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On the Cloud Web services: A Review

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Abstract

Cloud Computing is a constantly evolving IT generic term used to refer to various IT solutions and services provided via the internet. Precisely, cloud computing can be said to be the delivery of scalable IT resources over the Internet, as opposed to hosting and operating those resources locally; these resources can include applications and services, as well as the infrastructure on which they operate (EDUCAUSE 2009). So instead of spending money on applications and hardware, individuals and businesses have access to same resources without the commitment of ownership to vendors who provide on-demand services such as Customer Relationship Management (CRM), off-site storage, hosted email solutions, secure web portals, etc. Despite some seemingly security challenges that confront total adoption of Cloud computing by business organizations and educational institutions, the benefits of using services provided by Cloud technology still outweigh the perceived challenges. It is the aim of this paper to present an expository review of services that can run on the cloud thereby providing excellent opportunities for business groups and academics institutions. The paper also provides a contribution to the propagation of the adoption of cloud technology.

Keywords: Cloud Computing, Grid, Infrastructure, IaaS, PaaS SaaS

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1. Introduction

According to National Institute of Standards and Technology(NIST) Cloud Computing Project, Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. Figure 1 gave a description of the evolution of cloud computing

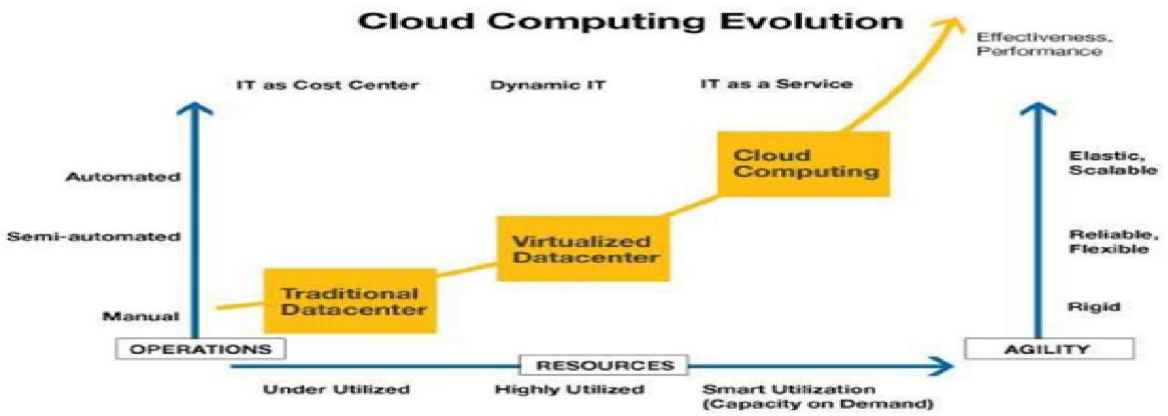

Figure 1. A description of Cloud Computing Evolution

The concept of cloud computing came through loud and clear in the 1990′s when telecommunications companies began making radical shifts from regular data circuits to Virtual Private Networks (VPN). They noticed by switching to a VPN they were able to get work done more efficiently and inexpensively.

In 1999, Salesforce.com introduced their business model of delivering enterprise applications via a website. According to a recent Carbon Disclosure Project report (http://del.ly/CDPreport) companies that streamline operations to improve IT performance will not only reduce capital expenditures but they'll shrink energy consumption and carbon emissions. The group estimated that, by 2020, U.S. organizations that move to the cloud could save $12.3 billion in energy costs and the equivalent of 200 million barrels of oil.

In 2009, revenue for cloud services was just over $58.6 billion. In 2011, IT spending is expected to top $2.6 trillion. And with cloud computing accounting for just 2.3 percent of that global market, there's plenty of room for growth. The research firm Gartner projects that revenue for cloud services will approach $152.1 billion in 2014.

Draškoet al in 2010 [1] highlighted some benefits of carrying out a high performance computing (HPC) in the cloud and other services offered by cloud computing vendors such as: Microsoft, Amazon, VMware.

1.1 Where is Cloud Computing located?

Various services provided by cloud computing are done over the Internet which means that the vendor can be located anywhere in the world. Businesses can access most purchased solutions through a secure device such as a workstation, laptop or smartphone and a web browser.

