

UNIT 16

COMPUTER MEMORY

Objectives: at the end of the lesson, students will be able to:

1. understand types of memory;
2. speak about troubleshooting in computer memory;
3. use imperative sentences to give instructions.

Lead-in: Let's talk!

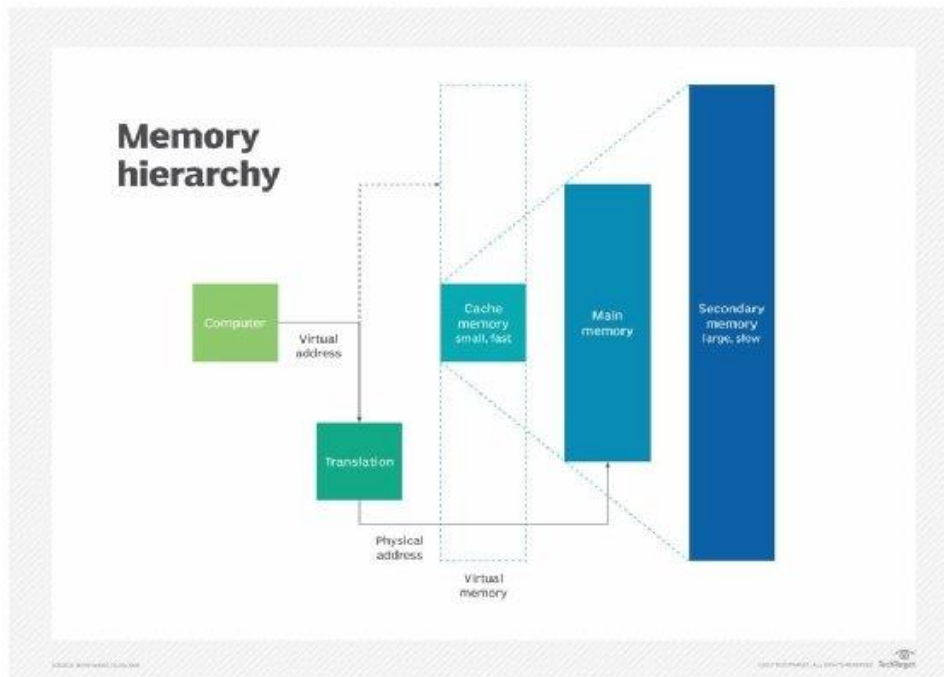
1. How has increased computer memory changed business?
2. When do people need to add more computer memory?

Computer Memory

Memory is the electronic holding place for the instructions and data a computer needs to reach quickly. It's where information is stored for immediate use. Memory is one of the basic functions of a computer because, without it, a computer would not be able to function properly. Memory is also used by a computer's operating system, hardware, and software.

There are technically two types of computer memory: primary and secondary. The term *memory* is used as a synonym for *primary memory* or as an abbreviation for a specific type of primary memory called *random access memory* (RAM). This type of memory is located on microchips that are physically close to a computer's microprocessor.

If a computer's central processor (CPU) had to only use a secondary storage device, computers would become much slower. In general, the more memory (primary memory) a computing device has, the less frequently the computer must access instructions and data from slower (secondary) forms of storage.



This image shows how primary, secondary, and cache memory relate to each other in terms of size and speed.

Memory vs. Storage

The concept of memory and storage can be easily conflated as the same concept; however, there are some distinct and important differences. Put succinctly, memory is primary memory, while storage is secondary memory. Memory refers to the location of short-term data, while storage refers to the location of data stored on a long-term basis.

Memory is most often referred to as the primary storage on a computer, such as RAM. Memory is also where information is processed. It enables users to access data that is stored for a short time. The data is only stored for a short time because primary memory is volatile, meaning it isn't retained when the computer is turned off.

The term *storage* refers to secondary memory and is where data in a computer is kept. An example of storage is a hard drive or a hard disk drive (HDD). Storage is nonvolatile, meaning the information is still there after the computer is turned off and then back on. A running program may be in a computer's primary memory when in use -- for fast retrieval of information -- but when that program is closed, it resides in secondary memory or storage.

