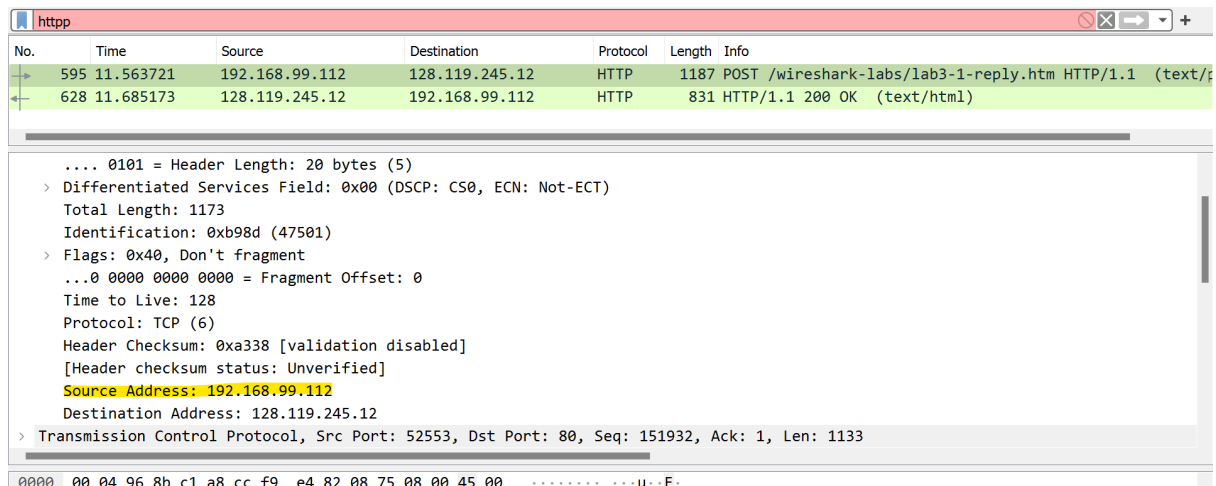


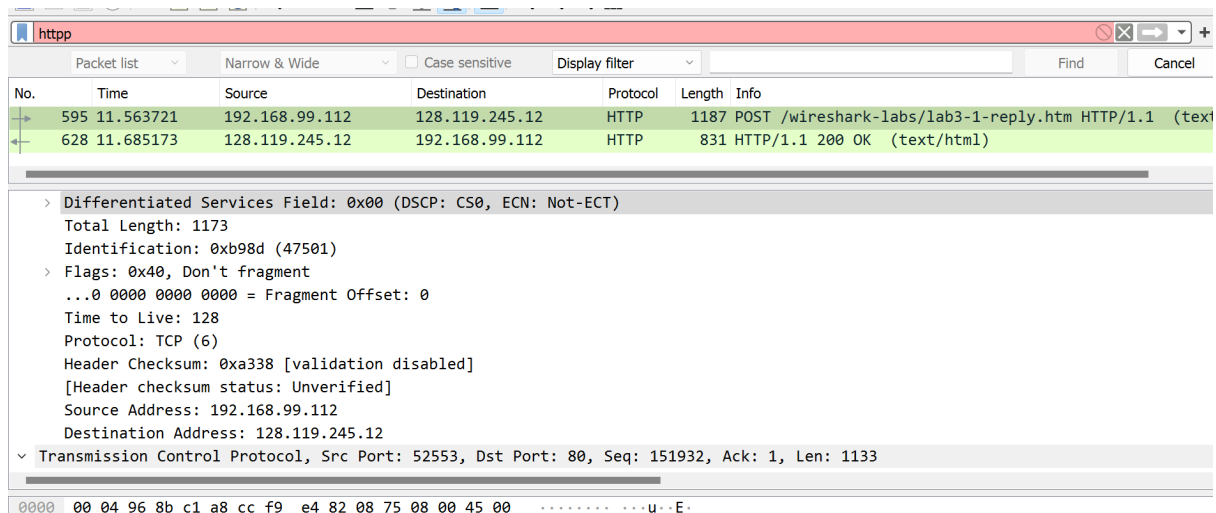
1 - Qual é o endereço IP e o número da porta TCP usados pelo computador cliente (origem) que está transferindo o arquivo alice.txt para gaia.cs.umass.edu? Para responder a essa pergunta, provavelmente é mais fácil selecionar uma mensagem HTTP e explorar os detalhes do pacote TCP usado para transportar essa mensagem HTTP, usando os “detalhes da janela de cabeçalho do pacote selecionado” (consulte a Figura 2 em “Introdução à Wireshark” Lab se você não tiver certeza sobre as janelas do Wireshark).

Endereço IP do cliente:



Porta: 80

2 - Qual é o endereço IP de gaia.cs.umass.edu? Em qual número de porta ele está enviando e recebendo segmentos TCP para esta conexão?



Porta: 80, IP do gaia: 128.119.245.12

3 - Qual é o número de sequência do segmento TCP SYN que é usado para iniciar a conexão TCP entre o computador cliente e o gaia.cs.umass.edu? (Nota: este é o número de sequência “bruto” carregado no próprio segmento TCP; NÃO é o pacote # na coluna “Número.” na janela Wireshark. Lembre-se de que não existe um “número de

pacote” no TCP ou UDP; como você sabe, existem números de seqüência no TCP e é isso que estamos procurando aqui. Observe também que este não é o número de seqüência relativo em relação ao número de seqüência inicial desta sessão TCP.). O que há neste segmento TCP que identifica o segmento como um segmento SYN?

