PERFORMANCE THRESHOLD TESTING

OBJECTIVE:

Determine the maximum packet processing and data processing threshold of the project before stdout buffer blocking causes packet drops.

1. PROBLEM STATEMENT & TESTING RATIONALE

Understanding the Bottleneck:

When tshark writes to stdout, it uses a 64KB pipe buffer. The processing pipeline works as follows:

tshark captures → 64KB stdout buffer → Python reads → Parse packet → Calculate metrics → Store data

Critical Issue:

• If parsing + metrics calculation takes too long, Python can't read from the buffer fast enough

• The 64KB stdout buffer fills up

• tshark's write() call BLOCKS (pauses)

• Result: PACKET DROPS occur

Wireshark as Benchmark:

• Wireshark is highly optimized for continuous capture

• It efficiently writes to disk without blocking

• No packet drops under normal conditions

• Therefore: Wireshark packet count = Ground Truth

Testing Goal:

1. Find the maximum packets per second our backend can handle before synchronous processing causes packet drops.
2. Find the maximum bytes our backend can handle before synchronous processing causes packet drops.

2. TEST DESIGN

Test 1: HIGH PACKET RATE (Small Packets)

Objective: Find maximum packets-per-second threshold and check packet processing threshold in case of high packet rate

Method: Open multiple browser tabs simultaneously to generate high packet rate

Traffic Generation:

• Open 10-15 browser tabs simultaneously

• Load high-traffic websites (YouTube, news sites, social media)

• Autoplay videos in multiple tabs

• Continuous scrolling and interaction

Success Criteria:

• Total packet count approximately matches Wireshark

Failure Indicators:

• Backend captures fewer packets than Wireshark

• Backend becomes unresponsive

Test 2: LARGE PACKET SIZE (High Throughput)

Objective: Test large packet handling efficiency and packet processing threshold in this case.

Method: Download large files to generate sustained high-throughput traffic

Traffic Generation:

• Download multiple large files (500MB-1GB each)

Success Criteria:

• All packets captured without drops

• Throughput measurement matches expected download speed. Can cross check with your internet throughput limit(from ISP)

• Backend remains responsive during sustained traffic

Failure Indicators:

• Packet loss during sustained high throughput

• Buffer overflow indicators

• Processing delays accumulate over time

3. TEST ENVIRONMENT SETUP

Hardware:

• CPU: 11th Gen Intel® Core™ i5-1135G7 @ 2.40GHz, 4 cores

• RAM: 16 GB at 2400 MT/s

• Network: Wi-Fi

• Disk: SSD 512 GB

Software:

• OS: Windows 11

• Python: Python 3.13.5

• Wireshark/tshark: TShark (Wireshark) 4.4.7 (v4.4.7-0-g7980339b1630).

• Network Interface: Wi-Fi

Python Backend Configuration:

• Metrics calculation: Every 1 second

4. TESTING PROCEDURE

Pre-Test Preparation:

1. Close all unnecessary applications
2. Disable background updates and services
3. Verify network interface is active
4. Clear system caches
5. Document baseline system resource usage

Test Execution Steps:

STEP 1: Start Wireshark (Baseline)

- Open Wireshark
- Select network interface
- Start capture
- Note start time

STEP 2: Start Backend Simultaneously

- Run: python main.py
- Start capture on same interface
- Synchronize start time (± 0.5 second)

STEP 3: Generate Test Traffic

For Test #1 (High Packet Rate):

- Open 20 Youtube tabs
- Open 2 google meet
- Continue browsing

For Test #2 (Large Packets):

- Start 10 simultaneous downloads (1GB to 10GB)
- Monitor for 5-10 minutes
- Observe backend behavior under sustained load

STEP 4: Stop Capture

- Stop backend capture
- Stop Wireshark capture simultaneously
- Save Wireshark capture file
- Document end time

STEP 5: Collect Data

- Backend terminal output (packet statistics)
- Wireshark Statistics → Capture File Properties
- System resource logs

5. DATA COLLECTION

Test #1

Test type: High Packet Rate

WIRESHARK RESULTS:

Metric	Value
Total Pakets Captured	1663858
Capture Duration	10 mins 50 seconds
Packets Dropped	15680(0.9%)

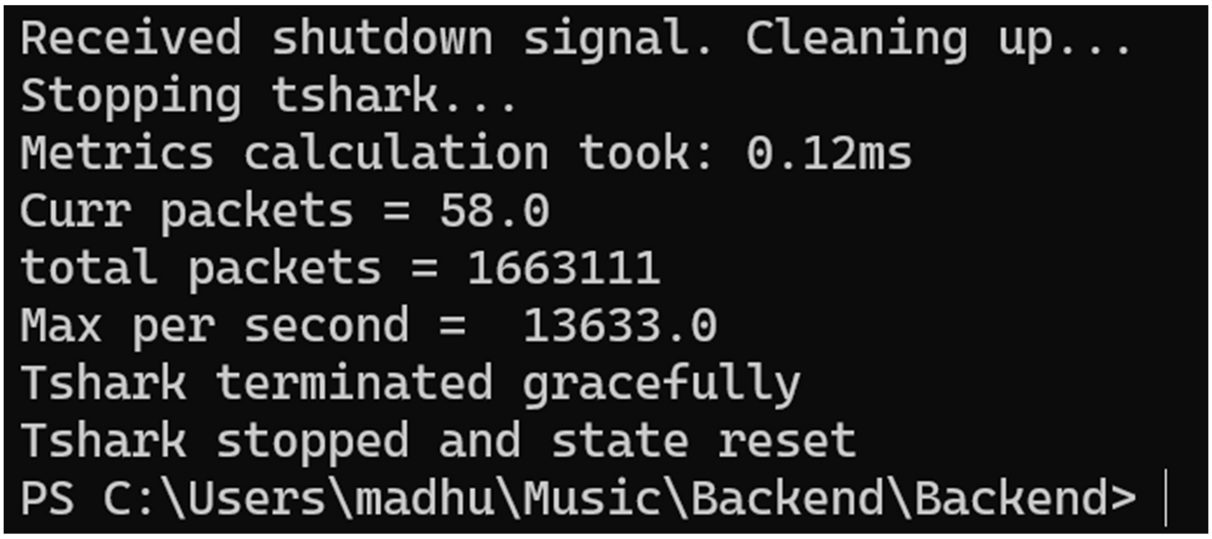
BACKEND RESULTS:

Metric	Value
Total Pakets Captured	1663111
Capture Duration	10 mins 49 seconds
Maximum Packets captured per second	13633

COMPARISON:

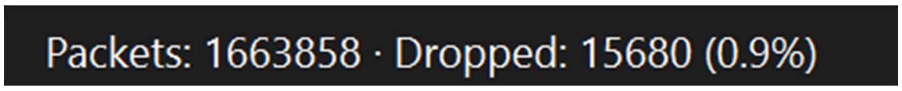
Metric	Backend Value	Wireshark Value	Difference
Total Pakets Captured	1663111	1663858	747
Capture Duration	10 mins 49 seconds	10 mins 50 seconds	1 second

