

# Part 1

## Case1: protocol works for no loss + no corruption

-- \* Network Simulator v1.0 \* --

Enter number of messages to simulate (> 0): [10] 20

Enter packet loss probability (0.0 for no loss): [0.0]

Enter packet corruption probability (0.0 for no corruption): [0.0]

Enter average time between messages from sender's layer 5 (> 0.0): [1000]

Enter window size (> 0): [8]

Enter retransmission timeout (>0.0) [15.0]

Enter trace level (>= 0): [0] 2

Enter random seed: [0] 1234

EVENT time: 217.16971343119602 type: 1 entity: 0

A output START

Upper layer MSG at A:aaaaaaaaaaaaaaaaaaaa

toLayer3: seqnum:0 acknum:-1 checksum:1939 payload:aaaaaaaaaaaaaaaaaaaa

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 217.16971343119602

startTimer: starting timer at 217.16971343119602

A output END

EVENT time: 219.39637440107424 type: 2 entity: 1

B input START

B getting:aaaaaaaaaaaaaaaaaaaa

Correct seq num. Expecting pkt:0, got pkt:0

toLayer3: seqnum:0 acknum:0 checksum:1940 payload:aaaaaaaaaaaaaaaaaaaa

B input END

EVENT time: 221.30524613177892 type: 2 entity: 0

A input START

A got ACK from B, packet is: seqnum:0 acknum:0 checksum:1940

payload:aaaaaaaaaaaaaaaaaaaa

stopTimer: stopping timer at 221.30524613177892

Received ACK:0

A input END

EVENT time: 336.802270577105 type: 1 entity: 0

A output START

Upper layer MSG at A:bbbbbbbbbbbbbbbbbbbb

toLayer3: seqnum:1 acknum:-1 checksum:1960 payload:bbbbbbbbbbbbbbbbbbbb

stopTimer: Warning: Unable to cancel your timer  
stopTimer: stopping timer at 336.802270577105  
startTimer: starting timer at 336.802270577105  
A output END

EVENT time: 338.2304757835627 type: 2 entity: 1  
B input START  
B getting:bbbbbbbbbbbbbbbbbb  
Correct seq num. Expecting pkt:1, got pkt:1  
toLayer3: seqnum:1 acknum:1 checksum:1962 payload:bbbbbbbbbbbbbbbbbb  
B input END

EVENT time: 340.19785149693286 type: 2 entity: 0  
A input START  
A got ACK from B, packet is: seqnum:1 acknum:1 checksum:1962  
payload:bbbbbbbbbbbbbbbbbb  
stopTimer: stopping timer at 340.19785149693286  
Received ACK:1  
A input END

EVENT time: 416.57765434736166 type: 1 entity: 0  
A output START  
Upper layer MSG at A:cccccccccccccccccc  
toLayer3: seqnum:2 acknum:-1 checksum:1981 payload:cccccccccccccccccc  
stopTimer: Warning: Unable to cancel your timer  
stopTimer: stopping timer at 416.57765434736166  
startTimer: starting timer at 416.57765434736166  
A output END

EVENT time: 421.25901058992275 type: 2 entity: 1  
B input START  
B getting:cccccccccccccccccc  
Correct seq num. Expecting pkt:2, got pkt:2  
toLayer3: seqnum:2 acknum:2 checksum:1984 payload:cccccccccccccccccc  
B input END

EVENT time: 424.9284951322977 type: 2 entity: 0  
A input START  
A got ACK from B, packet is: seqnum:2 acknum:2 checksum:1984 payload:cccccccccccccccccc  
stopTimer: stopping timer at 424.9284951322977  
Received ACK:2  
A input END

...

Case2: ack is lost/corrupted and a later cumulative ack moves the sender window by more than 1

...

