VOL. 10, NO. 18, OCTOBER 2015 ISSN 1819-6608
ARPN Journal of Engineering and Applied Sciences

www.arpnjournals.com

AN IMPROVED SOLUTION FOR RESOURCE MANAGEMENT BASED ON ELASTIC CLOUD BALANCING AND JOB SHOP SCHEDULING

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ABSTRACT

Cloud Computing is an internet based processor architecture that combines computing resources from various areas to reach a main goal. The Resource Management is heart of Cloud system because it maintains the entire system of Cloud environment. But it is difficult to manage the resources because they are heterogeneous and distributed in addition they were owned by different persons having different policies. In this paper, survey the various Resource Management Techniques and discuss the major issue of Resource Management and its solution. In existing system limited innovative Load Balancing and Scheduling in Resource Management process. In the proposed system, improve the previous system by using Elastic Cloud Balancing (ECB) combined with Job Shop Scheduling (JSS). ECB is techniques which avoid a situation where some cloud nodes are heavily loaded while others are unused doing little work. ECB enables to achieve even larger quality in cloud applications, seamlessly providing the amount of load balancing capacity needed in response to incoming application traffic. ECB helps to schedule computing cloud resources by using Job Shop Scheduling algorithm by considering QoS attributes.

Keywords: cloud computing, resource management, elastic cloud balancing, job shop scheduling, quality of services.

INTRODUCTION

Cloud computing is an expertise that uses the internet and central remote servers to maintain data and applications. Cloud is a mechanism that provides the ability of sharing available cloud resources and access to the distributed environment as well as virtualization technologies, scheduling techniques, load balancing, security, and resource management. The size of a Cloud may be very large, potentially scalable to the Internet size. Resource management is very important and complex problems in Cloud Computing environment [1]. The resource management problem becomes complex when resources are spread geographically, heterogeneous, dynamic and autonomous. Load balancing is the main issue in resource management [2][18]. Elastic Cloud Balancing (ECB) automatically scales its request handling capacity in response to incoming application traffic. When used in Virtual Private Cloud (VPC), can create and manage security groups associated with Elastic Cloud Balancing to provide additional networking and security options. When used in a VPC, you can create a load balancer without public IP addresses to serve as an internal load balancer. ECB supports Secure Socket Layer (SSL) termination at the Load Balancer, including offloading SSL decryption from application instances, centralized management of SSL certificates, and encryption to back-end instances with optional public key authentication.

LITERATURE REVIEW

In the existing model, Resource Management and Monitoring of agent in a Cloud Computing organize the sequence and fault-tolerant job execution with agents. Agents such as commander, resource, sensor, sentinel, and bookkeeper agents, each specialized in job submission, resource selection, resource monitoring, job deployment, and execution bookkeeping respectively [3]. The advantage is that it is the simultaneous use of multiple clusters for grid computing and XML-based resource database and resource- monitoring of mobile agents. The disadvantage is that it is poor load, memory management and low performance for network bandwidth and disk space. Network Weather Service (NWS) is dynamically characterize and forecast the performance deliverable at the application level, from a set of networks and computational networks. The advantage is that it is efficient load management, non-intrusiveness, long execution, and Ubiquity. The disadvantage is that it is works only in a meta-computing environment, and needs to be implemented in distributed computing.

Lightweight Directory Access Protocol (LDPA) is a standard protocol used to access the directory services that have become the de-facto standard. The advantage is that it is works in a Distributed environment and having object class for every resource leads to easy discovery of resources. The disadvantage is that it is difficult to find the root element in tree and difficult in resource management.
Hierarchical, Abstract owner, and Market model captures the architecture model followed in most contemporary systems [4]. It follows an order and delivery model for resource sharing, which for the most part, ignores the existing infrastructure in order to focus on long-term goals. It follows the economic model in resource discovery and scheduling, that can co- exist or work with contemporary systems, and capture the essence of both hierarchical and abstract owner model. The advantage is that it is efficient Resource Management, Resources are flexible and may also be negotiated at order time, and resource owners a better "incentive" for contributing their resources and helps recover the cost they incur, while serving grid users or finance services that they offer to

users, and also make some profit. The disadvantage is that it is designed for high level developers, not for low level ones, poor resource management and high cost.

Big Band is a light speed technique used for resources and users. The advantage is that it is designed for both low level and high level users. The disadvantage is that it is increases global warming, and high cost. Data Streaming is a more popular and recent technique, such as large-scale simulation and sensor networks, which bring new challenges to grid resource management. The advantage is that it is low cost, high Storage, and high bandwidth, which are actually tightly coupled with each other when applied to grid data streaming applications. The disadvantage is that it is lack of data sharing and QoS. Quality of service method to optimize resource grouping based on Quality of Services (QoS) criteria such as delay, bandwidth and semantics, in order to select the resources more quickly and appropriately. The advantage is that it is response to all QoS factors, accessibility to resource based on semantic requests, and decrease of delay. The main issue is that it is low load balancing, and poor Resource management.

