

UNIVERSITY OF BABYLON

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COLLEGE OF SCIENCE FOR WOMEN

FIRST CLASS

COMPUTER DEPARTMENT

Computer Skills

LECTURES

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❖ **LEARNING OBJECTIVES**

After completion of this lecture, you should be able to:

- Describe the type of Memory.
- Describe the Types of Computer Storage Devices.
- Describe the Characteristics of Computer Storage Devices.

1. TYPES OF MEMORY

The storage unit is a part of the computer system which is employed to store the information and instructions to be processed. A storage device is an integral part of the computer hardware which stores information/data to process the result of any computational work. Without a storage device, a computer would not be able to run or even boot up. Or in other words, we can say that a storage device is hardware that is used for storing, porting, or extracting data files. It can also store information/data both temporarily and permanently.

1.1. PRIMARY MEMORY

It is also known as internal memory and main memory. This is a section of the CPU that holds program instructions, input data, and intermediate results. It is generally smaller in size. RAM (Random Access Memory) and ROM (Read Only Memory) are examples of primary storage.

1.2. SECONDARY MEMORY

Secondary storage is a memory that is stored external to the computer. It is mainly used for the permanent and long-term storage of programs and data. Hard Disks, CDs, DVDs, Pen/Flash drives, SSD, etc, are examples of secondary storage.

2. TYPES OF COMPUTER STORAGE DEVICES

Now we will discuss different types of storage devices available in the market. These storage devices have their own specification and use. Some of the commonly used storage devices are:

1. Primary Storage Devices
2. Magnetic Storage Devices
3. Flash memory Devices
4. Optical Storage Devices
5. Cloud and Virtual Storage

2.1. PRIMARY STORAGE DEVICES

1. RAM

It stands for Random Access Memory. It is used to store information that is used immediately or we can say that it is a temporary memory. Computers bring the software installed on a hard disk to RAM to process it and to be used by the user. Once, the computer is turned off, the data is deleted. With the help of RAM, computers can perform multiple tasks like loading applications, browsing the web, editing a spreadsheet, experiencing the newest game, etc. It allows you to modify quickly among these tasks, remembering where you're in one task once you switch to a different task. It is also used to load and run applications, like your spreadsheet program, answers commands, like all edits you made within the spreadsheet, or toggle between multiple programs, like once you left the spreadsheet to see the email. Memory is nearly always actively employed by your computer. It ranges from 1GB – 32GB/64GB depending upon the specifications. There are different types of RAM, and although they all serve the same purpose, the most common ones are :

- a. SRAM:** It stands for Static Random Access Memory. It consists of circuits that retain stored information as long as the power supply is on. It is also known as volatile memory. It is used to build Cache memory. The access time of SRAM is lower and it is much faster as compared to DRAM but in terms of cost, it is costly as compared to DRAM.
- b. DRAM:** It stands for Dynamic Random Access Memory. It is used to store binary bits in the form of electrical charges that are applied to capacitors. The access time of DRAM

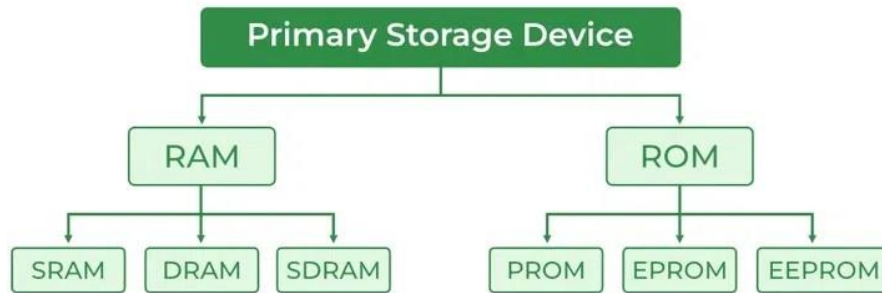
is slower as compared to SRAM but it is cheaper than SRAM and has a high packaging density.

- c. SDRAM:** It stands for Synchronous Dynamic Random Access Memory. It is faster than DRAM. It is widely used in computers and others. After SDRAM was introduced, the upgraded version of double data rate RAM, i.e., DDR1, DDR2, DDR3, and DDR4 was entered into the market and widely used in home/office desktops and laptops.

