ALab 2

Pre-Lab Questions

1. Choose 5 HTTP status codes and describe each one.
    a. “100” - Continue, This status code describes that the Initial part of the request been received by the server and that the client can continue with the request. It is used when the server needs to inform the client to continue sending the rest of the request.

    “201” - Created, This status code means that the request has been fulfilled and resulted in one or more new resources being made. The newly created resource(s) are typically included in the body of the response, and the URI(s) to these resources are returned as the entity of the response.

    “204” - No Content, This status code means that the server has successfully processed the request but is not returning any content in the response body. It's often used when the client doesn't need any new information from the server but the server may need to update some information on the current page.

    “302” - Found, This status code, means that the requested resource is under a temporarily under a different URI. The client should continue to use the Request-URI for more requests. This response is only cacheable if it is asked by a Cache-Control or an Expire header field. The temporary URI is given by the location field in the response.

    “410” - Gone, This status code is a error response code which is that the requested resource is no longer available on the server and has been permanently removed. Unlike a 404 Not Found response, which indicates that the resource may be available in the future, 410 Gone implies that the resource is gone for good.

2. List the 8 HTTP 1.1 methods and explain what they do
    - OPTIONS - The OPTIONS method describes the communication options available on the request/response chain asked by the Request-URI. It returns the HTTP methods supported by the server for a specific URL, allowing the client to understand what methods are allowed for the resource.

    - GET - The GET method requests data from a specified resource. It gets information from the server without changing it. This is used when you are retrieving data, such as looking at a web page.

- HEAD - The HEAD method is similar to the GET but in HEAD the server does not return a message-body in the response. It only request only the headers of the response, not the body.

- POST - The POST method is used to submit data to be processed to a specified resource. It sends data to the server to create or update the resource. These request are used when submitting form data or uploading files.

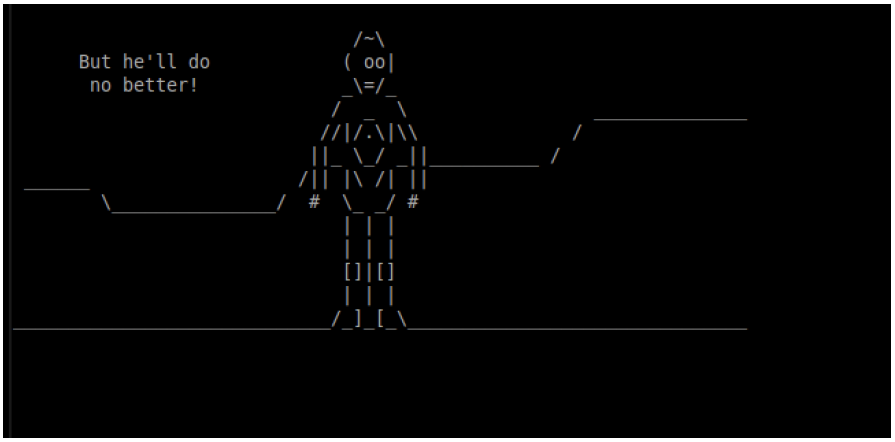
- PUT - The PUT method sends data to the server to create or update a resource at a specific URL. It replaces the current representation of the target resource with the request payload.

- DELETE - The DELETE method requests that the server deletes the resource specified by the URL. It removes the resource identified by the URL from the server.

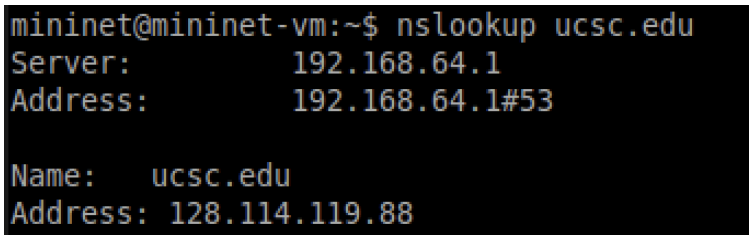
- TRACE - The TRACE method echoes the received request so that a client can see what changes or additions have been made by the servers. It is mainly used for diagnostic purposes.

- CONNECT - The CONNECT method converts the request connection to a transparent TCP/IP Tunnel. To facilitate HTTPS through an HTTP proxy. This is used when a client wants to establish a secure connection to a server through a proxy server.

