APPLICATIONS
OF COMPUTER SCIENCES

PART 1

In MEDICAL IMAGING TECHNOLOGIES

By

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BY

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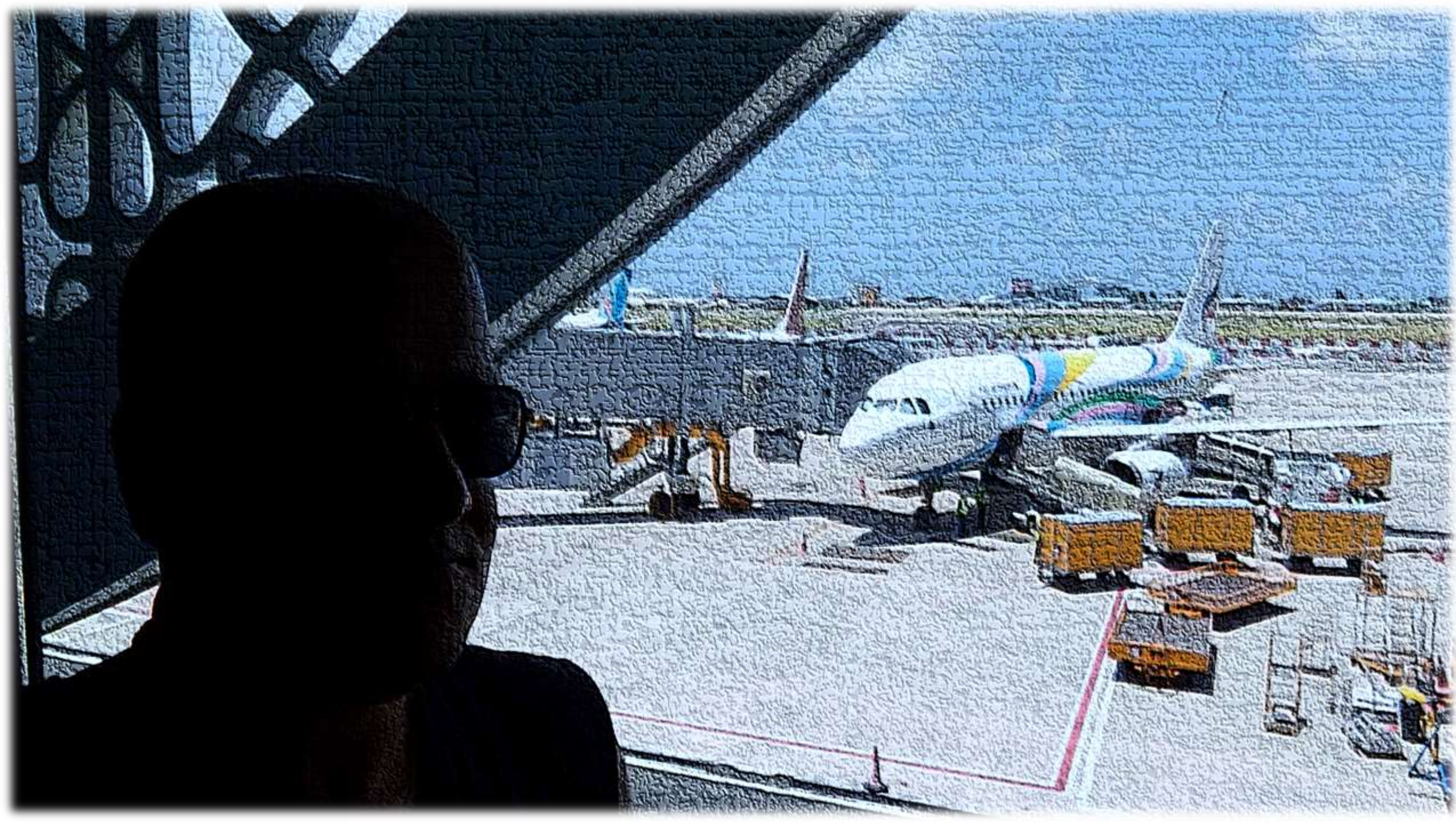
Sohag Military Hospital & Police Clinics, Egypt

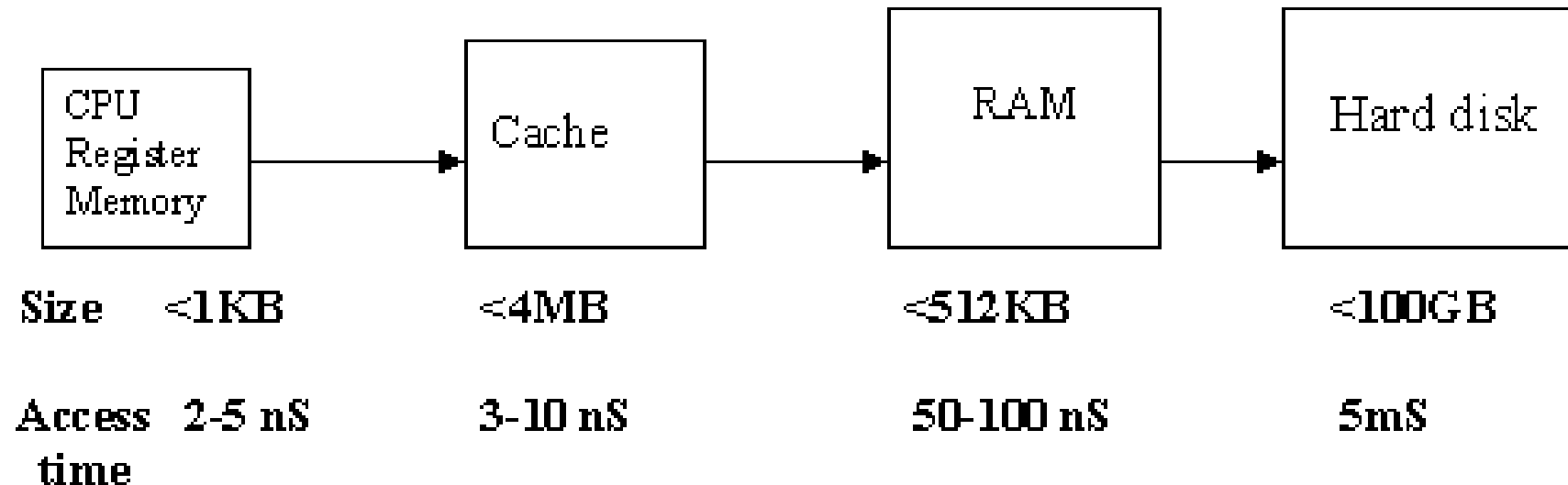*Saudi German Hospital (SGH), Hail - Olaya Medical Center (OMC) Riyadh - KSA*

LECTURE 2

Factors of Computer Performance

- ✓ **CPU** Speed
- ✓ **RAM** size
- ✓ **Hard desk** speed & capacity

CPU Register Memory		Cache		RAM		Hard disk
Size	<1KB	<4MB		<512KB		<100GB
Access time	2-5 nS	3-10 nS		50-100 nS		5mS

Computer Ports

➜ **Port :** socket that enable external device to be connected to computer.

