LK 01: Lingkungan Praktik Mandiri + Ujicoba Messaging Protocols

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Sistem Terdistribusi B

A. Jalankan sudo apt update dan install wireshark dan extension vsc-webshark

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ sudo apt install
wireshark -y
```

B. Protokol REST

a. Jalankan docker compose untuk REST

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker compos
e -f compose/rest.yml up -d
[+] Running 3/3
 ✓ Network compose_default   Created                0.0s
 ✓ Container rest-server     Started                0.2s
 ✓ Container rest-client     Started                0.4s
```

b. Jalankan kode server (terminal kiri) dan client (terminal kanan)

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker
compose -f compose/rest.yml exec rest-server python
server.py
```

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ doc
ker compose -f compose/rest.yml exec rest-client
 python client.py --op both -a 2 -b 3
```

Server tidak bisa terlihat di terminal karena sudah di jalankan otomatis di kode

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdist
ribusi$ docker compose -f compose/res
t.yml exec rest-server python server.
py
 * Serving Flask app 'server'
 * Debug mode: on
Address already in use
Port 5151 is in use by another progra
m. Either identify and stop that prog
ram, or start the server with a diffe
rent port.
```

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdi
hadik@LAPTOP-PI1D4LCK:~/SistemTerdi
stribusi$ docker compose -f compose
/rest.yml exec rest-client python c
lient.py --op both -a 2 -b 3
add(2,3) = 5
mul(2,3) = 6
hadik@LAPTOP-PI1D4LCK:~/SistemTerdi
stribusi$
```

c. Cek dengan ip a

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet 10.255.255.254/32 brd 10.255.255.254 scope global lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:89:bc:8c brd ff:ff:ff:ff:ff:ff
    inet 172.20.61.239/20 brd 172.20.63.255 scope global eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::215:5dff:fe89:bc8c/64 scope link
       valid_lft forever preferred_lft forever
4: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default
    link/ether 02:2f:b9:82:62:29 brd ff:ff:ff:ff:ff:ff
    inet 172.17.0.1/16 brd 172.17.255.255 scope global docker0
       valid_lft forever preferred_lft forever
    inet6 fe80::2f:b9ff:fe82:6229/64 scope link
       valid_lft forever preferred_lft forever
18: br-46c07a265caf: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default
    link/ether be:a6:72:79:0d:fe brd ff:ff:ff:ff:ff:ff
    inet 172.18.0.1/16 brd 172.18.255.255 scope global br-46c07a265caf
       valid_lft forever preferred_lft forever
    inet6 fe80::bca6:72ff:fe79:dfe/64 scope link
       valid_lft forever preferred_lft forever
23: vetheebb67e@if2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue master br-46c07a265caf state UP group default
    link/ether be:2c:64:7a:29:77 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet6 fe80::bc2c:64ff:fe7a:2977/64 scope link
       valid_lft forever preferred_lft forever
24: veth9651078@if2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue master br-46c07a265caf state UP group default
    link/ether 8a:59:f2:32:d8:44 brd ff:ff:ff:ff:ff:ff link-netnsid 1
```

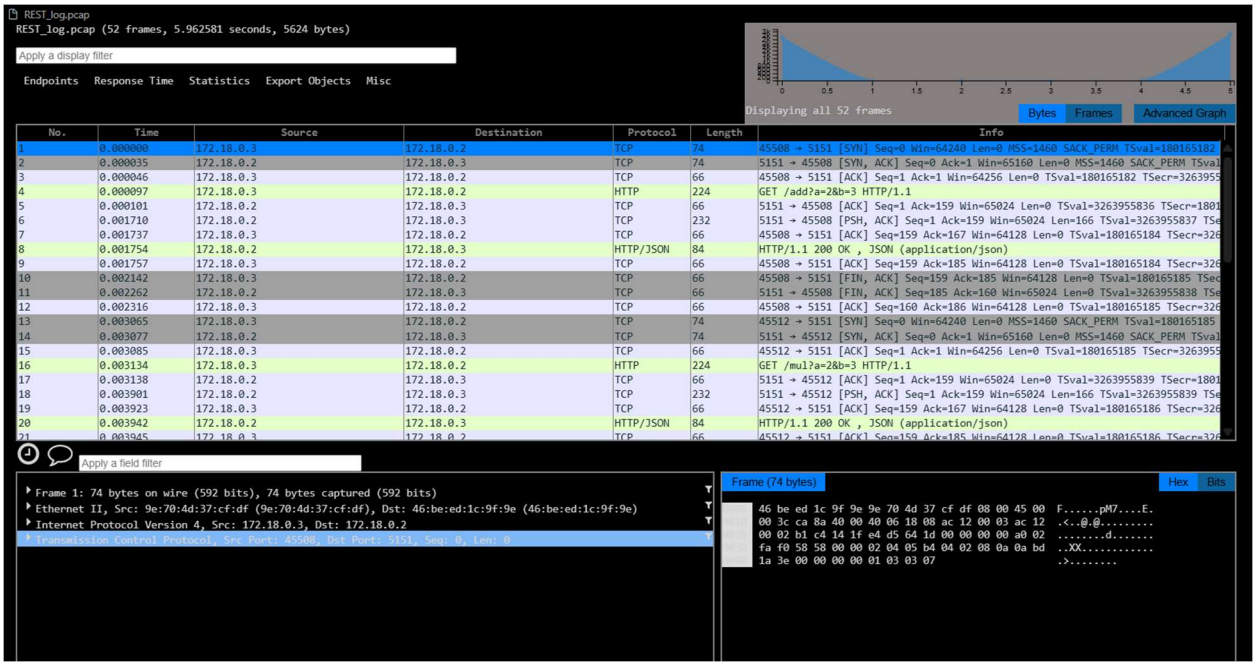
Ambil salah satu broadcast (pada percobaan ini pakai br-46c07a265caf)

