Willkommen!

Mit dem Handy das Auto aufschliessen? Hardware Protected Confirmation macht es möglich

Prof. Dr. Benjamin Fehrensen, Institute for Cybersecurity and Engineering ICE, BFH-TI

Class 4 Reader

Class 1 Reader

- Keys generated on Hardware, non-extractable
- Keys are protected against cloning

Class 2 Reader

- PIN entry on dedicated HW
- Credentials cannot easily be sniffed

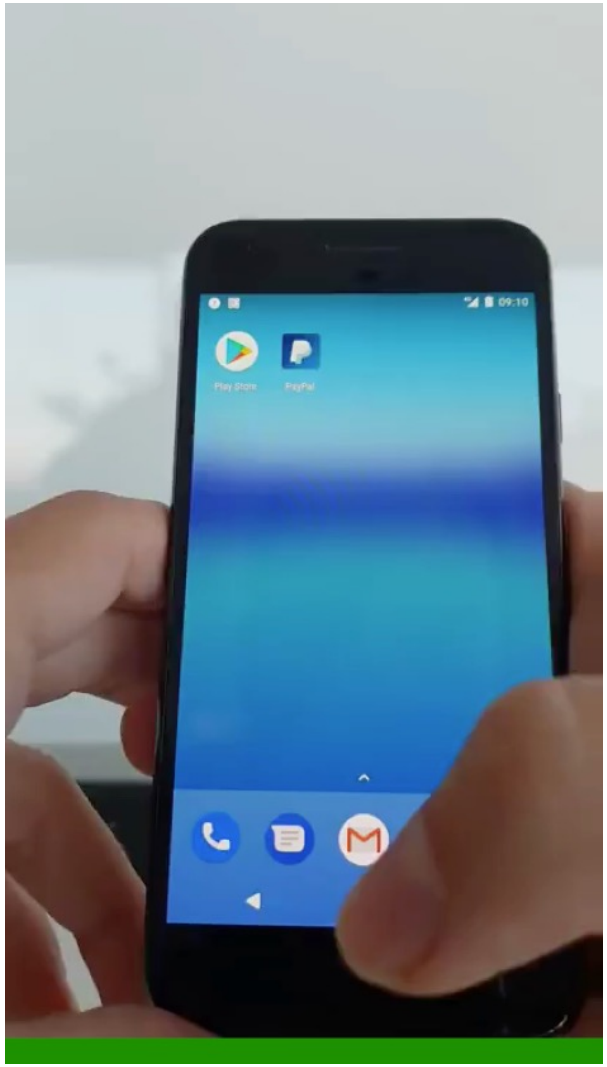
Class 3 Reader

- Trusted User Interface
- Prevents overlay attacks

Class 4 Reader

- Device attestation
- The integrity of the device / environment can be verified.

Remote Control Device



- Automate user input via Accessibility
- Attacker can sniff user input such as clicks, text input, voice input etc.
- Attacker can automate user input:
  - Auto-confirm granting privileges
  - Auto-confirm approving payments
  - Entering fraudulent payments
  - Prevent removing privileges
  - Prevent removing malware

EventBot Sample

Our Vision: Global «Protected Confirmation » API

Joint InnoSuisse Project: University of Applied Science Bern & UBS Business Solutions AG