1 Serial Ports
2 Parallel Ports
3 USB Ports
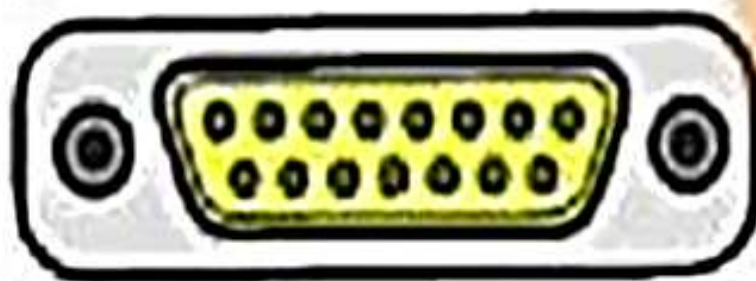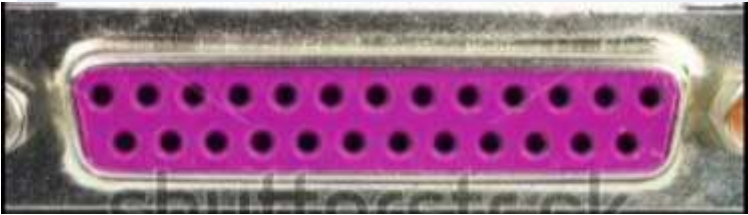
	Serial Port	Parallel Port	USB Port
Other name	communication Ports		
Hardware	Serial Hardware	External Parallel Hardware	Universal nowadays
Data transmission rate	Slow rate 1 bit / time	Faster 8 : 25 Bits	Fastest
Data Amount	Small amount of data	Large amount of data	
Ex.	Serial Mousses Serial Keyboards Modem	Printers Scanners	All new devices

VGA

VGA cable with DE-15 male connector
VGA = Video Graphic Array
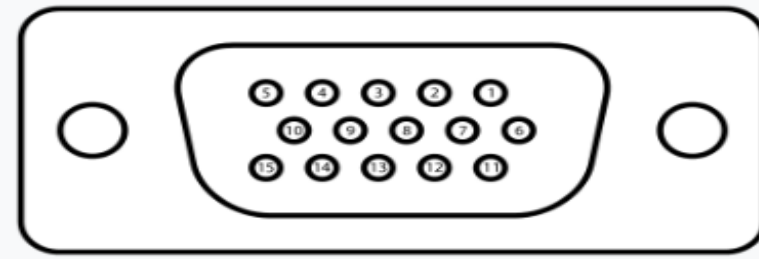
A female DE15 socket.

Pin 1	RED	Red video
Pin 2	GREEN	Green video
Pin 3	BLUE	Blue video
Pin 4	ID2/RES	formerly Monitor ID bit 2, reserved since E-DDC
Pin 5	GND	Ground (HSync)
Pin 6	RED_RTN	Red return
Pin 7	GREEN_RTN	Green return
Pin 8	BLUE_RTN	Blue return
Pin 9	KEY/PWR	formerly key, now +5V DC, powers EDID EEPROM chip on some monitors
Pin 10	GND	Ground (VSync, DDC)
Pin 11	ID0/RES	formerly Monitor ID bit 0, reserved since E-DDC
Pin 12	ID1/SDA	formerly Monitor ID bit 1, I²C data since DDC2
Pin 13	HSync	Horizontal sync
Pin 14	VSync	Vertical sync
Pin 15	ID3/SCL	formerly Monitor ID bit 3, I²C clock since DDC2

The image and table detail the 15-pin VESA DDC2/E-DDC connector; the diagram's pin numbering is that of

HDMI™

HIGH-DEFINITION MULTIMEDIA INTERFACE

HDMI™

HIGH-DEFINITION MULTIMEDIA INTERFACE

Not used in any products

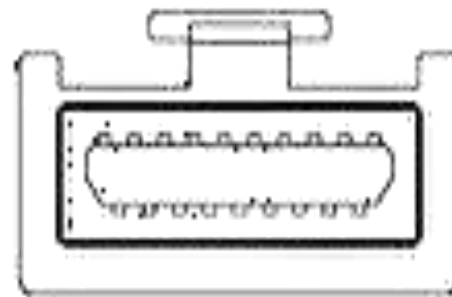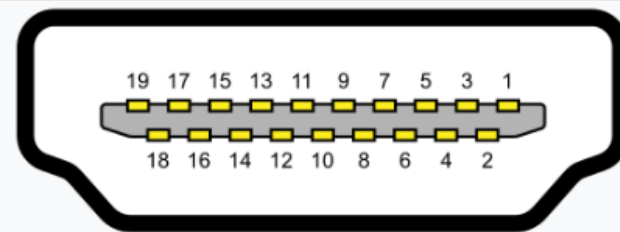Automotive Connection System

Standard	Dual-Link	Mini	Micro	
A	B	C	D	E

HDMI type A receptacle (female)

Pin 1	TMDS Data2+
Pin 2	TMDS Data2 Shield
Pin 3	TMDS Data2−
Pin 4	TMDS Data1+
Pin 5	TMDS Data1 Shield
Pin 6	TMDS Data1−
Pin 7	TMDS Data0+
Pin 8	TMDS Data0 Shield
Pin 9	TMDS Data0−
Pin 10	TMDS Clock+
Pin 11	TMDS Clock Shield
Pin 12	TMDS Clock−
Pin 13	CEC
Pin 14	Reserved (HDMI 1.0–1.3a) Utility/HEAC+ (HDMI 1.4+, optional, HDMI Ethernet Channel and Audio Return Channel)
Pin 15	SCL (I²C serial clock for DDC)
Pin 16	SDA (I²C serial data for DDC)
Pin 17	Ground (for DDC, CEC, ARC, and HEC)
Pin 18	+5 V (min. 0.055 A)[3]
Pin 19	Hot Plug Detect (all versions) HEAC− (HDMI 1.4+, optional, HDMI Ethernet Channel and Audio Return Channel)

