

Perbandingan Performa HTTP Server menggunakan Apache Benchmark

A. Perbandingan tanpa menggunakan Load Balancer

Pada perbandingan yang dilakukan, digunakan 3 macam banyak request dan 3 macam konkurensi. Request yang dibandingkan adalah 10, 200 dan 1000 request. Sedangkan konkurensi yang dibandingkan adalah konkurensi 1,3 dan 5

Asynchronus HTTP Server

1. Konkurensi 1

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     1
Time taken for tests:  0.361 seconds
Complete requests:     1000
Failed requests:        0
Non-2xx responses:     1000
Total transferred:     99000 bytes
HTML transferred:      0 bytes
Requests per second:   2766.67 [#/sec] (mean)
Time per request:      0.361 [ms] (mean)
Time per request:      0.361 [ms] (mean, across all concurrent requests)
Transfer rate:         267.48 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0    0   0.0      0    0
Processing:  0    0   0.2      0    3
Waiting:    0    0   0.1      0    2
Total:       0    0   0.2      0    3

Percentage of the requests served within a certain time (ms)
 50%    0
 66%    0
 75%    0
 80%    0
 90%    0
 95%    1
 98%    1
 99%    1
100%    3 (longest request)
chen@chen-X450CC:~/PROGJAR/pIndah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     1
Time taken for tests:  0.087 seconds
Complete requests:     200
Failed requests:        0
Non-2xx responses:     200
Total transferred:     19800 bytes
HTML transferred:      0 bytes
Requests per second:   2305.21 [#/sec] (mean)
Time per request:      0.434 [ms] (mean)
Time per request:      0.434 [ms] (mean, across all concurrent requests)
Transfer rate:         222.87 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0    0   0.0      0    0
Processing:  0    0   0.3      0    4
Waiting:    0    0   0.3      0    4
Total:       0    0   0.3      0    4

Percentage of the requests served within a certain time (ms)
 50%    0
 66%    0
 75%    0
 80%    0
 90%    0
 95%    1
 98%    1
 99%    2
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pIndah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     1
Time taken for tests:  0.003 seconds
Complete requests:     10
Failed requests:        0
Non-2xx responses:     10
Total transferred:     990 bytes
HTML transferred:      0 bytes
Requests per second:   2926.54 [#/sec] (mean)
Time per request:      0.342 [ms] (mean)
Time per request:      0.342 [ms] (mean, across all concurrent requests)
Transfer rate:         282.94 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0    0   0.0      0    0
Processing:  0    0   0.1      0    0
Waiting:    0    0   0.1      0    0
Total:       0    0   0.1      0    1

Percentage of the requests served within a certain time (ms)
 50%    0
 66%    0
 75%    0
 80%    0
 90%    1
 95%    1
 98%    1
 99%    1
100%    1 (longest request)
chen@chen-X450CC:~/PROGJAR/pIndah$
```

2. Konkurensi 3

```
Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:      0 bytes

Concurrency Level:    3
Time taken for tests: 0.003 seconds
Complete requests:    10
Failed requests:      0
Non-2xx responses:    10
Total transferred:    990 bytes
HTML transferred:     0 bytes
Requests per second: 3572.70 [#/sec] (mean)
Time per request:     0.840 [ms] (mean)
Time per request:     0.280 [ms] (mean, across all concurrent requests)
Transfer rate:        345.41 [Kbytes/sec] received
```

```
Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0      0  0.0      0      0
Processing:  0      1  0.1      1      1
Waiting:     0      1  0.1      1      1
Total:       1      1  0.1      1      1
```

Percentage of the requests served within a certain time (ms)

```
50%      1
66%      1
75%      1
80%      1
90%      1
95%      1
98%      1
99%      1
100%     1 (longest request)
```

chen@chen-X450CC:~/PROGJAR/pindah\$

```
Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:      0 bytes

Concurrency Level:    3
Time taken for tests: 0.057 seconds
Complete requests:    200
Failed requests:      0
Non-2xx responses:    200
Total transferred:    19800 bytes
HTML transferred:     0 bytes
Requests per second: 3531.07 [#/sec] (mean)
Time per request:     0.850 [ms] (mean)
Time per request:     0.283 [ms] (mean, across all concurrent requests)
Transfer rate:        341.38 [Kbytes/sec] received
```

