Algorithm: Reno - sender & receiver

0% packet loss

```
barye@barye-VirtualBox:~/from git/CN_EX3/communications_networ
k_EX3$ sudo tc qdisc change dev lo root netem loss 0%
barye@barye-VirtualBox:~/from git/CN_EX3/communications_networ
k_EX3$ ./TCP_Receiver -p 5060 -algo reno
Stating Receiver...
Waiting for TCP connection...
Sender 127.0.0.1:45026 connected, beginning to receive file...
File transfer completed.
File transfer completed.
File transfer completed.
File transfer completed.
File transfer completed.
Sender 127.0.0.1:45026 disconnected
---------------------------------
- * Statistics * -
Run #1 Data: Time=1.568000 S ; Speed=1275.510204 MB/S
Run #2 Data: Time=0.534000 S ; Speed=3745.318352 MB/S
Run #3 Data: Time=0.785000 S ; Speed=2547.770701 MB/S
Run #4 Data: Time=0.697000 S ; Speed=2869.440459 MB/S
Run #5 Data: Time=0.651000 S ; Speed=3072.196621 MB/S
 Average time: 0.847000 S
 Average speed: 2702.047267 S
Sender 127.0.0.1:45026 disconnected
Receiver finished!
barye@barye-VirtualBox:~/from git/CN_EX3/communications_networ
k_EX3$ []
```

```
barye@barye-VirtualBox:~/from git/CN_EX3/communications_netwo
rk_EX3$ ./TCP_Sender -ip 127.0.0.1 -p 5060 -algo reno
Connecting to 127.0.0.1:5060...
Successfully connected to the receiver!
Sending message to the receiver:
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
0
Connection closed!
```

- * Statistics * -

Run #1 Data: Time=1.568000 S ; Speed=1275.510204 MB/S

Run #2 Data: Time=0.534000 S ; Speed=3745.318352 MB/S

Run #3 Data: Time=0.785000 S ; Speed=2547.770701 MB/S

Run #4 Data: Time=0.697000 S ; Speed=2869.440459 MB/S

Run #5 Data: Time=0.651000 S ; Speed=3072.196621 MB/S

Average time: 0.847000 S

Average speed: 2702.047267 S

Sender 127.0.0.1:45026 disconnected

!Receiver finished

```
barye@barye-VirtualBox:~/from git/CN_EX3/communications_networ
k_EX3$ sudo tc qdisc change dev lo root netem loss 2%
barye@barye-VirtualBox:~/from git/CN_EX3/communications_networ
k_EX3$ ./TCP_Receiver -p 5060 -algo reno
 Stating Receiver...
 Waiting for TCP connection...
 Sender 127.0.0.1:34156 connected, beginning to receive file...
 File transfer completed.
 File transfer completed.
 File transfer completed.
 File transfer completed.
 File transfer completed.
 Sender 127.0.0.1:34156 disconnected
 --------------------------------
 - * Statistics * -
 Run #1 Data: Time=1.731000 S ; Speed=1155.401502 MB/S
 Run #2 Data: Time=0.599000 S ; Speed=3338.898164 MB/S
 Run #3 Data: Time=0.764000 S ; Speed=2617.801047 MB/S
 Run #4 Data: Time=4.465000 S ; Speed=447.928331 MB/S
 Run #5 Data: Time=0.524000 S ; Speed=3816.793893 MB/S
  Average time: 1.616600 S
  Average speed: 2275.364587 S
 Sender 127.0.0.1:34156 disconnected
 Receiver finished!
barye@barye-VirtualBox:~/from git/CN_EX3/communications_networ
k_EX3$ []
```

```
barye@barye-VirtualBox:~/from git/CN_EX3/communications_netwo
rk_EX3$ ./TCP_Sender -ip 127.0.0.1 -p 5060 -algo reno
Connecting to 127.0.0.1:5060...
Successfully connected to the receiver!
Sending message to the receiver:
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
0
Connection closed!
```

