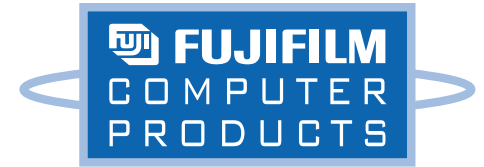


Fujifilm Computer Products

Tape Technology Seminar



WHERE THE FUTURE'S STORED.™

Why NEW High-End Tapes?

Mike McCorkle

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THIC Meeting at the Embassy Suites Hotel Denver South

Englewood CO 80112

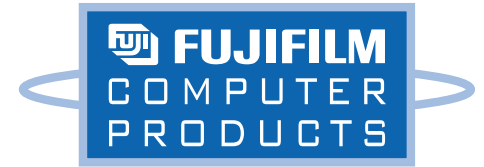
July 14, 1999

THIC Inc.

The Premier Advanced Recording Technology Forum

Fujifilm Computer Products

Tape Technology Seminar

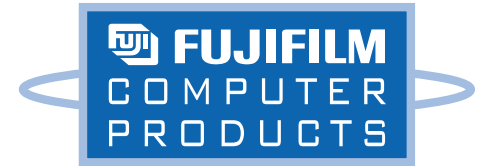


WHERE THE FUTURE'S STORED.™

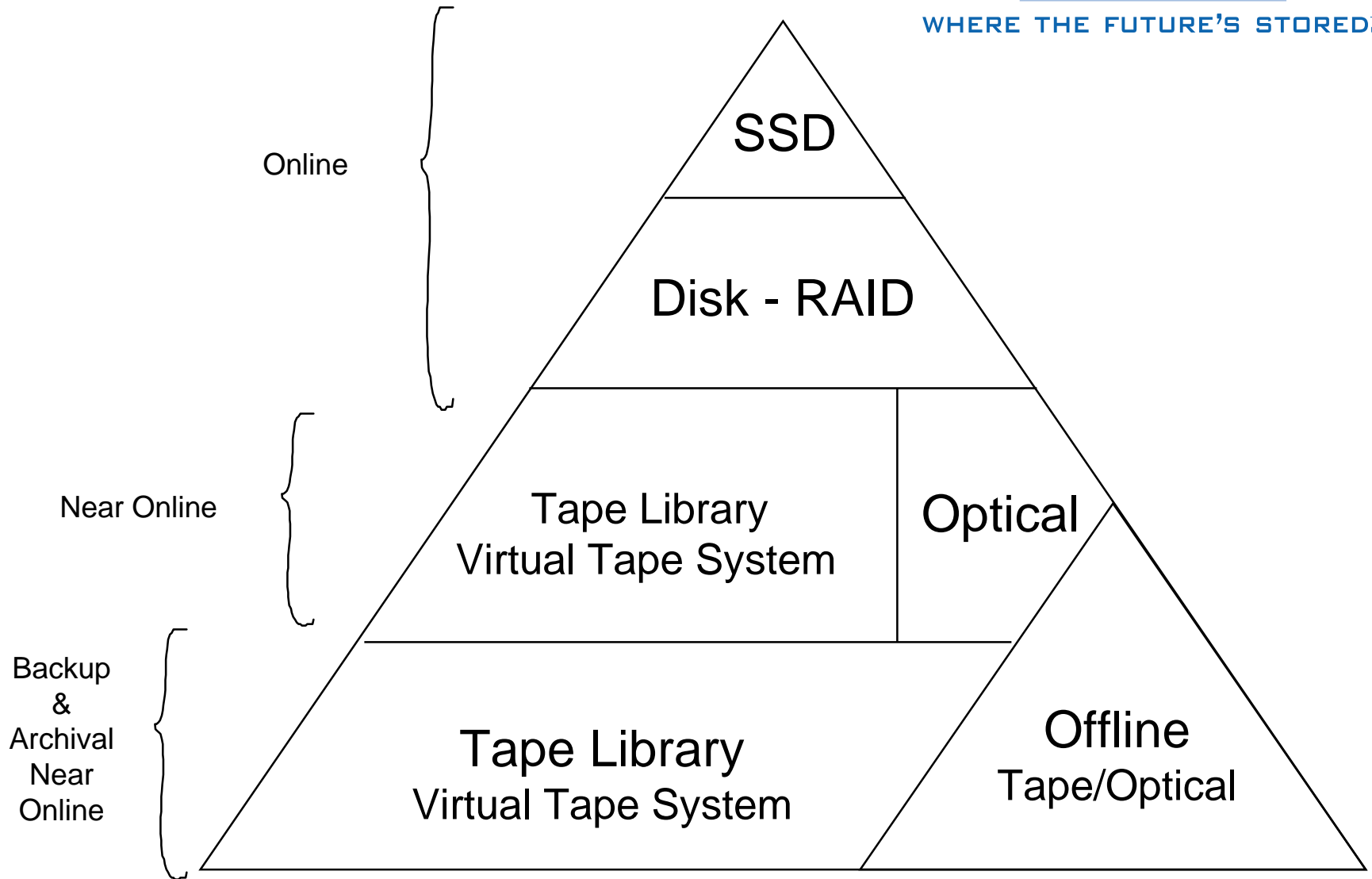
Why NEW High-End Tapes?

