Broadcasting the Future Load Using BN- Model for Ideal Resource Allocation in Cloud Computing

Rathinapriya Vasu, Prof. G.RamaKrishnan.

Abstract— **Cloud computing is one of the fastest growing most eminent technology that is being used for sharing and accessing the resources using the internet. It has established a commercially cost effective and self-sustaining work environment. Cloud computing utilizes a huge power mainly because of the availability of large number of servers that are emphasized in the cloud datacenters. In order to have an impressive impact on idealizing the power utility, forecasting the future load plays a major role. The power utilized in the data center could be reduced to a greater extent based on the broadcasting technique used by the Bayesian Network model to predict the future load using its past historic data. The main purpose is to allocate a perfect virtual machine to a requested job based on the forecasted future load. It deals with allocating a reliable server to the requested job using the recent downtime history of the server .These servers are frequently supervised and they are ranked using their reliability record. When the future load is broadcasted using the BN -model and the reliable server has been selected for the forecasted load using its past downtime history, an ideal Virtual machine could be allocated for the requested job with a comparatively less power consumption.**

Index Terms— **Cloud computing, Bayesian Network, Load Forecasting, Host management.**

I. INTRODUCTION

Cloud computing has been a recent step forward in the corporate world these days, here applications are afforded as services to the users based on a pay as you use model. This makes it possible for the users to access the resources from anywhere anytime. The traditional computer set up system feel the necessity for the user to in the location where the system is, but cloud computing breaks all the myth regarding this issue. The cloud makes the store house and the revival location identical from each other.

Cloud computing affords the delivery of the requested on-demand services from the datacenters lover the internet. It makes the customer to escalate their needs based on the dynamic demands. Cloud computing provides three different services :(i) Software as a Service(SaaS), here the application requested by the user is delivered as a service.(ii) Platform as a Service (PaaS) , here application platforms are provided over which the requested application could be deployed.(iii)Infrastructure as a Service(IaaS) , here the customer requests the infrastructure requirements like the storage , memory ,CPU utilization and network availability. IaaS depicts the delivery of hardware and the associated software to run the application [3].

Cloud computing is one of the highly prioritized development in the corporate world, since the invention of the personal computers. The clod computing market is getting wider and wider every now and then. Merrill lynth depicted that almost 12 % of the entire software industries are truly based on the internet [4].It makes the strategy more clear with a vision that the customers only pay for what they use. These days many researchers focus on creating and hosting an application that works efficiently in a dynamic environment regardless of the fact about the power utility. These leads to the process of using too many large servers in the datacenter that definitely leads to a huge consumption of power. Based on the reports in,the datacenters consume about a total of 1.5% of the total power consumption in the initial stage and it is almost doubled in the recent times, this eventually will lead to a huge purchasing cost.

The energy cost are drastically increasing these days, which makes us feel the importance of idealizing the power consumption. Cloud should also definitely doesn't compensate over the Quality standards of the resources. Almost every social media companies make use of cloud datacenter to store their resources, it is more important to idealize these in such a way that a best server is allocated for the requested job with minimal power consumption. In the existing system energy is saved by Dynamic voltage frequency Scaling (DVFS) system, where the power would be saved by adjusting the operating clock to scale down the supply voltages. The other type is shutting down of unused servers, this cannot done in a dynamic environment and it leads to huge wastage of resources. This paper aims to design, implement and evaluate a Broadcasting methodology using Bayesian network model to forecast the future load so that the resources could be utilized in a better way with a comparatively lesser power consumption [4] .This technique indicates a significantly accurate forecast, from the past history of records using its downtime so that it could perfectly fit to the dynamic real time. It is based on this forecast that a highly reliable servers would be allocated to the requested job.

The rest of the paper is organized as follows. In the next section, we present some of the related work in this direction. Section III describes the system architecture used for the Load

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forecasting. In section IV the details about the implementation of methodology. Section V outlines the future work and section VI concludes the paper.

II. RELATED WORKS

Power optimization is the key constraint in cloud computing, Truong Duy [6], proposed a system where the ideology is that with the energy shortages and climatic changes that is taking place globally the most important priorities which deal with the power consumption at the cloud datacenters .It is quite very obvious that a relative reduction in energy consumption could be made by shutting down the ideal servers, but that is highly risky to shut down the servers in a dynamic environment , it may also lead to a huge wastage of resources . Here a Green Scheduling Algorithm is integrated along with the neural network predictor for idealizing the server power consumption. This predictor is used to predict the future load that is to arrive based on the past historic record. Accordingly, this algorithm turns off servers that are not in use and restarts to minimize the total number of running servers, eventually leading to minimization of energy usage.

