**Interrupts**

**In early years of computing, processor has to wait for the signal for processing. So, processor has to check each and every hardware and software program in the system if it has any signal to process. This method of checking the signal in the system for processing is called Polling Method. In this method, the problem is that the processor has to waste number of clock cycles just for checking the signal in the system, by this, processor will become busy unnecessarily. If any signal came for the process, processor will take some time to process the signal due to the polling process in action. So, system performance also be degraded and response time of the system will also decrease.**

**So, to overcome this problem, engineers introduced a new mechanism. In this mechanism processor will not check for any signal from hardware or software but instead hardware/software will only send the signal to the processor for processing. The signal from hardware or software should have highest priority because processor should leave the current process and process the signal of hardware or software. This mechanism of processing the signal is called Interrupt of the system.**

**What is an Interrupt?**

**Interrupt is a signal which has highest priority from hardware or software which processor should process its signal immediately.**

**Types of Interrupts:**

**Although interrupts have highest priority than other signals, there are many type of interrupts but basic type of interrupts are**

**Hardware Interrupts:**

**If the signal for the processor is from external device or hardware is called hardware interrupts. Example: from keyboard we will press the key to do some action this pressing of key in keyboard will generate a signal which is given to the processor to do action, such interrupts are called hardware interrupts. Hardware interrupts can be classified into two types. They are**

**Maskable Interrupt: The hardware interrupts which can be delayed when a much highest priority interrupt has occurred to the processor.**

**Non Maskable Interrupt: The hardware interrupt which cannot be delayed and should process by the processor immediately.**

**Software Interrupts:**

**Software interrupt can also divide into two types. They are**

**Normal Interrupts: The interrupts which are caused by the software instructions are called normal interrupts.**

**Exception: Unplanned interrupts while executing a program is called Exception. For example: while executing a program if we got a value which should be divided by zero is called an exception.**

**Interrupt Handling**

**We know that instruction cycle consists of fetch, decode, execute and read/write functions. After every instruction cycle the processor will check for interrupts to be processed if there is no interrupt is present in the system it will go for the next instruction cycle which is given by the instruction register.**

**If there is an interrupt present then it will trigger the interrupt handler, the handler will stop the present instruction which is processing and save its configuration in a register and load the program counter of the interrupt from a location which is given by the interrupt vector table. After processing the interrupt by the processor interrupt handler will load the previous instruction and its configuration from the saved register, processor will continue its processing where it is left. This saving the old instruction processing configuration and loading the new interrupt configuration is also called as context switching.**

**The interrupt handler is also called as Interrupt service routine (ISR). In a typical application a number of I/O devices are attached to the computer, with each device being able to originate an interrupt request. The first task of the interrupt system is to identify the source of the interrupt.**

**Priority Interrupt**

**A priority interrupt is a system that establishes a priority over the various sources to determine which condition is to be serviced first when two or more requests arrive simultaneously.**

**Devices with high-speed transfers such as magnetic disks are given high priority and slow devices such as keyboards receive low priority.**

**When two devices interrupt the computer at the same time, the computer services the device, with the higher priority first.**

**Establishing the priority of simultaneous interrupts can be done by software or hardware. A polling procedure is used to identify the highest priority source by means of software.**

**Software priority interrupt**

**In this polling method there is one common branch address for all interrupts. The program that takes care of interrupts begins at the branch address and polls the interrupt sources in sequence.**

**The order in which they are tested determines the priority of each interrupt.**

**The highest-priority source is tested first, and if its interrupt signal is on, control branches to a service routine for this source. Otherwise, the next-lower-priority source is tested and so on.**

**The particular service routine reached belongs to the highest priority device among all devices that interrupted the computer.**

**The disadvantage of the software method is that if there are many interrupts, the time required to poll them can exceed the time available to service the I/O device.**

**In this situation hardware priority-interrupt unit can be used to speed up the operation.**

**Hardware priority interrupt**

**Hardware priority interrupt unit functions as an overall manager in an interrupt system environment. It accepts interrupt requests from many sources, determines which of the incoming requests has the highest priority, and issues an interrupt request to the computer based on this determination.**

**To speed up the operation, each interrupt source has its own interrupt vector to access its own service routine directly.**