INTRODUCTION TO COMPUTERS:

➢ Components of a PC and their functions

➢ Memory and storage devices

➢ Introduction to operating systems

OBJECTIVES:

➢Describe the four units of all computer systems
➢Identify system unit components
➢Describe the operations involved in executing a single instruction.
➢Tell the basic difference between system software and application software
➢List and explain the services provided by an operating system
➢Explain multitasking, multiprocessing, time-sharing and multiprogramming
➢ List and explain the functions of the components of an operating system

INTRODUCTION

➢A **computer** may be defined as a *device* that works under the control of stored programs, automatically accepting, storing and processing data to produce further data or information.

➢The computer performs the following functions:

    a. Accepts **Input**.

    b. **Storage**: Holds data internally before, during and after processing.

    c. **Processing:** Performs operations on data.

    d. **Output:** Produces data from within for external use

NB:

➢All computer systems regardless of their size or type have the same capabilities: **Input, Processing, Output and Storage**
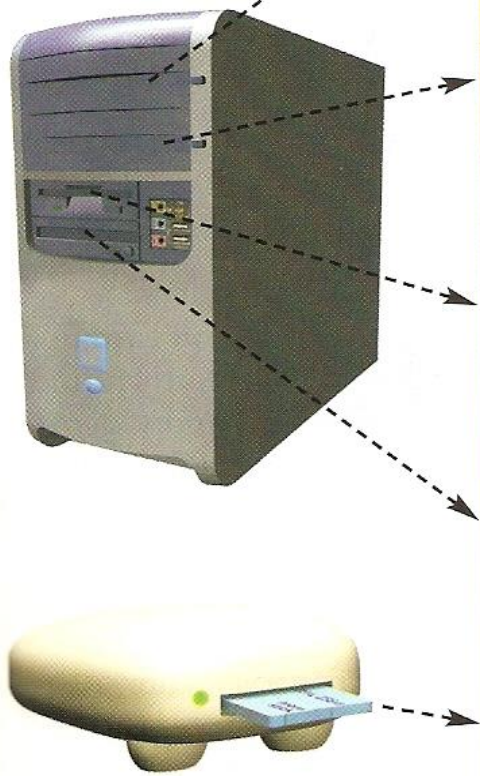
COMPUTER SYSTEM

