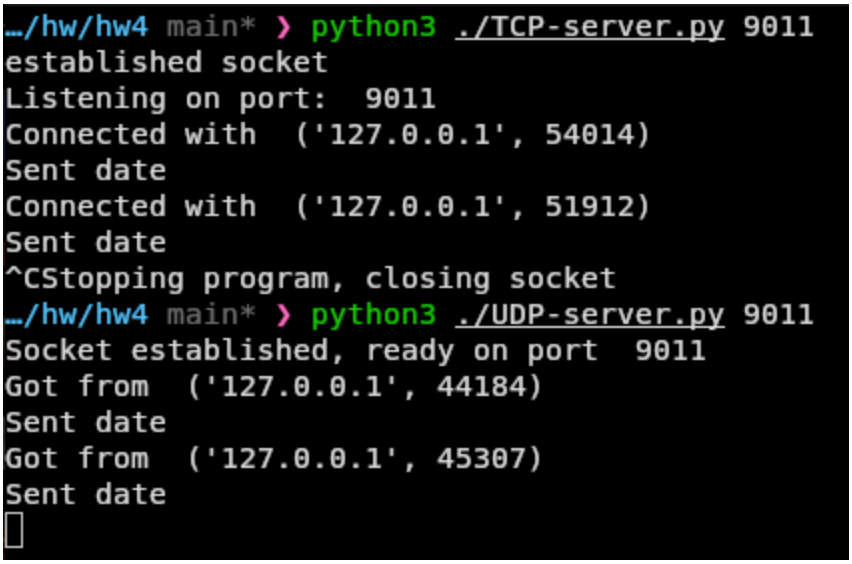
hw4

1. 
…/hw/hw4 main* ❯ python3 ./TCP-server.py 9011
established socket
Listening on port: 9011
Connected with ('127.0.0.1', 54014)
Sent date
Connected with ('127.0.0.1', 51912)
Sent date
^CStopping program, closing socket
…/hw/hw4 main* ❯ python3 ./UDP-server.py 9011
Socket established, ready on port 9011
Got from ('127.0.0.1', 44184)
Sent date
Got from ('127.0.0.1', 45307)
Sent date

```
…/hw/hw4 main* ❯ python3 ./TCP-client.py 127.0.0.1 9011
Established socket
Time delta (Establish connection with server):  0.49799999999999994  ms
Got packet, Server time:  2025-03-14 10:11:23.578927
Current time:  2025-03-14 10:11:23.586054
Time delta (client to server):  -6.944999999999999  ms
Time delta (server to client):  7.127  ms
Time delta (RTT for info):  0.182  ms
Time delta (info RTT + connection RTT):  0.68  ms
…/hw/hw4 main* ❯ python3 ./TCP-client.py 127.0.0.1 9011
Established socket
Time delta (Establish connection with server):  0.21000000000000002  ms
Got packet, Server time:  2025-03-14 10:11:32.009243
Current time:  2025-03-14 10:11:32.009456
Time delta (client to server):  0.049  ms
Time delta (server to client):  0.213  ms
Time delta (RTT for info):  0.262  ms
Time delta (info RTT + connection RTT):  0.472  ms
…/hw/hw4 main* ❯ python3 ./UDP-client.py 127.0.0.1 9011
Established socket
Sent message
Recieved message
Server time:  2025-03-14 10:12:01.250534
Current time:  2025-03-14 10:12:01.250761
Time delta (client to server):  0.38  ms
Time delta (server to client):  0.22699999999999998  ms
Time delta (Total RTT):  0.607  ms
…/hw/hw4 main* ❯ python3 ./UDP-client.py 127.0.0.1 9011
Established socket
Sent message
Recieved message
Server time:  2025-03-14 10:12:25.343900
Current time:  2025-03-14 10:12:25.344104
Time delta (client to server):  0.40299999999999997  ms
Time delta (server to client):  0.204  ms
Time delta (Total RTT):  0.607  ms
…/hw/hw4 main* ❯
```

2.
3. While my shown screenshots were a small sample size, I ran it a few more times and found that UDP was consistently faster than TCP but not by much. There was also high variability. Another oddity I noticed was that TCP was faster once the connection was established but that might be an anomaly since this is such a packet. When I ran this on a friend's computer, I found that TCP was much slower which is to be expected
4. For TCP, there is less time client to server which I think is due to my implementation. There is some processing delay especially with TCP dealing with ACK and the server having to do stuff before being able to record the time (whereas the user records time immediately). For UDP, it is a bit faster server to client but again this could be due to implementation or the fact that since UDP is connectionless there is no ACK packet to be sent back. There is also a lot of variability and the more I ran it the more inconsistent results I got as sometimes it was about the same.

5. The time of day did not affect it much. It was about the same no matter what. I did some at noon, some at 8pm and some at 3am and all of them were about the same. If there was any difference it was marginal. The location didn't make much of a difference either. I assume this is because it was self hosted. If this was a larger scale application, I would assume there would be slight differences during high volume times