

Networks Homework 8 (Due Friday 10/16/2020)

1. True or false.
 - (a) The IP header provides a way to tell what type of Layer 4 traffic is being carried by a packet.
 - (b) The IP header provides a way to make sure certain types of traffic get more favorable routing treatment over other less important types of traffic.
 - (c) The IP checksum only needs to be computed by the sender and receiver, not by the intermediate routers.
 - (d) IP packets can't be larger than 65,535 bytes.
 - (e) It's possible for IP packets to bounce around the internet through thousands of routers before finally being delivered to their destination.
 - (f) The purpose of path MTU discovery is to find the largest packet we are able to send without it having to get fragmented.
 - (g) It's possible for someone stuck on an IPv4-only network to communicate with a remote IPv6 server.
2. How does a receiver know when they have received the last fragment of an IP packet?
 - (a) The FIN flag will be set to 1.
 - (b) The fragment offset will be -1 .
 - (c) The fragment offset will equal $MTU - 1$.
 - (d) A particular flag in the IP header will be set to 0.
3. How does a receiver distinguish between fragments from two different packets?
 - (a) The different fragments would have incompatible fragment offsets.
 - (b) It uses the IP address and port number.
 - (c) It uses the identification field in the IP header.
 - (d) It can't, which is why a sender must wait for an ACK before sending fragments from a new packet.
4. If a network administrator decides to block all ICMP packets on their network, which of the following either won't work or will be much more difficult to use? Choose all that apply.
 - (a) traceroute (b) ping (c) nslookup (d) Path MTU discovery
5. Write the IPv6 address 1234:5678::90ab:cdef:1234 in non-zero-compressed form.
6. A /80 network in IPv6 has room for how many hosts?
7. IANA gives out /32 IPv6 blocks to certain organizations. How many /32 blocks are there in the entire IPv6 address space? Are there enough /32 blocks for everyone in the world to have one?
8. What protocol name is obscured in the Wireshark screenshot below?

Source	Destination	Protocol	Length	Info
192.168.1.116	192.168.1.1		74	Echo (ping) request
192.168.1.1	192.168.1.116		74	Echo (ping) reply

9. The hop limit field in the IPv6 header corresponds to which field in the IPv4 header?

10. Use the following IP header information taken from a Wireshark capture to answer the questions below.

```
Internet Protocol Version 4, Src: 192.168.1.116, Dst: 224.0.0.252
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
  Total Length: 55
  Identification: 0x1a11 (6673)
  Flags: 0x0000
  Fragment offset: 0
  Time to live: 1
  Protocol: UDP (17)
  Header checksum: 0xfc8c [validation disabled]
  [Header checksum status: Unverified]
  Source: 192.168.1.116
  Destination: 224.0.0.252
```

- (a) Does this packet go to a single destination or possibly to multiple destinations? How do you know?
- (b) Is this packet part of a fragment or not? How do you know?

11. Below is a the output I got when running traceroute. Use it to answer the questions below.

1	1 ms	1 ms	<1 ms	192.168.1.1
2	*	*	*	Request timed out.
3	12 ms	13 ms	11 ms	96.110.148.173
4	12 ms	10 ms	9 ms	96.108.5.229
5	15 ms	13 ms	13 ms	96.108.7.65
6	22 ms	21 ms	23 ms	69.139.168.185
7	32 ms	30 ms	30 ms	96.110.42.25
8	31 ms	32 ms	32 ms	96.110.38.42
9	33 ms	30 ms	32 ms	68.86.84.78
10	31 ms	31 ms	37 ms	66.208.216.118
11	32 ms	32 ms	33 ms	173.255.239.21
12	33 ms	32 ms	31 ms	45.79.189.210

- (a) If the TTL was set to 128 when it left my computer, what would its value be when it got to the last hop (45.79.189.210)?
- (b) The second line has * * * Request timed out. This happened not because of a slow internet connection, but because a particular message was not sent. What message was that?
12. Send a ping to msmaty.edu that is 200 bytes in size. Include a screenshot showing what you did and its result.
13. Run a traceroute to msmaty.edu. Give a screenshot showing just the last three hops.
14. Send a ping (using appropriate optional arguments) to determine the IP address of the router that is 5 hops away from you. Use ping, **do not** use traceroute. Include a screenshot showing the command and its result.
15. Perform path MTU discovery yourself using the ping tool. Give a screenshot showing all the steps you take to determine the *exact* MTU.