SICUREZZA NELLE RETI   SICUREZZA DEI SISTEMI SOFTWARE (6/9 CFU)

Laurea Specialistica in Ingegneria Informatica   ***Laurea Magistrale in Ingegneria Informatica***

SECURITY IN NETWORKED COMPUTING SYSTEMS

Computer Engineering

15 June 2015

EXERCISE NO. 1   #MARKS: 10

With reference to the Diffie-Hellmann key establishment scheme,

1. Describe the scheme;
2. Argue its security with respect to a passive adversary;
3. Argue its security with respect to an active adversary.

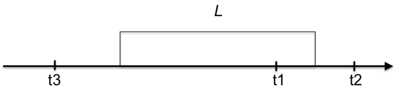
EXERCISE NO. 2   #MARKS: 10

Let us consider an implementation of One-Time Pad (OTP) on *n* bit that makes it a perfect cipher.

1. Let $k_0 = \overbrace{000\ldots000}^{n}$ be a key and m an *n*-bit message. Compute the cipher-text $c = m \oplus k_0$.
2. Is there any advantage, or disadvantage, in removing key k_0 from the set of possible keys?
3. Let us suppose that c = `"The password of my bank account is my wife's birthday"`. Which are the most probable plaintext messages (determine at least two)? Which are the corresponding keys?

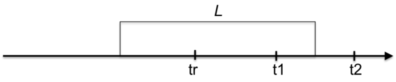
EXERCISE NO. 3   #marks: 10

Let us consider the “simplified” certificate $Cert_A = A, pubK_A, L, \sigma$, with $\sigma = S_{CA}(t)$ and $t = H(A, || pubK_A || L)$, where *A* is the user identifier, $pubK_A$ is the user’s public key, *L* is the validity period, *H* is a collision-resistant hash function and *S* is a secure digital signature scheme.



With reference to the figure on the right, give a motivated answer to the following questions:

1. Is $Cert_A$ valid at time *t* = t1?
2. Is $Cert_A$ valid at time *t* = t2?
3. Is $Cert_A$ valid at time *t* = t3?



With reference to the figure on the right, assume that $Cert_A$ has been revoked at time *t* = tr, give a motivated answer to the following questions:

4. Is $Cert_A$ certainly present in CRL at time *t* = t1?
5. Is $Cert_A$ certainly present in CRL at time *t* = t2?

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SOLUTION

Exercise n.1

See theory.

Exercise n.2

Question 1.

$c = m$

Question 2.

If you remove k_0, than the number of keys become $2^n - 1$. It follows that the number of keys becomes smaller than the number of messages and therefore the resulting cipher is not perfect anymore.

Question 3.

Four possible messages are:

```
The password of my bank account is my wife's birthday
The password of my bank account is my aunt's birthday
The password of my bank account is b4nk-P4ssw0rd12345
Love of my life you left me. You have broken my heart
```

The respective keys are obtained by computing $k_i = c \oplus m_i$.

Exercise n. 3

1: valid
2, 3: invalid as outside the validity interval

4: the certificate is certainly in CRL

5: the certificate may not be in CRL because, it is not valid anymore, it might have been removed to shorten the CRL itself.

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