

TUGAS 3 PROGRAM JARINGAN

1. Buatlah program client untuk Tugas 2 dengan mengimplementasikan ketentuan di tugas 2 dengan metode:
 - a) Thread
 - b) Threadpool
 - c) 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:
 - a) Tuliskan semua dalam satu file PDF dengan nama TUGAS3.PDF
 - i. Link menuju source code anda di github (masing-masing harus punya repository di github)
 - ii. 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 code sesuai dengan tugas 2, dengan mengedit log server sehingga menampilkan total client yang diterima oleh server, dan akan dibuat 3 jenis client, dengan menggunakan thread, threadpool, dan process, yang penulisan codenya dapat dilihat pada link github.

Thread

Pengujian terlebih dahulu dilakukan pada thread dengan nama client_thread. Jumlah thread dalam pengujicobaan dimulai dari 100 client yang dikirim ke server.

Server (100 threads)	Client (100 threads)
WARNING:root:total koneksi 60	WARNING:root:[CLIENT 70] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 61	WARNING:root:[CLIENT 73] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 62	WARNING:root:[CLIENT 74] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 63	WARNING:root:[CLIENT 75] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 64	WARNING:root:[CLIENT 76] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 65	WARNING:root:[CLIENT 78] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 66	WARNING:root:[CLIENT 77] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 67	WARNING:root:[CLIENT 81] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 68	WARNING:root:[CLIENT 80] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 69	WARNING:root:[CLIENT 82] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 70	WARNING:root:[CLIENT 83] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 71	WARNING:root:[CLIENT 84] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 72	WARNING:root:[CLIENT 85] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 73	WARNING:root:[CLIENT 86] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 74	WARNING:root:[CLIENT 87] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 75	WARNING:root:[CLIENT 88] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 76	WARNING:root:[CLIENT 90] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 77	WARNING:root:[CLIENT 89] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 78	WARNING:root:[CLIENT 91] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 79	WARNING:root:[CLIENT 92] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 80	WARNING:root:[CLIENT 93] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 81	WARNING:root:[CLIENT 95] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 82	WARNING:root:[CLIENT 94] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 83	WARNING:root:[CLIENT 96] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 84	WARNING:root:[CLIENT 97] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 85	WARNING:root:[CLIENT 98] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 86	WARNING:root:[CLIENT 99] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 87	WARNING:root:[CLIENT 19] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 88	WARNING:root:[CLIENT 23] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 89	WARNING:root:[CLIENT 72] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 90	WARNING:root:[CLIENT 11] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 91	WARNING:root:[CLIENT 2] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 92	WARNING:root:[CLIENT 79] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 93	WARNING:root:[CLIENT 28] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 94	WARNING:root:[CLIENT 8] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 95	WARNING:root:[CLIENT 40] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 96	WARNING:root:[CLIENT 6] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 97	WARNING:root:[CLIENT 7] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 98	WARNING:root:[CLIENT 68] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 99	WARNING:root:[CLIENT 71] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 100	WARNING:root:[CLIENT 26] sending b'TIME\r\n\r\n'
	WARNING:root:[CLIENT 5] sending b'TIME\r\n\r\n'
	WARNING:root:[CLIENT 24] sending b'TIME\r\n\r\n'
	WARNING:root:[CLIENT 15] sending b'TIME\r\n\r\n'
	WARNING:root:[CLIENT 9] sending b'TIME\r\n\r\n'
	WARNING:root:[CLIENT 14] sending b'TIME\r\n\r\n'
	(base) jovyang@4d709f5f9ed0:~/work/progjar/latihan-tugas/tugas-3/clients\$ █

Terlihat bahwa client_thread mampu melakukan 100 threads. Percobaan dilakukan dengan mencoba 200, 300, hingga 400, tanpa ada kegagalan dalam client. Pada percobaan dengan 500 threads, proses semakin lambat di akhir eksekusi, dimulai pada thread 400an, bahkan, hingga menyebabkan error pada client. Berikut dokumentasi client_thread dengan menggunakan 500 threads:

Server (500 threads)	Client (500 threads)
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WARNING:root:total koneksi 454	WARNING:root:[CLIENT 210] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 455	WARNING:root:[CLIENT 220] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 456	WARNING:root:[CLIENT 263] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 457	WARNING:root:[CLIENT 241] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 458	WARNING:root:[CLIENT 214] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 459	WARNING:root:[CLIENT 269] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 460	WARNING:root:[CLIENT 276] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 460	WARNING:root:[CLIENT 256] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 461	WARNING:root:[CLIENT 272] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 461	WARNING:root:[CLIENT 369] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 462	WARNING:root:[CLIENT 398] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 463	WARNING:root:[CLIENT 352] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 464	WARNING:root:[CLIENT 371] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 464	WARNING:root:[CLIENT 402] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 465	WARNING:root:[CLIENT 388] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 466	WARNING:root:[CLIENT 400] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 467	WARNING:root:[CLIENT 383] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 468	WARNING:root:[CLIENT 370] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 468	WARNING:root:[CLIENT 389] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 469	WARNING:root:[CLIENT 386] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 470	WARNING:root:[CLIENT 399] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 471	WARNING:root:[CLIENT 492] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 472	WARNING:root:[CLIENT 491] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 473	WARNING:root:[CLIENT 488] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 474	WARNING:root:[CLIENT 485] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 475	WARNING:root:[CLIENT 487] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 476	WARNING:root:[CLIENT 482] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 476	WARNING:root:[CLIENT 474] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 477	WARNING:root:[CLIENT 465] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 478	WARNING:root:[CLIENT 490] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 479	WARNING:root:[CLIENT 484] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 480	WARNING:root:[CLIENT 481] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 481	WARNING:root:[CLIENT 478] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 482	WARNING:root:[CLIENT 463] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 483	WARNING:root:[CLIENT 92] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 484	WARNING:root:[CLIENT 8] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 485	WARNING:root:[CLIENT 90] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 486	Exception in thread Thread-12 (kirim_data):
WARNING:root:total koneksi 487	Traceback (most recent call last):
WARNING:root:total koneksi 488	File "/opt/conda/lib/python3.10/threading.py", line 1016, in _bootstrap_inner
WARNING:root:total koneksi 489	self.run()
WARNING:root:total koneksi 490	File "/opt/conda/lib/python3.10/threading.py", line 953, in run
WARNING:root:total koneksi 491	self.target(*self.args, **self.kwags)
WARNING:root:total koneksi 492	File "/home/jovyan/work/progjar/latihan-tugas/tugas-3/client/client_thread.py", line 24, in kirim_data
WARNING:root:total koneksi 493	data = sock.recv(16)
WARNING:root:total koneksi 494	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 495	(base) jovyan@4d709f5f9ed0:~/work/progjar/latihan-tugas/tugas-3/client\$
WARNING:root:total koneksi 496	
WARNING:root:total koneksi 497	
WARNING:root:total koneksi 498	
WARNING:root:total koneksi 499	

Terlihat dalam server, jumlah client yang terhubung hanya 499, tidak 500, karena disebabkan error pada client. Begitu juga yang akan terjadi jika kita memperbanyak thread, contohnya pada 50000 threads. Walaupun client yang diterima bisa mencapai 49000an, jauh melebihi dari 500 yang telah kita coba sebelumnya, akan tetapi, tetap terjadi error setelahnya.

