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DATA SECURITY AND PRIVACY USING MULTICLOUD ARCHITECTURE

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ABSTRACT: *Now a day, cloud computing is a fastest growing technology. It allows users to use or access different applications, store information without access their personal files. File access assure in real technique to the file protection due to untrusted cloud servers. Attacks from opponent are difficult to stop in cloud storage. This paper helps for implementing the concept of multiple cloud storage along with enhanced security using encryption techniques rather than storing complete file on single cloud system. The system will encrypt the file and then splits the file in different parts and store it on different cloud.*

Keywords- *Cloud computing, Encryption, Security, Multicloud, Spilt.*

II. INTRODUCTION

1.1. What is Cloud Computing?

Cloud computing is the use of remote servers on the internet to store, manage and process data instead of using a personal computer. A common example of cloud computing is Gmail, where you can access your stored data from any computer with internet access. Cloud computing provides a data storage system which enables the users to be less dependent on the client system and provides an architecture to upload the data in a cloud that can be shared by multiple users. It provides security through authentication of the user. Cloud computing can allow a user to access applications and data from any computer at any time since they are stored on a remote server. It also decreases the need for companies to purchase top-of-the-line servers and hardware or hire people to run them. It is efficient because it is all maintained by a third party. There is no need to purchased software licenses for every user because the cloud stores and runs the software remotely. Data can also be stored with cloud computing so companies do not have to house servers and databases themselves. By centralizing memory, bandwidth, storage & processing in an off-site environment for a fee, cloud computing can significantly reduce costs.

1.2. Characteristics

Cloud computing has a variety of characteristics, with the main ones being:

1.2.1. **Shared Infrastructure**: Uses a virtualized software model, enabling the sharing of physical services, storage, and networking capabilities.

1.2.2. **Dynamic Provisioning**: Allows for the provision of services based on current demand requirements.

1.2.3. **Network Access**: Needs to be accessed across the internet from a broad range of devices such as PCs, laptops, and mobile devices, using standards-based APIs**.**

1.2.4. **Managed Metering**: Uses metering for managing and optimizing the service and to provide reporting and billing information.

1.3. Service Models

1.3.1. **Software as a Service (SaaS):** In this model, a complete application is offered to the customer, as a service on demand. A single instance of the service runs on the cloud & multiple end users are serviced. There is no need for upfront investment in servers or software licenses to user, while for the provider, the costs are lowered, so only a single application needs to be hosted & maintained.

1.3.2. **Platform as a Service (Paas):** A layer of software, or development environment is encapsulated & offered as a service, on which other higher levels of service can be built. The customers are free to build his own applications, which run on the provider's infrastructure. To meet manageability and scalability requirements of the applications, PaaS providers offer a predefined combination of OS and application servers, such as LAMP platform (Linux, Apache, MySql and PHP), restricted J2EE, Ruby etc.

1.3.3. Infrastructure as a Service (Iaas): IaaS provides basic storage and computing capabilities as standardized services over the network. Servers, storage systems, networking equipment, data center space etc. are pooled and made available to handle workloads. The customer can deploy his own software on the infrastructure.

1.4. DEPLOYMENT MODELS

1.4.1. Public cloud: Public cloud or external cloud share the resources which are provided dynamically on a fine-grained, self-service basis over the Internet through web applications/web services from an off-site third-party provider who bills on a fine-grained utility computing basis. The cloud infrastructure is made available to the general public or a large industry group, and is owned by an organization selling cloud services.

1.4.2. Community cloud: A community cloud may be established where several organizations have similar requirements. They are seeking to share infrastructure so as to realize some of the benefits of cloud computing. It is more expensive but may offer a higher level of privacy, security and policy compliance.

1.4.3. Private cloud: A private cloud is model of cloud computing which have a distinct and secure cloud based environment which is operated by specified client. In the private cloud model, the cloud is only accessible by a single organization which provide greater control and privacy to that organization.

1.4.4. Hybrid cloud: The term "Hybrid Cloud" has two separate clouds joined together (public, private) or "Hybrid Cloud" is probably the use of physical hardware and virtualized cloud server instances together to provide a single common service. If two clouds which are joined together then more correctly called a "combined cloud". A hybrid storage cloud is a combination of public and private storage clouds. Hybrid storage clouds are useful for archiving and backup functions.

1.5. Cloud Computing Benefits

Some of the typical benefits are given below:

1.5.1. Reduced Cost: The billing model is pay as per use and the infrastructure is not purchased so it reduces maintenance cost. Initial expense and frequent expenses are much lower than traditional computing.

1.5.2. Increased Storage: Cloud providers offer the massive Infrastructure to storage & maintenance of large volumes of data. Sudden workload points are also managed effectively & efficiently, since the cloud can scale dynamically.

1.5.3. Flexibility: flexibility of cloud computing allows companies to use extra resources at peak times, enabling them to satisfy consumer demands.

1.5.4. Reliability: All the services use multiple redundant sites which support business continuity and disaster recovery.

1.5.5. Maintenance: System maintenance is provided by Cloud service provider. User access is through APIs so they do not require application installations onto PCs, which reduce maintenance requirements.

1.5.6. Mobile Accessible: Mobile workers have increased productivity due to systems accessible in an infrastructure available from anywhere.

II. MULTI-CLOUD

A multi-cloud system, also known as cloud-to-cloud or mashup clouds. Multi-cloud is taking about 74% of enterprises usage which prove the large adaptation of such system in organizations [7].

