



IBM TotalStorage®

## Solutions matérielles IBM pour la sauvegarde

Mars 2006

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**IBM® TotalStorage® UltraScalable Tape Library 3584**

# IBM Tape Drives

## What determines Best of Breed?

### Technology Competencies

- MR Heads
- Media
- Mechanics
- Electronics / Servo
- Recording Technology
- Error Correction
- Dynamic Compression Look Ahead
- Speed Matching
- Attach Interface Architecture
- Dynamic Load Balancing
- Native Fibre Channel
- Common Libraries
- SARS (Statistical Analysis Reporting System)

**50 Years of Tape Technology**

### IBM LTO Drives



### IBM 3592 Technology



# Growth Plan of LTO



## Six-Generation Roadmap



	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5	Generation 6
Native Capacity	100 GB	200 GB	400 GB	800 GB	1.6 TB	3.2 TB
Native Transfer Rate	up to 20 MB/s	up to 40 MB/s	up to 80 MB/s	up to 120 MB/s	up to 180 MB/s	up to 270 MB/s

## LTO Generation 2

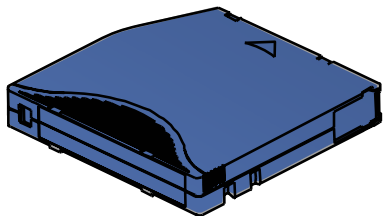


- ✓ 200 GB Native Capacity (400 GB compressed)
- ✓ New Cartridge Color
- ✓ 35 MB/s native (70 MB/s compressed)
- ✓ Ultra160 SCSI For all Models and HVD
- ✓ Native Switched Fabric 2 Gb Fibre Channel Interface on (3581,3582,3583,3584)
- ✓ Speed Matching
- ✓ Power Management (Sleep Mode)
- ✓ New IBM TotalStorage LTO Ultrium 2 Data Cartridge
- ✓ Backward Read/Write with Ultrium 1 Cartridge
- ✓ 512 Tracks
- ✓ 64 MB Buffer





## LTO Generation 3



**ULTRIUM**  
LTO **3**



- ✓ 400 GB Native Capacity (800 GB compressed)
- ✓ New Cartridge Color Blue
- ✓ 80 MB/s native (160 MB/s compressed)
- ✓ Ultra160 SCSI For all Models
- ✓ Native Switched Fabric 2 Gb Fibre Channel Interface)
- ✓ Enhanced Speed Matching
- ✓ Lower Power requirements (Sleep Mode)
- ✓ New IBM TotalStorage LTO Ultrium 3 Data Cartridge
- ✓ Backward Read/Write with Ultrium 2 Cartridge
- ✓ Backward Read Compatible with Ultrium 1
- ✓ 704 Tracks
- ✓ 128 MB Buffer

# IBM LTO Generation 3 – Key Features & Enhancements over Generation 2

## • Performance

- ✓ **400 GB native physical capacity** – via greater than 37% track vs. Generation 2 via increase to 704 tracks. Greater than 33% linear density increase to 250,000 bits per inch (bpi)
- ✓ **Up to 80 MB/second native data throughput** - made possible in part by a 16 read/write channels implementation.  
Provides the SCSI drive with up to **504 GB/hour (2:1 compressed)**
- ✓ **Low power: Ultra160 = 28W via highly integrated electronics using IBM engineered copper technology** – helps to improve reliability
- ✓ **Digital Speed Matching (40, 50, 60, 70, 80MB/s) and 128 MB Data Buffer** helps the tape maintain a more consistent speed and less back hitching

## • Compatibility with existing libraries and media

- ✓ **Read/write Gen2 cartridges, read Gen1 cartridges**
- ✓ **Same form factor as generation 1 & 2**



# IBM LTO Generation 3 – Feature Enhancements over Generation 2



- **Reliability:**

- ✓ **New independent tape loader and threader coupled with positive pin retention** – helps increase the reliability of loading & threading
- ✓ **Improved Electronics**
  - ✓ **Improved Channel calibration feature** helps compensate for variations in recording function, media and R/W head to help optimize performance.
  - ✓ **Increased component integration** help reduce component failure; **New IBM copper-based ASICs** run cooler and help reduce power consumption.
- ✓ **Improved Dual Stage Actuator** -- designed to provide precision head alignment for track density, improved data integrity as well as backwards compatibility with previous LTO generations
- ✓ **Graceful dynamic brake function** – reel motors designed to gradually decelerate rather than stopping abruptly in the event of a power failure
- ✓ **Firmware design stability - 70%+ firmware Reuse**

