Memory and Storage Devices

Presented by

MVSV Kiranmai
Assistant Professor (C)
CSE Department, UCEK, JNTUK
What is a Computer?

An electronic device that can be used to manipulate, store, retrieve and process data.
Information Processing Cycle

- Input
- Storage
- Process
- Output
Storage

- The process of saving data and instructions permanently is known as storage.
- All data and instructions are stored before and after processing.
- Intermediate results of processing are also stored here.

Memory:

- Used to store
- Data, information and instructions need to be stored
Memory Measurements

- Bit
  - Each 0 or 1
- Byte
  - 8 bits
- Kilo Byte
  - Approximately 1,000 bytes
  - Exactly 1,024 bytes
- Mega Byte
  - 1024 KB
- Giga Byte
  - 1024 MB
- Terabyte
  - 1024 GB

April 28, 2017
Computer System
Memory types

- **Semiconductor**
  - **Volatile**
    - RAM
      - SRAM
      - DRAM
  - **Non-volatile**
    - ROM
      - PROM
      - EPROM
Memory Hierarchy

- Fastest Speed (Registers)
- Faster Speed (Cache Memory)
- Fast Speed (Main Memory)
- Secondary Memory

Speed | Cost | Space
• **Registers**
  • High-speed storage areas used to temporarily hold small units of program instructions and data immediately before, during, and after execution by the CPU

• **Primary storage**
  • Primary memory
  • Holds program instructions and data
  • main memory
  • also known as internal memory
  • located in the mother board of system
Primary memory is further divided into two parts:-
1. RAM
2. ROM

- **Random Access Memory - RAM**
  - Temporary and volatile
  - Can be read or written
  - Stores the data which the user currently uses
  - Need power or electricity to work
  - when the computer is turned off then all the data in it will be erased automatically
  - Have separate space or slot in mother board
  - Allows the computer to run the software faster
RAM is further classified into two parts:

- **SRAM** - Static RAM
- **DRAM** – Dynamic RAM

Dynamic RAM needs to be refreshed thousands of times per second.

Static RAM does not need to be refreshed, which makes it faster; but it is also more expensive than dynamic RAM.

Both are volatile, i.e., they lose their contents when the power is turned off.
Read Only Memory – ROM

- Permanent and non-volatile
- Can only be read
- Contains BIOS (Basic Input / Output System of system)
- Stores critical programs such as the program that boots the computer
- Can be found on motherboards

- Mainly there are three types of ROM :-
  - PROM
  - EPROM
  - EEPROM
PROM (Programmable Read-Only Memory):
• manufactured as blank chips
• data can be written with a special device called a PROM programmer

EPROM (Erasable PROM):
• data can be changed with the help of ultra violet rays
• expensive than PROM

EEPROM (Electrically Erasable PROM):
• can be erased by electrical charges.
• can be erased one byte at any time rather than the entire chip by ultraviolet rays.
Processor Organization

- CPU
- Cache controller
- Cache memory
- Memory (main store)

- Hit
- Miss

Typically 4MB
Typically 64 KB
Cache Memory:

• special high-speed storage mechanism
• Two types of caching
  . memory caching and disk caching

• memory cache - RAM cache
  ▪ made of high speed SRAM
  ▪ is effective because most programs access the same data or instructions over and over
  ▪ some memory caches are built into the architecture of microprocessors – Internal Cache- Level 1 (L1) Cache
  ▪ most modern PCs come with external cache memory -Level 2 (L2) caches
Cache Memory:

- Disk cache uses conventional main memory

- Most recently accessed data from the disk is stored in a memory buffer

- When a program needs to access data from the disk, it first checks the disk cache to see if the data is there

- Disk caching improve the performance of applications, because accessing a byte of data in RAM can be thousands of times faster than accessing a byte on a hard disk
Secondary Storage

- Stores large amounts of data, instructions, and information more permanently than main memory.
- It is non-volatile in nature so that we cannot lose the data when power supply is off.
- Widely used secondary storage devices are:
  - Magnetic tape and disks
  - Compact Disk Read-Only Memory (CD-ROM)
  - Redundant Array of Inexpensive Disks (RAID)
  - Digital Video Disks
  - Removable storage
  - Disk drives
Hard disk drives

- It’s Magnetic media
- Data is stored magnetically onto tracks on the disk
- Disk rotates at high speed – passing under the read/write heads
- Read/write heads **READ** the data into main memory and **WRITE** data back to the
- Operating System is installed here only.
Hard disk drives

• Uses
  • Stores software
  • Stores your data files

• Advantages
  • Large storage capacity
  • Stored items are not lost when the computer is switched off.
  • Usually fixed inside the computer, so can’t get lost.

• Disadvantages
  • If the hard disk crashes the computer will not work & data will be lost
Floppy disks & drives

- **Uses**
  - To keep personal data and extra copies of data

- **Advantages**
  - Can be carried anywhere

- **Disadvantages**
  - Limited capacity (typically 1.44Mb)
  - 5¼” floppy disks – less storage capacity
  - 3½” floppy disk – better than above
  - Obsolete now Less storage and high cost
Optical disk drives

CD Rom

- Compact Disk Read Only Memory
- Known as WORM devices (Write Once Read Many times)

- Uses
  - Storing software

- Advantages
  - Data cannot be erased
  - Portable
  - Much larger capacity than floppy disks (about 650Mb)

- Disadvantages
  - Can’t write data to a CD Rom
  - Data access can be slower than a hard drive.

April 28, 2017
Optical disk drives contd...

**DVD**
- Digital Video Disk, Digital Versatile Disk
- High capacity storage medium.

- Uses
  - Storing high quality audio & video

- Advantages
  - Data cannot be erased
  - Portable
  - Much larger capacity than floppy disks and CD Rom (about 4.7 GB)
Optical disk drives

CD Rewriter
- Uses
  - Back up software & data files
  - Copy music files
- Advantages
  - Portable
  - Can store much larger files than floppy disks
- Disadvantages
  - Can’t always be read in some Optical drives
Optical disk drives

dvd rewriter

- Uses
  - Back up software & data files
  - Copy video files

- Advantages
  - Portable
  - Can store much larger files than CD R’s

- Disadvantages
  - Can’t always be read in some Optical drives or DVD players
USB storage devices

- Recent development
- Fits on a key ring
- Available in 1GB, 2GB, 4 GB, 8GB, 16 GB etc
Blu-ray Technology

• Name derived from the blue-violet laser used to read and write data.
• Developed by the Blu-ray Disc Association with more than 180 members.
  • Dell, Sony, LG etc.,
• It uses a blue laser (405 nanometers) instead of a red laser (650 nanometers) which allows the data tracks on the disc to be very compact
• Other formats are
  • BD-ROM (read-only) - for pre-recorded content
  • BD-R (recordable) - for PC data storage
  • BD-RW (rewritable) - for PC data storage
  • BD-RE (rewritable) - for HDTV recording
Data storage devices have very different capacities. Over time the capacity has increased which has allowed for more data to be stored:

- Floppy Disk: 1.4MB
- CD-ROM: 700MB
- DVD: 4.7GB
- Blu-Ray: 25 GB – 128GB
- Hard Drive: 8 TB
- Magnetic Tape: Up to 185 TB
Thank You