECYCLE option of the MOVEVOL utility to allow automatic selection of tape volumes for MOVEVOL/RECYCLE processing, based on installation-specified thresholds and limits.
- These enhancements will improve the efficiency and ease of use of tape management in OAM environments.

- **SMS Volume Selection Messages:**

- Provides an Operator command to change the SMS status of a volume. This augments the current ISMF method of changing an inactive configuration and activating it which requires you to log on to TSO and use the ISMF panels and applications. Also provides new volume selection analysis messages for successful and failed allocations. These enhancements will allow storage administrators the capability to more effectively maintain an efficient SMS environment.

DFSMSHsm Ease of Use - DFSMS 1.7

- **DFSMSHsm Recycle Enhancement**
 - Allow Recycle of connected sets to not require first volume of connected set to meet PERCENTVALID as long as average for connected set meets the criteria

- **Improvements to Fast Subsequent Migration**
 - Allow FSM to apply to data sets that got migrated to ML2 tape without a valid backup copy.
 - TMM candidates usually fall into this category

- **Improvement to HMIGRATE usability**
 - Eliminate multiple error messages when attempting to migrate already migrated data set
 - These data sets now skipped

DFSMSHsm Ease of Use - DFSMS1.7

- ***Cancellation of individual DFSMSHsm tasks:*** This enhancement allows DFSMSHsm users to cancel all active DFSMSHsm data movement tasks, including ABARS tasks that process in their own address space. Previously, when you needed to cancel an active individual DFSMSHsm data movement task, you had to bring down the entire DFSMSHsm address space. Now an active data movement task can be cancelled without impacting other ongoing DFSMSHsm activity. This enhancement will promote higher DFSMSHsm availability and better end-user satisfaction.
- This capability will be incorporated into z/OS V1.7. Support is planned to be made available via PTFs for z/OS V1.4 and higher in 2005.

Business Continuity - DFSMS 1.7 Functions

- **DFSMSshm:** Allow ABARS aggregate definition without INCLUDE statement
- **DADSM/CVAF Device Support Address Space**
 - Provides a functional address space that is started during a system IPL that is recoverable and restartable. This address space will also facilitate the addition of CTRACE support for the DADSM and CVAF components that will allow for First Failure Data Capture. This will allow improved serviceability and overall system availability
 -
- **IDCAMS Repro Mergecat fromkey/tokey**
 - Provides REPRO MERGECAT with a from key to key capability to move catalog entries from one catalog to another starting at some entry name (From key) and ending at a higher entry name (To key). This capability can reduce the time required to recover a damage catalog
- **Catalog Recovery**
 - The Integrated Catalog Forward Recovery Utility (ICFRU) which was formally a separate program product (5798-DXQ) is now part of a base z/OS. This utility allows you to recover a damaged catalog to a correct and current status using SMF records. This utility allows you to build your own catalog recovery solution and has been used successfully for many years. If a more complete solution is required, the Mainstar Catalog RecoveryPlus (5620-FGY) product is recommended.

Hardware Exploitation - DFSMS 1.7

- **Subchannel Set Support:**

- *The multiple subchannel set line item begins to address the 64K subchannel limit for UCBs in z/Series software.*
- *By defining a second subchannel set within the channel subsystem, the number of devices available to customers is doubled.*
- *The device numbers can be duplicated in the same channel subsystem by being in both subchannel sets*
- *The four digit device number limit remains unchanged.*
- *This support will be limited to Parallel Access Volumes (PAVs) alias devices on the Enterprise Storage Server (device types 3390A, 3380A).*

Interoperability - DFSMS 1.7

- **DFSMSrmm Enterprise Enablement**
 - In z/OS 1.6 support was provided for a z/OS client and server and for class libraries for using the RMM API to issue RMM subcommands. Now these class libraries are exploited so that the API can be used on behalf of any application or platform in the enterprise. This will more easily allow the use DFSMSrmm to manage all the tapes in an enterprise providing a more efficient use of tape resources.

- **z/OS NFS 1.7**

z/OS NFS: What does it do?

Network File System (NFS) provides a flexible option for exchange of data between like and unlike systems that support the NFS protocols. The current version of z/OS NFS supports the Sun NFS specification for Versions 2 and 3 and IPv4. With the planned enhancement in z/OS V1R7, z/OS NFS will support IPv6 and server support for the Sun NFS v4 protocols

The Importance of Supporting the NFS v4 Protocols

▪ **NFS v4 Highlights**

- ▶ **Improved access and good performance on the internet** through the ability to transit firewalls easily, perform well where latency is high and bandwidth is low, and scale to very large numbers of clients per server
- ▶ **Strong security with negotiation built-in**
- ▶ **Enhanced cross-platform interoperability** through a file system model that provides a useful, common set of features that does not unduly favor one file system or operating system over another
- ▶ **Extensibility of the protocol** through a design to accept standard extensions that do not compromise backward compatibility
- ▶ **Globalization (UTF-8)**

NFS z/OS Enhancements

- **NFS z/OS V1R7**

- ▶ IPv6 Support
- ▶ NFS v4 Server Support

- **NFS Future Release**

- ▶ NFS v4 Client Support
- ▶ Full Globalization Support including translation enablement

Final Good-bye to ISAM

- ISAM will no longer work in future releases of DFSMS z/OS
 - Target is DFSMS z/OS 1.7 and after
- Customers who are current on z/OS maintenance now receive a warning message when ISAM is used
- ISAM has been obsolete for over 25 years
- It is long past the time to say, "Good-bye"

