CLOUD COMPUTING & THEIR BENEFITS TO FUTURE APPLICATIONS

Sagar Sahni*

Robin Walia**

ABSTRACT

The concept of cloud computing provides a brand new opportunity for the development of user applications since it allows the devices to maintain a very thin layer for user applications and shift the computation and processing overhead to the virtual environment. Cloud computing reaches anywhere, everywhere, and effectively to everyone, as it enables a fundamentally new and simple way to access and deliver services across the globe. It is defined as an emerging computer paradigm where data and services reside in massively scalable data centers in the cloud and can be accessed from any connected devices over the internet. Thus, it developed into a major trend in IT. In this paper we would like to test the feasibility of extrapolating concepts from cloud computing in the domain of large-scale computers & also provide a comprehensive review of the academic research done in cloud computing.

Keywords: *Cloud architecture, Self Healing, Multi-tenancy, Scalable, Gadgets.*

*Lovely Professional University, Jalandhar.

**Lecturer, Maharishi Markandeshwar University, Mullana.

1. INTRODUCTION

Cloud computing is an emerging paradigm in the computer industry where the computing is moved to a cloud of computers. It has become one of the buzz words of the industry. The core concept of cloud computing is quite simple, that the vast computing resources that we need will reside somewhere out there in the cloud of computers and we"ll connect to them and use them as and when needed [1]. The US National Institute of Standards and Technology (NIST) has developed a working definition that covers the commonly agreed aspects of cloud computing. The NIST working definition summarises cloud computing as:

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 [2].

Cloud is a term used as a metaphor for the wide area networks (like internet) or any such large networked environment. It came partly from the cloud-like symbol used to represent the complexities of the networks in the schematic diagrams. It represents all the complexities of the network which may include everything from cables, routers, servers, data centers and all such other devices [3]. Thus, with the size and complexity of business today, cloud computing is the best way to start as instead of running our own applications on the PC within our company, it is better to work on a common data centers. We decide to use funds only to log in, set up and start using it to work on your data. Compared with the traditional software business, all types of business applications are currently working in the clouds. Thus, many functions are performed entirely by computers can now be done in the cloud. In theory, cloud computing promises availability of all required hardware, software, platform, applications, infrastructure and storage with an ownership of just an internet connection.People can access the information that they need from any device with an Internet connection-including mobile and handheld phones rather than being chained to the desktop. It also means lower costs, since there is no need to install software or hardware [15].Cloud computing is also used to post and share photos on orkut, facebook instant messaging with friends maintaining and upgrading business technology.

2. CHARACTERISTICS OF CLOUD COMPUTING

There has been much discussion in industry regarding the actually meaning of cloud computing. The term cloud computing seems to originate from computer network diagrams that represent the internet as a cloud [3]. The essential characteristics of cloud computing are:

- Self Healing: Any application running in a cloud computing environment has the property of self healing which means there is always a hot backup of the application ready to take over without disruption. There are multiple copies of the same application - each copy updating itself regularly so that at times of failure there is at least one copy of the application which can take over without even the slightest change in its running state.[6]

- Multi-tenancy: With cloud computing, any application supports multi-tenancy - that is multiple tenants at the same instant of time. The system allows several customers to share the infrastructure allotted to them without any of them being aware of the sharing. This is done by virtualizing the servers on the available machine pool and then allotting the servers to multiple users. This is done in such a way that the privacy of the users or the security of their data is not compromised [6].

- Linearly Scalable: Cloud computing services are linearly scalable. The system is able to break down the workloads into pieces and service it across the infrastructure. An exact idea of linear scalability can be obtained from the fact that if one server is able to process say 1000 transactions per second, then two servers can process 2000 transactions per second.

- Service-oriented: Cloud computing systems are all service oriented - i.e. the systems are such that they are created out of other discrete services [7]. Many such discrete services which are independent of each other are combined together to form this service. This allows re-use of the different services that are available and that are being created. Using the services that were just created, other such services can be created.

- Virtualized: The applications in cloud computing are fully decoupled from the underlying hardware. Thus, the cloud computing environment is a fully virtualized environment.

- Flexible: Another feature of the cloud computing services is that they are flexible. They can be used to serve a large variety of workload types -varying from small loads of a small consumer application to very heavy loads of a commercial application.

