ASSIGNMENT - 01

O.S

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CSE 'A' Sec

① Define operating system. with a neat diagram, explain the dual-mode operation of operating system.

> An OS is an intermediate b/w the user of the computer & the computer hardware. It provides a basis for application program & acts as an intermediate b/w user of computer & computer hardware.

Dual mode operation:

An error in one program can adversely affect many processes. It might modify data of another program, or also can affect the OS.

Ex: If a process stuck in an infinite loop could affect the correct operation of other processes.

To ensure the proper execution of the OS, there are two types of operation.

User mode:

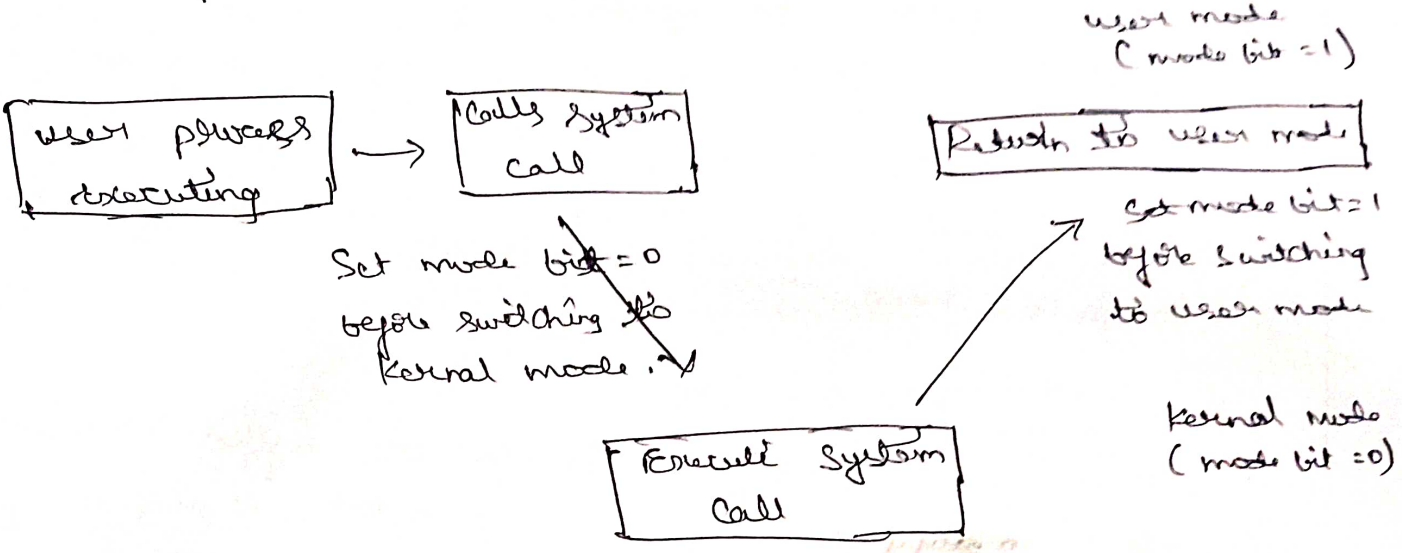
When the computer system is run by user applications, then the system is in user mode. When the user application requests for a service from the OS or an interrupt occurs. Then there will be a transition from user to kernel mode to fulfil the requests.

Kernel mode:

When the system boots, hardware starts in kernel mode and when the OS is loaded, it starts user applications in user mode. To provide protection to the

hardware, we have privileged instructions which execute only in kernal mode.

If the user attempts to run privileged instruction in user mode then it will treat instruction as illegal and traps to OS.



