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

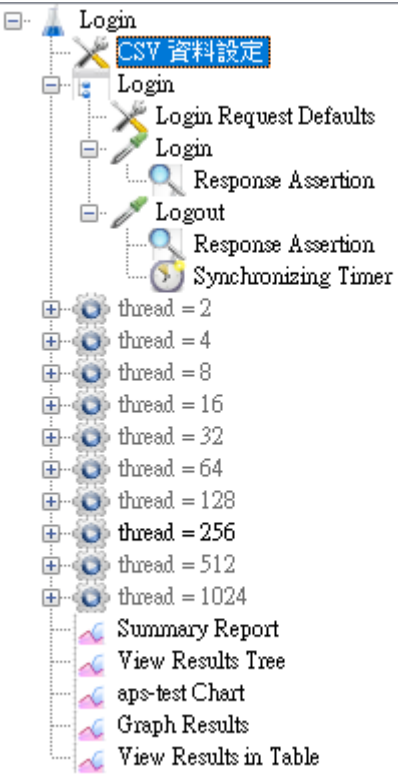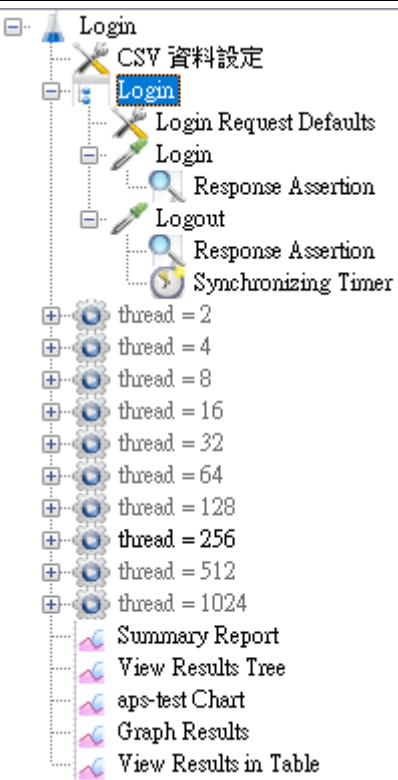|	

	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

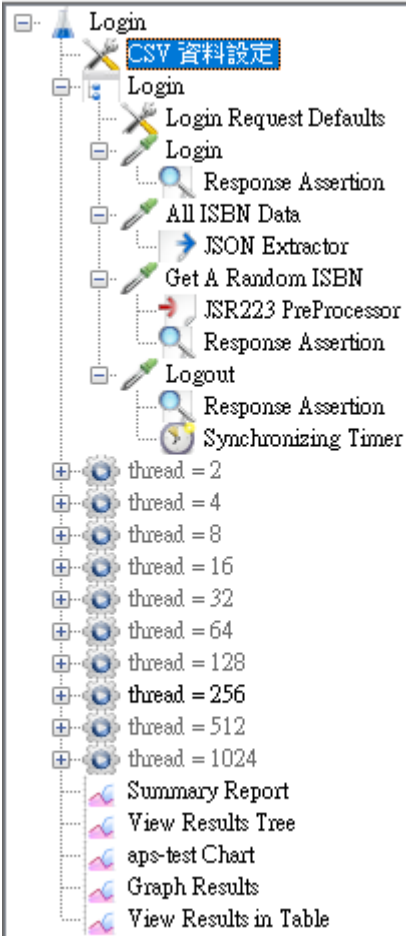|	2. get all ISBN data
	    JSON Extractor
	    Synchronizing timer
	3. Get a random ISBN
	    JSR223 PreProcessor
	    Assertion
	4. Book data
	    JSON Extractor
	5. Get a random code number
	    JSR223 PreProcessor
	    Assertion
	6. Critical Section Controller
	    Borrow Book
	      Assertion
	    Give it back
	      Assertion
	7. Logout
	    Assertion
	    Synchronizing timer

