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

CA Service Catalog r12.5

Table of Contents

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, the user submits the shopping cart for any approvals required by the organization. After any approvals, the user's request enters the fulfillment phase. Depending on the catalog items requested, the steps to fulfill the requested items might be different.

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 systems need to be scalable in order to support large volume of requests.

CA performed a series of stress tests on CA Service Catalog r12.5 for a large service provider whose client was a large national defense organization. Although these tests were specifically designed to replicate the test scenarios defined by that client, the results clearly demonstrate that CA Service Catalog is scalable, enterprise-ready solution for any client who needs to provide self-service and change management capabilities to the enterprise.

The 8-hour test exercised the repeatable execution of the self-service request life cycle from submission through approval at a rate of 8 requests per minute or approximately 3,840 requests for 8 hours. This request life cycle activity was occurring at the same time as 500 concurrent users were refreshing a CA Service Catalog screen, each at a rate of one refresh every two minutes, resulting in approximately 150,000 refreshes in ten hours.

The resulting performance showed an average page time of 0.175 seconds for requesters, 0.144 seconds for approvers, and 0.183 seconds for refreshers. The success rate for the test was 99.97%.

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

Test Environment

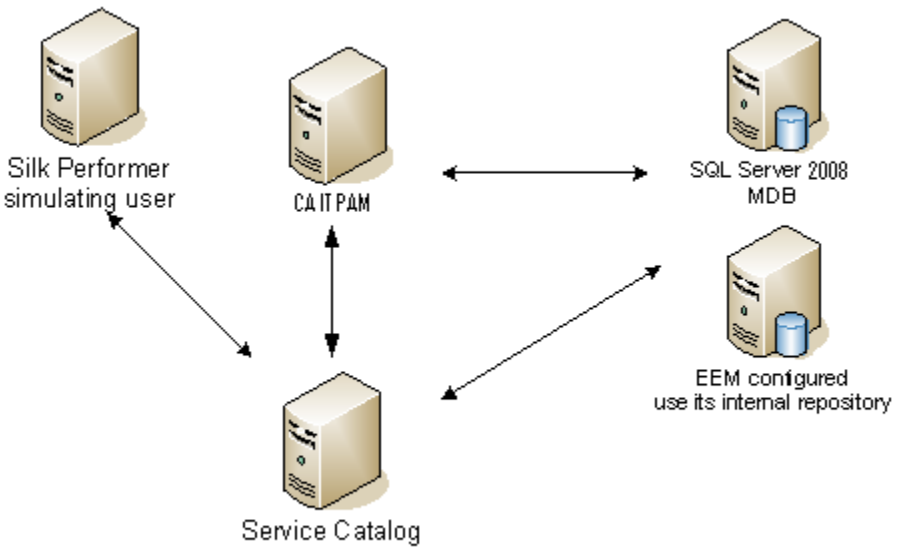
Multiple servers were used to provide a distributed environment. Borland SilkPerformer was used to create and run scripts to exercise the functionality being tested. The systems were pre-populated with substantial amounts of data.

Server Topology

All servers used in the test were set up at the Labs on Demand facility at CA's corporate headquarters in Islandia, NY, with the exception of the SilkPerformer client. Multiple servers were used for the testing as described in the table below. All systems were on a LAN and clustering was not used.

Server	***Software***	***OS***	***Hardware***
S1 – SilkPerformer simulating user	SilkPerformer client 2006 R2	Windows Server Enterprise Edition 2008 SP2	Intel Xeon CPU 3.00 GHz, 4.00 GB RAM, 149 GB drive with at least 4 GB free space
S2 – Service Catalog	CA Service Catalog r12.5	Windows Server Enterprise Edition 2008 SP2	Intel Xeon CPU 3.00 GHz, 4.00 GB RAM, 149 GB drive with at least 4 GB free space
S3 –IT PAM	CA IT Process Automation Manager (CA IT PAM) 2.2	Windows Server Enterprise Edition 2008 SP2	Intel Xeon CPU 3.00 GHz, 4.00GB RAM, 149 GB drive with at least 4 GB free space
S4 – MDB	SQL Server 2008	Windows Server Enterprise Edition 2008 SP2	Intel Xeon CPU 3.00 GHz, 4.00 GB RAM, 149 GB drive with at least 20 GB free space
S5 – CA EEM	CA Embedded Entitlements Manager (CA EEM) 8.4, configured to use its own data store for a user repository	Windows Server Enterprise Edition 2008 SP2	Intel Xeon CPU 3.00 GHz, 4.00 GB RAM, 149 GB drive with at least 4 GB free space

FIGURE 1: SERVER TOPOLOGY DIAGRAM



CA Service Catalog Settings

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

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

Database Settings

No changes were made to the default settings.

Test Scenarios

The test scripts simulated the submit and approval phases of the CA Service Catalog request life cycle. In addition, the test scripts simulated additional CA Service Catalog activity unrelated to the request life cycle.

