COMP 7005
Project
Testing

Sami Roudgarian, A01294122

Harmanbir Dhillon, A00994245

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Features

Running the Client

To run the Client you have to specify:

- IP address of the Client by using the -C flag, example: ./client -C 192.168.1.88
- Port number of the Client by using the -c flag, example: ./client -c 60000
- IP address of the server by using the -S flag, example: ./client -S 192.168.1.88
- Port number of the server by using the -s flag, example: ./client -s 60000
- Help by using the -h flag, example ./client -h

You have to use ALL flags other than the help flag

Running the Server

To run the Server you have to specify:

- IP address of the Client by using the -C flag, example: ./server -C 192.168.1.88
- Port number of the Client by using the -c flag, example: ./server -c 60000
- IP address of the Server by using the -S flag, example: ./server -S 192.168.1.88
- Port number of the Server by using the -s flag, example: ./server -s 60000
- Help by using the -h flag, example ./server -h

You have to use ALL flags other than the help flag

Running the Proxy

To run the Proxy you have to specify:

- IP address of the Client by using the -C flag, example: ./proxy -C 192.168.1.88
- Port number of the Client by using the -c flag, example: ./proxy -c 60000
- IP address of the Server by using the -S flag, example: ./proxy -S 192.168.1.88
- Port number of the Server by using the -s flag, example: ./proxy -s 60000
- IP address of the Proxy by using the -P flag, example: ./proxy -S 192.168.1.88

Optional:

- Drop rate of the Client by using the -D flag, example: ./proxy -D 100
- Drop rate of the Server by using the -d flag, example: ./proxy -d 100
- Delay rate of the Client by using the -L flag, example: ./proxy -L 100
- Delay rate of the Server by using the -l flag, example: ./proxy -l 100
- Corruption rate by using the -E flag, example: ./proxy -E 100
- Help by using the -h flag, example ./proxy -h

You have to use ALL flags other than the help flag and the flags for lossiness. If you don’t use the lossiness flags then they default to 0.

Running the GUI

The GUI has to be run after the Client, Server and Proxy are already running because the GUI will attempt to connect to all three.

Using IPv4 or IPv6:

The Client, Server and Proxy can run using IPv4 or IPv6. The Client, Server and Proxy have to be running either IPv4 or IPv6 at the same time.

Window:

The user can specify the size of the window in the -w flag for the Client. The Client then uses this window size when creating the window and also the Client can cumulatively remove multiple packets from the window based on the ACK number it receives from the Server.

Lossiness:

The Proxy can imitate a Lossy network by allowing the user to dynamically change the values for Drop, Delay and Corruption rates for both the Server and the Client separately. User just has to follow the prompts displayed by the menu.

Test Results

COMMAND	DESCRIPTION	STATUS	EXAMPLE
./client	Should tell the user they need to input the IP address of the Client	PASSED	Example 1
./client -C 192.168.1.80	Should tell the user that the Client port is required	PASSED	Example 2
./client -C 192.168.1.80 -c 60000	Should tell the user they need to input the IP address of the Server	PASSED	Example 3
./client -C 192.168.1.80 -c 60000 -S 192.168.1.80	Should tell the user that the Server port is required	PASSED	Example 4
./client -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 8000	Should tell the user that the window size is required	PASSED	Example 5
./client -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 8000 -w 5	Should try to initiate a connection with the server	PASSED	Example 6
./client -C <IPv6> -c 60000 -S 1<IPv6> -s 8000 -w 5	Should try to initiate a connection with the server using IPv6 address	PASSED	Example 7
./client -C 192.168.1.80 -c 60000 -w h -S 192.168.1.80 -s 8000	Tells the user that in the -w flag there is an invalid argument	PASSED	Example 8
./client -C 192.168.1.800 -c 60000 -w 5 -S 192.168.1.80 -s 8000	Tells the user that address family is not supported for the address “192.168.1.800”	PASSED	Example 9
./client -C 192.168.1.80 -c 600000 -w 5 -S 192.168.1.80 -s 8000	Tells the user that the port “600000” is out of range	PASSED	Example 10
./client -C 192.168.1.80 -c 60000 -w 5 -S 192.168.1.800	Tells the user that address family is not supported for the address “192.168.1.800”	PASSED	Example 11

-s 8000			
./client -C 192.168.1.80 -c 60000 -w 5 -S 192.168.1.80 -s 80000	Tells the user that the port “80000” is out of range	PASSED	Example 12
./server	Should tell the user they need to input the IP address of the Server	PASSED	Example 13
./server -S 192.168.1.80	Should tell the user that the Server port is required	PASSED	Example 14
./server -S 192.168.1.80 -s 60001	Should tell the user they need to input the IP address of the Client	PASSED	Example 15
./server -S 192.168.1.80 -s 60001 -C 192.168.1.80	Should tell the user that the Client port is required	PASSED	Example 16
./server -S 192.168.1.76 -s 60001 -C 192.168.1.80 -c 8050	Should run and wait for packets from the Client	PASSED	Example 17
./server -S <IPv6> -s 60001 -C <IPv6> -c 8050	Should run and wait for packets from the Client using an IPv6 address	PASSED	Example 18
./server -S 192.168.1.800 -s 60001 -C 192.168.1.80 -c 8050	Tells the user that address family is not supported for the address “192.168.1.800”	PASSED	Example 19
./server -S 192.168.1.80 -s 600001 -C 192.168.1.80 -c 8050	Tells the user that the port “600001” is out of range	PASSED	Example 20
./server -S 192.168.1.80 -s 60001 -C 192.168.1.800 -c 8050	Tells the user that address family is not supported for the address “192.168.1.800”	PASSED	Example 21
./server -S 192.168.1.80 -s 60001 -C 192.168.1.80 -c 80500	Tells the user that the port “80500” is out of range	PASSED	Example 22
./proxy	Tells the user that the client IP address is required	PASSED	Example 23

./proxy -C 192.168.1.80	Tells the user that the client port is required	PASSED	Example 24
./proxy -C 192.168.1.80 -c 60000	Tells the user that the server IP address is required	PASSED	Example 25
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.80	Tells the user that the Server port is required	PASSED	Example 26
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 60001	Tells the user that the Proxy IP address is required	PASSED	Example 27
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 60001 -P 192.168.1.80	Runs and waits for packets from both the client and the server. Sets the client and server delay, drop, and corruption rates at 0, the default	PASSED	Example 28
./proxy -C <IPv6> -c 60000 -S <IPv6> -s 60001 -P <IPv6>	Runs and waits for packets from both the client and the server. Sets the client and server delay, drop, and corruption rates at 0, the default using an IPv6 address	PASSED	Example 29
./proxy -C 192.168.1.800 -c 60000 -S 192.168.1.80 -s 60001 -P 192.168.1.80	Tells the user that address family is not supported for the address “192.168.1.800”	PASSED	Example 30
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.800 -s 60001 -P 192.168.1.80	Tells the user that address family is not supported for the address “192.168.1.800”	PASSED	Example 31
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 60001 -P 192.168.1.800	Tells the user that address family is not supported for the address “192.168.1.800”	PASSED	Example 32
./proxy -C 192.168.1.80 -c 600000 -S 192.168.1.80 -s 60001 -P 192.168.1.80	Tells the user that the port “600000” is out of range	PASSED	Example 33
./proxy -C	Tells the user that the port	PASSED	Example 34

