

UNIT-5

SYSTEM ORGANIZATION



Communication Methods

- There are 2 types of communication
 - Intersystem Communication
 - Intrasystem Communication

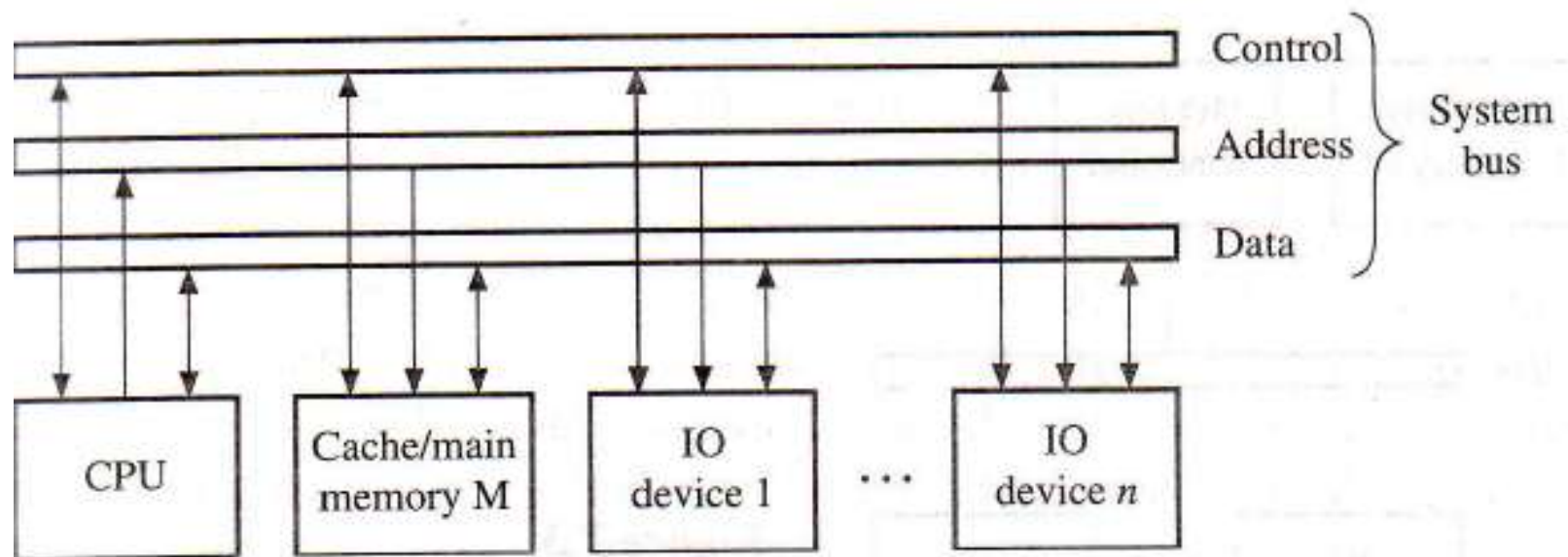
Communication Methods Contd...

- Intrasystem communication occurs within a single computer system and involve system transfer over distances of less than a meter. It is primarily implemented by groups of electrical wires called buses.
- Intersystem communication means communication between the system by using a variety of physical media including electrical cables, optical fibers and wireless links. Here serial data transfer is preferred for communication because of longer distances.

BUS

- A Single Bus handles all intra system communication. All unit share the system bus, therefore at any given time only two units can communicate with each other.
- The CPU act as an active device or bus master & memory unit and I/O devices may act as a passive or slave unit.
- A bus typically consist of 3 group of lines i.e.
 - Address Lines 8 to 32
 - Data Lines 16 to 128
 - Control Lines

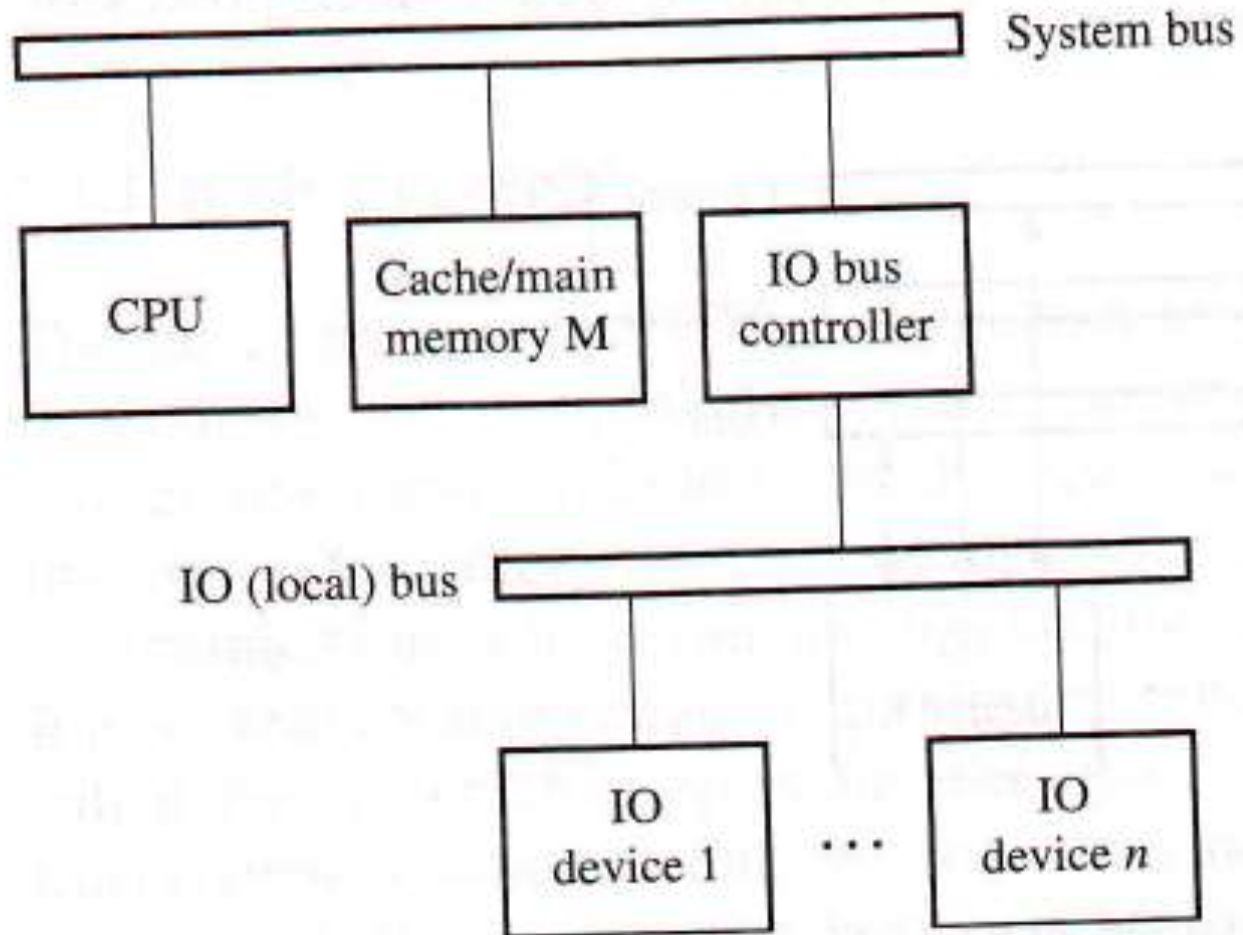
BUS Contd...



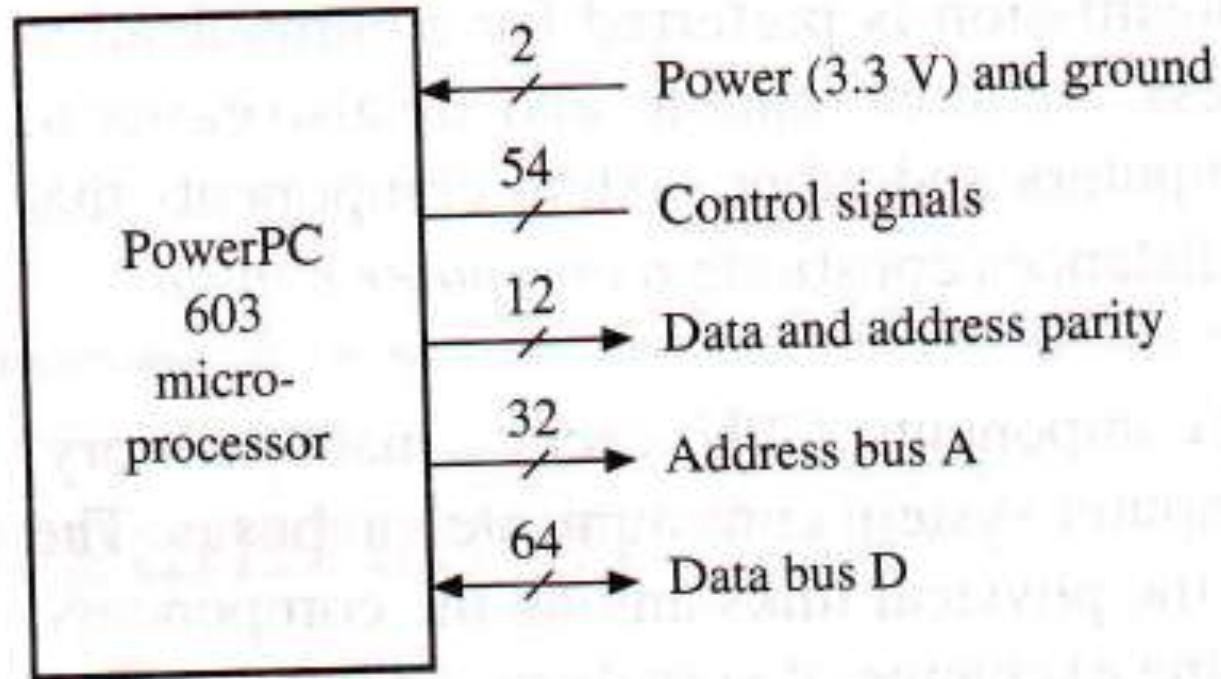
BUS Contd...

- The principal use of system bus is high speed data transfer between the CPU and main memory.
- Most I/O devices are slower than the CPU or M, therefore they need to be connected to the system bus by making use of an interface circuits called I/O Controller.
- A Single I/O controller can interface many I/O devices to the system bus. And this I/O controller is connected to many I/O devices by making use of I/O bus.

BUS Contd....



