System Administration

Week 02, Segment 2
Devices and Interfaces

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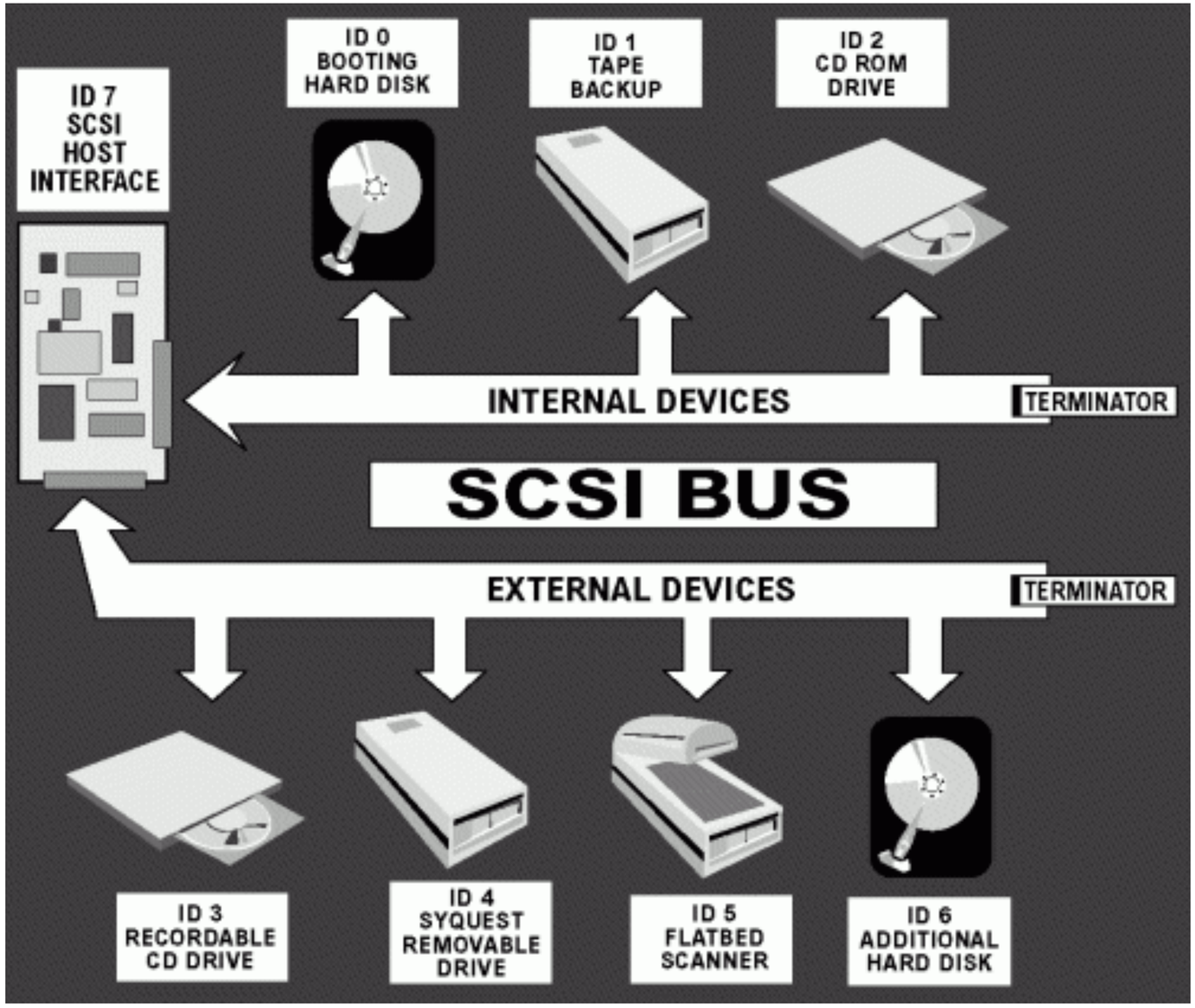
