G19 - IBM System Storage Tape Update

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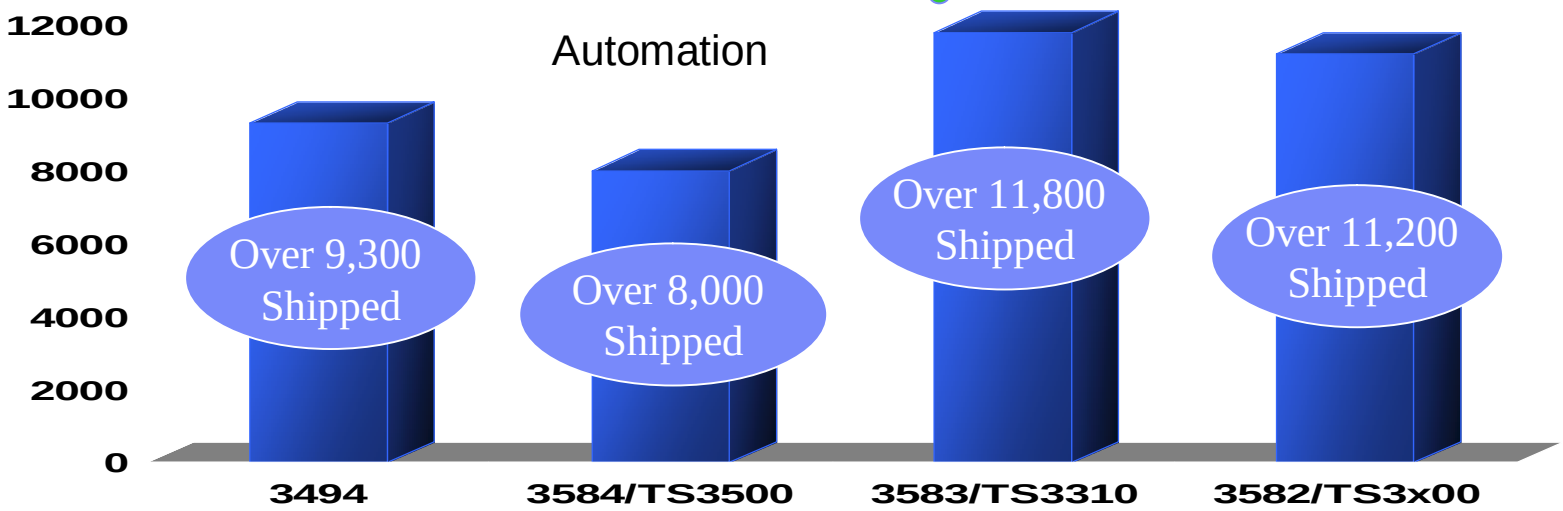
Agenda for IBM Tape Solutions

- IBM Tape Milestones
- IBM Enterprise and LTO Drive Technology
  - World Class Reliability
  - Encryption
- IBM Automation Family
  - Innovative Features and Capacity On Demand pricing
- Enterprise Tape Solutions
  - Mainframe and Open System Virtual Tape Solutions

Marketplace Milestones

IBM program to date shipments as of 1H2006

Over 40,000 IBM Automation Footprints



IBM LTO Drives

Over 670,000 Shipped

LTO format outships SDLT by > 6:1*

3592/TS1120 Drives

Nearly 33,000 Shipped

3592 continues to gain share

Virtual Tape Server

Over 4,700 VTS's^
Over 1,200 PtP VTS's Shipped

VTS continues strong …more to come!

IBM Logo Media

*Source: Industry Analyst
^Includes Approx. 950 VTS Upgrades

Enterprise Tape: What's New

- Announcing August 29th, GA September 8th
- The industry's first tape drive with Encryption: the IBM System Storage TS1120 tape drive
  - **A new, innovative encryption key management program supported on a wide range of servers**
  - **Integration with IBM tape systems and libraries**
  - **Integration with System z encryption key, policy management, security and cryptographic capabilities**
    - **Complements existing System z Encryption Facility for z/OS program product**

Java Encryption Key Manager

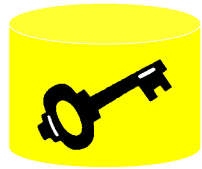
Enterprise Tape: What's New

- Announcing August 29, GA October 27
- TS3500 (3584) tape library supports TS1120 tape drive encryption
  - **Library firmware enhanced to support communications between TS1120 tape drive and Java Encryption Key Manager**
  - **Supported on all L2x and D2x frames**
- TS3500 tape library frame model conversions
  - **x22 and x52 frames can be converted to x23 and x53 frames which provide:**
    - **Enhanced power architecture and frame control assembly**
    - **Second Ethernet port for system console attachment**
  - **X23 frames can be converted to x53, x53 frames can be converted to x23**
    - **Provides capability to change the media type of the converted frame**
- Entry and tiered pricing for Advanced Library Management System (ALMS)
  - **Enables dynamic management of cartridges, storage slots, tape drives, and logical libraries**
    - **Lower priced Entry and Intermediate ALMS as growth path to Full ALMS**
    - **Tied to Capacity on Demand Feature Codes**

Why outboard encryption in the tape drive?

- **Performance**
  - **Our belief is that encryption can be performed in the drive with minimal performance impact**
    - **TS 1120 rated at 100 MB/Second – native data rate**
- **Cost**
  - **Compression of data**
    - **Unlikely to require more media than currently planned**
  - **Encryption capability can be added to drive with minimal price impact**
  - **Less than 1% performance cost**
- **Management**
  - **Fewer products to manage**
    - **Easier D/R and Business Partner sharing**
- **Key Management**
  - **Plan to integrate tape drive encryption with enterprise key management capability**

Our planned architecture supports the tailoring of key management policies, and management strategy based on the I/T environment and requirements



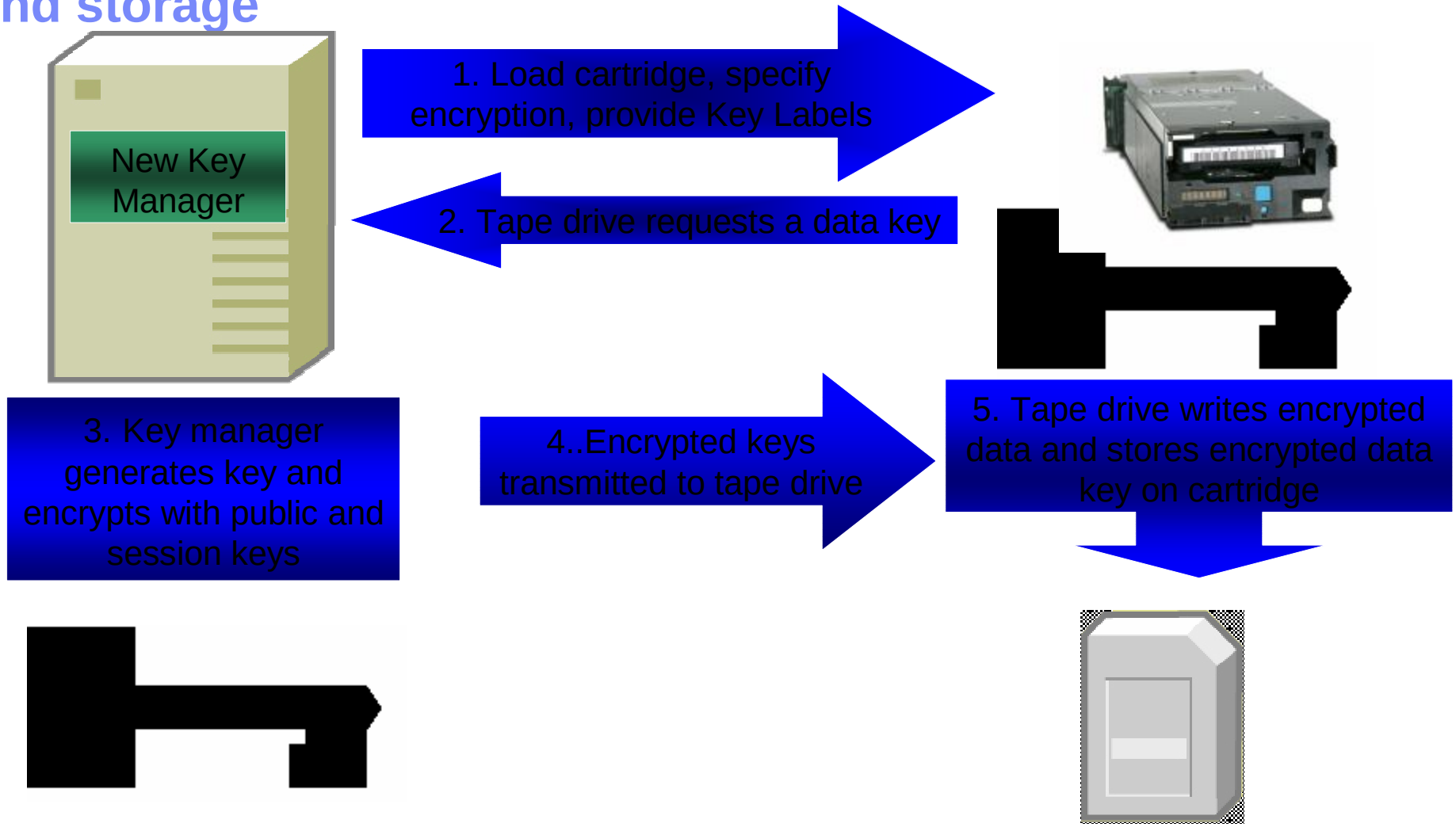
Provides a new Enterprise Key Manager program that supports, but does not require, a centralized, enterprise-class key manager with a choice of access methods.

Provides several options for selecting the data to be encrypted across a wide range of systems environments.

