CSC360 Computer Networks – Midterm Review

The exam will be close book & close note. No calculator will be needed – if you find yourself needing a calculator, you’re probably doing something wrong.

The exam will mostly consist of short answer format questions, true or false, multiple choices, and simple calculation. The basic idea of the exam will be to see if you understand the concepts. None of the questions will be “trick” questions, and many of them will have simple answers. If you know the concepts well, you may be done in forty five minutes.

Things you may wish to review should you feel rusty:

* Internet protocol layer
  + Link Layer
    - Local network
    - TCP/IP
    - Moves packets between Internet layer and two hosts on system
  + Internet Layer
    - Sends packets across networks
    - Sends data from source to destination network (called routing)
    - Host addressing identification: accomplished by a hierarchical IP addressing system
    - Packet routing basic manner of sending packets of data from source to destination by forwarding them to the next network router closer to the final destination
  + Transport Layer
    - Established a basic data channel that an application uses in its task specific data exchange
    - Provides end-to-end services that are independent of the structure of user data
  + Application Layer
    - Protocols used by most applications for providing user services over a network and some basic network support `services over a network and some basic network
    - Examples
      * FTP
      * SMTP
      * DHCP
* Network edge and the services it can provide
  + Run application programs (e-mail)
  + Client host requests (web browser)
  + Peer to peer (bit-torrent)
  + TCP – reliable
    - Reliable in-order byte-stream data transfer
  + UDP – best effort
    - Unreliable with no flow control
* Network core and related switching technology
  + Interconnected routers
  + Network of networks
  + Circuit switching
    - User A, B packets share network resources
    - Each packet uses full link bandwidth
    - Resources used as needed
    - Aggregate resource demand can exceed amount available
    - Congestion: packets queue, wait for link use
    - Store and forward: packets move one hop at a time
      * Note receives complete packet before forwarding
* Different access networks
  + Residential access networks
  + Institutional access networks (school/company)
  + Mobile access networks
  + Wired
  + Wireless
* ISPs and Internet backbone
  + Global
    - Mobile network
    - Regional
      * Home network
      * Institutional network
* Delay in packet switching networks, delay in circuit switching networks
  + Packet switching
    - Used for data
    - Can send to multiple hosts
    - Security
    - Devices of different speeds can communicate
    - No waiting for direct connection
  + Circuit switching
    - Used for calls
    - Circuit is dedicated
    - Guaranteed full bandwidth for the duration of the call
    - Guaranteed quality of service
* HTTP, nonpersistent connection, persistent connection
  + Non-persistent
    - Only one object sent over TCP
    - HTTP/1.0 uses non-persistent
  + Persistent
    - Multiple objects can be sent over single TCP connection between client and server
    - HTTP/1.1 uses persistent
* FTP, out-of-band control
  + Opens one connection for browsing and another for data transfer
* SMTP
  + Between mail servers to send email messages
    - Client: sending mail server
    - “server”: receiving mail server
  + Uses TCP
  + Direct transfer
  + Three phases of transfer
    - Handshaking
    - Transfer of messages
    - closure
* POP3 and IMAP
  + POP3
    - Original uses download and delete mode
    - Now uses download and keep
    - Stateless across sessions
  + IMAP
    - Keep all messages in one place
    - Allows user to organize messages in folders
    - Keeps state across sessions
      * Name of folders and mappings between message IDs and folder name
* Cookie
  + Header line of HTTP response
  + Header line in HTTP request
  + Cookie is a number used to identify a specific user
* How DNS works
  + Domain name system
  + Hostname of IP address translation
  + Host aliasing
  + Mail server aliasing
  + Load of distribution
  + The bads
    - Single point of failure
    - Traffic volume
    - Distant centralized database
    - maintance
* P2P. How are Napster, Guntella, and KaZaA different?
  + Napster
    - All connect to ingle server
    - Gets peer address to get data
  + Guntella
    - Each user quarries its immediate neighbor
    - Recursive calls
  + KaZaA
    - Creates multiple super hosts
* TCP, UDP. How TCP and UDP achieve multiplexing and demultiplexing?
  + Demultiplexing
    - Delivering received segments to correct socket
    - Each datagram has source IP and destination IP
    - Each datagram carries 1 transport-layer segment
    - Each segment has source destination port numbert
    - Sends data to correct port
  + Multiplexing
    - Gathering data from multiple sockets, enveloping data with header
* How TCP change congestion window size dynamically.
  + Continues to grow as long as all packets are received without time-out
* Stop-and-Wait, Go-Back-N, Selective Repeat
  + Stop-and-Wait
    - Halts all progress until every packet in a window is ack
  + Go-back-N
    - Windows of up to N consecutive unack’ed packets
  + Selective repeat
    - Selects packets not received in the window and re-sends them
* Congestion control, flow control
  + Congestion control
    - Throttle sender when network is overloaded
    - Can lead to lost packages and long delays
    - Make separate routers for each flow
    - End to end
      * No explicit feedback from network
      * Congestion inferred from end-system data loss or delay
      * Used by TCP
    - Network assisted congestion control
      * Routers provide feedback to end systems
        + Single bit indicating congestion
        + Explicit rate sender should send
  + Flow control
    - Takes spare room in buffer and sends how much spare room there is with a given packet