

Be **BEST QUALITY** basics of
SonarQube

Improve your Java(Script)
even further

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Agenda

- ☞ Basic features
- ☞ Analyzing data
- ☞ Code review
- ☞ Hunting bad design and architecture
- ☞ Testing
- ☞ Other languages
- ☞ Leftovers
- ☞ Using SonarQube on existing projects
- ☞ Tips / summary
- ☞ Questions

Quality for thousands of years



Quality after years of improvements



Quality for 39 days



Bugs

- Microsoft Applications: "about 10 - 20 defects per 1000 lines of code during in-house testing, and 0.5 defect per 1000 lines of code in released product (Dave Moore 1992)."



Bugs

- ☞ NASA's Spirit rover became unresponsive on January 21, 2004, a few weeks after landing on Mars. (Wikipedia)
- ☞ In January 2009, Google's search engine erroneously notified users that every web site world wide was potentially malicious, including its own. (Wikipedia)

Find them as fast as possible



Why should I use SonarQube?

- ☞ I'm told to use it.
- ☞ We need to achieve certain results (SIG...)
- ☞ I want to improve my coding standards



SonarQube

- ☞ Platform to manage code quality
- ☞ Open source, possible to pay for support and some plugins
- ☞ Since 2006; now they have 200 customers and SonarQube is used in 15.000 organizations
- ☞ Active community: support, plugins, books

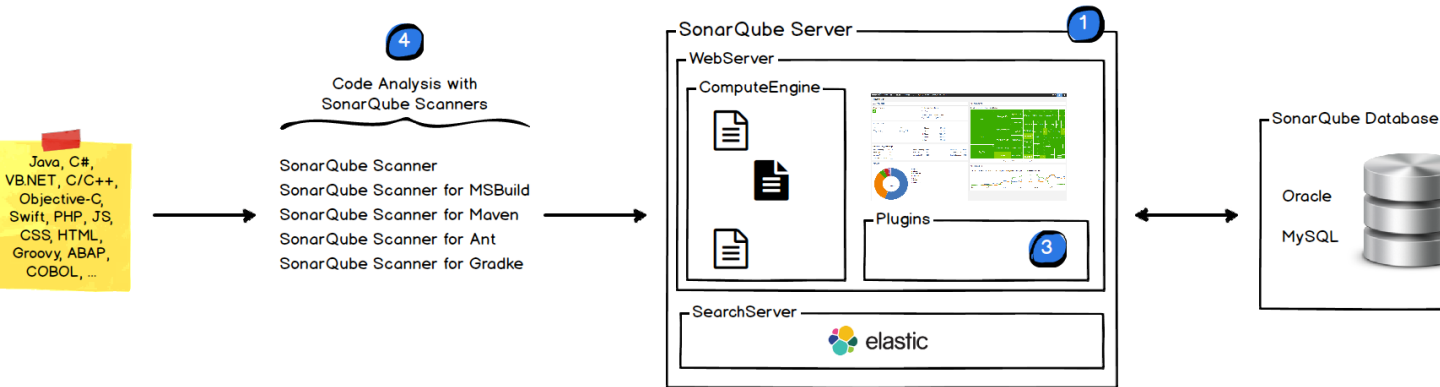
SonarQube

2013:

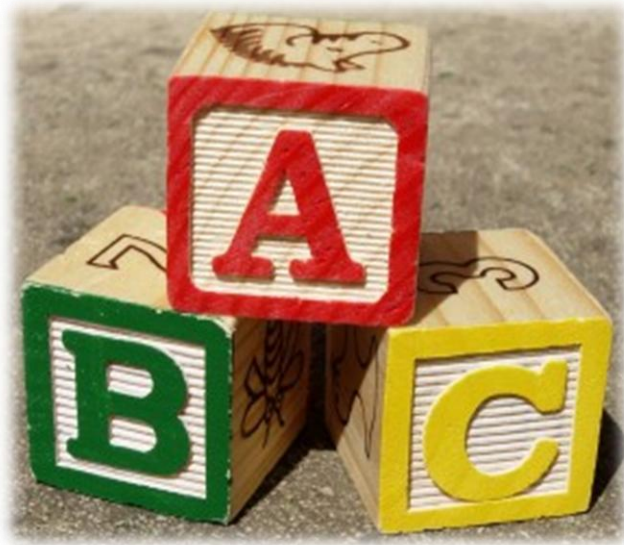
- ☞ 5 releases of SonarQube platform
- ☞ 130 releases of ecosystem products
- ☞ 75,000 downloads of SonarQube
- ☞ 13,000+ messages on mailing lists



SonarQube architecture



SonarQube basic features



Configure widgets

Welcome to SonarQube Dashboard

Since you are able to read this, it means that you have successfully started your SonarQube server. Well done!

If you have not removed this text, it also means that you have not yet played much with SonarQube. So here are a few pointers for your next step:

- » Do you now want to [run analysis](#) on a project?
- » Maybe start [customizing dashboards](#)?
- » Or simply browse the [complete documentation](#)?
- » If you have a question or an issue, please visit the [Get Support](#) page.

MY FAVOURITES

QG NAME ▲

LAST ANALYSIS

No data

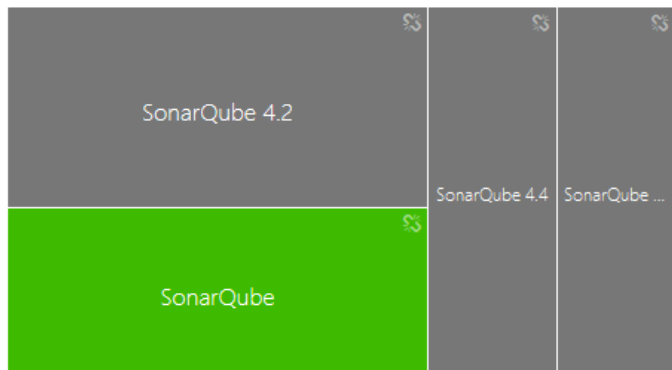
PROJECTS

	QG	NAME ▲	VERSION	LOC	TECHNICAL DEBT	LAST ANALYSIS
★	✖	DockerPiExample	1.0-SNAPSHOT	598	1d 7h	13:33
★	✔	SonarQube	5.3.1-SNAPSHOT	171.343	47d	12:53
★	✔	SonarQube 4.2	4.2.1-SNAPSHOT	203.921	382d	11:07
★	✖	SonarQube 4.3	4.3.4-SNAPSHOT	104.833	41d	10:35
★	✖	SonarQube 4.4	4.4.1-SNAPSHOT	114.901	45d	10:42
★	✔	TestApplication	1.0-SNAPSHOT	225	4h 3min	10:37

