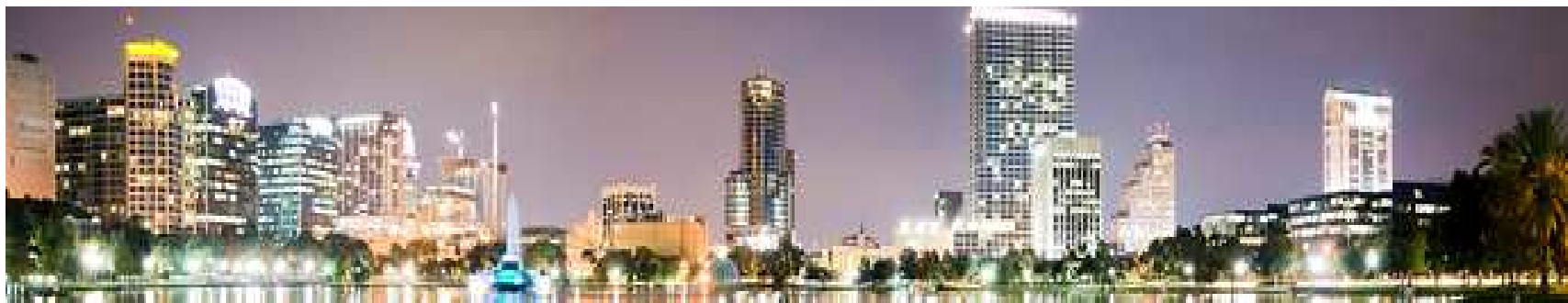




The Evolving Role of Tape and Disk in the High Performance Data Center



Bruce Master
IBM
LTO Program

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Agenda

- IT Storage Management Issues
 - Data Growth Explosion
 - Data Security – Tape Encryption
 - TCO and Energy Costs
- Best Practices for Backup & Archive
- User Examples



Today's IT Environment

- Massive Data Growth
- Daunting Compliance and Data Security Requirements
- Significant TCO and Energy Consumption Challenges



Data Growth

- By 2011, users will install almost 6.5 times the amount of terabytes that they installed in 2007.
- During the next five years, the amount of terabytes per array will increase by 400%.
- During the next five years, user spending on external, controller-based disk storage will outpace overall IT hardware budget growth.*

