September 29, 2014, Athens

Privacy-respecting Identity Management

ABC4TRUST

Attribute-based Credentials for Trust

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A research project funded by the European Commission's 7th Framework Programme

SEVENTH FRAMEWORK PROGRAMME

Agenda

- Identity Management
- Some Privacy Problems in Identity Management and Assurance
  - Identity Management and Overidentification
  - Identity Assurance and the “Calling Home” Problem
- Attribute Based Credentials
- The ABC4Trust Project
  - The Trials
  - The Architecture
  - Open Source Reference Implementation
  - ABC4Trust in Perspective
- Conclusions & Outlook

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Identity Management (IdM)
An early approach

- „Fear not, for I have redeemed you;
  I have called you by name: you are mine.”
  [Isaiah 43:1]

- „Var inte rädd, för jag har betalat lösen för dig.
  Jag har kallat dig vid namn, och du är min.”
  [Jesaja 43:1]

- „Μη φοβου˙ διοτι εγω σε ελυτρωσα,
  σε εκαλεσα με το ονομα σου˙ εμου εισαι“
  [Ησαιαν 43:1]

- „No temas, porque yo te he redimido,
  te he llamado por tu nombre; mío eres tú.“
  [Isaías 43 1]

- „Fürchte dich nicht, denn ich habe dich erlöst;
  ich habe dich bei deinem Namen gerufen; du bist mein!“
  [Jesaja 43,1]

Identity Management (IdM)
2 sides of a medal with enormous economic potential

- **Organisations** aim to sort out
  - User Accounts in different IT systems
  - Authentication
  - Rights management
  - Access control
- **Unified identities**
  help to
  - ease administration
  - manage customer relations
- **Identity management systems**
  - ease single-sign-on by unify accounts
  - solve the problems of multiple passwords

- **People** live their life
  - in different roles (professional, private, volunteer)
  - using different identities (pseudonyms): email accounts, SIM cards, eBay trade names, chat names, Facebook names, …)
- **Differentiated identities**
  help to
  - protect
    - privacy, especially anonymity
    - personal security/safety
  - enable reputation building at the same time
- **Identity management systems**
  - support users using role based identities
  - help to present the “right” identity in the right context

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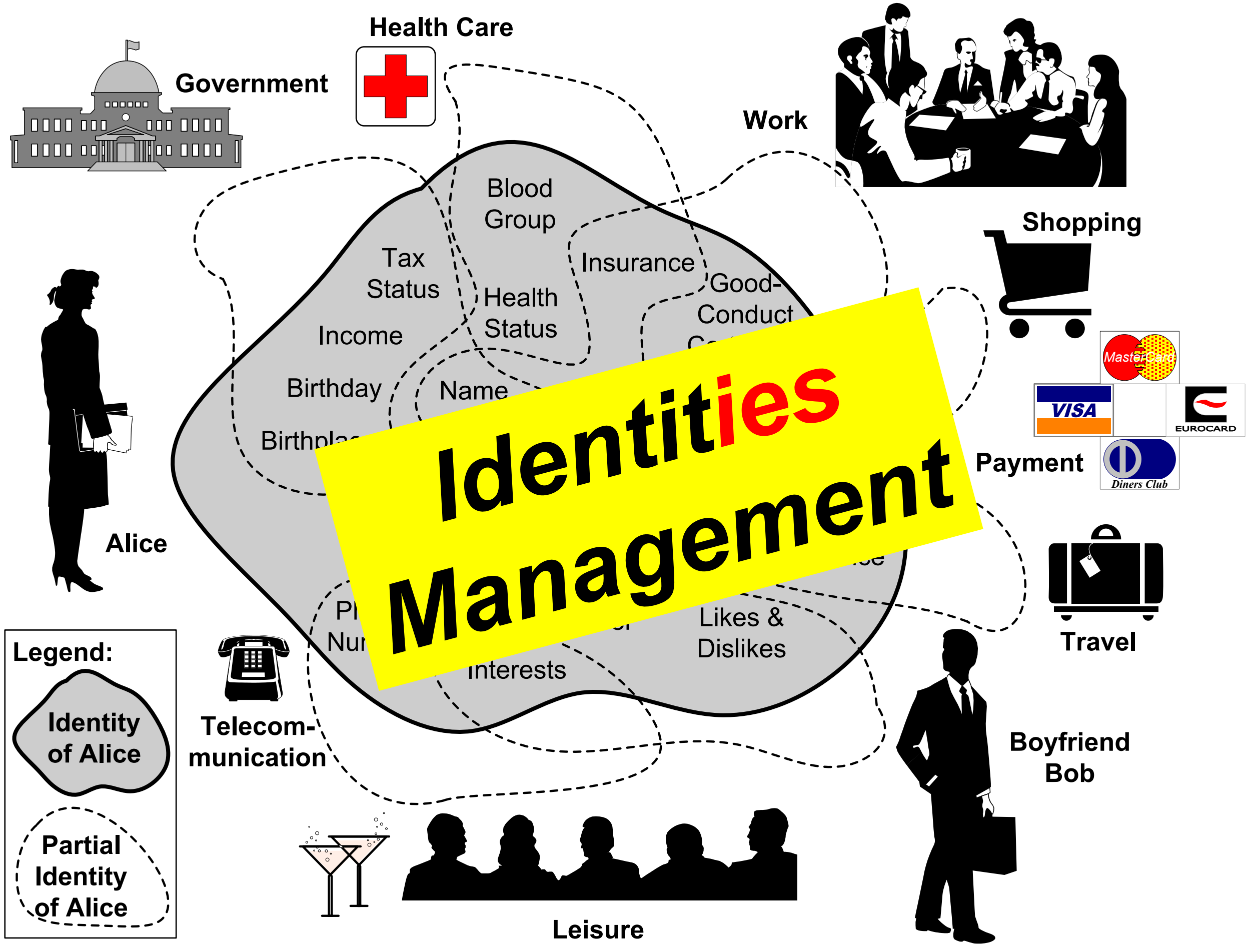
Partial Identities



