CSE321: Operating Systems
Introduction

FBA

Course Outcome

➔ **To explore** various aspects of process management in operating system

➔ **To know** how different CPU scheduling algorithm works and their respective importance

➔ **To develop practical knowledge on** the concepts and behaviors of threads

➔ **To inspect** process synchronization mechanisms and deadlocks

➔ **To be able to analyze** the management of main and virtual memory

➔ **To understand** the concepts and implementations of file systems

➔ **To identify** the security issues and protection mechanisms in operating systems
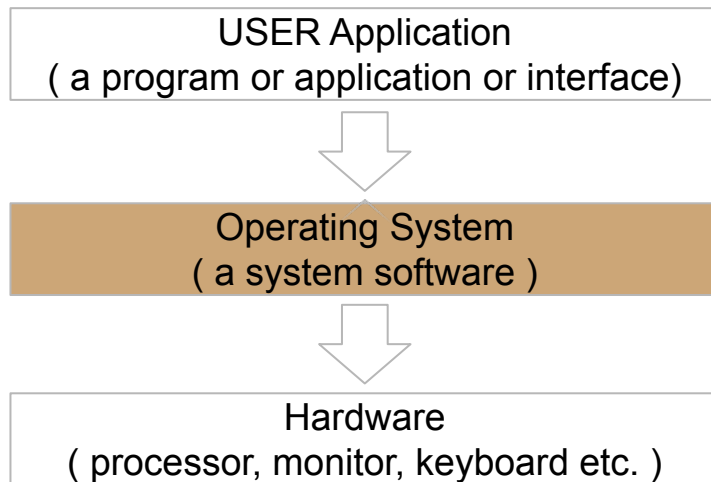
Marks Distribution

- Theory – 75%
  - Assignment – 5%
  - Quiz – 10% (n-1)
  - Mid – 25%
  - Final – 35%
- Lab – 25%

Attendance Rule: Every student must maintain the following attendance percentages in order to attend the final exam of the course.
➜ Theory classes: 70%
➜ Lab classes: 90%

What is an Operating System?

A program that acts as an intermediary
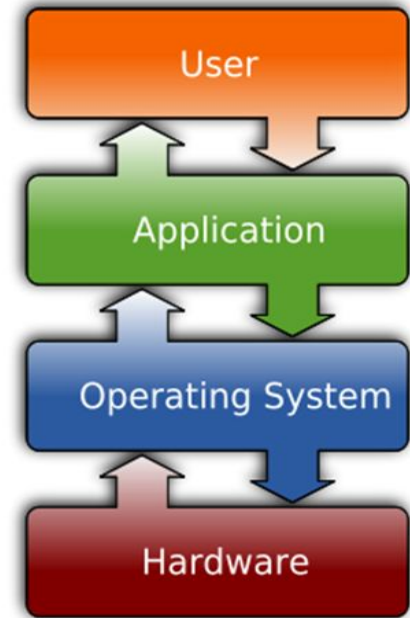between a user of a computer and the computer hardware.

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┌─────────────────────────────────────────┐
│            USER Application               │
│   ( a program or application or interface)│
└─────────────────────────────────────────┘
                    ⬇
┌─────────────────────────────────────────┐
│            Operating System               │
│          ( a system software )            │
└─────────────────────────────────────────┘
                    ⬇
┌─────────────────────────────────────────┐
│               Hardware                    │
│   ( processor, monitor, keyboard etc. )   │
└─────────────────────────────────────────┘
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System Software Vs Application Software

System Software:

- System Software refers to the operating system and all utility programs that manage computer resources at a low level.
- Systems software includes compilers, loaders, linkers, and debuggers.
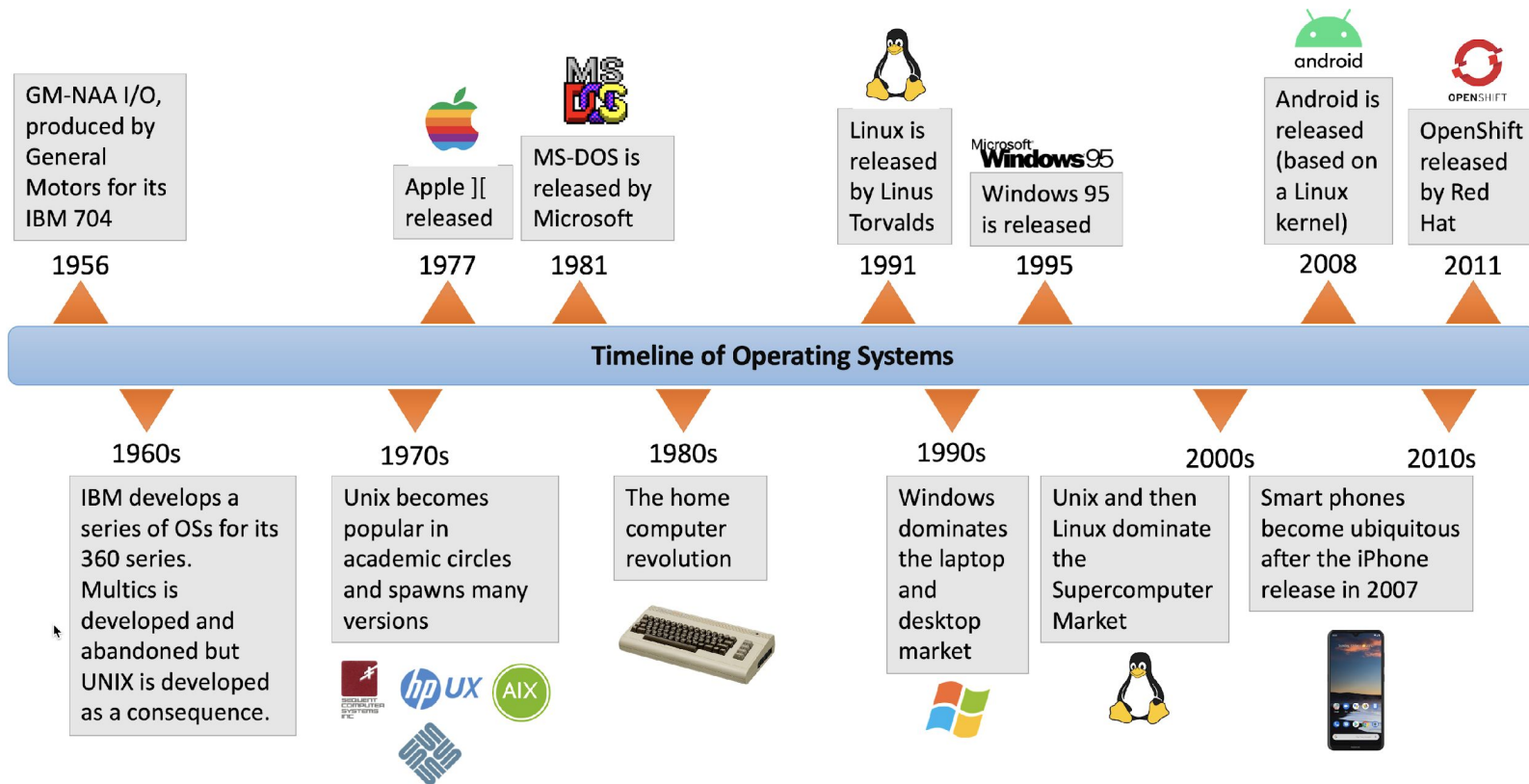
Application Software:

- Applications software comprises programs designed for an end user, such as word processors, database systems, and spreadsheet programs.

Major Goals of OS

- Execute user programs.
- Make the computer system convenient to use.
- Use the computer hardware in an efficient manner
- Manages and allocate all resources
- Controls the execution of user programs and operations of I/O devices

Timeline of OS

GM-NAA I/O, produced by General Motors for its IBM 704

Apple][released

MS-DOS is released by Microsoft

Linux is released by Linus Torvalds

Windows 95 is released

Android is released (based on a Linux kernel)

OpenShift released by Red Hat

1956   **1977**   **1981**   **1991**   **1995**   **2008**   **2011**

Timeline of Operating Systems

1960s   **1970s**   **1980s**   **1990s**   **2000s**   **2010s**

IBM develops a series of OSs for its 360 series. Multics is developed and abandoned but UNIX is developed as a consequence.

Unix becomes popular in academic circles and spawns many versions

The home computer revolution

Windows dominates the laptop and desktop market

Unix and then Linux dominate the Supercomputer Market

Smart phones become ubiquitous after the iPhone release in 2007

Timeline of OS

Timeline of OS

Timeline of OS

- Another revolution of OS came in the mobile computing domain, when Steve Jobs introduced iPhone with iOS in 2007

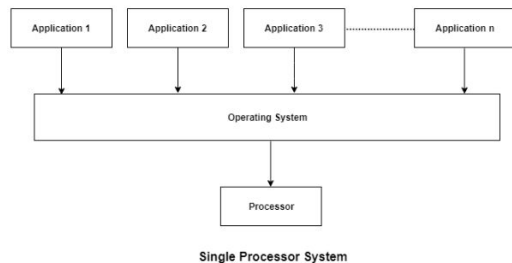- The iPhone introduction video is now regarded as a classic advertise video
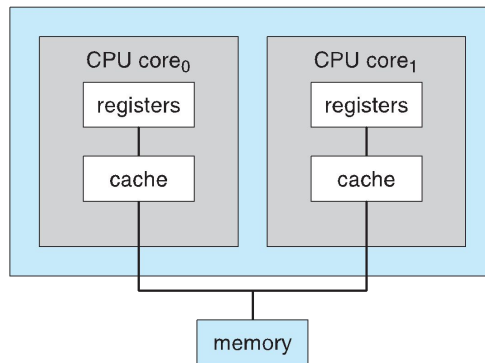
Kernel

The one program running at all times.