No.	Time	Source	Destination	Protocol	Length	Request line	Info
3697	6.490913	162.159.130.235	192.168.0.6	TCP	60		443 → 61598 [ACK] Seq=1 Ack=148 Win=8 Len=0
3698	6.497124	2804:2908:505a:207d::	2086:4700::6812:c21	TCP	74		60347 → 443 [ACK] Seq=32 Ack=42 Win=1021 Len=0
3708	6.527047	99.181.80.16	192.168.0.6	TLSv1.2	82		Application Data
3709	6.527047	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1273470 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3710	6.527047	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1274930 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3711	6.527213	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=8668 Ack=1276390 Win=8212 Len=0
3712	6.527363	192.168.0.6	128.119.245.12	TCP	66		63335 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM
3713	6.528017	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1276390 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3714	6.528301	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1277850 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3715	6.528366	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=8668 Ack=1279310 Win=8212 Len=0
3716	6.529037	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1279310 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3717	6.529252	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1280770 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3718	6.529285	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=8668 Ack=1282230 Win=8212 Len=0
3719	6.530090	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1282230 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3720	6.530307	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1283690 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3722	6.530403	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=8668 Ack=1285150 Win=8212 Len=0
3723	6.531473	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1285150 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3724	6.531473	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1286510 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3725	6.532070	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1288070 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3726	6.532109	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=8668 Ack=1289530 Win=8212 Len=0
3727	6.532303	99.181.80.16	192.168.0.6	TLSv1.2	1514		Application Data
3728	6.534006	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1290990 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3729	6.534040	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=8668 Ack=1292450 Win=8212 Len=0
3730	6.534241	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1292450 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3731	6.535018	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1293910 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3732	6.535018	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1295370 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]
3733	6.535057	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=8668 Ack=1296830 Win=8212 Len=0
3738	6.536049	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1296830 Ack=8668 Min=2495 Len=1460 [TCP segment of a reassembled PDU]

Transmission Control Protocol, Src Port: 63335, Dst Port: 80, Seq: 0, Len: 0

Source Port: 63335
Destination Port: 80
[Stream Index: 22]
[Conversation completeness: Complete, WITH_DATA (63)]
[TCP Segment Len: 0]
Sequence Number: 0 (relative sequence number)
Sequence Number (raw): 2453335501
[Next Sequence Number: 1 (relative sequence number)]
Acknowledgment Number: 0
Acknowledgment number (raw): 0
1000 = Header Length: 32 bytes (8)
Flags: 0x002 (SYN)
Window: 64240
[Calculated window size: 64240]
Checksum: 0xc62c [unverified]

0000 28 ee 52 3b a2 84 30 9c 23 27 f0 f1 08 00 45 00 (R; 0: #....E
0010 00 34 dc 17 40 00 00 e8 79 c0 a8 00 06 80 77 -4-0...y....W
0020 f5 8c f7 67 00 50 27 3a ed c6 00 00 00 00 02 ...gP...:....
0030 fa f0 c6 2c 00 00 02 04 05 b4 01 03 08 01 01 ..:.....
0040 04 02 ..

Seqüência: 0, identificamos que é um segmento SYN através do cabeçalho.

4 - Qual é o número de seqüência do segmento SYNACK enviado por gaia.cs.umass.edu ao computador cliente em resposta ao SYN? O que há no segmento que identifica o segmento como um segmento SYNACK? Qual é o valor do campo Acknowledgement no segmento SYNACK? Como gaia.cs.umass.edu determinou esse valor?

No.	Time	Source	Destination	Protocol	Length	Request line	Info
3786	6.579342	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1328374 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3787	6.579376	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=10119 Ack=1329834 Win=8212 Len=0
3788	6.580125	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1329834 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3789	6.580335	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1331294 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3790	6.580369	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=10119 Ack=1332754 Win=8212 Len=0
3791	6.581277	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1332754 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3792	6.581277	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1334214 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3793	6.582138	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1335674 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3794	6.582179	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=10119 Ack=1337134 Win=8212 Len=0
3795	6.582372	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1337134 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3796	6.584083	99.181.80.16	192.168.0.6	TLSv1.2	745		Application Data
3797	6.584154	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=10119 Ack=1339285 Win=8212 Len=0
3802	6.591301	192.168.0.6	99.181.80.16	TLSv1.2	1492		Application Data
3808	6.605112	192.168.0.6	162.159.130.235	TCP	54		61598 → 443 [ACK] Seq=148 Ack=58 Win=1022 Len=0
3815	6.622682	128.119.245.12	192.168.0.6	TCP	66		80 → 63335 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM WS=128
3816	6.622836	192.168.0.6	128.119.245.12	TCP	54		63335 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=0
3817	6.625218	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3818	6.625218	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=1461 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3819	6.625218	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=2921 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3820	6.625218	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=4381 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]

Ethernet II, Src: Tp-Link1_3b:a2:84 (28:ee:52:3b:a2:84), Dst: Micro-St_27:f0:f1 (30:9c:23:27:f0:f1)

Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.0.6

Transmission Control Protocol, Src Port: 80, Dst Port: 63335, Seq: 0, Ack: 1, Len: 0

