Software Security for Mobile Devices

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The RS³ Certifying App Store

- **vision:** user-centric, semantically justified security for Android devices
- **approach:** integrate security technology into an app store for Android
  - a single solution for multiple security concerns
  - accessible to the end user of a mobile device
  - providing explicit security guarantees
  - supporting user-defined security policies

static information-flow analysis

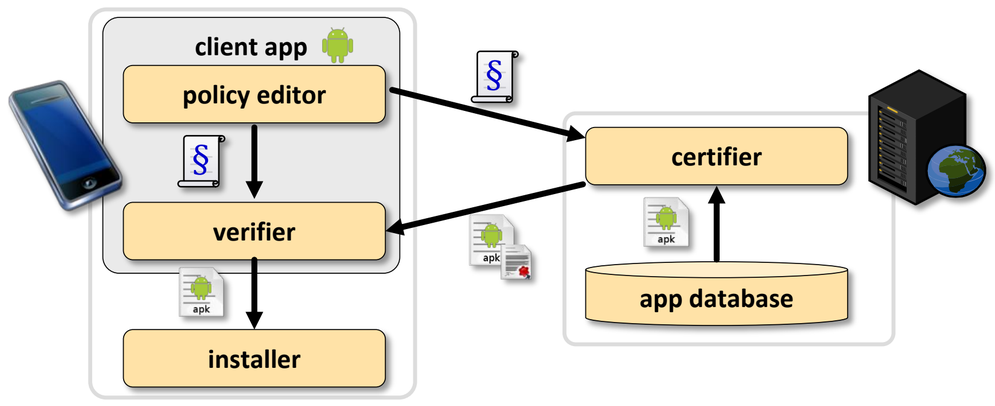
- before installation
- ensures **confidentiality** of sensitive user data

dynamic enforcement

- at run-time
- prevents **unwanted behavior** of applications

Static Analysis

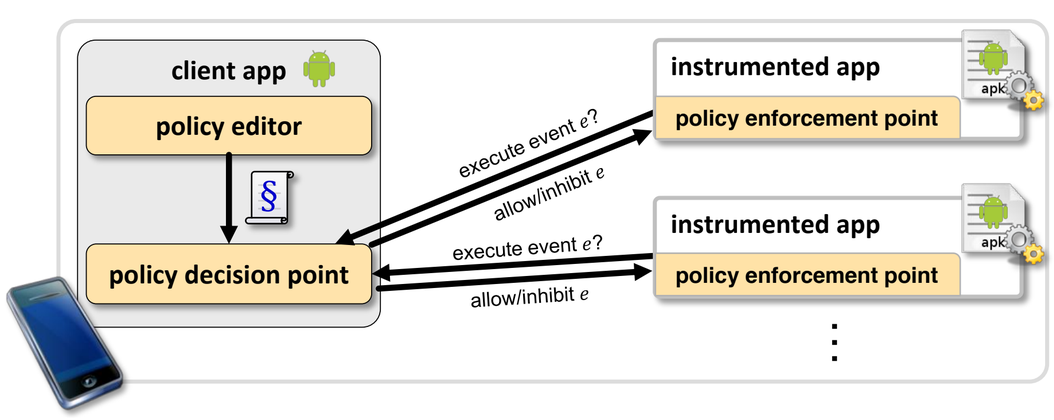
- **certification** of information flow security before installation of apps
  - notion of security formalized by a noninterference property
- two approaches to **static analysis of bytecode**
  - type-based and PDG-based
- **soundness** of the type-based analysis proven
  - w.r.t. formal operational semantics and the notion of security



- **proof-carrying code** principle used by the type-based analysis
  - allows to shift main workload to server
  - without including it in the trusted computing base

Dynamic Enforcement

- **enforcement** of usage control policies
- **instrumentation** of applications before installation
  - by inlining of policy enforcement points (PEPs)
  - intercept critical events and enforce decisions at run-time



- **central decision-making** by a single policy decision point (PDP)
  - enables enforcement of system-wide policies
  - enables exchange of policies without changing controlled apps

RS³

"Software Security for Mobile Devices" is one of the three reference scenarios of the nation-wide research program **"Reliably Secure Software Systems" (RS³)** funded by the German Research Foundation (DFG).

