1. 测试环境：SYSU-SECURE

2. 测试各服务器的 IP

    主服务器：172.19.49.212

    调度服务器：172.19.51.196
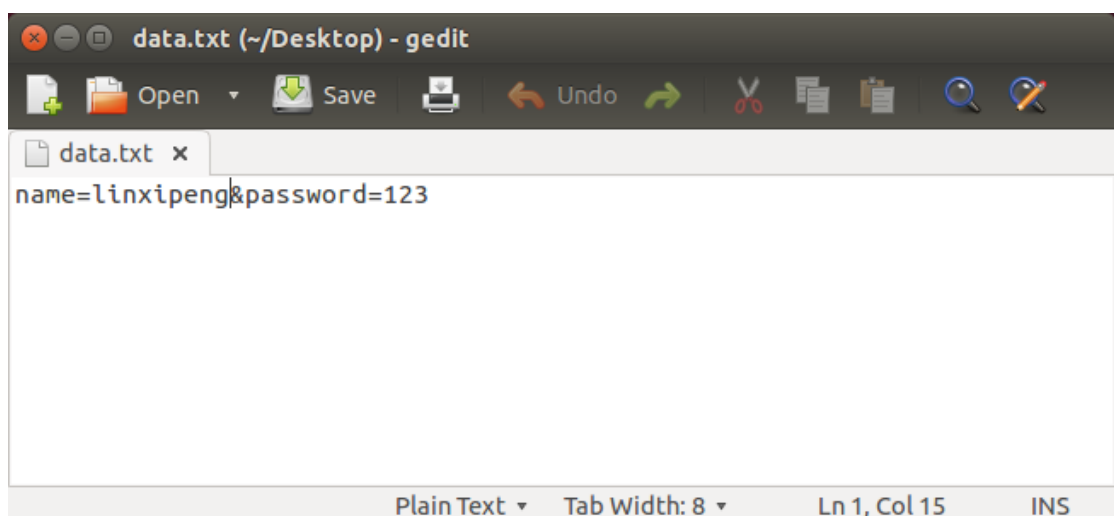
    从服务器：172.19.49.188

    测试机：172.19.51.179

3. 测试命令

    登录：ab -r -n 500 -c 10 -p data.txt -T application/x-www-form-
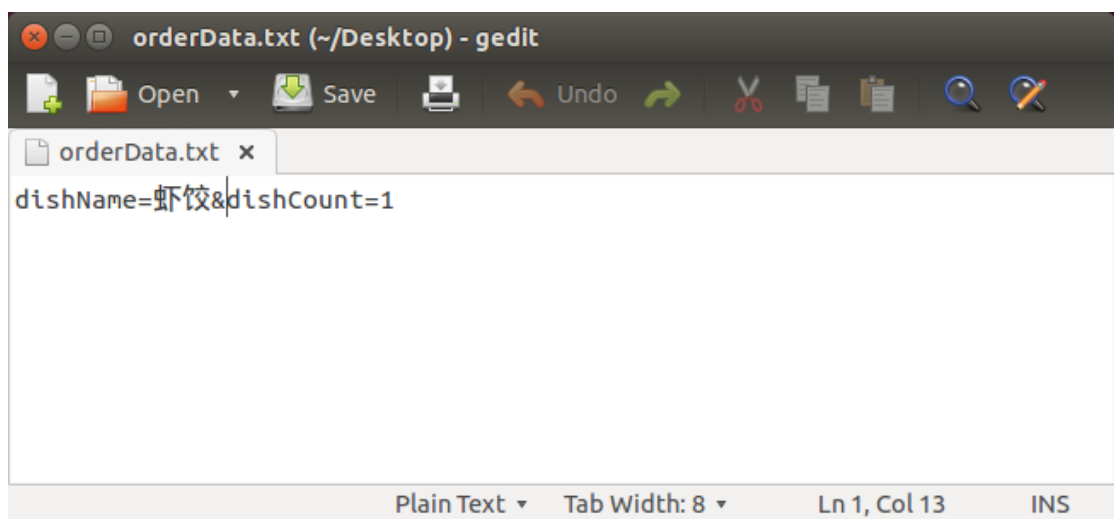    urlencoded http://172.19.49.212/index ；

