

Exercise 3:

Question1:

```
Transmission Control Protocol, Src Port: 80, Dst Port: 4127, Seq: 1, Len: 800
  Hypertext Transfer Protocol
    HTTP/1.1 200 OK\r\n
```

It response 200 and OK, it means the server response successfully.

Question2:

```
Hypertext Transfer Protocol
  HTTP/1.1 200 OK\r\n
    Date: Tue, 23 Sep 2003 05:29:50 GMT\r\n
    Server: Apache/2.0.40 (Red Hat Linux)\r\n
    Last-Modified: Tue, 23 Sep 2003 05:29:00 GMT\r\n
```

Last modified time is on Sep 23, 2003 5:29:00. And the response also contain a DATE header. Date refers to the date and time when the server generates and sends the response message. Last-Modified means the time when the object was created or last modified.

Question3:

```
Connection: Keep-Alive\r\n
```

According to the figure above, it can find that the connection is persistent.

Question4:

```
Content-Type: text/html; charset=ISO-8859-1\r\n
\r\n
[HTTP response 1/2]
[Time since request: 0.024143000 seconds]
[Request in frame: 10]
[Next request in frame: 13]
[Next response in frame: 14]
[Request URI: http://gaia.cs.umass.edu/favicon.ico]
File Data: 73 bytes
```

According to the figure above, there are 73 bytes contents are being returned to the browser.

Question5:

```
Connection: keep-alive\r\n
\r\n
[Full request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-1.html]
```

The data contained inside the HTTP response packet is a html projects named 'lab2-1.html' .

Exercise 4:

Question1:

No.	Time	Source	Destination	Protocol	Length	Info
8	2.331268	192.168.1.102	128.119.245.12	HTTP	555	GET /ethereal-labs/lab2-2.html HTTP/1.1
10	2.357902	128.119.245.12	192.168.1.102	HTTP	739	HTTP/1.1 200 OK (text/html)
14	5.517390	192.168.1.102	128.119.245.12	HTTP	668	GET /ethereal-labs/lab2-2.html HTTP/1.1
15	5.540216	128.119.245.12	192.168.1.102	HTTP	243	HTTP/1.1 304 Not Modified

Frame 8: 555 bytes on wire (4440 bits), 555 bytes captured (4440 bits)
Ethernet II, Src: Dell_4f:36:23 (00:08:74:4f:36:23), Dst: Linksys_6d:af:73 (00:06:25:da:af:73)
Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 4247, Dst Port: 80, Seq: 1, Ack: 1, Len: 501
Hypertext Transfer Protocol
GET /ethereal-labs/lab2-2.html HTTP/1.1\r\nHost: gaia.cs.umass.edu\r\nUser-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.0.2) Gecko/20021120 Netscape/7.01\r\nAccept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,video/x-mng,image/png,image/jpeg,image/gif;q=0.2,text/css,*/*\r\nAccept-Language: en-us,en;q=0.50\r\nAccept-Encoding: gzip, deflate, compress;q=0.9\r\nAccept-Charset: ISO-8859-1, utf-8;q=0.66, */q=0.66\r\nKeep-Alive: 300\r\nConnection: keep-alive\r\n\r\n[Full request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-2.html]
[HTTP request 1/2]
[Response in frame: 10]
[Next request in frame: 14]

There is not "IF-MODIFIED-SINCE" line in the HTTP GET.

Question2:

No.	Time	Source	Destination	Protocol	Length	Info
8	2.331268	192.168.1.102	128.119.245.12	HTTP	555	GET /ethereal-labs/lab2-2.html HTTP/1.1
10	2.357902	128.119.245.12	192.168.1.102	HTTP	739	HTTP/1.1 200 OK (text/html)
14	5.517390	192.168.1.102	128.119.245.12	HTTP	668	GET /ethereal-labs/lab2-2.html HTTP/1.1
15	5.540216	128.119.245.12	192.168.1.102	HTTP	243	HTTP/1.1 304 Not Modified

Frame 10: 739 bytes on wire (5912 bits), 739 bytes captured (5912 bits)
Ethernet II, Src: Linksys_6d:af:73 (00:06:25:da:af:73), Dst: Dell_4f:36:23 (00:08:74:4f:36:23)
Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.102
Transmission Control Protocol, Src Port: 80, Dst Port: 4247, Seq: 1, Ack: 502, Len: 685
Hypertext Transfer Protocol
HTTP/1.1 200 OK\r\nDate: Tue, 23 Sep 2003 05:35:50 GMT\r\nServer: Apache/2.0.40 (Red Hat Linux)\r\nLast-Modified: Tue, 23 Sep 2003 05:35:00 GMT\r\nETag: "1bfef-173-8f4ae900"\r\n

No, requested file was not modified.

