DICTO
Architecture Conformance Checking

Andrea Caracciolo

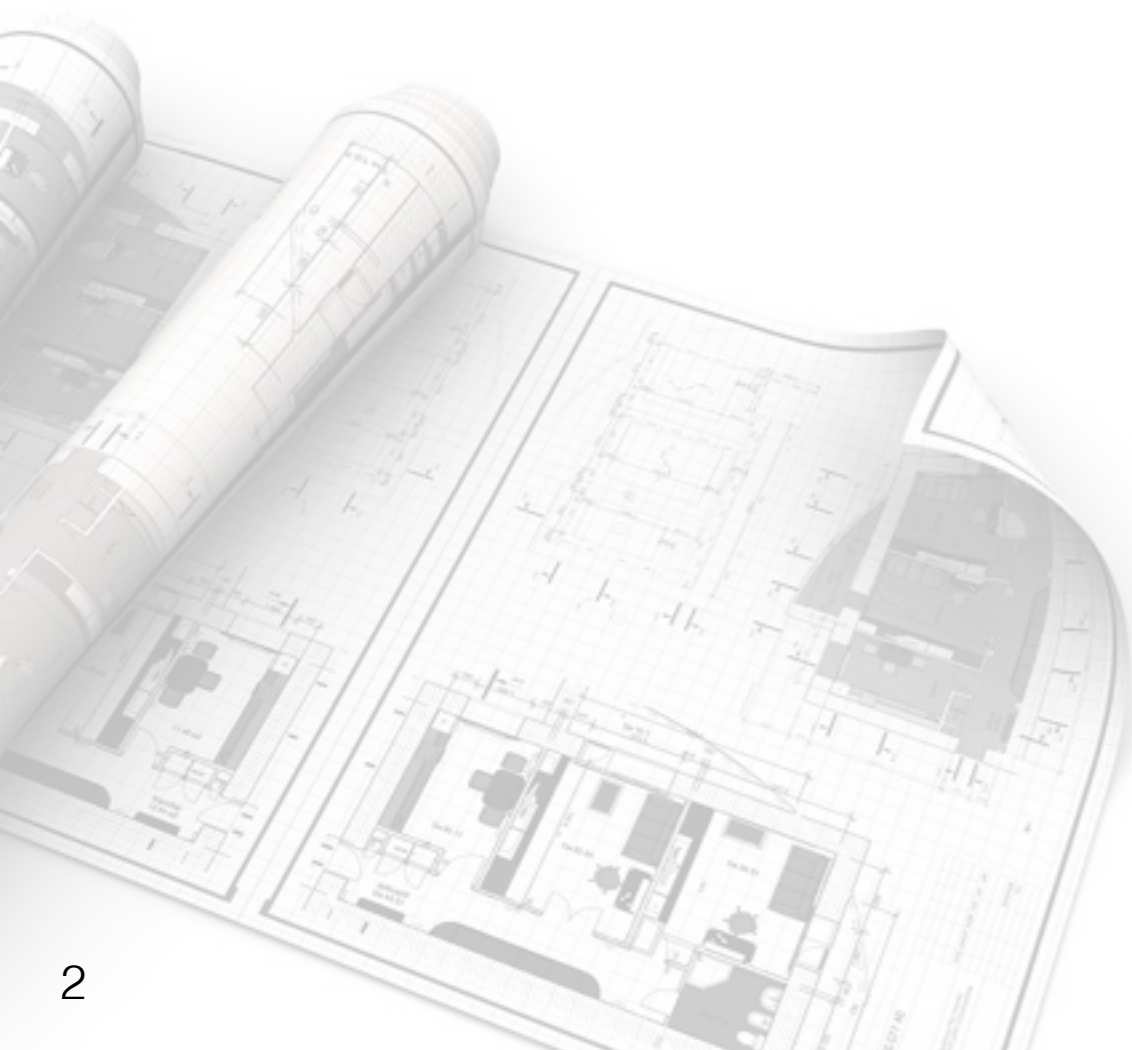http://scg.unibe.ch/dicto

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b
UNIVERSITÄT
BERN
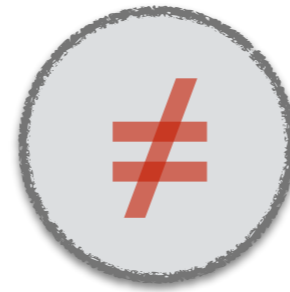
Design ≠ **Code**

Design ≠ **Code**

RULES
1. YOU CAN....
2. YOU CAN'T...
3. YOU CAN....
4. YOU CAN'T

Adapter		Target
− adaptee : Adaptee		+ requiredMethod()
+ requiredMethod() ●		

this.adaptee.oldMethod();

Adaptee
+ oldMethod()

