

Operating System

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Introduction: Application Scenarios, What is an Operation System?

Organization of Computer system

Session 1

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Goals For Session1

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- OS Services Support Applications on Computers
- What is an Operating System?
- Components of Computer System.
- User & System View of OS.
- Where does the OS system fits in?
- What does an OS system do?
- Computer system organization.

OS Services

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- The primary need of the Operating System arises from the fact that users needed the services.
- We often use computers for variety of applications which require some logistical system support. A few typical applications are:
 - Document Design
 - Accounting
 - E-Mail
 - Image Processing
 - Games.
- OS Support is *Application neutral* and *service-specific*.

What Is An Operating System?

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- There is no universally accepted definition of OS.
- Anyways, ***an OS is the layer of a computer system between the hardware and the user software.***
- It is a software layer(program) that manages the computer hardware.
- OS provides wide range of ***generic data services***
- ***Manages*** keyboard, display, processor, memory and other devices.
- “The One program running at all the time on the computer” is the ***Kernel***.

Components of Computer System

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- ❑ An OS is an important part of Computer System.
 - Computer system is roughly divide into 4 parts:
 - ✓ The **hardware**, the **operating system**, the **application programs**, & the **users**.

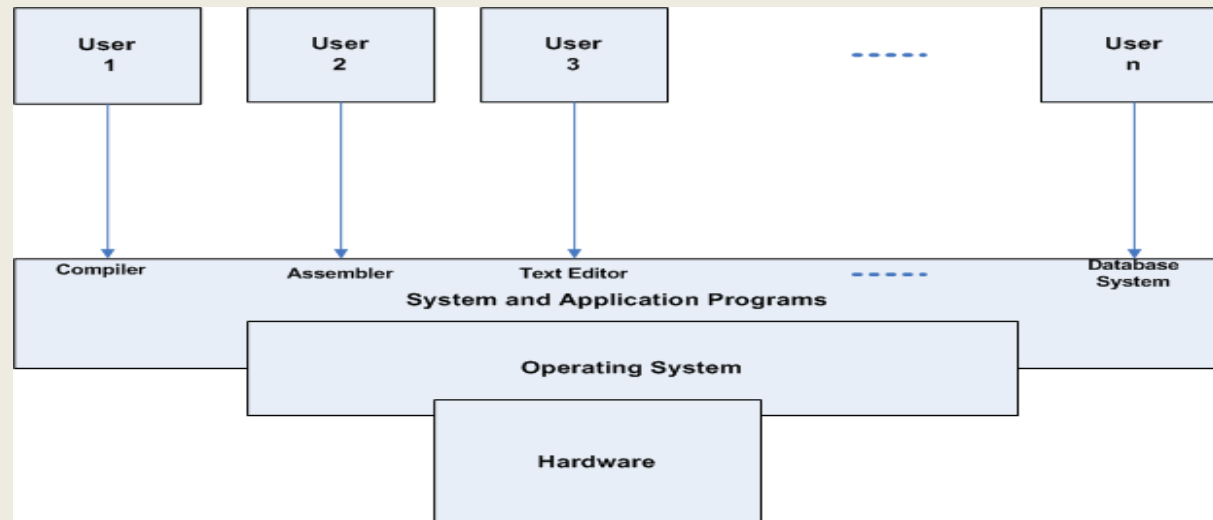


Figure 1.0

User & System View of OS

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❑ User View:

- Ease of usage is a main consideration

❑ System View:

- Efficiency of usage of resources is main consideration

Therefore, it is important for OS to have a control policy & algorithm to allocate the memory effectively.

Evolution

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- It is worthwhile to trace the evolution to identify the common elements of the OS, and to see **how** and **why** these systems have developed.
- **Mainframe computer systems** were the first computers used to tackle many commercial & scientific applications.

Systems in 60s - *Mainframe*

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□ System in Early 60s:

- *Batch Systems: - runs one & only one application.*
 - ✓ **The common input devices:** *card readers and tape drivers*
 - ✓ **The common output devices:** *line printers, tape drivers, and card punches.*
 - ✓ the user didn't interact directly with computer systems, instead user prepared a job (consisting program, data, control info.) & submitted to computer operator.
 - ✓ The jobs are *batched* together by operator & output from each job would be sent back to appropriate programmer.

