



**Calibration of
Performance Test tooling**
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SQUERIST
Proven Quality

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- What triggered this investigation
- Research definition & Scope
- First Findings
- Testenviroment setup
- Testplan & Scenario
- Results
- Calibration
 - Reference
 - Tool Behaviour & Solutions
- Results after calibration
- Conclusion

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What triggered the investigation



Historical *International Prototype Metre* bar, made of an alloy of platinum and iridium, that was the standard from 1889 to 1960

Q:

Do performance test tools emulate the exact same behavior a real user would show when accessing the application ?

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Scope:

- 4 commonly used test tools, installed with default settings
- 1 virtual user to execute the test
- 1 Browser
- 1 OS
- Mix of commercial and Open Source tools

Goal:

- Identify differences.
- Adjust settings.

- Tooling doesn't execute javascript like a browser does
- Different behavior at network level, number of tcp sessions
- Different behavior in **requests** methods
and number of **requests.**



1. Execute the testscenario manually, this is the Reference.
2. Record the scenario with the testtool.
3. Run the scenario with the testtool.

Scenario:

- Add the dvd “Speed” on the front page to the cart
- Search for a dvd with the word: “Mary”
- Add dvd “There’s something about Mary” to the cart
- Checkout
- Create a new account
- Complete the checkout & shipping
- Return to the frontpage and logout





Server: Bootable Linux CD
Turnkey Linux & OsCommerce
<http://www.turnkeylinux.org/oscommerce>

VMWare XP images:

- Tool A
- Tool B
- Tool C
- Tool D
- Clean image

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Results of the test

	Manual	Tool A	Tool B	Tool C	Tool D
Startpage	0,815	1,715	0,669	0,912	0,875
Select DVD Speed	0,942	0,99	0,473	0,946	0,313
Add to cart		0,197	2,071	3,21	0,14
Search "Mary"	5,98		4,689	1,22	5,984
Add to cart	1,367	6,92	2,092	3,538	0,094
Check Out	0,421	1,715	0,25	0,897	0,078
New Customer	0,408		0,637	0,896	
Account created	0,389	0,795	0,6	0,798	1,297
Continue	0,498				0,156
Shipping	0,374	0,13	0,417	0,883	0,312
Payment	0,431		0,358	0,787	0,141
Confirm Order	0,488	1,92	0,64	0,909	0,266
Startpage	0,418		0,383	0,808	0,188
Log Off	0,542	0,72	0,444	0,829	3,547
	13,073	15,102	13,723	16,633	13,391



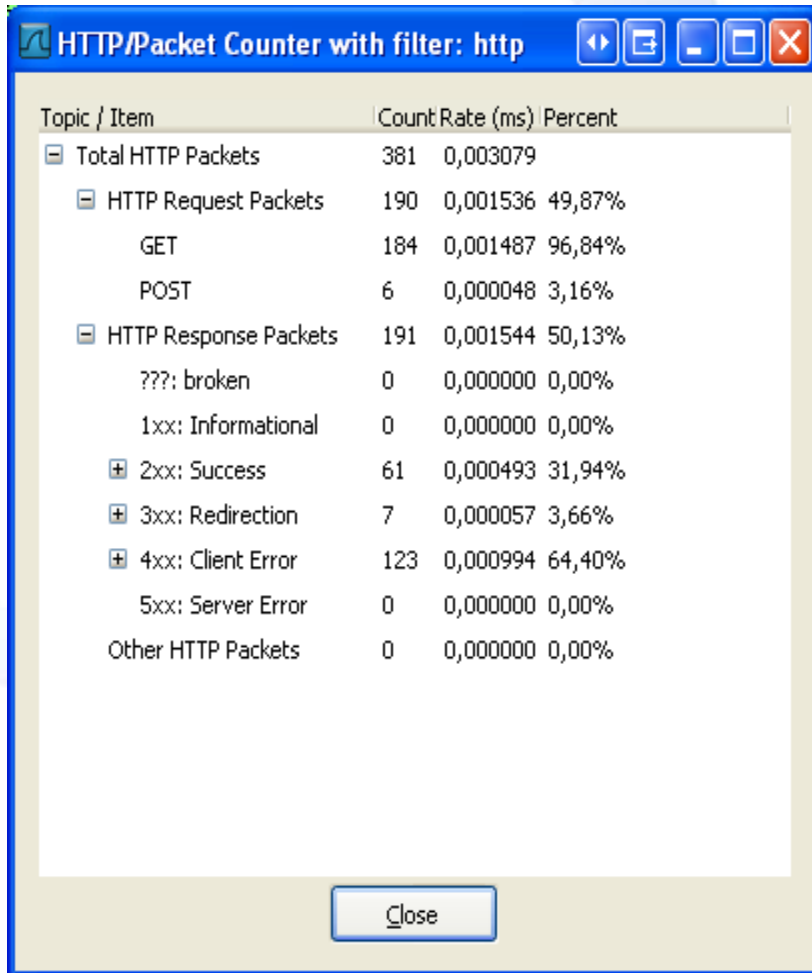
- Create the reference by analysing user behaviour with the application
- Analyse tool behaviour with the application
- Calibrate tool
- Validate calibration by rerunning the test.



