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 Kelas : Progjar E
 Soal 1

- Tampilan dari server

```
(base) joyan@5cd58a6b704:~/progjar/no1$ python3 top_server.py
WARNING:root:starting up on ('0.0.0.0', 12000)
WARNING:root:waiting for a connection
WARNING:root:incoming connection from ('172.16.16.102', 33936)
WARNING:root:received b'getdatapemain 10\r\n\r\n'
WARNING:root:getdata
WARNING:root:data 10 ketemu
WARNING:root:hasil proses: {'nomor': 10, 'nama': 'david da silva', 'posisi': 'striker tengah'}
WARNING:root:serialized data
WARNING:root:{"nomor": 10, "nama": "david da silva", "posisi": "striker tengah"}
WARNING:root:waiting for a connection
WARNING:root:incoming connection from ('172.16.16.102', 33938)
WARNING:root:received b'getdatapemain 8\r\n\r\n'
WARNING:root:getdata
WARNING:root:data 8 ketemu
WARNING:root:hasil proses: {'nomor': 8, 'nama': 'aryn williams', 'posisi': 'gelandang kanan'}
WARNING:root:serialized data
WARNING:root:{"nomor": 8, "nama": "aryn williams", "posisi": "gelandang kanan"}
WARNING:root:waiting for a connection
WARNING:root:incoming connection from ('172.16.16.102', 33940)
WARNING:root:received b'getdatapemain 5\r\n\r\n'
WARNING:root:getdata
WARNING:root:data 5 ketemu
WARNING:root:hasil proses: {'nomor': 5, 'nama': 'abu rizal', 'posisi': 'bek kanan'}
WARNING:root:serialized data
WARNING:root:{"nomor": 5, "nama": "abu rizal", "posisi": "bek kanan"}
WARNING:root:waiting for a connection
WARNING:root:incoming connection from ('172.16.16.102', 33942)
WARNING:root:received b'getdatapemain 2\r\n\r\n'
WARNING:root:getdata
WARNING:root:data 2 ketemu
WARNING:root:hasil proses: {'nomor': 2, 'nama': 'm. syaifuddin', 'posisi': 'bek kiri'}
WARNING:root:serialized data
WARNING:root:{"nomor": 2, "nama": "m. syaifuddin", "posisi": "bek kiri"}
WARNING:root:waiting for a connection
WARNING:root:incoming connection from ('172.16.16.102', 33944)
WARNING:root:received b'getdatapemain 2\r\n\r\n'
WARNING:root:getdata
WARNING:root:data 2 ketemu
WARNING:root:hasil proses: {'nomor': 2, 'nama': 'm. syaifuddin', 'posisi': 'bek kiri'}
WARNING:root:serialized data
WARNING:root:{"nomor": 2, "nama": "m. syaifuddin", "posisi": "bek kiri"}
WARNING:root:waiting for a connection
```

- Tampilan dari client

```
(base) joyan@9e67bc31e6d8:~/progjar/no1$ python3 top_client.py
Thread number 1
Sending request number 1 of 1 requests
=> Got data: {'nomor': 10, 'nama': 'david da silva', 'posisi': 'striker tengah'}
Thread number 1 finished. Average latency: 0.003425 seconds

Thread number 5
Sending request number 1 of 5 requests
Sending request number 2 of 5 requests
Sending request number 3 of 5 requests
=> Got data: {'nomor': 8, 'nama': 'aryn williams', 'posisi': 'gelandang kanan'}
Sending request number 4 of 5 requests
=> Got data: {'nomor': 5, 'nama': 'abu rizal', 'posisi': 'bek kanan'}
Sending request number 5 of 5 requests
=> Got data: {'nomor': 2, 'nama': 'm. syaifuddin', 'posisi': 'bek kiri'}
=> Got data: {'nomor': 2, 'nama': 'm. syaifuddin', 'posisi': 'bek kiri'}
=> Got data: {'nomor': 3, 'nama': 'arif satria', 'posisi': 'bek tengah kiri'}
Thread number 5 finished. Average latency: 0.003821 seconds

Thread number 10
Sending request number 1 of 10 requests
Sending request number 2 of 10 requests
=> Got data: {'nomor': 7, 'nama': 'm. hidayar', 'posisi': 'gelandang tengah'}
=> Got data: {'nomor': 8, 'nama': 'aryn williams', 'posisi': 'gelandang kanan'}
Sending request number 4 of 10 requests
Sending request number 5 of 10 requests
=> Got data: {'nomor': 4, 'nama': 'hanamu', 'posisi': 'bek tengah kanan'}
Sending request number 6 of 10 requests
=> Got data: {'nomor': 4, 'nama': 'hanamu', 'posisi': 'bek tengah kanan'}
Sending request number 7 of 10 requests
=> Got data: {'nomor': 8, 'nama': 'aryn williams', 'posisi': 'gelandang Kiri'}
=> Got data: {'nomor': 2, 'nama': 'm. syaifuddin', 'posisi': 'bek kiri'}
=> Got data: {'nomor': 4, 'nama': 'hanamu', 'posisi': 'bek tengah kanan'}
=> Got data: {'nomor': 8, 'nama': 'aryn williams', 'posisi': 'gelandang kanan'}
Thread number 10 finished. Average latency: 0.005391 seconds
```

