5027221020 - Wikri Cahya Syahrila
5027221021 - Steven Figo

Soal 8

Round Robin


```
Finished 500 requests


Server Software:        nginx/1.14.2
Server Hostname:        harkonen.it16.com
Server Port:            80

Document Path:          /
Document Length:        621 bytes

Concurrency Level:      50
Time taken for tests:   0.526 seconds
Complete requests:      500
Failed requests:        0
Total transferred:      379000 bytes
HTML transferred:       310500 bytes
Requests per second:    951.06 [#/sec] (mean)
Time per request:       52.573 [ms] (mean)
Time per request:       1.051 [ms] (mean, across all concurrent requests)
Transfer rate:          704.01 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0   11   8.7     10      34
Processing:    14   38  14.0     37      80
Waiting:       10   38  13.9     36      80
Total:         17   49  10.0     48      81

Percentage of the requests served within a certain time (ms)
  50%     48
  66%     52
  75%     55
  80%     56
  90%     65
  95%     68
  98%     74
  99%     77
 100%     81 (longest request)
```

Least Connection


```
Finished 500 requests


Server Software:        nginx/1.14.2
Server Hostname:        harkonen.it16.com
Server Port:            80

Document Path:          /
Document Length:        621 bytes

Concurrency Level:      50
Time taken for tests:   0.568 seconds
Complete requests:      500
Failed requests:        0
Total transferred:      379000 bytes
HTML transferred:       310500 bytes
Requests per second:    880.68 [#/sec] (mean)
Time per request:       56.774 [ms] (mean)
Time per request:       1.135 [ms] (mean, across all concurrent requests)
Transfer rate:          651.91 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0   10   9.1      8      49
Processing:     9   41  16.2     41      95
Waiting:        0   41  16.1     40      94
Total:         17   51  12.0     51      95

Percentage of the requests served within a certain time (ms)
  50%     51
  66%     54
  75%     57
  80%     59
  90%     65
  95%     74
  98%     88
  99%     93
 100%     95 (longest request)
```

Ip Hash

```
Finished 500 requests


Server Software:        nginx/1.14.2
Server Hostname:        harkonen.it16.com
Server Port:            80

Document Path:          /
Document Length:        621 bytes

Concurrency Level:      50
Time taken for tests:   0.485 seconds
Complete requests:      500
Failed requests:        0
Total transferred:      379000 bytes
HTML transferred:       310500 bytes
Requests per second:    1031.63 [#/sec] (mean)
Time per request:       48.467 [ms] (mean)
Time per request:       0.969 [ms] (mean, across all concurrent requests)
Transfer rate:          763.65 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0   16  10.7     16      47
Processing:     3   31  10.8     29      61
Waiting:        2   30  10.7     29      61
Total:          4   47  10.4     47      73

Percentage of the requests served within a certain time (ms)
  50%     47
  66%     50
  75%     54
  80%     56
  90%     61
  95%     65
  98%     68
  99%     70
 100%     73 (longest request)
```

Generic Hash

```
Server Software:        nginx/1.14.2
Server Hostname:        harkonen.it16.com
Server Port:            80

Document Path:          /
Document Length:        621 bytes

Concurrency Level:      50
Time taken for tests:   0.493 seconds
Complete requests:      500
Failed requests:        0
Total transferred:      379000 bytes
HTML transferred:       310500 bytes
Requests per second:    1013.81 [#/sec] (mean)
Time per request:       49.319 [ms] (mean)
Time per request:       0.986 [ms] (mean, across all concurrent requests)
Transfer rate:          750.45 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0   15   9.9     16      41
Processing:     4   33  12.1     30      72
Waiting:        2   32  11.9     30      71
Total:          4   47   9.9     48      72

Percentage of the requests served within a certain time (ms)
  50%     48
  66%     51
  75%     53
  80%     55
  90%     60
  95%     62
  98%     69
  99%     70
 100%     72 (longest request)
root@Dmitri:~#
```

Dari hasil test di atas, dapat disimpulkan bahwa IP_Hash dan Generic_hash memiliki algoritma yang baik karena memiliki nilai time per request paling rendah.

Hal tersebut dikarenakan IP Hash dan Generic Hash menggunakan algoritma hash untuk melakukan load balancing. Algoritma hash akan melakukan hashing terhadap IP address dari client yang melakukan request. Sehingga setiap client akan mendapatkan server yang sama selama server tersebut masih aktif.

