Enterprise
Data Backup and Recovery

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Do you need a commercial backup utility?

Introduction

- Thirty flavors of UNIX, Novell, W95/NT, Mac, Oracle, Informix, Sybase, Ingres, DB2, L. Notes, SQL Server
- Size and complexity of data growing rapidly
- Misinformation or *no* information
- ***Many shops do not not know the danger that lies before them***

Agenda

- Defining the Enterprise
- Native Utilities - what’s wrong with them?
- Databases - why are they so hard?
- Available Hardware and Software
- Putting it all together - don’t forget anything

Essential Premise

No Data Should Ever Be Lost!!!

Overview

- Native Utilities -- old pitfalls still there
- Databases make things even harder
- Get a good backup system and learn it
- <u>*You probably need a commercial utility now*</u>
- How to choose a commercial backup utility

TEST YOUR BACKUPS

- *Please* Document them
- *Test* the documentation
- Test *your* disaster recovery plan
- Prove your *backups* do what you think
- Test them *again* in 6 months

Defining the New Enterprise

- New file systems (jfs,vxfs,dfs)
- Huge Databases -- RLTP, Warehouse
- 24x7 -- Web, Batch Processing
- Linux, BSDI, NT, Novell
- MVS?

Native UNIX Utilities

- “Free”
- Almost always require some scripting
- Not always compatible, even when you think they are
- No cataloging, automatic re-routing,
- All responsibility lies on your shoulders
- tar, cpio, dump

tar vs. cpio

- Usually compatible*
- Include list limited to filename expansion
- Changes atime*
- No remote devices*
- No wild-cards on restore
- No sparse files*

- Often incompatible*
- Unlimited include list, read from stdin
- Change atime or ctime
- No remote devices*
- Supports wild-cards on restore
- No sparse files

*Fixed in GNU versions

“dump”

- Index on front of tape allows interactive restore and FFS
- Does not change access times
- Works directly with device (faster)
- Available on ***most*** UNIX systems
- ***Highly dependent on the type of file system***
- File systems developing faster than dump
- Different names, options, features, format

Database backups

- A difficult, sometimes impossible, task
- DBA's don't know backup methodologies
- SA's don't know database structures and technologies
- Assumptions mean ***things get left out***

Oracle

- Instances, Tablespaces, Data files, Control Files, On-line and Archived Redologs, oratab
- “begin backup,” “end backup” and “backup control file”
- oraback.sh
- Enterprise Backup Utility (EBU)
- SQL Backtrack

Informix

- Servers, Dbspaces, Data files, Continuous backups, no central file
- ontape (tbtape)
- ON-archive
- onbar
- SQL Backtrack

Sybase and SQL Server

- Master database, Devices, Transaction log
- Bad setup can invalidate any backup/recovery plan
- dump database, dump transaction log
- Backup Server
- SQL Backtrack

SQL Backtrack

- Incremental Backups
- Multiple backups per tape
- remote devices
- Single interface to 3 products

Others

- MS Exchange -- Cannot restore a single mailbox
- Lotus Notes -- Difficult to do incremental
- HP Openview -- Need tie-in to not lose display
- Remedy -- usually Informix
- ???? -- know what it is

3rd Party Utilities

- Public Domain Utilities (Amanda)
- Commercial Utilities
  - Low End, concentrating on desktop
  - High End, concentrating on servers
  - Middle of the Road

Which One is the Best?

- ***One that works!***
- One that works ***in your environment***
- One that works ***with you***
- One that ***lets you work around it***

Important Things to Look At

- Database
- Supported Platforms
- Multitasking

Database Format

- size (44 Bytes per file -> 600 Bytes per file)
- Backups for your backups (How hard?)
- Distributed Databases?
- ASCII, btree, DB2

Supported Platforms

- ***Properly*** Supported Platforms
  - UNIX Special files (Device,Named Pipes)
  - NT/95 registry
  - Netware NDS
- Interfaces to Databases
- Ability to run home-grown scripts

