

AngusTester 和 JMeter HTTP 基准测试结果比较

一、测试目的

本次测试主要目的是对比 AngusTester 和 JMeter 在 HTTP 协议基准性能测试(最小延迟小于1毫秒)的表现。

二、测试环境

以下测试 AngusTester 和 JMeter 使用相同环境。为了测试特定配置下服务的准确性能，将测试机和服务分开部署。

1、节点

节点	系统	规格	IP	应用
压测节点	CentOS 7.6 64 位	32 核(vCPU) 3.1 GHz 主频的 Intel® Xeon® Platinum 64GiB(内存)	172.26.167.78	AngusTester、JMeter
服务节点	CentOS 7.6 64 位	32 核(vCPU) 3.1 GHz 主频的 Intel® Xeon® Platinum 64GiB(内存)	172.26.167.79	Nginx

2、软件

- 测试服务
 - nginx-1.21.3
- 测试工具
 - AngusTester-1.0.0
 - apache-jmeter-5.4.1

3、Nginx 配置

```
worker_processes 24;
worker_rlimit_nofile 200000;

events {
    worker_connections 4096;
    use epoll;
    multi_accept on;
}

http {
    include mime.types;
    default_type application/octet-stream;

    access_log off;
```

```
sendfile      on;
tcp_nopush    on;
tcp_nodelay    on;

keepalive_timeout 65;
keepalive_requests 100000;
reset_timedout_connection on;

server {
    listen      80;
    server_name localhost;

    open_file_cache max=200000 inactive=20s;
    open_file_cache_valid 30s;
    open_file_cache_min_uses 2;
    open_file_cache_errors on;

    location / {
        root    html;
        index    index.html index.htm;
    }
}
```

4、测试接口

```
curl -i http://172.26.167.79:80
HTTP/1.1 200 OK
Server: nginx/1.21.3
Date: Mon, 29 Jan 2024 01:31:46 GMT
Content-Type: text/html
Content-Length: 75
Last-Modified: Mon, 29 Jan 2024 01:29:49 GMT
Connection: keep-alive
ETag: "65b6ff8d-4b"
Accept-Ranges: bytes

<!DOCTYPE html>
<html>
<body>
<p><em>Hello,World!</em></p>
</body>
</html>
```

三、测试脚本

JMeter 脚本 (script.jmx)

```
<?xml version="1.0" encoding="UTF-8"?>
<jmeterTestPlan version="1.2" properties="4.0" jmeter="4.0 r1823414">
  <hashTree>
    <TestPlan guiclass="TestPlanGui" testclass="TestPlan" testname="Http performance testing" enabled="true">
      <boolProp name="TestPlan.functional_mode">false</boolProp>
      <boolProp name="TestPlan.tearDown_on_shutdown">true</boolProp>
      <boolProp name="TestPlan.serialize_threadgroups">false</boolProp>
      <elementProp name="TestPlan.user_defined_variables" elementType="Arguments" guiclass="ArgumentsPanel"
        testclass="Arguments" testname="User Defined Variables" enabled="true">
        <collectionProp name="Arguments.arguments"/>
      </elementProp>
    </TestPlan>
  </hashTree>
  <ThreadGroup guiclass="ThreadGroupGui" testclass="ThreadGroup" testname="Thread Group" enabled="true">
    <stringProp name="ThreadGroup.on_sample_error">continue</stringProp>
    <elementProp name="ThreadGroup.main_controller" elementType="LoopController"
      guiclass="LoopControlPanel" testclass="LoopController" testname="Loop Controller" enabled="true">
      <boolProp name="LoopController.continue_forever">false</boolProp>
      <intProp name="LoopController.loops">-1</intProp>
    </elementProp>
    <stringProp name="ThreadGroup.num_threads">1<!-- 1/10/50/100/200/500/800/1000/2000 --></stringProp>
    <boolProp name="ThreadGroup.scheduler">true</boolProp>
    <stringProp name="ThreadGroup.duration">60</stringProp>
  </ThreadGroup>
  <hashTree>
    <HTTPSamplerProxy guiclass="HttpTestSampleGui" testclass="HTTPSamplerProxy" testname="HTTP Request" enabled="true">
      <elementProp name="HTTPSampler.Arguments" elementType="Arguments" guiclass="HTTPArgumentsPanel"
        testclass="Arguments" testname="User Defined Variables" enabled="true">
        <collectionProp name="Arguments.arguments"/>
      </elementProp>
      <stringProp name="HTTPSampler.domain">172.26.167.79</stringProp>
      <stringProp name="HTTPSampler.port">80</stringProp>
      <stringProp name="HTTPSampler.protocol">http</stringProp>
      <stringProp name="HTTPSampler.method">GET</stringProp>
      <boolProp name="HTTPSampler.follow_redirects">true</boolProp>
      <boolProp name="HTTPSampler.auto_redirects">false</boolProp>
      <boolProp name="HTTPSampler.use_keepalive">true</boolProp>
      <boolProp name="HTTPSampler.DO_MULTIPART_POST">false</boolProp>
    </HTTPSamplerProxy>
  </hashTree>
</hashTree>
</jmeterTestPlan>
```