192.168.1.80 -c 60000 -S 192.168.1.80 -s 600001 -P 192.168.1.80	“600001” is out of range		
./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 50 -L 50 -d 50 -I 50 -E 50	Runs the proxy and takes in the passed in values as the drop, delay and corruption rate for client and server	PASSED	Example 35
./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 500 -L 50 -d 50 -I 50 -E 50	Tells the user that the -D flag value is out of range	PASSED	Example 36
./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 50 -L 500 -d 50 -I 50 -E 50	Tells the user that the -L flag value is out of range	PASSED	Example 37
./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 50 -L 50 -d 500 -I 50 -E 50	Tells the user that the -d flag value is out of range	PASSED	Example 38
./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 50 -L 50 -d 50 -I 500 -E 50	Tells the user that the -I flag value is out of range	PASSED	Example 39
./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 50 -L 50 -d 50 -I 50 -E 500	Tells the user that the -E flag value is out of range	PASSED	Example 40
Dynamically set the proxy to 100% drop rate for the Client, and enter a message into	The proxy should drop every packet that the client sends it, so the client should keep resending the packet once the timeout	PASSED	Example 41

the command line for the client	occurs		
Dynamically set the proxy to 100% drop rate for the Server, and enter a message into the command line for the client	The proxy should forward the packet that the client sends to the server. The server should send a packet that acknowledges the packet. The proxy should then drop the ack packet. The client will keep retransmitting the same packet when the timeout occurs and the server will keep sending reacks for the packet that the proxy will drop	PASSED	Example 42
Dynamically set the proxy to 100% delay rate for the Client, and enter a message into the command line for the client	The proxy should delay every packet that the client sends it, so the client should keep resending the packet once the timeout occurs. The server will receive the same packet multiple times so it should send reack each time. The client will receive multiple reacks for the same packet and it will drop them	PASSED	Example 43
Dynamically set the proxy to 100% delay rate for the Server, and enter a message into the command line for the client	The proxy should delay every packet that the server sends it, so the client should keep resending the packet once the timeout occurs. The server will receive the same packet multiple times so it should send reack each time. The client will receive multiple reacks for the same packet and it will drop them	PASSED	Example 44
Dynamically set the proxy to 100% corruption rate, and enter a message into the command line for the client	The proxy should corrupt the data portion of the packet that the client and server sends it. It will not matter for the ack packets because they have no data. When the server receives the corrupted packet it will drop it and not send anything to the client. When the client doesnt receive an ack for the packet and the timeout occurs, it will resend the packet	PASSED	Example 45
Dynamically set the	The proxy will forward all	PASSED	Example 46

proxy to 0% for all drop, delay and corruption rate, and enter a message into the command line for the client	messages it gets to the intended recipients. There will be no retransmissions because no packets should be lost unless there actually is a problem in the network.		
	The Client, Proxy and Server will log all packets they receive and send in a .csv file	PASSED	Example 47
Dynamically set the Client drop rate to 100% and enter 5 messages from the client while the window size is 5. After sending the messages, dynamically set the Client drop rate to 0%	The client should send 5 packets at once without receiving any ack for any. Once the Client drop rate is set to 0% in the proxy, the client will receive acks for the packets it sent and remove that packet from the window.	PASSED	
Dynamically set the Client drop rate to 100% and enter 10 messages from the client while the window size is 5. After sending the messages, dynamically set the Client drop rate to 0%	The client should send 5 packets and then buffer the other 5. Once the Client drop rate is set to 0% in the proxy, the client will receive acks for the packets it sent and remove that packet from the window. Then the client will send the buffered packet and add that packet to the window.	PASSED	
Cumulative Acknowledgement	When the client receives an ACK for a packet greater than the current one, it will ACK all packets up to and including the highest ACK packet		Example 48
Send one packet from the client with all lossiness values on the proxy at 0	The Client GUI should show that SENT_PACKET, RECEIVED_PACKET, RECEIVED_ACK should all be at 1. The Proxy GUI should show that SENT_PACKET and RECEIVED_PACKET are at 2. The Server GUI should show that SENT_PACKET and RECEIVED_PACKET are at 1.	PASSED	Example 49

Examples

Example 1

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client
Usage: ./client [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-w] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -w <value>            Option 'w' (required) with value, Sets the window size
ERROR The client IP address is required.
In file command_line.c in function handle_arguments on line 161
```

Example 2

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client -C 192.168.1.80
Usage: ./client [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-w] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -w <value>            Option 'w' (required) with value, Sets the window size
ERROR The client port is required.
In file command_line.c in function handle_arguments on line 169
```

Example 3

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client -C 192.168.1.80 -c 60000
Usage: ./client [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-w] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -w <value>            Option 'w' (required) with value, Sets the window size
ERROR The server IP address is required.
In file command_line.c in function handle_arguments on line 177
```

Example 4

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client -C 192.168.1.80 -c 60000 -S 192.168.1.8
Usage: ./client [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-w] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -w <value>            Option 'w' (required) with value, Sets the window size
ERROR The server port is required.
In file command_line.c in function handle_arguments on line 185
```

Example 5

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 8000
Usage: ./client [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-w] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -w <value>            Option 'w' (required) with value, Sets the window size
ERROR window size is required
In file command_line.c in function handle_arguments on line 193
```

Example 6

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 8000 -w 5
binding to: 192.168.1.80:60000
Bound to socket: 192.168.1.80:60000
binding to: 192.168.1.80:61001
Bound to socket: 192.168.1.80:61001
Resent packet with seq number: 0
```

Example 7

```
~/C/reliable-udp/s/c/cmake-build-debug main !3
./client -C 2605:8d80:482:83ce:10d9:74b8:7472:d373 -c 60000 -w 5 -S 2605:8d80:
482:83ce:1ce7:97f0:8664:31f7 -s 8000
binding to: 2605:8d80:482:83ce:10d9:74b8:7472:d373:60000
Bound to socket: 2605:8d80:482:83ce:10d9:74b8:7472:d373:60000
binding to: 2605:8d80:482:83ce:10d9:74b8:7472:d373:61001
Bound to socket: 2605:8d80:482:83ce:10d9:74b8:7472:d373:61001
Server packet with ack number: 1 flag: 3 received
removing packet with expected ack number: 1 at index: 0

Enter string below [ctrl + d] to quit
```

Example 8

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client -C 192.168.1.80 -c 60000 -w h -S 192.168.1.80 -s 8000
ERROR Invalid argument
In file command_line.c in function convert_to_int on line 269
```

Example 9

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client -C 192.168.1.800 -c 60000 -w 5 -S 192.168.1.80 -s 8000
ERROR Address family not supported for IP address: 192.168.1.800
In file server_config.c in function convert_address on line 118
```

Example 10

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client -C 192.168.1.80 -c 600000 -w 5 -S 192.168.1.80 -s 8000
Usage: ./client [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-w] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -w <value>            Option 'w' (required) with value, Sets the window size
for port: 600000
ERROR in_port_t value out of range.
In file command_line.c in function parse_in_port_t on line 249
```

Example 11

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client -C 192.168.1.80 -c 60000 -w 5 -S 192.168.1.800 -s 8000
ERROR Address family not supported for IP address: 192.168.1.800
In file server_config.c in function convert_address on line 118
```

