Cloud Computing for Business Management

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***Abstract*— Cloud technologies are seen more as a new business model, rather than a new technology. They offer attractive opportunities for acquisition and management of computing resources and software platforms and capabilities for addition of new features according to changing needs. Cloud technologies allow companies to carry out their main functions in a new environment that provides a good basis for starting or expanding a business without large investments. There are opportunities for optimization of business processes and reducing the time to adapt and adjust to the changing market conditions. Technologies support the rapid growth of the business by ensuring access to virtually unlimited resources when they are needed. Based on the cloud technologies, companies can create a flexible strategy for development with maximal usage of resources, minimal efforts for their maintenance and effective implementation of business activities. Unnecessary procedural, administrative, hardware and software costs in organizations expenses are avoided using cloud computing. Overall, cloud computing enables the organizations to manage their business effectively.**

***Keywords*— cloud computing, virtualization, web services, data synchronization, Google Drive**

INTRODUCTION

Cloud Computing is quickly becoming one of the most popular and promising technologies. It offers variety of opportunities that help the organizations to improve their business and use technology more efficiently. Many organizations have started adopting cloud computing in their business. It is difficult for the organizations to survive in the traditional ways and they are unable to compete with their competitors. Especially in this competitive environment, respond quickly to business demands is necessary. The organizations are necessary to implement strategic ideas to gain competitive advantages. Cloud computing is an enhanced technology and become a vital technology to run business. It acts as an excellent technological tool that helps the organizations to stay competitive as it can be considered as an innovative way to increase business value. It enables the users and consumers to integrate and combine many different services together that increase the creativity and productivity.

CHARACTERISTICS OF CLOUD TECHNOLOGY

Operations Research and Applications: An International Journal (ORAJ), Vol. 1, No.1, August 2014 2 1. On-Demand Self Service: A customer can avail any contracted computing resource such as processing power, storage space, or application programs from a service provider without human interaction.

Broad Network Access: The computing resources can be accessed anywhere, anytime with any standard device which can access the web.

Resource Pooling: The computing resources of a provider are assembled to provide the confined service. The pooled resources may be geographically spread across multiple data centers. The computing resources of a provider are shared by several customers. The resources are dynamically assigned to customers depending on the demand.

Rapid Elasticity: Computing resources may be availed elastically by customers. A customer may request more resources when needed and release them when not required. From a customer's point of view the resources are unlimited. The customer pays only for the total resources used.

Measured Service: Cloud computing systems are adaptive systems. They automatically balance loads and optimize the use of resources. A user is permitted to monitor and control resource usage, thereby providing transparency in bills.

REASONS FOR THE EMERGENCE OF CLOUD TECHNOLOGY

Even though, there are numerous reasons for the emergence of Cloud Technology in the technical side, the major reasons for cloud emergence are

- Rapid growth of computer and communication technologies: Technological growth in computing and computing devices, and in the data communication lead to the tremendous growth of cloud technology.
- Changes in management philosophy: Decades ago, most of the organizations used to keep their data manual or stored their data in on premise infrastructure. But to meet the global competency, most of the organizations want to utilize their time to improve the business, and ready to outsource their IT requirement.
- Availability of excess computing capacities with giant corporations such as Amazon and Google.

CLOUD COMPUTING SERVICE MODELS

Cloud computing providers offer different types of services to their users based on the main three types of service models. Figure 1 shows the three main types of service models in cloud computing.

