Network Systems (201600146/201600197), Test 3

March 24, 2017, 13:45–15:15

- This is an open-book exam: you are allowed to use the book by Peterson & Davie and the reader that belongs to this module. Furthermore, use of a dictionary is allowed. Use of a simple (non-graphical) calculator is allowed.
- Other written materials, and laptops, tablets, graphical calculators, mobile phones, etc., are not allowed. ***Please remove any such material and equipment from your desk, now!***
- Visiting the toilet without explicit permission of the supervisor is not allowed. During the last 30 minutes of the exam, no toilet visits are allowed.
- Write your answers on this paper, in the provided boxes, and hand this in.
- Total number of pages: 6.

Your name:

(please underline your family name (i.e., the name on your student card), so that we know how to sort)

Your student number:

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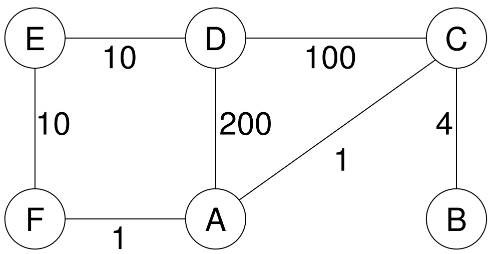
1. Distance-vector routing

Consider the following network, where the nodes represent routers, and the labelled links represent links between routers with their associated link costs. We assume they use a distance vector routing algorithm, with all nodes doing their updates simultaneously; for now, no split horizon or poisoned reverse is used.



Assume that initially, the nodes know themselves and their immediate neighbours.

1 pt (a) What is the initial distance vector sent by node A to node C?

1 pt (b) What is the distance vector sent by node A to node C in the next iteration?

1 pt (c) What is the distance vector sent by node A to node C when the network has converged?

1 pt (d) Same question, but assuming split horizon is used.

Next, assume the link between A and F breaks.

2 pt (e) Assuming no split horizon / poison reverse is used, how many iterations will it take (approximately) until the network has converged again?

Now compare the normal distance-vector algorithm to the BGP protocol.

1 pt (f) Which feature of BGP prevents the slow convergence that often plagues distance vector?

A. BGP sends path information so loops can be detected.
B. BGP limits routing information to Autonomous Systems.
C. *Counting to infinity* cannot happen because BGP has no cost metric.
D. *Counting to infinity* cannot happen because BGP uses finite datatypes.

Finally, compare the normal distance-vector algorithm to AODV.

1 pt (g) Does AODV suffer from the same kind of convergence problems that distance vector (DV) has?

A. No, since links do not change in Ad-Hoc networks.
B. No, since AODV can detect and remove routes that are no longer valid.
C. Yes, since AODV is just another DV algorithm, so it has the same problems.
D. Yes, even more, since in Ad-Hoc networks links change more often than in fixed networks.

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2. Addressing and routing

2 pt (a) Which of the following is/are valid IPv6 addresses *and* in the `1000:2800::/25` subnet?

A. `1000:0000::face:2`
B. `1000:2000::2`
C. `1000:2800::a:2`
D. `1000:2800:1:2:3:405:a:2`
E. `1000:2800:1:2:3:4:5:a:2`
F. `1000:29h0::2`
G. `1000:2c00::b00c:2`
H. `1000:2d00::2`
I. `1000:3000::2`
J. `1000:3000::d::2`
K. `1200:0000::2`

1 pt (b) Compare two computer networks, a large one with 24-bit addresses and a small one with 16-bit addresses. In both networks, 25% of their available addresses are in use. How do their HD ratios compare?

A. The large network has a lower HD ratio than the small network.
B. The large network has the same HD ratio as the small network.
C. The large network has a higher HD ratio than the small network.
D. We cannot say without more information.

1 pt (c) Consider the same two networks as the previous question. Which of the two networks is closest to getting into trouble for not having enough addresses for convenient assignment?

