Capgemini

CONSULTING.TECHNOLOGY.OUTSOURCING

People matter, results count.

Introduction to Database

- A database is a computerized record keeping system.
- As such, the purpose of a database is to store a collection of logically related data
- Databases are used whenever a large amount of data is needed to be stored and retrieved quickly and easily
- The database not only stores data, but also a description of the data.

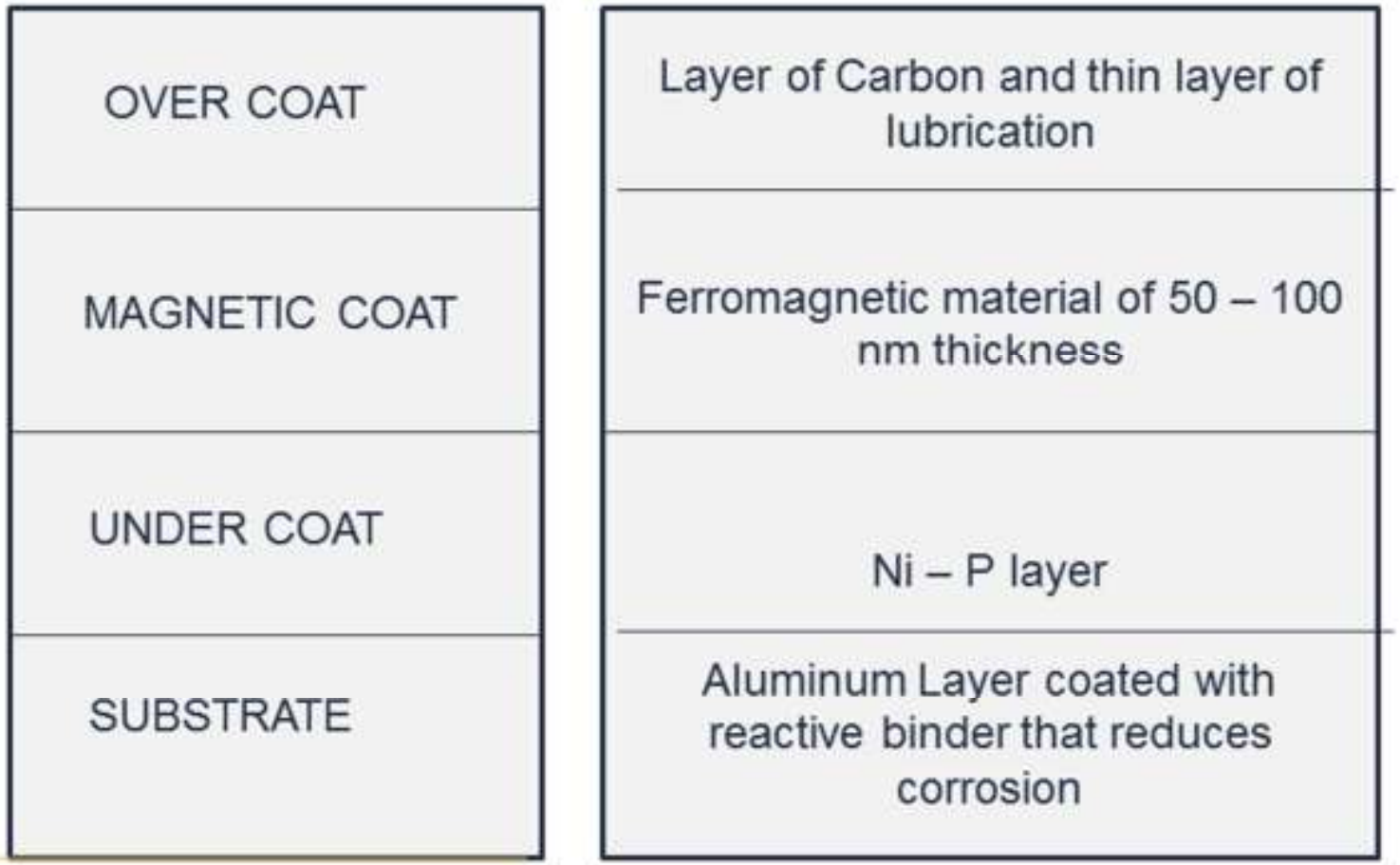
Storage

Storage is the place where data is held Temporarily or Permanently for later use.

Types of storage:

- Magnetic Storage
  - Diskettes
  - Hard Disk
  - Cartridges
  - Magnetic Tapes
- Optical Storage
  - CD
  - DVD
  - Blue Ray

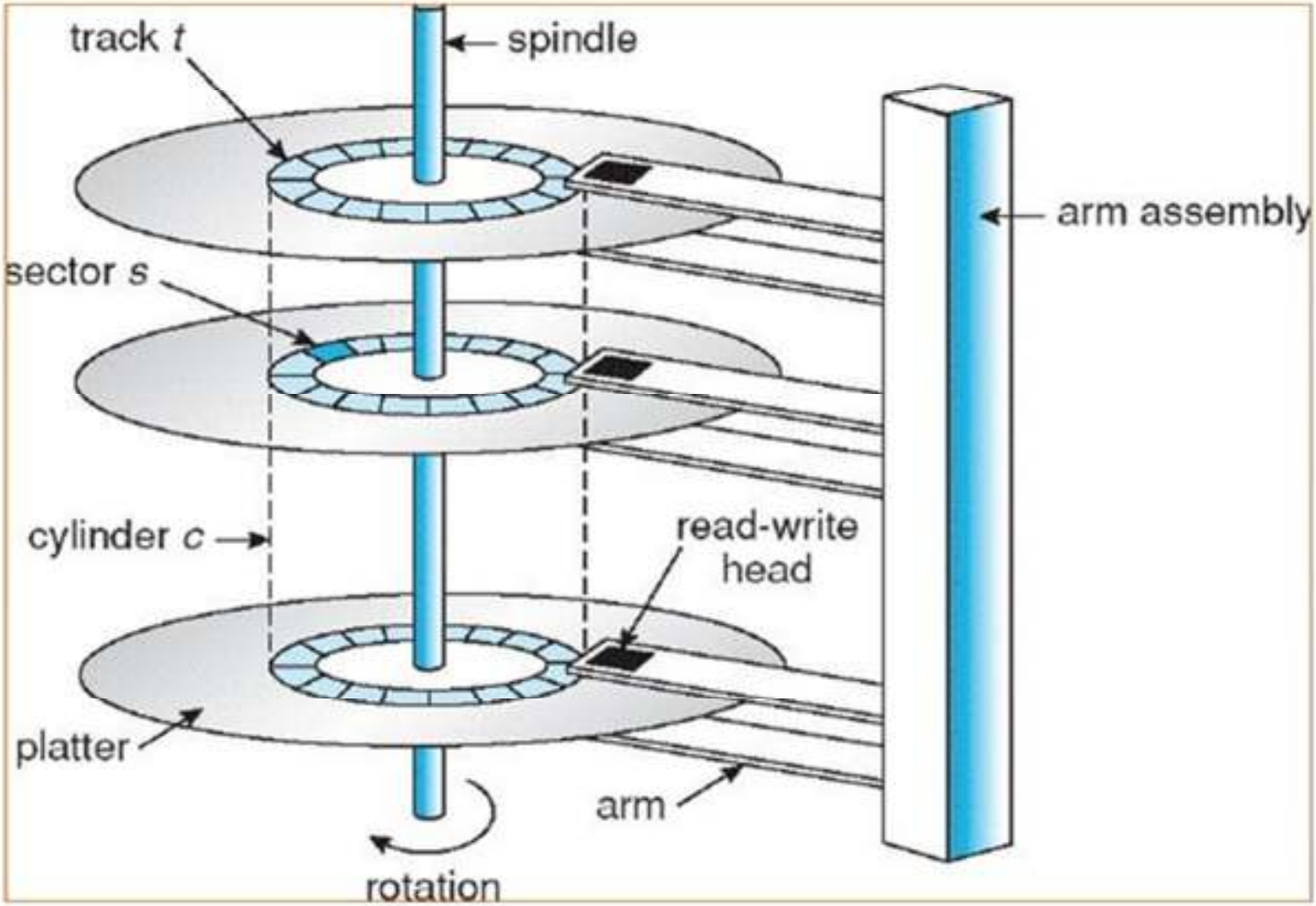
Types of storage - Magnetic Storage:



Types of storage - Hard Disk (Magnetic Storage):

Storage

Magnetic Storage-Hard disk(Contd…)



Storage

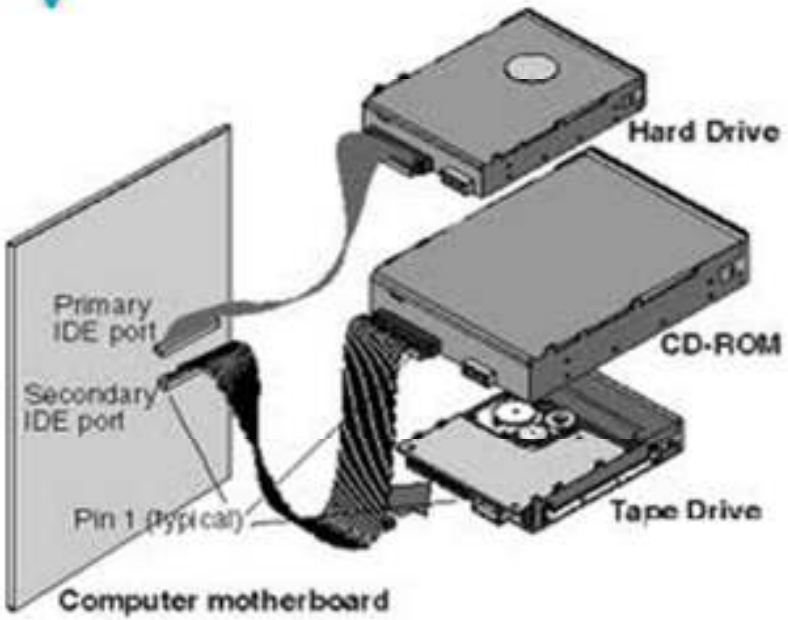
Magnetic Storage-Hard disk(Contd…)

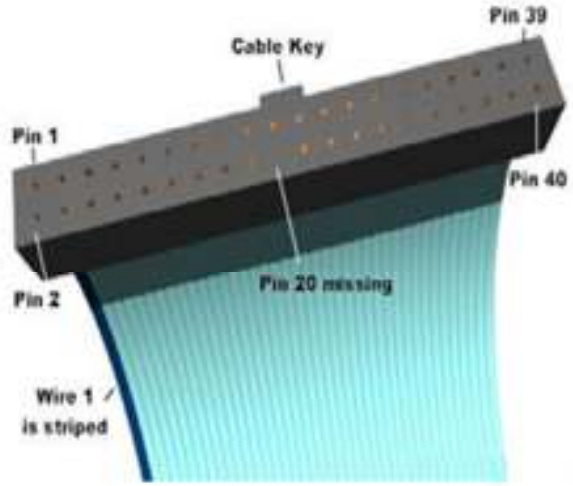
Types of hard disk interface:

- IDE
- SCSI
- SATA

IDE cable

Types of hard disk interface(contd…)





IDE connector

Storage Technology

- Magnetic Storage

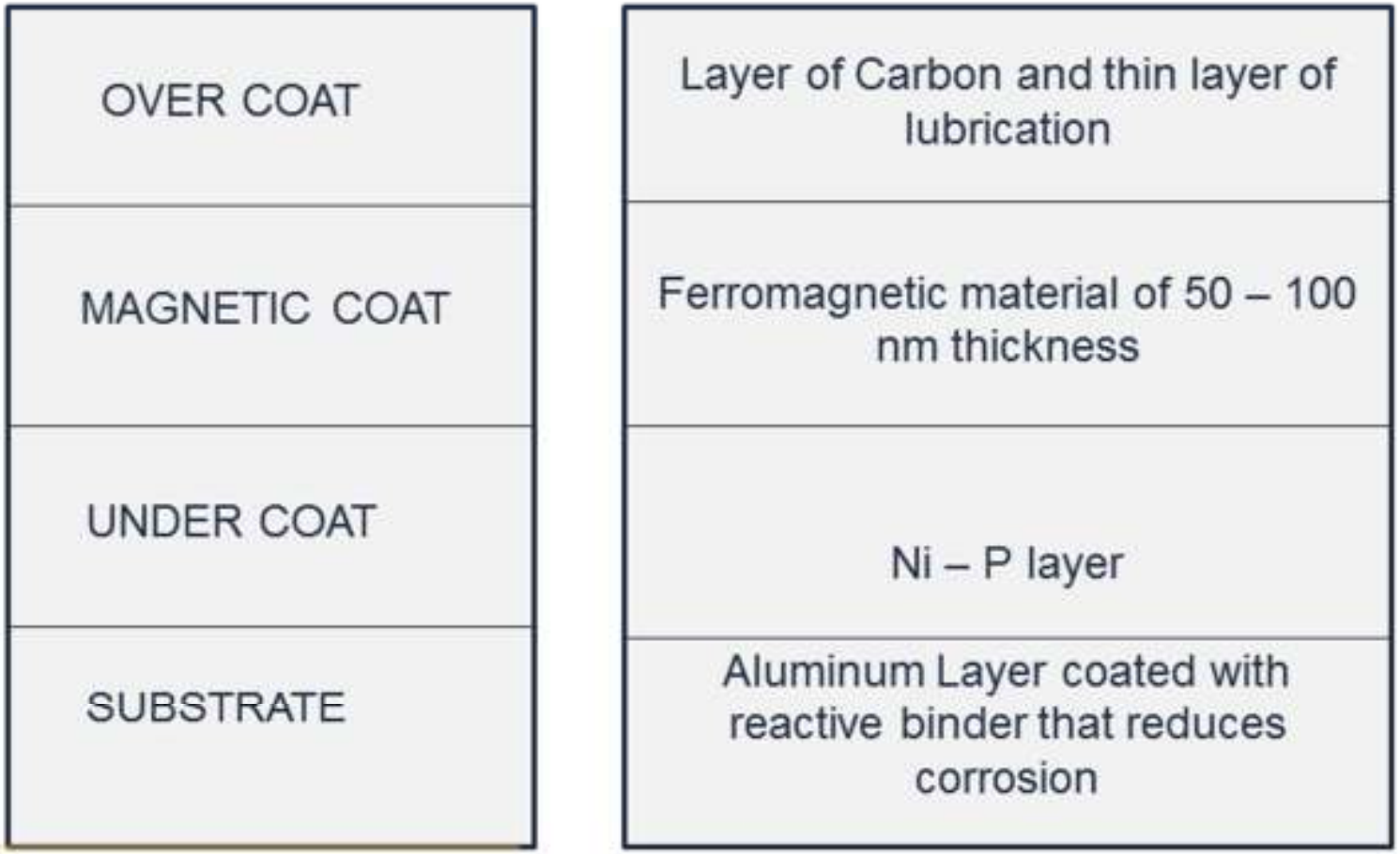
  Diskettes
  Hard Disk
  Cartridges
  Magnetic Tapes

- Optical Storage

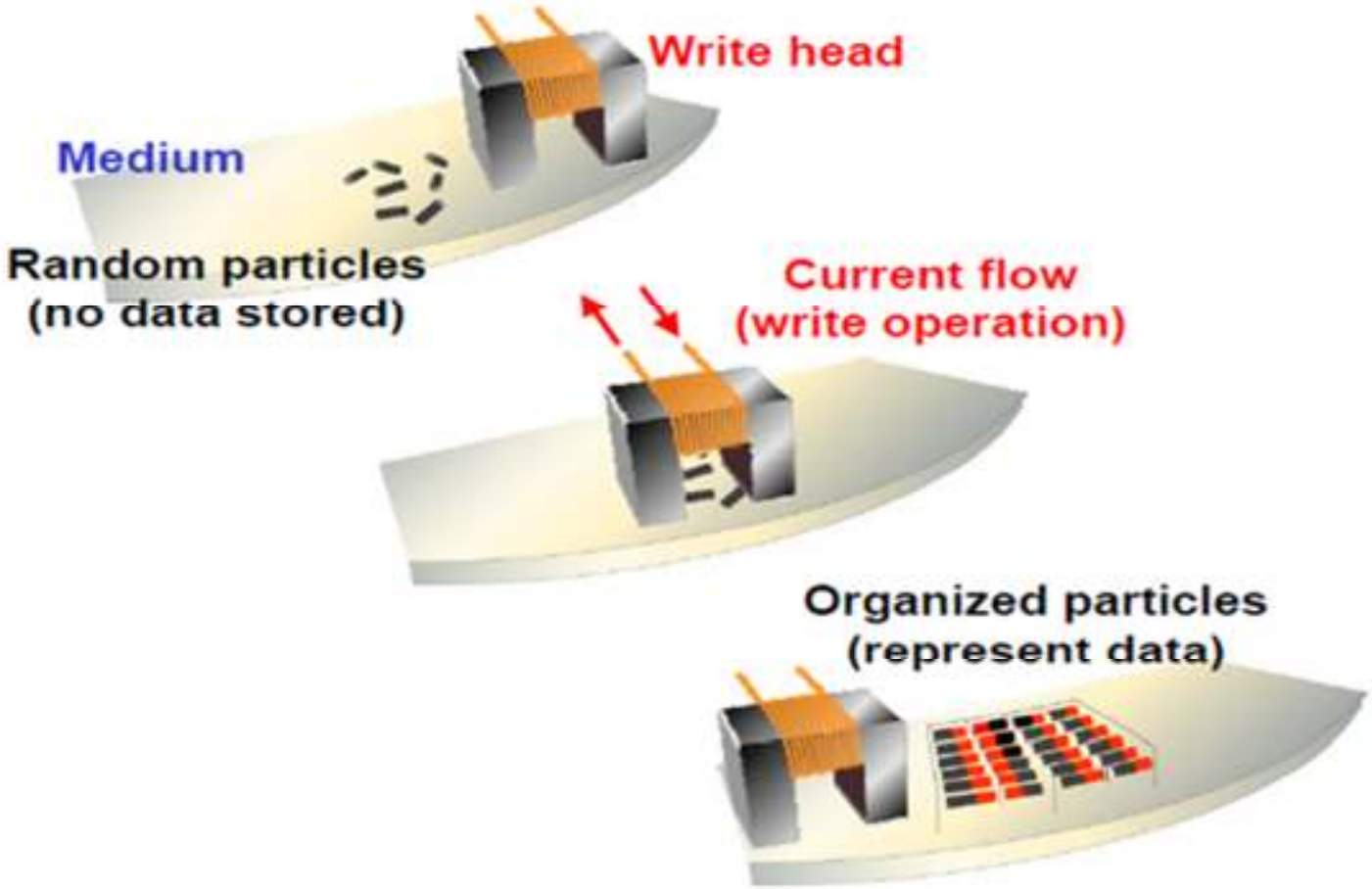
  CD
  DVD
  Blue Ray

Storage Technology

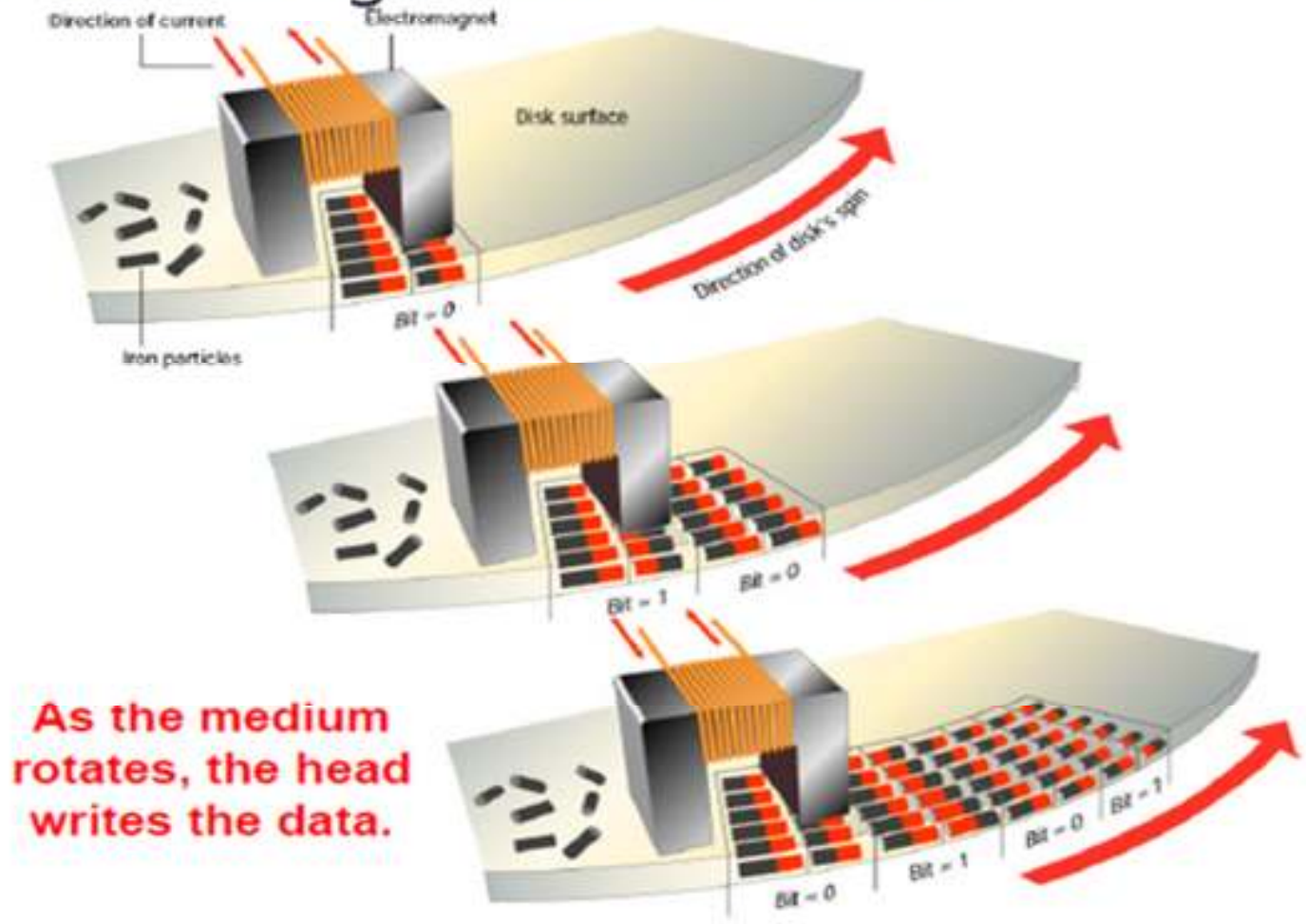
Magnetic Storage:



Magnetic Storage - How it works ?



