Midterm
Fall 2001 15-712

Please write your name on the following line:

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This midterm is open book and open notes.

You should write brief, precise, and legible answers. Rambling brain-dump answers may be punished twice — you run out of time writing them and we run out of patience reading them. :–)

There are eight questions but we will only grade **six**. List the **six** questions we should grade:

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Name: ______________________________________

1. The Virtual Log paper shows how a disk with eager writing can reduce write service times for small synchronous writes by more than 90%. Would a file system using track-aligned extents see benefits of that magnitude from eager writing? Explain.

Name: ______________________________

2. Assume that a log-structured file system sits atop a disk with eager writing support. Explain one workload under which the eager writing would help performance and one under which it does not.

Name: ____________________________________

3. Consider the *Better Security via Smarter Devices* proposal with regard to Saltzer's principles of secure systems design. Identify one principle that the proposal follows and one that the proposal violates. Explain.

Name: ____________________________________

4. System crashes are "yucky" [Greg's wording, not Jay's—Ed.]. Explain what data is lost (if any) and what recovery mechanism is used for each of these scenarios:

   (a) A client crash on a file sytem using soft-updates.

   (b) A server crash in NFS File Server Appliance.

Name: ______________________________

5. When a server supporting callbacks crashes, it must ensure that it knows about any valid callbacks before continuing to serve requests. One approach to doing this is to treat callbacks as leases, having them expire after a given amount of time. Explain how a server using this approach can achieve a known callback state after a crash. What trade-off is inherent in the lease expiration time?

Name: ____________________________________

6. The xFS file system offers significant scalability. Identify three security dilemmas created by its architecture. (Think about ways that an attacker could exploit it.)

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7. The River system focuses on dynamically balancing load across servers and across clients to avoid bottlenecks created by slow components. Abacus dynamically shifts functions between a client and a server. Is Abacus's goal to balance load? Explain how it does so or give an example of when it does not.

Name: ____________________________________

8. AFS was designed to scale to a large number of clients. The NASD architecture was also designed to scale. What kind of scalability does NASD offer that AFS does not? Ignoring cost, how could AFS offer the same kind of scalability?