3

Quality Monitoring

Quality Monitoring

011010
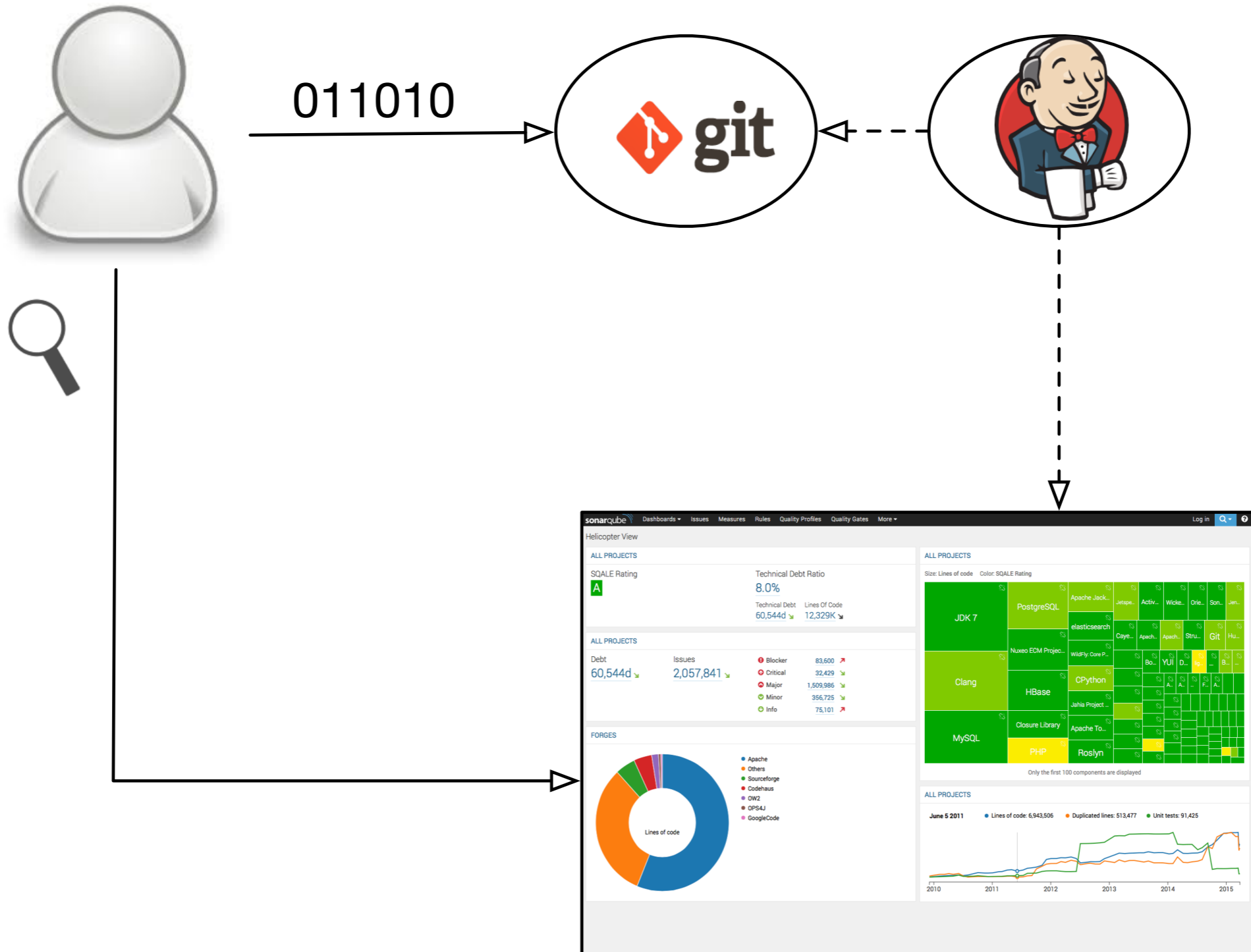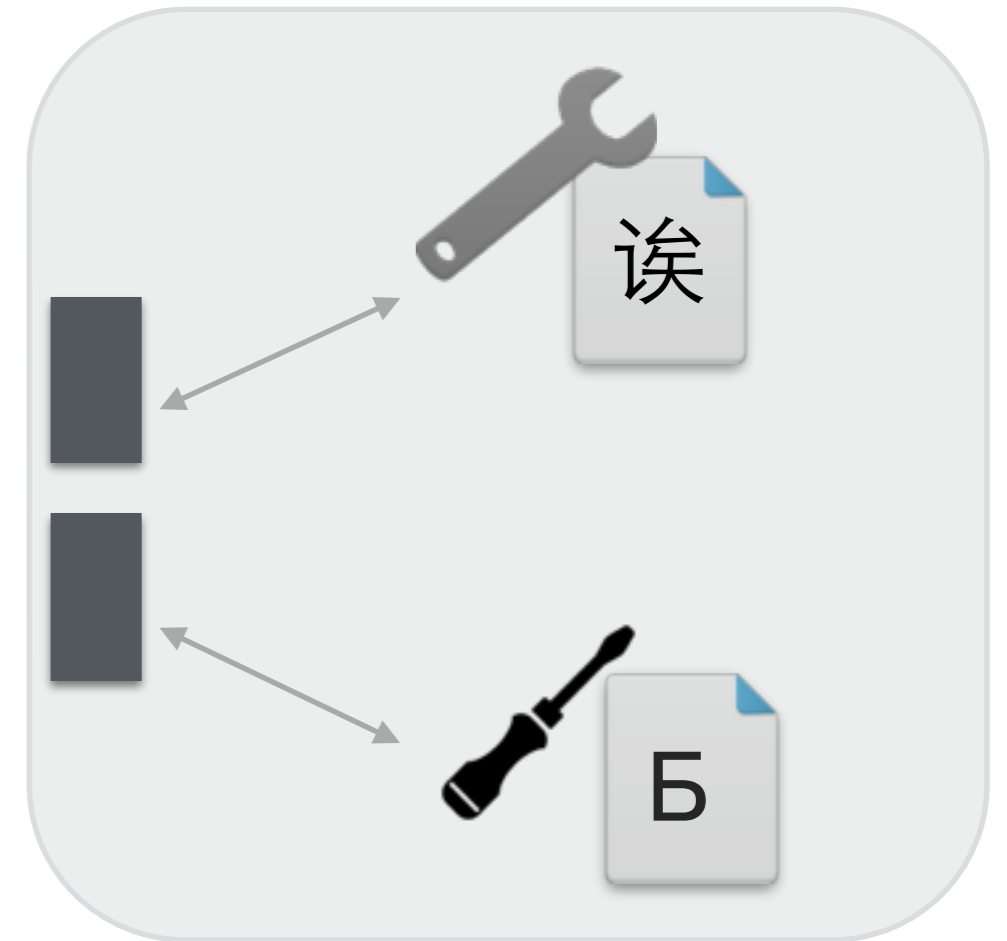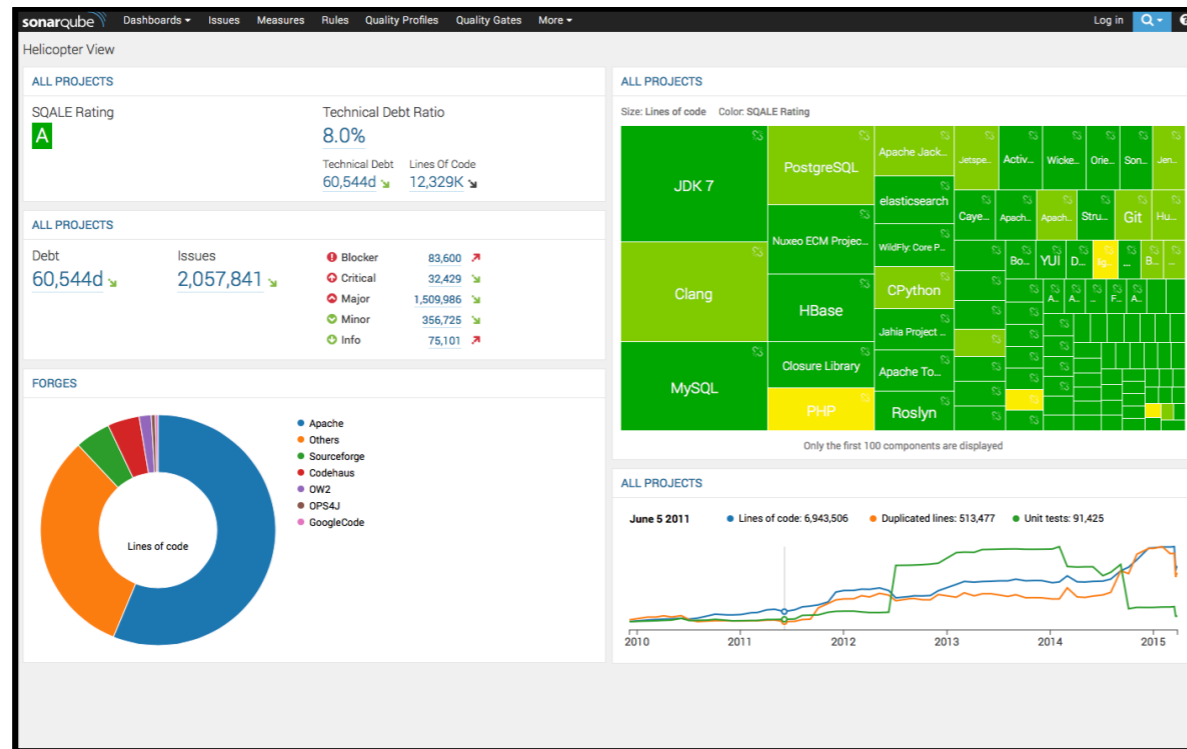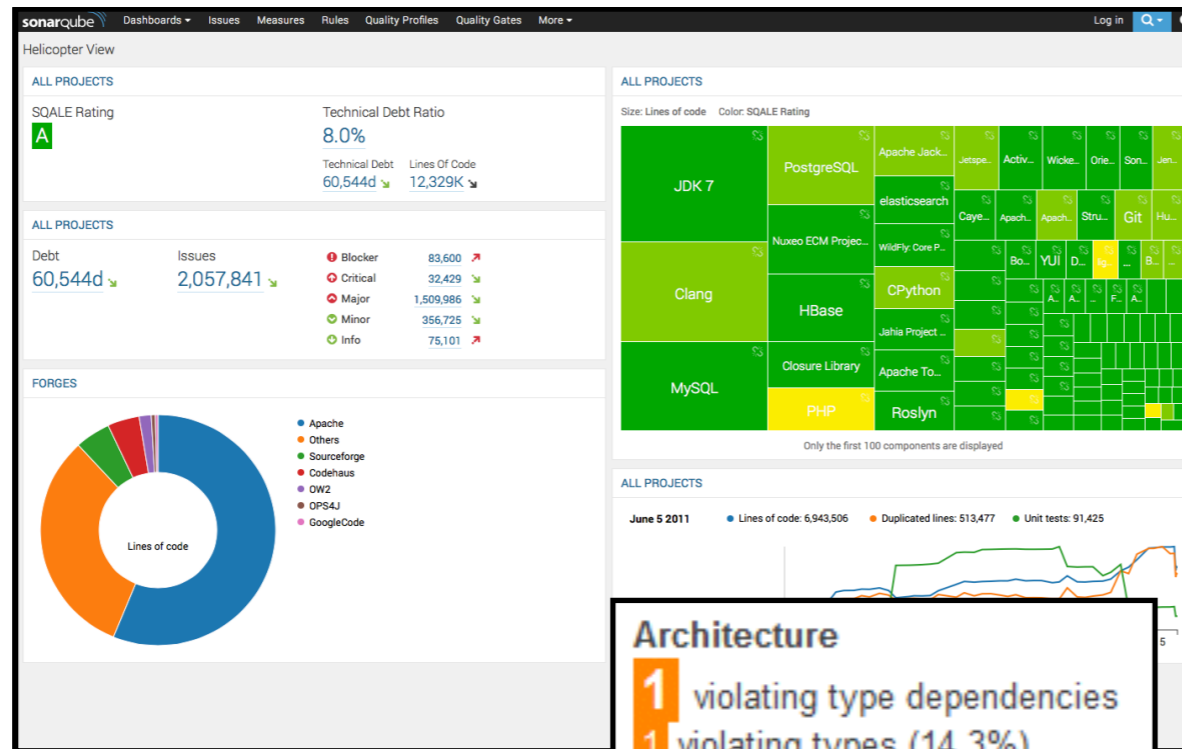
Architectural Rules

