

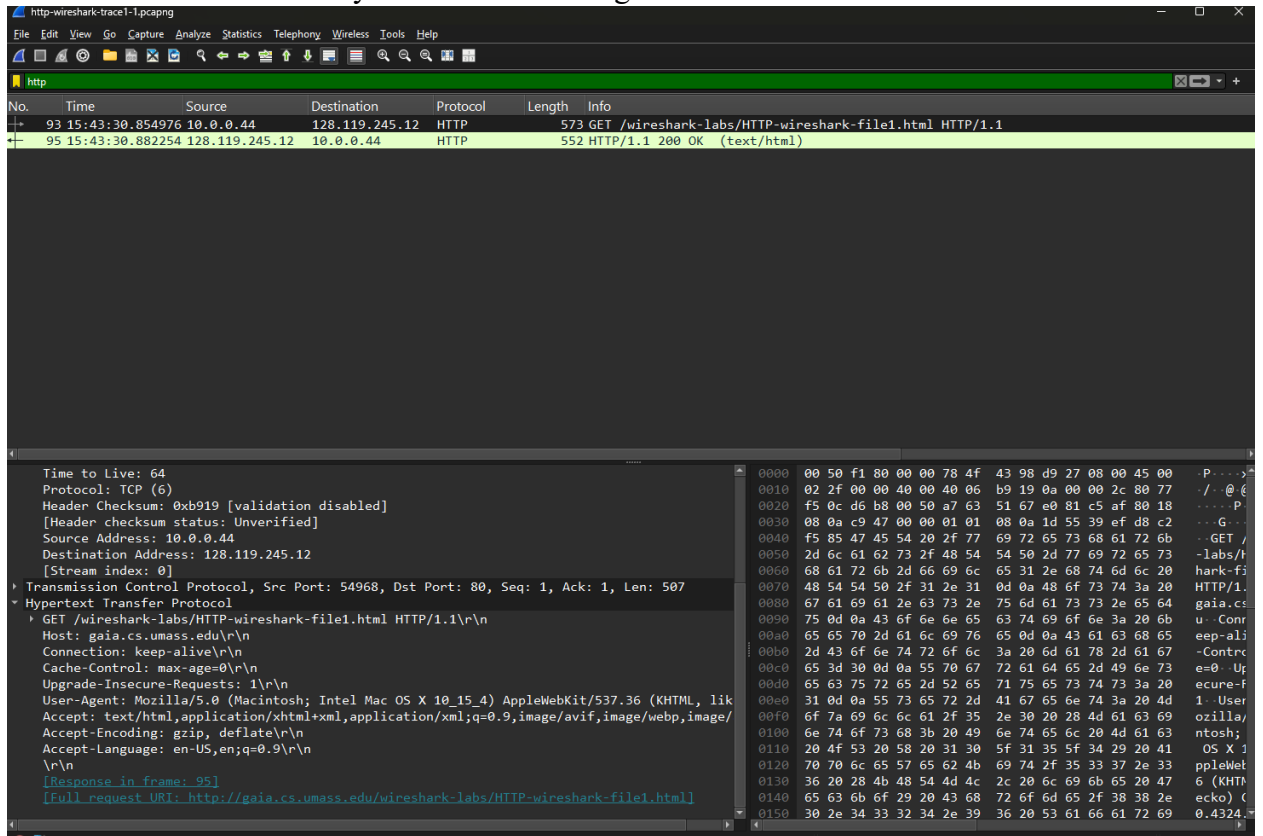
Kate Moreland

kem0149

COMP 4320: Midterm 1

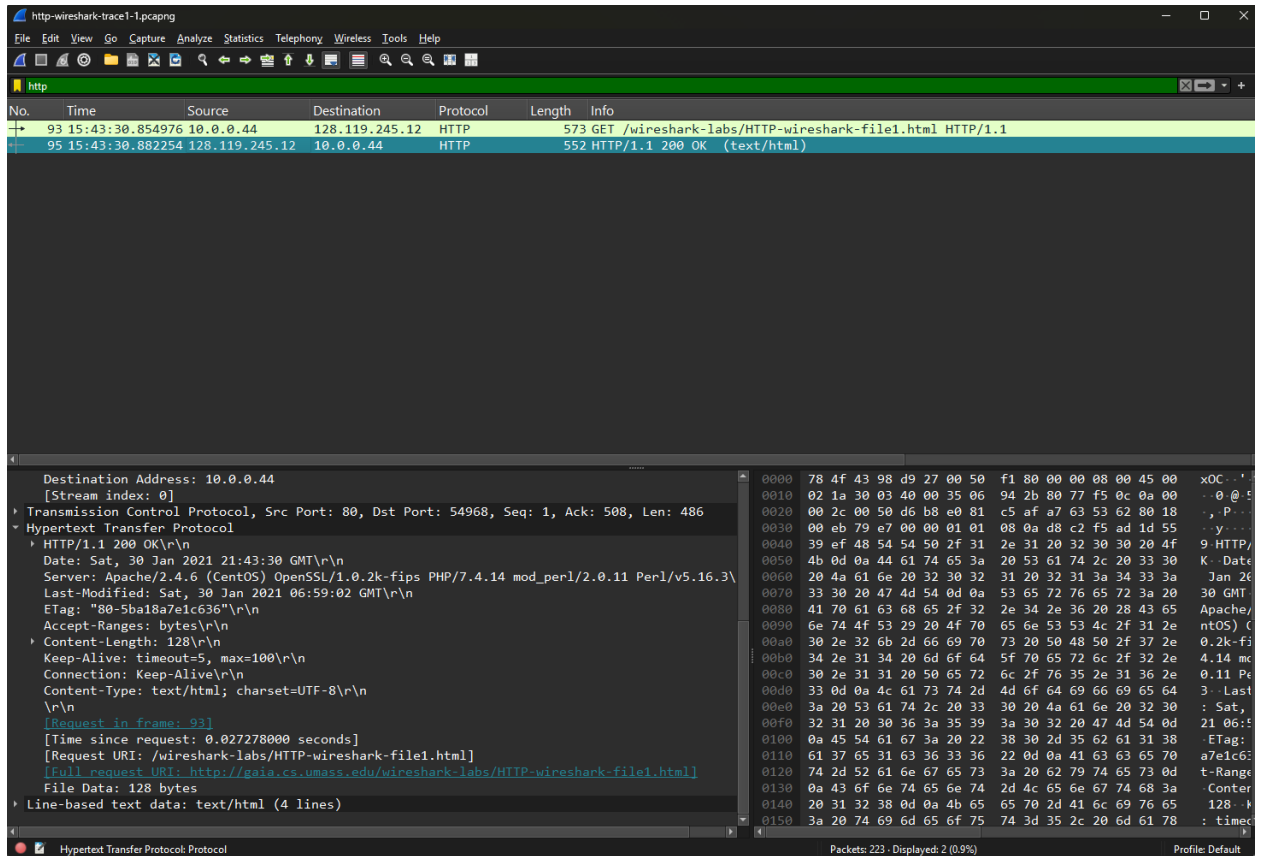
## Question 1

1. Which version of HTTP is your browser running?



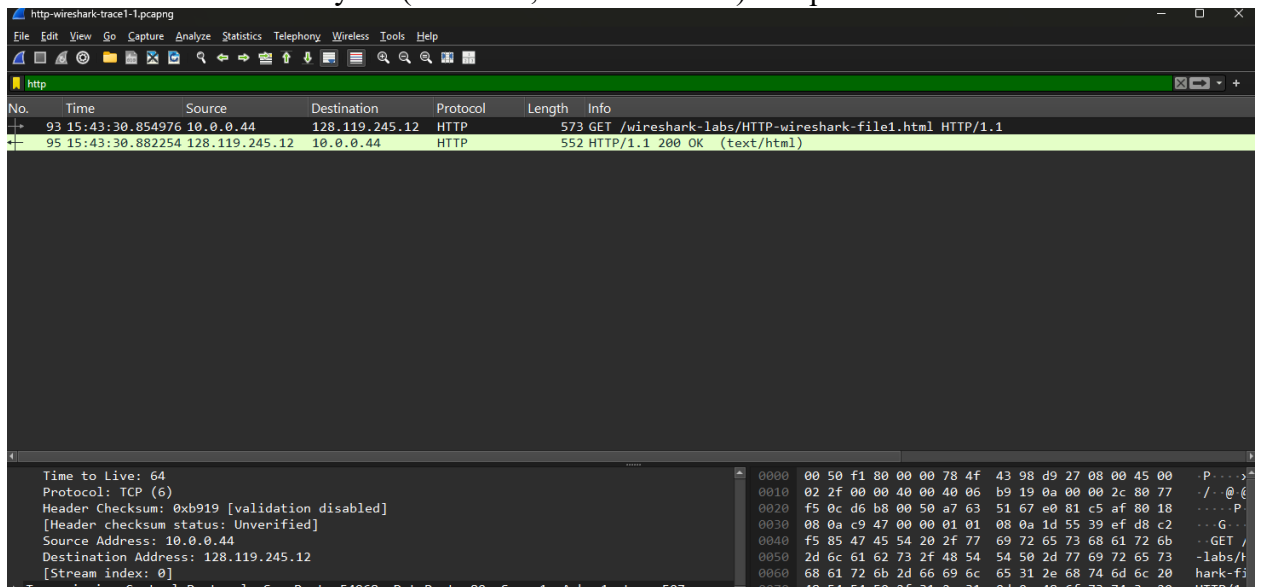
It is running 1.1 as you can see in the get message.

2. Which version of HTTP is running at the server?



It is running 1.1 at the server as well.

- What is the IP address of your (the client, with a browser) computer?



The IP address of the client is 10.0.0.44 because it is the source in this.

- What is the HTTP server that replied to your HTTP GET request?

