Department of BES-II

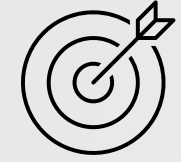**Digital Design and Computer Architecture
23EC1202**
Topic:

Main Memory Organization
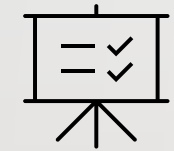
Session No: 33

To familiarize students with the basic concept of Main Memory organization.

INSTRUCTIONAL OBJECTIVES

This Session is designed to:

1. Demonstrate Main Memory organization.
2. Describe how data transfer takes place between main memory and CPU.
3. List out the similarity and differences of SRAM and DRAM.
4. Describe how SRAM and DRAM works.

LEARNING OUTCOMES
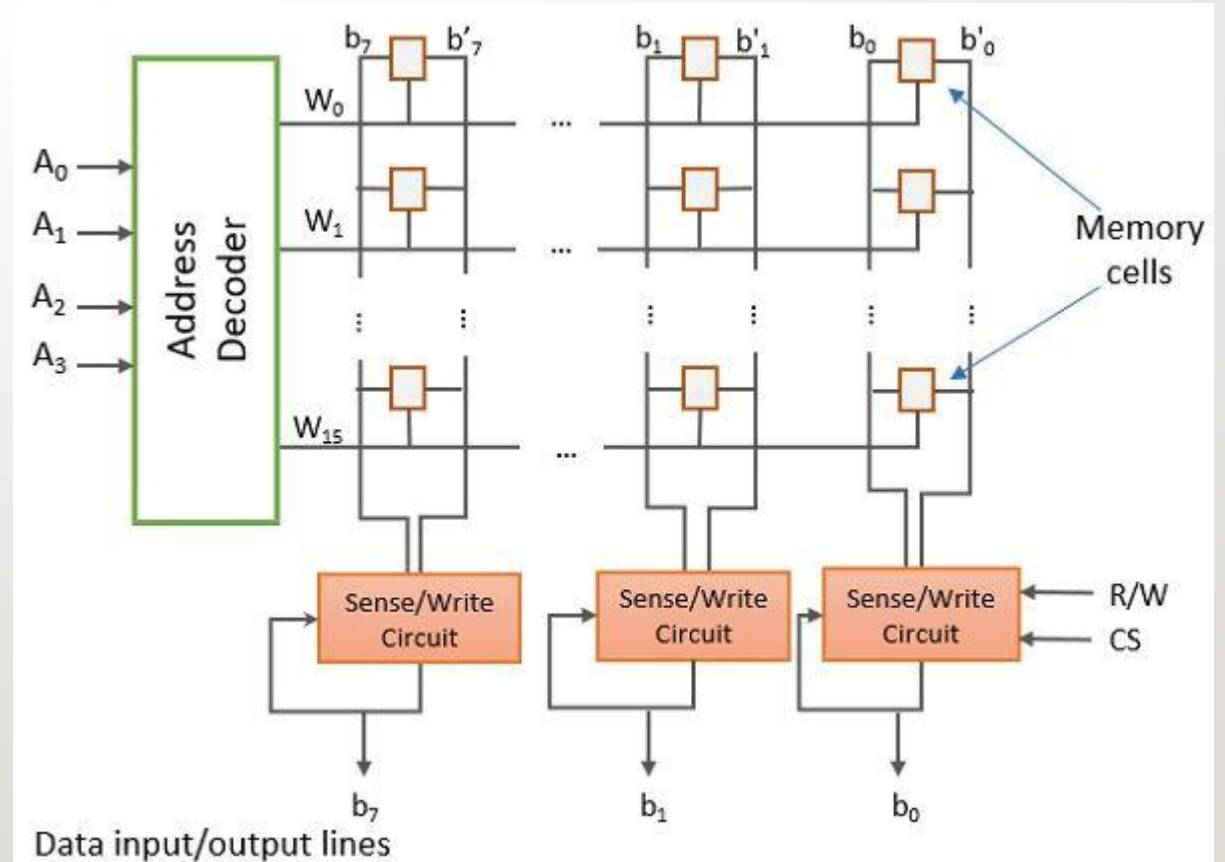
At the end of this session, you should be able to:

1. Define Main memory.
2. Describe Static and Dynamic RAM.
3. Summarize main memory in memory hierarchy.

Memory Organization

➢ It refers to the way that the computer's memory is arranged and managed.

➢ The memory of system can be thought of as a large number of addressable storage locations. Each location can store a fixed amount of data, typically measured in bits or bytes.

➢ The way these locations are organized and accessed can have a notable impact on the overall production and functionality of the system.