Design of workload	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

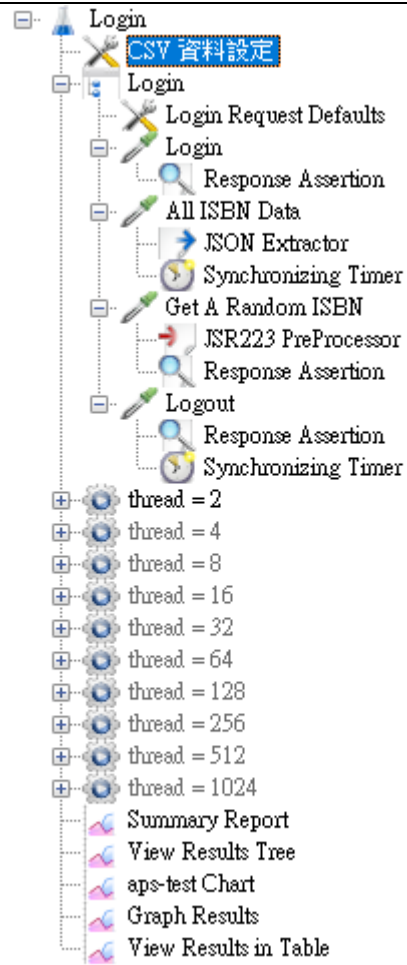| 1	Login and Logout with ramp-up	
2	Login and Logout without ramp-up	

3	ISBN search books synchronous	

4	ISBN search books asynchronous	

5	Check out and Check in book synchronous	
		Login 　CSV 資料設定 　Login 　　Login Request Defaults 　　Login 　　　Response Assertion 　　All ISBN Data 　　　JSON Extractor 　　　Synchronizing Timer 　　Get A Random ISBN 　　　JSR223 PreProcessor 　　　Response Assertion 　　Book Data 　　　JSON Extractor 　　Get A Random Code Number 　　　JSR223 PreProcessor 　　　Response Assertion 　　Critical Section Controller 　　　Borrow Book 　　　　Response Assertion 　　　Give It Back 　　　　Response Assertion 　　Logout 　　　Response Assertion 　　　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

| 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
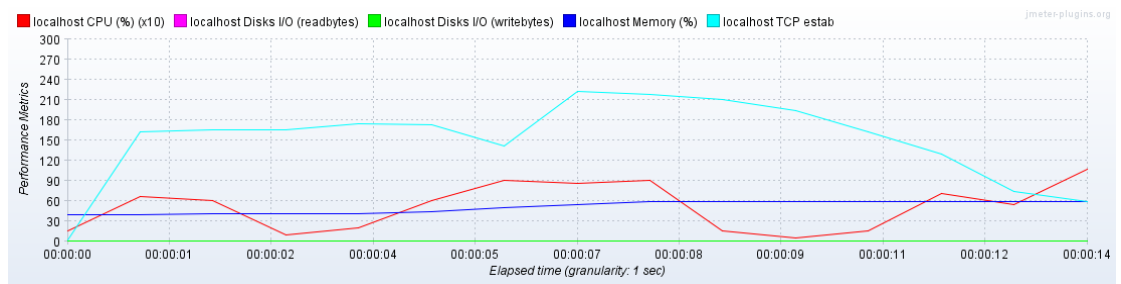
2. Thread 256 with ramp-up

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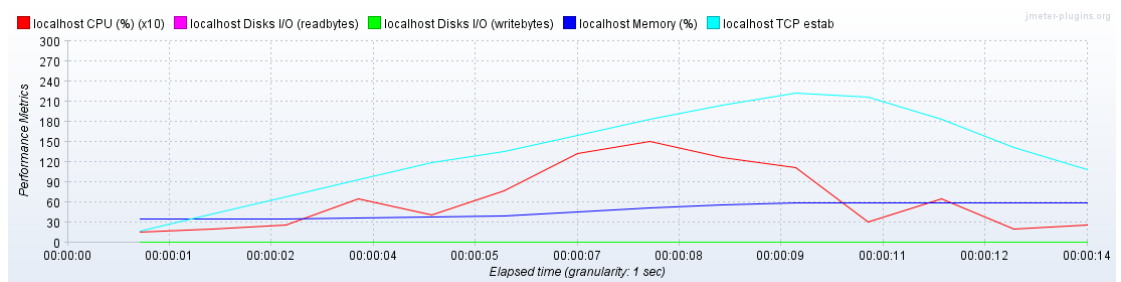
Attribute	Without ramp-up	With ramp-up
response time(Average Total)	3841(ms)	2089(ms)
CPU	起伏較多	緩慢上升到 7.5 秒下降最後一起 logout 在上升
Memory	較為平緩	緩慢上升
Network	一開始就飆高直到 9 秒後才下降	緩慢上升到 10 秒後開始下降
Disk	沒什麼變化	沒什麼變化