- Hasil

Jumlah Thread	Jumlah Request	Jumlah Response	Latency
1	1	1	0.003425 seconds
5	5	5	0.003821 seconds
10	10	10	0.005391 seconds
20	20	20	0.006875 seconds

- Deskripsi

Dari hasil pengamatan diperoleh kesimpulan bahwa semakin banyak request maupun thread pada client maka latency akan semakin membesar. Meskipun demikian koneksi tidak sampai terjadi timeout, jadi jumlah request dan jumlah response sama.

Soal 2

- Tampilan dari server

```
File Edit View Run Kernel Tabs Settings Help
[joyan@5cd58a6b704: ~/prog] python3 tcp_server.py
WARNING:root:starting up on ('0.0.0.0', 12000)

WARNING:root:Incoming connection from ('172.16.16.102', 34553)
WARNING:root:Request: getdatapemain 8
WARNING:root:Sending response: {'nomor': 8, 'nama': 'aryn williams', 'posisi': 'gelandang kanan'}

WARNING:root:Incoming connection from ('172.16.16.102', 34560)
WARNING:root:Request: getdatapemain 10
WARNING:root:Sending response: {'nomor': 10, 'nama': 'david da silva', 'posisi': 'striker tengah'}

WARNING:root:Incoming connection from ('172.16.16.102', 34562)
WARNING:root:Request: getdatapemain 3
WARNING:root:Sending response: {'nomor': 3, 'nama': 'arif azzria', 'posisi': 'bek tengah kiri'}

WARNING:root:Incoming connection from ('172.16.16.102', 34564)

WARNING:root:Incoming connection from ('172.16.16.102', 34566)
WARNING:root:Request: getdatapemain 2
WARNING:root:Sending response: {'nomor': 2, 'nama': 'm. syaifuddin', 'posisi': 'bek kiri'}
WARNING:root:Request: getdatapemain 6
WARNING:root:Sending response: {'nomor': 6, 'nama': 'makan komate', 'posisi': 'gelandang kiri'}

WARNING:root:Incoming connection from ('172.16.16.102', 34568)
WARNING:root:Request: getdatapemain 9
WARNING:root:Sending response: {'nomor': 9, 'nama': 'irfan jaya', 'posisi': 'striker kiri'}

WARNING:root:Incoming connection from ('172.16.16.102', 34570)
WARNING:root:Request: getdatapemain 2
WARNING:root:Sending response: {'nomor': 2, 'nama': 'm. syaifuddin', 'posisi': 'bek kiri'}

WARNING:root:Incoming connection from ('172.16.16.102', 34574)

WARNING:root:Incoming connection from ('172.16.16.102', 34572)
WARNING:root:Request: getdatapemain 8
WARNING:root:Sending response: {'nomor': 8, 'nama': 'aryn williams', 'posisi': 'gelandang kanan'}
WARNING:root:Request: getdatapemain 2
WARNING:root:Sending response: {'nomor': 2, 'nama': 'm. syaifuddin', 'posisi': 'bek kiri'}

WARNING:root:Incoming connection from ('172.16.16.102', 34576)

WARNING:root:Request: getdatapemain 3
WARNING:root:Incoming connection from ('172.16.16.102', 34578)
```

