Security vs. Privacy:

Revisiting the AAA Fundamentals

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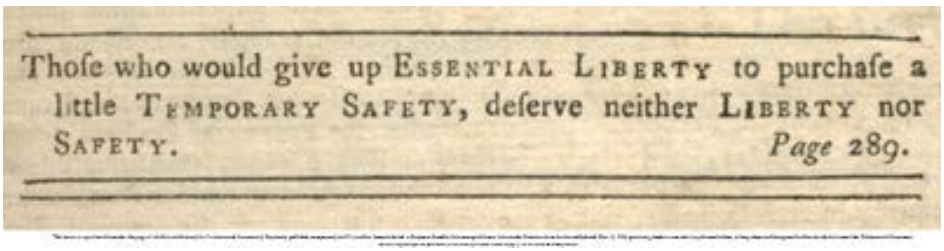
Security & Privacy: Two Fundamental Rights

Universal Declaration of Human Rights, UN, 1948

- **Article 3.**
  *Everyone has the right to life, liberty and **security** of person.*
- **Article 12.**
  *No one shall be subjected to arbitrary interference with his **privacy**, family, home or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks.*


Thoſe who would give up ESSENTIAL LIBERTY to purchaſe a little TEMPORARY SAFETY, deſerve neither LIBERTY nor SAFETY. *Page* 289.

Information System Security (ISS) & Privacy Protection

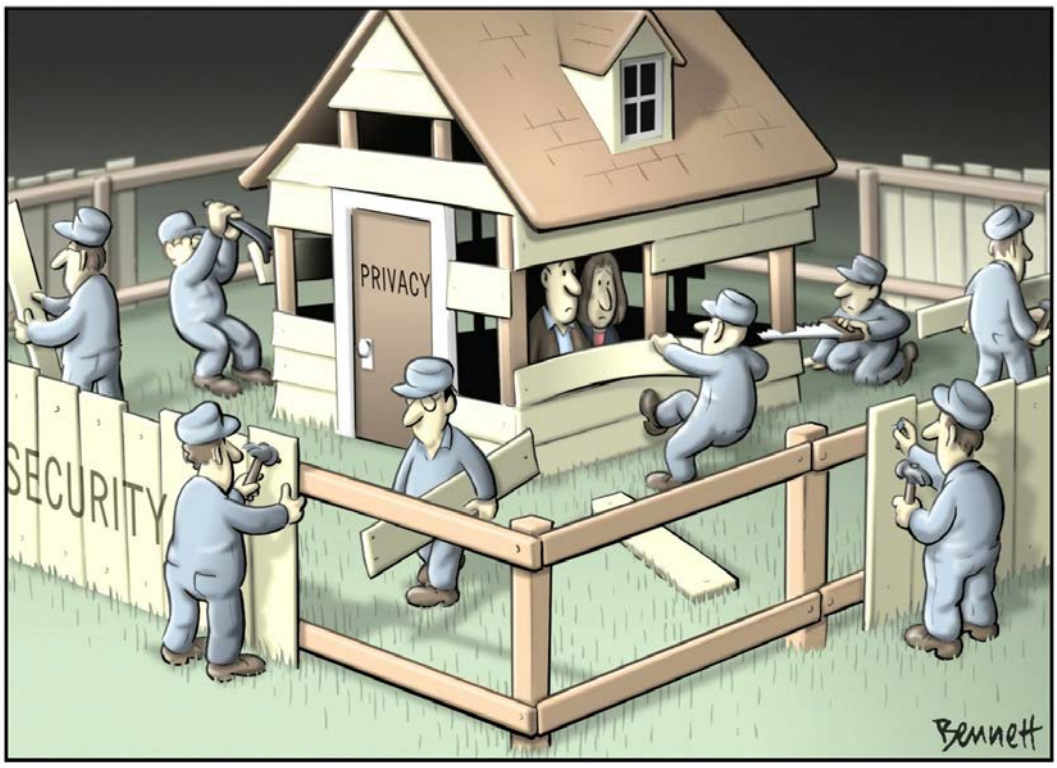
- Privacy Protection = confidentiality of personal information
- Confidentiality : one of the basic security properties (CIA = Confidentiality, Integrity, Availability)

➔ ISS provides the means to protect privacy

  - AAA : Authentication, Authorization, Accounting

- But…

…the devil lies in the details



…the devil lies in the details

- Some security techniques
  - Audit, evidence collection
  - Traceability
  - Strong authentication, …

… are threatening privacy !