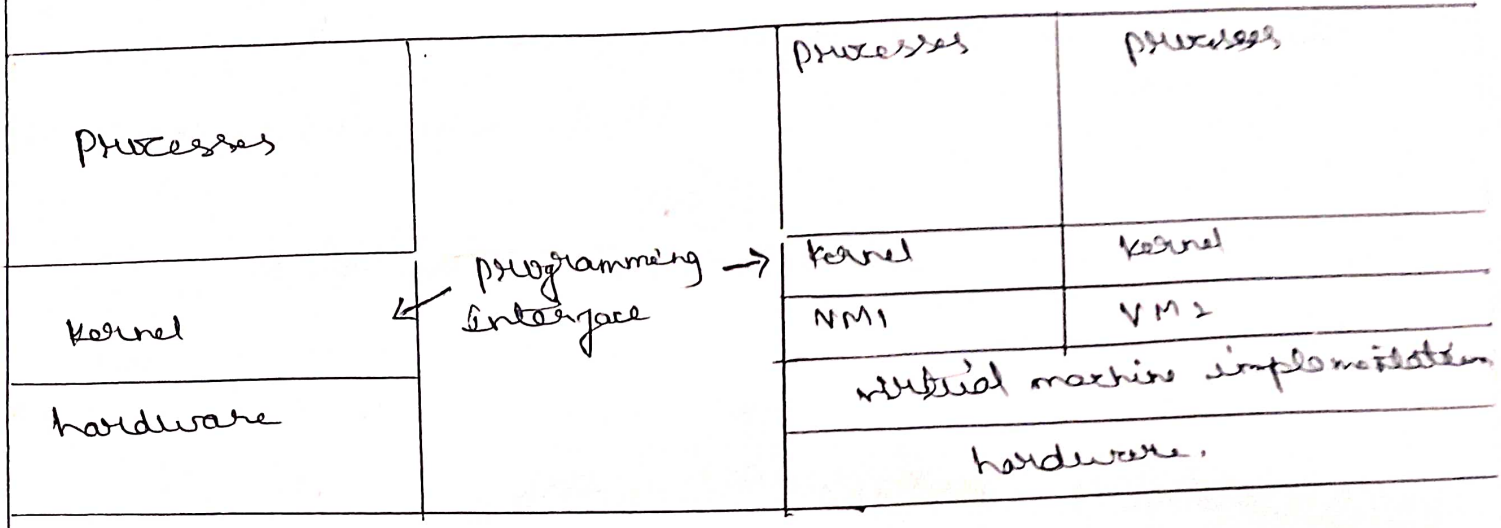
(2) Demonstrate the concept of virtual machine with an example,

A virtual machine takes the layered approach to its logical conclusion. It treats hardware & the OS kernel as though they were all hardware.

A virtual machine provides an interface to the underlying bare hardware. The OS creates the illusion of multiple processes, each executing on its own processor with its own (virtual) memory. The resources of the physical computer are shared to create the VM.

CPU Scheduling can create the appearance that users have their processor. Spooling and a file system can provide virtual card readers and virtual line printers. A normal user time-sharing terminal serves as a virtual

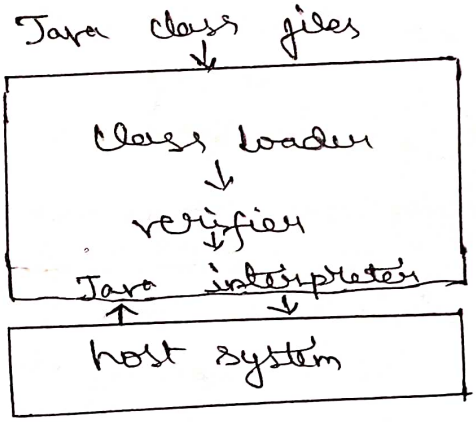
Machine operator's console.



Ex:- Java virtual machine

compiled Java programs are platform neutral bytecodes executed by a Java VM.

JVM consists of - class loader, - class verifier, - runtime interpreter. JIT (Just in time) compilers increases performance.



Java virtual.

(3) Explain the types of multiprocessing system and the types of clustering.

> Multi processor systems include more than one processor in close communication.

Multi processor systems are of two types!

a. Symmetric multiprocessor :- In SMP, each processors runs an identical copy of OS and they communicate with one another as needed. All the CPU shares the common memory.

b. ASymmetric multiprocessor :- Here, each processor is assigned a specific task. It uses a master slave relationship. A master processor controls the system The master processor schedules and allocates work to slave processors.

