Overview of Computers

Instructor – Dr. Shiv Ram Dubey

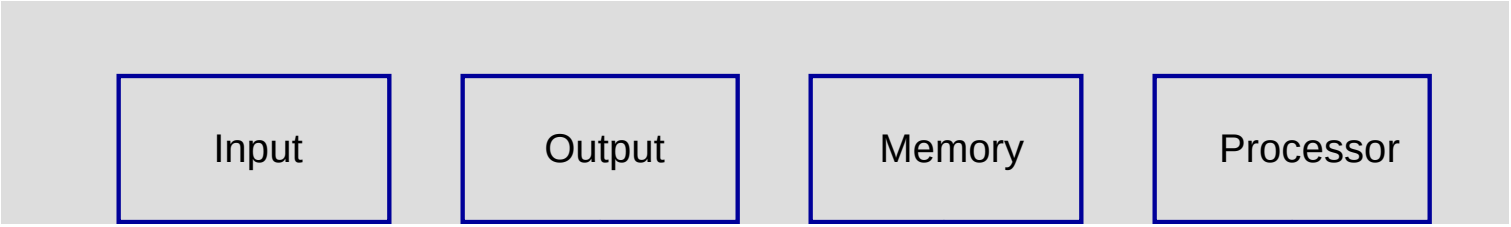
Busses, Ports and Connectors

Bus

- What ?
- Why ?

How are the functional units connected?

- For a computer to achieve its operation, the functional units need to communicate with each other.
- In order to communicate, they need to be connected.



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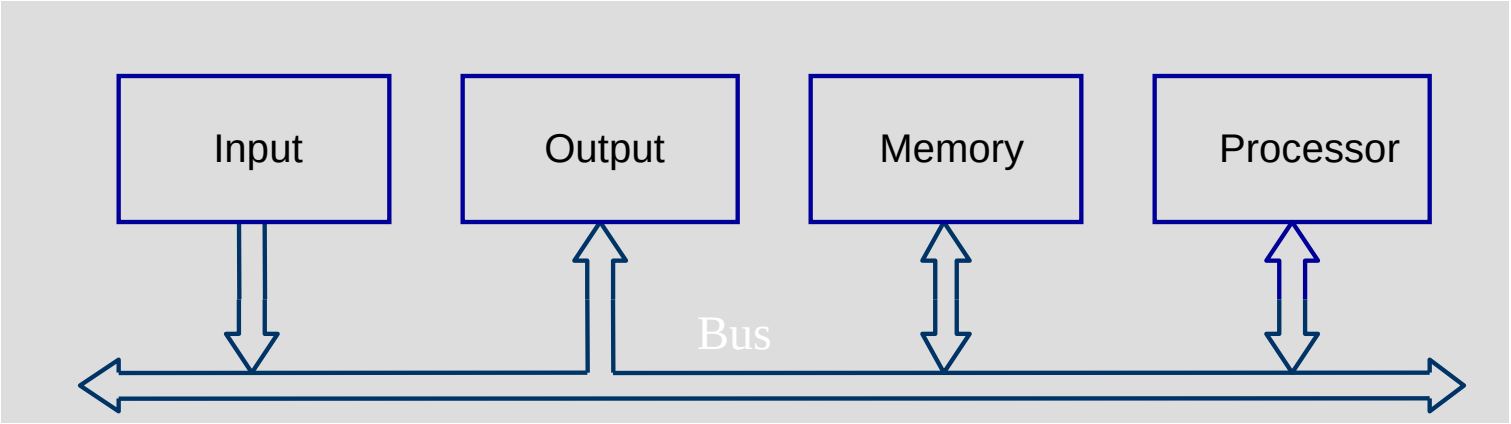

