

Lab 5 Report

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6/3

1 Test Plan

1.1 Summary/Scope

The LibSystem (<http://127.0.0.1/LibSystem>) which is a website for booking system. This report is a Load/Stress test for operate website. (e.g., Login/ search for book/ borrow the book)

1.2 Feature to be tested

1. Login
 - Login and Logout with ramp-up
 - Login and Logout without ramp-up
2. ISBN Search books
 - ISBN search books synchronous
 - ISBN search books asynchronous
3. Check out books/ Check in books
 - Check out and Check in book synchronous
 - Check out and Check in book asynchronous

1.3 Success criteria of completing the test

Test pass: thread's status is success.

Test fail criteria, response time > 40000 (ms) with 1024 users

1.4 Test environment and/or infrastructure

1. [Docker Desktop for Windows & Docker Hub](#)
2. Apache JMeter 5.1.1 (Require Java 8+)

1.5 Test approaches

In the script of Login, Login and Logout without ramp-up I design it with logout after every thread login and the assert with login is success.

Then, Login and Logout with ramp-up which the difference between the previous version is setting thread 256's ramp-up in 10 and thread 512's ramp-up in 20 and thread 1024's ramp-up in 40.

In the script of ISBN Search books, ISBN search books synchronous

the script is when every thread searching the book with ISBN then logout and the assertion after ISBN is randomly, and the other script difference between synchronous is searching the book with ISBN after every thread login.

In the script of Check out books/ Check in books, check out and check in book synchronous the step is first login, second searching book with ISBN, third check the free code, then check in and check out the book, logout finally. And the difference between synchronous is waiting until every thread login then start the action.

1.6 Testing tasks

To implement the proposed strategy, the following activities are planned to perform.

| No. | Activity Name | Plan hours | Schedule Date |
|-----|-------------------------|------------|---------------|
| 1 | Study JMeter | 4 | 5/26 |
| 2 | Familiar with LibSystem | 3 | 5/27 |
| 3 | Study Postman | 3 | 5/28 |
| 4 | Study JavaScript | 3 | 5/28 |
| 5 | Design test cases | 2 | 5/29 |
| 6 | Implement test cases | 10 | 5/29 |
| 7 | Perform tests | 3 | 5/30 |
| 8 | Complete Lab5 report | 6 | 5/30-6/3 |

2 Test Design

To fulfill the test requirements listed in section 1.2, the following test cases are selected and corresponding designed.

2.1

| Use Case Section | Comment |
|--------------------|--|
| Use Case Name | Login and Logout with ramp-up |
| Precondition | 可以運行在 http://127.0.0.1/LibSystem ，並且用 TA 給的範例檔修改。 |
| Expected output | Every thread's status is success |
| Input actions | 1. login request assertion 2. logout request assertion Synchronizing Timer |
| Design of workload | 1. ramp-up is 10 in thread 256 |

| | |
|--|--|
| | 2. ramp-up is 20 in thread 512 3. ramp-up is 40 in thread 1024 4. the assertion of login is {“status”:”success”,”authority”:”2”} 5. the assertion of logout is success |
|--|--|

2.2

| Use Case Section | Comment |
|--------------------|---|
| Use Case Name | Login and Logout without ramp-up |
| Precondition | 可以運行在 http://127.0.0.1/LibSystem ，並且用 TA 給的範例檔修改。 |
| Expected output | Every thread’s status is success |
| Input actions | 1. login request assertion 2. logout request assertion Synchronizing Timer |
| Design of workload | 1.the assertion of login is {“status”:”success”,”authority”:”2”} 2.the assertion of logout is success |

2.3

| Use Case Section | Comment |
|--------------------|--|
| Use Case Name | ISBN search books synchronous |
| Precondition | 可以運行在 http://127.0.0.1/LibSystem ，並且用 TA 給的範例檔修改。 |
| Expected output | Every thread’s status is success |
| Input actions | 1. login assertion 2. get all ISBN data JSON Extractor 3. Get a random ISBN JSR223 PreProcessor assertion 4. Logout Assertion Synchronizing timer |
| Design of workload | 1. ramp-up is 10 in thread 256 2. ramp-up is 20 in thread 512 3. ramp-up is 40 in thread 1024 |

| | |
|--|---|
| | 4. the assertion of login is { "status":"success","authority":"2"} 5. the assertion of get a random ISBN is "isbn":"\${randIsbn}" 6. the assertion of logout is success |
|--|---|

2.4

| Use Case Section | Comment |
|--------------------|--|
| Use Case Name | ISBN search books asynchronous |
| Precondition | 可以運行在 http://127.0.0.1/LibSystem ，並且用 TA 給的範例檔修改。 |
| Expected output | Every thread's status is success |
| Input actions | 1. login assertion 2. get all ISBN data JSON Extractor Synchronizing timer 3. Get a random ISBN JSR223 PreProcessor assertion 4. Logout Assertion Synchronizing timer |
| Design of workload | 1. ramp-up is 10 in thread 256 2. ramp-up is 20 in thread 512 3. ramp-up is 40 in thread 1024 4. the assertion of login is { "status":"success","authority":"2"} 5. the assertion of get a random ISBN is "isbn":"\${randIsbn}" 6. the assertion of logout is success |

2.5

| Use Case Section | Comment |
|------------------|--|
| Use Case Name | Check out and Check in book synchronous |
| Precondition | 可以運行在 http://127.0.0.1/LibSystem ，並且用 TA 給的範例檔修改。 |
| Expected output | Every thread's status is success |
| Input actions | 1. login assertion |

| | |
|---------------------------|--|
| | 2. get all ISBN data JSON Extractor 3. Get a random ISBN JSR223 PreProcessor Assertion 4. Book data JSON Extractor 5. Get a random code number JSR223 PreProcessor Assertion 6. Critical Section Controller Borrow Book Assertion Give it back Assertion 7. Logout Assertion Synchronizing timer |
| Design of workload | 1. ramp-up is 10 in thread 256 2. ramp-up is 20 in thread 512 3. ramp-up is 40 in thread 1024 4. the assertion of login is { "status":"success","authority":"2"} 5. the assertion of get a random ISBN is "isbn": "\${randIsbn}" 6. the assertion of get a random code number is \${randCode} 7. the assertion of borrow book is success 8. the assertion of give it back is success 9. the assertion of logout is success |

2.6

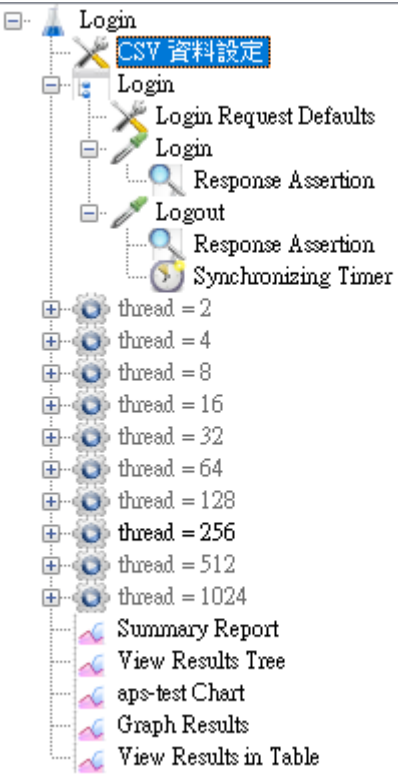
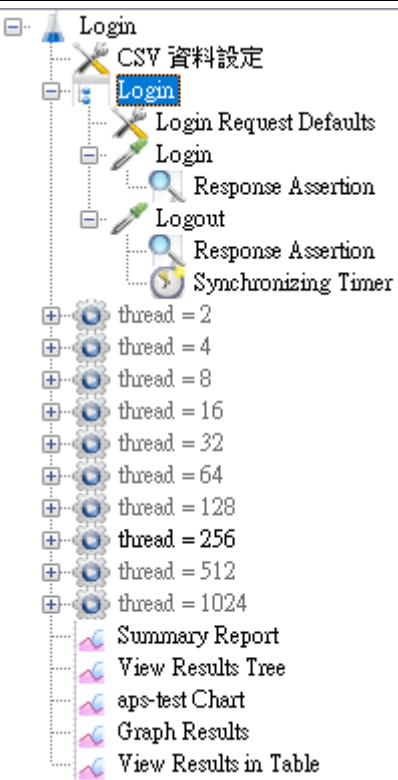
| Use Case Section | Comment |
|------------------------|--|
| Use Case Name | Check out and Check in book asynchronous |
| Precondition | 可以運行在 http://127.0.0.1/LibSystem ，並且用 TA 給的範例檔修改。 |
| Expected output | Every thread's status is success |
| Input actions | 1. login assertion |