运行脚本：

```
./jmeter -n -t ~/scripts/script.jmx -l /data/report.jtl
```

- -n: 以非图形化界面(GUI)方式运行
- -t: 指定测试脚本文件
- -l: 详细测试报告文件

AngusTester 脚本 (script.yaml)

```
specification: angus/1.0.0
type: TEST_CUSTOMIZATION
plugin: Http
configuration:
  duration: 1min
  thread:
    threads: 1 # 1/10/50/100/200/500/800/1000/2000
  reportInterval: 15s
task:
  pipelines:
    - target: HTTP
      request:
        method: GET
        url: http://172.26.167.79:80
```

运行脚本：

```
./startup-runner.sh -s ~/scripts/script.yaml -e 1 -R /data/result
```

- -s: 指定脚本文件
- -e: 指定执行编号
- -R: 指定详细报告和执行日志输出路径

四、测试过程

- 1 个线程运行 60 秒测试结果

JMeter 测试结果：

```
Starting standalone test @ Mon Jan 29 10:54:42 CST 2024 (1706496882051)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
summary + 108172 in 00:00:18 = 6093.5/s Avg:      0 Min:      0 Max:    24 Err:      0 (0.00%) Active: 1 Started: 1 Finished: 0
summary + 195180 in 00:00:30 = 6506.0/s Avg:      0 Min:      0 Max:     4 Err:      0 (0.00%) Active: 1 Started: 1 Finished: 0
```

```
summary = 303352 in 00:00:48 = 6352.7/s Avg:      0 Min:      0 Max:    24 Err:      0 (0.00%)
summary + 79344 in 00:00:12 = 6463.9/s Avg:      0 Min:      0 Max:      4 Err:      0 (0.00%) Active: 0 Started: 1 Finished: 1
summary = 382696 in 00:01:00 = 6375.4/s Avg:      0 Min:      0 Max:    24 Err:      0 (0.00%)
Tidying up ...      @ Mon Jan 29 10:55:42 CST 2024 (1706496942275)
... end of run
```

AngusTester 测试结果:

```
=====
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 10:58:00 ***
=====
Exec ID: 1                      Run Mode: LOCAL                      Memory: 113.32MBM(Used), 16.32GBM(Free)
Bytes: 111.2MB(Recv), 14.3MB(Write)  Iterations: 374930                  Cpu: 24.37%(Proc), 15.57%(Sys)
Date: 01/29 10:57:00 to 01/29 10:58:00  Duration: 60 Second                 Threads: 0/1 terminated
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Name | Samples | Mean | Min | Max | P50 | P75 | P90 | P99 | P999 | Trans | Trans/s | Errors | Error% | Recv/s | Write/s |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Total | 374930 | 0.16 | 0.0 | 86.0 | 0.0 | 0.0 | 1.0 | 1.0 | 1.0 | 374930 | 6248.83 | 0      | 0.0    | 1.85MB | 244.09KB |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
*** Sampling Result: SUCCESS
=====
```

