Infrastructure and Operations

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Performance Variable for IT

- Functional capabilities and limitations
  - **Price-performance ratio**
- Ease of use
- Compatibility
  - The extent to which various related technologies fit together
- Maintainability
  - **Scalability** – the ability to change capacity without major disruptions

Units of Measure for Technology Operation

- Measuring Amounts of Data
  - 8 Bit = 1 byte
  - Kilobyte (KB) $\cong 10^3$ bytes
  - Megabyte (MB) $\cong 10^6$ bytes
  - Gigabyte (GB) $\cong 10^9$ bytes
  - Terabyte (TB) $\cong 10^{12}$ bytes
  - Petabyte (PB) $\cong 10^{15}$ bytes
  - Hexabyte (HB) $\cong 10^{18}$ bytes
  - Zeetabyte (ZB) $\cong 10^{21}$ bytes
  - Yottabyte (YB) $\cong 10^{24}$ bytes

Units of Measure for Technology Operation

- Measuring time
  - Millisecond = 10^{-3} second
  - Microsecond = 10^{-6} second
  - Nanosecond = 10^{-9} second
  - Picosecond = 10^{-12} second
- Measuring the rate of data transfer
  - Bits per second (bps), Kbps, Mbps

Units of Measure for Technology Operation

- Measuring clock speed and transmission frequency
  - Hertz (Hz) – measures cycles per second
  - Current typical values for the internal clock of PCs are between 700 MHz and 1.5 GHz

Units of Measure for Technology Operation

- Measuring the speed of executing instructions
  - MIPS – million of instructions per second
  - FLOPS – floating point operations per second
    - Better measure than MIPS for computers used for scientific computations
    - Megaflops, gigaflops, teraflops

