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)

Sequence 4

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
Windows 2000 Architecture

System support processes
- Service control manager
- Lsass
- Winlogon
- Session manager

Service processes
- SVChost.exe
- Winmgmt.exe
- Spooler
- Services.exe

Applications
- Task manager
- Windows Explorer
- User application
- Subsystem DLLs

Environment subsystems
- OS/2
- POSIX
- Win32

System threads
- User mode
- Kernel mode

Ntdll.dll
- System service dispatcher
- (Kernel-mode callable interfaces)
- I/O manager
  - File system
  - Object manager
  - Plug and play
  - Power manager
  - Security reference monitor
  - Virtual memory
  - Processes and threads
  - Configuration manager (registry)
  - Local procedure call

Win32 USER, GDI
- Graphics drivers

Device and file system drivers

Hardware abstraction layer (HAL)

Sequence 4

Lsass = local security authentication server
POSIX = portable operating system interface
GDI = graphics device interface
DLL = dynamic link libraries

Colored area indicates Executive
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
Some UNIX Systems

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