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Task Scheduling for Profit Maximization in Hybrid Cloud-using PSO MOBA

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Abstract - In today's scenario, cloud computing has become an essential need storage and access of large amount of data from anywhere at any time. In this fast moving technological world, quick satisfaction of users' data needs becomes necessary. A private cloud provider aims to achieve profit maximization by intelligently scheduling tasks while guaranteeing the service delay bound of delay-tolerant tasks. However, the aperiodicity of arrival tasks brings a challenging problem of how to dynamically schedule all arrival tasks given the fact that the capacity of a private cloud provider is limited. For this to be possible, the servers in the cloud data centers must be efficient and the user requests/tasks must be scheduled to them appropriately so as to improve. Cloud service provider need to manage the resources and as well as optimize the resources to maximize the profit. To manage the profit we consider the M/M/m queuing model which manages the queue of job and provide average execution time. Resource Scheduling is one of the main concerns in profit maximization for which we take HYBRID PSO-MOBA as it resolves the global convergence problem, faster convergence, less parameter to tune, easier searching in very large problem spaces and locating the right resource. In HYBRID PSO-MOBA we are combining the features of PSO and MOBA to achieve the benefits of both PSO and MOBA to achieve the benefits of both PSO and MOBA and have greater compatibility.

Keywords: Cloud computing, Profit Maximization, Admission Control, SLA, Optimization, Hybrid Particle Swam Optimization , Multi Objective Bat Algorithm.

I. INTRODUCTION

Cloud computing is a technology which reduces the need for storing data redundantly in large number of physical servers and increases ease in sharing of data. But such advantages do not come free of cost. The cloud service providers provide their service to their customers on pay and use basis. In the end, the aim of any business is to increase its profit. The larger the number of client requests is satisfied, the largest the profit for the cloud service provider. So it is necessary that the servers in the cloud data centers are utilized efficiently.

Cloud computing is not a total new concept; it is originated from the earlier large-scale distributed computing technology. However, it will be a subversion technology and cloud computing will be the third revolution in the IT industry, which represent the development trend of the IT industry from hardware to software, software to services, distributed service to centralized service. Cloud computing is also a new model of business computing, it will be widely used in the near future. The core concept of cloud computing is reducing the processing burden on the users‟ terminal by constantly improving the handling ability of the "cloud", eventually simplify the users‟ terminal to a simple input and output.

The uncertainty and aperiodicity of arrival tasks makes it difficult to predict the future arrival tasks, and brings a major challenge to operators of a private cloud. Therefore, it is possible that a private cloud provider can not satisfy all arrival tasks with its limited resources if the arrival tasks are massive. The existing works usually provide an admission control mechanism to refuse some of arrival tasks that exceed the capacity of a private cloud. Nevertheless, this will decrease the throughput of a private cloud, and inevitably cause revenue loss to the private cloud provider. However, the mechanism of hybrid clouds enables a private cloud provider to make use of public clouds where resources are delivered in the form of virtual machines (VMs) when a resource of a private cloud is fully occupied.

Cloud service provider (cloud) includes the administrator of the cloud and cloud servers. The cloud stores a collection of data from owners, accepts download request from any users, as well as helps owners and users conduct onerous computations.

II. SYSTEM MODEL

The objective of the project is to maximize the profit in cloud which needs to consider, Resource scheduling, Power consumption model, QOS (Risk and Uncertainty), Optimal speed and Size of servers. In order to overcome these problems proper admission control, resource scheduling and optimal multiserver configuration is to be performed. To maximizing the profit the cloud has to take profit maximization technique which minimizes the cost and optimizes the profit. Therefore Cloud service provider has to manage and optimize the pool of resources along with the cloud user satisfaction and within the given infrastructure to its deployment. Cloud Computing provides computing as aUtility. Like measuring any other utility (such as electricity, water, etc) computing should only charged as per usage i.e. Pay-as-you-go on basis of cloud.

A job is submitted to cloud by a client. The job or request first enters the queue. To avoid unexpected loss we need to Concentrate on risk and uncertainty by controlling the admission of job and finally once the SLA is signed the Optimized resource allocation is done which will compute fast with efficient processing. Once the job is assigned to VMs it should start the process and complete as per required.

