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An Innovative Approach for Dynamic Authentication in Public Cloud: Using RSA, Improved OTP and MD5

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ABSTRACT: The cloud computing stage gives populace the chance for sharing information resources and services along with the people through internet. In the cloud computing system, both application software and databases are moved to the large data centres, where the data should not be secure in the hands of providers. IT organizations have expressed concerns about the various security aspects that exist with the widespread implementation of cloud computing. These types of concerns originate from the fact that data is stored remotely from the customer's location. From the consumers' perspective, cloud computing security concerns, especially data security and privacy protection issues, remain the primary inhibitor for adoption of cloud computing services. This paper describes an enhancement for the already existing data security model in cloud environment. The proposed data security model provides user authentication and data protection. This makes certain secure communication system and hiding information from others. In this model message digest based file encryption system and secure public-key encryption system using RSA for exchanging data is included. This model also includes onetime password (OTP) system for user authentication process. This structure can be easily applied with all cloud computing layers, e.g. PaaS, SaaS and IaaS.

KEYWORDS: Cloud computing; Security architecture; AES; MD5 Hashing; RSA; One-time Password (OTP**).**

I. INTRODUCTION

Cloud computing is one the most developing conception for both the developers and the users. Therefore in recent days providing security has become a major challenging issue in cloud computing. In the cloud environment, resources are shared among all of the servers, users and individuals. As a result files or data stored in the cloud become open to all. Therefore, data or files of an individual can be handled by all other users of the cloud. [2, 3] Thus the data or files become more vulnerable to attack. As a result it is very easy for an intruder to access, misuse and destroy the original form of data. An intruder can also interrupt the communication. Besides, cloud service providers provide different types of applications which are of very critical nature. Hence, it is extremely essential for the cloud to be secure [4]. Another problem with the cloud system is that an individual may not have control over the place where the data needed to be stored. A cloud user has to use the resource allocation and scheduling, provided by the cloud service provider..

In this paper we have proposed new security architecture for cloud computing platform. In this model high ranked security algorithms are used for giving secured communication process. Here files are encrypted with AES algorithm in which keys are generated randomly by the system. In our proposed model distributive server concept is used, thus ensuring higher security. This model also helps to solve main security issues like malicious intruders, hacking, etc. in cloud computing platform. The RSA algorithm is used for secured communication between the users and the servers. This paper is formatted in the following way: - section II describes related work of this paper work, section III describes proposed architecture and its working steps, section IV describes the experimental environment, results in different aspects and advantages of the proposed model, and section V describes the future aspects related to this paper work.

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II. RELATED WORK

Numerous research on security in cloud computing has already been proposed and done in recent times. Identification based cloud computing security model have been worked out by different researchers [12]. But only identifying the actual user does not all the time prevent data hacking or data intruding in the database of cloud environment. Yao's Garbled Circuit is used for secure data saving in cloud servers [13, 14]. It is also an identification based work. AES based file encryption system is used in some of these models [15, 16]. But these models keep both the encryption key and encrypted file in one database server. Only one successful malicious attack in the server may open the whole information files to the hacker, which is not desirable. Some other models and secured architectures are proposed for ensuring security in cloud computing environment [17, 18]. Although these models ensures secured communication between users and servers, but they do not encrypt the loaded information. For best security ensuring process, the uploaded information needs to be encrypted so that none can know about the information and its location. Recently some other secured models for cloud computing environment are also being researched [19, 20]. But, these models also fail to ensure all criteria of cloud computing security issues [21].

II. PROPOSED MODEL

In our proposed model we have worked with the following security algorithms:-

- RSA algorithm for secured communication [22, 23]
- AES for Secured file encryption [24, 25, 26]
- MD5 hashing for cover the tables from user [27]
- One time password for authentication [28, 29].