Policy

Places the encryption engine in the tape drive

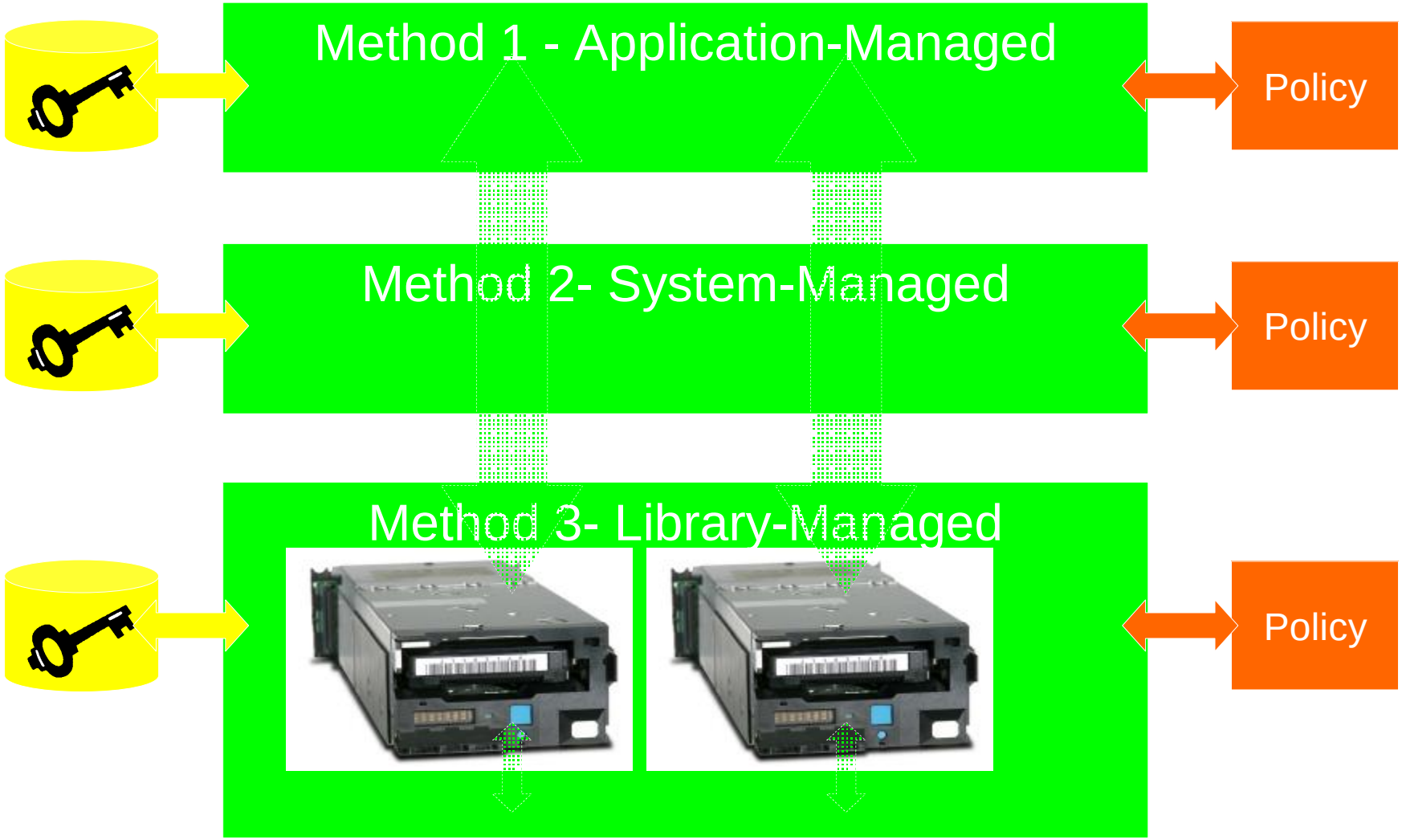
Overview of encryption key generation, communication and storage



Encryption Policy Choices are supported

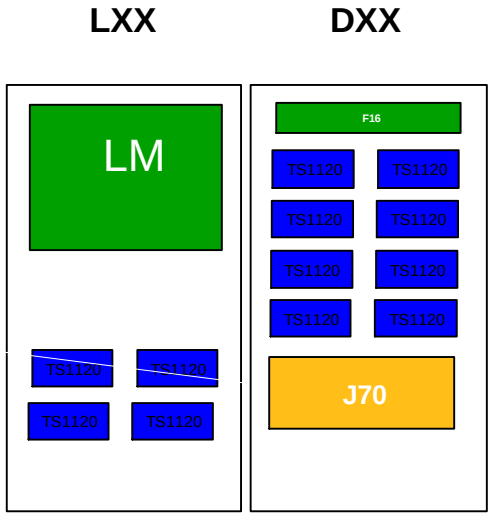
- Application managed (z/OS)
  - The application selects the data to be encrypted
- System managed (DFSMS, AIX)
  - System utilities (e.g. DFSMS in z/OS) or AIX tape device drivers establish the policies for encryption
    - New DFSMS data class parameter
- Library managed (Other Open Systems)
  - The 3584 or 3494 tape libraries establish policy
    - Volume Serial Number ranges
    - Logical Libraries (3584)

We are planning to support three methods for accessing keys and establishing policy



Example – Single z/OS System Key Management

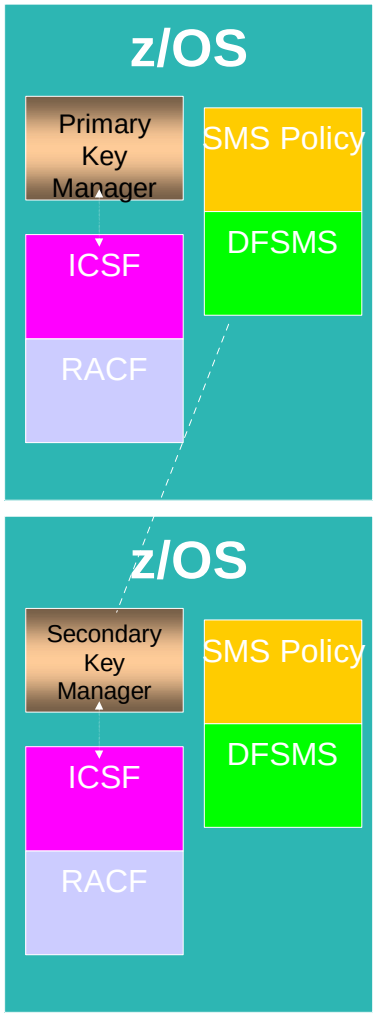
3494 or 3584 Tape Library



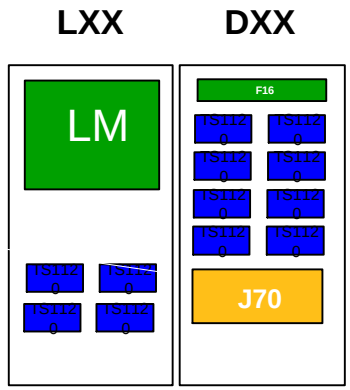
Scenario Description

- Encryption enablement provided transparently to the application through DFSMS (Data Class)
- Key management exchanges flow over ESCON/FICON

Example – Dual z/OS System Key Management



3494 Tape Library



Tape Encryption Summary

- Outboard encryption in the tape drive provides substantial potential benefits and we are planning to introduce it into the TS1120 tape drive
- Effective key management is an essential component of a data protection strategy
  - We are planning to leverage our zSeries encryption experience to develop a comprehensive strategy for mainframe environments
  - We are also planning to implement a new key management capability that may reside on z/OS as well as open systems
  - We are planning to update our libraries , control units and device drivers to support the new key manager functionality
  - All together, they will provide a great deal of flexibility, allowing encryption to be tailored to different I/T environments and business policies
- We are working with industry standards organizations to help develop standard encryption protocols

3592 (TS1120) Tape Drive Highlights

Drive status LED's

Fan Speed detection

Dual FC ports

100 mounts - SARS drive performance

Positive Pin Retention

40K lines of 3590 *u*code

Flat Contour Low Wrap Head

Vital Product Data -VPD

Surface Control
Guiding Rollers

128 MB Buffer

Separate Thread & Load
Motors allows tape removal

Dual scheme compression

Harden cartridge Loader

Vol ID Manual Mode Support

Dedicated Servo Control ASIC
and Speed Matching circuits

Enhanced R/W data
channel w/auto calibration

Long Life Brushless Spindle Motor

IBM 359X Enterprise Tape Drive Roadmap

Technology Demonstration
1 TB - April , 2002
8 TB – May, 2006

	3590 Generations			3592 Generations		
Tape Drive Model	Gen 1 3590 B	Gen 2 3590 E	Gen 3 3590 H	Gen 1 3592	Gen 2 3592	Gen 3 3592 xxx
Native Capacity GB Compressed 3:1	10/20	20/40	30/60	60 or 300	100 or 500	900 - 1100
Native Data Transfer Rate MB	9	14	14	40	100	120-160
Tracks	128	256	384	512	896	1024
Cartridge Type R/W or WORM	J & K	J &K	J & K	JJ/JA JR/JW	JJ/JA JR/JW	JX
Server Attachment	Ultra-SCSI ESCON FICON	Ultra-SCSI Fibre ESCON FICON	Ultra-SCSI Fibre ESCON FICON	2 GB Fibre ESCON FICON	4 GB Fibre ESCON FICON	8/10 Fibre ESCON FICON
	Began shipping Sept. xx, 1995	Began shipping Apr. xx, 1999	Began shipping June xx, 2002	Began shipping Sept. xx, 2003	Began shipping Oct. xx, 2005	

Product Road Map: These statements represent IBM's current intent, are subject to change or withdrawal, and represent only goals and objectives.

IBM Enterprise Tape Drive Roadmap

	Magstar Tape Drive Generations			Jaguar Tape Drive Generations		
	3590 B	3590 E	3590 H	3592 J1A	3592	Gen 3
Servo Bands	**3**	**3**	**3**	**5**	**5**	**TBD**
Servo Type	**Analog**			**Digital**		
Tracks	**128**	**256**	**384**	**512**	**896**	**TBD**
Read Previous Generations		**Y**	**Y**		**Y**	**Y**
Write Previous Generation		**N**	**N**		**Gen 1**	**Gen 2[1]**
Write Once Read Many	**N**			**Y**		
Virtual Backhitch	**N**			**Y**		
Encryption support	**N**			N	**Y†**	Y
Cartridge types	**J Cartridge**			**JJ / JR Cartridge**		
Native Capacity (GB)	**10**	**20**	**30**	**60**	**100**	**TBD[1]**
	K Cartridge			**JA / JW Cartridge**		
	20	**40**	**60**	**300**	**500**	**TBD[1]**
				Future High Capacity Cartridge		
					700[1] ⟷	**1 TB[1]**
Transfer Rate (MB/sec)	**9**	**14**		**40**	**100**	**100 - 160[1]**
FC-AL	**1 Gbit**			**2 Gbit**	**4 Gbit**	**TBD**
FC Fabric	**N/A**					

[1] Represents a statement of IBM future plans and directions. Such plans and direction are subject to change without notice.