Increased data from many sources

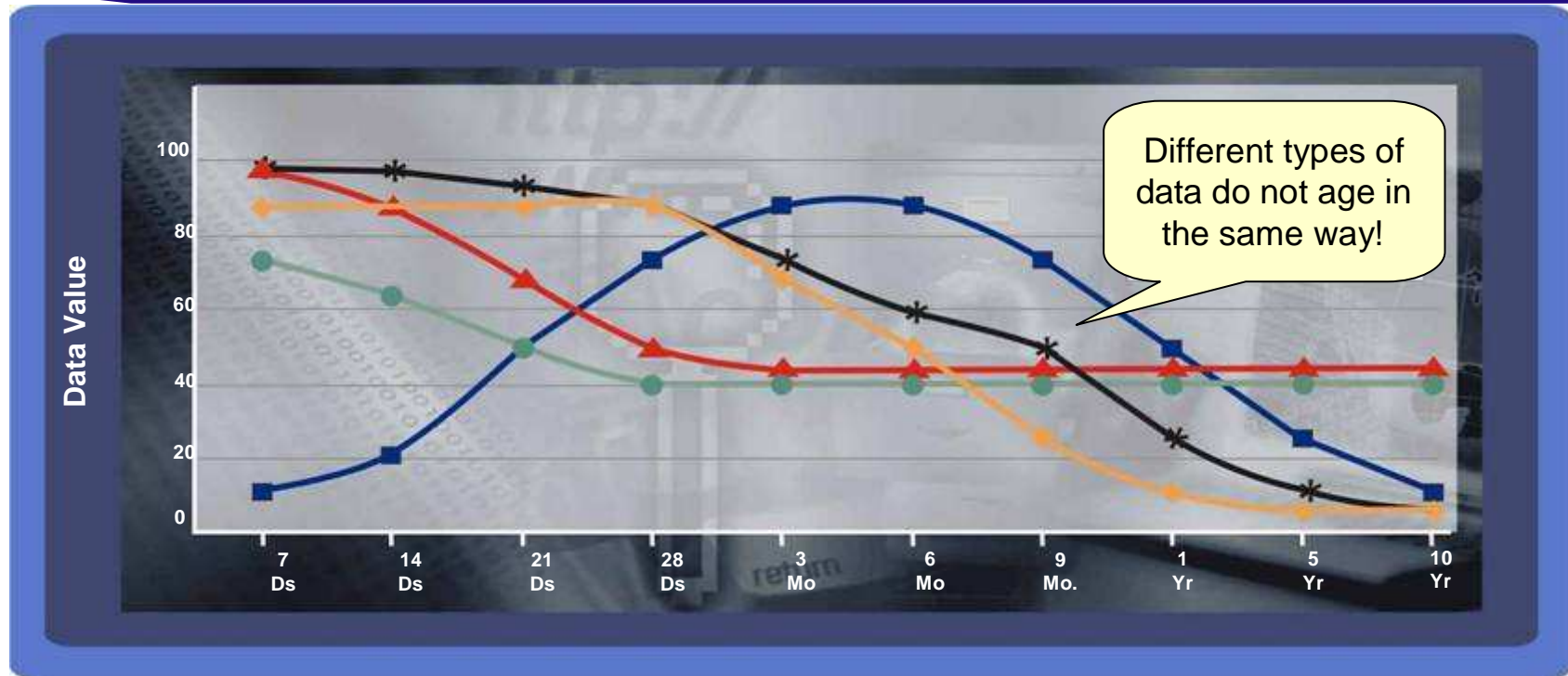


*Source: Gartner Data Center Conference Nov. 2007

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Not all the new information has equivalent value and it's value varies over time



- All data, when created, does not have equal value
- Data changes in business value and in service level requirements over time