Based on [Clauß, Köhntopp 2001]

Identity Management (IdM)
One of many definitions

An integrated concept of

processes, policies and **technologies**

that enable

organizations and **individual entities**

to facilitate and control

the

use of identity information

in **their** **respective relations**

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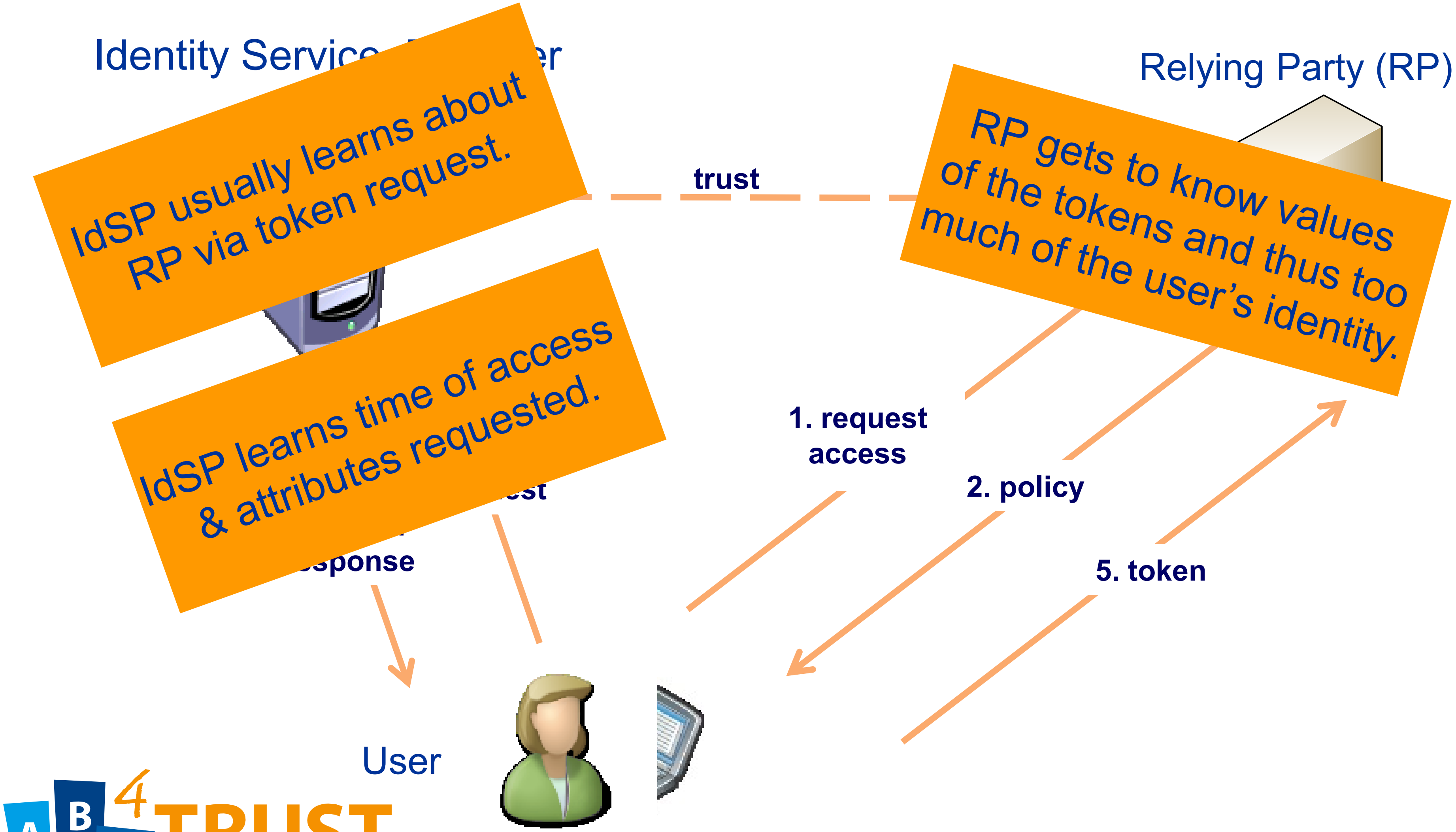
Privacy (and security) issues of typical federated IdM architectures



IdSP usually learns about RP via token request.

RP gets to know values of the tokens and thus too much of the user's identity.

IdSP learns time of access & attributes requested.