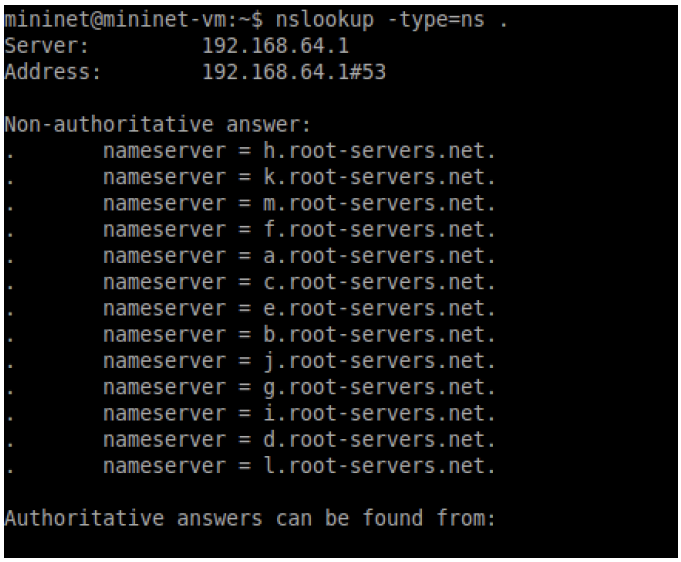
3. Use wget On example.com to view the last modified date of the webpage. What was the HTTP return status given and what command was used to do this?
    a. Using wget on example.com to view the last modified data of the webpage, the last HTTP the return Status given was '200 OK'. I used the 'wget -S example.com' to see the return status given.
4. Look up the telnet command. Use telnet to connect to www.telehack.com, Then type Starwars, What does this telnet server do?
    a. Using "telnet telehack.com" allows me to connect to telehack.com. After typing Starwars, it starts playing Star wars in the common prompt in a ASCII version.



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. A DNS resource record (RR) has information about about a resources in a zone like hosts, that the zone contains. Using the command “nslookup ucsc.edu” shows the Server IP, Address IP and port number along with the name and the address. This resource record stores the data about the domain names and IP addresses.



6. What does the command nslookup -type=ns . do ? Explain its output. (Note: the . is part of the command!)
    a. The command nslookup -type=ns . is used to search DNS servers for the authoritative name servers of the root domain given by “.” . In the output it first gave the Server IP (192.168.64.1) and the Address and the port number (192.168.64.1 #53). Then it gives the name servers for the root domain (.). Each letter from a to m corresponds with a different root server.



7. How can multiple application services running on a single machine with a single IP address be uniquely identified?
    a. A single machine with a single IP address can running multiple application services are uniquely identified by each application using a different port number. For example, Spotify could have a port number of 8090 while Apple music has a port number of 9090.
8. What is the purpose of the window mechanism in TCP?
    a. The purpose of window mechanism in TCP is to ensure how many packets are sent at at a time that depends on the size of the window and each packet. It allows to control the flow Of packets between two networks. It also allows us to know that each packet is received at the other side.
9. What is an MTU? What happens when a packet is larger than the MTU?
    a. An MTU is the Maximum transport unit, or in other words the size of the packet. If the packet size is larger than the MTU then the packets will be divided into smaller packets and these packets are put back together by the receiver into the original size.

Resources:

https://www.ietf.org/rfc/rfc2616.txt (1,2)

https://man7.org/linux/man-pages/man1/wget.1.html (3)

https://phoenixnap.com/kb/nslookup-command (5)

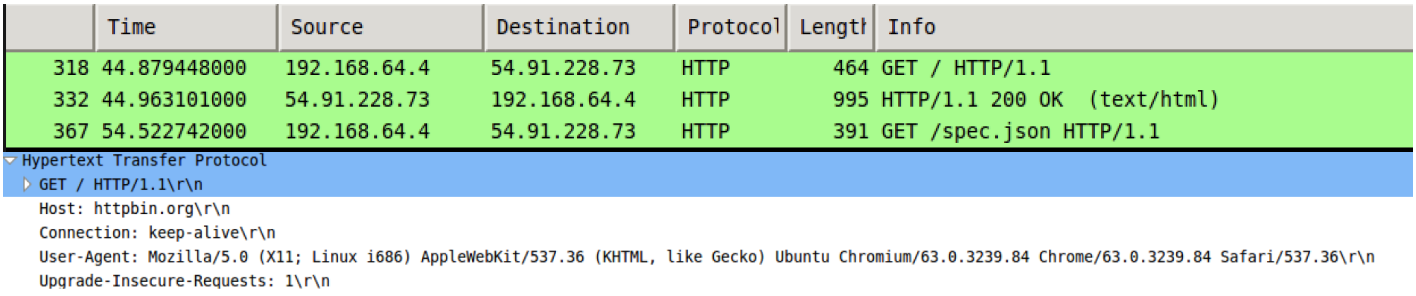
https://linux.die.net/man/1/nslookup (6)

http://www.tcpipguide.com/free/ (7,8)

