

# Protecting the World's Data - Quantum DLTtape

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**Quantum**

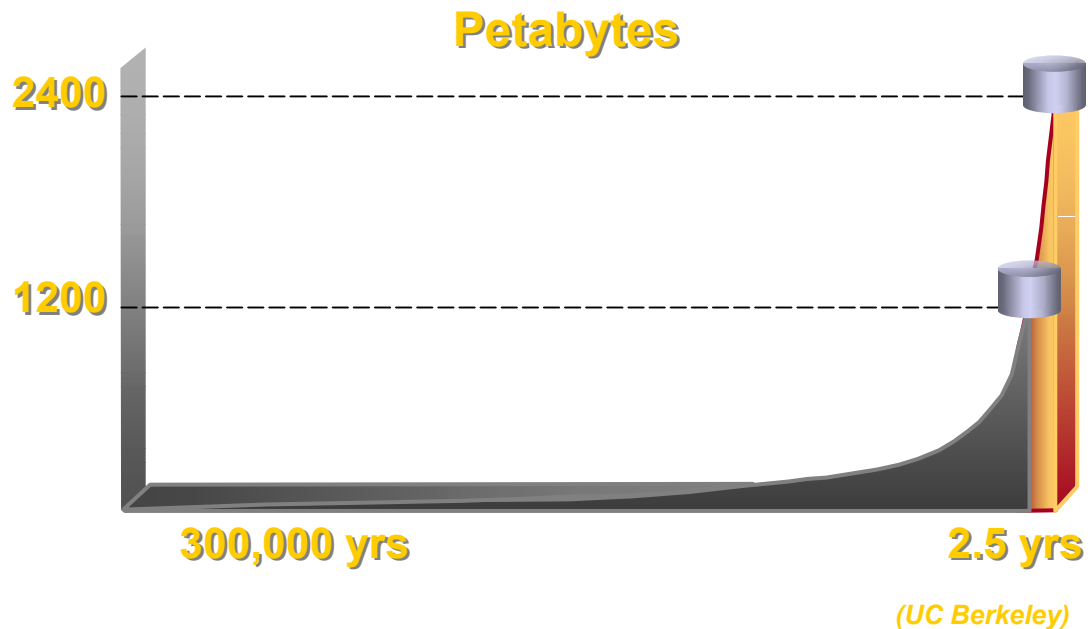
# Agenda

- Market Forces
- DLT Technology Enablers
- DLT Roadmap
- Summary

# Market Forces

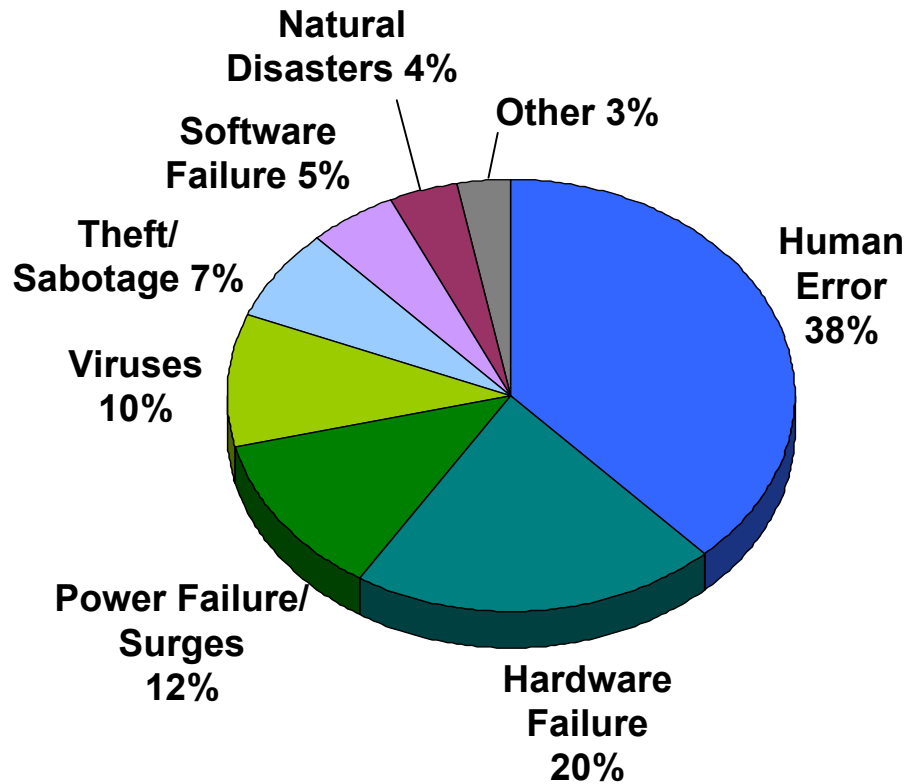
- **Demanding pace of storage growth**

- Corporate data is increasing 60% to 100% per year
- More data will be created in the next 2.5 years than in all of previous recorded history UC Berkeley