Systems in 60s – *Mainframe ...contd.*

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□ System in Late 60s:

➤ *Multiprogrammed System: - increases CPU utilization*

- ✓ All jobs that enters the system are kept in the job pool(which consist of all processes residing on disk awaiting allocation of main memory)
- ✓ If several jobs are ready to be brought into memory, & if no enough space for all of them, then the system must choose among them. Therefore, **job scheduling** is performed.
- ✓ When several programs are in the memory at the same time, the **memory management** is needed in the system.
- ✓ When OS selects the job from the pool, it loads that job into memory for execution. If several jobs are ready to run at the same time, the OS performed **CPU scheduling**.

Systems in 60s – *Mainframe ...contd.*

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□ **Still in Late 60s:**

➤ *Time sharing:*

- ✓ Multiple **users access** the system.
- ✓ Each user gets **time-slice** for his job.
- ✓ Users get impression as if the **whole system** is dedicated to his use although it is being shared among many users.
- ✓ Time sharing(**Multitasking**) is a logical extension of multiprogramming.

Systems in 70s

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□ Desktop Systems:

- **Personal computers** PCs launched in the 1970s.
- PCs operating system were **neither multiuser nor multitasking**.
- Goal of OS has changed from **maximizing CPU & Peripheral utilization to maximizing user conveniences & responsiveness**.
- MS-DOS OS superseded by multiple flavor of **MS Windows** & IBM upgraded it to **OS/2 multitasking system**.
- The **Apple Macintosh OS** included new features such as virtual memory & multitasking.
- **UNIX OS** – Major contribution by **Bell Labs & Unix(1972) supported Time-shared & multi-user operation**
- **Linux, a UNIX-like OS** are available for PCs, which has become popular recently.

Client-Server(80s)

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- Project “**Athena**” at **MIT** developed the **X-Clients**.
- Also, a “**window**” as a virtual terminal gave a user capability to **launch multiple applications** from the same terminal.
- A window “**client**” seeks a service from a “**server**”.
- A “**compute server**” could be sought for processing.
- A “**file server**” could be accessed for “**file access**”.

Early to Mid 80s-PC arrives

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- Need felt to distribute IO processing : led to the development of *BIOS*.
- Also, led to graphic drivers like *EGA*, *VGA* cards.
- *Networking support* developed.
- *Unix* (a command oriented OS) also developed *Networking support*.
- MAC developed “*drag and drop*” and icon based “*launch*” for applications.

Systems in Mid 80s

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❑ Multiprocessor/Parallel System:

- Lead us using multi-processor architectures
- Tightly-coupled multi-processor systems
- Multiprocessor system have 3 advantages:
 1. **Increased throughput:** more work in less time
 2. **Economy of scale:** Multiprocessor system can save more money than multiple single-processor system.
 3. **Increased reliability(fail-safe operation):** if one processor fails others process should shared the work of fail processor.
- ***Symmetric/Asymmetric*** multiprocessing means ***identical copy(uniform) of OS & Master-slave(heterogeneous) OS*** on ***interconnected systems.***

Real Time OS(RTOS)

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- Real time OS implements the real time applications.
- A real time application, user need the computer to perform some action in a timely manner to control the activities in an external system.
- Eg. Temperature monitoring chemical process.

An Example Real Time Control Application

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- ***Scenario*** : A temperature monitoring chemical process.
- ***what we need*** : A supervisory program to raise an alarm when temperature goes beyond a certain band.
- ***The desired sequence of operational events*** : Measure input temperature, process the most recent measurement, perform an output task.