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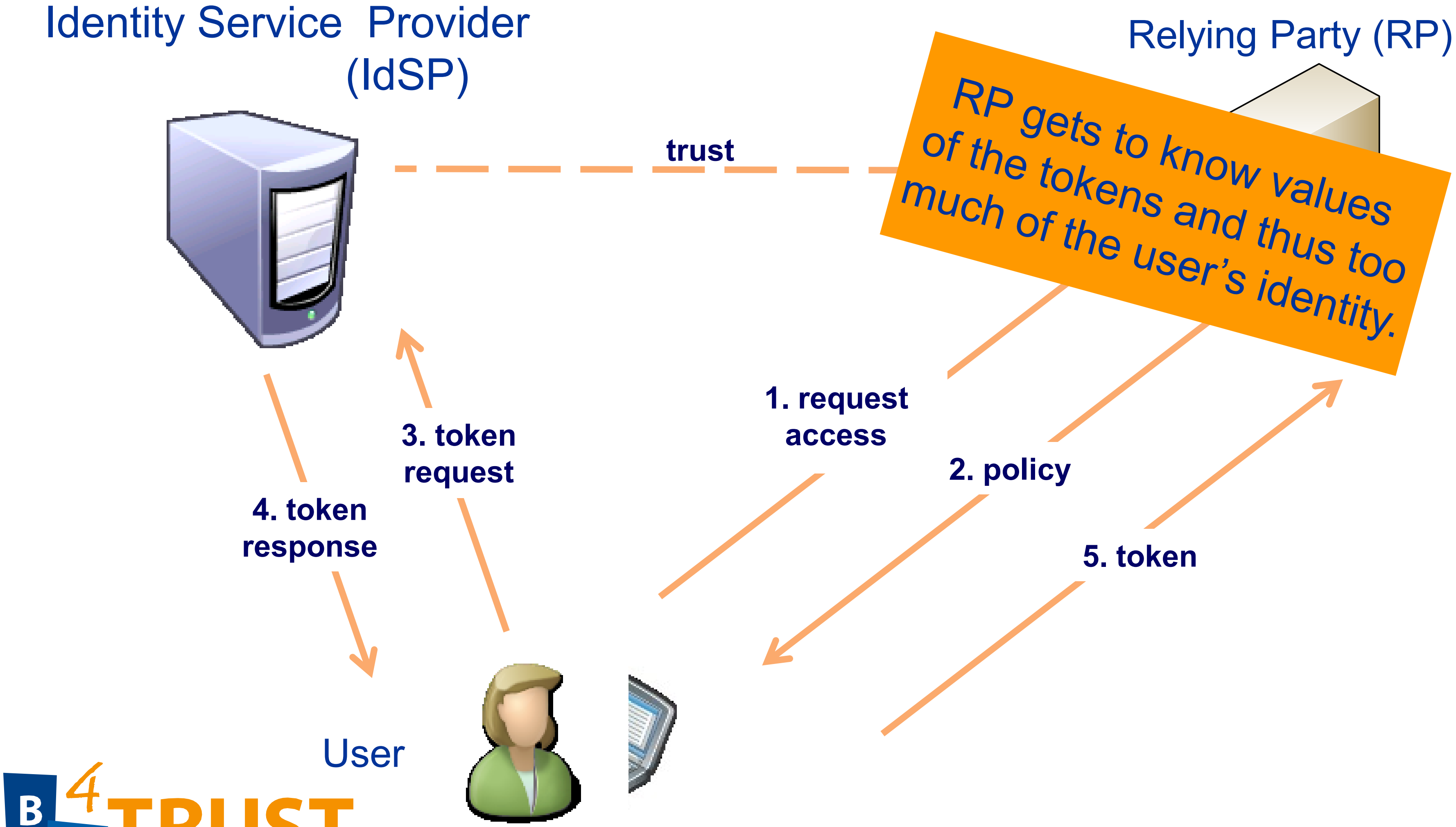
Identity Management and Overidentification



