# Chapter 1
# What is UNIX?

Graham Glass and King Ables,

*UNIX for Programmers and Users*,

Third Edition, Pearson Prentice Hall, 2003.

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Converted to presentation and updated by Michael Weeks

# Computer Systems

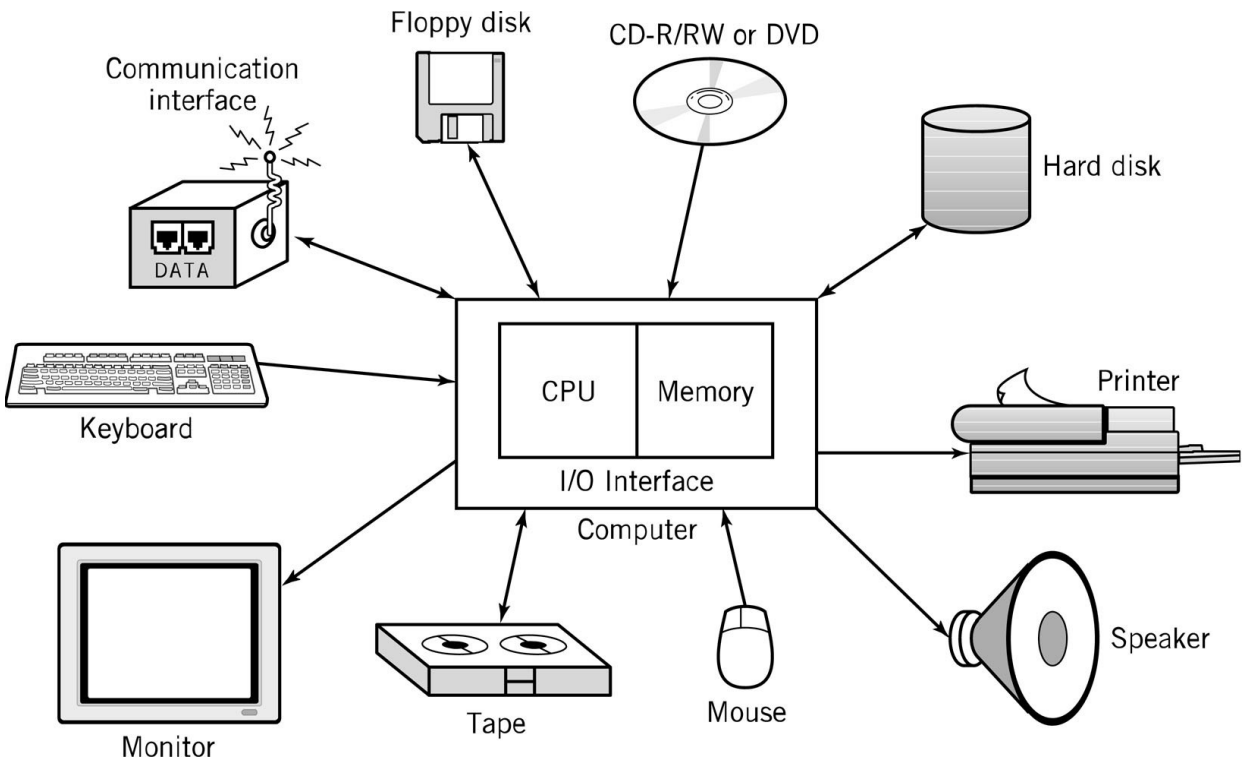
- **Computer System : Hardware + Software**

- **Hardware: CPU, Memory (RAM/ROM), Disk drives, CD-ROM drives, Monitor, Graphics card, Keyboard, Mouse, Printer, Tape drive, Modem, Ethernet interface, Other peripherals.**