How much space is available in memory and storage differs as well. In general, a computer will have more storage space than memory. For example, a laptop may have 8 GB of RAM while having 250 GB of storage. The difference in space is there because a computer will not need fast access to all the information stored on it at once, so allocating approximately 8 GB of space to run programs will suffice.

The terms *memory* and *storage* can be confusing because their usage today is not always consistent. For example, RAM can be referred to as primary storage -- and types of secondary storage can include flash memory. To avoid confusion, it can be easier to talk about memory in terms of whether it is volatile or nonvolatile -- and storage in terms of whether it is primary or secondary.

Activity: Watch a video and answer the question: “**How does the computer memory work?**”

https://youtu.be/H_M--weEzpA?si=gOSZ2-EfM5efXhcW

Vocabulary Building

Key Terms

RAM – (Random Access Memory) is a form of computer data storage. It is a physical device that holds data temporarily

***Example:** My computer is slow because it needs more RAM*

Bus speed – it measures how many times the CPU can access a group of bits per second. This is measured in MHz

***Example:** Bus speed is measured in MHz, and it determines the speed at which the components communicate, and how much data can move across the bus.*

SIMM – (Single Inline Memory Module) is an older type of memory module. It sends up to 32 bits of data to a CPU

***Example:** SIMM is a type of computer memory module that integrates multiple memory chips on a single circuit board. It is a compact and efficient solution for expanding the memory capacity of a computer system.*

DIMM- (Dual Inline Memory Module) is a newer type of memory module. It sends 64 bits of data to the CPU

Example: *DIMM is a 64-bit memory unit that contains multiple RAM chips on a circuit board with pins that connect to the computer's motherboard. Under the DIMM architecture, every data bit is stored in separate memory cells.*

Motherboard – is a circuit board in a computer. It holds the CPU and all attachments

Example: *A motherboard stores electrical components and helps them communicate.*

Paging file – is an area on the hard drive where the computer stores data that does not fit in the RAM

Example: *A page file, also known as a "paging file", is an optional, hidden system file on a hard disk.*

Virtual memory – is a method of computer data storage. The computer stores data on its hard drive instead of in the RAM

Example: *Virtual memory is a computing technique in which you increase the size of a computer's memory by arranging or storing the data in it differently. You can run low on virtual memory when you have insufficient free space left on the hard disk.*

Hard drive- is a device in a computer that stores all of its information permanently

Example: *There is a disparate bunch of songs on my hard drive that defy classification.*

Bit – is the smallest unit of computer data

Example: *Bit in computing means a binary digit.*

MHz – (megahertz) is a unit of measurement that measures the speed of a CPU

Example: *It has set aside capacity in the 107 to 108 megahertz band specifically for small-scale radio stations.*

Activity: Find a peer

Students will be divided into two groups and a teacher will distribute cards with written terms related to the topic to the first group and definitions of the terms to the other group. Students need to find the definition or the term of the definition by mingling in the class. Ultimately, reviewing vocabulary in this way students will be peered for future activity.

RAM	is a form of computer data storage. It is a physical device that holds data temporarily
MHz	is a unit of measurement that measures the speed of a CPU
Bit	is the smallest unit of computer data
Hard drive	is a device in a computer that stores all of its information permanently
Virtual memory	is a method of computer data storage. The computer stores data on its hard drive instead of in the RAM
Paging file	is an area on the hard drive where the computer stores data that does not fit in the RAM
Motherboard	is a circuit board in a computer. It holds the CPU and all attachments
DIMM	is a newer type of memory module. It sends 64 bits of data to the CPU
SIMM	is an older type of memory module. It sends up to 32 bits of data to a CPU
Bus speed	it measures how many times the CPU can access a group of bits per second. This is measured in MHz

(Ready to cut off)

Activity: Pair work. Fill in the blanks with the correct words and phrases from the word bank.

hard drive	RAM	bit size	MB	bus speed
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3. The computer has a _____ of 64 bits.

