



IBM Systems Group

# FujiFilm End User Seminar

Cancun, Mexico February 5, 2009

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IBM Systems and Technology Group

# Agenda

- Why Tape
- The IBM Tape Legacy
- IBM FujiFilm Partnership
- LTO Update
- Challenges
- Going Forward

## Is Tape Dead?

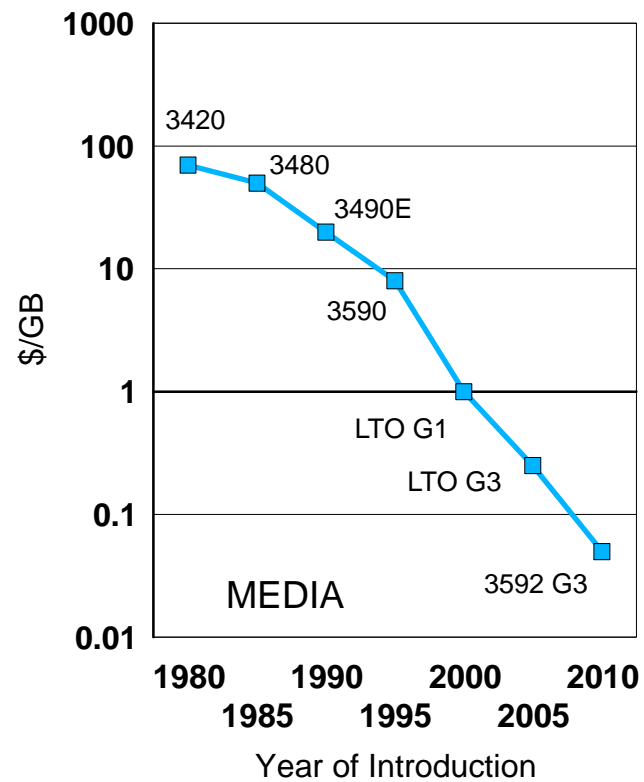
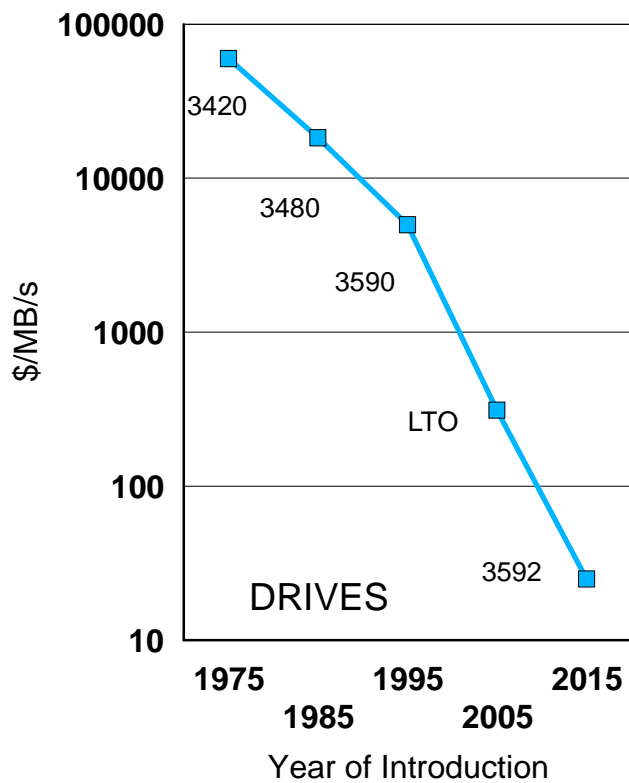
- Clients require an "ultimate insurance policy" on the data assets of their enterprise. This requirement will never go away.
- Today, tape is the most cost effective means of meeting this requirement. Tape will continue to be relevant in the enterprise so long as this is true.
- The emergence of large relatively inert archives, combined with environmental sensitivities, suggest that tape will continue as a viable storage option.

***The real question: while tape remains cost effective, is the systems integration relevant?***

## The "Storage Hierarchy"

- Solid state memory (nonvolatile) > \$6 / GB
  - ▶ Fastest access time
  - ▶ Durability concerns
  
- Direct access storage devices (HDD) ~ \$0.30 - 3 / GB
  - ▶ Slower access time, update in place
  - ▶ Poor power/GB stored
  - ▶ Data deduplication enabled
  
- Removable media storage devices (tape) < \$ 0.10 / GB
  - ▶ Slow access time, typically off-line
  - ▶ Portable, interchangeable, archivable
  - ▶ "Infinite capacity", volumetric efficiency
  - ▶ Compressibility, but data dedup not enabled
  - ▶ Zero power at rest

