



COMPUTER SYSTEMS & PROGRAMMING

Introduction to computers

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Computers

- What is computer?
- Classification can be done according to:
 - Working principle
 - Analog
 - Digital
 - Hybrid
 - Purpose
 - Special Purpose
 - General Purpose
 - Size
 - Super Computer
 - Mainframe
 - Mini Frame
 - Micro computers



According to working principle

○ Analog

- Manipulate data with continuously changing quantities like:
 - Voltage
 - Mechanical energy
 - Hydraulic energy
- Not much accurate since they measure rather than to count
- No storage
- Not reprogrammable
- Can be useful if used with some digital components

○ Digital

- Manipulate data with digits (discrete values)
- Can perform arithmetic and logic operations
- Fast, efficient and accurate
- Low cost and small size
- Based on electronic components



According to working principle

- Hybrid
 - Mixture of analog and digital
 - Combines best features of both
 - Examples are:
 - Petrol pump machines
 - Patients blood pressure and temperature measuring machines in ICU



According to purpose

- General purpose
 - Most of today's computers
 - Support a variety of tasks (by using an appropriate software)
 - Writing and editing (word processing)
 - Inventory control using data bases
 - Scientific calculations
 - Security surveillance
 - It has large amount of memory and is reprogrammable



According to purpose

- Special purpose
 - Designed to perform a specific task or to solve one problem
 - Dedicated computer to perform a task over and over again
 - Video games consoles (Xbox, Play station 3 etc.)
 - Traffic light controller
 - Aircraft navigation system
 - Weather forecasting
 - A digital watch
 - The programs are fixed in this type of computer
 - Memory is limited thus it is cost effective
 - Fast computers
 - The gap between both is decreasing day by day



According to size

- Super computers
 - The most powerful computers in terms of performance and data processing
 - Specialized and task specific computers used by large organizations
 - Used for research and exploration purposes
 - very expensive and very large in size
 - It can be accommodated in large air-conditioned rooms
 - In Pakistan and other countries Supercomputers are used by Educational Institutes like:
 - NUST (Pakistan) for research purposes
 - Pakistan Atomic Energy commission
 - Heavy Industry Taxila uses supercomputers for Research purposes



According to size

- Super computers
 - Other use of super computer are:
 - Space Exploration
 - Earthquake studies
 - Weather Forecasting
 - Nuclear weapons testing
 - Some popular Supercomputers are:
 - IBM's Sequoia, in United States
 - Fujitsu's K Computer in Japan
 - IBM's SuperMUC in Germany
 - NUDT Tianhe-1A in China



According to size

○ Mainframe computers

- Not as powerful as supercomputers, but quite expensive and large
- Many large firms & government organizations uses Mainframes to run their business operations
- The Mainframe computers can be accommodated in large air-conditioned rooms because of its size
- Popular Mainframe computers
 - Fujitsu's ICL VME
 - Hitachi's Z800

○ Mini computers

- Less expensive and smaller than mainframe
- Useful for small organizations
- Usually used when similar kind of operations are applied on different data (e.g. banks, airports etc.)
- Can support single or multi-user with active/dumb terminals
- Popular Mainframe computers
 - HP 3000
 - Honeywell-Bull