Magnetic Storage - How it works ?

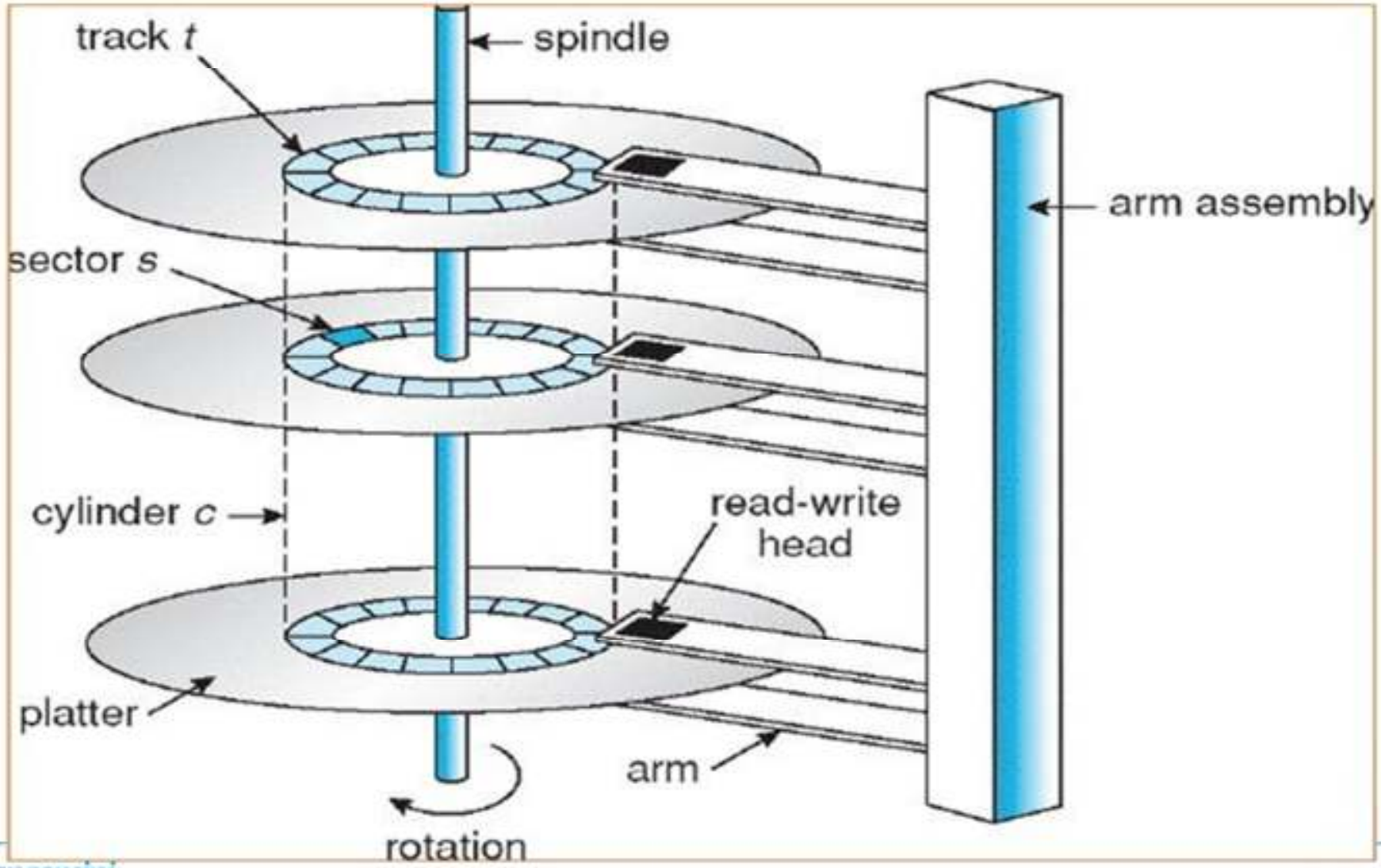


As the medium rotates, the head writes the data.

Storage Technology

Magnetic Storage - Hard Disk:

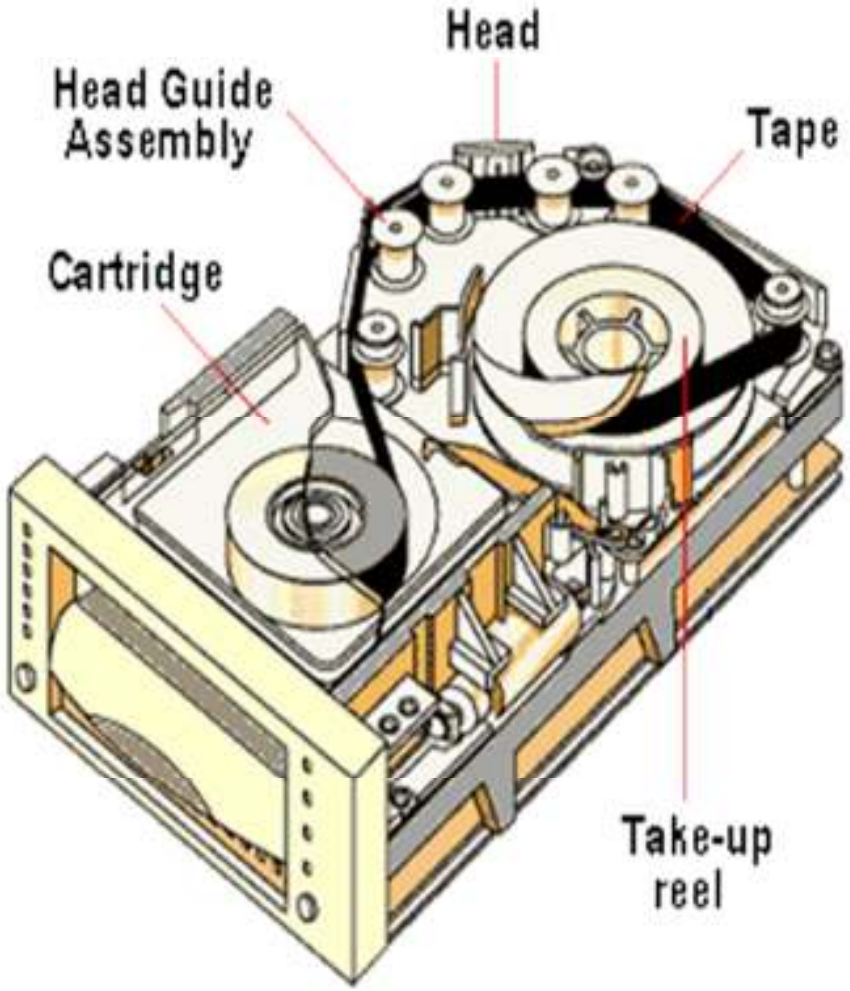
Storage Technology



Storage Technology

Magnetic Storage - Magnetic Tape:

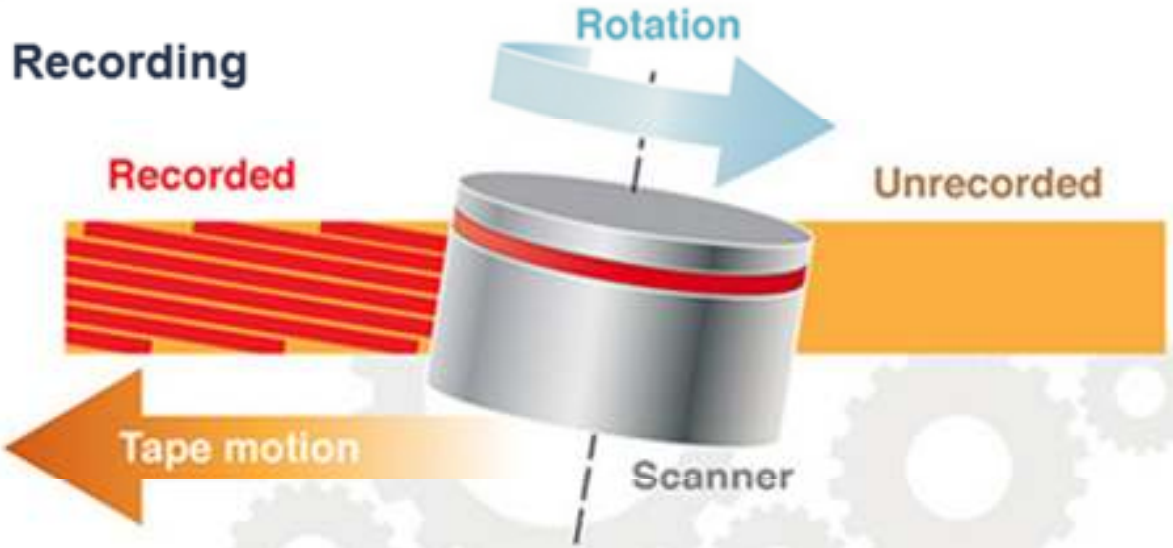
- Sequential storage
- Backup storage
- Tape Drive



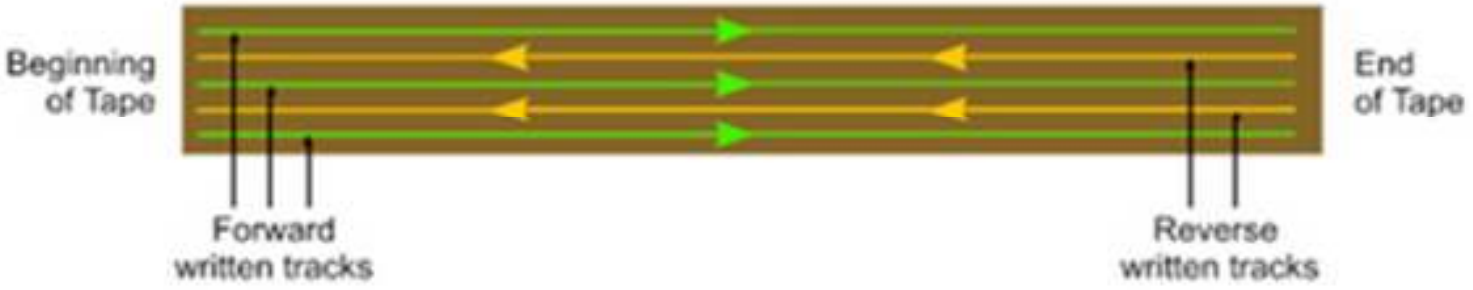
Storage Technology

Magnetic Storage - Recording Technology:

Helical Scan Recording

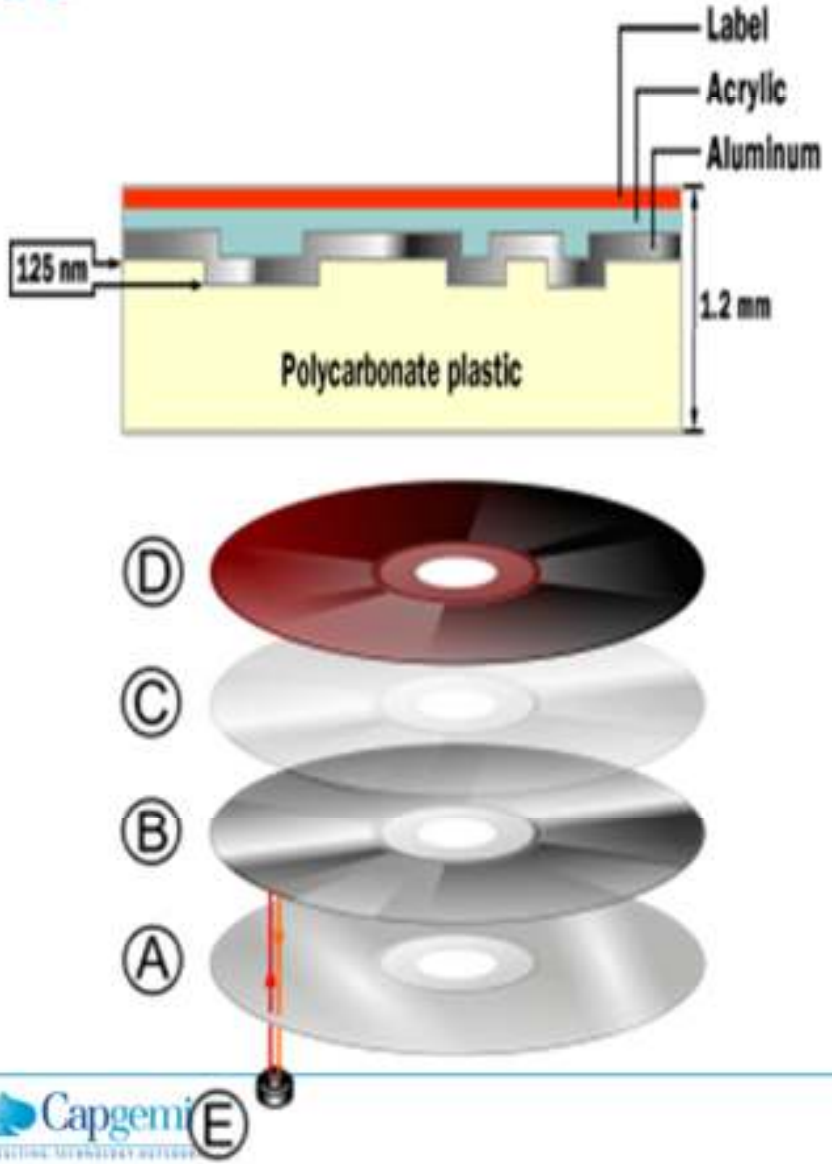


Linear Serpentine Recording



Storage Technology

Optical Storage:

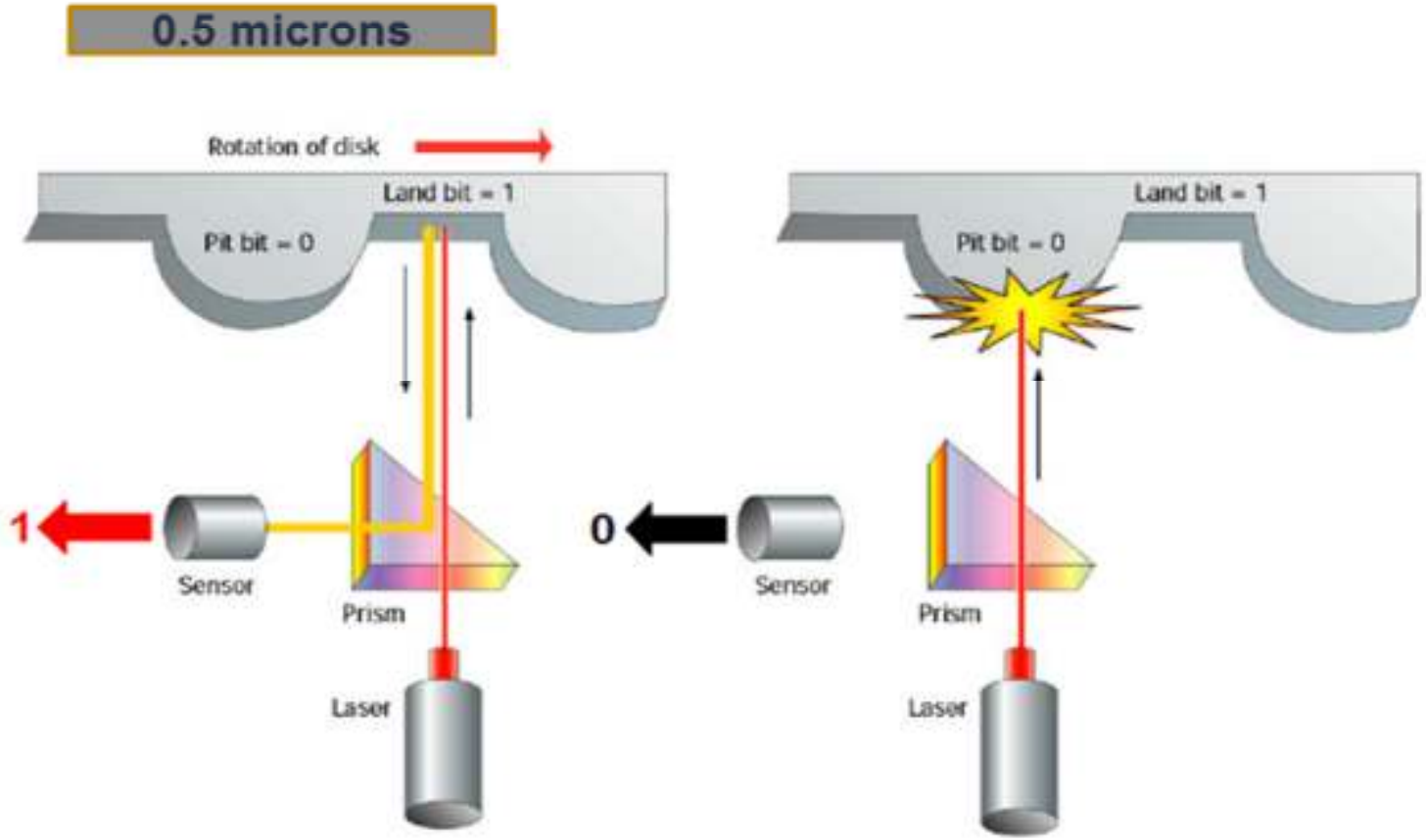


A – Polycarbonate disc layer coated with aluminum has the data encoded by using pits and lands
B – Shiny Layer reflects the laser
C – Layer of Lacquer protects the shiny layer
D – Artwork (screen printed) on top of disk
E -- Laser Beam reads the CD and reflected back to sensor.