Example 12

```
~/CLionProjects/reliable-udp/source/client/cmake-build-debug main !3
./client -C 192.168.1.80 -c 60000 -w 5 -S 192.168.1.80 -s 80000
Usage: ./client [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-w] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -w <value>            Option 'w' (required) with value, Sets the window size
for port: 80000
ERROR in_port_t value out of range.
In file command_line.c in function parse_in_port_t on line 249
```

Example 13

```
~/CLionProjects/reliable-udp/source/server/cmake-build-debug main !3
./server
Usage: ./server [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
ERROR The server IP address is required.
In file command_line.c in function handle_arguments on line 134
```

Example 14

```
~/CLionProjects/reliable-udp/source/server/cmake-build-debug main !3
./server -S 192.168.1.80
Usage: ./server [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
ERROR The server port is required.
In file command_line.c in function handle_arguments on line 142
```

Example 15

```
~/CLionProjects/reliable-udp/source/server/cmake-build-debug main !3
./server -S 192.168.1.80 -s 60001
Usage: ./server [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
ERROR The client IP address is required.
In file command_line.c in function handle_arguments on line 150
```

Example 16

```
~/CLionProjects/reliable-udp/source/server/cmake-build-debug main !3
./server -S 192.168.1.80 -s 60001 -C 192.168.1.80
Usage: ./server [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
ERROR The client port is required.
In file command_line.c in function handle_arguments on line 158
```

Example 17

```
~/CLionProjects/reliable-udp/source/server/cmake-build-debug main !3
./server -S 192.168.1.80 -s 60001 -C 192.168.1.80 -c 8050
binding to: 192.168.1.80:60001
Bound to socket: 192.168.1.80:60001
binding to: 192.168.1.80:61000
Bound to socket: 192.168.1.80:61000
```

Example 18

```
~/C/reliable-udp/s/s/cmake-build-debug main ⇡13 *1 !2 ?2
./server -S 2605:8d80:482:83ce:1c03:5b7b:1367:2817 -c 8050  -C 2605:8d80:482
:83ce:1ce7:97f0:8664:31f7 -s 60001
binding to: 2605:8d80:482:83ce:1c03:5b7b:1367:2817:60001
Bound to socket: 2605:8d80:482:83ce:1c03:5b7b:1367:2817:60001
binding to: 2605:8d80:482:83ce:1c03:5b7b:1367:2817:61000
Bound to socket: 2605:8d80:482:83ce:1c03:5b7b:1367:2817:61000
```

Example 19

```
~/CLionProjects/reliable-udp/source/server/cmake-build-debug main !3
./server -S 192.168.1.800 -s 60001 -C 192.168.1.80 -c 8050
ERROR Address family not supported for IP address: 192.168.1.800
In file server_config.c in function convert_address on line 103
```

Example 20

```
~/CLionProjects/reliable-udp/source/server/cmake-build-debug main !3
./server -S 192.168.1.80 -s 600001 -C 192.168.1.80 -c 8050
Usage: ./server [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
for port: 600001
ERROR in_port_t value out of range.
In file command_line.c in function parse_in_port_t on line 207
```

Example 21

```
~/CLionProjects/reliable-udp/source/server/cmake-build-debug main !3
./server -S 192.168.1.80 -s 60001 -C 192.168.1.800 -c 8050
ERROR Address family not supported for IP address: 192.168.1.800
In file server_config.c in function convert_address on line 103
```

Example 22

```
~/CLionProjects/reliable-udp/source/server/cmake-build-debug main !3
./server -S 192.168.1.80 -s 60001 -C 192.168.1.80 -c 80500
Usage: ./server [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
for port: 80500
ERROR in_port_t value out of range.
In file command_line.c in function parse_in_port_t on line 207
```

Example 23

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
ERROR The client IP address is required.
In file command_line.c in function handle_arguments on line 302
```

Example 24

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
ERROR The client port is required.
In file command_line.c in function handle_arguments on line 310
```

Example 25

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -c 60000
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
ERROR The server IP address is required.
In file command_line.c in function handle_arguments on line 318
```

Example 26

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.80
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
ERROR The server port is required.
In file command_line.c in function handle_arguments on line 326
```

Example 27

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 60001
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
ERROR The proxy IP address is required.
In file command_line.c in function handle_arguments on line 334
```

Example 28

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 60001 -P 192.168.1.80
Binding to: 192.168.1.80:8000
Bound to socket: 192.168.1.80:8000
Binding to: 192.168.1.80:8050
Bound to socket: 192.168.1.80:8050
Binding to: 192.168.1.80:61060
Bound to socket: 192.168.1.80:61060

Dynamic Proxy Lossiness Value:
1. Client Losiness
2. Server Losiness
3. Data Corruption
4. Exit
Enter your Answer:
```

Example 29

```
~/CL/reliable-udp/s/p/cmake-build-debug main ⇡84 ?1
./proxy -C 2605:8d80:482:83ce:10d9:74b8:7472:d373 -S 2605:8d80:482:83ce:1c03
:5b7b:1367:2817 -P 2605:8d80:482:83ce:1ce7:97f0:8664:31f7 -s 60001 -c 60000 -D
0 -L 0 -d 0 -l 0 -E 0
Binding to: 2605:8d80:482:83ce:1ce7:97f0:8664:31f7:8000
Bound to socket: 2605:8d80:482:83ce:1ce7:97f0:8664:31f7:8000
Binding to: 2605:8d80:482:83ce:1ce7:97f0:8664:31f7:8050
Bound to socket: 2605:8d80:482:83ce:1ce7:97f0:8664:31f7:8050
Binding to: 2605:8d80:482:83ce:1ce7:97f0:8664:31f7:61060
Bound to socket: 2605:8d80:482:83ce:1ce7:97f0:8664:31f7:61060

Dynamic Proxy Lossiness Value:
1. Client Losiness
2. Server Losiness
3. Data Corruption
4. Exit
```

Example 30

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.800 -c 60000 -S 192.168.1.80 -s 60001 -P 192.168.1.80
ERROR Address family not supported for IP address: 192.168.1.800
In file server_config.c in function convert_address on line 145
```

Example 31

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.800 -s 60001 -P 192.168.1.80
ERROR Address family not supported for IP address: 192.168.1.800
In file server_config.c in function convert_address on line 145
```

Example 32

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 60001 -P 192.168.1.800
ERROR Address family not supported for IP address: 192.168.1.800
In file server_config.c in function convert_address on line 145
```

Example 33

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -c 600000 -S 192.168.1.80 -s 60001 -P 192.168.1.80
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
for port: 600000
ERROR in_port_t value out of range.
In file command_line.c in function parse_in_port_t on line 422
```

Example 34

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -c 60000 -S 192.168.1.80 -s 600001 -P 192.168.1.80
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
for port: 600001
ERROR in_port_t value out of range.
In file command_line.c in function parse_in_port_t on line 422
```

Example 35

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
└─ ./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 50 -L 50 -d 50 -l 50 -E 50
Binding to: 192.168.1.80:8000
Bound to socket: 192.168.1.80:8000
Binding to: 192.168.1.80:8050
Bound to socket: 192.168.1.80:8050
Binding to: 192.168.1.80:61060
Bound to socket: 192.168.1.80:61060

Dynamic Proxy Lossiness Value:
1. Client Losiness
2. Server Losiness
3. Data Corruption
4. Exit
Enter your Answer:
```

