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Programming Assignment #2

CSE489, Spring 2014

## **Protocol Validation Tests (Section 4.1)**

Important/annotated lines are highlighted.

### **Alternating Bit**

```
127 rasputin ~/cse489-hw2 $ ./abt
```

```
----- Stop and Wait Network Simulator Version 1.1 -----
```

Enter the number of messages to simulate: **10**

Enter packet loss probability [enter 0.0 for no loss]:**0.2**

Enter packet corruption probability [0.0 for no corruption]:**0.2**

Enter average time between messages from sender's layer5 [ > 0.0]:**1000**

Enter TRACE:**2**

```
EVENT time: 1870.573975, type: 1, fromlayer5 entity: 0
```

```
[A_output] Sending packet 1
```

```
EVENT time: 1876.039062, type: 2, fromlayer3 entity: 1
```

```
[B_input] Receiving packet 1
```

```
[B_input] Sending ACK for packet 1
```

```
    TOLAYER3: packet being corrupted
```

```
EVENT time: 1881.270630, type: 2, fromlayer3 entity: 0
```

```
[A_input] Receiving packet
```

**[A\_input] Dropping corrupted packet** ← Corrupted ACK packet is dropped

EVENT time: 1885.573975, type: 0, timerinterrupt entity: 0

**[A\_timerinterrupt] Re-sending packet 1** ← Valid ACK was never received, so packet is re-sent

TOLAYER3: packet being lost

EVENT time: 1900.573975, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 1

TOLAYER3: packet being lost

EVENT time: 1915.573975, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 1

EVENT time: 1924.818481, type: 2, fromlayer3 entity: 1

**[B\_input] Receiving packet 1** ← Another copy of packet 1 finally arrives at receiver

**[B\_input] Re-sending ACK for duplicate packet 1** ← Receiver sends duplicate ACK for already received packet

TOLAYER3: packet being lost

EVENT time: 1930.573975, type: 0, timerinterrupt entity: 0

**[A\_timerinterrupt] Re-sending packet 1** ← Packet is re-sent yet again, due to lost ACK

EVENT time: 1932.052368, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 1

**[B\_input] Re-sending ACK for duplicate packet 1** ← Another duplicate ACK is sent

EVENT time: 1937.324585, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

**[A\_input] Received ACK for 1** ← ACK is finally received for packet, allowing sequence to move on

EVENT time: 3512.483887, type: 1, fromlayer5 entity: 0

**[A\_output] Sending packet 2** ← Next packet is sent, and the circle of life continues

EVENT time: 3518.513428, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 2

[B\_input] Sending ACK for packet 2

TOLAYER3: packet being lost

EVENT time: 3527.483887, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 2

TOLAYER3: packet being corrupted

EVENT time: 3531.547607, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 2

[B\_input] Dropping corrupted packet 2

EVENT time: 3542.483887, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 2

TOLAYER3: packet being corrupted

EVENT time: 3544.267822, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 2

[B\_input] Dropping corrupted packet 2

EVENT time: 3557.483887, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 2

EVENT time: 3561.642578, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 2

[B\_input] Re-sending ACK for duplicate packet 2

TOLAYER3: packet being lost

EVENT time: 3572.483887, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 2

TOLAYER3: packet being corrupted

EVENT time: 3578.321777, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 2

[B\_input] Dropping corrupted packet 2

EVENT time: 3587.483887, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 2

EVENT time: 3589.359131, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 2

[B\_input] Re-sending ACK for duplicate packet 2

TOLAYER3: packet being lost

EVENT time: 3602.483887, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 2

EVENT time: 3603.790283, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 2

[B\_input] Re-sending ACK for duplicate packet 2

TOLAYER3: packet being corrupted

EVENT time: 3609.368896, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Dropping corrupted packet

