BACHELOR OF COMPUTER APPLICATIONS (B.C.A)

SEMESTER – III

Computer Architecture & Assembly Language

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UNIT - IV

Input – Output Organization

PERIPHERAL DEVICES

Input Devices

- Keyboard
- Optical input devices
  - Card Reader
  - Paper Tape Reader
  - Bar code reader
  - Digitizer
  - Optical Mark Reader
- Magnetic Input Devices
  - Magnetic Stripe Reader
- Screen Input Devices
  - Touch Screen
  - Light Pen
  - Mouse

Analog Input Devices

Output Devices

- Card Puncher, Paper Tape Puncher
- CRT
- Printer (Impact, Ink Jet, Laser, Dot Matrix)
- Plotter
- Analog
- Voice

INPUT/OUTPUT INTERFACES

- Provides a method for transferring information between internal storage (such as memory and CPU registers) and external I/O devices
- Resolves the *differences* between the computer and peripheral devices

- Peripherals - Electromechanical Devices
  CPU or Memory - Electronic Device

- Data Transfer Rate
  Peripherals - Usually slower
  CPU or Memory - Usually faster than peripherals
  Some kinds of Synchronization mechanism may be needed

- Unit of Information
  Peripherals - Byte
  CPU or Memory - Word

- Operating Modes
  Peripherals - Autonomous, Asynchronous
  CPU or Memory - Synchronous

ASYNCHRONOUS DATA TRANSFER

Synchronous and Asynchronous Operations

Synchronous - All devices derive the timing information from common clock line

Asynchronous - No common clock

Asynchronous Data Transfer

Asynchronous data transfer between two independent units requires that *control signals* be transmitted between the communicating units *to indicate the time at which data is being transmitted*

Two Asynchronous Data Transfer Methods

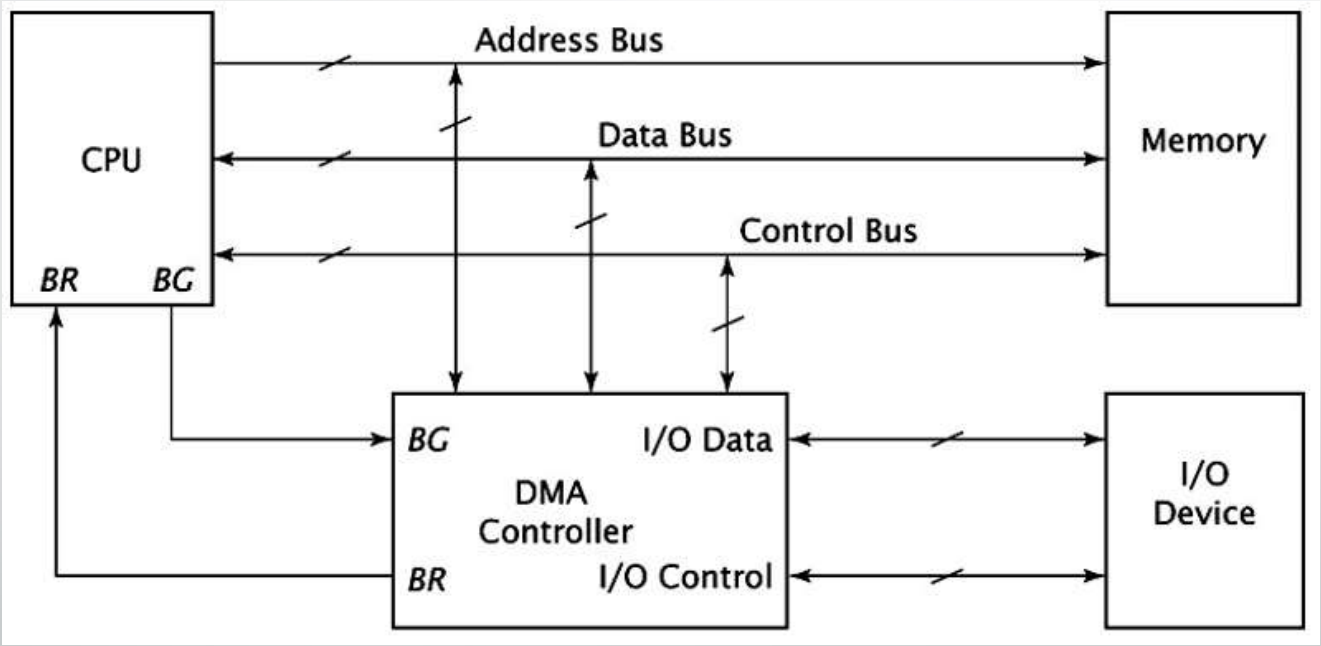
Strobe pulse

- A strobe pulse is supplied by one unit to indicate the other unit when the transfer has to occur

