

## Lecture (3) Computer Memory

### 1

### Types of Computer Memory

- **Primary Memory:** Volatile memory used for temporary data storage.

Examples: RAM (Random Access Memory), Cache.

- **Secondary Memory:** Non-volatile memory for permanent data storage.

Examples: Hard Drives, SSDs, Optical Discs.

### 2

### RAM (Random Access Memory)

- **Definition:** A type of volatile memory that stores data temporarily for quick access by the CPU.
- **Characteristics:**
  1. Fast read and write speeds.
  2. Data is lost when the power is turned off.
- **Usage:** Used to store the operating system, application programs, and currently processed data.

### 3

### ROM (Read-Only Memory)

- **Definition:** Non-volatile memory that is used primarily to store firmware or software that is not expected to change frequently.
- **Characteristics:**
  1. Data remains intact even when the power is off.
  2. Slower than RAM.
- **Usage:** Used for booting the computer and hardware initialization.

## 4

## DRAM (Daynamic Random Access Memory)

- **Definition:** A type of RAM that uses bistable latching circuitry to store each bit.
- **Characteristics:**
  - Faster than DRAM, but more expensive.
  - Retains data as long as power is supplied.
- **Usage:** Used in cache memory for CPUs.

## 5

## SRAM (Static Random Access Memory)

### Definition

SRAM, or Static Random Access Memory, is a type of fast memory used in computers and digital devices. Unlike DRAM (Dynamic Random Access Memory), SRAM does not require periodic refreshing to maintain data.

### Key Characteristics of SRAM

- **High Speed:** SRAM is faster than DRAM, making it suitable for applications that require high performance.
- **Data Stability:** SRAM retains data as long as it is powered, making it ideal for storing critical information.
- **Power Consumption:** While SRAM consumes less power when not in use, its power consumption may be higher during active operation compared to DRAM.

## 6

### Comparison Between Primary and Secondary Memory

#### 1. Primary Memory

- **Definition:** Primary memory, also known as Random Access Memory (RAM), is the memory used by the CPU to store data and programs that are currently in use.
- **Speed:** It is faster than secondary memory, allowing for high performance.
- **Storage Capacity:** Typically has a smaller capacity compared to secondary memory.
- **Nature:** Volatile, meaning it loses data when the power is turned off.

#### 2. Secondary Memory

- **Definition:** Secondary memory refers to storage media used for permanent data storage, such as Hard Disk Drives (HDD), Solid State Drives (SSD), and flash drives.
- **Speed:** Slower than primary memory.
- **Storage Capacity:** Generally has a much larger capacity than primary memory.
- **Nature:** Non-volatile, meaning it retains data even when the power is off.

## 7

### Comparison Between RAM and ROM

#### 1. RAM (Random Access Memory)

- **Definition:** A type of volatile memory that allows for read and write operations. Used for temporary storage of data currently being used by the CPU.
- **Nature:** Volatile; data is lost when power is turned off.
- **Speed:** Faster access times compared to ROM.
- **Usage:** Used for running applications and active processes.

#### 2. ROM (Read-Only Memory)

- **Definition:** A type of non-volatile memory that is used primarily for permanent storage of firmware and system software.
- **Nature:** Non-volatile; data is retained even when power is turned off.
- **Speed:** Slower access times compared to RAM.
- **Usage:** Used to store critical boot and system information that does not change frequently

## Comparison Between DRAM and SRAM

### 1. DRAM (Dynamic Random Access Memory)

- Definition: A type of volatile memory that stores data in capacitors, which need to be refreshed periodically to maintain the data.
- Speed: Slower than SRAM.
- Density: Higher density, allowing for more data storage in a smaller physical space.
- Cost: Generally cheaper to manufacture than SRAM.
- Usage: Commonly used as the main memory in computers and servers.

### 2. SRAM (Static Random Access Memory)

- Definition: A type of volatile memory that uses flip-flops to store data, which does not require refreshing.
- Speed: Faster than DRAM.
- Density: Lower density, resulting in less data storage capacity for the same physical space.
- Cost: More expensive to manufacture than DRAM.
- Usage: Typically used for cache memory in CPUs and high-performance applications.



## Multiple Choice Questions

1. What type of memory is RAM?

- A) Non-volatile
- B) Volatile
- C) Permanent
- D) Optical

2. Which of the following is an example of secondary memory?

- A) Cache
- B) SSD
- C) RAM
- D) Registers

3. What is the primary function of ROM?

- A) Temporary data storage
- B) Permanent firmware storage
- C) High-speed processing
- D) Data caching

4. Which memory type retains data when the power is off?

- A) RAM
- B) DRAM
- C) SRAM
- D) Both B and C



5. What is a key characteristic of SRAM?

- A) Requires periodic refreshing
- B) Slower than DRAM
- C) Uses flip-flops to store data
- D) Higher density than DRAM

6. Which memory type is used primarily for booting the computer?

- A) RAM
- B) ROM
- C) Cache
- D) DRAM

7. What type of memory is typically used in CPUs for cache?

- A) DRAM
- B) SRAM
- C) ROM
- D) Flash

8. What happens to the data in RAM when the power is turned off?

- A) It remains intact
- B) It is lost
- C) It is saved to secondary memory
- D) It is backed up automatically



9. Which type of memory is generally more expensive to manufacture?

- A) DRAM
- B) SRAM
- C) ROM
- D) HDD

10. What is the main advantage of DRAM?

- A) High speed
- B) Low cost
- C) No need for refreshing
- D) Higher stability

### Fill in the Blanks

1. Primary memory is also known as \_\_\_\_\_.
2. \_\_\_\_\_ memory is used for permanent data storage.
3. SRAM is faster than \_\_\_\_\_.
4. The data in \_\_\_\_\_ is lost when the power is turned off.
5. Firmware is typically stored in \_\_\_\_\_ memory.
6. DRAM requires \_\_\_\_\_ to maintain data.
7. Cache memory is usually implemented using \_\_\_\_\_.
8. \_\_\_\_\_ is a type of non-volatile memory.
9. The main advantage of SRAM is its \_\_\_\_\_ speed.
10. Secondary memory retains data even when \_\_\_\_\_ is off.



### True or False Questions

1. RAM is a type of non-volatile memory. (True/False)
2. SRAM requires periodic refreshing to retain data. (True/False)
3. Secondary memory typically has a larger capacity than primary memory. (True/False)
4. ROM is used for storing temporary data. (True/False)
5. DRAM is faster than SRAM. (True/False)
6. Cache memory can improve CPU performance. (True/False)
7. All types of memory lose their data when powered off. (True/False)
8. SRAM is cheaper to manufacture than DRAM. (True/False)
9. Primary memory is volatile. (True/False)
10. Secondary memory includes SSDs and HDDs. (True/False)

### Multiple Choice Questions with Answers

1. B
2. B
3. B
4. D
5. C
6. B
7. B
8. B
9. B
10. B

## Fill in the Blanks with Answers

1. RAM
2. Secondary
3. DRAM
4. RAM
5. ROM
6. Refreshing
7. SRAM
8. ROM
9. High
10. Power

## True or False Questions with Answers

1. False
2. False
3. True
4. False
5. False
6. True
7. False
8. False
9. True
10. True