GRAN SASSO SCIENCE INSTITUTE
SCHOOL OF ADVANCED STUDIES
Scuola Universitaria Superiore

VU VRIJE UNIVERSITEIT AMSTERDAM

MOBILESoft2018
5TH IEEE/ACM INTERNATIONAL CONFERENCE ON MOBILE SOFTWARE ENGINEERING AND SYSTEMS

Gothenburg, 27 May 2018

Identifying Architectural Technical Debt in Android Applications through Automated Compliance Checking

Roberto Verdecchia

roberto.verdecchia@gssi.it

Architectural Technical Debt (ATD)

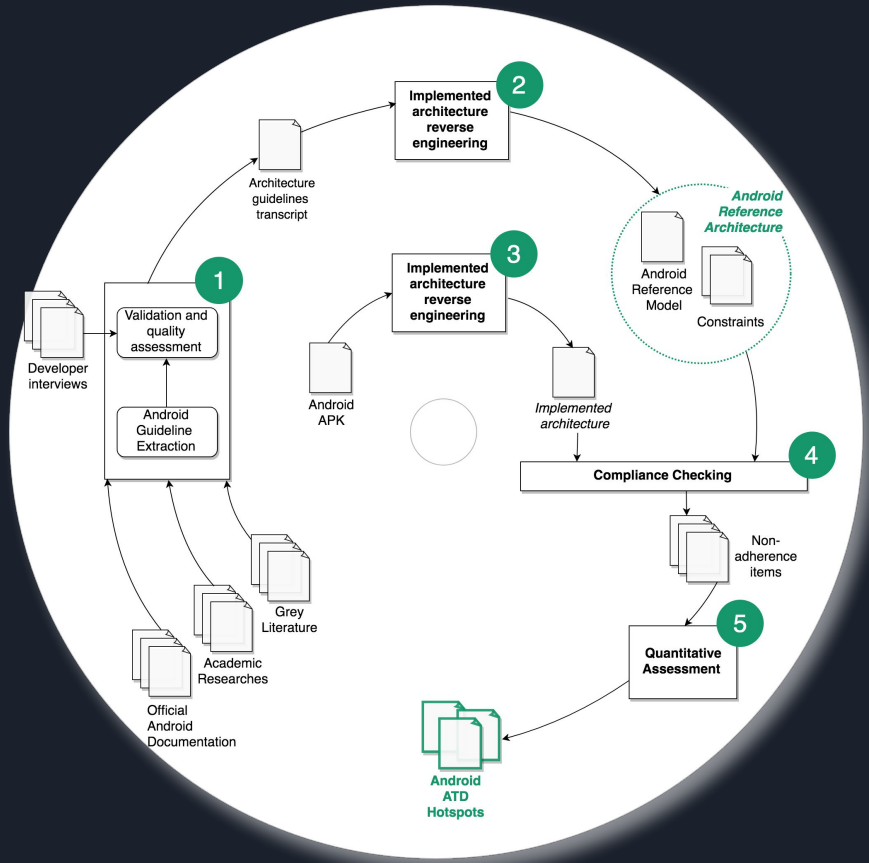
- **Sub-optimal decisions** resulting in **immature architectural artifacts**[1]
- Hinders **maintainability** and **evolvability**
- **ATD identification:** detecting ATD during or after architecting processes[2]
- To date, few approaches consider Android specific ATD

[1] "A Systematic Literature Review and a Unified Model of ATD." IEEE, 2016, pp. 189-197. T. Besker, A. Martini, and J. Bosch
[2] "Architectural Debt Management in Value-Oriented Architecting". 2014. In Economics-Driven Software Architecture, pp. 183-204. Z. Li, P. Liang, and P. Avgeriou.