6 results

PROJECTS

Size: Lines of code Color: Coverage



DockerPiExample

3 februari 2016 13:33 Version 1.0-SNAPSHOT

[Home](#) [Technical Debt](#) [Coverage](#) [Duplications](#) [Structure](#) [Dashboards ▾](#) [Components](#) [Issues](#) [Administration ▾](#)Quality Gate Failed

since previous version

0.0% Coverage on new code
< 80.0%Technical Debt [More >](#)Leak Period: since previous version
started 6 uur geledenB 1d
Debt88
Issues

started 6 uur geleden

59min

New Debt

12

New Issues

Coverage [More >](#) 11.1%
Coverage15
Tests

0.0%

Coverage on New Code

Duplications [More >](#) 16.3%
Duplications4
Duplicated Blocks

+11.8%

Duplications

Structure [More >](#)

Java	<div style="width: 52.7%;"></div>	52.7%
JavaScript	<div style="width: 21.7%;"></div>	21.7%
XML	<div style="width: 19.6%;"></div>	19.6%
CSS	<div style="width: 3.0%;"></div>	3.0%
Web	<div style="width: 3.0%;"></div>	3.0%

598
Lines of Code

+50

Lines of Code

☆ DockerPiExample

🏠 [Technical Debt](#)[Coverage](#)[Duplications](#)[Structure](#)

Dashboards ▾

[Components](#)[Issues](#)[Ad](#)

Technical Debt

Leak Period: since previous version started 3 dagen geleden

Files

B

Technical Debt

1d 7h

Added **1h**
Removed 0

Technical Debt Ratio

5.1%

On New Code **4.6%**

Issues

88

Added **12**
Removed 0

! Blocker

0

Added **0**
Removed 0

⬆️ Critical

2

Added **0**
Removed 0

⬆️ Major

55

Added **10**
Removed 0

✔️ Minor

28

Added **2**
Removed 0

✔️ Info

3

Added **0**
Removed 0

Issues

20


15

10

5

0

0

☆  DockerPiExample

Technical Debt

Coverage

Duplications

Structure

Dashboards ▾

Components

Issues

Coverage

Leak Period:

since previous

version started

3 dagen

geleden

Coverage

-0.9%

11.1%

Line coverage

-0.9%

12.8%Uncovered
lines116

+9

Lines to
cover133

+9

Files

Coverage

80.0%


60.0%

40.0%

20.0%

0.0%



☆  DockerPiExample

Technical Debt

Coverage

Duplications

Structure

Dashboards ▾

Compon

Duplications

Leak Period: since previous version started 3 dagen geleden

Duplications

16.3%

+11.8%

Duplicated blocks

4

+2

Duplicated files

2

+1

Duplicated lines

125

+93

☆ DockerPiExample



Technical Debt

Coverage

Duplications

Structure

Dashboards ▾

Components

Issues

Administration

Structure

Lines of code

598

+50

Java



52.7%

JavaScript



21.7%

XML



19.6%

CSS



3.0%

Web



3.0%

Classes

20

+1

Directories

12

+0

Files

26

+1

Functions

46

+1

Lines

769

+62

Statements

227

+7

Complexity

Complexity /function

Complexity /file

20



0

2

5

Complexity /class

Complexity

84

+4

Complexity /function

1.8

+0.0

Complexity /file

3.5

+0.0

20



2

0

1

0

0

0

0

5

10

20

30

60

90

Complexity /class

3.2

+0.1

Differential views Leak Period

The screenshot shows the SonarQube Administration interface. At the top, there is a navigation bar with the SonarQube logo and menu items: Dashboards, Issues, Measures, Rules, and Quality Profiles. Below this is the 'Administration' section with sub-menus: Configuration, Security, Projects, and System. The main content area is titled 'General Settings' and includes the instruction 'Edit global settings for this SonarQube instance.' A category list on the left includes Analysis Scope, CSS, General (selected), Java, Java Properties, JavaScript, Licenses, Pitest, SCM, Security, Technical Debt, and Web. The 'Differential Views' category is active, showing a 'Leak Period' setting with an empty input field. Below it, the text explains the default is 'previous_version' and describes the period used for comparing measures and tracking changes. A list of examples follows: 'Number of days before analysis, for ex', 'A custom date. Format is yyyy-MM-dd', ''previous_analysis' to compare to previ', ''previous_version' to compare to the p', and 'A version, for example '1.2' or 'BASELIN'. Further down, it states 'When specifying a number of days or a dat' and 'Changing this property only takes effect af'. The 'Key: sonar.timemachine.period1' is listed. At the bottom, a 'Period 2' setting has an input field containing '14', with a default of 'previous_analysis'.

sonarqube Dashboards Issues Measures Rules Quality Profiles

Administration

Configuration Security Projects System

General Settings

Edit global settings for this SonarQube instance.

CATEGORY General Database Cleaner **Differential Views** Duplications

[Analysis Scope](#)

[CSS](#)

General

[Java](#)

[Java Properties](#)

[JavaScript](#)

[Licenses](#)

[Pitest](#)

[SCM](#)

[Security](#)

[Technical Debt](#)

[Web](#)

Leak Period

Default: previous_version

Period used to compare measures and trac

- » Number of days before analysis, for ex
- » A custom date. Format is yyyy-MM-dd,
- » 'previous_analysis' to compare to previ
- » 'previous_version' to compare to the p
- » A version, for example '1.2' or 'BASELIN

When specifying a number of days or a dat

Changing this property only takes effect af

Key: sonar.timemachine.period1

Period 2

Default: previous_analysis

Differential views

ards ▾ Components Issues Administration ▾

Δ over 14 days (03/02/2016) ▾

Configure widgets

Debt

1d 6h

(+30min)

Added: +30min

Issues

82 (+6)

Added: +6

! Blocker	0	+0
⬆ Critical	2	+0
⬆ Major	51	+6
✓ Minor	26	+0
✓ Info	3	+0

Configure dashboards

🏠 Technical Debt Coverage Duplications Structure Dashboards Components Issues Administration

My Project Dashboards

+ Create

NAME	SHARED	OWNER	ORDER	OPERATIONS
Custom	✓	[SonarQube]	↓	Configure widgets Edit Delete Unfollow
TestProjectDashboard	✓	Administrator	↑	Configure widgets Edit Delete Unfollow

Configure dashboards

TestProjectDashboard

[Back to dashboard](#)

Category: [Any](#) [Filters](#) [Global History](#) [Hotspots](#) [Issues](#) [Measures](#) [Pitest](#) [Technical Debt](#) [Tests](#) Search:

Action Plans
Shows all the open action plans of the project.
[Add widget](#)

Complexity
Reports on complexity, average complexity and complexity distribution.
[Add widget](#)

Custom Measures
Displays a list of selected measures.
[Add widget](#)

Description
Displays general project information.
[Add widget](#)

Documentation & Comments
Reports on comments and documentation
[Add widget](#)

Duplications
Reports on copy/paste and code duplications
[Add widget](#)

[+](#) Quality Gate [Edit](#) [Delete](#)

✓ The project has passed the quality gate.