Source Port: 80
Destination Port: 63335
[Stream Index: 22]
[Conversation completeness: Complete, WITH_DATA (63)]
[TCP Segment Len: 0]
Sequence Number: 0 (relative sequence number)
Sequence Number (raw): 1148520944
[Next Sequence Number: 1 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 2453335502
1000 = Header Length: 32 bytes (8)
Flags: 0x0012 (SYN, ACK)
Window: 29200
[Calculated window size: 29200]
Checksum: 0x0090 [unverified]
[Checksum Status: Unverified]
Urgent Pointer: 0
Options: (12 bytes), Maximum segment size, No-Operation (NOP), No-Operation (NOP), SACK permitted, No-Operation (NOP), Window scale
[Timestamps]
[SEQ/ACK analysis]

0000 30 9c 23 27 f0 f1 28 ee 52 3b a2 84 08 00 45 00 0-#*-(R;...E
0010 00 34 00 00 40 00 2a 0e 1a 92 00 77 f5 8c c0 a8 -4-0...y....W
0020 00 06 00 50 f7 67 6a 75 09 f6 92 3a ed c6 00 00 02 ...gP...:....
0030 72 10 00 98 00 00 02 04 05 b4 01 01 04 02 01 03 ..:.....
0040 03 07 ..

Número de seqüência do segmento SYNACK é 0, raw(1148520944);
Identificamos o segmento através do cabeçalho com a presença do SYNACK;

Acknowledgement é igual a 1, raw(2453335502);

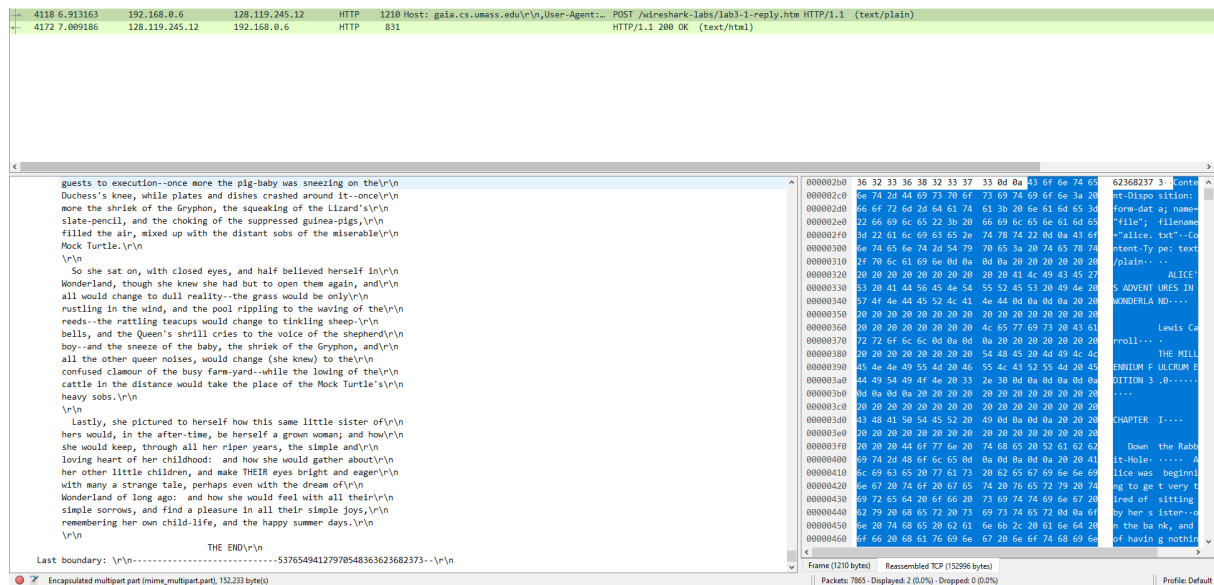
5 - Qual é o número de sequência do segmento TCP que contém o cabeçalho do comando HTTP POST? Observe que, para encontrar o cabeçalho da mensagem POST, você precisará cavar o campo de conteúdo do pacote na parte inferior da janela do Wireshark, procurando um segmento com o texto ASCII “POST” dentro do campo DATA 2 3. Quantos bytes de dados estão contidos no campo de carga útil (dados) deste segmento TCP? Todos os dados no arquivo transferido alice.txt se encaixam nesse único segmento?

Wireshark packet capture showing an HTTP POST request. The packet list shows three packets: a SYN, a POST request, and a 200 OK response. The packet details for the POST request (packet 4172) show the TCP segment with sequence number 151841 and length 1156 bytes. The packet bytes pane shows the raw data of the POST request, including the 'POST /wiresark-labs/lab3-1-reply.htm HTTP/1.1' line and the body content.

Número de sequência: 151841,

Wireshark packet capture showing the same three packets as the previous image. The packet details for the POST request (packet 4172) show the TCP segment with sequence number 151841 and length 1156 bytes. The packet bytes pane shows the raw data of the POST request, including the 'POST /wiresark-labs/lab3-1-reply.htm HTTP/1.1' line and the body content.

Total de bytes: 1156.

