International Journal of Marketing and Technology
Vol. 8 Issue 5, May 2018,
ISSN: 2249-1058 Impact Factor: 6.559
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

CLOUD COMPUTING AND ITS USE

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Abstract

Cloud computing environment provides a great flexibility and availability of computing resources at a lower cost. This emerging technology opens a new era of e-services in different disciplines. we explore cloud computing services and applications, we give examples for cloud services provided by the most common Cloud Service Providers (CSPs) such as Google, Microsoft, Amazon, HP, and Sales force and we present innovative applications for cloud computing in e-learning, Enterprise Resource Planning (ERP) and e-governance. Our study helps individuals and organizations understand how cloud computing can provide them with customized, reliable and cost-effective services in a wide variety of applications.

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Keywords:

Cloud Computing;

CSP;

SaaS;

PaaS;

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1. Introduction

Cloud computing is a complete new technology. It is the development of parallel computing, distributed computing grid computing, and is the combination and evolution of Virtualization, Utility computing, Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS). Cloud is a metaphor to describe web as a space where computing has been preinstalled and exist as a service; data, operating systems, applications, storage and processing power exist on the web ready to be shared. To users, cloud computing is a Pay-per-Use-On-Demand mode that can conveniently access shared IT resources through the Internet. Where the IT resources include network, server, storage, application, service and so on and they can be deployed with much quick and easy manner and least management and also interactions with service providers. Cloud computing can much improve the availability of IT resources and owns many advantages over other computing techniques. Users can use the IT infrastructure with Pay-per-Use-On-Demand mode; this would benefit and save the cost to buy the physical resources that may be vacant.Cloud computing is a paradigm that allow on demand network access to share computer resources. A model for managing, storing and processing data via internet. It is the development of parallel computing, distributed computing grid computing, and is the combination and evolution of Virtualization, Utility computing, Software as a Service, Infrastructure as a Service and Platform as a Service. Cloud is a metaphor to describe web as a space where computing has been preinstalled and exist as a service; data, operating systems, applications, storage and processing power exist on the web ready to be shared. To users, cloud computing is a Pay per Use on demand mode that can conveniently access shared IT resources through the Internet. Where the IT resources include network, server, storage, application, service and so on and they can be deployed with much quick and easy manner and least management and also interactions with service providers.

2. Research Method

Cloud computing can much improve the availability of IT resources and owns many advantages over other computing techniques. Users can use the IT infrastructure with Pay per Use On Demand mode; this would benefit and save the cost to buy the physical resources that may be vacant.

Software as a Service (SaaS):

In this model, CSPs are responsible for running and maintaining application software, operating system and computing resources. The customer views the SaaS model as a web-based application interface where services and complete software applications are delivered over the Internet and are accessed via a web browser. Customers can access hosted applications such as Gmail and Google Docs through different client devices such as laptops, iPads and cell phones. Unlike traditional software, SaaS has the advantage that the customer does not need to buy licences, install, upgrade, maintain or run software on his own computer. It has also other advantages such as multitenant efficiency, configurability and scalability. Examples of SaaS providers are Google Apps and Salesforce.com.

Benefits of SaaS:

SaaS enables organizations to make their software applications run in a virtual environment. IT professionals no longer have to buy or purchase expensive software applications, which consume a lot of time while installing, and also requires huge sums of money. SaaS in cloud computing takes care of this make businesses viable enough to work in a virtual, flexible yet reliable cloud environment. Nevertheless, SaaS has brought considerable and productive changes in the booming business environment. The load on computer reduces to a great percentage if all the software applications are built and run on SaaS platform. With SaaS, the large up-front capital expense gets reduced to a huge percentage. This wouldn't have been possible if you had to purchase the expensive software from the market. All one requires to invest in is a reasonable monthly fee that organizations will have to pay for the latest version of their favorite software. Even the cost of upgrading your SaaS platform will be taken care by your SaaS provider. SaaS is based on an on-demand service, thus, organizations can avail its services as per their requirement to fit the staffing needs. Because SaaS applications are part of cloud computing architecture, it is highly reliable, more powerful, secure, and redundant hardware infrastructure. SaaS solutions are web-based; deployment is quick, rapid and quite easy. This also gives businesses an instant access to the all the software applications one require. SaaS platform is easily accessible as one can share and access any kind of information or data related to the software application at any point of the hour from anywhere in the world. All you need to have is a good and speedy Internet