DFSMS Support for Copy Services

- **Available September 2004**
 - Includes TSO/ANTRQST API support for:
 - Open LUN Support
 - FlashCopy No Copy to Copy
 - Persistent / Incremental FlashCopy
 - Inband Commands for FlashCopy via PPRC Links

- **Available April 2005**
 - Includes TSO/ANTRQST API support for:
 - Global Mirror - Asynchronous PPRC
 - FlashCopy Consistency Groups
 - Failover/Failback for
 - Metro Mirror (Synchronous PPRC)
 - Global Mirror (Asynchronous PPRC)

DFSMS Support for Copy Services

- **Planned Availability 1Q 2006**
 - DFSMSdss Support for:
 - FlashCopy No Copy to Copy
 - Incremental FlashCopy
 - FlashCopy Consistency Groups

Future DFSMS Enhancement Themes

■ **Business Continuity**

- Nondisruptive Backup and Quick Recovery
- Higher Availability
- Improved Security

■ **Infrastructure Simplification**

- Scaling up with DFSMS
- Support Customer Growth
- Ease of Use (z/OS skilled resources are nearing retirement)

■ **Information Life Cycle Management (ILM)**

- DFSMS has provided life cycle management for OS/390 and z/OS data for over 17 years

Business Continuity

- **Fast Replication Data Set Recovery**
 - Capability to restore individual Data Sets from Fast Replication Copy Pools. Required for complementary functions planned by DB2
- **RLS MLS Support for IMS DBRC/TVS**
 - Capability to isolate IMS from general RLS applications. Customers could also use this capability to isolate test RLS applications
 -
- **Fast Replication Tape Support**
 - Capability for full volume dumps to tape of the Fast Replication Copy Pools
- **Rapid Index Rebuild**
 - Provides the ability to quickly rebuild a disabled index VTOC

Infrastructure Simplification

- **DFSMSrmm VRS Policy Management Simplification**
 - Simplifies RMM retention and movement policies by reducing the number of VRS's required by separating the data set names from the policy specifications for
- **PDSE 64-bit Virtual Storage**
 - Provides Storage constraint relief for users with large numbers of PDSE members s
 -
- **AMS LISTCAT and Delete Masking**
 - Improve performance of AMS LISTCAT and enhance filtering on DELETE
- **VSAM Code Modernization**
 - Provides additional reliability, availability, and serviceability characteristics to VSAM in order to reduced errors
- **DFSMSrmm Usability**
 - Enhances the usability of DFSMSrmm by improving Dialog Commands

Infrastructure Simplification

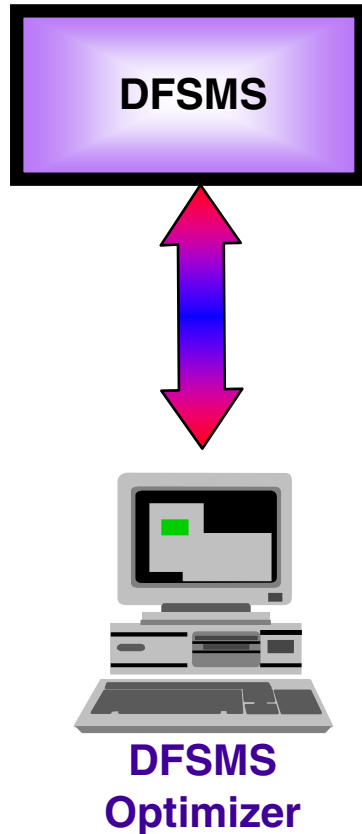
- **DFSMSrmm Enterprise Level Interface**
 - Allows easy access to RMM from other platforms and applications
- **DFSMSrmm UTC Implementation**
 - Allows DFSMSrmm to span multiple time zones
 -
- **SMS Fast Path Volume Selection Performance Enhancement**
 - Provides a new user-selectable approach to speed up volume selection processing
- **Copy SCDS as ACDS**
 - This new function will provide a new SETSMS subcommand, COPYSCDS, that will make it possible to create an ACDS from any valid SCDS
- **OAM Enhancements**
 - Provides support for very large objects

Information Life Cycle Management

- **DFSMSshm Customer Satisfaction Enhancements**
 - Provides improved error handling and improved tuning capabilities

- **DFSMSdss IMS BWO Support during Copy**
 - Allows IMS to exploit FlashCopy which will provide faster copies of IMS data sets

DFSMS Optimizer



- Current DFSMS Optimizer Product will be withdrawn from marketing in 2005
- It will be replaced by the IBM Tivoli Storage Optimizer (ITSO) for z/OS V3.1

Information about DFSMS

- **Information about DFSMS and components**
 - www.storage.ibm.com/software/sms/index.html
- **Additional Information**
 - www.redbooks.ibm.com
 - **z/OS V1R3 and V1R5 DFSMS Technical Guide - SG24-6979**

Summary

- **DFSMS and z/OS now on consistent delivery schedule**
- **IBM continues to enhance DFSMS between releases**
- **DFSMS z/OS is focused to meet customer objectives in 2005 and beyond**

Simplification through innovation

The TotalStorage DS Family includes:

A comprehensive management platform

- TotalStorage Productivity Center

Virtualization

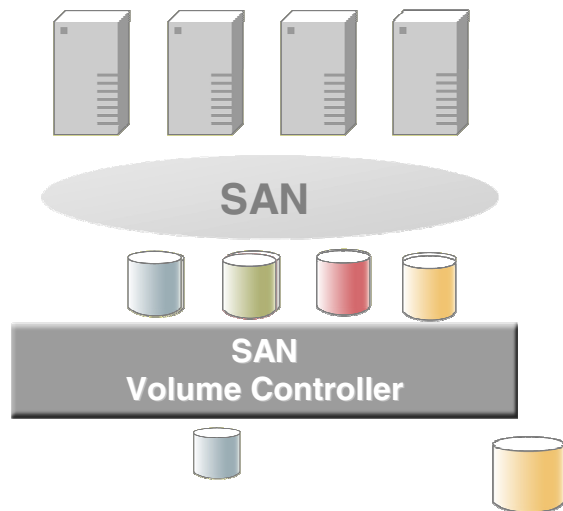
- TotalStorage SAN Volume Controller for centralized resource management
- TotalStorage SAN File System for policy-based file management

Focus on support open standards

- Storage Management Initiative Specification (SMI-S)
- Heterogeneous platform support

See **clearly**

SAN Volume Controller



Virtual disks, however, can remain constant while physical changes in the infrastructure are carried out.

Value

- Centralized point of control for volume management
- Reduce or eliminate downtime for planned outages, maintenance and backup
- Improved resource utilization
- Single, cost effective set of advanced copy services

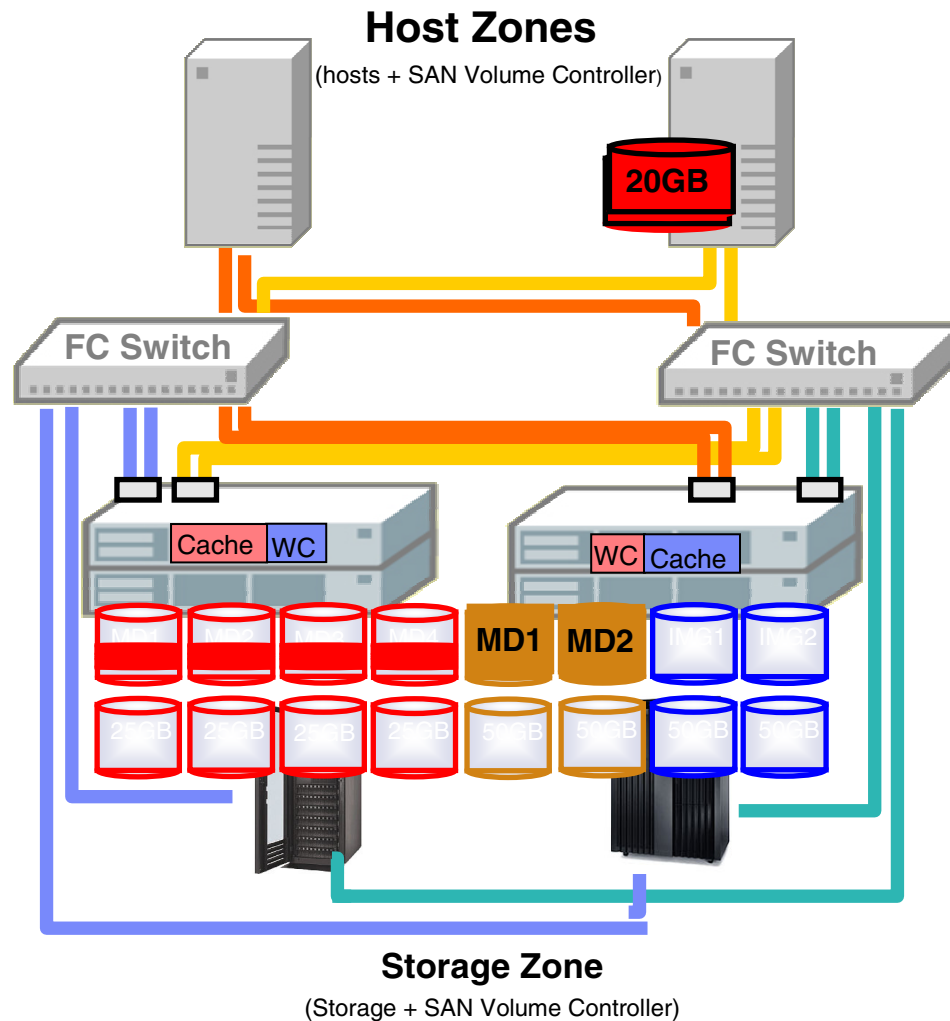
Functional Summary

- Single storage pool grouped into disk groups
- Dynamic Data Migration
- Image Mode to transition from existing SANs
- Copy Services with consistency groups
- SAN-wide FlashCopy
- SAN-wide Synchronous PRC