- **Software: Operating System, Application Programs**

- **UNIX is the name of a popular operating system.**

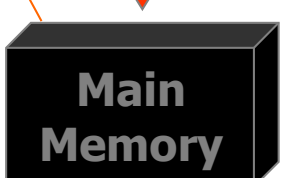
# Typical Personal Computer System



# Hardware Key Components (1) : CPU and Main Memory


**Chip that executes program commands**

**Intel Pentium 4 or Sun ultraSPARC III Processor**

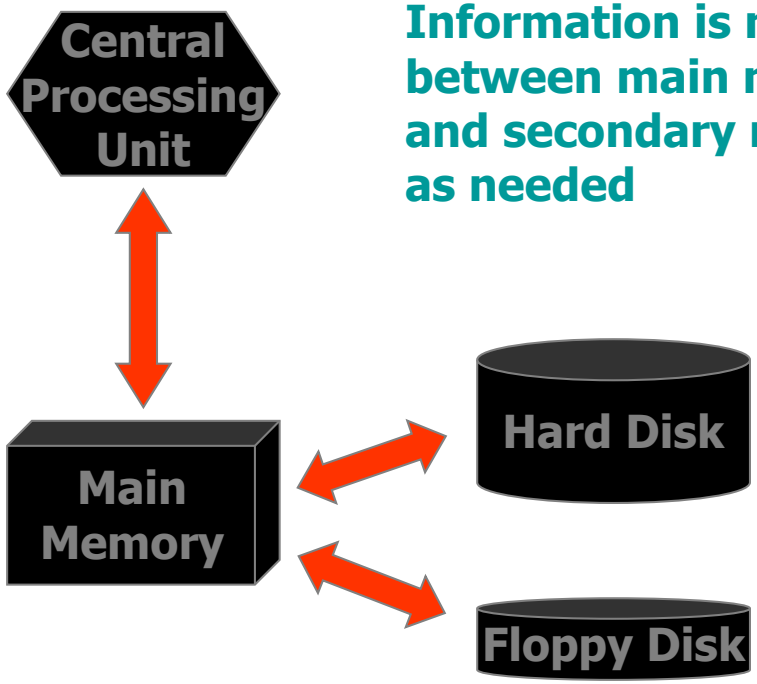



**Primary storage area for programs and data that are in active use**

**Synonymous with RAM**

# Hardware Key Components (2) : Secondary Memory Devices

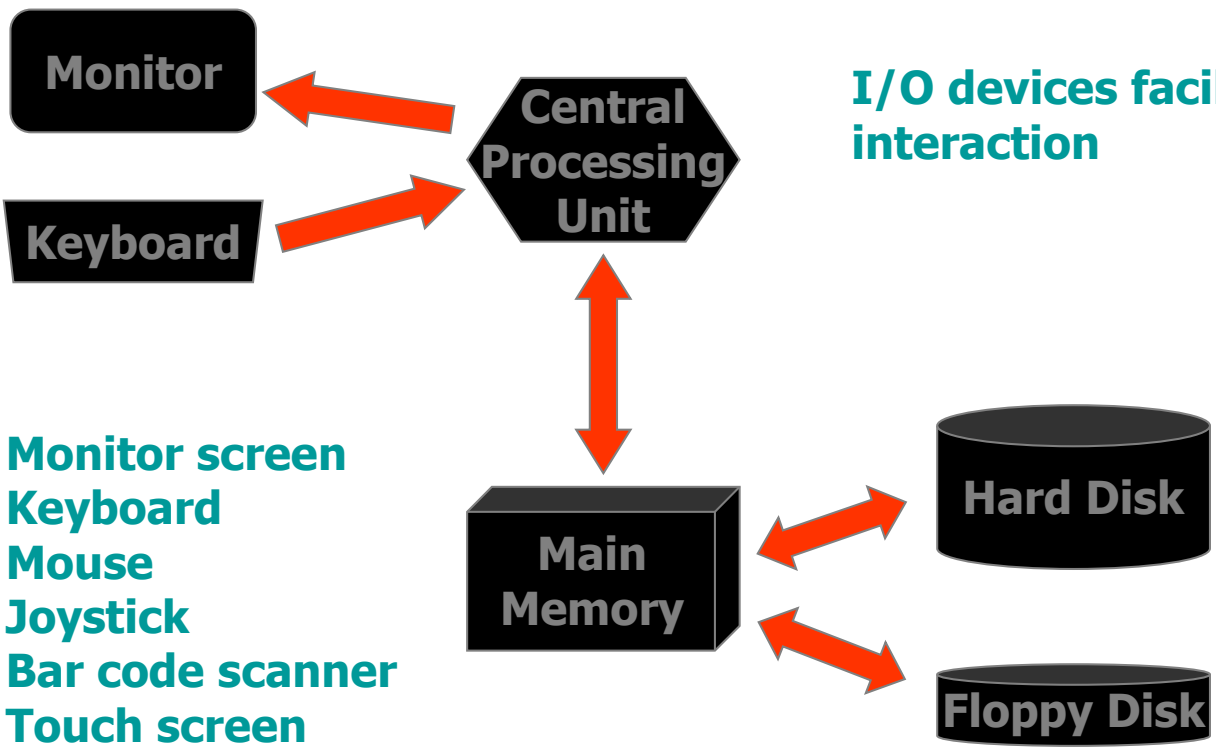
**Secondary memory devices provide long-term storage**