EVENT time: 3617.483887, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 2

TOLAYER3: packet being corrupted

EVENT time: 3623.733887, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 2

[B\_input] Dropping corrupted packet 2

EVENT time: 3632.483887, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 2

EVENT time: 3637.303223, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 2

[B\_input] Re-sending ACK for duplicate packet 2

EVENT time: 3646.699219, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Received ACK for 2

EVENT time: 4948.687500, type: 1, fromlayer5 entity: 0

[A\_output] Sending packet 3

TOLAYER3: packet being corrupted

EVENT time: 4957.598145, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 3

[B\_input] Dropping corrupted packet 3

EVENT time: 4963.687500, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 3

TOLAYER3: packet being corrupted

EVENT time: 4969.305176, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 3

[B\_input] Dropping corrupted packet 3

EVENT time: 4978.687500, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 3

TOLAYER3: packet being lost

EVENT time: 4993.687500, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 3

TOLAYER3: packet being lost

EVENT time: 5008.687500, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 3

TOLAYER3: packet being corrupted

EVENT time: 5010.493652, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 3

[B\_input] Dropping corrupted packet 3

EVENT time: 5023.687500, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 3

TOLAYER3: packet being lost

EVENT time: 5038.687500, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 3

EVENT time: 5041.704590, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 3

[B\_input] Sending ACK for packet 3

EVENT time: 5046.458496, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Received ACK for 3

EVENT time: 6308.438477, type: 1, fromlayer5 entity: 0

[A\_output] Sending packet 4

EVENT time: 6314.422363, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 4

[B\_input] Sending ACK for packet 4

TOLAYER3: packet being corrupted

EVENT time: 6322.284180, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Dropping corrupted packet

EVENT time: 6323.438477, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 4

TOLAYER3: packet being lost

EVENT time: 6338.438477, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 4

EVENT time: 6346.396484, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 4

[B\_input] Re-sending ACK for duplicate packet 4

EVENT time: 6350.789062, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Received ACK for 4



EVENT time: 6637.855469, type: 1, fromlayer5 entity: 0

[A\_output] Sending packet 5

EVENT time: 6647.703613, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 5

[B\_input] Sending ACK for packet 5

EVENT time: 6650.448730, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Received ACK for 5

EVENT time: 7241.909668, type: 1, fromlayer5 entity: 0

[A\_output] Sending packet 6

EVENT time: 7248.525391, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 6

[B\_input] Sending ACK for packet 6

TOLAYER3: packet being lost

EVENT time: 7256.909668, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 6

EVENT time: 7265.941406, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 6

[B\_input] Re-sending ACK for duplicate packet 6

TOLAYER3: packet being corrupted

EVENT time: 7267.455566, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Dropping corrupted packet

EVENT time: 7271.909668, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 6

TOLAYER3: packet being corrupted

EVENT time: 7273.007812, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 6

[B\_input] Dropping corrupted packet 6

EVENT time: 7286.909668, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 6

EVENT time: 7289.059082, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 6

[B\_input] Re-sending ACK for duplicate packet 6

TOLAYER3: packet being corrupted

EVENT time: 7290.643066, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Dropping corrupted packet

EVENT time: 7301.909668, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 6

EVENT time: 7307.156738, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 6

[B\_input] Re-sending ACK for duplicate packet 6

TOLAYER3: packet being corrupted

EVENT time: 7316.100586, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Dropping corrupted packet

EVENT time: 7316.909668, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 6

TOLAYER3: packet being corrupted

EVENT time: 7326.231934, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 6

[B\_input] Dropping corrupted packet 6

EVENT time: 7331.909668, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 6

EVENT time: 7334.906250, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 6

[B\_input] Re-sending ACK for duplicate packet 6

TOLAYER3: packet being lost

EVENT time: 7346.909668, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 6

TOLAYER3: packet being corrupted

EVENT time: 7348.058594, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 6

[B\_input] Dropping corrupted packet 6

EVENT time: 7361.909668, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 6

EVENT time: 7369.478027, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 6

[B\_input] Re-sending ACK for duplicate packet 6

EVENT time: 7373.651855, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Received ACK for 6