UBS

GlobalPlatform®
The Standard for Managing Applications on Secure Chip Technology

Berner Fachhochschule

android

SASFS
Standardisierung im Finanzbereich

adnovum

Practical Business Use Caes
Payments,
Signing, Voting,
Remote Control, …

Our Goals

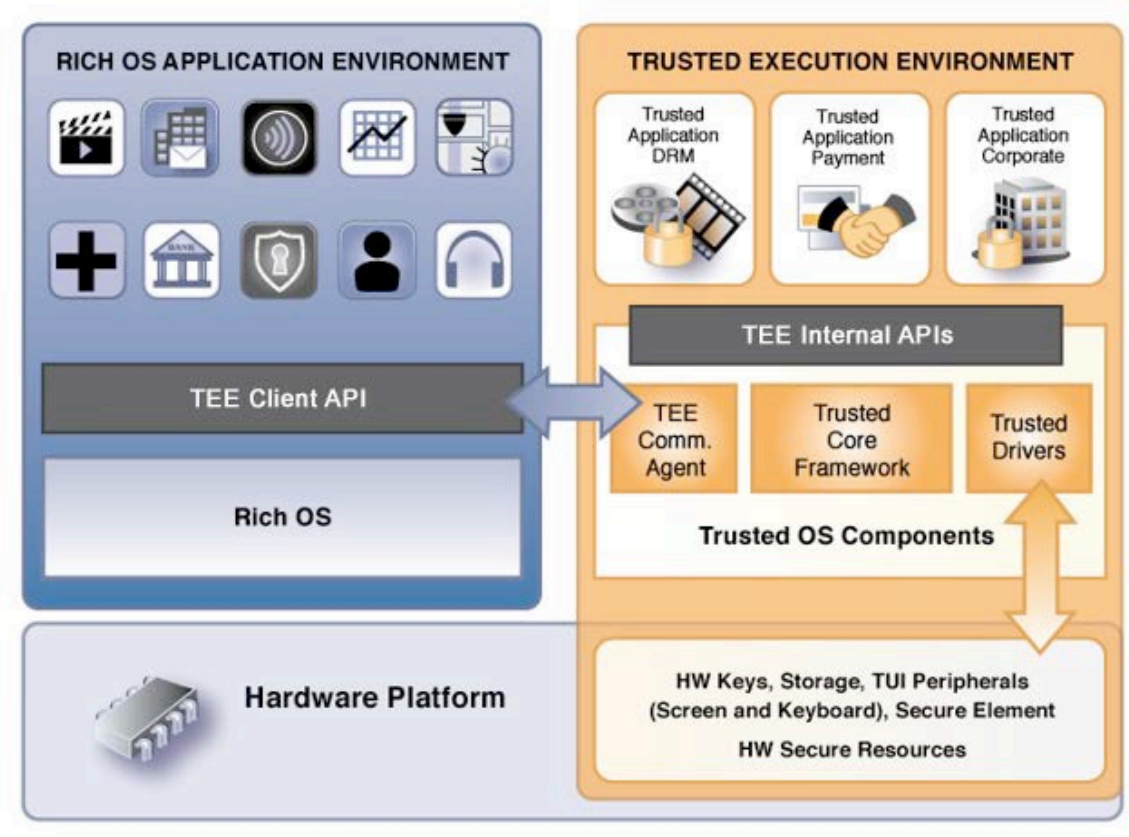
Put end users back into sole control

- Put end users back into **sole control** over their mobile-device
  - Leverage TUI for protected confirmation
  - Leverage TEE signatures for legally-binding evidence
  - Consider biometrics for stronger user binding

- Liaise with int' card schemes, int' banking regulators to strengthen the **demand** for a global protected confirmation API
  - Implement compelling payment business cases (3DS payment confirmation, PSD2 authentication with linking, …)
  - Motivate OEMs to implement the API *optional* standard set by Android

