Group 2 Members: Breena McGill, Karen Ibrahim, Aman Patel, Basil Bonney

Super Quiz 2 Study Guide

Week 9

- A communication mechanism with a dedicated path between two endpoints with guaranteed isolation is called circuit switching.
- The best example of a packet switched network is the analog telephone system, also known and the "Public Switched Telephone Network" or "PSTN."
- Properties of the circuit switched paradigm:
    1. A single communication is not affected by others
    2. circuits are not permanent but created when needed and removed when communication ends
    3. Endpoint-to-endpoint communication
- Packets:
    1. Small blocks of data
    2. Varied in size depending on technology but commonly 1500 Bytes
- Packet Switching:
    1. the basis of the Internet
    2. Uses statistical multiplexing
    3. Can communicate with one or many recipients
    4. Lower in cost due to the ability to share a single path
- Circuit Switching:
    1. uses frequency division multiplexing
    2. Uses Synchronous Time Division Multiplexing
    3. Can communicate with only one recipient
- LAN: Local area network
- WAN: Wide area network
- MAN: Metropolitan area network

Week 10 (Routing)

- Routing belongs to layer 3 on the TCP/IP model.

- Routers only go up to layer 3. When a router determines that the destination IP of a packet is on one of its local segments, it uses layer 2 to deliver that packet
- The layer 2 packet will contain the router's MAC address as a source MAC
- Each router has two or more interfaces, two or more IP addresses, and two or more MAC addresses
- Each router has a **routing table**: it contains a list of all of the network addresses and the next hops that lead them to their destination address
- Just as hosts use arp, routers use it after they get the datagram via IP
- **Router commands**
    - **Linux: display or manipulate routes**
        - route [-n]
        - route add
        - route del
    - **Windows: display or manipulate routes**
        - route print [-4]
        - route add
        - route delete
    - **Mac: display or manipulate routes**
        - netstat -rn [-i inet]
        - route [-n] add
        - route [-n] del
    - **Other relevant router commands**
        - ifconfig
        - arp
        - route
        - iptables
        - Sysctl
- In routing tables, 0.0.0.0/0 means "any destination"
- Sometimes you can manipulate routing behavior to achieve a desired outcome

Week 11 (UDP: Datagram Transport Service & TCP: Reliable Transport Service)

- UDP is characterized as -
    - **End-to-end** - UDP is a transport protocol that can distinguish among multiple application programs running on a given computer
    - **Connectionless** - the interface that UDP supplies to applications follows a connectionless paradigm
        - **Connectionless paradigm** - an application using UDP is not required to establish a connection beforehand to send data, also an application does not need to let the network know when data is transmitted
    - **Message-oriented** - an application that uses UDP sends and receives individual messages
    - **Best-effort** - UDP offers applications the same best-effort delivery semantics as IP
    - **Arbitrary interaction** - UDP allows an application to send to many other applications, receive from many other applications, or communicate with exactly one other application
    - **Operating System Independent** - UDP provides a means of identifying application programs that does not depend on identifiers used by the local operating system
- **Message-Oriented Interface** - when an application needs UDP to send frames of data, UDP takes the data and stores in in a single transmission message
- **User Datagram** - is a UDP message and consists of two parts
    - **Short header that indicates the sending and receiving application programs**
    - **Payload carrying the data**
- **UDP SOURCE PORT** - contains the port number for the sending application
- **UDP DESTINATION PORT** - contains the port number of the destination application
- **UDP MESSAGE LENGTH** - specifies the total size of the UDP message, **measured in 8-bit bytes**
- **UDP CHECKSUM** - an optional field format, all bits of the field can be set to zero or the checksum can be calculated
    - **Pseudo-header** - field that contains the source IP address, IP address destination, IP datagram field types, and datagram length of a UDP
- **UDP is encapsulated twice** -
    - First, each UDP message is encapsulated in an IP datagram and transmitted over the internet
    - Second, then that same datagram is encapsulated again and fragmented into frames to be transmitted across a specific network

- The service TCP provides to applications -

    - **Connection Oriented** - TCP provides connection-oriented service in which an application must first request a connection to a destination, and then use the connection to transfer data
    - **Point-to-point communication** - each TCP connection has exactly two endpoints
    - **Complete reliability** - TCP guarantees that the data sent across a connection will be delivered exactly as sent, complete, and in order
    - **Full Duplex Communication** - a TCP connection allows data to flow in either direction, and allows either application program to send data at any time
    - **Stream Interface** - TCP provides a stream interface, in which an application send a continuous sequence of octets across a connection; TCP does not group data into records or messages and doesn't guarantee the delivery of data will be in the same size pieces that were transmitted by the sending application
    - **Reliable Connection Startup** - TCP allows two applications to reliably start communication
    - **Graceful Connection Shutdown** - before terminating a connection, TCP ensures that all data has been delivered and that both sides have agreed to shut down the connection
- **Heterogeneous End Systems** - an application running on a powerful processor can generate data so fast that it overruns an application running on a slow processor
- **Adaptive Retransmission** - when TCP is monitoring any delays on each connection, and changes the retransmission timer to take into account changing conditions

Multiple Choice Questions

1. Packet Switching is the basis of the Internet and uses frequency division multiplexing.
    a. True
    b. False

2. Routing can go up to layer 4 of the TCP/IP model and has a significant contribution to applications and protocols.
    a. True
    b. False

3. Which of the following are Layer 4 protocol of the OSI Model?
    a. Cyclic UDP
    b. TCP (transaction control protocol)
    c. SPX (Sequence Packet exchange)
    d. UDP (User Datagram protocol)

Answer: **All the above**

4. IP is not able to tell the difference between multiple program applications running on a computer host or machine

a. True
b. False

5. UDP (User Datagram Protocol) messages can be -

a. Lost
b. Duplicated
c. Delayed
d. Corrupted
e. Delivered out-of-order
f. All of the above

6. UDP (User Datagram Protocol) does care about how it's messages are delivered, as long as they are delivered to the correct destination IP address

a. True
b. False

7. Many-to-1 is a type of networking message sharing model that means -

a. when multiple applications send and receive messages with multiple other applications
b. when the application sends a message to multiple program recipients
c. when the application receives messages from several application senders
d. Both A and B
e. when the application exchanges messages with exactly one other application

8. End-to-End Protocol is best described as, TCP communicating between an application on one host to an application running on another host

a. True
b. False