Types of USB

Type-A   Type-B   Micro-B   Type-C
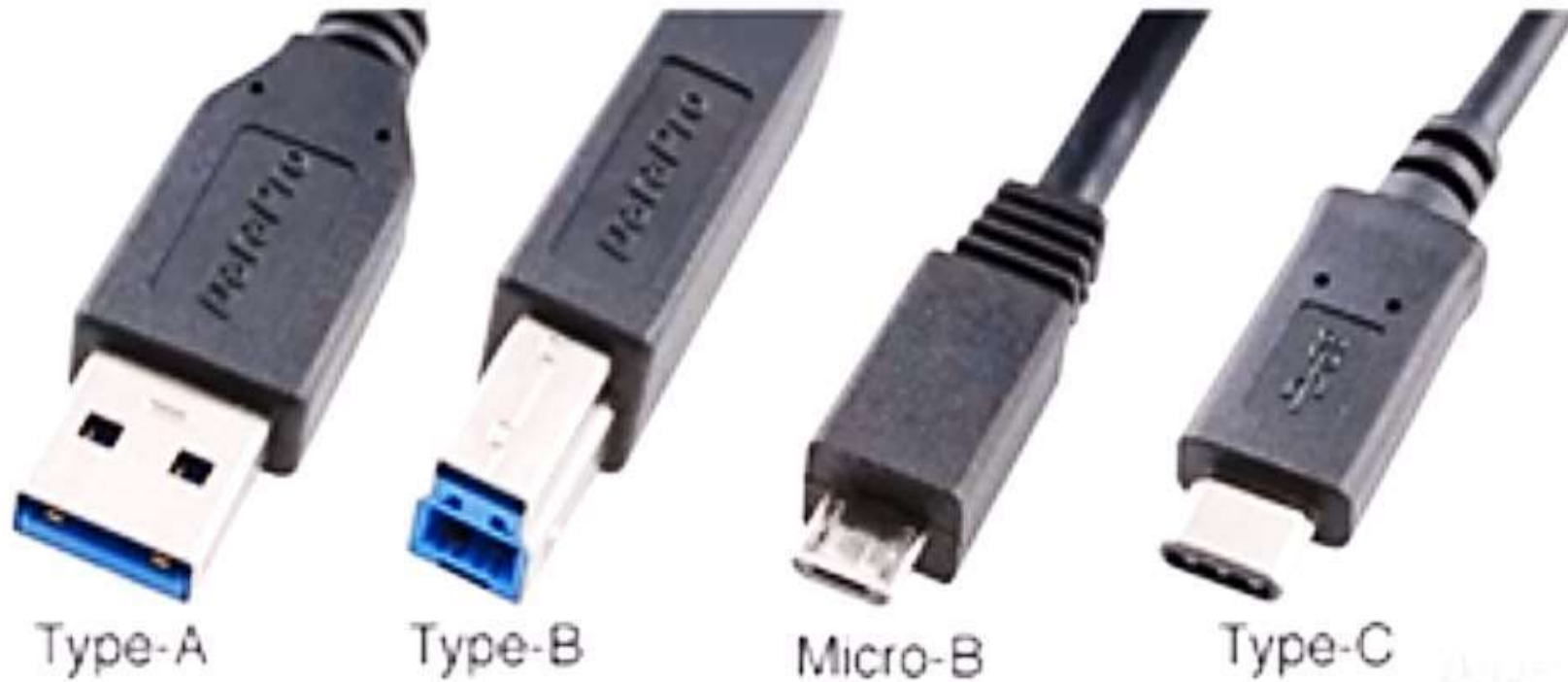
FireWire

IEEE 1394
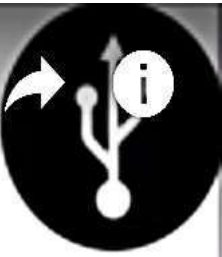
USB and FIREWIRE

- USB is a standard interface for a wired connection between two electronic devices, including a mobile phone and a desktop computer.

- The connection is made by a cable that has a connector at either end.

- A single USB port can be used to connect up to 127 peripheral devices, such as mice, modems, and keyboards.

- USB is also a power source for many small devices. This Chromecast streamer gets its DC power from a USB

What is FireWire ?

- FireWire is Apple Computer's version of a standard, IEEE 1394,

- A method of transferring information between digital devices, especially audio and video equipment.

- You can connect up to 63 devices to a FireWire bus. Windows operating systems (98 and later) and Mac OS (8.6 and later) both support it.

- Originally Created by Apple and standardized as IEEE1394 in 1995

FireWire Cables features

- Fast transfer of data
- Ability to put lots of devices on the bus
- Ease of use
- Provision of power through the cable
- Plug-and-play performance
- Low cabling cost

FireWire 400 is still in use today:

- Transfer rates of up to 400 Mbps

- Maximum distance between devices of 4.5 meters (cable length)

- FireWire 800 (1394b) started showing up in consumer devices.

FireWire 800 is capable of:

- Transfer rates up to 800 Mbps

- Maximum distance between devices of 100 meters (cable length)

- The faster 1394b standard is backward-compatible with 1394a.

	FireWire	USB
Width in bits	1	1
Capacity	400–3200 Mbit/s (50-400 MB/s)	1.5, 12, or 480 Mbit/s (0.2, 1.5 or 60 MByte/s)
External	Yes	Yes
Hot plugging	Yes	Yes
Style	Serial	Serial
Number of devices	63	127 per host controller
Year created	1995	1996
Created by	Apple Computer, Inc.	Intel, Compaq, Microsoft, Digital Equipment Corporation, IBM, Northern Telecom
Speed	FireWire 800 = 800 Mbit/s	faster for a high number of small data but slower while writing a small amount of huge files USB 3.0 = 5 GB/s