At present ensuring security in cloud computing platform has become one of the most significant concerns for the researchers. We have undertaken these problems in our research, to provide some solution correlated with security. We have proposed the following security model for cloud computing data storage shown in Figure 1. In this model, all the users irrespective of new or existing member, needs to pass through a secured channel which is connected to the main system computer. System server computer has relation with other data storage system. The data storage system can be servers or only storage devices. Here, each of the data storage devices can be thought as one or more servers in number.

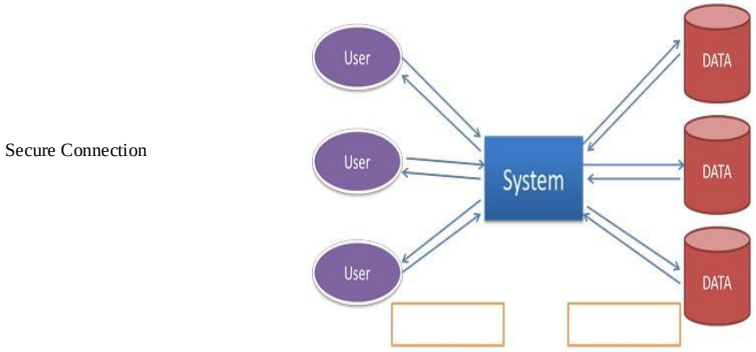

Figure 1.Proposed Security Model

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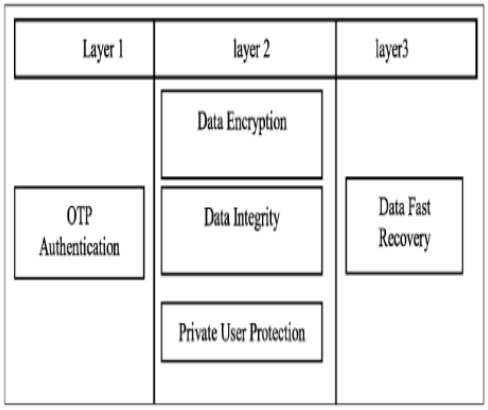

Fig.2 Proposed cloud data security model

In the proposed security model one time password has been used for authenticating the user. The password is used to keep the user account secure and secret from the unauthorized user. But the user defined password can be compromised. To overcome this difficulty one time password is used in the proposed security model. Thus whenever a user login in the system, he/she will be provided with a new password for using it in the next login.

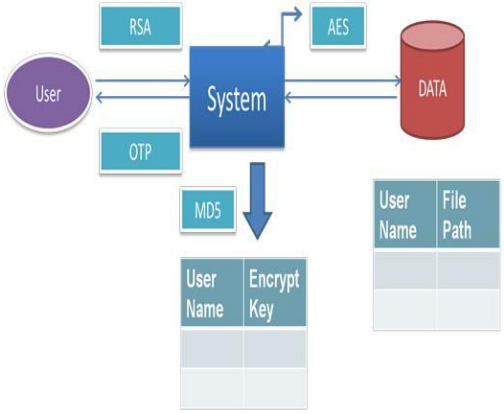

Figure3. Proposed Security Model/ Structure

IV. EXPERIMENTAL RESULTS

In the lab we have worked with about 100 users and also with their files for studying and prove the efficiency of the proposed model. We have tried to find out different execution results which helped us to demonstrate our model with better result. Different conditions and positions were observed during the working and execution time of this proposed model.

A. Lab Setup

- Platform: Visual Studio 2010 (asp.net)
- Processor: Core 2 Duo (2.93 GHz),
- RAM: 2 GB

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In this environment, the whole model took average of 5 seconds for executing all the steps. This hardware configuration takes highest 2 seconds to encrypt about a 10 KB file. This model is fast enough and can be applied to current cloud computing environments.

