

Load Test Results for Submit and Approval Phases of Request Life Cycle

Version 2



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Executive Summary

CA Service Catalog is a comprehensive IT service request and provisioning solution that helps to *unify and simplify* IT service management. Organizations populate the catalog with the services offered by IT and other departments. An end user browses the catalog and adds selected catalog items to the user's shopping cart. During the checkout process, user submits the shopping cart for any approvals required by the organization. After required approvals, the request enters the fulfillment phase. Depending on the catalog items requested, the steps to fulfill the requested items can vary.

For large organizations, depending on the number of end users and the types of catalog items being offered, there could be a high amount of request submission, approval and fulfillment activity per day. CA Service Catalog application needs to be scalable to support large volume of requests.

CA Technologies performed a series of load tests on CA Service Catalog Release 12.7 based on data and inputs received from large enterprises. These tests were designed to replicate the test scenarios based on inputs from respective enterprises. The results demonstrate that CA Service Catalog Release 12.7 is scalable, enterprise-ready solution for any client who needs to provide self-service capabilities to the enterprise.

The 1-hour test exercised the repeatable execution of the self-service request life cycle from submission through approval at a rate of 7.2 requests per minute or 441 requests for an hour. This request life cycle activity was occurring at the same time as 70 concurrent users were refreshing a CA Service Catalog screen, each at a rate of 1 refresh every 8 minutes, resulting in 350 refreshes in 1 hour. The objective of this refresher activity is to generate additional concurrent user load on the application. Other than these multiple 1-hour runs, there were 8-hours run also which resulted in similar performance.

Average transaction success rate during the tests was measured at 99.87%. Test result section provides more details about tests conducted along-with details about 0.13% failures.

Please note that these results are based on virtualized test environment and they are expected to be better with physical environment.

The remainder of this document provides details of the test environment, scenarios, and results.

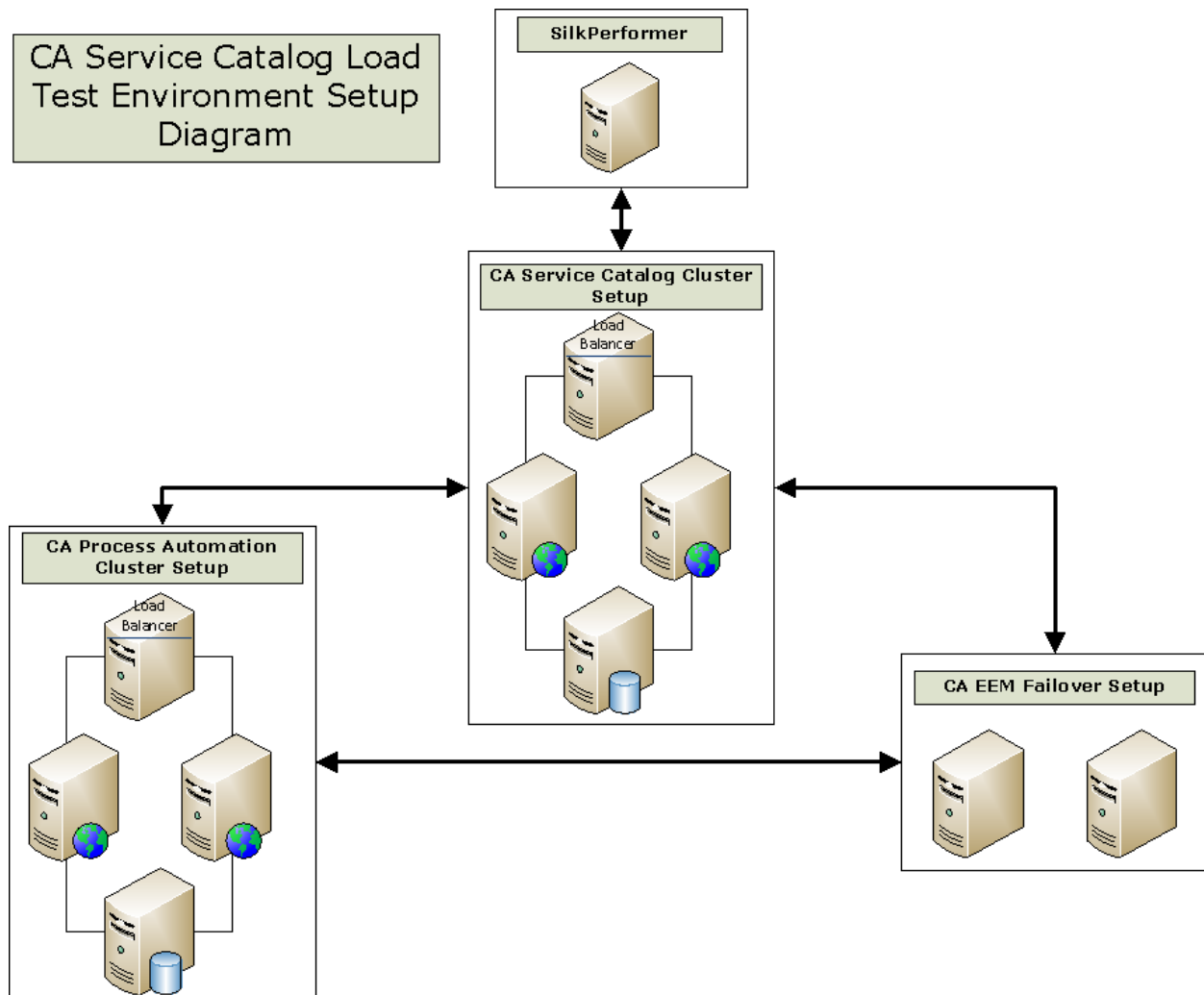
Test Environment

Multiple test servers were used for performance test environment. All test servers were hosted in virtualized environment to reflect current industry trends. Borland SilkPerformer 2010 R2 was used to create and run scripts to exercise the functionality being tested. The system (database) was pre-populated with data obtained from large enterprise customer(s).

