

Final Review

- When: May 9 (Wed) 1:00-3:00 pm
- Where: ST 302
- closed-book and closed-notes, you are allowed to bring a cheat sheet to each exam (one letter page single-sided). Calculator is allowed.
- Office hours in the final week: May 7 and May 8 11:00-12:00 pm and by appointment

Final Review

- Topics covered
 - Introduction: [KR 1.1-1.5]
 - Statistical multiplexing and queues: discrete probability and [SY 3.1-3.4]
 - Application layer: [KR 2.1-2.5, 2.7], [SY 8.2-8.3]
 - Transport layer: [KR 3.1-1.7]
 - Network layer: [KR 4.1-4.3, 5.1-5.2]
 - Link layer: [KR 6.1, 6.3.1, 6.3.2, 6.4.1, 6.7]

Introduction

- Network edge: hosts/switches/links, services, protocols, access networks
- Network core
 - circuit switching: multiplexing (FDM, TDM)
 - packet switching: store-and-forward, statistical multiplexing
- Performance measures:
 - Four types of delays
 - Queueing and packet loss
 - Throughput

Statistical Multiplexing and Queues

- Discrete probability
- Statistical multiplexing
 - The Chernoff bound
- Discrete-time Markov chains
 - state transition diagram, transition probability matrix
 - irreducible/aperiodic chains, stationary distributions, local balance equations
- Queues: Geo/Geo/1, Geo/Geo/1/B
- Little's law

Application layer

- Basic principles
 - client-server vs. peer-to-peer, addressing (IP address & port)
 - transport service requirement of various applications
 - services provided by Internet: TCP, UDP
- Important applications and protocols
 - Web and HTTP: non-persistent vs persistent HTTP, request/response, cookies, web caches
 - Email: protocols involved, SMTP vs. HTTP
 - Domain Name System (DNS): name resolution procedures, four types of DNS records
 - Peer-to-Peer File Sharing: BitTorrent, file distribution (CS vs. P2P), structural P2P File sharing

Transport layer

- Transport-layer services
 - service model, multiplexing/demultiplexing
- Connectionless Transport: UDP
 - checksum
- Principles of reliable data transfer
 - rdt 3.0, GBN, SR
- Connection-Oriented Transport: TCP
 - TCP segment structure, reliable data transfer, flow control, connection setup
- TCP congestion control
 - AIMD, throughput, fairness

Network layer

■ Forwarding

- Longest-prefix matching
- crossbar switching, queueing, packet scheduling
- IPv4: datagram format, fragmentation, addressing, subsets,
- DHCP, NAT

■ Routing

- Link state routing
- Distance vector routing

Link layer

- multiple access
 - Slotted ALOHA, ALOHA
- link addressing: ARP
- a day in the life of a web request