| | |
|---------------------------|---|
| | <ol style="list-style-type: none"> 2. get all ISBN data JSON Extractor Synchronizing timer 3. Get a random ISBN JSR223 PreProcessor Assertion 4. Book data JSON Extractor 5. Get a random code number JSR223 PreProcessor Assertion 6. Critical Section Controller Borrow Book Assertion Give it back Assertion 7. Logout Assertion Synchronizing timer |
| Design of workload | <ol style="list-style-type: none"> 1. ramp-up is 10 in thread 256 2. ramp-up is 20 in thread 512 3. ramp-up is 40 in thread 1024 4. the assertion of login is { "status":"success","authority":"2"} 5. the assertion of get a random ISBN is "isbn":"\${randIsbn}" 6. the assertion of get a random code number is \${randCode} 7. the assertion of borrow book is success 8. the assertion of give it back is success 9. the assertion of logout is success |

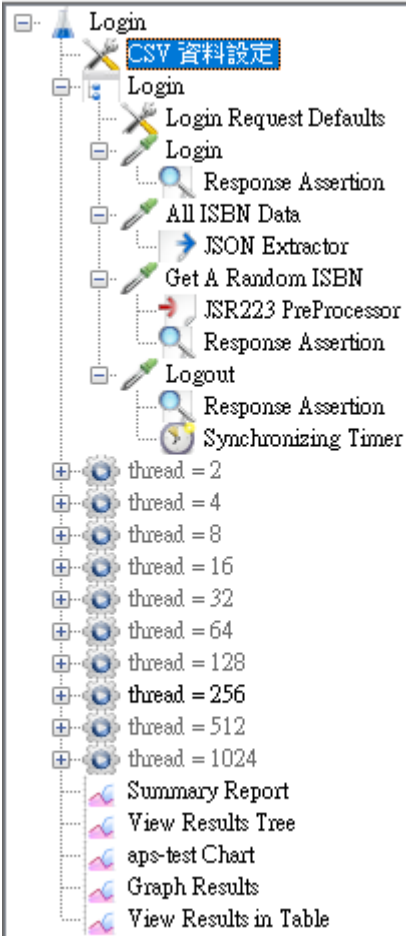
3 Test Implementation

The design of test cases specified in Section 1.2 was implemented JMeter IDE and JavaScript with random variables. All test scripts of scenario are given below. **The test script implementations can also be found in the [link](#).**

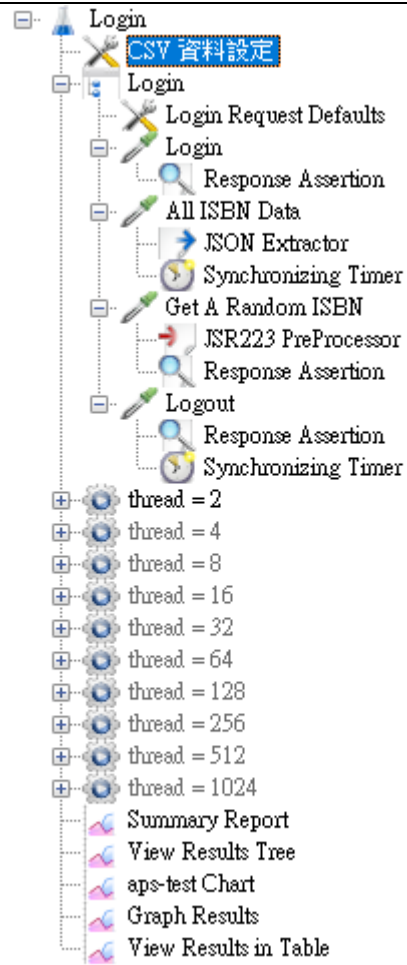
| No. | Test method | Test script |
|-----|-------------|-------------|
|-----|-------------|-------------|

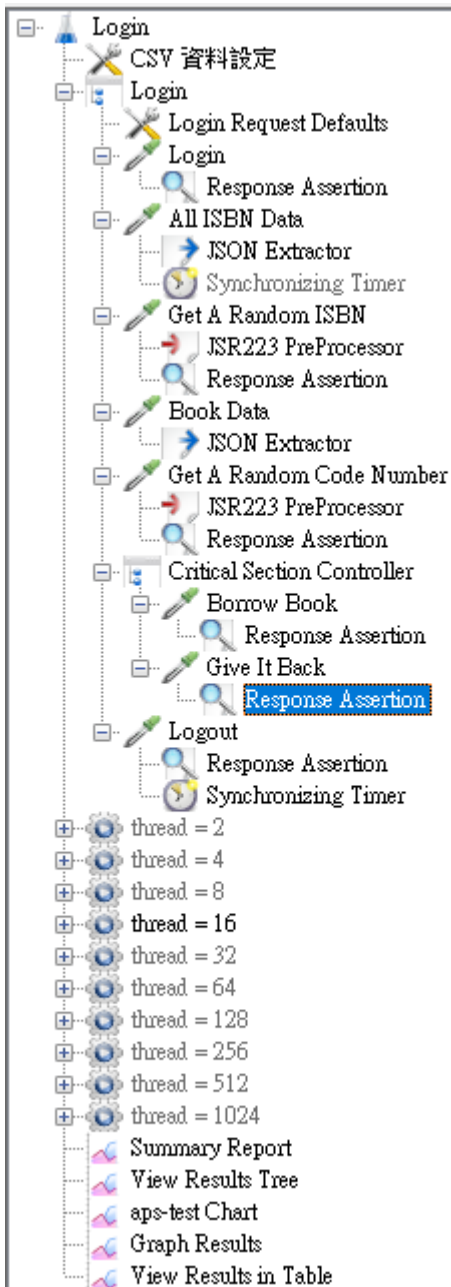
| | | |
|---|----------------------------------|---|
| 1 | Login and Logout with ramp-up |  <p>The screenshot shows a JMeter test plan for 'Login and Logout with ramp-up'. The test plan structure is as follows:</p> <ul style="list-style-type: none"> Test Plan (Login) <ul style="list-style-type: none"> CSV 資料設定 (CSV Data Set Config) Login (HTTP Request) <ul style="list-style-type: none"> Login Request Defaults (HTTP Request Defaults) Login (HTTP Request) Response Assertion (Response Assertion) Logout (HTTP Request) <ul style="list-style-type: none"> Response Assertion (Response Assertion) Synchronizing Timer (Synchronizing Timer) thread = 2 thread = 4 thread = 8 thread = 16 thread = 32 thread = 64 thread = 128 thread = 256 thread = 512 thread = 1024 Summary Report View Results Tree aps-test Chart Graph Results View Results in Table |
| 2 | Login and Logout without ramp-up |  <p>The screenshot shows a JMeter test plan for 'Login and Logout without ramp-up'. The test plan structure is as follows:</p> <ul style="list-style-type: none"> Test Plan (Login) <ul style="list-style-type: none"> CSV 資料設定 (CSV Data Set Config) Login (HTTP Request) <ul style="list-style-type: none"> Login Request Defaults (HTTP Request Defaults) Login (HTTP Request) Response Assertion (Response Assertion) Logout (HTTP Request) <ul style="list-style-type: none"> Response Assertion (Response Assertion) Synchronizing Timer (Synchronizing Timer) thread = 2 thread = 4 thread = 8 thread = 16 thread = 32 thread = 64 thread = 128 thread = 256 thread = 512 thread = 1024 Summary Report View Results Tree aps-test Chart Graph Results View Results in Table |

