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Supporting Service Owner-Controlled Placement Directives Using Cloud Services

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Abstract: Virtual machine placement is the process of mapping virtual machines to available physical hosts within a datacenter or on aremote datacenter in a cloud federation. Normally, service owners cannot influence the placement of service components beyondchoosing infrastructure provider and deployment zone at that provider. For some services, however, this lack of influence is ahindrance to cloud adoption. For example, services that require specific geographical deployment (due e.g. to legislation), or requirefault-tolerance by avoiding co-placement of critical components. We present an approach for service owners to influence placementof their service components by explicitly specifying service structure, component relationships, and placement constraints betweencomponents. We show how the structure and constraints can be expressed and subsequently formulated as constraints that canbe used in (integer) linear programming solvers used to determine the placement. We show the mathematical formulation of thismodel, and evaluate it using a large set of simulated input. Our experimental evaluation confirms the feasibility of the model andshows how varying amounts of placement constraints and background load affects the possibility for a solver to find a conclusionsatisfying all constraints within a certain time-frame. Our experiments indicate that the number of constraints affects the abilityof finding a solution to a higher degree than background load, and that for a high number of hosts with low capacity, componentaffinity is the dominating factor affecting the possibility to find a solution.

Index Terms: Cloud Computing, Virtual Machine, Cloud Adaption and Fault-tolerance.

I. INTRODUCTION

In traditional data centers, applications are tied to specific physical servers that are often over provisioned in order to serve the complex resource requirements of enterprise services and in the hope of handling unexpected surges in resource demands. As a consequence, the level of resource utilization on any server is typically very low [5]. Cloud Computing resources are represented to cloud consumers as the approachable public approachable services, e.g., storage, processing power, software, and network bandwidth. Infrastructure- as-a-Service (IaaS) is a computational service prototypical is broadly applied for paradigms in the cloud computing [2]. By the grid the large-scale is obtained for resources typically [5]. The computational resources like supercomputers or space-shared clusters can facilitate by the grid which is commonsensical of individual sites coupled via high speed networks. To local resource manager (LRM) at each site can be accessed by the user by submitting the batch job through grid protocols. Even in the poor performance for workflow applications often we can access the by this approach.

We have the several resources for furnishing the options, in order to avoid/minimize the job delays, for applications of workflow [4] [3]. Due to the uncertainty in the future demand and resource prices of consumers it is difficult to achieve the best advanced resources reservation.

The formulated stochastic programming model is proposed by optimal cloud resource provisioning (OCRP) algorithm to address the reservation of resources [6]. The OCRP algorithm can furnish the computing resource s has been used, as well as for the long plan terms e.g. quarter plan for 4 stages and yearly plan for 12 stages.

The Grid is realizing the vision of providing computation as utility: Based on the computational capacity the scheduled computational job can demand in the grid hosts. In our scheme, another emerging usage of Grid utility has been used: the hosting of application services. Different from a computation job, an application requested by its client's performs multiple jobs services such as e-Laboratory or on-line shopping has longer lifetime. On the basis of *on-demand* of HUP is reflected on the service hosting, utility vision. It can assume, On the providers request an application server can be created dynamically and bootstrapped automatically (and torn down).For example, consider without using its limited IT resources a bioinformatics institute wishes to provide a genome matching service to the research community [4]. The first gainsay is between virtualizationof services1 and *isolation*. In a set of *virtual service nodes*: each node is a virtual machine which is physically a 'slice' of a real server in the HUP, but the service should appear to its provider as running in a dedicated environment although sharing the same HUP. All the software's specified by the user, such as operating system and applications; want to package them, then all together in to the Virtual machines (VMs). Two resource furnishing plans can be offered by the cloud to the cloud consumers. They are named

- Short-term on-demand
- Long-term on-demand

In general, pricing in on-demand plan is charged by pay-per-use basis.

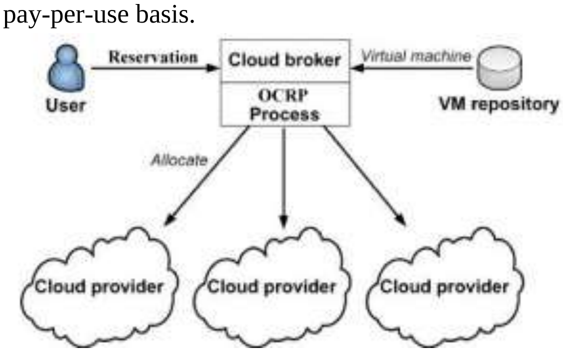

Figure 1: Cloud Computing Environment

By using the statement and work out the stochastic integer programming problem with multistage resources we can attain an optimal decision. To solve the RTUOP (Reservation Technique for Under over Provisioning) algorithm the possible technique is the Benders decomposition and sample-average approximation. On performing the Extensive numerical studies and simulations the result shows as the RTUOP can minify the uncertainty total cost. A cloud provider is responsible for guaranteeing the Quality of Services (Quos) for running the VMs. The pioneer of Cloud Computing vendors, Amazon Simple Storage Service (S3) and Amazon Elastic Compute Cloud (EC2) are both well-known examples. It can be acted by another operating system environment to increase in our source that produced in high bandwidth.