URL	Status	Domain	Size	Timeline
GET 192.168.0.10	200 OK	192.168.0.10	2.8 KB	62ms
GET jquery-ui-1.8.6.css	200 OK	192.168.0.10	6 KB	78ms
GET jquery-1.4.2.min.js	200 OK	192.168.0.10	24 KB	297ms
GET jquery-ui-1.8.6.min	200 OK	192.168.0.10	50 KB	547ms
GET jquery.bxGallery.1.	200 OK	192.168.0.10	1.4 KB	31ms
GET jquery.fancybox-1.	200 OK	192.168.0.10	1.8 KB	63ms
GET jquery.fancybox-1.	200 OK	192.168.0.10	5.4 KB	125ms
GET 960_24_col.css	200 OK	192.168.0.10	1.1 KB	63ms
GET stylesheet.css	200 OK	192.168.0.10	1.8 KB	141ms
GET store_logo.png	200 OK	192.168.0.10	7.2 KB	141ms
GET mg200mms.gif	200 OK	192.168.0.10	3.7 KB	109ms
GET courage_under_fir	200 OK	192.168.0.10	3.5 KB	156ms
GET speed.gif	200 OK	192.168.0.10	3.4 KB	156ms
GET speed_2.gif	200 OK	192.168.0.10	3.7 KB	172ms
GET theres_something.	200 OK	192.168.0.10	3.4 KB	188ms
GET beloved.gif	200 OK	192.168.0.10	3.4 KB	188ms
GET swat_3.gif	200 OK	192.168.0.10	3.9 KB	234ms
GET unreal_tournamen	200 OK	192.168.0.10	3.4 KB	188ms
GET wheel_of_time.gif	200 OK	192.168.0.10	3.7 KB	203ms
GET blade_runner.gif	200 OK	192.168.0.10	3.9 KB	203ms
GET stars_5.gif	200 OK	192.168.0.10	127 B	234ms
GET ui-bg_glass_85_dfl	200 OK	192.168.0.10	123 B	
GET ui-icons_6da8d5_2	200 OK	192.168.0.10	4.3 KB	
GET button_quick_find.	200 OK	192.168.0.10	554 B	
GET ui-bg_gloss-wave_	200 OK	192.168.0.10	3.9 KB	
GET ui-bg_inset-hard_1	200 OK	192.168.0.10	88 B	
26 requests			146.7 KB	766ms (onload: 815ms)