- IT resources should be allocated according to the value of data
- Data must be managed and leveraged effectively throughout its entire lifespan

Compliance and Data Security

- Government Regulations
 - Sarbanes Oxley, SEC...
- Internal Requirements
- Securing Data
 - Disclosure laws
 - Penalties and Fines
 - Loss of business



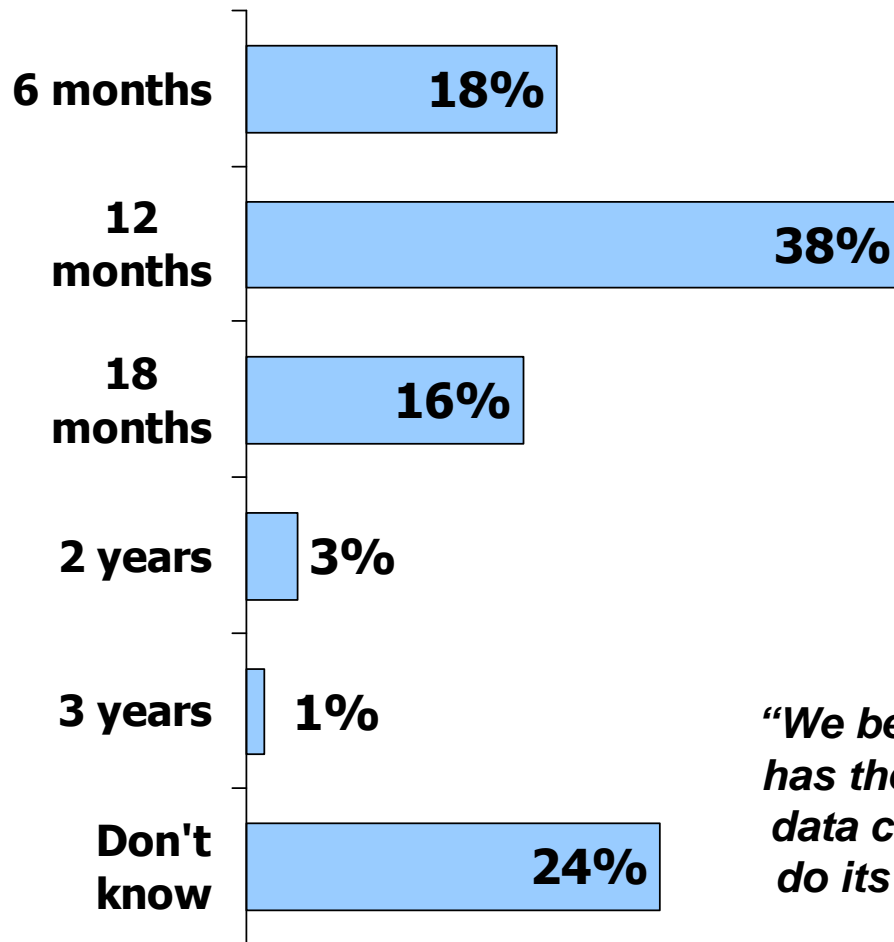
*A security breach can cost up to \$150 per record.**

