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KELAS : MI 3A  
MATKUL : PRAKTIKUM JARINGAN KOMPUTER

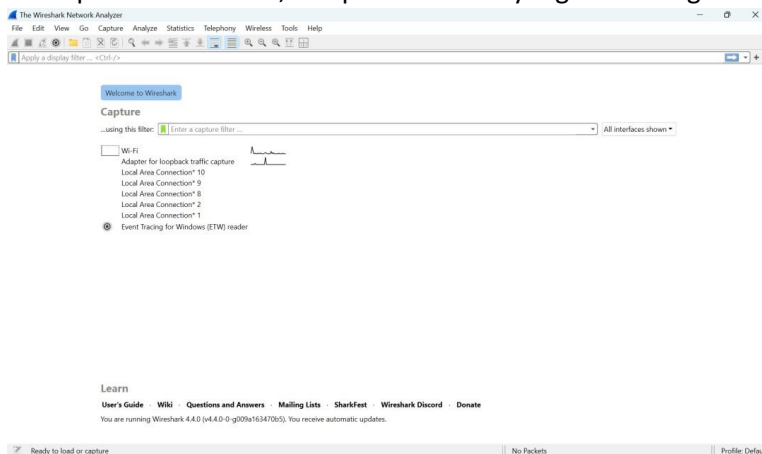
## Tugas Praktikum JARKOM MI3A

Analisa Quality of Service (QoS) Preparation:

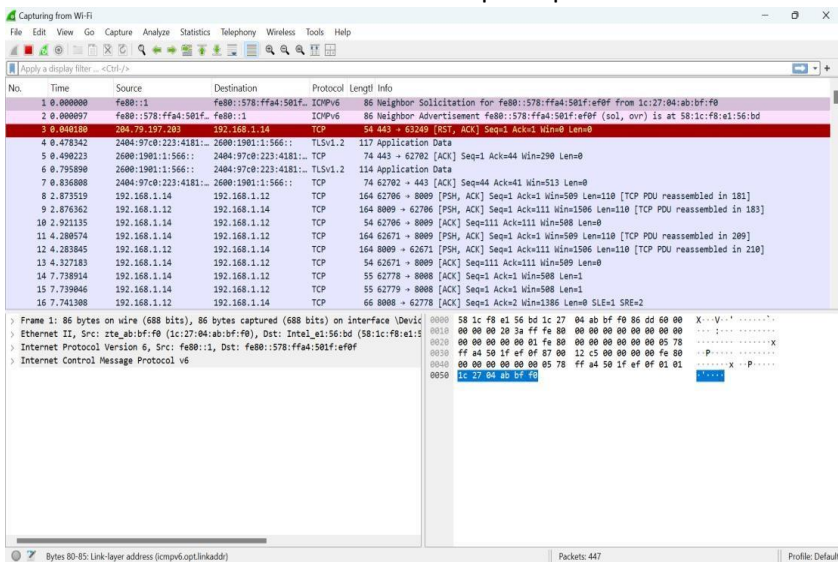
- Buat akun Github
- Download aplikasi Wireshark di Laptop
- Koneksi Internet

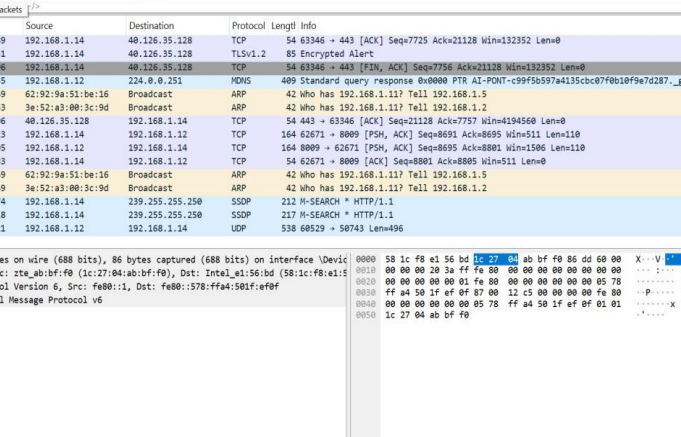
Task:

1. Pastikan Komputer/Laptop sudah terhubung ke internet.
2. Buka aplikasi Wireshark, lalu pilih interface yang terhubung ke internet.