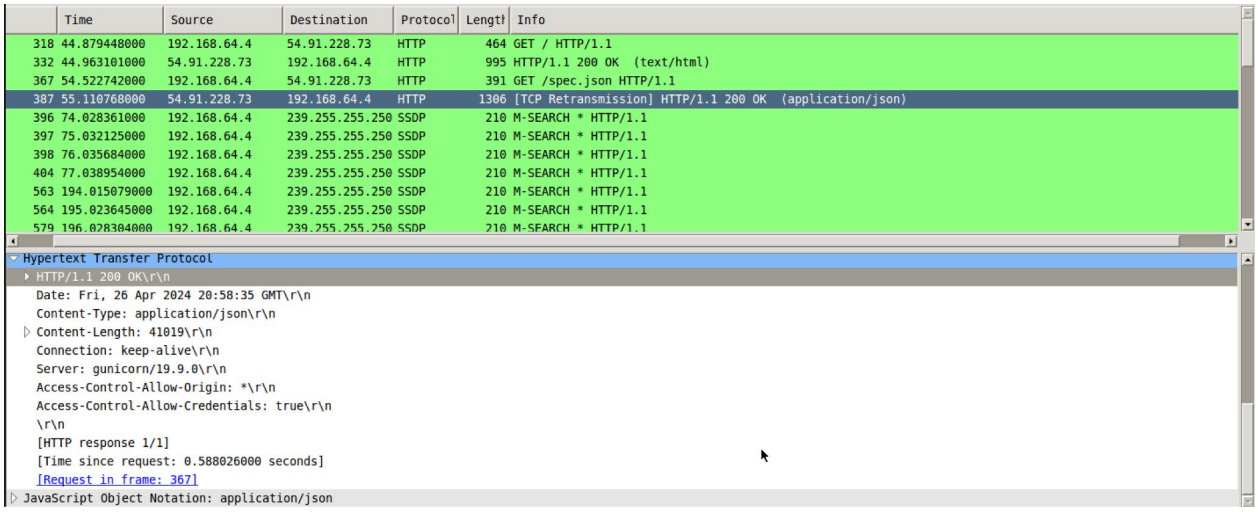
https://www.cloudflare.com/learning/network-layer/what-is-mtu/ (9)

Lab Questions:

1. Find the HTTP packet that corresponds to the initial request that your computer made. Take a screenshot of this packet. What HTTP method did your computer use to make this request?
    a. The initial request that the compute made was the request made in the first line of this screenshot. The HTTP method the computer used to make the request was the GET method, the source was 192.168.64.4 which is my computer and the destination is 54.91.228.73 which is the webpage.