1.2 Models of Clouds:

There are four forms of Cloud Computing: Private, Public , Hybrid and Community cloud and your choice depends on the type of data that you work with. Figure 2 shows cloud computing forms.

Figure 2: A diagram showing forms of clouds

1.2.1 Private cloud

A private cloud is one in which the services and infrastructure are maintained on a private network. These clouds offer the greatest level of security and control, but they require the company to still purchase and maintain all the software and infrastructure, which reduces the cost savings. A private cloud is the obvious choice when

Your business is your data and your applications. Therefore, control and security are paramount.

Your business is part of an industry that must conform to strict security and data privacy issues.

Your company is large enough to run a next generation cloud data center efficiently and effectively on its own,[2]

In the private cloud, scalable resources and virtual applications provided by the cloud vendor are pooled together and available for cloud users to share and use. It differs from the public cloud in that all the cloud resources and applications are managed by the organization itself, similar to Intranet functionality. Utilization on the private cloud can be much more secure than that of the public cloud because of its specified internal exposure. Only the organization and designated stakeholders may have access to operate on a specific Private cloud,[3]

1.2.2 Public cloud

A public cloud is one in which the services and infrastructure are provided off-site over the Internet. These clouds offer the greatest level of efficiency in shared resources; however, they are also more vulnerable than private clouds. A public cloud is the obvious choice when

Your standardized workload for applications is used by lots of people, such as e-mail.

You need to test and develop application code.

You have SaaS (Software as a Service) applications from a vendor who has a well-implemented security strategy.

You need incremental capacity (the ability to add computer capacity for peak times).

You're doing collaboration projects.

You're doing an ad-hoc software development project using a Platform as a Service (PaaS) offering cloud.[2]

It is typically based on a pay-per-use model, similar to a prepaid electricity metering system which is flexible enough to cater for spikes in demand for cloud optimization.[3] Public clouds are less secure than the other cloud models because it places an additional burden of ensuring all applications and data accessed on the public cloud are not subjected to malicious attacks.

1.2. 3 Hybrid cloud and the Need

Hybrid cloud is a private cloud linked to one or more external cloud services, centrally managed,

provisioned as a single unit, and circumscribed by a secure network [4]. It provides virtual IT

solutions through a mix of both public and private clouds. Hybrid Cloud provides more secure

A hybrid cloud includes a variety of public and private options with multiple providers. By spreading things out over a hybrid cloud, you keep each aspect at your business in the most efficient environment possible. The downside is that you have to keep track of multiple different security platforms and ensure that all aspects of your business can communicate with each other. Here are a couple of situations where a hybrid environment is best.

i. Your company wants to use a SaaS application but is concerned about security. Your SaaS vendor can create a private cloud just for your company inside their firewall. They provide you with a virtual private network (VPN) for additional security.

ii. Your company offers services that are tailored for different vertical markets. You can use a public cloud to interact with the clients but keep their data secured within a private cloud [2]. The needs for hybrid cloud can be summarized as follows

a. Leverage for Special Projects- this is a great option for organizations with the need to consistently leverage the cloud for the computing power. Especially if it's a project by project basis. By having an "on call" cloud of sorts, you're able to work with the same people, ensuring stability within your projects.

b. More Freedom- while most cloud computing options offer more freedom than traditional servers do, the hybrid cloud extends that freedom reach just a little further. While with cloud options in general you are able to manage them yourself, and dictate what goes where, it's easier with a hybrid cloud. Think of it as another server in your office, a fast server that is there for the projects you need.

c. Nothing Changes-As a common trait of cloud computing, Hybrid allows to gain another server, so absolutely nothing changes about your process.

