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Abstract:

# Introduction

# Early History

Caesar Cypher first actual use of cryptography to hide messages.

Vignere cipher first use of encryption key

# Cryptography and early computing

Hebern rotor machine.

Enigma.and Bombe machine.

# Early modern history

Ibm crypto group and Lucifer(D.E.S. Data Encryption Standard)

1997 NIST encryption (Advanced Encryption standard).

# Cryptography and modern computing

//also discuss key terms, mention cryptography and encryption were synonymous

//Terms to mention: key(randomness), plaintext, ciphertext

# Symmetric cryptography

## Introduction

The formal definition of symmetric encryption is “an algorithmic tool that allows a pair of parties to communicate secret information over open communication media that are accessible to eavesdroppers.” (Theory of Cryptography Conference Corporate 2010) This is a classic model of encryption, where the both parties share a secret key. The key is assumed to be random, single-purpose and not dependant on the message. The security is ensured by the fact that encryption and decryption happen in safe environments and the adversary cannot intercept the key.

According to (Buchanan 2017, p.55), there are two main types of symmetric (a.k.a. “secret key”) encryption: stream cipher and block cipher. Buchanan also mentions that symmetric key decryption is faster than the asymmetric one with two keys, and so it is more suitable to use where data has to be transmitted in real-time e.g. secure voice communication online.

## Stream cipher

Stream encryption works on the basis of operating on a continuous data stream, where “the message is broken into successive bits or characters and then the string of characters is encrypted using a key stream” (Nandi *et al.* 1994). In order to create a ciphertext, a pseudorandom, pseudo-infinite key must be generated in binary form. This key is then XOR-ed with the plaintext (here the data stream) in binary form. (Buchanan 2017, p.58)

According to Paar (2010) traditionally, modulo-2 addition performed by the XOR gates was used for stream encryption, since the key used by this form of encryption is random. This is because after XOR operation the resulting bit has 50% chances of being 1 and 50% chances of being 0, unlike if we were to use other gates (e.g. AND gate).

A popular example of a stream cipher encryption algorithm is RC4.

## Common attacks

# Public key cryptography

## Introduction

Public key encryption or asymmetric key encryption uses both a public and private key to secure a communication between two entities. The public key is shared and distributed while the private key is kept private and secure. The mathematics of the encryption make it really difficult to determine the one key when given the other key because of how difficult it is to factor a value for its prime number factors. So difficult that it should take conventional computers thousands of years of computing time to decrypt. This is achieved using the following methods. **Integer factorization** (RSA method) **discrete logarithms** (ElGamal)and **elliptic curve relationships** (Elliptic Curve).

Public key encryption is often used for identity checking. It does this by checks the identity of the entity by using its public key to decrypt a message that was encrypted using the entities private key. Since the two keys are mathematically linked then they can only be decrypted using the other so if it can be decrypted by the public key then it proves its identity.

## RSA

## Common attacks

# Hash functions

## Introduction

## Message Authentication

## SHA1,2,3,

## MD5

## Common attacks

# Crypto cracking

# Other technologies that rely on cryptography

## Blockchain

## VPN

# Short note on future of cryptography(quantum)

# Conclusion

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