3 ISBN search books synchronous

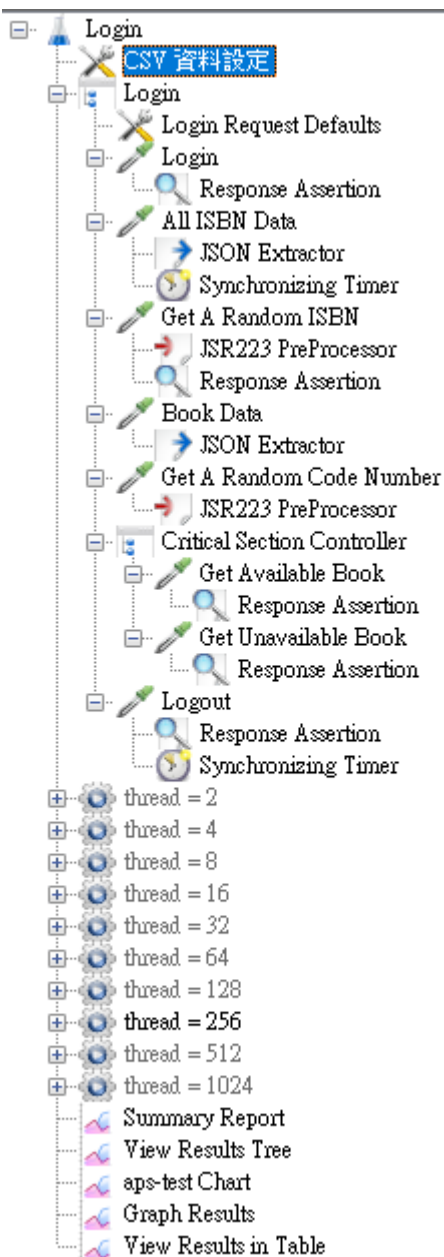


4 ISBN search books asynchronous





6 Check out and Check in book asynchronous

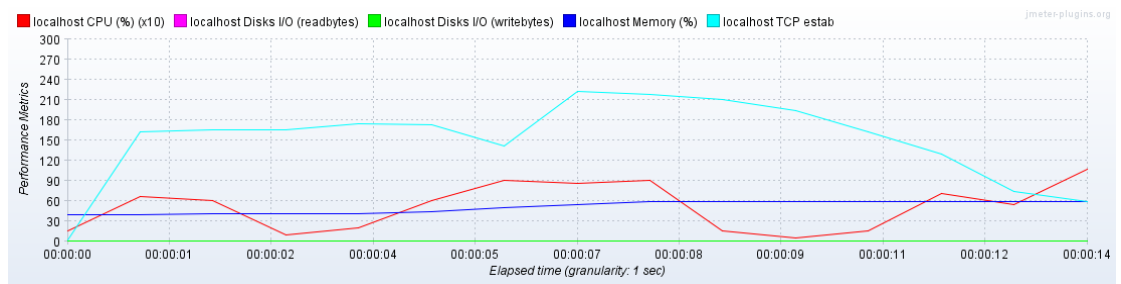


4 Test Results

Login:

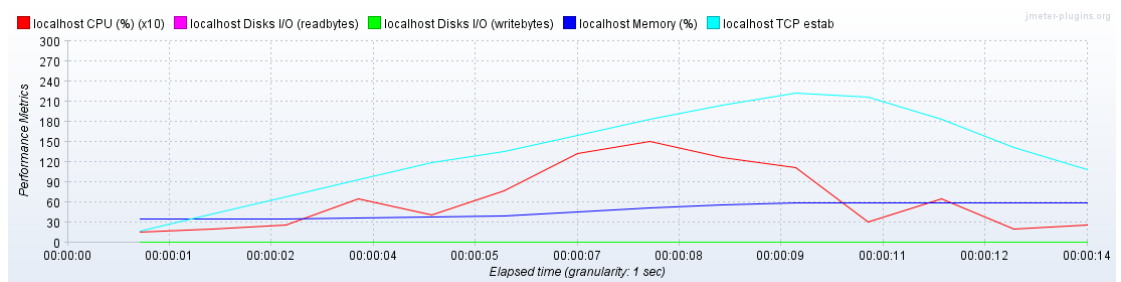
1. Thread 256 without ramp-up

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|--------|-----------|---------|-----|-------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 256 | 7158 | 69 | 13885 | 3950.66 | 0.00% | 18.4/sec | 7.32 | 4.43 | 408.0 |
| Logout | 256 | 523 | 289 | 722 | 130.18 | 0.00% | 343.6/sec | 126.85 | 46.31 | 378.0 |
| TOTAL | 512 | 3841 | 69 | 13885 | 4338.02 | 0.00% | 34.9/sec | 13.38 | 6.56 | 393.0 |



2. Thread 256 with ramp-up

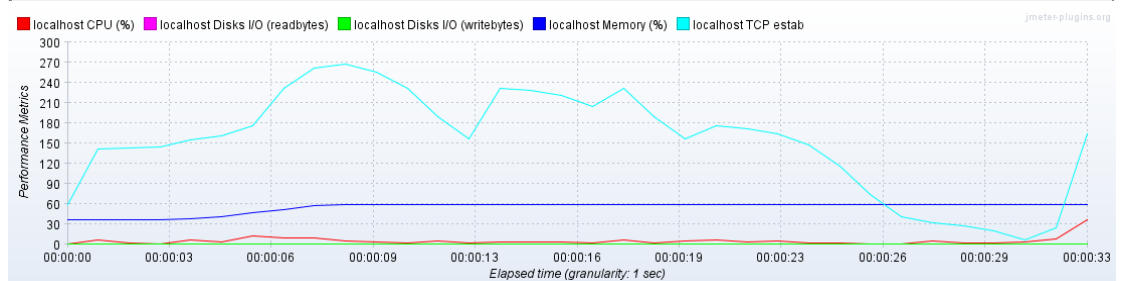
| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|--------|-----------|---------|-----|------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 256 | 3574 | 5 | 5356 | 1099.61 | 0.00% | 18.3/sec | 7.27 | 4.40 | 408.0 |
| Logout | 256 | 605 | 293 | 779 | 120.40 | 0.00% | 326.9/sec | 120.69 | 44.06 | 378.0 |
| TOTAL | 512 | 2089 | 5 | 5356 | 1678.28 | 0.00% | 34.6/sec | 13.27 | 6.50 | 393.0 |



| Attribute | Without ramp-up | With ramp-up |
|------------------------------|------------------|------------------------------|
| response time(Average Total) | 3841(ms) | 2089(ms) |
| CPU | 起伏較多 | 緩慢上升到 7.5 秒下降最後一起 logout 在上升 |
| Memory | 較為平緩 | 緩慢上升 |
| Network | 一開始就飆高直到 9 秒後才下降 | 緩慢上升到 10 秒後開始下降 |
| Disk | 沒什麼變化 | 沒什麼變化 |

