CAI method in Cloud services for user workload using Cloudsim framework

AlaguVignesh A, Barath B, R.R Sathiya, P Prakash

Abstract—In sighting the distinct patterns of processing capability in a cloud service is pedantic to enhance the resource management and operable conditions of the servers without compromising the Quality of Service is important. Simulations and models based on practicable parameters are required to understand the impact of the load on new system designs and policies. The proposed scheme and analysis provides a requirement for designing new systems which will be lessaffect by process loads. Classifying, analysis and improving (CAI) is done using real-time data center logs and simulations are done based on user requests and data center configurations. Simulations are created using cloudsim framework. Various simulations are done to provide a comprehensive result to improve the resource allocation for the system.

Index Terms—Cloud service, Resource, Users, Work load, Classification, Neural-network, Cloudsim, Simulation

I. INTRODUCTION

The growing ultimatum need for scalable and reliable services for computing has steered to the evolution of Cloudcom- puting. Users needed a salable and cost-effective computing environment that could serve their requirements in an efficient manner. The process of delivering hosted services over the internet is known as Cloud services. These services embrace servers, storage, databases, networking, software, analytics and intelligence. Users can access these services by logging in from any device thehasaninternetConnection. Infrastructure as a service, Software as a service and Platform as a service are the major services provided by the cloud environment. Infrastructure as a service(IaaS) fends for processing and storage resources. The advantage of using this model is that it reduces the overall cost, combines the resources, increases the speed of deployment as well as enhances security. Platform as a service(PaaS) provides an environment for creating cloud ready applications It also provides capabilities like development and deployment. Software as a service (SaaS) fends for software and applications through a subscription rather than physically installing it on the local machine. Example software as a service are Google apps, Dropbox etc.

II. LITERATURE SURVEY

The reduction of total cost for the end user by optimizing the response time which leads to reduced wear and tear of hardware equipment. It also deals with simulation of datacenters in various regions and analysis of network response time. There was a scope for the simulation and modeling by extendingthefunctionalitiesincloudsim[1]. The performance analysis mixed to CPU, HDD, server RAM thus improving the energy utilization of the servers. Then concentrated to increase the number of parameters used for the analysis [2].The cloud computation system uses signal processing techniques to analysis network usage and overall transmission delay between the end user and the data center. Themain drawback is the complexity of the Q(n2)algorithm. The concern wastoimprove the algorithm complexity[3]. The standard parameters such as task and user are used to create a model with only 5 percent error. This methodology can be applied to a data set that contains data for a month,and we can compare the parameters, for this data set with the parameters that we obtained [4]. An analysis of diversity of cloud
computing from a large scale data center are studied. Models are created based on task characteristics of the user, based on different observation over periods. Models are made based on diverse and critical operational parameters [5]. Further, design and implementation of a cloud computing service’s resource management system is given. This system maps the physical resources to virtual resources used as a metric. The virtual machines are grouped accordingly to fully utilize the server capacity. For machines with multi-resource constraints both green computing and avoidance of overload is achieved by this algorithm [6].

Performance analysis of the data center using task parameter submitted by the user and improvement of overall resource usage and the main drawback of this is the analysis is limited to 2-day log which gives inaccurate results in realtime [7]. This work presents the work that advances cloud computing. Clustering approaches are also used to categorize the users [16]. Clustering approaches can be used in any domain or data which can be either structured unstructured or semi-structured [17][18].

Cloud computing can be advanced by the following ways. First, this work can be used to reduce the cost of energy consumption. By reducing energy cost we can build a cloud computing industry that is stronger and more competitive. Second, the consumers nowadays are more considerable about the environment. The results of this work have depicted that when compared to the traditional method of resource allocation, the method mentioned in this paper is more efficient as it consumes less amount of energy [8].

A method for the classification of tasks is developed and this method is then applied to the Google Cloud Backend [9]. The methods for the classification of workloads are:

1. Identify the dimensions of the workload.
2. Construction of classes for the tasks using a suitable algorithm like k-means.
3. Determine the break point within the workload dimension range. (4) Merging nearby classes so that the workload number will decrease. The efficiency of the virtual machines and provides a vision of how cloud computing business can be in the future [10]. This provides how virtual machines can be increased in terms of scalability and elasticity for the user.

