Architecture of PC

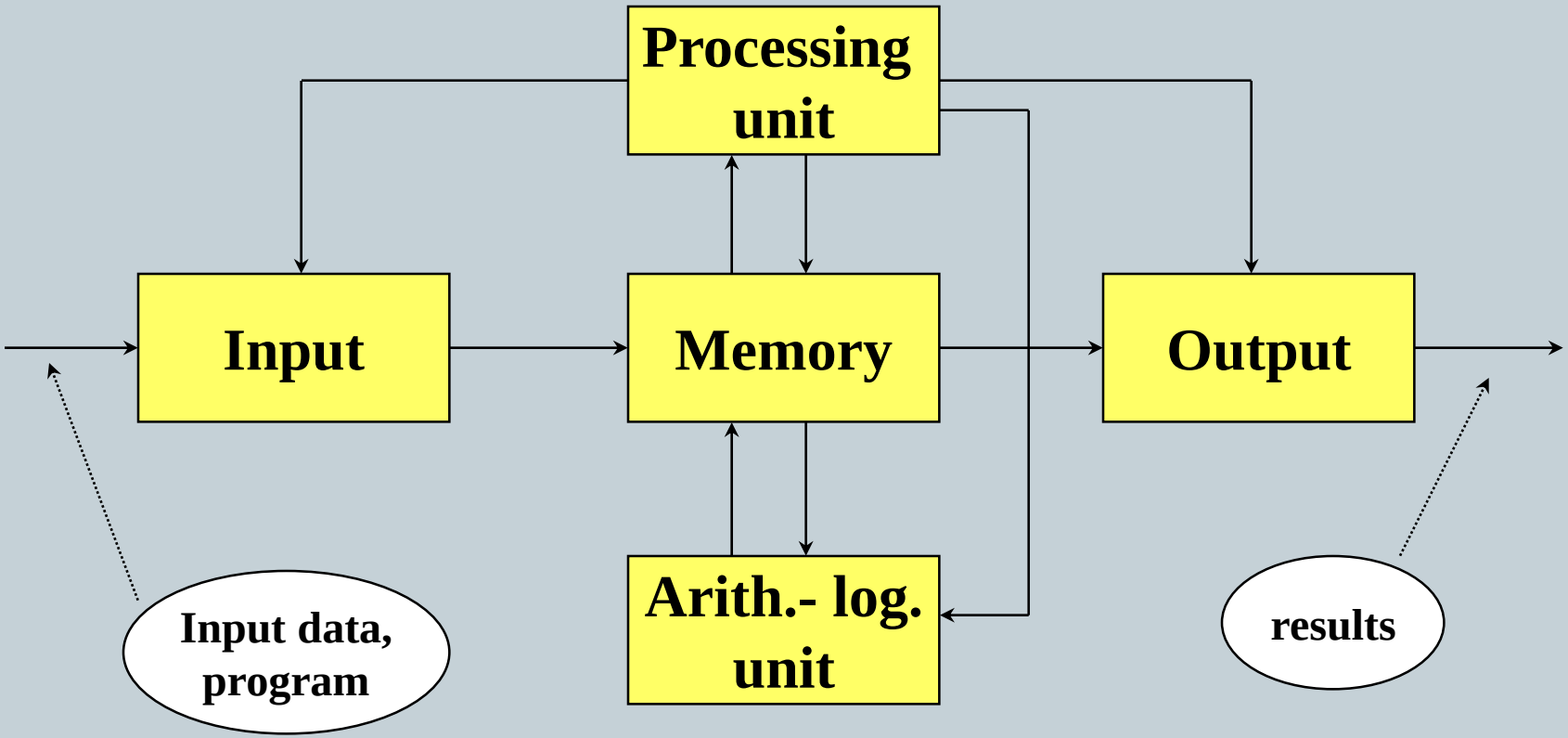
COMPUTER DATA PROCESSING

1ST LECTURE

Personal computer (PC)

- The computer can be described as a device that is capable of performing the requested data transformation.
- term „personal computer“ was introduced in 1981 by IBM company as a **PC** (**P**ersonal **C**omputer),
- These computers belong to the wider group of microcomputers.
- Their architecture is based on **Von Neuman conception** that means computers with internal management i.e. not only data processed are saved in memory but also the *program* that manages whole process of data processing.

