数链测试网络测试报告

# 一、链性能测试报告

## 1.官方测试方法测试结果

测试方法和结果简单介绍：这个插件是官方开发用来测试块打包交易量的，这种方式由于是直接系统内部调用来模拟transaction，没有中间通讯的损耗，因此效率是非常高的，官方称通过这个插件测试到了8000的tps结果，而图1 的测试结果来讲，没有这么恐怖，按照每秒两块的速度，能到1000了。

图1:官网测试方法的测试日志

```
597011ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a2ed1770948... #1645102 @ 2018-08-22T08:09:57.000 signed by fudata [trxs: 500, lib: 1645101, confirmed: 0]
597509ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a2fdc9e81ae... #1645103 @ 2018-08-22T08:09:57.500 signed by fudata [trxs: 503, lib: 1645102, confirmed: 0]
598010ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a309906a571... #1645104 @ 2018-08-22T08:09:58.000 signed by fudata [trxs: 499, lib: 1645103, confirmed: 0]
598510ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a313a54decd... #1645105 @ 2018-08-22T08:09:58.500 signed by fudata [trxs: 508, lib: 1645104, confirmed: 0]
599009ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a32ee4ea878... #1645106 @ 2018-08-22T08:09:59.000 signed by fudata [trxs: 487, lib: 1645105, confirmed: 0]
599510ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a33b8bfaa7d... #1645107 @ 2018-08-22T08:09:59.500 signed by fudata [trxs: 501, lib: 1645106, confirmed: 0]
600009ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a34ea54352c... #1645108 @ 2018-08-22T08:10:00.000 signed by fudata [trxs: 511, lib: 1645107, confirmed: 0]
600511ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a35056934c5... #1645109 @ 2018-08-22T08:10:00.500 signed by fudata [trxs: 491, lib: 1645108, confirmed: 0]
601012ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a3613b5478d... #1645110 @ 2018-08-22T08:10:01.000 signed by fudata [trxs: 497, lib: 1645109, confirmed: 0]
601511ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a37216489bd... #1645111 @ 2018-08-22T08:10:01.500 signed by fudata [trxs: 506, lib: 1645110, confirmed: 0]
602010ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a382a4aa1cc... #1645112 @ 2018-08-22T08:10:02.000 signed by fudata [trxs: 499, lib: 1645111, confirmed: 0]
602510ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a39e8a3e939... #1645113 @ 2018-08-22T08:10:02.500 signed by fudata [trxs: 499, lib: 1645112, confirmed: 0]
603010ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a3a75f3c6d8... #1645114 @ 2018-08-22T08:10:03.000 signed by fudata [trxs: 505, lib: 1645113, confirmed: 0]
603510ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a3baae69d46... #1645115 @ 2018-08-22T08:10:03.500 signed by fudata [trxs: 492, lib: 1645114, confirmed: 0]
604010ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a3cc9521980... #1645116 @ 2018-08-22T08:10:04.000 signed by fudata [trxs: 507, lib: 1645115, confirmed: 0]
604507ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a3da3edde8f... #1645117 @ 2018-08-22T08:10:04.500 signed by fudata [trxs: 411, lib: 1645116, confirmed: 0]
605005ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a3e37c97ec2... #1645118 @ 2018-08-22T08:10:05.000 signed by fudata [trxs: 305, lib: 1645117, confirmed: 0]
605509ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a3feb8ebdba... #1645119 @ 2018-08-22T08:10:05.500 signed by fudata [trxs: 504, lib: 1645118, confirmed: 0]
606015ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a40e9e8a6d8... #1645120 @ 2018-08-22T08:10:06.000 signed by fudata [trxs: 777, lib: 1645119, confirmed: 0]
606510ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a419ca71496... #1645121 @ 2018-08-22T08:10:06.500 signed by fudata [trxs: 462, lib: 1645120, confirmed: 0]
607010ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a424a47fcce... #1645122 @ 2018-08-22T08:10:07.000 signed by fudata [trxs: 531, lib: 1645121, confirmed: 0]
607510ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a43d71bbd4c... #1645123 @ 2018-08-22T08:10:07.500 signed by fudata [trxs: 503, lib: 1645122, confirmed: 0]
608010ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a444e837673... #1645124 @ 2018-08-22T08:10:08.000 signed by fudata [trxs: 504, lib: 1645123, confirmed: 0]
608509ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a4591bce6a8... #1645125 @ 2018-08-22T08:10:08.500 signed by fudata [trxs: 497, lib: 1645124, confirmed: 0]
