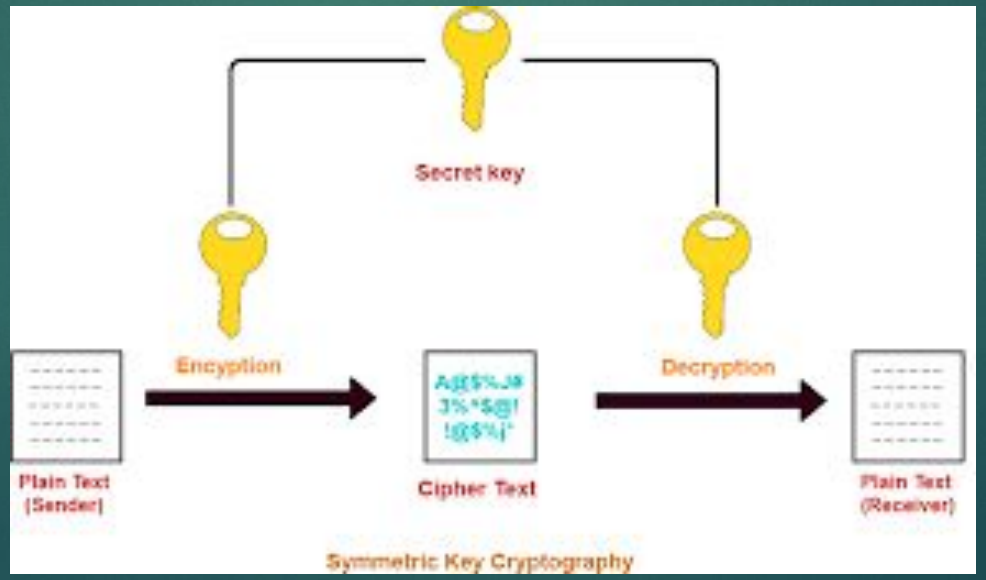
Network Security Laboratory Session 2

SYMMETRIC CRYPTOGRAPHY & STEGANOGRAPHY

Symmetric Cryptography

- Most widely used encryption system
- Based on shared key between hosts
- Most common symmetric algorithms are: DES, AES, TwoFish, etc...



Cryptography Terms

- **Plaintext** is the original message before it's encrypted. It can be a document, an image, a multimedia file, or any other binary data.
- **Ciphertext** is the message after encryption.
- **Cipher** is an algorithm to convert plaintext into ciphertext and back again.
- **Key** is a string of bits the cipher uses to encrypt or decrypt data.
- **Encryption** is the process of converting plaintext into ciphertext using a cipher and a key.
- **Decryption** is the reverse process of encryption, converting ciphertext back into plaintext using a cipher and a key.

How to build an **encrypted stream**?

Netcat

- CLI Tool for plain text transmission
- Used for reading and writing data between two computer in the networks

- Useful commands:
  - Server:
    - netcat -l <port>
  - Client:
    - netcat <hostname> <port>

- It will be used to exchange messages between 2 hosts

OpenSSL Enc

- It allows to encrypt or decrypt data using various block and stream ciphers, keys based on passwords or explicitly provided
- Used to encrypt data from stdin or files

- Useful commands:
  - Encrypt:
    - openssl enc -<cipher> -e -k <key> -in <file>
  - Decrypt:
    - openssl enc -<cypher> -d -k <key> -out <file>

- It will be used to encrypt and decrypt data sent/received by hosts

Cryptcat

- CLI Tool for encrypted text transmission in a stream
- It is a simple Unix utility which reads and writes data across network connections
- It makes use of TCP or UDP protocols
- It encrypts the data before transmission
- It is based on Netcat
- It uses a symmetric encryption algorithm (TwoFish) to send streams

- Useful commands:
  - Server:
    - cryptcat -l <port> -k <key>
  - Client:
    - cryptcat <hostname> <port> -k <key>

ES01- Cryptocat (~1h)

- Download exercise **cryptocat.pdf** on course repository
- Create and execute a python3 script called **cryptocat.py**
- Execute Wireshark and sniff the traffic between the hosts
- What are the differences between plain text and cypher text on wireshark?
- Hint
  - To execute bash command through python you can use **os.system('your_command')** or the **subprocess** library

ES02 - Decryptcat (~30m)

- Can we capture and decrypt an encrypted stream?
- YES, try to use
  - Decryptcat
  - Netcat
- Check **decrypt_cryptcat.pdf** on the repository and follow the guide

Mutt

- It is a tool to send email through CLI
- It uses SMTP protocol

- Useful Commands:
  - Send email: mutt [-s subject] [-a attachment] receiver_address

Steganography

- Technique for hide data into images or video
- The output images contains secret data
- The hidden file cannot be seen immediately without a deeper analysis of the image itself
- Image must be decrypted in order to extract hidden data

ES03 - Steghide (~30m)

- Download exercise **Steghide.pdf** on course repository
- Build and execute **steghide.py**
- Capture the traffic using wireshark
- Useful commands:
  - Encryption:
    - steghide embed -cf <source> -ef <data_to_encrypt> -sf <output_file> [-k key]
  - Decryption:
    - steghide extract -sf <image_with_encrypted_data>