Laporan Tugas 10

Pemrograman Jaringan B
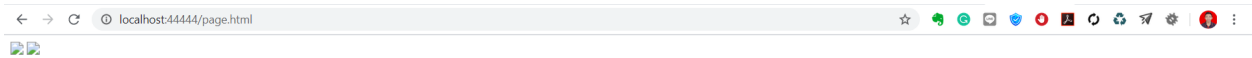
Oleh :
Rana Wijdan Naim

Departemen Teknik Informatika
Fakultas Teknologi Elektro dan Informatika Cerdas
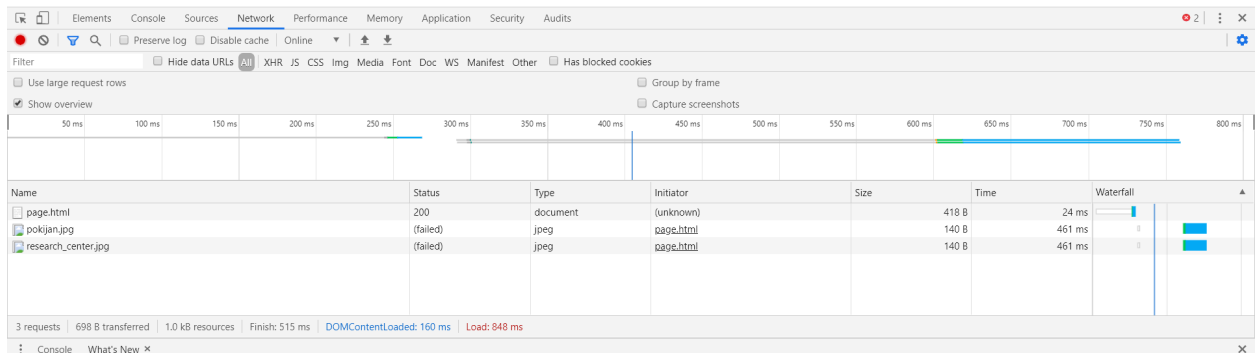**Institut Teknologi Sepuluh Nopember (ITS)**
Surabaya
2020

1. List Tugas 10

    a. Pull update terbaru progjar 6

    b. Jalankan async_server.py pada port 9002, 9003, 9004, 9005 (lihat pada BackendList)

    c. Jalankan file lb.py, jalankan di port 44444

    d. Jalankan browser, akseslah http://localhost:44444/page.html

    e. Lihatlah di log program, bahwa setiap request akan dilayani oleh backend yang bergantian

    f. Lakukan performance test seperti pada tugas 9, bandingkan penggunaan load balancer dengan async_server dengan server_thread_http pada folder progjar5

    g. Buatlah tabel hasilnya

Tampilan pada page http://localhost:44444/page.html

Kedua foto tidak berhasil diload oleh server.