The details of the 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.

Requester Scenario

In the requester scenario, a user in the Catalog End User role logs into CA Service Catalog, selects one of ten services 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 approximately 3,840 requests created over an eight-hour time period.

The steps in the script are as follows:

1. Ten requesters log in to CA Service Catalog at a rate of eight users per minute, overall.
2. Each of the 10 users selects one of 10 services from the catalog to add to her cart.
3. Because a form is associated with the service selected, the user completes the five fields on the form and continues.
4. The shopping cart displays and the user submits her cart.
5. The user logs out.

When the user submits to the cart, CA Service Catalog causes an associated CA IT PAM process to start. The process instance determines the manager of the requester and assigns an approval task to that manager, approver.

Approver Scenario

The approver scenario tests the condition where a user in the Catalog End User role logs into CA Service Catalog, refreshes his pending actions list until a request for approval appears, approves the first request in the list 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. Ten approvers log in to Service Catalog at a rate of eight users per minute.
2. The 10 users each refresh the Pending Actions page until an approval pending action appears in the list.

3. The approval page displays for the first pending action in the list.

4. The request is approved.

5. The user logs out.

When the user approves the request, CA Service Catalog causes an associated CA IT PAM process to start. The process instance 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 500 refreshers are logged in to CA Service Catalog at the beginning of the test. The users remain logged in during the entire test period.

2. Each of the 500 refreshers re-displays the User Profile page once every two minutes.

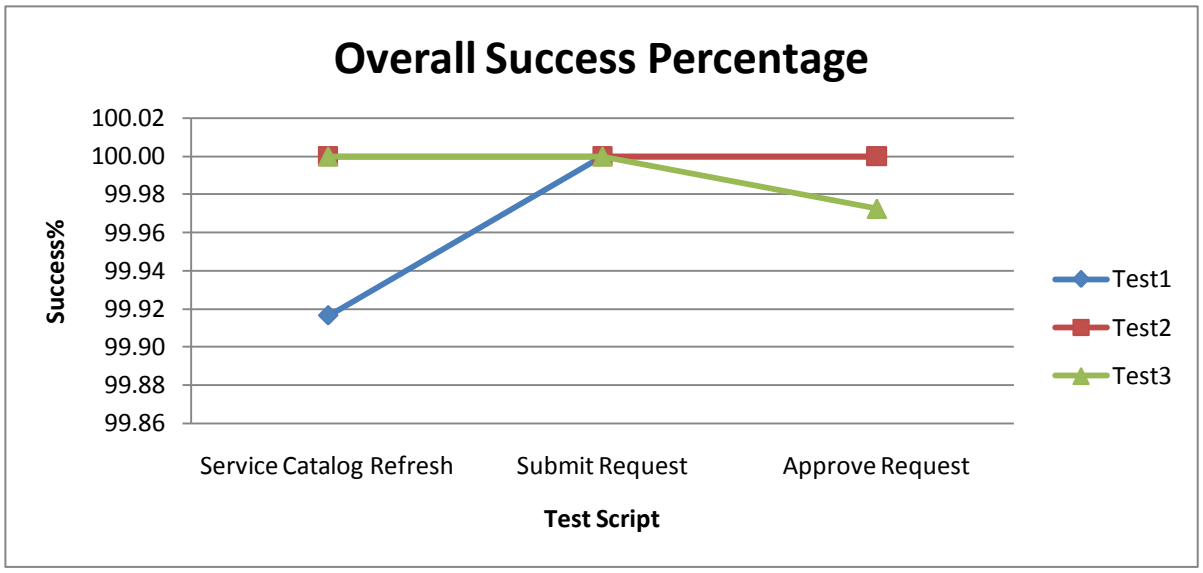
3. At the end of the test period, all 500 refreshers are logged out from CA Service Catalog.

Test Results

Transaction Statistics

The same tests were conducted three times with no change in the load or any test scenario. Transactions statistics for each of these three tests are shown below. The errors encountered in the failed transactions were due to HTTP connection resets primarily during the first few minutes of the test period while the one-time login of the refreshers was occurring.

OVERALL TRANSACTION SUCCESS



TEST 1

Test Scenario Name	# Successful Transactions	# Failed Transactions	% Successful Transactions
Submit Request	3,690	0	100.00%
Approve Request	3,637	0	100.00%
Refresh Service Catalog Page	120,688	101	99.92%

TEST 2

Test Scenario Name	# Successful Transactions	# Failed Transactions	% Successful Transactions
Submit Request	3,673	0	100.00%
Approve Request	3,650	0	100.00%
Refresh Service Catalog Page	120,802	0	100.00%

