## Tugas 3

- 1. Buatlah program client untuk Tugas 2 dengan mengimplementasikan ketentuan di tugas 2 dengan metode
- Thread
- Threadpool
- Process
- 2. Jalankan server pada tugas 2, lalu, untuk setiap metode pada nomor 1, jalankan tugas 3 nomor 1 dan amatilah jumlah maksimum thread yang dapat dijalankan di lingkungan eksekusi anda.
- 3. Jalankan di lab environment
- Tuliskan semua dalam satu file PDF dengan nama TUGAS3.PDF
- Link menuju source code anda di github (masing-masing harus punya repository di github)
- Jalankan program client (tugas 3 nomor 2) dan server (pada tugas 2), capturelah interaksi antara client dan server. Berikan deskripsi tentang interaksi ini terutama dengan jumlah thread di masing-masing sisi (client / server)

Untuk tugas 3, server akan tetap menggunakan kode yang sama dengan tugas 2, namun dengan penambahan pengeditan pada log server untuk menampilkan total klien yang diterima oleh server.

Penambahan code pada server berupa

```
self.my_socket.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEADDR, 1)
```

Supaya server dapat menerima koneksi yang sama secara

Selain itu, akan dibuat tiga jenis klien, yaitu menggunakan thread, threadpool, dan process.

## **THREAD**

Pengujian pertama akan dilakukan menggunakan klien dengan nama "client\_thread". Jumlah thread dalam pengujian pertama dimulai dari 50 thread yang dikirim ke server. Dan bisa dilihat dari hasil screenshot bahwa client\_thread bisa melakukan thread sampai 50 thread. Saya akan mencoba melakuakan eksplorasi dengan menambahkan banyak thread.

```
d59:~/work/progjar/progjar3/client$ python3 client_thread.py
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            (base) jovyam@248c9e3fbd59:~/work/progjar/progja
WARNING:root:[CLIENT 1] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 0] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 0] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 3] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 4] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 6] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 7] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 7] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 3] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 3] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 1] sending b'TIME\r\n\r\n'
                                                                                                                                  Bc9e3fbd59:~/work/progjar/progjar3/server$ python3 server.py
  WARNING:root:total koneksi 1
  WARNING:root:total koneksi
WARNING:root:total koneksi 4
WARNING:root:total koneksi 5
WARNING:root:total koneksi 6
WARNING:root:total koneksi 7
WARNING:root:total koneksi 8
WARNING:root:total koneksi 9
WARNING:root:total koneksi 10
WARNING:root:total koneksi 11
WARNING:root:total koneksi 12
WARNING:root:total koneksi 13
WARNING:root:total koneksi 13
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 WARNING:root:[CLIEN1 10] sending b'IJME\r\n\r\n'
WARNING:root:[CLIEN1 15] sending b'IJME\r\n\r\n'
WARNING:root:[CLIEN1 14] sending b'IJME\r\n\r\n'
WARNING:root:[CLIEN1 16] sending b'IJME\r\n\r\n'
WARNING:root:[CLIEN1 17] sending b'IJME\r\n\r\n'
WARNING:root:[CLIEN1 18] sending b'IJME\r\n\r\n'
WARNING:root:[CLIEN1 18] sending b'IJME\r\n\r\n'
WARNING:root:[CLIEN1 19] sending b'IJME\r\n\r\n'
WARNING:root:[CLIEN1 20] sending b'IJME\r\n\n'
WARNING:root:[CLIEN1 20] sending b'IJME\r\n\n'
WARNING:root:[CLIEN1 20] sending b'IJME\r\n'
WARNING:[CLIEN1 20] sending b'IJME\r\n'
WARNING:[CLIEN1 20] send
WARNING:root:total koneksi 15
WARNING:root:total koneksi 16
WARNING:root:total koneksi 17
WARNING:root:total koneksi 18
