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Identity-Based Remote Data Integrity Checking

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ABSTRACT: Secure search techniques over encrypted cloud data allow an authorized user to query data files of interest by submitting encrypted query keywords to the cloud server in a privacy-preserving manner. However, in practice, the returned query results may be incorrect or incomplete in the dishonest cloud environment. For example, the cloud server may intentionally omit some qualified results to save computational resources and communication overhead. Thus, a well-functioning secure query system should provide a query results verification mechanism that allows the data user to verify results. In this paper, we design a secure, easily integrated, and fine-grained query results verification mechanism, by which, given an encrypted query results set, the query user not only can verify the correctness of each data file in the set but also can further check how many or which qualified data files are not returned if the set is incomplete before decryption. The verification scheme is loose-coupling to concrete secure search techniques and can be very easily integrated into any secure query scheme. We achieve the goal by constructing secure verification object for encrypted cloud data. Furthermore, a short signature technique with extremely small storage cost is proposed to guarantee the authenticity of verification object and a verification object request technique is presented to allow the query user to securely obtain the desired verification object. Performance evaluation shows that the proposed schemes are practical and efficient.

KEY WORDS: Computer Networks, Database, Network Security Remote Sensing.

I. INTRODUCTION

Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the common use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation. Cloud computing consists of hardware and software resources made available on the Internet as managed third-party services. These services typically provide access to advanced software applications and high-end networks of server computers.

The goal of cloud computing is to apply traditional supercomputing, or high-performance computing power, normally used by military and research facilities, to perform tens of trillions of computations per second, in consumer-oriented applications such as financial portfolios, to deliver personalized information, to provide data storage or to power large, immersive computer games. The cloud computing uses networks of large groups of servers typically running low-cost consumer PC technology with specialized connections to spread data-processing chores across them. This shared IT infrastructure contains large pools of systems that are linked together. Often, virtualization techniques are used to maximize the power of cloud computing**.**

The salient characteristics of cloud computing based on the definitions provided by the National Institute of Standards and Terminology (NIST) are outlined below:

On-demand self-service:

A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service's provider.

Broad network access:
Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, laptops, and PDAs).

Resource pooling:
The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location-independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or data center). Examples of resources include storage, processing, memory, network bandwidth, and virtual machines.

Rapid elasticity:
Capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and rapidly released to quickly scale in. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time.

Measured service:
Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts).

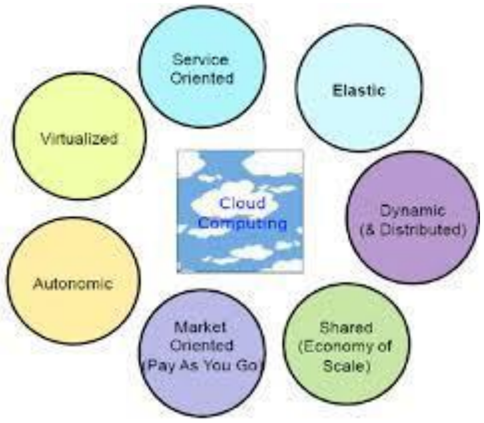

Fig1: Characteristics of cloud computing

II. SIGNIFICANCE OF THE SYSTEM

Remote data integrity checking (RDIC) enables a data storage server, say a cloud server, to prove to a verifier that it is actually storing a data owner's data honestly. To date, a number of RDIC protocols have been proposed in the literature, but most of the constructions suffer from the issue of a complex key management, that is, they rely on the expensive public key infrastructure (PKI), which might hinder the deployment of RDIC in practice. In this paper, we propose a new construction of identity-based (ID-based) RDIC protocol by making use of key-homomorphic cryptographic primitive to reduce the system complexity and the cost for establishing and managing the public key authentication framework in PKI based RDIC schemes. We formalize ID-based RDIC and its security model including security against a malicious cloud server and zero knowledge privacy against a thirdparty verifier. The proposed ID-based RDIC protocol leaks no information of the stored data to the verifier during the RDIC process. The new construction is proven secure against the malicious server in the generic group model and achieves zero knowledge privacy against a verifier. Extensive security analysis and implementation results demonstrate that the proposed protocol is provably secure and practical in the real-world applications..