For Eg: Power PC



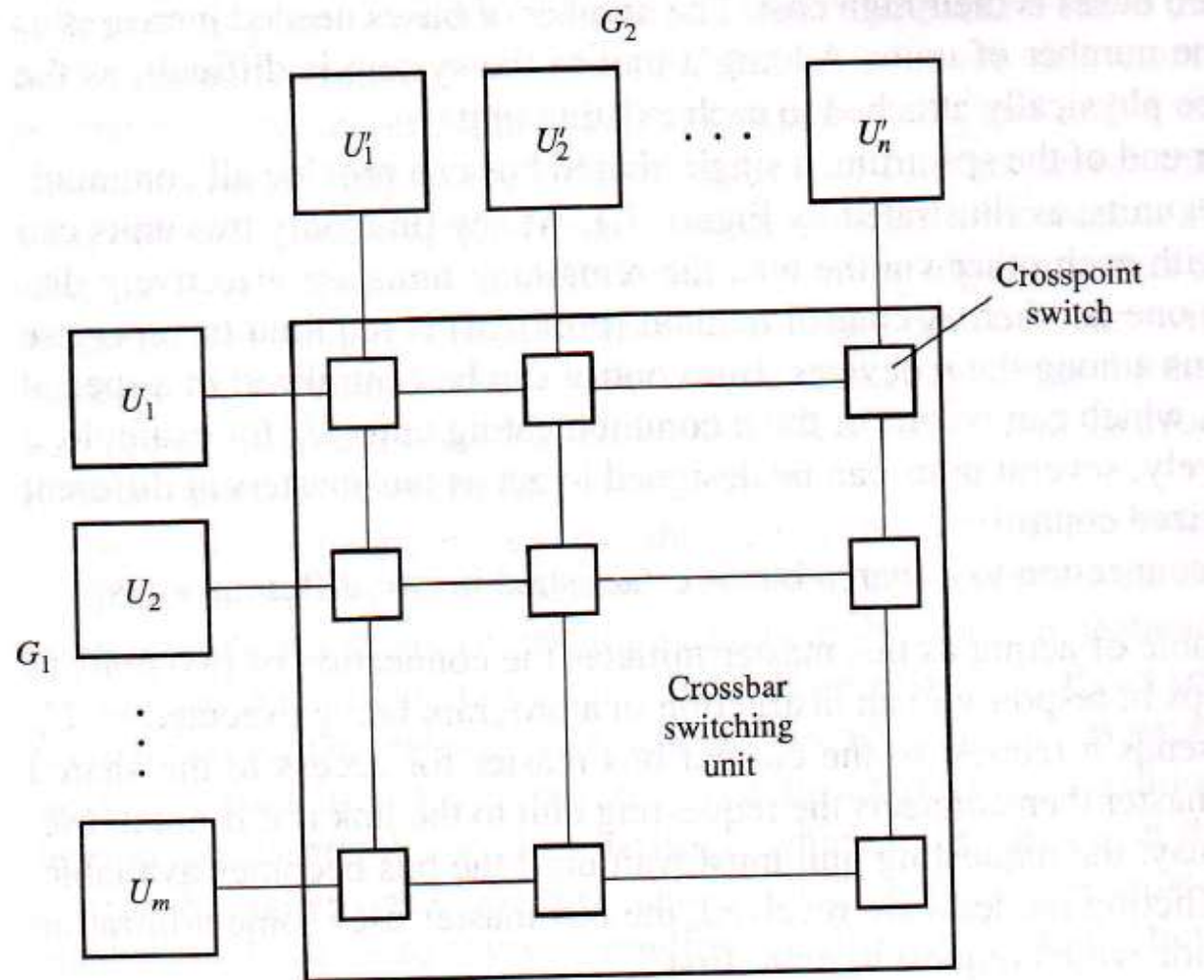
Long Distance Communication

- Long Distance Communication can be done by making use of modem.
- A modem act as a
 - ▣ Modulator
 - ▣ Demodulator
- Digital communication networks, that is a network designed expressly for transmitting information in digital form to achieve much higher data transfer rate. An eg. Of such network is ISDN.

- Digital communication can be done by making use of interconnected computer which is known as computer network.

- Within a network data is transferred by making use of 3 techniques:
 - Circuit Switching
 - Message Switching
 - Packet Switching

Crossbar Switching



- Network can be classified as
 - LAN
 - WAN

- Access within a LAN can be done by making use of two access methods
 - CSMA/CD
 - Token Passing

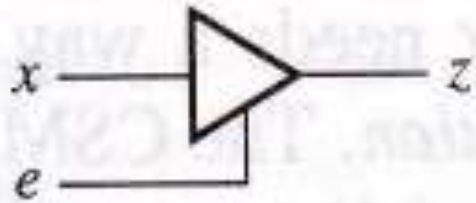
BUS Control

- Linear----Node Degree-----2
- Mesh----Node Degree-----4
- Ring----Node Degree-----2
- Star----Node Degree-----n-1
- Complete----Node Degree-----n-1
- Hypercube----Node Degree----- $\log_2 n$

Bus Interfacing

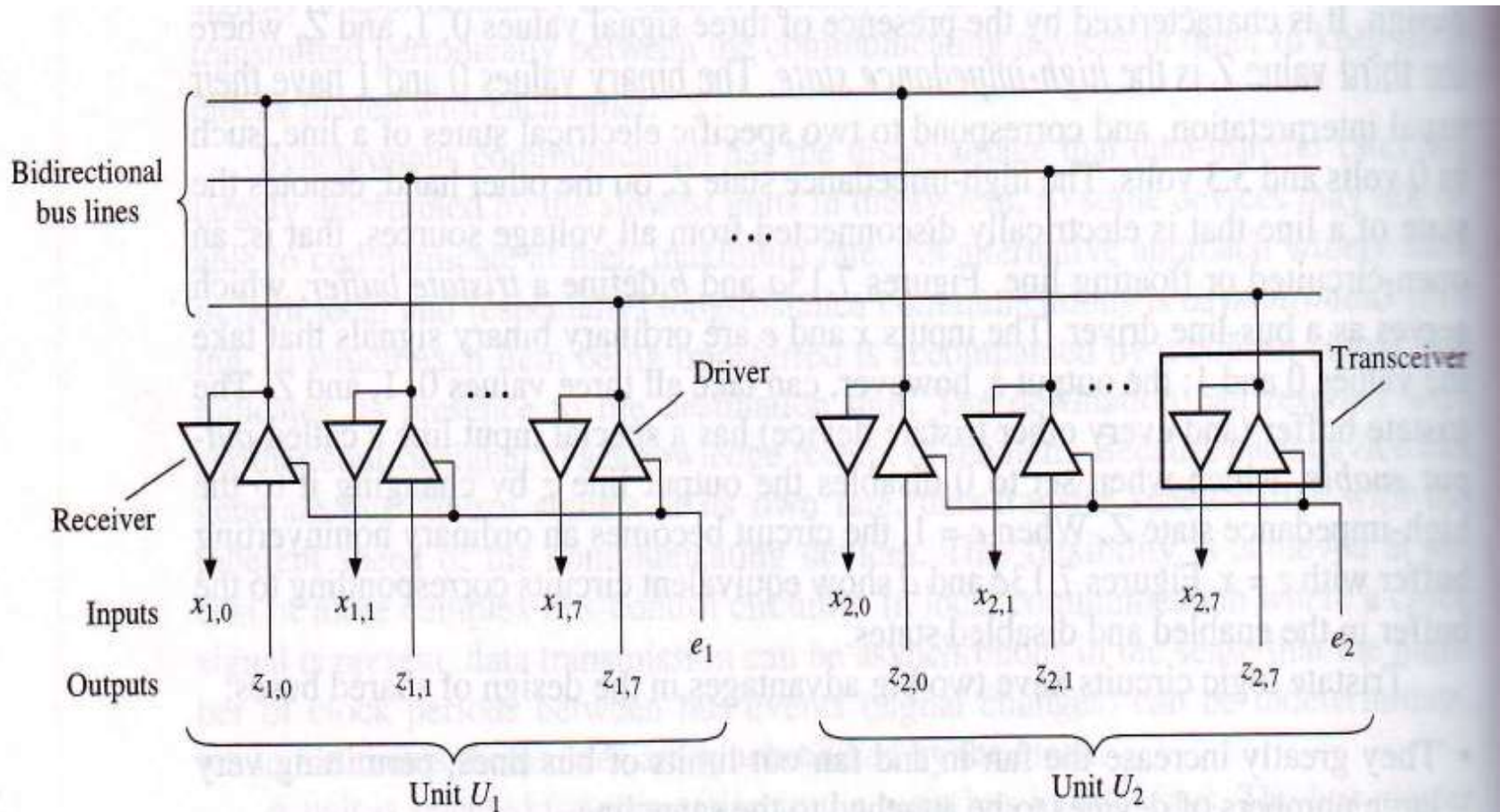
- A significant contributor to the cost of a bus is the number and the type of the circuits required to transfer signals to and from the bus.
- A special transistor circuit technology called tristate logic is often used in function design.
- The tristate logic is a three state gates that exhibits 3 state.
- The high impedance state behaves like an open circuit.

