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An Approach to Secure Resource Sharing Algorithm (SRSA) for Multi Cloud Environment

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Abstract: Cloud computing is an idea intended to deliver computing and storage resources to a community of users. In a cloud computing environment a user can use applications without installing, and accessing personal files of any other user in the network. The cloud computing technology allows efficient computation by centralizing storage, memory and processing. The practice of computing in two or more data centers separated by the Internet in popularity due to an explosion in scalable computing needs grow. However, one of the most important challenges for the cloud as the backup and protection of data and processes information from users. Security of cloud computing environment is a new research area, the further development of both the associations of academic and industrial research. In order to create secure and reliable services in cloud computing environment is major concerning issue.

This paper focuses more on the subject related to the securely resource sharing and privacy aspects in cloud computing environment, such as data integrity, data compromise, service availability. It proposes a new approach "An Approach to Secure Resource Sharing Algorithm (SRSA) for Multi Cloud Environment". It is based on multi-cloud service providers and the secret sharing key with object oriented hierarchy. This approach mainly considers three clouds in which bursting and aggregation operation had been performed and includes many object oriented aspects based on some parameter were analyzed. We also used secure sharing mechanism so that the cloud resources are shared among different cloud environment.

Keywords – Cloud Computing, Cloud environment, Resource sharing.

I. INTRODUCTION

Cloud computing has emerged as a major trend in information and communication technology and has been proven as a key technology for the development and market analysis for multiple domain users. Cloud computing is an idea intended to deliver computing and storage resources to a community of users. In a cloud computing environment a user can use applications without installing, and accessing personal files of any other user in the network. The cloud computing technology allows efficient computation by centralizing storage, memory and processing (Figure 1.1).

A simple example used in everyday life is emails. To use Gmail, yahoo mail, etc. A person need not to install the mail server or any other application on their system, in fact he just needs to have an internet connection and the cloud environment allows him to send emails to other users without running any application or storing any files on this system. This service of cloud computing which looks virtual would surely assist in fulfilling the demands of new generation. This new model uses two separate technological developments utility computing and service-oriented architecture to provide users with highly scalable, pay-per-use, as-a-service model for Information Technology (IT) delivery. Several properties that distinguish cloud services delivery model are scalability via flexibility, service on demand, shared resource pooling, multi-tenancy hosting, utilities pay-as-you-use pricing and the concept of lower layers [1].

The resources about which NIST had been talking can be seen in an infrastructure, and the need for outsourcing of infrastructure or Infrastructure as a Service (IaaS) is extremely important for any organization. This is the reason why the use of cloud computing has increased in many organizations rapidly. Cloud computing services provide quick access to applications, and reduction in infrastructure costs. This provision of fast and minimum management efforts can help to provide scalable IT resources as a service with the use of Internet technology. Thus it can be said that cloud computing is a mean to add up capacity or capability in an infrastructure without putting money in building new infrastructure, training new people, or purchasing/licensing new software. It extends IT's capability by providing subscription based or pay per use services [2].

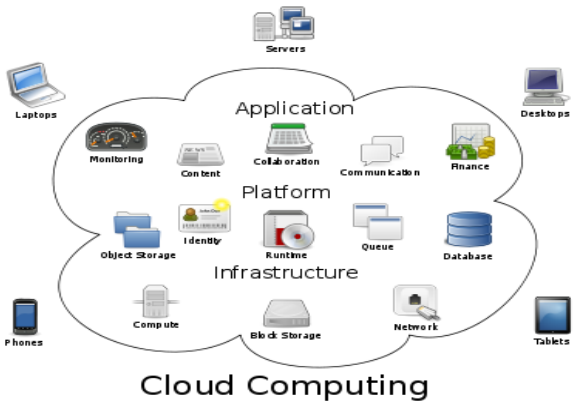

Figure 1.1 Cloud Computing

The rapid growth of computer resources has improved the performance of computers and decreased their cost. This low cost along with the facility of internet and high speed network would lead the computing environment to be mapped from multi cloud environments. In fact, researchers are working on this field to develop new architectures, which will be intended to share and coordinate resources and geographically distributed owners, who share the same goal of solving large-scale applications [3].

An aggregation and migration of cloud logically starts from the process of firstly understanding the target platform or infrastructure and then trying to map it to the location where the data is currently hosted (i.e. either in the private cloud or within the enterprise) [4]. The cloud computing providers avail their service on the basis of three basic models. The first model is Platform as a Service (PaaS). In PaaS model the cloud computing providers provide a computing platform and resources like operating system, application software, execution environment, database etc. The PaaS user can now work on the provided infrastructure of resources without taking pains of buying the desired software, and other resources needed for their work [3, 4].

