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Кафедра Вычислительных систем(ВС)

Лабораторная работа №2
по дисциплине «Облачные технологии»

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1. Выполнение

1.1. Установил apache2-utils

```
E: unable to locate package apache-utils
gfs@gfs-VirtualBox:~$ sudo apt-get install apache2-utils
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libapr1 libaprutil1
The following NEW packages will be installed:
  apache2-utils libapr1 libaprutil1
0 upgraded, 3 newly installed, 0 to remove and 706 not upgraded.
Need to get 259 kB of archives.
After this operation, 865 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://archive.ubuntu.com/ubuntu bionic/main amd64 libapr1 amd64 1.6.3-2 [90,9 kB]
Get:2 http://archive.ubuntu.com/ubuntu bionic/main amd64 libaprutil1 amd64 1.6.1-2 [84,4 kB]
Get:3 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 apache2-utils amd64 2.4.29-1ubuntu4.13 [83,8 kB]
Fetched 259 kB in 1s (254 kB/s)
Selecting previously unselected package libapr1:amd64.
(Reading database ... 238997 files and directories currently installed.)
Preparing to unpack .../libapr1 1.6.3-2_amd64.deb ...
Unpacking libapr1:amd64 (1.6.3-2) ...
Selecting previously unselected package libaprutil1:amd64.
Preparing to unpack .../libaprutil1 1.6.1-2_amd64.deb ...
Unpacking libaprutil1:amd64 (1.6.1-2) ...
Selecting previously unselected package apache2-utils.
Preparing to unpack .../apache2-utils 2.4.29-1ubuntu4.13_amd64.deb ...
Unpacking apache2-utils (2.4.29-1ubuntu4.13) ...
Setting up libapr1:amd64 (1.6.3-2) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
Setting up libaprutil1:amd64 (1.6.1-2) ...
Processing triggers for man-db (2.8.3-2) ...
Setting up apache2-utils (2.4.29-1ubuntu4.13) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
gfs@gfs-VirtualBox:~$
```

1.2. Посмотрел в /etc/nginx/nginx.conf предельные значения

```
gfs@gfs-VirtualBox: /etc/nginx
File Edit View Search Terminal Help
GNU nano 2.9.3 nginx.conf
user www-data;
worker_processes auto;
pid /run/nginx.pid;
include /etc/nginx/modules-enabled/*.conf;

events {
    worker_connections 768;
    # multi_accept on;
}

http {
```

Предельное значение 768.

1.3. Провел эксперименты командой `ab -n -c url`

В дальнейшем буду писать только 2 параметра команды.

Успешность эксперимента смотрел по «Failed requests».

1.3.1. `-n 20000 -c 760` — **✓ успешно**

```
fastcgi_params mime.types nginx.conf      sites-available uwsgi_params
gfs@gfs-VirtualBox:/etc/nginx$ nano conf.d
gfs@gfs-VirtualBox:/etc/nginx$ nano nginx.conf
gfs@gfs-VirtualBox:/etc/nginx$ ab -n 20000 -c 760 http://timofeev.loc:94/site15/
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 timofeev.loc (be patient)
Completed 2000 requests
Completed 4000 requests
Completed 6000 requests
Completed 8000 requests
Completed 10000 requests
Completed 12000 requests
Completed 14000 requests
Completed 16000 requests
Completed 18000 requests
Completed 20000 requests
Finished 20000 requests

Server Software:      nginx/1.14.0
Server Hostname:      timofeev.loc
Server Port:          94

Document Path:        /site15/
Document Length:      126 bytes

Concurrency Level:    760
Time taken for tests:  2.918 seconds
Complete requests:    20000
Failed requests:       0
Total transferred:    7340000 bytes
HTML transferred:     2520000 bytes
Requests per second:  6854.70 [#/sec] (mean)
Time per request:     110.873 [ms] (mean)
Time per request:     0.146 [ms] (mean, across all concurrent requests)
Transfer rate:        2456.71 [Kbytes/sec] received

Connection Times (ms)
      min   mean[+/-sd] median   max
Connect:    0    70 219.9     24   1067
Processing:  3    30  19.1     29    133
Waiting:    1    24  18.0     21    133
Total:      9   100 224.9     58   1135

Percentage of the requests served within a certain time (ms)
 50%    58
 66%    65
 75%    69
 80%    73
 90%    86
 95%   146
 98%  1095
 99%  1105
100%  1135 (longest request)
gfs@gfs-VirtualBox:/etc/nginx$
```