EVENT time: 8750.161133, type: 1, fromlayer5 entity: 0

[A\_output] Sending packet 7

EVENT time: 8754.887695, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 7

[B\_input] Sending ACK for packet 7

EVENT time: 8759.788086, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Received ACK for 7

EVENT time: 9791.898438, type: 1, fromlayer5 entity: 0

[A\_output] Sending packet 8

EVENT time: 9796.837891, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 8

[B\_input] Sending ACK for packet 8

TOLAYER3: packet being lost

EVENT time: 9806.898438, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 8

TOLAYER3: packet being corrupted

EVENT time: 9813.666992, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 8

[B\_input] Dropping corrupted packet 8

EVENT time: 9821.898438, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Re-sending packet 8

EVENT time: 9825.616211, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 8

[B\_input] Re-sending ACK for duplicate packet 8

EVENT time: 9830.488281, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Received ACK for 8

EVENT time: 10542.569336, type: 1, fromlayer5 entity: 0

[A\_output] Sending packet 9

EVENT time: 10548.279297, type: 2, fromlayer3 entity: 1

[B\_input] Receiving packet 9

[B\_input] Sending ACK for packet 9

EVENT time: 10553.112305, type: 2, fromlayer3 entity: 0

[A\_input] Receiving packet

[A\_input] Received ACK for 9

EVENT time: 12397.961914, type: 1, fromlayer5 entity: 0

[A\_output] Sending packet 10

TOLAYER3: packet being lost

EVENT time: 12412.961914, type: 0, timerinterrupt entity: 0

Simulator terminated at time 12412.961914

after sending 10 msgs from layer5

rasputin ~/cse489-hw2 \$

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## Go-Back-N

rasputin ~/cse489-hw2 \$ ./gbn

----- Stop and Wait Network Simulator Version 1.1 -----

Enter the number of messages to simulate: 20

Enter packet loss probability [enter 0.0 for no loss]: 0.2

Enter packet corruption probability [0.0 for no corruption]: 0.2

Enter average time between messages from sender's layer5 [ > 0.0]: 50

Enter TRACE: 2

EVENT time: 93.528702, type: 1, fromlayer5 entity: 0

**[A\_output] New packet in send buffer** ← New packet from layer 5 is placed in send buffer

**[A\_waiting] Sending packet, seqnum=0 sentc=0 base=0** ← Sendable packets (i.e. packets that fit into window) are flushed onto the wire from the buffer

EVENT time: 98.993797, type: 2, fromlayer3 entity: 1

**[B\_input] Accepting packet, seqnum=0** ← Receiver accepts valid packet

**[B\_input] Sending ACK, acknum=1** ← Receiver sends ACK for next expected packet

TOLAYER3: packet being corrupted

EVENT time: 100.000000, type: 0, timerinterrupt entity: 0

**[A\_timerinterrupt] Resending packet seqnum=0** ← Sender does not receive an ACK in time and resends packet

TOLAYER3: packet being lost

EVENT time: 104.225410, type: 2, fromlayer3 entity: 0

**[A\_input] Rejecting corrupted packet, acknum=1** ← Sender rejects corrupted ACK

EVENT time: 150.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=0

TOLAYER3: packet being lost

EVENT time: 175.624207, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

**[A\_waiting] Sending packet, seqnum=1 sentc=1 base=0** ← Sender sends new packet immediately because it fits into the window

TOLAYER3: packet being corrupted

EVENT time: 180.091476, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seqnum=1

EVENT time: 200.000000, type: 0, timerinterrupt entity: 0

**[A\_timerinterrupt] Resending packet seqnum=0**

TOLAYER3: packet being lost

**[A\_timerinterrupt] Resending packet seqnum=1** ← Sender does not receive an ACK in time, resends all previously sent and un-ACKed packets

