

# Business Requirement [C]

## BR [C].1

---

- To begin with, I created a new t2.xlarge VM for load balancing, named "Load-Balancer".
- I installed Apache from source (see resources/setup-balancer.sh):

```
sudo su
```

```
apt-get update
```

```
apt-get -y install build-essential libpcre3-dev libxml2-dev libtool-bin  
unzip
```

```
mkdir -p /etc/apache2/schyndel/server_root/sources/  
cd /etc/apache2/schyndel/server_root/sources/
```

```
wget http://apache.mirror.amaze.com.au//apr/apr-1.5.2.tar.gz
```

```
gzip -d apr-1.5.2.tar.gz
```

```
tar -xvf apr-1.5.2.tar
```

```
cd apr-1.5.2
```

```
./configure
```

```
make
```

```
make install
```

```
cd ..
```

```
wget http://apache.mirror.amaze.com.au//apr/apr-util-1.5.4.tar.gz
```

```
gzip -d apr-util-1.5.4.tar.gz
```

```
tar -xvf apr-util-1.5.4.tar
```

```
cd apr-util-1.5.4
```

```
./configure --with-apr=/usr/local/apr/bin/apr-1-config
```

```
make
```

```
make install
```

```
cd ..
```

```
wget http://apache.mirror.serversaustralia.com.au//httpd/httpd-  
2.4.25.tar.gz
```

```
gzip -d httpd-2.4.25.tar.gz
```

```
tar -xvf httpd-2.4.25.tar
```

```
cd httpd-2.4.25
```

```
./configure --prefix=/etc/apache2/schyndel/server_root --with-
```

```
mpm=event --enable-proxy --enable-proxy-http --enable-so --with-  
port=80
```

```
make
```

```
make install
```

```
sed -i '/exit 0/d' /etc/rc.local
```

```
echo "/etc/apache2/schyndel/server_root/bin/apachectl -k start || exit  
1" >> /etc/rc.local  
echo "exit 0" >> /etc/rc.local
```

```
bin/apachectl -k start
```

- Add the following config to /etc/apache2/schyndel/server\_root/conf/httpd.conf to setup load balancing

```
LoadModule proxy_module modules/mod_proxy.so  
LoadModule proxy_connect_module modules/mod_proxy_connect.so  
LoadModule proxy_http_module modules/mod_proxy_http.so  
LoadModule proxy_fcgi_module modules/mod_proxy_fcgi.so  
LoadModule proxy_scgi_module modules/mod_proxy_scgi.so  
LoadModule proxy_fdpass_module modules/mod_proxy_fdpass.so  
LoadModule proxy_wstunnel_module modules/mod_proxy_wstunnel.so  
LoadModule proxy_ajp_module modules/mod_proxy_ajp.so  
LoadModule proxy_balancer_module modules/mod_proxy_balancer.so  
LoadModule proxy_express_module modules/mod_proxy_express.so  
LoadModule proxy_hcheck_module modules/mod_proxy_hcheck.so  
LoadModule lbmethod_byrequests_module  
modules/mod_lbmethod_byrequests.so  
LoadModule slotmem_shm_module modules/mod_slotmem_shm.so  
LoadModule watchdog_module modules/mod_watchdog.so
```

```
ProxyRequests Off
```

```
<Proxy balancer://mycluster>  
    # Web Server A  
    BalancerMember http://13.55.244.171:8080/ loadfactor=13  
  
    # Web Server B  
    BalancerMember http://54.79.71.135:8050/ loadfactor=87
```

```
    ProxySet lbmethod=byrequests  
</Proxy>
```

```
<VirtualHost *:*>  
    ProxyPass / balancer://mycluster/  
</VirtualHost>
```

- Optionally, per being allowed by the cloud engineer, I could have installed Apache using a package manager.

```
sudo apt-get update && sudo apt-get -y install apache2
```

## **BR [C].2**

---

- The final loadfactors used were:
  - Web-Server-A: loadfactor=25
  - Web-Server-B: loadfactor=75
- My reasons for choosing this are highlighted in BR [C].3 below.

## **BR [C].3**

---

To deduce the viability of the loadfactor I will be using the time taken for the tests as a metric.

