Modern Operating Systems

- Microkernel architecture
  - Assigns only a few essential functions to the kernel
    - Address spaces
    - Interprocess communication (IPC)
    - Basic scheduling
Modern Operating Systems

• Multithreading
  – Process is divided into threads that can run concurrently
    • Thread
      – Dispatchable unit of work
      – executes sequentially and is interruptable
    • Process is a collection of one or more threads
Modern Operating Systems

• Symmetric multiprocessing (SMP)
  – There are multiple processors
  – These processors share same main memory and I/O facilities
  – All processors can perform the same functions


Multiprogramming and Multiprocessing

1 processor
multiprogramming

2 processors
multiprocessing

(a) Interleaving (multiprogramming, one processor)

(b) Interleaving and overlapping (multiprocessing; two processors)

Figure 2.12 Multiprogramming and Multiprocessing
Modern Operating Systems

- Distributed operating systems
  - Provides the illusion of a single main memory space and single secondary memory space
Modern Operating Systems

• Object-oriented design
  – Used for adding modular extensions to a small kernel
  – Enables programmers to customize an operating system without disrupting system integrity
UNIX

• Hardware is surrounded by the operating system software
• Operating system is called the system kernel
• Comes with a number of user services and interfaces
  – Shell
  – Components of the C compiler
UNIX

Figure 2.14 General UNIX Architecture
UNIX Kernel

Fig. 2.15

Sequence 4
Modern UNIX Kernel

Fig 2.16
Some UNIX Systems

- System V Release 4 (SVR4)
- Solaris 10
- 4.4BSD
- Linux
- OS X