The future of cloud computing literature review sample

Technology, Development



The Future of Cloud Computing

Introduction

Cloud Computing

Cloud computing applies to the development of parallel computing, distributed computing, and grid computing (Rad, et al., 2009). Cloud computing refers both to a platform and a type of application (Buyya, Yeo, Venugoplas, Broberg, & Brandic 2009). Cloud computing platforms provide the services necessary for developers to create new SaaS applications; it is a dynamic process that provisions, configures, reconfigures, and deprovisions servers. Cloud platforms provide a pool of resources to host different applications where computing power is delivered on demand (Van, Tran, & Menaud, 2009). Cloud applications use large databases and powerful servers that host Internet-based applications and services. Thus, cloud platforms are for developers, and cloud applications are for users. The two concepts are intimately interrelated and there are several factors to consider when analysing their interconnectedness: infrastructure, platform, storage, applications, and core. Figure 1 illustrates some of these possible interconnections.

Figure 1. Cloud application interconnections

Applications

A logical first step in the understanding of cloud computing is to begin by looking at the cloud services at the user end, starting with software as a service application (SaaS). First, we have SaaS application services like Salesforce. com's CRM application that allow users to integrate on-premises applications, or packaged software, with cloud applications (Hallestad, 2005). The vast storage capacity and infrastructure of cloud platforms have lured organizations into using cloud platforms to develop their own SaaS applications. In addition, the current trend in SaaS is to move away from traditional licensing of software into software subscriptions, further promoting a move to the cloud.

One of the most widely used cloud services other than the SaaS applications are the search engines; including universal application search engines like Google, Bing, and LiveSearch, and specialized search engine applications like Nexis/Lexis, and PubMed. Not only does one access the search engines via server that connects through the cloud, but the search engines themselves also provide cloud application services or interconnect through cloud platforms (Rad, et al., 2009). For example, PubMed allows the user to search for information within their own databanks while providing links to other proprietary databases, ranging from access to the vast genetic databanks, to the websites or private email accounts of the authors in the PubMed databank. In other words, search engines are more like applications than infrastructure services. Further blurring the line between application services and infrastructure services is the fact that mega service providers like Google and Microsoft tend to bundle cloud application services under one umbrella. Cloud storage is clearly an infrastructure service and cloud search is clearly an application service, but services such as Microsoft's Alert service might be seen as a hybrid of the two (Buyya, et al., 2009).

One of the most powerful services is storage. Limitations in storage capacity have until now defined the boundaries of research. Large-scale experiments

e Page 4

often need a vast amount of computing and storage capacity. In the past, these needs were met by using high-performance super computers that are expensive, and which require professional maintenance and training. Now, cloud computing can offer these services at a fraction of the cost and with real-time online support, and are offered through service level agreements (SLA) that contract quality of service (QoS). Vecciola, Pandely, and Buyya (2009) evaluated the services of Aneka, one of these providers, which uses private and public clouds to deliver the computing power necessary to run the desired programs. The authors conducted a survey to evaluate the effectiveness of Aneka in the classification of genetic data and in fMRI imaging, and found that Aneka could deliver cost-effective on-demand high quality services that allowed for wider use of computing applications in the experimental arena. In a similar study, Langmead, Hansen, and Leek (2010) used Myrna, another specialized cloud computing pipeline, to conduct RNAsequencing differential expression analyses. The authors analysed a large publicly available RNA-Seq dataset with over 1 billion reads, and found that the application services provided by Myrna were ultra-fast and memory efficient. Like Aneka, Myrna uses the cloud to run multiple computers and processors using Amazaon Elastic MapReducs on either a Hadoop cluster, or circumventing Hadoop altogether. One issue to consider is that privacy concerns might curtail the use of this service.

A wide range of applications have been targeted for the private sector, but no cloud application has grown as fast not has a wider use than do the social network applications. There are many such social networks but by far the largest is Facebook. One can find all sorts of Facebook statistics online, mostly from unfiltered sources, and they all say one thing: that Facebook is used by over 500 million people around the world; that is, 1 out of 13 on the planet are registered users, and half of them log in every day. Gjoka, Sirivianos , Markopoulou , and Yang (2008) conducted a more formal assessment of Facebook and suggest that Facebook's application platform is behind the unprecedented success of this network, which allows for thirdparty social networking applications. The authors gathered Facebook application usage data over six months and found that the distribution of the popularity of Facebook applications is rather skewed, with 18-24 year old users representing the core segment at over 60%. They also found that as the number of Facebook applications increase, their average use decreased, and the more applications a user has installed, the more likely the user is to install more applications.