Quality Monitoring

Quality Monitoring

Quality Monitoring
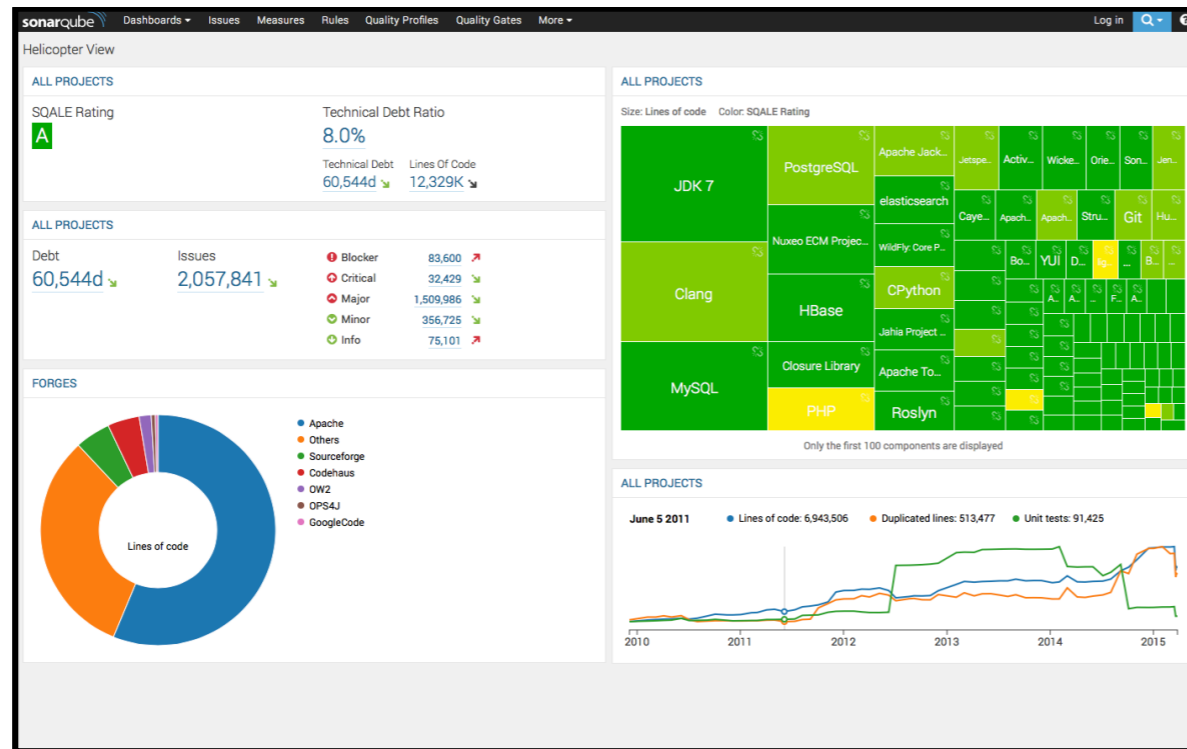
Rules

Persistence cannot **depend on** Service

Service must **have annotation** "*@Service*"