connection. Most of the SaaS applications are compatible with varied computer systems and telecommunication gadgets like smart phones etc.

Platform as a Service (PaaS):

In PaaS, a CSP provides, runs and maintains both system software (i.e., the operating system) and computing resources. The customer manages and runs the application software under the operating system and on the virtual resources provided by the CSP. The customer has little or no control over the operating system and hardware resources. Unlike SaaS that provides the customer with complete (ready to use) applications, PaaS gives him/her the opportunity to design, model, develop and test applications directly on the cloud; therefore, he/she can control the software lifecycle. PaaS supports collaborative work between members of a project team. For instance, a number of users located in different countries can collaborate in developing a website using a PaaS cloud service. Examples of PaaS providers are windows Azure, Google Apps Engine and Aptana cloud.

Benefits of PaaS:

Organizations don't have to invest in physical infrastructure. They don't need to purchase hardware themselves or employ the expertise to manage it. This leaves them free to focus on the development of applications. What's more, clients will only need to rent the resources they need rather than invest in fixed, unused and therefore wasted capacity. PaaS makes development possible for 'non-experts'. With some PaaS offerings anyone can develop an application. They can simply do this through their web browser utilizing one-click functionality. Salient examples of this are one-click blog software installs such as Word Press. PaaS provides flexibility. Clients can have control over the tools that are installed within their platforms and can create a platform that suits their specific requirements. They can 'pick and choose' the features they feel are necessary. Also, adaptability is easy for PaaS users. Features can be changed if circumstances dictate that they should. Teams in different locations can work together, as an internet connection and web browser are all that is required. Developers spread across several locations can work together on the same application build. PaaS providers offer data security, backup and recovery.

Infrastructure as a Service (IaaS):

In this model, the CSP provides a set of virtualized computing resources (e.g., network bandwidth, storage capacity, memory, processing power) in the cloud. It is the responsibility of the customer to run and maintain the operating system and the software applications on these virtual recourses. IaaS uses virtualization technology to convert physical resources into logical resources that can be dynamically provisioned and released by customers as needed. This services offers the computing architecture and infrastructure all computing recourses but in a virtual environment so that multiple user can access them. Resources include, data storage, virtualization, server and networking. Most vendors are responsible for managing the above four resources. User will be responsible for handling other resource such as application, data runtime and middleware. Examples of IaaS providers are Drop Box, Amazon EC2 and Akamai.

Benefits of IaaS:

The following are salient examples of how IaaS can be utilized by an enterprise: Enterprise infrastructure by internal business networks, such as private clouds and virtual local area networks, which utilize pooled server and networking resources and in which a business can store their data and run the applications they need to operate day-to-day. Expanding businesses can scale their infrastructure in accordance with their growth whilst private clouds (accessible only by the business itself) can protect the storage and transfer of the sensitive data that some businesses are required to handle. Cloud hosting of websites on virtual servers are founded upon pooled resources from underlying physical servers. A website hosted in the cloud, for example, can benefit from the redundancy provided by a vast network of physical servers and on-demand scalability to deal with unexpected demands placed on the website. Virtual Data Centers (VDC): a virtualized network of interconnected virtual servers, which can be used to offer enhanced cloud hosting capabilities, enterprise IT infrastructure or to integrate all of these operations within either a public or private cloud implementation. Scalability: resource is available as and when the client needs it and, therefore, there are no delays in expanding capacity or the wastage of unused capacity. No investment in hardware: the underlying physical hardware that supports an IaaS service is setup and maintained by the cloud provider saving the time and cost of doing so on the client side.