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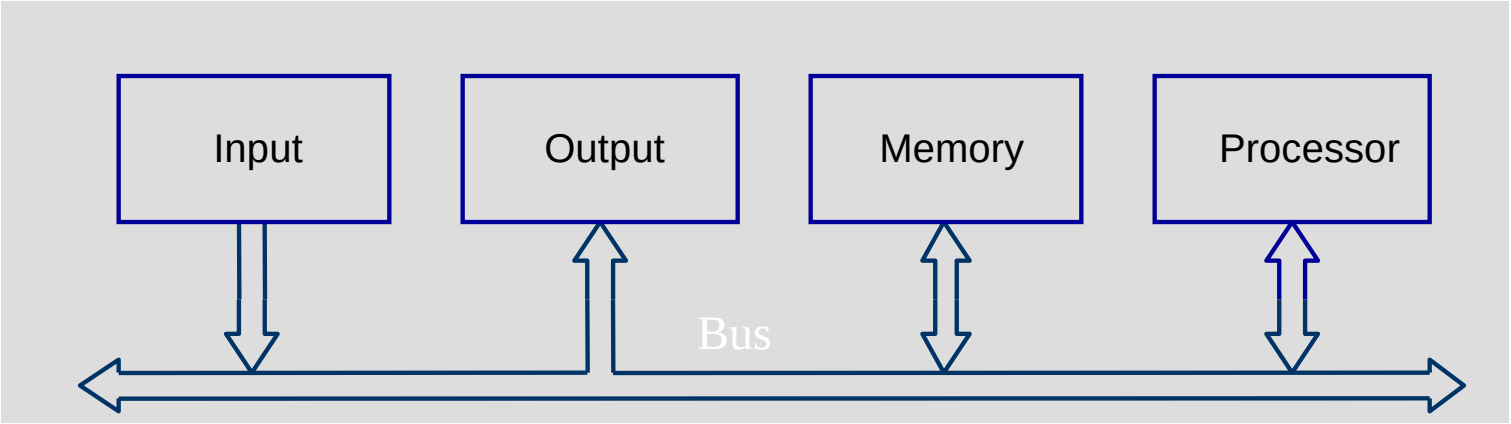


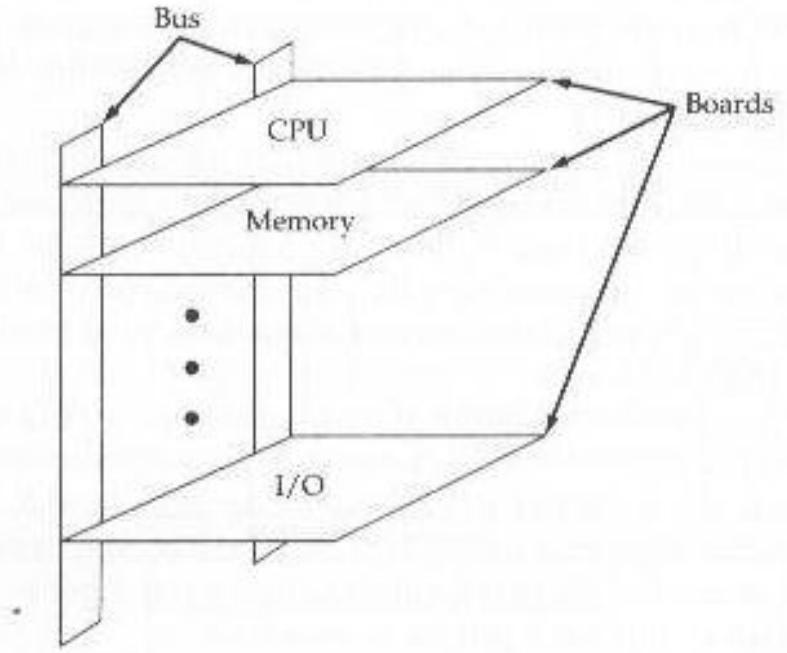
- Functional units may be connected by a group of **parallel wires** called as **bus**.
- **Each wire** in a bus can transfer **one bit** of information.
- The **number of parallel wires** in a bus is equal to the **word length** of a computer.

What is a Bus?

- A **communication pathway** connecting two or more devices
- Multiple **devices share** the same **bus**
- Usually **broadcast**
- Often **grouped**
  - A number of channels in one bus
  - e.g. 32 bit data bus is 32 separate single bit channels

Big and Yellow?

- What do buses look like?