USB versus FireWire

- **USB 1.1** — 12 Mpbs
- **FireWire 400** — 400 Mbps
- **USB 2.0** — 480 Mbps
- **FireWire 800** — 800 Mbps
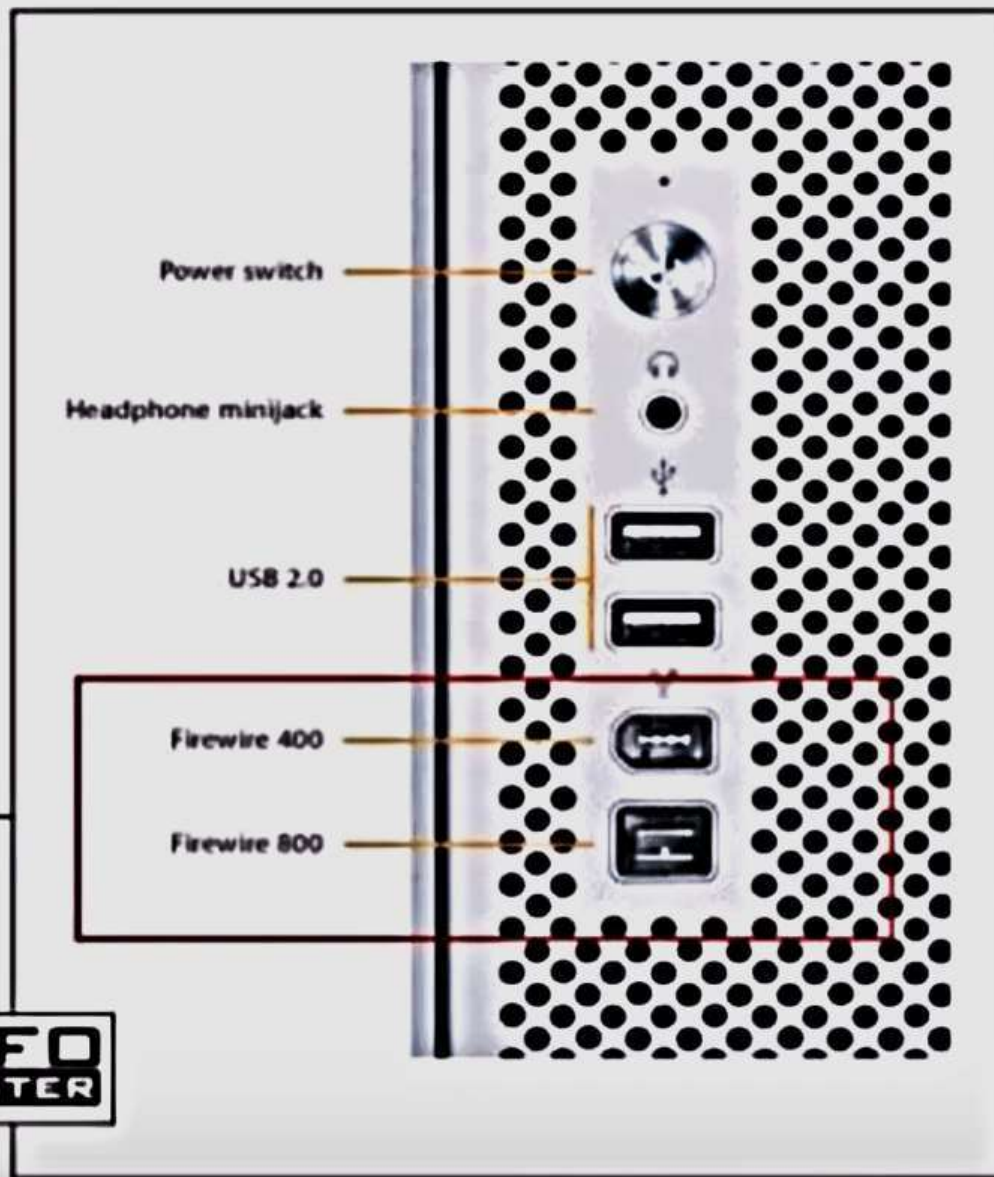
Due to the speed and efficiencies of FireWire 800, in many cases the effective bandwidth is more than twice that of USB 2.0.

FireWire 400 and 800 in a Apple CPU
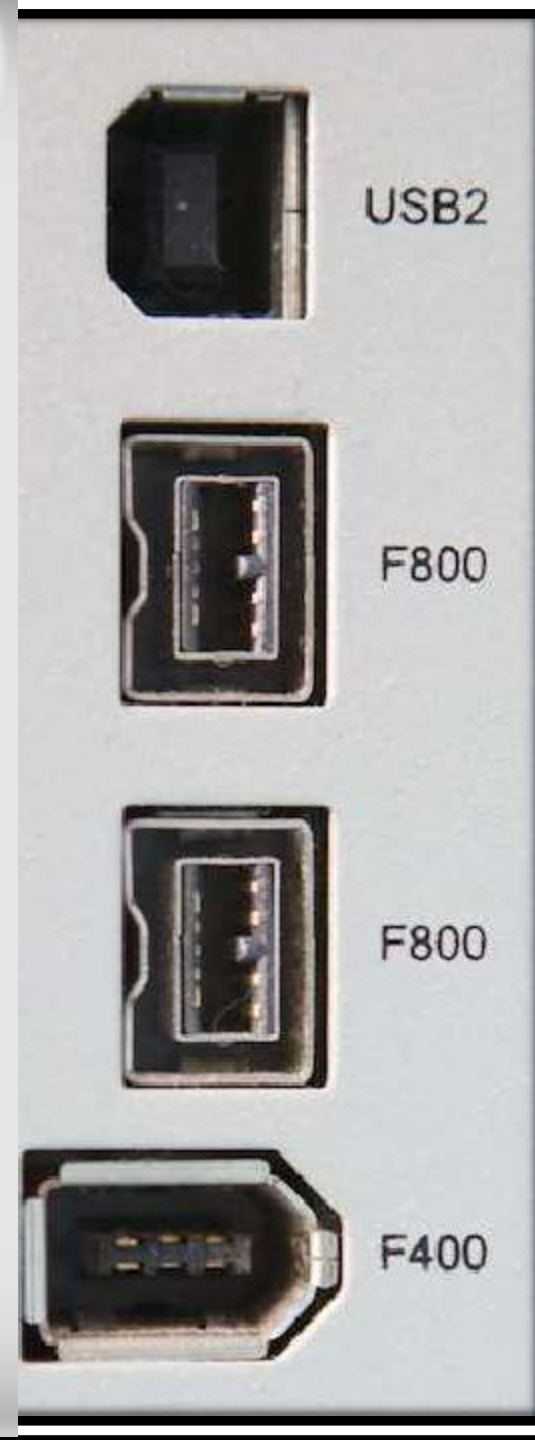
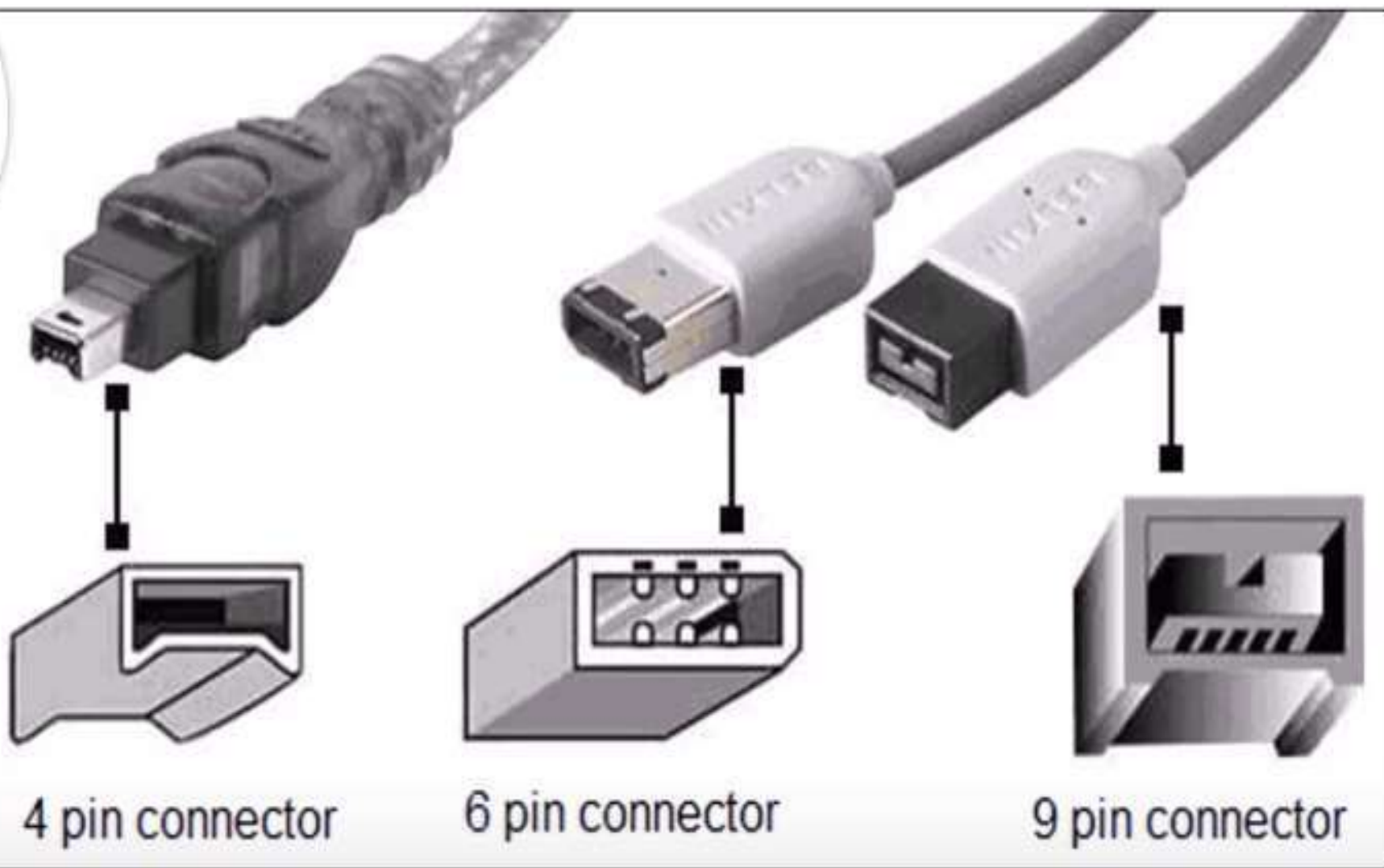Power switch