An Example Real Time Control Application

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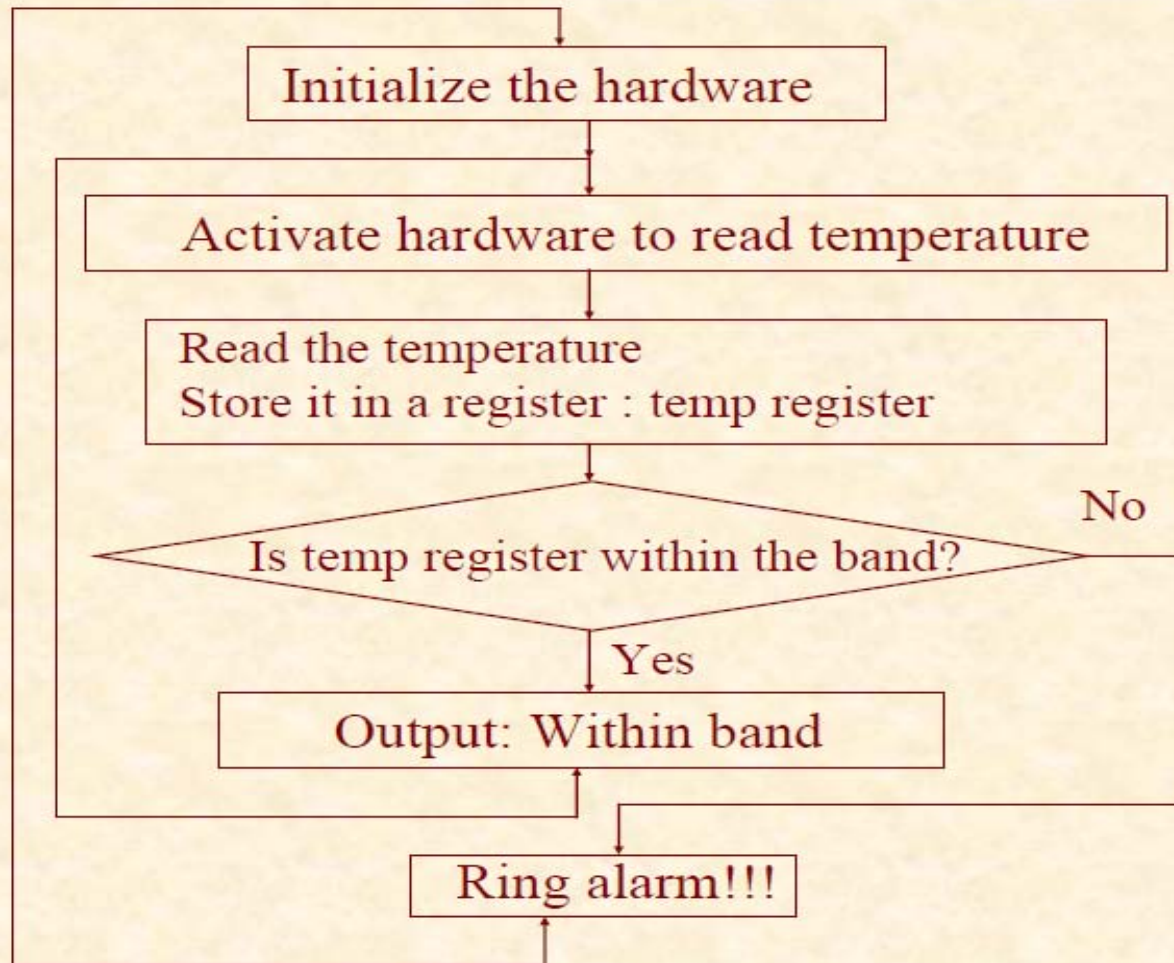


Monitoring

Input

Decision

Output



Feature Migration

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- In overall, the features available in mainframe have been adopted in microcomputer.