[+](#) Size Metrics [Delete](#)

Lines Of Code	Files	Functions
<u>203.921</u>	<u>2.067</u>	<u>27.018</u>

[+](#) Duplications [Delete](#)

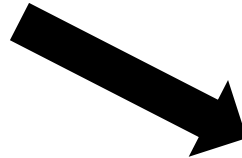
Duplications

30,6%

Lines	Blocks	Files
<u>93.161</u>	<u>632</u>	<u>121</u>

Overview

Profile



Rules



Projects

THE PROJECT

Quality Profiles

Create ▾

Show: All Profiles ▾

CSS

Sonar way

Default

Java

Sonar way

Default

JavaScript

Sonar Security Way

0 projects

Sonar way

Default

Web

Sonar way

Default

XML

Sonar way

Default

Sonar way Java

Back up

Rename

Copy

Rules

237 active rules! 21 blocker✓ 37 minor⬆ 74 critical⬇ 2 info⬇ 103 major

Projects

You must not select specific projects for the default quality profile.

Inheritance

Change Parent

Sonar way
237 active rules

Changelog

Changelog from To

Compare

There are no profiles for comparison

Rules

[Create Manual Rule](#)

▲ 1 / 601 ▼

[Reload](#)[New Search](#)[Bulk Change](#) Language

Java 345

JavaScript 126

CSS 59

Web 59

XML 12

"!important" annotation should be placed at the end of the declaration

"!important" annotation should not be used

".equals()" should not be used to test the values of "Atomic" classes

"<frames>" should have a "title" attribute

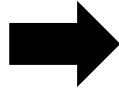
"" and "<dt>" item tags should be in "", "" or "<dl>" container tags

"<table>" tags should contain a "<caption>"

Overview

Projects

THE 
PROJECT



Quality Gates



Quality Gates

The screenshot shows the SonarQube interface for configuring a Quality Gate. The top navigation bar includes 'sonarqube', 'Dashboards', 'Issues', 'Measures', 'Rules', 'Quality Profiles', 'Quality Gates', 'Administration', and 'More'. The user is logged in as 'Administrator'. The left sidebar shows 'Quality Gates' with a 'Create' button and a list of gates, including 'SonarQube way' which is marked as 'Default'. The main content area is titled 'SonarQube way' and has buttons for 'Rename', 'Copy', 'Unset as Default', and 'Delete'. Below the title, there is a 'Conditions' section with a note: 'Only project measures are checked against thresholds. Sub-projects, directories and files are ignored.' An 'Add Condition' dropdown is set to 'Select a metric'. A table lists five conditions:


Metric	Operator	Warning Icon	Value	Threshold	Update	Delete
Coverage on new code	Δ since previous v...	!	80	is less than	Update	Delete
New Blocker issues	Δ since previous v...	!	0	is greater...	Update	Delete
New Critical issues	Δ since previous v...	!	0	is greater...	Update	Delete
Technical Debt Ratio on new code	Δ since previous v...	!	5	is greater...	Update	Delete
Duplicated lines	Value	!	10	is less than	Update	Delete



A notification card indicating a failed quality gate. It features a red 'Failed' status label at the top right. The text reads 'Quality Gate' followed by the status. Below, it says 'since previous version' and shows a large red '0.0%' next to the text 'Coverage on new code < 80.0%'. The card has a light gray background and a subtle border.

Notifications

sonarqube [Dashboards](#) [Issues](#) [Measures](#) [Rules](#) [Quality Profiles](#) [Quality Gates](#) [Adminis](#)



Administrator
admin

Groups
sonar-administrators
sonar-users

SCM Accounts
admin

[Change password](#)

Overall notifications

Subscribe to following channels to be notified when the related e

	Email
Changes in issues assigned to me or reported by me	<input type="checkbox"/>
Issues resolved as false positive or won't fix	<input type="checkbox"/>
My new issues	<input type="checkbox"/>
New issues	<input type="checkbox"/>
New quality gate status	<input type="checkbox"/>

Notifications per project

[Save changes](#)

Analysing data



Compare



Dashboards ▾

Issues

Measures

Rules

Quality Profiles

Quality Gates

Ad

Compare

Add metric ▾

Add project ▾

	SONARQUBE 4.3 4.3.4-SNAPSHOT 03/02/2016	SONARQUBE 5.3.1-SNAPSHOT 03/02/2016	DOCKERPIEXAMPLE 1.0-SNAPSHOT 03/02/2016
Lines of code	104.833	171.343	598
Complexity	20.832	32.261	84
Comments (%)	7,1%	6,0%	3,1%
Duplicated lines (%)	0,6%	1,2%	16,3%
Issues	2.573	2.063	88
Coverage		87,8%	11,1%
Complexity /class	10,1	8,9	3,2
Complexity /file	11,4	10,6	3,5