Input

Storage

Processing

Output
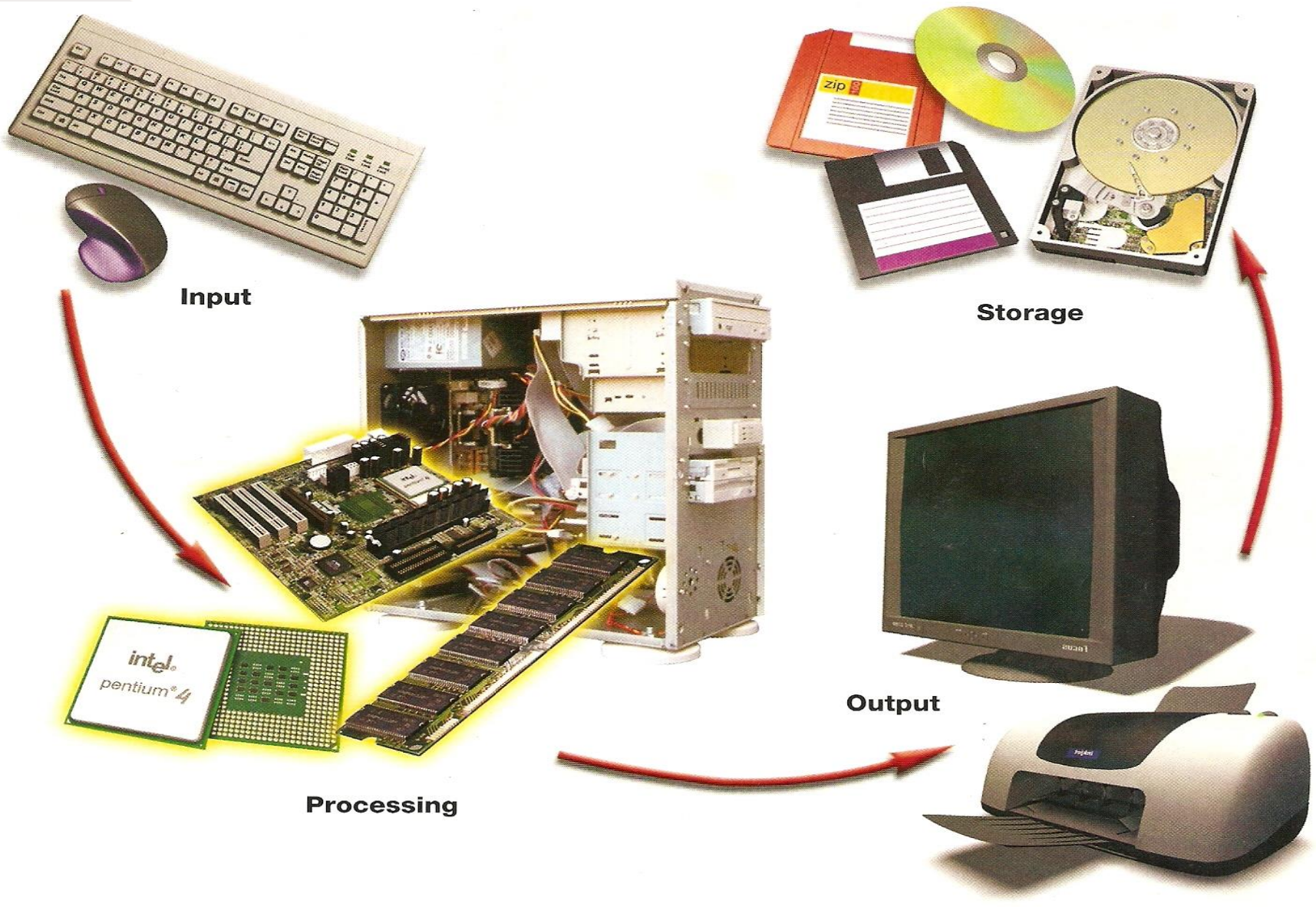
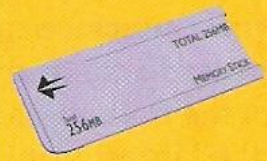➢**Input Unit:** Enables data entry in different forms (text, images, and sound) and instruction into the computer. E.g. keyboard, mouse, microphone, modem, and drawing tablet.

➢**Processing Unit:** processes that data into meaningful information. The processing unit also includes temporary storage (RAM).

Output Unit: devices used to show results of processed data to the user . E.g. monitor and printer, speakers, modem, etc.

➤ **Storage devices:** Storing of processed data

STORAGE MEDIUM	CAPABILITIES	STORAGE CAPACITY
DVD DVD+RW	Read-only Read and Write	9.4 GB
CD CD-RW	Read-only Read and Write	700 MB
Floppy Disk	Read and Write	1.44 MB
Zip Disk	Read and Write	100 MB, 250 MB, or 750 MB
Flash Memory Cards	Read and Write	16 MB to 1 GB

HARDWARE:

➤ The physical components of a computer system - the system unit and all its contents, the keyboard, mouse, monitor, etc are all computer hardware.

➤ PC hardware consists of:
  ➤ The System Unit and
  ➤ Attached devices called peripherals, e.g. monitor, keyboard, and mouse and maybe; speakers, a modem, printer, scanner, etc.