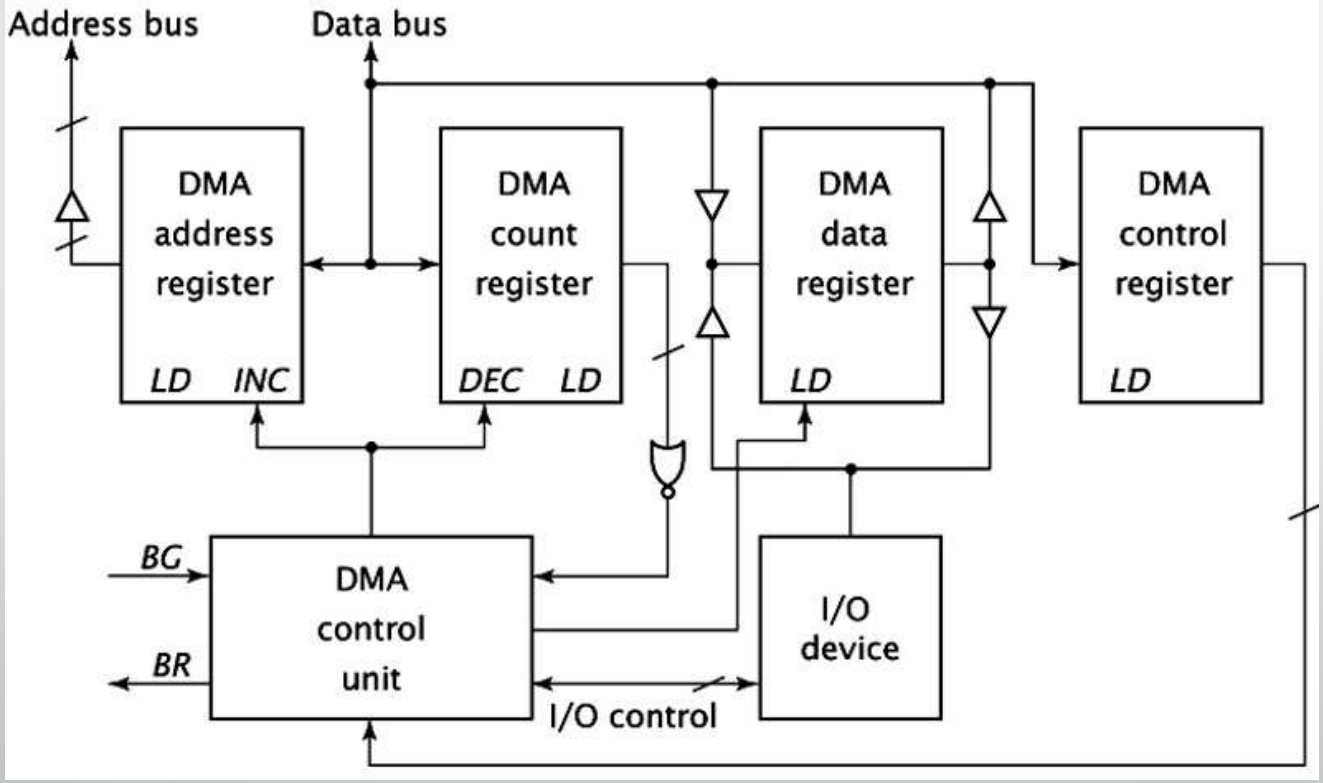
Handshaking

- A control signal is accompanied with each data being transmitted to indicate the presence of data
- The receiving unit responds with another control signal to acknowledge receipt of the data