Symbol of a 3-state gate by using buffer:



Inputs		Outputs
x	e	z
0	1	0
1	1	1
0	0	Z
1	0	Z

Use of Tristate logic for Bus interfacing:



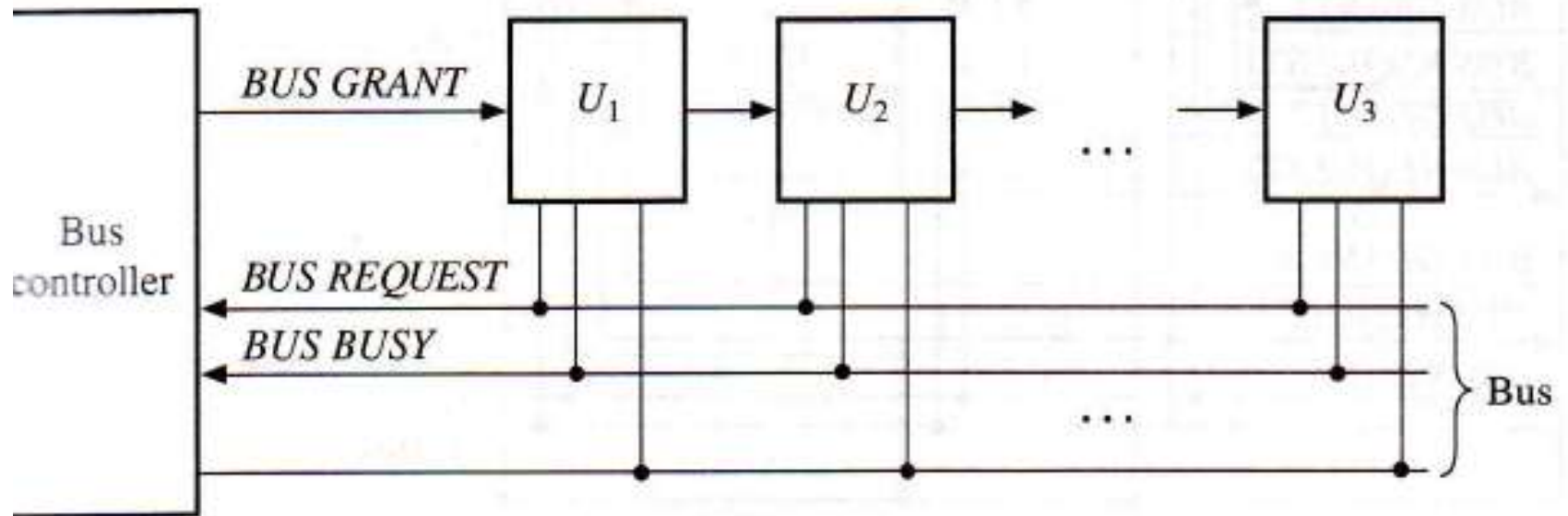
Data Transfer

- Synchronous Data Transfer
- Asynchronous Data Transfer

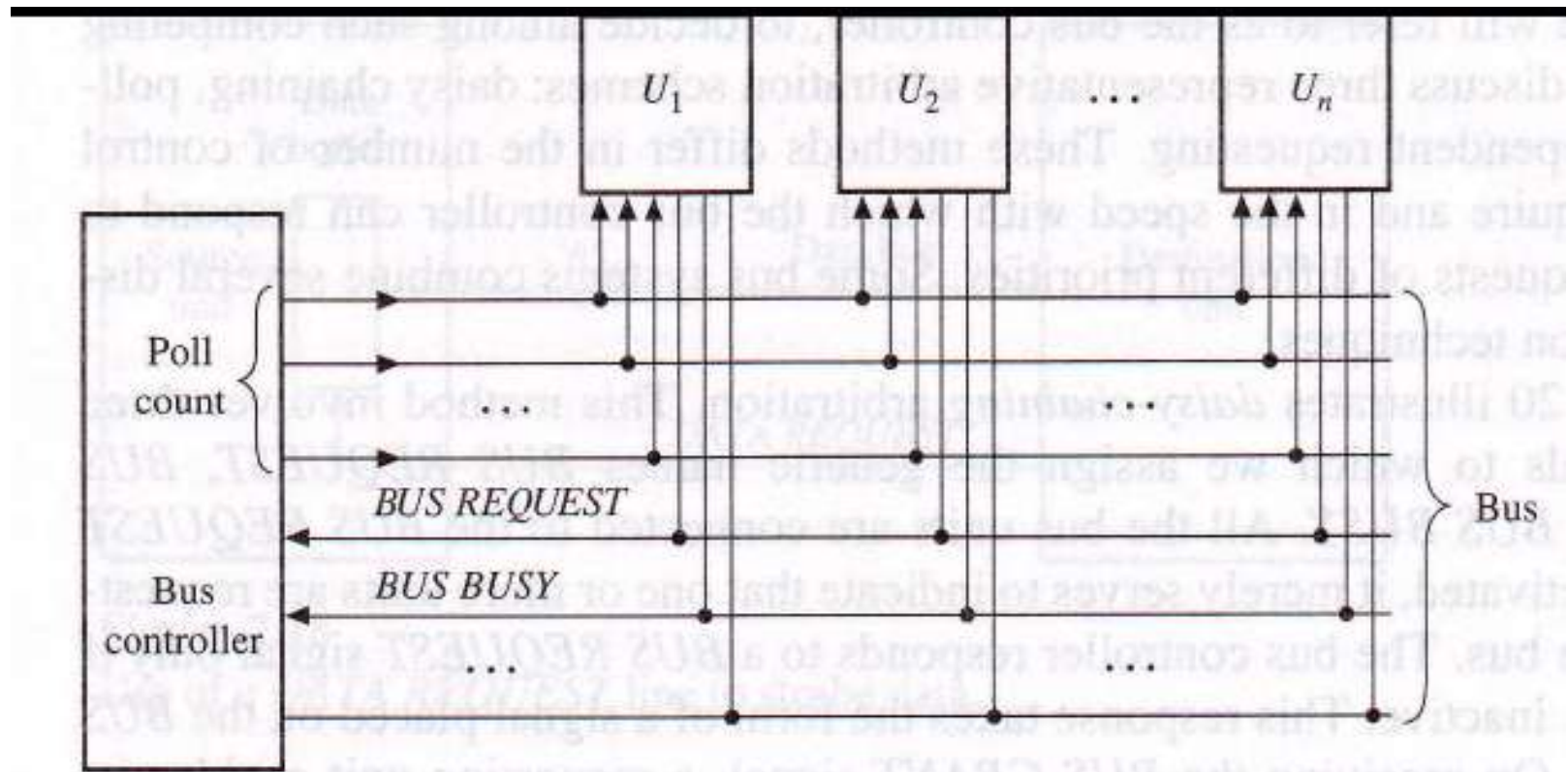
Bus Arbitration

- Daisy Chaining
- Polling
- Independent Requesting

