The term paper will be due on **April 25**. It should be approximately 4 pages (excluding references), typed and double spaced. The paper should have an abstract, introduction, description of the project, various design alternatives considered during implementation, performance results and conclusions. You must acknowledge any software that you download and use for your project. The paper should clearly identify which portions of your software project have been written by you (or modified by you). In addition, we will build a repository of educational material for this course. This repository will be accessible to public and it is hoped that it would be useful to the next class of EE 360P. The educational material could be a small tutorial on some important concept, a new example related to the topic, self-study questions, or background material for your term paper. The educational material should be approximately two pages. Related to each project, there will be suggestions on what you can add to this repository. The term paper with the educational material as an appendix must be submitted as a hard copy to the instructor.

*Using Paxos for Replicated State Machine*  
Implement Paxos protocol to build a fault-tolerant server (Assignment 4) that can tolerate crash faults in asynchronous systems. Information on Paxos is available at <http://research.microsoft.com/en-us/um/people/lamport/pubs/paxos-simple.pdf>. Add supplementary material to topics in Chapter 15.

**The Paxos Algorithm for Replicated State Machines**

*By: Ronald Macmaster, Gaurav Nagar, Hari Kosuru, Taylor Schmidt*

**Abstract**

The Paxos algorithm solves the consensus problem for replicated state machines.

**Introduction**

Replicated state machines represent a fundamental implementation for fault-tolerant distributed computing services. Servers that host such services are not always reliable, so distributed computing services must account for possible server failures (faults). A replicated state machine duplicates computation and state across multiple servers to backup data in the event of a failure.

However, the consensus problem illustrates the primary challenge to implementing a fault-tolerant replicated state machine. Entire server clusters must agree upon committing and aborting operations as well as the order of committed operations. Without the possibility of server faults, a simple centralized leader algorithm easily solves this problem. The classical Paxos algorithm provides a solution to the problem in the presence of server faults.

The following sections describe our specific research project, a replicated state machine for an online e-commerce store inventory. We provide a description of the project, some design alternatives, and some significant findings. Additionally, we provide some supplemental educational material on the Paxos algorithm in Appendix A.

**Project Description**

[talk about what software has been written by you]

Agreement: Two non-faulty processes cannot decide on different operations.

Termination: A non-faulty process decides within finite time.

**Design Alternatives considered during implementation**

**Results**

**Conclusion**

**References**

[1] Michael J. Fischer, Nancy Lynch, and Michael S. Paterson. Impossibility of distributed consensus with one faulty process. *Journal of the ACM*, 32 (2) : 374–382, April 1985.

[2] Leslie Lamport. Paxos Made Simple. *ACM SIGACT News (Distributed Computing Column)*, 32 (4) : 51-58, November 2001.

[3] Vijay K. Garg. “Chapter 15: Agreement” in [*Concurrent and Distributed Computing in Java*](http://users.ece.utexas.edu/%7Egarg/jbk.html), 2nd edition, Hoboken, NJ: Wiley & Sons, 2004, pp. 209-223.

**Appendix A: Educational Material (Paxos Algorithm)**

*[In addition, we will build a repository of educational material for this course. This repository will be accessible to public and it is hoped that it would be useful to the next class of EE 360P. The educational material could* ***be a small tutorial on some important concept, a new example related to the topic, self-study questions, or background material for your term paper****. The educational material* ***should be approximately two pages****. Related to each project, there will be suggestions on what you can add to this repository. The term paper with the educational material as an appendix must be submitted as a hard copy to the instructor.]*