

Cloud Computing Issues and Problems in Implementation

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Abstract

The National Institute of Standard and Technology defines cloud computing in the following way: Cloud Computing is a model for enabling convenient, on demand network access to share pool of configurable computing resources e.g. networks, services, storage, applications that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Traditional business applications have always been very complicated and expensive. However, with the emergence of cloud computing, various complex tasks like the amount and variety of hardware and software required to run and configure, test, secure and update etc. have become very easy. Cloud computing eliminates these problems to a large extent. It is a service oriented architecture that provides applications, infrastructure and platform as services. This technology is experiencing a rapid growth both in academia and industry. The applications of cloud computing are limitless. Its advantages like anywhere and anytime access to data, no set-up costs, automatic software upgrades, increased storage capabilities etc. make it so popular and demanding. There are various issues which make this technology difficult to implement.

In this paper, various implementation issues of cloud computing have been identified and studied in the light of different architectures and applications.

General Terms

Cloud implementation problems, data security, and privacy.

Keywords : Cloud computing, virtualization, security, vulnerability.

1. Introduction

Cloud computing is a way of computing in which software, computing resources, and platforms are provided to the users on request over the internet. It has moved the applications from desktop to browsers. Cloud computing has been evolving through different computing paradigms like multi-core processors, networked computing, cluster computing, grid computing, peer to peer computing, service computing, market- oriented computing and most

recently cloud computing. Cloud computing allows users to temporary utilize computing infrastructure over the network, supplied as a service by the cloud-provider at possibly one or more levels of abstraction [1]. It has become a key computing platform for sharing resources that include infrastructures, software, applications and business processes. A computing service provided by cloud requires being highly scalable, reliable and autonomic to support ubiquitous access, dynamic search and capability. Consumers can determine the required service level through quality of service parameters and service level agreements and cloud computing fulfils this to a large extent. In fact, cloud computing is built with the intention of developing an online application that could be supported anytime, anywhere with enough security for its users. Redistribution of the requirement based processing power among different users is certainly the dynamic feature of cloud computing. Besides, ability to adapt to number of users and data requests, working with different form of resources and their distribution is possible. For example, if one server goes down, the other server takes the load temporarily. The operations in cloud computing are observed as abstraction and this enables the application to be highly dynamic and adaptable. Cloud computing refers to the concept of grid computing, utility computing and virtualization. Resource sharing is the significant part of cloud computing. Virtualization is a core technology for enabling cloud resource sharing. In fact, the combination of virtual machines and virtual appliances used for server deployment objects is one of the key features of cloud computing [2-4].

Resources with requesters over the network are shared using the concept of provisioning. One of the major objectives of cloud computing is to leverage internet or intranet to provision resources to users. The different resources include infrastructure resources, software resources, application resources and business processes [5]. Virtualization and service oriented architecture (SOA) play a key role in cloud computing. Virtualization technology helps to create and allocate images to the operating system, middleware, software, application etc. to the right physical machines and SOA feature can be leveraged to build reusable components, standard- based interfaces and extensible solution architectures in order to construct scalable cloud computing platforms. However, building a unified, scalable and reusable cloud computing architecture to support sharing of all types of resources still faces challenges in the areas of this technology and industry practices [5]. Clouds are deployed on huge data centres which provide numerous amount of processing and storage capacity. Majority of software vendors are providing these services through cloud which tends to increase load on IdP (Identity Provider). Data centres are often in remote locations and they are dangerously prone to the effects of climate change [6]. In a survey by the industry group

AFCOM, sixty two per cent of data centre operators said the availability of sufficient power is the number one challenge in data centre consolidation projects, which can eliminate servers but result in higher density environments [7]. Vulnerabilities on each cloud server are more exposed to compromise than those in a traditional data centre. The compromised computers can bombard web servers with denial of service attacks. A virtual server duplicates so do its vulnerabilities and exposures and this increases the attackable surface area of a cloud server within minutes. Criminals for stealing credit card information. Protecting these web applications to comply with PCI (Payment Card Industry) compliance requirements may present technical and business challenges depending on the existing network architecture. Cloud computing allows a user to access software and information anywhere through internet with any device connected to it. Servers are no longer maintained and operated by a single person. This kind of set up can bring down internal expenditure and IT costs [8]. Though the benefits of cloud computing are limitless, but still this field is in its infancy as far as implementation and usage are concerned. The lack of security in cloud represents an obstacle for moving enterprises into the cloud. The objective of this paper is to address the challenges and threats in deployment models and discuss obstacles in the implementation of cloud computing technology.

The rest of the paper has been organized as follows. Section 2 comprises of literature review. A detailed study of different implementation issues of cloud computing has been given in section 3. Results and discussion have been presented in section 4. Finally, in Section 5 conclusion of the research study has been given.