Von Neuman computer scheme



Von Neuman scheme consists of five main blocks:

- System memory,
- Control unit,
- Arithmetic-logic unit,
- Input devices,
- Output devices.

- **System memory** serves to store the processed program and data processing – input and output.
- **Arithmetic logic unit (ALU)** performs all arithmetic calculations and logical operations, which are implemented by additioners, multiplicatiors and comparators.
- **Controller (control unit)** via the **control signals** governs the operation of individual parts of the computer.
- **Input devices** (e.g. keyboard, scanner, mouse) are devices intended for entering of programs and data.
- **Output devices** (monitor, printer) are designed to display data processed by computer.

Microprocessor, microcomputer

Microprocessor

- is an electronic circuit made by technology of a very large integration and placed on a single integrated circuit called chip,
- is controlled by programs stored in control memory ,
- contains Arithmetic logic unit (ALU), a universal and single-purpose registers and other logic circuits to enable its connection to other circuits (input and output buses).

Microcomputer

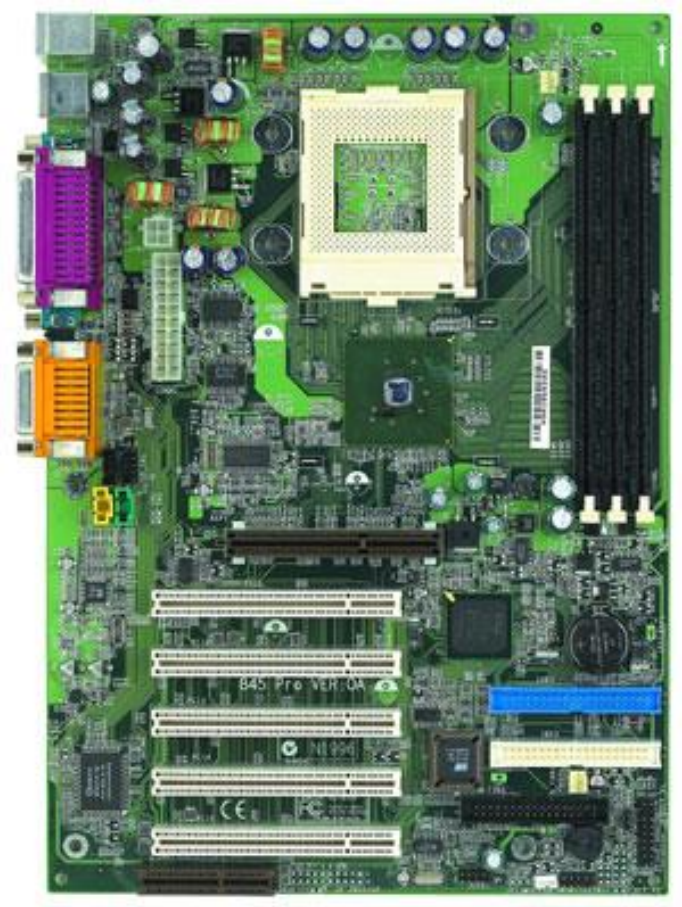
- is a universal digital computer containing a microprocessor or corresponding structure of logic circuits, semiconductor memory, ROM and RAM and other standard integrated circuits,
- after programming it is able to work independently.

Microprocessor in link with memory (RWM - Read Write Memory, ROM - Read Only Memory), input-output interfaces with support monitorial programs and other auxiliary circuits creates microcomputer.

The main parts of the PC
Basic (Mother) board

- PC is essentially one board microcomputer-based on one circuit microprocessor.
- The board on which personal computer stands is called the **basic**, respectively matrix or system board (Motherboard or Mainboard British English).
- The motherboard is the central part of the computer system and other units such as power supply, drive (s), flexible disks, hard drives, CDs, etc.. are connected to it.
- To the motherboard the equipment used for communication of computer with the surroundings, especially the keypad and display is attached.

Motherboard

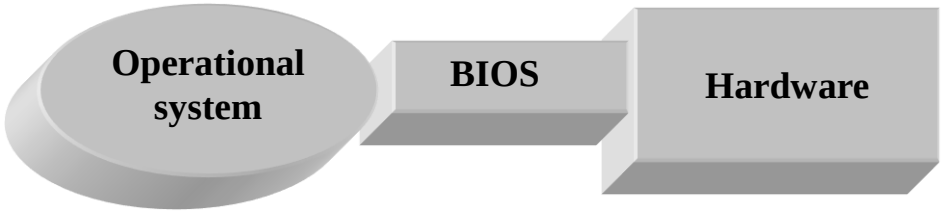


Motherboard contains and mutually connects individual technical parts of computer.