## Competitive Midrange Tape Drive Specifications and IBM Gen 1, 2, 3

	IBM Ultrium 1	IBM Ultrium 2	IBM Ultrium 3	Certance CL800	HP Ultrium 2	SDLT 320	SDLT 600	S-Ait 1
Physical Capacity (native)	100 GB	200 GB	400 GB ✓	400GB	200 GB	160 GB	300 GB	500 GB ✓
Max. Transfer Rate (Native)	15 MB/s	35 MB/s	80 MB/s ✓	60 MB/s	30MB/s	16 MB/s	36MB/s	30 MB/s
Read/Write (max)	4 m/s	6.2 m/s	5.5 m/s	4.65 (calc)	5.4 m/s	3.5 m/s?		3.1 m/s
Search/Rewind (max)	6 m/s	8 m/s	8 m/s		7.25 m/s	6 m/s?		10 / 14 m/s
Load Time to BOT (max)	15 s	12 s (typ)	15 s ✓ 12 s (typ)		< 19 s	12 s	12s /40s	15 s ✓
Average access time (from BOT)	73 s	49 s 46 s (typ)	49 s ✓ 46 s (typ)	58 s	52 s	70 s	79s	70s
Maximum / avg Rewind Time	110 s	80 / 50s	88 / 55 s		104 / 52s	140 s?	140s?	40s (max) ✓
Speed Matching	No	Yes	Yes	Yes	Yes	No	Yes	No
Power Consumption (max, other)	SCSI:41W FC:47W	SCSI:29W FC:32W sleep: 50% less	SCSI:28W ✓ sleep: 9.5W+	SCSI: 42W	32W	27W	32W	25W (avg) 50W (max)
Connectivity	SCSI 1Gb FCAL	SCSI U-160 2Gb Fabric	SCSI U-160	SCSI U-160	SCSI U-160	SCSI	SCSI	SCSI U-160

✓ = Leading Positions

+ = no cartridge

Sources: IBM - functional specs. Competitors: websites, publicized data sheets



# IBM LTO Ultrium

## IBM Ultrium Tape Autoloader 3581

jusqu'à 6.4TB

Un lecteur LTO Gen 3

80 MB/s natif

8 Cartouches

capacité native 400 GB  
par cartouche LTO Gen 3

LVD SCSI

ou 2 Gb Switched Fabric  
Fibre Channel



## IBM TS3310

jusqu'à 49 B / 1 à 6 lecteurs IBM  
LTO Ultrium generation 3

30 à 122 cartouches LTO Ultrium

Lecteur Code Bar et Remote  
Management Unit/Specialist

Guichet de sortie 12 ou 18 cartouches

Fibre Channel 2Gb, LVD Ultra160  
SCSI



## IBM 3584 UltraScalable Tape Library

jusqu'à 5.5 PetaBytes en LTO3  
interface Media Mover SCSI-3  
Performance impressionnante !  
Afficheur LCD Ecran Tactile

1 à 12 lecteurs par armoire  
Intermix LTO Gen1-2 et Gen 3  
et 3592 sur armoire spécifique

Calibration / inventaire automatique  
bras à Double gripper  
I/O Station de 16 ou 32 cartouches  
Architecture Exclusive Multipath  
Interface Web,  
Et fonction Call Home



## IBM Ultrium Library 3582

jusqu'à 19.2TB

1 ou 2 lecteurs LTO Ultrium 3

Fibre Channel 2Gb ,  
LVD Ultra160 SCSI,

24 Slots pour cartouches

2 magasins amovibles de 7  
cartouches en front / 1 fixe de 9  
cartouches en fond

Un guichet de sortie I/O

Capacité 9.6TB native  
(19.2 TB avec compression 2:1)