*Source: ESG

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Survey: Encryption of Tape Backups on the Rise



Base = All respondents (n = 206)

“Will you be required to encrypt your tape backups within the next...?”

72% expect to encrypt tape data within the next 18 months.

“We believe tape encryption with LTO-4 products has the potential to become ubiquitous. Just like data compression, users can turn it on and let it do its magic.” Heidi Biggar, Enterprise Strategy Group, September 2007

Source: Fleishman-Hillard, Inc. Research – Nov. 2007

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Tape Encryption: Helping Protect Vital Information

- **High performance**
 - Compresses the data then encrypts
 - Encryption at tape drive speeds
 - Off-loads encryption task from servers
- **Cost effective**
 - Leverages existing tape automation infrastru
 - Can eliminate need for encryption appliances
- **LTO-4 Encryption**
 - AES-256 bit symmetric data key is used to encrypt data
 - Supports T10 SSC-3 standards based security protocol commands
 - Symmetric data key is stored in key store



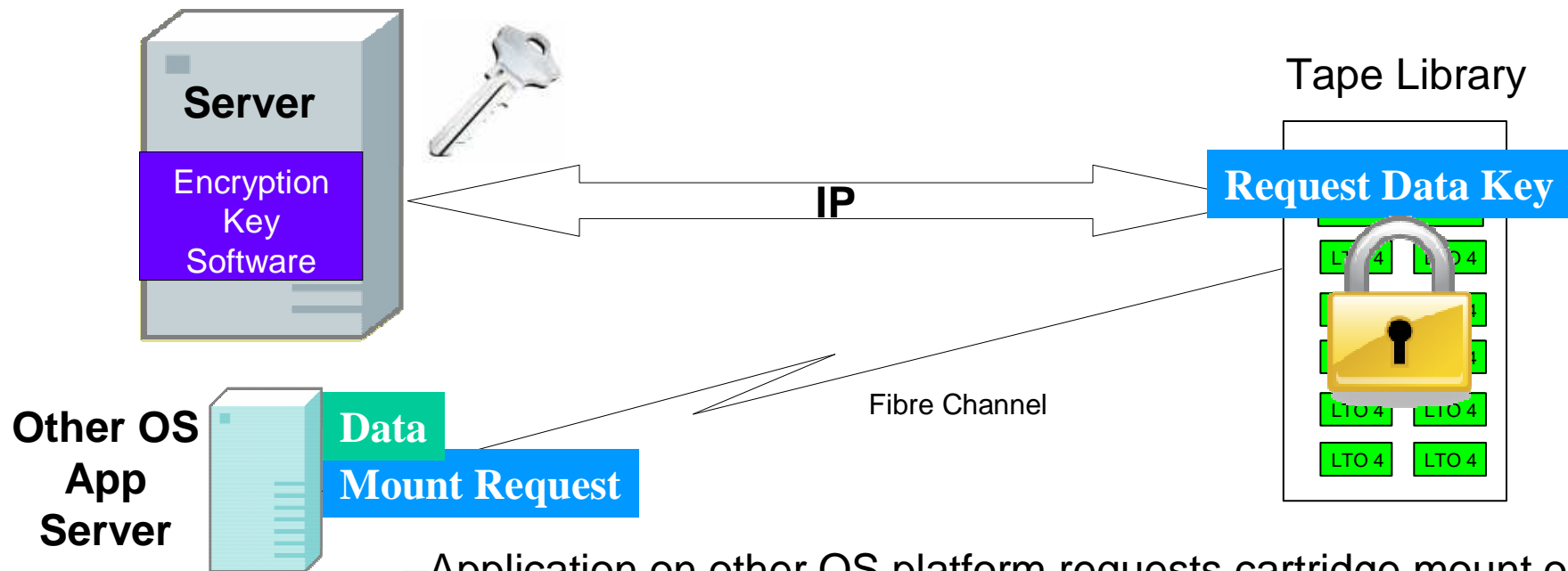
LTO Ultrium 4 Can Help Secure Your Data

Tape Drive Encryption Process Overview



1. AES 256 bit encryption data key provided to tape drive
2. Data is compressed then written to tape cartridge in encrypted form
3. Encrypted data helps protect sensitive information
4. Key management is “key” and is offered by system suppliers

Example – Centralized Encryption Key Management Using a Library and Key Software



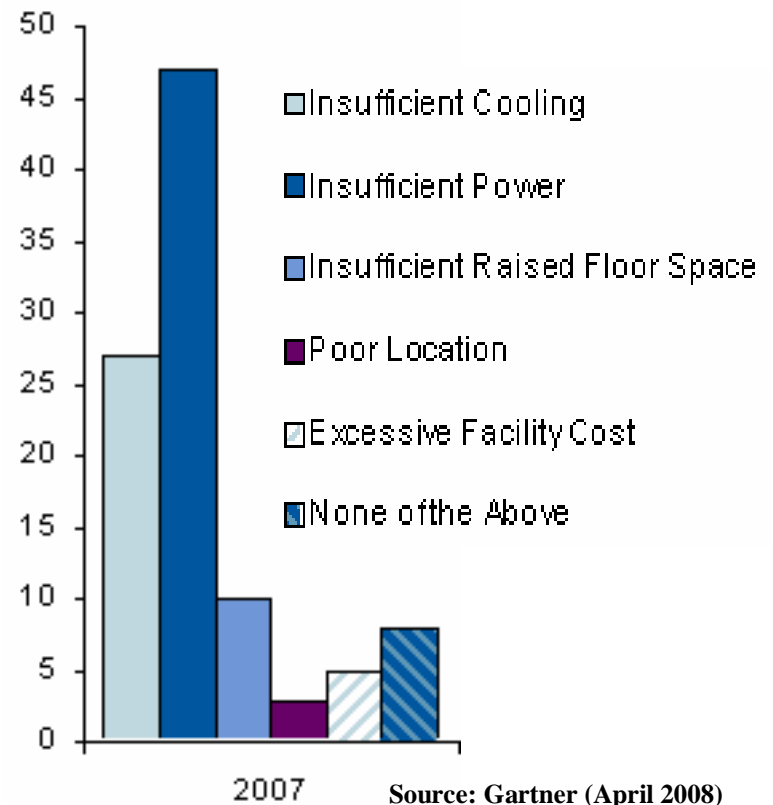
- Application on other OS platform requests cartridge mount on library with encryption policy “ON” for vol/ser range requested
- Library routes encryption key request to encryption key software
- Encryption key software provides key to the drive via the library and can be transparent to other OS server tape applications
- Application on other O/S begins write process
- Drive compresses data then encrypts data

