

A Review of Cloud Computing Issues and Challenges

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ABSTRACT

This paper presents a review of the main characteristics of cloud computing, their models, categories, background and how they work. In addition to the technological review that is done, is also carried out. Research has indicated that cloud computing has become the mainstream in computing technology and an effective tool for businesses, etc. Traditionally, companies build corporate data centers, install applications and are responsible for maintaining their IT infrastructures. However, cloud computing removes the need for organizations to own corporate data centers and install enterprise applications.

Keywords : Cloud Computing, Amazon EC2, IAAS, SAAS, PAAS

I. INTRODUCTION

The cloud computing can be described by term an umbrella which defines a category of sophisticated on-demand computing services offered by commercial providers, for example Amazon, Google and Microsoft, (Raj Kumaret al., 2011). "Cloud computing is a model for enabling universal, on-demand and convenient network access to a shared pool of configurable computing resources such as servers, applications, storage, networks and services, that can be quickly provisioned and released with little to no management effort or service provider interaction" (Mell & Grance, 2011). The cloud computing system as infrastructure and computational services on demand for different clients on shared resources or network such as Amazon EC2 (computation) or S3 (storage), over platform services such as Microsoft's database service SQL Azure or Google App Engine.

The CC came to break with the traditional view that organizations practiced, where the infrastructures are no longer proprietary organizations (something that happened for decades) and start to be seen as resources owned, managed and made available by

third parties. It goes on to look at them as a sub, which takes the form of services (Carr, 2009). Network resources can be easily shared through cloud technology. Improvements in communication and network technologies are supported by different reliable and robust solutions. (Alsaleh, 2018). In addition to the abovementioned technical characteristics of CC, several business aspects have emerged. Those aspects stem not only from the increasing trend towards service orientation but also cover opportunities for offering services on CC platforms and the possibilities of integrating individual component services with value-added services (Hentschel, 2018)

II. CONCEPT OF CLOUD COMPUTING

Cloud computing systems are typically homogeneous and the same level of security, resource management, cost and other policies are shared by all the users. (Marinescu, 2012). It makes it possible for you to access your information from anywhere at any time, conveniently. (James Cebula, 2010). (Mell and Grance, 2011) defines Cloud Computing as characteristic to deliver and deployment of specific models. Cloud computing offers reliable and

customized computing environments for extensive internet users due to this it has a very great computing paradigm (Gong et al., 2013). It is also identified as a technology which is considered as the next big step towards the development and implementations of an increasing number of distributed applications, (Marinescu, 2012).

Cloud computing systems are typically homogeneous and the same level of security, resource management, cost and other policies are shared by all the users. Williams (2010). When a user accesses the cloud for a popular website, many things can happen. The user's IP for example can be establish where the user is located (geolocation). DNS service can then direct the user to a cluster of servers that are closely to the user so the site can be accessed rapidly and in their local language. The user doesn't login to a server, but they login to the service they are using by obtaining a session id and/or cookie which is store in their browser.

It works from floppy disk to CDs to USB flash drive, file saving and sharing has undergone a significant evolution over a past decades. The device to share are becoming smaller and have higher capacities, increasingly destined to serve an on-the-go lifestyle.

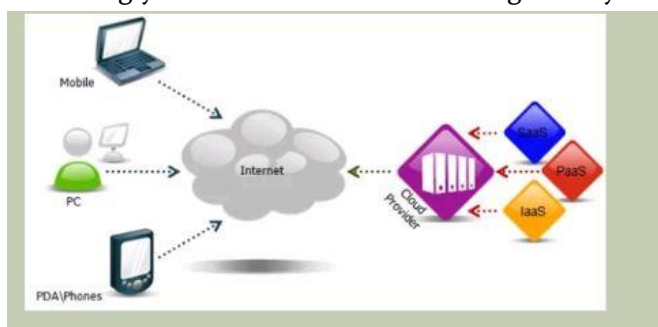


Figure 1. Diagram On How It Works

III. BRIEF REVIEW OF CLOUD COMPUTING

(Youssef et al. (2008)) stated that cloud computing is not a completely new concept but a combination of

new and already existing technology. Cloud computing is not a revolution in information technology but an evolution of existing technologies as the main revolution occurred long before the advent of cloud computing (Anjomshoaa, Tjoa (2011)). The U.S National Institute of Standards and Technology (NIST) defines Cloud computing from the characteristic point of view as being “a model for enabling ubiquitous, 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” (NIST 2011).

