

# COMP 4000: Distributed Operating Systems

Fall 2017 Mid-Term Exam

October 31, 2017

Instructor: Anil Somayaji

**80 minutes, Open Book**

Answer 3 out of the following 5 questions. If you answer more than 3 questions, clearly indicate which ones should be graded. Please write your answers in a separate exam booklet, or, alternately type them on a computer and email them to [anil.somayaji@carleton.ca](mailto:anil.somayaji@carleton.ca) or submit them on a provided USB key.

The exam is open book, open note, open Internet. The only thing you may not do is discuss questions with other individuals. In other words, no emailing/IM/texting/whatever with other people during the exam!

**How to Answer the Questions:** Answer each question with a small essay. When the question has multiple parts (e.g., asking for you to discuss two or three separate systems), please do not answer them separately; instead, use them to help structure your small essay answer. Be specific but also make appropriate generalizations. Be concise—the essays will be long enough if you really answer the questions and time is short.

Show me what you understand, not what you remember.

Good luck!

1. While the Google File System, FARSITE, and Oceanstore are all designed to store large amounts of data, they were designed for very different environments and workloads. What were those environments and workloads, and how did those impact their design?
2. “Precise UNIX compatibility is often sacrificed in order to improve filesystem scalability.” Explain this statement in the context of NFS, AFS, and the Google File System.
3. “Most earlier efforts in distributed operating systems focused on allowing users to roam between hosts in a network, thus allowing them to use the network like a mainframe.” Discuss this statement in the context of at least three of the following systems: LOCUS, Sprite, V, Amoeba, Clouds, and Plan 9. How did this focus affect the resulting systems’ scalability?
4. What are two fundamental challenges in distributing **computation** across multiple hosts (all running the same “distributed OS”)? Consider the problems in the context of resource allocation, resource access (e.g., files, network connections), inter-process communication, and shared memory.
5. Make up a question that addresses key ideas we discussed in class and answer it. (You’ll be graded on the quality of your question as well as your answer.)