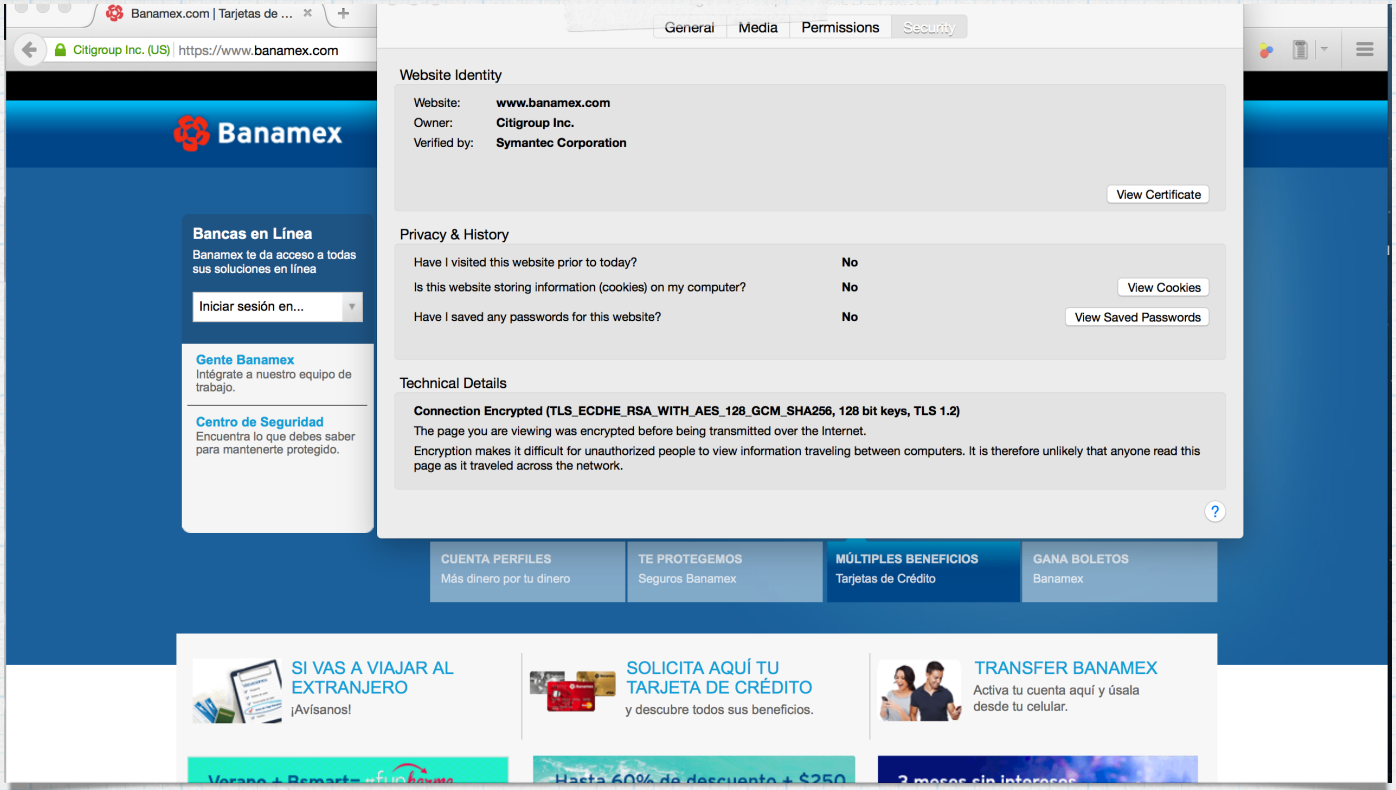
Cryptography

Basic Concepts



SHCP
SECRETARÍA DE HACIENDA Y CRÉDITO PÚBLICO

SAT
Servicio de Administración Tributaria

SAT Trámites Información Comercio exterior Aduanas Declarac

SAT > FICHAS TEMÁTICAS > FIEL

Imprimir Twittear 446

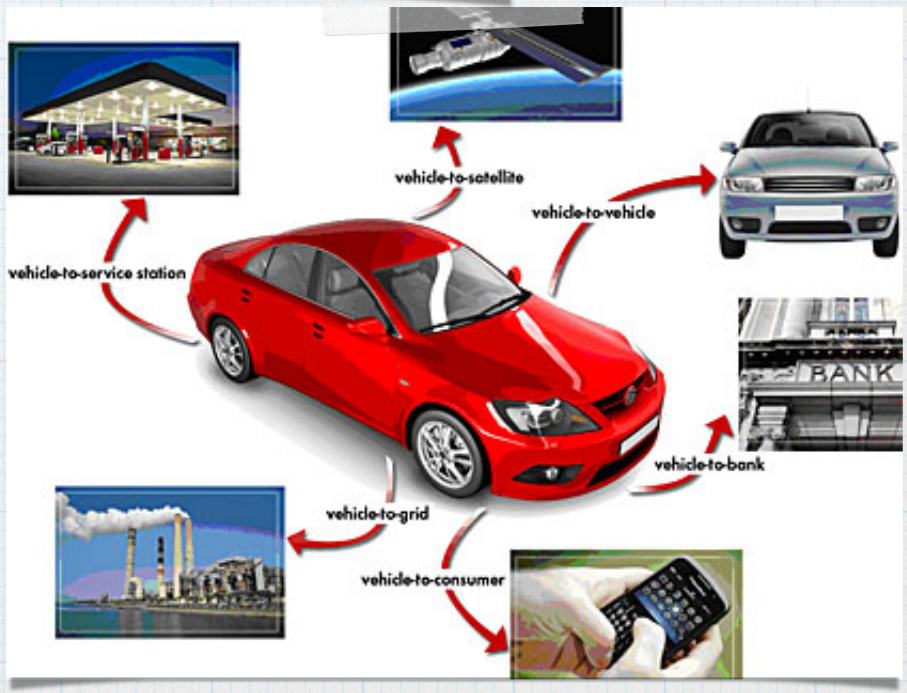
FIRMA ELECTRÓNICA

La Firma Electrónica es un archivo digital que te identifica al realizar trámites otras dependencias del Gobierno de la República.

Tu Firma Electrónica es única, es un archivo seguro y cifrado que incluye tu firr

Por sus características, es segura y garantiza tu identidad.