Example 36

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
└─ ./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 500 -L 50 -d 50 -l 50 -E 50
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
ERROR 500 value out of range in the -D flag

In file command_line.c in function convert_to_int on line 459
```

Example 37

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
└─ ./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 50 -L 500 -d 50 -l 50 -E 50
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
ERROR 500 value out of range in the -L flag

In file command_line.c in function convert_to_int on line 459
```

Example 38

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 50 -L 50 -d 500 -l 50 -E 50
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
ERROR 500 value out of range in the -d flag

In file command_line.c in function convert_to_int on line 459
```

Example 39

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 50 -L 50 -d 50 -l 500 -E 50
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
ERROR 500 value out of range in the -l flag

In file command_line.c in function convert_to_int on line 459
```

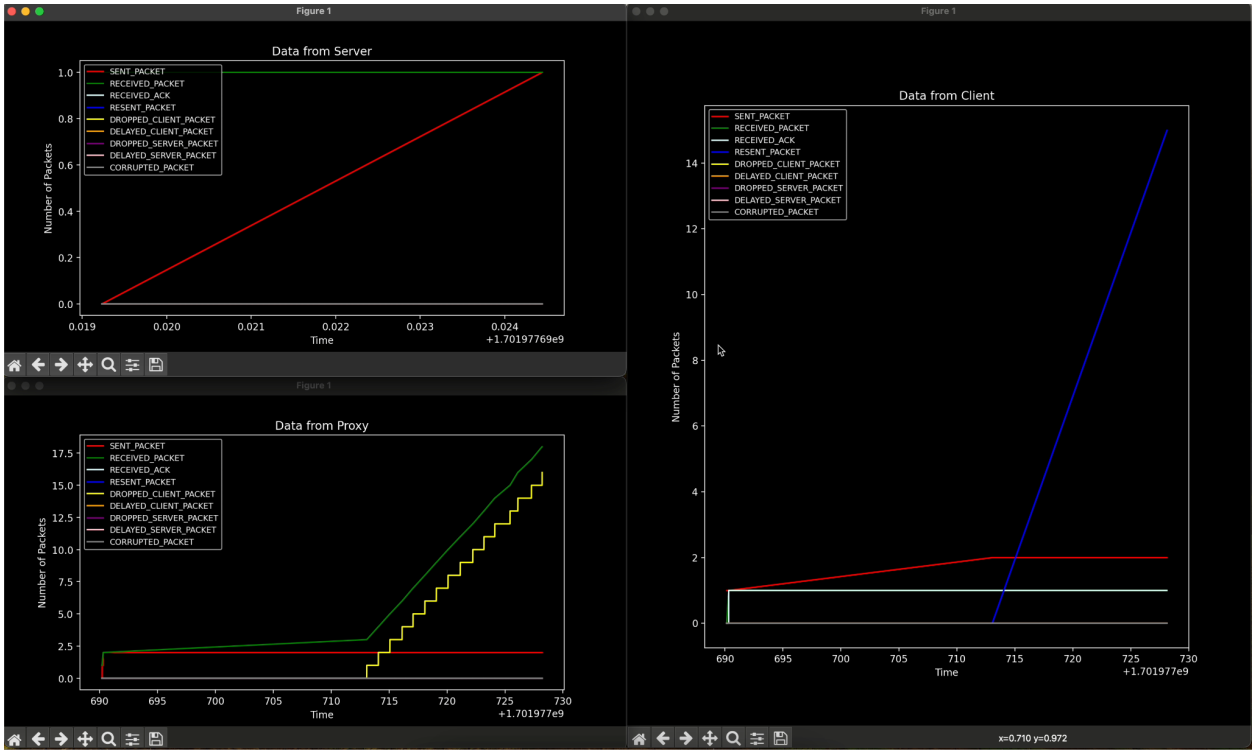
Example 40

```
~/CLionProjects/reliable-udp/source/proxy/cmake-build-debug main !3
./proxy -C 192.168.1.80 -S 192.168.1.80 -P 192.168.1.80 -s 60001 -c 60000 -D 50 -L 50 -d 50 -l 50 -E 500
Usage: ./proxy [-C] <value> [-c] <value> [-S] <value> [-s] <value> [-P] <value>
[-w] <value> [-D] <value>[-d] <value> [-L] <value> [-l] <value> [-E] <value> [-h]
Options:
  -h                    Display this help message
  -C <value>            Option 'C' (required) with value, Sets the IP client_addr
  -c <value>            Option 'c' (required) with value, Sets the client port
  -S <value>            Option 'S' (required) with value, Sets the IP server_addr
  -s <value>            Option 's' (required) with value, Sets the server port
  -P <value>            Option 'P' (required) with value, Sets the IP proxy_addr
  -D <value>            Option 'D' (required) with value, Sets the client drop rate
  -d <value>            Option 'd' (required) with value, Sets the server drop rate
  -L <value>            Option 'L' (required) with value, Sets the client delay rate
  -l <value>            Option 'l' (required) with value, Sets the server delay rate
  -E <value>            Option 'E' (required) with value, Sets the corruption rate
ERROR 500 value out of range in the -E flag

In file command_line.c in function convert_to_int on line 459
```

Example 41

```
Enter Client's Drop Rate: 100
Client Drop and Delay rate:
1. Drop Rate
2. Delay Rate
3. Back
Enter your Answer: Client packet with seq number: 16 ack number: 101 flags: 6 r
eceived
delay: 0 drop 100 corruption: 0
Client packet with seq number: 16 ack number: 101 flags: 6 dropped
Client packet with seq number: 16 ack number: 101 flags: 6 received
delay: 0 drop 100 corruption: 0
Client packet with seq number: 16 ack number: 101 flags: 6 dropped
Client packet with seq number: 16 ack number: 101 flags: 6 received
delay: 0 drop 100 corruption: 0
Client packet with seq number: 16 ack number: 101 flags: 6 dropped
Client packet with seq number: 16 ack number: 101 flags: 6 received
delay: 0 drop 100 corruption: 0
Client packet with seq number: 16 ack number: 101 flags: 6 dropped
Client packet with seq number: 16 ack number: 101 flags: 6 received
delay: 0 drop 100 corruption: 0
Client packet with seq number: 16 ack number: 101 flags: 6 dropped
```

```
Bound to socket: 172.20.10.4:60000
binding to: 172.20.10.4:61001
Bound to socket: 172.20.10.4:61001
Server packet with ack number: 1 flag: 3 received
removing packet with expected ack number: 1 at index: 0

Enter string below [ctrl + d] to quit
hello mesage 1
Client packet with SEQ number: 1 sent

Enter string below [ctrl + d] to quit
Server packet with ack number: 16 flags: 2 received
received ack
removing packet with expected ack number: 16 at index: 2
hello this should be dropped and keep resending
Client packet with SEQ number: 16 sent

Enter string below [ctrl + d] to quit
Resent packet with seq number: 16
Resent packet with seq number: 16
Resent packet with seq number: 16
Resent packet with seq number: 16
```