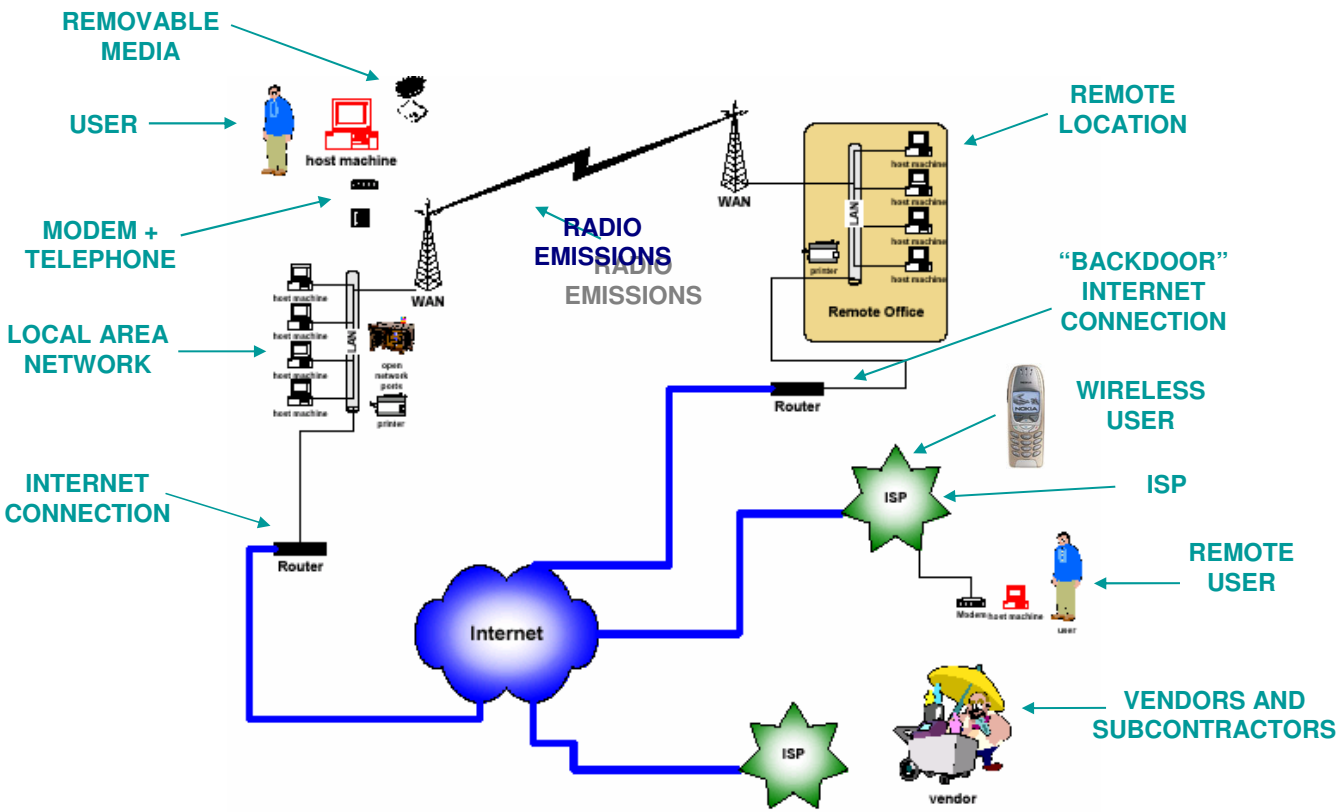

**Information is moved between main memory and secondary memory as needed**

**Hard disks**
**Floppy disks**
**ZIP disks**
**Writable CDs**
**Tapes**

# Hardware Key Components (3) : Input / Output Devices

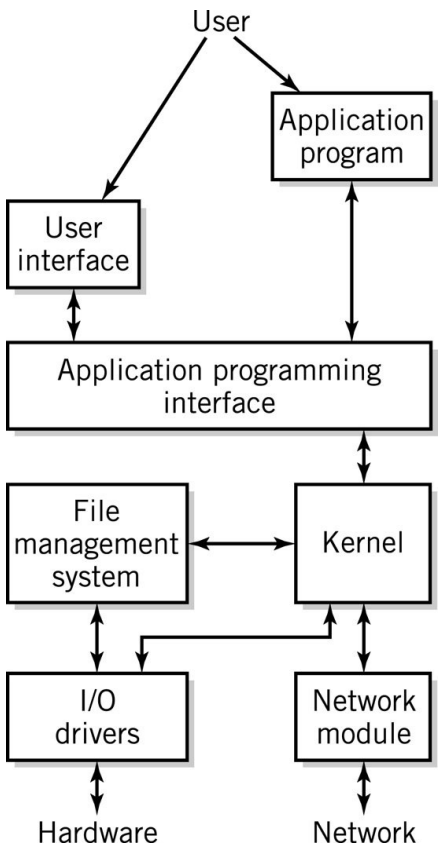