➔ Imbalances:
- Honest citizens are more observed than criminals
- Companies collecting illegal personal data are stronger than their victims: personal data = currency
- One-sided contracts: ex. Facebook, Google, Apple…

➔ Self-censorship --> liberty reduction

Privacy

Pri•va•cy |ˈprīvəsē| (noun)
- the state or condition of being free from being observed or disturbed by other people: *she returned to the privacy of her own home.*
- the state of being free from public attention *: a law to restrict newspapers' freedom to invade people's privacy.*

1st Principle to protect privacy

- "Sovereignty" : keep control of your personal data, they belong to you !

  -> store them on a personal device (smartcard, smartphone, tablet, laptop…)

  -> if you disclose your data to another party, impose **obligations** on their use

  - Erasure on demand (*right to be forgotten*)
  - Expiration date
  - Notification in case of transfer or unexpected use
  - etc.

2nd Principle to protect privacy

- Personal data minimization
  transmit only the data needed by those entrusted to:
  - perform the agreed task (and only to them)
    -> "*need-to-know*"
  - destroy it after use (*right to be forgotten*)

- … in "cyberspace" like in the real world

- …with limits: some personal data need to be transmitted to judicial authorities in case of dispute or enquiry (e.g., money laundering)
  "pseudonymity" rather than total anonymity

- Links : minimization <-> purpose: "legitimate"
  collected data: "not excessive"

Security Technologies and Privacy

- *AAA :*
  Authentication, Authorization, Accounting
  - Authentication: each user is to be identified safely
    - Identification + Identity Verification
  - Authorization: each user can only perform operations authorized for her/him
    - Manage and verify rights for each identity
  - Accounting: each user is kept liable for her/his acts
    - Audit : collect evidence by identity

"Virtual" Identity

- Identity = representation of a person in an information system
- In general, it contains:
  - External identifier, corresponding to only one person (e.g., login name)
  - Authentication information (e.g., password, public key, zero-knowledge proof data, biometric reference, …)
  - Other information linked to the person
    - Data: civil identity, credit card number, mail address, phone number, e-mail@, …
    - Meta Data: internal identifiers (e.g., uid, gid, …), privileges, roles, groups, IP@, MAC@, …
- Remark: a single person may have several (partial) virtual identities

Identification & authentication

- Identification = retrieve the identity of a person among all registered persons
  - User: provides the external identifier
- Authentication = verification that the identity corresponds to the user who presents:
  - Something s/he knows (e.g., password)
  - Something s/he owns (e.g., smartcard)
  - Something s/he can do (e.g., manuscript signature)
  - Something s/he is (biometry, e.g., fingerprint)

What is the Identity used for?

- Authorization: assign different privileges to different users
  - Right management:
    - Grant rights to each user
    - Enable/disable actions according to these rights

  ➔ Without an identity, a user has only minimal rights
- Accounting: keep each user liable for her/his acts
  - Identify a posteriori who has committed something bad
    - Requires a different identity for each user
    - Requires recording sensitive actions that are attempted by each user (Audit)

  ➔ Without an identity, a user can only perform actions that cannot be harmful

But…

… authentication and accounting are infringing
"minimization"
and "sovereignty"

- If you need to present your identity to exercise your rights --> personal data disclosure
- You cannot control how are used your personal data collected for accounting !

Identity and Privacy

- Identity = any representation of a person in an information system (not only "users" !!!)
  - Patients, personnel, clients, …
- Identity is a personal information !
  - Sovereignty: the person should keep control on it
  - Minimization: as little information as possible

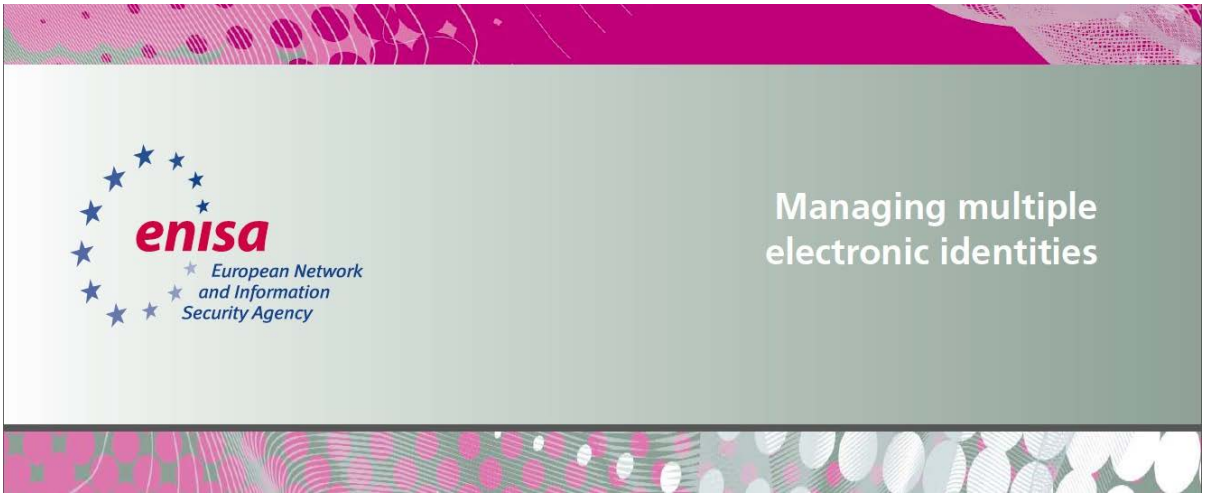
⇨ No identification without consent !

