

**Assessment Evaluation
Airline Reservation System**

**Submitted in partial fulfillment of the requirements of the degree of Master of
Software Engineering**

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1. INTRODUCTION

The Assessment Evaluation document presents the results obtained by testing the Airline Reservation System. The test cases are in reference to the test cases defined in the Test Plan document from the Phase II.

2. TEST CASE RESULT SUMMARY

The summary of the test case result has been depicted in the table shown below:

These are the test cases for the User/Customer pages. The major part of testing has been concentrated on the customer pages, as they would be the main clients of the Airline Reservation System website.

TEST CASE #	DESCRIPTION	RESULTS/COMMENTS
TC # 1	User Login	Passed
TC # 2	User Registration	Passed
TC # 3	Search and Book Flights	Passed
TC # 4	Search and Book Packages	Passed
TC # 5	Search and Book Hotels	Passed

Table 1: User/Customer pages testing results summary

The below table represents the summary of results of testing on the Administrator pages. The results have been explained in detail later in the document.

TEST CASE #	DESCRIPTION	RESULTS/COMMENTS
TC # 6	Administrator sign in	Passed
TC # 7	New Flight/Package/ Hotel addition	Passed
TC # 8	Updating Flight/Package/Hotel details	Passed

Table 2: Administrator pages testing results summary

3. DETAILED TEST RESULTS

3.1 MANUAL TESTING

To start with, I have performed manual testing on the Airline Reservation System web application. Manual Testing is one of the oldest and rigorous methods of software testing. This testing strategy gives the best opportunity to check every page thoroughly and make sure it works in the expected manner. Due to the complexity of the various automation tools and the time available for testing the entire web application, I preferred to use manual testing based on the fact that it is one of the best methods of testing suggested for a beginner.

All the test cases mentioned in the Test Plan document of Phase II were tested here. The results of the manual testing are represented in the following tables:

3.1.1 TC # 1 – USER LOGIN

TEST UNIT	TEST CASE	RESULT
Log In Button	An invalid username(which is the e-mail id in this case) or password is entered by the user	The system generates a message saying “ invalid user id” or invalid password, whichever is the case.
Log In Button	A valid username and password is entered by the user	The system logs on the user and transfers him to the booking page

3.1.2 TC # 2 - USER REGISTRATION

TEST UNIT	TEST CASE	RESULT
New User button (Used for Register)	Wrong format entered in the input fields of the registration page	The system prompts a message to the user saying that he has entered a wrong format in the input fields.

New User button	Passwords and Confirm Password fields do not match in the registration page	The system generates a message to the user saying “please enter the confirm password field” again.
New User button	Data Fields left out empty in the registration page.	The system prompts a message to the user asking him to fill the empty fields he has left out.
New User button	Correct data entered into the fields in the register page	The system accepts the details of the customer and then logs him onto the system and displays the page where he can search and book for flights, packages and hotels.

3.1.3 TC # 3 – SEARCH AND BOOK FLIGHTS

TEST UNIT	TEST CASE	RESULT
Flight booking	Wrong format of information entered into the data fields of the flight booking page	The system generates an error message to the user indicating that the wrong format of data is entered and to re-enter the data.
Flight Booking	Wrong date format, in the date of journey data field, wrong flight number in the Flight Number fields etc, (similarly for all the other data fields of the FlightSearch page)	The systems generates a message to the user saying that he has entered an invalid date format and incase of wrong flight number, indicates that his entry is invalid.
Flight Booking	Correct format of data is entered into the data fields in the flight booking page.	The system allows the users to book the flight by providing details required and directs them

		to the booking confirmation page.
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3.1.4 TC # 4 – SEARCH AND BOOK PACKAGES

TEST UNIT	TEST CASE	RESULT
Package Booking	Wrong format of data is entered into the data fields of the package booking page	The system displays an error message to the user saying that invalid form of data has been entered into the data fields of the page.
Package Booking	Correct form of data is entered into the datafields of the PackageSearch.aspx page.	The system verifies the details entered by the customer, accepts the details and confirms package booking by redirecting the customer to the package confirmation page.