Fuzzy method of classification can identify the possible area for each class within the pattern margin using multi-layer feed-forward artificial neural network [11]. Recurrent neural networks are more powerful than the traditional classifier models. This is because data vector’s correlation can be modeled by recurrent neural network. But this may not be practically achievable. The recurrent neural network’s performance is better than the traditional model when there is an overlap in the class data. This overlap is overcome by using smoothing techniques [12].

This paper [13] presents the techniques and methods for the construction of workload models. The techniques and methods presented in this paper are only related to system type and the objectives of this study. The problems faced during the workload characterization are already known and have been solved age back. But the same results or conclusions cannot be made for recent architectures. Nowadays it is important to identify the parameter set that will be able to capture the behavior of the workload and it should be able to reproduce the behavior. The hypothesis and how different workloads have a noticeable effect on energy consumption and that a low-cost, scalable, cross-platform software solution for energy measurement is possibly explored [14].

Various numbers of hidden layer determines the performance of the neural network thus producing extremely accurate results [15]. The range of hidden layer units vary from thirty to seventy. The output value can be used to find the confidence level which is between 0-1. The confidence value can be used to find the performance of the neural network. If the confidence value is more, then the probability of correct classification increases. For neural networks with less than 30 or more than 70 hidden layer unit’s convergence was not achievable.

An efficient resource usage ensures high Quality of Service for the provider as well as the end-user. Analyzing and classifying the users based on tasks helps to develop a model which can be used for economical resource allocation for the virtual machines. Most of the work is based on clustering the users using clustering algorithms for example k-means was used to cluster users based on their similarities in resource usage. To the best of our knowledge, we have not found any existing work that efficiently classifies users using Neural network classification and create server configurations based on the classification output, thus, the motivation for the proposed system.

III. PROPOSED SYSTEM

A. Classification

Classification is an approach used for supervised learning, the model learns from the input data, uses the insight to classify new observation. This proposed system uses Neural network classification algorithm to classify users based on their requested resources. The advantage of using classification in this system is that when a new user is added the system can classify him efficiently and can fit him in a data center which has a similar specification as requested by the new user. Fig 1 shows an example of classification.

![Multi-class classification](image)

Fig. 1. Classification
B. Model simulation

To analyze and model the performance of a cloud data-center under a set of conditions and policies it is essential to simulate a model which would give results similar to real-time usage. The simulation is done using cloud Analyst (Refer Fig 2 and Fig 3) which is an extension to cloud sim framework that provides graphical experience. Using this framework data centers can be configured and can be fed with user requests, then based on the simulation results the configuration can be modified to meet the requirement based on thenumberofuserrquests.

![Fig. 2. Cloud Analyst](image)

![Fig. 3. Configuration settings](image)

C. Verification

A standard validation technique is that part of the data is used to build the model and rest of the data is used to verify whether the system works as learnt. Similar to this based on the simulated model a data center can be designed, operated under the simulated conditions in real time, and verified for correctness of the simulation.

D. Methodology

The first step is to classify the users based on their requested resources as high, medium and low. This is achieved through Neural network classification. The classification works better than clustering in this application because new entries (users) can be classified efficiently than fitting them in a cluster. Classification does not have any overlap thus leading to proper fitting of a user in a data center. Using the classification result the user with the maximum usage is retrieved from each classified class and the resource parameters of that user is used to create the configuration model because it allocates the resources which is good enough to meet the user’s requirement and other users in the same class. The data set has important parameters User, CPU, Memory, and Disk usage. The data set has to be pre-processed to remove missing values, outliers, etc. to get an accurate classification.

