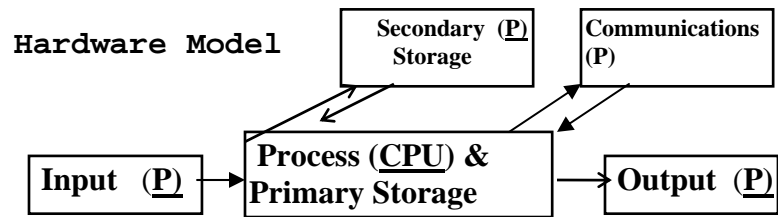


Chap-02, Hardware and Software

Hardware Components

- Central processing unit (CPU)
 - Arithmetic/logic unit (ALU)
 - Control unit
- Input devices
- Output devices
- Communications devices
- Primary storage devices
- Secondary storage devices



ALL PROCESSING IS DONE IN THE CPU & Primary Storage

Processing and Memory Devices: Power, Speed, and Capacity

- System unit (The Box) contains:
 - CPU/memory (note: “Memory”=“Primary Storage”)
 - **Peripherals (P)** other devices within the box or external are linked to the CPU

Processing Characteristics and Functions

- Machine cycle time: time to execute the instruction phase and the execution phase
- Clock speed: electronic pulses produced at a predetermined rate
- Wordlength: number of bits that can be processed at one time

Physical characteristics of the CPU

- Digital circuits on chips
- Electrical current flows through silicon

Memory Characteristics and Functions: Storage Capacity

Types of Memory (“Memory” = “Primary Storage”)

- Random access memory (RAM) Volatile (Temporary)
- ROM (read-only memory) Usually nonvolatile

Multiprocessing

- Multiprocessing: simultaneous execution of two or more instructions
- Parallel processing: linking hundreds or thousands of processors operating in parallel
- Grid computing: collection of computers working to solve a common problem

Secondary Storage and Input and Output Devices

- Secondary storage
- Also called permanent storage
- Nonvolatile
- Greater capacity and greater economy than memory

Secondary Storage Access Methods

- Sequential access: records must be retrieved in order
- Sequential access storage devices (SASD)
- Direct access: records can be retrieved in any order
- Direct access storage devices (DASDs)

Secondary Storage Devices

- Magnetic tapes Magnetic fixed & floppy disks
- Redundant array of independent/inexpensive disks (RAID)
- Expandable storage
 - Compact disc read-only memory (CD-ROM)
 - CD-recordable (CD-R) discs
 - CD-rewritable (CD-RW) discs
 - Digital versatile disc (DVD)
 - Memory cards

Input Devices

Transcriptive Input devices - (human interface)

- Keyboard
- Mouse
- Voice-recognition devices
- Terminals
- Touch-sensitive screens

Source-Data Input devices - Automated (without human interface)

- Bar-code scanners
- Optical data readers
- Point-of-sale (POS) devices
- Automatic teller machine (ATM) devices
- Magnetic ink character recognition (MICR) devices (Financial Institutions)
- Credit cards and ID cards with magnetic strips
- Radio-frequency identification (RFID)

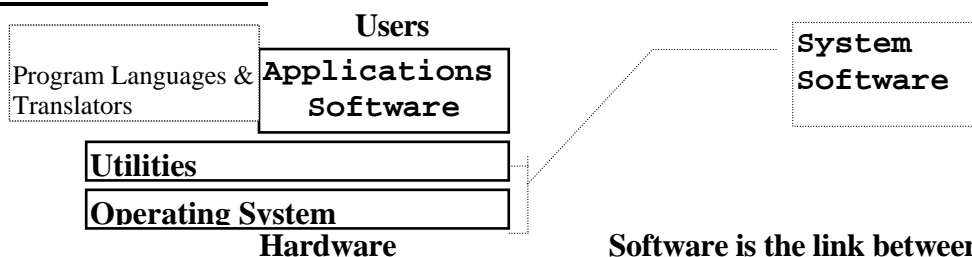
Output Devices

- Display monitors (CRTs - Cathode Ray Tubes)
- Liquid crystal displays (LCDs)
- Organic light-emitting diodes (OLEDs)
- Printers and plotters

Computer System Types

- Handheld computers, Portable, Desktop, Workstations, Servers
 - Mainframe computers
 - Supercomputers
-

Overview of Software



Software is the link between Users & Hardware

- Computer programs:** sequences of instructions
- Documentation:** describes program functions
- Systems software:** coordinates the activities of hardware and programs. Runs the computer.
- Application software:** The programs that help users solve particular computing problems
Supporting Individual, Group, and Organizational Goals

Sphere of influence: the scope of problems and opportunities addressed by a particular organization

–Personal, Workgroup, Enterprise

Systems Software: Operating Systems

•**Operating system (OS):** set of programs that control the hardware and act as an interface with applications. It plays a central role in the functioning of the complete computer system and is usually stored on disk.

