Mid Semester Assignment
Course: - Distributed Computing

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Class and Section: MS(CS) 4rth Semmester

Question1: **Provide an example of a modern Distributed System not discussed in the course; discuss how this system solves certain challenges by employing distributed architecture.** **(5)**

Ans: Distributed cache such as **Burst Buffer** is the fast intermediate storage layer positioned between the front-end processes and back-end storage systems. It can be rapidly accessed via persistent memory with its own processing power. It is built from array of high performance storage devices such as NVRAM and SSD to allow applications running on symmetric multi fast processors to quickly save the application data on some persistent media. The applications of multiple users don't need to wait long to learn that its data had been saved. If the power goes off after the completion of such write, then its responsibility of **Burst Buffer** to make the data available for rapid use. It causes low latency and real time response on the internet.

Question2: **Among the trends of Distributed Systems discussed in C1-Lec2, which trend in your opinion will be most dominant in the future and why?** **(4)**

Ans: In the trends of distributed systems I think cloud distributed computing will be the most dominant in future because cloud computing reduces the requirements on user devices, allowing a simple desktop or portable devices to access a wide range of resources and services. This services also points out everything as a service from physical or virtual infrastructure to software itself and every service will be paid up to its usage. So this system may be most dominant because users can access high services with low cost.

Question3: **Among the challenges of Distributed Systems discussed in C1-Lec2, which problem in your opinion will accompany distributed systems into the future and why?** **(3)**

Ans: Heterogeneity is the challenge which can accompany the distributed systems into the future because technology changes day by day. There is a lot of competition between companies to acquire new technologies. To acquire high technology different types of data structure and architectures are used by companies which lead to the heterogeneity in data as well as structures, which is a big challenge in Distributed System.

Question4: **The design of distributed systems can be described and discussed in three ways i.e Physical Model, Architectural Model and Fundamental Model. Describe the example of distributed system in Question1 with respect to these three models.** **(5)**

Ans: A tier of solid-state burst buffers is integrated into the storage system to absorb application I/O requests. This storage system is designed for use by large-scale HPC (high performance systems). Enhancements to the CODES of storage system simulator are done to enable burst buffer simulations. These enhancements include the integration of a burst buffer model into the I/O forwarding layer of the simulator, the development of an I/O kernel description language and interpreter, the development of a suite of I/O kernels that are derived from observed I/O patterns and fidelity improvements to the CODES models. These "leadership-class" systems are expected to have 100x to 1000x more compute nodes than today's largest-scale HPC systems in the near future, and require approximately 60 TB's of storage system bandwidth to drain application data bursts fast enough to meet the demands of huge end users in the future.
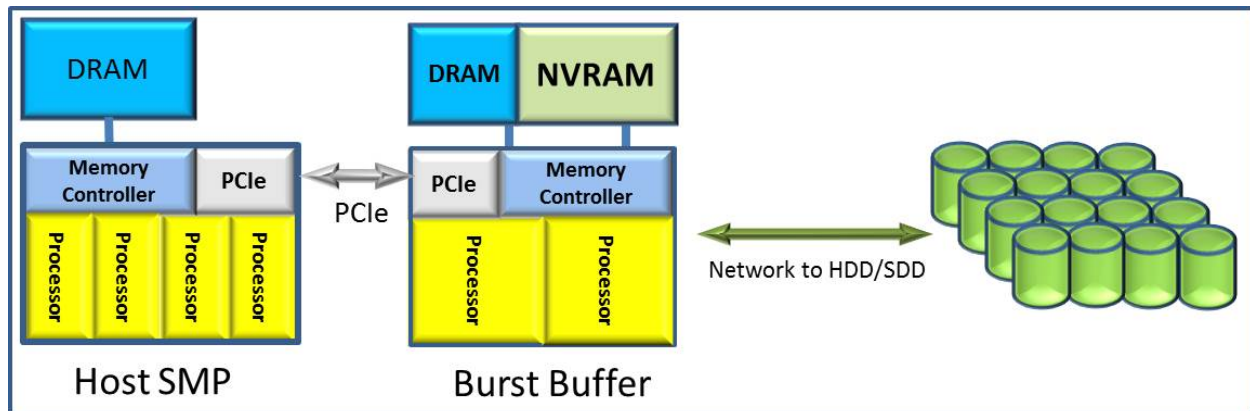
Question5: **What is the purpose of Inter Process Communication (IPC) in distributed systems? Given the choice which protocol out of UDP and TCP will you use for your own distributed system and why?** **(5)**

Ans: The process of exchanging the data between two or more independent process in a distributed environment is known as **Inter Process Communication (IPC)**. Inter Process communication on the internet provides both Datagram and stream communication. If we want to exchange an ordered sequence of messages over an unreliable channel that drops, duplicates and reorders messages, TCP is the best option for such situation, UDP is a very thin layer on top of IP, furthermore in UDP messages can be dropped and corrupted which is not good for distributed communication system. So for the above mentioned reason I will prefer to use TCP for my Distributed system.

Question6: **The following are some of the threats and attacks on Distributed Systems. Provide potential solutions as how may be these threats and attacks be mitigated?** **(8)**

1.   Leakage

Ans: Closely monitoring traffic on all networks prevents data leakage. The ability to automatically discover, map and track what is deployed across your entire business infrastructure provides a picture of your network in real-time. Because the average hacker conducts informal access to data within a network for six months before actually breaching a system, businesses need to identify abnormal behavior before a breach occurs.

2.   Tampering

Ans: By using a combination of copy-on-write, authentication, time-based codes, encryption, and other technologies, organizations can make it much harder for the casual attacker to tamper with what they're not authorized to.

3.   Vandalism

Ans: By installing and maintaining the latest versions of anti-virus and firewall software provides the best defense against the majority of these types of attacks. As new threats are identified, updates are issued which can identify and neutralize most harmful operations before they have a chance to do any damage.

4.   Eavesdropping.

Ans: By using a personal firewall, keeping antivirus software updated, and using a virtual private network (VPN) can prevent **Eavesdropping attacks**. Using a strong password and changing it frequently also prevents such type of attacks.