Cloud Computing: A Literature Review

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Abstract

This literature review define cloud computing and basic types of cloud computing. This consist of 17 referred journal articles published in cloud computing research. The articles are classified based on a scheme that consists of four main categories: technological issues, business issues, domains and applications, and conceptualizing cloud computing. The output show that although current research is still has technological issues, new research regarding social and organizational implications are emerging. This literature review provides a reference source and classification scheme for researchers of cloud computing, and to indicate under-researched areas as well as future directions in cloud computing.
Keywords: Private Cloud, Public Cloud, Community Cloud.

1. Introduction

For the new emerging technology i.e. Cloud Computing, there is no established definition yet, which contributes to the current skepticism and possible overestimation regarding its impact on the technology and business landscape. A Cloud is like a pool of *virtualized* computer resource[16]. In particular, Clouds allow the dynamic scale-in and scale-out of applications by the provisioning and de-provisioning of resources and services, e. g. by means of virtualization; the monitoring of resource utilization to support dynamic load-balancing and re-allocations of applications and resources like memory storage, processing, computing etc. Cloud Computing is not basically a new paradigm, but it draws on existing technologies and approaches, such as Utility Computing, Software as a Service, distributed computing, and centralized data centers. The new concept in Cloud Computing is that Cloud Computing combines and integrates these approaches[17]. Especially the combination with Utility *Computing* and *data centers* seems to differentiate Cloud Computing from Grid Computing.

Cloud computing is a set of information technology services which are delivered to a customer over a network on a leased basis and with the ability to scale up or down their service requirements or resources requirements[16]. Usually Cloud Computing services are delivered by a third party who owns the infrastructure. Cloud Computing holds the potential to eliminate the requirements for setting up of high-cost computing infrastructure for IT-based solutions and services that the industry uses[17]. It promises to provide a flexible IT infrastructure, accessible through internet from lightweight portable devices. This would allow multi-fold increase in the capacity and capabilities of the existing and new software. This new model for computing has found fertile ground and is attracting the world and massive global investment[8]. Many industries and organizations, such as banking, healthcare, agriculture, environment monitoring and education are moving towards the cloud due to the efficiency of services provided by the pay-per-use basis of the resources such as bandwidth consumed, memory space used, processing power used, transactions carried out, data transferred etc.

2. Types of Cloud

Cloud systems can be deployed in four forms viz. private, public, community and hybrid cloud [4] as per the access allowed to the users and are classified as follows:

2.1 Private Cloud

This deployment model is implemented solely for an organization and is exclusively used by their employees at organizational level and is managed and controlled by the organization or third party[17]. The cloud infrastructure in this model is installed on premise or off premise. In this

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deployment model, management and maintenance are easier, security is very high and organization has more control over the infrastructure and accessibility [4].

2.2 Public Cloud

This deployment model is implemented for general users. It is managed and controlled by an organization selling cloud services[17]. The users can be charged for the time duration they use the services. Public clouds are more vulnerable to security threats than other cloud models because all the application and data remains publicly available to all users making it more prone to malicious attacks. The services on public cloud are provided by proper authentication [4].

2.3 Community Cloud

This cloud model is implemented jointly by many organizations with shared concerns viz. security requirements, mission, and policy considerations. This cloud is managed by one or more involved organizations and can be managed by third party [4]. The infrastructure may exist on premise to one of the involved organization or it may exist off premise to all organizations.

2.4 Hybrid Cloud

This deployment model is an amalgamation of two or more clouds (private, community, public or hybrid). The participating clouds are bound together by some standard protocols. It enables the involved organization to serve its needs in their own private cloud and if some critical needs (cloud bursting for load-balancing) occur they can avail public cloud services [4].

3. Summary of Survey

Shyam Patidar, Dheeraj Rane, Pritesh Jain [1] discuss about the cloud computing which help to understand for anyone who may have recently heard the term "cloud computing" for the first time and needs to know what it is and how it helps them. It give broad detail about cloud computing like that basic fundamental paradigms, tools techniques, technologies and services provider companies.