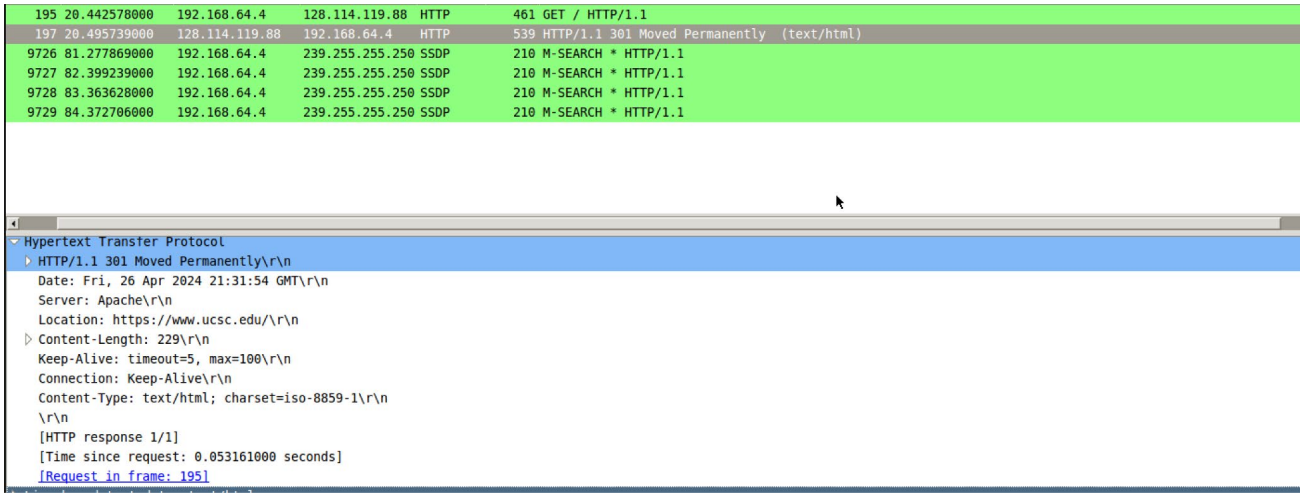


2. Find the HTTP packet that corresponds to the initial response the server made to your request. Take a screenshot of this packet. What HTTP status code did the server return? What is the content type of the response the server is sending back?
    a. The server returned a “200 OK” status code, in this code the source was “54.91.228.73”, which is the webpage and the destination is 192.168.64.4, which is my computer. This means that this packet was coming from the web page and going to my computer. The content the type of the response the server is sending back is “application/json\r\n”.



3. Find the HTTP packets that correspond to the initial request and response that your computer made. Take a screenshot of these packets. What's different? Explain.

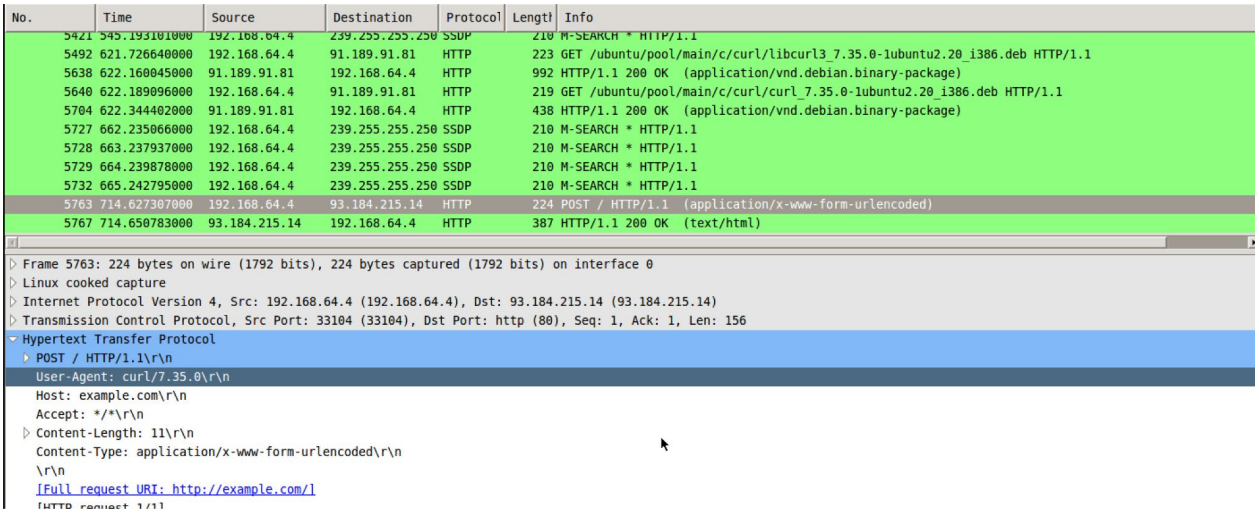
    a. The computer requested to open "http://ucsc.edu" however the server of that URL was moved to a different server so it responded with a "301 Moved Permanently" response status code. Going more into depth, looking at the Hypertext Transfer Protocol, it shows that the server was moved to "https://ucsc.edu" and not "http://ucsc.edu" like we requested, which is why we got the response code of "301 Moved Permanently"



4. Take a screenshot of your packet, and explain what you did to create it.
    a. In order to create a packet other than GET, I used the "curl - - data 'hello' http://example.com" terminal. This command creates a POST HTTP command because of the

