

COMP 7005

Project 1

Testing

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Tests	4
Baseline	4
Test 1 — No loss, no delay	6
Test 2 — BOTH 50% drop, no delay	8
Test 2 — CLIENT 50% drop, no delay	10
Test 2 — SERVER 50% drop, no delay	12
Test 3 — BOTH 100% drop, no delay	15
Test 3 — CLIENT 100% drop, no delay	17
Test 3 — SERVER 100% drop, no delay	19
Test 4 — BOTH No drop, 50% delay (100–500 ms)	23
Test 4 — CLIENT No drop, 50% delay (100–500 ms)	26
Test 4 — SERVER No drop, 50% delay (100–500 ms)	28
Test 5 — BOTH 100% delay, delay \geq client timeout	30
Test 5 — CLIENT 100% delay, delay \geq client timeout	33
Test 5 — SERVER 100% delay, delay \geq client timeout	37
Test 6 — BOTH 50% drop, 50% delay (delay \geq timeout)	40
Test 6 — CLIENT 50% drop, 50% delay (delay \geq timeout)	42
Test 6 — SERVER 50% drop, 50% delay (delay \geq timeout)	46

Test	Expected	Actual	Screenshot
Baseline	pass	pass	Baseline
Test 1 — No loss, no delay	pass	pass	Test 1
Test 2 — BOTH 50% drop, no delay	pass	pass	Test 2 — BOTH
Test 2 — CLIENT 50% drop, no delay	pass	pass	Test 2 — CLIENT
Test 2 — SERVER 50% drop, no delay	pass	pass	Test 2 — SERVER
Test 3 — BOTH 100% drop, no delay	pass	pass	Test 3 — BOTH
Test 3 — CLIENT 100% drop, no delay	pass	pass	Test 3 — CLIENT
Test 3 — SERVER 100% drop, no delay	pass	pass	Test 3 — SERVER
Test 4 — BOTH No drop, 50% delay (100–500 ms)	pass	pass	Test 4 — BOTH
Test 4 — CLIENT No drop, 50% delay (100–500 ms)	pass	pass	Test 4 — CLIENT
Test 4 — SERVER No drop, 50% delay (100–500 ms)	pass	pass	Test 4 — SERVER
Test 5 — BOTH 100% delay, delay \geq client timeout	pass	pass	Test 5 — BOTH
Test 5 — CLIENT 100% delay, delay \geq client timeout	pass	pass	Test 5 — CLIENT
Test 5 — SERVER 100% delay, delay \geq client timeout	pass	pass	Test 5 — SERVER
Test 6 — BOTH 50% drop, 50% delay (delay \geq timeout)	pass	pass	Test 6 — BOTH
Test 6 — CLIENT 50% drop, 50% delay (delay \geq timeout)	pass	pass	Test 6 — CLIENT
Test 6 — SERVER 50% drop, 50% delay (delay \geq timeout)	pass	pass	Test 6 — SERVER

Tests

EXTRA:

In the same folder the 3 programs are run, there is an extra program called clear_logs.py.

Run it with python3 clear_logs.py to clear all 3 log files of their contents.

I made this as a tool to help quickly move onto the next test without manually clearing the contents of each file.

Baseline

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
0	0	N/A

Client	Server	Proxy
<code>python3 client.py --target-ip 192.168.0.19 --target-port 9001 --timeout 1 --max-retries 5</code>	<code>python3 server.py --listen-ip 192.168.0.19 --listen-port 9001</code>	N/A

Client:

```
~/De/COMP7005/p/COMP7005-project/s/reliable_udp > P main !1 python3 client.py --target-ip 192.168.0.19 --target-port 9001 --timeout 1 --max-retries 5
[2025-12-01 19:14:08] Client sending to 192.168.0.19:9001
Hello!
[2025-12-01 19:14:11] SENT | seq=1 retries=0 payload=b'Hello!'
[2025-12-01 19:14:11] RECEIVED ACK for seq=1
[2025-12-01 19:14:11] Message seq=1 delivered
What a cool program!
[2025-12-01 19:14:23] SENT | seq=2 retries=0 payload=b'What a cool program!'
[2025-12-01 19:14:23] RECEIVED ACK for seq=2
[2025-12-01 19:14:23] Message seq=2 delivered
^C
KeyboardInterrupt received. Exiting...

Closing socket...
[2025-12-01 19:14:27] Client stopped cleanly.
```

✓ 19s ✘

```
< > client.log x
... source > reliable_udp > logs > client.log
1 [2025-12-01 19:14:08] Client sending to 192.168.0.19:9001
2 [2025-12-01 19:14:11] SENT | seq=1 retries=0 payload=b'Hello!'
3 [2025-12-01 19:14:11] RECEIVED ACK for seq=1
4 [2025-12-01 19:14:11] Message seq=1 delivered
5 [2025-12-01 19:14:23] SENT | seq=2 retries=0 payload=b'What a cool program!'
6 [2025-12-01 19:14:23] RECEIVED ACK for seq=2
7 [2025-12-01 19:14:23] Message seq=2 delivered
8 [2025-12-01 19:14:27] Client stopped cleanly.
9
```

Server:

```
reliable_udp : zsh — Konsole
New Tab Split View
~/De/b/COMP7005-project/s/reliable_udp > P main !3 python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 19:14:06] Server listening on 192.168.0.19:9001
[2025-12-01 19:14:11] RECEIVED from ('192.168.0.164', 43736) | seq=1 payload=b'Hello!'
Hello!
[2025-12-01 19:14:11] SENT ACK to ('192.168.0.164', 43736) | ack=1
[2025-12-01 19:14:23] RECEIVED from ('192.168.0.164', 43736) | seq=2 payload=b'What a cool program!'
What a cool program!
[2025-12-01 19:14:23] SENT ACK to ('192.168.0.164', 43736) | ack=2
^C
Closing socket...
[2025-12-01 19:14:30] Server stopped cleanly.
```

✓ 24s ✘

```

< > server.log x
... source > reliable_udp > logs > server.log
1 [2025-12-01 19:14:06] Server listening on 192.168.0.19:9001
2 [2025-12-01 19:14:11] RECEIVED from ('192.168.0.164', 43736) | seq=1 payload=b'Hello!'
3 [2025-12-01 19:14:11] SENT ACK to ('192.168.0.164', 43736) | ack=1
4 [2025-12-01 19:14:23] RECEIVED from ('192.168.0.164', 43736) | seq=2 payload=b'What a cool program!'
5 [2025-12-01 19:14:23] SENT ACK to ('192.168.0.164', 43736) | ack=2
6 [2025-12-01 19:14:30] Server stopped cleanly.
7

```

Proxy:

Test 1 — No loss, no delay

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
0	0	N/A

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 0 --server-drop 0 \ --client-delay 0 --server-delay 0

Client:

```

~/De/COMP7005/p/COMP7005-project/s/reliable_udp > main !3 python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5

[2025-12-01 19:20:14] Client sending to 192.168.0.18:4000
Hello From client!
[2025-12-01 19:20:27] SENT | seq=1 retries=0 payload=b'Hello From client!'
[2025-12-01 19:20:27] RECEIVED ACK for seq=1
[2025-12-01 19:20:27] Message seq=1 delivered
This is neat!
[2025-12-01 19:20:44] SENT | seq=2 retries=0 payload=b'This is neat!'
[2025-12-01 19:20:44] RECEIVED ACK for seq=2
[2025-12-01 19:20:44] Message seq=2 delivered
^C
KeyboardInterrupt received. Exiting...

Closing socket...
[2025-12-01 19:20:59] Client stopped cleanly.
~/De/COMP7005/p/COMP7005-project/s/reliable_udp > main !4

```

```
< > client.log < ... source > reliable_udp > logs > client.log
1 [2025-12-01 19:20:14] Client sending to 192.168.0.18:4000
2 [2025-12-01 19:20:27] SENT | seq=1 retries=0 payload=b'Hello From client!'
3 [2025-12-01 19:20:27] RECEIVED ACK for seq=1
4 [2025-12-01 19:20:27] Message seq=1 delivered
5 [2025-12-01 19:20:44] SENT | seq=2 retries=0 payload=b'This is neat!'
6 [2025-12-01 19:20:44] RECEIVED ACK for seq=2
7 [2025-12-01 19:20:44] Message seq=2 delivered
8 [2025-12-01 19:20:59] Client stopped cleanly.
```

Server:

```
[ 1 ↵ ~ /De/b /COMP7005-project/s/reliable_udp ↵ P main !5 ↵ python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 19:20:11] Server listening on 192.168.0.19:9001
[2025-12-01 19:20:27] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello From client!'
Hello From client!
[2025-12-01 19:20:27] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 19:20:44] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'This is neat!'
This is neat!
[2025-12-01 19:20:44] SENT ACK to ('192.168.0.18', 4000) | ack=2
^C
Closing socket...
[2025-12-01 19:21:02] Server stopped cleanly.
[ 1 ↵ ~ /De/b /COMP7005-project/s/reliable_udp ↵ P main !5 ?1 ↵ 51s ✘
```

```
< > server.log x
... source > reliable_udp > logs > server.log
1 [2025-12-01 19:20:11] Server listening on 192.168.0.19:9001
2 [2025-12-01 19:20:27] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello From client!'
3 [2025-12-01 19:20:27] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 19:20:44] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'This is neat!'
5 [2025-12-01 19:20:44] SENT ACK to ('192.168.0.18', 4000) | ack=2
6 [2025-12-01 19:21:02] Server stopped cleanly.
7
```

Proxy:

Test 2 — BOTH 50% drop, no delay

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
50	0	N/A

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 50 --server-drop 50 \ --client-delay 0 --server-delay 0

Client:

```
▶ ~ /De/COMP7005/p/COMP7005-project/s/reliable_udp ▶ P main !4 ?1 ▶ python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 19:59:56] Client sending to 192.168.0.18:4000
Hello with 50% delay
[2025-12-01 20:00:21] SENT | seq=1 retries=0 payload=b'Hello with 50% delay'
[2025-12-01 20:00:21] RECEIVED ACK for seq=1
[2025-12-01 20:00:21] Message seq=1 delivered
I meant drop hehe
[2025-12-01 20:00:27] SENT | seq=2 retries=0 payload=b'I meant drop hehe'
[2025-12-01 20:00:28] Error receiving ACK: timed out
[2025-12-01 20:00:28] SENT | seq=2 retries=1 payload=b'I meant drop hehe'
[2025-12-01 20:00:29] Error receiving ACK: timed out
[2025-12-01 20:00:29] SENT | seq=2 retries=2 payload=b'I meant drop hehe'
[2025-12-01 20:00:30] Error receiving ACK: timed out
[2025-12-01 20:00:30] SENT | seq=2 retries=3 payload=b'I meant drop hehe'
[2025-12-01 20:00:30] RECEIVED ACK for seq=2
[2025-12-01 20:00:30] Message seq=2 delivered
^C
KeyboardInterrupt received. Exiting...
Closing socket...
[2025-12-01 20:00:35] Client stopped cleanly.
```

```

< > client.log x
... source > reliable_udp > logs > client.log
1 [2025-12-01 19:59:56] Client sending to 192.168.0.18:4000
2 [2025-12-01 20:00:21] SENT | seq=1 retries=0 payload=b'Hello with 50% delay'
3 [2025-12-01 20:00:21] RECEIVED ACK for seq=1
4 [2025-12-01 20:00:21] Message seq=1 delivered
5 [2025-12-01 20:00:27] SENT | seq=2 retries=0 payload=b'I meant drop hehe'
6 [2025-12-01 20:00:28] Error receiving ACK: timed out
7 [2025-12-01 20:00:28] SENT | seq=2 retries=1 payload=b'I meant drop hehe'
8 [2025-12-01 20:00:29] Error receiving ACK: timed out
9 [2025-12-01 20:00:29] SENT | seq=2 retries=2 payload=b'I meant drop hehe'
10 [2025-12-01 20:00:30] Error receiving ACK: timed out
11 [2025-12-01 20:00:30] SENT | seq=2 retries=3 payload=b'I meant drop hehe'
12 [2025-12-01 20:00:30] RECEIVED ACK for seq=2
13 [2025-12-01 20:00:30] Message seq=2 delivered
14 [2025-12-01 20:00:35] Client stopped cleanly.
15

```

Server:

```

~> ~/De/b/COMP7005-project/s/reliable_udp & main !5 python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 19:59:58] Server listening on 192.168.0.19:9001
[2025-12-01 20:00:21] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with 50% delay'
Hello with 50% delay
[2025-12-01 20:00:21] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:00:28] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'I meant drop hehe'
I meant drop hehe
[2025-12-01 20:00:28] SENT ACK to ('192.168.0.18', 4000) | ack=2
[2025-12-01 20:00:30] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'I meant drop hehe'
I meant drop hehe
[2025-12-01 20:00:30] SENT ACK to ('192.168.0.18', 4000) | ack=2
[2025-12-01 20:00:31] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'I meant drop hehe'
I meant drop hehe
[2025-12-01 20:00:31] SENT ACK to ('192.168.0.18', 4000) | ack=2
^C
Closing socket...
[2025-12-01 20:00:39] Server stopped cleanly.
~> ~/De/b/COMP7005-project/s/reliable_udp & main !5

```

```

< > server.log x
... source > reliable_udp > logs > server.log
1 [2025-12-01 19:59:58] Server listening on 192.168.0.19:9001
2 [2025-12-01 20:00:21] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with 50% delay'
3 [2025-12-01 20:00:21] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 20:00:28] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'I meant drop hehe'
5 [2025-12-01 20:00:28] SENT ACK to ('192.168.0.18', 4000) | ack=2
6 [2025-12-01 20:00:30] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'I meant drop hehe'
7 [2025-12-01 20:00:30] SENT ACK to ('192.168.0.18', 4000) | ack=2
8 [2025-12-01 20:00:31] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'I meant drop hehe'
9 [2025-12-01 20:00:31] SENT ACK to ('192.168.0.18', 4000) | ack=2
10 [2025-12-01 20:00:39] Server stopped cleanly.
11

```

Proxy:

```

developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ python3 proxy.py \
--listen-ip 192.168.0.18 --listen-port 4000 \
--target-ip 192.168.0.19 --target-port 9001 \
--client-drop 50 --server-drop 50 \
--client-delay 0 --server-delay 0
[2025-12-01 19:59:55] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:00:21] Detected FIRST client: ('192.168.0.164', 56998)
[2025-12-01 20:00:21] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with 50% delay'
[2025-12-01 20:00:21] DROP (client -> server)
[2025-12-01 20:00:21] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with 50% delay'
[2025-12-01 20:00:21] FORWARDED to server
[2025-12-01 20:00:21] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:00:21] FORWARDED to client
[2025-12-01 20:00:28] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00I meant drop hehe'
[2025-12-01 20:00:28] FORWARDED to server
[2025-12-01 20:00:28] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x02\x00\x01'
[2025-12-01 20:00:28] DROP (server -> client)
[2025-12-01 20:00:29] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00I meant drop hehe'
[2025-12-01 20:00:29] DROP (client -> server)
[2025-12-01 20:00:30] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00I meant drop hehe'
[2025-12-01 20:00:30] FORWARDED to server
[2025-12-01 20:00:30] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x02\x00\x01'
[2025-12-01 20:00:30] DROP (server -> client)
[2025-12-01 20:00:31] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00I meant drop hehe'
[2025-12-01 20:00:31] FORWARDED to server
[2025-12-01 20:00:31] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x02\x00\x01'
[2025-12-01 20:00:31] FORWARDED to client
[2025-12-01 20:00:31] Proxy shutting down...
[2025-12-01 20:00:37] Proxy closed cleanly.
developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ 
```

```

proxy.py
proxy.log
x

[2025-12-01 19:59:55] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:00:21] Detected FIRST client: ('192.168.0.164', 56998)
[2025-12-01 20:00:21] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with 50% delay'
[2025-12-01 20:00:21] DROP (client -> server)
[2025-12-01 20:00:21] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with 50% delay'
[2025-12-01 20:00:21] FORWARDED to server
[2025-12-01 20:00:21] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:00:21] FORWARDED to client
[2025-12-01 20:00:28] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00I meant drop hehe'
[2025-12-01 20:00:28] FORWARDED to server
[2025-12-01 20:00:28] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x02\x00\x01'
[2025-12-01 20:00:28] DROP (server -> client)
[2025-12-01 20:00:29] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00I meant drop hehe'
[2025-12-01 20:00:29] DROP (client -> server)
[2025-12-01 20:00:30] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00I meant drop hehe'
[2025-12-01 20:00:30] FORWARDED to server
[2025-12-01 20:00:30] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x02\x00\x01'
[2025-12-01 20:00:30] DROP (server -> client)
[2025-12-01 20:00:31] FROM CLIENT ('192.168.0.164', 56998) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00I meant drop hehe'
[2025-12-01 20:00:31] FORWARDED to server
[2025-12-01 20:00:31] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x02\x00\x01'
[2025-12-01 20:00:31] FORWARDED to client
[2025-12-01 20:00:31] Proxy closed cleanly.
[2025-12-01 20:00:37] Proxy closed cleanly.
```