3. CLOUD ARCHITECTURE

Cloud architecture is the systems architecture of the software systems involved in the delivery of cloud computing which comprises hardware and software designed by a cloud architect who typically works for a cloud integrator. This is shown in Figure 1. It typically involves multiple cloud components communicating with each other over application programming interfaces, usually web services. This closely resembles the UNIX philosophy of having multiple programs doing one thing well and working together over universal

interfaces. Complexity is controlled and the resulting systems are more manageable than their monolithic counterparts [4].

Cloud architecture extends to the client, where web browsers and/or software applications access cloud applications. Cloud storage architecture is loosely coupled, where metadata operations are centralized enabling the data nodes to scale into the hundreds, each independently delivering data to applications or users [4].
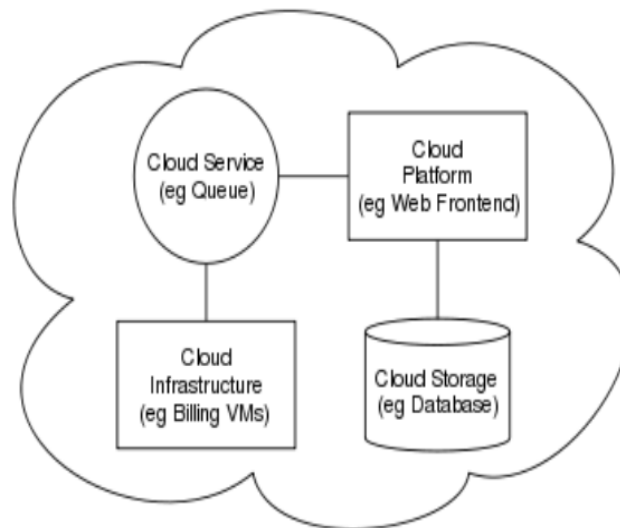
Figure 1 Cloud Architecture

4. WORKING OF CLOUD COMPUTING

Cloud computing system can be divided it into two sections: the front end or user end layers and the back end layers. They connect to each other through a network, usually the Internet. The front-end layers are the ones you see and interact with. When you access your email on Gmail for example, you are using software running on the front-end of a cloud. The same is true when you access your Facebook account. The back-end consists of the hardware and the software architecture that fuels the interface you see on the front end. On the back end there are various computers, servers and data storage systems that create the "cloud" of computing services [5]. A central server administers the system, monitoring traffic and client demands to ensure everything runs smoothly. This is shown in Figure 2. It follows a set of rules called protocols servers and remote computers do most of the work and store the data.
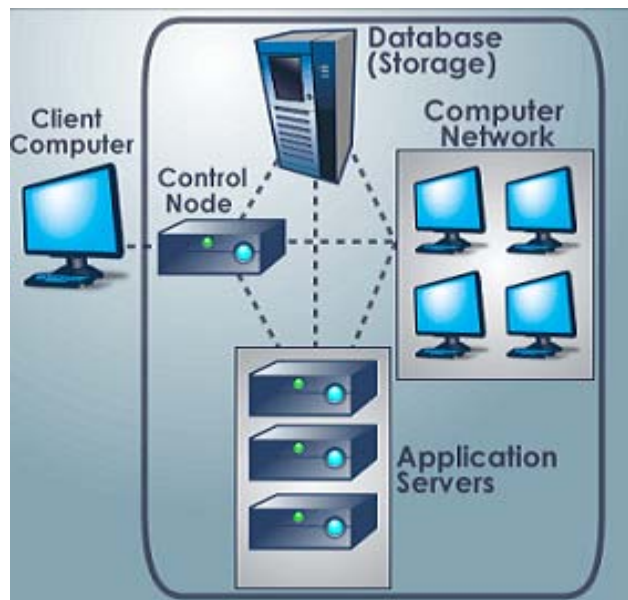
Figure 2 How cloud computing works

5. CLOUD COMPUTING GADGETS

As cloud computing is gaining impetus day by day, so are the cloud computing gadgets. There are different vendors in the market as shown in Figure 3 from Microsoft to Amazon to Google who are cashing on this billion dollar opportunity given the fact that cloud computing is very economical and thus so popular & powerful.