### **INITIAL LOAD TESTS RUN BASED OFF LOADFACTOR SETUP IN BR [C].3**

**Here the loadfactors chosen were :**

- Web-Server-A: 13
- Web-Server-B: 87

**I next tested the /load/io.php script (this script was run 3 times)**

ab -c 10 -n 150 -k <http://13.55.183.243:80/load/io.php>

## Test one

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 150 -k http://13.55.183.243:80/load/io.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 13.55.183.243 (be patient).....done


Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/io.php
Document Length:      3189 bytes

Concurrency Level:    10
Time taken for tests:  175.353 seconds
Complete requests:     150
Failed requests:       119
  (Connect: 0, Receive: 0, Length: 119, Exceptions: 0)
Keep-Alive requests:   149
Total transferred:     512056 bytes
HTML transferred:     472242 bytes
Requests per second:   0.86 [#/sec] (mean)
Time per request:      11690.202 [ms] (mean)
Time per request:      1169.020 [ms] (mean, across all concurrent requests)
Transfer rate:         2.85 [Kbytes/sec] received


Connection Times (ms)
              min      mean[+/-sd] median   max
Connect:        0        0   0.2      0      1
Processing:    1572    11554 3894.8   13169   13474
Waiting:       1572    11607 3858.5   13169   13474
Total:         1572    11554 3894.8   13169   13474


Percentage of the requests served within a certain time (ms)
 50%    13169
 66%    13241
 75%    13271
 80%    13293
 90%    13369
 95%    13414
 98%    13462
 99%    13466
100%    13474 (longest request)
ubuntu@ip-172-31-30-233:~$
```

## Test 2

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 150 -k http://13.55.183.243:80/load/io.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 13.55.183.243 (be patient).....done


Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/io.php
Document Length:      3189 bytes

Concurrency Level:    10
Time taken for tests:  179.451 seconds
Complete requests:    150
Failed requests:      123
    (Connect: 0, Receive: 0, Length: 123, Exceptions: 0)
Keep-Alive requests:  150
Total transferred:    518554 bytes
HTML transferred:     478473 bytes
Requests per second:  0.84 [#/sec] (mean)
Time per request:     11963.418 [ms] (mean)
Time per request:     1196.342 [ms] (mean, across all concurrent requests)
Transfer rate:        2.82 [Kbytes/sec] received

Connection Times (ms)
              min    mean[+/-sd] median    max
Connect:        0      0   0.1      0      1
Processing:   1585  11859 4044.8   13187  16771
Waiting:       1585  11859 4044.8   13187  16771
Total:         1585  11859 4044.8   13187  16772

Percentage of the requests served within a certain time (ms)
 50%   13187
 66%   13251
 75%   13285
 80%   13323
 90%   13478
 95%   16555
 98%   16658
 99%   16734
100%   16772 (longest request)
ubuntu@ip-172-31-30-233:~$
```

### Test 3

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 150 -k http://13.55.183.243:80/load/io.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 13.55.183.243 (be patient).....done


Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/io.php
Document Length:      3189 bytes

Concurrency Level:    10
Time taken for tests:  175.179 seconds
Complete requests:    150
Failed requests:      116
    (Connect: 0, Receive: 0, Length: 116, Exceptions: 0)
Keep-Alive requests:  150
Total transferred:    518545 bytes
HTML transferred:     478464 bytes
Requests per second:  0.86 [#/sec] (mean)
Time per request:     11678.588 [ms] (mean)
Time per request:     1167.859 [ms] (mean, across all concurrent requests)
Transfer rate:        2.89 [Kbytes/sec] received


Connection Times (ms)
              min    mean[+/-sd] median    max
Connect:        0      0    0.2      0      1
Processing:    1583  11570 3777.7   13080  13549
Waiting:       1583  11570 3777.7   13080  13549
Total:         1583  11570 3777.7   13080  13549