2.0 Characteristics and Benefits of Cloud Computing

While each cloud computing vendor will operate with a slightly different business plan, all vendors do share similarities.

i. **Affordable-** As an "on-demand" service, vendors will only charge businesses for the resources used. Typically, you will sign a contract of some sort, but the terms are flexible and should meet your business needs.

ii. **Scalable-** Most vendors provide cloud computing services to organizations of any size. Your business will not be restricted by its number of users or amount of data.

iii. **Self-service-** While vendors will maintain the hardware and the solution, your business will be responsible for maintaining all data.

iv. **Multi-tenancy-** Vendors store data from multiple companies on the same hardware. Don't worry; your business' data will be kept separate and secure through application architecture, while sharing resources such as storage, memory and processing power.

v. **Redundant data storage-** Most solutions provide multiple physical sites where they will store multiple copies of data, making cloud computing suitable for businesses that need high-availability.

Every business that uses cloud computing solutions will realize many benefits. While some benefits will be particular to your individual business, two key benefits that all businesses realize are as follows:

i). **No out-of-pocket infrastructure costs-** With cloud computing, your business won't need to buy additional servers, hardware or networking equipment to take advantage of a solution.

ii). Simple to support- Vendors will service and support their solution, upgrading and patching your solution so you don't have to.

2.1 Solutions and Services Provision by Cloud Computing

- **Managed email-** Many vendors offer solutions that will work well at your physical business site and on you mobile devices such as iPhones, Blackberries and other smart phones.
- **Email Archiving-** With cloud computing, your business can store an unlimited amount of email, providing your business with a clear audit trail.
- **Secure Web Gateway-** This cloud computing solution will babysit your network by limiting access to specific web pages and blocking access to others. This enhanced security will help protect your entire IT network from malware.
- **CRM-** Vendors such as Salesforce.com and Dynamics provide customizable customer management, sales, and marketing campaign tools for your business.
- **Finance/Accounting-** The vendor will host the software application, process the data, integrate it with taxes and also take care of payroll, expenses and other business needs.

Delivery models for services offered by Cloud Computing is illustrated in figure 3 below

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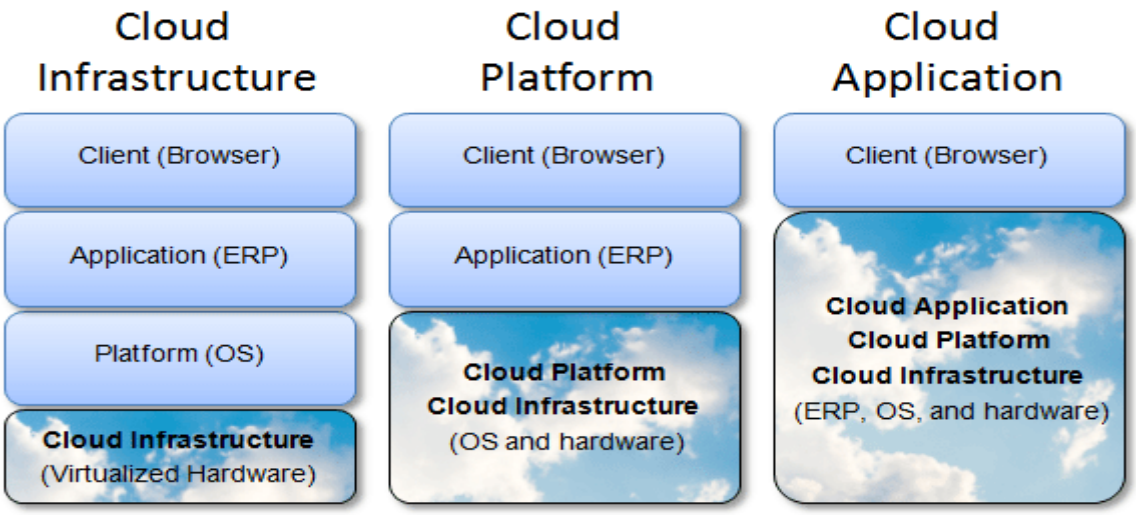

Figure 3: Showing different services provided by the cloud options

Apart from the three main cloud service delivery models **Infrastructure-as-a-Service** (IaaS), **Platform-as-a-Service (**PaaS) and **Software-as-a-Service** (SaaS), new services are helping to create a billion-dollar market, and securing numerous benefits for companies. Suitable systems and solutions are needed if companies are to benefit from greater flexibility, lower costs and enhanced efficiency.