## IBM Ultrium 3 Drive 3580

lecteur LTO Gen 3

80 MB/s natif

capacité native 400 GB



# IBM 3584 Enterprise Automation

- SCSI-3 Media Mover interface  
Outstanding Performance  
LCD Touch Screen display
- LTO GEN1, GEN 2 and GEN 3 Drives can be mixed inside. Along with 3592 on a frame by frame basis
- Auto-calibrating
- Automatic inventory  
Dual gripper robotics
- Dual Power Line Cord Option
- Viewing windows  
16 or 32 Cartridge I/O Station  
Exclusive Multipath Architecture  
Web Interface, Call Home Functionality,
- Warranty 1 year on site repair Concurrent maintenance 24x7 4 Hour Response Time

1 to 12  
Ultrium  
Drives Per  
Frame



# IBM 3584 Enterprise Automation

## 3584 UltraScalable Library

- ✓ Integration of IBM TS1120 (Jaguar) Tape Drives
- ✓ Worm Tape Enabled
- ✓ New L22 and D22 3592 Frames
- ✓ New L52 and D52 LTO
- ✓ Native switched fabric 2 Gb Fibre Channel
- ✓ Sixteen-frames 2.4 PB Native Storage Capacity
- ✓ New 16 Cartridge IO Stations



- ✓ Can be configured to hold up to 192 Drives Gen 1,2,3 LTO and TS1120 Tape Drives
- ✓ Drive Error Reporting Through SNMP and Call Home
- ✓ Remote Drive Power Cycle
- ✓ Load Balancing and Control Path failover for AIX and Linux
- ✓ Advanced Library Management System (ALMS)

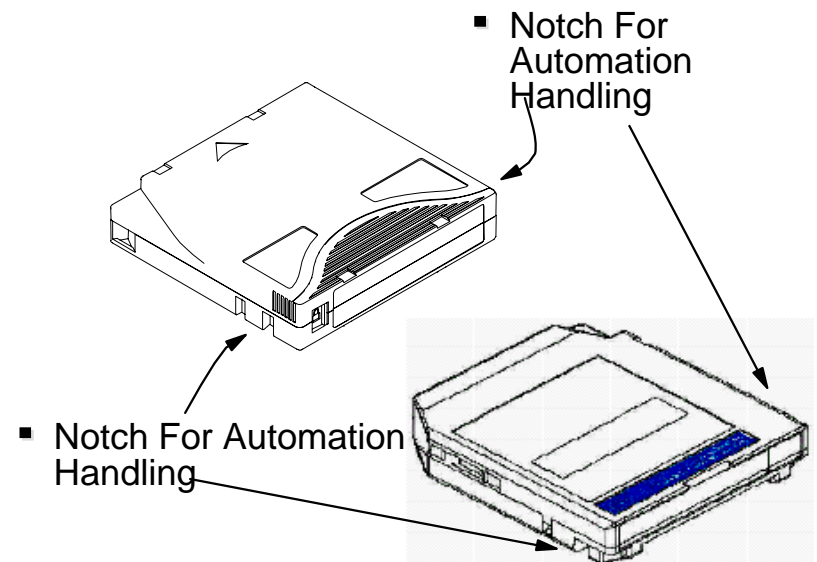
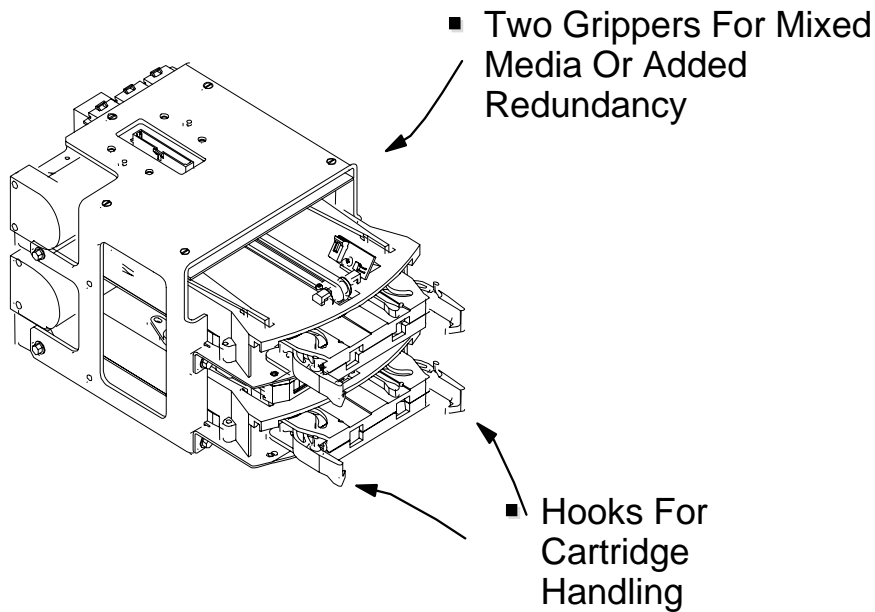
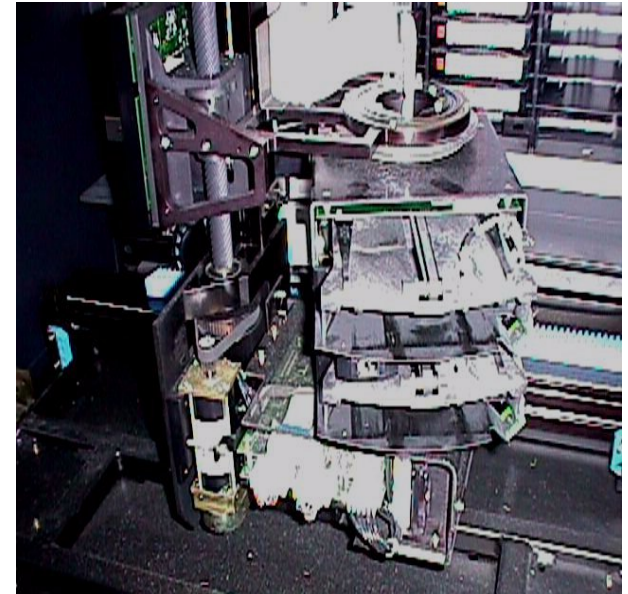




