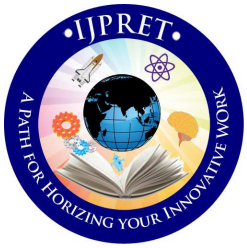
Research Article *ISSN: 2319-507X*
Karthi M, IJPRET, 2013; Volume 1(8):1062-1072 *IJPRET*



INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

EFFICIENT MANAGEMENT OF RESOURCES PROVISIONING IN CLOUD SYSTEMS

M. KARTHI, P. MANIKANDAPRABU

1. PG Student, Computer Science and Engineering, Velammal College of Engineering and Technology Madurai, Tamil Nadu, India.

2. PG Student, Computer Science and Engineering, St. Michal College of Engineering and Technology, Kalaiyarkovil, Tamil Nadu.

Accepted Date:

27/02/2013

Publish Date:

01/04/2013

Keywords

Cloud computing,

Future demand.

Resource provisioning,

Probabilistic model

Corresponding Author

Mr. M. KARTHI

Abstract

Cloud providers can offer two provisioning plans for computing resources, namely reservation plan and on-demand plan to cloud consumers. In generally, the cost of utilizing computing resources provisioned by reservation plan is cheaper than on demand plan. There are many kinds of resource provisioning options available in cloud environment to reduce the total paying cost and better utilizing cloud resources. However, the best advance reservation of resources is difficult to be achieved due to uncertainty of consumer's future demand and providers' resource prices. To address this problem an efficient cloud resource provisioning (ECRP) algorithm is proposed by predict the future demand .In existing optimal cost resource provisioning algorithm (OCRP) the demand variation in different VMs Class is not consider. In this paper to obtain the solution of the ECRP algorithm is considered including probability of utilization and Estimate future demand, analyze with available resource and consider the demand variation.

1. INTRODUCTION

In cloud computing a resource provisioning mechanism is required to supply cloud consumers a set of computing resources for processing the jobs and Storing the data and etc. Cloud providers can offers to cloud consumer's two resource provisioning plans. That namely short-term on-demand and long-term reservation plans. Amazon EC2 and Go Grid are cloud providers which offer IaaS services with both plans. In generally pricing in on-demand plan is charged by pay-per-use basis (e.g., per 1 day, per 1 hour). Therefore purchasing this on-demand plan, the consumers can dynamically provisioning resources at the moment when the resources are needed to fit the fluctuated and unpredictable and unexpected demands. For reservation plan, pricing is charged by a onetime fee (e.g., 1 year, 3year) typically before the computing resource will be utilized by Cloud consumer. In the reservation plan the price to utilize resources is cheaper than that of the on-demand plan. So the consumer can reduce the cost of computing resource provisioning by using the reservation plan. As example the reservation plan offered by Amazon EC2 can reduce the total provisioning cost up to 50 percent when the reserved resource is fully utilized when steady-state usage is reached. With the reservation plan, the cloud consumers a priory reserve the resources in advance. Result the Under Provisioning problem can occur when the reserved resources are unable to fully meet the demand due to its Uncertainty. This problem can be solved by provisioning more resources with on-demand plan to fit the additional demand, the high cost will be incurred due to more expensive price of resource provisioning with on-demand plan. On the other hand the over provisioning problem can occur if the reserved resources are more than the actual demand in which part of a resource pool will be underutilized. This is an important for the cloud consumer to minimize the total cost of resource provisioning by reducing the on-demand cost and oversubscribed cost of under provisioning and over provisioning.