2. ROM

It stands for Read-Only Memory. The data written or stored in these devices are non-volatile, i.e, once the data is stored in the memory cannot be modified or deleted. The memory from which will only read but cannot write it. This type of memory is non-volatile. The information is stored permanently during manufacture only once. ROM stores instructions that are used to start a computer. This operation is referred to as bootstrap. It is also used in other electronic items like washers and microwaves. ROM chips can only store a few megabytes (MB) of data, which ranges between 4 and 8 MB per ROM chip. There are two types of ROM:

- a. PROM:** PROM is Programmable Read-Only Memory. These are ROMs that can be programmed. A special PROM programmer is employed to enter the program on the PROM. Once the chip has been programmed, information on the PROM can't be altered. PROM is non-volatile, that is data is not lost when power is switched off.
- b. EPROM:** Another sort of memory is the Erasable Programmable Read-Only Memory. It is possible to erase the info which has been previously stored on an EPROM and write new data onto the chip.
- c. EEPROM:** EEPROM is Electrically erasable programmable read-only memory. Here, data can be erased without using ultraviolet light, with the use of just applying the electric field.



Primary Storage Devices

2.2. MAGNETIC STORAGE DEVICES

1. **FLOPPY DISK:** Floppy Disk is also known as a floppy diskette. It is generally used on a personal computer to store data externally. A Floppy disk is made up of a plastic cartridge and secured with a protective case. Nowadays floppy disk is replaced by new and effective storage devices like USB, etc.
2. **HARD DISK:** Hard Disk is a storage device (HDD) that stores and retrieves data using magnetic storage. It is a non-volatile storage device that can be modified or deleted n number of times without any problem. Most computers and laptops have HDDs as their secondary storage device. It is actually a set of stacked disks, just like phonograph records. In every hard disk, the data is recorded electromagnetically in concentric circles or we can say track present on the hard disk, and with the help of a head just like a phonograph arm (but fixed in a position) to read the information present on the track. The read-write speed of HDDs is not so fast but decent. It ranges from a few GBs to a few and more TB.
3. **MAGNETIC CARD:** It is a card in which data is stored by modifying or rearranging the magnetism of tiny iron-based magnetic particles present on the band of the card. It is also known as a swipe card. It is used like a passcode (to enter the house or hotel room), credit card, identity card, etc.

4. TAPE CASSETTE: It is also known as a music cassette. It is a rectangular flat container in which the data is stored in an analog magnetic tape. It is generally used to store audio recordings.

5. SUPERDISK: It is also called LS-240 and LS-120. It is introduced by Imation Corporation and it is popular with OEM computers. It can store data up to 240 MB.



Magnetic Storage Devices

2.3. FLASH MEMORY DEVICES

It is a cheaper and more portable storage device. It is the most commonly used device to store data because it is more reliable and efficient as compared to other storage devices. Some of the commonly used flash memory devices are:

1. PEN DRIVE: It is also known as a USB flash drive that includes flash memory with an integrated USB interface. We can directly connect these devices to our computers and laptops and read/write data into them in a much faster and more efficient way. These devices are very portable. It ranges from 1GB to 256GB generally.

2. SSD: It stands for Solid State Drive, a mass storage device like HDD. It is more durable because it does not contain optical disks inside like hard disks. It needs less power as compared to hard disks, is lightweight, and has 10x faster read and writes speed as compared to hard disks. But, these are costly as well. While SSDs serve an equivalent function as hard drives, their internal components are much different. Unlike hard drives, SSDs don't have any moving parts and thus they're called solid-state drives. Instead of storing data on magnetic platters,

SSDs store data using non-volatile storage. Since SSDs haven't any moving parts, they do not need to "spin up". It ranges from 150GB to a few more TB.

- 3. SD CARD:** It is known as a Secure Digital Card. It is generally used with electronic devices like phones, digital cameras, etc. to store larger data. It is portable and the size of the SD card is also small so that it can easily fit into electronic devices. It is available in different sizes like 2GB, 4GB, 8GB, etc.
- 4. MEMORY CARD:** It is generally used in digital cameras, printers, game consoles, etc. It is also used to store large amounts of data and is available in different sizes. To run a memory card on a computer you require a separate memory card reader.
- 5. MULTIMEDIA CARD:** It is also known as MMC. It is an integrated circuit that is generally used in-car radios, digital cameras, etc. It is an external device to store data/information.



USB Flash Memory Devices

2.4. OPTICAL STORAGE DEVICES

Optical Storage Devices is also secondary storage device. It is a removable storage device. Following are some optical storage devices:

- 1. CD:** It is known as Compact Disc. It contains tracks and sectors on its surface to store data. It is made up of polycarbonate plastic and is circular in shape. CD can store data up to 700MB. It is of two types:
 - CD-R: It stands for Compact Disc read-only. In this type of CD, once the data is written can not be erased. It is read-only.
 - CD-RW: It stands for Compact Disc Read Write. In this type of CD, you can easily write or erase data multiple times.