Unwinding the CD Track would extend out to 3.5 miles (5 km)

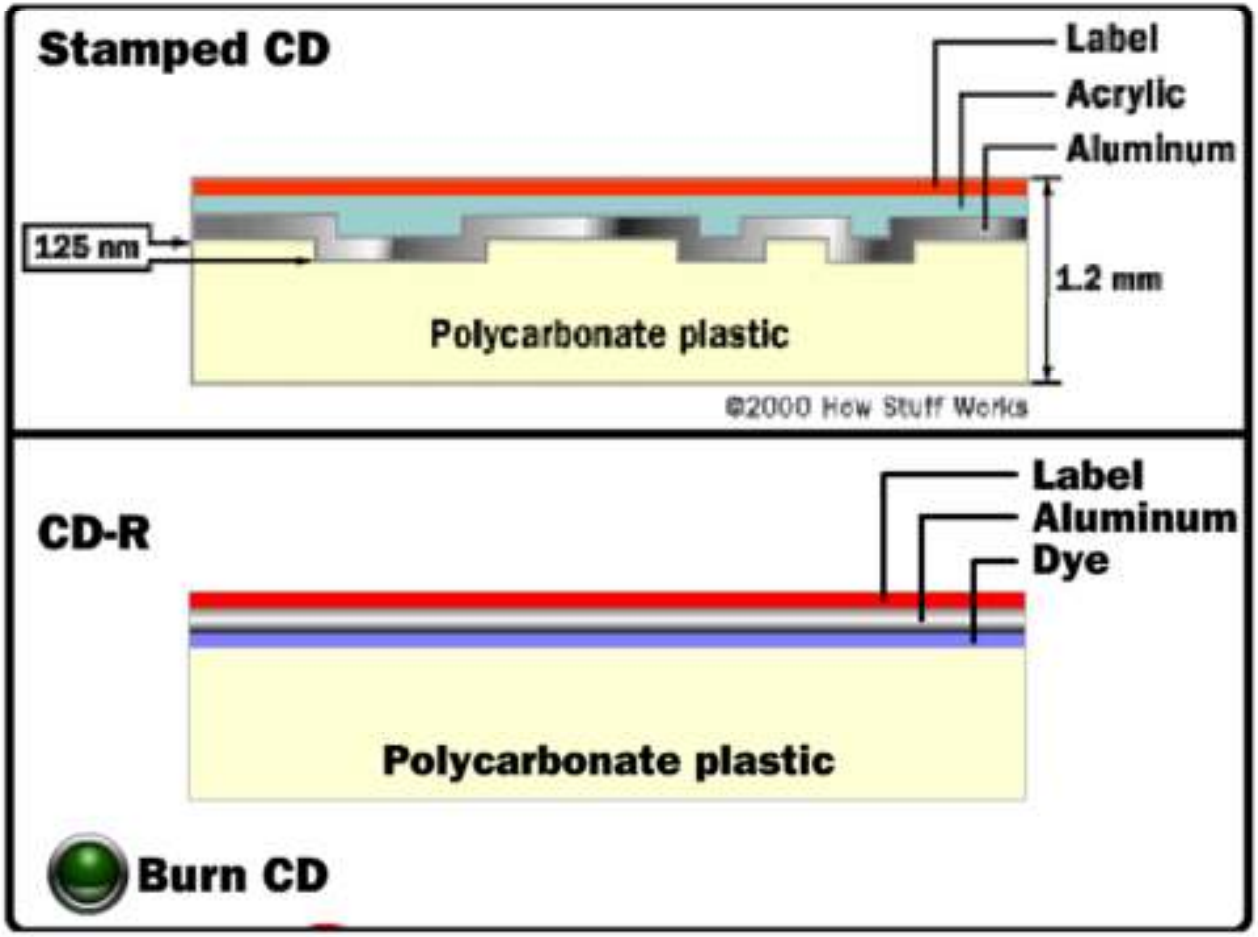
Storage Technology

Optical Storage - Optical disk:



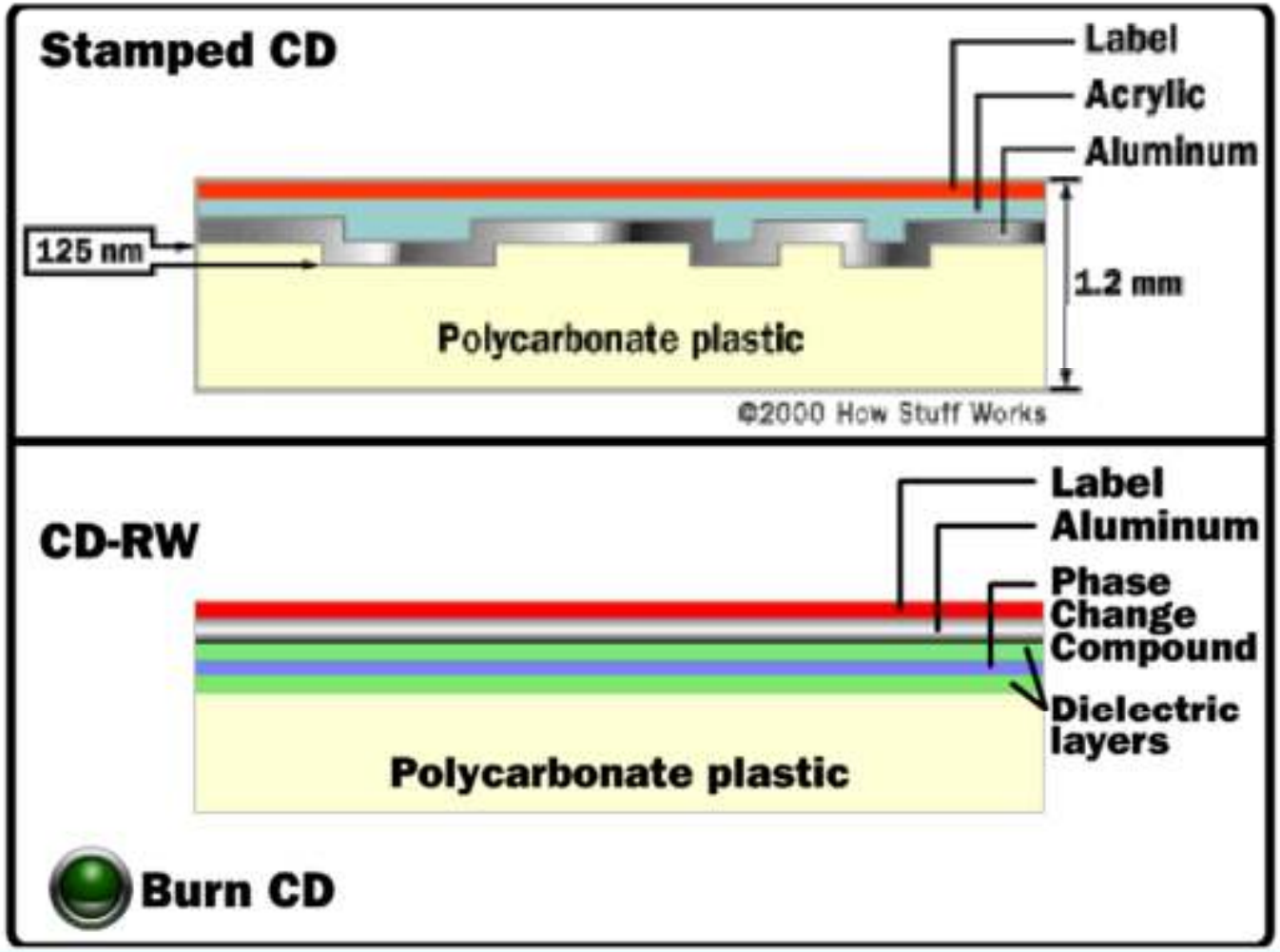
Storage Technology

Optical Storage - Writing a CD:

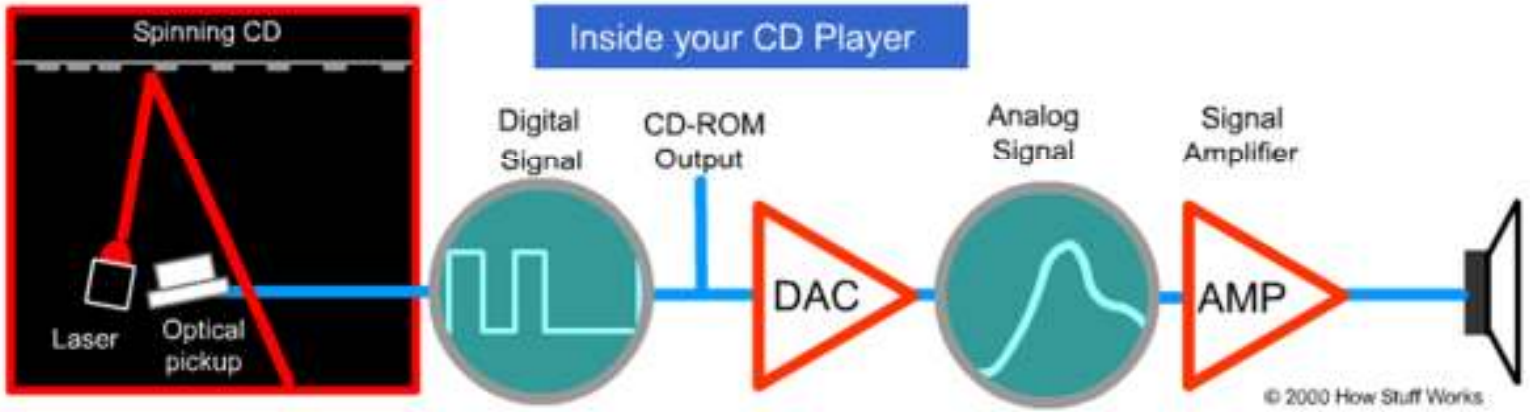


Storage Technology

Optical Storage - Reading a CD:



Optical Storage - CD Player:



Storage Technology

Optical Storage - DVD Disk:

- Base Layer - Polycarbonate Plastic
- Aluminum coating over the polycarbonate plastic
- Clear Protective acrylic Coating
- Semi Reflective and Fully reflective layers

Single-sided, single layer (4.7GB)

Single-sided, double layer (8.5GB)

Double-sided, double layer (17GB)

Storage

Types of Tapes - Linear Tape Open:

LTO or Linear Tape Open is a magnetic tape data media that was initiated and developed by IBM, Seagate and Hewlett-Packard

There were two forms of LTOs: Accelis and Ultrium.

- The Accelis form of LTO tapes was developed in 1997 for fast data access.
- The LTO form Ultrium is a half-inch magnetic tape with a single reel (contrasting with the 8mm double reel Accelis).
- LTO Ultrium tape uses a single reel to maximize storage capacity and thus is better suited for archival use.
- An Ultrium LTO drive is also backward compatible and contains a strong error correction algorithm that makes data recovery possible when lost data is within one track or up to 32 mm of the tape medium
- The LTO Ultrium is very popular and LTO in common usage usually refers to the LTO Ultrium as the LTO Accelis are no longer commercially available

Storage

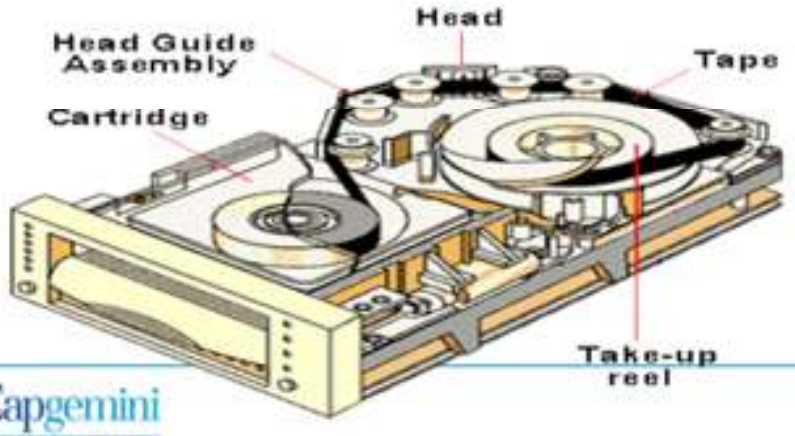
Types of Tapes - Digital Linear Tape:

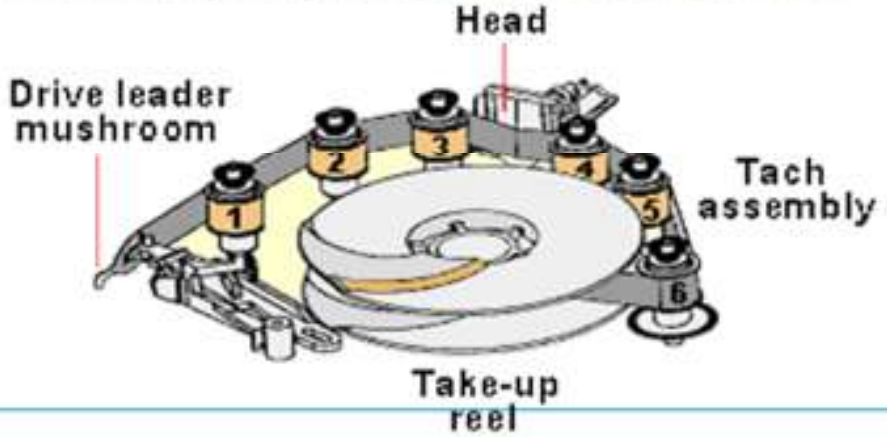
- The origins of Digital Linear Tape date back to the mid-1980s.
- The first true DLT system emerged in 1989 and the technology was later acquired by Quantum Corporation in 1994.
- A number of OEMs have subsequently licensed the technology primarily for the purpose of manufacturing automated tape libraries.
- Effectively, DLT is an adaptation of the old reel to reel magnetic recording method where the tape cartridge performs as one reel and the tape drive as the other.

Storage

Types of Tapes - Digital Linear Tape(DLT):

- DLT uses linear serpentine recording with multiple tracks on half-inch (12.7 mm) wide tape.
- The cartridges contain a single reel and the tape is pulled out of the cartridge by means of a leader tape attached to the take-up reel inside the drive.
- The drive leader tape is buckled to the cartridge leader during the load process.
- Tape speed and tension are controlled electronically via the reel motors;
- The tape is guided by 4 to 6 rollers that touch only the back side of the tape.
- The prime advantages DLT retains are higher storage capacity, higher data transfer rates, and higher reliability, mainly because the media does not physically touch the head in the drive





Storage

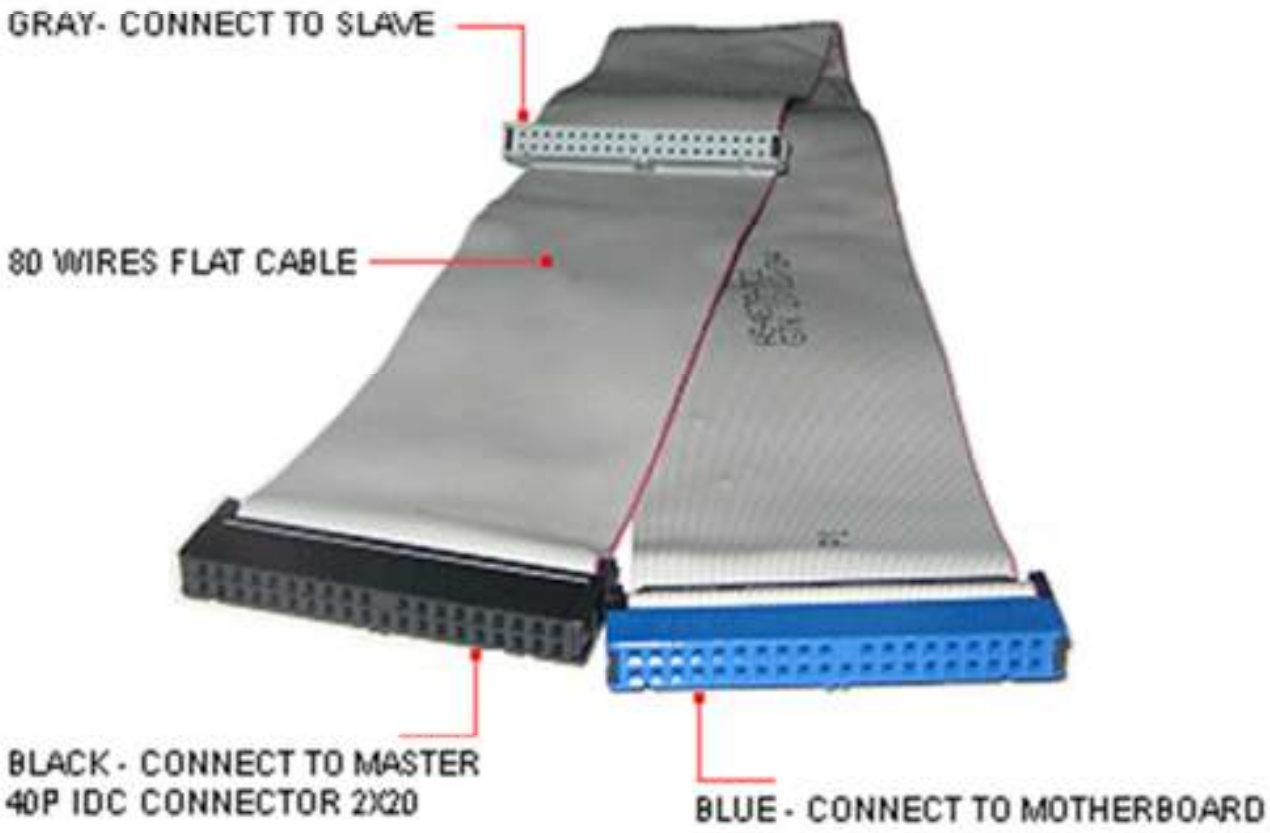
Tapes - virtual storage library:

- Virtual tape is an archival storage technology
- VTL makes it possible to save data as if it were being stored on tape although it may actually be stored on hard disk or on another storage medium.
- Benefits of virtual tape systems include better backup and recovery times and lower operating costs.
- The shift to VTL also eliminates streaming problems that often impair efficiency in tape drives as disk technology does not rely on streaming and can write effectively regardless of data transfer speeds.