Backend Logs -



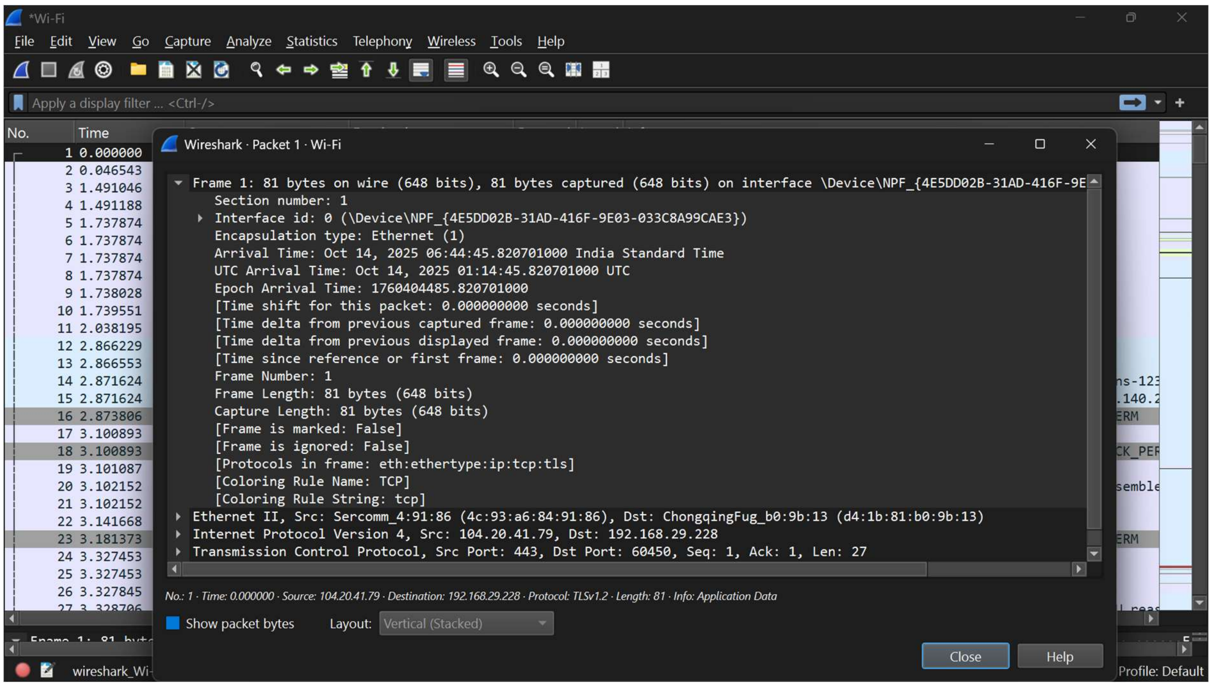
```
Received shutdown signal. Cleaning up...
Stopping tshark...
Metrics calculation took: 0.12ms
Curr packets = 58.0
total packets = 1663111
Max per second =  13633.0
Tshark terminated gracefully
Tshark stopped and state reset
PS C:\Users\madhu\Music\Backend\Backend>
```

Wireshark Status -



Packets: 1663858 · Dropped: 15680 (0.9%)

Wireshark(First and Last Packet) -



```
No.  Time
  1 0.000000
  2 0.046543
  3 1.491046
  4 1.491188
  5 1.737874
  6 1.737874
  7 1.737874
  8 1.737874
  9 1.738028
 10 1.739551
 11 2.038195
 12 2.866229
 13 2.866553
 14 2.871624
 15 2.871624
 16 2.873806
 17 3.100893
 18 3.100893
 19 3.101087
 20 3.102152
 21 3.102152
 22 3.141668
 23 3.181373
 24 3.327453
 25 3.327453
 26 3.327845
```

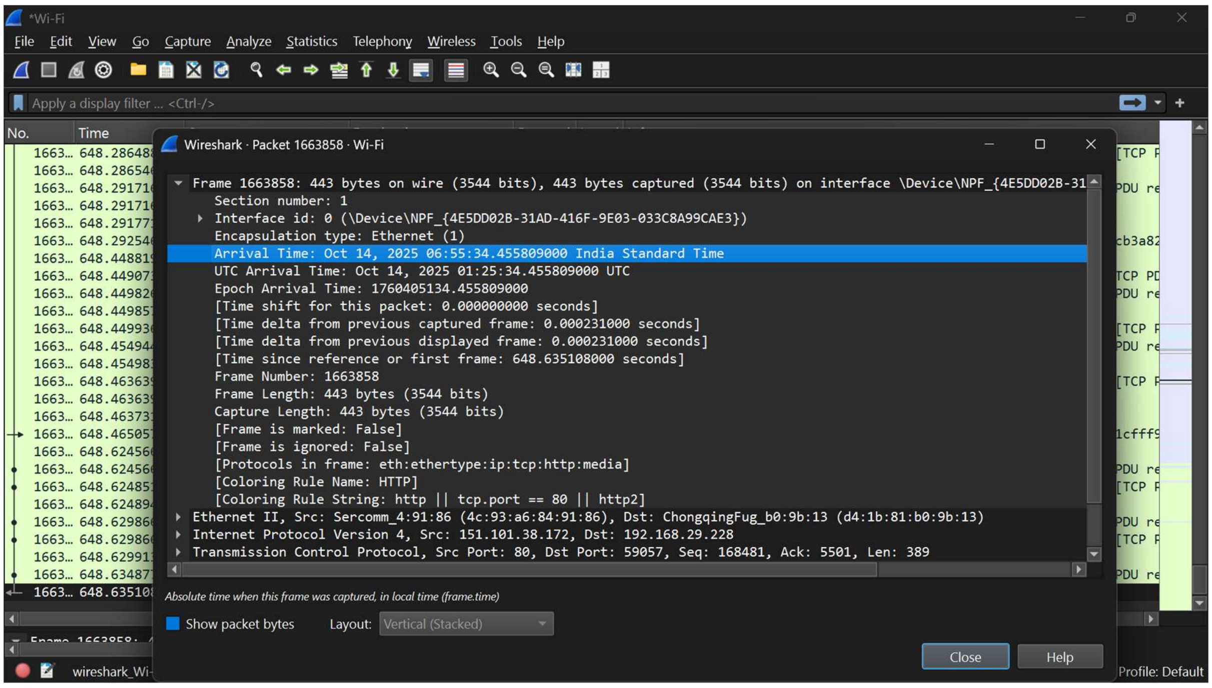
Wireshark · Packet 1 · Wi-Fi

```
Frame 1: 81 bytes on wire (648 bits), 81 bytes captured (648 bits) on interface \Device\NPF_{4E5DD02B-31AD-416F-9E
    Section number: 1
  Interface id: 0 (\Device\NPF_{4E5DD02B-31AD-416F-9E03-033C8A99CAE3})
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 14, 2025 06:44:45.820701000 India Standard Time
    UTC Arrival Time: Oct 14, 2025 01:14:45.820701000 UTC
    Epoch Arrival Time: 1760404485.820701000
    [Time shift for this packet: 0.000000000 seconds]
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 81 bytes (648 bits)
    Capture Length: 81 bytes (648 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:tcp:tls]
    [Coloring Rule Name: TCP]
    [Coloring Rule String: tcp]
Ethernet II, Src: Sercomm_4:91:86 (4c:93:a6:84:91:86), Dst: ChongqingFug_b0:9b:13 (d4:1b:81:b0:9b:13)
Internet Protocol Version 4, Src: 104.20.41.79, Dst: 192.168.29.228
Transmission Control Protocol, Src Port: 443, Dst Port: 60450, Seq: 1, Ack: 1, Len: 27
```

No.: 1 · Time: 0.000000 · Source: 104.20.41.79 · Destination: 192.168.29.228 · Protocol: TLSv1.2 · Length: 81 · Info: Application Data

Show packet bytes   Layout: Vertical (Stacked)

*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Close
Help
wireshark_Wi
Profile: Default



```
No.    Time
1663… 648.28648
1663… 648.28654
1663… 648.29171
1663… 648.29171
1663… 648.29177
1663… 648.29254
1663… 648.44881
1663… 648.44907
1663… 648.44982
1663… 648.44985
1663… 648.44993
1663… 648.45494
1663… 648.45498
1663… 648.46363
1663… 648.46363
1663… 648.46373
1663… 648.46505
1663… 648.62456
1663… 648.62456
1663… 648.62485
1663… 648.62489
1663… 648.62986
1663… 648.62986
1663… 648.62991
1663… 648.63487
1663… 648.63510
```

