

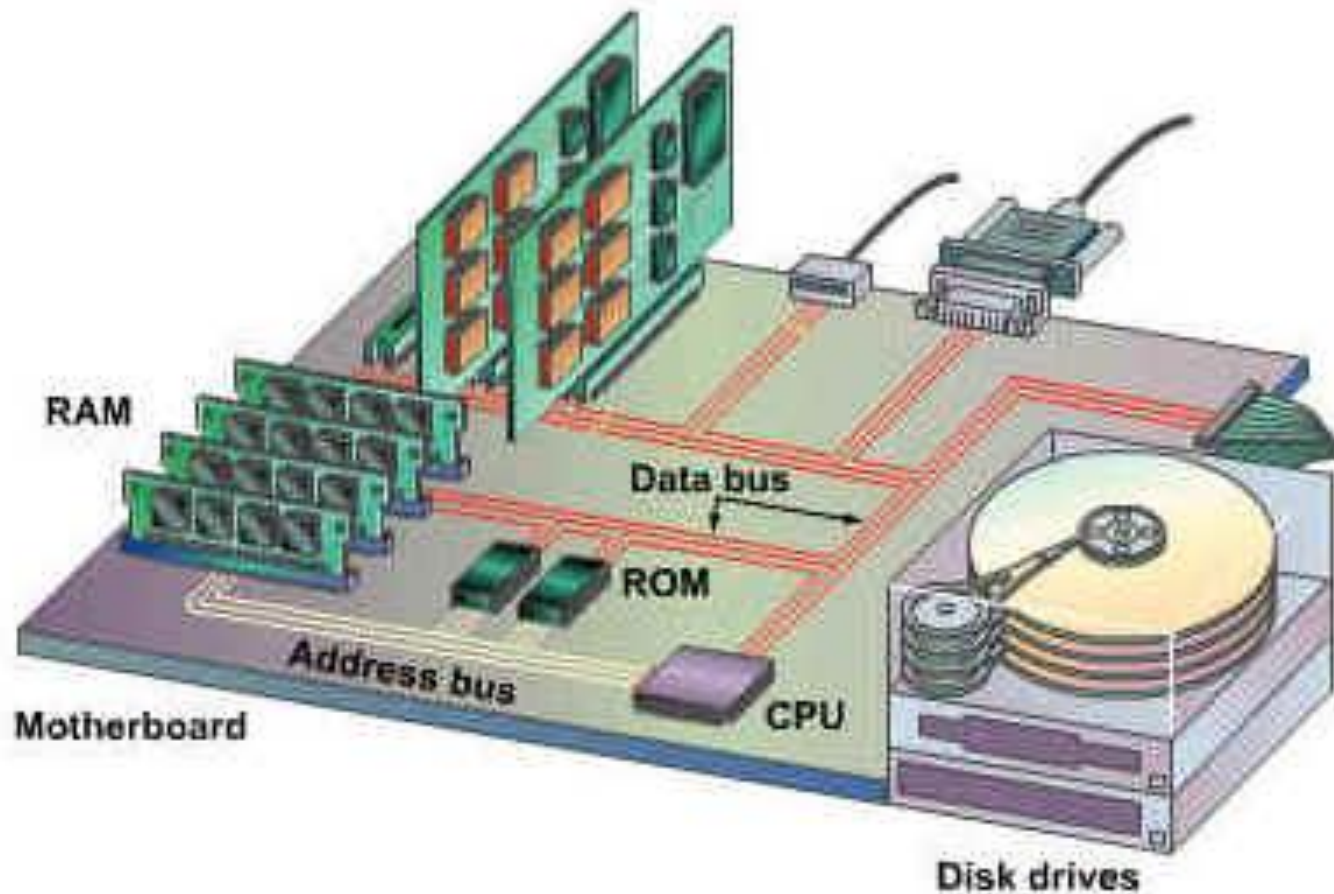
Overview of microcomputer structure and operation



Major Parts

- CPU
- Memory
- Input / Output circuitry
- Buses:
 - Address bus
 - Data bus
 - Control bus

