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# Information Security for Privacy Protection

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## Abstract

- How and Why our privacy has been leaked out?
- What is a solution to protect our privacy?  
→ Information Security
- Recent research interest on information security to enhance our privacy.

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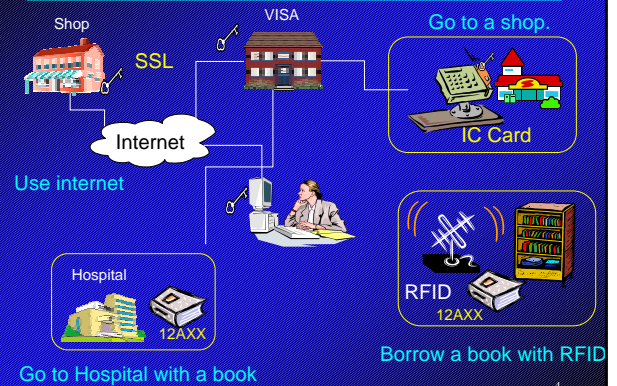
## Outline

- Our life has been digitalized.
- Our privacy has been leaked out.
- Subjects of Information Security.
- Recent research of information security
  - Protect your system even if your key has been stolen
  - Protect your key against electronic consumption
  - Protect your privacy against collusion

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## Our life has been digitalized



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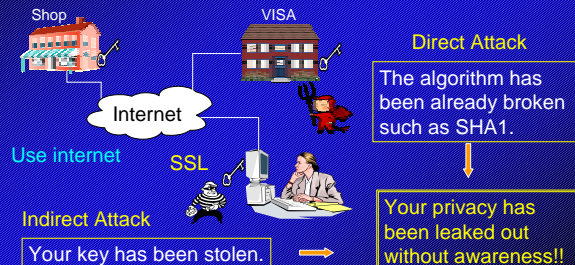


## Our privacy has been leaked out

It seems secure by encryption.

→ Theoretical security analysis is necessary.

Fault tolerance system is required: it stands if a key is stolen.



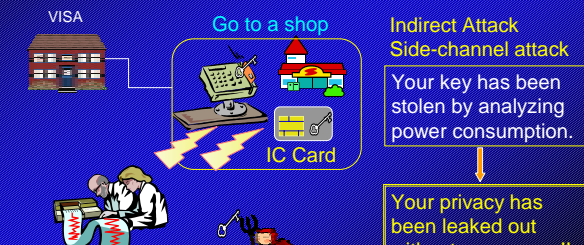
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## Our privacy has been leaked out

It seems secure: IC card, secure number theory, never stolen the card, and face-to-face communication without Internet.

→ Realistic security analysis is necessary: implementation



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## Our privacy has been leaked out

It seems secure through secure channel.  
 ⇒ Anonymity is necessary for protocol.

Shop: Alice Ski No insurance

VISA: Alice needs insurance.

Alice insurance.

Internet

Hospital: Alice Cancer Mild

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Indirect Attack

Your various privacy has been gathered and combined.

Your privacy has been leaked out without awareness!!

## Our privacy has been leaked out

Privacy information has expanded: location, taste, opinion, idea...  
 ⇒ Unlink-ability is necessary for protocol.

She is here!

Hospital: 12AXX

Serial No

12AXX RFID

Borrow a book with an RFID

Go to Hospital with the book

You just have a book with a RFID.

Your simple privacy such as location, idea, taste, etc has been leaked out without awareness!!

## What shall we do?

We need information security !

- Group signature
- E-money
- E-auction
- Fault-tolerance

Secure network modeling  
 analysis the security related with network or software.

Secure electronic protocol  
 provide enhanced secure electronic protocol: anonymity, unlink-ability, lost-key security

Cryptographic basic research  
 analysis security & efficiency  
 Side-channel attack

- mobile agent
- network virus
- RFID security

- Public-key encryption
- Secret-key encryption

## Fault tolerant system-key-evolving system

Minimize the damage when a secret key is lost or broken.

- A secret key is divided into two devices, user and base.
- Key evolution over time is achieved by user and base.
- User and base are exposed repeatedly
- Any user key except those exposed user keys remains secure.

base:  $sbk_0, sbk_t, sbk_{t+1}$

user:  $sk_0, sk_{t-1}, sk_t, sk_{t+1}$

exposed

secure

## Security Integration

Shop: SCA-resistance

VISA: IC Card

Internet

Hospital: Unlinkability, Secure RFID

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RFID

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Provable secure enc., Key evolving enc

Anonymity Group signature

SCA-resistance

## Concluding Remarks

- We have seen how our privacy has been leaked out without awareness.
- We have shown that information security protect our privacy.
- We will give a way that user can control her/his privacy level: sometimes link-ability is fine.
- We will provide the minimum integration that enhance various system security.