The second model is Infrastructure as a Service. In IaaS model the cloud computing providers provide basic infrastructure needed to carry out any work. The basic infrastructure may include resources like computers (physical or virtual machines), firewalls, load balancers etc. and it also can provide the basic network infrastructure. The third model is Software as a Service (SaaS). In SaaS model the cloud providers operate (or runs) the application software needed to run a program and the users who need to run a program communicate with the cloud client to access the application software. This helps to eliminate the use of application software on user's computer, which in terms becomes helpful in less maintenance and higher efficiency [4, 5, 6].

Since cloud computing is a computing paradigm to demand the immediate and automatic location is a preferred strategy planning. And most of the strategies are to be both an automated planning and considering the maximum use of resources. To achieve optimal or suboptimal allocation for immediate cloud services, the cloud environment security is the best option.

Security is considered the most critical problem in the computing environment due to the valuable information stored for users in the cloud. Cloud providers must address issues of privacy and security as a matter of high priority and urgency. As a result of the importance of secure resource sharing in cloud computing, this paper focuses more on the issues related to the secure resource sharing aspect of cloud computing. We apply multi clouds concept using Secret Sharing algorithm that is reduce risk of data intrusion and loss of service availability for ensuring data. It proposes a secure resource sharing algorithm which uses multi-cloud service providers.

The rest of this paper is arranged as follows: Section 2 introduces Cloud computing environment; Section 3 shows Recent Scenario; Section 4 describes the proposed method Section 5 describes the proposed algorithm; Section 6 describes Conclusion future prospect.

II. CLOUD COMPUTING ENVIRONMENT

Cloud computing is a network-based environment that focuses on the exchange of resources or computations. In fact, the clouds are Internet-based and it tries to disguise complexity for customers. Cloud computing refers to both the applications delivered as services over the Internet, hardware and system software in the datacenters that provide those services. Cloud providers are using virtualization technologies with self-service capabilities for IT resources across the network infrastructure. In cloud environments, various types of virtual machines host on the same physical server infrastructure. In the cloud, customers pay only for what they use and do not have to pay for the resources they need, such as storage or infrastructure.

Cloud is a metaphor for the internet. It is quite ordinary these days to draw system diagrams that depict the Internet as a cloud therefore the use of the word in this instance. In a typical situation of cloud computing organizations run their programs from a data center provided by a third-party cloud provider. The provider is responsible for the condition of the infrastructure, servers, storage and networks necessary for ease of use and scalability of applications.

A private cloud is a computing architecture owner, ownership or lease of a single organization, which provides services hosted behind a firewall for the "clients" of the organization. They say the word cloud implies an infrastructure in place on the Internet, do not hide behind a corporate firewall. There is however, a large body of opinion which suggests that private clouds will be the path chosen by many large companies and there will be considerable investment in this sector. Already vendors are lining up to deliver products that enable organizations to more easily deliver internal cloud services.

According to Microsoft, there are several advantages and disadvantages such as: Cloud computing surrounded with huge amount of publicity but even then, more and more C-level executives and IT decision makers agree that it is a real technology option. It was moved by the futuristic

technology to a commercially viable option for programs to run in the house. Organizations from vendors such as, Google, Salesforce.com, Amazon and Microsoft have invested millions in developing cloud computing platforms can offer others. In short, one should always take care to believe the allegations of a specific vendor [5, 7, 8].

There are several reasons for adopting cloud computing such as cost, scalability, business agility, security and disaster recovery. Cloud computing is a model to allow convenient access to network and to demand a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal effort management or service provider interaction [1].

Cloud model promotes accessibility and is composed of [9]:

1. Five essential characteristics:
   a. On-demand self-service
   b. Broad network access
   c. Resource pooling
   d. Rapid elasticity
   e. Measured Service

2. Three service models:
   a. Cloud Software as a Service
   b. Cloud Platform as a Service
   c. Cloud Infrastructure as a Service

3. Four deployment models:
   a. Private cloud
   b. Community cloud
   c. Public cloud
   d. Hybrid cloud

4. Key enabling technologies include:
   a. Fast wide-area networks
   b. Powerful, inexpensive server computers
   c. High-performance virtualization for commodity hardware

In general, a public (external) cloud is an environment that exists outside of the firewall of an enterprise. It may be a service provided by a third-party vendor. It may also be referred to as a multi-occupied or shared infrastructure, virtualized managed through a self-service portal. Private cloud (internal) reproduced delivery models of public cloud and behind the firewall for the exclusive benefit of an organization and its customers. The management interface for self-service is still in force, so that the resources of the IT infrastructure are collected internally. In a hybrid cloud environment, external services are used to extend or supplement an internal cloud.

