LABs

DI-FCT-UNL
Computer Systems Security
Segurança de Sistemas e Redes de Computadores
2013/2014

Password-Based Encryption (PBEncryption)

LABs

Tópicos

- Symmetric Algorithms and Key Generation
- Password-Based Encryption
- PBEncryption Scheme and Parameters
  - Salts + Counters
  - PBEEncryption with and without parameters

Key Generation for Symmetric Encryption

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- Key Generation Problem / Key Generators
  - Allow the dynamic generation of keys (with pseudo-random properties)

  Key Interface (base interface implemented and extended by all objects related to cryptographic keys, including symmetric keys (SecretKeySpec)

  - Key.getAlgorithm() // algorithm for which the key is generated
  - Key.getEncoded() // key enconding
  - Key.getFormal() // key format

Geração de chaves / criptografia simétrica

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- javax.crypto.KeyGenerator Class (class implementing the key generator factory)
  - KeyGenerator.getInstance() // expliciting the algorithm
    - Ex: KeyGenerator generator= KeyGenerator.getInstance("AES, "BC");
  - KeyGenerator.Init() // Init. , Key Size
  - KeyGenerator.generateKey() // Generate

  obj of type: javax.crypto.SecretKey

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Password-Based Encryption (PBE)

- Key Generation from "*user-friendly*" (passwords, or seeds)
  - "Encryption with "something" thus user Knows
- Pros: Key generated for use without the exposition of the key itself
- But ... How strog are tese keys ?
  - Problem of Shared Secrets / Shared PWDs, Seeds, etc
  - Ex: A Strong Key (ex., AES 256 bits) will not be so strong if the inout password is "sporting" !!!!
    - Similar to PWD dictionary Attacks !

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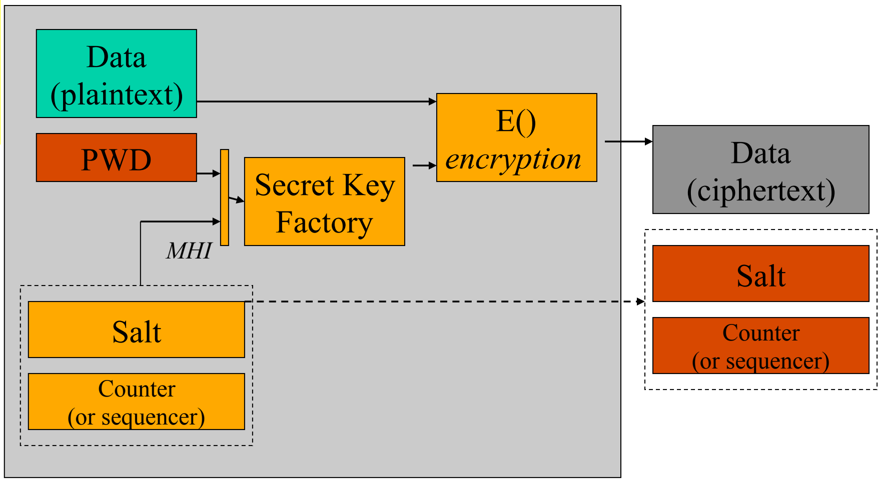
PB Encryption (PBE) in a Nutshell

- Essentially a primitive to encrypt/decrypt using Passwords
  - The PWD is used as the seed to generate a Symmetric Key
  - and the generated key is implicitly used for encryption/decryption

- Standardization for PBE Schemes
  - PKCS #5, PKCS#12
  - S/MIME Scheme (RFC 3211)

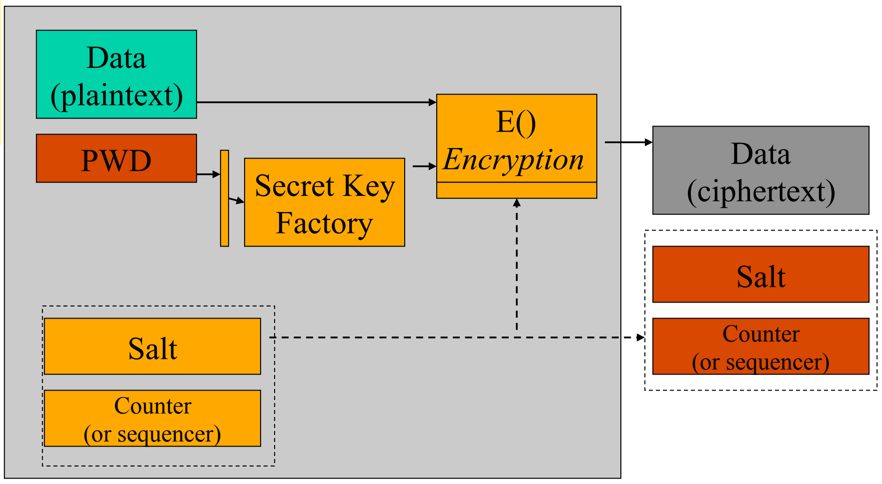
  Others
  - PGP Scheme for session keys
    (using ANSI X9.17 + CAST 128 e X.12.17)