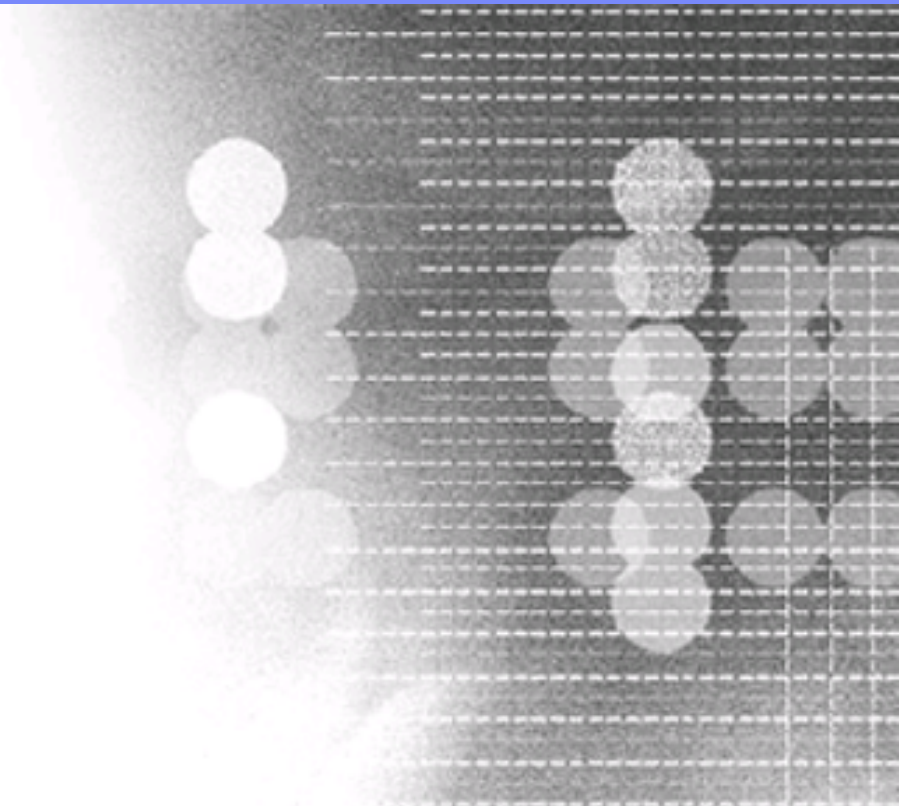
# Evolution of the Tape Value Proposition



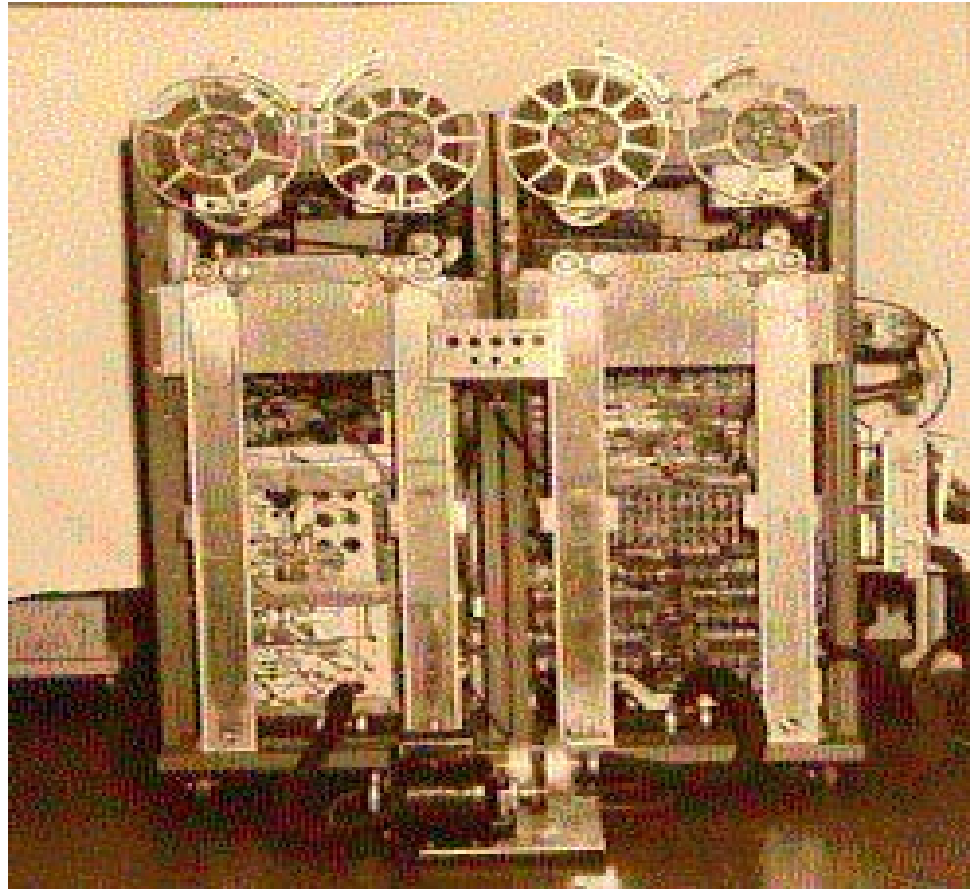


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# IBM Tape Leadership: 57 Years