4. The computer's CPU has a _____ of 800 MHz.

5. Increase the virtual memory to store data on the _____.

6. This computer comes with 900 _____ of RAM.

7. Install additional _____ into the motherboard.

Reading

ClearPic Troubleshooting Guide

Certain memory requirements are necessary to install and run ClearPic. Check that the computer has at least 500 MB of RAM available. For optimal performance, make sure the computer's CPU has a bit size of at least 32 bits. It should run at a bus speed of 800 MHz.

There are several options to fix problems with limited memory. One, is to limit the number of programs running at the same time.

Another, is to increase the amount of RAM. First, determine whether your computer uses SIMMs or DIMMs. Make sure that the memory's bus speed matches that of the computer. Purchase the appropriate amount of RAM and attach it to the motherboard.

You can also increase your computer's virtual memory. This temporarily stores data on a paging file on the computer's hard drive. To add virtual memory, click on the "My computer" icon. Under "Properties," increase the maximum memory amount.

Activity: Read the text. Then, mark the following statements as True (T) or False (F).

1. The minimum amount of RAM required to install and run ClearPic is 256 MB.

- A. True
- B. False

2. For optimal performance, the computer's CPU should be at least 32 bits in size.

- A. True
- B. False

3. The CPU's bus speed must be at least 1 GHz for optimal performance.

- A. True
- B. False

4. One way to fix problems with limited memory is to increase the number of programs running simultaneously.

- A. True
- B. False

5. To determine if additional RAM is compatible, you need to know whether your computer uses SIMMs or DIMMs.

- A. True
- B. False

6. The bus speed of the new RAM must match the bus speed of the computer.

- A. True
- B. False

7. Virtual memory is stored on a paging file located on the computer's hard drive.

- A. True
- B. False

8. To increase virtual memory, you should click on the "Network" icon.

- A. True
- B. False

9. Increasing the amount of RAM is a recommended solution for dealing with limited memory.

- A. True
- B. False

10. To add virtual memory, you should decrease the maximum memory amount under "Properties."

- A. True
- B. False

Grammar Focus: Imperative Sentences

An imperative sentence gives a direct command to an implied second person and it addresses an implied second person with a request, command, instruction, or invitation. Imperative sentences do not have a subject; instead, a directive is given to an implied second person, and typically it uses the base form of the verb. The reasons for using imperative sentences in technical instructions are to provide clear and direct instructions that are easy to follow, to convey steps concisely avoiding unnecessary details or distractions, and to keep the reader focused on the specific actions they need to perform.

Examples and Usage in Computer Memory

Instructions for Checking RAM Usage:

"Open Task Manager by pressing Ctrl + Shift + Esc."

Explanation: This command directs the user to open Task Manager, a built-in tool for checking memory usage.

"Navigate to the 'Performance' tab."

Explanation: This instructs the user to go to a specific tab within Task Manager to view memory statistics.

"Click on 'Memory' to view current RAM usage."

Explanation: This directs the user to select the memory section to see how much RAM is being used.

Activity: Work in pairs and create troubleshooting guides with imperative sentences.

Example: Ensure RAM modules are properly seated in their slots. Look for any dust or debris inside the computer; clean it gently.

Activity: Read the text about types of computer memory and write imperative sentences based on it.

Types of Computer Memory

Computer memory is essential for storing and retrieving data that a computer uses during its operation. Different types of memory serve various purposes, each with distinct characteristics that impact system performance and functionality. Understanding these types helps in optimizing computer performance and troubleshooting issues. Here, we explore the main types of computer memory and their roles.

1. Random Access Memory (RAM)

• **Definition:** RAM, or Random Access Memory, is a type of volatile memory that temporarily stores data and instructions that the CPU (Central Processing Unit) needs while performing tasks.

• **Characteristics:**

◦ **Volatile:** Data is lost when the computer is turned off or restarted.

