Performance Analysis For Optimization of Storage Reallocation Strategies In Cloud Environment

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***Abstract* — Cloud computing promises cost effective and agile computing resources for users.It improves efficiency ,save time and gives good return on investment in business.. Resource allocation guarantee that their customer get best performance or plan which services to offer to get the best return on investment. This work study and analyze existing resource allocation strategies also proposes hybrid solution for the development of high performance of resources allocation strategies which mainly focus on two Overbooking, & Just In Time (JIT), through implementation with help of Cloud Report Simulator. By combination of JIT and Overbooking simulation result shows that on average it increase resource allocation rate. It also possible for Cloud provider to execute maximum number of cloudlet(task) on minimum virtual machineIt also improved utilization rate with limited constraints.**

***Keywords*—**
Cloud computing, Economic, Resource Allocation, Storage, High utilization strategies, JIT ,Overbooking.

I. INTRODUCTION

Cloud Computing environment is used by most of IT industries to meet their high computational requirement with maximum system utilization. To achieve this, cloud provider need to ensure that resource being provided are highly available with optimizing cloud infrastructure to reduce their operational cost. On the other hand cloud users need to ensure that their application receive the best performance from the cloud.

System many times includes poor performance, high latency and high overhead, for example competitive economy resources are typically "reserved by m participants for the duration of a negotiation. In most cases ,there are only a n "winning" participants, therefore all other "m-n" reservation are essentially wasted for the duration of that negotiation. Moreover, there is an opportunity cost to reserving resources during a negotiation. as they will not be available for other negotiations that begins during the interval of the first negotiation. This type of scenario is clearly evident in auction or tender markets, however it can also seen in any negotiation in which parties are competing against one another for the goods on offer. In any case, this wasteful negotiation process is expensive in both time and cost and therefore reduces the overall utilization of System. Resource allocation is one of the most important (and difficult) tasks in Cloud systems This paper[1] gives the development of resources allocation strategies which mainly focus on three strategies. The input parameters to resource allocation vary based on the services, infrastructure and the nature of applications which demand resources. Paper [1] introduced different resource allocation Strategies. and it impact on cloud environment. So for proposed project work we examine two high performance resource allocation strategies for solution.

- **JIT(Just In Time)**
- **Overbooking**

We studied this strategy in details.JIT algorithm mainly paying attention on minize effect of delay in resources request also provide facility to resource provider to allocate resource at last possible moment. In our Overbooking Algorithm cloud provider allocate more resources than available one. So in proposed project we worked on this two algorithm .after that implement and analyzed experiment result of both algorithm. Then combine both Algorithm, and found out Hybrid solution to improve the performance..

This proposed work make analysis of proposed hybrid solution .To check experimental result we used **Cloud Report** as simulator, its simulation engine provides an easy-to-use user interface, report generation features and creation of extensions in a plug-in fashion[12]. Database used for the project is managed with help **SQLite database Server**. The main advantage to use of SQLite server is that no separate server process to install, setup, configure, initialize, manage, and troubleshoot[13].

Finally Simulation results a shows that on average, the optimized resource allocation algorithm that is JIT with Overbooking can be used for efficient resource allocation. Using this resource allocation Strategies cloud provider can efficiently allocate the available resources also will able to decide how much profit he can be gained with allocating limited resources.

II. LITERATURE REVIEW

In our previous work [14] we discussed following :Resources allocation integrates cloud provider activities for utilizing and

allocating scarce resources with limit of of cloud application.Criteria used for testing resource allocation is access of resources ,Fault tolerance,.Power distribution reliability, scalability.[2]

Cloud service provider examine different Situation to consider while allocating resources: Like ,Resource contention ,Scarcity of resources ,Resources Fragmentation,Over provisioning Resources,Under provisioning Resources. Input parameter to RAS and the way of resource allocation vary based on services, infrastructure and nature of application which demand resources.Paper[3] summarizes the classification of RAS and its impacts in Cloud Environment.Following are types Resource Allocation Strategies:Execution time ,Policy, VM(virtual machine),Gossip,Utility Hardware Resource Dependency ,Application.

A. EXECUTION TIME

Paper [3] discuss about actual task execution time required and preemptable scheduling is considered for resource allocation, overcomes the problem of resource contention and increases resource utilization by using different modes of renting computing capacities.

