CSE 60774: Graduate Networks - Spring 2008

Department of Computer Science and Engineering
University of Notre Dame

Description: Survey of topics in the area of advanced networking covering routing, quality of service, content distribution, and experimentation.

Class: Nieuwland Science Hall 184
M W F 1:55 pm – 2:45 pm
To be adjusted once class starts

Instructor: Dr. Aaron Striegel
383 Fitzpatrick Hall
striegel@nd.edu 631-6896

TA: None

Office Hours: M 10-11 AM
T 1-2 PM
By appointment

Course Webpage: http://netscale.cse.nd.edu/twiki/bin/view/Edu/GradNetworkS08
(also directly via CSE webpage)

Required Text: None

Course Overview:

This course will survey advanced networking topics, specifically the mechanics regarding scaling, connectivity, and performance in the core of the Internet. Topics to be covered include inter/intra-domain routing, TCP fundamentals, quality of service (QoS), and content distribution. Students will be expected to create protocol parsers using the language of their choice, use/modify an appropriate network simulator and/or emulator, and complete a research project over the course of the semester.
Grading:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>25%</td>
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<tr>
<td>Mid-Term Exam</td>
<td>20%</td>
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<td>Final Exam</td>
<td>25%</td>
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<tr>
<td>Research Project (Paper)</td>
<td>20%</td>
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<tr>
<td>Oral Presentation</td>
<td>10%</td>
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- Fixed grading scale with +/- A=90-100, B=80-89, C=70-79, D=60-69
- In the event of a bad exam, I may change the scale accordingly such that letter grades will be improved
- Inquiries about graded assignments/exams must be made within one week after the assignments are handed back.
- Late homework will lose 33% per day beyond the due date. Homework may be turned in either during class or to my office. Homework may not be submitted directly to the TA.

Course Objectives:

At the end of the course, you should be able to:

- Illustrate the dominant protocols / architectural components that affect a packet from end-to-end
- Compare / contrast the evolution of TCP and their strengths and weaknesses
- Compare / contrast the various approaches to quality of service in the literature
- Analyze a protocol through libpcap and tcpdump
- Compare / contrast the various approaches to content distribution
- Conduct a simple network simulation with the extraction of meaningful performance results
- Demonstrate an understanding of the tradeoffs in protocol design versus current protocols in the Internet
- Write, present, and review an effective research paper

Topics:

Topics that will be studied in CSE 498U/598U include:

- Inter/intra-domain routing (OSPF, IS-IS, BGP)
- TCP Fundamentals / Evolution (AIMD, Reno, New Reno, Vegas, Wireless)
- Protocol Analysis (tcpdump/ethereal, IPv4, IPv6, IPsec, TCP, UDP)
- Quality of Service (IntServ, DiffServ, RSVP, NSIS)
- Content Distribution (IntServ, DiffServ, RSVP, NSIS)
- Network Simulation
- Related Algorithms (DHT, Bellman-Ford, Max-Min Flow)
- Protocol Design
Course Policies:

1. Lecture
   • Lecture notes may or may not be on-line so taking notes during class is highly encouraged. In short, anything that is written down on the board, you can write down as well.
   • Attendance at lectures is required. If you must miss a lecture, please contact the instructor in advance.
   • Lectures will be driven by student interaction in addition to the standard lecture material.
   • Make sure to read the assigned research papers before lecture. Research papers will be made available in-class or through links on the course webpage. On-campus access will be necessary in the case of IEEE and ACM-linked papers.

2. Exams
   • There will be two exams for the class.
   • The first exam will be announced one month in advance and is scheduled during the week before spring break. The first exam will be held during normal class time.
   • The second exam will be held during finals week.

3. Research project
   • The research project will culminate in a research-quality paper at the end of the semester. The topic for the paper is a topic of your choosing.
   • The research project team will consist of 1-3 students. Keep in mind that the quality of the final result will also be judged on the number of students present in the team.

4. Homework
   • Homework will also be done in teams of 1-3 students. The makeup of the teams will be of your choosing.
   • Assignment solutions will not be posted. The burden will be on you to find out how to solve the problem.
   • No handwritten homework will be accepted. All homework must be printed using a word processor. Figures may be drawn using xfig or other drawing program.

5. Teamwork
   • Teamwork does not mean that one person does the work one week and the other person does the work the next week. If you sign your name to the solution set, it means that you have participated in solving the problems.

Other Notes:

• I will frequently use class e-mail lists to distribute important information related to the class. You will be expected to check your e-mail at least once a day for class announcements.
• Feel free to ask questions in class or by e-mail.
• The topics for the course will be quite flexible. If there is a technology related to networking that you would like to know more about, please let me know.
• You will receive an account for my research machines during the first week of classes. As you will have root access to several of them, be especially careful and mindful when logged in as root. It is your responsibility to ensure that your actions do not adversely affect the work of other students in the class.