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# Workload Modeling and Scalability Analysis of Resource Usage for E-commerce Application

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***Abstract*—**Performance analysis and simulation of cloud resource management policies allows cloud providers to improve their QOS. QOS denotes the level of performance, reliability and availability offered by the web application and by the platform infrastructure that hosted it. The modeling of workload is difficult due to the unavailability of trace logs for analysis. A web application model has been suggested to capture different behavior of user profile. The amount of the resource consumed during the process is known as resource usage. A resource usage model shall be created and validated to choose the best estimated policy among Generalized Lambda distribution & Generalized Extreme Value distribution. The validation is carried out by simulating the same model in cloudsim. The obtained results from amazon web services environment and cloudsim simulator are compared by Wilcox method and the accuracy is defined.

***Keywords-*** *Resource Usage profile; Workload generation; Validation; Best fit Policy.*

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## I. INTRODUCTION

The performance of policies is tested to know the threshold of policies and the maximum workload it can handle during busy schedule. By evaluating this we can manage different kinds of workload incoming at the server by implementing the tested policies. The user profiles such as browsing and buying are used to highlight different kinds of workload are generated using a tool of workload generator such as Apache Jmeter. The server in configured in Amazon web service environment. The workload on web server has become an interesting area for upcoming researches that are developing the new model to evaluate the performance considering the queue length and packet loss as metric under high loads. The parameters of the server such as Disk utilization, cpu utilization, Memory utilization, No of instruction executed by the server, and response time is recorded to carry out the following process. The detailed work of how the policies are estimated and the best policy is chosen is presented in this paper. The three main steps in performance modeling are a) Workload generation b) Resource Utilization Profile c) Validation d)Best fit Policy. Data transformation of collected data from the server are handled in statistical analysis, the distribution in which will the model fit is decided in parameter estimation, and the GOF test specifies whether the distribution selected is appropriate to the data or the step b is repeated by selecting the different distribution. Here section 1 shows the recent studies, section 2 with proposed system and data flow diagram, section 3 with evaluation or implementation and validation process done in cloudsim simulator, section 4 with the results and analysis, section 5 with conclusion

## II. BACKGROUND AND RECENT STUDIED.

Raouf Hesadat Hashemian in [1] has spoken about the different workload generator and varying results with workload generator. The author has used these tools to collect the parameters such as throughput, end user response time and other metric to find out the quality of service provided the cloud provider. He has used the virtual machine server where the database has to be installed. The author work serve as an example whether to verify a web workload generator is behaving as programmed or not. The http requests are generated and are monitored using the tool bro and tcp dump. The author work serve as an example whether to verify a web workload generator is behaving as programmed or not. The http requests are generated and are monitored using the tool bro and tcp dump. After observing the inconsistent results with one workload generator the author has implemented the same with the different workload generator and compared the results in the discussion part.

Michel Albonico in [2] has proposed a model to generate the appropriate workload variations for reputed web application entrepreneur by predefining the elastic state. In this process they are two states as described by the author they are warning up phase and workload generation phase. In warm up phase the web application is being analyzed by gathering the historical information of the application and now the input is ready for workload generation phase. The author has made this process automated entirely to reduce the stress. They generate different workload variation for reputed web application entrepreneur on amazon EC2 service. Here the cloud providers are able to predefine its elasticity state.

Keerthi Bangari1 in [3] describes the synthetic workload with same characteristic and behavior of real workload. The

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author has used the real trace from google cluster data which consist of two types of workload i.e real and synthetic method

Rodrigo N in his paper[4] has proposed an extensible simulation toolkit that enables modeling for cloud environments .The cloudsim consist of multilayer design which support for the creation of event and entities like Data center, broker and CIS registry. A cloud provider can also study his different scheduling policies in this cloudsim environment with cost effective manner here he talks about the data center which are hosted in host entity. The host may have one or more data centers but one data center will have only one host .the vm are allocated in data center which have the round robin by default .We have two types of policies that are space shared and time shared .we have a broker who will be communicating between the entities.

Chen in [8] tells about his distributed modeling analysis which will be aiming to high resource utilization with low cost .his application was similar to the mapreduce application type where chen had a goal to trade off between the latency and resource utilization .chen had used the test environment provided by Amazon .on the whole his paper does not present any verification results for his work.