System cannot **contain cycles**

Rule examples

Structural

Controller, Model, Dao must **be layered**

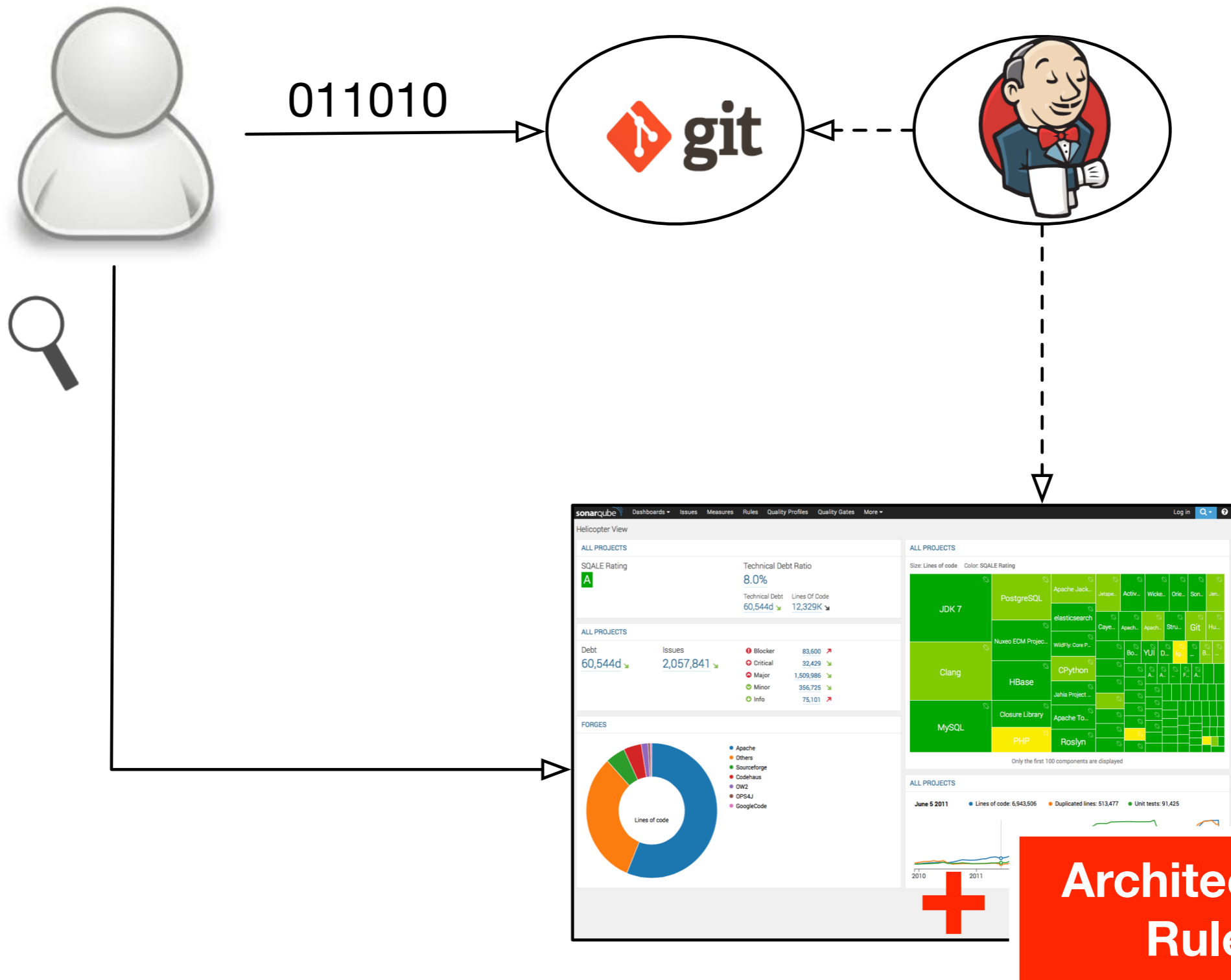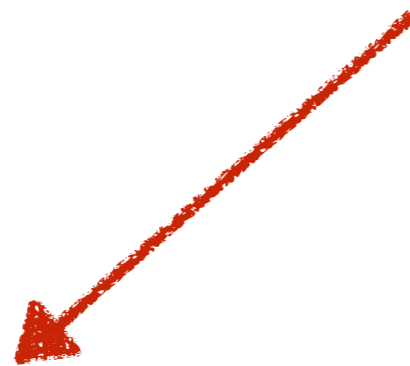*CoreExceptions* must **be caught**

PojoMethods can only **be named** "get*", "set*"

DataBean must **have attribute** "*destroy-method*"

only *TestPackage* can **contain dead methods**

Model cannot **contain code clones**; **contain cycles**

Behavioural

ModelClasses cannot **lead to deadlock**

PriceAPI must **have content** "*CHF*"; **status code** "200"

CustAPI must **have latency** < *100* **ms**

CustAPI must **handle load from** *30* **users**

Rule examples

Entity Definition

Tests = Class with **name:***"*test_*"*

PojoMethods = Method with **containingClass:***"*.pojos.*"*

DeprecatedMethods = Method with **annotation:***"@Deprecated"*

JunitSetup = Method with **annotation:***"@Before",* **name:***"setUp"*
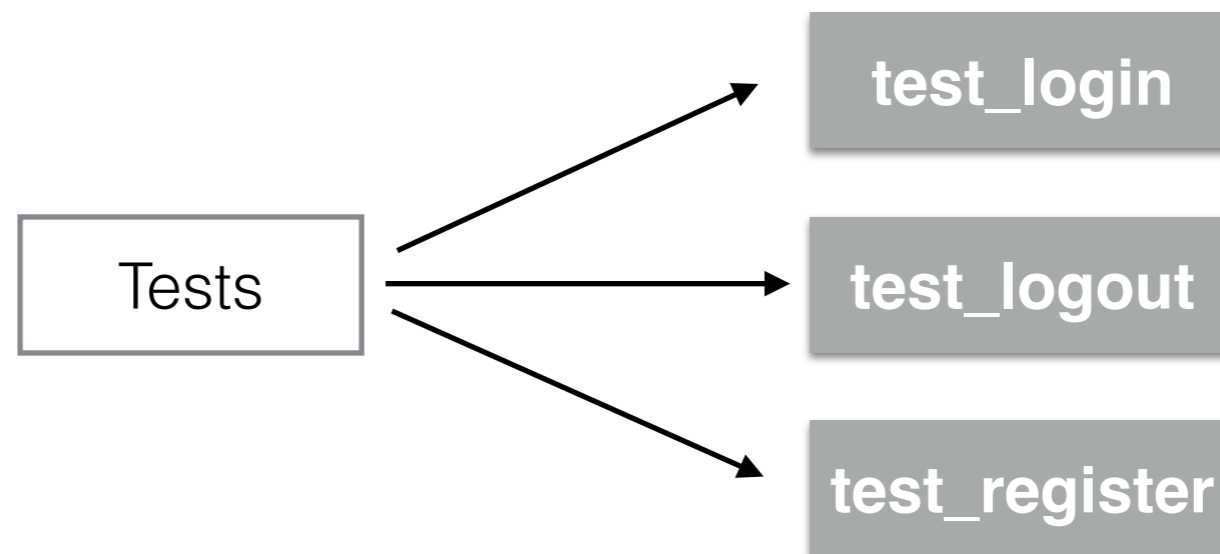
50K LOC

Persistence = Package with name:"**.*persistence.***"

Service = Class with superClass:"*.*IService*"

ImplClasses = Class with name:"**Impl*"

Persistence cannot **depend on** **Service**

ImplClasses must **have annotation** "@XXService"

System cannot **contain cycles**

analysis: **30 sec**

Persistence = Package with name:"**.*persistence.***"

Service = Class with superClass:"*.*IService*"

ImplClasses = Class with name:"**Impl*"

14 **Persistence** cannot **depend on Service**

15 **ImplClasses** must **have annotation** "@XXService"