Percentage of the requests served within a certain time (ms)
 50%   13080
 66%   13180
 75%   13236
 80%   13247
 90%   13309
 95%   13363
 98%   13430
 99%   13431
100%  13549 (longest request)
ubuntu@ip-172-31-30-233:~$
```

**I next tested the /load/cpu.php script (this script was also run 3 times)**

ab -c 10 -n 200 -k <http://13.55.183.243:80/load/cpu.php>

## Test 1

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 200 -k http://13.55.183.243:80/load/cpu.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 13.55.183.243 (be patient)
^FforceCompleted 100 requests
Completed 200 requests
Finished 200 requests

Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/cpu.php
Document Length:      3187 bytes

Concurrency Level:     10
Time taken for tests:   171.693 seconds
Complete requests:     200
Failed requests:        179
  (Connect: 0, Receive: 0, Length: 179, Exceptions: 0)
Keep-Alive requests:    200
Total transferred:      669790 bytes
HTML transferred:      616353 bytes
Requests per second:    1.16 [#/sec] (mean)
Time per request:       8584.670 [ms] (mean)
Time per request:       858.467 [ms] (mean, across all concurrent requests)
Transfer rate:          3.81 [Kbytes/sec] received

Connection Times (ms)
              min    mean[+/-sd] median    max
Connect:        0      0    0.1      0      1
Processing:    1998  8496 2672.0   9656   11267
Waiting:        1998  8496 2672.0   9656   11267
Total:          1998  8496 2672.0   9656   11267

Percentage of the requests served within a certain time (ms)
 50%    9656
 66%    9719
 75%    9754
 80%    9779
 90%    9841
 95%    9931
 98%   10028
 99%   10057
100%   11267 (longest request)
ubuntu@ip-172-31-30-233:~$
```

## Test 2

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 200 -k http://13.55.183.243:80/load/cpu.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
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Benchmarking 13.55.183.243 (be patient)
Completed 100 requests
Completed 200 requests
Finished 200 requests


Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/cpu.php
Document Length:      3187 bytes

Concurrency Level:    10
Time taken for tests:  172.351 seconds
Complete requests:    200
Failed requests:       181
  (Connect: 0, Receive: 0, Length: 181, Exceptions: 0)
Keep-Alive requests:  200
Total transferred:    669797 bytes
HTML transferred:     616360 bytes
Requests per second:  1.16 [#/sec] (mean)
Time per request:     8617.526 [ms] (mean)
Time per request:     861.753 [ms] (mean, across all concurrent requests)
Transfer rate:        3.80 [Kbytes/sec] received


Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    0   0.1      0      1
Processing:    1996 8520 2705.5   9704   11207
Waiting:       1996 8520 2705.5   9704   11207
Total:         1996 8520 2705.5   9704   11207


Percentage of the requests served within a certain time (ms)
 50%    9704
 66%    9763
 75%    9792
 80%    9827
 90%    9904
 95%    9954
 98%    9990
 99%   10015
100%   11207 (longest request)
ubuntu@ip-172-31-30-233:~$ █
```



### Test 3

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 200 -k http://13.55.183.243:80/load/cpu.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
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Benchmarking 13.55.183.243 (be patient)
Completed 100 requests
Completed 200 requests
Finished 200 requests


Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/cpu.php
Document Length:      3188 bytes

Concurrency Level:    10
Time taken for tests:  171.431 seconds
Complete requests:    200
Failed requests:       29
  (Connect: 0, Receive: 0, Length: 29, Exceptions: 0)
Keep-Alive requests:  200
Total transferred:    666769 bytes
HTML transferred:     613333 bytes
Requests per second:  1.17 [#/sec] (mean)
Time per request:     8571.564 [ms] (mean)
Time per request:     857.156 [ms] (mean, across all concurrent requests)
Transfer rate:        3.80 [Kbytes/sec] received


Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0    0   0.1      0      1
Processing:    1998 8510 2682.4   9656  11321
Waiting:       1998 8510 2682.4   9656  11321
Total:         1998 8510 2682.4   9656  11321


Percentage of the requests served within a certain time (ms)
 50%    9656
 66%    9736
 75%    9787
 80%    9809
 90%    9860
 95%    9910
 98%   10083
 99%   10208
100%   11321 (longest request)
ubuntu@ip-172-31-30-233:~$ █
```

**Based off the above tests, the following results were received:**

All Times Are In Seconds ..

<b>Figure</b>	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Average</b>
Time Taken for io.php	175	179	175	176.33
Time Taken for cpu.php	171	172	171	171.33
Final Number Used (just average)				<u>173.5</u>

So the result for loadfactors shown below was (**173.5**):

- Web-Server-A: 13
- Web-Server-B: 87

## **ROUND 2 LOAD TESTS RUN BASED OFF NEW LOADFACTOR**

**Here the loadfactors chosen were :**

- Web-Server-A: 25
- Web-Server-B: 75

After changing the config to reflect the new loadfactor, I restarted apache for the config to take effect.