# Market Forces

- Intense focus on reliable data protection



Source: Quantum analysis

# Quantum.



Key Technology  
Enablers



# SDLT 320 Key Technology Enablers

- Pivoting Optical Servo (POS)
  - Precise tracking enables high capacity through high track densities and more efficient use of media
- Magneto-Resistive Cluster Heads (MRC)
  - Enables maximum position accuracy for higher transfer rates and capacities
- Advanced Metal Particle Media
  - Enables higher storage density
- Partial Response Maximum Likelihood (PRML)
  - Enables higher capacity and performance
- Positive Engagement Leader Buckle
  - Increases cartridge life & supports heavy duty-cycle environments
- Advanced Media Cartridge
  - Increases reliability and durability

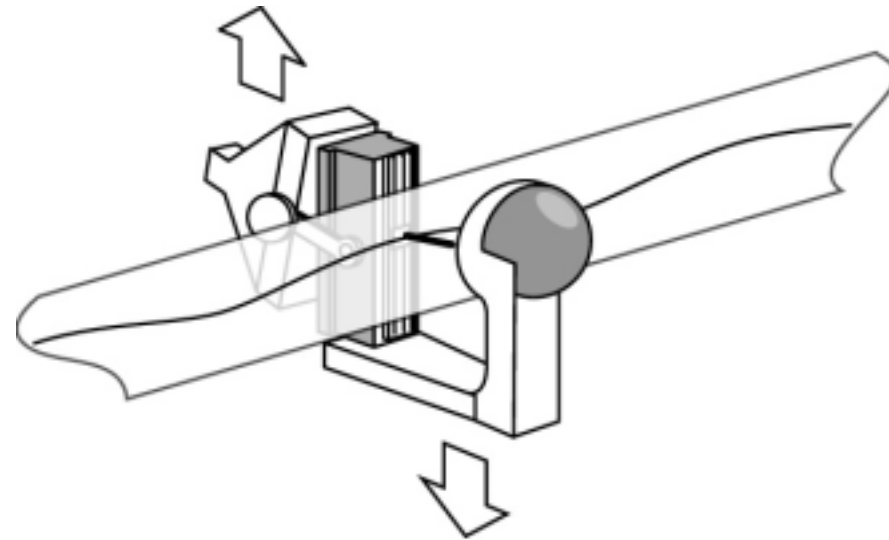
# Pivoting Optical Servo (POS)

## What is it?

- POS is an optically assisted servo system. It combines high-density magnetic read/write data recording with proven CD optical laser servo guiding technology
- POS implements an optical servo on the unused back side of the media

## Customer Benefit

- Higher capacities through very high track densities.
- Growth path to 20,000 tracks per inch (TPI) density
  - SDLT 320 only utilizes 1058 TPI today
- Reduced data tracking errors



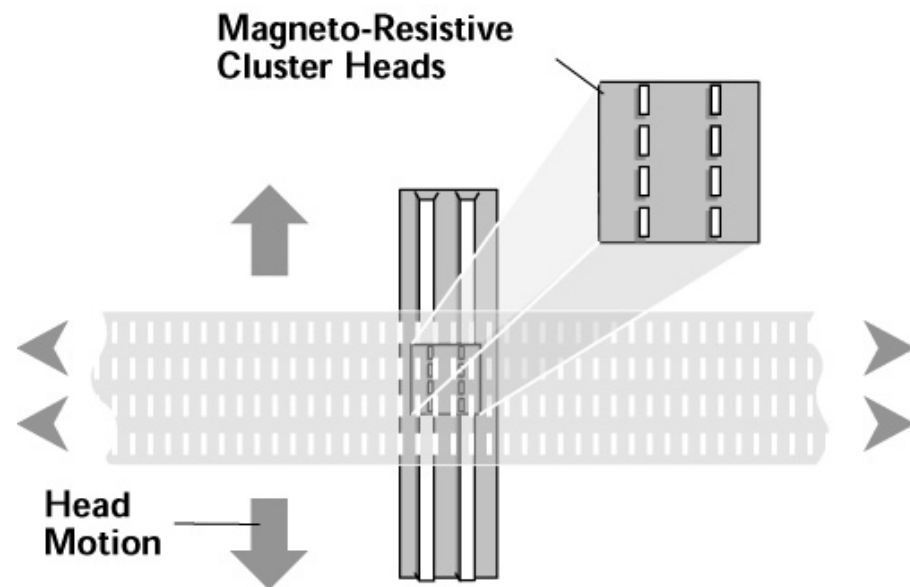
# Magneto-Resistive Cluster Heads (MRC)

