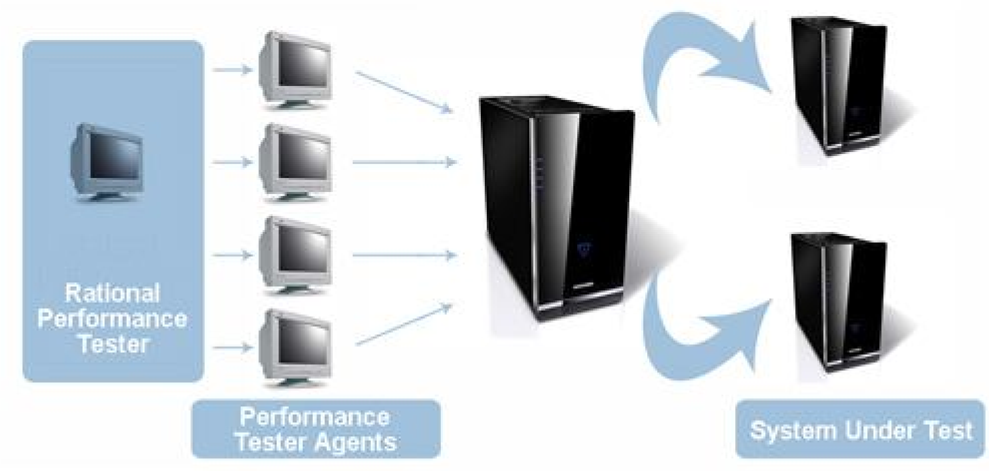
IBM RATIONAL PERFORMANCE TESTER

Today, a major portion of newly developed enterprise applications is based on Internet connectivity of a geographically distributed work force that all need on-line access to their respective information systems. To prevent the performance-related issues in these newly developed web-based applications, development teams should have ability to validate the scalability and reliability of application before deployment at production sites. Main benefit of an effective performance testing tool is to ensure the availability, scalability, robustness, and responsiveness of an application with the end-users and client's business perspective.

Main challenges that teams usually face during performance testing is tool complexity, lack of experience, complexity of system under test, and lack of ability of testing tool to diagnose the root cause for identified bottleneck.

Role of IBM Rational Performance Tester is crucial during the overall development process of a typical browser-based enterprise IBM-HATS Application. It simply exercises an under test application by emulating actual users with a load generation tool for the purpose of finding system bottlenecks thus enabling the team to achieve high software quality without requiring any knowledge of a proprietary programming language. It only requires knowledge of how to schedule and scale the user scenarios and where to put in the data variation for the application being tested.



IBM Rational Performance Tester offers a very simple-to-use test recorder, automated data manipulation, advanced and flexible workload scheduling, real-time reporting and a highly scalable execution engine to help ensure that applications are prepared to handle large user loads without compromising on the overall performance of the system, even with limited memory and processing resources.

CHARACTERISTICS OF IBM RATIONAL PERFORMANCE TESTER

Rapid Test Case Development

Rational Performance Tester offers a feature of script-less test recording to capture the series of interaction with the targeted IBM-HATS web application through web browser that enables the team to quickly build and execute the test cases against their respective use-cases. It also provides a rich, tree-based test editor that delivers high-level and detailed views of tests.

Automated Application Data Relationships

To ensure reliable test execution and accurate load simulation; Rational Performance Tester provides automated data relationship management capabilities that can identify and maintain application data relationships without requiring any mapping, test editing or other interaction from the user.

Realistic Load Emulation

To ensure realistic and accurate load emulation and to prevent server caching, IBM Rational Performance Tester utilizes unique TCP/IP addresses for each user to ensure realistic load and it also fully support the data driven testing through providing unique data from spreadsheet-like data pools while accessing the system.

Validating Server Response

IBM Rational Performance Tester allows inserting verification points with a variety of options through simple point-and-click actions in order to validate server response codes, response sizes or portions of response content. It also enables insertion of custom java code for flexible test customization and to handle unique performance challenges.

Executing based on user group

IBM Rational Performance Tester allows grouping of test scripts in various combinations to create an accurate transaction volume for a given projected user population.