EVENT time: 209.428421, type: 2, fromlayer3 entity: 1

**[B\_input] Accepting packet, seqnum=1** ← Receiver accepts expected packet

**[B\_input] Sending ACK, acknum=2** ← Receiver sends ACK for next expected packet



EVENT time: 216.891342, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=2

EVENT time: 219.193970, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=2 sentc=0 base=2

EVENT time: 221.924210, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=2

[B\_input] Sending ACK, acknum=3

EVENT time: 224.290558, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=3

EVENT time: 274.290558, type: 0, timerinterrupt entity: 0

EVENT time: 275.078979, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=3 sentc=0 base=3

TOLAYER3: packet being lost

EVENT time: 324.290558, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=3

TOLAYER3: packet being lost

EVENT time: 325.932312, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=4 sentc=1 base=3

EVENT time: 330.090881, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK, acknum=3

TOLAYER3: packet being lost

EVENT time: 374.290558, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=3

TOLAYER3: packet being corrupted

[A\_timerinterrupt] Resending packet seqnum=4

EVENT time: 380.128540, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seqnum=3

EVENT time: 382.003723, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK, acknum=3

TOLAYER3: packet being lost

EVENT time: 424.117676, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=5 sentc=2 base=3

TOLAYER3: packet being lost

EVENT time: 424.290558, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=3

[A\_timerinterrupt] Resending packet seqnum=4

TOLAYER3: packet being lost

[A\_timerinterrupt] Resending packet seqnum=5

TOLAYER3: packet being lost

EVENT time: 429.564667, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=3

[B\_input] Sending ACK, acknum=4

TOLAYER3: packet being corrupted

EVENT time: 435.814606, type: 2, fromlayer3 entity: 0

[A\_input] Rejecting corrupted packet, acknum=4

EVENT time: 474.290558, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=3

[A\_timerinterrupt] Resending packet seqnum=4

[A\_timerinterrupt] Resending packet seqnum=5

EVENT time: 477.958496, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=6 sentc=3 base=3

EVENT time: 479.109833, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK, acknum=4

TOLAYER3: packet being lost

EVENT time: 481.041412, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=7 sentc=4 base=3

TOLAYER3: packet being lost

EVENT time: 488.505920, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=4

[B\_input] Sending ACK, acknum=5

TOLAYER3: packet being lost

EVENT time: 492.397766, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=8 sentc=5 base=3

TOLAYER3: packet being lost

EVENT time: 497.738678, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=5

[B\_input] Sending ACK, acknum=6

TOLAYER3: packet being lost

EVENT time: 507.130096, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=6

[B\_input] Sending ACK, acknum=7

EVENT time: 509.242828, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=7

EVENT time: 513.478516, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=9 sentc=2 base=7

EVENT time: 519.710938, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK, acknum=7

EVENT time: 522.193298, type: 2, fromlayer3 entity: 0

[A\_input] Ignoring redundant ACK, acknum=7

EVENT time: 535.890076, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=10 sentc=3 base=7

EVENT time: 545.219116, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK, acknum=7

TOLAYER3: packet being lost

EVENT time: 559.242798, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=7

[A\_timerinterrupt] Resending packet seqnum=8

[A\_timerinterrupt] Resending packet seqnum=9

[A\_timerinterrupt] Resending packet seqnum=10

EVENT time: 560.766479, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=7

[B\_input] Sending ACK, acknum=8

EVENT time: 563.511719, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=8

EVENT time: 570.200989, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=8

[B\_input] Sending ACK, acknum=9

EVENT time: 579.026917, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=9

[B\_input] Sending ACK, acknum=10

EVENT time: 579.689148, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=9

EVENT time: 582.194397, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=10

EVENT time: 588.874878, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=10

[B\_input] Sending ACK, acknum=11

EVENT time: 591.268982, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=11 sentc=1 base=10

TOLAYER3: packet being lost

EVENT time: 595.134155, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=11

EVENT time: 596.981201, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=12 sentc=1 base=11