# Computer Network

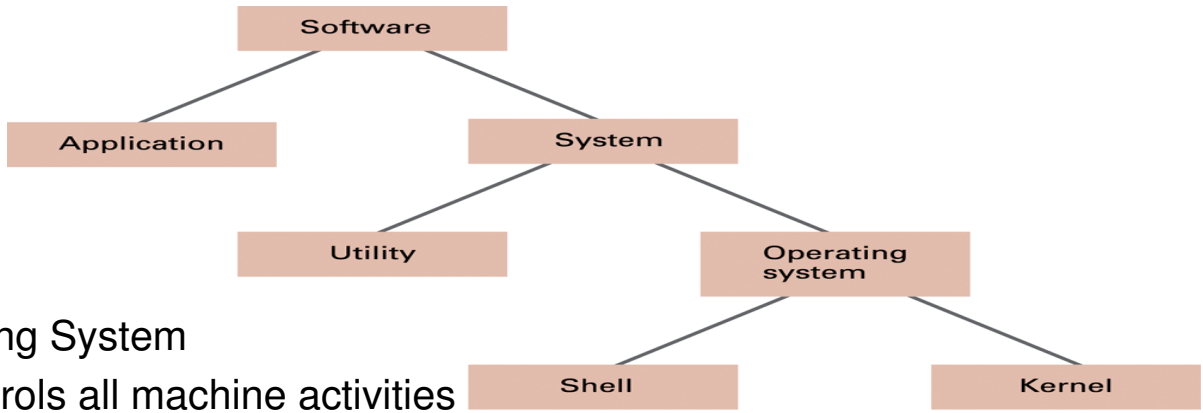


# Software Component

- Applications
- *Operating System*
  - API: application program interface
  - File management
  - I/O
  - Kernel
    - Memory management
    - Resource scheduling
    - Program communication
    - Security
  - Network Module