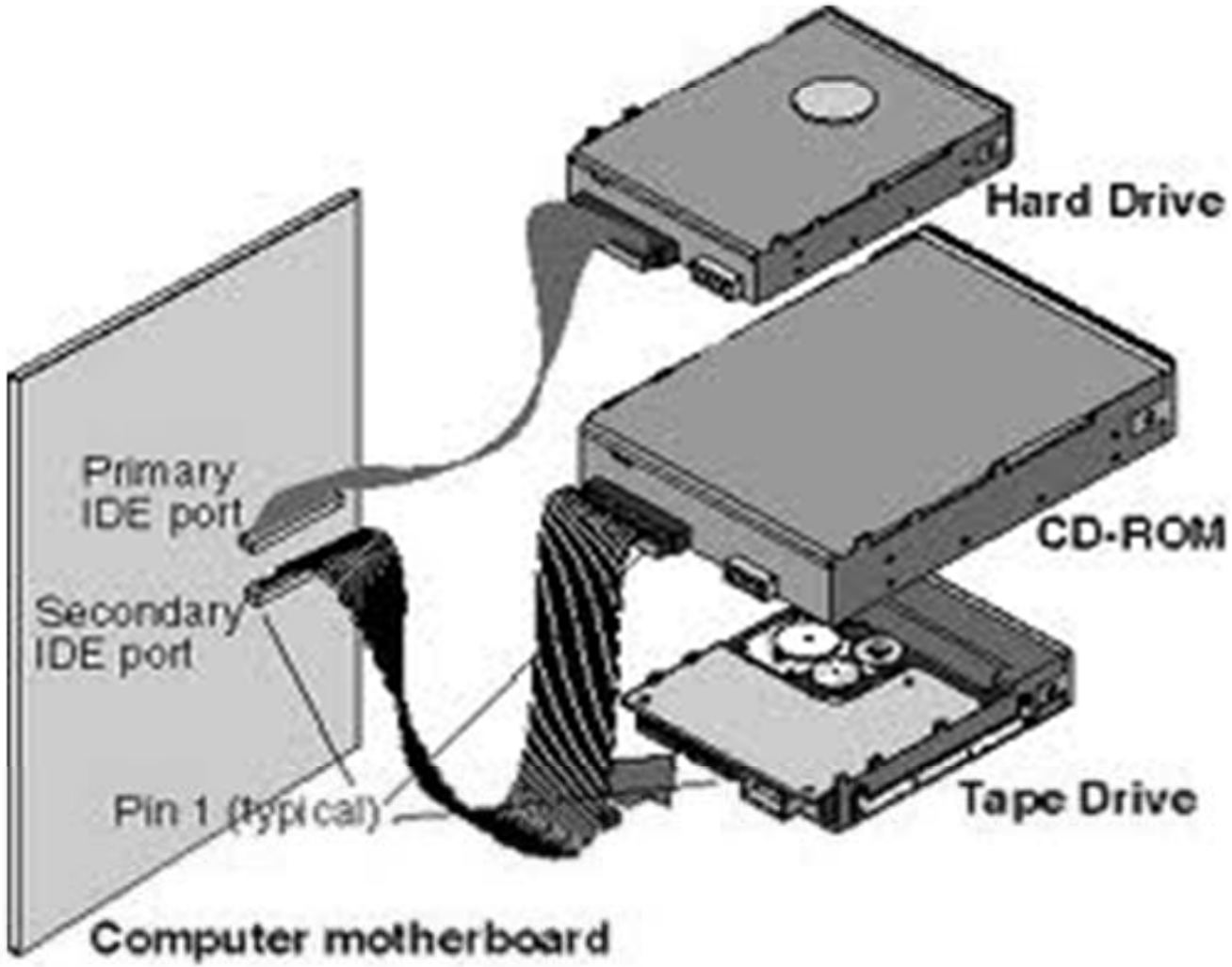
Types of Hard Disk Interface

- IDE
- SCSI
- SATA

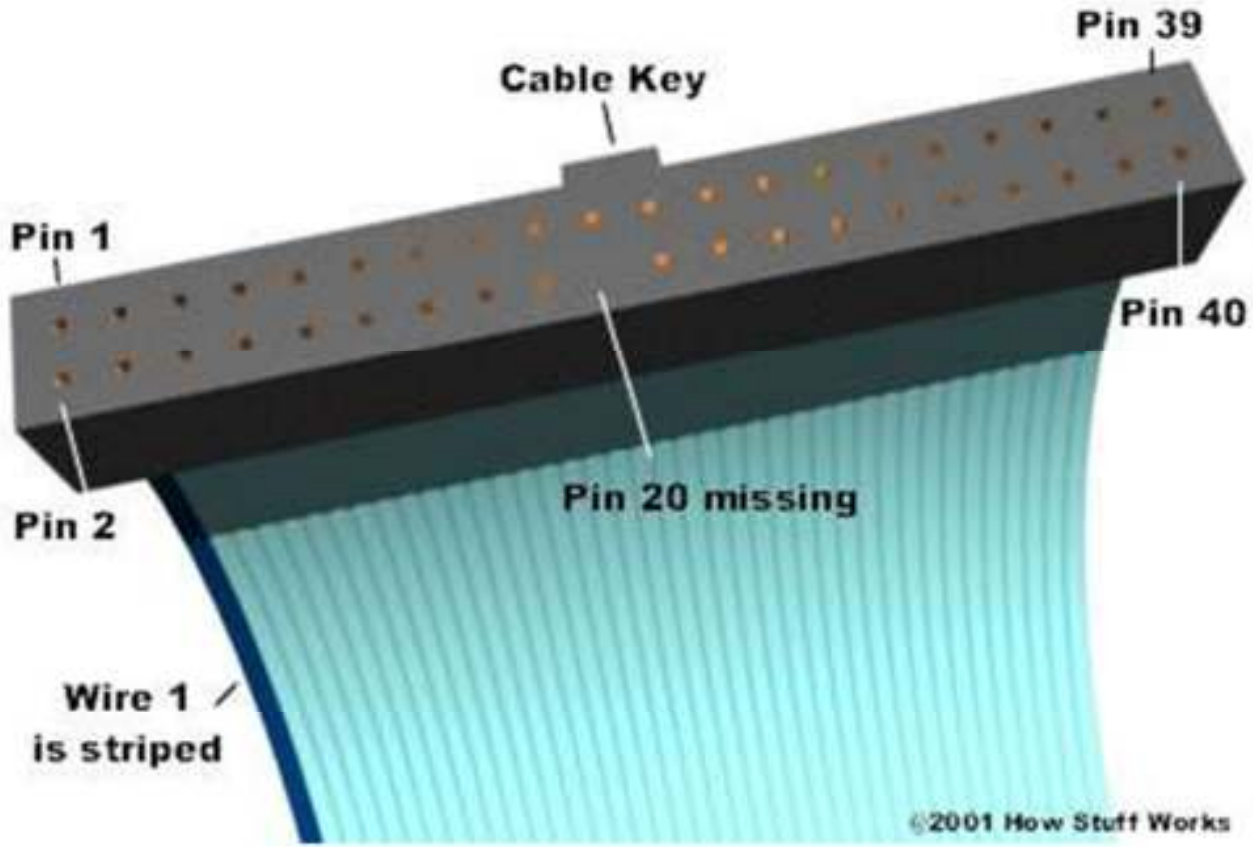
IDE Cable:



IDE Cable:



IDE Connector:



Pin	Description	Pin	Description
1	Reset	23	-IOW
2	Ground	24	Ground
3	Data Bit 7	25	-IOR
4	Data Bit 8	26	Ground
5	Data Bit 6	27	I/O Channel Ready
6	Data Bit 9	28	SPSYNC: Cable Select
7	Data Bit 5	29	-DACK 3
8	Data Bit 10	30	Ground
9	Data Bit 4	31	RQ 14
10	Data Bit 11	32	-IOCS 16
11	Data Bit 3	33	Address Bit 1
12	Data Bit 12	34	-PDIAG
13	Data Bit 2	35	Address Bit 0
14	Data Bit 13	36	Address Bit 2
15	Data Bit 1	37	-CS1FX
16	Data Bit 14	38	-CS3FX
17	Data Bit 0	39	-DA/SP
18	Data Bit 15	40	Ground
19	Ground	41	+5 Volts (Logic) (Optional)
20	Cable Key (pin missing)	42	+5 Volts (Motor) (Optional)
21	DRQ 3	43	Ground (Optional)
22	Ground	44	-Type (Optional)

SCSI:

Interface Types

- Standard SCSI
- Wide SCSI

SCSI Identifiers:

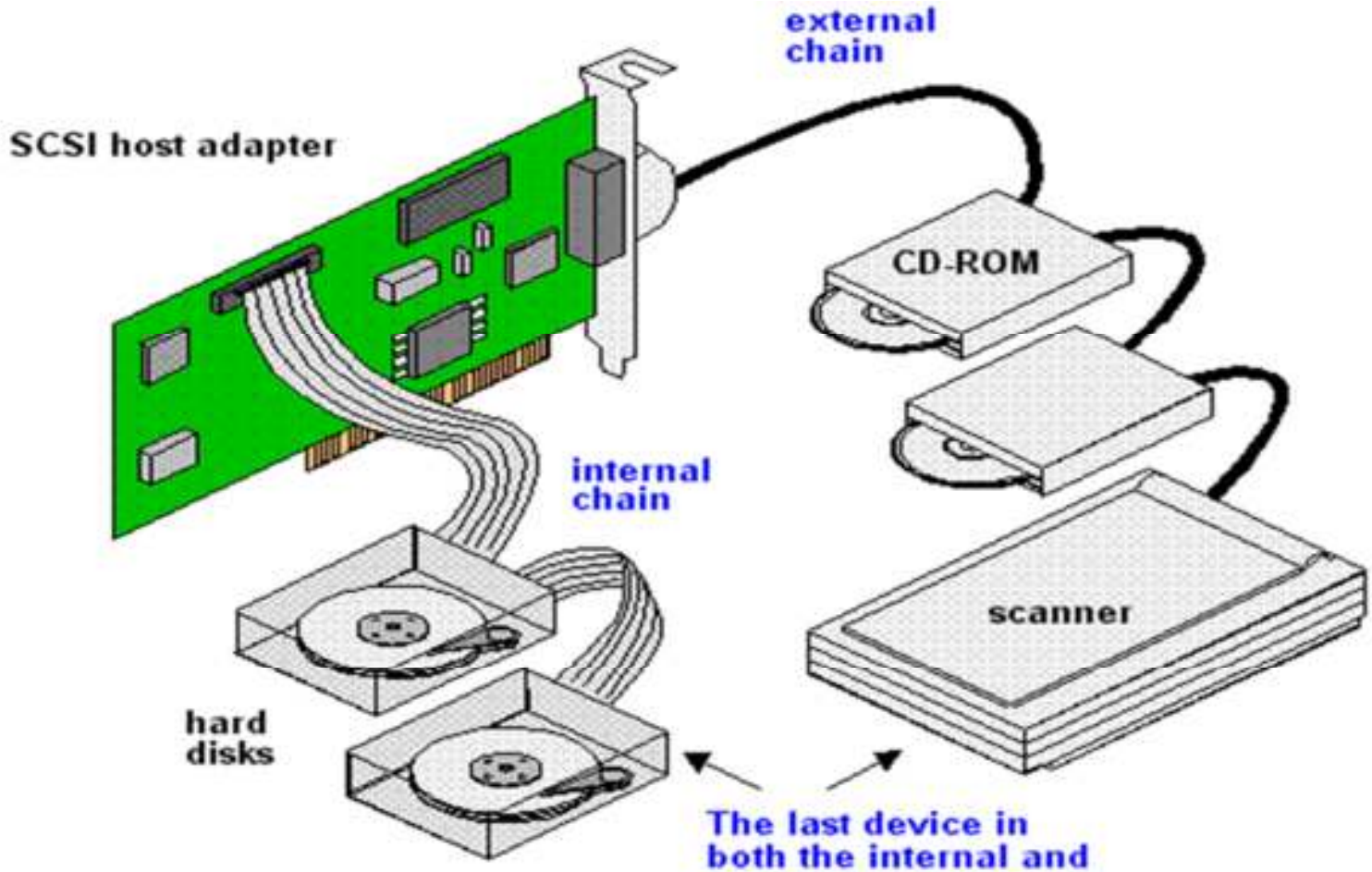
- Controller
- Device
- Cable
- Connectors

Interface Types

SCSI Controller:

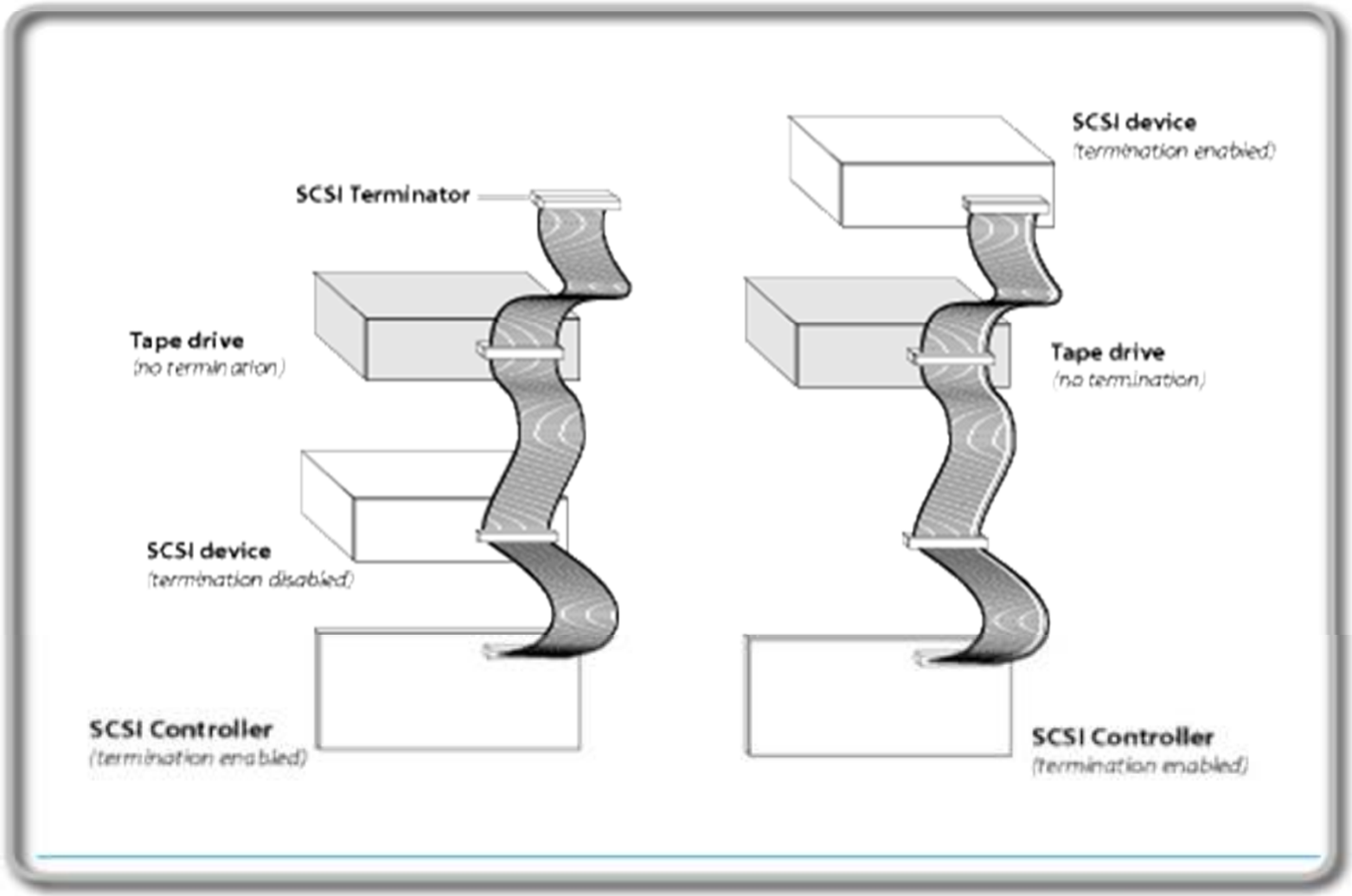
Interface Types

SCSI Device



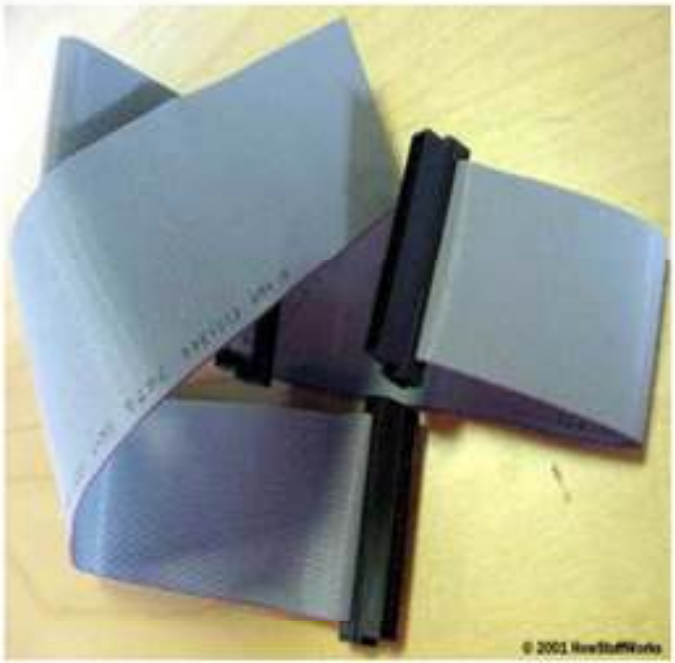
Interface Types

SCSI Terminator:



Interface Types

SCSI Cable:



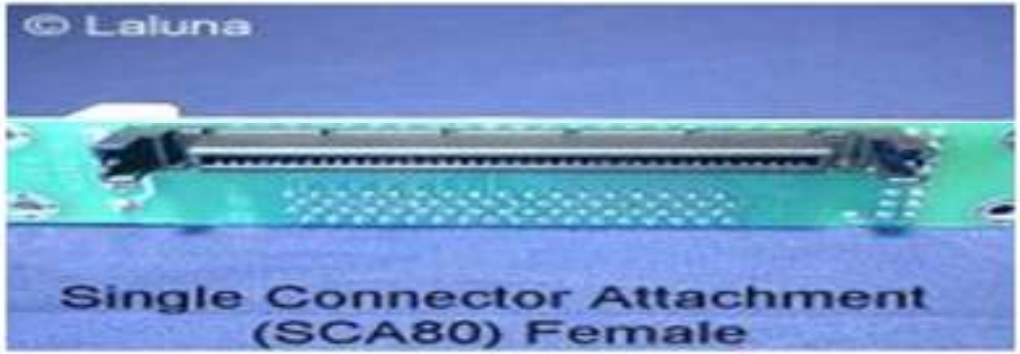
Interface Types

SCSI Connectors:

SCSI 50 Pin Connector

SCSI 68 Pin Connector

SCSI 80 Pin Connector



Interface Types

SCSI Types:

- SCSI-1
- SCSI-2
- SCSI-3

Name	Specification	# of Devices	Bus Width	Bus Speed	MBps
Asynchronous SCSI	SCSI-1	8	8 bits	5 MHz	4 MBps
Synchronous SCSI	SCSI-1	8	8 bits	5 MHz	5 MBps
Wide	SCSI-2	16	16 bits	5 MHz	10 MBps
Fast	SCSI-2	8	8 bits	10 MHz	10 MBps
Fast/Wide	SCSI-2	16	16 bits	10 MHz	20 MBps
Ultra	SCSI-3 SPI	8	8 bits	20 MHz	20 MBps
Ultra/Wide	SCSI-3 SPI	8	16 bits	20 MHz	40 MBps
Ultra2	SCSI-3 SPI-2	8	8 bits	40 MHz	40 MBps
Ultra2/Wide	SCSI-3 SPI-2	16	16 bits	40 MHz	80 MBps
Ultra3	SCSI-3 SPI-3	16	16 bits	40 MHz	160 MBps
Ultra320	SCSI-3 SPI-4	16	16 bits	80 MHz	320 MBps

SATA:

Interface Types

- Hot plugging
- Native command queuing

SATA Revisions:

- SATA revision 1.0 (1.5 Gbit/s)
- SATA revision 2.0 (3 Gbit/s)
- SATA revision 3.0 (6 Gbit/s)

SATA Cables:

- Data Connector
- Power Connector
  - Standard
  - Slim Line
- ESATA

SATA Data Connector:

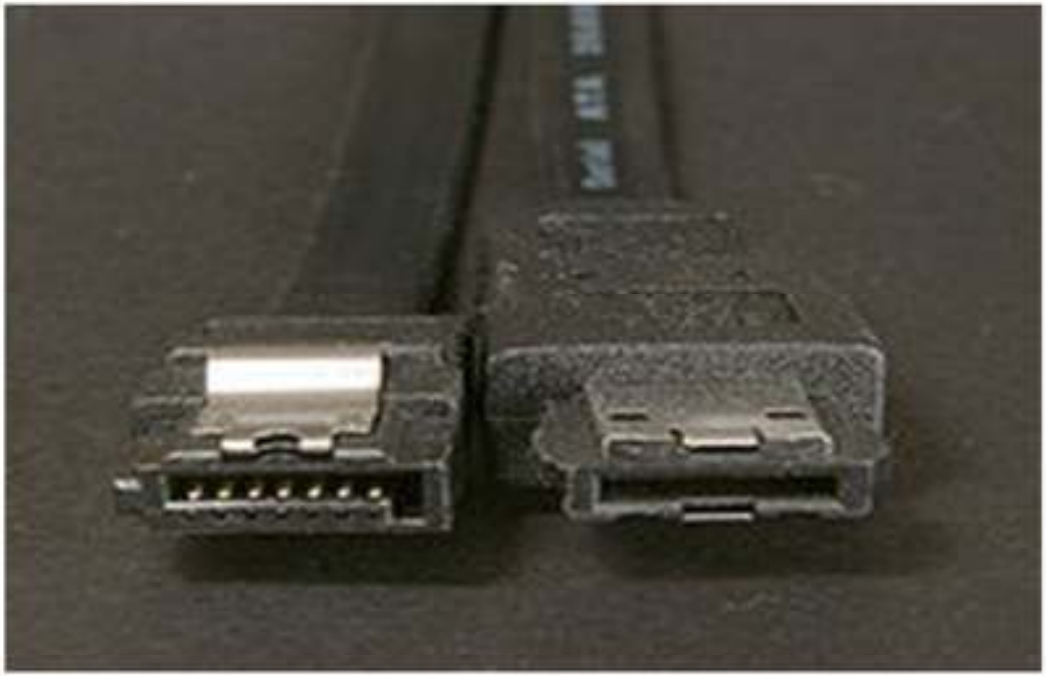
PIN#	FUNCTION
1	GROUND
2	A+ (transmit)
3	A- (transmit)
4	GROUND
5	B- (receive)
6	B+ (receive)
7	GROUND

Power Connector:

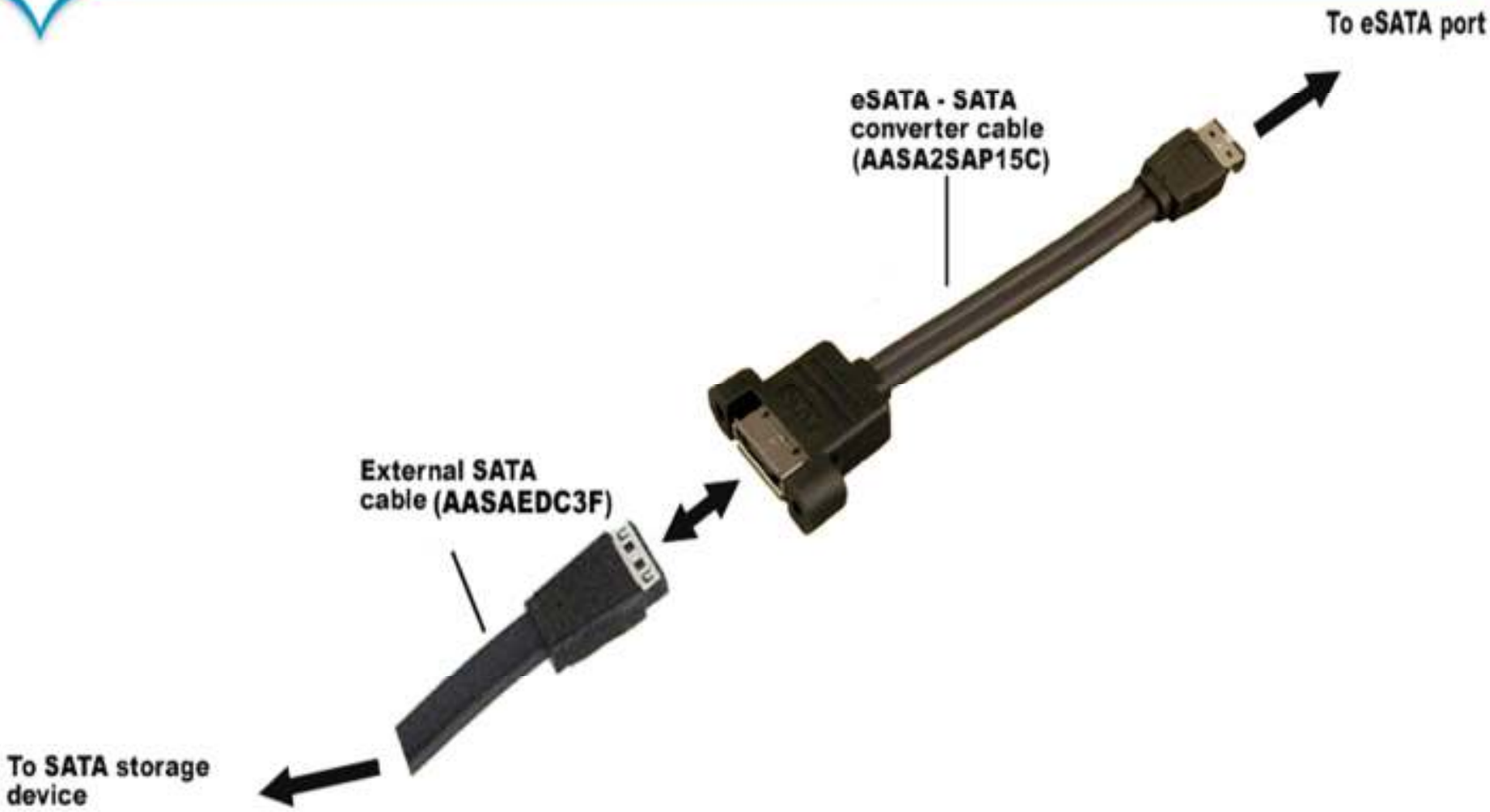
STANDARD

SLIM LINE

ESATA:



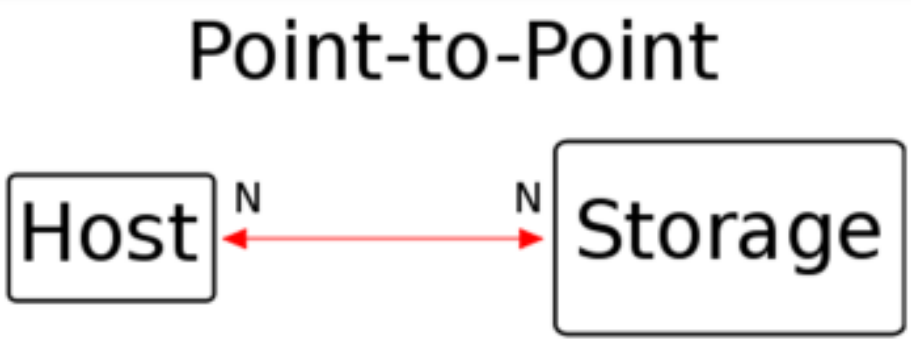
SATA to ESATA:



Thank you

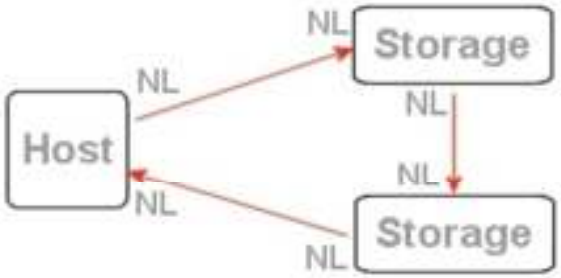
Interface Types

Fiber Channel P2P:

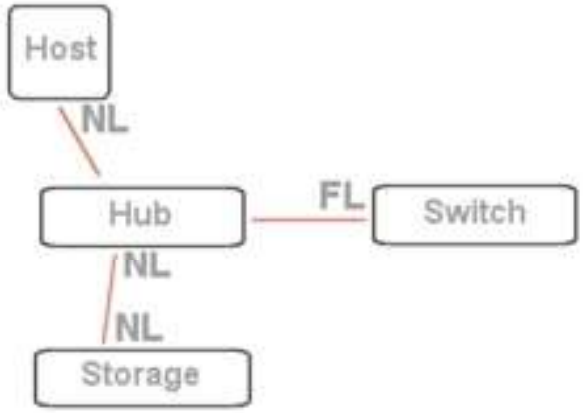


Fiber Channel Arbitrated Loop:

Arbitrated Loop



Public Loop with Hub



Fiber modality	Speed (MByte/s)	Distance
Singlemode Fiber	1600	0.5 m - 10 km
		0.5 m - 2 km
	800	2 m - 10 km
		2 m - 1.4 km
	400	2 m - 10 km
		2 m - 4 km
		2 m - 2 km
	200	2 m - 50 km
		2 m - 10 km
		2 m - 2 km
	100	2 m - 50 km
		2 m - 10 km
		2 m - 2 km

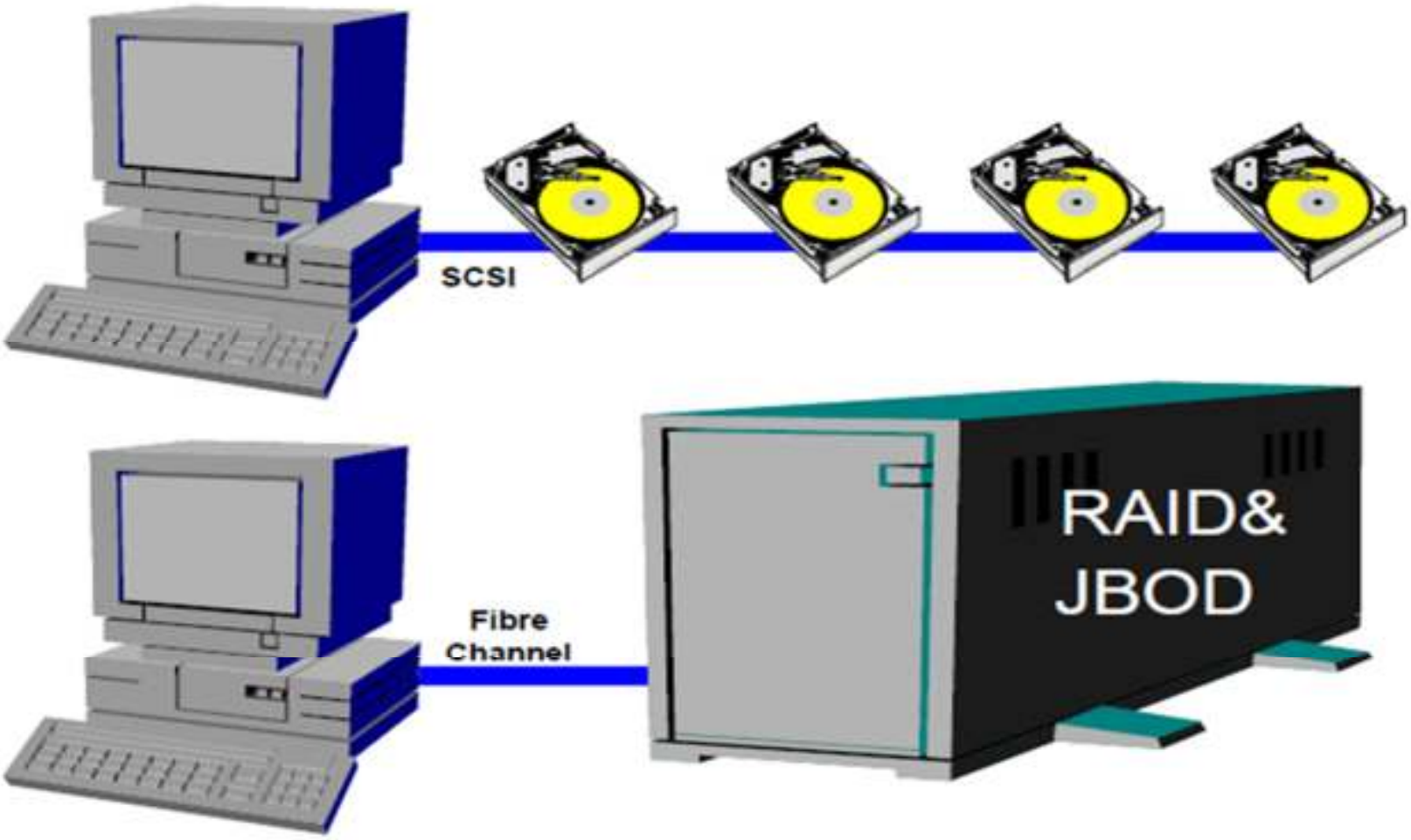
Fiber modality	Speed (MByte/s)	Distance
Multimode Fiber	1600	0.5 m - 125 m
		0.5 m - 100 m
		0.5 m - 35 m
		0.5 m - 15 m
	800	0.5 m - 190 m
		0.5 m - 150 m
		0.5 m - 50 m
		0.5 m - 21 m
	400	0.5 m - 400 m
		0.5 m - 380 m
		0.5 m - 150 m
		0.5 m - 70 m
	200	0.5 m - 500 m
		0.5 m - 300 m
		0.5 m - 150 m
	100	0.5 m - 860 m
		0.5 m - 500 m
		0.5 m - 300 m
		2 m - 500 m
		2 m - 175 m

DIRECT ATTACHED STORAGE

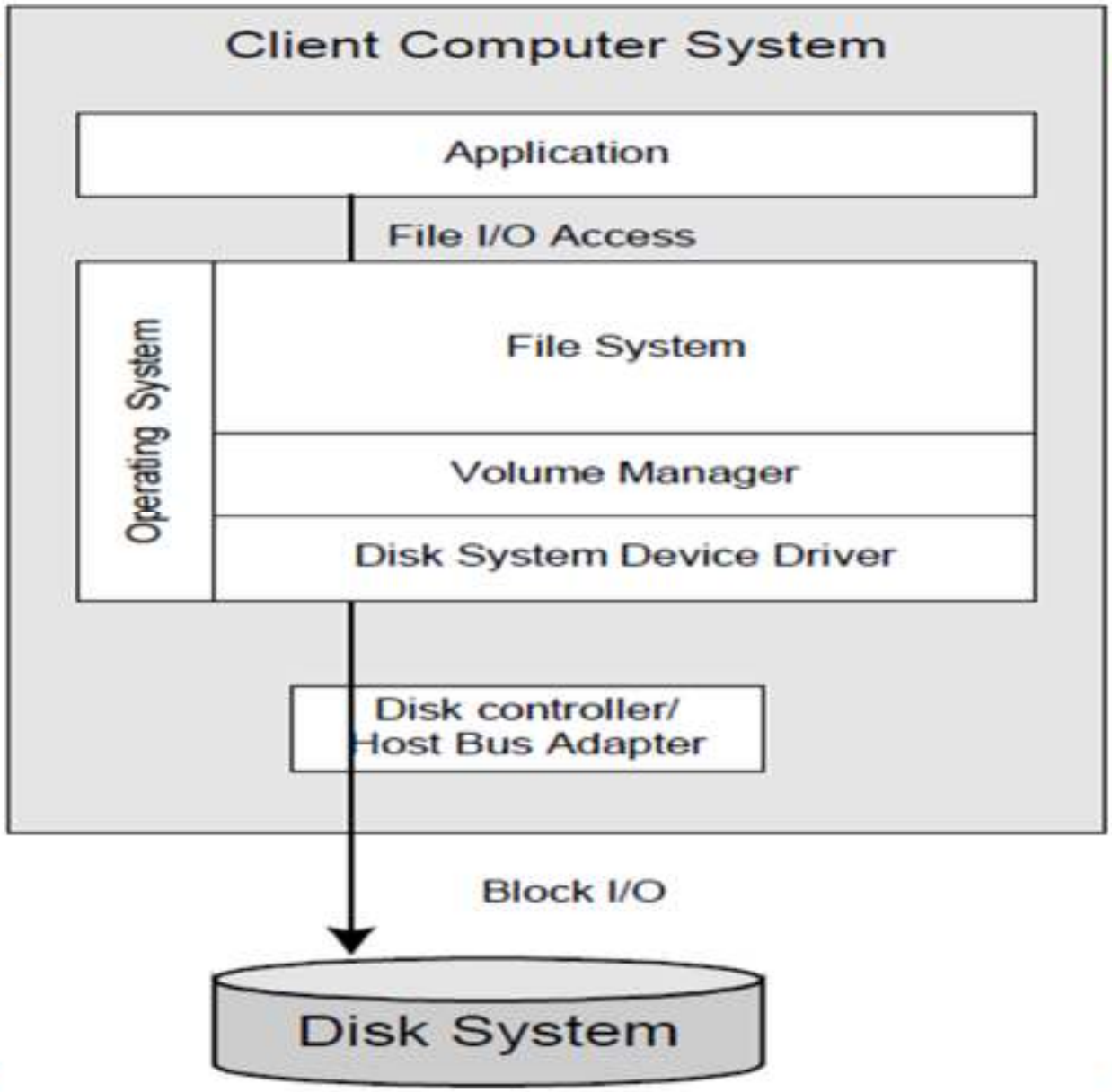
NETWORK ATTACHED STORAGE

STORAGE AREA NETWORK

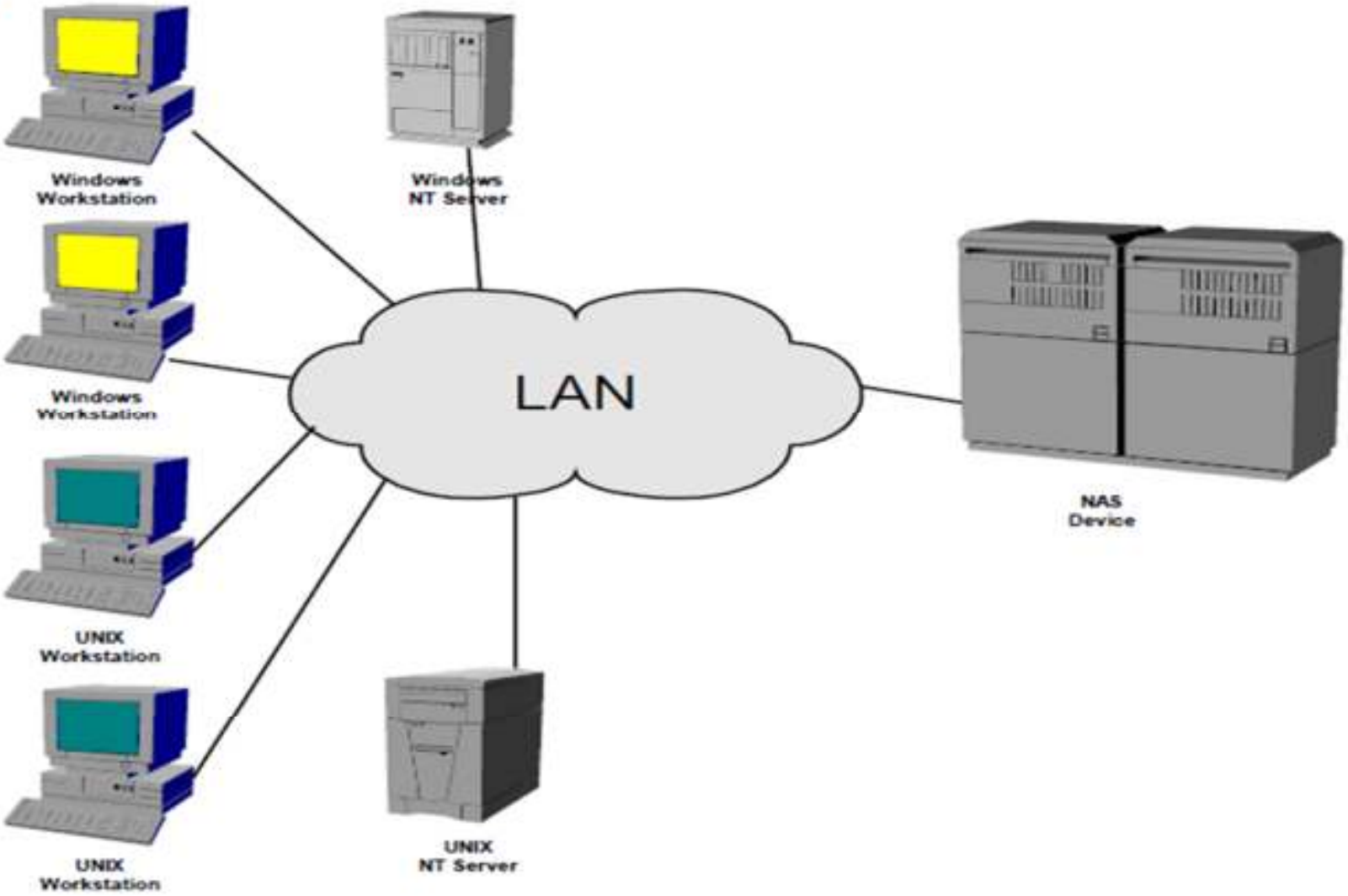
Direct Attached Storage:



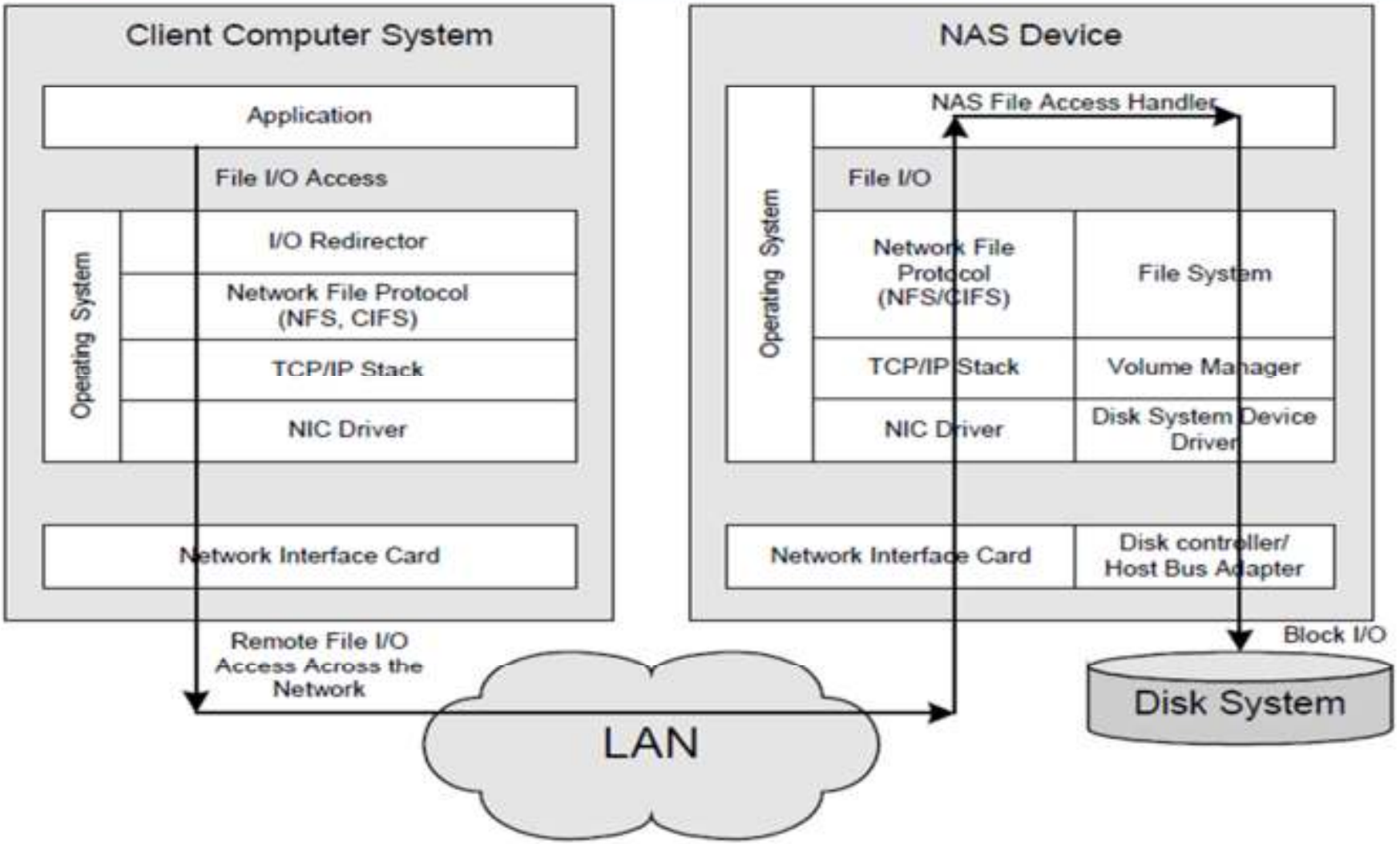
DAS Software Architecture



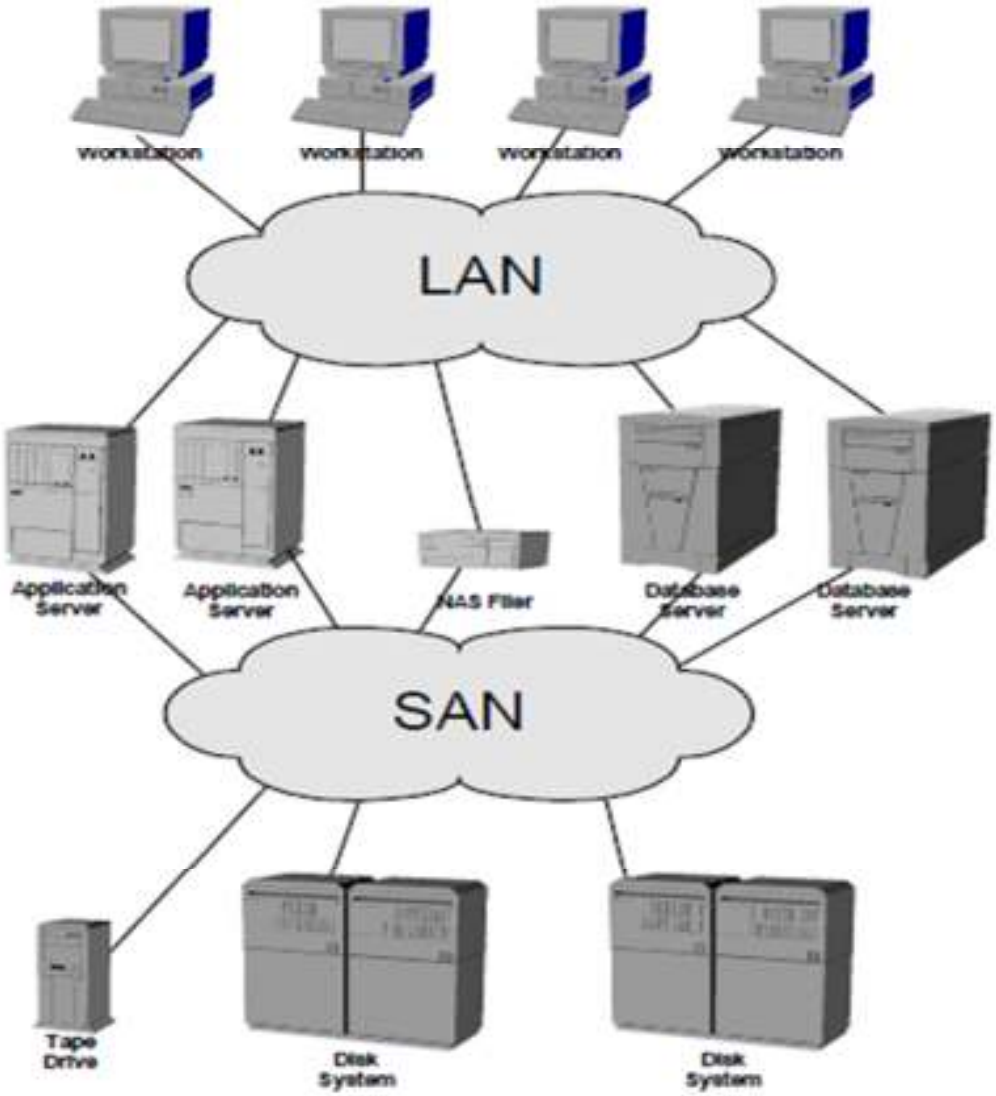
Network Attached Storage (file Oriented)



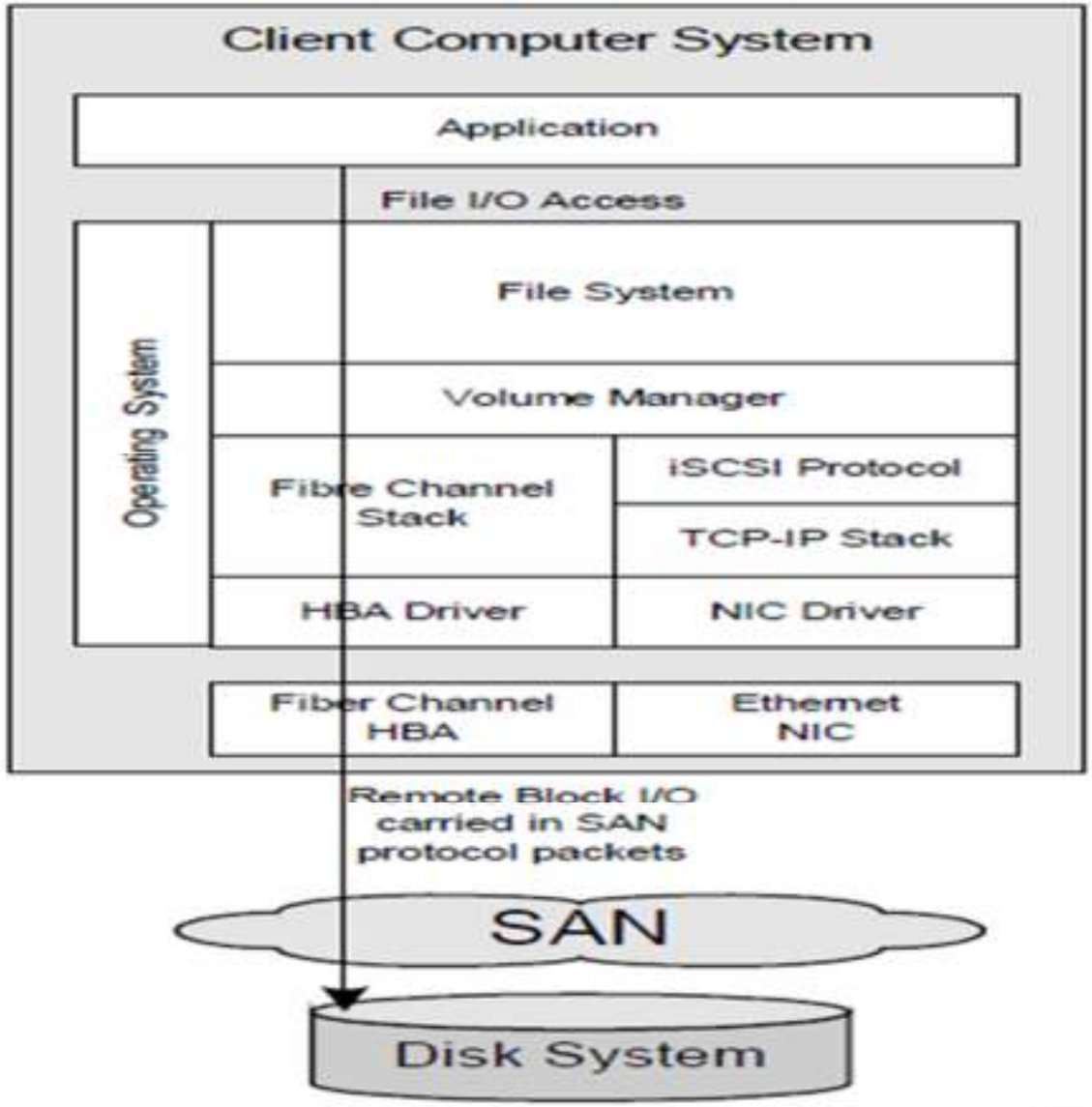
NAS Software Architecture



Storage Area Network (block Oriented)



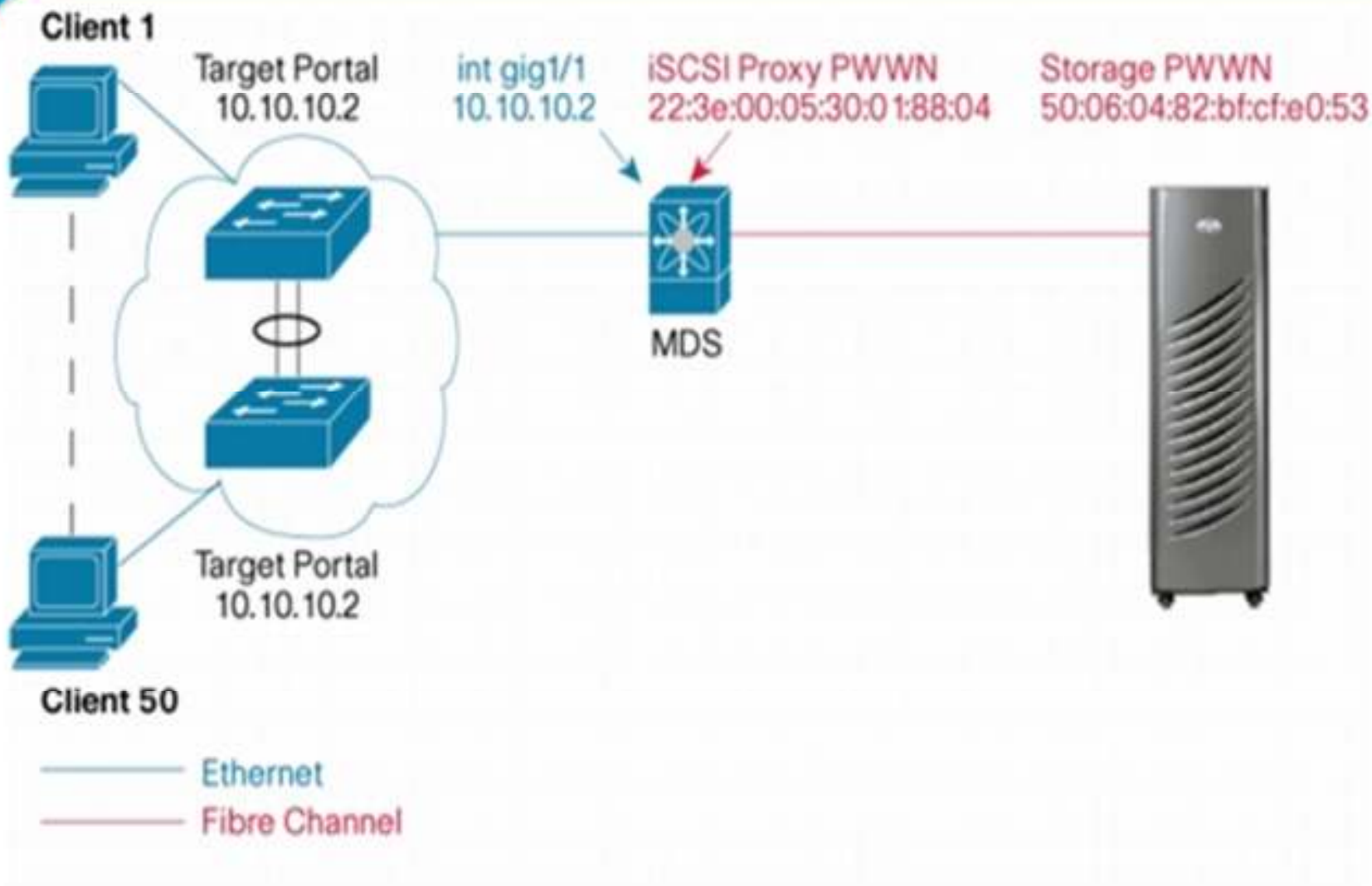
SAN Software Architecture



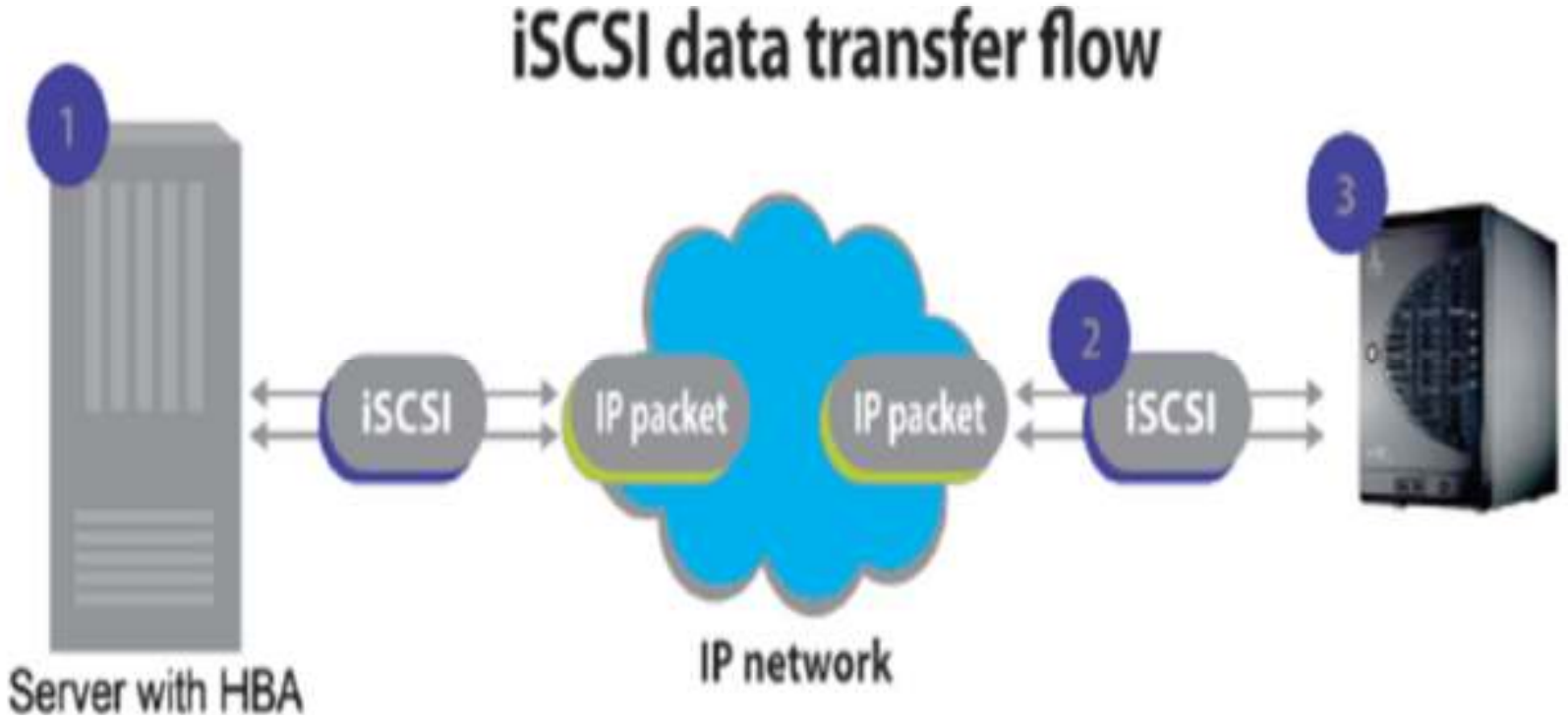
SAN - Logical Unit Number:

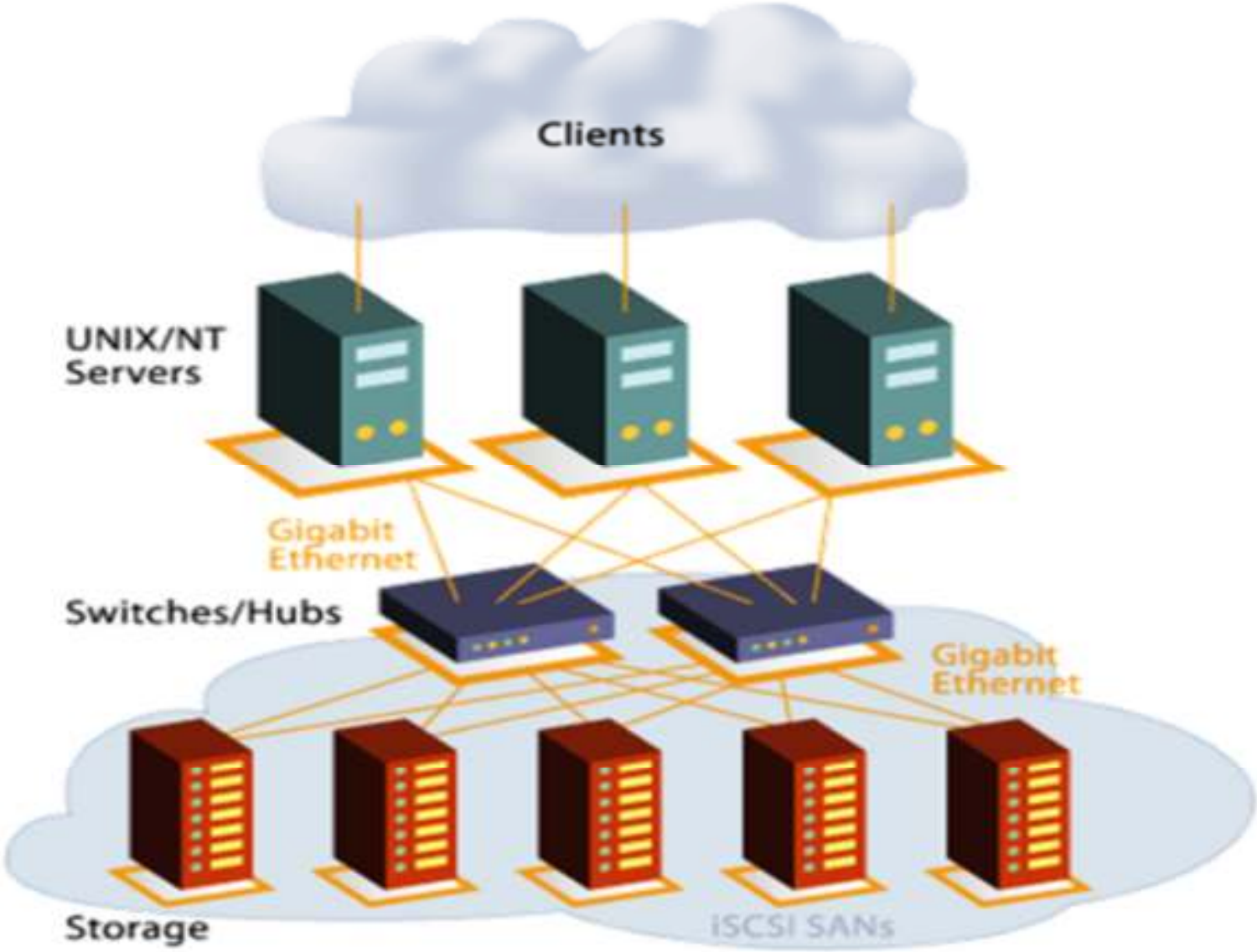
- Logical unit number is a number that is a used to identify a logical unit.
- Device addressed by the SCSI protocol or a fiber channel
- It can be used with any read write devices such as tape drive and so on.
- In SCSI it is a 64 bit identifier.