TOLAYER3: packet being corrupted

EVENT time: 598.079224, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seqnum=12

EVENT time: 627.689331, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=13 sentc=2 base=11

TOLAYER3: packet being lost

EVENT time: 645.134155, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=11

TOLAYER3: packet being corrupted

[A\_timerinterrupt] Resending packet seqnum=12

TOLAYER3: packet being lost

[A\_timerinterrupt] Resending packet seqnum=13

EVENT time: 651.915161, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seqnum=11

EVENT time: 657.162292, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK, acknum=11

TOLAYER3: packet being corrupted

EVENT time: 666.106018, type: 2, fromlayer3 entity: 0

[A\_input] Rejecting corrupted packet, acknum=11

EVENT time: 695.134155, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=11

TOLAYER3: packet being corrupted

[A\_timerinterrupt] Resending packet seqnum=12

[A\_timerinterrupt] Resending packet seqnum=13

TOLAYER3: packet being lost

EVENT time: 704.456604, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seqnum=11

EVENT time: 707.453003, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK, acknum=11

TOLAYER3: packet being corrupted

EVENT time: 708.602051, type: 2, fromlayer3 entity: 0

[A\_input] Rejecting corrupted packet, acknum=999999



EVENT time: 714.612915, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=14 sentc=3 base=11

EVENT time: 723.735596, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK, acknum=11

EVENT time: 731.681396, type: 2, fromlayer3 entity: 0

[A\_input] Ignoring redundant ACK, acknum=11

EVENT time: 745.134155, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=11

[A\_timerinterrupt] Resending packet seqnum=12

[A\_timerinterrupt] Resending packet seqnum=13

[A\_timerinterrupt] Resending packet seqnum=14

EVENT time: 746.976990, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=15 sentc=4 base=11

TOLAYER3: packet being lost

EVENT time: 749.860962, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=11

[B\_input] Sending ACK, acknum=12

EVENT time: 754.761230, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=12

[B\_input] Sending ACK, acknum=13

EVENT time: 756.691772, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=12

EVENT time: 764.499939, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=13

[B\_input] Sending ACK, acknum=14

EVENT time: 765.892029, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=13

EVENT time: 766.773987, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=14

[B\_input] Sending ACK, acknum=15

EVENT time: 775.241272, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=14

EVENT time: 778.503296, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=15

EVENT time: 811.070923, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=16 sentc=1 base=15

TOLAYER3: packet being corrupted

EVENT time: 818.352356, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seqnum=16

EVENT time: 828.503296, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=15

[A\_timerinterrupt] Resending packet seqnum=16

EVENT time: 835.008667, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=15

[B\_input] Sending ACK, acknum=16

EVENT time: 836.153015, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=16

EVENT time: 836.414307, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=16

[B\_input] Sending ACK, acknum=17

EVENT time: 838.832642, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=17

EVENT time: 853.657227, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=17 sentc=0 base=17

EVENT time: 862.413391, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=17

[B\_input] Sending ACK, acknum=18

TOLAYER3: packet being corrupted

EVENT time: 869.599304, type: 2, fromlayer3 entity: 0

[A\_input] Rejecting corrupted packet, acknum=999999

EVENT time: 888.832642, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet seqnum=17

EVENT time: 890.695557, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK, acknum=18

EVENT time: 894.820496, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, acknum=18

EVENT time: 914.574951, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=18 sentc=0 base=18

