CIS 788.08Q
Recent Advances in Networking 1999

Raj Jain

Raj Jain is now at
Washington University in Saint Louis
Jain@cse.wustl.edu
http://www.cse.wustl.edu/~jain/
- How am I going to grade you?
- What are we going to cover?
- When are you going to do it?
- Why you should not take this course?
Grading

- Quizzes (Best 2 of 3) 40%
- Class participation 10%
- Homeworks 15%
- Project 35%
- Most of the homeworks will be related to the project.
Text Book

- No required textbooks
- See “Books on Hot Topics in Networking,”
  http://www.cis.ohio-state.edu/~jain/refs/hot_book.htm
- Supplementary Reading:
  - Recent ANSI, ITU, IEEE Standards
  - ATM Forum www.atmforum.com
  - IETF RFCs and Internet Drafts www.ietf.org
Prerequisite: CIS677

- Protocol Layers: ISO/OSI reference model
- Physical Layer: Coding, Manchester
- Transmission Media: UTP, Cat 5, Microwave, Radio
- Data Communication: Asynchronous vs synchronous, Baud, bit, and Hz, Half-Duplex vs Full-duplex, Modulation/Demodulation
- Packet Transmissions: Framing, Bit stuffing, byte stuffing
- Flow Control: On-Off, Window
- Error Detection: Parity, Checksum, Cyclic Redundancy Check
Prerequisites (Cont)

- Error Recovery: Start and Stop, Go back \( n \), Selective Reject
- LANs: Aloha, CSMA/CD, Ethernet, IEEE 802.3, Token Ring/IEEE 802.5, FDDI
- LAN Addressing: Unicast vs multicast, Local vs Global
- LAN wiring: 10Base5, 10Base2, 10Base-T, 100Base-T4, 100Base-TX, 100Base-FX
- Extended LANs: Hubs, Bridges, Routers, Switches
- Routing: Distance Vector vs Link State, Spanning tree, source routing
- Network Layer: Connectionless vs connection oriented
Schedule (Tentative)

9/23/99 Course Overview, Networking Trends
9/28/99 Basic Concepts: Data Networks*
9/30/99 Basic Concepts: Telecommunications Networks*
10/5/99 ATM - Intro
10/7/99 IP Switching, Multiprotocol Label Switching
10/12/99 Optical Networks: WDM
10/14/99 Quiz 1
10/19/99 QoS over IP
10/21/99 Virtual Private Networks
Schedule (Cont)

10/26/99 Directory Enabled Networks
10/28/99 Res. Broadband: Cable Modems, ADSL*
11/2/99 Quiz 2
11/4/99 IP Over SONET
11/9/99 Web Service Distribution and Caching*
11/11/99 Gigabit and 10 G Ethernet*
11/16/99 Wireless Networks
11/18/99 Quiz 3
11/23/99 Graduating Seniors’ grades due
A survey paper on topic of your choice

Stages:
- Literature search
  - CD ROMs: Compendex, Books in Print, WWW
- Reading
- Writing

7.5 Hrs/week/person on project
7.5 Hrs/week/person on class
Project Topics

- QoS over Data Networks: Protocols and Standards
- QoS over Data Networks: Products, Services, Issues
- QoS/constraint/policy based Routing
- Voice over IP: Products, Services, Issues
- Voice over IP: Protocols and Standards (SIP, SAP, SDP, MGCP, …)
- Voice over IP: Signaling Transports
- Voice over ATM
- H.323 and Associated Protocols
- Video Compression Standards: DAVIC, MPEG-4,7
- Voice Compression Standards
Topics (Cont)

- Optical Networks and DWDM
- Wavelength Routing
- Terabit switches/routers
- Local Multipoint Distribution Services (LMDS)
- 10 Gb Ethernet
- Web Distribution Systems: Caching and Replication
- Directory Enable Networks
- Next Generation Wireless Networks
- Next Generation Satellite Networks
- Home Networking
- Wireless Local Loop
Topics (Cont)

- Virtual Private Networks: Products, Services, Issues
- Virtual Private Networks: Protocols and Standards
- Gigabit Networking Testbeds/Projects: NGI, Internet2, ...
- Packet Scheduling Techniques: WFQ, WF2Q, CBQ, PFQ, ...
- Packet over SONET
- New Developments in LANs: Flow Control, Aggregation, QoS, Multicast, VLANs
- Recent Developments in Frame Relay: SVC, High-speed, ATM Interworking, Voice, QoS
Topics (Cont)

- Recent Developments in ATM: Frame-Based ATM, DiffServ, Rerouting, ...
- Wireless ATM
- Security for electronic commerce
- ATM Products, Services, and Deployment
- ATM Network Security
- IP QoS over ATM
- TCP Extensions for Wireless
- Wireless Ad Hoc Routing Protocols
- Multicasting over Wireless
- LAN WAN Convergence
- IP over DWDM: Issues
Project Schedule

- 9/30/99: Preliminary Topic selection due
- 10/5/99: Final Topic Assignment
- 10/7/99: Literature search results due
- 10/12/99: Literature collection due
- 10/21/99: Key Points Due
- 10/28/99: Project report due
- 11/9/99: Peer Reviews Due
- 11/16/99: Final written Report (HTML Page) due

Note: Will need to sign Web/Print publications release
Office Hours

- Tuesday: 4:00 to 4:30 PM
  Thursday: 4:00 to 4:30 PM

- Office: 297 Dreese Lab, 2015 Neil Ave
Why You Shouldn’t take this course?