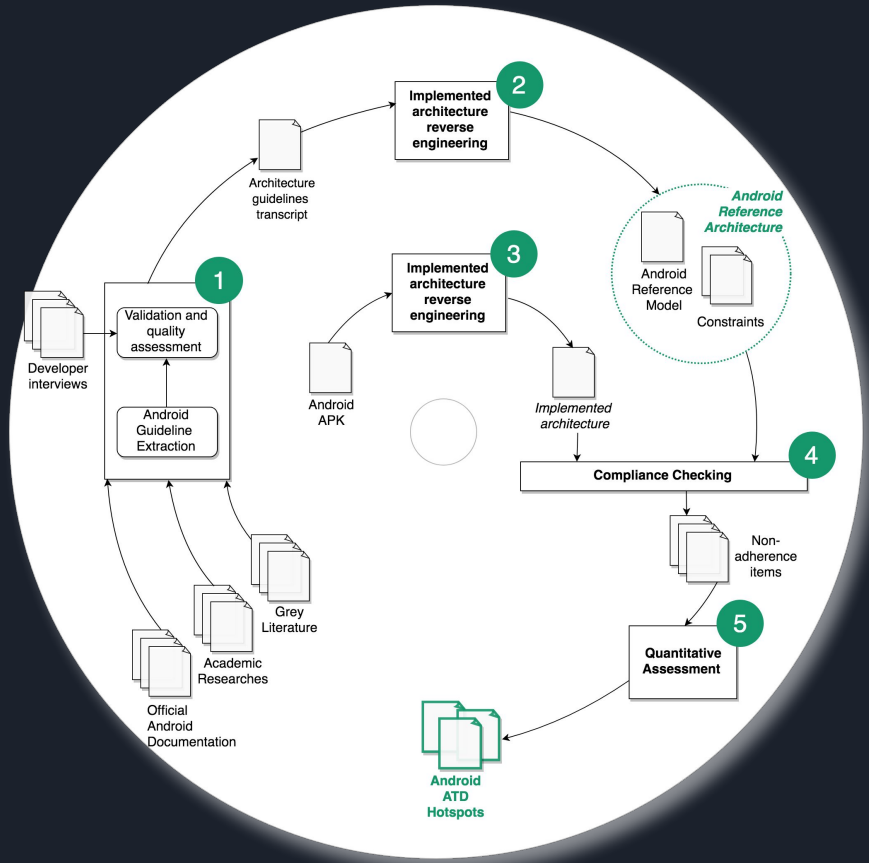
Research question

“How can we identify automatically Architectural Technical Debt specific to Android applications?”