    POST 测试参数：



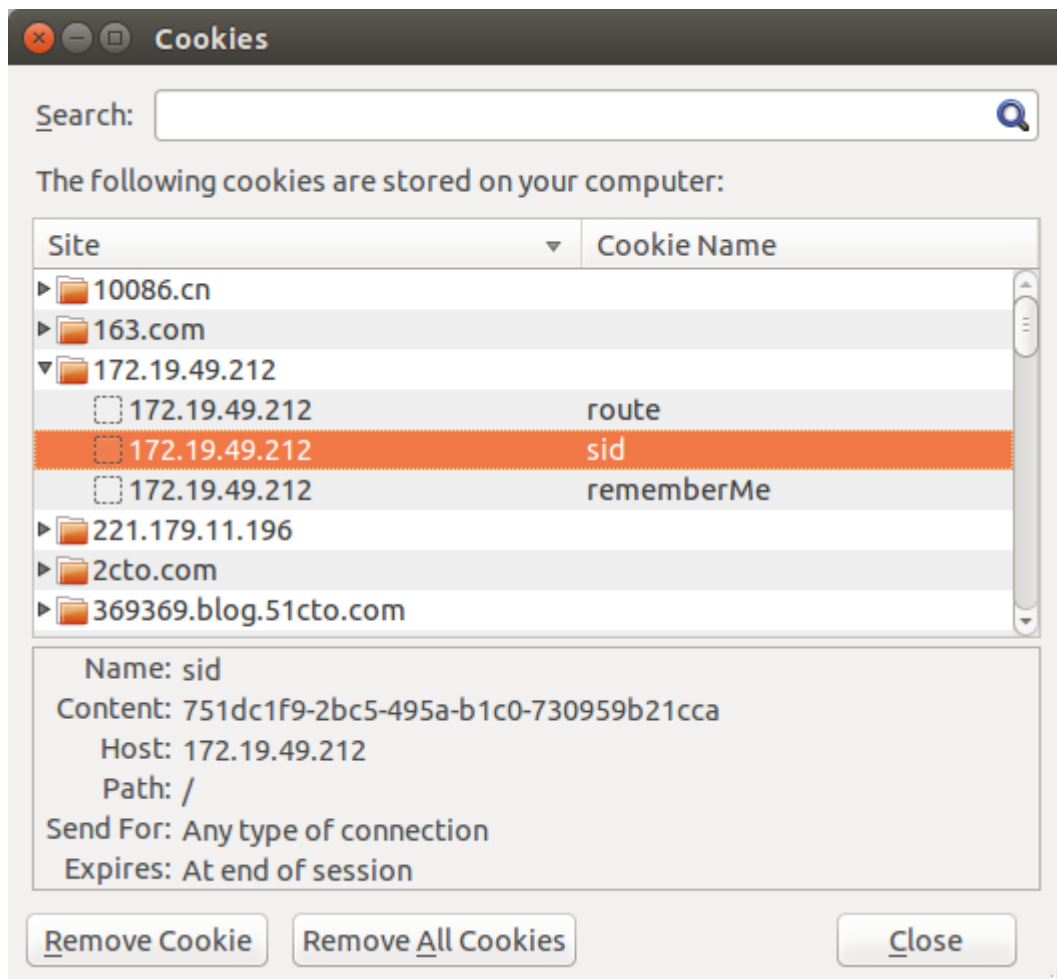    下单（需要先登录，所以需要用 Cookie）：

    ab        -H        "Cookie:**sid**=751dc1f9-2bc5-495a-b1c0-
    730959b21cca;**rememberMe**=y6Nce3i4pYI4B/v0g5mBYEzjWdNN
    C3z5PC5voLTdAX8QY8tN3aTyjwizZbgrOT20pwRvnw9sn2M0ICOZ
    gKzYlie8Njpfu0hw+3QneMF/zgR8UV63UUH4evTCit5+V6Dusb6D
    RAcNI22gTJkih4KzbXQf4RBhOMbIRHMBOv4/jjRSRAc0ZCAQAjX0x