SAN - Zoning:

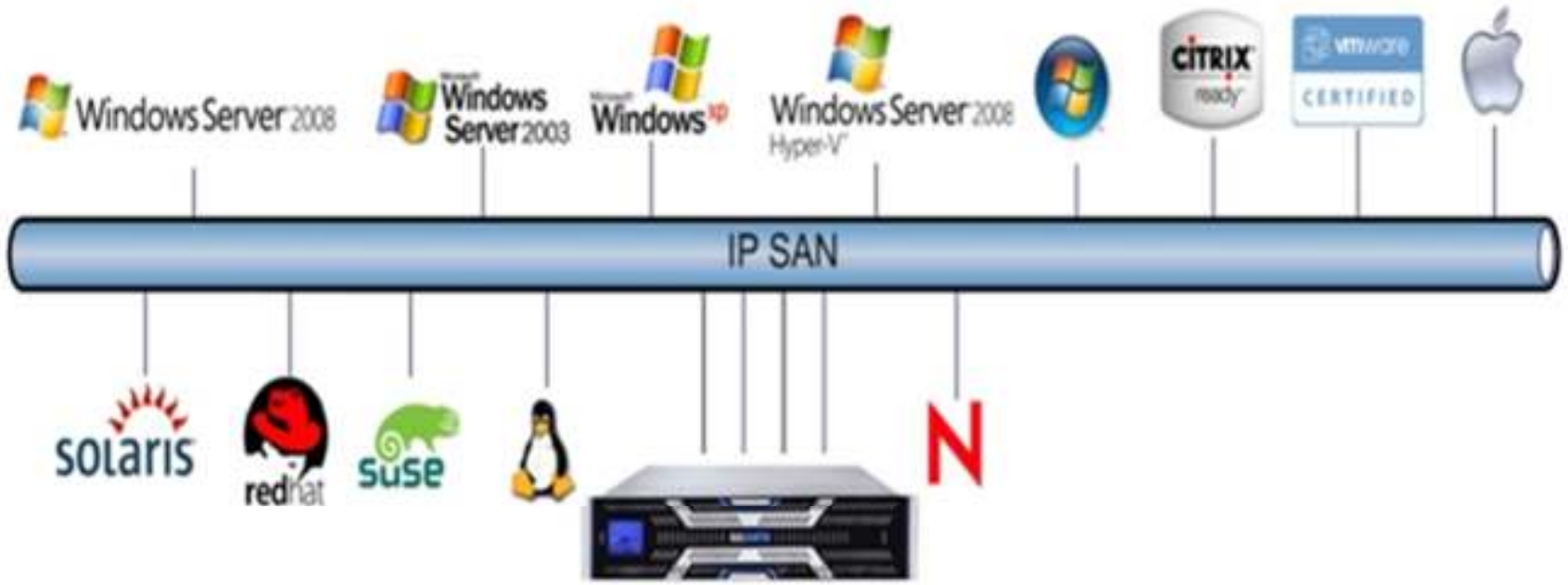


SAN - iSCSI





Supported Operating Systems for iSCSI



REDUNDANT

ARRAY OF

INDEPENDENT

DISKS

Raid Levels

RAID 0

RAID 1

RAID 2

RAID 3

RAID 4

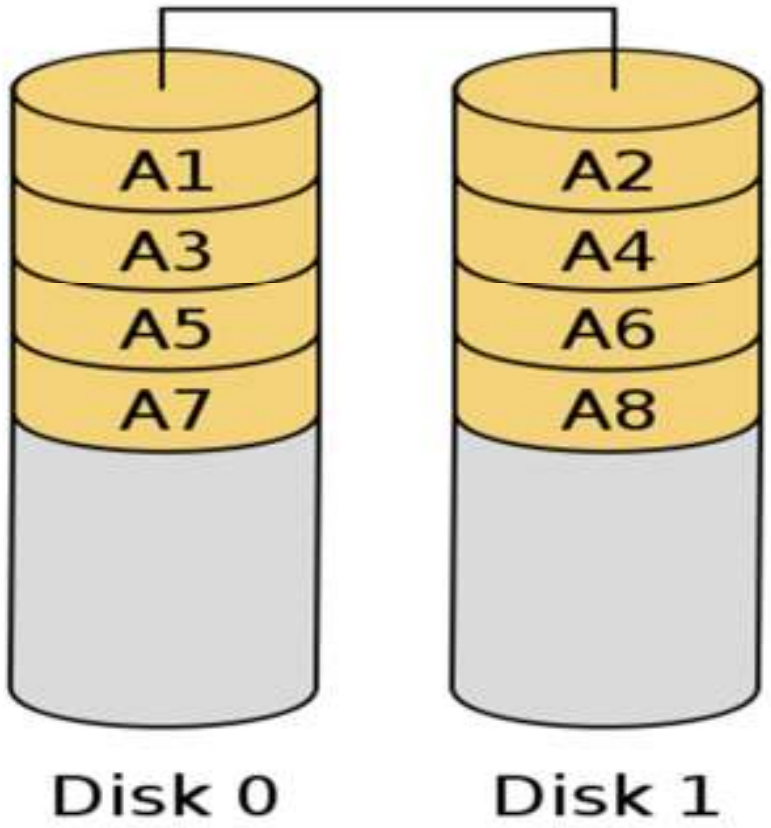
RAID 6

RAID 5

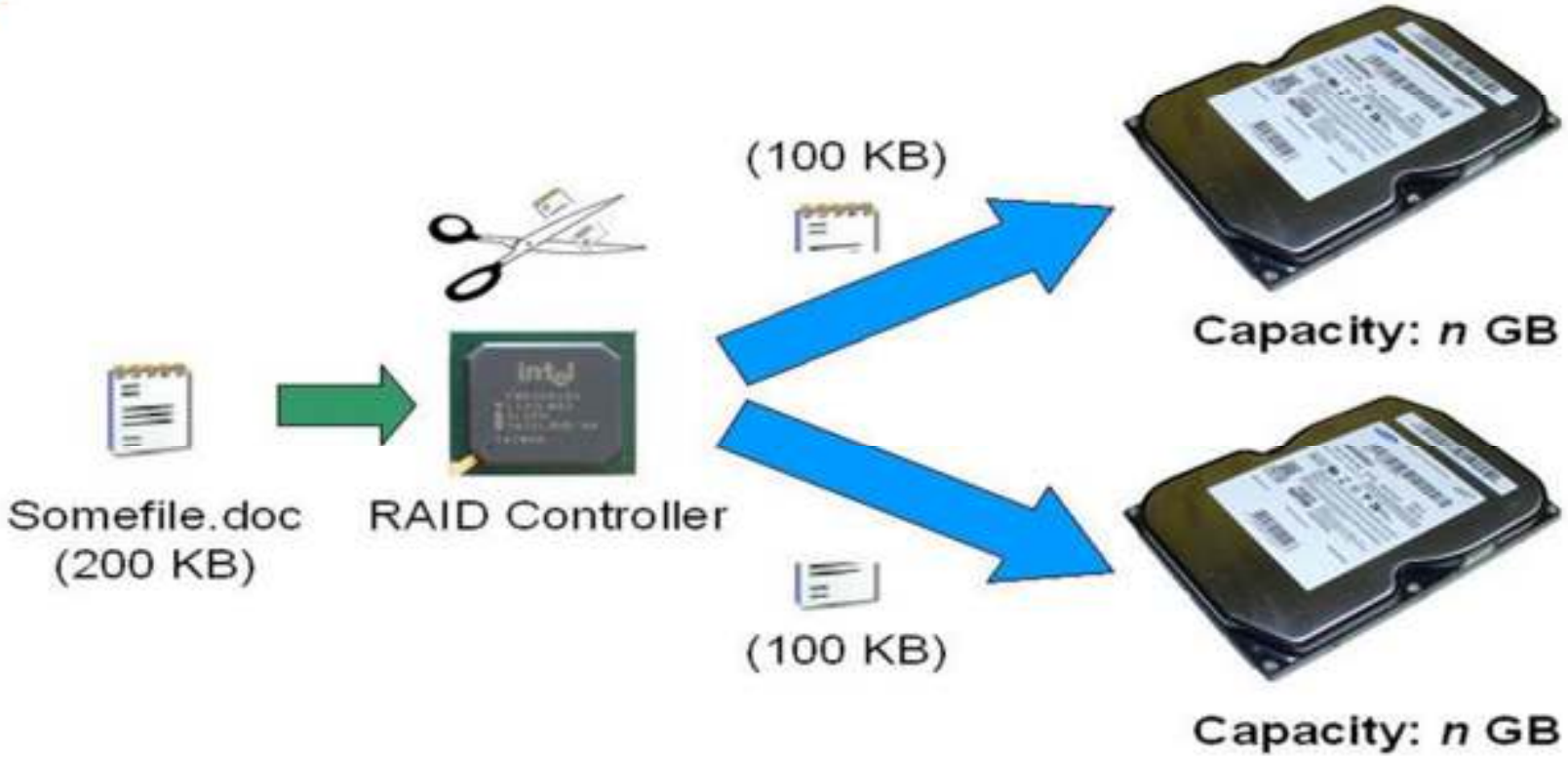
RAID 10

RAID 0

Block-level striping without parity or mirroring.



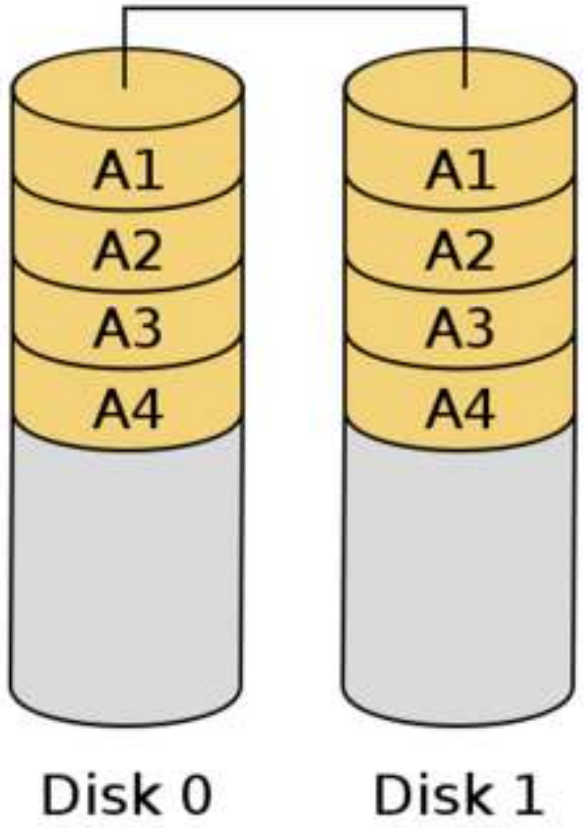
RAID 0 – Example:



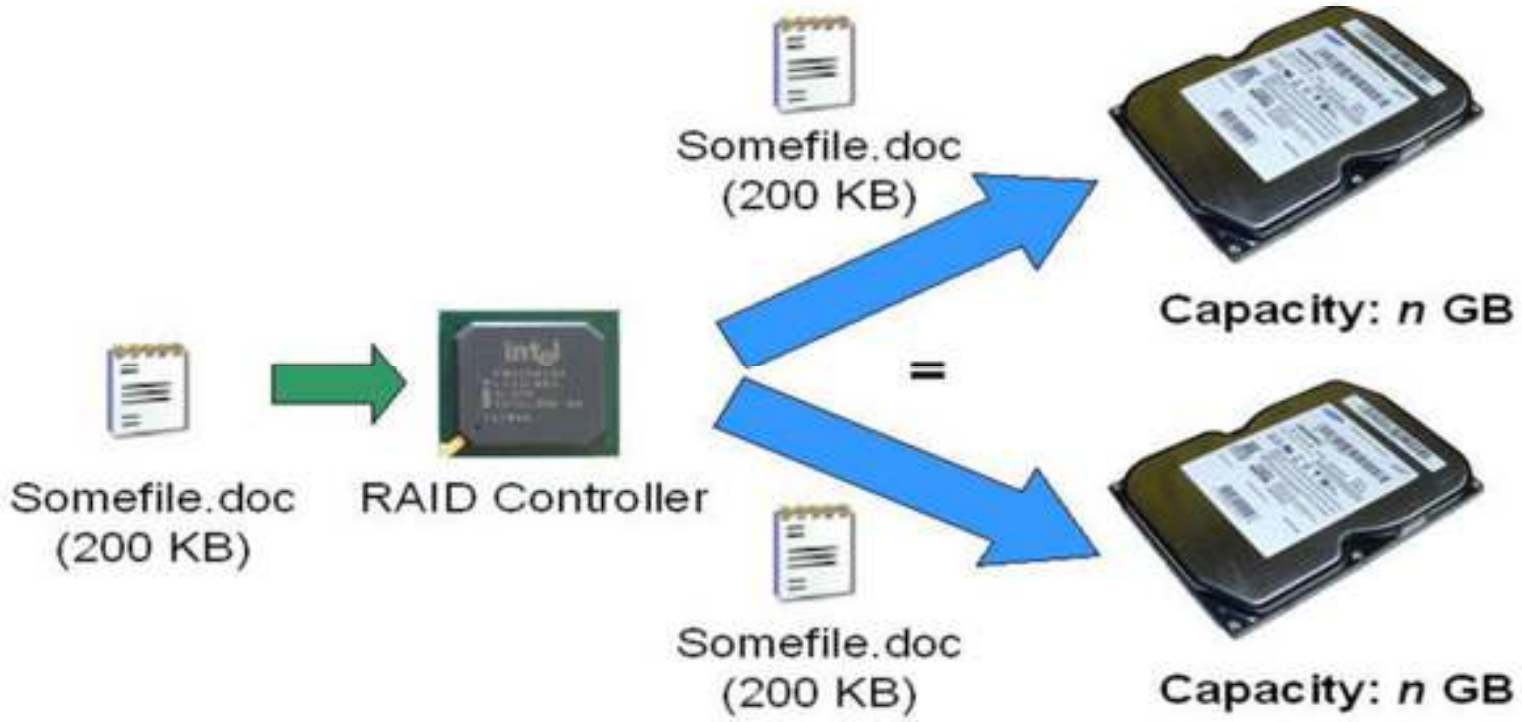
RAID0 (Data Striping)
Total Capacity: *n* x 2

RAID 1

Mirroring without parity or striping.



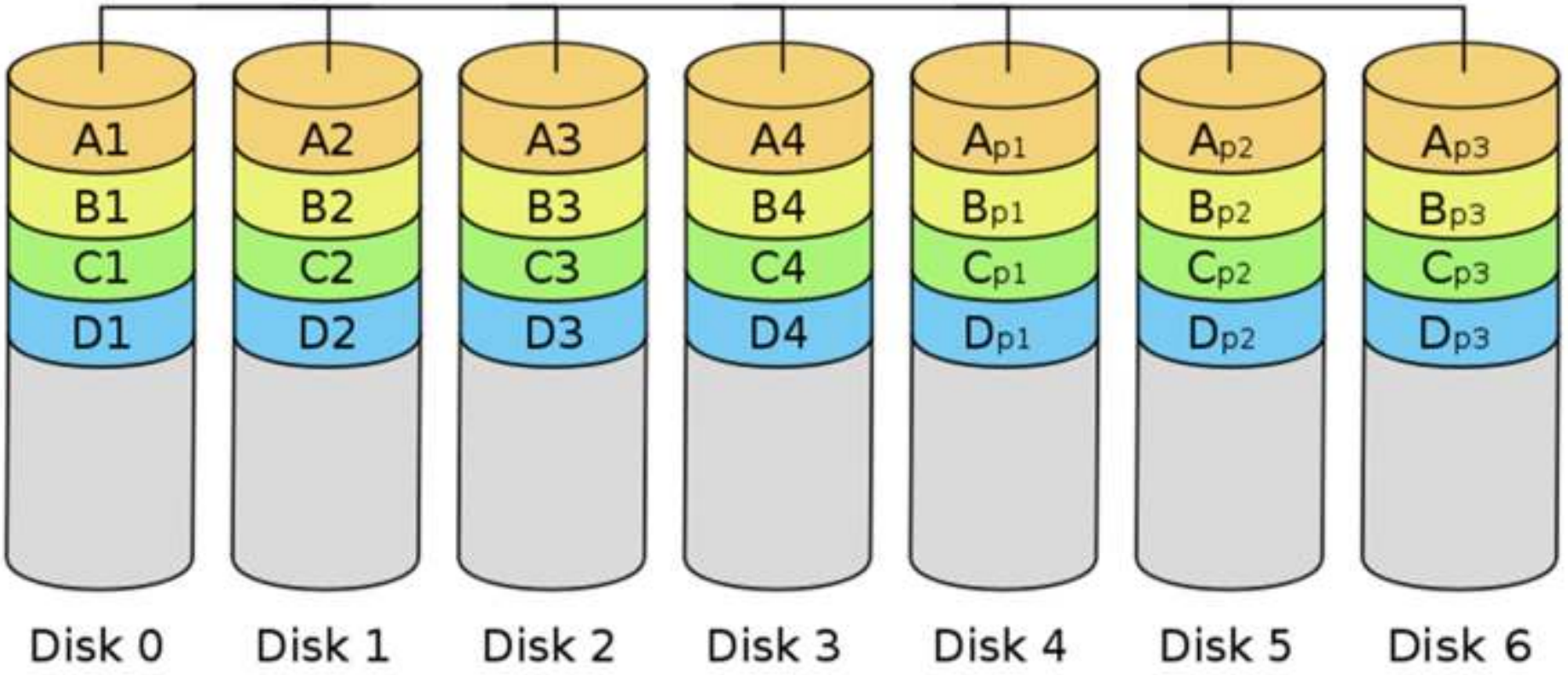
RAID 1 – Example:



RAID1 (Data Mirroring)
Total Capacity: *n* GB

RAID 2

Bit-level striping with dedicated Hamming-code parity.



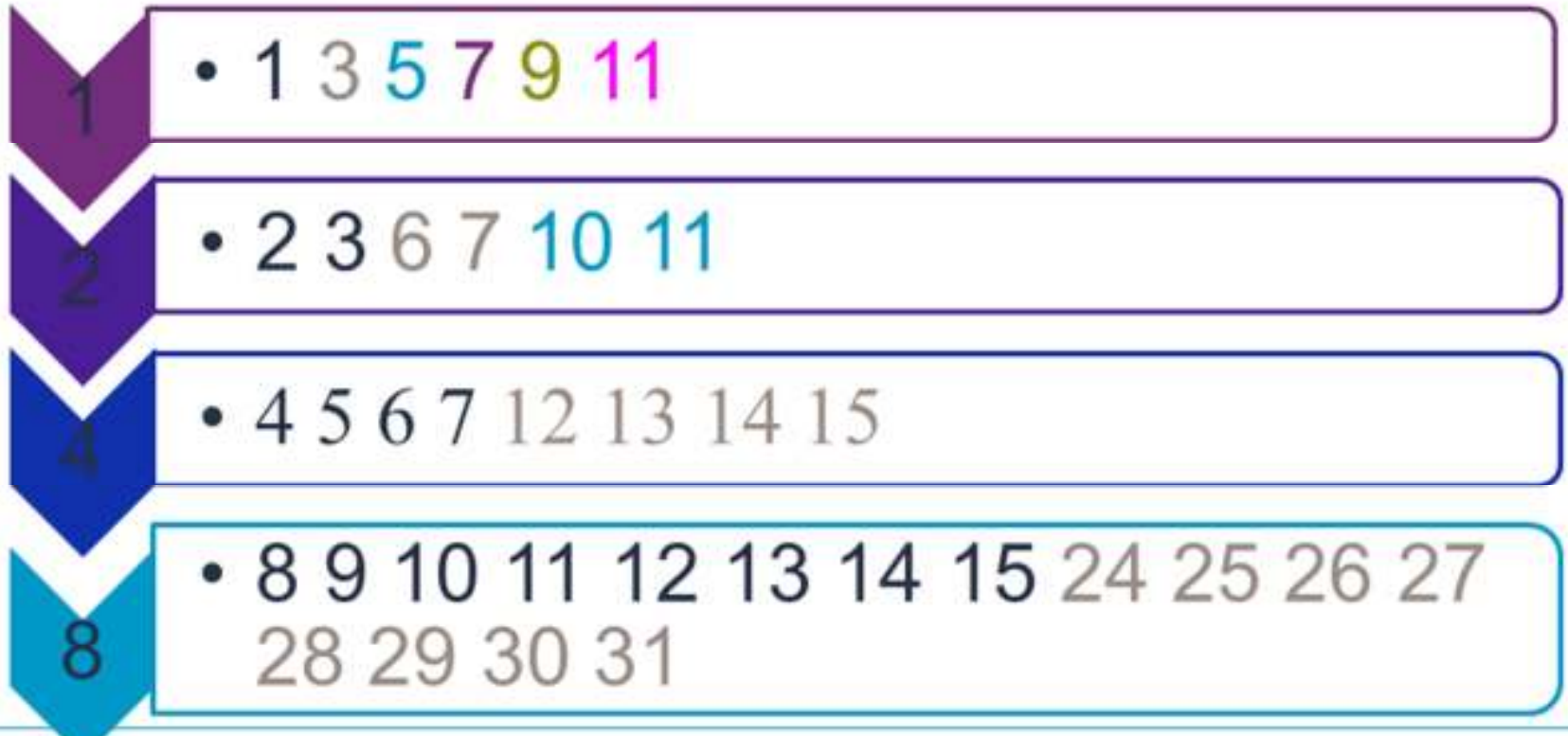
RAID 2 – Example:

How to find the **hamming code** ?