- 10 个线程运行 60 秒测试结果

JMeter 测试结果:

```
Starting standalone test @ Mon Jan 29 10:58:52 CST 2024 (1706497132076)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
summary + 441859 in 00:00:08 = 57213.4/s Avg:      0 Min:      0 Max:    28 Err:      0 (0.00%) Active: 10 Started: 10 Finished: 0
summary + 1783741 in 00:00:30 = 59458.0/s Avg:      0 Min:      0 Max:   564 Err:      0 (0.00%) Active: 10 Started: 10 Finished: 0
summary = 2225600 in 00:00:38 = 58998.5/s Avg:      0 Min:      0 Max:   564 Err:      0 (0.00%)
summary + 1342454 in 00:00:22 = 60178.1/s Avg:      0 Min:      0 Max:      3 Err:      0 (0.00%) Active: 0 Started: 10 Finished: 10
summary = 3568054 in 00:01:00 = 59435.9/s Avg:      0 Min:      0 Max:   564 Err:      0 (0.00%)
Tidying up ...      @ Mon Jan 29 10:59:52 CST 2024 (1706497192309)
... end of run
```

AngusTester 测试结果:

```
=====
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 11:01:13 ***
=====
Exec ID: 1                      Run Mode: LOCAL                      Memory: 169.89MBM(Used), 16.26GBM(Free)
Bytes: 1.03GB(Recv), 135.76MB(Write)  Iterations: 3558774                  Cpu: 246.20%(Proc), 152.77%(Sys)
Date: 01/29 11:00:13 to 01/29 11:01:13  Duration: 60 Second                 Threads: 0/10 terminated
```

```
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Name | Samples | Mean | Min | Max | P50 | P75 | P90 | P99 | P999 | Trans | Trans/s | Errors | Error% | Recv/s | Write/s |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Total | 3558774 | 0.17 | 0.0 | 102.0 | 0.0 | 0.0 | 1.0 | 1.0 | 1.0 | 3558774 | 59312.9 | 0 | 0.0 | 17.59MB | 2.26MB |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+

*** Sampling Result: SUCCESS
=====
```

- 50 个线程运行 60 秒测试结果

JMeter 测试结果:

```
Starting standalone test @ Mon Jan 29 11:04:19 CST 2024 (1706497459523)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
summary + 2306472 in 00:00:10 = 224583.4/s Avg: 0 Min: 0 Max: 34 Err: 0 (0.00%) Active: 50 Started: 50 Finished: 0
summary + 7096396 in 00:00:30 = 236546.5/s Avg: 0 Min: 0 Max: 10 Err: 0 (0.00%) Active: 50 Started: 50 Finished: 0
summary + 9402868 in 00:00:40 = 233501.4/s Avg: 0 Min: 0 Max: 34 Err: 0 (0.00%)
summary + 4735525 in 00:00:20 = 239518.7/s Avg: 0 Min: 0 Max: 4 Err: 0 (0.00%) Active: 0 Started: 50 Finished: 50
summary = 14138393 in 00:01:00 = 235479.0/s Avg: 0 Min: 0 Max: 34 Err: 0 (0.00%)
Tidying up ... @ Mon Jan 29 11:05:19 CST 2024 (1706497519772)
... end of run
```

AngusTester 测试结果:

```
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 11:07:22 ***
=====
Exec ID: 1                               Run Mode: LOCAL                               Memory: 678.34MBM(Used), 15.77GBM(Free)
Bytes: 4.11GB(Recv), 541.23MB(Write)      Iterations: 14188094                          Cpu: 1045.70%(Proc), 893.41%(Sys)
Date: 01/29 11:06:22 to 01/29 11:07:22   Duration: 60 Second                          Threads: 0/50 terminated
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Name | Samples | Mean | Min | Max | P50 | P75 | P90 | P99 | P999 | Trans | Trans/s | Errors | Error% | Recv/s | Write/s |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Total | 14188094 | 0.21 | 0.0 | 145.0 | 0.0 | 0.0 | 1.0 | 1.0 | 1.0 | 14188094 | 236464.29 | 0 | 0.0 | 70.13MB | 9.02MB |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+

*** Sampling Result: SUCCESS
=====
```