## What is it?

- MRC is eight small magneto resistive heads packed together to form a cluster through thin film technology
- MRC heads are contoured to reduce contact with the tape recording surface.

## Customer Benefit

- Increased capacity and data transfer rates
- Increased reliability through decreased sensitivity to media and environmental variations
- Increased media life





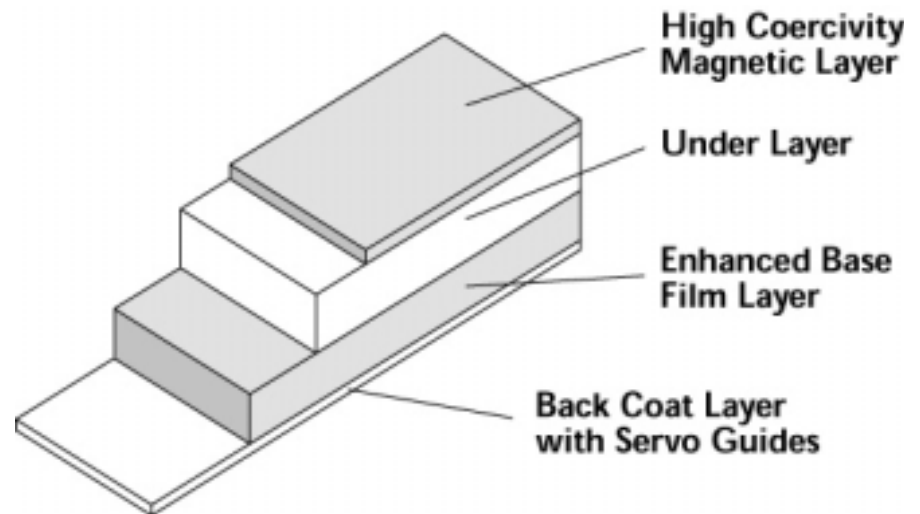
# Advanced Metal Particle Media (AMP)

## What is it?

- Durable multi-coated metal particle media technology
- Patented technology that will support multiple generations of Super DLTtape products

## Customer Benefit?

- Increased native storage capacity
- Multiple media suppliers



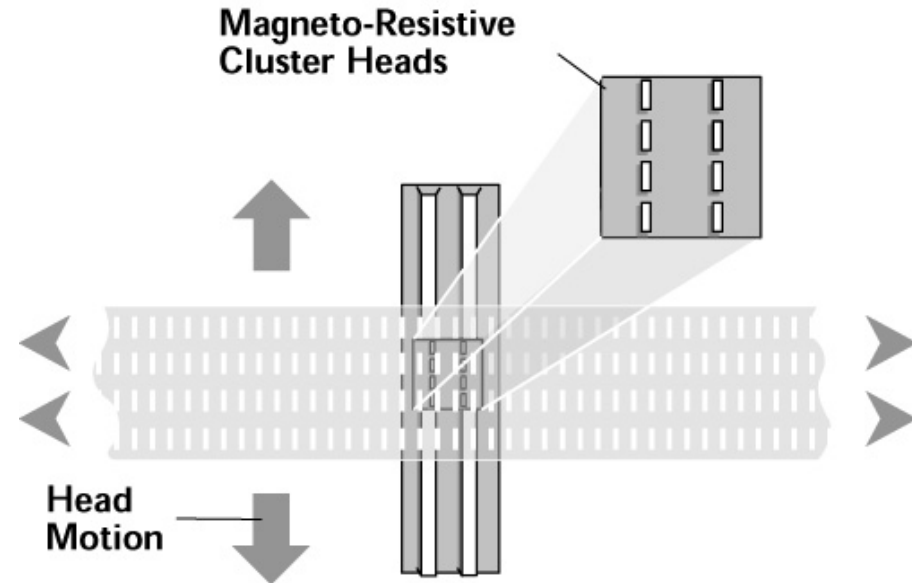
# High-Efficiency PRML Channel

## What is it?

- Partial Response Maximum Likelihood (PRML) is a technology for correctly interpreting small changes in analog signal and converting them to digital. It detects a greater number of bits per area, which improves the read error rate response
- The new PRML Channel used in the SDLT 320 was jointly developed with Lucent Technologies.
- It is 97 percent code efficient.