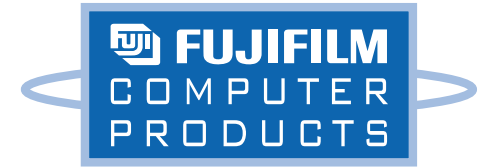
- Tape's Architecture
 - NAS & SAN
 - VTS, RAID & Primary Storage
- DDS4 & DLT8000
 - The Industry Standards
- Tape's Future
 - SuperDLT
 - LTO Ultrium
 - and more

New Architecture



WHERE THE FUTURE'S STORED.™





WHERE THE FUTURE'S STORED.™

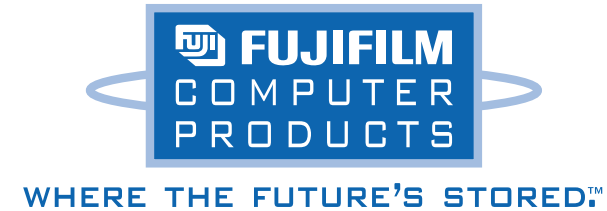
Tape's Future

Why New High-End Tapes?

- Primary Storage
- Near Online
- VTS

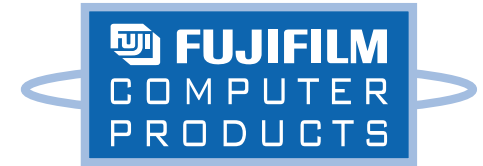
- **NAS & SAN**

Current Industry Standards 4mm & DLT



- 6 million 4 mm Drives
 - > DDS-1 Still Shipping
 - > DDS Family Still Growing
- 1 million DLT Drives
 - > Fastest Growing market Segment
 - > DLT8000 to be Shipping Soon

4mm DDS



WHERE THE FUTURE'S STORED.™

DDS4 Drives (Shipping 3Q 1999)

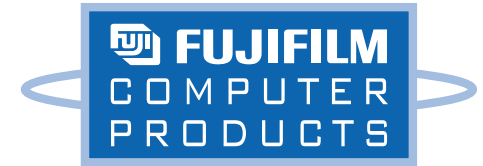
- 150 meter MP+ + + Media
- 20 GB Native Capacity
- 1 - 3 MB/sec. Data Rate

TAPE MEDIA	Fujifilm P/N	DDS Drives	DDS-2 Drives	DDS-3 Drives	DDS-4 Drives
DG-60M	26047060	1.3 GB	1.3 GB	1.3 GB	Note
DG-90M	26047190	2 GB	2 GB	2 GB	Note
DG-120M	26047120	N/A	4 GB	4 GB	4 GB
DG3-125M	26047300	N/A	N/A	12 GB	12 GB
DG4-150M	26047350	N/A	N/A	N/A	20 GB

Native Capacities Shown

Note: DDS-1 tape compatibility on DDS-4 drives varies with different drive manufacturers.

DLTtape



WHERE THE FUTURE'S STORED.™

DRIVES	MEDIA	CAPACITY (Native-Compressed)	PERFORMANCE (Native-Compressed)
DLT-600 - Tz85	DLTtape III – TK85	2.6 GB	0.8 MB/s
DLT-600 - Tz86	DLTtape III – TK85	6 GB	0.8 MB/s
DLT-2000 - Tz87	DLTtape III – TK85	10 GB – 20 GB	1.25 MB/s – 2.5 MB/s
DLT-2000XT -	DLTtape IIIXT –	15 GB – 30 GB	1.25 MB/s – 2.5 MB/s
DLT-4000 - Tz88	DLTtape IV – TK88	20 GB – 40 GB	1.5 MB/s – 3 MB/s
DLT-7000 - Tz89	DLTtape IV – TK88	35 GB – 70 GB	5 MB/s – 10 MB/s
DLT-8000	DLTtape IV – TK88	40 GB – 80 GB	6 MB/s – 12 MB/s