wMaYcJX3cfsoJHaMTNskKRYEID/jrmS3jTcHm0MC8D1jTMPKxVqt4
WO7ZjscNpmeIUwFSEM2bPfANf3zGfuC5qYMhd/vzxq/u5TfWcws
OyorjIH6pXYFS3b0ANDLOX27aWRzsA5G4s6F3btdk72lBOWxSv+
HB7nkuRWAkvIKkP/9aUbileSMoeSZ+hwvJdR/28PJzuAQBwIMtQu
huZXdISGZ26Udpxxa6p6FbAyyxTiFoXZIURJI5cRfOfxUIeBpeJp7kN
mQhTbxrPGfPkO+XVgpJL6/OYZCjz/6ymLXej3MgvkkG0xvNImpI/b
5ZmpNahlHhq/k+t4TCYR1qkCf//+eRxgxo3nvdZ31DB9Xek4pzsgE
38=" -r -n 1000 -c 10 -p orderData.txt -T application/x-www-
form-urlencoded http://172.19.49.212/order

POST 参数：



其中，cookie 的键值可以在浏览器看到：

测试时，逐渐增大并发数，直到每秒的请求数达到最大值；

4. 测试结果对比：

1）未开启负载均衡（Nginx）的单服务器性能：

登录：

```
😣⊝▣  linxp@ubuntu: ~/Desktop

Benchmarking 172.19.49.212 (be patient)
Completed 100 requests
^C

Server Software:
Server Hostname:        172.19.49.212
Server Port:            8080

Document Path:          /index
Document Length:        0 bytes

Concurrency Level:      10
Time taken for tests:   50.992 seconds
Complete requests:      160
Failed requests:        320
   (Connect: 0, Receive: 160, Length: 0, Exceptions: 160)
Total transferred:      0 bytes
Total body sent:        0
HTML transferred:       0 bytes
Requests per second:    3.14 [#/sec] (mean)
Time per request:       3187.009 [ms] (mean)
Time per request:       318.701 [ms] (mean, across all concurrent requests)
Transfer rate:          0.00 [Kbytes/sec] received
                        0.00 kb/s sent
                        0.00 kb/s total

Connection Times (ms)
          min  mean[+/-sd] median   max
Connect:       0    0   0.0      0       0
Processing: 2997 3000   1.0   3000    3003
Waiting:       0    0   0.0      0       0
Total:      2997 3000   1.0   3000    3003

Percentage of the requests served within a certain time (ms)
  50%   3000
  66%   3000
```

可以看到，并发数为 10（增大也差不多）时，每秒的支持的请求数平均为 3.14，每个请求的处理时间平均为 3187ms（98%的请求都接近 3000ms）；

下单：

```
Document Path:          /order
Document Length:        2425 bytes

Concurrency Level:      10
Time taken for tests:   30.398 seconds
Complete requests:      392
Failed requests:        787
   (Connect: 0, Receive: 0, Length: 0, Exceptions: 787)
Total transferred:      2577000 bytes
Total body sent:        806000
HTML transferred:       2425000 bytes
Requests per second:    12.90 [#/sec] (mean)
Time per request:       775.459 [ms] (mean)
Time per request:       77.546 [ms] (mean, across all concurrent requests)
Transfer rate:          82.79 [Kbytes/sec] received
                        25.89 kb/s sent
                        108.68 kb/s total

Connection Times (ms)
              min  mean[+/-sd] median    max
Connect:        3    69  145.3     17    1224
Processing:    19   106  174.0     54    1225
Waiting:       17   104  173.5     53    1225
Total:         24   175  273.6     91    1743

Percentage of the requests served within a certain time (ms)
  50%     91
  66%    114
  75%    152
  80%    221
  90%    356
  95%    672
  98%   1530
  99%   1733
 100%   1743 (longest request)
linxp@ubuntu:~/Desktop$
```

