

Outline

Computer Networks (CS 30006), Section 2

Lecture 1:

- Brief history of networking and Internet
- Need for protocols, goals
- Organization of the course
- Outline of the course

Lecture 2:

- Topology
- Switching Techniques

Lecture 3:

- Analog and Digital transmission
- Pros and cons of analog and digital transmission
- Attenuation, Delay distortion, noise, SNR
- Channel capacity, data rate, baud rate, Nyquist's sampling theorem, Nyquist Bandwidth, Shannon capacity

Lecture 4:

- Transmission Medium
 - Media types and their basic characteristics/advantages/disadvantages – coaxial cables, twisted pairs, OFC, wireless
 - Some more details of Cat5/5e/6/7/8 and Single Mode and Multimode OFCs

Lecture 5:

- Need for synchronization, encoding, error control, flow control
- Basics of Synchronous and Asynchronous Transmission
- Data Encoding
 - Encoding digital data with digital signals:
 - NRZ-L, NRZ-I, Manchester, Differential Manchester
 - 4B/5B, 8B/10B

Lecture 6:

- Encoding digital data with analog signals: ASK, FSK, BPSK, QPSK
- Error Control
- Error Detection: Parity, CRC, checksum

Lecture 7:

- Stop-and-Wait
- Go-back-N
- Selective-reject ARQ

Lecture 8:

- Need for sharing
- What is needed for sharing –Medium Access Control, Addressing
- Medium Access Control
- Multiplexing techniques – FDM, TDM, Statistical TDM, WDM

Lecture 9:

- Contention-based protocols
 - Aloha
 - Slotted Aloha
 - CSMA/CD
 - CSMA/CA
 - Token ring

Lecture 10:

Test

Lecture 11:

- Introduction to overall network stack of a machine
- Layering
- OSI and TCP-IP Layers

Lecture 12:

- LAN as broadcast domain
- Ethernet – history, standards, division into IEEE 802.2 and 802.x
- IEEE 802.3 – frame format, operation, sub-standards based on it
- Difference between “Ethernet” and 802.3

Lecture 13:

- Hubs and switches, spanning tree protocol
- Bridges
- Status of Ethernet as it stands today, 10G/40G/100G

Lecture 14:

Full Test

Lecture 15:

- Network Layer
- Addressing
- Class-full Addressing
- Classless Addressing
- Subnetting
- Network Address Translation

Lecture 16:

- DHCP
- IPV4 header
- Fragmentation
- ICMP

Lecture 17:

- Unicast Routing
- Distance Vector Routing
- Link State Routing

Lecture 18:

- Routing protocols (OSPF, RIP, BGP)

Lecture 19:

- Multicast Routing
- IPV6

Lecture 20:

Test

Lecture 21:

- Introduction to transport layer
- Transport Layer protocols

Lecture 22:

- TCP
- Segments
- Data Flow in TCP

Lecture 23:

- UDP
- Difference between TCP and UDP

Lecture 24:

- Error and Flow Control Techniques at Transport Layer

Lecture 25:

- Congestion Control Techniques
 - Slow start, exponential increase
 - Additive increase, multiplicative decrease (AIMD)

Lecture 26:

Test

Lecture 27:

- Introduction to application Layer
- WWW and HTTP
- FTP
- EMAIL

Lecture 28:

- TELNET

- DNS
- SSH

Lecture 29:

- WAN
- ATM

Lecture 30:

Test

Lecture 31:

- Network management
 - Introduction
 - SNMP
 - ASN.1

Lecture 32:

- Cryptography And Network Security
- Attacks
- Cryptographic algorithm

Lecture 33:

- Digital Signature
- Diffie-Hellman method

Lecture 34:

- Network Layer Security
- Transport Layer Security
- Application Layer Security
- Firewalls

Lecture 35:

Full Test