2. RELATED WORK

In [1], Available resource provisioning options was proposed. A profile-based approach to capture expert's knowledge of

scaling applications was proposed in [9] which extra demanded resources can be more efficiently provisioned. The concept of resource slot was proposed in [3]. In [4] the arrival pattern of workloads is estimated by using online forecasting techniques. In [10], heuristic method for service reservation was proposed. Prediction of demand was performed to define reservation prices. In [2], K-nearest-neighbors algorithm was applied to predict the demand of resources. In [11], a dynamic VM placement was proposed. However, the placement is heuristic-based which cannot guarantee the optimal solution. The optimal virtual machine placement (OVMP) algorithm was proposed in [7]. This OVMP algorithm can yield the optimal solution for both resources provisioning and VM placement in two provisioning stages. In [8] introduce the OCRP algorithm in this paper .The problem is generalized into the multiple stage formulation first. Second the different approaches to obtain the solution of computing resource provisioning are considered. Motivated by this previous work, we introduce Efficient cloud resource provisioning (ECRP) algorithm in this paper which achieves more availability than OCRP algorithm can avoid the under provision and overprovision problems

3. SYSTEM MODEL & ASSUMPTION

3.1 Cloud Computing Environment

As shown in Fig 1, the system model of cloud computing environment consists of four main components, namely virtual machine (VM) repository, cloud providers, cloud consumer, and cloud broker. The cloud consumer has demand to execute their jobs. Before the jobs are executed, cloud providers provisioned computing resources to cloud consumer. The consumer first creates VMs integrated with software required to execute the jobs. The created VMs are stored in the VM repository

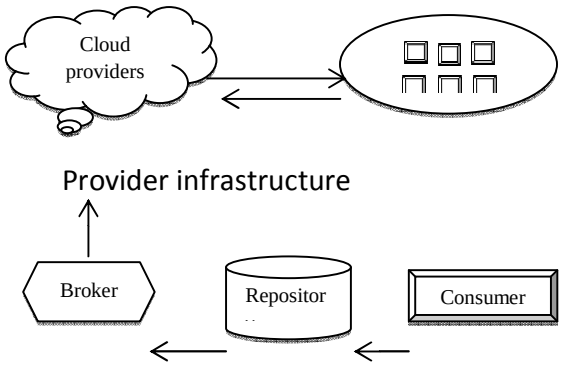


Fig 1 system model

VM repository has a collection of VMs separate for each cloud providers. Then the VMs can be hosted on cloud providers' infrastructures whose resources can be utilized by the VMs. The cloud broker is located in the cloud consumer's site and cloud broker responsible on behalf of the cloud consumer for provision resources for hosting the VMs. The broker implements the ECRP algorithm to make an efficient decision of resource provisioning. In ECRP there are multiple VM classes used to classify different types of VMs. Each one VM class represents a distinct type of jobs (e.g., one class for database application, Network application and the other for web application). An amount of resources is required for running the VM is varying. This required amount of resources can be different for VM in different classes. According this Resource requirement, the cloud broker can be reserve computing resources from different cloud providers. It is possible that additional resources can be provisioned instantly from cloud providers if the reserved resources are not enough to accommodate the actual demand.

3.2 Provisioning Plans

A cloud provider can offer the consumer two provisioning plans. The plans are reservation and/or on-demand plans. The cloud broker considers the reservation plan as medium- to long-term planning because in the plan resources has to be subscribed in advance e.g., 1 or 3 years and the plan can reduce the total provisioning cost. The broker considers the on-demand plan as short term planning because the on-demand plan resource can be purchased anytime for short period of time e.g., one week; one month. The resources reserved by the reservation-plan are insufficient when the load is peak load.

3.3 Provisioning Phases

The cloud broker considers both reservation and on demand plans for provisioning resources to cloud consumer. There are three provisioning phases used: reservation, Prediction and on-demand phases. In the reservation phase without knowing the consumer's actual need the cloud broker provisions resources with reservation plan in advance. In the Prediction phase the future need or demand of customer is predict by probabilistic model .Then Analysis a result the reserved available resources could be

observed to be either over provisioned or under provisioned when that consumer will utilize the resources in future. If the Needs exceeds the amount of available reserved resources (i.e., under provisioned), the broker can pay for additional resources with on-demand plan and then the on-demand phase starts. If the amount of available reserved resources Exceeds future need (i.e., over provisioned) the broker can Release additional resources.

