A Sustainable Approach for Analyzing Load Testing Tools

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Abstract- **Software testing is a separate discipline from software development. It is both a process and a discipline. Software testing is a technique aimed at evaluating an attribute or usability/capability of a program or system/product and determining that it meets its quality. It is an activity to check whether the actual results match, the expected results and to ensure that the software system is defect free. The objective of this research paper is to evaluate and analyze the performance of some testing tools and compare them to determine their effectiveness and reliability, used in software testing. In this research paper, two testing tools: WAPT and NEOLOAD are used, Which are implemented and worked on a web application. WAPT provides a load, stress and performance testing of websites and web applications with web interface. Whereas, The NEOLOAD is a load and performance testing software solution designed for web applications to monitor server behavior. The performance of these testing tools is evaluated and compared and their results will help in adoption**

Keywords — Load testing, WAPT, NEOLOAD, web application, test oracles.

I. INTRODUCTION

Testing is the process of evaluating a system or its component(s) with the intent to find that whether it satisfies the specified requirements or not. Testing is executing a system in order to identify any gaps, errors or missing requirements in contrary to the actual desire or requirements. Software testing is a process used to identify the correctness, completeness and quality of developed computer software. Testing identifies faults, whose removal increases the software quality by increasing the software's potential reliability. It includes a set of activities conducted with the intent of finding errors in software so that it could be corrected before the product is released to the end process. Software testing is an investigation conducted to provide stakeholders with information about the quality of the product or service under test. Software testing can also provide an objective, independent view of the software to allow the business to appreciate and understand the risks of software implementation. Test techniques include, but are not limited to the process of executing a program or application with the intent of finding software bugs.

II. OBJECTIVE

The objective of this research paper is to evaluate the performance of some specific testing tools and compare them on the basis of certain metrics. In recent years, various tools and techniques are developed for measurement and evaluation of quality of service of web application. These tools facilitate in quality of service analysis and are helpful in evaluation of service performance in real time network. This work will help the professionals to choose the appropriate testing tool according to the need of their organization.

III. RELATED WORK

Nianmin yao, feng gao, shaobin cai & wenbin yao proposed a new method to test the performance of network storage, which easily can generate requests that exceed the maximum loading of storage devices. Pu yunning and xu mingna analyzed the performance testing criteria, including response time, concurrency users, throughout and performance counter. With the load runner and test director testing tools, a load testing scheme based on an online examination system was designed. Zhang Hui-li, Zhang Shu, Li Xiao-jie, Zhang Pie, Zhengzhou and Liu Shao-bo implemented load testing for the e-commerce application system by means of load runner testing tool, analyzed results, and improved the performance of the system based on the test results. Osama Hamed and Nedal Kafri proposed a performance testing approach for web based aapplication early in the development process. They compared performance in terms of response time for two web application architectures. Sneha khoria and pragati upadhyay analyzed the performance of some specific testing tools and compared them to determine their usability and effectiveness in software testing. William Howden, a professor from university of California at san Diego, wrote that" testing is the unavoidable part of any responsible effort to develop a software system". It describes that these software testing tools can help in increasing the reliability of software by automating mechanical aspects of the software testing tasks. pooja ahlawat & sanjay tyagi, various tools and techniques are developed for measurement and evaluation of quality of service of web application. These tools facilitate in quality of service analysis and are helpful in evaluation of service

performance in real time network. In this paper, three popular load testing tools have been described and their comparison has been made in terms of average response time and optimal response rate.

The paper described two testing tools: WAPT and NEOLOAD, which are implemented on a web application. The performance of these testing tools were evaluated and compared. Tools were evaluated by collecting the sample web services and collecting the test results.

IV. PROPOSED WORK

In this work, two testing tools WAPT and NEOLOAD are taken, which are implemented on a web application. WAPT is a load, stress and performance testing tools, used for website and web application. WAPT provides a load, stress and performance testing of websites and web applications with web interface. Whereas, NEOLOAD is a load and performance testing software solution designed web applications to monitor server behavior. NEOLOAD is load testing tool for web application, which is used for testing web application, web services, flex application oracle forms and silver light applications. The web browser can be used to record the scripts which are easy to use and record. The performance of these testing tools have been evaluated and compared and results have been presented and discussed.