INPUT (8 Bit Data) :10010001

Note :Before that we should know parity check

PARITY CHECK



CODE WORD :

INPUT (8 Bit Data) :10010001

Step 1) 0 * 1 * 0 0 1 * 0 0 0 1

Step 2) 0 0 1 * 0 0 1 * 0 0 0 1

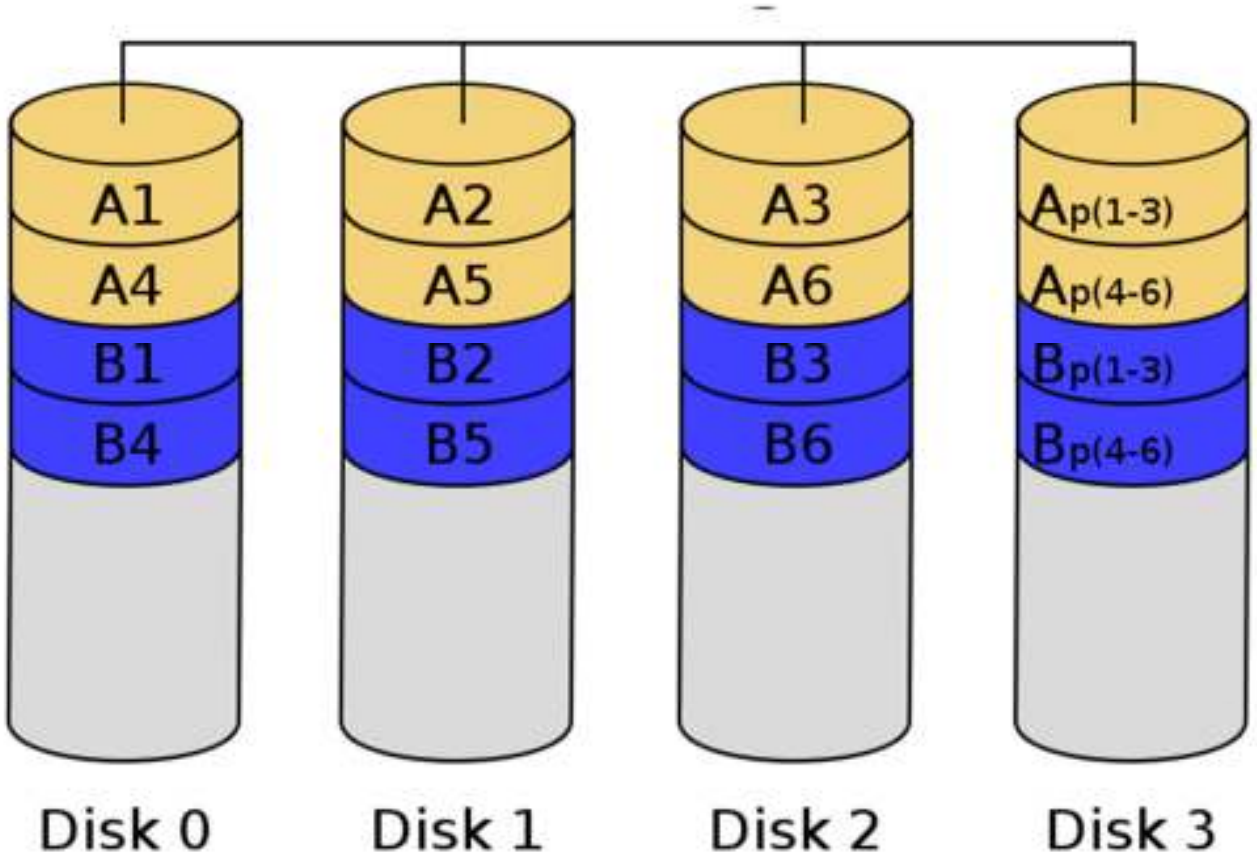
Step 3) 0 0 1 1 0 0 1 1 0 0 0 1

Answer: 0 0 1 1 0 0 1 1 0 0 0 1

RESULT = ODD = '1', EVEN = '0'

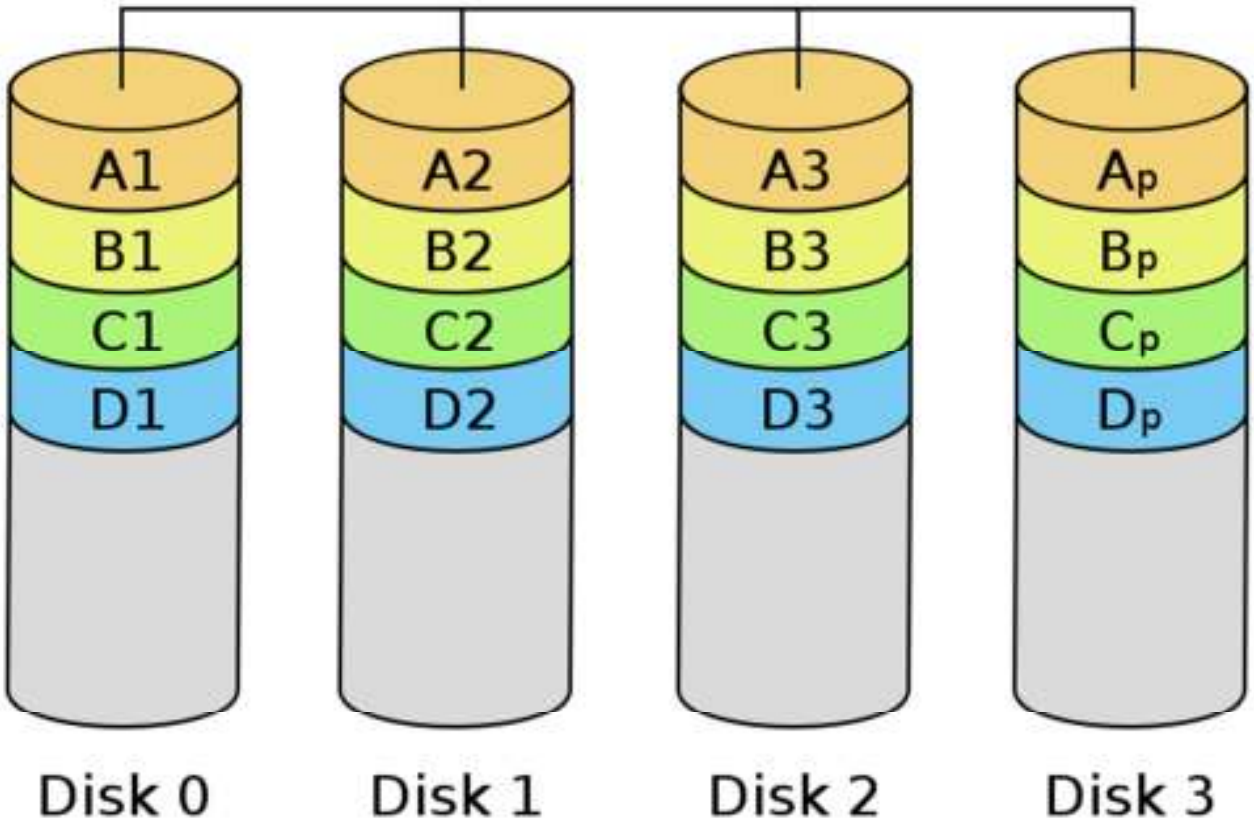
RAID 3

Byte-level striping with dedicated parity.



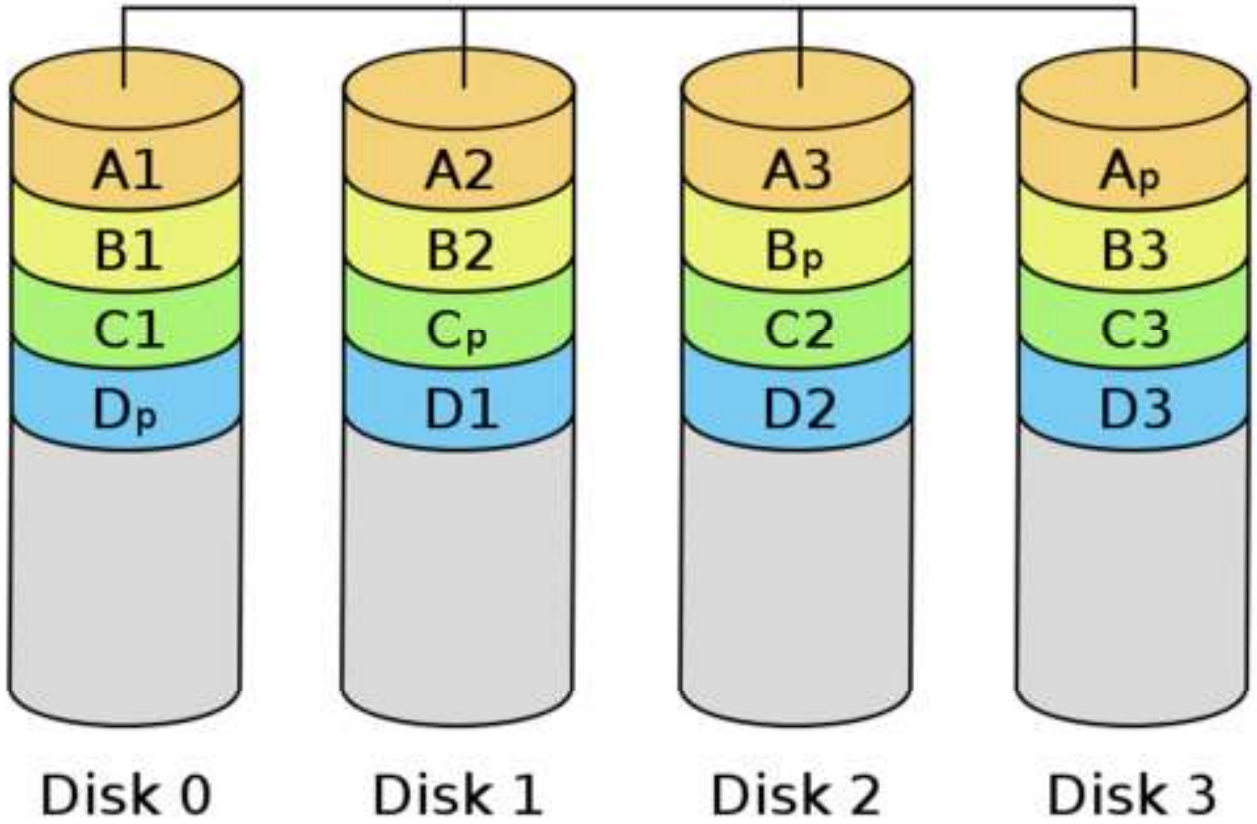
RAID 5

Block-level striping with dedicated parity.

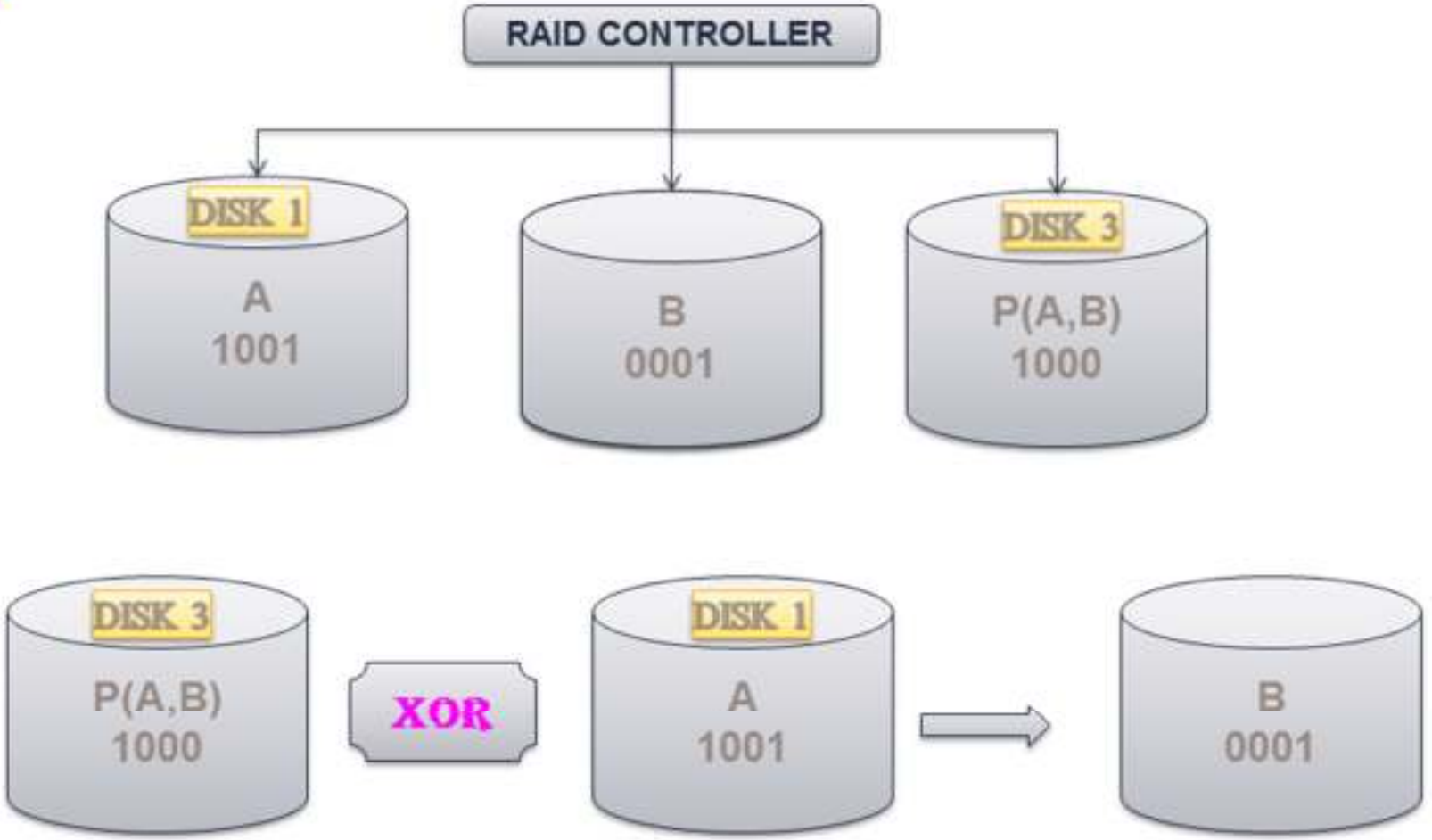


RAID 5

Block-level striping with distributed parity.

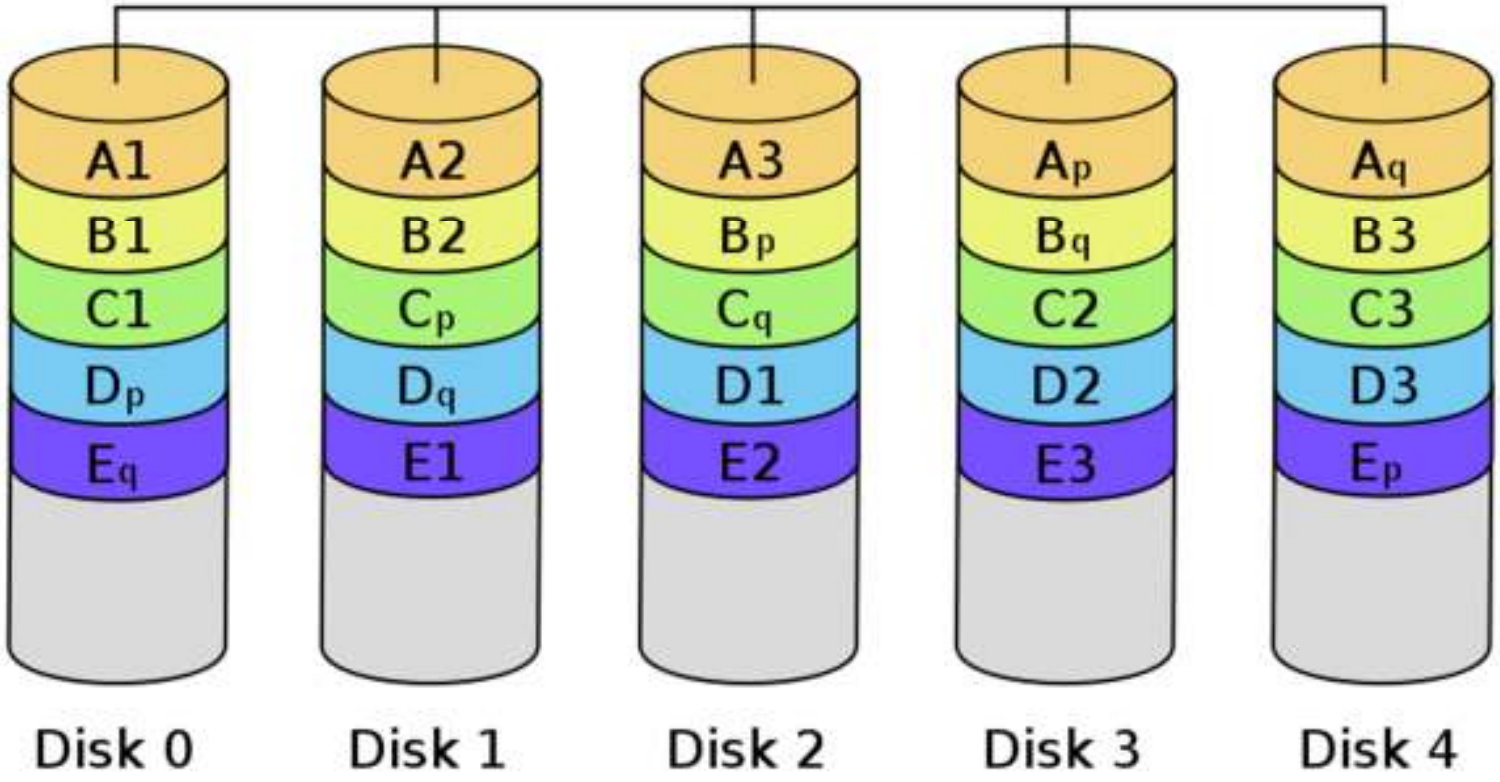


RAID 5 – Example:



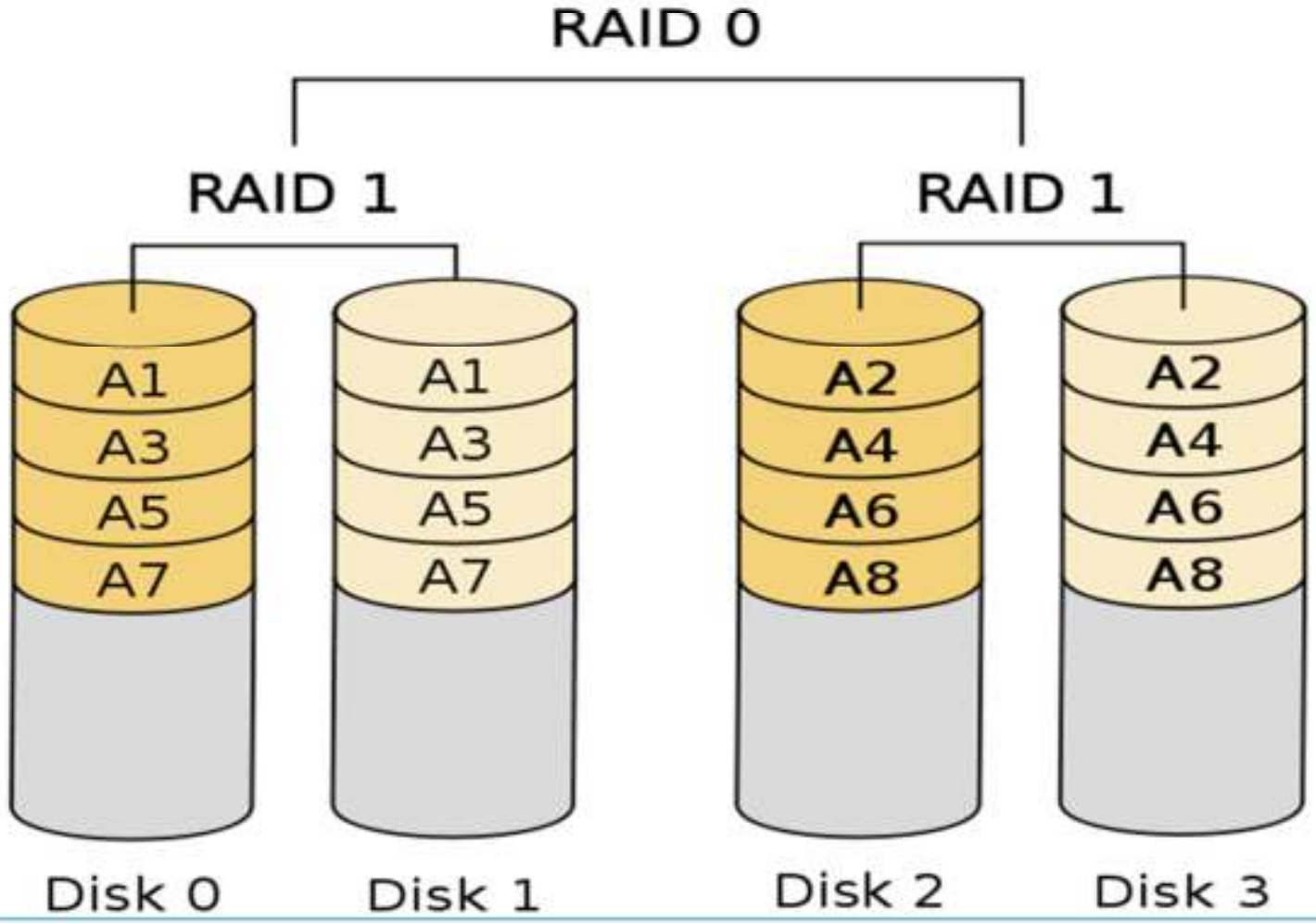
RAID 9

Block-level striping with double distributed parity.



RAID 10

Very High Reliability combined with High Performance



Thank you