3. Jalankan Wireshark untuk melakukan capture packet.



- 
- File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
- Stop capturing packets
- | No.   | Time       | Source            | Destination     | Protocol | Length | Info                                                                                         |
|-------|------------|-------------------|-----------------|----------|--------|----------------------------------------------------------------------------------------------|
| 51674 | 395.659489 | 192.168.1.14      | 40.126.35.128   | TCP      | 54     | 63346 → 443 [ACK] Seq=7725 Ack=21128 Win=132352 Len=0                                        |
| 51675 | 395.660051 | 192.168.1.14      | 40.126.35.128   | TLSv1.2  | 85     | Encrypted Alert                                                                              |
| 51676 | 395.660186 | 192.168.1.14      | 40.126.35.128   | TCP      | 54     | 63346 → 443 [FIN, ACK] Seq=7756 Ack=21128 Win=132352 Len=0                                   |
| 51677 | 395.676535 | 192.168.1.12      | 224.0.0.251     | HQMS     | 409    | Standard query response 0x0000 PTR AI-PON? c99f565974d135cb070010f9f4287f_googlecast_tcp.io. |
| 51678 | 395.676849 | 62.92.94.51:be:16 | Broadcast       | ARP      | 42     | Who has 192.168.1.11? Tell 192.168.1.5                                                       |
| 51679 | 395.676963 | 3e:52:a3:00:3c:9d | Broadcast       | ARP      | 42     | Who has 192.168.1.11? Tell 192.168.1.2                                                       |
| 51680 | 395.683286 | 40.126.35.128     | 192.168.1.14    | TCP      | 54     | 443 → 63346 [ACK] Seq=21128 Ack=7757 Win=4194560 Len=0                                       |
| 51681 | 395.889823 | 192.168.1.14      | 192.168.1.12    | TCP      | 164    | 62671 → 8009 [PSH, ACK] Seq=8691 Ack=8695 Win=511 Len=110                                    |
| 51682 | 395.894205 | 192.168.1.12      | 192.168.1.14    | TCP      | 164    | 8009 → 62671 [PSH, ACK] Seq=8695 Ack=8801 Win=1506 Len=110                                   |
| 51683 | 395.930803 | 192.168.1.14      | 192.168.1.12    | TCP      | 54     | 62671 → 8009 [ACK] Seq=8861 Ack=8805 Win=511 Len=0                                           |
| 51684 | 396.394360 | 62.92.94.51:be:16 | Broadcast       | ARP      | 42     | Who has 192.168.1.11? Tell 192.168.1.5                                                       |
| 51685 | 396.496549 | 3e:52:a3:00:3c:9d | Broadcast       | ARP      | 42     | Who has 192.168.1.11? Tell 192.168.1.2                                                       |
| 51686 | 396.589574 | 192.168.1.14      | 239.255.255.250 | SSDP     | 212    | M-SEARCH * HTTP/1.1                                                                          |
| 51687 | 396.600518 | 192.168.1.14      | 239.255.255.250 | SSDP     | 212    | M-SEARCH * HTTP/1.1                                                                          |
| 51688 | 396.701821 | 192.168.1.12      | 192.168.1.14    | UDP      | 538    | 60529 → 50743 Len=496                                                                        |
- Frame 1: 86 bytes on wire (688 bits), 86 bytes captured (688 bits) on interface \Device\NPF{...}
- Ethernet II, Src: zte\_ab:bf:f0 (1c:27:04:ab:bf:f0), Dst: Intel\_i56:bd (58:1c:f8:e1:56:bd)
- Internet Protocol Version 6, Src: fe80::1, Dst: fe80::578:f4a:501f:efbf
- Internet Control Message Protocol v6
- 0000 58 1c f8 e1 56 bd 1c 27 04 ab bf f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 X: V: ...
- 0010 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 X: V: ...
- 0020 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 X: V: ...
- 0030 ff a4 50 1f ef ef 07 00 12 c5 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 X: V: ...
- 0040 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 X: V: ...
- 0050 1c 27 04 ab bf f0
- Wi-Fi: <live capture in progress>
- Packets: 51688
- Profile: Default

