CSE 473s
Introduction to Computer Networks

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Audio/Video recordings of this lecture are available on-line at:

http://www.cse.wustl.edu/~jain/cse473-11/

Overview

- Why Study Computer Networking?
- Goal of This Course
- Instructor
- Grading
- Contents of the course
- Tentative Schedule

Why Study Computer Networking?

- Networking is the "plumbing" of computing
- Almost all areas of computing are network-based.
  - Distributed computing
  - Distributed databases
  - Distributed storage
- Fast growing field
- Job Opportunities: Google, Facebook, eBay, Microsoft, Cisco, HP, Intel, …

Stone Age to Networking Age

- Stone, iron, …, automotive, electricity, telephone, jet plane,…, networks caused a fundamental change in our life style

- No need to get out for
  - Office
  - Shopping
  - Entertainment
  - Education
- Virtual reality will satisfy your needs for
  - Games
  - Tourism
  - Sex

Goal of This Course

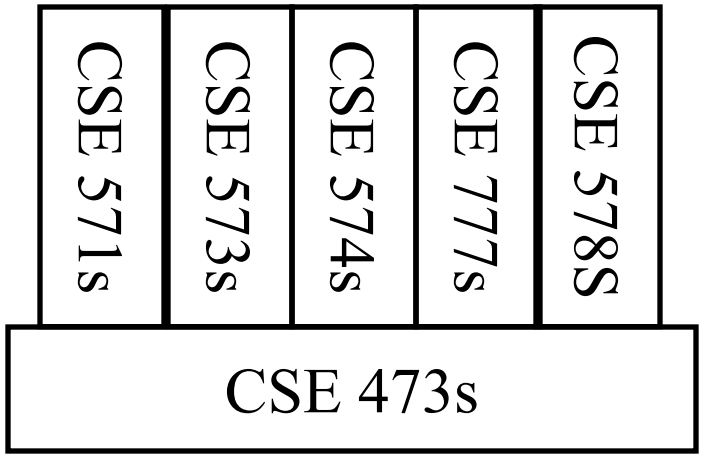
- First course in networking
- Fundamentals
- Broad coverage of key areas of networking
- Networking background for networking applications in other areas of computing
- This is a course on Networking Architecture
- This is not a course on network building or usage
- You will be able to understand protocols
- An example of the difference between architecture and implementation is the computer architecture course and a course on Intel Pentium Chip.

Goals of This Course (Continued)

- You will learn about networking concepts that will help you understand how computer networks work:
  - What messages are sent when you surf on the web?
  - How the mail forwarded?
  - What happens when the network is overloaded?
  - How the messages find the best route?
  - What happens if there are bit errors in the messages?
  - What's the difference between Ethernet and WiFi protocols?
- This is the first course on networking.
- Basis for more advanced networking courses

Networking Courses at WUSTL

- CSE 473s: Introduction to Computer Networks
- CSE 571S: Network Security
- CSE 573s: Protocols for Computer Networks
- CSE 574s: Wireless and Mobile Networking
- CSE 578S: Multimedia Computing and Networking
- CSE 777s: Research Seminar in Networking



Grading

- Mid-Term Exams (Best of 2) 30%
- Final Exam 30%
- Class participation 5%
- Homeworks 20%
- Labs 15%
- Note: Labs require programming in C
- Academic integrity is expected in homeworks

Homework Submission

- Every class will have one or more homeworks.
- All homeworks are due on the following Monday at the beginning of the class unless specified otherwise.
- All homeworks should be submitted in the class and on paper, unless indicated otherwise.
- Any late submissions, if allowed, will ***always*** have a penalty.
- Please write CSE473 in the subject field of all emails related to this course.
- Use word "Homework" in the subject field on emails related homework. Also indicate the homework number.
- All homeworks are identified by the class handout number.
- All homeworks should be on a separate sheet. Your name should be on every page.