Data as a Service (DaaS):

The delivery of virtualized storage on demand becomes a separate Cloud service - data storage service. Notice that DaaS could be seen as a special type IaaS. The motivation is that on-premise enterprise database systems are often tied in a prohibitive upfront cost in dedicated server, software license, post-delivery services and in-house IT maintenance. DaaS allows consumers to pay for what they are actually using rather than the site license for the entire database. In addition to traditional storage interfaces such as RDBMS and file systems, some DaaS offerings provide table-style abstractions that are designed to scale out to store and retrieve a huge amount of data within a very compressed timeframe, often too large, too expensive or too slow for most commercial RDBMS to cope with. Examples of this kind of DaaS include Amazon S3, Google Big Table, and Apache HBase, etc.

Google Apps:

In 2004, Google launched an invitation-only e-mail service called Gmail. At the time of launch, there were already other free e-mail services available, such as Yahoo! Mail and Microsoft's Hotmail. What set Gmail apart from the competition, however, was its simplistic interface and abundant storage. Expanding on the success of Gmail, Google developed many other online offerings that complement their existing services. Google Calendar was introduced in 2006, which also relied heavily on AJAX technologies to provide a more application-like experience. To compete with Microsoft Office, Google acquired up startle, which was the company responsible for creating an easy-to-use online word processor called Writely. Google created an online spreadsheets application to compliment the word processor, and officially launched Google Docs in the summer of 2006. A year later Google acquired Tonic Systems, which added a presentation application to their online office suite. Google offers all of these services to anyone with a Google Account, but they also offer them to their Google Apps customers. Google Apps allows organizations to use the online services (Gmail, Calendar, Google Docs, etc.) through a customized domain.

Microsoft Office Web:

Microsoft Office version 14, the successor to Office 2007, will have a web-based version to go along with the standard desktop application. While the details of this launch are still unknown, it

is expected that Microsoft will release sometime next year online versions of Microsoft Word, Excel, PowerPoint, and OneNote. This strategic move is in direct response to Google Docs, which has grown in popularity since its initial launch in 2006. Unlike traditional SaaS offerings that are 100% web-based, Microsoft is referring to Office Web as software plus services. Rather than moving their entire suite to the web and killing their standard Office sales, they will continue to offer traditional software applications in conjunction with their web-based offerings.

Amazon EC2 & Microsoft Windows Azure:

Amazon launched a cloud computing initiative in 2006 called EC2, which allows developers to build scalable applications that run on their cloud. To use the cloud, developers only pay for the computing power that they actually use. This opens the door to many opportunities, particularly for smaller businesses that cannot afford to run their own data center. EC2 supports both Microsoft Windows and Linux solutions. In October 2008, Microsoft announced their own cloud computing initiative called Windows Azure. Like Amazon's Ec2, Axure will allow developers to tap into the computing power of Microsoft's hosted cluster, while only paying for the actual usage. Perhaps one of most interesting prospects for Azure is the large developer community that Microsoft already has. Microsoft would not be where it is today without 3rd party developers. If they can appeal to the developers and make it relatively easy to develop solutions for their cloud, we may very well see a huge increase in the number of SaaS offerings over the next couple of years. Microsoft also stands to gain an advantage over other cloud-hosting providers (i.e. Amazon, etc.), by offering more competitive pricing. Amazon, for instance, has to license Microsoft Windows for use in the cloud. Microsoft on the other hand, could offer the same services without any licensing fees since they are the makers of the software.