## III. PROPOSED SYSTEM

### A. *Workload*

Workload is nothing but the request generated from the client. Workloads also have different user profiles such as browsing, buying etc. Workload can also be correlated as workload generation in cloud environment. A workload is a benchmark for evaluating the performance of the server. The workload is defined as the amount of work performed by the entity in a given period of time. The amount of work handled by an entity gives an estimate of the efficiency and performance of the concerned entity. The snap shot of workload generation in cloudsim environment is shown below in fig 2.1, 2.2. The workload generation in AWS environment is shown in fig 2.3, 2.4.

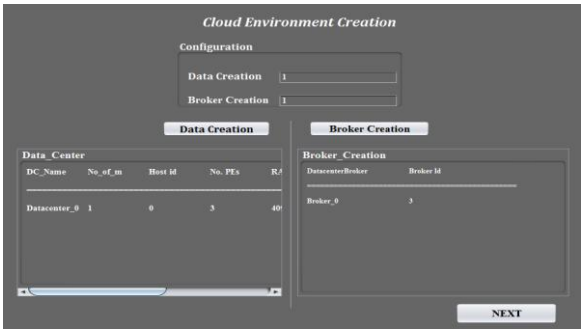


Fig 2.1

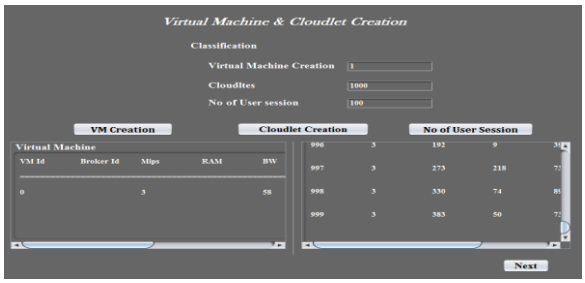


Fig 2.2

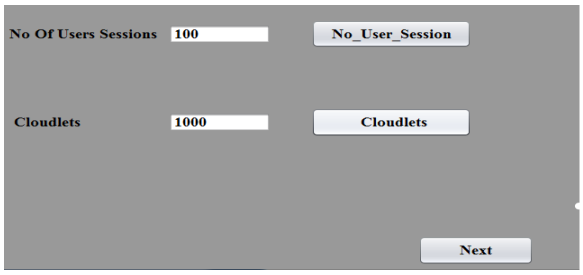


Fig 2.3

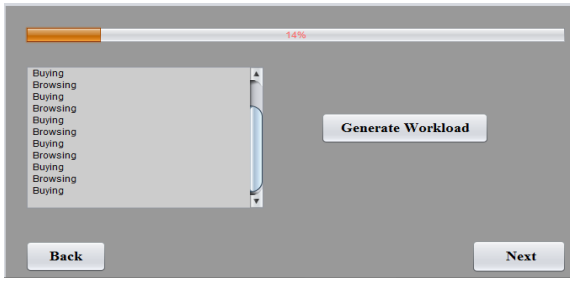


Fig 2.4

### B. *Resource usage profile*

The resource usage profile contains the utilized parameters of the server during the execution of the workload arrived to the server. It contains the number of request executed by the server during process, cpu utilized for the request, memory utilized for the request, Disk utilized for the request, Response time taken execute the request. The profile contains the no of session as an input parameter which gives us the profile as same given in the input.

### C. *Validation*

In the validation process we compare the observed data from real cloud and the data obtained from the simulator. The P-Value is given by the Wilcox test which depicts the lack of cloudsim simulator to mimic the cloud environment. And the p-value is calculated for each simulated resource profile to the observed resource profile. The large number of comparison is performed and the relative error rate is determined.

### D. *Best Policy for each Parameter*

Here the best estimation policy along with the distribution is determined. The policy is chosen among the maximum likelihood policy, Probability weighted moments policy, Maximum Product of spacing Policy. Along with the specified distribution to which it fits. The distributions are GL and GEV distribution.

