Economy Based Resource Allocation in IaaS Cloud

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ABSTRACT
Infrastructure as a Service (IaaS) offers hardware resources (computing power, storage and network) as a service to its customers. The customers order these resources in the form of a lease. Aim of any service provider is to make a leasing plan to maximize the number of accepted leases. Opennebula is popular open source toolkit for building IaaS cloud. Opennebula has its own lease manager and it can also be integrated with Haizea which is an open source lease manager. An economy based algorithm should focus on incentives of both the consumers and the providers. In this paper, an economy based leasing algorithm is developed and integrated with Haizea. This economy based algorithm takes care of incentives of both the parties i.e. customer and service provider. It uses the concept of optimization techniques to optimize the costs. The incentive for customers is lower cost of execution of its lease on the capable node as compare to existing non-economy based algorithms. If an appropriate resource is not found, then the algorithm uses negotiation on budget and resource demand; that increases the number of accepted lease. Thus, incentive for providers is an increase in profit as the amount of accepted leases increase. Experimental results show that the proposed economy based leasing algorithm reduces the cost of execution of the consumer’s lease and increases the profit of the provider to a considerable extent.

Keywords: Economy Based Leasing Algorithm, Economy Based Resource Allocation, Infrastructure as a Service (IaaS) Cloud, Negotiation, Optimization

1. INTRODUCTION
Cloud services divided into three broad categories; they are Infrastructure as a Service, Platform as a Service, and Software as a Service. These services called as fifth utility as it provides to end users exactly the same as a public utility service like electricity, water, and gas (Buyya, 2009). Infrastructure as a service offers processors, storage and network hardware as a service based on pay-as-you-use and on-demand computing models to the end users. Platform as a service provides computing platform and application solution stack as a service. In this model, the consumer creates the software using the tools and APIs provided by the service provider. The users also control the software configuration and deployment. Platform as a service provides the deployment of application without complexity of buying and managing

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the hardware and software. In the Software as a Service (SaaS) different application software such as email, CRM etc provide as a service to the users. The users of such applications may customize them according to their needs.

This research work mainly concerned with infrastructure as a service which provides resources to its users with the help of virtualizations. Haizea is an open source virtual machine based lease management software under consideration in this paper. Its lease manager allocates the virtual machines with the help of its resource allocation policies. Haizea runs in two modes one is simulation mode, and it can be integrated with Opennebula, which is popular open source toolkit for building IaaS cloud. In both cases, it is used to schedule leases (Sotomayor, 2007; Sotomayor, 2008; Sotomayor, 2009; Haizea 2012). Leases are the customer requests for demanding resources from provider. Haizea supports three kinds of lease policies, Best-Effort lease, Advanced Reservation Lease and the Immediate Lease. In case of Best-Effort Lease, resources are provisioned as soon as they are available. In case of Advanced Reservation Lease, resources are provisioned for a fixed period. In case of Immediate Lease, resources must be provision right now or not at all. Akhani et al. and Nathani et al. have performed modification in these three leases to include time negotiation, in advance reservation leases and deadline sensitivity, in best effort leases to improve the performance respectively (Akhani, 2011; Nathani, 2011).

To receive proper return on investments (ROI) made on the resources only effective utilization is not enough their profitability must also be considered. Economy based scheduling algorithms takes care of this profitability. To use the resources of the cloud provider economically and effectively, we need to consider certain points:

- Budget of the customer’s lease,
- Price of the service provider’s resources?
- Possibility of negotiation in terms of budget or amount of resources?

At present Haizea does not have any choice of specifying the budget of a lease and cost of a resource, resulting in resource allocation just on the basis of configuration of resources. We have checked out the current code from SVN repository of Haizea but the economy based algorithm is not implemented yet (Haizea, 2012). Main goal of this paper is to develop an economy based leasing algorithm which allocated the leases on the basis of budget of the customer, cost and configuration of demanded and available resources. To achieve this new economy based lease policy, lease format is developed through which customer will be able to specify the budget along with the configuration of demanded resources. This paper also describe new format of the service provider’s database which will contain cost of the resources along with their configuration.

If resource allocation is performed without consideration of cost of a resource and budget of the lease, then there is an always possibility that low budget leases will allot to the resources with higher cost node and vice versa as depicted in the Figure 1. Low cost nodes and low budget leases are represented with single outline box and dark diamond respectively. Similarly, high cost nodes and high budget leases are denoted by double outline box and white diamond.

Economy based leasing algorithm will allocate resource, specified in lease on the basis of budget and configuration of resources. If all of the capable resources have cost greater than budget of lease, in such case it will be rejected. To minimize such rejection, an opportunity must be given to the consumer to increase the budget or reduce the configuration of demanded resources. The economy based leasing algorithm with the negotiation capability results into increased profit of the providers due to minimal rejections. This will also save the cost of execution customer’s lease, ultimately resulting in the net saving of the customers.

The proposed algorithm is implemented with this dual objective of increasing profit of the providers and net savings of the consumers.
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