- Tampilan dari client

```
File Edit View Run Kernel Tabs Settings Help
+ - C
Filter files by name
/
Name Last Modified
Thread number 1
Sending request number 1 of 1 requests
==> Got data: {'nomor': 8, 'nama': 'aryn williams', 'posisi': 'gelandang kanan'}
Thread number 1 finished. Average latency: 0.003802 seconds

Thread number 5
Sending request number 1 of 5 requests
Sending request number 2 of 5 requests
Sending request number 3 of 5 requests
Sending request number 4 of 5 requests
Sending request number 5 of 5 requests
==> Got data: {'nomor': 10, 'nama': 'david da silva', 'posisi': 'striker tengah'}
==> Got data: {'nomor': 6, 'nama': 'maken konate', 'posisi': 'gelandang kiri'}
==> Got data: {'nomor': 3, 'nama': 'arif satria', 'posisi': 'bek tengah kiri'}
==> Got data: {'nomor': 2, 'nama': 'm. ayaifuddin', 'posisi': 'bek kiri'}
==> Got data: {'nomor': 9, 'nama': 'irfan jaya', 'posisi': 'striker kiri'}
Thread number 5 finished. Average latency: 0.004114 seconds

Thread number 10
Sending request number 1 of 10 requests
Sending request number 2 of 10 requests
Sending request number 3 of 10 requests
Sending request number 4 of 10 requests
==> Got data: {'nomor': 2, 'nama': 'm. ayaifuddin', 'posisi': 'bek kiri'}
==> Got data: {'nomor': 8, 'nama': 'aryn williams', 'posisi': 'gelandang kanan'}
==> Got data: {'nomor': 2, 'nama': 'm. ayaifuddin', 'posisi': 'bek kiri'}
Sending request number 5 of 10 requests
Sending request number 6 of 10 requests
Sending request number 7 of 10 requests
Sending request number 8 of 10 requests
Sending request number 9 of 10 requests
==> Got data: {'nomor': 3, 'nama': 'arif satria', 'posisi': 'bek tengah kiri'}
Sending request number 10 of 10 requests
==> Got data: {'nomor': 2, 'nama': 'm. ayaifuddin', 'posisi': 'bek kiri'}
==> Got data: {'nomor': 10, 'nama': 'david da silva', 'posisi': 'striker tengah'}
==> Got data: {'nomor': 4, 'nama': 'hansamu', 'posisi': 'bek tengah kanan'}
==> Got data: {'nomor': 6, 'nama': 'maken konate', 'posisi': 'gelandang kiri'}
==> Got data: {'nomor': 3, 'nama': 'arif satria', 'posisi': 'bek tengah kiri'}
==> Got data: {'nomor': 9, 'nama': 'irfan jaya', 'posisi': 'striker kiri'}
Thread number 10 finished. Average latency: 0.0053369 seconds
```

- Hasil

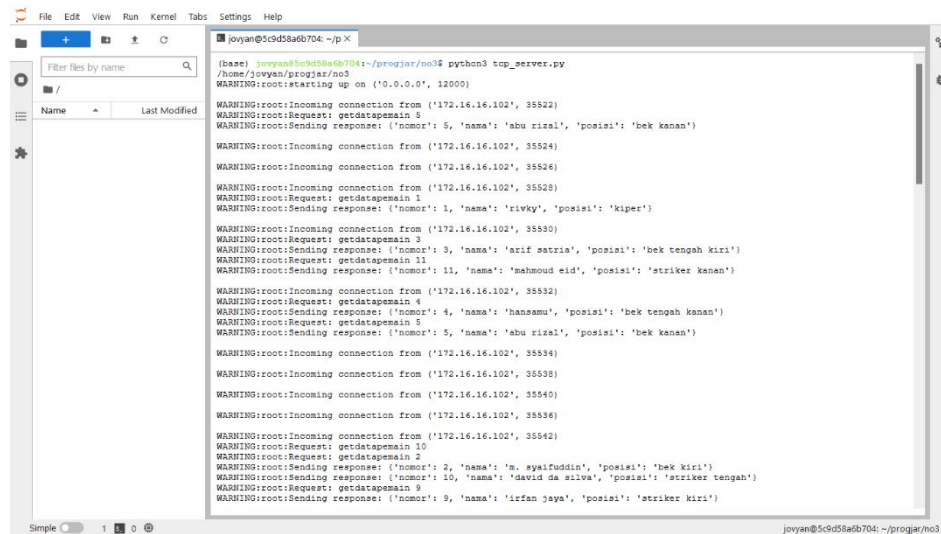
Jumlah Thread	Jumlah Request	Jumlah Response	Latency
1	1	1	0.003802 seconds
5	5	5	0.0044114 seconds
10	10	10	0.0053369 seconds
20	20	20	0.0062661 seconds

- Deskripsi

Dari hasil pengamatan diperoleh kesimpulan bahwa semakin banyak request maupun thread dari client dan thread dari server maka latency akan semakin membesar. Meskipun demikian koneksi tidak sampai terjadi timeout, jadi jumlah request dan jumlah response sama.

