



Data Protection in 2006 – A look into strategy, technology and design



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Agenda

- Introduction
- Backup philosophy & ILM
- Enabling technologies
 - Disk, tape, optical
 - Tape library technology
 - Storage Networking
- Legal compliance
- Putting it all together in an Enterprise Solution

Backup Philosophy

- zero downtime
- multi-level backup
- restore
- life cycle data management
- snapshots, clones & mirrors
- security



Backup in 2006

Enabling Technologies



Disk drive technology in the future

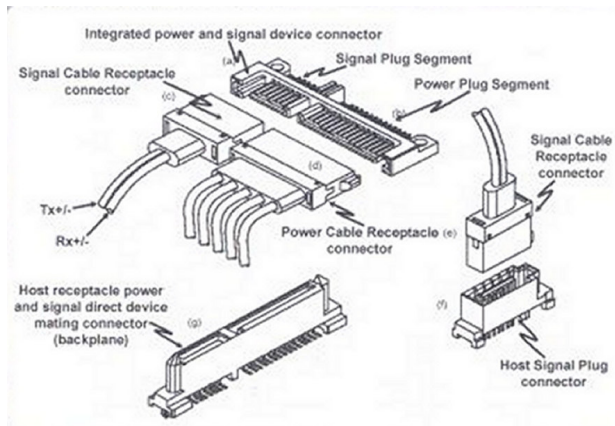
- magnetic disk recording densities have been growing 60% per annum
- densities will approach the Superparamagnetic limit where magnetic signals on the media become unstable (this is currently estimated at 40G bits per in²)
- Using perpendicular recording techniques and advanced media 3.5" disks of around 1000GB will be available in 2006
- Advanced technologies such as near field and crescent recording will take disk storage beyond these limits by an order of magnitude

Disk interfaces - Serial ATA

- Serial Attach ATA
 - uses 4-wire low voltage differential connection to achieve data transfer rates of 150MB/s (gen. 1)
- Ideally suited for low cost disk arrays (parallel ATA was not!) - point-to-point connection
- 3 generation roadmap (gen1 -150MB/s, gen2 300MB/s, gen 3 600MB/s)

able for 'hot-plug' environment

- can be used with Serial Attach SCSI



Disk interfaces - Serial Attach SCSI (SAS)



- Parallel SCSI is limited to Ultra 320 speed due to signal 'jitter' (max. 160MB/s)
- developed as a logical extension of the existing SCSI standards
- serial full duplex 4 wire connection
- roadmap of 1.5Gbps, 3Gbps ,6Gbps (3Gbps available by 2006)
- enables dual port 3.5 inch form factor disk drives
- software compatible with Parallel SCSI
- point to point connection but with port 'expanders' available to increase the number of connections
- allows 6m compact cable length at 3GBps