609009ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a46d5166997... #1645126 @ 2018-08-22T08:10:09.000 signed by fudata [trxs: 500, lib: 1645125, confirmed: 0]
609508ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a47f063e54d... #1645127 @ 2018-08-22T08:10:09.500 signed by fudata [trxs: 502, lib: 1645126, confirmed: 0]
610008ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a4855b40e04... #1645128 @ 2018-08-22T08:10:10.000 signed by fudata [trxs: 501, lib: 1645127, confirmed: 0]
610509ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a49aa4b602f... #1645129 @ 2018-08-22T08:10:10.500 signed by fudata [trxs: 506, lib: 1645128, confirmed: 0]
611008ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a4a431706c9... #1645130 @ 2018-08-22T08:10:11.000 signed by fudata [trxs: 497, lib: 1645129, confirmed: 0]
611509ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a4b5d1b8633... #1645131 @ 2018-08-22T08:10:11.500 signed by fudata [trxs: 491, lib: 1645130, confirmed: 0]
612009ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a4caba5e2d0... #1645132 @ 2018-08-22T08:10:12.000 signed by fudata [trxs: 510, lib: 1645131, confirmed: 0]
612508ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a4d29b60849... #1645133 @ 2018-08-22T08:10:12.500 signed by fudata [trxs: 497, lib: 1645132, confirmed: 0]
613008ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a4e1f1ce22e... #1645134 @ 2018-08-22T08:10:13.000 signed by fudata [trxs: 500, lib: 1645133, confirmed: 0]
613508ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a4f2514515d... #1645135 @ 2018-08-22T08:10:13.500 signed by fudata [trxs: 501, lib: 1645134, confirmed: 0]
614012ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a500431ea2f... #1645136 @ 2018-08-22T08:10:14.000 signed by fudata [trxs: 498, lib: 1645135, confirmed: 0]
614508ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a512886e54d... #1645137 @ 2018-08-22T08:10:14.500 signed by fudata [trxs: 504, lib: 1645136, confirmed: 0]
615009ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a52d847308b... #1645138 @ 2018-08-22T08:10:15.000 signed by fudata [trxs: 305, lib: 1645137, confirmed: 0]
615510ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a5373992bbb... #1645139 @ 2018-08-22T08:10:15.500 signed by fudata [trxs: 690, lib: 1645138, confirmed: 0]
616007ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a54d32e1891... #1645140 @ 2018-08-22T08:10:16.000 signed by fudata [trxs: 498, lib: 1645139, confirmed: 0]
616507ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a5554d44d95... #1645141 @ 2018-08-22T08:10:16.500 signed by fudata [trxs: 505, lib: 1645140, confirmed: 0]
617007ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a56a1a16329... #1645142 @ 2018-08-22T08:10:17.000 signed by fudata [trxs: 502, lib: 1645141, confirmed: 0]
617507ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a576b17603f... #1645143 @ 2018-08-22T08:10:17.500 signed by fudata [trxs: 496, lib: 1645142, confirmed: 0]
618007ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a5829f34582... #1645144 @ 2018-08-22T08:10:18.000 signed by fudata [trxs: 501, lib: 1645143, confirmed: 0]
618508ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a5999edb67a... #1645145 @ 2018-08-22T08:10:18.500 signed by fudata [trxs: 506, lib: 1645144, confirmed: 0]
619007ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a5ab64a029b... #1645146 @ 2018-08-22T08:10:19.000 signed by fudata [trxs: 488, lib: 1645145, confirmed: 0]
619507ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a5b9b536496... #1645147 @ 2018-08-22T08:10:19.500 signed by fudata [trxs: 496, lib: 1645146, confirmed: 0]
620007ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a5cea139879... #1645148 @ 2018-08-22T08:10:20.000 signed by fudata [trxs: 510, lib: 1645147, confirmed: 0]
620507ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a5d6ab83419... #1645149 @ 2018-08-22T08:10:20.500 signed by fudata [trxs: 501, lib: 1645148, confirmed: 0]
621007ms thread-0   producer_plugin.cpp:1073    produce_block       ] Produced block 00191a5ed7c635b8... #1645150 @ 2018-08-22T08:10:21.000 signed by fudata [trxs: 491, lib: 1645149, confirmed: 0]
```

