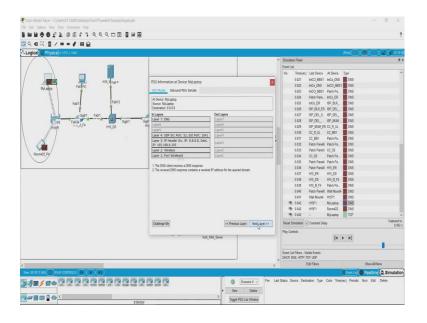
## Demystifying Networking Prof. Sridhar Iyer Department of Computer Science and Engineering Indian Institute of Technology, Bombay

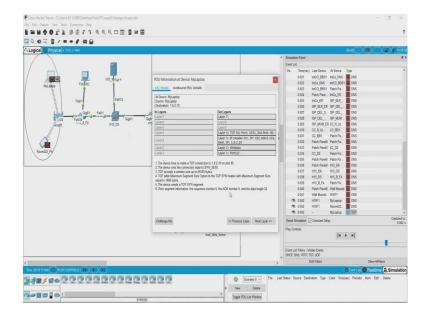
## Lecture - 60 TCP Connection Establishment

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After this, after DNS reply is received by the laptop, the response contains the IP address of the website.

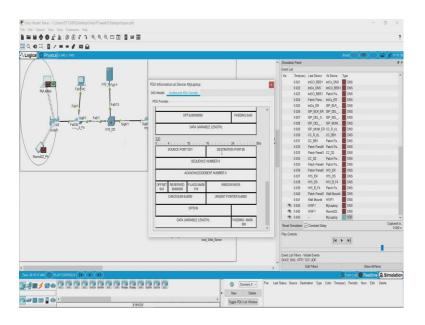
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So, in order to access the website, what the laptop does is, it initially establishes a TCP connection because HTTP works on top of TCP. If we can open this packet here we can see that the HTTP client makes a connection to the server which is actually done by the device trying to make a TCP connection. And we can see that here also port numbers are assigned, here the source port number is 1031 and destination port number is 80 which is the standard port number for HTTP services.

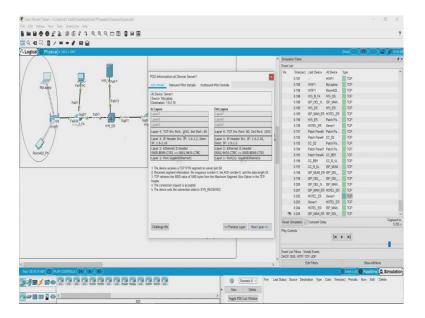
The laptop is trying to make a, start a TCP connection, in order to do that it has to set some parameters. Here we can see that the device sets the connection state to SYN\_SENT. TCP accepts a window size up to 65535 bytes. The information sent in the segment are - the sequence number is 0, the acknowledgement number is 0 and the data length is 24, since this is the very first packet that is being sent.

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And we can also see the TCP packet that is being sent here - the source number and the destination port numbers.

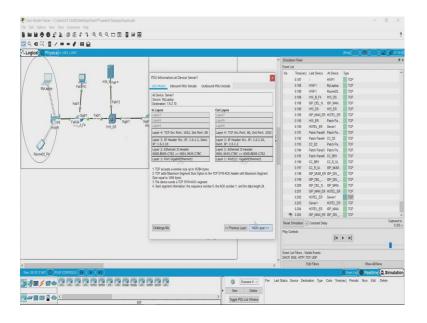
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Here if we see the first packet for TCP connection establishment from laptop has reached the hotel server. And we can see that here, the source port is 1032 and destination port is 80. We can see that the device receives a TCP SYN segment on server port 80 with some device segment information.

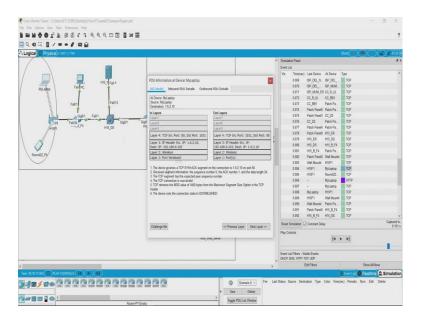
Now, the device, that is, the server sets the connection state to SYN\_RECEIVED.

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And then it sends a reply to the laptop as follows and it sends a TCP SYN-ACK segment back to the laptop. We have got the first response to our TCP packet, let us see what is there inside.

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Here the device receives a TCP SYN+ACK segment on the connection to 1.6.2.10 on port 80, this was the IP address of the website that we were trying to connect and we have received a SYN+ACK segment. And in the received segment we have the sequence number as 0 acknowledgement number 1 and the data length is 24.

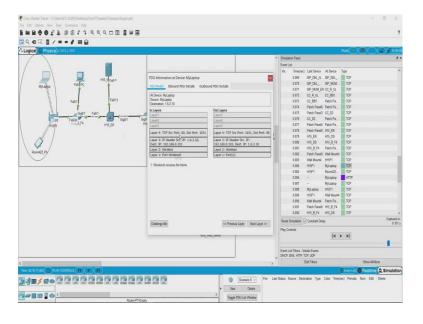
And TCP segment has the expected peer sequence number. So, it means that the TCP connection is successful and because of the successful connection TCP sends a TCP ACK segment.

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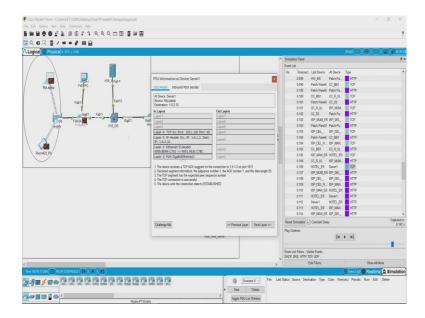


And this, the segment information in this segment are that sequence number here would be 1, acknowledgment number would be 1 and the data length is 20.

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And we can also see that the source port here is 80 and destination port is 1031 for the incoming packet and for the outgoing packet, the source port is 1031 and destination port is 80. If we compare the path travelled by the TCP packets we can actually see that, the packets follow the same path because TCP is a connection oriented protocol.



This packet here shows the final part of the three-way handshake for connection establishment in TCP. Here, I am looking at a packet received by the server of the hotel whose website we are accessing. The device receives a TCP acknowledgement segment on the connection to 1.6.1.2 on port 1031, and it has received some segment information like the sequence number acknowledgement number etcetera and the TCP segment has the expected peer sequence number.

So, the connection is successful and this device sets the connection state to establish. Now that TCP path has been set from the client to the server and the path is established and now the other protocol that is the HTTP which is working on top of TCP, can work.