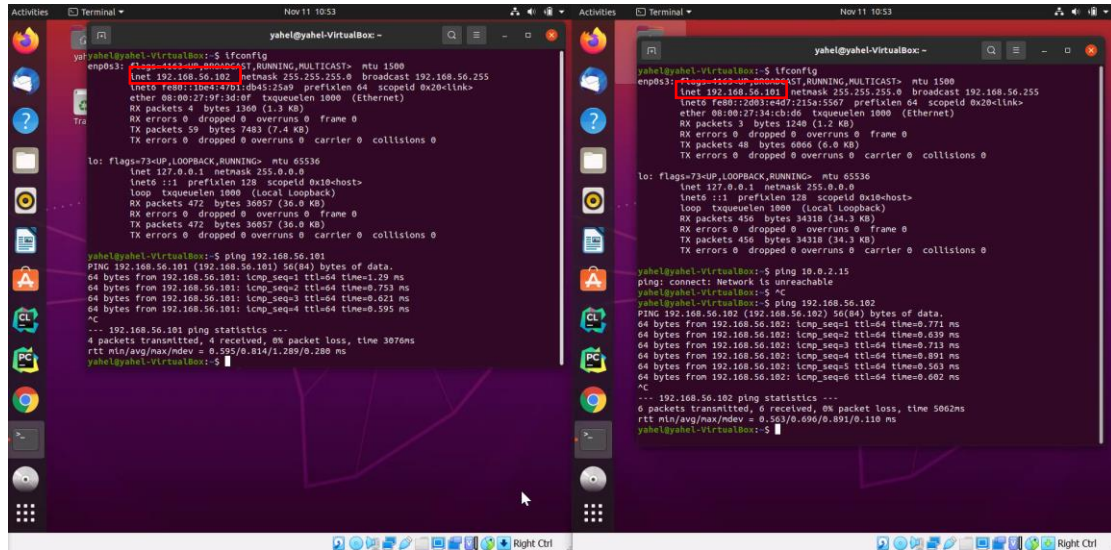


Setup:

Two virtual machines with different Ips as you can see in the red rectangles.



The image shows two terminal windows side-by-side, each representing a virtual machine. The left window is titled 'yahal@yahal-VirtualBox-' and shows the output of 'ifconfig' and 'ping' commands. The right window is titled 'yahal@yahal-VirtualBox-' and shows similar output. In both windows, the IP addresses 192.168.56.101 and 192.168.56.102 are highlighted with red rectangles. The ping results show successful communication between the two VMs.

```
yahal@yahal-VirtualBox:~$ ifconfig
enp0s3: flags=4096<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.56.101 netmask 255.255.255.0 broadcast 192.168.56.255
    ether 08:00:27:9f:3d:0f txqueuelen 1000 (Ethernet)
    RX packets 4 bytes 1260 (1.2 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 59 bytes 7483 (7.4 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 472 bytes 36857 (36.0 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 472 bytes 36857 (36.0 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

yahal@yahal-VirtualBox:~$ ping 192.168.56.102
PING 192.168.56.102 (192.168.56.102) 56(84) bytes of data:
 64 bytes from 192.168.56.102: icmp_seq=1 ttl=64 time=1.29 ms
 64 bytes from 192.168.56.102: icmp_seq=2 ttl=64 time=0.753 ms
 64 bytes from 192.168.56.102: icmp_seq=3 ttl=64 time=0.621 ms
 64 bytes from 192.168.56.102: icmp_seq=4 ttl=64 time=0.595 ms
--- 192.168.56.102 ping statistics ---
 4 packets transmitted, 4 received, 0% packet loss, time 3076ms
 rtt min/avg/max/mdev = 0.505/0.814/1.289/0.280 ms
yahal@yahal-VirtualBox:~$
```

