Privacy-ABC Technologies – on Mobile Phones

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Challenges and possibilities.

- Pilots and Reference implementation in ABC4Trust
  - Focus on Client(PC)-Server and smartcards
- Users are using mobile devices

- Users bring their smart phones everywhere
- New Use cases – e.g., in the physical world.
  - Now even iPhones come with NFC – currently very restricted!

NEM ID

Pay

Google wallet

Challenges on mobile devices

- Platform?:
  - Native – very diverse
    - Android, iOS, Windows Phone etc.
  - Common language: JavaScript?
  - Cloud IdMaaS?
  - HW support?

- Computational power?
- Storage of keys and credentials.
- Usability

Smart Phone Feasibility Study

- Focus on what can be done with current technology
- Focus on functionality
- 3 Proof of Concepts
  - Smart Card emulation
  - Native App
  - Java Script

- Relevant roles
  - <u>User</u>
  - <u>Part of User’s SW (Smart Card emulation)</u>
  - Verifier
  - Inspection
- Not so relevant roles
  - Issuer
  - Revocation authority

Smart Card emulation

- Still Client(PC)-server setup

+ Development time

+ Performance

+ User Convenience

+ User interface

+ No additional HW

- Security

- Devices

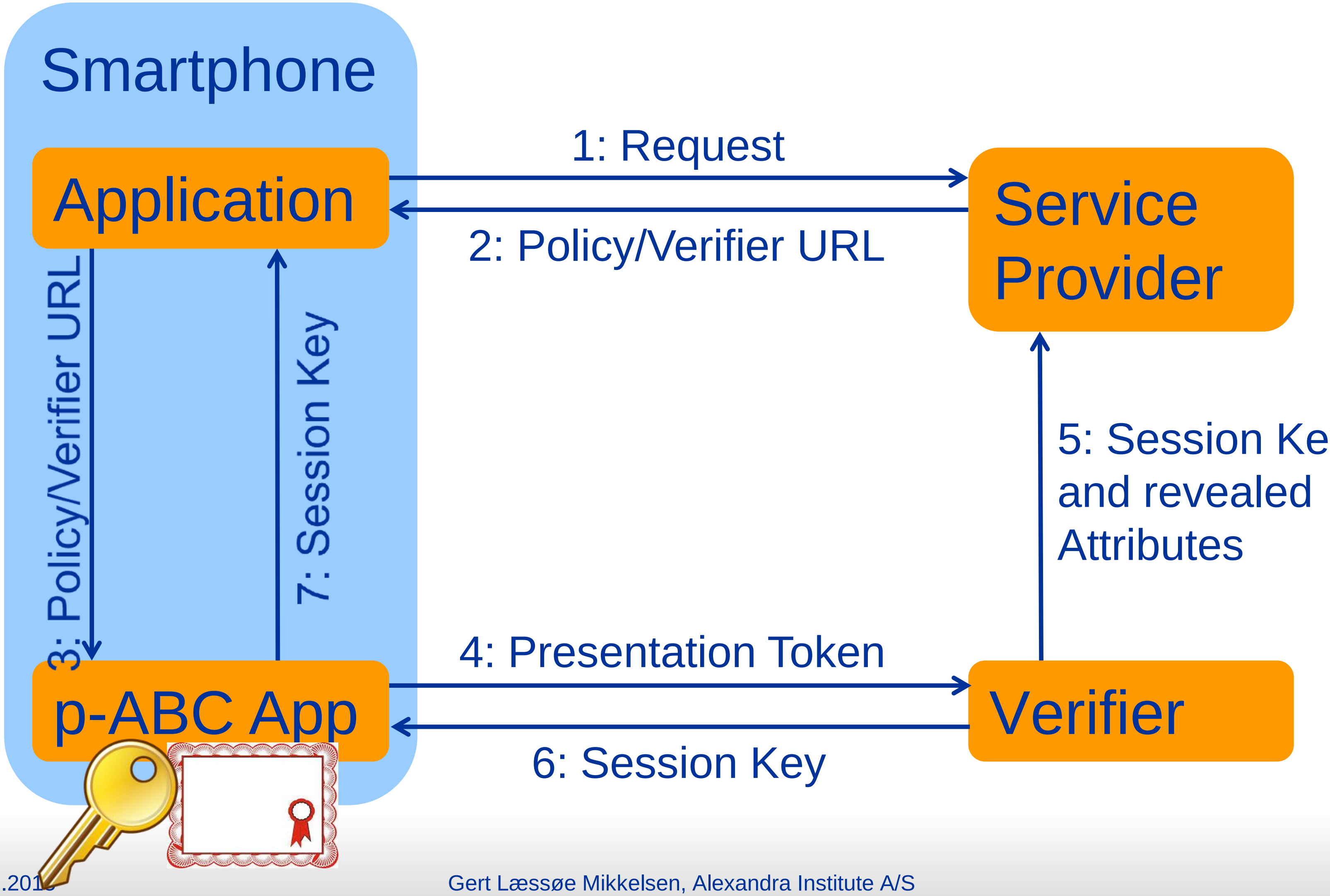
Native App

user service of ABC4Trust reference implementation as mobile service-app

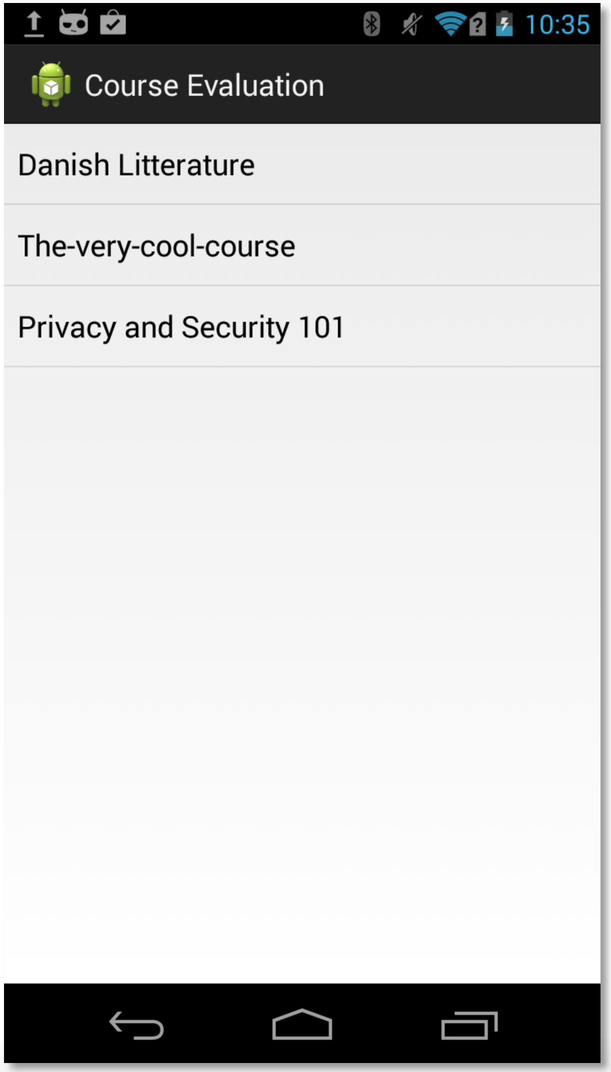
- Android!
  - ABC4Trust Reference implementation in Java

- Security
  - Keys/Credential stored in ABC4Trust App's internal memory
- Usability?

Native App


Smartphone
Application
1: Request
Service Provider
2: Policy/Verifier URL
3: Policy/Verifier URL
7: Session Key
5: Session Key and revealed Attributes
4: Presentation Token
p-ABC App
Verifier
6: Session Key