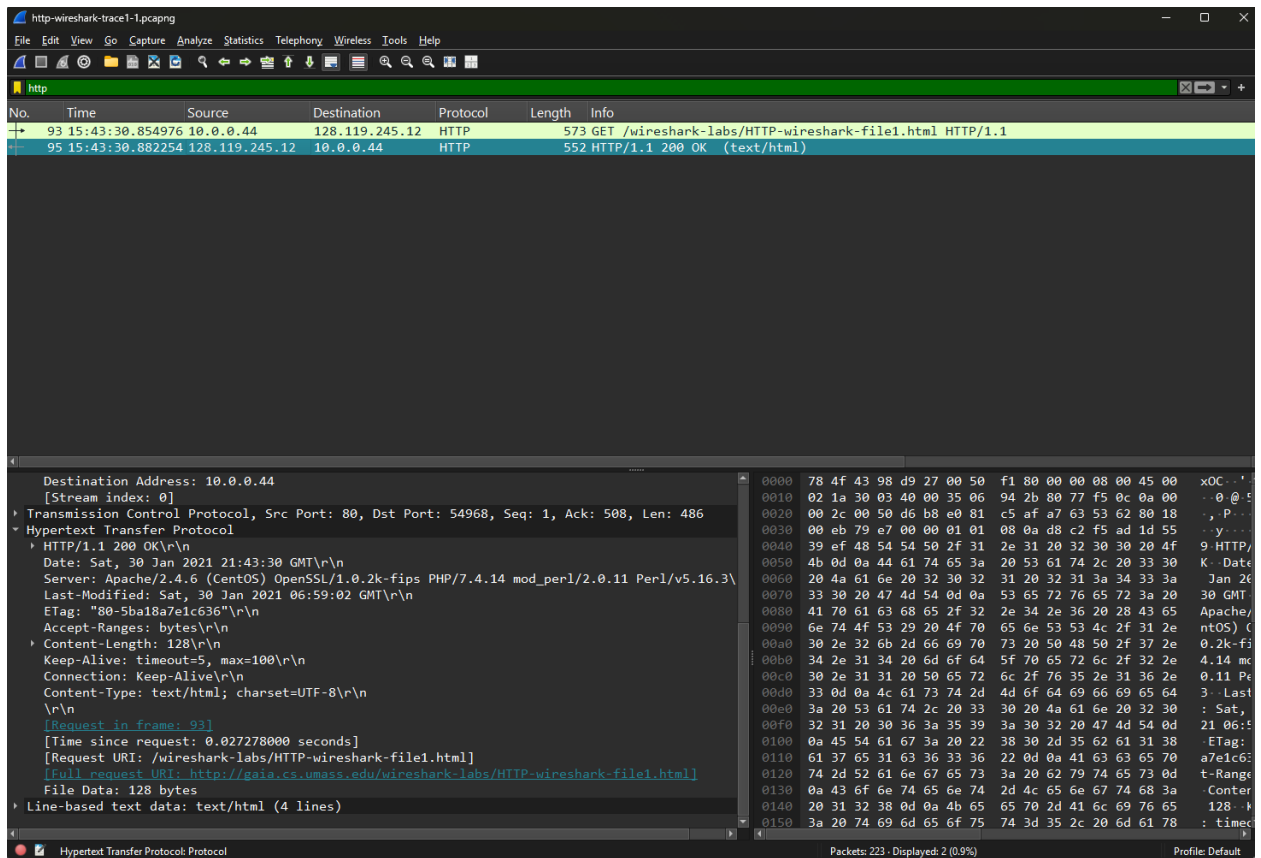
http						
No.	Time	Source	Destination	Protocol	Length	Info
93	15:43:30.854976	10.0.0.44	128.119.245.12	HTTP	573	GET /wireshark-labs/HTTP-wireshark-file1.html HTTP/1.1
95	15:43:30.882254	128.119.245.12	10.0.0.44	HTTP	552	HTTP/1.1 200 OK (text/html)

▶ Frame 95: 552 bytes on wire (4416 bits), 552 bytes captured (4416 bits) on interface en0, id 0		0000	78 4f 43 98 d9 27 00 50 f1
▶ Ethernet II, Src: Maxlinear_80:00:00 (00:50:f1:80:00:00), Dst: Apple_98:d9:27 (78:4f:43:98:d9:27)		0010	02 1a 30 03 40 00 35 06 94
▶ Internet Protocol Version 4, Src: 128.119.245.12, Dst: 10.0.0.44		0020	00 2c 00 50 d6 b8 e0 81 c5
▶ 0100 .... = Version: 4 .... 0101 = Header Length: 20 bytes (5)		0030	00 eb 79 e7 00 00 01 01 08
▶ Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)		0040	39 ef 48 54 54 50 2f 31 2e
Total Length: 538		0050	4b 0d 0a 44 61 74 65 3a 20
Identification: 0x3003 (12291)		0060	20 4a 61 6e 20 32 30 32 31
▶ 010. .... = Flags: 0x2, Don't fragment		0070	33 30 20 47 4d 54 0d 0a 53
...0 0000 0000 0000 = Fragment Offset: 0		0080	41 70 61 63 68 65 2f 32 2e
Time to Live: 53		0090	6e 74 4f 53 29 20 4f 70 65
Protocol: TCP (6)		00a0	30 2e 32 6b 2d 66 69 70 73
Header Checksum: 0x942b [validation disabled]		00b0	34 2e 31 34 20 6d 6f 64 5f
[Header checksum status: Unverified]		00c0	30 2e 31 31 20 50 65 72 6c
Source Address: 128.119.245.12		00d0	33 0d 0a 4c 61 73 74 2d 4d
Destination Address: 10.0.0.44		00e0	3a 20 53 61 74 2c 20 33 30
[Stream index: 0]		00f0	32 31 20 30 36 3a 35 39 3a
		0100	0a 45 54 61 67 3a 20 22 38