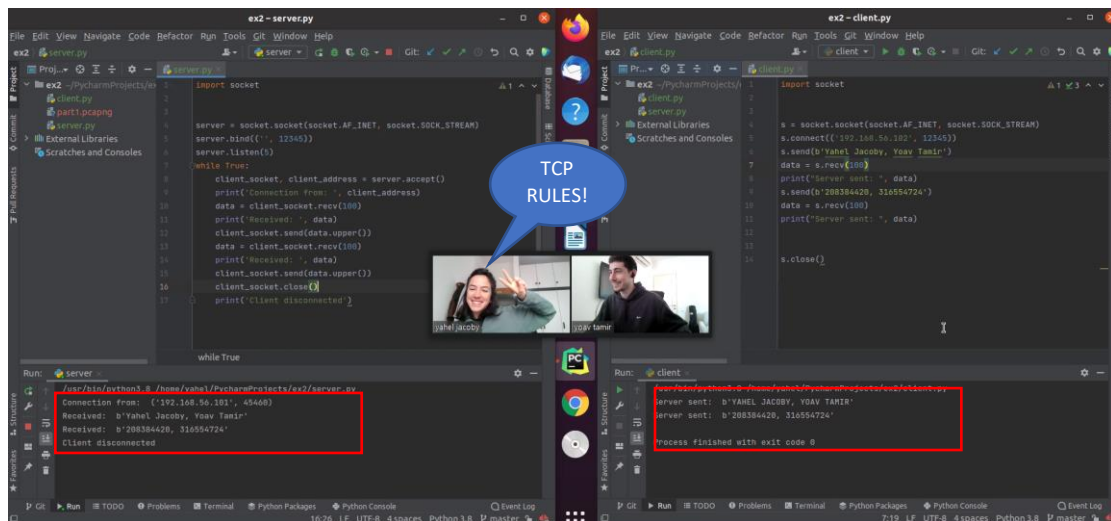
```
yahal@yahal-VirtualBox:~$ ifconfig
enp0s3: flags=4096<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.56.102 netmask 255.255.255.0 broadcast 192.168.56.255
    ether 08:00:27:34:c1:d6 txqueuelen 1000 (Ethernet)
    RX packets 3 bytes 1248 (1.2 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 48 bytes 6866 (6.8 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 456 bytes 34318 (34.3 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 456 bytes 34318 (34.3 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

yahal@yahal-VirtualBox:~$ ping 192.168.56.101
ping: connect: Network is unreachable
yahal@yahal-VirtualBox:~$ ping 192.168.56.102
PING 192.168.56.102 (192.168.56.102) 56(84) bytes of data:
 64 bytes from 192.168.56.102: icmp_seq=1 ttl=64 time=0.771 ms
 64 bytes from 192.168.56.102: icmp_seq=2 ttl=64 time=0.639 ms
 64 bytes from 192.168.56.102: icmp_seq=3 ttl=64 time=0.891 ms
 64 bytes from 192.168.56.102: icmp_seq=4 ttl=64 time=0.563 ms
 64 bytes from 192.168.56.102: icmp_seq=5 ttl=64 time=0.602 ms
--- 192.168.56.102 ping statistics ---
 5 packets transmitted, 5 received, 0% packet loss, time 5062ms
 rtt min/avg/max/mdev = 0.563/0.696/0.891/0.110 ms
yahal@yahal-VirtualBox:~$
```

Server-client TCP simple communication:

Python console view:



The image shows two Python IDE windows side-by-side. The left window is titled 'ex2 - server.py' and contains a simple TCP server script. The right window is titled 'ex2 - client.py' and contains a simple TCP client script. A blue speech bubble with the text 'TCP RULES!' is overlaid on the server window. Below the code, the 'Run' output for both scripts is shown. The server output shows a connection from 192.168.56.101 and the client output shows the server's response. The IP addresses 192.168.56.101 and 192.168.56.102 are highlighted with red rectangles in the output.

```
ex2 - server.py
1 import socket
2
3 server = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
4 server.bind(('', 12345))
5 server.listen(1)
6
7 while True:
8     client_socket, client_address = server.accept()
9     print('Connection from: ', client_address)
10    data = client_socket.recv(100)
11    print('Received: ', data)
12    client_socket.send(data.upper())
13    data = client_socket.recv(100)
14    print('Received: ', data)
15    client_socket.send(data.upper())
16    client_socket.close()
17    print('Client disconnected')
```

```
ex2 - client.py
1 import socket
2
3 s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
4 s.connect(('192.168.56.101', 12345))
5 s.send(b'Yahal Jacoby, Yoav Tamar')
6 data = s.recv(100)
7 print('Server sent: ', data)
8
9 print('Server sent: ', data)
10 data = s.recv(100)
11 print('Server sent: ', data)
12 s.close()
```

Run: server

```
Connection from: ('192.168.56.101', 45448)
Received: b'Yahal Jacoby, Yoav Tamar'
Received: b'Yahal Jacoby, Yoav Tamar'
Client disconnected
```

Run: client

```
Server sent: b'Yahal Jacoby, Yoav Tamar'
Server sent: b'Yahal Jacoby, Yoav Tamar'
Process finished with exit code 0
```

Wireshark sniff from server:

Sequence number: 3807782029. This is the number in which the represent the first bit of the stream.

Acknowledgment number: 0. No Ack in this point. Generally, represent the last bit accepted.

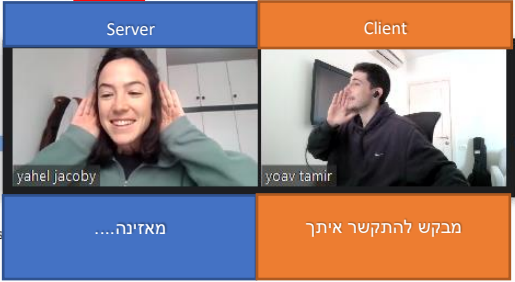
Flags: SYN. Client is asking to start connection with server.

