International Journal of Soft Computing and Engineering (IJSCE)
ISSN: 2231-2307, Volume-3, Issue-1, March 2013

Study on Cloud Computing and Security Approaches

G. Murugaboopathi, C.Chandravathy, P. Vinoth Kumar

Abstract: ***This paper highlights the basic concept of cloud computing and some of the security measures which have been taken into consideration till now. This paper also includes various ways which can be implemented for the betterment of cloud computing. With the recent advancement of technologies cloud computing has become a hotcake on which multiple organizations are working (e.g. Dell, IBM, Sun, Microsoft, Amazon etc.). It is out of reach for most of the organizations and/or individuals to purchase all the required hardware/software resources. So, using the resources available on the cloud one can perform required task by paying the applicable amount. But, always with popularity security issues come into picture and in this case security involves privacy and consistency of user data, durability of systems, protection from hacking and specially protection of contents which are vulnerable to potential threats. So, cloud computing must be launched with a strong security system so, that both service provider and user can be benefited.***

Keywords: Cloud Computing, Security, Vulnerable, Threats, Resources.

I. INTRODUCTION

Cloud computing is a systematic arrangement of computer technology which is a kind of abstract concept where user can use the resource available on cloud without having a complete control on them. Cloud computing is a better way of running business. Instead of having the data by their own one can use the concept of shared data. The major power of cloud computing is that, if someone wants to use any application which is running on the cloud then one has to simply log in to the web and run the application and customize it according to the requirement.

Businesses are running all kinds of applications in the cloud these days, like CRM, HR, accounting, and custom-built applications. Cloud-based applications can be up and running in a few days, which is unheard of with traditional business software. They cost less, because we don't need to pay for all the people, products, and facilities to run them. The concept of cloud computing is more scalable, more secure, and more reliable than most applications. Plus, upgrades are taken care of for the users, so our applications get security and performance enhancements and some new features automatically [1].

Manuscript received March 2013.

Dr. G.Murugaboopathi, Department of IT, Vel Tech Multi Tech Dr.Rangarajan Dr.Sakunthala Engineering College, Chennai, India,

C.Chandravathy, Department of IT, Vel Tech High Tech Dr.Rangarajan Dr.Sakunthala Engineering College, Chennai, India,

P. Vinoth Kumar, Department of IT, Vel Tech High Tech Dr.Rangarajan Dr.Sakunthala Engineering College, Chennai, India

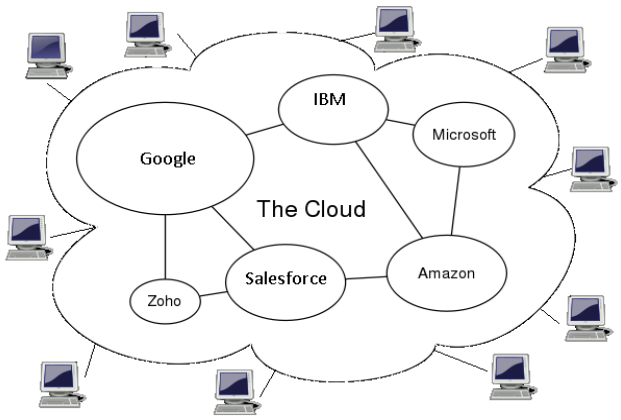

Figure 1: Basic structure of Cloud Computing

II. WHY CLOUD COMPUTING?

There are many reasons of introducing cloud computing. But, we have discussed only few reasons which are basically advantage of the cloud computing.

SUBSCRIPTION OF SOFTWARE: In cloud computing software is available in the server. So, people do not need to buy all the softwares. They can pay for what they actually use as monthly subscription. Suppose, a software's original price is $120 and in cloud computing its monthly subscription is $6 then, definitely cloud computing is profitable than purchasing the original software.

Free From Maintenance: Because, of cloud computing people do not need to install all the applications in their systems so, the maintenance of software is reduced i.e. people do not have to take care of the latest software updates, software flaws etc.