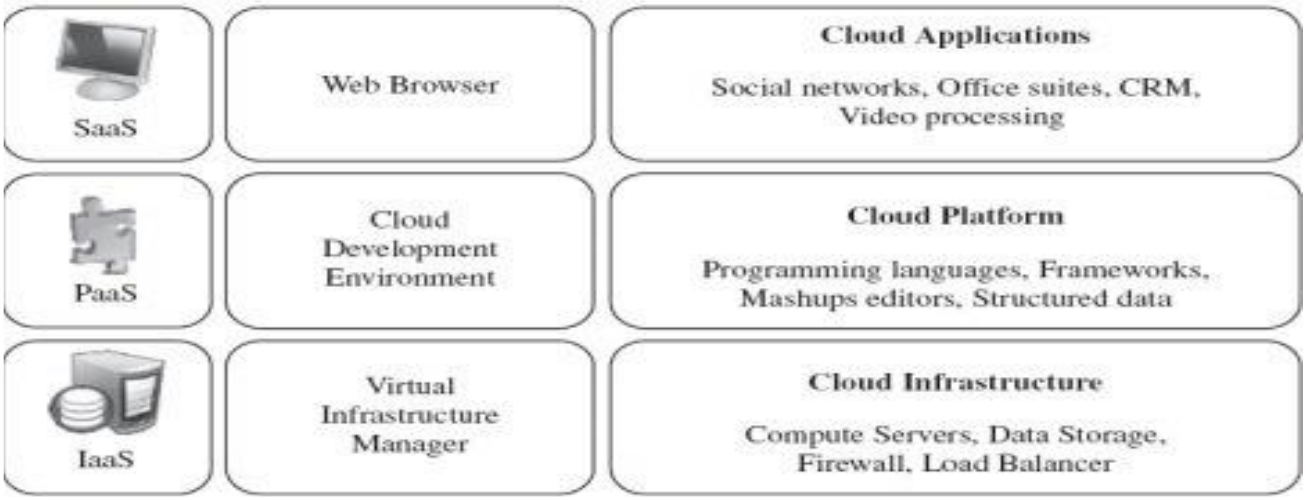

Figure 1: Cloud Computing Service Model

Service as a Service (SaaS)
Service providers will install their software applications which operated by them for the users to use as a service. The users can rent it on a subscription or pay-per use model. The users can access the software applications without the concerns of installation and maintenance. They alsodo not need to know the infrastructure and platform where the applications are running .Compared to the traditional software, SaaS does not require own software and hardware resources. SaaS is popular due to its scalability, compatibility, accessible worldwide and the users do not need to do/worry about scaling, configuration and updates. However, users do not have any control on the components, security and application customization . Examples of SaaS are Google Docs, Microsoft Office 365, salesforce.com etc.

Platform as a Service (PaaS)
PaaS plays a major role in cloud as development environment will be provided by service providers for application developers to implement and maintain their applications. A platform, including software, hardware, operating system, server, development tool and database will be provided by service providers. Users do not need to know how much processing unit, memory, storage they need for their applications. PaaS provides a full “Software Lifecycle” since it allows the application developers to directly implement on the cloud. The difference between PaaS and SaaS is the users to develop the applications on cloud or host the completed Applications on PaaS while the users can only host the completed applications on SaaS. Some examples of PaaS are Amazon Web Services, Google App Engine and Microsoft Azure.

Infrastructure as a Service (IaaS)
The bottom layer of service model is IaaS. The main concept of IaaS is virtualization. IaaS provides the infrastructure for the applications to run. IaaS provides the necessary computational resources and infrastructure such as storage, processing unit, networks etc. It allows users to deploy and run both operating systems and applications. The main benefit is that users do not take any responsibility on deployment, administration and maintenance. An example of IaaS is Amazon EC2.

DEPLOYMENT MODELS

There are different deployment models of cloud computing that can be implemented:
Public cloud – the cloud infrastructure is available to a large group of users (general public). Resources can be used by any registered user and they are available over the Internet usually through web browsers.
Private cloud – the cloud infrastructure is intended for use by a private organization or group. It is not shared with other users and is accessible only through the private network controlled and used by the organization. The private cloud has a higher level of security than a public cloud and most businesses prefer to use this deployment model because it guarantees greater reliability and security**.**
Hybrid cloud – the cloud infrastructure is a combination of distinct cloud infrastructures. The hybrid model allows the deployment of information and applications with significant importance on a private cloud, while applications with lower security requirements and wider access can be deployed on a public cloud. Besides the mentioned deployment models, there are also Community Cloud, Combined cloud, Cloud of Clouds.