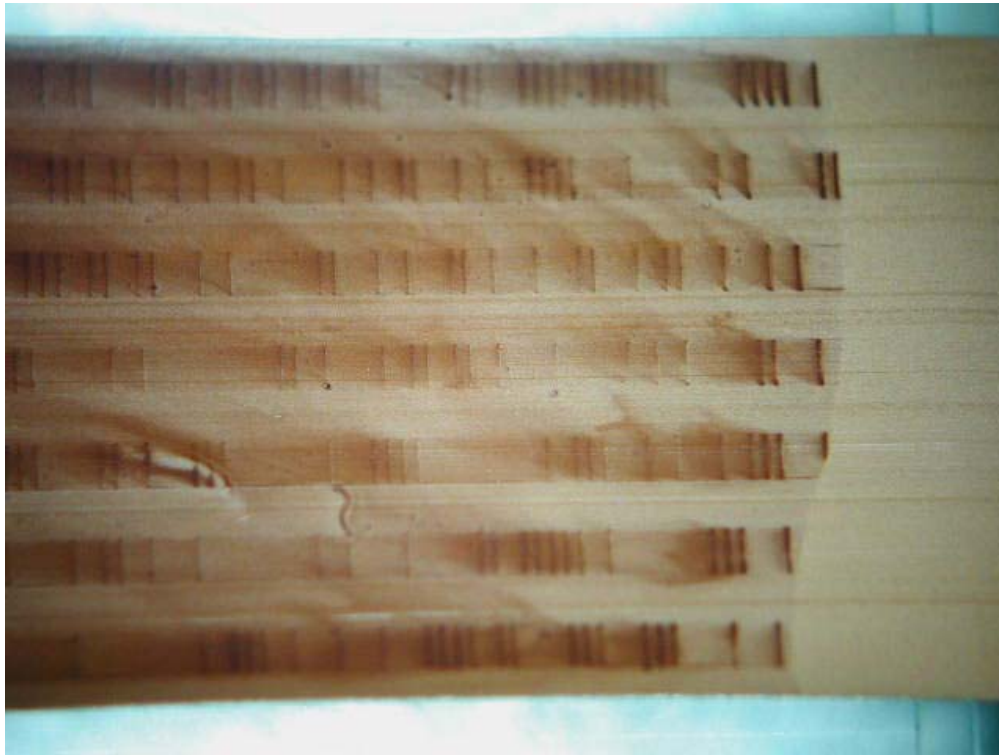


May 21, 1952





## 726 Developed Tape

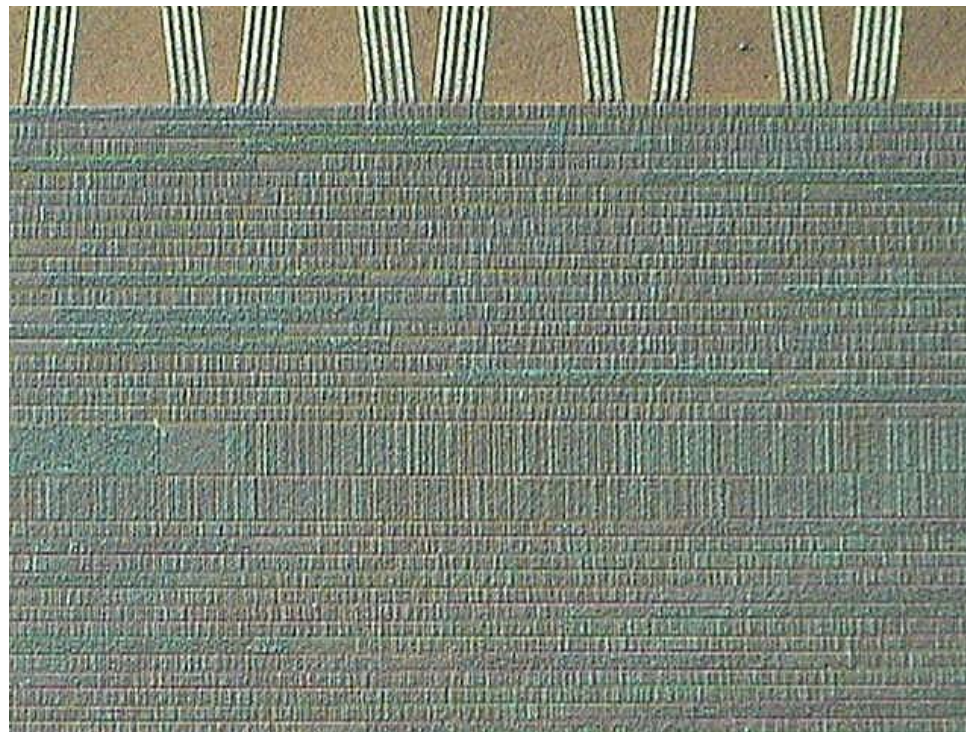




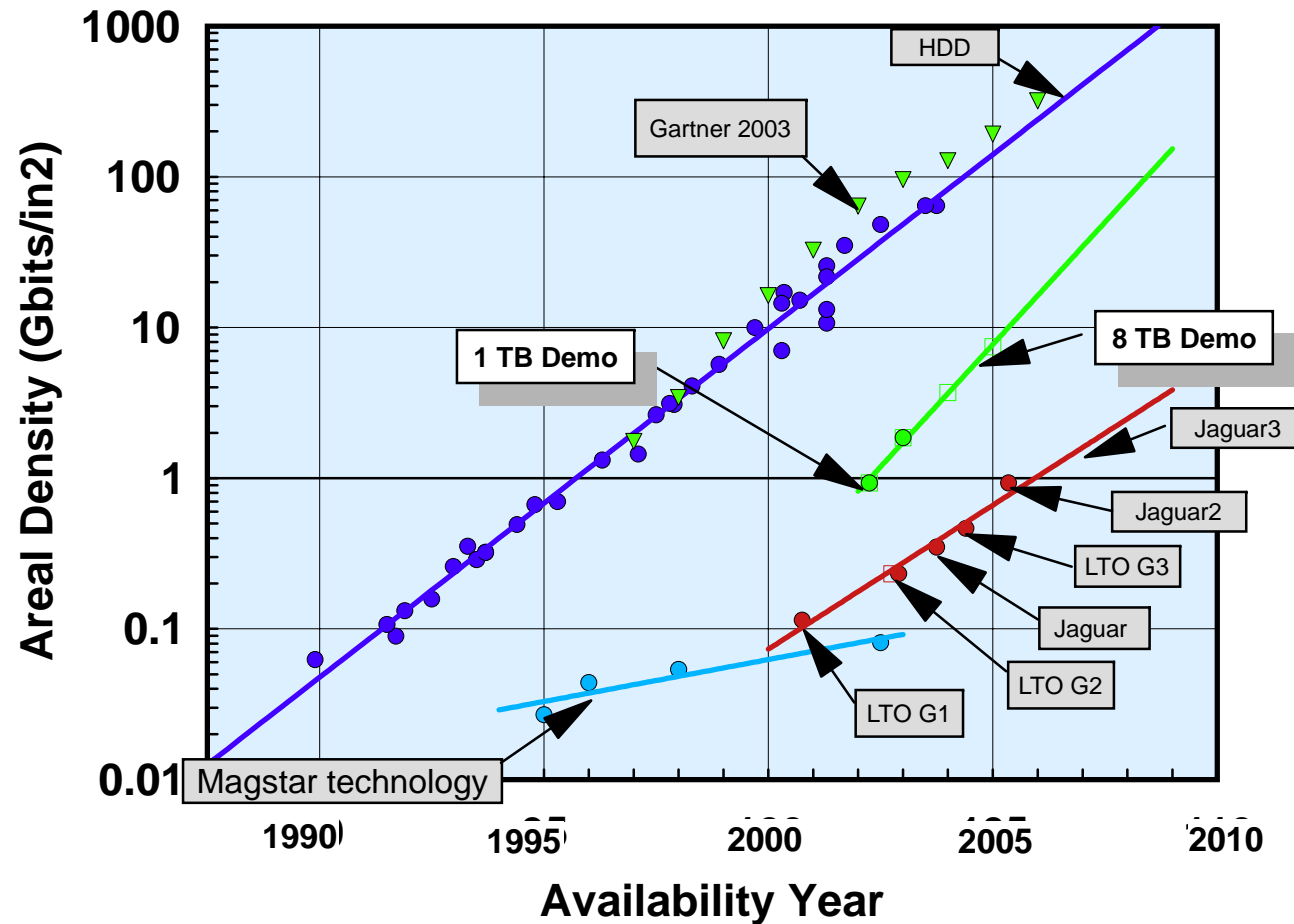
## IBM Tape Firsts

<b>7XX - 3420 series</b>	<b>Vacuum columns, data encoding</b>
<b>3480 - 3490 series</b>	<b>Cartridge media, MR head, channel equalization, compression, reel servo, chrome tape, ECC, pneumatics</b>
<b>3590 series (Magstar)</b>	<b>Interleaved recording, track following servo, AMR head</b>
<b>LTO series</b>	<b>Timing based servo, no pneumatics</b>
<b>TS11XX series</b>	<b>High resolution directory, recursive accumulating backhitchless flush, GMR head, encryption!</b>