Approach overview

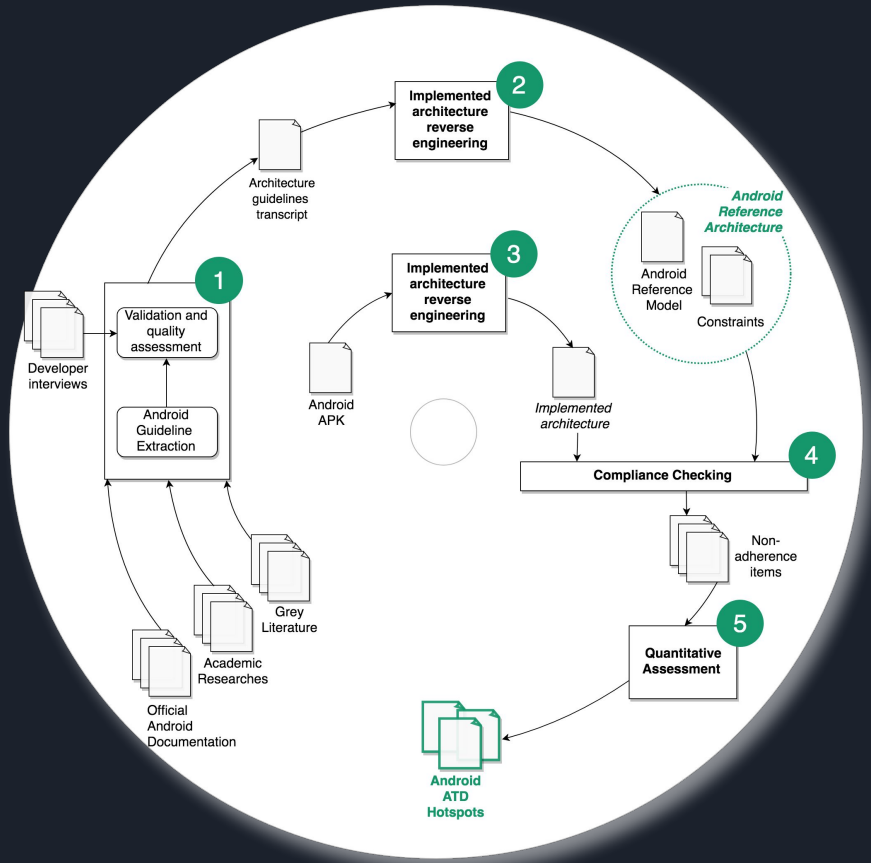


Approach overview



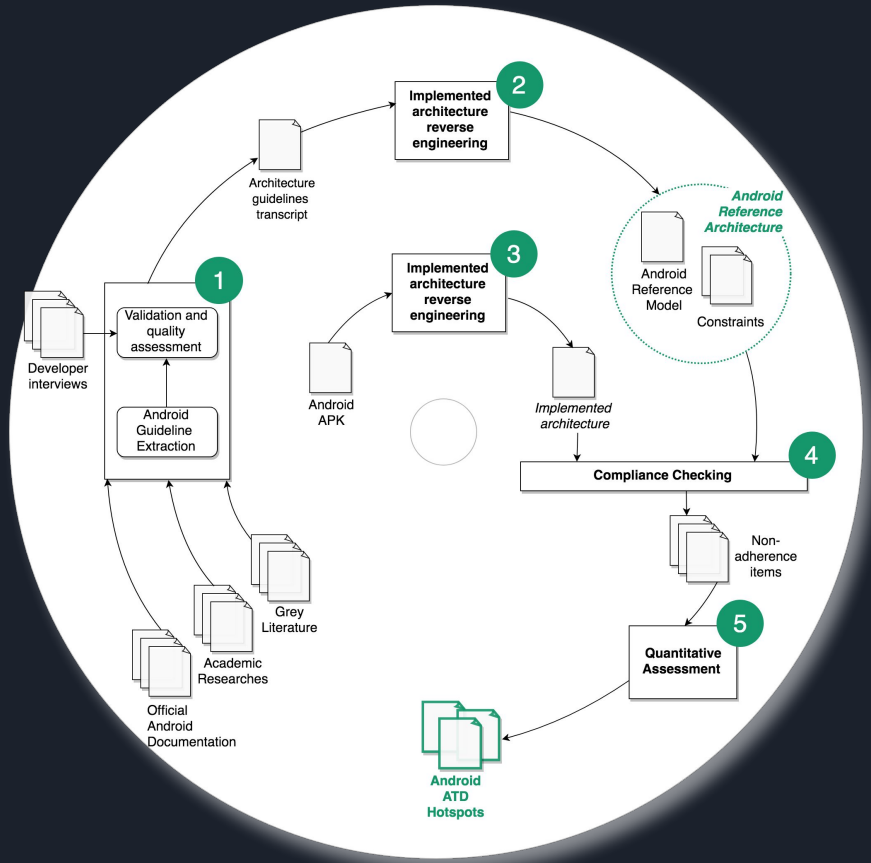
1. Extraction of Android architectural guidelines