V. SOFTWARE TESTING TOOLS

A. WAPT:

WAPT is a load & stress testing tool that provides an easy to use & cost effective way to test any website including business application, mobile sites, web portal's etc. with WAPT, we can test and analyze the performance characteristics and bottlenecks of web site under various load conditions. WAPT is used to test web application and web related interfaces. These tools are used for load & stress testing of web application.

Features of WAPT:

- Accurate simulation of real user activity
- Different types of users in one test
- Testing of dynamic web applications
- Testing of HTTPS/SSL content
- Descriptive test reports and graphs

B. NEOLOAD:

Load testing tool for web application from Neotys with clear and intuitive graphical interface, no scripting/fast learning curve, clear 7 comprehensive reports & test results can design complex scenarios to handle real world applications features include data replacement, data extraction, system monitors, SSL recording, PDF & HTML reporting, IP spoofing, and more. Tool that

measures performance and behavior of the system under load. It is used for testing web application, web services, flex application oracle forms and silver light applications. It uses java script for script enhancements.

Features of NEOLOAD

- Clear and intuitive graphical interface
- Clear and comprehensive reports and test results.
- Allows advanced scenarios to handle real world applications
- Get statistics from your servers

VI. METHODOLOGY

In this research paper, we are selecting two testing tools and comparing them on the basis of some different parameters.

- Firstly, choosing two testing tools (WAPT and NEOLOAD)
- Then, designing the test metrics suit for testing.
- One web based application is applied for testing.
- Then, manually testing is done on this application using these two testing tools and recording is performed.
- Then analyzing the various features of these tools and gathering results.
- Drawing the conclusion and inferences.

Selected tools:

The testing tools chosen for comparison are WAPT and NEOLOAD. Many other tools could also be selected for comparison. But because of the easy to use and initialization these tools have been selected among them. The first tool selected is WAPT. This tool is selected because it is easy to use and cost effective. It can analyze the performance characteristics and bottlenecks of web site under various load conditions.

And the second tool is NEOLOAD. The reason to select this tool is its wide use for web applications. It allows advanced scenarios to handle real world applications.

VII. EVALUATION METRICS

We are comparing these testing tools for following reasons:

- With the help of metrics, we can easily compare the various features of the testing tools.
- With the help of metrics, it is easy to find out which testing tool is appropriate for which application.

In my work, metrics used for comparison are as follows:

1) Database support metrics
2) Tool usability metrics
3) Support for web component test metrics
4) Automated testing progress metrics

The first metrics defined is database support metrics. This metrics includes features like database testing, data functions, object mapping, object name map. this metrics will help to test how easily database and data functions can be verified and validated using the application. This metric is also an important metrics because most of the applications keep their data out of itself.

Table 1: database support metrics

Attributes	Description
Data base testing	This features describes whether the database verifies the proper validation of tests on the front end of an application, whether the tool manipulate the returned data, whether it can call stored procedures and supply required input variables
Data functions	This attributes describes does the tool allow to specify the type of data required? Can data be automatically generated? Can one interface with files, spreadsheets, to create, extract data?
Object mapping	This features describes is anyone able to map the custom control to the standard controls? Does the application support all the standard controls methods?
Object name mapping	This feature describes whether the tool provides a central repository to store these object identities and does the object name map allow to alias the name or change the name given by the tool to some more meaningful name?

The next metric defined is tool usability metrics. This is important metrics since it provides technical guide to use the testing tool. It highlights the various attributes like how easily the recording and playback is done, how easily

the tool is installed and used, is it provide sound technical support. Table 2 shows the different attributes of this metrics.

Table 2: tool usability metrics

Attributes	Description
Record and play back	This category details how easy it is to record and playback a test.
Ease of use	Ease of use includes debugging facilities, help files and user manuals, layout on screen, out the box functions
Easy installation and configuration	This feature describes how easy or difficult it is to install the software.
Technical support	This feature describes how to get help when there is a technical problem with using software.
User friendly GUI support	This feature describes whether the tools are easy to understand.

The next metrics that is being used is support for web component metrics. Table 3 describes the various web components that are tested by these two testing tools. Different attributes will be listed and component between two testing tools.

Table 3: support for web component metrics

Name of web component	Description
Web testing	Exclusively adopted to test the application that are hosted on web in which the application interfaces and other functionalities are tested & support HTML tables, frames & various platforms for browsers.
Image testing	To test image processing & image compression algorithm.
Object testing	Used to test the different kind of services. It provide for testing object properties.