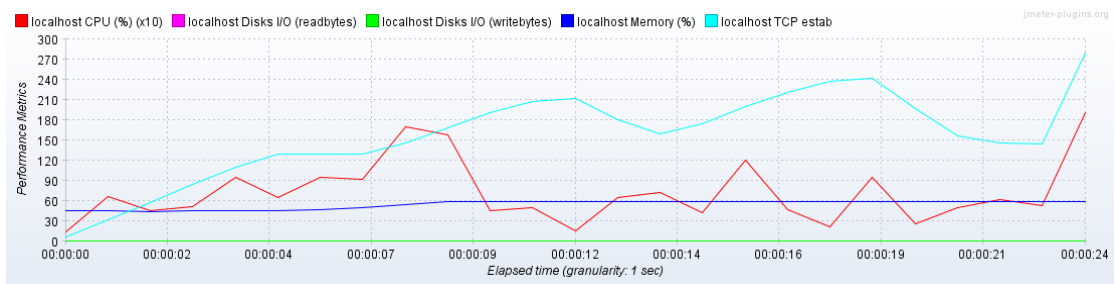
3. Thread 512 without ramp-up

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|--------|-----------|---------|-----|-------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 512 | 14173 | 76 | 31830 | 7407.55 | 0.00% | 15.9/sec | 6.32 | 3.82 | 408.0 |
| Logout | 512 | 1155 | 649 | 1712 | 300.78 | 0.00% | 298.7/sec | 110.27 | 40.26 | 378.0 |
| TOTAL | 1024 | 7664 | 76 | 31830 | 8357.46 | 0.00% | 30.1/sec | 11.55 | 5.66 | 393.0 |



4. Thread 512 with ramp-up

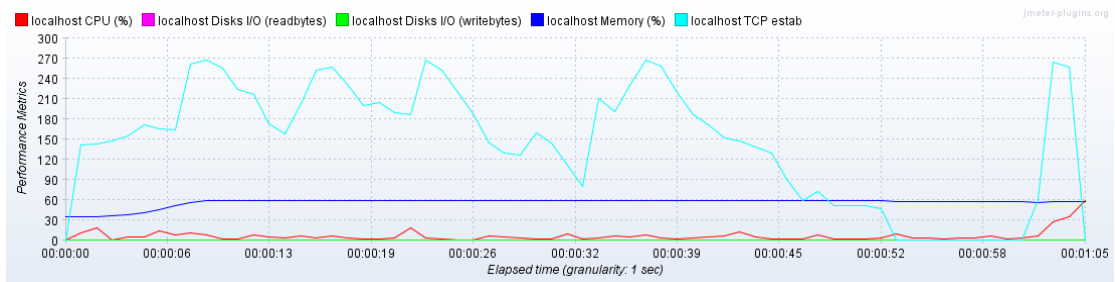
| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|--------|-----------|---------|-----|------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 512 | 3086 | 5 | 6048 | 1649.84 | 0.00% | 21.9/sec | 8.71 | 5.27 | 408.0 |
| Logout | 512 | 1162 | 725 | 1701 | 296.85 | 0.00% | 291.2/sec | 107.51 | 39.25 | 378.0 |
| TOTAL | 1024 | 2124 | 5 | 6048 | 1526.64 | 0.00% | 40.7/sec | 15.61 | 7.65 | 393.0 |



| Attribute | Without ramp-up | With ramp-up |
|------------------------------|--|-----------------------------------|
| response time(Average Total) | 7664 (ms) | 2124 (ms) |
| CPU | 只有最後 logout 才上升 | 起伏較多，大多和網路的曲線呈正相關 |
| Memory | 較為平緩 | 較為平緩 |
| Network | 一開始就飆高直到 8 秒到達最高，17 秒後開始下降，最後 logout 再飆高 | 緩慢上升到 19 秒後開始下降，22 秒後因為 logout 飆高 |
| Disk | 沒什麼變化 | 沒什麼變化 |

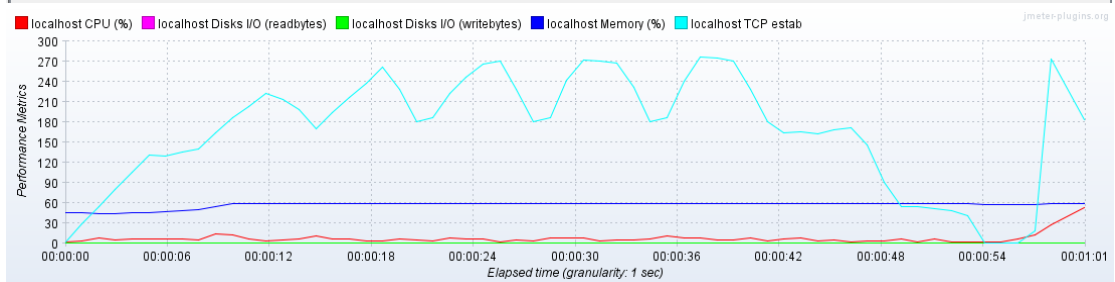
5. Thread 1024 without ramp-up

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|--------|-----------|---------|------|-------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 1024 | 26364 | 25 | 61099 | 15194.82 | 0.00% | 16.6/sec | 6.60 | 4.00 | 408.0 |
| Logout | 1024 | 2422 | 1118 | 4161 | 681.66 | 0.00% | 234.9/sec | 86.70 | 31.65 | 378.0 |
| TOTAL | 2048 | 14393 | 25 | 61099 | 16092.71 | 0.00% | 31.0/sec | 11.88 | 5.82 | 393.0 |



6. Thread 1024 with ramp-up

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|--------|-----------|---------|------|-------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 1024 | 5276 | 5 | 31959 | 3419.09 | 0.00% | 17.8/sec | 7.10 | 4.30 | 408.0 |
| Logout | 1024 | 2187 | 1065 | 3093 | 538.82 | 0.00% | 322.7/sec | 119.13 | 43.49 | 378.0 |
| TOTAL | 2048 | 3732 | 5 | 31959 | 2894.02 | 0.00% | 33.8/sec | 12.96 | 6.35 | 393.0 |



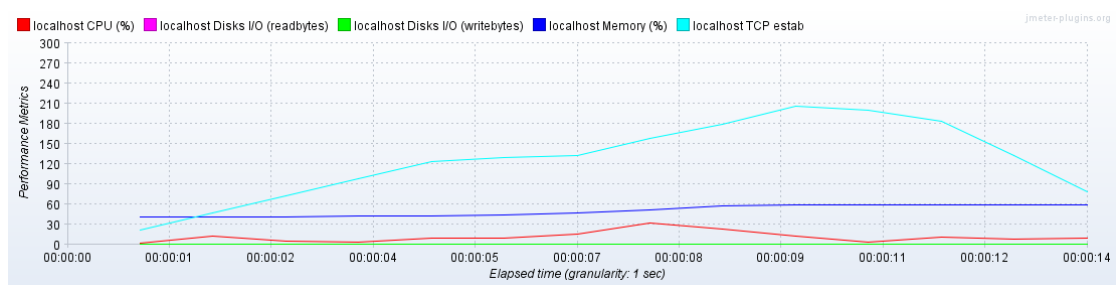
| Attribute | Without ramp-up | With ramp-up |
|-----------|-----------------|--------------|
|-----------|-----------------|--------------|

| | | |
|------------------------|--------------------------------|---|
| response time(Average) | 14393 (ms) | 3732 (ms) |
| CPU | 只有最後 logout 才上升 | 只有最後 logout 才上升 |
| Memory | 較為平緩 | 較為平緩 |
| Network | 一開始就飆高，37 秒後開始下降，最後 logout 再飆高 | 持續上升到 19 秒後開始在 180-270(metrics)來回，47 秒後下降，55 秒後因為 logout 飆高 |
| Disk | 沒什麼變化 | 沒什麼變化 |