† Future upgrade path for Jaguar II drive

LTO Tape Drive Roadmap

LTO Model	Gen 1	Gen 2	Gen 3	Gen 4	Gen 5	Gen 6
Native capacity (GBs) Compression = 2:1	100	200	400	800 1.6 TBs	1600	3200
Data transfer rate MB/S With Compression	15 Up to 40	35 Up to 80	80 Up to 160	100-120 Up to 240	180 Up to 360	270 Up to 540
Tracks	384	512	704	894+		
Cartridge Type WORM	LTO 1 N/A	LTO 2 N/A	LTO 3 Yes	LTO 4 Yes	LTO 5 Yes	LTO 6 Yes
Encryption	N/A	N/A	N/A	Yes	Yes	Yes
Sever Attachment	Ultra-SCSI	Fibre	4 Gb Fibre	4 Gb Fibre	8 or 10 Gb Fibre	10 Fibre

Began shipping Sept. 1, 2000	Began shipping Dec. xx, 2002	Began shipping Dec.17, 2004	1H 07

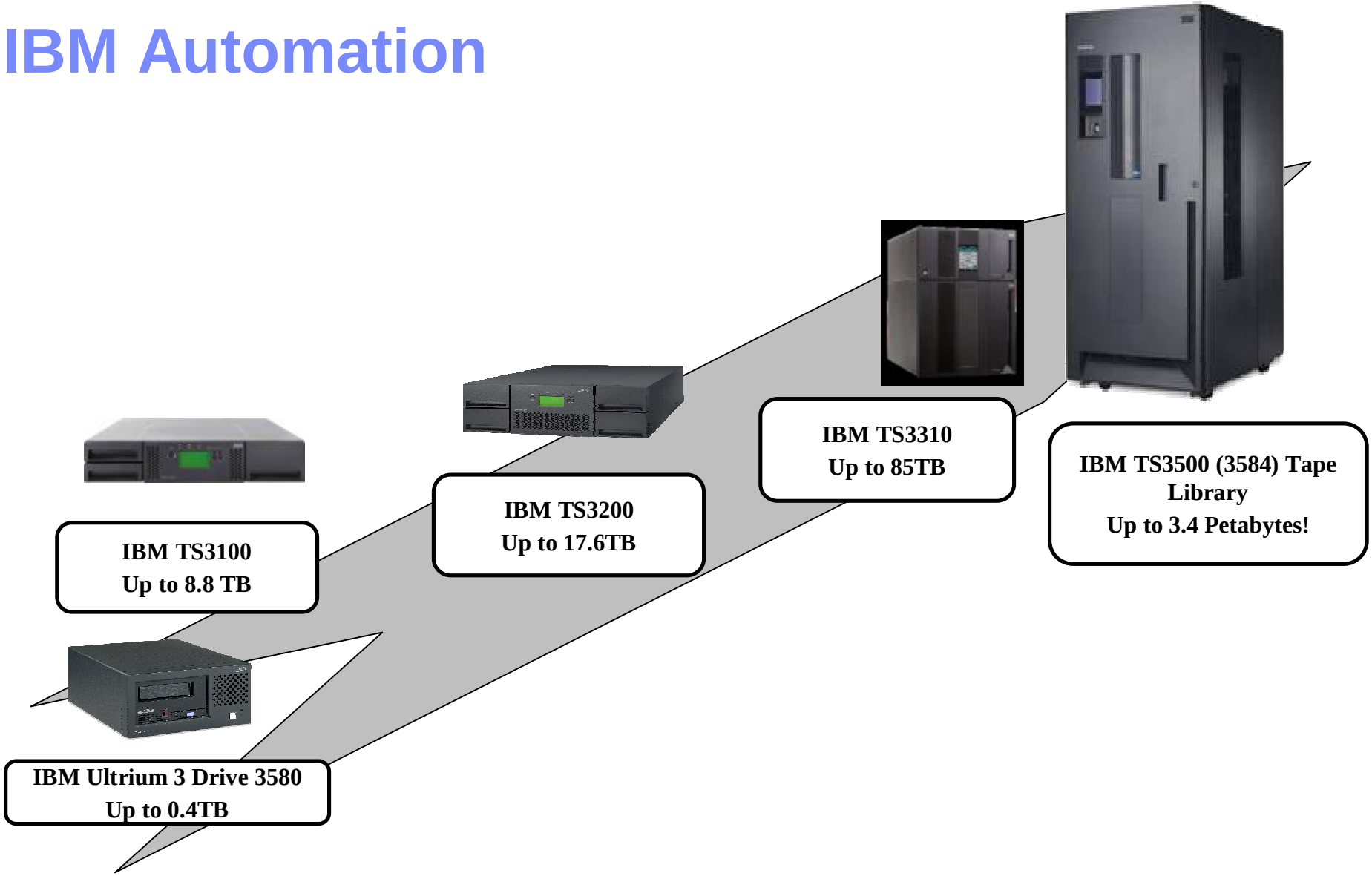
Roadmap is an estimate of the LTO Program's current intent and is subject to change without notice.

Drive Design Criteria

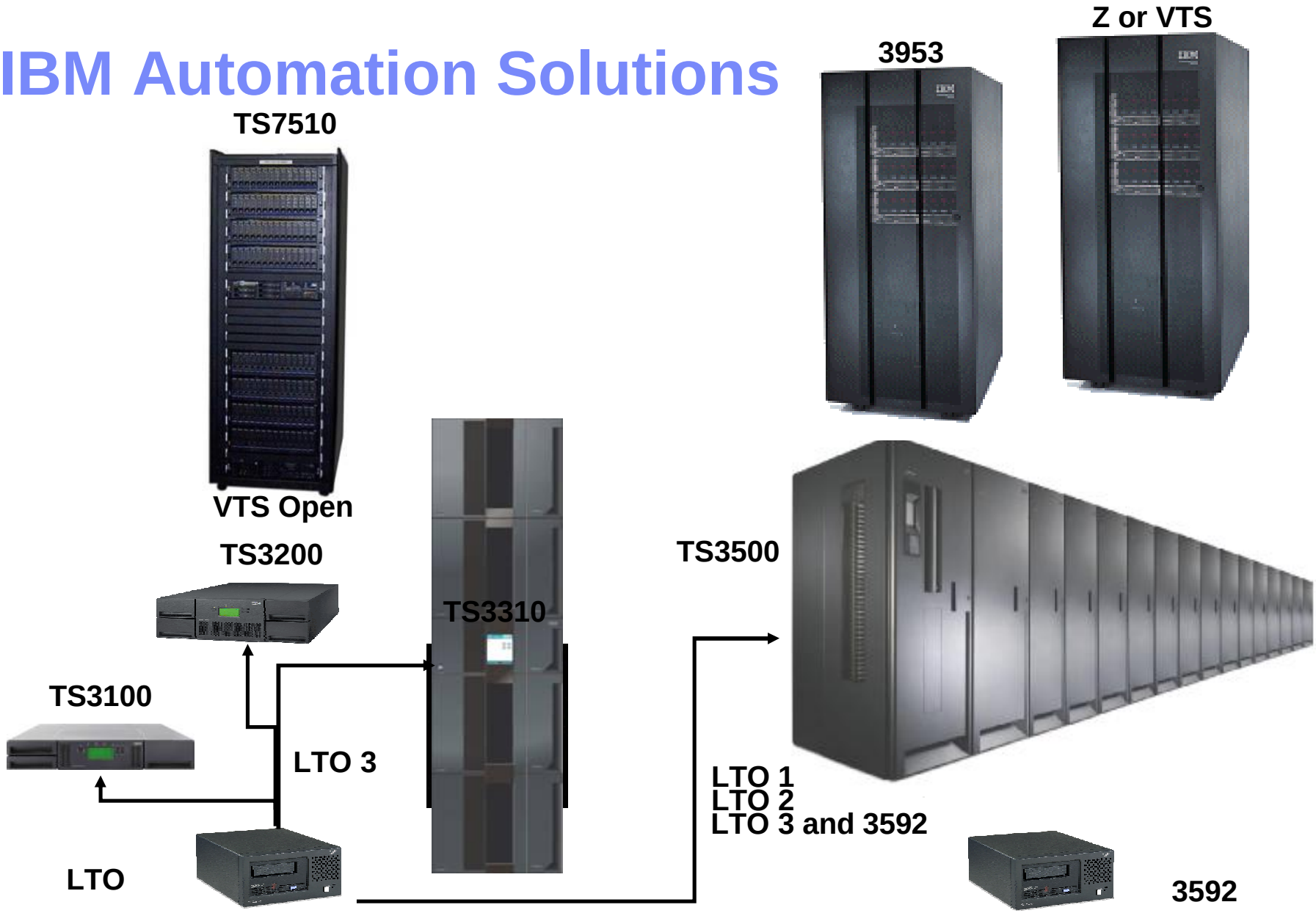
- **LTO**
  - Open tape format specification
    - Drive specification written by LTO consortium
    - LTO consortium includes HP, IBM, C
    - Drive specifications designed by committee
  - LTO compliant media from any vendor can be read in LTO compliant drives from any vendor
- **3592**
  - IBM exclusive design

§Quantum

IBM Automation



IBM Automation Solutions



TS3100 Tape Library Overview

- New single drive tape library
  - LTO 3 drive with either LVD SCSI or new 4Gb Native Fibre Channel attachment
  - Completely new robotics and operational design, same shared design between the L2U and L4U models of the 3573

- Larger capacity
  - 22 data cartridge slots, 1 dedicated I/O slot
  - 8.8 TB of native storage capacity (17.6 with 2:1 compression)

- More standard features
  - Bar code reader – enabling user to use the TS3100 as a sequential or random access library
  - Remote management unit – allowing for administrative control of the TS3100 with Web access
  - Drive moveable to TS3200

- Greater flexibility
  - Removable tape cartridge magazines for easy bulk loading
  - basic parts are Customer Replacement Units (CRU)
    - Drive sled with drive
    - Power Supply
    - Cartridge magazine
    - Library Control Card

TS3200 Tape Library Overview

- New dual drive tape library in a 4U form factor
  - 2 LTO 3 drive with either LVD SCSI or new 4Gb Native Fibre Channel attachment
  - Completely new robotics and operational design, same shared design between the L2U and L4U models of the 3573
- Larger capacity
  - 44 data cartridge slots, 3 dedicated I/O slot, 1 dedicated cleaning cartridge slot
  - 17.6 TB of native storage capacity (35.2 with 2:1 compression)
- More standard features
  - Multi Path Logical Library support
  - Bar code reader – enabling user to use the TS3200 as a sequential or random access library
  - Remote management unit – allowing for administrative control of the TS3200 with Web access
- Optional Path Failover
- Greater flexibility
  - Four removable tape cartridge magazines for bulk loading
  - Basic parts are Customer Replacement Units (CRU)
    - Drive sled with drive
    - Power Supply
    - Cartridge magazine
    - Library Control Card