Server (50000 threads)	Client (50000 therads)
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WARNING:root:total koneksi 49451	ConnectionResetError: [Errno 104] Connection reset by peer data = sock.recv(16)
WARNING:root:total koneksi 49452	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49453	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49454	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49455	ConnectionResetError: [Errno 104] Connection reset by peer File "/home/jovyan/work/progjar/latihan-tugas/tugas-3/client/client_thread.py", line 24, in kirim_data
WARNING:root:total koneksi 49456	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49457	ConnectionResetError: [Errno 104] Connection reset by peer File "/home/jovyan/work/progjar/latihan-tugas/tugas-3/client/client_thread.py", line 24, in kirim_data
WARNING:root:total koneksi 49458	data = sock.recv(16)
WARNING:root:total koneksi 49459	data = sock.recv(16)
WARNING:root:total koneksi 49460	File "/home/jovyan/work/progjar/latihan-tugas/tugas-3/client/client_thread.py", line 24, in kirim_data
WARNING:root:total koneksi 49461	data = sock.recv(16)
WARNING:root:total koneksi 49462	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49463	File "/home/jovyan/work/progjar/latihan-tugas/tugas-3/client/client_thread.py", line 24, in kirim_data
WARNING:root:total koneksi 49464	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49465	data = sock.recv(16)
WARNING:root:total koneksi 49466	data = sock.recv(16)
WARNING:root:total koneksi 49467	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49468	File "/home/jovyan/work/progjar/latihan-tugas/tugas-3/client/client_thread.py", line 24, in kirim_data
WARNING:root:total koneksi 49469	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49470	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49471	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49472	data = sock.recv(16)
WARNING:root:total koneksi 49473	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49474	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49475	data = sock.recv(16)
WARNING:root:total koneksi 49476	data = sock.recv(16)
WARNING:root:total koneksi 49477	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49478	ConnectionResetError: [Errno 104] Connection reset by peer
WARNING:root:total koneksi 49479	(base) jovyan@b79d9c7c0cd7:~/work/progjar/latihan-tugas/tugas-3/client\$
WARNING:root:total koneksi 49480	
WARNING:root:total koneksi 49481	
WARNING:root:total koneksi 49482	
WARNING:root:total koneksi 49483	
WARNING:root:total koneksi 49484	
WARNING:root:total koneksi 49485	

Sehingga, dengan memastikan bahwa tidak ada thread yang gagal, maka, client_thread memiliki maksimal thread sebesar 450

Server (450 threads)	Client (450 threads)
WARNING:root:total koneksi 434	WARNING:root:[CLIENT 246] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 435	WARNING:root:[CLIENT 364] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 436	WARNING:root:[CLIENT 267] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 437	WARNING:root:[CLIENT 262] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 438	WARNING:root:[CLIENT 396] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 439	WARNING:root:[CLIENT 356] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 440	WARNING:root:[CLIENT 260] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 441	WARNING:root:[CLIENT 392] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 442	WARNING:root:[CLIENT 393] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 443	WARNING:root:[CLIENT 391] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 444	WARNING:root:[CLIENT 386] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 445	WARNING:root:[CLIENT 317] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 446	WARNING:root:[CLIENT 284] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 447	WARNING:root:[CLIENT 349] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 448	WARNING:root:[CLIENT 272] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 449	WARNING:root:[CLIENT 383] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 450	WARNING:root:[CLIENT 255] sending b'TIME\r\n\r\n'
	WARNING:root:[CLIENT 362] sending b'TIME\r\n\r\n'
	WARNING:root:[CLIENT 355] sending b'TIME\r\n\r\n'
	WARNING:root:[CLIENT 416] sending b'TIME\r\n\r\n'
	WARNING:root:[CLIENT 411] sending b'TIME\r\n\r\n'
	(base) jovyan@b79d9c7c0cd7:~/work/progjar/latihan-tugas/tugas-3/client\$

Threadpool

Pengujian selanjutnya dilakukan pada threadpool yang dinamakan dengan client_thread_pool. Jumlah thread dalam pengujian client_thread_pool dimulai dari 100 threads client yang mencoba terhubung ke server.