ISBN Search books

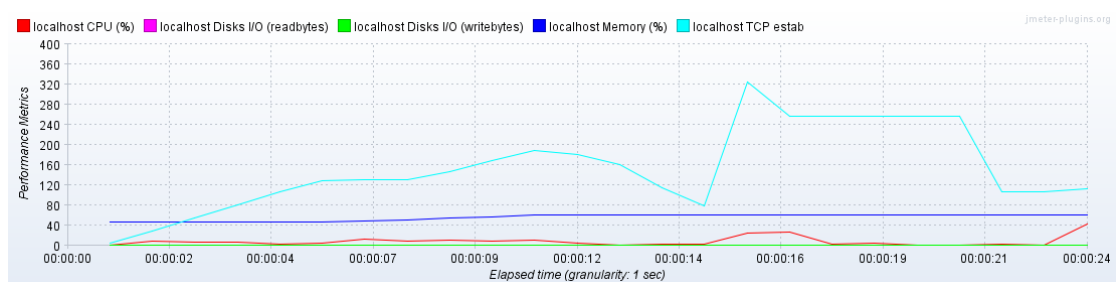
1. Thread 256 with ISBN search books synchronous

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|-------------------|-----------|---------|-----|------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 256 | 1695 | 5 | 2863 | 834.10 | 0.00% | 20.7/sec | 8.24 | 4.99 | 408.0 |
| All ISBN Data | 256 | 847 | 4 | 2616 | 969.95 | 0.00% | 17.8/sec | 65.59 | 4.11 | 3779.4 |
| Get A Random ISBN | 256 | 455 | 4 | 2610 | 711.73 | 0.00% | 18.0/sec | 66.27 | 4.56 | 3779.3 |
| Logout | 256 | 473 | 40 | 705 | 139.98 | 0.00% | 359.6/sec | 132.69 | 48.46 | 377.9 |
| TOTAL | 1024 | 867 | 4 | 2863 | 890.74 | 0.00% | 67.2/sec | 136.92 | 14.47 | 2086.2 |



2. Thread 256 with ISBN search books asynchronous

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|-------------------|-----------|---------|-----|------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 256 | 2273 | 5 | 5138 | 1584.80 | 0.00% | 17.7/sec | 7.04 | 4.26 | 408.0 |
| All ISBN Data | 256 | 3683 | 295 | 8135 | 3629.92 | 0.00% | 31.4/sec | 116.08 | 7.28 | 3780.0 |
| Get A Random ISBN | 256 | 247 | 131 | 400 | 54.48 | 0.00% | 32.8/sec | 121.07 | 8.33 | 3779.4 |
| Logout | 256 | 310 | 52 | 524 | 143.71 | 0.00% | 482.1/sec | 177.77 | 64.97 | 377.6 |
| TOTAL | 1024 | 1628 | 5 | 8135 | 2449.24 | 0.00% | 43.8/sec | 89.32 | 9.44 | 2086.2 |

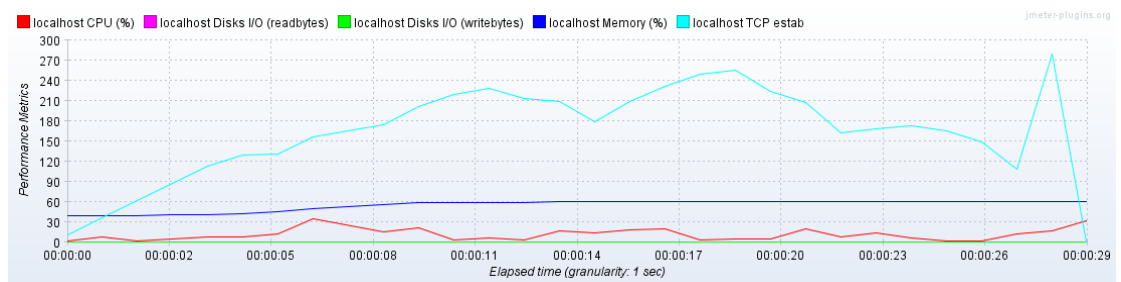


| Attribute | synchronous | asynchronous |
|------------------------------|-------------|---------------------|
| response time(Average Total) | 867 (ms) | 1628 (ms) |
| CPU | 較為平緩 | 只有在 logout 才上升 |
| Memory | 較為平緩 | 較為平緩 |
| Network | 緩慢上升至 9 秒 | 緩慢上升至 10 秒下降，15 秒飆高 |

| | | |
|------|-------|-----------|
| | 後開始下降 | 後再 20 秒下降 |
| Disk | 沒什麼變化 | 沒什麼變化 |

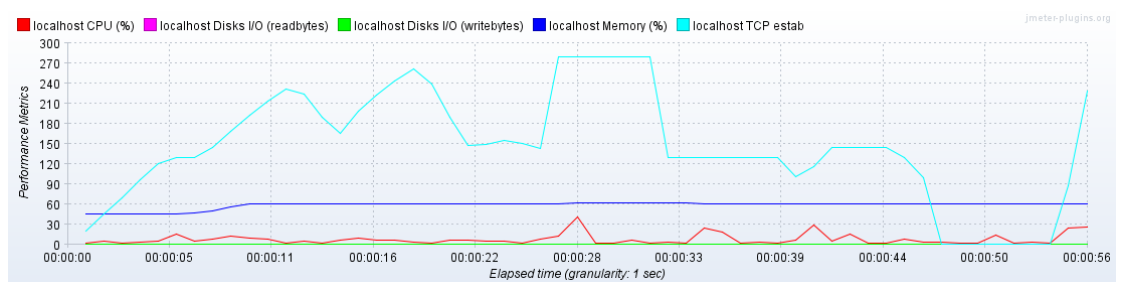
3. Thread 512 with ISBN search books synchronous

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|-------------------|-----------|---------|-----|------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 512 | 2333 | 5 | 6212 | 1160.98 | 0.00% | 19.9/sec | 7.95 | 4.81 | 408.0 |
| All ISBN Data | 512 | 1103 | 4 | 4993 | 1144.05 | 0.00% | 19.1/sec | 70.41 | 4.42 | 3779.6 |
| Get A Random ISBN | 512 | 635 | 4 | 5009 | 1153.36 | 0.00% | 19.1/sec | 70.63 | 4.86 | 3779.3 |
| Logout | 512 | 1067 | 41 | 1600 | 342.81 | 0.00% | 309.6/sec | 114.26 | 41.72 | 378.0 |
| TOTAL | 2048 | 1284 | 4 | 6212 | 1194.40 | 0.00% | 71.8/sec | 146.35 | 15.47 | 2086.2 |