Object identity tool	To test the internals of the object giving details like the object name, ID and similar.

The next metrics is automated testing progress metrics. This metric describes is it easy to automate the scripts. This metrics includes the features like ability to comparing the test results, ability to document the test cases, ability to perform the regression testing.

Table 4: automated testing progress metrics

Attributes	Description
Ability to compare test results	This feature describes whether the tool provides a mechanism for automatically comparing results of the test against the expected results.
Ability to document the test cases	This feature describes whether the tool provides the documentation of test cases.
Ability to perform regression testing	The feature describes whether or not the tool will automate regression testing.

VIII. TESTING APPROACH

In this paper, the performance of tools will be evaluated for their support for web-based testing. first of all, application was manually tested and each feature was reviewed for their working. In the testing approach, application was tested on each tool, and execution of each feature was recorded manually so that test could easily be played over and test results could be evaluated whether they are passed or failed. we have applied some test cases on each tool. The table below describes the test cases.

Test cases executed on Wapt tool

Test cases for WAPT tool	Description
Creating and manipulating the profiles of virtual users	This test case creates many virtual users and tests the tool on the server.
Data driven test	This test case verifies the data variables by passing the various values.
Different forms of graphs	This test case verifies the various forms of graph

	generation feature of the tool.
Error report graphs	This test case verifies the various forms of error report generation feature of the tool.
Test verification	This is useful to make sure that scenario does not contain errors, especially when we calculate parameters dynamically.

Test cases executed on neoload tool

Test cases for NEOLOAD tool	Description
Recording the test scenario	This test case verifies the playback feature of the tool and record.
Vuser script	This test case define a single user activity on the application.
Population	This test case defines the number of users.
Container	This case shows the group of http request that represents a single user action.
Scenarios	It shows no. of users, run pattern & various other run time settings to mimic the real world load test.

IX. TARGET APPLICATION

The target application chosen for testing is the largest ecommerce site in india , named www.irctc.co.in. This application is chosen because of its importance in india. As a website that millions of Indians use on a daily basis, countless hours of productive time is lost to india everyday. It is beneficial for every kind of person. Booking railway tickets is one of the most traumatic online experience for an Indian. Indian railway catering & tourism corporation, is a subsidiary of the Indian railways, that handless the catering, tourism and online ticketing operations of the railways. Since it automates manual work as well as provides various online services.

X. TEST RESULTS

The results of test cases executed on each tool WAPT and NEOLOAD respectively.

Test result of Wapt

Test cases for wapt tool	Results
Creating and manipulating the profiles of virtual users	Pass
Data driven test	Pass
Different forms of graphs	Pass
error report graph	Pass
Test verification	Pass

Test result for NEOLOAD tool

test cases for neoload	Results
Recording the test scenario	Pass
Vuser script	Pass
Population	Pass
Container	Pass

When the test cases were executed, the results were gathered for each test case. Below are images of each test case, highlighting the features that have been considered.