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## IV. IMPLEMENTATION AND VALIDATION

The workload is generated using apache jmeter plug-in to the required server in aws environment with the help of Netbeans IDE. The program is written in the java to generate workload and capture the required metric in AWS environment and named as observed data. Now the same experiment is repeated with in a simulator for validation purpose, this data is named as simulated data and then comparisons of results with the observed data and simulated data is done with Wilcox test. The snapshot of the resource utilization profile obtained from aws is shown in fig 3.1.The

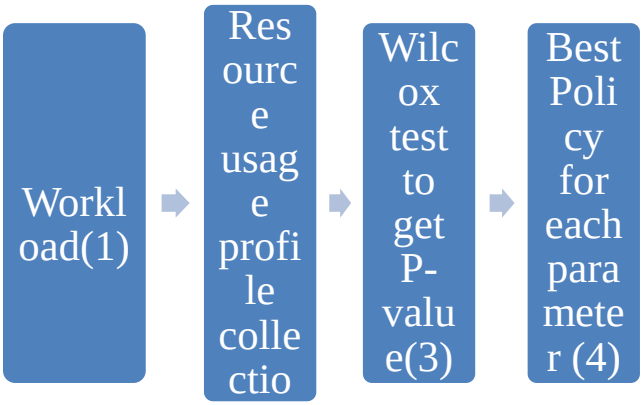


Fig 3

resource utilization profile obtained from cloudsim is shown in the snapshot fig 3.2.The validation part of both the data is done by picking one value of one parameter from cloudsim environment and one value of the same parameter from the aws environment. These values together are fed into a Wilcox method program written in java Netbeans IDE which gives us the p-value as the output. The critical value is considered as 0.05 and the values below the critical value is avoided and displayed. The values for both the buying and browsing user profile are shown below. The snapshot of this process is shown in the fig 3.3 and 3.4.