Identifying the presence and cause of performance bottlenecks

IBM Rational Performance Tester allows real-time rendering and integration of server responses and throughputs along remote server statistics (i.e. CPU and memory utilization at server) with the help of a user friendly, dynamic and interactive console. This console can help to identify and analyze the performance bottlenecks and issues in the application as well as their respective root causes.

Efficient and Low Cost Performance Testing

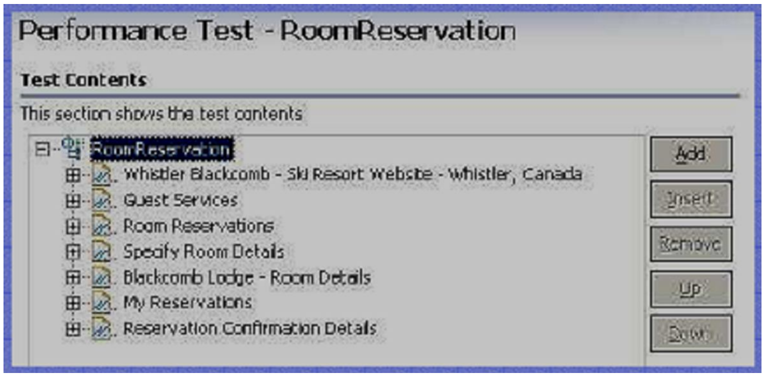
IBM Rational Performance Tester provides strong basis for achieving high level of scalability though generation of low processor and memory footprints when emulating large number of virtual users during the system test with limited hardware resources thus reducing the overall cost of performance testing.

CREATING A PERFORMANCE TEST

Creating a performance test in IBM Rational Performance Tester is a three step process.

1. Build Scripts.
2. Schedule Workload.
3. Execute and Analyze.

1. **Build Scripts**
    - Tests are created by capturing user interactions with a server.
    - Test creation results in a tree view of the sequential web pages accessed.
    - It eliminates the need of programming.
    - Varying input data across users.
    - Correlating system response data.



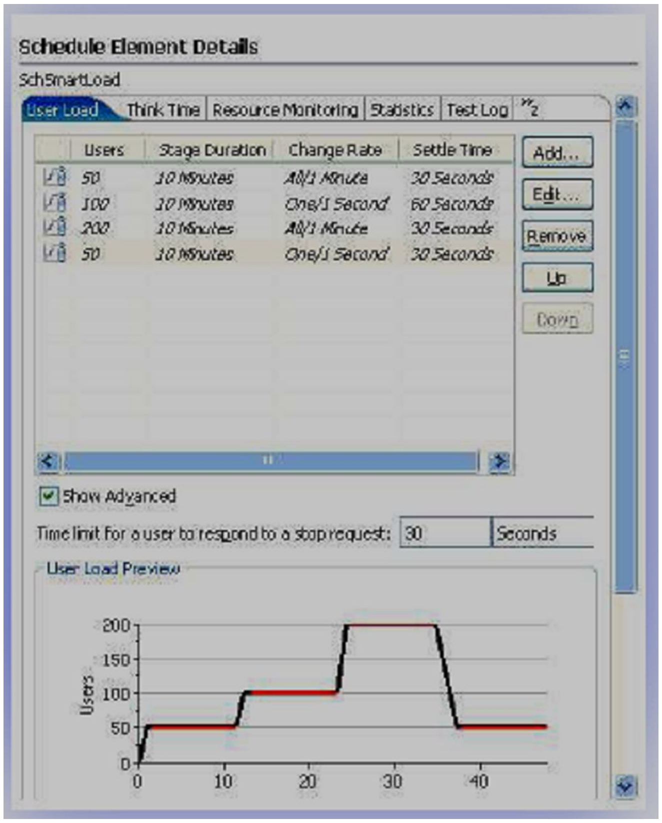
Performance Test - RoomReservation

Test Contents

This section shows the test contents

- RoomReservation
    - Whistler Blackcomb - Ski Resort Website - Whistler, Canada
    - Guest Services
    - Room Reservations
    - Specify Room Details
    - Blackcomb Lodge - Room Details
    - My Reservations
    - Reservation Confirmation Details

2. **Scheduled Workload**
    - Schedule defines order and sequencing of script execution.
    - Schedule defines physical Windows or Linux based agents to be used to generate load.
    - Flexibility to accurately model complex workloads.
    - Dynamically add load during the run to find breakpoints.