Server Topology

The load test environment was configured as cluster setups for CA Service Catalog and integrated products. For simulating a production environment, these virtual machines were hosted on two separate ESX servers. Separate database machines were used for CA Service Catalog and CA Process Automation (formerly known as CA IT PAM).

FIGURE 1: SERVER TOPOLOGY DIAGRAM



There were total 11 virtual machines in the performance test environment all having following configuration:

- Intel(R) Xeon(R) CPU E5645@2.40GHz – Dual Core
- 4096 MB RAM
- Microsoft Windows Server 2008 R2 Enterprise edition (64-bit)

Server	Software	ESX Server	Provisioned Space
Service View (Primary), CA Service Catalog and CA Service Accounting	CA Service Catalog Release 12.7	ESX Server 1	122.08 GB
Service View (Secondary)	CA Service Catalog Release 12.7	ESX Server 2	121.27 GB
CA Service Catalog Load Balancer	Apache Webserver 2.2	ESX Server 1	124.00 GB
Database (MDB)	MS SQL Server 2008	ESX Server 1	240.64 GB
CA Process Automation Load Balancer	Apache Webserver 2.2	ESX Server 2	124.07 GB
CA Process Automation Node 1	CA PAM R3.1	ESX Server 2	124.47 GB
CA Process Automation Node 2	CA PAM R3.1	ESX Server 1	125.56 GB
CA Process Automation Database	MS SQL Server 2008	ESX Server 2	124.00 GB
Primary CA EEM	CA EEM R8.4	ESX Server 1	120.00 GB
Secondary CA EEM	CA EEM R8.4	ESX Server 2	120.00 GB
SilkPerformer controller	SilkPerformer 2010 R2	ESX Server 1	204.00 GB

CA Service Catalog Settings

The following CA Service Catalog configuration settings were adjusted to promote optimal performance.

Item	Setting	Unit
Tomcat threads	800	number
Tomcat connection timeout	1000000	milliseconds
Java initial heap size	512	MB
Java maximum heap size	1025	MB
Max database connection pool size	200	number

Database Settings

No changes were made to the default settings. Transaction log for MS SQL Server was set at Full mode (the default).

Transaction volume

As highlighted earlier, the test data was obtained from different large enterprise customers. Following table summarizes the transaction data and counts were captured just before the execution of the first load test:

Record type	Count
No. of Requests	100000
No. of Services	1800
No. of Business Units	100
No. of Users	20000

Test Scenarios

The test scripts simulated submit and approval process of the CA Service Catalog request life cycle. In addition, the test scripts simulated additional CA Service Catalog activity of refreshing logged in users' profile. This activity is unrelated to the request life cycle; however, it generates application load.

The details of the performance test scripts are given below. For all scripts, to simulate users' "think" time, there was a pause of two seconds for each page displayed and a pause of five seconds between user logout and subsequent login.

The service used for the test was the predefined Access Security service which is available out of the box.

Requester Scenario

In the requester scenario, a user in the Catalog End User role logs in to CA Service Catalog, selects a service to add to his cart, submits his request for approval, and logs out of CA Service Catalog. This test simulates the catalog entry selection and request submission phases of the CA Service Catalog request life cycle. This script results in average of 441 requests created over a 1-hour time period.

The steps in the script are as follows

- 1 15 requesters log in to CA Service Catalog at an interval of 5 seconds each, ramping up load on the application.
- 2 Each of these 15 users; selects a service from the CA Service Catalog to add to its cart.
- 3 User completes the fields on the form associated with selected service.
- 4 The shopping cart is displayed and user submits the cart.
- 5 The user logs out.

When the user submits the cart, CA Service Catalog causes an associated CA Process Automation process to initiate. The process instance determines the manager of the requester and assigns an approval task to that manager (the approver).

Approver Scenario

The approver scenario tests the condition where a user in the Catalog User role logs into CA Service Catalog, refreshes his pending actions list until a request for approval appears, selects a request from the displayed list; approves it and logs out of CA Service Catalog. This test simulates the approval phase of the CA Service Catalog request life cycle.

The steps in the script are as follows.

- 1 15 approvers log in to Service Catalog at an interval of 5 seconds.
- 2 These 15 users each look for greater than 0 pending actions else waits for 5 seconds before they log out.
- 3 Go to pending action page and select a request for approval and open the approval page for the same.
- 4 The approval page displays for the selected request.
- 5 The request is approved.
- 6 The user logs out.

Performance test suite was configured to have a lag of 5 minutes for approver scripts so that requests are placed before approver scripts starts. When approver approves the request, CA Service Catalog causes an associated CA IT PAM process to start which changes the status of the request to Pending Fulfillment.