- 100 个线程运行 60 秒测试结果

JMeter 测试结果:

```
Starting standalone test @ Mon Jan 29 11:15:24 CST 2024 (1706498124043)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
summary + 1596569 in 00:00:06 = 277085.9/s Avg: 0 Min: 0 Max: 72 Err: 0 (0.00%) Active: 100 Started: 100 Finished: 0
```

```
summary + 9617906 in 00:00:30 = 320618.2/s Avg:      0 Min:      0 Max:    13 Err:      0 (0.00%) Active: 100 Started: 100 Finished: 0
summary = 11214475 in 00:00:36 = 313603.9/s Avg:      0 Min:      0 Max:    72 Err:      0 (0.00%)
summary + 7758563 in 00:00:24 = 319427.0/s Avg:      0 Min:      0 Max:    11 Err:      0 (0.00%) Active: 0 Started: 100 Finished: 100
summary = 18973038 in 00:01:00 = 315954.0/s Avg:      0 Min:      0 Max:    72 Err:      0 (0.00%)
Tidying up ...      @ Mon Jan 29 11:16:24 CST 2024 (1706498184290)
... end of run
```

AngusTester 测试结果:

```
=====
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 11:24:33 ***
=====
Exec ID: 1                               Run Mode: LOCAL                       Memory: 723.62MBM(Used), 15.72GBM(Free)
Bytes: 6.66GB(Recv), 876.96MB(Write)      Iterations: 22989023                  Cpu: 1857.48%(Proc), 1664.31%(Sys)
Date: 01/29 11:23:32 to 01/29 11:24:32   Duration: 60 Second                   Threads: 0/100 terminated
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Name | Samples | Mean | Min | Max | P50 | P75 | P90 | P99 | P999 | Trans | Trans/s | Errors | Error% | Recv/s | Write/s |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Total | 22989023 | 0.26 | 0.0 | 193.0 | 0.0 | 0.0 | 1.0 | 1.0 | 2.0 | 22989023 | 383150.38 | 0 | 0.0 | 113.64MB | 14.62MB |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
*** Sampling Result: SUCCESS
=====
```

- 200 个线程运行 60 秒测试结果

JMeter 测试结果:

```
Starting standalone test @ Mon Jan 29 11:28:06 CST 2024 (1706498886095)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
summary + 7144871 in 00:00:24 = 301585.9/s Avg:      0 Min:      0 Max:   100 Err:      0 (0.00%) Active: 200 Started: 200 Finished: 0
summary + 9344497 in 00:00:30 = 311514.4/s Avg:      0 Min:      0 Max:   202 Err:      0 (0.00%) Active: 200 Started: 200 Finished: 0
summary = 16489368 in 00:00:54 = 307133.2/s Avg:      0 Min:      0 Max:   202 Err:      0 (0.00%)
summary + 1989267 in 00:00:06 = 311944.0/s Avg:      0 Min:      0 Max:     7 Err:      0 (0.00%) Active: 0 Started: 200 Finished: 200
summary = 18478635 in 00:01:00 = 307644.0/s Avg:      0 Min:      0 Max:   202 Err:      0 (0.00%)
Tidying up ...      @ Mon Jan 29 11:29:06 CST 2024 (1706498946378)
... end of run
```

AngusTester 测试结果:

```
=====
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 11:30:51 ***
=====
Exec ID: 1                               Run Mode: LOCAL                       Memory: 1.39GBM(Used), 15.04GBM(Free)
Bytes: 9.63GB(Recv), 1.24GB(Write)      Iterations: 33238690                  Cpu: 1173.17%(Proc), 1106.63%(Sys)
```

Date: 01/29 11:29:51 to 01/29 11:30:51Duration: 60 SecondThreads: 0/200 terminated

Name	Samples	Mean	Min	Max	P50	P75	P90	P99	P999	Trans	Trans/s	Errors	Error%	Recv/s	Write/s
Total	33238690	0.36	0.0	334.0	0.0	1.0	1.0	1.0	5.0	33238690	553913.54	0	0.0	164.29MB	21.13MB