B. POLICY

Centralized user and resource management lacks in scalable management of users, resources and organization-level security policy. Paper [4] proposed a decentralized user and virtualized resource management for IaaS by adding a new layer called domain in between the user and the vritualized resources. Based on role based access control(RBAC), virtualized resources are allocated to users through domain layer, which used the most- fit processor policy for resource allocation. The most-fit policy allocates a job to the cluster, which produces a leftover processor distribution, leading to the most number of immediate subsequent job allocations.This policy is practical to use in a real system. [5]

C. GOSSIP

Cloud environment differs in terms of clusters, servers, nodes, their locality reference and capacity. The problem of resource management for a large-scale cloud environment (ranging to above 100,000 servers) is addressed in [6] ,general Gossip protocol is proposed for fair allocation of CPU resources to clients .

D. UTILITY FUNCTION

There are many proposals that dynamically manage VMs in IaaS by optimizing some objective function such as minimizing cost function, cost performance function and meeting QoS objectives. The objective function is defined as Utility property which is selected based on measures of response time, number of QoS, targets met and profit [7]

E. HARDWARE RESOURCE DEPENDENCY

To improve the hardware utilization, Multiple Job Optimization (MJO) scheduler is proposed. Jobs could be classified by hardware-resource dependency such as CPU-bound, Network I/O-bound, Disk I/O bound and memory bound. MJO scheduler can detect the type of jobs and parallel jobs of different categories. Based on the categories, resources are allocated. This system focuses only on CPU and I/O resource. [8].

F. AUCTION

Cloud resource allocation by auction mechanism is addressed In Paper [9]. The proposed mechanism is based on sealed-bid auction. The cloud service provider collects all the users' bids and determines the price. The resource is distributed to the first kth highest bidders under the price of the (k+1)th highest bid. This system simplifies the cloud service provider decision rule and the clear cut allocation rule by reducing the resource problem into ordering problem. But this mechanism does not ensure profit maximization due to its truth telling property under constraints.

RELATED WORK

This paper mainly focus on market based strategies and dynamic cloud environment .This work concentrate on high performance resource utilization strategies and that can be deployed in cloud

- .Overbooking.
- Just in time

These strategies are examined experimentally so that it can be used within dynamic cloud environment.

I. OVERBOOKING

Overbooking strategy used in Economic model can improved the system utilization rate and occupancy..This strategy is capable to allocate the resources dynamically so easily overcome the problem of resource allocation .so this strategy used by in auction based resource allocation model for a resource provider. Overbooking model from revenue Management to manege cancellation and no-show of reservation in a grid system. So Same technique can be used for cloud environment for resource allocation. Many time resource provider is faced with a prospect of loss of income and lower system utilization because during period of high demands resource provider reject booking from potential user,who are committing to use the resources and willing to pay for higher price. overbooking offers solution for above problem ,by allowing the resource provider to accepts more reservation than capacity .Hence it can be effectively used to minimize the loss of income.

In paper [10] discussed about American Airline ,50% of the booking were result in cancellation or no-shows. many time it found that 15% of the flight seats would be unused, if booking were only limited to the capacity of plane. Most airlines routinely overbook aircraft in an attempt to maximize occupancy and therefore revenue by ensuring they have maximum no of passengers on a flight.Without overbooking full flight often depart with 15% of seats empty.

Paper [11] explained various overbooking model ,also integrates overbooking into a capacity allocation heuristic to estimate a suitable quota for different user ,along with that calculate cost and penalties of each reservation. This paper focus on, Overbooking Strategy is to improved the expected profit,.With overbooking resources /services are get on time,waiting period of services is less ,but most of the time resources are wasted,need to calculate workload every time

II. JUST IN TIME

Just-In-Time (JIT) bidding is employed to minimize the effect of auction latency by committing/reserving resources to be allocated by the resource provider at the last possible moment. Just in time bidding is used during the auction process. It may happen that during the negotiation resource state may change and therefore invalidate provider valuation (or bid). In general there are two way to ways to minimize the effect of latency .

Reducing the duration of auction. The problem with this approach is that there is minimal time for providers to discover the auction and to compute their bids.

Bid as late as possible the advantage with this approach is that provider can compute their bids with the most up to date resources state and resources are reserved for shorter time .Primary problem with this approach is time sensitivity, the auction can missed if the bid is too late or experiences unexpected network delays.

For just in time bidding process we consider the point Profit maximization due to truth telling property, under constrains, Less overhead, Based on agreement forty percent time resources and services are available for cloud users [1][With used of two main Strategies we just try to improve benefits of cloud provider as well as maximum satisfaction to cloud users or customers. We used here different combination CPU scheduling policies to arrange user request or process in the implementation part.

