

COSC 6360: Operating Systems MATERIALS ON THE SECOND FALL 2009 QUIZ

You are only responsible for the materials discussed in class as they are *summarized* in the handouts and discussed in the PowerPoint presentations. I expect you to understand these summaries and to be able to comment around them.

Always ask yourself *why* a specific technique was used and *which* problem it addressed.

Interprocess Communication

C. A. R. Hoare, "Communicating Sequential Processes," *CACM*, 21(8):666-677, Aug. 1978.

- *Focus on the discussion of guarded commands and alternative commands. You must be able to read CSP but will never be asked to write CSP code.*

L. E. Moser, P. M. Melliar-Smith, D. A. Agarwal, R. K. Budhia, and C. A. Lingley-Papadopoulos, "Totem: a fault-tolerant multicast group communication system," *CACM*, 39(4) April 1996.

- *We covered this paper in some detail. You should understand the two reliable totally ordered message delivery services that Totem provides and their implementation; how the single ring protocol orders messages and the role of guaranteed vector messages.*

B. Cohen. "Incentives build robustness in BitTorrent," *Proc. 2003 Workshop on Economics of Peer-to-Peer Systems*, Berkeley, CA, May 2003.

- *We covered this short paper in some detail. You should understand the role of the BitTorrent tracker, the peer selection rule, how peers select the file pieces they download first and so on.*

Security

J. G. Steiner, C. Neuman and J. I. Schiller, "Kerberos: An authentication service for open network systems," *Proc. 1988 Winter USENIX Conference*, pp. 205-211, Feb 1988.

- *We covered the paper in some detail. You should understand all the materials in the slides.*

Secondary Storage Organizations

D. A. Patterson, G. A. Gibson, and R. H. Katz, "A case for redundant arrays of inexpensive disks (RAID)," *Proc. SIGMOD International Conference*, pp. 109-116, June 1988.

- *You should understand the general motivation for RAID organizations and the small write problem in RAID 5. Skip the availability analysis: it is wrong.*

(The paper on log-structured file systems will be on the fourth quiz.)

Selected Revision Questions

1. Why do neither C nor C++ include any statements comparable to the CSP guarded command and alternative command?
2. What is the function of Totem *guaranteed vector messages*?
3. A Totem system has three rings A, B and C. Which messages will a processor *X* be able to deliver using *agreed delivery* assuming that it has received but not yet delivered messages with the following timestamps?

From ring A: 4:50 PM

From ring B: 4:55 PM and 5:00 PM

From ring C: 4:45 PM and 5:05 PM,

4. What would be the consequences of having an intruder penetrate (a) the Kerberos server and (b) the Kerberos Ticket Granting Service?
5. What is the purpose of Kerberos authenticators?
6. A RAID level 5 array consists of n drives. What is the most efficient way to update a single block whose previous contents were never read into memory when (a) $n = 3$ and (b) $n = 8$?
7. Consider a *single-ring* Totem system comprising two processors A and B. Assuming that each of these two processors has received the messages with the following sequence numbers:

Processor	Messages
A	3, 4, 6, 8
B	3, 4, 5, 7, 8

Which messages will be delivered by each processor if all messages are *safe delivery messages*?

8. Explain BitTorrent *rarest first* policy.

Answers

1. Neither C nor C++ has the equivalent of a guarded command because the message passing primitives they support all use indirect naming. 2. Guaranteed vector messages let processes in a multiple ring protocol keep delivering the messages they receive when one of the rings does not forward any messages. 3. The processor will deliver the first messages from both rings A and C. 4. (a) Since all passwords would have been compromised, all users would have to obtain new passwords. (b) Since all tickets would have been compromised, all users currently logged on the system would have to reenter their logins and passwords. 5. Kerberos authenticators prevent intruders from successfully submitting replays of previous messages. 6. (a) When the RAID array has only three disks, the best solution is to read the value of the other block in the stripe and use that value in the parity computation. (b) When the RAID array has eight disks, the best solution is to compute the new parity from the old value of the parity block and the old value of the block that is being updated. 7. Since we are assuming safe delivery, only messages 3 and 4 should be delivered. 8. Once a downloader has downloaded at least one full file piece, it will download first pieces that the fewest of their own peers have.