

Wireshark explanation

In the first screenshot, Wireshark shows a TCP segment sent from the server (port 1337) to the client (port 61259).

The payload at the bottom contains the ASCII bytes: Welcome! Please log in

This confirms that our application-layer protocol messages are transmitted as raw text inside the TCP payload.

| | | | | | | | | |
|----|-----------|-----------|-----------|-----|----|----------------------|---|-----------------------------------|
| 10 | 32.843021 | 127.0.0.1 | 127.0.0.1 | TCP | 79 | 1337 → 61259 | [PSH, ACK] Seq=1 Ack=1 Win=408256 Len=23 | TSval=1236289250 TSecr=2550585863 |
| 11 | 32.843047 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 | [ACK] Seq=1 Ack=24 Win=408256 Len=0 | TSval=2550585863 TSecr=1236289250 |
| 12 | 38.018660 | 127.0.0.1 | 127.0.0.1 | TCP | 67 | 61259 → 1337 | [PSH, ACK] Seq=1 Ack=24 Win=408256 Len=11 | TSval=2550591039 TSecr=1236289250 |
| 13 | 38.018717 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 | [ACK] Seq=24 Ack=12 Win=408256 Len=0 | TSval=1236294426 TSecr=2550591039 |
| 14 | 38.018747 | 127.0.0.1 | 127.0.0.1 | TCP | 77 | 61259 → 1337 | [PSH, ACK] Seq=12 Ack=24 Win=408256 Len=21 | TSval=2550591039 TSecr=1236294426 |
| 15 | 38.018755 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 | [ACK] Seq=24 Ack=33 Win=408256 Len=0 | TSval=1236294426 TSecr=2550591039 |
| 16 | 38.019119 | 127.0.0.1 | 127.0.0.1 | TCP | 81 | 1337 → 61259 | [PSH, ACK] Seq=24 Ack=33 Win=408256 Len=25 | TSval=1236294426 TSecr=2550591039 |
| 17 | 38.019140 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 | [ACK] Seq=33 Ack=49 Win=408192 Len=0 | TSval=2550591039 TSecr=1236294426 |
| 30 | 53.605207 | 127.0.0.1 | 127.0.0.1 | TCP | 82 | 61259 → 1337 | [PSH, ACK] Seq=33 Ack=49 Win=408192 Len=10 | TSval=2550606625 TSecr=1236294426 |
| 31 | 53.605263 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 | [ACK] Seq=49 Ack=59 Win=408192 Len=0 | TSval=1236310012 TSecr=2550606625 |
| 32 | 53.605909 | 127.0.0.1 | 127.0.0.1 | TCP | 90 | 1337 → 61259 | [PSH, ACK] Seq=49 Ack=59 Win=408192 Len=34 | TSval=1236310012 TSecr=2550606625 |
| 33 | 53.605937 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 | [ACK] Seq=59 Ack=83 Win=408192 Len=0 | TSval=2550606625 TSecr=1236310012 |
| 34 | 53.606258 | 127.0.0.1 | 127.0.0.1 | TCP | 66 | 61259 → 1337 | [PSH, ACK] Seq=59 Ack=83 Win=408192 Len=10 | TSval=2550606625 TSecr=1236310012 |
| 35 | 53.606276 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 | [ACK] Seq=83 Ack=69 Win=408192 Len=0 | TSval=1236310013 TSecr=2550606626 |
| 36 | 53.607536 | 127.0.0.1 | 127.0.0.1 | TCP | 71 | 1337 → 61259 | [PSH, ACK] Seq=83 Ack=69 Win=408192 Len=15 | TSval=1236310013 TSecr=2550606626 |
| 37 | 53.607564 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 | [ACK] Seq=69 Ack=98 Win=408192 Len=0 | TSval=2550606628 TSecr=1236310015 |
| 38 | 53.607684 | 127.0.0.1 | 127.0.0.1 | TCP | 72 | 61259 → 1337 | [PSH, ACK] Seq=69 Ack=98 Win=408192 Len=16 | TSval=2550606628 TSecr=1236310015 |
| 39 | 53.607700 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 | [ACK] Seq=98 Ack=85 Win=408192 Len=0 | TSval=1236310015 TSecr=2550606628 |
| 40 | 53.607840 | 127.0.0.1 | 127.0.0.1 | TCP | 81 | 1337 → 61259 | [PSH, ACK] Seq=98 Ack=85 Win=408192 Len=25 | TSval=1236310015 TSecr=2550606628 |
| 41 | 53.607855 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 | [ACK] Seq=85 Ack=123 Win=408128 Len=0 | TSval=2550606628 TSecr=1236310015 |
| 42 | 53.607908 | 127.0.0.1 | 127.0.0.1 | TCP | 61 | 61259 → 1337 | [PSH, ACK] Seq=85 Ack=123 Win=408128 Len=5 | TSval=2550606628 TSecr=1236310015 |
| 43 | 53.607922 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 | [ACK] Seq=123 Ack=90 Win=408192 Len=0 | TSval=1236310015 TSecr=2550606628 |
| 44 | 53.608053 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 | [FIN, ACK] Seq=123 Ack=90 Win=408192 Len=0 | TSval=1236310015 TSecr=2550606628 |
| 45 | 53.608054 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 | [FIN, ACK] Seq=90 Ack=123 Win=408128 Len=0 | TSval=2550606628 TSecr=1236310015 |
| 46 | 53.608072 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | [TCP Retransmission] | 61259 → 1337 [FIN, ACK] Seq=90 Ack=124 Win=408128 Len=0 | TSval=2550606628 TSecr=1236310015 |
| 47 | 53.608076 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | [TCP Retransmission] | 1337 → 61259 [FIN, ACK] Seq=123 Ack=91 Win=408192 Len=0 | TSval=1236310015 TSecr=1236310015 |