Test 2 — CLIENT 50% drop, no delay

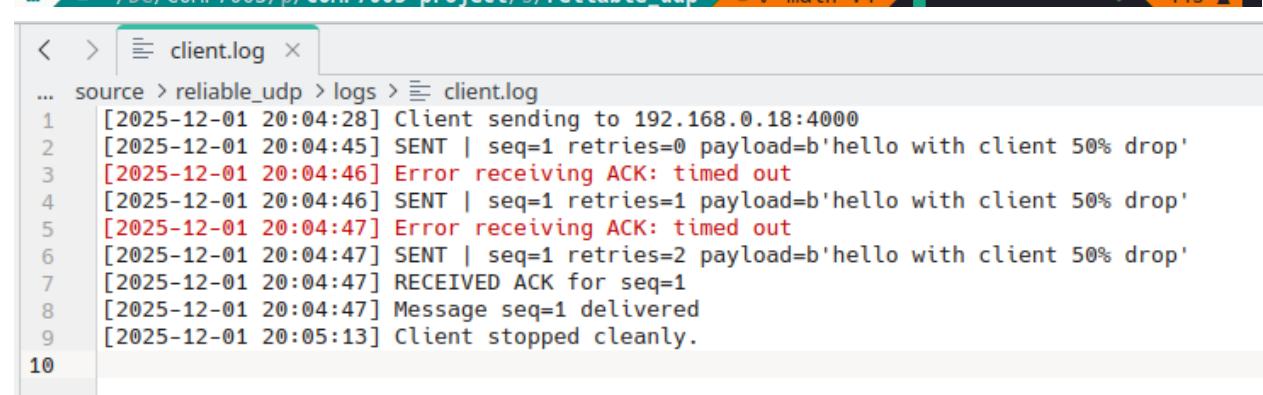
Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
50	0	N/A

Client	Server	Proxy
--------	--------	-------

python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 50 --server-drop 0 \ --client-delay 0 --server-delay 0
---	---	---

Client:

```
~> ~De/COMP7005/p/COMP7005-project/s/reliable_udp > P main !4 python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 20:04:28] Client sending to 192.168.0.18:4000
hello with client 50% drop
[2025-12-01 20:04:45] SENT | seq=1 retries=0 payload=b'hello with client 50% drop'
[2025-12-01 20:04:46] Error receiving ACK: timed out
[2025-12-01 20:04:46] SENT | seq=1 retries=1 payload=b'hello with client 50% drop'
[2025-12-01 20:04:47] Error receiving ACK: timed out
[2025-12-01 20:04:47] SENT | seq=1 retries=2 payload=b'hello with client 50% drop'
[2025-12-01 20:04:47] RECEIVED ACK for seq=1
[2025-12-01 20:04:47] Message seq=1 delivered
^C
KeyboardInterrupt received. Exiting...
Closing socket...
[2025-12-01 20:05:13] Client stopped cleanly.
```



```
< > client.log x
... source > reliable_udp > logs > client.log
1 [2025-12-01 20:04:28] Client sending to 192.168.0.18:4000
2 [2025-12-01 20:04:45] SENT | seq=1 retries=0 payload=b'hello with client 50% drop'
3 [2025-12-01 20:04:46] Error receiving ACK: timed out
4 [2025-12-01 20:04:46] SENT | seq=1 retries=1 payload=b'hello with client 50% drop'
5 [2025-12-01 20:04:47] Error receiving ACK: timed out
6 [2025-12-01 20:04:47] SENT | seq=1 retries=2 payload=b'hello with client 50% drop'
7 [2025-12-01 20:04:47] RECEIVED ACK for seq=1
8 [2025-12-01 20:04:47] Message seq=1 delivered
9 [2025-12-01 20:05:13] Client stopped cleanly.
10
```

Server:

```
~> ~De/b/COMP7005-project/s/reliable_udp > P main !5 python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 20:04:22] Server listening on 192.168.0.19:9001
[2025-12-01 20:04:47] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'hello with client 50% drop'
hello with client 50% drop
[2025-12-01 20:04:47] SENT ACK to ('192.168.0.18', 4000) | ack=1
^C
Closing socket...
[2025-12-01 20:05:19] Server stopped cleanly.
```

```
< > server.log x
...
... source > reliable_udp > logs > server.log
1 [2025-12-01 20:04:22] Server listening on 192.168.0.19:9001
2 [2025-12-01 20:04:47] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'hello with client 50% drop'
3 [2025-12-01 20:04:47] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 20:05:19] Server stopped cleanly.
5
```

Proxy:

Test 2 — SERVER 50% drop, no delay

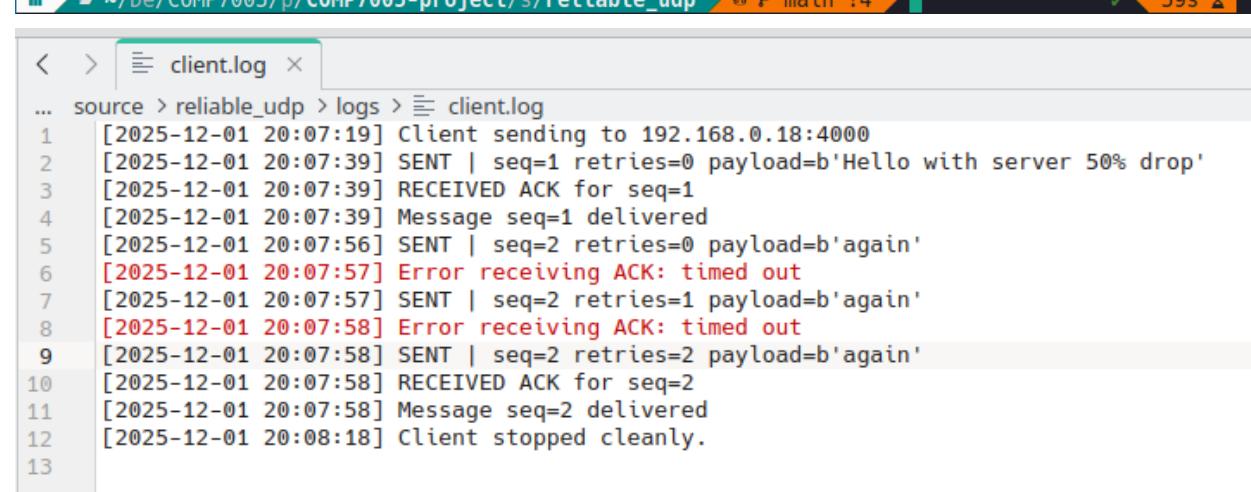
Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
50	0	N/A

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 0 --server-drop 50 \

```
--client-delay 0  
--server-delay 0
```

Client:

```
▶ ~ /De/COMP7005/p/COMP7005-project/s/reliable_udp ▶ P main !4 ▶ python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5  
[2025-12-01 20:07:19] Client sending to 192.168.0.18:4000  
Hello with server 50% drop  
[2025-12-01 20:07:39] SENT | seq=1 retries=0 payload=b'Hello with server 50% drop'  
[2025-12-01 20:07:39] RECEIVED ACK for seq=1  
[2025-12-01 20:07:39] Message seq=1 delivered  
again  
[2025-12-01 20:07:56] SENT | seq=2 retries=0 payload=b'again'  
[2025-12-01 20:07:57] Error receiving ACK: timed out  
[2025-12-01 20:07:57] SENT | seq=2 retries=1 payload=b'again'  
[2025-12-01 20:07:58] Error receiving ACK: timed out  
[2025-12-01 20:07:58] SENT | seq=2 retries=2 payload=b'again'  
[2025-12-01 20:07:58] RECEIVED ACK for seq=2  
[2025-12-01 20:07:58] Message seq=2 delivered  
^C  
KeyboardInterrupt received. Exiting...  
  
Closing socket...  
[2025-12-01 20:08:18] Client stopped cleanly.
```



```
< > client.log x  
... source > reliable_udp > logs > client.log  
1 [2025-12-01 20:07:19] Client sending to 192.168.0.18:4000  
2 [2025-12-01 20:07:39] SENT | seq=1 retries=0 payload=b'Hello with server 50% drop'  
3 [2025-12-01 20:07:39] RECEIVED ACK for seq=1  
4 [2025-12-01 20:07:39] Message seq=1 delivered  
5 [2025-12-01 20:07:56] SENT | seq=2 retries=0 payload=b'again'  
6 [2025-12-01 20:07:57] Error receiving ACK: timed out  
7 [2025-12-01 20:07:57] SENT | seq=2 retries=1 payload=b'again'  
8 [2025-12-01 20:07:58] Error receiving ACK: timed out  
9 [2025-12-01 20:07:58] SENT | seq=2 retries=2 payload=b'again'  
10 [2025-12-01 20:07:58] RECEIVED ACK for seq=2  
11 [2025-12-01 20:07:58] Message seq=2 delivered  
12 [2025-12-01 20:08:18] Client stopped cleanly.  
13
```

Server:

```
▶ ~ /De/b/COMP7005-project/s/reliable_udp ▶ P main !5 ▶ python3 server.py --listen-ip 192.168.0.19 --listen-port 9001  
[2025-12-01 20:07:17] Server listening on 192.168.0.19:9001  
[2025-12-01 20:07:39] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with server 50% drop'  
Hello with server 50% drop  
[2025-12-01 20:07:39] SENT ACK to ('192.168.0.18', 4000) | ack=1  
[2025-12-01 20:07:56] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again'  
again  
[2025-12-01 20:07:56] SENT ACK to ('192.168.0.18', 4000) | ack=2  
[2025-12-01 20:07:57] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again'  
again  
[2025-12-01 20:07:57] SENT ACK to ('192.168.0.18', 4000) | ack=2  
[2025-12-01 20:07:58] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again'  
again  
[2025-12-01 20:07:58] SENT ACK to ('192.168.0.18', 4000) | ack=2  
^C  
Closing socket...  
[2025-12-01 20:08:15] Server stopped cleanly.
```

```

< > └─ server.log ×
... source > reliable_udp > logs > └─ server.log
1 [2025-12-01 20:07:17] Server listening on 192.168.0.19:9001
2 [2025-12-01 20:07:39] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with server 50% drop'
3 [2025-12-01 20:07:39] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 20:07:56] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again'
5 [2025-12-01 20:07:56] SENT ACK to ('192.168.0.18', 4000) | ack=2
6 [2025-12-01 20:07:57] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again'
7 [2025-12-01 20:07:57] SENT ACK to ('192.168.0.18', 4000) | ack=2
8 [2025-12-01 20:07:58] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again'
9 [2025-12-01 20:07:58] SENT ACK to ('192.168.0.18', 4000) | ack=2
10 [2025-12-01 20:08:15] Server stopped cleanly.
11

```

Proxy:

```

developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ python3 proxy.py \
--listen-ip 192.168.0.18 --listen-port 4000 \
--target-ip 192.168.0.19 --target-port 9001 \
--client-drop 0 --server-drop 50 \
--client-delay 0 --server-delay 0
[2025-12-01 20:07:14] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:07:39] Detected FIRST client: ('192.168.0.164', 48040)
[2025-12-01 20:07:39] FROM CLIENT ('192.168.0.164', 48040) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with server 50% drop'
[2025-12-01 20:07:39] FORWARDED to server
[2025-12-01 20:07:39] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01\x01'
[2025-12-01 20:07:39] FORWARDED to client
[2025-12-01 20:07:56] FROM CLIENT ('192.168.0.164', 48040) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00again'
[2025-12-01 20:07:56] FORWARDED to server
[2025-12-01 20:07:56] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x02\x00\x00\x01'
[2025-12-01 20:07:56] DROP (server -> client)
[2025-12-01 20:07:57] FROM CLIENT ('192.168.0.164', 48040) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00again'
[2025-12-01 20:07:57] FORWARDED to server
[2025-12-01 20:07:57] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x02\x00\x00\x01'
[2025-12-01 20:07:57] DROP (server -> client)
[2025-12-01 20:07:58] FROM CLIENT ('192.168.0.164', 48040) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00again'
[2025-12-01 20:07:58] FORWARDED to server
[2025-12-01 20:07:58] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x02\x00\x00\x01'
[2025-12-01 20:07:58] FORWARDED to client
^C
Proxy shutting down...
[2025-12-01 20:08:17] Proxy closed cleanly.
developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ 

```

```

Open ▾   • proxy.log
/home/developer/Desktop/brandon-project/COMP7005-project/source/reliable_udp/logs
/home/developer/Desktop/brandon-project/COMP7005-project/source/reliable_udp/logs/proxy.log
• proxy.log ×
[2025-12-01 20:07:14] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:07:39] Detected FIRST client: ('192.168.0.164', 48040)
[2025-12-01 20:07:39] FROM CLIENT ('192.168.0.164', 48040) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with server 50% drop'
[2025-12-01 20:07:39] FORWARDED to server
[2025-12-01 20:07:39] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01\x01'
[2025-12-01 20:07:39] FORWARDED to client
[2025-12-01 20:07:56] FROM CLIENT ('192.168.0.164', 48040) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00again'
[2025-12-01 20:07:56] FORWARDED to server
[2025-12-01 20:07:56] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x02\x00\x00\x01'
[2025-12-01 20:07:56] DROP (server -> client)
[2025-12-01 20:07:57] FROM CLIENT ('192.168.0.164', 48040) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00again'
[2025-12-01 20:07:57] FORWARDED to server
[2025-12-01 20:07:57] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x02\x00\x00\x01'
[2025-12-01 20:07:57] DROP (server -> client)
[2025-12-01 20:07:58] FROM CLIENT ('192.168.0.164', 48040) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00\x00again'
[2025-12-01 20:07:58] FORWARDED to server
[2025-12-01 20:07:58] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x02\x00\x00\x01'
[2025-12-01 20:07:58] FORWARDED to client
[2025-12-01 20:08:17] Proxy closed cleanly.

