Alper Ozturk

1.1

Step 1:
1.

```
C:\Users\Alper Ozturk>ipconfig

Windows IP Configuration


Ethernet adapter Ethernet 3:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Ethernet adapter Hamachi:

   Connection-specific DNS Suffix  . :
   IPv6 Address. . . . . . . . . . . : 2620:9b::1934:7d5c
   Link-local IPv6 Address . . . . . : fe80::3f4d:aace:c060:267e%5
   Default Gateway . . . . . . . . . : 2620:9b::1900:1
                                       25.0.0.1

Ethernet adapter VirtualBox Host-Only Network:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::b35:2cd9:5f5f:9604%17
   IPv4 Address. . . . . . . . . . . : 192.168.56.1
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :

Wireless LAN adapter Local Area Connection* 1:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   IPv6 Address. . . . . . . . . . . : 2600:8800:2400:6a40:f1ee:9cc:5f70:23b
   Temporary IPv6 Address. . . . . . : 2600:8800:2400:6a40:a0ab:f2a0:1663:5c53
   Link-local IPv6 Address . . . . . : fe80::941d:39e4:47d:4bf%4
   IPv4 Address. . . . . . . . . . . : 192.168.0.4
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::62d2:48ff:fef8:9fb0%4
                                       192.168.0.1
```
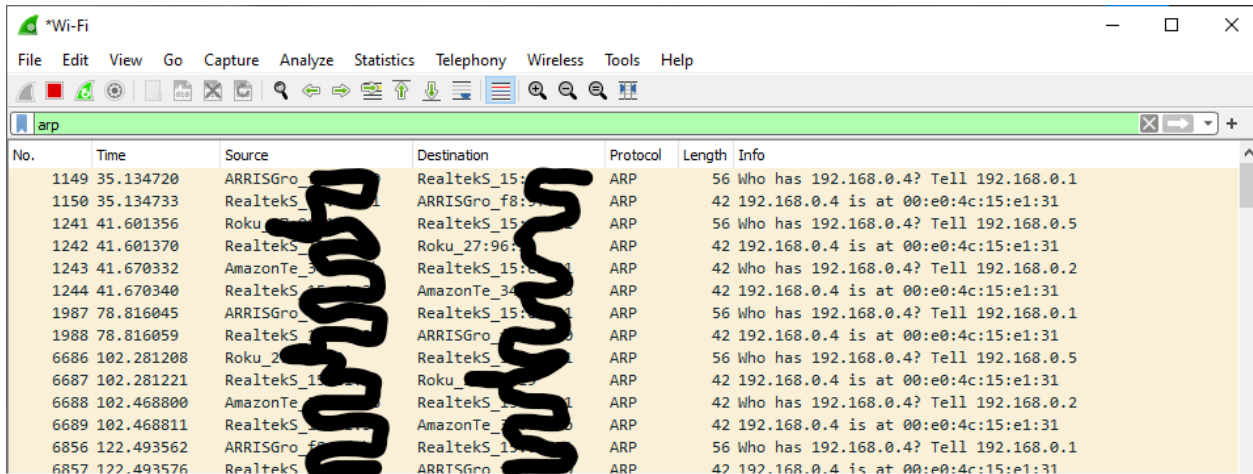
2.

```
C:\Users\Alper Ozturk>netstat -r
===========================================================================
Interface List
 25...30 9c 23 e4 60 5d ......Realtek PCIe GbE Family Controller #3
  5...7a 79 00 00 00 00 ......LogMeIn Hamachi Virtual Ethernet Adapter
 17...0a 00 27 00 00 11 ......VirtualBox Host-Only Ethernet Adapter
  8...02 e0 4c 15 e1 31 ......Microsoft Wi-Fi Direct Virtual Adapter
  7...00 e0 4c 15 e1 31 ......Microsoft Wi-Fi Direct Virtual Adapter #2
  4...00 e0 4c 15 e1 31 ......Realtek 8812AU Wireless LAN 802.11ac USB NIC
 21...00 1a 7d da 71 13 ......Bluetooth Device (Personal Area Network) #4
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0         25.0.0.1              5     9256
          0.0.0.0          0.0.0.0      192.168.0.1      192.168.0.4     40
        127.0.0.0        255.0.0.0         On-link        127.0.0.1    331
        127.0.0.1  255.255.255.255         On-link        127.0.0.1    331
  127.255.255.255  255.255.255.255         On-link        127.0.0.1    331
      192.168.0.0    255.255.255.0         On-link      192.168.0.4    296
      192.168.0.4  255.255.255.255         On-link      192.168.0.4    296
    192.168.0.255  255.255.255.255         On-link      192.168.0.4    296
     192.168.56.0    255.255.255.0         On-link     192.168.56.1    281
     192.168.56.1  255.255.255.255         On-link     192.168.56.1    281
   192.168.56.255  255.255.255.255         On-link     192.168.56.1    281
        224.0.0.0        240.0.0.0         On-link        127.0.0.1    331
        224.0.0.0        240.0.0.0         On-link              5     9256
        224.0.0.0        240.0.0.0         On-link     192.168.56.1    281
        224.0.0.0        240.0.0.0         On-link      192.168.0.4    296
  255.255.255.255  255.255.255.255         On-link        127.0.0.1    331
  255.255.255.255  255.255.255.255         On-link              5     9256
  255.255.255.255  255.255.255.255         On-link     192.168.56.1    281
  255.255.255.255  255.255.255.255         On-link      192.168.0.4    296
===========================================================================
Persistent Routes:
  Network Address          Netmask  Gateway Address  Metric
          0.0.0.0          0.0.0.0         25.0.0.1  Default
===========================================================================
```