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> Frame 10: Packet, 79 bytes on wire (632 bits), 79 bytes captured (632 bits)
> Null/Loopback
> Internet Protocol Version 4, Src: 127.0.0.1, Dst: 127.0.0.1
> Transmission Control Protocol, Src Port: 1337, Dst Port: 61259, Seq: 1, Ack: 1, Len: 23
> Data (23 bytes)
```

| | | | |
|------|-------------------------|-------------------------|------------------|
| 0000 | 02 00 00 00 45 00 00 4b | 00 00 40 00 40 06 00 00 | ...E·K·@·@· |
| 0010 | 7f 00 00 01 7f 00 00 01 | 05 39 ef 4b 58 58 8e d5 |9·KXX· |
| 0020 | 39 2b ed f9 80 18 eb | fe 3f 00 00 01 01 08 0a | 9+.....?..... |
| 0030 | 49 b0 46 e2 98 06 da 07 | 57 65 6c 63 6f 6d 65 21 | I·F.....Welcome! |
| 0040 | 20 50 6c 65 61 73 65 20 | 6c 6f 67 20 69 6e 0a | Please log in· |

In the second screenshot, the TCP connection is now carrying data **from the client to the server**.

The selected packet (client port 61259 → server port 1337) contains:

User: maoz

This matches the client-side behavior defined in the assignment:

| | | | | | | |
|----|-----------|-----------|-----------|-----|----|--|
| 12 | 38.018660 | 127.0.0.1 | 127.0.0.1 | TCP | 67 | 61259 → 1337 [PSH, ACK] Seq=1 Ack=24 Win=408256 Len=11 TStamp=2550591039 TSectr=1236289250 |
| 13 | 38.018717 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 [ACK] Seq=24 Ack=12 Win=408256 Len=0 TStamp=1236294426 TSectr=2550591039 |
| 14 | 38.018747 | 127.0.0.1 | 127.0.0.1 | TCP | 77 | 61259 → 1337 [PSH, ACK] Seq=12 Ack=24 Win=408256 Len=21 TStamp=2550591039 TSectr=1236294426 |
| 15 | 38.018755 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 [ACK] Seq=24 Ack=33 Win=408256 Len=0 TStamp=1236294426 TSectr=2550591039 |
| 16 | 38.019119 | 127.0.0.1 | 127.0.0.1 | TCP | 81 | 1337 → 61259 [PSH, ACK] Seq=24 Ack=33 Win=408256 Len=25 TStamp=1236294426 TSectr=2550591039 |
| 17 | 38.019140 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 [ACK] Seq=33 Ack=49 Win=408192 Len=0 TStamp=2550591039 TSectr=1236294426 |
| 30 | 53.605207 | 127.0.0.1 | 127.0.0.1 | TCP | 82 | 61259 → 1337 [PSH, ACK] Seq=33 Ack=49 Win=408192 Len=26 TStamp=2550606625 TSectr=1236294426 |
| 31 | 53.605263 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 [ACK] Seq=49 Ack=59 Win=408192 Len=0 TStamp=1236310012 TSectr=2550606625 |
| 32 | 53.605989 | 127.0.0.1 | 127.0.0.1 | TCP | 90 | 1337 → 61259 [PSH, ACK] Seq=49 Ack=59 Win=408192 Len=34 TStamp=1236310012 TSectr=2550606625 |
| 33 | 53.605937 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 [ACK] Seq=59 Ack=83 Win=408192 Len=0 TStamp=2550606625 TSectr=1236310012 |
| 34 | 53.606258 | 127.0.0.1 | 127.0.0.1 | TCP | 66 | 61259 → 1337 [PSH, ACK] Seq=59 Ack=83 Win=408192 Len=10 TStamp=2550606626 TSectr=1236310012 |