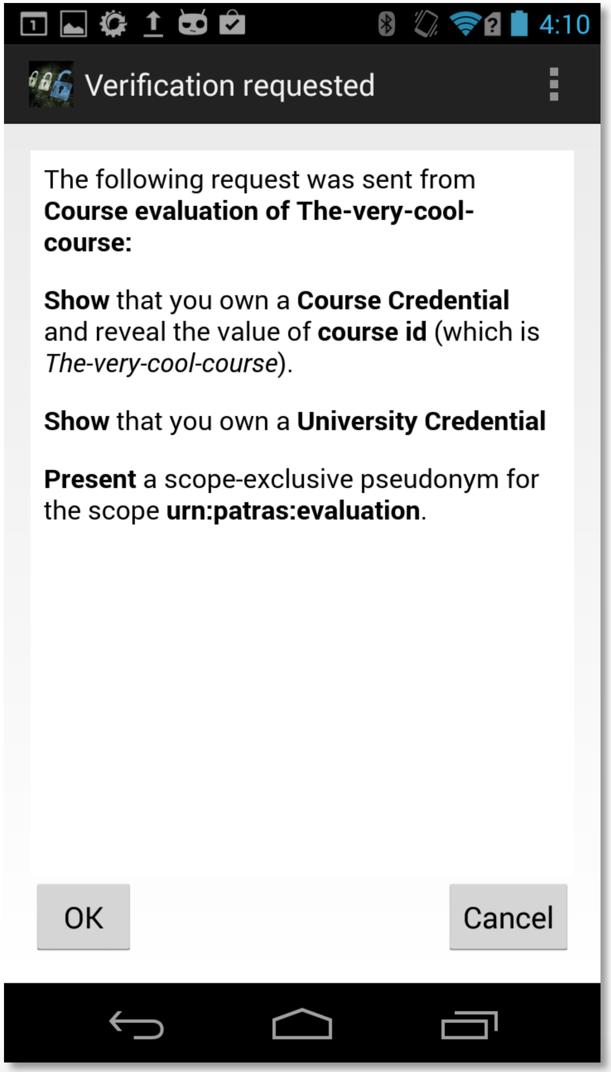
Native App



Danish Litterature

The-very-cool-course

Privacy and Security 101



The following request was sent from **Course evaluation of The-very-cool-course:**

Show that you own a **Course Credential** and reveal the value of **course id** (which is *The-very-cool-course*).

Show that you own a **University Credential**

Present a scope-exclusive pseudonym for the scope **urn:patras:evaluation**.

MS U-Prove Native App.