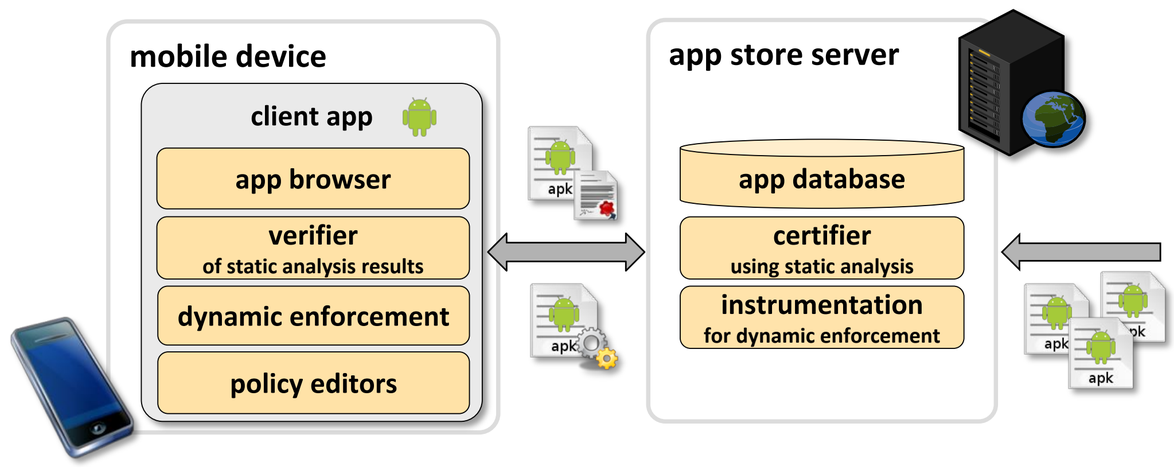
The vision of RS³ is to initiate a shift to a property-centric view on software security based on semantically well-founded approaches.

For more information, visit:

`http://www.reliably-secure-software-systems.de`

Architecture

- **client-server architecture**
  - security technology integrated on both sides



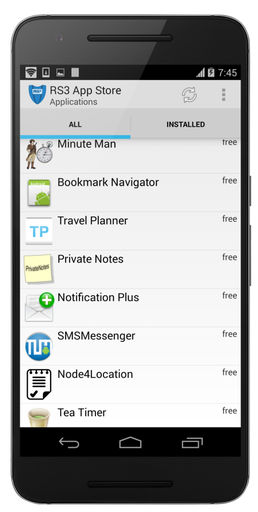
Prototype

- **policy editors** aid the user in specifying his security requirements
  - selection of categories of sensitive data to keep confidential
  - instantiation of generic policy templates restricting the behavior of apps
- **visualization** makes information flow in apps transparent to the user

- **simple** to set up and use
  - client app runs on off-the-shelf devices
  - server-side part runs on conventional web servers

Evaluation

- initial evaluation on self-developed **case studies**
  - core functionality of existing third-party apps
  - check whether problems are found/prevented
- recently: evaluation on **third-party apps**
  - from the F-Droid open-source app store
  - investigate how technologies scale
- **example:** "Tea Timer"
  - provides countdown timers
  - is allowed to read identity and write to SD card
  - concern: identity may be leaked to SD card
  - IF analyses guarantee absence of potential leak



next goal: provide useful guarantees for more third-party apps to user

Selected Publications

- S. Lortz, H. Mantel, A. Starostin, T. Bähr, D. Schneider, and A. Weber. Cassandra: Towards a Certifying App Store for Android. In *Proceedings of the 4th ACM Workshop on Security and Privacy in Smartphones and Mobile Devices*, pages 93–104, 2014.
- M. Mohr, J. Graf, and M. Hecker. JoDroid: Adding Android Support to a Static Information Flow Control Tool. In *Proceedings of the 8th Working Conference on Programming Languages*, pages 140–145, 2015.
- S. Rasthofer, S. Arzt, E. Lovat, and E. Bodden. DroidForce: Enforcing Complex, Data-Centric, System-Wide Policies in Android. In *Proceedings of the 9th International Conference on Availability, Reliability and Security*, pages 40–49, 2014.

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