Schedule Element Details

SchSmartLoad

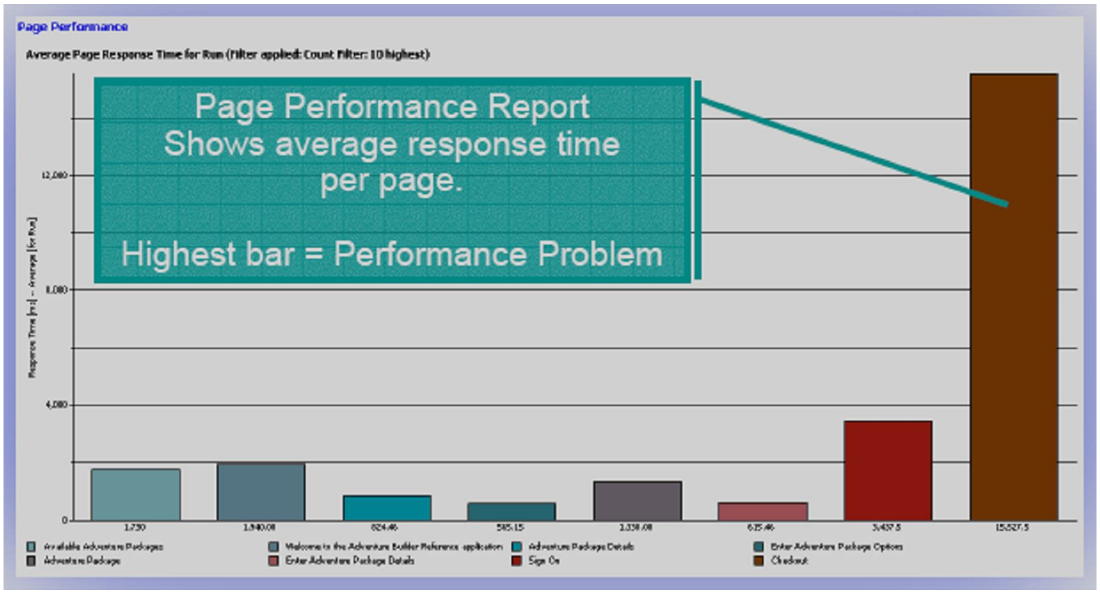
Users	Stage Duration	Change Rate	Settle Time
50	10 Minutes	All/1 Minute	30 Seconds
100	10 Minutes	One/1 Second	60 Seconds
200	10 Minutes	All/1 Minute	30 Seconds
50	10 Minutes	One/1 Second	30 Seconds

☑ Show Advanced

Time limit for a user to respond to a stop request: 30 Seconds

User Load Preview

3. **Execute & Analyze**
   - All activity coordinated and monitored from master console.
   - Windows and Linux agents are used to create the load.
   - Responsible to locate the problem.
   - Responsible to diagnose the root cause.



Page Performance

Average Page Response Time for Run (Filter applied: Count Filter: 10 highest)

Page Performance Report
Shows average response time
per page.

Highest bar = Performance Problem

CASE STUDY

One of our prestigious clients, a leading supplier of Supply Chain Solutions for Automotives Industry in the North American and International Markets, who had already been developed and deployed an enterprise browser-based IBM-HATS Application on the top of their existing iSeries 5250 Host Application.

Due to some changes in their business requirements, some modifications were made at their backend iSeries 5250 Host Application by their developers. But these modifications affected some of their IBM-HATS transformations in their already deployed web-based IBM-HATS Application. To ensure the high level of availability, scalability, robustness, and responsiveness in their already developed IBM-HATS browser-based application, they consulted *Royal Cyber Inc* in order to identify the performance-related issues.

Following steps were followed during the whole project cycle.