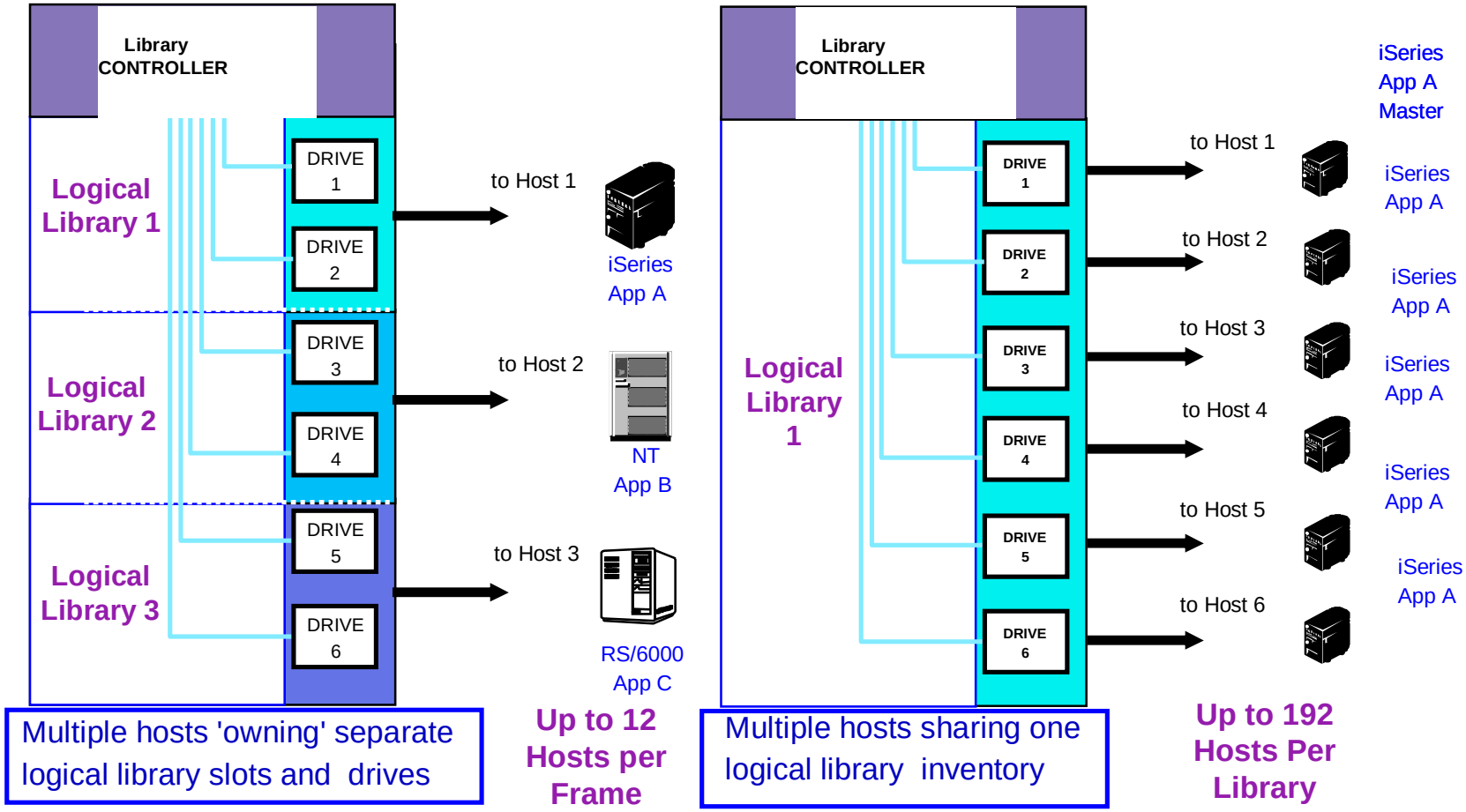
TS3310 Tape Library Overview

- New Modular Library
  - 12 TB up to 49 TB storage slot native capacity (30 to 122 LTO® storage slots)
  - One to six LTO3 FC/SCSI hot-swappable tape drives (up to 480 MB/sec native performance)
- Supports
  - Logical Partitioning and Native SMI-S
  - Optional features
    - Capacity on demand
    - Rack Mounting
    - Path Failover (Data and Control)
    - Redundant power
- Host Attachment
  - IBM eServers (except IBM System z9™)
  - Selected HP and Sun Microsystems servers
  - Servers running select versions of Microsoft Windows™ and Linux operating systems

IBM 3584 Enterprise Tape Library

- 1- 16 Frames
  Up to 192 IBM LTO, *3592 R/W&WORM, intermix of both*
  4 New Frames – 20% Smaller L22,D22/3592 and L52,D52/LTO
  - Over to 6880 Cartridges - over to *2 PB native capacity*
  - Attach: FCP and FC-AL; Ultra-SCSI LVD
- Multi-path Architecture supports up to 192 logical libraries
  Multi-path Advanced Library Management System (GA 8/20)
  Designed for Concurrent Maintenance
  - Dual AC power option 110V or 220V
  - Hot swappable power supplies/Hot swappable drives
  - Remote Management- Multiple simultaneous web clients- 2 access levels
- RAS
  - Control path failover
  - Data path failover and load balancing
  - Dual grippers
- Persistent World Wide Names
  Automatic backup/restore vital products data
  Mixed media and drive support
  Automatic inventory and calibration

Multi-Path Logical Libraries - Standard For All Automation

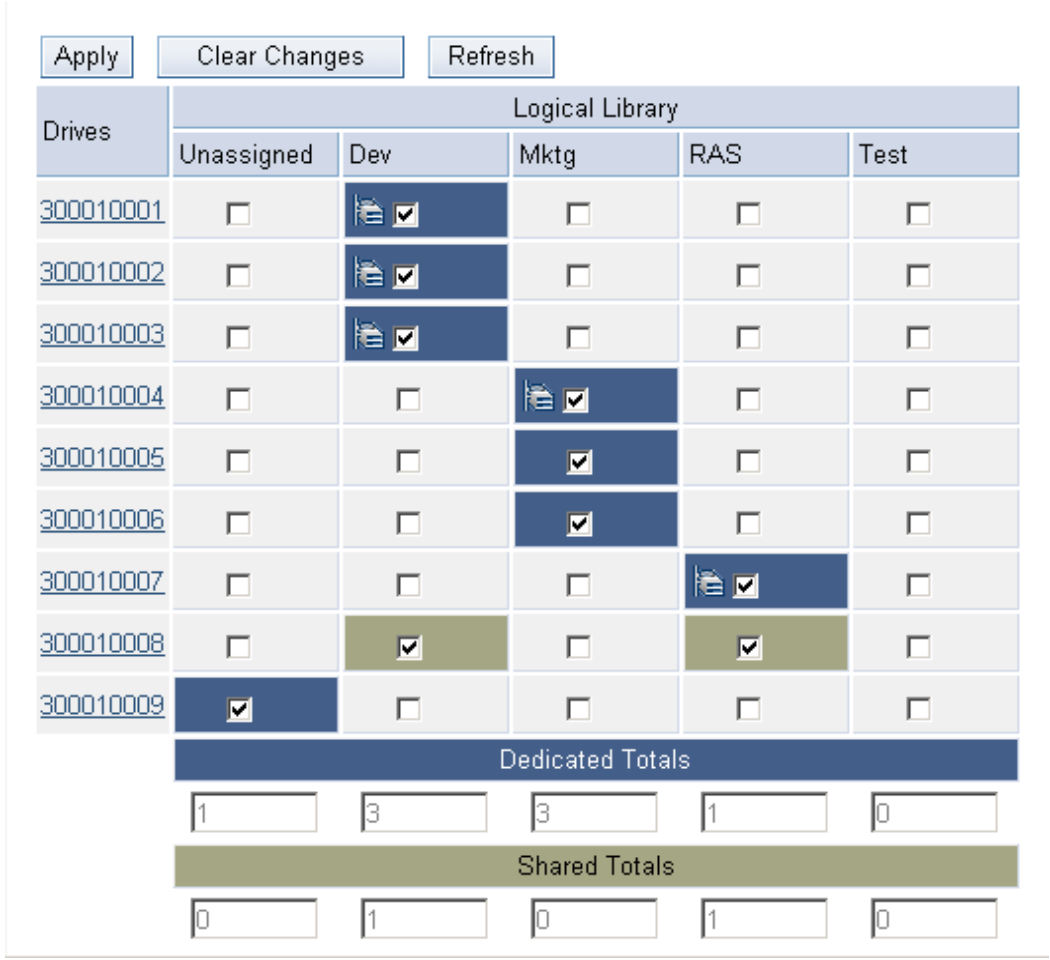


Enables hardware partitioning for heterogeneous server and application attachment to separate logical tape library

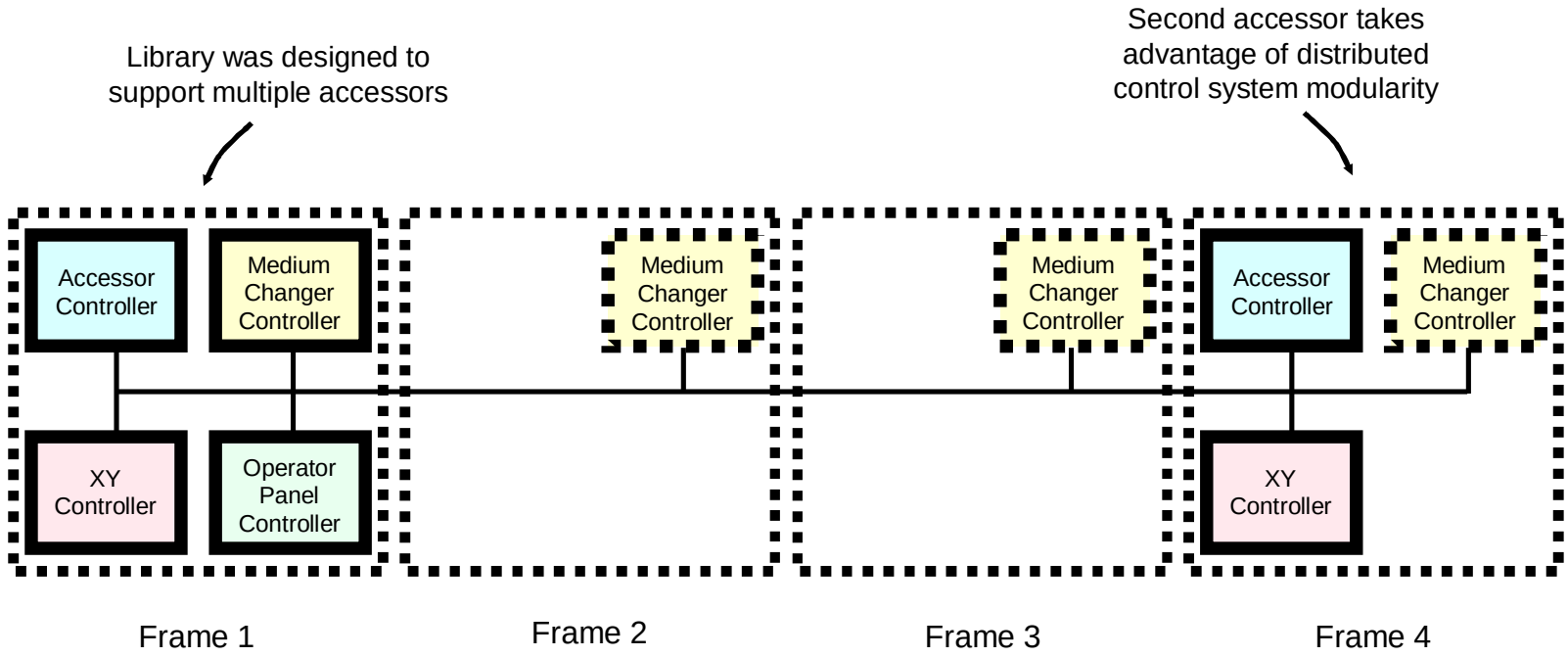
Advanced Library Management System - 3584 only

- **"Point & Click" Web Interface operation (non-disruptive)**
  - **Add drive**
  - **Remove drive**
  - **Move drive**
  - **Share drive***