Storage Engine

- Modular, HW/SW integrated solution 1-2 pairs of xSeries storage engines

SAN Volume Controller Architecture

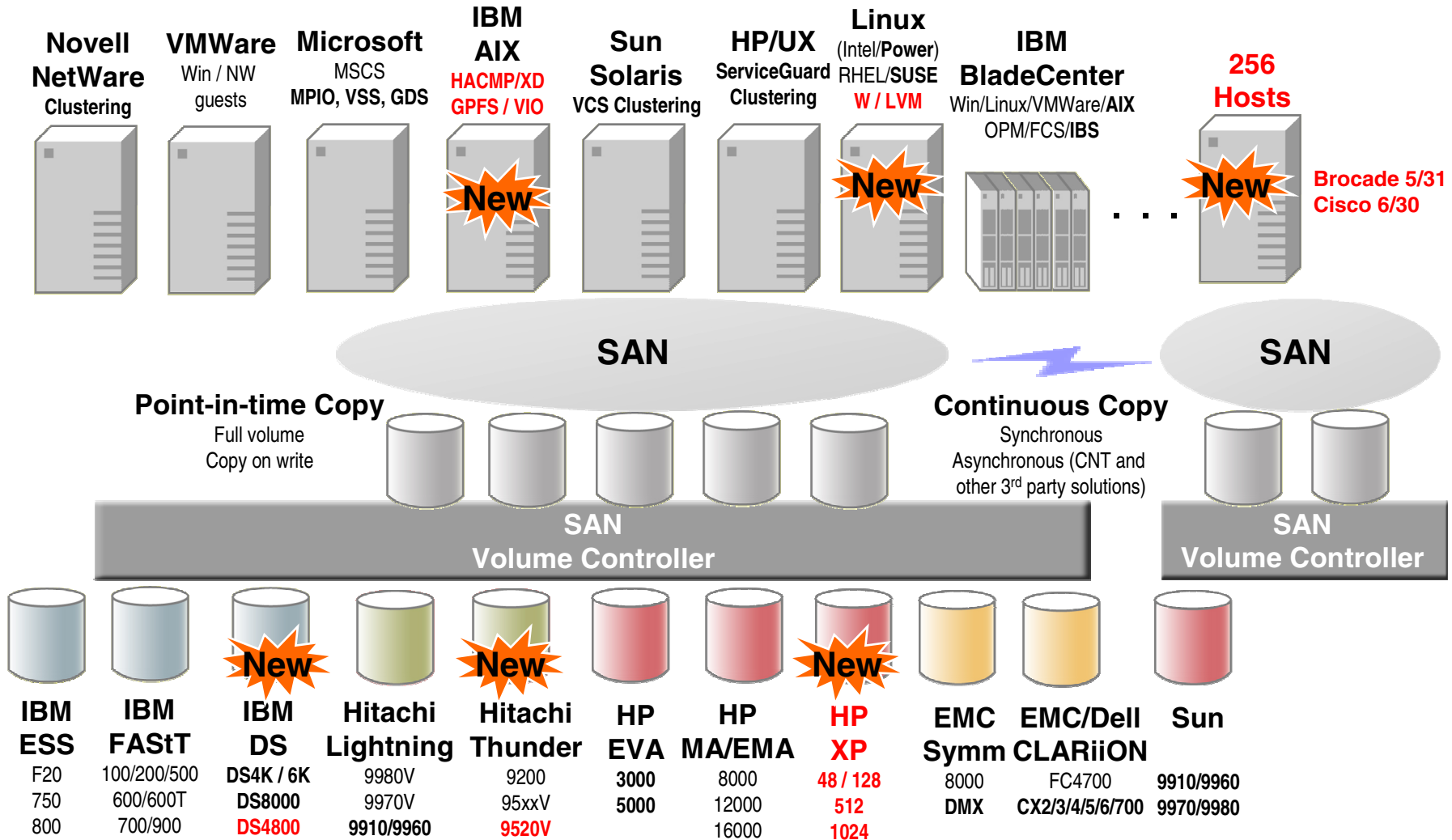


To ensure high availability and peak performance, each **SAN Volume Controller node** pair is connected to your SAN using 8 fibre channel ports – four ports per node.

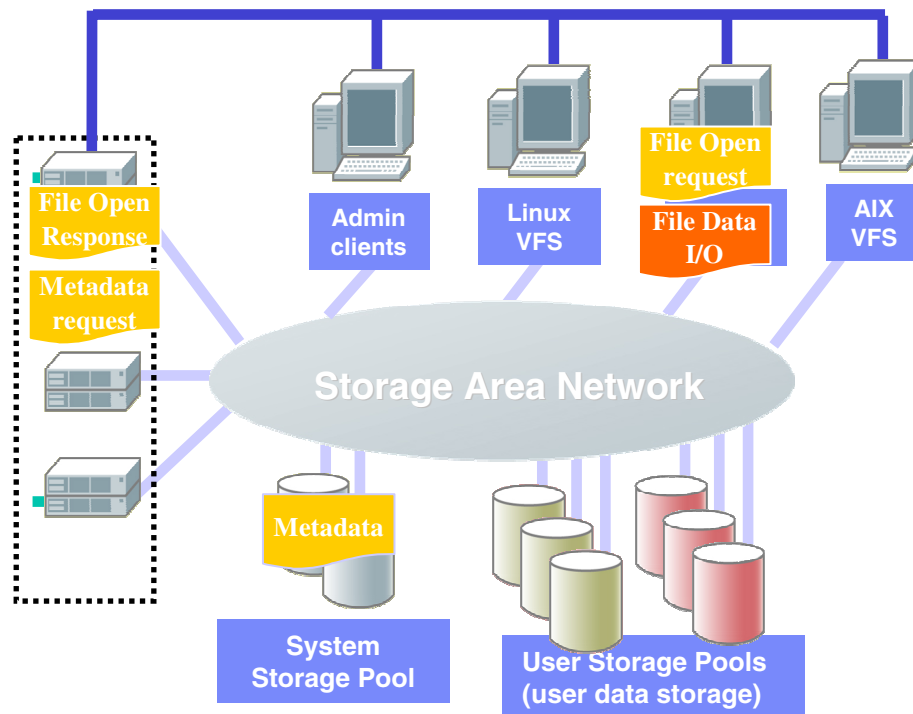
The SAN Volume Controller provides in-band storage virtualization by creating a pool of **managed disks** from attached back-end disk storage subsystems. These managed disks are then mapped to a set of virtual disks for use by various host computer systems.

vDisks are created using managed disks within a managed disk group (MDG). Accordingly, all the managed disks in a single MDG should have the same (or very similar) performance characteristics.