Clustered systems!

Like parallel system the clustered systems will have multiple CPU but they are composed of two or more individual system coupled together.

Clustered Systems can be categorized into two groups.

a. Asymmetric clustering! Here, one M/c is in hot standby mode while others are running the application. The hot ~~standby~~ standby M/c does nothing but it monitors the active server. If the server fails the hot standby M/c becomes the active server.

b. Symmetric clustering! In Symmetric mode two or more hosts are running the application & they monitor each other. This mode is more efficient since it uses all the available H/w.

(4) Describe the implementation of interprocess communication using shared memory and message passing.

> Shared memory: In this the processes uses the map m/y system calls to gain access to m/y owned by another process. The OS tries to prevent one process from accessing another process m/y.

In shared m/y this restriction is eliminated and they exchange information by reading & writing data in shared areas. These areas are located by these processes & not under OS control.

They should ensure that they are not writing to same m/y area. Both these types are commonly used in OS and some even implement both. Message passing is useful when small number of data need to be exchanged since no conflicts to be avoided and it is easier to implement that in shared m/y. Shared m/y allows maximum speed and convenience of communication as it is done at m/y speed when within a computer.

Message passing:

In this information is exchanged using interprocess communication facility provided by OS. Before communication the connection should be opened, the name of the other communicating party should be known, it can be on the same computer or it can be on another computer connected by a computer network.

Each computer connected by a computer network,

which can be translated into equivalent identifier by OS. The get host id & process id system call do this translation. These identifiers are then passed to the open & close connection system calls.

The recipient process must give its permission for communication to take place with an accept connection call.

(5) Explain Computer System structure, explain view of OS.

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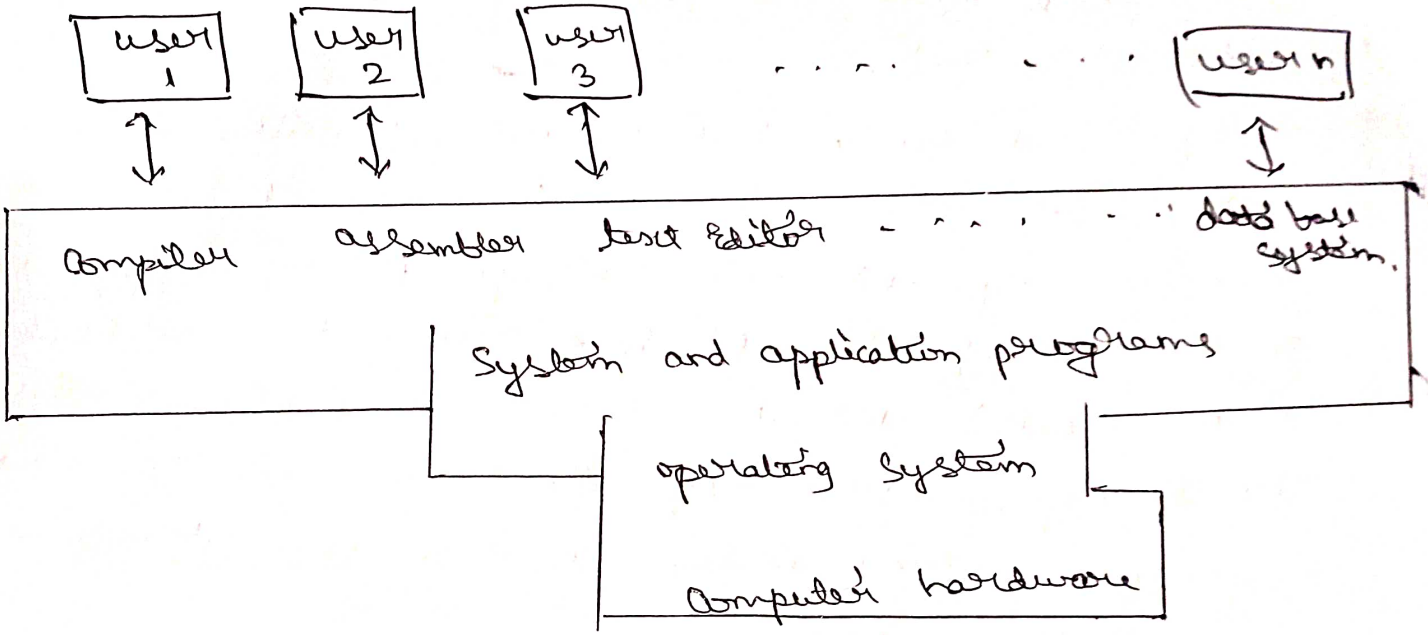


