Early history

-1940s to 1950s

- 1940: the earliest electronic digital computers did not include operating system. Machines of the time were so primitive (ancient).
- 1950: the systems generally executed one job at a time. A job constituted the set of program instructions. These computers were called single-stream batch-processing systems. The operating systems reduced interjob transition times; programmers were required to directly control system resources.

- The 1960s

- It is also called the batch processing systems but using resources more efficiently by running several jobs at once.
- The systems improved resource utilization by allowing one job to use the processor while other jobs used peripheral devices.
- Processor bound job or compute bound job means jobs that mainly used the processor.
- I/O bound job means mainly used peripheral devices.
- Multiprogramming: systems that managed several jobs at once. The operating system rapidly switches the processor from job to job. Degree of multiprogramming or level of multiprogramming indicates how many jobs can be managed at once. Resources are shared among a set of processes.
- Interactive users: communicate with their jobs during execution via dumb terminals which were online.
- Timesharing: systems were developed to support simultaneous interactive users.
- Real-time systems: attempt to supply a response within a certain bounded time period.
- Virtual machine (VM) operating system: these systems were designed to perform basic interactive computing tasks for individuals, but their real value proved to be the manner in which they shared programs and data and demonstrated the value of interactive computing in program development environment.
- Process: to describe a program in execution in the context of operating system.
- Concurrent processes: execute independently but multiprogrammed systems enable multiple processes to cooperate to perform a common task.
- Turnaround time: the time between submission of a job and the return of its results, was reduced to minutes or seconds.

- Virtual memory: programs are able to address more memory locations than are actually provided in main memory, also called real memory or physical memory.

- 1970s
- The systems were primarily multimode multiprogramming systems that supported batch processing, time sharing and real-time applications
- Personal computers posted by early and continuing developments in microprocessor technology
- Communications between computers in local area networks (LANs) was made practical and economical by the Ethernet standard
- Security problems increased with growing volumes of information passing over vulnerable communications lines. Encryption received much attention

-1980s
- It was the decade of the personnel computers and the workstation
- Software such as spreadsheet programs, word processors, database packages and graphics packages
- Personnel computers proved to be easy to learn and use partially because of GUI(windows, icons, menus)
- Distributed computing became wide spread under client/server model. Clients request services and servers perform the requested services
- The software engineering field continued to evolve

-The 1990s
- Operating system designers developed techniques to protect computers from attacks
- Microsoft became the dominant in the 1990s. In 1981 Microsoft released DOS operating system. 1n the mid 1980 Microsoft developed its windows operating system, and then in 1990s released windows 3.0. 1993 release of Windows 3.1. After, that Windows 95, Windows 98, Windows NT, and Windows XP.
- Object technology: each software object encapsulates a set of attributes and methods. This allows applications to be built with components that can be reused in many applications. In object-oriented operating system objects represent components of the operating system and system resources. Object-oriented concepts were exploited to create modular operating system that were easier to maintain

- Open-source movement: open-source software is distributed with the source code, allowing individuals to examine and modify the software before compiling and executing (Linux operating system)
- Operating system became increasingly user friendly (GUI features)

-2000 and beyond
- Middleware: is a software that links two separate applications to communicate and exchange data via the internet
- Massive parallelism: number of systems has large of processors so that many independent parts of computations can be performed in parallel.

Computing on mobile devices which are used for e-mail, web browsin