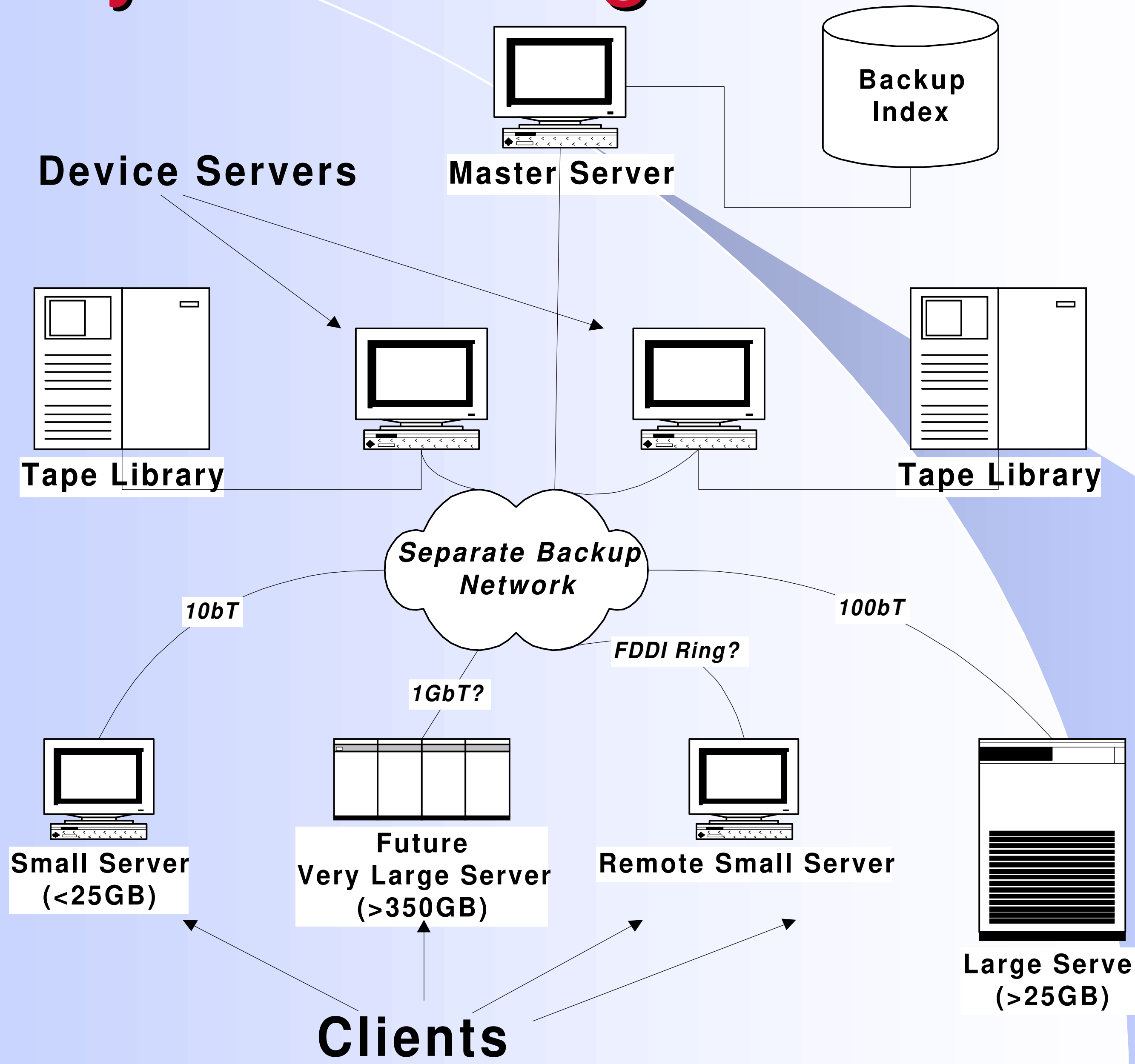
Multitasking

- Many systems to one device
- One system to many devices
- Test effect on backups & restores
- Automated or manual