WARNING:root:total koneksi 19
WARNING:root:total koneksi 20
WARNING:root:total koneksi 21
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 WARNING:root:[CLIENT 20] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 21] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 26] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 23] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 25] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 25] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 25] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 27] sending b'IJME\r\n\n'
WARNING:root:[CLIENT 27] sending b'IJME\r\n\n'
WARNING:root:[CLIENT 27] sending b'IJME\r\n'
WARNING:[CLIENT 27] sending b'IJME\r\n'
WARNING:[CLIENT 27] send
WARNING:root:total koneksi 22
WARNING:root:total koneksi 23
WARNING:root:total koneksi 24
WARNING:root:total koneksi 25
WARNING:root:total koneksi 26
WARNING:root:total koneksi 27
WARNING:root:total koneksi 28
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 WARNING:root:[CLIENT 27] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 28] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 29] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 39] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 30] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 31] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 31] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 31] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 35] sending b'IJME\r\n\n'
WARNING:root:[CLIENT 35] sending b'IJME\r\n'
WARNING:[CLIENT 35] send
WARNING:root:total koneksi 29
WARNING:root:total koneksi 30
WARNING:root:total koneksi 31
WARNING:root:total koneksi 32
WARNING:root:total koneksi 33
WARNING:root:total koneksi 34
WARNING:root:total koneksi 35
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 WARNING:root:[CLIENT 34] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 35] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 37] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 34] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 34] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 34] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 34] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 43] sending b'IJME\r\n\r\n'
WARNING:root:[CLIENT 44] sending b'IJME\r\n\n\r\n'
WARNING:root:[CLIENT 44] sending b'IJME\r\n\n\n'
WARNING:root:[CLIENT 44] sending b'IJME\r\n\n'
WARNING:root:[CLIENT 44] sending b'IJME\r\n'
WARNING:root:[CLIENT 44] sending b'IJME\r\n'
WARNING:root:[CLIENT 44] sending b'IJME\r\n'
WARNING:root:[CLIENT 44] sending b'IJME\r\n'
WARNING:[CLIENT 44] sending b'IJME\r\n'
WARNING:[CLIENT 44] sending b'IJME\r\n'
WARNING:[CLIENT 44] send
WARNING:root:total koneksi 36
WARNING:root:total koneksi 37
WARNING:root:total koneksi 38
WARNING:root:total koneksi 39
WARNING:root:total koneksi 40
WARNING:root:total koneksi 41
WARNING:root:total koneksi 42
WARNING:root:total koneksi 43
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 WARNING:root:[CLIENT 46] Sending b'TIME\r\n\r\n
WARNING:root:[CLIENT 45] sending b'TIME\r\n\r\n
WARNING:root:[CLIENT 47] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 44
WARNING:root:total koneksi 45
WARNING:root:total koneksi 46
WARNING:root:total koneksi 47
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 WARNING:root:[CLIENT 38] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 39] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 40] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 48] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 48
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 WARNING:root:[CLIENT 49] sending b'TIME\r\n\r\n'
```

