

1. Define Operating System. Explain the components and role of an OS as a resource manager.
2. Differentiate between user view and system view of an Operating System with suitable examples.
3. Explain various operations performed by an Operating System.
4. Explain the concept and advantages of multiprogramming operating system.
5. What is a real-time operating system? Explain hard and soft real-time systems with examples.
6. Compare and contrast multiprogramming and multitasking operating systems.
7. Explain the concept of time-sharing operating system. Write its advantages and disadvantages.
8. What are the features, advantages, and disadvantages of Android Operating System?
9. What is process management in OS? Describe process management activities.

**Ans:** Process Management A process is a program in execution. It is a unit of work within the system. Program is a passive entity; process is an active entity. Process needs resources to accomplish its task ◦ CPU, memory, I/O, files ◦ Initialization data Process termination requires reclaim of any reusable resources Single-threaded process has one program counter specifying location of next instruction to execute ◦ Process executes instructions sequentially, one at a time, until completion Multi-threaded process has one program counter per thread Typically system has many processes, some user, some operating system running concurrently on one or more CPUs ◦ Concurrency by multiplexing the CPUs among the processes / threads.

#### Process Management Activities

The operating system is responsible for the following activities in connection with process management:

Creating and deleting both user and system processes

Suspending and resuming processes

Providing mechanisms for process synchronization

Providing mechanisms for process communication

Providing mechanisms for deadlock handling

#### 10. What is Memory Management in OS?

**Ans:**

##### Memory Management

To execute a program all (or part) of the instructions must be in memory

All (or part) of the data that is needed by the program must be in memory

Memory management determines what is in memory and when

◦ Optimizing CPU utilization and computer response to users

Memory management activities

◦ Keeping track of which parts of memory are currently being used and

by whom

◦ Deciding which processes (or parts thereof) and data to move into and

out of memory

◦ Allocating and de allocating memory space as needed

File-system Management

OS provides uniform, logical view of information storage

◦ Abstracts physical properties to logical storage unit - file

## File-System management

- Files usually organized into directories
- Access control on most systems to determine who can access what
- OS activities include
- Creating and deleting files and directories
- Primitives to manipulate files and directories
- Mapping files onto secondary storage
- Backup files onto stable (non-volatile) storage media

## I/O Subsystem

One purpose of OS is to hide peculiarities of hardware devices from the user

I/O subsystem responsible for

- Memory management of I/O including buffering (storing data temporarily while it is being transferred), caching (storing parts of data in faster storage for performance), spooling (the overlapping of output of one job with input of other jobs)
- General device-driver interface
- Drivers for specific hardware devices

## 11. Write a short note on:

### (a) Command Line Interface

Ans: Command Line Based OS

A command line interface (CLI) is a text-based user interface (UI) used to view and manage computer files.

Command line interfaces are also called command-line user interfaces, console user interfaces and character user interfaces

It is a type of human-computer interface (i.e., a way for humans to interact with digital computers or personal computer) that relies solely on textual request and response transaction process.

A Command Line Interface is a powerful way of user interacting with an operating system.

Advantages Command Line Interface:

- A CLI does not require Windows to run.
- If the user knows the correct commands then this type of interface can be much faster than any other type of interface.
- This type of interface needs much less memory (Random Access Memory) in order to use compared to other types of user interfaces.

Disadvantages of Command Line Interface:

- For someone who has never used a CLI, it can be very confusing.
- Commands have to be typed precisely. If there is a spelling mistake

then the command will not respond or fail.

- o If user can mis-type an instruction, it is often necessary to start from scratch again.

- o There are a large number of commands which need to be learned-in the case of Unix it can be more than hundred

## **(b) Graphical User Interface**

Ans:

- A Graphical User Interface (GUI for short) allows users to interact with the computer hardware in a user friendly way.
- Windows is the most popular GUI OS.
- GUI uses windows, icons, and menus to carry out commands, such as opening, deleting, and moving files. Although a GUI operating system is primarily navigated using a mouse, the keyboard can also be used to navigate using keyboard shortcuts or the arrow keys.
- Different GUI based OS Microsoft Windows, Apple system, Linux variants like Ubuntu .
- Advantages
  - o Programmer or user need not have to understand working of the computer system.
  - o It looks very attractive and multi-coloured.
  - o It is much better than command driven interface which has many drawbacks.
  - o User can switch quickly between tasks on the GUI interface.
  - o Full screen interaction is also possible with quick and wholesome access to anywhere on the screen
- Disadvantages
  - o It uses more computer memory as the aim is to make it for user friendly and not resource optimized. As a result, it can be slow on older machines.
  - o GUI becomes more complex if user needs to communicate with the computer directly.
  - o Certain tasks may take long due to many menus to select the desired choice.
  - o Hidden commands need to be searched using Help file.
  - o GUI based applications require more RAM in order to run.
  - o It uses more processing power compare to other interface types.
- Windows
  - Microsoft Windows is a group of several graphical operating system families, all of which are developed, marketed and sold by Microsoft.
  - Windows is a series of OS developed by Microsoft
  - Each version includes a GUI with a desktop that allows users to view files and folders in windows.
  - The current version Windows 10 was released on 29 July 2015
- Linux
  - Linux is a Unix like OS created by Linus Torvalds.
  - Linux is an operating system or a kernel.
  - It is distributed under an open source license and available in several distributions.
  - Its functionality list is quite like UNIX
  - Most Linux system provide either the K-Desktop Environment or the Gnome Interface both of which are built on top of X-Windows and resemble the windows Interface

## **12. What is MS-DOS, explain it.**

Ans:

A disk operating system doesn't have a graphical user interface (GUI). Its interface is character-based, so users must type commands in the command line to indicate what actions they want. An example of a PC-DOS 2.0 startup screen on an early IBM PC shows the command-line interface.

MS-DOS is a non-graphical "Disk Operating System".

- That means it is simply: "a System for Operating the Computer from a Disk"
- It enabled the user to organize data files, load and execute (run) program files, and control the input and output devices attached to the computer.
- Most current operating systems still use disks (hard disks) but have dropped the D from DOS, and it's now called just Operating System (OS).
- MS-DOS uses character user Interface(CUI) in which the user interacts with the system with the help of some predefined commands through a command Line Interface.
- In DOS the commands are executed by command line interpreter by translating them into system call.
- Generally this interpreter resides outside the kernel so that is not affected by the user

```
C:\Windows\System32\cmd.exe

Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.
clink v0.3.1 [git:5c9a90] (c) 2013 Martin Ridgers
http://code.google.com/p/clink

Copyright (c) 1994-2012 Lua.org, PUC-Rio
Copyright (c) 1987-2010 Free Software Foundation, Inc.

C:\Windows\system32>N
NAPCLCFG.MSC  Netplwiz.exe  net1.exe  netsh.exe  nslookup.exe
NAPSTAT.EXE  nbtstat.exe  netbtugc.exe  newdev.exe  ntoskrnl.exe
NETSTAT.EXE  ndadmin.exe  netcfg.exe  nltest.exe  ntprint.exe
Narrator.exe  net.exe  netiougc.exe  notepad.exe  nvsvc.exe
C:\Windows\system32>N_
```

13. Explain Unix operating system.

Ans:

- Unix is an Operating System which is truly the base of all Operating Systems like Linux, Ubuntu, Solaris, POSIX etc.
- It was developed in the 1970s by Ken Thompson, Dennis Ritchie, and others in the AT&T Laboratories.
- Unix is a computer Operating System which is capable of handling activities from multiple users at the same time.
- It was originally meant for programmers developing software rather than non-programmers.
- Main focus that was brought by the developers in this operating system was the Kernel. Unix was considered to be the heart of the operating System.
- System Structure of Unix OS are as follows:
- Layer-1: Hardware

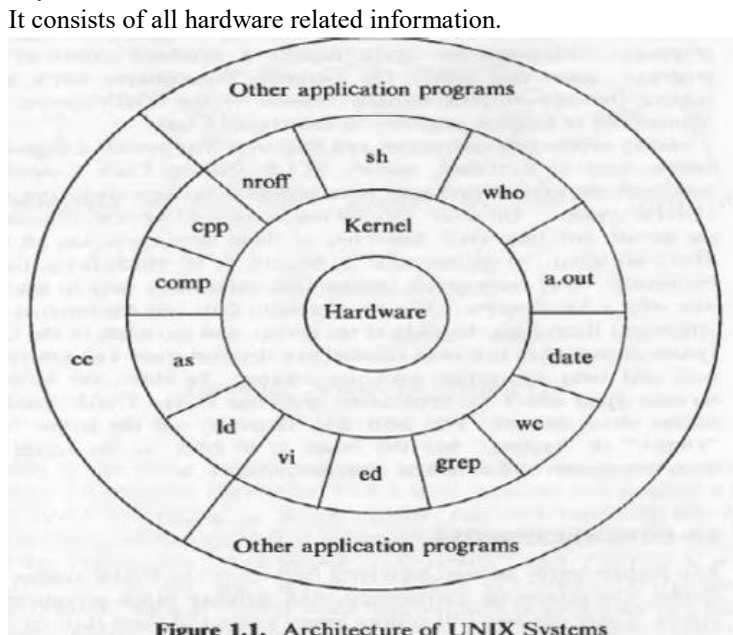


Figure 1.1. Architecture of UNIX Systems

- Layer-2: Kernel It interacts with hardware and most of the tasks like memory management, task scheduling and management are done by the kernel.
- Layer-3: Shell commands Shell is the utility that processes your requests. When you type in a command at the terminal, shell interprets the command and calls the program that you want. There are various commands like cp, mv, cat, grep, id, wc, nroff, a.out and more.