- [illegible]

7. Perhatikan bagian Statistics pada halaman Capture File Properties. Pada halaman ini kita dapat melakukan perhitungan Throughput, Packet Loss, Delay, dan Jitter.

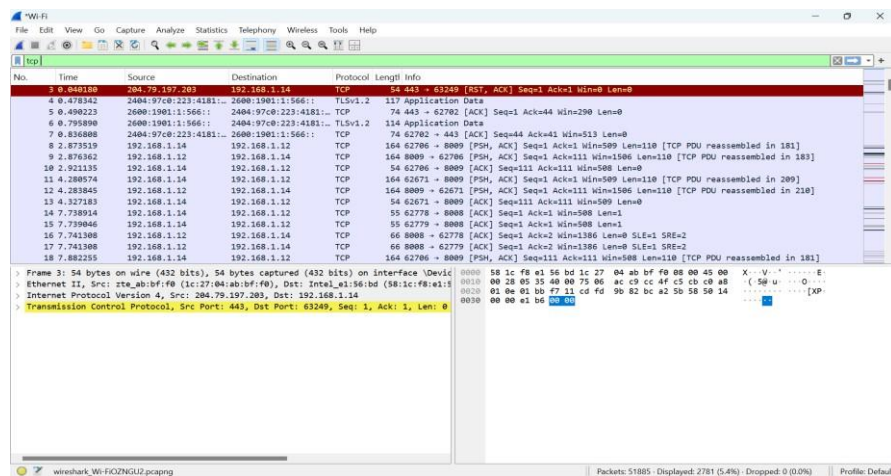
Measurement	Captured	Displayed
Packets	51885	51885 (100.0%)
Time span, s	415.045	415.045
Average pps	125.0	125.0
Average packet size, B	877	877
Bytes	45496613	45496613 (100.0%)
Average bytes/s	109 k	109 k
Average bits/s	876 k	876 k

8. Hitunglah berapa Throughput, Packet Loss, Delay, dan Jitter yang didapatkan dari Statistics Wireshark yang kalian jalankan di Komputer/Laptop masing-masing. Isi lah tabel berikut:

PENGUKURAN	NILAI	KATEGORI
Throughput	109,618506427 / 876 Mbps	Baik
Packet Loss	0 %	Sangat Baik
Delay	0.000178349 / 3.4374E-09	Sangat Baik
Jitter	0.00033704 / 6.4959E-09	Sangat Baik

Jawaban :

- Throughput



#### Statistics

Measurement	Captured	Displayed
Packets	51885	2781 (5.4%)
Time span, s	415.045	415.004
Average pps	125.0	6.7
Average packet size, B	877	386
Bytes	45496613	1074484 (2.4%)
Average bytes/s	109 k	2589
Average bits/s	876 k	20 k