Work Load Model consider the grid environment as a star like structure with the central node as the broker, and the edges as the nodes [5]. The advantage is that it is equally distribute the load all nodes, less time delay, and good efficiency in resource allocation [6]. The disadvantage is that it is for a static environment. We need to build it for a dynamic environment. KAPAC and Ant Colony algorithm calculate the QoS distance for resource confirmation. Here, similar resource requests are indexed and the resources are distributed. The advantage is that it will work in a dynamic environment, high guaranteed scheduling mechanism for similar requests from different users, and better performance for similar resources. The disadvantage is that it is lack of QoS factors like time delay, and availability.

Fuzzy and Semantic Theory proposes some singular characteristics that make it an especially pleasant option for many control problems [7]. It works based on semantic web development technique. The advantage is that it is efficient QoS factors, Efficiency of the design in scalability, robustness, delay, waiting time, response time and access time to resources. The disadvantage is that it is poor job refusal rate and utilization of resources. Scheduling and Data Replication is defined as assigning a job to specific resources to be performed. Data replication is multiplied and spread to different parts of a system; thus the system will reach a higher level of reliability. The advantage is that it is high resource utilization, data access based time locality, and create a new replica, based on global information of data access in the grid system. The disadvantage is that it is need to maintain same data in various sites, high cost, time delay and low fault tolerance, and low reliability.

Machine Learning (ML) is the study of the design and development of algorithms to make computers learn from experience [8], and use this knowledge for better results of a given problem. The advantage is that it is high fault tolerance, automatic searching process, and No human intervention is required. The disadvantage is that it is less level QoS, low dynamicity of workload, less maintenance of historical Data, and low Load Balancing. ECA Rule Mining resource manager rules select user participation from resource management, and the set of optimal resources that must provide job execution efficiently [9]. The advantage is that it is high fault tolerance and the disadvantage is that it is needs to update the rule often and need to optimize our rule dynamically and learning new rules.

Resource Bundle is collect the resource information from the grid nodes and maintained under the scheduler. The resource information is frequently updated under the resource management process [10]. The advantage is that it is no need to update, achieving high scalability, and designed to fetch resource in a large-scale grid Environment. The disadvantage is that it is improve security features, enhanced to manage resources under computing environment, and need to manage cost, speed, data storage, and time complexity. Resource Co-Allocation follows the Graph theoretic approach and Directed Acyclic Graph (DAG) concepts [11]. The advantage is that it is complete the maximal independent tasks and the disadvantage is that it is takes more time to complete the task.

Adaptation follows the off-line planning phase concept, where schedule plan is generated at compile-time with run-time adaptation phase. The advantage is that it is taking less time for complete the task and the disadvantage is that it is low performance. Parallel Job Scheduling is a Multi-site scheduler. The advantage is that it is good Performance and the disadvantage is that it is quality of scheduling is low. Scheduling Algorithm with Co-allocation is following the NP-complete concept [12]. The advantage is that it is minimum execution time and completion time followed in scheduling algorithm, and Quality of scheduling is little better. But lead to low Reliability. Fault Tolerance approach to build co-allocation service with reliable manner with advantage of high reliability and disadvantage of big data's not possible to transact. Rescheduling is following Job response time and system utilization factors with advantage of flexible rescheduling and accurate data transact. The drawback is that it is low Quality and only small jobs are handling. Virtualization is based on the concept of Negotiation with the advantage of Greater throughput in scheduling and the problem is lacking mechanism of advance reservation.

Processor Remapping based Rescheduling algorithm follows co-allocation, advance reservations, rescheduling, and user runtime estimates techniques [13]. The advantage is that it is flexible rescheduling with advance reservations and the disadvantage is that it is inaccurate estimations provided by users for scheduling. Backfilling is a process to collect the user's historical data to predict the future. The advantage is that it is accurate data and the disadvantage is that it is only small jobs are handling. Session Scheduling is follow the dynamic priority-based proportional pattern and reservation pattern concepts. The advantage is that it is high throughput and QoS for large amount of data. The catch is that it is low

priority for FCFS. Job Scheduling using Backfilling is a process to collect the user's historical data to predict the future and also reduces fragmentation. The advantage is that it is high preference for FCFS and the disadvantage is that only limited resources are considered. Energy Consumption scheduling algorithm based on load balancing concept [14]. The advantage is that it is reduces the Peak-to-Average Ratio (PAR) and the total cost with high energy resources consideration. The disadvantage is that it real-time not tested.