SYSTEM UNIT COMPONENTS

Power supply

Processor

Motherboard

Adapter cards (such as sound card)

CD drive

Open drive bay

Indicator lights

Floppy drive

Zip drive

Hard disk
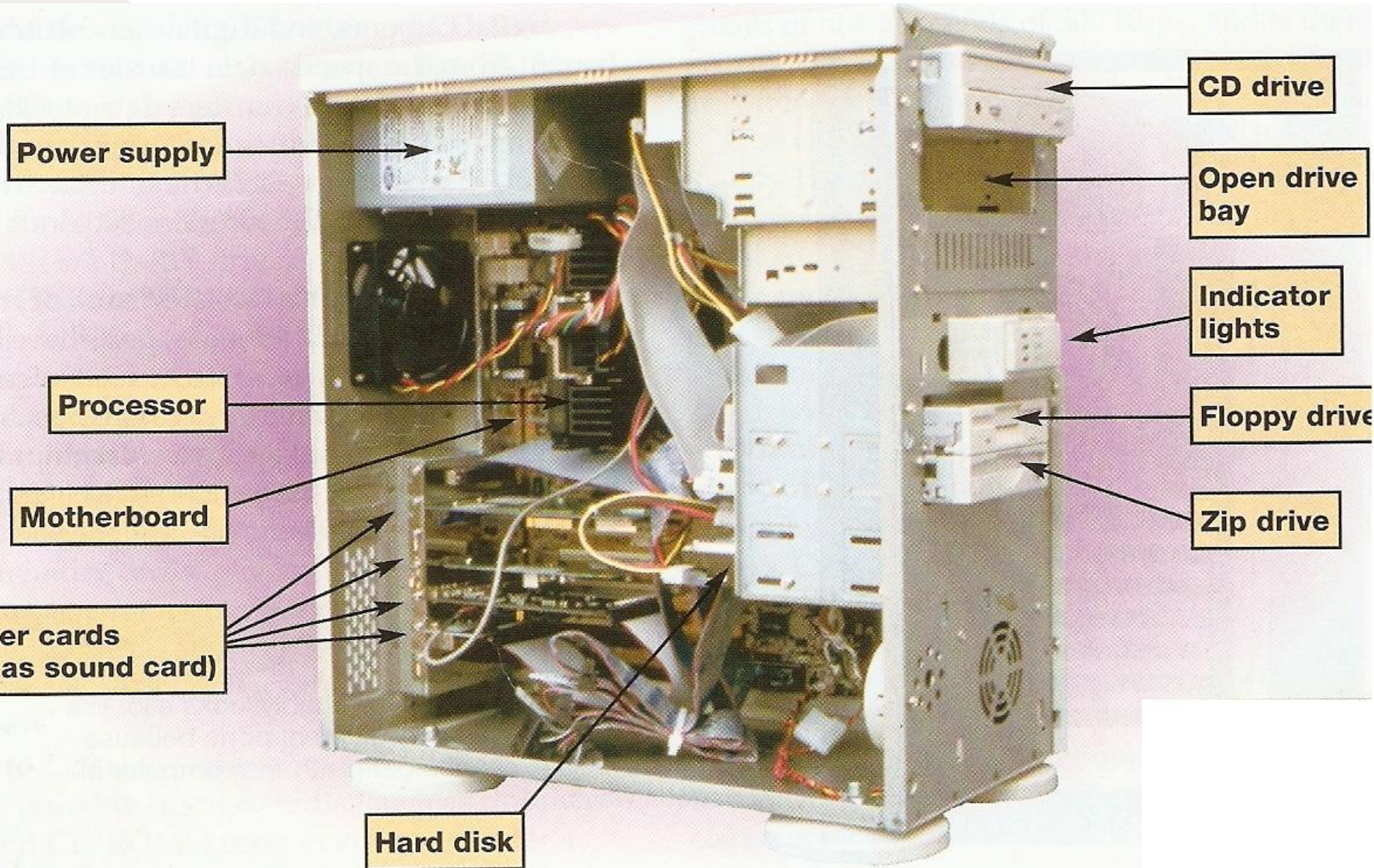
THE MOTHERBOARD

The motherboard provides the following basic functionalities:

➢It provides connectivity for all system components.