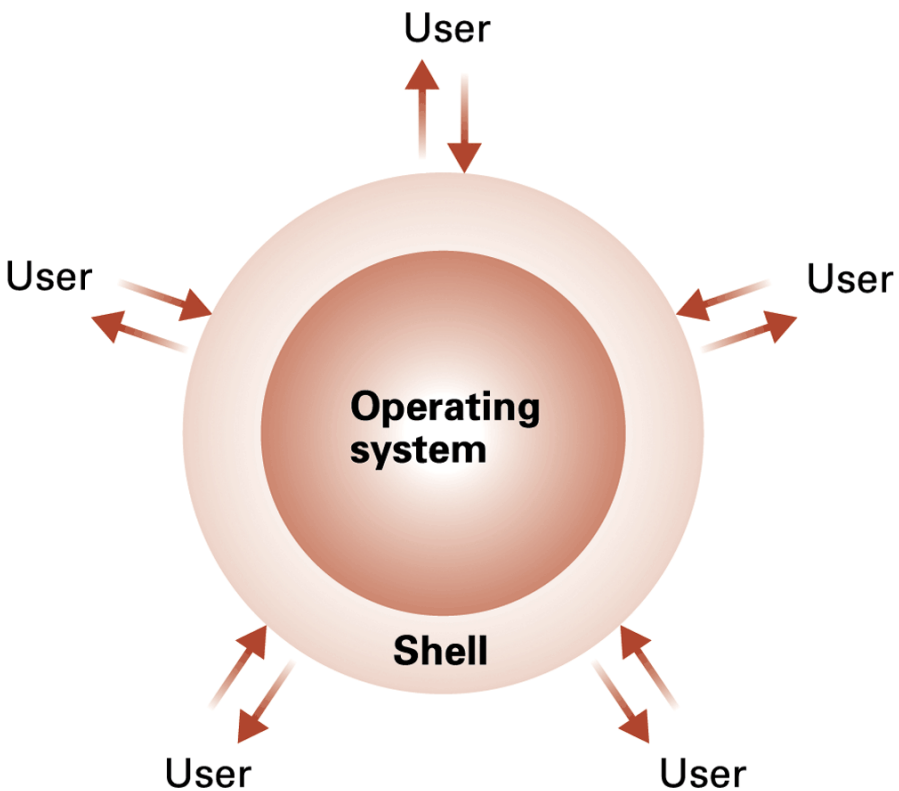


# Software Categories

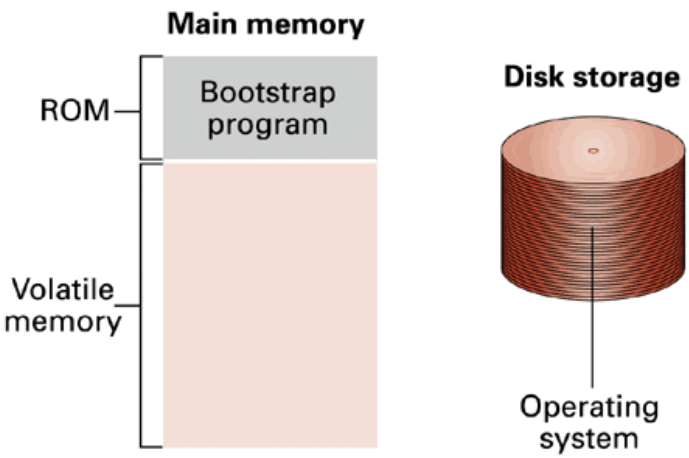



- Operating System
  - controls all machine activities
  - Oversee operation of computer - Store and retrieve files
  - Schedule programs for execution - Coordinate the execution of programs - Provides the user interface to the computer
  - manages resources such as the CPU and memory
- Application program
  - generic term for any other kind of software
  - word processors, missile control systems, games
- Most operating systems and application programs have a *graphical user interface* (GUI)

