

NAME: _____ (FIRST NAME FIRST) SCORE: _____

COSC 6360 FINAL EXAMINATION DECEMBER 12, 2006

THIS EXAM IS **CLOSED BOOK**. YOU CAN HAVE ONE SHEET (I.E., TWO PAGES) OF NOTES.

1. Mark all properties that apply to the following distributed file systems (5 points per correct line)

<i>Distributed file system</i>	<i>NFS</i>	<i>AFS</i>	<i>Coda</i>
Does not <i>trust</i> its clients		X	X
Allows clients to <i>hoard files</i>		X	
Supports <i>diskless clients</i>	X		
Uses <i>callbacks</i>		X	X
Has no equivalent to the UNIX <i>close()</i> operation	X		
Attempts to maintain <i>single-copy consistency</i>	X		

2. What are the two kinds of old file versions that Elephants lets you save and how does it select them? (2×5 points)

- Recent versions of files: they are identified by their timestamps
- Landmark versions: Elephant picks the last version of each group of updates

3. What is the purpose of the *i-node map* of a log-structured file system? (5 points) Where is it stored? (5 points) How can we retrieve it when the system reboots after a crash? (5 points)

4. What are the main advantage and main disadvantage of journaling file systems implementing *synchronous log writes*? (2×5 points)

- Main advantage: They guarantee metadata update durability by immediately recording all metadata updates on the log.
- Main disadvantage: They have a much lower throughput than (a) journaling file systems using asynchronous log writes and (b) file systems using soft updates.

5. What would be the main disadvantage of a log-structured file system having *very small*—say, 16 kilobyte—*segments*? (5 points)

Having very small segments would void all the benefits of log-structured file systems as long sequential writes would become impossible.

6. How does the Blue file system aggregate writes? (5 points) How can this policy save energy? (5 points)

(This is well explained in the paper)

7. What is a *lease*? (5 points) Explain how the addition of leases would improve the performance of the NFS file system. (5 points) Would this modification leave NFS *stateless*? (5 points) Would that affect the *robustness* of the file system? (5 points)

A lease is a time-limited contract between the file server and a client guaranteeing that the server will not accept any update for a given file or set of files during the duration of the lease without notifying first the client. Typical lease durations are fairly short.

Implementing leases would greatly improve the performance of NFS because clients would only have to renew their leases every few seconds rather than having to constantly revalidate their caches.

Including leases would require the server to keep track of the leases that it has granted to clients (and their expiration times) thus making the server stateful.

It would not affect the robustness of the server as long as lease durations remain shorter than the server reboot time. (That is the beauty of the scheme!)