Reliability: Our personal system has a very limited reliability because; if we don't save the content then we will lose all our data but, if we use cloud computing then, that data will be stored in the cloud and we do not need to think of our data.

Scalability: Personal systems are very less scalable. If, our hard disk is full then, immediately it is not possible to purchase a new one. But, in cloud computing if, one data server is not sufficient to store user data then the data will be shifted from one server to another server i.e. it is easily scalable.

Current Trends: This feature is more related to hardware. Now-a-days hardware system is growing rapidly so, people needs more processing speed for faster execution of task. But, with this rapid advancement it is not possible to buy such high end processors. So, in cloud computing the server side high processing hardwares are really very helpful.

Portable And Accessible: Cloud computing provides the easy accessibility to files because; it is available globally over active internet connection and thus portable too.

III. ARCHITECTURE

Cloud computing architecture is a combination of front end and back end which are connected through network. The front end includes different client side tools and softwares such as email client, web browsers etc. which are required to interact with the cloud from client machine. On the other hand back end includes many computers, servers, data storages etc. which forms cloud of computing services. Normally, every application uses its own dedicated server. A central server administers the system, monitoring traffic and client demands to ensure everything runs smoothly. It follows a set of rules called protocols and uses a special kind of software called middleware. Middleware allows networked computers to communicate with each other [2].

Previous architecture exhibits only the physical arrangement of servers, computers and interfaces. But, the architecture style of cloud computing is different because, in cloud computing the architecture pattern is more programmable. "A developer can use a cloud provider's API to create not only an application's initial composition onto virtual machines, but also how it scales and evolves to accommodate workload changes. Consider this analogy: historically, a developer was writing software using the Java programming language determines when it's appropriate to create new threads to allow multiple activities to progress in parallel. Today, a developer can discover and attach to a service with the same ease, allowing them to scale an application to the point where it might engage thousands of virtual machines in order to accommodate a huge spike in demand" [3].

In a cloud computing system, there's a significant workload shift. Local computers no longer have to do all the heavy lifting when it comes to running applications. The network of computers that make up the cloud handles them instead. Hardware and software demands on the user's side decrease. The only thing the user's computer needs to be able to run is the cloud computing systems interface software, which can be as simple as a Web browser, and the cloud's network takes care of the rest.

IV. CLOUD COMPUTING SERVICES

If, we want to discuss the SERVICES of cloud computing then, we have to mention the term EaaS (Everything as a Service) which says, it is a concept of being able to call up re-usable, fine grained software components across a network. Jonathan Yarmis (vice president of advanced, emerging and disruptive technologies at AMR Research) said "Cloud computing offers an independence of device and location that is profoundly important [4].

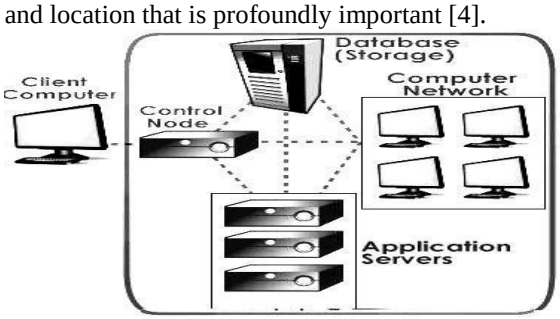

Figure 2: How cloud computing works – source at *http://communication.howstuffworks.com/cloud-computing.htm*

The main function of cloud computing is a combination of three different sub functions -

SaaS (Software As A Service): is a model of software deployment where a provider licenses an application to customers for use as a service on demand. SaaS software vendors may upload the specific application to the consumer device or they can host the application on their own. If, the contract expires then the service automatically gets disabled [5].