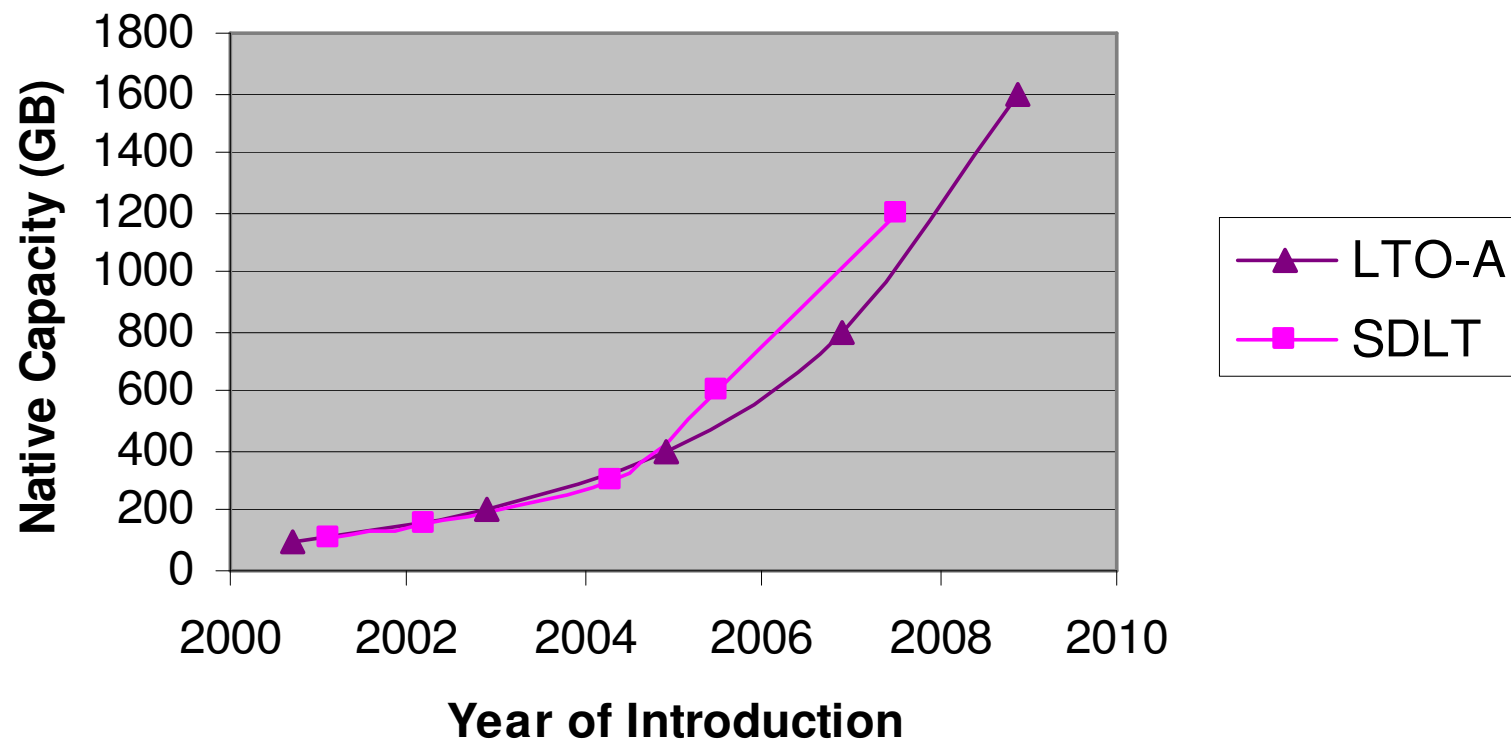
Magnetic Tape



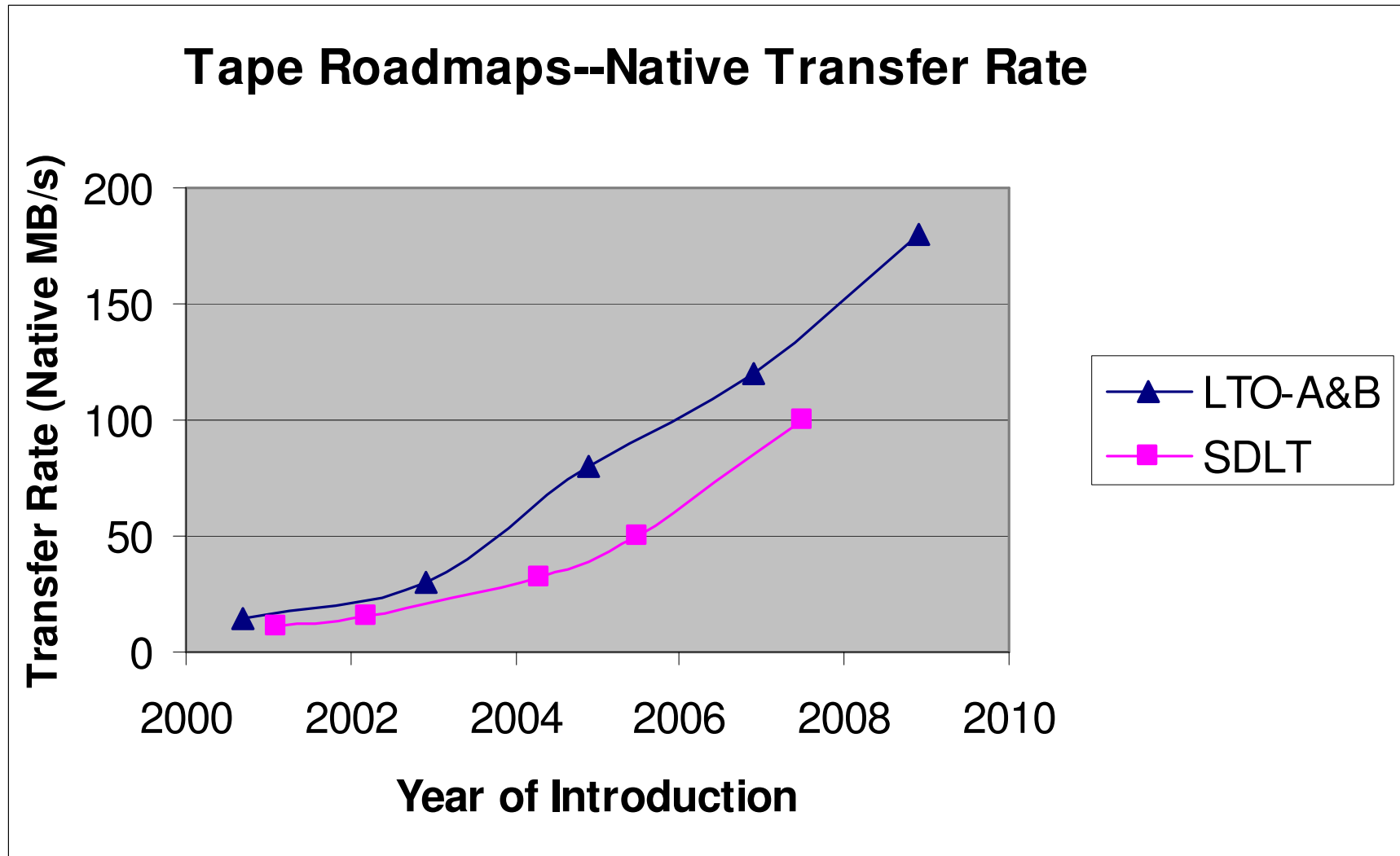
Is there a future for tape?

