AN ARCHITECTURAL SMELL EVALUATION IN AN INDUSTRIAL CONTEXT

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UNIVERSITA' DEGLI STUDI DI MILANO BICOCCA

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IARIA

SHORT INTRODUCTION

Ilaria Pigazzini is currently a Ph.D. student in computer science at the Department of Computer Science, Systems and Communications, **University of Milano-Bicocca**. She has received her B.Sc. and M.Sc. degrees from the University of Milano-Bicocca in Computer Science in 2016 and 2018, respectively. Her research interests include **reverse engineering**, **architectural smell detection and refactoring** of Object Oriented systems.

STUDY GOALS

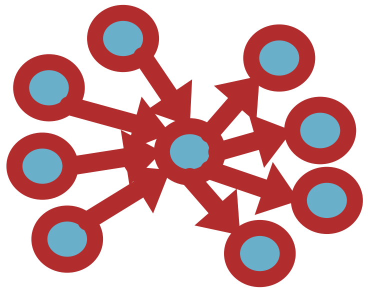
Architectural Smells (AS) are design decisions which negatively impact on the system internal quality.

Investigate the perception of architectural smells in an **industrial context**

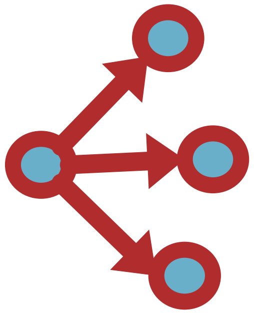
Hints on how to conduct **smell refactoring** from practitioners' experience

Identification of the **most critical type of smell**, in the practitioners' opinion

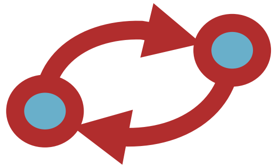
ARCHITECTURAL SMELLS



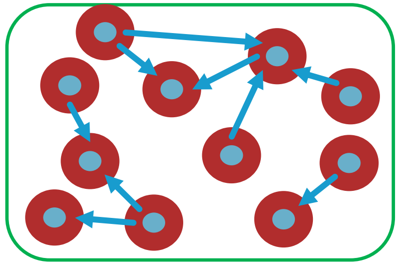
HUB LIKE DEPENDENCY
(HL)



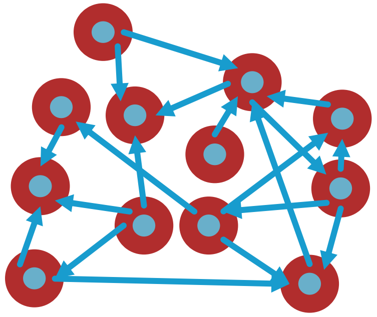
UNSTABLE DEPENDENCY
(UD)



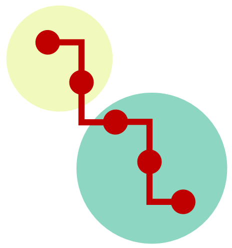
CYCLIC DEPENDENCY
(CD)



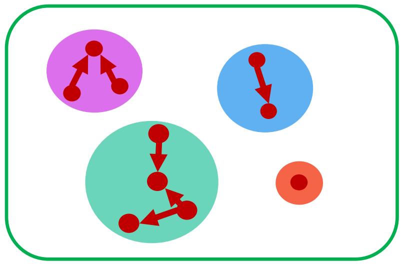
GOD COMPONENT
(GC)



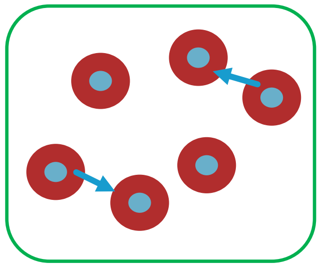
DENSE STRUCTURE
(GC)



SCATTERED FUNCTIONALITY
(SF)



FEATURE CONCENTRATION
(FC)