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
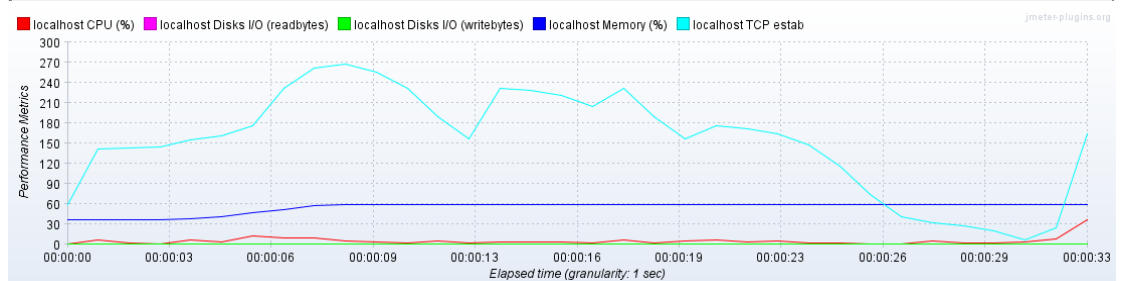
4. Thread 512 with ramp-up

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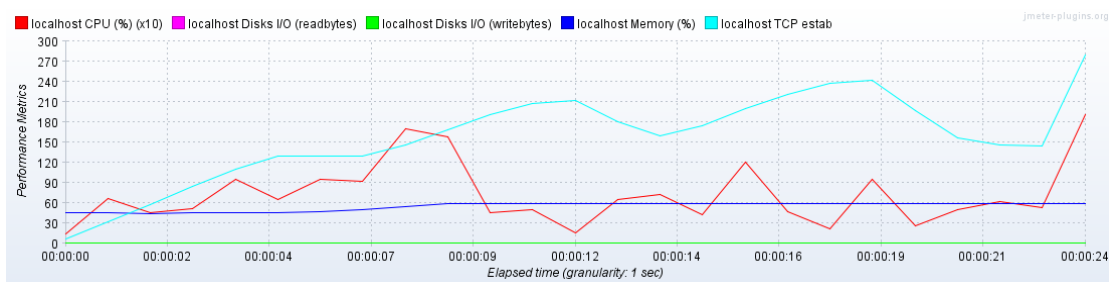
Attribute	Without ramp-up	With ramp-up
response time(Average Total)	7664 (ms)	2124 (ms)
CPU	只有最後 logout 才上升	起伏較多，大多和網路的曲線呈正相關
Memory	較為平緩	較為平緩
Network	一開始就飆高直到 8 秒到達最高，17 秒後開始下降，最後 logout 再飆高	緩慢上升到 19 秒後開始下降，22 秒後因為 logout 飆高
Disk	沒什麼變化	沒什麼變化

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
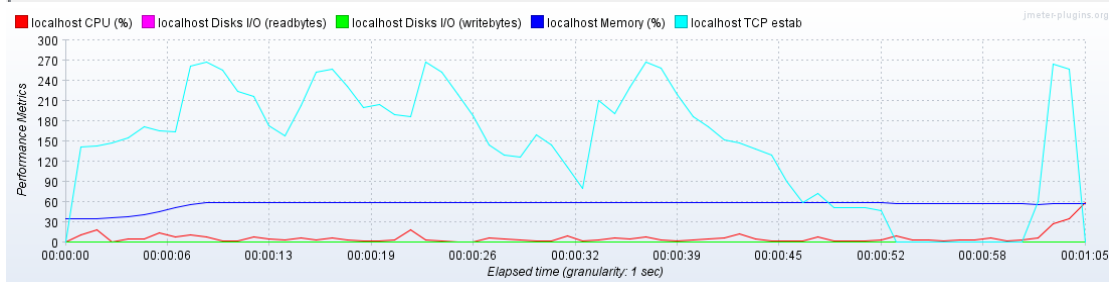
6. Thread 1024 with ramp-up

