Introduction to Operating Systems

Computer Software is of two types:

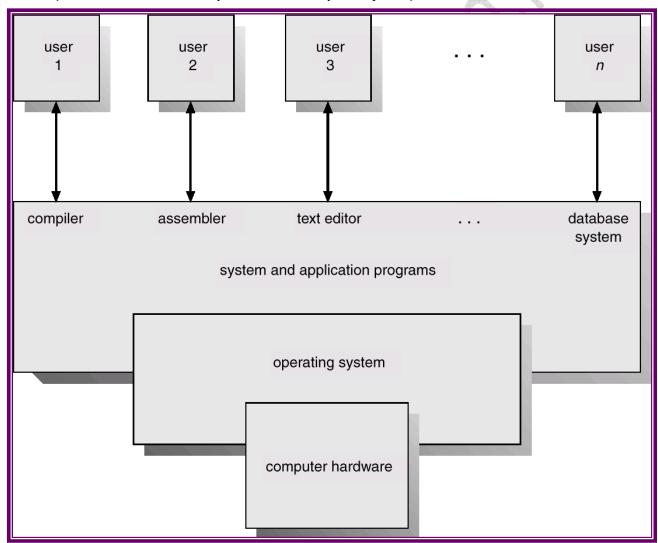
- (1) System Software (Manages operations of computers)
- (2) Application Software (Solves problems of users)

An example of an important system software is **Operating System.**

What is an Operating System?

An operating system is a set of routines to manage the running of the computer. It controls all computer resources and provides a base upon which application programs can be written.

(Abstract view of the components of a computer system)



Why do we need an operating system?

- Convenience operating system is an extended machine i.e.
 1st Gen → 2nd Gen → 3rd Gen → 4th Generation computers
- Efficiency Operating system as a resource allocator

Functions of an Operating System:

- Job scheduling and management
- Scheduling of input and output operations
- Operator communication
- Job-to-job communication
- Interrupt handling
- Process management
- · Memory management
- File management

History of Operating Systems

- → Early systems were "Bare machines" {1940's}
 - programming done in machine language
 - programmer was operator

Drawbacks:

- Idle time
- Common functions programmed by all.
- → Additional hardware and software developed {1950's}
 - hardware implied card readers, line printers, paper tape
 - software implied compilers, libraries of common functions

Steps included load compiler, run compiler, unload compiler, load object program

Drawbacks:

- Operations became more complex
- Too much setup time and cpu idle
- → Simple Monitor
 - Utilization improvement
 - Professional operators hired which meant less idle cpu reduced setup time increased efficiency and decreased convenience for the programmer.
- → Batch Systems (First rudimentary operating system) also called Mainframe systems
 - automatic job sequencing (resident monitor)
 - resident monitor consisted of control card interpreter, loader and job sequences, device drivers, interrupt handling routines and automatic job sequencing.

Performance:

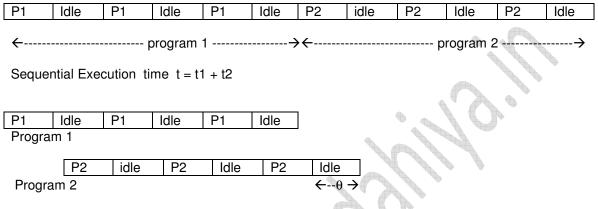
- Automatic job sequencing used to reduce setup time
- Improved I / O devices speed (mechanical to electromechanical)

Offline operation features

- cards copied to magnetic tape for input
- contents on tape and printed later

Multi programming (Parallel processing)

- denotes an operating system to increase cpu utilization (by having more than one program in memory at the same time) by executing programs concurrently.



Total time, $t = t1 + \theta$ (multiprogrammed execution)

Result: Throughput increases

Degree of Multiprogramming

Number of programs actively competing for resources (number of programs in memory).

Higher the degree of multiprogramming → higher the resources utilization

Multiaccess or Multiuser operating system

An operating system that allows simultaneous access to computer system through two or more terminals.

→ A multiuser operating system does not imply multiprogramming

Serial Processing

Resources of a computer system may be dedicated to a single program until its completion.

Time-Sharing Systems

Early Batch systems – "batching" of similar jobs (phasing)

(card / tape systems allowed only sequential access to programs and data)

- lack of user interaction during execution
- turn around time large
- inconvenient to user (handling all possible outcome / errors)

Batch systems appropriate for executing large jobs which need little interaction.

Interactive (Hands - on) Systems

- Implies online communication between user and system.
- Smaller jobs
- Response time should be small

Time shared systems provide interactive use of a system to many users at the same time (by providing user with a part of CPU time)

Time sharing → Multiprogramming
← (reverse not true)

Multiuser / Multiaccess systems → Multiprogramming

Real Time Systems

Processing must be done within a fixed time constraint or system will fail.

- → Is unix a real time system ? (No)
 - Telephone switching systems, flight control
 - Objective is to provide quick event response time
 - User convenience and response utilization

Separate process is charged with handling a specific event. Process is activated upon occurance of the event.

Hands- on Component

Introduction to Unix / Linux and Windows Operating Systems