Refresher Scenario

In the refresher scenario, a user with the Catalog End User role is logged into CA Service Catalog and continually refreshes the User Profile page. This test simulates random CA Service Catalog activity while the primary request life cycle test is being conducted.

The steps in the script are as follows.

- 1 All 70 refreshers are logged in to CA Service Catalog at the rate of 5 users every 10 seconds.
- 2 Each of these 70 refreshers re-load the User Profile page once every 8 minutes.
- 3 The user logs out from CA Service Catalog.

This is repeated for the entire duration of the test to have a consistent load of 100 virtual users.

Test Results

Transaction Statistics

Performance test results have been obtained as an average of 3 runs (1hour each) and following table represents the same:

Test	# Successful Transactions	# Failed Transactions	Success Rate
Test 1	1301	2	99.84%
Test 2	1278	3	99.76%
Test 3	1094	-	100.0%

Average transaction success rate for 3 tests was 99.87% and 0.13% failure was due to 5 failed transactions. These failed transactions were analyzed and following paragraph shares outcome of same:

All of these 5 transactions failed due to error *500: Internal Server Error*. When this error occurred there were no errors found in application logs and it appeared to be a temporary issues with test environment as it didn't halt other virtual users and subsequent requests were successful.

Request placed & approved statistics

Test	Requests Placed	Requests Approved	Requests processed per minute
Test 1	460	445	7.41
Test 2	435	429	7.15
Test 3	428	422	7.03

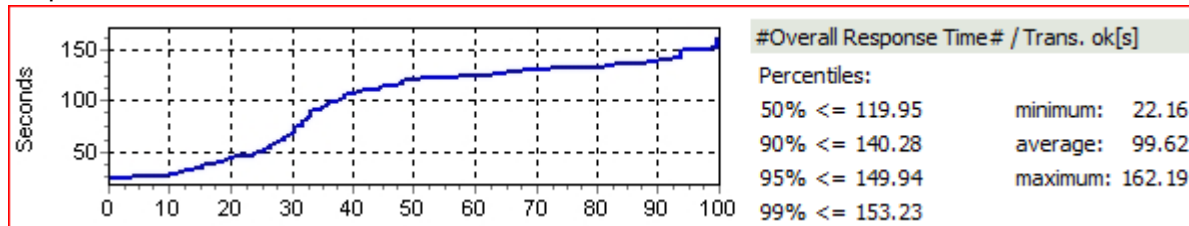
Note: Difference in number of requests placed and requests approved was due to the fact that performance test was configured to be aborted exactly after 1 hour of execution. Due to this requests placed at the very end of this period couldn't be approved by the time test ended.

Percentile Chart

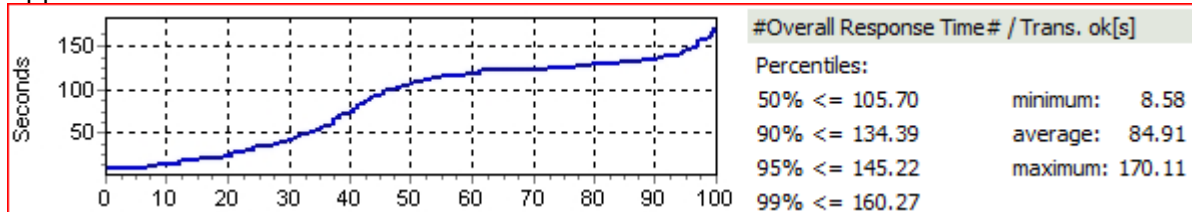
Percentile chart shows the transaction times sorted in an ascending order. The X-axis shows the percentiles and y-axis shows response time for transactions in seconds for respective percentile. An intersection of percentile and response time conveys the response time taken for that percentile of users.