Figure 3 Cloud providers

The devices available in the market for cloud computing are the ones that can be used inside and outside an organisation [8]. Many of such gadgets are:

- Chromebooks: Google is trying to push cloud computing to the masses through Chromebooks, which come with the Chrome OS, a thin version of Linux to run Web applications or light applications purchased from the Chrome Store. Chromebooks are lightweight, albeit slightly expensive, alternatives to regular laptops. Google says Chromebooks provide instant access to the Web and a "faster, simpler and more secure experience without all the headaches of ordinary computers." Chromebooks have minimal storage, and applications and documents are stored in the cloud. Samsung and Acer are the first companies to jump on the Chromebook bandwagon with the Series 5 and Chromia laptops, respectively. The Samsung Series 5 Chromebooks, shown in Figure 4, also available in Wi-FI ($429) and 3G ($499) configurations, includes a 12.1-inch screen. The laptop offers 8.5 hours of battery life and is available at Amazon.com [8].

Figure 4 Samsung Series 5 Chromebooks

- iTwin: Startup iTwin offers a gadget of the same name for users to access files on remote PCs over the Internet. Resembling a USB drive, as shown in Figure 5, the device has two pieces that can be used to create a secure peer-to-peer network over the Internet between two PCs to share files. One piece goes into the main computer, while the other half needs to be carried and activated on any computer with an Internet connection. Both PCs have to be online and users need to carry an iTwin piece to remotely access files. The company is also looking beyond PCs into Apple's iPad tablets. In 2012, iTwin hopes to release the device for the iPad, which will allow tablet users to access files stored on a PC [8].

Figure 5 Startup iTwin Gadget

- I-Share USB Cloud technology: It is used to share files i.e. music, images, videos, etc over the internet and is developed by MRT Communication. It allows sharing between multiple users and it also does not use any setup or registration. This is shown in Figure 6.

Figure 6 I-Share USB Cloud technology

- Panasonic's Viera cloud tablets: Panasonic is expected to ship the Viera tablet, shown in Figure 7, which is designed to work with the company's Viera Internet-connected TV sets. Beyond being a flashy remote control with advanced visual toys, the tablet will provide easy access to a number of Internet-based services such as video streams from Netflix delivered to Panasonic TV sets [9]. The tablets, which will be available with screen sizes in 4, 7 and 10 inches, marks Panasonic's "first step toward cloud-based services," the company said. The tablet will also provide a more interactive interface than TVs for customers to purchase content, Panasonic said. The tablet will allow users to define viewing angles for specific scenes on the TV. The tablet can also display information related to specific scenes. Users can also check e-mail, use applications like Skype or access social networks. The company did not comment about price or availability of the product.

Figure 7 Panasonic's Viera cloud tablets

Many other vendors like Dell is also pushing cloud computing with its Inspiron Mini 9 netbooks which comes packed with a secret 3G card. It also provides 2GB free online storage which can be expanded upto 25GB.

ASUS Eee pad, Eee Tablet and Garmin-Asus A10 Smartphone have been designed by ASUS for cloud computing. The ASUS Eee tablet is designed with students and business professionals in mind. It is considered as the world's most accurate digital notepad which gives us the option to sort and organise the various templates and makes note making easier to read & write [10].

The Eee pad is a Windows based portable PC with virtually everything on the user's fingertips. The Garmin-Asus A10 Smartphone lets you navigate the world connecting people and places together. Users can select from 30,000 apps apart from Google apps to personalise their phone [10].

Thus, it can be clearly summarized that since cloud computing is the talking point of the town nowadays, so are the gadgets. More and more vendors are exploring this space day by day so that to ensure they are the top runners in the cloud space.

6. BENEFITS OF CLOUD COMPUTING

Cloud applications move the computing power and data storage away from computer and into the cloud. So there are large groups of often low-cost servers with specialized connections to spread the data-processing chores among them. Since there are a lot of low-cost servers connected together, there are large pools of resources available. So these offer almost unlimited computing resources. This makes the availability of resources a lesser issue [11]. The data of the application can also be stored in the cloud. Storage of data in the cloud has many distinct advantages over other storages. One thing is that data is spread evenly through the cloud in such a way that there are multiple copies of the data and there are ways by which

failure can be detected and the data can be rebalanced on the fly [14]. The I/O operations become simpler in the cloud such that browsing and searching for something in 25GB or more of data becomes simpler in the cloud, which is nearly impossible to do on a desktop. Thus, there are many cases that become possible through the use of cloud computing. Chun and Maniatis [13] describe one such use-case, where cloud computing enables a technology which otherwise would not be possible: to overcome hardware limitations and enable more powerful applications on smartphones, they use external resources. This is done by partially off-loading execution from the smartphone and using cloud resources. But, Chun and Maniatis [13] also include laptops or desktops near the phone in their "cloud" because of the network latency for phones. Thus, we enlist the possible benefits of Cloud Computing which help in future applications:

- Predictable anytime, anywhere access to IT resources.
- Flexible scaling of resources (resource optimization).
- Rapid, request-driven provisioning.
- Lower total cost of operations as we have to pay for what we use.
- We may have access to specific versions of programs depending on the device to use to connect to the cloud.
- Information services, entertainment-oriented services such as video on demand, simple business services such as customer authentication or identity management and contextual services such as location or mapping services are positioned well by using the service [12].
- A cloud infrastructure can be a cost efficient model for delivering the information services

  & reducing IT management complexity.

Although, Cloud Computing is not yet well understood & it is still in its infancy. So by the time this technology develops its benefits will increase resulting in generation of new applications.

7. CONCLUSION

Cloud computing infrastructures are next generation platforms that can provide tremendous value to companies of any size. It is a powerful new abstraction for large scale data processing systems which is scalable, reliable and available. Cloud computing services can also grow and shrink according to need. Cloud computing is particularly valuable to small and medium businesses, where effective and affordable IT tools are critical to helping them

become more   productive without spending lots of money on in-house resources and technical equipment. Thus, it increases profitability by improving resource utilization. Also it is a new emerging architecture needed to expand the Internet to become the computing platform of the future. Thus, it implies a service oriented architecture, reduced information technology overhead for the end-user, great flexibility, reduced total cost of ownership, on demand services and many other things. In today's global competitive market, companies must innovate and get the most from its resources to succeed.

REFERENCES

[1] RAYPORT, J. F. and HEYWARD, A.2009. Envisioning the Cloud: The Next Computing Paradigm. Marketspace.

[2] MELL, P. and GRANCE, T. 2009. Draft NIST Working Definition of Cloud Computing.

[3] Cloud Computing – MLADEN .A.VOUK -Issues, Research an Implementations, Information Technical Interfaces, June 2008.

[4] VARIA, J2009. Cloud Architectures. Amazon Web Services. J. Dean and S. Ghemawat. Mapreduce: Simplified data processing on large clusters. In OSDI '04: Proceedings of the 5th USENIX Symposium on Operating Systems Design and Implementation, pages 137–150, 2004.

[5] "What Cloud Computing Really Means" from http://www.infoworld.com/article/08/04/07/15FE-cloud-computing-reality_1.html.

[6] "Welcome to the new era of cloud computing" from http://www.spinnakerlabs.com/Cloudcomputing.pdf.

[7] Zehua Zhang and Xuejie Zhang. Realization of open cloud computing federation based on mobile agent. In ICIS '09: IEEE International Conference on Intelligent Computing   and Intelligent Systems, Vol 3, pp. 642–646, 2009.

[8] Rajkumar Buyya, Chee Shin Yeo, Srikumar Venugopal, James Broberg, & Ivona Brandic. Cloud computing and emerging it platforms: Vision, hype, and reality for delivering computing as the 5th utility. Future Generation Computing System, pp. 599–616, 2009.

[9] DODDA. R., SMITH. C., and MOORSEL.A. An Architecture for Cross-Cloud System Management, 2009, pp. 556-567.

[10] SONG, S., RYU, K. and DA SILVA, D. 2009. Blue Eyes: Scalable and reliable system management for cloud computing. In Parallel & Distributed Processing, 2009. IPDPS 2009. IEEE International Symposium on, 1-8.

[11] SRIRAM, I. 2009. A Simulation Tool Exploring Cloud-Scale Data Centres. In 1st International Conference on Cloud Computing (CloudCom 2009), pp. 381-392.

[12] CHUN, B.-G. and MANIATIS, P. 2009. Augmented Smart Phone Applications Through Clone Cloud Execution. In Proceedings of the 12th Workshop on Hot Topics in Operating Systems (HotOS XII).

[13] KEAHEY, K., TSUGAWA, M., MATSUNAGA, A. & FORTES, J. 2009. Sky Computing. Internet Computing, IEEE 13, 5, 43-51.

[14] HARMER, T., WRIGHT, P., CUNNINGHAM, C. and PERROTT, R. 2009. Provider-Independent Use of the Cloud.