```
18: br-46c07a265caf: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default
    link/ether be:a6:72:79:0d:fe brd ff:ff:ff:ff:ff:ff
    inet 172.18.0.1/16 brd 172.18.255.255 scope global br-46c07a265caf
       valid_lft forever preferred_lft forever
    inet6 fe80::bca6:72ff:fe79:dfe/64 scope link
       valid_lft forever preferred_lft forever
```

d. Jalankan sudo tcpdump -nvi br-46c07a265caf -w REST_log.pcap untuk membuat file log dari REST yang sudah dijalankan

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ sudo tcpdump -nvi br-46c07a265
caf -w REST_log.pcap
tcpdump: listening on br-46c07a265caf, link-type EN10MB (Ethernet), snapsho
t length 262144 bytes
^C52 packets captured
52 packets received by filter
0 packets dropped by kernel
```

e. Isi dari log yang sudah terbuat



- Terdapat HTTP GET requests dari service rest-client (ip 172.18.0.3) ke rest-server (ip 172.18.0.2) pada port 5151.
- Dua endpoint yang dipanggil sesuai server.py: /add dan /mul.
- Client membuat panggilan berulang (berdasarkan timestamp, terlihat panggilan setiap ~6 detik).
- Semua response adalah HTTP 200 OK dengan Content-Type: application/json dan body JSON yang berisi result:
  1. /add?a=2&b=3 → response body: {"result": 5}
  2. /mul?a=2&b=3 → response body: {"result": 6}

C. Protokol MTQQ

a. Jalankan docker compose untuk MTQQ

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker c
ompose -f compose/mqtt.yml up -d
[+] Running 5/5
 ✓ compose-mqtt-sub          Built      0.0s
 ✓ compose-mqtt-pub          Built      0.0s
 ✓ Container mqtt-broker     Started    0.3s
 ✓ Container mqtt-subscriber Started    0.4s
 ✓ Container mqtt-publisher  Started    0.4s
```

b. Jalankan kode subscriber (terminal kiri) dan publisher (terminal kanan)

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker compose -f compose/mqtt.yml exec mqtt-sub python sub.py
```

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker compose -f compose/mqtt.yml exec mqtt-pub python pub.py
```

Hasil dari menjalankan 2 kode di atas

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker compose -f compose/mqtt.yml exec mqtt-sub python sub.py
WARN[0000] /home/hadik/SistemTerdistribusi/compose/mqtt.yml: the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential confusion
Menghubungkan ke mqtt-broker...
Menunggu pesan... (Tekan Ctrl+C untuk keluar)
Berhasil terhubung ke broker MQTT mqtt-broker
Berlangganan topik: sister/temp
Received message: Suhu: 28°C (Topic: sister/temp)
Received message: Suhu: 28°C (Topic: sister/temp)
Received message: Suhu: 28°C (Topic: sister/temp)
Received message: Suhu: 28°C (Topic: sister/temp)
Received message: Suhu: 28°C (Topic: sister/temp)
Received message: Suhu: 28°C (Topic: sister/temp)
Received message: Suhu: 28°C (Topic: sister/temp)
Received message: Suhu: 28°C (Topic: sister/temp)
Received message: Suhu: 28°C (Topic: sister/temp)
Received message: Suhu: 28°C (Topic: sister/temp)
Received message: Suhu: 28°C (Topic: sister/temp)
```