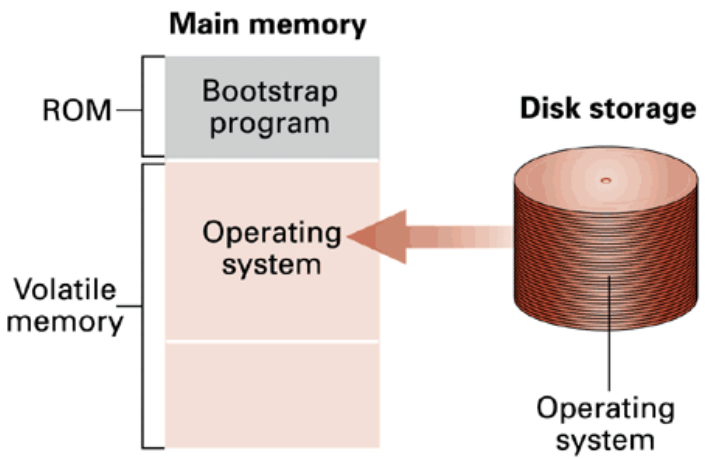
# The shell as an interface between users and the operating system



# **Figure 3.5** The booting process

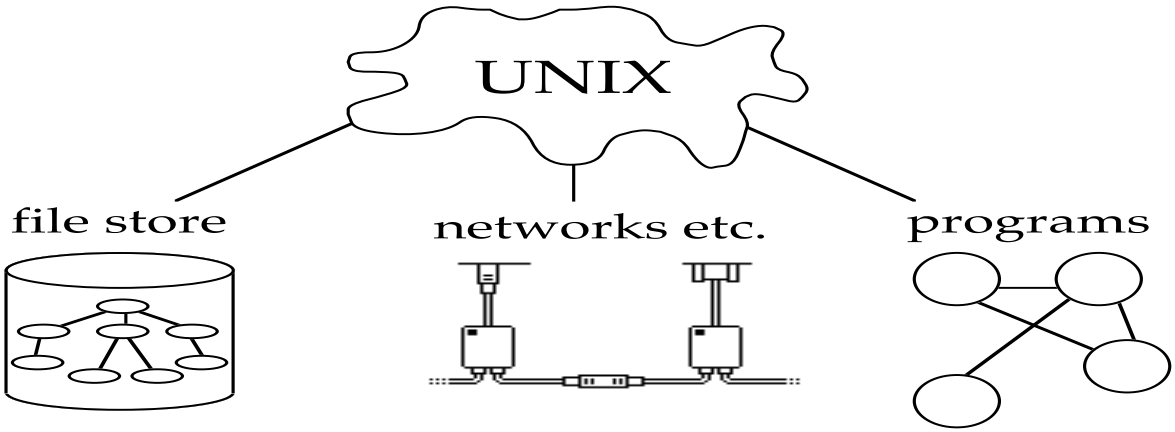



**Step 1:** Machine starts by executing the bootstrap program already in memory. Operating system is stored in mass storage.




**Step 2:** Bootstrap program directs the transfer of the operating system into main memory and then transfers control to it.

