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Effective use of cloud computing in educational institutions

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Abstract

Cloud computing is becoming an adoptable technology for many of the organizations with its dynamic scalability and usage of virtualized resources as a service through the Internet. It will likely have a significant impact on the educational environment in the future. Cloud computing is an excellent alternative for educational institutions which are especially under budget shortage in order to operate their information systems effectively without spending any more capital for the computers and network devices. Universities take advantage of available cloud-based applications offered by service providers and enable their own users/students to perform business and academic tasks. In this paper, we will review what the cloud computing infrastructure will provide in the educational arena, especially in the universities where the use of computers are more intensive and what can be done to increase the benefits of common applications for students and teachers.

Keywords: Cloud computing; virtualization; SaaS.

1. Introduction

Nowadays, the term "cloud computing" has been an important term in the world of Information Technology (IT). Cloud computing is a kind of computing which is highly scalable and use virtualized resources that can be shared by the users. Users do not need any background knowledge of the services. A user on the Internet can communicate with many servers at the same time and these servers exchange information among themselves (Hayes, 2008). Cloud Computing is currently one of the new technology trends (broadband internet, fast connection and virtualization) will likely have a significant impact on teaching and learning environment. Senior people in charge of their business place challenge how to redesign their IT operations to support their business units in the light of different technology trends so they can achieve their corporate objectives. Rising business demands are forcing responsible IT people to consider new ways to reallocate their limited internal resources to better support their corporate priorities. This is driving them to rely more heavily on third-party services to increase their in-house capabilities and better satisfy the needs of their end-users, as well as their customers and strategic partners.

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Today's "*cloud*" platforms such as "*Microsoft"* and "*Google"* are providing free services to students and staff at educational institutions which include email, contact lists, calendars, document storage, creation and sharing documents and the ability to create websites (Sclater, 2009). He surveyed in different companies from different industries who have built custom applications in the cloud and analyzed how cloud computing affected their operations in three important areas: Security, Integration, and Time-to-Value.

2. Previous Studies

Many of the previous work in the field of cloud computing have been in the areas of new technologies, general explanation of the cloud technology, differences among similar technologies, security requirements and the future expectations in these emerging environments. While Banerjee (2009) provides an overview of technological researches performed in HP labs, and a cloud-scale intelligent infrastructure attracts, smart environments like utility computing, smart data centers, pervasive computing, automation, virtualization and intelligent networks already penetrate many spaces of our daily live (Klein & Kaefer, 2008). Cloud computing is an emerging application platform and aims to share data, calculations and services among users. The methods to model it with the challenges like user interface, task distribution and coordination issues are explained and evaluated in (Lijun, Chan, & Tse, 2008).

Grossman et a1, (2009) developed a cloud-based infrastructure which had been optimized for wide area, performance networks and supported necessary data mining applications. Cloud computing infrastructures accelerated the adoption of different technological innovations in academia and its facilities and resources could be accessed by the colleges as on–demand. Praveena & Betsy, (2009) provided a comprehensive introduction to the application of cloud in universities. Delic & Riley (2009) assessed the current state of the Enterprise Knowledge Management and how it would turn into a more global, dependable and efficient infrastructure namely cloud computing. They discussed architectural technologies and related applications.

The basic features of cloud computing are presented and compared with the original "Grid Computing" technology (Aymerich, Fenu & Surcis, 2008). They introduced new services that will replace many types of computational resources currently used. In that perspective, they also consider that grid computing will play a fundamental role in defining how cloud services will be provided. SaaS, the software deployment service provided by the Internet Service Providers (ISP) and the carrier companies is expected to change the current system architecture of the organizations and thus is accepted as another innovation for the network society (Hirata et a1, 2008). In the software-as-a-service (SaaS) cloud model, service providers supply the hardware and software products and interact with the user through a web portal. Services can be anything from Web-based email to inventory control and database processing (Newton, 2009).

Cloud provides the opportunity of flexibility and adaptability to use the computing resources on-demand. Contrary to having only one service provider, different providers use different interfaces to their compute resources utilizing varied architectures and implementation technologies for customers. Although this creates a management problem, a common architecture facilitates the management of compute resources from different Cloud providers in a homogenous manner (Dodda, Smith & van Moorsel, 2009). Mitchell (2008) provided an overview of existing learning architectures, and raised questions about how educational institutions are managing the cloud computing resources. He also brought reasonable explanations for the challenge of indexing web resources for optimum discoverability by students and educators.

After this brief literature review providing the context from the infrastructure, application and services aspect of cloud computing, this paper focuses on the educational usage of the cloud services and how it will support these virtual services in a secure manner. We will also look for the answers of its benefits to higher education institutions and different educational uses. Based on the literature review and analysis of the current cloud computing service provisions and applications in institutions, we also introduce cloud computing to educators and help them to gain a better understanding of the conception of cloud technology and its impact on teaching and learning in institutions.