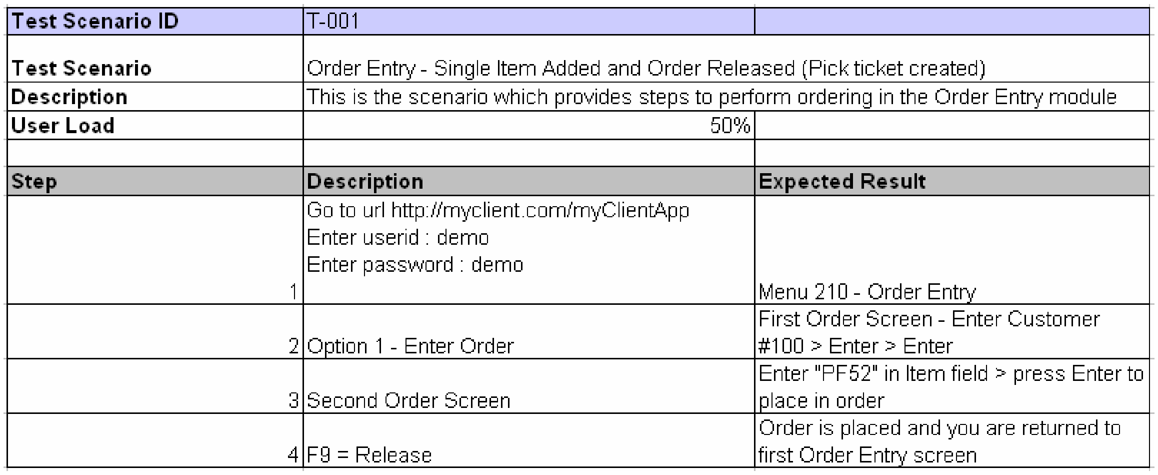
1. Domain Understanding

At very first stage, our team spent some time to build effective understanding and knowledgebase about the client's business domain and processes.

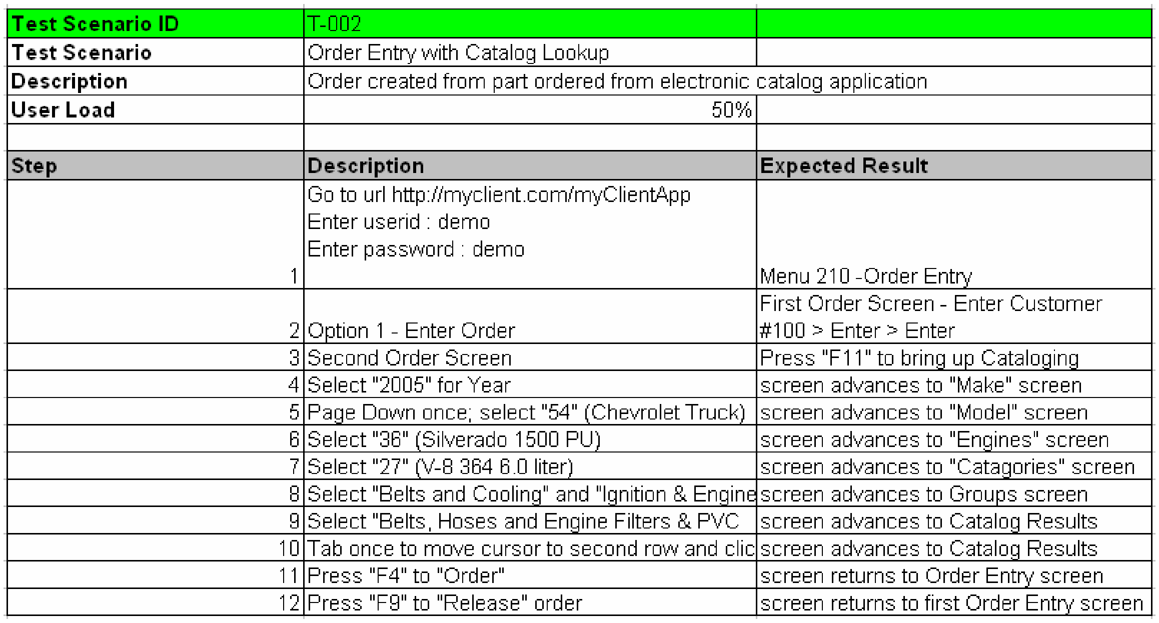
2. Test Cases

After building basic understanding of our client's business domain, our team received two major test scenarios for testing that are as follows.

