HUST

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HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY

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LÝ THUYẾT MẬT MÃ

Cryptography Theory

ET3310

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Stream Cipher

1. Introduction
2. Stream Cipher Structure
3. RC4 Stream Cipher

1 Introduction to Stream Cipher

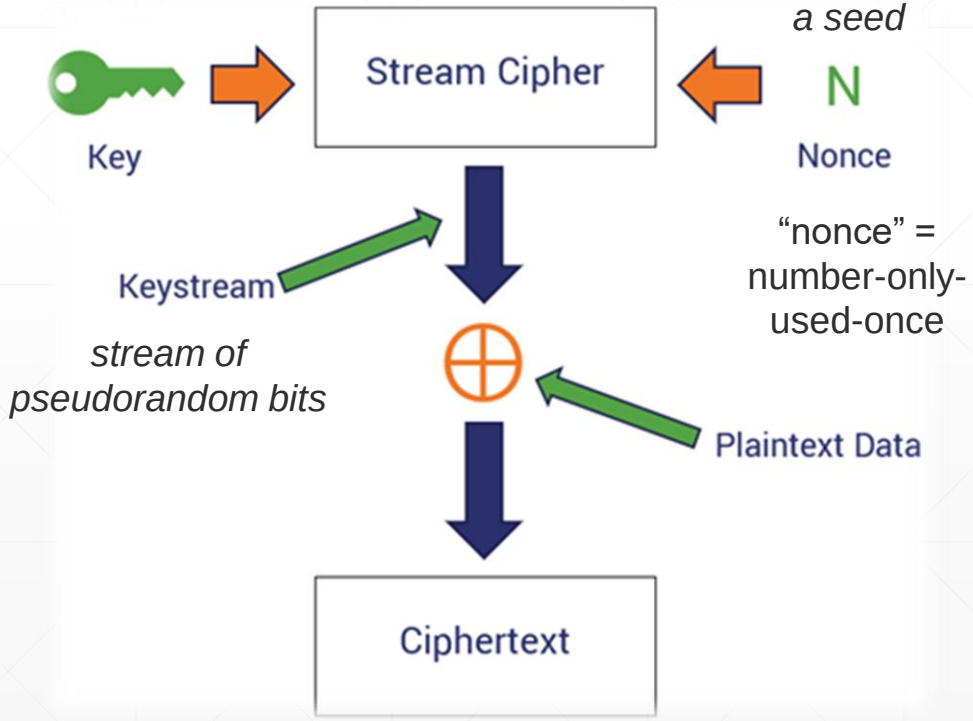
- In stream cipher, one byte is encrypted at a time while in block cipher N bits are encrypted at a time.
- *Benefit : usually simpler & faster*

the water/data flow

XOR Operations in Cryptography

Bit1 ⊕ Bit2 = Output.

