CSC 138 Exam 1 Study Guide

1. The 4 sources of packet delay and the key factor(s) that affect each

-Nodal processing delay, queuing delay, transmission delay, propagation delay

-Nodal processing delay: determine output link, check for bit errors

> -Key factors: time required to examine packet's header and determine where to direct the packet (time required to determine output link), time required to check for bit errors

-Queuing delay: waiting at output link for transmission

> -Key factors: number of earlier arriving packets that are queued and waiting for transmission onto the link (congestion level of router)

-Transmission delay: push (transmit) all of the packet's bits onto the link

> -Key factors: length of packet, transmission rate of link, L/R

-Propagation delay: propagate from beginning of link to receiving router

> -Key factors: length of physical link, propagation speed, d/s
> -Propagation speed: ~2 x 10^8 m/s, about the speed of light

2. The name and function of each layer in the IP stack

-Application layer, transport layer, network layer, link layer, physical layer

-Application layer: Network applications and their application layer protocols

> -Function: allows applications in one end system to exchange packets of information (messages) with applications in another end system
> -FTP, SMTP, HTTP

-Transport layer: process to process data transfer

> -Function: transports application layer messages between application endpoints
> -TCP, UDP
> -Transport layer packet: segment

-Network layer: routing of network layer packets (datagrams) from source to destination

-Function: move datagrams from one host to another
-Transport layer segment and destination address passed to network layer
-IP protocol: defines fields in the datagram and how end systems and routers act on these fields
-Routing protocols: determine the routes that datagrams take between sources and destinations
-Only one IP protocol, but many routing protocols

-Link layer: data transfer between neighboring network elements

-Function: move a packet from one node (host or router) to the next node in the route
-Ethernet, 802.11 (WiFi), PPP (Point to Point Protocol)
-Link layer packet: frame

-Physical layer: bits “on the wire”

-Function: move individual bits within the frame from one node to the next
-Different protocols for twisted pair, coaxial cable, fiber optics (bits moved across link in different ways)

3. Define IP address, socket, and protocol, and describe their role in process communications

-IP address: A quantity that uniquely identifies a host

-Role: uniquely identifies a host

-Socket: A software interface that a process uses to send messages into, and receive messages from, the network

-Role: Identifies a process on a host (using a port number), as many processes can be running on same host
-Process sends/receives messages to/from its socket

-Protocol: defines the format and order of messages exchanged between communicating entities, as well as the actions taken on the transmission and/or receipt of a message or other event

-Role: Governs all activity in the Internet involving communication between remote entities
-Different protocols are used to accomplish different communication tasks

4. The three primary protocols used for email

-SMTP, POP, IMAP

-SMTP (Simple Mail Transfer Protocol): sending mail, from client to server and server to server

-POP: (Post Office Protocol): mail access, from receiver's server to user agent

-IMAP (Internet Mail Access Protocol): mail access, from receiver's server to user agent, more features than POP, like manipulation of stored messages on server

5. Dedicated and shared access networks as discussed

-Dedicated: dedicated line from home to central office

    -DSL

-Shared: homes share line to central office

    -Cable, fiber

6. FDM and TDM

-Circuit switching: dedicated resources (FDM and TDM), guaranteed performance, circuit segment idle if not used, used in traditional telephone networks

-FDM (Frequency Division Multiplexing): frequency divided among users, users get a little bit of the bandwidth all the time

-TDM (Time Division Multiplexing): time divided among users, users get all the bandwidth a little bit of the time

-Packet switching: allows more users on network, great for bursty data, no call setup, shared resources

7. Throughput vs. bandwidth

-Throughput: rate at which bits transferred between sender and receiver

-Bandwidth: the width of a frequency band that a link dedicates for a connection

8. HTTP (non-persistent and persistent)

-HTTP (Hypertext Transfer Protocol)

-Non persistent: one object sent over TCP connection, connection is then closed, downloading multiple objects require multiple connections

-Persistent: multiple objects can be sent over single TCP connection between client and server

-HTTP is stateless, server maintains no information about past client requests

-Cookie file kept on user's host, managed by browser, identifies users

9. Web caching and its benefits

-Web cache (proxy server): between client and origin server, satisfies HTTP requests on origin server's behalf, keeps copies of recently requested objects in storage.

-If client requests object that is cached, web cache returns object instead of origin server

-Both a server and a client, used by ISP

-Reduces response time and traffic