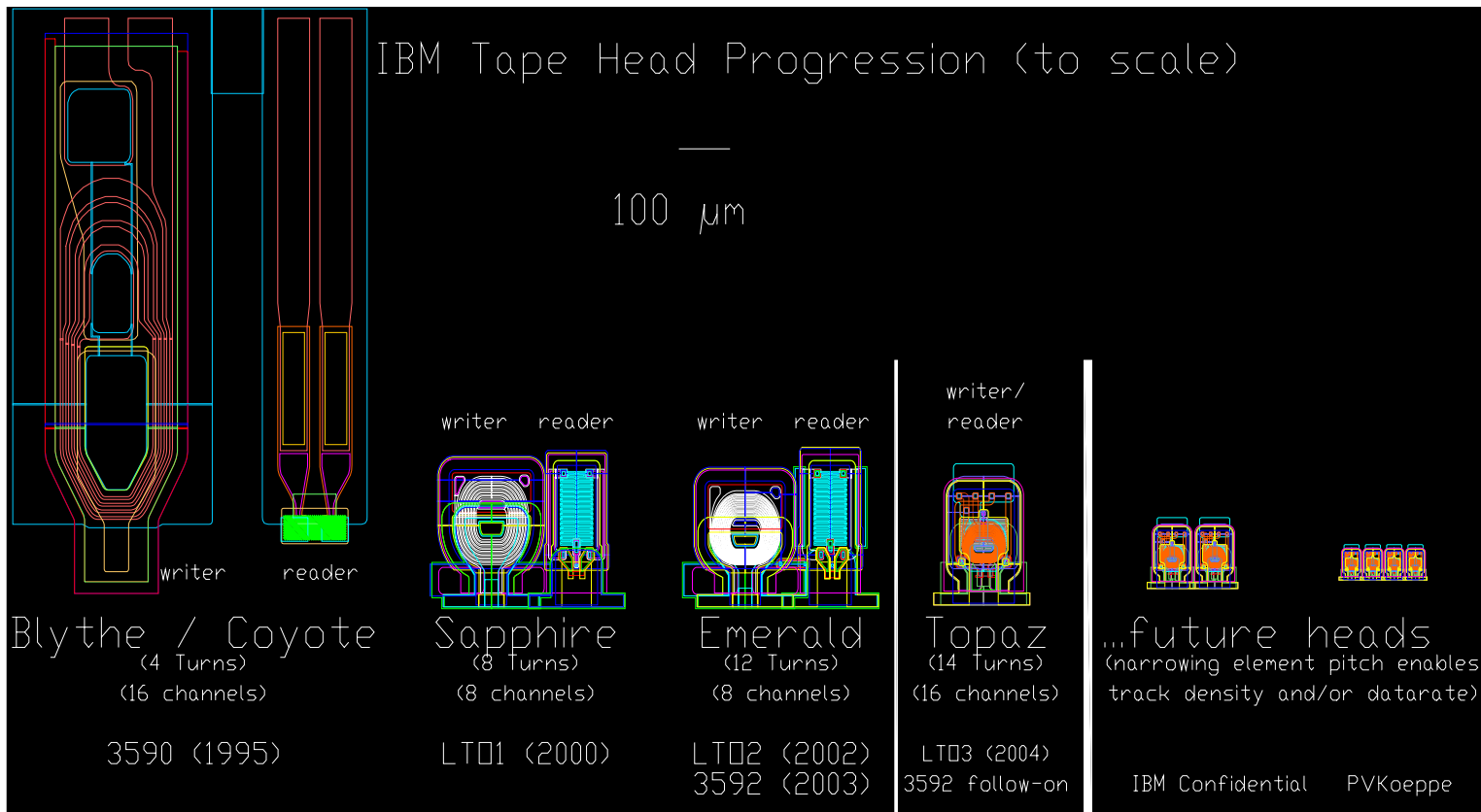
# April 5, 2002: 1 TB Cartridge!



# Storage Products: History/Roadmap