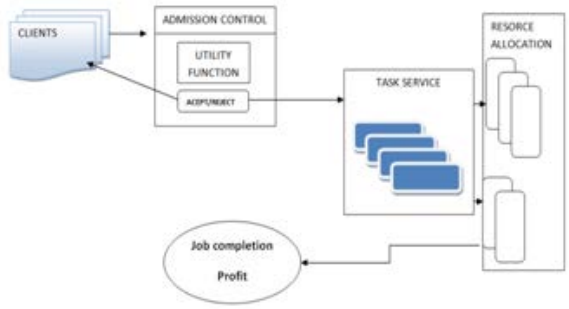

Fig. 2.1 Proposed Framework for Profit Maximization in Cloud Computing

III. PREVIOUS WORK

During past years much work has been contributed by the researchers on Cloud Computing. Amirthavarshini LJ, Varshini R, Dr.V.Jeyabalaraja [1] proposed that in the existing system, tasks are allocated to cloud servers on the basis of queuing system. Once a task arrives in the queue, it waits until a server is ready to process it. Deciding which server will process a task in a serialized manner will not result in efficient usage of data center resources. It is necessary to decide which server must process the request so that the waiting time is reduced, so that more number of user requests may be satisfied in the same stipulated time and results in profit maximization.

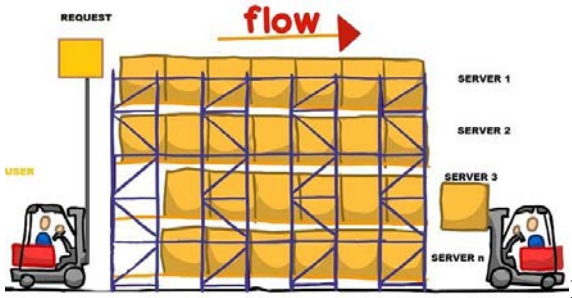

Fig. 3.1 Example representation of the existing system

The above picture is an example representation of the existing system. Even though the waiting time for the newly arriving request will be lesser if allocated to server 3, it still waits to be allocated to server 1 due to serialization. The major disadvantage of this system is that, it does not handle traffic intensity efficiently. Users may submit many tasks at a time because of this bags-of-task will appear, increasing the waiting time for each task.

Haitao Yuan, Jing Bi, Wei Tand and Bo Hu Li [2] proposed that Resource allocation is a basic problem in cloud data centres. The objective of resource allocation is to reasonably provision limited resources in cloud data centres to process consumers' arrival tasks with the constraint that the performance requirement of arrival tasks must be ensured. So far, there have been a growing number of recent studies to investigate the problem of resource allocation in cloud data centres. Authors proposed a lightweight simulation system to model real-time resource allocation in cloud data centres. Authors presented a method to optimize data centre resource and to support green computing according to application demands. Authors studied the effect of future workload information on dynamic provisioning of resources, and presented a decentralized algorithm to dynamically provision resources. However, all above works focus on resource allocation without the consideration of profit maximization of a private cloud.

Dr. Salu George [3] discussed a method in which Profit maximization is a process by which a firm determines the price and output level that returns the maximum profit. Any firm must ensure that it provides the products at cheaper rate along with quality. They should not provide low quality and user satisfaction is important. Cloud computing takes technology, services and application on remote system through Internet, into self service utility. Computing as utility is one of the biggest business today IT is revolving to and apart from providing services at low these firms are interested in gaining the maximum profit on large investments made on data centre of cloud.

N.Ani Brown Mary [4] analyzed that Cloud computing is an emerging technology in the IT world. Some features of cloud, such as low cost, scalability, robustness and availability are attracting large-scale industries as well as small business towards cloud. Cloud computing is a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. At present some major cloud providers are Amazon Web Services, Microsoft Azure and Google AppEngine. These cloud providers offer many type of services for monitoring, managing and provisioning resources and application services. A cloud provider can support more number of users with same number of resources. During the busy hours service provider needs more resources and at other periods of time load on the service providers are very less, so there is a need of continuous scale up and scale down the service providers infrastructure of resources. These scale up and scale down operations require dynamic provision.

