

Syllabus

Handout 0

Aug. 27, 2009

Location: FPAT 259 (F. Paul Anderson Tower)
Time: TR 11:00 - 12:15
URL: <http://voip.netlab.uky.edu/~fei/teaching/cs571/index.html>

Instructor

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Office hours: TR 10:00 - 11:00 (or by appointment)

Textbook

Larry L. Peterson & Bruce S. Davie, Computer Networks: A Systems Approach, Fourth Edition, Morgan Kaufmann Publishers, 2007. (Required)

Michael J. Donahoo and Kenneth L. Calvert, TCP/IP Socket in C, Morgan Kaufmann, 2001. (Highly Recommended)

Description

This course focuses on the principles of computer networks using current Internet technologies and protocols as examples. Topics include routing algorithms and protocols; end-to-end transport; flow control; congestion avoidance and control; mail, web, and file transfer protocols; designing and implementing applications using common network APIs. Advanced topics, included as time permits, include network security, multicast, and quality of service.

Prerequisite

CS 471G or consent of instructor

Needed Skills: Background equivalent to what successful completion of CS471G. Students should be able to:

1. Understand channels and how information is transmitted over digital channels. Explain the concepts of channel capacity (“bandwidth”) and latency.
2. Describe, apply and implement techniques for framing, error detection, and error recovery.
3. Explain the difference between virtual circuit and datagram network services. Describe the steps taken by the network infrastructure in forwarding a packet from one host to another using IP.
4. Design, code, and test simple programs that communicate using a network.

Learning Outcomes

Students will develop knowledge and skills in computer networking. At the conclusion of the course, students will be able to:

1. Understand and explain in detail the operation of the important Internet protocols, including IP, ARP, TCP, HTTP, SMTP, and DNS.
2. Explain the problem of congestion in networks, describe various strategies for dealing with it, and explain their strengths and weaknesses.

3. Explain the difference between intra-domain routing and inter-domain routing, and describe the protocols commonly used for each.
4. Evaluate and select a Medium Access Control protocol for a given set of application parameters. Explain the limits on scalability of MAC protocols, the difference between routing and bridging, and why the former scales but the latter doesn't.
5. Construct a queueing model of a simple queueing system and specify the parameters of its performance.
6. Implement a protocol from a given specification.

Grading

The grade will be determined by your performance on homework, programming assignments, participation in class, a midterm exam and a final exam. The tentative weights are as follows:

Class participation	5%
Homework, Programming Assignments	45%
Midterm exam	20%
Final exam	30%

Final grades will be assigned according to the following scale:

A=90-100%, B=80-89%, C=70-79%, D=60-69%, E=0-59%.

For graduate students, grade D will automatically be replaced by E. Also, any grade normalization will be done against peer students, i.e. undergraduates will only be normalized with undergraduates, and graduates with graduates.

No incomplete grades will be assigned unless there exist exceptional, extenuating circumstances.

Late programs or homework will be penalized 10% per day for each day late. No programs or homework will be accepted if they are late for more than 3 days. Attendance is mandatory. For each unexcused absence, two points will be deducted from your final average.

Additional Sources

The textbook will be supplemented with additional materials. Among them, RFCs (RFC stands for *Request for Comments*) will be used most frequently.

Here are some other textbooks:

- James F. Kurose and Keith W. Ross, *Computer Networking: A Top-Down Approach Featuring the Internet*, 4/e, Addison Wesley, 2007.
- Behrouz A. Forouzan, *TCP/IP Protocol Suite*, Third Edition, McGraw-Hill, 2005.
- Christian Huitema, *Routing in the Internet*, Second Edition, Prentice Hall, 2000.
- Gary R. Wright, W. Richard Stevens, *TCP/IP Illustrated*, Volume 2, Addison Wesley, 1995.
- William Stallings, *Data and Computer Communications*, Prentice Hall, 8th Edition, 2007.
- Douglas Comer, *Internetworking with TCP/IP: Principles, Protocols, and Architecture*, Prentice Hall, 5th Edition, 2006.
- Andrew S. Tanenbaum, *Computer Networks*, 4th Edition, Prentice Hall, 2002.

Journals and magazines of interest include: *IEEE/ACM Transactions on Networking*, *IEEE Journal on Selected Areas in Communications*, *Computer Communication Review*, *IEEE Network Magazine*. Some major conference proceedings (SIGCOMM, INFOCOM, etc.) are also a good source to get up-to-date information about current research directions and topics.

Academic Conduct Expectations

Students are expected to do all assignments independently, unless explicitly told otherwise. Honest and ethical behavior is expected at all times. There will be no tolerance for plagiarism or other academic misconduct. The minimum punishment is an E grade that cannot be removed by the repeat option. You may read U.K. Student Rights and Responsibilities at <http://www.uky.edu/StudentAffairs/Code> for a detailed description.

Schedule

This schedule is **tentative** and subject to change. Rxxx stands for RFC (Request For Comment) xxx, which can be found at <http://www.ietf.org/rfc.html>.

Please be advised that you are supposed to read the corresponding sections in the textbook and other listed materials before each class. Some of the contents will not be covered during the class meeting. We will discuss a substantial number of research papers to cover the most up-to-date technologies in the computer network field. I will post links to these papers in the class web site. It is your responsibility to download these papers and read them.

Week	Start From	Topic
1	08/27	Introduction, Motivation 1.1, 1.2, 1.3
2	08/31	Ethernet, CSMA/CD, Bridges 2.6, 3.2
3	09/07	Internetworking 4.1.1, R791 IP - Addressing, Forwarding 4.1.3, 4.1.4
4	09/14	IP - Fragmentation, ARP, ICMP 4.1.2, 4.1.5, 4.1.7 Fast IP lookup
5	09/21	IP Routing, 4.2.1, 4.2.4 Intra-domain routing: RIP, OSPF 4.2.2, 4.2.3
6	09/28	Subnets, CIDR 4.3.1, 4.3.2
7	10/05	Inter-domain routing: BGP 4.3.3, R1771 IPv6 4.3.5
8		Midterm exam and flexible
9	10/19	Transport, UDP 5.1, R768 TCP overview, sliding window, flow control 5.2, R793
10	10/26	Congestion avoidance and Control 6.3, 6.4, R2581 DCCP
11	11/02	Application: DNS/HTTP/FTP/SMTP/SNMP 9.1, R2616
12	11/09	Network security (DES, RSA) 8.1-8.5 Message integrity, PGP, firewall
13	11/16	Multicast 4.4 Overlay & DHTs 9.4
14	11/23	QoS 6.5
15	11/30	Multimedia Applications (SIP, RTP) 9.3, 5.4, R1889
16	12/07	Introduction to Queueing Theory Flexible and review
17		Final exam at 10:30am on Dec. 15, 2009 (Tuesday)