TCO and Energy Costs

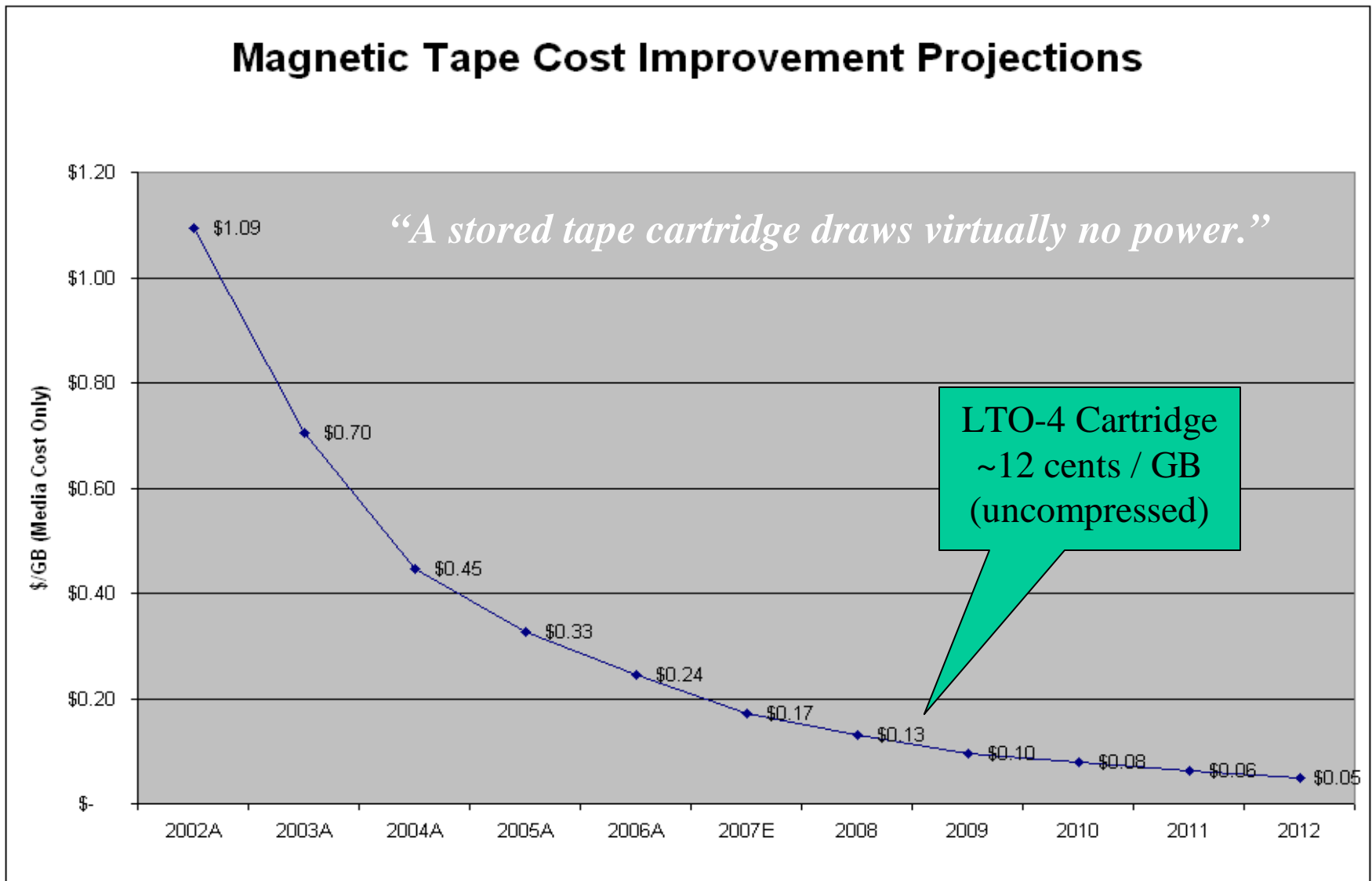
- Energy consumption must be controlled. Driven by:
 - Rising energy Costs
 - Regulations
 - Limits of data center designs
 - Energy scarcity
 - Societal pressures
 - Impact on the environment
- Long term storage costs must be optimized
 - Categorize (backup, archive)
 - Use the most cost effective storage to meet a variety of SLAs

What Is the Greatest Facility Problem With Your Primary Data Center?