```
Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0      0  0.0      0      0
Processing:  0      1  0.4      1      4
Waiting:     0      1  0.4      1      4
Total:       1      1  0.4      1      4
```

Percentage of the requests served within a certain time (ms)

```
50%      1
66%      1
75%      1
80%      1
90%      1
95%      1
98%      2
99%      4
100%     4 (longest request)
```

chen@chen-X450CC:~/PROGJAR/pindah\$

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:      0 bytes

Concurrency Level:    3
Time taken for tests: 0.259 seconds
Complete requests:    1000
Failed requests:      0
Non-2xx responses:    1000
Total transferred:    99000 bytes
HTML transferred:     0 bytes
Requests per second: 3862.76 [#/sec] (mean)
Time per request:     0.777 [ms] (mean)
Time per request:     0.259 [ms] (mean, across all concurrent requests)
Transfer rate:        373.45 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0      0  0.0      0      1
Processing:  0      1  0.2      1      2
Waiting:     0      1  0.2      1      2
Total:       0      1  0.2      1      2

Percentage of the requests served within a certain time (ms)
50%      1
66%      1
75%      1
80%      1
90%      1
95%      1
98%      1
99%      2
100%     2 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

3. Konkurensi 5

```
File Edit View Search Terminal Help
Server Hostname: localhost
Server Port: 8887

Document Path: /
Document Length: 0 bytes

Concurrency Level: 5
Time taken for tests: 0.006 seconds
Complete requests: 10
Failed requests: 0
Non-2xx responses: 10
Total transferred: 990 bytes
HTML transferred: 0 bytes
Requests per second: 1707.65 [#/sec] (mean)
Time per request: 2.928 [ms] (mean)
Time per request: 0.586 [ms] (mean, across all concurrent requests)
Transfer rate: 165.10 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0      0  0.1      0      0
Processing:  1      2  0.7      3      4
Waiting:    1      2  0.7      2      4
Total:      1      3  0.7      3      4
WARNING: The median and mean for the processing 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%    3
 75%    3
 80%    3
 90%    4
 95%    4
 98%    4
 99%    4
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help
Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path: /
Document Length: 0 bytes

Concurrency Level: 5
Time taken for tests: 0.060 seconds
Complete requests: 200
Failed requests: 0
Non-2xx responses: 200
Total transferred: 19800 bytes
HTML transferred: 0 bytes
Requests per second: 3337.45 [#/sec] (mean)
Time per request: 1.498 [ms] (mean)
Time per request: 0.300 [ms] (mean, across all concurrent requests)
Transfer rate: 322.66 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0      0  0.0      0      0
Processing:  1      1  0.6      1      4
Waiting:    1      1  0.6      1      4
Total:      1      1  0.6      1      5

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    2
 80%    2
 90%    2
 95%    3
 98%    4
 99%    4
100%    5 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help
Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path: /
Document Length: 0 bytes

Concurrency Level: 5
Time taken for tests: 0.249 seconds
Complete requests: 1000
Failed requests: 0
Non-2xx responses: 1000
Total transferred: 99000 bytes
HTML transferred: 0 bytes
Requests per second: 4021.77 [#/sec] (mean)
Time per request: 1.243 [ms] (mean)
Time per request: 0.249 [ms] (mean, across all concurrent requests)
Transfer rate: 388.82 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0      0  0.0      0      0
Processing:  0      1  0.2      1      3
Waiting:    0      1  0.2      1      3
Total:      1      1  0.2      1      3

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    2
 98%    2
 99%    2
100%    3 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

Syncronus HTTP Server

1. Konkurensi 1

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     1
Time taken for tests:  0.008 seconds
Complete requests:     10
Failed requests:        0
Non-2xx responses:     10
Total transferred:     990 bytes
HTML transferred:      0 bytes
Requests per second:   1247.97 [#/sec] (mean)
Time per request:      0.801 [ms] (mean)
Time per request:      0.801 [ms] (mean, across all concurrent requests)
Transfer rate:         120.65 [Kbytes/sec] received