•Common hardware functions

Get input (e.g., keyboard)

Retrieve data from disks and store data on disks

Display information on a monitor or printer

•User interface

Allows individuals to access and command the computer system

Command-based user interface: uses text commands

Graphical user interface (GUI): uses icons and menus to send commands to the computer system

•Hardware independence

Application program interface (API): allows applications to make use of the operating system

•Memory management

Controls how memory is accessed and maximize available memory and storage

•Processing tasks

Multitasking: more than one program running at the same time

Time-sharing: more than one person using a computer system at the same time

Scalability: ability to handle an increasing number of concurrent users smoothly

•Networking capability: features that aid users in connecting to a computer network

•Access to system resources

Protection against unauthorized access

Logons and passwords

•File management

Ensures that files in secondary storage are available when needed

Protected from access by unauthorized users

Current Operating Systems [Listed to let you know there is more than just Windows or Mac OS]

(see pp. 710-074 in text)

Workgroup Operating Systems

Windows Server

UNIX

NetWare

Red Hat Linux

Mac OS X Server

Enterprise Operating Systems

z/OS

MPE/iX and HP-UX

Linux

Operating Systems for Small Computers and Special-Purpose Devices

Palm OS

Windows Embedded

Windows Mobile

Application Software

Gives users the ability to solve problems and perform specific tasks

Interacts with systems software; systems software then directs the hardware to perform the tasks

Types and Functions of Application Software

- Proprietary software:** unique program for a specific application, usually developed and owned by a single company
- Off-the-shelf software:** purchased software
- Customized package** [Combination of above two types]

Personal Application Software:

Specific uses: **Money Management, Games, Statistical Packages, Browsers,**

Personal productivity software: The software that enables users to improve their personal effectiveness, increasing the amount of work they can do and its quality

Spreadsheets, Word Processors, Databases, Presentations etc. ___[Labs at PhilaU]

Workgroup Application Software

- Workgroup application software:** supports teamwork, whether people are in the same location or dispersed around the world
- Groupware:** software that helps groups of people work together more efficiently and effectively

Enterprise Application Software

- Software that benefits an entire organization**
- Enterprise resource planning (ERP) software: programs that manage a company's vital business operations for an entire multisite, global organization**

Programming Languages

- Sets of keywords, symbols, and a system of rules for constructing statements**
- Allow humans to communicate instructions to be executed by a computer**
- Syntax: a set of rules associated with a programming language**
- Different languages have characteristics making them appropriate for particular types of applications**

Software Issues and Trends

Software bugs: Program defects that keep it from performing correctly

Copyrights and licenses

Global software support

Summary

- Hardware:** central processing unit (CPU), input and output devices, communications devices, primary storage devices, and secondary storage devices
- Random access memory (RAM):** temporary and volatile
- ROM (read-only memory):** usually nonvolatile
- Multiprocessing:** simultaneous execution of two or more instructions
- Sequential access:** records retrieved in order
- Direct access:** records retrieved in any order
- Computer programs:** sequences of instructions
- Systems software:** coordinates the activities of hardware and programs
- Application software:** helps users solve problems
- Operating system (OS):** programs that control the hardware and act as an interface with applications
- Graphical user interface (GUI):** uses icons and menus to send commands to the computer system
- Programming languages:** allow humans to communicate instructions to be executed by a computer