EVENT time: 921.108093, type: 2, fromlayer3 entity: 1

[B\_input] Accepting packet, seqnum=18

[B\_input] Sending ACK, acknum=19

TOLAYER3: packet being lost

EVENT time: 941.399292, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer

[A\_waiting] Sending packet, seqnum=19 sentc=1 base=18

TOLAYER3: packet being lost

EVENT time: 944.820496, type: 0, timerinterrupt entity: 0

Simulator terminated at time 944.820496

after sending 20 msgs from layer5

rasputin ~/cse489-hw2 \$

---

## Selective Repeat

rasputin ~/cse489-hw2 \$

----- Stop and Wait Network Simulator Version 1.1 -----

Enter the number of messages to simulate: **20**

Enter packet loss probability [enter 0.0 for no loss]:**0.2**

Enter packet corruption probability [0.0 for no corruption]:**0.2**

Enter average time between messages from sender's layer5 [ > 0.0]:**50**

Enter TRACE:**2**

EVENT time: 93.528702, type: 1, fromlayer5 entity: 0

**[A\_output] New packet in send buffer, seq=0** ← New packet is placed in send buffer

**[A\_waiting] Sending packet, seq=0** ← Packet fits in window and is sent immediately

EVENT time: 98.993797, type: 2, fromlayer3 entity: 1

**[B\_input] Sending ACK for in-window packet, seq=0** ← Receiver receives packet, sends ACK

TOLAYER3: packet being corrupted

**[B\_input] Sending up packet, seq=0** ← Receiver sends contiguous completed segment at front of receive buffer to layer 5

EVENT time: 100.000000, type: 0, timerinterrupt entity: 0

**[A\_timerinterrupt] Resending packet, seq=0** ← Sender did not receive ACK in time and resends packet

TOLAYER3: packet being lost

EVENT time: 104.225410, type: 2, fromlayer3 entity: 0

**[A\_input] Rejecting corrupted ACK, ack=0** ← Sender drops corrupted ACK

EVENT time: 150.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=0

TOLAYER3: packet being lost

EVENT time: 175.624207, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=1

[A\_waiting] Sending packet, seq=1

TOLAYER3: packet being corrupted

EVENT time: 180.091476, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seq=1

EVENT time: 200.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=0

TOLAYER3: packet being lost

EVENT time: 219.193970, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=2

[A\_waiting] Sending packet, seq=2

EVENT time: 224.466202, type: 2, fromlayer3 entity: 1

**[B\_input] Sending ACK for in-window packet, seq=2** ← Receiver receives packet that is above base, puts it into receive buffer

EVENT time: 228.668839, type: 2, fromlayer3 entity: 0

**[A\_input] Accepting ACK, ack=2** ← Sender receives ACK for packet that is above base

EVENT time: 250.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=0

EVENT time: 252.730240, type: 2, fromlayer3 entity: 1

[B\_input] Resending ACK for below-window packet, seq=0

EVENT time: 255.096588, type: 2, fromlayer3 entity: 0

**[A\_input] Accepting ACK, ack=0** ← Sender receives ACK for base sequence, allowing window to move up

EVENT time: 262.120697, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=3

[A\_waiting] Sending packet, seq=3

TOLAYER3: packet being lost

EVENT time: 300.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=1

TOLAYER3: packet being lost

EVENT time: 312.974030, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=4

[A\_waiting] Sending packet, seq=4

EVENT time: 317.132599, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK for in-window packet, seq=4

TOLAYER3: packet being lost

EVENT time: 350.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=1

TOLAYER3: packet being corrupted

EVENT time: 355.837982, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seq=1

EVENT time: 400.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=1



EVENT time: 401.875183, type: 2, fromlayer3 entity: 1

**[B\_input] Sending ACK for in-window packet, seq=1** ← Receiver receives base packet, creating contiguous region at front of receive buffer

TOLAYER3: packet being lost

**[B\_input] Sending up packet, seq=1**

**[B\_input] Sending up packet, seq=2** ← Receiver sends contiguous region at front of buffer to layer 5

EVENT time: 411.159363, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=5

[A\_waiting] Sending packet, seq=5

TOLAYER3: packet being lost

EVENT time: 450.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=1

EVENT time: 455.274109, type: 2, fromlayer3 entity: 1

[B\_input] Resending ACK for below-window packet, seq=1

TOLAYER3: packet being lost

EVENT time: 465.000183, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=6

[A\_waiting] Sending packet, seq=6

TOLAYER3: packet being corrupted

EVENT time: 471.250122, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seq=6