Headphone minijack

USB 2.0

Firewire 400

Firewire 800

USB2

F800

F800

F400

INFO WESTER

Imagens por: Apple.com

4,6 AND 9 PIN CONNECTORS

FireWi

4 pin connector

6 pin connector

9 pin connector

THUNDERBOLT 3 DOCK

SD Card

High-Powered Port

USB 3.1 Gen 1

SD Card Reader
Copy photos & movies from your media cards directly.

Expanded Analog Audio In/Out
Connect external speakers & mics.

USB 3.1 Gen 1
Delivering 5Gb/s data speed, as well as high power to your devices.

High-Powered Port

USB 3.1 Gen 1

S/PDIF Out

FireWire 800

DC IN 20V 6.75A

USB 3.1 Gen 1
The most ubiquitous interface on the planet connects to all of your current USB devices.

FireWire 800
Connect your legacy devices to your new workflow hub.

Dual Thunderbolt 3 Ports
The fastest, most versatile connection available — up to 40Gb/s.

S/PDIF
Pro-grade digital audio output for signal transfer.

Gigabit Ethernet
Connect to secure, reliable, high-speed wired networks.

mini DisplayPort
Configure your perfect display layout.

Thunderbolt™ 3 brings Thunderbolt to USB-C

The USB-C that does it all.

- More **Speed** — 40 Gbps fastest connection
- More **Pixels** — Dual 4K displays 60Hz
- More **Power** — 100W charging, 15W device
- More **Protocols** — THUNDERBOLT, USB, DisplayPort, PCI EXPRESS

THUNDERBOLT.
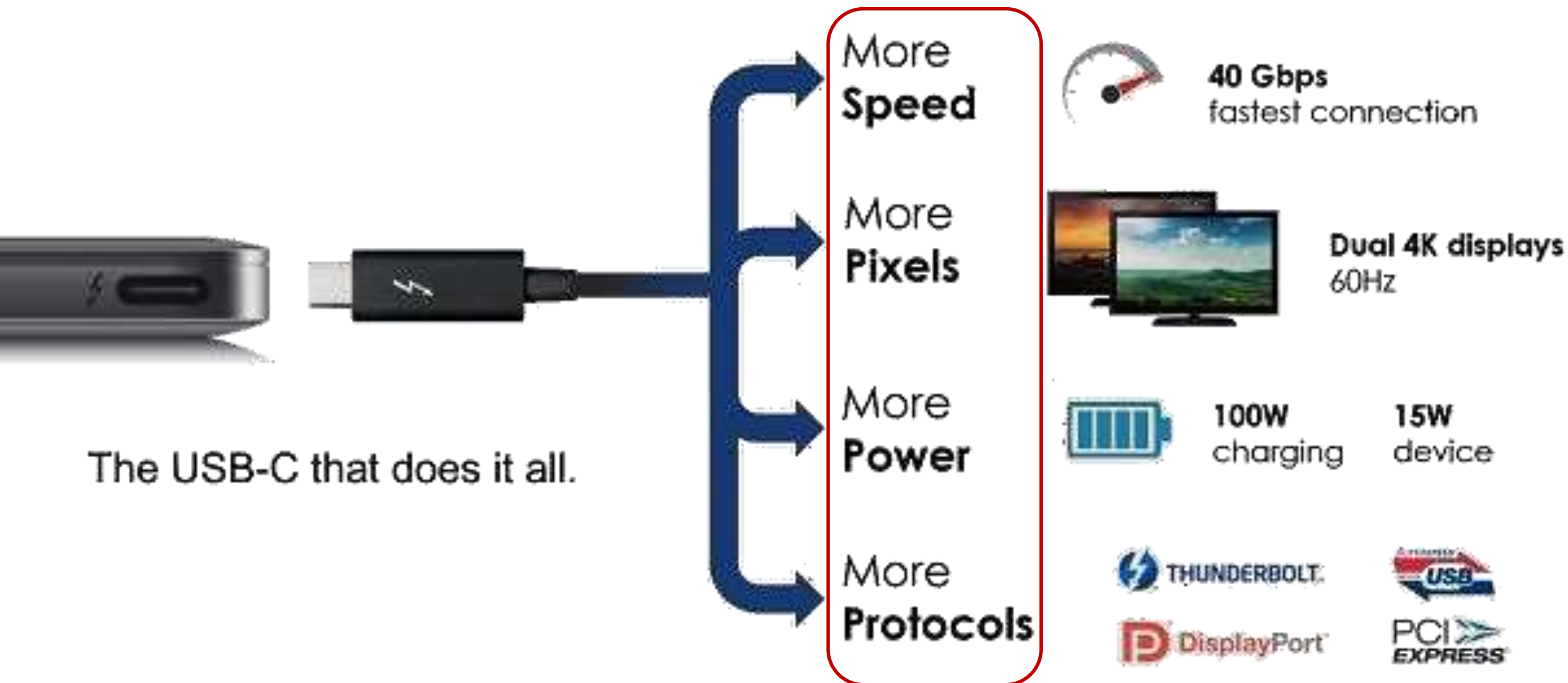
Desk Technology I/O

- **1956 ,** Hard disk drives were introduced by **IBM**.

- At the time, used with **mainframes** and **minicomputers**.

- Advancements over the years.

- This is in terms of **capacity**, **size**, **shape**, internal structure, performance, interface, and modes of storing data.