3. Educational Usage of Cloud Computing

The Cloud delivers computing and storage resources to its users/customers. It works as a service on demand policy. Cloud computing is a new business model wrapped around new technologies like virtualization, SaaS and broadband internet. Recent interests offered new applications and elastic scalability with higher computing parameters. So that, these positive effects have shifted to outsourcing of not only equipment setup, but also the ongoing IT administration of the resources as well (Open Grid Forum, 2009). The results of a survey that have been completed in 2009 by Gartner analysts (Figure 1) about the IT trends (especially cloud computing) show that it is being used more in the areas of finance and business when compared to other sectors (Gartner, 2009). Results are shown as a pie chart and the labels on each different slice represent different industrial sectors and services. The "/" is used to separate different sectors with the same percentage.

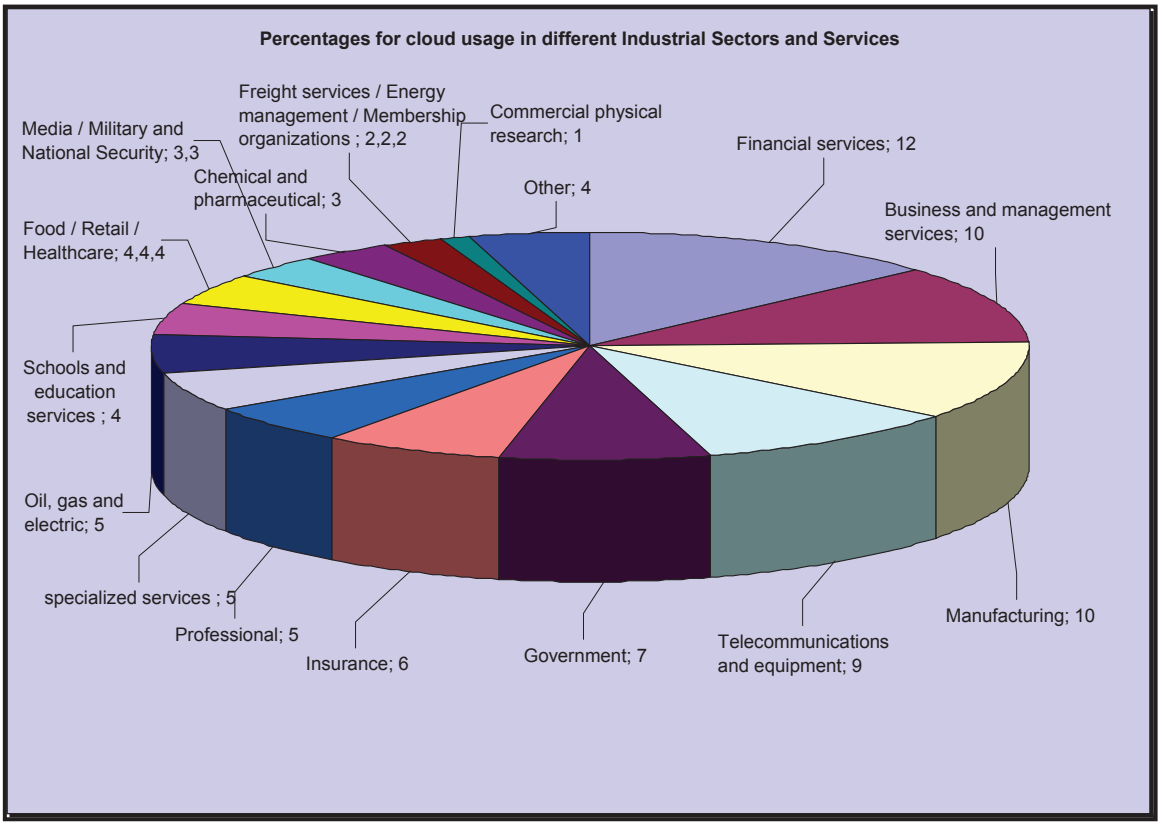

Figure 1. Cloud usage

3.1. Requirements

Many technologies that were previously expensive or unavailable are now becoming free to anyone with a web browser. This is true for all web sites, blogs, video sharing, music sharing, social sharing, collaboration software, editing/presentation and publishing, and computing platforms in the "cloud". Students are already using many of these technologies in their personal lives. In the professional world, the trend of discovering and using technologies in our personal life is called "consumerization". This means we should demand and consume the required services. Our education system should take advantage of this same trend, which will both enrich our student's technology-enabled education, and importantly, reduce the budget impact in academic institutions. University management

should identify and leverage emerging technologies that are cost-effective, and strive for the broadest feasible and equitable access to technology for students and staff. The need for hardware and software isn't being eliminated, but it is shifting from being on-premises to being in the cloud. All that is needed is a cheap access device and a web browser, broadband in the schools, perhaps wireless hotspots.