A. The large network.
B. The small network.
C. Both are equally close.
D. We cannot say without more information.

1 pt (d) Suppose you want to use multicast for a video-conference with 20 participants, spread out all over the world. Is a *flood-and-prune* based multicast algorithm a good choice?

A. Yes, since *flooding* ensures that all participants get all data.
B. Yes, since *pruning* ensures the data reaches only the participants.
C. No, since due to the *pruning* not all participants would get all data.
D. No, since the *flooding* would be wasting a lot of Internet bandwidth.

1 pt (e) In Mobile IP, does traffic *from* the mobile node to the correspondent node go through the "home agent"?

A. Yes, always.
B. No, there is no need for that.
C. Yes, unless route optimization is used.
D. Only if the mobile host is on its home network.
E. Only if the mobile host is *not* on its home network.

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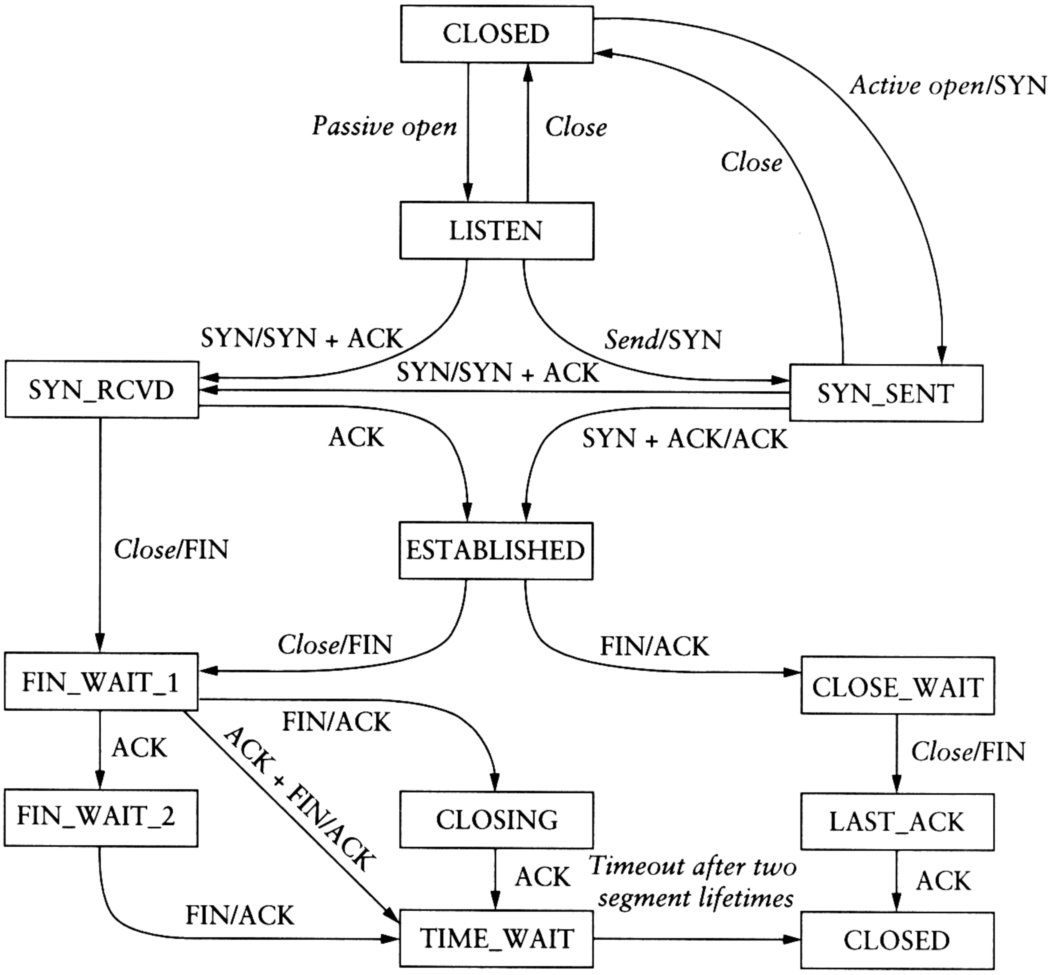
You may want to use this diagram for problem 3:



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3. Transport layer protocols

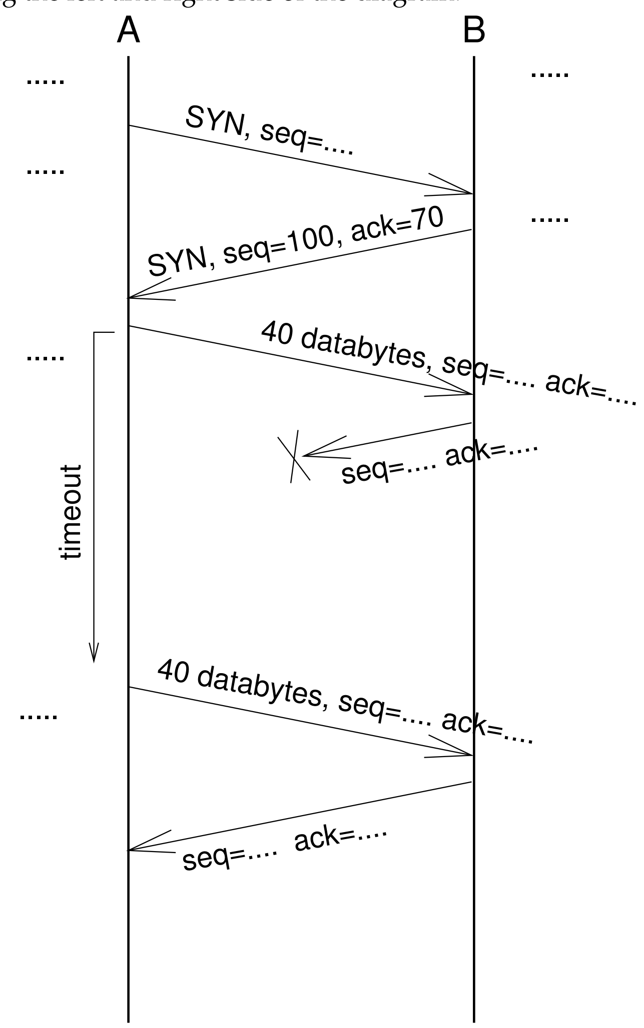
1 pt (a) DNS traffic consists mostly of short requests and replies. What transport-layer protocol is used for DNS?

A. Usually UDP.
B. Usually TCP.
C. UDP for IPv4, TCP for IPv6 lookups.
D. Neither, since DNS itself is a transport-layer protocol.

1 pt (b) Suppose a host has done a DNS query, and shortly thereafter needs to send another DNS query to the same server. Which *source* port would it use for the second query?

A. 53.
B. A random one.
C. A random one below 1024.
D. The previous source port number plus one.
E. The same as the previous time, but the sequence number would increase.

3 pt (c) Fill in the dots in this diagram: sequence/acknowledgement numbers of the packets, and TCP state names along the left and right side of the diagram.



1 pt (d) Which of the following statements is/are true?

A. The effective window is communicated in the TCP header.
B. The sequence number increments by 1 each time a packet is sent.
C. The acknowledgement number increments by 1 each time a packet is sent.
D. The acknowledgement number is related to the number of bytes received in the previous received packet.
E. Sequence numbers and acknowledgement numbers are used in both the communication between the client and the server and between the server and the client.

2 pt (e) The TCP state-transition diagram does not show what should happen if a segment is received with the RST (or RESET) flag set to 1. What arrow(s) (including their event/action tags) should be added to the diagram? You may either describe it here in text, or draw it in the provided diagram.

2 pt (f) For TCP several extensions were needed to cope with today's fast networks, like window scaling and timestamps. Would it be useful to define such extensions also for UDP? Explain your answer.

End of this exam.