Question3:

14	5.517390	192.168.1.102	128.119.245.12	HTTP	668	GET /ethereal-labs/lab2-2.html HTTP/1.1
15	5.540216	128.119.245.12	192.168.1.102	HTTP	243	HTTP/1.1 304 Not Modified

Frame 14: 668 bytes on wire (5344 bits), 668 bytes captured (5344 bits)
Ethernet II, Src: Dell_4f:36:23 (00:08:74:4f:36:23), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)
Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12
Transmission Control Protocol, Src Port: 4247, Dst Port: 80, Seq: 502, Ack: 686, Len: 614
Hypertext Transfer Protocol
GET /ethereal-labs/lab2-2.html HTTP/1.1\r\n
Host: gaia.cs.umass.edu\r\n
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.0.2) Gecko/20021120 Netscape/7.01\r\n
Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,video/x-mng,image/png,image/jpeg,image/gif;q=0.8\r\n
Accept-Language: en-us,en;q=0.5\r\n
Accept-Encoding: gzip, deflate, compress;q=0.9\r\n
Accept-Charset: ISO-8859-1, utf-8;q=0.66,*;q=0.66\r\n
Keep-Alive: 300\r\n
Connection: keep-alive\r\n
If-Modified-Since: Tue, 23 Sep 2003 05:35:00 GMT\r\n
If-None-Match: "1bfef-173-8f4ae900"\r\n

There are 'If-Modified-Since' and 'If-None-Match' lines in the HTTP GET. 'If-Modified-Since' is a header line sent by the client to the server to record the last modification time of the page. 'If-None-Match' appear only when: the server return the requested resource if and only if no resource's ETag attribute value on the server matches the one listed in the header

Question4:

15	5.540216	128.119.245.12	192.168.1.102	HTTP	243	HTTP/1.1 304 Not Modified
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Hypertext Transfer Protocol
HTTP/1.1 304 Not Modified\r\n
Date: Tue, 23 Sep 2003 05:35:53 GMT\r\n
Server: Apache/2.0.40 (Red Hat Linux)\r\n
Connection: Keep-Alive\r\n
Keep-Alive: timeout=10, max=99\r\n
ETag: "1bfef-173-8f4ae900"\r\n
\r\n
[HTTP response 2/2]
[Time since request: 0.022826000 seconds]
[Prev request in frame: 8]
[Prev response in frame: 10]
[Request in frame: 14]
[Request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-2.html]

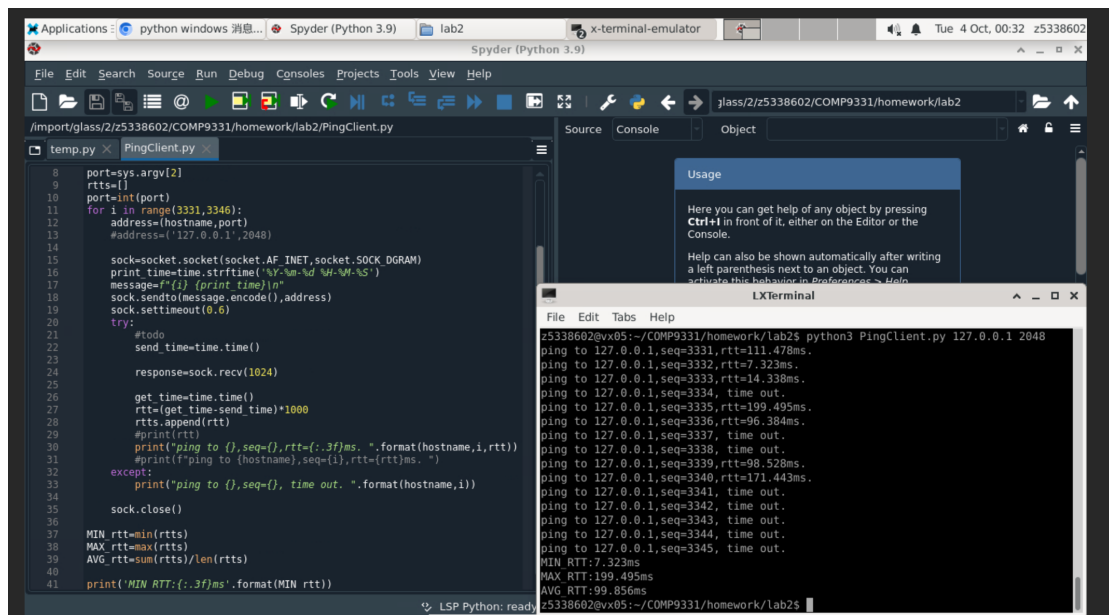
the HTTP status code and phrase returned from the server in response to this second HTTP GET is 304 and Not Modified. The server explicitly returns the contents of the file and the file was not modified.