MSS: 1460 bytes.

tcp.port == 12345

No.	Time	Source	Destination	Protocol	Length	Info
5	23.293385160	192.168.56.101	192.168.56.102	TCP	74	45462 → 12345 [SYN] Seq=3807782029 Win=64240 Len=0 MSS=1460 S...
6	23.293440982	192.168.56.102	192.168.56.101	TCP	74	12345 → 45462 [SYN, ACK] Seq=4185602086 Ack=3807782030 Win=65...
7	23.293864353	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782030 Ack=4185602087 Win=64256 L...
8	23.293864674	192.168.56.101	192.168.56.102	TCP	90	45462 → 12345 [PSH, ACK] Seq=3807782030 Ack=4185602087 Win=64...
9	23.293952853	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602087 Ack=3807782054 Win=65152 L...
10	23.294363744	192.168.56.102	192.168.56.101	TCP	90	12345 → 45462 [PSH, ACK] Seq=4185602087 Ack=3807782054 Win=65...
11	23.294963128	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782054 Ack=4185602111 Win=64256 L...
12	23.294963599	192.168.56.101	192.168.56.102	TCP	86	45462 → 12345 [PSH, ACK] Seq=3807782054 Ack=4185602111 Win=64...
13	23.295010109	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602111 Ack=3807782074 Win=65152 L...
14	23.295384120	192.168.56.102	192.168.56.101	TCP	86	12345 → 45462 [PSH, ACK] Seq=4185602111 Ack=3807782074 Win=65...
15	23.295448753	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [FIN, ACK] Seq=4185602131 Ack=3807782074 Win=65...
16	23.296546435	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782074 Ack=4185602131 Win=64256 L...
17	23.297360969	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [FIN, ACK] Seq=3807782074 Ack=4185602132 Win=64...
18	23.297410118	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602132 Ack=3807782075 Win=65152 L...

Frame 5: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface enp0s3, id 0
Ethernet II, Src: PcsCompu_34:cb:d6 (08:00:27:34:cb:d6), Dst: PcsCompu_9f:3d:0f (08:00:27:9f:3d:0f)
Internet Protocol Version 4, Src: 192.168.56.101, Dst: 192.168.56.102
Transmission Control Protocol, Src Port: 45462, Dst Port: 12345, Seq: 3807782029, Len: 0
Source Port: 45462
Destination Port: 12345
[Stream index: 0]
[TCP Segment Len: 0]
Sequence number: 3807782029
[Next sequence number: 3807782030]
Acknowledgment number: 0
Acknowledgment number (raw): 0
1010 = Header length: 40 bytes (10)
Flags: 0x002 (SYN)
Window size value: 64240
[Calculated window size: 64240]
Checksum: 0x3a09 [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
Options: (20 bytes), Maximum segment size, SACK permitted, Timestamps
TCP Option - Maximum segment size: 1460 bytes
TCP Option - SACK permitted
TCP Option - Timestamps: TSval 492968500, TSecr 0
TCP Option - No-Operation (NOP)
TCP Option - Window scale: 7 (multiply by 128)
[Timestamps]



Sequence number: 4185602086.

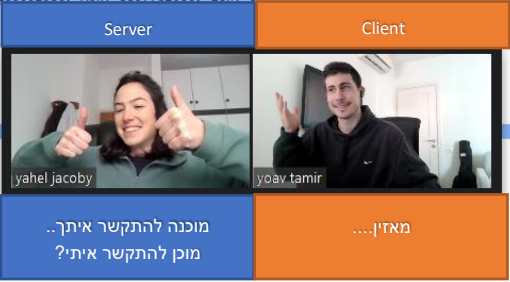
Acknowledgment number: 3807782030= last sequence accepted +1.

Flags: (SYN,ACK). Server accepted Client request with Ack and send SYN to Client.

tcp.port == 12345

No.	Time	Source	Destination	Protocol	Length	Info
5	23.293385160	192.168.56.101	192.168.56.102	TCP	74	45462 → 12345 [SYN] Seq=3807782029 Win=64240 Len=0 MSS=1460 S...
6	23.293440982	192.168.56.102	192.168.56.101	TCP	74	12345 → 45462 [SYN, ACK] Seq=4185602086 Ack=3807782030 Win=65...
7	23.293864353	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782030 Ack=4185602087 Win=64256 L...
8	23.293864674	192.168.56.101	192.168.56.102	TCP	90	45462 → 12345 [PSH, ACK] Seq=3807782030 Ack=4185602087 Win=64...
9	23.293952853	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602087 Ack=3807782054 Win=65152 L...
10	23.294363744	192.168.56.102	192.168.56.101	TCP	90	12345 → 45462 [PSH, ACK] Seq=4185602087 Ack=3807782054 Win=65...
11	23.294963128	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782054 Ack=4185602111 Win=64256 L...
12	23.294963599	192.168.56.101	192.168.56.102	TCP	86	45462 → 12345 [PSH, ACK] Seq=3807782054 Ack=4185602111 Win=64...
13	23.295010109	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602111 Ack=3807782074 Win=65152 L...
14	23.295384120	192.168.56.102	192.168.56.101	TCP	86	12345 → 45462 [PSH, ACK] Seq=4185602111 Ack=3807782074 Win=65...
15	23.295448753	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [FIN, ACK] Seq=4185602131 Ack=3807782074 Win=65...
16	23.296546435	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782074 Ack=4185602131 Win=64256 L...
17	23.297360969	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [FIN, ACK] Seq=3807782074 Ack=4185602132 Win=64...
18	23.297410118	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602132 Ack=3807782075 Win=65152 L...