## Cara Menghitung Throughput:

Throughput =  $\frac{\text{Jumlah data yang dikirim}}{\text{Waktu Pengiriman Data}}$

$$= \frac{\text{Bytes}}{\text{Time span, s}}$$

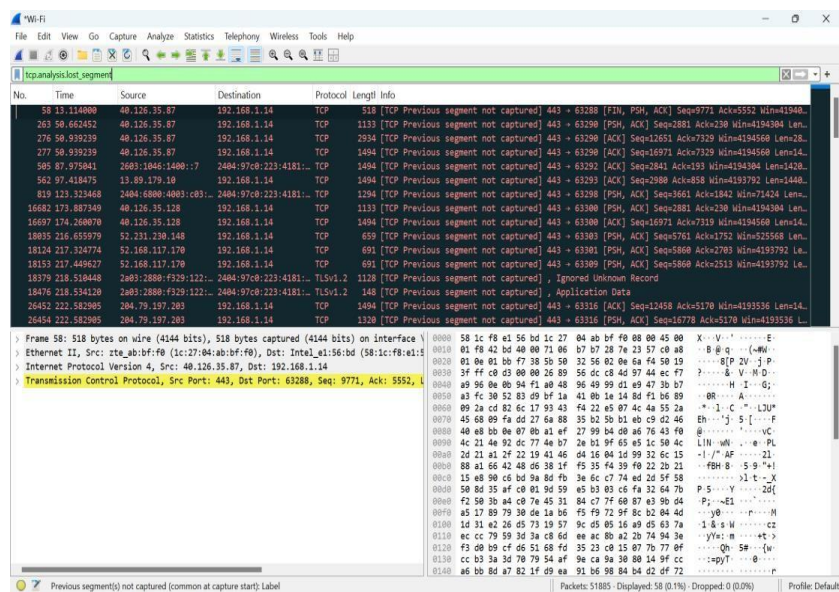
$$= \frac{45496613}{415.045}$$

$$= 109,618506427 = 876 \text{ Mbps}$$

Karna hasil akhir dari perhitungan belum berbentuk bytes, maka akan diubah dalam satuan bytes. 1 byte = 8bit.

Jadi,  $109,618506427 \times 8 = 876,948051416$  atau 876 kbps.

## - Packet Loss



### Statistics

Measurement	Captured	Displayed
Packets	51885	2781 (5.4%)
Time span, s	415.045	415.004
Average pps	125.0	6.7
Average packet size, B	877	386
Bytes	45496613	1074484 (2.4%)
Average bytes/s	109 k	2589
Average bits/s	876 k	20 k

## Cara Menghitung Packet Loss :

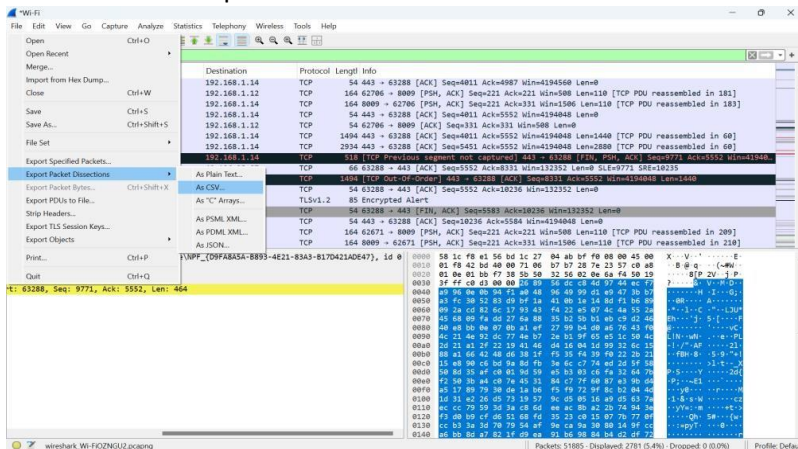
Packet Loss :

$$= \left( \frac{51885 - 51885}{51885} \right) \times 100\%$$

$$= 0\%$$

## - Delay dan Jitter

- Lakukan Export Packet Dissections dan Save As CSV.



- Setelah disimpan maka data akan otomatis tersimpan seperti gambar di bawah ini.