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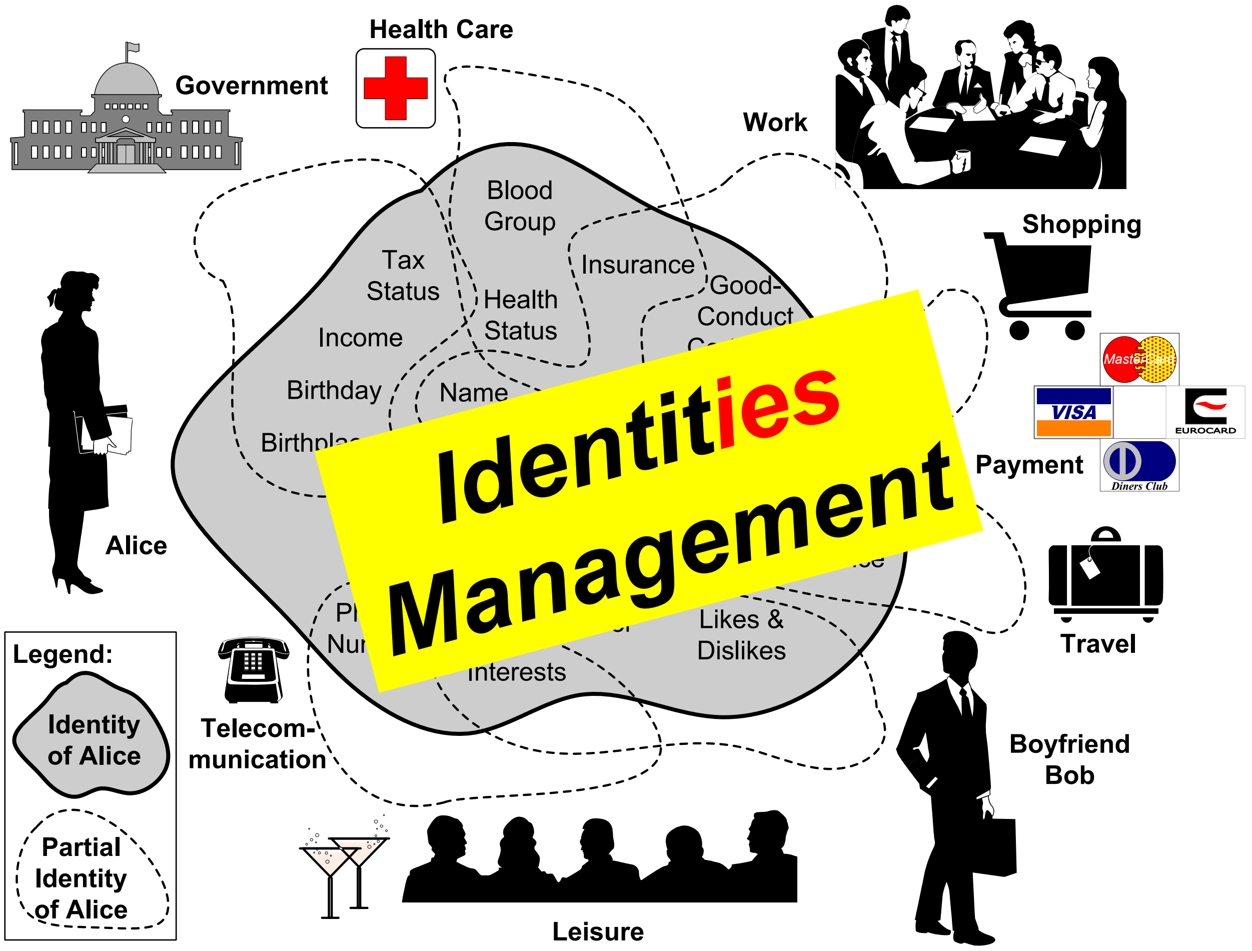
Partial Identities needed



Based on [Clauß, Köhntopp 2001]

Identity Definition in ISO/IEC 24760 to reduce the risk of Overidentification

- **Identity** (partial identity):
  - “Set of **attributes** related to an **entity**”
  - From “A Framework for Identity Management” (ISO/IEC 24760)
    - **Part 1: Terminology and concepts (IS:2011)**
    - Part 2: Reference framework and requirements (DIS)
    - Part 3: Practice (CD)

[standards.iso.org/ittf/PubliclyAvailableStandards/index.html, www.jtc1sc27.din.de/en]

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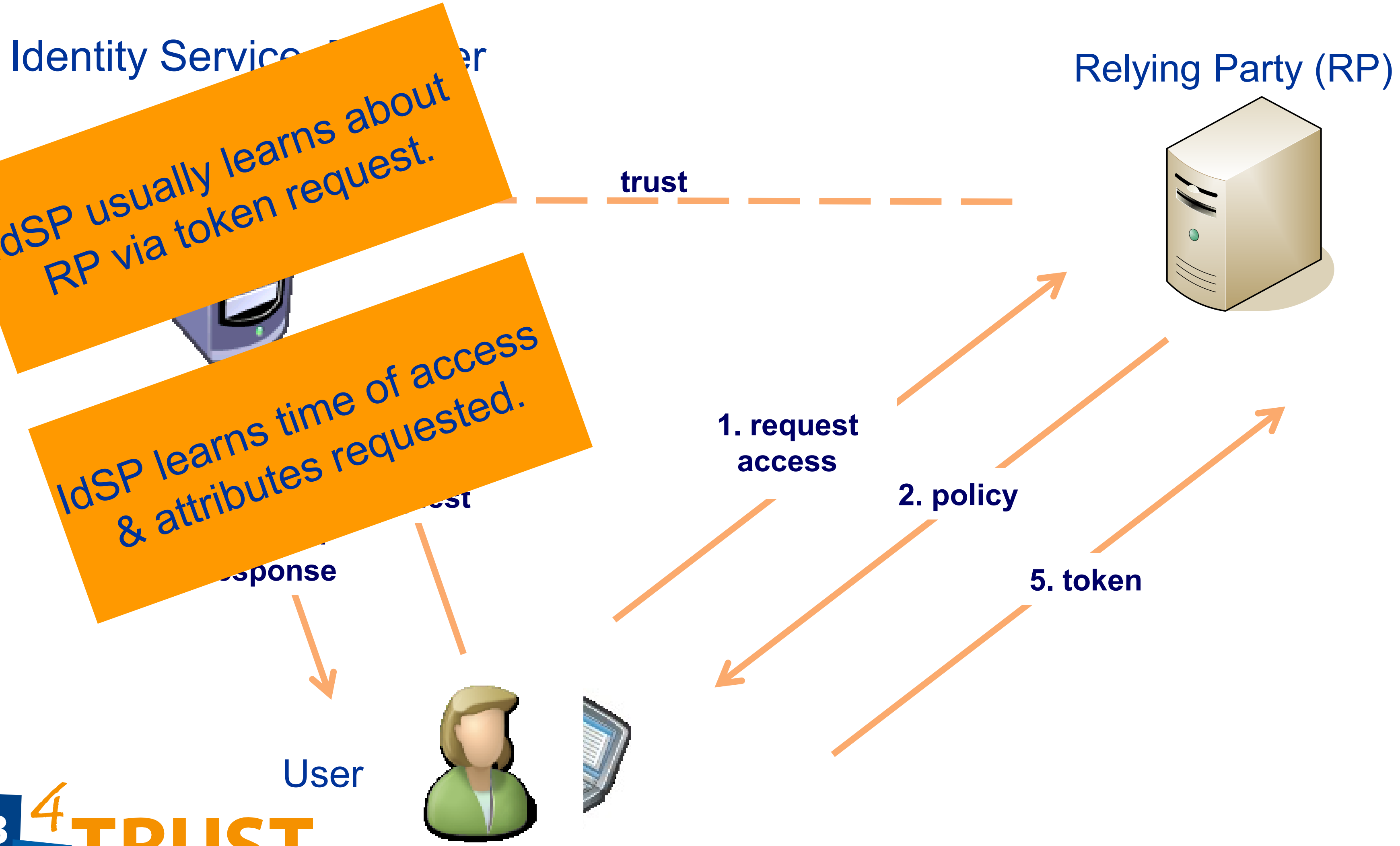
The “Calling Home” Problem



