Interrupts & Interrupt Routines

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What is an Interrupt?

- It is some times necessary to have the computer automatically execute one of a collection of special routines whenever certain conditions exist within a program or the computer system. The action that prompts the execution of one of these routines is called an interrupt and the routine is known as an interrupt service routine
- ***Dictionary meaning*:- "to break the sequence of operations"**

- Nested interrupts
- Multiple interrupt processing capability
- Maskable, non maskable
- NMI,INTR(256 types)
- If more INTR occurs at a time - Programmable Interrupt Controller is used

Types of Interrupt

- Internal
- That are initiated by the state of the CPU or by an instruction. Eg: division by zero

- External
- That are caused by a signal being send to the CPU from elsewhere in the computer system. Eg:- Printer error

Interrupt Cycle

- The actions that result from an interrupt are same (Interrupt sequence) regard less of the type.
- Suppose an interrupt occurred at NMI or INTR pin, while cpu executing an instruction.
- Completes instruction
- Updates IP
- Acknowledges the request immediately if it is NMI,trap or div by zero , INTR request ack depends on IF.

Interrupt Cycle

- After acknowledging cpu computes vector address from the type specified.
- Type supplied internally or externally
- Push IP,CS,PSW
- IF clears
- Loads vector address.
- Starts ISR routine.
- At IRET pop operation

How address of ISR is obtained?

- vector table at location 0000:0000
- 1024 bytes (256*4)
- N*4 address of the location in vector table where the address of ISR is stored.
- Diagram1
- Diagram 2

Non Maskable interrupt

- **NMI** – highest priority among external interrupts
- **Trap** is an internal interrupt having the highest priority among all interrupts except **divide by zero**
- NMI pin interruption is equivalent to INT 02h
- The NMI pin should remain high for atleast 2 clock cycles.

Maskable interrupt(INTR)

- Low priority compared to NMI
- IF and INTR
- 2 INTA signals
  - First to make the controller ready
  - Second to indicate the controller to place the type of interrupt.
  - Type remains there for 2 clock cycles

Interrupt programming