```

Test 3 — BOTH 100% drop, no delay

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
100	0	N/A

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 \ --listen-port 4000 \ --target-ip 192.168.0.19 \ --target-port 9001 \ --client-drop 100 \ --server-drop 100 \ --client-delay 0 \ --server-delay 0

Client:

```
▶ ~ ~/De/COMP7005/p/COMP7005-project/s/reliable_udp ▶ P main !4 python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 20:18:25] Client sending to 192.168.0.18:4000
Hello with BOTH 100% drop!
[2025-12-01 20:18:41] SENT | seq=1 retries=0 payload=b'Hello with BOTH 100% drop!'
[2025-12-01 20:18:42] Error receiving ACK: timed out
[2025-12-01 20:18:42] SENT | seq=1 retries=1 payload=b'Hello with BOTH 100% drop!'
[2025-12-01 20:18:43] Error receiving ACK: timed out
[2025-12-01 20:18:43] SENT | seq=1 retries=2 payload=b'Hello with BOTH 100% drop!'
[2025-12-01 20:18:44] Error receiving ACK: timed out
[2025-12-01 20:18:44] SENT | seq=1 retries=3 payload=b'Hello with BOTH 100% drop!'
[2025-12-01 20:18:45] Error receiving ACK: timed out
[2025-12-01 20:18:45] SENT | seq=1 retries=4 payload=b'Hello with BOTH 100% drop!'
[2025-12-01 20:18:46] Error receiving ACK: timed out
[2025-12-01 20:18:46] SENT | seq=1 retries=5 payload=b'Hello with BOTH 100% drop!'
[2025-12-01 20:18:47] Error receiving ACK: timed out
[2025-12-01 20:18:47] FAILED to send message after 5 retries: seq=1
^C
KeyboardInterrupt received. Exiting...
Closing socket...
[2025-12-01 20:18:56] Client stopped cleanly.
```

```
< > client.log x
... source > reliable_udp > logs > client.log
1 [2025-12-01 20:18:25] Client sending to 192.168.0.18:4000
2 [2025-12-01 20:18:41] SENT | seq=1 retries=0 payload=b'Hello with BOTH 100% drop!'
3 [2025-12-01 20:18:42] Error receiving ACK: timed out
4 [2025-12-01 20:18:42] SENT | seq=1 retries=1 payload=b'Hello with BOTH 100% drop!'
5 [2025-12-01 20:18:43] Error receiving ACK: timed out
6 [2025-12-01 20:18:43] SENT | seq=1 retries=2 payload=b'Hello with BOTH 100% drop!'
7 [2025-12-01 20:18:44] Error receiving ACK: timed out
8 [2025-12-01 20:18:44] SENT | seq=1 retries=3 payload=b'Hello with BOTH 100% drop!'
9 [2025-12-01 20:18:45] Error receiving ACK: timed out
10 [2025-12-01 20:18:45] SENT | seq=1 retries=4 payload=b'Hello with BOTH 100% drop!'
11 [2025-12-01 20:18:46] Error receiving ACK: timed out
12 [2025-12-01 20:18:46] SENT | seq=1 retries=5 payload=b'Hello with BOTH 100% drop!'
13 [2025-12-01 20:18:47] Error receiving ACK: timed out
14 [2025-12-01 20:18:47] FAILED to send message after 5 retries: seq=1
15 [2025-12-01 20:18:56] Client stopped cleanly.
16
```

Server:

```
▶ ➤ ~ /De/b/COMP7005-project/s/reliable_udp ➤ ➤ P main !5 ➤ python3 server.py --listen-ip 192.168.0.19 --listen-port 9001  
[2025-12-01 20:18:27] Server listening on 192.168.0.19:9001  
^C  
[Closing socket...  
[2025-12-01 20:19:02] Server stopped cleanly.  
▶ ➤ ~ /De/b/COMP7005-project/s/reliable_udp ➤ ➤ P main !5 ➤
```

```
< > ⌂ server.log x
... source > reliable_udp > logs > ⌂ server.log
1 [2025-12-01 20:18:27] Server listening on 192.168.0.19:9001
2 [2025-12-01 20:19:02] Server stopped cleanly.
3 |
```

Proxy:

```
developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ python3 proxy.py \
--listen-ip 192.168.0.18 --listen-port 4000 \
--target-ip 192.168.0.19 --target-port 9001 \
--client-drop 100 --server-drop 100 \
[2025-12-01 20:18:24] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:18:41] Detected FIRST client: ('192.168.0.164', 45937)
[2025-12-01 20:18:41] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:41] DROP (client -> server)
[2025-12-01 20:18:42] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:42] DROP (client -> server)
[2025-12-01 20:18:43] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:43] DROP (client -> server)
[2025-12-01 20:18:44] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:44] DROP (client -> server)
[2025-12-01 20:18:45] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:45] DROP (client -> server)
[2025-12-01 20:18:46] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:46] DROP (client -> server)
^C
Proxy shutting down...
[2025-12-01 20:18:58] Proxy closed cleanly.
developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$
```

```
[2025-12-01 20:18:24] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:18:41] Detected FIRST client: ('192.168.0.164', 45937)
[2025-12-01 20:18:41] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:41] DROP (client -> server)
[2025-12-01 20:18:42] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:42] DROP (client -> server)
[2025-12-01 20:18:43] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:43] DROP (client -> server)
[2025-12-01 20:18:44] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:44] DROP (client -> server)
[2025-12-01 20:18:45] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:45] DROP (client -> server)
[2025-12-01 20:18:46] FROM CLIENT ('192.168.0.164', 45937) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH 100% drop!'
[2025-12-01 20:18:46] DROP (client -> server)
[2025-12-01 20:18:58] Proxy closed cleanly.
```

Test 3 — CLIENT 100% drop, no delay

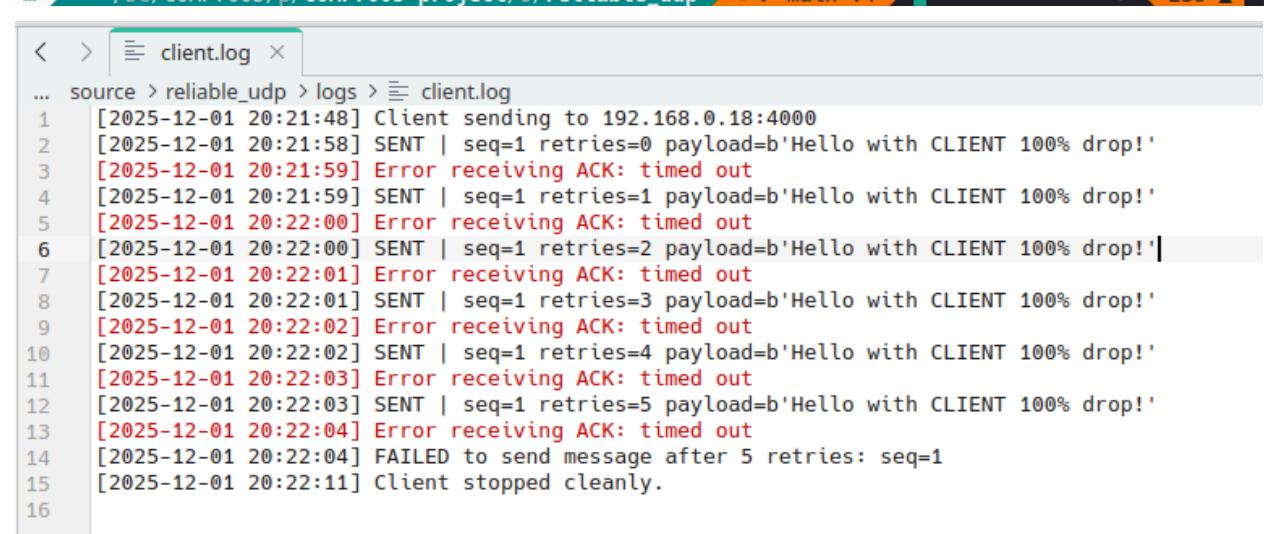
Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
100	0	N/A

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 100 --server-drop 0 \ --client-delay 0 --server-delay 0

Client:

```
~> ~De/COMP7005/p/COMP7005-project/s/reliable_udp > P main !4 python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 20:21:48] Client sending to 192.168.0.18:4000
Hello with CLIENT 100% drop!
[2025-12-01 20:21:58] SENT | seq=1 retries=0 payload=b'Hello with CLIENT 100% drop!'
[2025-12-01 20:21:59] Error receiving ACK: timed out
[2025-12-01 20:21:59] SENT | seq=1 retries=1 payload=b'Hello with CLIENT 100% drop!'
[2025-12-01 20:22:00] Error receiving ACK: timed out
[2025-12-01 20:22:00] SENT | seq=1 retries=2 payload=b'Hello with CLIENT 100% drop!'
[2025-12-01 20:22:01] Error receiving ACK: timed out
[2025-12-01 20:22:01] SENT | seq=1 retries=3 payload=b'Hello with CLIENT 100% drop!'
[2025-12-01 20:22:02] Error receiving ACK: timed out
[2025-12-01 20:22:02] SENT | seq=1 retries=4 payload=b'Hello with CLIENT 100% drop!'
[2025-12-01 20:22:03] Error receiving ACK: timed out
[2025-12-01 20:22:03] SENT | seq=1 retries=5 payload=b'Hello with CLIENT 100% drop!'
[2025-12-01 20:22:04] Error receiving ACK: timed out
[2025-12-01 20:22:04] FAILED to send message after 5 retries: seq=1
^C
KeyboardInterrupt received. Exiting...

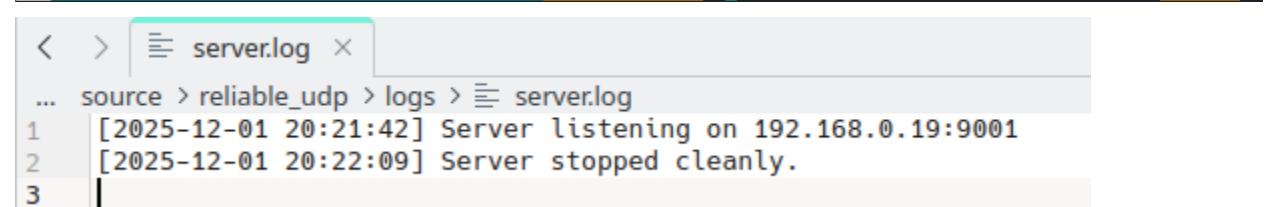
Closing socket...
[2025-12-01 20:22:11] Client stopped cleanly.
```



```
client.log < > x
...
... source > reliable_udp > logs > client.log
1 [2025-12-01 20:21:48] Client sending to 192.168.0.18:4000
2 [2025-12-01 20:21:58] SENT | seq=1 retries=0 payload=b'Hello with CLIENT 100% drop!'
3 [2025-12-01 20:21:59] Error receiving ACK: timed out
4 [2025-12-01 20:21:59] SENT | seq=1 retries=1 payload=b'Hello with CLIENT 100% drop!'
5 [2025-12-01 20:22:00] Error receiving ACK: timed out
6 [2025-12-01 20:22:00] SENT | seq=1 retries=2 payload=b'Hello with CLIENT 100% drop!'
7 [2025-12-01 20:22:01] Error receiving ACK: timed out
8 [2025-12-01 20:22:01] SENT | seq=1 retries=3 payload=b'Hello with CLIENT 100% drop!'
9 [2025-12-01 20:22:02] Error receiving ACK: timed out
10 [2025-12-01 20:22:02] SENT | seq=1 retries=4 payload=b'Hello with CLIENT 100% drop!'
11 [2025-12-01 20:22:03] Error receiving ACK: timed out
12 [2025-12-01 20:22:03] SENT | seq=1 retries=5 payload=b'Hello with CLIENT 100% drop!'
13 [2025-12-01 20:22:04] Error receiving ACK: timed out
14 [2025-12-01 20:22:04] FAILED to send message after 5 retries: seq=1
15 [2025-12-01 20:22:11] Client stopped cleanly.
16
```

Server:

```
~> ~De/b/COMP7005-project/s/reliable_udp > P main !5 python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 20:21:42] Server listening on 192.168.0.19:9001
^C
Closing socket...
[2025-12-01 20:22:09] Server stopped cleanly.
```



```
server.log < > x
...
... source > reliable_udp > logs > server.log
1 [2025-12-01 20:21:42] Server listening on 192.168.0.19:9001
2 [2025-12-01 20:22:09] Server stopped cleanly.
3
```

Proxy:

```

developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ python3 proxy.py \
--listen-ip 192.168.0.18 --listen-port 4000 \
--target-ip 192.168.0.19 --target-port 9001 \
--client-drop 100 --server-drop 0 \
--client-delay 0 --server-delay 0
[2025-12-01 20:21:40] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:21:58] Detected FIRST client: ('192.168.0.164', 55822)
[2025-12-01 20:21:58] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 10
0% drop!'
[2025-12-01 20:21:58] DROP (client -> server)
[2025-12-01 20:21:59] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 10
0% drop!'
[2025-12-01 20:21:59] DROP (client -> server)
[2025-12-01 20:22:00] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 10
0% drop!'
[2025-12-01 20:22:00] DROP (client -> server)
[2025-12-01 20:22:01] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 10
0% drop!'
[2025-12-01 20:22:01] DROP (client -> server)
[2025-12-01 20:22:02] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 10
0% drop!'
[2025-12-01 20:22:02] DROP (client -> server)
[2025-12-01 20:22:03] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 10
0% drop!'
[2025-12-01 20:22:03] DROP (client -> server)
^C
Proxy shutting down...
[2025-12-01 20:22:07] Proxy closed cleanly.
developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ 

```

```

[2025-12-01 20:21:40] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:21:58] Detected FIRST client: ('192.168.0.164', 55822)
[2025-12-01 20:21:58] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 100% drop!'
[2025-12-01 20:21:58] DROP (client -> server)
[2025-12-01 20:21:59] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 100% drop!'
[2025-12-01 20:21:59] DROP (client -> server)
[2025-12-01 20:22:00] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 100% drop!'
[2025-12-01 20:22:00] DROP (client -> server)
[2025-12-01 20:22:01] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 100% drop!'
[2025-12-01 20:22:01] DROP (client -> server)
[2025-12-01 20:22:02] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 100% drop!'
[2025-12-01 20:22:02] DROP (client -> server)
[2025-12-01 20:22:03] FROM CLIENT ('192.168.0.164', 55822) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with CLIENT 100% drop!'
[2025-12-01 20:22:03] DROP (client -> server)
[2025-12-01 20:22:07] Proxy closed cleanly.