Startpage

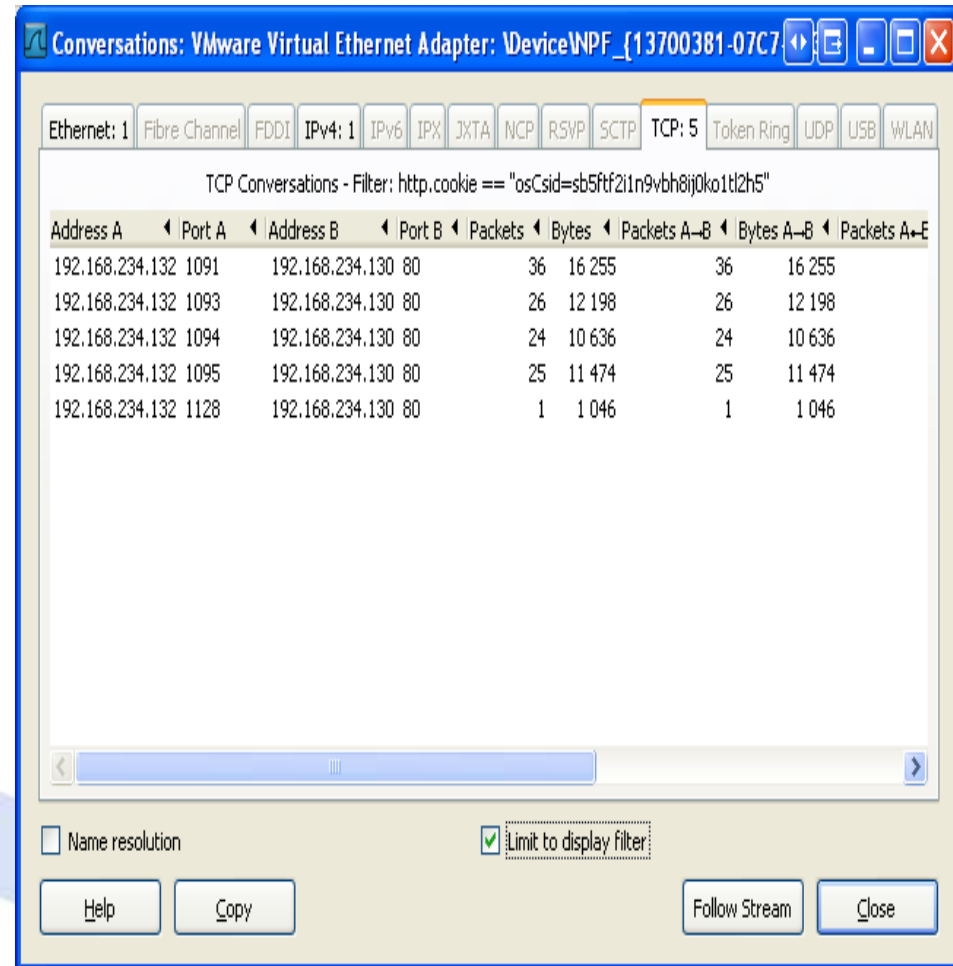
Manual
Network Onload
766ms 815ms



HTTP/Packet Counter with filter: http

Topic / Item	Count	Rate (ms)	Percent
Total HTTP Packets	381	0,003079	
HTTP Request Packets	190	0,001536	49,87%
GET	184	0,001487	96,84%
POST	6	0,000048	3,16%
HTTP Response Packets	191	0,001544	50,13%
???: broken	0	0,000000	0,00%
1xx: Informational	0	0,000000	0,00%
2xx: Success	61	0,000493	31,94%
3xx: Redirection	7	0,000057	3,66%
4xx: Client Error	123	0,000994	64,40%
5xx: Server Error	0	0,000000	0,00%
Other HTTP Packets	0	0,000000	0,00%

Close



Conversations: VMware Virtual Ethernet Adapter: Device\NPF_{137003B1-07C7}

Ethernet: 1 | Fibre Channel | FDDI | IPv4: 1 | IPv6 | IPX | JXTA | NCP | RSVP | SCTP | TCP: 5 | Token Ring | UDP | USB | WLAN

TCP Conversations - Filter: http.cookie == "osCsid=sb5ff21n9vbh8ij0ko1tl2h5"

Address A	Port A	Address B	Port B	Packets	Bytes	Packets A-B	Bytes A-B	Packets A-E
192.168.234.132	1091	192.168.234.130	80	36	16 255	36	16 255	
192.168.234.132	1093	192.168.234.130	80	26	12 198	26	12 198	
192.168.234.132	1094	192.168.234.130	80	24	10 636	24	10 636	
192.168.234.132	1095	192.168.234.130	80	25	11 474	25	11 474	
192.168.234.132	1128	192.168.234.130	80	1	1 046	1	1 046	

Name resolution Limit to display filter

Help Copy Follow Stream Close

Conversations: VMware Virtual Ethernet Adapter: \Device\NPF_{13700381-07C7}

Ethernet: 1 Fibre Channel FDDI IPv4: 1 IPv6 IPX JXTA NCP RSVP SCTP **TCP: 5** Token Ring UDP USB WLAN

TCP Conversations - Filter: http.cookie == "osCsid=sb5ftf2i1n9vvh8ij0ko1tl2h5"

