EE/CS 450 - Spring 2015 Tu/Tu 2:30pm

SPECIAL SECTION

EE/CS 450: Computer Networking

3 Units

A First-Principles Approach to Computer Networking
Spring 2015

Tu/Th 2:00pm-3:20pm -- Fr 12:00 discussion

Dr. Joe Touch

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General Information

NOTE: this section is using a new approach that differs from past EE/CS 450 as well as other Spring 2015 sections.

Location: DRB 146 (Tu-Thu class) / KAP 140 (Fr discussion)

Discussion forum: Piazza (contact the TA to be enrolled if you have not already been invited)

Instructor: Dr. Joe Touch

Office: PHE414 during scheduled campus office hours (also USC/ISI 1130N by appointment only)

Office hours: On campus at PHE414 Thursday 3:30-4:40pm (also at USC/ISI by appointment only)

Contact info: touch@isi.edu, TBA during scheduled campus office hours, 310-448-9151 otherwise

Teaching Assistant: Parisa Mansourifard

Office: PHE 3rd floor (loc. TBA)

Office hours: TBA

Contact info: parisama@usc.edu

Grader: Avinash Reddy

Contact info: asingire@usc.edu

IT Help: TBA

Hours of Service: TBA

Contact info: TBA

Course Description

Network architectures; layered protocols, network service interface; local networks; long-haul networks; internal protocols; link protocols; addressing; routing; flow control; higher level protocols.

NOTE: this section is using a new approach that differs from past EE/CS450 as well as other Spring 2015 sections, as described below:

“You told me to go back to the beginning... so I have.”
- Inigo Montoya, quoting Vizzini’s advice, from the movie ‘the Princess Bride’

Vizzini was right: when in doubt, it can be useful to revisit origins. Spring 2015 introduces a special section of EE450 based on a new “first principles” approach to computer networking based on fundamental principles that evolved from USC/ISI’s experience developing virtual networks and recursive networking.

Past approaches focus on a protocol architecture that was developed in the 1970s by the international organization of telephone companies (the ITU) called Open Systems Interconnect (OSI). The OSI model was never widely deployed, yet it remains the basis of our network teaching. It describes a seven-layer architecture, but why those seven? Why exactly seven?

Most computer networking texts explore past and present examples of networks by either assembling them bottom-up or disassembling them top-down. This section of EE450 goes beyond construction and destruction towards fundamental understanding.
Join us for this special section
to go beyond the OSI stack
and answer “WHY”...

Learning Objectives

Prerequisites: Junior standing (Note: EE/CS450 duplicates credit in CSCI353, so CSCI353 MUST NOT have already been taken)

Co-Requisites: none

Concurrent Enrollment: Friday 12pm discussion section

NOTE: The discussion section is that it is a “group chat” with the TA and other students. It is “not” intended to extend classtime, and NO NEW MATERIAL will be covered there. If you have a schedule conflict for the discussion, please contact the instructor.

Recommended Preparation: Review Unix C programming.

Course Notes

Grading type: Letter grades

On-line: TBA

Technological Proficiency and Hardware/Software

Students are expected to be proficient in Unix C programming.

Computer access or substitute requirements TBA.

Required Readings and Supplemental Material

Required:

Peterson/Davie, Computer Networks: A systems approach (any edition). Readings will be cited from the Fifth Edition; students are responsible for locating the corresponding material in other editions.

Supplemental:

Shannon/Weaver, The Mathematical Theory of Communication (any edition)

Description and Assessment of Assignments

Description

Homeworks:

1. TBA
2. TBA
3. TBA

Programming:

1. TBA
2. TBA
3. TBA

Assessment

Homeworks and programming assignments are to be completed individually. Homeworks will include multiple choice, true/false, and essay questions, and are graded according to predefined metrics. Programming assignments will be graded based on an evaluation of running code.

Grading

15% Homeworks (3 assignments, 5% each)
15% Programming (3 assignments, 5% each)
30% Midterm exam (in-class, tentatively scheduled for Feb. 26, 2015; EXCEPTIONS ONLY PER UNIVERSITY POLICY)
40% Final exam (on-campus, as scheduled by USC on Thursday May 7, 2015 @2-4pm, EXCEPTIONS ONLY PER UNIVERSITY POLICY)

Assignment Submission Policy

Homeworks and programming assignments will be submitted TBA. Homeworks/programs due at the start of class on the date indicated.
No extensions except as per USC policy. Assignments can be turned un late with 20% (1 total course percentage point) per day.

Additional Policies

Midterm and final exams

Midterms and final exams must be taken on campus on the scheduled date except as per documented USC policy. Note that certain exceptions require advance notice.

Incompletes

Incompletes will not be granted except as per documented USC policy.

Course outline (subject to change)

There are no assigned readings. Students should refer to Peterson/Davie as reference.

Lecture notes are posted here after each lecture.

1. Introduction
   - JAN 13 #01 - Background
   - JAN 15 #02 - Performance and efficiency

2. Communication
   - JAN 20 #03 - Communication as shared state
   - JAN 22 #04 - The perfect channel
   - JAN 27 #05 - Encodings
   - JAN 29 #06 - Protocols as two-party interactions

3. Networking
   - FEB 3 #07 - Multiparty
   - FEB 5 #08 - Sharing 1
   - FEB 10 #09 - Sharing 2
   - FEB 12 #10 - Relaying

4. Layers
   - FEB 17 #11 - Common translation
   - FEB 19 #12 - The need for naming and resolution
5. Naming
- MAR 3 #14 - Layer traversal and naming
- MAR 5 #15 - Resolution
- MAR 10 #16 - Sockets - naming inside and out
- MAR 12 #17 - Automatic naming
- MAR 17 - BREAK
- MAR 19 - BREAK

6. Recursion
- MAR 24 #18 - Recursion and layering
- MAR 26 #19 - Base case - physical layer
- MAR 31 #20 - Routing protocols
- APR 2 #21 - Forwarding as tail recursion

7. Intra-layer Issues
- APR 7 #22 - Intralayer optimizations
- APR 9 #23 - Intralayer examples
- APR 14 #24 - Intralayer transit support
- APR 16 #25 - Security

8. History
- APR 21 #26 - OSI and the cake
- APR 23 #27 - The Internet and the short stack

9. New Concepts
- APR 28 #28 - TBA
- APR 30 #29 - TBA
- May 5 - study day
- MAY 7 - FINAL, 2-4pm (location TBA)

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism - presenting someone else’s ideas as your own, either verbatim or recast in your own words - is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Section 11, Behavior Violating University Standards https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct/.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity http://equity.usc.edu/ or to the Department of Public Safety http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety whole USC community. Another member of the university community - such as a friend, classmate, advisor, or faculty member - can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel...
to campus infeasible, USC Emergency Information http://emergency.usc.edu/ will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.