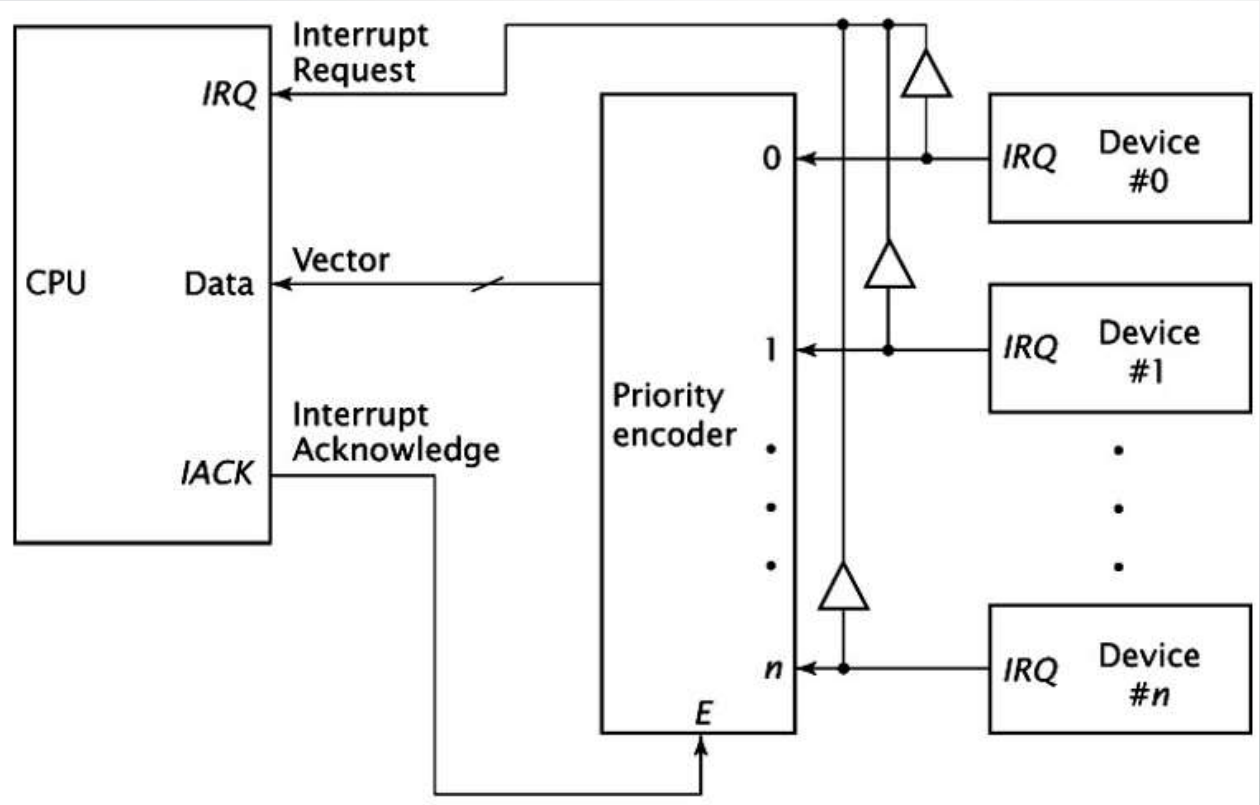
Direct Memory Access



DMA Controller



Parallel Priority Interrupts



Data Communication Processor

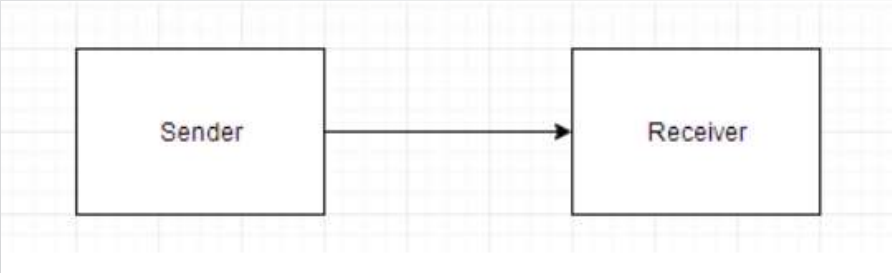
- A data communication processor is an I/O processor that distributes and collects data from numerous remote terminals connected through telephone and other communication lines to the computer. It is a specialized I/O processor designed to communicate with data communication networks.
- In a Data Communication Network, the remote terminals are connected to the data communication processor through telephone lines or other wires. Such telephone lines are specially designed for voice communication and computers use them to communicate in digital signals, therefore some conversion is required. These conversions are called modem (modulator-demodulator).

