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Message Authentication

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CSE565: Computer Security

Hash Function

- Hash function (H)
  - accepts a variable-length block of data (M) as input and produces a fixed-size hash value

$$\mathbf{h=H(M)}$$

- Good hash functions
  - evenly distributed
  - apparently random

Cryptographic Hash Functions

- Hash functions needed for security applications
- Computationally infeasible:
  - (given h) to find x s.t. H(x)=h
    - one-way property
  - (given x) to find y s.t. H(y)=H(x)
    - weak collision resistance
  - to find any x,y s.t. H(y)=H(x)
    - strong collision resistance

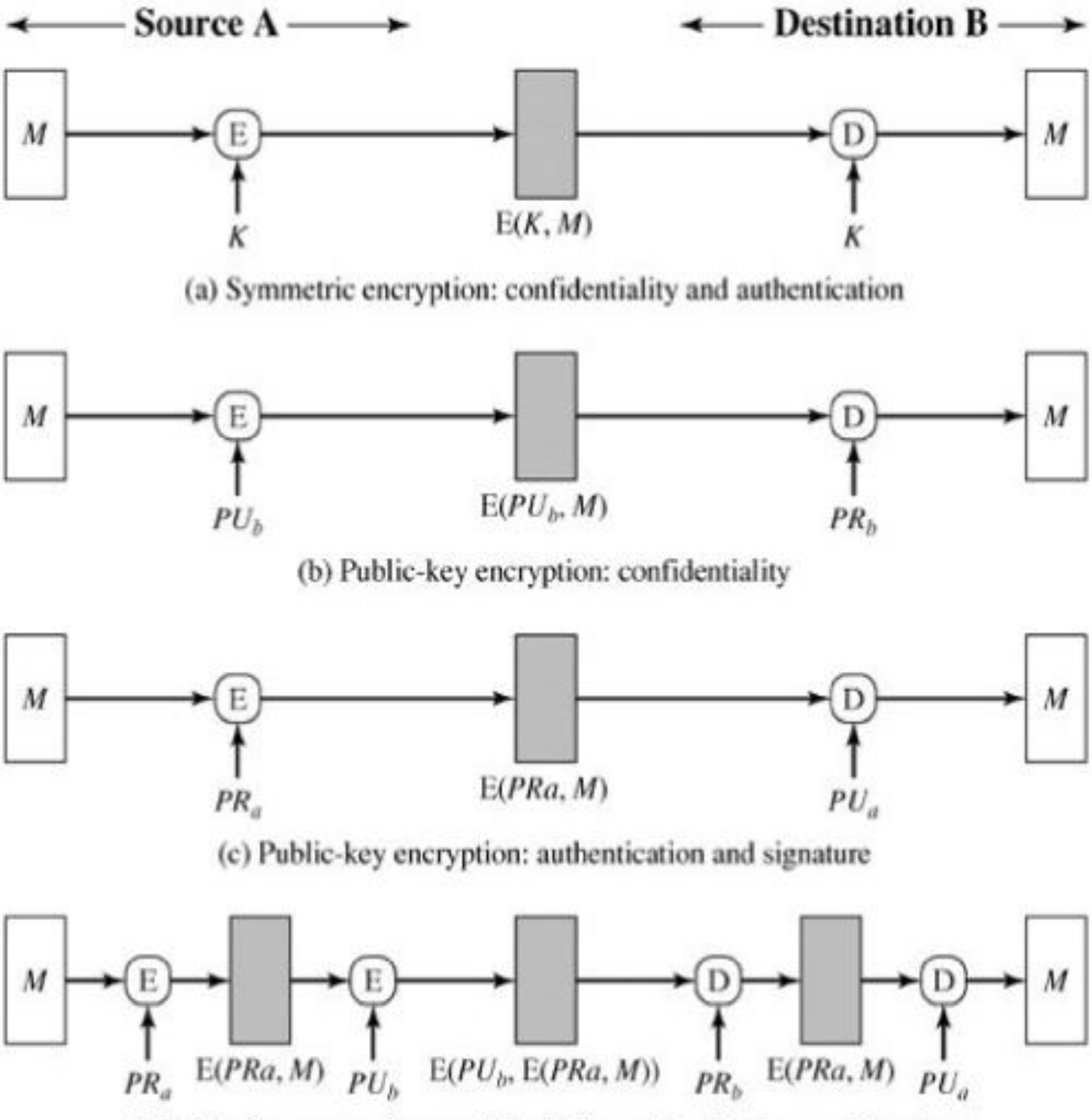
Applications

- Message Authentication
- Digital Signatures
- Other applications
  - one-way password file
  - intrusion detection
  - virus detection
  - pseudorandom number generator
  - etc.