3.

No.	Time	Source	Destination	Protocol	Length	Info
1149	35.134720	ARRISGro_	RealtekS_15:	ARP	56	Who has 192.168.0.4? Tell 192.168.0.1
1150	35.134733	RealtekS_	ARRISGro_f8:	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
1241	41.601356	Roku_	RealtekS_15:	ARP	56	Who has 192.168.0.4? Tell 192.168.0.5
1242	41.601370	RealtekS_	Roku_27:96:	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
1243	41.670332	AmazonTe_3	RealtekS_15:	ARP	42	Who has 192.168.0.4? Tell 192.168.0.2
1244	41.670340	RealtekS_	AmazonTe_34	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
1987	78.816045	ARRISGro_	RealtekS_15:	ARP	56	Who has 192.168.0.4? Tell 192.168.0.1
1988	78.816059	RealtekS_	ARRISGro_	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
6686	102.281208	Roku_2	RealtekS_	ARP	56	Who has 192.168.0.4? Tell 192.168.0.5
6687	102.281221	RealtekS_15	Roku_	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
6688	102.468800	AmazonTe_	RealtekS_1	ARP	42	Who has 192.168.0.4? Tell 192.168.0.2
6689	102.468811	RealtekS_	AmazonTe_	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
6856	122.493562	ARRISGro_f	RealtekS_15	ARP	56	Who has 192.168.0.4? Tell 192.168.0.1
6857	122.493576	RealtekS_	ARRISGro_	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31

4.

```
C:\WINDOWS\system32>arp -a

Interface: 192.168.0.4 --- 0x4
  Internet Address      Physical Address      Type
  192.168.0.1           60-d2-48-f8-9f-b0     dynamic
  192.168.0.2           0c-ee-99-34-8f-ab     dynamic
  192.168.0.3           40-a2-db-3f-e9-9a     dynamic
  192.168.0.5           d8-31-34-27-96-19     dynamic
  192.168.0.255         ff-ff-ff-ff-ff-ff     static
  224.0.0.2             01-00-5e-00-00-02     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

Interface: 192.168.56.1 --- 0x11
  Internet Address      Physical Address      Type
  192.168.56.255        ff-ff-ff-ff-ff-ff     static
  224.0.0.2             01-00-5e-00-00-02     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static

C:\WINDOWS\system32>arp -d 192.168.56.255

C:\WINDOWS\system32>arp -d

C:\WINDOWS\system32>arp -a

Interface: 192.168.0.4 --- 0x4
  Internet Address      Physical Address      Type
  192.168.0.1           60-d2-48-f8-9f-b0     dynamic
  224.0.0.2             01-00-5e-00-00-02     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.252           01-00-5e-00-00-fc     static

Interface: 192.168.56.1 --- 0x11
  Internet Address      Physical Address      Type
  224.0.0.22            01-00-5e-00-00-16     static
```