Sekarang saya ingin mencoba thread sebanyak 500. Saat thread mencapai 490 pada server, proses mengalami perlambatan, tapi akhirnya proses 500 thread berhasil. Setelah itu saya mencoba untuk 5000 thread.

```
WARNING:root:total koneksi 465
                                                                                              WARNING:root:[CLIENT 39] sending b'TIME\r\n\r\n
WARNING:root:total koneksi 466
                                                                                               WARNING:root:[CLIENT 41] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 467
                                                                                               WARNING:root:[CLIENT 106] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 468
                                                                                               WARNING:root:[CLIENT 105] sending b'TIME\r\n\r\n'
                                                                                              WARNING:root:[CLIENT 166] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 469
WARNING:root:total koneksi 470
                                                                                               WARNING:root:[CLIENT 161] sending b'TIME\r\n\r\n'
                                                                                              WARNING:root:[CLIENT 157] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 471
WARNING:root:total koneksi 472
                                                                                               WARNING:root:[CLIENT 144] sending b'TIME\r\n\r\n'
                                                                                              WARNING:root:[CLIENT 164] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 473
WARNING:root:total koneksi 474
                                                                                               WARNING:root:[CLIENT 160] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 475
                                                                                               WARNING:root:[CLIENT 145] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 476
                                                                                               WARNING:root:[CLIENT 273] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 477
                                                                                              WARNING:root:[CLIENT 288] sending b'TIME\r\n\r\n'
                                                                                               WARNING:root:[CLIENT 274] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 478
                                                                                               WARNING:root:[CLIENT 276] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 479
WARNING:root:total koneksi 480
                                                                                               WARNING:root:[CLIENT 325] sending b'TIME\r\n\r\n'
                                                                                              WARNING:root:[CLIENT 280] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 481
WARNING:root:total koneksi 482
                                                                                               WARNING:root:[CLIENT 287] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 483
                                                                                               WARNING:root:[CLIENT 272] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 484
                                                                                               WARNING:root:[CLIENT 271] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 485
                                                                                              WARNING:root:[CLIENT 286] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 486
                                                                                               WARNING:root:[CLIENT 396] sending b'TIME\r\n\r\n'
                                                                                               WARNING:root:[CLIENT 388] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 487
WARNING:root:total koneksi 488
                                                                                               WARNING:root:[CLIENT 389] sending b'TIME\r\n\r\n'
                                                                                              WARNING:root:[CLIENT 360] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 489
                                                                                              WARNING:root:[CLIENT 362] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 410] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 490
WARNING:root:total koneksi 491
                                                                                               WARNING:root:[CLIENT 409] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 492
                                                                                              WARNING:root:[CLIENT 486] sending b'TIME\r\n\r\n
WARNING:root:total koneksi 493
                                                                                              WARNING:root:[CLIENT 488] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 7] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 494
WARNING:root:total koneksi 495
                                                                                              WARNING:root:[CLIENT 142] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 141] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 141] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 159] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 223] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 357] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 496
WARNING:root:total koneksi 497
WARNING:root:total koneksi 498
WARNING:root:total koneksi 499
WARNING:root:total koneksi 500
```

```
WARNING:root:[CLIENT 2126] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4953
                                           WARNING:root:[CLIENT 2134] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4954
                                           WARNING:root:[CLIENT 2123] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4955
                                           WARNING:root:[CLIENT 2154] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4956
                                           WARNING:root:[CLIENT 2132] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4957
                                           Exception in thread Thread-2458 (kirim_data):
WARNING:root:total koneksi 4958
                                           Exception in thread Thread-2535 (kirim_data):
WARNING:root:total koneksi 4959
                                           Traceback (most recent call last):
WARNING:root:total koneksi 4960
                                           Exception in thread Thread-2581 (kirim data):
WARNING:root:total koneksi 4961
                                           Traceback (most recent call last):
WARNING:root:total koneksi 4962
                                           Exception in thread Thread-2548 (kirim_data):
WARNING:root:total koneksi 4963
                                           Traceback (most recent call last):
WARNING:root:total koneksi 4964
WARNING:root:total koneksi 4965
                                           Exception in thread Thread-2514 (kirim data):
WARNING:root:total koneksi 4966
                                           Traceback (most recent call last)
WARNING:root:total koneksi 4967
                                           Exception in thread Thread-2530 (kirim_data):
WARNING:root:total koneksi 4968
                                           Exception in thread Thread-2483 (kirim_data):
                                             File "/opt/conda/lib/python3.10/threading.py", line 1016, in _bootstrap_inner File "/opt/conda/lib/python3.10/threading.py", line 1016, in _bootstrap_inner File "/opt/conda/lib/python3.10/threading.py", line 1016, in _bootstrap_inner
WARNING:root:total koneksi 4969
WARNING:root:total koneksi 4970
WARNING:root:total koneksi 4971
WARNING:root:total koneksi 4972
                                           Traceback (most recent call last):
WARNING:root:total koneksi 4973
                                             File "/opt/conda/lib/python3.10/threading.py", line 1016, in _bootstrap_inner
WARNING:root:total koneksi 4974
                                           Exception in thread Thread-2627 (kirim_data):
WARNING:root:total koneksi 4975
                                           Traceback (most recent call last):
WARNING:root:total koneksi 4976
                                             File "/opt/conda/lib/python3.10/threading.py", line 1016, in _bootstrap_inner
WARNING:root:total koneksi 4977
                                                self.run()
WARNING:root:total koneksi 4978
                                             File "/opt/conda/lib/python3.10/threading.py", line 953, in run
WARNING:root:total koneksi 4979
                                                self.run()
WARNING:root:total koneksi 4980
                                             File "/opt/conda/lib/python3.10/threading.py", line 953, in run
WARNING:root:total koneksi 4981
WARNING:root:total koneksi 4982
                                             File "/opt/conda/lib/python3.10/threading.py", line 953, in run
WARNING:root:total koneksi 4983
                                           Exception in thread Thread-2562 (kirim_data): self._target(*self._args, **self._kwargs)
WARNING:root:total koneksi 4984
WARNING:root:total koneksi 4985
                                             File "/home/jovyan/work/progjar/progjar3/client/client_thread.py", line 24, in kirim_data
WARNING:root:total koneksi 4986
                                           Traceback (most recent call last):
WARNING:root:total koneksi 4987
                                                self.run()
WARNING:root:total koneksi 4988
                                             File "/opt/conda/lib/python3.10/threading.py", line 953, in run
                                                self._target(*self._args, **self._kwargs)
```