- **Layer-4: Application Layer** It is the outermost layer that executes the given external applications Graphical User Interface(GUI) Based OS:

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Disadvantages :

- It uses more computer memory as the aim is to make it for user friendly and not resource optimized. As a result, it can be slow on older machines.
- GUI becomes more complex if user needs to communicate with the computer directly. Certain tasks may take long due to many menus to select the desired choice.
- Hidden commands need to be searched using Help file. GUI based applications require more RAM in order to run.
- It uses more processing power compare to other interface types.

#### 14. Difference.

Ans:

Difference between MS DOS and Windows		
Sr. No.	MS DOS	Windows OS
1.	DOS only supports for single tasking.	Windows OS is multitasking.
2.	DOS uses CLI (command line interface)	Windows supports GUI (graphical user interface).
3.	It is a single user OS.	It is a multi user OS.
4.	It is a single threading OS.	It is a multithreading OS.
5.	It doesn't supports the networking.	It supports the networking.
6.	Less user friendly with compare to Windows.	More user friendly with compare to DOS.
7.	DOS uses FAT 16 file system	Windows uses FAT 32 file system
8.	DOS supports 2 GB of maximum partition size.	Windows supports 2 TB or more partition size.

Difference between GUI and CUI		
Sr. No.	GUI	CUI
1.	GUI refers to Graphical User Interface.	CUI stands for Character User Interface
2.	User interacts with computer using mouse.	keyboard is needed to type commands in order to interact with the computer.
3.	Navigation is easy.	Navigation is not easy
4.	We deal with graphics and other visual clues.	We deal with text only.
5.	It is more user friendly.	It is less user friendly.
6.	Modern operating systems are GUI base.	Modern OS does not use CUI.
7.	Example of GUI is Widows OS.	DOS is the example of CUI.

### 15. State any four types of system calls.

Ans: Four common types of **system calls** in an operating system are:

1. **Process Control** – For creating, terminating, and managing processes.

*Example:* fork(), exit(), wait()

2. **File Management** – For creating, opening, reading, writing, and closing files.

*Example:* open(), read(), write(), close()

3. **Device Management** – For requesting and releasing I/O devices, reading/writing device data.

*Example:* ioctl(), read(), write()

4. **Information Maintenance** – For getting/setting system data, date, time, system attributes.

*Example:* getpid(), time()

### 16. Define: Process, PCB

Ans:

1. Process:

A process is a program in execution. It is an active entity that includes the program code, current activity (value of program counter, CPU registers), and allocated resources such as CPU time, memory, files, and I/O devices.

Example: When you open a text editor, the program becomes a process while it is running.

2. PCB (Process Control Block):

The Process Control Block is a data structure maintained by the operating system to store information about a particular process.

It acts as the "identity card" of the process.

Contents of PCB include:

- Process ID (PID)

- Process state
- Program counter
- CPU registers
- Memory management information
- I/O status information
- Accounting information

### 17. Explain PCB with suitable diagram

**Ans:**

A Process Control Block is a data structure maintained by the Operating System for every process. • PCB contain Information associated with each process. It is also called task control block • The PCB is identified by an integer process ID (PID). • A PCB keeps all the information needed to keep track of a process as listed below.

Process ID
State
Pointer
Priority
Program counter
CPU registers
I/O information
Accounting information
etc....

1. Process State The current state of the process i.e., whether it is ready, running, waiting, or whatever.
2. Process privileges This is required to allow/disallow access to system resources.
3. Process ID Unique identification for each of the process in the operating system.
4. Pointer A pointer to parent process.
5. Program Counter Program Counter is a pointer to the address of the next instruction to be executed for this process.
6. CPU registers Various CPU registers where process need to be stored for execution for running state.
7. CPU Scheduling Information Process priority and other scheduling information which is required to schedule the process.
8. Memory management information This includes the information of page table, memory limits, Segment table depending on memory used by the operating system.
9. Accounting information This includes the amount of CPU used for process execution, time limits, execution ID etc.
10. IO status information This includes a list of I/O devices allocated to the process.