TotalStorage SAN Volume Controller Version 2.1.0.x Supported Environments



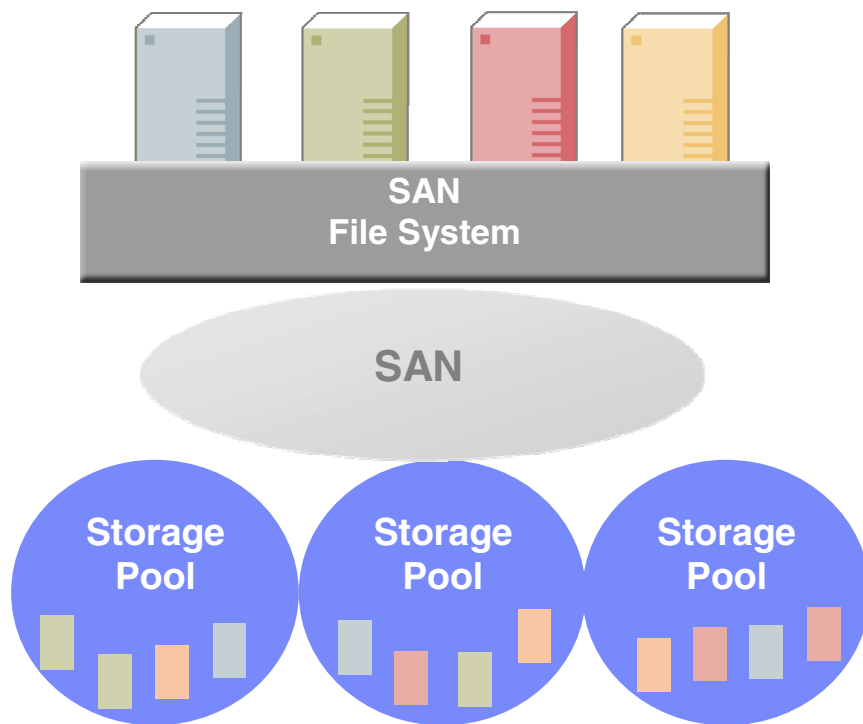
SAN File System Architecture



Typical I/O Request:

1. Application makes "File Open" request. This is intercepted by SAN File System Client and directed to Metadata server.
2. Metadata server gets metadata (file location, permissions, locks, attributes) stored on system location on SAN
3. Metadata server verifies available locks and responds to "File Open" request
4. SAN File System Client verifies security permissions and provides access to file
5. Application conducts direct I/O with storage device on SAN. Achieves near local file performance