Measures

res

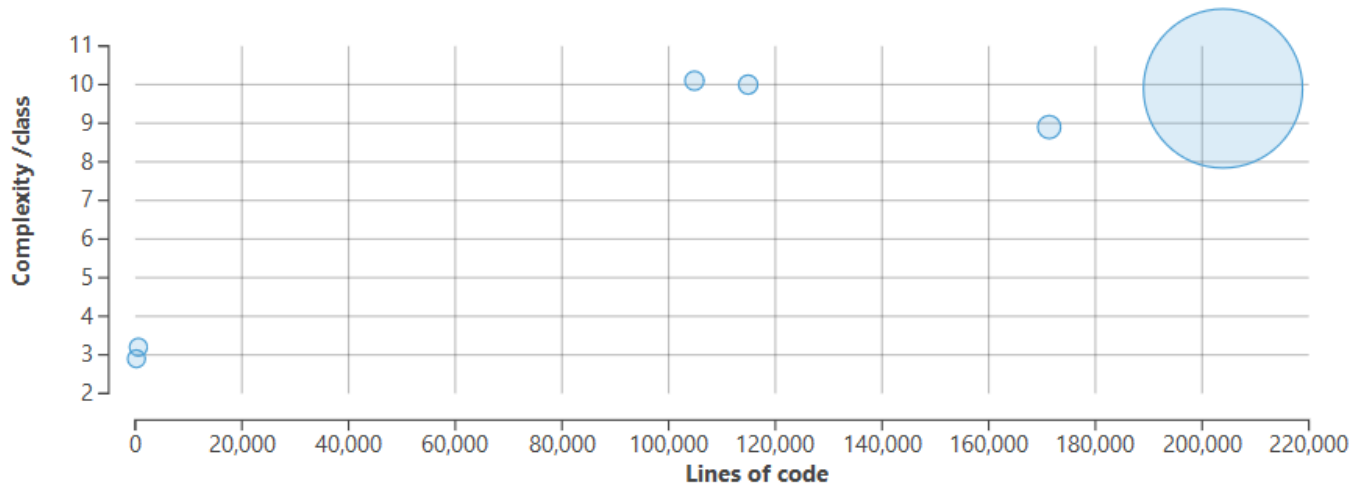
New Search Save As Change Columns

Components: Files Metric: Duplicated lines > 5 × + More Criteria Search

NAME ▲	LAST ANALYSIS	LOC	ISSUES	LINK
src/main/java/com/dockerpi/sonar/metrics/LCOM4.java	03/02/2016	17	3	
src/main/java/com/dockerpi/sonar/metrics/SomeViolations.java	03/02/2016	82	22	
src/main/java/com/mycompany/testapp/examples/metrics/SomeViolations.java	03/02/2016	82	21	

Measure Filter as Bubble Chart

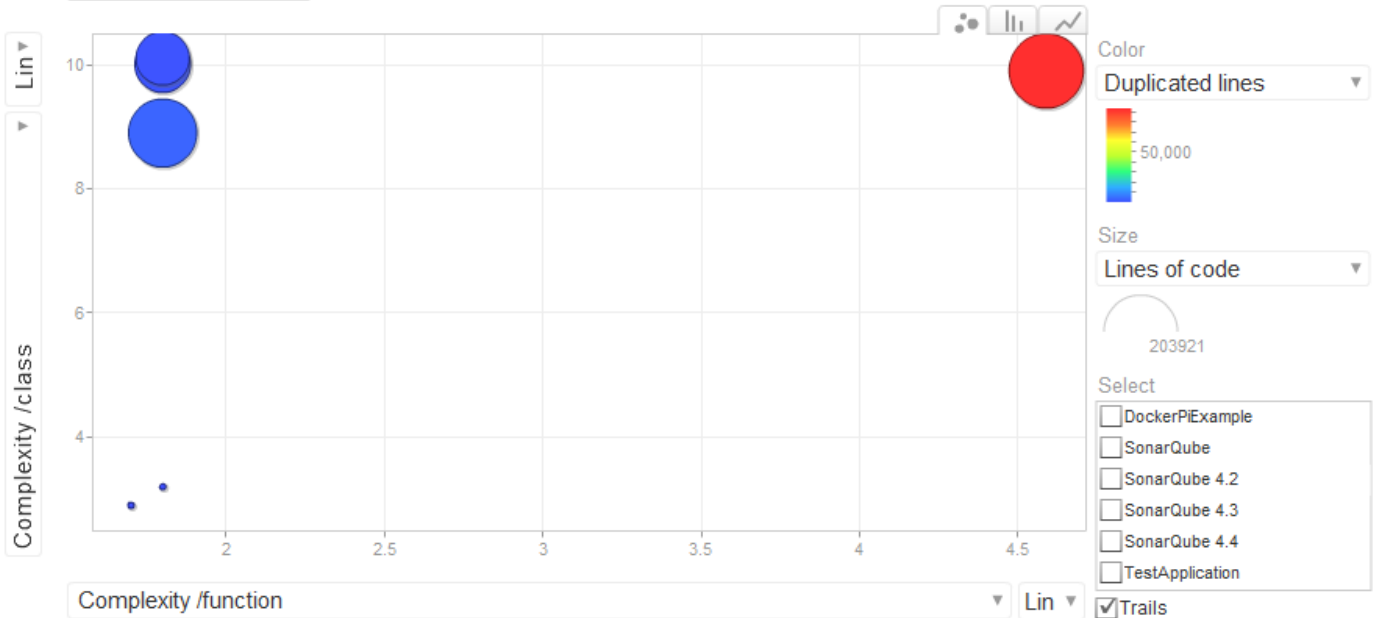
PROJECTS



Filter Motion Chart

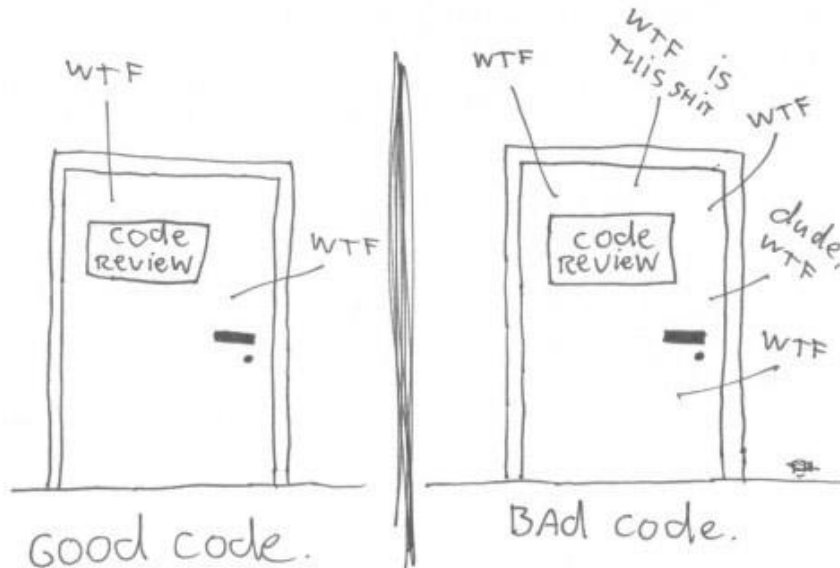
PROJECTS

Period: Components:

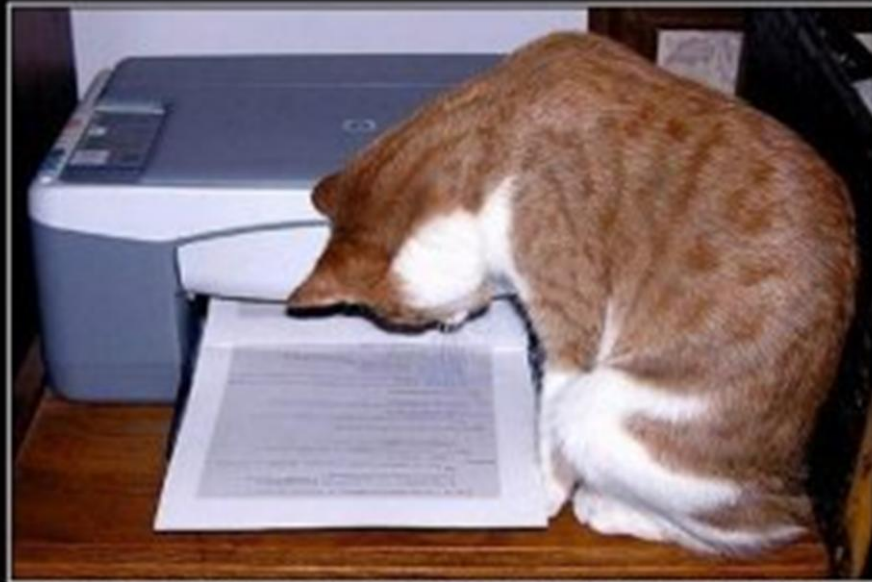


What is good code?