Wireshark · Packet 1663858 · Wi-Fi

```
Frame 1663858: 443 bytes on wire (3544 bits), 443 bytes captured (3544 bits) on interface \Device\NPF_{4E5DD02B-31
    Section number: 1
  Interface id: 0 (\Device\NPF_{4E5DD02B-31AD-416F-9E03-033C8A99CAE3})
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 14, 2025 06:55:34.455809000 India Standard Time
    UTC Arrival Time: Oct 14, 2025 01:25:34.455809000 UTC
    Epoch Arrival Time: 1760405134.455809000
    [Time shift for this packet: 0.000000000 seconds]
    [Time delta from previous captured frame: 0.000231000 seconds]
    [Time delta from previous displayed frame: 0.000231000 seconds]
    [Time since reference or first frame: 648.635108000 seconds]
    Frame Number: 1663858
    Frame Length: 443 bytes (3544 bits)
    Capture Length: 443 bytes (3544 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:tcp:http:media]
    [Coloring Rule Name: HTTP]
    [Coloring Rule String: http || tcp.port == 80 || http2]
Ethernet II, Src: Sercomm_4:91:86 (4c:93:a6:84:91:86), Dst: ChongqingFug_b0:9b:13 (d4:1b:81:b0:9b:13)
Internet Protocol Version 4, Src: 151.101.38.172, Dst: 192.168.29.228
Transmission Control Protocol, Src Port: 80, Dst Port: 59057, Seq: 168481, Ack: 5501, Len: 389
```

Absolute time when this frame was captured, in local time (frame.time)

Show packet bytes   Layout: Vertical (Stacked)

*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Close
Help
wireshark_Wi
Profile: Default

Test #2

Test type: LARGE PACKET SIZE (High Throughput)

WIRESHARK RESULTS:

Metric	Value
Total Pakets Captured	799979

Capture Duration	6 mins 11 seconds
Packets Dropped	0

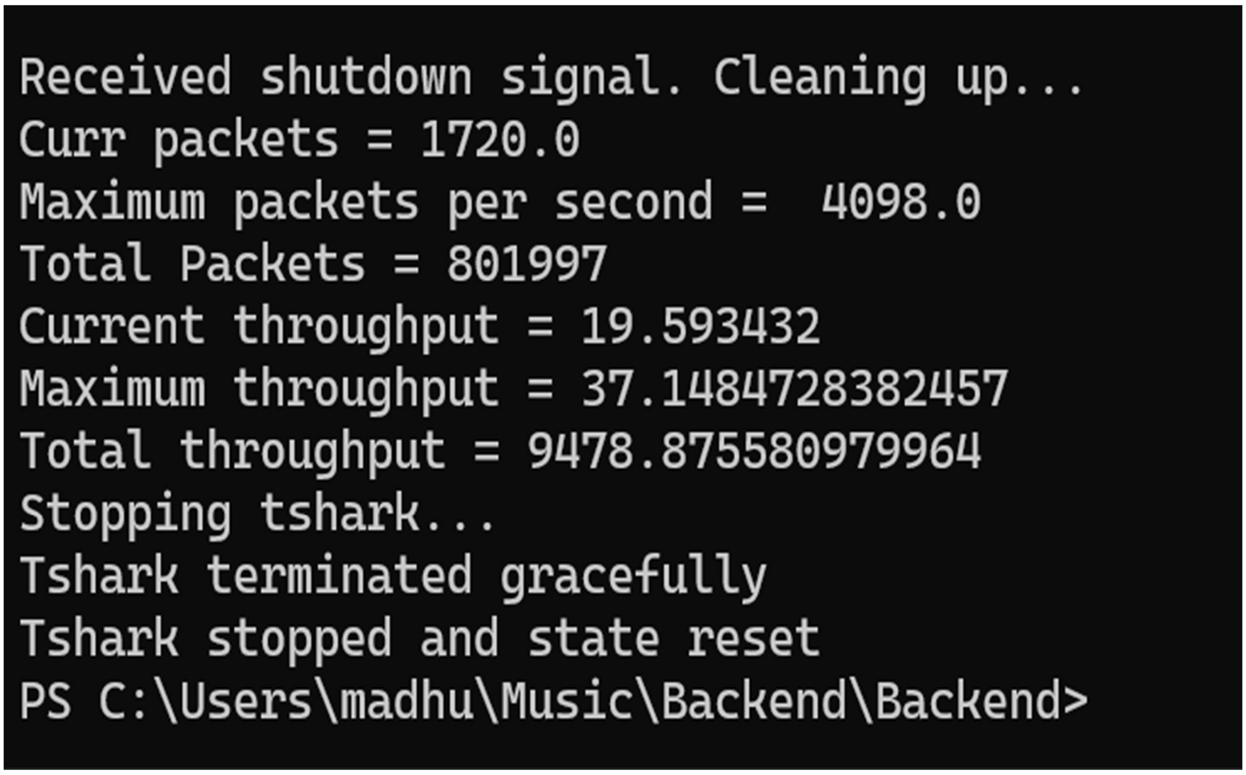
BACKEND RESULTS:

Metric	Value
Total Pakets Captured	801997
Capture Duration	6 mins 13 seconds
Maximum Packets captured per second	4098
Maximum Throughput	37.14 Mbps

COMPARISON:

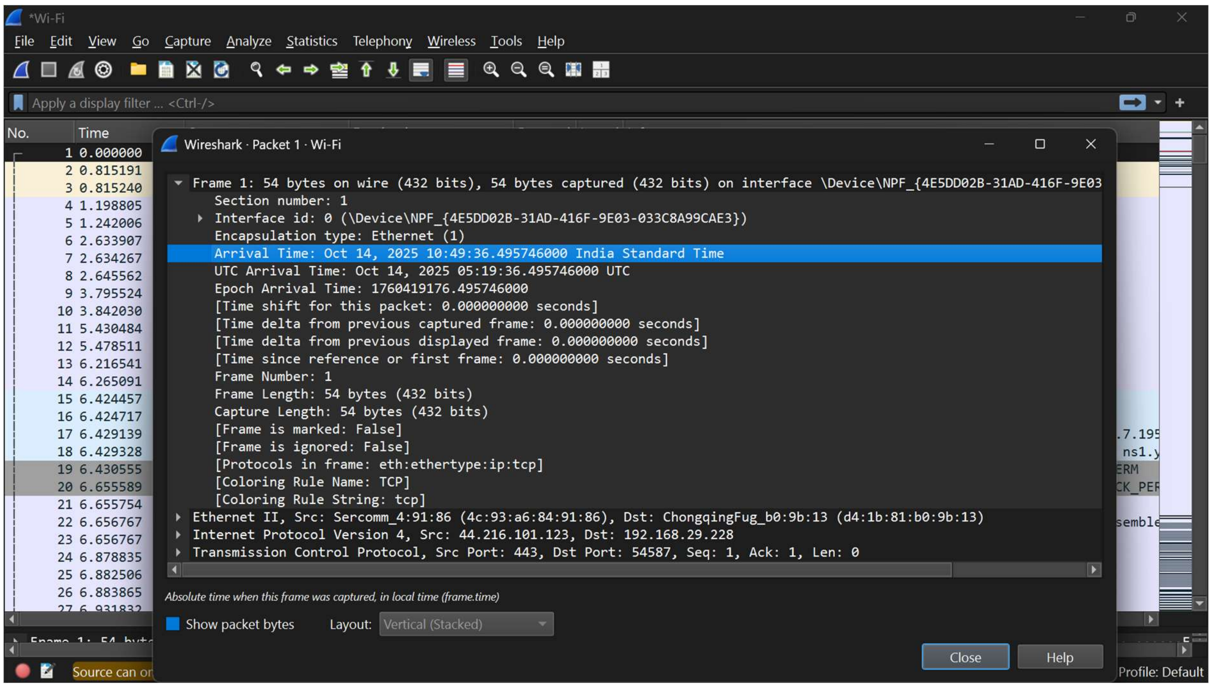
Metric	Backend Value	Wireshark Value	Difference
Total Pakets Captured	801997	799979	2018
Capture Duration	6 mins 13 seconds	6 mins 11 seconds	2 seconds

Backend Logs -



```
Received shutdown signal. Cleaning up...
Curr packets = 1720.0
Maximum packets per second =  4098.0
Total Packets = 801997
Current throughput = 19.593432
Maximum throughput = 37.1484728382457
Total throughput = 9478.875580979964
Stopping tshark...
Tshark terminated gracefully
Tshark stopped and state reset
PS C:\Users\madhu\Music\Backend\Backend>
```