SAN File System Policy-Based Automation

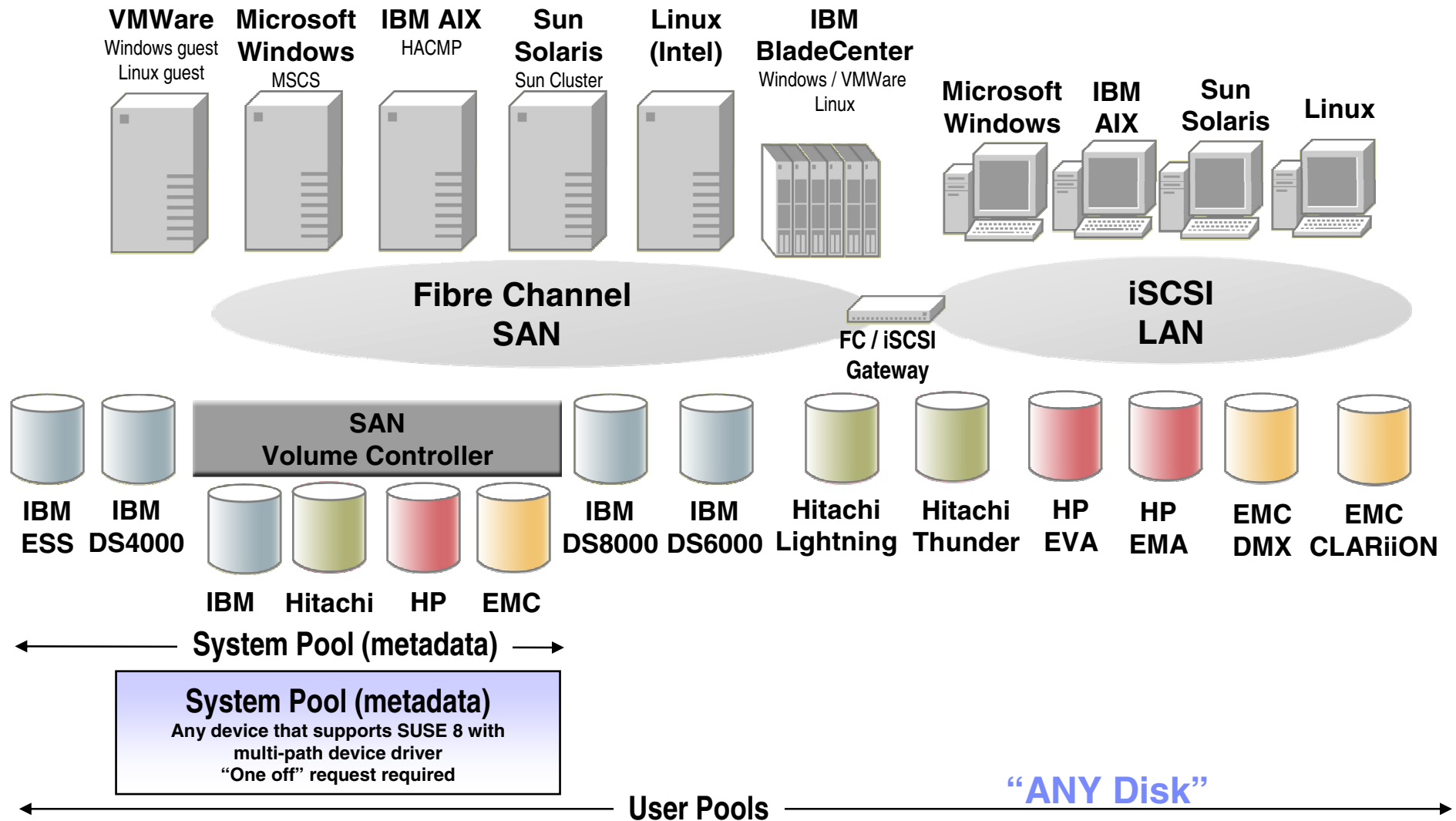


- **Storage and file management feature**
 - Designed to provide automatic file allocation
 - Can help ease management of storage growth
- **Policy-based management uses policy sets**
- **A policy is an ordered list of rules**
 - Multiple policies can be stored but only one is active
- **Rules and how are they used**
 - Rules determine which storage pool each file is automatically allocated to
 - Files matching a rule are placed in stg. pool specified by the rule
 - If no rule applies, then file is allocated to the default pool
 - File allocation to storage based on business requirements
 - Storage pools may have different service characteristics
 - Rules use SQL-like language
- **Placement only enforced at file creation time**

IBM TotalStorage SAN File System

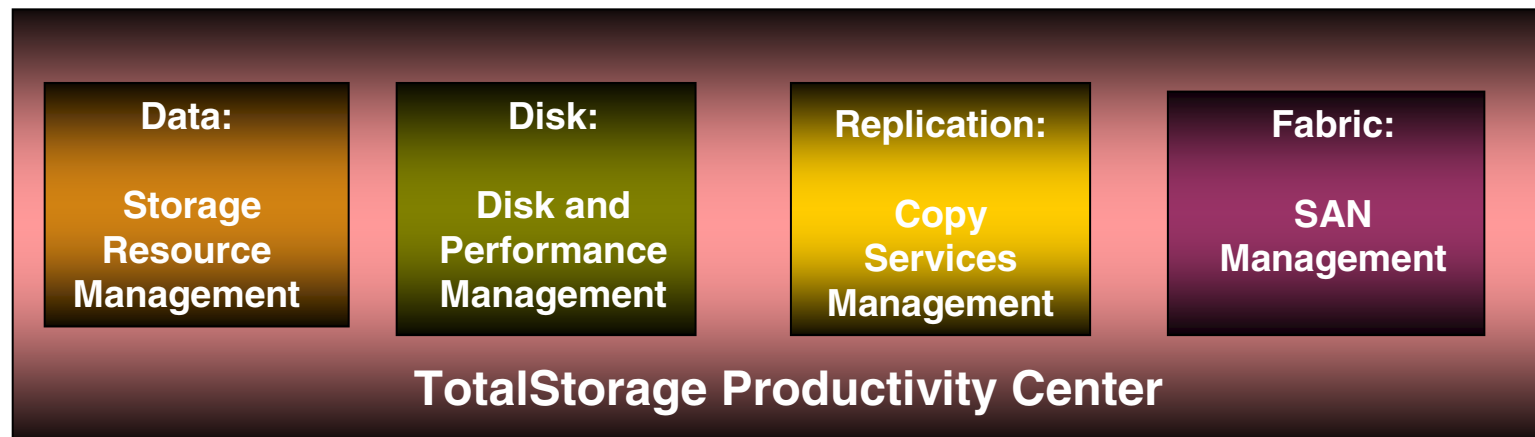
Supported Environments

Intended as an overview only.
For the most complete information, visit ibm.com/storage/software

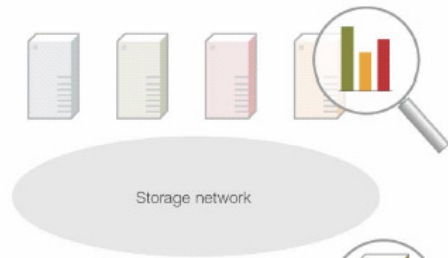


TotalStorage Productivity Center (TPC)

- **Simplifies management of storage infrastructures**
- **Manage, configure and provision SAN attached storage**
- **Monitor and track performance of SAN attached devices**
- **Manage advanced storage replication services**
- **Monitor, manage and control (zone) SAN fabric components**
- **Manage the capacity utilization and availability of file systems and databases**



IBM TotalStorage Productivity Center for Data



Automated identification of the storage resources in an infrastructure and **analysis** of how effectively those resources are being used.