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker compose -f compose/mqtt.yml exec mqtt-pub python pub.py
WARN[0000] /home/hadik/SistemTerdistribusi/compose/mqtt.yml: the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential confusion
Menghubungkan ke mqtt-broker...
Published: Suhu: 28°C
Published: Suhu: 28°C
Published: Suhu: 28°C
Published: Suhu: 28°C
Published: Suhu: 28°C
Published: Suhu: 28°C
Published: Suhu: 28°C
Published: Suhu: 28°C
Published: Suhu: 28°C
Published: Suhu: 28°C
```

c. Cek IP dengan ip a

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ ip a
```

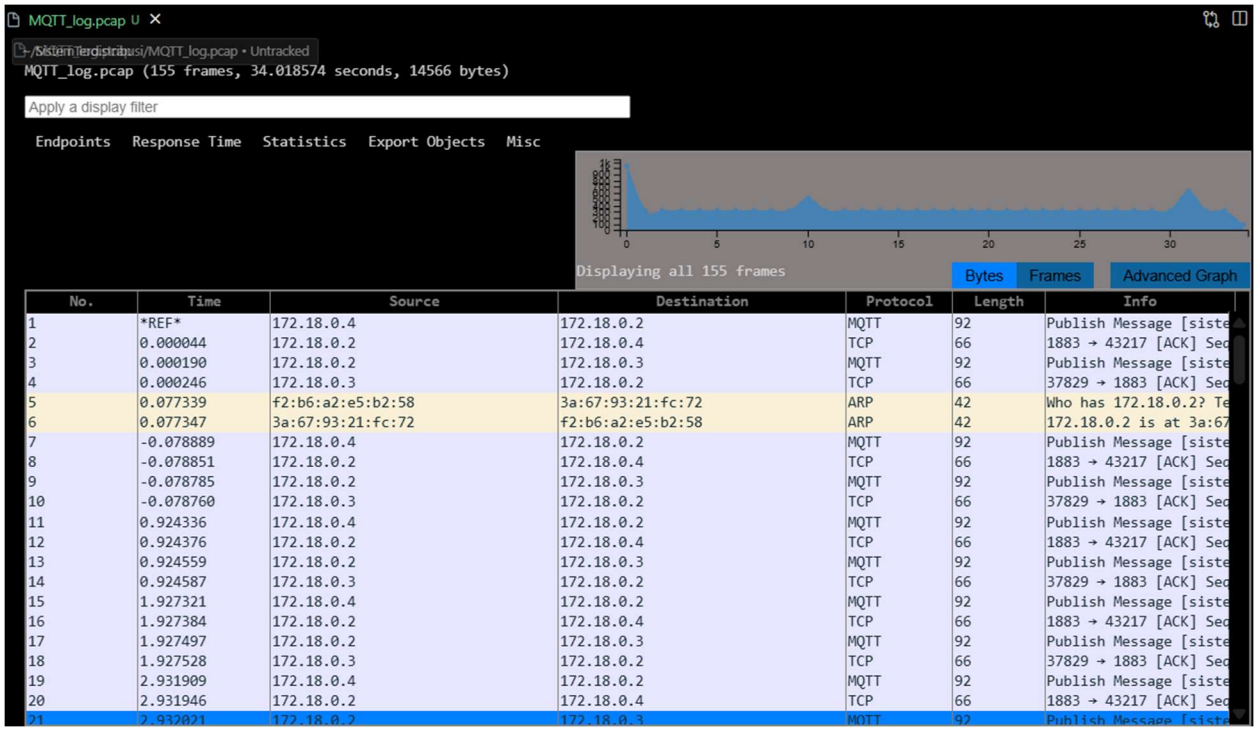
Ambil salah satu broadcast (pada percobaan ini pakai br-692c0e6ccd4c)

```
veth72ad3f8@if2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue master br-692c0e6ccd4c state UP group default
 link/ether 06:9a:69:61:d3:f1 brd ff:ff:ff:ff:ff:ff link-netnsid 2
 inet6 fe80::49a:69ff:fe61:d3f1/64 scope link
    valid_lft forever preferred_lft forever
```

d. Jalankan sudo tcpdump -nvi br-692c0e6ccd4c -w MQTT_log.pcap untuk membuat file log dari MQTT yang sudah dijalankan