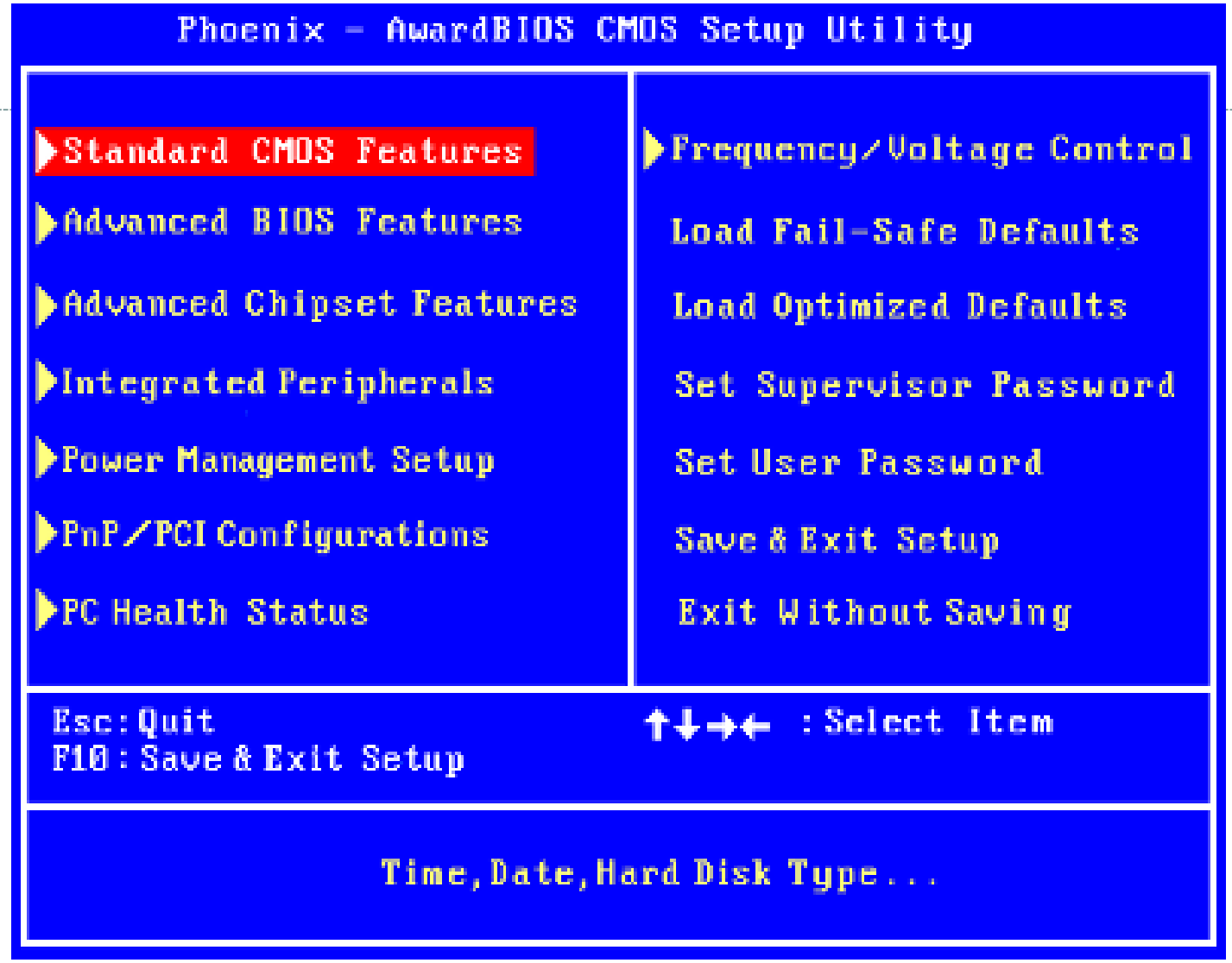
BIOS

- For the interconnection of the various technical elements and different operating systems is used BIOS (**B**asic **I**nput **O**utput **S**ystem).
- BIOS is the most basic system program for the technical operation of your computer, stored in ROM memory and it mediates the communication between the technical and operational data of computer systems .

