

A terminal window titled "TCP — -zsh — 80x24" with a dark background. The prompt is "yanzuwu@Yanzus-MBP TCP %". The command entered is "python receiver.py test/received.pdf 8082 192.168.1.42 8080". The cursor is at the end of the command.

```
yanzuwu@Yanzus-MBP TCP % python receiver.py test/received.pdf 8082 192.168.1.42 8080
```

Command to run receiver

A terminal window titled "TCP — -zsh — 80x24" with a dark background. The prompt is "yanzuwu@Yanzus-MBP TCP %". The command entered is "python sender.py test/sample.pdf 192.168.1.42 41192 10000 8080". The cursor is at the end of the command.

```
yanzuwu@Yanzus-MBP TCP % python sender.py test/sample.pdf 192.168.1.42 41192 10000 8080
```

Command to run sender

```
newudpl-1.7 — newudpl -i192.168.1.42:8080 -o192.168.1.42:8082 -B50 -...
yanzuwu@Yanzus-MBP newudpl-1.7 % ./newudpl -i192.168.1.42:8080 -o192.168.1.42:8082 -B50 -L10 -O10 -d0.2

Network emulator with UDP link
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Link established:
  yanzus-mbp.lan(192.168.1.42)/8080 ->
    Yanzus-MBP.lan(192.168.1.42)/41192
  /41193 ->
    yanzus-mbp.lan(192.168.1.42)/8082

emulating speed   : 1000 kb/s
delay             : 0.200000 sec
Ethernet          : 10 Mb/s
Queue buffersize  : 8192 bytes

error rate
  Random packet loss: 10%
  Bit error         : 50 (1/100000 per bit)
  Out of order      : 10%
  Jitter            : 0% of delay
```

Command to run simulator and parameters I used

```
message invalid
seqnum:126
message invalid
seqnum:125
message invalid
seqnum:123
message invalid
seqnum:2172
message invalid
seqnum:125
message invalid
seqnum:126
message invalid
seqnum:2147483771
message invalid
seqnum:124
message invalid
seqnum:125
message invalid
seqnum:126
message invalid
seqnum:123
message invalid
seqnum:92
message invalid
seqnum:125
message invalid
seqnum:126
message invalid
seqnum:123
message invalid
seqnum:125
message invalid
seqnum:126
message invalid
seqnum:123
message invalid
seqnum:124
message valid
seqnum:126
message invalid
seqnum:124
message invalid
seqnum:124
message invalid
seqnum:2173
message invalid
seqnum:126
message invalid
seqnum:126
message invalid
seqnum:124
message invalid
seqnum:124
message invalid
seqnum:125
message invalid
seqnum:126
message invalid
seqnum:125
message valid
seqnum:126
message valid
end of transfer
yanzuwu@Yanzus-MBP TCP %
```

sample console result from receiver

```

handle timeout
length of buffer:2
0
send buffered pkt 125
1
send buffered pkt 126
receive ack124
received ACK
receive ack124
received ACK
handle timeout
length of buffer:2
0
send buffered pkt 125
1
send buffered pkt 126
receive ack124
received ACK
receive ack124
received ACK
handle timeout
length of buffer:2
0
send buffered pkt 125
1
send buffered pkt 126
receive ack124
received ACK
receive ack124
received ACK
handle timeout
length of buffer:2
0
send buffered pkt 125
1
send buffered pkt 126
receive ack124
received ACK
receive ack124
received ACK
receive ack124
received ACK
handle timeout
length of buffer:2
0
send buffered pkt 125
1
send buffered pkt 126
receive ack124
received ACK
receive ack124
received ACK
receive ack125
ack matches send base and reset timeout value to 9.03680520285e-05
pop first one in buffer
reset timer
received ACK
handle timeout
length of buffer:1
0
send buffered pkt 126
receive ack126
ack matches send base and reset timeout value to 9.43675994899e-05
pop first one in buffer
receive all and stop timer
end of file
yanzuwu@Yanzus-MBP TCP % █

```

Sample console result from sender



```

--- Statistics ---
Total time      : 34.196527 sec
    received: 2269 packets with 1234414 bytes
    send      : 2026 packets with 1106880 bytes
Rejected from invalid host: 0 packets with 0 bytes

Dropped by congestion: 8556 packets) with 4918358 bytes

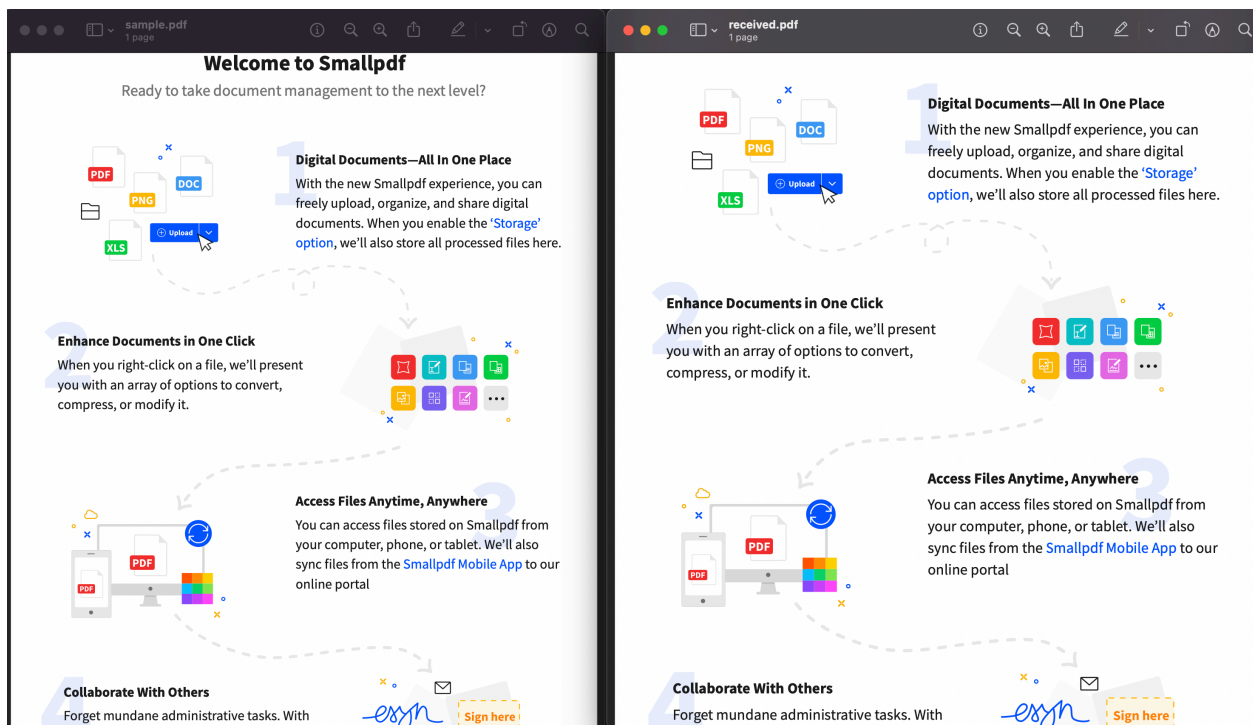
Errors emulated:
    Random packet loss: 243 packets = 12% of packets
    Bit error          : 4523 bits   = 51 (1/100000 per bit)
    Out of order        : 186 packets = 9.2%

Transfer speed
    receive: min 1.492 kb/s   max 1266666.666 kb/s
    send    : average 258.946 kb/s

yanzuyu@Yanzus-MBP newudpl-1.7 %

```

Sample final statistics from simulator



Sample result with original document