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CSE 150 Computer Networking
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28 October 2020

Lab 2: HTTP, DNS, and TCP

Prelab Questions
https://www.ietf.org/rfc/rfc2616.txt
https://www.ietf.org/rfc/rfc1035.txt

HTTP Questions

1. **Choose 5 HTTP status codes and describe each one.**
   200 OK: the request succeeded, and the requested object is later in the message
   301 Moved Permanently: the request object is moved, and the new location is specified later in the message
   400 Bad Request: the request message is not understood by the server
   404 Not Found: the requested document is not found on this server
   505 HTTP Version Not Supported
2. **List the 8 HTTP 1.1 methods and explain what they do.**
   OPTIONS: allows the client to determine the options/requirements of a resource or the capabilities of a server without initiating resource retrieval.
   GET: retrieve the information by the request.
   HEAD: the same as GET except the server does not return the body of the message.
   POST: asks the origin server to accept the data in the request
   PUT: asks that the enclosed data be stored under the requested URI
   DELETE: asks the origin server to delete the specified resource
   TRACE: echos back input to the user
   CONNECT: starts a two-way communication with a requested resource
3. **Use wget on example.com to view the last modified date of the webpage. What was the HTTP return status given and what command was used to do this?**
   The HTTP return status is 200 OK. The GET command was used to do this.
4. **Look up the telnet command. Use telnet to connect to towel.blinkenlights.nl. What does this telnet server do?**
   This telnet server plays a text and character-based Star Wars animation.

DNS Questions

5. **In your own words describe what a DNS resource record (RR) is. Now using the command line tool nslookup find the MX resource record of ucsc.edu. What does this resource record mean?**
   A DNS resource record (RR) refers to the unit of information in DNS zone files, and they are utilized to solve DNS queries. MX stands for mail exchange, and it directs email

messages to a mail server. The MX record shows how the emails should be routed with SMTP.

6. **What does the command nslookup -type=ns . do? Explain its output.**
   The command nslookup means “name server look up”, and is used to locate the IP address that corresponds to a host or domain name which corresponds to an IP address. The parameter -type=ns . denotes the query type to be name server.

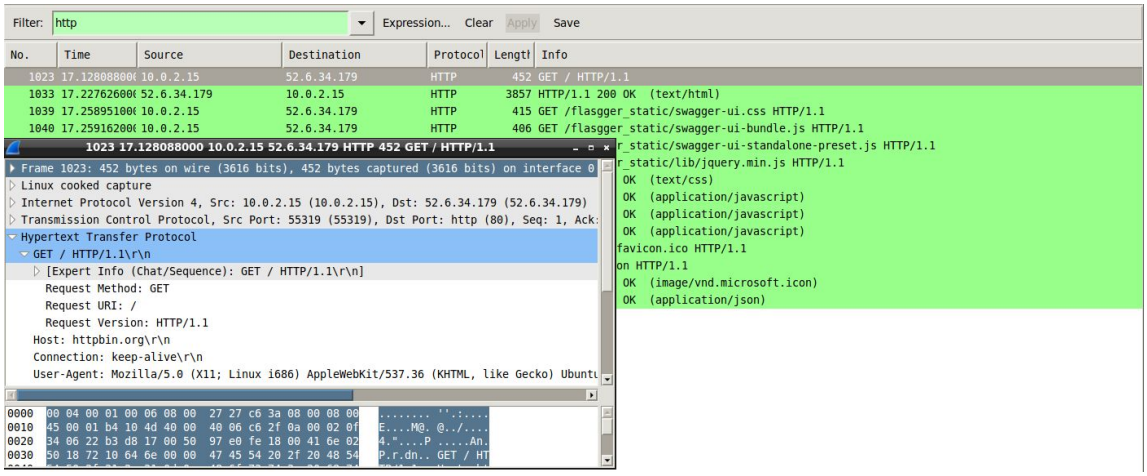
```
mininet@mininet-vm:~$ nslookup -type=ns .
Server:         192.168.1.1
Address:        192.168.1.1#53

Non-authoritative answer:
.       nameserver = a.root-servers.net.
.       nameserver = b.root-servers.net.
.       nameserver = c.root-servers.net.
.       nameserver = d.root-servers.net.
.       nameserver = e.root-servers.net.
.       nameserver = f.root-servers.net.
.       nameserver = g.root-servers.net.
.       nameserver = h.root-servers.net.
.       nameserver = i.root-servers.net.
.       nameserver = j.root-servers.net.
.       nameserver = k.root-servers.net.
.       nameserver = l.root-servers.net.
.       nameserver = m.root-servers.net.

Authoritative answers can be found from:
```