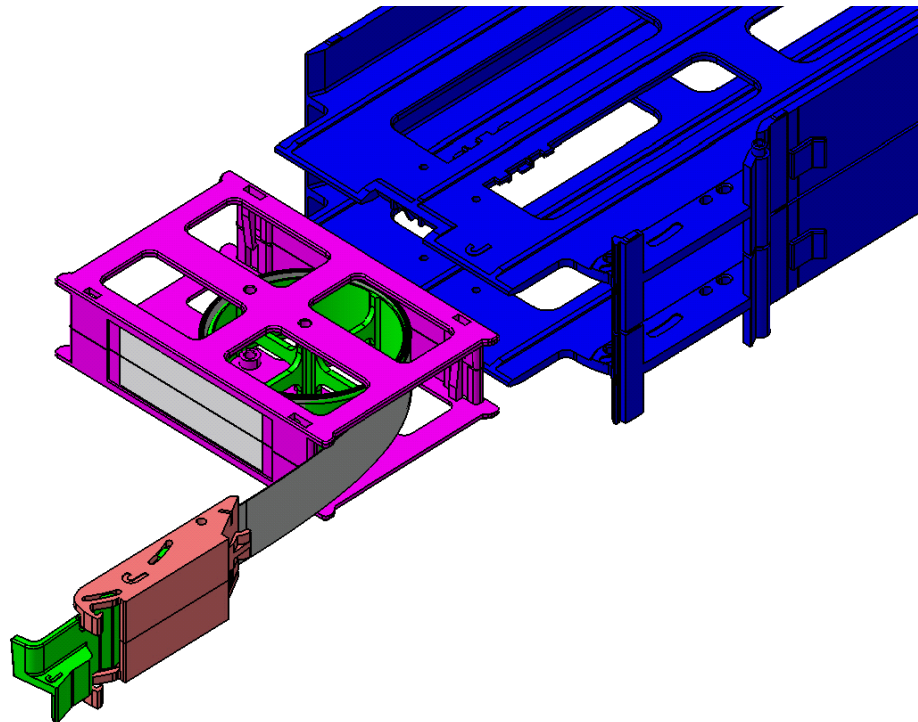
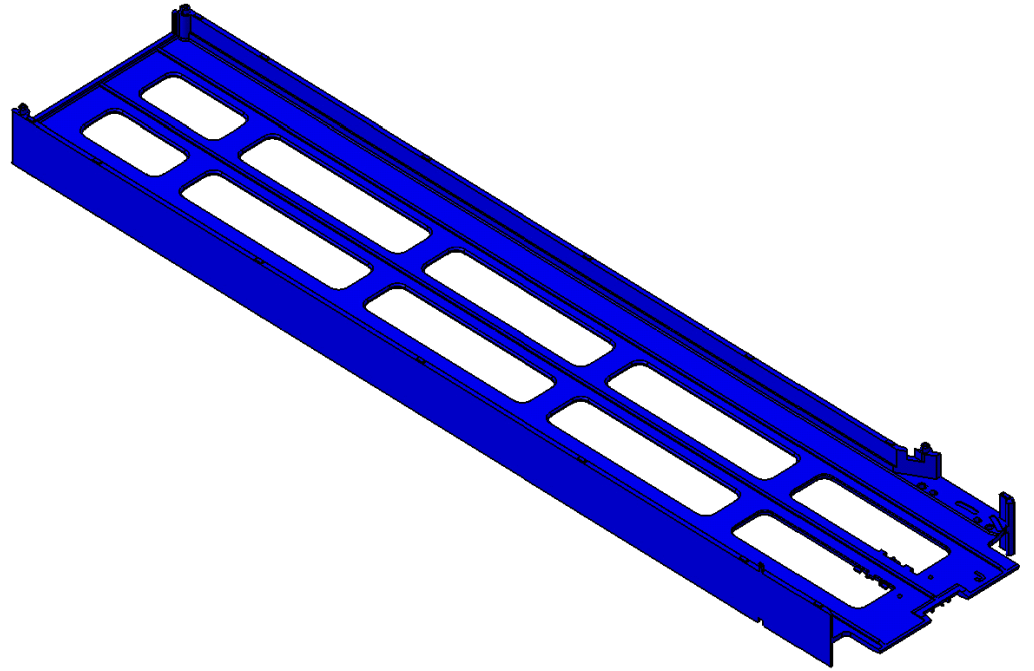
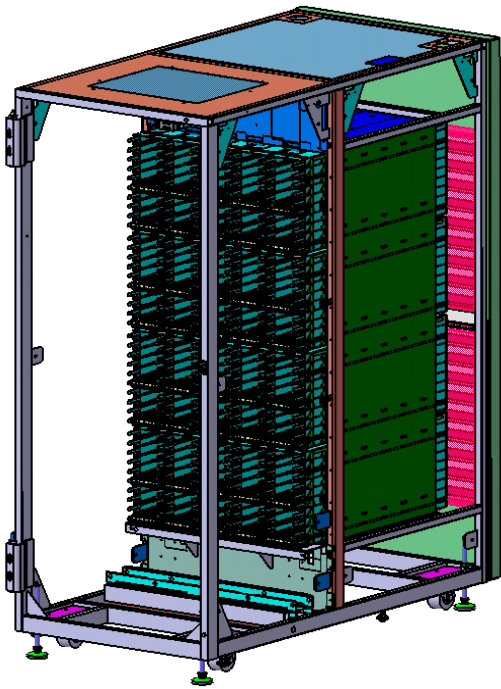
# Head Technology Innovation