## 2.数据合约测试结果

### 2.1 测试环境介绍：

测试内容：模拟用户进行交易

性能测试工具：Jmeter3.2

java jdk版本：1.8.0_5

### 2.2 模拟并发 50、100线程下的测试结果（采用数链数据合约）

设置场景如下：

l This group will start Max threads - 设置单台负载机，线程组启动的线程总数为50个

l First,wait for N seconds - 启动第一个线程之前，需要等待1秒

l Then start N threads - 设置最开始时启动1个线程

l Next add N1 threads every N2 seconds, using ramp-up N3 seconds - 然后，每隔1秒，在1秒内启动1个线程

l Then hold load for N seconds - 单台负载机启动的线程总数达到50之后，持续运行300秒

l Finally,stop N1 threads ervery N2 seconds - 最后，每隔5秒，停止1个线程数。

图2:模拟50并发线程场景：

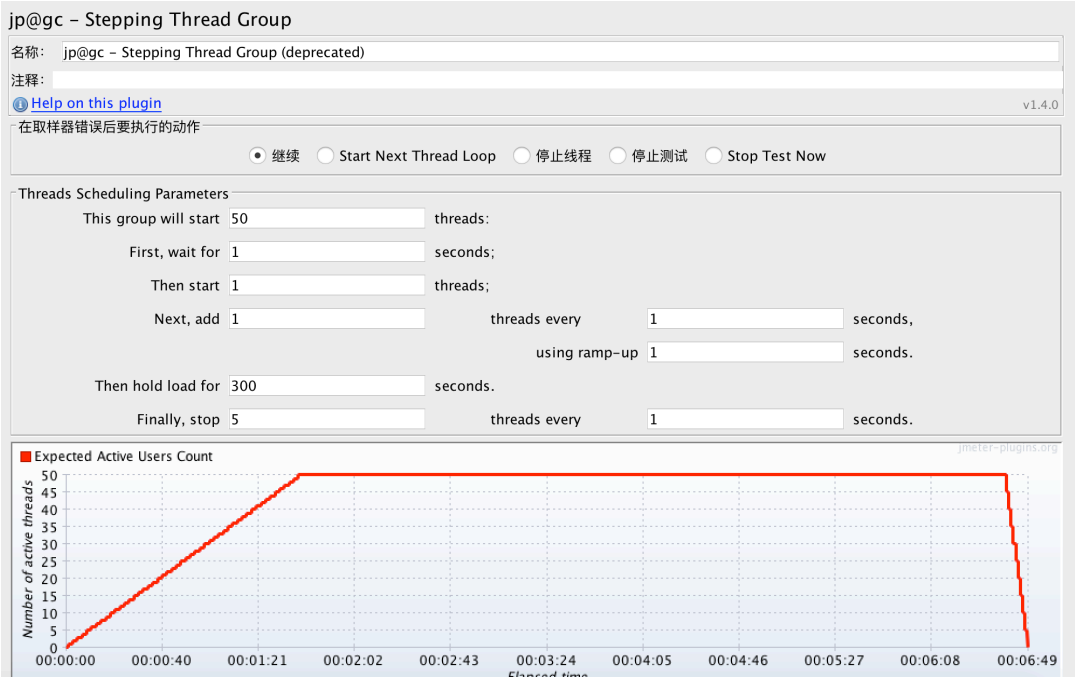


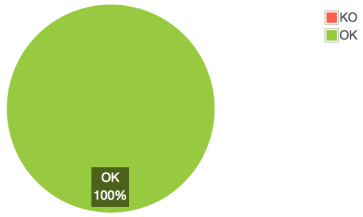

图3:请求设置的断言可以过滤错误请求：


图4:性能测试结果如下：

## APDEX (Application Performance Index)

| Apdex | T (Toleration threshold) | F (Frustration threshold) | Label |
|---|---|---|---|
| **0.890** | **500 ms** | **1 sec 500 ms** | **Total** |
| 0.890 | 500 ms | 1 sec 500 ms | HTTP请求-create-域名访问 |

## Requests Summary




## Statistics

| Requests | Executions | | | Response Times (ms) | | | | | | | Network (KB/sec) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | #Samples | KO | Error % | Average | Min | Max | 90th pct | 95th pct | 99th pct | Throughput | Received | Sent |
| **Total** | **47050** | **0** | **0.00%** | **375.10** | **7** | **1673** | **658.00** | **845.00** | **931.00** | **115.30** | **387.78** | **136.44** |
| HTTP请求-create-域名访问 | 47050 | 0 | 0.00% | 375.10 | 7 | 1673 | 658.00 | 845.00 | 931.00 | 115.30 | 387.78 | 136.44 |