6.


```
 *Wi-Fi                                                                          —   □   ×
File   Edit   View   Go   Capture   Analyze   Statistics   Telephony   Wireless   Tools   Help
```

```
 arp                                                                                   ⊠ ⇒ ▾ +
```

No.	Time	Source	Destination	Protocol	Length	Info
48	3.079666	ARRISGro_f	RealtekS_15	ARP	56	Who has 192.168.0.4? Tell 192.168.0.1
49	3.079673	RealtekS_15	ARRISGro_f	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
2850	15.687105	Roku_27:96	RealtekS_1	ARP	56	Who has 192.168.0.4? Tell 192.168.0.5
2853	15.687128	RealtekS_15	Roku_27:96	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
3007	16.096925	AmazonTe_34	RealtekS_1	ARP	42	Who has 192.168.0.4? Tell 192.168.0.2
3008	16.096939	RealtekS_15	AmazonTe_3	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
7729	25.245172	ARRISGro_f8	RealtekS_15	ARP	56	Who has 192.168.0.4? Tell 192.168.0.1
7730	25.245182	RealtekS_15	ARRISGro_f8	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
8848	40.896016	AmazonTe_34	RealtekS_15	ARP	42	Who has 192.168.0.4? Tell 192.168.0.2
8849	40.896048	RealtekS_15	AmazonTe_34	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
9337	47.398751	ARRISGro_f8	RealtekS_1	ARP	56	Who has 192.168.0.4? Tell 192.168.0.1
9338	47.398761	RealtekS_15	ARRISGro_f8	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
39972	69.591476	ARRISGro_f8	RealtekS_15	ARP	56	Who has 192.168.0.4? Tell 192.168.0.1
39973	69.591481	RealtekS_1	ARRISGro_f	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
50837	74.574922	AmazonTe_3	RealtekS_15	ARP	42	Who has 192.168.0.4? Tell 192.168.0.2
50838	74.574929	RealtekS_1...31	AmazonTe	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
50995	74.677040	Roku_27:9	RealtekS_	ARP	56	Who has 192.168.0.4? Tell 192.168.0.5
50996	74.677048	RealtekS_1	Roku_27:96	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
87485	91.859481	ARRISGro_f8	RealtekS_15	ARP	56	Who has 192.168.0.4? Tell 192.168.0.1
87486	91.859487	RealtekS_1	ARRISGro_f	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31
1204...	114.078879	ARRISGro_	RealtekS_1	ARP	56	Who has 192.168.0.4? Tell 192.168.0.1
1204...	114.078894	RealtekS_15:e1:31	ARRISGro_f	ARP	42	192.168.0.4 is at 00:e0:4c:15:e1:31

```
⌄ Frame 48: 56 bytes on wire (448 bits), 56 bytes captured (448 bit   0000  00 e0 4c 15 e1 31 60 d2  48 f8 9f b0 08 06 00 01    ··L··1`· H
```

Step 2:

2.


```
⌄ Address Resolution Protocol (request)
      Hardware type: Ethernet (1)
      Protocol type: IPv4 (0x0800)
      Hardware size: 6
      Protocol size: 4
      Opcode: request (1)
      Sender MAC address: ARRISGro_f8
      Sender IP address: 192.168.0.1
      Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
      Target IP address: 192.168.0.4

⌄ Address Resolution Protocol (reply)
      Hardware type: Ethernet (1)
      Protocol type: IPv4 (0x0800)
      Hardware size: 6
      Protocol size: 4
      Opcode: reply (2)
      Sender MAC address: RealtekS_15
      Sender IP address: 192.168.0.4
      Target MAC address: ARRISGro_f
      Target IP address: 192.168.0.1
```