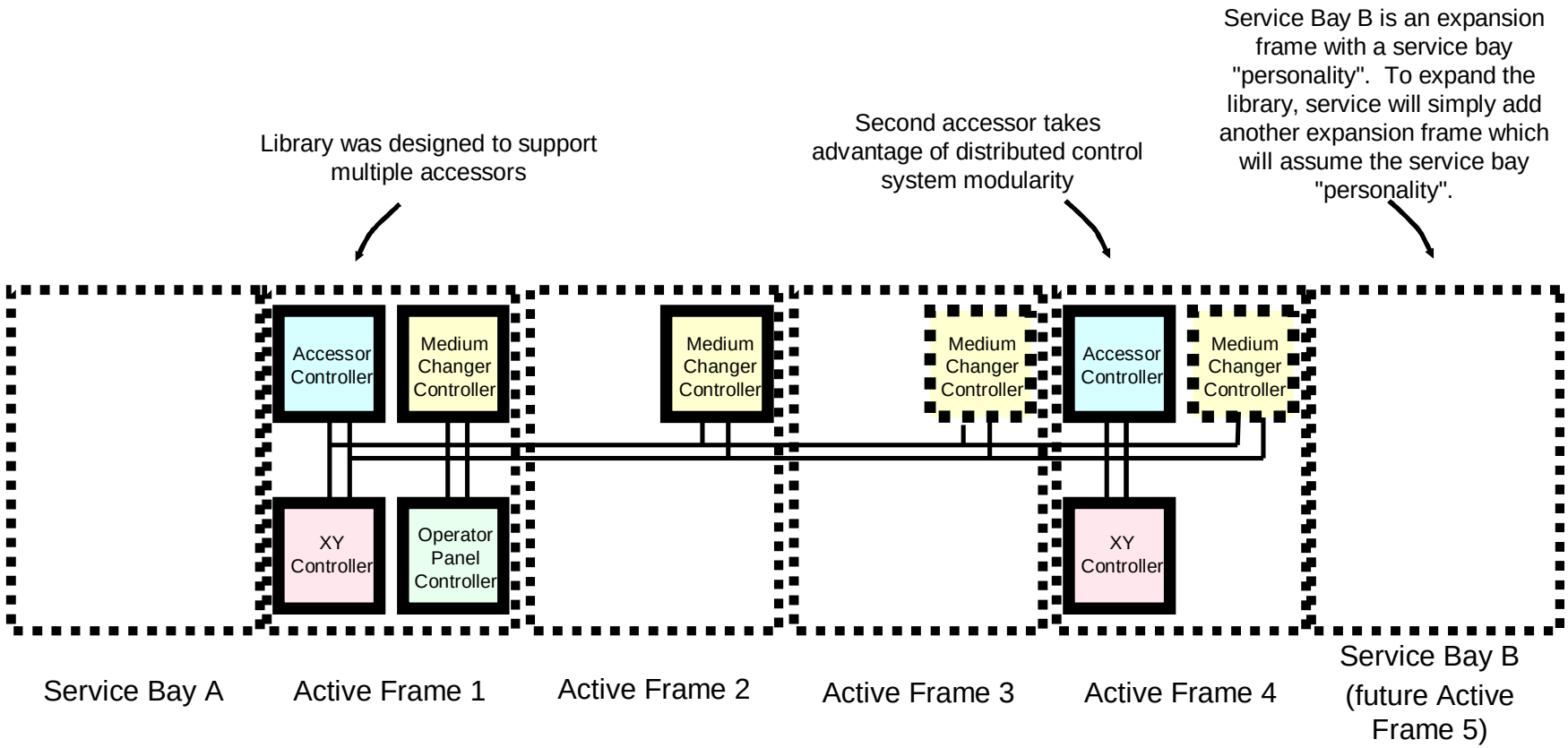
*An application which occasionally leaves cartridges in drives intentionally will not be a good candidate for sharing of drives between logical libraries



TS3500 (3584) Dual Accessor



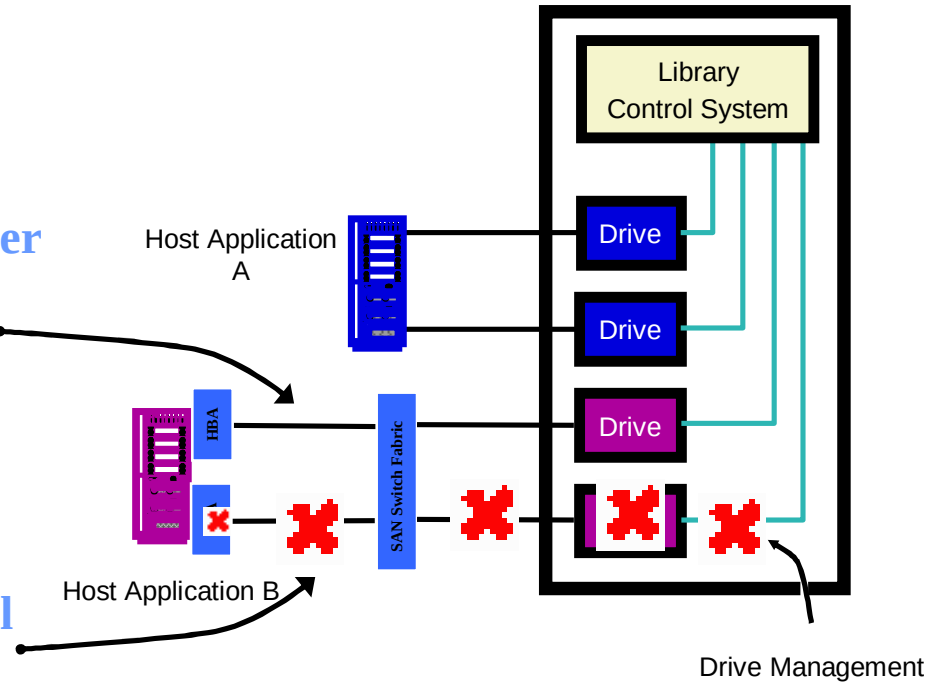
High Availability (HA) 3584 Distributed Control System



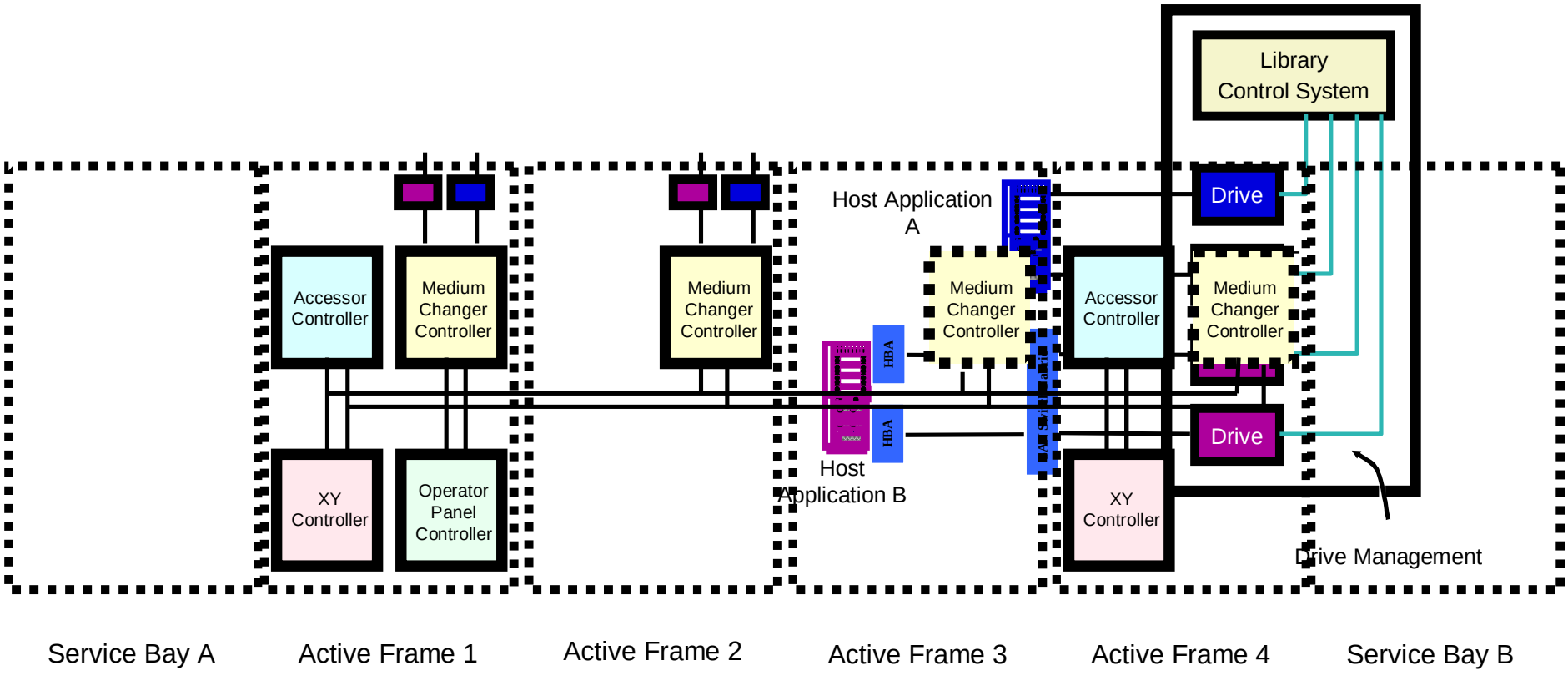
In a SAN environment, clients that provide multiple independent control paths to an application's drives can also implement Control Path Failover*.

At job initiation the IBM Device driver is designed to discover all possible control paths to the tape library.

The device driver is designed to automatically switch to an alternate path when the driver senses a control path failure, avoiding impact to the application.

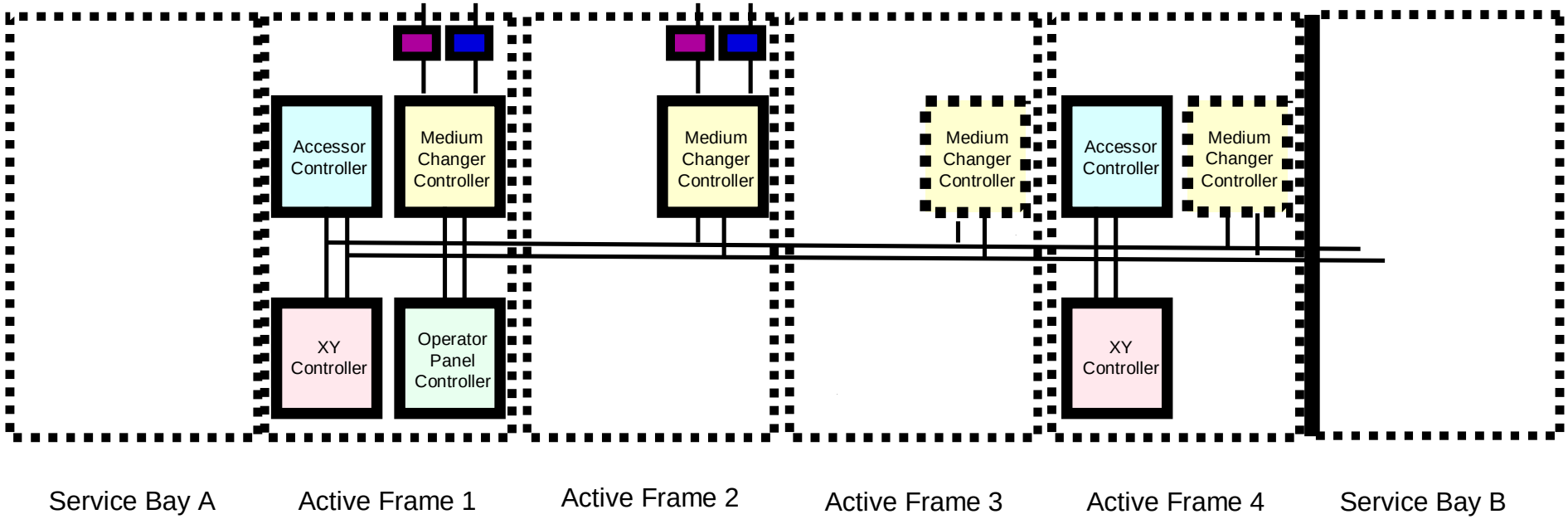


Key components in the High Availability 3584 distributed control system are designed to be redundant.