选取重要指标进行解释：

1. Samples - 总的发出请求数:47050

2. Average - 请求的平均响应时间:375.10ms

3. 99% Line - 99%的样本都没有超过931.00ms这个时间。这个值是指把所有数据按由小到大将其排列，就是排列在第99%的值。

4. Min - 最小响应时间:7ms。

5. Error % - 本次测试中，有错误请求的百分比为0，即成功率100%。

6.Throughput - 这里表示每秒完成的请求数为115.3。

7.Received KB/sec - 收到的千字节每秒的吞吐量为387.78。

图5:不同TPS下的响应时间图如下：

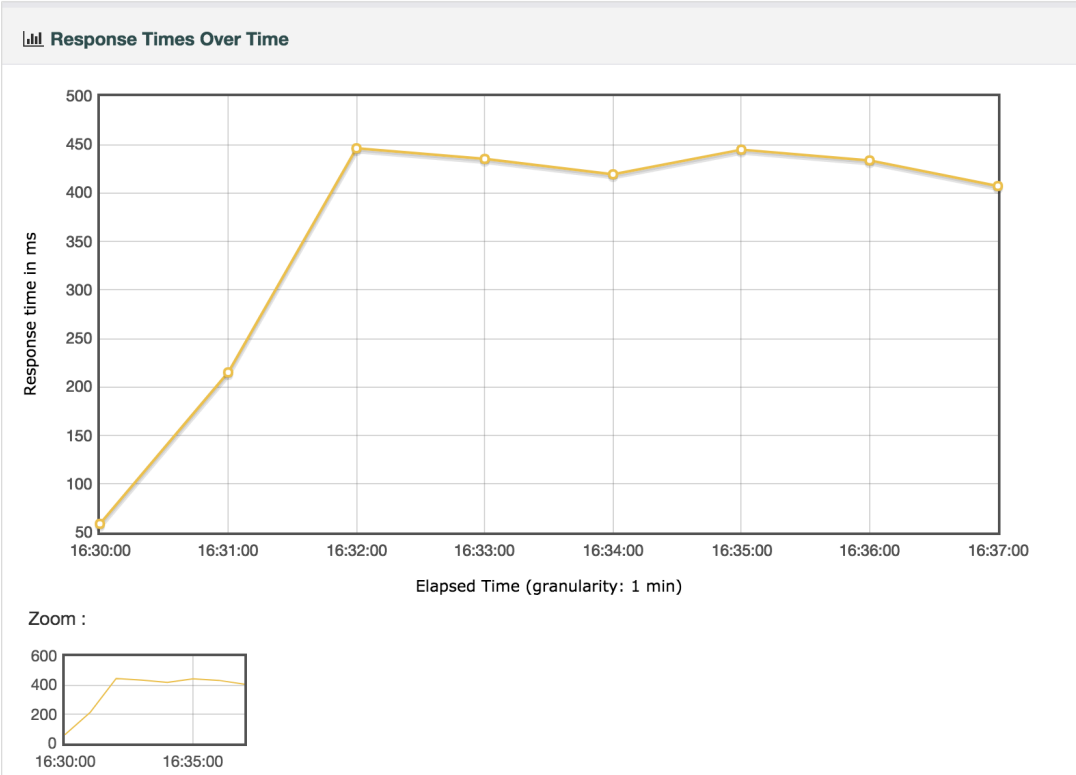



图6:不同并发请求数下的TPS：

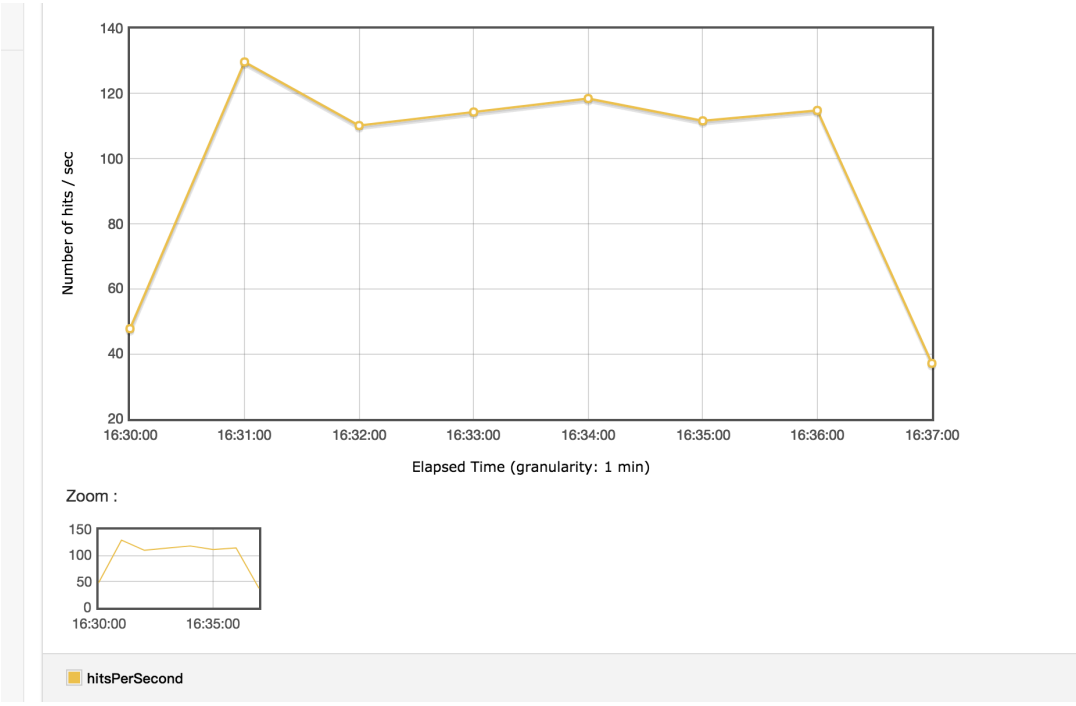



图7:模拟100并发线程的测试场景：

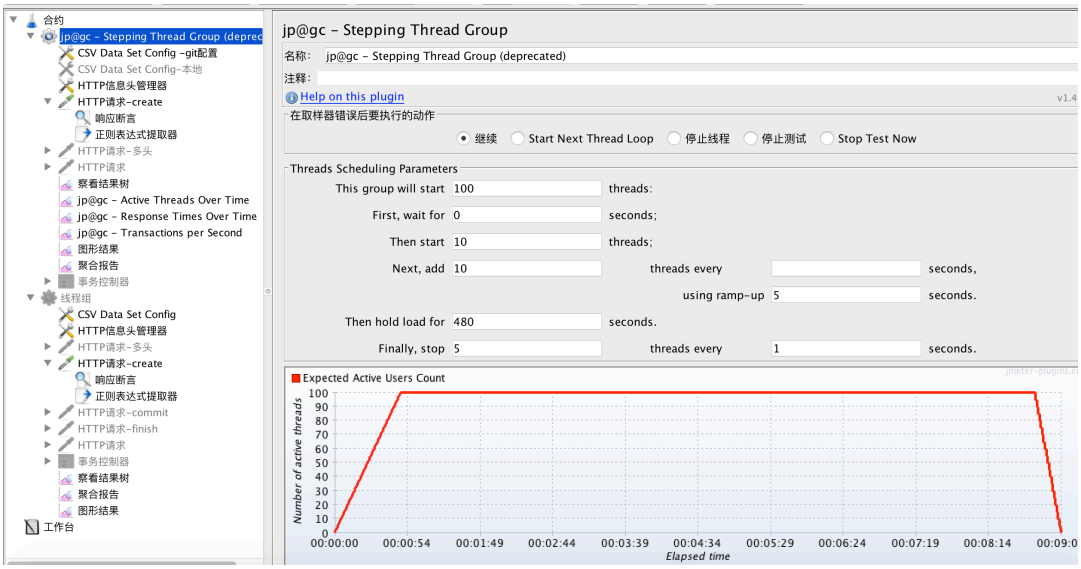
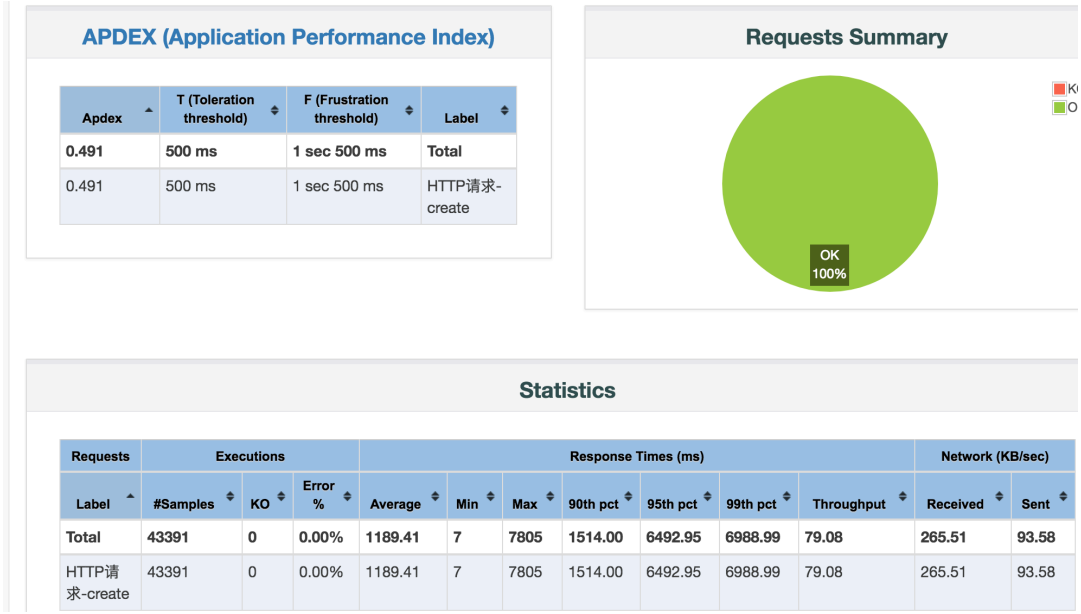



图8:模拟100并发线程的测试的测试结果



**APDEX (Application Performance Index)**

| Apdex | T (Toleration threshold) | F (Frustration threshold) | Label |
|---|---|---|---|
| 0.491 | 500 ms | 1 sec 500 ms | Total |
| 0.491 | 500 ms | 1 sec 500 ms | HTTP请求-create |

**Requests Summary**



**Statistics**

| Requests | Executions | | | Response Times (ms) | | | | | | | Network (KB/sec) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | #Samples | KO | Error % | Average | Min | Max | 90th pct | 95th pct | 99th pct | Throughput | Received | Sent |
| Total | 43391 | 0 | 0.00% | 1189.41 | 7 | 7805 | 1514.00 | 6492.95 | 6988.99 | 79.08 | 265.51 | 93.58 |
| HTTP请求-create | 43391 | 0 | 0.00% | 1189.41 | 7 | 7805 | 1514.00 | 6492.95 | 6988.99 | 79.08 | 265.51 | 93.58 |

测试结果总结：前后测试结果数据对比TPS相差30～40，其他时候测试结果相差并不是很大，只是结果没有保存，加压之后，TPS下降，请求时间变长，请求数会下降，陡然加压导致某些节点截断可能会有短暂性影响，可继续测试模拟。