3.4 Provisioning Stages

A provisioning stage is the time slot based when the cloud Broker makes a decision to provision resources by purchasing reservation and/or on-demand plans. the mean and deviation value. Then predict the future need of the consumer at when consumer will utilize next time. The normal distribution is a continuous probability distribution, defined by the formula

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \quad (1)$$

The parameter μ is the *mean* and the parameter σ is its standard deviation.

Future Need[i] = $E[X_j]$ for i=j+1 (2)

Therefore each provisioning stage can consist of one reservation phase and more on demand phases. The number of provisioning stages is based on the number of planning epochs considered by the cloud broker.

4. EFECTIVE CLOUD RESOURCE PROVISIONING ALGORITHM

4.1 *Predict future need*

After reservation phase cloud consumer start to utilize the reserved cloud resources.in each arrival of consumer we noted the arrival time and how much resources are utilized .In successive utilization consumer arrival should follow normal discrete probability distribution, using this distribution find

When i=0 shows the customers first utilization that time future need is not consider.

4.2 Compare with Available reserved resources

The cloud resources VMs are reserved in first phase for cloud consumer in advance for example 1year, 3 year. These resources are utilized by consumer at different time and

Different size. The remaining availability of these reserved resources is noted at each time. Then compare with future needed predict value. Available reserved resources are too low compare to future needed value the reserve on demand VMs using on demand phase, if Available

Reserved resources are too high comparing to future need then release the on demand VMs resources

4.4 Cost Estimation

Let P (p_1, p_2, p_3……., p_n) denotes the set of cloud providers, C (c_1, c_2, c_3……., c_n) denotes the set of VM Classes and R (r_1, r_2, r_3……., r_n) denotes the set of resources available to cloud consumer.

$$Cost_{RP} = \sum\sum\sum Res\ Cost_{crp} * X_{crp} + cost_{UP} \quad (3)$$

$$Cost_{OP} = \sum\sum\sum on\ demand\ Cost_{crp} * X_{crp} \quad (4)$$

$$Total\ cost = Cost_{RP+}\ Cost_{OP} \quad (5)$$

$Cost_{crp}$ denotes the cost for a single VM resource instance.

X_{crp} denotes the number of VM instances reserved.

Total Cost using ECRP algorithm

In first stage cost calculation and all stage cost is similar to OCRP algorithm except cost of reservation phase in next phases. In next Stages

$$Cost_{RP} = \sum\sum\sum NewRes\ Cos_{tcrp} * X_{crp} + cost_{UP} \quad (6)$$

For i=1, 2, 3…….n

$Cost_{crp}$ denotes the cost for a single VM resource instance.

X_{crp} denotes the number of VM instances reserved. Where i denotes the number of VM instances are modified its value. In each state value of i the allocated resources are different.

VI RESULT COMPARISION

Assume the cloud environment as the VMs demand is increase day by day so the cost of virtual machine instances increase 2$ per each request. A single consumer can utilize the cloud resources here and find the total paying cost in both OCRP and ECRP algorithm. Table 1 shows the overall process of single consumer for six month or 6 stages. In both algorithms we reserve 4 VMs at initial stage by advance reservation. In successive