The second step is to simulate the workload in a data-center with predefined configurations and see how it behaves to the process load. The simulation is done using cloud Analyst which extends cloud sim framework to give a graphical experience. Using cloud sim we can configure data centers and provide it with number of requests sent by the users. These parameters can be modified to see different results and create an impeccable model which can be used to design new systems to handle large amount of data generated by the users. The overall steps are shown as architecture diagrams inFig6and Fig7

![Fig. 4. Original data set](image)

![Fig. 5. Data set after pre-processing](image)

![Fig. 6. Classification of users](image)

![Fig. 7. Model simulation and creating configuration](image)

IV. RESULT ANALYSIS

On classifying the users based on their resource requirement using neural network the following result (Refer Fig 8) was achieved. This is a plot of users and the color coding represents the class to which they belong; e.g. high, medium and low.
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Fig. 8. Classification of Users as (i) High (ii) Medium (iii) Low

| Class     | CPU usage % | Memory usage % | Disk usage % |
|-----------|-------------|----------------|--------------|
| A (Violet)| 0.25        | 0.318366667    | 0.006086     |
| B (Blue)  | 0.1875      | 0.1143         | 0.001201583  |
| C (Yellow)| 0.195549767 | 0.69150216     | 0.000801006  |

On Simulating the Data center with various configuration and user requests per hour the following data center processing time (Average, Maximum) was identified and tabulated in (Refer Table II)

| RAM (MB) | CPU Cores | Min (ms) | Avg (ms) | Max (ms) |
|----------|-----------|----------|----------|----------|
| 1024     | 4         | 5.51     | 84.09    | 170.00   |
| 2048     | 2         | 3.01     | 34.20    | 84.01    |
| 4096     | 4         | 1.26     | 14.04    | 28.75    |
| 8124     | 4         | 1.011065 | 24.00    |          |

Response timing for varied number of requests sent per user to the data center configured with RAM = 1024, No. Cores = 1 is depicted in Table III and configuration settings is shown in Fig9

| No. requests sent per user | Maximum (ms) |
|---------------------------|--------------|
| 60                         | 170.00       |
| 120                        | 177.5        |
| 240                        | 178.5        |
| 480                        | 183.5        |

Response timing for varied number of requests sent per user to the data center configured with RAM = 2048, No. Cores = 2 is depicted in Table IV and configuration settings are shown in Fig 10.

| No. requests sent per user | Maximum (ms) |
|---------------------------|--------------|
| 60                         | 84.01        |
| 120                        | 85.51        |
| 240                        | 85.51        |
| 480                        | 95.00        |
V. CONCLUSION

In this paper we have presented how the data center would behave on a peak time using simulations. The analysis is different configuration directly reflected in the response time, this clearly shows that when a data center is under powered it works good under normal operating conditions and it may subject to overload and throttle during peak time leading to wastage of energy and faster worn out time of hardware. Future data centers can be built efficiently by using optimum resources without overfitting or underfitting. This analysis improves the data-center only by the means of resource allocation, during peak time due to processing load the hardware operates at high load leading to wear out of the hardware and due to high operation of the hardware it consumes more energy leading to wastage of energy resources. Future work can be focused on improving the hardware capabilities to handle these processing loads.

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AUTHORS PROFILE

AlaguVignesh A. is a B.Tech student at Amrita Vishwa Vidyapeetham, Department of Computer Science and Engineering, Amrita School of Engineering, Coimbatore India. He is actively involved in research in the areas of Cyber Security, Networks, IoT and Cloud Computing. He is a Certified Ethical Hacker (CEH) and CISCO Certified Network Associate(CCNA R&S).

Barath B. is a B.Tech student at Amrita Vishwa Vidyapeetham, Department of Computer Science and Engineering, Amrita School of Engineering, Coimbatore India. He is actively involved in research in the areas of Cloud Computing. He is also a Certified Ethical Hacker (CEH).

Sathiya R. R. currently serves as Assistant Professor at Amrita Vishwa Vidyapeetham, Department of Computer Science and Engineering, Amrita School of Engineering, Coimbatore India. Her research areas include Data mining, Cloud computing and Data analytics in particular with cloud computing.

Dr.PrakashP, currently serves as Assistant Professor at Amrita Vishwa Vidyapeetham, Department of Computer Science and Engineering, Amrita School of Engineering, Coimbatore Campus. His areas of research include Cloud Computing, Automata Theory and Analysis of Algorithms. Dr. Prakash's broad areas of research interest are Cloud computing and Big data analytics.