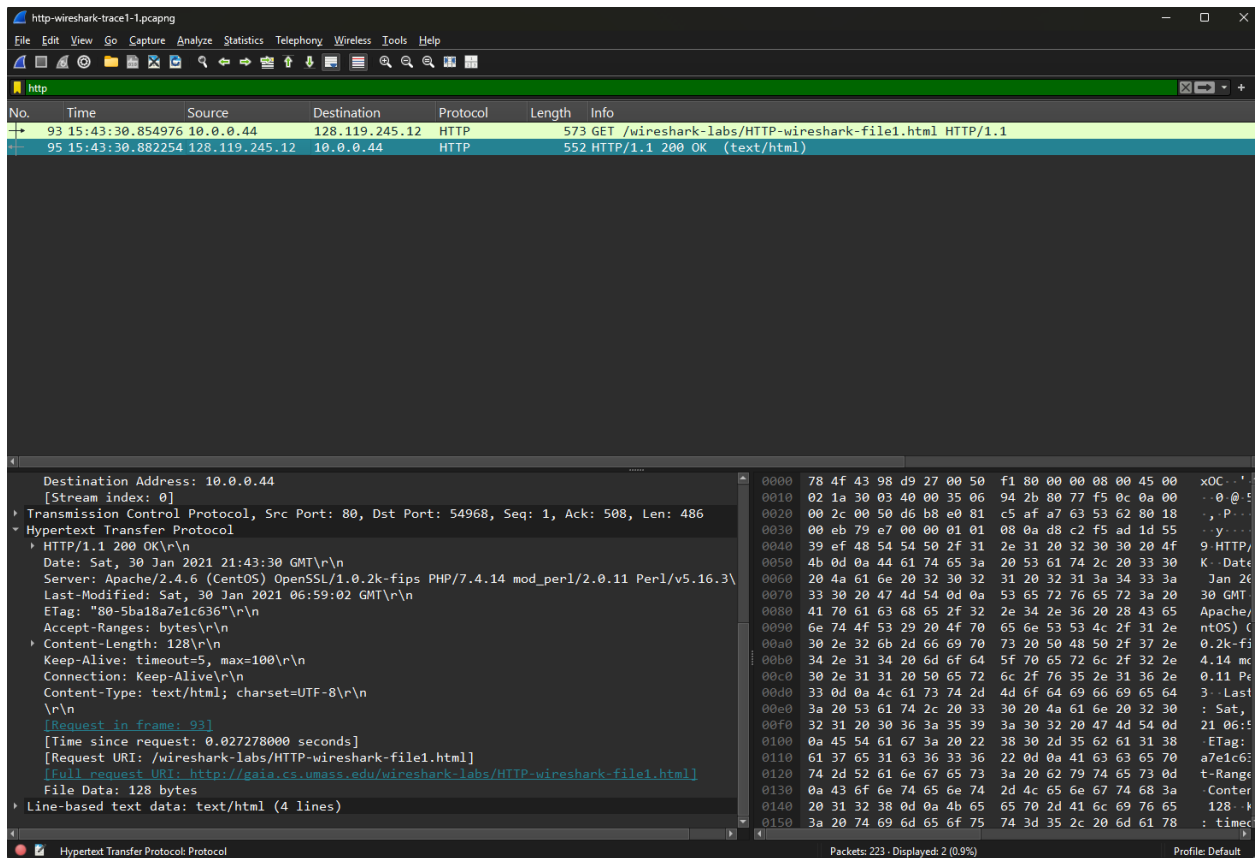
The IP address of the server is 128.119.245.12 because it is sending the response from the HTTP GET request.

- What is the status code returned from the server to your browser in response to the original HTTP GET?