Soal 9

3 Worker


```
Server Software:        nginx/1.14.2
Server Hostname:        harkonen.it16.com
Server Port:            80

Document Path:          /
Document Length:        621 bytes

Concurrency Level:      10
Time taken for tests:   1.268 seconds
Complete requests:      1000
Failed requests:        0
Total transferred:      758000 bytes
HTML transferred:       621000 bytes
Requests per second:    788.43 [#/sec] (mean)
Time per request:       12.683 [ms] (mean)
Time per request:       1.268 [ms] (mean, across all concurrent requests)
Transfer rate:          583.62 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    3   3.1      3      23
Processing:     1    9   4.8      9      37
Waiting:        0    9   4.7      8      36
Total:          4   12   4.7     11      37

Percentage of the requests served within a certain time (ms)
  50%     11
  66%     13
  75%     14
  80%     15
  90%     18
  95%     21
  98%     27
  99%     31
 100%     37 (longest request)
root@Dmitri:~#
```

2 Worker


```
Server Software:        nginx/1.14.2
Server Hostname:        harkonen.it16.com
Server Port:            80

Document Path:          /
Document Length:        621 bytes

Concurrency Level:      10
Time taken for tests:   1.234 seconds
Complete requests:      1000
Failed requests:        0
Total transferred:      758000 bytes
HTML transferred:       621000 bytes
Requests per second:    810.60 [#/sec] (mean)
Time per request:       12.337 [ms] (mean)
Time per request:       1.234 [ms] (mean, across all concurrent requests)
Transfer rate:          600.03 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    2   2.8      1      17
Processing:     2   10   4.4     10      25
Waiting:        0    9   4.3      9      25
Total:          3   12   3.7     12      27

Percentage of the requests served within a certain time (ms)
  50%     12
  66%     13
  75%     14
  80%     15
  90%     17
  95%     19
  98%     22
  99%     23
 100%     27 (longest request)
root@Dmitri:~#
```

1 Worker

```
Server Software:        nginx/1.14.2
Server Hostname:        harkonen.it16.com
Server Port:            80

Document Path:          /
Document Length:        621 bytes

Concurrency Level:      10
Time taken for tests:   1.216 seconds
Complete requests:      1000
Failed requests:        0
Total transferred:      758000 bytes
HTML transferred:       621000 bytes
Requests per second:    822.05 [#/sec] (mean)
Time per request:       12.165 [ms] (mean)
Time per request:       1.216 [ms] (mean, across all concurrent requests)
Transfer rate:          608.51 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    3   3.1      2      19
Processing:     1    9   4.0      8      24
Waiting:        0    9   4.0      8      24
Total:          3   12   3.4     11      29

Percentage of the requests served within a certain time (ms)
  50%     11
  66%     13
  75%     14
  80%     15
  90%     17
  95%     18
  98%     20
  99%     21
 100%     29 (longest request)
root@Dmitri:~#
```

Kesimpulannya adalah penggunaan 1 worker saja lebih cepat daripada menggunakan 3 worker, namun untuk penggunaan yang efisien dapat dilihat dari penggunaan 2 worker.

soal 19

- Default

```
1    echo '[www]
2    user = www-data
3    group = www-data
4    listen = /run/php/php8.0-fpm.sock
5    listen.owner = www-data
6    listen.group = www-data
7    php_admin_value[disable_functions] = exec,passthru,shell_exec,system
8    php_admin_flag[allow_url_fopen] = off
9
10   pm = dynamic
11   pm.max_children = 5
12   pm.start_servers = 2
13   pm.min_spare_servers = 1
14   pm.max_spare_servers = 3' > /etc/php/8.0/fpm/pool.d/www.conf
15
16   service php8.0-fpm restart
17   service nginx restart
```

- Test 1

```
root@Leto:~# cat test1.sh
echo '[www]
user = www-data
group = www-data
listen = /run/php/php8.0-fpm.sock
listen.owner = www-data
listen.group = www-data
php_admin_value[disable_functions] = exec,passthru,shell_exec,system
php_admin_flag[allow_url_fopen] = off

pm = dynamic
pm.max_children = 10
pm.start_servers = 4
pm.min_spare_servers = 2
pm.max_spare_servers = 6' > /etc/php/8.0/fpm/pool.d/www.conf

service php8.0-fpm restart
service nginx restart
```

- Test 2

```
root@Leto:~# cat test2.sh
echo '[www]
user = www-data
group = www-data
listen = /run/php/php8.0-fpm.sock
listen.owner = www-data
listen.group = www-data
php_admin_value[disable_functions] = exec,passthru,shell_exec,system
php_admin_flag[allow_url_fopen] = off

pm = dynamic
pm.max_children = 20
pm.start_servers = 8
pm.min_spare_servers = 4
pm.max_spare_servers = 12' > /etc/php/8.0/fpm/pool.d/www.conf

service php8.0-fpm restart
service nginx restart
```

- Test 3

```
root@Leto:~# cat test3.sh
echo '[www]
user = www-data
group = www-data
listen = /run/php/php8.0-fpm.sock
listen.owner = www-data
listen.group = www-data
php_admin_value[disable_functions] = exec,passthru,shell_exec,system
php_admin_flag[allow_url_fopen] = off

pm = dynamic
pm.max_children = 40
pm.start_servers = 16
pm.min_spare_servers = 8
pm.max_spare_servers = 24' > /etc/php/8.0/fpm/pool.d/www.conf

service php8.0-fpm restart
service nginx restart
```