Images of test case executed on WAPT

- Creating and manipulating the profiles of virtual users
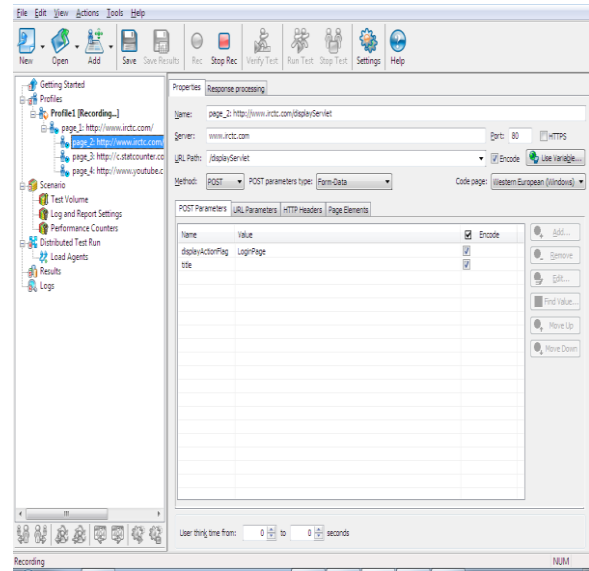
- Data driven test
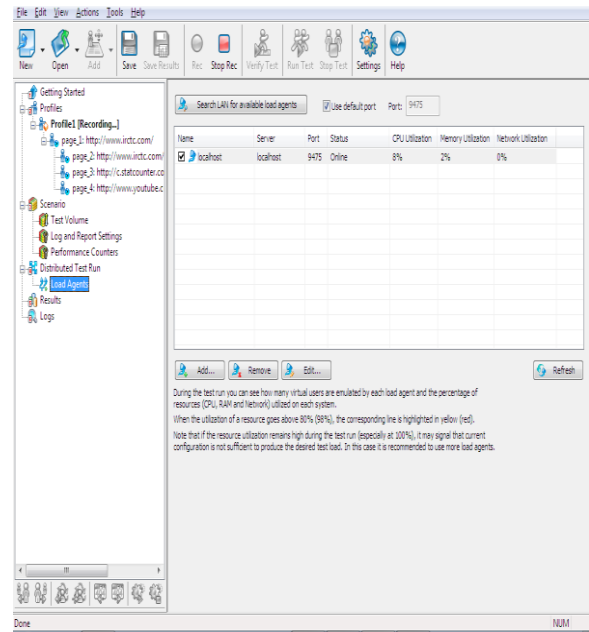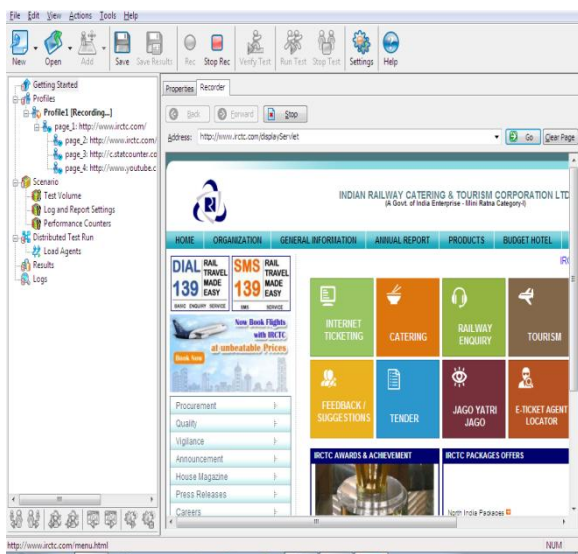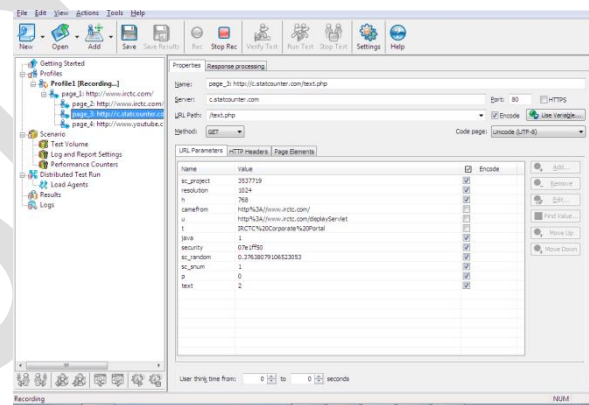
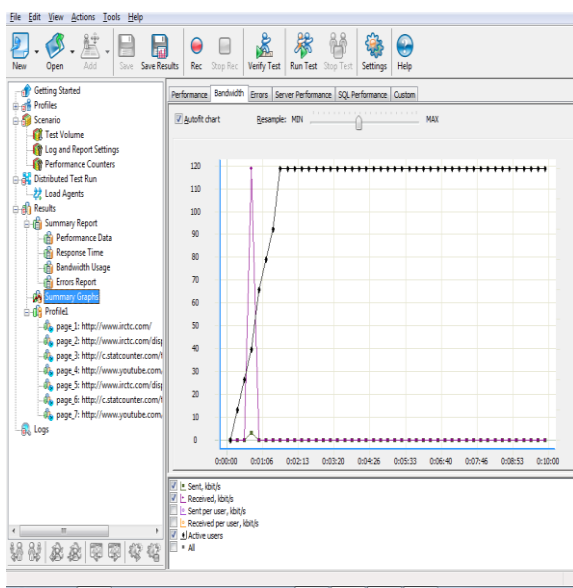- Changing the number of virtual users on each profile
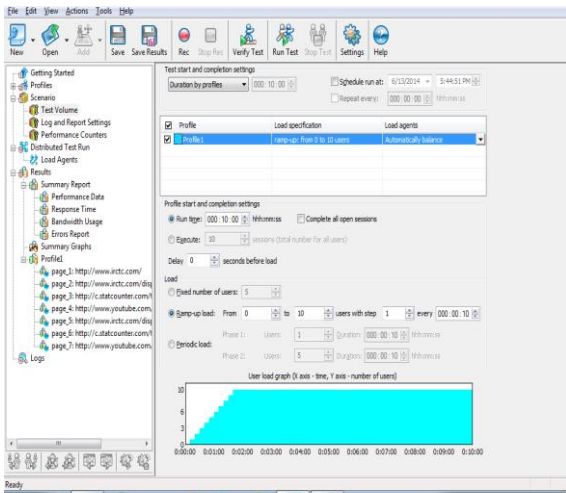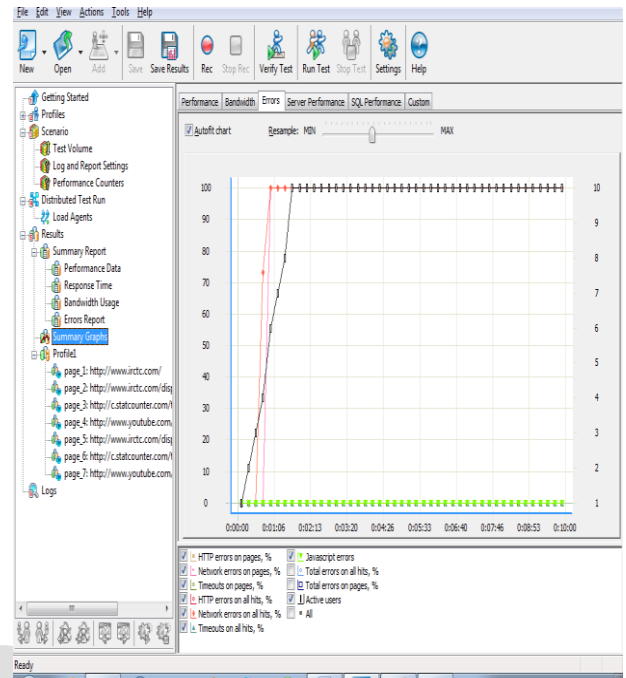