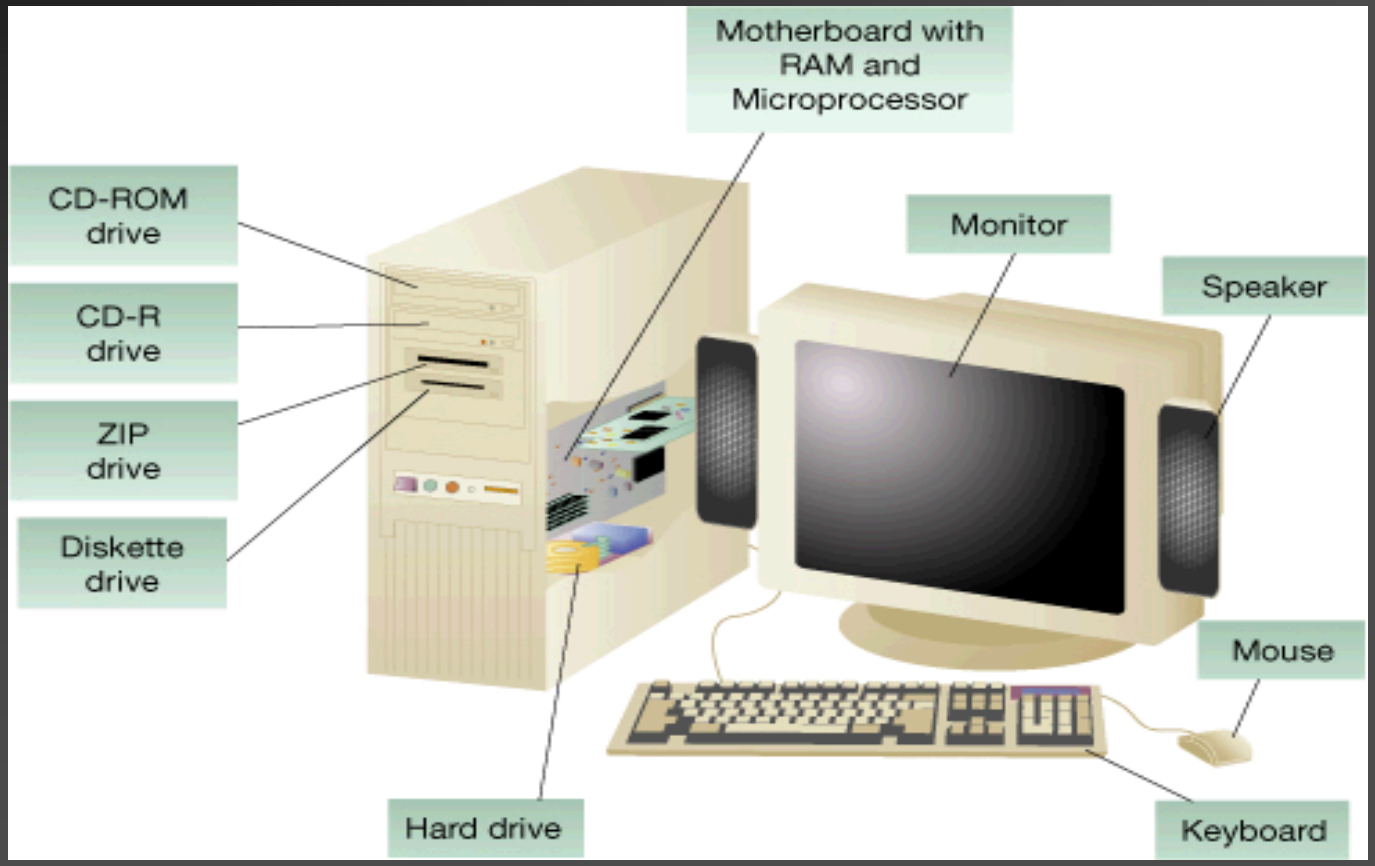
Overview of Computer Systems

- **Computer** = device that can execute previously stored instructions
- **Program** = a set of instructions for performing a particular task
- **Hardware** = the physical devices in a computer system
- **Software** = the programs

Basic Model of a Computer System

- Microprocessor or Central Processing Unit (CPU) -executes the instructions
- Random access memory (RAM) – stores the instructions and data the processor works with
- Peripherals:
  - Input devices
  - Output devices
  - Storage devices

Basic Model of a Computer System



Types of Computers

- Personal computer (PC) – a single-user computer
- Laptop and notebook computers – portable PCs
- Personal digital assistant (PDA) and palmtop computers – handheld devices
- Workstation – powerful single-user computer

Types of Computers

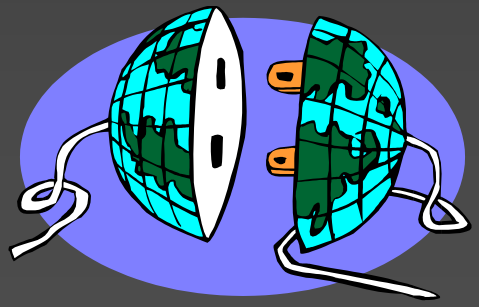
- Midrange computers – multi-user computers, typically shared by a department
- Mainframes – powerful computers, typically linked to hundreds or thousands of terminals
- Supercomputers – the most powerful computers at a given time. Used for both scientific and business applications
- Servers – specialized computers, performing specific tasks for other computers in a network

Types of Computers (Purpose-wise)

- Analog – Special purpose computer based on continuous data and produce approximate results
- Digital Computers – General purpose Computers based on discrete date and produce accurate results
- Hybrid – Combination of Digital and Analog computers.

Middleware

- The software tools that allow clients to communicate with servers
- Perform the necessary translation so that the client's request can be understood by the server

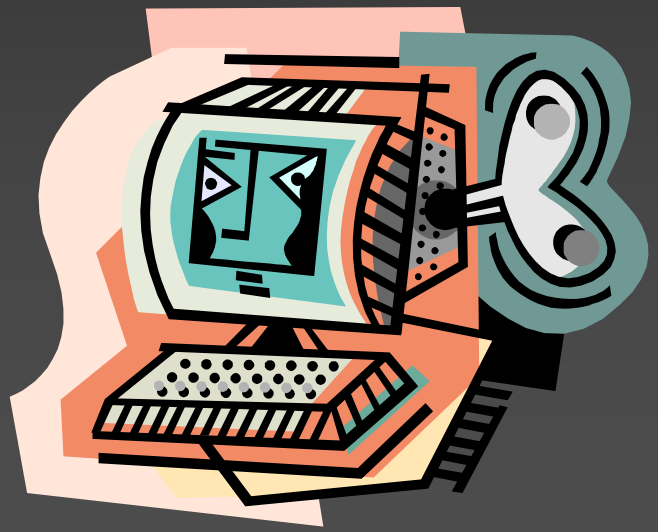


Peer-to-Peer

- An alternative to the client/server architecture for small networks
- Each computer can play the role of server for the other computers in the network
- Appropriate when the network users mostly do their own work, but occasionally need to exchange data

Machine Language

- The computer's internal programming language
- Specific to each family of microprocessors



Impact of Miniaturization and Integration on Performance

- Faster and more powerful processors
  - Integrated circuit – an entire electronic circuit is embedded on a single piece of silicon called a chip
  - Miniaturization and integration reduce power consumption and increase the power of circuits

Data Input: Capturing Data

- Keyboards and pointing devices
  - Mouse, Joystick, Touch Sensitive Screen
  - Light Pen, Graphic Pen
- character recognition
  - OMR, OBR, OCR
  - Magnetic ink character recognition (MICR)
- Capturing pictures, sounds, and video

Storing and Retrieving Data

- Paper and micrographics
- Magnetic tapes and disks
- Optical disks – CDs, DVD, CD-R/RW
- Flash memory – Semiconductor device
- Smart cards = Cards with Microchips

Data Output: Displaying Data

- Screen outputs
  - CRT, LED, GPD, TFT
- Paper outputs
  - Impact Printers, Laser Printers, Plotter, Graphic Printers, Photographic Printers, Thermal Printers
- Audio outputs
  - Speakers