**I next tested the /load/io.php script (this script was run 3 times)**

ab -c 10 -n 150 -k <http://13.55.183.243:80/load/io.php>

## Test One

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 150 -k http://13.55.183.243:80/load/io.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
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Benchmarking 13.55.183.243 (be patient).....done


Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/io.php
Document Length:      3189 bytes

Concurrency Level:    10
Time taken for tests:  149.024 seconds
Complete requests:    150
Failed requests:       106
  (Connect: 0, Receive: 0, Length: 106, Exceptions: 0)
Keep-Alive requests:   149
Total transferred:    515244 bytes
HTML transferred:     475258 bytes
Requests per second:  1.01 [#/sec] (mean)
Time per request:     9934.902 [ms] (mean)
Time per request:     993.490 [ms] (mean, across all concurrent requests)
Transfer rate:        3.38 [Kbytes/sec] received


Connection Times (ms)
              min   mean[+/-sd] median   max
Connect:        0     0   0.1      0      1
Processing:    1653  9789 4548.6  12326  14582
Waiting:       1653  9768 4578.4  12326  14582
Total:         1653  9789 4548.6  12326  14583


Percentage of the requests served within a certain time (ms)
 50%    12326
 66%    12426
 75%    12497
 80%    12551
 90%    12652
 95%    12856
 98%    14537
 99%    14545
100%    14583 (longest request)
ubuntu@ip-172-31-30-233:~$
```

## Test Two

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 150 -k http://13.55.183.243:80/load/io.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
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Benchmarking 13.55.183.243 (be patient).....done


Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/io.php
Document Length:      3189 bytes

Concurrency Level:    10
Time taken for tests:  148.789 seconds
Complete requests:    150
Failed requests:      109
  (Connect: 0, Receive: 0, Length: 109, Exceptions: 0)
Keep-Alive requests:  149
Total transferred:    515231 bytes
HTML transferred:     475254 bytes
Requests per second:  1.01 [#/sec] (mean)
Time per request:     9919.276 [ms] (mean)
Time per request:     991.928 [ms] (mean, across all concurrent requests)
Transfer rate:        3.38 [Kbytes/sec] received


Connection Times (ms)
              min    mean[+/-sd] median    max
Connect:        0      0   0.1      0      1
Processing:    1593  9785 4595.0  12517  12993
Waiting:       1593  9836 4583.4  12519  12993
Total:         1593  9785 4595.0  12517  12993


Percentage of the requests served within a certain time (ms)
 50%    12517
 66%    12622
 75%    12731
 80%    12752
 90%    12852
 95%    12906
 98%    12954
 99%    12959
100%    12993 (longest request)
ubuntu@ip-172-31-30-233:~$
```

## Test Three

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 150 -k http://13.55.183.243:80/load/io.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
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Benchmarking 13.55.183.243 (be patient).....done


Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/io.php
Document Length:      3188 bytes

Concurrency Level:    10
Time taken for tests:  148.503 seconds
Complete requests:    150
Failed requests:      147
  (Connect: 0, Receive: 0, Length: 147, Exceptions: 0)
Keep-Alive requests:  149
Total transferred:    515231 bytes
HTML transferred:     475254 bytes
Requests per second:  1.01 [#/sec] (mean)
Time per request:     9900.181 [ms] (mean)
Time per request:     990.018 [ms] (mean, across all concurrent requests)
Transfer rate:        3.39 [Kbytes/sec] received

Connection Times (ms)
              min    mean[+/-sd] median    max
Connect:        0      0    0.2      0      1
Processing:    1608  9741 4553.2  12368  12973
Waiting:       1608  9794 4543.9  12372  12973
Total:         1608  9741 4553.2  12368  12973

Percentage of the requests served within a certain time (ms)
 50%   12368
 66%   12490
 75%   12584
 80%   12630
 90%   12726
 95%   12784
 98%   12920
 99%   12968
100%  12973 (longest request)
ubuntu@ip-172-31-30-233:~$ █
```

**I next tested the /load/cpu.php script (this script was also run 3 times)**

ab -c 10 -n 200 -k <http://13.55.183.243:80/load/cpu.php>

## Test One

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 200 -k http://13.55.183.243:80/load/cpu.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 13.55.183.243 (be patient)
Completed 100 requests
Completed 200 requests
Finished 200 requests


Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/cpu.php
Document Length:      156 bytes

Concurrency Level:     10
Time taken for tests:   149.568 seconds
Complete requests:     200
Failed requests:        195
  (Connect: 0, Receive: 0, Length: 195, Exceptions: 0)
Keep-Alive requests:   200
Total transferred:     676085 bytes
HTML transferred:     622421 bytes
Requests per second:   1.34 [#/sec] (mean)
Time per request:      7478.412 [ms] (mean)
Time per request:      747.841 [ms] (mean, across all concurrent requests)
Transfer rate:         4.41 [Kbytes/sec] received


Connection Times (ms)
              min    mean[+/-sd] median    max
Connect:        0      0   0.1      0      1
Processing:    1995  7367 3076.3   9269   11012
Waiting:       1995  7367 3076.3   9269   11012
Total:         1995  7367 3076.3   9269   11012


Percentage of the requests served within a certain time (ms)
 50%    9269
 66%    9383
 75%    9421
 80%    9464
 90%    9556
 95%    9665
 98%    9807
 99%   10689
100%   11012 (longest request)
ubuntu@ip-172-31-30-233:~$
```