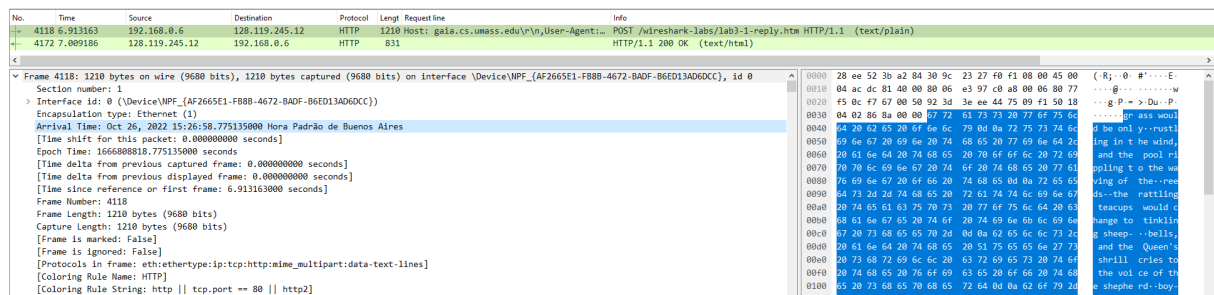


Sim, todos os dados do arquivo se encaixam em um único segmento.

6 - Considere o segmento TCP contendo o HTTP “POST” como o primeiro segmento na parte de transferência de dados da conexão TCP.

Em que momento foi enviado o primeiro segmento (aquele que contém o HTTP POST) na parte de transferência de dados da conexão TCP?

A que horas foi recebido o ACK para este primeiro segmento contendo dados?



26 de outubro de 2022, 15:26

Qual é o RTT para este primeiro segmento contendo dados?

Qual é o valor RTT do segundo segmento TCP que transporta dados e seu ACK? Nota: O Wireshark tem um bom recurso que permite plotar o RTT para cada um dos segmentos TCP enviados. Selecione um segmento TCP na janela "lista de pacotes capturados" que está sendo enviado do cliente para o servidor gaia.cs.umass.edu. Em seguida, selecione: Estatísticas->Gráfico de fluxo TCP->Gráfico de tempo de viagem de ida e volta.

TCP segment data: 1460
Lenght: 1514
Header Lenght: 20
Carga útil = 1480

TCP segment data: 1460
Lenght: 1514
Header Lenght: 20
Carga útil = 1480

3791 0.000908 99.181.80.16	192.168.0.6	TCP	1514	443 → 60937 [ACK] Seq=1332754 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3792 0.000000 99.181.80.16	192.168.0.6	TCP	1514	443 → 60937 [ACK] Seq=1334214 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3793 0.000061 99.181.80.16	192.168.0.6	TCP	1514	443 → 60937 [ACK] Seq=1335674 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3794 0.000041 192.168.0.6	99.181.80.16	TCP	54	60937 → 443 [ACK] Seq=10119 Ack=1337134 Win=8212 Len=0
3795 0.000193 99.181.80.16	192.168.0.6	TCP	1514	443 → 60937 [ACK] Seq=1337134 Ack=10119 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
3796 0.001711 99.181.80.16	192.168.0.6	TLSv1.2	745	Application Data
3797 0.000071 192.168.0.6	99.181.80.16	TCP	54	60937 → 443 [ACK] Seq=10119 Ack=1339285 Win=8212 Len=0
3800 0.007147 192.168.0.6	99.181.80.16	TLSv1.2	1492	Application Data
3808 0.013811 192.168.0.6	162.159.130.235	TCP	54	61598 → 443 [ACK] Seq=148 Ack=58 Win=1022 Len=0
3815 0.017570 128.119.245.12	192.168.0.6	TCP	66	80 → 63335 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM WS=128
3816 0.000154 192.168.0.6	128.119.245.12	TCP	54	63335 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=0
3817 0.002382 192.168.0.6	128.119.245.12	TCP	1514	63335 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3818 0.000000 192.168.0.6	128.119.245.12	TCP	1514	63335 → 80 [ACK] Seq=1461 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3819 0.000000 192.168.0.6	128.119.245.12	TCP	1514	63335 → 80 [ACK] Seq=2921 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3820 0.000000 192.168.0.6	128.119.245.12	TCP	1514	63335 → 80 [ACK] Seq=4381 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3821 0.000000 192.168.0.6	128.119.245.12	TCP	1514	63335 → 80 [ACK] Seq=5841 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3822 0.000000 192.168.0.6	128.119.245.12	TCP	1514	63335 → 80 [ACK] Seq=7301 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3823 0.000000 192.168.0.6	128.119.245.12	TCP	1514	63335 → 80 [ACK] Seq=8761 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3824 0.000000 192.168.0.6	128.119.245.12	TCP	1514	63335 → 80 [ACK] Seq=10221 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3825 0.000000 192.168.0.6	128.119.245.12	TCP	1514	63335 → 80 [ACK] Seq=11681 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3826 0.000000 192.168.0.6	128.119.245.12	TCP	1514	63335 → 80 [ACK] Seq=13141 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3839 0.029581 99.181.80.16	192.168.0.6	TCP	60	443 → 60937 [ACK] Seq=1339285 Ack=11557 Win=2495 Len=0
3840 0.003445 99.181.80.16	192.168.0.6	TLSv1.2	298	Application Data
3841 0.000000 99.181.80.16	192.168.0.6	TLSv1.2	82	Application Data
3842 0.000147 192.168.0.6	99.181.80.16	TCP	54	60937 → 443 [ACK] Seq=11557 Ack=1339557 Win=8211 Len=0
3843 0.000363 109.168.0.6	109.168.0.6	TCP	1514	443 → 60937 [ACK] Seq=1330007 Ack=11557 Win=2495 Len=1460 [TCP segment of a reassembled PDU]