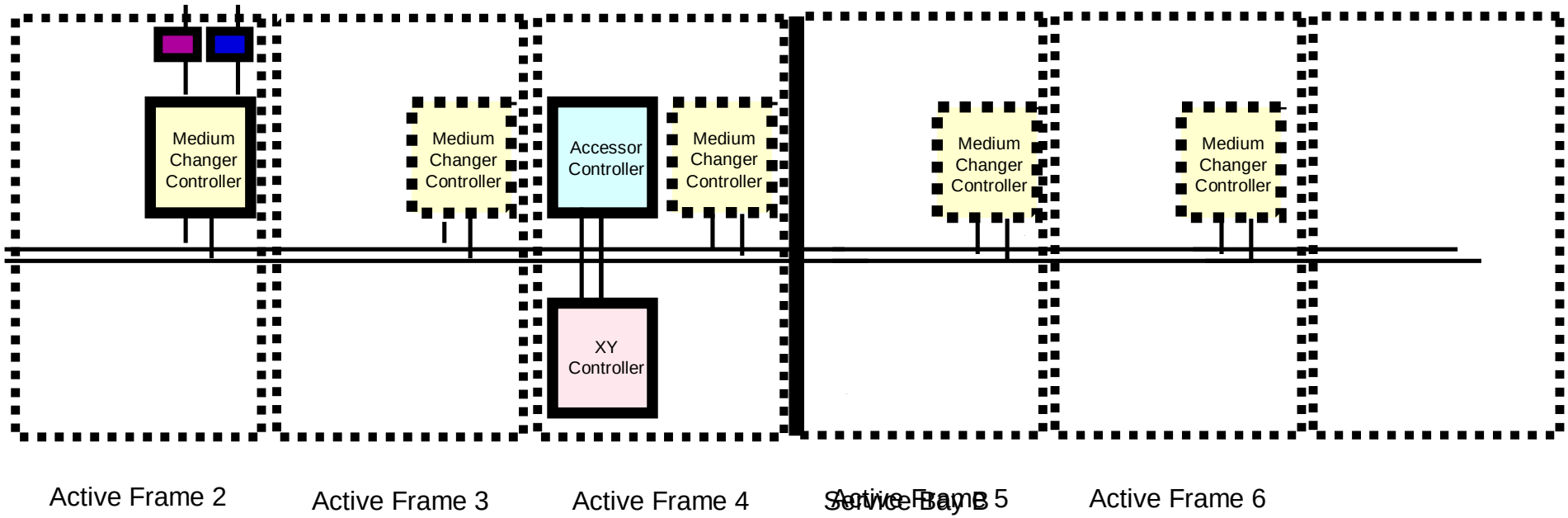
The HA 3584 is designed such that a faulty accessor (including its associated controllers) will either move itself or be moved by the other accessor to its respective service bay.

The active accessor takes over all work requests including any in progress when the fault occurred.



When the Service Bay door is opened to install or remove a safety barrier, the library continues to queue commands. When the safety barrier door is in place, the active accessor is designed to resume operation without loss of any commands.

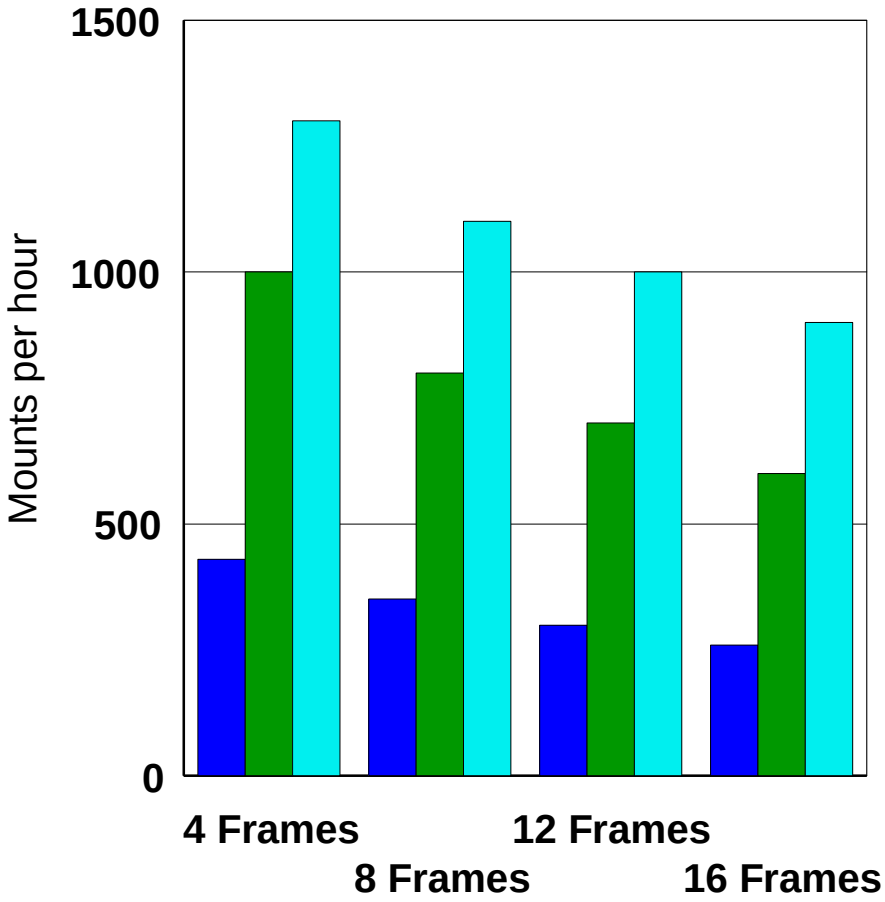
Expansion of an HA 3584 is designed to be performed with a downtime of less than 60 minutes.



Why less than 60 minutes?

Because no frame is removed and, most of the work required to expand the library can be performed with the safety barrier in place.

Up to 1300 Mounts per Hours with Dual Accessors



Single Accessor
Dual Accessor (moves)
Dual Accessor (exchanges at cell)

Note: The maximum mounts per hour specification for a dual accessor library assumes the library is partitioned into at least two logical libraries such that the cartridges located in each of two zones of the library will be mounted in drives which are installed within that zone resulting in no accessor path overlap. This requires up to 160 empty storage slots between zones of 4 frames or less.

Persistent World Wide Names (WWN) - Standard For All IBM Automation

- Fibre Channel devices use a world wide name that identifies the device on a network
  - Unique such that no two devices, in the world, will have the same world wide name
- If a drive is swapped in a conventional library
  - World wide name of the drive will change
  - May result in a customer outage
- The IBM TS3200, TS3310 or TS3500 assigns WWN to the drives
  - This technique is referred to as Persistent WWN
  - Potential drive slots are each assigned a world wide name
  - WWN does not change when a drive is swapped or replaced
  - No customer impact to zones

Automatic Backup/Restore of Vital Product Data (VPD)- Standard For All IBM Automation

- **Automatically manages 2 or more copies of VPD**
  - **VPD Contains**
    - **Library configuration information**
    - **User settings**
  - **Used to minimize service activities**

Capacity on Demand

L23 frame (3592 drives and cartridges)

Starting Capacity	Intermediate Capacity	Full Capacity
"Entry Capacity" **Up to 58 cartridges**	**"Intermediate Capacity"** **Up to 117 cartridges**	**"Full Capacity"** **Up to 260 cartridges**

L53 frame (LTO Generation 3 drives and cartridges)

Starting Capacity	Intermediate Capacity	Full Capacity
"Entry Capacity" **Up to 64 cartridges**	**"Intermediate Capacity"** **Up to 129 cartridges**	**"Full Capacity"** **Up to 287 cartridges**

IBM Tape Automation

	3581	3582	3583	3584	TS3100	TS3200	TS3310	TS3500
Replaced by	TS3100	TS3200	TS3310	TS3500				
Drive Technology	LTO 1, 2, 3	LTO 1, 2, 3	LTO 1, 2, 3		LTO 3	LTO 3	LTO 3	All LTO 3592
Cartridge capacity	8	24	72		22	44	122^	6887
Dual power Dual robot/picker	N/A	Yes N/A	Yes NA		N/A	Yes N/A	Yes N/A	Yes Yes
Partitions, up to	N/A	2	3		N/A	2	18^	192
Platform Support	Open	Open	Open		Open	Open	Open	Z Open
Server attachment					4 Gb Fibre	4 Gb Fibre	4 Gb Fibre	4 Gb and FICON ESCON
Persistent WWN		Yes	Yes			Yes	Yes	Yes
Encryption					LTO 4	LTO 4	LTO 4	Yes-3592

^ When current roadmap is complete in 12/06

Tape Automation Roadmap

	2Q06	2H06	1H07	2H07
TS3100			§LTO 3588 Gen 4 Support	
TS3200			§LTO 3588 Gen 4 Support	
TS3310		•32u and 41u configuration	§LTO 3588 Gen 4 Support	
TS3500	R6A & 3588 F3B (Ann: 5/9/06) §New models w/ new power structure (L23, D23, L53, D53) §LTO 4Gb FC (3588 F3B) §New frames (Lx3, Dx3, HA1) §Enhanced Frame Control Assembly 3584 Tape Library Models L22, D22, L52, D52; 3588 F3A (Ann: 5/9/06) §Withdrawal from marketing	R6B §*3592 Encryption support* §Model x52 to x53, x22 to x23 conversions, and x23 to x53 and x53 to x23 §*JB/JX Media Support* §TS7740 (VTS Next Gen) support	R7A §LTO 3588 Gen 4 Support §Multiple I/O's in D Frame	R7B §3592 GEN 3 support