Connection Times (ms)
      min      mean[+/-sd] median   max
Connect:    0       0   0.1      0      0
Processing:  0       1   0.3      1      1
Waiting:    0       1   0.3      1      1
Total:       0       1   0.3      1      2

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    2
 95%    2
 98%    2
 99%    2
100%    2 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     1
Time taken for tests:  0.104 seconds
Complete requests:     200
Failed requests:        0
Non-2xx responses:     200
Total transferred:     19800 bytes
HTML transferred:      0 bytes
Requests per second:   1927.82 [#/sec] (mean)
Time per request:      0.519 [ms] (mean)
Time per request:      0.519 [ms] (mean, across all concurrent requests)
Transfer rate:         186.38 [Kbytes/sec] received

Connection Times (ms)
      min      mean[+/-sd] median   max
Connect:    0       0   0.0      0      0
Processing:  0       0   0.2      0      2
Waiting:    0       0   0.2      0      2
Total:       0       0   0.2      0      2

Percentage of the requests served within a certain time (ms)
 50%    0
 66%    0
 75%    1
 80%    1
 90%    1
 95%    1
 98%    1
 99%    2
100%    2 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     1
Time taken for tests:  0.450 seconds
Complete requests:     1000
Failed requests:        0
Non-2xx responses:     1000
Total transferred:     99000 bytes
HTML transferred:      0 bytes
Requests per second:   2223.64 [#/sec] (mean)
Time per request:      0.450 [ms] (mean)
Time per request:      0.450 [ms] (mean, across all concurrent requests)
Transfer rate:         214.98 [Kbytes/sec] received

Connection Times (ms)
      min      mean[+/-sd] median   max
Connect:    0       0   0.0      0      0
Processing:  0       0   0.2      0      2
Waiting:    0       0   0.2      0      2
Total:       0       0   0.2      0      2

Percentage of the requests served within a certain time (ms)
 50%    0
 66%    0
 75%    0
 80%    0
 90%    1
 95%    1
 98%    1
 99%    1
100%    2 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```


