ABSTRACT

One of the most popular computer applications is web application. The explosive growth of web applications and web services has changed the present scenario in exchanging information around the globe. The web applications may be implemented with different implementation techniques. It is essential to carry out comparative study of such techniques for evaluation of merits and demerits of the techniques, for the benefit of users in research laboratory, industry, corporate sector and business establishments.

As such, we have designed, developed and implemented two prototype research web applications based on two different implementation techniques, keeping the contents of the application unchanged. One of the web applications is designed, developed and implemented on Microsoft .NET platform (Version: Microsoft visual studio 2005; Framework 2.0), we called it PReWebD. We deploy Internet Information Server 5.1 (IIS 5.1) for running the application in this platform. The Microsoft Standard Query Language (SQL) (Version: Server Express 2005) data base server is deployed to store and retrieve the data.

The other web application is designed, developed and implemented on NetBeans platform (Version: NetBeans IDE 6.5.1; Java Server Faces (JSF)), we called it PReWebN. The Apache tomcat web server (Version: Apache tomcat 6.0.18) is deployed for running the application in this platform. The MySQL data base server (Version: 5.0) is deployed to store and retrieve the data.

Our objective is to carry out a comparative study of both the techniques in terms of reliability, performance, scalability etc. As such load and stress testing are performed on PReWebD and PReWebN using software testing tool Mercury Load Runner (Version: 8.0). The performance metrics are recorded during the experiment (e.g. response time, throughput, and hits/sec). The testing is carried out for 10, 20, 30, 40, 50, 75, 100, and 125 virtual users for insert, delete operation. The statistical analysis of recorded data for both the applications is carried out to ensure the reliability, quality and stability of the systems. The effect of hits/sec and throughput on response time is analyzed statistically and the results are interpreted and verified.
All the tests have been performed at 128kbps system bandwidth including think time. It is observed that up to 40 virtual users, both the systems provide low response time and high throughput without any transaction errors. Also, no connection refusal is observed. As the number of user increased above 40, the performance of both the systems degrades gradually with high response time, low throughput and transactions errors. The refusal of connections is also observed.

For the PReWebD, the recorded response time for 75, 100 and 125 virtual users are 45.86 sec, 49.859 sec and 76.646 sec respectively. The observed throughput for 75, 100 and 125 virtual users is 328940.716 bytes/sec, 308799.512 bytes/sec and 52673.631 bytes/sec respectively. The recorded hits/sec for 75, 100 and 125 virtual users is 12.241, 8.963 and 1.515 respectively.

For the PReWebN, the recorded response time for 75, 100 and 125 virtual users is 124.876 sec, 139.412 sec and 129.12 sec respectively. The observed throughput for 75, 100 and 125 virtual users is 129440.023 bytes/sec, 122645.04 bytes/sec and 103503.55 bytes/sec respectively. The recorded hits/sec for 75, 100 and 125 virtual users is 3.681, 2.524 and 2.6 respectively.

To study the scenario of PReWebD and PReWebN, the replica of data has been recorded for both the systems. The recorded data are then analyzed to study the reliability and quality of the systems. The statistical analysis is carried out on response time, throughput and hits/sec. Various distributions are plotted (histograms, quantile plot and normal probability plots) to study the normality of both the systems. Based upon the data, these plots do appear to be normal. The confidence interval for response time, throughput and hits/sec are calculated at 95% confidence level. The multiple linear regression analysis predicts that the hits/sec and throughput influenced the response time, which is verified through scatter plots for both the systems.

In this work we are presenting in details the design, development and implementation of PReWebD & PReWebN. The results of various load and stress testing on the two systems are discussed. The interpretation of results and the advantages and disadvantages of both the techniques are also discussed. The results of statistical analysis are presented to verify the suitability of both the techniques. A benchmark on the two techniques is made based on the various experimental results and statistical analysis of the recorded data.