Devices

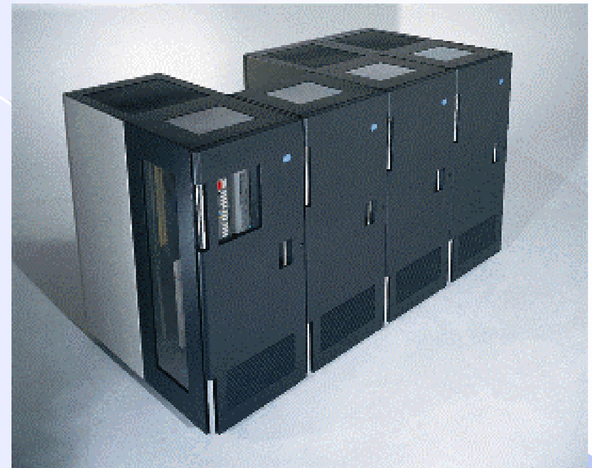
- Standard device drivers
- Jukeboxes
- Remote devices
- Peer-to-Peer backups

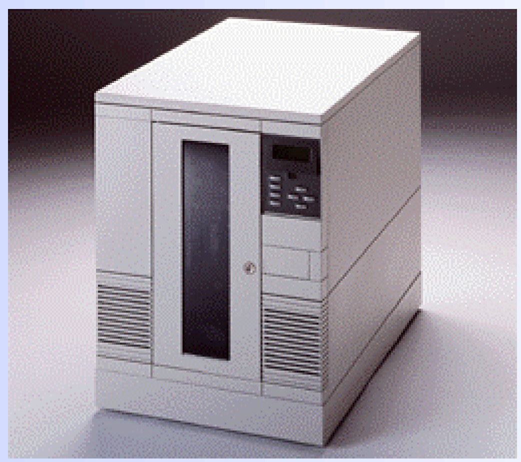
Generic System Design



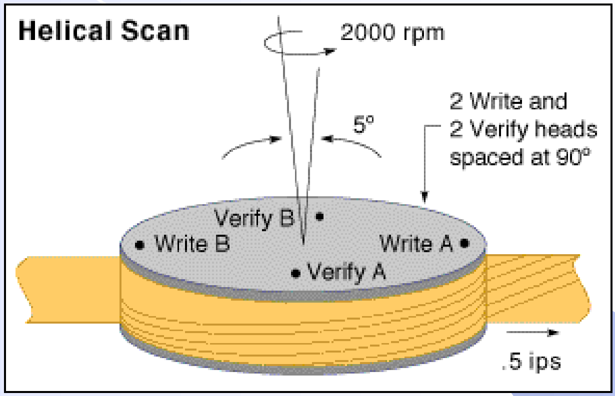
Tape Storage Technologies

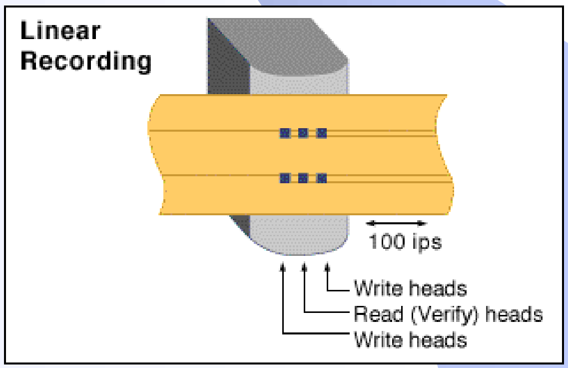
- DLT
- Mammoth
- Magstar
- AIT





Tape Drive Technology Issues





- Helical vs. Linear
  - .5 ips vs. 100 ips
  - Overwrites=resync
- Size vs. access time
  - Large Tape ~= Long Seek Time
  - ***Total access time*** must be considered in high-use environments (HSM, heavy restores)

Tape Technology Advances

- Memory in Cassette
  - 75/150ips seek speed
  - Does not require rewind
  - Stores Reads/Write Passes & Cumulative ECC Rate
- DLC vs. MP
  - Extended Life
  - No cleaning
  - Higher Magnetic Flux Density

