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Cpre 489 – Homework 4

10/24/21

Homework 4

**Problem 23:**

To avoid the occurrence of the problems we saw in the provided example we want to avoid having the leading edge of receiver’s window wrap around in the sequence number space and overlap with the trailing edge. Assuming that lowest sequence number that the receiver is waiting for is packet m, the window would then be (m, m + w – 1) and it has received and ACKed packet m – 1 and the w – 1 packets before that, where w could be the size of the window. If none of the w ACKs have been received by the sender, then ACK messages with values of (m – w, m – 1) will still propagate back. If no ACKs with these ACK numbers have been received by the sender, then the sender’s window would be (m – w, m – 1). So from this, the lower edge of the sender’s window should be m - w, and the leading edge of the receiver’s window should be m + w – 1. To ensure that the leading edge of the receiver’s window doesn’t overlap with the trailing edge of the sender’s window the trailing edge of the sender’s window must be big enough to hold 2w sequence numbers. This means the sequence number space must be at least twice as large as the window size .

**Problem 27:**

1. In the second segment from Host A to B, the sequence number is 207, the source port number is 302, and the destination port number is 80.
2. If the first segment arrives before the second, in the acknowledgment of the first arriving segment, the acknowledgement number is 207, the source port number is 80, and the destination port number is 302.
3. If the second segment arrives before the first segment, in the acknowledgement of the first arriving segment, the acknowledgment number is 127.
4. A picture containing diagram

   Description automatically generated

**Problem 32:**

It’s called an exponential moving average because the weight given to past samples decays exponentially.

**Problem 37**

1. GBN: A sends a total of 9 segments. It first sends segments 1, 2, 3, 4, and 5 and then re-sends segments 2, 3, 4, and 5. B sends 8 ACKs. There are 4 ACKS with sequence numbers 2, 3, 4, and 5.

Selective Repeat: A sends a total of 6 segments. It first sends segments 1, 2, 3, 4, 5 and later re-sends segment 2. B sends 5 ACKs. There are 4 ACKS with sequence numbers 1, 3, 4, 5. And there is one ACK with sequence number 2.

TCP: A sends 6 segments. It first sends segments 1, 2, 3, 4, 5 and later re-sends segment 2. B sends 5 ACKs. There are 4 ACKs with sequence number 2. There is one ACK with sequence number 6.

1. TCP because it uses fast retransmit without waiting until time out.

**Problem 40**

1. TCP slowstart is operating in the intervals of [1, 6] and [23, 26]
2. TCP congestion avoidance is operating in the intervals [6, 16] and [17, 22]
3. After the 16th transmission round, packet loss is recognized by a triple duplicate ACK. If there was a timeout the congestion window size would have dropped down to 1.
4. After the 22nd transmission round, segment loss is detected due to timeout, and hence the congestion window size is set to 1.
5. 32
6. 21
7. 14
8. The 7th transmission round
9. Threshold is 4 and Window Size is 7
10. Threshold is 21, and congestion window size is 1
11. Round 17, 1 packet; Round 18, 2 packets; Round 19, 4 packets; Round 20, 8 packets; Round 21, 16 packets; Round 22, 21 packets. As such the total number is 52.

**Problem 1:**



|  |  |
| --- | --- |
| Destination Address | Link Interface |
| H3 | 3 |

1. No, because forwarding rule is only based on destination address.

**Problem 4:**

If we follow this schedule the minimum number of time slots needed is 3.

Slot 1: send X in top queue, send Y in middle input queue.

Slot 2: send X in middle input queue, send Y in bottom input queue.

Slot 3: send Z in bottom input queue.

Assuming the worst-case scenario the largest number of slots needed is still 3.

**Problem 8:**

|  |  |
| --- | --- |
| Prefix Match | Link Interface |
| 11100000 00 | 0 |
| 11100000 01000000 | 1 |
| 1110000 | 2 |
| 11100001 1 | 3 |
| Otherwise | 3 |

1. Prefix match for first address is 5th entry: link interface 3

Prefix match for second address is 3rd entry: link interface 2

Prefix match for third address is 4th entry: link interface 3