可以看到，并发数为 10 时，每秒的支持的请求数平均为 12.9，每个请求的处理时间平均为 775.49ms（95%的请求可以在 1s 内完成）；

2）使用负载均衡以及网页的动静分离后性能：

登录：

```
😡⊖▢  linxp@ubuntu: ~/Desktop

Document Path:          /index
Document Length:        5649 bytes

Concurrency Level:      10
Time taken for tests:   18.250 seconds
Complete requests:      500
Failed requests:        2
   (Connect: 0, Receive: 0, Length: 2, Exceptions: 0)
Total transferred:      3349202 bytes
Total body sent:        92000
HTML transferred:       2813202 bytes
Requests per second:    27.40 [#/sec] (mean)
Time per request:       364.996 [ms] (mean)
Time per request:       36.500 [ms] (mean, across all concurrent requests)
Transfer rate:          179.22 [Kbytes/sec] received
                        4.92 kb/s sent
                        184.14 kb/s total

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        5    26   35.2     17     563
Processing:    12   337  936.8     79    6939
Waiting:        9   325  935.3     69    6938
Total:         19   364  939.1    104    6997

Percentage of the requests served within a certain time (ms)
  50%     104
  66%     150
  75%     203
  80%     313
  90%     654
  95%    1827
  98%    3082
  99%    6851
 100%    6997 (longest request)
linxp@ubuntu:~/Desktop$
```

可以看到，这里每秒平均支持的请求数已经达到 27.4，每个登录请求的平均时间为 366.9ms；

增大并发数（并发数为 20,基本达到了最大值）：

```
😀 🔵 🔳   linxp@ubuntu: ~/Desktop
Server Port:            80

Document Path:          /index
Document Length:        5649 bytes

Concurrency Level:      20
Time taken for tests:   2.684 seconds
Complete requests:      500
Failed requests:        0
Total transferred:      3360500 bytes
Total body sent:        92000
HTML transferred:       2824500 bytes
Requests per second:    186.29 [#/sec] (mean)
Time per request:       107.357 [ms] (mean)
Time per request:       5.368 [ms] (mean, across all concurrent requests)
Transfer rate:          1222.73 [Kbytes/sec] received
                        33.47 kb/s sent
                        1256.21 kb/s total

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        4    26  36.2     13     238
Processing:    11    77  66.1     61     329
Waiting:        8    67  65.4     50     327
Total:         21   103  75.3     78     339

Percentage of the requests served within a certain time (ms)
  50%     78
  66%    104
  75%    133
  80%    174
  90%    212
  95%    281
  98%    297
  99%    332
 100%    339 (longest request)
linxp@ubuntu:~/Desktop$
```

可以看到，这里每秒支持的请求数已经达到了 186.29，每个请求的处理时间平均为 107.357，性能有了极大的提高；

**下单**：

（首先并发数还是为 10)

```
linxp@ubuntu: ~/Desktop
Document Path:          /order
Document Length:        2425 bytes

Concurrency Level:      10
Time taken for tests:   25.357 seconds
Complete requests:      1000
Failed requests:        500
   (Connect: 0, Receive: 0, Length: 500, Exceptions: 0)
Non-2xx responses:      500
Total transferred:      1513000 bytes
Total body sent:        801000
HTML transferred:       1212500 bytes
Requests per second:    39.44 [#/sec] (mean)
Time per request:       253.566 [ms] (mean)
Time per request:       25.357 [ms] (mean, across all concurrent requests)
Transfer rate:          58.27 [Kbytes/sec] received
                        30.85 kb/s sent
                        89.12 kb/s total

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        4  187 1703.2     12   17128
Processing:    15   65  118.5     33    1343
Waiting:       14   64  117.7     32    1343
Total:         22  253 1722.9     47   17481

Percentage of the requests served within a certain time (ms)
  50%     47
  66%     60
  75%     81
  80%     90
  90%    143
  95%    222
  98%    791
  99%  17161
 100%  17481 (longest request)
linxp@ubuntu:~/Desktop$
```