19 **System** cannot **contain cycles**

Persistence = Package with name:"**.*persistence.***"

name!:"**.*service.***"

Service = Class with superClass:"*.*IService*"

ImplClasses = Class with name:"*Impl*"

14

4 **Persistence** cannot **depend on Service**

ImplClasses must **have annotation** "@XXService"

System cannot **contain cycles**

Persistence = Package with name:"**.*persistence.***",

name!:"**.service.**"

Service = Class with superClass:"*.*IService*"

Impl = Class with name:"*Impl*"

Persistence cannot **depend on Service**

16 only **ImplClasses** can **have annotation** "@XXService"

System cannot **contain cycles**
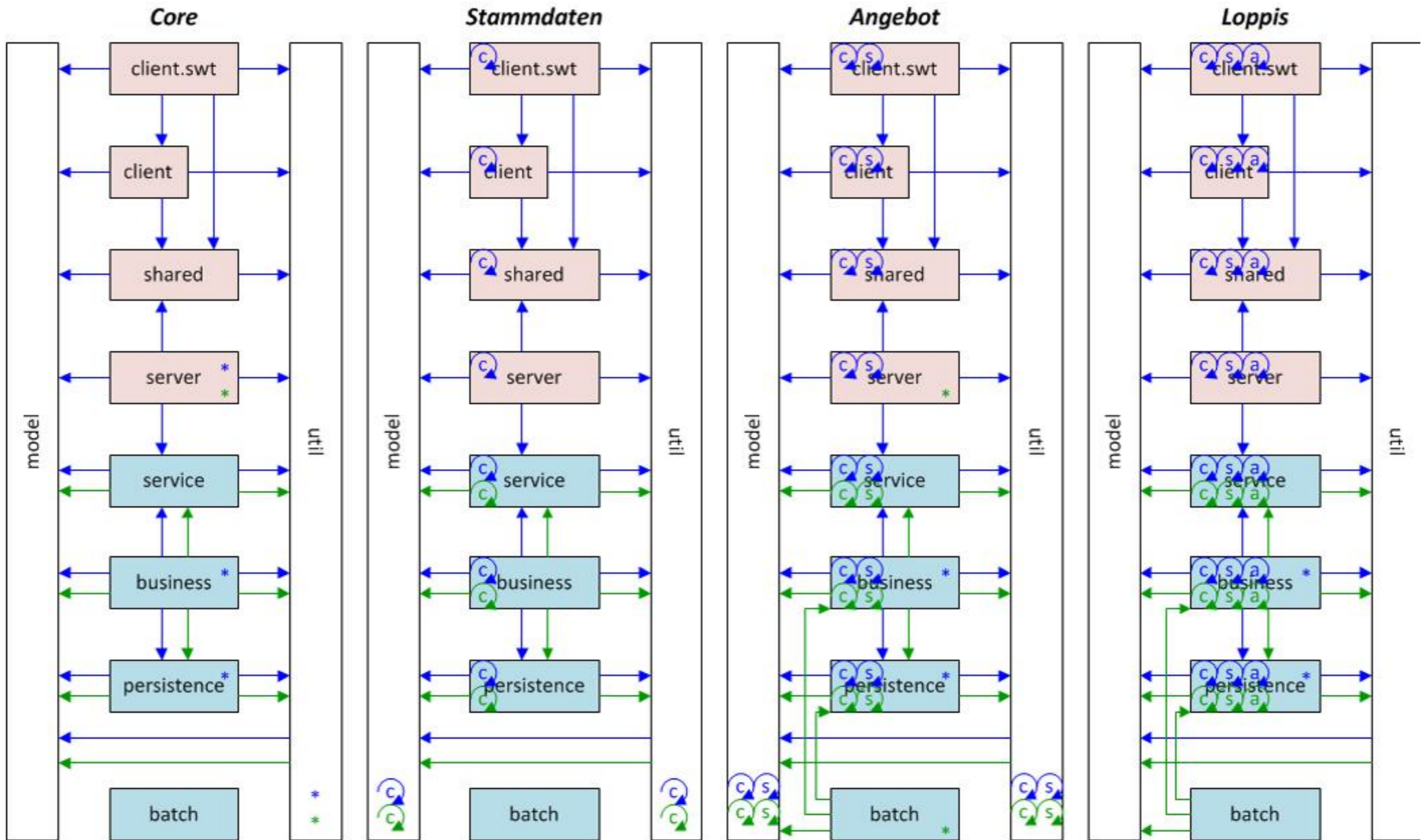
0.5M LOC

CoreProject cannot **depend on** StammdatenProject, AngebotProject, [..]

StammdatenProject cannot **depend on** AngebotProject, BetriebProject, [..]

AngebotProject cannot **depend on** BetriebProject, FosProject, [..]

BetriebProject cannot **depend on** StammdatenProject, FosProject, [..]

LoppisProject cannot **depend on** StammdatenProject, FosProject

ClientScoutSWTPackage cannot **depend on** ServerScoutPackage, ServicePackage, [..]

ClientScoutPackage cannot **depend on** ClientScoutSWTPackage, ServerScoutPackage, [..]

SharedScoutPackage cannot **depend on** ClientScoutSWTPackage, ClientScoutPackage, [..]

ServerScoutPackage cannot **depend on** ClientScoutSWTPackage, ClientScoutPackage, [..]

ServicePackage cannot **depend on** ClientScoutSWTPackage, ClientScoutPackage, [..]

BusinessPackage cannot **depend on** ClientScoutSWTPackage, ClientScoutPackage, [..]

PersistencePackage cannot **depend on** ClientScoutSWTPackage, ClientScoutPackage, [..]

UtilityPackage cannot **depend on** ClientScoutSWTPackage, ClientScoutPackage, [..]

ModelPackage cannot **depend on** ClientScoutSWTPackage, ClientScoutPackage, [..]

analysis: **8 min**

CoreProject cannot depend on StammdatenProject, AngebotProject, [..]

StammdatenProject cannot depend on AngebotProject, BetriebProject, [..]

AngebotProject cannot depend on BetriebProject, FosProject, [..]

57 **BetriebProject** cannot **depend on StammdatenProject, FosProject, [..]**

136 **LoppisProject** cannot **depend on StammdatenProject, FosProject**

ClientScoutSWTPackage cannot depend on ServerScoutPackage, ServicePackage, [..]

27 **ClientScoutPackage** cannot **depend on ClientScoutSWTPackage, ServerScoutPackage, [..]**

SharedScoutPackage cannot depend on ClientScoutSWTPackage, ClientScoutPackage, [..]

ServerScoutPackage cannot depend on ClientScoutSWTPackage, ClientScoutPackage, [..]

22 **ServicePackage** cannot **depend on ClientScoutSWTPackage, ClientScoutPackage, [..]**

19 **BusinessPackage** cannot **depend on ClientScoutSWTPackage, ClientScoutPackage, [..]**

PersistencePackage cannot depend on ClientScoutSWTPackage, ClientScoutPackage, [..]

UtilityPackage cannot depend on ClientScoutSWTPackage, ClientScoutPackage, [..]