TCP Questions

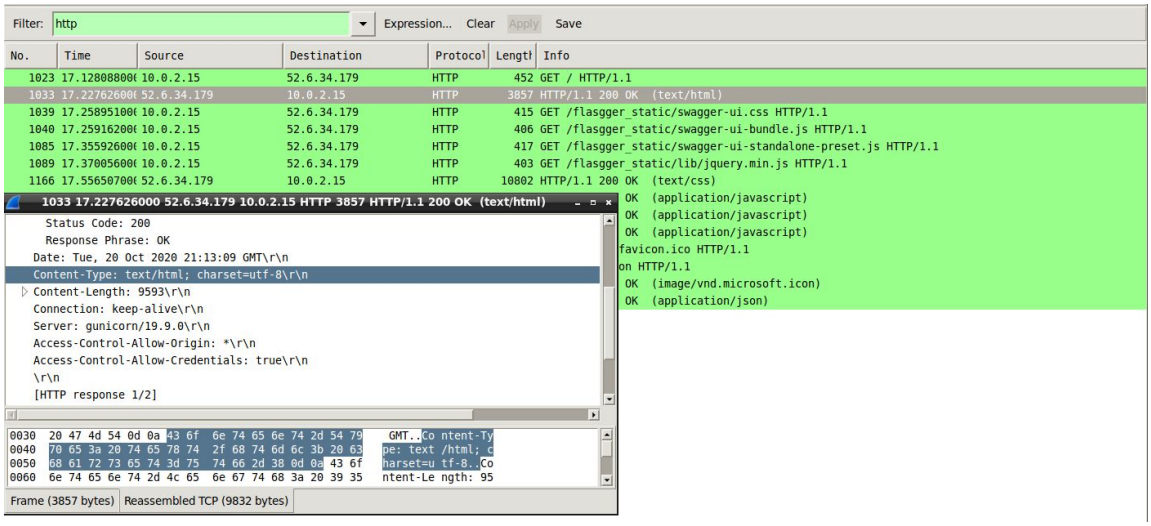
7. **How can multiple application services running on a single machine with a single IP address be uniquely identified?**
   Multiple application services running on a single machine with a single IP address can be uniquely identified by their port number.
8. **What is the purpose of the window mechanism in TCP?**
   The purpose of the window mechanism in TCP is to control the flow of data packets between two computers or networks, and requires an acknowledgement that the data has been received.
9. **What is an MTU? What happens when a packet is larger than the MTU?**
   A maximum transmission unit (MTU) is the size of the largest data unit communicated in a single network layer transaction. When a packet is larger than the MTU, the packets will be divided into smaller units and then reassembled to their original size after being received.