```

Test 3 — SERVER 100% drop, no delay

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
100	0	N/A

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 0

		--server-drop 100 \ --client-delay 0 \ --server-delay 0
--	--	---

Client:

```
▶ ~/De/COMP7005/p/COMP7005-project/s/reliable_udp ▶ P main !4 ▶ python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 20:27:18] Client sending to 192.168.0.18:4000
Hello with SERVER 100% drop!
[2025-12-01 20:27:33] SENT | seq=1 retries=0 payload=b'Hello with SERVER 100% drop!'
[2025-12-01 20:27:34] Error receiving ACK: timed out
[2025-12-01 20:27:34] SENT | seq=1 retries=1 payload=b'Hello with SERVER 100% drop!'
[2025-12-01 20:27:35] Error receiving ACK: timed out
[2025-12-01 20:27:35] SENT | seq=1 retries=2 payload=b'Hello with SERVER 100% drop!'
[2025-12-01 20:27:36] Error receiving ACK: timed out
[2025-12-01 20:27:36] SENT | seq=1 retries=3 payload=b'Hello with SERVER 100% drop!'
[2025-12-01 20:27:37] Error receiving ACK: timed out
[2025-12-01 20:27:37] SENT | seq=1 retries=4 payload=b'Hello with SERVER 100% drop!'
[2025-12-01 20:27:38] Error receiving ACK: timed out
[2025-12-01 20:27:38] SENT | seq=1 retries=5 payload=b'Hello with SERVER 100% drop!'
[2025-12-01 20:27:39] Error receiving ACK: timed out
[2025-12-01 20:27:39] FAILED to send message after 5 retries: seq=1
^C
KeyboardInterrupt received. Exiting...
Closing socket...
[2025-12-01 20:27:44] Client stopped cleanly.
```

```

< > client.log x
... source > reliable_udp > logs > client.log
1 [2025-12-01 20:27:18] Client sending to 192.168.0.18:4000
2 [2025-12-01 20:27:33] SENT | seq=1 retries=0 payload=b'Hello with SERVER 100% drop!'
3 [2025-12-01 20:27:34] Error receiving ACK: timed out
4 [2025-12-01 20:27:34] SENT | seq=1 retries=1 payload=b'Hello with SERVER 100% drop!'
5 [2025-12-01 20:27:35] Error receiving ACK: timed out
6 [2025-12-01 20:27:35] SENT | seq=1 retries=2 payload=b'Hello with SERVER 100% drop!'
7 [2025-12-01 20:27:36] Error receiving ACK: timed out
8 [2025-12-01 20:27:36] SENT | seq=1 retries=3 payload=b'Hello with SERVER 100% drop!'
9 [2025-12-01 20:27:37] Error receiving ACK: timed out
10 [2025-12-01 20:27:37] SENT | seq=1 retries=4 payload=b'Hello with SERVER 100% drop!'
11 [2025-12-01 20:27:38] Error receiving ACK: timed out
12 [2025-12-01 20:27:38] SENT | seq=1 retries=5 payload=b'Hello with SERVER 100% drop!'
13 [2025-12-01 20:27:39] Error receiving ACK: timed out
14 [2025-12-01 20:27:39] FAILED to send message after 5 retries: seq=1
15 [2025-12-01 20:27:44] Client stopped cleanly.
16

```

Server:

```

~> ~/De/b/COMP7005-project/s/reliable_udp > P main !5 > python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 20:27:16] Server listening on 192.168.0.19:9001
[2025-12-01 20:27:33] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:33] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:27:33] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:33] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:27:34] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:34] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:27:34] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:34] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:27:35] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:35] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:27:35] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:35] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:27:36] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:36] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:27:36] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:36] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:27:37] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:37] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:27:38] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:38] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:27:38] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
Hello with SERVER 100% drop!
[2025-12-01 20:27:38] SENT ACK to ('192.168.0.18', 4000) | ack=1
^C
Closing socket...
[2025-12-01 20:27:46] Server stopped cleanly.
~> ~/De/b/COMP7005-project/s/reliable_udp > P main !5 >

```

✓ 29s ✘

```

< > └─ server.log ×
... source > reliable_udp > logs > └─ server.log
1 [2025-12-01 20:27:16] Server listening on 192.168.0.19:9001
2 [2025-12-01 20:27:33] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
3 [2025-12-01 20:27:33] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 20:27:33] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
5 [2025-12-01 20:27:33] SENT ACK to ('192.168.0.18', 4000) | ack=1
6 [2025-12-01 20:27:34] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
7 [2025-12-01 20:27:34] SENT ACK to ('192.168.0.18', 4000) | ack=1
8 [2025-12-01 20:27:34] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
9 [2025-12-01 20:27:34] SENT ACK to ('192.168.0.18', 4000) | ack=1
10 [2025-12-01 20:27:35] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
11 [2025-12-01 20:27:35] SENT ACK to ('192.168.0.18', 4000) | ack=1
12 [2025-12-01 20:27:35] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
13 [2025-12-01 20:27:35] SENT ACK to ('192.168.0.18', 4000) | ack=1
14 [2025-12-01 20:27:36] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
15 [2025-12-01 20:27:36] SENT ACK to ('192.168.0.18', 4000) | ack=1
16 [2025-12-01 20:27:36] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
17 [2025-12-01 20:27:36] SENT ACK to ('192.168.0.18', 4000) | ack=1
18 [2025-12-01 20:27:37] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
19 [2025-12-01 20:27:37] SENT ACK to ('192.168.0.18', 4000) | ack=1
20 [2025-12-01 20:27:37] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
21 [2025-12-01 20:27:37] SENT ACK to ('192.168.0.18', 4000) | ack=1
22 [2025-12-01 20:27:38] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
23 [2025-12-01 20:27:38] SENT ACK to ('192.168.0.18', 4000) | ack=1
24 [2025-12-01 20:27:38] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% drop!'
25 [2025-12-01 20:27:38] SENT ACK to ('192.168.0.18', 4000) | ack=1
26 [2025-12-01 20:27:46] Server stopped cleanly.
27

```

Proxy:

```

developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ python3 proxy.py \
--listen-ip 192.168.0.18 --listen-port 4000 \
--target-ip 192.168.0.19 --target-port 9001 \
--client-drop 0 --server-drop 100 \
--client-delay 0 --server-delay 0
[2025-12-01 20:27:15] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:27:33] Detected FIRST client: ('192.168.0.164', 40389)
[2025-12-01 20:27:33] FROM CLIENT ('192.168.0.164', 40389) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with SERVER 10
0% drop!'
[2025-12-01 20:27:33] FORWARDED to server
[2025-12-01 20:27:33] FROM CLIENT ('192.168.0.164', 40389) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with SERVER 10
0% drop!'
[2025-12-01 20:27:33] FORWARDED to server
[2025-12-01 20:27:33] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:27:33] DROP (server -> client)
[2025-12-01 20:27:33] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:27:33] DROP (server -> client)
[2025-12-01 20:27:34] FROM CLIENT ('192.168.0.164', 40389) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with SERVER 10
0% drop!'
[2025-12-01 20:27:34] FORWARDED to server
[2025-12-01 20:27:34] FROM CLIENT ('192.168.0.164', 40389) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with SERVER 10
0% drop!'
[2025-12-01 20:27:34] FORWARDED to server
[2025-12-01 20:27:34] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:27:34] DROP (server -> client)
[2025-12-01 20:27:34] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:27:34] DROP (server -> client)
[2025-12-01 20:27:35] FROM CLIENT ('192.168.0.164', 40389) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with SERVER 10
0% drop!'
[2025-12-01 20:27:35] FORWARDED to server
[2025-12-01 20:27:35] FROM CLIENT ('192.168.0.164', 40389) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with SERVER 10
0% drop!'
[2025-12-01 20:27:35] FORWARDED to server
[2025-12-01 20:27:35] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:27:35] DROP (server -> client)
[2025-12-01 20:27:35] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:27:35] DROP (server -> client)
[2025-12-01 20:27:36] FROM CLIENT ('192.168.0.164', 40389) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with SERVER 10
0% drop!'
[2025-12-01 20:27:36] FORWARDED to server
[2025-12-01 20:27:36] FROM CLIENT ('192.168.0.164', 40389) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with SERVER 10
0% drop!'

```

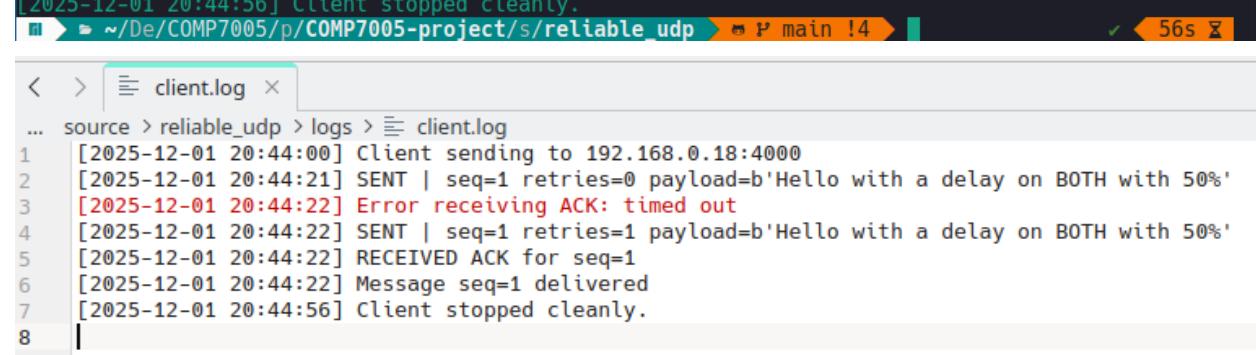
Test 4 — BOTH No drop, 50% delay (100–500 ms)

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
0	50	100-500

Client	Server	Proxy
<pre>python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5</pre>	<pre>python3 server.py --listen-ip 192.168.0.19 --listen-port 9001</pre>	<pre>python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 0 --server-drop 0 \ --client-delay 50 --server-delay 50 \ --client-delay-time-min 100 --client-delay-time-max 500 \ --server-delay-time-min 100 --server-delay-time-max 500</pre>

Client:

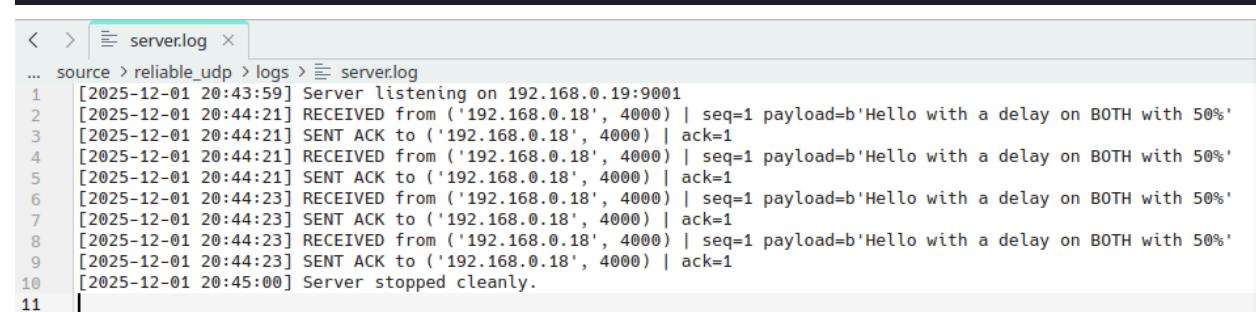
```
~De/COMP7005/p/COMP7005-project/s/reliable_udp main !4 python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 20:44:00] Client sending to 192.168.0.18:4000
Hello with a delay on BOTH with 50%
[2025-12-01 20:44:21] SENT | seq=1 retries=0 payload=b'Hello with a delay on BOTH with 50%'
[2025-12-01 20:44:22] Error receiving ACK: timed out
[2025-12-01 20:44:22] SENT | seq=1 retries=1 payload=b'Hello with a delay on BOTH with 50%'
[2025-12-01 20:44:22] RECEIVED ACK for seq=1
[2025-12-01 20:44:22] Message seq=1 delivered
^C
KeyboardInterrupt received. Exiting...
Closing socket...
[2025-12-01 20:44:56] Client stopped cleanly.
```



```
client.log
...
source > reliable_udp > logs > client.log
1 [2025-12-01 20:44:00] Client sending to 192.168.0.18:4000
2 [2025-12-01 20:44:21] SENT | seq=1 retries=0 payload=b'Hello with a delay on BOTH with 50%'
3 [2025-12-01 20:44:22] Error receiving ACK: timed out
4 [2025-12-01 20:44:22] SENT | seq=1 retries=1 payload=b'Hello with a delay on BOTH with 50%'
5 [2025-12-01 20:44:22] RECEIVED ACK for seq=1
6 [2025-12-01 20:44:22] Message seq=1 delivered
7 [2025-12-01 20:44:56] Client stopped cleanly.
8
```

Server:

```
~De/b/COMP7005-project/s/reliable_udp main !5 python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 20:43:59] Server listening on 192.168.0.19:9001
[2025-12-01 20:44:21] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with a delay on BOTH with 50%'
Hello with a delay on BOTH with 50%
[2025-12-01 20:44:21] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:44:21] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with a delay on BOTH with 50%'
Hello with a delay on BOTH with 50%
[2025-12-01 20:44:21] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:44:23] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with a delay on BOTH with 50%'
Hello with a delay on BOTH with 50%
[2025-12-01 20:44:23] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:44:23] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with a delay on BOTH with 50%'
Hello with a delay on BOTH with 50%
[2025-12-01 20:44:23] SENT ACK to ('192.168.0.18', 4000) | ack=1
^C
Closing socket...
[2025-12-01 20:45:00] Server stopped cleanly.
```



```
server.log
...
source > reliable_udp > logs > serverlog
1 [2025-12-01 20:43:59] Server listening on 192.168.0.19:9001
2 [2025-12-01 20:44:21] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with a delay on BOTH with 50%'
3 [2025-12-01 20:44:21] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 20:44:21] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with a delay on BOTH with 50%'
5 [2025-12-01 20:44:21] SENT ACK to ('192.168.0.18', 4000) | ack=1
6 [2025-12-01 20:44:23] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with a delay on BOTH with 50%'
7 [2025-12-01 20:44:23] SENT ACK to ('192.168.0.18', 4000) | ack=1
8 [2025-12-01 20:44:23] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with a delay on BOTH with 50%'
9 [2025-12-01 20:44:23] SENT ACK to ('192.168.0.18', 4000) | ack=1
10 [2025-12-01 20:45:00] Server stopped cleanly.
11
```

Proxy:

```

developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ python3 proxy.py --listen-ip 192.168.0.18 --listen-port 4000 --target-ip 192.168.0.19 --target-port 9001 --client-drop 0 --server-drop 0 --client-delay 50 --server-delay 50 --client-delay-time-min 100 --client-delay-time-max 500 --server-delay-time-min 100 --server-delay-time-max 500
[2025-12-01 20:44:01] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:44:21] Detected FIRST client: ('192.168.0.164', 60313)
[2025-12-01 20:44:21] FROM CLIENT ('192.168.0.164', 60313) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with a delay on BOTH with 50%'
[2025-12-01 20:44:21] DELAY 0.214s (client -> server)
[2025-12-01 20:44:21] FORWARDED to server
[2025-12-01 20:44:21] FROM CLIENT ('192.168.0.164', 60313) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with a delay on BOTH with 50%'
[2025-12-01 20:44:21] DELAY 0.332s (client -> server)
[2025-12-01 20:44:21] FORWARDED to server
[2025-12-01 20:44:21] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:44:21] DELAY 0.465s (server -> client)
[2025-12-01 20:44:22] FORWARDED to client
[2025-12-01 20:44:22] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:44:22] DELAY 0.209s (server -> client)
[2025-12-01 20:44:22] FORWARDED to client
[2025-12-01 20:44:22] FROM CLIENT ('192.168.0.164', 60313) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with a delay on BOTH with 50%'
[2025-12-01 20:44:22] DELAY 0.435s (client -> server)
[2025-12-01 20:44:23] FORWARDED to server
[2025-12-01 20:44:23] FROM CLIENT ('192.168.0.164', 60313) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with a delay on BOTH with 50%'
[2025-12-01 20:44:23] DELAY 0.206s (client -> server)
[2025-12-01 20:44:23] FORWARDED to server
[2025-12-01 20:44:23] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:44:23] DELAY 0.427s (server -> client)
[2025-12-01 20:44:23] FORWARDED to client
[2025-12-01 20:44:23] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:44:23] DELAY 0.273s (server -> client)
[2025-12-01 20:44:23] FORWARDED to client

```

Open +/-

proxy.log
~/Desktop/brandon-project/COMP7005-project/source/reliable_udp/logs

proxy.py

```

[2025-12-01 20:44:01] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:44:21] Detected FIRST client: ('192.168.0.164', 60313)
[2025-12-01 20:44:21] FROM CLIENT ('192.168.0.164', 60313) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with a delay on BOTH with 50%'
[2025-12-01 20:44:21] DELAY 0.214s (client -> server)
[2025-12-01 20:44:21] FORWARDED to server
[2025-12-01 20:44:21] FROM CLIENT ('192.168.0.164', 60313) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with a delay on BOTH with 50%'
[2025-12-01 20:44:21] DELAY 0.332s (client -> server)
[2025-12-01 20:44:21] FORWARDED to server
[2025-12-01 20:44:21] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:44:21] DELAY 0.465s (server -> client)
[2025-12-01 20:44:22] FORWARDED to client
[2025-12-01 20:44:22] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:44:22] DELAY 0.209s (server -> client)
[2025-12-01 20:44:22] FORWARDED to client
[2025-12-01 20:44:22] FROM CLIENT ('192.168.0.164', 60313) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with a delay on BOTH with 50%'
[2025-12-01 20:44:22] DELAY 0.435s (client -> server)
[2025-12-01 20:44:23] FORWARDED to server
[2025-12-01 20:44:23] FROM CLIENT ('192.168.0.164', 60313) | b'\x00\x00\x01\x00\x00\x00\x00\x00\x00Hello with a delay on BOTH with 50%'
[2025-12-01 20:44:23] DELAY 0.206s (client -> server)
[2025-12-01 20:44:23] FORWARDED to server
[2025-12-01 20:44:23] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:44:23] DELAY 0.427s (server -> client)
[2025-12-01 20:44:23] FORWARDED to client
[2025-12-01 20:44:23] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:44:23] DELAY 0.273s (server -> client)
[2025-12-01 20:44:23] FORWARDED to client
[2025-12-01 20:44:58] Proxy closed cleanly.