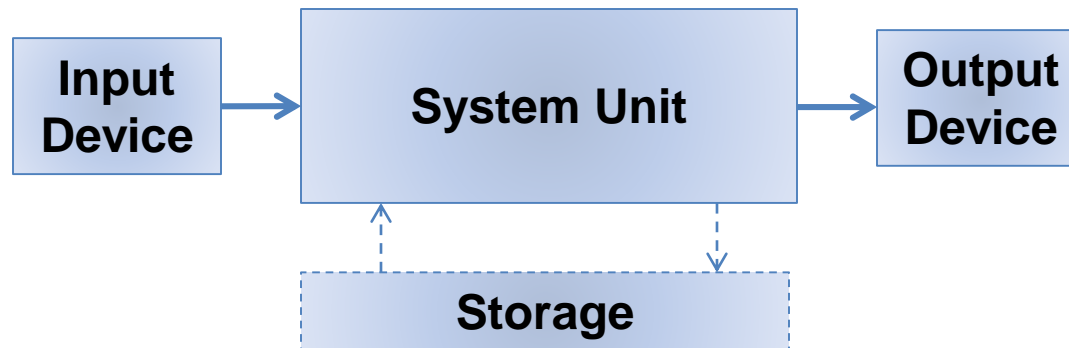
According to size

- Micro computers
 - Include laptops, personal digital assistant (PDA), tablets & smartphones
 - Widely used & the fastest growing computer
 - Also the cheapest among the other three types of computers
 - Specially designed for general usage like entertainment, education and work purposes
 - Well known manufacturers of Micro-computer are:
 - IBM
 - Dell
 - Hewlett Packard
 - Apple
 - Samsung
 - Sony
 - And many more



Components of computer

- Three-stage diagram



Input Unit

- A unit which allows data to enter into the system for processing
- Data may be:
 - Instructions
 - Data
- Regardless of the type of input device, the data arrives in the main memory in binary form
- Interfaces transform the data received into form that is acceptable by the CPU



Output Unit

- Reverse of what input unit does
- Links the CPU to outside world
- Also use interface for transformation of result into user readable/required form



Memory & Storage

- Memory and storage are different terms
- Memory holds data:
 - input from input interface
 - Data to be output to output interface
 - Intermediate data during processing
- The word memory is referred Main memory (RAM)
- Storage is referred as Secondary storage (HDD, Flash memory etc.)



Central Processing Unit (CPU)

- Responsible for all events inside the computer
- Controls all internal and external devices
- Performs "Arithmetic and Logical operations"
- CPU is also referred as microprocessor
- The operations a Microprocessor performs are called "instruction set" of this processor
- The instruction set is "hard wired" in the CPU
- The more complicated the instruction set is, the slower the CPU works
- Processors differed from one another by the instruction set
- If the same program can run on two different computer brands they are said to be compatible
- Programs written for Intel compatible computers will not run on Apple computers because these two architectures are not compatible
- Logical Parts:
 - Arithmetic & Logic Unit
 - Control Unit
 - Memory Unit



Components of Personal Computer

○ I- Case

- In case of laptop, the computer case includes keyboard and screen
- For desktop PCs, the case is typically some type of box with lights, vents, and places for attaching cables
- The size of the case can vary from small tabletop units to tall towers
- A larger case doesn't always imply a more powerful computer; it's what's inside that counts
- PC builders design or select a case based on the type of motherboard that should fit inside



Components of Personal Computer

○ II- Motherboard

- The primary circuit board inside PC where all components, inside and out, connect
- Several important components are attached directly to the motherboard



Components of Personal Computer

○ III- Power supply

- every component (other than CMOS) in PC relies on its power supply
- The power supply connects to some type of power source (AC)
- In a desktop PC, power supply is mounted inside the case with a power cable connection on the outside and a handful of attached cables inside
- Some of these cables connect directly to the motherboard while others connect to other components like drives and fans