USE OF CLOUD COMPUTING TO IMPROVE BUSINESS VALUE

The concept of cloud computing in business may sound ideal and easy to implement, but like all new technology being introduced into a business that already has a system and method in place it has both positive and negative aspects. As previously mentioned, cloud computing has both benefits and drawbacks, however it is vital to examine if these benefits and drawbacks are beneficial or detrimental to businesses when deciding whether or not to implement cloud computing. Although cloud computing has been recognized as a way to improve business, not all businesses are the same. So, is cloud computing for all businesses or is it more beneficial for a certain type of business with certain infrastructure already in place? One service provider that has been paving the way for businesses is Amazon. To narrow the scope of this research paper, Amazon‟s cloud computing services will be used to give a better idea of the uses of cloud computing in business, as well as how it can improve business. Amazon‟s cloud computing services serve as a model for this paper to describe cloud computing services due to the fact that its cloud computing services are one of the best available. Amazon has different branches of its company in seven different countries. Also, it has more than 79 million active customer accounts around the world, along with around one and a half million active seller accounts. Moreover, it has around 400,000 registered Amazon web service developers along with 17, 000 employees around the world (Vaira, 2008b). Amazon‟s platform includes the web services. Furthermore, Amazon provides its customers or sellers with web services that they can use to have easy access to documents, share files and applications, as well as store documents in the cloud (Vaira, 2008b).Taking a closer look at some of the services that Amazon offers will help determine what the business benefits of cloud computing are and who benefits the most from these services.

Amazon offers its customers Elastic Compute Cloud web services. This web service has several advantages for customers, including elasticity, flexibility, decreased costs, and reliability. Another one of the services that Amazon offers is S3. This service is mainly created to securely store business‟s information in the cloud. Many companies like to store their information in the cloud as a way to reduce the expenses. By doing this, companies can save money instead of buying various powerful servers for storage. Rather these companies can just pay for this service and use Amazon‟s storage to store their information and allocate their funds to other areas within the business. The point of any business is to increase profit, while decreasing cost. Amazon‟s cloud computing has the ability to decrease costs in several ways. Especially, as businesses begin to downsize as a result of economic hardship, cloud computing can serve as a tool to not only decrease costs, but simultaneously increase profit, build better business relations, and remain current on technological advances. To begin, Amazon‟s Elastic Compute Cloud web services can reduce the costs of cooling and power, new servers, and server administration and management (Greggo, 2009). Thus, with these reductions a business is able to then reduce the amount of space, equipment, and energy needed to run the same business only cheaper and more effectively. Moreover, it enables businesses the ability to provide standardized and lower cost services (Etro, 2009). As a result of these reduced expenses, businesses will be able to free up operational budgets for new investments for direct business benefits. Also, Elastic Compute Cloud services can not only save companies money on the amount of hardware they must invest in, but also in the number of employees that they must hire (Varia, 2008a). This point is extremely beneficial for new businesses trying to get started. Also, for companies looking to reduce personnel because of limited resources or cutbacks, cloud computing can come to the rescue. The use of cloud computing will allow businesses to cut the cost of numerous employees for a task that can be completed by a few employees through the use of

cloud computing (Galarneau, 2009). Furthermore, as a result of the reduced amount of hardware needed, business can cut the number of operations personnel once needed to manage hardware. However, while management may see this point as a benefit, for those working in IT departments this issue would be seen as a negative. What‟s more, is that by using Amazon‟s services, the hardware requirements can be increased or decreased within minutes, making the service elastic for its customers. While cloud computing can limit the number of employees needed on a given project, it can also bring together the key players in business. Amazon‟s cloud computing services can help teams, customers and suppliers meet, share ideas and basically do business more effectively and without delay (King, 2008). Given that team members, customers and suppliers can be given access to the cloud, business can be conducted like never before.