➢It distributes power to every component on the motherboard.

➢Provides various connectors for attaching components such as the Network Interface Card (NIC), Video Card, Modem, Sound Card, Keyboard, Mouse, etc.

The following components are found on a typical motherboard:

- Expansion slots
- Processor socket
- Memory slots
- On -board drive connectors
- Power connector
- Keyboard and mouse connectors
- Peripheral port and connectors
- CMOS battery

A TYPICAL MOTHERBOARD

CENTRAL PROCESSING UNIT (CPU)

➤The CPU is the `brain' of the computer. The processor works hand in hand with other circuits known as main memory and registers to carry-out processing.

➤The CPU (Central Processing Unit) takes the data entered into the PC and processes that data into meaningful information;

➤Examples include running a specific program, producing a sound, drawing an image on-screen, etc.

➤The processing unit also includes temporary storage (RAM) in which the information currently being processed is stored temporarily.

Central Processing Unit
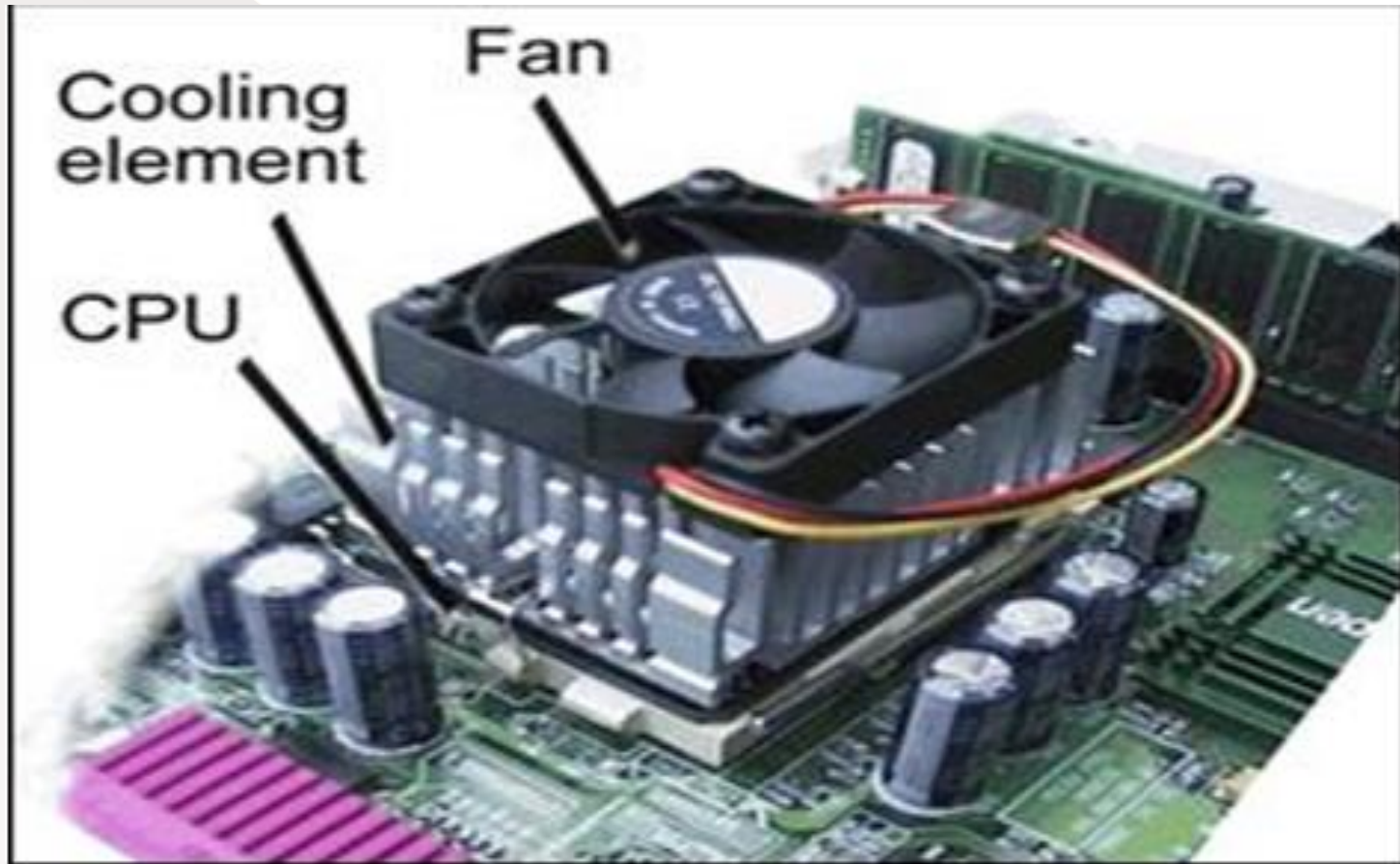
The processor consists of two units:
Control Unit and **Arithmetic/Logic Unit**.