Example 42

```
Enter Server's Drop Rate: 100
Server Drop and Delay rate:
1. Drop Rate
2. Delay Rate
3. Back
Enter your Answer: Client packet with seq number: 64 ack number: 101 flags: 6 r
eceived
delay: 0 drop 0 corruption: 0
Client packet with seq number: 64 ack number: 101 flags: 6 sent
Server packet with seq number: 101 ack number: 93 flags: 2 received
delay: 0 drop 100 corruption: 0
Server packet with seq number: 101 ack number: 93 flags: 2 dropped
Client packet with seq number: 64 ack number: 101 flags: 6 received
delay: 0 drop 0 corruption: 0
Client packet with seq number: 64 ack number: 101 flags: 6 sent
Server packet with seq number: 101 ack number: 93 flags: 2 received
delay: 0 drop 100 corruption: 0
Server packet with seq number: 101 ack number: 93 flags: 2 dropped
```

```
expected: 64
RECEIVED:
seq number: 64 data: this is 100 server drop rate

expected: 64 got: 64
SENDING:
ack number: 93
expected: 93
RECEIVED:
seq number: 64 data: this is 100 server drop rate

expected: 93 got: 64
SENDING:
ack number: 93
```

```
this is 100 server drop rate
Client packet with SEQ number: 64 sent

Enter string below [ctrl + d] to quit
Resent packet with seq number: 64
Resent packet with seq number: 64
Resent packet with seq number: 64
Resent packet with seq number: 64
Resent packet with seq number: 64
```

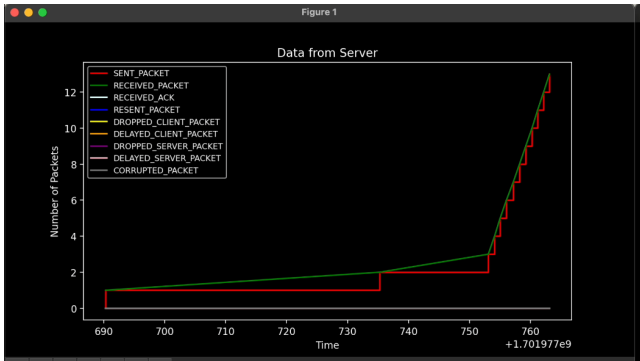


Figure 1
Data from Server
SENT_PACKET
RECEIVED_PACKET
RECEIVED_ACK
RESENT_PACKET
DROPPED_CLIENT_PACKET
DELAYED_CLIENT_PACKET
DROPPED_SERVER_PACKET
DELAYED_SERVER_PACKET
CORRUPTED_PACKET
Number of Packets
Time
+1.701977e9

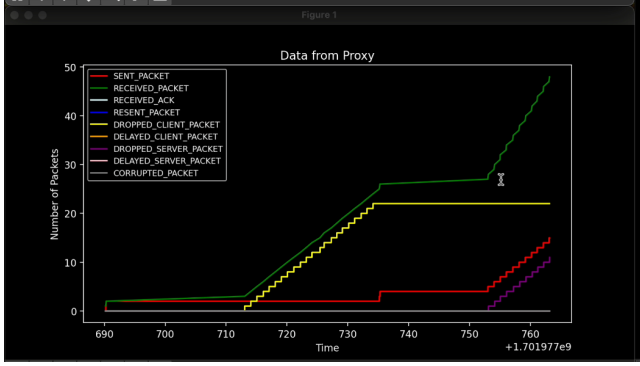


Figure 1
Data from Proxy
SENT_PACKET
RECEIVED_PACKET
RECEIVED_ACK
RESENT_PACKET
DROPPED_CLIENT_PACKET
DELAYED_CLIENT_PACKET
DROPPED_SERVER_PACKET
DELAYED_SERVER_PACKET
CORRUPTED_PACKET
Number of Packets
Time
+1.701977e9

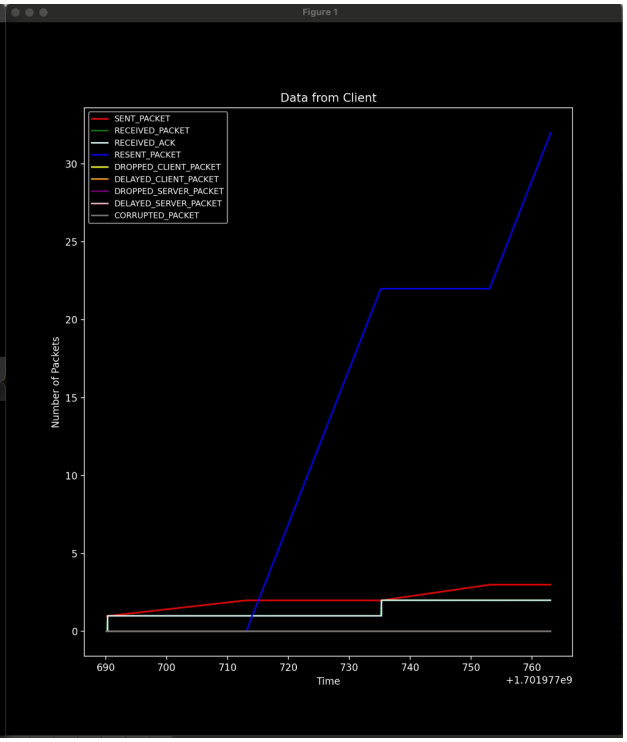


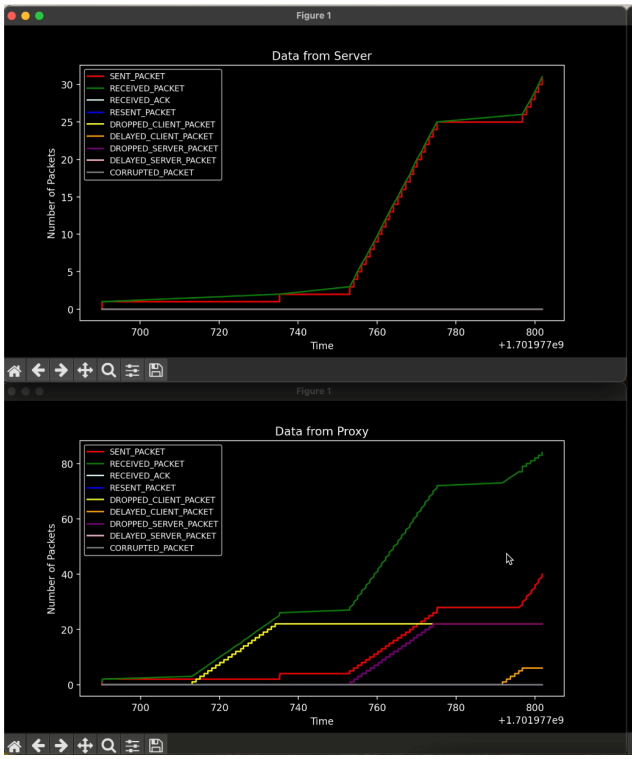
Figure 1
Data from Client
SENT_PACKET
RECEIVED_PACKET
RECEIVED_ACK
RESENT_PACKET
DROPPED_CLIENT_PACKET
DELAYED_CLIENT_PACKET
DROPPED_SERVER_PACKET
DELAYED_SERVER_PACKET
CORRUPTED_PACKET
Number of Packets
Time
+1.701977e9