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Attribute Based Credentials (Privacy-ABCs)

- Certifying **relevant attributes**
- Token issuance and presentation **unlinkable**
  - Rather “coins” (that cannot be distinguished) than “bank notes” (that have a serial number)
- Users can disclose (minimal) **subsets** of the encoded **claims**
  - To respond to unanticipated requests of RPs
  - Without invalidating the token integrity
  - E.g. Certificate for birth date -> Claim for being over 21
- Two major **approaches** and **technologies**
  - U-Prove (Credentica -> Microsoft)
  - Idemix (IBM)

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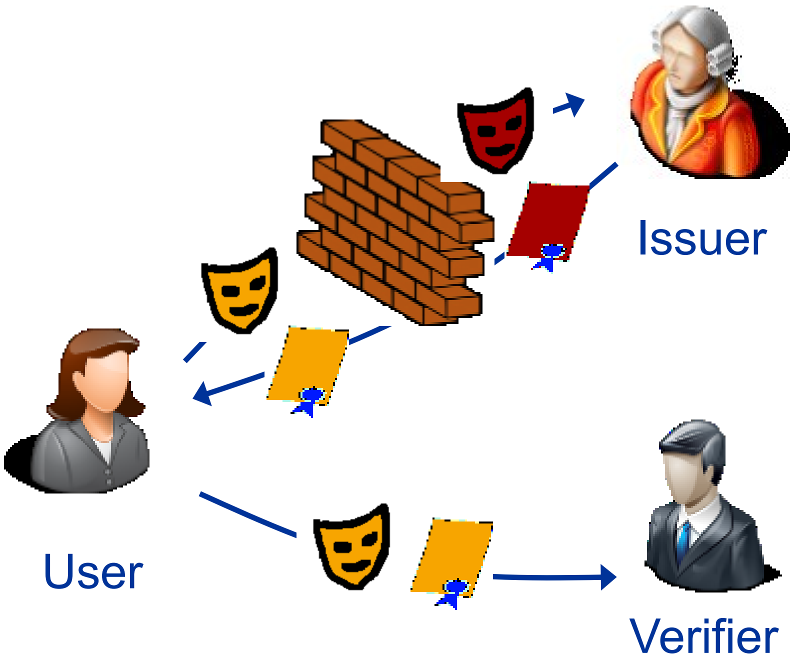
Two approaches for Privacy-ABCs

Blind Signatures



Issuer

User

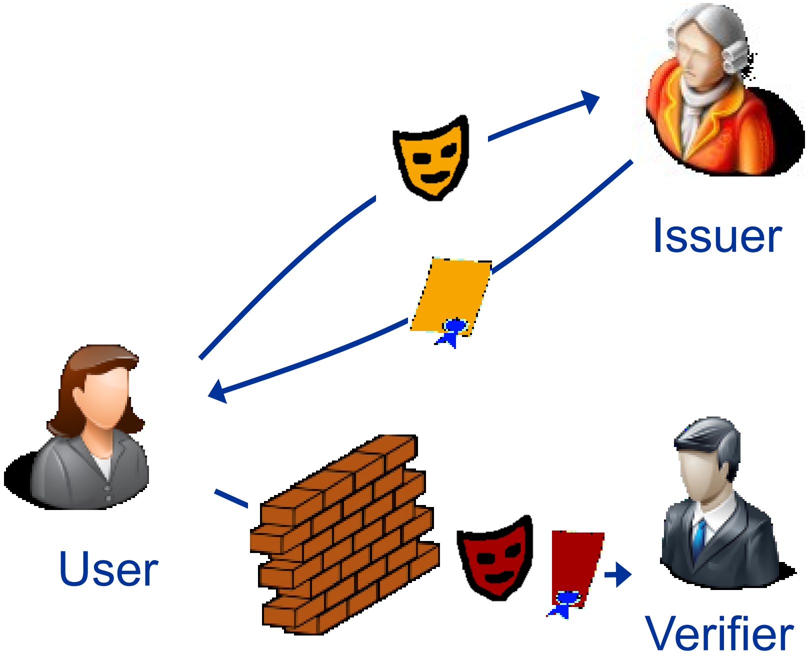
Verifier

U-Prove

Brands, Paquin et al.