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
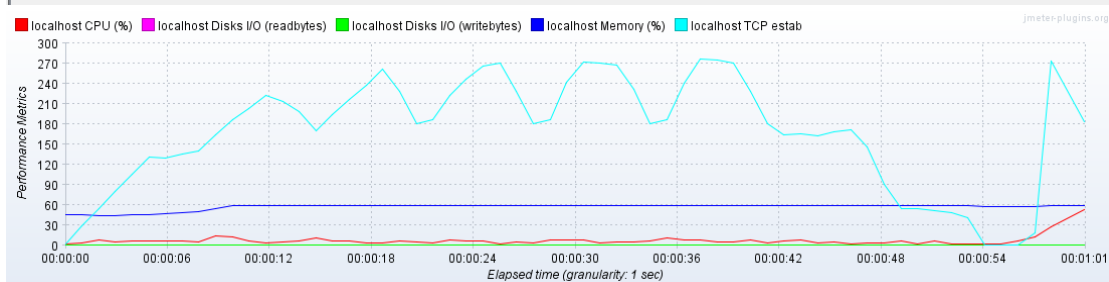
Attribute	Without ramp-up	With ramp-up

| 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
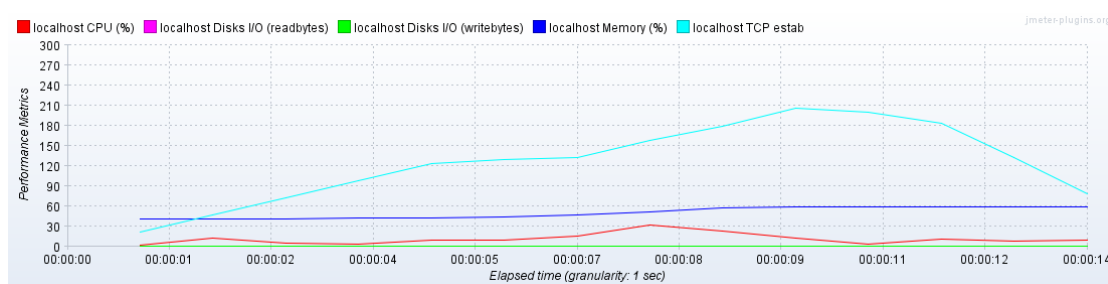
2. Thread 256 with ISBN search books asynchronous

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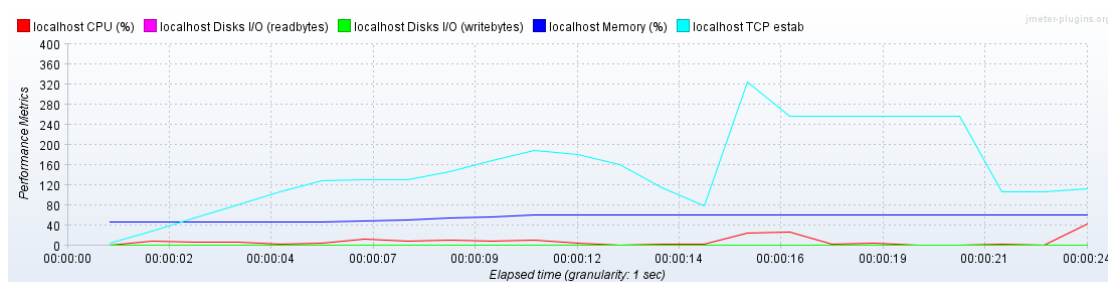
Attribute	synchronous	asynchronous
response time(Average Total)	867 (ms)	1628 (ms)
CPU	較為平緩	只有在 logout 才上升
Memory	較為平緩	較為平緩
Network	緩慢上升至 9 秒	緩慢上升至 10 秒下降，15 秒飆高

