**KEY-POLICY ATTRIBUTE-BASED ENCRYPTION SCHEME FOR GENERAL CIRCUITS FROM BILINEAR MAPS**

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**Abstract.** Due to previous KP-ABE schemes being unviable when applied to complex circuits, a new efficient scheme is needed. Thus, the following contribution is presented. The paper “Key-Policy Attribute-Based Encryption Scheme for General Circuits from Bilinear Maps” discusses about a new viable and secure cryptographic scheme based on attribute encryption for any given access structure represented through a circuit. The solution has two components: the physical transformation of the circuit and the modifications in the cryptographic algorithm. The new scheme keeps the size of the circuit unmodified, replacing the OR gates with NAND gates and adds additional functionalities in the algorithm for the new logical NAND gate. The solution uses the decisional bilinear Diffie-Hellman assumption to prove the security soundness of the new scheme and the proof of the AND gate functionality in backtracking attacks.

**Key Words.** *KP-ABE scheme, general circuit, decisional bilinear Diffie-Hellman assumption*

**1. INTRODUCTION**

Attribute-Based Encryption (ABE) is a cryptographic scheme in which the identity of the user is defined through a set of elements called attributes. The main purpose of ABE schemes is to establish simplified means of decryption by describing a group of authorized users and ??. There are two forms of ABE scheme : chipertext-policy ABE (CP-ABE) [1] and key-policy ABE (KP-ABE) [2].

Previous works and why we need a better one

What do we compare

The paper is organized into eight sections. The next section contains theoretical notions which will be recalled throughout the presentation of the new KP-ABE scheme for general circuits and will provide a better understanding of the new construction. Before detailing the construction, we discuss about backtracking attack and why its existence is such an important problem that needs to be addressed and prevented in the general circuits extention of KP-ABE schemes. In the following four chapters the contribution is described alongside its security soundess, complexity and the new possible extention that can be applied over it. The eigth and the final chapter concludes our paper.

**2. PRELIMINARIES**

*Multiplicative cyclic group.* A multiplicative group is a set equipped with the binary operation which satisfies the following properties:

- ;

- so that;

- so that;

- .

A multiplicative group is called cyclic if there is an element which can generate all the elements of the group by repeatedly multiplying it with itself. Such elements are called generators.

*Bilinear maps.* Let there be , two multiplicative cyclic groups of the same order. A bilinear map from to it is a function where:

- , for ;

- is a generator of , for .

The *computational Diffie-Hellman problem* (CDH) states the fact that if and are given, looks like a random element of where is a generator of , a multiplicative cyclic group of order with randomly chosen elements from . The *decisional Diffie-Hellman problem* (DDH) is an indistinguishability problem in which there are two computational indistinguishable instances, and , where are elements defined as above and is a randomly chosen element of . The *decisional bilinear Diffie-Hellman problem* (DBDH) is the problem of distinguishing two elements and , where is a bilinear map defined from to , is a generator of and are randomly chosen elements of .

*Access structures.* Let be a set of elements called attributes. A set of nonempty subsets of is called *authorized access structure* if it is used to define the authorized user in a cryptographic system. Any other subset of that does not belong to is called *unauthorized* and it is an element of , the set of unauthorized users.

**3. BACKTRACKING ATTACK**

**4. NEW CONSTRUCTION**

**5. SECURITY SOUNDNESS**

**6. COMPLEXITY OF THE CONSTRUCTION**

**7. EXTENTIONS**

**8. CONCLUSIONS**

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