可以看到，这里的每秒支持的平均请求数为 39.44，也就是说，每小时已经可以支持约 14 万，达到项目要求的每小时支持十万个请求。下单请求的平均处理时间也只有 253.56ms；

再增大并发数到 40 看一下：

```
😣 ⊖ ⬜   linxp@ubuntu: ~/Desktop
Server Software:        Jetty(9.3.7.v20160115)
Server Hostname:        172.19.49.212
Server Port:            80

Document Path:          /order
Document Length:        2425 bytes

Concurrency Level:      40
Time taken for tests:   5.949 seconds
Complete requests:      1000
Failed requests:        500
   (Connect: 0, Receive: 0, Length: 500, Exceptions: 0)
Non-2xx responses:      500
Total transferred:      1513000 bytes
Total body sent:        801000
HTML transferred:       1212500 bytes
Requests per second:    168.10 [#/sec] (mean)
Time per request:       237.947 [ms] (mean)
Time per request:       5.949 [ms] (mean, across all concurrent requests)
Transfer rate:          248.38 [Kbytes/sec] received
                        131.50 kb/s sent
                        379.88 kb/s total

Connection Times (ms)
              min  mean[+/-sd] median   max
Connect:        7   80 127.9     32    1121
Processing:    24  154 157.8    107    1080
Waiting:       24  151 156.3    104    1067
Total:         40  234 215.9    155    1185

Percentage of the requests served within a certain time (ms)
  50%    155
  66%    231
  75%    266
  80%    351
  90%    537
  95%    596
```

再增大并发数到 50：

可以看到，已经平均每秒支持的请求数已经稳定为 168 个，也就是说，

我们每小时支持的**下单请求数可以达到约 60 万**；

```
linxp@ubuntu: ~/Desktop
Completed 1000 requests
Finished 1000 requests


Server Software:        Jetty(9.3.7.v20160115)
Server Hostname:        172.19.49.212
Server Port:            80

Document Path:          /order
Document Length:        2425 bytes

Concurrency Level:      50
Time taken for tests:   5.944 seconds
Complete requests:      1000
Failed requests:        500
   (Connect: 0, Receive: 0, Length: 500, Exceptions: 0)
Non-2xx responses:      500
Total transferred:      1513000 bytes
Total body sent:        801000
HTML transferred:       1212500 bytes
Requests per second:    168.23 [#/sec] (mean)
Time per request:       297.212 [ms] (mean)
Time per request:       5.944 [ms] (mean, across all concurrent requests)
Transfer rate:          248.57 [Kbytes/sec] received
                        131.59 kb/s sent
                        380.16 kb/s total

Connection Times (ms)
            min  mean[+/-sd] median   max
Connect:      5   72  93.1     41    1074
Processing:  18  217 204.8    161    1378
Waiting:     18  213 202.4    157    1377
Total:       33  289 246.9    215    1767

Percentage of the requests served within a certain time (ms)
  50%     215
  66%     316
```

5. 数据库列表展示

   主服务器上的 Customer：

```
erwin@erwin: /
Query OK, 0 rows affected, 1 warning (0.00 sec)

mysql> flush privileges;
Query OK, 0 rows affected (0.01 sec)

mysql> select * from Customer;
+---------------+----------+
| customer_name | password |
+---------------+----------+
| 123           | 123      |
| 123456        | 123456   |
| aaa           | 111      |
| linxipeng     | 123      |
|               |          |
| wangfy        | 111      |
| xieshui       | 111      |
| youngdou      | password |
+---------------+----------+
7 rows in set (0.00 sec)

mysql>
```