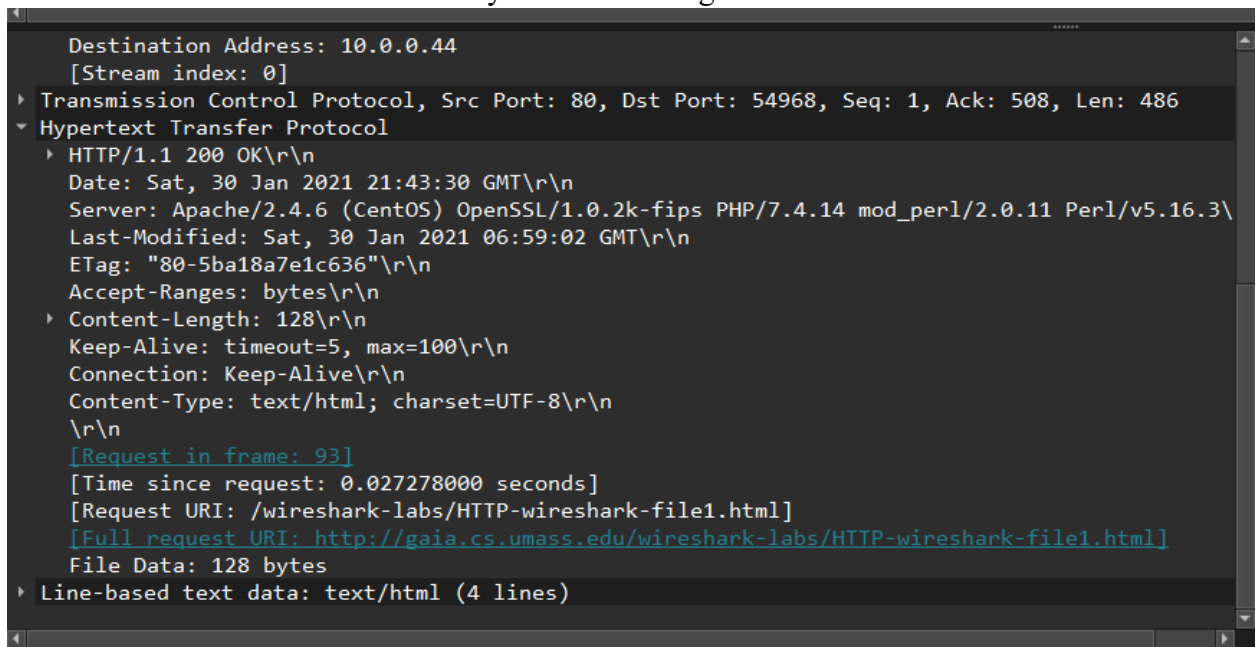
The status code of the response is 200.

- What is the status phrase returned from the server to your browser in response to the original HTTP GET?



The phrase return is OK.

- At what date was the HTML file that you are retrieving last modified at the server?



01/30/2021

- At what time was the HTML file that you are retrieving last modified at the server?

```
Destination Address: 10.0.0.44
[Stream index: 0]
Transmission Control Protocol, Src Port: 80, Dst Port: 54968, Seq: 1, Ack: 508, Len: 486
Hypertext Transfer Protocol
  HTTP/1.1 200 OK\r\n
  Date: Sat, 30 Jan 2021 21:43:30 GMT\r\n
  Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.14 mod_perl/2.0.11 Perl/v5.16.3\r\n
  Last-Modified: Sat, 30 Jan 2021 06:59:02 GMT\r\n
  ETag: "80-5ba18a7e1c636"\r\n
  Accept-Ranges: bytes\r\n
  Content-Length: 128\r\n
  Keep-Alive: timeout=5, max=100\r\n
  Connection: Keep-Alive\r\n
  Content-Type: text/html; charset=UTF-8\r\n
  \r\n
  [Request in frame: 93]
  [Time since request: 0.027278000 seconds]
  [Request URI: /wireshark-labs/HTTP-wireshark-file1.html]
  [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html]
  File Data: 128 bytes
Line-based text data: text/html (4 lines)
```

21:43:30

9. How many bytes of content are being returned to your browser?

```
Destination Address: 10.0.0.44
[Stream index: 0]
Transmission Control Protocol, Src Port: 80, Dst Port: 54968, Seq: 1, Ack: 508, Len: 486
Hypertext Transfer Protocol
  HTTP/1.1 200 OK\r\n
  Date: Sat, 30 Jan 2021 21:43:30 GMT\r\n
  Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.14 mod_perl/2.0.11 Perl/v5.16.3\r\n
  Last-Modified: Sat, 30 Jan 2021 06:59:02 GMT\r\n
  ETag: "80-5ba18a7e1c636"\r\n
  Accept-Ranges: bytes\r\n
  Content-Length: 128\r\n
  Keep-Alive: timeout=5, max=100\r\n
  Connection: Keep-Alive\r\n
  Content-Type: text/html; charset=UTF-8\r\n
  \r\n
  [Request in frame: 93]
  [Time since request: 0.027278000 seconds]
  [Request URI: /wireshark-labs/HTTP-wireshark-file1.html]
  [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html]
  File Data: 128 bytes
Line-based text data: text/html (4 lines)
```

128 bytes are being returned to your browser.