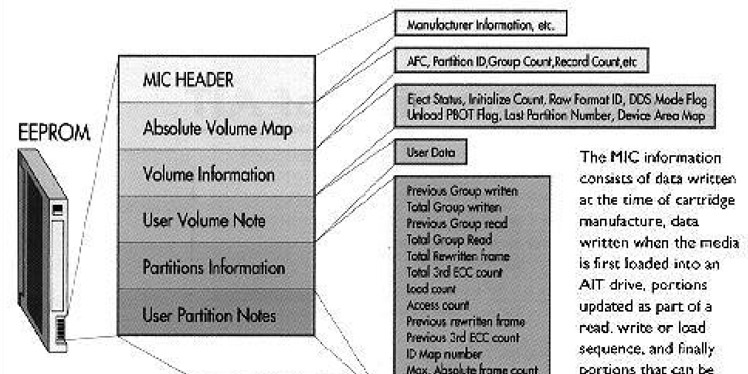
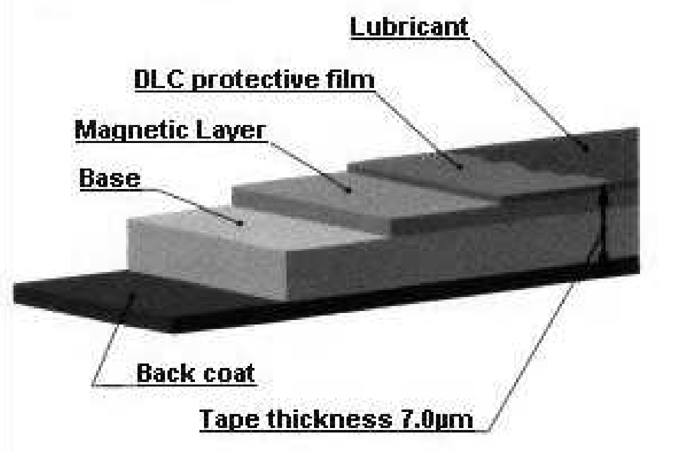
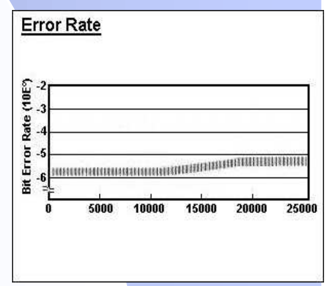