The screenshot shows a Microsoft Excel spreadsheet with the following columns: No., Time, Source, Destination, Protocol, Length, and Info. The data is organized into rows, with each row representing a packet capture event. The 'Info' column contains detailed information about each packet, including sequence numbers, window sizes, and reassembly status.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.04018	204.79.19	192.168.1	TCP	54	443 > 63249 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
2	0.478342	2404.97.0	2600.1901	TLSv1.2	117	Application Data
3	0.490223	2600.1901	2404.97.0	TCP	74	443 > 62702 [ACK] Seq=1 Ack=44 Win=290 Len=0
4	0.79589	2600.1901	2404.97.0	TLSv1.2	114	Application Data
5	0.836808	2404.97.0	2600.1901	TCP	74	62702 > 443 [ACK] Seq=44 Ack=41 Win=513 Len=0
6	2.873519	192.168.1	192.168.1	TCP	164	62706 > 8009 [PSH, ACK] Seq=1 Ack=1 Win=509 Len=110 [TCP PDU reassembled in 181]
7	2.876362	192.168.1	192.168.1	TCP	164	8009 > 62706 [PSH, ACK] Seq=1 Ack=111 Win=1506 Len=110 [TCP PDU reassembled in 183]
8	2.921135	192.168.1	192.168.1	TCP	54	62706 > 8009 [ACK] Seq=111 Ack=111 Win=508 Len=0
9	4.280574	192.168.1	192.168.1	TCP	164	62671 > 8009 [PSH, ACK] Seq=1 Ack=1 Win=509 Len=110 [TCP PDU reassembled in 209]
10	4.283845	192.168.1	192.168.1	TCP	164	8009 > 62671 [PSH, ACK] Seq=1 Ack=111 Win=1506 Len=110 [TCP PDU reassembled in 210]
11	4.327780	192.168.1	192.168.1	TCP	54	62671 > 8009 [ACK] Seq=111 Ack=111 Win=509 Len=0
12	7.738914	192.168.1	192.168.1	TCP	55	62778 > 8008 [ACK] Seq=1 Ack=1 Win=508 Len=1
13	15.739046	192.168.1	192.168.1	TCP	55	62779 > 8008 [ACK] Seq=1 Ack=1 Win=508 Len=1
14	16.741308	192.168.1	192.168.1	TCP	66	8008 > 62778 [ACK] Seq=1 Ack=2 Win=1386 Len=0 SLE=1 SRE=2
15	17.741308	192.168.1	192.168.1	TCP	66	8008 > 62779 [ACK] Seq=1 Ack=2 Win=1386 Len=0 SLE=1 SRE=2
16	17.882255	192.168.1	192.168.1	TCP	164	62706 > 8009 [PSH, ACK] Seq=111 Ack=111 Win=508 Len=110 [TCP PDU reassembled in 181]
17	17.894295	192.168.1	192.168.1	TCP	164	8009 > 62706 [PSH, ACK] Seq=111 Ack=221 Win=1506 Len=110 [TCP PDU reassembled in 183]
18	7.94514	192.168.1	192.168.1	TCP	54	62706 > 8009 [ACK] Seq=221 Ack=221 Win=508 Len=0
19	9.287309	192.168.1	192.168.1	TCP	164	62671 > 8009 [PSH, ACK] Seq=111 Ack=111 Win=509 Len=110 [TCP PDU reassembled in 209]
20	9.293841	192.168.1	192.168.1	TCP	164	8009 > 62671 [PSH, ACK] Seq=111 Ack=221 Win=1506 Len=110 [TCP PDU reassembled in 210]
21	9.348809	192.168.1	192.168.1	TCP	54	62671 > 8009 [ACK] Seq=221 Ack=221 Win=508 Len=0
22	11.40495	2404.97.0	2600.4700	TCP	75	63217 > 443 [ACK] Seq=1 Ack=1 Win=515 Len=1
23	11.42343	2606.4700	2404.97.0	TCP	86	443 > 63217 [ACK] Seq=1 Ack=2 Win=8 Len=0 SLE=1 SRE=2



- Selanjutnya kita bisa melakukan perhitungan seperti gambar di bawah ini.