Dan di bawah ini dapat dilihat bahwa setiap request akan dilayani oleh backend yang bergantian

```
rwnaim@WIJDANNAIM-LAPTOP:/mnt/d/I Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 10$ python3 lb.py
WARNING:root:Load Balancer berjalan pada port 44444
WARNING:root:Koneksi dari ('127.0.0.1', 61521)
WARNING:root:Koneksi dari ('127.0.0.1', 61521) akan di teruskan ke ('127.0.0.1', 9002)
WARNING:root:Koneksi dari ('127.0.0.1', 61592)
WARNING:root:Koneksi dari ('127.0.0.1', 61592) akan di teruskan ke ('127.0.0.1', 9003)
WARNING:root:Koneksi dari ('127.0.0.1', 61602)
WARNING:root:Koneksi dari ('127.0.0.1', 61602) akan di teruskan ke ('127.0.0.1', 9004)
WARNING:root:Koneksi dari ('127.0.0.1', 61604)
WARNING:root:Koneksi dari ('127.0.0.1', 61604) akan di teruskan ke ('127.0.0.1', 9005)
WARNING:root:Koneksi dari ('127.0.0.1', 61638)
WARNING:root:Koneksi dari ('127.0.0.1', 61638) akan di teruskan ke ('127.0.0.1', 9002)
WARNING:root:Koneksi dari ('127.0.0.1', 61646)
WARNING:root:Koneksi dari ('127.0.0.1', 61646) akan di teruskan ke ('127.0.0.1', 9003)
WARNING:root:Koneksi dari ('127.0.0.1', 61674)
WARNING:root:Koneksi dari ('127.0.0.1', 61674) akan di teruskan ke ('127.0.0.1', 9004)
WARNING:root:Koneksi dari ('127.0.0.1', 61678)
WARNING:root:Koneksi dari ('127.0.0.1', 61678) akan di teruskan ke ('127.0.0.1', 9005)
WARNING:root:Koneksi dari ('127.0.0.1', 61679)
WARNING:root:Koneksi dari ('127.0.0.1', 61679) akan di teruskan ke ('127.0.0.1', 9002)
WARNING:root:Koneksi dari ('127.0.0.1', 61682)
WARNING:root:Koneksi dari ('127.0.0.1', 61682) akan di teruskan ke ('127.0.0.1', 9003)
WARNING:root:Koneksi dari ('127.0.0.1', 61689)
WARNING:root:Koneksi dari ('127.0.0.1', 61689) akan di teruskan ke ('127.0.0.1', 9004)
WARNING:root:Koneksi dari ('127.0.0.1', 61691)
WARNING:root:Koneksi dari ('127.0.0.1', 61691) akan di teruskan ke ('127.0.0.1', 9005)
```

2. **Parameter Test**

   Jumlah Request : 1000

   Konkurensi : 1, 5, 10, 25, 50, 75, 100

3. **Hasil Performance Test**

   a. Server Async dengan Load Balancer

No.	Concurrency Level	Time Taken For Rest (seconds)	Complete Request	Failed Request	Total Transferred	Request per second (#/sec)	Time per request (ms)	Transfer Rate
1	1	1.350	1000	0	122000	736.47	1.358	87.74
2	5	1.433	1000	0	122000	697.81	1.433	83.14
3	10	1.410	1000	0	122000	709.36	1.410	84.51
4	25	1.860	1000	0	122000	537.67	1.860	64.06
5	50	7.817	1000	0	122000	127.93	7.817	15.24
6	75	55.102	1000	0	122000	18.15	55.102	1.16

b. Server Thread

No.	Concurrency Level	Time Taken For Rest (seconds)	Complete Request	Failed Request	Total Transferred	Request per second (#/sec)	Time per request (ms)	Transfer Rate
1	1	684.702	1000	0	122000	1.46	684.702	0.17
2	5	188.797	1000	0	122000	5.30	188.797	0.63
3	10	194.726	1000	0	122000	5.14	194.726	0.61
4	25	200.788	1000	0	122000	4.98	200.788	0.59
5	50	186.588	1000	0	122000	5.36	186.588	0.64
6	75	209.421	1000	0	122000	4.78	209.421	0.57

4. Kesimpulan

Dari hasil performance test diatas, menunjukkan bahwa server async memiliki waktu running yg lebih cepat daripada server thread. Lalu, dengan bantuan load balancer, server async memiliki proses yg jauh lebih baik / cepat dibandingkan server thread.

5. Dokumentasi

a. Async Server
- **Concurrency 1**

```
Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            44444

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      1
Time taken for tests:   1.358 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    736.47 [#/sec] (mean)
Time per request:       1.358 [ms] (mean)
Time per request:       1.358 [ms] (mean, across all concurrent requests)
Transfer rate:          87.74 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    0   0.1      0       4
Processing:     0    1   1.1      1      13
Waiting:        0    1   1.1      1      13
Total:          1    1   1.1      1      13

Percentage of the requests served within a certain time (ms)
  50%      1
  66%      1
  75%      1
  80%      2
  90%      3
  95%      4
  98%      5
  99%      6
 100%     13 (longest request)
```