Step 3:

1. Opcode for request is "1"

```
∨ Address Resolution Protocol (request)
      Hardware type: Ethernet (1)
      Protocol type: IPv4 (0x0800)
      Hardware size: 6
      Protocol size: 4
      Opcode: request (1)
```

Opcode for reply is "2"

```
∨ Address Resolution Protocol (reply)
      Hardware type: Ethernet (1)
      Protocol type: IPv4 (0x0800)
      Hardware size: 6
      Protocol size: 4
      Opcode: reply (2)
```

2. ARP header for a request is "28 bytes"
https://en.wikipedia.org/wiki/Address_Resolution_Protocol
ARP header for a reply is also "28 bytes"

3. Target MAC address is "00:00:00:00:00:00"

```
 Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
```

4. ARP's higher level protocol is indicated by "0x0806"

```
 Type: ARP (0x0806)
```

1.2

1.3

Step 1 (TCP)

a) First command starts looking for connections coming into port 3333. Second command looks to establish a connection with port 3333.
b) 4
c) 4
d) 8
e) 7 for both
f) 382 for the whole thing with all 8 frames
g) 382 - 14 = 368

Step 2 (UDP)

a) First command starts looking for connections coming into port 3333. Second command looks to establish a connection with port 3333. Similar to TCP but this time specified -u for UDP
b) 2
c) 2
d) 4
e) 145
f) 7 each for 14 total
g) 145 - 14 = 131
h) UDP has less overhead because it doesn't have to do a three–way handshake
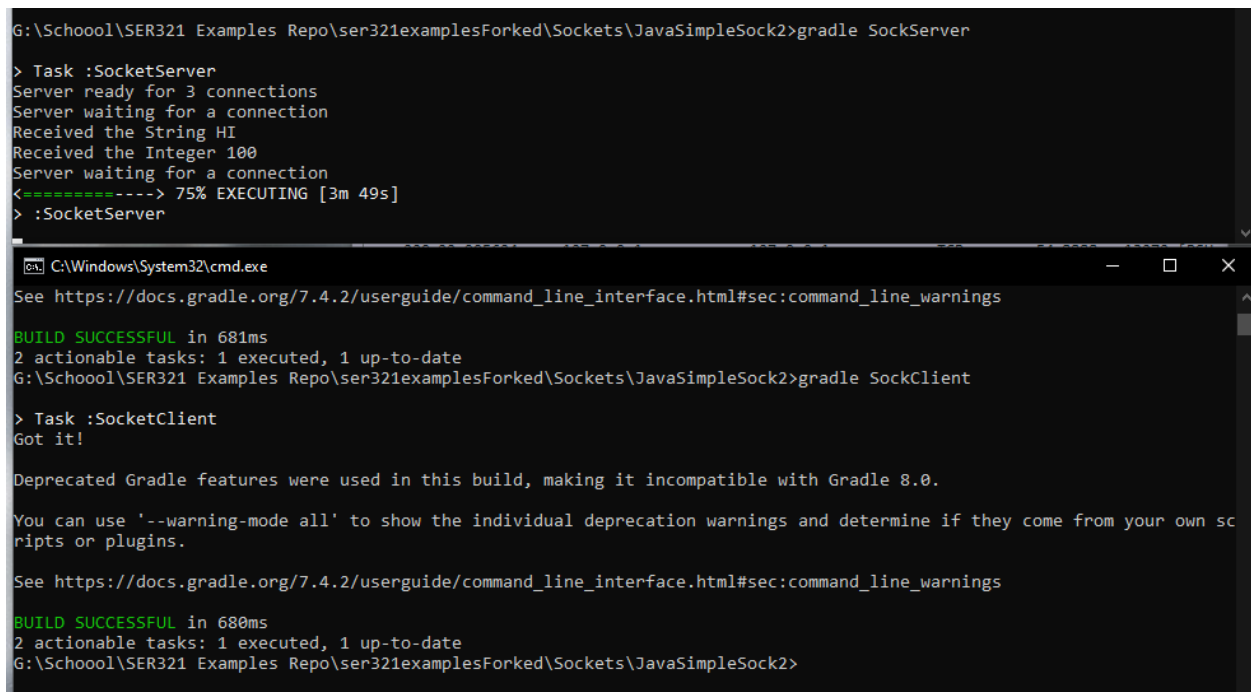
1.4