PBE Encryption Scheme



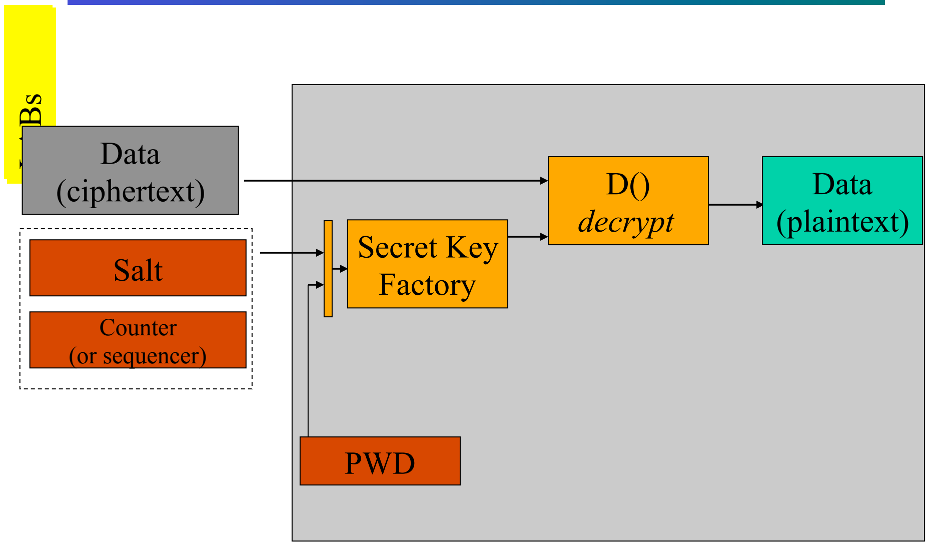
MHI-Mixing hashing pwd input: PBEKeySpec(pwd,salt,cont)
Esquema de cifra sem parametros

PBE Scheme (alternative)

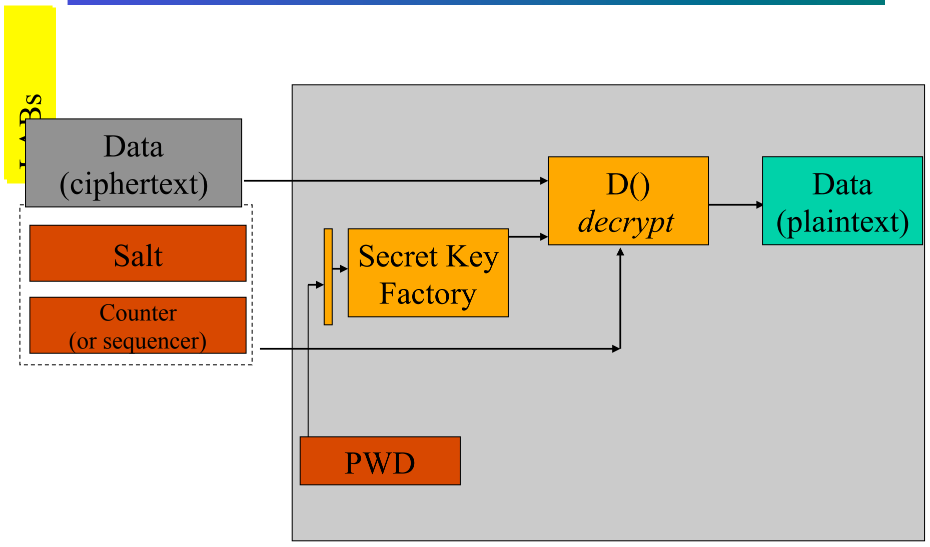


MHI-Mixing hashing pwd input: PBEKeySpec(pwd)
Esquema de cifra com geração da chave final com parametros

Esquema de referência para decifra com PBE



Esquema alternativo para decifra com PBE



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PBE na framework Java JCE

- PBEParameterSpec, PBEKeySpec:
  - Classes for Key Generation and Parameters
- SecretKeyFactory: factory to generate symmetric Keys
- Cipher.getInstance: Instantiation of the PBE parameterization (ciphersuite) in the PBE scheme to use

- See examples
  - PBEWithParamsExample()
  - PBEWithoutParamsExample()

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Hands-On w/ PBE Schemes

- See the Exercices (Lab)

- See ListAlgorithms (Lab 1) and see the supported PBE Schemes in your Java Framework