- **Concurrency 5**

```
Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            44444

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      5
Time taken for tests:   1.433 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    697.81 [#/sec] (mean)
Time per request:       7.165 [ms] (mean)
Time per request:       1.433 [ms] (mean, across all concurrent requests)
Transfer rate:          83.14 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    0   0.1      0       4
Processing:     1    7   3.7      6      43
Waiting:        1    6   3.6      6      42
Total:          1    7   3.7      6      43

Percentage of the requests served within a certain time (ms)
  50%      6
  66%      8
  75%      8
  80%      9
  90%     11
  95%     13
  98%     16
  99%     19
 100%     43 (longest request)
```

- Concurrency 10

```
Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            44444

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      10
Time taken for tests:   1.410 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    709.36 [#/sec] (mean)
Time per request:       14.097 [ms] (mean)
Time per request:       1.410 [ms] (mean, across all concurrent requests)
Transfer rate:          84.51 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    4  64.1      0    1023
Processing:     2    9   3.2      9      26
Waiting:        2    8   3.2      8      26
Total:          2   13  64.3      9    1034

Percentage of the requests served within a certain time (ms)
  50%      9
  66%     10
  75%     10
  80%     11
  90%     13
  95%     15
  98%     18
  99%     22
 100%   1034 (longest request)
```

- Concurrency 25

```
Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            44444

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      25
Time taken for tests:   1.860 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    537.67 [#/sec] (mean)
Time per request:       46.497 [ms] (mean)
Time per request:       1.860 [ms] (mean, across all concurrent requests)
Transfer rate:          64.06 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0   19 137.7      0    1011
Processing:     2   19  69.2     11     843
Waiting:        2   18  69.2     10     842
Total:          2   38 194.4     11    1851

Percentage of the requests served within a certain time (ms)
  50%     11
  66%     13
  75%     15
  80%     16
  90%     20
  95%     24
  98%     30
  99%   1231
 100%   1851 (longest request)
```

- Concurrency 50

```
Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            44444

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      50
Time taken for tests:   7.817 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    127.93 [#/sec] (mean)
Time per request:       390.839 [ms] (mean)
Time per request:       7.817 [ms] (mean, across all concurrent requests)
Transfer rate:          15.24 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    45 210.0      0    1024
Processing:     2    81 528.3      9    6789
Waiting:        2    80 528.4      8    6789
Total:          2   126 680.8      9    7813

Percentage of the requests served within a certain time (ms)
  50%      9
  66%     10
  75%     11
  80%     12
  90%     17
  95%     28
  98%   1862
  99%   4356
 100%   7813 (longest request)
naim@naim-VirtualBox:~/progjar/progjar-b-its-2020/Tugas 10$
```

- Concurrency 75

```
Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            44444

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      75
Time taken for tests:   55.102 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    18.15 [#/sec] (mean)
Time per request:       4132.627 [ms] (mean)
Time per request:       55.102 [ms] (mean, across all concurrent requests)
Transfer rate:          2.16 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    70 257.4      0    1016
Processing:     2   484 3469.0     9   54081
Waiting:        2   483 3469.1     8   54081
Total:          2   554 3605.3     9   55097

Percentage of the requests served within a certain time (ms)
  50%      9
  66%     11
  75%     12
  80%     14
  90%     18
  95%   1434
  98%   7739
  99%  14400
 100%  55097 (longest request)
naim@naim-VirtualBox:~/progjar/progjar-b-its-2020/Tugas 10$
```