- fingerprint, DNA, video-monitoring, RFID…
- IP addresses, Caller-ID, …

Multiple virtual identities

- Reduce/control links between the person and the personal data (control the *linkability*)
- Basic rule: for public access, anonymity
- But for customized / privileged access, pseudonyms
  - Preferences (e.g., weather forecast)
  - Different "roles" -> different pseudonyms
    - E.g., tax payer and elector
  - Pseudonym lifetime: related to linkability
    -> one-time pseudonyms
  - Authentication strength: related to identity stealing risks (and liability)
- Multiple virtual identities managed by the user vs. "single-sign-on" e.g., IdNum, Liberty Alliance, OpenID

Multiple virtual identities



http://www.enisa.europa.eu/activities/identity-and-trust/library/deliverables/mami

Authorization

- Today on the Internet: client-server
  the server grants or denies privileges to the client according to her/his claimed identity (possibly verified by authentication mechanisms)
- The server needs to store personal data
  -> evidence in case of dispute
- These data can be used for other purposes:
  client profiling, direct marketing, client data trading, blackmailing, …: personal data = currency

The client-server scheme is obsolete!

- Internet transactions spread among more than two parties (e.g., e-commerce)
- These parties can have different (or even opposite) interests: mutual suspicion
- Harmful for privacy:
  infringing the "need to know" principle

Authorization without identity ?

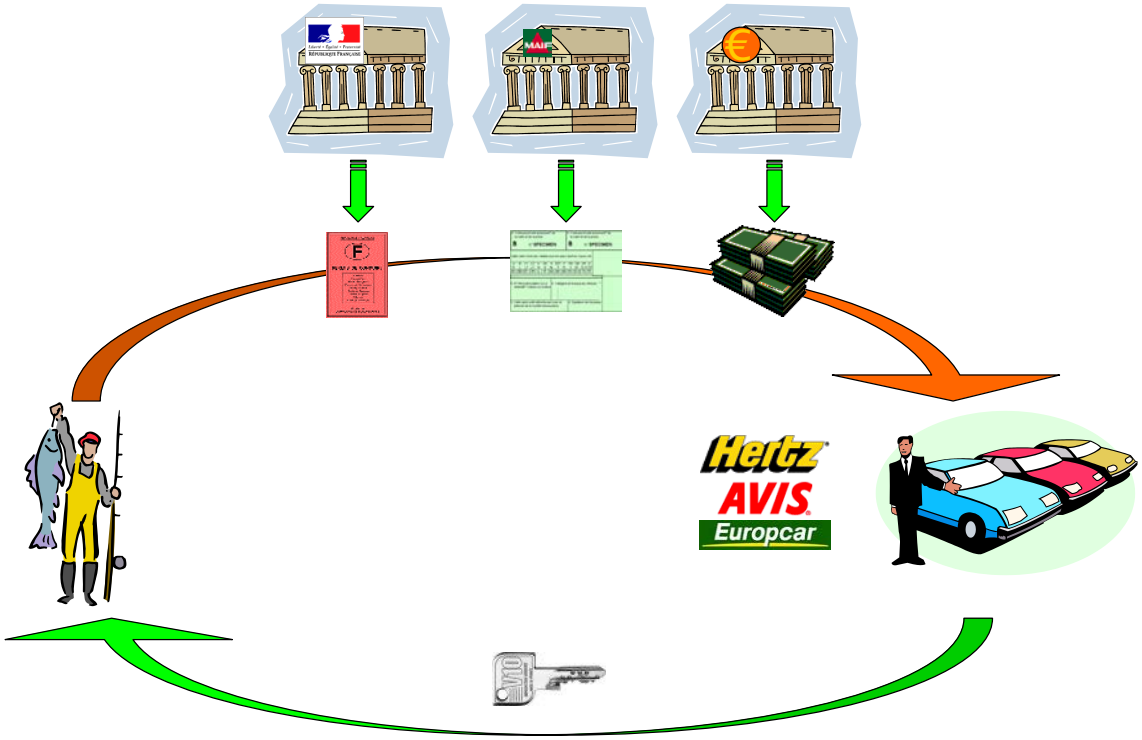
- Prove your rights without disclosing your identity

  Anonymous credentials
- Examples
  - Subscription cards, association membership, …
  - Driving license, identity card, elector card, …
- Multiple certificates ?