II. METHODS

The service of the grid computing is provided by an architectural design of the on-demand service. An escalade applications was proposed to profile-based approach to capture expert's knowledge in which extra demanded resources can be more efficiently provisioned [5][3] . The objective is to address uncertainty of resources availability. To maximize the revenues and the utilization of the resource in the binary integer program providers are formulated. Originally the consolidation mechanism was designed for the homogeneous clusters. In the multiple cloud provider environment was ignored in the heterogeneity clusters [6]. Stochastic programming has been developed to solve resource planning under uncertainty in various fields, e.g., production planning, financial management, and capacity planning. In utility computing models the computing resource provisioning problem we can review the prior research addressing resources furnishing problem. By using the both predictive and the reactive resource management technique the effective energy is operated by the homogeneous computing clusters [5][2].Using the predicted workload patterns processors can provisioned and aggregate operating system sets by feedback controller and reacting on the short-term workload variations. The overall operating cost in the distributed systems is most significant among the power consumption cost. Much work has been devoted to power-efficient data processing in computing systems, ranging from small mobile devices to large server farms. The formulation

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accounting random uncertainties in generation capacities and load has been shown in stochastic programming literature but consideration of reliability indices is not included. The problem is Statemented as two-stage recourse model where the primary stage decision variables are the additional capacity units and the second stage decision variables are network flows.

III. EXISTING APPROACH

Using the elastic provisioning capability of a cloud, a cloud application can ideally provision its infrastructure dynamically based on cloud users requirements using optimal cloud resource provisioning (OCRP) algorithm [6]. Using in the multiple provisioning states the OCRP algorithm can furnish the computing resource s has been used, as well as for the long plan terms e.g. quarter plan for 4 stages and yearly plan for 12 stages. The demand and price uncertainty is considered in OCRP and according to these variations adjusts the resources of a cloud. The optimal cloud resource provisioning algorithm is proposed for the virtual machine management [5][6][1]. To obtain the decision of the OCRP algorithm we propose the optimization formulation of stochastic integer programming, and the cost of the resource provision is minified in the cloud computing environment. The formulation considers multiple provisioning stages with demand and price uncertainties. To solve the optimized formulation we use the solution based on the Benders decomposition and sample-average approximation algorithms in an efficient manner. OCRP algorithm for clouds in combination with elastic provisioning can successfully minimize total cost of resource provisioning in cloud computing environments.

IV. OUR PROPOSED APPROACH

To solve the OCRP problem with the large set of scenarios we have applied SOFTWARE AS A SERVICE approach furtherly [6]. The optimal solution can be achieved by the SOFTWARE AS A SERVICE approach even the problem size is large [2][5]. Numerical studies and the simulations are used by the performance evaluation of the OCRP algorithm is performed [6]. The algorithm can optimally adjust the tradeoff between allocation of on-demand resources and the reservation of resources from the results. The OCRP algorithm can be used as a resource provisioning tool in which the tool can effectively save the total cost for the emerging cloud computing market.

a. System model and assumption

The system model and assumption of cloud computing environment consists of four main components:

- Namely cloud consumer,
- Virtual machine (VM) repository[1],
- Cloud providers, and
- Cloud broker.

Cloud providers are provision for computing resources, before the jobs ordered by cloud consumers are executed.

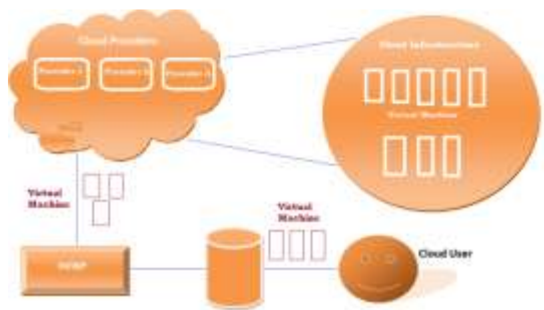

Figure 2: OCRP Algorithm System Model.