b. Thread Server

- ## Concurrency 1


```
rwnaim@WIJDANNAIM-LAPTOP:/mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 4$ sudo ab -n 1000 -c 1 http://127.0.0.1:46000/
[sudo] password for rwnaim:
This is ApacheBench, Version 2.3 <$Revision: 1807734 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 127.0.0.1 (be patient)
Completed 100 requests
Completed 200 requests
Completed 300 requests
Completed 400 requests
Completed 500 requests
Completed 600 requests
Completed 700 requests
Completed 800 requests
Completed 900 requests
Completed 1000 requests
Finished 1000 requests


Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            46000

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      1
Time taken for tests:   684.702 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    1.46 [#/sec] (mean)
Time per request:       684.702 [ms] (mean)
Time per request:       684.702 [ms] (mean, across all concurrent requests)
Transfer rate:          0.17 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    0   0.1      0       2
Processing:     1  684 774.1    388    5196
Waiting:        1  638 723.1    369    5109
Total:          1  685 774.1    389    5197

Percentage of the requests served within a certain time (ms)
  50%    389
  66%    681
  75%    944
  80%   1185
  90%   1857
  95%   2392
  98%   2900
  99%   3271
 100%   5197 (longest request)
rwnaim@WIJDANNAIM-LAPTOP:/mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 4$
```

- ## Concurrency 5


```
rwnaim@WIJDANNAIM-LAPTOP:/mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 4$ sudo ab -n 1000 -c 5 -r -k -s 999999 http://127.0.0.1:46000/
[sudo] password for rwnaim:
This is ApacheBench, Version 2.3 <$Revision: 1807734 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 127.0.0.1 (be patient)
Completed 100 requests
Completed 200 requests
Completed 300 requests
Completed 400 requests
Completed 500 requests
Completed 600 requests
Completed 700 requests
Completed 800 requests
Completed 900 requests
Completed 1000 requests
Finished 1000 requests


Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            46000

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      5
Time taken for tests:   188.797 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Keep-Alive requests:    0
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    5.30 [#/sec] (mean)
Time per request:       943.985 [ms] (mean)
Time per request:       188.797 [ms] (mean, across all concurrent requests)
Transfer rate:          0.63 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    0   0.1      0       1
Processing:     2  934 1013.0   586    5772
Waiting:        2  896 974.7    559    5381
Total:          3  934 1013.0   587    5772

Percentage of the requests served within a certain time (ms)
  50%    587
  66%    989
  75%   1332
  80%   1570
  90%   2290
  95%   3109
  98%   4191
  99%   4619
 100%   5772 (longest request)
rwnaim@WIJDANNAIM-LAPTOP:/mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 4$
```

- ## Concurrency 10

```
rwnaim@WIJDANNAIM-LAPTOP:/mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 9$ sudo ab -n 1000 -c 10 -r -k -s 999999 http://127.0.0.1:46000/
[sudo] password for rwnaim:
This is ApacheBench, Version 2.3 <$Revision: 1807734 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 127.0.0.1 (be patient)
Completed 100 requests
Completed 200 requests
Completed 300 requests
Completed 400 requests
Completed 500 requests
Completed 600 requests
Completed 700 requests
Completed 800 requests
Completed 900 requests
Completed 1000 requests
Finished 1000 requests


Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            46000

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      10
Time taken for tests:   194.726 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Keep-Alive requests:    0
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    5.14 [#/sec] (mean)
Time per request:       1947.263 [ms] (mean)
Time per request:       194.726 [ms] (mean, across all concurrent requests)
Transfer rate:          0.61 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    0   0.2      0       3
Processing:     2 1921 2213.7   1139   12422
Waiting:        2 1876 2167.9   1104   12373
Total:          5 1922 2213.7   1139   12422

Percentage of the requests served within a certain time (ms)
  50%   1139
  66%   1925
  75%   2673
  80%   3092
  90%   5172
  95%   6973
  98%   8390
  99%   9824
 100%  12422 (longest request)
rwnaim@WIJDANNAIM-LAPTOP:/mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 9$
```