The inclusion of BIOS in operating system and hardware



Communication with user	Services programs	Application software
Core of operational system		
Hardware operation - BIOS		
Hardware		


Phoenix - AwardBIOS CMOS Setup Utility
Standard CMOS Features
Advanced BIOS Features
Advanced Chipset Features
Integrated Peripherals
Power Management Setup
PnP/PCI Configurations
PC Health Status
Frequency/Voltage Control
Load Fail-Safe Defaults
Load Optimized Defaults
Set Supervisor Password
Set User Password
Save & Exit Setup
Exit Without Saving
Esc: Quit
F10: Save & Exit Setup
: Select Item
Time, Date, Hard Disk Type...

Computer memory

Computer memory - contains data processing by computer and program instructions that control this process and serves to store the processed results.

Categorization:

- **internal (primary) -** microprocessor cooperates with it immediately;
- **external (secondary) -** stores the results and programs that the microprocessor does not need at the time.

Internal memory

- Memory with random access, i.e. that any place in the memory is available at the same time, latency time is the same for all addresses
- data can be read and written into RAM (Random Access Memory)
- after disconnecting the computer from the power source, the information stored in RAM is lost.

ROM

- ROM, which can be read only, contains data that are usually stored by the manufacturer.
- The information remains in memory even when disconnected from the power source.
- The program stored in ROM is used to perform procedures related to starting computer after power-up (BIOS).

Main memory characteristics

- **Capacity** - the amount of data that can be placed into memory. It is expressed usually in *bytes* [b].
- **Latency time** - is the delay time which elapses between the moment a memory controller tells the memory module to access a particular data, and the moment the data is available on the module's output pins.
- **Duration of the cycle** - the minimum period of time during which the memory can receive and process a request for writing or reading.

External memory

- External memory devices are not located on motherboard.
- They are used for permanent storage of data, since their content remains after turning the computer off or removal off the storage medium.
- Information stored on external storage media can be read at any time into the internal memory and processed.
- Like the internal memory also external memory is characterized with capacity and the access time (latency).
- External memory devices have greater capacity but lower access speed than the internal memory.

Magnetic memory

HDD (Hard Disk Drive)

external memory

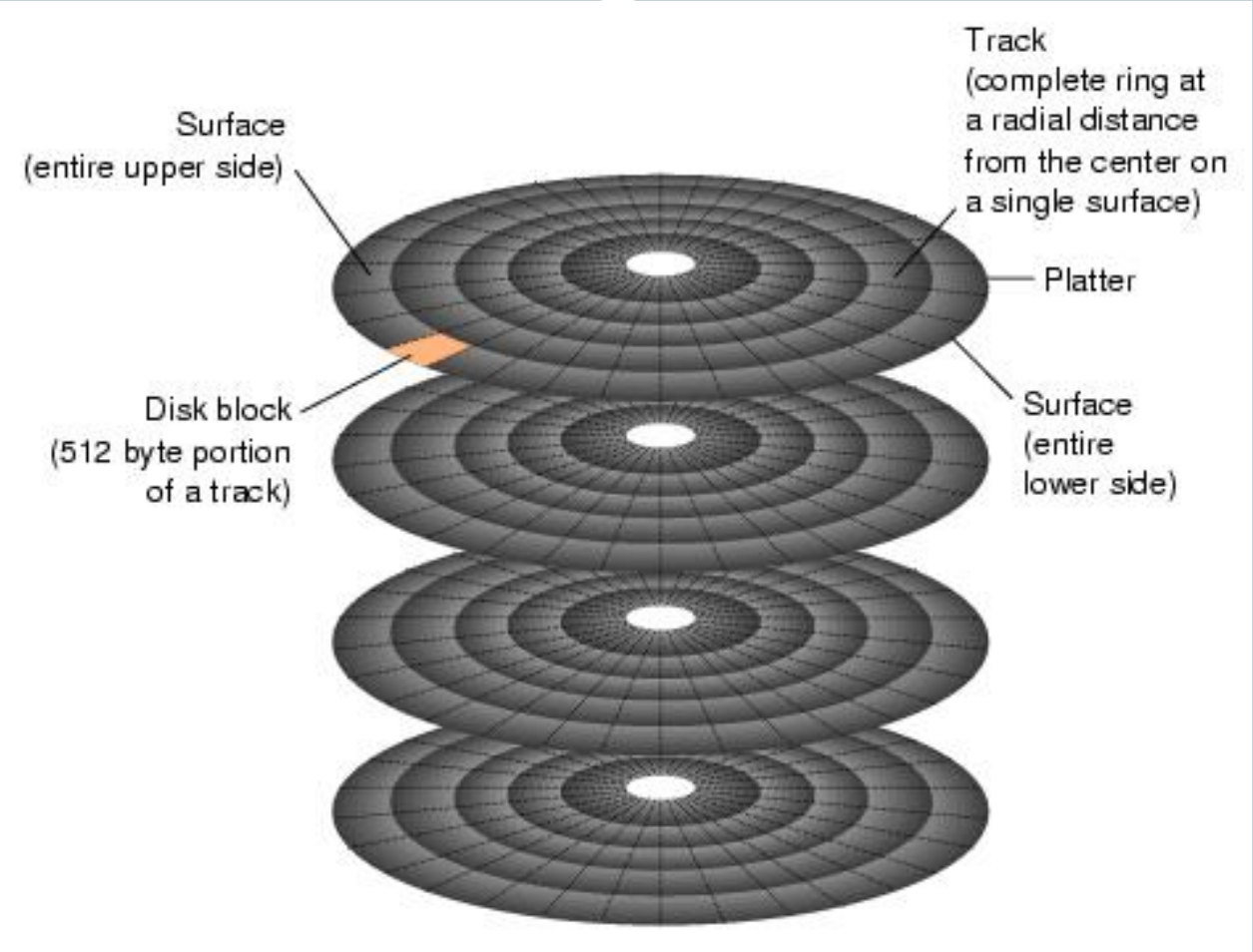
Floppy disk: 5,25” a 3,5”