A computer system can be roughly divided into four components,

- The Hardware
- The OS
- The application program
- The user

The hardware consists of memory, CPU, ALU & I/O devices, peripherals devices & storage devices. The application program mainly consisted of word processors, spread sheets, compilers & web browsers defines the ways in which the resources are used to solve the problems of the users.

view of OS:

User views: The user view of the computer depends on the interface used. Some users may use PC's. In this the system is designed so that only one user can utilize the resources and mostly for ease of use where the attention is mainly on performances and not on the resource utilization.

Some users may use a terminal connected to a mainframe or minicomputers. other users may access the same computer through other terminals. These users may share resources and exchange information. In this case the OS is designed to maximize resource utilization so that all available cpu time, memory & I/O are used efficiently.

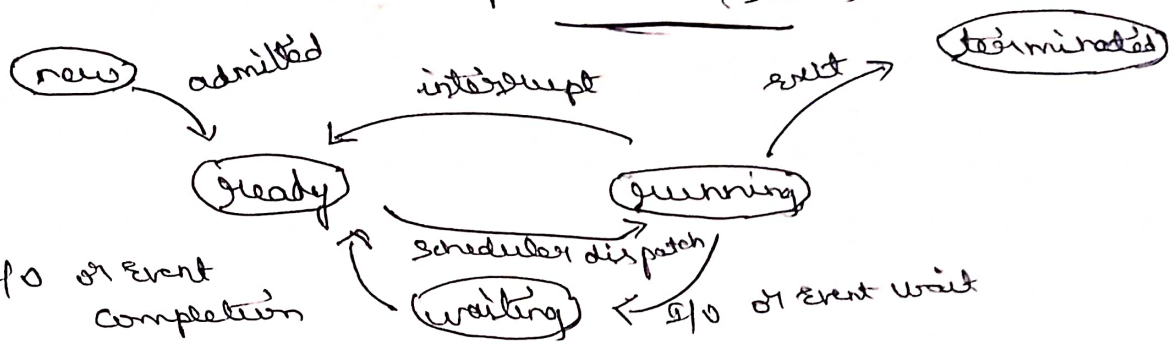
System views:

We can view system as resources allocator i.e. a computer system has many resources that may be used to solve a problem. The OS acts as a manager of these resources. The OS must decide how to allocate these resources to programs and the users so that it can operate the computer system efficiently and fairly.

A different view of an OS is that it need to control various I/O devices & user programs i.e an OS is a control program used to manage the execution of user program to prevent errors and improper use of the computer.

(6) Illustrate with a neat sketch, the process states & process control block.