Frame 6: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface enp0s3, id 0
Ethernet II, Src: PcsCompu_9f:3d:0f (08:00:27:9f:3d:0f), Dst: PcsCompu_34:cb:d6 (08:00:27:34:cb:d6)
Internet Protocol Version 4, Src: 192.168.56.102, Dst: 192.168.56.101
Transmission Control Protocol, Src Port: 12345, Dst Port: 45462, Seq: 4185602086, Ack: 3807782030, Len: 0
Source Port: 12345
Destination Port: 45462
[Stream index: 0]
[TCP Segment Len: 0]
Sequence number: 4185602086
[Next sequence number: 4185602087]
Acknowledgment number: 3807782030
1010 = Header length: 40 bytes (10)
Flags: 0x012 (SYN, ACK)
Window size value: 65160
[Calculated window size: 65160]
Checksum: 0xf24a [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
Options: (20 bytes), Maximum segment size, SACK permitted, Timestamps
TCP Option - Maximum segment size: 1460 bytes
TCP Option - SACK permitted
TCP Option - Timestamps: TSval 107517072, TSecr 492968500
TCP Option - No-Operation (NOP)
TCP Option - Window scale: 7 (multiply by 128)
[SEQ/ACK analysis]
[Timestamps]



Flags: (ACK). Client accepted Server SYN.

Connection Begins.


tcp.port == 12345

No.	Time	Source	Destination	Protocol	Length	Info
5	23.293385160	192.168.56.101	192.168.56.102	TCP	74	45462 → 12345 [SYN] Seq=3807782029 Win=64240 Len=0 MSS=1460 S...
6	23.293440982	192.168.56.102	192.168.56.101	TCP	74	12345 → 45462 [SYN, ACK] Seq=4185602086 Ack=3807782030 Win=65...
7	23.293864353	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782030 Ack=4185602087 Win=64256 L...
8	23.293864674	192.168.56.101	192.168.56.102	TCP	90	45462 → 12345 [PSH, ACK] Seq=3807782030 Ack=4185602087 Win=64...
9	23.293952853	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602087 Ack=3807782054 Win=65152 L...
10	23.294363744	192.168.56.102	192.168.56.101	TCP	90	12345 → 45462 [PSH, ACK] Seq=4185602087 Ack=3807782054 Win=65...
11	23.294963128	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782054 Ack=4185602111 Win=64256 L...
12	23.294963599	192.168.56.101	192.168.56.102	TCP	86	45462 → 12345 [PSH, ACK] Seq=3807782054 Ack=4185602111 Win=64...
13	23.295010109	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602111 Ack=3807782074 Win=65152 L...
14	23.295384120	192.168.56.102	192.168.56.101	TCP	86	12345 → 45462 [PSH, ACK] Seq=4185602111 Ack=3807782074 Win=65...
15	23.295448753	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [FIN, ACK] Seq=4185602131 Ack=3807782074 Win=65...
16	23.296546435	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782074 Ack=4185602131 Win=64256 L...
17	23.297360069	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [FIN, ACK] Seq=3807782074 Ack=4185602132 Win=64...
18	23.297410118	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602132 Ack=3807782075 Win=65152 L...

Frame 7: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface enp0s3, id 0
Ethernet II, Src: PcsCompu_34:cb:d6 (08:00:27:34:cb:d6), Dst: PcsCompu_9f:3d:0f (08:00:27:9f:3d:0f)
Internet Protocol Version 4, Src: 192.168.56.101, Dst: 192.168.56.102
Transmission Control Protocol, Src Port: 45462, Dst Port: 12345, Seq: 3807782030, Ack: 4185602087, Len: 0
Source Port: 45462
Destination Port: 12345
[Stream index: 0]
[TCP Segment Len: 0]
Sequence number: 3807782030
Next sequence number: 3807782031
Acknowledgment number: 4185602087
1000 - Header length: 32 bytes (8)
Flags: 0x010 (ACK)
Window size value: 502
[Calculated window size: 64256]
[Window size scaling factor: 128]
Checksum: 0x9524 [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamp
TCP Option - No-Operation (NOP)
TCP Option - No-Operation (NOP)
TCP Option - Timestamps: TSval 492968500, TSecr 107517072
[SEQ/ACK analysis]
[Timestamps]

Server

Client



Yahel Jacoby

Yoav Tamir

מאזינה....

קיבלתי את המסר של
אני מוכן להתקשר איתך גם.

Flags: (PSH,ACK).

Clients send message "Yahel Jacoby, Yoav Tamir" to server.


tcp.port == 12345

No.	Time	Source	Destination	Protocol	Length	Info
5	23.293385160	192.168.56.101	192.168.56.102	TCP	74	45462 → 12345 [SYN] Seq=3807782029 Win=64240 Len=0 MSS=1460 S...
6	23.293440982	192.168.56.102	192.168.56.101	TCP	74	12345 → 45462 [SYN, ACK] Seq=4185602086 Ack=3807782030 Win=65...
7	23.293864353	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782030 Ack=4185602087 Win=64256 L...
8	23.293864674	192.168.56.101	192.168.56.102	TCP	90	45462 → 12345 [PSH, ACK] Seq=3807782030 Ack=4185602087 Win=64...
9	23.293952853	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602087 Ack=3807782054 Win=65152 L...
10	23.294363744	192.168.56.102	192.168.56.101	TCP	90	12345 → 45462 [PSH, ACK] Seq=4185602087 Ack=3807782054 Win=65...
11	23.294963128	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782054 Ack=4185602111 Win=64256 L...
12	23.294963599	192.168.56.101	192.168.56.102	TCP	86	45462 → 12345 [PSH, ACK] Seq=3807782054 Ack=4185602111 Win=64...
13	23.295010109	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602111 Ack=3807782074 Win=65152 L...
14	23.295384120	192.168.56.102	192.168.56.101	TCP	86	12345 → 45462 [PSH, ACK] Seq=4185602111 Ack=3807782074 Win=65...
15	23.295448753	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [FIN, ACK] Seq=4185602131 Ack=3807782074 Win=65...
16	23.296546435	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782074 Ack=4185602131 Win=64256 L...
17	23.297360069	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [FIN, ACK] Seq=3807782074 Ack=4185602132 Win=64...
18	23.297410118	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602132 Ack=3807782075 Win=65152 L...

