CS573 Course Outline
Network Protocols and Standards

Description:
This course covers Network Protocols and Standards used by various entities in an end-to-end connection over the Internet. Specifically, we will consider Bridging (≈ LAN) protocols, routing (≈ WAN) protocols, and, to some extent, ATM and MPLS protocols. LAN protocols and standards will include MAC addressing schemes, bridging, and VLANs. Routing protocols will include unicast (RIP, OSPF, etc.) and multicast (DVMRP, MOSPF, PIM-SM, PIM-DM, etc.) protocols between Internet gateways. Tentatively, ATM signaling and internetworking, ATM LAN Emulation, IP over ATM, and MPLS will be covered in the last part of the course.

Prerequisites:
1. Ability to program in C and C++.
2. CS 471 or equivalent.

Talk to the instructor or go to the first class meeting if you are not sure whether you have the right background for this course.

Detailed Contents:
1. Introduction
   (a) Local Area Networks
   (b) LAN Addressing Schemes
   (c) Protocol Type Multiplexing
2. Bridging
   (a) Why Bridges?
   (b) What is Switched Ethernet?
   (c) Transparent Bridges
      i. Learning Process
      ii. Forwarding Database: Creation and Maintenance
      iii. Forwarding Process
      iv. Dealing with Loops: Spanning Tree Algorithm
      v. Configuration BPDUs
vi. Root and Designated Bridges
vii. Learning after Spanning Tree Algorithm
viii. Addition and Failure of Bridges
ix. Aging of Configuration Messages
x. Avoiding Temporary Loops
xi. Bridge Message Format
(d) Source Routing Bridges (SR-TB, SRT Bridges)
(e) Expedited Traffic Capabilities
(f) Selective Multicast Capabilities
   i. GARP (Generic Attribute Registration Protocol)
   ii. GMRP (GARP Multicast Registration Protocol)
   iii. GARP Information Propagation (GIP)
(g) IEEE 802.1Q VLANs
   i. VLAN IDs (VLAN Tags)
   ii. GVRP (GARP VLAN Registration Protocol)
   iii. Ingress and Egress rules
   iv. Implications on GMRP
3. Internet Protocol
   (a) IPv4 Datagram
   (b) Internet Address Classes
   (c) Special IP Addresses
   (d) ARP: I need your address!
   (e) RARP: Can I have my address?
   (f) IP Routing
   (g) Proxy ARP
   (h) Subnetting and Supernetting
   (i) IPv6
   (j) ICMP: Tracing a route
   (k) Network Address Translation (NAT)
   (l) BOOTP and DHCP
4. IP Routing Protocols
   (a) Autonomous System
   (b) Interior Gateway Protocols
      i. Routing Algorithms Review
ii. Gateway to Gateway (GGP) Protocol (RFC 823)

iii. RIP
   B. Split Horizon
   C. Split Horizon with Poisonous Reverse
   D. RIPv2 Message Format

iv. OSPF
   A. RFC 1583, RFC 2178, and RFC 2328
   B. Link State Protocol
   C. OSPF (Dijkstra’s) Algorithm
   D. Support for Multiple Metrics
   E. Link State Advertisements (LSAs)
   F. The Hello Protocol

v. IGRP

(c) Exterior Gateway Protocols
   i. BGP (RFC 1771)
   ii. EGP
   iii. CIDR
   iv. Policy Routing

(d) IP Multicast Routing
   i. Host Extensions for Multicast (RFC 1112)
   ii. IP Multicast and Ethernet Multicast
   iii. Flooding
   iv. Spanning Trees
   v. Reverse Path Forwarding (RPF)
   vi. Core-Based Trees
   vii. Internet Group Membership Protocol (IGMP)
   viii. MBONE
   ix. Steiner Trees
   x. MOSPF
   xi. PIM (PIM-DM and PIM-SM)

5. IP Switching and Tag Switching

6. Multiprotocol Label Switching (MPLS)

7. Supporting DiffServ on MPLS

8. Classical IP over ATM and ATM LAN Emulation (LANE)