2. Literature Review

An extensive survey of the existing work in the area of the implementation has been carried out to understand the extent of the research work done in this area. The significant research papers, articles and other published work of different researchers have been studied. A detailed relevant research work in this domain has been presented below.

There has been an increasing interest of researchers in the field of cloud computing to make it the best technology. That is why lot of research has been going on in this field. The biggest concern of current cloud computing system is auditing of the security controls and mechanisms in terms of user level. Interoperability is one of the challenging issues for future clouds as there is no good way to translate Service Level Agreements in cloud allocation chain. These issues are still in discussion [9]. Cloud fears largely stems from the perceived loss of control of sensitive data. Current control measures do not adequately address cloud

computing's third party data storage and processing needs. Chow et al. proposes to extend control measures from the enterprise into cloud through the use of trusted computing and applied cryptographic techniques [10]. No doubt, the latest innovations in cloud computing are making business applications even more mobile and collaborative. However, there are certain challenges to be addressed in this technology. The issue of vulnerability is one of them. In fact, vulnerability and security are closely related to each other. So, a vulnerable system cannot be secure. These different types of vulnerabilities are to be identified and removed to make the security of cloud computing environment strong. The core technologies in cloud computing like web application, virtualization and cryptography have vulnerabilities that are either intrinsic to the technology or prevalent in the implementations of technology. Vulnerability is a prominent factor of risk. So, security relates to saving the data and program from danger and vulnerability [11-12].

The lack of security and standards in cloud represents an obstacle for most enterprises for moving into the cloud. Sharma et al. have addressed various challenges and threats in the deployment models and discuss obstacles in the implementation of cloud computing [13]. In fact, proper attention is required to handle these implementation issues. Maurya et al. have also explained the various issues which are important for the implementation of this technology and have proposed some possibilities of enhancing performance on cloud environment, which otherwise, is an obstacle for its proper adoption [14]. The issues like bandwidth, quality of service and data limits are also the challenges for cloud computing. The problems related to these challenges represent the frustration, inconvenience involved in using cloud computing. These very real frustrations often cause people to not use cloud computing services. Cloud computing requires broadband of considerable speed. In fact, not just speed but also high quality broadband connections, which are always connected. The problems like unable to log into or maintain a connection with online email, the online document will not load, payment has not been effected etc. are the results of slow and poor quality connections. If the benefits of cloud computing are to be reaped at a national development level, then investment in access infrastructure, backbone infrastructure as well as regulation issues with regard to quality of service issues perhaps become important [15].

3. Issues in Cloud Computing

The following are different implementation issues of cloud computing

3.1 Problem of virus and worms

In cloud computing, services are delivered through internet, so the problems of viruses, worms, hackers and cybercriminals to attack cloud computing environment are common. There are more chances for attackers to steal private information, disrupt services and cause harm to the enterprise cloud computing network.

3.2 Data Location

Data in cloud environment is spread in different locations like different continents, countries, states etc. So the physical location of the data in the cloud is the major worry for the implementation of cloud computing technology for any organization. It is not necessary that the server which we are using in our cloud may reside at the same place where we are. It may be located in another country and unfortunately if that country does not have enough laws and methods to protect the data, then it can lead to a serious problem.

3.3 Lack of Standardization

Proper levels of standards in the whole cloud environment are necessary to adopt this technology. But lack of standardization problem is a main obstacle in the slow adoption of this technology. In fact, proper standardization of cloud processes at all levels is needed to reduce the complexity involved in this environment. Only then the various benefits of cloud computing can be realized and enjoyed.

3.4 Reliability and Availability of Service

Cloud computing is not perfect in terms of reliability and availability of service. There have been so many instances where many cloud servers were completely shut down making all cloud services unavailable for hours and even for days. It is even difficult to imagine the loss of any company which is completely dependent on cloud computing services that remains disrupted for hours or even days.

3.5 Bandwidth and Speed Requirements

Cloud computing requires broadband of considerable speed, excellent bandwidth and good quality of service. But presently these criteria have to be met which is also a reason not for the proper implementation of cloud environment. Slow and poor quality connection makes people not to use cloud computing services. Bandwidth problems also lead to data transfer a

bottleneck which rises in peak load time or in congestion period when more users communicate at limited bandwidth.

3.6 Data Protection

The issue of data protection is very serious problem in cloud computing. The significant issues include data sensitivity, data protection and portability. For example, if the client does not want to continue anymore or if the contract is terminated, the sensitive data of the client may be deleted or misused by the service provider. Also if the provider went out of business due to any reasons and handout the data of the client to new provider, it may be difficult for the client to trust the new service provider immediately.