| 35 | 53.606276 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 [ACK] Seq=83 Ack=69 Win=408192 Len=0 TStamp=1236310013 TSectr=2550606626 |
| 36 | 53.607536 | 127.0.0.1 | 127.0.0.1 | TCP | 71 | 1337 → 61259 [PSH, ACK] Seq=83 Ack=69 Win=408192 Len=15 TStamp=1236310015 TSectr=2550606626 |
| 37 | 53.607564 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 [ACK] Seq=69 Ack=98 Win=408192 Len=0 TStamp=2550606628 TSectr=1236310015 |
| 38 | 53.607684 | 127.0.0.1 | 127.0.0.1 | TCP | 72 | 61259 → 1337 [PSH, ACK] Seq=69 Ack=98 Win=408192 Len=16 TStamp=2550606628 TSectr=1236310015 |
| 39 | 53.607700 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 [ACK] Seq=98 Ack=85 Win=408192 Len=0 TStamp=1236310015 TSectr=2550606628 |
| 40 | 53.607840 | 127.0.0.1 | 127.0.0.1 | TCP | 81 | 1337 → 61259 [PSH, ACK] Seq=98 Ack=85 Win=408192 Len=25 TStamp=1236310015 TSectr=2550606628 |
| 41 | 53.607855 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 [ACK] Seq=85 Ack=123 Win=408128 Len=0 TStamp=2550606628 TSectr=1236310015 |
| 42 | 53.607908 | 127.0.0.1 | 127.0.0.1 | TCP | 61 | 61259 → 1337 [PSH, ACK] Seq=85 Ack=123 Win=408128 Len=5 TStamp=2550606628 TSectr=1236310015 |
| 43 | 53.607922 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 [ACK] Seq=123 Ack=90 Win=408192 Len=0 TStamp=1236310015 TSectr=2550606628 |
| 44 | 53.608053 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 1337 → 61259 [FIN, ACK] Seq=123 Ack=90 Win=408192 Len=0 TStamp=1236310015 TSectr=2550606628 |
| 45 | 53.608054 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | 61259 → 1337 [FIN, ACK] Seq=90 Ack=123 Win=408128 Len=0 TStamp=2550606628 TSectr=1236310015 |
| 46 | 53.608072 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | [TCP Retransmission] 61259 → 1337 [FIN, ACK] Seq=90 Ack=124 Win=408128 Len=0 TStamp=2550606628 TSectr... |
| 47 | 53.608076 | 127.0.0.1 | 127.0.0.1 | TCP | 56 | [TCP Retransmission] 1337 → 61259 [FIN, ACK] Seq=123 Ack=91 Win=408192 Len=0 TStamp=1236310015 TSectr... |

Frame 12: Packet, 67 bytes on wire (536 bits), 67 bytes captured (536 bits)

Null/Loopback

Internet Protocol Version 4, Src: 127.0.0.1, Dst: 127.0.0.1

Transmission Control Protocol, Src Port: 61259, Dst Port: 1337, Seq: 1, Ack: 24, Len: 11

Data (11 bytes)

| | | | |
|------|-------------------------|-------------------------|---------------------|
| 0000 | 02 00 00 00 45 00 00 3f | 00 00 40 00 40 06 00 00 | ... E ... ? @ @ ... |
| 0010 | 7f 00 00 01 7f 00 00 01 | ef 4b 05 39 39 2b ed f9 | ... K-99+ ... |
| 0020 | 58 58 8e ec 80 18 18 eb | fe 33 00 00 01 01 08 0a | XX ... 3 ... |
| 0030 | 98 06 ee 3f 49 b0 46 e2 | 55 73 65 72 3a 20 6d 61 | ?I·F ·User: ma |
| 0040 | 6f 7a 0a | | oz · |