File-system and file-level evaluation uncovers categories of files that, if deleted or archived, can potentially represent **significant reductions in the amount of data** that must be stored, backed up and managed.

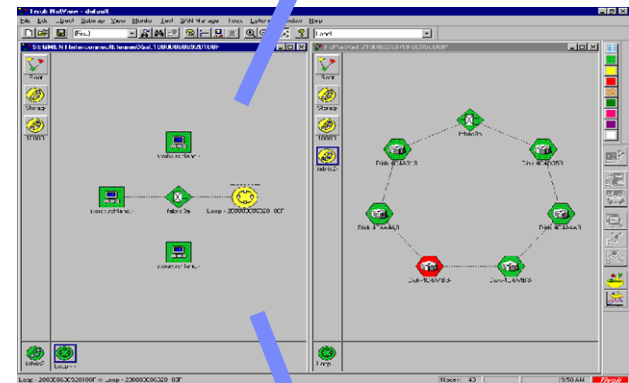
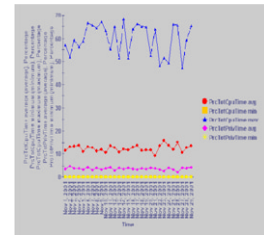
Automated control through policies that are customizable with actions that can include centralized alerting, distributed responsibility and fully automated response.



Predict future growth and future at-risk conditions with historical information.

IBM TotalStorage Productivity Center for Fabric

- **Centralized point of control for SAN configuration**
- **Automated management**
 - Multi-vendor switch zone provisioning
 - SAN, NAS, iSCSI
 - Multi-vendor HBA support
- **Visualization of the topology**
- **Real-time monitoring**
- **Automated status and problem alerts**
 - Direct integration with Tivoli system management
 - Integrated with 3rd party system management via SNMP

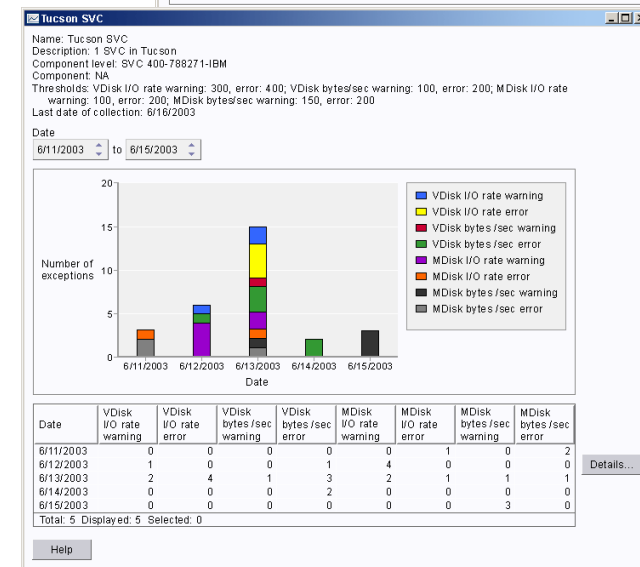
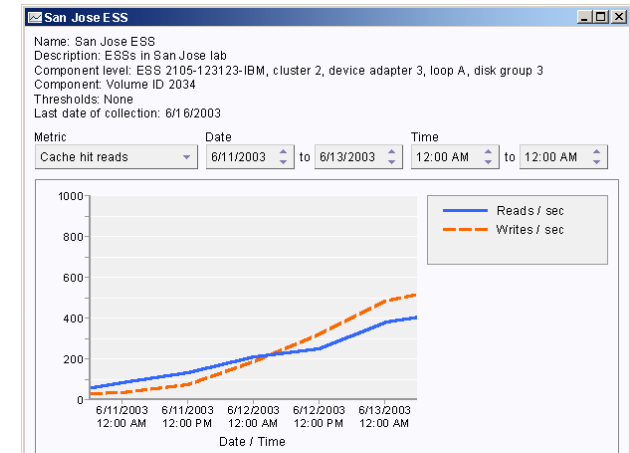


An event viewer window titled 'Event Viewer: Group SAN - SAN'. It displays a list of events with columns for 'Time Received', 'Class', 'Hostname', 'Severity', 'Status', and 'Message'. The events are related to SAN connectivity issues.

Time Received	Class	Hostname	Severity	Status	Message
May 20, 2003 4:43:10 PM EDT	PhysicalEvent	azusa	Warning	Open	Node silver.uk.tivoli.com is missing
May 20, 2003 4:43:11 PM EDT	PhysicalEvent	azusa	Warning	Open	Node silver.uk.tivoli.com is missing
May 20, 2003 4:43:11 PM EDT	PhysicalEvent	azusa	Warning	Open	The connection from Node silver.uk.tivoli.com port 0 to Switch Brocade_1 port 3 is missing
May 20, 2003 4:43:22 PM EDT	PhysicalEvent	azusa	Warning	Open	Node silver.uk.tivoli.com is normal
May 20, 2003 4:47:33 PM EDT	PhysicalEvent	azusa	Warning	Open	Node silver.uk.tivoli.com is normal
May 20, 2003 4:47:33 PM EDT	PhysicalEvent	azusa	Warning	Open	The connection from Node silver.uk.tivoli.com port 0 to Switch Brocade_1 port 3 is normal
May 20, 2003 4:47:33 PM EDT	PhysicalEvent	azusa	Warning	Open	The connection from Switch Brocade_1 port 3 to Node silver.uk.tivoli.com port 0 is normal