# Robotic Grippers

## ■ Robotic Features

- Standard Dual Picker
- Bar-code Scanner
- Robotic Picker Accelerates at  $3.8 \text{ m/s}^2$





# Hot Swap Drive and Power Canisters

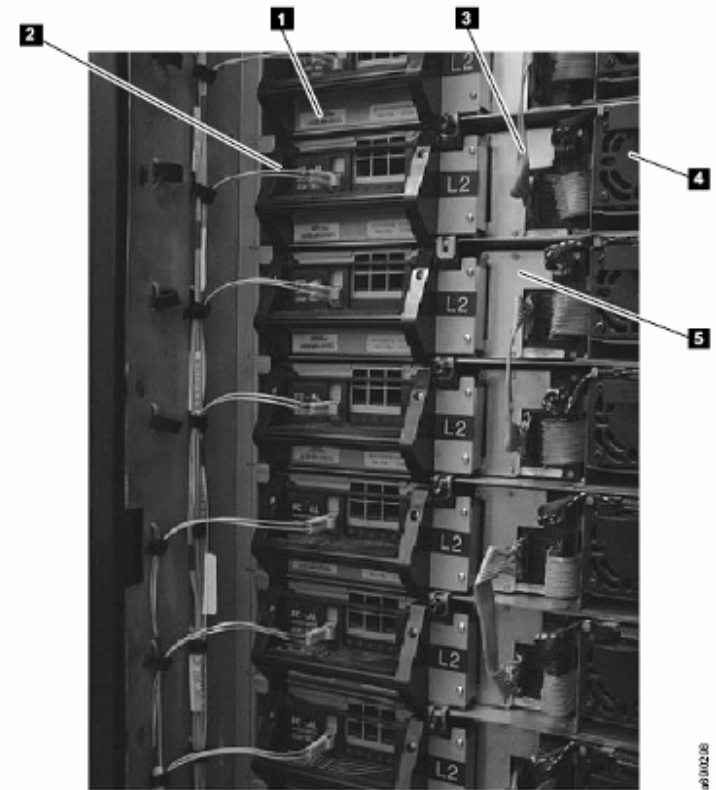
- Hot Swap Drive Maintenance
- Hot Swap Drive Power Supplies
- Cross Drive Power Redundancy
- Canister is easily accessed even while robot is in operation
- Drives and Power Supplies easily removable via Handle Ejection Process.
- GEN 2,3 Ultra3-SCSI LVD; Ultra-SCSI HVD; Native Fibre Channel (Fabric Login)