The use of cloud computing in any given company can help give them the edge over their competition, which ultimately increases business value. This shared access also essentially shortens the time it takes for customers or suppliers to access the market (Klems, Nimis& Tai, 2009). When the market is virtual and constantly accessible, both business profits and relationships can grow. In addition to shortening the time it takes for buyers and sellers to get to the market, Amazon architectures also shorten the amount of time that it takes to process "compute-intensive or data intensive jobs." Amazon cloud architectures offer parallelization, which can reduce processing time. For example, "If one compute-intensive or data-intensive job that can be run in parallel takes 500 hours to process on one machine, with Cloud Architectures, it would be possible to spawn and launch 500 instances and process the same job in 1 hour" (Varia, 2008a, p. 2). Therefore, it can be seen that Amazon‟s cloud computing services can not only reduce costs in terms of hardware, but also save money by saving time in turn allowing for the business to grow. Still though, business growth can also be a problem. Even though business growth is what businesses essentially strive for, if a business outgrows its infrastructure then they may begin to slip backwards. Through the use of Amazon architectures, businesses not only have room to grow, but also scale back if need be. Pay-per-use services allow for businesses to only pay for what they need. This service will save system administrators from worrying about hardware procuring or making better use of excess and idle capacity (Varia, 2008a). Now, system administrators can have the applications either request more capacity or relinquish unused capacity. Moreover, Amazon‟s system does not require a specific amount of capital to be invested, providing for inexpensive services. Amazon allows for customers to pay for the services used, instead of paying for a service, only to find that the business did not used the services paid for or greatly exceeded the amount of service purchased.

Specifically, Amazon‟s Elastic Block Store only charges $0.10 per gigabyte of storage and $0.10 per million IO transactions (Kondo, Javadi, Malecot, Cappello& Anderson, 2009). This demonstrates the flexibility of Amazon‟s services for users in that it allows them to choose the specification of each individual instance of computing power purchased (Varia, 2008b). Although the use of Amazon‟s cloud computing services can be seen as highly beneficial, not all businesses are ready to jump on board. Many businesses have doubts about whether cloud computing services, like Amazon, are able to service large businesses in a way that is cost efficient and reliable (Seeley, 2008). Large businesses have voiced concerns over the use of cloud computing. Some of the concerns include initial start up costs and data center constraints. These large business concerns are not unfounded; however their reasoning may be under informed. The initial start up cost for large businesses may be expensive, as switching between any services can not only incur new costs, but most importantly can be time consuming (Staten, 2008); and in business, time is money. However, the long-term costs of switching services may be more profitable for large businesses willing to make the shift. Using the costs of Google Apps and Microsoft Office Professionals as an example of the cost of switching services, it can be seen that Google Apps only costs $50 per user per year in contrast to Microsoft Office Professionals which retails at $499.00 (King, 2008). Likewise, Amazon boasts reliable services because it makes use of Amazon data centers and network infrastructure (Vaira, 2008b). Large businesses fear that data centers may not be able to keep up with their extensive needs. Also, the possibility of outages forces these same large businesses to rethink the use of cloud computing services. Data center downtime would result in profit loss. Still though, outages can happen both within a business‟ own IT department, as well as with Amazon services.

However, it seems more likely that outages would happen within a business‟ own IT department, rather than with Amazon‟s services (Seeley, 2008). This is not to say that Amazon‟s service has never had an outage. In 2008, Amazon‟s S3 service was down for six hours (King, 2008). With less server outages, system administrators can focus their attention on driving innovation to improve business growth allowing for increased business value. So, it can be seen that cloud computing services, like Amazon‟s, can be used by all business types. Still though, they may be more ideal for smaller businesses or especially ideal for businesses just starting.