Fig 1
The MIC concept

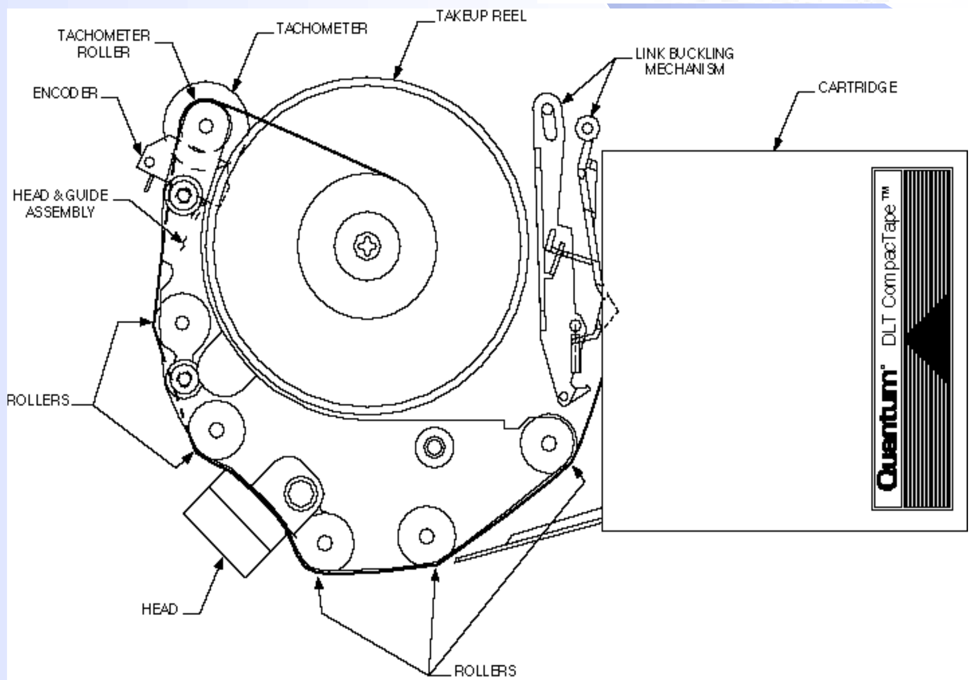


AME vapor deposition tape structure diagram



Quantum DLT

- 5/10 MB/s <u>if streamed</u>
- MB/s Very Logarithmic
- Linear, slow load & FFS
- Longest total access time
- Fragile cartridge interior
- Costly (purch. oper'n)

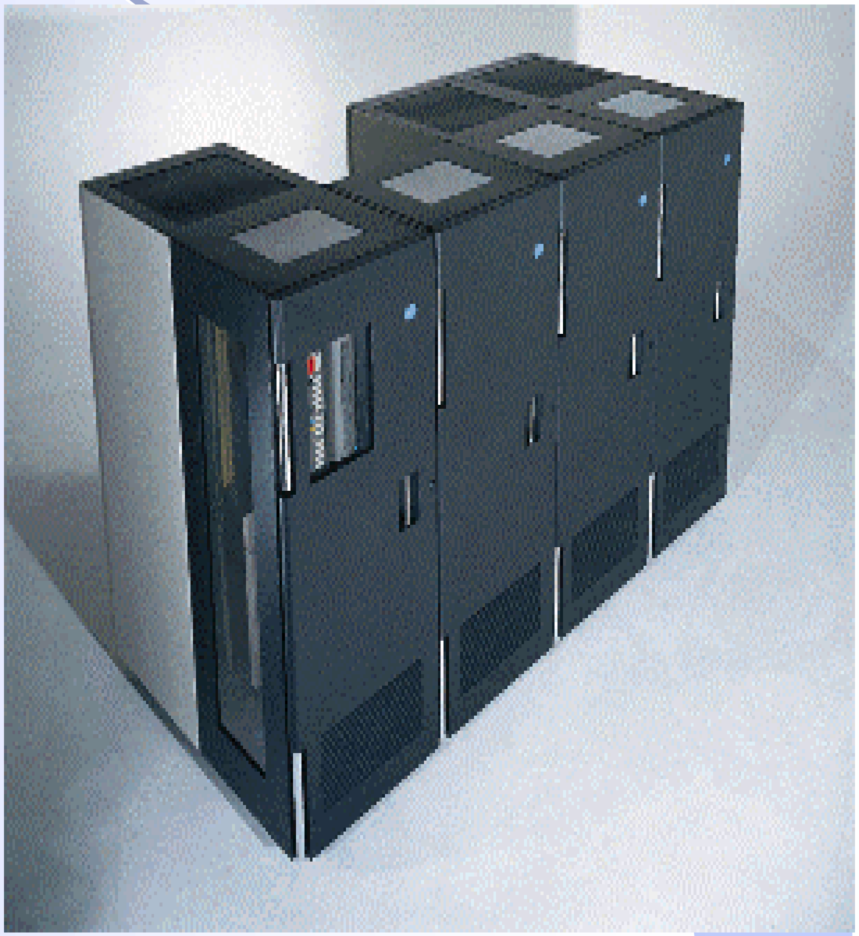


Exabyte Mammoth

- 3/6 MB/s
- Helical Scan
- Long total access time
- DLC Coating = no cleaning
- Limited due to backward compatibility
- No upgrade announcements