3.1.5 TC # 5 - SEARCH AND BOOK HOTELS

TEST UNIT	TEST CASE	RESULT
Hotel Booking	Wrong format of data is entered into the data fields of the flight search page.	The system displays an error message to the user saying that he has entered invalid data into the data fields
Hotel Booking	Correct data entered into the data entry fields of the HotelSearch.aspx Page	The system then verifies and accepts the data entered by the user into the data entry fields allowing the user to book hotel specified and then directs him to the hotel confirmation page

All the above mentioned results are for the customer pages. On the whole, the user/customer pages have passed the manual testing phase. The manual testing results for the Administrator pages of the Airline Reservation System are as follows:

3.1.6 TC # 6 - ADMINISTRATOR SIGN IN

TEST UNIT	TEST CASE	RESULT
Administrator sign in feature	Wrong username/password entered into the username and password data fields	The system generates a message to the user saying that an incorrect username / password have been entered.
Administrator sign in feature	Correct username and password entered into the username and password fields in the Administrator sign in page.	The system verifies the details and allows the administrator to log on to the system.

3.1.7 TC # 7 – NEW FLIGHT/PACKAGE/HOTEL ADDITION

TEST UNIT	TEST CASE	RESULT
Add new flight /package/hotel to the database	The administrator tries to add flight details already matching the details of a flight present in the database. In other words, a duplicate record is being created by the administrator.	The system generates a message to the Administrator saying that the Record already exists, thus avoiding duplicates.
Add new flight feature	The administrator enters new flight details into the form, that is those details are already not present in the database.	The system then verifies the details entered by the Administrator and then saves the entry into the table and displays a message that Record has been saved successfully.

3.1.8 TC # 8 – UPDATING FLIGHT, PACKAGE, MOTEL DETAILS

TEST UNIT	TEST CASE	RESULT
Update flight/package/motel details button	The administrator enters the wrong format of data in the data fields of the flight/motel/package page and hits the update button	The system displays a message to the Administrator saying that wrong format of data has been entered into the data fields
Update flight/package/motel details button	The administrator enters the correct format of data in the data entry fields for the flight/motel/package updating	The system verifies the details entered by the administrator and then sends a message to the admin saying that the update was successful and updates the details in the database.

Thus, the Administrator web pages have also passed the manual testing phase and thus the above results have been produced.

3.2 PERFORMANCE TESTING

In general performance testing can be defined as one form of testing where we test the system to determine how fast the system performs under a particular workload. Several other features of the system such as scalability and security etc can also be tested under the performance testing phase. For the performance testing of the Airline Reservation System, I have used the JMeter tool. The Apache JMeter is a 100% pure Java desktop application which has been designed to load test functional behavior and measure performance. This tool has been originally designed for Web Applications, which has now been extended to a variety of other functions.

The Apache JMeter can be used to performance test both static and dynamic sources. With JMeter I was able to test various combinations of load types on the Airline Reservation System web application and analyze the strength of the system.

The inputs to the JMeter tool, generally used for the performance testing of a web application would be as follows:

- Number of Threads /Users – The total number of people sending requests to a web page
- Ramp-Up Period - The Ramp Up period would be the time taken by J Meter to create and make sure that all the threads are up and running.
- Loop Count – It would be the value which determines the number of times that the test should be carried out.

The criteria selected to be the input to the JMeter tool for the Airline Reservation System would be explained later in the document. For the performance testing of the Airline Reservation System, I have chosen three kinds of pages.

1. Home Page of the Airline Reservation System - It deals with people just accessing the Home page of the Airline Reservation System. There is no database activity involved here. So this would be one good choice
<http://localhost/Kansas%20Air/Home.aspx>
2. Login Page of the Airline Reservation System- This is the page where the user logs onto the home page of the system and is redirected to the Booking.aspx page after he logs in. So, here it involves authentication and some database activity. This would be another good choice.
3. Flight Search and Booking Page of the Airline Reservation System
Here, the user searches for the available flights in the database of flights available and makes a reservation for a specific flight. There is a lot of database activity involved with the flight search page.

The results of the JMeter testing are as follows for each of the above mentioned pages:

3.2.1 Home page of Airline Reservation System website

<http://localhost/Kansas%20Air/Home.aspx>

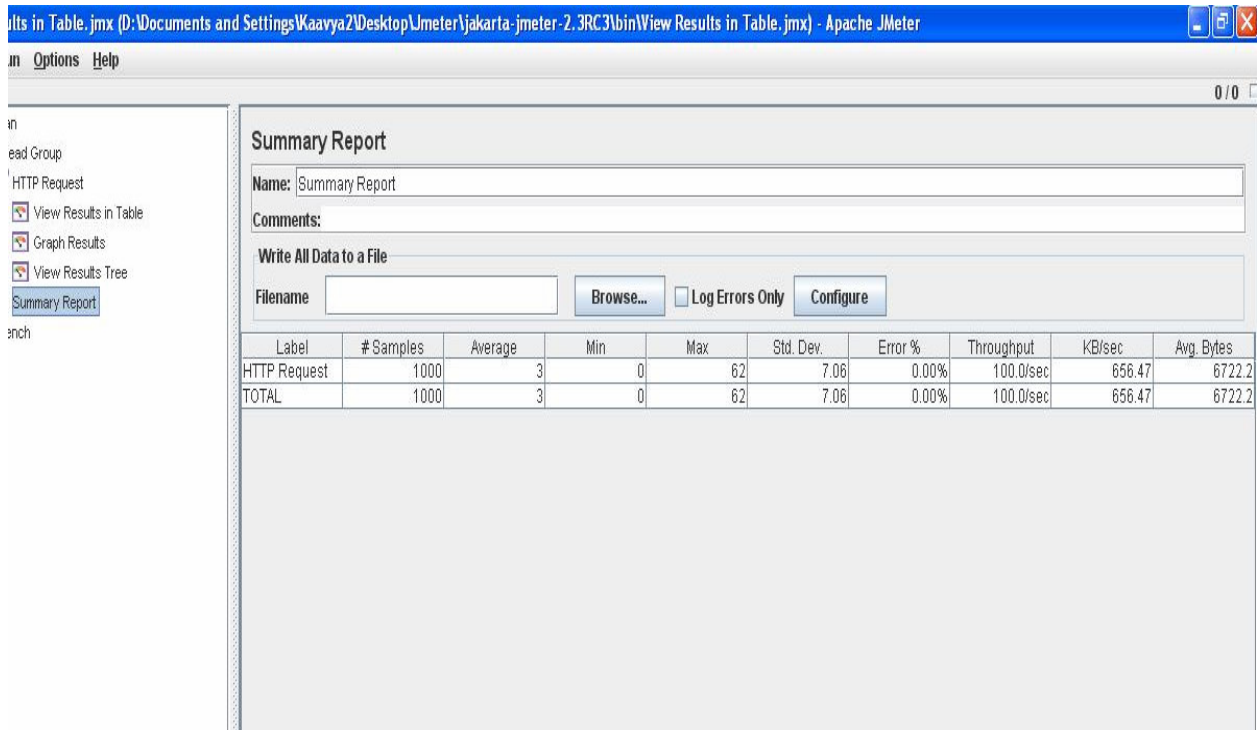


Fig: Summary report for Home.aspx page

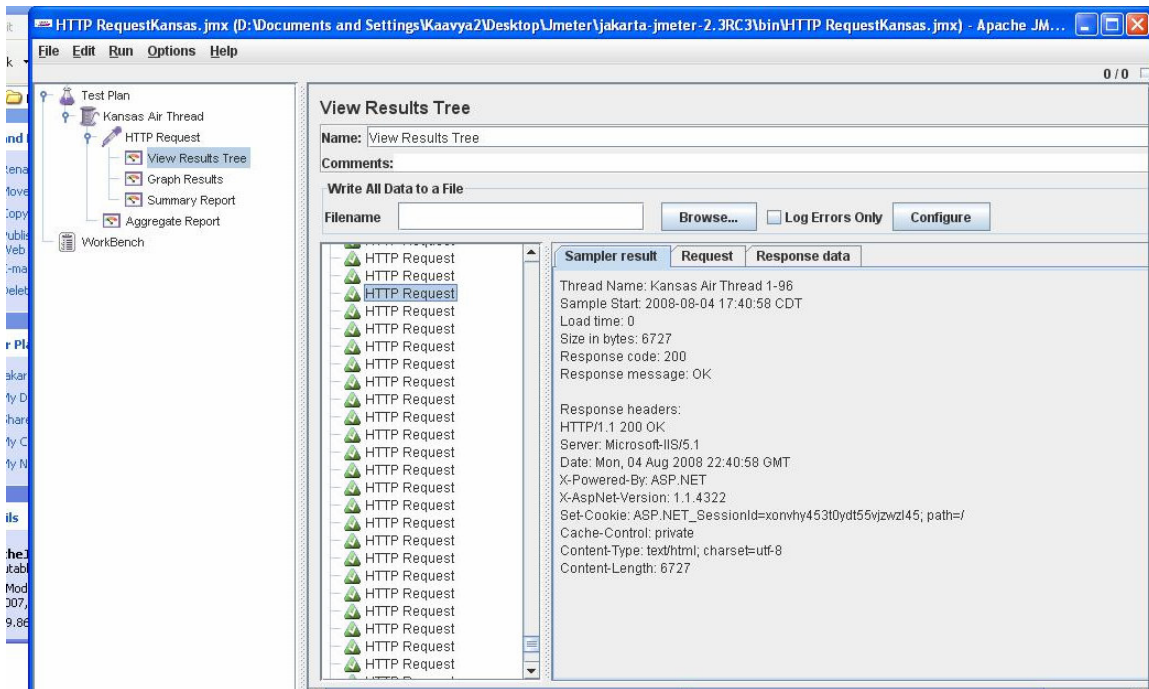
The above screenshot shows the result of running the JMeter test for the home page of the Airline Reservation System project. The above sample has been obtained as a result of the following load details applied in the JMeter:

Thread Count	Ramp-Up Period	Loop Count
100	10	10

Thus the above result was obtained for a total of 1000 samples.

The following screen shot shows the response code 200 generated by the JMeter after it has accessed the page.

Here the Response 200 code is generated in a response that the home page has been detected by the server.



The response time for the Home page was very less, and the number of requests handled per sec is higher when compared to the other pages of the project. Since there is no database activity involved. For the home page a throughput of about 100 requests/sec is recorded, which is the number of requests handled by the server per second.

3.2.2 Login Page of the Airline Reservation System

<http://localhost/Kansas%20Air/Booking.aspx>

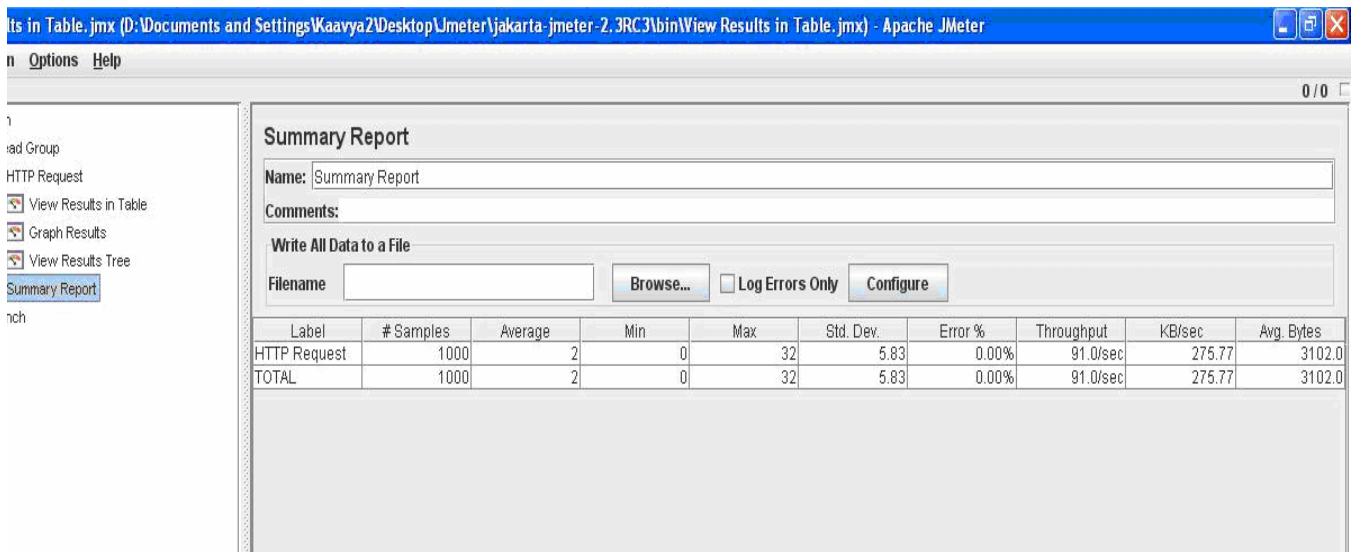


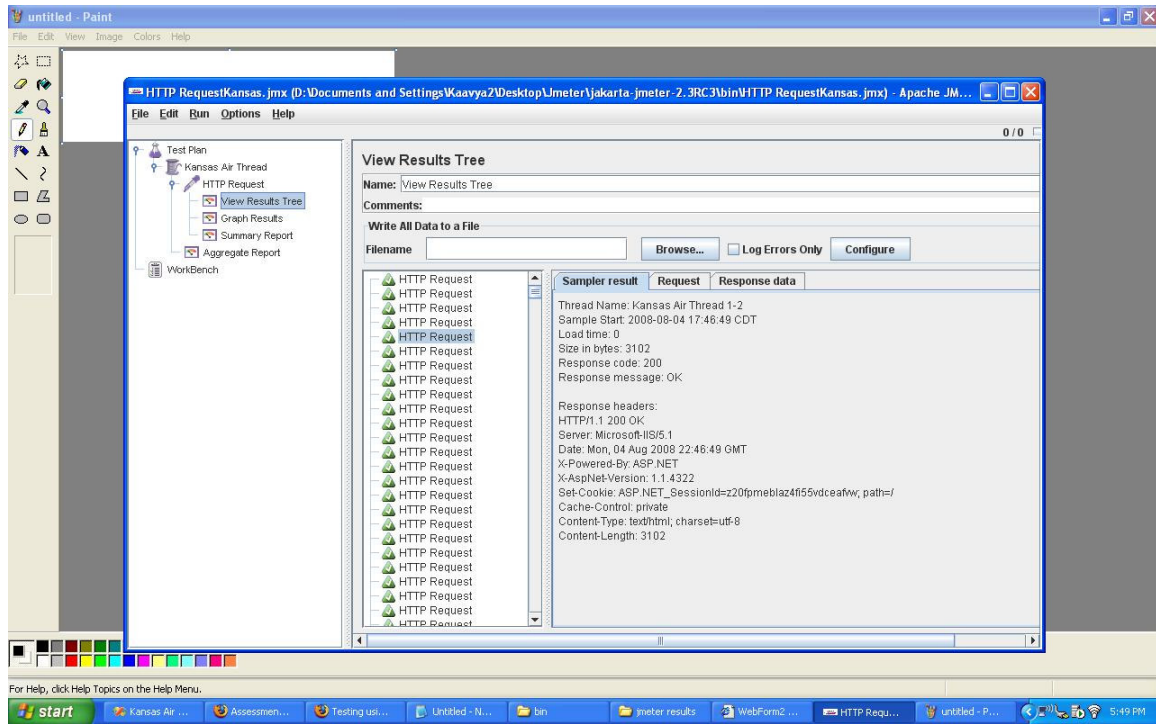
Figure: Summary report for Booking.aspx

The above screenshot is produced as a result of the JMeter test performed on the Booking.aspx page, which can be accessed by the user after he logs onto the website. The above result has been produced as a result of the following load being applied on the server:

Thread Count	Ramp Up Period	Loop Count
100	10	10

Thus, for a total of about 1000 samples, the above results were recorded by JMeter. The response time for the Booking.aspx page is a little higher than that of the Home page. The Home page of the project does not have any database activity related to it. Where as for the Booking.aspx page, the customer has to login in order to access the page. So, the response time for the Booking.aspx page was a little higher when compared to the Home.aspx.

The result of the response created by JMeter while accessing the Booking.aspx page is as follows:



3.2.3 Flight Search and booking page of the Airline Reservation System

[http://localhost/Kansas% 20Air/FlightSearch.aspx](http://localhost/Kansas%20Air/FlightSearch.aspx)