```

Test 4 — CLIENT No drop, 50% delay (100–500 ms)

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
0	50	100-500

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 0 --server-drop 0 \ --client-delay 50 --server-delay 0 \ --client-delay-time-min 100 --client-delay-time-max 500 \ --server-delay-time-min 0 --server-delay-time-max 0

Client:

```
▶ ~ /De/COMP7005/p/COMP7005-project/s/reliable_udp ▶ P main !4 ▶ python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 20:47:58] Client sending to 192.168.0.18:4000
Hello with CLIENT 50% delay
[2025-12-01 20:48:15] SENT | seq=1 retries=0 payload=b'Hello with CLIENT 50% delay'
[2025-12-01 20:48:16] RECEIVED ACK for seq=1
[2025-12-01 20:48:16] Message seq=1 delivered
again
[2025-12-01 20:48:20] SENT | seq=2 retries=0 payload=b'again'
[2025-12-01 20:48:20] RECEIVED ACK for seq=2
[2025-12-01 20:48:20] Message seq=2 delivered
^C
KeyboardInterrupt received. Exiting...
Closing socket...
[2025-12-01 20:48:29] Client stopped cleanly.
```

```
< > client.log x
...
... source > reliable_udp > logs > client.log
1 [2025-12-01 20:47:58] Client sending to 192.168.0.18:4000
2 [2025-12-01 20:48:15] SENT | seq=1 retries=0 payload=b'Hello with CLIENT 50% delay'
3 [2025-12-01 20:48:16] RECEIVED ACK for seq=1
4 [2025-12-01 20:48:16] Message seq=1 delivered
5 [2025-12-01 20:48:20] SENT | seq=2 retries=0 payload=b'again'
6 [2025-12-01 20:48:20] RECEIVED ACK for seq=2
7 [2025-12-01 20:48:20] Message seq=2 delivered
8 [2025-12-01 20:48:29] Client stopped cleanly.
9
```

Server:

```
m ➤ ~ /De/b/COMP7005-project/s/reliable_udp ➤ ⌂ main !5 ➤ python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 20:47:55] Server listening on 192.168.0.19:9001
[2025-12-01 20:48:16] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 50% delay'
Hello with CLIENT 50% delay
[2025-12-01 20:48:16] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:48:20] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again'
again
[2025-12-01 20:48:20] SENT ACK to ('192.168.0.18', 4000) | ack=2
^C
Closing socket...
[2025-12-01 20:48:33] Server stopped cleanly.
```

```
< > server.log x
... source > reliable_udp > logs > server.log
1 [2025-12-01 20:47:55] Server listening on 192.168.0.19:9001
2 [2025-12-01 20:48:16] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 50% delay'
3 [2025-12-01 20:48:16] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 20:48:20] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again'
5 [2025-12-01 20:48:20] SENT ACK to ('192.168.0.18', 4000) | ack=2
6 [2025-12-01 20:48:33] Server stopped cleanly.
7
```

Proxy:

```

[2025-12-01 20:47:57] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:48:15] Detected FIRST client: ('192.168.0.164', 57774)
[2025-12-01 20:48:15] FROM CLIENT ('192.168.0.164', 57774) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with CLIENT 50% delay'
[2025-12-01 20:48:15] DELAY 0.228s (client -> server)
[2025-12-01 20:48:16] FORWARDED to server
[2025-12-01 20:48:16] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01'
[2025-12-01 20:48:16] FORWARDED to client
[2025-12-01 20:48:20] FROM CLIENT ('192.168.0.164', 57774) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00again'
[2025-12-01 20:48:20] DELAY 0.427s (client -> server)
[2025-12-01 20:48:20] FORWARDED to server
[2025-12-01 20:48:20] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x02\x00\x01'
[2025-12-01 20:48:20] FORWARDED to client
[2025-12-01 20:48:31] Proxy closed cleanly.

```

Test 4 — SERVER No drop, 50% delay (100–500 ms)

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
0	50	100-500

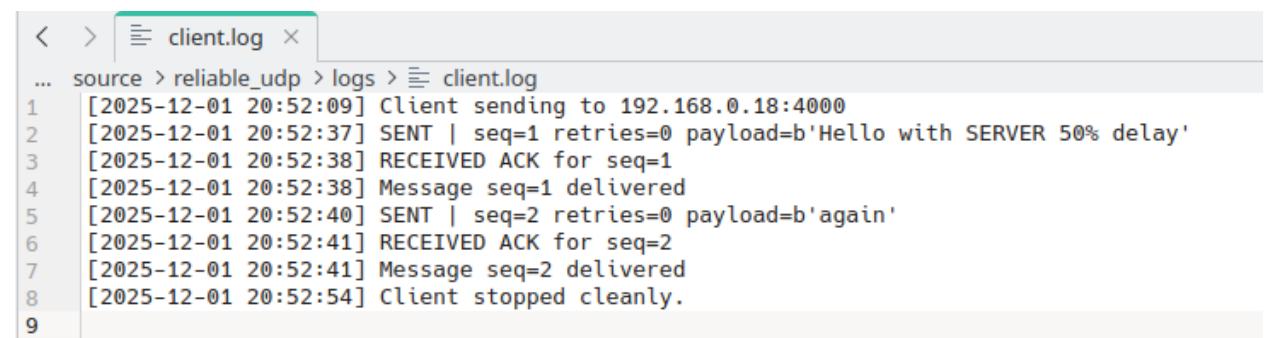
Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 0 --server-drop 0 \ --client-delay 0 --server-delay 50 \ --client-delay-time-min 0 --client-delay-time-max 0 \ --server-delay-time-min 100 --server-delay-time-max 500

Client:

```
▶ ~ /De/COMP7005/p/COMP7005-project/s/reliable_udp ➤ main !4 ➤ python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 20:52:09] Client sending to 192.168.0.18:4000
Hello with SERVER 50% delay
[2025-12-01 20:52:37] SENT | seq=1 retries=0 payload=b'Hello with SERVER 50% delay'
[2025-12-01 20:52:38] RECEIVED ACK for seq=1
[2025-12-01 20:52:38] Message seq=1 delivered
again
[2025-12-01 20:52:40] SENT | seq=2 retries=0 payload=b'again'
[2025-12-01 20:52:41] RECEIVED ACK for seq=2
[2025-12-01 20:52:41] Message seq=2 delivered
^C
KeyboardInterrupt received. Exiting...

Closing socket...
[2025-12-01 20:52:54] Client stopped cleanly.

▶ ~ /De/COMP7005/p/COMP7005-project/s/reliable_udp ➤ main !4 ➤ 45s ✘
```

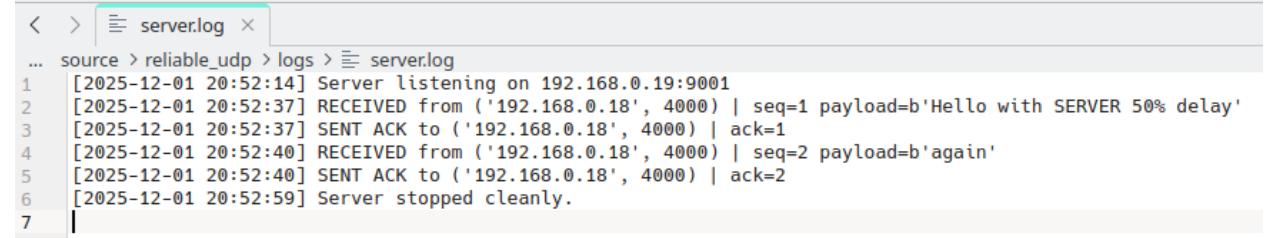


```
< > ⌂ client.log ×
... source > reliable_udp > logs > ⌂ client.log
1 [2025-12-01 20:52:09] Client sending to 192.168.0.18:4000
2 [2025-12-01 20:52:37] SENT | seq=1 retries=0 payload=b'Hello with SERVER 50% delay'
3 [2025-12-01 20:52:38] RECEIVED ACK for seq=1
4 [2025-12-01 20:52:38] Message seq=1 delivered
5 [2025-12-01 20:52:40] SENT | seq=2 retries=0 payload=b'again'
6 [2025-12-01 20:52:41] RECEIVED ACK for seq=2
7 [2025-12-01 20:52:41] Message seq=2 delivered
8 [2025-12-01 20:52:54] Client stopped cleanly.
9
```

Server:

```
▶ ~ /De/b/COMP7005-project/s/reliable_udp ➤ main !5 ➤ python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 20:52:14] Server listening on 192.168.0.19:9001
[2025-12-01 20:52:37] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 50% delay'
Hello with SERVER 50% delay
[2025-12-01 20:52:37] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:52:40] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again'
again
[2025-12-01 20:52:40] SENT ACK to ('192.168.0.18', 4000) | ack=2
^C
Closing socket...
[2025-12-01 20:52:59] Server stopped cleanly.

▶ ~ /De/b/COMP7005-project/s/reliable_udp ➤ main !5 ➤ 45s ✘
```



```
< > ⌂ server.log ×
... source > reliable_udp > logs > ⌂ server.log
1 [2025-12-01 20:52:14] Server listening on 192.168.0.19:9001
2 [2025-12-01 20:52:37] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 50% delay'
3 [2025-12-01 20:52:37] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 20:52:40] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again'
5 [2025-12-01 20:52:40] SENT ACK to ('192.168.0.18', 4000) | ack=2
6 [2025-12-01 20:52:59] Server stopped cleanly.
7
```

Proxy:

Test 5 — BOTH 100% delay, delay \geq client timeout

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
0	100	1000-1500

Client	Server	Proxy
<pre>python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5</pre>	<pre>python3 server.py --listen-ip 192.168.0.19 --listen-port 9001</pre>	<pre>python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 0 --server-drop 0 \ --client-delay 100 --server-delay 100 \ --client-delay-time-min 1000 --client-delay-time-max</pre>

		1500 \ --server-delay-time-min 1000 --server-delay-time-max 1500
--	--	---

Client:

```
▶ ➤ ~/De/COMP7005/p/COMP7005-project/s/reliable_udp ➤ P main !4 ➤ python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 20:55:13] Client sending to 192.168.0.18:4000
Hello with BOTH having a 100% delay that is greater than the client timeout
[2025-12-01 20:55:43] SENT | seq=1 retries=0 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:44] Error receiving ACK: timed out
[2025-12-01 20:55:44] SENT | seq=1 retries=1 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:45] Error receiving ACK: timed out
[2025-12-01 20:55:45] SENT | seq=1 retries=2 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:46] Error receiving ACK: timed out
[2025-12-01 20:55:46] SENT | seq=1 retries=3 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:47] RECEIVED ACK for seq=1
[2025-12-01 20:55:47] Message seq=1 delivered
^C
KeyboardInterrupt received. Exiting...

Closing socket...
[2025-12-01 20:56:02] Client stopped cleanly.
```

```

< > [client.log]
... source > reliable_udp > logs > client.log
1 [2025-12-01 20:55:13] Client sending to 192.168.0.18:4000
2 [2025-12-01 20:55:43] SENT | seq=1 retries=0 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
3 [2025-12-01 20:55:44] Error receiving ACK: timed out
4 [2025-12-01 20:55:44] SENT | seq=1 retries=1 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
5 [2025-12-01 20:55:45] Error receiving ACK: timed out
6 [2025-12-01 20:55:45] SENT | seq=1 retries=2 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
7 [2025-12-01 20:55:46] Error receiving ACK: timed out
8 [2025-12-01 20:55:46] SENT | seq=1 retries=3 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
9 [2025-12-01 20:55:47] RECEIVED ACK for seq=1
10 [2025-12-01 20:55:47] Message seq=1 delivered
11 [2025-12-01 20:56:02] Client stopped cleanly.
12

```

Server:

```

[m ~ /De/b/COMP7005-project/s/reliable_udp m P main !5] python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 20:55:16] Server listening on 192.168.0.19:9001
[2025-12-01 20:55:45] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
Hello with BOTH having a 100% delay that is greater than the client timeout
[2025-12-01 20:55:45] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:55:46] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
Hello with BOTH having a 100% delay that is greater than the client timeout
[2025-12-01 20:55:46] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:55:48] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
Hello with BOTH having a 100% delay that is greater than the client timeout
[2025-12-01 20:55:48] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 20:55:51] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
Hello with BOTH having a 100% delay that is greater than the client timeout
[2025-12-01 20:55:51] SENT ACK to ('192.168.0.18', 4000) | ack=1
^C
Closing socket...
[2025-12-01 20:56:04] Server stopped cleanly.
[m ~ /De/b/COMP7005-project/s/reliable_udp m P main !5] 48s

```

```

< > [server.log]
... source > reliable_udp > logs > server.log
1 [2025-12-01 20:55:16] Server listening on 192.168.0.19:9001
2 [2025-12-01 20:55:45] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
3 [2025-12-01 20:55:45] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 20:55:46] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
5 [2025-12-01 20:55:46] SENT ACK to ('192.168.0.18', 4000) | ack=1
6 [2025-12-01 20:55:48] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
7 [2025-12-01 20:55:48] SENT ACK to ('192.168.0.18', 4000) | ack=1
8 [2025-12-01 20:55:51] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with BOTH having a 100% delay that is greater than the client timeout'
9 [2025-12-01 20:55:51] SENT ACK to ('192.168.0.18', 4000) | ack=1
10 [2025-12-01 20:56:04] Server stopped cleanly.
11

```

Proxy:

```

developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ python3 proxy.py \
--listen-ip 192.168.0.18 --listen-port 4000 \
--target-ip 192.168.0.19 --target-port 9001 \
--client-drop 0 --server-drop 0 \
--client-delay 100 --server-delay 100 \
--client-delay-time-min 1000 --client-delay-time-max 1500 \
--server-delay-time-min 1000 --server-delay-time-max 1500
[2025-12-01 20:55:14] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:55:43] Detected FIRST client: ('192.168.0.164', 52564)
[2025-12-01 20:55:43] FROM CLIENT ('192.168.0.164', 52564) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:43] DELAY 1.421s (client -> server)
[2025-12-01 20:55:45] FORWARDED to server
[2025-12-01 20:55:45] FROM CLIENT ('192.168.0.164', 52564) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:45] DELAY 1.025s (client -> server)
[2025-12-01 20:55:46] FORWARDED to server
[2025-12-01 20:55:46] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:46] DELAY 1.071s (server -> client)
[2025-12-01 20:55:47] FORWARDED to client
[2025-12-01 20:55:47] FROM CLIENT ('192.168.0.164', 52564) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:47] DELAY 1.310s (client -> server)
[2025-12-01 20:55:48] FORWARDED to server
[2025-12-01 20:55:48] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:48] DELAY 1.275s (server -> client)
[2025-12-01 20:55:49] FORWARDED to client
[2025-12-01 20:55:49] FROM CLIENT ('192.168.0.164', 52564) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:49] DELAY 1.438s (client -> server)
[2025-12-01 20:55:51] FORWARDED to server
[2025-12-01 20:55:51] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:51] DELAY 1.010s (server -> client)
[2025-12-01 20:55:52] FORWARDED to client
[2025-12-01 20:55:52] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:52] DELAY 1.350s (server -> client)
[2025-12-01 20:55:53] FORWARDED to client
^C
Proxy shutting down...
[2025-12-01 20:56:03] Proxy closed cleanly.