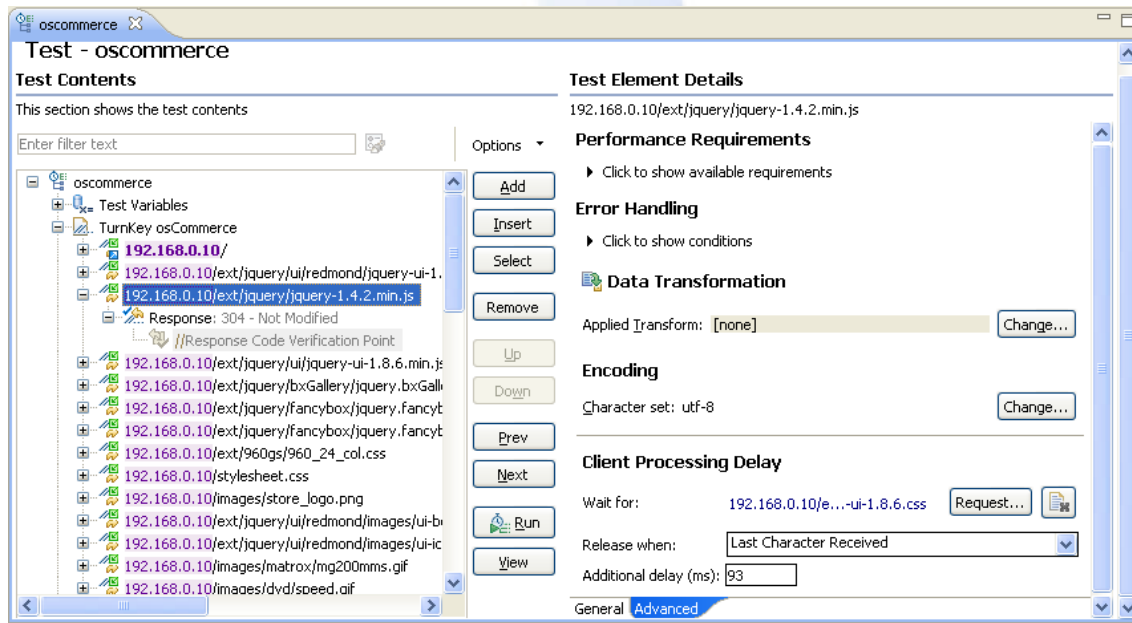
Address A	Port A	Address B	Port B	Packets	Bytes	Packets A-B	Bytes A-B	Packets A-E
192.168.234.132	1091	192.168.234.130	80	36	16 255	36	16 255	
192.168.234.132	1093	192.168.234.130	80	26	12 198	26	12 198	
192.168.234.132	1094	192.168.234.130	80	24	10 636	24	10 636	
192.168.234.132	1095	192.168.234.130	80	25	11 474	25	11 474	
192.168.234.132	1128	192.168.234.130	80	1	1 046	1	1 046	

Name resolution Limit to display filter

Help Copy Follow Stream Close

Reference 5 sessions





Gaussian Random Timer

Name: Internal Processing Browser

Comments:
 JavaScript Callback (76ms)
 Style Recalculation (15ms)
 Paint (7ms)
 Layout (8ms)
 Garbage Collection (34ms)
 Parse HTML (26ms)

Thread Delay Properties

Deviation (in milliseconds): 140

Constant Delay Offset (in milliseconds): 166

Problem identified: *Tooling doesn't do processing like a browser. (javascript, rendering)*

Solution: *Compensate in the tool for clientside processing and during a loadtest execute the scenario manually to capture the user experience.*

HTTP/Packet Counter with filter: http

Topic / Item	Count	Rate (ms)	Percent
Total HTTP Packets	381	0,003079	
HTTP Request Packets	190	0,001536	49,87%
GET	184	0,001487	96,84%
POST	6	0,000048	3,16%
HTTP Response Packets	191	0,001544	50,13%
??? : broken	0	0,000000	0,00%
1xx : Informational	0	0,000000	0,00%
2xx : Success	61	0,000493	31,94%
3xx : Redirection	7	0,000057	3,66%
4xx : Client Error	123	0,000994	64,40%
5xx : Server Error	0	0,000000	0,00%
Other HTTP Packets	0	0,000000	0,00%

Close

Reference

HTTP/Packet Counter with filter: http.coo

Topic / Item	Count	Rate (ms)	Percent
Total HTTP Packets	57	0,000291	
HTTP Request Packets	57	0,000291	100,00%
GET	53	0,000270	92,98%
POST	4	0,000020	7,02%
HTTP Response Packets	0	0,000000	0,00%
??? : broken	0	0,000000	
1xx : Informational	0	0,000000	
2xx : Success	0	0,000000	
3xx : Redirection	0	0,000000	
4xx : Client Error	0	0,000000	
5xx : Server Error	0	0,000000	
Other HTTP Packets	0	0,000000	

Close

Tool A

HTTP/Packet Counter with filter: eth.addr ==00:0c:29:2e...

Topic / Item	Count	Rate (ms)	Percent
Total HTTP Packets	570	0,000484	
HTTP Request Packets	284	0,000241	49,82%
GET	279	0,000237	98,24%
POST	5	0,000004	1,76%
HTTP Response Packets	286	0,000243	50,18%
??? : broken	0	0,000000	0,00%
1xx : Informational	0	0,000000	0,00%
2xx : Success	165	0,000140	57,69%
3xx : Redirection	6	0,000005	2,10%
4xx : Client Error	115	0,000098	40,21%
5xx : Server Error	0	0,000000	0,00%
Other HTTP Packets	0	0,000000	0,00%

