

GS1018 – SISTEMAS OPERACIONAIS

Operating Systems – William Stallings – 7th Edition Chapter 01 – Computer System Overview

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REVIEW QUESTIONS

- 1.3. In general terms, what are the four distinct actions that a machine instruction can specify?
- 1.5. How are multiple interrupts dealt with?
- 1.8. What is the difference between a multiprocessor and a multicore system?
- 1.9. What is the distinction between spatial locality and temporal locality?

PROBLEMS

1.1. Suppose the hypothetical processor of Figure 1.3 also has two I/O instructions: a) 0011 # Load AC from I/O; b) 0111 # Store AC to I/O. In these cases, the 12-bit address identifies a particular external device. Show the program execution (using format of Figure 1.4) for the following program:

- 1. Load AC from device 5.
- 2. Add contents of memory location 940.
- 3. Store AC to device 6.

Assume that the next value retrieved from device 5 is 3 and that location 940 contains a value of 2.

1.3. Consider a hypothetical 32-bit microprocessor having 32-bit instructions composed of two fields. The first byte contains the opcode and the remainder an immediate operand or an operand address.

- a. What is the maximum directly addressable memory capacity (in bytes)?
- b. Discuss the impact on the system speed if the microprocessor bus has
 - 1. a 32-bit local address bus and a 16-bit local data bus, or
 - 2. a 16-bit local address bus and a 16-bit local data bus.

1.7. In virtually all systems that include DMA modules, DMA access to main memory is given higher priority than processor access to main memory. Why?

1.8. A DMA module is transferring characters to main memory from an external device transmitting at 9600 bits per second (bps). The processor can fetch instructions at the rate of 1 million instructions per second. By how much will the processor be slowed down due to the DMA activity ?

1.10. Consider the following code:

```
for (i # 0; i # 20; i++)  
    for (j # 0; j # 10; j++)  
        a[i] # a[i] * j
```

- a. Give one example of the spatial locality in the code.
- b. Give one example of the temporal locality in the code.

1.13. A computer has a cache, main memory, and a disk used for virtual memory. If a referenced word is in the cache, 20 ns are required to access it. If it is in main memory but not in the cache, 60 ns are needed to load it into the cache (this includes the time to originally check the cache), and then the reference is started again. If the word is not in main memory, 12 ms are required to fetch the word from disk, followed by 60 ns to copy it to the cache, and then the reference is started again. The cache hit ratio is 0.9 and the main-memory hit ratio is 0.6. What is the average time in ns required to access a referenced word on this system?