MITP 432
Communication Networks I

Homework #3

1) [10] ARP replies are typically not broadcast and have their integrity protected by the Ethernet checksum. However, explain how a single corrupted broadcast ARP reply packet sent from host C could potentially make host D unreachable. Include a description of the contents of key fields.

2) You are given the class C address space of 201.37.2.0/24. You must partition this address space into a number of equally-sized subnets, each capable of supporting at least 20 hosts.

   a) [5] What is the maximum number of subnets that can be supported?

   b) [5] Given your answer for (a), what should the netmask of these subnets be?

   c) [5] Given your answer for (a), what is the maximum number of hosts per subnet?

   d) [5] For each subnet, specify the network address, range of valid host addresses, and broadcast address.

3) Routing aggregation

   a) [5] Aggregate the following set of network addresses to the highest degree possible.

      212.56.132.0/24

      212.56.133.0/24

      212.56.134.0/24

      212.56.135.0/24

   b) [5] Aggregate the following set of network addresses to the highest degree possible.

      212.56.146.0/24

      212.56.147.0/24

      212.56.148.0/24

      212.56.149.0/24

4) [15] The MTU of a link is set to 576 bytes. An IP packet with a total length field of 1500 bytes (as reported in the IP header) must be fragmented to be transmitted over this link. Determine the IP header fields total length, fragmentation offset and the state of the "more fragments" bit for each of the fragments created.

5) [10] Given what you know about UDP and IP, are the checksum and length fields in UDP really necessary? In other words, if they did not exist, would UDP/IP applications still work reasonably well? Consider both transactional and real-time UDP protocols. Explain.

6) For the following server applications, determine the transport protocol (UDP or TCP) that should be used with each, and justify your decision with a convincing argument. Feel free to make *realistic* assumptions, if necessary.

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a) [5] A server that serves non-interactive requests for two separate databases that are stored local to the server. The requests are high-volume. The databases contain criminal records (State and Federal information, respectively).

b) [5] A server that transmits the current status of a piece of farm equipment via a microwave link. Client requests arrive at a constant rate of one per second per client.

7) [15] Currently, TCP path MTU discovery is an end-to-end process and requires some trial and error. A TCP sender may not discover the path MTU until it sends a TCP segment with a large MSS. Suppose that an intermediate router (e.g., a router between the sender and receiver) could re-write the TCP MSS option in TCP SYN packets. This router could place its own interface MTU in an MSS option if the router's MTU minus 40 bytes was smaller than the observed MSS option value in the SYN packet. Argue for why this attempt at optimizing path MTU discovery would not work well, and give at least two reasons why.

8) [10] Considering the following call flow diagram of LCP negotiation between a PPP client and PPP server. For each host, there is a list of supported LCP options with associated values (if any). The initial LCP-configure-request message is given. Complete the diagram by drawing the remaining messages with the appropriate options that appear in each message. Be sure to clearly mark the message type, options and any values.

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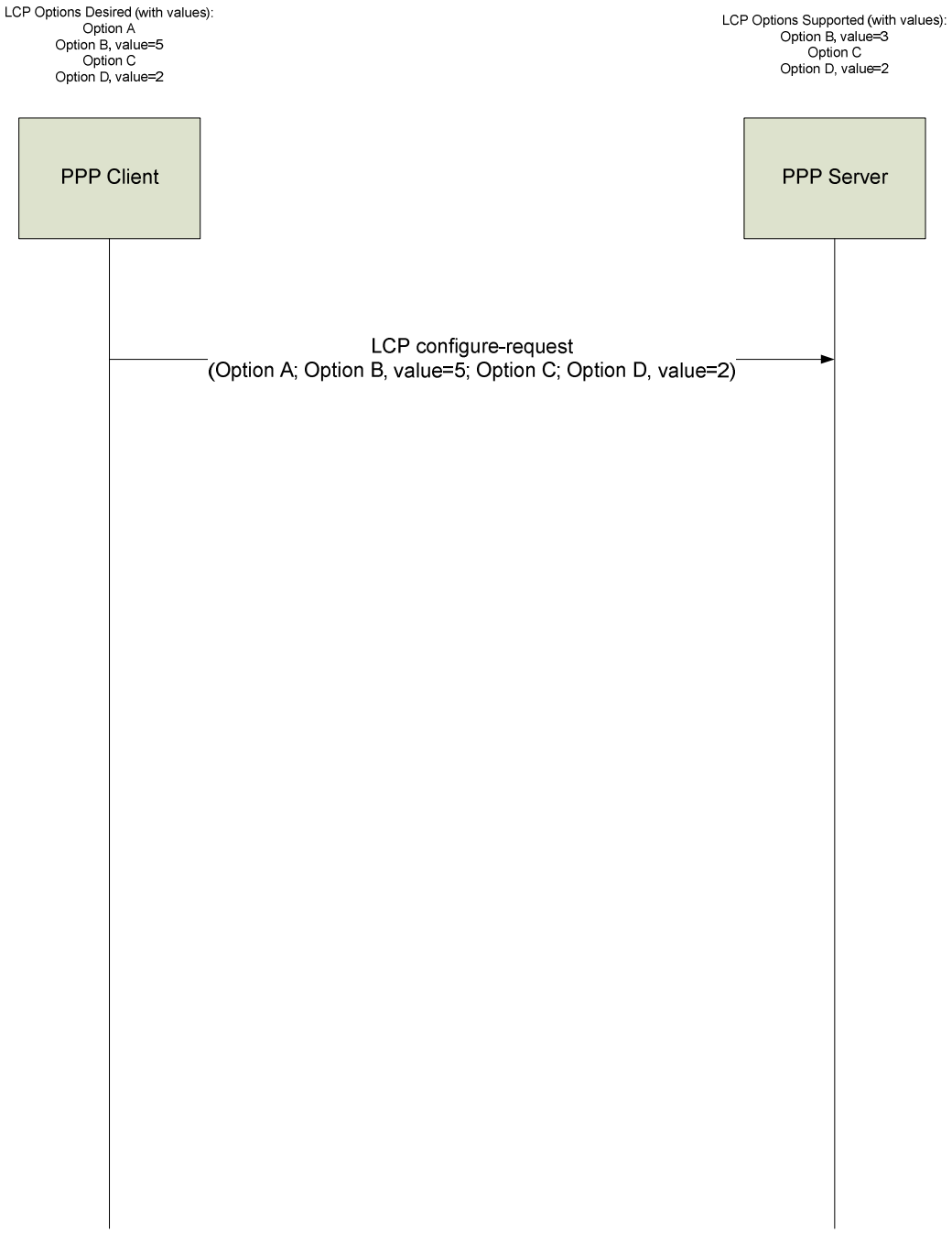
LCP Options Desired (with values):
Option A
Option B, value=5
Option C
Option D, value=2
LCP Options Supported (with values):
Option B, value=3
Option C
Option D, value=2
PPP Client
PPP Server
LCP configure-request
(Option A; Option B, value=5; Option C; Option D, value=2)