Wang, Lizhe [2] reviews the recent advances of Cloud computing and presents our views on Cloud computing: definition, key features and enabling technologies. The perspective study aims to contribute the evolution of the Cloud computing paradigm.

Zhang, Shuai [3] The clouds will grow in size as soon as available bandwidth and the corresponding service model mature enough, cloud computing will bring a revolutionary change in the Internet. Cloud computing announced a low-cost super-computing services to provide the possibility, while there are a large number of manufacturers behind, there is no doubt that cloud computing has a bright future.

Nandgaonkar, Suruchee V., and A. B. Raut [4] Cloud computing have several benefits over traditional (non- cloud) environment and have capability to handle most sudden, temporary peaks in application demand on cloud infrastructures. Virtualization technology provides good support to achieve aim of cloud computing like higher resource utilization, elasticity, reducing IT cost or capital expenditure to handle temporary loads as well as cloud computing have various flexible service and deployment models which is also one of the main issue of adopting this computing paradigm. Virtualization concepts have open shared nature which is responsible for the violation of security polices and laws as well as degrades their computing reputation and performance. So there is need to focus on privacy and on solutions of various security problems to maintain the trust level of organization for deploying the cloud computing without any hesitation and also need of technical support for elastic scalability to serve by vertical scaling approach which is currently restricted to only horizontal scaling.

Avram, Maricela-Georgiana [5] with all of the hype around cloud computing, and multiple definitions of cloud computing, it is difficult to discern exactly what constitutes "cloud computing." This problem is made more difficult as vendors rush to claim that they are now cloud computing companies, or at least "cloud-friendly." Suddenly, the entire technology sector has become "cloudy"—similar to the dot-com stampede of the late 1990s. Adopting one or another technology should start by evaluating the economical processes of the organization. IT is, or it is supposed to be, an integrated part of a business. We need technology to support or improve the economical processes. Before rushing into the cloud, the company should study

their processes and evaluate the risks and advantages brought to their business. Since the small and mid-size companies have less complex processes, they should be the first category of businesses to use cloud computing services. One of the most important advantages offered by cloud computing is the reduced cost. Related to the IT governance principles we should study first the value brought by cloud services to our organization. This value is defined by two characteristics: utility and guarantee. Any organization has customers and the main scope is satisfying their needs. In my opinion, the organization should first define their economic objectives related to the 4 elements of the balanced scorecard: financial, customer, internal and learning-development and then we should identify the way cloud services can sustain these objectives.

Khalid, Umer [6] designed an anonymous authentication and authorization protocol using anonymous public key certificates along with standard Strong Authentication and XACML servers. The proposed protocol promises full anonymity and prevents identity theft by employing anonymous identities. We have kept our framework flexible enough to provide multiple levels of anonymity by using more than just one CA for issuing anonymous certificates. The protocol has been designed such that the real identity is never used in actual communication and whole process is transparent to the user. Our proposed protocol can be integrated with existing identity management systems and provide anonymity as a cloud service.

Yang, Haibo, and Mary Tate [7] provides insights into the current state of cloud computing research. Our classification and descriptive review can provide a useful quality reference source for academics and practitioners with an interest in cloud computing, and suggestions for future lines of research that will have strong salience to our practitioner community. Also, this study contributes to our understanding of how research into the business applications of new technologies develops.

Sajid, Mohammad, and Zahid Raza [8] Cloud computing can be considered as an integral component of almost all businesses in near future and it is expected to change the landscape of IT industry. It is based on the model of delivering services on internet with pay-as-yougo model with advantages like no up-front cost, lower IT staff, lower cost of operation to name a few. Although cloud computing has bright prospects both for business and researchers certain challenging issues including security, performance, reliability, scalability, interoperability, virtualization etc. needs to be addressed carefully. The improvement in bandwidth technology, corresponding service models and security models can really revolutionize this area along with the IT industry. The paper has discussed the concept of cloud computing and shades some lights on various issues and challenges that needs to be addressed in order to realize the implementation of the cloud and making it a dominant part of our life in order to thrive.

