SOCKET PROGRAMMING PROJECT

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TCP diagram:

A picture containing text, screenshot, parallel, diagram

Description automatically generated

UDP diagram:

A screenshot of a computer program

Description automatically generated with low confidence

Differences between UDP and TCP implementations:

TCP is a connection-oriented protocol, so it needs to establish a connection before being able to send any data. UDP is connection-less, so there is no need to wait for a connection before sending data: just create and bind a socket, and start sending data. We can already observe that UDP is faster than TCP, but at the price of reliability.

The diagrams are mostly the same, but there are some differences: UDP does not need a connection, so the server side socket will not need to listen and accept requests, like the TCP one. In both cases there is a loop happening, so the sockets remain open until there is no more data to be sent. In the case of UDP, after receiving the close signal, both the server and client close their sockets, with no further communication. This does not happen with TCP: if the client does not want to send any more messages, it will send a FIN packet to the server. The server receives this packet, and sends an ACK back. Now the client has closed his side of the connection: it can receive packets, but not send them. The server will do the same to close it’s side of the connection: send a FIN, and receive an ACK. Now that both client and server closed their connection, we can close the sockets to deallocate memory.

We can notice the differences between the two protocols using Wireshark:

TCP:

A screenshot of a computer

Description automatically generated

UDP:

A picture containing text, screenshot, software, multimedia software

Description automatically generated

In the TCP capture, a single message was sent from the client to the server, but if we check with Wireshark, we can see that there were actually 9 packets exchanged for a single message the reach the server. In the UDP capture, there were 2 messages sent, and a total of 3 packets exchanged ( the third packet is the close signal). We can see why UDP is faster but less reliable.