## Test Two

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 200 -k http://13.55.183.243:80/load/cpu.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 13.55.183.243 (be patient)
Completed 100 requests
Completed 200 requests
Finished 200 requests

Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/cpu.php
Document Length:      3188 bytes

Concurrency Level:    10
Time taken for tests:  150.926 seconds
Complete requests:    200
Failed requests:       26
  (Connect: 0, Receive: 0, Length: 26, Exceptions: 0)
Keep-Alive requests:  200
Total transferred:    682133 bytes
HTML transferred:     628476 bytes
Requests per second:  1.33 [#/sec] (mean)
Time per request:     7546.300 [ms] (mean)
Time per request:     754.630 [ms] (mean, across all concurrent requests)
Transfer rate:        4.41 [Kbytes/sec] received

Connection Times (ms)
              min    mean[+/-sd] median    max
Connect:        0      0    0.1      0      1
Processing:    1999  7460 3091.7   9275   11011
Waiting:       1999  7460 3091.7   9275   11011
Total:         1999  7460 3091.7   9275   11011

Percentage of the requests served within a certain time (ms)
 50%    9275
 66%    9376
 75%    9431
 80%    9476
 90%    9586
 95%    9645
 98%    9774
 99%   10866
100%   11011 (longest request)
ubuntu@ip-172-31-30-233:~$
```



## Test Three

```
ubuntu@ip-172-31-30-233:~$ ab -c 10 -n 200 -k http://13.55.183.243:80/load/cpu.php
This is ApacheBench, Version 2.3 <$Revision: 1706008 $>
Copyright 1996 Adam Twiss, Zeus Technology Ltd, http://www.zeustech.net/
Licensed to The Apache Software Foundation, http://www.apache.org/

Benchmarking 13.55.183.243 (be patient)
Completed 100 requests
Completed 200 requests
Finished 200 requests

Server Software:      Apache/2.4.25
Server Hostname:      13.55.183.243
Server Port:          80

Document Path:        /load/cpu.php
Document Length:      156 bytes

Concurrency Level:    10
Time taken for tests:  150.273 seconds
Complete requests:    200
Failed requests:      195
  (Connect: 0, Receive: 0, Length: 195, Exceptions: 0)
Keep-Alive requests:  200
Total transferred:    676078 bytes
HTML transferred:     622423 bytes
Requests per second:  1.33 [#/sec] (mean)
Time per request:     7513.665 [ms] (mean)
Time per request:     751.367 [ms] (mean, across all concurrent requests)
Transfer rate:        4.39 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        0     0   0.1      0     1
Processing:    2000  7413 3139.6   9263  10025
Waiting:       2000  7413 3139.6   9262  10025
Total:         2000  7413 3139.6   9263  10025

Percentage of the requests served within a certain time (ms)
 50%    9263
 66%    9362
 75%    9419
 80%    9449
 90%    9531
 95%    9660
 98%    9759
 99%    9786
100%   10025 (longest request)
ubuntu@ip-172-31-30-233:~$
```

**Based off the above tests, the following results were received:**

All Times Are In Seconds ..

Figure	Test 1	Test 2	Test 3	Average
Time Taken for io.php	149	149	149	149
Time Taken for cpu.php	150	151	150	150.33
Final Number Used (just average)				<u>149.66</u>

So the result for loadfactors shown below was (**149.66**):

- Web-Server-A: 25
- Web-Server-B: 75

**Final Result:**

Based on the above tests, I can deduce that the following loadfactors yield the best performance:

Web-Server-A: 25

Web-Server-B: 75

***This report was submitted by Aaron Horler for a Web Servers and Web Technologies assignment in semester two of 2017 at RMIT University.***