Digital Signatures

Objectives

- Features of hand-written signatures in Digital World
- Ensure hardness of forgery

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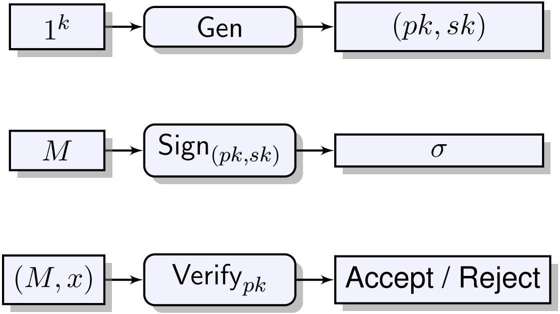
  - Security: Hard to forge.

Signature Schemes

Signature Scheme (Gen, Sign, Verify)

Required Properties:

- Correctness
- Unforgeability



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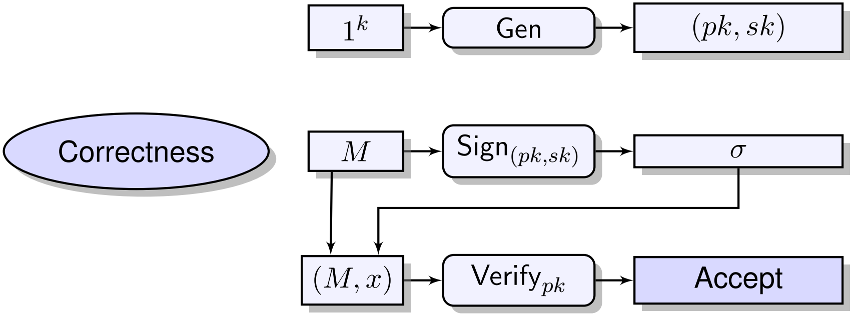
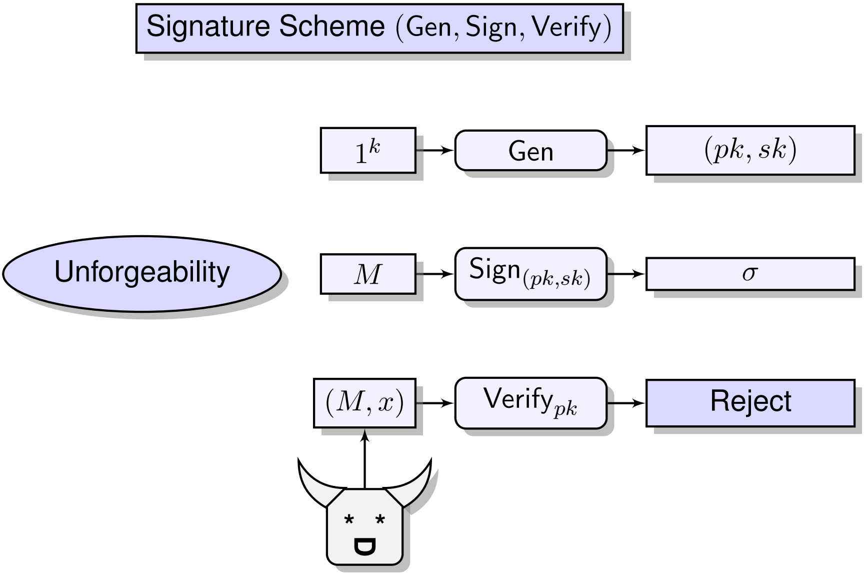


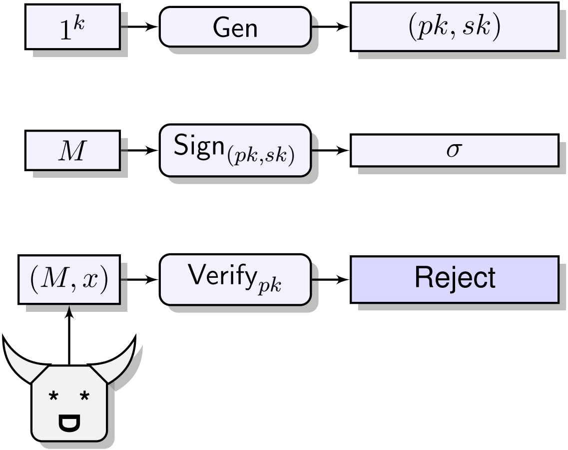
Signature Schemes



Signature Schemes

Signature Scheme (Gen, Sign, Verify)

Unforgeability:
Must output forgery for a message for which the attacker did not request the signature.



Signature Schemes Designs: RSA Full Domain Hash

- **Public Functions** A hash function $H : \{0,1\}^* \to \mathbb{Z}_N^*$
- **Keygen:** Run RSA.Keygen. $pk = (e, N)$, $sk = (d, N)$.
- **Sign**: Input: sk, M. Output
  $\sigma = \mathsf{RSA.Dec}(sk, H(M)) = H(M)^d \mod N$

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note

A hash function takes strings of arbitrary length as input and produces a fixed length output. For cryptographic hash functions, given a z, it is very expensive to find x such that $H(x) = z$