- You aren’t ready for the hardwork
- You don’t have 15 hours/week
- You don’t have the background
- You just want to sit and listen
- You were expecting an introductory course
- You are not ready to take the initiative
  Only key concepts will be covered in the class.
  Students are expected to research and read.
- This does not cover what you want
Frequently Asked Questions

- Yes, I do use “curve”. Your grade depends upon the performance of the rest of the class.
- All homeworks are due at the beginning of the next class.
- All late submissions must be preapproved.
- All quizzes are open-book and extremely time limited.
- Quizzes consist of numerical as well as multiple-choice (true-false) questions.
- There is 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.
Trend: Networking Age

- No need to get out for
  - Office
  - Shopping
  - Entertainment
  - Education

- Virtual Schools
- Virtual Cash
- Virtual Workplace
  (55 Million US workers will work remotely by 2000)
Life Cycles of Technologies

Number of Problems Solved

Research  Productization  Time

You are here

The Ohio State University  Raj Jain
**New Challenges**: Exponential growth in number of users. Exponential growth in bandwidth per user. Traffic management, Security, Usability, ...
There will be a lot of self-reading

Goal: To prepare you for a career in networking

Get ready to work hard

Networking is a hot field
Quiz 0: Prerequisites

True or False?

T  F

☐ ☐ Datalink refers to the 2nd layer in the ISO/OSI reference model

☐ ☐ Category 5 unshielded twisted pair cable is better than category 3 cable.

☐ ☐ Finding path from one node to another in a large network is a transport layer function.

☐ ☐ It is impossible to send 3000 bits/second through a wire which has a bandwidth of 1000 Hz.
Prerequisites (Cont)

- Bit stuffing is used so that characters used for framing do not occur in the data part of the frame.
- For long delay paths, on-off flow control is better than window flow control.
- Ethernet uses a CSMA/CD access method.
- 10Base2 runs at 2 Mbps.
- The packets sent in a connection-oriented network are called datagrams.
- Spanning tree algorithm is used to find a loop free path in a network.

Marks = Correct Answers _____ - Incorrect Answers
Homework 1: Due 9/28/99

- Search web pages, Compendex CD-ROM (Science and Engineering Library), and Ohio link for one of the following topics:
  - Optical Networking
  - Directory Enabled Networks
  - Terabit Networking
  - Wavelength Division Multiplexing
Ignore all entries dated 1995 or before. List others in the following format (5 each):

- Author, “Title,” publisher, year. (for 5 books)
- “Title,” URL [One line description] (for 5 web pages)
- Author, “Title,” source (for 5 articles)
- Organization name, URL (for 5 organizations)

Serially number the references and submit electronically to durresi@netlab.ohio-state.edu (Please note the address carefully). The mail must have a subject field of “CIS 788 Homework 1”
For web page search use at least the following starting points:

- http://google.stanford.edu/
- http://liinwww.ira.uka.de/bibliography/index.html
- http://www.ncstrl.org
- http://www.allonesearch.com/
- http://stoat.shef.ac.uk:8080/megaweb/

Make a list of other interesting search starting points, add it to your homework, and share with the class.
Homework 2: Due 9/30/99

- Prepare your personal web page.
- Must include your photograph
- Use meta-HTML commands in the header to indicate title, author, keywords, and description.
- Recommended HTML Editor: Netscape Gold
- Use netlab facilities to take your picture
- Submit a one-page hard-copy printout
Project Selection: Due 9/30/99

- Name: ______________________________________________________
- Project Choice 1: _____________________________________________
  - Why? ______________________________________________________
    ___________________________________________________________
    ___________________________________________________________
    ___________________________________________________________

- Name: ______________________________________________________
- Project Choice 2: _____________________________________________
  - Why? ______________________________________________________
    ___________________________________________________________
    ___________________________________________________________
Project Selection (Cont)

- Name: _____________________________________________
- Project Choice 3: ________________________________
  - Why? _________________________________________
    _____________________________________________

- Name: _____________________________________________
- Project Choice 4: ________________________________
  - Why? _________________________________________
    _____________________________________________
Student Questionnaire

- Name: ________________________________
- Email: ______________________________
- Phone: ______________________________

- Networking courses taken
  _______________________________________________________________________
  _______________________________________________________________________
  _______________________________________________________________________

- Prior Networking Background:
  _______________________________________________________________________
  _______________________________________________________________________
  _______________________________________________________________________