Al-Mustaqbal University
Department of Artificial Intelligence Techniques Engineering
Class one - first semester
Lecture 3-4

Operating system and GUI

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Behavioral objectives

At the end of the lecture, the student is able to

1- Explains the types of memory.
2- Explains the Basic CPU Components.
3- Explains the Resource Management an Operating System.
4- Explains a concept User Interface.
5- Explains the Functions of the user interface.
6- Explains the Graphical User Interface (GUI).

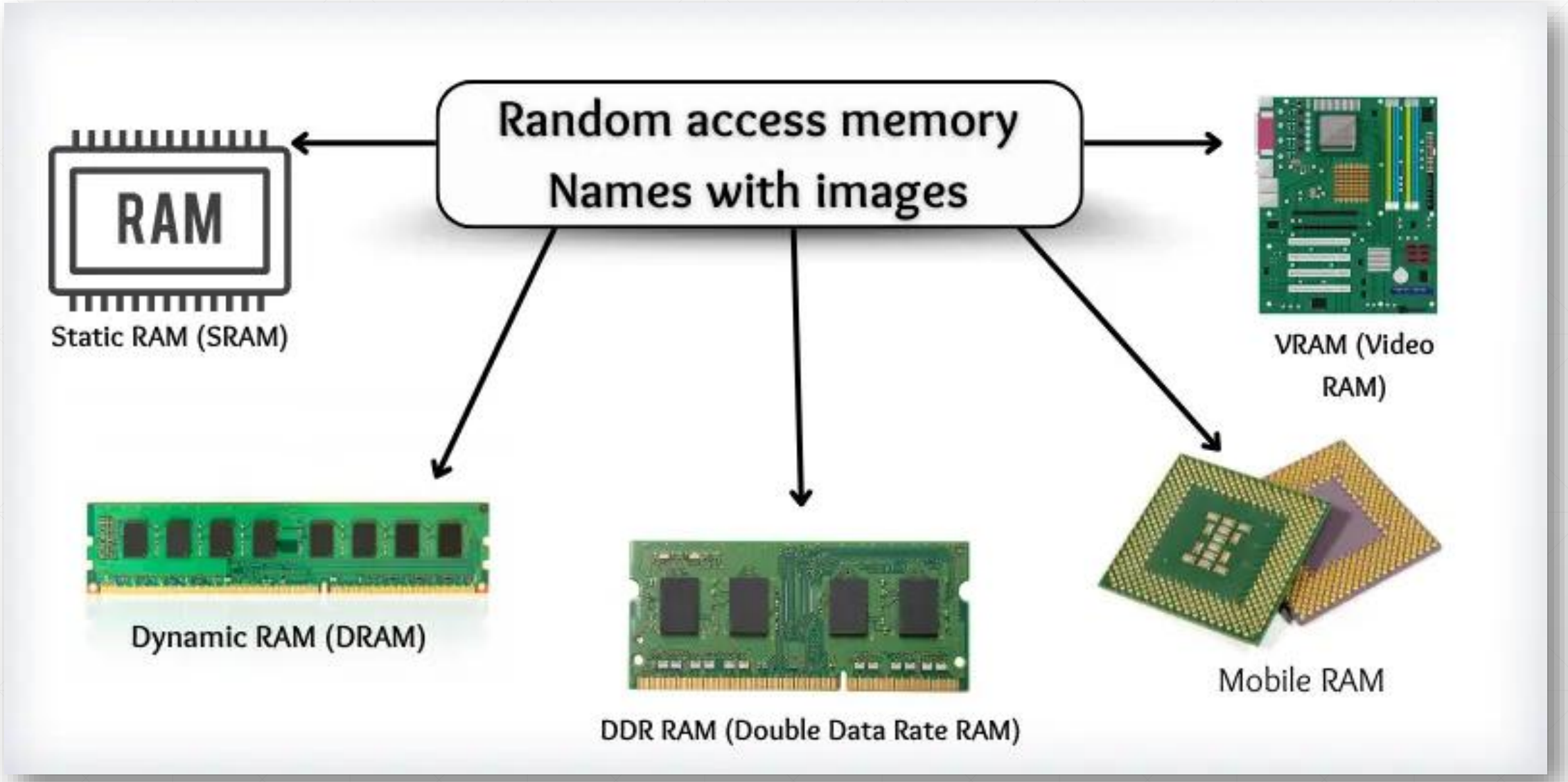
Introduction

A computer system consists of several integrated components that work together to process data and produce meaningful information. These components include hardware units, memory, and the central processing unit.