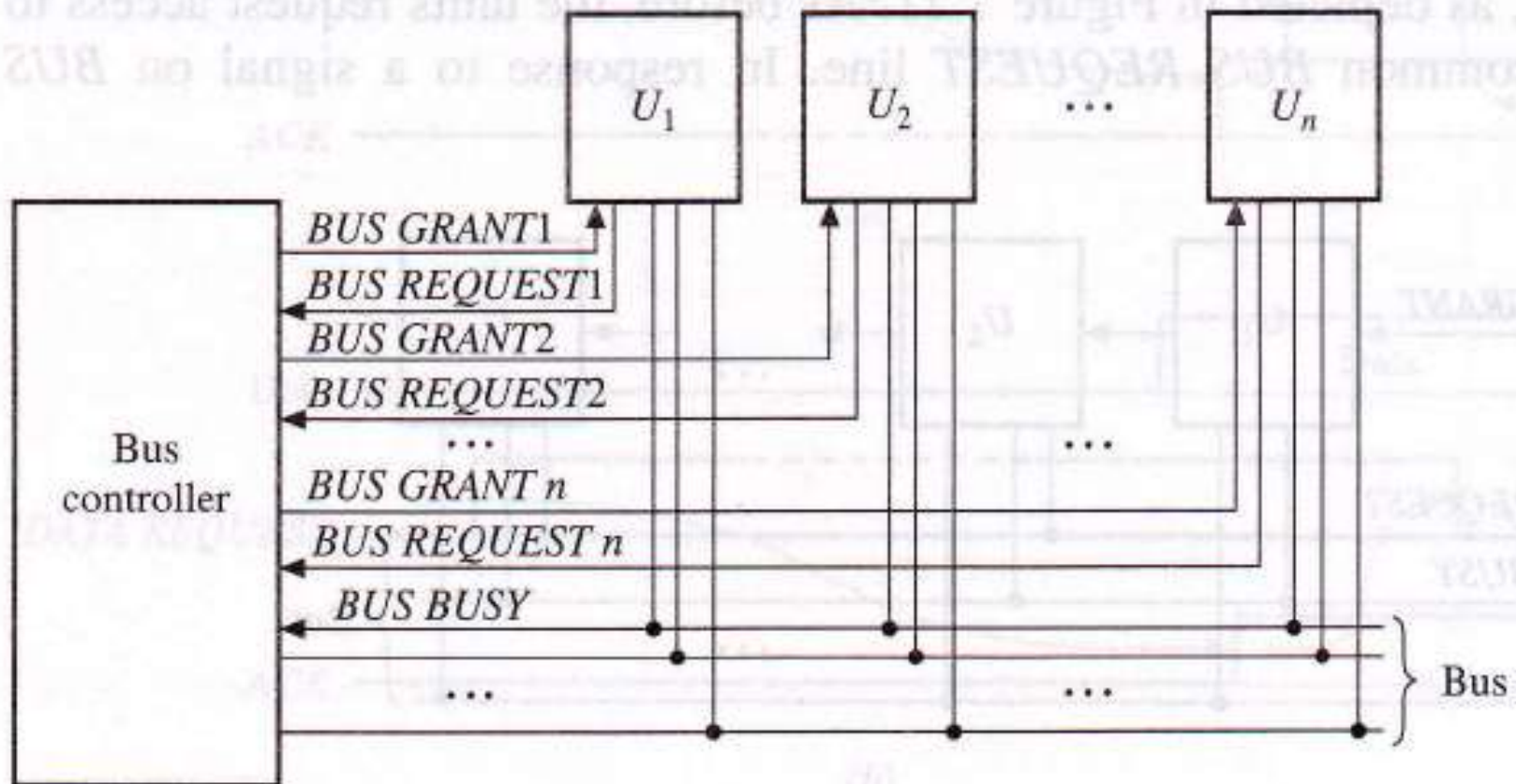
Daisy Chaining



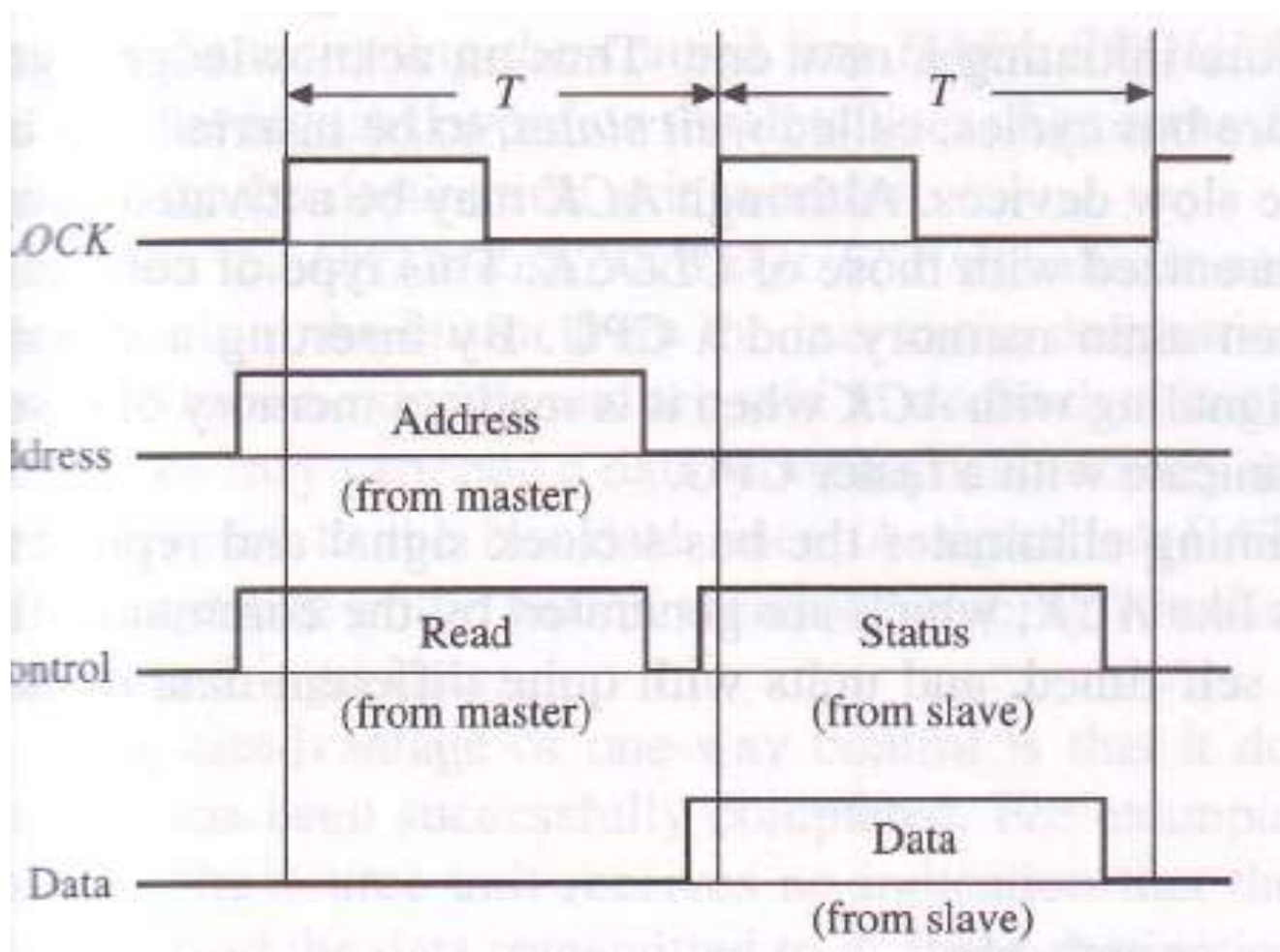
Polling



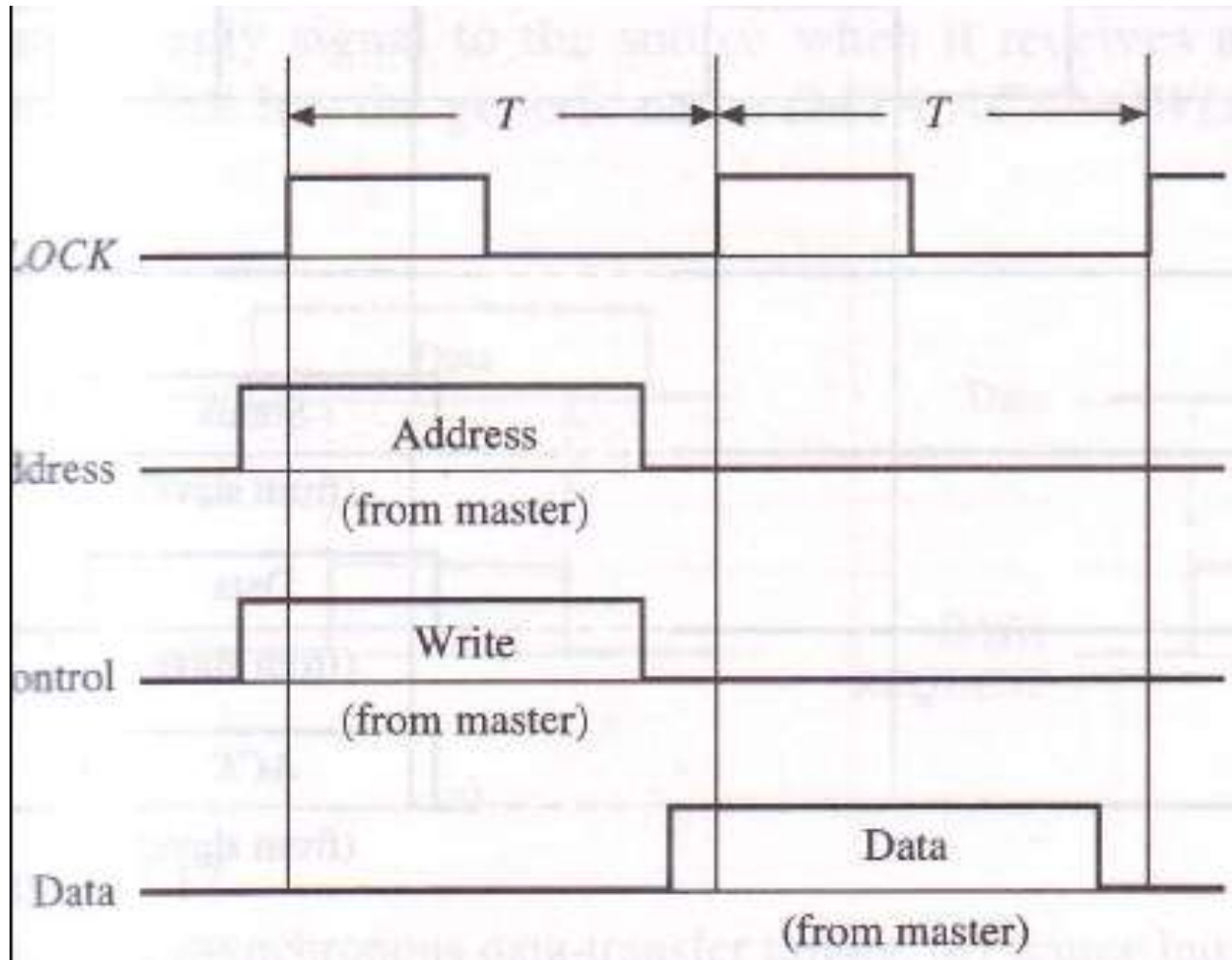
Independent Requesting



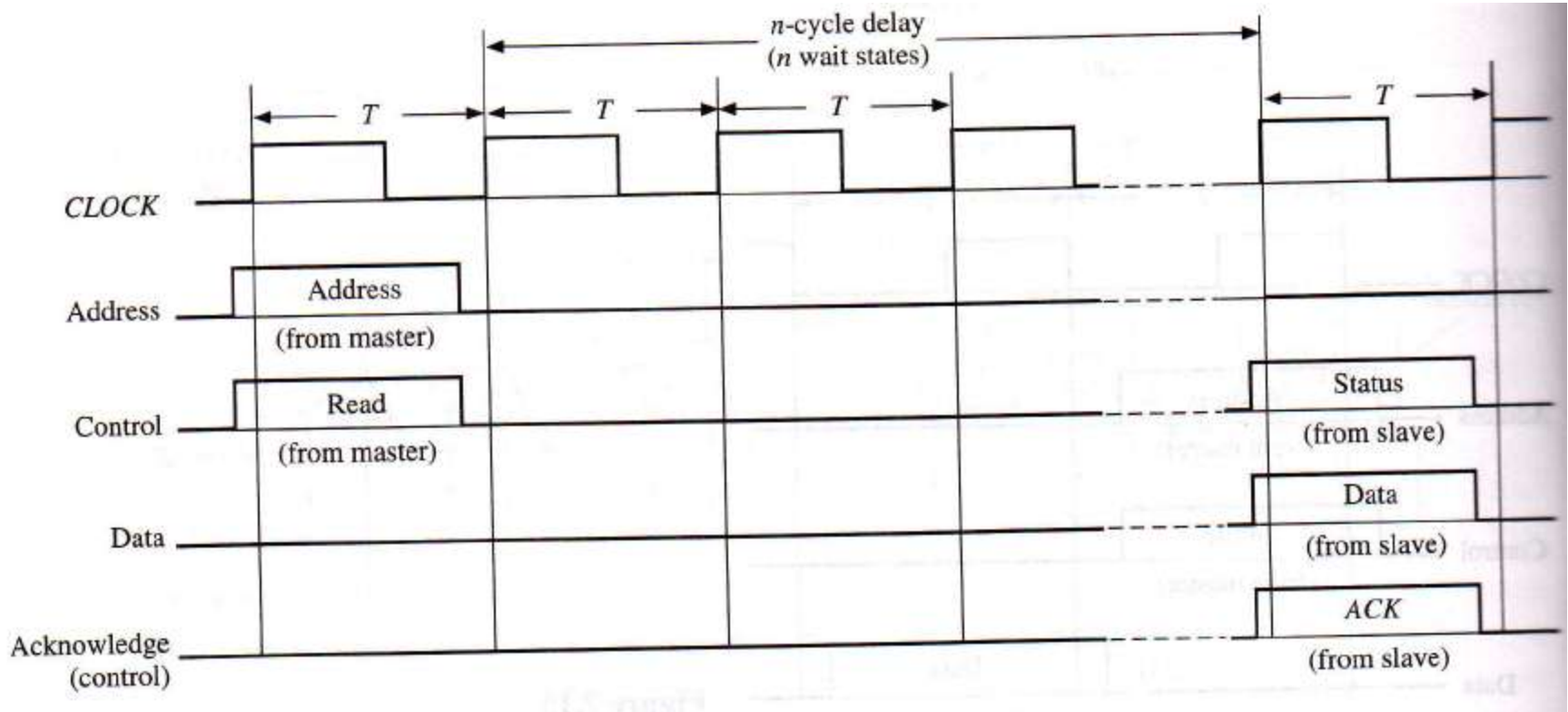
Synchronous Data Transfer for Read Operation:



Synchronous Data Transfer for Write Operation:



Synchronous Data Transfer for Read Operation With Wait States:



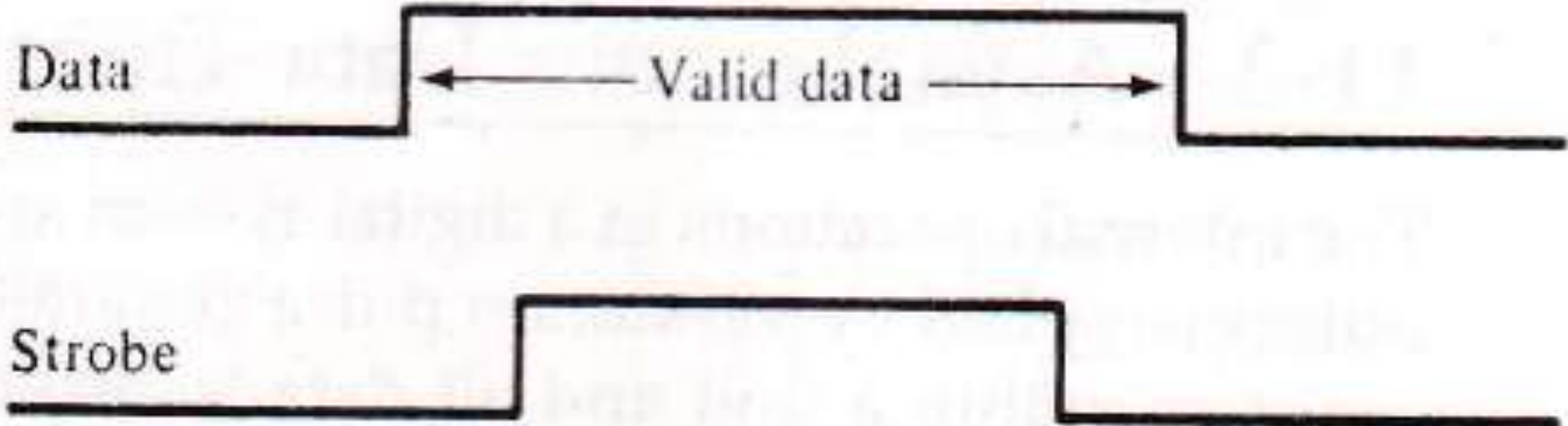
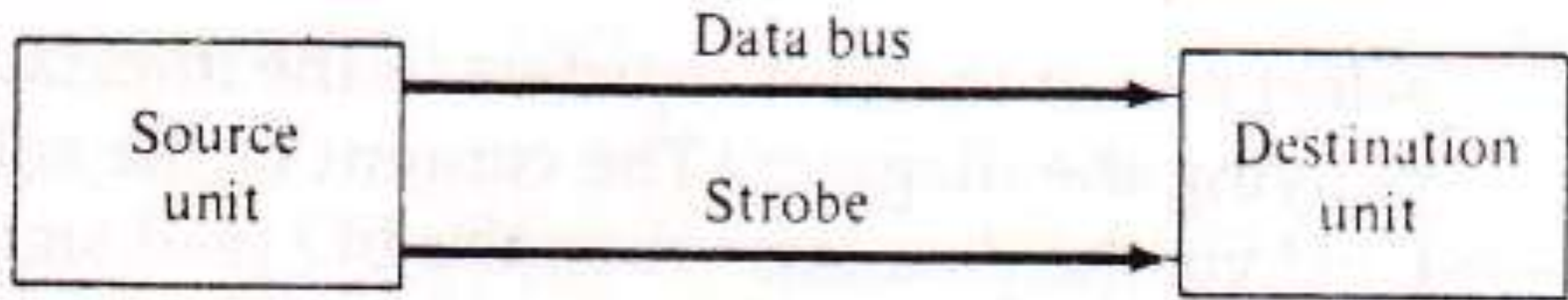
Asynchronous Data Transfer

- Strobe Control
- Handshaking

Strobe Control Contd...