- Kernel is the central module of an operating system
- Part of OS that loads first, and it remains in main memory.
- As small as possible
- Provide all the essential services required by other parts of the operating system and applications.
- Kernel code is usually loaded into a protected area of memory to prevent it from being overwritten.
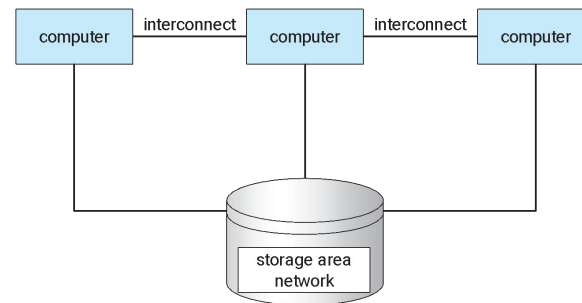
System Architecture

Single-Processor Systems
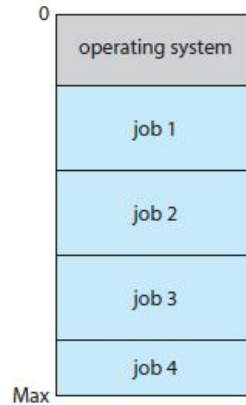
Multiprocessor Systems

Clustered Systems

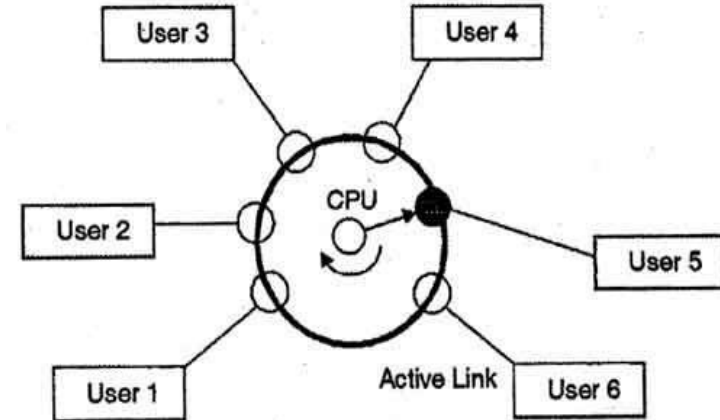# Operating System Architecture

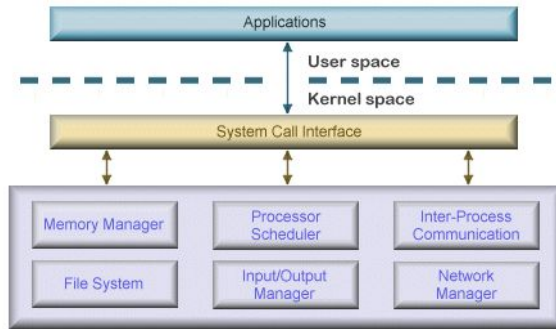**Multiprogramming**

- Job Scheduling
- CPU Scheduling

Memory layout for a multiprogramming system.
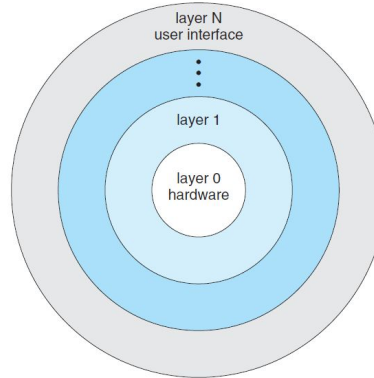
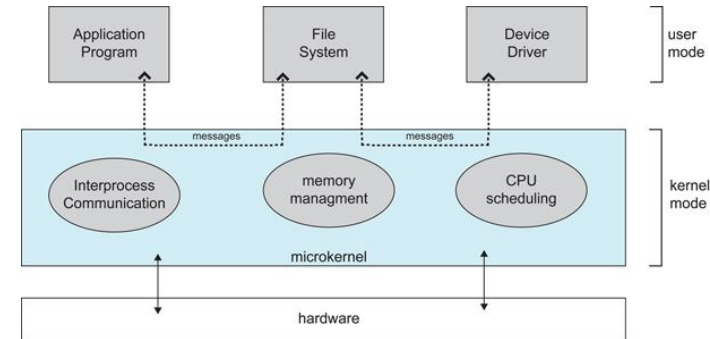**Time Sharing System**

Operating System Structure

Simple/Monolithic structure

Layered structure

Microkernel structure

Operating System Services

- OS provides an environment for the execution of programs.
- Specific services provided, differ from one operating system to another, but there are some common classes
- Services are provided for the convenience of the programmer

user and other system programs		
GUI	batch	command line
user interfaces		

system calls

services

program execution	I/O operations	file systems	communication	resource allocation	accounting

error detection

protection and security

operating system

hardware