Chapter 3
Performance Evaluation of Energy-Aware Virtual Machine Placement Techniques for Cloud Environment

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ABSTRACT

The most dominant service of cloud computing is infrastructure as a service (IaaS). Virtualization is the most important feature of IaaS and it is very important for the improvement of resource utilization; but along with this, it also degrades the system's performance and makes them overutilized. Therefore, to solve the problem of overutilization or underutilization of machines and performance improvement of machine, the VMs present inside the physical machine needs to be migrated to another physical machine using the process of VM consolidation, and the reduced set of physical machines after placement needs a lesser amount of power or energy consumption, which is the main aim of energy-aware VM placement. This chapter presents a decision-making VM placement system and compares it with other predefined VM placement techniques. This analysis contributes to a better understanding of the effects of the placement strategies over the overall performance of cloud environment and also shows how the one algorithm delivers better results for VM placement than another.

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INTRODUCTION

The digital business transformation has changed the ways we live, we do our work, buy products and many more. It offers new ways to conduct business, to connect with people and to do our day today work. The concept of digital business transformation is incomplete without the knowledge of cloud computing environment. The models of cloud computing acts like catalyst for the innovation during digital transformation. Both of these terms (cloud models and digital transformation) are inter-related. The different characteristics of cloud computing such as: on demand access, pay per usage, 24 hours availability, low cost of ownership makes the innovation more affordable. Cloud computing is now adopted not only in the technology sector but also in the academics, healthcare, finance, retailers and many other sectors. Application as a Service model of cloud environment is very popular in day to day lives, as most of the individuals now days would not like to do any physical efforts for their work either it is the matter of their medical checkup, financial services, business services, social interaction, entertainment services and so on. All these services are provided by cloud service providers to their door steps example: online banking features, online shopping (Amazon, Flipkart, E-bay and many more), entertainment applications (you-tube, online Tv etc.), social media for interaction (such as facebook) and more importantly online taxi booking (Uber and OLA). Clearly, the capabilities of cloud model are important for enabling digital business transformation.

Cloud computing is a technology which provides the resources over the network on pay-per usage basis. Everything from applications to hardware is provided by cloud service providers. There are three different types of cloud service providers: SaaS (Software as a service) providers which provides applications to the users over the network such as: Facebook, Gmail, Twitter and many other entertainment applications. PaaS (Platform as a Service) provides runtime platforms for the cloud users so that they don't need to install any particular platform for developing any application. Moreover, IaaS (Infrastructure as a Service) provides infrastructure i.e. hardware, storage for user example data centers. Due to the easy availability of these resources cloud users not need to spend their extra money for buying their own hardware.

Emerging trend of applications requires the demand of cloud environment and this term of cloud computing is defined by (Buyya, 2009) which is a parallel and distributed system with large number of virtualized computers where the provisioning of the resources is provided according to the mentioned SLA (Service Level Agreement) that has been signed between cloud service user and service provider. Virtualization is important features of cloud computing environment or it is the backbone of cloud