- Source Initated Data Transfer
- Destination Initated Data Transfer

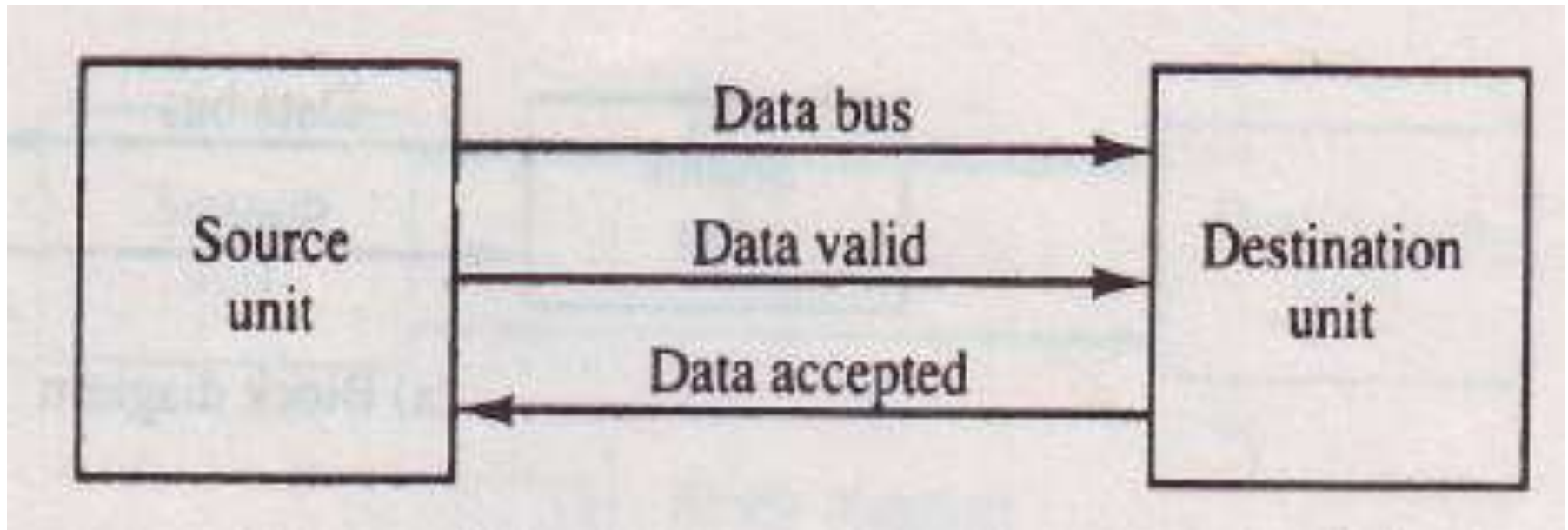
Source Initiated Data Transfer



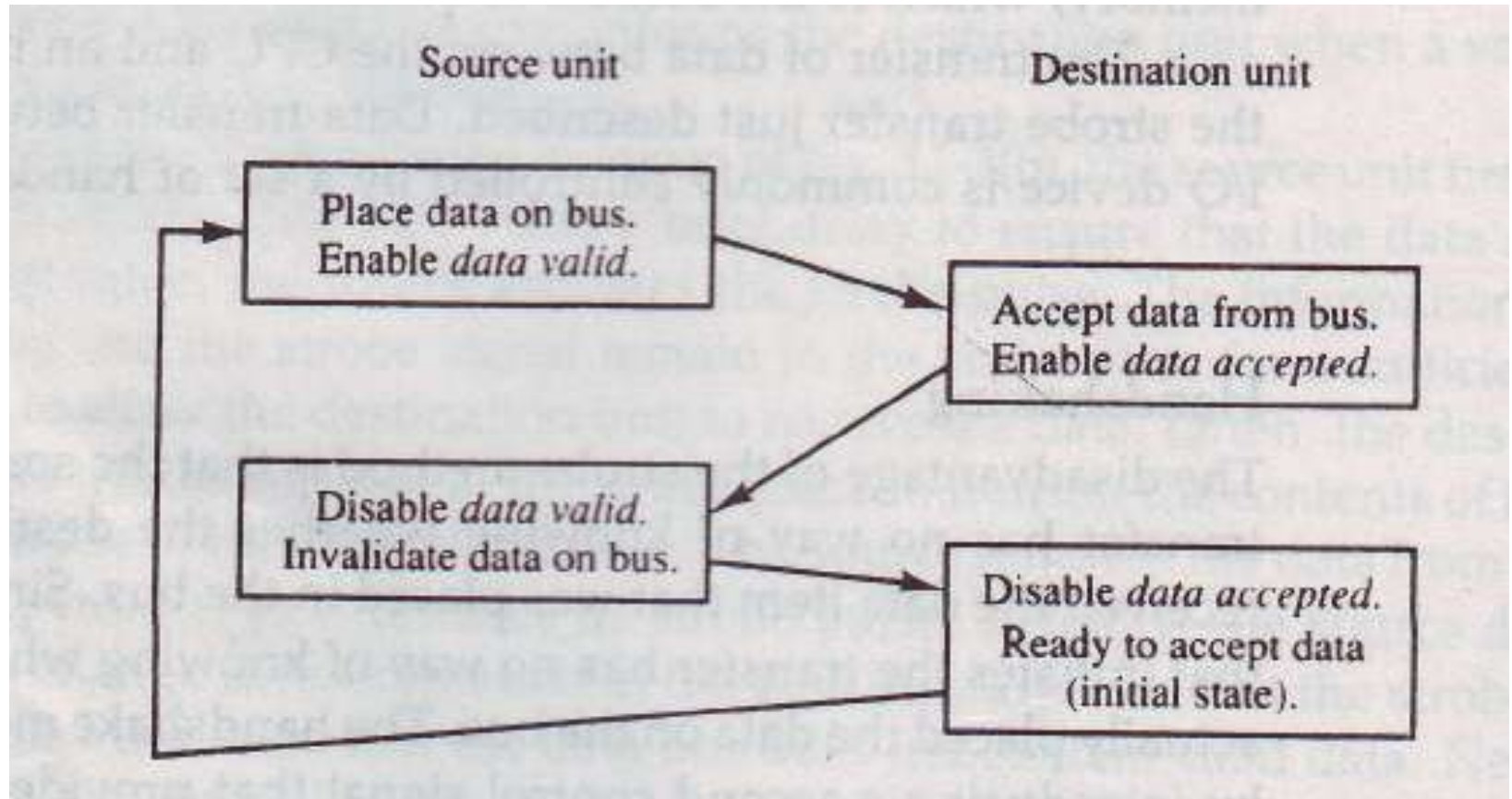
Handshaking

- Source Initiated Data Transfer
- Destination Initiated Data Transfer

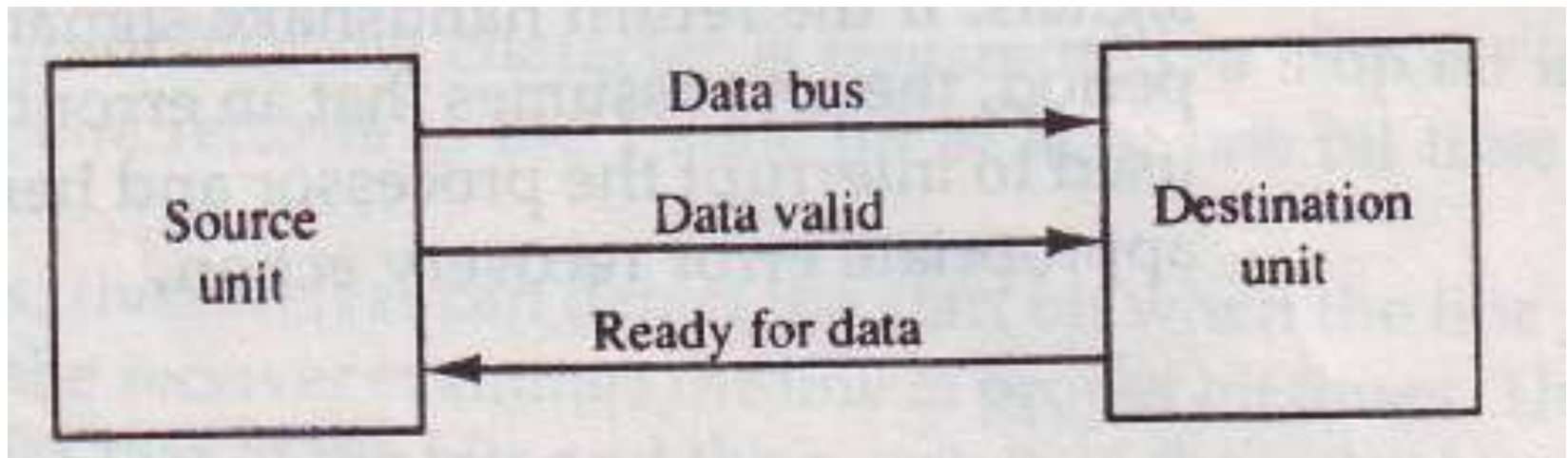
Source Initiated Data Transfer



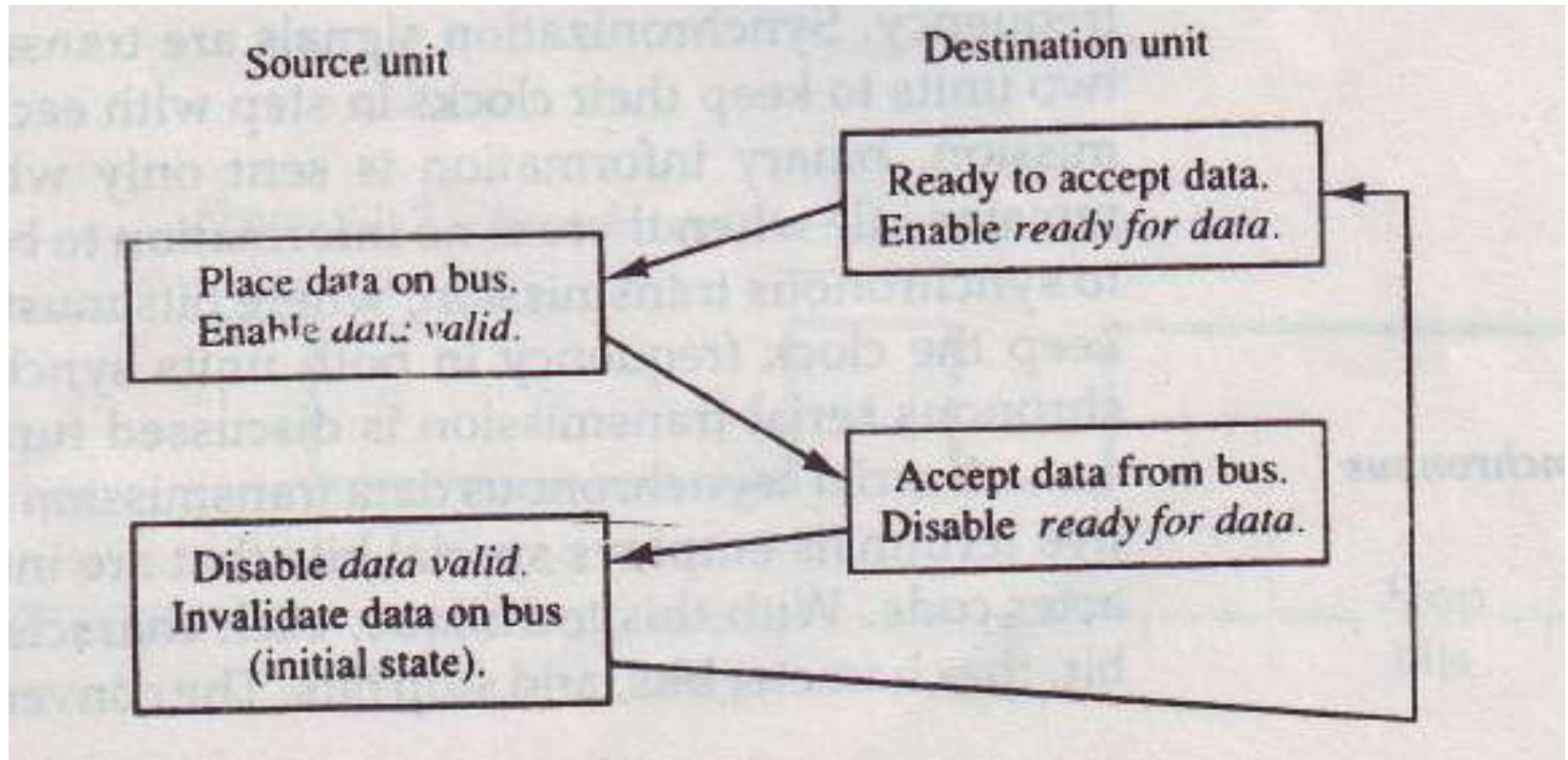
Source Initiated Data Transfer Contd...



Destination Initiated Data Transfer



Destination Initiated Data Transfer Contd...



How Data is transferred between 2 Units:

- Parallel Data Transmission
- Serial Data Transmission
 - ▣ Asynchronous Data Transmission
 - ▣ Synchronous Data Transmission

I/O Control Method

- Programmed I/O
- Interrupt Initiated I/O
- DMA

Programmed I/O

- There are 3 ways
 - ▣ Use 2 separate buses
 - ▣ Use 1 common bus for both memory & I/O but have separate control lines. (Isolated I/O)
 - ▣ Use 1 common bus for both memory and I/O (Memory-Mapped I/O)

Interrupt Initiated I/O

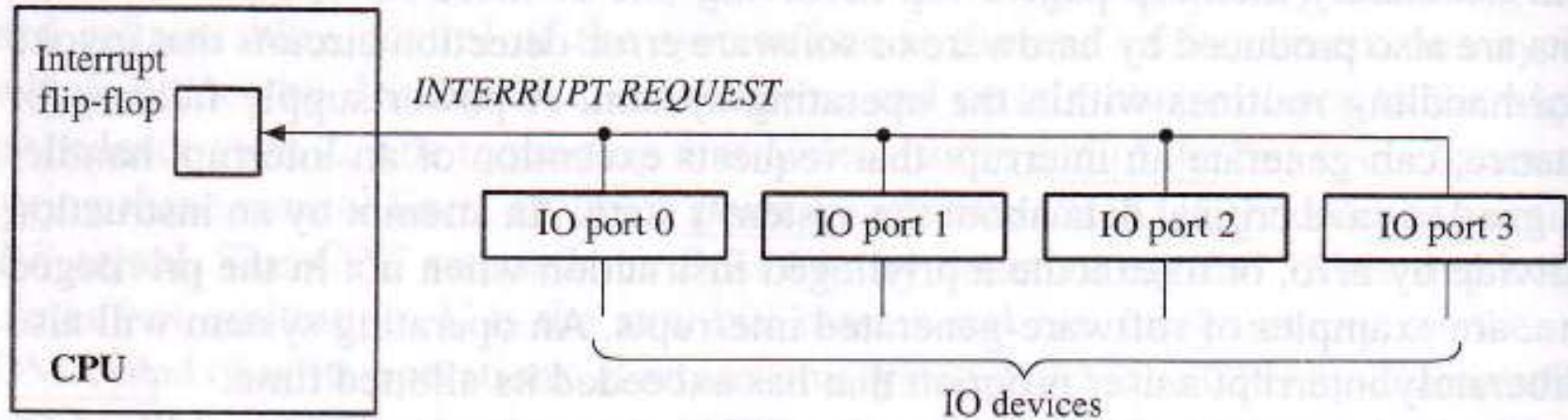
- Interrupt is an exceptional event that occurs during the execution of the program.
- While an interrupt occurs then CPU temporarily transfer the control from its current program to an interrupt handling program which is known as interrupt handler.
- The basic method of interrupting the CPU by activating it's control line named INTERRUPT REQUEST.

Interrupt Initiated I/O Contd.....

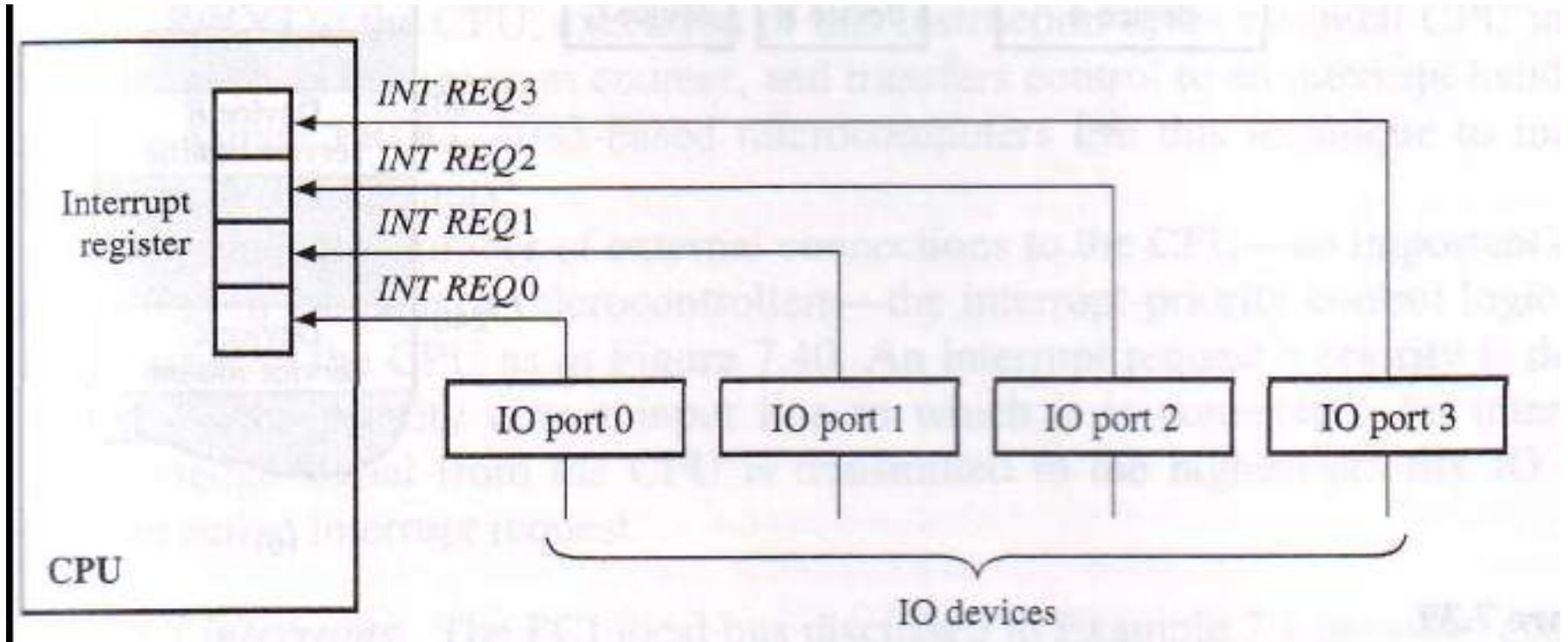
The CPU responds to an interrupt request by transfer a control to an interrupt handler . The following steps are taken:

- The CPU identifies the source of the interrupt.
- The CPU obtains the memory address of the required interrupt handler.
- According to that the PC and certain different registers are updated.

