Rohit Anand 15UCS111

The LNM Institute of Information Technology

Computer Networks (CSE 332)

End Term - 2016-17, Part B

Duration: 2 hours 15 Min **01 May 2018** **Max Marks: 60**

1. **Network Layer** **[3 + 6 = 9]**
   a. In a network, Distance vector routing is used, and the following vectors have just come in to router C: from B: (5, 0, 8, 12, 6, 2); from D: (16, 12, 6, 0, 9, 10); and from E: (7, 6, 3, 9, 0, 4). The cost of the links from C to B, D, and E are 6, 3, and 5, respectively. What is C's new routing table? Give both the outgoing line to use and the cost.
   b. Suppose that host A is connected to a router R1, R1 is connected to another router, R2, and R2 is connected to host B. Suppose that a TCP message that contains 900 bytes of data and 20 bytes of TCP header is passed to the IP code at host A for delivery to B. Show the Total length, Identification, DF, MF, and Fragment offset fields of the IP header in each packet transmitted over the three links. Assume that link A-R1 can support a maximum frame size of 1024 bytes including a 14-byte frame header, link R1-R2 can support a maximum frame size of 512 bytes, including an 8-byte frame header, and link R2-B can support a maximum frame size of 512 bytes including a 12- byte frame header.
2. **IP Addressing** **[6 + 4 = 10]**
   a. Consider the IP address 132.239.15.87.
      a. What type of network would this IP address be a part of in class-based addressing? **[1]**
      b. If the network administrator had decided to break the network in part a) into 16 different subnets, what would the subnet mask of the subnet to which this IP address belongs be? **[1]**
      c. What is the subnet number (address) of the subnet to which this IP address would be attached? **[1]**
      d. Now suppose instead that we are using CIDR addressing instead of Class-based addressing and subnets. What would the length of CIDR prefix for the physical network in part c) to which the host were attached be? **[1]**
      e. Suppose a router had a routing table with three entries: default (0/0), 132.239.8/21, and the network in part d). Which entry would it use to forward a packet to 132.239.15.87? Why? **[2]**
   b. Without using longest prefix matching, a forwarding table looks like this. If we use longest prefix matching, we can combine a few entries together. What is a table with a minimum number of entries that still be able to forward packet correctly?

Prefix	Outgoing Interface
128.0.0.0/11	eth1
128.16.0.0/12	eth1
128.24.0.0/12	eth2
128.32.0.0/12	eth2
128.40.0.0/12	eth1
128.48.0.0/11	eth1
128.64.0.0/9	eth0
128.128.0.0/10	eth0
128.160.0.0/11	eth1
128.176.0.0/11	eth0
128.192.0.0/9	eth0
Default	eth3

Prefix	Outgoing Interface
Default	eth3

3. **Transport Layer** [2 + 3 + 6 + 6 = 17]

   a. A sender sends a series of packets to the same destination using 5-bit sequence numbers. If the sequence numbers start with 0, what is the sequence number of the 100th packet?

   b. Host A (With IP address as 12.12.12.12. and port number 52000) is sending a UDP packet to host 2 (With IP address as 141.22.141.22. and port number 80) with data as "4A 4B C3" (in Hex). Compute checksum at host A for the UDP packet.

   c. In a TCP connection, the initial sequence number at the client is 8090 and server is 1000. The client opens the connection, send three segment and each of which carries 5000 bytes of data, and closes the connection from client and server send two segment each of which carries 2000 bytes and closes the connection from server side. What are the value of the sequence number, acknowledge number and status of flag bits in each of the segment sent.

   d. The following is part of a TCP header dump (contents) in hexadecimal format.

      00 50 9A 03 3E 64 E5 58 DF D0 08 B3 80 18 00 DE 00 02 00 00...

      i. What is the source port number?
      ii. What is the sequence number?
      iii. Is the packet directed from a client to a server or vice versa?
      iv. What is the type of the segment?
      v. What is the value of window size? How is the content of this field interpreted by the recipient of the segment?

4. **Application Layer:** Consider a scenario where Alice (Alice@abc.com) want to send an email to Bob (bob@xyz.com), where two mail servers are in two separate networks. Alice is using a web browser to compose and send an email to Bob who is using a GUI based application to access emails. Assume both Alice and Bob are part of the same network which is different from the two networks that the two mail servers belongs to. Show the steps involved including the protocol for the email communication in the above scenario at application layer, transport layer and network layer. **[6]**

5. **Explain Briefly** [9 x 2 = 18]

   a. Why does a new frame have to be constructed at each hop? Why cannot the same frame travel throughout?
   b. How an IP packet will be identified as "Internet delivery" or "Local delivery"?
   c. Is Network layer modifies the TCP header? Explain.
   d. The Protocol field used in the IPv4 header is not present in the fixed IPv6 header. Why not?
   e. What is the size of ARP packet when the protocol is IPv4 and the hardware is Ethernet?
   f. What is zero window advertisement? What is its purpose?
   g. What are HTTP headers? Give an examples of HTTP headers and their typical values.
   h. A TCP connection is opened with slow start. Estimate the number of round trip times required to send ***n*** TCP segment.
   i. Assume a host with Ethernet address (F5 A9 23 11 9B E2) has joined the network. What would be its global unicast IPv6 address if the global unicast prefix of the organization is 3A21:1216:2165 and the subnet id is A245:1232?