Adaptive scheduler works based on the concepts of monitoring and prediction. The advantage is that it is high performance in scheduling and the disadvantage is that needs a large amount of monitoring and prediction data. Performance Information Services for Computational Grids collects information from these sensors on computing nodes, and predicts resource usages in certain time interval ahead, using multiple models. The advantage is that it is easy way of development with high level monitoring and the disadvantage is that logging in large number nodes. The Grid Monitoring Architecture (GMA) algorithm has an advantage of monitoring and fault diagnosis for task with large number of nodes [15]. The disadvantage is that it is take more cost, time and space. The Globus Heartbeat Monitor system is able to monitor High performance resource with less cost. The downside is that it is limited portion monitoring. Ganglia use the following factors for monitoring the resources. Such as, Host name, Identification, Memory capacity, Name and version of operating system, File system data, the processor load, and so on through carrying on the monitoring to the cluster. The advantage is that it is focus to monitor more resource and the disadvantage is that low accuracy.

Grid Harvest Service (GHS) system is a performance evaluation and task scheduling system for solving large-scale environments. The advantage is that it is a well systematic structured network with high accuracy and the disadvantage is that missing the concept of reservation. Resource Prediction System (RPS) is a resources-oriented system for online prediction and scheduling. The advantage is that it is high priority for reserved job and the disadvantage is that limited resource management. Grid Remote Procedure Call (RPC) use the following concepts such as Collectors of Resource Information (CORI) model designs a performance subsystem to enable, Distributed Interactive Engineering Toolbox (DIET) model interfacing with third-party performance prediction tools. The advantage is that it is high level resource management and the disadvantage is that less number of programming languages support.

In Literature, Survey, those existing system where lack in load balancing [16] [17]. This leads to poor resource allocation, time delay, and poor prediction. Overcome those disadvantages by using ECB. ECB optimizes fault tolerance by adjusting capacity according to incoming application traffic. Users can enable ECB within a single availability zone or across multiple availability zones to maintain consistent application performance.

PROPOSED SYSTEM

Industry, business and home users are handling the more complex and challenging demands on the network so entering a new era of computing called Cloud Computing. Cloud technologies allow large-scale parallel computing over distributed resources which is managed by different organizations. The crucial issue for achieving high performance is Cloud allocation of various distributed computing resources. Cloud computing appears to be a promising trend for reasons namely: Cost effective utilization of available resources, Easy to collaborate with any organizations, Solve complex problem in quick time.

Motivation and objective

Cloud Computing is an extension of distributed computing, Sharing of resources and services in a large scale distributed environment, Support the virtualization Technique to the resource, Open standards are used, More loosely coupled, heterogeneous, and geographically dispersed and high level Quality of Service (QoS) is achieved for both service provider and requestor. Big Cloud system Resource Management is complex one. By scheduling properly, the resources were allocated and consume by users perfectly.

The main objective of proposed work is to provide efficient cloud balancing with scheduling in Cloud environment for submitted job, computing available resource, and Dynamic Price. The Existing systems have a Limited innovation for resource management process. The proposed work provides the enhanced algorithm for load balancing namely Elastic Cloud Balancing (ECB) and also improves the quality of scheduling based on Job Shop Scheduling (JSS) algorithm by considering the Cloud as Directed Acyclic Graph (DAG). The Proposed Resource Management utilizes the more number of QoS attributes for better enhancement of existing Resource Management. This research work gives a comprehensive solution to design a Cloud balance by Resource Management for a given task. Resource Management will provide an efficient Resource allocation automatically for a user and provide an Enhanced Cloud balancing system for multi-tasking. Scheduling is the resource allocation request based on Job Shop Scheduling. Fault can be identified and load can be balanced very quickly in the field of Cloud Computing.

Architecture of elastic cloud balancing

Cloud balancing is an important role of scheduler from the available best cloud node based on workload of each resource with respect to price and polices. Cloud balancing is not only load balancing of computing resources, it also balance the many Quality of Service attributes like balance the dynamic price, balance the execution time, balance the polices, and balance the job's workload. ECB is able to dynamically adjust the processing capacity of back-end server with the applied load. Besides it could make full use of the 'on demand' feature of cloud computing, ECB leads to a better application of prediction based load balancing in Cloud Computing. It concludes that compared with the

traditional improved resource management, ECB is more reasonable for providing scalability and high availability.
The cloud users submit the jobs through the cloud portal with interoperability manner. Submitted jobs workloads are balance as balanced tasks (T1, T2…….Tn) as shown in Figure-1.The Balanced tasks are implemented through proposed algorithm namely Elastic Cloud Balancing (ECB) with Job Shop Scheduling (JSS). The proposed algorithms are follow the higher level of QoS Attributes like dynamic price, execution time, polices for job and resource, and balanced job's workload. Cloud provider's computing resources are equally loaded.