Virtualization one another important concept in cloud computing [8], the main reason behind the usage of the virtualization technology is that it could make full use of the expensive mainframe resources. This technology helps to run multiple server on a single host in a simultaneous manner .It is like a mirroring concept where a similar application could be run on a multiple identical virtual machines. Flash crowd an important virtualization concept is dealt with the virtualization where a particular job is split to small chunks and has been allocated to various virtual machines to complete the job in a fast manner .This technology is used in such a way that it allows a host to run multiple operating system simultaneously Virtualization is of two main techniques: (a) full virtualization and (b) para-virtualization. CPU virtualization technology can use a single CPU to simulate multiple CPUs in parallel and allow a platform to run multiple operating systems and applications that are running independently of each other, thus significantly improving the efficiency of the computer. Virtualization technology is totally different from the multitasking or Hyper-Threading technology.

Mohanraj [11] , proposed a paper on a study on server sleep state transition to reduce power consumption in a virtualized server cluster environment .Growth of the Cloud computing has fueled the demand for large infrastructures called data centers. Reducing power consumption is an essential requirement for Cloud resource providers to decrease operating costs. One of the options to reduce power consumption is to reduce the number of servers in IDLE (unused) state— as these IDLE servers consume as much as 60% of peak power. Two parameters are considered here:

a) Power consumption of the cloud computing environment,

b) Average response time per request.

Bayesian Networks (BN), [10] to assist the datacenter dynamic provisioning system in making predictions about the workload demands and provisioning resources within the SLA constraints. . It involved training neural network with an augmented cross-entropy error function. A new feature selection algorithm based on the wrapper approach using neural networks. Bayesian Networks have been specifically used for managing the situations in a deadly environment in Cloud Computing.

Based on the above study we introduce a novel framework, which combines both load broadcasting and reliable server selection model. So that the load could be fairly distributed among the available reliable servers, that consumes less power.

III. SYSTEM ARCHITECTURE

System architecture is the introspective representation that helps in defining the entire structure and the behavior of the system completely. It helps in identifying a way so that the products could be solicited, systems could be viewed as an architectural overview of the overall system. The aim of the proposed resource allocation policy is to assign the request to a reliable server while idealizing the energy consumption. To achieve the objective of adaptive resource allocation for satisfying the service request of customers, we define the following architecture:

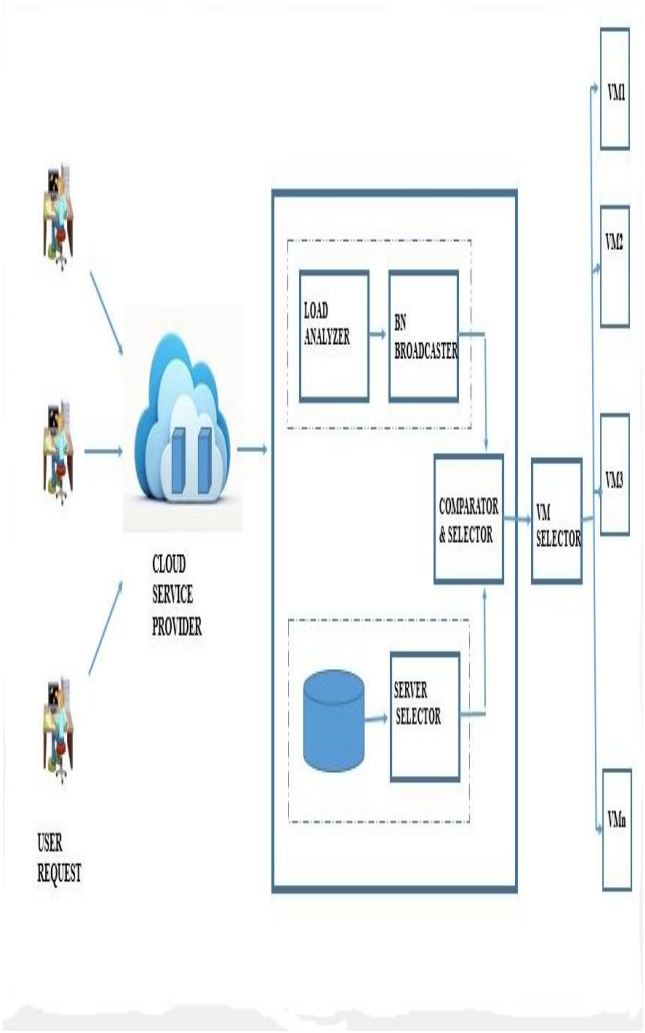

Figure 1 System architecture

Figure 1 represents the entire workflow of the future load broadcasting architecture. Users from different environment

gives the requests, these are created as the instances and then they are coupled using the ganglia monitoring system. These real time load are fed into the Load analyzer, which translates the unstructured data into a structured format based on time series. The load broadcasting device calculates the future load using the Bayesian network prediction model .Server selector selects the best reliable server from the database and allocates it to the requested job. Based on the server reliability and the downtime history, a reliable virtual machine is allocated.

a. Load Analyzer

Load analyzer is one which analyzes the available dataset which is obtained from the instance created and the ganglia monitoring system. These values are in a unstructured format initially, the load analyzer analyses and modifies it to a structured format based on time series.

b. BN broadcaster.