Photoshop.com:

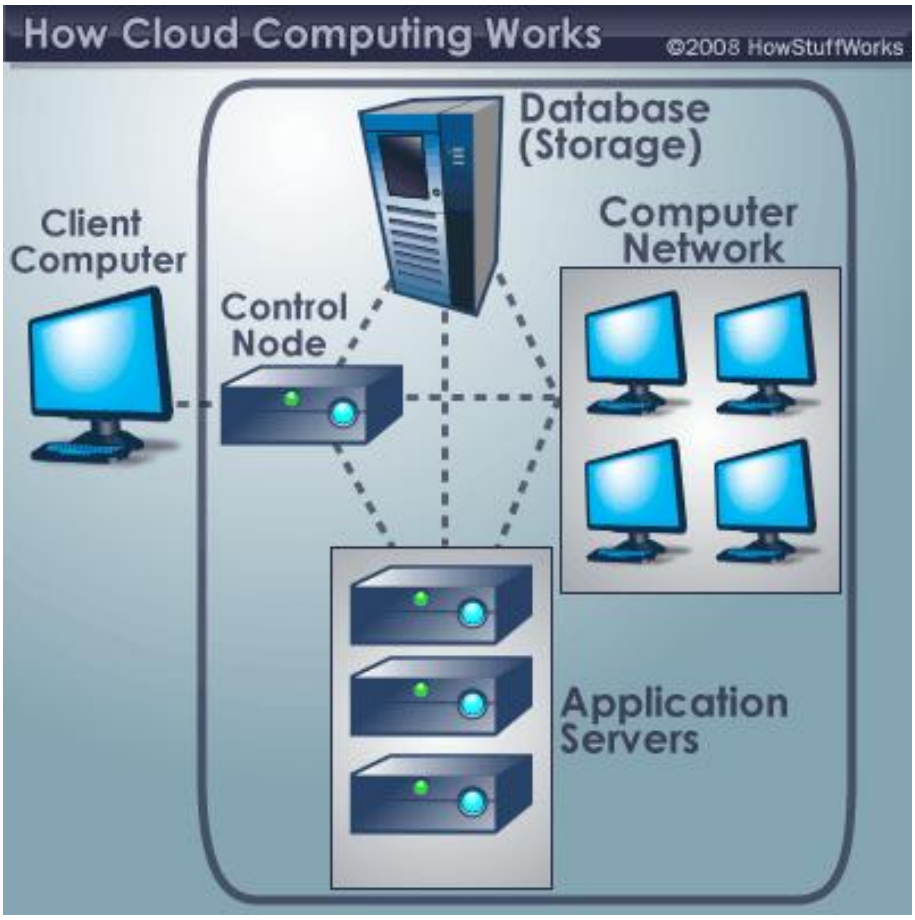
Since the early 1990's, Adobe has dominated the photo editing market place with their Photoshop application. After seeing the success of many other photo sharing websites, such as Flickr and Picasa, Adobe launched a new service of its own at Photoshop.com. Like many other photo sharing websites, Photoshop.com offers a limited amount of free photo storage (currently 2 GB), and several upgrade options for purchasing more space. To add more value to their service, Adobe has also pushed many of their photo editing tools from their Photoshop application to

their online service. Users can login to Photoshop.com and have access to many photo editing tools absolutely free.

NetSuite:

With the financial backing of Larry Ellison (CEO of Oracle), Evan Goldberg founded NetSuite in 1999. NetSuite was one of the earliest SaaS offerings on the market, and its primary purpose is to provide integrated business management software to midsize organizations. Their NetSuite application includes a comprehensive set of features, including customer relationship management (CRM), order fulfillment, inventory, accounting and finance, product assembly, ecommerce, website management, and employee productivity. NetSuite fully supports multiple languages, which gives customers the ability to conduct business globally while properly handling different currencies, taxation rules, and reporting requirements.

In a cloud computing system, there's a significant workload shift. Local computers no longer have to do all the heavy lifting when it comes to running applications. The network of computers that make up the cloud handles them instead which leads in reduction of hardware and software demands on the user's side. A typical cloud computing architecture is given below.