> Frame 3819: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits) on interface \Device\NPF_{AF2665E1-F8B8-4672-BADF-86ED13AD60CC}, id 0 > Ethernet II, Src: Micro-St-27:f0:f1 (30:9c:23:27:f0:f1), Dst: Tp-Link_3b:a2:84 (28:ee:52:3b:a2:84) > Internet Protocol Version 4, Src: 192.168.0.6, Dst: 128.119.245.12 > Transmission Control Protocol, Src Port: 63335, Dst Port: 80, Seq: 2921, Ack: 1, Len: 1460 Source Port: 63335 Destination Port: 80 [Stream Index: 22] [Conversation completeness: Complete, WITH_DATA (63)] [TCP Segment Len: 1460] Sequence Number: 2921 (relative sequence number) Sequence Number (raw): 245338422 [Next Sequence Number: 4381 (relative sequence number)] Acknowledgment Number: 1 (relative ack number) Acknowledgment number (raw): 1148520945 0101 = Header Length: 20 bytes (5) > Flags: 0x010 (ACK) Window: 1026 [Calculated window size: 262656] [Window size scaling factor: 256] Checksum: 0x37f [unverified] [Checksum Status: Unverified] Urgent Pointer: 0 > [Timestamps] > [SEQ/ACK analysis]	0020 f5 0c f7 67 00 50 92 3a f9 36 44 75 09 f1 80 10 ...g:P: ...60u... 0030 04 02 37 bf 00 00 20 73 68 65 20 74 72 69 65 64 ...7... s he tried 0040 20 74 6f 20 6c 6f 6f 6f 6f 6f 6f 6f 6f 6f 6f 6f ... to look ...down a 0050 6e 64 20 6d 61 6b 65 20 6f 75 74 20 77 68 61 74 ...nd make out what 0060 20 73 68 65 20 77 61 73 20 63 6f 6d 69 6e 67 20 ... she was coming 0070 74 6f 2c 20 62 75 74 20 69 74 20 77 61 73 20 74 ... to, but it was t 0080 6f 6f 20 64 61 72 6b 20 74 6f 6f 6f 6f 6f 6f 6f ... ood dark to see 0090 61 6e 79 74 68 69 6e 67 3b 20 74 68 65 6e 20 73 ... anything ; then s 00a0 68 65 20 6c 6f 6f 6f 6f 6f 6f 6f 6f 6f 6f 6f 6f ... he looks d at the 00b0 20 73 69 64 65 73 20 6f 66 20 74 68 65 20 77 65 ... sides o f the we 00c0 6c 6c 2c 20 61 6e 64 6d 0a 6e 6f 74 69 63 65 64 ... ll, and- noticed 00d0 20 74 68 61 74 20 74 68 65 79 20 77 65 72 65 20 ... that they were 00e0 66 69 6c 6c 65 64 20 77 69 74 68 20 63 75 70 62 ... filled w ith cupb 00f0 6f 61 72 64 73 20 61 6e 64 20 62 6f 6f 6b 2d 73 ... oards and d book-s 0100 68 65 6c 76 65 73 3b 0d 0a 68 65 72 65 20 61 6e ... helves; here an 0110 64 20 74 68 65 72 65 20 73 68 65 20 73 61 77 20 ... d there she saw 0120 6d 61 70 73 20 61 6e 64 20 70 69 63 74 75 72 65 ... maps and picture 0130 73 20 68 75 6e 67 20 75 70 6f 6e 20 70 65 67 73 ... s hung u pon pags 0140 2e 20 20 53 68 65 6d 0a 74 6f 6f 6b 20 64 6f 77 She... took dow 0150 6e 20 61 20 6a 61 72 20 66 72 6f 6d 20 6f 6e 65 ... n a jar from one 0160 20 6f 66 20 74 68 65 20 73 68 65 6c 76 65 73 20 ... of the shelves 0170 61 73 20 73 68 65 20 70 61 73 73 65 64 2b 20 69 ... as she p asse; i 0180 74 20 77 61 73 0d 0a 6c 61 62 65 6c 6c 65 64 20 ... t was- i abelled
---	--

TCP segment data: 1460
 Length: 1514
 Header Lenght: 20
 Carga útil = 1480

8 - Qual é a quantidade mínima de espaço de buffer disponível anunciado ao cliente por gaia.cs.umass.edu entre esses quatro primeiros segmentos TCP de transporte de dados? A falta de espaço no buffer do receptor estrangula o remetente para esses quatro primeiros segmentos de transporte de dados?

No.	Time	Source	Destination	Protocol	Length	Request line	Info
3797	0.000071	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=10119 Ack=1339285 Win=8212 Len=0
3802	0.007147	192.168.0.6	99.181.80.16	TLSv1.2	1492		Application Data
3808	0.013811	192.168.0.6	162.159.130.235	TCP	54		61598 → 443 [ACK] Seq=148 Ack=58 Win=1022 Len=0
3815	0.017570	128.119.245.12	192.168.0.6	TCP	66		80 → 63335 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM WS=128
3816	0.000154	192.168.0.6	128.119.245.12	TCP	54		63335 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=0
3817	0.002382	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=1461 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3818	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=2921 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3819	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=4381 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3820	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=5841 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3821	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=7301 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3822	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=8761 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3823	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=10221 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3824	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=11681 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3825	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=13141 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3826	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=13141 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3839	0.029581	99.181.80.16	192.168.0.6	TCP	60		443 → 60937 [ACK] Seq=1339285 Ack=11557 Win=2495 Len=0
3840	0.003445	99.181.80.16	192.168.0.6	TLSv1.2	298		Application Data
3841	0.000000	99.181.80.16	192.168.0.6	TLSv1.2	82		Application Data
3842	0.000147	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=11557 Ack=1339557 Win=8211 Len=0
3843	0.000363	109.168.0.6	109.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=1330007 Ack=11557 Win=2495 Len=1460 [TCP segment of a reassembled PDU]