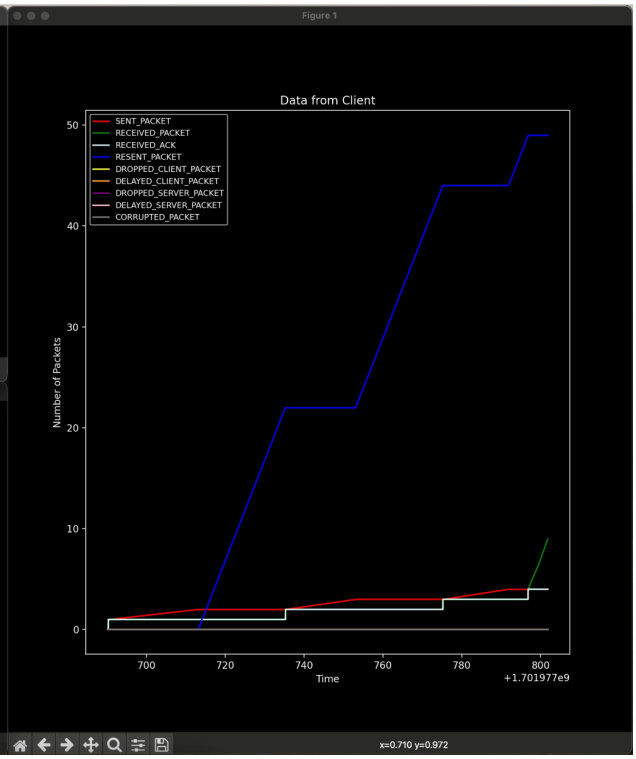
Example 43

```
Enter Client's Delay Rate: 100
Client Drop and Delay rate:
1. Drop Rate
2. Delay Rate
3. Back
Enter your Answer: Client packet with seq number: 93 ack number: 101 flags: 6 r
eceived
delay: 100 drop 0 corruption: 0
Client packet with seq number: 93 ack number: 101 flags: 6 delayed
Client packet with seq number: 93 ack number: 101 flags: 6 delayed for 5 second
s
Client packet with seq number: 93 ack number: 101 flags: 6 received
delay: 100 drop 0 corruption: 0
Client packet with seq number: 93 ack number: 101 flags: 6 delayed
Client packet with seq number: 93 ack number: 101 flags: 6 delayed for 5 second
s
Client packet with seq number: 93 ack number: 101 flags: 6 received
delay: 100 drop 0 corruption: 0
Client packet with seq number: 93 ack number: 101 flags: 6 delayed
Client packet with seq number: 93 ack number: 101 flags: 6 delayed for 5 second
s
```

```
this is 100 delay rate for client
Client packet with SEQ number: 93 sent

Enter string below [ctrl + d] to quit
Resent packet with seq number: 93
Resent packet with seq number: 93
Resent packet with seq number: 93
Resent packet with seq number: 93
Resent packet with seq number: 93
Server packet with ack number: 127 flags: 2 received
received ack
removing packet with expected ack number: 127 at index: 0
Server packet with ack number: 127 flags: 2 received
received ack
Server packet with ack number: 127 flags: 2 received
received ack
Server packet with ack number: 127 flags: 2 received
received ack
Server packet with ack number: 127 flags: 2 received
received ack
Server packet with ack number: 127 flags: 2 received
received ack
```

```
expected: 93 got: 93
SENDING:
ack number: 127
expected: 127
RECEIVED:
seq number: 93 data: this is 100 delay rate for client

expected: 127 got: 93
SENDING:
ack number: 127
RECEIVED:
seq number: 93 data: this is 100 delay rate for client

expected: 127 got: 93
SENDING:
ack number: 127
```





Example 44

```
Enter Server's Delay Rate: 100
Server Drop and Delay rate:
1. Drop Rate
2. Delay Rate
3. Back
Enter your Answer: Client packet with seq number: 127 ack number: 101 flags: 6
received
delay: 0 drop 0 corruption: 0
Client packet with seq number: 127 ack number: 101 flags: 6 sent
Server packet with seq number: 101 ack number: 157 flags: 2 received
delay: 100 drop 0 corruption: 0
Server packet with seq number: 101 ack number: 157 flags: 2 delayed for 5 secon
ds
Client packet with seq number: 127 ack number: 101 flags: 6 received
delay: 0 drop 0 corruption: 0
Client packet with seq number: 127 ack number: 101 flags: 6 sent
Server packet with seq number: 101 ack number: 157 flags: 2 received
delay: 100 drop 0 corruption: 0
Server packet with seq number: 101 ack number: 157 flags: 2 delayed for 5 secon
ds
```

```
Server packet with seq number: 101 ack number: 157 flags: 2 delayed for 5 secon
ds
Client packet with seq number: 127 ack number: 101 flags: 6 received
delay: 0 drop 0 corruption: 0
Client packet with seq number: 127 ack number: 101 flags: 6 sent
Server packet with seq number: 101 ack number: 157 flags: 2 received
delay: 100 drop 0 corruption: 0
Server packet with seq number: 101 ack number: 157 flags: 2 delayed for 5 secon
ds
Server packet with seq number: 101 ack number: 157 flags: 2 sent
Server packet with seq number: 101 ack number: 157 flags: 2 sent
Server packet with seq number: 101 ack number: 157 flags: 2 sent
Server packet with seq number: 101 ack number: 157 flags: 2 sent
Server packet with seq number: 101 ack number: 157 flags: 2 sent
Server packet with seq number: 101 ack number: 157 flags: 2 sent
```

```
this is 100 server delay rate
Client packet with SEQ number: 127 sent

Enter string below [ctrl + d] to quit
Resent packet with seq number: 127
Resent packet with seq number: 127
Resent packet with seq number: 127
Resent packet with seq number: 127
Resent packet with seq number: 127
Server packet with ack number: 157 flags: 2 received
received ack
removing packet with expected ack number: 157 at index: 1
Server packet with ack number: 157 flags: 2 received
received ack
Server packet with ack number: 157 flags: 2 received
received ack
Server packet with ack number: 157 flags: 2 received
received ack
Server packet with ack number: 157 flags: 2 received
received ack
Server packet with ack number: 157 flags: 2 received
received ack
```

```
RECEIVED:
seq number: 127 data: this is 100 server delay rate

expected: 127 got: 127
SENDING:
ack number: 157
expected: 157
RECEIVED:
seq number: 127 data: this is 100 server delay rate

expected: 157 got: 127
SENDING:
ack number: 157
```

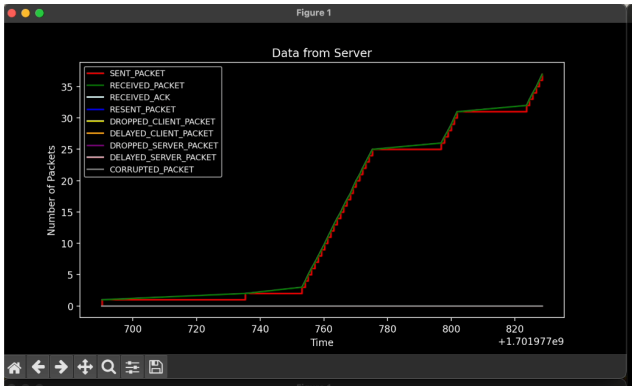


Figure 1
Data from Server
SENT_PACKET
RECEIVED_PACKET
RECEIVED_ACK
RESENT_PACKET
DROPPED_CLIENT_PACKET
DELAYED_CLIENT_PACKET
DROPPED_SERVER_PACKET
DELAYED_SERVER_PACKET
CORRUPTED_PACKET
Number of Packets
Time
+1.701977e9