Our Implementation Security Architecture

Trusted Execution Environment – Prerequisites at our fingertips

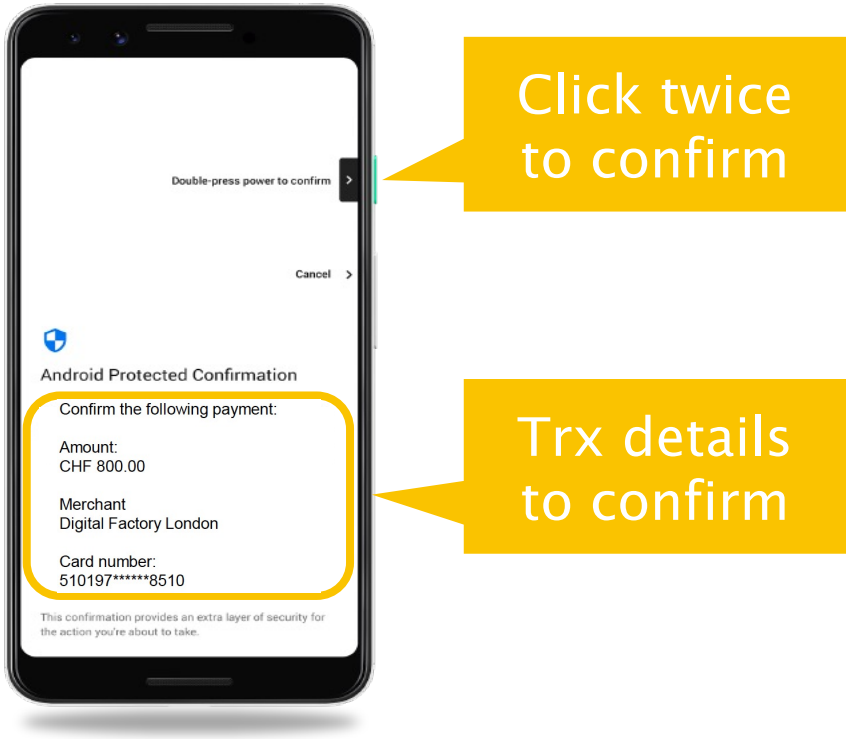


- Separation between 2 security domains
- Device attestation
- Hardware backed key on Hardware Storage Module (HSM) FIPS 140-3 (Level 3+) certified
- Trusted UI

Source: GlobalPlatform, The Trusted Execution Environment: Delivering Enhanced Security at a Lower Cost to the Mobile Market, February 2011.

Implementation Standard

Trusted User Interface

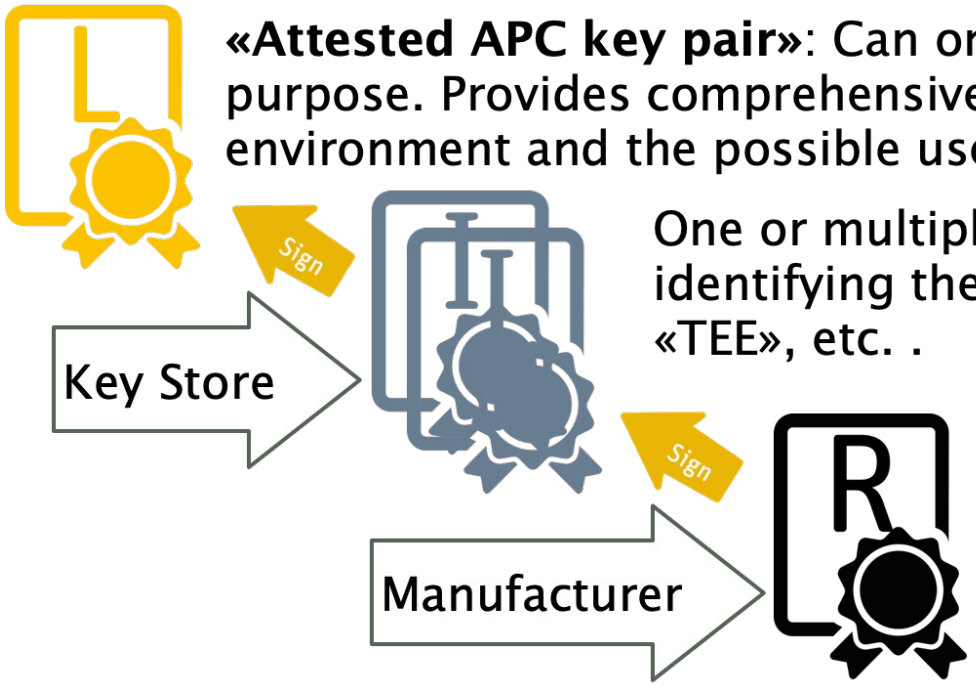


Android Protected Confirmation

- Transaction details displayed on a Trusted User Interface (TUI)
- Physical presence enforced via power button
- Protected confirmation evidenced through a TEE electronic signature
- Security context & device integrity proven by TEE key attestation
- Enhancement with device biometrics enforced via TEE

Attestation - Also Used By OEM Checks

The integrity of the environment is certified by attestation.