The ONLY VALID MEASUREMENT
OF CODE QUALITY: WTFs/MINUTE



Code review



CODE REVIEWS

An essential step to ensure code quality.

Roles

Administration













Configuration ▾ Security ▾ Projects ▾ System ▾

Users

Create User

Create and administer individual users.

🔍 Search

	SCM ACCOUNTS	GROUPS	TOKENS	
 Administrator admin		sonar-administrators sonar-users 		  
 Johan johan		sonar-users 		  

sonarqube Dashboards Issues Measures Rules Quality Profiles Quality G

Rules Create Manual Rule 1 / 601

Search

"important" annotation should be placed at t

Language

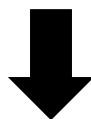
- Java
- JavaScript
- CSS
- Web
- XML

Create Manual Rule

Name * Codereview

Key * Codereview

Description * Use this rule to create manual codereviews



12

13 Get Permalink

14 Add Manual Issue

15

16

17

18 @GET

19 @Path("/{param}")

20 public Response ge

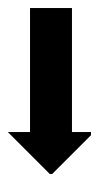
21 logger.inf

```
11
12 @Path("/bla")
13 public class BlaService {
```

Codereview

Please use a better name for this class.

Create Cancel



```
13 public class BlaService {
```

Please use a better name for this class. ...

Major Open Not assigned Not planned Comment

Why code reviews?

“We all need people who will give us feedback.
That's how we improve.”

- Bill Gates

Hunting bad design and architecture



Hunting bad design and architecture



Architectural constraints

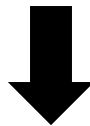
sonarqube Dashboards Issues Measures Rules Quality Profiles Quality Gates

Rules Create Manual Rule Reload New Search Bulk Change

architectural Architectural constraints should be

Create Custom Rule

Description * The frontend should use the service layer instead of directly using the backend layer.



Custom Rules [Create](#)

[NotFromFrontendToBackend](#) 🔴 Major fromClasses: com.dockerpi.sonar.layers.frontend.**
toClasses: com.dockerpi.sonar.layers.backend.**

[Delete](#)

Architectural constraints

```
package com.dockerpi.sonar.layers.frontend;
```

```
import com.dockerpi.sonar.layers.backend.PersonBackend;
```

```
public class DirectFromFrontendToBackend {
```

```
    private PersonBackend personBackend = new PersonBackend();
```

com.dockerpi.sonar.layers.frontend.DirectFromFrontendToBackend must not use
com.dockerpi.sonar.layers.backend.PersonBackend ...

Major ▼ Open ▼ Not assigned ▼ Not planned ▼ Comment

Testing



Now manual execution of unit tests

```
mvn clean install  
mvn sonar:sonar
```



```
mvn clean org.jacoco:jacoco-maven-  
  plugin:prepare-agent install  
  -Dmaven.test.failure.ignore=true  
mvn sonar:sonar
```

Coverage per test

- ☞ Configure the POM (see next slide)
- ☞ Activate profile to get coverage per test information

```
mvn org.jacoco:jacoco-maven-  
    plugin:prepare-agent clean  
    install -Pcoverage-per-test
```

- ☞ Analyze the project

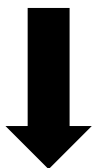
```
mvn sonar:sonar
```



```
<profiles>
  <profile>
    <id>coverage-per-test</id>
    <build>
      <plugins>
        <plugin>
          <groupId>org.apache.maven.plugins</groupId>
          <artifactId>maven-surefire-plugin</artifactId>
          <!-- Minimal supported version is 2.4 -->
          <version>2.13</version>
          <configuration>
            <properties>
              <property>
                <name>listener</name>
                <value>org.sonar.java.jacoco.JUnitListener</value>
              </property>
            </properties>
          </configuration>
        </plugin>
      </plugins>
    </build>

    <dependencies>
      <dependency>
        <groupId>org.codehaus.sonar-plugins.java</groupId>
        <artifactId>sonar-jacoco-listeners</artifactId>
        <version>1.2</version>
        <scope>test</scope>
      </dependency>
    </dependencies>
  </profile>
</profiles>
```

```
12 public int getValueOrBoundary(int value, int boundary) {
13     if (value < boundary) {
14         return value;
15     }
16     return boundary;
```



Covered by unit tests (1 of 2 conditions)

- ✓ [testGetValueOrBoundaryNoAssert](#) 0ms
- ✓ [testGetValueOrBoundary](#) 3ms
- ✓ [testGetValueOrBoundaryNoAssert](#) 2ms
- ✓ [testGetValueOrBoundary](#) 3ms



```
12
13
14 Covered by unit tests (1 of 2 conditions)
15 ✓ testGetValueOrBoundaryNoAssert 0ms
16 ✓ testGetValueOrBoundary 3ms
17
18 ✓ testGetValueOrBoundaryNoAssert 2ms
19 ✓ testGetValueOrBoundary 3ms
20
21     int i = 10;
22     return i;
23 }
```

PiTest.java

DockerPiExample

src/test/java/com/dockerpi/sonar/metrics/PiTest.java

```
1 joha... package com.dockerpi.sonar.metrics;
2
3 import static org.junit.Assert.*;
4
5 import org.junit.Before;
6 import org.junit.Test;
7
8 public class PiTest {
```

Integration testing

Unit Tests Coverage

30.8% ↗

Line Coverage

34.3% ↗

Branch Coverage

0.0%

Unit Test Success

100.0%

Failures

0

Errors

0

Tests

3 ↗

Execution Time

3 ms ↗

Integration Tests Coverage

46.2% ↘

Line Coverage

45.7% ↘

Branch Coverage

50.0% ↗

Overall Coverage

61.5%

Line Coverage

62.9%

Branch Coverage

50.0%

Integration testing

∞ ! Unit testing



Integration testing



THE OUTCOME OF THE TESTS



WILL DEPEND ON HIS MOOD

Integration testing

- ☞ Add integration test coverage widget to SonarQube
- ☞ Download Jacoco agent
- ☞ Configuration for Tomcat's catalina.bat:
set JACOCO=-
javaagent:\$path\$\lib\jacocoagent.jar,
destfile=\$resultpath\$\jacoco.exec,
append=false,includes=com.dockerpi.*
set JAVA_OPTS=%JAVA_OPTS% %JACOCO%