- MS U-Prove C# version can run on Windows Phones

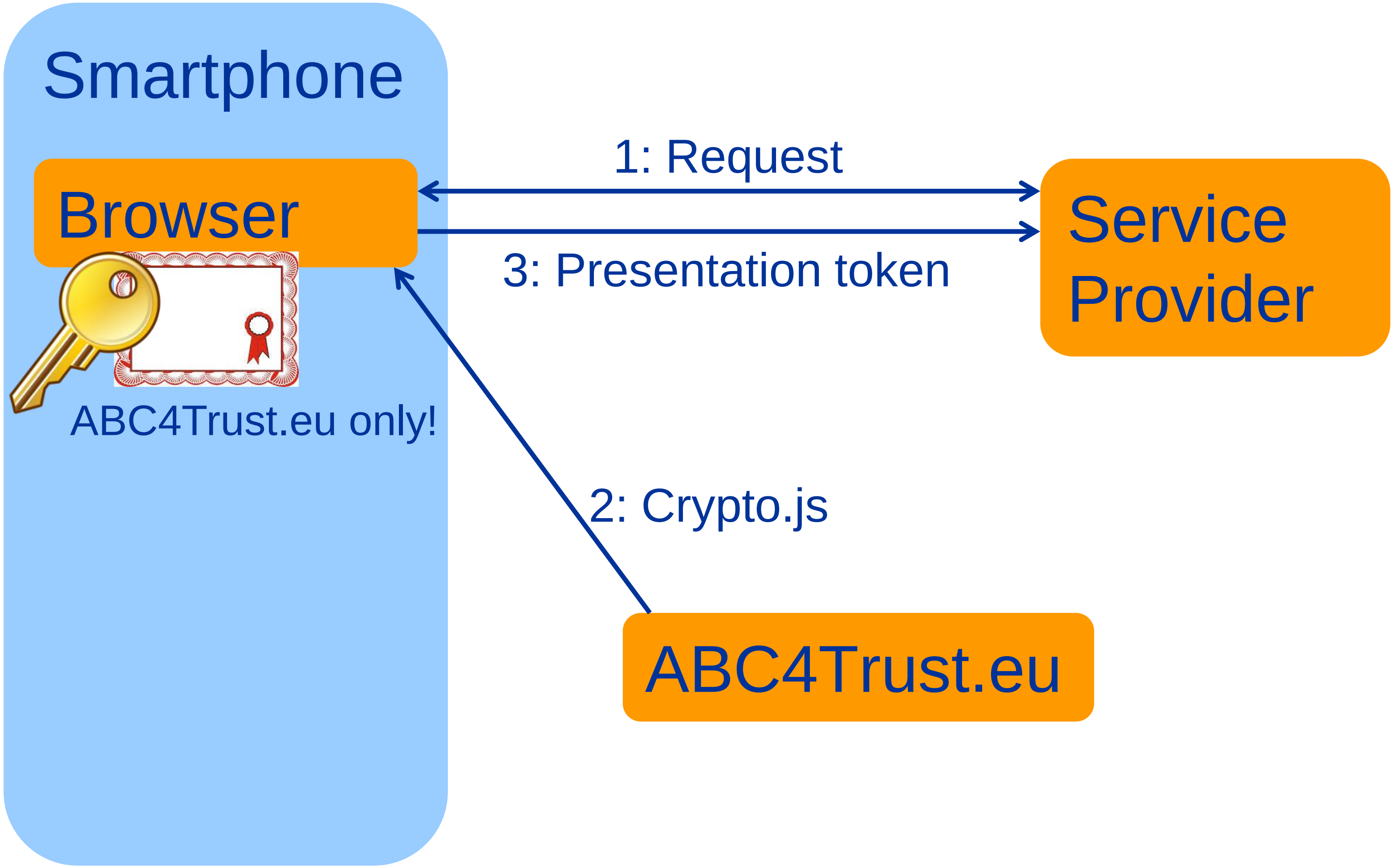
JavaScript?

- JavaScript is highly cross platform
  - Every device with a modern browser
  - Not build for security/Cryptography
  - How to verify the code?
    - Has someone changed the code server side?
    - Do I get the same code as everyone else?
  - Where to store keys/credentials securely?
    - Server side?
    - Cookies?
    - Local storage?
    - Issue when needed?

JavaScript Prototype

- Prototype implementation of MS U-Prove
    - U-Prove is simpler than the ABC4Trust reference implementation and Identity Mixer.
- Elliptic Curves using “jsbn” (“Stanford”) library.
- Compatible with MS U-Prove C# library

JavaScript



Smartphone

Browser

ABC4Trust.eu only!

1: Request

3: Presentation token

2: Crypto.js

Service Provider

ABC4Trust.eu

JavaScript Performance

- Very dependent on platform, and use of libraries!
- Our implementation:
  - 2.1 sec (Galaxy Nexus, default browser)
  - 30 sec (iPhone 5, Safari)

- Microsoft implementation: iPhones nearly as fast as Androids.

JavaScript the new language for Crypto?

A lot is happening- Since this task of the project was finished:

- Microsoft U-Prove JavaScript (July 2014)
- Microsoft Research JavaScript Cryptography Library (August 2014)
- Google End-to-end Chrome Extension (June 2014)
- W3C Cryptography API

Security Mobile Devices.

- Subject to malware attacks
- Subject to physical theft

- Define a threat model
- Security improvements
  - Secure elements
  - Direct Anonymous Attestation TPM
  - SIM cards
  - Smart card read by the smartphone.

Conclusion

- Using p-ABC’s on mobile devices is feasible
  - both as native applications and JavaScript.
- New use cases/improved user experience.
- New security issues
  - Mobile devices vulnerable to a number of attacks - should be addressed according to the threat model.
- A lot is happening on JavaScript right now.
- D4.4 Smartphone feasibility analysis
  www.abc4trust.eu