Memory Types

Random Access Memory (RAM)

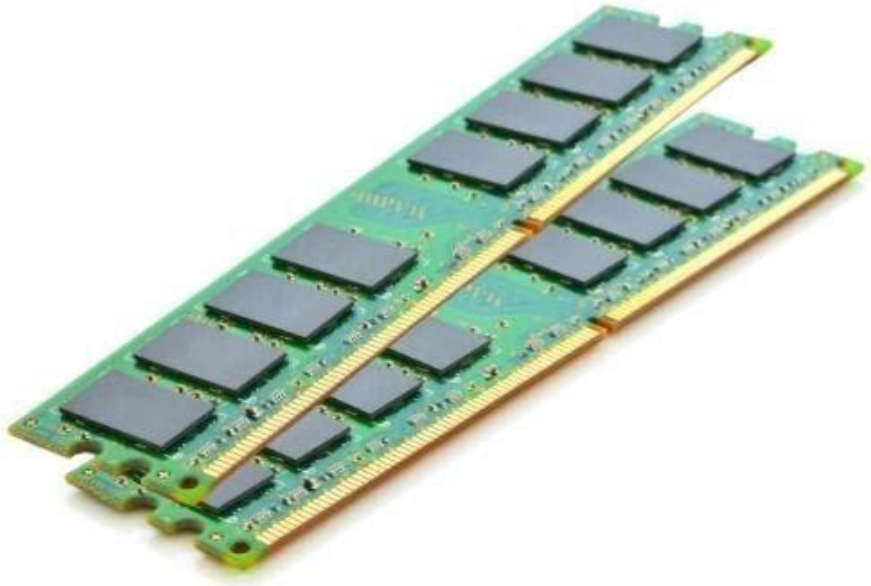
Random Access Memory (RAM) is a primary and volatile memory used by the computer to store data and instructions that are currently being executed by the CPU. RAM allows fast access to data, which improves system performance. However, all data stored in RAM is lost when the computer is turned off.


Random access memory
Names with images
RAM
Static RAM (SRAM)
VRAM (Video RAM)
Dynamic RAM (DRAM)
DDR RAM (Double Data Rate RAM)
Mobile RAM

Read Only Memory (ROM)

Read Only Memory (ROM) is a non-volatile memory that permanently stores essential instructions required to start and operate the computer. ROM contains the booting program that initializes hardware components and loads the operating system.

RANDOM ACCESS MEMORY



RAM

VS

READ ONLY MEMORY

ROM

Cache Memory

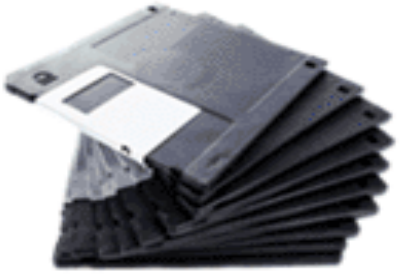
Cache memory is a small but very fast memory located close to or inside the CPU. It stores frequently used data and instructions to reduce access time and improve processing speed.

Secondary Storage

Secondary storage devices are non-volatile and used for permanent data storage. Common examples include Hard Disk Drives (HDD) and Solid-State Drives (SSD). HDDs store data magnetically, while SSDs use flash memory and provide faster access speeds.

