MaAL

Lecture: 4
14. Sep
Theory

8086 Family:

Multitasking:

→ Ability to execute several programs/tasks at the same time.

Memory Protective:

→ The ability to protect the memory used by one program from the actions of another program

Virtual Memory:

→ Treating the external storage i.e, disk as if it were physical memory

→ In real address mode 80286 behaves like 8086 and programs for 8086 can be executed without modification.

→ In protected virtual address mode also called protected mode, the 80286 supports multitasking and memory protection.

→ The 80286 can address 16MB of physical memory in protected mode whereas in protected virtual address mode it can

treat external storage as if it were physical memory and execute program up to 1GB.

Address Registers:

→ A typical address registers store addresses of instructions and data in memory. These values are used by the processor to access the memory.

→ A memory is a collection of bytes. Each memory byte has an address starting with 0.

→ The 8086 processor assigns a 20-bit physical address to its memory locations and it is possible to address 1MB of memory.

For example:

00000h
00001h
00002h
00003h
00009h
0000Ah
.....
FFFFFh

Memory Segments:

→ How typical 20-bit address fits in a 16-bit register?

→ The 8086 gets around this problem by partitioning its memory into segments.

→ A memory segment is a block of 64k (2^{16}) consecutive memory bytes.

→ Each segment is identified by a segment number starting with 0.

→ A segment number is 16 bits so the highest segment number is FFFFh.

→ Within a segments memory location is specified by giving an offset. This is the number of bytes from the beginning of the segment.

→ For a 64KB segment, the offset can be given as a 16-bit number. The first byte in a segment has offset 0. The last offset in a segment is FFFFh.

→ A memory location may be specified by providing a segment number and an offset having form.
Segment : offset.

→ This is known as logical address.

For example: A4FB : 4872h means offset 4872h within segment A4FBh

→ To obtain a 20-bit physical address, the 8086 microprocessor first multiplies the segment address by 10 and then adds the offset.

→ A4FB × 10 = A4FB0h + 4872h = A9822h

[B+7 = 11+7 = 18 = 16+2 = Carry+2]

[F+8+Carry = 15+8+1 = 24 = 16+8 = Carry+8]

[4+4+Carry = 4+4+1 = 9 = 8+1 = 9]

[A+0=A].

Address Registers:

→ A typical machine language program consists of instructions (code) and data.

→ A data structure called the stack used by the processor to implement procedure calls.

→ The programs code, data, and stack are loaded into different memory segments (code segment, data segment, and stack segment).

→ Address registers can be subdivided into:

- → Segment registers
- → Pointer registers
- → Index registers

Segment Registers:

→ 8086 uses segment registers to keep track of different program segments. Segment registers hold segment numbers.

- **Code Segment (CS)**
  → holds the code segment number.
- **Data Segment (DS)**
  → holds the data segment number.
- **Stack Segment (SS)**
  → holds the stack segment number.
- **Extra Segment (ES)**
  → holds the additional segment number.