The single cloud service provider does not provide any type of security so researcher moves to multi-cloud environment:

1. **Single Cloud Environment:** Amazon produced the Amazon Elastic compute Cloud (EC2) as a cloud service to allow users to purchase computational resources, without the need to have significant technical background to deal with the cloud computing environment. Users can focus on their own application instead of maintaining the cloud environment software and hardware. Amazon EC2 is a virtual machine that provides users with a super computer equivalent without the need to purchase it. The cost of renting the services of a cloud service provider (as-you-go) is cheaper than purchasing a super computer for the same purpose [10]. Because of Amazon EC2 instances are virtual machines, so they do not have the ability to backup the changes on disks, hence the changes on the virtual disk are lost when the instance is shut down. Therefore, in order to save modifications, the user should save them in Amazon Simple Storage Service (S3) [10]. Public cloud services for data storage, such as S3 in Amazon, provide customers with dynamic and scalable storage services. The public cloud protects the user from the cost of purchasing hardware and software for their storage infrastructure; instead, they pay a cloud service provider.

2. **Multi Cloud Environment:** The migration of cloud computing from single to multi-cloud in order to ensure the security of user data is extremely important. The term “multi-clouds” is similar to the terms “inter cloud” or “cloud-of-clouds” that were introduced by Vukolic et al. [11]. The researchers also suggest that cloud computing will not be terminated by a single cloud. Through her art a cloudy sky integrates various colors and shapes of clouds, leading to different implementations and administrative areas. Recent research has focused the dependence of an individual cloud on multi-cloud environment, control and prevents more clouds. [12]. Moving from single cloud or inner-cloud to multi-clouds is reasonable and important for many reasons. Vukolic et al. assume that the main purpose of moving to inter-cloud is to improve what was offered in single cloud by distributing the reliability, trust, and the security among multiple cloud providers [11].

III. RECENT SCENARIO

In 2010, Yi Hu et al. proposed about security aware and fault-tolerant jobs scheduling strategy for grid, which makes assess of security demand (SD) and trust level to become more flexible and more reliable. Meanwhile, the different fault-tolerant strategy has been applied in grid job scheduling algorithm by the SD and job workload. Moreover, much more important, we are able to set up some rules and active each qualitative rule to select a suitable fault tolerant strategy for a scheduling job by input value (the SD and job workload) to realize the uncertainty reasoning [13].

In 2010, Hai Zhong et al. planned about simulation experiments indicate that their dynamic scheduling policy performs much better than that of the Eucalyptus, Open Nebula, Nimbus IaaS cloud, etc. The tests illustrate that the speed of the improved genetic algorithm almost twice the traditional GA scheduling method in Grid environment and the utilization rate of resources always higher than the open-source IaaS cloud systems [14].

In 2010, Yu Weng1 et al. proposed about cloud architecture for psychological health analysis and describes the service component representation, workflow customization and workflow execution. With the excellent semantic representation ability of resource description frame, a service component metadata representation method is presented. Through querying the metadata of service component, end-users could choose the service components and customize the logic workflow on demand [15].

In 2010, G. Hughes et al. proposed about continues, to describe the structure and operation of an object mapping declarative language and the object oriented system which employs it. Both are currently under development to support the management of these numerous Cloud Computing components. The ultimate aim is to develop a system that combines the rich capability of an imperative assembly with the concise simplicity of a declarative language [16].

In 2010, Srijith K.Nair et al. introduced the concepts of cloud bursting, cloud brokerage and cloud aggregation and identified the capability requirement of the entities. The cloud brokerage model was examined in further detail, identifying the steps necessary to provide an efficient cloud broker service in storage and compute use case scenarios [17].

In 2011, Md Kausar Alam et al. provides an It proposes a Multi-clouds Database Model (MCDB) which is based on Multi-clouds service providers instead of using single cloud service provider such as in Amazon cloud service, it will discuss and present the architecture of the proposed MCDB model and describe its components and layers [18].