Buses

- There are a number of possible interconnection systems
  - **Single** and **multiple BUS** structures are most common

Single Bus Problems

- Lots of devices on one bus leads to:
  - **Propagation delays**
    - Long data paths
      - co-ordination of bus use can adversely affect performance

- Most systems use **multiple buses** to overcome these problems

Data Bus

- Carries data
- Width is a key determinant of performance
  - 8, 16, 32, 64 bit

Address bus

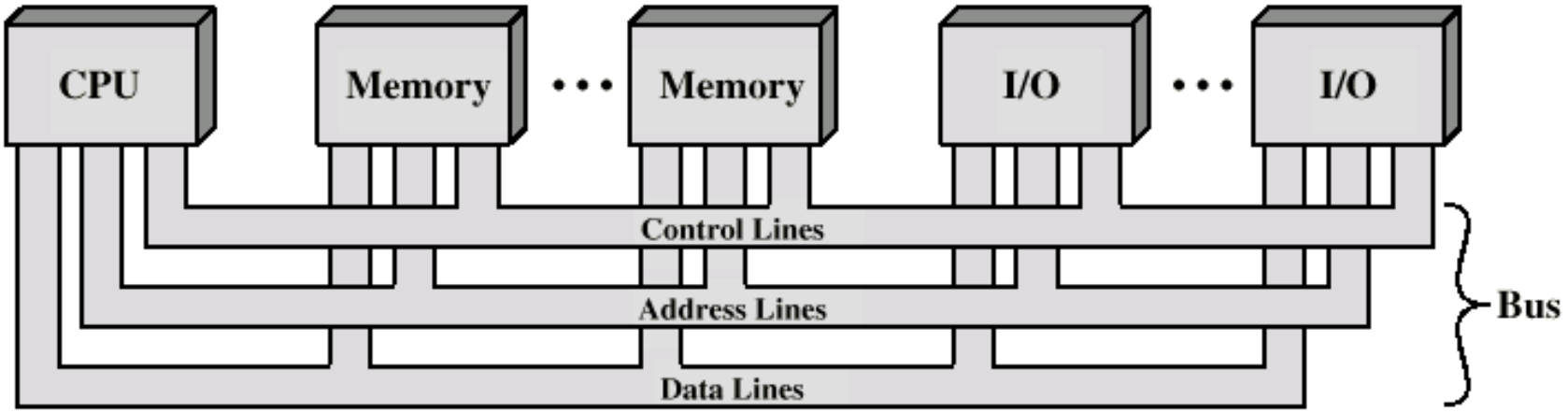
- Identify the source or destination of data
  - e.g. CPU needs to read an instruction (data) from a given location in memory

- Bus width determines maximum memory capacity of system
  - e.g. 8080 has 16 bit address bus giving 64k address space