> [Coloring Rule String: http tcp.port == 80 http] > Ethernet II, Src: Micro-St-27:f0:f1 (30:9c:23:27:f0:f1), Dst: Tp-Link_3b:a2:84 (28:ee:52:3b:a2:84) > Internet Protocol Version 4, Src: 192.168.0.6, Dst: 128.119.245.12 > Transmission Control Protocol, Src Port: 63335, Dst Port: 80, Seq: 1, Ack: 1, Len: 0 Source Port: 63335 Destination Port: 80 [Stream Index: 22] [Conversation completeness: Complete, WITH_DATA (63)] [TCP Segment Len: 0] Sequence Number: 1 (relative sequence number) Sequence Number (raw): 245333502 [Next Sequence Number: 1 (relative sequence number)] Acknowledgment Number: 1 (relative ack number) Acknowledgment number (raw): 1148520945 0101 = Header Length: 20 bytes (5) > Flags: 0x010 (ACK) Window: 1026 [Calculated window size: 262656] [Window size scaling factor: 256] Checksum: 0xaf78 [unverified] [Checksum Status: Unverified] Urgent Pointer: 0 > [Timestamps] > [SEQ/ACK analysis]	0000 28 e6 52 3b a2 84 30 9c 23 27 f0 f1 08 00 45 00 ...R: 0 #....E 0010 00 28 dc 18 40 00 80 06 e8 b4 c8 a8 00 06 80 77 ...(-@.....w 0020 f5 0c f7 67 00 50 92 3a ed ce 44 75 09 f1 50 10 ...g:P: ...Du:P: 0030 34 02 af 78 00 00 ...x...
--	---

O primeiro ACK do servidor indica a quantidade mínima do buffer, então temos o valor de 262656.

9 - Existem segmentos retransmitidos no arquivo de rastreamento? O que você verificou (no rastreamento) para responder a essa pergunta?

No.	Time	Source	Destination	Protocol	Length	Request line	Info
6151	0.000063	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=17335 Ack=2202193 Win=8212 Len=0
6152	0.000952	99.181.80.16	192.168.0.6	TLV1.2	1304		Application Data, Application Data
6154	0.011816	2800:3f0:4004:803::	2804:2908:505a:207d::	TLV1.2	617		Application Data
6155	0.000000	2800:3f0:4004:803::	2804:2908:505a:207d::	TLV1.2	136		Application Data
6156	0.000000	2800:3f0:4004:803::	2804:2908:505a:207d::	TLV1.2	105		Application Data
6157	0.000149	2804:2908:505a:207d::	2800:3f0:4004:803::	TCP	74		62122 → 443 [ACK] Seq=2778 Ack=676 Win=1026 Len=0
6158	0.000206	2800:3f0:4004:803::	2804:2908:505a:207d::	TLV1.2	113		Application Data
6159	0.000044	2804:2908:505a:207d::	2800:3f0:4004:803::	TCP	74		62122 → 443 [ACK] Seq=2778 Ack=715 Win=1026 Len=0
6163	0.003447	2804:2908:505a:207d::	2800:3f0:4004:803::	TLV1.2	126		Application Data
6174	0.038937	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=17335 Ack=2203443 Win=8207 Len=0
6184	0.015710	192.168.0.6	192.168.1.255	TCP	66		[TCP Retransmission] [TCP Port numbers reused] 61340 → 1680 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM
6189	0.012753	2800:3f0:4004:803::	2804:2908:505a:207d::	TCP	74		443 → 62122 [ACK] Seq=715 Ack=2830 Win=10940 Len=0
6194	0.014069	99.181.80.16	192.168.0.6	TLV1.2	82		Application Data
6195	0.000281	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=2203471 Ack=17335 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
6196	0.000000	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=2204931 Ack=17335 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
6197	0.000066	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=17335 Ack=2206391 Win=8212 Len=0
6198	0.001707	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=2206391 Ack=17335 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
6199	0.000000	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=2207851 Ack=17335 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
6200	0.000996	99.181.80.16	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=2209311 Ack=17335 Win=2495 Len=1460 [TCP segment of a reassembled PDU]
6201	0.000000	192.168.0.6	192.168.0.6	TCP	64		60937 → 443 [ACK] Seq=17335 Ack=2210771 Win=8212 Len=0

Não, pois não foram encontrados pacotes de retransmissão (como o demonstrado acima) na comunicação com o gaia.

10 - Quantos dados o receptor normalmente reconhece em um ACK entre os dez primeiros segmentos de transporte de dados enviados do cliente para gaia.cs.umass.edu? Você pode identificar casos em que o receptor é ACK em todos os outros segmentos recebidos entre esses dez primeiros segmentos de transporte de dados?