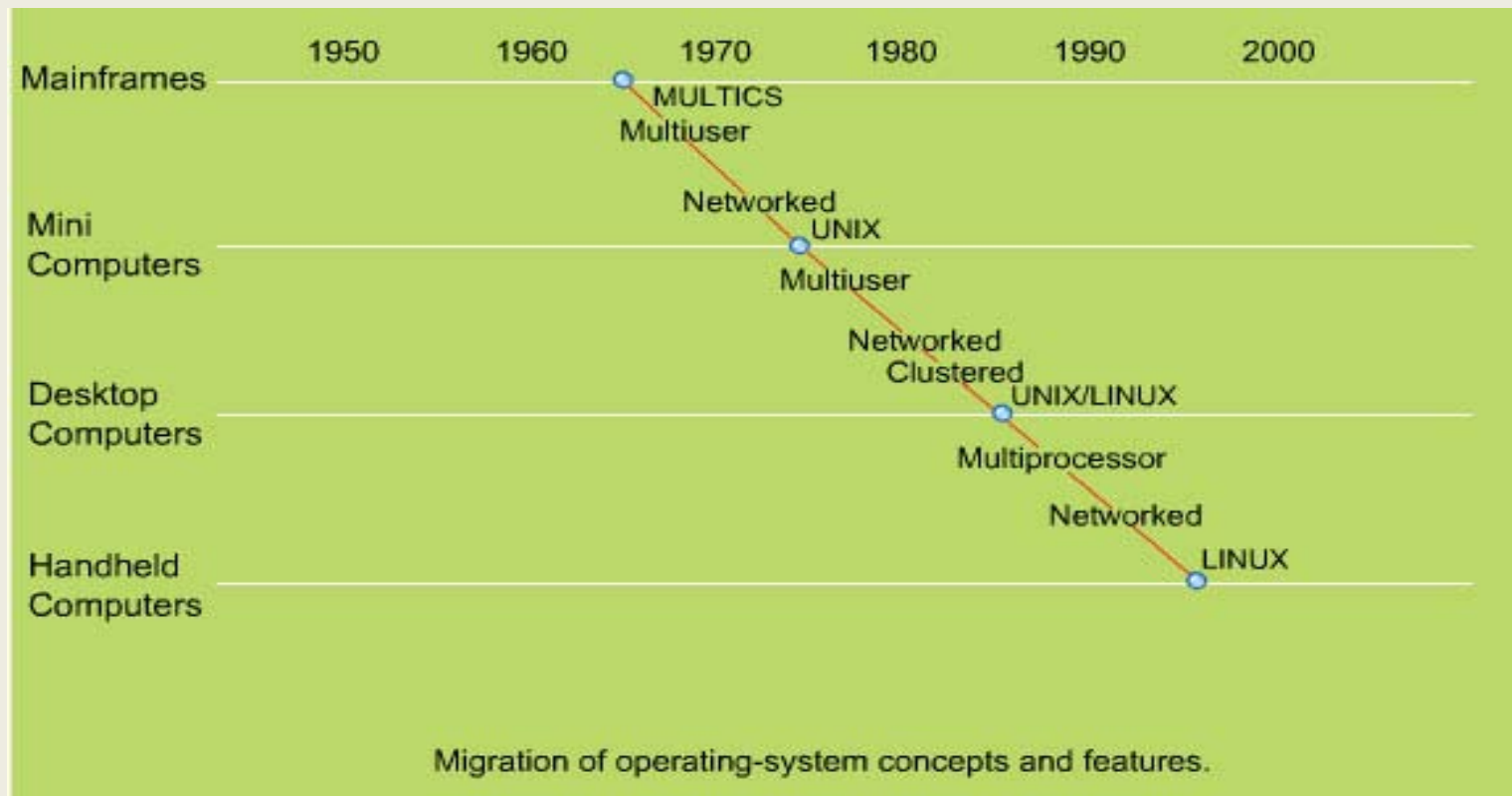


Figure 1.1

Where Does An OS Fit In?

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- OS is the layer between the h/w & the s/w.
- It acts as an interface between the hardware and the user program.