Lab Questions
Part 1: HTTP

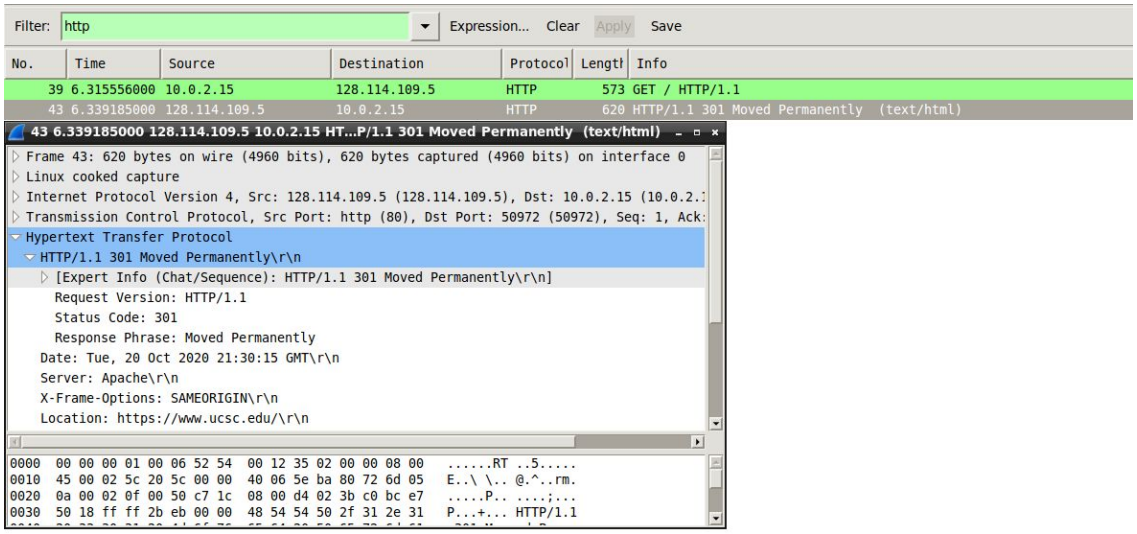
1. My computer used the HTTP method “GET” in order to make this request.



2. The server returned a status code of 200 OK. The content type of the response the server is sending back is “text/html”.



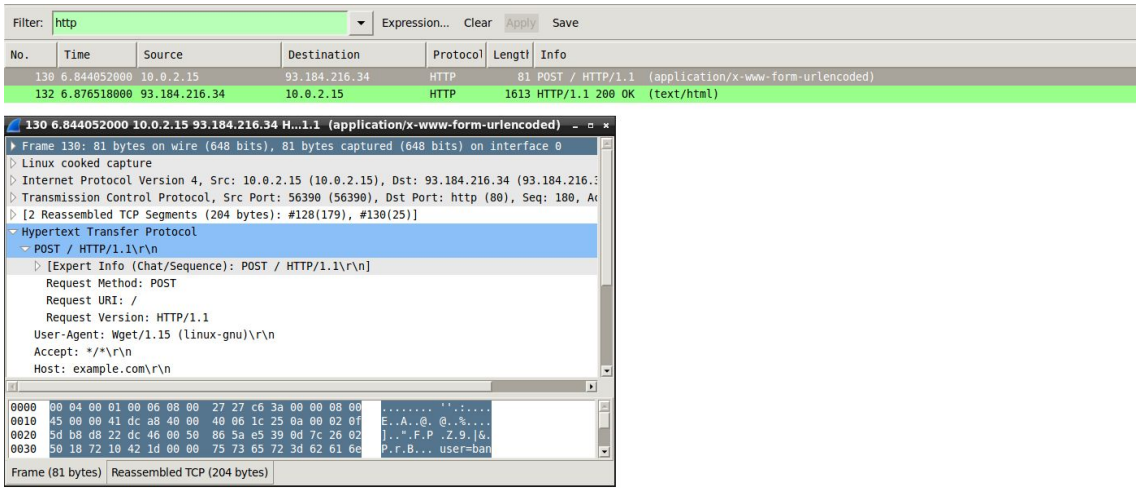
3. The difference here is that we are getting a 301 Moved Permanently status code instead of a 200 OK. The packet indicates the new location of the URL as well. Chromium also redirects you to the correct URL, which is https://www.ucsc.edu.



4. I generated an HTTP POST method by issuing the following command from the Mininet VM:

   wget --post-data ‘user=banana&password=slug’ http://example.com/

   I initiated a request to post data on example.com with a username banana and password slug.