*** Sampling Result: SUCCESS

- 300 个线程运行 60 秒测试结果

JMeter 测试结果:

```
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
summary +      1 in 00:00:00 =      4.1/s Avg:      51 Min:      51 Max:      51 Err:      0 (0.00%) Active: 300 Started: 300 Finished: 0
summary + 7870388 in 00:00:26 = 299539.0/s Avg:      0 Min:      0 Max:      59 Err:      0 (0.00%) Active: 300 Started: 300 Finished: 0
summary = 7870389 in 00:00:27 = 296816.6/s Avg:      0 Min:      0 Max:      59 Err:      0 (0.00%)
summary + 9191994 in 00:00:30 = 306399.8/s Avg:      0 Min:      0 Max:      11 Err:      0 (0.00%) Active: 300 Started: 300 Finished: 0
summary = 17062383 in 00:00:57 = 301903.6/s Avg:      0 Min:      0 Max:      59 Err:      0 (0.00%)
summary + 1099938 in 00:00:05 = 205788.2/s Avg:      0 Min:      0 Max:      6 Err:      0 (0.00%) Active: 0 Started: 300 Finished: 300
summary = 18162321 in 00:01:02 = 293598.9/s Avg:      0 Min:      0 Max:      59 Err:      0 (0.00%)
Tidying up ...      @ Mon Jan 29 11:32:35 CST 2024 (1706499155345)
... end of run
```

AngusTester 测试结果:

```
=====
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 11:33:56 ***
=====
Exec ID: 1Run Mode: LOCALMemory: 1.46GBM(Used), 14.97GBM(Free)
Bytes: 10.58GB(Recv), 1.36GB(Write)Iterations: 36520948Cpu: 2021.30%(Proc), 1957.66%(Sys)
Date: 01/29 11:32:56 to 01/29 11:33:56Duration: 60 SecondThreads: 0/300 terminated
=====
| Name | Samples | Mean | Min | Max | P50 | P75 | P90 | P99 | P999 | Trans | Trans/s | Errors | Error% | Recv/s | Write/s |
=====
| Total | 36520948 | 0.49 | 0.0 | 528.0 | 0.0 | 1.0 | 1.0 | 1.0 | 10.0 | 36520948 | 608662.18 | 0 | 0.0 | 180.52MB | 23.22MB |
=====
*** Sampling Result: SUCCESS
=====
```

- 500 个线程运行 60 秒测试结果

JMeter 测试结果:


```
Starting standalone test @ Mon Jan 29 11:52:40 CST 2024 (1706500360367)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
summary + 5486537 in 00:00:19 = 282287.4/s Avg:      0 Min:      0 Max:   142 Err:      0 (0.00%) Active: 500 Started: 500 Finished: 0
summary + 8827110 in 00:00:30 = 294237.0/s Avg:      0 Min:      0 Max:   200 Err:      0 (0.00%) Active: 500 Started: 500 Finished: 0
summary = 14313647 in 00:00:49 = 289538.9/s Avg:      0 Min:      0 Max:   200 Err:      0 (0.00%)
summary + 3151073 in 00:00:11 = 294878.6/s Avg:      0 Min:      0 Max:     7 Err:      0 (0.00%) Active: 0 Started: 500 Finished: 500
summary = 17464720 in 00:01:00 = 290483.2/s Avg:      0 Min:      0 Max:   200 Err:      0 (0.00%)
Tidying up ...      @ Mon Jan 29 11:53:40 CST 2024 (1706500420687)
... end of run
```

AngusTester 测试结果:

```
=====
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 12:03:23 ***
=====
Exec ID: 1                               Run Mode: LOCAL                       Memory: 1.44GBM(Used), 14.99GBM(Free)
Bytes: 10.22GB(Recv), 1.32GB(Write)       Iterations: 35299279                  Cpu: 1533.22%(Proc), 1468.81%(Sys)
Date: 01/29 12:02:23 to 01/29 12:03:23   Duration: 60 Second                  Threads: 0/500 terminated
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Name | Samples | Mean | Min | Max | P50 | P75 | P90 | P99 | P999 | Trans | Trans/s | Errors | Error% | Recv/s | Write/s |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Total | 35299279 | 0.84 | 0.0 | 1095.0 | 1.0 | 1.0 | 1.0 | 4.0 | 36.0 | 35299279 | 588115.48 | 0 | 0.0 | 174.43MB | 22.43MB |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
*** Sampling Result: SUCCESS
=====
```