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ sudo tcpdump -nvi br-692c0e6ccd4c -w MQTT_log.pcap
tcpdump: listening on br-692c0e6ccd4c, link-type EN10MB (Ethernet), snapshot length 262144 bytes
^C155 packets captured
159 packets received by filter
0 packets dropped by kernel
```

e. Isi dari log yang sudah terbuat



No.	Time	Source	Destination	Protocol	Length	Info
1	*REF*	172.18.0.4	172.18.0.2	MQTT	92	Publish Message [siste
2	0.000044	172.18.0.2	172.18.0.4	TCP	66	1883 → 43217 [ACK] Seq
3	0.000190	172.18.0.2	172.18.0.3	MQTT	92	Publish Message [siste
4	0.000246	172.18.0.3	172.18.0.2	TCP	66	37829 → 1883 [ACK] Seq
5	0.077339	f2:b6:a2:e5:b2:58	3a:67:93:21:fc:72	ARP	42	Who has 172.18.0.2? Te
6	0.077347	3a:67:93:21:fc:72	f2:b6:a2:e5:b2:58	ARP	42	172.18.0.2 is at 3a:67
7	-0.078889	172.18.0.4	172.18.0.2	MQTT	92	Publish Message [siste
8	-0.078851	172.18.0.2	172.18.0.4	TCP	66	1883 → 43217 [ACK] Seq
9	-0.078785	172.18.0.2	172.18.0.3	MQTT	92	Publish Message [siste
10	-0.078760	172.18.0.3	172.18.0.2	TCP	66	37829 → 1883 [ACK] Seq
11	0.924336	172.18.0.4	172.18.0.2	MQTT	92	Publish Message [siste
12	0.924376	172.18.0.2	172.18.0.4	TCP	66	1883 → 43217 [ACK] Seq
13	0.924559	172.18.0.2	172.18.0.3	MQTT	92	Publish Message [siste
14	0.924587	172.18.0.3	172.18.0.2	TCP	66	37829 → 1883 [ACK] Seq
15	1.927321	172.18.0.4	172.18.0.2	MQTT	92	Publish Message [siste
16	1.927384	172.18.0.2	172.18.0.4	TCP	66	1883 → 43217 [ACK] Seq
17	1.927497	172.18.0.2	172.18.0.3	MQTT	92	Publish Message [siste
18	1.927528	172.18.0.3	172.18.0.2	TCP	66	37829 → 1883 [ACK] Seq
19	2.931909	172.18.0.4	172.18.0.2	MQTT	92	Publish Message [siste
20	2.931946	172.18.0.2	172.18.0.4	TCP	66	1883 → 43217 [ACK] Seq
21	2.932021	172.18.0.2	172.18.0.3	MQTT	92	Publish Message [siste

Pcap menunjukkan publisher mengirim pesan setiap 1 detik ke topik sister/temp dengan payload "Suhu: 28°C" menggunakan QoS 0; broker meneruskan pesan ke subscriber.

D. UDP One-way

a. Jalankan docker compose untuk UDP One-way

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker compos
e -f compose/udp.yml up -d
[+] Running 5/5
 ✓ compose-udp-server      Built      0.0s
 ✓ compose-udp-client      Built      0.0s
 ✓ Network compose_default  Created   0.0s
 ✓ Container udp-server     Started   0.2s
 ✓ Container udp-client     Started   0.3s
```

b. Jalankan kode server (terminal kiri) dan client (terminal kanan)

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker
 compose -f compose/udp.yml exec udp-server python
serverUDP.py
```

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$
docker compose -f compose/udp.yml exec udp-cl
ient python clientUDP.py
```