Question5:

```
Keep-Alive: timeout=10, max=99\r\n
ETag: "1bfef-173-8f4ae900"\r\n
\r\n
```

The value of the Etag was shown in figure. The Etag can be compared with the If None Match header line sent by the client. The content of this header is that the Etag server returned by the server at the first request determines whether the sent Etag matches the calculated Etag. And the status code is 304 means there is not change since the first response.

Exercise 5:

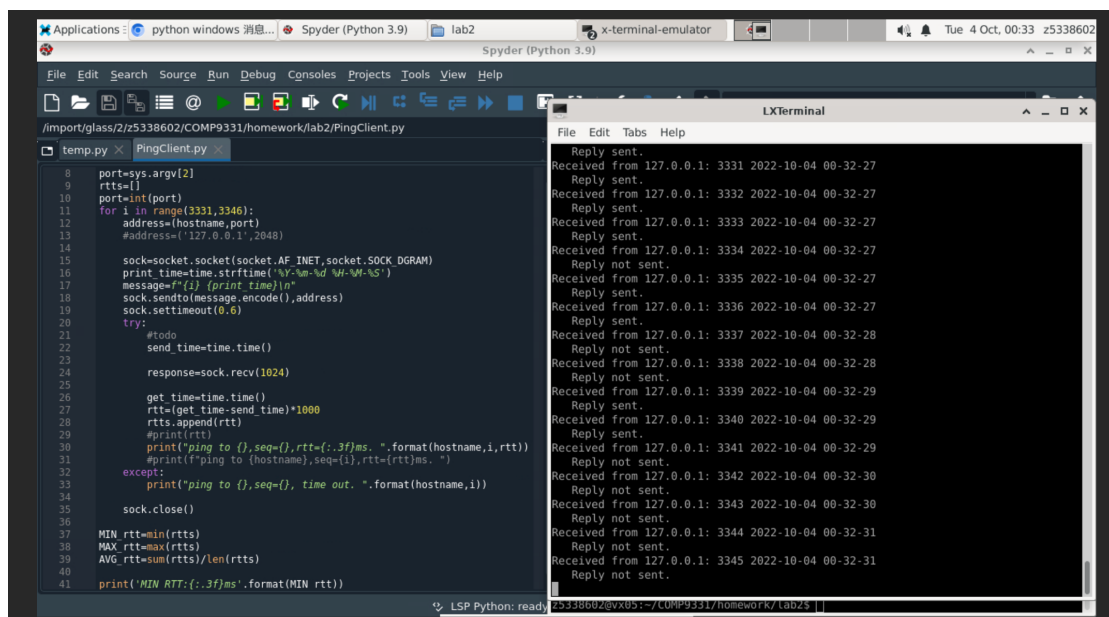


```
port=sys.argv[2]
rtts=[]
port=int(port)
for i in range(3331,3346):
    address=(hostname,port)
    #address=('127.0.0.1',2048)

    sock=socket.socket(socket.AF_INET,socket.SOCK_DGRAM)
    print time.strftime('%Y-%m-%d %H-%M-%S')
    message=f'{i} {print time}\n'
    sock.sendto(message.encode(),address)
    sock.settimeout(0.6)
    try:
        #todo
        send_time=time.time()
        response=sock.recv(1024)
        get_time=time.time()
        rtt=(get_time-send_time)*1000
        rtts.append(rtt)
        #print(rtt)
        print("ping to {},seq={},rtt={:.3f}ms. ".format(hostname,i,rtt))
        #print(f"ping to {hostname},seq={i},rtt={rtt}ms. ")
    except:
        print("ping to {},seq={}, time out. ".format(hostname,i))
    sock.close()

MIN_rtt=min(rtts)
MAX_rtt=max(rtts)
AVG_rtt=sum(rtts)/len(rtts)
print('MIN RTT:{:.3f}ms'.format(MIN_rtt))
```

```
z5338602@vx05:~/COMP9331/homework/lab2$ python3 PingClient.py 127.0.0.1 2048
ping to 127.0.0.1,seq=3331,rtt=111.478ms.
ping to 127.0.0.1,seq=3332,rtt=7.323ms.
ping to 127.0.0.1,seq=3333,rtt=14.338ms.
ping to 127.0.0.1,seq=3334, time out.
ping to 127.0.0.1,seq=3335,rtt=199.495ms.
ping to 127.0.0.1,seq=3336,rtt=96.384ms.
ping to 127.0.0.1,seq=3337, time out.
ping to 127.0.0.1,seq=3338, time out.
ping to 127.0.0.1,seq=3339,rtt=98.528ms.
ping to 127.0.0.1,seq=3340,rtt=171.443ms.
ping to 127.0.0.1,seq=3341, time out.
ping to 127.0.0.1,seq=3342, time out.
ping to 127.0.0.1,seq=3343, time out.
ping to 127.0.0.1,seq=3344, time out.
ping to 127.0.0.1,seq=3345, time out.
MIN RTT: 7.323ms