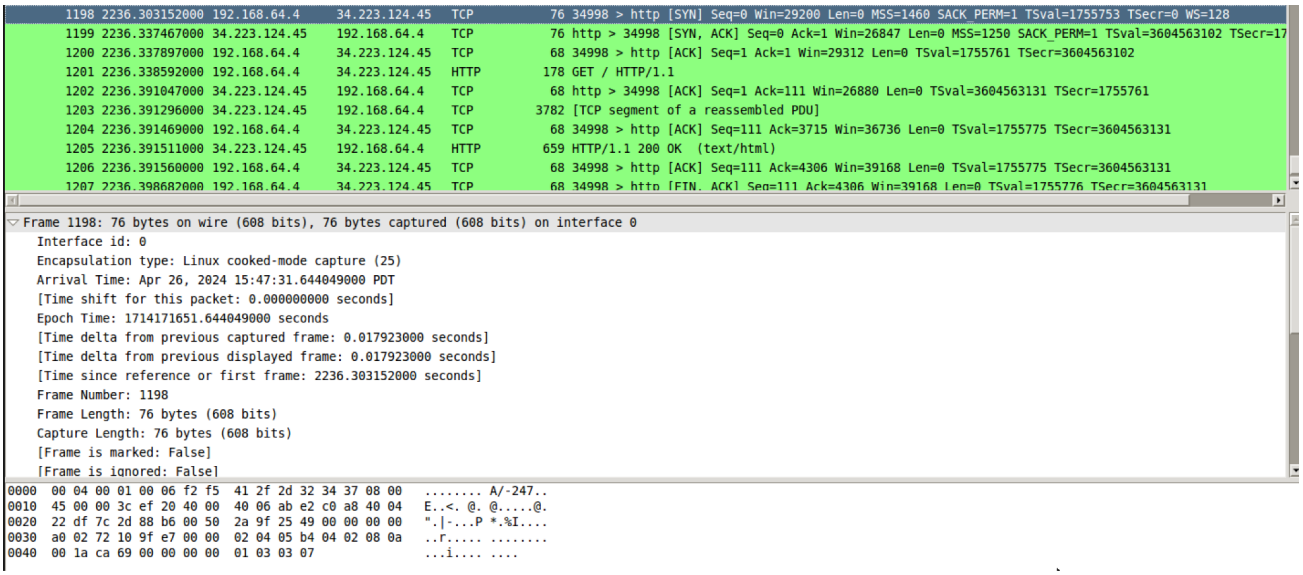
"--data" option. The "--data" option is used to send data in a POST request. When using "--data" it automatically sets the HTTP method to POST.

5. Were any steps taken by your computer before the web page was loaded? If so, using your captured packets in Wireshark, find the packets that allowed your computer to



successfully load http://www.example.com. Take a screenshot of these packets, and explain why you think these are the correct packets. What's the IP address of www.example.com?

   a. I believe that all the packets from No. 1198 to No. 1201 were the steps that the computer took before the webpage was loaded. I think that these are the correct packets because the destination of the those packets is the same destination (34.223.124.45) that the GET HTTP command used in order to get to the "http://neverssl.com" webpage. Making the IP address of http://neverssl.com, 34.223.124.45.



6. Open a terminal window. Execute the command to flush your DNS cache: sudo /etc/init.d/networking restart. Using wget, download the same content of www.example.com with its IP address you discovered in question 5, without sending DNS requests. What command did you use to accomplish that? Take a screenshot of related packets and explain why you think these are the correct packets.
    a. Using the command “wget --no-dns-cache http://34.223.124.45/” downloads the same content, without sending DNS requests. Using “wget --no-dns-cache http://34.223.124.45/”, does not initiate any DNS request because its directly using the IP address provided instead of a domain name. Also the “--no-dns-cache” flag prevents wget from caching any DNS, since our DNS was not able to flush.

7. Take a screenshot of the packets corresponding to your request, and the response from the server. If the request was resolved, what is the IP address you were given for www.google.com?
    a. The IP address I was given for "www.google.com" was 142.251.46.228.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	192.168.64.4	192.168.64.1	DNS	76	Standard query 0x22a9 A www.google.com
2	0.001450000	192.168.64.1	192.168.64.4	DNS	92	Standard query response 0x22a9 A 142.251.46.228
3	7.455349000	192.168.64.1	192.168.64.255	UDP	88	Source port: 57621 Destination port: 57621

