Lecture 4

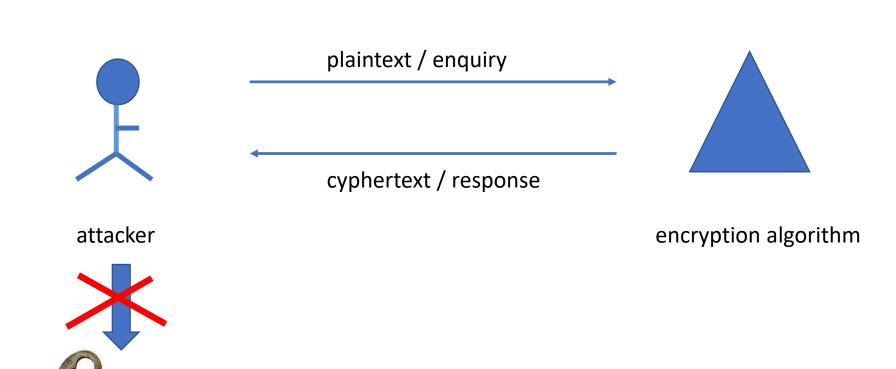
Requirements

- Two requirements for secure use of symmetric encryption:
 - a strong encryption algorithm
 - a secret key known only to sender / receiver

$$Y = \mathsf{E}_{\kappa}(X)$$
$$X = \mathsf{D}_{\kappa}(Y)$$

- assume encryption algorithm is known
- the security of symmetric encryption depends on the secrecy of the key
- implies a secure channel to distribute key

A strong encryption algorithm



Secure Encryption Scheme

Unconditional security

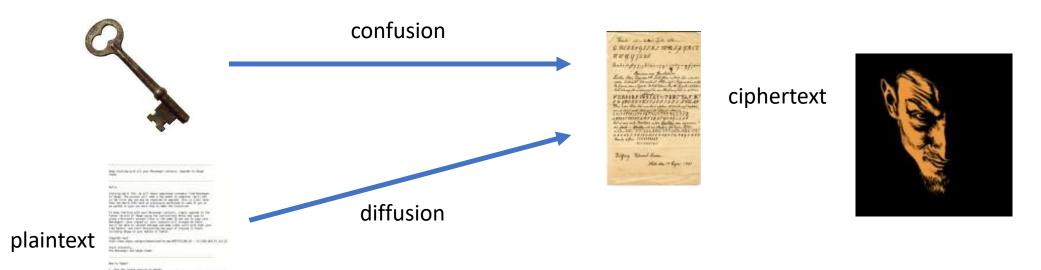
 no matter how much computer power is available, the cipher cannot be broken since the ciphertext provides insufficient information to uniquely determine the corresponding plaintext

Computational security

- the cost of breaking the cipher exceeds the value of the encrypted information;
- or the time required to break the cipher exceeds the useful lifetime of the information

Desired characteristics

- Cipher needs to completely obscure statistical properties of original message
- more practically Shannon suggested combining elements to obtain:
 - Confusion how does changing a bit of the key affect the ciphertext?
 - Diffusion how does changing one bit of the plaintext affect the ciphertext?



Ways to achieve

- Symmetric Encryption:
 - substitution / transposition / hybrid
- Asymmetric Encryption:
 - Mathematical hardness problems that are efficient to compute in one direction, but inefficient to reverse by the attacker
 - Examples: Modular arithmetic, factoring, discrete logarithm problem, Elliptic Logs over Elliptic Curves

Project

• TA Name: Lin, Yu

• Email: Yu.Lin@ttu.edu

- Form a group (no submission)
 - •The project will be assigned as a group project. Six students will be considered a group for a project. Here is the link to enter your project group member names.

FALL 2023 CS5342 PROJECT GROUP NAMES.xlsx

- •It is recommended that one person in the group fills in the form to avoid multiple entries and submits project files on Blackboard. If you cannot get a group, contact the TA.
- Deadline to submit your group members is 11:59 PM on Sept 8th, 2023