Network Systems (201300179), Test 3

March 21, 2014, 15:45–17:15

Brief answers

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1. Distance-vector routing

3 pt (a)

Information stored at node	Distance to reach node			
	A	B	C	D
A	0	15	3	∞
B	15	0	1	2
C	3	1	0	∞
D	∞	2	∞	0

3 pt (b)

Information stored at node	Distance to reach node			
	A	B	C	D
A	0	4	3	17 or 6
B	4	0	1	2
C	3	1	0	3
D	17	2	3	0

1 pt (c)

Information stored at node	Distance to reach node			
	A	B	C	D
A	0	4	3	6
B	4	0	1	2
C	3	1	0	3
D	6	2	3	0

3 pt (d)

Information stored at node	Distance to reach node			
	A	B	C	D
A	0	4	3	17
B	8	0	5	2
C	3	7	0	9
D	6	2	3	0

2 pt (e)

In its 1st update, B will report a cost of 5 to C. D will report back that his cost to C has increased to 7. In the 2nd update, B will report a cost of 9 to C, and so on. The sequence of reported costs to C (as sent by B to D) is: 5, 9, 13, 17, 18. This last value comes from the cost reported by A (3) + the link cost to A (15),

which is the real cost. So, B will send node D 5 updates before D learns the real cost to C.

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2. Addressing issues

2 pt (a)

Because we want to assign the addresses hierarchically for efficient routing.

3 pt (b)

Only the 3rd one is incorrect (it has two :: marks).
The 1st and the 4th are in the 2001:0600::/23 range.

3 pt (c)

In a /20 address block, the first 20 address bits identify the network, leaving 12 for identifying the host: 2^{12} addresses. HD-ratio of about 0.87 is the upper threshold for comfortable assignment. Denote the maximum comfortable number of hosts by N, then solve $0.87 = \log(N)/\log(2^{12})$, so $N = 2^{0.87 \cdot 12} \approx 1400$ hosts.

3 pt (d)

It's limited: if all those computers behind the NAT want to connect to a single TCP port on a single server outside the NAT, the NAT has to distinguish the connections by port numbers, of which there are only 65536. So if it is to be expected that all computers may want to connect to say google's web service simultaneously, 65536 is an absolute maximum. In practice, you'd probably want to allow multiple such connections per computer, reducing the maximum even further.
Also, the number of available IPv4 addresses for local use is limited; the biggest address block for local use is 10.0.0.0/8, which has 16 million addresses (although this could be overcome by multiple levels of NAT). But anyway, the 65536 port numbers mentioned above cause a much lower limit.

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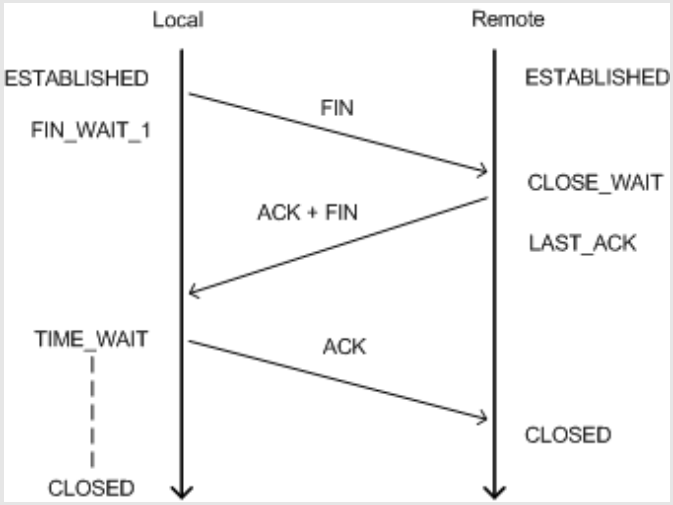
3. TCP

3 pt (a)



3 pt (b)

In the state `ESTABLISHED` a TCP node can expect data from the remote side. Also, when it has sent a `SYN+ACK` in response to a `SYN` (in state `SYN_RCVD`), the remote side may send data together with the `ACK`. Finally, until the local side has received a `FIN` message from the remote side, it can expect new data that has to be passed to the application. So these are the states `FIN_WAIT_1` and `FIN_WAIT_2`.

3 pt (c)

This out-of-sequence data has not yet been acknowledged to the sender, so for the sender it is part of the amount of data that may be outstanding, and that should fit in the receiver's buffer.

End of this exam.