Test 1

Requestor

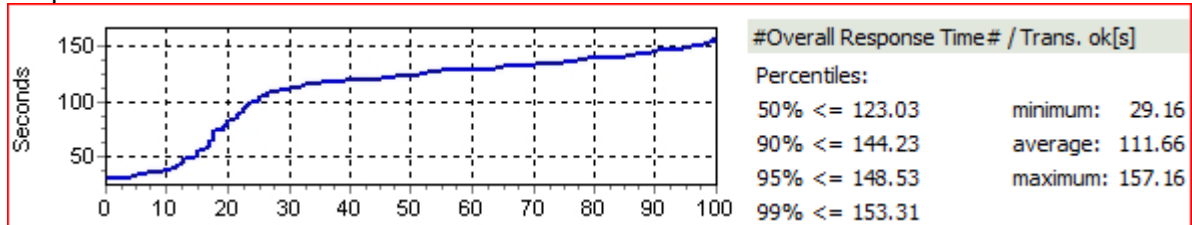


Approver

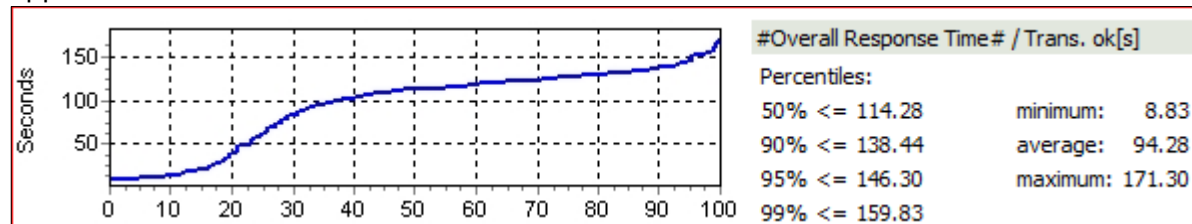


Test 2

Requestor

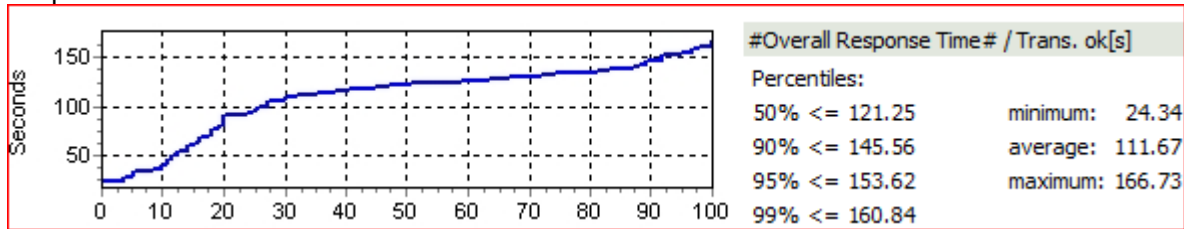


Approver

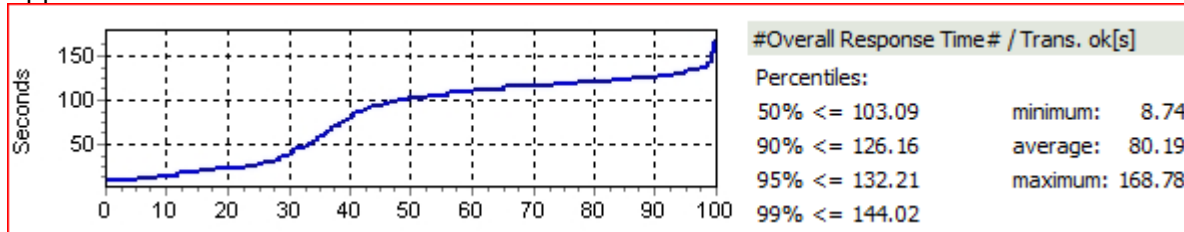


Test 3

Requestor



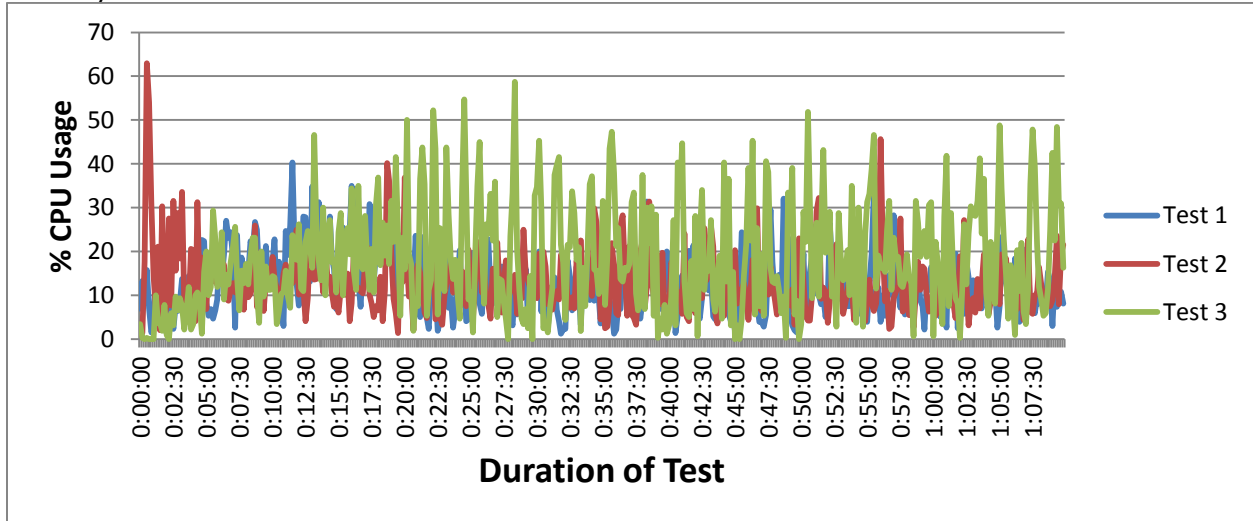
Approver



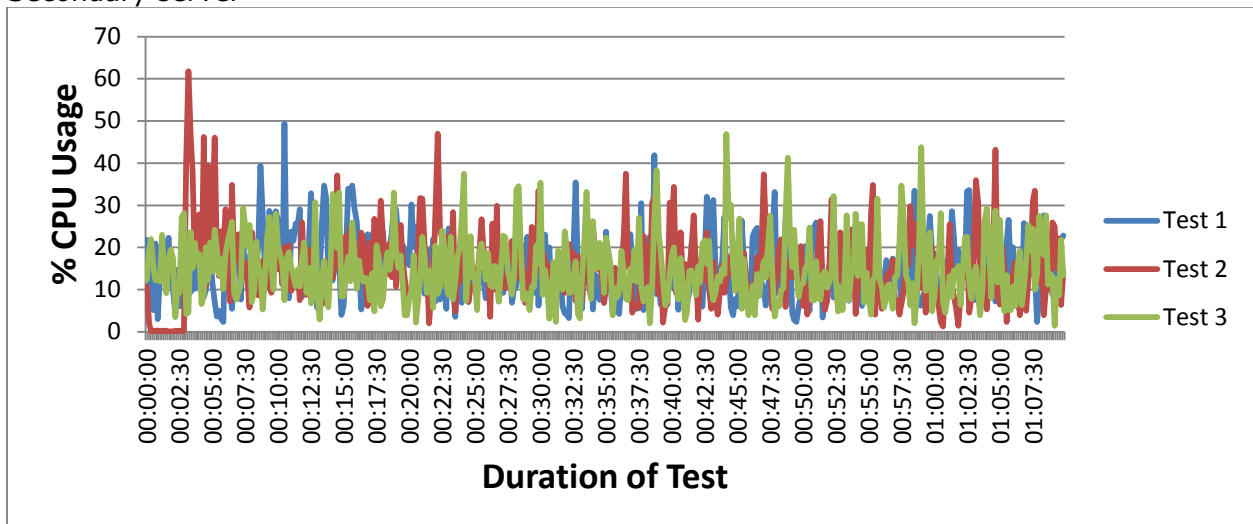
CPU Usage

Following charts show total % CPU usage during test for CA Service Catalog's primary and secondary servers. Please note that for a machine it is depicting average of multiple CPUs.