The Control Unit:

- ➢ Tells the rest of the computer system how to carry out a program's instructions.
- ➢ It directs the movement of electronic signals between main memory and the arithmetic/logic unit.
- ➢ It also directs these electronic signals between main memory and the input and output devices.

The arithmetic logic unit (ALU):

➢ Performs arithmetic and logic operations
➢ Does comparisons
➢ Controls the speed of the various operations.

To execute a single program instruction, the processor performs a series of operations referred to as the ***machine cycle.***

THE CPU MACHINE CYCLE

➢ **FETCH:** When any program begins to run, the program's binary code is "fetched" from the random access memory (RAM) and to the CPU.

➢ **DECODE:** Once the program's binary code is in the CPU, it is "decoded" into the commands the CPU understands.

➢ **EXECUTE:** Next, the CPU actually performs the work described in the command. Specialized hardware on the CPU performs the mathematical and logical operations at incredible speeds.

➢ **STORE:** The result is stored in **registers**, special memory storage areas built into the CPU. The CPU is then ready to fetch the next set of bits encoding the next instruction.

RANDOM ACCESS MEMORY (RAM)

➢ RAM is the temporal working storage of the computer.

➢ RAM is *volatile* – it only works while the power is on.

RAM has three tasks:
  ➢It holds data for processing.

  ➢It holds instructions (programs) for processing data.

  ➢ It holds data that has been processed

READ ONLY MEMORY (ROM) CHIPS

➢ROM is an acronym for *Read Only Memory*.

➢ROM is non-volatile.

➢One of the ROM chips in a PC contains instructions the computer needs when it is turned on or booted. These instructions are called *ROM bootstrap*.

➢A ROM chip helps the processor transfer information between the keyboard, screen, printer, and other peripheral devices to make sure all units are functioning properly. These instructions are called *ROM BIOS (basic input/output system)*.
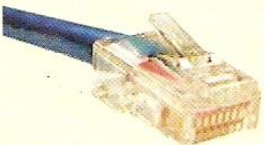
Expansion Card and Slots

Extra functionality can be added to a computer by connecting an expansion card. Some examples are:

➤Graphics card

➤Sound card

➤Network Interface Card (NIC)

➤Internal modem

PORTS

➢ A port is a socket on the outside of the system unit that is connected by a bus to the motherboard on the inside of the system unit or connected directly to integrated circuitry on the motherboard.

➢ A port allows connection to peripheral devices, such as monitor, mouse, keyboard, printer, so that it can communicate with the computer system.