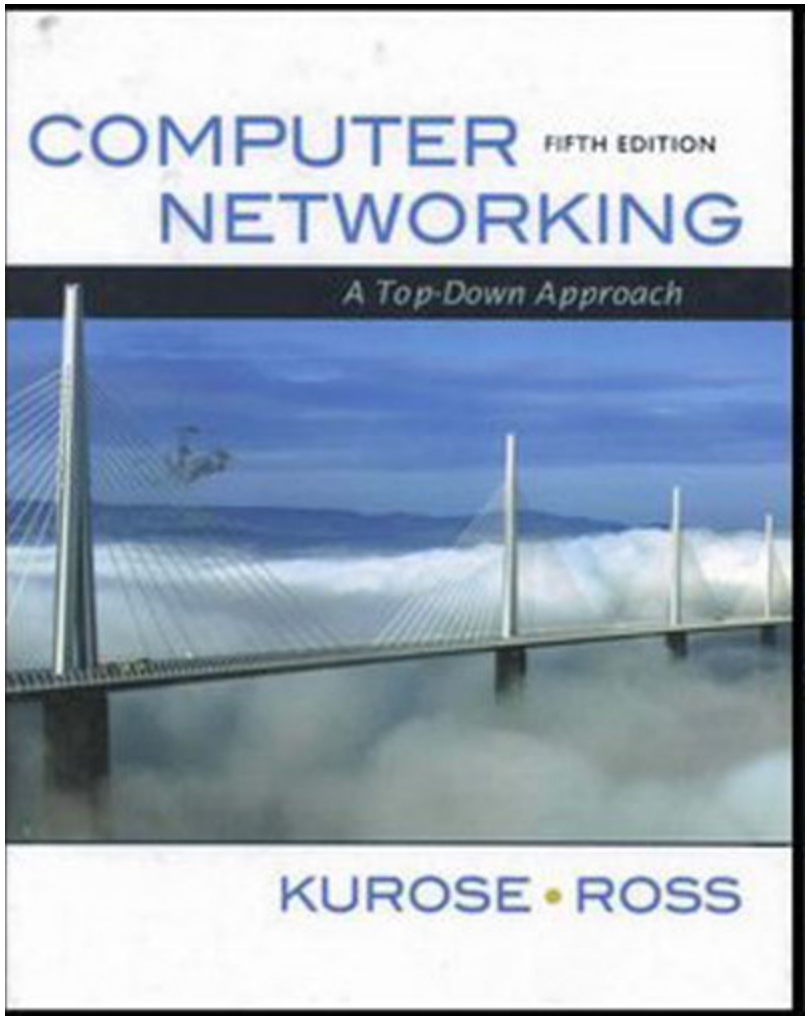
Exams

- There are two mid-terms and one final exam.
- All exams are 1 hour long. One notes sheet of 8.5"x11" (both sides) is allowed along with a simple calculator (TI-30).
- Exams consist of numerical as well as multiple-choice (true-false) questions.
- There is a negative grading on incorrect multiple-choice questions. Grade: +1 for correct. -1/(n-1) for incorrect.
- Everyone including the graduating seniors are graded the same way.
- Your grade depends upon the performance of the rest of the class.

Textbook

- J.F. Kurose and K.W. Ross, "Computer Networking" 5th Edition, Addison-Wesley, March 2009, 864 pages, ISBN:0136079679. **Required**.

- Get the latest edition. Do not use older editions. If you use international edition, it should be dated later than March 2009, should have 864 pages, ISBN: 978-0-13-136548-3, or 0-13-136548-7



Textbook (Cont)

- It is recommended that you read the relevant chapter of the book chapter before coming to the class
  $\Rightarrow$ Class time will be used for discussing and clarifying key concepts
- Only key concepts will be covered in the class.
  You are expected to read the rest from the book.
- Please ask questions in the next class about any concepts that are not clear to you
- Material covered in the class will include some concepts from other textbooks. Please pay attention to the class lecture.

Prerequisite

- General knowledge of computer systems organization
  - Memory
  - System bus
  - Interrupt
  - CPU
  - Binary, decimal, hexadecimal representations
  - Bits, bytes
  - Storage: Memory and disk
- CSE 131: Computer Science I or equivalent
- CSE 241: Algorithms and Data Structures (not required)

What Will You Learn?

1. What messages and messages are exchanged when you fetch a web page?
2. What messages are used to send/receive emails?
3. How the names such as www.google.com gets translated to IP addresses such as 74.125.73.104?
4. What is done to avoid congestion under overload?
5. How is the path in the Internet determined?
6. What happens if bits in a packet get corrupted?
7. How WiFi or Ethernet works?
8. What is the difference between WiFi, Ethernet, IP, and TCP?
9. What is done to handle audio/video on the Internet?
10. How can you guarantee security on the Internet?

Tentative Schedule

#	Date	Topic	Chapter
1	8/31	Course Overview	
2	*9/05*	*Labor Day Holiday*	
3	9/07	Internet: Core and Edge, History	1
4	9/12	Protocol Layers	1
5	9/14	Application Layer: HTTP,	2
6	9/19	FTP, SMTP,	2
7	9/21	Domain Name System (DNS), Peer to Peer (P2P) Networking	2
8	9/26	Transport Layer: Design Issues	3
9	9/28	Universal Datagram Protocol (UDP) and Transmission Control Protocol (TCP)	3
10	**10/03**	**Mid-Term Exam 1**	

Tentative Schedule (Cont)