Micro-computer overview



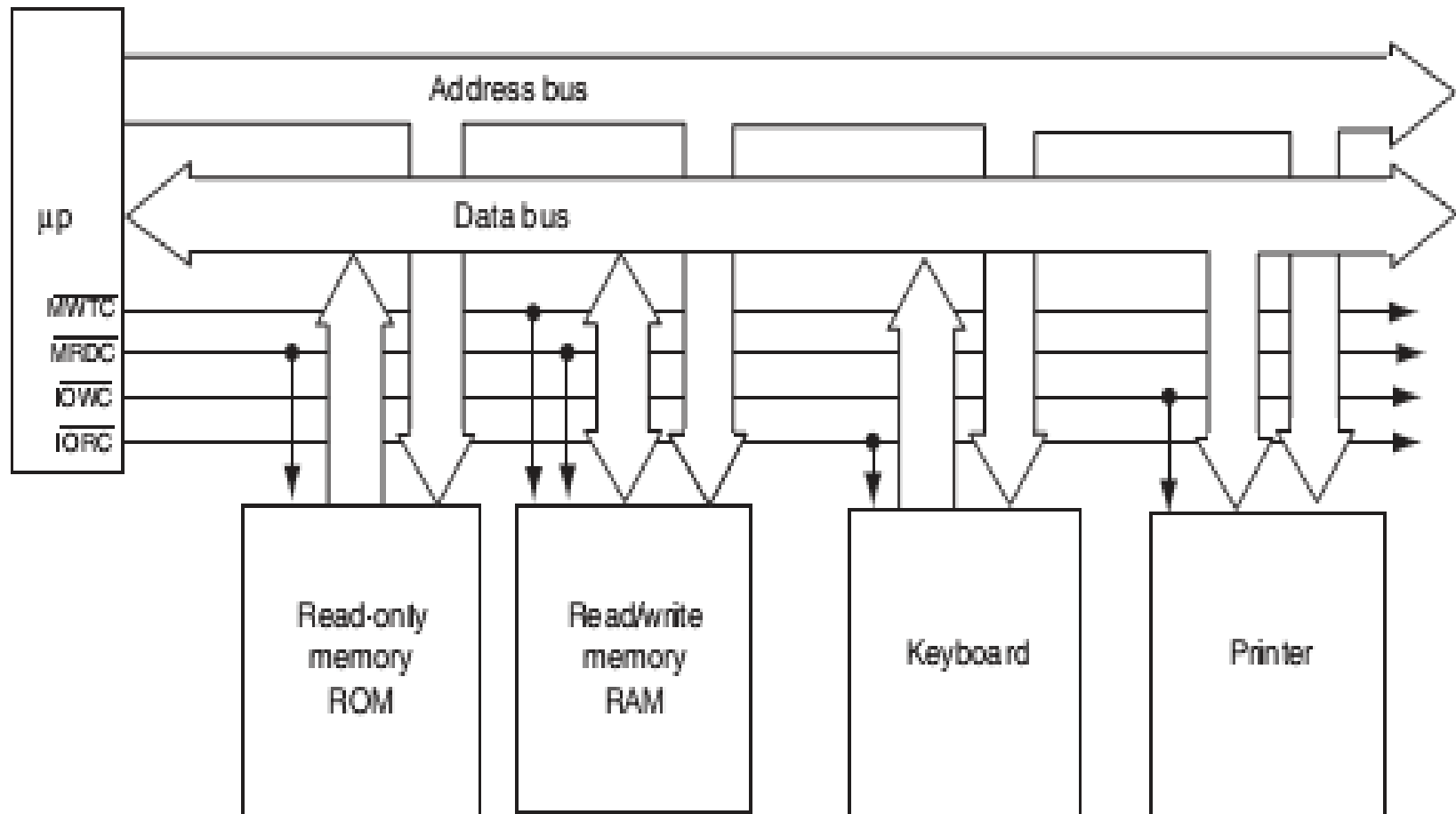


FIGURE 1-12 The block diagram of a computer system showing the address, data, and control bus structure.