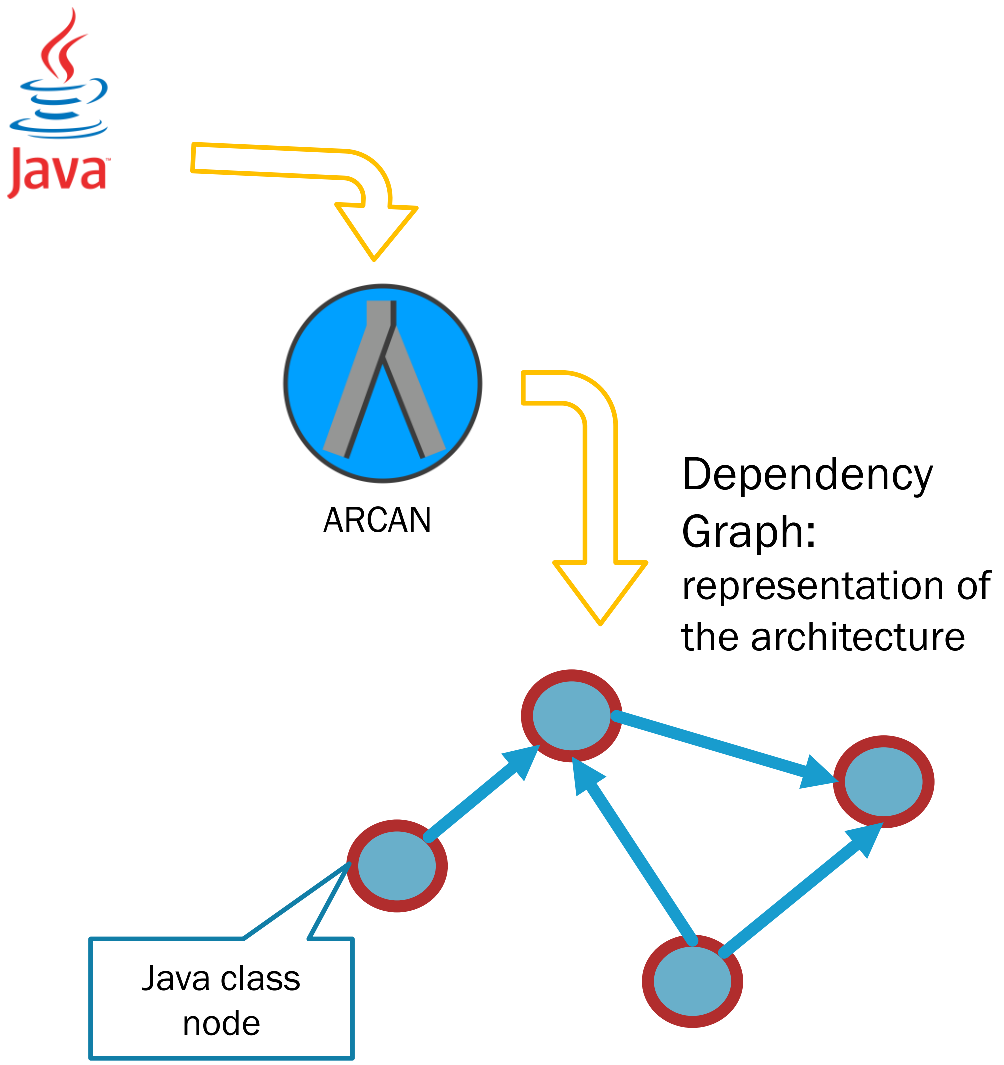
INSUFFICENT PACKAGE COHESION
(IPC)

ARCAN: TOOL FOR ARCHITECTURAL SMELL DETECTION

Represents the architecture as a dependency graph

Nodes: classes or packages

Edges: relationships among classes and packages



Dependency Graph: representation of the architecture

CASE STUDY DESIGN (1)

Analysed project

□ Domain: Business Management System

□ Language Java

□ Architecture: monolithic

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Project size

NOC	NOP
1343	112

Class level smells

CD	HL
135	3

Package level smells

CD	HL	UD	GC	DS	IPC	FC	SF
5	3	19	10	1	107	4	81

CASE STUDY DESIGN (2)

Survey with 12 questions, 3 Anoki developers with different developing experiences.

Detection and awareness

4 questions to evaluate the precision of Arcan detection and investigate the awareness of practitioners on the smell presence.

Impact

2 questions to investigate the perceived impact of smells on software quality attributes

Refactoring

3 questions to understand when refactoring should be conducted and which type to apply

Severity, priority and refactoring effort

3 questions to evaluate the effort/time needed and to investigate if smells can be ranked depending on their severity

RESULTS (1): How are architectural smells perceived in an industrial context?

19 **smells** presented in the survey: 6 **false positives** → 70% **precision**

- Developers did not know about the concept of AS, however they reported that they **were aware of some of them;**
- AS have a negative impact on **maintainability;**
- Developers recognized **usefulness of automatic tools** to spot AS.

- HL: utility classes designed on purpose
- GC: designed on purpose to avoid boilerplate code
- SF: in some cases it was due to the layer organization of the architecture

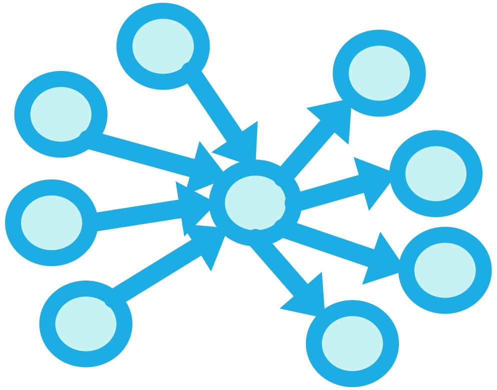
RESULTS (2): What practitioners suggest according to the refactoring of the smells?

Developers would not refactor some smells. **Why?**

- the refactoring activities could be **too expensive**
- the smell could represent the **only possible solution**

Feature Concentration, Scattered Functionality and Insufficient Package Cohesion: the refactoring of such smells is useful, when the system architecture is layered, to prepare the migration towards microservices.

RESULTS (3): Which are the most critical smells according to the practitioners perception?



Most critical smell: Hub Like Dependency on classes

which is also one of the smell which gets worse the most, as time passes.

Less critical smell: Insufficent Package Cohesion

Smell with highest refactoring priority: Cyclic Dependency

Smell with highest refactoring effort: Dense structure

Other insights

We found also relationships among metrics used for the smell detection and the smell severity indicated by the developers

CONCLUSIONS

- Concrete feedback for Arcan developers to improve the detection of architectural smells;
- Useful data on smells’ criticality, smells’ impact on maintainability and smells’ refactoring effort;
- Helpful insights for Anoki practitioners on how their architecture evolved and which spots require more attention from now on to avoid architecture erosion.

An Architectural Smell Evaluation in an Industrial Context

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Thank you

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