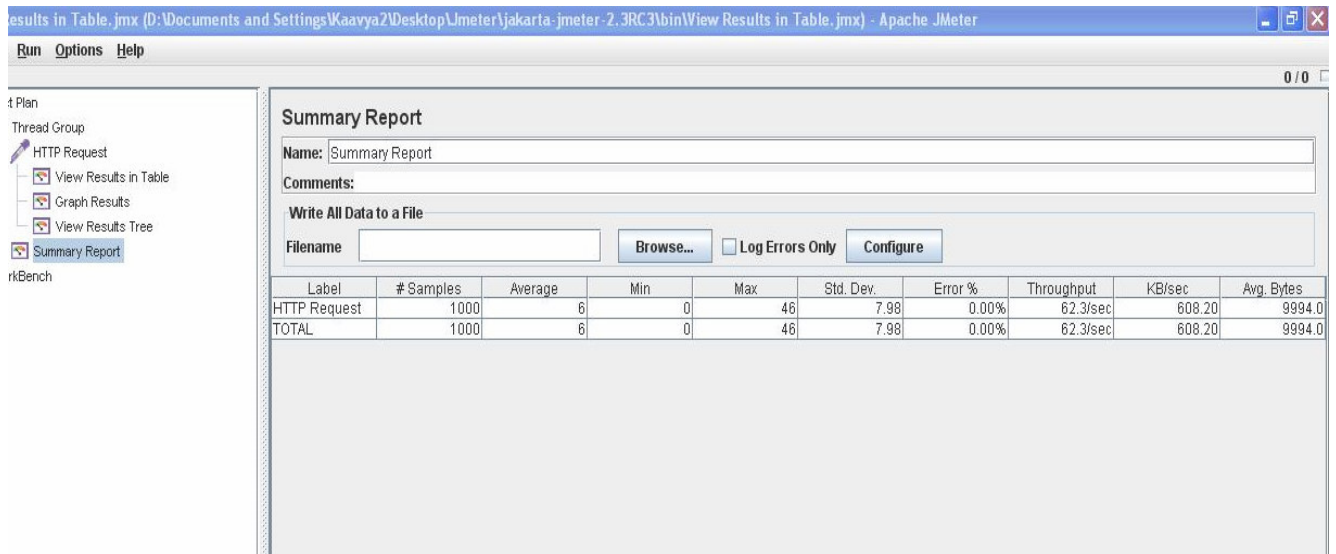


Fig: Summary report for the FlightSearch.aspx page

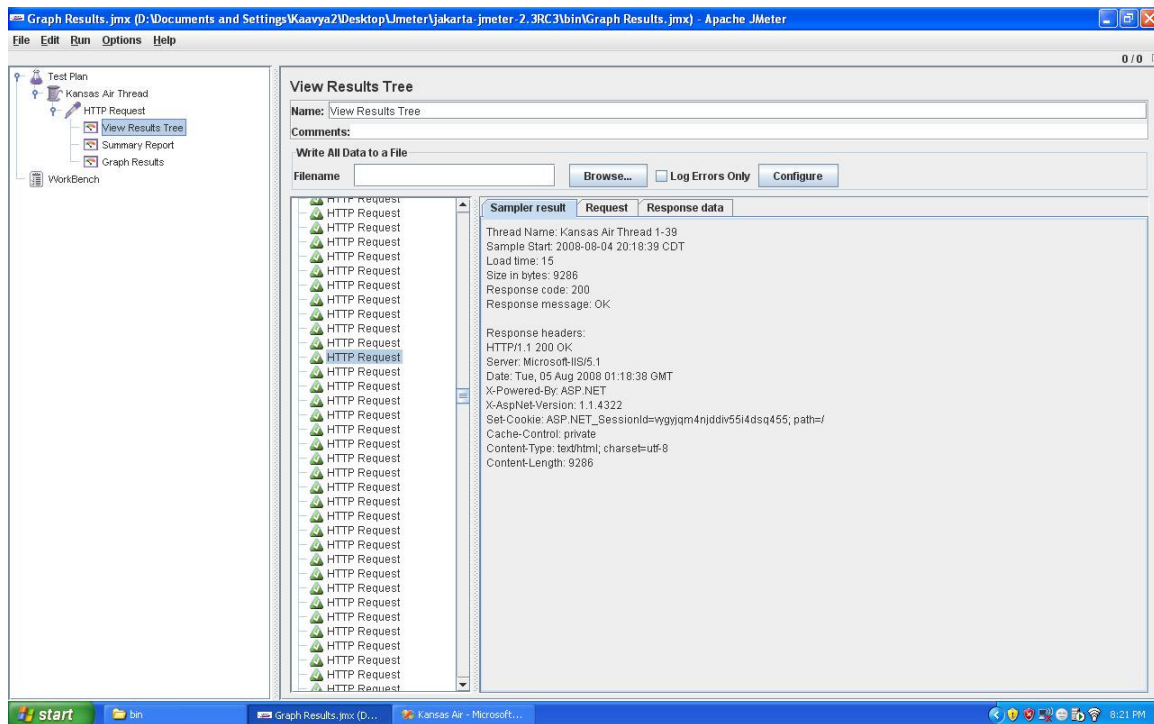
The above screenshot is produced as a result of the JMeter test performed on the FlightSearch.aspx page, which can be accessed by the user after he logs onto the website.

The above result has been produced as a result of the following load being applied on the server:

Thread Count	Ramp Up Period	Loop Count
100	10	10

Thus, for a total of about 1000 samples, the above results were recorded by JMeter. The throughput for the FlightSearch.aspx page is very less when compared to the Home.aspx page or the Booking.aspx page. It is because, the Flights available to the customer are displayed on this page from the database and then the customer searches for a desirable flight and book the flight. The response time for the FlightSearch.aspx page is very high when compared to the other two pages. The time taken for the page to load is also very high compared to the other two pages.

