

1. Airborne Express provides a number of services to its customers in addition to next-day delivery. One of these services is called “Stock Exchange”. The following is a description of this service taken from their web site.

The Stock Exchange offers a strategically located distribution center with immediate access to Airborne's express delivery system. Your customers can order parts as late as 2:00 a.m. EST for delivery later that same morning. Create your own centralized warehousing and distribution operation, let our consultants go to work for you. Ready-to-occupy or build-to-suit warehouse space is available.

Describe how this service impacts efficiency and effectiveness.

2. For secondary storage devices, what is “access time” and what is “transfer rate”? Assume you could increase one or the other factor (but not both). What kinds of applications would benefit from faster access time and what kinds of applications would benefit from faster transfer rates?
3. Assume that you have a file that is 4.5 megabytes in size. You want to transfer this file from your home computer to your Dante account. Assume that your modem is rated at 28.8 Kbps and you are using asynchronous transmission. Also assume that the modem is achieving the 28.8 Kbps speed and that there is no special compression taking place during transmission.

Given this information, how long would it take to transmit the file? Provide your answer in seconds. Show your work.

4. For each of the following scenarios, classify them as either “client/server” or “not client/server”. Briefly justify your answer.
 - a. A firm performs its entire payroll process at its headquarters location. At this location, a single computer system is utilized. This computer supports both data storage and data entry via dumb terminals. There is also a high-speed laser printer that is used to print paychecks or vouchers. After payroll is completed, magnetic tape cartridges are sent via courier to area banks for direct deposit processing.
 - b. A manufacturing company uses computers to support product design. For this activity, engineers use high-powered workstations that display complex drawings. The data for these drawings is stored and managed on several large mainframe computers. When a change is made in any drawing, a supercomputer is used to verify that the change does not conflict with any of the other drawings.
 - c. Consider the scenario in part “a” above except the firm uses a computer network, not a courier, to transmit direct deposit information to local banks.

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- d. A bank uses a system to support its tellers. Customer records are stored and maintained on a single mainframe computer located in the corporate headquarters. This mainframe also runs the teller support system. At the branch banks, tellers use “dumb” terminals to enter transactions and display customer information. These terminals are connected to the mainframe using a communications network.
5. In class RealVideo was demonstrated by showing a live feed of the FOX News Channel. What fundamental Internet technology makes it very difficult to show live video like the demonstration? Explain. (You do not need to fill up this whole page to get full credit!)
 6. Consider the following statement:

Programs written in the Java programming language are translated into what is called “byte code”. Byte code is like machine language except it is designed around a nonexistent, hypothetical machine. In order for the byte code to be executed, another program, called a Java Virtual Machine (VM), interprets the byte code. There are many Java VMs available but they all understand the same set of byte code. Both the Netscape Navigator browser and the Internet Explorer browser include a Java Virtual Machine.

 - a. Is Java object code or source code? Explain.
 - b. Can the byte code created from a Java program likely execute using Netscape’s Navigator on a Macintosh as well as using Microsoft’s Internet Explorer on a Windows machine? Explain.
 7. Identify each of the following statements as either True (T) or False (F). If you select False, explain why it is False.
 - a. Business users should try to purchase object code, not source code, when they purchase applications software.
 - b. Programming in a low-level language requires more specialized skill and knowledge than programming in a non-procedural language.
 - c. It is generally considered not legal for a software firm to exclude the implied warranties provided in the Uniform Commercial Code when a business purchases software from the software firm.
 - d. An operating system that supports multitasking must have at least two central processing units.

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8. In an in-class demonstration, the number 0.01 was repeatedly added to a running total. After doing this many times, the sum was 0.5499992 when it should have been 0.55. Explain this situation. What can be done to reduce the likelihood of this occurring?
9. Storing an image for a video display often requires special storage (video RAM). Assume that you want to display color images on a monitor with 800 pixels horizontally and 600 pixels vertically where each pixel can represent one of over 16 million colors. This means that each pixel requires 24 bits of RAM. Using this information, determine how much video RAM would be needed in the computer. Provide your answer in bytes.
10. Assume that you just purchased some new software for your computer. This software requires a large amount of RAM in order to run. After you install the software, you discover that it is very slow because of the memory requirements. Given this information, select (and justify) from the options below the one that would have the best chance of improving performance of the software.
 - a. Purchase some virtual memory.
 - b. Delete some unused software from your hard disk.
 - c. Buy more RAM.
 - d. Upgrade your CPU with a new one that has more cycles per second.
 - e. Replace all your source code with object code.

Suggested Answers

1. Any answer should clearly show an applied understanding of the terms efficiency and effectiveness. An example of effectiveness is the fact that a company's customers can request parts very late into the night and still get them in the morning. This is a service customers would clearly like and that's the essence of effectiveness.

Efficiency might be improved because instead of having several regional distribution centers around the country in order to provide fast service to customers, one central distribution center can provide the same level of service. Hopefully this one distribution center would be less costly than several regional ones. Thus, the same level of service could be provided for less cost.

2. Access time is the time it takes to locate the data on the storage device in preparation for sending it to the CPU. Transfer rate the speed that the data moves from the secondary storage device.

Increasing the access time would help if you access small amount of data many times. Thus, the access time becomes the dominant factor. If you make few accesses to large quantities of data, then transfer rate becomes the important factor.

3. Because asynchronous transmission is being used, each byte of the original file requires 10 bits (8 bits of data plus a start and stop bit). The total number of bits to be transmitted is 45,000,000. The data is transmitted at a rate of 28,800 bits per second so the total transmission time is 1,562.5 seconds.
4. (a) This is **not** client/server. All tasks (data management, application logic, and presentation) are being performed on the single central computer. (b) This is an example of client/server. The mainframes are doing data management, the workstations are doing presentation, and the supercomputer is doing part of the application processing. (c) This is still **not** client/server. Replacing the courier with a network connection does not change the fact that all payroll tasks are performed on the same central computer. (d) This is **not** client/server. The only computer in the scenario is the mainframe located at headquarters so by definition all processing tasks have to be taking place on a single computer.
5. The technology that causes problems is packet switching. This causes problems because the stream of data that represents the video is broken down into small packets and sent to the destination by a number of different routes. It is difficult (and impossible) to ensure that all packets will arrive at their destination on time and in the correct order to reconstruct the video.
6. (a) Java is source code. It is the code the programmer writes in. (b) The same Java program should be able to run in either browser. Since they both contain a VM, they should be able to interpret the byte code.

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7. (a) False. Object code cannot be modified by the end user and thus is not a good choice if the source code is available (which is unlikely). (b) True (c) False. It is legal for software vendors to exclude the implied warranties for business purchasers. (d) False. Multitasking means two or more tasks (programs) are running concurrently on the same CPU.
8. The problem was the decimal number 0.01 was converted to a binary number and this conversion was not precise. One way to reduce the likelihood of this type of error is to use more bits to represent the number in its internal binary representation.
9. The total number of pixels for the monitor is 480,000 (800 x 600). Since each pixel requires 24 bits, the total number of bits is 11,520,000 (480,000 x 24). Thus, the total number of bytes needed to store the image in video RAM is 1,400,000 (11,520,000 / 8).
10. You need to find a solution that will allow more of the software to reside in RAM and not have to be moved between RAM and disk. The best solution for this problem is (c), buy more RAM. You cannot purchase “virtual memory” so (a) is not a good answer. Deleting files from the hard drive (b) does not help. Upgrading your CPU (d) does not make the data move faster between RAM and the disk. Finally, replacing source code with object code (e) has no impact on the problem and is also probably not possible.