Security Properties

Design and Verification of Security Protocols and Security Ceremonies

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- Two or more parties are involved;
- Communication is carried over an insecure network;
- 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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- Other security protocols;

Standard Security Properties

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- Etc...

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- Can be provided using symmetric cryptography or asymmetric cryptography;
- Symmetric cryptography is not “clean cut” since it always provide some sort of authentication;
- 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 hash of message M;
- 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.

Timeliness Examples

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- A sends to B the timestamp of the generation time of the messages.

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- Aliveness - A runs the protocol with B;
- Weak Agreement - A runs the protocol with B but B does not authenticate A;
- Non-Injective Agreement - Key exchange;
- Mutual Agreement - A runs the protocol with B but B does not authenticate A.

Two facets of authentication

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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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Views on responsibility and credit

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- There does not seem to be a consensus that an authentication protocol should also establish credit;
- 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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- Honest protocol participants are expected to follow the rules of the protocol faithfully,and not to try to obtain credit for messages that they did not generate themselves. A proof about honest protocol participants may show that a protocol establishes responsibility, but not credit;
- 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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- 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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