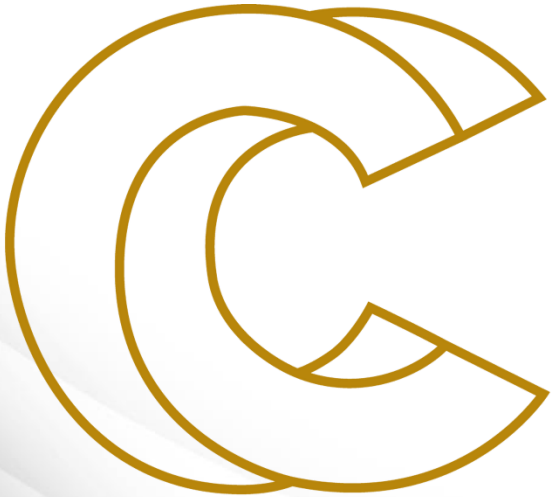

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GPU Assisted Brute Force Cryptanalysis of GPRS, GSM, RFID, and TETRA

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Lesson 2: Introduction to Stream Ciphers

The Unbreakable Cipher

- Generate a very long sequence of ***random*** bits (one-time pad)
- **Encryption:** XOR the plaintext and the one-time pad to get the ciphertext
- **Decryption:** XOR the ciphertext and the one-time pad to get the plaintext

Plaintext	0101011110010 01……
One-time pad	1011110101101 01……
Ciphertext	1110101011111 00……

Lesson 2: Introduction to Stream Ciphers

The Unbreakable Cipher

- Perfect secrecy: Ciphertext provides no information about plaintext.
- Instead of working with bits, one can work on letters or characters.
- Usually printed on a single page with very small letters (hence the name one-time pad).
- **Problems:**
  - Key is too long
  - Key distribution
  - Randomness
- ***Stream ciphers*** try to achieve the one-time pad like security by generating *pseudo-random keystream* from a short key

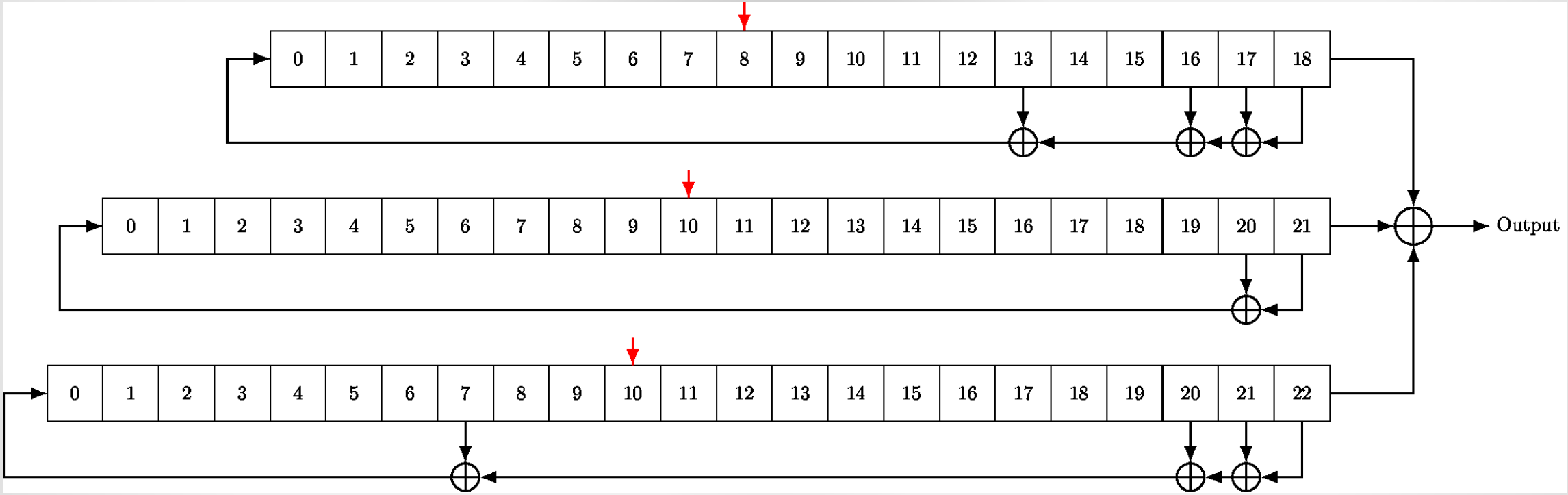
Lesson 2: Introduction to Stream Ciphers

Symmetric Key Cryptography

- Symmetric key cryptosystems are classified as ***block ciphers*** and ***stream ciphers***:
  - ***Block Ciphers*** operate on large blocks of plaintext data with a fixed transformation
  - ***Stream Ciphers*** operate on individual plaintext digits with a time varying transformation
- Contrary to a block cipher, a stream cipher has a (sort of) memory (the internal state) as it processes the plaintext.

Lesson 2: Introduction to Stream Ciphers

Example: A5/1 Stream Cipher (2G Standard)



Next lecture

KASUMI Block Cipher

- KASUMI block cipher is a 3G encryption standard
- Its modified version A5/3 is used in 2G communications

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Thanks!

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