Ultrium vs SDLT

Tape Roadmaps--Native Capacity



Ultrium vs. SDLT



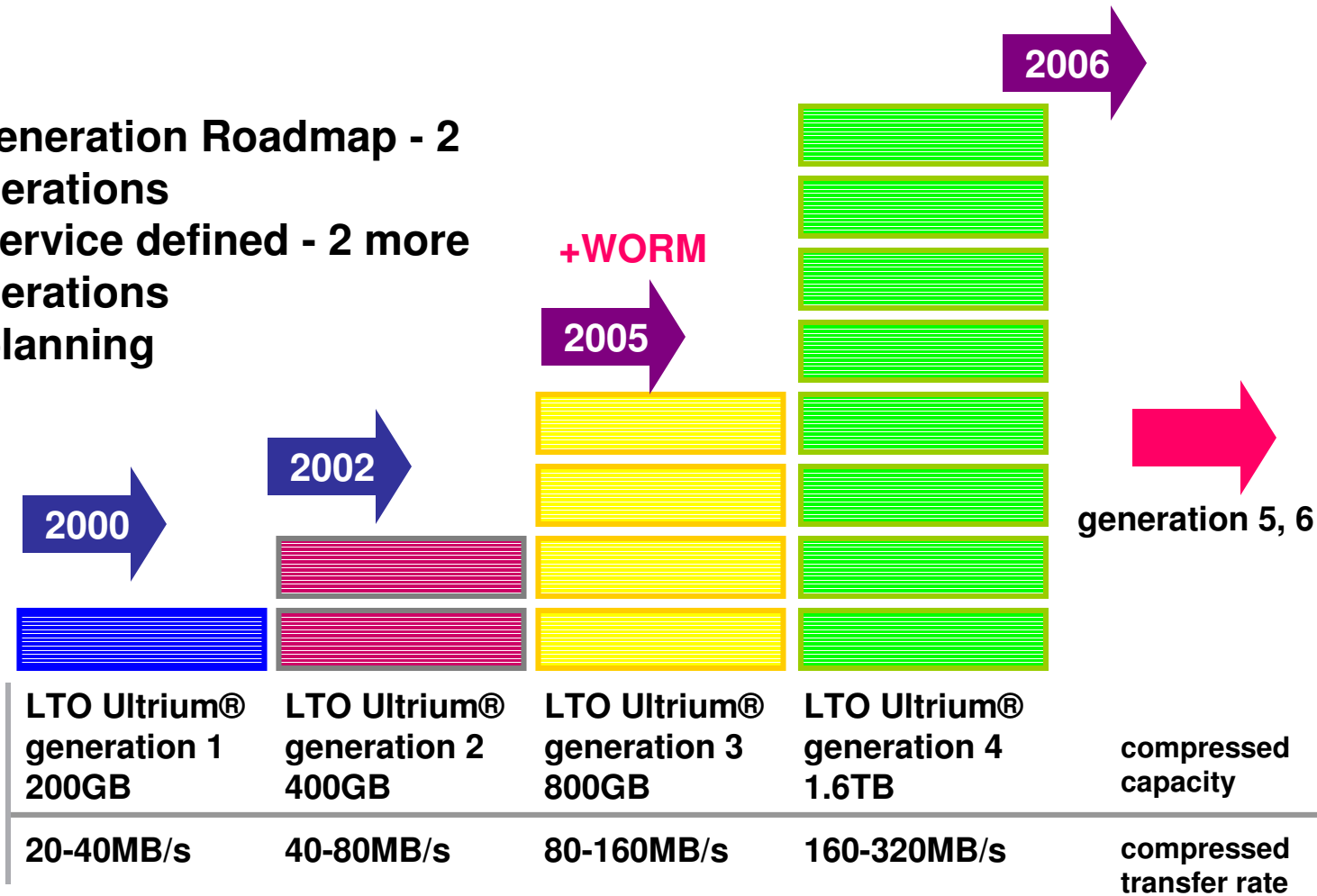
Tape and Optical technology in 2006

- Generation 3 Ultrium tape (with WORM capability)
- Generation 6 DDS
- Generation 3 SDLT tape
- T-series STK
- Super AIT



Linear Tape Open - the way ahead!