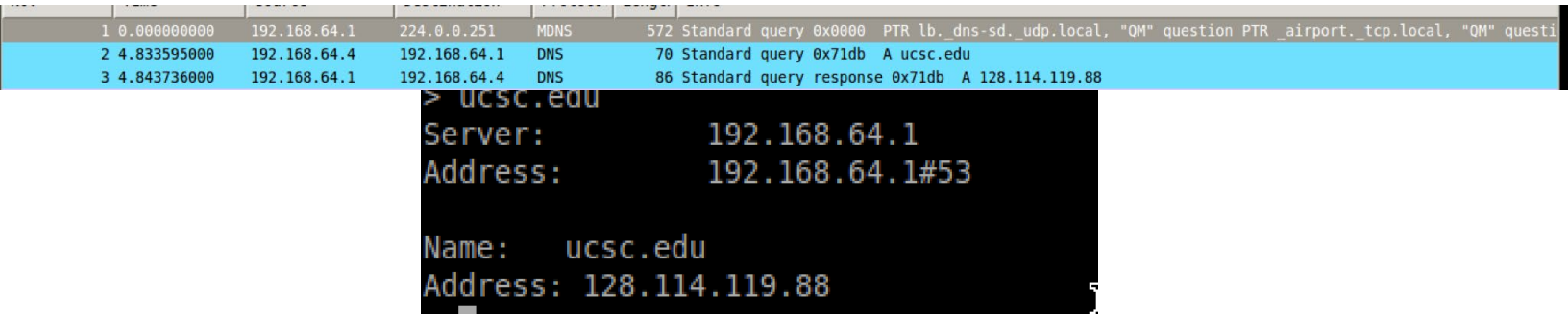
```
> www.google.com
Server:         192.168.64.1
Address:        192.168.64.1#53

Non-authoritative answer:
Name:   www.google.com
Address: 142.251.46.228
```

8. Did your computer want to complete the request recursively? How do you know? Take a screenshot proving your answer.
    a. Yes, my computer wanted to complete the request recursively. Opening the packet you can find that under Domain Name system and Flags, that Recursion is desired, and it's going to query recursively.

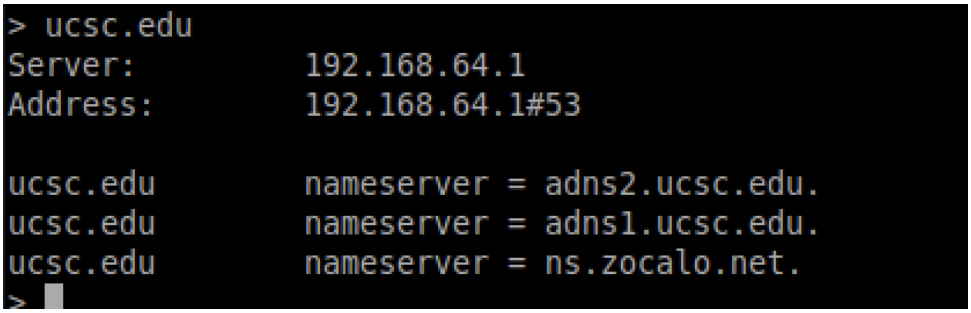
```
2 0.001450000 192.168.64.1 192.168.64.4 DNS 92 Standard query response 0x22a9 A 142.251.46.228
    Destination port: 37466 (37466)
    Length: 56
  ▷ Checksum: 0xbae2 [validation disabled]
▽ Domain Name System (response)
    [Request In: 1]
    [Time: 0.001450000 seconds]
    Transaction ID: 0x22a9
  ▽ Flags: 0x8180 Standard query response, No error
      1... .... .... .... = Response: Message is a response
      .000 0... .... .... = Opcode: Standard query (0)
      .... .0.. .... .... = Authoritative: Server is not an authority for domain
      .... ..0. .... .... = Truncated: Message is not truncated
      .... ...1 .... .... = Recursion desired: Do query recursively
      .... .... 1... .... = Recursion available: Server can do recursive queries
      .... .... .0.. .... = Z: reserved (0)
      .... .... ..0. .... = Answer authenticated: Answer/authority portion was not authenticated by the server
      .... .... ...0 .... = Non-authenticated data: Unacceptable
      .... .... .... 0000 = Reply code: No error (0)
    Questions: 1
    Answer RRs: 1
    Authority RRs: 0
    Additional RRs: 0
  ▽ Queries
    ▷ www.google.com: type A, class IN
  ▽ Answers
```

9. Take a screenshot of the packets corresponding to your request, and the response from the server. If the request was resolved, what is the IP address you were given for ucsc.edu?

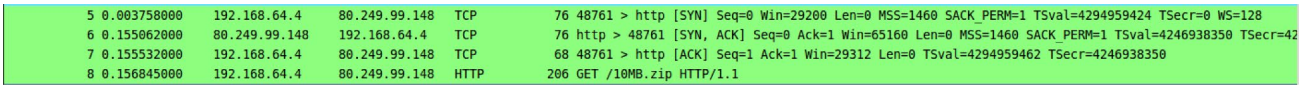
a. The IP address I was given for UCSC.edu was 128.114.119.88.