CD/DVD

Hard Disk

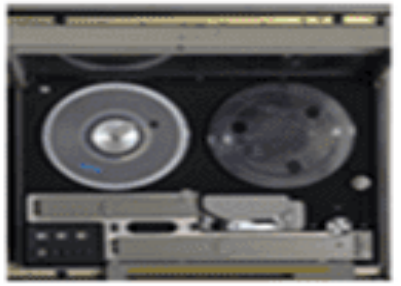


Floppy Drive

Secondary Memory / Storage Device

Flash Memory

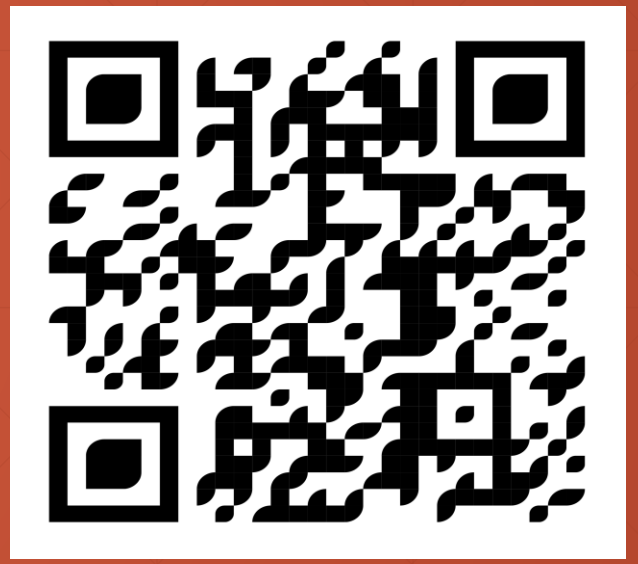
Pen Drive



Tape Drive

Homework:-
compare between Ram&Rom&Cache&Secondary storage in terms of speed,location and functionality.

https://forms.gle/F3QUHBD4zoUchfvo9



Basic CPU Components

1- Arithmetic Logic Unit (ALU)

The ALU, as its name suggests performs mathematical calculations and takes logical decisions. Arithmetic calculations include addition, subtraction, multiplication and division. Logical decisions involve the comparison of two data items to see which one is larger or smaller or equal.

Arithmetic Logical Unit is the main component of the CPU

It is the fundamental building block of the CPU.

Arithmetic and Logical Unit is a digital circuit that is used to perform arithmetic and logical operations.

2-Control Unit (CU)

The Control unit coordinates and controls the data flow in and out of the CPU, and also controls all the operations of ALU, memory registers and also input/output units. It is also responsible for carrying out all the instructions stored in the program. It decodes the fetched instruction, interprets it and sends control signals to input/output devices until the required operation is done properly by ALU and memory.

The Control Unit is a component of the central processing unit of a computer that directs the operation of the processor.

It instructs the computer's memory, arithmetic and logic unit, and input and output devices on how to respond to the processor's instructions.

In order to execute the instructions, the components of a computer receive signals from the control unit.

It is also called the central nervous system or brain of the computer.

3-Registers

A register is a small, temporary memory inside the CPU. The processor uses it to store data that it is currently working on. Registers come in different sizes, such as 16-bit, 32-bit, and 64-bit, and each has a specific role. Some store data, some store instructions, and others hold memory addresses.

For example, the Accumulator (ACC) is an important register in the CPU. It holds one of the values used in calculations inside the Arithmetic and Logic Unit (ALU).

Apart from registers, the internal memory (also called primary memory or main memory) is where data and instructions are stored temporarily while a program runs. This memory is called RAM (Random Access Memory). Every piece of data in RAM is stored at a unique location with an address, so the processor can access it quickly without searching the entire memory.

Since RAM provides direct access to any data location, it is called Random Access Memory.
Memory Unit is the primary storage of the computer.
It stores both data and instructions.
Data and instructions are stored permanently in this unit so that they are available whenever required.

4-clock unit

It generates timing pulses that control the speed and synchronization of instruction execution inside the CPU.

Output Unit :

The output unit consists of output devices that are attached to the computer. It converts the binary data coming from the CPU to human understandable form. The common output devices are monitor, printer, plotter, etc.