Control Bus

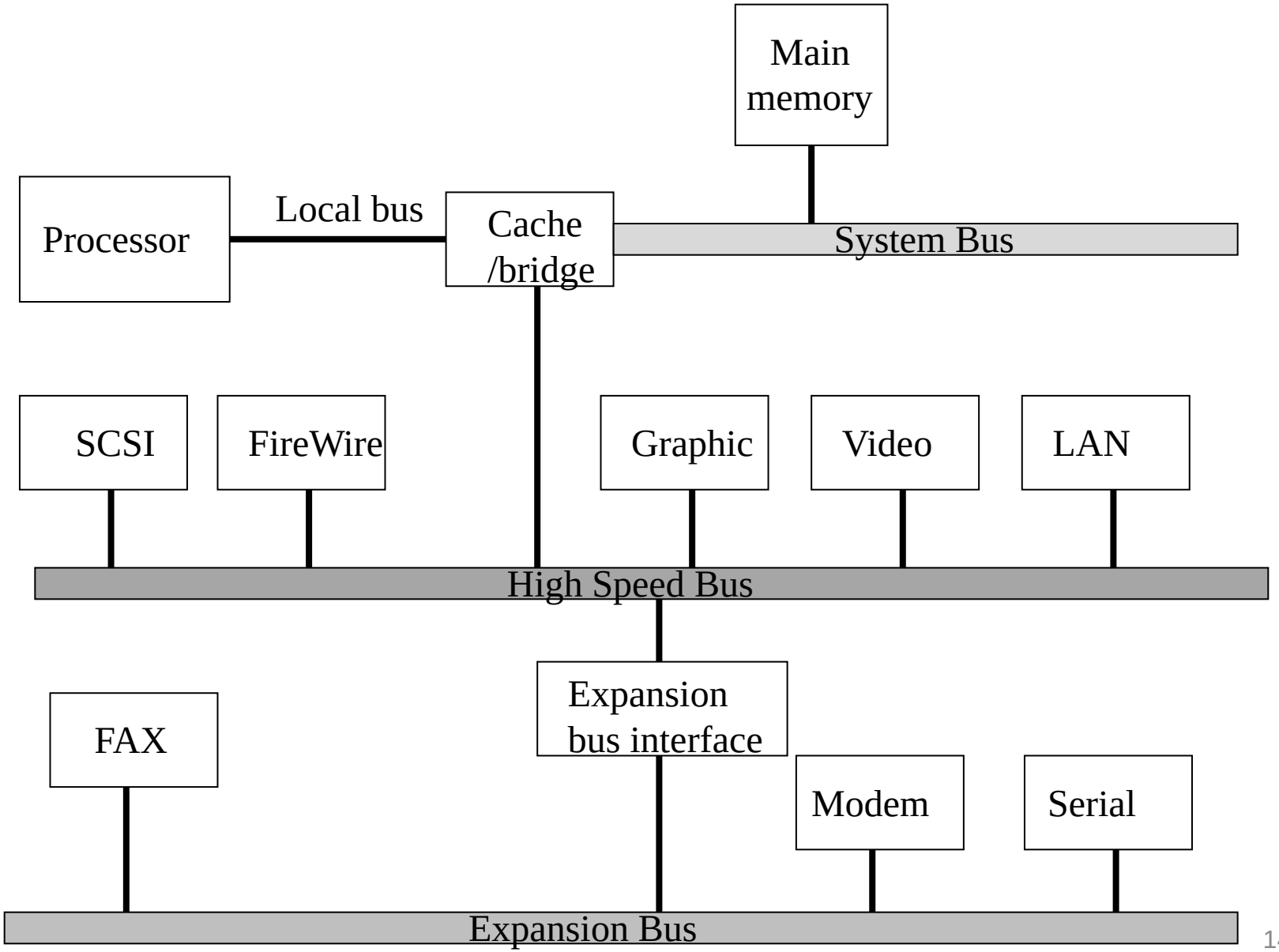
- Control and timing information
  - Memory read/write signal
  - Interrupt request
  - Clock signals

Bus Interconnection Scheme



- Every device is attached to the bus:
  - its use needs to be coordinated

High Performance Bus



Small Computer System Interface (SCSI): communicate with peripheral hardware such as disk drives, tape drives, CD-ROM drives, printers and scanners faster and more flexibly than previous parallel data transfer interfaces.

Now replaced with SATA

FireWire is a method of transferring information between digital devices, especially audio and video equipment.

Front Side Bus (FSB)

- **Front Side Bus (FSB) –**
  - An **alternative name** for the **data and address buses** of the CPU.
  - Front side buses serve as a connection between the CPU and the rest of the hardware via a so-called chipset.

PCI Bus

- **PCI Bus-**
  - Connects expansion cards and drives to processor and other sub systems.
  - Usually, the speed of the PCI bus speed is basically **33MHz**
  - Now, replaced with **PCI Express** (PCIe)

PCI Express Bus

- **PCIe Bus –**
  - Base Clock Speed:
    - PCIe 1.1 = **2.5**GHz,
    - PCIe 2.0 = **5.0**GHz,
    - PCIe 3.0 = **8.0**GHz.
  - Data Rate:
    - PCIe 1.1 = **250**MB/s,
    - PCIe 2.0 = **500**MB/s,
    - PCIe 3.0 = **1000**MB/s.