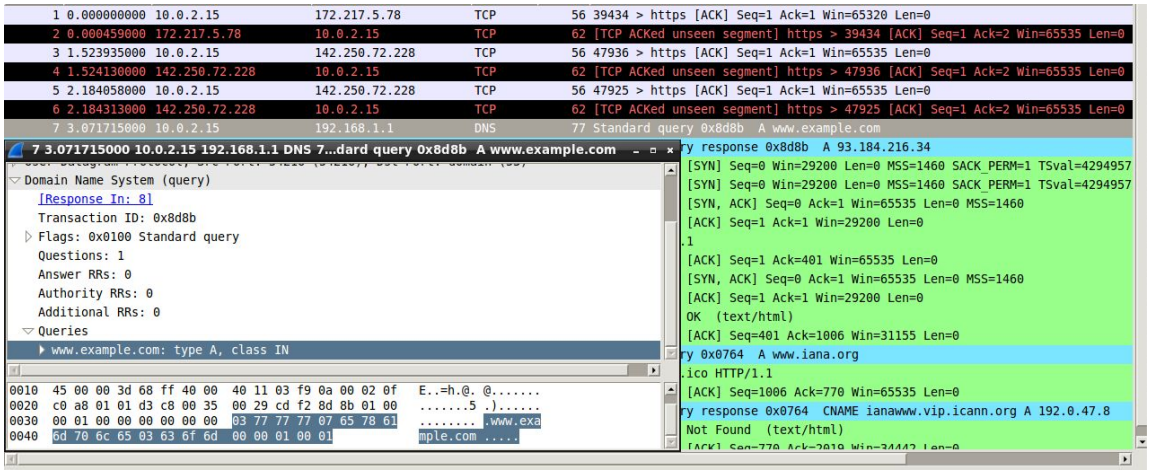
   NOTE: I used StackOverflow to learn how to generate a POST command with wget.

Part 2: DNS

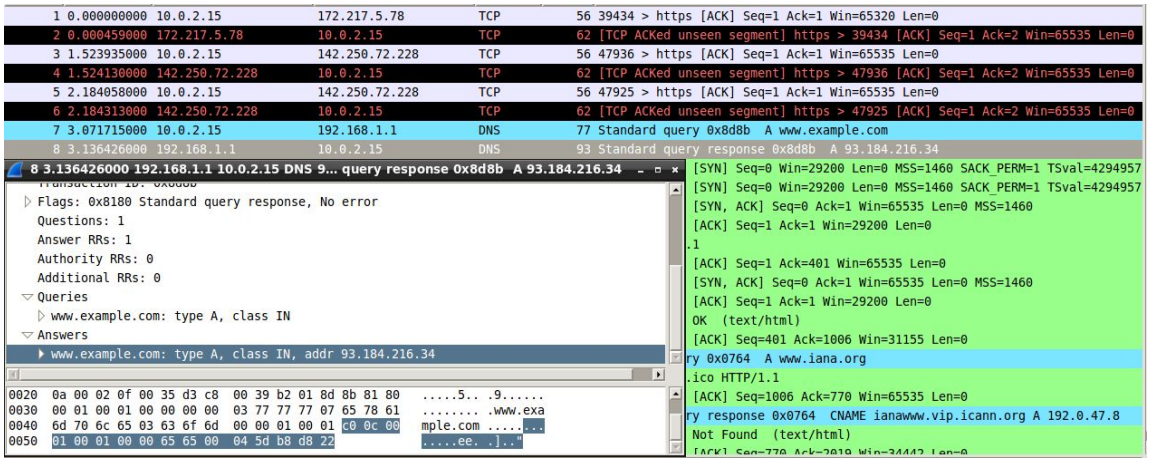
5. Yes, there were steps taken by my computer before the web page was loaded. The DNS server was queried for the IP address of www.example.com. The query was responded to by a packet that contained the IP address of **93.184.216.34**. Finally, an HTTP packet with

a GET method was sent to that IP address, and a 200 OK was returned from example.com.