- Order Entry - Single Item Added and Order Released (Pick ticket created).
- Order Entry - Catalog Lookup.



Test Scenario ID	T-001	
Test Scenario	Order Entry - Single Item Added and Order Released (Pick ticket created)	
Description	This is the scenario which provides steps to perform ordering in the Order Entry module	
User Load	50%	
Step	**Description**	**Expected Result**
1	Go to url http://myclient.com/myClientApp Enter userid : demo Enter password : demo	Menu 210 - Order Entry
2	Option 1 - Enter Order	First Order Screen - Enter Customer #100 > Enter > Enter
3	Second Order Screen	Enter "PF52" in Item field > press Enter to place in order
4	F9 = Release	Order is placed and you are returned to first Order Entry screen



Test Scenario ID	T-002	
Test Scenario	Order Entry with Catalog Lookup	
Description	Order created from part ordered from electronic catalog application	
User Load	50%	
Step	**Description**	**Expected Result**
1	Go to url http://myclient.com/myClientApp Enter userid : demo Enter password : demo	Menu 210 -Order Entry
2	Option 1 - Enter Order	First Order Screen - Enter Customer #100 > Enter > Enter
3	Second Order Screen	Press "F11" to bring up Cataloging
4	Select "2005" for Year	screen advances to "Make" screen
5	Page Down once; select "54" (Chevrolet Truck)	screen advances to "Model" screen
6	Select "36" (Silverado 1500 PU)	screen advances to "Engines" screen
7	Select "27" (V-8 364 6.0 liter)	screen advances to "Catagories" screen
8	Select "Belts and Cooling" and "Ignition & Engine	screen advances to Groups screen
9	Select "Belts, Hoses and Engine Filters & PVC	screen advances to Catalog Results
10	Tab once to move cursor to second row and clic	screen advances to Catalog Results
11	Press "F4" to "Order"	screen returns to Order Entry screen
12	Press "F9" to "Release" order	screen returns to first Order Entry screen

3. Build Scripts

Test cases received from client were automated by building scripts for both test cases respectively. These scripts were developed by capturing user interactions with a server according to the use case scenario; that results in a tree view of the sequential web pages accessed.

4. Scheduled Workload

In the schedule, team defined order and sequencing of script execution. Three different cycles were scheduled (Run#1, Run#2 and Run#3) for both test cases with three different criteria i.e. 33, 66 and 99 simultaneous virtual users respectively. During specification of load schedule for every run, virtual users were equally and simultaneously distributed on both test cases for better stress analysis.

5. Test Case Execution

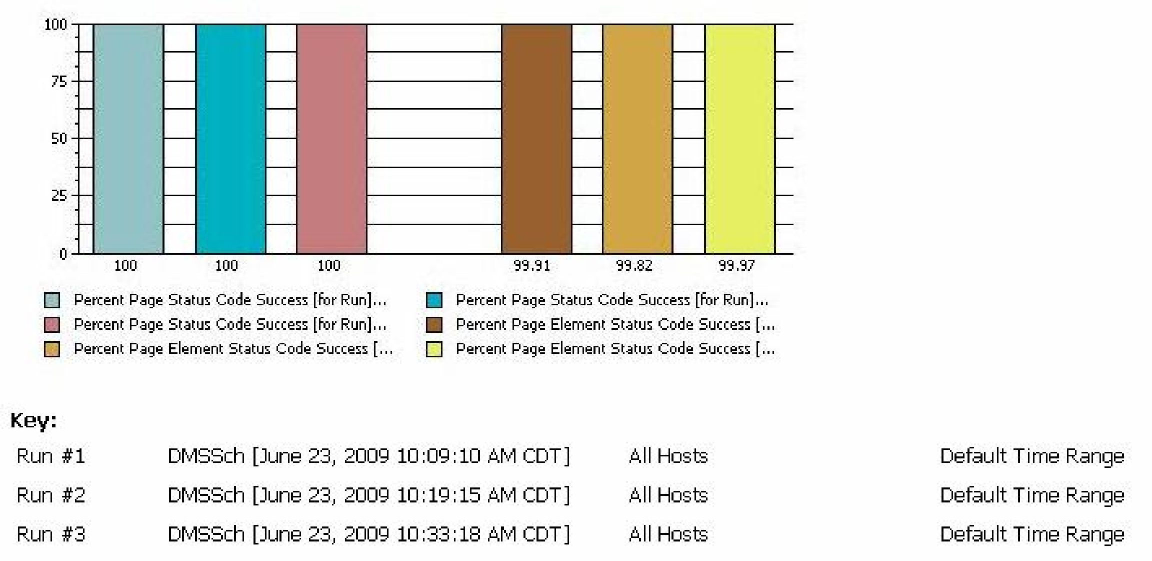
In this phase, both recorded test case scripts were executed according to the specifications defined in workload schedule, developed in previous stage. Results were saved in the form of graphs and tables.