Frame 8: 90 bytes on wire (720 bits), 90 bytes captured (720 bits) on interface enp0s3, id 0
Ethernet II, Src: PcsCompu_34:cb:d6 (08:00:27:34:cb:d6), Dst: PcsCompu_9f:3d:0f (08:00:27:9f:3d:0f)
Internet Protocol Version 4, Src: 192.168.56.101, Dst: 192.168.56.102
Transmission Control Protocol, Src Port: 45462, Dst Port: 12345, Seq: 3807782030, Ack: 4185602087, Len: 8
Source Port: 45462
Destination Port: 12345
[Stream index: 0]
[TCP Segment Len: 24]
Sequence number: 3807782030
Next sequence number: 3807782054
Acknowledgment number: 4185602087
1000 - Header length: 32 bytes (8)
Flags: 0x010 (PSH, ACK)
Window size value: 502
[Calculated window size: 64256]
[Window size scaling factor: 128]
Checksum: 0x8499 [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps
TCP Option - No-Operation (NOP)
TCP Option - No-Operation (NOP)
TCP Option - Timestamps: TSval 492968500, TSecr 107517072
[SEQ/ACK analysis]
[Timestamps]
TCP payload (24 bytes)
Data (24 bytes)
0000 08 00 27 9f 3d 0f 08 00 27 34 cb d6 08 00 45 00 ... 4...E...
0010 00 4c 44 eb 40 00 40 06 03 a5 c0 a8 38 65 c0 a8 ... LD 0 0 ... 8e...
0020 38 66 b1 96 30 39 e2 f6 24 8e f9 7b 38 27 00 16 ... 8f...09... \$- {8...
0030 01 f6 84 99 00 00 01 01 08 0a 1d 62 1a 34 06 684...
0040 94 99 59 61 68 65 6c 20 4a 61 63 6f 62 79 2c 20Yahel Jacoby,
0050 59 6f 61 76 20 54 61 6d 69 72Yoav Tamir

Server

Client



Yahel Jacoby

Yoav Tamir

מאזינה....

שולח לך הודעה.
"Yahel Jacoby, Yoav Tamir"

Flags: (ACK).

Server send Ack to Client – accepted the message.

tcp.port == 12345

No.	Time	Source	Destination	Protocol	Length	Info
5	23.293385160	192.168.56.101	192.168.56.102	TCP	74	45462 → 12345 [SYN] Seq=3807782029 Win=64240 Len=0 MSS=1460 S...
6	23.293440982	192.168.56.102	192.168.56.101	TCP	74	12345 → 45462 [SYN, ACK] Seq=4185602086 Ack=3807782030 Win=65...
7	23.293864353	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782030 Ack=4185602087 Win=64256 L...
8	23.293864674	192.168.56.101	192.168.56.102	TCP	90	45462 → 12345 [PSH, ACK] Seq=3807782030 Ack=4185602087 Win=64...
9	23.293952853	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602087 Ack=3807782054 Win=65152 L...
10	23.294363744	192.168.56.102	192.168.56.101	TCP	90	12345 → 45462 [PSH, ACK] Seq=4185602087 Ack=3807782054 Win=65...
11	23.294963128	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782054 Ack=4185602111 Win=64256 L...
12	23.294963599	192.168.56.101	192.168.56.102	TCP	86	45462 → 12345 [PSH, ACK] Seq=3807782054 Ack=4185602111 Win=64...
13	23.295010109	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602111 Ack=3807782074 Win=65152 L...
14	23.295384120	192.168.56.102	192.168.56.101	TCP	86	12345 → 45462 [PSH, ACK] Seq=4185602111 Ack=3807782074 Win=65...
15	23.295448753	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [FIN, ACK] Seq=4185602131 Ack=3807782074 Win=65...
16	23.296546435	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782074 Ack=4185602131 Win=64256 L...
17	23.297360969	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [FIN, ACK] Seq=3807782074 Ack=4185602132 Win=64...
18	23.297410118	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602132 Ack=3807782075 Win=65152 L...

