

CS471: Operating System Concepts
Fall 2006
(Lecture: TR 11:25-12:40 PM)
Homework #8
Points: 20
Due: November 2, 2006
SOLUTION

Question 1 [Points 4] 17.3 Discuss whether AFS and NFS provide the following: (a) location transparency and (b) location independence.

Solution:

AFS provides both location transparent and location independence. AFS uses fids to provide location transparency. They are mapped to a path name and are updated when a file is moved to a different server. Location independence is provided using volume-location database, which tracks which server a file is stored on. The volume-location database is updated when a volume is automatically moved to a different server.

In NFS, file name is independent from file's physical location and hence provides Location transparency. The file must be accessed by referencing physical location. Hence, it is not location independent.

Question 2 [Points 4] 17.8 AFS is designed to support a large number of clients. Discuss three techniques used to make AFS a scalable system.

Solution:

- 1) Servers keep track of volumes of data. This eases the burden on very large file systems.
- 2) The transferring of volumes between servers requires minimal effort.
- 3) The volume database can be copied to multiple servers.

Question 3 [Points 4] 16.11 Run the program shown in Figure 16.5 and determine the IP addresses of the following host names:

Solution:

- a) www.wiley.com
208.215.179.146

- b) www.cs.yale.edu
128.36.229.30
- c) www.javasoft.com
192.18.97.48
- d) www.westminstercollege.edu
146.86.1.17
- e) www.ietf.org
209.173.53.180

Question 4 [Points 4] 17.12 Discuss whether clients in the following systems can obtain inconsistent or stale data from the file server and, if so, under what scenarios this could occur. (Consider only AFS and NFS)

Solution:

AFS: AFS uses write-on-close which causes consistency problems. In this, either a file is already in a client's cache or disk or it gets a fresh copy from the server. So even if a file copy has been changed at a site, the other sites would not know about it until the file is closed. If client crashes, then data can be lost since the file may have never closed, committing the changes to the server. If a server crashes, it will not cause loss of data only loss of the callback promises.

NFS: Suppose client A gets a copy of a file from the server. It checks with the server at regular intervals to see if the cached blocks of the file are consistent. In between these intervals, if another client B writes to the file and changes it, then the client A will have stale data until it checks in the next interval to be in consistent with that of servers copy.

Question 5: Given the space-diagram of three processes and their interactions, determine whether or not the following happened-before relations are valid. (For each, state VALID or INVALID)

Relationship	Valid/Invalid
E1→E8	Valid
E5→E3	Valid
E7→E3	Invalid
E5→E13	Valid
E10→E4	Valid
E6→E13	Valid

E1->E8 → E1->E6->E7->E8

E5->E3 → E5->E10->E11->E3

E7->E3 is invalid

E5->E13 → E5->E6->E7->E8->E12->E13

E10->E4 → E10->E11->E3->E4

E6->E13 → E6->E7->E8->E12->E13