6. Performance Test Result Analysis

In this phase, results of the test case scripts execution were deeply studied and analyzed to propose a brief summary of performance results

PERFORMANCE RESULTS

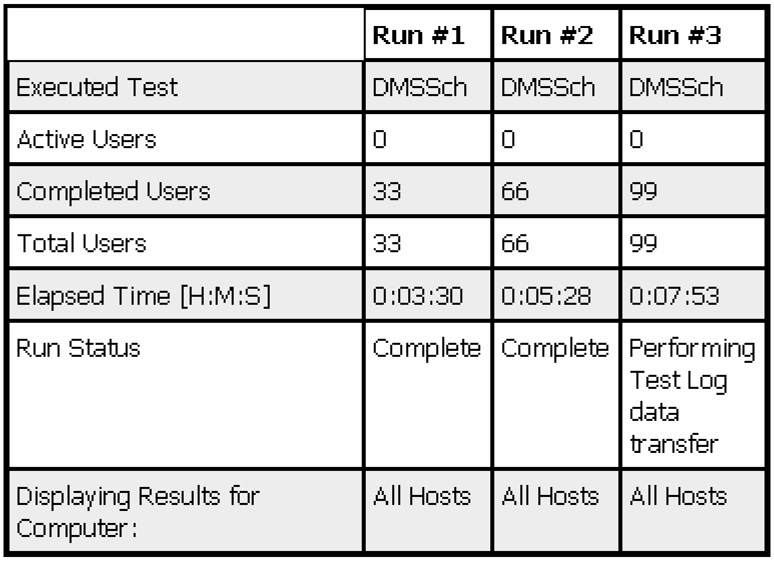
Overall



Key:

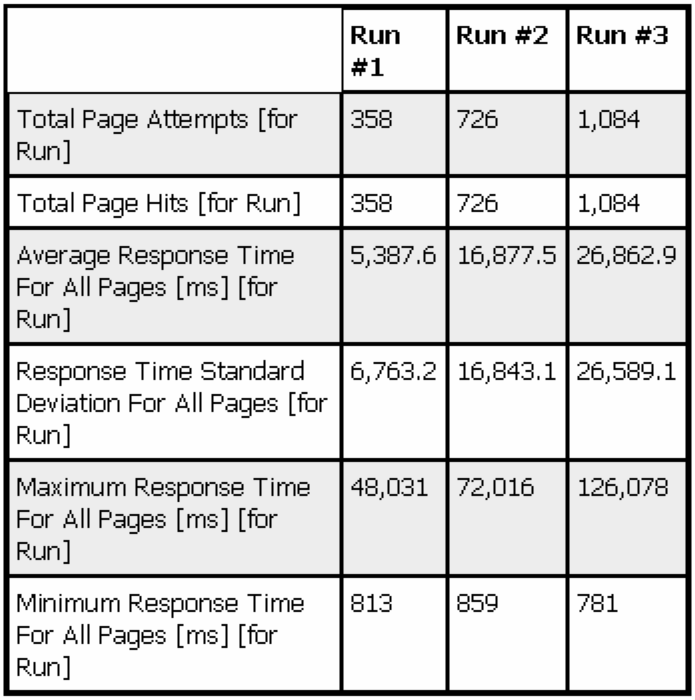
Run #1	DMSSch [June 23, 2009 10:09:10 AM CDT]	All Hosts	Default Time Range
Run #2	DMSSch [June 23, 2009 10:19:15 AM CDT]	All Hosts	Default Time Range
Run #3	DMSSch [June 23, 2009 10:33:18 AM CDT]	All Hosts	Default Time Range