2. Konkurensi 3

```
File Edit View Search Terminal Help
Document Length: 0 bytes

Concurrency Level: 3
Time taken for tests: 0.008 seconds
Complete requests: 10
Failed requests: 0
Non-2xx responses: 0
Total transferred: 990 bytes
HTML transferred: 0 bytes
Requests per second: 1207.29 [#/sec] (mean)
Time per request: 2.485 [ms] (mean)
Time per request: 0.828 [ms] (mean, across all concurrent requests)
Transfer rate: 116.72 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0     0  0.1      0     0
Processing:  1     2  1.0      1     4
Waiting:    1     2  1.0      1     4
Total:      1     2  1.0      1     4
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.
WARNING: The median and mean for the total 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%    1
 66%    2
 75%    2
 80%    2
 90%    4
 95%    4
 98%    4
 99%    4
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:      0 bytes

Concurrency Level:    3
Time taken for tests: 0.096 seconds
Complete requests:    200
Failed requests:      0
Non-2xx responses:    200
Total transferred:    19800 bytes
HTML transferred:     0 bytes
Requests per second:  2082.25 [#/sec] (mean)
Time per request:     1.441 [ms] (mean)
Time per request:     0.480 [ms] (mean, across all concurrent requests)
Transfer rate:        201.31 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0     0  0.0      0     0
Processing:  0     1  0.7      1     5
Waiting:    0     1  0.7      1     5
Total:      1     1  0.7      1     5

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    2
 95%    3
 98%    4
 99%    5
100%    5 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:      0 bytes

Concurrency Level:    3
Time taken for tests: 0.434 seconds
Complete requests:    1000
Failed requests:      0
Non-2xx responses:    1000
Total transferred:    99000 bytes
HTML transferred:     0 bytes
Requests per second:  2305.16 [#/sec] (mean)
Time per request:     1.301 [ms] (mean)
Time per request:     0.434 [ms] (mean, across all concurrent requests)
Transfer rate:        222.86 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:    0     0  0.0      0     0
Processing:  0     1  0.3      1     3
Waiting:    0     1  0.3      1     3
Total:      0     1  0.3      1     4

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    1
 98%    2
 99%    2
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

3. Konkurensi 5

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     5
Time taken for tests:  0.006 seconds
Complete requests:     10
Failed requests:       0
Non-2xx responses:    10
Total transferred:     990 bytes
HTML transferred:      0 bytes
Requests per second:   1552.80 [#/sec] (mean)
Time per request:      3.220 [ms] (mean)
Time per request:      0.644 [ms] (mean, across all concurrent requests)
Transfer rate:         150.12 [Kbytes/sec] received

Connection Times (ms)
  min  mean[+/-sd] median   max
Connect:    0    0  0.1    0    0
Processing:  1    2  0.5    2    3
Waiting:    1    2  0.5    2    3
Total:       1    2  0.5    2    3

Percentage of the requests served within a certain time (ms)
 50%    2
 66%    2
 75%    2
 80%    2
 90%    3
 95%    3
 98%    3
 99%    3
100%    3 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     5
Time taken for tests:  0.098 seconds
Complete requests:     200
Failed requests:       0
Non-2xx responses:    200
Total transferred:     19800 bytes
HTML transferred:      0 bytes
Requests per second:   2047.33 [#/sec] (mean)
Time per request:      2.442 [ms] (mean)
Time per request:      0.488 [ms] (mean, across all concurrent requests)
Transfer rate:         197.94 [Kbytes/sec] received

Connection Times (ms)
  min  mean[+/-sd] median   max
Connect:    0    0  0.0    0    0
Processing:  0    1  0.5    1    4
Waiting:    0    1  0.5    1    4
Total:       0    1  0.5    1    4

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    2
 98%    2
 99%    4
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     5
Time taken for tests:  0.433 seconds
Complete requests:     1000
Failed requests:       0
Non-2xx responses:    1000
Total transferred:     99000 bytes
HTML transferred:      0 bytes
Requests per second:   2311.57 [#/sec] (mean)
Time per request:      2.163 [ms] (mean)
Time per request:      0.433 [ms] (mean, across all concurrent requests)
Transfer rate:         223.48 [Kbytes/sec] received

Connection Times (ms)
  min  mean[+/-sd] median   max
Connect:    0    0  0.0    0    0
Processing:  0    1  0.4    1    4
Waiting:    0    1  0.4    1    4
Total:       0    1  0.4    1    4

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    2
 98%    2
 99%    3
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

B. Perbandingan dengan menggunakan Load Balancing.

Pada perbandingan performa untuk bagian ini, HTTP Server akan menggunakan load balancing yang digunakan untuk membagi beban server terhadap request sama banyak, sehingga waktu yang diperlukan untuk menangani request semakin cepat.

Asynchronous HTTP Server

1. Konkurensi 1

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     1
Time taken for tests:  0.006 seconds
Complete requests:     10
Failed requests:        0
Non-2xx responses:     10
Total transferred:     990 bytes
HTML transferred:      0 bytes
Requests per second:   1671.96 [#/sec] (mean)
Time per request:      0.598 [ms] (mean)
Time per request:      0.598 [ms] (mean, across all concurrent requests)
Transfer rate:         161.64 [Kbytes/sec] received

Connection Times (ms)
  min  mean[+/-sd] median  max
Connect:    0    0  0.0   0    0
Processing:  0    0  0.2   0    1
Waiting:    0    0  0.2   0    1
Total:      0    1  0.2   1    1

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    1
 98%    1
 99%    1
100%    1 (longest request)
chen@chen-X450CC:~/PROGJAR/plndah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     1
Time taken for tests:  0.071 seconds
Complete requests:     200
Failed requests:        0
Non-2xx responses:     200
Total transferred:     19800 bytes
HTML transferred:      0 bytes
Requests per second:   2803.04 [#/sec] (mean)
Time per request:      0.357 [ms] (mean)
Time per request:      0.357 [ms] (mean, across all concurrent requests)
Transfer rate:         271.00 [Kbytes/sec] received

Connection Times (ms)
  min  mean[+/-sd] median  max
Connect:    0    0  0.0   0    0
Processing:  0    0  0.2   0    2
Waiting:    0    0  0.2   0    2
Total:      0    0  0.2   0    2

Percentage of the requests served within a certain time (ms)
 50%    0
 66%    0
 75%    0
 80%    0
 90%    0
 95%    1
 98%    1
 99%    1
100%    2 (longest request)
chen@chen-X450CC:~/PROGJAR/plndah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     1
Time taken for tests:  0.322 seconds
Complete requests:     1000
Failed requests:        0
Non-2xx responses:     1000
Total transferred:     99000 bytes
HTML transferred:      0 bytes
Requests per second:   3105.16 [#/sec] (mean)
Time per request:      0.322 [ms] (mean)
Time per request:      0.322 [ms] (mean, across all concurrent requests)
Transfer rate:         300.21 [Kbytes/sec] received

Connection Times (ms)
  min  mean[+/-sd] median  max
Connect:    0    0  0.0   0    0
Processing:  0    0  0.1   0    2
Waiting:    0    0  0.1   0    2
Total:      0    0  0.1   0    2

Percentage of the requests served within a certain time (ms)
 50%    0
 66%    0
 75%    0
 80%    0
 90%    0
 95%    0
 98%    1
 99%    1
100%    2 (longest request)
chen@chen-X450CC:~/PROGJAR/plndah$
```