1.3.2. -n 20000 -c 767 — X провал

Не смотря на то, уровень конкурентности не превысил максимум, все запросы провалились. Видимо причина в том, несколько системных процессов тоже отправляли запросы.

```
gfs@gfs-VirtualBox:/etc/nginx$ ab -n 20000 -c 767 http://timofeev.loc:94/site15/
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 timofeev.loc (be patient)
```

```
Completed 2000 requests
Completed 4000 requests
Completed 6000 requests
Completed 8000 requests
Completed 10000 requests
Completed 12000 requests
Completed 14000 requests
Completed 16000 requests
Completed 18000 requests
Completed 20000 requests
Finished 20000 requests
```

```
Server Software:      timofeev.loc
Server Hostname:      94
Server Port:          94
```

```
Document Path:        /site15/
Document Length:       0 bytes
```

```
Concurrency Level:    767
Time taken for tests:  2.847 seconds
Complete requests:     20000
Failed requests:       20000
```

```
(Connect: 0, Receive: 0, Length: 19968, Exceptions: 32)
```

```
Total transferred:    7328256 bytes
HTML transferred:      2515968 bytes
Requests per second:   7024.85 [#/sec] (mean)
Time per request:      109.184 [ms] (mean)
Time per request:      0.142 [ms] (mean, across all concurrent requests)
Transfer rate:         2513.67 [Kbytes/sec] received
```

```
Connection Times (ms)
```

	min	mean[+/-sd]	median	max
Connect:	2	63 190.7	26	1059
Processing:	5	35 12.2	35	78
Waiting:	0	26 10.6	25	66
Total:	19	98 192.7	63	1119

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

50%	63
66%	69
75%	73
80%	77
90%	86
95%	98
98%	1085
99%	1097
100%	1119 (longest request)

```
gfs@gfs-VirtualBox:/etc/nginx$
```


1.3.3. —n 20000 —c 777 — **X** провал

Провал тестов, как и ожидалось, ибо превышено максимальное количество конкурентных запросов.

```
99% 1097
100% 1119 (longest request)
gfs@gfs-VirtualBox:/etc/nginx$ ab -n 20000 -c 777 http://timofeev.loc:94/site15/
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 timofeev.loc (be patient)
Completed 2000 requests
Completed 4000 requests
Completed 6000 requests
Completed 8000 requests
Completed 10000 requests
Completed 12000 requests
Completed 14000 requests
Completed 16000 requests
Completed 18000 requests
Completed 20000 requests
Finished 20000 requests

Server Software:
Server Hostname: timofeev.loc
Server Port: 94

Document Path: /site15/
Document Length: 0 bytes

Concurrency Level: 777
Time taken for tests: 3.279 seconds
Complete requests: 20000
Failed requests: 20000
  (Connect: 0, Receive: 0, Length: 19968, Exceptions: 32)
Total transferred: 7328256 bytes
HTML transferred: 2515968 bytes
Requests per second: 6099.40 [#/sec] (mean)
Time per request: 127.390 [ms] (mean)
Time per request: 0.164 [ms] (mean, across all concurrent requests)
Transfer rate: 2182.52 [Kbytes/sec] received

Connection Times (ms)
      min  mean[+/-sd] median   max
Connect:    1    80 268.3    21   3074
Processing:   3    32  32.1    27    484
Waiting:     0    25  31.1    20    476
Total:      18   112 282.0    45   3107

Percentage of the requests served within a certain time (ms)
 50%    45
 66%    56
 75%    67
 80%    75
 90%    93
 95%   1053
 98%   1110
 99%   1276
100%   3107 (longest request)
gfs@gfs-VirtualBox:/etc/nginx$
```