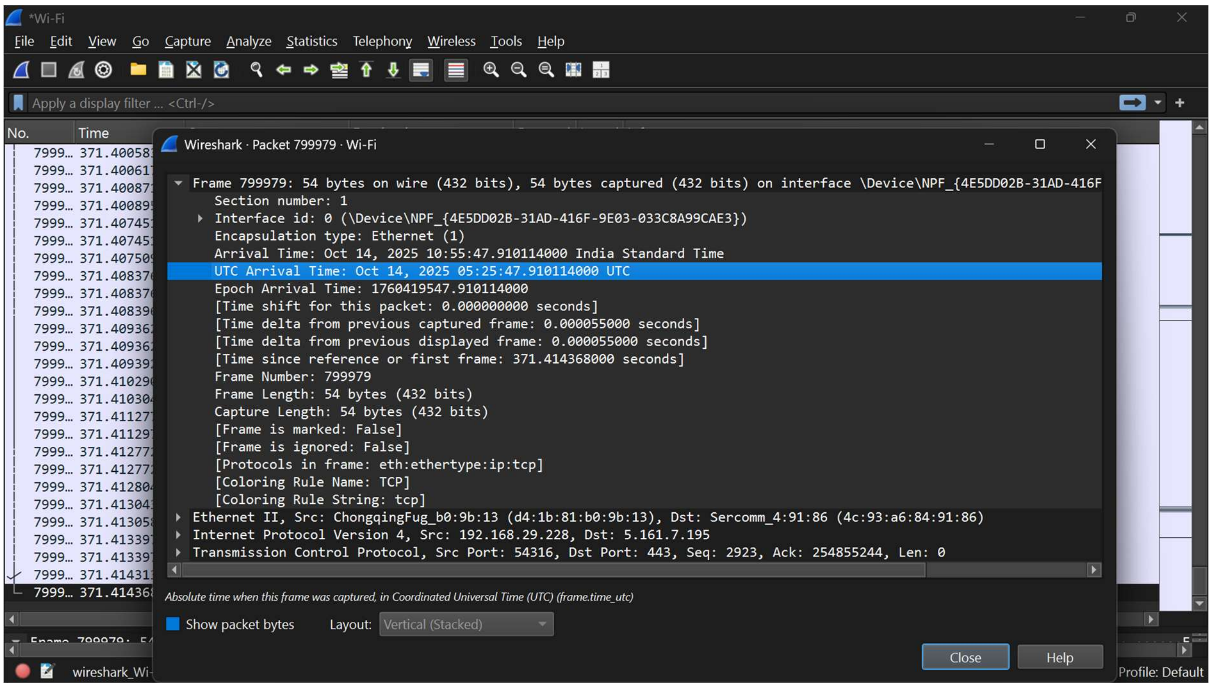
Wireshark(First and Last Packet) –


*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Wireshark · Packet 1 · Wi-Fi
Show packet bytes
Layout: Vertical (Stacked)
Close
Help
Source can or
Profile: Default

```
No.  Time
 1 0.000000
 2 0.815191
 3 0.815240
 4 1.198805
 5 1.242006
 6 2.633907
 7 2.634267
 8 2.645562
 9 3.795524
10 3.842030
11 5.430484
12 5.478511
13 6.216541
14 6.265091
15 6.424457
16 6.424717
17 6.429139
18 6.429328
19 6.430555
20 6.655589
21 6.655754
22 6.656767
23 6.656767
24 6.878835
25 6.882506
26 6.883865
27 6.931832
```

```
Frame 1: 54 bytes on wire (432 bits), 54 bytes captured (432 bits) on interface \Device\NPF_{4E5DD02B-31AD-416F-9E03
    Section number: 1
    Interface id: 0 (\Device\NPF_{4E5DD02B-31AD-416F-9E03-033C8A99CAE3})
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 14, 2025 10:49:36.495746000 India Standard Time
    UTC Arrival Time: Oct 14, 2025 05:19:36.495746000 UTC
    Epoch Arrival Time: 1760419176.495746000
    [Time shift for this packet: 0.000000000 seconds]
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 54 bytes (432 bits)
    Capture Length: 54 bytes (432 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:tcp]
    [Coloring Rule Name: TCP]
    [Coloring Rule String: tcp]
Ethernet II, Src: Sercomm_4:91:86 (4c:93:a6:84:91:86), Dst: ChongqingFug_b0:9b:13 (d4:1b:81:b0:9b:13)
Internet Protocol Version 4, Src: 44.216.101.123, Dst: 192.168.29.228
Transmission Control Protocol, Src Port: 443, Dst Port: 54587, Seq: 1, Ack: 1, Len: 0
```

Absolute time when this frame was captured, in local time (frame.time)


*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Wireshark · Packet 799979 · Wi-Fi
Show packet bytes
Layout: Vertical (Stacked)
Close
Help
wireshark_Wi-
Profile: Default

```
No.    Time
7999… 371.40058
7999… 371.40061
7999… 371.40087
7999… 371.40089
7999… 371.40745
7999… 371.40745
7999… 371.40750
7999… 371.40837
7999… 371.40837
7999… 371.40839
7999… 371.40936
7999… 371.40936
7999… 371.40939
7999… 371.41029
7999… 371.41030
7999… 371.41127
7999… 371.41129
7999… 371.41277
7999… 371.41277
7999… 371.41280
7999… 371.41304
7999… 371.41305
7999… 371.41339
7999… 371.41339
7999… 371.41431
7999… 371.41436
```

```
Frame 799979: 54 bytes on wire (432 bits), 54 bytes captured (432 bits) on interface \Device\NPF_{4E5DD02B-31AD-416F
    Section number: 1
    Interface id: 0 (\Device\NPF_{4E5DD02B-31AD-416F-9E03-033C8A99CAE3})
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 14, 2025 10:55:47.910114000 India Standard Time
    UTC Arrival Time: Oct 14, 2025 05:25:47.910114000 UTC
    Epoch Arrival Time: 1760419547.910114000
    [Time shift for this packet: 0.000000000 seconds]
    [Time delta from previous captured frame: 0.000055000 seconds]
    [Time delta from previous displayed frame: 0.000055000 seconds]
    [Time since reference or first frame: 371.414368000 seconds]
    Frame Number: 799979
    Frame Length: 54 bytes (432 bits)
    Capture Length: 54 bytes (432 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:tcp]
    [Coloring Rule Name: TCP]
    [Coloring Rule String: tcp]
Ethernet II, Src: ChongqingFug_b0:9b:13 (d4:1b:81:b0:9b:13), Dst: Sercomm_4:91:86 (4c:93:a6:84:91:86)
Internet Protocol Version 4, Src: 192.168.29.228, Dst: 5.161.7.195
Transmission Control Protocol, Src Port: 54316, Dst Port: 443, Seq: 2923, Ack: 254855244, Len: 0
```

Absolute time when this frame was captured, in Coordinated Universal Time (UTC) (frame.time_utc)

Test #3

Test type: High Packet Rate

WIRESHARK RESULTS:

Metric	Value
Total Pakets Captured	1160821
Capture Duration	8 mins 15 second
Packets Dropped	568

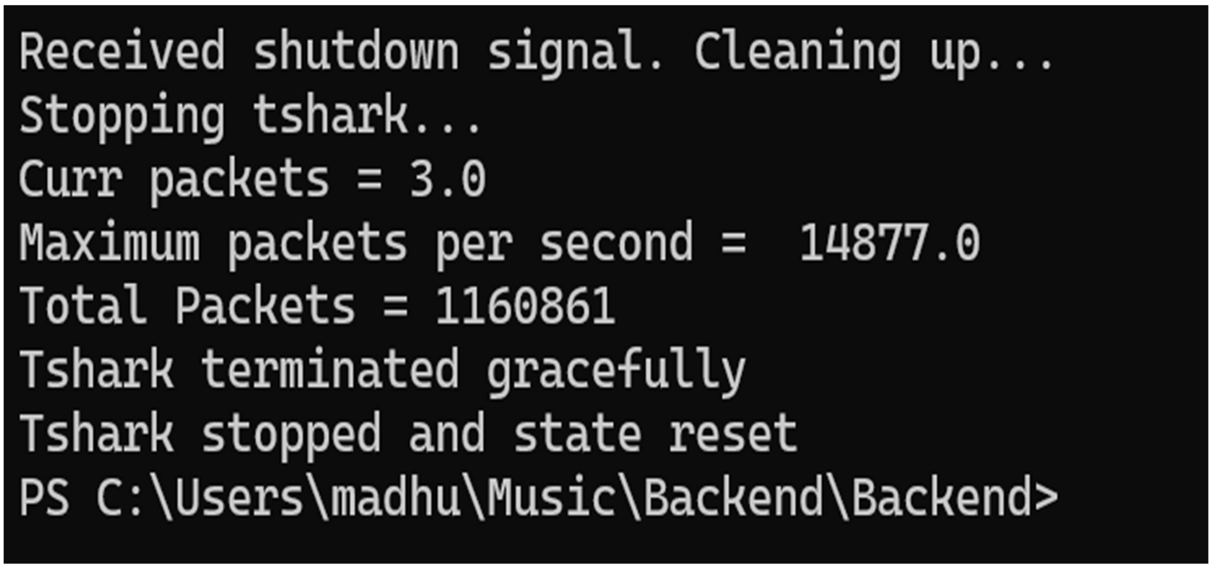
BACKEND RESULTS:

Metric	Value
Total Pakets Captured	1660861
Capture Duration	8 mins 16 seconds
Maximum Packets captured per second	14877

COMPARISON:

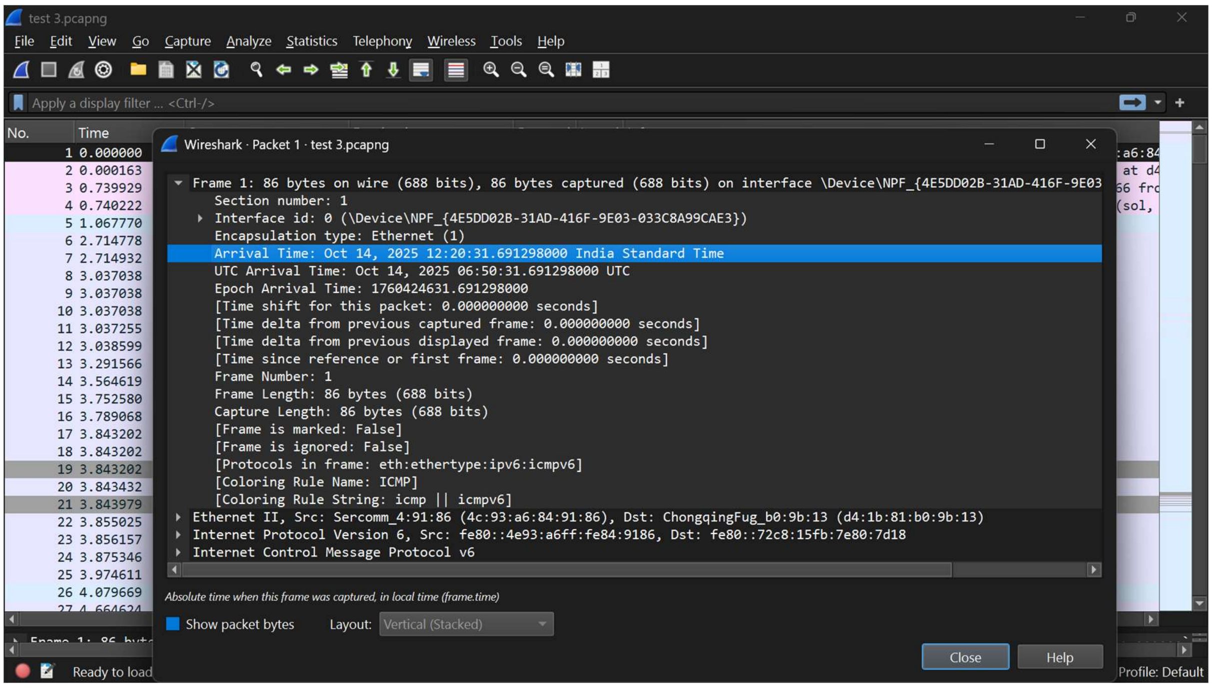
Metric	Backend Value	Wireshark Value	Difference
Total Pakets Captured	1660861	1160821	40
Capture Duration	8 mins 16 second	8 mins 15 second	1 second

Backend Logs –



```
Received shutdown signal. Cleaning up...
Stopping tshark...
Curr packets = 3.0
Maximum packets per second =  14877.0
Total Packets = 1160861
Tshark terminated gracefully
Tshark stopped and state reset
PS C:\Users\madhu\Music\Backend\Backend>
```

Wireshark(First and Last Packet) –



```
No.   Time
   1 0.000000
   2 0.000163
   3 0.739929
   4 0.740222
   5 1.067770
   6 2.714778
   7 2.714932
   8 3.037038
   9 3.037038
  10 3.037038
  11 3.037255
  12 3.038599
  13 3.291566
  14 3.564619
  15 3.752580
  16 3.789068
  17 3.843202
  18 3.843202
  19 3.843202
  20 3.843432
  21 3.843979
  22 3.855025
  23 3.856157
  24 3.875346
  25 3.974611
  26 4.079669
```

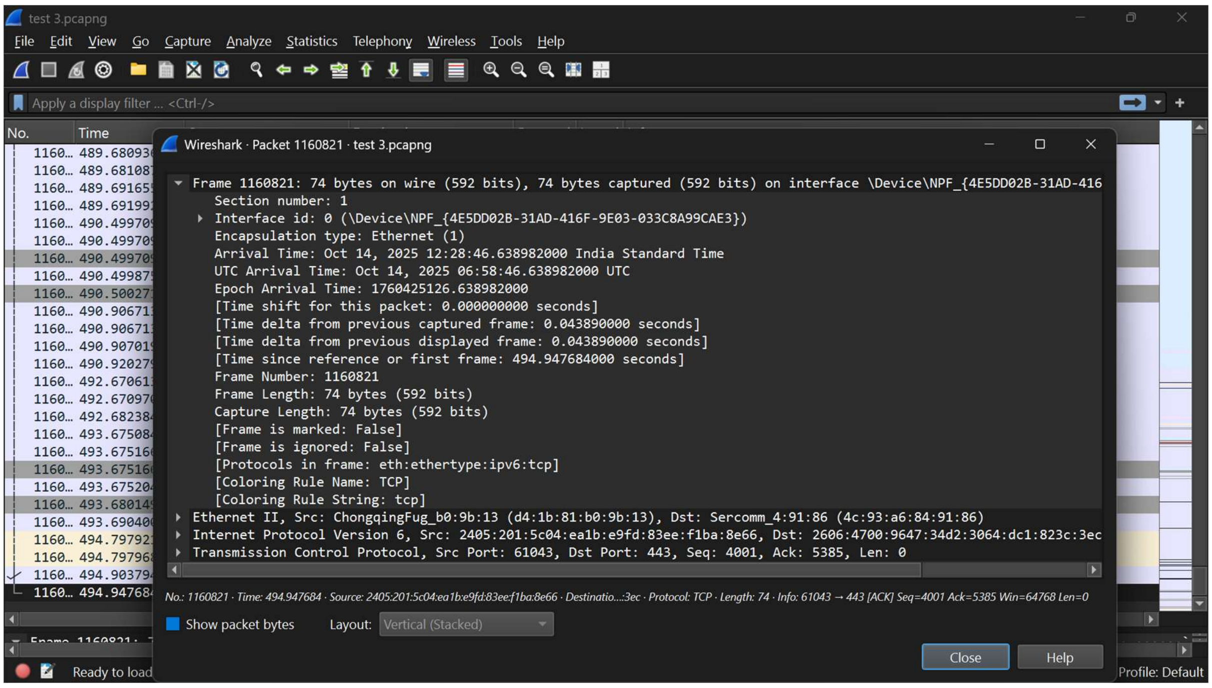
Wireshark · Packet 1 · test 3.pcapng

```
Frame 1: 86 bytes on wire (688 bits), 86 bytes captured (688 bits) on interface \Device\NPF_{4E5DD02B-31AD-416F-9E03
    Section number: 1
    Interface id: 0 (\Device\NPF_{4E5DD02B-31AD-416F-9E03-033C8A99CAE3})
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 14, 2025 12:20:31.691298000 India Standard Time
    UTC Arrival Time: Oct 14, 2025 06:50:31.691298000 UTC
    Epoch Arrival Time: 1760424631.691298000
    [Time shift for this packet: 0.000000000 seconds]
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 86 bytes (688 bits)
    Capture Length: 86 bytes (688 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ipv6:icmpv6]
    [Coloring Rule Name: ICMP]
    [Coloring Rule String: icmp || icmpv6]
Ethernet II, Src: Sercomm_4:91:86 (4c:93:a6:84:91:86), Dst: ChongqingFug_b0:9b:13 (d4:1b:81:b0:9b:13)
Internet Protocol Version 6, Src: fe80::4e93:a6ff:fe84:9186, Dst: fe80::72c8:15fb:7e80:7d18
Internet Control Message Protocol v6
```