Message Authentication

- Message authentication
  - a mechanism or service used to verify the integrity of a message
    - it assures that data received is exactly as sent
    - the purported identity of the sender is valid.
    - non-repudiation (dispute resolution)
- Message digest – Hash function value
- Techniques used
  - encryption
  - secure hash function.
  - message authentication code (MAC)

Message Encryption



(a) Symmetric encryption: confidentiality and authentication

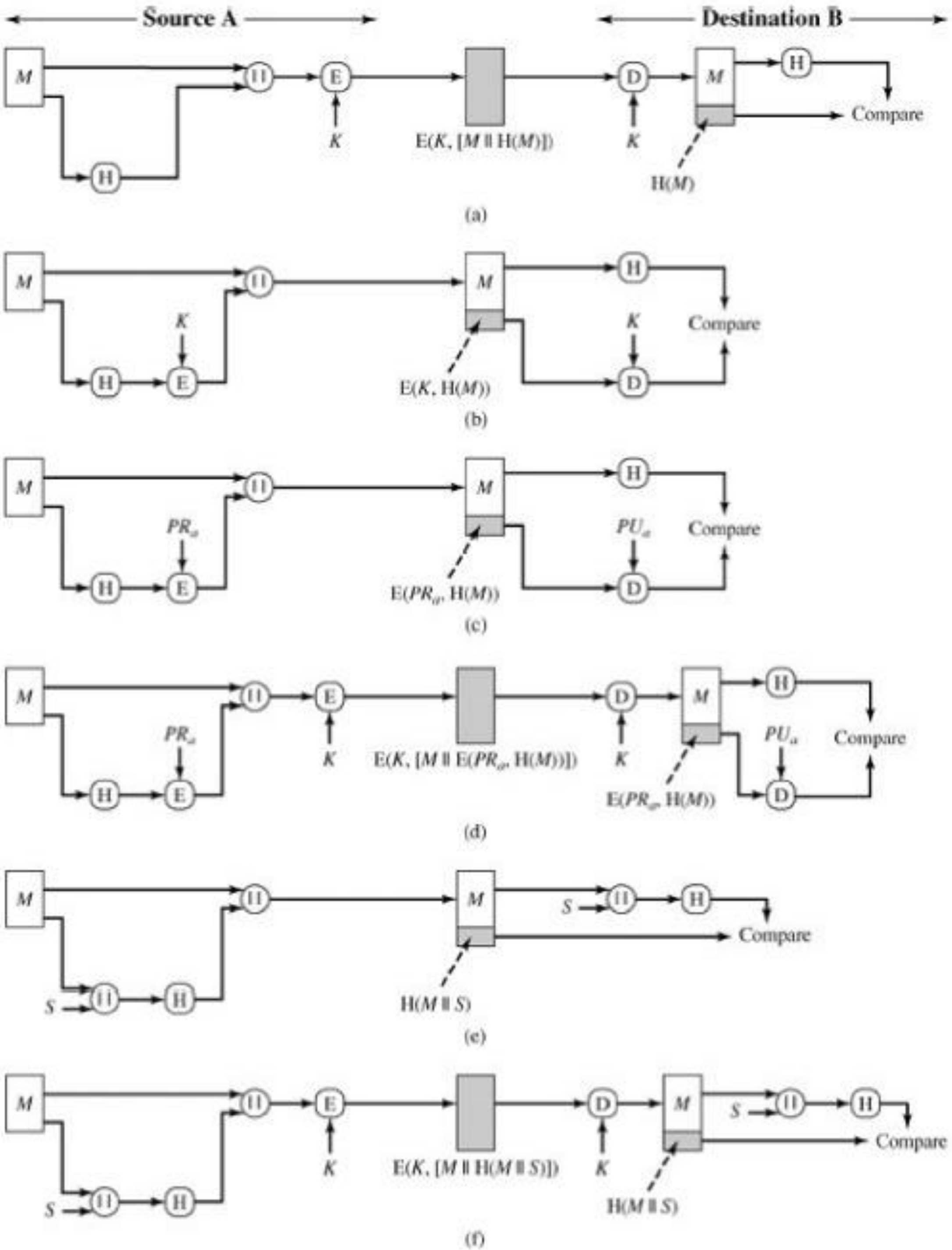
(b) Public-key encryption: confidentiality

(c) Public-key encryption: authentication and signature

(d) Public-key encryption: confidentiality, authentication, and signature

Why not PU_b then PR_a?

Secure Hash Function



Simple Hash Functions

- XOR
- RXOR
- Technique proposed by National Bureau of Standards

Discussed in the class