III. PROPOSED PROJECT WORK

Proposed Project work implement the overbooking and JIT in different way and examined it in cloud report environment.

Following are the phases of Proposed Project work :

Phase I: Study of strategies for resource allocation which include overbooking and JIT,design algorithem for overbooking

Phase II: Implementation & Analysis of above Strategies for analysis of performance

Phase III: Comparative result and their analysis

Phase IV: Proposed a Hybrid Solution for optimized resource allocation

Phase V: Implementation of Proposed Hybrid Solution

Phase VI: Analysis of implementation of proposed work on the given Platform

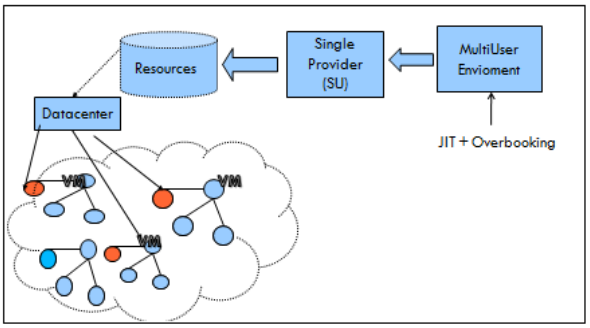


Fig.1 Architecture of Proposed Model

IV. RESEARCH METHODOLOGY

In a cloud computing environment, multiple customers are submitting job request with possible constraints that is multiple users are requesting same resource. For example in a high performance computational environment which mainly deal with scientific simulations such as weather prediction, rainfall simulation, monsoon prediction and cyclone simulation etc which requires huge amount of computing resources such as processors, servers, storage etc. Many users are requesting these computational resources to run their model which is used for scientific predictions. So at this situation it will be problem for cloud administrator to decide how to allocate the available resources among the requested users.so the proposed model is design and we try to find out solution with three main strategies

4.1 DETAILS OF PROPOSED STATERGIES

4.1.1 OVERBOOKING ALGORITHM

Parameter consider for overbooking algorithm

SR.NO	PARAMETER S
1	Job **j** process)
2	Duration **d** (life time)
3	Number of Nodes **n**
4	Execution Start time **Tstart**
5	Execution end time **Tend**(finish)

Table 4.1: list Parameter consider for overbooking Algorithm

The following algorithm is used inserting the request into the schedule which has anchor point Ts where resources become available and points where such slots end Tendslot by using short process (job).

STEP 1:

1) Select, if available, statistical information about the runtime of the application and the runtime estimation of the user. Compare them with the given runtime for the new job j.

2) If the estimated runtime d is significant longer than the standard runtime of the application or the user is tending to overestimate the run time of jobs, then mark the application as promising for overbooking.

3) Assuming a uniform distribution, the duration of the job d can be adjusted to

d1 = d/1+maxPoF, where maxPoF is the maximum acceptable probability of failure.

4) The time interval Oj = d – d1 can be used for overbooking.

STEP2:

1)Find starting point Ts for job j, set Ts as anchor point ,Scan the current schedule and find the first pointTs>= Tstart where enough processors are available to run this job.

2)Starting from this point, check whether Ts + d <= Tend and if this is valid, continue scanning the schedule to ascertain that these processors remain available until the job's expected terminations + d <= Tendslot.

3)If not, check validity of Ts + d1 <= Tend and whether the processors remain available untilthe job's expected termination reduced by the time usable for overbooking Ts +d1 <= Tendslot.

4) If successful, mark the jobas overbooked and set the job duration d1 =Tendslot-Ts.
5) It not, check, if there are direct predecessors in the plan, which are ending at Ts and are usable for overbooking. Then reduce Ts by the time a = MINk{Ok} of those jobs k and try again.
6) Ts - a+ d1 <= Tendslot. (In this case,other jobs are also overbooked; neverthelesstheir runtime is not reduced. If they do not finish earlier than excepted, they can still finish and the overbooked job will be started after their initially planned completion.)
7) If successful, mark the job as overbooked and set the job duration **d1 = Tendslot - (Ts- a).**

STEP 3:
Update the schedule to reflect the allocation of r processors by this job j with the duration d0 for the reservation h = [Ts, min (Tendslot, Ts +d)], starting from its anchor point Ts, or earlier Ts- a.
STEP 4 :
If the job's anchor is the current time, start it immediately.