RSA is a public key algorithm invented in 1977 by 3 scientists Ron Rivest, Adi Shamir, Leonard Adleman (RSA).
IPSEC/IKE: IP Data Security
TLS/SSL: Transport Layer Security
PGP: Email Security
SSH: Terminal Connection Security
SILC: Conferencing Service Security

Algorithm Steps of Authentication and Security Implementation
Step 1: Key Generation
Declare e as encryption exponent and d as decryption exponent.
p, q ← Integer numbers.
n←Modulus for keys.
Ø (n) ← Euler's Totient.
e ←Public key exponent.
Step 2: Compute Values
Choose two distinct large prime numbers p &q (Random prime no generation algorithm).
Compute n=p*q
Compute Ø(n)=(p-1)(q-1).
Choose e such that 1<e< Ø(n)
Compute d*e=1
Public key is (n, e), private key is (n, d)

Step 3: Digital Signing
Sender A create message digest of information using hash function (MD5).
Hash Function
Declare character, str' of unsigned long type.
Declare & initialize hash of unsigned integer type.
Unsigned int hash=0 int q. While (q = str + 1) Hash=hash + q.
Represent this digest as integer m& it is having value between 0 to n-1.
Uses private key (n, d) to compute the signature S=mD mod n
Send signature S to the recipients.
Step 4: Encryption
Sender A obtain receiver B's public key (n, e).
Plaintext message as integer m
Compute cipher text c=me mod n
Sends this message (cipher text) to B
Step 5: Decryption
Uses his private key (n, d) to compute m=cd mod n
Extract plain text.
Step 6:
Signature Verification
Receiver uses senders public key (n,e) to compute V=Se mod n
Extract message digest from integer V

III. OTP (ONE TIME PASSWORD)

A onetime password (OTP) is generated without connecting the client to the server [3]. The mobile phone will act as a token and use certain factors unique to it among other factors to generate a one-time password locally. The server will

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have all the required factors including the ones unique to each mobile phone in order to generate the same password at the server side and compare it to the password submitted by the client. The client may submit the password online or through a device such as an ATM machine. Therefore, it's very important to develop a secure OTP generating algorithm. Several factors can be used by the OTP algorithm to generate a difficult-to-guess password. Users seem to be willing to use simple factors such as their mobile number and a PIN for services such as authorizing mobile micropayments [3].

IV. PERFORMANCE EVALUATION

Models for delivering information technology services in which resources are retrieved from the internet through web based tools and applications, rather than a direct connection to a server. Initially, the access to the cloud was not secure because credentials such as username and password were required to access. Any invalid user tries to make login to the system using other's account then he is able to access the data [14]. Security policies like 3 dimensional framework enables to categorize data into different security levels. Digital signature is very strong authentication scheme for verifying that only valid user who is liable to access can access the file. RSA is strongest public key encryption algorithm used over the internet now a day. RSA is one of the algorithms having asymmetric key encryption policy. Any invalid user accessing encrypted data then it is hard to interpret [10]. Security of cloud is enhanced by using 3 Dimensional Framework, Digital Signature, RSA Encryption Algorithm and Two Factor Authentication Schemes

V. CONCLUSION

Cloud computing has bright prospects both for business and researchers certain challenging issues including security, performance, reliability, scalability, interoperability, virtualization etc. needs to be addressed carefully. We describe the security issues related to the cloud computing; help to better understand the protocols and the principles behind it thus make better integrity and authentication. In this paper we have projected a novel security formation for cloud computing environment which comprises AES, md5, OTP and RSA. The AES is used for file encryption system, RSA system is used for secure communication, Onetime password (OTP) is used to authenticate users in cloud environment and MD5 hashing method is used for hiding information. This model ensures authentication and security for complete cloud computing system.

In our proposed model we have used RSA encryption system which is deterministic. For this reason, it becomes brittle in long run process. But the other algorithms like AES, MD5 and OTP makes the model highly secured. In future we want to work with certifying protected communication system among users and systems and user to user. In future it can also possible that encryption algorithms will get weak, so we want to work with encryption algorithms to find out more secure encryption system for secured file information protected system.

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