Input Bit1	Input Bit2	Output
0	0	0
0	1	1
1	0	1
1	1	0



encrypts data one bit at a time

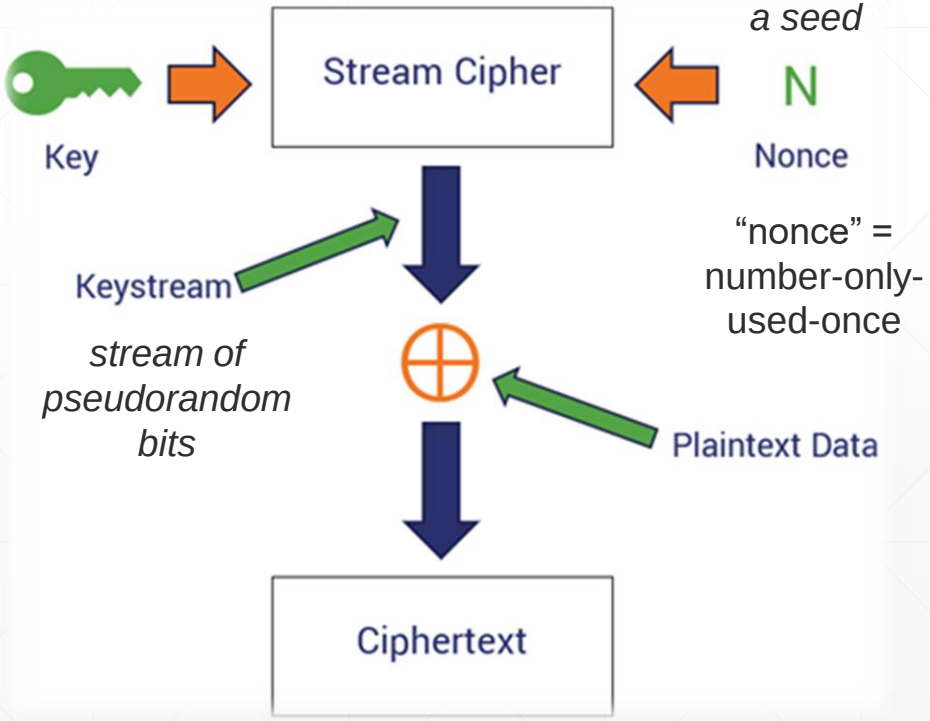
1 Introduction to Stream Cipher

- In stream cipher, one byte is encrypted at a time while in block cipher N bits are encrypted at a time.
- *Benefit : usually simpler & faster*

the water/data flow

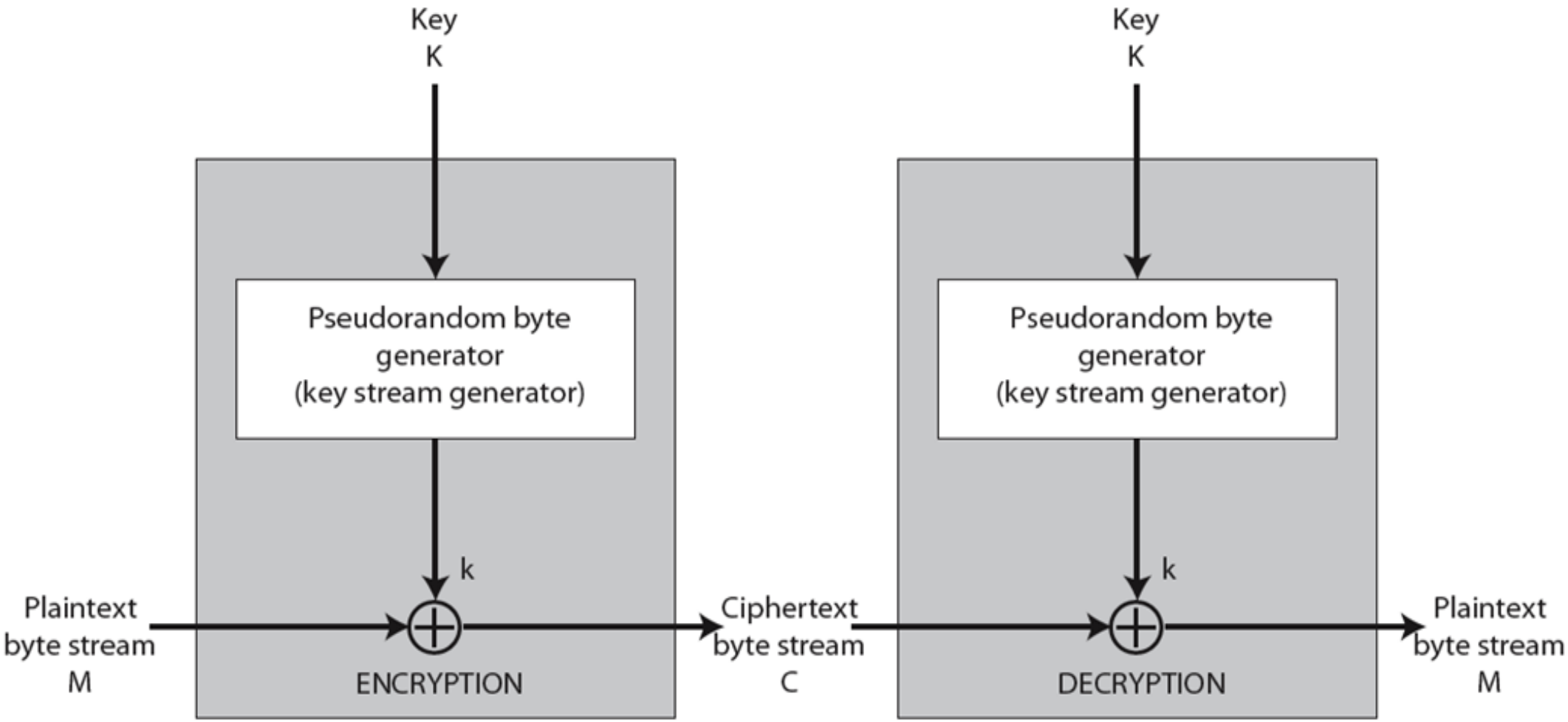
Two types of stream ciphers

1. ***Synchronous stream ciphers*** (aka key auto-key, or **KAK**) — These types of ciphers generate keystreams independently of any previous plaintext or ciphertexts.
2. ***Self-synchronizing stream ciphers*** (aka asynchronous stream ciphers, ciphertext autokey or **CTAK**) — These ciphers, on the other hand, rely on previous ciphertext bits to generate keystreams.



encrypts data one bit at a time

2 Stream Cipher Structure



3 RC4 Stream Cipher

- RC4 is an example of a modern symmetric-key stream cipher. It was developed in 1987 by Ron Rivest.
- For RC4, stream combinations are done on byte-length strings of plaintext. 256 bytes of memory are required for the state array.

