

Chapter 19

Optimized Energy Aware VM Provisioning in Green Cloud Based on Cuckoo Search with Levy Flight

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ABSTRACT

This chapter proposed a nature inspired energy aware VM provisioning technique in cloud computing to minimize the power consumption by the resources while providing negotiable Quality of Services (QoS). Data centers hosting different cloud application consume huge amount electrical energy which leads to a higher operational cost for service provider and makes an adverse effect in environment in terms of co2 emission. Green cloud computing can provide the solutions by optimum use of electrical energy in data center without degrading the Quality of Service (QoS). The proposed technique works in three phases: firstly consumer's service request validation is done with respect to Service Level Agreement. Then move to VM placement phase. Lastly VM placement optimization is done in order to minimize the power consumption by physical host. This chapter use Cuckoo search for optimization technique. The performance of proposed approach is validates by conducting series of evaluation using CloudSim framework

INTRODUCTION

Client-server architecture was designed to address data-sharing and load distribution challenge by distribution of data storage and processing capabilities to the several servers and they provides services to the clients. But simple client-server model is no longer able to provide satisfactory service for high end scientific and business data storage, processing, analysis and management. This leads to more complex

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client server architecture. The use of high end server side computing nodes for satisfactory service, results in higher complexity and management costs of IT infrastructure. The costs of software and infrastructure maintenance at the server side are much higher than costs of actual software development for any organization.

Here cloud computing technology comes in to picture that offer feasible alternative computing and service model that reduce service and operational costs and complexity while increasing customer service satisfactory.

Cloud computing can be defined as self-contained framework technology based on network-based services that provides on- demand real-time seamless convenient access to shared pool of configurable homogeneous or heterogeneous computing resources which can be dynamically provisioned with minimal management effort. It offers more efficient resource utilization, resource management, on-demand scalable service and cost reduction for the cloud users.

The provider offers three types of Cloud services, namely: Software as Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).

- **SaaS Model:** The software that is required by the consumers is traditionally purchased with a payment for the license and copy or copies of the respective software are supplied to the client through appropriate media. The typical license of the software permits the user to install the software on one or more client-end computer. If some major update is made to the software and some new version is released consisting those updates, the users, those are willing to avail the updates are required to make further payment for use of the new version. Some of the users always exist who are willing to continue with the older version. But with the arrival of a new version, the support for older versions is reduced significantly and also the updates become really infrequent. Recently, the software industry is sharply bending to provide the software as service. With the ubiquitous availability high band-width internet service SaaS model is curving the concept software use to a new dimension. In this service model, clients pay charges for a time period and during that, they avail the access to the latest version of the needed software (D. Meisner et al., 2009; A. Kansal et al., 2010). But the major advantage is that, there is no need to install the full-fledge software on the client-end machine, rather it is hosted in the service provider's cloud and all the computation in the form of requests from the consumers is performed in the cloud as well. The client-end machine acts as interface, where the client submits the requests and receives corresponding results. In SaaS model full-fledge application is offered to the customer where the service runs on the cloud as a single instance, but can be used by multiple end users through the concept of Virtual Machine (VM) technique. From the customer perspective, there is no need to invest on server/software and they are free from hosting and maintenance, hence lowering the cost. Consumers now can use any machine with an internet connection and log on to the portal of the service provider with proper authentication to avail the service. There is some other constraint related to service. A major constraint is, a fixed number of instances of a particular service are permitted to run per user. A few examples of SaaS providers are Google, Salesforce, Zoho etc.
- **PaaS Model:** Platform as a service provides the resources of some powerful server to the users to perform large-scale computational tasks. The majority of tasks typically are not demanding in terms of computational need and those can be carried out on low power PCs of client end. But all the jobs with higher computational need are submitted to the cloud for processing and the results are returned back to the client. Similar to the SaaS, the platform as a service can be availed from

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