10. By inspecting the raw data in the packet content window, do you see any headers within the data that are not displayed in the packet-listing window? (Yes/No)

```
[Stream index: 0]
Transmission Control Protocol, Src Port: 80, Dst Port: 54968, Seq: 1, Ack: 508, Len: 486
Hypertext Transfer Protocol
  HTTP/1.1 200 OK\r\n
    Date: Sat, 30 Jan 2021 21:43:30 GMT\r\n
    Server: Apache/2.4.6 (CentOS) OpenSSL/1.0.2k-fips PHP/7.4.14 mod_perl/2.0.11 Perl/v5.16.3\r\n
    Last-Modified: Sat, 30 Jan 2021 06:59:02 GMT\r\n
    ETag: "80-5ba18a7e1c636"\r\n
    Accept-Ranges: bytes\r\n
    Content-Length: 128\r\n
    Keep-Alive: timeout=5, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=UTF-8\r\n
  \r\n
  [Request in frame: 92]
  [Time since request: 0.022728000 seconds]
  [Request URI: /wireshark-labs/HTTP-wireshark-file1.html]
  [Full request URI: http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html]
  File Data: 128 bytes
Line-based text data: text/html (4 lines)
<html>\n
  Congratulations. You've downloaded the file \n
  http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html\n
</html>\n
Bytes 326-357: Response line (http.response.line)
```

```
0000 34 2e 31 34 20 6d 6f 64 5f 70 65 72 6c 2f 32 2e 41 14 mod_perl/2.
0000 30 2e 31 31 20 50 65 72 6c 2f 76 35 2e 31 36 2e 0.11 Perl/v5.16.
0000 33 0d 0a 4c 61 73 74 2d 4d 6f 64 69 66 69 65 64 3 Last-Modified
0000 3a 20 53 61 74 2c 20 33 30 20 4a 61 6e 20 32 30 : Sat, 30 Jan 20
0000 32 31 20 30 36 3a 35 39 3a 30 32 20 47 4d 54 0d 21 06:59 :02 GMT
0100 0a 45 54 61 67 3a 20 22 38 30 2d 35 62 61 31 38 ETag: " 80-5ba18
0110 61 37 65 31 63 36 33 22 0d 0a 41 63 63 65 70 a7e1c636 " Accep
0120 74 2d 52 61 6e 67 65 73 3a 20 62 79 74 65 73 0d t-Ranges: bytes-
0130 0a 43 6f 6e 74 65 6e 74 2d 4c 65 6e 67 74 68 3a Content-Length:
0140 20 31 32 38 0d 0a 4b 65 65 70 2d 41 6c 69 76 65 128 Keep-Alive
0150 3a 20 74 69 6d 65 6f 75 74 3d 35 2c 20 6d 61 78 timeout=5, max
0160 3d 31 30 30 0d 0a 43 6f 6e 6e 65 63 74 69 6f 6e =100-Connection
0170 3a 20 4b 65 65 70 2d 41 6c 69 76 65 0d 0a 43 6f : Keep-A live- Co
0180 6e 74 65 6e 74 2d 54 79 70 65 3a 20 74 65 78 74 nent-Type: text
0190 2f 68 74 6d 6c 3b 20 63 68 61 72 73 65 74 3d 55 /html; c harset=U
01a0 54 46 2d 38 0d 0a 0d 0a 3c 68 74 6d 6c 3e 0a 43 TF-8 <html> C
01b0 6f 6e 67 72 61 74 75 6c 61 74 69 6f 6e 73 2e 20 ongratul ations.
01c0 20 59 6f 75 27 76 65 20 64 6f 77 6e 6c 6f 61 64 You've download
01d0 65 64 20 74 68 65 20 66 69 6c 65 20 0a 68 74 74 ed the f ile htt
01e0 70 3a 2f 6f 61 69 61 2e 63 73 2e 75 6d 61 73 p://gaia .cs umas
01f0 73 2e 65 64 75 2f 77 69 72 65 73 68 61 72 6b 2d s.edu/wi reshark-
0200 6c 61 62 73 2f 48 54 54 50 2d 77 69 72 65 73 68 labs/HT P-wresh
0210 61 72 6b 2d 66 69 6c 65 31 2e 68 74 6d 6c 21 0a ark-file 1.html
0220 3c 2f 68 74 6d 6c 3e 0a </html>
```

Packets: 223 · Displayed: 2 (0.9%) Profile: Default

No

Question 3



3.

1.