Interrupt Request By Using Single Line Interrupt System:



Interrupt Request By Using Multiple Line Interrupt System:



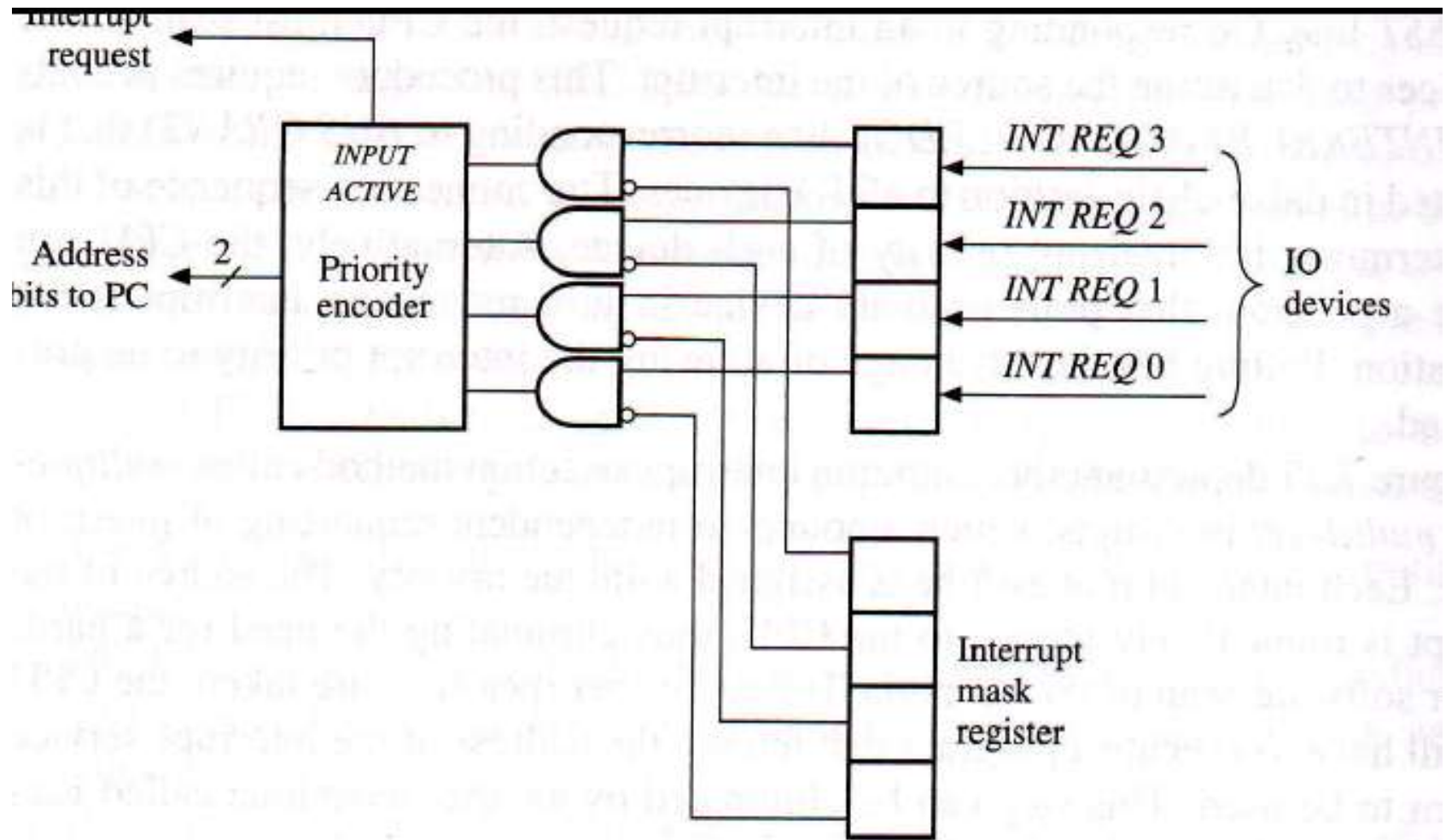
Interrupt Selection

- Daisy Chaining
- Polling
- Independent Requesting

Vectored Interrupts

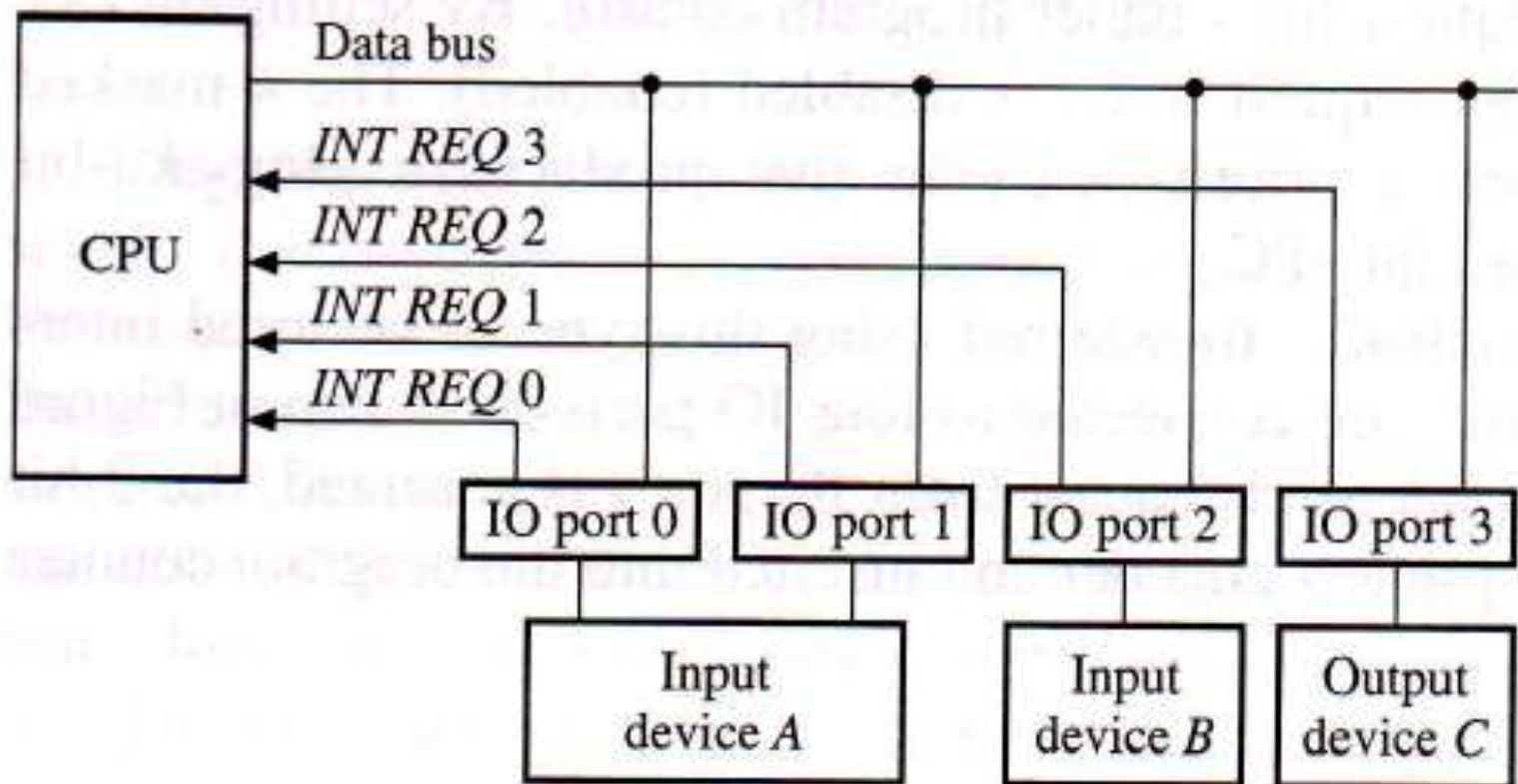
In case of Interrupt Initiated I/O, the interrupting device must supply the CPU with the starting address which is also known as interrupt vector of that program.

A Vectored Interrupt Scheme



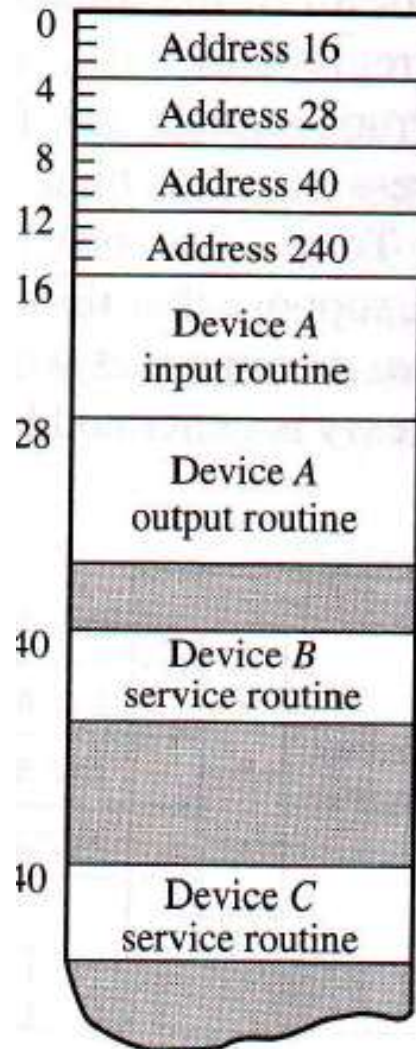
A Vectored Interrupt Scheme

Contd...