IBM TotalStorage Productivity Center for Disk

- **Centralized point of control for Disk configuration**
 - Device grouping services
 - Logging
- **Automated management and provisioning**
 - Capacity monitoring / reporting
 - Scheduled actions
 - Create and assign LUNs
 - Integrated with Fabric management
- **Performance trending**
- **Performance thresholds and notification**
- **Automated status and problem alerts**
 - Integrated with 3rd party system management via SNMP



IBM TotalStorage Productivity Center for Replication

- **Single point of control** for Point-in-time and Remote volume replication services.
- **Automated source-destination matching**
 - Administrator defines destination volume candidate pools
- **Cross-device consistency groups**
 - Single commands that execute across groups of volumes (script elimination)
 - Start / Stop Point-in-Time Copy
 - Start / Stop / Suspend / Resume Continuous Copy
 - Status Query
 - Resynchronize remote volumes
 - Used to synchronize databases or applications across multiple storage devices

TPC Version 2 Release 3 Highlights

Improved Installation and Customization

- Over 80% reduction in CDs
- New and improved Installation and Configuration Guide based on field experiences
- Ability to install TPC on a single server
- Cleaner install; prereqs installed first, then TPC

Enhanced Storage Management

Enhanced Performance Management

- Enhanced support for DS8000 and DS6000
Including NEW storage port statistics

Enhanced Replication Management

- Enhanced support for ESS Model 800
Supports z/OS and open attached

NEW Device Support

- DS8000, DS6000 and DS4800 support
- 3rd party support (SMI-S Certified)
TPC provides discovery, asset reporting, capacity reporting, and monitoring for SMI-S 1.0.2 compliant storage (including Hitachi, HP, EMC)

Overview of TPC V2R3

- **Extended IBM TotalStorage DS Family Support**
 - DS8000 and DS6000 asset, capacity and performance management
 - DS4800 asset, capacity and device support
 - Currency support for DS4000 Family and SAN Volume Controller 2.1
- **Extended 3rd party storage support**
 - SMIS 1.0.2 Certification for 3rd party storage support (including EMC, HP and Hitachi support)
 - HP Logical Volume Manager and Veritas Volume Manager support
 - Brocade, CNT and LSI HBA support

Overview of TPC V2R3

- New and enhanced reporting:
 - Report of storage assigned to hosts (LUN to HBA associations)
 - Improved Disk capacity reports
 - More granular reporting showing disk storage assigned, unassigned and available
 - Improved Database reporting
 - NetApp Reporting
 - NetApp configuration reports, quota reports and reporting on the Netapp filer capacity utilization
 - Improved performance reporting
 - Customizable threshold event reporting
- Improved Product Installation, Packaging and Configuration

DS8000 and DS6000 Management Support

- **Operational Management**
 - Discovery of the DS8000s and DS6000
 - Topology views for SAN Fabric, LUNs, hosts
 - Unique ICONs for DS8000 and DS6000
 - Launch DS Storage Manager UI

- **Performance Management**
 - Performance metrics and thresholds for the storage array
 - Port, Rank and Volume Statistics

- **Reporting**
 - Asset and Capacity Reports

SMI-S 1.0.2 Certified Support

- Enhanced support for SMI-S interfaces that support discovery, monitoring, and reporting of any disk array storage subsystem device that is SMI-S 1.0.2 certified
- IBM TotalStorage Productivity Center provides discovery, asset reporting, capacity reporting, and monitoring for this SMIS compliant storage
 - Logical Capacity and Volumes Reporting
 - Reporting of detailed information about the subsystem device (firmware, model, etc).
 - Physical Capacity and Disks (Storage must support the 'Disk Drive SubProfile')
- The SMI-S compliant storage listing is maintained by SNIA at <http://www.snia.org/ctp/certified>

Extended 3rd Party Storage Support

- Updated Support of the HP-UX operating system
 - Support for Veritas Volume Manager on HP-UX,
 - Support for HP-UX Logical Volume Manager and subsystem discovery, monitoring, and reporting
 - Support for HP XP512 and XP1024 disk subsystems

- Updated Fabric Support
 - Brocade 3.2, CNT, and LSI Logic HBA support

New Reports

- **Storage Capacity Report**
 - Total of all LUNs the storage subsystem knows to be assigned to a host computer.
 - Total the capacity of all LUNs the storage subsystem knows is not assigned to a host computer.
 - Total Formatted Free Space
 - Any formatted capacity in the storage subsystem that has not been carved into a LUN or is a LUN, but has not yet been assigned to a host computer.
 - LUN Capacity Visible
 - Shows total storage that has been discovered by the IBM TotalStorage Productivity Center
 - LUN Capacity Not Visible
 - Shows total storage that has been discovered by the IBM TotalStorage Productivity Center

Improved Installation and Customization

- Over 80% reduction in CDs
- New and improved Installation and Configuration Guide based on field experiences
- IBM TotalStorage Productivity Center can now be installed on a single server
- Cleaner, faster installation
 - Middleware is installed first
 - IBM TotalStorage Productivity Center applications are installed next

Thank You



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