stage the consumer starts to utilize the resources. In some one time consumer meet the overprovisioning and under provisioning problem that time In OCRP algorithm buy the resources in on demand cost only after occur the provisioning problem. In stage 2, 4, 5 meet the under provisioning problem and stage 6 meet over provisioning problem. By using the ECRP algorithm find the future need of the consumer then reserve the VMs in advance before meet the provisioning problem. Stage 2 needs 1 VMs on demand for existing system but in proposed system we predict this future need of 1VMs in stage 1 and buy it on demand service in first stage. In first stage on demand cost is 2$ lower the on demand cost of next stage. The result comparisons of both algorithms are performed in follow by parameter cost, resource allocation, waiting time. Figure 1 shows the OCRP algorithm and ECRP algorithm resource provision. In OCRP algorithm met four time provision problem in stage 2,4,5,6. But in ECRP provision problem not occur. Figure 2 shows the cost comparisons in both algorithms are approximately consumer pay equal total cost. Consider each time met the provisioning problem the provision process will wait for 1. Check VMs availability in cloud provider infrastructure (E.g. 5 ns), 2. Wait in queue to get on demands VMS (E.g. 2-5 ns), 3. Wait for confirmation of on demand VMs reserved by cloud providers (E.g. 2 ns), 4. Wait for utilize resources (E.g. 2 ns). But in ECRP we reserve on demand VMs in advance using prediction value so no need to wait for to purchase resources in on demand service. Using OCRP algorithm normally 15-25 ns wait for each on demand purchase VMs.

Table 1: shows half year cloud consumer's resources and cost using both algorithms

OCRP					**ECRP**				
Available	Cost	Need	Cost On-Demand	Problem	Available	Cost	prediction	Cost On-Demand	Problem
4 VMs	20$	0	0	No	4 VMs	20$	1VMs	6$	No
4 VMs	20$	1VMs	8$	Yes	5 VMs	26$	0	0	No
5 VMs	28$	0	0	No	5 VMs	26$	1VMs	10$	No
5 VMs	28$	1VMs	12$	Yes	6 VMs	36$	1VMs	12$	No
6 VMs	40$	1VMs	14$	Yes	6 VMs	48$	-1VMs	0	Yes
7 VMs	54$	-1VMs	0	Yes	6 VMs	48$	0	0	No
Total cost=190$			Problem= 4times		Total cost=204$			Problem= 1time	

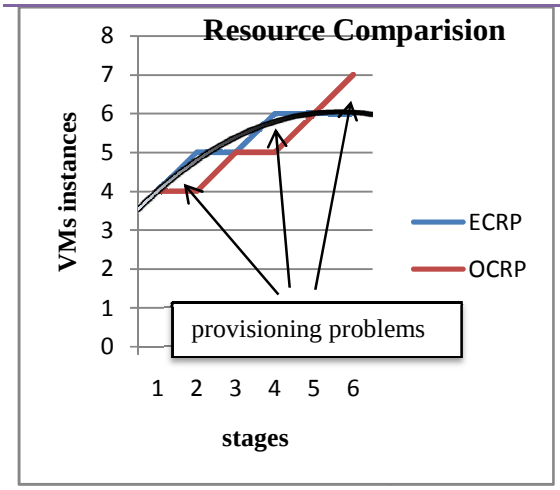


Fig 1 shows the resource allocation comparisons

VII. CONCLUSION& FUTURE WORK

This paper, we have proposed an optimal cloud resource provisioning (ECRP) algorithm to provision resources offered by multiple cloud providers. As the results, the algorithm can adjust the tradeoff between

reservations of resources and allocation of on-demand resources. The ECRP algorithm can be used as a resource provisioning tool for the emerging cloud computing market in which the tool can effectively save the total cost and better utilizing resources.

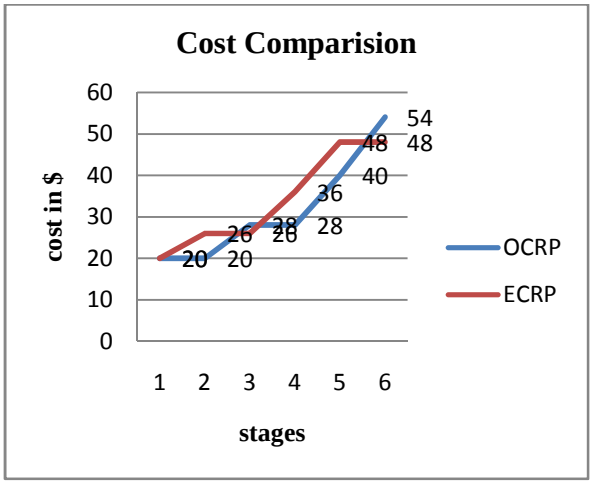


Fig 2 shows cost comparisons between OCRP and ECRP

Compare to previous existing system ECRP can reduce the under and over provision problem , reduce the delay.The sudden huge workload variations using this model we can't eliminate under provisioning and overprovisioning problems because the prediction value will not accurate.in future we consider the huge sudden work load variation and reduce the scenarios or event of under and over provision problem .