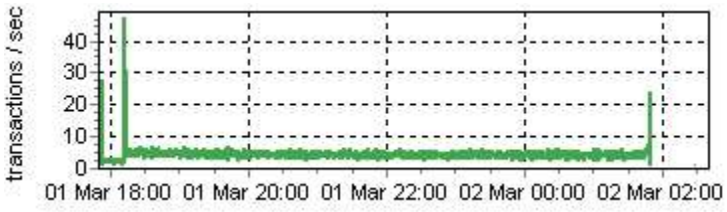
TEST 3

Test Scenario Name	# Successful Transactions	# Failed Transactions	% Successful Transactions
Submit Request	3,704	0	100.00%
Approve Request	3,666	1	99.97%
Refresh Service Catalog Page	120,785	0	100.00%

Transaction Rate over Time

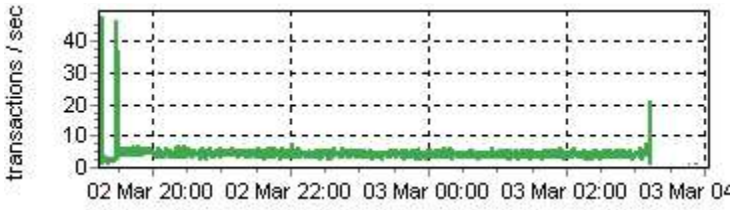
The chart below show the number of transactions included in all scripts over time. The high values shown at the start and end of the test period are due to the one-time login and logout of the refreshers. Otherwise, the chart shows consistent transaction rates throughout the test.

TEST 1



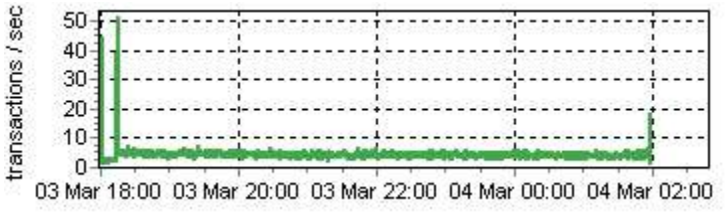
Transactions	
The number of SilkPerformer transactions per second.	
number of transactions:	129,497
average number of transactions/sec:	4.07

TEST 2



Transactions	
The number of SilkPerformer transactions per second.	
number of transactions:	129,507
average number of transactions/sec:	4.07

TEST 3



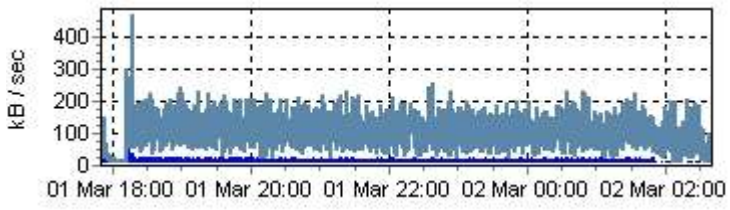
Transactions	
The number of SilkPerformer transactions per second.	
number of transactions:	129,495
average number of transactions/sec:	4.07

Throughput Rate

The charts below show the throughput from all scripts over time for the test. The high values shown at the start and end of the test period are due to the one-time login and logout of the refreshers. Otherwise, the charts show consistent throughput rates throughout the test.

TEST 1

Throughput / Concurrency



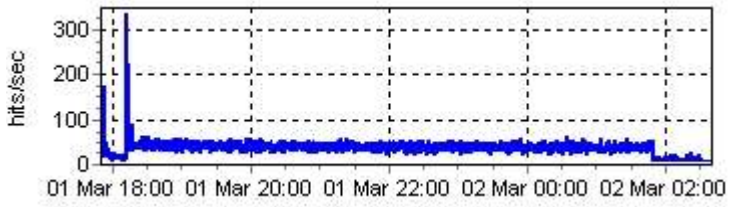
Throughput[kB]

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.

Request data sent

Response data received

throughput[kB]:	3,802,907
average throughput[kB]/sec:	119.55



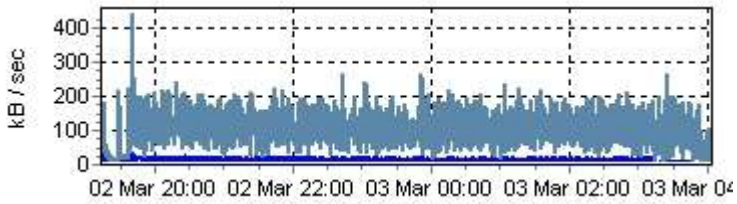
Http Hits

The number of HTTP requests that arrive at the Web server.

number of hits:	1,183,505
average number of hits/sec:	37.21

TEST 2

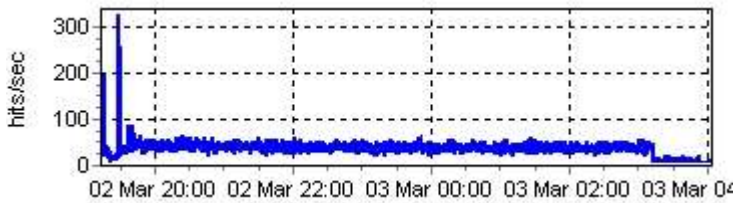
Throughput / Concurrency



Throughput[kB]