## Recent IBM Announcements

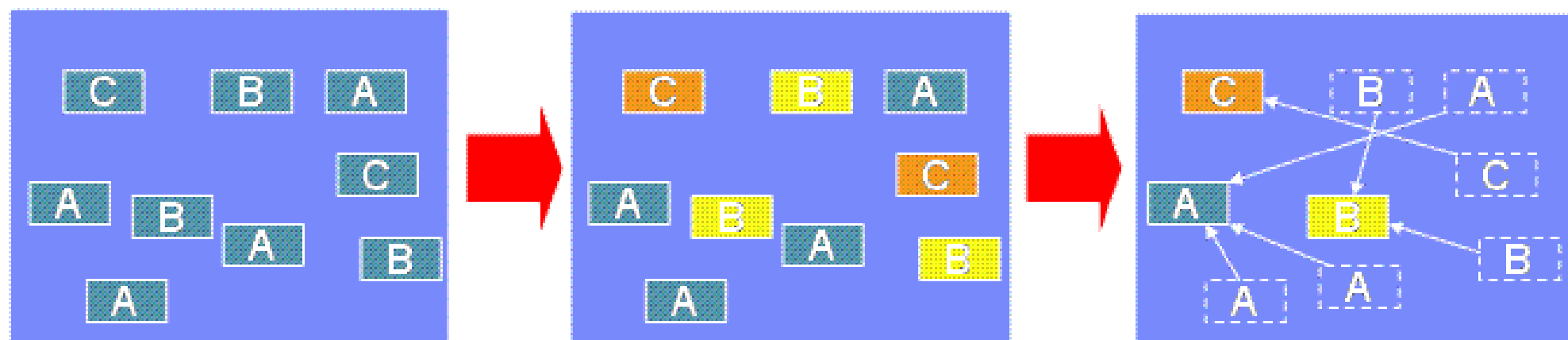
- TS1130 1TB Tape Drive
- High Density Library Frame
- Diligent Gateway
- Tapeless Enterprise Virtualization