REFERENCES

1. G. juve and e. deelman, "resource provisioning options for large-scale scientific workflows," proc. IEEE fourth int'l conf. e-science, 2008

2. J. chen, g. soundararajan, and c.amza," autonomic provisioning of backend databases in dynamic content web servers," proc. ieee int'l conf. autonomic computing, 2006

3. Y.kee and c.kesselman,"grid resource abstraction, virtualization, and provisioning for Time-target applications," proc. ieee int'l symp. Cluster computing and the grid, 2008.

4. D. kusic and n. kandasamy, "risk-aware limited look ahead control for dynamic resource provisioning in enterprise computing systems," proc. ieee int'l conf. autonomic computing, 2006

5. H.n. van, f.d. tran, and j.-m. menaud, "sla-aware virtual resource management for cloud infrastructures," proc. ieee ninth int'l conf. computer and information technology, 2009.

6. Peng-yeng yin, shiuh-sheng yu, pei-peiwang a hybrid particle swarm optimization algorithm for optimal task assignment in distributed systems journal computer standards & interfaces archive volume 28 issue 4, april, 2006 pages 441-450

7. S.chaisiri, b.s.lee, and d.niyato, "optimal virtual machine placement across multiple cloud providers," proc. ieeeasia- pacific services computing conf. (apscc), 2009.

8. S.chaisiri, b.s.lee, and d. niyato optimization of resource provisioning cost in cloud computing,ieee transactions on services computing, vol. 5, no. 2, april-june 2012

9. Y. jie, q. jie, and l. ying, "a profile-based approach to just-in- time scalability for cloud applications," proc. ieee int'l conf. cloud computing (cloud '09), 2009

10. K.miyashita, k.masuda, and f. higashitani, "coordinating service allocation through flexible reservation," ieee trans. services computing, vol. 1, no. 2, pp. 117-128, apr.-june 2008.

11. N. bobroff, a. kochut, and k. beaty, "dynamic placement of virtual machines for managing sla violations," proc. ifip/ieee int'l symp. Integrated network management (im '07), pp. 119-128, May 2007

12. WenjunWu ; Dichen Di ; Fei Zhang ; Yizhou Yan ; Yaokuan Mao A resource scheduling algorithm of cloud computing based on energy efficient optimization methods Green Computing Conference (IGCC), 2012 InternationalJune 2012

13. Pradeep.RKavinya.R Resource Scheduling In Cloud Using Bee Algorithm for Heterogeneous Environment IOSR Journal of Computer Engineering (IOSRJCE) (July-Aug. 2012)

14. Yong Beom Ma, Sung Ho Jang, Jong SikLeeOntology-Based Resource Management for Cloud Computing,Intelligent Information and Database Systems Volume 6592, 2011, pp 343-352

15. PreetiAgrawal and YogeshRathore,An"Approach for Effective Resource Management in Cloud

Computing,"Int. J. Tech. 2011; Vol. 1: Issue 2, Pg 121-124

16. BahmanJavadi, ParimalaThulasiraman and RajkumarBuyya, Cloud Resource Provisioning to Extend the Capacity of Local Resources in the Presence of Failures, IEEE 14th International Conference on High Performance Computing and Communications in 2012'

17. Thomas sandholm, kevinlai evaluating demand prediction techniques for computational markets proceedings in gecon2006 may 21, 2007.