Rao, R. Velumadhava, and K. Selvamani [9] provides data security challenges and solutions for these challenges to overcome the risk involved in cloud computing. In future concrete standards for cloud computing security can be developed. To provide a secure data access in cloud, advanced encryption techniques can be used for storing and retrieving data from cloud. Also proper key management techniques can be used to distribute the key to the cloud users such that only authorized persons can access the data.

Low, Chinyao, Yahsueh Chen, and Mingchang Wu [10] presents several key findings and implications about the determinants of cloud computing adoption in the high-tech industry.

A Vouk, Mladen [11] "Cloud" computing builds on decades of research in virtualization, distributed computing, utility computing, and, more recently, networking, web and software services. It implies a service-oriented architecture, reduced information technology overhead for the end-user, great flexibility, reduced total cost of ownership, ondemand services and many other things. This paper discusses the concept of "cloud" computing, the issues it tries to address, related research topics, and a "cloud" implementation based on VCL technology. Our experience with VCL technology is excellent and we are working on additional functionalities and features that will make it even more suitable for cloud framework construction.

Sriram, Ilango, and Ali Khajeh-Hosseini [12] presented the work published by the academic

community advancing the technology of cloud computing. Much of the work has focussed on creating standards and allowing interoperability, and describes ways of designing and building clouds. We were surprised so far not to see significant contributions to the usage and scaling properties of Hadoop/MapReduce, which is a new programming paradigm in the cloud. Similarly, there was no work published yet on effective usage of PaaS offerings such as Google Apps.

Khajeh-Hosseini, Ali, Ian Sommerville, and Ilango Sriram [13] discusses some of the research challenges for cloud computing from an enterprise or organizational perspective, and puts them in context by reviewing the existing body of literature in cloud computing. Various research challenges relating to the following topics are discussed: the organizational changes brought about by cloud computing; the economic and organizational implications of its utility billing model; the security, legal and privacy issues that cloud computing raises. It is important to highlight these research challenges because cloud computing is not simply about a technological improvement of data centers but a fundamental change in how IT is provisioned and used. This type of research has the potential to influence wider adoption of cloud computing in enterprise, and in the consumer market too.

Kumar, Santosh, and R. H. Goudar [14] design the architecture and popular platforms of cloud computing. It also addressed challenges and issues of cloud computing in detail. In spite of the several limitations and the need for better methodologies processes, cloud computing is becoming a hugely attractive paradigm, especially for large enterprises. Cloud Computing initiatives could affect the enterprises within two to three years as it has the potential to significantly change IT.

Zhang, Qi, Lu Cheng, and Raouf Boutaba [15] Cloud computing has recently emerged as a compelling paradigm for managing and delivering services over the Internet. The rise of cloud computing is rapidly changing the landscape of information technology, and ultimately turning the long-held promise of utility computing into a reality. However, despite the significant benefits offered by cloud computing, the current technologies are not matured enough to realize its full potential. Many key challenges in this domain, including automatic resource provisioning, power management and security management, are only starting to receive attention from the research community. Therefore, we believe there is still tremendous opportunity for researchers to make groundbreaking contributions in this field, and bring significant impact to their development in the industry. In this paper, we have surveyed the state-of-the-art of cloud computing, covering its essential concepts, architectural designs, prominent characteristics, key technologies as well as research directions. As the development of cloud computing technology is still at an early stage, we hope our work will provide a better understanding of the design challenges of cloud computing, and pave the way for further research in this area.

4. Conclusion

Cloud computing is an emerging information technology broadly studied and researched in recent years. Now there are many cloud platforms both in industries and in academic circle. How to understand and use these platforms is a big issue. In this paper, we introduce the Cloud Computing and types of Clouds in Cloud Computing. In this paper we mainly described the work done by researchers. Though each cloud computing platform has its own strength, but there are many unsolved issues. For example, Data Confidentiality, continuously high availability, Performance issues, Auditability, Synchronization in different clusters in cloud platform, storage issues, interoperation and standardization of the security of cloud platform. These issues will be the research challenges of cloud computing.

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