Primary server:



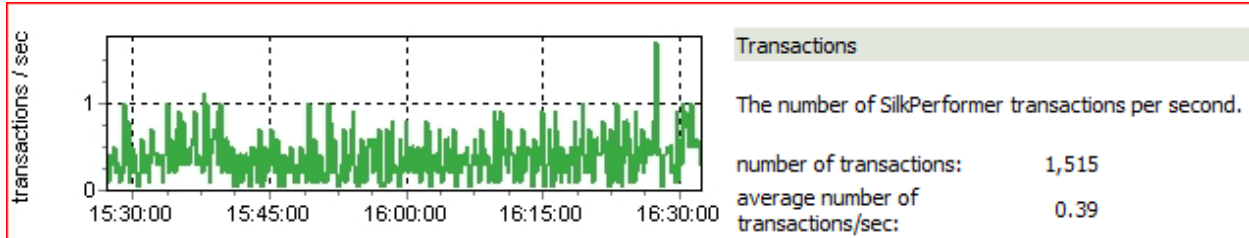
Secondary server



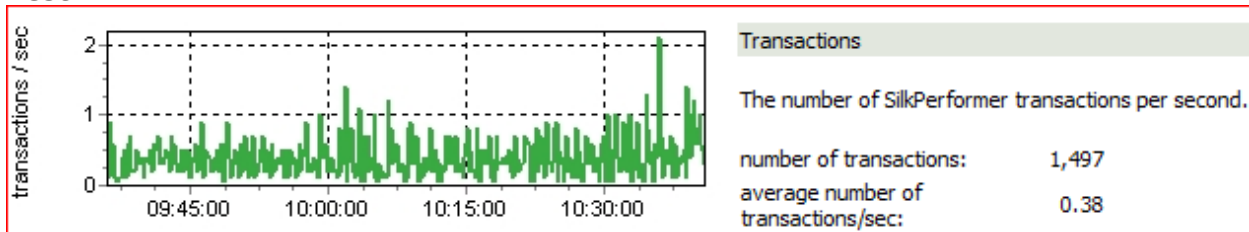
Transaction Rate over Time

The chart below show the number of transactions included in all scripts over time. The graph displays number of transactions taking place over time. Average transactions per second means the total number of transactions divided by total time of test.