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.
Request data sent
Response data received

throughput[kB]:	3,804,722
average throughput[kB]/sec:	119.61



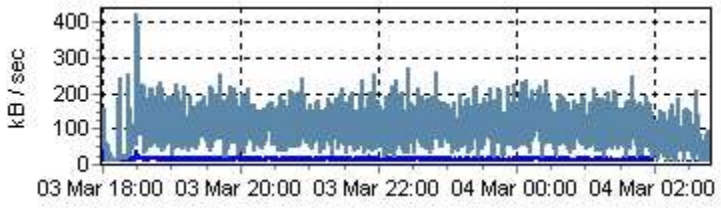
Http Hits

The number of HTTP requests that arrive at the Web server.

number of hits:	1,184,912
average number of hits/sec:	37.25

TEST 3

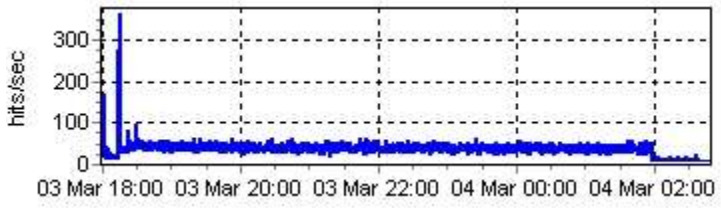
Throughput / Concurrency



Throughput[kB]

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.
Request data sent
Response data received

throughput[kB]:	3,809,454
average throughput[kB]/sec:	119.76



Http Hits

The number of HTTP requests that arrive at the Web server.

number of hits:	1,185,742
average number of hits/sec:	37.28

Timer Response Times

Timers record the response time from the user's perspective. SilkPerformer separates timers into Page Timers and Custom Timers. Page Timers are used for simple pages while Custom Timers are used for more complex pages. The Page Timer charts also indicate the server busy time vs. the page and document download (network transmission time), including a histogram of this data showing what portion of the total response time was due to server busy and network transmission time. This detailed data is not available for Custom Timers.

Most of the timers used in the test scripts are Page Timers. Custom Timers are used for these scripts with user interaction steps:

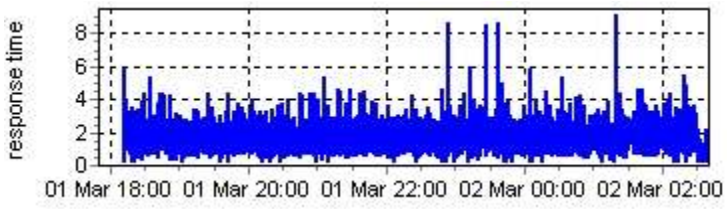
- RequesterAddToCart – The requester enters values on the fields on the displayed form and clicks Add to Cart and Checkout to check out.
- RequesterSubmitCart – The requester clicks Submit to submit his cart.
- ApproverApprove – The approver selects Approve then OK to approve the request.

The charts below show Page Timer and Custom Timer response times included in all scripts over time. The high values shown at the start and end of the test period are due to the one-time login and logout of the refreshers. Otherwise, the charts show consistent response times throughout the test.

TEST 1

CUSTOM TIMERS

Response Times – Timers



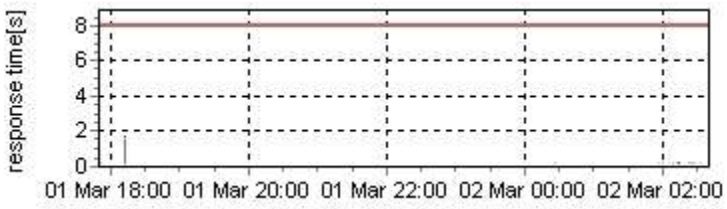
Overall Response Time

This chart displays the overall response times for all custom timers defined in the load-testing script. Custom timers are started and stopped with the MeasureStart and MeasureStop functions, respectively.

minimum[s]:	0.00
average[s]:	1.77
maximum[s]:	16.15
standard deviation[s]:	2.83

PAGE TIMERS

Response Times - Page Timers



Page time[s]

The time it takes a virtual user to download a Web page from the server, in seconds. Response times for Web pages are subdivided into server-busy times, document-downloading times, and round-trip times.

average page time[s]:	0.21
average document downloading time[s]:	0.18
average server busy time[s]:	0.08

PAGE TIMERS OVERALL RESPONSE TIME PER SCRIPT

SUBMIT REQUEST

response time breakdown (server / document / page)

APPROVE REQUEST

response time breakdown (server / document / page)

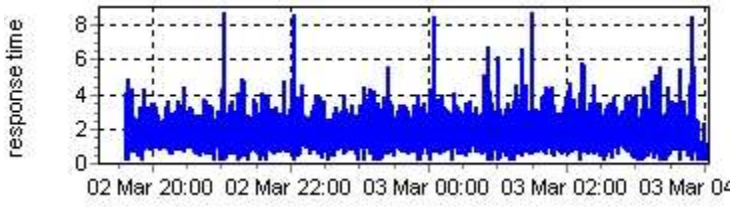
SERVICE CATALOG REFRESH

response time breakdown (server / document / page)