Percentage of Respondents



Tape cartridge price/GB history

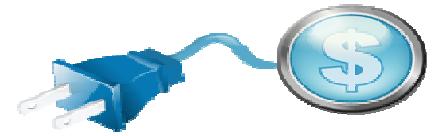


Source: Estimates from Industry Market Research & Imation

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Disk and Tape TCO Archive Study



- **Scenario**

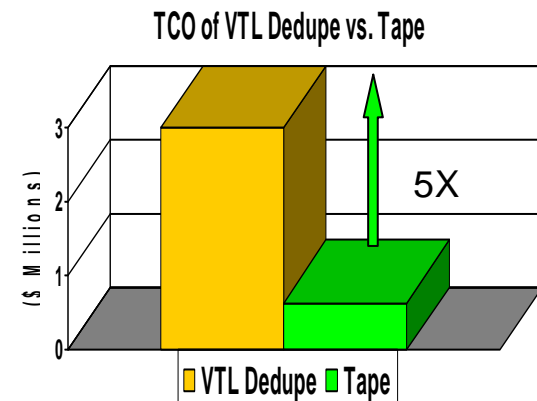
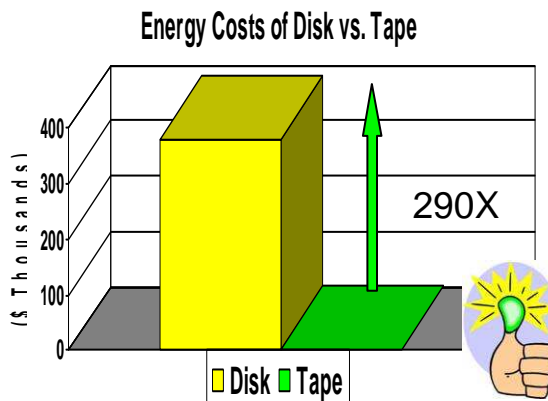
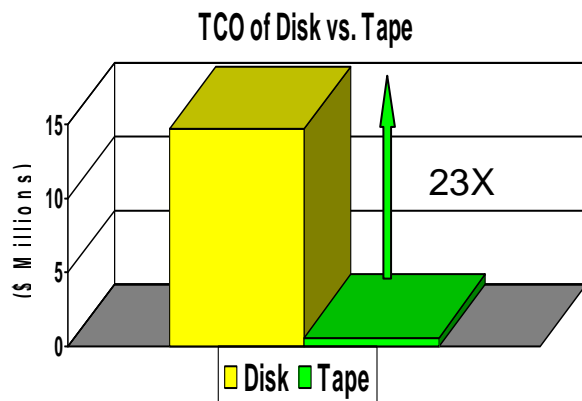
- 5 year TCO to store 2.4 PB of archive data
- Including hardware, energy, and space costs
- SATA disk system versus LTO-4 tape library

- **Findings**

- Cost Ratio to archive data on Disk vs Tape is 23:1*
- Energy costs of disk was 290 times more than tape
- VTL with 20X data de-dupe is about 5X more costly than tape

The Cost Ratio for a Terabyte Stored Long-Term on SATA Disk versus LTO-4 Tape is about **23:1**