4 **ModelPackage** cannot **depend on ClientScoutSWTPackage, ClientScoutPackage, [..]**

project B

Planned rules:

Exceptions

- classes cannot catch java.lang.Exception or java.lang.RuntimeException

Class Naming

- interfaces must start with "I"

- persistence classes must end with "PO"

Class Hierarchy

- impl classes must use interfaces parent package

Comments

- comments must start by TODO [ID]: or FIXME [ID]:

Annotations

- @Autowire can only be used on interface attributes
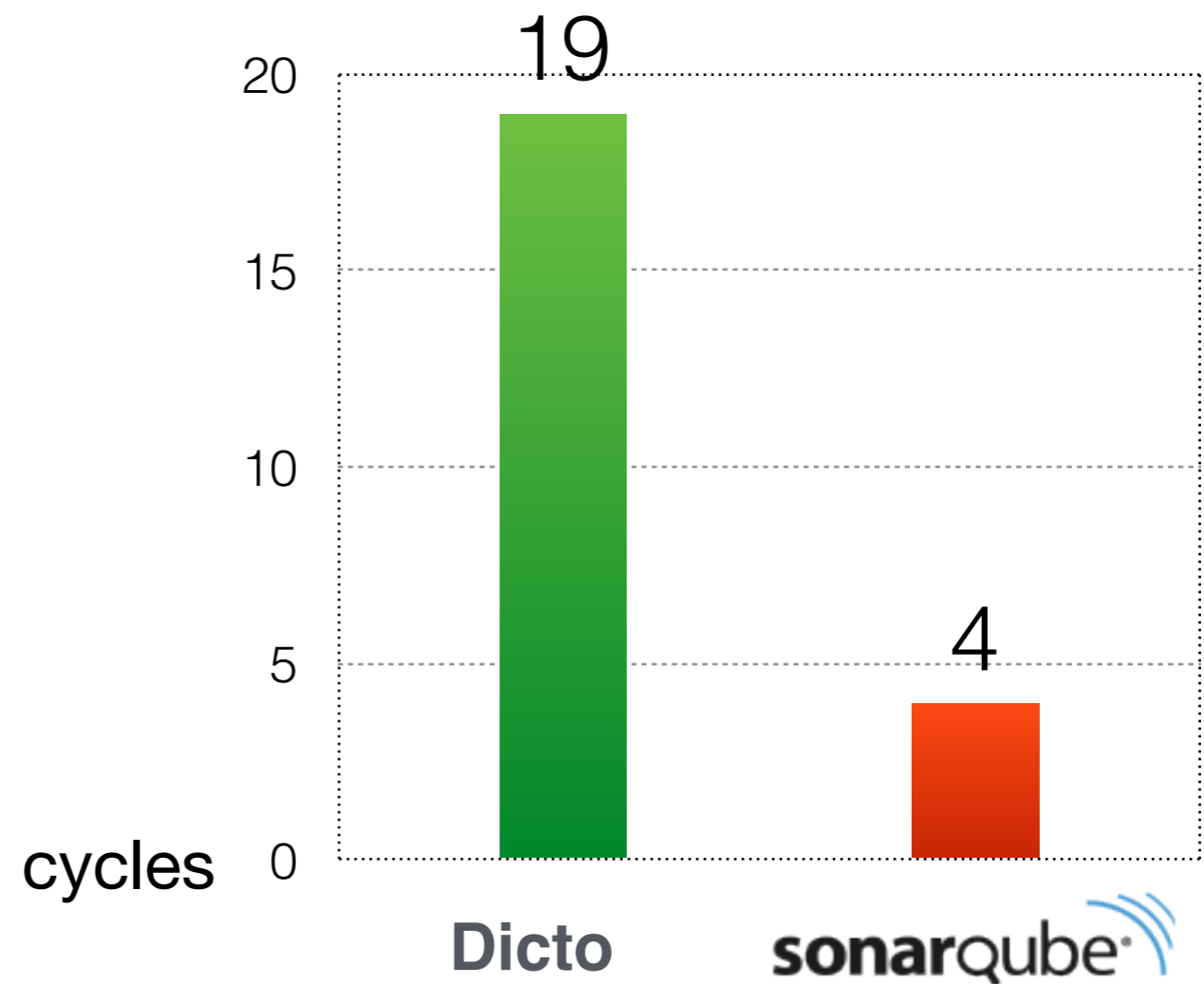
System cannot **contain cycles**

cycles

Dicto   sonarqube

BetriebProject cannot **depend on StammdatenProject, FosProject, [..]**

LoppisProject cannot **depend on StammdatenProject, FosProject [..]**

ClientScoutPackage cannot **depend on ClientScoutSWTPackage, ServerScoutPackage, [..]**

ServicePackage cannot **depend on ClientScoutSWTPackage, ClientScoutPackage, [..]**

...

logical dep.

8

2

Dicto   SONARGRAPH

1M LOC
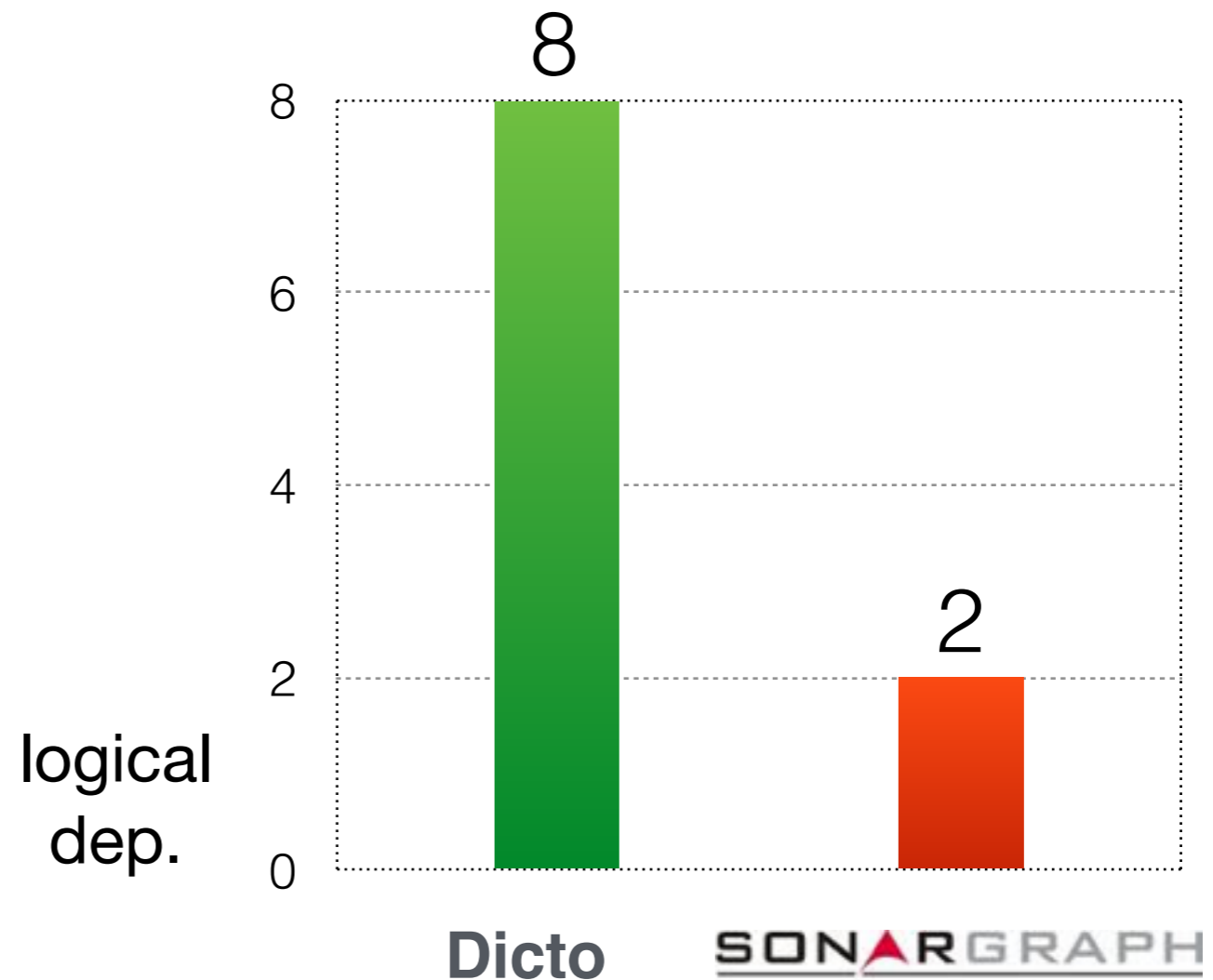
ilExceptionsWithoutTopLevelException can only **depend on** **ilExceptions**