TEST 2

CUSTOM TIMERS

Response Times – Timers



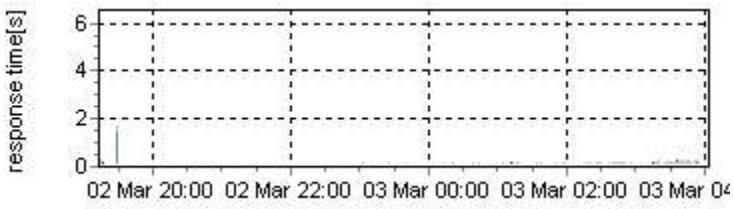
Overall Response Time

This chart displays the overall response times for all custom timers defined in the load-testing script. Custom timers are started and stopped with the MeasureStart and MeasureStop functions, respectively.

minimum[s]:	0.00
average[s]:	1.76
maximum[s]:	11.44
standard deviation[s]:	2.83

PAGE TIMERS

Response Times - Page Timers



Page time[s]

The time it takes a virtual user to download a Web page from the server, in seconds. Response times for Web pages are subdivided into server-busy times, document-downloading times, and round-trip times.

average page time[s]:	0.16
average document downloading time[s]:	0.16
average server busy time[s]:	0.07

PAGE TIMERS OVERALL RESPONSE TIME PER SCRIPT

SUBMIT REQUEST

response time breakdown (server / document / page)

APPROVE REQUEST

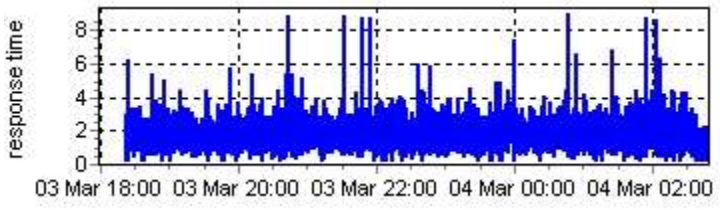
response time breakdown (server / document / page)

SERVICE CATALOG REFRESH

response time breakdown (server / document / page)

TEST 3

CUSTOM TIMERS



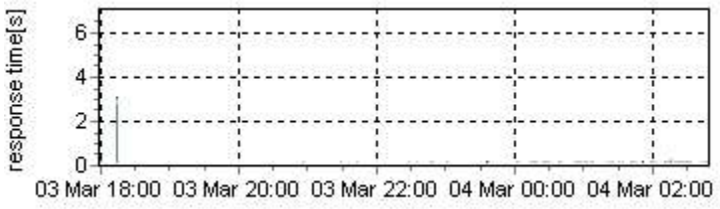
Overall Response Time

This chart displays the overall response times for all custom timers defined in the load-testing script. Custom timers are started and stopped with the MeasureStart and MeasureStop functions, respectively.

minimum[s]:	0.00
average[s]:	1.79
maximum[s]:	13.14
standard deviation[s]:	2.83

PAGE TIMERS

Response Times - Page Timers



Page time[s]

The time it takes a virtual user to download a Web page from the server, in seconds. Response times for Web pages are subdivided into server-busy times, document-downloading times, and round-trip times.

average page time[s]:	0.16
average document downloading time[s]:	0.16
average server busy time[s]:	0.07

PAGE TIMERS OVERALL RESPONSE TIME PER SCRIPT

SUBMIT REQUEST

response time breakdown (server / document / page)

APPROVE REQUEST

response time breakdown (server / document / page)

