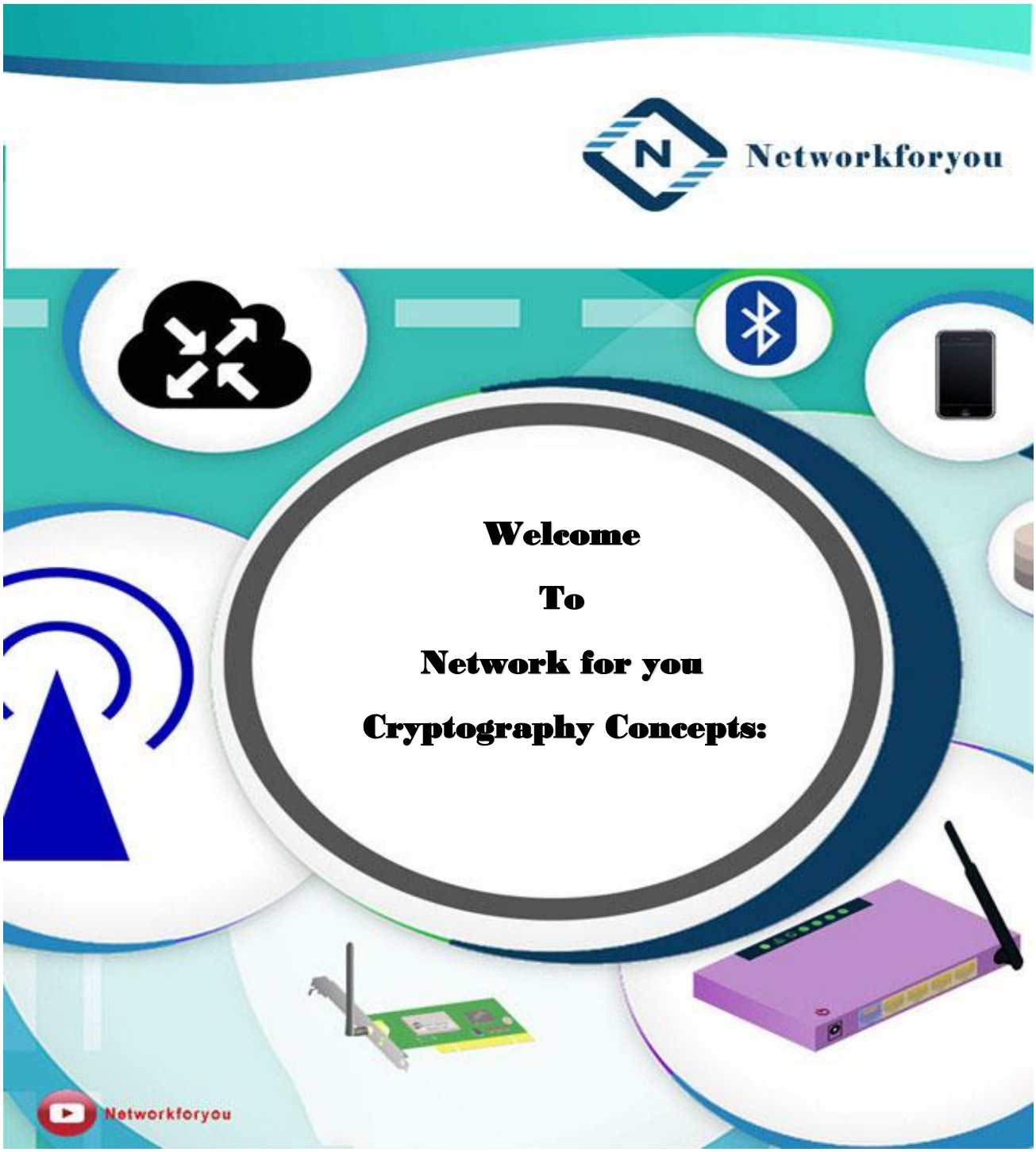
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Cryptography Concepts:
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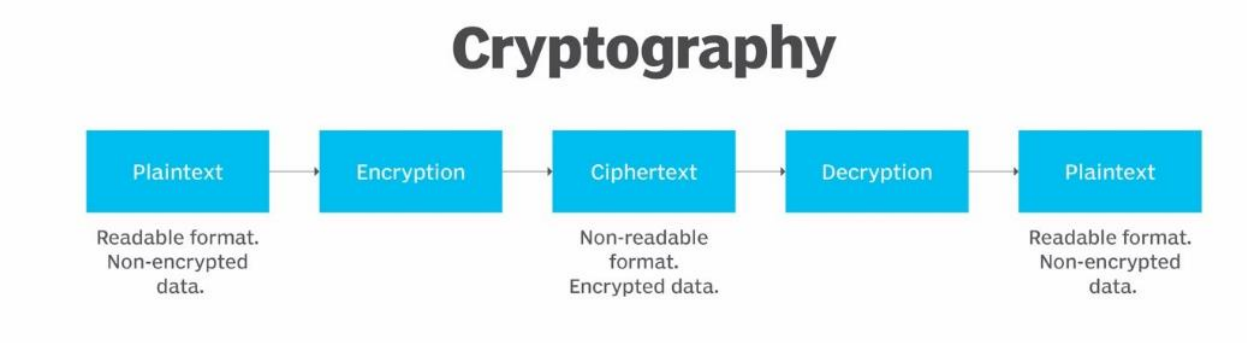
Cryptography Concepts:

- Cryptography is the practice of securing information and communications through the use of codes so that only those for whom the information is intended can understand it and process it.
- The prefix **"crypt" means "hidden"** and suffix **"graphy" means "writing"**.
- In cryptography, the techniques which are used to protect information are obtained from mathematical concepts and a set of rule based calculations known as algorithms to convert messages in ways that make it hard to decode it.



Here are some of the key concepts in cryptography:

Plaintext: The original message that is to be encrypted.

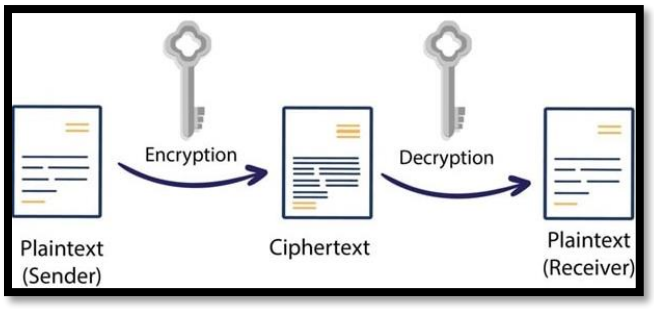
Ciphertext: The encrypted message that is the result of applying an encryption algorithm to the plaintext.

Encryption algorithm: A mathematical procedure that is used to **transform plaintext into ciphertext**.

Decryption algorithm: A mathematical procedure that is used to **transform ciphertext back into plaintext**.

Key: A secret value that is used by the encryption and decryption algorithms.

Salt: A random value that is used to make the encryption process more secure.

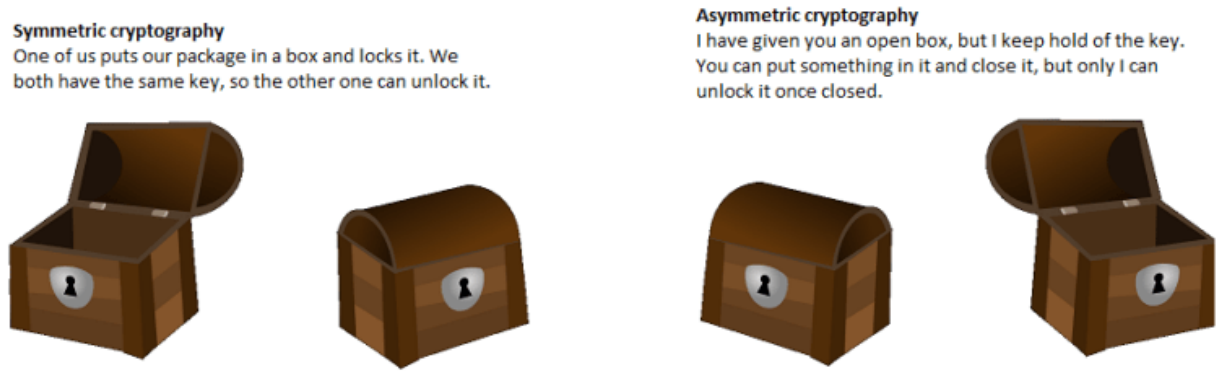


Let see some example online this is link we use to check.