- 800 个线程运行 60 秒测试结果

JMeter 测试结果:

```
Starting standalone test @ Mon Jan 29 12:06:11 CST 2024 (1706501171560)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
summary + 4664907 in 00:00:18 = 255807.6/s Avg:      0 Min:      0 Max:  1019 Err:      0 (0.00%) Active: 800 Started: 800 Finished: 0
summary + 8213552 in 00:00:30 = 273785.1/s Avg:      0 Min:      0 Max:   201 Err:      0 (0.00%) Active: 800 Started: 800 Finished: 0
summary = 12878459 in 00:00:48 = 266988.5/s Avg:      0 Min:      0 Max:  1019 Err:      0 (0.00%)
summary + 3274861 in 00:00:12 = 274552.4/s Avg:      0 Min:      0 Max:     8 Err:      0 (0.00%) Active: 0 Started: 800 Finished: 800
summary = 16153320 in 00:01:00 = 268488.1/s Avg:      0 Min:      0 Max:  1019 Err:      0 (0.00%)
Tidying up ...      @ Mon Jan 29 12:07:11 CST 2024 (1706501231928)
... end of run
```

AngusTester 测试结果:

- 2000 个线程运行 60 秒测试结果

JMeter 测试结果:

```
Starting standalone test @ Mon Jan 29 12:21:28 CST 2024 (1706502088371)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
summary + 96922 in 00:00:01 = 67872.5/s Avg:      2 Min:      0 Max: 1118 Err:      0 (0.00%) Active: 2000 Started: 2000 Finished: 0
summary + 7417064 in 00:00:30 = 247235.5/s Avg:      0 Min:      0 Max:  20 Err:      0 (0.00%) Active: 2000 Started: 2000 Finished: 0
summary = 7513986 in 00:00:31 = 239085.7/s Avg:      0 Min:      0 Max: 1118 Err:      0 (0.00%)
summary + 7206406 in 00:00:29 = 244907.6/s Avg:      0 Min:      0 Max:  15 Err:      0 (0.00%) Active: 0 Started: 2000 Finished: 2000
summary = 14720392 in 00:01:01 = 241900.8/s Avg:      0 Min:      0 Max: 1118 Err:      0 (0.00%)
Tidying up ...      @ Mon Jan 29 12:22:29 CST 2024 (1706502149426)
... end of run
```

AngusTester 测试结果:

```
=====
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 21:40:59 ***
=====
Exec ID: 1                               Run Mode: LOCAL                       Memory: 1.35GBM(Used), 15.08GBM(Free)
Bytes: 5.47GB(Recv), 720.87MB(Write)      Iterations: 18897114                   Cpu: 48.07%(Proc), 44.94%(Sys)
Date: 01/29 09:39:58 to 01/29 09:40:58   Duration: 60 Second                    Threads: 0/2000 terminated
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Name | Samples | Mean | Min | Max | P50 | P75 | P90 | P99 | P999 | Trans | Trans/s | Errors | Error% | Recv/s | Write/s |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Total | 18897114 | 3.09 | 0.0 | 6192.0 | 1.0 | 1.0 | 2.0 | 28.0 | 163.0 | 18897114 | 314789.26 | 0 | 0.0 | 93.36MB | 12.01MB |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
*** Sampling Result: SUCCESS
=====
```

测试工具/QPS/线程	1	10	50	100	200	300	500	800	1000	2000
JMeter	6375.4/s	59435.9/s	235479.0/s	236464.29/s	307644.0/s	293598.9/s	290483.2/s	268488.1/s	266158.6/s	241900.8/s
AngusTester	6248.83/s	59312.9/s	236464.29/s	383150.38/s	553913.54	608662.18	588115.48	580479.25	585673.87	314789.26

