Rutgers University, Computer Science
CS 545: Distributed Systems, Instructor: Liviu Iftode
Midterm, April 6, 2007, 12:00 pm

This is a 36 hours, take-home exam. Collaborations are not permitted. The answers must be returned by email (pdf or word format) no later than Saturday, April 7, 11:59 pm.

1. Ubiquitous Computing. User mobility demands effective and convenient solutions for ubiquitous computing access. In our course, we looked at two different approaches, Coda and ISR. Two other research groups, one from Columbia University (Jason Nieh's group) and the other one from IBM Watson (Caceres et al), proposed other solutions (MobiDesk and SoulPad) to address the same problem. You are required to read the main papers of these two projects (published to Mobicom'04 and Mobisys'05, respectively) and compare the three projects (ISR, MobiDesk and SoulPad). You need to emphasize the differences on the ubiquitous access model, the assumptions they make on user and infrastructure support, and indicate evaluation metrics that can reveal the differences between these approaches.

2. Continuous Consistency. The intuition one may get from reading the Bayou paper is that consistency models can be further relaxed in two ways: (i) by assuming an optimistic course of events, and (ii) by involving the application in defining the consistency rules and operations. Another approach that exploits the same lessons is the Continuous Consistency project, developed at Duke by Yu and Vahdat. You are required to read the main papers of the project describe the basic idea and develop a comparison between Bayou and Continuous Consistency projects, emphasizing the differences in their application domains, solutions, challenges and performance.

3. Transactional Memory is a concurrency control mechanism that has recently received a lot of attention. The most recent ASPLOS conference (2006) had an entire section dedicated to transactional memory, but this is not the only conference that accepted papers on this topic. In our course, we discussed the AVIO paper, whose focus is in discovering certain concurrency bugs. You are required to detail the observation from the introduction of the paper according to which concurrency bugs "will soon become increasingly important due to the emerging trend of transactional memory models". What problems each of the two projects (AVIO and transactional memory) solve, how different are they, and what is their common denominator?

4. Secure File Systems. In our course, we discussed the paper that introduced the Secure File System (SFS), a file system for the Internet, which factors out the key management in order to improve security and make it more flexible. Since this paper was published, the SFS project continued to grow, proposing new systems and solutions essentially rooted in SFS. You are requested to identify at least three distinct and non-trivial follow-up papers from the same group (David Mazieres et al), to present their contributions and to assembly the big picture of the project out of the papers you selected, identifying the steps each paper made towards the big picture.

5. Naming for Sensor Networks. Naming is an essential component of any networking infrastructure. In our course, we discussed two ways to adapt naming to mobile networks and computers. Sensor networks have emerged as a distinct class of networks with specific challenging problems and solutions. One problem is naming. You are required to identify two major sensor network projects (at two different universities), to present them and to discuss the solutions they propose for naming comparatively with those we discussed in class.

Good Luck!