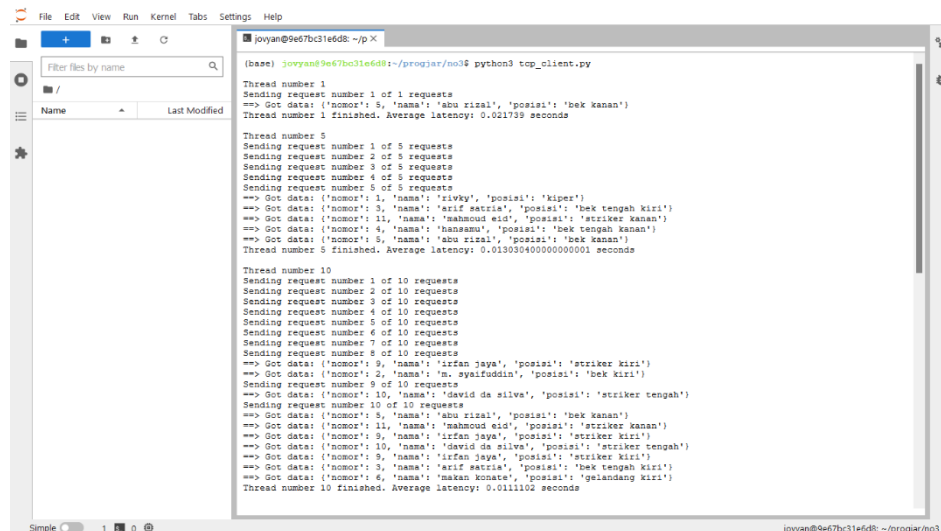
Soal 3

- Tampilan dari server



```
(base) joyvan@5cd58a6b704:~/progjar/no3$ python3 top_server.py
/home/joyvan/progjar/no3
WARNING:root:starting up on ('0.0.0.0', 12000)
WARNING:root:Incoming connection from ('172.16.16.102', 35522)
WARNING:root:Request: getdatapemain 5
WARNING:root:Sending response: {'nomor': 5, 'nama': 'abu rizal', 'posisi': 'bek kanan'}
WARNING:root:Incoming connection from ('172.16.16.102', 35524)
WARNING:root:Incoming connection from ('172.16.16.102', 35526)
WARNING:root:Incoming connection from ('172.16.16.102', 35528)
WARNING:root:Request: getdatapemain 1
WARNING:root:Sending response: {'nomor': 1, 'nama': 'riwky', 'posisi': 'kipar'}
WARNING:root:Incoming connection from ('172.16.16.102', 35530)
WARNING:root:Request: getdatapemain 9
WARNING:root:Sending response: {'nomor': 3, 'nama': 'arif satria', 'posisi': 'bek tengah kiri'}
WARNING:root:Request: getdatapemain 11
WARNING:root:Sending response: {'nomor': 11, 'nama': 'mahaoud eid', 'posisi': 'striker Kanan'}
WARNING:root:Incoming connection from ('172.16.16.102', 35532)
WARNING:root:Request: getdatapemain 4
WARNING:root:Sending response: {'nomor': 4, 'nama': 'hanamu', 'posisi': 'bek tengah kanan'}
WARNING:root:Request: getdatapemain 5
WARNING:root:Sending response: {'nomor': 5, 'nama': 'abu rizal', 'posisi': 'bek kanan'}
WARNING:root:Incoming connection from ('172.16.16.102', 35534)
WARNING:root:Incoming connection from ('172.16.16.102', 35538)
WARNING:root:Incoming connection from ('172.16.16.102', 35540)
WARNING:root:Incoming connection from ('172.16.16.102', 35536)
WARNING:root:Incoming connection from ('172.16.16.102', 35542)
WARNING:root:Request: getdatapemain 10
WARNING:root:Request: getdatapemain 2
WARNING:root:Sending response: {'nomor': 2, 'nama': 'm. ayafuddin', 'posisi': 'bek kiri'}
WARNING:root:Sending response: {'nomor': 10, 'nama': 'david da silva', 'posisi': 'striker tengah'}
WARNING:root:Request: getdatapemain 9
WARNING:root:Sending response: {'nomor': 9, 'nama': 'irfan jaya', 'posisi': 'striker kiri'}
```

