CMPSCI 754: MULTIMEDIA SYSTEMS

Homework 2: Multimedia File Systems and Operating Systems

Due: May 8, 2001

1. Why are models that determine the optimal stripe unit size for textual workloads unsuitable for continuous media?

2. Explain the impact of the following parameters on the optimal stripe unit size: (i) the playback rate of clients, and (ii) the round duration.

3. Prove that each image in the self recovering JPEG algorithm must be partitioned into 4 sub-images to ensure that none of the blocks contained in a sub-image are in the 8-*neighborhood* of each other.

4. The class independent scheduler in Cello prohibits requests from being reordered once they have been inserted into scheduled queue. Argue for or against this design decision. How would the class independent scheduler change if you had the flexibility of reordering requests?

5. Integrated file systems can be designed using a logically integrated architecture or a physically integrated architecture. As a system designer, what architecture would you pick for designing your file system? Why?

6. Design a buffer manager for Symphony that allows multiple cache replacement policies to dynamically share the buffer cache. Your buffer manager must allow each partition size to vary dynamically, while preventing interference among polices.

7. Consider a network interface card that does not make its on-board memory available to the host CPU. What additional techniques would you need to employ to implement an application device channel (ADC) for this card?

8. Consider the taxonomy of data passing semantics presented in class. Classify fbufs, fbufs caching and application device channels using this taxonomy.

9. Consider a malicious user who inflicts an denial of service attack on a web server. A denial of service attack involves bombarding the server with a very large number of requests, and thereby denying service to other users by overloading the server. How would such an attack affect the web server if the underlying OS employed a lazy receiver processing based network subsystem?

10. List the advantages and disadvantages of employing a hierarchical CPU scheduler (which uses a fair share scheduler) versus employing the SMART CPU scheduler. Assume that the application mix consists of both best-effort and soft real-time applications.