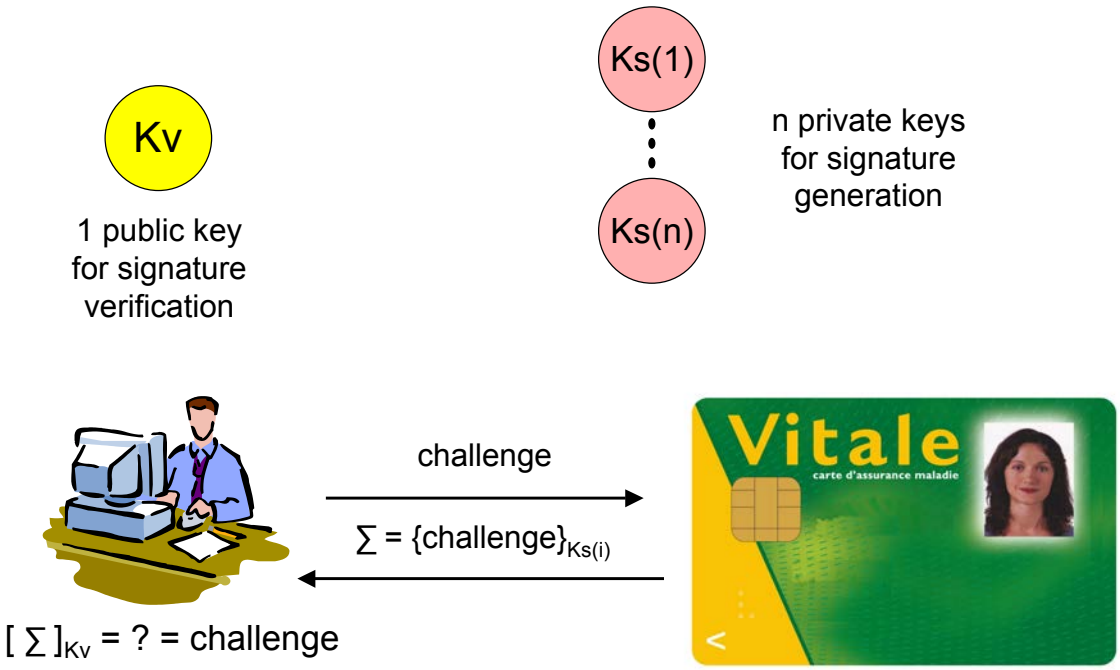
  ex: SPKI : attribute certificates / authorization certificates

  … but linkability: public key !

Idemix anonymous credentials



Group Signature



Accounting

- The Authority maintains a directory (authenticated user, signature key)
- The server records the signatures
  -> audit log
- From the signature, the Authority can recognize the signer -> anonymity lifting

A new scheme for AAA

- Separate authentication and authorization enforcement
  - Credential Issuing Authority : authentication + right granting --> anonymous credential
  - Server: verifies the validity of the anonymous credential and enables the authorized actions
- Separate evidence collection and accounting
  - Server : audit the actions --> log the credentials
  - Credential Issuing Authority : if case of evidence of wrong doing, lifts the credential anonymity

--> the anonymous credential should not be transferable (nor forgeable…)

Non transferability ?

- Idea : a personal device (smartcard) + biometric recognition

Conclusion

- It is possible to enforce both security and privacy by the same technology

  It is possible:

  - To prove rights without disclosing identity
  - To develop Privacy-Enhancing Technologies
    that do not provide impunity to criminals
  - To develop Security Technologies
    that do not invade privacy

Recommendations

- Analyze privacy impact as soon as inception of a new technology: "*Privacy by Design*", else "*Privacy by disaster*"
  - *Privacy by Design, Privacy by Default, Privacy Impact Analysis*
  - *Right to be forgotten*
- Take the opportunity of new services installment to provide privacy benefits
  e.g., German electronic identity card --> certified pseudonyms
- Respect the sovereignty and data minimization principles
- Develop new personal devices to facilitate privacy:
  e.g., personal data storage, identity management, e-Cash, …