Close

Tool B

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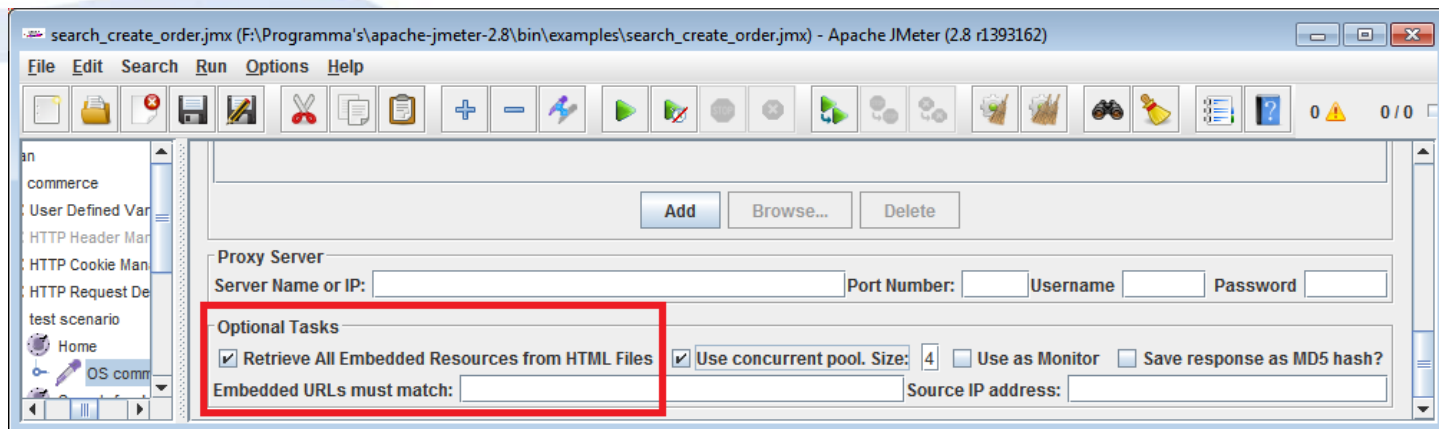
Adjust get & post request setting

```
other_vhosts_access.log | C:\Temp\Orders\Calista\src\src\Apache_log\other_vhosts_access.log | C:\Temp\Orders\Calista\src\src\Apache_log\other_vhosts_access.log
"GET /fancybox/fancy_shadow_ne.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow_e.png HTTP/1.1" 404 517 "-" "Mozilla"
"GET /fancybox/fancy_shadow_se.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow_s.png HTTP/1.1" 404 517 "-" "Mozilla"
"GET /fancybox/fancy_shadow_sw.png HTTP/1.1" 404 517 "-" "Mozilla"
"GET /fancybox/fancy_shadow_w.png HTTP/1.1" 404 517 "-" "Mozilla"
"GET /fancybox/fancy_shadow_nw.png HTTP/1.1" 404 517 "-" "Mozilla"
"GET /index.php HTTP/1.1" 200 3143 "http://192.168.234.130/logo"
"GET /fancybox/fancy_shadow_n.png HTTP/1.1" 404 517 "-" "Mozilla"
"GET /fancybox/fancy_shadow_ne.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow_e.png HTTP/1.1" 404 517 "-" "Mozilla"
"GET /fancybox/fancy_shadow_se.png HTTP/1.1" 404 515 "-" "Mozilla"
"GET /fancybox/fancy_shadow_s.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow_sw.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow_w.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow_nw.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /ext/jquery/ui/redmond/images/ui-bg_glass_75_d0e5f5_1x400.

"POST /create_account.php HTTP/1.1" 302 528 "http://192.168.234.130"
"GET /create_account_success.php HTTP/1.1" 200 3034 "http://192.168.234.130"
"GET /create_account_success.php HTTP/1.1" 200 3068 "http://192.168.234.130"
"GET /ext/jquery/ui/redmond/jquery-ui-1.8.6.css HTTP/1.1" 200 6
"GET /ext/jquery/jquery-1.4.2.min.js HTTP/1.1" 200 24960 "http://192.168.234.130"
"GET /ext/jquery/ui/jquery-ui-1.8.6.min.js HTTP/1.1" 200 51576
"GET /ext/jquery/bxGallery/jquery.bxGallery.1.1.min.js HTTP/1.1" 200 10240
"GET /ext/jquery/fancybox/jquery.fancybox-1.3.4.css HTTP/1.1" 200 10240
"GET /ext/jquery/fancybox/jquery.fancybox-1.3.4.pack.js HTTP/1.1" 200 10240
"GET /ext/960gs/960_24_col.css HTTP/1.1" 200 1419 "http://192.168.234.130"
"GET /stylesheet.css HTTP/1.1" 200 2166 "http://192.168.234.130"
"GET /fancybox/fancy_shadow_n.png HTTP/1.1" 404 517 "-" "Mozilla"
"GET /fancybox/fancy_shadow_ne.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow_e.png HTTP/1.1" 404 517 "-" "Mozilla"
"GET /fancybox/fancy_shadow_se.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow_s.png HTTP/1.1" 404 517 "-" "Mozilla"
"GET /fancybox/fancy_shadow_sw.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow_w.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /fancybox/fancy_shadow_nw.png HTTP/1.1" 404 516 "-" "Mozilla"
"GET /checkout_shipping.php HTTP/1.1" 200 3681 "http://192.168.234.130"
"GET /ext/jquery/ui/redmond/jquery-ui-1.8.6.css HTTP/1.1" 200 6
"GET /ext/jquery/jquery-1.4.2.min.js HTTP/1.1" 200 24961 "http://192.168.234.130"
"GET /ext/jquery/ui/jquery-ui-1.8.6.min.js HTTP/1.1" 200 51575
"GET /ext/jquery/bxGallery/jquery.bxGallery.1.1.min.js HTTP/1.1" 200 10240
```

