CS 340
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Lecture #2

Topics: Operating Systems
Generations of Operating Systems
Read: Textbook – ch.1 (accent on topics covered in class and web lectures)
Web lecture and class notes

Operating System: A collection of programs that act as intermediaries between the user and the computer hardware. It can also be thought of as a resource manager.

Operating Systems Generations
Prior to the 1st Generation: early computing systems had NO operating system.

1st Generation (50s):
Batch processing systems: Jobs with similar needs were batched together and were run as a group. The operating system's major task was to automatically transfer control from one job to the following one. A batch system is characterized by the lack of interaction between the user and the job during execution.

2nd Generation (early 60s):
Multiprogramming, Multiprocessing systems

Multiprogramming: one CPU, multiple processes ready for execution.
In a multiprogramming OS there is competition among processes for resources (memory, the CPU, etc.).

Multiprocessing: several processors are used on a single computer system to increase the processing power of the machine.
Processes share the computer bus, the clock and sometimes memory and peripheral devices.

There are two popular multiprocessing models:

The **Symmetric multiprocessing model**:

The **Asymmetric multiprocessing model**:

3rd Generation (mid 60s to mid 70s)
by the early 60s, most computers manufacturers had two distinct, totally incompatible, product lines:
- the word-oriented, large-scale scientific computers
- the character-oriented, commercial computers

IBM attempted to solve this problem by introducing the System/360. The System/360 was designed to handle both scientific and commercial computing by providing the largest assortment of machine simulators and emulators ever assembled.

Timesharing systems (interactive) are multiprogramming systems that support multiple terminals, one for each active user of the system.
Today most systems provide both, batch and timesharing processing. These are known as ***multimode systems.***

A major feature introduced in this generation is **spooling**. (Simultaneous Peripheral Operation On-Line)

4th Generation (mid 70's to Present)
As hardware costs decreased, it became feasible to have a computer system dedicated to a single user. Personal computers appeared in the 70s. In the beginning the CPUs in PCs lacked the features needed to protect an operating system from user programs. The goals of these operating systems have changed with time. Now the systems try to maximize user convenience and responsiveness.

The mid 80's saw the growth of networks with PC's running network operating systems and distributed operating systems.

***Network Operating Systems*:**
Each computer has its own operating system. The user is aware that there are multiple independent computers and must deal with them explicitly. Communication is done by message passing.

***Distributed Operating Systems*:**
There is one common operating system shared by a network of computers.

Real-Time Systems are used when there are rigid time requirements. A real-time operating system has fixed time constraints. Processing must be done within the given amount of time.

There are 2 flavors of real-time systems:
Hard real-time system: guarantees that critical task is done in time

Soft real-time system: a critical real-time task gets priority over other tasks