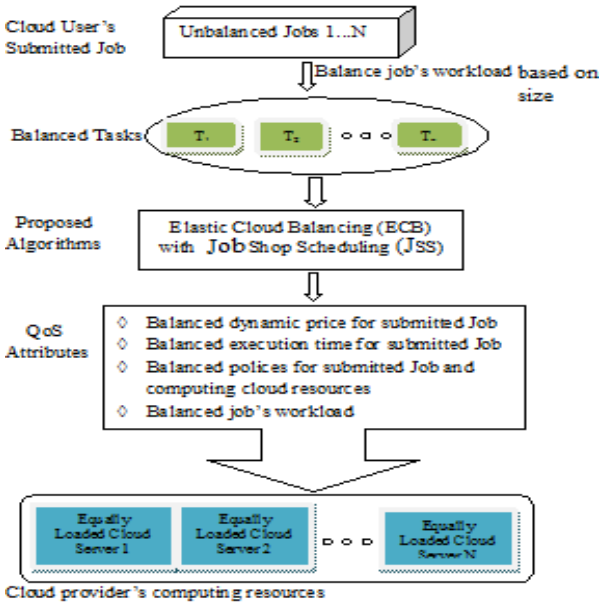

Figure-1. Architecture of elastic cloud balancing.

Elastic cloud balancing algorithm

The steps for Elastic Cloud Balancing based on dynamic price, execution time, polices for job and resource, and balanced job's workload are given below:
1. Let N be the number of resources with balanced price and polices in the cloud Zone.
2. Let S be the status of the cloud resources.
3. Let J be the number of incoming jobs with balanced execution time, polices and workload
4. Activities (arrival of any new job, completion of any job, arrival of any new resources, withdrawal of any existing resources)
4.1. Loop
If any of the activity happens
While HeavilyLoaded_list is not empty
Selected job=J;
If LightyLoaded_list is empty
Check the status of the resources
If S=available
Let B=Cloud Portal bandwidth
b=Incoming Job bandwidth
Check Bandwidth B
If B=b
Allocate the resource
Else
Adjust the capacity of B
Else
Add J1 to the waiting queue.
Else

Migrate (LightlyLoaded_list[first], HeavilyLoaded_list[n],j); //update the database
End While
End Loop
5. Repeat step 4

PERFORMANCE ANALYSIS OF ECB ALGORITHM

In the Experimental setup, the cloud nodes are arranged in the simulated Local Area Network (LAN) based on graph network. The output of the Job Shop scheduler is a list, which provides information about the host on which each task should be executed, the starting time of that task, and the time when data transfer should take place as shown in Figure-2.

In Table-1, the proposed ECB algorithm compare with the existing Honeybee Foraging scheduling algorithm with respect to the execution time and simulation. In this experiment, the given job is file management cloud service. The ECB algorithm reduces the execution time based on simulation value. The proposed ECB algorithm gives a better result in the cloud network as shown in the graph Figure-3.

Figure-2. Experimental result of ECB prediction.

Table-1. Comparison of ECB with honeybee foraging algorithm.

Simulation value	Honeybee foraging algorithm (ms)	ECB algorithm (ms)
1	8000	7718
2	9000	8878
3	11000	10621
4	12000	11134
5	14000	13458
6	17000	16897

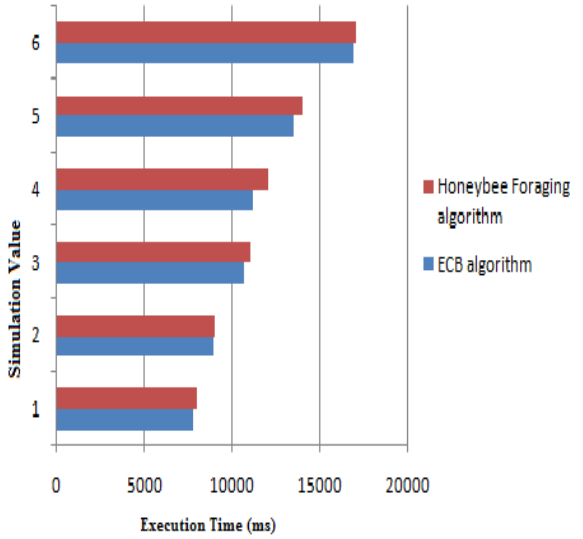

Figure-3. Performance analysis of ECB algorithm.

CONCLUSION AND FUTURE WORK

This paper is introduced an extensive literature review for Load Balancing. ECB is used to provide enhanced load balancing with user and provider satisfaction. Providing high security backup solutions is an important issue in Job Shop Scheduling model. The Proposed ECB can be enhanced to provide real time interoperability between Cloud models. In future work need to focus on other factors like Virtualization and Negotiation.

ACKNOWLEDGMENT

The authors would like to thank Sathyabama Univesrsity (India) and Special thanks go to Sur University College (Sultanate of Oman) for providing us with various resources and an unconditional support for carrying out this study.

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