## Customer Benefit

- Increased capacity
- Higher data transfer rates
- Better reliability through decreased sensitivity to media and environmental variations



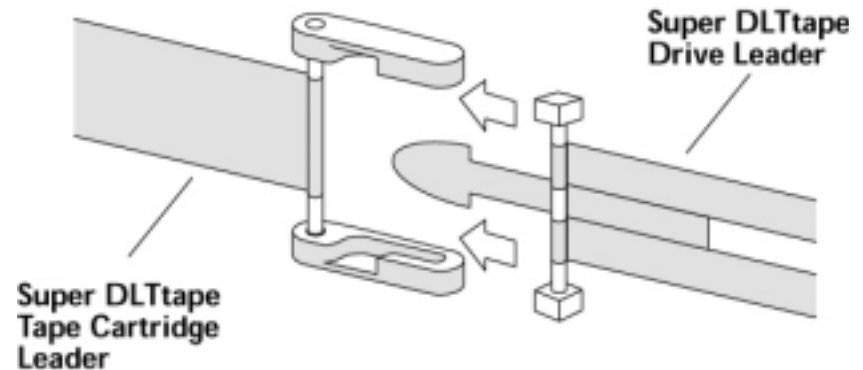
# Positive Engagement Leader Buckle

## What is it?

- A solid metal pin attached to the drive leader to link with molded clips attached to the cartridge tape leader
- This unique buckling mechanism engages the tape leaders at cartridge loads and unloads.
- It has been tested to withstand a million plus load / unloads

## Customer Benefit

- Increased cartridge life
- Increased reliability in heavy duty 24x7 automation environments
- Ensures compatibility with DLTtape IV cartridges.



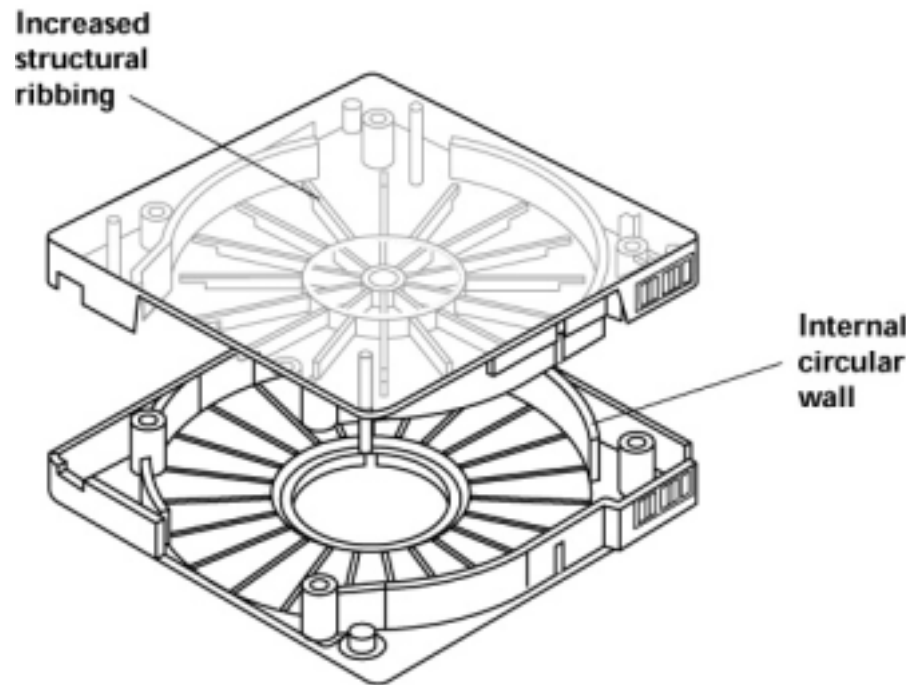
# Advanced Media Cartridge

## What is it?

- The Super DLTtape I cartridge is a new rugged design
- It features a thicker internal circular wall surrounding the media, more structural ribbing and is made with advanced wear-resistant materials