III. LITERATURE SURVEY

We introduce a model for provable data possession (PDP) that allows a client that has stored data at an untrusted server to verify that the server possesses the original data without retrieving it. The model generates probabilistic proofs of possession by sampling random sets of blocks from the server, which drastically reduces I/O costs. The client maintains a constant amount of metadata to verify the proof. The challenge/response protocol transmits a small, constant amount of data, which minimizes network communication. Thus, the PDP model for remote data checking supports large data sets in widely-distributed storage system.We present two provably-secure PDP schemes that are more efficient than previous solutions, even when compared with schemes that achieve weaker guarantees. In particular, the overhead at the server is low (or even constant), as opposed to linear in the size of the data. Experiments using our implementation verify the practicality of PDP and reveal that the performance of PDP is bounded by disk I/O and not by cryptographic
Computation.

Increasingly more and more organizations are opting for outsourcing data to remote cloud service providers (CSPs). Customers can rent the CSPs storage infrastructure to store and retrieve almost unlimited amount of data by paying fees metered in gigabyte/month. For an increased level of scalability, availability, and durability, some customers may want their data to be replicated on multiple servers across multiple data centers. The more copies the CSP is asked to store, the more fees the customers are charged. Therefore, customers need to have a strong guarantee that the CSP is storing all data copies that are agreed upon in the service contract, and all these copies are consistent with the most recent modifications issued by the customers. In this paper, we propose a map-based provable multicopy dynamic data possession (MB-PMDDP) scheme that has the following features: 1) it provides an evidence to the customers that the CSP is not cheating by storing fewer copies; 2) it supports outsourcing of dynamic data, i.e., it supports block-level operations, such as block modification, insertion, deletion, and append; and 3) it allows authorized users to seamlessly access the file copies stored by the CSP. We give a comparative analysis of the proposed MB-PMDDP scheme with a reference model obtained by extending existing provable possession of dynamic single-copy schemes. The theoretical analysis is validated through experimental results on a commercial cloud platform. In addition, we show the security against colluding servers, and discuss how to identify corrupted copies by slightly modifying the proposed scheme.

In a proof-of-retrievability system, a data storage center convinces a verifier that he is actually storing all of a client's data. The central challenge is to build systems that are both efficient and provably secure—that is, it should be possible to extract the client's data from any prover that passes a verification check. In this paper, we give the first proof-of-retrievability schemes with full proofs of security against arbitrary adversaries in the strongest model, that of Juels and Kaliski. Our first scheme, built from BLS signatures and secure in the random oracle model, has the shortest query and response of any proof-of-retrievability with public verifiability. Our second scheme, which builds elegantly on pseudorandom functions (PRFs) and is secure in the standard model, has the shortest response of any proof-of-retrievability scheme with private verifiability (but a longer query). Both schemes rely on homomorphic properties to aggregate a proof into one small authenticator value.

IV. METHODOLOGY

In an ID-based signature scheme, anyone with access to the signer’s identity can verify a signature of the signer. Similarly, in ID-based RDIC protocols, anyone knowing a cloud user’s identity, say a third party auditor (TPA), is able to check the data integrity on behalf of the cloud user. Thus, public verifiability is more desirable than private verification in ID-based RDIC, especially for the resource constrained cloud users. In this case, the property of zero-knowledge privacy is highly essential for data confidentiality in ID-based RDIC protocols.

1.Our first contribution is to formalize the security model of zero knowledge privacy against the TPA in ID-based RDIC protocols for the first time.