4 Generation Roadmap - 2 generations in service defined - 2 more generations in planning

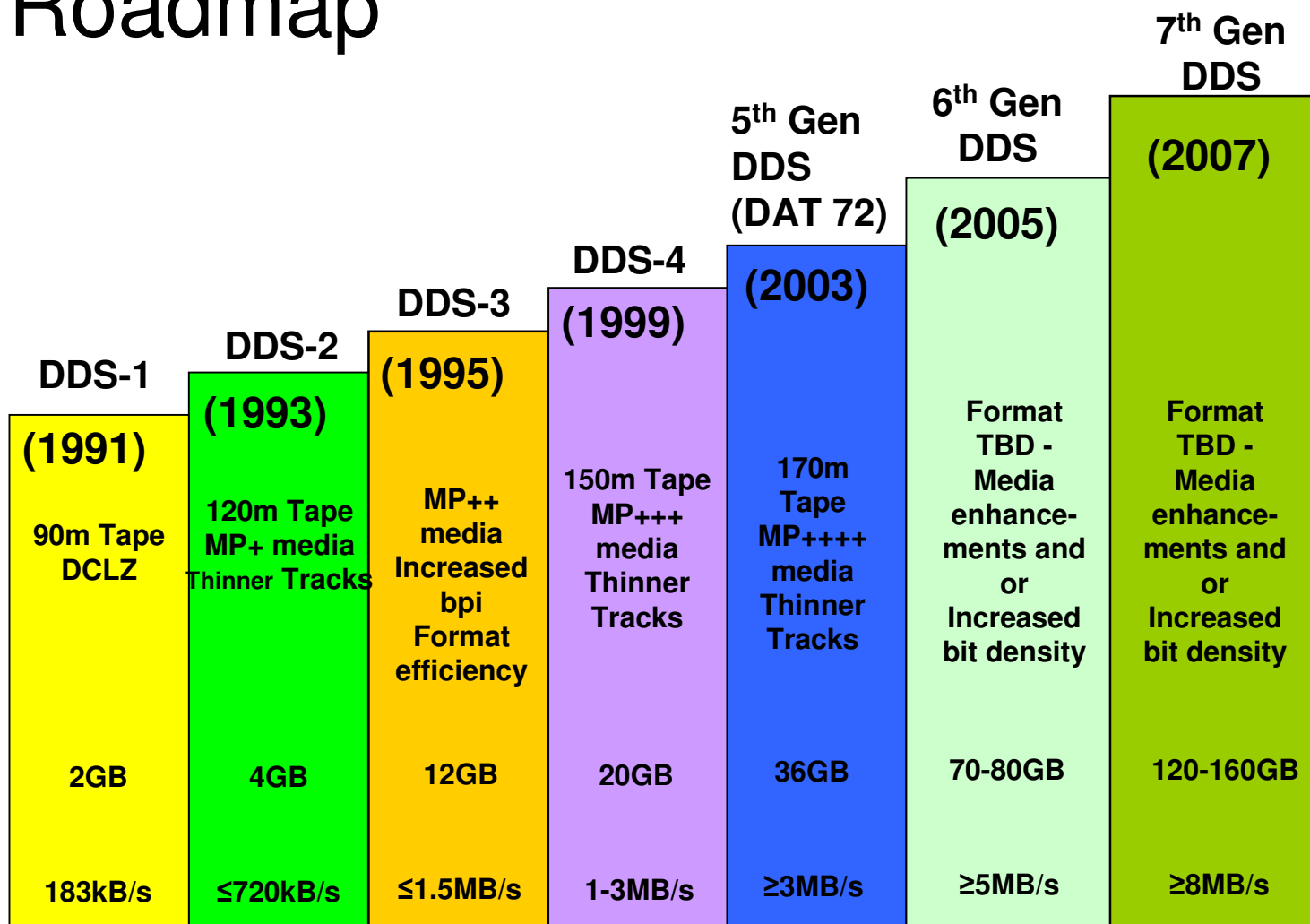


DDS Roadmap

Enabling
Technologies

Native
Capacity

Native
Transfer Rate



Tape Media

- Terabyte per tape is a reality - developments in Nano-particle technology remove the traditional barriers of coercivity/magnetization. Enable thinner magnetic coatings and therefore thinner longer tapes.