Physical Disk Structure

- disc is divided into concentrated circles (**tracks**) in which the data are recorded.
- each track is divided into **sectors**, whose size is 512 B.
- current high capacity discs have, due to easier organization, sectors associated **clusters** (allocation units).

- **The sector is considered as the basic physical unit and the cluster as the basic logical unit of disk drive.**

Physical Disk Structure

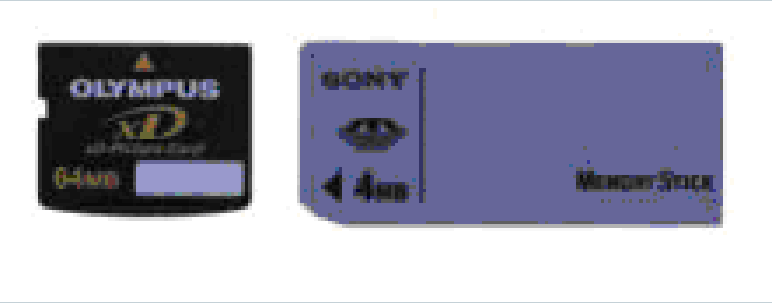


Optical Memory

- Optical storage media raised theirs popularity with the introduction of the Windows 3.0.
- In Optical Memory, data is stored on an optical medium (i.e., CD-ROM or DVD), and read with a laser beam. While not currently practical for use in computer processing, optical memory is an ideal solution for storing large quantities of data very inexpensively, and more importantly, transporting that data between computer devices.
- Currently, in addition to conventional optical CD (Compact Disc) are also used digital DVD (Digital Versatile Disc) and BlueRay Disc.

Semiconductor memory

- In addition to the internal memory, semiconductor memory includes the USB drives and memory cards (memory cards are mainly used in digital cameras and camcorders, PDAs, MP3 players, etc.).