Route 1 (ASU Network)
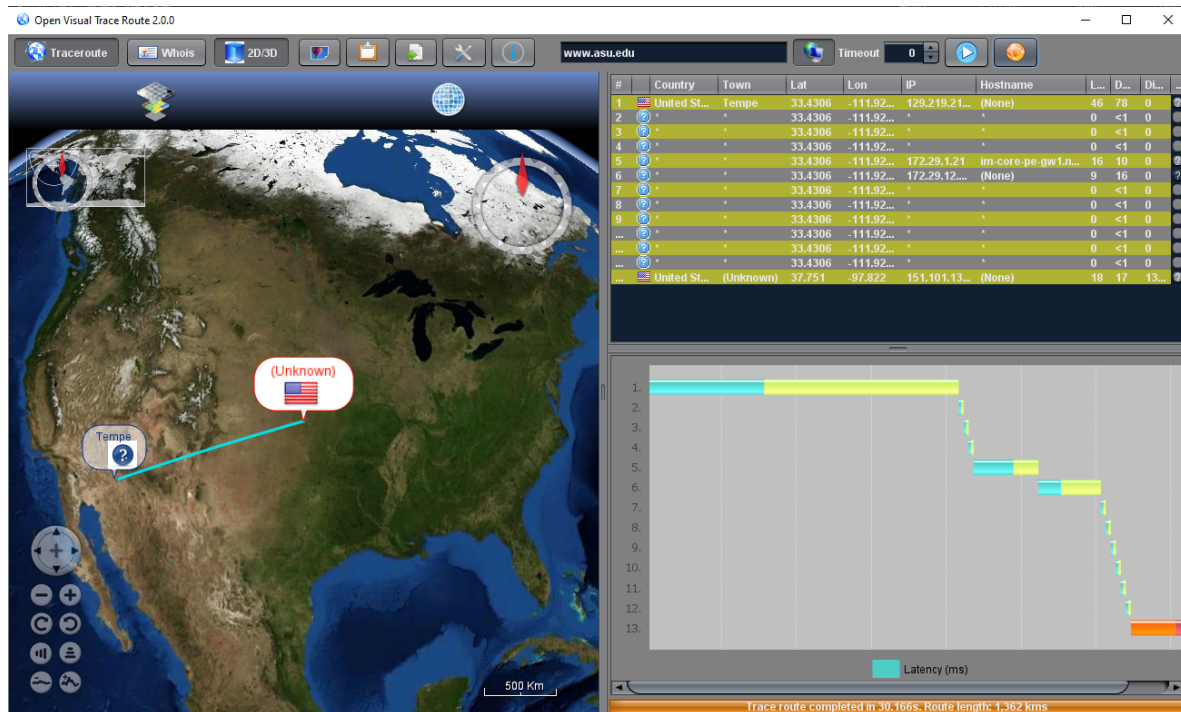
Route 2 (Non-ASU Network)
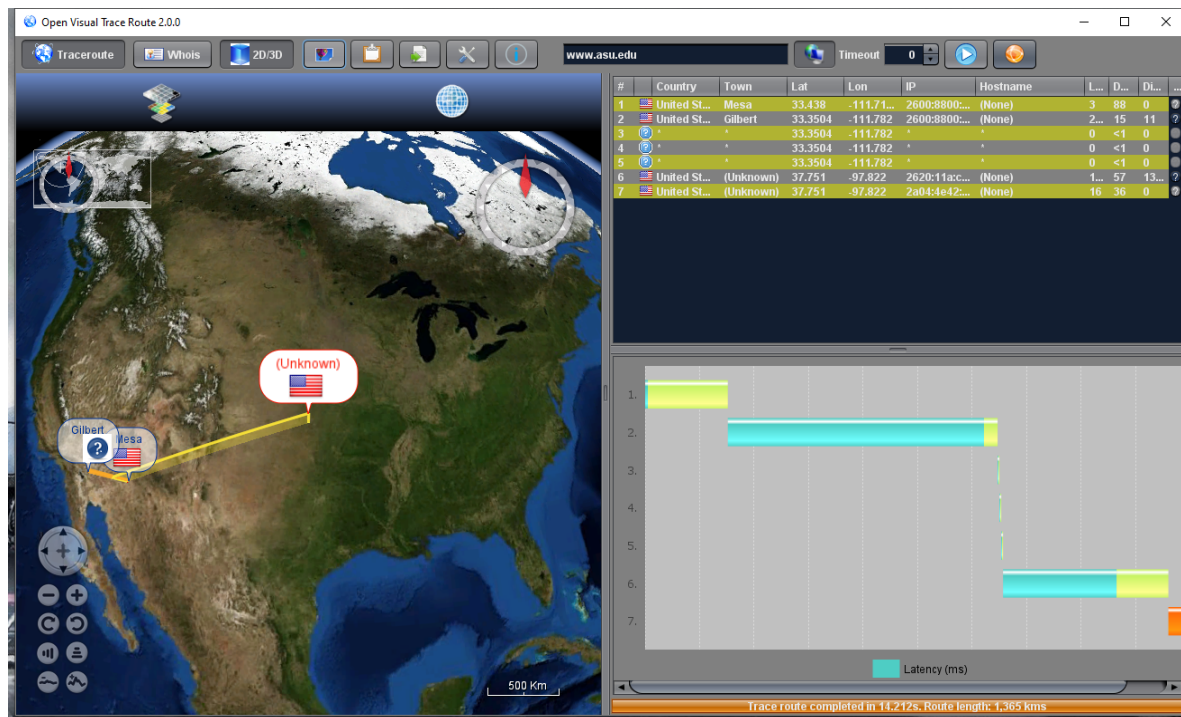
a) Although my house was farther away, it was faster than the ASU Network
b) ASU Network has less hops.

