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Optimizing Migration of the Application Data in Cloud Environment Using ACO Algorithm and RSA Encryption

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Abstract: *Taking the advantages of the capabilities offered by cloud computing requires either an application to be built especially for it, or for existing application to migrated to it. The main focus on migrate the application data with speedily and accurately. Migrating data to the cloud creates a series of technical, architectural and legal challenges which resolved by using following algorithms. Organize such efforts into a set of migration schemes and connect them with a list of reusable solution for application data migration in form of packets. At last, define an application data migration methodology and demonstrate how it can be used in practice.*

Keywords: *Cloud Computing, Data Migration, RSA Encryption and ACO Algorithm.*

I. Introduction

1.1 Cloud Computing

The term "cloud", as used in this white paper, appears to have its origins in network diagrams that represented the internet, or various parts of it, as schematic clouds.[3]"Cloud computing" was coined for what happens when applications and services are moved into the internet "cloud." Cloud computing is not something that suddenly appeared overnight; in some form it may trace back to a time when computer systems remotely time-shared computing resources and applications [4]. More currently though, cloud computing refers to the many different types of services and applications being delivered in the internet cloud, and the fact that, in many cases, the devices used to access these services and applications do not require any special applications. In short, cloud computing allows for the sharing and scalable deployment of services, as needed, from almost any location, and for which the customer can be billed based on actual usage [6].

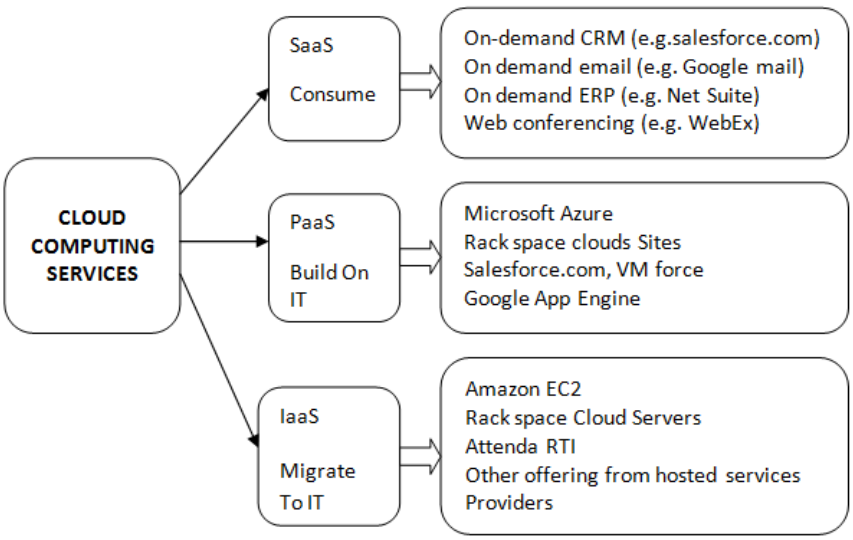

Figure 1: cloud computing services and their types

1.2 Data Migration

Data migration is a process of resettling between storage types, formats and computers systems[5]. Basically it is programmatically preformed to achieve automated migration, which freeing up human resource from tedious tasks. Data migration process has different phases to migrate the data from one server to another: Design, Extraction, Cleaning, Loading and Verification [3].