Absolute time when this frame was captured, in local time (frame.time)

Show packet bytes   Layout: Vertical (Stacked)

test 3.pcapng
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Close
Help
Ready to load
Profile: Default



```
No.      Time
1160… 489.68093
1160… 489.68108
1160… 489.69165
1160… 489.69199
1160… 490.49970
1160… 490.49970
1160… 490.49970
1160… 490.49987
1160… 490.50027
1160… 490.90671
1160… 490.90671
1160… 490.90701
1160… 490.92027
1160… 492.67061
1160… 492.67097
1160… 492.68238
1160… 493.67508
1160… 493.67516
1160… 493.67516
1160… 493.67520
1160… 493.68014
1160… 493.69040
1160… 494.79792
1160… 494.79796
1160… 494.90379
1160… 494.94768
```

Wireshark · Packet 1160821 · test 3.pcapng

```
Frame 1160821: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface \Device\NPF_{4E5DD02B-31AD-416
    Section number: 1
    Interface id: 0 (\Device\NPF_{4E5DD02B-31AD-416F-9E03-033C8A99CAE3})
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 14, 2025 12:28:46.638982000 India Standard Time
    UTC Arrival Time: Oct 14, 2025 06:58:46.638982000 UTC
    Epoch Arrival Time: 1760425126.638982000
    [Time shift for this packet: 0.000000000 seconds]
    [Time delta from previous captured frame: 0.043890000 seconds]
    [Time delta from previous displayed frame: 0.043890000 seconds]
    [Time since reference or first frame: 494.947684000 seconds]
    Frame Number: 1160821
    Frame Length: 74 bytes (592 bits)
    Capture Length: 74 bytes (592 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ipv6:tcp]
    [Coloring Rule Name: TCP]
    [Coloring Rule String: tcp]
Ethernet II, Src: ChongqingFug_b0:9b:13 (d4:1b:81:b0:9b:13), Dst: Sercomm_4:91:86 (4c:93:a6:84:91:86)
Internet Protocol Version 6, Src: 2405:201:5c04:ea1b:e9fd:83ee:f1ba:8e66, Dst: 2606:4700:9647:34d2:3064:dc1:823c:3ec
Transmission Control Protocol, Src Port: 61043, Dst Port: 443, Seq: 4001, Ack: 5385, Len: 0
```

No.: 1160821 · Time: 494.947684 · Source: 2405:201:5c04:ea1b:e9fd:83ee:f1ba:8e66 · Destinatio...:3ec · Protocol: TCP · Length: 74 · Info: 61043 → 443 [ACK] Seq=4001 Ack=5385 Win=64768 Len=0

Show packet bytes   Layout: Vertical (Stacked)

test 3.pcapng
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Close
Help
Ready to load
Profile: Default

Test #4

Test type: LARGE PACKET SIZE (High Throughput)

WIRESHARK RESULTS:

Metric	Value
Total Pakets Captured	786706
Capture Duration	6 mins 10 seconds
Packets Dropped	0

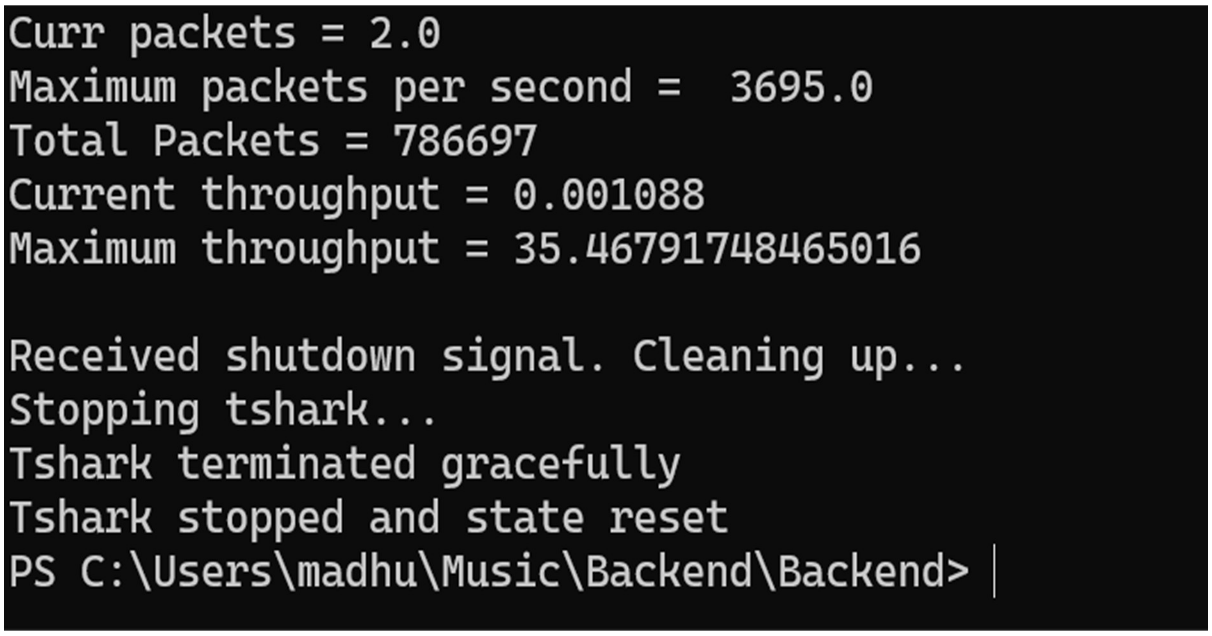
BACKEND RESULTS:

Metric	Value
Total Pakets Captured	786697
Capture Duration	6 mins 9 seconds
Maximum Packets captured per second	3695
Maximum Throughput	35.4 Mbps

COMPARISON:

Metric	Backend Value	Wireshark Value	Difference
Total Pakets Captured	786697	786706	9
Capture Duration	6 mins 10 seconds	6 mins 9 seconds	1 second