MAX RTT: 199.495ms
AVG RTT: 99.856ms
```



```
port=sys.argv[2]
rtts=[]
port=int(port)
for i in range(3331,3346):
    address=(hostname,port)
    #address=('127.0.0.1',2048)

    sock=socket.socket(socket.AF_INET,socket.SOCK_DGRAM)
    print time.strftime('%Y-%m-%d %H-%M-%S')
    message=f'{i} {print time}\n'
    sock.sendto(message.encode(),address)
    sock.settimeout(0.6)
    try:
        #todo
        send_time=time.time()
        response=sock.recv(1024)
        get_time=time.time()
        rtt=(get_time-send_time)*1000
        rtts.append(rtt)
        #print(rtt)
        print("ping to {},seq={},rtt={:.3f}ms. ".format(hostname,i,rtt))
        #print(f"ping to {hostname},seq={i},rtt={rtt}ms. ")
    except:
        print("ping to {},seq={}, time out. ".format(hostname,i))
    sock.close()

MIN_rtt=min(rtts)
MAX_rtt=max(rtts)
AVG_rtt=sum(rtts)/len(rtts)
print('MIN RTT:{:.3f}ms'.format(MIN_rtt))
```

```
Reply sent.
Received from 127.0.0.1: 3331 2022-10-04 00:32:27
Reply sent.
Received from 127.0.0.1: 3332 2022-10-04 00:32:27
Reply sent.
Received from 127.0.0.1: 3333 2022-10-04 00:32:27
Reply sent.
Received from 127.0.0.1: 3334 2022-10-04 00:32:27
Reply not sent.
Received from 127.0.0.1: 3335 2022-10-04 00:32:27
Reply sent.
Received from 127.0.0.1: 3336 2022-10-04 00:32:27
Reply sent.
Received from 127.0.0.1: 3337 2022-10-04 00:32:28
Reply not sent.
Received from 127.0.0.1: 3338 2022-10-04 00:32:28
Reply not sent.
Received from 127.0.0.1: 3339 2022-10-04 00:32:29
Reply sent.
Received from 127.0.0.1: 3340 2022-10-04 00:32:29
Reply not sent.
Received from 127.0.0.1: 3342 2022-10-04 00:32:30
Reply not sent.
Received from 127.0.0.1: 3343 2022-10-04 00:32:30
Reply not sent.
Received from 127.0.0.1: 3344 2022-10-04 00:32:31
Reply not sent.
Received from 127.0.0.1: 3345 2022-10-04 00:32:31
Reply not sent.
```

Python version is 3.9.

As shown in the figure: The client request 15 times, of which the server successfully responded 7 times, the minimum RTT is 7.323ms and the maximum RTT is 199.495ms, the average RTT is 99.856ms.