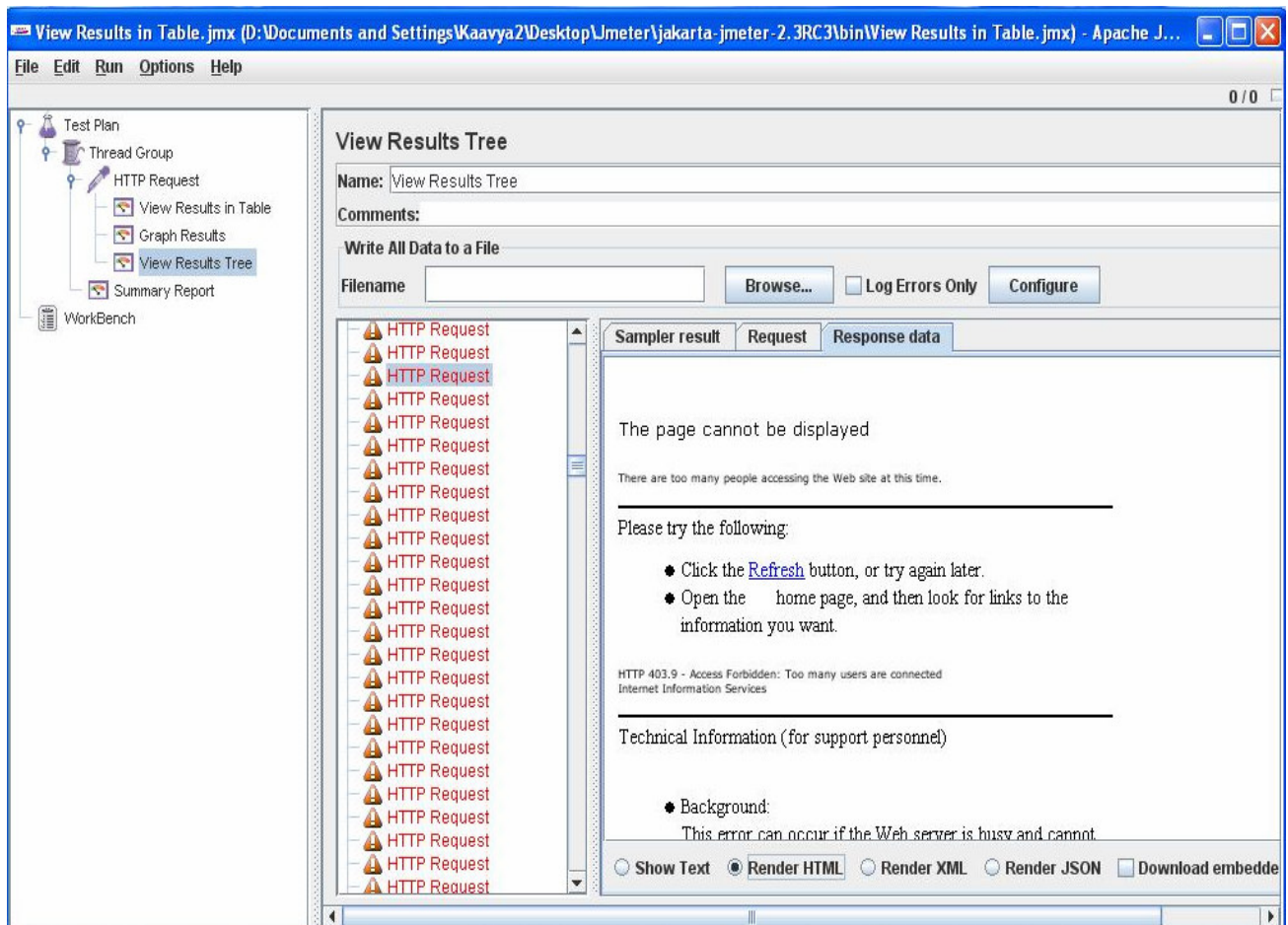
The result of the response created by the JMeter for the FlightSearch.aspx page is as follows:



4. OBSERVATIONS

Based on the results obtained from the JMeter, the following observations were made:

1. The system can accept only a total of 800 users at a time. But there are some exceptions to this too. If a combination of 800 users with a loop count of 1 was used for testing, then system responds well. But when a combination of 800 users with a greater loop count is used, it produced the following output in the response window of JMeter:



Ultimately, the page requested would not be available to any of the users and an error message would be displayed saying that there are too many people connected to the IIS server and that the access to the requested web page is forbidden.

