Internet Construction

Tuesday 6:00 - 9:00 pm.

Course Objective

The objective of the course is to provide an understanding of the basic principles and fundamental design issues of next generation networking over the Internet. The first part of the course will focus on core issues related to quality-of-service (QoS) support for multimedia applications. The topics covered include characterization of multimedia application performance objectives, characterization of network traffic and its implications on network design, network-level traffic management and congestion control, transport-level traffic management and flow control, multicast routing, and resource reservation protocols. The Internet QoS service model, namely the Differentiated Service (DiffServ) architecture, will be discussed.

The second part of the course will investigate the next generation of networking concept where converging of multiple different types of wireline and wireless networks is possible using IP technology. Emerging switching technologies will be discussed including Multi-Protocol Label Switching (MPLS). Fault management and network provisioning concept will also be discussed.

The third part of the course will cover application layer topics including the applications of Internet telephony over Session Initiation Protocol (SIP) architecture, multimedia and multicasting, overlay networking and content distribution.

Course Outlines

1. Introduction
    - Internet Architecture
    - Multimedia Service Applications
    - Motivation for New Networking Technologies
2. Application Characteristics
    - Application Requirements
    - Quality of Services Guarantees
3. Congestion and Flow Control
    - Preventive and Reactive Controls
    - Traffic Contract
    - Resource Management
    - Scheduling
4. Traffic Control and Resource Management
    - Traffic Shaping
    - Connection Admission Control
5. Differentiated Services (DiffServ) Architecture
6. Next Generation Networking Architecture
    - Next Generation Networking Paradigm
    - Emerging of switching technologies
        - MultiProtocol Labeling Switch (MPLS)
        - Virtual Private Networking Technologies
7. Network Provisioning and Fault Management Concept

- Network Provisioning Concept
- Fault Management Techniques

8. Internet Applications
    - Internet Telephony Applications
    - Multimedia and Multicasting Applications
    - Overlay Networking
    - Content Distribution Applications

Course Evaluation

- Homeworks : 10 %
- Projects : 30 %
- Midterm Exam: 30 %
- Final Exam : 30%

References

- *Internet QoS: Architectures and Mechanisms for Quality of Service,* Zheng Wang, Morgan Kaufmann; 1st edition, 2001.
- *Computer Networking; A Top-Down Approach Featuring the Internet,* 3rd Edition, James F Kurose and Keith W. Ross, Addison Wesley, 2003.
- *High Speed Networks and Internets: Performance and Quality of Service*, William Stallings, 2nd Edition, Prentice Hall, 2001.
- *Engineering Approach to Computer Networks*, Srinivasan Keshav, 1st Edition, Addison Wesley, 1997.
- *Computer Networks: A Systems Approach*, Larry L. L. Peterson Bruce S. Davie Bruce S. Davie, 3rd Edition, Morgan Kaufmann Publishers, 2003.
- Journal Papers: Many problems related to next generation networks are under active debate and are not covered in the textbooks. Papers from current literature will be assigned.

Instructor Contact

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Instructor's Policies

- This is an advanced course in computer communication networks. The goal of the course is to provide a basis for understanding, appreciating, and performing research in advanced networking. The course emphasizes the concepts and issues underlying the design and implementation of the Internet. The course will use both a textbook as well as a set of research papers. We will use the textbook for the fundamentals, seminal research papers for the origins of the problems and techniques, and recent research papers for the current state of the art.
- Homework assignments are expected to be available at the start of class period on the due date. Homework is due one week after it is assigned unless otherwise mentioned. If the student is unable to attend the class, homework may be submitted directly to the instructor prior to the scheduled class time.

- No late homework assignments will be accepted.
- Project assignment must be a collaborative work of all group members. The copy of work is prohibited and will be handled under a serious action. Students are advised to consult with the Instructor on issues related to the project completion.
- Make-up exams for midterm only by prior arrangement with the instructor, and only with prior notice and documented extraordinary circumstances.
- No make-up will be given for the final examination.