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	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
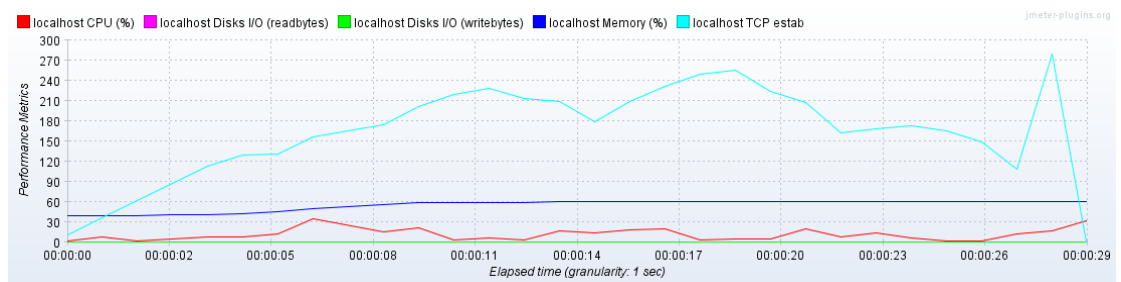
4. Thread 512 with ISBN search books asynchronous

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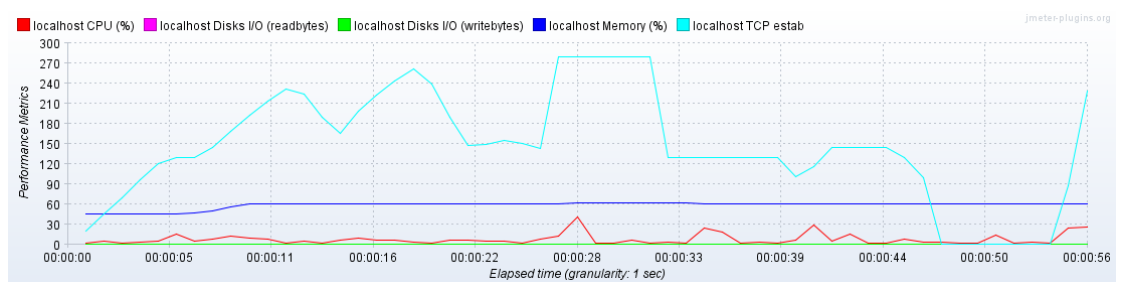
Attribute	synchronous	asynchronous
response time(Average Total)	1284(ms)	4153 (ms)
CPU	6 秒到高峰，logout 也有上升	28 秒到高峰
Memory	較為平緩	較為平緩
Network	緩慢上升至 19 秒後開始下降，27 秒開始飆高後開始下降	較為極端在 27 秒飆高 32 秒急速下降，至 47 秒為最低點，logout 再飆高
Disk	沒什麼變化	沒什麼變化

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	3779.8
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
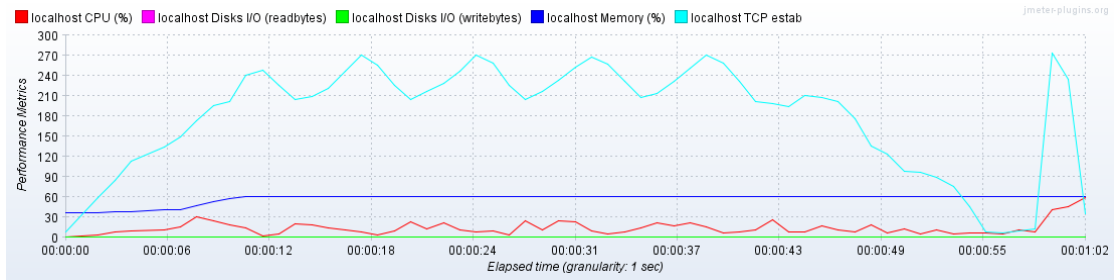
6. Thread 1024 with ISBN search books asynchronous

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	13906.08	0.00%	32.8/sec	66.87	7.07	2086.5
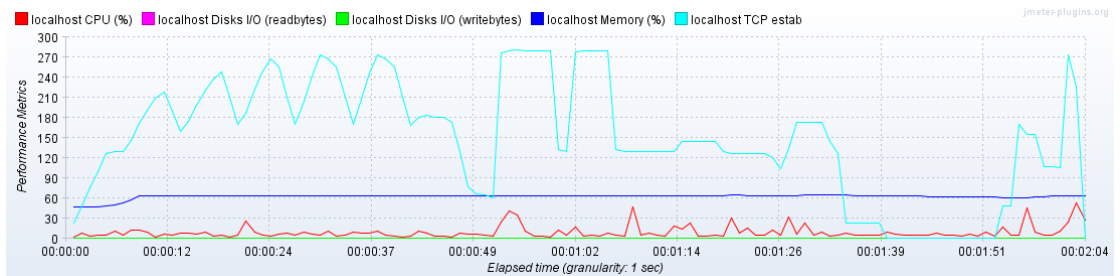
Attribute	synchronous	asynchronous
response time(Average Total)	2408(ms)	8593 (ms)
CPU	Logout 是最高點	除了 logout 外也有幾處到 30
Memory	較為平緩	較為平緩
Network	線性上升至 11 秒後開始在 240-270 震盪，44 秒後下降到最低點，logout 再飆高	10 秒到 48 秒在 150-270 震盪，50 秒飆高，最後 logout 再飆高
Disk	沒什麼變化	沒什麼變化