Beloglazov et al. (2012) Identified cloud computing as an abstraction based on the notion of pooling physical resources, presented the NIST draft definition and described five essential characteristics. Marinescu (2012) Identified cloud in other way as the next big stage in the development and deployment of an increasing number of distributed applications. Xiao et al. (2012) stated five most representative securities and privacy attributes which are confidentiality, integrity, availability, accountability, and privacy preservability.

Chadwick and Fatema (2012) described a policy based authorization infrastructure that a cloud provider can run as an infrastructure service for its users. Gong et al. (2013) Provided survey on cloud computing, which highlight its key ideas, architecture, state of the art application, and some main challenges. NIST (2009) Defined cloud computing and presented its characteristics, specific delivery models and deployment models. Adrian (2013) Aimed to determine whether or not cloud computing infrastructure can support privacy regulation yet remain practical.

The cloud computing platforms and the possibilities of integrating individual component services with value-added services (Hentschel, 2018). A cloudlet also

refers to a small cloud that is present near the mobile users that is connected to the remote clouds via a LAN Network (Alsaleh, 2018).

ADVANTAGES AND DISADVANTAGES OF CLOUD COMPUTING

ADVANTAGES

- Protects data privacy, allow access control and allow user to retrieve search token and decryption key from database owner (Lu and Tsudik (2011).
- Compliance with the data protection(Ranchal et al. 2010) Ensures user-demand privacy requirement and provides the better performance at the same time Chuang et al. (2011).
- Allowed the data owner to representative most of computation intensive tasks to cloud servers without user access privilege information (Raja (2012).
- Give high level regulatory recommendations about data protection, data security etc. Porwal et al. (2011).
- Focusing on the weakness of weaknesses of current methodologies (Hafner, 2012). Ensured that the users' privacy policies are stuck to their data(Fatema ,2012).
- Analysis the relationship between privacy, cloud and internet.(Adrian (2013)). Analyzing the risks related to data privacy in cloud.
- Provide comprehensive taxonomy and investigating possible solutions to detect and prevent intrusions in cloud computing systems (Khan et al. (2012).
- Provides logging and auditing at the platform level (Sridevi, 2013).This drives the communication between mobile applications and cloud services (Sykes et al. (2013).
- Customers can access the services through heterogeneous thin or thick client tools due to services are brought across the Internet via a standard device that allows. Clarke (2010)

- The cloud provider services a multitenant model to help multiple clients by pooling Computing resources, which are dissimilar physical and virtual resources dynamically allocated or reassigned according to client demand. Lai (2013).
- Cloudlets are beneficial because they allow their users to instantiate custom virtual machines rapidly on the running cloudlet, which requires software in a thin client fashion (Alsaleh, 2018).

DISADVANTAGES

- It only supports equality testing, hides concrete value in the conditional expression and join operations between two tables is not supported Lu and Tsudik (2011).
- Lowering the predictive capability against confidential attributes Goutet al. (2010). Their methodology, pile is needed to more study and more experts Mowbray et al. (2010). When using a cloud computing you are essentially handling over your data to the third party (Wang et al, 2010).
- Cloud computing comes with the risk that authorize user might access your information Wang (2011).
- Cloud computing entities the user.

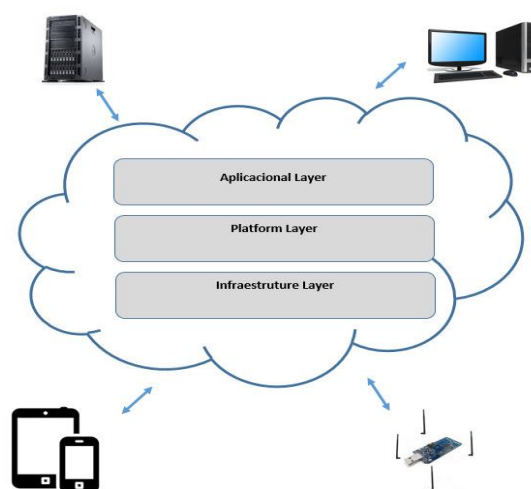


Figure 2. A Conceptual View Of Cloud Computing

CLOUDLET INFRASTRUCTURE AND ITS VIRTUALIZATION

A cloudlet also refers to a small cloud that is present near the mobile users that is connected to the remote clouds via a LAN network (Hentschel, 2018). The convergence of cloud and mobile computing has resulted in the emergence of a new architectural element known as a cloudlet (Alsaleh, 2018). The CC is destined to become more important and to have substantial effects on the IT market, primarily due to economically motivations (Hentschel, 2018). Chadwick and Fatema (2015) have presented an infrastructure service run on authorization Infrastructure. The proposed infrastructure ensures the users' privacy policy and access would always be monitored and managed by the policies even for the transferring of data between cloud providers or services.

