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# A Study on Cloud Computing Research and Challenges

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***Abstract***:

*Cloud Computing is the emerging technology and is the model of business computing. Cloud computing explores the architectures for business computing by adapting many resources for the complete functionality. We also address the characteristics and applications of several popular cloud computing platforms Now a day's people all are ready to store their personal data and business data in the cloud only. Cloud computing can provide infinite computing resources on demand due to its high scalability in nature, which eliminates the needs for Cloud service providers to plan far ahead on hardware provisioning. This paper describes the challenges and the security issues in the cloud. .*

***Keywords***

*Cloud computing, cloud technologies, review*

## 1. Introduction

We define architectural components such as Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS) and Data as a Service (DaaS). Then, we compare cloud and grid computing Cloud computing has recently reached popularity and developed into a major trend in IT. While industry has been pushing the Cloud research agenda at high pace, academia has only recently joined, as can be seen through the sharp rise in workshops and conferences focussing on Cloud Computing. Lately, these have brought out many peer-reviewed papers on aspects of cloud computing, and made a systematic review necessary, which analyses the research done and explains the resulting research agenda. We performed such a systematic review of all peerreviewed academic research on cloud computing, and explain the technical challenges facing in this paper. There were several whitepapers and general introductions to cloud computing, which provide an overview of the field, [e.g. 1, 2, 3, 4, 5], but yet there is no systematic review of the agenda academia has taken. Pastaki Rad et al. [6] presented a preliminary survey that included a short overview of storage systems and Infrastructure as a Service (IaaS), which, however, was not systematic and fell short of providing a good overview of the state-of-the-art and lacked a discussion of the research challenges. Our paper aims to provide a comprehensive review of the academic research done in cloud computing and to highlight the research agenda academia is pursuing. We are well aware that a survey in such a fast moving field will soon be out of date, but feel such a survey would provide a good base for the 1st ACM Symposium on Cloud Computing to set new work in context with, and that it can act as a resource for researchers new in this area. Research in this field appeared to be split into two distinct viewpoints. One investigates the technical issues that arise when building and providing clouds, and the other looks at implications of cloud computing on enterprises and users. In this paper we discuss the advances and research questions in technical aspects of Cloud Computing, such as protocols, interoperability and techniques for building clouds, while we discuss the research challenges facing enterprise users, such as cost evaluations, legal issues, trust, privacy, security, and the effects of cloud computing on the work of IT departments, elsewhere [7]. This paper is structured as follows: the methodology used to carry out this review is shown in the Section 2; Section 3 discusses various definitions of cloud computing; Section 4 outlines the lessons to be learnt from related areas; Section 5 and Section 6 review the work on standardised interfaces and Cloud interoperability respectively; Section 7 summarises various other research done in support of building Cloud infrastructures; while use cases of Cloud computing are reviewed in Section 8; finally Section 9 concludes the review by summing up the research directions academia faces.

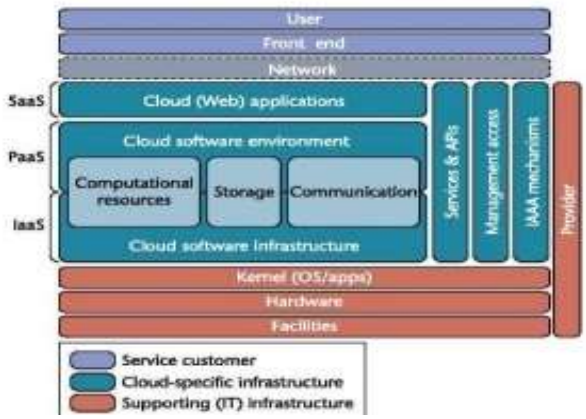


Figure 1: Cloud Computing Reference Architecture

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## 2. Popular Cloud Platforms

AbiCloud Abicloud [5] is a cloud computing platform, It can be used to build, integrate and manage public as well as private cloud in the homogeneous environments. Using Abicloud, user can easily and automatically deploy and manage the server, storage system, network, virtual devices and applications and so on. The main difference between Abicloud and other cloud computing platforms is its powerful web-based management function and its core encapsulation manner. Using the Abicloud, user can finish deploying a new service by just dragging a virtual machine with mouse. This is much easier and flexible than other cloud computing platforms that deploy new services through command lines.

Eucalyptus (Elastic Utility Computing Architecture for Linking Your Programs to Useful Systems) [5] mainly was used to build open-source private cloud platform. Eucalyptus is an elastic computing structure that can be used to connect the users' programs to the useful systems, it is an open-source infrastructure using clusters or workstation implementation of elastic, utility, cloud computing and a popular computing standard based on a service level protocol that permit users lease network for computing capability. Currently, Eucalyptus is compatible with EC2 from Amazon, and may support more other kinds of clients with minimum modification and extension.

OpenNebula [5] is also an open source cloud service framework. It allows user deploy and manage virtual machines on physical resources and it can set user's data centers or clusters to flexible virtual infrastructure that can automatically adapt to the change of the service load. The main difference of OpenNebula and nimbus is that nimbus implements remote interface based on EC2 or WSRF through which user can process all security related issues, while OpenNebula does not. OpenNebula is also an open and flexible virtual infrastructure management tool, which can use to synchronize the storage, network and virtual techniques and let users dynamically deploy services on the distributed infrastructure according to the allocation strategies for data center and remote cloud resources. Through the interior interfaces and OpenNebula data center environment, users can easily deploy any types of clouds.

