

CMPE 256: Design Project in Computer Networks Fall 2008

Syllabus and General Information

Instructor

Anujan Varma, Professor, Computer Engineering
E-mail: varma@soe.ucsc.edu
Office location: E2-221
Office Hours: Mon 12:30 – 1:30

Class Timings

Friday 5:00 – 8:00 PM, UCSC Silicon Valley Center
Final presentation: Friday, Dec 5, 5:00 – 8:00 PM

Course Description

This is a quarter-length project class for MSNE students that serves as the substitute for a Masters Thesis. You may choose the topic for your project from a list of potential topics provided by the instructor, or your own topic with the consent of the instructor. Example project topics include:

1. Congestion control for non-TCP Internet traffic: Many new Internet applications (such as IPTV) are designed to run over UDP, and therefore cannot make use of the congestion control mechanisms provided by TCP. To address this problem, researchers have introduced a new protocol called DCCP (Datagram Congestion Control Protocol) that adds congestion control mechanisms to an unreliable transport protocol such as UDP. The congestion control mechanisms of DCCP are quite different from those of TCP (rate-based versus window-based). The purpose of this project is to study the dynamics of DCCP congestion control mechanisms and how DCCP flows interact with TCP flows.

The students use the public-domain network simulator NS for this project to implement the DCCP congestion control mechanisms in the UDP model. They then simulate a network with a mix of UDP and TCP flows and study the behavior of the congestion control mechanisms under various traffic scenarios.

The primary reference for this project is: E. Kohler, M. Handley and S. Floyd, “Designing DCCP: Congestion Control Without Reliability,” Proc. ACM SIGCOMM ’2006, pp. 27–38.

2. TCP Offload Engines: With the widespread adoption of 10Gb/s Ethernet interfaces in servers and high-end workstations, there is considerable motivation for implementing part or all of the TCP protocol in hardware, thus offloading the TCP processing tasks from the main processor. A few such products are already in use, but the benefits offloading TCP processing are still being debated. The objective of this project is to study the tradeoffs involved in offloading TCP processing, evaluate the bottlenecks involved, and arrive at some insightful conclusions.
K. Kant, “TCP Offload Performance for Front-End Servers,” *IEEE Globecom 2003*, pp. 3242–3247.
G. Regnier, et al., TCP Onloading for Data Center Servers, *IEEE Computer*, Nov. 2004, pp. 46–56.

3. Simulation Study of IEEE 802.11 and 802.16 MAC Protocols: The objective of this project is to study one or more of these protocols by simulation, so as to gain an in-depth understanding of a wireless MAC protocol.

Class time is spent in the students presentating the status of their work, and the instructor providing both group-level and individual feedback.

Prerequisites

An introductory graduate class in computer networks (CMPE 252A or equivalent).

Deadlines

The project will be done individually. The following deadlines will be used to ensure that projects will be completed on schedule:

October 3: First draft of Project proposal due.

October 10: Project proposal due (2–5 pages in length). The proposal must describe the topic, summary of work to be done, and the software tools to be used.

November 14: Mid-quarter report and presentation due. The report must outline the progress so far and describe any problems encountered.

December 5: Project presentation. Final written report due.

Evaluation Criteria

Class participation: 10%

Mid-quarter review and presentation: 20%

Final presentation and report: 70%

Class attendance:

You are expected to attend every class and give a short presentation on your progress.