1  
2  
3

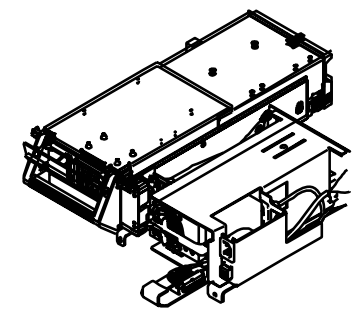
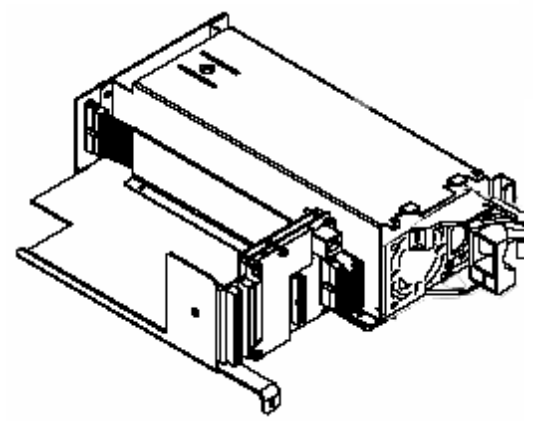
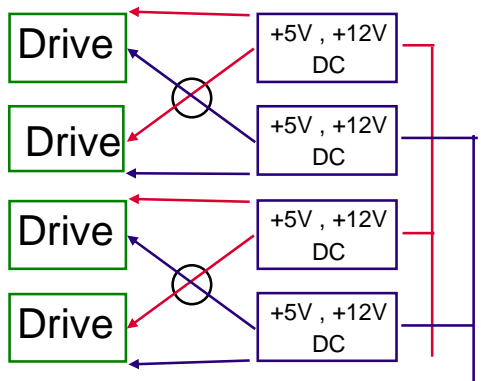
Drive canister  
Fibre Channel cable connection  
Redundant drive dc power cable

4  
5

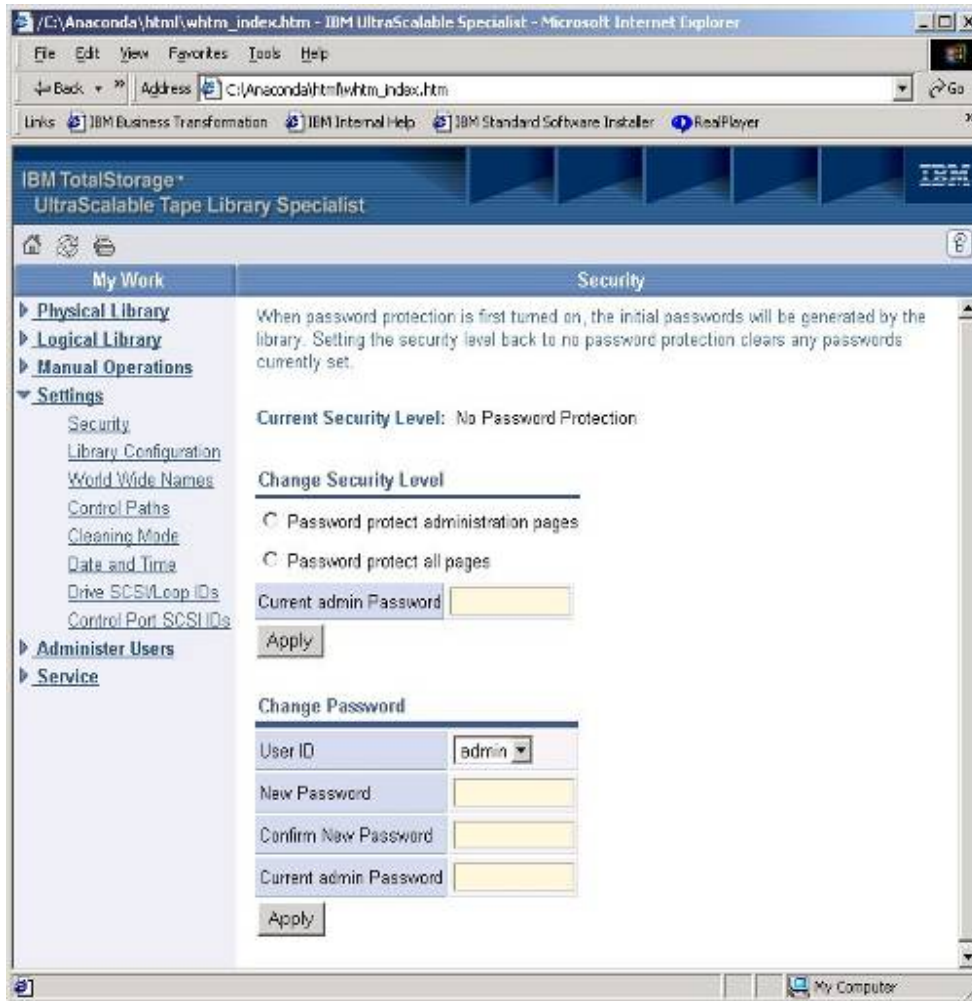
Drive power supply  
Fixed tray assembly