2.1. Multi-Cloud as a Secured Architecture

A multi-cloud system has multiple architectural views even they all share the same components: clients, cloud storage servers (CSS) and a manager. A client is the entity which store a large amount of data which may be either individuals or companies. A CSS is the entity which store the data and managed cloud service providers. A manager is the entity that maintain and apply access control to data either by key or access control policies [9]. The manager is the entity which can be located inside the organization or outsources to a trusted entity. In traditional architecture, if a client wants to use multiple services from multiple cloud, they would manage his own access to both clouds and interact with each cloud individually, process the collect data and make his own results. But now there is large movement toward multi-clouds because of the ability to separate private and public data, the dynamic data storage size that is needed and there is also need for secondary services which are host on other clouds [8]. An organization have both private and public data. In this case, they will need multi-cloud to build a hybrid cloud. A multi-cloud system can offer a private access in one cloud and a public access in another without mixing the two. This help to concentrate more on securing their private data without worrying about public ones. There is need to stored data which have dynamic sizes based on different time of the year. A dynamic infrastructure and a multi-cloud system would be the best solutions for such needs. There may be the need for a service offered by another cloud which are in another part of the world. Then costumer can duplicate such service in his own cloud which would cost him money and consume time. There is a solution for this problem is that subscribing to this

service from the other cloud, in a multi-cloud manner, which would save the costumer a lot of time and might even cost less.

As a multi-cloud architecture offer some level of security by providing one or more of the fallowing four strategies, as explained in [6] and visualized in Fig. 1:

2.1.1. Data replication: Data is duplicated in multiple clouds, as shown in Fig. 1a. and also synchronized whenever a change happens. Replication provide data integrity and availability because of multiple copies of the same data.

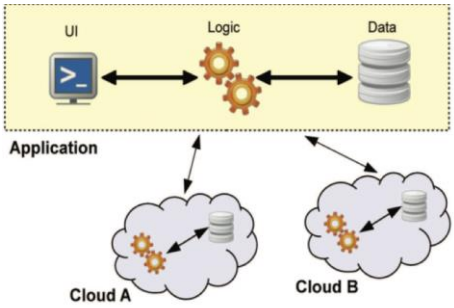
2.1.2. Data partitioning: Partitioning is split the data between multiple clouds, as shown in Fig. 1b, such that no cloud provider can get a meaningful insights of the data that it is hosting. It provides data privacy and allow data accessing only for authorized clients.

2.1.3. Application partitioning into tiers: It provide security by partitioning application system into tiers, as shown in Fig. 1c, which allow the separation between application logic and data which gives protection of data leakage due to application logic flow.

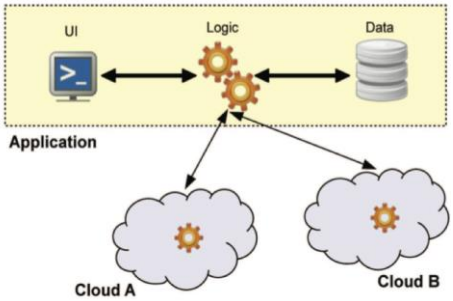
2.1.4. Application Fragmentation: Fragmenting the application, as shown in Fig. 1d, which allow the application to be saved on multiple clouds. It provides a distributed fine grained fragments among multiple clouds. Thus, cloud provider cannot gain access to whole application which provide data confidentiality.

2.2. Advantages over single cloud:

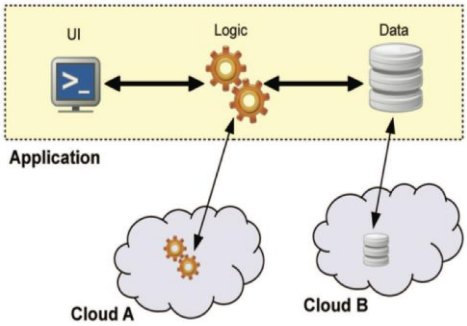
In the single cloud storage, there is no solution for cloud failure and there may be chances of data lost due cloud failure. By using Multicloud architecture, Data can be divide into different forms and store it onto two different clouds. If any cloud provider or unauthorized user wants to gain that private data was unable to get the whole data because different parts of data are stored onto different clouds. Multicloud architecture will prevents data lost and provide high privacy and double security to cloud users with less computation cost and minimum time. Multicloud architecture will be used in industrial data storage and also useful in banking storage for storing the data of different branches.



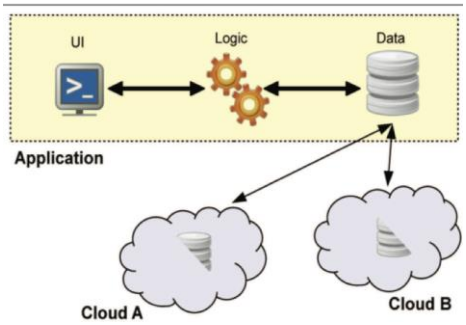
(a) Data Replication



(b) Data Partitioning



(c) Application Partitioning into tiers



(d) Application Fragmentation

Fig.1: Four Security Strategies offered by Multi-Clouds [6]

III. CONCLUSION:

By implementing the cloud based databases and application solve many business secure and safe storage issues. But on the other side, it is riskier to put the data over single cloud because it will increase the malicious user attack possibilities hence by using the multicloud architecture we are increase the cloud security by encrypting and distributing the data.

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