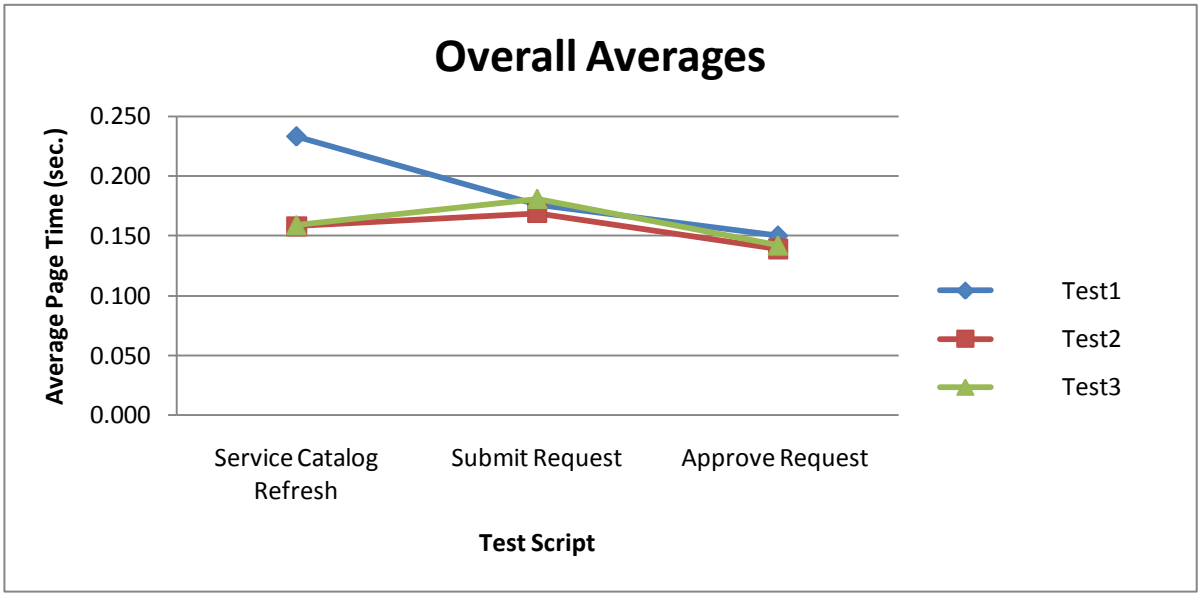
SERVICE CATALOG REFRESH

response time breakdown (server / document / page)

Transaction Response Time Details

The chart below shows overall average page time for each script. Average page time indicates the average time before a page is returned to the user and includes all steps in the script.

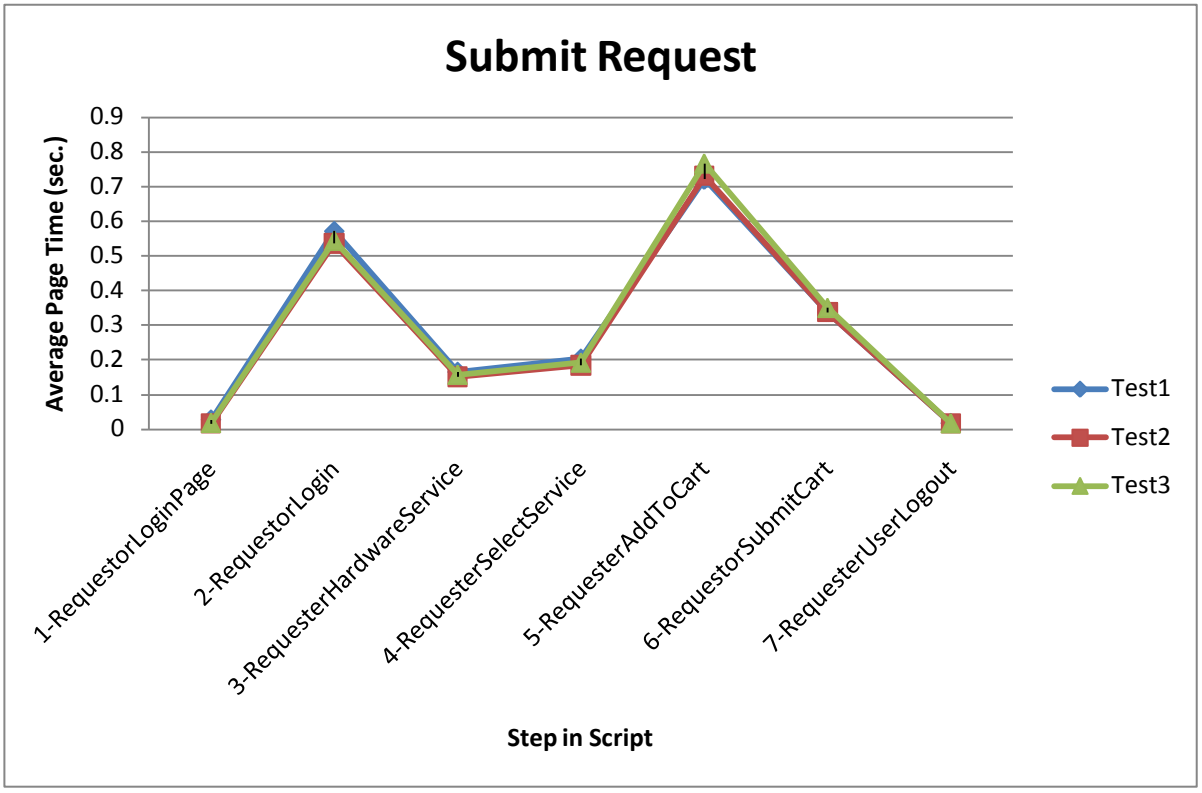
AVERAGE PAGE TIME FOR EACH SCRIPT BY TEST



The charts below show detailed response times for each step in each script. Average page time indicates the average time before a page is returned to the user for the step in the script.

