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Unit - I (Introduction to Operating System)

① Operating System

• Operating System is a system software that provide interface between user and computer hardware

• Operating system manages computer hardware and software resource and provide common services for computer program.

② Booting Process

• Booting is basically the process of starting the computer. In order to start the computer load the operating system into the main memory and then computer is ready to take command from the user.

• Booting happens when we start the computer. This happens when we turned ON the power or the computer restart. The system BIOS make the peripheral devices active.

Steps of Booting

• The startup

It is the first step that involves switching the power ON. It supplies electricity to the main component like BIOS and processor.

- BIOS (Basic Input/Output System)

It is an initial test performed by the BIOS, this test performs an initial check on the input/output devices, computer's main memory etc.

- Loading of Operating System

The operating system is loaded into the main memory. The O.S starts working and executes all files and information.

- System Configuration

The drivers are loaded into the main memory. Drivers are programs that help in functioning of peripheral devices.

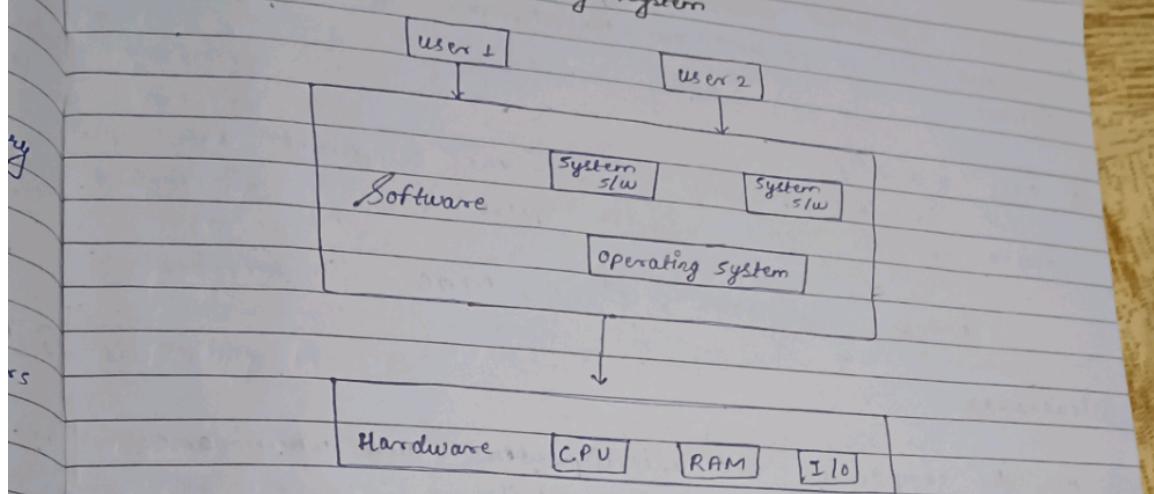
- Loading System Utilities

System utilities are loaded into the memory.
Ex:- Volume control, antivirus etc.

- User Authentication

If any password has been set up in the computer system, the system checks for user authentication.

Architecture of Operating System



There are two types of architecture :-

→ Monolithic Architecture

A monolithic Operating System architecture includes all system functionality in a single module with the kernel and device drivers as main components. In this architecture, the operating system as a whole is working in kernel space, the kernel directly controls all the files, memory, and devices.

Advantage

① fast

Monolithic Operating Systems are faster as they provide better memory management and scheduling.

② Direct Interaction between Component
All the component and the kernel can directly interact.

③ Easy and Simple
This structure is easy as all the component are located in the same address space.

Example :- Windows, Linux, MAC

Disadvantage

- ① All the components are interdependent and when one of them fails the entire system fails.
- ② In case the user has to add new service or functionality the entire operating system needs to be changed.

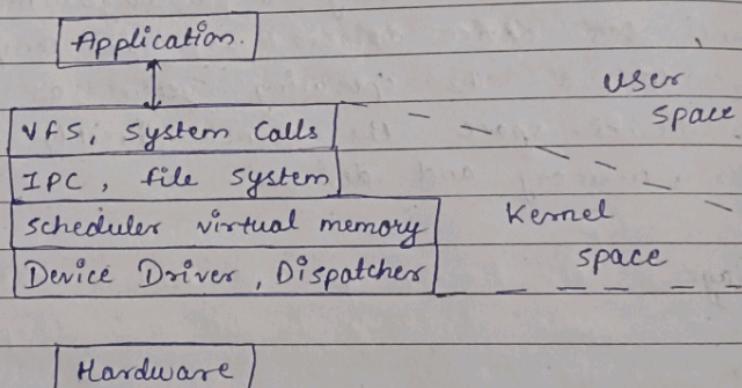


fig:- Monolithic

→ Microkernel Architecture
Microkernel Architecture include only major functions like memory and process management in the Kernel in this architecture file management, I/O management are included in the user space.

Advantage

① Performance

Microkernel architecture is compact and isolated so it can perform better.

② Security

Microkernel are safe since only those component are provided that would otherwise disturb the system functionality.

