SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION

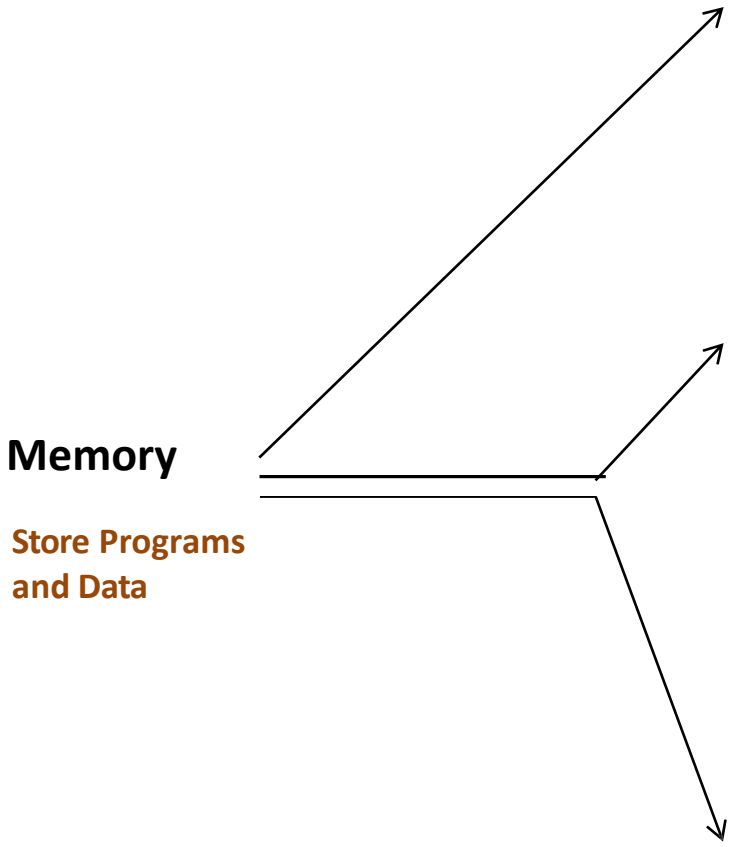
MICROPROCESSORS AND MICROCONTROLLERS ENGINEERING

II YEAR/ IV SEMESTER

UNIT II – I/O Interfacing

TOPIC – Memory and I/O Interfacing

Memory



Processor Memory

- Registers inside a microcomputer
- Store data and results temporarily
- No speed disparity
- Cost ↑

Primary or Main Memory

- Storage area which can be directly accessed by microprocessor
- Store programs and data prior to execution
- Should not have speed disparity with processor ⇒ Semi Conductor memories using CMOS technology
- ROM, EPROM, Static RAM, DRAM