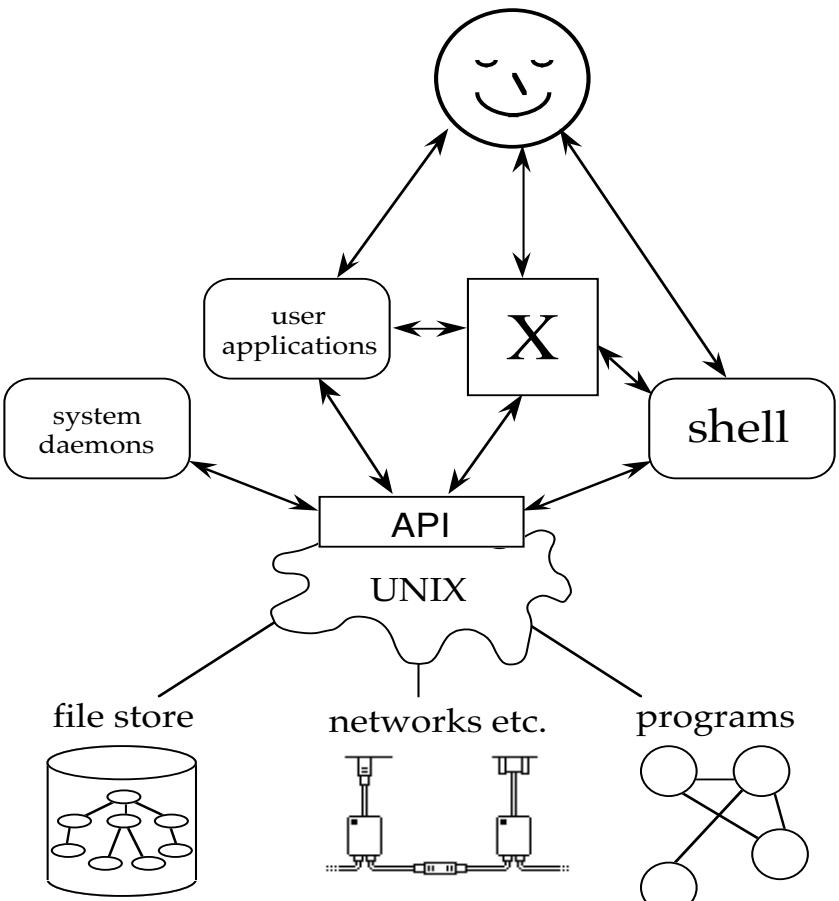
# UNIX is an operating system




- **Provides a framework for executing programs and storing files**
  - **File: collection of data normally stored on disk.**
  - **Program: collection of instructions/data that is stored in a file.**

# UNIX API – the system calls

ultimately everything works through system calls



# Process

- **When a program is executed, it is loaded into memory. It is called a *process* when it is executing.**
- **Most processes read/write data from/to files**
- **Processes and files have an owner**
- **UNIX supports hierarchical directory structure**
- **Files and processes have a location within the directory structure**
- **UNIX provides the capabilities to create, modify and destroy files, programs, and processes.**

# Unix Attributes

- **Sharing of resources: CPU (time slices), memory (pages), disk (blocks)**

- **Communication: process-device controller, process-process, etc. (pipes 1-way, sockets 2-way)**