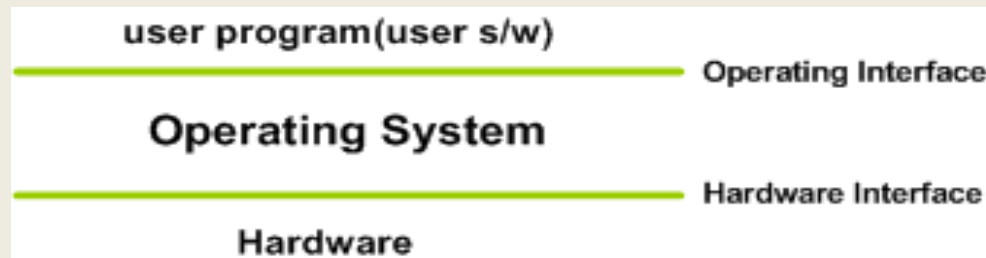


Figure 1.2

- It is a program that is compiled, linked, and run on a computer/hardware.

What Does An OS Do?

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- **The functions of an OS can be viewed:**

- ***As a Coordinator and Traffic Cop:***

- ✓ Manages all resources
- ✓ Settle conflicting requests for resources
- ✓ Prevent errors & improper use of computer

- ***As Facilitator:***

- ✓ Provide facilities that every one need
- ✓ Standard libraries, windowing system
- ✓ Make application programming easier, faster & less bug.

- ***Some features gives both:***

- ✓ For instance, file system is needed by every one(Facilitator)
- ✓ But file system must be protected(Traffic Cop)

Computer System Organization

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❑ Computer System Operation

- One or more CPUs, device controllers connected through common bus providing access to shared memory.
- Concurrent execution of CPUs & devices competing for memory cycle.

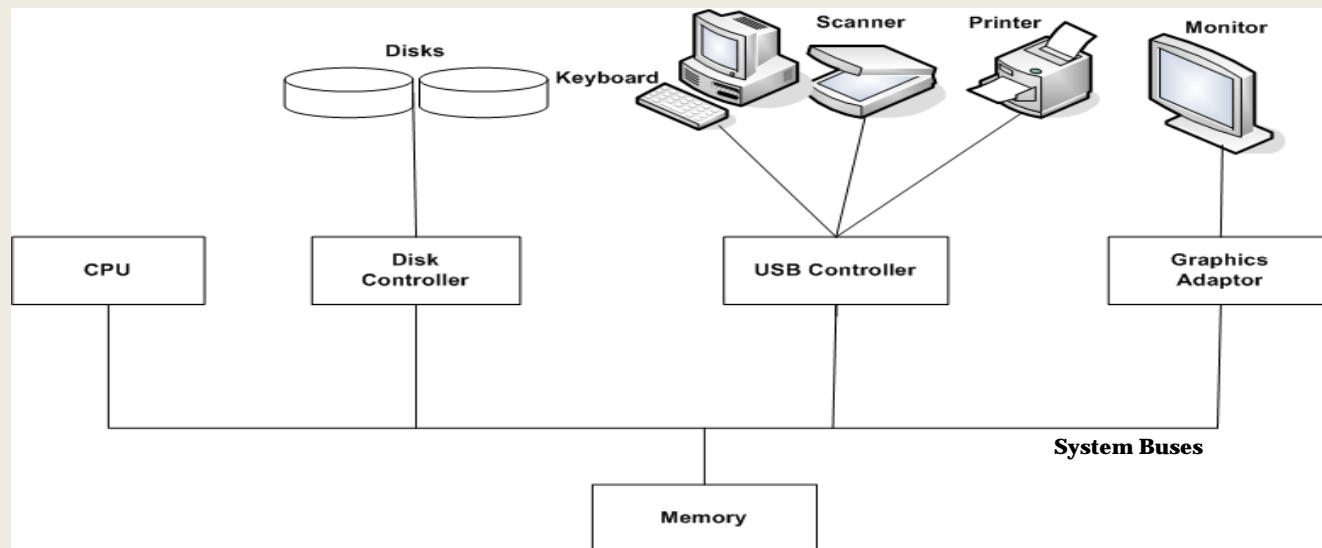


Figure 1.3

Summary

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- OS is developed mainly for 2 purposes: scheduling for good performance(effective utilization) & user convenience.
- Features of mainframe to handheld system
- Real time application are based on time frame.
- OS function as Coordinator & Traffic Cop, and as facilitator.
- Computer system is divided into hardware, OS, Application s/w & Users.
- Operation of computer system with I/O, memory, & controllers.