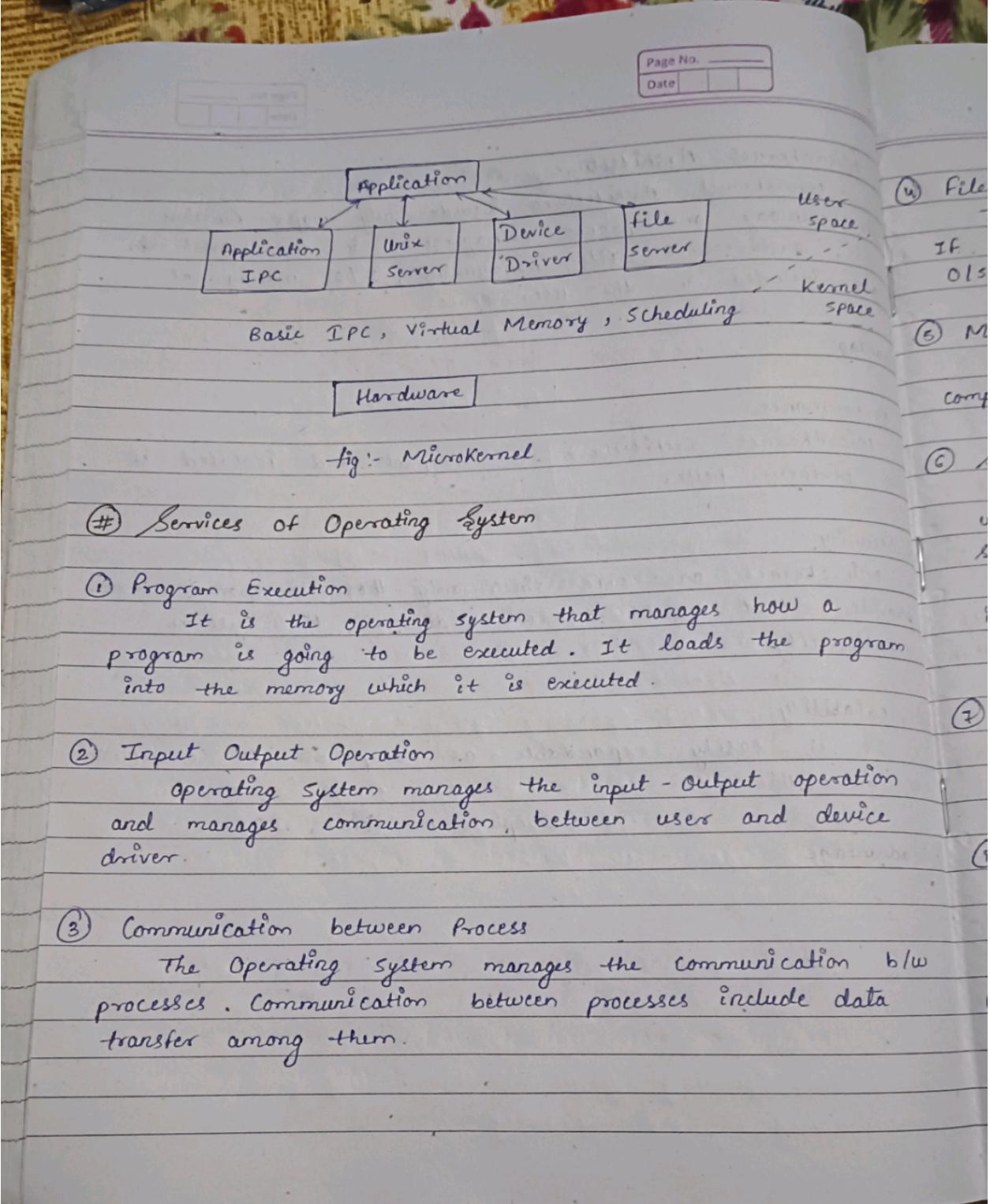
③ Scalability

It is easily expandable as component is compared to monolithic.

Example:- Android, IOS

Disadvantage

①



Services of Operating System

① Program Execution

It is the operating system that manages how a program is going to be executed. It loads the program into the memory which it is executed.

② Input Output Operation

Operating System manages the input - output operation and manages communication between user and device driver.

③ Communication between Process

The Operating System manages the communication b/w processes. Communication between processes include data transfer among them.

④ File Management

The operating system helps in managing the files. If a program needs access to a file, it is the OS that grants access.

⑤ Memory Management

Memory management is responsible for managing the computer's primary memory.

⑥ Security and Privacy

Operating system keep our computer safe from an unauthorised user by adding security layer to it. Operating system provide defence like firewalls, antivirus etc. OS give us facility to keep our essential information hidden like having lock. It provide us facility to keep our files or information safe.

⑦ Resource Management

The OS ensure the proper use of all the resource available by deciding which resource to be used by whom.