Server (100 threads)	Client (100 threads)
WARNING:root:total koneksi 75 WARNING:root:total koneksi 76 WARNING:root:total koneksi 77 WARNING:root:total koneksi 78 WARNING:root:total koneksi 79 WARNING:root:total koneksi 80 WARNING:root:total koneksi 81 WARNING:root:total koneksi 82 WARNING:root:total koneksi 83 WARNING:root:total koneksi 84 WARNING:root:total koneksi 85 WARNING:root:total koneksi 86 WARNING:root:total koneksi 87 WARNING:root:total koneksi 88 WARNING:root:total koneksi 89 WARNING:root:total koneksi 90 WARNING:root:total koneksi 91 WARNING:root:total koneksi 92 WARNING:root:total koneksi 93 WARNING:root:total koneksi 94 WARNING:root:total koneksi 95 WARNING:root:total koneksi 96 WARNING:root:total koneksi 97 WARNING:root:total koneksi 98 WARNING:root:total koneksi 99 WARNING:root:total koneksi 100	WARNING:root:[CLIENT 87] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 88] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 89] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 90] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 91] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 92] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 93] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 94] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 95] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 96] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 97] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 98] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 99] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 100] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 56] 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 16] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 8] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 12] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 11] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 9] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 7] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 5] sending b'TIME\r\n\r\n' (base) jovyan@4d709f5f9ed0:~/work/progjar/latihan-tugas/tugas-3/clients\$

Terlihat bahwa client_thread_pool mampu menjalankan 100 threads. Pengujian dilanjutkan dengan meningkatkan jumlah thread. Client_thread_pool mampu menjalankan 200 threads, 300 threads, bahkan sampai jumlah yang sangat besar, yaitu 1000000 threads tanpa ada error sama sekali.

Server (1000000 threads)	Client (1000000 threads)
WARNING:root:total koneksi 999981 WARNING:root:total koneksi 999982 WARNING:root:total koneksi 999983 WARNING:root:total koneksi 999984 WARNING:root:total koneksi 999985 WARNING:root:total koneksi 999986 WARNING:root:total koneksi 999987 WARNING:root:total koneksi 999988 WARNING:root:total koneksi 999989 WARNING:root:total koneksi 999990 WARNING:root:total koneksi 999991 WARNING:root:total koneksi 999992 WARNING:root:total koneksi 999993 WARNING:root:total koneksi 999994 WARNING:root:total koneksi 999995 WARNING:root:total koneksi 999996 WARNING:root:total koneksi 999997 WARNING:root:total koneksi 999998 WARNING:root:total koneksi 999999 WARNING:root:total koneksi 1000000	WARNING:root:[CLIENT 999990] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 999991] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 999992] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 999993] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 999994] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 999995] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 999996] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 999997] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 999998] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 999999] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 1000000] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 997293] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 997441] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 997516] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 991203] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 997924] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 992379] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 998840] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 998949] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 999888] sending b'TIME\r\n\r\n' WARNING:root:[CLIENT 995087] sending b'TIME\r\n\r\n' (base) jovyan@4d709f5f9ed0:~/work/progjar/latihan-tugas/tugas-3/clients\$

Bisa disimpulkan, bahwa client_thread_pool mampu menjalankan banyak thread sesuai dengan kemampuan device yang dimiliki. Adanya perbedaan kemampuan thread dengan threadpool disebabkan terletak pada menggunakan threadnya. Pada thread class, setiap thread yang dibuat tidak dapat digunakan kembali, sehingga thread yang lama akan diberhentikan. Pemberhentian

thread ini akan memakan waktu sehingga bisa dilihat thread class akan mengalami kelambatan diakhir eksekusi. Sedangkan thread threadpool class tetap aktif dan siap menjalankan tugas hingga pool dimatikan.

