Chapter 26
A Novel Performance Enhancing Task Scheduling Algorithm for Cloud-Based E-Health Environment

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ABSTRACT

The fast-growing internet services have led to the rapid development of storing, retrieving and processing health-related documents from a public cloud. In such a scenario, the performance of cloud services offered is not guaranteed, since it depends on efficient resource scheduling, network bandwidth, etc. The trade-off which lies between the cost and the QoS is that the cost should be variably low on achieving high QoS. This can be done by performance optimization. In order to optimize the performance, a novel task scheduling algorithm is proposed in this article. The main advantage of this proposed scheduling algorithm is to improve the QoS parameters which comprises of metrics such as response time, computation time, availability and cost. The proposed work is simulated in Aneka and shows better performance compared to existing paradigms.

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1. INTRODUCTION

Many Organizations store health related documents in a secure way and provide them to their customers in electronic way which is denoted as E-Health. In such a scenario, to minimize the cost and to improve the performance, the organization used to store their documents in a cloud. Cloud computing is a technology that provides the efficiency, scalability and flexibility for the services it offers. It is a framework implemented for providing anything as a service over the Internet. Cloud is a network grid that relies on virtualization and strives to offer multi-tenancy. It works on a pay-per-service model that delivers on-demand services. Cloud computing deployment models are classified into public cloud, private cloud, hybrid cloud and community cloud. It also comprises of different service models namely software-as-a-service (SAAS), platform-as-a-service (PAAS) and infrastructure-as-a-service (IAAS). SAAS allows cloud users to consume application software over Internet on demand based requests without installations to the local machines. PAAS model is utilized to develop applications and for hosting them on cloud, consists of operating systems, resource allocation and sharing, databases, etc. IAAS forms the base for the other two service models that consists of data centers, physical computing devices and also enables virtualization. Various vendors provide these services directly to the cloud users. Some of the well-known cloud giants are Amazon, Microsoft, salesforce, google and IBM. PAAS vendors are google app engine, azure, salesforce, bluecloud, amazon web services and Manjrasoft Aneka. IAAS providers are open nebula, eucalyptus, etc. It consists of stacks, libraries and runtime environment to develop and maintain services across the network (Buyya et al., 2013; Buyya et al., 2010; Ferry et al., 2013). Cloud computing is a technology that enforces a connective environment that allows concurrent execution of services across the network. The accessibility to cloud is made easier by its deployment models, though which utilization of cloud is limited by pay per use model. The distributed applications are migrated to cloud from desktop grids. PAAS model is utilized to develop applications and for hosting it on cloud, consists of operating systems, resource allocation and sharing, databases, etc. Multiple developers use tools to develop web apps provided by PAAS. Though development is constrained to certain languages like java, python, .Net, ruby on rails and few more, it provides efficiency, scalability, interoperability and quick deployment with reduction in cost (Banerjee et al.,2014). Various risk factors are associated with PAAS such as access control, security, technical support from vendors and flexibility. It comprises of user management, resource allocation and database management. The scalability and performance of applications on cloud environment should be comparatively high over traditional distributed computing. To ensure this, various service models support enormous functionalities which offer the quality of service and the performance metrics.

Aneka is purely a PAAS provider and it supports linux and windows platforms. It also allows third party cloud deployment which is useful for dynamic scheduling. Aneka is extensible, i.e. the aneka built-in API's can be used for developing application on top of it, the programming model and algorithms can be extended or customized by the developers. The platform abstraction layer (PAL) in aneka allows the cloud computing platform to work upon different operating systems. This layer interacts with the physical machine on which aneka is installed and supports a run time environment to scale applications on various platforms. The detailed architecture of the aneka cloud is illustrated in (Vecchiola et al., 2009). It comprises of four layers namely application development and management, middleware, PAL layer and infrastructure. Inbuilt API's and various tools are implemented in the application layer. The middleware hosts distinct services offered by aneka, the fabric services, the foundation services, execution services that includes different programming models and the transversal services that provides persistence and