49101238



# New Enhanced Management Capabilities



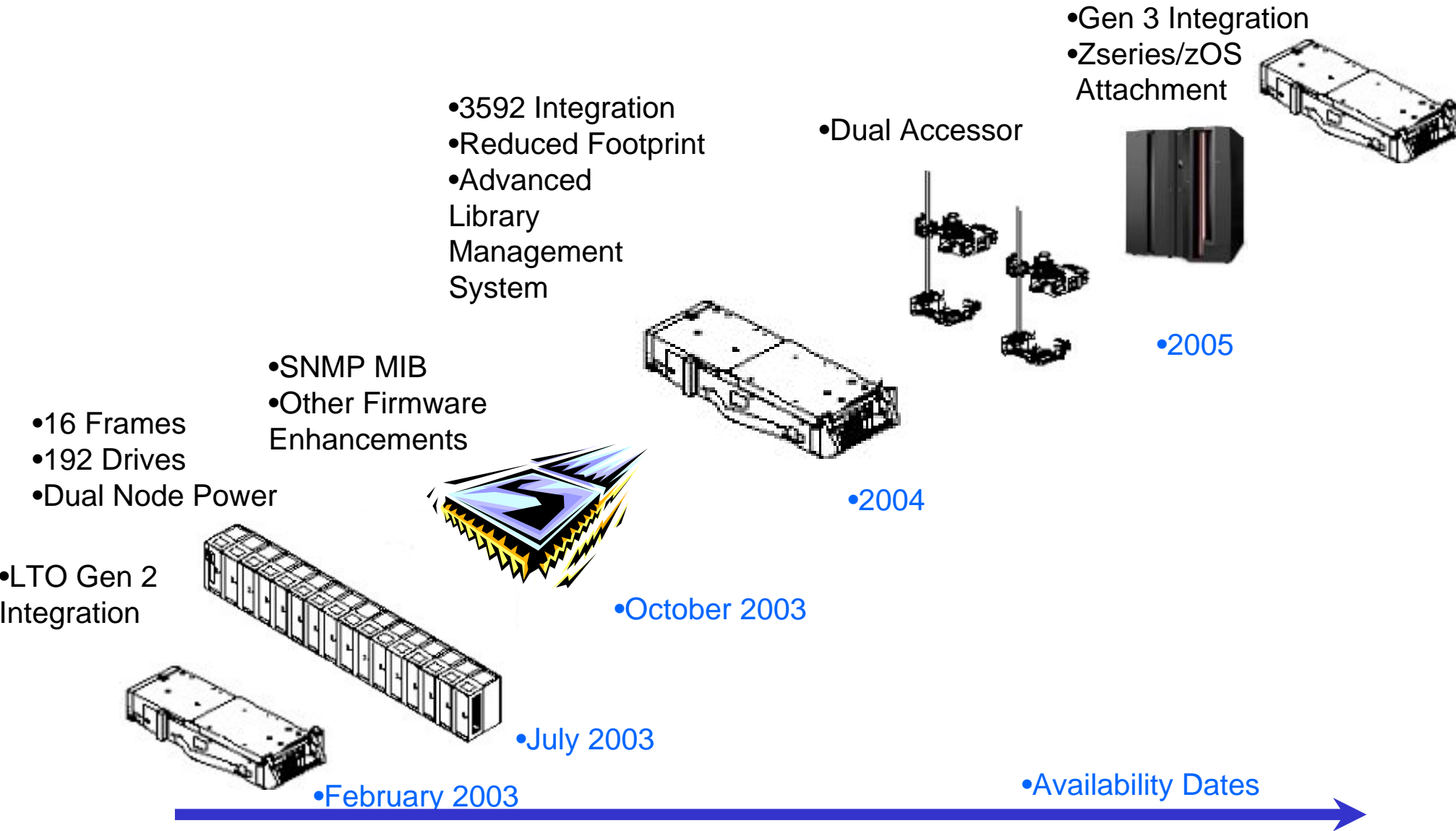
## ■ StorWatch Specialist Support for 3584 Libraries