No.	Time	Source	Destination	Protocol	Length	Request line	Info
3797	0.000071	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=10119 Ack=1339285 Win=8212 Len=0
3800	0.007147	192.168.0.6	99.181.80.16	TLV1.2	1492		Application Data
3808	0.013811	192.168.0.6	162.159.130.235	TCP	54		61598 → 443 [ACK] Seq=148 Ack=58 Win=1022 Len=0
3815	0.017570	128.119.245.12	192.168.0.6	TCP	66		80 → 63335 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM WS=128
3816	0.000154	192.168.0.6	128.119.245.12	TCP	54		63335 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=0
3817	0.002382	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3818	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=1461 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3819	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=2921 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3820	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=4381 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3821	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=5841 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3822	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=7381 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3823	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=8761 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3824	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=10221 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3825	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=11681 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3826	0.000000	192.168.0.6	128.119.245.12	TCP	1514		63335 → 80 [ACK] Seq=13141 Ack=1 Win=262656 Len=1460 [TCP segment of a reassembled PDU]
3829	0.029581	99.181.80.16	192.168.0.6	TCP	60		443 → 60937 [ACK] Seq=1339285 Ack=11557 Win=2495 Len=0
3840	0.003445	99.181.80.16	192.168.0.6	TLV1.2	298		Application Data
3841	0.000000	99.181.80.16	192.168.0.6	TLV1.2	82		Application Data
3842	0.000147	192.168.0.6	99.181.80.16	TCP	54		60937 → 443 [ACK] Seq=11557 Ack=1339557 Win=8211 Len=0
3843	0.000101	00.100.00.10	192.168.0.6	TCP	1514		443 → 60937 [ACK] Seq=11557 Ack=1339557 Win=8211 Len=0 [TCP segment of a reassembled PDU]

O servidor recebe 1460 bytes de um pacote para outro, pois quando subtraímos o número de sequência de um pacote X com o seu pacote TCP posterior, temos uma diferença de 1460 entre os números de sequência.

11 - Qual é a taxa de transferência (bytes transferidos por unidade de tempo) para a conexão TCP? Explique como você calculou esse valor.

Selecionei o pacote -> Statistics File Properties -> Statistics: Average bits/s

File

Name:

C:\Users\user\AppData\Local\Temp\wireshark_EthernetTVMGU1.pcapng

Length:

7828 kB

Hash (SHA256):

b0e23a5f70d8302ba0cbbc4fd6d2c5194a1ccce288f1352a00fb59ba6e13f424c

Hash (RIPEMD160):

83f4933e00841dbca44bfa27cf0594fa08dfc35

Hash (SHA1):

e08159fb2ea61089336c35dc06a335728669260e

Format:

Wireshark/... - pcapng

Encapsulation:

Ethernet

Time

First packet:

2022-10-26 15:26:51

Last packet:

2022-10-26 15:27:06

Elapsed:

00:00:14

Capture

Hardware:

AMD Ryzen 5 1600X Six-Core Processor (with SSE4.2)

OS:

64-bit Windows 10 (21H2), build 19044

Application:

Dumpcap (Wireshark) 4.0.0 (v4.0.0-0-g0cbe09cd79b6)

Interfaces

Interface	Dropped packets	Capture filter	Link type	Packet size limit (snaplen)
Ethernet	0 (0.0%)	none	Ethernet	262144 bytes