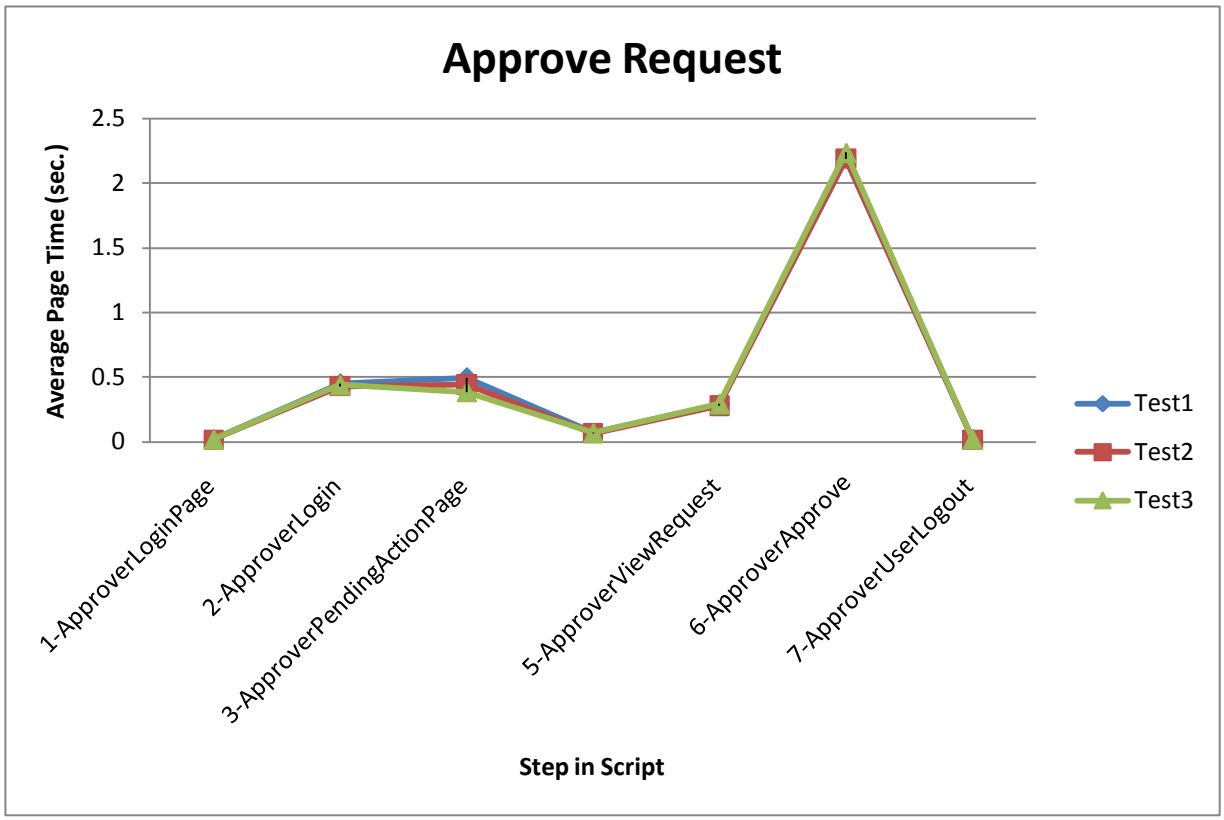
AVERAGE PAGE TIME FOR EACH STEP IN THE SCRIPT BY TEST

SUBMIT REQUEST



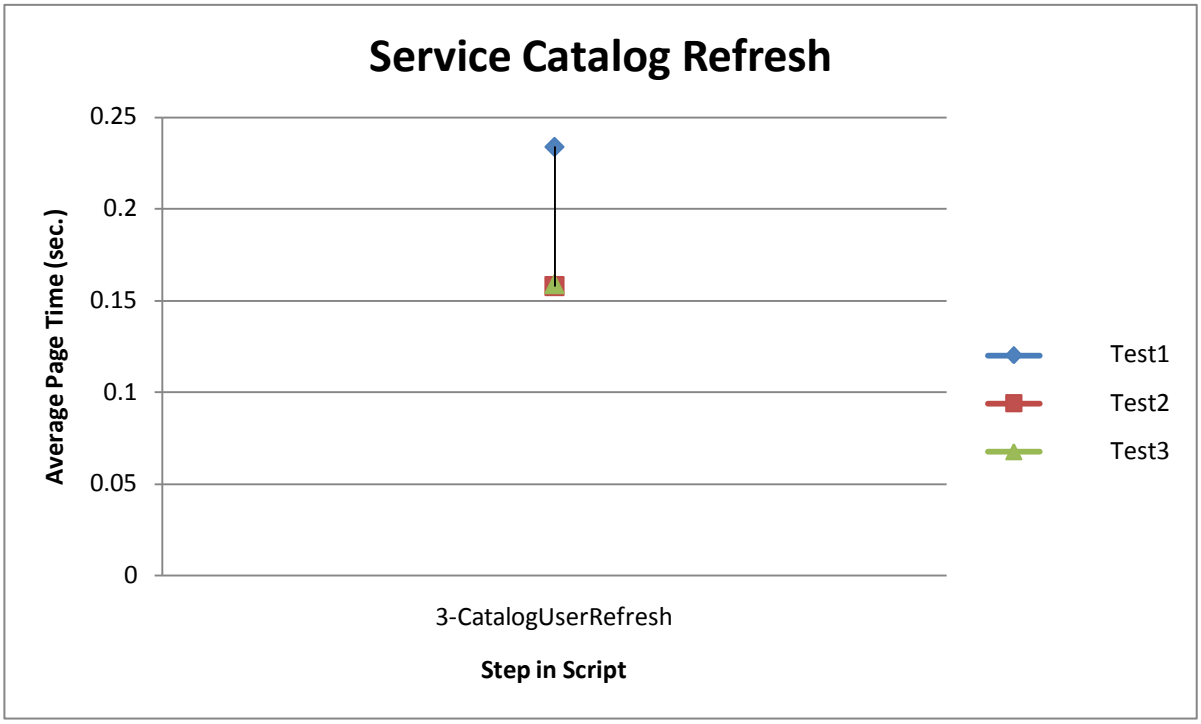
AVERAGE PAGE TIME FOR EACH STEP IN THE SCRIPT BY TEST