Run Summary



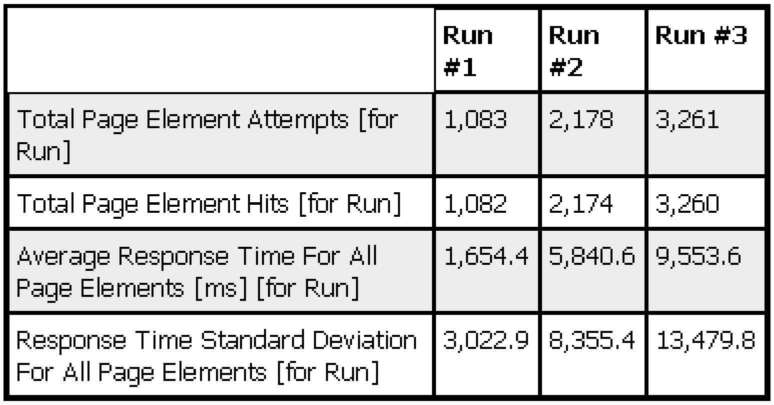
	Run #1	**Run #2**	**Run #3**
Executed Test	DMSSch	DMSSch	DMSSch
Active Users	0	0	0
Completed Users	33	66	99
Total Users	33	66	99
Elapsed Time [H:M:S]	0:03:30	0:05:28	0:07:53
Run Status	Complete	Complete	Performing Test Log data transfer
Displaying Results for Computer:	All Hosts	All Hosts	All Hosts

Page Summary



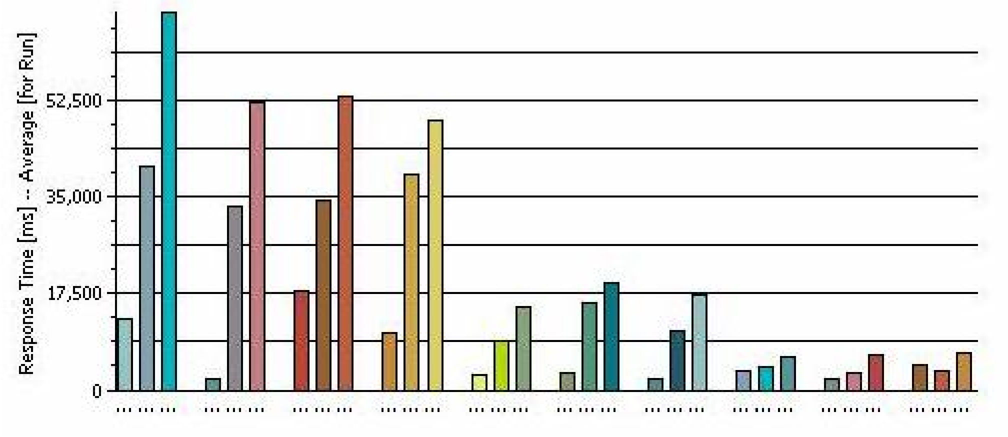
	Run #1	Run #2	Run #3
Total Page Attempts [for Run]	358	726	1,084
Total Page Hits [for Run]	358	726	1,084
Average Response Time For All Pages [ms] [for Run]	5,387.6	16,877.5	26,862.9
Response Time Standard Deviation For All Pages [for Run]	6,763.2	16,843.1	26,589.1
Maximum Response Time For All Pages [ms] [for Run]	48,031	72,016	126,078
Minimum Response Time For All Pages [ms] [for Run]	813	859	781