Cómo obtener tu Firma Electrónica | Cómo renovar tu Firma Electrónica | Cói



Cryptology

The study of codes or the art of writing and solving them

Cryptography

Cryptanalysis

What is cryptography?

From the Greek: cryptos, meaning hidden
and graphien, meaning to write.

"The art of secret writing"
(Merriam-Webster dictionary)

Definition of cryptography

"Cryptography is the study of mathematical techniques related to aspects of information security such as:

- confidentiality,
- data integrity,
- entity authentication and
- data origin authentication"

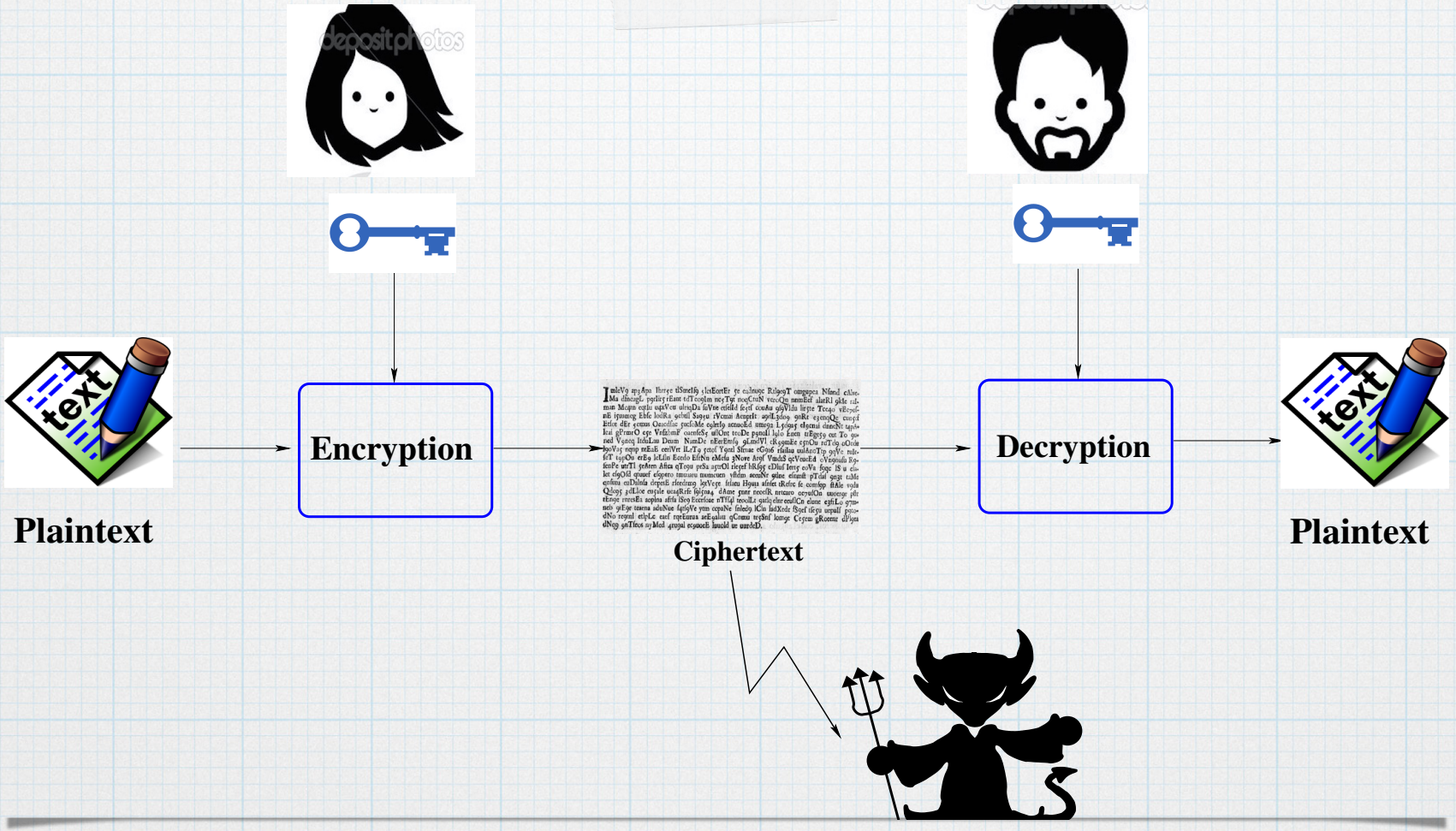
(Handbook of applied cryptography)

