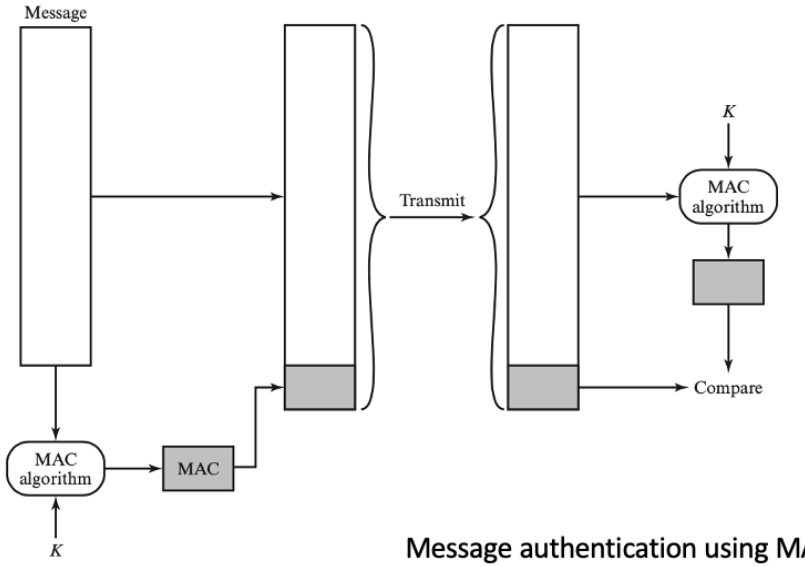
Lecture 15

Message Authentication

Message authentication

- message authentication is concerned with:
  - protecting the integrity of a message
  - validating identity of originator
  - non-repudiation of origin (dispute resolution)
- then three alternative functions used:
  - message encryption - symmetric
  - message authentication code (MAC)
  - digital signature



Message authentication using MAC

Message encryption

- Symmetric message encryption by itself also provides a measure of authentication
- if symmetric encryption is used then:
  - receiver knows sender must have created it
  - since only sender and receiver know key used
  - know content cannot be altered

Homework 1 questions

- Q1: Symmetric Block Cypher provides authentication and confidentiality
  - Ans: True

Message encryption

- if public-key encryption is used:
  - encryption provides no confidence of sender
  - since anyone potentially knows public-key
  - so, need to recognize corrupted messages
  - however, if
    - sender **signs** message using their private-key
    - then encrypts with recipients' public key
    - have both secrecy and authentication
  - but at cost of two public-key uses on message

Reasons to avoid encryption authentication

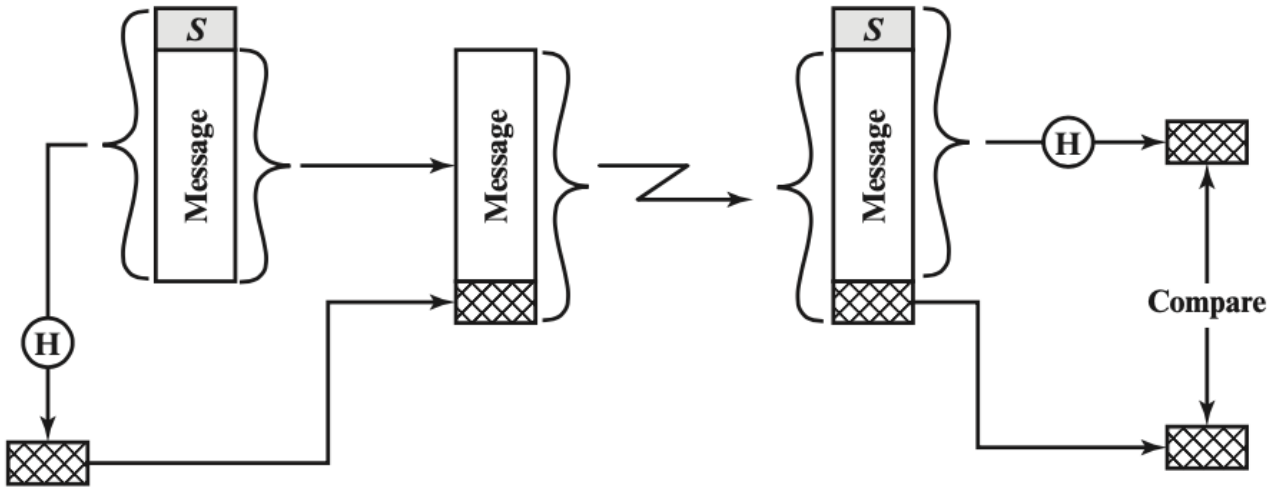
- Encryption software is quite slow
- Encryption hardware costs are nonnegligible
- Encryption hardware is optimized toward large data sizes
- An encryption algorithm may be protected by a patent

Hash Function

Hash functions

- Hash function: h = H(M)
  - M can be of any size
  - h is always of fixed size
  - Typically, h << size(M)

One use case - using hash function



(c) Using secret value

- Initialization: A and B share a common secret, S_{AB}
- Message, M
- A calculates $MD_M = H(S_{AB} || M)$
- B recalculates MD'_M, and check
- $MD'_M = MD_M$

This scheme cannot provide authentication.