APPROVE REQUEST



AVERAGE PAGE TIME FOR EACH STEP IN THE SCRIPT BY TEST

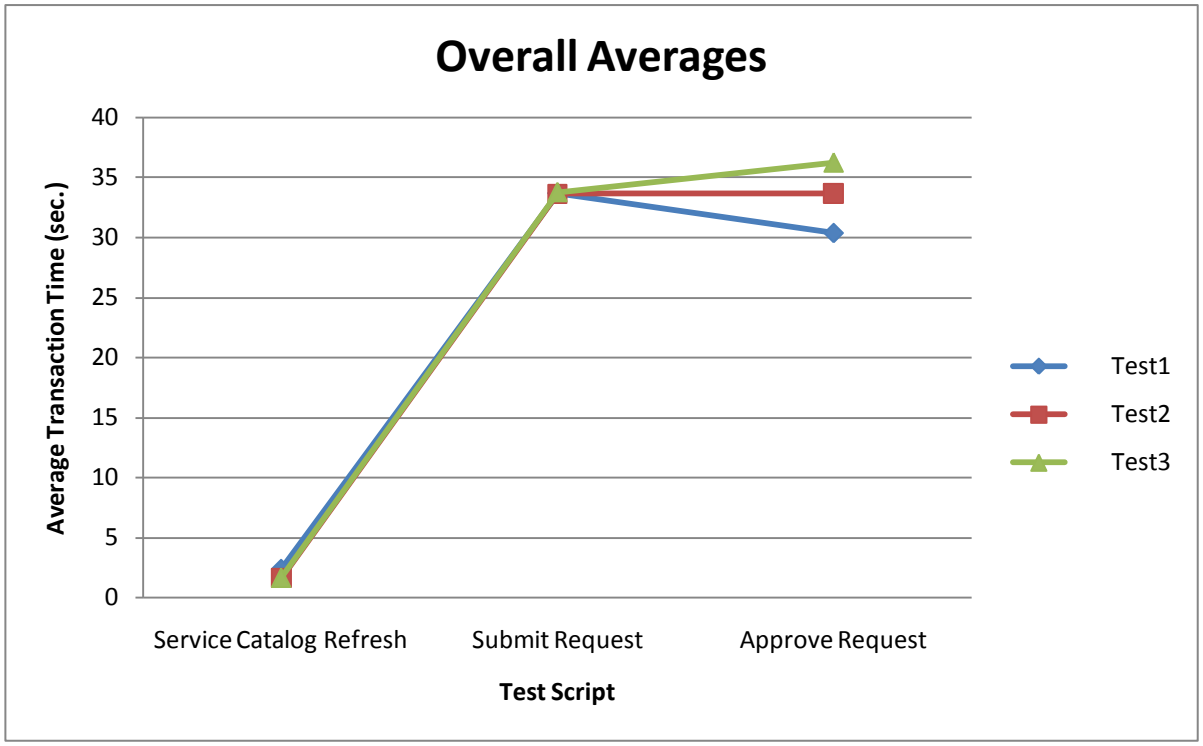
SERVICE CATALOG REFRESH



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 the complexity of the script. The Submit Request and Approve Request scripts show higher transaction completion times because they are more complex.

AVERAGE TRANSACTION COMPLETION TIME FOR EACH SCRIPT BY TEST



Conclusion

The result showed an average page time of 0.175 seconds for requesters, 0.144 seconds for approvers, and 0.183 seconds for refreshers. The success rate for the test was 99.97%. These stress tests results provide reliable evidence that CA Service Catalog can be used to provide the enterprise with a self-service request capability that meets the high standards for reliability, availability and throughput that large enterprises require.