only **GUIClasses** can **depend on** **ilTemplate**

IliasCodebase cannot **use** **triggerError**

IliasCodebase cannot **use** **eval**

IliasCodebase cannot **use** **exitOrDie**

IliasCodebase cannot **use** **SuppressErrors**

only **GUIClasses** can **depend on** **ilLanguage**

IliasCodebase cannot **depend on** **SetErrorOrExceptionHandler**

GUIClasses cannot **depend on** **ilDB**

only **GUIClasses** can **depend on** **ilTabs**

analysis: **2 min**

7 · **ilExceptionsWithoutTopLevelException** can only **depend on ilExceptions**

101 · only **GUIClasses** can **depend on ilTemplate**

6 · **IliasCodebase** cannot **use triggerError**

3 · **IliasCodebase** cannot **use eval**

227 · **IliasCodebase** cannot **use exitOrDie**

203 · **IliasCodebase** cannot **use SuppressErrors**

316 · only **GUIClasses** can **depend on ilLanguage**

4 · **IliasCodebase** cannot **depend on SetErrorOrExceptionHandler**

45 · **GUIClasses** cannot **depend on ilDB**

5 · only **GUIClasses** can **depend on ilTabs**

analysis: **2 min**

7 | **ilExceptionsWithoutTopLevelException** can only **depend on ilExceptions**

101 | only **GUIClasses** can **depend on ilTemplate**

6 | **IliasCodebase** cannot **use triggerError**

3 | **IliasCodebase** cannot **use eval**

227 | **IliasCodebase** cannot **use exitOrDie**

203 | **IliasCodebase** cannot **use SuppressErrors**

316 | only **GUIClasses** can **depend on ilLanguage**

4 | **IliasCodebase** cannot **depend on SetErrorOrExceptionHandler**

45 | **GUIClasses** cannot **depend on ilDB**

5 | only **GUIClasses** can **depend on ilTabs**

after 1st week
-4 violations

Projects | **Changes** | **Agents** 1 | **Build Queue** 0

Guest user |

ILIAS > ILIASBuildConfig > #68 (22 Apr 15 16:28) |

Overview Changes Tests Build Log Dependencies Artifacts **Dicto**

« ● #67 | All history | Last recorded build

Dicto
Automated Architectural Tests. With emphasis on the Diff. **What's this?**

- Repository: https://github.com/studer-raimann/ILIAS
- Commit: ec5aff7e96c6ab3efbfca0e5461d7dd0815b833a
- Compared to Commit: 1d8c0bc57f2f7ac02a0df2a5ab82a541dec10e46

742
Total Violations

468
Added Violations

0
Resolved Violations

✏ only GUIClasses can depend on ilLanguage   +275 ⚡

✏ WholeIliasCodebase cannot depend on SuppressErrors   +182 ⚡

✏ ilExceptionsWithoutTopLevelException can only depend on ilExceptions   +7 ⚡

✏ WholeIliasCodebase cannot depend on eval   +3 ⚡

✏ WholeIliasCodebase cannot depend on exitOrDie   +1 ⚡

Exit and die are a bad idea in both development and production: In development you have no idea what went wrong and in production the user receives a white page and has no idea what's going on. The implemented exception handling does not work if you use exit or die.

If you want to send a file consider using: Services/FileDelivery.

Exception: Currently if you want to output json you most likely have to use exit() at the moment.

Added Violations	1
Resolved Violations	0
All Violations	228

Search...   🔍

Newly Introduced Violations

ilFileDelivery depends on exit/die

24

Dicto Metricss All None

☑ ● Dicto Added Violations
☑ ● Dicto Resolved Violations
☑ ● Dicto Violation Index

65

Value: **468**
Build: #68 ✔ Tests failed: 76, passed: 182
Started: 22 Apr 15 16:28
Branch: continuous_integration
Series: Dicto Added Violations