Integration testing

- ☞ Start Tomcat
 - ☞ Execute tests (manual, integration, performance...)
 - ☞ Stop Tomcat and execute SonarQube analysis
- ```
mvn clean install sonar:sonar
-Dsonar.dynamicAnalysis=reuseReports
-Dsonar.jacoco.itReportPath=
$resultpath$\jacoco.exec
```

# Unit and integration testing combined

| Unit Tests      |       | Integration Tests |       |
|-----------------|-------|-------------------|-------|
| Coverage        | 83.3% | Coverage          | 50.0% |
| Line coverage   | 83.3% | Line coverage     | 50.0% |
| Lines to cover  | 12 >  | Lines to cover    | 12 >  |
| Uncovered lines | 2 >   | Uncovered lines   | 6 >   |

```
13 public Store() {
14 super();
15 }
16
17 public Store(String name, String place) {
18 this.name = name;
19 this.place = place;
20 }
```

| Unit Tests      |       | Integration Tests |       |
|-----------------|-------|-------------------|-------|
| Coverage        | 83.3% | Coverage          | 50.0% |
| Line coverage   | 83.3% | Line coverage     | 50.0% |
| Lines to cover  | 12 >  | Lines to cover    | 12 >  |
| Uncovered lines | 2 >   | Uncovered lines   | 6 >   |

```
13 public Store() {
14 super();
15 }
16
17 public Store(String name, String place) {
18 this.name = name;
19 this.place = place;
20 }
21
```

# PMD rules for unit testing

The screenshot shows the SonarQube interface with the 'Rules' tab selected. The left sidebar contains a search bar and a table of repositories. The main content area displays a list of rules for 'PMD Unit Tests Java'.

**SonarQube** Dashboards ▾ Issues Measures **Rules** Quality Profiles Quality Gates Admin

Search ▾

Tag

Search ▾

Repository

|                            |           |
|----------------------------|-----------|
| SonarQube Java             | 338       |
| PMD Java                   | 270       |
| SonarQube JavaScript       | 120       |
| SonarQube Web              | 53        |
| SonarQube CSS              | 53        |
| SonarQube Java Properties  | 18        |
| <b>PMD Unit Tests Java</b> | <b>17</b> |

▲ 1 / 17 ▾

Reload New Search Bulk Change

- JUnit assertions should include a message
- JUnit spelling
- JUnit static suite
- JUnit Test Contains Too Many Asserts
- JUnit tests should include an assert
- JUnit Use Expected
- JUnit4 Suites Should Use Suite Annotation

✓<sup>2</sup> assertTrue(a==b);

JUnit assertions should include a message ...

✓ Minor ▾ ○ Open ▾ Not assigned ▾ Not planned ▾ 10min debt Comment

Use assertEquals(x, y) instead of assertTrue(x=y), or assertNotSame(x,y) vs assertFalse(x=y) ...

✓ Minor ▾ ○ Open ▾ Not assigned ▾ Not planned ▾ 10min debt Comment

✓ assertEquals("", true, a);

Use assertTrue(x)/assertFalse(x) instead of assertEquals(true, x)/assertEquals(false, x) or assertEquals(Boolean.TRUE, x)/assertEquals(Boolean.FALSE, x). ...

✓ Minor ▾ ○ Open ▾ Not assigned ▾ Not planned ▾ 10min debt Comment

✓ assertTrue("", a.equals(b));

✓ assertTrue("", c==null);

Use assertNull(x) instead of assertTrue(x=null), or assertNotNull(x) vs assertFalse(x=null) ...

✓ Minor ▾ ○ Open ▾ Not assigned ▾ Not planned ▾ 10min debt Comment

# Pitest plugin

```
public int getValueOrBoundary(int value, int boundary) {
 if (value < boundary) {
 return value;
 }
 return boundary;
}
```

```
@Test
public void testGetValueOrBoundary() {
 assertTrue(pi.getValueOrBoundary(20, 100) < 101);
}
```

```
@Test
public void testGetValueOrBoundaryNoAssert() {
 pi.getValueOrBoundary(40, 200);
}
```

# Pitest plugin

- ☞ Enable 'Survived mutant' rule in SonarQube Quality Profile
- ☞ Configure Pitest for instance with Maven (see next slides)

# Pitest plugin

☞ Execute tests and send results to SonarQube

```
mvn org.pitest:pitest-
 maven:mutationCoverage
```

```
mvn sonar:sonar
 -Dsonar.pitest.mode=reuseReport
```

# Pitest plugin

## ☞ Maven configuration inside the build/plugins section

```
<plugin>
 <groupId>org.pitest</groupId>
 <artifactId>pitest-maven</artifactId>
 <version>LATEST</version>
 <configuration>
 <inScopeClasses>
 <param>com.example*</param>
 </inScopeClasses>
 <targetClasses>
 <param>com.example*</param>
 </targetClasses>
 <outputFormats>
 <outputFormat>XML</outputFormat>
 </outputFormats>
 </configuration>
```



# Pitest plugin

```
public int getValueOrBoundary(int value, int boundary) {
 if (value < boundary) {
```

A relational operator has been replaced by a boundary counterpart without breaking the tests ...

Major Open Not assigned Not planned Comment

A conditional expression has been negated without breaking the tests ...

Major Open Not assigned Not planned Comment

```
return value;
```

The return value of a method call has been replaced without breaking the tests ...

Major Open Not assigned Not planned Comment

# Other languages

Language ഭാഷা Linguaggio ЯЗЫК  
Γλώσσα Jezyk താമരം: بولی لسان  
ഭാഷা הישנה ગા a Lenguaje  
Langage ভাষা 言語  
भाषा భాషা 鮫 é  
Linguagem Wika @|@| @|@|  
Sprache 语言 777 Bahasa 언어



# JavaScript

DockerPiExample

src/main/webapp/sonarviolations.js ★

```
1 joha... function nesting(temp) {
2 if(temp != ""){
```

Replace "!=" with "!==". ...

Major Open Not assigned Not planned 5min debt Comment

```
3 alert("No var supplied");
```

Remove this usage of alert(...). ...

Major Open Not assigned Not planned 10min debt Comment

```
4 }
5 if (temp < 100) {
```

Merge this if statement with the nested one. ...

Major Open Not assigned Not planned 5min debt Comment



```
6 if (temp < 75) {
7 // TODO do something
```


Complete the task associated to this TODO comment. ...