IBM Magstar

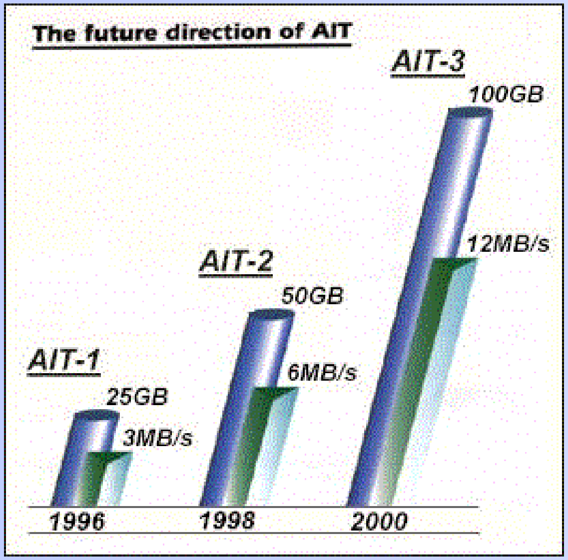
- New 3570 Cartridge
- 3/8 MB/s
- Linear
- Rugged Cartridge
- Tape stays inside
- Mounts mid-point
- Fastest total access time

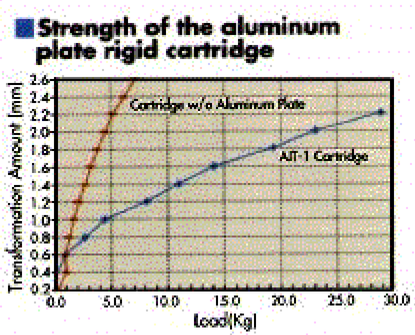


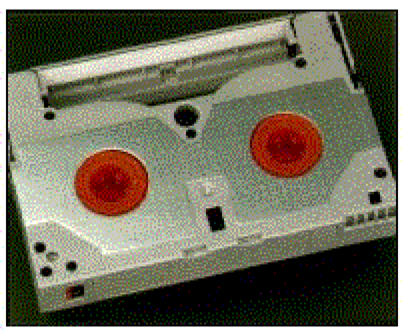
Sony AIT

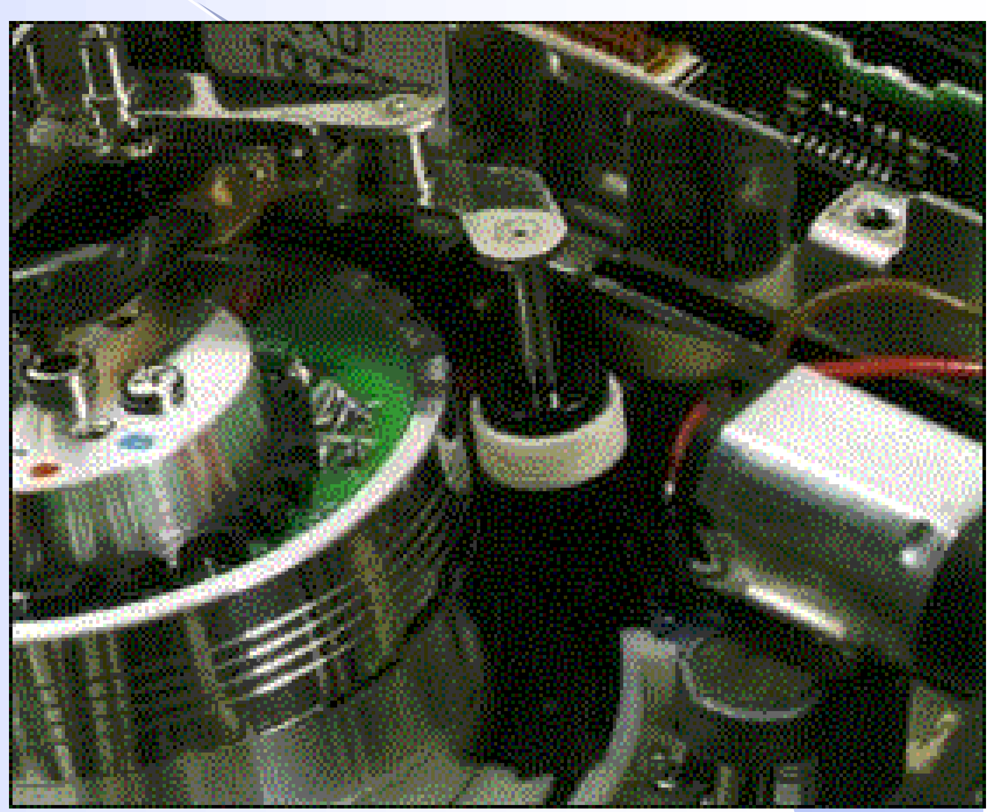
- 3/8 MB/s
- Helical Scan
- DLC = no cleaning
- Memory in Cassette
- Redesigned Media made to support all three drive generations (6/16 MB's in '98 & 12/32 MB/s in '00)
- As Fast as Mag, Faster than DLT, Cheaper than both