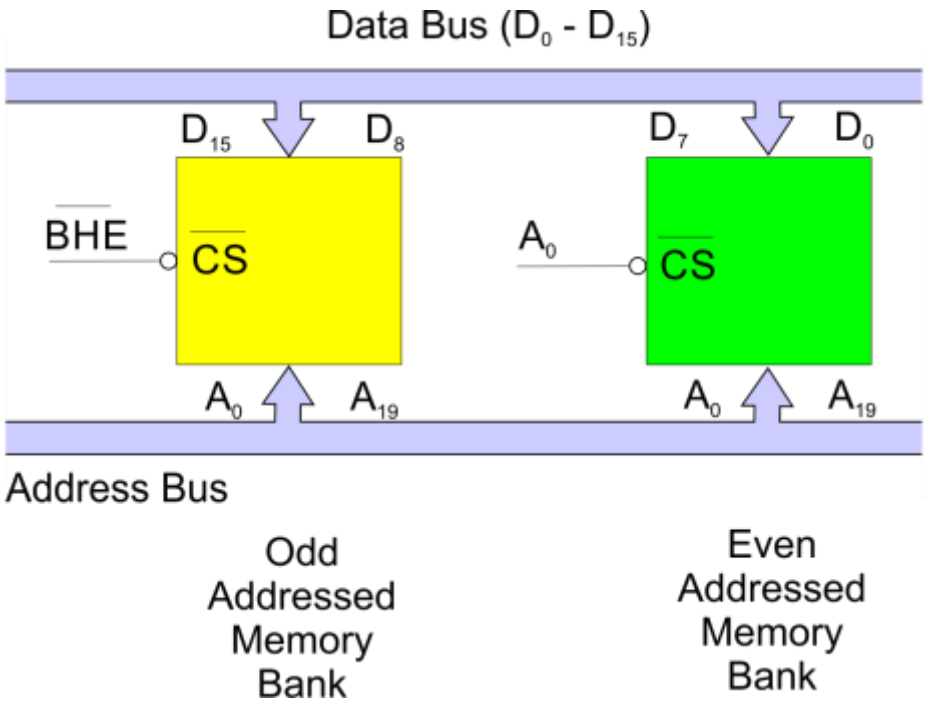
Secondary Memory

- Storage media comprising of slow devices such as magnetic tapes and disks
- Hold large data files and programs: Operating system, compilers, databases, permanent programs etc.

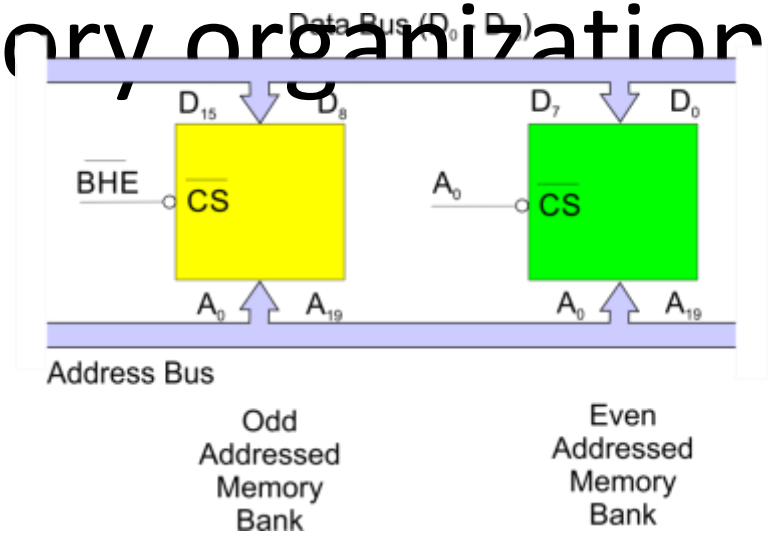
Memory organization in 8086

- Memory IC's : Byte oriented
- 8086 : 16-bit
- Word : Stored by two consecutive memory locations; for LSB and MSB
- Address of word : Address of LSB
- Bank 0 : $A_0 = 0 \Rightarrow$ Even addressed memory bank

Bank 1 : $\overline{BHE} = 0 \Rightarrow$ Odd addressed memory bank



Memory organization in 8086



	Operation	$\overline{BHE}$	A_0	Data Lines Used
1	Read/ Write byte at an even address	1	0	$D_7 – D_0$
2	Read/ Write byte at an odd address	0	1	$D_{15} – D_8$
3	Read/ Write word at an even address	0	0	$D_{15} – D_0$
4	Read/ Write word at an odd address	0	1	$D_{15} – D_0$ in first operation byte from odd bank is transferred
		1	0	$D_7 – D_0$ in first operation byte from odd bank is transferred

Memory organization in 8086

- **Available memory space = EPROM + RAM**
- **Allot equal address space in odd and even bank for both EPROM and RAM**
- **Can be implemented in two IC's (one for even and other for odd) or in multiple IC's**

Interfacing SRAM and EPROM

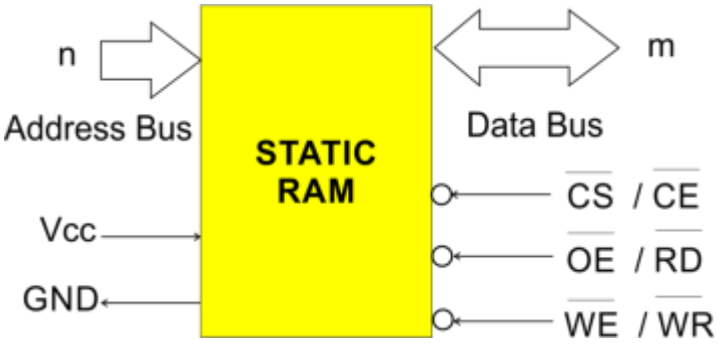
- Memory interface ⇒ Read from and write in to a set of semiconductor memory IC chip
- EPROM ⇒ Read operations
- RAM ⇒ Read and Write

