Department of Computer Science, Virtual University of Pakistan

CS716: Advanced Computer Networks

Assignment 3 **MS(CS), Spring 2011** **Maximum Points: 100**

Due Date: Wednesday, 6th July 2011

Instructions

The purpose of this assignment is to give you hands on practice. It is expected that students will solve the assignments themselves. Following rules will apply during the evaluation of assignment.

- Cheating from any source will result in zero marks in the assignment.
- Any student found cheating in any of the two assignments submitted will be awarded "F" grade in the course.
- No assignment after due date will be accepted

Required Readings: Lectures: 23 – 32, Text Book: Chapters 4 and 5

Question No. 1 (10 Points)

What aspect of IP addresses makes it necessary to have one address per network interface, rather than just one per host? In light of your answer, why does IP tolerate point-to-point interfaces that have nonunique addresses or no addresses?

Question No. 2 (10 Points)

Why does the Offset field in the IP header measure the offset in 8-byte units? (Hint: Recall that the Offset field is 13 bits long.)

Question No. 3 (10 Points)

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 (i.e., from the source host to a router to the destination host). The first network uses 14-byte headers and has an MTU of 1024 bytes; the second uses 8-byte headers with an MTU of 512 bytes. Each network's MTU gives the size of the largest IP datagram that can be carried in a link-layer frame. Give the sizes and offsets of the sequence of fragments delivered to the network layer at the destination host. Assume all IP headers are 20 bytes.

Question No. 4 (15 Points)

Suppose an IP packet is fragmented into 10 fragments, each with a 1% (independent) probability of loss. To a reasonable approximation, this means there

is a 10% chance of losing the whole packet due to loss of a fragment. What is the probability of net loss of the whole packet if the packet is transmitted twice,

(a) Assuming all fragments received must have been part of the same transmission?

(b) Assuming any given fragment may have been part of either transmission?

(c) Explain how use of the Ident field might be applicable here.

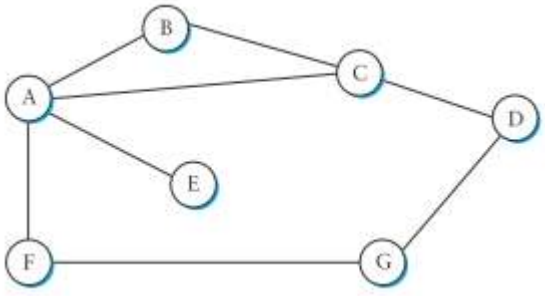
Question No. 5 (10 Points)

Why do you think IPv4 has fragment reassembly done at the endpoint, rather than at the next router? Why do you think IPv6 abandoned fragmentation entirely?

Hint: Think about the differences between IP-layer fragmentation and link-layer fragmentation.

Question No. 6 (15 Points)

Consider the situation involving the creation of a routing loop in the network of figure given below when the A–E link goes down. List all sequences of table updates among A, B, and C, pertaining to destination E, that lead to the loop. Assume that table updates are done one at a time, that the split horizon technique is observed by all participants, and that A sends its initial report of E's unreachability to B before C. You may ignore updates that don't result in changes.



Distance-vector routing: an example network.

Question No. 7 (15 Points)

Design a simple UDP-based protocol for retrieving files from a server. No authentication is to be provided. Stop-and-wait transmission of the data may be used.

Your protocol should address the following issues:

(a) Duplication of the first packet should not duplicate the "connection."
(b) Loss of the final ACK should not necessarily leave the server in doubt as to whether the transfer succeeded.
(c) A late-arriving packet from a past connection shouldn't be interpretable as part of a current connection.

Question No. 8 (10 + 5 = 15 Points)

(a) A sender on a TCP connection that receives a 0 advertised window periodically probes the receiver to discover when the window becomes nonzero. Why would the receiver need an extra timer if it were responsible for reporting that its advertised window had become nonzero (i.e., if the sender did not probe)?
(b) When closing a TCP connection, why is the two-segment-lifetime timeout not necessary on the transition from LAST ACK to CLOSED?

GOOD LUCK !