End of Chapter 9 Exercises

Due on July 14th, 2019
Computer Organization & Programming
CS550WS—Summer I
Ed Banduk

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Problem 9.7. What is polling used for? What are the disadvantages of polling? What is a better way to perform the same job?

Solution

Polling is when a program uses programmed input-output (I/O) to determine the status of an I/O device by sending out requests. The I/O device returns a word description of the requested information in a message and must be frequently checked by the CPU so there is no lost data that is awaiting transfer. This is the disadvantage of polling since a CPU might waste processing power and time polling devices. A better alternative is using interrupts.

Englander, I. (2014). *The architecture of computer hardware, systems software, & networking: An information technology approach* (Fifth ed.). Hoboken, NJ: John Wiley & Sons.

Problem 9.12. In general, what purpose does an interrupt serve? Stated another way, suppose there were no interrupts provided in a computer. What capabilities would be lost?

Solution

An interrupt occurs as a notification to the CPU when a device needs action or attention from it. Interrupts allow the CPU to run and focus on processing tasks until it is disturbed by one. Without interrupts, the CPU would be required to poll the various devices frequently to check for external events at risk of losing data like keys being struck, power failure messages, or illegal instruction warnings. Polling on the other hand is expensive on the CPU since it has to constantly and periodically check all I/O devices instead of focusing on processing.

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Problem Calculation. If my CPU runs at 4.0GHz, and on average takes 10 clock cycles to complete an instruction, how many instructions will be completed in the time it takes to type:

"MY CPU IS RUNNING NOW"

Assume it takes 5 seconds to type the message. Show your work and how you arrived at the solution.

Solution

$$4,000,000,000\frac{\text{cycles}}{\text{second}} \times \frac{1 \text{ instruction}}{10 \text{ cycles}} \times 5 \text{ seconds} = 2,000,000,000 \text{ instructions}$$