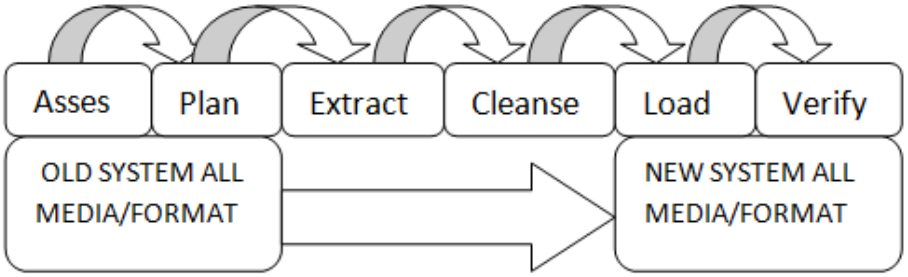

Figure 2: Phases of Data Migration

1.1.1 Characteristics of Data Migration

Data Migration is the procedure of transferring data from one system to additional while changing the storage, database or application. In position to the Extract Transform-Load process, data migration always requires or transfer to an entirely new system. Examples include: Relocation to or from hardware platform; upgrading a database or travelling to new software; or company mergers when the parallel systems in the two businesses need to be merged into one.[12] The data migration is preformed due to following:

1. Combine the systems from the two concerns into a brand new one[11]
2. Transfer one of the systems to the other one.
3. Leave the systems as they are but create a mutual view on top of them a data warehouse [14].
4. Make backup of system due security point of view

One significant step to take is to make sure that the client appreciates the importance of the scope of presence it and the risks that may occur due to the lack of it. With the benefits, it's easy for the client to view the scopes as time consuming and redundant.

1.1.2. Optimization Techniques for Data Migration

- ANT Colony Optimization: Ant Colony Optimization (ACO) studies artificial systems that take inspiration from the *behavior of real ant colonies* and which are used to solve discrete optimization problems.
- GENETIC Algorithm Optimization: The genetic algorithm is a model of machine learning which derives its behaviour from a metaphor of the developments of evolution in nature. This is done by the creation within a machine of a population of personalities represented by chromosomes, in essence a set of character strings that are analogous to the base-4 chromosomes that we see in our own DNA.
- BEE Colony Optimization: The bee's algorithm is a population-based search algorithm which was developed in 2005.it mimics the food foraging behaviour of honey bee colonies. In its basic version the algorithm performs a kind of neighbourhood search combined with global search and used for combinational optimization.
- Particle Swarm Optimization (PSO):The PSO is a computational method that optimizes a problem by iteratively trying to improves a candidate solution with regards to a given measures of quality. They solved the problem using simple mathematical formulae's over the particle position and velocity.

1.1.3 Security Techniques for Data Migration

- RSA Encryption**:** In 1978, Ron Rivest, Adi Shamir, and Leonard Adleman introduced a cryptographic algorithm, which was essentially to replace the less secure National Bureau of Standards (NBS) algorithm. Most importantly, RSA implements a public-key cryptosystem, as well as digital signatures. RSA is motivated by the published works of Diffie and Hellman from several years before, who described the idea of such an algorithm, but never truly developed it.

RSA implemented two important ideas:

1. Public-key encryption: This idea omits the need for a "courier" to deliver keys to recipients over another secure channel before transmitting the originally-intended message. In RSA, encryption keys are public, while the decryption keys are not, so only the person with the correct decryption key can decipher an encrypted message. Everyone has their own encryption and decryption keys.
2. Digital signatures: The receiver may need to verify that a transmitted message actually originated from the sender (signature), and didn't just come from there (authentication). This is done using the sender's decryption key, and the signature can later be verified by anyone, using the corresponding public encryption key. Signatures therefore cannot be forged. Also, no signer can later deny having signed the message.

The security of the RSA algorithm has so far been validated, since no known attempts to break it have yet been successful, mostly due to the difficulty of factoring large numbers n = p q, where p and q are large prime numbers.

- Public key Cryptography: Public-key/two-key/asymmetric cryptography involves the use of two keys: a public-key, which may be known by anybody, and can be used to encrypt messages, and verify signatures a private-key, known only to the recipient, used to decrypt messages, and sign (create) signatures is asymmetric because those who encrypt messages or verify signatures cannot decrypt messages or create signatures. Public-Key algorithms rely on two keys with the characteristics that it is computationally infeasible to find decryption key knowing only algorithm & encryption key computationally easy to en/decrypt messages when the relevant (en/decrypt) key is known either of the two related keys can be used for encryption, with the other used for decryption (in some schemes).

