Lecture: 4
(Part-II)
Types of Operating System

4. **Multitasking System:**
   - Technically, multitasking is same as multiprogramming.
   - In a multitasking OS, a single user can execute multiple programs at the same time.
   - Multitasking is the system's capability to work one or more than one job or process at the same time. It means that whenever a job needs to perform I/O operations, the CPU can be used for executing some other job or process that is also residing in the system and is ready to use the CPU.
   - *The term Multiprogramming is used for multi-user systems i.e. system that are simultaneously used by many users. The term multitasking is used for single user system i.e. systems that are used by only one user at a time.*
   - e.g. a user is running separate program in 4 different windows at the same time. The program in window 1 could be printing a document, the program in window 2 could be displaying an e-mail of user, a spreadsheet program in window 3 could be preparing sales report and compilation of a program is in progress in window 4. In this manner, a user may work on many tasks at the same time. Thus, progress of different tasks can be viewed on different windows in a multitasking system.

5. **Multiprocessing/Parallel/ Tightly Coupled System:**
   - Multiprocessing systems have more than one processor in close communication sharing the computer bus, the clock and sometimes memory and peripheral devices.
   - It executes multiple jobs at same time and makes the processing faster.
   - Multiprocessor systems have three main advantages:
     - ✓ **Increased Throughput:** by increasing the number of processors, the system performs more work in less time. The speed-up ratio with N processors is less than N.
     - ✓ **Economy of Scale:** Multiprocessor systems can save more money than multiple single-processor systems, because they can share peripherals, mass storage and power supplies.

- ✓ **Increased reliability:** If one processor fails to done its task, then each of the remaining processors must pick up a share of the work of the failed processor. The failure of one processor will not halt the system, only slow it down.
- The multiprocessor operating systems are classified into two categories:
  - ✓ **Symmetric multiprocessing system:** each processor runs an identical copy of the operating system and these copies communicate with one another as needed.
  - ✓ **Asymmetric Multiprocessing system:** a processor is called master processor that controls other processors called slave processor. Thus, it establishes master-slave relationship. The master processor schedules the jobs and manages the memory for entire system.

6. Real-Time Operating Systems (RTOS):
- A real-time operating system (RTOS) is an operating system intended to serve real-time applications that process data as it comes in, typically without buffer delays.
- Processing time requirements are measured in tenths of seconds or shorter increments of time.
- Real time operating systems are generally special-purpose ones designed to run embedded or specialized systems.
- These systems often operate in environments where there are significant constraints on hardware design and often narrow tasks that need to be done with great accuracy and speed.
- Examples: Air Traffic Control Systems, Command Control Systems etc.
- **Advantages:**
  - ✓ Better throughput
  - ✓ Time taken for response is less
- **Disadvantages;**
  - ✓ Very Costly
  - ✓ Large memory required

7. Distributed Operating Systems:

- In distributed system, the different machines are connected in a network and each machine has its own processor and own local memory.
- In this system, the operating systems on all the machines work together to manage the collective network resource.
- It can be classified into tow categories:
  - ✓ Client-server systems
  - ✓ Peer-to-Peer systems

- **Advantages:**
  - ✓ Resources sharing
  - ✓ Reliability
  - ✓ Requires networking infrastructure