Components of Personal Computer

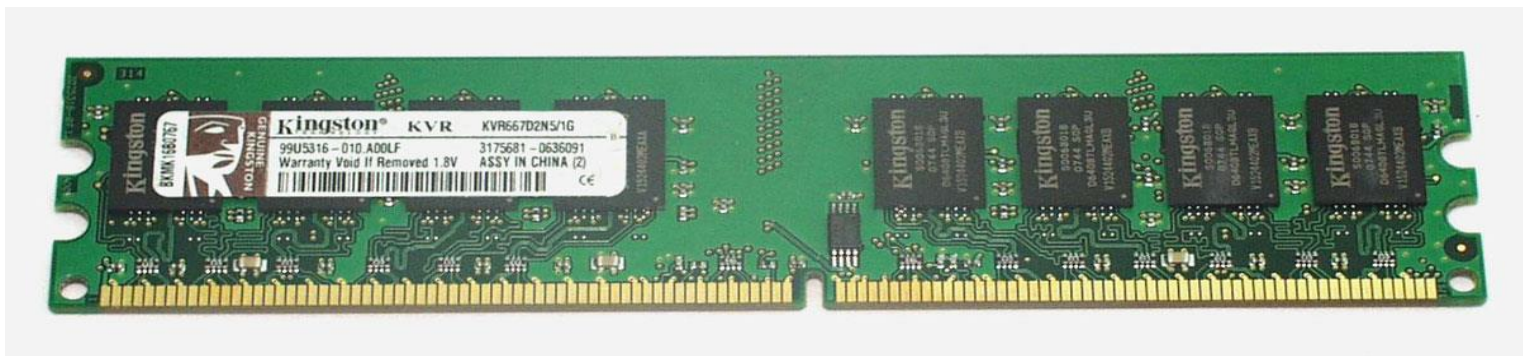
○ IV- CPU

- The CPU, often just called the processor, is the component that contains the microprocessor
- That microprocessor is the heart of all the PC's operations
- Intel and AMD are the largest CPU manufacturers for PCs
- The two common CPU architectures are 32-bit and 64-bit, and certain software relies on this architecture distinction



Components of Personal Computer

- V- Random-access memory (RAM)
 - Even the fastest processor needs a buffer to store information while it's being processed
 - Both a fast CPU and an ample amount of RAM are necessary for a speedy PC
 - Each PC has a maximum amount of RAM it can handle, and slots on the motherboard indicate the type of RAM the PC requires



Components of Personal Computer

○ VI- Drives

- A drive is a device intended to store data when it's not in use
- A hard drive or solid state drive stores a PC's operating system and software
- This category also includes optical drives such as those used for reading and writing CD and DVD
- A drive connects to the motherboard based on the type of drive controller technology it uses, including the older IDE standard and the newer SATA standard



Components of Personal Computer

○ VII- Cooling devices

- The more your computer processes, the more heat it generates
- The CPU and other components can handle a certain amount of heat
- However, if a PC isn't cooled properly, it can overheat, causing costly damage to its components and circuitry
- Fans are the most common device used to cool a PC
- In addition, the CPU is covered by a metallic block called a heat sink, which draws heat away from the CPU
- Some serious computer users, such as gamers, sometimes have more expensive heat management solutions, like a water-cooled system, designed to deal with more intense cooling demands





Components of Personal Computer

○ VIII- Cables

- All the components are connected by some combination of cables
- These cables are designed to carry data, power or both
- PCs should be constructed so that the cables fold neatly within the case and do not block air flow throughout it



Ports, Peripherals and Expansion Slots

- A PC needs additional components for interacting with human users and other computers
- While some motherboards have on-board graphics, others include what's called an expansion slot
- It is used to install a separate video card, audio card, TV card
- Video components (integrated or add-in) in a PC process some of the complex graphics data going to the screen, taking some of the load off your CPU
- A motherboard accepts video cards based on a specific interface, such as the older AGP standard or one of the newer PCI standards



Ports, Peripherals and Expansion Slots

○ *Ports*

- The word port is often used to describe a place on the outside of your PC where you can plug in a cable
- Many ports are affixed directly to the motherboard
- Some of the ports you'll find on a PC include:
- USB ports
- Ethernet
- video ports (VGA, DVI, HDMI)
- Parallel port
- Serial port



Ports, Peripherals and Expansion Slots

- Peripherals
- Any piece of hardware that isn't mounted inside a PC's case is called a peripheral
- This includes your basic input and output devices:
 - Monitors
 - Keyboards
 - Mice
- It also includes:
 - Printers
 - Speakers
 - Headphones
 - Microphones
 - Webcams
 - USB flash drives



Questions