With regard to services, at the present time, the concept of **cloud computing** involves the provision of the following types of services [5]to its users:

Everything as a Service (EaaS): This type of service is provided to all users of the software and hardware to control the business processes, including the interaction between users, the user only needs to have access to the Internet.

In my opinion, this kind of service is a general concept with respect to the services. Below mentioned are some of the more special cases.

Infrastructure as a Service (IaaS: The computing infrastructure is given to the user, typically virtual platforms (PCs) connected to the network. It adjusts itself to suit your purpose.

Platform as a Service (PaaS) : The computing platform is given to the user, with the operating system and required software.

Software as a Service(SaaS) : This type of service is usually positioned as "**software on demand**", this software is deployed on remote servers and the user can access it via the Internet, and all updates and licenses for this software is governed by the service provider. Payment in this case is made for actual use of the software.

Hardware as a Service (HaaS): In this case, the user of the service leases the hardware for his own purposes. This option allows you to save on maintenance of the equipment, but in essence little different from "**Infrastructure as a Service**" except that you have the bare hardware on which you can deploy your own infrastructure using the most appropriate software.

Workplace as a Service (WaaS): In this case, the company is using cloud computing for the organization of employment of its employees by setting up and installing the necessary software required to operate personnel.

Data as a Service (DaaS): The main idea of this type of service lies in the fact that the user is provided with storage space, which may be used to store large amounts of information.

Security as a Service (SaaS): This type of service enables users to quickly deploy, allowing products to ensure the safe use of Web technologies security of electronic communications, as well as the safety of the local system, which allows users of the service to save on deploying and maintaining their own security system.

2.1.1.Services That can be hosted on the Cloud.

1. Online Planning and Task Management in the Cloud

Cloud computing can allow you to add and view the things you need to do wherever you are from any Internet-connected computer and, in many cases, from your handy-dandy cell phone. Then there's the benefit of collaborating on your task, to-do lists then to complex planning such as managing a large team project. Examples of Software include[9]:

- iPrioritize(www.iprioritize.com)

- Bla-Bla List (www.blablalist.com)
- Hiveminder (www.hiveminder.com)
- Remember the Milk (www.rememberthemilk.com)
- Ta-da List (www.tadalist.com)
- Tudu List (www.tudulist.com)
- TaskTHIS (taskthis.darthapo.com)
- Vitalist (www.vitalist.com)
- Trackslife (www.trackslife.com)
- Voo2Do (www.voo2do.com)
- HiTask(www.hitask.com)
- Zoho Planner (planner.zoho.com)

2. Event Management Applications

i).Event Planning and Workflow Management[8]

There are tons of details involved in an event of any size, and managing all those tasks takes quite a bit of computing horsepower—just the thing cloud computing can help you out with. Most event management applications include robust task planning modules, similar to what you'd find in higher-end task management applications or lower-end project management apps.

Cloud computing can help you with the planning and workflow management functionality to continue into the event itself, so that you can manage your staff in an efficient and effective manner.

ii). Event Marketing

Cloud provides modules that can help with event marketing; For example, many apps offer web-based email marketing, which lets you promote your event via targeted email messages. Other apps help you create your own event website (on their cloud computers), which also helps to promote your event.

iii).Event Calendar

Another part of your event marketing mix is an event calendar—an online calendar that displays all the happenings within your overall event. This proves particularly useful if you're hosting a conference or trade show made of lots of individual panels, sessions, or meetings. You can post each individual event on the main event calendar, easily accessed by any attendee or potential attendee with a web browser.

Other event related services possible with the cloud are:

Facilities Scheduling, Advance Registration, Payment Processing,Travel Management, Housing Management,Contact Management,Budget Management,Post-Event Reporting and Analysis.