#	Date	Topic	Chapter
11	10/05	TCP Congestion Control	3
12	10/10	Network Layer:	4
13	10/12	IP4, ICMP, IPv6	4
14	10/17	Intro to Open Networking Lab (Lab1)	
15	10/19	Routing Algorithms	4
16	10/24	Internet Routing Protocols: OSPF, RIP, BGP	4
17	10/26	Link Layer: Error correction	5
18	10/31	Ethernet	5
19	11/02	LLC, VLANs, PPP, MPLS	5
20	**11/07**	**Mid-Term Exam 2**	

Tentative Schedule (Cont)

#	Date	Topic	Chapter
21	11/09	Wireless and Mobile Networks: WiFi 802.11	6
22	11/14	Bluetooth, WiMAX, Cellular wireless Networks	
23	11/16	Mobile IP and Cellular Mobility | ONL Lab 3	6
24	11/21	Security in Computer Networks:Cryptography	8
25	*11/23*	*Thanksgiving Holiday*	
26	11/28	Public Key Cryptography, IPSec	8
27	11/30	Network Management	9
28	12/05	Multimedia Networking	7
29	**12/07**	**Final Exam**	

Note that the final exam is on December 7, 2011.
The dates for all exams are fixed. No substitute exams.

Office Hours

- Monday: 11:00AM to 12:00 noon
  Wednesday: 11:00AM to 12:00noon
- Office: Bryan 523
- Teaching Assistants:

Name	Room	Email	Office Hours
Minjie Zheng	Bryan 516	mzheng@go.wustl.edu	Th 1-2:30PM Sat (by appt)
Daniel McCown	Bryan 516	dpm3@cec.wustl.edu	

mCLK System for Instant Quizzes

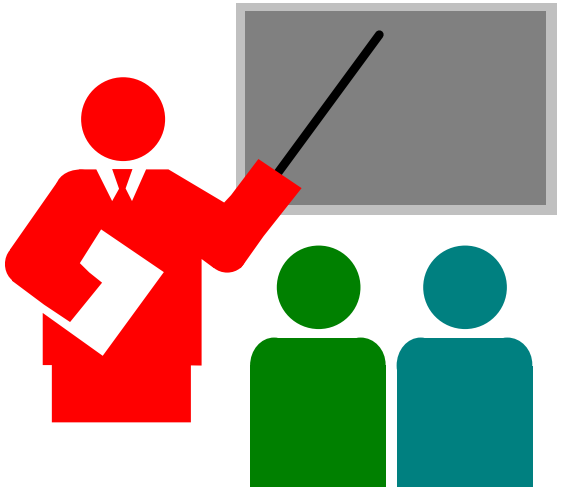
To set up your phone to use mClk (one time setup)

1. I have set-up the keyword "net" on the mClk system
2. Using your cell phone, send a text message to short code 29671
3. Content of message must be: start net [first initial lastname]
   (example: start net jsmith)
4. A confirmation text message will be sent to your phone.

To use mClk (for each class)

1. On the first mClk question, send a text message to short code 29671 with the message "join" and the session ID that is posted on the screen (example: join 1248).
2. A confirmation text message will be sent to your phone
3. To answer each question, text the question number and your answer to 29671 (example: 1 C). Be sure to separate the question number and your answer with a SPACE.
4. Your response is added to those of the other attendees and results are projected on the screen.

Summary



- Computer networking is important for all areas of computing
- First course in computer networking
- Goal: To prepare you for a career in networking
- Get ready to work hard

Quiz 0: Prerequisites

- True or False?
- T F

1. ❑ ❑ Transmitting 100 bytes @ 800 bit/sec will take 1 sec.
2. ❑ ❑ A system with 32kB memory can hold only 16000 ASCII characters
3. ❑ ❑ A system with 2GB memory is same as that with 2GB disk.
4. ❑ ❑ Interrupts are used by CPU to stop an ongoing I/O.
5. ❑ ❑ Binary representation of 9 is 1001
6. ❑ ❑ 0A in Hexadecimal is 11 in decimal system.
7. ❑ ❑ For $I = A \sin(2\pi ft + \phi)$, the frequency is f.
8. ❑ ❑ 5 modulo 2 is 1
9. ❑ ❑ Two entries "P" and "Q" are pushed sequentially on a stack. A "pop" operation on the stack will produce P.
10. ❑ ❑ If x is 0, then after x++, x will be 1.

Marks = Correct Answers _____ - Incorrect Answers _____ = _____

Student Questionnaire

- Name: _____
- Major: _____
- Email: _____
- Degree/Expected Year: _____
- Operating Systems/Architecture course taken:

  _____
- Computer networking courses taken:

  _____
- What do you expect to learn from this course:

  _____

  _____

  _____

  _____