PaaS (Platform As A Service): is a model which delivers a computing platform and solution stack as a service. PaaS includes workflow facilities for application design, application development, testing, deployment, and hosting as well as application services such as team collaboration, web service integration and marshalling, database integration, security, scalability, storage, persistence, state management, application versioning, application instrumentation and developer community facilitation. These services are provisioned as an integrated solution over the web [6].

Iaas (Infrastructure As A Service): is the delivery of computer infrastructure as a service. The virtual infrastructure stacks are an example of Everything as a Service trend and shares many of the common characteristics. Instead of purchasing servers, software, data center space or network equipment, clients can buy those resources as a fully outsourced service. It is an evolution of web hosting and virtual private server offerings [7].

V. SECURE THE CLOUD

Security issue always plays a vital role in every growing field. It has the highest priority if, the evolved system has effect on economy and privacy. In cloud computing also security is one of the biggest challenges. Normally, the security issue in cloud computing is related to data security. Following is a brief discussion of possible security issues involved in cloud computing

Information Security: Security is one of the properties of a well defined system as defined by FISMA. Information security is related to protection of information and information systems from unauthorized access [8]. Information security is one of the important security issues in cloud computing because; business organizations and/or individuals store data on the cloud i.e. in data centers. If these data centers are hacked or accessed without authorization then, it may harm individuals or business organizations existence.

Durability: If, the data centers or the servers are not durable then, one can lose all the necessary information which is kept in the "cloud". Suppose, some company "X" is storing account information for a bank "Y". If, the company has only one server which stores all the account information and if, that server fails to work then, bank "Y" will lose all data.

Availability: This kind of security issue is related to the availability of data in the cloud. If, a business organization uploads some data in the cloud and if, that data is removed from the cloud-server automatically or due to some technical fault then, it will affect the organization's economical stability. So, if data is uploaded in cloud then, it must be available for future use also.

Consistency: The concept of consistency in database management system can be viewed as one of the security issues in cloud computing. Suppose, one business organization has updated some of its previously uploaded data on the cloud and the data is updated only in the main data server but not in the auxiliary data server then, there will be a data consistency problem.

Sensitive Data: If, some Government organization has plenty of sensitive data related to national defense which is stored in the cloud then, the risk factor will also be high for such kind of data. If, the data is hacked then, it may affect the national security.

Virtual Machine: Service providers of cloud computing uses virtual machine which works on multi tenant architecture i.e. single server serves multiple clients. This kind of architecture is not universally accepted because it works on virtual partition concept. The different virtual machines like, VMware, Xen, and Microsoft's Virtual PC are vulnerable to attacks so, vendor like, Third Brigade is trying to reduce the vulnerabilities through monitoring and firewalls [9].

Integrity: There is a problem with the integrity. No one can give the assurance that, cloud computing providers are maintaining everything faithfully, recording data with privacy, displaying result correctly.

Control Over Cloud: Another security factor is the control over cloud. In cloud computing the control is with the service provider's only. So, always a risk factor comes into picture which is security and privacy of data. So, there must be a user level control.

VI. POSSIBLE APPROACHES

Cloud computing is almost on the way to be launched. Companies like Dell, Google, IBM, Sun, Microsoft, Amazon etc. are the major players behind cloud computing. Almost every service providers have designed their own security mechanisms for providing better services. But, implementing fully secured system is not so easy because it is very difficult to estimate all types of security risks.

Hardware: If, the hardware used in cloud computing are of high configuration then, the durability of the hardware will be more and it will be able to process more complex task and handle more number of requests. The durability of the hardware also depends on the compatibility with the directly connected hardware.

Software: The software used in cloud computing must be reliable and with a very minimal bugs. Then only we can expect a robust system or else system will be unstable. In single sentence software used in cloud computing must be flawless to gain the computing facility.

Client Side: The client must use a reliable user interface to access the cloud. This can be done if; a separate browser is provided exclusively for cloud computing with all built in client side security features and firewalls.