```

```

[2025-12-01 20:55:14] Proxy listening on 192.168.0.18:4000
[2025-12-01 20:55:43] Detected FIRST client: ('192.168.0.164', 52564)
[2025-12-01 20:55:43] FROM CLIENT ('192.168.0.164', 52564) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:43] DELAY 1.421s (client -> server)
[2025-12-01 20:55:45] FORWARDED to server
[2025-12-01 20:55:45] FROM CLIENT ('192.168.0.164', 52564) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:45] DELAY 1.025s (client -> server)
[2025-12-01 20:55:46] FORWARDED to server
[2025-12-01 20:55:46] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:46] DELAY 1.071s (server -> client)
[2025-12-01 20:55:47] FORWARDED to client
[2025-12-01 20:55:47] FROM CLIENT ('192.168.0.164', 52564) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:47] DELAY 1.310s (client -> server)
[2025-12-01 20:55:48] FORWARDED to server
[2025-12-01 20:55:48] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:48] DELAY 1.275s (server -> client)
[2025-12-01 20:55:49] FORWARDED to client
[2025-12-01 20:55:49] FROM CLIENT ('192.168.0.164', 52564) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:49] DELAY 1.438s (client -> server)
[2025-12-01 20:55:51] FORWARDED to server
[2025-12-01 20:55:51] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:51] DELAY 1.010s (server -> client)
[2025-12-01 20:55:52] FORWARDED to client
[2025-12-01 20:55:52] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x01\x00\x01\x00Hello with BOTH having a 100% delay that is greater than the client timeout'
[2025-12-01 20:55:52] DELAY 1.350s (server -> client)
[2025-12-01 20:55:53] FORWARDED to client
[2025-12-01 20:56:03] Proxy closed cleanly.

```

Test 5 — CLIENT 100% delay, delay \geq client timeout

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
-----------------	-----------------	-----------------------

0	100	1000-1500
---	-----	-----------

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 \ --listen-port 4000 \ --target-ip 192.168.0.19 \ --target-port 9001 \ --client-drop 0 \ --server-drop 0 \ --client-delay 100 \ --server-delay 0 \ --client-delay-time-min 1000 --client-delay-time-max 1500 \ --server-delay-time-min 0 --server-delay-time-max 0

Client:

```
▶ ➤ ~ /De /COMP7005/p /COMP7005-project/s /reliable_udp ➤ ➤ ➤ main !4 ➤ python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 21:02:20] Client sending to 192.168.0.18:4000
Hello with CLIENT 100% delay greater than its timeout
[2025-12-01 21:02:49] SENT | seq=1 retries=0 payload=b'Hello with CLIENT 100% delay greater than its timeout'
[2025-12-01 21:02:50] Error receiving ACK: timed out
[2025-12-01 21:02:50] SENT | seq=1 retries=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
[2025-12-01 21:02:51] Error receiving ACK: timed out
[2025-12-01 21:02:51] SENT | seq=1 retries=2 payload=b'Hello with CLIENT 100% delay greater than its timeout'
[2025-12-01 21:02:52] Error receiving ACK: timed out
[2025-12-01 21:02:52] SENT | seq=1 retries=3 payload=b'Hello with CLIENT 100% delay greater than its timeout'
[2025-12-01 21:02:53] Error receiving ACK: timed out
[2025-12-01 21:02:53] SENT | seq=1 retries=4 payload=b'Hello with CLIENT 100% delay greater than its timeout'
[2025-12-01 21:02:54] RECEIVED ACK for seq=1
[2025-12-01 21:02:54] Message seq=1 delivered
^C
KeyboardInterrupt received. Exiting...
Closing socket...
[2025-12-01 21:03:13] Client stopped cleanly.
```

✓ 53s ✘

```

< > client.log x
.. source > reliable_udp > logs > client.log
1 [2025-12-01 21:02:20] Client sending to 192.168.0.18:4000
2 [2025-12-01 21:02:49] SENT | seq=1 retries=0 payload=b'Hello with CLIENT 100% delay greater than its timeout'
3 [2025-12-01 21:02:50] Error receiving ACK: timed out
4 [2025-12-01 21:02:50] SENT | seq=1 retries=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
5 [2025-12-01 21:02:51] Error receiving ACK: timed out
6 [2025-12-01 21:02:51] SENT | seq=1 retries=2 payload=b'Hello with CLIENT 100% delay greater than its timeout'
7 [2025-12-01 21:02:52] Error receiving ACK: timed out
8 [2025-12-01 21:02:52] SENT | seq=1 retries=3 payload=b'Hello with CLIENT 100% delay greater than its timeout'
9 [2025-12-01 21:02:53] Error receiving ACK: timed out
10 [2025-12-01 21:02:53] SENT | seq=1 retries=4 payload=b'Hello with CLIENT 100% delay greater than its timeout'
11 [2025-12-01 21:02:54] RECEIVED ACK for seq=1
12 [2025-12-01 21:02:54] Message seq=1 delivered
13 [2025-12-01 21:03:13] Client stopped cleanly.

```

Server:

```

~/De/b/COMP7005-project/s/reliable_udp main !5 python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 21:02:22] Server listening on 192.168.0.19:9001
[2025-12-01 21:02:50] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
Hello with CLIENT 100% delay greater than its timeout
[2025-12-01 21:02:50] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:02:51] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
Hello with CLIENT 100% delay greater than its timeout
[2025-12-01 21:02:51] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:02:53] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
Hello with CLIENT 100% delay greater than its timeout
[2025-12-01 21:02:53] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:02:54] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
Hello with CLIENT 100% delay greater than its timeout
[2025-12-01 21:02:54] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:02:55] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
Hello with CLIENT 100% delay greater than its timeout
[2025-12-01 21:02:55] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:02:56] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
Hello with CLIENT 100% delay greater than its timeout
[2025-12-01 21:02:56] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:02:57] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
Hello with CLIENT 100% delay greater than its timeout
[2025-12-01 21:02:57] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:02:59] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
Hello with CLIENT 100% delay greater than its timeout
[2025-12-01 21:02:59] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:03:00] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
Hello with CLIENT 100% delay greater than its timeout
[2025-12-01 21:03:02] SENT ACK to ('192.168.0.18', 4000) | ack=1
^C
Closing socket...
[2025-12-01 21:03:17] Server stopped cleanly.

```

```
... source > reliable_udp > logs > server.log
1 [2025-12-01 21:02:22] Server listening on 192.168.0.19:9001
2 [2025-12-01 21:02:50] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
3 [2025-12-01 21:02:50] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 21:02:51] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
5 [2025-12-01 21:02:51] SENT ACK to ('192.168.0.18', 4000) | ack=1
6 [2025-12-01 21:02:53] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
7 [2025-12-01 21:02:53] SENT ACK to ('192.168.0.18', 4000) | ack=1
8 [2025-12-01 21:02:54] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
9 [2025-12-01 21:02:54] SENT ACK to ('192.168.0.18', 4000) | ack=1
10 [2025-12-01 21:02:55] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
11 [2025-12-01 21:02:55] SENT ACK to ('192.168.0.18', 4000) | ack=1
12 [2025-12-01 21:02:56] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
13 [2025-12-01 21:02:56] SENT ACK to ('192.168.0.18', 4000) | ack=1
14 [2025-12-01 21:02:57] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
15 [2025-12-01 21:02:57] SENT ACK to ('192.168.0.18', 4000) | ack=1
16 [2025-12-01 21:02:59] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
17 [2025-12-01 21:02:59] SENT ACK to ('192.168.0.18', 4000) | ack=1
18 [2025-12-01 21:03:00] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
19 [2025-12-01 21:03:00] SENT ACK to ('192.168.0.18', 4000) | ack=1
20 [2025-12-01 21:03:02] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with CLIENT 100% delay greater than its timeout'
21 [2025-12-01 21:03:02] SENT ACK to ('192.168.0.18', 4000) | ack=1
22 [2025-12-01 21:03:17] Server stopped cleanly.
23
```

Proxy:

```

[2025-12-01 21:02:54] DELAY 1.307s (client -> server)
[2025-12-01 21:02:55] FORWARDED to server
[2025-12-01 21:02:55] FROM CLIENT ('192.168.0.164', 55834) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with CLIENT 100% delay greater than its timeout'
[2025-12-01 21:02:55] DELAY 1.145s (client -> server)
[2025-12-01 21:02:56] FORWARDED to client
[2025-12-01 21:02:56] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:02:56] FORWARD to client
[2025-12-01 21:02:56] FROM CLIENT ('192.168.0.164', 55834) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with CLIENT 100% delay greater than its timeout'
[2025-12-01 21:02:56] DELAY 1.246s (client -> server)
[2025-12-01 21:02:57] FORWARD to server
[2025-12-01 21:02:57] FROM CLIENT ('192.168.0.164', 55834) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with CLIENT 100% delay greater than its timeout'
[2025-12-01 21:02:57] DELAY 1.367s (client -> server)
[2025-12-01 21:02:59] FORWARD to server
[2025-12-01 21:02:59] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:02:59] FORWARD to client
[2025-12-01 21:02:59] FROM CLIENT ('192.168.0.164', 55834) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with CLIENT 100% delay greater than its timeout'
[2025-12-01 21:02:59] DELAY 1.368s (client -> server)
[2025-12-01 21:03:00] FORWARD to server
[2025-12-01 21:03:00] FROM CLIENT ('192.168.0.164', 55834) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello with CLIENT 100% delay greater than its timeout'
[2025-12-01 21:03:00] DELAY 1.467s (client -> server)
[2025-12-01 21:03:02] FORWARD to server
[2025-12-01 21:03:02] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello'
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:02] FORWARD to client
[2025-12-01 21:03:16] Proxy closed cleanly.

```

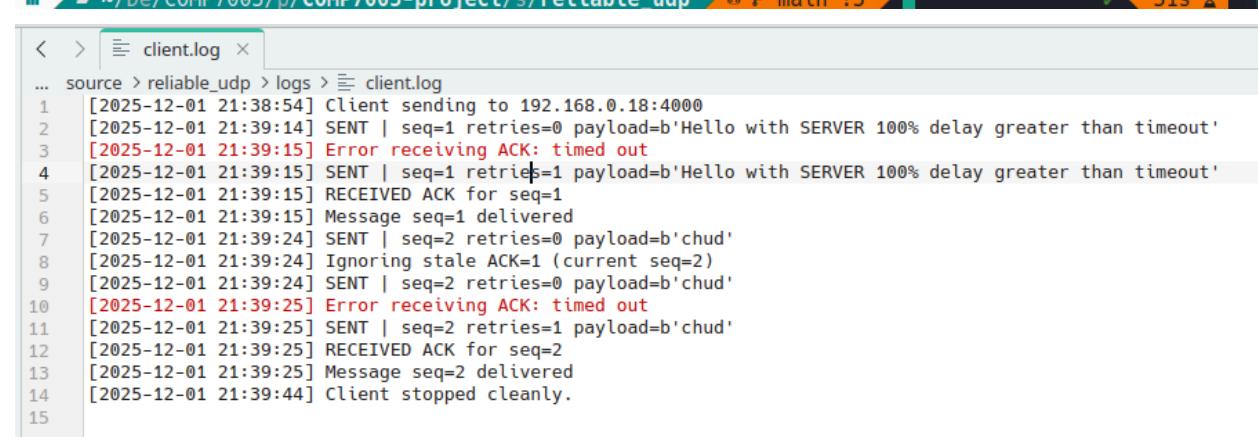
Test 5 — SERVER 100% delay, delay \geq client timeout

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
0	100	1000-1500

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 \ --listen-port 4000 \ --target-ip 192.168.0.19 \ --target-port 9001 \ --client-drop 0 \ --server-drop 0 \ --client-delay 0 \ --server-delay 100 \ --client-delay-time-min 0 \ --client-delay-time-max 0 \ --server-delay-time-min 1000 \ --server-delay-time-max 1500

Client:

```
~> ~/De/COMP7005/p/COMP7005-project/s/reliable_udp > main !5 python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 21:38:54] Client sending to 192.168.0.18:4000
Hello with SERVER 100% delay greater than timeout
[2025-12-01 21:39:14] SENT | seq=1 retries=0 payload=b'Hello with SERVER 100% delay greater than timeout'
[2025-12-01 21:39:15] Error receiving ACK: timed out
[2025-12-01 21:39:15] SENT | seq=1 retries=1 payload=b'Hello with SERVER 100% delay greater than timeout'
[2025-12-01 21:39:15] RECEIVED ACK for seq=1
[2025-12-01 21:39:15] Message seq=1 delivered
chud
[2025-12-01 21:39:24] SENT | seq=2 retries=0 payload=b'chud'
[2025-12-01 21:39:24] Ignoring stale ACK=1 (current seq=2)
[2025-12-01 21:39:24] SENT | seq=2 retries=0 payload=b'chud'
[2025-12-01 21:39:25] Error receiving ACK: timed out
[2025-12-01 21:39:25] SENT | seq=2 retries=1 payload=b'chud'
[2025-12-01 21:39:25] RECEIVED ACK for seq=2
[2025-12-01 21:39:25] Message seq=2 delivered
^C
KeyboardInterrupt received. Exiting...
Closing socket...
[2025-12-01 21:39:44] Client stopped cleanly.
```



```
client.log >
...
... source > reliable_udp > logs > client.log
1 [2025-12-01 21:38:54] Client sending to 192.168.0.18:4000
2 [2025-12-01 21:39:14] SENT | seq=1 retries=0 payload=b'Hello with SERVER 100% delay greater than timeout'
3 [2025-12-01 21:39:15] Error receiving ACK: timed out
4 [2025-12-01 21:39:15] SENT | seq=1 retries=1 payload=b'Hello with SERVER 100% delay greater than timeout'
5 [2025-12-01 21:39:15] RECEIVED ACK for seq=1
6 [2025-12-01 21:39:15] Message seq=1 delivered
7 [2025-12-01 21:39:24] SENT | seq=2 retries=0 payload=b'chud'
8 [2025-12-01 21:39:24] Ignoring stale ACK=1 (current seq=2)
9 [2025-12-01 21:39:24] SENT | seq=2 retries=0 payload=b'chud'
10 [2025-12-01 21:39:25] Error receiving ACK: timed out
11 [2025-12-01 21:39:25] SENT | seq=2 retries=1 payload=b'chud'
12 [2025-12-01 21:39:25] RECEIVED ACK for seq=2
13 [2025-12-01 21:39:25] Message seq=2 delivered
14 [2025-12-01 21:39:44] Client stopped cleanly.
15
```