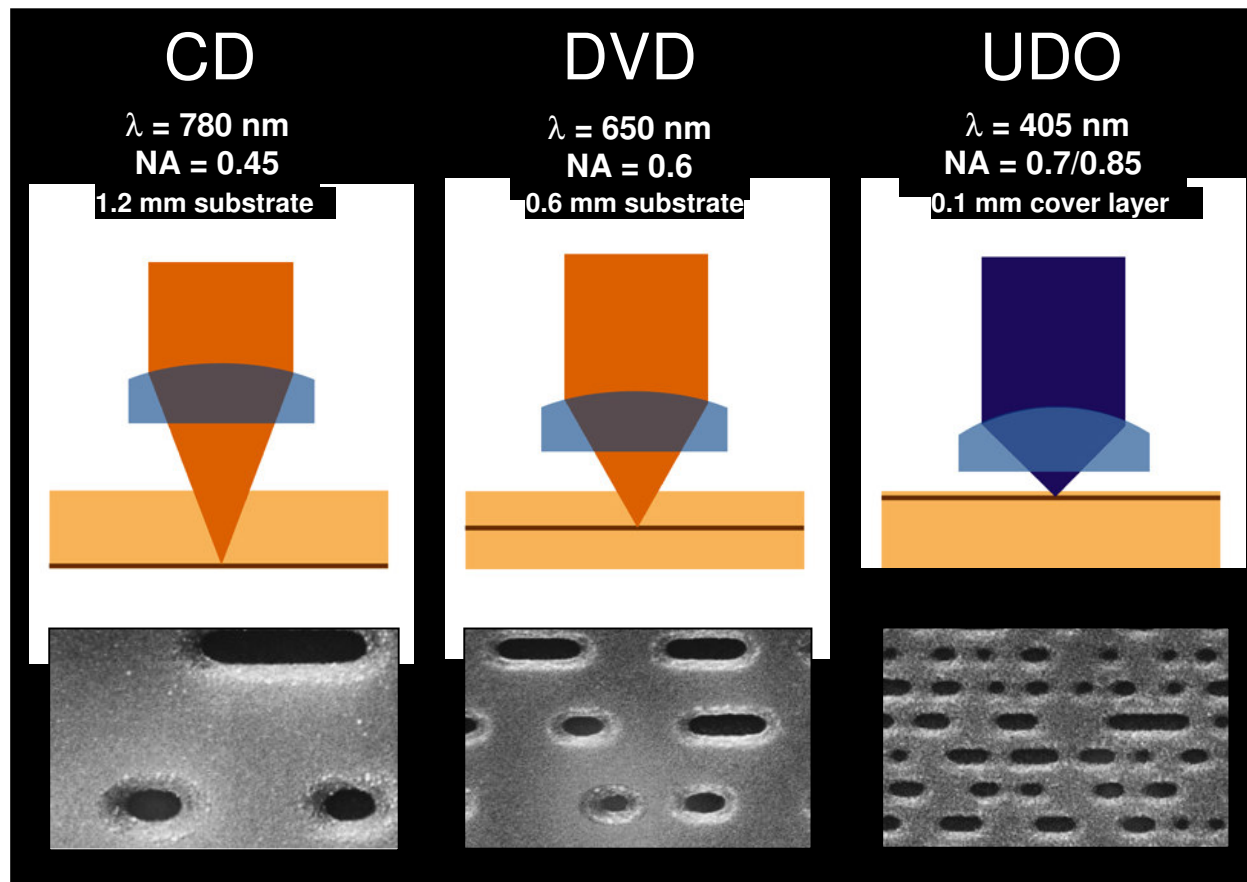




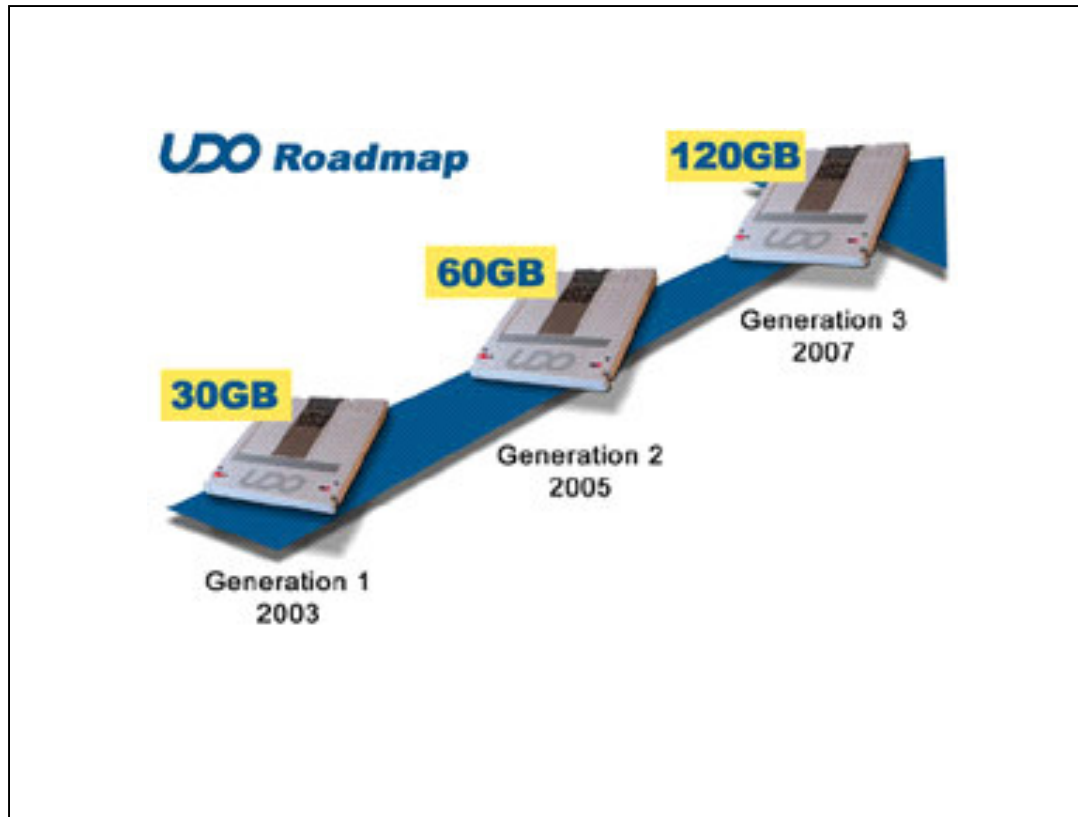
Optical Storage



Optical Storage Technology Evolution



UDO Optical roadmap



Tape Library technology for 2006

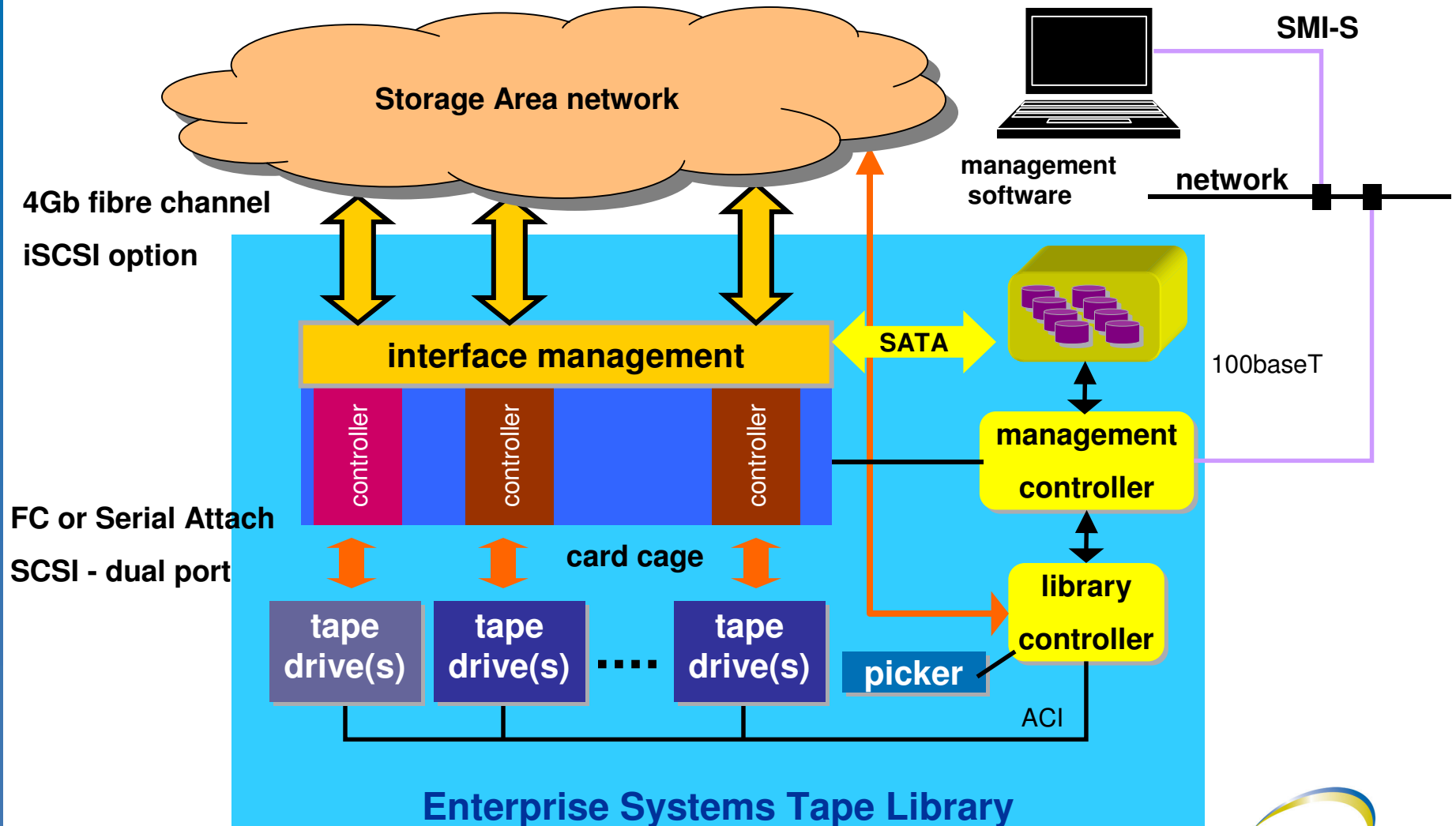