EVENT time: 2.0844141972106085 type: 1 entity: 0

A output START

Upper layer MSG at A:aaaaaaaaaaaaaaaaaaaa

toLayer3: seqnum:0 acknum:-1 checksum:1939 payload:aaaaaaaaaaaaaaaaaaaa

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 2.0844141972106085

startTimer: starting timer at 2.0844141972106085

A output END

Send packet with sequence no. 0

EVENT time: 3.5214087343974123 type: 2 entity: 1

B input START

B getting:aaaaaaaaaaaaaaaaaaaa

Correct seq num. Expecting pkt:0, got pkt:0

toLayer3: seqnum:0 acknum:0 checksum:1940 payload:aaaaaaaaaaaaaaaaaaaa

toLayer3: packet being lost

B input END

Correct packet received at B  
ACK 0 send to A lost

EVENT time: 62.327951902829064 type: 1 entity: 0

A output START

Upper layer MSG at A:bbbbbbbbbbbbbbbbbbbb

toLayer3: seqnum:1 acknum:-1 checksum:1960 payload:bbbbbbbbbbbbbbbbbbbb

stopTimer: stopping timer at 62.327951902829064

startTimer: starting timer at 62.327951902829064

A output END

Send packet with sequence no. 1

EVENT time: 69.12067018646809 type: 2 entity: 1

B input START

B getting:bbbbbbbbbbbbbbbbbbbb

Correct seq num. Expecting pkt:1, got pkt:1

toLayer3: seqnum:1 acknum:1 checksum:1962 payload:bbbbbbbbbbbbbbbbbbbb

B input END

Correct packet received at B  
ACK 1 send to A

EVENT time: 78.63011566515091 type: 2 entity: 0

A input START

A got ACK from B, packet is: seqnum:1 acknum:1 checksum:1962

payload:bbbbbbbbbbbbbbbbbbbb

stopTimer: stopping timer at 78.63011566515091

Received Cumulative ACK. Expected:0 Received:1

A received ACK 1. This is ACK for sequence 0 as will. Sliding window by 2.

A input END

EVENT time: 156.11133152256843 type: 1 entity: 0

A output START

Upper layer MSG at A:cccccccccccccccccc

Send packet with sequence 2

toLayer3: packet being lost

toLayer3: seqnum:2 acknum:-1 checksum:1981 payload:cccccccccccccccccc

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 156.11133152256843

startTimer: starting timer at 156.11133152256843

A output END

...

Case3: data packet is lost/corrupted, and data is retransmitted  
after RTO

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EVENT time: 6284.493545335246 type: 1 entity: 0

generateNextArrival(): called

generateNextArrival(): time is 6284.493545335246

generateNextArrival(): future time for event 1 at entity 0 will be 6682.882168034914

A output START

Data packet being sent by A,  
but is corrupted

Upper layer MSG at A:fffffffffffffffffff

toLayer3: seqnum: 5 acknum: -1 checksum: 2044 payload: ffffffffffffffffffff

toLayer3: packet being corrupted

toLayer3: scheduling arrival on other side

toLayer3: seqnum:5 acknum:-1 checksum:2044 payload:fffffffffffffffffff

stopTimer: stopping timer at 6284.493545335246

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 6284.493545335246

startTimer: starting timer at 6284.493545335246

startTimer: starting timer at 6284.493545335246

A output END

EVENT time: 6292.556321909238 type: 2 entity: 1

B input START

B getting: ?fffffffffffffffffff

Corrupted Packet received at B

Checksum error in B, corrupted

B input END

EVENT time: 6299.493545335246 type: 0 entity: 0

Timer interrupt A at local time: 6299.493545335246

Timer: A retrans 5

Timer interrupts and the packet is retransmitted

toLayer3: seqnum: 5 acknum: -1 checksum: 2044 payload: ffffffffffffffffffff

toLayer3: scheduling arrival on other side

toLayer3: seqnum: 5 acknum: -1 checksum: 2044 payload: ffffffffffffffffffff

stopTimer: stopping timer at 6299.493545335246

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 6299.493545335246

startTimer: starting timer at 6299.493545335246

startTimer: starting timer at 6299.493545335246

...

## Case4: data packet is lost/corrupted, and data is retransmitted after receiving duplicate ack

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EVENT time: 373.13150425733204 type: 1 entity: 0

A output START

Upper layer MSG at A:cccccccccccccccccccc

toLayer3: packet being lost

toLayer3: seqnum:2 acknum:-1 checksum:1981 payload:cccccccccccccccccccc

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 373.13150425733204 Data packet sequence 2 sent from A but lost.

startTimer: starting timer at 373.13150425733204

A output END

EVENT time: 373.5221411786248 type: 1 entity: 0

A output START

Upper layer MSG at A:dddddddddddddddddddd

toLayer3: seqnum:3 acknum:-1 checksum:2002 payload:dddddddddddddddddddd

stopTimer: stopping timer at 373.5221411786248

startTimer: starting timer at 373.5221411786248 Data packet sequence 3 sent from A

A output END

EVENT time: 379.3076570940275 type: 2 entity: 1

B input START

B getting:dddddddddddddddddddd

Expecting pkt:2, got pkt:3

Putting packet into rcv\_buffer[3]

Sending ACK: 1

Expecting sequence no. 2 but got sequence no. 3. Buffer sequence 3 and send ACK 1.