## 2.3 合约大小因素

使用官方合约（eosio.token大小 197KB）和数链数据合约（我们数据合约大小 946kb）进行测试：

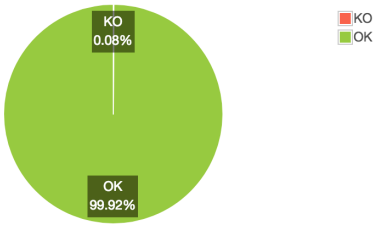
测试场景，其他变量和环境因素保持一致，只替换合约文件进行测试：

图9:官方合约测试结果：（人为手动手误开了两个任务导致交易重复的错误请忽视）

**APDEX (Application Performance Index)**

| Apdex | T (Toleration threshold) | F (Frustration threshold) | Label |
|---|---|---|---|
| 0.995 | 500 ms | 1 sec 500 ms | Total |
| 0.995 | 500 ms | 1 sec 500 ms | HTTP请求-create-域名访问 |

**Requests Summary**




**Statistics**

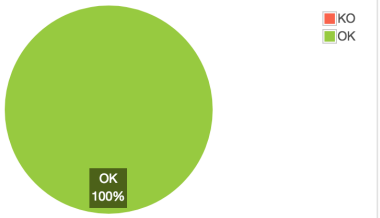
| Requests | Executions | | | Response Times (ms) | | | | | | | Network (KB/sec) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | #Samples | KO | Error % | Average | Min | Max | 90th pct | 95th pct | 99th pct | Throughput | Received | Sent |
| Total | 60000 | 50 | 0.08% | 195.11 | 4 | 1217 | 396.00 | 425.00 | 586.00 | 356.51 | 911.57 | 415.25 |
| HTTP请求-create-域名访问 | 60000 | 50 | 0.08% | 195.11 | 4 | 1217 | 396.00 | 425.00 | 586.00 | 356.51 | 911.57 | 415.25 |

图10:我们的数据合约测试结果：

**APDEX (Application Performance Index)**

| Apdex | T (Toleration threshold) | F (Frustration threshold) | Label |
|---|---|---|---|
| 0.890 | 500 ms | 1 sec 500 ms | Total |
| 0.890 | 500 ms | 1 sec 500 ms | HTTP请求-create-域名访问 |

**Requests Summary**




**Statistics**

| Requests | Executions | | | Response Times (ms) | | | | | | | Network (KB/sec) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | #Samples | KO | Error % | Average | Min | Max | 90th pct | 95th pct | 99th pct | Throughput | Received | Sent |
| Total | 47050 | 0 | 0.00% | 375.10 | 7 | 1673 | 658.00 | 845.00 | 931.00 | 115.30 | 387.78 | 136.44 |
| HTTP请求-create-域名访问 | 47050 | 0 | 0.00% | 375.10 | 7 | 1673 | 658.00 | 845.00 | 931.00 | 115.30 | 387.78 | 136.44 |

测试结果总结：显然，合约小的TPS远大于合约大的TPS，合约文件的大小是影响TPS的关键因素！

## 2.4 单个合约和多个合约

还未测试，后续优化之后测试一版本。可能会有影响，但是不是主要因素。

### 2.5 性能测试结果总结及优化计划

1.测试工具的差异（主要）：分别采用官网插件及普通常用Http协议性能测试工具Jmeter存在以下不同：EOS.IO官方提供的测试插件txn_test_gen_plugin需要与EOS节点部署在同一物理机，Jmeter支持通过真实网络接入EOS，更贴近真实使用场景。当使用EOSBenchTool通过网络接入EOS时，能够明显观察到EOS性能的下降，大约维持在115TPS左右。这和IO的真实场景传输存在很大关联，所以参考意义不是很大，后续可配合服务模型计算一起测试。同时可用考虑官方EOS测试工具的使用配合测试。

2.合约大小的差异（主要）：合约文件的大小是影响TPS的关键因素！同时加入真实的交易之后，返回的交易体也会变多，适当有必要重新优化一下合约或筛选过滤掉一些没必要的返回可作为参考之一。当然主网的合约是没有交易实体，也是部分脱离了现实意义。