4. Thread 512 with ISBN search books asynchronous

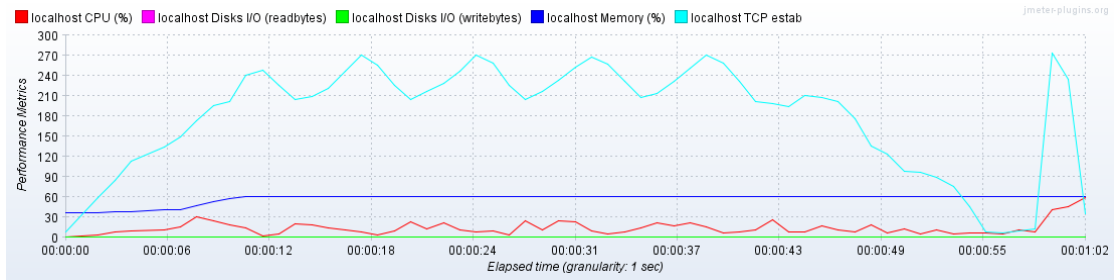
| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|-------------------|-----------|---------|-----|-------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 512 | 3594 | 5 | 7305 | 1737.77 | 0.00% | 19.9/sec | 7.92 | 4.80 | 408.0 |
| All ISBN Data | 512 | 11491 | 753 | 29025 | 9375.41 | 0.00% | 17.6/sec | 65.11 | 4.08 | 3780.0 |
| Get A Random ISBN | 512 | 563 | 9 | 1994 | 631.22 | 0.00% | 18.2/sec | 67.28 | 4.63 | 3779.7 |
| Logout | 512 | 963 | 124 | 1645 | 430.96 | 0.00% | 303.1/sec | 111.85 | 40.85 | 377.8 |
| TOTAL | 2048 | 4153 | 5 | 29025 | 6494.77 | 0.00% | 36.3/sec | 73.86 | 7.81 | 2086.4 |



| Attribute | synchronous | asynchronous |
|------------------------------|--------------------------------------|---|
| response time(Average Total) | 1284(ms) | 4153 (ms) |
| CPU | 6 秒到高峰， logout 也有上升 | 28 秒到高峰 |
| Memory | 較為平緩 | 較為平緩 |
| Network | 緩慢上升至 19 秒 後開始下降，27 秒開始飆高後開始下降 | 較為極端在 27 秒飆高 32 秒急速下降，至 47 秒為最低點，logout 再飆高 |
| Disk | 沒什麼變化 | 沒什麼變化 |

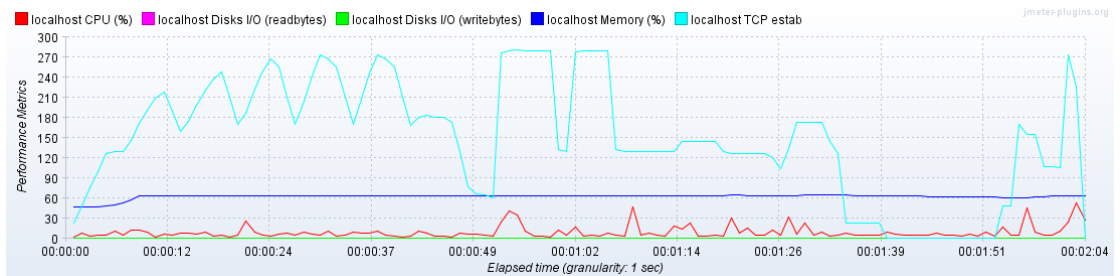
5. Thread 1024 with ISBN search books synchronous

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|-------------------|-----------|---------|-----|-------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 1024 | 4166 | 5 | 32483 | 4185.43 | 0.00% | 17.6/sec | 7.02 | 4.25 | 408.0 |
| All ISBN Data | 1024 | 1993 | 4 | 26591 | 2220.68 | 0.00% | 17.6/sec | 65.02 | 4.08 | 3779.5 |
| Get A Random ISBN | 1024 | 1177 | 4 | 15751 | 1502.55 | 0.00% | 17.6/sec | 65.10 | 4.48 | 3779.5 |
| Logout | 1024 | 2297 | 36 | 4085 | 587.87 | 0.00% | 244.4/sec | 90.21 | 32.94 | 378.0 |
| TOTAL | 4096 | 2408 | 4 | 32483 | 2731.42 | 0.00% | 65.7/sec | 133.88 | 14.15 | 2086.3 |



6. Thread 1024 with ISBN search books asynchronous

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|-------------------|-----------|---------|------|-------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 1024 | 5256 | 5 | 26962 | 3233.50 | 0.00% | 19.8/sec | 7.87 | 4.77 | 408.0 |
| All ISBN Data | 1024 | 24823 | 1218 | 64113 | 20000.80 | 0.00% | 15.9/sec | 58.80 | 3.69 | 3780.0 |
| Get A Random ISBN | 1024 | 1771 | 7 | 13545 | 2096.68 | 0.00% | 15.3/sec | 56.37 | 3.88 | 3779.9 |
| Logout | 1024 | 2523 | 1213 | 4286 | 837.71 | 0.00% | 235.7/sec | 87.02 | 31.77 | 378.0 |
| TOTAL | 4096 | 8593 | 5 | 64113 | 13906.06 | 0.00% | 32.8/sec | 66.87 | 7.07 | 2086.5 |

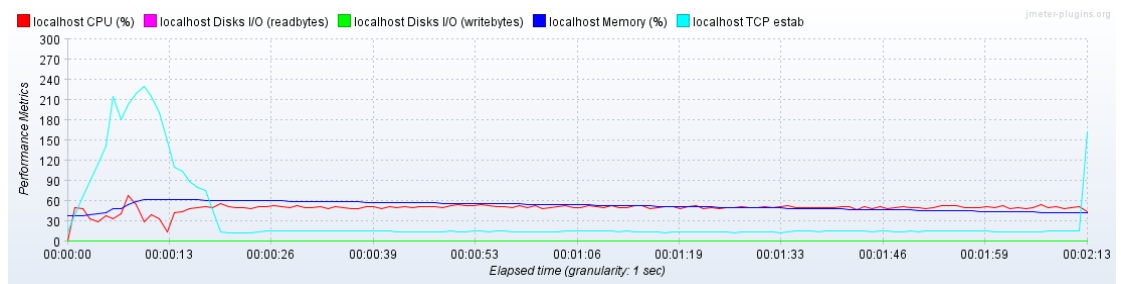


| Attribute | synchronous | asynchronous |
|------------------------------|--|---|
| response time(Average Total) | 2408(ms) | 8593 (ms) |
| CPU | Logout 是最高點 | 除了 logout 外也有幾處到 30 |
| Memory | 較為平緩 | 較為平緩 |
| Network | 線性上升至 11 秒後開始在 240-270 震盪，44 秒後下降到最低點，logout 再飆高 | 10 秒到 48 秒在 150-270 震盪，50 秒飆高，最後 logout 再飆高 |
| Disk | 沒什麼變化 | 沒什麼變化 |

Check out books /Check in books

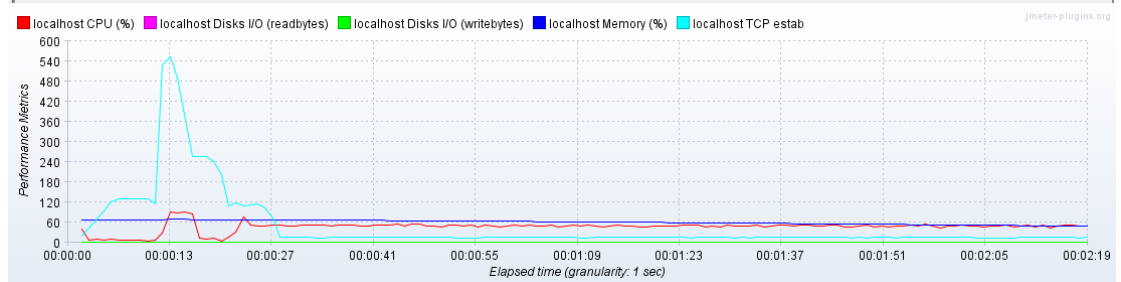
1. Thread 256 with Check out and check in books synchronous