CLOUD COMPUTING FOR BUSINESS

Cloud computing became a mandatory technology for each company. It has significant potential and provides effective business opportunities for organizations that adopted this approach. Along with all the advantages associated with cloud computing, businesses can elicit additional benefits.

- **Reduced investments for building IT infrastructure and administrative costs for IT personnel.** Cloud technologies eliminate the need for significant capital investments – companies do not have to purchase expensive equipment (servers and network equipment) and software licenses. They can start their business by employing less computing resources and increase them only when their needs grow. There is a transformation of capital investments to operational expenses and thus eliminates the high barrier to entry in the business. Small and medium businesses can afford to hire resources and technologies, which can not buy, and start from equal positions with other competitors on the market.
- **Possibilities of using modern ICT**, which enable efficient management of business processes. Small businesses can not afford to buy the latest versions of the software and to pay licenses, but by cloud technologies they have up-to-date applications.
- **Scalability of the business**. From a business perspective cloud technologies allow companies not only to increase or decrease computing capacity, but also to expand their business processes and activities. The opportunities for fast and almost unlimited provision of computing power and software applications support the growth and expansion of the companies.
- **Adaptation and adjustment to the changing market conditions.** Today's economic situation and environment requires the ability to react quickly and respond to changing conditions and needs of consumers. Through cloud computing, companies can adapt processes, products and services to the new market circumstances quickly and they are more competitive.
- **Easy administration.** Office suites are accessible via web browser and can be used regardless of the operating system. There is no need to install the packages on the local devices and software versions are updated regularly by the service provider.
- **Reduced costs.** Companies do not need to pay legacy license fees. Usually, prices are per user per month, but sometimes there are annual plans with discounts.
- **Accessibility**. Documents are accessible anywhere at any time, from various devices (including mobile) with different operating systems and browsers.

DOCUMENTS SHARING AND COLLABORATION

Cloud office suites give opportunities for documents sharing, joint simultaneous work on them with options for tracking changes. All these possibilities increase the office work productivity. The most popular office suites are Google Apps for Work, Microsoft Office 365 and Zoho Docs.

- **Google Apps for Work** (previously known as Google Apps for Business) is an office suite based on cloud technologies that includes additional features specific to business. Applications in the package can be grouped into four categories (7, 8): Communicate (Gmail, Hangouts and Calendar, Google+), Store (Drive), Collaborate (Docs, Sheets, Forms, Slides and Sites) and Manage (Admin and Vault). There is a free 30-day trial period (up to 10 users). There are different payment options with opportunities for flexible adding new user accounts – Flexible Plan (payment is for the services used during each month) and Annual Plan (the contract is for one year with discounts). Google Apps for Work provides opportunities for offline work – users can create and edit content even when they are not connected to the Internet and synchronize it later when they are online.
- **Microsoft Office 365** includes traditional office suites components and provides almost all features of standard office. Office 365 provides tools for collaboration and data sharing in real time – documents are stored in the cloud and everyone has access to their latest version. There are options for tracking changes and recovering older versions. The collaboration includes online meetings, portal for sharing corporate videos and etc. Microsoft Office 365 involves enterprise social network Yammer, which supports collaboration and cooperation among employees. There are various options for using Microsoft Office 365 – 3 Business plans and 3 Enterprise plans, which offer different functionality at different prices (9).

- **Zoho Office Suite** is a free software package that includes applications for text processing, spreadsheets and presentations. There are opportunities for synchronizing files across various devices and maintain different documents versions. Zoho supports all types of Microsoft Office documents, allows export to XML, PDF and LaTeX format. Zoho provides opportunities for sharing files, integration with Google Apps, task management. The package includes application Projects to facilitate projects work. Zoho offers real-time collaboration, such as online meetings, desktop sharing and a private social network Connect that allows employees to share data and collaborate with each other. The main Office Suite advantage is the availability of applications that are specific to business – marketing and finance tools, CRM system, human resources management and others.