Approach overview



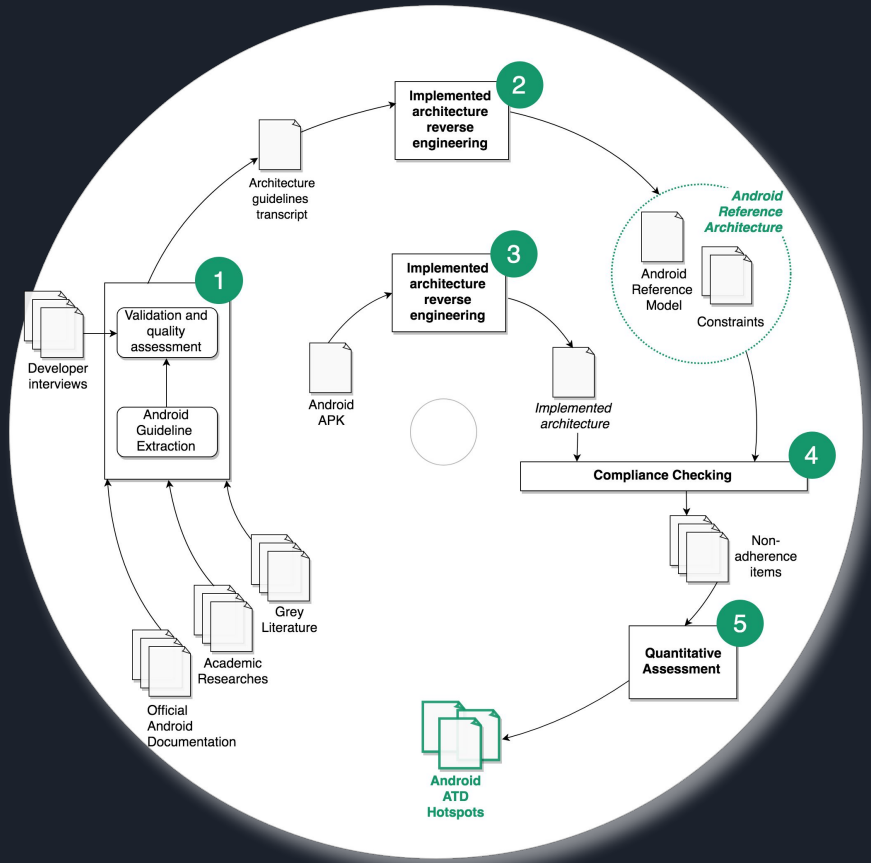
1. Extraction of Android architectural guidelines
2. Establishment of Android reference architecture

Approach overview



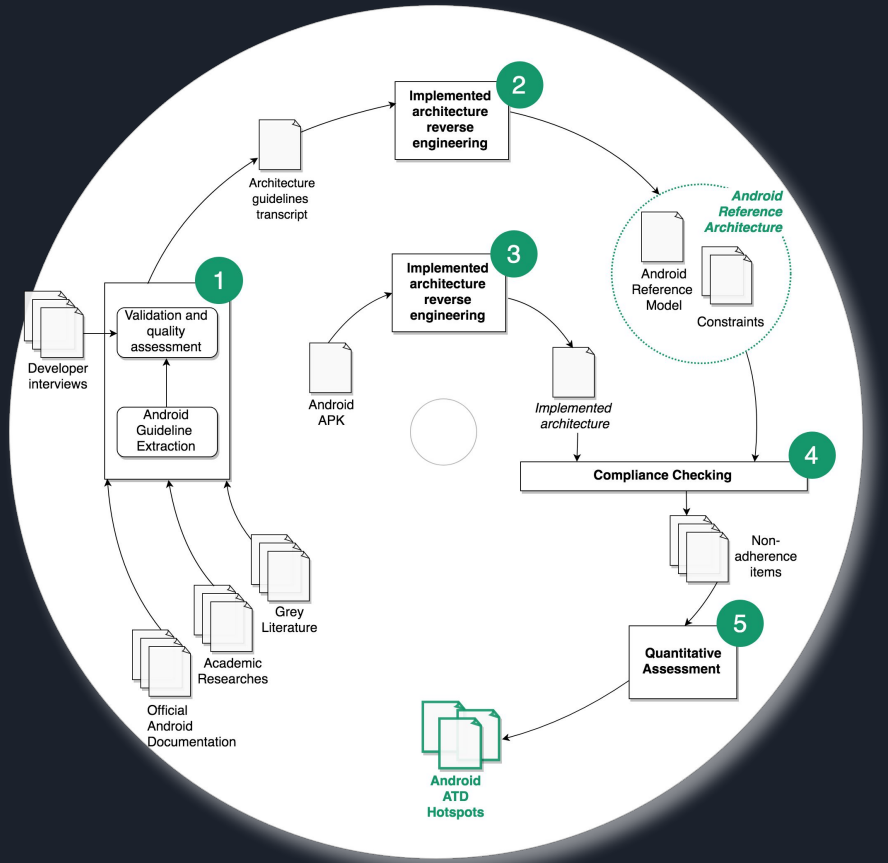
1. Extraction of Android architectural guidelines
2. Establishment of Android reference architecture
3. Reverse engineering of implemented architecture

Approach overview



1. Extraction of Android architectural guidelines
2. Establishment of Android reference architecture
3. Reverse engineering of implemented architecture
4. Compliance checking

Approach overview



1. Extraction of Android architectural guidelines
2. Establishment of Android reference architecture
3. Reverse engineering of implemented architecture
4. Compliance checking
5. Quantitative assessment of compliance violations

See you at the poster!