Process states

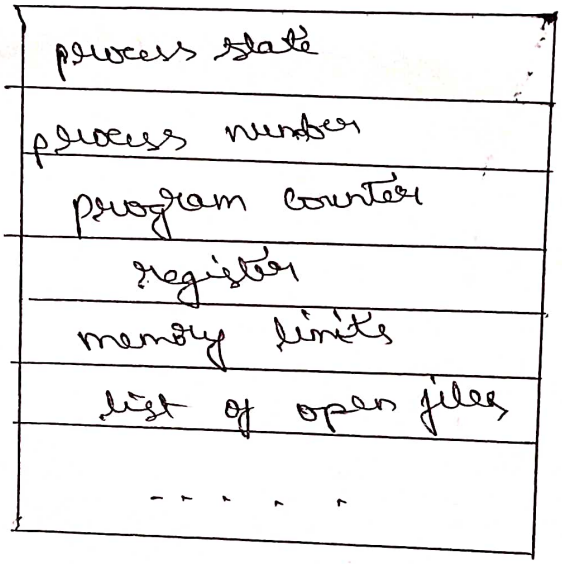


- new state :- the process being created.
- Terminated :- the process has finished execution.
- Blocked (waiting) state :- when a process blocks, it does so because logically it cannot continue, typically because it is waiting for input that is not yet available. Formally a process is said to be blocked if it is waiting for some event to happen before it can processed. In this state a process is unable to run until some external event happens.
- Running state :- A process is said to be running if it currently has the cpu, that is, actually using the CPU at that particular instant.
- Ready state :- A process is said to be ready if it use a cpu if one were available. It is runable but tempor - arily stopped to let another process run.

Process control Block

A process in an operating system is represented by a data structure known as a process control Block (PCB) or process descriptor. The PCB contain important information about the specific process including

- The current state of the process i.e whether it is ready, running, waiting or whatever.
- unique identification of the process in order to track "which is which" information.
- A pointer to parent process.
- Similarly, a pointer to child process (if it exists).
- The priority of process.
- Pointers to locate memory of processes.
- A register save area.
- The processor it is running on.



process control Block.

(7) Define: (i) virtual machine:-

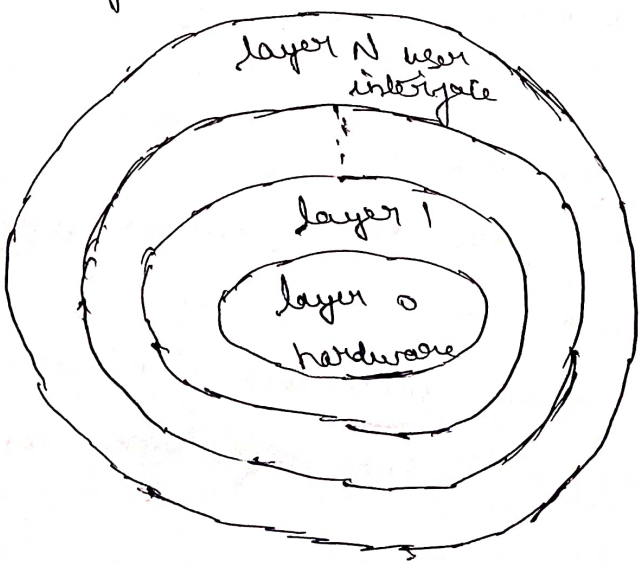
A virtual machine takes the layered approach to its logical conclusion. It treats hardware and the OS kernel as though they were all hardware. A VM provides an interface identical to the underlying bare hardware.

(ii) System Call :- System provides interface b/w the process & the OS.
The calls are generally available as assembly language instruction and certain system allows system calls to be made directly from a high level language program.

(iii) CPU Scheduler :- It selects which process should be executed next and allocates CPU. It is invoked very frequently.

(iv) Context Switch :- When CPU switches to another process, the system must save the state of the old process and load the saved state for the new process.
Context-Switch time is overhead; the system does no useful work while switching.

(8) Explain the layered approach of OS structure, with supporting diagram.



In this OS is divided into number of layers, where one layer is built on the top of another layer. The bottom layer

is hardware and higher layer is the user interface. An OS is an implementation of abstract object i.e. the encapsulation of data & operation to manipulate these data.

The main advantage of layered approach is the modularity i.e each layer uses the services & function provided by the lower layer. This approach simplifies the debugging & verification. once first layer is debugged the correct functionality is guaranteed while debugging the second layer. If an error is identified then it is a problem in that layer because the layer below it is already debugged.

Each layer is designed with only the operations provided by the lower level layers. Each layers tries to ~~the~~ hide some data structures, operations and hardware from the higher level layers. A problem with layered implementation is that they are less efficient than the other types.