Disini bisa dilihat untuk thread sebanyak 5000 server tidak bisa melaukan proses lagi, dan pada bagian client juga terdapat error. Sehingga saya mencoba melakukan percobaan sebanyak 4500 thread, supaya mengetahui batas proses yang bisa dilakukan dengan client thread tanpa mengalami error.

```
WARNING:root:total koneksi 4498
WARNING:root:total koneksi 4499
WARNING:root:total koneksi 4499
WARNING:root:total koneksi 4500
WARNING:root:[CLIENT 3356] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 3501] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 3512] sending b'TIME\r\n\r\n'
(base) jovyan@248c9e3fbd59:~/work/progjar/progjar3/client$
```

## **THREADPOOL**

Pengujian selanjutnya dilakukan pada threadpool. Jumlah thread dalam penguji cobaan client\_thread\_pool dimulai dari 100 threads client yang mencoba terhubung ke server. Dan dari hasil yang saya dapat saya langsung mencoba ke jumlah thread yang lebih tinggi yaitu 5000. Ini hasil yang saya dapatan.

```
WARNING:root:[CLIENT 4975] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4965
                                             WARNING:root:[CLIENT 4976] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4966
                                             WARNING:root:[CLIENT 4977] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4967
                                             WARNING:root:[CLIENT 4978] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4968
                                             WARNING:root:[CLIENT 4979] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4969
                                             WARNING:root:[CLIENT 4980] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4970
                                             WARNING:root:[CLIENT 4981] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4971
                                             WARNING:root:[CLIENT 4982] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4972
                                             WARNING:root:[CLIENT 4983] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4973
                                             WARNING:root:[CLIENT 4984] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4974
                                             WARNING:root:[CLIENT 4985] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4975
                                             WARNING:root:[CLIENT 4986] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4976
                                             WARNING:root:[CLIENT 4987] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4977
                                             WARNING:root:[CLIENT 4988] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4978
                                             WARNING:root:[CLIENT 4989] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4979
                                             WARNING:root:[CLIENT 4990] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4980
                                             WARNING:root:[CLIENT 4991] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4981
                                             WARNING:root:[CLIENT 4992] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4982
                                             WARNING:root:[CLIENT 4993] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4983
                                             WARNING:root:[CLIENT 4994] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4984
                                             WARNING:root:[CLIENT 4995] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4985
                                             WARNING:root:[CLIENT 4996] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4986
                                             WARNING:root:[CLIENT 4997] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4987
                                             WARNING:root:[CLIENT 4998] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4988
                                             WARNING:root:[CLIENT 4999] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4989
                                             WARNING:root:[CLIENT 5000] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4990
WARNING:root:total koneksi 4991
                                             WARNING:root:[CLIENT 4059] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4992
                                             WARNING:root:[CLIENT 4062] sending b'TIME\r\n\r\n'
                                             WARNING:root:[CLIENT 4060] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4993
WARNING:root:total koneksi 4994
                                             WARNING:root:[CLIENT 4061] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4995
                                             WARNING:root:[CLIENT 1384] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4996
                                             \label{eq:warning:root:[CLIENT 4177]} $$ sending $b'TIME\r\n'\n'$$ $$
                                             WARNING:root:[CLIENT 4343] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 4997
WARNING:root:total koneksi 4998
                                             \label{eq:warning:root:[CLIENT 4332]} \ \ sending \ b'TIME\r\n'r\n'
WARNING:root:total koneksi 4999
                                             WARNING:root:[CLIENT 2739] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 5000
                                             WARNING:root:[CLIENT 39] sending b'TIME\r\n\r\n'
                                             (base) jovyan@248c9e3fbd59:~/work/progjar/progjar3/client$
```