## Customer Benefit

- Increased durability and resiliency
- Reduced potential for debris generation
- Decreased cartridge damage from accidental drops



# Quantum.



## DLT Roadmap



# Market Segmentation

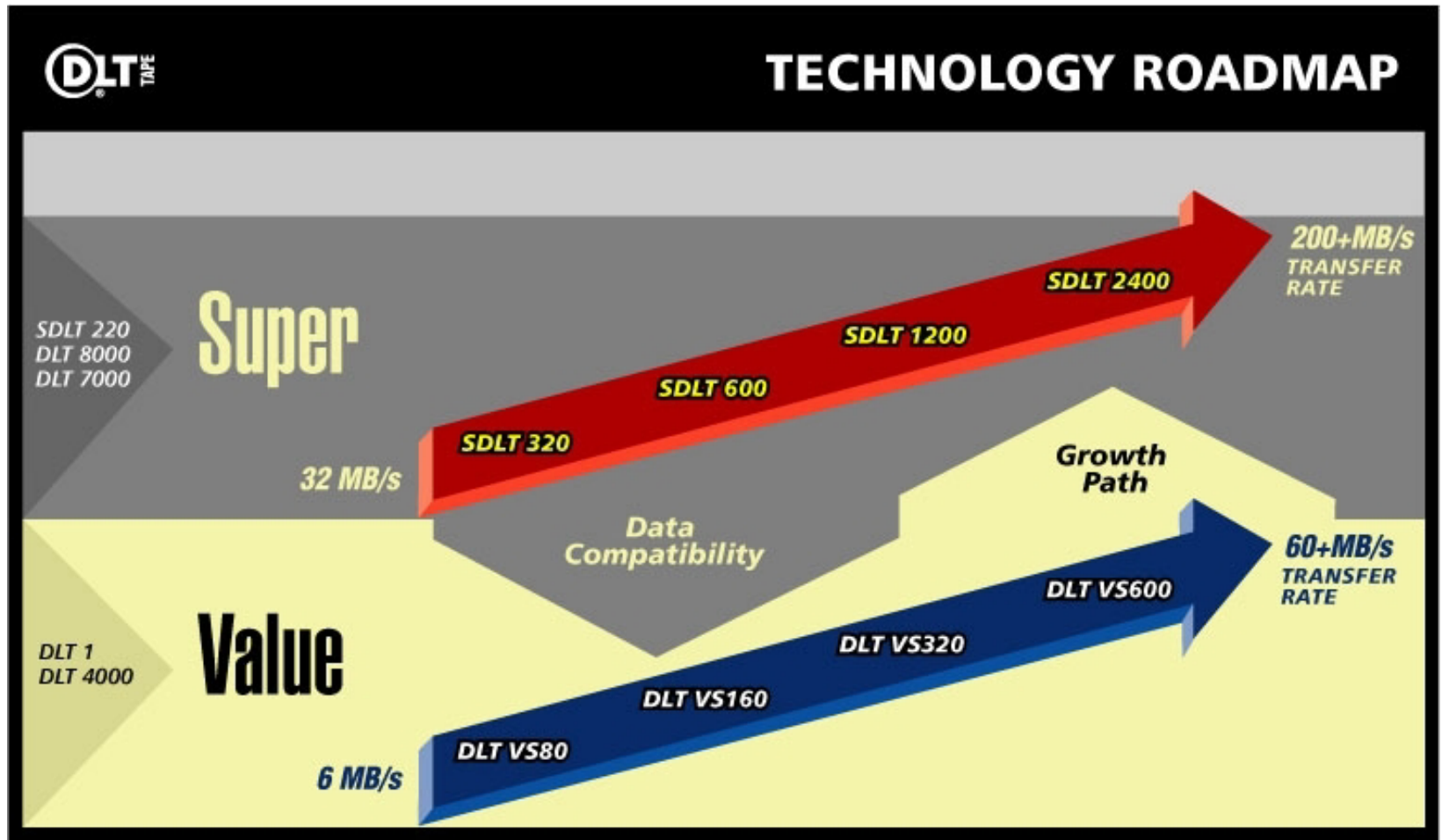
	<div style="text-align: center; padding: 10px;"> <p><b>DDS</b></p> <p>Low End Segment WW Units=1,100K</p> </div>	<div style="text-align: center; padding: 10px;"> <p><b>DLT VS</b></p> <p>Value Segment WW Units=500K</p> </div>	<p><b>SDLT</b></p>
			<p><b>LTO</b></p>
			<p>Super Segment WW Units=300K</p>
<b>Street Prices</b>	<ul style="list-style-type: none"> <li>• &lt;\$1000</li> </ul>	<ul style="list-style-type: none"> <li>• \$1000-\$3,000</li> </ul>	<ul style="list-style-type: none"> <li>• &gt;\$3,000</li> </ul>
<b>Segment Characteristics</b>	<ul style="list-style-type: none"> <li>• 1:1 Server to Tape Users (Standalone)</li> <li>• Price Sensitive</li> <li>• Media Price Sensitive</li> </ul>	<ul style="list-style-type: none"> <li>• Multiple Server Environments</li> <li>• Rack Servers Density</li> <li>• Entry Automation</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Computing/Automation</li> <li>• Mission Critical</li> <li>• Limited Back up Windows</li> <li>• SAN's</li> </ul>