# CSS


DockerPiExample

src/main/webapp/style.css

```
1 joha...   ^2 .company .project .subproject .website .component .page .redbackground {
```

Simplify this over-specified selector 

 Major  Open  Not assigned  Not planned 2h debt [Comment](#)

Add the missing vendor prefix: -webkit- to the property: border-radius 

 Major  Open  Not assigned  Not planned 10min debt [Comment](#)

```
2  ^2 *background-color: red;
```


Remove this usage of "\*" 



 Major  Open  Not assigned  Not planned 1h debt [Comment](#)

Remove the usage of this unknown property: background-color 


 Major  Open  Not assigned  Not planned 10min debt [Comment](#)



```
3  ^2 -moz-border-radius: 5px;
```

Define the standard property after this vendor-prefixed property 


 Major  Open  Not assigned  Not planned 10min debt [Comment](#)

# Web plugin

 DockerPiExample

 src/main/webapp/index.html 

```
1 joha... <!DOCTYPE html>
2 <html>
3 <head>
```

Add a 'favicon' declaration in this 'header' tag. 

 Major   Open  Not assigned  Not planned  Comment

# Import unknown files

sonarqube

Dashboards ▾

Issues

Measures

Rules

Quality Profiles

Quality

## Administration

Configuration ▾

Security ▾

Projects ▾

System ▾

## General Settings

Edit global settings for this SonarQube instance.

CATEGORY

Code Coverage Duplications **Files** Issues

Analysis Scope

Configure the files that should be completely ignored by the analysis.

CSS

Import unknown files

True



General

Default: false

# Import unknown files

 DockerPiExample

 src/main/java/com/dockerpi/sonar/info.txt 

```
1 joha... Some very important info.
2
```

# Leftovers





# Branches

```
mvn sonar:sonar -Dsonar.branch=4.4
```

## PROJECTS

	<u>QG</u>	<u>NAME</u> ▲	<u>VERSION</u>	<u>LOC</u>	<u>TECHNICAL DEBT</u>	<u>LAST ANALYSIS</u>
★	✖	<a href="#">DockerPiExample</a>	1.0-SNAPSHOT	598	1d 7h	13:33
★	✔	<a href="#">SonarQube</a>	5.3.1-SNAPSHOT	171.343	47d	12:53
★	✔	<a href="#">SonarQube 4.2</a>	4.2.1-SNAPSHOT	203.921	382d	11:07
★	✖	<a href="#">SonarQube 4.3</a>	4.3.4-SNAPSHOT	104.833	41d	10:35
★	✖	<a href="#">SonarQube 4.4</a>	4.4.1-SNAPSHOT	114.901	45d	10:42
★	✔	<a href="#">TestApplication</a>	1.0-SNAPSHOT	225	4h 3min	10:37

6 results

# Exclusions

- ☞ Ignore files
- ☞ Ignore issues
- ☞ Ignore duplications
- ☞ Ignore code coverage
- ☞ Example:

```
mvn sonar:sonar -Dsonar.exclusions=
src/main/webapp/lib/*.js
```



DockerPiExample

src/main/java/com/dockerpi/helloworld/HelloWorldService.java

Lines	37
Lines of code	25
Comments	0,0% / 0

Complexity	3
Complexity /function	1,5



37min 5  
Debt Issues

- Blocker 0
- Critical 0
- Major 3
- Minor 2
- Info 0

- convention 2
- unused 2
- bad-practice 1
- cert 1
- cwe 1
- suspicious 1



0,0%  
Coverage

Covered by Unit Tests  
Lines 0/9

<b>Complexity</b>	
Complexity	3
Complexity /class	3,0
Complexity /file	3,0
Complexity /function	1,5

<b>Issues</b>	
Issues	5
Major issues	3
Minor issues	2
Open issues	5

<b>Size</b>	
Classes	1
Files	1
Functions	2
Lines	37
Lines of code	25
Statements	7

<b>Documentation</b>	
Comment lines	0
Comments (%)	0,0%
Public API	3
Public documented API (%)	0,0%
Public undocumented API	3

<b>Mutation analysis</b>	
Detected Mutations	0
Killed Mutations	0
Memory Error Mutations	0
Non Covered Mutations	5
Survived Mutations	0
Timed Out Mutations	0
Total Mutations	5
Unknown Status Mutations	0

<b>Technical Debt</b>	
SQALE Rating	A
Technical Debt	37min

# Duplications across projects

sonarqube [Dashboards](#) [Issues](#) [Measures](#) [Rules](#) [Quality Profiles](#) [Quality Gates](#) [Administration](#)

## Administration

[Configuration](#) [Security](#) [Projects](#) [System](#)

### General Settings

Edit global settings for this SonarQube instance.

CATEGORY [General](#) [Database Cleaner](#) [Differential Views](#) **[Duplications](#)** [Email](#) [Issues](#) [Look & Feel](#)

[Analysis Scope](#)

[CSS](#)

**[General](#)**

[Java](#)

[Java Properties](#)

[JavaScript](#)

[Licenses](#)

Cross project

True

duplication

Default: false



detection


By default, SonarQube detects duplications at sub-project level. This same project won't be reported. Setting this parameter to "true" allow generally across projects. Note that activating this property will slight

Key: sonar.cpd.cross\_project

[Save Duplications Settings](#)


# Duplications across projects

 DockerPiExample 110 Lines 

 src/main/java/com/dockerpi/sonar/metrics/SomeViolations.java ★

```
1 joha... package com.dockerpi.sonar.metrics;
2
3 public class SomeViolations {
4
5 // Checkstyle: visibility modifier (not checked in Eclipse)
6 String name;
7
8
9
10
11
12 private String zipCode;
13
14 // Checkstyle: visibility modifier (not checked in Eclipse)
15 public String country;
16
17 // PMD: unused private field
18 private String unused;
```