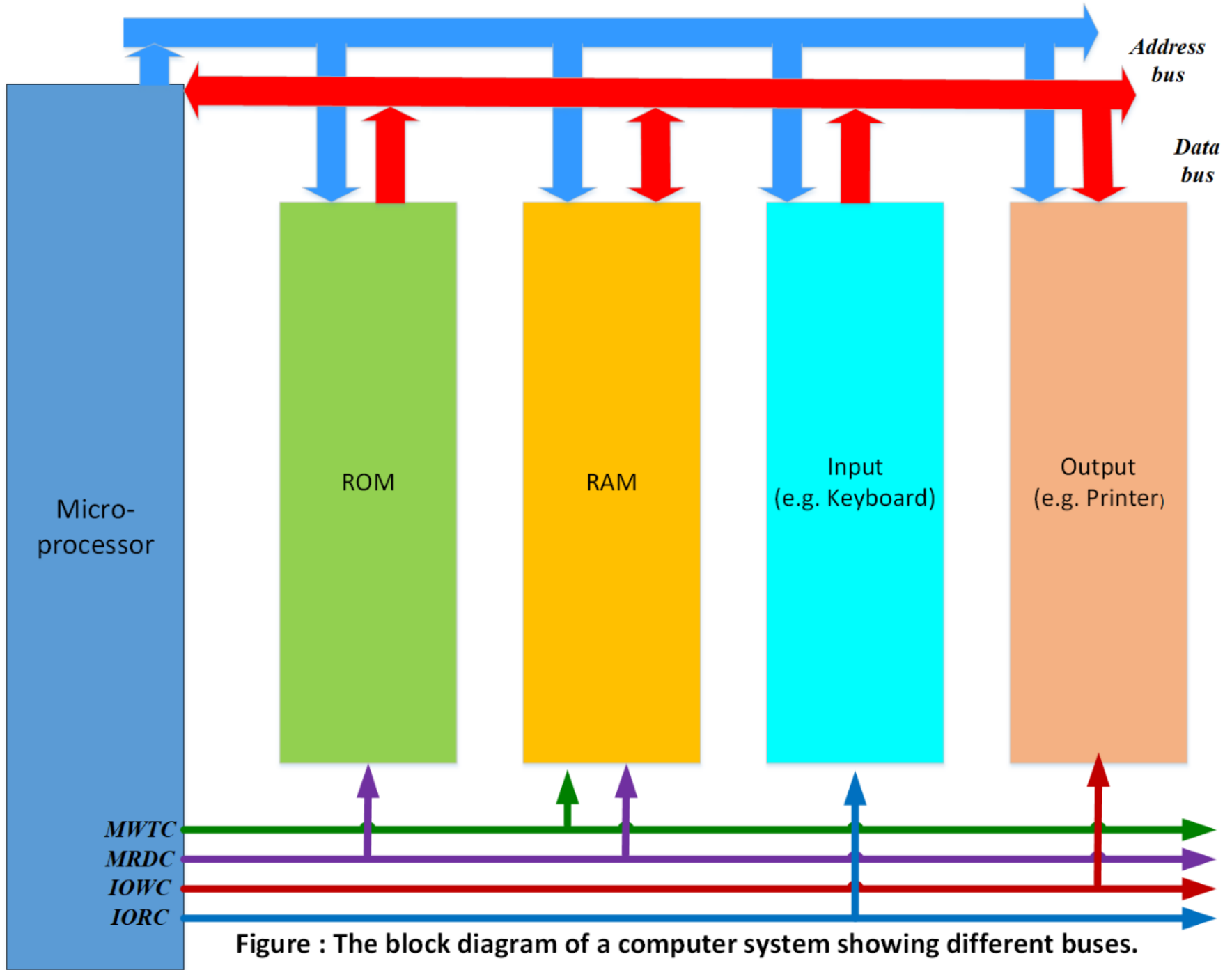


Figure : The block diagram of a computer system showing different buses.

Central Processing Unit (CPU)

- It controls the operation of computer
- The CPU fetches binary-coded instructions from memory
- Decodes the instructions into a series of simple actions
- Carries out these actions in a sequence of steps

Input / Output

- They are used to take data from outside world or send data to the outside world
- I/O devices are connected with microprocessor through I/O ports
- Example: Keyboards, video display terminals, printers, modems

Examples of Manual Input Devices

Keyboard



Numeric Keypad



Pointing Device



Remote Control



Joystick



Touch Screen



Scanner



Graphics Tablet



Microphone



Digital Camera



Webcams



Light Pens



Examples of Output Devices

CRT Monitor



TFT Monitor



Laser Printer



Inkjet Printer



Dot Matrix Printer



Speakers



Plotters



Multimedia Projectors



Memory

- It stores the binary codes for the sequences of instructions
- It stores binary coded data
- Example: ROM, RAM, magnetic / optical disks

Memory Organization:

- Processor memory
- Primary or main memory
- Secondary memory

Processor Memory:

- It refers to the microprocessor registers which are used to hold temporary results when computation is in progress
- No speed disparity between these registers and microprocessor because they are fabricated using the same technology
- Costly

Primary Memory

- This is the storage area in which all programs are executed
- The microprocessor can directly access only those items that are stored in primary memory
- All programs and data must be within the primary memory prior to execution
- Example: ROM, RAM

Secondary Memory

- It stores program and data in excess of main memory
- Microprocessor can not directly execute programs which are stored in secondary memory
- In order to execute these programs, the microprocessor must transfer them to its main memory by a system program called operating system
- Example: Floppy disk, Hard disk etc.



Figure: ROM



Figure: CD ROM

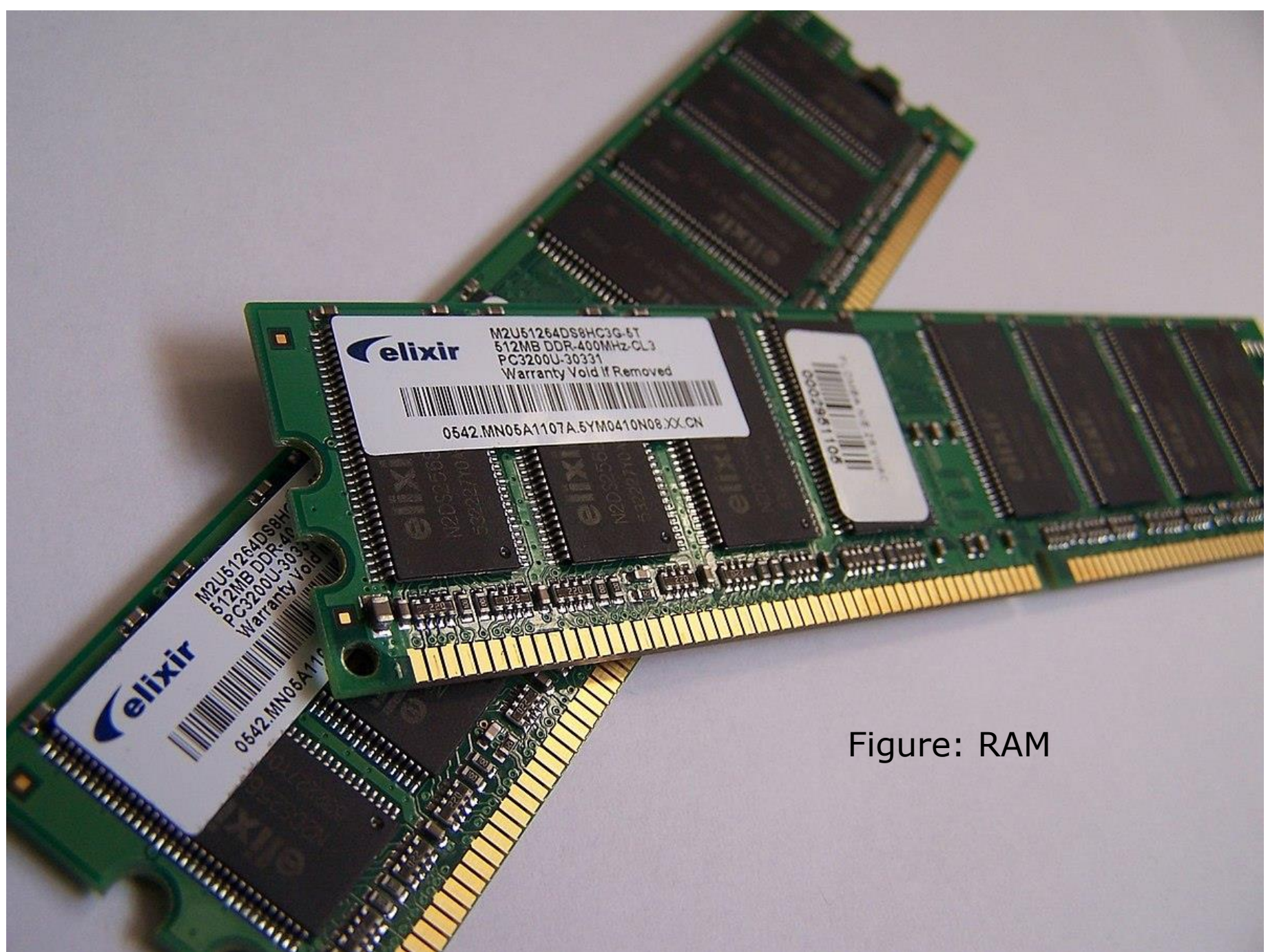


Figure: RAM