«Attested APC key pair»: Can only be used for the attested purpose. Provides comprehensive information about the environment and the possible use of the key-pair.

One or multiple **intermediate device key(s)** identifying the keystore such as «StrongBox», «TEE», etc. .

Attestation root key (Trust Anchor) injected into the hardware-backed keystore by the device manufacturer.

Attestation Attributes

Root Of Trust

- Device Locked
- Verified Boot State
- OS Version
- OS Patch Level
- Boot Patch Level
- Brand
- Device
- Product
- Serial Number
- IMEI
- MEID
- Manufacturer
- …

TEE Enforced Authorization

- Purpose(s)
- User Auth Type
- Trusted Confirmation Required
- Trusted User Presence Required
- Unlocked Device Required
- Rollback Resistance
- Creation DateTime
- Algorithm
- Digest(s)
- …

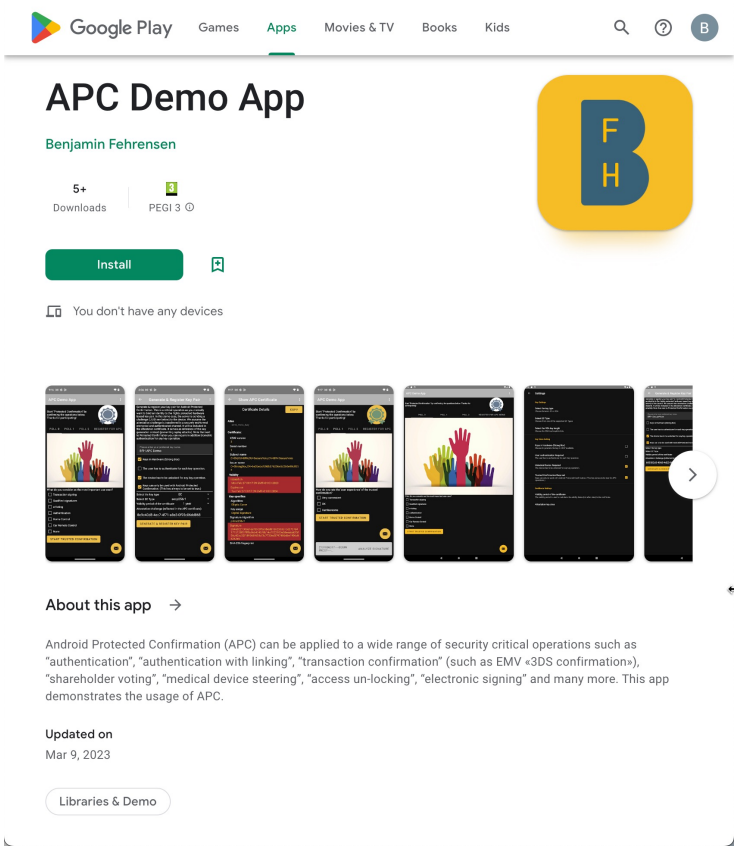
Attestation Application

- Package Infos
- Signature Digests
- Attestation Application ID Bytes
- Attestation ID Brand
- Attestation ID Device
- Attestation ID Product
- Attestation ID Serial
- …