EVENT time: 484.300354, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=7

[A\_waiting] Sending packet, seq=7

EVENT time: 487.178192, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK for in-window packet, seq=7

EVENT time: 490.839966, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, ack=7

EVENT time: 500.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=1

TOLAYER3: packet being corrupted

EVENT time: 508.910797, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seq=1

EVENT time: 516.572327, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=8

[A\_waiting] Sending packet, seq=8

TOLAYER3: packet being corrupted

EVENT time: 518.844910, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seq=8

EVENT time: 550.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=1

TOLAYER3: packet being lost

EVENT time: 600.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=1

TOLAYER3: packet being corrupted

EVENT time: 601.806335, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seq=1

EVENT time: 609.810303, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=9

[A\_waiting] Sending packet, seq=9

EVENT time: 612.827332, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK for in-window packet, seq=9

EVENT time: 617.581360, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, ack=9

EVENT time: 622.173950, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=10

[A\_waiting] Sending packet, seq=10

EVENT time: 628.158081, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK for in-window packet, seq=10

TOLAYER3: packet being corrupted

EVENT time: 636.020020, type: 2, fromlayer3 entity: 0

[A\_input] Rejecting corrupted ACK, ack=10

EVENT time: 638.644775, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=11

EVENT time: 644.463745, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=12

EVENT time: 650.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=1

EVENT time: 659.434509, type: 2, fromlayer3 entity: 1

[B\_input] Resending ACK for below-window packet, seq=1

EVENT time: 668.260437, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, ack=1

[A\_waiting] Sending packet, seq=11

[A\_waiting] Sending packet, seq=12

EVENT time: 678.108398, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK for in-window packet, seq=11

EVENT time: 680.853638, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK for in-window packet, seq=12

EVENT time: 687.596558, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, ack=11

EVENT time: 690.101807, type: 2, fromlayer3 entity: 0

[A\_input] Accepting ACK, ack=12

EVENT time: 700.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=3

EVENT time: 706.259277, type: 2, fromlayer3 entity: 1

[B\_input] Sending ACK for in-window packet, seq=3

TOLAYER3: packet being lost

[B\_input] Sending up packet, seq=3

[B\_input] Sending up packet, seq=4

EVENT time: 720.276123, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=13

EVENT time: 728.820679, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=14

EVENT time: 750.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=3

TOLAYER3: packet being corrupted

EVENT time: 751.098022, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seq=3

EVENT time: 759.528809, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=15

EVENT time: 800.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=3

TOLAYER3: packet being lost

EVENT time: 846.452393, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=16

EVENT time: 850.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=3

TOLAYER3: packet being corrupted

EVENT time: 851.583862, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seq=3

EVENT time: 884.544678, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=17

EVENT time: 900.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=3

EVENT time: 905.838501, type: 2, fromlayer3 entity: 1

[B\_input] Resending ACK for below-window packet, seq=3

TOLAYER3: packet being corrupted

EVENT time: 908.373840, type: 2, fromlayer3 entity: 0

[A\_input] Rejecting corrupted ACK, ack=3

EVENT time: 950.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=3

TOLAYER3: packet being corrupted

EVENT time: 951.491150, type: 2, fromlayer3 entity: 1

[B\_input] Rejecting corrupted packet, seq=3

EVENT time: 977.986572, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=18

EVENT time: 1000.000000, type: 0, timerinterrupt entity: 0

[A\_timerinterrupt] Resending packet, seq=3

EVENT time: 1000.168640, type: 1, fromlayer5 entity: 0

[A\_output] New packet in send buffer, seq=19

EVENT time: 1001.824585, type: 1, fromlayer5 entity: 0

Simulator terminated at time 1001.824585

after sending 20 msgs from layer5

rasputin ~/cse489-hw2 \$