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COP4600

HW5.1

2. Given the speeds listed in Fig. 5-1, it is possible to scan documents from a scanner and transmit them over an 802.11g network at full speed because the wireless speed is 6.75 MB/sec while scanner output max speed is at 1 MB/sec. Thus, the scanner can transmit over an 802.11g network at full speed.

5. DMA controller has 5 channels. Request/Response time = 40 nsec

Total time = Request time + Response time = 40 nsec + 40 nsec = 80 nsec

* 8 million transactions/sec

The speed of the DMA bus to run to avoid being a bottleneck would be 4 byte per 80 nsec as the number of channels in the DMA controller doesn’t matter.

8. R/W time = 5 nsec, both time = 10 nsec

Interrupt of (32 CPU registers+PC+PSW) \* both time = 340 nsec

1 interrupt/340 nsec \* 10^9 nsec/1 sec=> 2.94 million interrupt per sec

Maximum number of interrupts per second this machine can process is 2.94 million.

11. This machine have precise interrupts as the condition includes the PC to point to the first instruction but not fetched where all instructions before is to be executed and the instruction points to and its successors that have not been executed.

12. Text contains 50 lines of 80 characters each. Print 6 pages per minute.

Interrupt that takes 50 μsec all-in to service.

Prints time = 50×80×6=24000 characters/min => 400 characters/sec

Interrupt overhead = 20 msec

Each character has an interrupt that takes 50 usec, 2 % of the total time. Then it makes sense to use interrupt driven I/O

13. In the OS there is a table with a list of device number containing pointers. To install a new device, a new entry is made in the table with pointers created to the new device driver.

15. Each interrupt takes 1 msec, that packets are 1024 bytes and that copying a byte takes 1μsec.

Network rate = 10 megabits/sec

2\*Interrupt time + 4\*copy time + transmission time = 2msec + 4msec +6.93msec per 1024 bytes

* 147763 bytes/sec

The maximum rate at which one process can pump data to another is 147763 bytes/sec.

17. 7200-RPM disk with 200 sectors of 512 bytes each on each track. seek time = 1 msec

7200RPM \* 1min/60sec = 120RPS

=> 1 rotation = 1sec/120rotations \* 1000msec/1sec = 1000/120 msec.

(1000/120 msec) / 200 sectors = 1/24msec. 24 sectors per msec,

Cylinder skew should be 24.

18. Disk rotates at 7200 RPM, has 500 sectors of 512 bytes.

7200RPM \* 1min/60sec = 120RPS

=> 1 rotation = 1sec/120rotations \* 1000msec/1sec = 1000/120 msec.

(1000/120 msec) / 500 sectors = 16.67usec.

19. The disk has 500×512 bytes passing under its head = 256,000 bytes per rotation. The maximum data rate in bytes/sec is 256,000 bytes per rotation\*60\*2= 30,720,000 bytes/sec.

21. The probability of a k-drive RAID failing in a given hour 1−P0−P1=1− (1−p)k −kp(1−p)k−1.