Bisa dilihat untuk thread sebanyak 5000 tidak ada kendala dan lebih cepat dibanding client\_thread. Disini saya akan mencoba dengan thread yang lebih besar yaitu 500000 thread. Ini merupakan hasil dari percobaan saya

```
WARNING:root:total koneksi 499965
                                                  WARNING:root:[CLIENT 499975] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499966
                                                  WARNING:root:[CLIENT 499976] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499967
                                                  WARNING:root:[CLIENT 499977] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499968
                                                  WARNING:root:[CLIENT 499978] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499969
                                                  WARNING:root:[CLIENT 498384] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499970
                                                  WARNING:root:[CLIENT 499979] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499971
                                                  WARNING:root:[CLIENT 499980] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499972
                                                  WARNING:root:[CLIENT 499981] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499973
                                                  WARNING:root:[CLIENT 499982] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499974
                                                  WARNING:root:[CLIENT 499983] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499975
                                                  WARNING:root:[CLIENT 499984] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499976
                                                  WARNING:root:[CLIENT 499986] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499977
                                                  WARNING:root:[CLIENT 499987] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499978
                                                  WARNING:root:[CLIENT 499988] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499979
                                                  WARNING:root:[CLIENT 499989] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499980
                                                  WARNING:root:[CLIENT 499990] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499981
                                                  WARNING:root:[CLIENT 499991] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499982
                                                  WARNING:root:[CLIENT 499992] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499983
                                                  WARNING:root:[CLIENT 499993] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499984
                                                  WARNING:root:[CLIENT 499994] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499985
                                                  WARNING:root:[CLIENT 499995] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499986
                                                  WARNING:root:[CLIENT 499996] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499987
                                                  WARNING:root:[CLIENT 499997] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499988
                                                  WARNING:root:[CLIENT 499998] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499989
                                                  WARNING:root:[CLIENT 499999] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499990
                                                  WARNING:root:[CLIENT 500000] sending b'TIME\r\n\r\n'
                                                  WARNING:root:[CLIENT 498497] sending b'TIME\r\n\r\n
WARNING:root:total koneksi 499991
WARNING:root:total koneksi 499992
                                                  WARNING:root:[CLIENT 498986] sending b'TIME\r\n\r\n'
                                                  WARNING:root:[CLIENT 499123] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499993
                                                  WARNING:root:[CLIENT 496323] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499994
                                                  WARNING:root:[CLIENT 499358] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499995
                                                  WARNING:root:[CLIENT 493090] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499996
WARNING:root:total koneksi 499997
                                                  WARNING:root:[CLIENT 499736] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499998
                                                  WARNING:root:[CLIENT 499874] sending b'TIME\r\n\r\n'
                                                  WARNING:root:[CLIENT 499985] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 499999
                                                  WARNING:root:[CLIENT 495328] sending b'TIME\r\n\r\n
WARNING:root:total koneksi 500000
                                                  (base) jovyan@248c9e3fbd59:~/work/progjar/progjar3/client$
```

Bisa dilihat bahwa untuk banyak thread tidak ada error. Dapat disimpulkan bahwa client\_thread\_pool memiliki kemampuan untuk menjalankan banyak thread sesuai dengan kapabilitas perangkat yang digunakan. Perbedaan antara thread dan threadpool terletak pada penggunaan thread-nya. Pada kelas thread, setiap thread yang dibuat tidak dapat digunakan kembali, sehingga thread yang sudah selesai akan dihentikan. Proses penghentian thread ini membutuhkan waktu, yang mengakibatkan kelas thread mengalami keterlambatan saat eksekusi selesai. Sementara itu, pada kelas threadpool, thread tetap aktif dan siap menjalankan tugas baru sampai pool tersebut dimatikan.

## **PROCESS**

untuk percobaan pada process saya akan mencoba dengan melakukan 100 thread.

```
WARNING:root:total koneksi 81
                                          WARNING:root:[CLIENT 83] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 82
                                          WARNING:root:[CLIENT 85] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 83
                                          WARNING:root:[CLIENT 86] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 84
                                          WARNING:root:[CLIENT 84] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 85
                                          WARNING:root:[CLIENT 87] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 86
                                          WARNING:root:[CLIENT 88] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 87
                                          WARNING:root:[CLIENT 89] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 88
                                          WARNING:root:[CLIENT 90] sending b'TIME\r\n\r\n
WARNING:root:total koneksi 89
                                          WARNING:root:[CLIENT 91] sending b'TIME\r\n\r\n'
                                          WARNING:root:[CLIENT 92] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 90
                                          WARNING:root:[CLIENT 93] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 91
                                          WARNING:root:[CLIENT 94] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 92
                                          WARNING:root:[CLIENT 95] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 93
                                          WARNING:root:[CLIENT 96] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 94
                                          WARNING:root:[CLIENT 98] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 95
                                          WARNING:root:[CLIENT 99] sending b'TIME\r\n\r\n
WARNING:root:total koneksi 96
                                          WARNING:root:[CLIENT 97] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 97
                                          WARNING:root:[CLIENT 100] sending b'TIME\r\n\r\n
WARNING:root:total koneksi 98
                                          WARNING:root:[CLIENT 26] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 99
                                          (base) jovyan@248c9e3fbd59:~/work/progjar/progjar3/client$
WARNING:root:total koneksi 100
```