- 5000 个线程运行 60 秒测试结果

JMeter 测试结果:

```
Starting standalone test @ Mon Jan 29 21:44:10 CST 2024 (1706535850247)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
Warning: Nashorn engine is planned to be removed from a future JDK release
summary + 4079076 in 00:00:20 = 208552.4/s Avg:      0 Min:      0 Max: 218 Err:      0 (0.00%) Active: 5000 Started: 5000 Finished: 0
summary + 6710956 in 00:00:30 = 223698.5/s Avg:      0 Min:      0 Max:  20 Err:      0 (0.00%) Active: 5000 Started: 5000 Finished: 0
```

```
summary = 10790032 in 00:00:50 = 217720.9/s Avg:      0 Min:      0 Max:   218 Err:      0 (0.00%)
summary + 2748345 in 00:00:13 = 219727.0/s Avg:      0 Min:      0 Max:   117 Err:      0 (0.00%) Active: 0 Started: 5000 Finished: 5000
summary = 13538377 in 00:01:02 = 218121.7/s Avg:      0 Min:      0 Max:   218 Err:      0 (0.00%)
Tidying up ...      @ Mon Jan 29 21:45:12 CST 2024 (1706535912509)
... end of run
```

AngusTester 测试结果:

```
=====
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 21:47:19 ***
=====
Exec ID: 1                               Run Mode: LOCAL                       Memory: 1.42GBM(Used), 15.01GBM(Free)
Bytes: 5.23GB(Recv), 688.45MB(Write)      Iterations: 18047434                   Cpu: 49.04%(Proc), 45.88%(Sys)
Date: 01/29 09:46:18 to 01/29 09:47:18   Duration: 60 Second                   Threads: 0/5000 terminated
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Name | Samples | Mean | Min | Max | P50 | P75 | P90 | P99 | P999 | Trans | Trans/s | Errors | Error% | Recv/s | Write/s |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Total | 18047434 | 5.59 | 0.0 | 13445.0 | 1.0 | 2.0 | 4.0 | 52.0 | 324.0 | 18047434 | 300765.5 | 0 | 0.0 | 89.2MB | 11.47MB |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
*** Sampling Result: SUCCESS
=====
```

- 10000 个线程运行 60 秒测试结果

JMeter 测试结果:

```
Starting standalone test @ Mon Jan 29 21:48:01 CST 2024 (1706536081580)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
Warning: Nashorn engine is planned to be removed from a future JDK release
summary +      1 in 00:00:01 = 1.7/s Avg:  147 Min:  147 Max:  147 Err:      0 (0.00%) Active: 1641 Started: 1641 Finished: 0
summary + 3154676 in 00:00:28 = 114047.8/s Avg:      0 Min:      0 Max:   369 Err:      0 (0.00%) Active: 10000 Started: 10000 Finished: 0
summary = 3154677 in 00:00:28 = 111737.2/s Avg:      0 Min:      0 Max:   369 Err:      0 (0.00%)
summary + 3463338 in 00:00:30 = 115444.6/s Avg:      0 Min:      0 Max:    50 Err:      0 (0.00%) Active: 10000 Started: 10000 Finished: 0
summary = 6618015 in 00:00:58 = 113647.2/s Avg:      0 Min:      0 Max:   369 Err:      0 (0.00%)
summary + 549613 in 00:00:06 = 93567.1/s Avg:      0 Min:      0 Max:   276 Err:      0 (0.00%) Active: 0 Started: 10000 Finished: 10000
summary = 7167628 in 00:01:04 = 111807.3/s Avg:      0 Min:      0 Max:   369 Err:      0 (0.00%)
Tidying up ...      @ Mon Jan 29 21:49:05 CST 2024 (1706536145874)
... end of run
```