Different forms of graph showing results

- Performance forms of "creation of virtual user" test
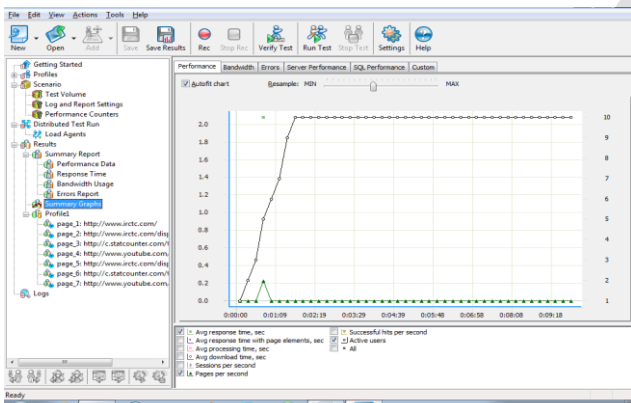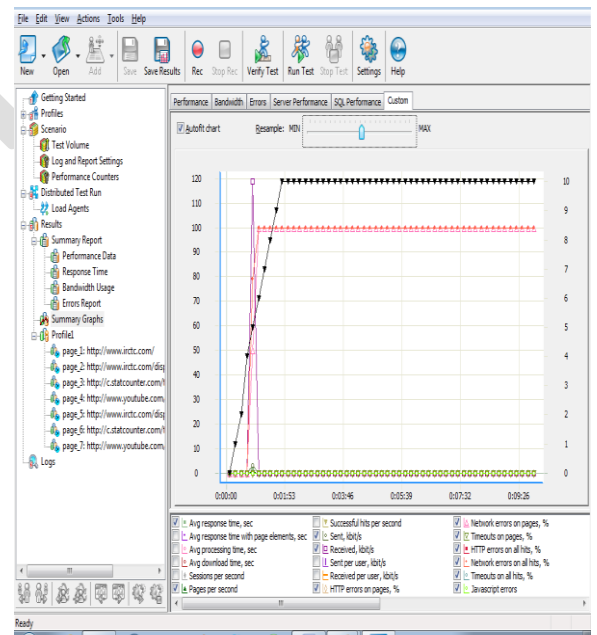