1.3.4. -n 30000 -c 760 — ✓ успешно

Решил на всякий случай увеличить очередь запросов при ранее успешной куркурентности.

```
98% 1251
99% 1407
100% 3112 (longest request)
gfs@gfs-VirtualBox:/etc/nginx$ ab -n 30000 -c 760 http://timofeev.loc:94/site15/
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 timofeev.loc (be patient)
Completed 3000 requests
Completed 6000 requests
Completed 9000 requests
Completed 12000 requests
Completed 15000 requests
Completed 18000 requests
Completed 21000 requests
Completed 24000 requests
Completed 27000 requests
Completed 30000 requests
Finished 30000 requests

Server Software:      nginx/1.14.0
Server Hostname:      timofeev.loc
Server Port:          94

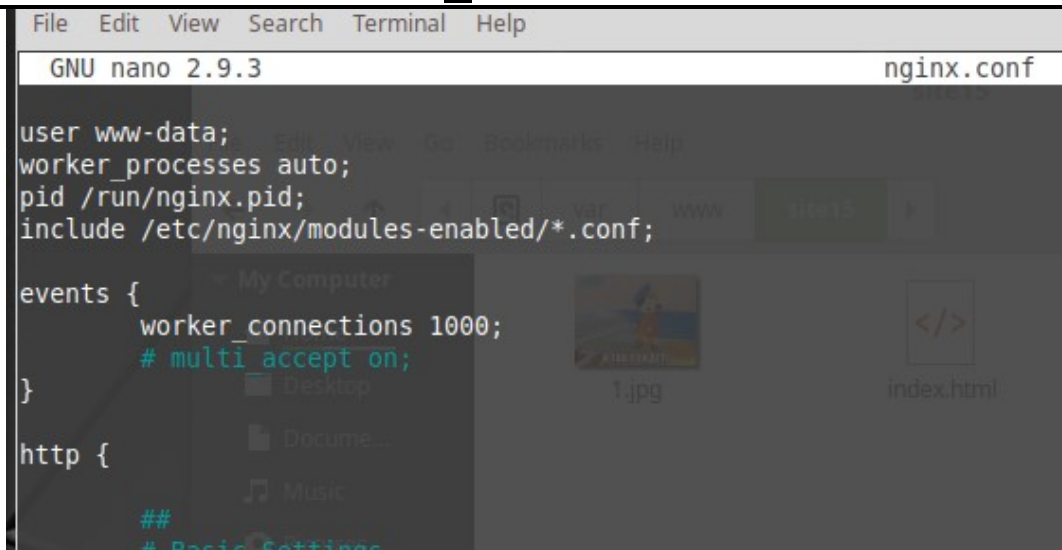
Document Path:        /site15/
Document Length:      126 bytes

Concurrency Level:    760
Time taken for tests:  4.388 seconds
Complete requests:    30000
Failed requests:       0
Total transferred:    11010000 bytes
HTML transferred:     3780000 bytes
Requests per second:  6836.54 [#/sec] (mean)
Time per request:     111.167 [ms] (mean)
Time per request:     0.146 [ms] (mean, across all concurrent requests)
Transfer rate:        2450.21 [Kbytes/sec] received

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        5   70 207.9      25  1074
Processing:      3   33  16.2      31   274
Waiting:         2   26  15.3      24   258
Total:          31  103 213.6      57  1346

Percentage of the requests served within a certain time (ms)
 50%    57
 66%    64
 75%    68
 80%    70
 90%    77
 95%   105
 98%  1080
 99%  1097
100%  1346 (longest request)
gfs@gfs-VirtualBox:/etc/nginx$
```

1.4. Увеличил worker_connection до 1000 с 768



```
File Edit View Search Terminal Help
GNU nano 2.9.3 nginx.conf
user www-data;
worker_processes auto;
pid /run/nginx.pid;
include /etc/nginx/modules-enabled/*.conf;

events {
    worker_connections 1000;
    # multi_accept on;
}

http {
    ##
    # Basic Settings
```


1.4.1. —n 30000 —с 777 —✓ успешно —Проверил новые максимальные ограничения

Перезапустил сервер и заново сделал эксперимент.

```
gfs@gfs-VirtualBox:/etc/nginx$ sudo systemctl restart nginx
gfs@gfs-VirtualBox:/etc/nginx$ ab -n 30000 -c 777 http://timofeev.loc:94/site15/
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 timofeev.loc (be patient)
Completed 3000 requests
Completed 6000 requests
Completed 9000 requests
Completed 12000 requests
Completed 15000 requests
Completed 18000 requests
Completed 21000 requests
Completed 24000 requests
Completed 27000 requests
Completed 30000 requests
Finished 30000 requests

Server Software:      nginx/1.14.0
Server Hostname:      timofeev.loc
Server Port:          94

Document Path:        /site15/
Document Length:      126 bytes

Concurrency Level:    777
Time taken for tests:  4.328 seconds
Complete requests:     30000
Failed requests:       0
Total transferred:     11010000 bytes
HTML transferred:      3780000 bytes
Requests per second:   6931.37 [#/sec] (mean)
Time per request:      112.099 [ms] (mean)
Time per request:      0.144 [ms] (mean, across all concurrent requests)
Transfer rate:         2484.19 [Kbytes/sec] received

Connection Times (ms)
      min   mean[+/-sd] median   max
Connect:    6    61 179.3    27   1064
Processing: 12    36  12.1    34    96
Waiting:    2    28  10.5    26    83
Total:      31    96 181.6    63   1135

Percentage of the requests served within a certain time (ms)
 50%    63
 66%    69
 75%    72
 80%    74
 90%    92
 95%   107
 98%  1088
 99%  1096
100%  1135 (longest request)
gfs@gfs-VirtualBox:/etc/nginx$
```