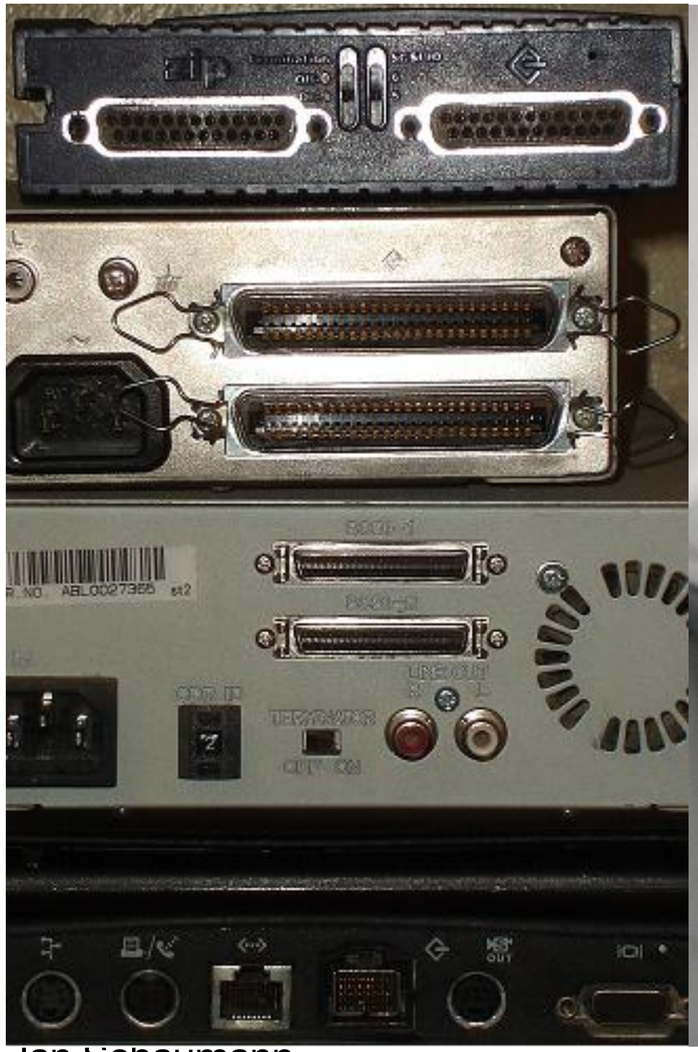
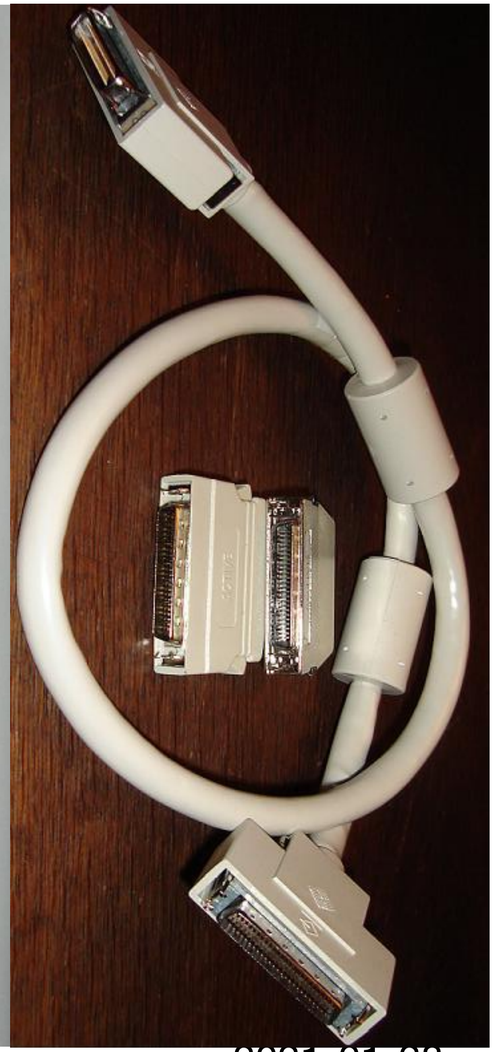
https://stevens.netmeister.org/615/