In 2013, Md Kausar Alam et al. introduced the concepts of recent research on single clouds and multi-clouds using secret sharing algorithm and to address the security risks and solutions using Shamir's Secret Sharing algorithm. These algorithms generate their own secret sharing schemes and use secure channels to distribute shares among themselves [19].

IV. PROPOSED METHOD

In this paper, a new approach called An Approach to Secure Resource Sharing Algorithm (SRSA) for Multi Cloud Environment has been proposed. SRSA ensures security and privacy in cloud computing environment. The purpose of proposed new approach is secure cloud resource sharing, avoids the risk of malicious insider in the cloud and to avoid the failing of cloud services. This is based on multi-clouds service providers and the secret sharing key with object oriented mapping hierarchy. In this approach main focus has been given on four phases: Inter-connectivity, Security, Resource Sharing and OOP Mapping through a backup files.

In this approach, the main concentration is on four phases

1. Cloud 1 (C++ Cloud)
2. Cloud 2 (Java Cloud)
3. Cloud 3 (C# Cloud)
4. Sharable Cloud

Part-I
First part of algorithm opens the environment to cloud 1 for performing aggregation and bursting on C++ files. This algorithm calculate several object oriented properties like class and object and according to those values perform aggregation and bursting is done.
Part–II
Second part of algorithm opens the environment to cloud 2 for performing aggregation and bursting on Java files. This algorithm calculate several object oriented properties like class and object and according to those values perform aggregation and bursting is done.
Part-III
Third part of algorithm opens the environment to cloud 3 for performing aggregation and bursting on C# files. This algorithm calculate several object oriented properties like class and object and according to those values perform aggregation and bursting is done.
Part-IV
In the final phase of operating resources sharing between clouds are done by using security key to stop unauthorized access. Authorized person can access the cloud and share the resources from one cloud to another cloud.

V. PROPOSED ALGORITHM

In this section we discuss about the proposed algorithm.
Assumption:
SRSA - Secure Resource Sharing Algorithm
CE –Cloud Environment
CClass- Count the no of classes [Initialize to 0]
CObject-Count the no of Object [Initialize to 0]

```
If (Cloud1)
{
[Select the C++ file for aggregation]
Select */col1, col2…coln from tablename;
[Show the table with their Parameters]
Select */col1, col2…coln from tablename where condition;
[Select Object oriented Concept]
If (class)
CClass++;
If(CObject)
CObject++;
[Print the parameter according to the count of classes and object]
}
Else If (Cloud2)
{
[Select the Java file for aggregation]
Select */col1, col2…coln from tablename;
[Show the table with their Parameters]
Select */col1, col2…coln from tablename where condition;
[Select Object oriented Concept]
If (class)
CClass++;
If (CObject)
CObject++;
[Print the parameter according to the count of classes and object]
}
```

```
Else If (Cloud3)
{
[Select the C# file for aggregation]
Select */col1, col2…coln from tablename;
[Show the table with their Parameters]
Select */col1, col2…coln from tablename where condition;
[Select Object oriented Concept]
If (class)
CClass++;
If (CObject)
CObject++;
[Print the parameter according to the count of classes and object]
}
[Enter the password for Sharing]
Else if (Sharing)
{
If (Cloud n)
{
[Enter the Key]
If (Key)
[Share the attribute]
{
Select the attribute to be shared
}
Else
[Not Authorized]
}
}
Else
{
Exit (0)
}
```

VI. CONCLUSION AND FUTURE WORK

Customers do not want to lose their private information by malicious insiders in the cloud. In addition, loss of availability of the service has caused customer recently a lot of problems for a large number. Furthermore, execution time and response time lead to many problems for the users of Internet. The benefits of implementing cloud computing applications are reducing the execution time and response time, minimizing the risk of deployment of physical infrastructure, reduce cost of entry, and increase the pace of innovation.

In this paper we proposed an approach to Secure Resource Sharing Algorithm (SRSA) for multi cloud environment. In this approach, three clouds are considered for bursting and aggregation operation. Furthermore, both sides secure sharing mechanism is used so that the cloud resources are shared among different cloud environment and consider some of the security concern for the cloud computing for authorized data sharing between clouds.

In this approach, the main concentration is on four phases:

1. Inter-connectivity
2. Security
3. Resource Sharing
4. Mapping

In future, planning is made to compare this approach with other multi-clouds approaches or systems to go further in this comparison until to the best and improved approach will achieve. This approach will also be applied in wireless environments and to check the real time simulations on different Platform.

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