Sony AIT

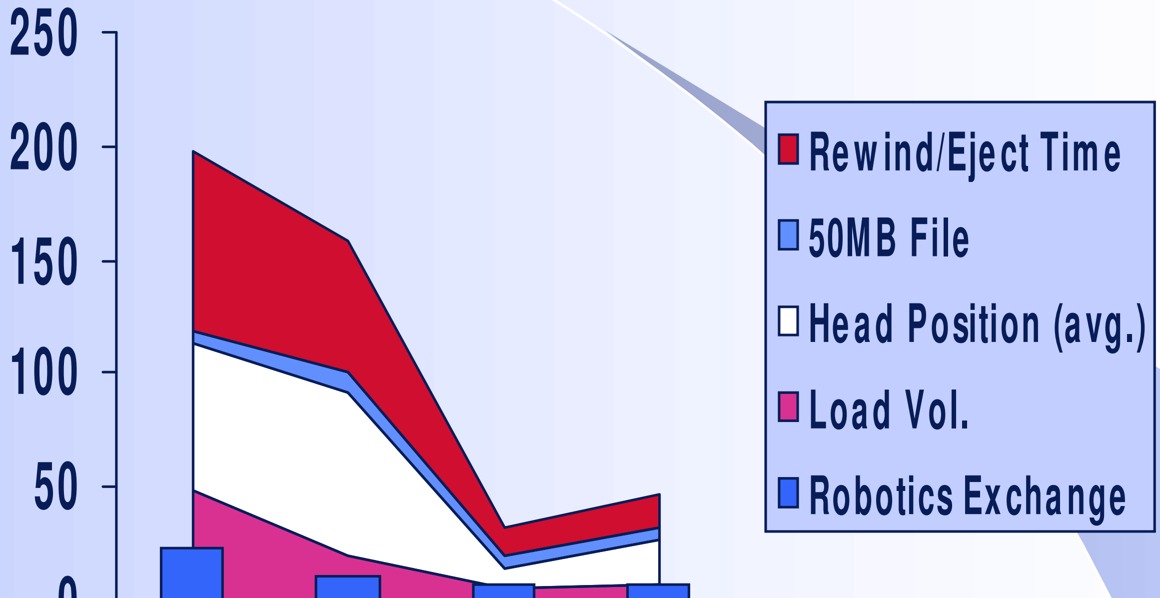

The future direction of AIT
AIT-1
25GB
3MB/s
AIT-2
50GB
6MB/s
AIT-3
100GB
12MB/s
1996
1998
2000


Strength of the aluminum plate rigid cartridge
Cartridge w/o Aluminum Plate
AIT-1 Cartridge
Transformation Amount [mm]
Load[Kg]