A	B	C	D	E
time 1	time 2	delay 1	delay 2	jitter
0.04018	0.478342	0.438162	0.011881	0.426281
0.478342	0.490223	0.011881	0.305667	0.293786
0.490223	0.79589	0.305667	0.040918	0.264749
0.79589	0.836808	0.040918	2.036711	1.995793
0.836808	2.873519	2.036711	0.002843	2.033868
2.873519	2.876362	0.002843	0.044773	0.04193
2.876362	2.921135	0.044773	1.359439	1.314666
2.921135	4.280574	1.359439	0.003271	1.356168
4.280574	4.283845	0.003271	0.043338	0.040067
4.283845	4.327183	0.043338	3.411731	3.368393
4.327183	7.738914	3.411731	0.000132	3.411599
7.738914	7.739046	0.000132	0.002262	0.00213
7.739046	7.741308	0.002262	0	0.002262
7.741308	7.741308	0	0.140947	0.140947
7.741308	7.882255	0.140947	0.01204	0.128907
7.882255	7.894295	0.01204	0.050845	0.038805
7.894295	7.94514	0.050845	1.342169	1.291324
7.94514	9.287309	1.342169	0.006532	1.335637
9.287309	9.293841	0.006532		
	TOTAL DALEY	9.253661		
	RATA - RATA DALEY	0.000178349		
	SATUAN DALAM DETIK	3.4374E-09		
	TOTAL JITTER	17.487312		
	RATA - RATA JITTER	0.00033704		
	SATUAN DALAM DETIK	6.4959E-09		

#### Statistics

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Packets	51885	2781 (5.4%)
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Average pps	125.0	6.7
Average packet size, B	877	386
Bytes	45496613	1074484 (2.4%)
Average bytes/s	109 k	2589
Average bits/s	876 k	20 k

Cara Menghitung Daley :

$$\begin{aligned}
 \text{Rata - Rata Daley} &= \frac{\text{Total Daley}}{\text{Total Paket Yang Di Terima}} \\
 &= \frac{9.253661}{51885} \\
 &= 0.000178349 = 3.4374\text{E-}09
 \end{aligned}$$

Cara Menghitung Jitter :

$$\begin{aligned}
 \text{Rata - Rata Daley} &= \frac{\text{Total Jitter}}{\text{Total Paket Yang Di Terima}} \\
 &= \frac{17.487312}{51885} \\
 &= 0.00033704 = 6.4959\text{E-}09
 \end{aligned}$$

9. Setelah mendapatkan hasil perhitungan Throughput, Packet Loss, Delay, dan Jitter. Selanjutnya isilah tabel indeks yang didapatkan dari pengukuran Quality of Service (QoS):

PENGUKURAN	KETERANGAN	
	INDEKS	KATEGORI
Throughput	87,6% indeks 5	Sangat baik
Packet Loss	0% indeks 5	Sangat baik
Delay	0.000178349 detik, 178 mikrodetik 0.178 ms indeks 5	Sangat baik
Jitter	0.00033704 detik, 337 mikrodetik 0.337 ms indeks 5	Sangat baik
RATA-RATA INDEKS	Indeks 5	Sangat Baik

10. Untuk mengisi tabel nomor 8 dan nomor 9, silahkan kalian cari di Youtube, Google, dan sebagainya.

### Assesment:

Silahkan kalian tuliskan di Github:

1. Apa kegiatan yang dilakukan dan berapa lama kalian melakukan capturing packet. Jawaban : Kegiatan yang dilakukan meliputi streaming video dari aplikasi YouTube untuk mempelajari cara download Wireshark di Laptop, mencari materi yang akurat melalu AI ChatGPT, upload file Excel, dan aktivitas internet lainnya. Durasi kegiatan ini dilakukan selama  $\pm 4$  jam menggunakan aplikasi Wireshark untuk capturing packet dan membuat laporan.
2. Buatlah tabel hasil pengukuran dari Throughput, Packet Loss, Delay, dan Jitter. Jawaban :