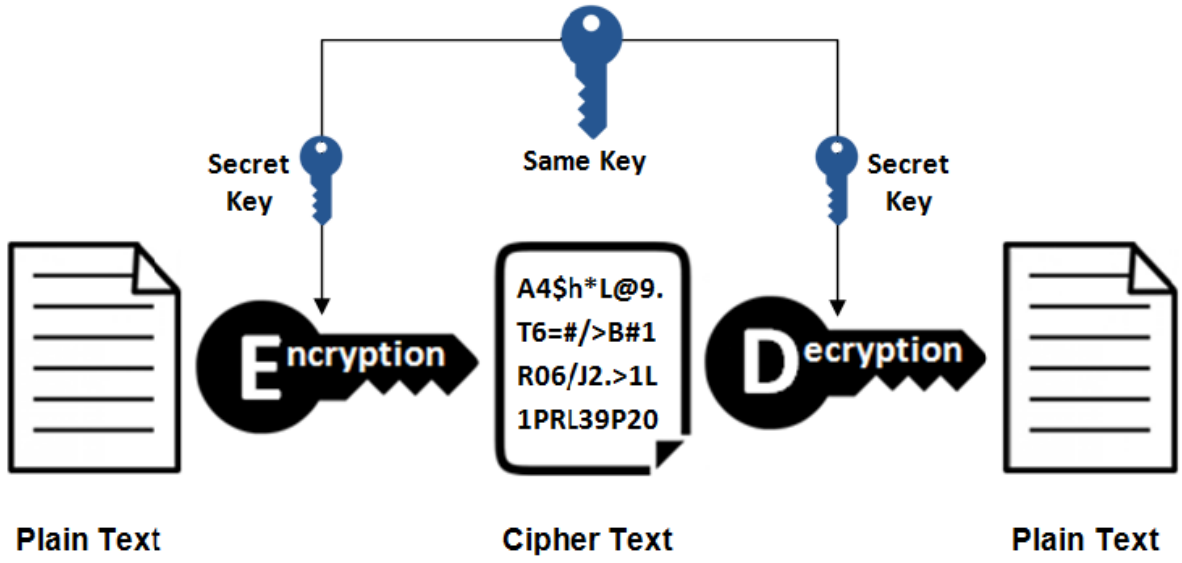
https://www.cryptool.org/en/cto/caesar

Symmetric and Asymmetric Encryption:

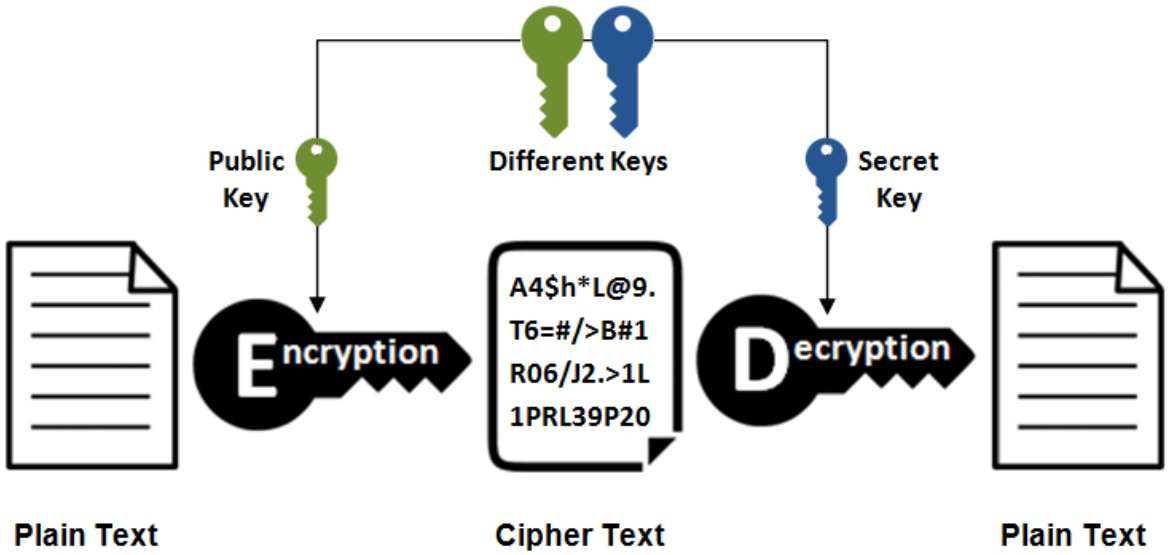
- Symmetric and asymmetric encryptions are two different types of encryption that are used to protect data.
- **Symmetric encryption uses the same key for both encryption and decryption**, while **asymmetric encryption uses two keys: a public key and a private key**.
- Symmetric encryption is the most common type of encryption.
- It is relatively fast and efficient, and it can be used to encrypt large amounts of data.
- However, symmetric encryption requires that the key be shared between the sender and receiver, which can be a security risk if the key is compromised.
- Asymmetric encryption is slower than symmetric encryption, but it is more secure.
- This is because the public key can be shared with anyone, while the private key is kept secret.
- This means that only the person with the private key can decrypt the data that was encrypted with the public key.