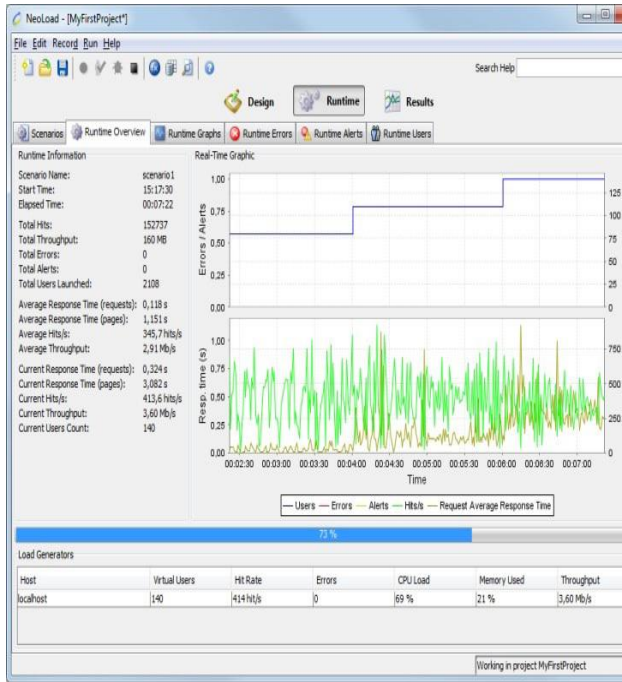- Bandwidth graph
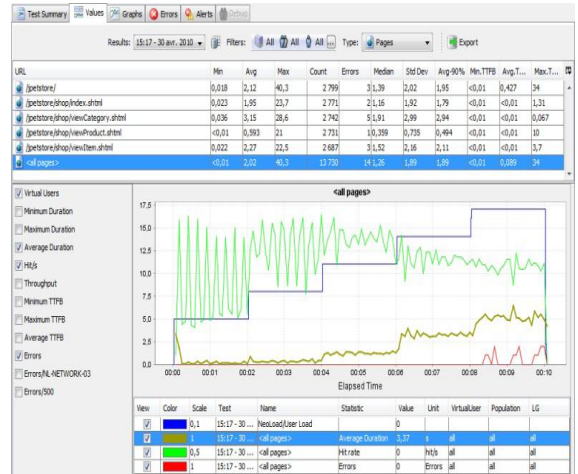

- Error report graph

- Custom graph

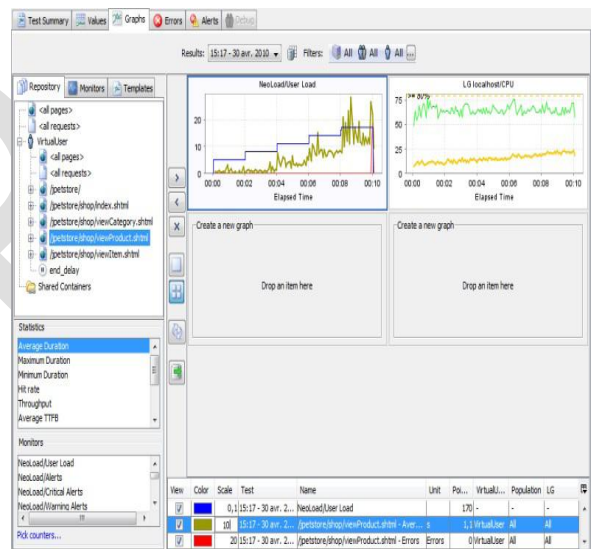Images of test case executed on NEOLOAD
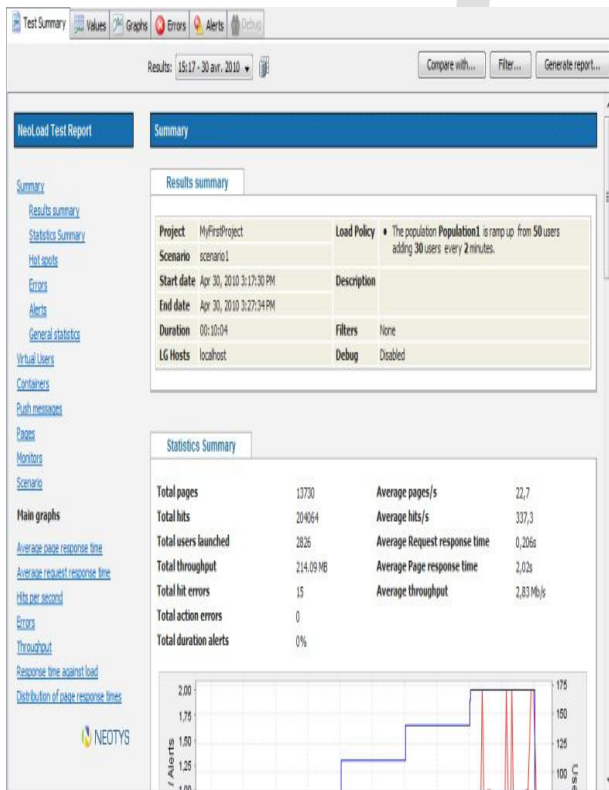
- Running overview