Hasil dari menjalankan 2 kode di atas

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker compose -f compose/udp.yml exec udp-server python serverUDP.py
WARN[0000] /home/hadik/SistemTerdistribusi/compose/udp.yml: the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential confusion
UDP server up and listening on ('0.0.0.0', 12345)
Received message from ('172.18.0.3', 34125): Hello, UDP server2!
```

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ docker compose -f compose/udp.yml exec udp-client python clientUDP.py
WARN[0000] /home/hadik/SistemTerdistribusi/compose/udp.yml: the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential confusion
Received from server: Hello, ('172.18.0.3', 34125). You said: Hello, UDP server2!
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$
```

c. Cek IP dengan ip a

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ ip a
```

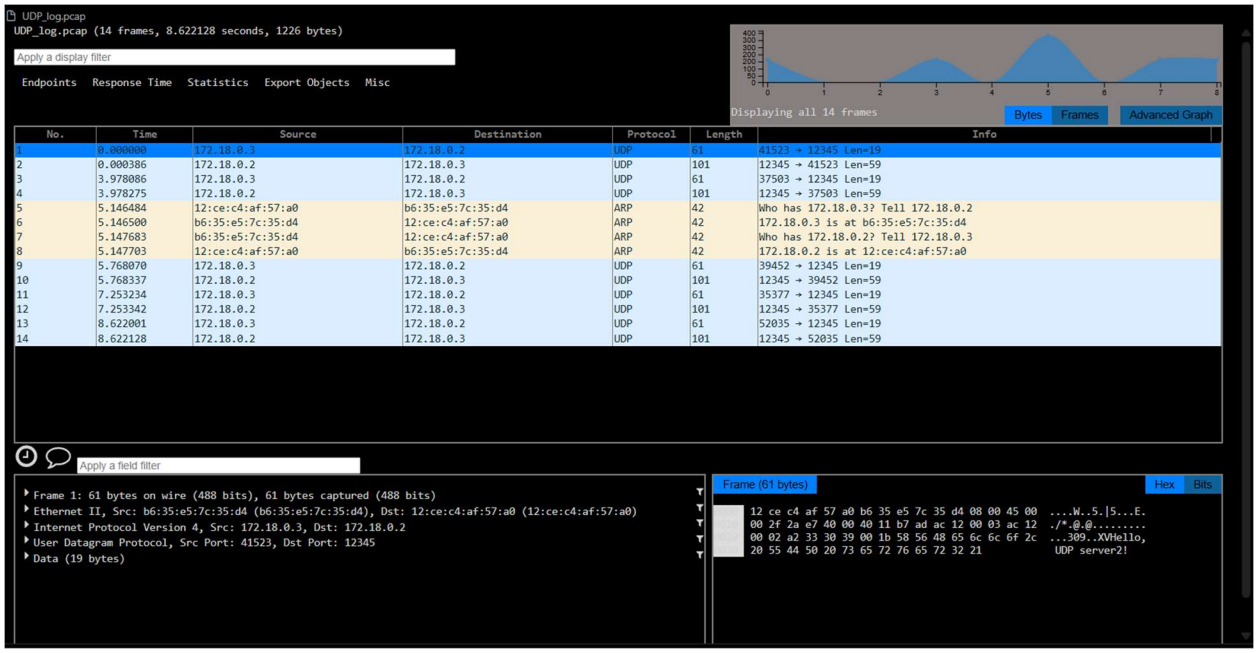
Ambil salah satu broadcast (pada percobaan ini pakai br-a654e3b46ed7)

```
28: veth430e537@if2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue master br-a654e3b46ed7 state UP group default
    link/ether 96:ca:57:66:26:45 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet6 fe80::94ca:57ff:fe66:2645/64 scope link
       valid_lft forever preferred_lft forever
```

d. Jalankan sudo tcpdump -nvi br-a654e3b46ed7 -w UDP_log.pcap untuk membuat file log dari UDP yang sudah dijalankan

```
hadik@LAPTOP-PI1D4LCK:~/SistemTerdistribusi$ sudo tcpdump -nvi br-a654e3b46ed7 -w UDP_log.pcap
tcpdump: listening on br-a654e3b46ed7, link-type EN10MB (Ethernet), snapshot length 262144 bytes
^C14 packets captured
14 packets received by filter
0 packets dropped by kernel
```

e. Isi dari log yang sudah terbuat



- clientUDP.py mengirimkan pesan, serverUDP.py menerima dan mengirimkan balasan.
- UDP_log.pcap berisi banyak pertukaran UDP antara client (172.18.0.3) dan server (172.18.0.2) pada server port 12345.