25

New Issue

sonarqube®

Dashboards   Projects ▾   Measures   Issues   Rules   Quality Profiles   Quality Gates
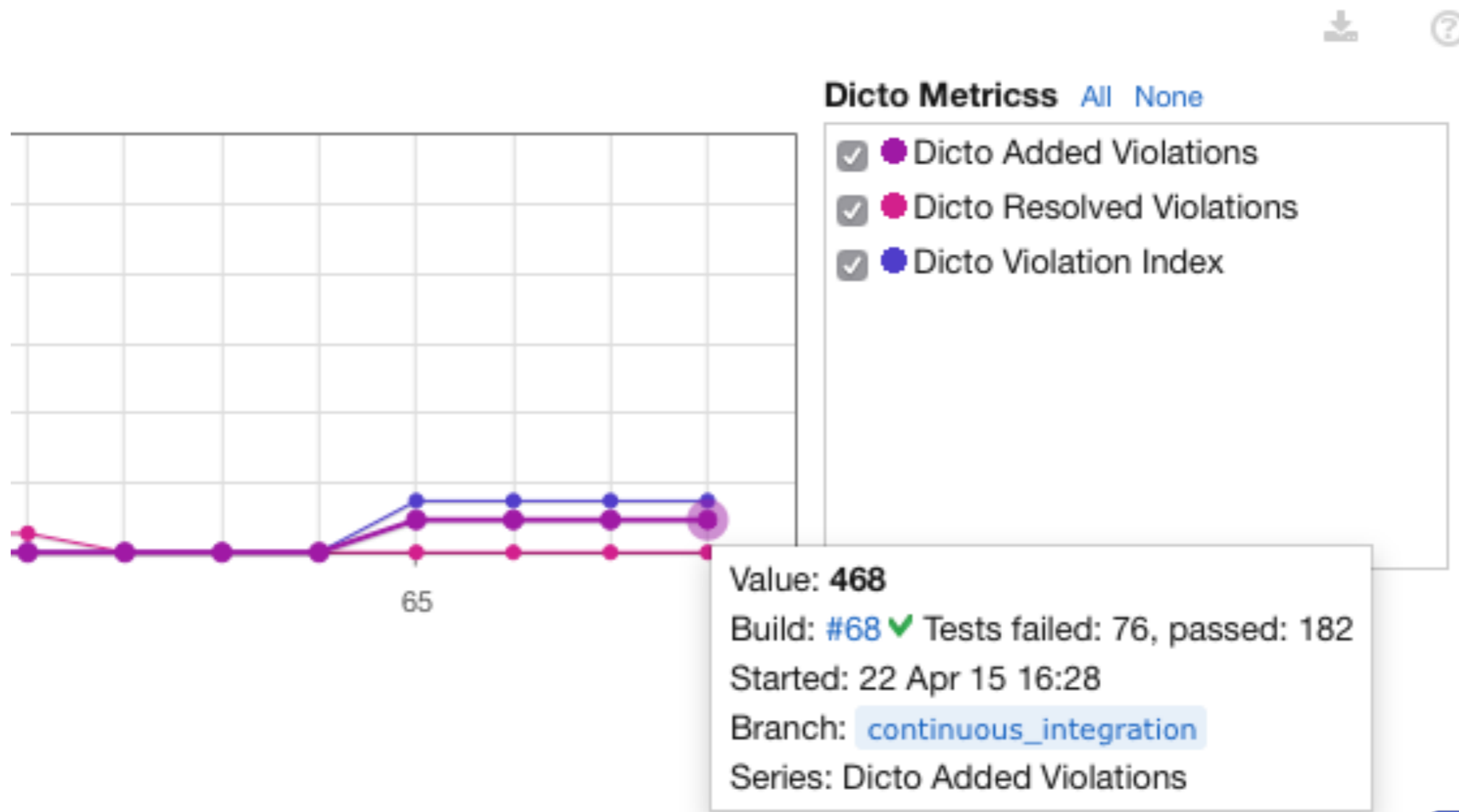
Issues   New Search

Project: All   Severity: All   Status: All   Assignee: All   Resolution: Unresolved   + More Criteria

Ordered by **Update Date** ▾   Found: **8**

📁 Simple Dicto project
📁 **Simple Dicto project**

10
Lines of code

🔴 Major ◯ Open   14 minutes

only Application can depend on Util

Simple Dicto project
Simple Dicto project

🔴 Major ◯ Open   13 minutes

Test cannot depend on Application

Simple Dicto project
Simple Dicto project

🔴 Major ◯ Open   13 minutes

Application can only depend on Test

Simple Dicto project
Simple Dicto project

🟢 Minor ◯ Open   17 minutes

Move this trailing comment on the previous empty line.

Simple Dicto project
src/Helloworld.java

🔴 Critical ◯ Open   17 minutes

Remove this exit() call or ensure it is really required.

🔴 **only Application can depend on Util**

◯ Open

Rule   Changelog

only Application can depend on Util

Rule evaluated on: 2015-02-24 10:05:01 CET
Failing constraints:

> • only Application can depend on Util

- *cause* : org.jhotdraw.util.collections.jdk11 dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.test.util dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.contrib.html dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.test.util.collections.jdk11 dependOn org.jhotdraw.util = Tr
- *cause* : org.jhotdraw.contrib.dnd dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.test.samples.javadraw dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.samples.javadraw dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.applet dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.test.contrib dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.figures dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.samples.pert dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.framework dependOn org.jhotdraw.util = True
- *cause* : org.jhotdraw.application dependOn org.jhotdraw.util = True

Evaluation

Open source organization

PHP (1.8M LOC)
12 service providers, 900'000+ users
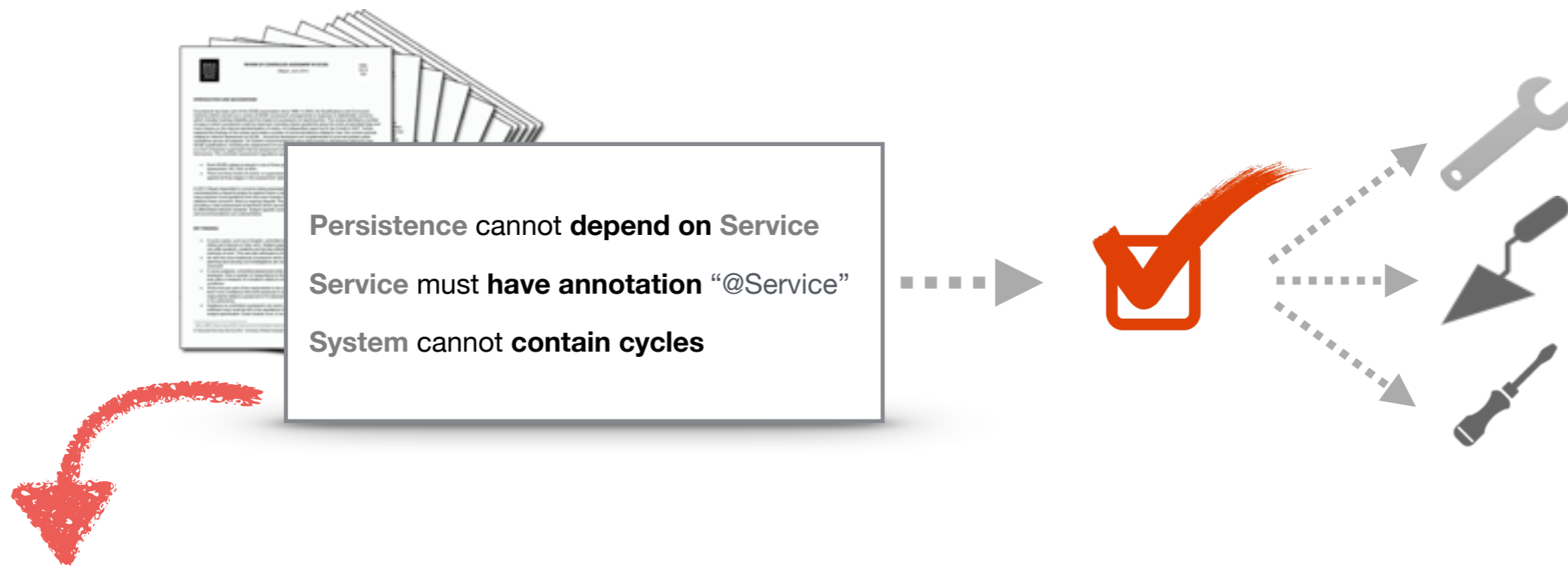
Transportation company

Java EE
1'000+ employees

Consulting company

Java EE / .NET
1'000+ employees

Summary

Persistence cannot **depend on** Service

Service must **have annotation** "@Service"

System cannot **contain cycles**

- **Enforce guidelines**

- **Check NFRs**

- **Readable & executable specification**

@ **scg.unibe.ch/dicto**