Homework-1 CS-149

Homework format: Use the same document and answer the problems. Answer the problem after each problem statement.

1) The interrupt request of a device is connected to IR-7 of a slave 8259 and another device interrupt request is at IR-3 of Master 8259 within the PC architecture. Which device has a higher interrupt priority and what is your reason?

**Answer:**

The device connected to IR-7 of the slave 8259 has a higher interrupt priority than the device connected to IR-3 of the master 8259. This is because the slave 8259 connects to the master 8259 in the 3rd slot in this particular architecture, aka IR-2. If both 8259s have 8 slots, then the priority would be Master IR-0 > Master IR-1 > Slave IR-0 > Slave IR-1 > Slave IR-2 > Slave IR-3 > Slave IR-4 > Slave IR-5 > Slave IR-6 > Slave IR-7 > Master IR-3 > Master IR-4 > Master IR-5 > Master IR-6 > Master IR-7 .



**Answer:**

Modern Operating Systems are based on interrupts. An interrupt's purpose is to alert the CPU of events that require attention, and allow for transfer of control from one device to another. This allows for sharing of the CPU resources among all programs and devices and provides a way for interconnected devices to communicate with the CPU to let it know when the device has finished it's process.

Interrupts can be generated from hardware or software. A trap is a software interrupt. Thus, generally speaking, an interrrupt is hardware related, whereas a trap is software related. A trap also signals when the mode is being changed from user mode to kernal mode. a trap can be intentionally generated in the form of a system call. System calls are part of the operating system, and thus must be performed in kernal mode. When a user program needs a process to be completed that is controlled by the OS, it requests a system call.



**Answer:**

a) device requests access to the bus (address, data, and control) via a specific control signal. In the intel architecture, the DMA 8237 chip sends an HRQ signal to the CPU. When the CPU detects this control flag, it relinquishes control to the bus to the device. Once the device gains control of the bus, it can perform its I/O operation.

b) Once the device has completed it's memory operation, it emits a signal back to the CPU in the form of an interrupt. This interrupt signal is detected by the CPU durings its normal processing workflow.

c) relinquishing control of memory and DIsk I/O to DMA can interfere with user programs. WHile DMA has control of memory and Disk I/O, user programs cannot access these resources. Thus these processes will have to wait for DMA to finish its process before it can finish.



**Answer:**

slowest: f. magnetic tapes

c. Optical disk

a. Hard-disk drives

e. Non-volatile memory

d. Main memory

g. Cache

fastest: b. Registers