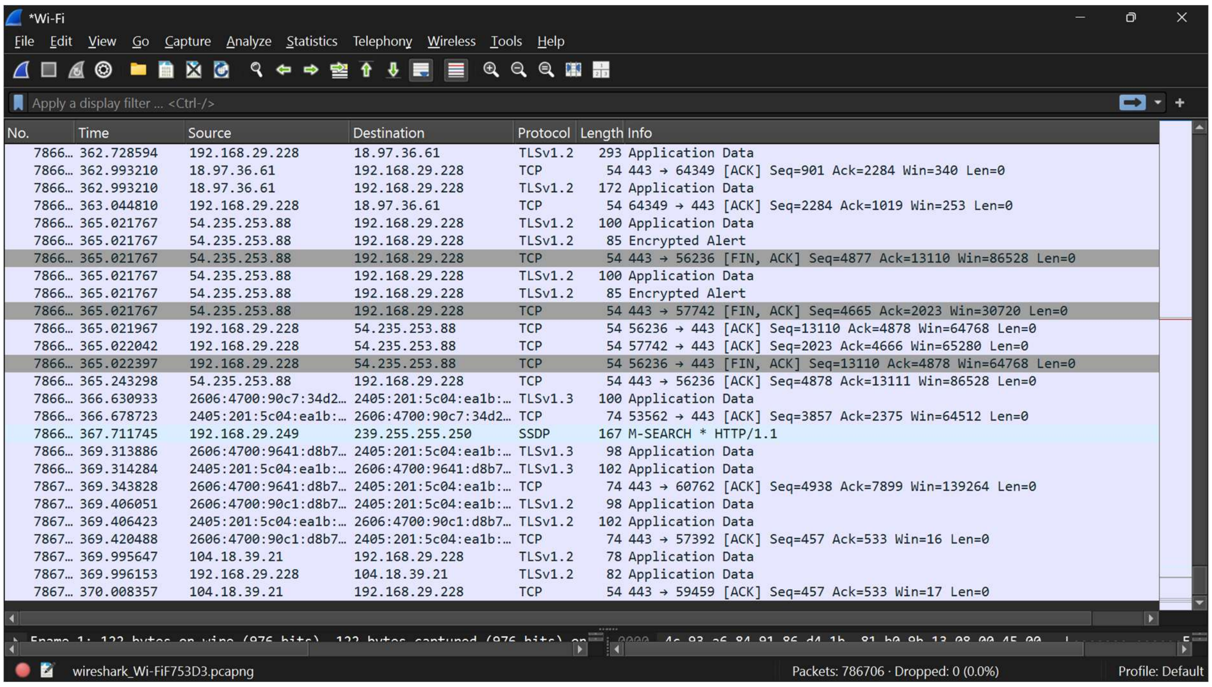
Backend Logs –



```
Curr packets = 2.0
Maximum packets per second =  3695.0
Total Packets = 786697
Current throughput = 0.001088
Maximum throughput = 35.46791748465016

Received shutdown signal. Cleaning up...
Stopping tshark...
Tshark terminated gracefully
Tshark stopped and state reset
PS C:\Users\madhu\Music\Backend\Backend>
```

Wireshark Status -

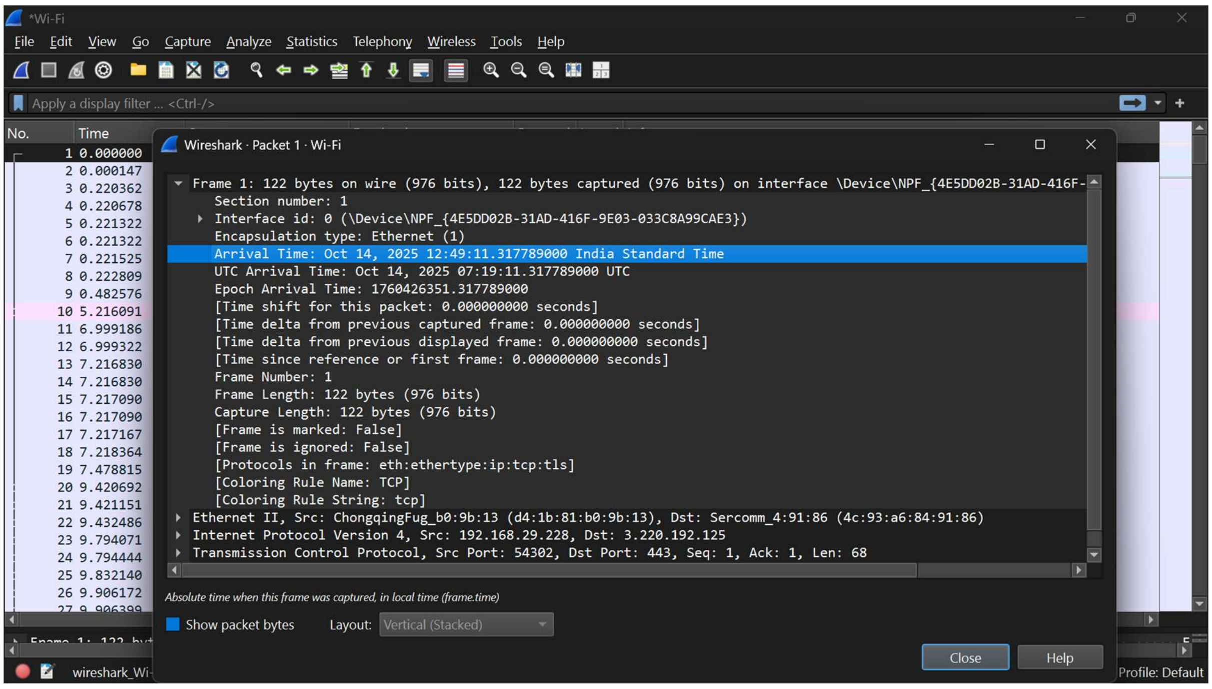


```
No.     Time         Source                  Destination             Protocol Length Info
7866… 362.728594  192.168.29.228          18.97.36.61             TLSv1.2   293 Application Data
7866… 362.993210  18.97.36.61             192.168.29.228          TCP        54 443 → 64349 [ACK] Seq=901 Ack=2284 Win=340 Len=0
7866… 362.993210  18.97.36.61             192.168.29.228          TLSv1.2   172 Application Data
7866… 363.044810  192.168.29.228          18.97.36.61             TCP        54 64349 → 443 [ACK] Seq=2284 Ack=1019 Win=253 Len=0
7866… 365.021767  54.235.253.88           192.168.29.228          TLSv1.2   100 Application Data
7866… 365.021767  54.235.253.88           192.168.29.228          TLSv1.2    85 Encrypted Alert
7866… 365.021767  54.235.253.88           192.168.29.228          TCP        54 443 → 56236 [FIN, ACK] Seq=4877 Ack=13110 Win=86528 Len=0
7866… 365.021767  54.235.253.88           192.168.29.228          TLSv1.2   100 Application Data
7866… 365.021767  54.235.253.88           192.168.29.228          TLSv1.2    85 Encrypted Alert
7866… 365.021767  54.235.253.88           192.168.29.228          TCP        54 443 → 57742 [FIN, ACK] Seq=4665 Ack=2023 Win=30720 Len=0
7866… 365.021967  192.168.29.228          54.235.253.88           TCP        54 56236 → 443 [ACK] Seq=13110 Ack=4878 Win=64768 Len=0
7866… 365.022042  192.168.29.228          54.235.253.88           TCP        54 57742 → 443 [ACK] Seq=2023 Ack=4666 Win=65280 Len=0
7866… 365.022397  192.168.29.228          54.235.253.88           TCP        54 56236 → 443 [FIN, ACK] Seq=13110 Ack=4878 Win=64768 Len=0
7866… 365.243298  54.235.253.88           192.168.29.228          TCP        54 443 → 56236 [ACK] Seq=4878 Ack=13111 Win=86528 Len=0
7866… 366.630933  2606:4700:90c7:34d2…    2405:201:5c04:ea1b:…    TLSv1.3   100 Application Data
7866… 366.678723  2405:201:5c04:ea1b:…    2606:4700:90c7:34d2…    TCP        74 53562 → 443 [ACK] Seq=3857 Ack=2375 Win=64512 Len=0
7866… 367.711745  192.168.29.249          239.255.255.250         SSDP      167 M-SEARCH * HTTP/1.1
7866… 369.313886  2606:4700:9641:d8b7…    2405:201:5c04:ea1b:…    TLSv1.3    98 Application Data
7866… 369.314284  2405:201:5c04:ea1b:…    2606:4700:9641:d8b7…    TLSv1.3   102 Application Data
7867… 369.343828  2606:4700:9641:d8b7…    2405:201:5c04:ea1b:…    TCP        74 443 → 60762 [ACK] Seq=4938 Ack=7899 Win=139264 Len=0
7867… 369.406051  2606:4700:90c1:d8b7…    2405:201:5c04:ea1b:…    TLSv1.2    98 Application Data
7867… 369.406423  2405:201:5c04:ea1b:…    2606:4700:90c1:d8b7…    TLSv1.2   102 Application Data
7867… 369.420488  2606:4700:90c1:d8b7…    2405:201:5c04:ea1b:…    TCP        74 443 → 57392 [ACK] Seq=457 Ack=533 Win=16 Len=0
7867… 369.995647  104.18.39.21            192.168.29.228          TLSv1.2    78 Application Data
7867… 369.996153  192.168.29.228          104.18.39.21            TLSv1.2    82 Application Data
7867… 370.008357  104.18.39.21            192.168.29.228          TCP        54 443 → 59459 [ACK] Seq=457 Ack=533 Win=17 Len=0

wireshark_Wi-FiF753D3.pcapng          Packets: 786706 · Dropped: 0 (0.0%)          Profile: Default
```