~~700 Mbps~~

$$80 > 60 = 60 \text{ Mbps}$$

$$2. R_s = 80 \text{ Mbps}$$

$$R_{\text{bottleneck}}/R_s = 60/80 = 3/4 = 75\%$$

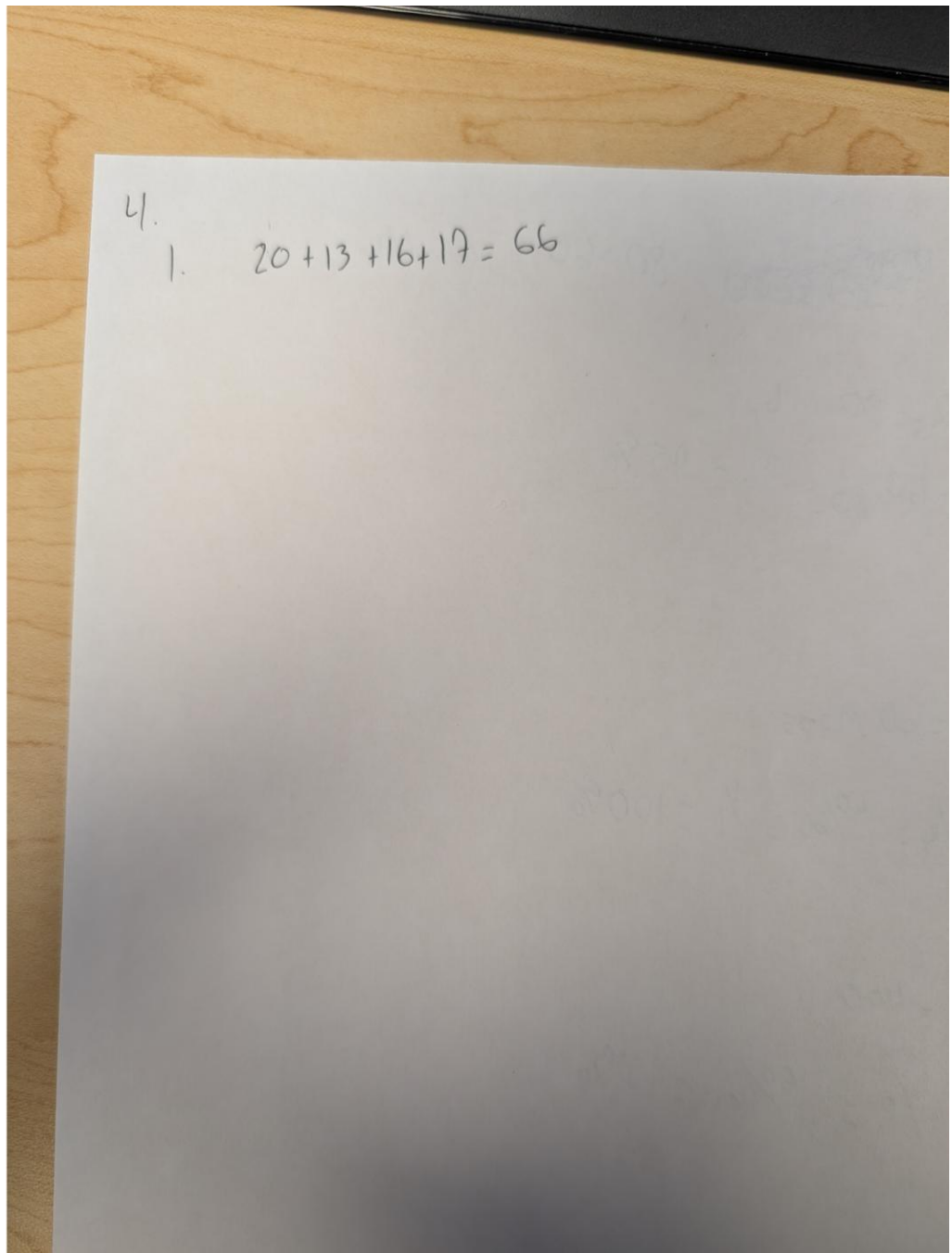
$$3. R_c = 60 \text{ Mbps}$$

$$R_{\text{bottleneck}}/R_c = 60/60 = 1/1 = 100\%$$

$$4. R = 400$$

$$R_{\text{bottleneck}}/R = 60/400 = 15\%$$

Question 4



A photograph of a piece of white paper with handwritten text in black ink. The paper is placed on a light-colored wooden surface. The handwriting shows a list item '4.' followed by a sub-item '1.' and an arithmetic equation.

4.  
1.  $20 + 13 + 16 + 17 = 66$

Question 5

5.

$$1. D_{cs} \geq \max \left\{ \frac{NF}{U_s}, \frac{F}{d_{min}} \right\}$$

$$\frac{NF}{U_s} = \frac{9.9000 \text{ mb}}{91 \text{ Mbps}} = \frac{81000}{91} \approx 890.109899$$

$$\frac{F}{d_{min}} = \frac{9000 \text{ mb}}{13} \approx 692.30769231$$

2. S

$$3. D_{p2p} \geq \max \left\{ \frac{F}{U_s}, \frac{F}{d_{min}}, \frac{NF}{U_s + \sum_{i=1}^n U_i} \right\}$$

