CSci 555 Final Exam

Fall 2011

Instructions:

Show all work. No electronic devices are allowed. This exam is open book, open notes. You have \textbf{120 minutes} to complete the exam.

Please prepare your answers on separate sheets of paper. You may write your answers on the sheet of paper with the question (front and back). If you need more space, please attach a separate sheet of paper to the page with the particular question. \textbf{Do NOT extend your answer on the back of the sheet for a different question, and do NOT use the same extra sheet of paper to answer more than one question.}

In particular, \textbf{each numbered questions must appear on separate pieces of paper so that the exam can be split for grading}. If part of the answer to one of the questions (Q1, Q2, or Q3) is on a sheet of paper also used for one of the other questions, then that part of your answer might not be graded and you will NOT receive credit for that part of your answer.

Be sure to include your \textbf{name} and \textbf{USC ID number on each page}.

There are \textbf{100 points} in all and \textbf{3 questions}.

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Total</th>
<th>Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. (30 points) File Systems

Fill in the table below with brief descriptions of use (or indicate no if not used) of replication and caching in each of the listed file systems, and describe the semantics of concurrent reads and writes, and concurrent writes in the system (by semantics, please indicate the end result of near concurrent write operations, or state that inconsistency may result). (If your writing is small and readable, your answer should fit in the table, but if you need extra room, you may answer or extend an answer on extra pages, just note a number in the box, that identifies the paragraph on the extra sheets that would go in the box.)

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Replication</th>
<th>Caching</th>
<th>Concurrent R-W</th>
<th>Concurrent W-W</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFS-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AFS-2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sprite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote Virtual Disk in Athena</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. (30 points) Kernel and Case Study Matching

For each of the following Kernels or case studies, match the numbered system with the lettered characteristic. This is not a one-to-one mapping. So more than one system may match a characteristic, and a single method or system may also match more than one characteristic. We are looking for specific characteristics, for which you will receive credit. If you list a less major characteristic, while you will not lose credit, you will not get credit either. You will lose a point if you associated a method with a characteristic that does not apply to the system. There are more blanks in the page below than actual correct answers, so you do not need to fill in all the blanks.

1. Andrew
2. Project Athena
3. Locus
4. Mach
5. V
6. Amoeba
7. The X Kernel

a) Capability Based: _____ _____ _____ _____ _____
b) Transparency: _____ _____ _____ _____ _____
c) Microkernel: _____ _____ _____ _____ _____
d) Monolithic Kernel: _____ _____ _____ _____ _____
e) Focused on communication: _____ _____ _____ _____ _____

f) Heterogeneous: _____ _____ _____ _____ _____
g) RPC Based: _____ _____ _____
h) Broadcast: _____ _____ _____ _____ _____
3. (40 points) Design Problem

You have been hired by a startup to design the next greatest “cloud-based” filesystem for personal and small business use. The system is intended to support automated backup from local disks, as well as real-time shared access to files across devices, with the potential for “concurrent” read-write access, and even “concurrent” writes. The system must also support disconnected operation of files. Because the market for such products is evolving so quickly, you have been asked to provide you initial thoughts on this problem very quickly (in fact, in the next two hours, and you have even less time since you already committed to taking a final exam in CSci555 during that time, and there are two other questions answer as well).

a. Given the requirements above, what are likely to be the difficult issues to address? Are the requirements consistent? By this I am asking whether they can all be met, or do some requirements potentially conflict with others in that solving one will prevent meeting other requirements? Consider whether they can be met if one is an optimist, as well as whether pessimistic approach allows them to be met. Explain any conditions you feel must be placed on the ability to meet the requirements, as a way to resolve potential conflicts. (10 points)

b. From the class readings, discuss the approaches taken to solve the issues you identified in a. For each issue, list the systems from the readings that took an approach to solving the issue, and describe the approach. Discuss the tradeoffs between the alternative approaches taken by systems in the readings. (15 points) [please write answer on back of this page]
c. Briefly describe the design for your approach to meeting the requirements in this problem (subject to the conditions you placed on the requirements in your answer to part a). Include a discussion of the reason for your particular design choices. (15 points)