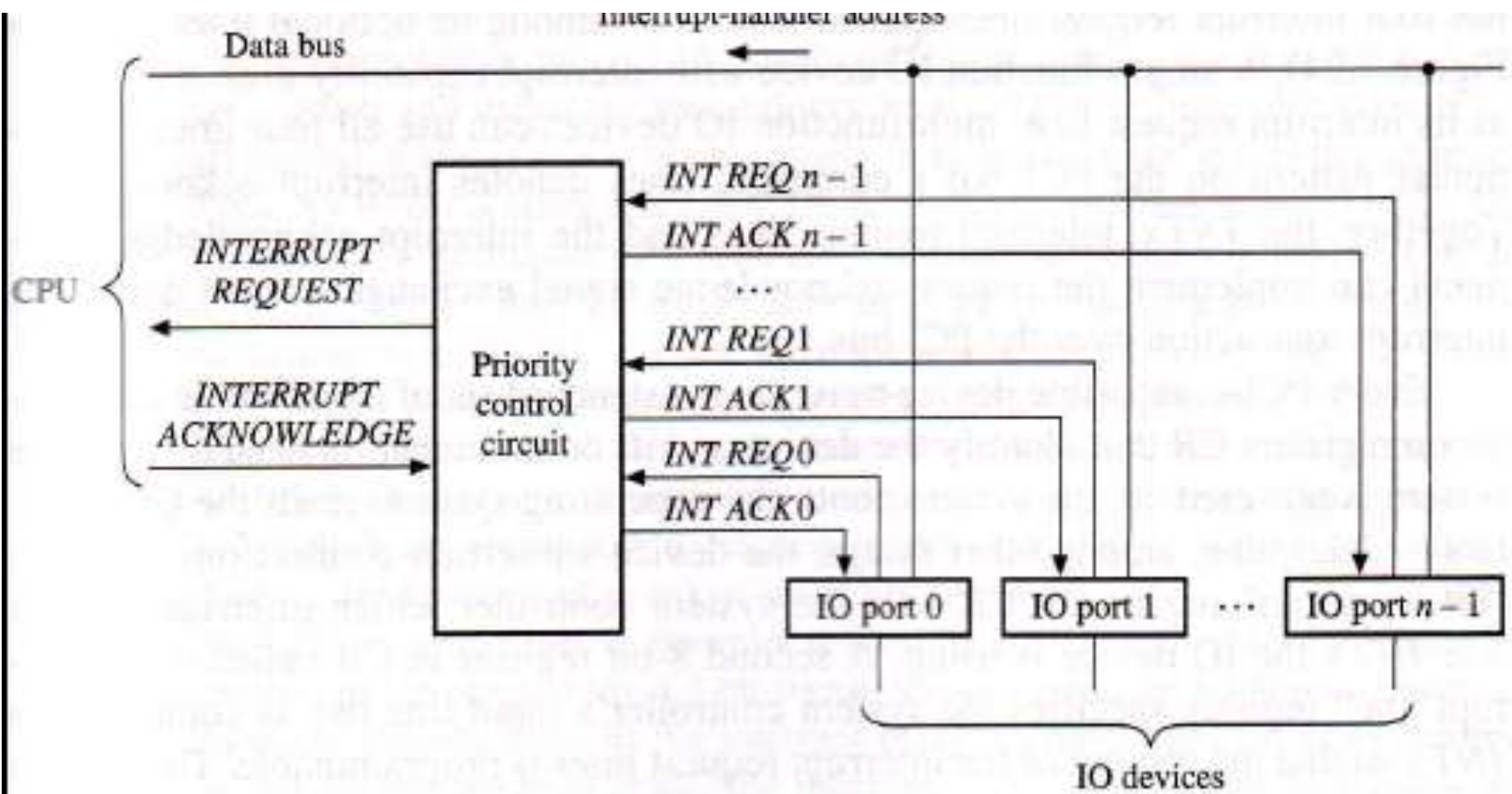


A Vectored Interrupt Scheme

Contd...

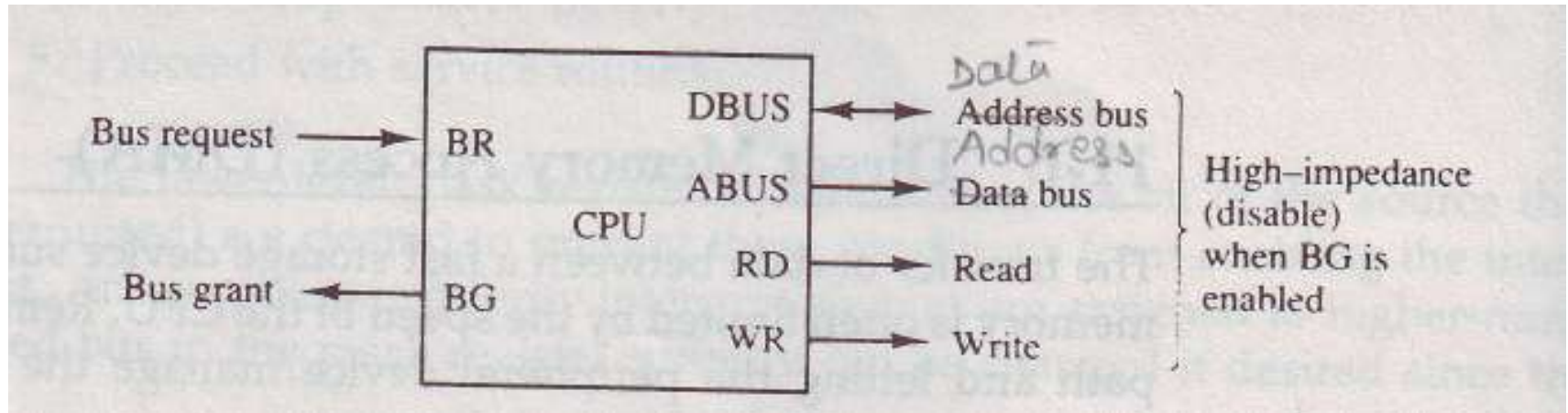


Implementation of Vectored Interrupt by Using Acknowledgement:

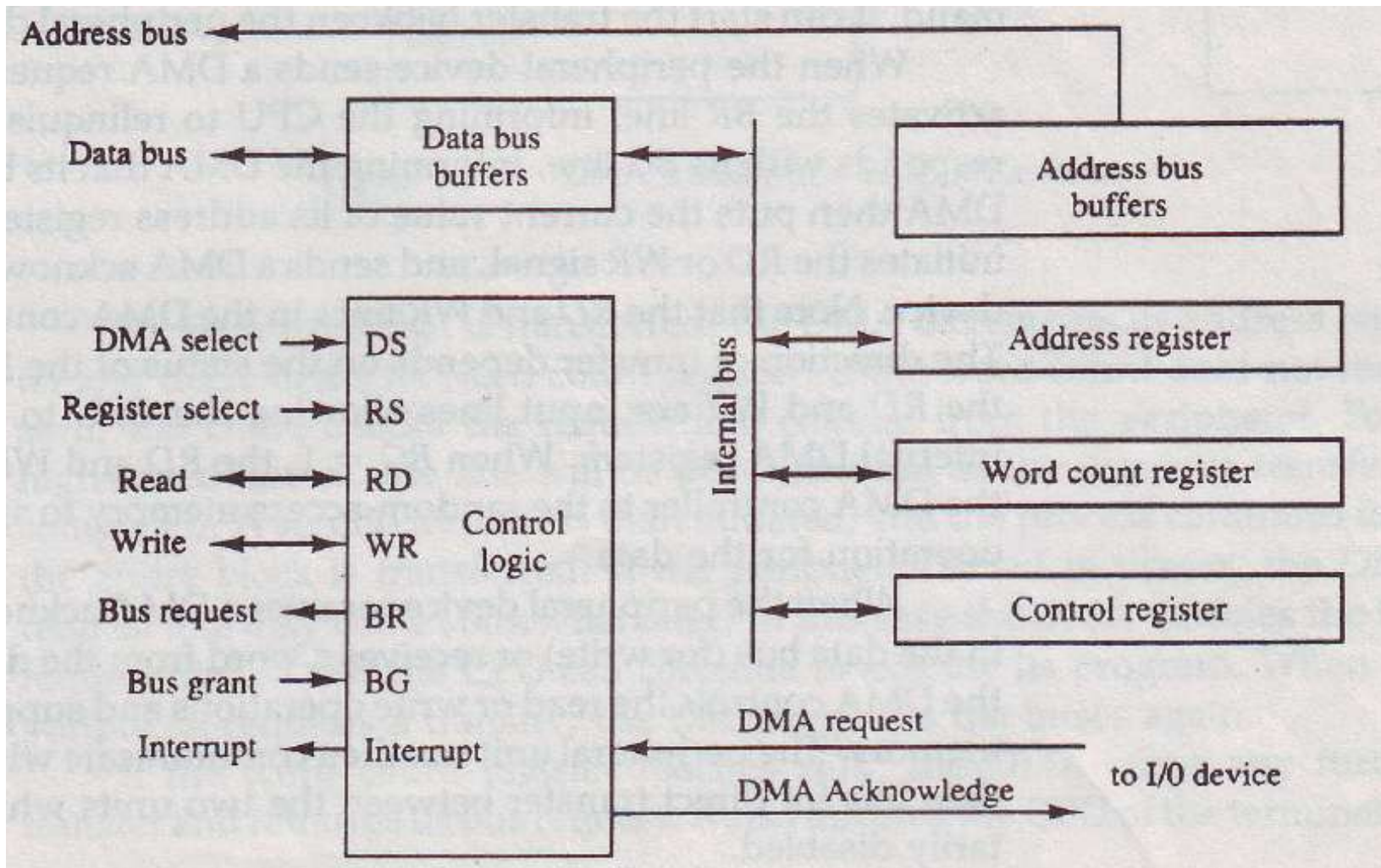


DMA (Direct Memory Access)

The transfer of data between a fast storage device such as magnetic disk and memory is often limited by the speed of the CPU. Removing CPU from the path and letting the peripheral device manage the memory buses directly would improve the speed of transfer. This transfer technique is called Direct Memory Access.



Block Diagram of DMA Controller



DMA Transfer In A Memory System