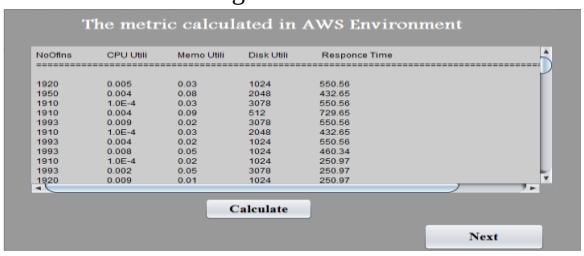


Fig 3.1

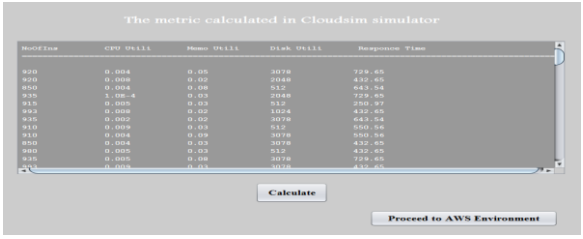


Fig 3.2

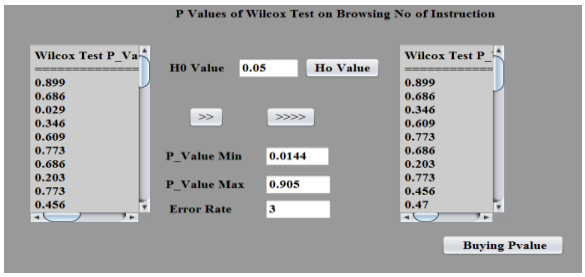


Fig 3.3

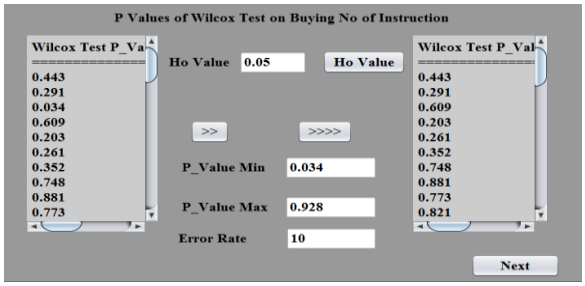


Fig 3.4

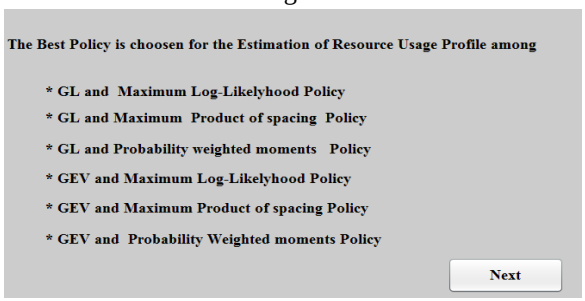


Fig 3.5

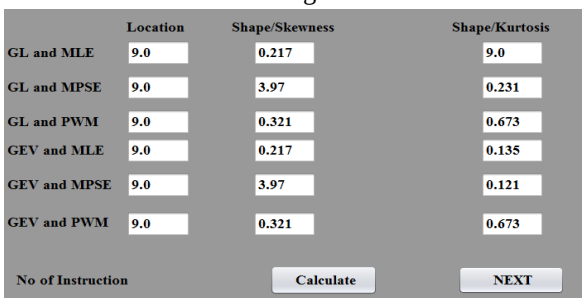


Fig 3.6

The same process is repeated with all values and all parameters. The error rate is determined in percentage and displayed. This rate tells us that where the cloudsim is lacking in mimicking the cloud environment. With this one of requirement is fulfilled and the next process is how the best policy is selected. The snapshot of policy which is shot listed to choose the best among them are shown in fig 3.5. The resource utilization profiles obtained from both the environments are column wise fed into a tool and location, skewness, and kurtosis are found. The location is found by the mean of the values. The best policy is shot listed as the maximum of mean, minimum of skewness, and maximum of kurtosis. The best is found and displayed in the page. The process of finding the location, skewness, and kurtosis is shown in fig 3.6. The best policy is found in both the environment. And the snapshot is shown in fig 3.7 and 3.8.

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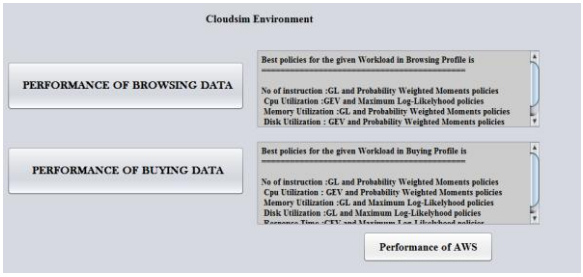


Fig 3.7

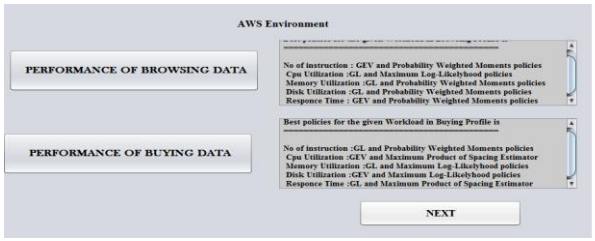


Fig 3.8

## V. RESULT AND ANALYSIS

The graph for number of instruction is obtained for buying and browsing user profiles for both the environments which tell us that the cloudsim is mimicking the cloud environment.

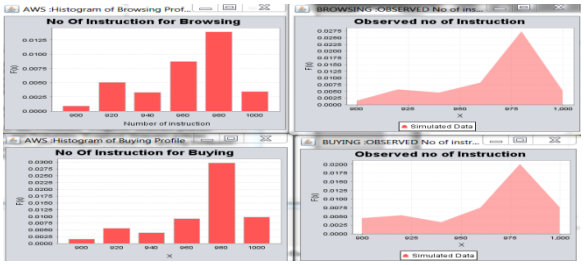


Fig 4.1

The fig 4.1 depicts the process.In the above graph the line graph is obtained from simulated data and histogram is obtained from observed data. When compared the graphs with number of instruction in x axis and probability density function of number of instruction in y axis. And the graphs for other parameters are also obtained in the same manner. The result is shown in a display which contains the better environment for the given data. The snapshot of this window is shown in fig 5.1.

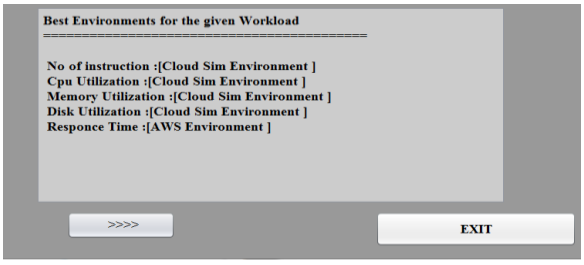


Fig 5.1

## CONCLUSION.

The three important covered topics are, the first one is that the work is useful for the researches and policy makers i.e the cloud service providers. The second is that the cloudsim is mimicking the cloud environment. And the third and the last one is selecting the best fit policy among the given estimation policy. The future work will be carried out with other resource estimation policy.

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