Process

Pengujian terakhir dilakukan pada multiprocessing yang dinamakan dengan client_process. Jumlah process yang dilakukan pengujian client_process dimulai dari 100 process client yang mencoba terhubung ke server

Server (100 process)	Client (100 Process)
WARNING:root:total koneksi 82	WARNING:root:[CLIENT 88] sending b'TIME\r\n\r\n'
WARNING:root:total koneksi 83	WARNING:root:[CLIENT 100] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 84	WARNING:root:[CLIENT 34] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 85	WARNING:root:[CLIENT 68] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 86	WARNING:root:[CLIENT 71] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 87	WARNING:root:[CLIENT 63] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 88	WARNING:root:[CLIENT 70] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 89	WARNING:root:[CLIENT 83] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 90	WARNING:root:[CLIENT 76] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 91	WARNING:root:[CLIENT 85] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 92	WARNING:root:[CLIENT 81] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 93	WARNING:root:[CLIENT 74] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 94	WARNING:root:[CLIENT 97] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 95	WARNING:root:[CLIENT 96] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 96	WARNING:root:[CLIENT 90] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 97	WARNING:root:[CLIENT 94] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 98	WARNING:root:[CLIENT 93] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 99	WARNING:root:[CLIENT 98] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 100	WARNING:root:[CLIENT 91] sending b'TIME\r\n\r\n\r\n'
█	WARNING:root:[CLIENT 92] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 95] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 99] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 82] sending b'TIME\r\n\r\n\r\n'
	(base) jovyan@4d709f5f9ed0:~/work/progjar/latihan-tugas/tugas-3/client\$

Terlihat bahwa client_process masih mampu menjalankan 100 process. Pengujian dilakukan dengan meningkatkan jumlah process, sebanyak 200 process, 500 process, hingga 3000 process dijalankan. Akan tetapi, pada saat menjalankan 3000 process, pada client_process terjadi error dan menyebabkan koneksi ke server berhenti di angka 2044.

Server (3000 process)	Client (3000 process)
WARNING:root:total koneksi 2030	WARNING:root:[CLIENT 2043] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 2031	Traceback (most recent call last):
WARNING:root:total koneksi 2032	File "/home/jovyan/work/progjar/latihan-tugas/tugas-3/client/client_process.py", line 49, in <module>
WARNING:root:total koneksi 2033	File "/opt/conda/lib/python3.10/multiprocessing/process.py", line 121, in start
WARNING:root:total koneksi 2034	File "/opt/conda/lib/python3.10/multiprocessing/context.py", line 224, in _Popen
WARNING:root:total koneksi 2035	File "/opt/conda/lib/python3.10/multiprocessing/context.py", line 281, in _Popen
WARNING:root:total koneksi 2036	File "/opt/conda/lib/python3.10/multiprocessing/popen_fork.py", line 19, in _init
WARNING:root:total koneksi 2037	File "/opt/conda/lib/python3.10/multiprocessing/popen_fork.py", line 65, in _launch
WARNING:root:total koneksi 2038	WARNING:root:[CLIENT 2044] sending b'TIME\r\n\r\n\r\n'
WARNING:root:total koneksi 2039	OSError: [Errno 24] Too many open files
WARNING:root:total koneksi 2040	Process Process-2045:
WARNING:root:total koneksi 2041	Traceback (most recent call last):
WARNING:root:total koneksi 2042	File "/opt/conda/lib/python3.10/multiprocessing/process.py", line 314, in _bootstrap
WARNING:root:total koneksi 2043	File "/opt/conda/lib/python3.10/multiprocessing/process.py", line 108, in run
WARNING:root:total koneksi 2044	File "/home/jovyan/work/progjar/latihan-tugas/tugas-3/client/client_process.py", line 12, in kirim_data
█	OSError: [Errno 24] Too many open files
	WARNING:root:[CLIENT 1591] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 1593] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 1613] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 1645] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 1648] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 1644] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 1654] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 1662] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 1653] sending b'TIME\r\n\r\n\r\n'
	WARNING:root:[CLIENT 1660] sending b'TIME\r\n\r\n\r\n'

Sehingga, dapat disimpulkan, maksimal process yang mampu dilakukan oleh client_process sebanyak 2044 process.

Link Github: <https://github.com/silabanjames/tugas-program-jaringan/tree/main/tugas3>