2. Konkurensi 3

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     3
Time taken for tests:  0.005 seconds
Complete requests:     10
Failed requests:        0
Non-2xx responses:     10
Total transferred:     990 bytes
HTML transferred:      0 bytes
Requests per second:   1917.18 [#/sec] (mean)
Time per request:      1.565 [ms] (mean)
Time per request:      0.522 [ms] (mean, across all concurrent requests)
Transfer rate:         185.35 [Kbytes/sec] received

Connection Times (ms)
  min  mean[+/-sd] median  max
Connect:    0      0  0.0      0      0
Processing:  1      1  0.3      1      2
Waiting:    1      1  0.3      1      2
Total:      1      1  0.3      1      2

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    2
 75%    2
 80%    2
 90%    2
 95%    2
 98%    2
 99%    2
100%    2 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     3
Time taken for tests:  0.235 seconds
Complete requests:     1000
Failed requests:        0
Non-2xx responses:     1000
Total transferred:     99000 bytes
HTML transferred:      0 bytes
Requests per second:   4246.77 [#/sec] (mean)
Time per request:      0.706 [ms] (mean)
Time per request:      0.235 [ms] (mean, across all concurrent requests)
Transfer rate:         410.58 [Kbytes/sec] received

Connection Times (ms)
  min  mean[+/-sd] median  max
Connect:    0      0  0.0      0      0
Processing:  0      1  0.2      1      2
Waiting:    0      1  0.2      1      2
Total:      0      1  0.2      1      2

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    1
 98%    1
 99%    2
100%    2 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     3
Time taken for tests:  0.056 seconds
Complete requests:     200
Failed requests:        0
Non-2xx responses:     200
Total transferred:     19800 bytes
HTML transferred:      0 bytes
Requests per second:   3555.11 [#/sec] (mean)
Time per request:      0.844 [ms] (mean)
Time per request:      0.281 [ms] (mean, across all concurrent requests)
Transfer rate:         343.71 [Kbytes/sec] received

Connection Times (ms)
  min  mean[+/-sd] median  max
Connect:    0      0  0.0      0      0
Processing:  0      1  0.2      1      2
Waiting:    0      1  0.2      1      2
Total:      1      1  0.3      1      2

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    1
 98%    2
 99%    2
100%    2 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```