DLTtape Fujifilm P/N

III 26112085

IIIXT 26112092

IV 26112088

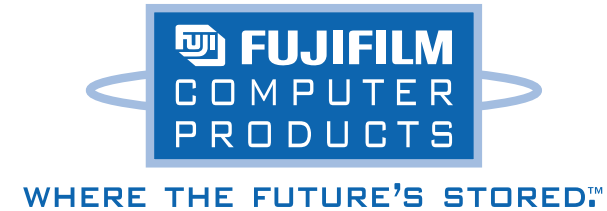
MEDIA DESCRIPTION

1200' Metal Particle Media (MP)

1828' Metal Particle Media (MP)

1828' ATOMM (Advance super Thin-layer and high-Output Metal Media)

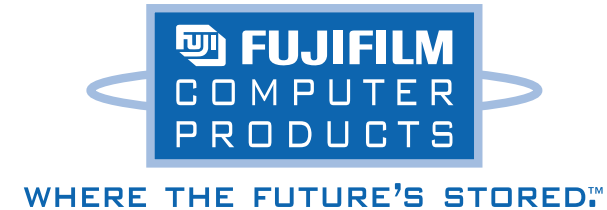
What New High-End Technologies?



New High-End 1/2" Tape Technologies

Two Future Product Families

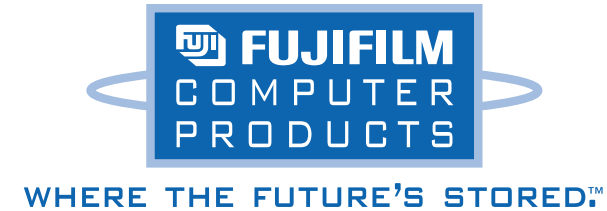
New Technologies: *SuperDLT*tape Technology



- **Quantum & Tandberg *SuperDLT***
- Enabled by Four New Technologies
 - Pivoting Optical Servo
 - [*Advanced Metal Powder Media \(AMP\)*](#)
 - Magneto Resistive Cluster Heads
 - Enhanced Partial Response Channel
- Product roadmap from 100 GB to 1000 GB
- Backward compatible with DLTtape IV formats

New Technologies

*SuperDLT*tape Technology

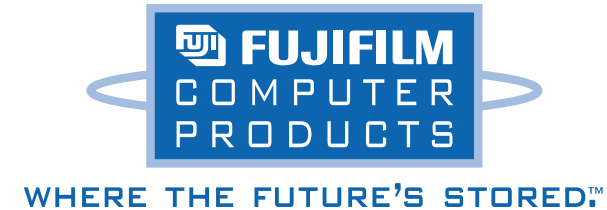


July 1999

- *Fujifilm announces it has signed a Development agreement with Quantum for S-DLTtape media.*
- **ATOMM Technology once again puts Fujifilm in a Leadership position in high-capacity data storage.**

New Technologies

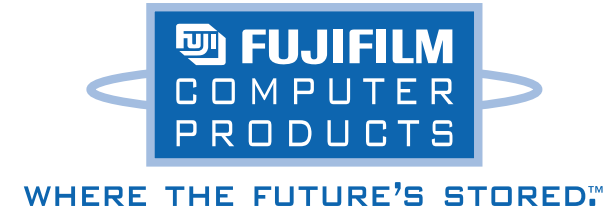
LTO (Linear Tape Open)



- **IBM / HP / Seagate**
- Two Products
 - Ultrium (single-reel; high capacity)
 - Accelis (dual-reel; fast access)
- Four-generation Roadmap
 - Ultrium from 100 GB to 800 GB
 - Accelis from 25 GB to 200 GB
- New (Pioneer) Formats

New Technologies

LTO (Linear Tape Open)

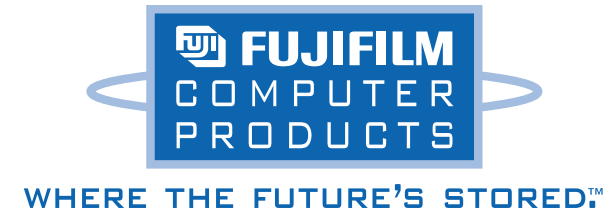


May 1999

- *Fujifilm announces it has taken out a license for Ultrium tape manufacturing.*
- **ATOMM Technology once again puts Fujifilm in a Leadership position in high-capacity data storage.**

Product Comparison*

SuperDLT & LTO Ultrium



	<u>Native Capacity</u>	<u>Native Data Rate</u>
<i>SuperDLT</i>	100 GB	10-20 MB/sec
LTO Ultrium	100 GB	10-20 MB/sec

* No products have been announced at this time - information based on technology announcements. Exact transfer rates not yet announced - proposed rates shown. The proposed roadmaps for future generation *SuperDLT* and LTO Ultrium drives have also been announced.