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|--------------------|-----------|---------|-----|------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 256 | 1956 | 6 | 2740 | 494.35 | 0.00% | 21.1/sec | 9.39 | 5.00 | 408.0 |
| All ISBN Data | 256 | 1035 | 4 | 2514 | 1003.71 | 0.00% | 18.6/sec | 68.64 | 4.30 | 3779.5 |
| Get A Random ISBN | 256 | 578 | 3 | 2481 | 876.28 | 0.00% | 17.1/sec | 63.00 | 4.33 | 3779.3 |
| Book Data | 256 | 304 | 9 | 2887 | 568.99 | 0.00% | 17.1/sec | 29.46 | 4.68 | 1769.4 |
| Get A Random Co... | 256 | 553 | 6 | 2966 | 943.49 | 0.00% | 17.2/sec | 29.67 | 4.98 | 1769.6 |
| Borrow Book | 256 | 255 | 160 | 2481 | 194.97 | 0.00% | 1.9/sec | 0.43 | 0.52 | 226.0 |
| Give It Back | 256 | 262 | 164 | 2776 | 262.37 | 0.00% | 1.9/sec | 0.43 | 0.53 | 225.0 |
| Logout | 256 | 594 | 90 | 802 | 137.68 | 0.00% | 311.1/sec | 114.82 | 41.92 | 378.0 |
| TOTAL | 2048 | 692 | 3 | 2966 | 839.84 | 0.00% | 15.3/sec | 23.03 | 3.76 | 1541.8 |



2. Thread 256 with Check out and check in books asynchronous

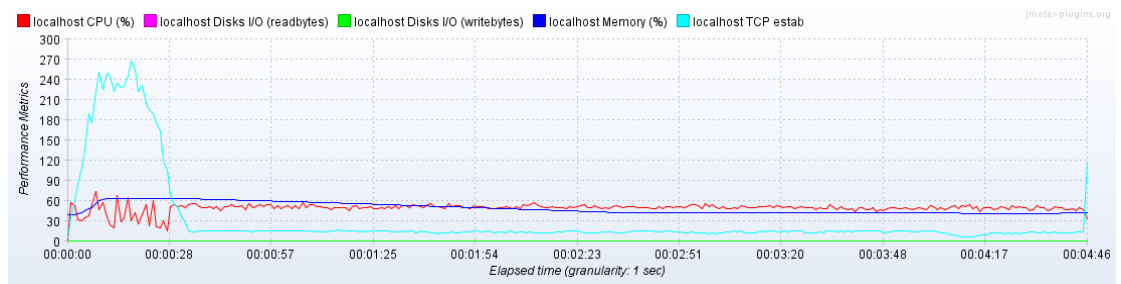
| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|----------------------|-----------|---------|-----|------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 256 | 547 | 5 | 1423 | 607.63 | 0.00% | 23.1/sec | 9.19 | 5.57 | 408.0 |
| All ISBN Data | 256 | 1244 | 69 | 2780 | 913.77 | 0.00% | 91.8/sec | 338.70 | 21.24 | 3779.9 |
| Get A Random ISBN | 256 | 785 | 8 | 6974 | 1202.58 | 0.00% | 26.5/sec | 97.74 | 6.72 | 3779.4 |
| Book Data | 256 | 1377 | 30 | 6993 | 885.38 | 0.00% | 22.8/sec | 39.73 | 6.26 | 1782.9 |
| Get A Random Co... | 256 | 3274 | 8 | 7757 | 3084.78 | 0.00% | 23.5/sec | 40.93 | 6.82 | 1783.4 |
| Get Available Book | 256 | 262 | 158 | 7709 | 473.27 | 0.00% | 2.0/sec | 0.45 | 0.55 | 226.0 |
| Get Unavailable B... | 256 | 231 | 158 | 1603 | 99.43 | 0.00% | 2.0/sec | 0.45 | 0.55 | 225.0 |
| Logout | 256 | 574 | 38 | 790 | 146.36 | 0.00% | 311.4/sec | 114.96 | 41.97 | 378.0 |
| TOTAL | 2048 | 1037 | 5 | 7757 | 1586.55 | 0.00% | 14.7/sec | 22.18 | 3.62 | 1545.3 |



| Attribute | synchronous | asynchronous |
|------------------------------|----------------------|----------------------|
| response time(Average Total) | 692(ms) | 1037 (ms) |
| CPU | 7 秒到最高 13 秒後都維持在 60 | 13 秒到最高 22 秒後都維持在 60 |
| Memory | 較為平緩 | 較為平緩 |
| Network | 7-10 秒都在最高之後下降後再也沒上升 | 13 秒到最高之後就下降了 |
| Disk | 沒什麼變化 | 沒什麼變化 |

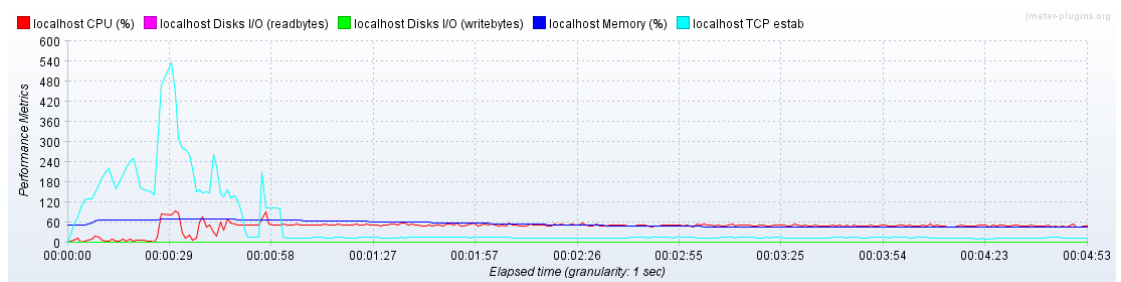
3. Thread 512 with Check out and check in books synchronous

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|-------------------|-----------|---------|-----|------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 512 | 2422 | 6 | 9560 | 1178.32 | 0.00% | 19.3/sec | 7.70 | 4.66 | 408.0 |
| All ISBN Data | 512 | 1252 | 3 | 9658 | 1149.46 | 0.00% | 18.0/sec | 66.36 | 4.16 | 3779.6 |
| Get A Random ISBN | 512 | 785 | 3 | 3393 | 1032.60 | 0.00% | 18.0/sec | 66.41 | 4.57 | 3779.4 |
| Book Data | 512 | 536 | 10 | 3429 | 824.33 | 0.00% | 18.0/sec | 30.31 | 4.93 | 1726.8 |
| Borrow Book | 512 | 641 | 6 | 3313 | 1043.02 | 0.00% | 18.0/sec | 30.41 | 5.23 | 1726.8 |
| Give H Back | 512 | 273 | 158 | 2876 | 248.05 | 0.00% | 1.8/sec | 0.39 | 0.49 | 225.0 |
| Logout | 512 | 1290 | 95 | 1829 | 357.81 | 0.00% | 275.9/sec | 101.83 | 37.18 | 378.0 |
| TOTAL | 4096 | 935 | 3 | 9658 | 1082.45 | 0.00% | 14.3/sec | 21.32 | 3.51 | 1531.2 |



