

Spring term 2008
TELCOM 2321 – CS 2520
Wide Area Networks
Tuesday 6:00 pm - 8:50 pm
6110 SENSQ
<http://www.sis.pitt.edu/~wcerroni/wans.html>

Instructor

Dr. Walter Cerroni
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TA (homeworks)

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GSA (lab)

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Course overview and objectives

The widespread use of networking technologies to deliver data and multimedia services to end users all over the world is an important challenge for the global network infrastructure. High-speed Wide Area Network (WAN) technologies must then cope with different service requirements and be capable of providing a satisfying level of Quality of Service (QoS) in terms of available bandwidth and limited latency and jitter.

The main objective of this course is to provide an understanding of the basic principles and fundamental design issues related to multi-service networks, with particular reference to TCP/IP networks.

General topics such as flow and congestion control, traffic shaping and packet scheduling will be the focus of the first part of the course. Then the TCP flow and congestion control and the Internet QoS architectures (IntServ, DiffServ) will be discussed in detail. MPLS and protocols for multimedia services will also be covered.

Prerequisite

TELCOM 2310 or other background on computer networking fundamentals.

Course topics

Network Architectures and Protocols Fundamentals

The case of WANs: requirements for High-speed Multi-service Networks

WANs Design Issues

Latency-Bandwidth Trade-off

The end-to-end argument

Data Link Layer Flow and Error Control Schemes

End-to-End Flow and Congestion Control Schemes

Traffic shaping

Packet Scheduling

Active queue management: RED

Internet protocol suite

TCP Flow Control

TCP Congestion Control

TCP performance models

QoS: Integrated Services Architecture

QoS: Differentiated Services Architecture

Multi-Protocol Label Switching
Generalized MPLS
Internet Traffic Engineering
Protocols for real-time, interactive applications: RTP, RTCP, SIP

Textbook

William Stallings, “High Speed Networks and Internets: Performance and Quality of Service”, 2nd Edition, Prentice Hall, 2002.

Additional reference material

- Research papers on specific topics will be suggested during the course.
- Zheng Wang, “Internet QoS: Architectures and Mechanisms for Quality of Service”, Morgan Kaufmann, 2001.
- Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, 3rd Edition, Morgan Kaufmann, 2003.

Office Hours

Wednesday: 11:00am – 12:00 pm
Thursday: 11:00 am - 12:00 pm
Additional hours by appointment

Important Dates

Mid-term exam: Tuesday, March 4, 2008.
Project discussion: Tuesday, April 15, 2008.
Final exam: Tuesday, April 22, 2008.

Course Evaluation

Homework/Lab: 20%
Project: 30%
Mid-term exam: 20%
Final exam: 30%

Course Policies

All work must be the student’s own, unless collaboration is specifically and explicitly permitted.
The course will use both a textbook as well as a set of research papers. We will use the textbook for the fundamentals and seminal research papers for specific topics.
Students are expected to regularly check the course webpage at <http://www.sis.pitt.edu/~wcerroni/wans.html> for announcements, class schedule updates, lecture notes, homework assignment and solutions and other related course material.
Homework assignments are expected to be turned in at the start of class period on the due date. Typically, homework is due one week after it is assigned, unless otherwise mentioned. Late assignments will be penalized.
Project policies will be posted on the course web page soon.
Mid-term exam will be during class hours.

Disability Resources and Services

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact the instructor and Disability Resources and Services, 216 William Pitt Union, 412-648-7890 or 412-383-7355 (TTY), as early as possible in the term.

Tentative course schedule

This course schedule is tentative and may be subject to changes. Check the web page for updates.

Week	Date	Topics
1	08/01/2008	Introduction to the course Network Architectures and Protocols Fundamentals The case of WANs: requirements for High-speed Multi-service Networks
2	15/01/2008	WANs Design Issues Latency-Bandwidth Trade-off The end-to-end argument Data Link Layer Flow and Error Control Schemes
3	22/01/2008	End-to-End Flow and Congestion Control Schemes
4	29/01/2008	Traffic shaping Packet Scheduling
5	05/02/2008	Active queue management: RED
6	12/02/2008	Internet protocol suite TCP Flow Control
7	19/02/2008	TCP Congestion Control
8	26/02/2008	TCP performance models
9	04/03/2008	Mid-term exam QoS: Integrated Services Architecture
	11/03/2008	Spring Break
10	18/03/2008	QoS: Differentiated Services Architecture
11	25/03/2008	Multi-Protocol Label Switching Generalized MPLS

12	01/04/2008	Internet Traffic Engineering
13	08/04/2008	Protocols for real-time, interactive applications RTP, RTCP, SIP
14	15/04/2008	Project presentations
15	22/04/2008	Final Exam