TripleDES Implementation

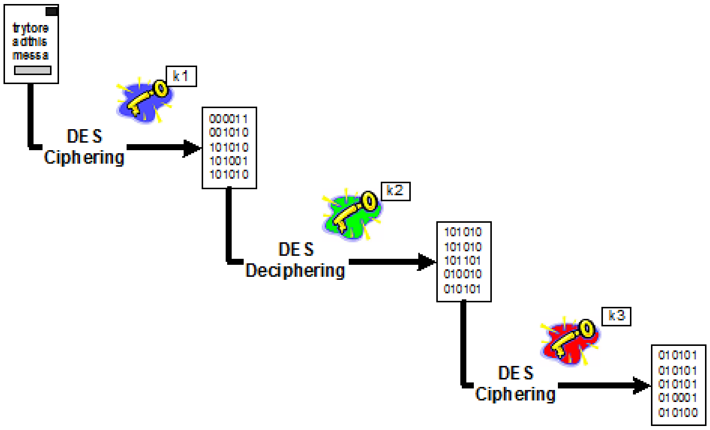
Objective:

The goal of the exercise is to get familiar with the API of javax.crypto. In order to so, you will have to implement 3DES in EBC and CBC mode.

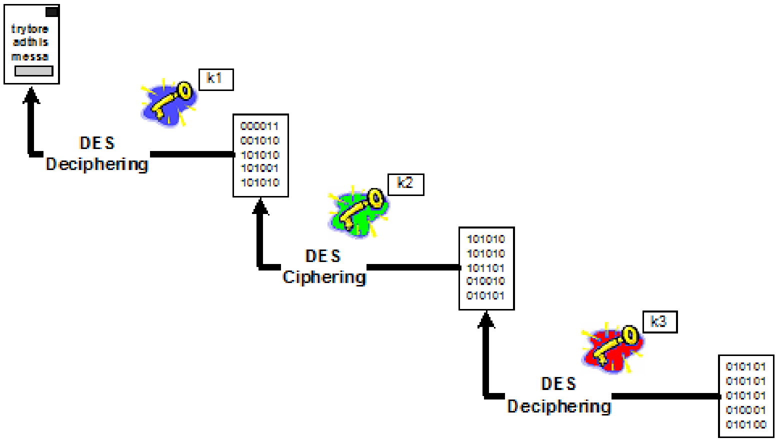
You will have to use the

1. Reminder

3DES is based on the symmetric algorithm **DES**.
3DES Encryption is based on the following schema:



Decryption is based on the following schema :



2. DES encryption

Generate 3 DES keys

[*javax.crypto.KeyGenerator*] and [*javax.crypto.SecretKey*]

1. Generate 3 DES keys and store them into the following files: *DESKey1, DESKey2, DESKey3.*

Hint: *look at javax.crypto.KeyGenerator and its methods KeyGenerator ::getInstance(String algorithm) et KeyGenerator::generateKey(). The algorithm to be used here is « DES ».*

In EBC mode

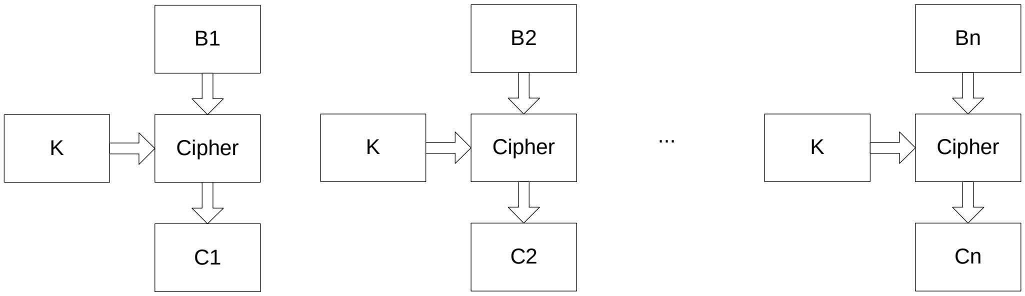


Figure 1: EBC Block Cipher

Ciphering - **[***javax.crypto.Cipher***]**

1. DES ciphering with the first key
2. DES deciphering with the second key
3. DES ciphering with the third key

Deciphering- [*javax.crypto.Cipher*]

1. DES decipehering with the thrid key
2. DES cipehring with the second key
3. DES deciphering with the first key

Hint:
Cipher Name is "DES" By default, "DES" implements DES/EBC.
Use NoPadding as padding mechanism.