Bayesian network broadcaster is used to forecast the future load for idealized resource allocation. Bayesian model predicts the value in a more accurate manner for the historic data. It uses supervised method of learning to train the data set, which eventually leads to reduction in wastage of resources.

c. Server Selector

It selects a reliable server from the available server based which ranking is given to these servers. Based on the forecasted future load a most suitable server is selected from the database and is given to the comparator which eventually selects the best virtual machine.

d. Host State Management

The host state management algorithm leverages the resultant prediction in managing the host state's decision making process without compromising the commitment towards SLA. Host state manager continuously monitors the health of the hosts including start time, end time and uptime of each and every physical server.

IV IMPLEMENTATION

The implementation stage involves careful planning, investigation of the existing system and it's constraints on implementation, designing of method to achieve changeover and evaluation of changeover methods. Implementation is the process of converting a new system design into operation. The important factor should be considered here is that the conversion should not disrupt the functioning of the organization.

Here the implementation is done with Eucalyptus cloud, an open source software framework for cloud computing that implements Infrastructure as a Service (IaaS), this system provides the ability to run and control the entire virtual machine instances built across a variety of physical resources.

a. EUCALYPTUS CLOUD

EUCALYPTUS Cloud is an open source software framework for cloud computing to implement the Infrastructure as a Service (IaaS). The user requests for the CPU, Memory and Storage here. Initially an instance is created using the EUCALYPTUS CLOUD.

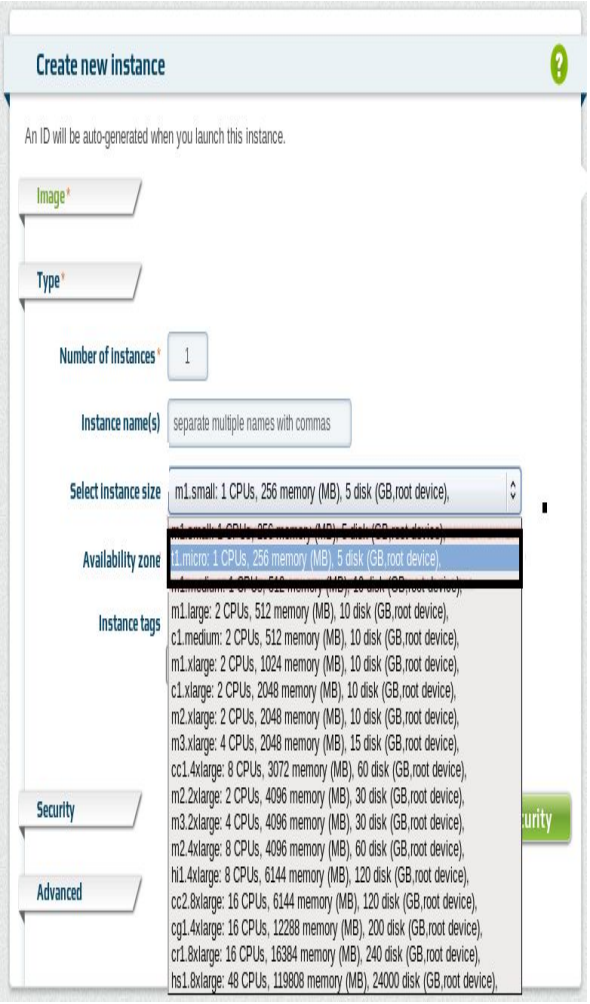

Figure 2 Instance creation

Figure 2 represents the instance created using the EUCALYPTUS cloud .The user selects different instances based on his requirements.

b. BN Broadcaster – Prediction model

Bayesian networks (BNs), also known as belief networks (or Bayes nets for short), belong to the family of probabilistic graphical models (GMs). These graphical structures are used to represent knowledge about an uncertain domain. In particular, each node in the graph represents a random variable, while the edges between the nodes represent probabilistic dependencies among the corresponding random variables. These conditional dependencies in the graph are often estimated by using known statistical and computational methods. Hence, BNs combine principles from graph theory, probability theory, computer science, and statistics

$$P_B(X_1, X_2, \ldots, X_n) = \prod_{i=1}^{n} P_B(X_i|\pi_i) = \prod_{i=1}^{n} \theta_{X_i|\pi_i}$$

For simplicity of representation we omit the subscript B henceforth. If Xi has no parents, its local probability distribution is said to be unconditional, otherwise it is conditional. If the variable represented by a node is observed, then the node is said to be an evidence node, otherwise the node is said to be hidden or latent.