For energy cost, it is about **290:1**



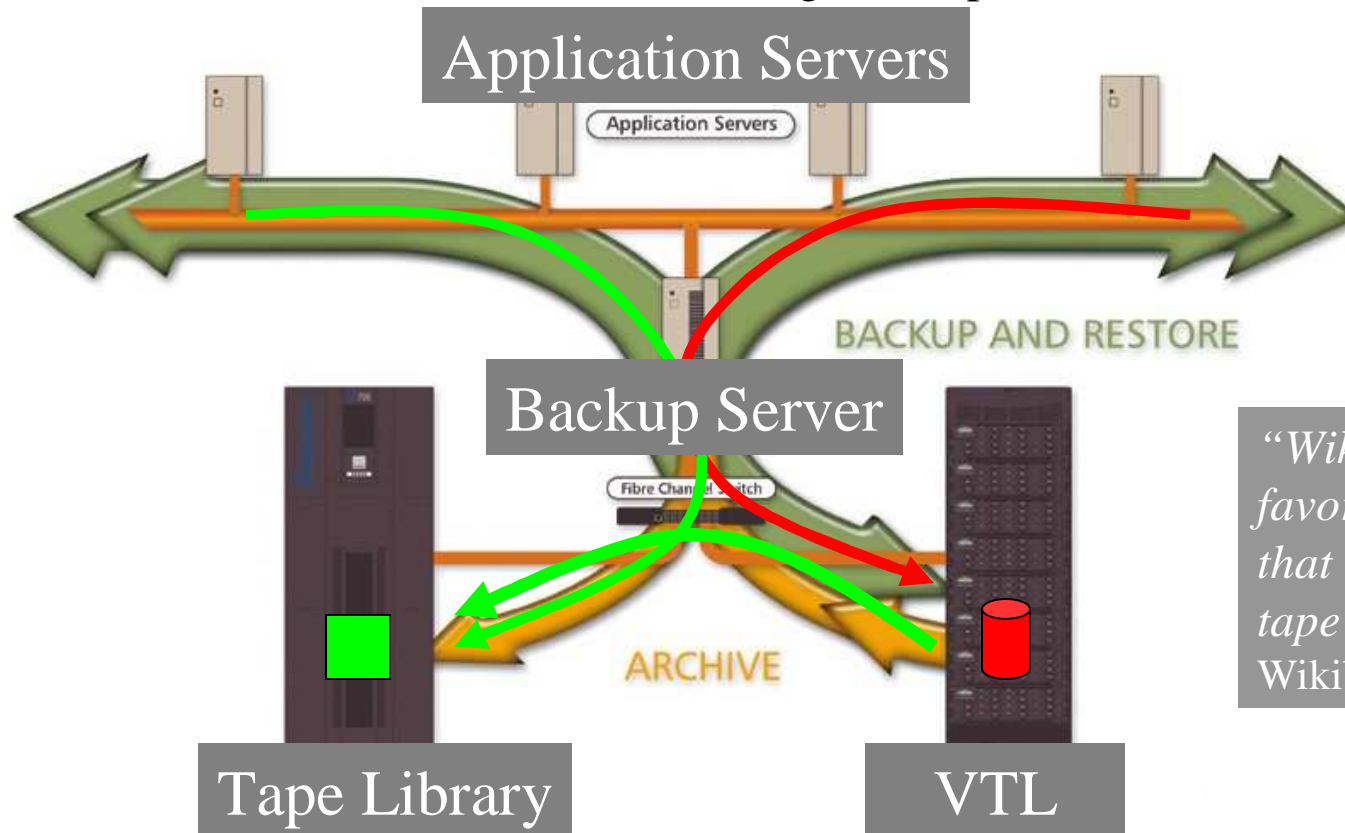
"Tape continues to provide the fiscal responsibility and functional value that enterprises require in the twenty-first century." The Clipper Group

*Source: The Clipper Group, "Disk and Tape Square Off Again" Report #TCG2008009LI, Feb 2008



Tape and Disk are Complementary for Optimal Performance, Archive, Data Protection and TCO

Blended Tiered Storage Example



“Wikibon community favors hybrid solutions that combine disk with tape” Bert Latamore, Wikibon, Sept. 6, 2007

Storage Manager Survey Results*

- 68% of current disk-only users plan to start using tape for long-term archiving
- 58% of current disk-only users plan to start using tape for short-term storage

*Source: Fleishman-Hillard Research Nov. 2007

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Backup and Archive Best Practices



- **Protect Data**
 - **Have multiple degrees of protection**: at least 3 copies of data in different locations and one out of region for DR*
 - **Have technology diversification**: copies on different forms of media to avoid a media or system process disaster*
 - **Have I/O isolation**: at least one copy offline to avoid intentional / unintentional corruption*
 - **Protect access to data** at rest and in transit
- **Manage active data, active archive and fixed archive data**
 - **Consider disk** for select backups to meet SLA performance goals
 - Send low demand active archive or fixed-deep archive data **directly to tape**
 - When disk fills, **move retention archive data to tape**
 - **Consider data de-duplication** to reduce disk storage requirements
- **Control TCO and energy consumption**
 - Employ server, controller and storage **energy saving strategies**
 - Move archive data to **lower energy consuming** storage