- The output unit displays or prints the processed data in a user-friendly format.
- The output unit is formed by attaching the output devices of a computer.
- The output unit accepts the information from the CPU and displays it in a user-readable form.

Motherboard:

The motherboard is like the backbone of a computer, connecting all the important parts such as the CPU, memory, and storage. It also helps distribute power, transfer information, and connect devices like a mouse, keyboard, or monitor. If there is a problem with the motherboard, a computer technician may open the PC to check for any loose or damaged connections, such as corrosion. They may also inspect the power supply to ensure the computer is receiving electricity properly.

Power Supply Unit (PSU):

The Power Supply Unit (PSU) gives electricity to all the parts of a computer. It usually connects the PC to a wall socket using a power cord. If there's a problem, a technician may check by turning off the computer, unplugging the power cord, or trying a different cord or outlet to see if the issue is with the power supply

An Operating System (OS) is system software that manages computer hardware and software resources and provides services to users and applications. Two of its main functions are Resource Management and User Interface.

Resource Management

Resource management is one of the core responsibilities of an operating system. It ensures that the computer's resources are used efficiently and fairly.

1. Resource Management

Resource management is one of the core responsibilities of an operating system. It ensures that the computer's resources are used efficiently and fairly.

Main resources managed by the OS:

CPU(Processor):

The OS schedules processes and decides which program gets CPU time and for how long (process scheduling).

Memory(RAM):
It allocates memory to running programs and frees it when programs finish, preventing conflicts and wastage.

Storage Devices:
The OS manages files on hard disks/SSDs, organizes data into files and directories, and controls access to storage.

Input/Output Devices:
Devices such as keyboards, mice, printers, and monitors are managed through device drivers.

Purpose of resource management:

- Efficient use of hardware
- Fair sharing of resources among programs
- Preventing system crashes and conflicts

User Interface

The user interface (UI) is the part of the operating system that allows users to interact with the computer.

Types of user interfaces:

Command Line Interface (CLI):

Users interact by typing text commands (e.g., MS-DOS, Linux Terminal).

Graphical User Interface(GUI):

Users interact through windows, icons, menus, and pointers (e.g., Windows, macOS, Linux GUI).

Functions of the user interface:

Allows users to run programs

Enables file management (create, delete, copy files)

Makes the system easy and user-friendly to operate

Graphical User Interface (GUI)

A graphical user interface (GUI) operating system User interact the system through WIMP environment Windows, Icon, Menus, and Pointers (WIMP). GUIs are small pictures that represent actions, and they can be selected by 'clicking' on them with the mouse. Example of GUI interface Windows & Mac OS

1. Using the Mouse and Keyboard

Mouse: Used to point, click, double-click, drag, and drop objects on the screen.

- Left click: select items
- Double click: open files or applications
- Right click: show a context (shortcut) menu

Keyboard: Used to type text, enter commands, and use shortcuts (e.g., Ctrl + C for copy, Ctrl + V for paste).

common Icons and Their Functions

Icons are small graphical symbols that represent files, programs, or system functions.

Folder icon: Stores and organizes files

File icon: Represents a document, image, or other data

Recycle Bin / Trash: Temporarily stores deleted files

Application icon: Launches a specific program (e.g., browser, word processor)

This PC / Computer: Accesses system drives and hardware

Menus and Menu Navigation

Menus provide a list of commands or options.

Menu bar: Located at the top of a window (e.g., File, Edit, View)

Drop-down menus: Appear when clicking a menu item

Context menus: Appear when right-clicking an item

Navigation: Users select commands by clicking menu options or using keyboard shortcuts

managing Windows and Applications

The GUI allows users to work with multiple programs at the same time.

Opening applications**:** Click on application icons or select from the Start/Menu

Window controls:

- Minimize: hide the window
- Maximize/Restore: resize the window
- Close: exit the application

Switching between applications: Using the taskbar, dock, or keyboard shortcuts (Alt + Tab)

Resizing and moving windows: Drag window borders or title bars