Note: The algorithm defines that a job k which was overbooked by a job j should be resumed until its completion or its planned completion time if it had not finished at time Ts- a. Considering SLA bound jobs, this might be doubtful if fulfilling the SLA (Service Level Agreements) of job j would be more profitable than of job k. However, the reservation duration of job k is only reduced after curtaining the duration of job j. Hence, the provider has no guarantee that the SLA of job j would be not violated if stopping the job execution of job k. Consequently, the scheduler should act conservatively and provide for job k the resources as required and prevent an SLA violation of job k.

4.1.2 JIT ALGORITHEM

In Just in Time (JIT) the process which be same only difference that ,the objective of the JIT is to schedule a given set of jobs on a single machine. Every job has a release date that represents the time at which production or assembly of the batch can begin at the earliest. Since the batches are produced in series, the jobs are scheduled on a single machine

With JIT and Overbooking strategies proposed work try to find out solution improve to overall system utilization.we also check result for different strategies combination for CPU state like CPU in busy,Idle state.to execute the users requests or process.

4.1.3 LOGIC FOR DIFFERENT STRATEGY COMBINATION

Here to discuss we Considered ,

- **G** (Guaranteed Bidding Strategy) ,
- **O**(Overbooking Strategy)
- **S + O** (Second Chance Substitutes and Overbooking)
- **R+S+O** (Reservations, Substitutes, and Overbooking)

We consider a main resource for example cpu in cloud and number of small resource (having bandwidth, time ,cost, power, RAM etc) which will access the main resource.

I) G (Guaranteed Bidding Strategy): In this strategy the main resource i.e. CPU will guarantee all the small re source that each resource will get sufficient time and capacity to access main resource. Such that provider i.e main resource guarantee of satisfaction to small resource. During duration of the auction main provider have reserved their resources with very less probability of winning the auction since every resource is guarantee the capacity.
II) O (Overbooking Strategy) :In this strategy the main resource cannot guarantee the proper utilization of workload to all the small resource. In this scenario the average workload and percentage of work on each small resource is double then the guaranteed to work item assigned to each resource my main resource.
III) S+O (Second Chance Substitutes and Overbooking); In this scenario the work item are divided on actual utilization of capacity by small resource. In this second chance is given to the resource if its fail to utilize the main resource in first chance ,but this will be base on other resource capacity, since some resource does not have sufficient capacity to access resource then other resource is given second chance to access resource.
IV) **R+S+O** (Reservations, Substitutes, and Overbooking): same as the above only here second change is given to resource if its fail to make it in first chance**.**

The proposed project work implement using java language and cloud report simulator used for cloud environment setup.

V. RESULT ANALYSIS AND DISCUSSION

5.1 EXPEIMENATL RESULT OF PROPOSED STRATEGIES

In this Project Work Here we considered following data for simulation purpose:

1.Provider Side details :	-Number of Datacenter: 2
	-Number of Host:02
	-Number of Processing Unit :08
	-Processing Capacity (MIPS):19,200
	-Storage Capacity: 32 TB
	-Total Amount of RAM :80 GB
2.Customer Side Details	-Number of Customer 5
	-Cloudlet Sent per minute:250
	-Average Length of CloudLet File :460
	-Average Cloudlet Output Size :500
	-Number of Customer 5
	-Cloudlet Sent per minute:250
	-Average Length of CloudLet File :460
	-Average Cloudlet Output Size :500
3.Virtual Machine Details	-Number of Virtual Machine :10
	-Average image Size :780
	-Average RAM :563 MB
	-Average Bandwidth :100,000
	-Number of Virtual Machine :10

Table 5.1:Values(Parameter) consider for Experimental result

We run cloud report simulation environment for

1.JIT

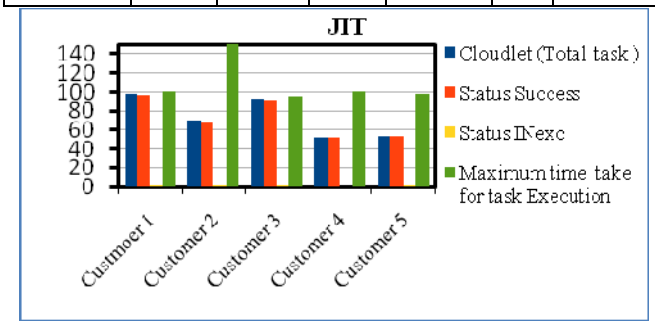
2.Overbooking

3.Overbooking and JIT

5.2 RESULTS CALCULATED FROM LOG GENERATED FOR JIT ALGORITHM:

Table 5.2: JIT Algorithm Experimental result

Customer Name	Cloudlet (Total task)	Status		Resource ID	VM ID	Maximum time take for task Execution
		Success	INexc			
Customer 1	98	97	1	2,3	0	100
Customer 2	70	68	2	2	1	192
Customer 3	93	92	1	1	0	96
Customer 4	52	52	0	2	0	100
Customer 5	54	53	1	2	1	98



Result Evolution of JIT

Main aim of JIT algorithem is to Schedule a given set of job on single machine and Reserving resources at last possible moment .