➢ Memory organization involves the use of different types of memory, including RAM, ROM, cache memory, virtual memory, flash memory, and magnetic disks.
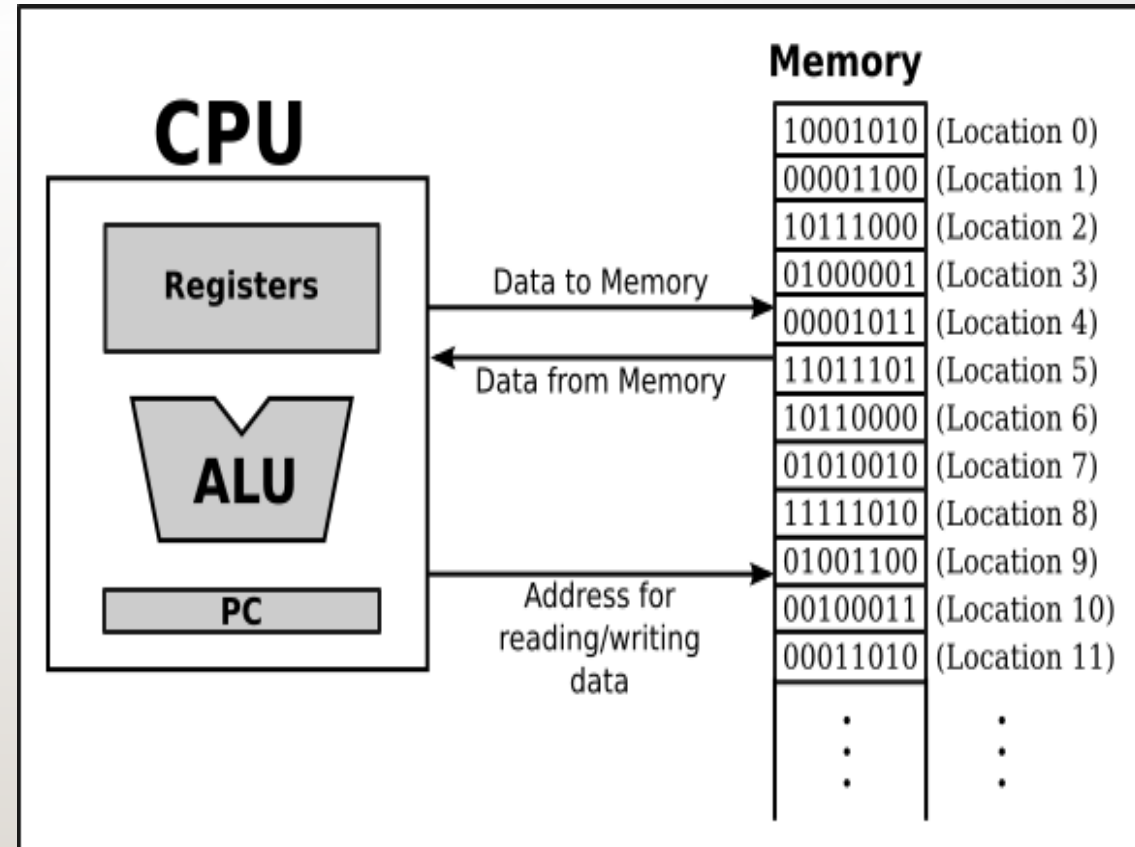
Memory Cells @ Main Memory Organization

➢ Memory is organized into individual memory cells, each capable of storing a fixed amount of data, usually represented in bits or bytes.

➢ Cells are typically arranged in rows and columns, forming a grid-like structure. Each cell has a unique address that allows the CPU to access it directly.

Memory Addressing @ Main Memory Organization

➤ Main memory is byte-addressable, meaning each byte of data has a unique address.

➤ Addresses are typically represented in binary form and are used by the CPU to read from or write to specific memory locations.

➤ The size of an address determines the maximum amount of memory the system can address.

Memory access request @ Main Memory Organization

➢ To access the instruction CPU generates the memory request. Memory request contains the address along with the control signals.

➢ When inserting data into the stack, each block consumes memory (RAM) and the number of memory cells can be determined by the capacity of a memory chip.

Example: Find the total number of cells in 64k*8 memory chip.

Size of each cell = 8 Number of bytes in 64k = $(2^6)*(2^{10})$

Therefore, the total number of cells = 2^{16} cells

Cache Memory @ Main Memory Organization

➢ Main memory is often organized hierarchically, with cache memory serving as a small, high-speed buffer between the CPU and main memory.

➢ Cache memory is designed to store frequently accessed data, reducing access times and improving overall system performance.

➢ Main memory is accessed by the CPU using memory access instructions. Access time refers to the time it takes for the CPU to retrieve data from or store data into memory.

1. What is the primary characteristic of memory addressing in main memory?

A) Memory addresses are typically represented in decimal form.
B) Main memory is accessed using segment registers.
C) Each byte of data has a unique address.
D) Memory modules are used to organize memory cells.

2. Which memory organization model divides memory into fixed-size blocks called pages?

A) Segmented Memory Model
B) Paged Memory Model
C) Flat Memory Model
D) Cache Memory Model

Short answer questions:

1. Specify the role of memory cell in the context of memory organization.

Long answer questions:

1. Formulate the concept of gaming development in which memory addressing and access requests play a role.

Reference Books:

1. Computer Organization by Carl Hamacher, Zvonko Vranesic and Saftwat Zaky.

2. Computer System Architecture by M. Morris Mano

3. Computer Organization and Architecture by William Stallings

Sites and Web links:

1. https://www.geeksforgeeks.org/memory-organisation-in-computer-architecture/

THANK YOU

Team – Digital Design & Computer Architecture