Total Access Time Comparison

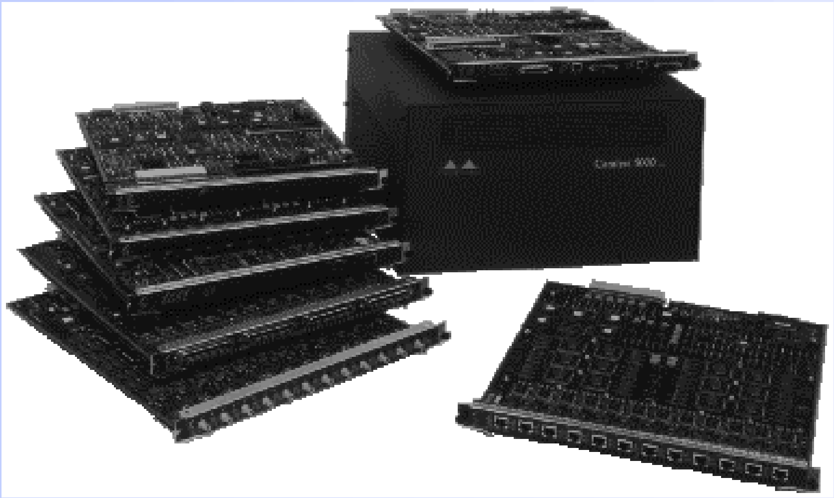


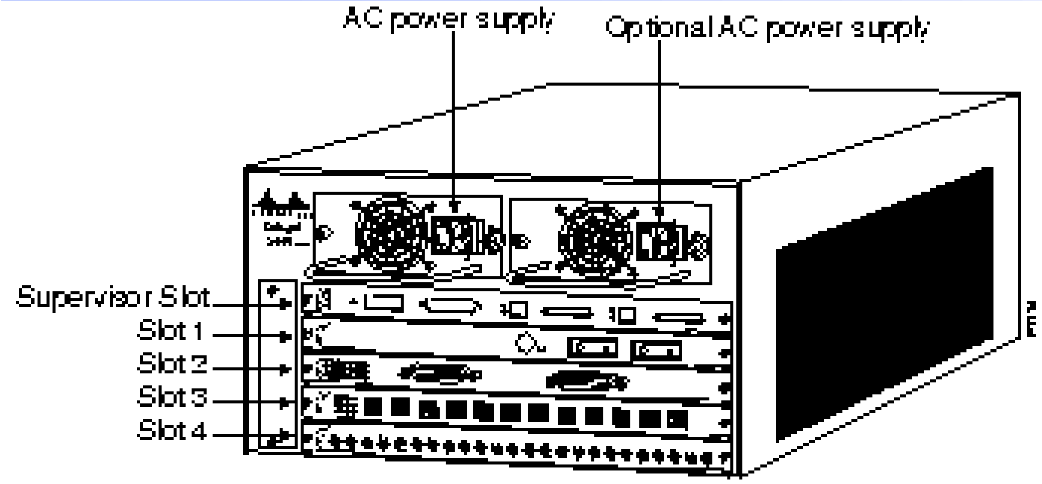
	DLT	Mamm.	Magstar	AIT
Rewind/Eject Time	79	58.1	12	13
50MB File	5	8	6	6
Head Position (avg.)	66	72	8.8	20
Load Vol.	48	20	5.6	7
Robotics Exchange	24	10	6.7	7.5

Network Hardware

- IBM 8270
  - 8-16 Token Ring Ports
  - 1 UFC Slots
- IBM 8272
  - 8 UFC Slots
- Universal Feature Cards
  - 4 port Token TP
  - 2 port Token Fiber
  - 1 port 155Mbps ATM

Network Hardware





- Cisco Catalyst 5000
  - HSC has chassises
  - Auto 10/100 Modules
  - Will support 1 1Gb card

Backup Product Evaluation

- 250 question RFI
- A lot of "good" products out there
- Good products with some bad answers
- Some products with false answers
- More products coming

Putting it all Together

- Scripts can copy database data to backup disks
- Scripts can shutdown databases
- “Second opinion” monitor -- is every system/disk included?
- Success Monitor -- is everything we’re backing up being backed up?

New Things To Keep You up all Night

- DFS, EFS
- Terabyte File Systems
- New File system types
- Networks not capable
- More local data

New Things That Keep *me* up all Night

- Ampex
- DTF, Magstar, AIT
- DLT “Stackable” Jukeboxes
- API’s
- NDMP

Summary

- Take your backups seriously
- Understand the data you are responsible for
- Find the proper tools and make them co-exist
- Monitor the tool
- Keep up with new technology (It doesn't)

For more help:

- I can be reached at: curtis@pencom.com
  http://www.pencom.com/psa/answer.html
- Independent Backup & Recovery info at:
  http://www.backupcentral.com
- Look for "Enterprise Backup and Recovery" from O'Reilly and Associates
  (Estimated Release Date 1Q, 1998)