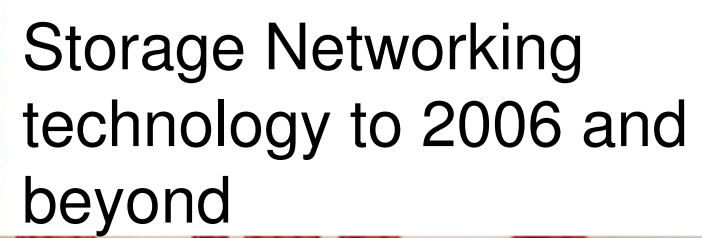
Tape Library technology towards 2006



- SAS & 4Gbps Fibre Channel
- Intelligent controllers
- Advanced management
- Disk to disk to tape
- SATA low cost disk array built in
- SMI-S standard implemented
- Modular and scaleable hardware

Future Library Architecture concepts





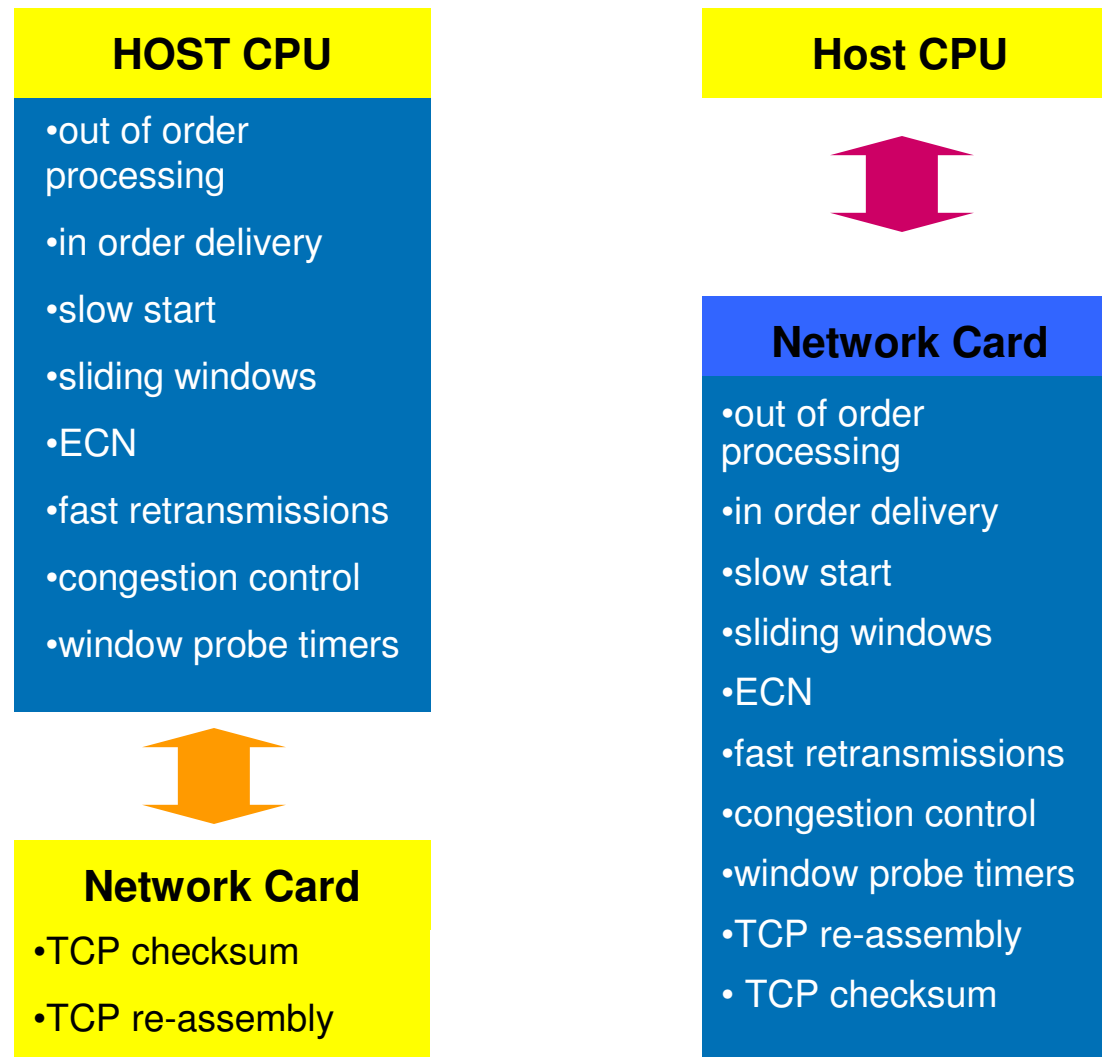
Fibre channel future directions

- 10 Giga bit
- 4 Giga bit
- DWDM (now)
- CWDM (now - lower cost)
- Metro - area fibre (more cities)