Cloud based event software include the following

- Acteva (www.acteva.com)
- Conference.com (www.conference.com)
- Cvent (www.cvent.com)
- Event Wax (www.eventwax.com)
- eventsbot (www.eventsbot.com)
- RegOnline (www.regonline.com)
- Setdot (www.setdot.com)
- Tendenci (www.tendenci.com)

3. Project Management

A project management platform such as policies, procedures, standards, guidelines, integrated project management processes, tools, techniques, templates, project assets library, best practices, learning assets, lessons learned or next practices will all prove so difficult to manage without a sophisticated project management platform, and that one big solution offered in the cloud

This major divide in the profession could be reduced through cloud computing -- providing businesses, governments and individuals with access to a reliable project management platform over internet at an affordable price as per usage (on rental basis). This is called Project Management Cloud (PM Cloud)[9]. The following give some examples of cloud based project management systems

i. Engineering & Construction PM Cloud

ii. Information Technology PM Cloud

iii. Research & Development PM Cloud

iv. Government PM Cloud

v. Education PM Cloud

4. Web-Based Word Processing

Microsoft Word is a software program that is installed on your computer's hard disk. Web-based word processors, in contrast, are hosted in the cloud, not on your hard drive—as are the documents you create with these applications. And these web-based applications mimic the key features of Microsoft Word, so you don't give up much in the way of functionality[10].Cloud based word processors include the following

- Google Docs (docs.google.com)
- Buzzword (buzzword.acrobat.com)
- ajaxWrite (ajaxwrite.com)

5. Web-based Spreadsheet

Cloud offers a wide range of data analysis and calculation solutions [10][,11] using apps platforms such as:

- Google Spreadsheets (googlespread.com)
- EditGrid (editgrid.com)
- Expresso (expressocorp.com)
- Glide Crunch (glidedigital.com)
- Num Sum (numsum.com)
- PeepelWebSheet (people.com)

6. Online Presentation

Cloud Computing provides online presentation services which allow user to create and make presentations online. For example SlideRocket, founded in 2007, is currently being used by about 20,000 licensees and distributed to some 300,000 users to create, share and store presentations in the cloud. The services enable users to create presentations and easily add such features as video, Twitter feeds, various types of charts and graphs, and embedded financial data widgets with real-time information updates. SAAS-based presentation service adds to VMware's growing catalog of applications that can be deployed across any device via the cloud [13]

7. Cloud Storage

Scribd, Docstoc, Google Docs, Issuu, wePapers and Yumpu are document-sharing services. These services allow users to share and collaborate on document files, such as PDFs, word processor documents, and spreadsheets. Several more recently-launched file storage services are aimed at allowing users to share and sychronize all types of files across all the devices they use. The major players in this arena are Dropbox, SkyDrive, iCloud, and Amazon Cloud Drive

Cloud Storage is also very useful for Software file hosting; Authors of Shareware, Freeware and Open Source/Free software often use file hosting services to serve their software. These hosts also offer additional services to the authors such as statistics or other marketing features[14]

8. Web conferencing

Cloud Computing uses web collaboration to provide a platform where users can made face-to-face exchanges like effect via the Internet. The web conferencing system uses advanced audio, video and network technology and provides many feature such as

- Data sharing
- Web synchronization
- Program/application sharing even you can share desktop
- Virtual printing
- File transfer

Recent cloud based wed conferencing tools are: Cisco WebEx, iLinc, TeamViewer, Skype, Oovoo, Citrix, Gotomeeting, Microsoft live meeting , Adobe acrobat connect, IBM lotus live meeting, Fuze meeting, SABA Centra[15]

9. Instant Messaging

The spread of cloud computing and the increasing sophistication of web-enabled programs, sharing pictures or video while chatting with someone is very easy; But before now, Chatting, also known as Instant Messaging has been around for as long as the Internet has. Chatting clients were once known only as IRC or Internet Relay Chat, which was a command-line program allowing users to chat in groups or one-on-one. The problem was that to do that, the chat users needed to know various computer language and program codes. Sending a file, such as a picture or video was possible but challenging, especially to the beginner. IM apps such as: AIM (AOL Instant Messenger), Microsoft's Windows Messenger, Yahoo! Messenger, and Google Chat, Google's Picasa, YouTube, Photobucket, Flickr are all examples of cloud-based instant messaging solutions

10. Social Networking

Everything you tweet, facebook, linkedin, pinIT to and pretty much everything else you are doing is connected to the cloud. Cloud enables you to share information with people from around the world. These may be very sophisticated and includegraphics or games; they may also be blogs or wikis, which are dedicated to specific types of communication.

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