Cloud computing systems are classified as public cloud, private cloud, community cloud and hybrid cloud. These classes are known as deployment models and they describe the scope of services offered on the cloud to the customers.

Public Cloud:

In public clouds the infrastructure and other cloud services are made available to the general public over the Internet. The cloud is owned and managed by a CSP who offers services to consumers on a pay-per-use basis. Public cloud users are by default treated as untrustworthy; therefore, security and privacy are big concerns about this type of cloud. Many popular cloud services are public including Amazon EC2, Google App Engine and Salesforce.com.

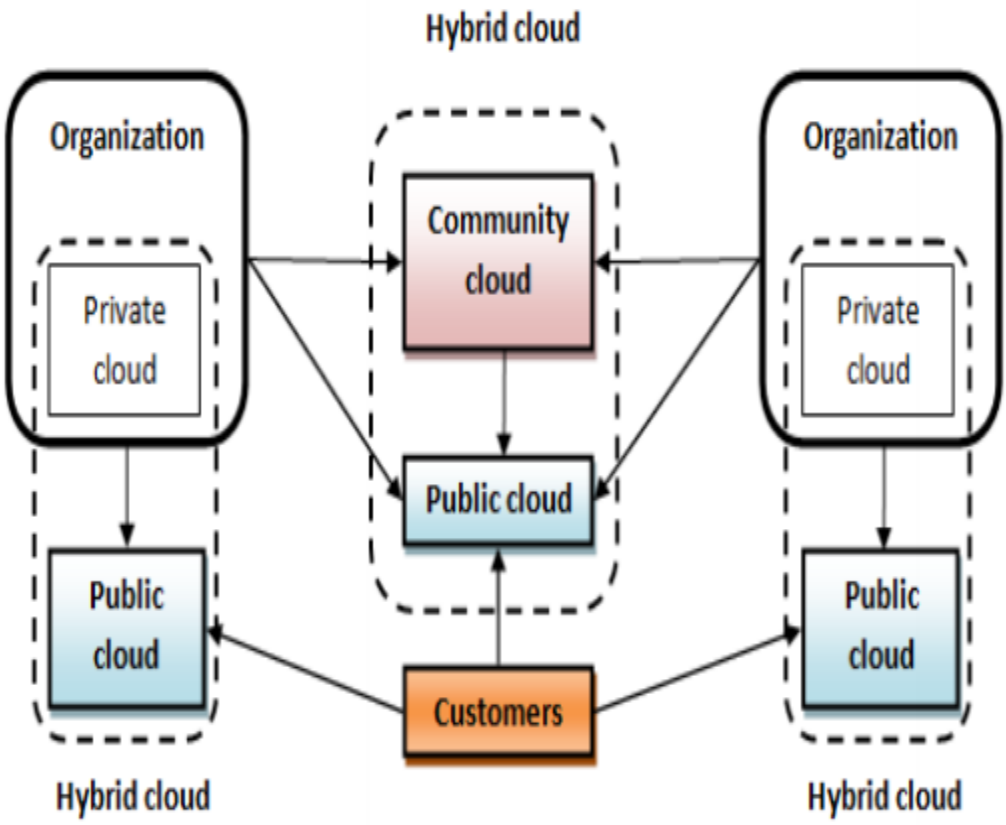
Private Cloud:

In private clouds the computing resources are operated exclusively by one organization. It may be managed by the organization itself or a CSP. Private clouds are considered to be more secure than public clouds since their users are trusted individuals inside the organization. The other two deployment models, community clouds and hybrid clouds, fall between public and private clouds Community clouds:

Community clouds are similar to private clouds but the cloud infrastructure and computing resources are shared by several organizations that have the same mission, policy and security requirements. An example of a community cloud is the educational cloud used by universities and institutes around the world to provide education and research services.