- Provides remote management capability, allowing operator control panel functions to be handled through the network, including microcode downloads
- Provides SNMP monitoring capability
- ✓ Additional security options
- ✓ VolSer filter search capability (specific or wildcard)
- ✓ Administrator option to power cycle a drive canister

# 3584 L22/D22 and L52/D52 Competitive Overview

	IBM 3584 L52 / D52	IBM 3584 L22 / D22	STK L700e	STK L5500 (LTO Silo)	STK 9310 (Silo)	STK SL8500 (1 LSM)	ADIC Scalar i2000	ADIC Scalar 10K	HP Storage works ESL 712e
<b>Maximum Configuration</b>	16 Frames	16 Frames	Dual Frame	Single LSM	24 LSMs	32 LSMs	4 Frames	CoD*	1 Frame
<b>Maximum Drives</b>	192	192	40	80	1,760	64 per LSM	48	84	24
<b>Maximum Cartridges</b>	6,887	6,260	1,344	5,500	6,000	5,824	1,674	3,945	712
<b>Max. Capacity (TB native)</b>	1,377	1,878	268.80	1.1 PB	1,200	1,165	334.8	789	142
<b>I/O Slots</b>	16 or 32	16 or 32	20 to 40	80	21 to 80	39 or 78	96	up to 72	18,36,48 (1-3 mag)
<b>Library Height (inch)</b>	70.9	70.9	72	92.5	92.5	93.2	77.4	76.8	75
<b>Min. Footprint (sq. ft per Frame)</b>	10.2	10.2	16	89	89	51	6.46	45	10.4
<b>Max Footprint (sq. feet)</b>	163	163	38	89	89	5,401	25	88	10.4
<b>Max. native TB / Sq. Foot</b>	8	12+	7.1	12	13.5	11.1	13	9	13.7
<b>Router-less native FC</b>	Y	Y	Y	Y	Y	Y?	Y	N	N
<b>Native Dual Grippers</b>	Y	Y	N	Y	Y	N	N	N	N
<b>Built-in native Partitioning</b>	Y	Y	N	N	N	N	N	N	N
<b>Multi-Path architecture</b>	Y	Y	N	N	N	N	N	N	N
<b>Linear Scalability</b>	Y	Y	Y	N	N	Y	Y	Y	N
<b>Pass-through port</b>	N	N	Y	N	Y	Y	N	N	N
<b>Data-Path Failover</b>	Y	Y	N	N	N	N	N	N	N
<b>Load Balancing</b>	Y	Y	N	N	N	?	N	N	N
<b>Control-Path Failover</b>	Y	Y	N	N	N	N	N	N	N
<b>WWN persistence</b>	Y	Y	Y	Y	Y	?	N	N	N
<b>Dynamic Partitioning</b>	Y	Y	Y-ACSLs add on	Y-ACSLs add on	Y-ACSLs add on	Y-ACSLs add on	N	N	N

# 3584 2003 – 2005 Product Roadmap





## IBM Tape Library Offerings



### IBM LTO & TS1120 Offering

**IBM 3584  
Tape Library**  
LTO Gen 1 (Up to 688.1TB)  
LTO Gen 2 (Up to 1.36PB)  
LTO Gen 3 (Up to 2.72 PB)  
3592 (Up to 1.87PB)