There are many factors affecting the behavior of the server.

- a. The Airline Reservation system project runs on a personal version of IIS and on a personal computer. So, the hardware capability of the system might be one of the reasons for the server to respond slowly.
 - b. JMeter also took a lot of time to respond to each request. This might be due to the fact that the server on the laptop is very slow. So, the results produced by JMeter also might not be accurate results.
2. The throughput obtained for the three pages are different. The three pages have been tested under the same condition that is for 100 users, the loop count being 10 and the ramp up period also being 10. The home page of the Airline Reservation System project does not have any database activity involved with it. So the throughput for it is very high when compared to the other pages.

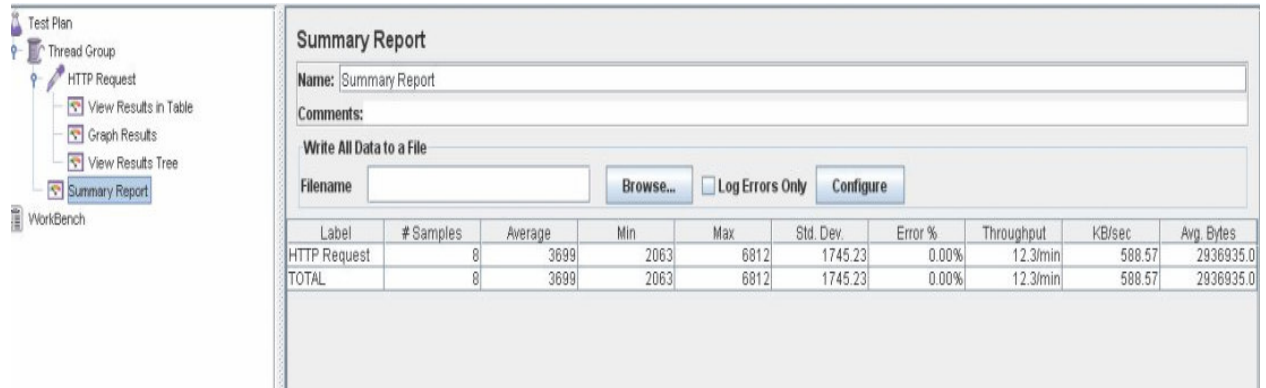
WEB PAGE	THROUGHPUT
Home page	100/sec
Login page	91.0/sec
Flight Search and Booking page	62.3/sec

Table: Comparison of throughput for three pages

3. The response time for each page also increases with the number of users accessing the page. For the three pages the average response time with the number of users as 100, loop count as 10 and ramp up period as 10, are as follows:

Web Page	Average Response Time
Home.aspx	3 ms
Booking.aspx	2 ms
FlightSearch.aspx	6 ms

Upon increasing the number of elements present in the customer database table, which is by adding around 5000 new rows of random data to the customer table, the results obtained for JMeter are as follows:



The throughput also decreases a lot and the number of requests handled by the server reduces to about 12.3 requests per second.

The average response time for the customer details page before adding large number of rows into the database table and after adding 5000 rows of data to the database table are as follows:

WEB PAGE	BEFORE	AFTER
CustomerDetails.aspx	5 ms	3699 ms

The average response time of the page has shot up by a very high percentage.

I have added 10,000 users to the customer table and tested the application with JMeter, the error rate obtained was very high and JMeter displayed a message in the response window saying that there are too many users accessing the website and the access has been forbidden.

- The above results are also influenced by the fact that the IIS server and the database server run on the same machine. So, this excessive load might also affect the results being produced by the JMeter tool.

Based on the above observations the following conclusions can be made about the Airline Reservation System project:

1. The error percentage for each of the three pages is always 0%. So, the pages are very reliable to the customer.
2. A decent throughput has also been obtained for the tested pages and it is above 63 requests/sec. However by improving the hardware of the system and by testing under conditions where the overall performance of the system is very high also produces changes in the results.
3. Since the IIS server and the database server run on the same machine, the results obtained by JMeter might be affected by this factor. The performance and scalability of the Airline Reservation System could be further improved by using dedicated Database server and a dedicated web server.

Thus the above observations have been drawn based on results of testing of Airline Reservation System.