3.不同并发情况下的加压测试（次要）：阶梯式加压的方式以及网络耗时都可能对TPS造成影响，但不是主要影响。多次测试及模拟的情况下，数据相差不是很大。

测试过程中：我们对出现的节点断块，502报错，交易过多产生的资源报价过高等问题进行了优化，但是仍然是有很多优化的地方需要继续。

## 3.后台系统服务性能测试报告

### 3.1安全多方计算性能情况

分别模拟50和100个线程进行加压调试，交易ID采取自增的形式真实模拟数据交易进行安全多方计算

图11:模拟50个线程进行加压的场景

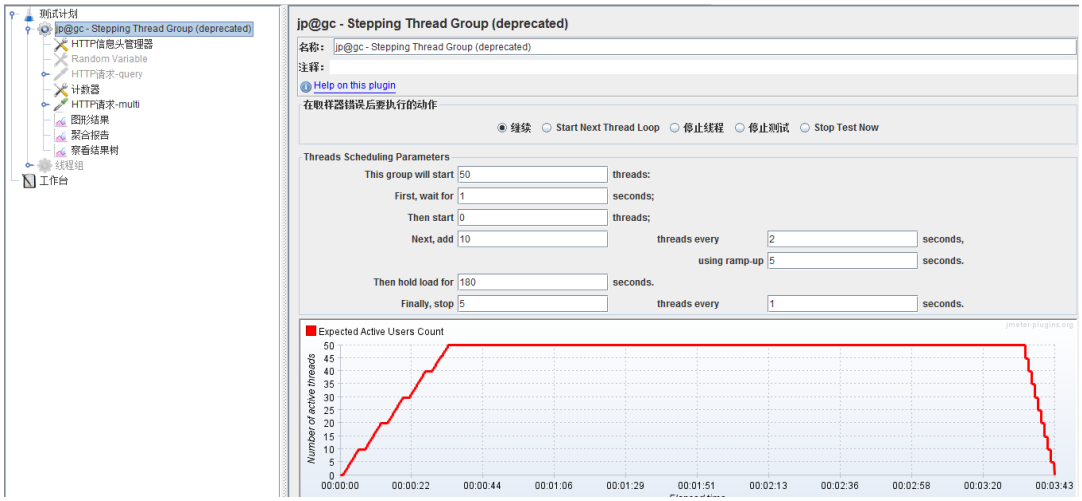
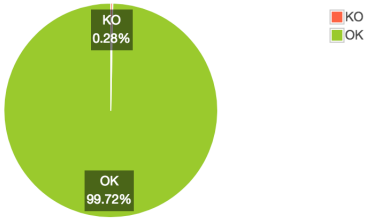



图12:模拟50个线程的测试结果如下：

## APDEX (Application Performance Index)

| Apdex | T (Toleration threshold) | F (Frustration threshold) | Label |
|---|---|---|---|
| 0.997 | 500 ms | 1 sec 500 ms | Total |
| 0.997 | 500 ms | 1 sec 500 ms | HTTP请求-multi |

## Requests Summary




## Statistics

| Requests | Executions | | | Response Times (ms) | | | | | | | Network (KB/sec) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | #Samples | KO | Error % | Average | Min | Max | 90th pct | 95th pct | 99th pct | Throughput | Received | Sent |
| Total | 188631 | 529 | 0.28% | 53.22 | 0 | 1066 | 55.00 | 63.00 | 187.99 | 850.01 | 227.86 | 562.87 |
| HTTP请求-multi | 188631 | 529 | 0.28% | 53.22 | 0 | 1066 | 55.00 | 63.00 | 187.99 | 850.01 | 227.86 | 562.87 |

图13:进行100个线程的加压：

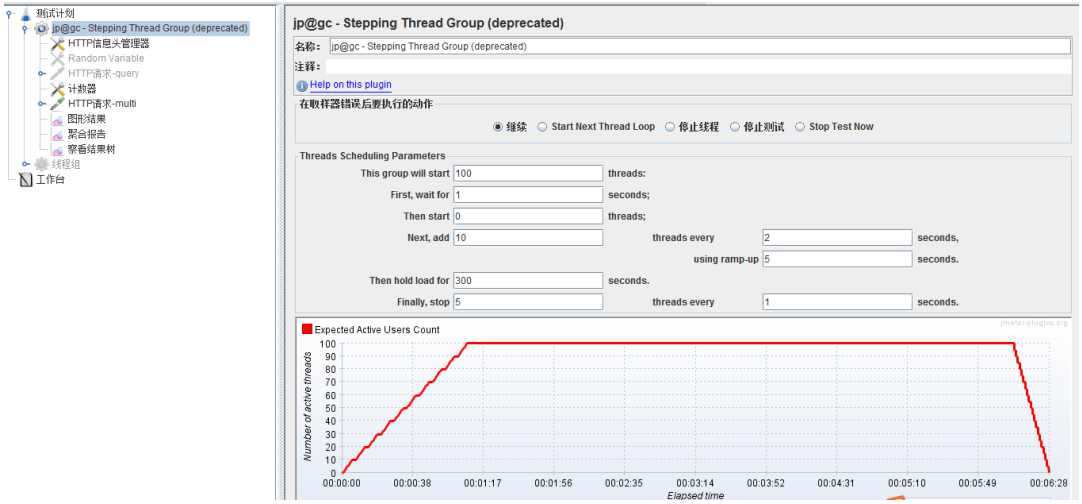
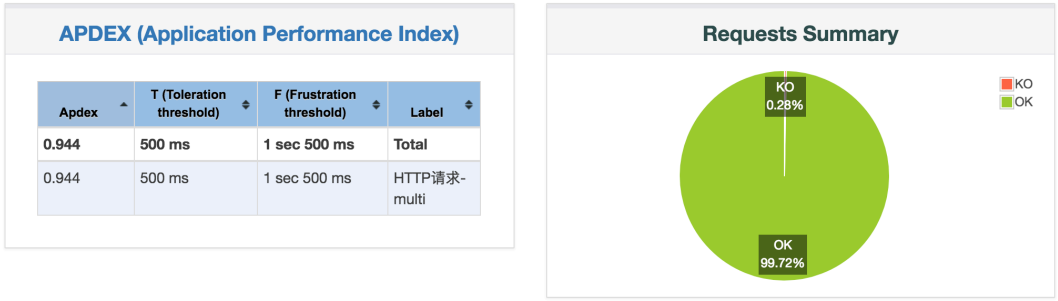