Source: IDC 2002 & Quantum Segmentation

# What Makes a Winning Roadmap?

- Single Compatible technology to grow with customer needs
  - Not just interchangeable
- Comfort and Assurance
- Tailored Data Protection Solutions
  - Performance
  - Value
- Legacy Migration / Investment Protection

# Integrated DLTtape Roadmap





# Technology Levers:

These parameters will be used to take the product from 1<sup>st</sup> generation through 5<sup>th</sup> generation:

Technology Lever	Capacity Uplift	Transfer Rate Uplift
Track density	X3	
Number of Channels		x2
Media formulation	X2.2	X2.2
Recording code	x1.2	x1.2
Tape Length	x1.3	
Tape Speed		X2
Total	<b>x 10.3</b>	<b>x 10.6</b>

# Super DLT Family Technical Specs Summary

	<b>SDLT 320</b>	<b>SDLT 220</b>
Capacity (compressed/native)	320/160 GB	220/110 GB
Transfer Rate (compressed/native)	32/16 MB/sec	22/11 MB/sec
Cartridge Load Time (from BOT)	12 sec	12 sec
AVG. File Access Time	70 sec	70 sec
Interfaces	LVD Ultra2 SCSI, HVD Ultra SCSI	LVD Ultra2 SCSI, HVD Ultra SCSI
Encoding Method	PRML	PRML
Servo Method	Optical Servo	Optical Servo
Recording Format	448 track serial serpentine	448 track serial serpentine
Bit Density (Kbpi)	193	133
Track Density (tpi)	1058	1058
Data Compression Algorithm	DLZ	DLZ
Media	Super DLTtape Media I	Super DLTtape Media I
Media Durability	1,000,000 passes	1,000,000 passes
Backward Read/Write Compatibility	SDLT 220	-
Backward Read Compatibility	DLT 8000, DLT 7000, DLT 4000, DLT1/VS80	DLT 8000, DLT 7000, DLT 4000, DLT1/VS80
Bit Error Rate	< 1 in 10 <sup>17</sup> bit	< 1 in 10 <sup>17</sup> bit
MTBF	250,000 hours @ 100% duty cycle	250,000 hours @ 100% duty cycle
Warranty	3 year	3 year

Compressed Ratio = 2:1

# Enhancing the SDLT Platform

## *SLDT Added Functionality*

- A robust set of value-added diagnostic, analytical and predictive failure tools which anticipate and report drive and/or media wellness
- Provides library OEM's access to drive and media information
- Provides end users with relevant summary information to better manage their storage systems

# SDLT Roadmap Highlights

- Path to 2+ terabyte capacity on a single cartridge and transfer rate of 200+ MB/s (compressed)
- The Super DLTtape product line extends to the end of the decade across five generations
- This progressive roadmap enables you to meet your accelerating storage requirements
- SDLT will continue to deliver backward compatibility to the prior tape generation for each new product
- Developed by Quantum -- an industry leader in tape technology for more than a decade and committed to tape for years to come

# Summary

## DLTtape Continues to Lead the Market

- DLT Technology is trusted by 98% of Fortune 500 companies
- Nearly 2 million DLTtape drives in use and more than 90 million DLTtape media cartridges shipped to date
- Quantum has shipped more super drives than any other vendor
- SDLT continues to gain share in the Super drive category
- Quantum is the only vendor to supply products to 100% of the major system OEM's and automation vendors