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Homework One

1. From a computing perspective, explain the difference between a personal computer, embedded computer, server, and supercomputer. Provide examples of each system. Are there any similarities between these systems? You may have to do some research for this question. [10]

A personal computer is designed to be used by an individual for general purposes. These computers can run a wide variety of software. These devices are subject to a cost-performance tradeoff but generally offer good performance at a lower cost than other devices. Examples of PCs include personal laptops and desktop computers.

An embedded computer is a computer that is a component of another device. They are designed to run one application or related applications. Because of their specialization in a specific task, they span the widest range of applications and performance. Examples of embedded computers include microprocessors in vehicles and computers in television sets.

A server computer is a computer used for running large programs for multiple users and is typically accessed via a network. Server computers have high capacity, performance, and reliability. These devices can range in size from small servers to building-building sized. Due to their variability, they span the widest range in cost and capability. Low-end servers could be as simple as a desktop without a screen or keyboard. These lower-end servers are often just used for

file storage or small business applications. On the other end, server computers could be supercomputers.

Supercomputers have the highest performance and cost of the four types. They are used for high-end scientific and engineering calculations and are configured as servers. These computers are made up of over 100,000 processors and many terabytes in memory. The costs of these computers can be upwards of one hundred million dollars. Examples of supercomputer usage can be weather forecasting, oil exploration, and other major problems.

As you can see from the descriptions of these four types of computers, there are many differences. However, there are some similarities between them. One similarity is that supercomputers are servers. Though that does not mean all servers are supercomputers for the same reason that all squares are rectangles but not all rectangles are squares. Another similarity is that PCs and embedded computers are used daily by regular individuals even if they don't know they are using the embedded computers. Another similarity between all the devices is that as the cost increases, the performance also generally increases.

2. What is an algorithm? Why is it important to develop an algorithm when using computers to solve problems? [10]

An algorithm is a set of well-defined instructions designed to perform a specific task. It is important to develop an algorithm when using computers to solve problems because you can call the function you developed multiple times without having to rewrite the instructions. Also, computers execute these instructions much faster than we can which makes algorithms much more efficient for computers than us humans. These algorithms, when written efficiently, can be the difference of hours of manual calculations and computer calculations in seconds

3. Explain Moore's law. Is it a law of nature (physical law)? Why or why not? [10]

Moore's law states the number of transistors on an integrated circuit every 18-24 months. Essentially, it means that the processing power of an integrated circuit will double roughly every two years. It is not a law of nature but it is more of an observation of past progress and a projection for the future. It is not a law of nature because it cannot be proven.

In fact, the progression may slow to a halt as companies begin to find the limit of how small these devices can be without causing other issues. According to *Investopedia*, many experts believe that the end of Moore's law will occur this decade. This is mainly to do with the fact that transistors will be unable to function within smaller circuits at higher temperatures. They won't be able to function because cooling the transistors will require more energy than the amount of energy that passes through the transistor (Tardi). When they reach this limitation, it will be the end of Moore's law until they can figure out a way to solve this problem.

Works Cited

Tardi, Carla. “Moore's Law Explained.” *Investopedia*, Investopedia, 4 Oct. 2021, https://www.investopedia.com/terms/m/mooreslaw.asp.