Problem identified:
Different number of Requests, GET and POST

Possible Solution:
Adjust settings on how to Retrieve resources



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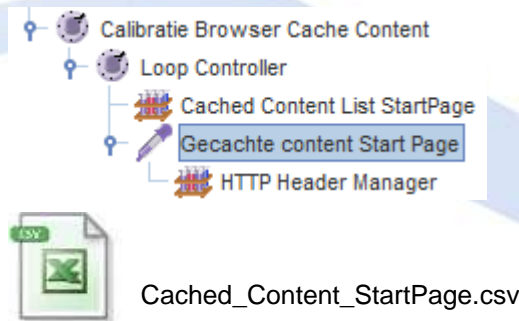
Problem identified: *Some content is cached within the browser.*
Solution: *Retrieve cached content once for every VU.*

```
▼ Response Headers view source  
access-control-allow-origin: *  
cache-control: private, max-age=31536000  
content-length: 2991  
content-type: image/png
```

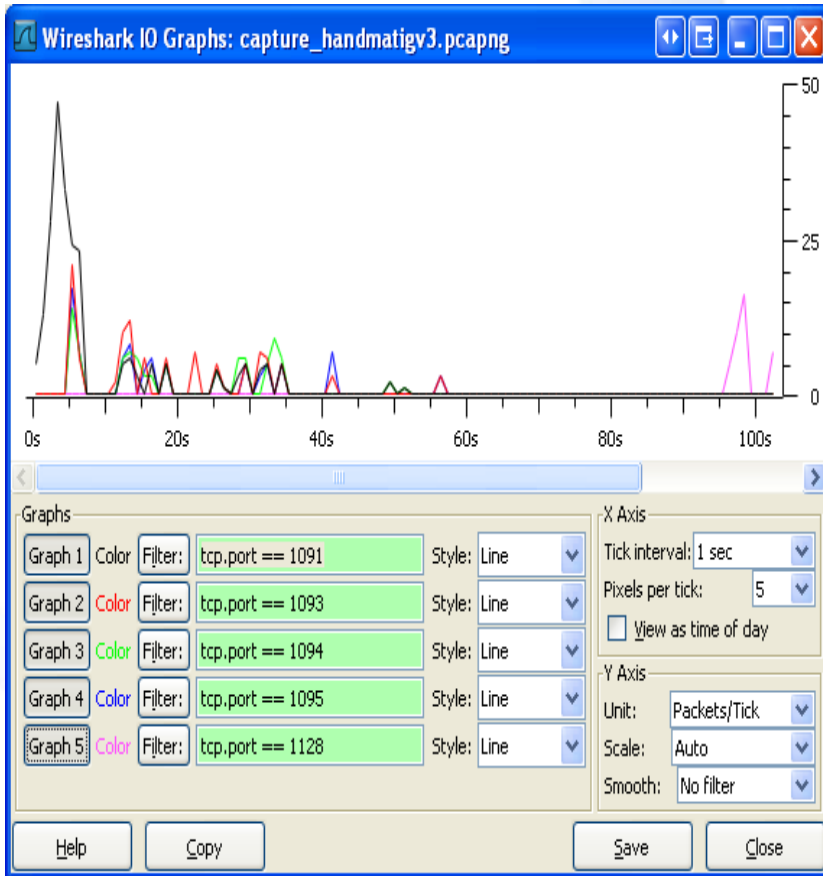
With Browser caching

```
▼ Response Headers view source  
cache-control: private, no-cache  
content-length: 0  
content-type: image/gif
```

