CS 6380 — Computer Networks

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1 Course Summary

CS 6380 (Computer Networks) is the introductory graduate course in telecommunications/networking, laying the foundation for all other graduate networking courses. CS 6380 assumes no prior experience in networking; students who have previously taken a networking course may be able to skip 6380; this should be discussed with the professor. The material in 6380 is extremely broad, dealing with issues ranging from physical transmission to end-to-end transport. A lot of material falls in between, and the course moves along quickly. In addition to graduate students in CoC, this course also attracts some ECE graduate students. The course emphasizes problem solving to make fundamental concepts concrete; leaving hands-on exposure to networking hardware and protocol development to CS 6381.

Telecommunications and networking attracts a large number of students, reflecting an increased emphasis in society on the information age. The area is of great practical importance; nearly every one of us makes use of networking on a daily basis, often without a second thought about the details of operation. One goal of the this course is to reveal the underlying principles of operation, and convince you that there is no "magic." In addition, the subject area serves to integrate a wide range of computer science (and electrical engineering) concepts, including coding, algorithms, distributed systems, mathematical performance analysis and fault tolerance.

2 Teaching Philosophy

The purpose of this course is for you to (1) understand the fundamental problems and solution techniques involved in networking from the data link to the transport layers, and (2) to see how these fundamental concepts are manifest in practice, via case studies of particular protocols. This is not a course about any particular protocol or networking technology (e.g., Ethernet), rather it is about the more enduring concepts that appear in networking technology (e.g., medium access control). Case studies provide an excellent opportunity to see the messiness of principles in practice. In addition, they provide the opportunity to practice a critical skill: sifting through details for the key idea. Protocols are a great example of lots of details that can obscure a core concept.

I encourage (and expect) you to participate actively in the learning process. In particular, I welcome your comments and questions as we cover material in class. One-way lectures quickly becoming boring, both for you and for me. By asking lots of questions, your understanding of the material will be deepened signficantly, and the course will be much more fun!

3 Teaching/Learning Goals

My primary goals for this course are for you to develop the following abilities:

1. to correctly use the core terminology of networking (protocol, service, interface, peer-to-peer communication, layering, etc.);
2. to demonstrate understanding of the fundamental problems and solution techniques that arise in the data link, networking and transport layers;
3. to understand the details of several particular protocols, as example implementations of fundamental principles;
4. to propose and analyze candidate solutions, to determine if they satisfy correctness criteria;
5. to assess and compare solution approaches using performance evaluation techniques;
6. to apply basic concepts of networking in new networking contexts; (aside: re-inventing the wheel is common in networking).

4 Method

- Lectures and assignments

  Most of the class time will be spent on lectures about the information content of the course, supporting primarily goals 1, 3, 4 and 6. Through a series of homework assignments, you will have the opportunity to develop the skills listed in goals 2, 4, 5 and 6. Near the end of the course there will be some sort of project, involving either development of a protocol or in-depth study of some current networking issue. Details will be provided later in the quarter.

- Textbook

  Saadawi, Ammar and Hakeem, *Fundamentals of Telecommunications Networks*, Wiley, 1994. An errata sheet for the book can be found on the Web at:

  `http://www.cc.gatech.edu/fac/Mostafa.Ammar/BOOK.html`

  If you do not know how to access this, consult the TA. There are several other textbooks that cover similar material, including:

  - Spragins, Hammond and Pawlikowski, *Telecommunications Protocols and Design*, Addison-Wesley, 1991. (Reprinted, 1992)
  - Tanenbaum, *Computer Networks* (2nd edition), Prentice-Hall, 1988.
  - Stallings, *Data and Computer Communications* (2nd edition), Macmillan, 1988.

- Teaching Assistant

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5 Grading

The tentative grading allocation is given below. This is subject to possible revision, namely to give more weight to homework and other out-of-class activities and less to the midterm and final.

Homework	30%
Midterm	30%
Final	35%
Class participation	5%

6 Schedule (tentative)

Date	Topic	Reading
Wed, Sept 20	Introduction	Chap 1
Mon, Sept 25	Physical layer	Chap 2
Wed, Sept 27	Physical layer	
Mon, Oct 2	Intro to data link layer, framing	Chap 4
Wed, Oct 4	Coding	Sect 2.9
Mon, Oct 9	Medium access overview	Chap 7
Wed, Oct 11	Scheduling methods of medium access	Sect 7.5,7.6
Mon, Oct 16	Random access methods of medium access	Sect 7.4
Wed, Oct 18	802.x, HFC access	Sect 8.1
Mon, Oct 23	ARQ protocols	Sect 4.5
Wed, Oct 25	HDLC, X.25	Sect 4.6, 4.8
Mon, Oct 30	Intro to network layer	
Wed, Nov 1	Routing	Chap 5
Mon, Nov 6	Link state and distance vector routing	Chap 5
Wed, Nov 8	Bridging	Sect 9.2
Mon, Nov 13	IP	Sect 9.3
Wed, Nov 15	Intro to transport protocols	Chap 10
Mon, Nov 20	Transport protocols	Sect 10.2
Wed, Nov 22	TCP, UDP	Sect 10.3
Mon, Nov 27	Congestion control and avoidance	
Wed, Nov 29	HTTP	