Disk Interfaces: SCSI

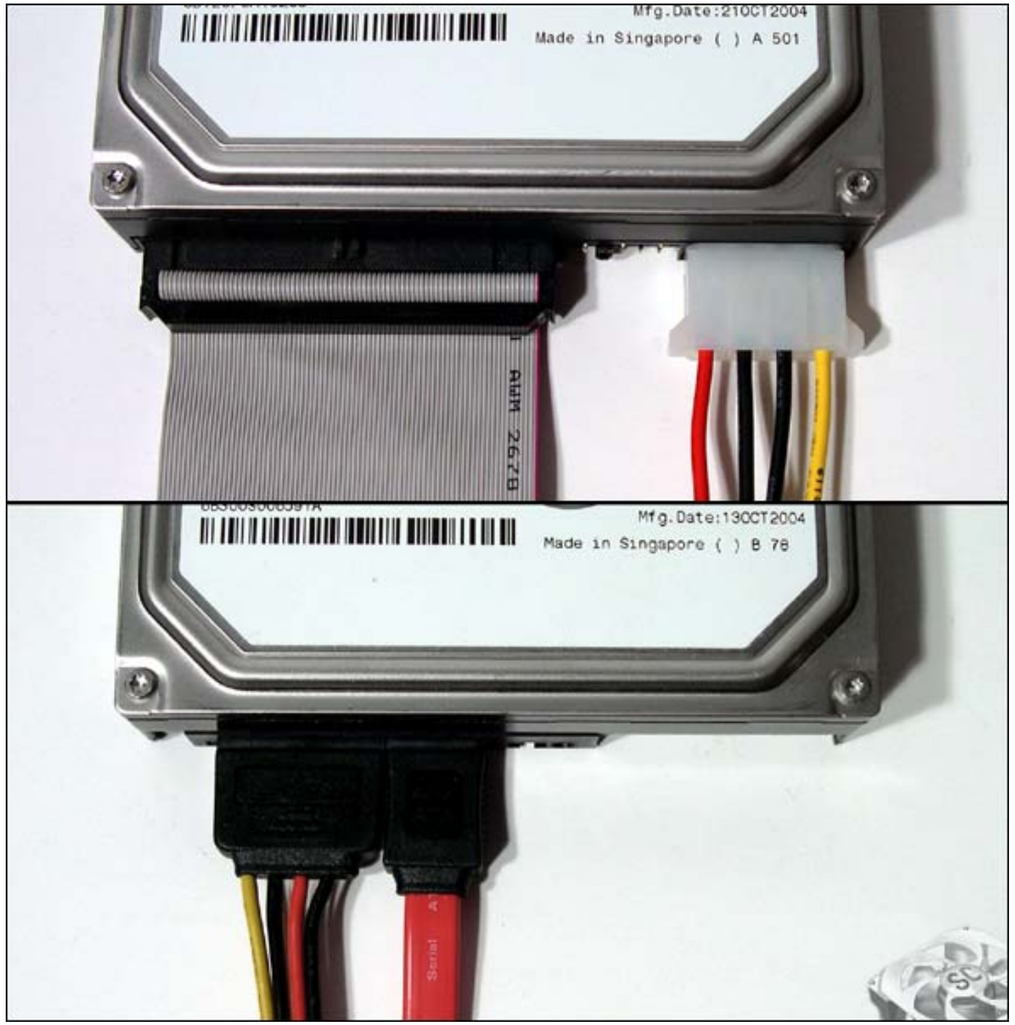


Disk Interfaces: SCSI





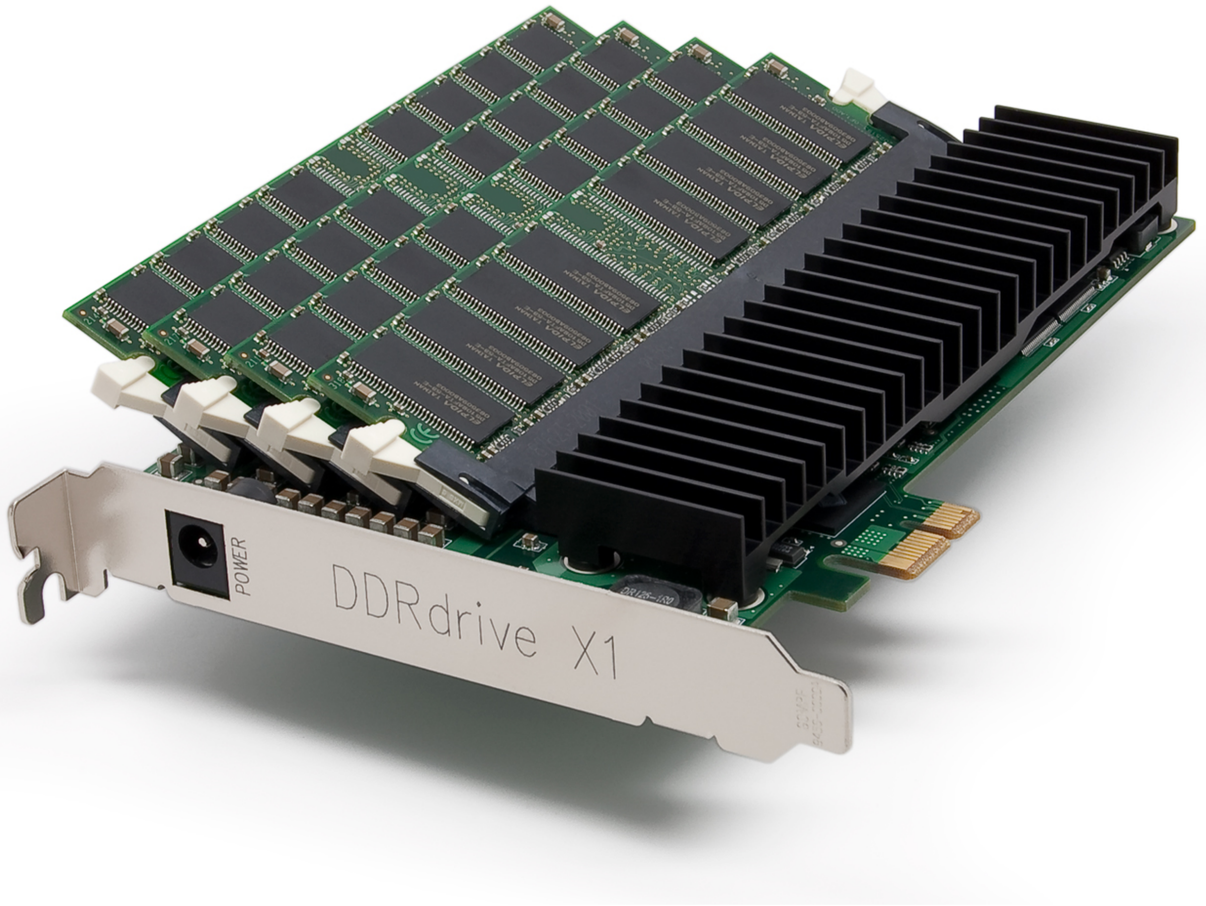
Disk Interfaces: ATA



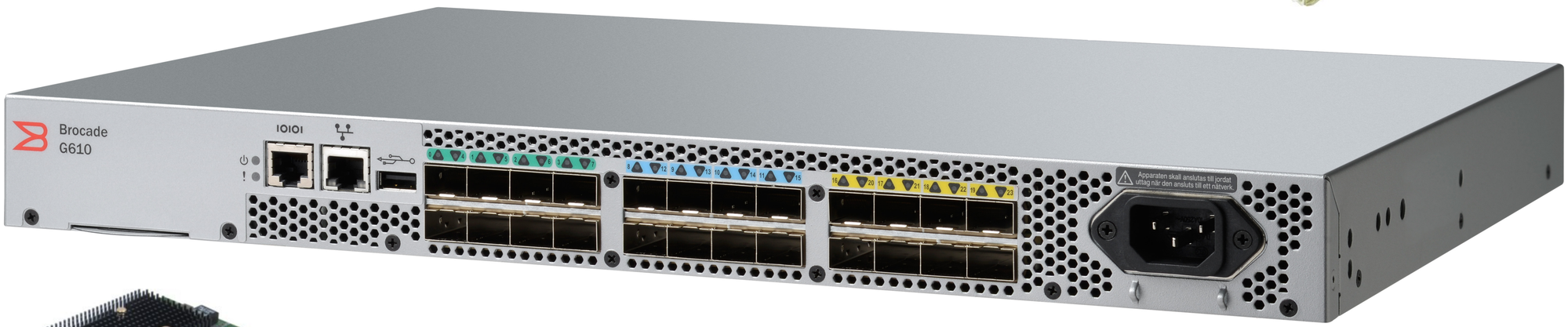
Disk Interfaces: IDE

https://is.gd/bKOrwd

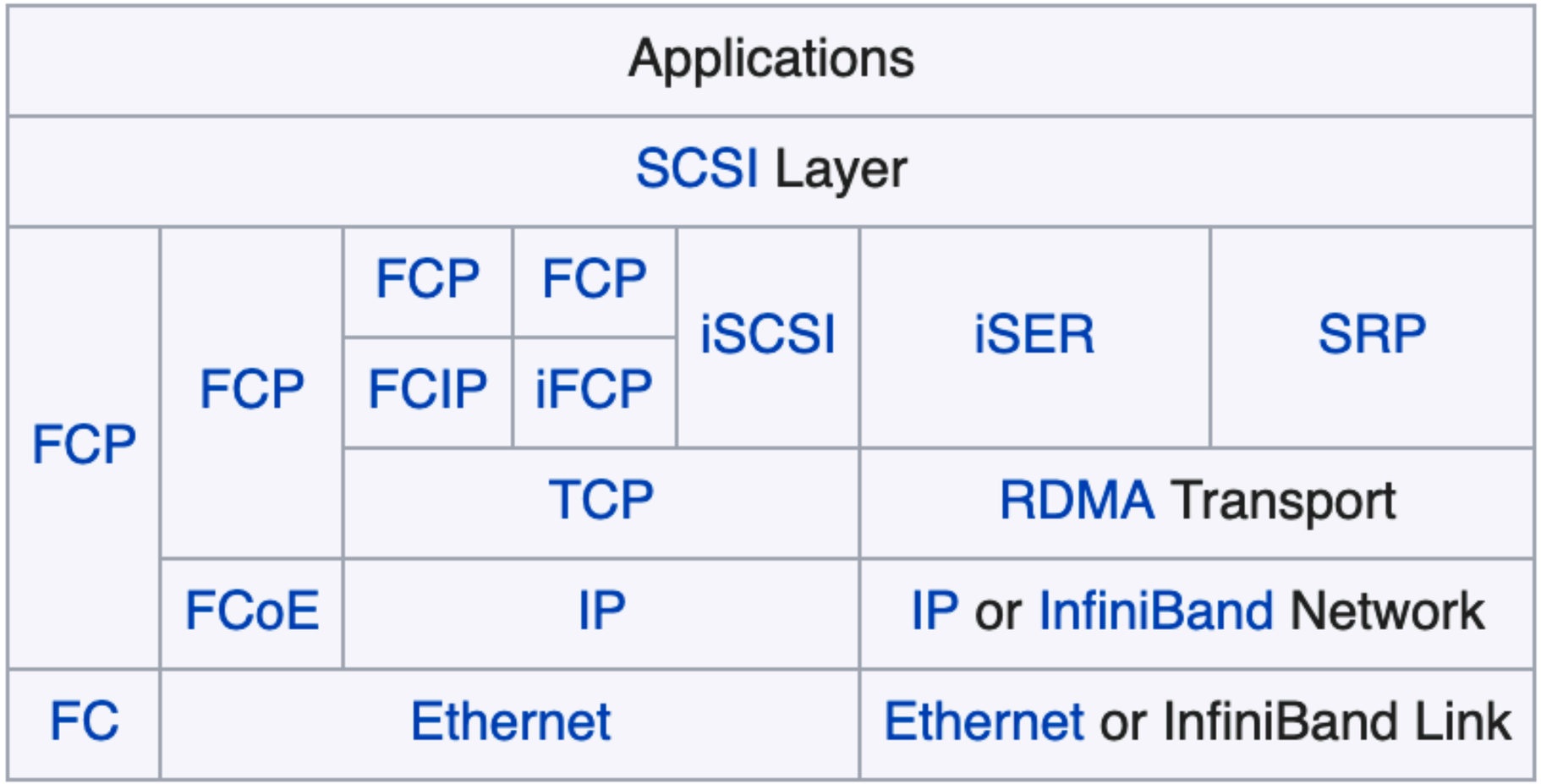
Disk Interfaces: SSD



Disk Interfaces: Fibre Channel



Disk Interfaces: Fibre Channel



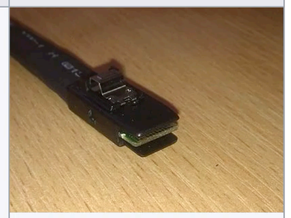
Storage Protocols

- ATA over Ethernet (*AoE*):
  - create low-cost SAN
  - ATA encapsulated into Ethernet frames
- Fibre Channel over Ethernet (*FCoE*):
  - consolidate IP and FC/SAN networks
  - FC encapsulated into Ethernet frames
- **oE*:
  - no TCP/IP overhead
  - restricted to a single Layer 2 network
  - no inherent security features
- iSCSI
  - SCSI encapsulated in TCP/IP packets
- Serial Attached SCSI (*SAS*)
  - Backwards compatible with SATA
  - 6-layered architecture comprised of three protocols:
    - Serial SCSI Protocol (SSP)
    - Serial ATA Tunneling Protocol (STP)
    - Serial Management Protocol (SMP)

Connectors [edit]

SAS connectors are much smaller than traditional parallel SCSI connectors. Commonly, SAS provides for point data transfer speeds up to 12 Gbit/s.[17]

The physical SAS connector comes in several different variants:[18]

Codename	Other names	ext./int.	Pins	No of devices / lanes	Comment	Image
SFF-8086	Internal mini-SAS, internal mSAS	internal	26	4	This is a less common implementation of internal mSAS than SFF-8087's 36-circuit version. The fewer positions is enabled by it not supporting sidebands.	
SFF-8087	Internal mini-SAS, internal mSAS, internal iSAS, internal iPass	internal	36	4	Unshielded 36-circuit implementation of SFF-8086. Molex iPass reduced width internal 4× connector; 12 Gbit/s capability.	