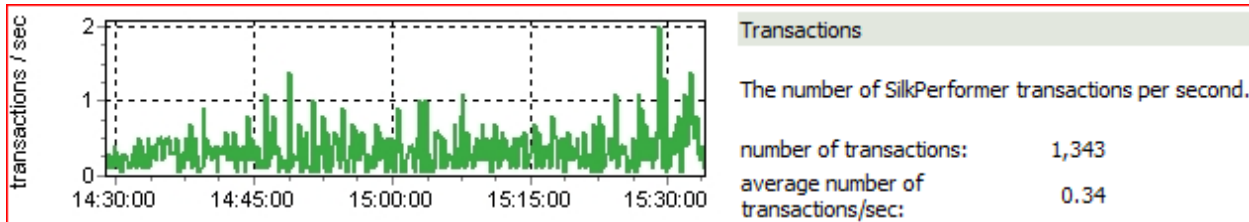
Test 1



Test 2



Test 3

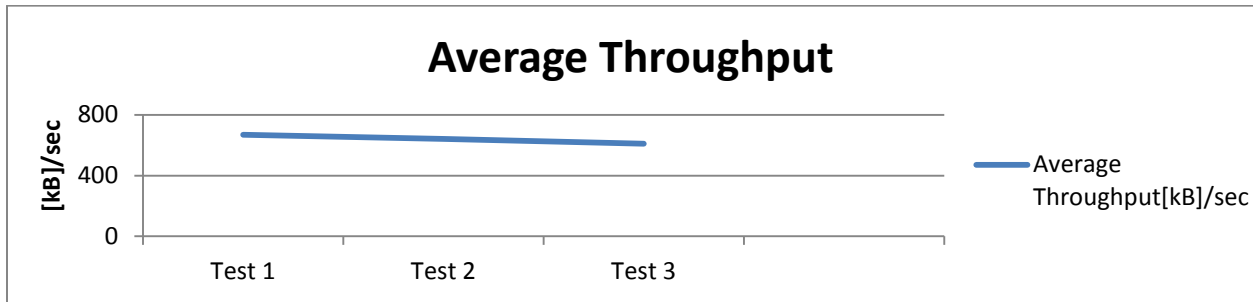
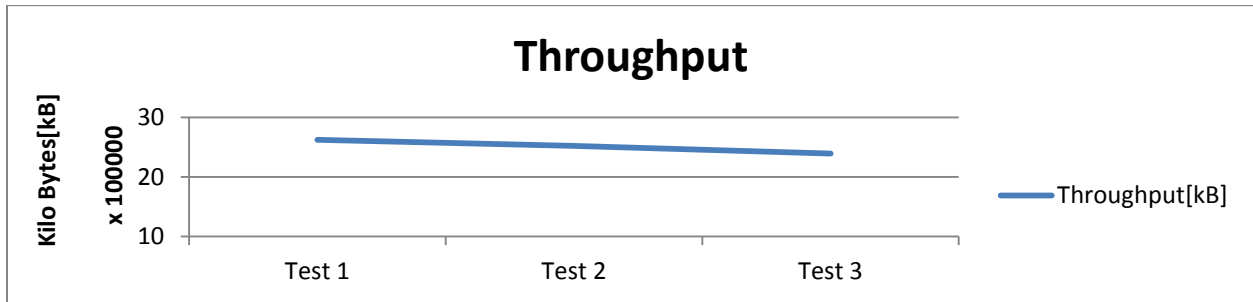


Note: The drop in average transactions may be attributed to the use of same database over multiple tests that led to increase in database size.

Throughput Rate

The charts below show the throughput from all scripts over time for the test. The high values of the throughput* are indicators that application is scalable to handle large volume of data transactions.

During load testing of CA Service Catalog r12.7 average throughput* was recorded as 640.20 KB/sec as compared to average throughput of 119.64 KB/sec during previous load test conducted for CA Service Catalog r12.5.



Note:

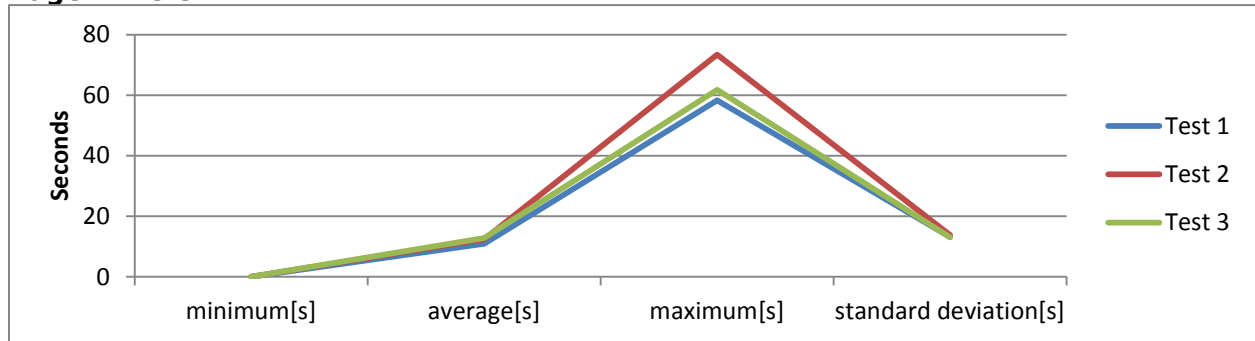
- * *Throughput and Average Throughput for a performance test, is a measures for total data transferred between Server and SilkPerformer agent(s). The amount of data sent to and received from the server; this includes header and body content information, all TCP/IP-related traffic (HTTP, native TCP/IP, IIOP, POP3, SMTP, FTP, LDAP and WAP), and secure traffic over SSL/TLS. This measurement does not include data overhead caused by SSL/TLS encryption and WTLS encryption in case of WAP.*
- *Note: The drop in average transactions may be attributed to the use of same database over multiple tests that led to increase in database size.*

Response Times

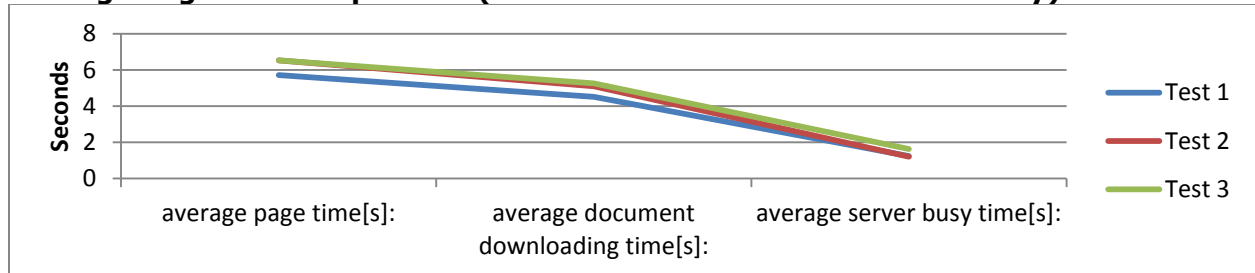
Timers record the response time from the users' perspective. SilkPerformer separates timers into Page Timers and Custom Timers. Page Timers are default counters used by SilkPerformer for each page whereas custom times are set while recording script based on important user actions. The Page Timer charts also indicate the server busy time vs. the page and document download time (network transmission time); a histogram of this data showing what portion of the total response time was due to server busy and network transmission time is included. This detailed data is not available for Custom Timers.