TS7700 Virtualization Engine for Tape Announcement Overview

- The TS7700 Virtualization Engine for Tape is composed of:
  - One IBM Virtualization Engine TS7740 server (3957 Model V06)
  - One IBM Virtualization Engine TS7740 MODEL CC6 (3956 Model CC6) -- Cache Controller
  - Three IBM Virtualization Engine TS7740 MODEL CX6 (3956 Model CX6) -- Cache Drawer
- Successor to the successful IBM TotalStorage Virtual Tape Server (VTS)
- Introduces a new modular, scalable, high-performing architecture for mainframe tape virtualization.
- New TS7700 Grid Communication features provides peer-to-peer like copy capability between two TS7700's using IP network connections.
- General Availability
  - September 29, 2006
- IBM TotalStorage Virtual Tape Server Withdrawal From Marketing:
  - 3494 Models B10, B20, CX1 and selected features
  - Last order date: Dec 1th

TS7700 Virtualization Engine Highlights

- Significant architectural changes
  - Architecture re-designed to facilitate future enhancements
  - Advanced IBM technology to increase performance and capacity
  - New business continuity option to increase flexibility and reduce cost
- Higher performance and capacity
  - Supports performance of up to 500MB/sec performance
  - Provides up to 18 TB of native cache capacity (3:1 compression)
- Supports attachment to IBM TS1120[1] and /or 3592 J1A tape drives
  - Supports faster cache miss recall times and migration datarate
  - Supports up to 300 GB on a 3592 JA cartridge
- Supports tape drives in an IBM TS3500 tape library
- Supports an optional GRID feature to support business continuity

[1]Supported in 3592 Model J1A emulation mode

TS7700 Virtualization Engine Components – 3592 F05 Tape Frame

- A tape frame[1]
  - Frame provides up to 36u for mounting
    - A TS7740 Virtualization Engine
    - One TS7740 cache controller
    - Three TS7740 cache drawers
  - Supports High availability
    - Redundant power supplies
    - Two power feeds

[1] Machine Type 3952 Model F05

TS7700 Virtualization Engine TS7740 Server

- High performance IBM System p server
  - Two dual-core, 64-bit, 1.9-GHz processors
  - 8 GB
  - Two or four 4 Gbps FICON host interfaces
  - Two 1 Gbps replication links
  - Additional adapters
    - Physical library and drive attachments (fiber)
    - Management interface (Ethernet)
    - Service interface (Ethernet)
- Supports high availability
  - Dual power
  - Redundant hot-swap power supplies and fans

[1] Machine Type 3957 Model V06

TS7700 Virtualization Engine Components - TS7740 cache controller[1]

- Provides high performance RAID 5 disk tape volume cache
  - Attach to one TS7740 Virtualization Engine node
  - Provide up to 1.5 TB of usable cache capacity
  - Includes 16 15k rpm 146GB FC HDDs
  - Includes four 4 Gbps FC interfaces
- Supports high availability
  - Dual power
  - Automatic hot sparing/rebuild
  - Redundant hot-swap components
    - Raid Controllers
    - Power Supplies
    - Enclosure fans
    - Hard disks

[1] Machine Type 3956 Model CC6

TS7700 Virtualization Engine Components - TS7740 cache drawers[1]

- Three TS7740 cache drawers[1]
  - Provide high performance RAID 5 disk arrays
- Each TS7740 cache drawer
  - High performance RAID 5 disk
    - Attaches to the TS7740 cache controller
    - Provide 1.5 TB of usable cache capacity
    - Includes 16 15k rpm 146GB FC HDDs
  - Supports high availability
    - Dual power
    - Automatic hot sparing/rebuild
    - Redundant hot-swap components
      - Power Supplies
      - Enclosure fans
      - Hard disks

Machine Type 3956 Model CX5

TS7700 Virtualization Engine Comparison

Specification	TS7740	Model B10			Model B20		Model B18		
Number of Virtual Devices	128	64			128	256	64	128	
Usable Cache Capacity	6 TB	216 – 432 GB			864 GB to 1.7 TB		72 GB to 1.7 TB		
Compressed Cache Capacity	18 TB	648 GB to 1.2 TB			2.4 TB to 5.2 TB		216 GB to 5.2 TB		
FICON	4	2	4		4	8			
ESCON Channels		2	4	8	8	16	2	4	8
TS1120/3592 Tape Drive Attachment	4 - 16	4 - 12			4 - 12				
3590 Tape Drive Attachment		4 - 6			4 - 12		3 - 6		
Number of Virtual Volumes	500,000	250,000			500,000		250,000		
Supports upgrade path	planned				planned				

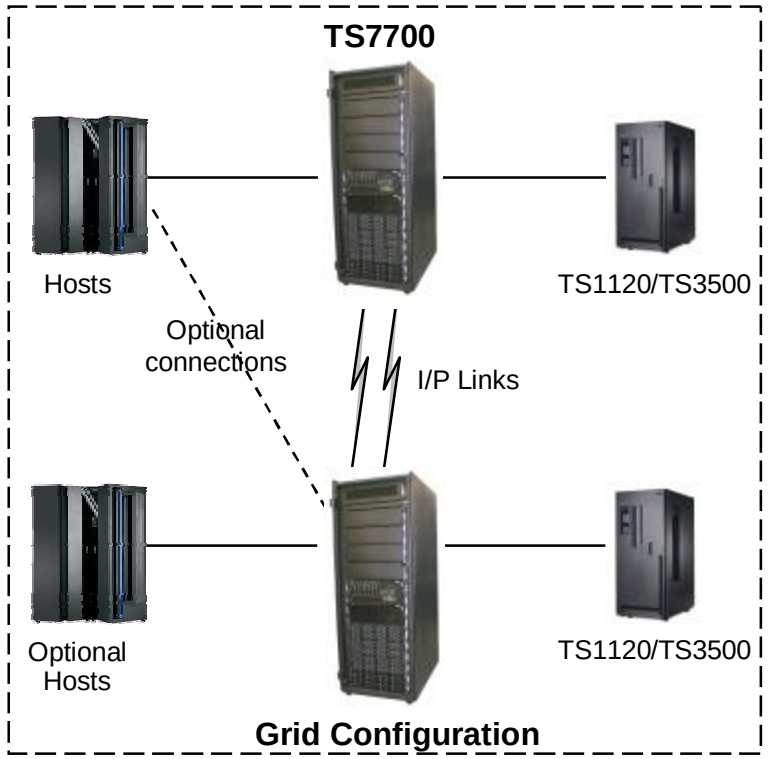
Statements of IBM future plans and directions are provided
for information purposes only. Plans and direction are subject to change without notice.

IBM System Storage™

TS7700 Virtualization Engine Grid & Performance Topics

TS7700 Grid Configuration - 1st Release

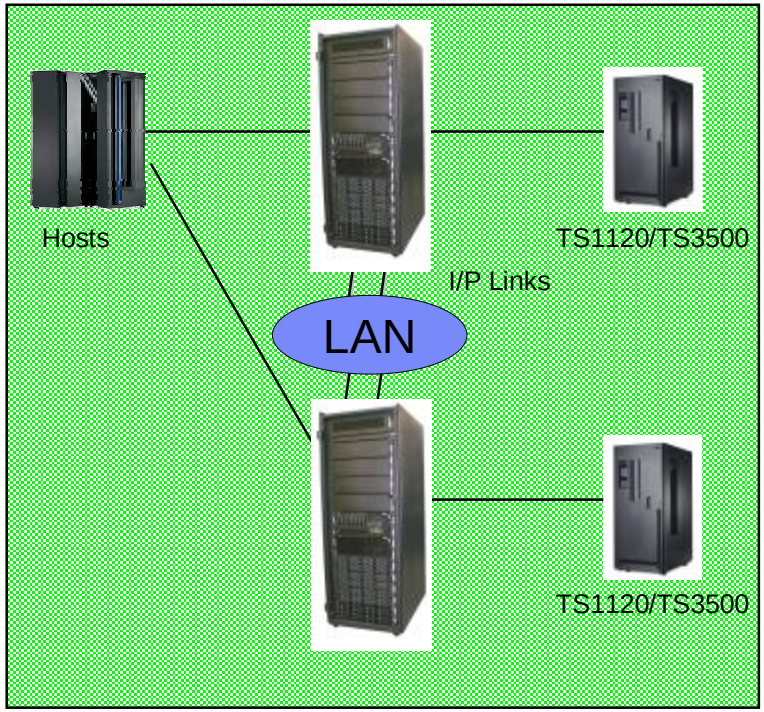
- Couples two TS7700 Clusters together to form a Grid configuration
  - VTCs have been eliminated
  - Hosts attach directly to the TS7700 Clusters
- Any volume accessible through either TS7700 cluster in the Grid configuration
- I/P based replication
  - Two 1 Gbps Ethernet links
  - RJ45 Copper (Cat 6)
  - Standard TCP/IP
- Policy-based replication management
- Can be configured for disaster recovery or higher availability environments



I/P replication may greatly simplify the infrastructure and management needed for a disaster recovery solution as compared to IBM's existing PTP VTS

TS7700 Grid Configuration for High Availability

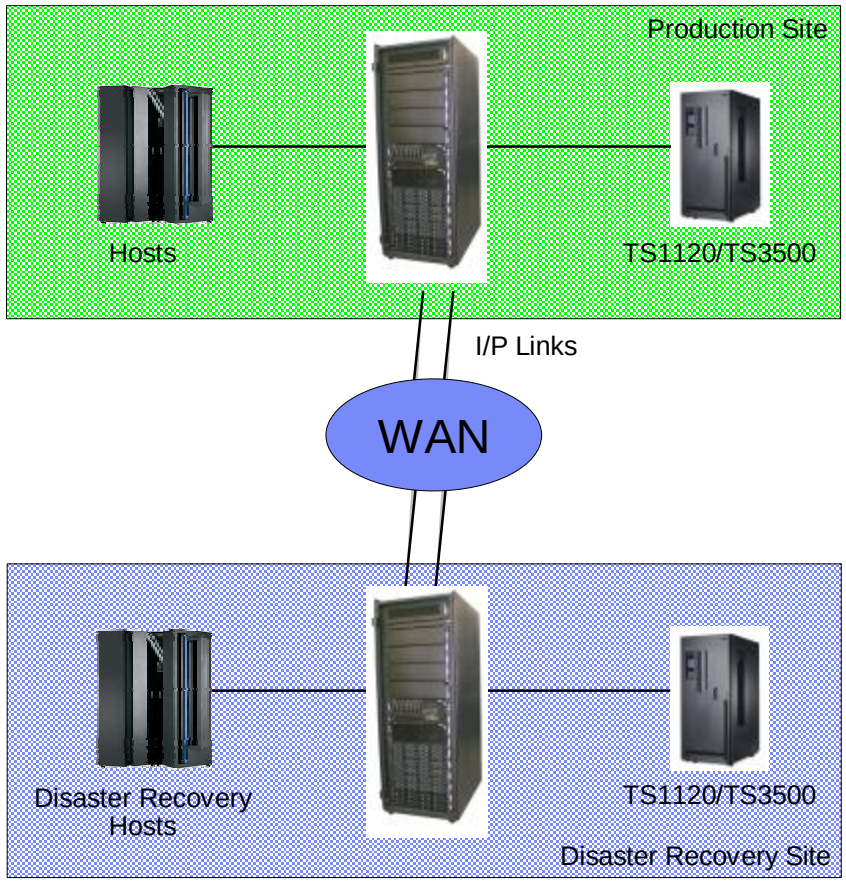
- The two TS7700s are located at one site
- Interconnected through a Local Area Network
- Hosts are attached to both TS7700s
- Data is available through either TS7700
  - After ownership takeover is enabled