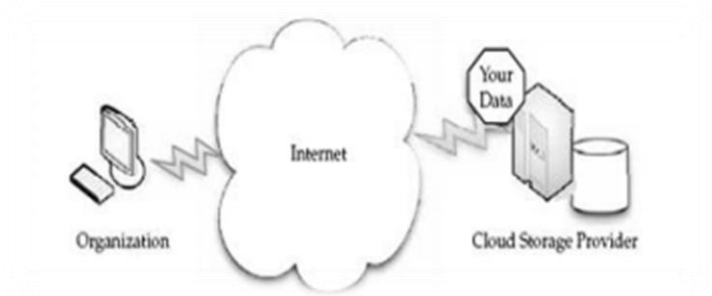
Hybrid Clouds:

In hybrid clouds, the cloud infrastructure consists of a combination of two or more public, private or community cloud components. The cloud components are bound together by standardized technology and managed as a single unit, yet each cloud remains a unique entity. Hybrid clouds allow organizations to optimize their resources, so the critical core activities can be run under the control of the private component of the hybrid cloud while other auxiliary tasks may be outsourced to the public component.



Cloud Storage:

Rapid data growth and the need to keep it safer and longer will require organizations to integrate how they manage and use their data, from creation to end of life. Now there is an opportunity to store all our data in the internet. Those off-site storages are provided and maintained by the third parties through the Internet. Cloud storage offers a large pool of storage was available for use, with three significant attributes: access via Web services APIs on a non-persistent network connection, immediate availability of very large quantities of storage, and pay for what you use. It supports rapid scalability.



Evolution of Cloud Storage:

Cloud storage is an offering of cloud computing. The evolution of Cloud Storage based on traditional network storage and hosted storage. Benefit of cloud storage is the access of your data from anywhere. Cloud storage providers provide storage varying from small amount of data to even the entire warehouse of an organization. Subscriber can pay to the cloud storage provider for what they are using and how much they are transferring to the cloud storage. Basically the cloud storage subscriber copies the data into any one of the data server of the cloud storage provider. That copy of data will be made available to all the other data servers of the cloud storage provider featuring redundancy in the availability which ensures that the data of the subscriber is safe even anything goes wrong. Most systems store the same data on servers that use different power supplies.

Benefits of Cloud storage:

No need to invest any capital on storage devices.

No need for technical expert to maintain the storage, backup, replication and importantly disaster management.

Allowing others to access your data will result with collaborative working style instead of individual work.

3. Results and Analysis

All resources, including expensive networking equipment, servers, IT personnel, etc. are shared, resulting in reduced costs, especially for small to mid-sized applications. Pay only for resources used. Cloud computing enables companies to shift money from capital expenses to operating expenses, which ultimately allows the enterprise to focus their money and resources on innovation. Compute resources are measured at a granular level, enabling users to pay only for the resources and workloads they use. Organizations can move certain workloads to or from the cloud or to different cloud platforms as desired or automatically for better cost savings or to use new services as they emerge. Cloud providers are responsible for their underlying infrastructure. You will not worry about acquiring an update, a new software, their licenses or upgrading some hardware. With cloud computing, all this is solely done by the provider. Maybe you only need to down a client software update. Cloud computing services are platform independent; they are accessible across all devices with internet connection. This increases mobility and ensures that you can access all your information from any place. By this, cloud computing also increases productivity as it allows staff to collaborate on projects.

4. Conclusion

Cloud computing has enormous prospects, but the security threats embedded in cloud computing approach are directly proportional to its offered advantages. Cloud computing is a great opportunity and lucrative option both to the businesses and the attackers – either parties can have their own advantages from cloud computing. Cloud computing is a new emerging technology that is expected to significantly change the field of IT in the next few years and lead it for the coming decades. Numerous services and applications can be provided in the Cloud due to its many interesting and promising characteristics. In this paper, we explored some of these services and applications and we are certain that many others will see the light in the near future. Cloud services and applications are expected to attract many individuals and organizations from different disciplines and our study helps them understand the impact of these services on their work, however, cloud computing technology is not free of risks and concerns.

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