2. DVD: It is known as Digital Versatile Disc. DVDs are circular flat optical discs used to store data. It comes in two different sizes one is 4.7GB single-layer discs and another one is 8.5GB double-layer discs. DVDs look like CDs but the storage capacity of DVDs is more than as compared to CDs. It is of two types:

- DVD-R: It stands for Digital Versatile Disc read-only. In this type of DVD, once the data is written can not be erased. It is read-only. It is generally used to write movies, etc.
- DVD-RW: It stands for Digital Versatile Disc Read Write. In this type of DVD, you can easily write or erase data multiple times.

3. BLU-RAY DISC: It is just like CD and DVD but the storage capacity of blu ray is up to 25GB. To run a Blu-ray disc you need a separate Blu-ray reader. This Blu-ray technology is used to read a disc from a blue-violet laser due to which the information is stored in greater density with a longer wavelength.

2.5. CLOUD AND VIRTUAL STORAGE

Nowadays, secondary memory has been upgraded to virtual or cloud storage devices. We can store our files and other stuff in the cloud and the data is stored for as long as we pay for the cloud storage. There are many companies that provide cloud services largely Google, Amazon, Microsoft, etc. We can pay the rent for the amount of space we need and we get multiple benefits out of it. Though it is actually being stored in a physical device located in the data centers of the service provider, the user doesn't interact with the physical device and its maintenance. For example, Amazon Web Services offers AWS S3 as a type of storage where users can store data virtually instead of being stored in physical hard drive devices. These sorts of innovations represent the frontier of where storage media goes.



Cloud and Virtual Storage

CHARACTERISTICS OF COMPUTER STORAGE DEVICES

1. Data stored in the Memory can be changed or replaced in case of a requirement, because of the mobility of the storage devices.
2. Storage Devices validate that saved data can be replaced or deleted as per the requirements because the storage devices are easily readable, writeable, and rewritable.
3. Storage Devices are easy and convenient to access because they do not require much skill set to handle these resources.
4. The storage capacity of these devices is an extra advantage to the system.
5. Storage Devices have better performance and data can be easily transferred from one device to another.

3. BYTE ORDERING

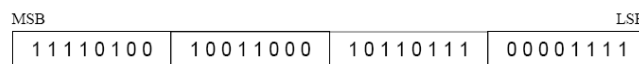
Storing data often requires more than a byte. For example, we need four bytes of memory to store an integer variable that can take a value between 0 and $2^{32}-1$. Let us assume that the value to be stored is the one in Figure 1a.

Suppose that we want to store these 4-byte data in memory at locations 100 through 103.

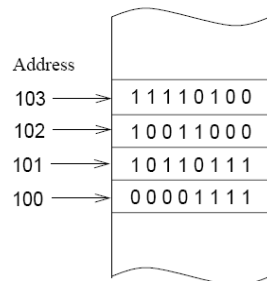
How do we store them? Figure below shows two possibilities: least significant byte (Figure 1b) or most significant byte (Figure 1c) is stored at location 100. These two bytes ordering schemes are referred to as the *little endian* and *big endian*. In either case, we always refer to such multibyte data by specifying the lowest memory address (100 in this example). Is one byte ordering scheme better

than the other? Not really! It is largely a matter of choice for the designers. For example, Pentium processors use the little-endian byte ordering. However, most processors leave it up to the system designer to configure the processor. For example, the MIPS and PowerPC processors use the big-endian byte ordering by default, but these processors can be configured to use the little-endian scheme.

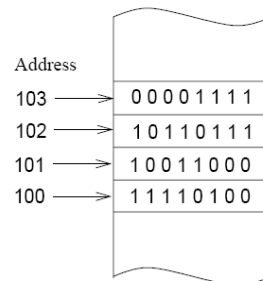
The particular byte ordering scheme used does not pose *لا تشكل* any problems as long as you are working with machines that use the same byte ordering scheme. However, difficulties arise when you want to transfer data between two machines that use different schemes. In this case, conversion from one scheme to the other is required. For example, the Pentium provides two instructions to facilitate such conversion: one to perform 16-bit data conversions and the other for 32-bit data.



(a) 32-bit data



(b) Little-endian byte ordering



(c) Big-endian byte ordering

TWO BYTE ORDERING SCHEMES COMMONLY USED BY COMPUTER SYSTEMS.

STUDENT-ACTIVITY

1. What is a computer storage device?

Computer storage device gives a way to the user to store data and safely access it on a computer system. There are various types of storage devices.

2. What are examples of Optic storage devices?

Examples of optic devices are CD-ROMs, DVDs, Blu-Disc, etc.

3. Is online cloud storage a device?

Online cloud storage is not a device, it is simply a tool where we can store our data files, images, etc. and these data are stored over the internet.