Symmetric Encryption

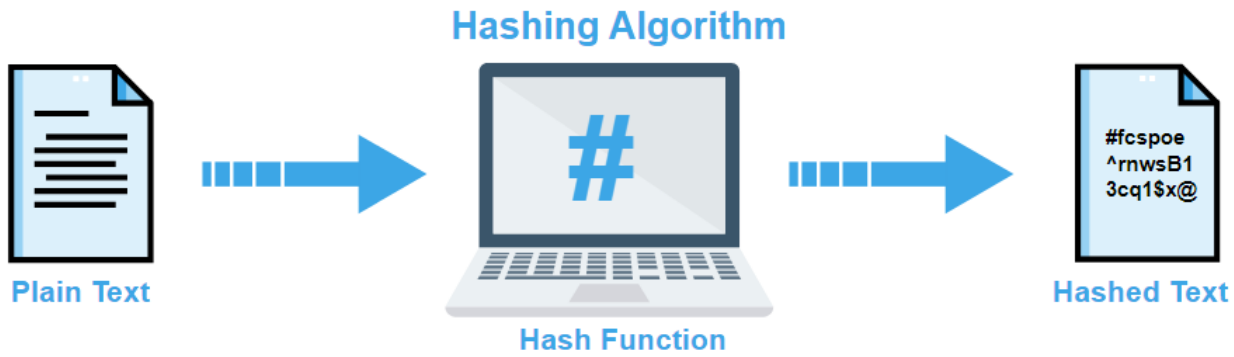


Asymmetric Encryption



Describe Hash:

- Cryptographic hash function is kind of algorithm that can be run on a piece of data.
- The produced value is called checksum, digest, message digest or hash value.
- It is string value, which is the result of calculation of a Hashing Algorithm.
- Hash is a number that is generated from the text through a hash algorithm.
- Hashing is one-way function that scrambles plaintext to produce unique message digest.
- There is no way to reverse the hashing process to reveal the original data or message.
- Hash Values have different uses main uses is to protects the integrity of your data.
- Protects data against potential alteration so that your data is not changed one bit.
- Sender sends the data and digest; receiver takes data & runs its own hash to create digest.
- Receiver then compares digests, if the two digests are same, then data is not manipulated.
- Two methods commonly available MD5 (Message Digest) and SHA (Secure Hash Algorithm).



MD5 Hashing:

- Hashing is the technique to ensure the integrity.
- MD5, which stands for Message Digest algorithm 5.
- The Message Digest (MD5) is a cryptographic hashing algorithm.
- MD5 hash is typically expressed as a 32-digit hexadecimal number.
- MD5 or message digest algorithm will produce a 128-bit hash value.
- Input data can be of any size or length, but the output size is always fixed.
- MD5 algorithm generates a fixed size (32 Digit Hex) MD5 hash.
- The hash is unique for every file irrespective of its size and type.

SHA Hashing:

- SHA, stands for Secure Hash Algorithm, is cryptographic hashing algorithm.
- SHA used to determine the integrity of a particular piece of data.
- The Secure Hashing Algorithm comes in several flavors.
- SHA-1 and SHA-2 are two different versions of that algorithm.
- SHA1 produces a 160-bit (20-byte) hash value.
- SHA2 has option to vary digest between 224 bits to 512 bits.
- SHA224 produces a 224-bit (28-byte) hash value.
- SHA256 produces a 256-bit (32-byte) hash value.
- SHA384 produces a 384-bit (48-byte) hash value.
- SHA512 produces a 512-bit (64-byte) hash value.

HMAC:

- HMAC stand for Hash Message Authentication Code, Hash with plus secret key.
- HMAC use hash algorithm on data plus secret key that only sender & receiver know.
- Therefore, both parties with secret keys can calculate and verify their hash values.
- This prevents a man in the middle attacks by making it very difficult to modify data.
- This prevents a man in the middle attacks making it difficult and create a new hash.

For MD5 and SHA Hashing Demo, use HashCalc and WinMD5 free application:

Link to download Hashcalc:

https://www.slavasoft.com/hashcalc/

Link to download WINMD5 free:

https://www.winmd5.com/