IDE Bus

- **IDE Bus-**
  - Primary interface for the hard drive.
  - Now replaced with SATA

SATA Bus

- **SATA Bus-**
  - Serial Advanced Technology Attachment
  - 1.5, 3.0, 6.0 and 16 Gbit/s

AGP Bus

- **AGP Bus-**
  - Connects the graphics card directly to memory and processor.
  - AGP 1X: 66.66 MHz x 1x 32 bits /8 = 266.67 MB/s
  - AGP 2X: 66.66 MHz x 2 x 32 bits /8 = 533.33 MB/s
  - AGP 4X: 66.66 MHz x 4 x 32 bits /8 = 1.06 GB/s
  - AGP 8X: 66.66 MHz x 8 x 32 bits /8 = 2.11 GB/s

Bandwidth

- The bandwidth of the data bus is how much information can flow through it, and is a function of the bus width (in bits) and its speed (in MHz).

- You can think of the data bus as a highway; its width is the number of lanes and its speed is how fast the cars are travelling.

- The bandwidth then is the **amount of traffic** the highway can carry in a given **unit of time**, which is a function of how many lanes there are and how fast the cars can drive in them.

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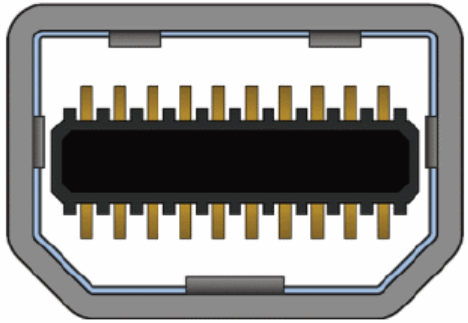
- Therefore in bytes (8512,000,000/8) = 1064,000,000 bytes/s
- To convert to Mbytes 1064,000,000/(1024 x 1024) = 1014.71MB/s

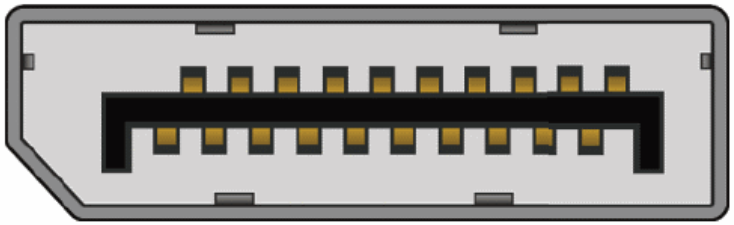
Bandwidth

Bus	Maximum Transfer Rate
PCI	**133 MB/s**
AGP 2x	**533 MB/s**
AGP 4x	**1,066 MB/s**
AGP 8x	**2,133 MB/s**
PCI Express x1	**250 MB/s**
PCI Express x2	**500 MB/s**
PCI Express x4	**1,000 MB/s**
PCI Express x16	**4,000 MB/s**
PCI Express x32	**8,000 MB/s**