After examined the JIT algorithem we got following result:

1)Overall Less number of cloudlet (task) executed because all jobs or task executed on single machine .

2) less number of resource ID used (less resource utilization

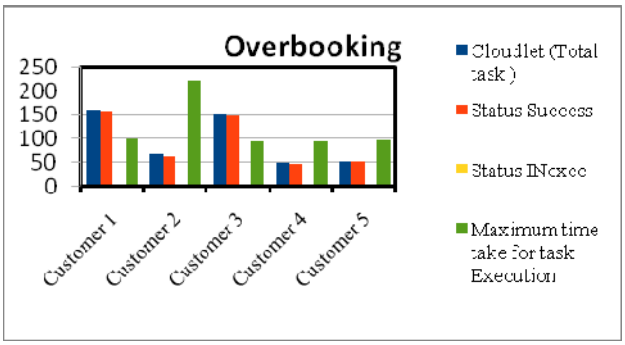
3)Each customer maximum time cloudlet task success fully executed (i.e 10 % of task are in INexe Status)

Customer Name	Cloudlet (Total task)	Status		Resource ID	VM ID	Maximum time take for task Execution
		Success	INexec			
Customer 1	162	159	4	1,2,3	0,1,2	102
Customer 2	68	64	4	2,3	0,1	222
Customer 3	151	148	3	2,3	0,1,2	96
Customer 4	50	49	2	2	0	96
Customer 5	54	53	1	2	0	98

5.3 RESULTS CALCULATED FROM LOG GENERATED FOR OVERBOOKING ALGORITHM

Table 5.3: Overbooking Algorithm Experimental result

Overbooking : Allocate More Resources that available one on understanding that some resource request s will not be used due to "no –shows" or over estimated resource requirements. More number of task can be executed.Overbooking algorithemIncrease Resource utilization.With overbooking more number of task are INEXec State(Not get complete success).all drawbacks of Overbooking algorithem get sloved with proposed hybrid solution.following chart gives complete experimental result of overbooking.



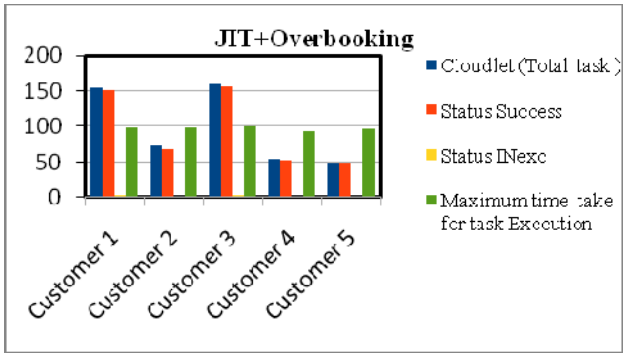
5.4 JIT PLUS OVERBOOKING ALGORITHEM

By combining the both strategy we got following result)

Customer Name	Cloudlet (Total task)	Status		Resource ID	VM ID	Maximum time take for task Execution
		Success	INexc			
Customer 1	154	151	3	1,2,3	0,1	98
Customer 2	73	67	1	1,2,3	0,1	99
Customer 3	159	156	2	2,3	0,1	100
Customer 4	54	53	1	2	1	94
Customer 5	50	50	0	2	0	96

Table 5.4: JIT plus Overbooking Algorithm Experimental result

With JIT plus overbooking, it would be possible for cloud service provider to serve the request of all customer with limited constraints.More no of customer cloudlets get executed with Limited resources (resource ID).It also Increase resource utilization rate .also Overall Minimum execution time take to complete task(Cloudlet).



VI. CONCLUSION

After the study of different Resource allocation Strategies we observed, how cloud provider allocate available resources to needed application .Due to limited resources cloud provider need efficient resource allocation system that suit cloud environment.

Thus the proposed project analyzed the different issue of resource allocation and solved it by providing hybrid solution. Implemented it with Cloud Report simulator. The resource allocation rate at provider side, Maximum number of Cloudlet(Tasks) can be executed on minimum number of Virtual Machine ,Improve Overall System utilization 40 % with limited constraints.

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