- These numerous changes have made **HDDs here to stay**, not like other devices that became obsolete.

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I/O Busses

- Special busses (roads) connecting all of your input/output devices to your motherboard.

- The **three main types** of I/O busses are : ISA, PCI and USB.

○ This was the industry standard in the **1980s** and early **1990s.**

o It is now used to provide support for **older** and **slower devices**.

o Common devices connected to the ISA bus might include an older modem, a

joystick, a *mouse*, or a *printer* (using the older, wide-style printer port).

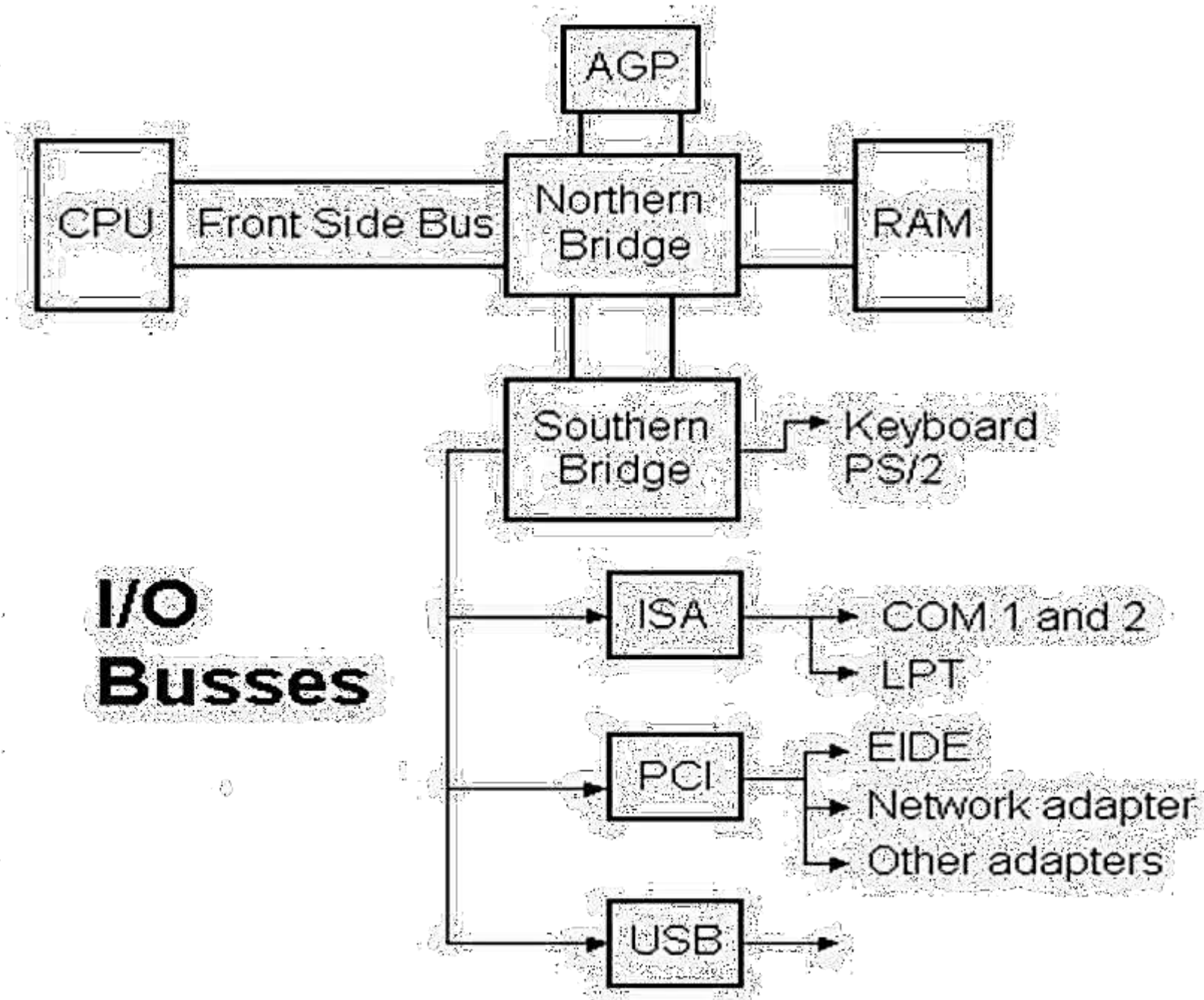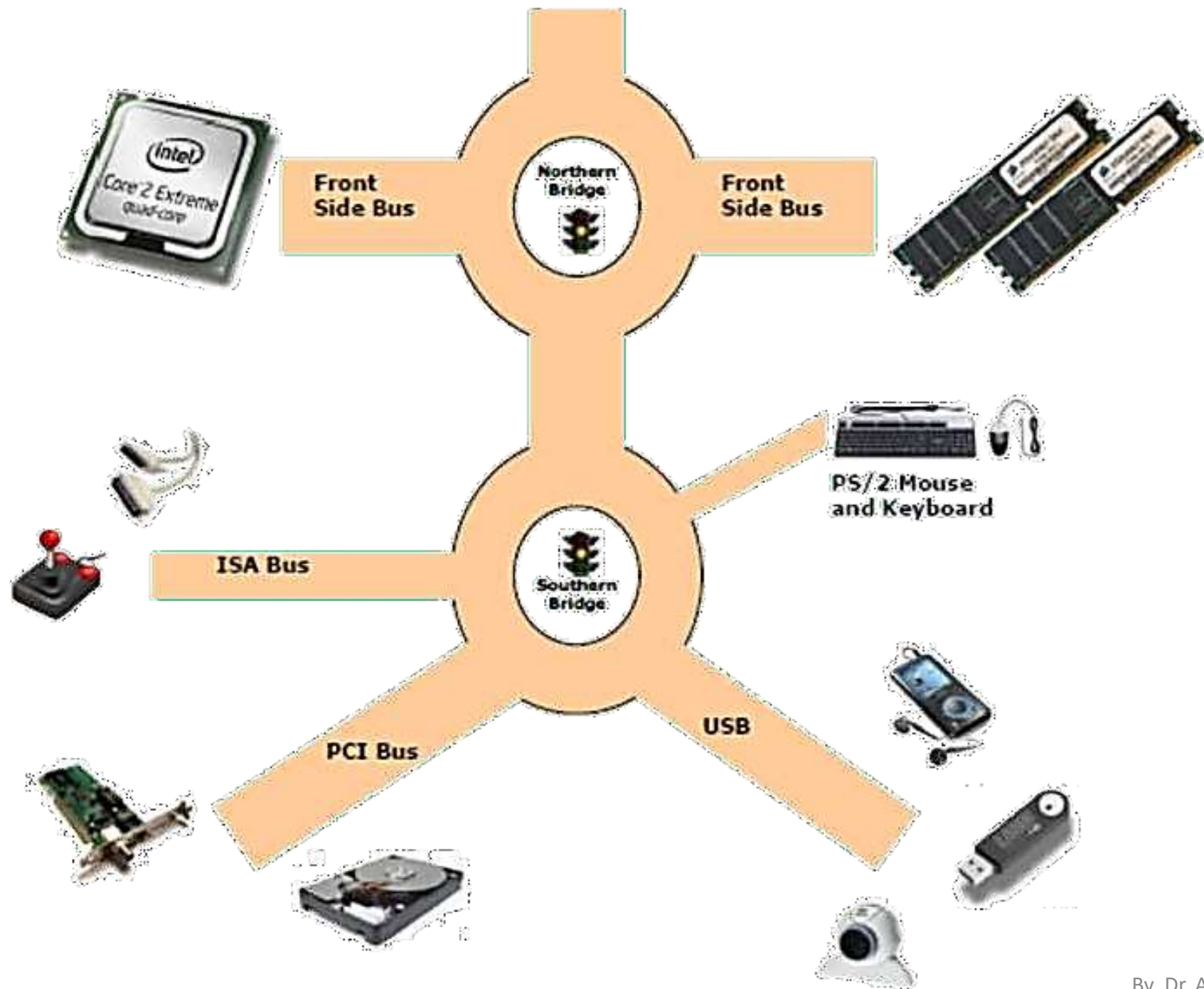One 8-bit and five 16-bit ISA slots on a motherboard