Ports and Connectors

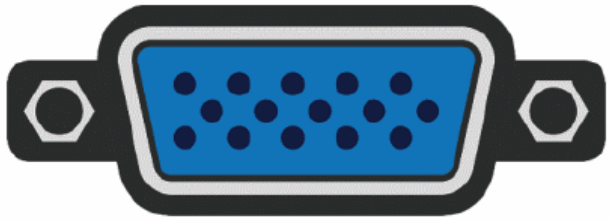


Mini DisplayPort



DisplayPort

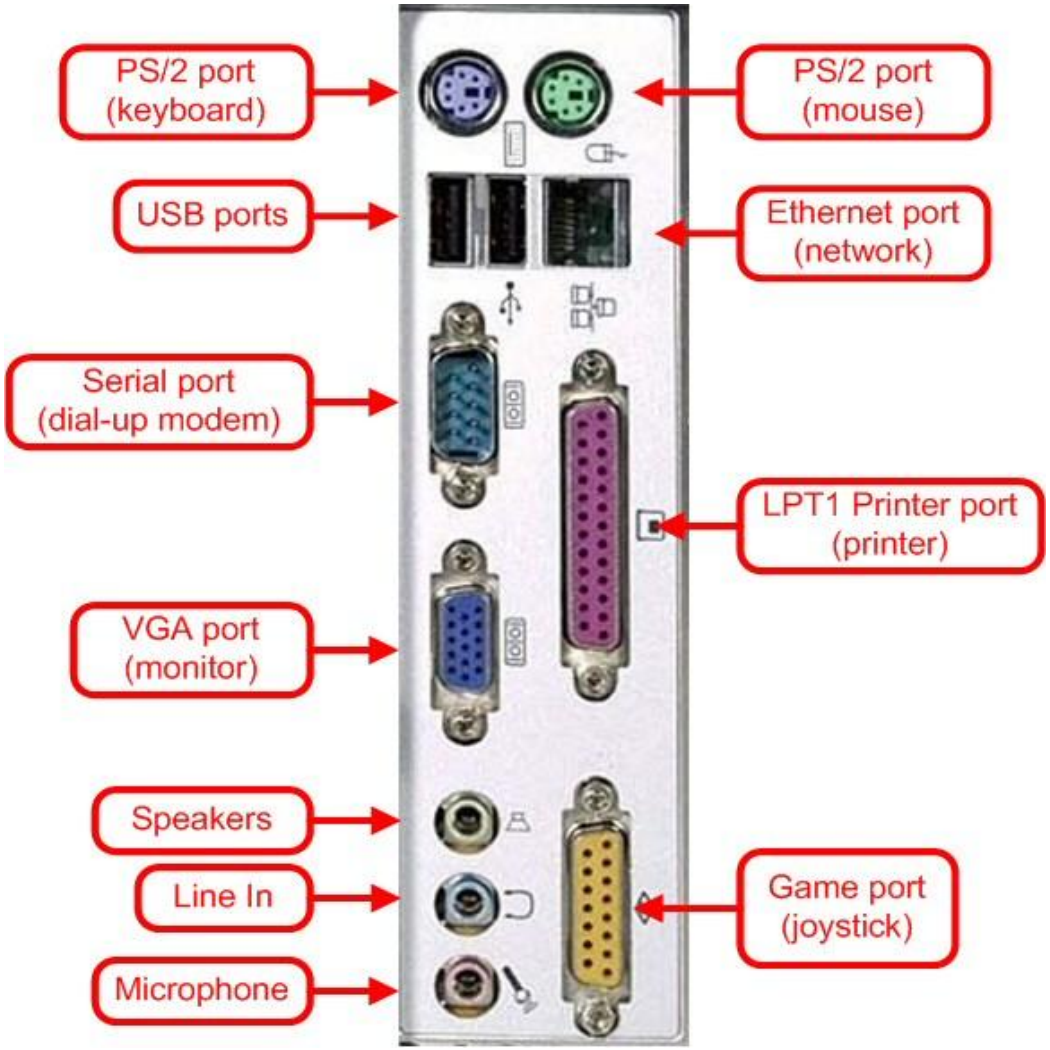
HDMI



VGA

What are Ports?

- On computer, a *port* is generally a specific place for being physically connected to some other device, usually with a socket or plug which we call Connectors



Typical Computer Port found behind a desktop PC

What are Connectors?

- A connector is any connector used within computers or to connect computers to networks, printers or other devices.

Many types of computer connectors

The PS/2 Connector

- The PS/2 connector are use for connecting keyboard and mouse on the modern PCs. The PS2 mouse connector and port is usually green in colour to distinguish it from the PS2 keyboard, which is purple.

The USB Port

- Universal Serial Bus: a protocol for transferring data to and from digital devices. Many digital cameras and memory card readers connect to the USB port on a computer.

USB Port

- A **USB port** can connect up to 127 different peripherals together with a single connector
  - You can attach multiple peripherals using a single USB port with a **USB hub**

USB Connectors and Ports

	Connector	Port	Where Used
Type A			Desktop and notebook computers
Type B			Peripherals (printers, scanners, external hard disks, etc.)
Mini-B			Mobile devices (cameras, phones, handheld game consoles)

USB Port

USB A-Type

USB B-Type

USB C-Type

Micro-USB A

Micro-USB B

USB Mini-b (5-pin)

USB Mini-b (4-pin)

USB 3.0 A-Type

USB 3.0 B-Type

USB 3.0 Micro B

The Firewire IEEE 1394 Port

- A type of cabling technology for transferring data to and from digital devices at high speed. FireWire are typically faster than those that connect via USB.