1.5.1

```
G:\Schoool\SER321 Examples Repo\ser321examplesForked\Sockets\JavaSimpleSock2>gradle SockServer

> Task :SocketServer
Server ready for 3 connections
Server waiting for a connection
Received the String HI
Received the Integer 100
Server waiting for a connection
<=========----> 75% EXECUTING [3m 49s]
> :SocketServer
```

```
C:\Windows\System32\cmd.exe                                                    —    □    ×

See https://docs.gradle.org/7.4.2/userguide/command_line_interface.html#sec:command_line_warnings

BUILD SUCCESSFUL in 681ms
2 actionable tasks: 1 executed, 1 up-to-date
G:\Schoool\SER321 Examples Repo\ser321examplesForked\Sockets\JavaSimpleSock2>gradle SockClient

> Task :SocketClient
Got it!

Deprecated Gradle features were used in this build, making it incompatible with Gradle 8.0.

You can use '--warning-mode all' to show the individual deprecation warnings and determine if they come from your own sc
ripts or plugins.

See https://docs.gradle.org/7.4.2/userguide/command_line_interface.html#sec:command_line_warnings

BUILD SUCCESSFUL in 680ms
2 actionable tasks: 1 executed, 1 up-to-date
G:\Schoool\SER321 Examples Repo\ser321examplesForked\Sockets\JavaSimpleSock2>
```

1.5.2

In order for you to reach from your local computer to your AWS server, you have to change the ports as well as specifying your IP. Which can be done in the SockServer.java and SockClient.java files.

1.5.3 and 1.5.4

It can work without issue if you don't have to worry about other people. You can't do it the same way but would have to port forward through router for AWS to see your local computer. It can work but it also can leave your computer vulnerable. AWS looks for your computer directly but your computer is behind your router which has a different ip so it has to be set up to be a middleman.