Server:

```
~> ~/De/b/COMP7005-project/s/reliable_udp > main !5 python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 21:38:56] Server listening on 192.168.0.19:9001
[2025-12-01 21:39:14] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% delay greater than timeout'
Hello with SERVER 100% delay greater than timeout
[2025-12-01 21:39:14] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:39:15] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% delay greater than timeout'
Hello with SERVER 100% delay greater than timeout
[2025-12-01 21:39:15] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:39:24] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'chud'
chud
[2025-12-01 21:39:24] SENT ACK to ('192.168.0.18', 4000) | ack=2
[2025-12-01 21:39:24] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'chud'
chud
[2025-12-01 21:39:24] SENT ACK to ('192.168.0.18', 4000) | ack=2
[2025-12-01 21:39:26] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'chud'
chud
[2025-12-01 21:39:26] SENT ACK to ('192.168.0.18', 4000) | ack=2
^C
Closing socket...
[2025-12-01 21:39:42] Server stopped cleanly.
```

```
... source > reliable_udp > logs > server.log
1 [2025-12-01 21:38:56] Server listening on 192.168.0.19:9001
2 [2025-12-01 21:39:14] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% delay greater than timeout'
3 [2025-12-01 21:39:14] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 21:39:15] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello with SERVER 100% delay greater than timeout'
5 [2025-12-01 21:39:15] SENT ACK to ('192.168.0.18', 4000) | ack=1
6 [2025-12-01 21:39:24] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'chud'
7 [2025-12-01 21:39:24] SENT ACK to ('192.168.0.18', 4000) | ack=2
8 [2025-12-01 21:39:24] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'chud'
9 [2025-12-01 21:39:24] SENT ACK to ('192.168.0.18', 4000) | ack=2
10 [2025-12-01 21:39:26] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'chud'
11 [2025-12-01 21:39:26] SENT ACK to ('192.168.0.18', 4000) | ack=2
12 [2025-12-01 21:39:42] Server stopped cleanly.
13
```

Proxy:

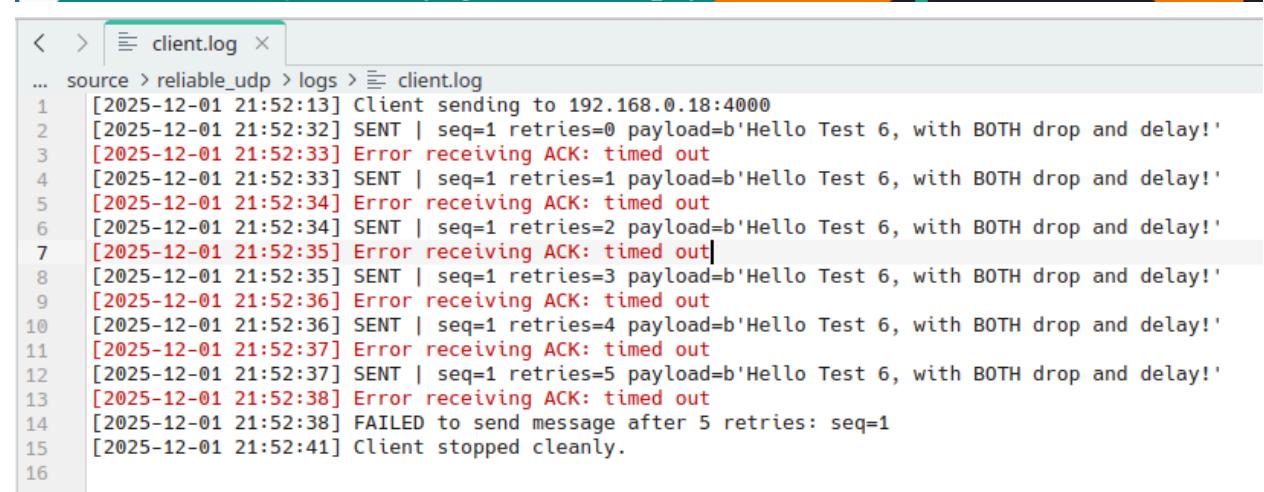
Test 6 — BOTH 50% drop, 50% delay (delay \geq timeout)

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
50	50	1000-2000

Client	Server	Proxy
<pre>python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5</pre>	<pre>python3 server.py --listen-ip 192.168.0.19 --listen-port 9001</pre>	<pre>python3 proxy.py \ --listen-ip 192.168.0.18 --listen-port 4000 \ --target-ip 192.168.0.19 --target-port 9001 \ --client-drop 50 --server-drop 50 \ --client-delay 50 --server-delay 50 \ --client-delay-time-min 1000 --client-delay-time-max 2000 \ --server-delay-time-min 1000 --server-delay-time-max 2000</pre>

Client:

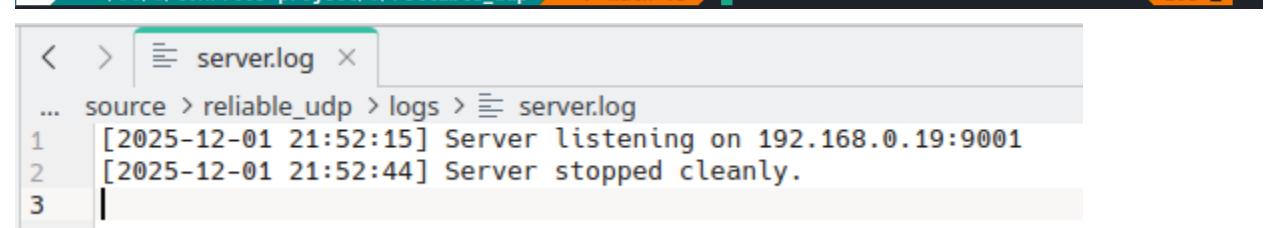
```
~/.De/COMP7005/p/COMP7005-project/s/reliable_udp > main !5 python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 21:52:13] Client sending to 192.168.0.18:4000
Hello Test 6, with BOTH drop and delay!
[2025-12-01 21:52:32] SENT | seq=1 retries=0 payload=b'Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:33] Error receiving ACK: timed out
[2025-12-01 21:52:33] SENT | seq=1 retries=1 payload=b'Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:34] Error receiving ACK: timed out
[2025-12-01 21:52:34] SENT | seq=1 retries=2 payload=b'Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:35] Error receiving ACK: timed out
[2025-12-01 21:52:35] SENT | seq=1 retries=3 payload=b'Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:36] Error receiving ACK: timed out
[2025-12-01 21:52:36] SENT | seq=1 retries=4 payload=b'Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:37] Error receiving ACK: timed out
[2025-12-01 21:52:37] SENT | seq=1 retries=5 payload=b'Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:38] Error receiving ACK: timed out
[2025-12-01 21:52:38] FAILED to send message after 5 retries: seq=1
^C
KeyboardInterrupt received. Exiting...
Closing socket...
[2025-12-01 21:52:41] Client stopped cleanly.
```



```
< > client.log x
... source > reliable_udp > logs > client.log
1 [2025-12-01 21:52:13] Client sending to 192.168.0.18:4000
2 [2025-12-01 21:52:32] SENT | seq=1 retries=0 payload=b'Hello Test 6, with BOTH drop and delay!'
3 [2025-12-01 21:52:33] Error receiving ACK: timed out
4 [2025-12-01 21:52:33] SENT | seq=1 retries=1 payload=b'Hello Test 6, with BOTH drop and delay!'
5 [2025-12-01 21:52:34] Error receiving ACK: timed out
6 [2025-12-01 21:52:34] SENT | seq=1 retries=2 payload=b'Hello Test 6, with BOTH drop and delay!'
7 [2025-12-01 21:52:35] Error receiving ACK: timed out
8 [2025-12-01 21:52:35] SENT | seq=1 retries=3 payload=b'Hello Test 6, with BOTH drop and delay!'
9 [2025-12-01 21:52:36] Error receiving ACK: timed out
10 [2025-12-01 21:52:36] SENT | seq=1 retries=4 payload=b'Hello Test 6, with BOTH drop and delay!'
11 [2025-12-01 21:52:37] Error receiving ACK: timed out
12 [2025-12-01 21:52:37] SENT | seq=1 retries=5 payload=b'Hello Test 6, with BOTH drop and delay!'
13 [2025-12-01 21:52:38] Error receiving ACK: timed out
14 [2025-12-01 21:52:38] FAILED to send message after 5 retries: seq=1
15 [2025-12-01 21:52:41] Client stopped cleanly.
16
```

Server:

```
~/.De/b/COMP7005-project/s/reliable_udp > main !5 python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 21:52:15] Server listening on 192.168.0.19:9001
^C
Closing socket...
[2025-12-01 21:52:44] Server stopped cleanly.
```



```
< > server.log x
... source > reliable_udp > logs > server.log
1 [2025-12-01 21:52:15] Server listening on 192.168.0.19:9001
2 [2025-12-01 21:52:44] Server stopped cleanly.
3
```

Proxy:

```

Proxy shutting down...
[2025-12-01 21:51:51] Proxy closed cleanly.
developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ python3 proxy.py --listen-ip 192.168.0.18 --listen-port 4000 --target-ip 192.168.0.19 --target-port 9001 --client-drop 50 --server-drop 50 --client-delay 50 --server-delay 50 --client-delay-time-min 1000 --client-delay-time-max 2000 --server-delay-time-min 1000 --server-delay-time-max 2000
[2025-12-01 21:52:14] Proxy listening on 192.168.0.18:4000
[2025-12-01 21:52:32] Detected FIRST client: ('192.168.0.164', 47638)
[2025-12-01 21:52:32] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:32] DROP (client -> server)
[2025-12-01 21:52:33] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:33] DROP (client -> server)
[2025-12-01 21:52:34] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:34] DROP (client -> server)
[2025-12-01 21:52:36] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:36] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:37] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:37] DROP (client -> server)
[2025-12-01 21:52:37] DROP (client -> server)
^C
Proxy shutting down...
[2025-12-01 21:52:43] Proxy closed cleanly.
developer@lab-18:~/Desktop/brandon-project/COMP7005-project/source/reliable_udp$ 

```

```

[2025-12-01 21:52:14] Proxy listening on 192.168.0.18:4000
[2025-12-01 21:52:32] Detected FIRST client: ('192.168.0.164', 47638)
[2025-12-01 21:52:32] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:32] DROP (client -> server)
[2025-12-01 21:52:33] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:33] DROP (client -> server)
[2025-12-01 21:52:34] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:34] DROP (client -> server)
[2025-12-01 21:52:36] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:36] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:37] FROM CLIENT ('192.168.0.164', 47638) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello Test 6, with BOTH drop and delay!'
[2025-12-01 21:52:37] DROP (client -> server)
[2025-12-01 21:52:43] Proxy closed cleanly.

```

Test 6 — CLIENT 50% drop, 50% delay (delay ≥ timeout)

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
50	50	1000-2000

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 \ --listen-port 4000 \ --target-ip 192.168.0.19 \ --target-port 9001 \ --client-drop 50 \ --server-drop 0 \ --client-delay 50 \ --server-delay 0 \ --client-delay-time-min

		1000 --client-delay-time-max 2000 \ --server-delay-time-min 0 --server-delay-time-max 0
--	--	--

Client:

```
m ➤ ~ /De/COMP7005/p/COMP7005-project/s/reliable_udp ➤ P main !5 ➤ python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5
[2025-12-01 21:55:11] Client sending to 192.168.0.18:4000
Hello CLIENT drop and delay!
[2025-12-01 21:55:25] SENT | seq=1 retries=0 payload=b'Hello CLIENT drop and delay!'
[2025-12-01 21:55:26] Error receiving ACK: timed out
[2025-12-01 21:55:26] SENT | seq=1 retries=1 payload=b'Hello CLIENT drop and delay!'
[2025-12-01 21:55:27] Error receiving ACK: timed out
[2025-12-01 21:55:27] SENT | seq=1 retries=2 payload=b'Hello CLIENT drop and delay!'
[2025-12-01 21:55:28] Error receiving ACK: timed out
[2025-12-01 21:55:28] SENT | seq=1 retries=3 payload=b'Hello CLIENT drop and delay!'
[2025-12-01 21:55:28] RECEIVED ACK for seq=1
[2025-12-01 21:55:28] Message seq=1 delivered
test
[2025-12-01 21:55:40] SENT | seq=2 retries=0 payload=b'test'
[2025-12-01 21:55:40] Ignoring stale ACK=1 (current seq=2)
[2025-12-01 21:55:40] SENT | seq=2 retries=0 payload=b'test'
[2025-12-01 21:55:41] Error receiving ACK: timed out
[2025-12-01 21:55:41] SENT | seq=2 retries=1 payload=b'test'
[2025-12-01 21:55:42] Error receiving ACK: timed out
[2025-12-01 21:55:42] SENT | seq=2 retries=2 payload=b'test'
[2025-12-01 21:55:43] Error receiving ACK: timed out
[2025-12-01 21:55:43] SENT | seq=2 retries=3 payload=b'test'
[2025-12-01 21:55:43] RECEIVED ACK for seq=2
[2025-12-01 21:55:43] Message seq=2 delivered
^C
KeyboardInterrupt received. Exiting...
Closing socket...
[2025-12-01 21:55:48] Client stopped cleanly.
```

```

< > client.log x
... source > reliable_udp > logs > client.log
1 [2025-12-01 21:55:11] Client sending to 192.168.0.18:4000
2 [2025-12-01 21:55:25] SENT | seq=1 retries=0 payload=b'Hello CLIENT drop and delay!'
3 [2025-12-01 21:55:26] Error receiving ACK: timed out
4 [2025-12-01 21:55:26] SENT | seq=1 retries=1 payload=b'Hello CLIENT drop and delay!'
5 [2025-12-01 21:55:27] Error receiving ACK: timed out
6 [2025-12-01 21:55:27] SENT | seq=1 retries=2 payload=b'Hello CLIENT drop and delay!'
7 [2025-12-01 21:55:28] Error receiving ACK: timed out
8 [2025-12-01 21:55:28] SENT | seq=1 retries=3 payload=b'Hello CLIENT drop and delay!'
9 [2025-12-01 21:55:28] RECEIVED ACK for seq=1
10 [2025-12-01 21:55:28] Message seq=1 delivered
11 [2025-12-01 21:55:40] SENT | seq=2 retries=0 payload=b'test'
12 [2025-12-01 21:55:40] Ignoring stale ACK=1 (current seq=2)
13 [2025-12-01 21:55:40] SENT | seq=2 retries=0 payload=b'test'
14 [2025-12-01 21:55:41] Error receiving ACK: timed out
15 [2025-12-01 21:55:41] SENT | seq=2 retries=1 payload=b'test'
16 [2025-12-01 21:55:42] Error receiving ACK: timed out
17 [2025-12-01 21:55:42] SENT | seq=2 retries=2 payload=b'test'
18 [2025-12-01 21:55:43] Error receiving ACK: timed out
19 [2025-12-01 21:55:43] SENT | seq=2 retries=3 payload=b'test'
20 [2025-12-01 21:55:43] RECEIVED ACK for seq=2
21 [2025-12-01 21:55:43] Message seq=2 delivered
22 [2025-12-01 21:55:48] Client stopped cleanly.
23

```

Server:

```

~> ~/De/b/COMP7005-project/s/reliable_udp > main !5 python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 21:55:12] Server listening on 192.168.0.19:9001
[2025-12-01 21:55:26] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello CLIENT drop and delay!'
Hello CLIENT drop and delay!
[2025-12-01 21:55:26] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:55:28] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello CLIENT drop and delay!'
Hello CLIENT drop and delay!
[2025-12-01 21:55:28] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:55:41] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'test'
test
[2025-12-01 21:55:41] SENT ACK to ('192.168.0.18', 4000) | ack=2
[2025-12-01 21:55:43] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'test'
test
[2025-12-01 21:55:43] SENT ACK to ('192.168.0.18', 4000) | ack=2
[2025-12-01 21:55:44] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'test'
test
[2025-12-01 21:55:44] SENT ACK to ('192.168.0.18', 4000) | ack=2
^C
Closing socket...
[2025-12-01 21:55:53] Server stopped cleanly.
~> ~/De/b/COMP7005-project/s/reliable_udp > main !5