Pada percobaan client\_process untuk melakukan proses 100 thread sangat cepat dilakuakn. Saat mencoba melakukan percobaan di labtop saya, waktu yang dibutuhkan hanya dibawah 1 detik untuk proses tersebut. Saya akan mencoba untuk 5000 thread

```
WARNING:root:[CLIENT 2043] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 2027
                                                                       Traceback (most recent call last):
File "/home/jovyan/work/progjar/progjar3/client/client_process.py", line 49, in <module>
WARNING:root:total koneksi 2028
                                                                         File "/opt/conda/lib/python3.10/multiprocessing/context.py", line 224, in File "/opt/conda/lib/python3.10/multiprocessing/context.py", line 224, in Fopen
File "/opt/conda/lib/python3.10/multiprocessing/context.py", line 281, in Fopen
File "/opt/conda/lib/python3.10/multiprocessing/context.py", line 281, in Fopen
File "/opt/conda/lib/python3.10/multiprocessing/popen
fork.py", line 19, in __int
WARNING:root:total koneksi 2029
WARNING:root:total koneksi 2030
WARNING:root:total koneksi 2031
                                                                       Process Process-2045:
                                                                         File "/opt/conda/lib/python3.10/multiprocessing/popen_fork.py", line 65, in _launch
WARNING:root:total koneksi 2032
                                                                      OSError: [Errno 24] Too many open files
WARNING:root:[CLIENT 2044] sending b'TIME\r\n\r\n'
Traceback (most recent call last):
WARNING:root:total koneksi 2033
                                                                         File "/opt/conda/lib/python3.10/multiprocessing/process.py", line 314, in _bootstrap File "/opt/conda/lib/python3.10/multiprocessing/process.py", line 108, in run
WARNING:root:total koneksi 2034
WARNING:root:total koneksi 2035
                                                                       File "/home/jovyan/work/progjar/progjar3/client/client_process.py", line 12, in kirim_data OSError: [Errno 24] Too many open files
WARNING:root:total koneksi 2036
                                                                       WARNING:root:[CLIENT 1657] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 1692] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 2037
                                                                       WARNING:root:[CLIENT 952] sending b'TIME\r\n\r\n WARNING:root:[CLIENT 950] sending b'TIME\r\n\r\n
WARNING:root:total koneksi 2038
                                                                       WARNING:root:[CLIENT 1783] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 1874] sending b'TIME\r\n\r\n
WARNING:root:total koneksi 2039
WARNING:root:total koneksi 2040
                                                                       WARNING:root:[CLIENT 1893] sending b'TIME\r\n\r\n'
                                                                       WARNING:root:[CLIENT 1895] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 1140] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 2041
                                                                       WARNING:root:[CLIENT 1961] sending b'TIME\r\n\r\n'
WARNING:root:[CLIENT 2004] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 2042
WARNING:root:total koneksi 2043
                                                                       WARNING:root:[CLIENT 2006] sending b'TIME\r\n\r\n
                                                                       WARNING:root:[CLIENT 1979] sending b'TIME\r\n\r\n
WARNING:root:total koneksi 2044
                                                                       WARNING:root:[CLIENT 2038] sending b'TIME\r\n\r\n'
                                                                                                           ork/progjar/progjar3/client$
```

Proses berlangsung dengan cepat sama seperti percobaan pertama. Namun pada proses yang ke 2044 server tidak melakukan proses dan pada client terjadi error. Disini saya mengambil kesimpulan bahwa untuk client\_process dapat melakukan proses thread dengan cepat, tetapi terbatas hanya sampai 2044 proses saja.

Link github: https://github.com/bosbonta/Tugas-Progjar/tree/main/Tugas%203