Storage Protocol Bit Rates

Storage [edit]

Technology	Rate		Year
Teletype Model 33 paper tape	**70 bit/s**	10 B/s	1963
TRS-80 Model 1 Level 1 BASIC cassette tape interface	**250 bit/s**	32 B/s	1977
Apple 2 cassette tape interface	**1.5 kbit/s**	200 B/s	1977
Single Density 8-inch FM Floppy Disk Controller (160 KB)	**250 kbit/s**	31 KB/s	1973
Double Density 5.25-inch MFM Floppy Disk Controller (360 KB)	**500 kbit/s**	62 KB/s	1978
High Density MFM Floppy Disk Controller (1.2 MB/1.44 MB)	**1 Mbit/s**	124 KB/s	1984
CD Controller (1×)	**1.171 Mbit/s**	0.146 MB/s	1988
MFM hard disk	**5 Mbit/s**	0.625 MB/s	1980
RLL hard disk	**7.5 Mbit/s**	0.937 MB/s	
DVD Controller (1×)	**11.1 Mbit/s**	1.32 MB/s	

Disk Device Configurations: Single Disk

$600

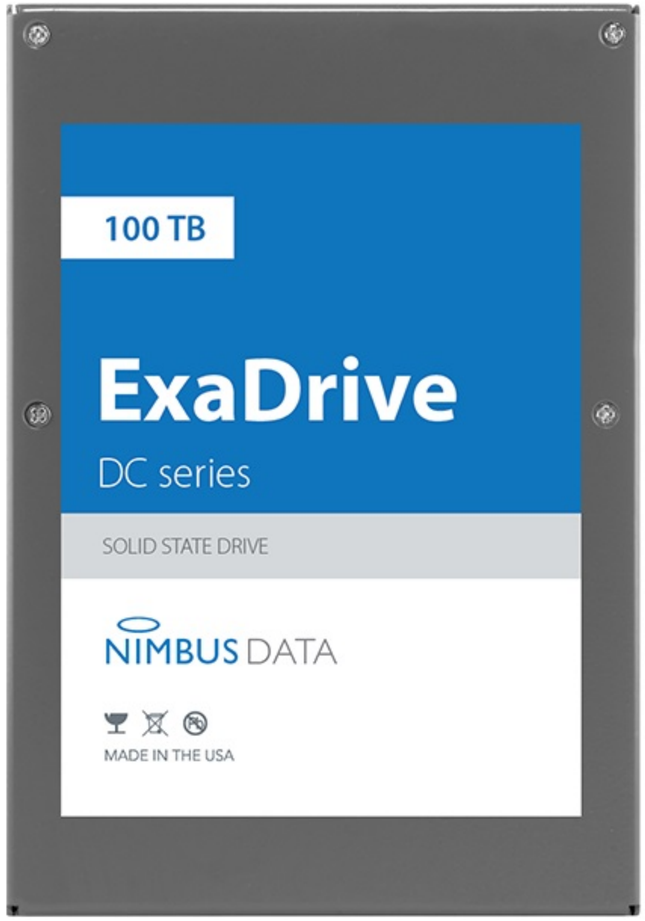
Disk Device Configurations: JBOD

Disk Device Configurations: RAID

Disk Device Configurations: Single Disk

100TB SSD

$40K



Disk Device Configurations: Flash Array

Recommended Exercises

Research available storage media and solutions and their performance characteristics and price points. How would you spec out a storage solution for *e.g.*, Stevens shared Linux systems? Can you adjust this proposal for different fictional budgets?

What are the implications resulting from your choices? Think power/cooling, OS choice, software support, future upgrade paths, …

Links

File Systems and Storage Models:

https://www.netmeister.org/book/04-file-systems.pdf

Wikipedia:

https://en.wikipedia.org/wiki/Parallel_ATA

https://en.wikipedia.org/wiki/Solid-state_drive

https://en.wikipedia.org/wiki/Non-RAID_drive_architectures