Park, Kee, and Valenzuela (2009) conduced a survey of 1, 715 college to determine the attraction of one of these applications—Facebook Groups and found that the primary reason for joining such groups were a need to socialize, be entertained, improve the standing of their status, and acquire information. The level of participation in these groups correlated with gender, hometown, and year in school. In addition, students with political and civic interests were more likely to join Facebook Groups for informational rather than recreational uses. In a similar study, Zhang, Tang, and Leung (2011) explored the impact of an individual's psychological traits on their use of Facebook and discovered that self-esteem, the ability to express emotional online, and concerns about communication were strongly associated with degree of networking in Facebook. However, there have also been concerns regarding the safety of Facebook. In addition to potential risks with social predators and cyber bullying, there is the real risk of Internet addiction. Kittinger, Correia, and Irons (2012) assessed the level of Internet addiction in a group of 281 college undergraduate students. The students completed a set of online questionnaires as well as the Internet Addiction Test and found that a significant number of students reported problems and symptoms related to Internet addiction.

The influence of Facebook goes far beyond campus life and keeps spreading across all areas of social life. Marzouki et al. (2012) analysed the impact of Facebook on the success of the Tunisian revolution. The authors describe the perception of Tunisian Internet users that see Facebook as a catalyst for their revolution. The study began five days after the fall of the regime via an online survey of 333 participants who rated the impact of Facebook on the revolution and provided reasons for their evaluation. The results showed that Facebook had three salient functions: political, informational, and as a media platform, all three of which interacted to connect Tunisian Internet users under a common goal.

There are countless other applications and as new devices are being developed new applications soon follow. Table 1 is a representative sample of some of these other applications.

In the research and development sector, cloud computing infrastructure promotes the development and adoption of innovations. It provides the resources necessary for developers to test and share their innovations and thus frees innovators from having to search for the means and the resources to conduct their research and development. Cloud computing also fosters innovation by providing flexibility and adaptability. It is also cheap. In the business sector, cloud computing infrastructure provides for more efficient use of information technology hardware and software investments. Cloud computing also increases profits by allowing for more efficient use of computing resources as well as for more efficient use of human resources by promoting cooperative and collaborative teamwork.

The next step is to evaluate the various platforms used to develop, deliver, and maintain these applications.

Table 1. Cloud services and applications Cloud Service Service Provider Application Webmail Gmail, Yahoo, Hotmail Private communication Social networking Facebook, MySpace Social communication Professional networking LinkedIn. Professional communication Document applications Google Docs, Document archiving and sharing Blogging

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Wordpress, Blogger

Public broadcast by individuals

Microblogging

Twitter

Public broadcast by individuals

Business sites

eBay, Amazon, Craigslist

Consumer advantage

Video-sharing

YouTube, Vimeo, GoAnimate

Public sharing of private work

Picture-sharing

Flickr

Private sharing of images

Desktop publishing

PhotoShop, SumoPaint

Publishing, drawing

Search

Professional databanks

Pubmed, MedScape, Nexis, Lexis

Access to professional information, professional development

Search

NPO/Government databanks

CDC, WHO

Public welfare

Search

Education

Molecular Workbench, BrainPop, Nobelprize

Self-guided learning Home-schooling Professional Development

Consumer services

Search

Yelp, TripAdvisor

Consumer advantage

Search

Universal information

Wikipedia, WolframAlpha

Dissemination of knowledge

Storage

Google, Microsoft, banks

Private storage of data

Mega-storage and data streaming

Aneka, Myrna, Human Genome Project

Mega data analyses Public storage of mega data

Remote employment

CareerBuilder

Home-based work

Key Drivers for Business Cloud Applications

Cost. One critical factor to consider when deciding whether cloud-based applications are right for a business is value. Many IT applications have the immediate potential for lowering the costs of making business; however, due diligence must be conducted to ensure that short-term reduction in cost does not in the end result in loss of functionality or productivity, or that it leaves the business in a vulnerable position or that it exposes it to security risks. Value is more important than mere cost to consider.