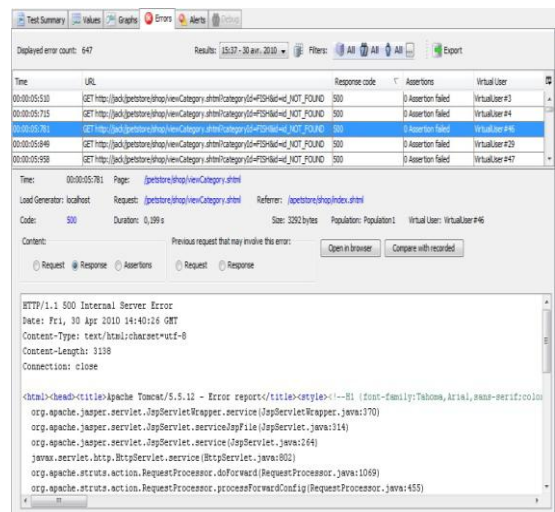Value tab

Graph tab

Test results

- Scenario tab

Error tab

XI. COMPARATIVE ANALYSIS OF TOOLS

The results were gathered and analyzed. In this section, the two tools have been tested, evaluated and compared to each other. Below table shows the results via a ranking from 1 through 5.

Table 1: support for web component metric range 1-5

Features	WAPT	NEOLOAD
Web testing	4	5
Image testing	3	4
Object testing	2	5
Object identity testing	5	5

The next metric result set is for tool usability. This metric will help in choosing the best one in terms of ease of use, technical support and user friendliness.

Table 2: tool usability metrics

Attributes	WAPT	NEOLOAD
Record and play back	Recording feature is available but the real time play back is not visible.	Can record HTTPS request and play them back.
Ease of use	Need some proper technical guide.	Very easy to use
Easy installation and configuration	Very easy to install	Very easy to install
Technical support	Not easy to find	Easy to find
User friendly GUI support	Yes	Yes

The next metric set is for database support. This metric results highlights the features which is useful in database support.

Table3: database support metrics

Attributes	WAPT	NEOLOAD
Database testing	Yes	It support Microsoft SQL server, oracle, mysql, IBMDB2, mongo DB.
Data functions	It allows to specify the type of data and can generate data automatically.	It provides additional function for more experienced users enabling the creation of data parameters & more advanced technologies to support up to date business function.
Object mapping	No	Test complete GUI extensibility with object mapping & best tool for UI based automated testing for websites.

The next metric set is for support for the testing process. This metric determines whether or not the testing tool fit into the testing process easily.

Table 4: automated testing progress metrics

Attribute	WAPT	NEOLOAD
Ability to compare test results	Yes	Yes
Ability to document the test cases	Yes	Yes
Ability to perform regression testing	Yes	Yes

CONCLUSION AND FUTURE WORK

Software testing is both a discipline and a process. It is a separate discipline from software development. In this research, we have referred two testing tools WAPT and NEOLOAD, because of their individual usage in web testing. After analyzing the performance of these testing tools, we can conclude that NEOLOAD is the best tool for web application, because of its object mapping feature and data binding. Whereas WAPT is the best tools for web applications where the load, stress and performance testing is required.

This research work can be further enhanced by including more testing tools for comparison so that we could find more suitable testing tools for testing the application software. Further, some different parameters can be used for performance evaluation so that comparison could be more realistic and reliable.

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