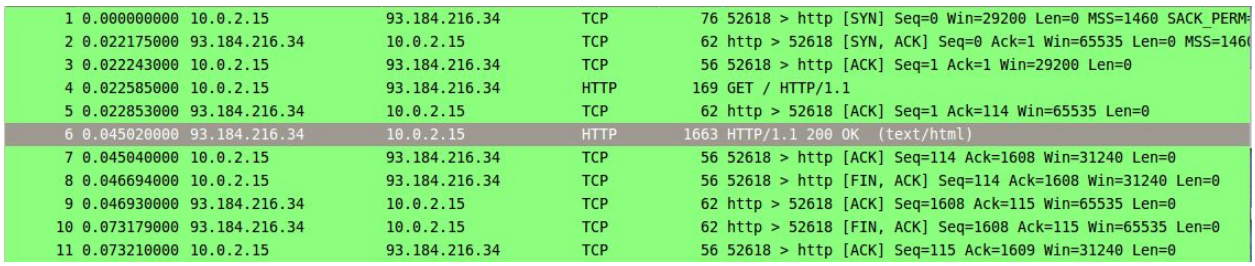
Screenshot of the DNS request for the IP address for example.com.



Screenshot of the response from the DNS server with the IP address of example.com, which is **93.184.216.34.**

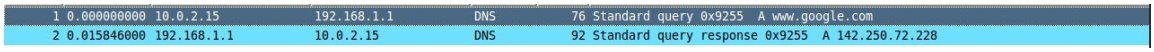


6. We use the command “wget 93.184.216.34 --header ‘Host: www.example.com’” in order to download the same content of www.example.com with its IP address without sending DNS requests.

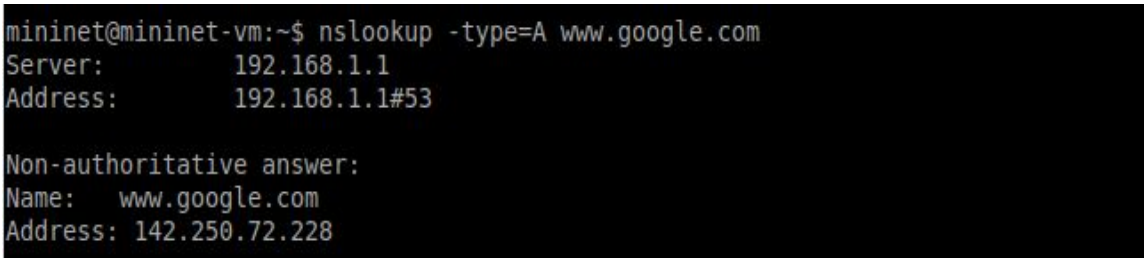


The screenshot does not have any DNS packets, as expected. This is because we have utilized the IP address of the site, and therefore it does not go through the DNS.

7. The following is a screenshot with packets corresponding to ‘nslookup -type A www.google.com’

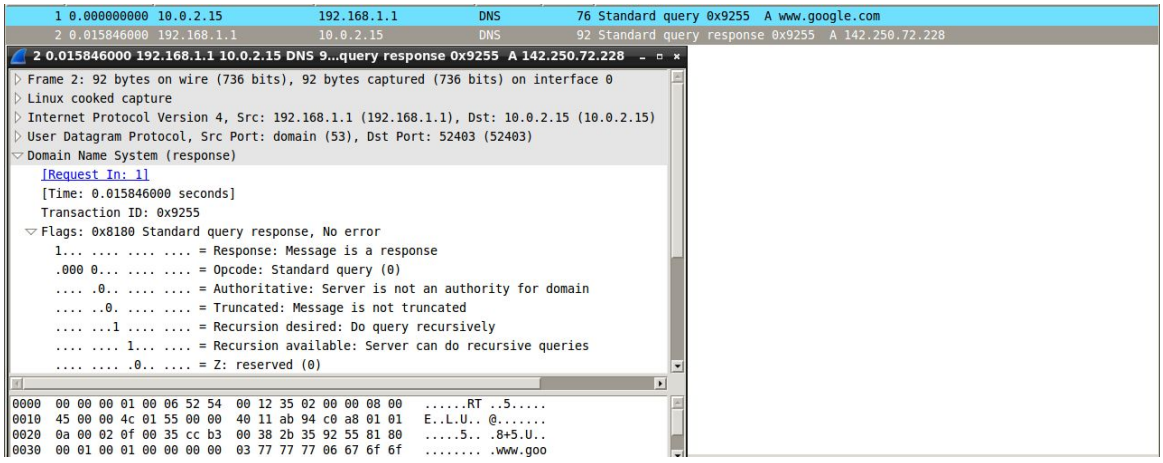


The following is a screenshot indicating the response from the server:

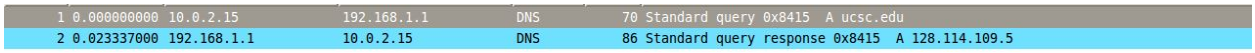


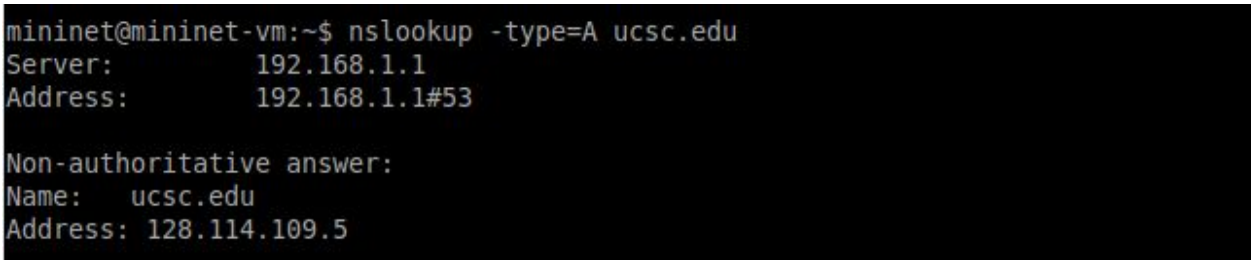
Since the request was resolved, the IP address I was given for www.google.com is **142.250.72.228.**

8. My computer wanted to complete the request recursively. From the packet content, we can open the “Flags” option and navigate to the section that says “Recursion desired: Do query recursively”.



9. Here is a screenshot with the packets corresponding to “nslookup -type=A ucsc.edu”, followed by another screenshot indicating the response from the server.





The request was resolved, and the IP address I was given for ucsc.edu is **128.114.109.5.**

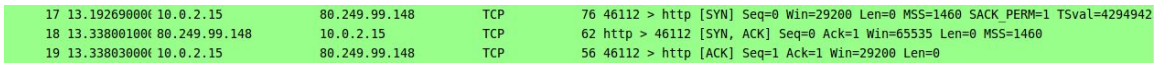
10. In order to find the authoritative name server for the ucsc.edu domain, we must add the parameter “type=soa”. I learned of this parameter from StackOverflow. Thus, our

command becomes “nslookup type=soa ucsc.edu”. From the screenshot below, the authoritative name server for the ucsc.edu domain is **adns1.ucsc.edu**.

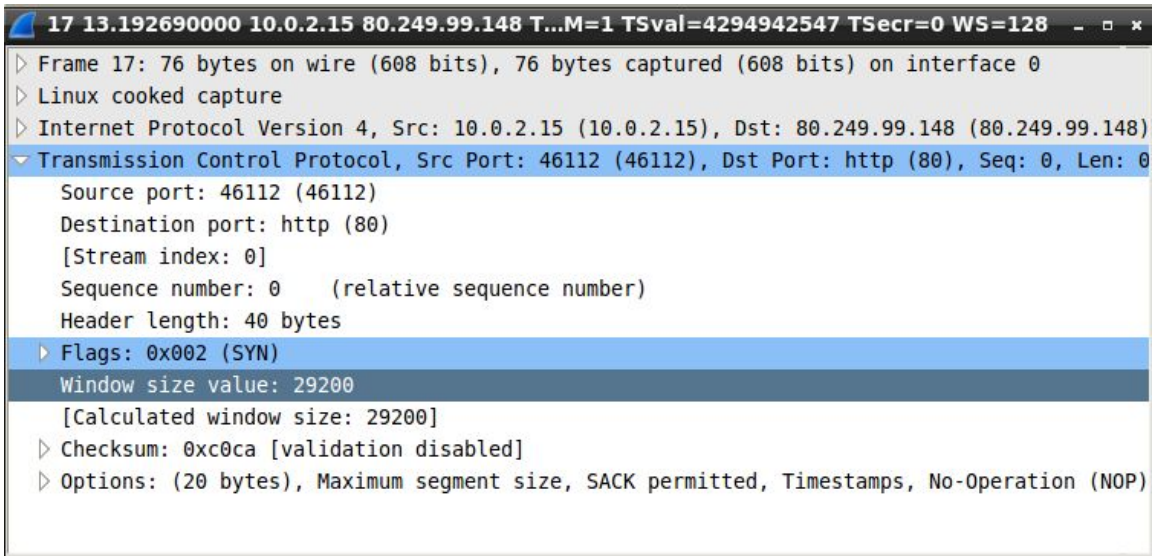
```
mininet@mininet-vm:~$ nslookup -type=soa ucsc.edu
Server:         192.168.1.1
Address:        192.168.1.1#53

Non-authoritative answer:
ucsc.edu
        origin = adns1.ucsc.edu
        mail addr = hostmaster.ucsc.edu
        serial = 20647867
        refresh = 10800
        retry = 900
        expire = 2419200
        minimum = 900

Authoritative answers can be found from:
```