3. Konkurensi 5

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     5
Time taken for tests:  0.004 seconds
Complete requests:     10
Failed requests:       0
Non-2xx responses:    10
Total transferred:     990 bytes
HTML transferred:      0 bytes
Requests per second:   2357.38 [#/sec] (mean)
Time per request:      2.121 [ms] (mean)
Time per request:      0.424 [ms] (mean, across all concurrent requests)
Transfer rate:         227.91 [Kbytes/sec] received

Connection Times (ms)
      min      mean[+/-sd] median   max
Connect:    0       0   0.1      0      0
Processing:  1       2   0.6      2      3
Waiting:    1       2   0.6      2      3
Total:       1       2   0.6      2      3

Percentage of the requests served within a certain time (ms)
 50%    2
 66%    2
 75%    2
 80%    3
 90%    3
 95%    3
 98%    3
 99%    3
100%    3 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     5
Time taken for tests:  0.056 seconds
Complete requests:     200
Failed requests:       0
Non-2xx responses:    200
Total transferred:    19800 bytes
HTML transferred:      0 bytes
Requests per second:   3542.52 [#/sec] (mean)
Time per request:      1.411 [ms] (mean)
Time per request:      0.282 [ms] (mean, across all concurrent requests)
Transfer rate:         342.49 [Kbytes/sec] received

Connection Times (ms)
      min      mean[+/-sd] median   max
Connect:    0       0   0.0      0      0
Processing:  1       1   0.4      1      3
Waiting:    1       1   0.4      1      3
Total:       1       1   0.4      1      4

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    2
 90%    2
 95%    2
 98%    3
 99%    3
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8887

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     5
Time taken for tests:  0.233 seconds
Complete requests:     1000
Failed requests:       0
Non-2xx responses:    1000
Total transferred:    99000 bytes
HTML transferred:      0 bytes
Requests per second:   4283.37 [#/sec] (mean)
Time per request:      1.167 [ms] (mean)
Time per request:      0.233 [ms] (mean, across all concurrent requests)
Transfer rate:         414.11 [Kbytes/sec] received

Connection Times (ms)
      min      mean[+/-sd] median   max
Connect:    0       0   0.0      0      0
Processing:  1       1   0.4      1      4
Waiting:    1       1   0.4      1      4
Total:       1       1   0.4      1      4

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    1
 98%    2
 99%    3
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

Syncronus HTTP Server

1. Konkurensi 1

```
File Edit View Search Terminal Help
Server Software:      myserver/1.0
Server Hostname:     localhost
Server Port:         8889

Document Path:       /
Document Length:     0 bytes

Concurrency Level:    1
Time taken for tests: 0.006 seconds
Complete requests:    10
Failed requests:      0
Non-2xx responses:    10
Total transferred:    990 bytes
HTML transferred:     0 bytes
Requests per second: 1538.70 [#/sec] (mean)
Time per request:     0.650 [ms] (mean)
Time per request:     0.650 [ms] (mean, across all concurrent requests)
Transfer rate:        148.76 [Kbytes/sec] received

Connection Times (ms)
      min      mean[+/-sd] median   max
Connect:    0      0   0.0      0      0
Processing: 0      1   0.2      1      1
Waiting:    0      1   0.2      0      1
Total:      0      1   0.3      1      1
ERROR: The median and mean for the waiting time are more than twice the standard
deviation apart. These results are NOT reliable.

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    1
 98%    1
 99%    1
 99%    1
100%    1 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help
Server Software:      myserver/1.0
Server Hostname:     localhost
Server Port:         8889

Document Path:       /
Document Length:     0 bytes

Concurrency Level:    1
Time taken for tests: 0.422 seconds
Complete requests:    1000
Failed requests:      0
Non-2xx responses:    1000
Total transferred:    99000 bytes
HTML transferred:     0 bytes
Requests per second: 2369.83 [#/sec] (mean)
Time per request:     0.422 [ms] (mean)
Time per request:     0.422 [ms] (mean, across all concurrent requests)
Transfer rate:        229.11 [Kbytes/sec] received

Connection Times (ms)
      min      mean[+/-sd] median   max
Connect:    0      0   0.0      0      1
Processing: 0      0   0.1      0      2
Waiting:    0      0   0.1      0      2
Total:      0      0   0.1      0      2

Percentage of the requests served within a certain time (ms)
 50%    0
 66%    0
 75%    0
 80%    0
 90%    0
 95%    1
 98%    1
 99%    1
100%    2 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help
Server Software:      myserver/1.0
Server Hostname:     localhost
Server Port:         8889

Document Path:       /
Document Length:     0 bytes

Concurrency Level:    1
Time taken for tests: 0.094 seconds
Complete requests:    200
Failed requests:      0
Non-2xx responses:    200
Total transferred:    19900 bytes
HTML transferred:     0 bytes
Requests per second: 2134.38 [#/sec] (mean)
Time per request:     0.469 [ms] (mean)
Time per request:     0.469 [ms] (mean, across all concurrent requests)
Transfer rate:        206.35 [Kbytes/sec] received

Connection Times (ms)
      min      mean[+/-sd] median   max
Connect:    0      0   0.0      0      0
Processing: 0      0   0.2      0      3
Waiting:    0      0   0.2      0      2
Total:      0      0   0.3      0      3

Percentage of the requests served within a certain time (ms)
 50%    0
 66%    0
 75%    0
 80%    0
 90%    1
 95%    1
 98%    1
 99%    2
100%    3 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

2. Konkurensi 3

