Homework 4

CS550 (V01)

Amit Nikam (A20470263)

anikam@hawk.iit.edu

Fall 2020

---

1. Read Chapter 6, 7, 8 (Done)

2. (5 points) What are the design issues of distributed scheduling?

Ans: Some of the design issues are the ability to measure resource availability as it needs to be easy to measure amd must reflect performance improvement, deciding what type of algorithm to use out of static, dynamic and adaptive, and deciding on types of tasks to transfer and type of architecture to implement.

3. (5 points) Why is message logging useful in Checkpointing? Discuss.

Ans: Message logging helps keep a record of the state of the system i.e. checkpointing, which is very curtial when it comes to recovering from a failure in the system. If message logging is not done alot of data is lost and backward recovery will not become possible.

4. (5 points) In Fig. 7.7 of the text, is signature 001001 valid for sequential consistent memory? Explain your answer.

Ans: No, 001001 is not valid for sequential consistent memory because there is no 11 pair in signature which implies one of the reads occured before write operation which violates the program order.

5. (5 points) Suppose that two processes detect the demise of the coordinator simultaneously and both decide to hold an election using the bull algorithm. What happens?

Ans: The higher-nodes will be receiving two messages for election from these respective nodes, but only the first message will be considered enough for starting the election process.

6. (10 points) Explain in your own words what the main reason is for considering weak consistency models.

Ans: The main reason for considering weak consistency model is performance. In cases where there are way more read operation than writes, a weak consistence model could be more better to implement. Since the main idea behind such a decision would be fast delivery of read operation on certain data with a same replica delivered to all the clients reading it.

7. (10 points) For active replication to work in general, it is necessary that all operations be carried out in the same order at each replica. Is this ordering always necessary?

Ans: This depends on the type of operation that is being carried out, for example

mutually exclusive writes which do not have affect on the outcome irrespective of the order can be executed in different order. But the trouble is, this cannot be the case everytime, thus having a ordering in place for such cases would be required.

8. (10 points) What kind of consistency would you use to implement an electronic stock market? Explain your answer.

Ans: Causal consistency, since the order sequence matters within a stock. But for different stocks there is no causality between them.

9. (10 points) Give an example where client-centric consistency can easily lead to write-write conflicts.

Ans: In applications like electronic stock market using a client-centric consistency can lead to a write-write conflict. It is better only when used in cases where writes are very less.

10. (10 points) A file is replicated on 10 servers. List all the combinations of read quorum and write quorum that are permitted by the voting algorithm.

Ans: The following combinations for read, write are premitted: 1,10; 2,9; 3,8; 4,7; 5,6; 6,5; 7,4; 8,3; 9,2; 10,1;

11. (10 points) Explain the difference between linearizability and sequential consistency, and why the latter is more practical to implement, in general.

Ans: In linearizability the rule to remember is that each operation should appear to take affect instantaneously at some moment between its start and completion, but in sequeantial consistencey their composition as a set need not be the same, which also happens to be the more practical case in general.

12. (10 points) During the discussion of consistency models, we often referred to the contract between the software and data store. Why is such a contract needed?

Ans: For achieving consistence, it becomes important that the software and data store are on the same page about obeying the rules such that the model is perceived as it needs to be. Thus for this reason a contract between them is needed.

13. (10 points) Describe a simple implementation of read-your-writes consistency for displaying Web pages that have just been updated.

Ans: A simple implementation would be when a web browser checks with web server if it is displaying the most recent version of a page via a request.

14. (10 points) Is the following sequence of events allowed with a sequentially-consistent store? What about a causally-consistent data store? Explain your answer.

P1:	W(x)a			W(x)c	
P2:		R(x)a	W(x)b		
P3:		R(x)a		R(x)c	R(x)b
P4:		R(x)a		R(x)b	R(x)c

Ans: This sequence of events is not allowed with sequentially consistent store as

the last two read operations at P3 and P4 are not consistent. Although it is allowed with causally-consistent data store as they are not causally related.