Page Element Summary

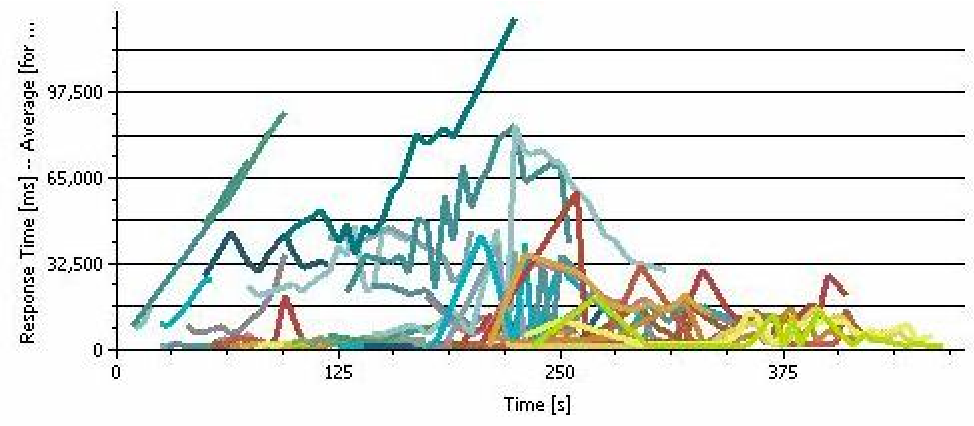


	Run #1	Run #2	Run #3
Total Page Element Attempts [for Run]	1,083	2,178	3,261
Total Page Element Hits [for Run]	1,082	2,174	3,260
Average Response Time For All Page Elements [ms] [for Run]	1,654.4	5,840.6	9,553.6
Response Time Standard Deviation For All Page Elements [for Run]	3,022.9	8,355.4	13,479.8

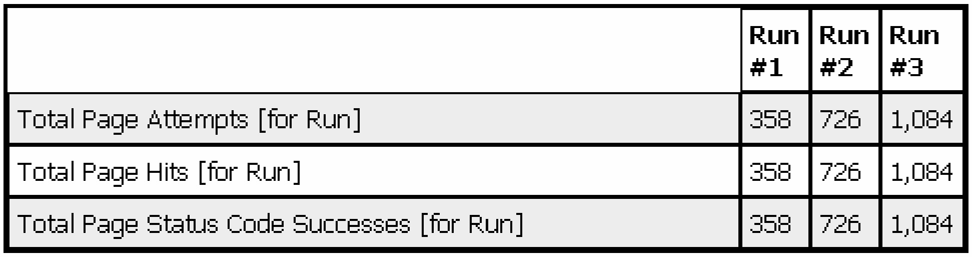
Average Page Response Time for Run



Average Page Response Time for Interval



Page Health Performance Summary



	Run #1	Run #2	Run #3
Total Page Attempts [for Run]	358	726	1,084
Total Page Hits [for Run]	358	726	1,084
Total Page Status Code Successes [for Run]	358	726	1,084

PERFORMANCE RESULT SUMMARY REPORT

This summary of performance results were generated for only 33, 66 and 99 simultaneous virtual users on the browser-based IBM-HATS Application.

1. Page performance section is the most important section of analysis.
2. Run#1, Run#2 and Run#3 represent test with 33 virtual users, 66 and 99 respectively.
3. If you look at Page Performance section you can figured out that 4 pages are taking significant amount of time.
    a. **Login Page** (time taken when user enter the url : http://myclient.com/myClientApp and sign on page appears) took 12,739.7, 40,360.8 and 68,601.6 milliseconds on average (i.e. 12.73,40.36 and 68.6 seconds) for 33. 66 and 99 users.
    b. **Order Entry Menu** (user enters the login details and main menu appears) took 17,911.6, 34,477.3 and 53,229.1 milliseconds on average.
    c. **Order Entry** (user clicks the Enter Order button and Order Entry form appears) took 2,163.3, 33,109.6 and 52,235.3 milliseconds on average.
    d. **Order Line** (where user adds the order line from catalogue or manually) took 10,347.6, 38,843 and 48,783.6 milliseconds on average.
4. Rest of the page is functioning relatively satisfactory.

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