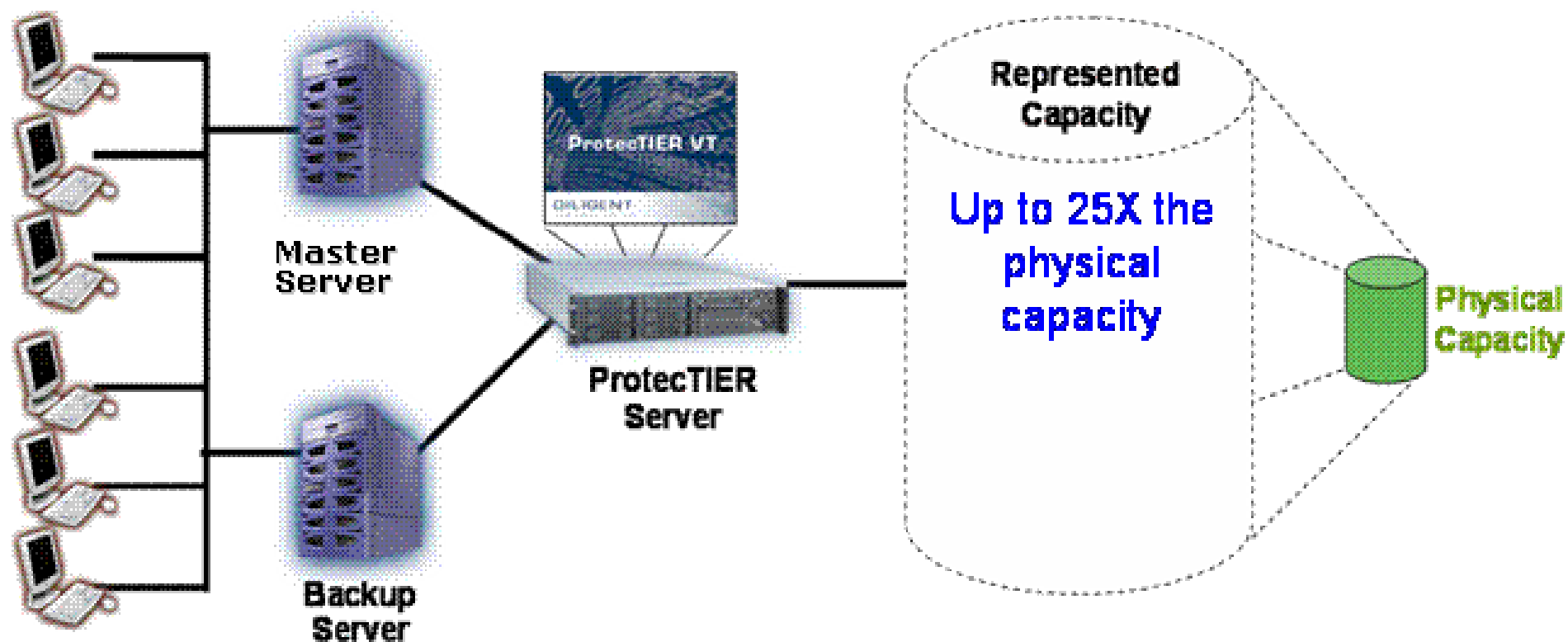
## What is Data-deduplication?

**Data de-duplication** (often called "intelligent compression") is a method of reducing storage needs by eliminating redundant data. Only one unique instance of the data is actually retained on storage media. Redundant data is replaced with a reference or pointer to the unique data copy.





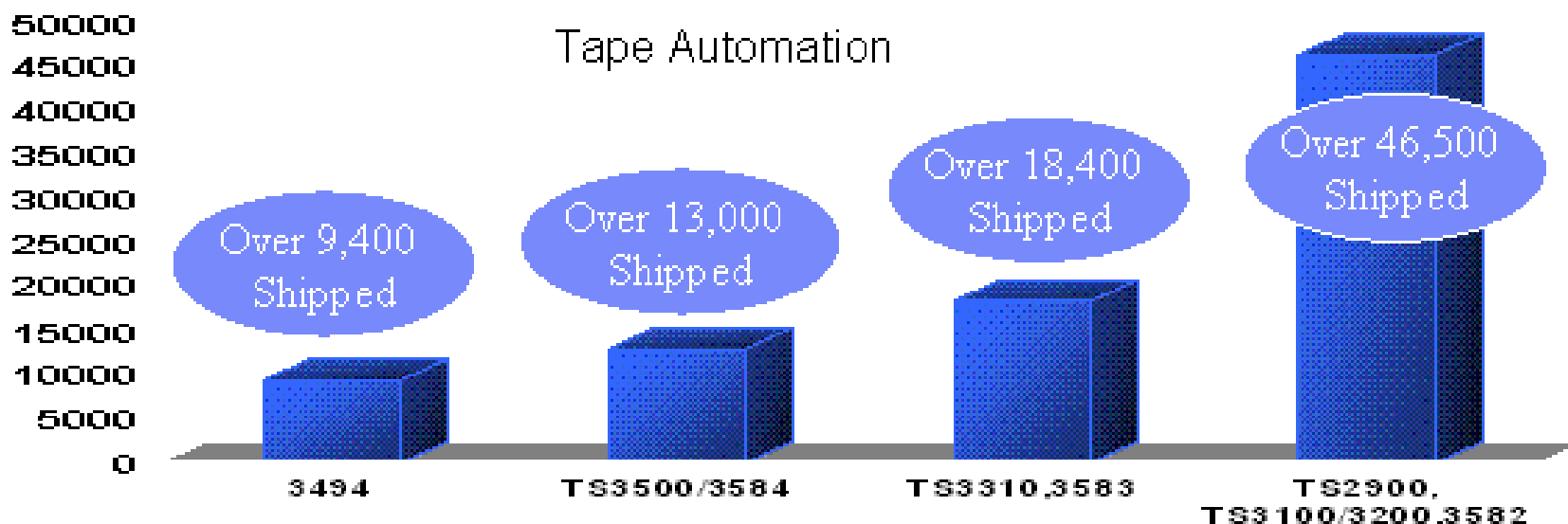
## The Impact of HyperFactor



# Marketplace Milestones

IBM tape program shipment estimates

Over 87,000 IBM Automation Footprints



LTO Drives

Over 1,100,000 Shipped

IBM LTO-4 Encryption!