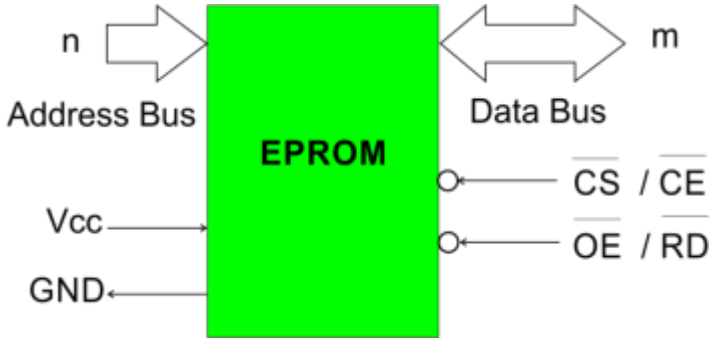
In order to perform read/ write operations,

- Memory access time < read / write time of the processor
- Chip Select (CS) signal has to be generated
- Control signals for read / write operations
- Allot address for each memory location

Interfacing SRAM and EPROM

- **Typical Semiconductor IC Chip**

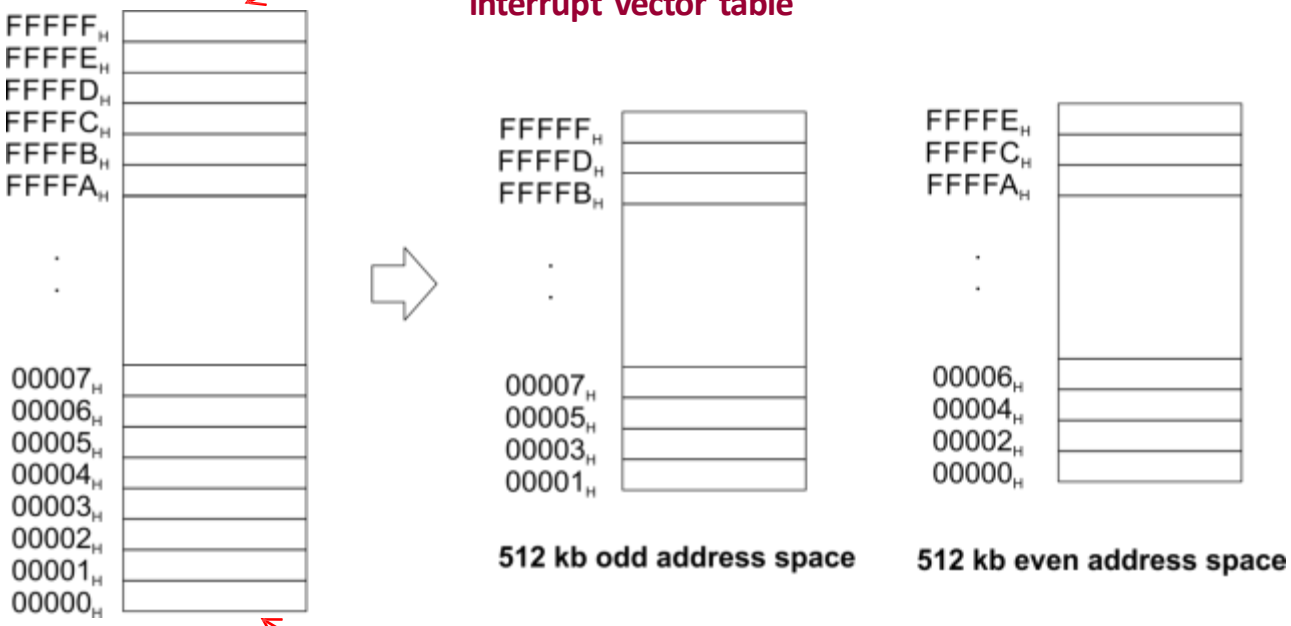




No of Address pins	Memory capacity			Range of address in hexa
	In Decimal	In kilo	In hexa	
20	2^{20}= 10,48,576	1024 k = 1M	100000	00000 to FFFFF

Interfacing SRAM and EPROM

- **Memory map of 8086**



Interfacing SRAM and EPROM

Monitor Programs

- ⇒ Programing 8279 for keyboard scanning and display refreshing
- ⇒ Programming peripheral IC's 8259, 8257, 8255, 8251, 8254 etc
- ⇒ Initialization of stack
- ⇒ Display a message on display (output)
- ⇒ Initializing interrupt vector table