3. In CBC mode

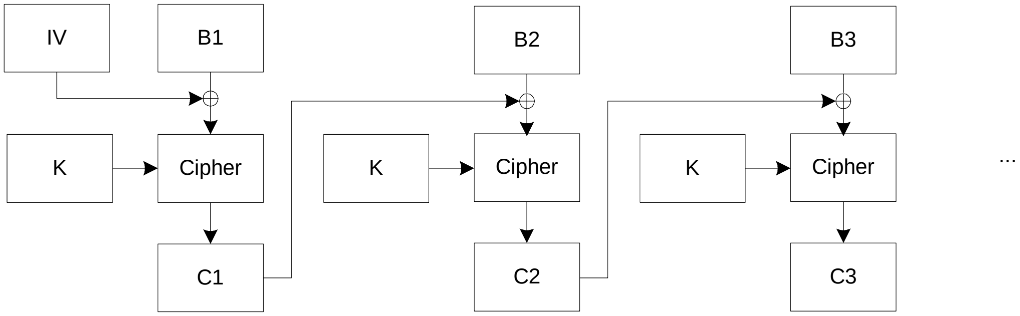


Figure 2: CBC Block Cipher

Ciphering
[*javax.crypto.Cipher***] et [***javax.crypto. AlgorithmParameterSpec***]**

1. Create anInitialisation Vector
2. DES Ciphering with the first key
3. DES deciphering with the second key
4. DES ciphering with the third key

Deciphering
[*javax.crypto.Cipher***]**

1. Reuse the SAME IV
2. DES deciphering with the third key
3. DES ciphering with the second key
4. DES deciphering with the first key

Hint :
Cipher engine can be initialized with an object of type
javax.crypto.AlgorithmParameterSpec.
Use NoPadding.

RSA Signature Implementation

Objective:

The goal of the exercise is to get familiar with the API of java.security. In order to so, you will have to implement RSA signature and encryption.

1. Generation of a public/private key pair

[java.security.KeyPairgenerator]

In method *Entity::Entity()*

Generate a keypairgenerator object of type java.security.KeyPairgenerator for RSA.
Generate a keypair public/private.
Store them in class members Entity::thePublicKey and Entity::thePrivateKey.

2. RSA Signature

Signature[java.security.Signature]

In method *Entity::sign()*
Create an signature object java.security.signature for « MD5withRSA ».
Initialise the object with the private key in SIGN_MODE.
Sign

Check signature [java.security.Signature]

In method *Entity::checkSignature()*
Create an objet java.security.Signature
Initialise it in VERIFY_MODE mode with the public key
Check the signature.

3. Implementation of your own RSA signature

Signature

In methode *Entity::mySign()*
Implement your own signature using

- javax.crypto.Cipher with RSA in ENCRYPT_MODE mode
- java.security.MessageDigest with MD5.

Check signature

In methode *Entity::myCheckSignature()*
Implement your own signature verification using

- javax.crypto.Cipher with RSA in DECRYPT_MODE mode
- java.security.MessageDigest with MD5

4. RSA Ciphering

Warning : RSA implementation by SUN does not support message greater than 127 bytes.

RSAEncryption

In method *Entity::encrypt()*
Use method *javax.crypto.Cipher::doFinal()*

RSADecryption

In method *Entity::decrypt()*.
Use method *javax.crypto.Cipher::doFinal()*

Bonus

1. Implement the following protocol between Alice and Bob

Alice sends her public key to Bob.
Bob generate a DES session key.
Bob encrypts it with Alice’s public key.
Alice decrypts the DES key with her private key.
Alice sends a message to Bob with her session key
Bob decrypts the message with the session key

2. The art of cryptography

A secret message is hidden inside this extract of “The Tragedy of Hamlet, Prince of Denmark” by William Shakespeare. You can find the original text here: http://shakespeare.mit.edu/hamlet/hamlet.1.3.html.
Provide a Java class able to decrypt this message.

2LORD POLONIUS
ZYet here, Laertes! aboard, aboard, for shame!
The wind sits in the shoulder of your sail,
And you are stay'd for. There; my blessing with thee!
And these few precepts in thy memory
See thou character. Give thy thoughts no tongue,
Nor anUy unproportioned thought his act.
Be thou familiar, but by no means vulgar.
Those frieJnds thou hast, and their adoption tried,
Grapple them to thy soul with hoops of steel;
But do nPot dull thy palm with entertainment
Of each new-hatch'd, unfledged comrade. Beware
Of entrance to a quarrel, but being in,
Bear't thaGt the opposed may beware of thee.
Give every man thy ear, but few thy voice;
Take each man's cGensure, but reserve thy judgment.
Costly thy habit as thy purse can buy,
But not express'd in fancy; rich, not gaudy;
For the apparel ofDt proclaims the man,
And they in France of the best rank and station
Are of a most select and generous chief in that.
Neither a borrowXer nor a lender be;
For loan oft loses both itself and friend,
And borDrowing dulls the edge of husbandry.
This above all: to thine ownself be true,
And it must follow, as the night the day,
Thou caTnst not then be false to any man.
Farewell: my blessing season this in thee!
LAERTES
Most humblCy do I take my leave, my lord.
LORD POLONIUS
The tEime invites you; go; your sRervants tend.
LAERTES
FareGwell, Ophelia; and remember well
What IB have said to you.
OPHELIA
'TiIs in my memoFry lock'd,
And you yourseClf shall keep the kWey of it.

Encryption key: 6132342135343721393631633233346221233132

3. Encrypted LOLCat

Decrypt the message embedded in Challenge2.jpg.