Discrete Logs, RSA,..

Zero-Knowledge Proofs



Issuer

User

Verifier

Idemix (Identity Mixer)

Damgard, Camenisch & Lysyanskaya

Strong RSA, pairings (LMRS, q-SDH)

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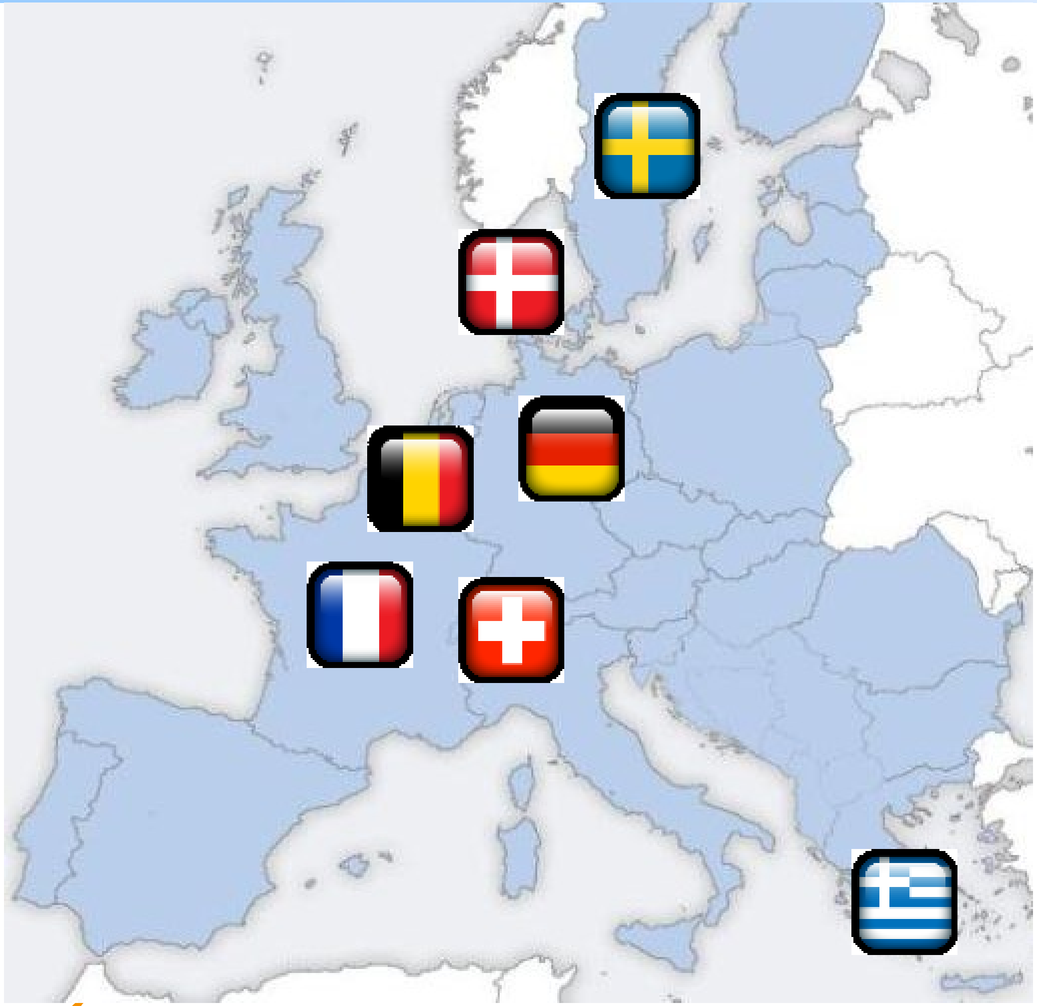
ABC4Trust Objectives

- A common, unified architecture for ABC systems to enable
  - Comparing their respective features
  - Combining them on common platforms
  - “Lock-In” free usage of ABC systems
- Open reference implementations of selected ABC systems
- Deployments in actual production enabling
  - Minimal disclosure
  - Provision of anonymous feedback to a community to one is accredited as a member
- Relevant Standards
  - e.g. in ISO/IEC JTC 1/SC 27/WG 5
    “Identity Management and Privacy Technologies”

ABC4Trust Partners



Johann Wolfgang Goethe-Universität Frankfurt, DE

Alexandra Institute AS, DK

Computer Technology Institute & Press – "DIOPHANTUS", GR

IBM Research - Zurich, CH

Miracle A/S, DK

Nokia, DE

Technische Universität Darmstadt, DE

Unabhängiges Landeszentrum für Datenschutz, DE

Eurodocs AB, SE

CryptoExperts SAS, FR

Microsoft NV, BE

Söderhamn Kommun, SE

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ABC4Trust Pilot Trial: Course Rating