B input END

EVENT time: 387.2429883724478 type: 2 entity: 0

A input START

A got ACK from B, packet is: seqnum:1 acknum:1 checksum:1962  
payload:bbbbbbbbbbbbbbbbbbbb

A got Corrupted ACK/NAK from B, received duplicate ACK 1.

A got Corrupted ACK/NAK from B

A input END

EVENT time: 388.5221411786248 type: 0 entity: 0

Timer interrupt A at local time:388.5221411786248

Timer: A retrans 2

toLayer3: seqnum:2 acknum:-1 checksum:1981 payload:cccccccccccccccccccc

Resend sequence no. 2

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 388.5221411786248  
startTimer: starting timer at 388.5221411786248

...

Case5: data packet is lost/corrupted, and the retransmitted data is delivered and a cumulative ack moves the sender window by more than 1

...

EVENT time: 371.1333293739274 type: 1 entity: 0

A output START

Upper layer MSG at A:cccccccccccccccccc

toLayer3: packet being lost

toLayer3: seqnum:2 acknum:-1 checksum:1981 payload:cccccccccccccccccc

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 371. 1333293739274

startTimer: starting timer at 371. 1333293739274

A output END

Packet with sequence no.2 is sending to B but lost halfway.

EVENT time: 371.8482739392044 type: 1 entity: 0

A output START

Upper layer MSG at A:dddddddddddddddddd

toLayer3: seqnum:3 acknum:-1 checksum:2002 payload:dddddddddddddddddd

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 371. 8482739392044

startTimer: starting timer at 371. 8482739392044

A output END

Packet with sequence no.3 is sending to B.

EVENT time: 377.9374836110583 type: 2 entity: 1

B input START

B getting:dddddddddddddddddd

Expecting pkt:2, got pkt:3

Putting packet into rcv\_buffer[3]

Sending ACK: 1

B input END

B receives sequence no.3 but expecting no.2  
Buffer sequence no.3 and send ACK 1

EVENT time: 385.98630484381739 type: 2 entity: 0

A input START

A got ACK from B, packet is: seqnum:1 acknum:1 checksum:1962

payload:bbbbbbbbbbbbbbbbbbbb

A got Corrupted ACK/NAK from B

A input END

A receives ACK for sequence no.1 from B

EVENT time: 386.0548383818249 type: 0 entity: 0

Timer interrupt A at local time:388.5221411786248

Timer: A retrans 2

toLayer3: seqnum:2 acknum:-1 checksum:1981 payload:cccccccccccccccccc

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 386. 0548383818249

startTimer: starting timer at 386. 0548383818249

A retransmits sequence no.2

EVENT time: 392.9521367854582 type: 2 entity: 1

B input START

B getting: cccccccccccccccccc

Correct seq num. Expecting pkt:2, got pkt:2

Sending ACK: 3

B input END

B receives correct sequence no.2, send cumulative ACK 3

EVENT time: 401.0298821372482 type: 2 entity: 0

A input START

A got ACK from B, packet is: seqnum:3 acknum:3 checksum:2006

payload: ddddddddddddddddddd

stopTimer: stopping timer at 401. 0298821372482

Received ACK:3

A input END

A receives cumulative ACK 3

EVENT time: 403.283740184292 type: 1 entity: 0

A output START

Upper layer MSG at A:eeeeeeeeeeeeeeeeee

toLayer3: seqnum: 4 acknum: -1 checksum: 2023 payload: eeeeeeeeeeeeeeeeeee

stopTimer: Warning: Unable to cancel your timer

stopTimer: stopping timer at 403. 283740184292

startTimer: starting timer at 403. 283740184292

A output END

A sends next packet with sequence no.4

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