Course Description

This course presents a complete overview of the standard Internet routing algorithms and protocols, data link-layer, wireless and mobile networks and Multimedia Networking. This course first focuses on the fundamental concepts of networking. Then, routing algorithms and unicast, broadcast and multicast routing protocols are described in details. Next, we will fundamentals of the data-link layer and Ethernet. Then we will cover principles of wireless networks and we focus on WiFi and cellular network protocols. We then describe Multimedia networking and communication protocols used by Internet Multimedia providers to deliver Multimedia content to the users. We will briefly cover the concept of network management as well. In this Semester, we will implement some networking concepts with programming languages such as Python.

Required/Recommended Textbooks

Title: Computer Networking: A Top-Down Approach, 6/E
Author: James F. Kurose and Keith W. Ross
Publisher: Addison-Wesley
Year: 2013
ISBN: 0132856204

Required? (Y)

Course Outline

- Overview on Networks and the Internet
  - What Is the Internet?
  - The Network Edge
  - The Network Core
  - Delay, Loss, and Throughput in Packet-Switched Networks
  - Protocol Layers and Their Service Models
- Routing Algorithms
  - Link state (Dijkstra's algorithm)
  - Distance Vector (Bellman-Ford Equation)
  - Hierarchical routing
- Routing Protocols
  - RIP: Routing Information Protocol
  - IGRP: Interior Gateway Routing Protocol (Cisco proprietary)
  - OSPF: Open Shortest Path First
- EIGRP: Enhanced Interior Gateway Routing Protocol (Cisco proprietary)
- BGP (Border Gateway Protocol)
- Broadcast Routing
  - Flooding
  - Controlled Flooding
  - Spanning Tree
- Multicast routing
  - Internet Group Management Protocol (IGMP)
  - Distance Vector Multicast Routing Protocol (DVMPR)
  - Protocol Independent Multicast (RIP)
- The Data Link Layer
  - Introduction and services
  - Error detection and correction
  - Multiple access protocols
  - Link-layer Addressing
  - Ethernet
  - Link-layer switches
  - PPP
  - Link virtualization: MPLS
  - A day in the life of a web request
- Wireless and Mobile Networks
  - Wireless links, characteristics
  - IEEE 802.11 wireless LANs (“wi-fi”)
  - Cellular Internet Access
  - Principles: addressing and routing to mobile users
  - Mobile IP
  - Handling mobility in cellular networks
  - Mobility and higher-layer protocols
- Multimedia Networking
  - multimedia networking applications
  - streaming stored audio and video
  - making the best out of best effort service
  - protocols for real-time interactive applications
  - RTP, RTCP, SIP
  - providing multiple classes of service
  - providing QoS guarantees
- Network Management
  - What is network management?
  - Internet-standard management framework
  - ASN.1

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