*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>

Wireshark(First and Last Packet) –



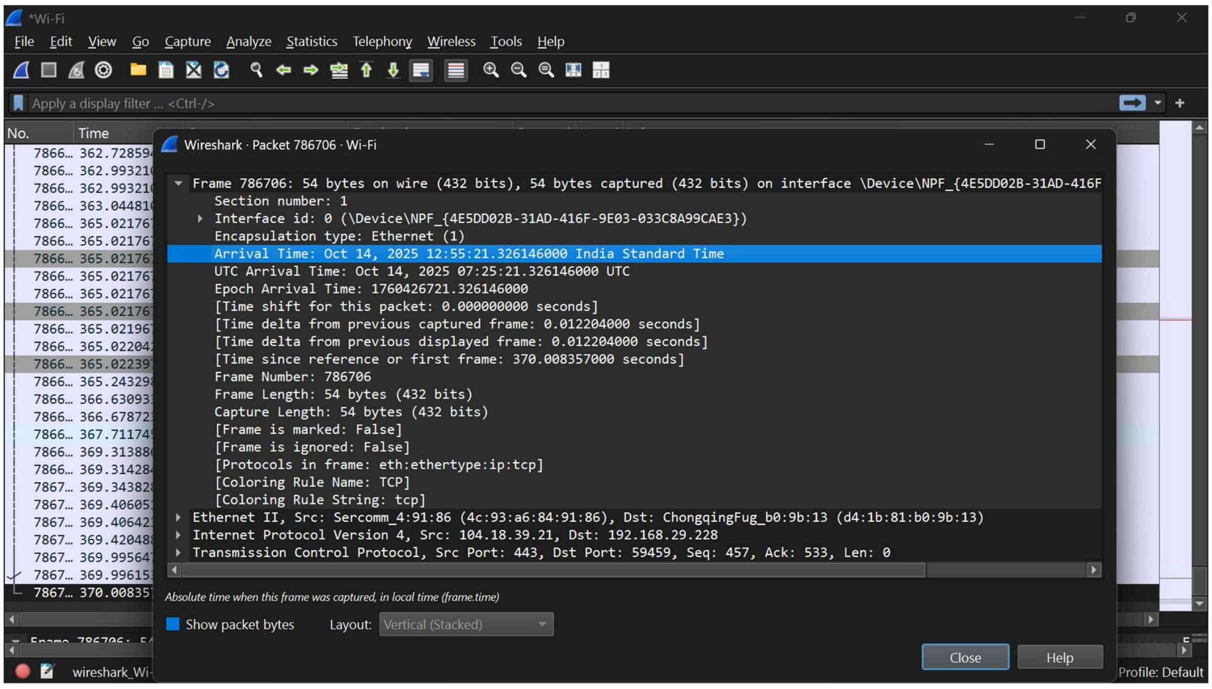
```
No.  Time
  1 0.000000
  2 0.000147
  3 0.220362
  4 0.220678
  5 0.221322
  6 0.221322
  7 0.221525
  8 0.222809
  9 0.482576
 10 5.216091
 11 6.999186
 12 6.999322
 13 7.216830
 14 7.216830
 15 7.217090
 16 7.217090
 17 7.217167
 18 7.218364
 19 7.478815
 20 9.420692
 21 9.421151
 22 9.432486
 23 9.794071
 24 9.794444
 25 9.832140
 26 9.906172
```

```
Wireshark · Packet 1 · Wi-Fi

Frame 1: 122 bytes on wire (976 bits), 122 bytes captured (976 bits) on interface \Device\NPF_{4E5DD02B-31AD-416F-
    Section number: 1
  Interface id: 0 (\Device\NPF_{4E5DD02B-31AD-416F-9E03-033C8A99CAE3})
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 14, 2025 12:49:11.317789000 India Standard Time
    UTC Arrival Time: Oct 14, 2025 07:19:11.317789000 UTC
    Epoch Arrival Time: 1760426351.317789000
    [Time shift for this packet: 0.000000000 seconds]
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 122 bytes (976 bits)
    Capture Length: 122 bytes (976 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:tcp:tls]
    [Coloring Rule Name: TCP]
    [Coloring Rule String: tcp]
Ethernet II, Src: ChongqingFug_b0:9b:13 (d4:1b:81:b0:9b:13), Dst: Sercomm_4:91:86 (4c:93:a6:84:91:86)
Internet Protocol Version 4, Src: 192.168.29.228, Dst: 3.220.192.125
Transmission Control Protocol, Src Port: 54302, Dst Port: 443, Seq: 1, Ack: 1, Len: 68

Absolute time when this frame was captured, in local time (frame.time)
Show packet bytes    Layout: Vertical (Stacked)
```

*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Close
Help
Profile: Default


*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Wireshark · Packet 786706 · Wi-Fi
Show packet bytes
Close
Help
wireshark_Wi-
Profile: Default

```
No.      Time
7866…  362.72859
7866…  362.99321
7866…  362.99321
7866…  363.04481
7866…  365.02176
7866…  365.02176
7866…  365.02176
7866…  365.02176
7866…  365.02176
7866…  365.02176
7866…  365.02196
7866…  365.02204
7866…  365.02239
7866…  365.24329
7866…  366.63093
7866…  366.67872
7866…  367.71174
7866…  369.31388
7866…  369.31428
7867…  369.34382
7867…  369.40605
7867…  369.40642
7867…  369.42048
7867…  369.99564
7867…  369.99615
7867…  370.00835
```

```
▾ Frame 786706: 54 bytes on wire (432 bits), 54 bytes captured (432 bits) on interface \Device\NPF_{4E5DD02B-31AD-416F
    Section number: 1
  ▸ Interface id: 0 (\Device\NPF_{4E5DD02B-31AD-416F-9E03-033C8A99CAE3})
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 14, 2025 12:55:21.326146000 India Standard Time
    UTC Arrival Time: Oct 14, 2025 07:25:21.326146000 UTC
    Epoch Arrival Time: 1760426721.326146000
    [Time shift for this packet: 0.000000000 seconds]
    [Time delta from previous captured frame: 0.012204000 seconds]
    [Time delta from previous displayed frame: 0.012204000 seconds]
    [Time since reference or first frame: 370.008357000 seconds]
    Frame Number: 786706
    Frame Length: 54 bytes (432 bits)
    Capture Length: 54 bytes (432 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:tcp]
    [Coloring Rule Name: TCP]
    [Coloring Rule String: tcp]
▸ Ethernet II, Src: Sercomm_4:91:86 (4c:93:a6:84:91:86), Dst: ChongqingFug_b0:9b:13 (d4:1b:81:b0:9b:13)
▸ Internet Protocol Version 4, Src: 104.18.39.21, Dst: 192.168.29.228
▸ Transmission Control Protocol, Src Port: 443, Dst Port: 59459, Seq: 457, Ack: 533, Len: 0
```

Absolute time when this frame was captured, in local time (frame.time)

Layout: Vertical (Stacked)

6. ANALYSIS METHODOLOGY

Packet Drop Detection:

- Compare total packet counts (Backend vs Wireshark)
- Check tshark statistics for kernel drops
- Review timing inconsistencies in capture

7. SUMMARY

Test Type	Max Packets/sec	Max Throughput	Total Packets Difference	Drop Detected
High Packet Rate (Test #1)	13,633	–	0.045%	Yes
High Packet Rate (Test #3)	14,877	–	0.003%	Yes
Large Packet Size (Test #2)	4,098	37.14 Mbps	0.25%	No
Large Packet Size (Test #4)	3,695	35.4 Mbps	0.001%	No

8. REPORTING RESULTS

1. Test Type : High Packet Rate

- Project is able to efficiently parse and calculate metrics values for all the packets that are being captured during that time. The difference in packets captured in wireshark and backend is insignificant.
- Wireshark drops some packet in case of High Packet rate.

2. Test Type : Large Packet Size

- Project is able to efficiently parse and calculate metrics values for all the packets that are being captured during that time. The difference in packets captured in wireshark and backend is insignificant.
- No packet drops noticed.