Hardware

> Digital devices you can physically touch

Digital Devices

> A device that processes electronic signals into discrete values or which there can be two or more. In comparison Analog signals are continuous and can be represented by a smooth wave pattern

These two discrete values are known as binary .i.e. 1s and 0s, with one representing “on” and a zero representing “off”, where the value represents the presence of an electronic signal (high voltage and low voltage). Each value is referred to as a bit (binary digit) and a group of 8 bits is a byte. Early computers could only process 8 bits of data (1 byte) at a time. Current PCs can process 64 bits (8 bytes) at a time.

Word-Size

> The number of bits that can be processed by a computer.

128	64	32	16	8	4	2	1
0	0	0	0	0	0	0	0

Tour of a PC

Basic components of a PC:

- Central Processing Unit (CPU)
- Memory
- Circuit Board
- Storage
- Input / Output devices

Processing Data: The CPU

> Carries out the commands sent to it by the software and returns results to be acted upon

The speed (“clock time”) of a CPU is measured in hertz (one cycle per second). CPU chips contain multiple processors, which increase the processing power of a computer by providing the capability of multiple CPUs all sharing the processing load.

Moore’s Law

> An empirical observation that the density of integrated circuits on a chip doubles every two years. Largely debunked

Huang's Law

> An observation that the performance of a graphics processing unit (GPU) will more than double every two years. Up for debate.

Motherboard

> The main circuit board on the computer, the CPU, memory, storage components, etc. all connect into the motherboard

Most modern motherboards have many integrated components such as network interface card (NIC), video and sound processing. The motherboard provides much of the bus of the computer. The bus is a important factor in determining the computer's speed, i.e. how fast the bus can transfer data and the number of data bits what can be moved at one time. The motherboard serves as a bus through traces which provide connections between the motherboard components.

Bus

> The electrical connections between different computer components

Random-Access Memory (RAM)

> The working memory of a computer

RAM transfers data faster than the Hard Disk so programs are loaded onto it for speed. For a computer to work effectively some minimal amount of RAM is required. RAM is volatile, meaning it can only store data when receiving power, i.e. when the computer turns off any data stored in RAM is lost. RAM is usually installed in a PC using a Double Data Rate (DDR) memory module, the type of which depends on the motherboard. Generations of DDR:

- DDR1
- DDR2
- DDR3
- DDR4
- DDR5

Which each generation running faster than the previous.

Hard Disk (HD)

> A computer's long term storage medium

Considered non-volatile as data is kept even after power is lost. Drives with a capacity less than 1 Terabyte usually have a single platter.

Solid State Drives (SSD)

> A storage medium that uses flash memory incorporating Electrically Erasable Programmable Read Only Memory (EEPROM) chips, instead of spinning disks

The use of flash memory makes SSDs lighter, faster and less affected by fall damage than hard disks.

Removable Media

- Floppy disks
- CD-ROM drives
- Universal Serial Bus drives (USB) - Also use EEPROM technology

Network Connection

> The ability of a computer to connect to other computers to share resources, using a Network Interface Card (NIC)

Ethernet Network ports come built into most modern PC motherboards.

Input and Output

> Channels for receiving and delivering input and output to the user respectively.

Input and output devices are connected to the computer via various connection ports,which are generally apart of the motherboard.

Bluetooth

> A wireless technology that allows devices to exchange under short distances (10 to 100 meters) using radio waves.

The devices communicating must both have a Bluetooth communication chip installed.

Input Devices

> Devices that allow users to input data into the computer.

Today the primary input devices of a PC are the mouse and keyboard.

Output Devices

> Devices that deliver data output to the user.

Primary output devices include monitors.

Which Hardware Components Contribute to the Speed of Your Computer.

In hardware speed is improved by giving electrons shorter distances to travel in completing a circuit.

Hardware that contribute to the speed of a computer:

- CPU - Clock Speed (GHz)
- Motherboard - Bus Speed (MHz)
- RAM - Data Transfer Rate (Mb/s)
- Hard Disk - Access Time (ms) and Data Transfer Rate (MBit/s)

Other Computing Devices