PORT NAME	PORT SHAPE	CONNECTOR SHAPE	DATA TRANSFER SPEED	TYPICAL DEVICES ATTACHED TO PORT
Serial			56 Kbps	Mice External modems
Parallel			12 Mbps (12,000 Kbps)	Printers External Zip drives
NEW TECHNOLOGY				
USB 1.1			12 Mbps	Mice Keyboards External Zip drives Printers Scanners Game controllers
USB 2.0			480 Mbps	Same as USB 1.1, but at faster transfer rates Also suitable for camcorders and digital cameras Maintains backward compatibility with USB
FireWire			400 Mbps	Digital video camcorders Digital cameras
Ethernet			Up to 100 Mbps	Network connections Cable modems

SYSTEM SOFTWARE:

➢Starts up the computer and functions as the principal coordinator of all hardware components.

➢Without System software loaded into the computer's RAM, hardware and applications software are useless.

➢System software comprises a large number of instructions that can be grouped into three basic parts:

1. Operating system.

2. Utilities

3. Language translators.

OPERATING SYSTEM

➢The OS is a program that acts as an intermediary between a user of a computer and the computer hardware.

SOFTWARE:

Is the general term used to describe all the various programs that may be used on a computer system together their associated documentation.

➢There are two basic types of software:

➢ **System software** tells the computer how to communicate with peripheral devices.

➢**Applications software** programs are programs designed to satisfy a user's needs.

THE OPERATING SYSTEM

Manages the computer system's hardware and peripheral devices

The Operating System

Provides a way for the user to interact with the computer

Manages the memory and storage

Manages the processor

Provides a consistent means for software applications to work with the CPU
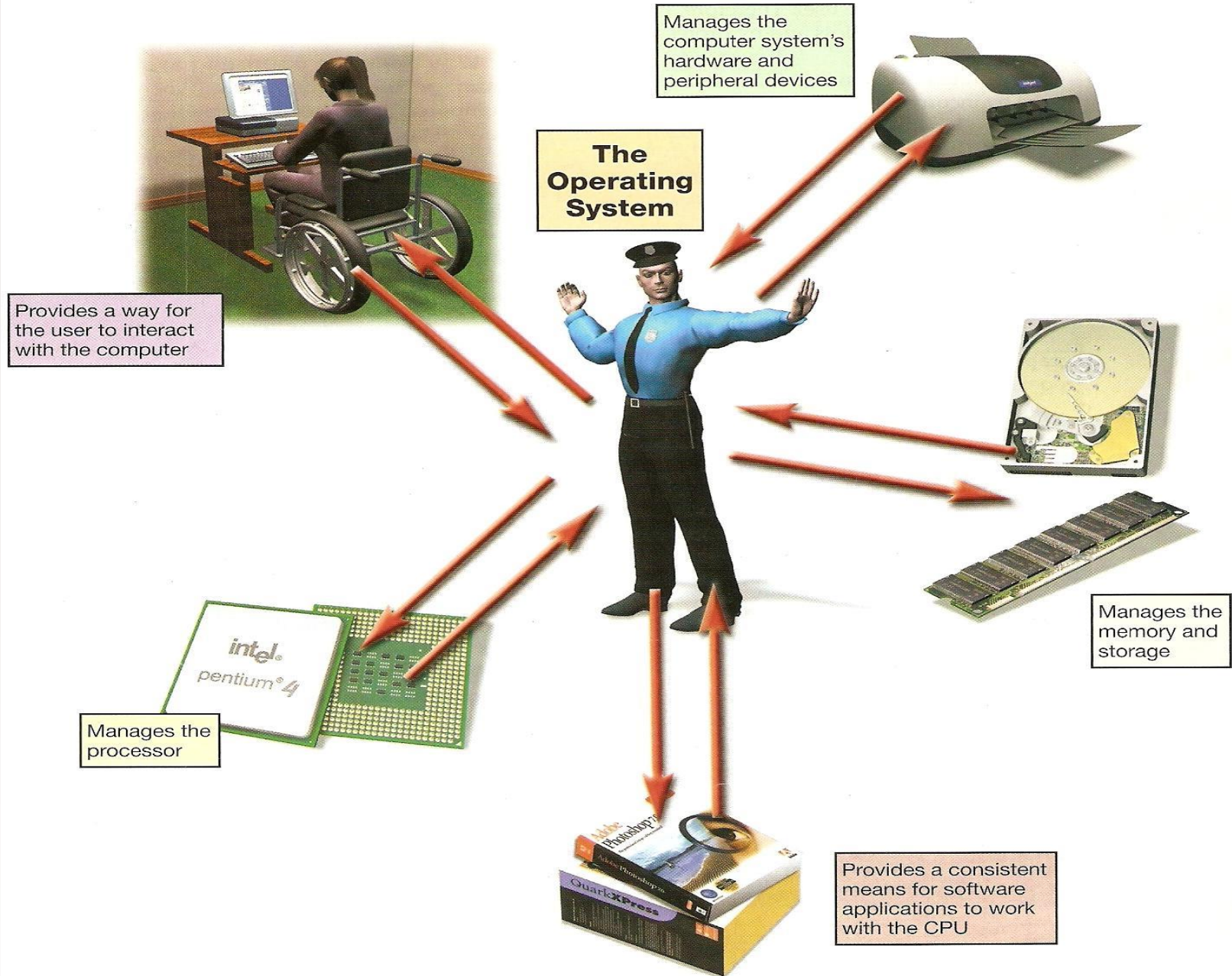
FUNCTIONS OF THE OS