```
File Edit View Search Terminal Help
Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     3
Time taken for tests:  0.006 seconds
Complete requests:     10
Failed requests:        0
Non-2xx responses:     10
Total transferred:     990 bytes
HTML transferred:      0 bytes
Requests per second:   1572.57 [#/sec] (mean)
Time per request:      1.908 [ms] (mean)
Time per request:      0.636 [ms] (mean, across all concurrent requests)
Transfer rate:         152.04 [Kbytes/sec] received

Connection Times (ms)
      min    mean[+/-sd] median   max
Connect:    0      0  0.0      0      0
Processing:  1      1  0.6      1      2
Waiting:    1      1  0.6      1      2
Total:       1      1  0.6      2      2
WARNING: The median and mean for the total 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%    2
 66%    2
 75%    2
 80%    2
 90%    2
 95%    2
 98%    2
 99%    2
100%    2 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help
Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     3
Time taken for tests:  0.091 seconds
Complete requests:     200
Failed requests:        0
Non-2xx responses:     200
Total transferred:     19800 bytes
HTML transferred:      0 bytes
Requests per second:   2203.15 [#/sec] (mean)
Time per request:      1.362 [ms] (mean)
Time per request:      0.454 [ms] (mean, across all concurrent requests)
Transfer rate:         213.00 [Kbytes/sec] received

Connection Times (ms)
      min    mean[+/-sd] median   max
Connect:    0      0  0.0      0      0
Processing:  0      1  0.6      1      4
Waiting:    0      1  0.5      1      3
Total:       0      1  0.6      1      4

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    2
 95%    2
 98%    3
 99%    4
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

```
File Edit View Search Terminal Help
Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:       0 bytes

Concurrency Level:     3
Time taken for tests:  0.437 seconds
Complete requests:     1000
Failed requests:        0
Non-2xx responses:     1000
Total transferred:     99000 bytes
HTML transferred:      0 bytes
Requests per second:   2288.78 [#/sec] (mean)
Time per request:      1.311 [ms] (mean)
Time per request:      0.437 [ms] (mean, across all concurrent requests)
Transfer rate:         221.28 [Kbytes/sec] received

Connection Times (ms)
      min    mean[+/-sd] median   max
Connect:    0      0  0.0      0      0
Processing:  0      1  0.3      1      3
Waiting:    0      1  0.3      1      3
Total:       0      1  0.3      1      3

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    2
 98%    2
 99%    2
100%    3 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$
```