Statistics

Run #1 Data: Time=1.731000 S ; Speed=1155.401502 MB/S

Run #2 Data: Time=0.599000 S ; Speed=3338.898164 MB/S

Run #3 Data: Time=0.764000 S ; Speed=2617.801047 MB/S

Run #4 Data: Time=4.465000 S ; Speed=447.928331 MB/S

Run #5 Data: Time=0.524000 S ; Speed=3816.793893 MB/S

Average time: 1.616600 S

Average speed: 2275.364587 S

Sender 127.0.0.1:34156 disconnected

!Receiver finished

בס"ד

5% packet loss

- * Statistics * -

Run #1 Data: Time=2.574000 S ; Speed=777.000777 MB/S

Run #2 Data: Time=0.471000 S ; Speed=4246.284501 MB/S

Run #3 Data: Time=0.419000 S ; Speed=4773.269690 MB/S

Run #4 Data: Time=1.180000 S ; Speed=1694.915254 MB/S

Run #5 Data: Time=0.530000 S ; Speed=3773.584906 MB/S

Average time: 1.034800 S

Average speed: 3053.011026 S

Sender 127.0.0.1:46214 disconnected

!Receiver finished

```
barye@barye-VirtualBox:~/from git/CN_EX3/communications_networ     barye@barye-VirtualBox:~/from git/CN_EX3/communications_netwo
k_EX3$ sudo tc qdisc change dev lo root netem loss 10%            rk_EX3$ ./TCP_Sender -ip 127.0.0.1 -p 5060 -algo reno
barye@barye-VirtualBox:~/from git/CN_EX3/communications_networ     Connecting to 127.0.0.1:5060...
k_EX3$ ./TCP_Receiver -p 5060 -algo reno                          Successfully connected to the receiver!
Stating Receiver...                                               Sending message to the receiver:
Waiting for TCP connection...                                     Sent 2097153 bytes to the receiver!
Sender 127.0.0.1:59202 connected, beginning to receive file...    Do you want to send the file again?
File transfer completed.                                              No - press 0
File transfer completed.                                              Yes- press 1
File transfer completed.                                          1
File transfer completed.                                          Sent 2097153 bytes to the receiver!
File transfer completed.                                          Do you want to send the file again?
Sender 127.0.0.1:59202 disconnected                                   No - press 0
---------------------------------                                     Yes- press 1
- * Statistics * -                                                1
Run #1 Data: Time=1.165000 S ; Speed=1716.738197 MB/S             Sent 2097153 bytes to the receiver!
Run #2 Data: Time=0.473000 S ; Speed=4228.329810 MB/S             Do you want to send the file again?
Run #3 Data: Time=0.838000 S ; Speed=2386.634845 MB/S                 No - press 0
Run #4 Data: Time=0.833000 S ; Speed=2400.960384 MB/S                 Yes- press 1
Run #5 Data: Time=0.757000 S ; Speed=2642.007926 MB/S             1
 Average time: 0.813200 S                                         Sent 2097153 bytes to the receiver!
 Average speed: 2674.934232 S                                     Do you want to send the file again?
Sender 127.0.0.1:59202 disconnected                                  No - press 0
Receiver finished!                                                   Yes- press 1
barye@barye-VirtualBox:~/from git/CN_EX3/communications_networ     1
k_EX3$ []                                                         Sent 2097153 bytes to the receiver!
                                                                  Do you want to send the file again?
                                                                     No - press 0
                                                                     Yes- press 1
                                                                  0
                                                                  Connection closed!
```

- * Statistics * -

Run #1 Data: Time=1.165000 S ; Speed=1716.738197 MB/S

Run #2 Data: Time=0.473000 S ; Speed=4228.329810 MB/S

Run #3 Data: Time=0.838000 S ; Speed=2386.634845 MB/S

Run #4 Data: Time=0.833000 S ; Speed=2400.960384 MB/S

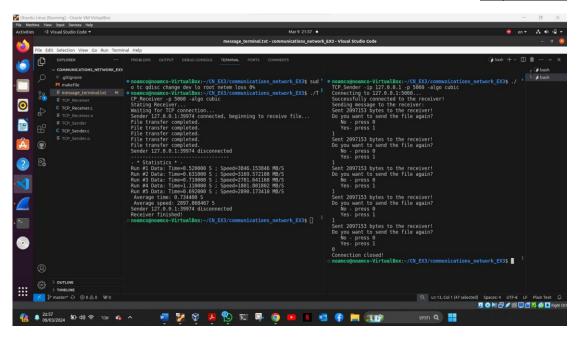Run #5 Data: Time=0.757000 S ; Speed=2642.007926 MB/S

