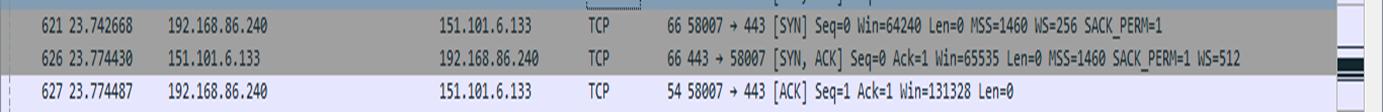
**Wireshark: Home Packet Capture and Analysis**

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**TCP Three-Way Handshake**

 The Transport Control Protocol (TCP) collaborates with the Internet Protocol (IP) and serves as the standard for ensuring a smooth connection between devices and a successful flow of information over the Internet. An established TCP connection is vital for the successful delivery of information across networks. It is beneficial from a security standpoint and allows a reliable and secure connection. It provides users with the ability to use the Internet with a higher level of efficiency and security. The TCP port 443 is the HTTPS protocol that manages the data packets and the network traffic between the client and server (Beardsley & Qian, 2010).

I ran Wireshark on my home network and connected to the dictionary.com website. The screenshot above demonstrates a successful connection between a client and server. In this case, the client would be my personal computer using a web browser and the server would be the software that supports and serves the website. For the TCP connection to be successful, there must be a three-way handshake. When I wanted to connect to the website, I had to make sure I could send data and request to connect to the website. This is shown by the action SYN, which means that the client sends a synchronization packet to the server. Packets are also labeled with their own sequence number to keep track of the bits/bytes of data being sent. Next, the server sends back a SYN/ACK packet. The SYN/ACK packet is sent to send back data, approve the connection, and acknowledge the client’s request and sequence number. Finally, the client sends back an ACK packet, which acknowledges the server’s previous actions and sequence number. The client only sends back an ACK to let the server know the message went through because it already knows that the information can travel each way. It is important to know that both the client and server must agree on and be aware of the initial sequence number chosen, which is a random value. If everything went smoothly and all connections between packets were successful, then a connection is made across networks. Once the connection is officially established, then information is ready to be transmitted (Hsu et al., 2016). The screenshot shows that my IP address sent a SYN packet to the IP address of the web server. Then the web server for dictionary.com sent back a SYN/ACK packet. Finally, my IP address sent an ACK packet, and a connection was established. This is evident when I can successfully load the dictionary.com website page.

A TCP three-way connection is important because it allows both the client and server to send and get information. If there was just a two-way connection, only one would be able to send a SYN and the other send an ACK back. This essentially means that only one would be able to send data. With a three-way connection, it enables a more smooth and reliable communication across networks, with both sides needing to have a sequence number and acknowledging each other. If the communication is successful, both the client and server know they can send the information to each other as well as approve the request for a connection. The way the sequence numbers work is first the client sends a sequence number for the SYN packet. Then, the server sends back its own sequence number for their SYN packet, but also adds 1 to the client’s initial sequence number (SYN packet) in the form of an ACK packet. Finally, the client adds 1 to the server’s initial sequence number (SYN packet) by sending an ACK packet. The reason why the sequence numbers are random and agreed upon is because it is necessary from a security standpoint. Random sequence numbers help prevent cyberattacks to the TCP connection. The three-way connection also provides the ability to detect errors and assess why a connection may not have been established (Beardsley & Qian, 2010).

**Conclusion**

In many ways, the collaboration of the TCP and IP provides the foundation for how reliable and efficient connections are made over the Internet. The TCP three-way handshake ensures that a connection is established between the client and server across networks, where both sides can both transmit and receive information by sending packets of data. Once the connection is successful, information can then be transmitted. It also provides many benefits, which includes a higher level of security, a method for checking flaws/errors, and better organization of information. Everyone who uses the Internet benefits from the TCP standards and three-way connection.

**References**

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