Figure: Floppy Disk



Figure: Hard Disk

BUS

The bus is an electrical path that connects the CPU, memory, and the other hardware devices on the motherboard. The bus is a group of parallel wires. The number of wires in the bus affects the speed at which data can travel between hardware components, just as the number of lanes on a highway affects how long it takes people to reach their destinations.

Because each wire can transfer 1 bit of data at a time, an 8-wire bus can move 8 bits at a time, which is a full byte. A 16-bit bus can transfer 2 bytes, and a 32-bit bus can transfer 4 bytes at a time. Newer model computers have a 64-bit bus, which transfers 8 bytes at a time.

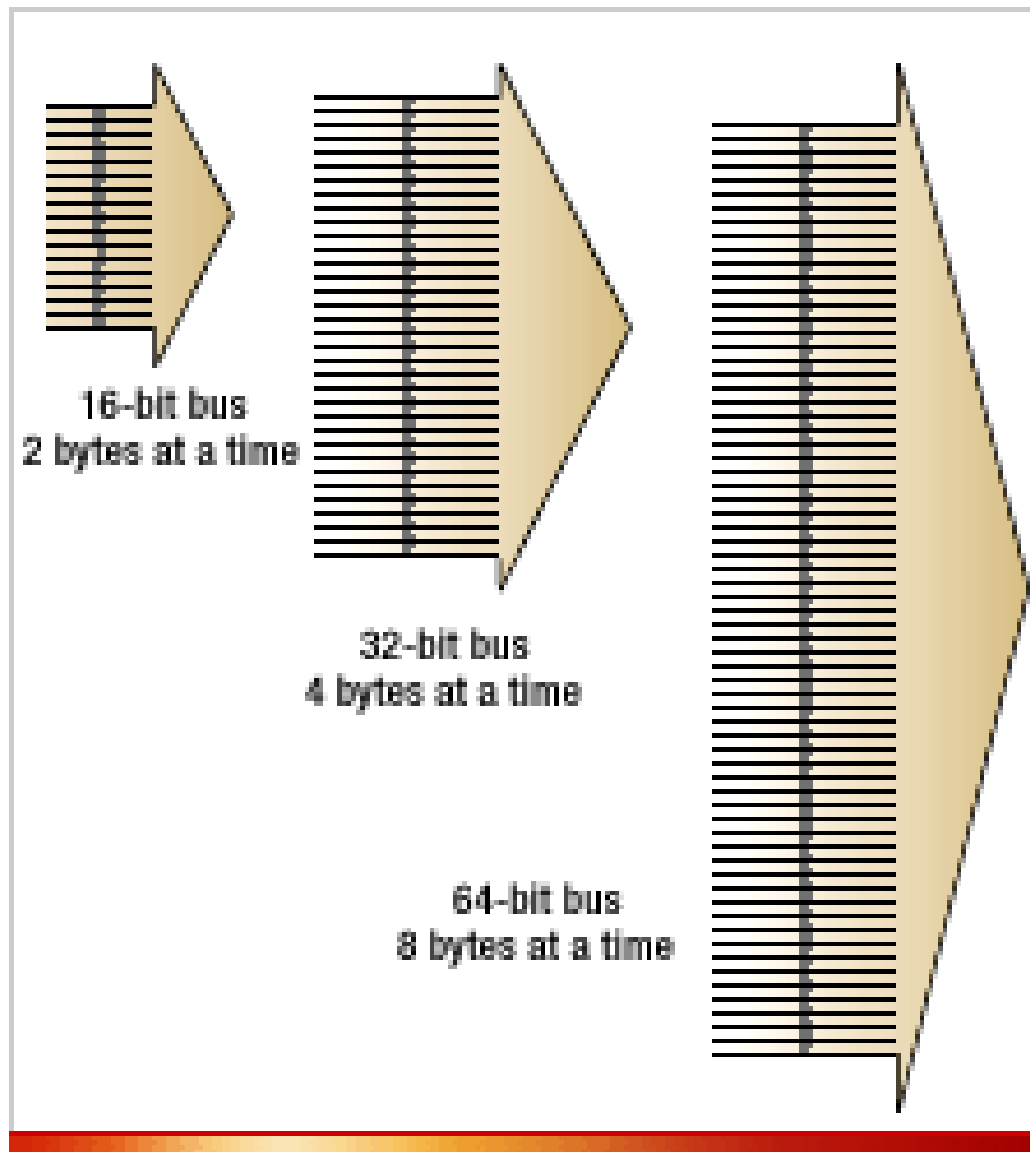
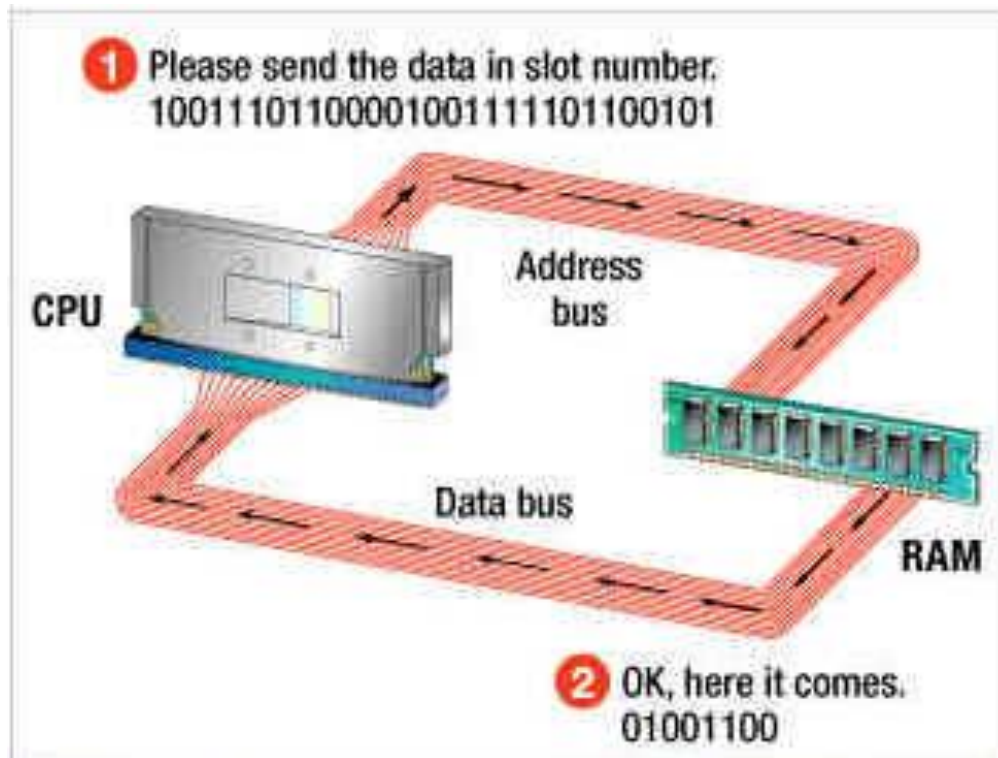


Figure:
BUS

With a wider bus, the computer can move more data in the same amount of time (or the same amount of data in less time).



Memory organization

Memory address

<u>Binary</u>	<u>Decimal</u>	Memory contents
0000000000	0	10110101 01011100
0000000001	1	10101011 10001001
0000000010	2	00001101 01000110
	•	•
	•	•
	•	•
	•	•
	•	•
1111111101	1021	10011101 00010101
1111111110	1022	00001101 00011110
1111111111	1023	11011110 00100100

Address Bus

- The address bus is a set of wires. It consists of 16, 20, 24, 32 or 36 parallel unidirectional signal lines
- On these lines the CPU sends out the address of the memory location or I/O port that is to be written to or read from
- The number of locations that the CPU can address is determined by the number of address lines

Data Bus

- The data bus is a set of wires which consists of 8, 16, 32 parallel bidirectional signal lines
- Many devices in the system will have their output connected to data bus, but only one device at a time will have its output enabled

Control Bus

- The control bus is a set of wires which consists of 4 to 10 parallel signal lines
- The CPU sends out signals on the control bus to enable the outputs of addressed memory devices or I/O devices
- Example of control signals: Memory read, Memory write

