**Memory Segmentation in 8086**

 The total memory size is divided into

segments of various sizes.

 A segment is just an area in memory.

 The process of dividing memory this

way is called Segmentation.

Memory Segmentation

 In memory, data is stored as bytes.

 Each byte has a specific address.

 Intel 8086 has 20 lines address bus.

 With 20 address lines, the memory that can

be addressed is 220 bytes.

 220 = 1,048,576 bytes (1 MB).

 8086 can access memory with address

ranging from 00000 H to FFFFF H.

Types Memory Segmentation

 In 8086, memory has four different types

of segments.

These are:

 Code Segment

 Data Segment

 Stack Segment

 Extra Segment

Segment Registers

 Each of these segments are addressed by

an address stored in corresponding

segment register in 8086.

 These registers are 16-bit in size.

 Each register stores the base address

(starting address) of the corresponding

segment.

 Because the segment registers cannot

store 20 bits, they only store the upper 16

bits.

Segment Registers

 How is a 20-bit address obtained if there are only 16-

bit registers?

 The answer lies in the next few slides.

 The 20-bit address of a byte is called its Physical

Address.

 But, it is specified as a Logical Address.

 Logical address is in the form of:

Base Address: Offset

 Offset is the displacement of the memory location

from the starting location of the segment.

Example

 The value of Data Segment Register\ (DS) is 2222 H.

 To convert this 16-bit address into 20-bit,

the BIU appends 0H to the LSBs of the address.

 After appending, the starting address of

the Data Segment becomes 22220H.

 If the data at any location has a logical address specified as:

2222 H : 0016 H

 Then, the number 0016 H is the offset.

 2222 H is the content value of DS.

 To calculate the effective address of the

memory, BIU uses the following formula:

 Effective Address = Starting Address of Segment + Offset

 To find the starting address of the segment, BIU appends the contents of

Segment Register with 0H.

 Then, it adds offset to it.

 Therefore:

 EA = 22220 H + 0016 H = 22236 H

Max. Size of Segment

 All offsets are limited to 16-bits.

 It means that the maximum size

possible for segment is 216 = 65,535 bytes (64 KB).

 The offset of the first location within the

segment is 0000 H.

 The offset of the last location in the segment is FFFF H.

Where to Look for the Offset

|  |  |  |
| --- | --- | --- |
| Segment | Offset Registers | Function |
| CS | IP | Address of the next instruction |
| DS | BX, DI, SI | Address of Data |
| SS | SP, BP | Address in stack |
| ES | BX, DI, SI | Address of the destination data  (for string operation) |

Question

 The contents of the following registers are:

 CS = 1111 H

 DS = 3333 H

 SS = 2526 H

 IP = 1232 H

 SP = 1100 H

 DI = 0020 H

 Calculate the corresponding physical addresses for

the address bytes in CS, DS and SS.

Solution

1. CS = 1111 H

 The base address of the code segment is 11110 H.

 Effective address of memory is given by 11110H + 1232H = 12342H.