Computer Technology Institute & Press – "Diophantus"
Patras, Greece

- Course ratings conducted anonymously without lecturers knowing participants' identities
- Conduct polls based on attendance
- Issue multiple credentials (student cards, course enrolment)
- Verify with anonymous proofs towards "untrusted" infrastructure
- Privacy-friendly rewarding process

ABC4Trust Pilot Trial: Community Interaction

Norrtullskolan School
Söderhamn, Sweden

- School internal social network for communication among pupils, teachers, and personnel
- Provide trusted authentication while protecting pseudonymity/anonymity
- Usability: make privacy technology usable for non-technical users (e.g. pupils)

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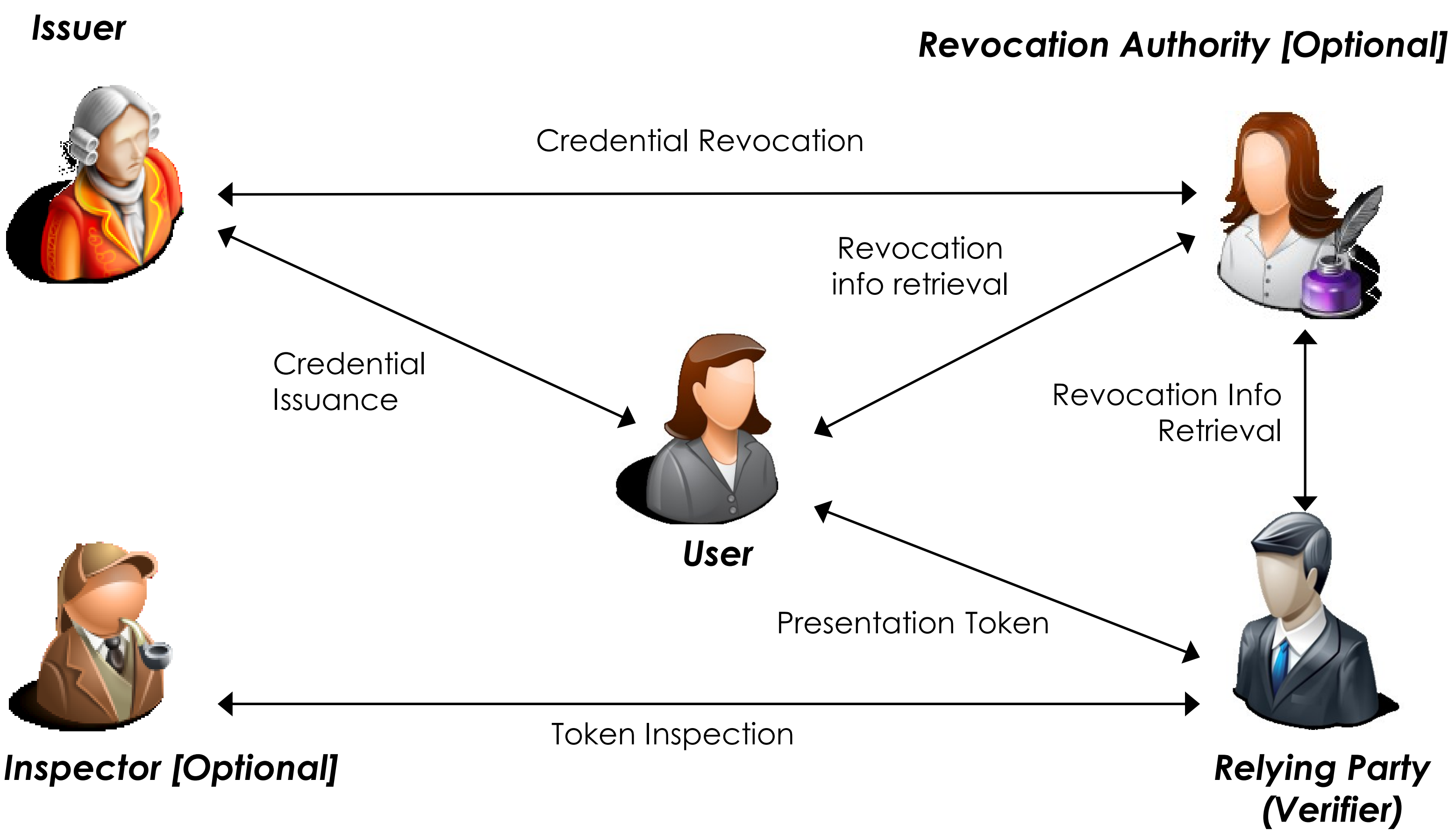
The ABC4Trust Architecture Objectives

- Abstraction of concepts of Privacy-ABCs & unification of features
- A common unified architecture
  - That is independent of the specific technologies
  - Federation of Privacy-ABC Systems based on different technologies
  - Interoperability between different Privacy-ABC technologies
- ➢ Avoid technology lock-in
- ➢ Raise trust in Privacy-ABC technologies
- Users will be able to
  - obtain credentials for many Privacy-ABC technologies and
  - use them on the same hardware and software platforms
  - without having to consider which Privacy-ABC technology has been used.
- Service providers and Identity Service Providers will be able to
  - adopt whatever Privacy-ABC technology best suits their needs.

