CS 524 Homework #5

Due: April 18, 2017

This homework is rather straightforward; it is essentially a reading assignment, but it is important to start working on this right away. Note: This assignment should take about five hours (the rest of the time to be spent on the Lab Assignment #3).

Reading assignment: Chapter 6 and Appendix Topic A.3

1. **(5 points)** Explain the motivation behind the two forms of server placement (rack-mounted servers and blade servers). What is sacrificed to make a blade server more compact than a rack-mounted server?

2. **(5 points)** Why is the use of the Ethernet technology particularly important to the data centers? [Hint: What need does the use of Ethernet effectively eliminate?]

3. **(5 points)** Explain why NAS and SAN but not DAS are readily applicable to Cloud Computing. What are the limitations of DAS? Why is DAS suitable for keeping local data (such as boot image or swap space)?

4. **(5 points)** Why is there a need for the *Phy* layer in the SAS architecture? How is it different from the physical layer?

5. **(10 points)** List the generic file-related system calls. Why in the NFS there is no RPC invocation for the *close <file>* system call? Under which circumstances other file operations may not result in an RPC invocation?

6. (**10 points)** What types of *connection topologies* are supported in *FC-2M?* Which of them is the most flexible? Why?

7. **(5 points)** How does the FCF respond to a discovery solicitation from the ENode?

8. **(5 points)** Please answer the following four questions:
   a) What features of TCP are leveraged in *iSCSI*?
   b) Explain why these features are essential to *SCSI* operations.
   c) Why is not SCTP used in *iSCSI*?
   d) Why does *iSCSI* has to be deployed over an *IPsec* tunnel when its path traverses an untrusted network?

9. **(10 points)** What is *connection allegiance?* Explain how *iSCSI* sessions are managed.

10. **(10 points)** Why the *credential* (as defined in ANSI INCITS 458-2011) itself cannot serve as a *proof* for access control? Give one example of a *proof* derived from the capability key.

11. **(10 points)** Describe the three approaches to the block-level virtualization. Which approach is most suitable to the needs of Cloud Computing? What are the differences between the *in-band* and *out-of-band* mechanisms of the network-based approach along with their advantages and disadvantages.

12. **(5 points)** Explain the difference (in terms of their capabilities) between the *NOR flash*- and *NAND flash* solid state drives.

13. **(5 points)** What are the three limitations that stand in the way of deploying the *NAND flash* solid state drives in the Cloud?

14. **(10 points)** Explain the mechanism of *consistent hashing* used in *Memcached servers.*