To get the resources, first the consumer creates VMs integrated with software required by the jobs [5][4] . VM repository stores the created VMs. Then, the cloud provider's infrastructures are hosts as VMs. From the cloud provider infrastructures the VMs can utilize the resources.

b. Stochastic Programming Model

In this section, the queue will follows the first in first out technique to apply the scheduling. For our reservation technique we implement the scheduling algorithm of priority scheduling. Priority scheduling will take the starting date which is specified in the reservation plan [5]. Virtual machines are individually scheduled during the time of when the reservation plan submitted. Next we use the scenario technique to reduce the scenarios present in the individual services.

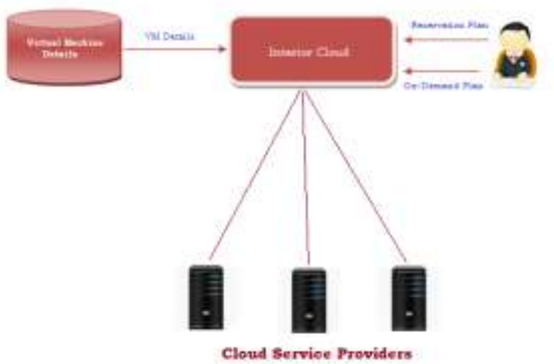

Figure 3: Stochastic Programming Route .Map.

For the optimization problems under stochastic uncertainty mathematical models are viewed as Stochastic programming problems. Most computational values can be solved by underlying the probability distribution by a probability measure with finite support.

It formulated by,

$$M = \sum_{x \in X} \sum_{y \in Y} \sum_{z \in Z} A_{xyz}^{(R)} B_{xyz}^{(R)} + IE_{\alpha}[C(B_{xyz}^{(R)}, \rho)]$$

Subject to,

$$B_{xyz}^{(R)} \in N_0, \forall \in X, \forall \in Y, \forall \in Z.$$

The deterministic integer programming is transformed from the probability distribution of all scenarios in sets is referred as deterministic equivalent formulation [6][7]. The price and the demand both must be available to solve DEFINITION OF CLOUDINITION OF CLOUD.

It Expressed by,

$$M_{\alpha}^{\wedge} = \sum_{x \in x} \sum_{y \in Y} \sum_{z \in Z} A_{xyz}^{(R)} B_{xyz}^{(R)} + \sum_{w \in W} \sum_{x \in x} \sum_{y \in Y} \sum_{z \in Z} \sum_{u \in U} P(W) A_{xyzu}^{(r)}(W) B_{xyzu}^{(r)}(W) + \sum_{w \in W} \sum_{x \in x} \sum_{y \in Y} \sum_{u \in U} P(W) (\sum_{z \in Z} A_{xyzu}^{(e)}(W) B_{xyzu}^{(e)}(W) + A_{xyu}^{(o)}(W) B_{xyu}^{(0)}(W))$$

The representation of expression are described here,

- P(W) means probability distribution of price and demand,
- α- considered set,
- W- considered scenario,
- X- class of VM,
- Y- provider of cloud,
- K- reservation contract,
- U- provisioning stage,
- R- reservation cost and

e means expending cost.

The price is Definition of Cloudinition of Cloud in dollars ($) per resource unit for cloud provider. Let c(R) jkr denote the unit price (i.e., costs to the consumer) of resource type r subscribed to reservation contract k provided by cloud provider j in reservation phase of the first provisioning stage. The fixed one-time fee can be charged in the first stage for the price of reservation plan. The main aim of this algorithm is to split down the optimization problem into number smaller problems which can be solved separately and simultaneously [3][2]. Because of this benders decomposition algorithm the time can be reduced to obtain the solution of the OCRP algorithm. The integer programming problems is decomposed in by Benders decomposition algorithm in to the complicating variables into two major problems: First is the master problem and the second one is the sub problem

Benders Decomposition Algorithm

When the number of scenarios is numerous, it may be difficult to obtain the solution of the OCRP algorithm is Definition of Cloud in directly if all scenarios in the problem are taken into account by solving the stochastic programming formulation.

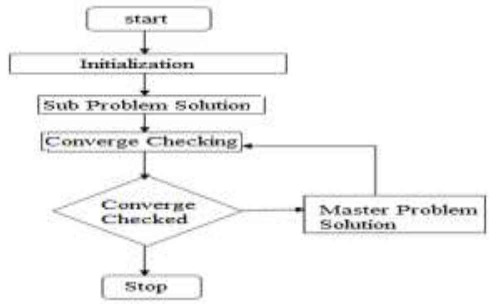

Figure 4: Flow chart for Benders decomposition algorithm.

The master problem and the sub problems in the prior iterations can be obtained for the benders cuts are constructed for the optimal cost.