II. Related Works

Shen, et al. [1] define security issue in data migration in different clouds. They have some steps for security: firstly, during migration process define some threats. After that implement a mechanism which deal with threats during migrate data from one server to another one. In last, design a prototype which based on Hadoop distributed file system (HDFS). In which series of test evaluate for prototype implementation. Basically the security of data migration carry out by SSL negotiation, migration ticket design and block encryption in distributed file system and cluster parallel computing. In **[2] Chadi Kari, et al.** assumed that each storage node can achieve only one data transfer at a time. A storage node, conversely, can typically handle multiple assignments concurrently and this can reduce the total migration time knowingly. Moreover, storage devices tend to have varied capabilities as devices may be added over time due to storage request increase. In this paper, they consider the assorted data migration problematic, where they assume that each storage node v has different transfer constraint CV, which characterizes how many instantaneous transfers, can handle. They develop algorithms to minimize the data migration time. **As** discuss **Yunpeng Chai, et al [3]** described new energy-efficient technique called Explicit Energy Saving Disk Cooling or EESDC. EESDC suggestively reduces data migration above because of two reasons. First, a set of disks discussed to Explicit Energy Saving Disks was obviously fixed according to temporal system load. Subsequent, all the migrated data in EESDC directly back on extending the idle time of EESD to reservation more energy efficiently. Therefore, the EESDC technique is conducive to saving more energy by quickly accomplishing energy-efficient data layouts without redundant data migrations. They instrument EESDC in a simulated disk system, which is authenticated against a prototype system mechanical by our EESDC. **Hui Liu et al. [4]** define characteristics of delivery model of cloud computing. In scarce table, one of the most general multi-tenant data storage schemas for Saas, all tenants' data are stored into sparse table and plotted to tenant's logical view by metadata. Throughout the data storage scheme advancement in SaaS, all tenants' data need to be travelled into the new data schema before it becomes operative to ensure the integrity of the tenants' data. However, the migration is composite and brings overhead workload. Inferior still, it may cause the system unusable. In this paper, they recommend metadata evolution technology. They can understand the mapping from the old data schema to new data scheme smoothly via**. Yanling Du et al. [5]** planned a hybrid cloud storage explanation in view of high performance, high retreat of private cloud and the large capacity features of public cloud. With the measurable expressing of the real-time property, compassion, decentralization and data access heat of aquatic data, they assumed the model of marine data migration between the hybrid clouds. Temporarily, the data migration method was improved to avoid the restraint of the traditional data migration process which is built just according to the data access. **Pawan Nahar et al. [6]** using active cloud engine in data migration. Data rate increase day by day, so big data analysis is needed which is challenge, That's why organization search cloud based storage having highly efficient storage infrastructure in place to support high scale operation, without losing data.IBM active cloud engine, which comes with that features enhances the process of data migration by caching the world wide data and make it available locally with zero down time. In **[7] Koong wah yan, et al. defined** data migration ecosystem for big data is the production set of interacting process , practices and environments to collection data from one location storage , medium or one location , storage medium or to cleanse, transform and transfer to another. The process and practices are governed by rules and disciplines with complete information with high accuracy and consistency. **Jianzhe Tai, et al. [8]** work on live data migration so reduce service level agreements (SLA).To store process and query large scale data sets is big challenges. In multi-tiered storage system, the new approach of automatic data movement used, where lively data migrate to support SLA's for application with low cost. LMT's enhance average I/O response time, I/O violation time and I/O violation ratio with minor degradation on performance of highly priority applications. **Cui Shuo et al. in 2014 [9]** studied the mass data storage data migration knowledge to meet business continuousness, data security, data integrity necessities, while research massive data replication technology based on storage block asynchronous migration method. **Steve Strauch, et**

al., 2014[16] says that cloud computing requires either an application to be built especially for it, or for existing application to migrated to it. Migrating data to the cloud creates a series of technical, architectural and legal challenges that the state of the art attempts to address. A set of migration scenarios and connect them with a list of reusable solution for application data migration in form of patterns.

