Hi Professor Aspnes,

I know it's somewhat late in the shopping period, but I would like to start a directed study project with Professor Soule as my advisor. My project constitutes a continuation of work on partitioned Paxos; see http://www.cs.yale.edu/homes/soule/pubs/usi-tr-2019-01.pdf.

The project is related to some previous work that Professor Soule did regarding the implementation of the Paxos distributed consensus algorithm within hardware switches, which were themselves programmable via the P4 language. This work resulted in a 5 orders of magnitude improvement of the processing speeds of Paxos protocol messages. However, in practice, applications were not equipped to handle the increased throughput demands, and therefore the 5 orders of magnitude improvements were not fully realized. Partitioned Paxos is an attempt to solve this issue by running multiple simultaneous and independent instances of Paxos, each working on different partitions of a database, to better take advantage of the improved Paxos message processing capabilities. A partial implementation of this system is already in place, but it does not address the crucial use case of operations which span multiple partitions. At its core, my project will be to complete this implementation and address this use case. To do so, I will have to learn to interface and interact with the high-performance DPDK networking libraries, and implement a synchronization mechanism for the operations which span across partitions. If necessary, it will also be my responsibility to debug the P4 code used to program the ASIC-based switches. By the end of the semester, we hope to have completed the implementation and debugging and finished writing a publishable paper on the topic.

My understanding, based on the discussion you had with Professor Soule, is that sending this description of the project should be sufficient to begin the process of enrolling in CPSC 290.

Regards,
Harshal Sheth