CSC 435 Computer Networks

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Question Bank: Module - Internet Layer

1) Compute the minimum and maximum size of an IP header? Justify your answer.

2) Is the IP Header Checksum changed at every router? Why or why not?

3) What does the TYPE field in the IP header indicate? Give two examples of values for the TYPE field and indicate what they represent?

4) What are the different components of the IP Options field? What do they indicate? What is the maximum possible length for a particular option in the IP options field? Justify your answer.

5) Explain two uses of the IP Options field?

6) Consider a datagram sent from 178.56.2.90 to 143.132.20.1. Let the 16-bit checksum computed on the first four 32-bit words of the IP header be 71FC (in hexadecimal). Assume the IP Options are omitted. Compute the 16-bit checksum (in hexadecimal) for the entire IP header.

7) Define a MTU?

8) What are the fields in the IP header that are used for fragmentation and reassembly? Explain their individual roles?

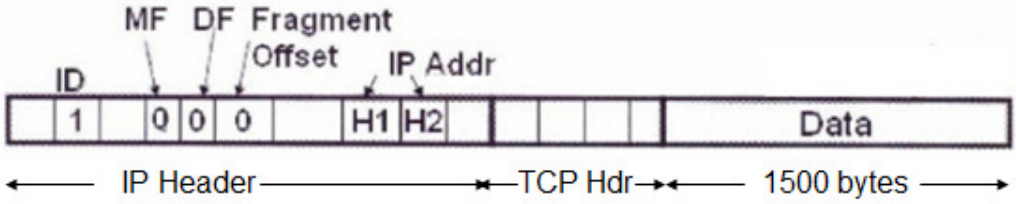
9) Give two significant reasons explaining why fragmentation reassembly is done only at the end hosts?

10) Mention three significant reasons why a router could drop a datagram?

11) Let an IP datagram with the following data and header sizes be sent through a network of MTU 500 bytes. Calculate the fragment offset values that should be set for the different fragments?

IP header = 40 bytes TCP header = 60 bytes Data = 900 bytes

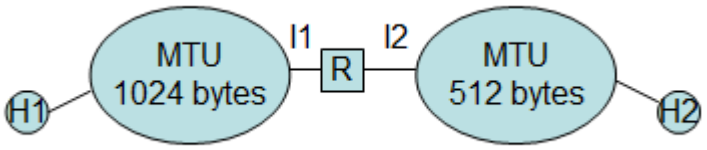
12) Consider fragmenting the IP datagram shown below. Show the structure of all the fragments of this datagram along with the values for the MF bit, DF bit, Offset field, the starting and ending byte number for the portion of actual data in each fragment. Assume the Maximum Transmission Unit (MTU) of the network is 512 bytes. Use the minimum size value for the IP header and TCP header.



13) Suppose an IP packet is fragmented into 10 fragments, each with a 1% (independent probability) of loss. With one transmission of all the 10 fragments, what is the probability of losing the whole packet due to the loss of a fragment? Also, what is the probability of loss of the whole packet if the packet is transmitted twice,

- assuming all fragments received must have been part of the same transmission?
- assuming any given fragment may have been part of either transmission?

14) Suppose a TCP message that contains 2048 bytes of data and 20 bytes of TCP header is passed to IP for delivery across two networks of the Internet (as shown below: i.e., from the source host to a router to the destination host). The MTU of the source and destination networks are 1024 bytes and 512 bytes respectively. Show the structure of all the fragments of this datagram along with the values for the MF bit, DF bit, Offset field, the starting and ending byte number for the portion of actual data in each fragment. Assume the IP headers and TCP header used are of the minimum size.



15) Suppose a router has built up the routing table shown in the following table. The router can deliver packets directly over interfaces 0 and 1, or it can forward packets to routers R1, R2 or R3.

Determine what the router does with a packet addressed to each of the following destinations:
(a) 148.110.17.131 (b) 148.110.16.18 (c) 212.40.163.90 (d) 212.40.163.17

Network Prefix/ Destination Network	Subnet Mask	Next Hop
148.110.16.0	255.255.255.128	Interface 0
148.110.16.128	255.255.255.128	Interface 1
148.110.17.0	255.255.255.128	R1
212.40.163.0	255.255.255.192	R2
<default>		R3

16) Briefly explain the working of the Address Resolution Protocol (ARP). Also, explain how a host can efficiently minimize the number of times ARP would be run.

17) Briefly explain the working of the Dynamic Host Configuration Protocol (DHCP).

18) Assume there are two hosts H1 and H2 with IP addresses 143.132.1.2 and 143.132.4.5 and their MAC address be: 12:34:56:AB:CD:EF and AB:CD:EF:12:34:56. New!!

(a) If H1 runs the ARP protocol to find the MAC address of H2, what would be the source/destination IP addresses and source/destination MAC addresses of the ARP Request packet? Justify your answer.

(b) Let H2 be the DHCP server for the network. H1 releases its current IP address and runs the DHCP protocol to obtain an IP address. What would be the source/destination IP addresses and source/destination MAC addresses for the DHCP Request packet? Justify your answer.

19) What is meant by IP-in-IP encapsulation? Give two examples of where you saw it in use in this module. Explain the encapsulation involved.

19) What is the difference between "Network Address Translation" and "Network Address Port Translation"? Which is more scalable and why?

20) What is the fundamental difference between IP-in-IP encapsulation and Network Address Translation? New!!

21) What is the difference between a ping command and a traceroute command?

22) Briefly explain how you would use the ping command to determine the MTU of the underlying network. What are the different options of the ping command you would use and why? Also, explain the logic behind your approach. New!!

23) Compute the IPv4-compatible IPv6 address for 143.132.10.45

24) Briefly explain the principle behind "Next header chaining" used in the IPv6 header.