2. We fill the gap that there is no a secure and novel ID based RDIC scheme to date. Specifically, we propose a concrete ID-based RDIC protocol, which is a novel construction that is different from the previous ones, by making use of the idea of a new primitive called asymmetric group key agreement.

3. To be more specific, our challenge-response protocol is a two party key agreement between the TPA and the cloud server, the challenged blocks must be used when generating a shared key,
which is a response to a challenge from the TPA, by the cloud server.

4. We provide detailed security proofs of the new protocol, including the soundness and zero-knowledge privacy of the stored data. Our security proofs are carried out in the generic group model.

ADVANTAGES OF PROPOSED SYSTEM:

5. This is the first correct security proof of ID-based RDIC protocol. Thus, the new security proof method itself may be of independent interest.

6. We show the practicality of the proposal by developing a prototype implementation of the protocol.

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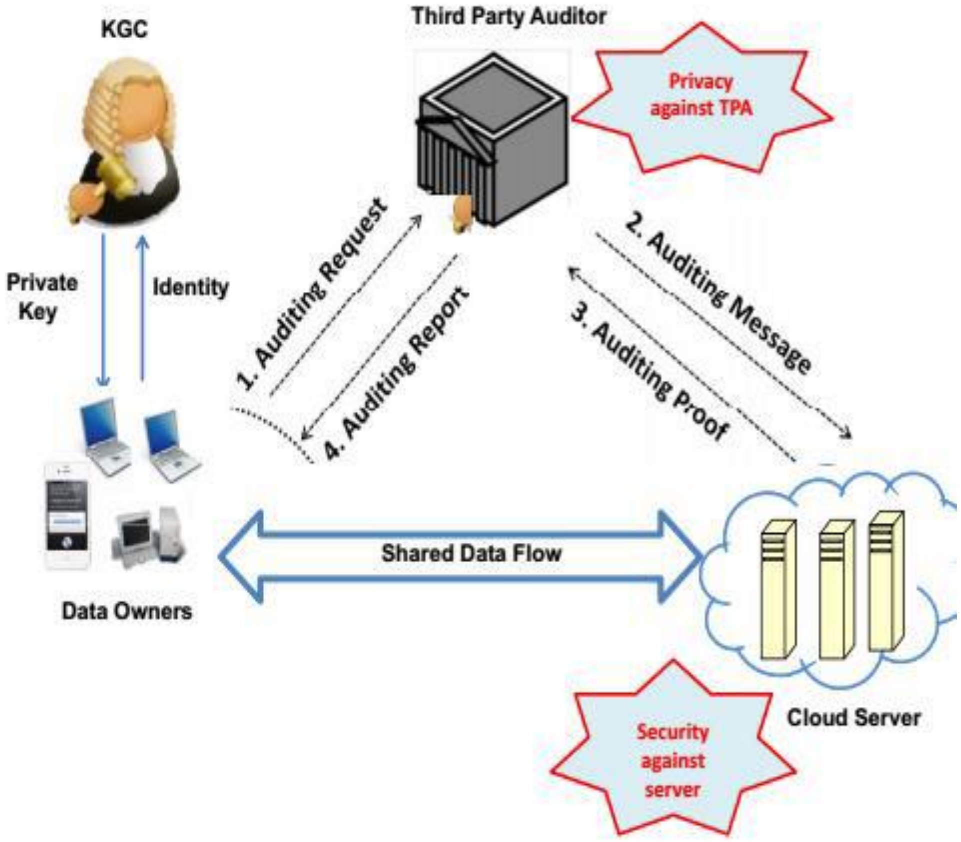

Fig2. System Design

V. CONCLUSION

In this paper, we investigated a new primitive called identity-based remote data integrity checking for secure cloud storage. We formalized the security model of two important properties of this primitive, namely, soundness and perfect data privacy. We provided a new construction of of this primitive and showed that it achieves soundness and perfect data privacy. Both the numerical analysis and the implementation demonstrated that the proposed protocol is efficient and practical.

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