菜品 Dish：



```
erwin@erwin: /
6545 rows in set (0.01 sec)

mysql> mysql> select * from Dish;
+----+---------------+--------+------------------------------------------
----------------+---------------+
| id | name          | price  | description
                | pic           |
+----+---------------+--------+------------------------------------------
----------------+---------------+
|  1 | 扬州炒饭       |     32 | 飘香米饭，材料丰富
                | menu1.jpg     |
|  2 | 鲜虾粥         |     12 | 鲜甜河虾，回味无穷
                | menu2.jpg     |
|  3 | 三明治         |     12 | 新鲜美味，健康有机
                | menu3.jpg     |
|  4 | 牛肉面         |     15 | 正宗牛肉
                | menu4.jpg     |
|  5 | 章鱼小丸子     |     12 | 酱香浓郁
                | menu5.jpg     |
|  6 | 鸡扒饭         |     11 | 香脆鸡扒
                | menu6.jpg     |
|  7 | 虾饺           |     17 | 味道鲜美爽滑，美味可口。
                | guangzhou.jpg |
|  8 | 小笼包         |     17 | 选料精细，皮薄卤多、口味鲜甜。
                | shanghai.png  |
|  9 | 烤鸭           |     36 | 色泽红艳，肉质细嫩，味道醇厚，肥而不腻。
                | beijing.jpeg  |
+----+---------------+--------+------------------------------------------
----------------+---------------+
9 rows in set (0.00 sec)

mysql>
```

订单 OrderTable(由于进行了模拟下单测试，所以条目较多):



```
erwin@erwin: /
+--------------+----------+
7 rows in set (0.00 sec)

mysql> select * from OrderTable;
+------+--------------+-------------+-----------------+-----------+
| id   | customerName | expenditure | dishName        | dishCount |
+------+--------------+-------------+-----------------+-----------+
|    1 | wangfy       |          32 | 扬州炒饭         |         1 |
|    2 | wangfy       |          64 | 扬州炒饭         |         2 |
|    3 | youngdou     |          32 | 扬州炒饭         |         1 |
|    4 | 123          |          85 | 虾饺             |         5 |
|    5 | wangfy       |          68 | 虾饺             |         4 |
|    6 | youngdou     |          32 | 扬州炒饭         |         1 |
|    7 | youngdou     |       16.15 | 虾饺             |         1 |
|    8 | 123          |         120 | 章鱼小丸子       |        10 |
|    9 | youngdou     |        30.4 | 扬州炒饭         |         1 |
|   10 | 123          |          51 | 虾饺             |         3 |
|   11 | youngdou     |        30.4 | 扬州炒饭         |         1 |
|   12 | youngdou     |       16.15 | 虾饺             |         1 |
|   13 | youngdou     |       16.15 | 虾饺             |         1 |
|   14 | youngdou     |       16.15 | 虾饺             |         1 |
|   15 | youngdou     |       16.15 | 虾饺             |         1 |
|   16 | youngdou     |       16.15 | 虾饺             |         1 |
|   17 | youngdou     |       16.15 | 虾饺             |         1 |
|   18 | youngdou     |       16.15 | 虾饺             |         1 |
|   19 | youngdou     |       16.15 | 虾饺             |         1 |
|   20 | youngdou     |       16.15 | 虾饺             |         1 |
|   21 | youngdou     |       16.15 | 虾饺             |         1 |
|   22 | youngdou     |       16.15 | 虾饺             |         1 |
|   23 | youngdou     |       16.15 | 虾饺             |         1 |
|   24 | youngdou     |       16.15 | 虾饺             |         1 |
|   25 | youngdou     |       16.15 | 虾饺             |         1 |
```

由于使用了 sticky session 在从数据库上也可以看到：