1.1 Cost Benefit Analysis

First set the cloud environment, the environment consist of only one consumer. Initially the resource reserved by advance reservation of reservation plan in first phase of both OCRP & RTUOP algorithm. In OC RP algorithm, any under provisioning or over provisioning problem will arise or not is checking [4] . In second phase SRT algorithm predict future need. In third phase both algorithms used on demand phase to solve this problem.

OCRP algorithm					
Si No	Reservation Plan		On Demand Plan		Prob lem
	Resources	Cost	Resources	Cost	
1	2gb	10$	Nil	0	No
2	2gb	10$	1024 Mb	5$	Yes
3	2gb	10$	256 Mb	1$	Yes
4	2gb	10$	800 Mb	6$	Yes
5	2gb	10$	600 Mb	3$	Yes
Total cost				65$	

Table 1: Consumer sample provisioning cost detail using OCRP algorithm.

Normally the prediction value not exactly true so small deviation will occur here. After some few stages the prediction value should be optimal and provision problem will solved early.

V. EXPERIMENT RESULTS

In our scheme, this section deals, At the end of the year the provisioning resources are generated by the decision making of the cloud broker [7][4]. The cloud broker performs the advance reservation under the price and the demand uncertainty of resources in the primary stage for being used in the next whole year which is the second stage [3]. Our proposed system can certainly improve the computational efficiency. Using the Consumer Reseller News we have examined the variance reduction, but other techniques have been explored.

Although the confidence intervals can be obtained for the two-stage stochastic programs because of lower-bounding result is so simple and so general e.g. with second stage parameters for randomness, first/second stage variables with integers etc.

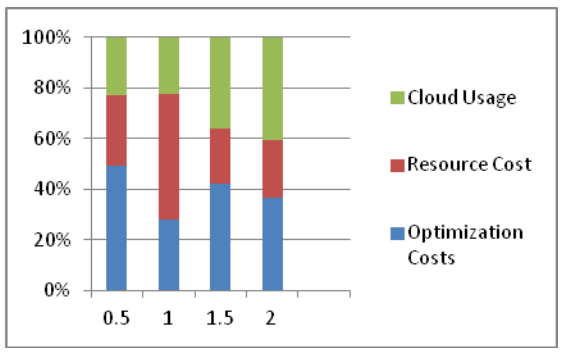

Figure 5: Analysis for Cost Convergence Values with Resource Usage.

By using these results calculate the efficiency of the cloud resource for both Reservation and On-Demand services [1][3].

Balance of costs: To minify*on-demand* the cost rather than oversubscribed cost over the cloud broker with OCRP which we can observe [5]. The cloud broker makes more attractive of the reservation plan, cloud provider increases possibility and the higher in the on-demand plan for the resource pricing.

Provisioning Planning: To represent the long-term planning the OCRP algorithm is applied to multiple provision stages [6]. The multiple probability distributions is turn to the first provisioning stage for the optimal solution, where the probability distributions describing the uncertainty occurring in multiple stages planning is needed consequent time epochs [1][5]. As a result, the websites should provision resources by considering multiple time epochs (i.e., provisioning stages) in advance.

We consider the empirical results of the multi stage planning of cloud resources in provisioning;[4] calculate the resource cost of both reservation and on-demand services provided by the cloud provider.

Using Bender decomposition method in Stochastic Programming. The use of decomposition method for OCRP has to be carefully considered, since the formulation of the OCRP algorithm is a pure integer program which is the NP-hard problem[6][5]. In each iteration the task is performed by adjusting of lower and upper bounds. The solution for Definition of Cloudwithout the decomposition is same as the optimal solution obtained for the decomposition [7]. We observe that the sub problems can be solved efficiently due to their smaller number of variables and parallelization.

Figure 6: Consumer results with Software resources.

Reservation technique may cause some unauthenticated user access [6]. It may be reduced by using the cipher techniques. In addition, the optimal pricing scheme for cloud provider's competition market will be investigated.

VI. CONCLUSION

Solving stochastic integer programming we can obtain the optimal solution from OCRP is formulated by formulating with multistage recourse [1][4][7].To divide the OCRP problem, we applied Benders decomposition, into sub problems for the large set of the scenarios to solve OCRP problem we can apply the Software as a Serviceapproach. In Software as a Service the problem for the optimal solution even the problem size is greatly large. By the numerical studies and simulations the performance can evaluation for the OCRP algorithm. As the results, the algorithm can adjust the tradeoff between reservations of resources and allocation of on-demand resources [6]. The OCRP 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 [2]. The Software as a Serviceapproach can effectively achieve an estimated optimal solution even the problem size is greatly large and can eliminate under provisioning and over provisioning problems because the prediction value will accurate.

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