Hasil Default

```
Paul
root@Paul:~# bash soal18.sh
This is ApacheBench, Version 2.3 <$Revision: 1843412 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking atreides.it16.com (be patient).....done


Server Software:        nginx/1.14.2
Server Hostname:        atreides.it16.com
Server Port:            80

Document Path:          /api/auth/login
Document Length:        169 bytes

Concurrency Level:      10
Time taken for tests:   0.050 seconds
Complete requests:      100
Failed requests:        0
Non-2xx responses:      100
Total transferred:      31900 bytes
Total body sent:        20600
HTML transferred:       16900 bytes
Requests per second:    2011.63 [#/sec] (mean)
Time per request:       4.971 [ms] (mean)
Time per request:       0.497 [ms] (mean, across all concurrent requests)
Transfer rate:          626.67 [Kbytes/sec] received
                        404.68 kb/s sent
                        1031.35 kb/s total

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    2   2.6      1      10
Processing:     1    2   2.4      1       9
Waiting:        0    2   2.2      1       9
Total:          1    5   3.5      3      18

Percentage of the requests served within a certain time (ms)
  50%      3
  66%      4
  75%      7
  80%      8
  90%     11
  95%     12
  98%     14
  99%     18
 100%     18 (longest request)
```

Hasil Test 1

```
root@Paul:~# bash soal18-19.sh
This is ApacheBench, Version 2.3 <$Revision: 1843412 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking atreides.it16.com (be patient).....done


Server Software:        nginx/1.14.2
Server Hostname:        atreides.it16.com
Server Port:            80

Document Path:          /api/auth/login
Document Length:        169 bytes

Concurrency Level:      10
Time taken for tests:   0.036 seconds
Complete requests:      100
Failed requests:        0
Non-2xx responses:      100
Total transferred:      31900 bytes
Total body sent:        20600
HTML transferred:       16900 bytes
Requests per second:    2765.64 [#/sec] (mean)
Time per request:       3.616 [ms] (mean)
Time per request:       0.362 [ms] (mean, across all concurrent requests)
Transfer rate:          861.56 [Kbytes/sec] received
                        556.37 kb/s sent
                        1417.93 kb/s total

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    2   1.1      1       5
Processing:     1    2   0.9      1       5
Waiting:        1    2   0.9      1       5
Total:          2    3   1.2      3       6
WARNING: The median and mean for the processing time are not within a normal deviation
        These results are probably not that reliable.
WARNING: The median and mean for the waiting time are not within a normal deviation
        These results are probably not that reliable.

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

Hasil Test 2

```
root@Paul:~# bash soal18-19.sh
This is ApacheBench, Version 2.3 <$Revision: 1843412 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking atreides.it16.com (be patient).....done


Server Software:        nginx/1.14.2
Server Hostname:        atreides.it16.com
Server Port:            80

Document Path:          /api/auth/login
Document Length:        169 bytes

Concurrency Level:      10
Time taken for tests:   0.022 seconds
Complete requests:      100
Failed requests:        0
Non-2xx responses:      100
Total transferred:      31900 bytes
Total body sent:        20600
HTML transferred:       16900 bytes
Requests per second:    4526.94 [#/sec] (mean)
Time per request:       2.209 [ms] (mean)
Time per request:       0.221 [ms] (mean, across all concurrent requests)
Transfer rate:          1410.25 [Kbytes/sec] received
                        910.69 kb/s sent
                        2320.94 kb/s total

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    1   0.8      1       4
Processing:     0    1   0.6      1       4
Waiting:        0    1   0.6      1       4
Total:          1    2   1.0      2       5

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

Hasil Test 3

```
root@Paul:~# bash soal18-19.sh
This is ApacheBench, Version 2.3 <$Revision: 1843412 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking atreides.it16.com (be patient).....done


Server Software:        nginx/1.14.2
Server Hostname:        atreides.it16.com
Server Port:            80

Document Path:          /api/auth/login
Document Length:        169 bytes

Concurrency Level:      10
Time taken for tests:   0.042 seconds
Complete requests:      100
Failed requests:        0
Non-2xx responses:      100
Total transferred:      31900 bytes
Total body sent:        20600
HTML transferred:       16900 bytes
Requests per second:    2363.40 [#/sec] (mean)
Time per request:       4.231 [ms] (mean)
Time per request:       0.423 [ms] (mean, across all concurrent requests)
Transfer rate:          736.25 [Kbytes/sec] received
                        475.45 kb/s sent
                        1211.70 kb/s total

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    1   0.8      1       6
Processing:     1    2   1.9      2       7
Waiting:        0    2   1.8      2       7
Total:          1    4   2.2      3       8

Percentage of the requests served within a certain time (ms)
  50%      3
  66%      3
  75%      4
  80%      7
  90%      8
  95%      8
  98%      8
  99%      8
 100%      8 (longest request)
```

Analisis
- keadaaan default time taken = 0.050
- keadaaan test1 time taken = 0.036
- keadaaan test2 time taken = 0.022
- keadaaan test3 time taken = 0.042

Dari hasil uji coba dapat disimpulkan bahwa meningkatkan pm dapat meningkatkan efektifitas, namun ketika test3 time taken sedikit meningkat, menunjukkan bahwa terlalu banyak meningkatkan pm bisa menimbulkan overhead manajemen proses yang lebih tinggi atau resource contention, sehingga performa tidak selalu linear meningkat. Oleh karena itu, penting untuk menemukan pengaturan pm yang optimal.