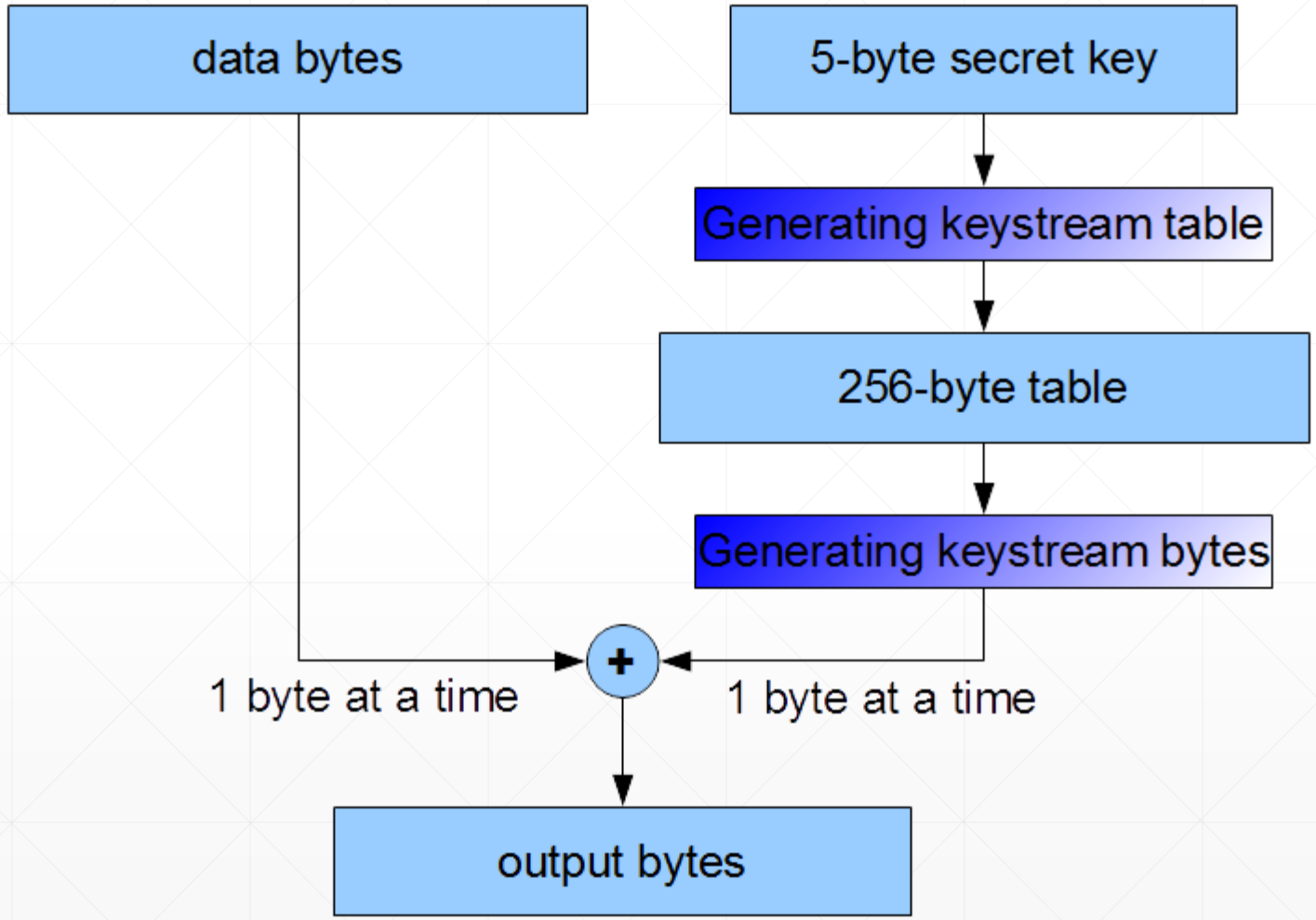
3 RC4 Stream Cipher

- Keystream Initialization

```
for i from 0 to 255
    T[i] := i
endfor
x_temp := 0
for i from 0 to 255
    x_temp := (x_temp + T[i] + K[i mod k_len]) mod 256
    swap(T[i], T[x_temp])
endfor
```