Gigabit Ethernet & beyond

- IEEE 802.3ae defines 10Gbps ethernet
- less expensive technology than SONET for metropolitan area networks and wide area networks
- 10Gbps ethernet is a fat enough data pipe for Enterprise storage products
- competes with ATM for WAN
- TCP/IP offload essential for good performance

TCP/IP offload engine [TOE]



iSCSI vs Fibre Channel

- iSCSI
 - price performance
 - common network components
 - lower cost Metro-area connections (gigabit-E infrastructure)
- Fibre Channel
 - mature technology
 - 4 and 10Gbps soon
 - complete solution
 - greater data security



Legal compliance

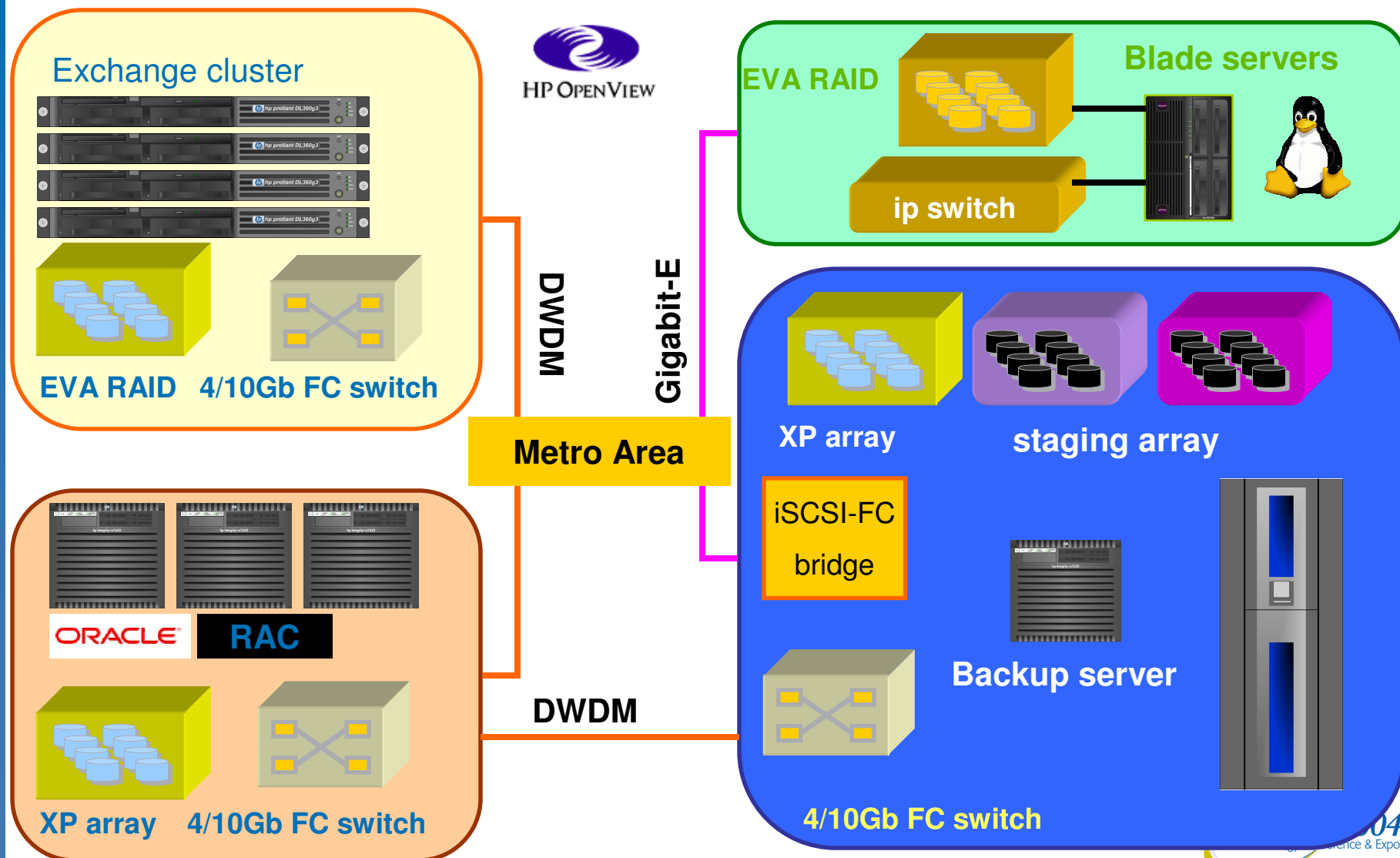
Legal requirements now & future

- USA mandatory
 - SEC17a
 - NASD 3010
 - US Food & Drug CFR part 11
- European Union
 - EU regulations still under development but companies and organisations are still liable to individual country legal requirements (eg United Kingdom - Data protection Act)

Putting it all together



Enterprise backup 2006





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