➔ 2. **PCI – <u>P</u>eripheral <u>C</u>omponent <u>I</u>nterconnect**

- This is for **newer** and **faster** devices than ISA.(like a wider road, with a

  faster speed limit!)

- Some common devices connected to the PCI bus include:

  - your network card, EIDE devices (hard disk, CD/DVD drive, etc).

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➔ 3. USB – Universal Serial Bus

- Many new devices can connect to your computer using a **USB port**.

- Examples include *webcams*, *MP3 players*, *printers*, PDAs, etc.

Northern Bridge

Front Side Bus

Front Side Bus

Southern Bridge

ISA Bus

PS/2 Mouse and Keyboard

PCI Bus

USB

Hard Drive Types

- Hard drives into **Four types**:

  1. **P**arallel **A**dvanced **T**echnology **A**ttachment (**PATA**)

  2. **S**erial ATA (**SATA**)

  3. Small Computer System Interface (**SCSI**)

  4. Solid State Drives (**SSD**)

1. PATA Parallel Advanced Technology Attachment

- **First types of hard disk** drives

- introduced by **Western Digital back in 1986**.

- Data transfer rate up to **133MB/s** and

- maximum of 2 devices can be connected to a drive channel.

- These drives store data by the use of **magnetism**.

- The internal structure is one made of **mechanical moving parts**.

- They have been superseded by **serial ATA**.
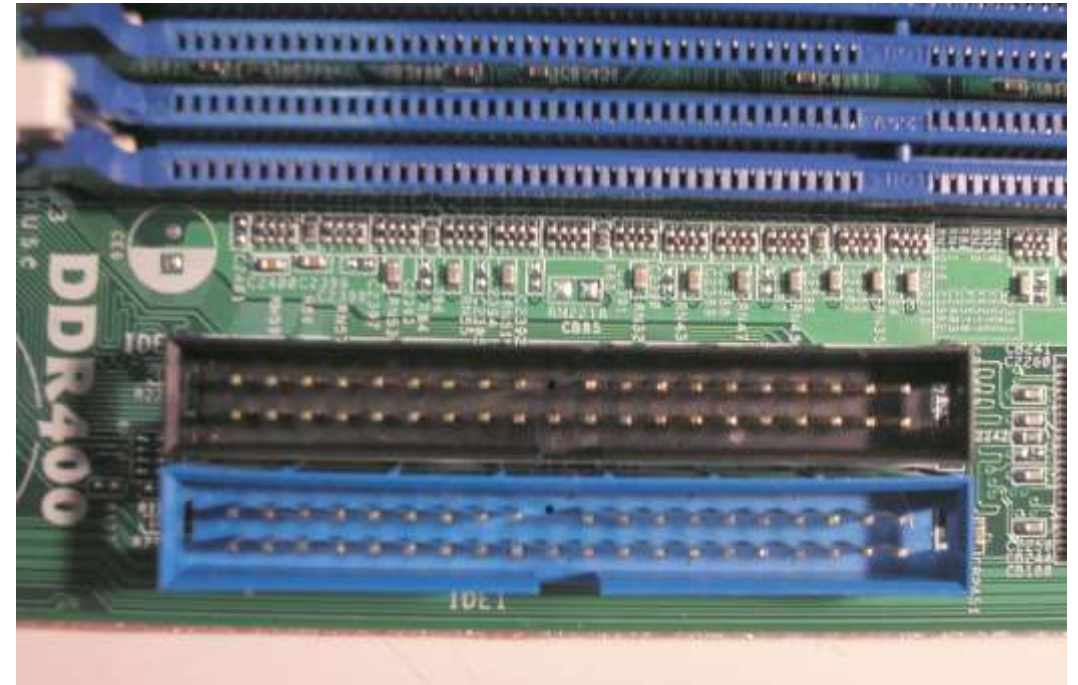
A hard disk drive (PATA type)

2. SATA Serial ATA Storage Drives

- Replaced the PATA drives in desktop and laptop computers.

- The main physical difference between the two is the interface, although their method of connecting to a computer is the same.

- **Aadvantages of SATA Hard Disk Drives.**

  - SATA transfer data **faster** than PATA types.

  - SATA cables are **thinner** and **more flexible** than PATA cables.

  - They have a 7-pin data connection, with cable limit of **1 meter**.

  - They consume **less power**. (They only require 250 mV as opposed to **5V for PATA)**.

A SATA Hard Disk Drive Pin Out
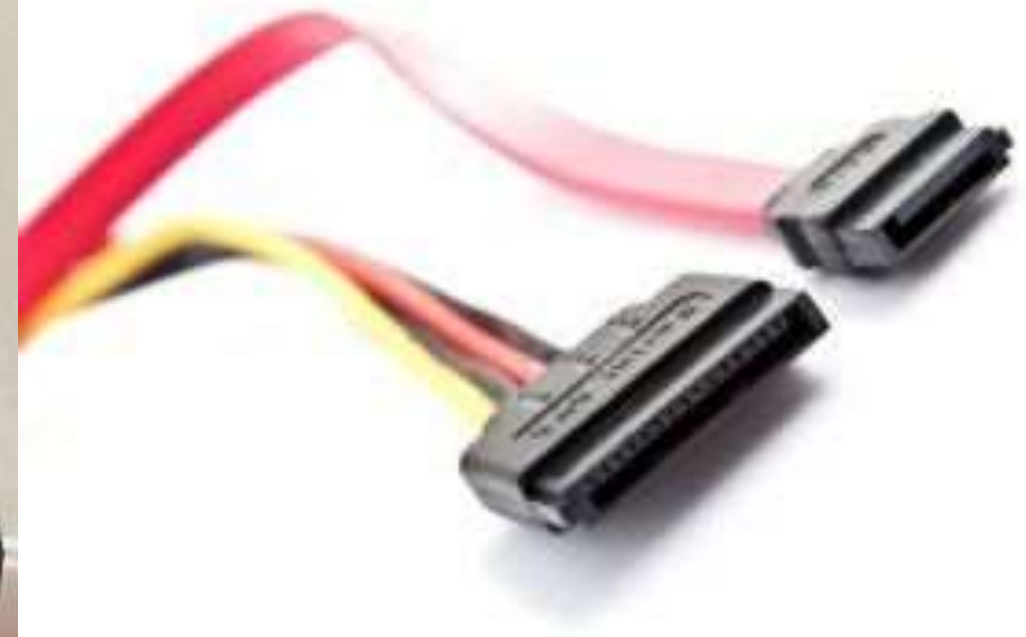
3. SCSI Small Computer System Interface

- These are **quite similar to IDE** hard drives but they make use of the Small Computer System Interface to connect to the computer.