Statistics

Measurement	Captured	Displayed	Marked
Packets	7865	3490 (44.4%)	1 (0.0%)
Time span, s	14.170	14.099	—
Average pps	555.1	247.5	—
Average packet size, B	962	947	1514
Bytes	7562958	3303407 (43.7%)	1514 (0.0%)
Average bytes/s	533 k	234 k	—
Average bits/s	4269 k	1874 k	—

```

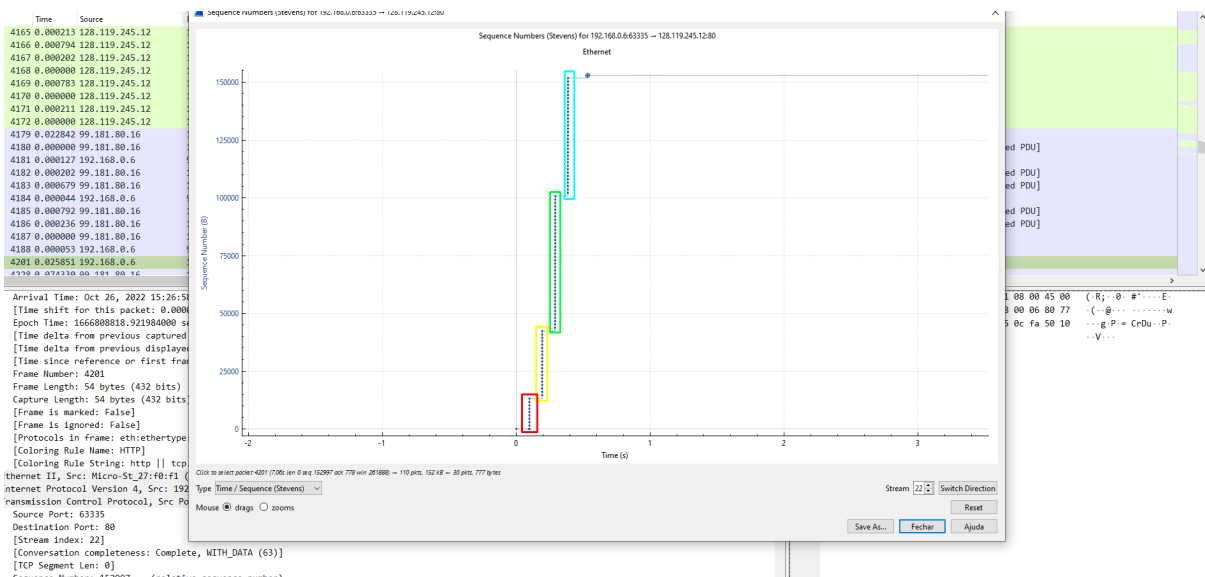
3817 0.002380 192.168.0.6      128.119.245.12      1514      63335 -> 80 [ACK] Seq=1461 Akin=26255 Len=1460 [TCP segment of a reassembled PDU]
3818 0.000000 192.168.0.6      128.119.245.12      TCP 1514      63335 -> 80 [ACK] Seq=1461 Akin=26255 Len=1460 [TCP segment of a reassembled PDU]
3819 0.000000 192.168.0.6      128.119.245.12      TCP 1514      63335 -> 80 [ACK] Seq=2921 Akin=26256 Len=1460 [TCP segment of a reassembled PDU]
3820 0.000000 192.168.0.6      128.119.245.12      TCP 1514      63335 -> 80 [ACK] Seq=4381 Akin=26256 Len=1460 [TCP segment of a reassembled PDU]
3821 0.000000 192.168.0.6      128.119.245.12      TCP 1514      63335 -> 80 [ACK] Seq=5841 Akin=26256 Len=1460 [TCP segment of a reassembled PDU]
3822 0.000000 192.168.0.6      128.119.245.12      TCP 1514      63335 -> 80 [ACK] Seq=7301 Akin=26256 Len=1460 [TCP segment of a reassembled PDU]
3823 0.000000 192.168.0.6      128.119.245.12      TCP 1514      63335 -> 80 [ACK] Seq=8761 Akin=26256 Len=1460 [TCP segment of a reassembled PDU]
3824 0.000000 192.168.0.6      128.119.245.12      TCP 1514      63335 -> 80 [ACK] Seq=10221 Akin=26256 Len=1460 [TCP segment of a reassembled PDU]

> Frame 3817: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits) on Interface [Device]NPF_{AF2665E1-F8B8-4672-BADF-B6E013AD0CC0}, Id 0
  Section number: 1
  Interface info: 0 \Device\NPF_{AF2665E1-F8B8-4672-BADF-B6E013AD0CC0}
  Encapsulation type: Ethernet II (1)
  Arrival Time: Oct 26, 2022 15:26:58.487190000 Hora Padrão de Buenos Aires
  [Time shift for this packet: 0.000000000 seconds]
  Epoch Time: 166688818.487190000 seconds
  [Time delta from previous captured frame: 0.002380000 seconds]
  [Time delta from previous displayed frame: 0.002380000 seconds]
  [Time since reference or first frame: 6.625218000 seconds]
  Frame Number: 3817
  Frame Length: 1514 bytes (12112 bits)
  Capture Length: 1514 bytes (12112 bits)
  [Frame is marked: False]
  [Frame is ignored: False]
  [Protocols in frame: ethertype:ip:tcp]
  [Coloring Rule Name: HTTP]
  [Coloring Rule Link: http || tcp.port == 80 || http2]

  Ethernet II, Src: Micro-Str_27:70:f1 (30:93:23:27:70:f1), Dst: Tp-Link_Br_a2B4 (28:ee:53:b2:a2B4)
  > Internet Protocol Version 4, Src: 192.168.0.6, Dst: 128.119.245.12
  > Transmission Control Protocol, Src Port: 63335, Dst Port: 80, Seq: 1, Ack: 1, Len: 1460
  > Hypertext Transfer Protocol
  Destination Port: 80
  [Stream index: 22]

```

12 - Use a ferramenta de plotagem Time-Sequence-Graph(Stevens) para visualizar o gráfico de número de sequência versus tempo dos segmentos que estão sendo enviados do cliente para o servidor gaia.cs.umass.edu. Considere as "frotas" de pacotes enviados em torno de $t = 0,025$, $t = 0,053$, $t = 0,082$ e $t = 0,1$. Comente se parece que o TCP está em sua fase de início lento, fase de prevenção de congestionamento ou alguma outra fase. A Figura 6 mostra uma visão ligeiramente diferente desses dados.



- Em vermelho há a primeira frota, a qual está com poucos pacotes a fim de prevenir perdas.
- Em amarelo há a segunda frota, com tamanho dobrado em relação à primeira, já que nela todos os pacotes foram recebidos, nesta segunda frota subtende se que é possível enviar mais pacotes.
- Em verde há a terceira frota, com quantidade de pacotes dobrada em relação à segunda, também pelo mesmo motivo.
- Por fim, em azul, há a quarta e última frota, com o restante dos pacotes.

13. Essas “frotas” de segmentos parecem ter alguma periodicidade. O que você pode dizer sobre o período?

Sim, as frotas posteriores à primeira tem uma quantidade de pacotes dobrada em relação à anterior, que tinha poucos pacotes para controlar o congestionamento de pacotes, mas quando são recebidos em sua completude, na frota posterior a quantidade de pacotes é dobrada, e assim posteriormente

14 - Responda a cada uma das duas perguntas acima para o rastreamento que você coletou quando transferiu um arquivo do seu computador para gaia.cs.umass.edu.