III. Problem Formulation

During the data transfer from one cloud to another has data loss and data corruption risk. A host of a cloud has a large amount of data so it's difficult task to transfer the data accurately in less time to another. In such a case a tool is required through which transfer of the data from one cloud to another. Migration of the data is quite difficult task because every cloud server has its own protocol service to work. Some mediator protocol service would be required which can understand both cloud servers' protocols [16].

In proposed work, signify a mediator protocol service is as bridge which communicates with both the cloud servers and successfully data migrate from one cloud host to another. Optimize migration of data using ANT Colony Optimization (ACO) algorithm which also makes fast transmission. Add RSA encryption to maintain data security and accuracy [17].

Objectives

Our objectives includes the following

1. To implement the data migration framework in cloud environment using mediator protocol
2. To optimize the performance of migration using ACO algorithm in terms of accuracy based on error rate, throughput related to transfer rate, error and probability check by secure transmission.
3. To evaluate the above performance parameters and compare the results with previous reusable pattern techniques used earlier.

IV. Methodologies

The process of data migration over cloud environment need to be follow different rules of two servers in which data transfer, Because every server has their own different protocols. Firstly, migration of data started by detection of data which migrated than make their schemas. Classification of tables and entities, re-organize the types and make structure of columns use for pattern. ACO Algorithm apply on bit pattern for optimize the migration so that migration of data one cloud to another take less-time. When all bit patterns optimize than apply RSA encryption to bit stream section so data transfer one cloud to another securely and accurately. After implement ACO Algorithm and RSA encryption on bit pattern generate migration request. Using handshaking process, Request send by one cloud server and another cloud send back acknowledge. In between protocol active in both server and make common bridge to joint both cloud servers. For sending packets launch an optimized path by ACO. At the end launch migration process. Data accurately, securely and timely transfer than stop the process.

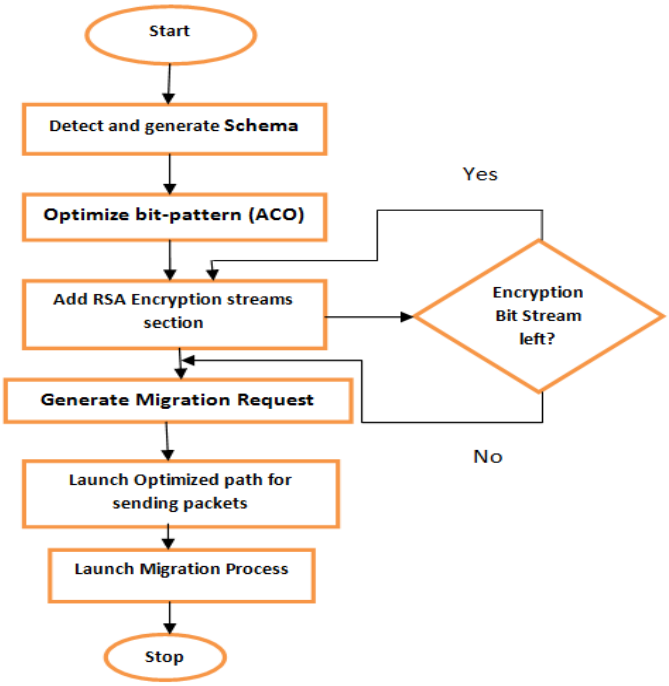

Figure 3: flow diagram

V. Conclusions

Data migration is process of transfer data from one cloud server to another. Process seems to be simple and easy but it is not. Because every cloud server have their different protocols and rules. In transmission time possibility of data loss, data theft and transmission take more time. These are following challenges data migration process faced so for resolution use different techniques. To adjoin two different protocol clouds server using mediator protocol in between as bridge. ACO Algorithm used for optimization data so take less time in transmission. RSA Encryption applies on bit stream so securely and accurately data migrate one cloud to another. By this way make data migration process correct and fast.

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