AngusTester 测试结果:

```
=====
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 21:50:15 ***
=====
```

```
Exec ID: 1                               Run Mode: LOCAL                               Memory: 4.89GBM(Used), 11.54GBM(Free)
Bytes: 6.25GB(Recv), 823.03MB(Write)      Iterations: 21575117                          Cpu: 41.56%(Proc), 38.79%(Sys)
Date: 01/29 09:49:14 to 01/29 09:50:14   Duration: 60 Second                          Threads: 0/10000 terminated

+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Name | Samples | Mean | Min | Max | P50 | P75 | P90 | P99 | P999 | Trans | Trans/s | Errors | Error% | Recv/s | Write/s |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Total | 21575117 | 2.42 | 0.0 | 9792.0 | 1.0 | 2.0 | 4.0 | 28.0 | 145.0 | 21575117 | 358200.24 | 0 | 0.0 | 106.24MB | 13.66MB |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+

*** Sampling Result: SUCCESS
=====
```

- 15000 个线程运行 60 秒测试结果

JMeter 测试结果:

```
Starting standalone test @ Mon Jan 29 21:51:54 CST 2024 (1706536314595)
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
Warning: Nashorn engine is planned to be removed from a future JDK release
summary + 494183 in 00:00:05 = 94761.8/s Avg: 0 Min: 0 Max: 315 Err: 0 (0.00%) Active: 11573 Started: 11573 Finished: 0
summary + 1240257 in 00:00:30 = 41307.5/s Avg: 1 Min: 0 Max: 496 Err: 0 (0.00%) Active: 15000 Started: 15000 Finished: 0
summary = 1734440 in 00:00:35 = 49217.9/s Avg: 1 Min: 0 Max: 496 Err: 0 (0.00%)
summary + 1170455 in 00:00:30 = 38837.8/s Avg: 1 Min: 0 Max: 304 Err: 0 (0.00%) Active: 9523 Started: 15000 Finished: 5477
summary = 2904895 in 00:01:05 = 44432.3/s Avg: 1 Min: 0 Max: 496 Err: 0 (0.00%)
summary + 314346 in 00:00:03 = 94454.9/s Avg: 0 Min: 0 Max: 383 Err: 0 (0.00%) Active: 0 Started: 15000 Finished: 15000
summary = 3219241 in 00:01:09 = 46855.3/s Avg: 1 Min: 0 Max: 496 Err: 0 (0.00%)
Tidying up ... @ Mon Jan 29 21:53:03 CST 2024 (1706536383492)
... end of run
```

AngusTester 测试结果:

```
=====
*** Task Summary Report @ Http TEST_CUSTOMIZATION @ 2024-01-29 21:54:26 ***
=====

Exec ID: 1                               Run Mode: LOCAL                               Memory: 4.87GBM(Used), 11.56GBM(Free)
Bytes: 4.9GB(Recv), 645.29MB(Write)      Iterations: 16915859                          Cpu: 26.71%(Proc), 24.39%(Sys)
Date: 01/29 09:53:25 to 01/29 09:54:25   Duration: 60 Second                          Threads: 0/15000 terminated

+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Name | Samples | Mean | Min | Max | P50 | P75 | P90 | P99 | P999 | Trans | Trans/s | Errors | Error% | Recv/s | Write/s |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Total | 16915859 | 3.14 | 0.0 | 13321.0 | 1.0 | 2.0 | 4.0 | 44.0 | 142.0 | 16915859 | 280779.79 | 0 | 0.0 | 83.28MB | 10.71MB |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+

*** Sampling Result: SUCCESS
=====
```

五、测试结果



测试工具/QPS/线程	1	10	50	100	200	300	500	800	1000	2000	5000	10000	15000
JMeter	6375.4/s	59435.9/s	235479.0/s	236464.29/s	307644.0/s	293598.9/s	290483.2/s	268488.1/s	266158.6/s	241900.8/s	218121.7/s	111807.3/s	46855.3/s
AngusTester	6248.83/s	59312.9/s	236464.29/s	383150.38/s	553913.54/s	608662.18/s	588115.48/s	580479.25/s	585673.87/s	314789.26/s	300765.5/s	358200.24/s	280779.79/s

- 相同条件下，不断增加并发线程数，JMeter 200 并发时 QPS 达到最高 307644.0/s，AngusTester 300 并发时 QPS 达到最高 608662.18/s，最大 **QPS** 提升了 **97.85%**；
- QPS 达到最大后，随着并发线程数继续增加，JMeter 性能下降迅速，AngusTester 性能下降比较平缓，表现平稳。