CLOUD COMPUTING SERVICES

Cloud computing services are grouped into three areas: software as a service (SaaS), platform as a service (PaaS) and Infrastructure as a service (IaaS) (Zhang et al. 2010). These services are arranged in layers and they replace the traditional "in-premises" computing systems (Barnatt, 2010).

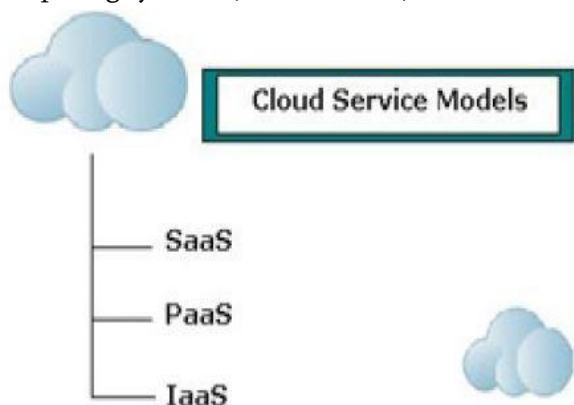


Figure 3. Cloud services

PLATFORM AS A SERVICE (PAAS)

This is the middle layer between SaaS and IaaS (see Fig 3). It consists of operating systems and application

development platform which can be accessed and utilized through the Internet (Zhang et al. 2010). Developers use this platform to develop, test, deploy and host web application as a service via the internet. For example: Google Application Engine, Microsoft Windows Azure and International Business Machine (IBM) are providers of such platforms as a service (Barnett 2010). The PaaS provide the consumer operating system, software development platform and programming language, as well as storage solution and database (vecchiola, 2009).

INFRASTRUCTURE AS A SERVICE (I.A.A.S.)

This is the bottom layer and is basically what software applications run on and where data is stored [Barnatt 2010]. This service provides available storage, servers, networking, management and support components for organizations, on demand, making use of virtual servers (Vaquero et al. 2009). These servers and storage infrastructures are accessed through the internet (Leavitt, 2009). The IaaS is typically a layer that uses virtualization engines of computing resources (Liu, 2007).

SOFTWARE AS A SERVICE (S.A.A.S.)

This is because this layer involves applications such as word processors, video editors and databases to be hosted by cloud service provider and is made available to the customers on demand or pay as you go, through the internet. (Leavitt, 2009;). This layer is the outermost layer of CN. The SaaS represent a set of application that run in a cloud environment (Barnett, 2010).

CLOUD COMPUTING DEVELOPMENT MODEL

There are four types of cloud computing deployment models, which include private, public, hybrid and community cloud computing.

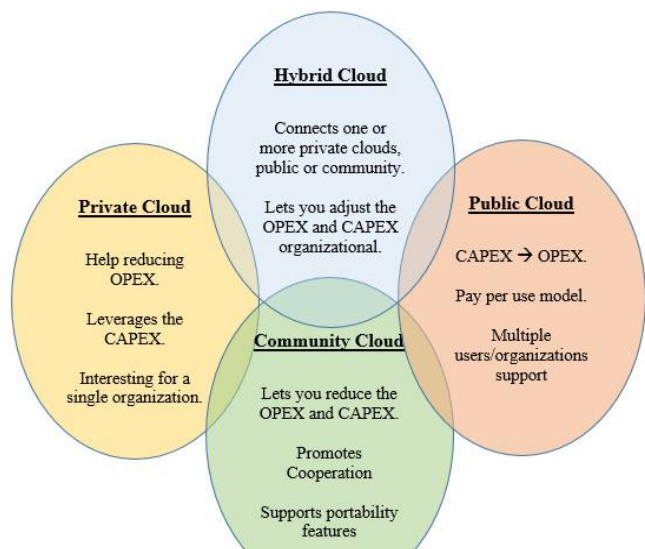


Figure 4. Cloud Computing Implementation Models

PRIVATE CLOUD

Private cloud also referred to as internal cloud, (Zhang et al. (2010)) is exclusive to the internal use of an organization. A private cloud is established for a specific group or organization and limits access to just that group. (Lewis, 2010). Private clouds are built exclusively for a single enterprise. They aim to address concerns on data security and offer greater control, which is typically lacking in a public cloud (Torry Harris, 2009). The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). (Garay, 2008) See figure 4.

