

EXAM 2 • name _____

CS 4210 Advanced Operating Systems

Fall 1999 • Georgia Tech/Computer Science • Hutto

This exam is closed-book. There are 14 questions, 2 per topic. You must answer ANY EIGHT for a total of 80 points. Circle the questions you wish graded below.

1 2 3 4 5 6 7 8 9 10 11 12 13 14

You have 1 hour and 20 minutes. The number of points is a rough estimate of the amount of time you should spend on a question. Don't spend too much time on one question! All questions have relatively short answers. Partial credit is possible. Ask if you have any questions. Good luck!

Bershad User-level IPC

1. [10 points] Bershad et al. say "Shared memory message channels do not increase the 'abusability factor' of client-server interactions." Explain.

2. [10 points] The authors had previously developed a highly optimized "traditional" kernel-level IPC system they called LRPC. What observations about that system lead them to the development of a user-level IPC mechanism?

SG Chs 15, 16 Distributed Systems

3. [10 points] What is process migration? Why might you want to migrate a process?

4. [10 points] How might the kernel of a distributed operating system differ from the kernel of a centralized operating system?

Edwards paper (Jini book chapter)

5. [10 points] How are the issues of partial failure and consistency maintenance related in a distributed system?

6. [10 points] Keith begins the section entitled "New Failure Modes" with the sentence:

"Networked systems can fail in ways which stand-alone systems cannot."

Explain why this is a problem for a system that tries to "paper over the network." Give an example.

Spring Nucleus (Doors)

7. [10 points] Assume that a cross-domain call-chain spanning several machines is active in Spring. What happens if the machine in the middle crashes?

8. [10 points] Compare and contrast the Spring door mechanism to a traditional RPC system.

System V Shared Memory

9. [10 points] What's the difference between a shared memory id (shmid) and a shared memory key?

10. [10 points] How does the kernel actually implement shared memory segments?

Birrell and Nelson RPC

11. [10 points] Under what circumstances might an RPC-based program be less efficient than a carefully optimized message-based program?

12. [10 points] If the caller machine (client) in an RPC crashes while waiting for a reply, we say that the computation which was initiated on the callee machine is an "orphan". Properly terminating orphan computations is called the **orphan elimination problem**. What sort of issues makes orphan elimination difficult in RPC systems?

SG, Tannenbaum Distributed File Systems

13. [10 points] What are the advantages of a stateless distributed file server?

14. [10 points] Caching is an important optimization technique. Describe the three potential locations for caching in a distributed file system. Briefly discuss the advantages and disadvantages of each location.