- Tampilan dari client



```
(base) joyvan@9e67bc31e6d8:~/progjar/no3$ python3 top_client.py
Thread number 1
Sending request number 1 of 1 requests
=> Got data: {'nomor': 5, 'nama': 'abu rizal', 'posisi': 'bek kanan'}
Thread number 1 finished. Average latency: 0.021739 seconds

Thread number 5
Sending request number 1 of 5 requests
Sending request number 2 of 5 requests
Sending request number 3 of 5 requests
Sending request number 4 of 5 requests
Sending request number 5 of 5 requests
=> Got data: {'nomor': 1, 'nama': 'riwky', 'posisi': 'kipar'}
=> Got data: {'nomor': 3, 'nama': 'arif satria', 'posisi': 'bek tengah kiri'}
=> Got data: {'nomor': 11, 'nama': 'mahaoud eid', 'posisi': 'striker Kanan'}
=> Got data: {'nomor': 4, 'nama': 'hanamu', 'posisi': 'bek tengah kanan'}
=> Got data: {'nomor': 5, 'nama': 'abu rizal', 'posisi': 'bek kanan'}
Thread number 5 finished. Average latency: 0.013030400000000001 seconds

Thread number 10
Sending request number 1 of 10 requests
Sending request number 2 of 10 requests
Sending request number 3 of 10 requests
Sending request number 4 of 10 requests
Sending request number 5 of 10 requests
Sending request number 6 of 10 requests
Sending request number 7 of 10 requests
Sending request number 8 of 10 requests
=> Got data: {'nomor': 9, 'nama': 'irfan jaya', 'posisi': 'striker kiri'}
=> Got data: {'nomor': 2, 'nama': 'm. ayafuddin', 'posisi': 'bek kiri'}
Sending request number 9 of 10 requests
=> Got data: {'nomor': 10, 'nama': 'david da silva', 'posisi': 'striker tengah'}
Sending request number 10 of 10 requests
=> Got data: {'nomor': 5, 'nama': 'abu rizal', 'posisi': 'bek kanan'}
=> Got data: {'nomor': 11, 'nama': 'mahaoud eid', 'posisi': 'striker Kanan'}
=> Got data: {'nomor': 9, 'nama': 'irfan jaya', 'posisi': 'striker kiri'}
=> Got data: {'nomor': 10, 'nama': 'david da silva', 'posisi': 'striker tengah'}
=> Got data: {'nomor': 3, 'nama': 'arif satria', 'posisi': 'bek tengah kiri'}
=> Got data: {'nomor': 6, 'nama': 'makan kunate', 'posisi': 'gelandang kiri'}
Thread number 10 finished. Average latency: 0.0118296 seconds
```

- Hasil

Jumlah Thread	Jumlah Request	Jumlah Response	Latency
1	1	1	0.021739 seconds
5	5	5	0.0130304 seconds
10	10	10	0.0111102 seconds
20	20	20	0.0118296 seconds

- Deskripsi

Dari hasil pengamatan diperoleh bahwa latency tidak lagi bergantung pada jumlah request maupun thread baik dari client maupun server. Meskipun demikian koneksi tidak sampai terjadi timeout, jadi jumlah request dan jumlah response masih tetap sama.

Soal 4

- Kesimpulan

Dari hasil pengamatan yang sudah saya lakukan, *multithreading* pada *server* dapat membuat *latency* menjadi lebih stabil. Hal ini dibuktikan dengan perbedaan rentang *latency* pada soal nomor 2 yakni antara 0.003802 - 0.0062661 *seconds*. Sedangkan pada soal nomor 1 berada pada rentang 0.003425 - 0.006875 *seconds*. Jika dilihat lebih jauh lagi, *multithreading* pada *server* akan memberikan dampak yang signifikan lebih bagus daripada *singlethreading* untuk menghandle banyak *request* sekaligus. *Multithread* pada *secure mode* memiliki *latency* yang acak dan lebih besar dari pada *insecure mode*. Hal ini dibuktikan dengan *latency* pada soal nomor 2 (*insecure mode*) yang mendapatkan *latency* rata-rata sebesar 0.0049541 *seconds*. Sedangkan pada soal nomor 3 (*secure mode*) mendapatkan *latency* rata-rata sebesar 0.0144273 *seconds*. Hal ini mungkin dapat terjadi karena *client* harus memastikan terlebih dahulu keabsahan sertifikat pada *server* untuk tiap *request*. Juga adanya pertukaran informasi seperti *public key* dan *private key* antara *client* dan *server* sehingga menyebabkan pemrosesan menjadi lebih lambat dan berakibat pada membengkaknya *latency*. Meskipun demikian *secure mode* sangat berguna untuk mengamankan data antara *client* dan *server*.

- Github Repository

<https://github.com/Fajar19051/progiar>