Security Properties, Advanced Security Properties and Properties Composition

Design and Verification of Security Protocols and Security Ceremonies

Programa de Pós-Graduacão em Ciências da Computacão
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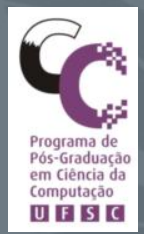

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- Cryptography is used to achieve some goal.

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  - Provide an end-to-end encryption channel;
  - Authenticate peers;
  - Enable secure money transfer;
  - Provide anonymity;
  - Authenticate data;
- Usually are a claim of designers that must be verified.

Building Blocks

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- Advanced primitives;
- Other security protocols;

Standard Security Properties

- Confidentiality;

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- Integrity;

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- Confidentiality;
- Integrity;
- Timeliness;

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- Confidentiality;
- Integrity;
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- Authentication.

Advanced Security Properties

- Forward secrecy;

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- Etc...

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- Can be provided using symmetric cryptography or asymmetric cryptography;
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- Asymmetric cryptography separate confidentiality from authentication.

Confidentiality Examples

- A sends to B message M encrypted with shared key Kab;

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- A sends to B message M encrypted with shared key Kab;
- A sends to B message M encrypted with B's public key.

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- On itself is a weak property.

Integrity Examples

- A sends to B the hash of message M;

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- A sends to B the authentication code of message M with Key Kab.

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- Allows for peers to check the liveness of other peers.

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- Mutual Agreement - A runs the protocol with B but B does authenticate A.

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- The two facets of authentication are most clearly separate in protocols that rely on asymmetric cryptosystems;
- Even when it is proved beyond a reasonable doubt that a principal sent a message, responsibility and credit may not follow.

Views on responsibility and credit

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- Once a protocol has set up a channel that speaks for a principal, it is easy to use the channel for establishing credit whenever the need arises;
- Establishing credit is a matter of prudence.

Analysis of Authentication

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- When an attacker is included as protocol participant, the attacker is not forced to follow the rules of the protocol, and may attempt to get undue credit. A proof that concerns such an attacker can show that a protocol establishes credit.

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- Having both lead to full non-interference among session keys.

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- Can also be achieve by the use of commitments.

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- There are some interesting primitives that achieve availability such as secret-sharing.

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- Can also control the number of times the peer is allowed to do something.

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- The keys are them distributed is such a way that only an agreement can enable decryption.

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- Implementation usually is not done using cryptographic means.

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  - Individual verifiability: a voter can verify that her vote was really counted;
  - Universal verifiability: the published outcome really is the sum of all the votes.

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- Which are the dichotomies you can see between the properties shown today?
- Can you foresee an online activity that you require a property not listed here?

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- Can you give examples of problems/attacks on security protocols that have these properties we shown above?

Discussion

- Can give examples of security protocols that have these properties we shown above?
- Can you give examples of problems/attacks on security protocols that have these properties we shown above?
- How can we avoid problems/attacks on security protocols?

Questions????

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