⑧ User Interface

- User interface is essential and all OS provide it.
- GUI • CLI (command-line interface)

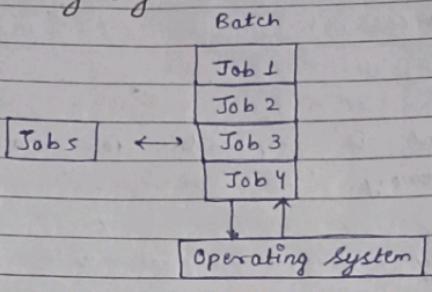
⑨ Networking

This service enables communication b/w devices on a network such as connecting to internet.

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#) Types of Operating System

→ Batch Operating System



Hardware

This type of operating system does not interact with the computer directly. There is an operator which takes similar jobs having the same requirement and groups them into batches.

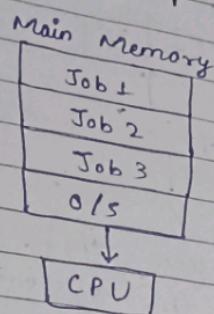
Advantage

- Multiple user can share the batch system
- It is easy to manage large works.
- The idle time for the batch system is very less.

Disadvantage

- Computer operator should be well known with batch system
- Batch System are hard to debug
- The other jobs will have to wait for an unknown time if any job fails.

→ Multi- Programming Operating System



Multiprogramming Operating System is an extension of batch operating system where the CPU is always kept busy. More than one program is present in the main memory and any one of them can be kept in execution. In Multiprogramming environment when a process does its input-output execution the CPU can start the execution of other process.

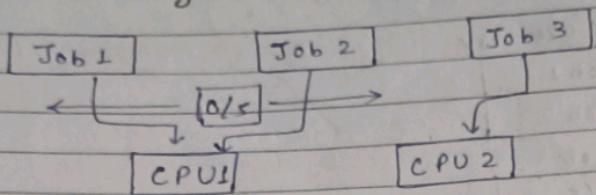
Advantage

- Increases throughput of the system and CPU always have a program to execute.
- Helps in reducing the response time.

Disadvantage

- Multiprogramming does not provide user interaction of system resources with system.

→ Multi-Processing Operating System



In Multi-processing Operating System there are more than one Processor present in the system which can execute more than one process at the same time

Advantage

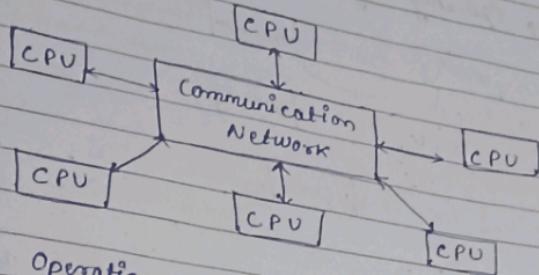
- Increases the throughput of the system
- As it has several processor, if one processor fails, we can proceed with another processor.

Disadvantage

- Due to multiple CPU, it can be complex and difficult to understand.

→ Distributed Operating System

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Distributed Operating System have many central Processing Unit (CPU) to serve multiple real time application and user. As a result, data processing jobs are distributed between the processor. It connect multiple computer by a single communication channel each of these computer have there own computer memory and they communicate through high speed buses.

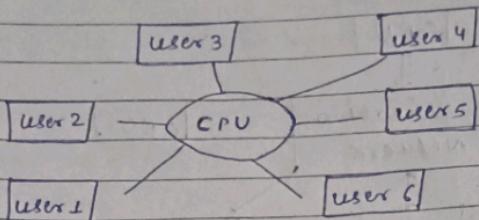
Advantage

- It share all resources like CPU, memory etc.
- It reduces the probability of data lost because all data is replicated across all side if one side fail user can access data from other side
- Data Processing time reduced.

Disadvantage

- failure of the main network will stop the entire communication

→ Time Sharing Operating System



In time sharing operating system, computer system allocated in time dependent pattern to several program simultaneously thus it helps to provide a large number of user direct access to the main computer.

Advantage

- Each task get equal opportunity.
- CPU ideal time reduced.
- Response time reduces

Disadvantage

- Data communication problem
- Security Risk
- It is complex and require advance software to manage multiple user.

Application of Operating System

- More than one program runs at a time in a computer, and all of them require your computer's CPU and memory.
- Multitasking is a feature of OS we can run many programs simultaneously.
- It helps the user in the file management.
- The Operating system creates a communication link between the user and computer allowing the user to run any application program.
- The operating system provides a platform to run any application program in the computer.

System Call

System call is a method for a computer program to request a service from a kernel from the operating system. A system call is a method of interacting with a system by a program.

- A system call is a request from computer software to an operating system kernel.

Types of System Call

There are commonly 5 types of System Call

① Process Control

Process Control is the system call that is used to direct the process

Ex:- Load, Execute, Process, Terminate the process

② File Management

File management is a system call that is used to handle the file

Ex:- Creating file, Deleting file, Open file, Close file, Read, Write.

③ Device Management

It is a system call that is used to deal with devices

Ex:- Read console, Write console

④ Information Management

It is a system call that is used to maintain information in computer

Ex:- Set time or date, set system data, Get time or date.

(5) Communication

Communication is a system call that is used to establish communication between resources.

Ex:- Create and delete connection , send message.

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