ABC4Trust Architecture High Level View



Crypto Architecture

- Provide a truly plug-and-play architecture that allows the seamless integration of cryptographic primitives e.g.:
  - Privacy-ABC signatures: Idemix and Uprove
  - Predicate Proofs

- Move away from the "bridging" approach between several incompatible crypto engines

- Encapsulated in components with common interfaces, allowing the rest of the cryptographic layer to be implementation-agnostic

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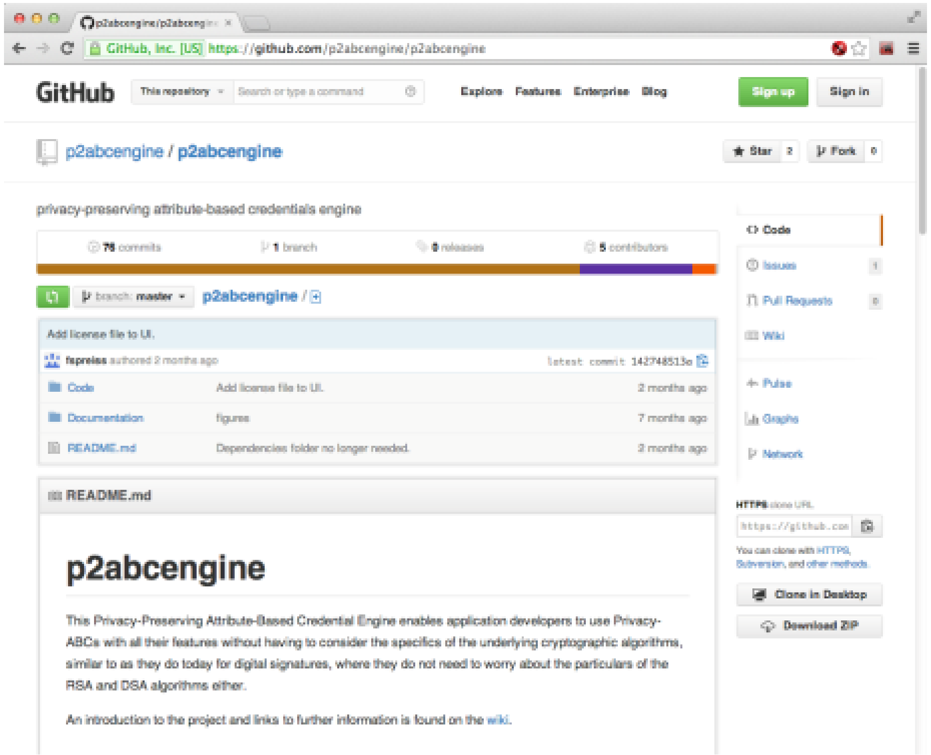
ABC4Trust @GitHub

- https://github.com/p2abcengine/
- Source codes available under Apache license
- Documentation, installation guide and wiki pages



p2abcengine / p2abcengine

privacy-preserving attribute-based credentials engine

78 commits · 1 branch · 0 releases · 5 contributors

branch: master · p2abcengine / +

Add license file to UI.

fspreiss authored 2 months ago · latest commit 142748513a

Code	Add license file to UI.	2 months ago
Documentation	figures	7 months ago
README.md	Dependencies folder no longer needed.	2 months ago

You can clone with HTTPS, Subversion, and other methods.

README.md

p2abcengine

This Privacy-Preserving Attribute-Based Credential Engine enables application developers to use Privacy-ABCs with all their features without having to consider the specifics of the underlying cryptographic algorithms, similar to as they do today for digital signatures, where they do not need to worry about the particulars of the RSA and DSA algorithms either.

An introduction to the project and links to further information is found on the wiki.

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General Challenges & Potential Identity Management

- Considering
  - the views of the respective stakeholders (Multilateral Security)
  - separations of domains that had been natural “before”
- Enabling users to manage their identities and IDs
- Frameworks and reference architectures
  - Along the value chain (with appropriate incentives)
  - For business processes and applications
  - For new communities and networks
- Globally standardized (e.g. in ISO/IEC JTC 1/SC 27/WG 5 “Identity Management and Privacy Technologies” & OpenID Foundation)

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Conclusions & Outlook

- ICT and related services are coming ever closer to people.
- A more privacy friendly Internet requires:
  - Partial Identities and Identifiers
  - Minimum Disclosure
  - Attribute Based Credentials
  - Strong Sovereign Assurance Tokens (smart cards, mobile devices, …)

- www.abc4trust.eu

- www.jtc1sc27.din.de/en

- www.fidis.net
- www.picos-project.eu
- www.primelife.eu
- www.prime-project.eu

- www.m-chair.de, Kai.Rannenberg@m-chair.de

Announcement

- ABC4Trust **Summit Event**
  - January 20th, 2015
  - Venue: The Representation of the German federal state of Hessen in Brussels, 21 rue Montoyer.
  - The date conveniently allows interested privacy experts to attend the Summit Event in connection with their travel to attend the Computers, Privacy and Data Protection Conference 2015 (CPDP)