Part 3: TCP

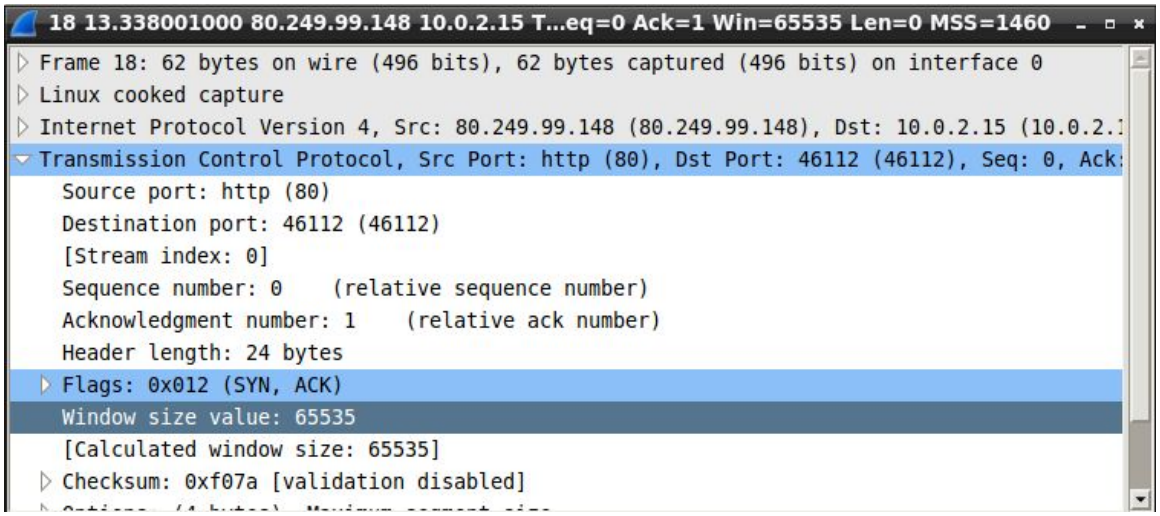
11. The following is a screenshot of the corresponding packets with the SYN, SYN-ACK, and ACK.