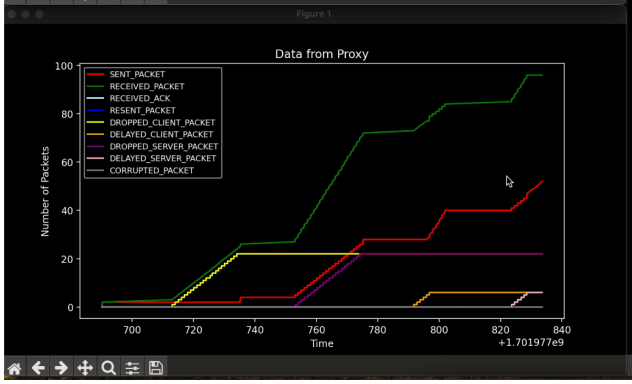


Figure 1
Data from Proxy
SENT_PACKET
RECEIVED_PACKET
RECEIVED_ACK
RESENT_PACKET
DROPPED_CLIENT_PACKET
DELAYED_CLIENT_PACKET
DROPPED_SERVER_PACKET
DELAYED_SERVER_PACKET
CORRUPTED_PACKET
Number of Packets
Time
+1.701977e9

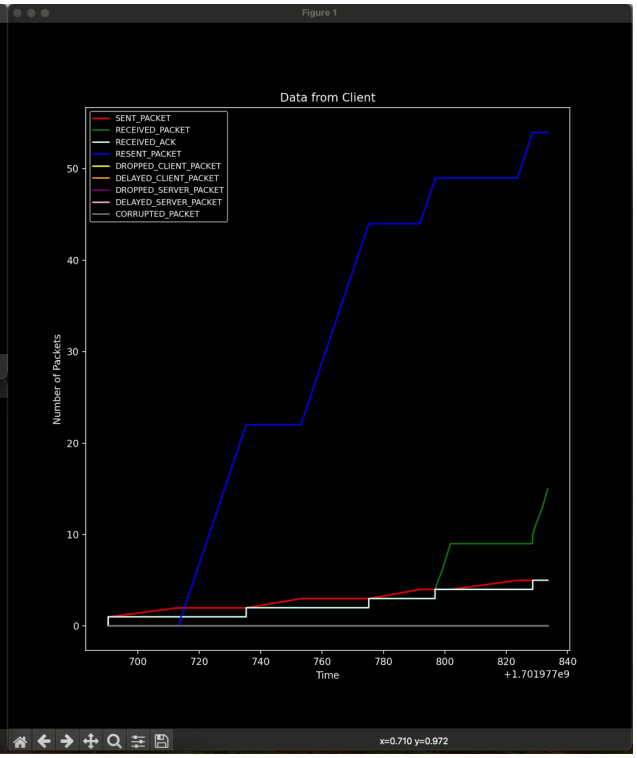


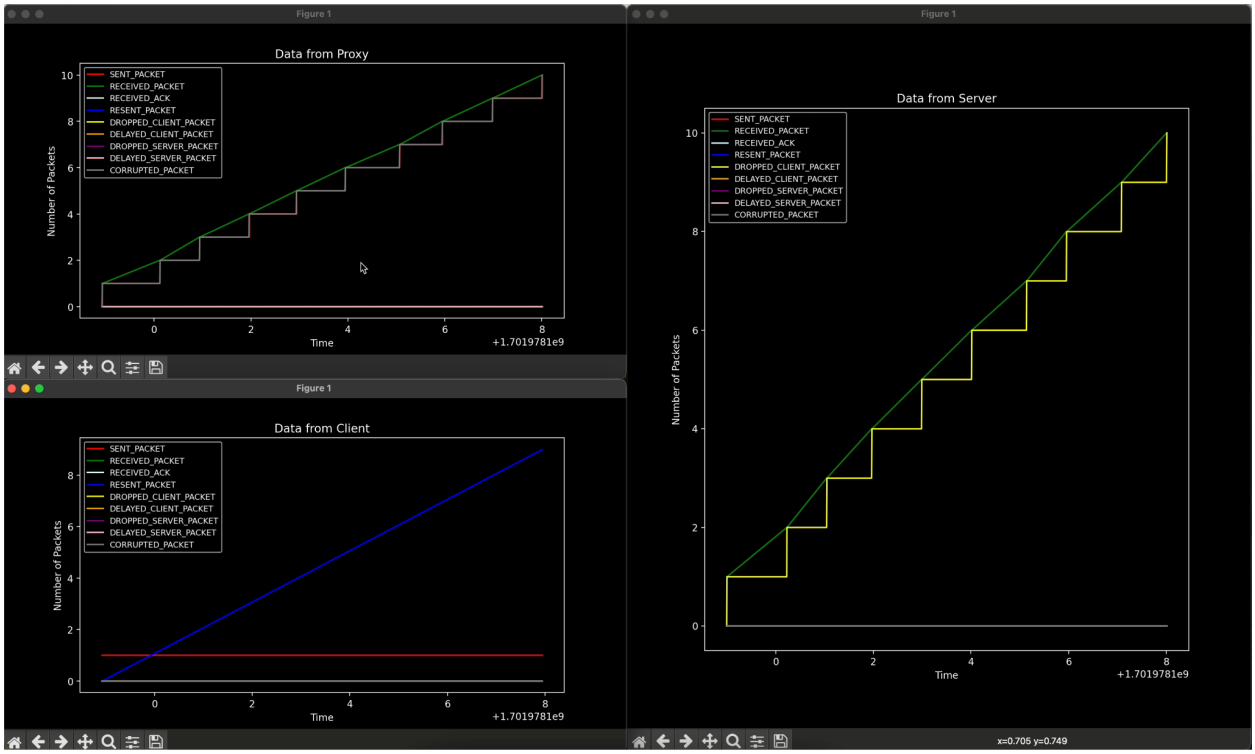
Figure 1
Data from Client
SENT_PACKET
RECEIVED_PACKET
RECEIVED_ACK
RESENT_PACKET
DROPPED_CLIENT_PACKET
DELAYED_CLIENT_PACKET
DROPPED_SERVER_PACKET
DELAYED_SERVER_PACKET
CORRUPTED_PACKET
Number of Packets
Time
+1.701977e9
x=0.710 y=0.972

Example 45

```
Enter Data Corruption's Rate: 100

Dynamic Proxy Lossiness Value:
1. Client Losiness
2. Server Losiness
3. Data Corruption
4. Exit
Enter your Answer: Client packet with seq number: 1 ack number: 101 flags: 6 re
ceived
delay: 0 drop 0 corruption: 100
Client packet with seq number: 1 ack number: 101 flags: 6 corrupted
Client packet with seq number: 1 ack number: 101 flags: 6 sent
Client packet with seq number: 1 ack number: 101 flags: 6 received
delay: 0 drop 0 corruption: 100
Client packet with seq number: 1 ack number: 101 flags: 6 corrupted
Client packet with seq number: 1 ack number: 101 flags: 6 sent
Client packet with seq number: 1 ack number: 101 flags: 6 received
delay: 0 drop 0 corruption: 100
Client packet with seq number: 1 ack number: 101 flags: 6 corrupted
Client packet with seq number: 1 ack number: 101 flags: 6 sent
```

```
RECEIVED:
seq number: 1 data: Thhw(hs05�rc {�]�4ioN ratu w$ S~oh�ano�`xeaui&e�y@ a#k$b`#
0
RECEIVED:
seq number: 1 data: 4ii3 @Y 140 c@ssup5cnnra<d-E@!snoudd
RECEIVED:
seq number: 1 data: d@kr"isr1"1@@?vr}pti ~ pcue$sesh@sndh.ot vD+emWE(un`@bk bcc
n`

RECEIVED:
seq number: 1 data: thi@@r040
RECEIVED:
seq number: 1 data: Tjhs@yc 14 0#jb@}`4io@$RAqO(w%`qhN5ld@not r@kc we@al qcrA@j
"
```

```
this is 100 corruption rate we should not receive an ack back
Client packet with SEQ number: 1 sent

Enter string below [ctrl + d] to quit
Resent packet with seq number: 1
Resent packet with seq number: 1
Resent packet with seq number: 1
Resent packet with seq number: 1
```