10. What is the authoritative name server for the ucsc.edu domain? How do you know? Take a screenshot proving your answer.
    a. The authoritative name servers for the ucsc.edu domain are “adns2.ucsc.edu.”, “adns1.ucsc.edu.”, and “ns.zocalo.net.”. By typing “set type=ns”, it sets the query type to only Name servers. So when typing in a domain name, it will only return the authoritative name servers of the domain.



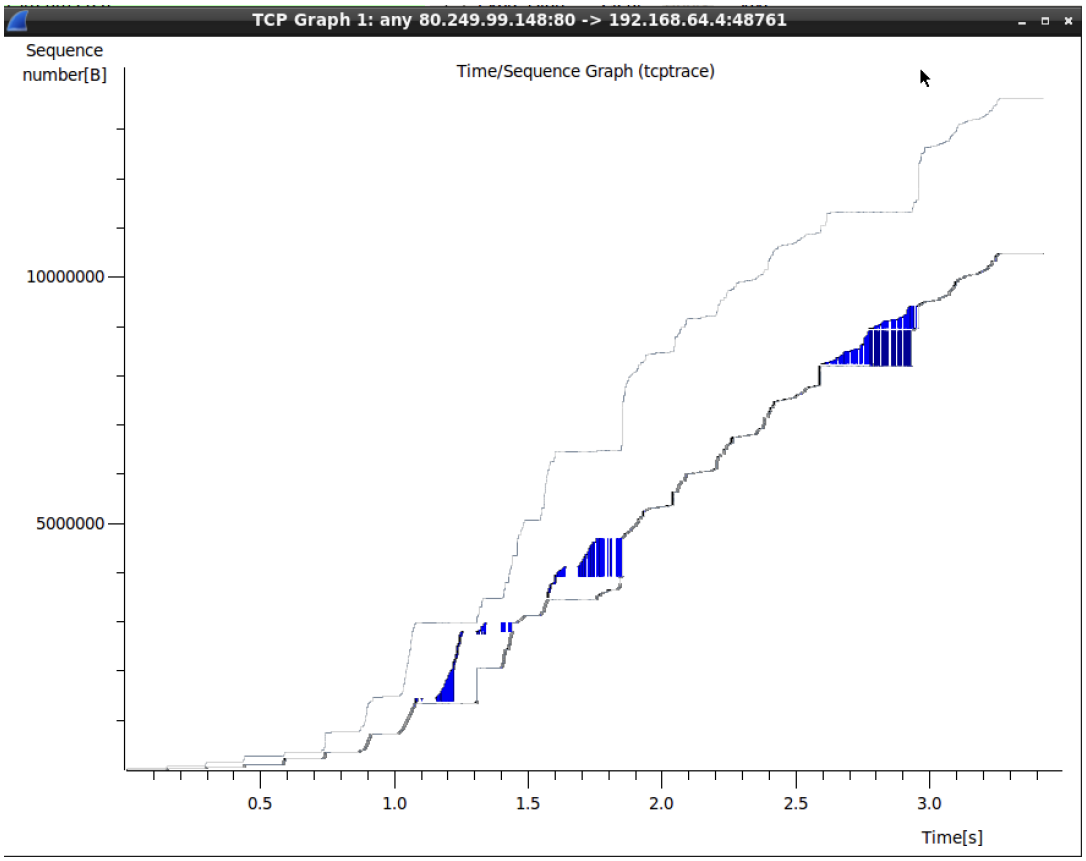
11. Find the packets corresponding with the SYN, SYN-ACK, and ACK that initiated the TCP connection for this file transfer. Take a screenshot of these packets. What was the initial window size that your computer advertised to the server? What was the initial window size that the server advertised to you?
    a. The initial window size that the computer advertised to the server was 29200, and the initial Window size that the server advertised was 65160.



12. Find a packet from the download with a source of the server and a destination of your

computer. Create a tcptrace graph with this packet selecrated. Take a screenshot of the graph and explain what it is showing. Look into the Wireshark documentation if you I need assistance making this graph.