4. Thread 512 with Check out and check in books asynchronous

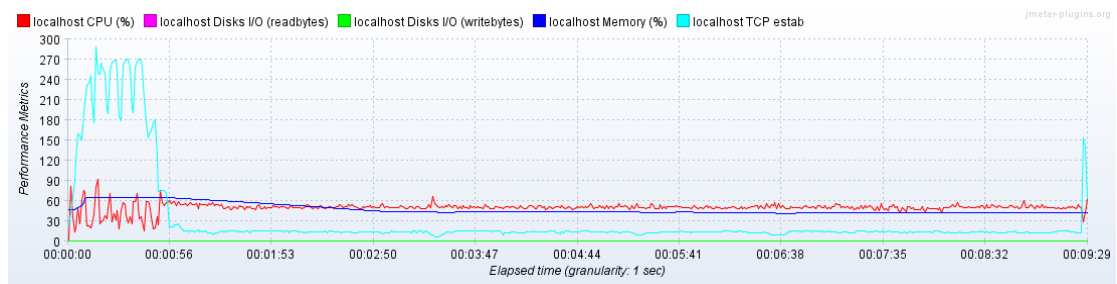
| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|----------------------|-----------|---------|-----|-------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 512 | 3112 | 5 | 5951 | 1593.39 | 0.00% | 20.4/sec | 8.11 | 4.91 | 408.0 |
| All ISBN Data | 512 | 10120 | 727 | 28886 | 10203.57 | 0.00% | 17.7/sec | 65.41 | 4.10 | 3780.0 |
| Get A Random ISBN | 512 | 1325 | 10 | 8698 | 1631.19 | 0.00% | 18.3/sec | 67.44 | 4.64 | 3779.8 |
| Book Data | 512 | 1209 | 6 | 7270 | 1549.25 | 0.00% | 17.8/sec | 29.62 | 4.88 | 1707.0 |
| Get A Random Co... | 512 | 1171 | 6 | 8692 | 1951.99 | 0.00% | 17.8/sec | 29.68 | 5.16 | 1707.0 |
| Get Available Book | 512 | 269 | 160 | 6572 | 302.99 | 0.00% | 1.9/sec | 0.43 | 0.53 | 226.0 |
| Get Unavailable B... | 512 | 246 | 158 | 1851 | 101.36 | 0.00% | 1.9/sec | 0.43 | 0.53 | 225.0 |
| Logout | 512 | 1296 | 71 | 1857 | 356.62 | 0.00% | 273.5/sec | 100.96 | 36.86 | 378.0 |
| TOTAL | 4096 | 2344 | 5 | 28886 | 4877.33 | 0.00% | 14.0/sec | 20.83 | 3.44 | 1526.3 |



| Attribute | synchronous | asynchronous |
|------------------------------|-------------------------------|--------------------------|
| response time(Average Total) | 935(ms) | 2344 (ms) |
| CPU | 28 秒前在 20-60 震盪，28 秒後幾乎都在 60 | 28 秒到 60 秒起伏最大，之後維持在 60 |
| Memory | 較為平緩 | 較為平緩 |
| Network | 28 秒前幾乎都在 270，最後只有 logout 時飆升 | 29 秒到達最高，起伏只有在 60 秒前較為劇烈 |
| Disk | 沒什麼變化 | 沒什麼變化 |

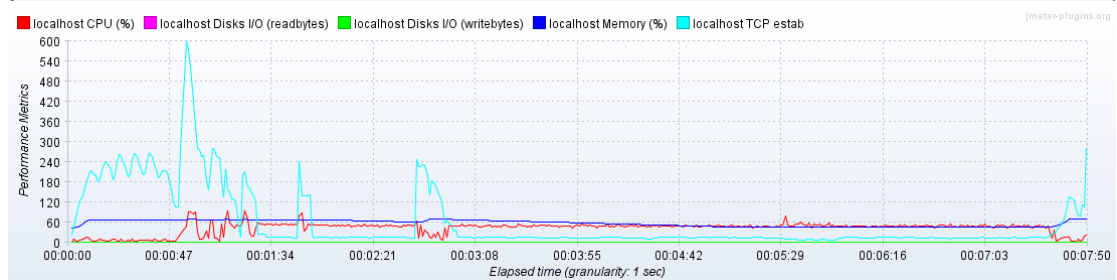
5. Thread 1024 with Check out and check in books synchronous

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|--------------------|-----------|---------|-----|-------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 1024 | 3857 | 5 | 32454 | 4868.11 | 0.00% | 17.5/sec | 6.96 | 4.21 | 408.0 |
| All ISBN Data | 1024 | 1485 | 4 | 27119 | 1370.97 | 0.00% | 17.5/sec | 64.45 | 4.04 | 3779.7 |
| Get A Random ISBN | 1024 | 876 | 3 | 9243 | 1047.62 | 0.00% | 17.5/sec | 64.52 | 4.44 | 3779.5 |
| Book Data | 1024 | 496 | 9 | 9285 | 854.05 | 0.00% | 17.5/sec | 29.75 | 4.79 | 1744.1 |
| Get A Random Co... | 1024 | 420 | 5 | 32194 | 1312.55 | 0.00% | 17.5/sec | 29.85 | 5.08 | 1744.1 |
| Borrow Book | 1024 | 279 | 158 | 3542 | 310.48 | 0.00% | 1.8/sec | 0.40 | 0.49 | 226.0 |
| Give It Back | 1024 | 270 | 156 | 3258 | 224.15 | 0.00% | 1.8/sec | 0.40 | 0.49 | 225.0 |
| Logout | 1024 | 2585 | 41 | 4157 | 722.82 | 0.00% | 238.8/sec | 88.13 | 32.18 | 378.0 |
| TOTAL | 8192 | 1284 | 3 | 32454 | 2283.72 | 0.00% | 14.4/sec | 21.59 | 3.54 | 1535.5 |



6. Thread 1024 with Check out and check in books asynchronous

| Label | # Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|----------------------|-----------|---------|------|--------|-----------|---------|------------|-----------------|-------------|------------|
| Login | 1024 | 6107 | 6 | 23465 | 3278.50 | 0.00% | 20.6/sec | 8.22 | 4.98 | 408.0 |
| All ISBN Data | 1024 | 44826 | 1229 | 109001 | 43819.71 | 28.81% | 9.4/sec | 30.19 | 1.55 | 3292.6 |
| Get A Random ISBN | 1024 | 2192 | 24 | 28739 | 3469.07 | 28.81% | 8.4/sec | 31.11 | 2.14 | 3779.9 |
| Book Data | 1024 | 2499 | 5 | 106821 | 8624.76 | 0.39% | 8.4/sec | 11.37 | 2.30 | 1386.6 |
| Get A Random Co... | 1024 | 1586 | 4 | 16839 | 2626.04 | 0.00% | 8.5/sec | 11.45 | 2.47 | 1384.2 |
| Get Available Book | 1024 | 210 | 4 | 3544 | 251.54 | 29.20% | 2.5/sec | 0.53 | 0.68 | 219.9 |
| Get Unavailable B... | 1024 | 191 | 3 | 5725 | 278.35 | 29.20% | 2.5/sec | 0.53 | 0.68 | 218.9 |
| Logout | 1024 | 2210 | 224 | 3097 | 644.29 | 0.00% | 321.6/sec | 118.70 | 43.34 | 377.9 |
| TOTAL | 8192 | 7478 | 3 | 109001 | 21338.63 | 14.55% | 17.5/sec | 23.59 | 4.16 | 1383.5 |



| Attribute | synchronous | asynchronous |
|------------------------------|------------------------------------|--------------------------------------|
| response time(Average Total) | 1284(ms) | 7478 (ms) |
| CPU | 60 秒前在 20-90 震盪，60 秒後幾乎都在 60 | 最高是 60 左右 |
| Memory | 較為平緩 | 較為平緩 |
| Network | 58 秒前主要在 180-270 震盪，最後只有 logout 飆高 | 50 秒到達最高，起伏只有在 3 分前較為劇烈，最後 logout 飆高 |
| Disk | 沒什麼變化 | 沒什麼變化 |

5 Summary

In Lab 5, 6 test scripts have been designed and implemented using JMeter with JavaScript. The previous five test scripts execution results are **all pass**. And the last test was **failed** because its response time. Thus, the test requirements described in Section 1 are satisfied. By using JMeter let me learn a

lit bit of JavaScript and the reality of the test facing on which problem.