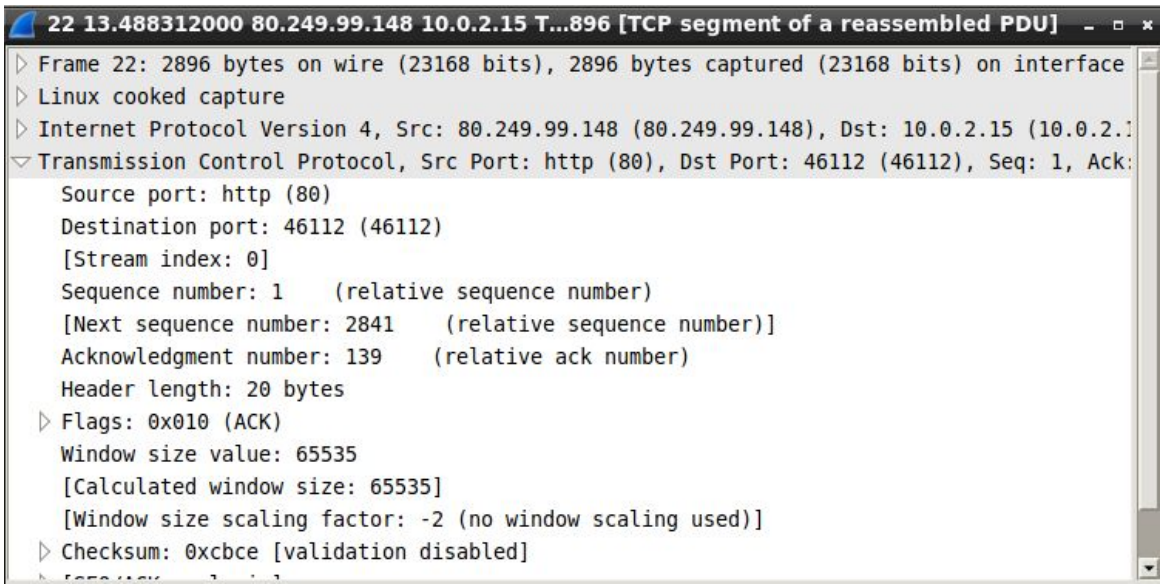
The initial window size that my computer advertised to the server is **29200**.



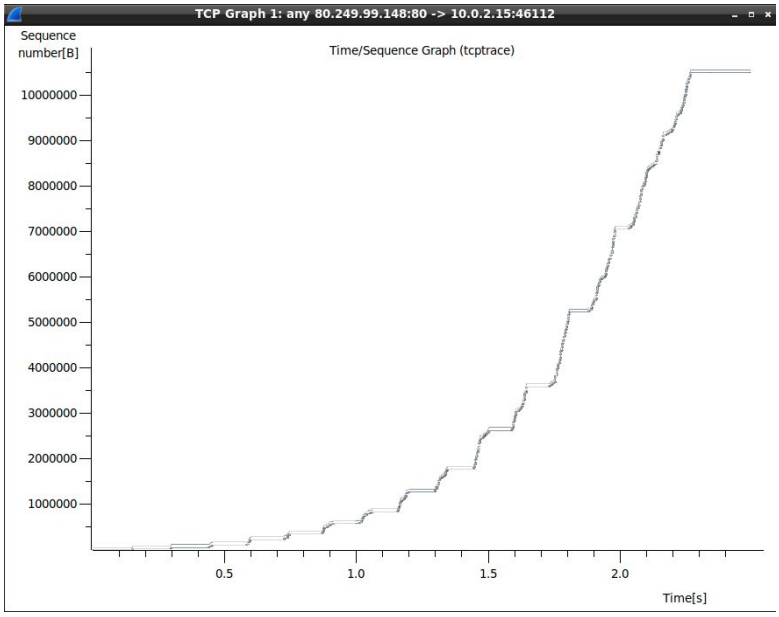
The initial window size that the server advertised is **65535**.



12. The following screenshot indicates a packet from the download with a source of the server and a destination of my computer. The source port number is 80 and the destination port is 46112.



The following screenshot captures the tcptrace graph with the selected packet. The x-axis represents time and the y-axis represents the sequence numbers. The graph indicates the progression of sequences as time went by during the download. It took approximately 2.4 seconds to download the entire file.



13. When we start the download of the file, loss is set to 0%. This means the packet transmission is successful. At approximately 3 seconds, the graph plateaus for a 10-second duration. This occurs at the moment we set the loss to be 100%, and the download progress is halted. After a brief pause, we change the loss back to 0%, and the graph sharply trends upward. The download of the file took approximately 15 seconds in this scenario.

    0% loss is shown between the 2.5 second and 13 mark, as indicated by the plateau.

    TCP is slow-start between 0 and 2.5 seconds.

    TCP is in congestion avoidance from 13-14 seconds, as it is recovering from the 0% loss period