Identifying Architectural Technical Debt in Android Applications through Automated Compliance Checking

Roberto Verdecchia

mail: *roberto.verdecchia@gssi.it*
supervisor: Patricia Lago
co-supervisor: Ivano Malavolta

Questions? Look for me around!

IN FEW WORDS

what (project goals):

- ✓ Reusable *Android Reference Architecture*
- ✓ Automated process for architectural technical debt hotspot analysis of Android applications

how (technique):

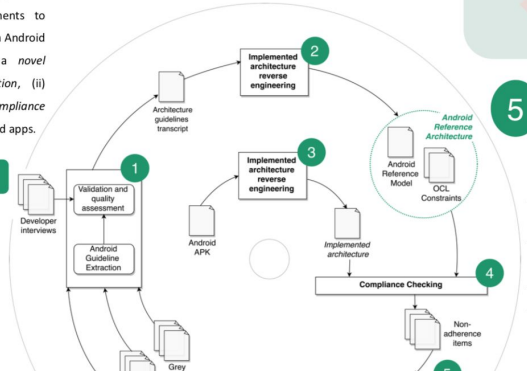
- ➢ Manual extraction and formalization of Android architectural guidelines
- ➢ Automated *implemented architecture* reverse engineering
- ➢ Automated model-based compliance checking
- ➢ Quantitative assessment of compliance-violations to identify hotspot components

Overview

Mobile application business model is tightly coupled to users satisfaction. Promptly and efficiently releasing new versions to introduce new features, fix bugs, and adapt to users' needs is crucial. *Architectural technical debt (ATD)* hinders by definition evolvability. Among other techniques, compliance checking is used to undercover ATD [1]. Recently, effort was spent in standardizing Android architectural components to lower complexity of Android apps and provide a Android architectural guidelines [2]. We present a *novel approach*, based on (i) *guideline extraction*, (ii) *architecture reverse engineering* and (iii) *compliance checking*, for identifying ATD hotspots in Android apps.

1 Guidelines extraction

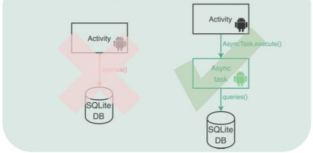
The first step consists in an *architectural guideline extraction from heterogeneous sources*. Guidelines should embed architectural rules designed to avoid incurring in potential ATD. The extracted guidelines are validated through developers interviews.



4 Compliance checking

During this process, items of non-adherence of the *implemented architecture* w.r.t. the *Android reference architecture* are identified. The items are stored for a subsequent analysis carried out in Step 5. Due to its complexity this step has to be carried out (semi) automatically through a model comparison tool.

Example of guideline violation



5 Quantitative assessment

Once the set of non-adherence items is computed, it is possible to analyze the gathered data to identify which architectural elements of the implemented architecture violate the highest number of Android architectural guidelines. Distinct violation types can even be associated to specific weights to support a more involved prioritization process. The final architectural elements identified through this process are

GRAN SASSO SCIENCE INSTITUTE
SCHOOL OF ADVANCED STUDIES
Scuola Universitaria Superiore

VRIJE UNIVERSITEIT AMSTERDAM

MOBILESOFT2018
5TH IEEE/ACM INTERNATIONAL CONFERENCE ON MOBILE SOFTWARE ENGINEERING AND SYSTEMS

Gothenburg, 27 May 2018

Identifying Architectural Technical Debt in Android Applications through Automated Compliance Checking

Roberto Verdecchia

roberto.verdecchia@gssi.it