[www.ibm.com/storage/lto](http://www.ibm.com/storage/lto)

# Tape Re-Branding

- New Sub-Branding
  - “TotalStorage” changing to “IBM System Storage”
    - New products will be introduced under the System Storage Brand
    - Existing Products will be renamed in 2006 to adopt the System Storage Brand
  - “Virtualization Engine” is its own sub-brand (a peer of System Storage)
- “TSxxxx series” names
  - **1000 series reserved for tape drives**
    - Machine Type 3592 becomes the TS1120 Tape Drive
  - **3000 series reserved for automation**
    - Machine Type 3576 becomes the TS3310 Tape Library
  - **7000 series reserved for virtualization**
    - CVT (the subsystem) becomes the TS7510 Virtualization Engine
- When?
  - October 11<sup>th</sup> for New Products

# TS1120 Tape Drives

- Small form factor drive designed for automation
- The TS1120 is an Enterprise Class tape drive that:
  - Increases performance to 100 MB/sec
  - Increases capacity to 500 GB per cartridge
  - 512 MB Buffer
  - Reduces time to first byte of data to 27 seconds
  - Reduces average search time to 11 seconds
  - Reduces rewind time to 11 seconds
- Uses a new IBM cartridge that can be initialized as a
  - 100 GB (Normal/or Worm) cartridge to provide fast access to data  
or
  - 500 GB (Normal/or Worm) cartridge to provide high capacity
- Dynamic Compression Look-Ahead
- Virtual Back hitch
- Enhanced Speed Matching
- Includes a dual-ported 4 Gbit FC / FC-AL interface
- Integrate into existing IBM 3494/3584 Tape Libraries or STK Silos



# TS1120 Tape Drive Description

- Small form factor drive designed for automation
- Uses the original 3592 JA cartridge that can be initialized as a 100 GB cartridge to provide fast access to data or a 500 GB high capacity cartridge
- Includes a dual-ported 4 Gbit FC / FC-AL interface
- Provides superior locate and rewind times



**Average Tape Drive Performance Metrics**

	3592 60 GB	TS1120 500 GB	TS1120 100 GB	LTO gen 3
Load	20	16	16	10
Initial Search	12	37	11	46
Rewind	12	37	11	46
Unload	19	19	19	15



# 3592 JA/JJ Cartridge Media

- Uses a new 'dual layer' metal particle media
- Allows greater recording density and data rate
- Supports enhanced Statistical Analysis Recording System (SARS)
- Compatible with existing automation
- Available in a Standard Length, 600 Meter Cartridge
  - Can be initialized to two native capacities
    - 100 GB capacity to provide rapid access to data (JJ)
    - 500 GB to provide a high capacity solution (JA)
  - Capacity will typically range from the native capacity \*
  - up to 1000 GB in Open System environments
  - up to 1500 GB in zSeries environments



\* assumes 2:1 compression for open systems and 3:1 for mainframe

# 3592 WORM cartridge media

- Two new platinum colored WORM cartridges
  - 100 GB JR cartridge
  - 500 GB JW cartridge
- Designed to provide a non-alterable, non-rewriteable media
  - During the manufacturing process WORM flags are written to the cartridges
    - a low level encoding is written to the tape media
    - a low level encoding is written to the Cartridge Memory (CM)
  - A robust algorithm uses the low level encoding to prevent tampering
  - Semantics permit appending
    - to labeled or unlabeled files
    - new labeled or unlabeled files
  - Cartridges include a worldwide unique name to allow applications to track and validate subsequent access to records stored on the WORM cartridges



# WORM Enablement

- Cartridges are designed to coexist in
  - IBM 3494 and 3584 tape libraries
  - 3592 C20 frame in a StorageTek 9310 silo
  - Standalone IBM 7014 T00 and T42 frame
- Designed for long term record retention and to meet regulatory criteria
- Operation
  - 3592 J1A Tape drive detects WORM cartridge
  - Selects WORM Operational Mode which is designed to
    - prevent overwrite or changes to existing customer data
    - supports appending new data following existing data
  - Data is read concurrently during the write operation to verify data integrity
  - Re-labeling of empty WORM cartridges is permitted