CLOUD STORAGE SERVICES

Cloud storage services allow companies to avoid buying additional hardware for data storage, maintenance in order to prevent data loss, regular activities in data backup. These cloud services enable data sharing between company's employees as well as between company and its partners – customers, suppliers, etc. The main advantages of cloud storage services are:

- **Access to data** anytime and anywhere regardless of hardware devices and software (most cloud solutions provide mobile access to stored data).
- **Data synchronization** between different devices and users.
- **Integration** to the operating system files managers.
- **Dropbox** is one of the most popular cloud storage services. Its main advantage is the ability to synchronize data between different devices. The service is available for both individual and business users. **Dropbox for Business** provides additional services such as improved data security by using cipher encryption for file data, unlimited storage, collaboration management tools (tracking data sharing process, restricting access to files or their sharing with external people who are not part of a business account), integration with other applications (over 300,000), etc. Users can connect and at the same time there is a separation between personal and work Dropbox.
- **Box** is a cloud service that provides space for data storage – free with certain restrictions as well as paid versions, which are designed primarily for business users. **Box for Business** offers opportunities for sharing workspace between multiple users. Box allows collaboration by ensuring the security and privacy of data by setting and assigning different permission levels to each collaborator. There are tools for controlling and managing content shared with external users and monitoring users' performance – what content they share and whom they work together. Box supports collaboration on projects by task management which allows assigning and tracking individual tasks to team members and reducing inefficient communication. Box provides opportunities for integration with different applications.
- **Google Drive** is part of cloud solutions offered by Google and is not just a service for storing data, but also provides opportunities for real-time interaction. There is free service with some restrictions as well as paid services (**Google Drive for Work**) with unlimited space for data storing. Google Drive allows synchronization of information, which is accessible from different devices. Sharing information can be both internal (with colleagues) and external (with customers and partners), and is even possible with users who do not use Google Drive. Google Drive and Google Docs enable joint work on the same document simultaneously. There are tools for automatic updates and notification of changes in shared documents, tracking and maintaining a history of changes, management of different versions
- **OneDrive** is a Microsoft cloud service, which provides users storage space and remote data access. The service allows integration with Microsoft Office and Windows Phone and different options for uploading and accessing data – via Web, directly from Microsoft Office applications, through mobile apps. OneDrive offers a free personal disk space for data storing. **OneDrive for Business** is a service designed to organizations to store their information which can be accessed, shared and synchronized among many users. The storage service is part of Office 365 or SharePoint Server 2013, which also allows real-time collaboration on documents. OneDrive for Business provides tools for maintaining documents versions and reviewing and approving made changes.

RISKS OF CLOUD COMPUTING IN BUSINESS

Cloud computing, which some people claimed as a new technology, has helped a lot of organizations in doing business. Although cloud computing brings some benefits to the organizations as aforementioned, there are some shortcomings for decision makers that need to be taken into consideration. Cloud network traffic will be pernicious to the performance of cloud. When cloud capacity is more than 80% occupied, the computers will be irresponsible . There is the chance of crashing between servers and computers. This will lead to the loss of valuable data such as customers' data, organizations' sales report etc. Cloud attack is also a major issue in cloud computing. Cloud computing is a place for the users to host their web services such as web hosting and cloud storage. This has attracted the hackers to steal the business data, such as daily sales, profit reports, financial reports etc.

SUGGESTED SOLUTIONS TO OVERCOME RISKS

Cloud computing brings conveniences to the organizations, but there are some risks threatening organizations too. In order to provide a better quality of services, the providers have responsibilities to ensure that cloud environment is highly secured. Providers have to make enhancement on security to gain users' trust. There are some solutions to enhance the security of cloud.