The charts below show Page Timer response times included in all scripts over time. In these graphs minimum, average and maximum page response times are indicated across 3 load tests. Due to obvious reasons for maximum category page load time is high however that may be experienced by only few transactions. For data analysis perspective average page timers can be used along-with standard deviation.

Page Timers



Average Page Timers split into (Document download and server busy)



PAGE TIMER OVERALL RESPONSE TIMES PER SCRIPT

The page timer measurements contain measurements related to web pages that are downloaded by a virtual user:

Test 1

Requestor

Name	Avg	Min	Max	Count	Measured	Total	StdDev	Bound1	Bound2	Histogram
#Overall Response Time#										
response time breakdown (server / document / page)										
Page time[s]	6.008	0.031	33.937	6,454	6,310	37,908.599	7.517	72.85% <8.0	87.39% <16.0	

Approver

Name	Avg	Min	Max	Count	Measured	Total	StdDev	Bound1	Bound2	Histogram
#Overall Response Time#										
response time breakdown (server / document / page)										
Page time[s]	6.346	0.000	39.031	6,159	6,130	38,902.430	8.089	69.02% <8.0	84.85% <16.0	

Test 2

Requestor

Name	Avg	Min	Max	Count	Measured	Total	StdDev	Bound1	Bound2	Histogram
#Overall Response Time#										
response time breakdown (server / document / page)										
Page time[s]	6.871	0.047	33.891	6,090	5,972	41,032.480	7.780	69.04% <8.0	85.37% <16.0	

Approver

Name	Avg	Min	Max	Count	Measured	Total	StdDev	Bound1	Bound2	Histogram
#Overall Response Time#										
response time breakdown (server / document / page)										
Page time[s]	7.343	0.000	44.625	6,034	6,005	44,096.530	8.437	63.63% <8.0	81.70% <16.0	

Test 3

Requestor

Name	Avg	Min	Max	Count	Measured	Total	StdDev	Bound1	Bound2	Histogram
#Overall Response Time#										
response time breakdown (server / document / page)										
Page time[s]	6.822	0.062	34.609	5,992	5,865	40,009.396	7.136	68.08% <8.0	86.82% <16.0	

Approver

Name	Avg	Min	Max	Count	Measured	Total	StdDev	Bound1	Bound2	Histogram
#Overall Response Time#										
response time breakdown (server / document / page)										
Page time[s]	6.624	0.000	36.875	6,162	6,154	40,764.141	7.435	66.07% <8.0	85.68% <16.0	

Custom Response Times

The charts below show average response times for custom timers used for various user actions in performance test scripts. This is average time taken for a virtual user to perform specified action:

Custom timers are used for these scripts with user interaction steps and following is list of same:

Requestor

- Load Login Page
- Login
- SelectSecurityAccess (Select Service)
- Select ID Badges
- ClickAddToCartAndCheckOut
- ClickSaveAndSubmitCart
- Logout

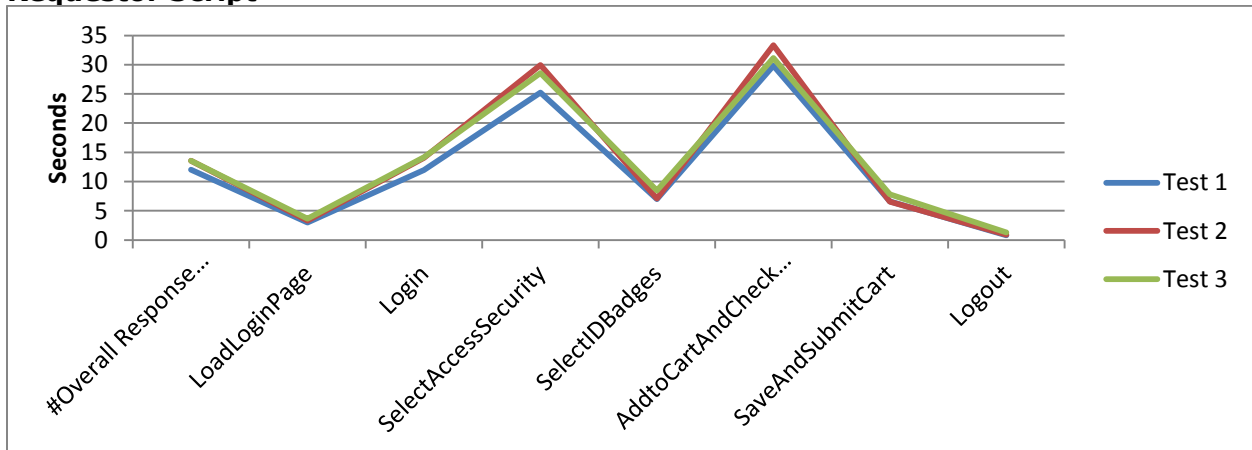
Approver

- Load Login Page
- Login
- MyReqPending (My Pending Requests)
- ClickApproveRequest
- ClickSave
- Logout

