Cloud Computing Security using multi-cloud approach

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ABSTRACT

Cloud Computing is an emerging technology which has considerable potential as an alternative process for traditional silo computing. One can deploy applications more speedily across shared server storage resource pools than is possible with conventional enterprise solutions. Beside all the benefits cloud computing has big issue to be concern which is its security, reason is involvement of third party. Now a days, enterprises preferring "multi-clouds" rather than single cloud provider. This paper focuses on multicloud security by using secrete sharing algorithm.

Keyword : - *Cloud Computing, Multi-clouds, Secrete Sharing, Security*

1. INTRODUCTION

Adopting cloud computing can help organizations to their conduct core business activities more effectively since the managing and monitoring task for data centers is reduced. Again businesses can also save on power costs as the resources required are reduced. Then one may think, if cloud computing is such a great thing then why most businesses are not going for it, and as per the research the reason is poor security. The third party is involved called CSP (cloud Service Provider) to whom businesses have to provide their data including sensitive data. This paper surveys recent research related to security of single and multi-cloud and comes up with possible solutions for preservation of security. Though multicloud computing is relatively new concept, biggest security factors in cloud computing, such as data intrusion, data integrity, and service availability are handled in better way in multi-cloud than that of single cloud computing [4]. This project work promotes the use of multi-cloud architecture than that of single cloud architecture.

2. BACKGROUND

NIST defined cloud computing as "a model for enabling 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".[1]

2.1 Cloud computing components

The cloud computing environment comprises of five characteristics, three delivery models and four deployment models (see fig. 1). The five important characteristics of cloud computing are comprising first stratum are: location-independent resource pooling that is provider resources pooled to server multiple clients, on-demand self-service, rapid elasticity which is ability to quickly scale in/out service, broad network access, and measured service that is renting the services use per pay basis.
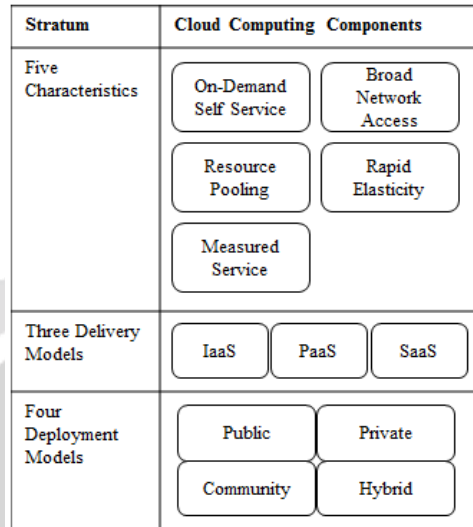

Fig- 1: Cloud Computing Environment

Three Cloud Delivery models are Iaas, PaaS and SaaS, comprises middle stratum of cloud computing environment. In Software as a Service (SaaS), applications are there that are enabled for the cloud. It supports an architecture that can run multiple instances of itself which are location independent. This is nothing but a monthly subscription based pricing model and it is stateless. Examples of SaaS are MobileMe, Google docs, Zoho. Platform as a Service (PaaS) includes platform on which developers can write their applications to be run on cloud environment. This platform normally has multiple application services available for quick deployment. Examples of PaaS are Google App Engine, Microsoft AZURE, Force.com.

Infrastructure as a Service (IaaS) used by consumer by providing storage, processing, networking, and other fundamental computing resources where the consumer is able to deploy and run software, which can include operating systems and applications. It is highly scaled redundant and shared computing Infrastructure approachable using internet technologies. Examples of this type of delivery model include Amazon EC2, Sun's cloud services, Terremark cloud offering etc. Third stratum in the cloud computing environment consists of cloud deployment models which include public, private, community, and hybrid clouds. A cloud architecture which can be accessed by multi-tenants and is available to the public is called a public cloud. Cloud which is available for a particular group is private cloud, while a community cloud is modified for a specific group of consumers. Hybrid cloud infrastructure is a combination of two or more clouds[4].

3. LITERATURE SURVEY

Research illustrates that in 2009, 67% of the research on security in cloud computing covered the issue of a single cloud, whereas 33% of the research in the same year covered the issue of multi-clouds. In 2010, 80% of research focused on single clouds while only 20% or research was directed in the area of multi-clouds[8]. HAIL (High Availability and Integrity Layer) which is combination of Proofs and cryptography, presented in the year 2009 used to control multiple clouds. It ensures data integrity and service availability. But the limitation of HAIL is that it needs code execution in their servers and it does not deal with multiple versions of data[5].

RACS (Redundant Array of Cloud Storage) is a protocol for intercloud storage in the year of 2010.This Technique is similar to RAID and normally used by disks and file systems and replication offers better fault tolerance. But the

problem is unable to cooperate with vendor lock-in and economic failure. Cachin [11] presented a design for intercloud storage named ICStore in 2010. ICstore is client centric distributed protocol which can handle data integrity issue but has poor performance in case of data intrusion and service availability. Same thing happened with encrypted cloud VPN[4]. Moving from single clouds multi-clouds is sensible and significant for many reasons. According to Cachin et al [5], "Services of single clouds are still subject to outage". DepSky presented by Bessani [9] in 2011 is virtual storage cloud system comprising of a combination of different clouds to build a cloud-of-clouds.