Check out books /Check in books

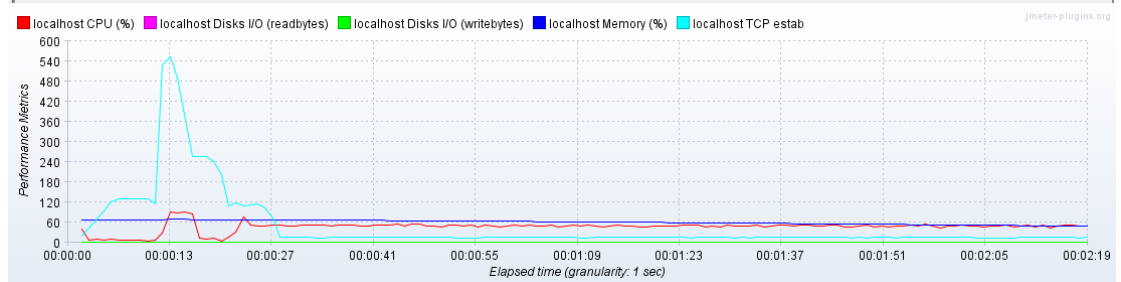## 1. Thread 256 with Check out and check in books synchronous

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	8.39	5.08	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
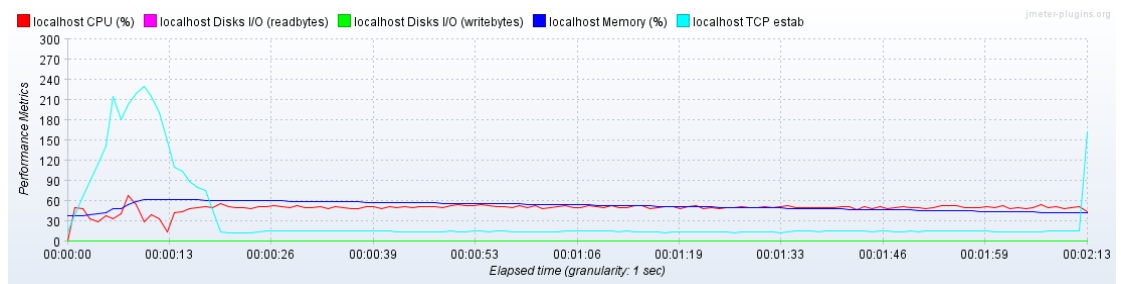
2. Thread 256 with Check out and check in books asynchronous

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
Get A Random Co...	512	641	6	5313	1043.02	0.00%	18.0/sec	30.41	5.23	1726.8
Borrow Book	512	282	159	3640	264.34	0.00%	1.8/sec	0.40	0.49	226.0
Give It 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
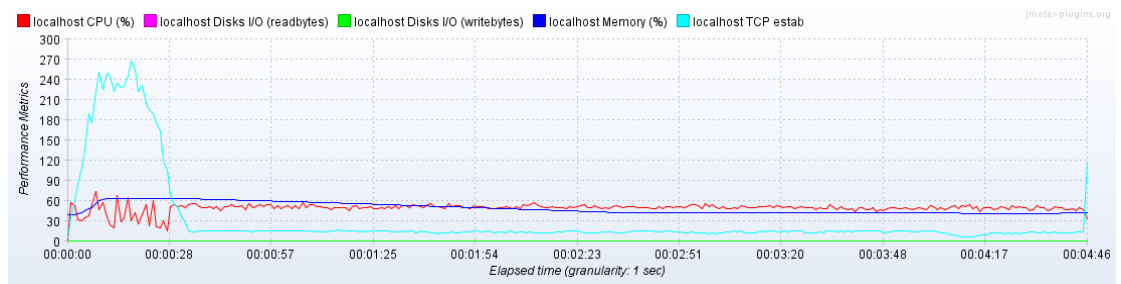
4. Thread 512 with Check out and check in books asynchronous