Cloud Configuration: The cloud must be configured in a different way in order to achieve better security level. Cloud must be secured with multi layer security firewall but, in every layer there should be a queuing system which will hold multiple requests and responses to maintain the data transmission rate normal (works as pipelining technology) with multi layer security approach. The cloud should be scalable up to certain limit so that, better security level can be imposed. For security clustering is a better approach. Cluster can be formed with the similar kind of hardware e.g. cluster of application servers and cluster of database servers. Then different security level can be incorporated on each of the cluster depending on the accessibility of the cluster. If, cloud computing clusters are well defined then incorporating security and accessibility of resources both will be much more easier. Apart from clustering intelligent checking system can be applied in cloud computing in order to check the different modules regularly and to create artificial environment for pseudo attack which will help in estimating the actual attack. This kind of system can be designed using cognitive architecture such as VMSoar [10].

VII. ABBREVIATIONS

CRM – Customer Relationship Management
HR – Human Resource
API – Application Programming Interface
FISMA - Federal Information Security Management Act, 2002
IBM – International Business Machines Corporation

VIII. SUBSCRIPTION

Three Year Term			
Instance Type	**Instance Price**	**Hourly Charge**	**Effective Hourly Rate***
m1.xlarge	$2800.00	$0.24	$0.347
m1.large	$1400.00	$0.12	$0.174
m1.small	$350.00	$0.03	$0.043 (new cost floor)
c1.xlarge	$2800.00	$0.24	$0.347
c1.medium	$700.00	$0.06	$0.087

One Year Term			
Instance Type	**Instance Price**	**Hourly Charge**	**Effective Hourly Rate***
m1.xlarge	$1820.00	$0.24	$0.448
m1.large	$910.00	$0.12	$0.224
m1.small	$227.50	$0.03	$0.056
c1.xlarge	$1820.00	$0.24	$0.448
c1.medium	$455.00	$0.06	$0.112

Table 1: Amazon EC2 pricing Source: http://www.ebizq.net/blogs/enterprise/2009/08/what_does_cloud_computing_actu.php

ACKNOWLEDGEMENT

The Authors sincerely thank the chairman of VelTech Group of Institution Col.Prof. Dr.Vel Sri.R.Rangarajan, Chairperson and Managing Trustee, Director for their encouragement to prepare this review. They further extends sincere thanks to Principal and Head of the Department of Information Technology of Vel Tech Multi Tech Dr.Rangarajan Dr.Sakunthala Engineering College for their constant support at every stage to complete this review

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G. Murugaboopathi received the Undergraduate Degree in Computer Science and Engineering from Madurai Kamaraj University, in 2000, the Post Graduate degree in Digital Communication and Network from Madurai Kamaraj University, in 2002 and Ph.D in Computer Science and Engineering at Bharath University, Chennai. He has more than 17 publications in National Conferences International Conference and International Journal proceedings. He has more than 11 years of teaching experience. His areas of interest include Wireless Sensor Networks, Mobile Communication, Mobile Adhoc Networks Computer Networks, Network Security, High Speed Networks, Network and Data Security Cryptography and network security DBMS and etc., He is currently working as an Head R & D and Associate Professor in the Department of Information Technology at Vel Tech Multi Tech Dr.Rangarajan Dr.Sakunthala Engineering College Chennai, India.

C. Chandravathi has received her Bachelor's degree in Information Technology in 2003 from Madras University. Started the career as a Lecturer and then received her Master's degree in Embedded System Technologies in 2007 from Anna University. Then, promoted as an to Assistant Professor and continuing the service since 2003. She has published her papers in various International Journals and National Conferences. Her field of interest and her research is in Wireless Sensor Networks.

P. Vinoth Kumar has received his Bachelors degree in Electronics and Communication Engineering in 2006 at Anna university. Worked as a network Engineer for a year. He has awarded Gold medal in Master degree in Network Engineering .He has published various journals and presents international conferences. He has handled real time research projects such as picco satellite system, RF tracking systems in his institute with industry collaborations. His interest is in Mobile communication and data networking.