Note :

8279	Programmable keyboard/ display controller
8257	DMA controller
8259	Programmable interrupt controller
8255	Programmable peripheral interface

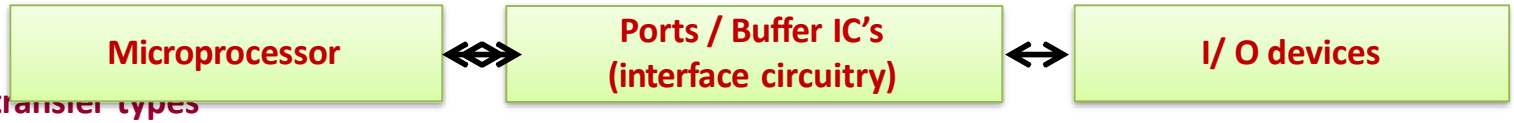
Interfacing I/O and peripheral devices

I/O devices

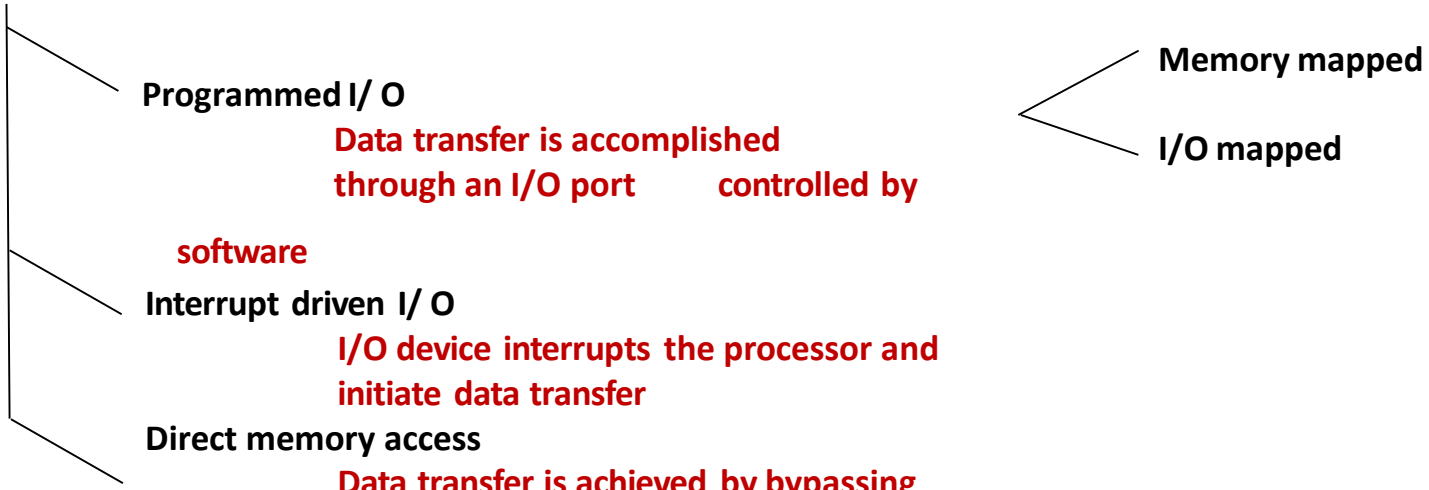
⇒ For communication between microprocessor and outside world

⇒ Keyboards, CRT displays, Printers, Compact Discs etc.

⇒



⇒ Data transfer types



8086 and 8085 comparison

Memory mapping	I/O mapping
20 bit address are provided for I/O devices	8-bit or 16-bit addresses are provided for I/O devices
The I/O ports or peripherals can be treated like memory locations and so all instructions related to memory can be used for data transmission between I/O device and processor	Only IN and OUT instructions can be used for data transfer between I/O device and processor
Data can be moved from any register to ports and vice versa	Data transfer takes place only between accumulator and ports
When memory mapping is used for I/O devices, full memory address space cannot be used for addressing memory. ⇒ Useful only for small systems where memory requirement is less	Full memory space can be used for addressing memory. ⇒ Suitable for systems which require large memory capacity
For accessing the memory mapped devices, the processor executes memory read or write cycle. ⇒ M / $\overline{IO}$ is asserted high	For accessing the I/O mapped devices, the processor executes I/O read or write cycle. ⇒ M / $\overline{IO}$ is asserted low

THANK YOU