```

```

< > server.log x
... source > reliable_udp > logs > server.log
1 [2025-12-01 21:55:12] Server listening on 192.168.0.19:9001
2 [2025-12-01 21:55:26] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello CLIENT drop and delay!'
3 [2025-12-01 21:55:26] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 21:55:28] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello CLIENT drop and delay!'
5 [2025-12-01 21:55:28] SENT ACK to ('192.168.0.18', 4000) | ack=1
6 [2025-12-01 21:55:41] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'test'
7 [2025-12-01 21:55:41] SENT ACK to ('192.168.0.18', 4000) | ack=2
8 [2025-12-01 21:55:43] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'test'
9 [2025-12-01 21:55:43] SENT ACK to ('192.168.0.18', 4000) | ack=2
10 [2025-12-01 21:55:44] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'test'
11 [2025-12-01 21:55:44] SENT ACK to ('192.168.0.18', 4000) | ack=2
12 [2025-12-01 21:55:53] Server stopped cleanly.
13

```

Proxy:

Open ▾

proxy.log

~/Desktop/brandon-project/COMP7005-project/source/reliable_udp/logs

proxy.py

```
[2025-12-01 21:55:10] Proxy listening on 192.168.0.18:4000
[2025-12-01 21:55:25] Detected FIRST client: ('192.168.0.164', 44527)
[2025-12-01 21:55:25] FROM CLIENT ('192.168.0.164', 44527) | b'\x00\x00\x00\x01\x00\x00\x00\x00Hello' CLIENT drop and delay!
[2025-12-01 21:55:25] DELAY 1.854s (client -> server)
[2025-12-01 21:55:26] FORWARDED to server
[2025-12-01 21:55:26] FROM CLIENT ('192.168.0.164', 44527) | b'\x00\x00\x00\x01\x00\x00\x00\x00Hello' CLIENT drop and delay!
[2025-12-01 21:55:26] DELAY 1.521s (client -> server)
[2025-12-01 21:55:28] FORWARDED to server
[2025-12-01 21:55:28] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x01\x00'
[2025-12-01 21:55:28] FORWARDED to client
[2025-12-01 21:55:28] FROM CLIENT ('192.168.0.164', 44527) | b'\x00\x00\x00\x01\x00\x00\x00\x00Hello' CLIENT drop and delay!
[2025-12-01 21:55:28] DROP (client -> server)
[2025-12-01 21:55:28] FROM CLIENT ('192.168.0.164', 44527) | b'\x00\x00\x00\x01\x00\x00\x00\x00Hello' CLIENT drop and delay!
[2025-12-01 21:55:28] DROP (client -> server)
[2025-12-01 21:55:28] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x01\x00'
[2025-12-01 21:55:28] FORWARDED to client
[2025-12-01 21:55:40] FROM CLIENT ('192.168.0.164', 44527) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00test'
[2025-12-01 21:55:40] DROP (client -> server)
[2025-12-01 21:55:40] FROM CLIENT ('192.168.0.164', 44527) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00test'
[2025-12-01 21:55:40] DELAY 1.612s (client -> server)
[2025-12-01 21:55:41] FORWARDED to server
[2025-12-01 21:55:41] FROM CLIENT ('192.168.0.164', 44527) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00test'
[2025-12-01 21:55:41] DELAY 1.672s (client -> server)
[2025-12-01 21:55:43] FORWARDED to server
[2025-12-01 21:55:43] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x02\x00\x01'
[2025-12-01 21:55:43] FORWARDED to client
[2025-12-01 21:55:43] FROM CLIENT ('192.168.0.164', 44527) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00test'
[2025-12-01 21:55:43] DELAY 1.439s (client -> server)
[2025-12-01 21:55:44] FORWARDED to server
[2025-12-01 21:55:44] FROM CLIENT ('192.168.0.164', 44527) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00test'
[2025-12-01 21:55:44] DROP (client -> server)
[2025-12-01 21:55:44] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x02\x00\x01'
[2025-12-01 21:55:44] FORWARDED to client
[2025-12-01 21:55:44] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x00\x00\x00\x00\x02\x00\x01'
[2025-12-01 21:55:44] FORWARDED to client
[2025-12-01 21:55:50] Proxy closed cleanly.
```

Test 6 — SERVER 50% drop, 50% delay (delay ≥ timeout)

Drop Chance (%)	Delay Chance(%)	Delay Time (ms range)
50	50	1000-2000

Client	Server	Proxy
python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5	python3 server.py --listen-ip 192.168.0.19 --listen-port 9001	python3 proxy.py \ --listen-ip 192.168.0.18 \ --listen-port 4000 \ --target-ip 192.168.0.19 \ --target-port 9001 \ --max-retries 5

```
--client-drop 0  
--server-drop 50 \  
    --client-delay 0  
--server-delay 50 \  
    --client-delay-time-min 0  
--client-delay-time-max 0 \  
    --server-delay-time-min  
1000 --server-delay-time-max  
2000
```

Client:

```
▶ ~ /De/COMP7005/p/COMP7005-project/s/reliable_udp > p main !5 ➤ python3 client.py --target-ip 192.168.0.18 --target-port 4000 --timeout 1 --max-retries 5  
[2025-12-01 21:58:01] Client sending to 192.168.0.18:4000  
Hello SERVER 50% drop and 50% chance with delay!  
[2025-12-01 21:58:27] SENT | seq=1 retries=0 payload=b'Hello SERVER 50% drop and 50% chance with d  
elay!'  
[2025-12-01 21:58:28] Error receiving ACK: timed out  
[2025-12-01 21:58:28] SENT | seq=1 retries=1 payload=b'Hello SERVER 50% drop and 50% chance with d  
elay!'  
[2025-12-01 21:58:29] Error receiving ACK: timed out  
[2025-12-01 21:58:29] SENT | seq=1 retries=2 payload=b'Hello SERVER 50% drop and 50% chance with d  
elay!'  
[2025-12-01 21:58:30] Error receiving ACK: timed out  
[2025-12-01 21:58:30] SENT | seq=1 retries=3 payload=b'Hello SERVER 50% drop and 50% chance with d  
elay!'  
[2025-12-01 21:58:31] Error receiving ACK: timed out  
[2025-12-01 21:58:31] SENT | seq=1 retries=4 payload=b'Hello SERVER 50% drop and 50% chance with d  
elay!'  
[2025-12-01 21:58:32] RECEIVED ACK for seq=1  
[2025-12-01 21:58:32] Message seq=1 delivered  
again!  
[2025-12-01 21:58:36] SENT | seq=2 retries=0 payload=b'again!'  
[2025-12-01 21:58:37] Error receiving ACK: timed out  
[2025-12-01 21:58:37] SENT | seq=2 retries=1 payload=b'again!'  
[2025-12-01 21:58:38] Error receiving ACK: timed out  
[2025-12-01 21:58:38] SENT | seq=2 retries=2 payload=b'again!'  
[2025-12-01 21:58:39] Error receiving ACK: timed out  
[2025-12-01 21:58:39] SENT | seq=2 retries=3 payload=b'again!'  
[2025-12-01 21:58:39] RECEIVED ACK for seq=2  
[2025-12-01 21:58:39] Message seq=2 delivered  
^C  
KeyboardInterrupt received. Exiting...  
  
Closing socket...  
[2025-12-01 21:58:42] Client stopped cleanly.
```

✓ 42s ✎

```

< > client.log x
... source > reliable_udp > logs > client.log
1 [2025-12-01 21:58:01] Client sending to 192.168.0.18:4000
2 [2025-12-01 21:58:27] SENT | seq=1 retries=0 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
3 [2025-12-01 21:58:28] Error receiving ACK: timed out
4 [2025-12-01 21:58:28] SENT | seq=1 retries=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
5 [2025-12-01 21:58:29] Error receiving ACK: timed out
6 [2025-12-01 21:58:29] SENT | seq=1 retries=2 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
7 [2025-12-01 21:58:30] Error receiving ACK: timed out
8 [2025-12-01 21:58:30] SENT | seq=1 retries=3 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
9 [2025-12-01 21:58:31] Error receiving ACK: timed out
10 [2025-12-01 21:58:31] SENT | seq=1 retries=4 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
11 [2025-12-01 21:58:32] RECEIVED ACK for seq=1
12 [2025-12-01 21:58:32] Message seq=1 delivered
13 [2025-12-01 21:58:36] SENT | seq=2 retries=0 payload=b'again!'
14 [2025-12-01 21:58:37] Error receiving ACK: timed out
15 [2025-12-01 21:58:37] SENT | seq=2 retries=1 payload=b'again!'
16 [2025-12-01 21:58:38] Error receiving ACK: timed out
17 [2025-12-01 21:58:38] SENT | seq=2 retries=2 payload=b'again!'
18 [2025-12-01 21:58:39] Error receiving ACK: timed out
19 [2025-12-01 21:58:39] SENT | seq=2 retries=3 payload=b'again!'
20 [2025-12-01 21:58:39] RECEIVED ACK for seq=2
21 [2025-12-01 21:58:39] Message seq=2 delivered
22 [2025-12-01 21:58:42] Client stopped cleanly.
23

```

Server:

```

~/De/b/COMP7005-project/s/reliable_udp main !5 python3 server.py --listen-ip 192.168.0.19 --listen-port 9001
[2025-12-01 21:57:59] Server listening on 192.168.0.19:9001
[2025-12-01 21:58:27] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
Hello SERVER 50% drop and 50% chance with delay!
[2025-12-01 21:58:27] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:58:28] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
Hello SERVER 50% drop and 50% chance with delay!
[2025-12-01 21:58:28] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:58:29] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
Hello SERVER 50% drop and 50% chance with delay!
[2025-12-01 21:58:29] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:58:30] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
Hello SERVER 50% drop and 50% chance with delay!
[2025-12-01 21:58:30] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:58:32] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
Hello SERVER 50% drop and 50% chance with delay!
[2025-12-01 21:58:32] SENT ACK to ('192.168.0.18', 4000) | ack=1
[2025-12-01 21:58:36] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again!'
again!
[2025-12-01 21:58:36] SENT ACK to ('192.168.0.18', 4000) | ack=2
[2025-12-01 21:58:37] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again!'
again!
[2025-12-01 21:58:37] SENT ACK to ('192.168.0.18', 4000) | ack=2
[2025-12-01 21:58:39] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again!'
again!
[2025-12-01 21:58:39] SENT ACK to ('192.168.0.18', 4000) | ack=2
[2025-12-01 21:58:41] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again!'
again!
[2025-12-01 21:58:41] SENT ACK to ('192.168.0.18', 4000) | ack=2
^C
Closing socket...
[2025-12-01 21:58:47] Server stopped cleanly.

```

48s

```
... source > reliable_udp > logs > server.log
1 [2025-12-01 21:57:59] Server listening on 192.168.0.19:9001
2 [2025-12-01 21:58:27] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
3 [2025-12-01 21:58:27] SENT ACK to ('192.168.0.18', 4000) | ack=1
4 [2025-12-01 21:58:28] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
5 [2025-12-01 21:58:28] SENT ACK to ('192.168.0.18', 4000) | ack=1
6 [2025-12-01 21:58:29] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
7 [2025-12-01 21:58:29] SENT ACK to ('192.168.0.18', 4000) | ack=1
8 [2025-12-01 21:58:30] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
9 [2025-12-01 21:58:30] SENT ACK to ('192.168.0.18', 4000) | ack=1
10 [2025-12-01 21:58:32] RECEIVED from ('192.168.0.18', 4000) | seq=1 payload=b'Hello SERVER 50% drop and 50% chance with delay!'
11 [2025-12-01 21:58:32] SENT ACK to ('192.168.0.18', 4000) | ack=1
12 [2025-12-01 21:58:36] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again!'
13 [2025-12-01 21:58:36] SENT ACK to ('192.168.0.18', 4000) | ack=2
14 [2025-12-01 21:58:37] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again!'
15 [2025-12-01 21:58:37] SENT ACK to ('192.168.0.18', 4000) | ack=2
16 [2025-12-01 21:58:39] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again!'
17 [2025-12-01 21:58:39] SENT ACK to ('192.168.0.18', 4000) | ack=2
18 [2025-12-01 21:58:41] RECEIVED from ('192.168.0.18', 4000) | seq=2 payload=b'again!'
19 [2025-12-01 21:58:41] SENT ACK to ('192.168.0.18', 4000) | ack=2
20 [2025-12-01 21:58:47] Server stopped cleanly.
21
```

Proxy:

Open ▾



proxy.log

~/Desktop/brandon-project/COMP7005-project/source/reliable_udp/logs

proxy.py

proxy.l

```
[2025-12-01 21:58:02] Proxy listening on 192.168.0.18:4000
[2025-12-01 21:58:27] Detected FIRST client: ('192.168.0.164', 45766)
[2025-12-01 21:58:27] FROM CLIENT ('192.168.0.164', 45766) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:27] FORWARDED to server
[2025-12-01 21:58:27] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:27] DROP (server -> client)
[2025-12-01 21:58:28] FROM CLIENT ('192.168.0.164', 45766) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:28] FORWARDED to server
[2025-12-01 21:58:28] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:28] FORWARDED to server
[2025-12-01 21:58:28] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:28] DROP (server -> client)
[2025-12-01 21:58:29] FROM CLIENT ('192.168.0.164', 45766) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:29] FORWARDED to server
[2025-12-01 21:58:29] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:29] FORWARDED to server
[2025-12-01 21:58:29] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:29] DROP (server -> client)
[2025-12-01 21:58:30] FROM CLIENT ('192.168.0.164', 45766) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:30] FORWARDED to server
[2025-12-01 21:58:30] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:30] FORWARDED to server
[2025-12-01 21:58:30] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:30] DELAY 1.067s (server -> client)
[2025-12-01 21:58:32] FORWARDED to client
[2025-12-01 21:58:32] FROM CLIENT ('192.168.0.164', 45766) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:32] FORWARDED to server
[2025-12-01 21:58:32] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:32] FORWARDED to client
[2025-12-01 21:58:32] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x01\x00\x00\x00\x00\x00Hello SERVER 50% drop and 50% chance with delay!'
[2025-12-01 21:58:32] DROP (server -> client)
[2025-12-01 21:58:36] FROM CLIENT ('192.168.0.164', 45766) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00again!'
[2025-12-01 21:58:36] FORWARDED to server
[2025-12-01 21:58:36] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00again!'
[2025-12-01 21:58:36] FORWARDED to client
[2025-12-01 21:58:36] DROP (server -> client)
[2025-12-01 21:58:37] FROM CLIENT ('192.168.0.164', 45766) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00again!'
[2025-12-01 21:58:37] FORWARDED to server
[2025-12-01 21:58:37] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00again!'
[2025-12-01 21:58:37] FORWARDED to client
[2025-12-01 21:58:37] DELAY 1.783s (server -> client)
[2025-12-01 21:58:39] FORWARDED to client
[2025-12-01 21:58:39] FROM CLIENT ('192.168.0.164', 45766) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00again!'
[2025-12-01 21:58:39] FORWARDED to server
[2025-12-01 21:58:39] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00again!'
[2025-12-01 21:58:39] FORWARDED to client
[2025-12-01 21:58:39] DELAY 1.864s (server -> client)
[2025-12-01 21:58:41] FORWARDED to client
[2025-12-01 21:58:41] FROM CLIENT ('192.168.0.164', 45766) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00again!'
[2025-12-01 21:58:41] FORWARDED to server
[2025-12-01 21:58:41] FROM SERVER ('192.168.0.19', 9001) | b'\x00\x00\x00\x02\x00\x00\x00\x00\x00again!'
[2025-12-01 21:58:41] FORWARDED to client
[2025-12-01 21:58:41] DROP (server -> client)
[2025-12-01 21:58:44] Proxy closed cleanly.
```