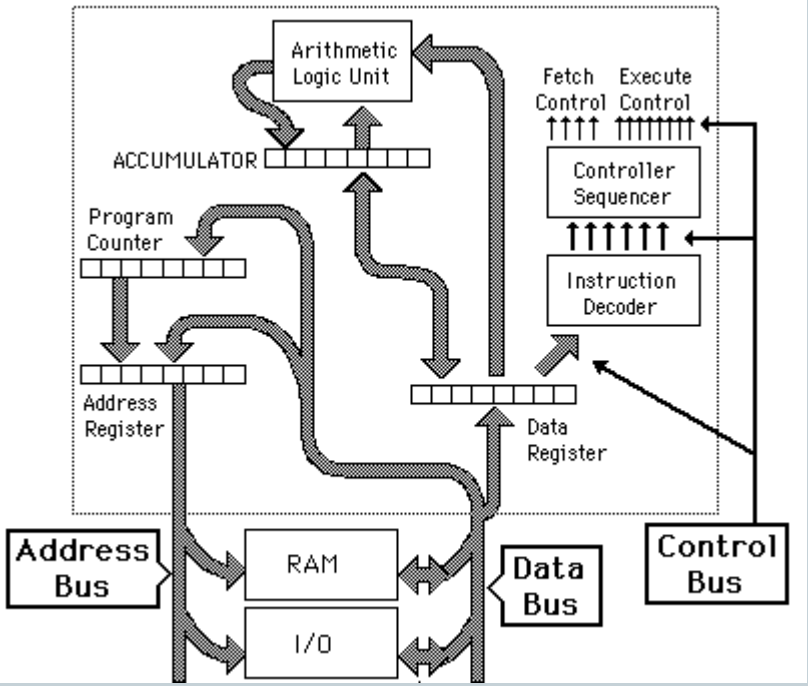


Bus

Communication of processor for processing program with other parts is done by buses - the type of data transmitted makes bus to be divided into three groups:

- **Address bus**, which is one way and through it generated address of memory cell (to which the current figure should be imposed respectively of which it should be loaded) is transmitted from processor to operational memory.
- **Data bus** is bidirectional and allows the transfer of data between the ALU (Arithmetic Logic Unit), memory and computer peripherals.
- **Control bus** is used to transmit signals that control the activity of individual parts of computer.

Buses: The exchange of information.



Information is transferred between units of the microcomputer by collections of conductors called buses.

PC Interfaces

- To the computer can be attach peripherals such as: keyboard, printer, modem, pointing device (mouse), etc..
- These are added using the “Port interface” .
- Port serves as an interface between the computer and other computers or peripheral devices.

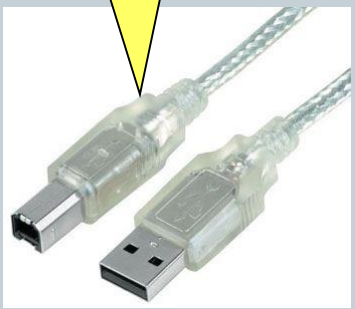
PC Interfaces

parallel

serial

PS/2

USB



Input / Output devices

- For communication between user and computer
- Ensure the transformation of user-friendly data into a electronic computer intelligible form.

The most commonly used input devices:

- keyboard,
- mouse (trackball, touchpad)
- tablet
- scanner.

Output devices:

- monitor
- printer
- speakers
- headphones.

Software

- Computer Software (software) is the sum of all the programs that can be used on a computer.
- Every task for computer from ordinary addition to processing of complex project, must be programmed using the instructions that the computer understands, and that determine how each of the computer part should behave. These elementary instructions are merging to create units and create programs.
- The program is an operating system, but also word processing, spreadsheet, computer game and so on.
- Computer software, or just software, is a collection of computer programs and related data that provide the instructions for telling a computer what to do and how to do it.

Software classification

Practical computer systems divide software systems into three major classes:

- system software
- programming software
- application software,

although some software is difficult to include into one category.

System software

System software helps run the computer hardware and computer system. It includes a combination of the following:

- device drivers,
- operating systems,
- servers,
- utilities.

System software is a program that manages and supports the computer resources and operations of a computer system while it executes various tasks such as processing data and information, controlling hardware components, and allowing users to use application software. That is, systems software functions as a bridge between computer system hardware and the application software. System software is made up of many control programs, including the operating system, communications software and database manager.

Programming software

Programming software usually provides tools to assist a programmer in writing computer programs, and software using different programming languages in a more convenient way. The tools include:

- compilers
- debuggers
- interpreters
- linkers
- text editors

An Integrated Development Environment (IDE) is a single application that attempts to manage all these functions.

Application software

Application software allows end users to accomplish one or more specific (not directly computer development related) tasks. Typical applications include:

- industrial automation
- business software
- computer games
- databases
- educational software
- medical software
- military software
- molecular modeling software
- quantum chemistry and solid state physics software
- telecommunications (i.e., the internet and everything that flows on it)
- image editing
- spreadsheet
- simulation software
- word processing
- decision making software

Thank you for your attention!