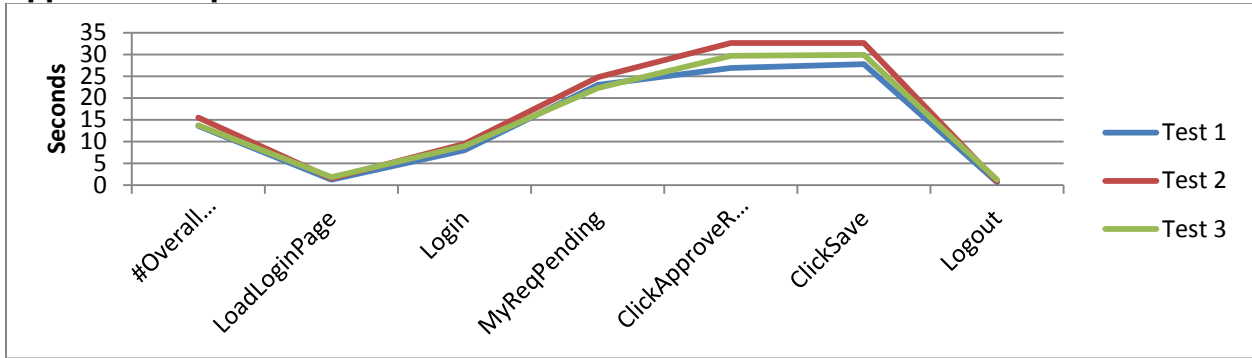
Refresher

- Load Login Page
- Login
- View User Profile
- ClickDone
- Logout

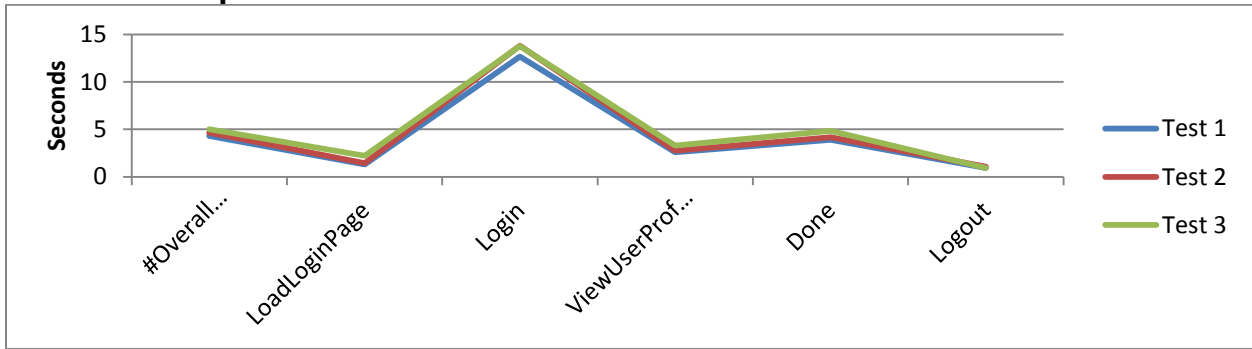
Requestor Script



Approver Script



Refresher Script



Transaction Completion Time

The chart below shows overall average transaction completion time for each script for each of the three tests. Average transaction time indicates the average time for all the steps in the script to be completed and reflects on the complexity of the script. The Submit Request and Approve Request scripts show higher transaction completion times because they are more complex.

Note: *Trans. (busy) ok[s]* is the measurement without think time. Think time is time for which virtual users waits before processing next transaction.

AVERAGE TRANSACTION COMPLETION TIME FOR EACH SCRIPT BY TEST

Requestor Script

Name	Test 1			Test 2			Test 3		
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max
Trans. ok[s]	99.618	22.156	162.188	111.66	29.156	157.156	111.673	24.344	166.734
Trans.(busy) ok[s]	85.614	8.156	148.172	97.656	15.156	143.156	97.657	10.328	152.734

Approver Script

Name	Test 1			Test 1			Test 1		
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max
Trans. ok[s]	84.909	8.578	170.110	94.278	8.828	171.297	80.186	8.735	168.781
Trans. failed[s]	105.844	100.609	111.079	107.672	97.219	121.172	N/A	N/A	N/A
Trans.(busy) ok[s]	73.555	0.578	158.110	83.057	0.859	159.297	69.317	0.766	156.766
Trans.(busy) failed[s]	93.844	88.609	99.079	95.672	85.219	109.172	N/A	N/A	N/A

Refresher Script

Name	Test 1			Test 2			Test 3		
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max
Trans. ok[s]	22.553	1.500	34.812	24.575	3.188	34.985	26.261	3.063	42.515
Trans.(busy) ok[s]	22.553	1.500	34.812	24.575	3.188	34.985	26.261	3.063	42.515

Note: Please note that aforementioned load test results are captured using SilkPerformer and results may vary slightly with other load test tools.

Conclusion

Load testing of CA Service Catalog Release 12.7 was successfully conducted covering 3 scenarios (requester, approval and refresher) at 100VU load at a test environment primed with a predefined record volume. During these load tests average transaction success rate of 99.87% and average throughput was recorded as 640.20 KB/sec.

Average throughput of this release is observed better than earlier release, CA Service Catalog Release 12.5, which was measured as 119.64 KB/sec. It should also be noted that load test environment used for earlier release was a non-clustered & physical environment.

Please note that these results are based on virtualized test environment and they are expected to be better with physical environment.

These load tests results provide reliable supporting facts that CA Service Catalog Release 12.7 can be used for providing the enterprise with a self-service request capability that meets the high standards of reliability, availability and throughput that large enterprises require.