Key Terms

- **Application program interface (API):** The interface that allows applications to make use of the operating system
- **Application service provider (ASP):** A company that provides software, end-user support, and the computer hardware on which to run the software from the user's facilities
- **Application software:** The programs that help users solve particular computing problems
- **Arithmetic/logic unit (ALU):** The portion of the CPU that performs mathematical calculations and makes logical comparisons
- **Byte (B):** Eight bits that together represent a single character of data
- **Central processing unit (CPU):** The part of the computer that consists of two associated elements: the arithmetic/logic unit and the control unit
- **Clock speed:** A series of electronic pulses produced at a predetermined rate that affect machine cycle time
- **Command-based user interface:** A user interface that requires that text commands be given to the computer to perform basic activities
- **Compact disc read-only memory (CD-ROM):** A common form of optical disc on which data, after it has been recorded, cannot be modified
- **Computer programs:** The sequences of instructions for the computer
- **Computer system platform:** The combination of a particular hardware configuration and systems software package
- **Contract software:** The software developed for a particular company
- **Control unit:** The part of the CPU that sequentially accesses program instructions; decodes them; and coordinates the flow of data in and out of the ALU, primary storage, and even secondary storage and various output devices
- **Coprocessor:** The part of the computer that speeds processing by executing specific types of instructions while the CPU works on another processing activity
- **Desktop computer:** A relatively small, inexpensive single-user computer that is highly versatile
- **Digital versatile disc (DVD):** A storage medium used to store digital video or computer data
- **Direct access:** The retrieval method in which data can be retrieved without the need to read and discard other data
- **Direct access storage device (DASD):** The device used for direct access of secondary storage data
- **Documentation:** Describes the program functions to help the user operate the computer system
- **Enterprise resource planning (ERP):** A set of integrated programs that manage a company's vital business operations for an entire multisite, global organization
- **Expandable storage devices:** These devices use removable disk cartridges to provide additional storage capacity
- **Graphical user interface (GUI):** An interface that uses icons and menus displayed on screen to send commands to the computer system
- **Handheld computer:** A single-user computer that provides ease of portability because of its small size
- **Magnetic disk:** A common secondary storage medium, with bits represented by magnetized areas
- **Magnetic tape:** A common secondary storage medium; Mylar film coated with iron oxide, with portions of the tape magnetized to represent bits
- **Mainframe computer:** A large powerful computer often shared by hundreds of concurrent users connected to the machine via terminals
- **Multiprocessing:** The simultaneous execution of two or more instructions at the same time
- **Multitasking:** The capability that allows a user to run more than one application at the same time

- **Off-the-shelf software:** An existing software program that is purchased
- **Operating system (OS):** A set of computer programs that controls the computer hardware and acts as an interface with application programs
- **Parallel processing:** A form of multiprocessing that speeds processing by linking several processors to operate at the same time, or in parallel
- **Personal productivity software:** The software that enables users to improve their personal effectiveness, increasing the amount of work they can do and its quality
- **Point-of-sale (POS) device:** A terminal used in retail operations to enter sales information into a computer system
- **Programming languages:** The sets of keywords, symbols, and a system of rules for constructing statements by which humans can communicate instructions to be executed by a computer
- **Proprietary software:** A one-of-a-kind program for a specific application, usually developed and owned by a single company
- **Radio-frequency identification (RFID):** A technology that employs a microchip with an antenna that broadcasts its unique identifier and location to receivers
- **Random access memory (RAM):** A form of memory in which instructions or data can be temporarily stored
- **Read-only memory (ROM):** A nonvolatile form of memory
- **Redundant array of independent/inexpensive disks (RAID):** A method of storing data that generates extra bits of data from existing data, allowing the system to create a “reconstruction map” so that if a hard drive fails, it can rebuild lost data
- **Scalability:** The ability to increase the capability of a computer system to process more transactions in a given period by adding more, or more powerful, processors
- **Secondary storage (permanent storage):** The devices that store larger amounts of data, instructions, and information more permanently than allowed with main memory
- **Sequential access:** The retrieval method in which data must be accessed in the order in which it is stored
- **Sequential access storage device (SASD):** The device used to sequentially access secondary storage data
- **Server:** A computer designed for a specific task, such as network or Internet applications
- **Software bug:** A defect in a computer program that keeps it from performing in the manner intended
- **Software suite:** A collection of single application programs packaged in a bundle
- **Storage area network (SAN):** The technology that provides high-speed connections between data storage devices and computers
- **Supercomputers:** The most powerful computer systems, with the fastest processing speeds
- **Syntax:** A set of rules associated with a programming language
- **Systems software:** The set of programs designed to coordinate the activities and functions of the hardware and various programs throughout the computer system
- **Time-sharing:** The capability that allows more than one person to use a computer system at the same time
- **User interface:** The element of the operating system that allows individuals to access and command the computer system
- **Voice-recognition device:** An input device that recognizes human speech
- **Wordlength:** The number of bits a CPU can process at any one time
- **Workgroup application software:** The software that supports teamwork, whether in one location or around the world
- **Workstation:** A more powerful personal computer that is used for technical computing, such as engineering, but still fits on a desktop