PENGUKURAN	NILAI	KATEGORI
Throughput	876 kbps	Baik
Packet Loss	0 %	Sangat Baik
Delay	0.000178349 detik	Sangat Baik
Jitter	0.00033704 detik	Sangat Baik

3. Tulislah hasil perhitungan dengan rumus dari Throughput, Packet Loss, Delay, dan Jitter. Jawaban :

- Throughput:

$$\text{Throughput} = \frac{\text{Jumlah data yang dikirim (Bytes)}}{\text{Waktu Pengiriman Data (s)}} = \frac{109618506427}{415.045} = 876 \text{ kbps}$$

- Packet Loss:

$$\text{Packet Loss} = \frac{\text{Data yang Dikirim} - \text{Data yang Diterima}}{\text{Data yang Dikirim}} \times 100\% = \frac{51885 - 51885}{51885} \times 100\% = 0\%$$

- Delay:

$$\text{Rata-Rata Delay} = \frac{\text{Total Delay}}{\text{Total Paket Diterima}} = \frac{9.253661}{51885} = 0.000178349 \text{ detik (178 } \mu s)$$

- Jitter:

$$\text{Rata-Rata Jitter} = \frac{\text{Total Jitter}}{\text{Total Paket Diterima}} = \frac{17.487312}{51885} = 0.00033704 \text{ detik (337 } \mu s)$$



4. Buatlah tabel indeks yang didapatkan dari pengukuran Quality of Service (QoS).

Jawaban :

PENGUKURAN	KETERANGAN	INDEKS	KATEGORI
Throughput	876 kbps	5	Sangat Baik
Packet Loss	0%	5	Sangat Baik
Delay	0.000178349 detik (0.178 ms)	5	Sangat Baik
Jitter	<b>0.00033704 detik (0.337 ms)</b>	<b>5</b>	<b>Sangat Baik</b>

5. Buatlah Kesimpulan.

Jawaban : Dengan durasi capturing packet selama  $\pm 4$  jam yang saya lakukan dari mulai kegiatan yang melibatkan streaming video, pencarian materi dan pengunggahan file mencerminkan penggunaan jaringan yang cukup intensif. Analisis hasil capturing packet seperti throughput, packet loss, delay, dan jitter harus memberikan gambaran yang lebih mendetail tentang kualitas jaringan selama aktivitas ini. Berdasarkan hasil pengukuran, nilai-nilai QoS seperti throughput yang tinggi, packet loss minimal, delay, dan jitter yang rendah mengindikasikan kualitas jaringan yang sangat baik dan optimal, mendukung kelancaran aktivitas-aktivitas tersebut tanpa gangguan signifikan.

6. Sumber/referensi/daftar pustaka.

Jawaban :

Belajar download Wireshark

<https://youtu.be/IMdg9z8zHFA?si=SEdMzSJwCRwP6vzD> Panduan

Penggunaan Wireshark Basic

<https://youtu.be/2YgrhMUrLRc?si=Ggvlpdi9lpoY7qmv> Implementasi

Fitur Filter pada Wireshark

<https://youtu.be/VSj1f7KH0QA?si=PPHUOWeMKXMiWxQ>

Menghitung Throughput, Packet Loss, Delay dan Jitter Menggunakan Wireshark

[https://youtu.be/RgPhJ0r7duk?si=I\\_J0slsuNziqE0Sm](https://youtu.be/RgPhJ0r7duk?si=I_J0slsuNziqE0Sm)

Cara Membuat Akun Github dan Upload File ke Github | Terbaru

[https://youtu.be/V8V2CBlarEU?si=ZmakBv\\_jK0tEqzwd](https://youtu.be/V8V2CBlarEU?si=ZmakBv_jK0tEqzwd)

7. Kumpulkan link Github pada ketua kelas (*pastikan link Github dapat diakses Public*).