图14:模拟100个线程测试结果如下：



APDEX (Application Performance Index)

| Apdex | T (Toleration threshold) | F (Frustration threshold) | Label |
|---|---|---|---|
| 0.944 | 500 ms | 1 sec 500 ms | Total |
| 0.944 | 500 ms | 1 sec 500 ms | HTTP请求-multi |

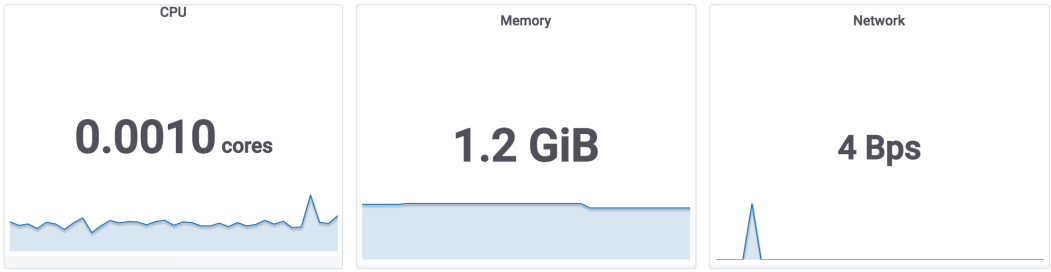


Statistics

| Requests | Executions | | | Response Times (ms) | | | | | | | Network (KB/sec) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | #Samples | KO | Error % | Average | Min | Max | 90th pct | 95th pct | 99th pct | Throughput | Received | Sent |
| Total | 178470 | 495 | 0.28% | 192.47 | 0 | 4894 | 108.00 | 127.00 | 206.99 | 461.27 | 123.62 | 305.46 |
| HTTP请求-multi | 178470 | 495 | 0.28% | 192.47 | 0 | 4894 | 108.00 | 127.00 | 206.99 | 461.27 | 123.62 | 305.46 |

图15:多方计算CPU资源消耗情况如下：

总体占用




各实例CPU

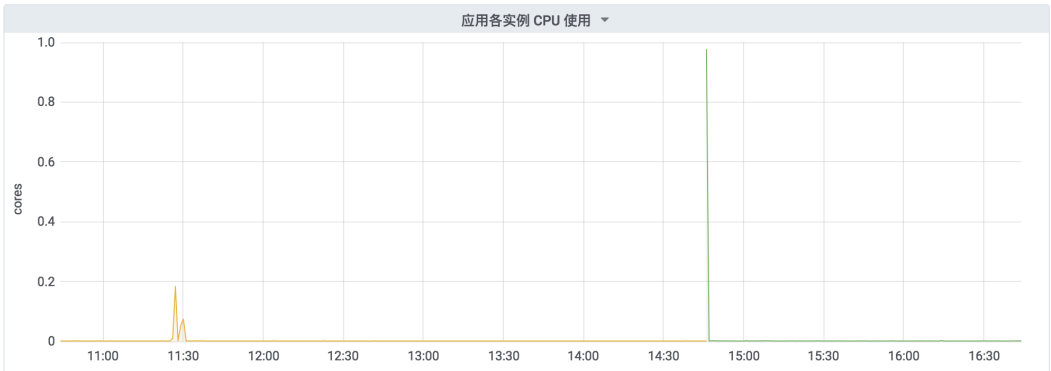



图16:多方计算RAM资源消耗情况如下：


安全多方计算性能测试结果总结：在启动单进程50线程时，TPS高达800多，效果最佳。并且服务器资源消耗正常。

### 3.2其他场景（还在加载中...）

去除多方计算的模型计算测试；

匿踪查询测试；

去除匿踪查询的模型计算测试；

# 二、Web站点测试

具体包括钱包管理、资源管理、交易明细查询、合约中心、充值中心、数据字典和设置等7大测试模块。

钱包管理涉及的17个测试指标：注册账号、登陆、账户忽略、切换账号、修改账号密码、创建钱包、备份钱包、导入私钥、导入钱包、修改钱包密码、切换钱包、链积分转账、数积分转账、解锁、提额、近期活动等200多个测试点。

交易所涉及的测试16个指标：创建合约、登记合约、修改合约、参与管理、合约分类、合约详情、创建数据字典、查询数据字典、投票、修改数据字典、账户认证设置、邮箱管理、添加供货、供货管理、积分兑换、积分充值等300多个测试点。

通过接口测试、web测试、性能测试、安全测试、功能测试对整体数链项目的功能性、性能效率、安全性、可靠性、产品易用性、可扩展性、可维护性、兼容性等8 大类属性进行测试。测试用例覆盖100%，0.2%的bug和2%遗留问题需要优化。