3. Konkurensi 5

```

File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:      0 bytes

Concurrency Level:    5
Time taken for tests: 0.008 seconds
Complete requests:    10
Failed requests:      0
Non-2xx responses:    10
Total transferred:    990 bytes
HTML transferred:     0 bytes
Requests per second:  1300.73 [#/sec] (mean)
Time per request:     3.821 [ms] (mean)
Time per request:     0.764 [ms] (mean, across all concurrent requests)
Transfer rate:        126.53 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:  0    0  0.0      0    0
Processing: 1  2  0.9      2    4
Waiting:   1  2  0.9      2    4
Total:     1  2  0.9      2    4

Percentage of the requests served within a certain time (ms)
 50%    2
 66%    3
 75%    3
 80%    3
 90%    4
 95%    4
 98%    4
 99%    4
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$

```

```

File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:      0 bytes

Concurrency Level:    5
Time taken for tests: 0.095 seconds
Complete requests:    200
Failed requests:      0
Non-2xx responses:    200
Total transferred:    19800 bytes
HTML transferred:     0 bytes
Requests per second:  2109.68 [#/sec] (mean)
Time per request:     2.370 [ms] (mean)
Time per request:     0.474 [ms] (mean, across all concurrent requests)
Transfer rate:        203.96 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:  0    0  0.0      0    0
Processing: 0  1  0.5      1    4
Waiting:   0  1  0.5      1    3
Total:     0  1  0.5      1    4

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    2
 95%    2
 98%    3
 99%    3
100%    4 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$

```

```

File Edit View Search Terminal Help

Server Software:      myserver/1.0
Server Hostname:      localhost
Server Port:          8889

Document Path:        /
Document Length:      0 bytes

Concurrency Level:    5
Time taken for tests: 0.424 seconds
Complete requests:    1000
Failed requests:      0
Non-2xx responses:    1000
Total transferred:    99000 bytes
HTML transferred:     0 bytes
Requests per second:  2350.90 [#/sec] (mean)
Time per request:     2.120 [ms] (mean)
Time per request:     0.424 [ms] (mean, across all concurrent requests)
Transfer rate:        228.06 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median  max
Connect:  0    0  0.0      0    0
Processing: 0  1  0.3      1    3
Waiting:   0  1  0.3      1    3
Total:     0  1  0.3      1    3

Percentage of the requests served within a certain time (ms)
 50%    1
 66%    1
 75%    1
 80%    1
 90%    1
 95%    2
 98%    2
 99%    2
100%    3 (longest request)
chen@chen-X450CC:~/PROGJAR/pindah$

```

C. Hasil

Time	Asynchronous			Synchronous			LB Asynchronous			LB Synchronous		
	k = 1	k = 3	k = 5	k = 1	k = 3	k = 5	k = 1	k = 3	k = 5	k = 1	k = 3	k = 5
n = 10	0.03	0.03	0.006	0.008	0.008	0.006	0.006	0.05	0.004	0.006	0.006	0.008
n = 200	0.087	0.057	0.06	0.104	0.096	0.098	0.071	0.056	0.056	0.094	0.091	0.095
n = 1000	0.361	0.259	0.249	0.405	0.434	0.433	0.322	0.235	0.233	0.422	0.437	0.424

Tabel diatas merupakan waktu yang diperlukan untuk merespon server dengan jumlah request dan konkurensi yang berbeda-beda. Dari tabel diatas dapat dilihat bahwa semakin banyak request yang dikirimkan, maka waktu yang diperlukan server untuk merespon akan semakin lama. Selain itu waktu yang diperlukan oleh server Asynchronous untuk merespon jauh lebih cepat dibandingkan dengan waktu respon server Synchronous.

Load Balancer, digunakan agar beban server dalam menangani request dibagi agar server menjadi lebih cepat dalam merespon request. Dari tabel diatas, dapat dilihat bahwa penggunaan Load Balancer pada server Asynchronous, membuat waktu yang diperlukan untuk merespon request menjadi lebih cepat. Hal ini terutama sangat terlihat jelas dengan penggunaan konkurensi yang lebih besar, perbedaan waktu yang diperlukan terlihat signifikan.

Sedangkan pada server Synchronous, waktu yang diperlukan untuk merespon request cenderung stabil berapapun konkurensi yang digunakan dan berapapun request yang dikirimkan.