3.7 Data Loss and Leakage

Data loss or leakage is another serious problem in the implementation of cloud computing technology. It can have worst impact on any organization because compliance might be violated due to lost or leaked data. These problems can occur due to operational failures, unreliable data storage and inconsistent use of encryption keys, insufficient authentication, authorization, and audit (AAA) controls etc. Basically, deletion or alteration of records without a backup of the original content increases the problem of data compromise in the cloud. This not only damages the data but also affects the brand and reputation of the enterprises.

3.8 Data Lock-in

The problem of data lock-in in cloud computing environment is one of the major obstacles in the implementation of this technology. It is a provision that a consumer of cloud can be easily shift from one cloud to another for the fulfilment of their requirements. But unfortunately, some cloud provider companies bound a person in their cloud by applying certain terms and conditions and these conditions are not shown to users. Moreover, some cloud service providers keep on changing the prices of their offerings and if consumers may be interested in having their services delivered through another provider, then it becomes more difficult.

3.9 Data audit ability

Audit ability implies that any transaction, report etc. can be tracked to its originating transaction. However, this data audit ability is not an easy job in cloud paradigm. It is of critical importance for the clients to ensure that their data are being correctly stored and

maintained. They should have certain security means to periodically verify the correctness of their remote data. Although the existing schemes provide integrity verification for different data storage systems but still the problem of data audit ability has not been fully addressed.

3.10 Performance unpredictability

Performance unpredictability in cloud is in fact another major issue for users and it is also one of the major obstacles for cloud computing. For example, researchers expect guaranteed performance for their experiments. Similarly, small and medium sized enterprises want strict assurance on Service Level Agreements (SLAs). Hence, it is highly important for cloud vendors to offer guaranteed SLAs based on performance metrics such as response time and throughput. Similarly, there are many situations in which it is necessary to move large amount of data but here also cloud service consumer meets the performance issues.

3.11 Scalable storage

This issue is very important in the use of cloud computing because we are charged on the resources used, so if an application does not vertically scale, it increase the costs in the cloud. However, horizontal scalability is achieved through the implementation of a load balancing technique but vertical scalability has still remain an issue in cloud computing.

3.12 Software licensing

Software licensing is a method that allows an individual or group to use a piece of software. It should be clear and in simple format that the user can easily grasp the matter written in the licensing document. In cloud environment, this poses a different scene where the number of servers hosting an application dynamically increases or decreases. For example, if the number of servers increases from ten to five hundred during some particular time, then it would be difficult to predict and license them appropriately.

3.13 Metering and Billing

Cloud computing is a pay per use process. For the enterprises, it is very difficult to show the procedure of billing of resources used by the users. This obstacle creates fear in the minds of users regarding the billing charges. Many doubts arises like is the provider charging fairly and using proper metering methods etc. So it all requires certain standards to be adopted for the fair working of this paradigm.

3.14 Privacy

In cloud computing consumers and enterprises use online computing with the trust that their data will remain private and secure. In reality, this does not happen exactly. It has remained an obstacle in the proper implementation of this paradigm. Strong privacy protections are essential for cloud computing to reach its full potential. Secure and privacy sensitive systems and datacentres are needed to protect individual's privacy.

3.15 Security

Security is a critical issue in cloud computing, particularly in large public or shared environments. The cloud provider needs to make sure the data privacy and compliance is guaranteed. In fact, information security needs to be guaranteed, data protection ensured and compliance achieved. These are important for providers and users. clouds, as well as secure application connectivity are the major security concerns. Organizations need a proper and secure way to manage the activities like monitoring, updating, tracking, change management and auditing etc. Last but not the least, security at every point, every level is required to achieve safe and secure cloud environment.

3.16 Data back up

Back up services are provided by cloud computing but there are certain issues that need to be clarified about this. For example, it is necessary to think about the kind of security and compliance the cloud provider implements before obtaining the online back-up services. Secondly, there is no compatibility and portability of standards, thus a user may take a long time for restoring and extracting data because of the limitations like API and bandwidth.

3.17 Sustainability

Cloud computing is assumed to be a form of green computing. With the growth of cloud, however, comes an increasing demand for energy. The data centers have massive storage facilities that cause incredible amounts of energy. Thus, energy consumption and carbon emission by cloud infrastructures have become a key environmental concern. There are several interconnected issues related to the cloud's impact on climate change. The issue of sustainability is one of the main obstacles in the implementation of cloud computing technology.

4. Result and Discussion

Cloud computing is fully enabled by virtualization. It is a relatively new way of referring to the use of shared computing resources and it is an alternative to having local servers handled applications. The end users of cloud computing network usually have no idea where the servers are physically located. This flexibility is the key advantage of cloud computing and it distinguishes it from other technologies. But in spite of all this, there are various issues which need to be addressed as explained above. Such issues eventually compromise the security of this paradigm. In other words, these issues pose several significant problems in the implementation of this technology. To overcome these issues proper understanding and addressing of the root causes is needed.