- Keystream Generation

```
p1 := 0
p2 := 0
while GeneratingOutput
    p1 := (p1 + 1) mod 256
    p2 := (p2 + T[p1]) mod 256
    swap(T[p1], T[p2])
    send(T[(T[p1] + T[p2]) mod 256])
endwhile
```



http://www.crypto-it.net/eng/symmetric/rc4.html

3 RC4 Stream Cipher

1. Key-Scheduling Algorithm

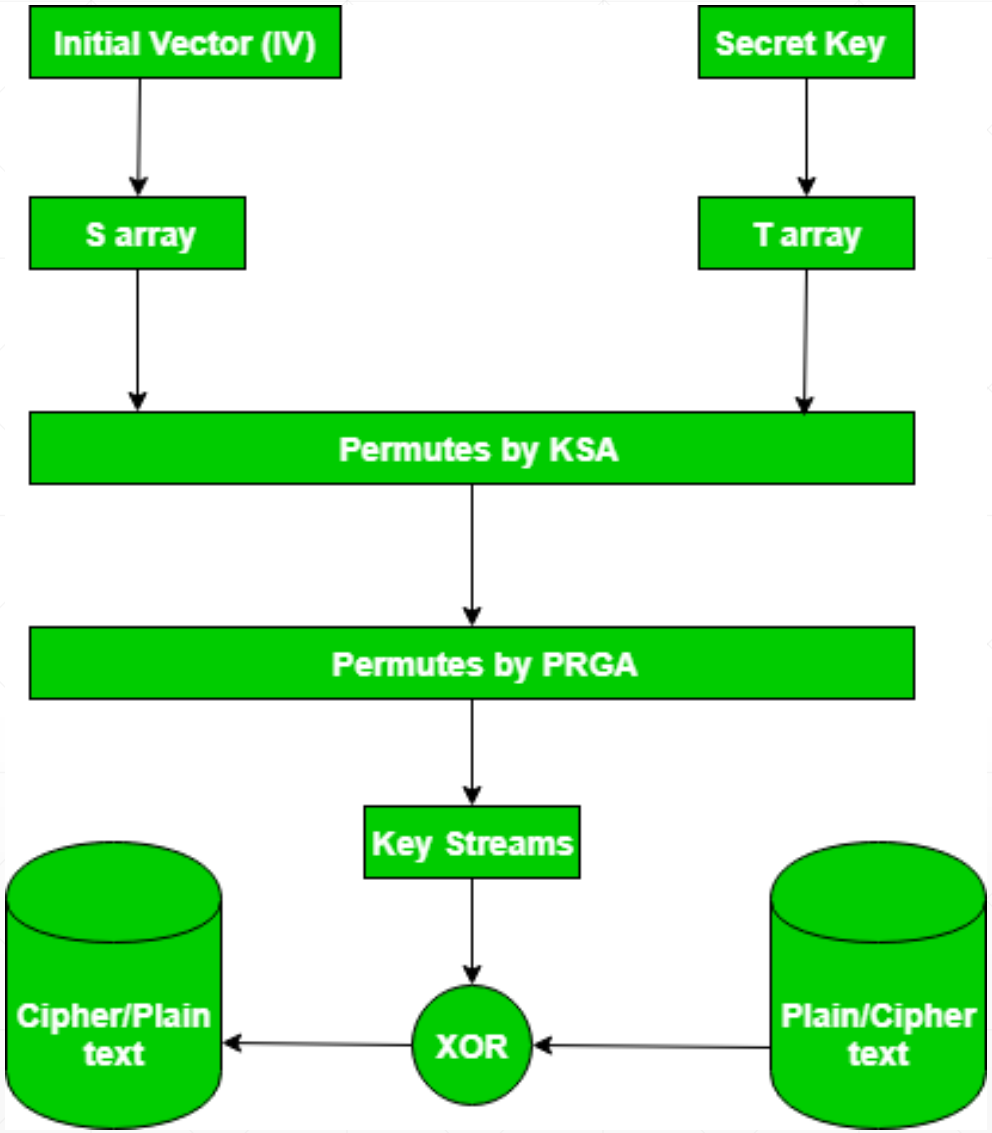
2. Pseudo random generation algorithm (Stream Generation):

3. Encrypt using X-Or()

Example:

```
RC4 Encryption
10011000 ? 01010000 = 11001000

RC4 Decryption
11001000 ? 01010000 = 10011000
```



https://www.geeksforgeeks.org/rc4-encryption-algorithm/

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THANK YOU !