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TCSS558

Final Essay

In this course, I learned a lot from the lecture itself and the conference paper survey. Through the lecture, I comprehended the aspect of the distributed system – the goal of the distributed system, the types of the system we have, and their architectures. Furthermore, I also learned the communication between clients and servers. Besides the lecture, the conference paper survey enforced my extensive reading skill and presentation skills, and they are also significant to my career life. Facing the problem that I never meet and presenting the progress of how I conquered it will occur frequently in the industry, and it is beneficial to train myself before starting to look for the job.

The supercomputer is a huge multiprocessor system that shares RAM. Since all the hardware of the supercomputer is in one location, it technically is a "not distributed" system. Compared to the other distributed system, it is suited for highly complex, real-time applications and simulations, but are very expensive to build and maintain. Besides it, cluster computers, computer clusters, and grid computing are the distributed systems that their servers may be geographically located in different locations. The cluster computer is a set of independent IT resources that work together so that they can be viewed as a single system. All the resources (off-the-shelf computers) are connected via a high-speed network, and also have homogeneous hardware and software. This redundant design lets server components be easily interchanged to keep the system running. Nowadays, cluster computer is used for many web applications such as database servers. However, this design is not only sustainable to the big companies. If we want to upgrade the system, we need to upgrade each independent off-the-shelf computer. Furthermore, all the computers are clustered in one location, which occupies lots of resources and huge space. Because of this, we have an alternative design called computer cluster. In this design, all the commodity computers are connected by Ethernet switches, which means they don't have to locate in one location. Instead of web applications, computer cluster is used for computation-intensive purposes. Compared to the conventional design, it is more scalable and much cheaper. Unlike the cluster computer, gird computer uses widely distributed computer resources to reach a common goal, by signing each individual computer the unique task. In this design, the computer resources can be heterogeneous and geographically in different locations. It uses the middleware software layer to sustain workload distribution and coordination functions. Usually, grid computers are built and owned by many organizations. Currently, grid computing is used in the field of distributed supercomputing.

The Smartphone system is an implementation of the distributed system that all smart home's devices that are connected with each other and can be accessed through one central point. This design provides homeowners with convenience and energy savings. Instead of controlling the home utilities like thermostats and lighting, using different devices, homeowners can control them all using one device like smartphones. Since these utilities are connected to a remote device, homeowners can obtain notifications and control them anytime and anywhere.

Furthermore, this efficient remote control minimizes energy usage. While this system design offers convenience and cost-saving, it involved security issues. For example, adept hackers can gain the access to all interconnected devices through the botnet. The web system is a huge distributed system consisting of millions of clients and servers. While servers maintain collections of documentations, the clients offer users easy-to-use interfaces for accessing them. Because of this, instead of installing the application on the local device, users can obtain the services by requesting to execute the application on the server. This design brings easy installation and maintenance for the applications, and easy data sharing and collaboration, since all the documentation are located on the server-side. Furthermore, it avoids sensitive data hold on multiple local devices, which is hard to secure. Bitcoin system is a decentralized system that records transactions in a distributed ledger called the blockchain. The blockchain is a single chain consisting of discrete blocks of information. As long as the parties agree to the contract established on the blockchain, the information stored in the blockchain is valid. This technique takes away the need for a third party to be involved in any contract for notarization, and blocks of information can be stored in anywhere and any form. Because of its decentralization, it is almost impossible to make a fake blockchain.

In the article "Battery-Free Eye Tracker on Glasses", the author discusses the usage of continuous eye tracking in multiple fields and the main challenge about the performance and cost. In order to support the application such as cognitive process, identifying health issues, and assessing the effectiveness of clinical treatments, eye-tracking must have a high tracking rate at the sub-millimeter level. In the addition, it should support long-term usage with high accuracy. Because of this, high performance always bundles with high energy consumption. Consequently, a high-end eye tracker entails an extremely high price because of the tracking camera and requires an external battery pack to sustain long-term usage. For providing a clue of conflict between cost and performance, the author introduces a low-cost design that satisfies the requirement of tracking rate. This design can operate at a rate above 100 Hz with sub-millimeter accuracy while the energy consumption is at the microwatt level. However, the current version is only feasible and reaches the requirement in an environment where ambient NIR light is relatively weak and unable to detect micro-saccades [1]. For possible improvement, the section of related work should not be placed after the prototype experiment. I think this section should be used to help the audience comprehend the general concept of the eye tracker, and it should be placed after the introduction. Besides this, the article is perfect.

Reference:

[1] Li, T., & Zhou, X. (2018). Battery-Free Eye Tracker on Glasses. Proceedings of the 10th on Wireless of the Students, by the Students, and for the Students Workshop, 27-29.