Assignment 3

***Chapter 7***

*Question 3: Explain howreplication in DNS takes place, and whyitactually works so well?*

*Ans: The basic idea is that name servers cache previously looked up results. These results can be kept in a cache for a long time, because DNS makes the assumption that name-to-address mappings do not change often.*

*Question 4: During the discussion of consistencymodels, we often referred to the con- tract between the software and data store. Whyissuch a contract needed?*

*Ans: If a program expects a sequentially consistent data store and cannot live with anything less, the store must provide sequential consistency. Howev er, to improve performance, some systems provide a weaker model. It is then essen- tial that the software agrees to abide by the rules imposed by this model. Gen- erally,itmeans that programs obeying the rules will perceive what looks likea sequentially consistent data store.*

*Question 5: Giventhe replicas in Fig.7-0, what would need to be done to finalize the values in the conit such that both Aand Bsee the same result?*

*Ans: In this case it is relatively simple: if Aand B exchange their list of tentative operations and subsequently order them according the time, then both would get to see the same result.*

*Question 6: In Fig.7-0, is 001110 a legaloutput for a sequentially consistent memory?*

*Ans: Yes. If the processes run in the order (a), (c), (b), this result is obtained.*

*Question 9: What kind of consistencywould you use to implement an electronic stock market?*

*Ans: Causal consistencyisprobably enough. The issue is that reactions to changes in stock values should be consistent. Changes in stocks that are inde- pendent can be seen in different orders.*

*Question 10: Consider a personal mailbox for a mobile user,implemented as part of a wide-area distributed database. What kind of client-centric consistencywould be most appropriate?*

*Ans: All of them, actually.What it boils down to is that the owner should always see the same mailbox, no matter whether he is reading or updating it. In fact, the simplest implementation for such a mailbox may well be that of a primary- based local-write protocol, where the primary is always located on the user’s mobile computer.*

***Chapter 8***

*Question 1: Dependable systems are often required to provide a high degree of security. Why?*

*Ans: If, for example, the responses givenbyservers cannot be trusted to be correct because some malicious party has tampered with them, it hardly makes sense to talk about a dependable system. Likewise, servers should be able to trust their clients.*

*Question 2: What makes the fail-stop model in the case of crash failures so difficult to implement?*

*Ans: The fact that, in practice, servers simply stop producing output. Detecting that theyhav e actually stopped is difficult. As far as another process can see, the server may just be slow, or communication may (temporarily) be failing.*

*Question 3: Consider a Web browser that returns an outdated cached page instead of a more recent one that had been updated at the server. Is this a failure, and if so, what kind of failure?*

*Ans : Whether or not it is a failure depends on the consistency that was promised to the user. If the browser promises to provide pages that are at most T time units old, it may exhibit performance failures. However, a browser can never live up to such a promise in the Internet. A weaker form of consistencyisto provide one of the client-centric models*

*discussed in Chap.7. In that case, simply returning a page from the cache without checking its consistencymay lead to a response failure.*

*Question 4: Can the model of triple modular redundancydescribed in the text handle Byzantine failures?*

*Ans: Absolutely.The whole discussion assumed that failing elements put out random results, which are the same as Byzantine failures.*

*Question 6: Does TMR generalize to fiveelements per group instead of three? If so, what properties does it have?*

*Ans: Yes, anyodd number can be used. With fiveelements and fivevoters, up to twofaults per group of devices can be masked.*

*Question 9: Give anexample in which group communication requires no message ordering at all.*

*Ans: Multicasting images in small fragments, where each fragment contains the (x,y)coordinate as part of its data. Likewise, sending the pages of a book, with each page being numbered.*

*Question 16: In the two-phase commit protocol, whycan blocking neverbecompletely eliminated, evenwhen the participants elect a newcoordinator?*

*Ans: After the election, the newcoordinator may crash as well. In this case, the remaining participants can also not reach a final decision, because this requires the vote from the newly elected coordinator,just as before.*

*Question 17: In our explanation of three-phase commit, it appears that committing a transaction is based on majority voting. Is this true?*

*Ans: Absolutely not. The point to note is that a recovering process that could not takepart in the final decision as taken by the other process, will recovertoa state that is consistent with the final choice made by the others.*