Average time: 0.813200 S

Average speed: 2674.934232 S

Sender 127.0.0.1:59202 disconnected

!Receiver finished

Algorithm: cubic - sender & receiver

<u>0% packet loss</u>

\- * Statistics * -

Run #1 Data: Time=0.520000 S ; Speed=3846.153846 MB/S

Run #2 Data: Time=0.631000 S ; Speed=3169.572108 MB/S

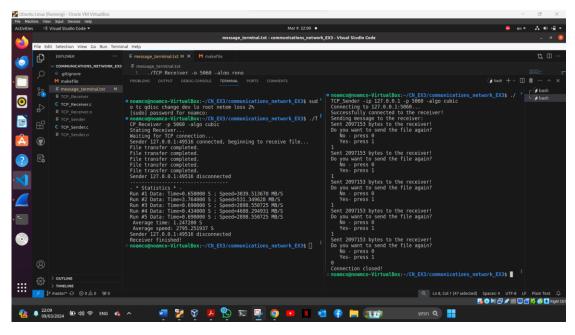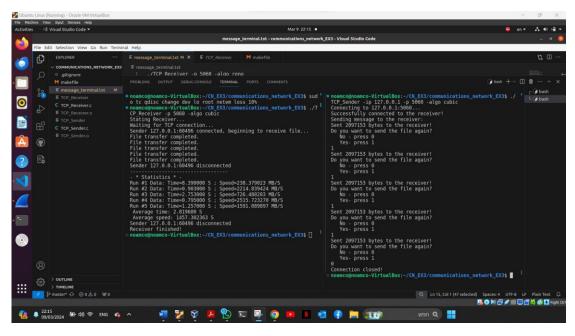Run #3 Data: Time=0.719000 S ; Speed=2781.641168 MB/S

Run #4 Data: Time=1.110000 S ; Speed=1801.801802 MB/S

Run #5 Data: Time=0.692000 S ; Speed=2890.173410 MB/S

Average time: 0.734400 S

Average speed: 2897.868467 S

Sender 127.0.0.1:39974 disconnected

ᶦReceiver finished

בס"ד

2% packet loss

- * Statistics * -

Run #1 Data: Time=0.658000 S ; Speed=3039.513678 MB/S

Run #2 Data: Time=3.764000 S ; Speed=531.349628 MB/S

Run #3 Data: Time=0.690000 S ; Speed=2898.550725 MB/S

Run #4 Data: Time=0.434000 S ; Speed=4608.294931 MB/S

Run #5 Data: Time=0.690000 S ; Speed=2898.550725 MB/S

Average time: 1.247200 S

Average speed: 2795.251937 S

Sender 127.0.0.1:49516 disconnected

Receiver finished

- * Statistics * -

Run #1 Data: Time=1.511000 S ; Speed=1323.626737 MB/S

Run #2 Data: Time=0.983000 S ; Speed=2034.587996 MB/S

Run #3 Data: Time=0.535000 S ; Speed=3738.317757 MB/S

Run #4 Data: Time=0.752000 S ; Speed=2659.574468 MB/S

Run #5 Data: Time=0.577000 S ; Speed=3466.204506 MB/S

Average time: 0.871600 S

Average speed: 2644.462293 S

Sender 127.0.0.1:49524 disconnected

!Receiver finished

- * Statistics * -

Run #1 Data: Time=8.390000 S ; Speed=238.379023 MB/S

Run #2 Data: Time=0.903000 S ; Speed=2214.839424 MB/S

Run #3 Data: Time=2.753000 S ; Speed=726.480203 MB/S

Run #4 Data: Time=0.795000 S ; Speed=2515.723270 MB/S

Run #5 Data: Time=1.257000 S ; Speed=1591.089897 MB/S

Average time: 2.819600 S

Average speed: 1457.302363 S

Sender 127.0.0.1:60496 disconnected

!Receiver finished

Bonus:

Algorithm: receiver- cubic, - sender- reno

<u>0% packet loss</u>

- * Statistics * -

Run #1 Data: Time=0.576000 S ; Speed=3472.222222 MB/S

Run #2 Data: Time=0.711000 S ; Speed=2812.939522 MB/S

Run #3 Data: Time=0.571000 S ; Speed=3502.626970 MB/S

Run #4 Data: Time=0.833000 S ; Speed=2400.960384 MB/S

Run #5 Data: Time=1.009000 S ; Speed=1982.160555 MB/S

Average time: 0.740000 S

Average speed: 2834.181931 S

Sender 127.0.0.1:49866 disconnected

!Receiver finished

בס"ד

2% packet loss

- * Statistics * -

Run #1 Data: Time=2.128000 S ; Speed=939.849624 MB/S

Run #2 Data: Time=0.384000 S ; Speed=5208.333333 MB/S

Run #3 Data: Time=0.546000 S ; Speed=3663.003663 MB/S

Run #4 Data: Time=0.488000 S ; Speed=4098.360656 MB/S

Run #5 Data: Time=0.436000 S ; Speed=4587.155963 MB/S

Average time: 0.796400 S

Average speed: 3699.340648 S

Sender 127.0.0.1:56106 disconnected

!Receiver finished

\- * Statistics * -

Run #1 Data: Time=0.573000 S ; Speed=3490.401396 MB/S

Run #2 Data: Time=0.911000 S ; Speed=2195.389682 MB/S

Run #3 Data: Time=0.407000 S ; Speed=4914.004914 MB/S

Run #4 Data: Time=0.408000 S ; Speed=4901.960784 MB/S

Run #5 Data: Time=0.504000 S ; Speed=3968.253968 MB/S

Average time: 0.560600 S

Average speed: 3894.002149 S

Sender 127.0.0.1:57512 disconnected

!Receiver finished

```
barye@barye-VirtualBox:~/from git/CN_EX3/communications_network_
EX3$ sudo tc qdisc change dev lo root netem loss 10%
barye@barye-VirtualBox:~/from git/CN_EX3/communications_network_
EX3$ ./TCP_Receiver -p 5060 -algo cubic
Stating Receiver...
Waiting for TCP connection...
Sender 127.0.0.1:56976 connected, beginning to receive file...
File transfer completed.
File transfer completed.
File transfer completed.
File transfer completed.
File transfer completed.
Sender 127.0.0.1:56976 disconnected
--------------------------------
- * Statistics * -
Run #1 Data: Time=1.988000 S ; Speed=1006.036217 MB/S
Run #2 Data: Time=0.279000 S ; Speed=7168.458781 MB/S
Run #3 Data: Time=0.807000 S ; Speed=2478.314746 MB/S
Run #4 Data: Time=0.632000 S ; Speed=3164.556962 MB/S
Run #5 Data: Time=0.410000 S ; Speed=4878.048780 MB/S
 Average time: 0.823200 S
 Average speed: 3739.083097 S
Sender 127.0.0.1:56976 disconnected
Receiver finished!
barye@barye-VirtualBox:~/from git/CN_EX3/communications_network_
EX3$
```
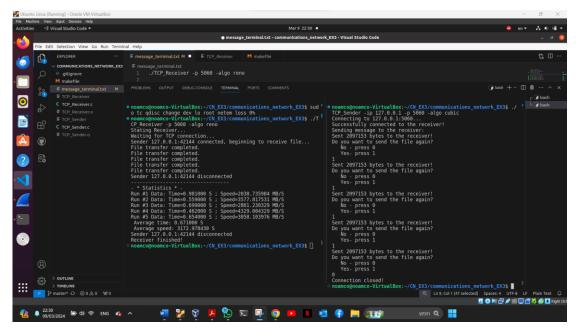
```
barye@barye-VirtualBox:~/from git/CN_EX3/communications_network
_EX3$ ./TCP_Sender -ip 127.0.0.1 -p 5060 -algo reno
Connecting to 127.0.0.1:5060...
Successfully connected to the receiver!
Sending message to the receiver:
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
1
Sent 2097153 bytes to the receiver!
Do you want to send the file again?
    No - press 0
    Yes- press 1
0
Connection closed!
barye@barye-VirtualBox:~/from git/CN_EX3/communications_network
```