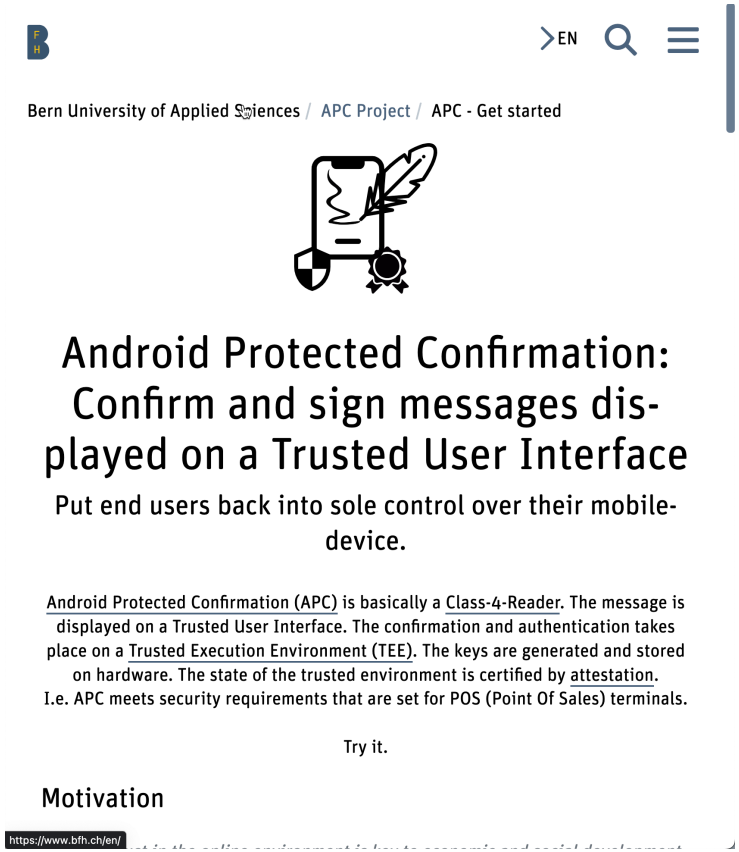
Global Attestation Parameters

- KeyStore
- Attestation Challenge
- Attestation Version
- Keymaster Version
- Unique ID

APC Demo App – Try it



https://play.google.com/store/apps/details?id=ch.bfh.securevote



https://apc.ti.bfh.ch/

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Nächste Seminare

Biel / Bienne
Quellgasse 21, Aula

6.4.2023 | **Von der Laborbank zum Patienten – Erste klinische Resultate zur selektiven Netzhauttherapie** Christian Burri, Institute for Human Centered Engineering HuCE, BFH-TI

13.4.2023 | **Intégration d'un ensemble complet de logiciels pour la conduite autonome** Ahmed Hanachi, Institut pour la recherche sur l'énergie et la mobilité IEM, BFH-TI

27.4.2023 | **Die digitale Transformation des Exportgeschäfts** Prof. Dr. Paul Ammann, Institute for Data Applications and Security IDAS, BFH-TI

11.5.2023 | **The Relevance and Hands-on Application of Biomedical Record Linkage in the Big Data Era** Prof. Dr. Murat Sariyar, Institute for Medical Informatics I4MI, BFH-TI

1.6.2023 | **Averaging Model for Feedback Control of Ultrasonic Transducers** Diego Stutzer, Institute for Human Centered Engineering HuCE, BFH-TI

Burgdorf / Berthoud
Pestalozzistrasse 20, E013

20.4.2023 | **How Data Analysis Can Help to Better Understand the Degradation in PV Modules** Prof. Dr. Jasmin Wandel, Institute for Optimisation and Data Analysis IODA , BFH-TI and Sara El Hassani, Institute for Energy and Mobility Research IEM, BFH-TI

4.5.2023 | **TPV 5000 – Beitrag zur Defossilisierung des Verkehrs** Dr. Albrecht Tribukait, CEO ad int., Silent-Power AG

25.5.2023 am Jlcoweg 1 | **What is High Voltage Engineering about?** Prof. Dr. Roman Grinberg, Institute for Energy and Mobility Research IEM, BFH-TI

8.6.2023 | **Waghalsige Holzkonstruktionen unter Anwendung moderner Technologie neu denken** Matias Penrroz, Institut für digitale Bau- und Holzwirtschaft IdBH, BFH-AHB