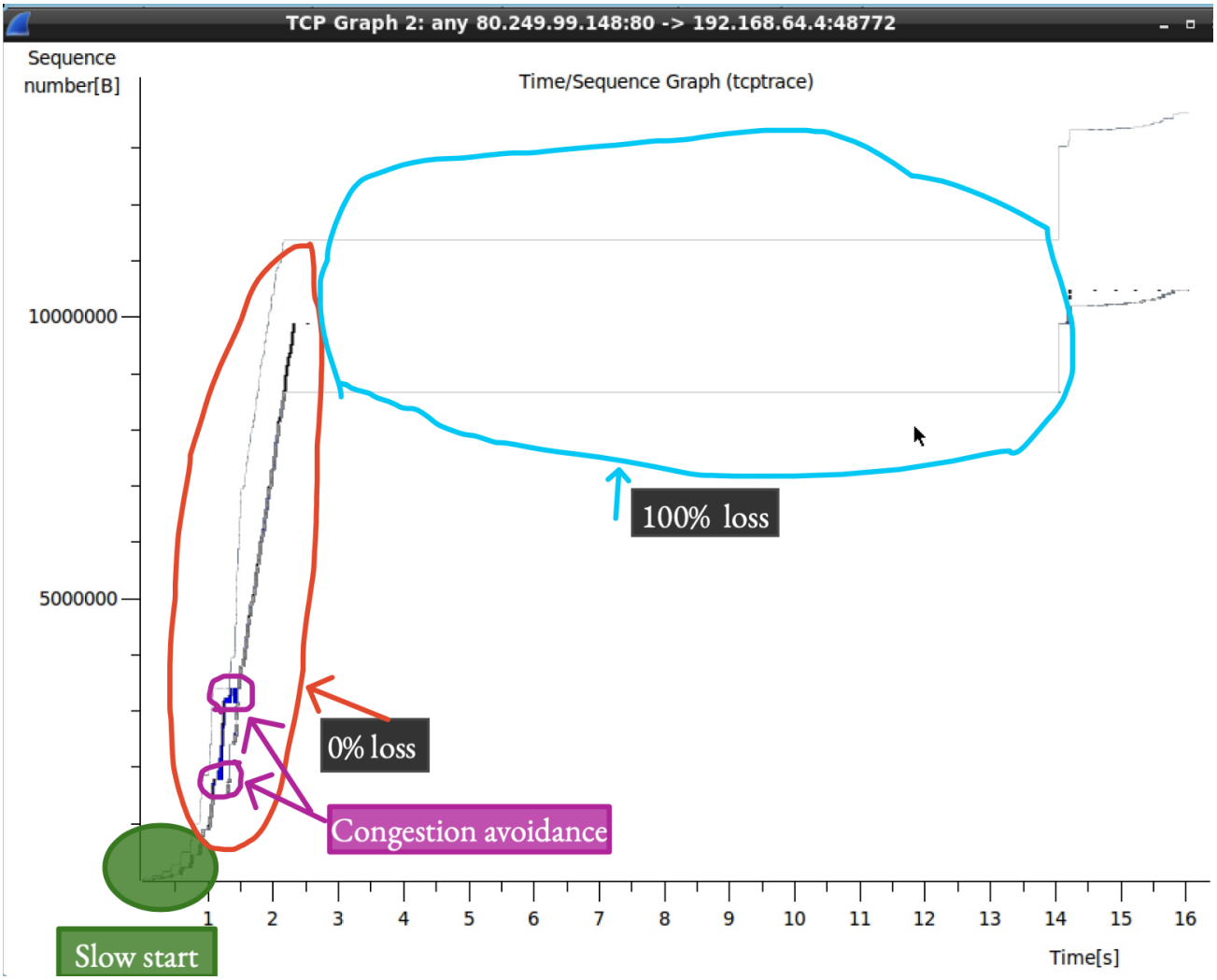
a. This is tcptrace graph that goes from the server to my computer, which shows the sequence of numbers of TCP over time. This graph shows the blue lines which are the sequence and the vertical lines are the TCP segments. Like looking at time 2.5s to 3.0 s you can see the sequence numbers which is the counter of the bytes transmitted. So with each byte sent, the sequence number is incremented. So by the end of 3 seconds, there around 10000000 bytes sent.



13. Find a packet from the download with a source of the server and a destination of your computer. Create a tcptrace graph with this packet selected. Take a screenshot of the

graph and explain what it is showing. Using an image editting program, circle the areas where the 0% loss is shown, as well as where TCP is in slow-start and congestion-avoidance.

a. This is a TCPtrace graph where a packet is sent from the server to my computer with where there is TCP loss and not in a loss. In the first couple seconds, where there is 0% loss, so it is able to download without any loss, but after a while I put in the command To be 100% loss. In the 100% loss section, there is no downloading progress which is why it is just flat, since there is no downloading going on.



Resource:

https://www.linode.com/docs/guides/how-to-use-nslookup-command/ (10)

https://www.packetsafari.com/blog/2021/10/31/wireshark-tcp-graphs/ (12,13)