Lecture 4

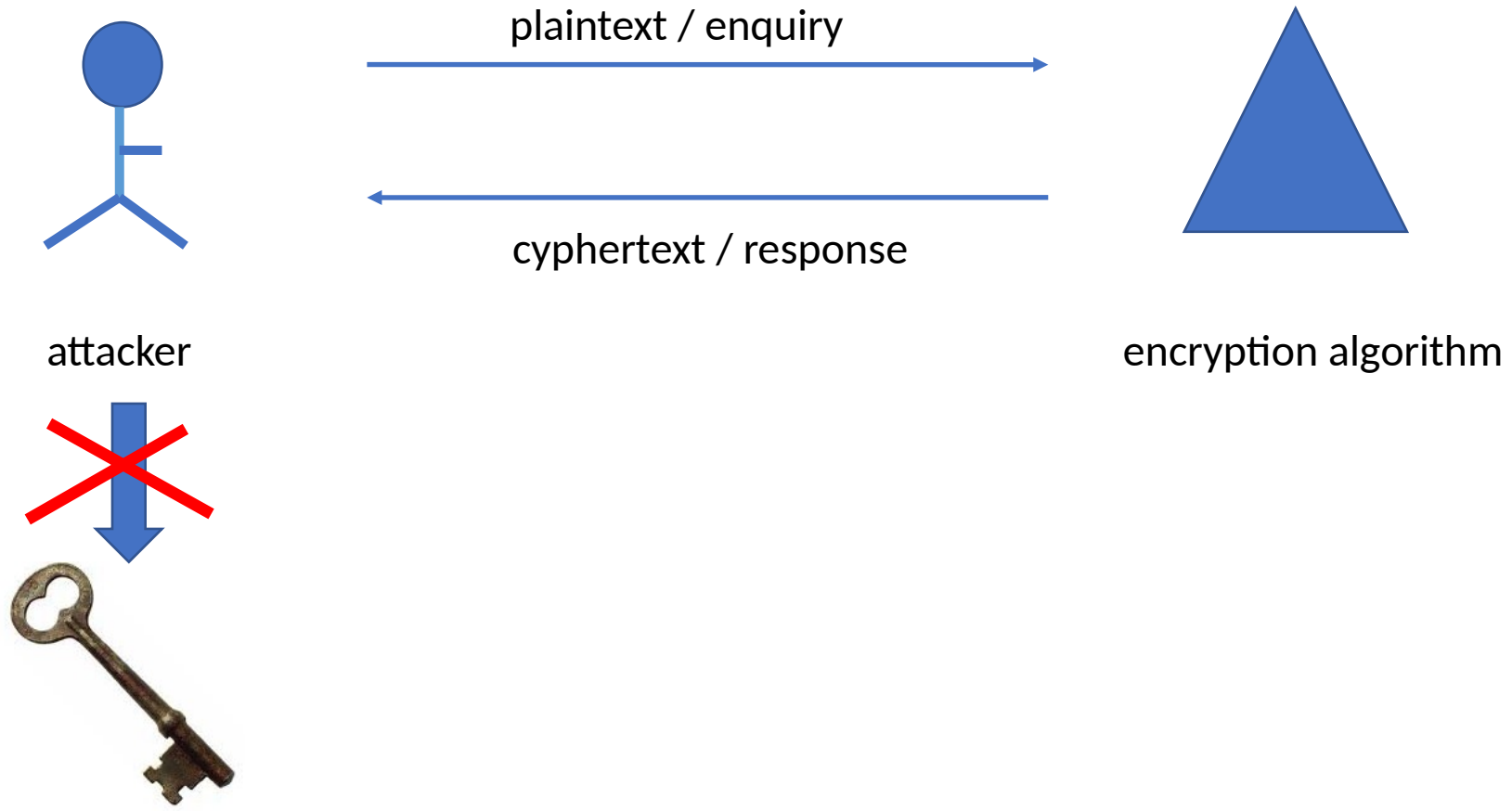
Requirements

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

  $Y = E_K(X)$

  $X = D_K(Y)$
- 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

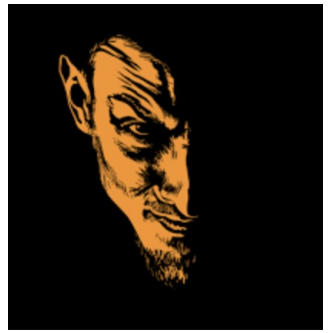
- **Unconditional security**
  - no matter how much computer power is available, the cipher cannot be broken since the ciphertext provides insufficient information to uniquely determine the corresponding plaintext
- **Computational security**
  - the cost of breaking the cipher exceeds the value of the 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?

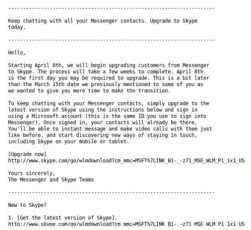
confusion

ciphertext



diffusion

plaintext



Keep chatting with all your Messenger contacts. Upgrade to Skype today.

Hello,

Starting April 8th, we will begin upgrading customers from Messenger to Skype. The process will take a few weeks to complete. April 8th is the first day you may be required to upgrade. This is a bit later than the March 15th date we previously mentioned to some of you as we wanted to give you more time to make the transition.

To keep chatting with your Messenger contacts, simply upgrade to the latest version of Skype using the instructions below and sign in using a Microsoft account (this is the same ID you use to sign into Messenger). Once signed in, your contacts will already be there. You'll be able to instant message and make video calls with them just like before, and start discovering new ways of staying in touch, including Skype on your mobile or tablet.

[Upgrade now] http://www.skype.com/go/wlmdownload?cm_mmc=MSFTVLINK_81-_-271_MSE_WLM_P1_1x1_US

Yours sincerely,
The Messenger and Skype Teams

New to Skype?

1. [Get the latest version of Skype].
http://www.skype.com/go/wlmdownload?cm_mmc=MSFTVLINK_81- -271 MSE WLM P1 1x1 US

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