Today's Users Have a Choice of Many Different Tape Technologies

New Industry Offerings Continue to Expand User's Choices

**More and More Choices
in this Fast-Growing Marketplace**

Today's Users Have a Choice of Many Different Tape Technologies

High-Capacity Tape Technologies

<u>Tape</u>	<u>Media</u>	<u>Drive</u>	<u>Native Capacity</u>	<u>Native Data Rate</u>	<u>Drive Maker</u>
DD-2 L 19mm Helical	MP	DST-312	330 GB	15 MB/s	Ampex
SD-3 ½" Helical	MP	Redwood	50 GB	11 MB/s	StorageTek
AIT-2 8mm Helical	AME+	SDX-5000C	50 GB	6 MB/s	Sony
DTF-1 ½" Helical	MP	DTF-1	42 GB	12 MB/s	Sony
DLTtape IV ½" Linear	MP++	DLT-8000	40 GB	6 MB/s	Quantum, Tandberg
SLR50 ¼" Linear	MP	SLR50	25 GB	2 MB/s	Tandberg
Magstar-3590 ½" Linear	MP	3590-E	20 GB	14 MB/s	IBM
Mammoth-1 8mm Helical	AME	Mammoth (8900)	20 GB	3 MB/s	Exabyte
DDS4-150M 4mm Helical	MP+++	DDS-4	20 GB	~ 2.7 MB/s	Seagate, Sony, HP
NCTP ½" Linear	MP	NCTP	18 GB	10 MB/s	Plasmon LMS

New Industry Offerings Continue to Expand User's Choices

Next* Generation High-Capacity Tape Technologies

* Products expected to impact the market within the next one to twelve months.

<u>Tape</u>	<u>Media</u>	<u>Drive</u>	<u>Native Capacity</u>	<u>Native Data Rate</u>	<u>Drive Maker</u>
DTF-2 ½" Helical	MP	GY-4240	200 GB	24 MB/s	Sony
Super DLT ½" Linear	AMP	Super DLT-	100 GB	10 - ? MB/s	Quantum, Tandberg
LTO Ultrium ½" Linear	AMP	LTO Ultrium-	100 GB	10 - 20 MB/s	Fujitsu, IBM, Seagate, HP
Mammoth-2 8mm Helical	AME	Mammoth-2	60 GB	12 MB/s	Exabyte
SLR100 ¼" Linear	MP	SLR100	50 GB	5 MB/s	Tandberg
VXA* 8mm Helical	AME	VXA-1	45 GB	3 MB/s	Ecrix
Magstar 3590 [E] ½" Linear	MP	3590-E	40 GB	14 MB/s	IBM
ADR70** 8mm Linear	Co- Fe ₂ O ₃	ADR70	35 GB	2 MB/s	OnStream

* Ecrix currently shipping 33GB VXA

** OnStream currently shipping 25GB ADR

16 7/14/99

Today's Users Have a Choice of Many Different Tape Technologies

Fast-Access Tape Technologies

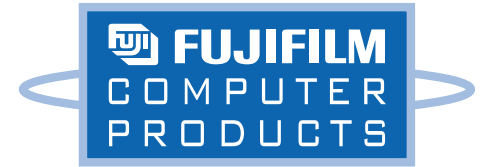
<u>Tape</u>	<u>Media</u>	<u>Drive</u>	<u>Native Capacity</u>	<u>Native Data Rate</u>	<u>Drive Maker</u>
Magstar-MP "C" 8mm Linear	MP	IBM 3570-C12	5 GB	7 MB/s	IBM
STK-9840 ½" Linear	MP	STK 9840	20 GB	10 MB/s	StorageTek

New Industry Offerings Continue to Expand User's Choices

Future Generation Fast-Access Tape Technologies

<u>Tape</u>	<u>Media</u>	<u>Drive</u>	<u>Native Capacity</u>	<u>Native Data Rate</u>	<u>Drive Maker</u>
LTO Accellis 8mm Linear	AMP	LTO Accellis-	25 GB	10-20 MB/s	IBM, HP, Seagate

New Architecture



WHERE THE FUTURE'S STORED.™