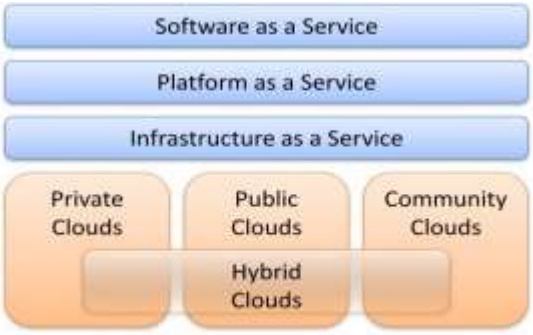


**Figure 2: Cloud computing deployment and service models**

## 3. Applications

There are a few applications of cloud computing [4] as follows: 1) Cloud computing provides dependable and secure data storage center. 2) Cloud computing can realize data sharing between different equipments. 3) The cloud provides nearly infinite possibility for users to use the internet. 4) Cloud computing does not need high quality equipment for the user and it is easy to use.

## 4. Standards and Interfaces

Cloud computing seeks to be a utility delivered in a similar as way electricity is delivered. Due to the higher complexity involved in delivering IT resources, open standards are necessary that enable an open market of providing and consuming resources. Currently, each vendor develops its own solution and avoids too much openness, to tie consumers in to their services and make it hard for them to switch to competitors. However, to new adopters the fear of vendor lockin presents a barrier to cloud adoption and increases the required trust. There are three groups currently working on standards for cloud computing: The Cloud Computing Interoperability Forum9 , the Open Cloud Consortium10, and the DMTF Open Cloud Standards Incubator11 . There is also a document called the open cloud manifesto12, in which various stakeholders express why open standards will benefit cloud computing. In literature, Grossman [2009] points out that the current state of standards and interoperability in cloud computing is similar to the early Internet era where each organization had its own network and data transfer was difficult. This changed with the introduction of TCP and other Internet standards. However, these standards were initially resisted by vendors just as standardisation attempts in cloud computing are being resisted by some vendors.

## 5. Use case in Cloud Computing

In this paper we have so far presented work that seeks to advance the technology of cloud computing. We end this by presenting new technologies and use cases that become possible through the use of cloud computing. Chun and Maniatis [47] 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 also include laptops or desktops near the phone in their "cloud" because of the network latency for phones. Depending on the use case, their model offloads entire computations or parts thereof, and only has the remainder executed locally.

## 6. SECURITY ISSUES IN CLOUD

Cloud computing comes with numerous possibilities and challenges simultaneously. Of the challenges, security is considered to be a critical barrier for cloud computing in its path to success (Khorshed, Ali & Wasimi, 2012). The security challenges for cloud computing approach are somewhat dynamic and vast. Data location is a crucial factor in cloud computing security (Teneyuca, 2011). Location transparency is one of the prominent flexibilities for cloud computing, which is a security threat at the same time – without knowing the specific location of data storage, the provision of data protection act for some region might be severely affected and violated. Cloud users' personal data security is thus a crucial concern in a cloud computing environment (Joint, Baker & Eccles, 2009; Ismail, 2011; King & Raja, 2012). In terms of customers' personal or business data security, the strategic policies of the cloud providers are of highest significance (Joint & Baker, 2011) as the technical security solely is not adequate to address the problem. Trust is another problem which raises security concerns to use cloud service (Ryan & Falvy, 2012) for the reason that it is directly related to the credibility and authenticity of the cloud service providers. Trust establishment might become the key to establish a successful cloud computing environment. The provision of trust model is essential in cloud computing as this is a common interest area for all stakeholders for any given cloud computing scenario. Trust in cloud might be dependent on a number of factors among which some are automation management, human factors, processes and policies (Abbadi & Martin, 2011). Trust in cloud is not a technical security issue, but it is the most influential soft factor that is driven by security issues inherent in cloud computing to a great extent. All kinds of attacks that are applicable to a computer network and the data in transit equally applies to cloud based services – some threats in this category are man-in-the-middle attack, phishing, eavesdropping, sniffing and other similar attacks. DDoS (Distributed Denial of Service) attack is one common yet major attack for cloud computing infrastructure (Dou, Chen & Chen, 2013). The well known DDoS attack can be a potential problem for cloud computing, though not with any exception of having no option to mitigate this. The security of virtual machine will define the integrity and level of security of a cloud environment to greater extent (Rakhmi, Sahoo & Mehfuz, 2013; Agarwal & Agarwal, 2011). Accounting & authentication as well as using encryption falls within the practice of safe computing - they can be well considered as part of security concerns for cloud computing (Lee, 2012; Ogigau-Neamtiu, 2012; Singh & Jangwal, 2012). However, it is important to distinguish between risk and security concerns in this regard. For example, vendor lock-in might be considered as one of the possible risks in cloud based services which do not essentially have to be related to security aspects. On the contrary, using specific type of operating system (e.g. opensource vs. proprietary) might pose security threat and concerns which, of course, is a security risk. Other examples of business risks of cloud computing could be licensing issues, service unavailability, provider's business discontinuity that do not fall within the security concerns from a technical viewpoint

## 7. 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. The vast possibilities of cloud computing cannot be ignored solely for the security issues reason – the ongoing investigation and research for robust, consistent and integrated security models for cloud computing could be the only path of motivation.

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