Timing. Once the assessment has been made and a model has been chosen, the next step is to consider when, and how fast, to begin implementing the change of collaboration capabilities to a cloud platform. Another thing to consider is whether all assets are to shift to the cloud or whether some assets are to be kept behind private platforms. Prioritization analysis must also be conducted to determine which aspects of the business will be the first to be integrated into cloud-based applications, and these will tend to vary widely from business to business. Some of these applications will be placed on a faster track than others, based on the current status of their software applications, standing service agreements, projects in progress and Quality of Service. It is important to understand how to integrate a cloud application into the existing enterprise infrastructure; therefore, it might be wise until one set of applications is safely launched to the cloud and tested before a new of applications is even considered for adoption.

The Right Applications. A business must also determine what are the right tools that are needed for its smooth operation. Some businesses may run well on light applications whereas others might require applications rich in functionality. One factor to consider is the number of users involved, the extent of need and use of the applications, and whether the cloud application is to be used internally or is to be shared externally. It must also to be taken into consideration how to segment or compartmentalize the various users. Flexibility is important in most business enterprises and this often comes with some degree of uncertainty; thus, another key determinant is the ability to support unpredictable workloads.

Trust. A business enterprise must feel comfortable with its provider of cloud applications or platforms, thus the vendors particular strengths and weaknesses must be evaluated. It is important to determine whether the provider understands and is capable of meeting the long-term goals of the business and whether it can adapt as the business changes and matures. The business must ensure that the vendor delivers timely and relevant solutions and is able to guide the business IT needs into the cloud. Transparency is an important factor in developing trust between the business and the enterprise providing the cloud platform and applications. The largest barriers to cloud adoption are data security and how to protect against unauthorized access; thus, vendors should be prepared to discuss security of their cloud infrastructure, privacy concerns, SLAs or issues related to data storage, retrieval, or analysis.

Communication and collaboration. Cloud-computing has the potential to improve communication and collaboration between and among enterprises or individuals. It can also provide new ways for businesses to engage and interact with their customers.

Efficiency. Cloud-based platforms can also help to standardize processes and thus promote efficient business practices and solutions.

Research and development. Cloud-computing allows for timely research and development of new and improved services or products at a reasonable cost, promoting the evolution of technology.

Key Drivers for Mobile Cloud Computing

Scalability. The cloud also has the ability to scale deployment of mobile applications while offering indefinite data storage capabilities.

SAAS licensing model. A significant portion of the cloud market is comprised of enterprise users with time-based subscriptions. Time-based subscriptions help reduce costs by not locking users into costly platforms such as Mobile Enterprise Application Platforms (MEAP). SAAS licensing also offers a great deal of flexibility.

HTML5. This new application improves the caching of data while reducing load demands, which will help widen access to areas where coverage is poor.

Greater processing power. The enhanced power of the cloud will allow for quick downloads of applications as thin clients and cloud-based data processing.

Cloud-based enterprise mobility. Collaboration will allow for universal access to applications regardless of the size of the business, anywhere and at any time. That is, small business will have access to computing tools previously reserved for large enterprises.

Customized data plans. Access to cloud-based applications will be on a need-

to-access basis and only the data necessary for a particular task will be downloaded from the cloud, cutting down on costs.

Economics of Cloud Computing

Cloud computing is able to provide a wide range of IT services at a more affordable cost than current IT infrastructures. The savings have been shown to be significant and many enterprises have switched, and many more are considering switching, their services to run on a cloud platform. But before doing so, there are three key economic factors that need to be assesed: the Net Present Value (NPV), or out-year cost savings minus direct investments; the Benefit-Cost Ratio (BCR), or out-year cost savings divided by direct investments; and the Discounted Payback Period (DPP), or the time it takes to get back the money invested. Studies have shown that the NPV and BCR are higher and the DPP is shorter for cloud computing than for conventional IT services. Payment on investment has been estimated at 3-4 years for cloud-computing.

Savings would vary depending on whether the enterprise is to use a private, a public cloud, or a combination of the two. Key drivers also play a role in determining the benefit of adopting cloud computing, especially scalability and the time it takes to implement the new process. The greater the scale, and the shorter the time of implementation, the higher the BCR. Economic benefit decreases as the time of implementation increases. That is, time is money.

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