Enterprise Drives

Over 70,500 Shipped

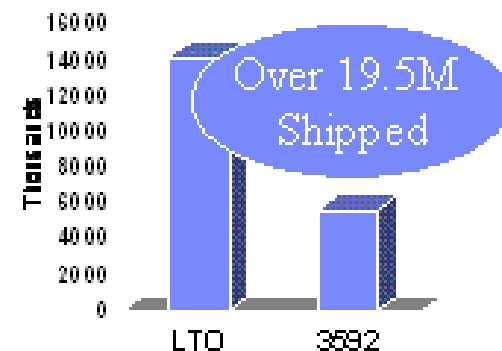
TS1130 Fastest 1TB Drive in the World

Tape Virtualization Solutions

Over 6,500 Virtual Tape Systems Shipped

TS7720 VT Systems Shipping!

IBM Logo Media



## FujiFilm and IBM: 14 Years of Collaboration

- 1995: FujiFilm supplied the MP media enabling Magstar (indirect)
- 2000: IBM/FujiFilm partner to announce LTO Gen 1 (ATOMM media)
- 2002: IBM/FujiFilm announce 1TB research demonstration
- 2002: IBM/FujiFilm announce LTO Gen 2
- 2003: IBM/FujiFilm announce TS1100 (nanocubic)
- 2004: IBM/FujiFilm announce LTO Gen 3
- 2005: IBM/FujiFilm announce TS1120
- 2006: IBM/FujiFilm announce 6.8 TB/sq in demo
- 2007: IBM/FujiFilm announce LTO Gen 4
- 2008: IBM/FujiFilm announce TS1130 (1TB tape drive)

# FujiFilm and IBM Joint Research and Development

- In 2007, IBM and FujiFilm recognized the need to accelerate tape research to maintain tape as a media of choice
- A joint development agreement was signed pooling IBM and FujiFilm skills in both research and development to collaborate on the next generation of tape technology
- This is the closest collaboration with a media manufacturer in the history of IBM
- The program is proceeding as planned and excellent progress has been made in the areas of head/tape interface compatibility, head and media magnetics requirements and integration, and the tradeoffs between tape dimensional stability and the head/actuator designs needed to achieve high areal density

## LTO Update

- Roadmap extended through generations 5,6
- Datarate evolution reduced from 2x to 1.5x / generation
- Considerable discussion about new media - deferred to gen 6
- Gen 5 specification will be a little later than historical
- Considerable technical risk for gen 6 - new media, GMR head

# Challenges

- Negative perceptions about tape
  - ▶ Unreliable
  - ▶ Hard to manage
  - ▶ Slow
  - ▶ Limited archive life
  
- Alternative technology threats
  - ▶ "Cheap disk"
  - ▶ Holography
  - ▶ Blu-ray
  
- Virtualization
  - ▶ Enabling the alternative technologies

## Addressing the Negative Perceptions

- Unreliable and not suitable for archive
  - ▶ Consumer experience - broke tapes, fading fidelity
  - ▶ Modern tape cartridges - tape never handled by humans
  - ▶ Digital tapes do not experience fidelity degradation
  - ▶ Fact: data on tape never disappears, many recent examples of successful data recovery from tape
  
- Management
  - ▶ Lost tapes - mitigated by automation
  - ▶ Obsolete technology - mitigated by migration
  - ▶ Need better software
  
- Slow
  - ▶ Yes, tape is slow, but in most cases data recovery will not be enhanced much by alternatives due to streaming restore



## Alternative Technologies

- "Cheap" disk
  - ▶ Disk is the most unreliable storage device ever designed
  - ▶ Even if disk is selected for archive or backup, IBM strongly recommends that tape be incorporated behind the disk
  
- Holography
  - ▶ The 75 year archive claims are unproven
  - ▶ These disks have failure mechanisms tape does not have
  - ▶ Who will have a drive to read these disks anyway?
  - ▶ None of the roadmap promises have been kept
  - ▶ IBM exited holography research for storage years ago
  
- Blu-ray
  - ▶ No consumer technology has succeeded in data storage
  - ▶ Non-cartridge media not ready for prime time
  - ▶ IBM exited optical recording years ago

## Virtualization Trends

- Clear threat to tape in the low end library space
  - ▶ SATA disk competitive with tape if scaling is small
  - ▶ Data deduplication further enables disk competitiveness
  
- Emerging alternative in the enterprise space
  - ▶ EMC/Bustech enterprise tapeless VTL offering
  - ▶ IBM's tapeless VTL offering
  
- IBM has embraced virtualization with and without tape
  - ▶ Diligent acquisition
  - ▶ Hydra tapeless announcement

## Going Forward

- Continue the climb up the areal density curve, maintain costs
- Drive the high density library value proposition down market
- Exploit tape as a green technology for archive
- Fix virtualization for archive
  - ▶ The world wants its data NOW.....

## Call to Action for the Systems Makers

- Tape needs better compression to combat data deduplication.
- Tape would benefit from a new format with customized in-situ metadata that is adaptable to the needs of each industry opportunity (challenge to LTO).

***And finally, it is LONG overdue that someone, like IBM, have an integrated disk and tape solution that acts like a disk subsystem to fully exploit the advantages of tape for large archival needs.***

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# Thank you!

