Organization of a computer system defines the way system is structured so that all those catalogued tools

can be used.

The significant components of Computer organization are ALU, CPU, memory and memory organization.

von Neumann Architecture:

"data and instructions to manipulate data were logically the same and could be stored in the same place."

CPU:

A central processing unit (CPU), also called a central processor or main processor,

is the electronic circuitry within a computer that executes instructions that make up a computer program.

The CPU performs basic arithmetic, logic, controlling, and input/output (I/O) operations specified

by the instructions in the program.

CPU - Brain of the computer.

clock - a wire in CPU which turns OFF and ON to keep things in sync.

CPUs are measured in GHz[Giga = 1 billion, Hz = Times/sec]

Scott CPU

motherboard - platform to connect all the parts of computer.

Instruction set of CPU - Address/Data/Operations like - Load,Add,Compare,Store,JumpIf,Jump,In,Out.

CPU - interacts with RAM and works with Data in RAM [Instructions,Address,Numbers,Letters] using Instruction Set.

CPU = ALU + CU + Register

ALU - Input and Output

CU - Operations

Register - store data temporarily inside CPU when instructions are processed.

Set/Enable wires

Register sets output to CPU bus when enable wire is ON.

registers - stores Instruction, Instruction Address

Port - plug Input / Op devices and port numbers are used by CPU to identify them.

RAM:

temporary storage and working space for the operating system and applications.

A program to Run, it needs to be loaded in to RAM first.

Computer Run fatser if RAM size is more.

RAM requires constant electrical power to store data.

Types: Dynamic RAM - contains capacitors, Operates Asynchronously with system clock.

Synchronous DRAM - Operates synchronously with system clock./ faster than DRAM.

Note:

term 32/64 bit data path refers to number of bits transferred in 1 clock cycle.

RAM are placed in DIMM on a motherboard and each DIMM transfers 64 bits of Data in each clock cycle.

DDR - Double Data Rate - send double the data in each clock cycle.

OS:

is system software that manages computer hardware and software resources and provides

common services for computer programs.

An Operating System provides services to both the users and to the programs.

It provides programs an environment to execute.

It provides users the services to execute the programs in a convenient manner.

common services provided by an operating system −

1. Program execution:

A process includes the complete execution context

(code to execute, data to manipulate, registers, OS resources in use).

Following are the major activities of an operating system with respect to program management −

Loads a program into memory.

Executes the program.

Handles program's execution.

Provides a mechanism for process synchronization.

Provides a mechanism for process communication.

Provides a mechanism for deadlock handling.

2. I/O Operation

An I/O subsystem comprises of I/O devices and their corresponding driver software.

Drivers hide the peculiarities of specific hardware devices from the users.

An Operating System manages the communication between user and device drivers.

I/O operation means read or write operation with any file or any specific I/O device.

Operating system provides the access to the required I/O device when required.

3. File system manipulation

A file represents a collection of related information.

Computers can store files on the disk (secondary storage), for long-term storage purpose.

Examples of storage media include magnetic tape, magnetic disk and optical disk drives like CD, DVD.

Each of these media has its own properties like speed, capacity, data transfer rate and data access methods.

A file system is normally organized into directories for easy navigation and usage.

These directories may contain files and other directions.

Following are the major activities of an operating system with respect to file management −

Program needs to read a file or write a file.

The operating system gives the permission to the program for operation on file.

Permission varies from read-only, read-write, denied and so on.

Operating System provides an interface to the user to create/delete files.

Operating System provides an interface to the user to create/delete directories.

Operating System provides an interface to create the backup of file system.

4. Communication

In case of distributed systems which are a collection of processors that do not share memory,

peripheral devices, or a clock, the operating system manages communications between all the processes.

Multiple processes communicate with one another through communication lines in the network.

The OS handles routing and connection strategies, and the problems of contention and security.

Following are the major activities of an operating system with respect to communication −

Two processes often require data to be transferred between them

Both the processes can be on one computer or on different computers, but are connected through a computer network.

Communication may be implemented by two methods, either by Shared Memory or by Message Passing.

5. Error handling

Errors can occur anytime and anywhere. An error may occur in CPU, in I/O devices or in the memory hardware.

Following are the major activities of an operating system with respect to error handling −

The OS constantly checks for possible errors.

The OS takes an appropriate action to ensure correct and consistent computing.

6. Resource Management

In case of multi-user or multi-tasking environment, resources such as main memory, CPU cycles and files storage

are to be allocated to each user or job. Following are the major activities of an operating system with

respect to resource management −

The OS manages all kinds of resources using schedulers.

CPU scheduling algorithms are used for better utilization of CPU.

7. Protection

Considering a computer system having multiple users and concurrent execution of multiple processes,

the various processes must be protected from each other's activities.

Protection refers to a mechanism or a way to control the access of programs, processes, or users

to the resources defined by a computer system.

Following are the major activities of an operating system with respect to protection −

The OS ensures that all access to system resources is controlled.

The OS ensures that external I/O devices are protected from invalid access attempts.

The OS provides authentication features for each user by means of passwords.

Note:

In computing, a process is the instance of a computer program that is being executed by one or many threads.

It contains the program code and its activity.

Depending on the operating system (OS), a process may be made up of multiple threads of execution

that execute instructions concurrently.

The central processing unit is the most important processing device of a computer.

a thread of execution is the smallest sequence of programmed instructions that can be managed independently

by a scheduler, which is typically a part of the operating system.

The implementation of threads and processes differs between operating systems, but in most cases a thread is a

component of a process. Multiple threads can exist within one process, executing concurrently and sharing resources

such as memory, while different processes do not share these resources.

In particular, the threads of a process share its executable code and the values of its dynamically allocated variables

and non-thread-local global variables at any given time.

A device driver is a small piece of software that tells the operating system and other software

how to communicate with a piece of hardware.

Driver Software = Device Drivers

Middleware is software that provides common services and capabilities to applications outside of

what’s offered by the operating system.

Data management, application services, messaging, authentication, and API management are all commonly handled by

middleware.