Frame 9: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface enp0s3, id 0
Ethernet II, Src: PcsCompu_9f:3d:0f (08:00:27:9f:3d:0f), Dst: PcsCompu_34:cb:d6 (08:00:27:34:cb:d6)
Internet Protocol Version 4, Src: 192.168.56.102, Dst: 192.168.56.101
Transmission Control Protocol, Src Port: 12345, Dst Port: 45462, Seq: 4185602087, Len: 8
Source Port: 12345
Destination Port: 45462
[Stream index: 0]
TCP Segment Len: 8
Sequence number: 4185602087
[Next sequence number: 4185602087]
Acknowledgment number: 3807782054
1000... = Header Length: 32 bytes (8)
Flags: 0x010 (ACK)
Window size value: 509
[Calculated window size: 65152]
[Window size scaling factor: 128]
Checksum: 0xf242 [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps
TCP Option - No-Operation (NOP)
TCP Option - No-Operation (NOP)
TCP Option - Timestamps: TSval 107517073, TSecr 492968500
[SEQ/ACK analysis]
[Timestamps]

Server

Client

Flags: (PSH,ACK).

Server send message "YAHIEL JACOBY, YOAV TAMIR" to Client.

tcp.port == 12345

No.	Time	Source	Destination	Protocol	Length	Info
5	23.293385160	192.168.56.101	192.168.56.102	TCP	74	45462 → 12345 [SYN] Seq=3807782029 Win=64240 Len=0 MSS=1460 S...
6	23.293440982	192.168.56.102	192.168.56.101	TCP	74	12345 → 45462 [SYN, ACK] Seq=4185602086 Ack=3807782030 Win=65...
7	23.293864353	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782030 Ack=4185602087 Win=64256 L...
8	23.293864674	192.168.56.101	192.168.56.102	TCP	90	45462 → 12345 [PSH, ACK] Seq=3807782030 Ack=4185602087 Win=64...
9	23.293952853	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602087 Ack=3807782054 Win=65152 L...
10	23.294363744	192.168.56.102	192.168.56.101	TCP	90	12345 → 45462 [PSH, ACK] Seq=4185602087 Ack=3807782054 Win=65...
11	23.294963128	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782054 Ack=4185602111 Win=64256 L...
12	23.294963599	192.168.56.101	192.168.56.102	TCP	86	45462 → 12345 [PSH, ACK] Seq=3807782054 Ack=4185602111 Win=64...
13	23.295010109	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602111 Ack=3807782074 Win=65152 L...
14	23.295384120	192.168.56.102	192.168.56.101	TCP	86	12345 → 45462 [PSH, ACK] Seq=4185602111 Ack=3807782074 Win=65...
15	23.295448753	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [FIN, ACK] Seq=4185602131 Ack=3807782074 Win=65...
16	23.296546435	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782074 Ack=4185602131 Win=64256 L...
17	23.297360969	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [FIN, ACK] Seq=3807782074 Ack=4185602132 Win=64...
18	23.297410118	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602132 Ack=3807782075 Win=65152 L...

Frame 10: 90 bytes on wire (720 bits), 90 bytes captured (720 bits) on interface enp0s3, id 0
Ethernet II, Src: PcsCompu_9f:3d:0f (08:00:27:9f:3d:0f), Dst: PcsCompu_34:cb:d6 (08:00:27:34:cb:d6)
Internet Protocol Version 4, Src: 192.168.56.102, Dst: 192.168.56.101
Transmission Control Protocol, Src Port: 12345, Dst Port: 45462, Seq: 4185602087, Len: 24
Source Port: 12345
Destination Port: 45462
[Stream index: 0]
TCP Segment Len: 24
Sequence number: 4185602087
[Next sequence number: 4185602111]
Acknowledgment number: 3807782054
1000... = Header Length: 32 bytes (8)
Flags: 0x0105 (PSH, ACK)
Window size value: 509
[Calculated window size: 65152]
[Window size scaling factor: 128]
Checksum: 0xf25a [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps
TCP Option - No-Operation (NOP)
TCP Option - No-Operation (NOP)
TCP Option - Timestamps: TSval 107517073, TSecr 492968500
[SEQ/ACK analysis]
[Timestamps]
TCP payload (24 bytes)
Data (24 bytes)
0000 00 00 27 34 cb d6 08 00 27 9f 3d 0f 08 00 45 00
0010 00 4c ed d3 40 00 40 06 5a bc c0 a8 38 66 c0 a8
0020 38 65 30 90 b1 96 f9 7b 38 27 e2 f6 24 a6 00 00
0030 01 fd f2 5a 00 00 01 01 08 0a 06 68 94 9d 62
0040 1a 34 59 41 48 45 4c 20 4a 41 43 4f 42 59 2c 20
0050 59 4f 41 56 20 54 41 4d 49 52

Server

Client

Flags: (ACK).

Client send Ack to Server – accepted the message.