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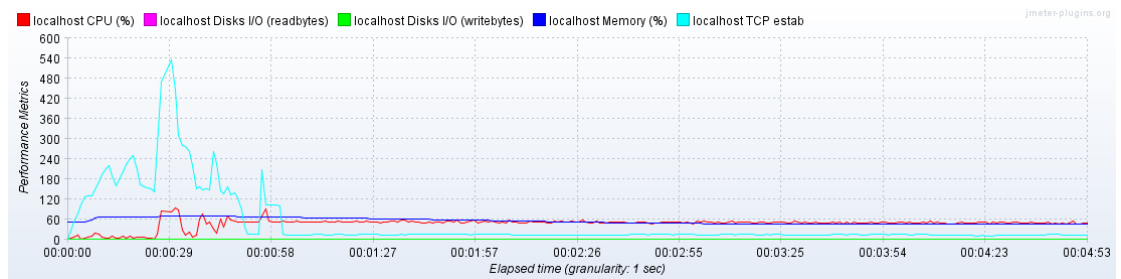
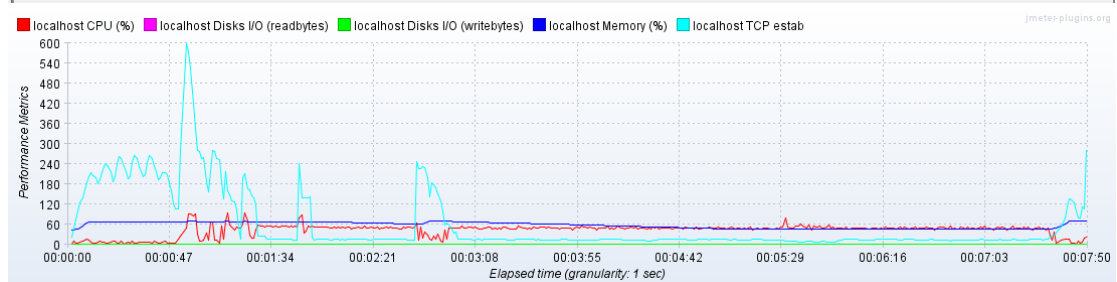| Attribute	synchronous	asynchronous
response time(Average Total)	935(ms)	2344 (ms)
CPU	28 秒前在 20-60 震盪，28 秒後幾乎都在 60	28 秒到 60 秒起伏最大，之後維持在 60
Memory	較為平緩	較為平緩
Network	28 秒前幾乎都在 270，最後只有 logout 時飆升	29 秒到達最高，起伏只有在 60 秒前較為劇烈
Disk	沒什麼變化	沒什麼變化

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	5542	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
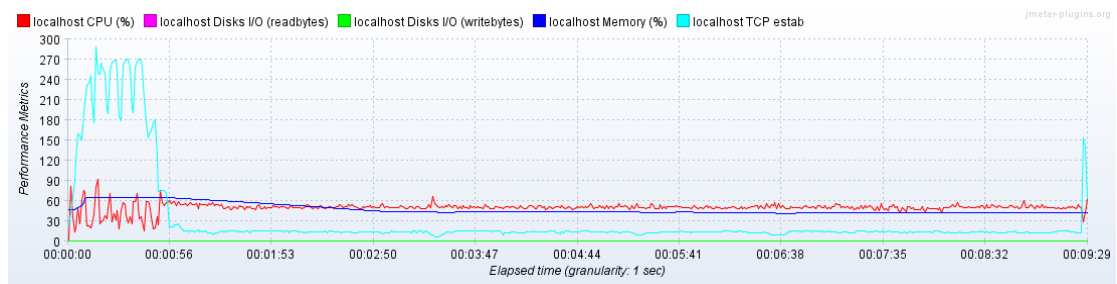
6. Thread 1024 with Check out and check in books asynchronous

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.