M. Manikandan and M.Suguna [5] analyzed that Cloud computing is a solution for addressing challenges such as licensing, distribution, configuration, and operation of

enterprise applications associated with the traditional IT infrastructure, software sales and deployment models. Migrating from a traditional model to the Cloud model reduces the maintenance complexity and cost for enterprise customers, and provides on-going revenue for Software as a Service (SaaS) providers. Clients and SaaS providers need to establish a Service Level Agreement (SLA) to define the Quality of Service (QoS). The main objectives of SaaS providers are to minimize cost and to improve Customer Satisfaction Level (CSL). In this paper, we propose customer driven SLA-based resource provisioning algorithms to minimize cost by minimizing resource and penalty cost and improve CSL by minimizing SLA violations. The proposed provisioning algorithms consider customer profiles and providers _quality parameters (e.g., response time) to handle dynamic customer requests and infrastructure level heterogeneity for enterprise systems. We also take into account customer-side parameters (such as the proportion of upgrade requests), and infrastructure-level parameters (such as the service initiation time) to compare algorithms. Simulation results show that our algorithms reduce the total cost up to 54 percent and the number of SLA violations up to 45 percent, compared with the previously proposed best algorithm.

IV. PROPOSED METHODOLOGY

The proposed system aims to efficiently allocate the arriving tasks to the cloud servers in such a way that the waiting time of the requests is reduced. The number of instructions per second is an approximate indicator of the likely performance of the processor. This is not a constant for a given processor; it depends on how particular instruction or process being run interacts with the processor. Hence the processing time of two servers with the same core and architecture may still vary in milliseconds, due to usage, wear and tear, etc. So considering all this request is allocated to the server which has a lesser waiting time.

The objective of the project is to maximize the profit in cloud which needs to consider, Resource scheduling, Power consumption model, QOS (Risk and Uncertainty), optimal speed and Size of servers. In order to overcome these problems proper admission control, resource scheduling and optimal multiserver configuration is to be performed. To maximizing the profit the cloud has to take profit maximization technique which minimizes the cost and optimizes the profit. Therefore Cloud service provider has to manage and optimize the pool of resources along with the cloud user satisfaction and within the given infrastructure to its deployment. Cloud Computing provides computing as a Utility. Like measuring any other utility (such as electricity, water, etc) computing should only charged as per usage i.e. Pay-as-you-go on basis of cloud. A job is submitted to cloud by a client. The job or request first enters the queue. To avoid unexpected loss we need to concentrate on risk and uncertainty by controlling the admission of job and finally once the SLA is signed the optimized resource allocation is done which will compute fast with efficient processing. Once the job is assigned to VMs it should start the process and complete as per SLA.

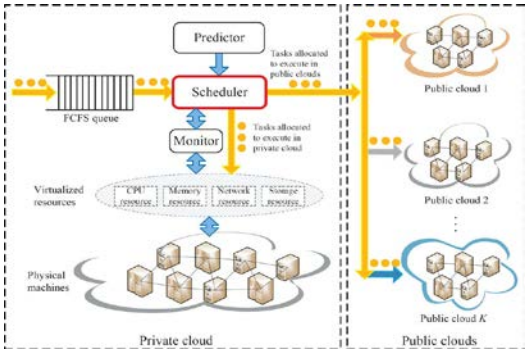

Fig. 4.1. Architecture of task scheduling in hybrid clouds.

We propose a HYBRID PSO-MOBA, (Hybrid Particle Swarm Optimization and Multi Objective Bat Algorithm)

which combines PSO(Particle Swarm Optimization) and MOBA(Multi Objective Bat Algorithm). PSO search takes place in local space and global updation is done by MOBA.

Cloud user submits the job to service provider where we take the probabilistic optimization of all jobs in queue through M/M/m queuing model. Then we take multi objective resource allocation to services in by MOBA, where the first objective is to consider cloud user‘s and then client willing to pay double and finally we need to consider the expected service time. The process updates in global search space through MOBA.