tcp.port == 12345

No.	Time	Source	Destination	Protocol	Length	Info
5	23.293385160	192.168.56.101	192.168.56.102	TCP	74	45462 → 12345 [SYN] Seq=3807782029 Win=64240 Len=0 MSS=1460 S...
6	23.293440982	192.168.56.102	192.168.56.101	TCP	74	12345 → 45462 [SYN, ACK] Seq=4185602086 Ack=3807782030 Win=65...
7	23.293864353	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782030 Ack=4185602087 Win=64256 L...
8	23.293864674	192.168.56.101	192.168.56.102	TCP	90	45462 → 12345 [PSH, ACK] Seq=3807782030 Ack=4185602087 Win=64...
9	23.293952853	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602087 Ack=3807782054 Win=65152 L...
10	23.294363744	192.168.56.102	192.168.56.101	TCP	90	12345 → 45462 [PSH, ACK] Seq=4185602087 Ack=3807782054 Win=65...
11	23.294963128	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782054 Ack=4185602111 Win=64256 L...
12	23.294963599	192.168.56.101	192.168.56.102	TCP	86	45462 → 12345 [PSH, ACK] Seq=3807782054 Ack=4185602111 Win=64...
13	23.295010109	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602111 Ack=3807782074 Win=65152 L...
14	23.295384120	192.168.56.102	192.168.56.101	TCP	86	12345 → 45462 [PSH, ACK] Seq=4185602111 Ack=3807782074 Win=65...
15	23.295448753	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [FIN, ACK] Seq=4185602131 Ack=3807782074 Win=65...
16	23.296546435	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782074 Ack=4185602131 Win=64256 L...
17	23.297369069	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [FIN, ACK] Seq=3807782074 Ack=4185602132 Win=64...
18	23.297410118	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602132 Ack=3807782075 Win=65152 L...

Frame 11: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface enp0s3, id 0
Ethernet II, Src: PcsCompu_34:cb:d6 (08:00:27:34:cb:d6), Dst: PcsCompu_9f:3d:0f (08:00:27:9f:3d:0f)
Internet Protocol Version 4, Src: 192.168.56.101, Dst: 192.168.56.102
Transmission Control Protocol, Src Port: 45462, Dst Port: 12345, Seq: 3807782054, Win: 64256, Len: 0
Source Port: 45462
Destination Port: 12345
[Stream index: 0]
[TCP Segment Len: 0]
Sequence number: 3807782054
Next sequence number: 3807782054
Acknowledgment number: 4185602111
1000 ... = Header Length: 32 bytes (8)
Flags: 0x010 (ACK)
Window size value: 502
[Calculated window size: 64256]
[Window size scaling factor: 128]
Checksum: 0x94f2 [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps
TCP Option - No-Operation (NOP)
TCP Option - No-Operation (NOP)
TCP Option - Timestamps: TSval 492968501, TSecr 107517073
[SEQ/ACK analysis]
[Timestamps]

0000 08 00 27 9f 3d 0f 08 00 27 34 cb d6 08 00 45 00 ... 4 ... E
0010 00 34 44 ec 40 00 40 06 03 bc c9 a8 38 65 c0 a8 ... 4D 0 0 ... Be
0020 38 66 b1 96 30 39 e2 f6 24 a6 f9 7b 38 3f 00 00 ... 8f 09 ... \$... 87
0030 01 f6 94 f2 00 00 01 01 08 0a 1d 62 1a 35 06 68 b-5-h
0040 94 91

(The same process happened with the message contains the id's)

Flags: (FIN,ACK).

Client send FIN to Server and ask for stop the connection between them.

tcp.port == 12345

No.	Time	Source	Destination	Protocol	Length	Info
5	23.293385160	192.168.56.101	192.168.56.102	TCP	74	45462 → 12345 [SYN] Seq=3807782029 Win=64240 Len=0 MSS=1460 S...
6	23.293440982	192.168.56.102	192.168.56.101	TCP	74	12345 → 45462 [SYN, ACK] Seq=4185602086 Ack=3807782030 Win=65...
7	23.293864353	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782030 Ack=4185602087 Win=64256 L...
8	23.293864674	192.168.56.101	192.168.56.102	TCP	90	45462 → 12345 [PSH, ACK] Seq=3807782030 Ack=4185602087 Win=64...
9	23.293952853	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602087 Ack=3807782054 Win=65152 L...
10	23.294363744	192.168.56.102	192.168.56.101	TCP	90	12345 → 45462 [PSH, ACK] Seq=4185602087 Ack=3807782054 Win=65...
11	23.294963128	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782054 Ack=4185602111 Win=64256 L...
12	23.294963599	192.168.56.101	192.168.56.102	TCP	86	45462 → 12345 [PSH, ACK] Seq=3807782054 Ack=4185602111 Win=64...
13	23.295010109	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602111 Ack=3807782074 Win=65152 L...
14	23.295384120	192.168.56.102	192.168.56.101	TCP	86	12345 → 45462 [PSH, ACK] Seq=4185602111 Ack=3807782074 Win=65...
15	23.295448753	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [FIN, ACK] Seq=4185602131 Ack=3807782074 Win=65...
16	23.296546435	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [ACK] Seq=3807782074 Ack=4185602131 Win=64256 L...
17	23.297369069	192.168.56.101	192.168.56.102	TCP	66	45462 → 12345 [FIN, ACK] Seq=3807782074 Ack=4185602132 Win=64...
18	23.297410118	192.168.56.102	192.168.56.101	TCP	66	12345 → 45462 [ACK] Seq=4185602132 Ack=3807782075 Win=65152 L...