USB vs FireWire

USB

- Universal Serial Bus
- USB2.0: data transfer rate of 480 Mbps
- USB2.0 can manage 127 devices
- Two USB based devices need to be connected to computer for communication

FireWire

- High Performance Serial Bus
- FireWire800: data transfer rate of 800 Mbps
- FireWire800 can manage only 63 devices
- Two FireWare based devices can make the communication without computer (i.e., peer-to-peer)

The **RJ45 Ethernet Port**

- LAN or (Local Area Network) uses a CAT5 cable and a RJ45 connection. The CAT 5 cable is also called the Ethernet Cable.

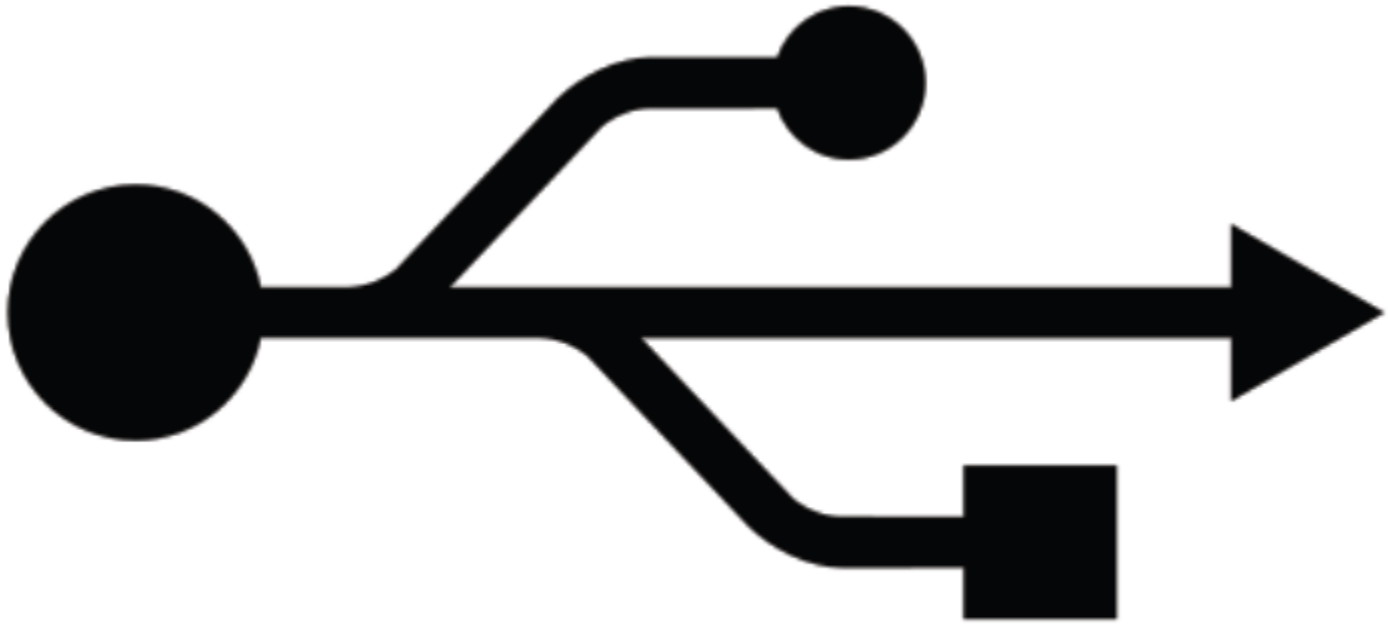
- Network connection generally uses a 10/100 Mbps speed. This means it has two different speeds 10 Mbps and 100 Mbps.

DB25 Parallel Port

- The printer connects to your computer with a Parallel connector.
  This connector has 25 pins.
- Parallel means the device is capable of receiving more than one bit at a time (that is, it receives several bits in parallel).

Exploring Data Communications

Ports and Connectors



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