➤ It provides a way for the user to interact with the computer.

➤ It manages the central processing unit (CPU).

➤ It manages the memory and storage.

➤ It manages the computer system's hardware and peripheral devices.

➤ It provides a consistent means for software applications to work with the CPU.

THE BOOT PROCESS

1. The basic input/output system (BIOS) is activated by powering on the CPU.

2. The BIOS checks that all attached devices are in place (called a Power- On Self - Test, or POST)

3. The operating system is loaded into RAM.

4. Configuration and customization settings are checked.

Some Well – Known Pc Operating Systems:

➢ Windows 98, Windows XP, Windows Vista, Windows 7, Windows NT by Microsoft.

➢ MacOS for Apple Macintosh Computers.

➢ Linux, which is a PC version of the Unix Operating Systems. (e.g. RedHat, Suse, Ubuntu, Debian, etc)

➢ Solaris by Sun Microsystems.

Components of an Operating System

- ➢ **Process Manager and Scheduler**
- ➢ **Memory Manager**
- ➢ **File Manager**
- ➢ **I/O Management**
- ➢ **Secondary Storage Management**
- ➢ **Network Manager**
- ➢ **Protection System**
- ➢ **Command interpreter system**

Process Manager and Scheduler

The five major activities of an operating system in regard to process management are:

- ➤ Creation and deletion of user and system processes.
- ➤ Suspension and resumption of processes.
- ➤ A mechanism for process synchronization.
- ➤ A mechanism for process communication.
- ➤ A mechanism for deadlock (standstill) handling.

MEMORY MANAGER

The major activities of an operating in regard to memory - management are:

➢Keep track of which part of memory are currently being used and by whom.

➢Decide which processes are loaded into memory when memory space becomes available.

➢Allocate and de - allocate memory space as needed

FILE MANAGER

The five main major activities of an operating system in regard to file management are:

➢ The creation and deletion of files.

➢ The creation and deletion of directories.

➢ The support of primitives for manipulating files and directories.

➢ The mapping of files onto secondary storage.
➢ The back up of files on stable storage media.

INPUT OUTPUT MANAGER

➢ I/O subsystem hides the distinctive features of specific hardware devices from the user.

➢ Only the device driver knows the peculiarities of the specific device to which it is assigned.

➢ These device drivers tell the respective devices how to work.