- ## Concurrency 25

```
rwnaim@WIJDANNAIM-LAPTOP:/mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 9$ sudo ab -n 1000 -c 25 -r -k -s 999999 http://127.0.0.1:46000/
[sudo] password for rwnaim:
This is ApacheBench, Version 2.3 <$Revision: 1807734 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 127.0.0.1 (be patient)
Completed 100 requests
Completed 200 requests
Completed 300 requests
Completed 400 requests
Completed 500 requests
Completed 600 requests
Completed 700 requests
Completed 800 requests
Completed 900 requests
Completed 1000 requests
Finished 1000 requests


Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            46000

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      25
Time taken for tests:   200.788 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Keep-Alive requests:    0
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    4.98 [#/sec] (mean)
Time per request:       5019.706 [ms] (mean)
Time per request:       200.788 [ms] (mean, across all concurrent requests)
Transfer rate:          0.59 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    0   0.5      0       6
Processing:     5 4796 4821.4   3102   19626
Waiting:        4 4746 4765.7   3069   19427
Total:          9 4796 4821.3   3102   19626

Percentage of the requests served within a certain time (ms)
  50%   3102
  66%   5293
  75%   7599
  80%   8150
  90%  13393
  95%  15705
  98%  16947
  99%  17594
 100%  19626 (longest request)
rwnaim@WIJDANNAIM-LAPTOP:/mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 9$
```

• Concurrency 50

```
rwnaim@WIJDANNAIM-LAPTOP: /mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 5$ sudo ab -n 1000 -c 50 -r -k -s 999999 http://127.0.0.1:46000/
[sudo] password for rwnaim:
This is ApacheBench, Version 2.3 <$Revision: 1807734 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 127.0.0.1 (be patient)
Completed 100 requests
Completed 200 requests
Completed 300 requests
Completed 400 requests
Completed 500 requests
Completed 600 requests
Completed 700 requests
Completed 800 requests
Completed 900 requests
Completed 1000 requests
Finished 1000 requests


Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            46000

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      50
Time taken for tests:   186.588 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Keep-Alive requests:    0
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    5.36 [#/sec] (mean)
Time per request:       9329.385 [ms] (mean)
Time per request:       186.588 [ms] (mean, across all concurrent requests)
Transfer rate:          0.64 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    1   1.6      0      12
Processing:     6 8440 7912.3   6176   34128
Waiting:        4 8400 7874.7   6167   33908
Total:         15 8440 7911.9   6176   34128

Percentage of the requests served within a certain time (ms)
  50%   6176
  66%   9831
  75%  12273
  80%  16309
  90%  21708
  95%  23580
  98%  28093
  99%  30024
 100%  34128 (longest request)
rwnaim@WIJDANNAIM-LAPTOP: /mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 5$
```

▪ Concurrency 75

```
rwnaim@WIJDANNAIM-LAPTOP: /mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 5$ sudo ab -n 1000 -c 75 -r -k -s 999999 http://127.0.0.1:46000/
[sudo] password for rwnaim:
This is ApacheBench, Version 2.3 <$Revision: 1807734 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 127.0.0.1 (be patient)
Completed 100 requests
Completed 200 requests
Completed 300 requests
Completed 400 requests
Completed 500 requests
Completed 600 requests
Completed 700 requests
Completed 800 requests
Completed 900 requests
Completed 1000 requests
Finished 1000 requests


Server Software:        myserver/1.0
Server Hostname:        127.0.0.1
Server Port:            46000

Document Path:          /
Document Length:        4 bytes

Concurrency Level:      75
Time taken for tests:   209.421 seconds
Complete requests:      1000
Failed requests:        0
Non-2xx responses:      1000
Keep-Alive requests:    0
Total transferred:      122000 bytes
HTML transferred:       4000 bytes
Requests per second:    4.78 [#/sec] (mean)
Time per request:       15706.586 [ms] (mean)
Time per request:       209.421 [ms] (mean, across all concurrent requests)
Transfer rate:          0.57 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    1   2.4      0      14
Processing:     4 13404 14006.0  9373   60223
Waiting:        4 13361 13960.8  9299   60223
Total:         17 13405 14005.4  9374   60223

Percentage of the requests served within a certain time (ms)
  50%   9374
  66%  14025
  75%  17622
  80%  19828
  90%  33743
  95%  50451
  98%  54887
  99%  56518
 100%  60223 (longest request)
rwnaim@WIJDANNAIM-LAPTOP: /mnt/d/1 Rana/2020/1 Kuliah/Progjar/Tugas/Tugas 5$
```