A Study of Identity Based Encryption Systems

Samuel Petit
3rd Year Integrated Computer Science student at Trinity College Dublin, the University of Dublin
Email: petits@tcd.ie

***Abstract*—The abstract goes here.**

I. Introduction

Will be studying IBE. A type of Asymmetric paired keys encryption system. Charcterised with the fact that one of its keys identifies the recipient (email...phone no).

Makes a lot of sense to compare with classical systems currently in use such as RSA.

So let's compare both systems and try to explain why IBE is not as popular

A. Introduction to Public Key Cryptography

Public Key Cryptography, also called Asymmetric Cryptography is an encryption scheme. In other words, it is a method for encrypting messages. Unlike symmetric cryptography which uses the same key for both encrypting and decrypting messages, asymmetric cryptography uses two different keys such that one is used for encrypting and the other for decrypting information. In this context, a key is a string of characters that is used in some mathematical formula to turn a information (a message for example) such that it is impossible to understand in its encrypted form. Similarly, we would then also use a key to map the encrypted information back to its original, usable form. In asymmetric encryption, we typically call the encryption key the Public Key, and the decryption key the Private Key. The first asymmetric key cryptosystem was published in 1976 by Whitfield Diffie and Martin Hellman, previously, all useful modern encryption system used symmetric key encryption systems. While both systems still have their usages in todays world, asymmetric key encryption systems are now used on a daily basis throughout the world. With systems such as both HTTP over TLS and HTTP over SSL protocols, digitally signed files, bitcoin, encrypted messaging services and many other all using some for of asymmetric encryption.

1) How it works: Put simply, let's say we had a public key K_{public} and $K_{private}$. We would then obtain a ciphertext $cipher$ with the following formula:

$$cipher = K_{public}(message)$$

Similarly, we obtain the original message from the ciphertext with the following formula:

$$message = K_{private}(cipher)$$

B. Different implementations

There are many different implementations of asymmetric

1) Requirements for public key algorithms (key gen, encrypt and decrypt): explain Requirements here

2) How RSA is Implemented: Perhaps on of the most famous system based on public key cryptography is RSA. An RSA encryption scheme uses 3 different algorithms, Setup, Encryption and Decryption.

3) Explain how IBE works: explain IBE systems

C. Math Systems at the core of Public Key Encryption

Explain that at the core of public key encryption, underlies many important mathematical concepts.

1) Extended euclidean algo to find gcd, coefficients: euclidean algo

2) Fermat's little theorem: fermats little thm, its place in public crypto

3) Prime numbers: prime numbers at the core of crypto

4) Discrete logarithms: discrete log problem

5) Chinese remainder theorem: chinese remainded thm at the core of decryption (or encryption)

6) Square and multiply: square and multiply to compute large exponents

D. What is identity based encryption ?

Explain what is exactly IBE now that we know more about public key encryption

1) IBE typical implementation: how is an IBE system implemented

2) What are its advantages and flaw?: pros and cons of IBE

E. IBE vs RSA

Compare the two

1) Attacks on IBE Public key systems: Go through possible attacks on Public key systems

2) Are these attacks all possible on IBE? is it better or worse with IBE?: go through how IBE protects from attacks differently than rsa systems

3) which is most safe?: expalin which system is safest

II. Conclusion

The conclusion goes here.

Appendix A
Proof of the First Zonklar Equation

Appendix one text goes here.

Appendix B

Appendix two text goes here.