Ownership takeover is similar to the Read/Write Disconnected mode of the PTP VTS

TS7700 Grid Configuration for Disaster Recovery

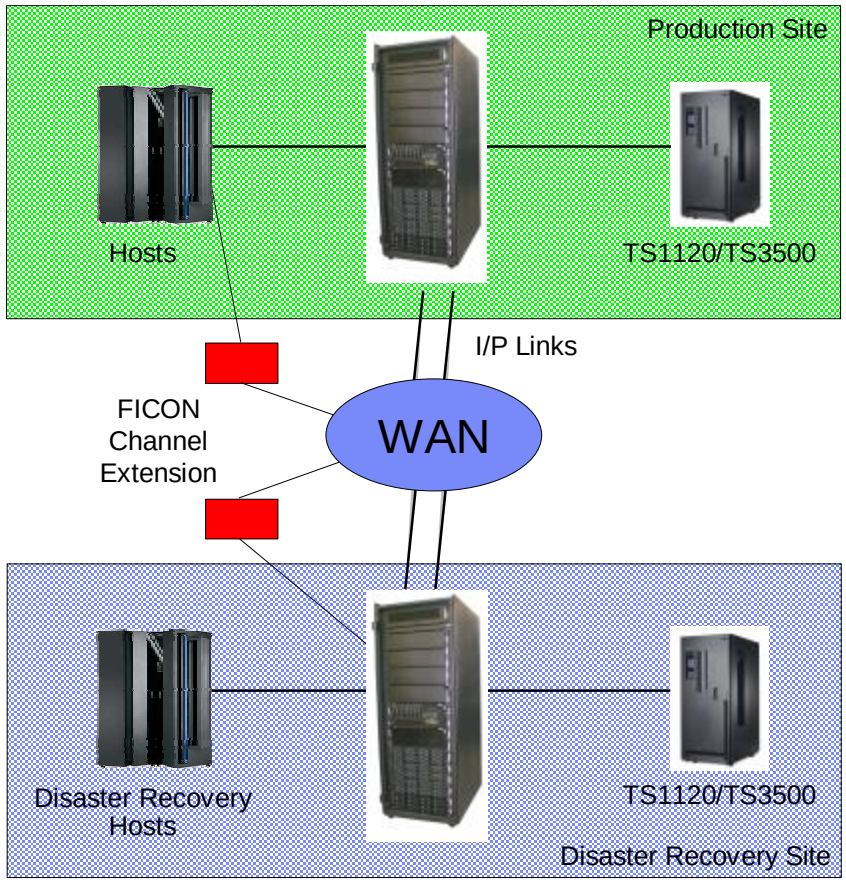
- The two TS7700s are located at two sites geographically separated
- Interconnected through a Wide Area Network
- Only the disaster recovery host is connected to the remote TS7700
- If local TS7700 is unavailable, data is only available at remote TS7700
  - After ownership takeover is enabled



Ownership takeover is similar to the Read/Write Disconnected mode of the PTP VTS

TS7700 Grid Configuration for Disaster Recovery & Availability

- The two TS7700s are located at two sites geographically separated
- Interconnected through a Wide Area Network
- The local host connects to the remote TS7700 through channel extended FICON interfaces making data available through either TS7700
  - Vary devices online when needed
  - After ownership takeover is enabled



Ownership takeover is similar to the Read/Write Disconnected mode of the PTP VTS

TS7700 Grid Configuration Summary

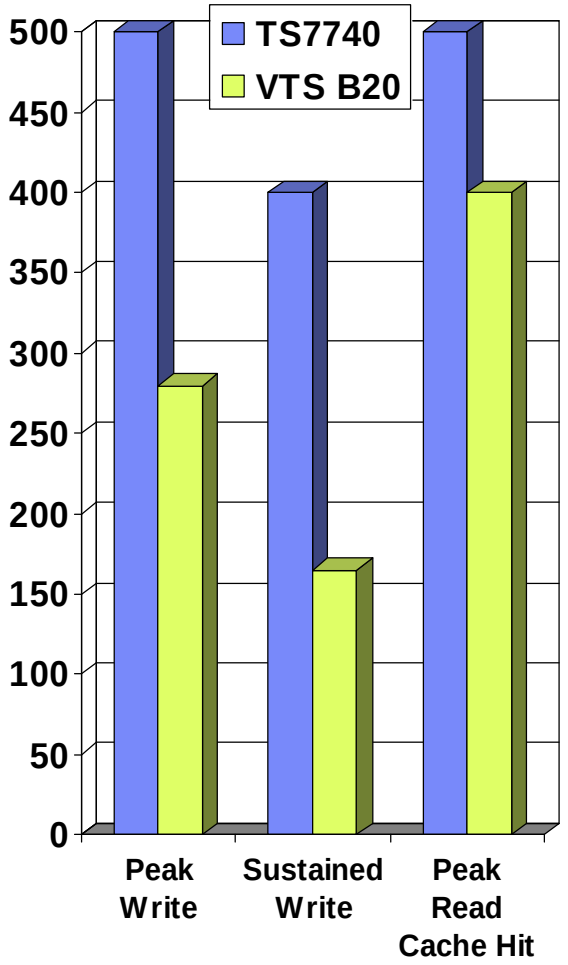
- The capability to peer is built into the architecture of the TS7700 Virtualization Engine
- All TS7700 configurations, including standalone - appear to the host as a PTP VTS (Composite and Distributed libraries) to simplify migration
- Activated by feature codes 4015 - Grid Enablement
- VTCs have been eliminated
- IP interface between TS7700s
- For higher availability, host attachment to both TS7700s is required, which may require channel extension equipment

Grid Configuration

The TS7700 Grid architecture is designed to support a future three site configuration

TS7700 Preliminary Performance[1]

- Single TS7740 Cluster
  - Laboratory measurements indicate a potential peak write data rate of >500MB/s
  - Lab measurements indicate a potential sustained write data rate of >400MB/s
  - Lab measurements indicate a potential peak read cache hit data rate of >500MB/s
- Customer performance may vary
  - Block size, compression ratio and batch window characteristics
  - Processor and channel configuration
- Laboratory measurements
  - Four FICON channels
  - 128 Concurrent jobs
  - 800 MB volumes
  - 32 KB blocks
  - 3:1 compression ratio
  - 20 buffers



[1]Lab measurements, customer results will vary

TS7740 Virtualization Engine Features at a Glance

Includes 3952, 3956 and 3957 R1 features

3956 CC6 Cache Contr.

6003 Intraframe Fibre Cabling (4)
7120 1.7TB Fibre Storage
9230 Attach to 3957 V06
9352 Plant Install 3956 CC6

3956 CX6 Cache Drawer (3)

6000 Intraframe Fibre Cabling (4)
7120 1.7TB Fibre Storage
9354 Plant Install 3956 CX6

3957 V06 Server

1030 1Gb GRID Copper Conn.(2)

3441 FICON Shortwave Attachm.
3442 FICON Longwave Attachm.
3443 FICON 10km Longw.Attach.
(2 or 4)

4015 GRID Enablement
5240 Attach to 3592 Tape Drives
5267 1TB Cache Enablement (6)
5268 100MB/sec Increment (6)
9000 Mainframe Attachment
9217 Attach to 3953 Library Manager
9350 Plant Install 3957 V06

Remote Support IBM TS3000 System Console

2720 TS3000 System Console
2719 Console Upgrade
2714 Console Expansion
2715 Console Attachment

Cables

0201 9 Micron LC/LC 31m
0202 9 Micron LC/SC 31m
0203 50 Micron LC/LC 31m
0204 50 Micron LC/SC 31m
0205 62.5 Micron LC/LC 31m
0206 62.5 Micron LC/SC 31m

9700 No Factory Cables

3952 F05 Base Frame

7312 TS7700 Base Unit
1903 Dual AC Power
5759 Integrated Control Path
5628 Plant Install 3957 V06
5638 Plant Install 3956 CC6
5648 Plant Install 3956 CX6 **(3)**

Power Cords

9954 NEMA L6-30
9955 RS 3750DP (watertight)
9956 IEC 309 (EMEA)
9957 PDL 4.3
9958 Korean 4.3

3953 F05 Tape Frame

1903 Dual AC Power
3488 or 4897 4Gb Switch (2)
9013 TS7700 Attach
9065 or 9066 3953 L05 Install

Operating Systems Supported

- z/OS V1R4 and higher
- z/VM 4.4.0 and higher
- z/VSE.3.1.2
- TPF 4.1 and z/TPF V1.1

TS7700 Design Objectives

- Today's announcement addressed
  - Exploitation of the latest IBM technologies
    - IBM System p5 servers to increase performance
    - IBM modular disk subsystems to significantly increase cache capacity
  - Extending our Virtual Tape leadership position
    - Re-engineer the software architecture
      - Reuse a substantial percentage of the existing code
      - Rewrite components that will substantially improve performance or function
    - Address emerging customer requirements
      - Cost effectively manage Information lifecycles
      - Address Business Continuity Challenges
- Future Plan Strategy
  - Extending the hardware architecture to
    - Support a high availability subsystem
    - Reduce the disruption of planned or unplanned outages
  - Protecting customer investment
    - Provide upgrade path for current B20 VTS installations
    - Supporting 3494 Tape Libraries

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Previous Statements of Direction - Continued Focus

- Enhanced Import/Export capability for IBM TotalStorage VTS products that will allow ‘sets’ of cartridges to be interchanged
  - Can enhance operational efficiencies for customers who choose to move cartridges offsite for manual vaulting
- Support for full-duplex communication between three sites for enhanced electronic vaulting with PtP VTS

TS7700 Statements of Direction

- IBM plans to :
  - Enhance the IBM System Storage TS7700 Virtualization Engine by supporting the installation of a second TS7740 Server (Machine Type 3957, Model V06) within the 3952 Model F05 Tape Frame.
  - Support attachment of TS7700 to the IBM TotalStorage 3494 Enterprise Tape Library
  - Provide an upgrade conversion of IBM TotalStorage 3494 Model B20s to a TS7740 server.
    - Upgraded Model B20s will operate as a single server TS7700, including ability to participate in a TS7700 grid configuration.
  - Utilize the encryption capability of the TS1120 Tape Drive Model E05.

TS7700 Virtualization Engine Milestones

- Announcement: Aug 29th
- GA: Sept 29th
- IBM TotalStorage Virtual Tape Server Withdrawal From Marketing: Aug 29th
  - 3494 Models B10, B20, CX1 and selected features
  - Last order date: Dec 1th