Admission Control

Profit aware cloud considers utility function which is price that the customer is willing to pay. If the job can completed within specified response time than the job is accepted but a service provider is also doing business where gain cannot only relay on admitting possible things but retaining its customers in a competitive cloud market is important as rejection will lead to loss of business. Therefore, a service provider should consider yield function with weight functions of cost minimizing (CPU and time) and trustworthy customer (Cloud Client Register with service provider) to sustain in the market for long (i.e. regular at payment).

To maximize the profit

When the server size is small the waiting time of the request is long also gain and the service charge is low. If the server size increases the waiting time will become decreased also the service charge and the gain are increased. It is also applicable to the speed of the server.

Waiting time of the request is increased, gain and the service charge is decreased when the server speed is low. Waiting time of the request is decreased, gain and the service charge is increased when the speed of the server is high. Cloud service provider manages the multiserver System through M/M/m Queuing System and optimizes the resource using Hybrid PSO-MOBA. Resource allocation according to admission control and profit aware SLA. To Provide efficient multiserver (powerful) than more servers as it will increase cost of renting and power consumption. EA Scheduling proprietary algorithms, coupled with advanced heuristics, deliver highly optimized schedules blisteringly fast even for the largest and most complex scheduling problems.

Hybrid PSO-MOBA

Initialization:

Initialize a population array of particles with random

positions and velocities on *D* dimensions

in the search space.

Iterative loop:

For each particle, evaluate the desired optimization fitness

function in *D* variables.

Compare particle‘s fitness evaluation with its *pbesti* . If

current value is better than

pbesti, then set *pbesti* equal to the current value, and _ *pi*

equal to the current location

_*xi* in *D*-dimensional space.

Identify the particle in the neighbourhood with the best success

so far, and assign its

index to the variable *g*.

Repeat:

Change the velocity and position of the particle according to the following equation

_

_*vi* ← _*vi* + _ *U*(0,*φ*1)⊗(_ *pi* − _*xi*)+ _ *U*(0,*φ*2)⊗(_ *pg* −

_*xi*),

_*xi* ← _*xi* + _*vi* .

Until a complete schedule is constructed

Apply MOBA search process

Apply the global updating rule

If a criterion is met (usually a sufficiently good fitness or a

maximum number of

iterations), exit loop.

end loop

MOBA search process

Objective function f1(x), …….fk(x),x=(x1,….xd)r

Initialize the bat population xi(i=1,2,……,n) and vi

For j =1 to N

Generate K weights wk>=0 so that ΣK

k=1 wk=1

From a single objective f=ΣK

K=1wkfk

while(t<Max number of iterations)

Generate new solutions and update by (1) to (3)

If(rand>ri)

Random walk around a selected best solution
End if
Generate a new solution by flying randomly
If (rand<Ai&f(xi) < f(x*))
Accept the new solutions, and increase ri& reduce Ai
end if
Rank the bats and find the current best x∗
End while
Record x∗ as a non-dominated solution
End
Postprocess results and visualization

Algorithm: Hybrid PSO-MOBA

V. SIMULATION/EXPERIMENTAL RESULTS

Service provider allocates resources and schedules tasks in such a way that the total profit earned is maximized. Our methodology can be applied to other pricing models. The cost of the service is also reduced. Managing Multiserver through M/M/m Queuing model will provided efficient resource management. Optimizing Resources through MOBA will achieve Faster Global convergence. This effective resource optimization will lead to best utilization of resources and as well as Effective and powerful server which ultimately maximizes the profit.

VI. CONCLUSION

Optimization of cost model, agility and scales are primary value proposition of adopting a cloud computing based on pay by use, scalable infrastructure and platform services. Organization need to analyze their application portfolio to profile applications which would be adaptable for cloud computing models. The Cloud infrastructure once setup is business investment which needs to return maximum profit over the time period for which we need to consider mainly low power consumption, high performance

computing, optimized resource allocation with SLA policy satisfaction.

VII. FUTURE SCOPES

In future, we need to develop different factors of VM allocation, energy efficiency, different levels of service, and cost of network. We need to develop individual factor based profit system, but considering all factors ensures no loss in business, which itself ultimately leads to profit. A perfect framework with all the factors with market oriented approach is to be enhanced.

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