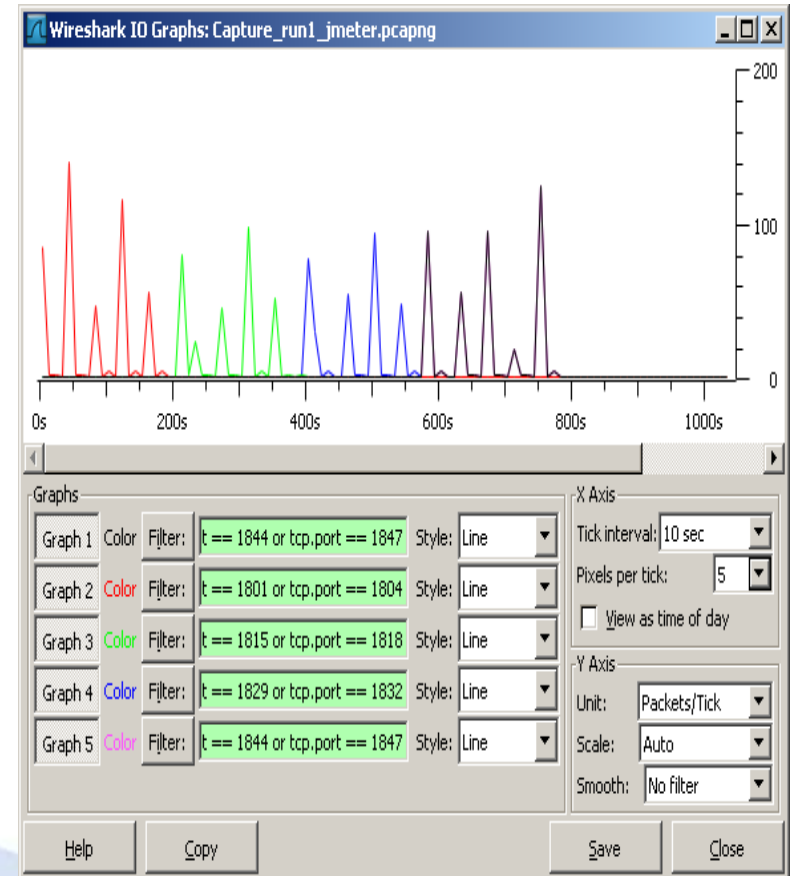
Without browser caching



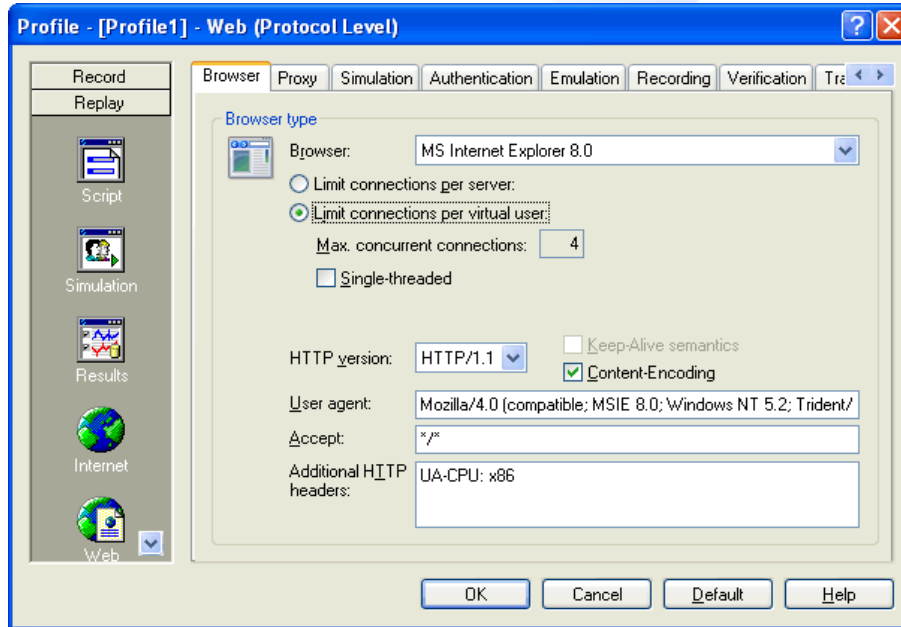
Compensation in J-meter for cached content using an “Only once Loop Controller”