- * Statistics * -

Run #1 Data: Time=1.988000 S ; Speed=1006.036217 MB/S

Run #2 Data: Time=0.279000 S ; Speed=7168.458781 MB/S

Run #3 Data: Time=0.807000 S ; Speed=2478.314746 MB/S

Run #4 Data: Time=0.632000 S ; Speed=3164.556962 MB/S

Run #5 Data: Time=0.410000 S ; Speed=4878.048780 MB/S

Average time: 0.823200 S

Average speed: 3739.083097 S

Sender 127.0.0.1:56976 disconnected

!Receiver finished

בס"ד

Algorithm: receiver- reno, - sender- cubic

<u>0% packet loss</u>

- * Statistics * -

Run #1 Data: Time=0.981000 S ; Speed=2038.735984 MB/S

Run #2 Data: Time=0.559000 S ; Speed=3577.817531 MB/S

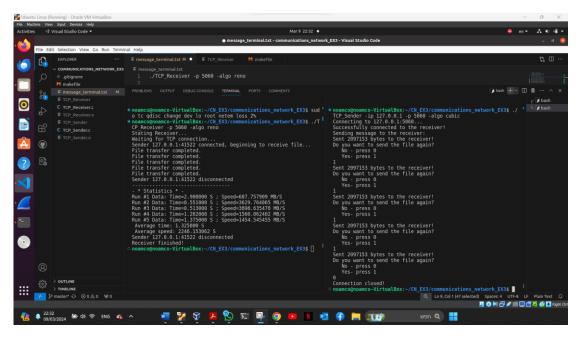Run #3 Data: Time=0.699000 S ; Speed=2861.230329 MB/S

Run #4 Data: Time=0.462000 S ; Speed=4329.004329 MB/S

Run #5 Data: Time=0.654000 S ; Speed=3058.103976 MB/S

Average time: 0.671000 S

Average speed: 3172.978430 S

Sender 127.0.0.1:42144 disconnected

Receiver finished

<u>2% packet loss</u>

- * Statistics * -

Run #1 Data: Time=2.908000 S ; Speed=687.757909 MB/S

Run #2 Data: Time=0.551000 S ; Speed=3629.764065 MB/S

Run #3 Data: Time=0.513000 S ; Speed=3898.635478 MB/S

Run #4 Data: Time=1.282000 S ; Speed=1560.062402 MB/S

Run #5 Data: Time=1.375000 S ; Speed=1454.545455 MB/S

Average time: 1.325800 S

Average speed: 2246.153062 S

Sender 127.0.0.1:41522 disconnected

!Receiver finished

<u>5% packet loss</u>

- * Statistics * -

Run #1 Data: Time=1.072000 S ; Speed=1865.671642 MB/S

Run #2 Data: Time=0.725000 S ; Speed=2758.620690 MB/S

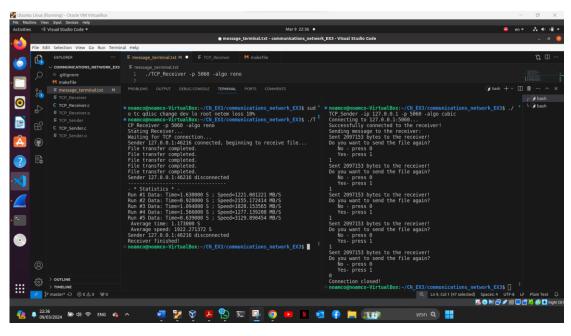Run #3 Data: Time=1.013000 S ; Speed=1974.333662 MB/S

Run #4 Data: Time=0.746000 S ; Speed=2680.965147 MB/S

Run #5 Data: Time=0.919000 S ; Speed=2176.278564 MB/S

Average time: 0.895000 S

Average speed: 2291.173941 S

Sender 127.0.0.1:53348 disconnected

!Receiver finished

<u>10% packet loss</u>

- * Statistics * -

Run #1 Data: Time=1.638000 S ; Speed=1221.001221 MB/S

Run #2 Data: Time=0.928000 S ; Speed=2155.172414 MB/S

Run #3 Data: Time=1.094000 S ; Speed=1828.153565 MB/S

Run #4 Data: Time=1.566000 S ; Speed=1277.139208 MB/S

Run #5 Data: Time=0.639000 S ; Speed=3129.890454 MB/S

Average time: 1.173000 S

Average speed: 1922.271372 S

Sender 127.0.0.1:46216 disconnected

!Receiver finished