Optimization of Resource Usage for Computer-Based Education through Mobile, Speech and Sky Computing Technology

Azeta A. Ambrose, Covenant University, Ota, Ogun State, Nigeria, azetaambrose@gmail.com

Abstract

Cloud computing encompasses any subscription-based or pay-per-use service over the Internet. Using a cloud that is owned by a single service provider has its demerit to the customer such as the risk of downtime or breakdown of equipment arising from disaster that can jeopardize the subscribers' business. Data security and reliability due to over centralization of company's data poses a high risk for subscribers, hence a call for distributed cloud also known as Sky Computing. When application is distributed across several clouds with varied interest, infrastructure, policy, etc, the issue therefore will be how to determine the most cost effective cloud during access time. The amount of money a student pays in accessing learning content is determined by how much an institution pay as subscription to cloud providers. The objective of this study is to utilize optimization theory to determine the most cost effective cloud for mobile virtual education in Sky Computing environment. This will be achieved by optimizing resource usage for Computer-based Education through Mobile, Speech and Sky Computing Technology. As a proof of concept, we will design and implement a cloud middle ware (CMW) to interface with an eEducation system. Access to the eEducation shall be Mobile, Speech and Web. Through the communication platform, the students can communicate with their teacher at any convenient time, and vice versa at the most reduced cost.

Keywords: Cloud, eEducation, Optimization and Sky Computing.

1. INTRODUCTION

The information age and technological revolution has made computer-based education indispensible for learning, teaching, social interaction among learners. A lot of research has been done on deploying educational system on web, mobile, speech and cloud platform. The cloud platform allows institutions to use resources on a pay as you go basis, without necessarily having to invest huge sum of money in acquiring Information Technology infrastructure. These new features have a direct impact on information technology (IT) budgeting, particularly for educational institutions that may not be able to afford personal IT infrastructure and also may find it difficult to pay high subscription rate to web server owners or cloud owners for service usage.

Providers of cloud computing uses networks of large groups of servers typically running low-cost consumer PC technology with specialized connections to spread data-processing chores across them. These development however bring problems including risk of failure since the application reside on cloud owned and managed by a single cloud provider. Having an application distributed across multiple clouds to a large extent reduces the risk of data security and storage, as well as power and equipment breakdown. This is one of the reasons that led to the bringing together of several clouds (owned by different providers) to form what is known as Sky Computing. The main advantage of the cloud computing is that this technology reduces the cost effectiveness for the implementation of the Hardware, software and License for all (Mallikharjuna et al. 2010). Users can further benefit from low cost and high resource utilization by using sky computing.

2. STATEMENT OF THE PROBLEM

Sky Computing is an emerging computing model where resources from multiple clouds providers are leveraged to create large scale distributed infrastructures (Keahey et al., 2009). These clusters provide resources to execute scientific computations requiring large computational power. Cloud computing is gaining acceptance in many IT organizations, as an elastic, flexible and variable-cost

way to deploy their service platforms using outsourced resources (Moreno-Vozmediano et al., 2010). Establishing a sky computing system is challenging due to differences among providers in terms of hardware, resource management and connectivity (Riteau et al., 2010). These new features have a direct impact on information technology (IT) budgeting, particularly for educational institutions that may not be able to afford personal IT infrastructure and also may find it difficult to pay high subscription rate to certain cloud owners for service usage. The technology of cloud computing has a high risk of failure if provided by a single provider, since the application reside on cloud owned and managed by a single cloud provider. Having an application distributed across multiple clouds to a large extent reduces the risk of data security and storage, as well as power and equipment breakdown. When application is distributed across several clouds with different cloud owners, architecture, infrastructure, policy, etc, the issue therefore will be how to determine the most cost effective cloud during access time. The amount of money a student pays in accessing learning content is determined by how much an institution pay as subscription to cloud providers.

3. RESEARCH OBJECTIVE

The objective of this study is to utilize optimization theory to determine the most cost effective cloud for mobile virtual education. This will be achieved by optimizing resource usage for Computer-based Education through Mobile, Speech and Sky Computing Technology. As a proof of concept, we will design and implement a cloud middle ware (CMW) to interface with an eEducation system. The CMW is at the middle between the mobile/speech client and the Sky computing platform. Every request to the cloud resources goes through the CMW. The clouds advertises available resources and cost of access to the CMW. The CMW receives request from client and searches through an resource vector of all the clouds in the Sky environment to determine the one with the most cost effective policies. The CMW then establish a connection between the user making the request and the corresponding cloud. The eEducation system that will be provided will allow students to communicate among themselves and with their teachers. The study will minimize cost of access and maximize usage of resources across multiple clouds,.

4. RESEARCH METHODOLOGY

In client, we will develop the mobile phone software based on J2ME. VoiceXML will be used to provide the speech client application, and PHP will be used to provide the server side information processing. The application will be deployed and tested on several Cloud providers such as Amazon web services, Rackspace cloud, Google's App Engine, Microsoft, Ubuntu's enterprise cloud, etc. The modules of the application will comprise of (i) students social media for learning interaction, (ii) students profile personalization which gradually converges to alumni set after graduation through regular update, (iii) speech-based voting for departmental associations and alumni elections, (iv) lecture/research project upload/download, and (v) Video lessons.

The optimization technique used will be linear programming model to determine the most cost effective cloud (cost minimization), while ensuring effective resource usage (resource maximization). These will be achieve through minimization and maximization technique of LP. A utility software will be developed as an API to work with the application during access to determine the most cost effective cloud during mobile and speech access.

5. CONCLUSION

Through the communication platform, the students can communicate with their teacher at any convenient time, and vice versa at the most reduced cost. This helps teachers know the situation of teaching and student's knowledge level of the course. The teacher also can answer questions or send messages to students through this communication platform freely. In practice, through these technical means it narrows the gap between students and teachers and produces satisfactory results

REFERENCES

Keahey K., Tsugawa M., Matsunaga A. and Fortes J.(2009), "Sky Computing," IEEE Internet Computing Magazine, vol. 13, no. 5, pp. 43, September 2009.

Mallikharjuna Rao N., Sasidhar C., Satyendra Kumar V. (2010), Cloud Computing Through Mobile-Learning", (IJACSA) International Journal of Advanced Computer Science and Applications, Vol.1, No. 6, December 2010

Moreno-Vozmediano R., Montero R. S., Llorente I. M. (2010), "Multi-Cloud Deployment of Computing Clusters for Loosely-Coupled MTC Applications", DRAFT FOR IEEE TPDS (Special Issue on Many-Task Computing), July 2010.

Riteau P., Tsugawa M, Matsunaga A., Fortes J. and Keahey K. (2010), "Large-Scale Cloud Computing Research: Sky Computing on FutureGrid and Grid'5000", Cloud Computing, October 2010.