3.2. Proposed Model

The model we will try to offer in this study, should easily meet the needs of the administrative staff (student affairs, finance and accounting, purchasing and procurement, etc.) and education, training and research related needs of students and academic staff who work especially in the educational institutions. Universities should perform all the necessary stages in order to establish infrastructure for cloud as they work for an appropriate network design and should work together with the units and personnel mentioned in the above paragraph in order to optimize all the requirements (Figure 2). Compute resources (processors, memory, storage, bandwidth, etc.) are provided in an as-needed, pay-as-you-go model. Infrastructure scales up and down quickly to meet demand.

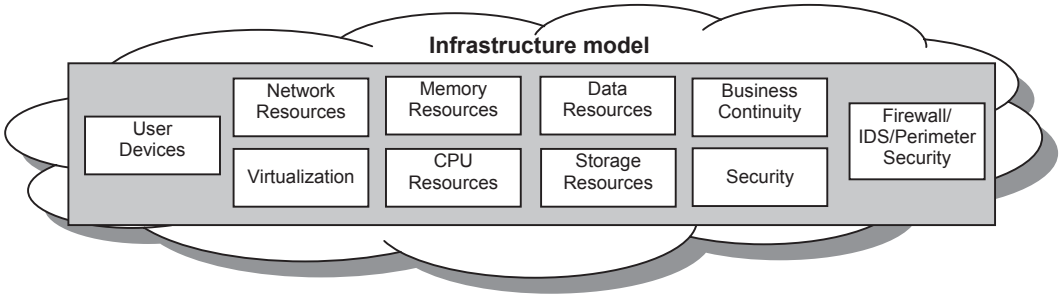

Figure 2. Required infrastructure model

The most important feature of the various applications offered by cloud is their availability and scalability. User-friendly interfaces of cloud based applications enable users successfully enlarge their computing environment. A cloud-based platform planned by (Erickson et a1, 2009) places the application-content rather than applications themselves at the center. This enables users to rapidly build customized solutions around their content items. Cloud content (scientific and social subjects, art, opinions, textbooks, encyclopedias, etc.) is controlled by the service providers and available to users whenever they request. Improved data mining techniques filter and find the requested content in order to help students (Figure 3). Student's objectives are not limited to their courses or schools, hence existing content should be changed dynamically and frequently. Custom services are combined with 3rd party commercial services to create new applications.

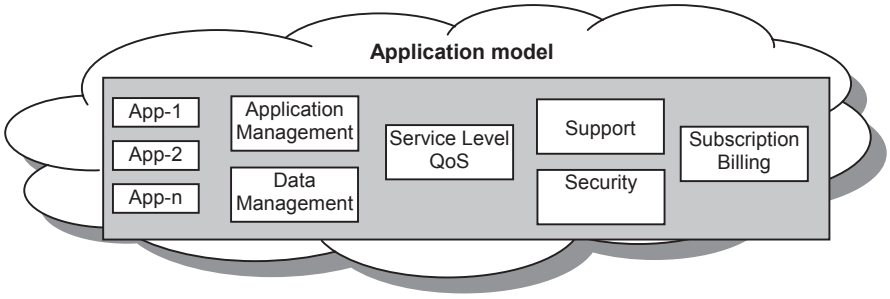

Figure 3. Required application model

4. Conclusion

Cloud computing as an exciting development is a significant alternative today's educational perspective. Students and administrative personnel have the opportunity to quickly and economically access various application platforms and resources through the web pages on-demand. This automatically reduces the cost of organizational expenses and offers more powerful functional capabilities. There will be an online survey to collect the required data for the use of cloud computing in the universities and other governmental or private institutions in the region. This will help us review the current status and probable considerations to adopt the cloud technology. Beginning with the outsourcing of email service seems attractive. The gradually removal of software license costs, hardware costs and maintenance costs respectively provides great flexibility to the university/corporate management.

From the points of advantages provided by cloud, there is a great advantage for university IT staff to take them away the responsibility of the maintenance burden in the university. Cloud provides instant global platforms, elimination of H/S capacities and licenses, reduced cost, simplified scalability. Adopting cloud network redundancy eliminates disaster recovery risks and its high costs. There can always be new tools and applications to improve IT features.

There are of course some disadvantages too. The cloud computing services needed to deliver the majority of IT services needed by customers do not yet exist. There are still problems and constraints with application offerings, service-level agreements, more importantly security issues. All of the cloud providers do not have the same capability for their technological levels.

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