- **SCSI** drives can be connected **internally** or **Eexternally**.

- Here are some of their **advantages**:

  ✓They are **faster**.

  ✓They are **very reliable**.

  ✓Good for **24/7** operations.

  ✓Have a better scalability and flexibility in arrays.

  ✓Well-adapted for storing and moving **large amounts** of data.

4. SSD Solid State Drives

- The **latest in drive technology** in the computer industry.

- They are totally different from the other drives in that they **do not consist of moving parts**.

- They also **do not store data using magnetism**.

- Instead, they make use of **flash memory technology**.

- **Advantages**:

  ✓**Faster** data access.

  ✓Less susceptible to shock.

  ✓Lower access times and latency.

  ✓**Durability.**

  ✓Less power usage.

Solid State Drive (SSD)

How to Identify Which Type Hard

Drive You Have ?

https://www.youtube.com/watch?v=CHclT8NkgUI

Redundancy

Redundancy

- **Redundancy** : is a **data protection method** .

- RAID is A common redundancy feature found in servers → to prevent

  data loss is (which stands for **R**edundant **A**rray of **I**ndependent **D**isks),

- which creates **multiple copies of files** across **several hard drives**.

- If one hard drive in the array fails, the other hard drives pick up the slack with (usually) no interruption.

- **A backup**, on the other hand, doesn't provide real-time protection, but it does provide protection against a greater set of problems, including failed drives, device theft, fire, or even just accidentally deleting files.

RAID "Redundant Array of Independent Disks"

- RAID allows you to **combine multiple physical hard drives** into a **single logical hard** drive.

- This allows you to **mirror your data across two hard drives**, ensuring you always have your important data **stored in multiple places**.

-

RAID Setup

- RAID is generally used **on servers**, mainframes, and other computer systems where having redundantly stored data is important.

- When using RAID, you can either use "**hardware RAID**" or "**software RAID**."

- With **hardware RAID**, a hardware device in your computer does all the RAID work.

- With **software RAID,** the work is handled by the operating system.

- For example, you can [create a software RAID while installing Linux](#) on your computer — the Linux kernel knows about the RAID and will do the work itself without any special hardware necessary.

- You can also [create a software RAID in Windows](#).

RAID Similar Technologies

- Popular operating systems have technologies that

  function similarly to RAID.

- Windows 8 introduced Storage Spaces.

- Linux has the logical volume manager, or LVM.

- **Both technologies** allow you to group several

  physical disks into a single logical disk to **mirror**

  your data for redundancy or pool your disks'

  storage, making it available as a single disk

  without providing redundancy.
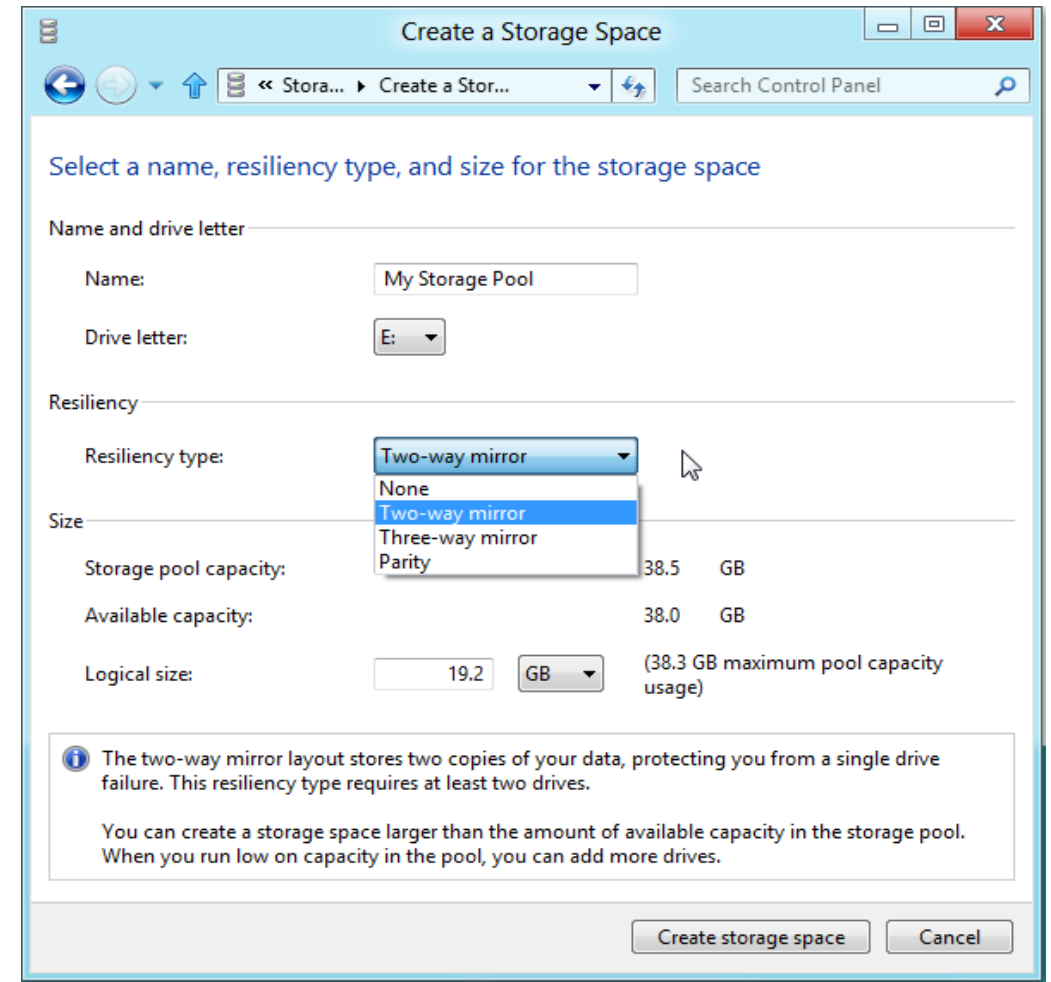
GOOD LUCK

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