- **Data Stealing Solution**
  Data stealing is usually widely occurred. The attackers will try to steal users' account credentials.To prevent this, a special and distinct number should be generated at login session [9]. Every time the session ends, the users are required to send an email about the usage and duration together with the unique number for the next login. Through this, the users will be more aware of the usage and unique number to be used for every login. For example, in Amazon EC2 cloud service, a unique number is used to verify the users [59]. For retail organizations, it requires the users to register as a user first before purchasing something. The information includes credit card details. [45] stated that it is necessary to enhance registration system to reduce the chance of customers' data stolen. This can be done by applying credit card fraud monitoring system. Security policy, rules and regulations can reduce the risks of improper use of cloud computational power.
- **Malware Attack Solution**
  In cloud computing, the users' requests are processed based on authorization and authentication and these will be done between web servers and web browsers. Hackers will try to inject harmful code to the cloud environment. To prevent this, cloud service providers need to store the information about the Operating System (OS) the users use during the first time registration. Since cloud computing is a fully independent OS platform, cross checking will be done before launching an instance on a cloud.
- **Wrapping Attack Solution**
  Wrapping attack can be prevented by enhancing the security between the communication with the web server and a web browser. This can be done by adding an extra bit which called reluctant STAMP bit contains signature value to the SOAP message . This type of bit is used to prevent the value being changed by the attackers. If there is any interfere during the communication, the STAMP bit will be toggled and new signature value will be produced in browser and is sent to the server.
- **Authentication Attack Solution**
  Authentication is always a weak point, especially in a cloud environment.. One of the ways is to use Key Management for both sides. Server logs should be used to record the access time. Besides, the account should be automatically locked after several unsuccessful login attempts.
- **Denial of Service Attack Solution**
  The solution to overcome this attack is still improving. One common way is to enhance the security of networks. Several approaches such as filter-based, firewall-based and signature based can be used to eliminate the attacks. Filter-based approach can be used to detect a low rate of attacks like an increase and attack in traffic rate and network. Firewall-based approach is to use a firewall in order to enhance the strategy. It can be used to allow or deny protocol access. For example, if an attack is coming from an unusual IP address, the firewall based approach will try to drop the unauthorized coming traffic. Signature-based approach is used to compare the signature database. In the network, the traffic is monitored with the signature pattern. If the signature does not match each other, it will block the attacks. They suggested that by disabling IP broadcast can reduce the chances of DoS attacks. Another way is applying the

security patches. Operating System (OS) and applications can be the victims of DoS attack. To prevent from the attacks, the OS should have installed with the latest security patches. For example, when there is a SYN Flood attack, the servers should have software patches to detect and avoid it.

CONCLUSION AND FUTURE RESEARCH

Cloud computing has become one of the transformational technologies that is tremendously important to improve ways of doing business. It has been proved to be a valuable asset for organizations to stay competitive. Cloud computing has been defined from different perspectives by different experts and it is difficult to discern exactly how cloud computing is constituted. As discussed in this paper, cloud computing brings conveniences and benefits to the organizations such as business flexibility, cost reduction, automatic hardware and software upgrade, agility and scalability. The main benefit is it helps to reduce the unnecessary costs such as purchasing and maintaining hardware and software. Besides, the workers working in IT are reduced. However, like all other technologies, there are some issues with cloud computing. The biggest concern, issue is security, especially data stealing. More organizations will be willing to adopt cloud computing only if the issues are solved. Some solutions have been suggested to overcome these issues. The safety of cloud computing service should be placed at the front. Cloud service providers should provide regulatory compliances that the users may concern about. Through the compliances, it helps the users to be certified securely. Besides, security, policies should be provided with details regarding access control, risk management, system backup and recovery. Due to the time limitation, in the future, few case studies will be chosen and discussed on how organizations gained the benefits of cloud computing. Theoretical framework will be also used to discuss how organizations have applied framework. Different types of attacks always occur in a cloud environment, thus a strong theoretical concept and generalized architecture especially for security will be proposed. This is a crucial step required for the cloud service provider to handle the cyber-attack.

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