$$\frac{F}{U_s} = \frac{9000}{91}$$

$$\frac{F}{d_{min}} = \frac{9000}{13}$$

$$\frac{NF}{U_s + \sum U_i} = \frac{9.9000}{91 + 186}$$

$$\approx 692.31$$

$$4. d_{min} = 13 \text{ Mbps}$$

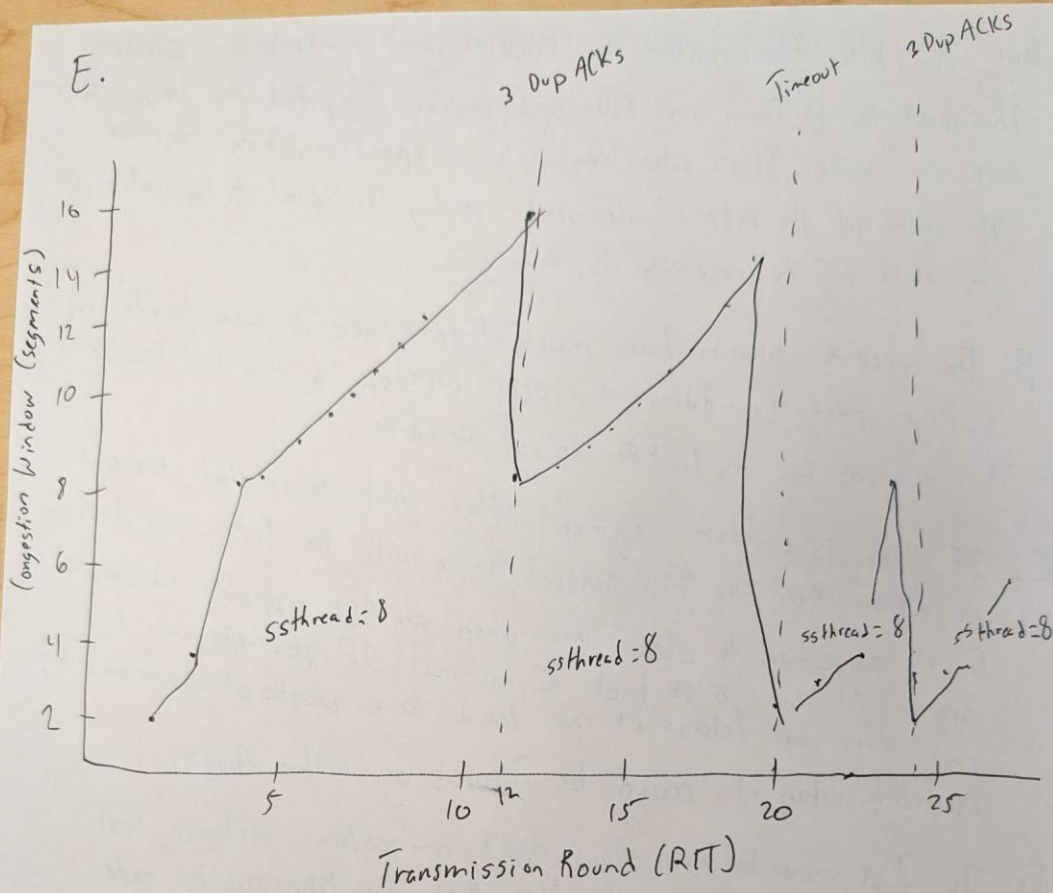
6. A. With flow control the receiver will control the sender. This protects it from overflow and makes it spread the transmission out over time. It is also known as a speed-matching service. The value of the rate of the sender sending is equal to the value of the rate of the receiver's reading.

B. The receiver shows how much free space is available in buffer space by adding a receive window in the TCP header. This allows for the buffer to not overflow.

C. If there is a lost segment then that shows that there is congestion. Then the TCP sender's rate will be lessened to allow for the congestion to clear. Then when an ACK appears for that segment it can go back to normal. If packets are lost and there are delays it can lead to a waste of resources by resending when it could be focused on other things.

D. The 3 components are slow start, congestion avoidance, fast recovery. Slow start is the idea that the transmission rate should start slow and slowly increase after no packet loss. Congestion avoidance is the idea the transmission rate should increase gradually instead of exponentially. Fast recovery is the idea that after packet loss it still sends packets but at a slightly lower rate, which improves efficiency.





$$\frac{cwnd}{2} = \frac{16}{2} = 8$$

Question 7

$$7. 1. \text{ Estimated RTT} = (1 - \alpha) \times \text{Estimated RTT} + \alpha \times \text{Sample RTT}$$

$$\alpha = 0.125 \quad \beta = 0.25$$

$$= (1 - 0.125) \times 300 + 0.125 \times 380$$

$$= 310 \text{ ms}$$

$$\text{Dev RTT} = (1 - \beta) \times \text{Dev RTT} + \beta \times |\text{Sample RTT} - \text{Estimated RTT}|$$

$$= (1 - 0.25) \times 44 + 0.25 \times |380 - 310| = 50.5 \text{ ms}$$

$$\text{Timeout Interval} = \text{Estimated RTT} + 4 \times \text{Dev RTT}$$

$$= 310 + 4 \times 50.5 = 512$$

$$2. \text{ Est.} = (1 - 0.125) \times 310 + 0.125 \times 260 = 303.75$$

$$\text{Dev RTT} = (1 - 0.25) \times 50.5 + 0.25 \times |260 - 303.75|$$

$$= 48.8125$$

$$\text{Timeout} = 303.75 + 4 \times 48.8125 = 499$$

8. TCP 1 = 150

$$\text{TCP 2} = 150 + 547 = 697$$

$$\text{TCP 3} = 697 + 547 = 1244$$

$$\text{TCP 4} = 1244 + 547 = 1791$$

$$\text{TCP 5} = 1791 + 547 = 2338$$

$$\text{ACK 1} = 697$$

$$\text{ACK 2} = 1244$$

$$\text{ACK 3} = \text{none}$$

$$\text{ACK 4} = \text{none}$$

$$\text{ACK 5} = \text{none}$$