Modes Of Transmission

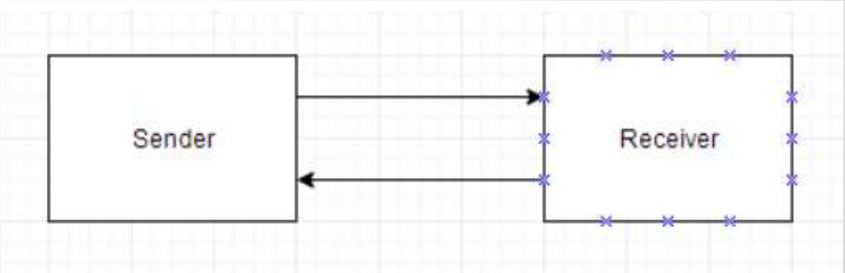
Data can be transmitted between 2 points by three different modes:

- Simplex: A simplex line carries information in one direction only. In this mode receiver cannot communicate with the sender to indicate the occurrence of errors that means only sender can send data but receiver cannot. **For example:** Radio and Television Broadcasting.
- Half – Duplex: In half duplex mode, system is capable of transmitting data in both directions but data can be transmitted in one direction only at a time. A pair of wires is needed for this mode. **For example:** Walkie - Talkie.
- Full – Duplex: In this mode data can be send and received in both directions simultaneously. In this four wire link is used. **For example:** Video Calling, Audio calling etc.

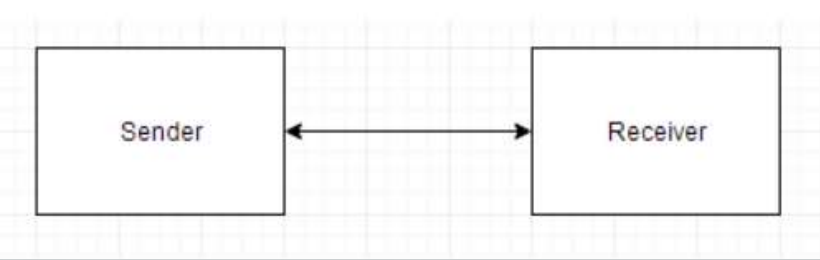
Modes Of Transmission



SIMPLEX



HALF - DUPLEX



FULL – DUPLEX

What are Protocols?

- A **Protocol** is a set of rules that are followed by interconnecting devices to ensure that all data is passed correctly without any error.
- There are two types of protocols:
  - Character Oriented Protocol: It is based on the binary code of character set. The code is mostly used in **ASCII**. It includes upper case and lower case letters, numerals and variety of special symbols. The characters that control the transmission is called **communication control characters**.
  - Bit Oriented Protocol: It does not use characters in its control field and is independent of any code. It allows the transmission of serial bit stream of any length without the implication of character boundaries.

EXCERCISES

- List four peripheral devices that produce an acceptable output for a person to understand.
- Write your full name in ASCII using eight bits per character with the leftmost bit always 0. Include a space between names and a period after a middle initial.
- What is the difference between isolated 110 and memory-mapped 110? What are the advantages and disadvantages of each?
- A CPU with a 20-MHz clock is connected to a memory unit whose access time is 40 ns. Formulate a read and write timing diagrams using a READ strobe and a WRITE strobe. Include the address in the timing diagram.
- What is the basic advantage of using interrupt-initiated data transfer over transfer under program control without an interrupt?

References

- Leventhal, L.A, “Introduction to Microprocessors”, Prentice Hall of India
- Mathur, A.P., “Introduction to Microprocessors”, Tata McGraw Hill
- Rao, P.V.S., “Prospective in Computer Architecture” , Prentice Hall of India

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THANK YOU !!!