LIS 506: Introduction to Information Technologies

Assignment 1

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Assignment Objective
This assignment is designed to provide an opportunity to get deeper understanding of basic concepts of computing and computer and use the concepts to solve real life problems.

Course Objective addressed by the Assignment
• Be familiar with fundamental concepts, techniques and issues in information processing and management.

LIS Program Objectives addressed by the Assignment
• Graduates demonstrate an understanding of the domain knowledge and a mastery of skills required in diverse information environments.

Assignment Instruction
First, let’s look at a detailed specification for a Dell Inspiron 15R Non-Touch laptop:

CPU: 4th Generation Intel Core i5-4200U processor (2 cores, up to 2.6GHz, 3MB Cache)
RAM: 8GB Dual Channel DDR3 at 1600MHz
Hard drive: 500GB, 5400 RPM, 10ms access time
Operating System: Windows 8, 64-bit

Please answer the next four questions:

1. (25 points) If you buy some 4.7GB write-once DVD-R disks that can be written by the DVD+/RW drive, how many disks would you need to buy to back up a full hard drive once (assume no compression)? At 30 cents per DVD-R disk, how much would a full backup cost? At 10 minutes per DVD-R disk, how long would a full backup take?

2. (25 points) Now, let’s see how much stuff that hard drive can hold. Assume you have access to the following information stored for all 3.8 million print volumes of UB library collection:

\[ \frac{500\text{GB}}{4.7\text{GB}} = 106.38 \text{ disks} \]

You would need \(107\) \(\text{DVD-R disks}\) for a full hard drive back up

\[ 107 \times 0.30 = \$32.10 \] is the cost for full back up

\[ 107 \times 10\text{mins} = 1070\text{ mins} = 17.83\text{ hours} \]
and that each character is stored in one byte.

Would all of this data fit on the hard drive of the computer described above? If not, how big a hard drive would you need? If so, what fraction of the disk would this fill? 

$$\frac{1,786,000,000}{500} = 3,572 = 0.36\%$$

3. (25 points) Now let's see how long it would take to read that much data off the disk. Assume that you access the data in a random order, and that you start a new disk access for each volume. How long would it take to get all materials published in 2012 (for each volume, check if the publication year equal to 2012)? Could this be done in a second? In a minute? In an hour? In a day? In a month? In a year?

4. (25 points) Assume for the sake of comparison that all of this data fit in RAM. How long would it take the processor to perform 3.8 million comparisons if it can perform one comparison instruction for every two clock cycles (this means that at the best performance, the 2.6 GHz processor can process 1,300 Million (this) Instruction per second (MIPS) because 2.6 GHz (2,600 million cycles) should be divided by 2)? Could this be done in a second? In a minute? In an hour? In a day? In a month? In a year? Note for this question, you are not required to calculate the time for transferring the data from RAM to CPU. Also note that 2 Cores processor has two CPUs.

Partial credit may be awarded for an incorrect answer if you show your work.

$$3,800,000 \text{ volumes} \times 0.01 \text{ sec} = 38,000 \text{ sec}$$

$$38,000 \text{ sec} \div 60 = 633.\overline{3} \text{ mins}$$

$$633.\overline{3} \text{ mins} \div 60 = 10.55 \text{ hours}$$

$$\frac{2.6 \text{ GHz} (2,600 \text{ million cycles/sec})}{2} = 1.3 \text{ GHz (1,300 million cycles/sec)}$$

$$3,800,000 \text{ comparisons} \div 1,300,000 = 2.923 \text{ ms} = 2.92 \text{ ms}$$

Yes, this can be processed in less than a second.