5. Conclusion

Cloud computing is emerging as a major platform that shall provide a medium for different users to access the required services. These users may include the business enterprises, educational institutions, service providers etc. However, this technology is in the state of development. In these initial stages, there are many issues which still remain to be resolved so that this technology can be implemented properly with ease. These technical issues include problems of standardization, broadband and speed requirements, data protection and back up, security, scalability of storage issues, privacy and licensing issues etc. In this study an analysis of different issues that affect the implementation of cloud computing infrastructure have been presented. As discussed above these issues cause mistrust and relatively slow adoption of this technology. This eventually creates obstacles in the smooth implementation of cloud computing. Such problems must be addressed in order to deploy and implement safe and secure cloud environment.

In further work, some of the critical and significant issues discussed above based on present research survey shall be identified. These shall be studied in detail with possible ways to overcome and optimize the performance of cloud infrastructure.

6. Reference

[1] M. Böhm, S. Leimeister, C. Riedl & H. Krcmar, "Cloud Computing and Computing Evolution" In: San Murugesan (ed.) Cloud Computing: Technologies, Business Models, Opportunities and Challenges, CRC Press, 2010.

- [2] P. Abrol and I. Gandotra, "Cloud Commerce a New era of e-Commerce", Strategic Service Management, Excel Books, New Delhi, pp. 228-233, 2010.
- [3] I. Gandotra and P. Abrol, "Cloud Computing: A New Paradigm for Education", Proc. Intl Conf. on Advances & Emerging Trends in Computing Technologies (ICAET10), pp.- 92-96, SRM University, Chennai, Jun.2010.
- [4] I. Gandotra and P. Abrol, "Challenges and Issues in Adaptation of Cloud Computing in Business World", e-Proc. Intl Conf. on Upcoming Trends on IT, pp.- 70, PCTE, Ludhiana, 2010.
- [5] L.J. Zhang & Q. Zhou, "CCOA: Cloud Computing Open Architecture," IEEE Int. Conf. Web Services, Los Angeles, CA, pp. 607–616, July 6-10, 2009.
- [6] P. Foster, "Cloud computing – a green opportunity or climate change risk?"the guardian, August 18,2011.[online].Available: <http://www.guardian.co.uk/sustainable-business/cloud-computing-climate-change>. [Accessed:August 10,2012]
- [7] R.Miller,"DataCenter Leasing: It's All About the Megawatts" Data Centre Knowledge, Nov. 11,2009. [Online].Available:<http://www.datacenterknowledge.com/archives/2009/11/11/data-center-leasing-its-all-about-the-megawatts/>. [Accessed: August 11,2012]
- [8] "Tax Issues In Cloud Computing"CloudTweaks, May 28, 2012. [Online]. Available: <http://www.cloudtweaks.com/2012/05/tax-issues-in-cloud-computing/>. [Accessed: August 12,2012]
- [9] B.P. Rimal, E. Choi &I.Lumb, "A taxonomy and survey of cloud computing Systems," in Fifth Int. Joint Conf. INC, IMS, IDC(NCM 2009), Seoul, Korea, pp. 44–51, IEEE Press, Aug.25-27, 2009.
- [10] R. Chow, P. Golle , M. Jakobsson, R.Masuoka&J.Molina, "Controlling Data in the Cloud: Outsourcing Computation without Outsourcing Control," in ACM Cloud Comput. Security Workshop (CCSW), Chicago, Illinois, USA, Nov. 9–13, 2009.
- [11] A. Sharma & P. Abrol, "Vulnerabilities in Cloud Computing: A Research Perspective," Int. J. Comput., Communication & Emerging Technology, vol. 01, no. 02, 2012.
- [12] A. Sharma & P. Abrol, "Vulnerability Issues in cloud computing", proc. 7th JK Science Congress JKSC-11, pp 191, Oct. 2011.

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[13] P. Sharma, S. K. Sood& S. Kaur, "Cloud Implementation Issues and What to Compute on Cloud," Int. J. Advances Comput. Networks Its Security, vol. 1, no. 1, pp. 130–135, 2011.

[14] A. Maurya, R. Nawal& M. Sharma, "Future Advancement In Cloud Computing," Int. J. Comput., Communication Emerging Technology, vol. 1, no. 1, pp. 18–24, Apr. 2012.

[15] “Emerging Issues: Cloud Computing” Southern African Internet Governance Forum (SAIGF) and 6th internet Governance Forum(IGF),Issue No.1,Sep.2011.