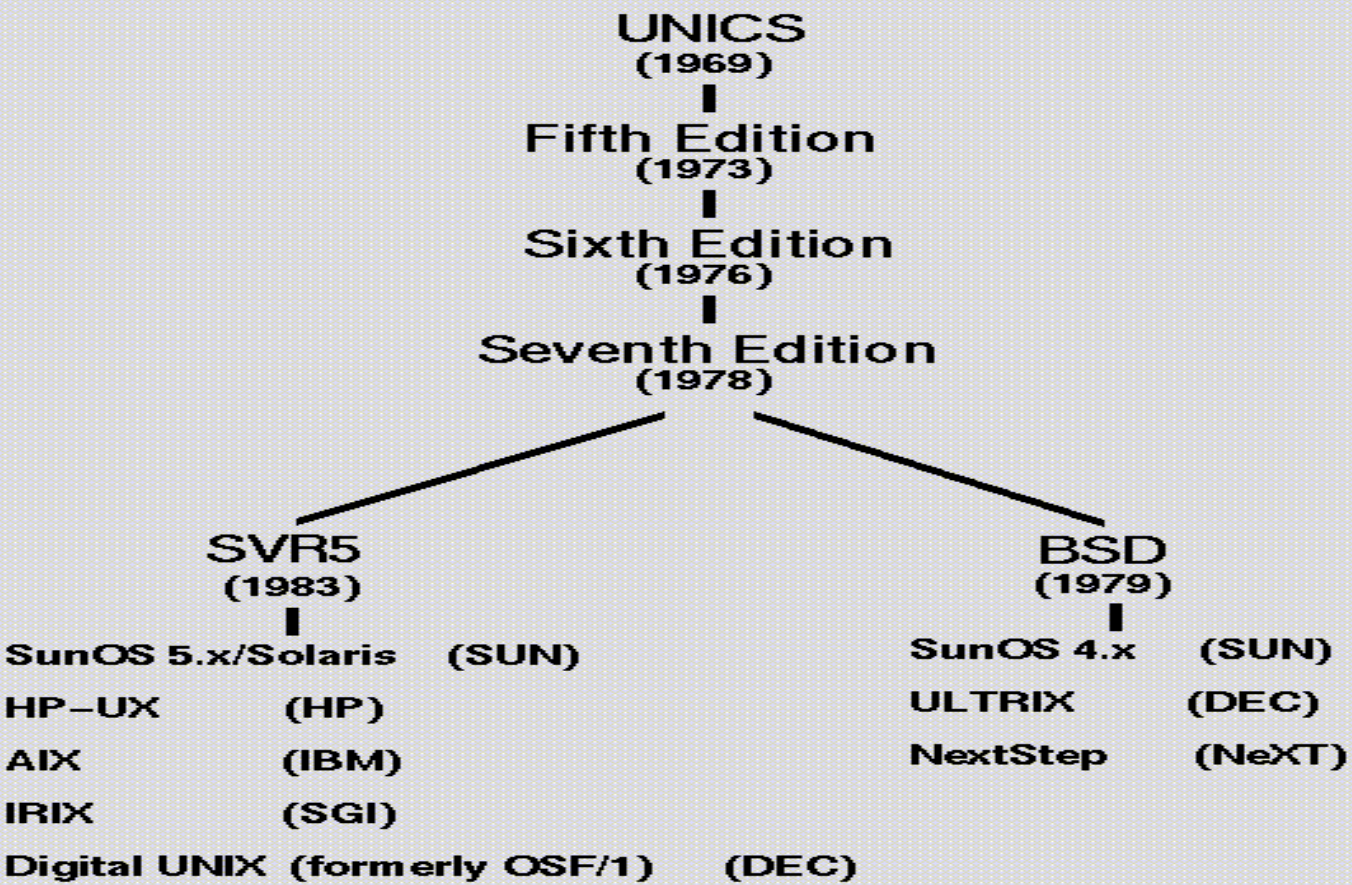
- **Utilities: Unix comes with a large collection of utilities; we will study many of these.**

- **Programmer support: All kinds of compilers available; Access to parallel processing, file handling and interprocess communication via System calls in C**

# Advantages of UNIX

- It is **multitasking**, therefore, multiple programs can run at one time.
- It is **multiuser**, allowing more than a single user to work at any given time. This is accomplished by sharing processing time between each user and utilizing distributed computing systems.
- It is **safe**, preventing one program from accessing memory or storage space allocated to another, and enables protection, requiring users to have permission to perform certain functions, i.e. accessing a directory, file, or disk drive

# The Unix Family Tree



# Two Main Varieties of Unix

- System V (AT&T) and
- BSD (Berkeley Standard Distribution)
  - Both are merged now. SunOS, IRIX, AIX, HP-UX have features from both varieties although most are System V Unix.
- Other Unix versions you may have heard of:
  - Linux (Fedora, Red Hat, Ubuntu, SUSE, etc.)
  - Sun Java Desktop OS, Solaris
  - Apple OS/X

# Sub-Varieties of Unix

- Linux (Runs on PC architecture)
  - Fedora
  - Red Hat
  - Ubuntu
  - Sun Java Desktop OS, etc.
- Sun Solaris (Runs on SPARC architecture)
- Apple OS/X (Runs on PowerPC and Intel platforms)

# Philosophies of Unix

- **Pipe mechanism**
  - **Output of one process can be used as input for another process. e.g.**
    - **$ who | sørt**
  - **Using the pipe mechanism, complex tasks can be broken down into simpler ones and combined using pipes etc.**
- **Super user**
  - **user who has complete control over the system resources. Typically the System's Administrator.**

# Review

- Computer Systems
- Unix as an operating system
- Processes
- Unix Attributes
- Unix Varieties
- Unix Philosophies