Frame 15: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface enp0s3, id 0
Ethernet II, Src: PcsCompu_9f:3d:0f (08:00:27:9f:3d:0f), Dst: PcsCompu_34:cb:d6 (08:00:27:34:cb:d6)
Internet Protocol Version 4, Src: 192.168.56.102, Dst: 192.168.56.101
Transmission Control Protocol, Src Port: 12345, Dst Port: 45462, Seq: 4185602131, Win: 0, Len: 0
Source Port: 12345
Destination Port: 45462
[Stream index: 0]
[TCP Segment Len: 0]
Sequence number: 4185602131
[Next sequence number: 4185602132]
Acknowledgment number: 3807782074
1000 ... = Header Length: 32 bytes (8)
Flags: 0x011 (FIN, ACK)
Window size value: 509
[Calculated window size: 65152]
[Window size scaling factor: 128]
Checksum: 0xf242 [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps
TCP Option - No-Operation (NOP)
TCP Option - No-Operation (NOP)
TCP Option - Timestamps: TSval 107517074, TSecr 492968501
[Timestamps]

0000 08 00 27 9f 3d 0f 08 00 27 34 cb d6 08 00 45 00 ... 4 ... E
0010 00 34 44 ec 40 00 40 06 03 bc c9 a8 38 65 c0 a8 ... 4D 0 0 ... Be
0020 38 66 b1 96 30 39 e2 f6 24 a6 f9 7b 38 3f 00 00 ... 8f 09 ... \$... 87
0030 01 f6 94 f2 00 00 01 01 08 0a 1d 62 1a 35 06 68 b-5-h
0040 94 91

Flags: (FIN,ACK).

Server send FIN to Client and ask for stop the connection between them

```

tcp.port == 12345

No.    Time                Source                Destination           Protocol  Length  Info
 1    5.23.293385160      192.168.56.101       192.168.56.102       TCP      74      45462 → 12345 [SYN] Seq=3807782029 Win=64240 Len=0 MSS=1460 S.
 6    6.23.293409002      192.168.56.101       192.168.56.102       TCP      74      12345 → 45462 [SYN, ACK] Seq=4185602006 Ack=3807782030 Win=65-
 7    7.23.293864353      192.168.56.101       192.168.56.102       TCP      66      45462 → 12345 [ACK] Seq=3807782030 Ack=4185602007 Win=64256 L
 8    8.23.293864674      192.168.56.101       192.168.56.102       TCP      90      45462 → 12345 [PSH, ACK] Seq=3807782030 Ack=4185602007 Win=64-
 9    9.23.293952853      192.168.56.102       192.168.56.101       TCP      66      12345 → 45462 [ACK] Seq=4185602007 Ack=3807782054 Win=65152 L
10   10.23.294363744      192.168.56.102       192.168.56.101       TCP      90      12345 → 45462 [PSH, ACK] Seq=4185602007 Ack=3807782054 Win=65-
11   11.23.294963128      192.168.56.101       192.168.56.102       TCP      66      45462 → 12345 [ACK] Seq=3807782054 Ack=4185602111 Win=64256 L
12   12.23.294963599      192.168.56.101       192.168.56.102       TCP      86      45462 → 12345 [PSH, ACK] Seq=3807782054 Ack=4185602111 Win=64-
13   13.23.295019109      192.168.56.102       192.168.56.101       TCP      66      12345 → 45462 [ACK] Seq=4185602111 Ack=3807782074 Win=65152 L
14   14.23.295384120      192.168.56.102       192.168.56.101       TCP      86      12345 → 45462 [PSH, ACK] Seq=4185602111 Ack=3807782074 Win=65-
15   15.23.295448753      192.168.56.102       192.168.56.101       TCP      66      12345 → 45462 [FIN, ACK] Seq=4185602131 Ack=3807782074 Win=65-
16   16.23.296546435      192.168.56.101       192.168.56.102       TCP      66      45462 → 12345 [ACK] Seq=3807782074 Ack=4185602131 Win=64256 L
17   17.23.297360969      192.168.56.101       192.168.56.102       TCP      66      45462 → 12345 [FIN, ACK] Seq=3807782074 Ack=4185602132 Win=64-
18   18.23.297410118      192.168.56.102       192.168.56.101       TCP      66      12345 → 45462 [ACK] Seq=4185602132 Ack=3807782075 Win=65152 L

Frame 17: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface enp83s1, id 0
Ethernet II, Src: PcsCompu34:cb:d6 (08:00:27:34:cb:d6), Dst: PcsCompu_9f:3d:0f (08:00:27:9f:3d:0f)
Internet Protocol Version 4, Src: 192.168.56.101, Dst: 192.168.56.102
Transmission Control Protocol, Src Port: 45462, Dst Port: 12345, Seq: 3807782074
  Source Port: 45462
  Destination Port: 12345
  [Stream index: 0]
  [TCP Segment Len: 0]
  Sequence number: 3807782074
  [Next sequence number: 3807782075]
  Acknowledgment number: 4185602132
  1000 .... = Header Length: 32 bytes (8)
  Flags: 0x01 = [FIN, ACK]
  Window size value: 502
  [Calculated window size: 64256]
  [Window size scaling factor: 128]
  Checksum: 0x94c5 [unverified]
  [Checksum Status: Unverified]
  Urgent pointer: 0
  Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps
    TCP Option - No-Operation (NOP)
    TCP Option - No-Operation (NOP)
    TCP Option - Timestamps: TSval 492968503, TSecr 107517074
  [SEQ/ACK analysis]
  [Timestamps]

```

Server and client are both ending the process