Alfred Menezes

Cryptographic services

* Privacy or confidentiality
* Integrity
* Authentication
* Non-repudiation

Privacy



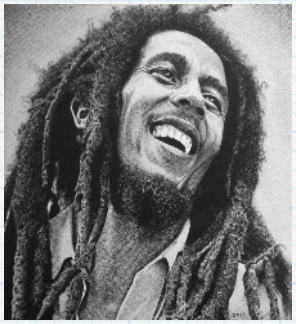
To provide secret communication between two parties, who must share certain information in advance

Public-key cryptography

* Each entity has two keys: private and public.
* Public key is used to encrypt
* Private key is used to decrypt

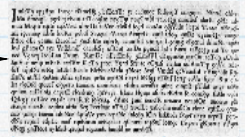
Private

Public

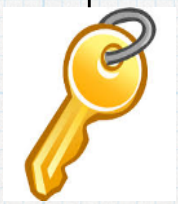


Plaintext

Encryption Algorithm



Ciphertex



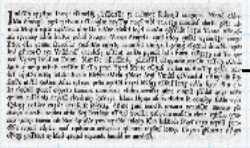
Alice
Public Key

Encryption

with asymmetric cryptography

Decryption

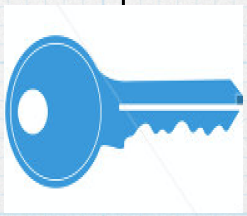
with asymmetric Cryptography



Ciphertext

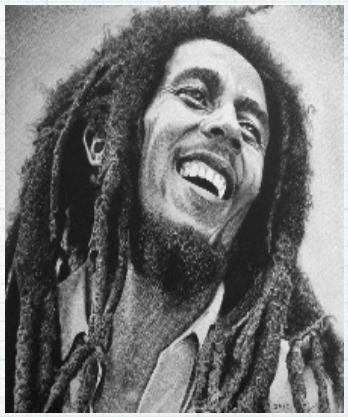
Decryption Algorithm

Plaintext



Alice
Private Key

Integrity



Interception

Replaced info

To prevent unauthorised alteration of data

Authentication

To guarantee that each entity in a communication is who claims to be

Non-repudiation

It prevents an entity from denying previous commitments or actions

Cryptographic system

$$(\mathcal{M}, \mathcal{C}, \mathcal{K}, \mathcal{E}, \mathcal{D})$$

* $\mathcal{M}$ Plaintext space
* $\mathcal{C}$ Ciphertext space
* $\mathcal{K}$ Key space
* Encryption algorithm $\mathcal{E} : \mathcal{M} \times \mathcal{K} \to \mathcal{C}$
* Decryption algorithm $\mathcal{D} : \mathcal{C} \times \mathcal{K} \to \mathcal{M}$

Type of attacks

* Ciphertext only attack (eavesdropping)
* Known plaintext attack
* Chosen plaintext attack (CPA)
* Chosen cipher text attack (CCA)

Adversary

On July 11,2014 Lang Lang performed together with Placido Domingo, Ana Maria Martinez, Maestro Eugene Kohn, the Orchestra Sinfonica Brasileira, Paula Fernandez and other musicians for World Cup Concert at HSBC Arena in Rio de Janeiro Brasil

X: Plaintext

E_K

```
ue4n32EAf/UEF6JLrap10B
pN3AgAhObP2eUFU29EJAQpo3j
6E+Gc4iumM1725JNahJzl5ED33LFdZ6
tAqTk572zdZbrCtSgcthrN/uxbJSN
XFG1J8oaLpRV499m71Nfo+ZV2HrR
MdKMvb+DZ9GVoijUixH+gbci9qvC3kt
1qHXSukK648DgpWS2oxJvmGuf/YKn+FF
```

Ciphertext

Ciphertext only attack

Known plaintext attack

* Adversary has access to cipher text for some plaintext.
* Cryptosystem is broken if an adversary is able to find plaintext of other cipher text

CPA attack

* An adversary has access to encryption machinery
* She is able to choose messages
* She gets the corresponding cipher text

CCA attack

* An adversary has access to decryption machinery.
* She is able to choose cipher texts and obtain the corresponding plaintexts.
* Her goal is to find plaintexts of other cipher texts.