PUBLIC CLOUD

A public cloud can be accessed by any subscriber with an internet connection and access to the cloud space (Jansen, 2011). It involves making services such as application, hardware and servers available to the general public (Dillon et al. 2010). Public clouds are owned and operated by third parties; they deliver superior economies of scale to customers, as the infrastructure costs are spread among a mix of users, giving each individual client an attractive low-cost, “Pay-as-you-go” model (Torry harris, 2009). See fig: 4. The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed,

and operated by a business, academic, or government organization, or some combination of them. (Garay, 2008)

HYBRID CLOUD

This is a combination of two cloud models: public, and private or public and community etc. The clouds, which are bound together by standardization, allows for data and application portability [Dillon et al. 2010]. A hybrid cloud is essentially a combination of at least two clouds, where the clouds included are a mixture of public, private, or community. (Wayne & Grance, 2009). It combines both public and private cloud models. With a Hybrid Cloud, service providers can utilize 3rd party Cloud Providers in a full or partial manner thus increasing the flexibility of computing. (Torry Harris, 2009). See fig: 4. The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).

COMMUNITY CLOUD

A community cloud is shared among two or more organizations that have similar cloud requirements. (Torry harris, 2009). Is provided exclusively for a set of users within an organization having a shared and common goal (Dillon et al. 2010). The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). (Garay, 2008) See figure 4

IV. CONCLUSION

To summarize, the cloud provides many options for the everyday computer user as well as large and small

businesses. It opens up the world of computing to a broader range of uses and increases the ease of use by giving access through any internet connection. In recent years, the improvement of cloud computing has provided opportunities for investigation in all aspects of cloud computing. Cloud computing is becoming more attractive for many organizations due to fact that it provides multiple computing services as cloud storage, cloud hosting and cloud servers etc.

Although, there are numerous benefits of cloud computing, governments and big organizations are concerned about security and privacy issues on cloud. Privacy of cloud system is a serious concern for the customers. A large number of public and private cloud providers exist. If you are considering using the cloud, be certain that you identify what information you will be putting out in the cloud, who will have access to that information, and what you will need to make sure it is protected. Additionally, know your options in terms of what type of cloud will be best for your needs, what type of provider will be most useful to you, and what the reputation and responsibilities of the providers you are considering are before you sign up.

V. REFERENCES

- [1]. Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., Lee, G., Patterson, D., Rabkin, A., Stoica, I., e Zaharia, M. (2010). A view of Cloud computing. *Commun. ACM*, 53(4):50–58.
- [2]. Buyya, R., Yeo, C. S., e Venugopal, S. (2008). Market-oriented cloud computing: Vision, hype, and reality for delivering it services as computing utilities. In *Proceedings of the 2008 10th IEEE International Conference on High Performance Computing and Communications, HPCC '08*, 5–13, Washington, DC, USA. IEEE Computer Society.
- [3]. Carr, Garay N. (2009). *The Big Switch: Rewiring the World, from Edison to Google*. W.W. Norton & Company.
- [4]. D. Cearley et al (2009). Hype cycle for applications development gartner group reporter number G00147982, Gartner.
- [5]. Ciurana, E. (2009). *Developing with Google App Engine*. Apress, Berkely, CA, USA, 1st Edition. 6. Liu, S., Liang, Y., e Brooks, M. (2007). Eucalyptus: A web service-enabled einfrastructure. In *Proceedings of the 2007 Conference of the Center for Advanced Studies on Collaborative Research, CASCON '07*, 1–11, Riverton, NJ, USA. IBM Corp.
- [6]. NIST (2012). *The NIST Definition of Cloud Computing*, Gartner.
- [7]. Leavitt, N. (2009) 'Is Cloud Computing Really Ready for Prime Time?', *Computer*, 42(1), pp.15-20.
- [8]. Vaquero, L. M., Rodero-Merino, L., Caceres, J. Whyman, B. (2008), and Lindner, M. (2008) 'A break in the clouds: towards a cloud definition', *SIGCOMM Computer. Commun. Rev.*, 39(1), pp.50-55.
- [9]. Dillon, T., Chen, W. and Chang, E. (2010) *Cloud Computing: Issues and Challenges*, pp.27-33.