◦ **Speed:** RAM is high-speed memory, allowing quick read and write operations.

- **Usage:** It is used to store data for running applications, operating system processes, and active files.

- **Types:**

- **DDR (Double Data Rate):** Includes DDR3, DDR4, and DDR5, with each generation offering improved speed and efficiency.

- **SDRAM (Synchronous DRAM):** Synchronizes with the CPU clock for faster data access.

2. Read-Only Memory (ROM)

- **Definition:** ROM, or Read-Only Memory, is a type of non-volatile memory that stores critical system firmware and software that are not intended to be modified frequently.

- **Characteristics:**

- **Non-Volatile:** Retains data even when the computer is powered off.

- **Speed:** Slower than RAM, but essential for storing firmware.

- **Usage:** Contains the BIOS (Basic Input/Output System) or UEFI (Unified Extensible Firmware Interface) that initializes hardware during startup.

- **Types:**

- **PROM (Programmable ROM):** Can be programmed once after manufacturing.

- **EPROM (Erasable Programmable ROM):** Can be erased and reprogrammed using ultraviolet light.

- **EEPROM (Electrically Erasable Programmable ROM):** Can be erased and reprogrammed electrically.

3. Cache Memory

- **Definition:** Cache memory is a small, high-speed memory located inside or close to the CPU. It stores frequently accessed data to speed up processing.

- **Characteristics:**

- **Volatile:** Data is lost when the power is off.

- **Speed:** Extremely fast compared to RAM, helping to reduce latency.

- **Usage:** Reduces the time the CPU needs to access data from the main memory (RAM) by storing copies of frequently used data and instructions.

4. Virtual Memory

• **Definition:** Virtual memory is a memory management technique that creates an illusion of a large, contiguous memory space by using a combination of physical RAM and disk storage.

• **Characteristics:**

- **Volatile and Non-Volatile:** Combines RAM with a paging file or swap space on a hard drive or SSD.
- **Speed:** Slower than physical RAM due to disk access times.
- **Usage:** Allows the computer to run more applications or handle larger files than the physical RAM alone would permit.

Each type of computer memory plays a crucial role in the overall functioning and performance of a computer system. RAM provides fast, temporary storage for active data, ROM stores essential system firmware, cache memory speeds up data access, virtual memory extends usable memory space, and flash memory offers persistent storage solutions. Understanding these different types of memory helps in optimizing system performance and effectively managing resources.

Quiz Questions:

1. Write an imperative sentence instructing someone to define RAM.
2. Write an imperative sentence explaining how to check the speed and volatility of ROM.

Answers:

1. Identify RAM Usage

- Open Task Manager by pressing Ctrl + Shift + Esc.
- Navigate to the 'Performance' tab.
- Click on 'Memory' to view the current RAM usage.
- Write down the amount of RAM being used and the amount available.

2. Describe ROM Characteristics

- Look up the definition of ROM (Read-Only Memory).
- List the characteristics of ROM, including whether it is volatile or non-volatile.

- Write a brief description of the typical uses of ROM in a computer system.

Home assignment

Analyze the memory usage of your own computer or another device you use regularly.

Instructions:

- ✓ Use built-in tools or third-party software to check the current RAM and virtual memory usage.
- ✓ Document how much RAM is in use, how much is available, and how virtual memory is being utilized.
- ✓ Identify and list the programs that are consuming the most memory.
- ✓ Write a 1-page report of your findings, including screenshots or graphs if possible.

Tips:

Using Third-Party Software:

Download and Install: Download from CPU-Z's official website

Task Manager:

Open Task Manager:

Press Ctrl + Shift + Esc or Ctrl + Alt + Del and select "Task Manager."

Check RAM Usage:

Go to the "Performance" tab.

Click on "Memory" to see the current RAM usage, available memory, and other details.

Check Virtual Memory:

Go to the "Performance" tab.

Click on "Memory," then scroll down to see "Virtual Memory" statistics at the bottom of the window.