Reference

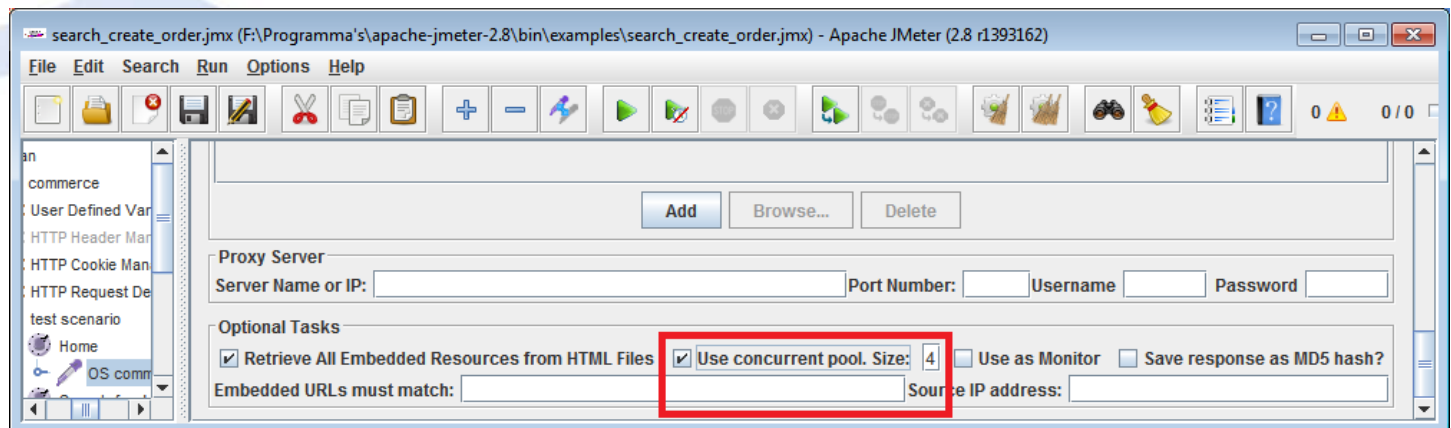


Tools



Problem identified: *Different behavior at network level caused by different number of connections used*

Possible Solution:
Adjust settings for number of connections per virtual user



Conversations: VMware Virtual Ethernet Adapter: \Device\NPF_{13700381-07C7}

Ethernet: 1 | Fibre Channel | FDDI | IPv4: 1 | IPv6 | IPX | JXTA | NCP | RSVP | SCTP | TCP: 5 | Token Ring | UDP | USB | WLAN

TCP Conversations - Filter: http.cookie == "osCsid=sb5ftf21n9vvh8ij0ko1dt2h5"

Address A	Port A	Address B	Port B	Packets	Bytes	Packets A-B	Bytes A-B	Packets A-E
192.168.234.132	1091	192.168.234.130	80	36	16 255	36	16 255	
192.168.234.132	1093	192.168.234.130	80	26	12 198	26	12 198	
192.168.234.132	1094	192.168.234.130	80	24	10 636	24	10 636	
192.168.234.132	1095	192.168.234.130	80	25	11 474	25	11 474	
192.168.234.132	1128	192.168.234.130	80	1	1 046	1	1 046	

Name resolution Limit to display filter

Help Copy Follow Stream Close

Reference 5 sessions

Conversations: run_script_timers.pcapng

Ethernet: 1 | Fibre Channel | FDDI | IPv4: 1 | IPv6 | IPX | JXTA | NCP | RSVP | SCTP | TCP: 16 | Token Ring | UDP | USB | WLAN

TCP Conversations - Filter: http.cookie == "osCsid=02rvdng8t55n6c1cmeun8jmdh2"

Address A	Port A	Address B	Port B	Packets	Bytes	Packets A-B	Bytes A-B	Packets A-B
192.168.28.1	1739	192.168.28.128	80	6	2 423	6	2 423	
192.168.28.1	1740	192.168.28.128	80	5	2 083	5	2 083	
192.168.28.1	1741	192.168.28.128	80	5	2 130	5	2 130	
192.168.28.1	1742	192.168.28.128	80	3	1 266	3	1 266	
192.168.28.1	1743	192.168.28.128	80	4	1 681	4	1 681	
192.168.28.1	1744	192.168.28.128	80	4	1 742	4	1 742	
192.168.28.1	1745	192.168.28.128	80	4	1 857	4	1 857	
192.168.28.1	1748	192.168.28.128	80	2	856	2	856	
192.168.28.1	1747	192.168.28.128	80	2	848	2	848	
192.168.28.1	1746	192.168.28.128	80	2	842	2	842	
192.168.28.1	1750	192.168.28.128	80	1	433	1	433	
192.168.28.1	1749	192.168.28.128	80	2	845	2	845	
192.168.28.1	1765	192.168.28.128	80	9	4 610	9	4 610	
192.168.28.1	1766	192.168.28.128	80	2	837	2	837	
192.168.28.1	1767	192.168.28.128	80	2	854	2	854	
192.168.28.1	1768	192.168.28.128	80	4	1 662	4	1 662	

Name resolution Limit to display filter

Help Copy Follow Stream Close

Tools 8 ~ 32 sessions

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Results after Calibration

The behavior and reported results from Performance Testtools need to be:

VALIDATED & CALIBRATED



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How do we do this?



At Squerist part of our intake and tool selection process for performance testing is the calibration and validation of the tools we are going to use.

We monitor developments in the market on tooling, network and application level and conduct our own research.



Are we finished? **NO!!!**

We want to research the influence of:

- Different browsers
- Different OS.
- Different amounts of VU

On performance and user experience

Why?

Because we are testers and our customers deserve accurate results!!!