P (hypothesis| data) = P(data|hypothesis)P(hypothesis) / P(data)

P(hypothesis), P(data|hypothesis) and P(data) may be estimated from the available dataset. Baye 's theorem is useful in predicting the values for the historic data .In short Baye' s theorem is highly helpful in calculating the posteriori probability, that is it helps in most accurate way to forecast the future load.

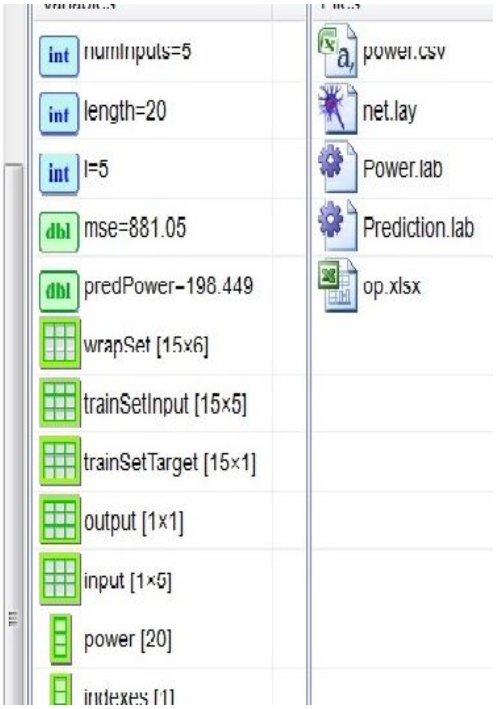

Figure 3 Power Prediction.

Figure 3 represents the power prediction using Bayesian network prediction model, using which a reliable server could be selected to complete the requested job.

V. EXPERIMENTAL RESULTS

An instance is created using the Eucalyptus cloud, these values are in a unstructured format, which leads to fact that load forecasting couldn't be possible in this form. These values are coupled to the ganglia monitoring system, now these values are coupled based on time series.

Once it is coupled, it is fed to the neural lab tool where Bayesian Network model is used for prediction of the Power consumed by the host totally. Then Host management algorithm is used to turn off the idle servers and allocate a reliable virtual machine. Based on the experiment performed, it could be verified that the prediction is almost near to the actual value. It saves huge resource from wastage.

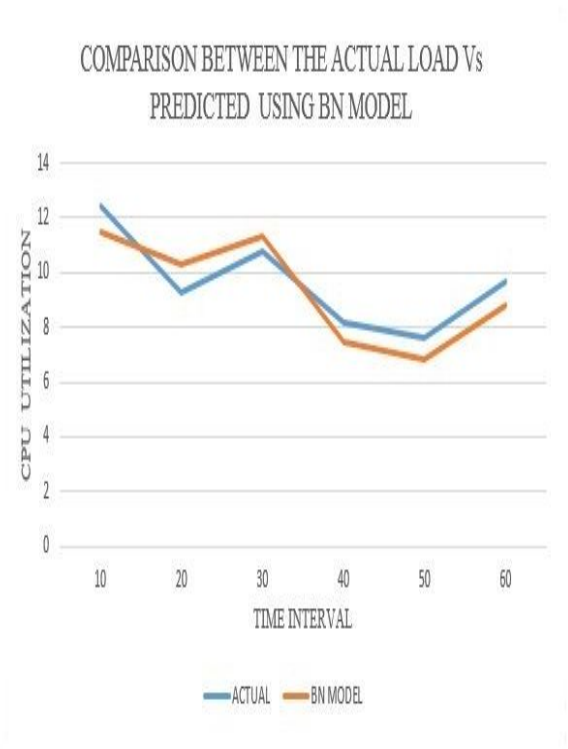

Figure 5. Comparison between the actual load and the BN model Prediction

Figure 5 states that the actual value is almost near to the forecasted value .This states that this method is most efficient in forecasting the load and idealizing the resource allocation.

CONCLUSION AND FUTURE WORKS

This paper proposed an attempt which is used for broadcasting the future load using BN model for ideal resource allocation in cloud computing. The instances were created initially using the EUCALYPTUS cloud, which were coupled using the ganglia monitoring system, then the future load has been broadcasted using the Bayesian Network model. Based on the server reliability an efficient virtual machine has been allocated for the requested Job. The current system implementation is being evaluated for its performance. Refinements in the Prediction models could be incorporated so as to improve the forecasting accuracy.

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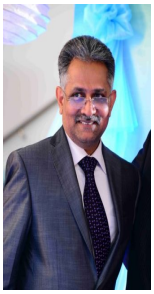

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