*Source: David Hill, Mesabi Group

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Large Carrier Express Line Survives Hurricane



•Problem

- Hurricane Gastone flooded Data Center with 5 ft. of water
- Total loss of hardware, networks, phone systems, generator, utility power
- Good news: *We had a tape backup of 100% of our data made night before - off site!*

•Objective

- Protect assets and business resilience with comprehensive strategy
- Control TCO with tiered storage strategy

•Solution

- Create flash copy for fast retrieval and window-less backup to tape
- Backup 100% production data to LTO-4 tape and library
- Global Mirror DR site

•Benefits

- No production System interruption
- No save window-Set it & forget it
- No production cycles, no operators, lights out operations
- Multiple tiers of protection
- Out of region protection

"You are out of your mind if you think you can live without tape."

Dick Cosby, Systems Administrator

Note: Do not contact customer directly. Individual user results may vary.

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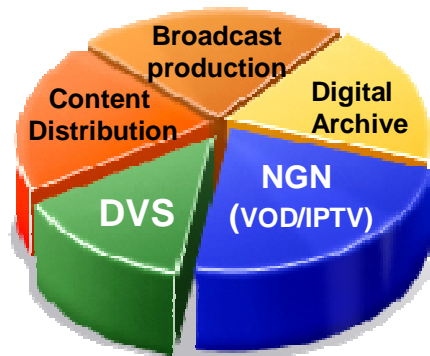
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Digital Video Storage Becomes a Must for Media Industry

Clients Require:

- Cost effective and efficient ways to capture and store digital content
- Repurpose the content and make it available for both traditional and new distribution outlets



For:

- Digital Video Surveillance (DVS)
- Broadcast Production
- Content Distribution
- Digital Archive
- NGN (Next Generation Networks)

Law Enforcement:

- European city government stores video evidence from city park cameras to LTO tape
- Large U.S. city PD stores squad car live action video surveillance to LTO tape library

Video Archive:

- Major Asian broadcaster stores video to LTO archive to save cost and maintain longevity
- Large US entertainment news show stores video content to LTO tape library

Fox Goes Digital with LTO Technology

Improves Video Storage and Reduces Costs



•Problem

- Production costs are rising
- Analog storage is aging and difficult to access
- High definition puts more demands on infrastructure

•Objective

- Lower production costs especially analog tape
- Improve archive / retrieval process
- Improve the quality of output for audiences

•Solution

- LTO Tape Library and drives, Linux servers
- Data base manager and backup manager

•Benefits

- Significantly lower production costs for HD broadcasts
- HD broadcast content is now available on demand
- Better viewing experience for the audience
- Faster access to stored video and a longer shelf life



Note: Do not contact customer directly. Individual user results may vary.

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Will be speaking in this room next!

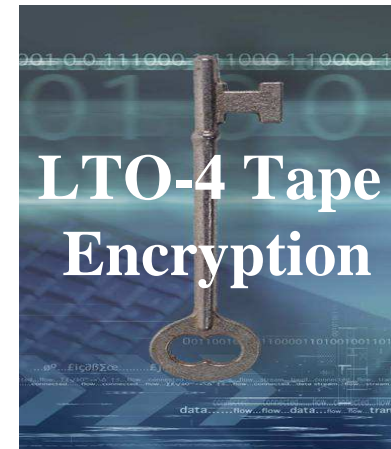
Providence Health & Services



Securing Data With Tape Encryption – A User Experience

Mack Kigada

Data Storage Engineer



Storage in the Information Infrastructure

- Manage data availability, performance, data protection and TCO with blended tiered storage of disk and tape
- Manage data security in transit with tape drive encryption
- Manage long term data retention, archive and compliance with tape due to tapes:
 - Attractive TCO
 - Low energy consumption
 - Long shelf life
 - High reliability
 - Removal from the system and portability
 - WORM capability



Thank You!

LTO Ultrium Technology

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energy consumption
and protect data!*

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Nintendo Wii Game Console and Game!*



Question and Answer Session