Example 46

```
Client packet with seq number: 1 ack number: 101 flags: 6 received
delay: 0 drop 0 corruption: 0
Client packet with seq number: 1 ack number: 101 flags: 6 sent
Server packet with seq number: 101 ack number: 16 flags: 2 received
delay: 0 drop 0 corruption: 0
Server packet with seq number: 101 ack number: 16 flags: 2 sent
```

```
hello mesage 1
Client packet with SEQ number: 1 sent

Enter string below [ctrl + d] to quit
Server packet with ack number: 16 flags: 2 received
received ack
removing packet with expected ack number: 16 at index: 2
```

```
RECEIVED:
seq number: 1 data: hello mesage 1

expected: 1 got: 1
SENDING:
ack number: 16
expected: 16
```

Example 47

```
~/C/reliable-udp/source/client main !3 ✔ 11:46:09 am
cat client_received_data.csv
100,1,3,0,33967,
101,64,2,0,28024,
101,192,2,0,28024,
101,192,2,0,28024,
101,203,2,0,28024,
101,218,2,0,28024,
101,218,2,0,28024,
101,225,2,0,28024,
101,225,2,0,28024,
101,232,2,0,28024,
101,239,2,0,28024,
101,246,2,0,28024,
101,260,2,0,28024,
101,265,2,0,28024,
101,270,2,0,28024,
101,274,2,0,28024,
101,285,2,0,28024,
101,285,2,0,28024,
101,290,2,0,28024,
101,298,2,0,28024,
101,298,2,0,28024,
101,298,2,0,28024,
101,298,2,0,28024,
```

```
101,298,2,0,28024,
285,101,6,5,2480,rggr

101,290,2,0,28024,
290,101,6,5,11970,erwrew3

285,101,6,5,2480,rggr

101,290,2,0,28024,
101,290,2,0,28024,
290,101,6,5,11970,erwrew3

101,290,2,0,28024,
290,101,6,5,11970,erwrew3

101,298,2,0,28024,
101,298,2,0,28024,
101,298,2,0,28024,
101,298,2,0,28024,
```

```
285,101,6,5,2480,rggr

285,101,6,5,2480,rggr

285,101,6,5,2480,rggr

285,101,6,5,2480,rggr

290,101,6,5,11970,erwrew3

290,101,6,5,11970,erwrew3

290,101,6,5,11970,erwrew3

290,101,6,5,11970,erwrew3


 ~/C/reliable-udp/s/server  main ⇡13 *1 !2 ?1
cat server_sent_data.csv
```

Example 48

```
Server packet with ack number: 285 flags: 2 received
received ack
removing packet with expected ack number: 279 at index: 2
removing packet with expected ack number: 285 at index: 3
```

Example 49

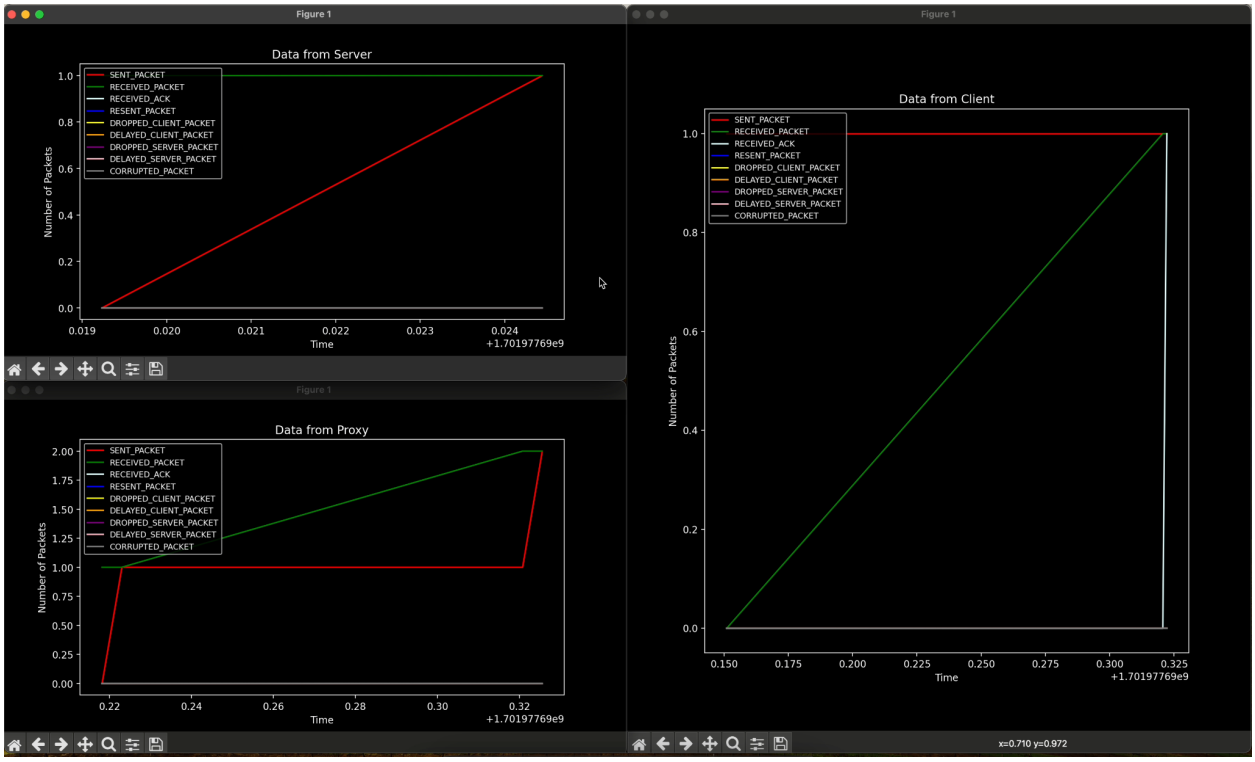


Figure 1
Data from Server
SENT_PACKET
RECEIVED_PACKET
RECEIVED_ACK
RESENT_PACKET
DROPPED_CLIENT_PACKET
DELAYED_CLIENT_PACKET
DROPPED_SERVER_PACKET
DELAYED_SERVER_PACKET
CORRUPTED_PACKET
Number of Packets
Time
+1.70197769e9
Figure 1
Data from Proxy
Number of Packets
Time
+1.70197769e9
Figure 1
Data from Client
Number of Packets
Time
+1.70197769e9
x=0.710 y=0.972