4.   IMPLEMENTATION DETAILS

Primary objective of our work is to make the assurance that data is in secure and stable form. We are using DepSky system in our work which contains four commercial storage clouds (Amazon S3, Windows Azure, Nirvanix and Rackspace). It increases the system availability as data is not relayed on a single cloud, also avoids vendor lock-in issue since lack of dominant cloud. The DepSky system also reduces cost of than using single cloud, which is a significant advantage. DepSky uses a set of Byzantine quorum system protocols in order to implement the read and write operations in the system, so it needs only two communication round trips for each operation to deal with several clouds[4]. To make a shift towards more secure cloud computing, we are using multi-cloud computing than that of single cloud computing.

4.1 DepSky architecture

Bessani et al. [9] present a virtual storage cloud system called DepSky on which prototype of our system is based. As figure 2 shows it is a multi-cloud architecture which consists of a combination of different storage clouds. There are no codes to be executed as clouds are used for data storage and maintenance .The DepSky system accosts the confidentiality and the availability of data in their storage system.
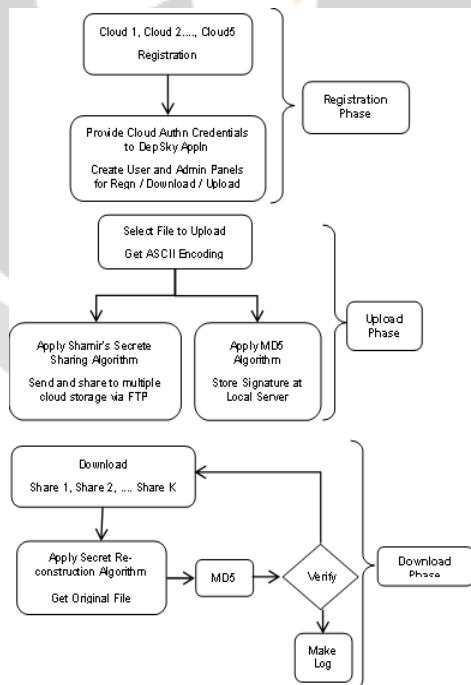
4.2 Security using secret sharing

Fig - 2: Block Diagram of Proposed System

In our system we aim to provide a framework to supply a secure cloud database that will assure to prevent security risks that the cloud computing community is facing. This framework will go for multi-clouds architecture and the

Shamir's secret sharing algorithm to reduce the risk of data intrusion and the loss of service availability in the cloud and ensure data integrity.

The scope of this project is to upload and download a file from multi-cloud. If one cloud is failed, we can download the same file from other cloud as the data is replicated among multiple clouds. Files should be uploaded using Byzantine fault tolerance (BFT) algorithm. The Byzantine protocols involve a set of storage clouds (n) where n = 3 f +1, and f is maximum number of clouds which could be faulty. In addition, any subset of (n − f) storage cloud creates byzantine quorum protocols [2], [9].

Each file is encrypted and secrete generated as shown in Fig 2. Next step in implementation is using Shamir's secrete sharing algorithm. In the Shamir's Secrete sharing scheme invented by Adi Shamir, secrete is divided into parts and then all parts are stored at different places (clouds in our case). So to reconstruct original secrete, one has to acquire all or some parts (of the secrete) from those different places. Message Digest concept MD5 is used for ensuring integrity of data at the time of upload phase. And at the time of download phase, reconstruction algorithm is applied to get original file and then verified with its message digest, if match found then file is considered to be integral.

While making a cloud secure, the following objectives are focused:

- Understanding the cloud computing environment provided by the cloud service provider
- The cloud computing solution should meet the basic security & privacy requirements of any firm deploying it.
- Maintain an account of the privacy of the cloud& data security and applications that are deployed in cloud computing environment
- Data Integrity preservation
- Increased Service Availability
- The user runs customer applications using the service provider's resources

5. CONCLUSION AND FUTURE SCOPE

Use of cloud computing has rapidly growing but with major issues to be taken care is cloud security. Security is the reason due to which most of the businesses hesitating for moving their workload to cloud computing. Cloud clients fear to lose their private information if malicious insiders in the cloud. Also service availability is area to be concerned in single cloud, if that cloud fails. In multi-cloud data is replicated so available even if on cloud fails. Integrity of data is also maintained in our proposed work by making use of MD5.We are making use of strongest cryptographic algorithm named Shamir's secrete sharing algorithm, which has number of advantages including security, client-side aggregation. It claims that security is maintained even when k or more servers collude. We have found that much research has been done to ensure the security of the single cloud and cloud storage whereas multi-clouds have received less attention in the area of security. We affirm the moving to multi-clouds due to its ability to decrease security risks that affect the cloud computing user. The key conclusion is that proposed work provides confidentiality, data integrity, improved availability and capacity to handle multiple requests at a time.

In future scope, we aim to implement privacy-preserving public auditing system for data storage security instead of verifying file at each upload and download phase by using its message digest (MD5). Storage auditing will be performed by TPA without demanding the local copy of data

6. REFERENCE

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