Duplicated By

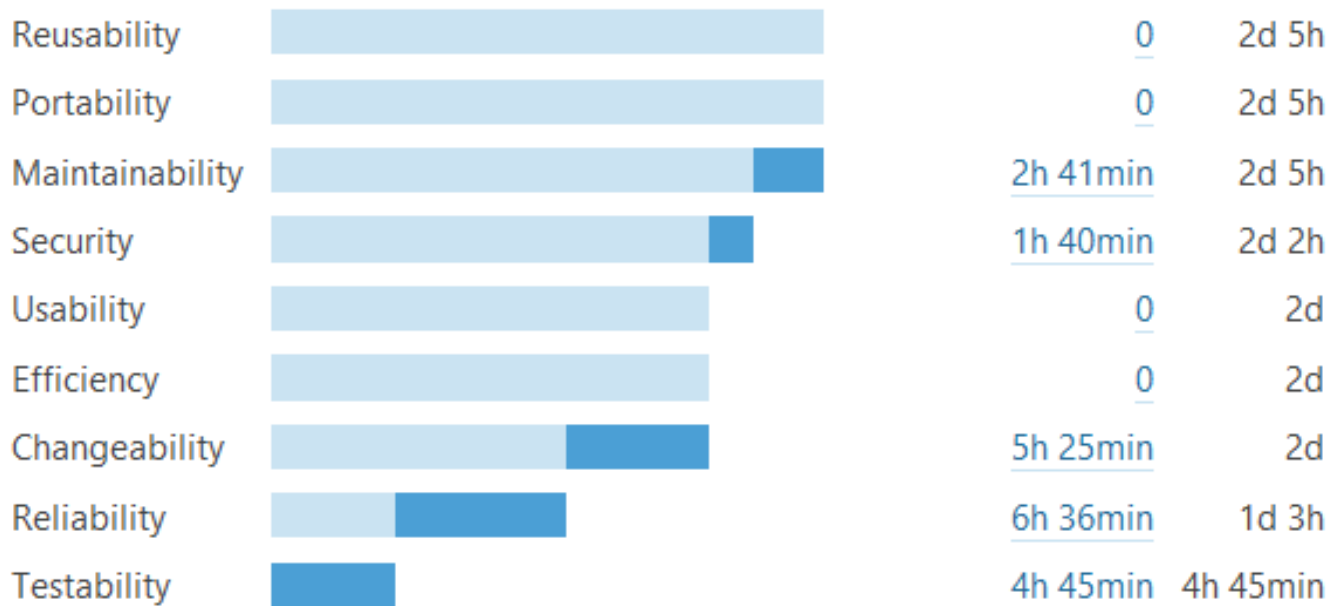
 TestApplication

src/.../com/mycompany/testapp/examples/metrics/SomeViolations.java

Lines: 3 – 107

# Technical debt pyramid

## Technical Debt Pyramid



# SCM Activity

 [DockerPiExample](#)

 `src/.../java/com/dockerpi/sonar/layers/frontend/LocationContr`

1 joha\_

johanj@infosupport.com

2

30 augustus 2014 19:28

3

4

2892fb1f64c203d76f7cb5781180d7fc06306b8a

5

`public class LOCATIONCONTROLLER {`

-



# Web Service API



Dashboards ▾

Issues

Measures

Rules

Quality Profiles

Quality Gates

Administration

More ▾

SonarQube™ technology is powered by SonarSource SA

Version 5.3 - [LGPL v3](#) - [Community](#) - [Documentation](#) - [Get Support](#) - [Plugins](#) - [Web Service API](#)



Dashboards ▾

Issues

Measures

Rules

Quality Profiles

Quality Gates

Administration

More ▾

Web Service API

Show Internal



Search

api/action\_plans

Action plans management

api/authentication

Check authentication credentials

api/ce

Compute Engine

api/action\_plans

POST api/action\_plans/close

Close an action plan. Requires Administer permission on project

Parameters

format  
optional

Response format can be set through:

- Parameter format: xml | json
- Or the 'Accept' property in the HTTP header:
  - Accept:text/xml
  - Accept:application/json

# Background Tasks

## Administration

Configuration ▾ Security ▾ Projects ▾ System ▾

### Background Tasks

The server is in charge of process reports submitted by batch analyses. This page allows to monitor the queue of pending reports to process, and gives access to the history of past analyses.

0 pending    0 still failing

All Success Failed Canceled All Only Latest Analysis Any Date Today Custom 🔍 Search Reload

		SUBMITTED	STARTED	FINISHED	DURATION	
Success	DockerPiExample	6 februari 2016	21:10:50	21:10:51	21:10:53	2s <a href="#">Logs</a>
Success	DockerPiExample		20:52:41	20:52:42	20:52:43	1s <a href="#">Logs</a>
Success	DockerPiExample		20:37:26	20:37:28	20:37:29	2s <a href="#">Logs</a>
Success	DockerPiExample	3 februari 2016	13:33:47	13:33:47	13:33:50	2s <a href="#">Logs</a>

# Update center

## Administration

Configuration ▾ Security ▾ Projects ▾ System ▾

### Update Center

Install, uninstall and delete plugins. You can also download SonarQube updates from the System Updates tab on this page.

Installed Updates Only Available System Upgrades 🔍 Search

CSS <a href="#">Languages</a>	1.6-RC1 installed	<a href="#">Homepage</a> <a href="#">Issue Tracker</a> Licensed under GNU LGPL 3 Developed by Tamas Kende and David RACODON	<a href="#">Uninstall</a>
Git <a href="#">Integration</a>	1.1 installed	<a href="#">Homepage</a> <a href="#">Issue Tracker</a> Licensed under GNU LGPL 3 Developed by SonarSource	<a href="#">Uninstall</a>
Java <a href="#">Languages</a>	3.9 installed	<a href="#">Homepage</a> <a href="#">Issue Tracker</a> Licensed under GNU LGPL 3 Developed by SonarSource	<a href="#">Update to 3.10</a> <a href="#">Uninstall</a>
Enables scanning of Java source files		Updates: <b>3.10</b> 17 new rules including the analysis of EJB, Spring, Web XML configuration files and handling of relationships between symbolic values in Symbolic Execution engine ...	

# Using SonarQube on existing projects



# Using SonarQube on existing projects

Violations

**79,500**

Rules compliance

**81,6%**



Blocker

0



Critical

3



Major

70.240



Minor

0



Info

9.257



Package tangle index

**44,7%**

> 455 cycles ↗

Dependencies to cut

105 between packages ↗

724 between files ↘

Unit tests coverage

**7,6%**

8,3% line coverage

6,2% branch coverage

Unit test success

**21,3%**

39 failures ↗

2.858 errors ↘

3.682 tests ↘

**34:29 min** ↘

Duplications

**30,9%**

51.025 lines ↘

1.152 blocks ↗

450 files ↘

# Using SonarQube on existing projects

- ☞ Identity hotspots
- ☞ Use action plans
- ☞ Maybe use a less strict quality profile
- ☞ Add tasks/stories in the sprint to improve quality
- ☞ Monitor quality of new code

# Hotspots

## Hotspots

Time changes... ▾ [Configure widgets](#)

### Hotspots by Lines of code [More](#)

<a href="#">sonarviolations.js</a>	122	<div style="width: 100%;"></div>
<a href="#">pom.xml</a>	99	<div style="width: 82%;"></div>
<a href="#">SomeViolations.java</a>	82	<div style="width: 67%;"></div>
<a href="#">Store.java</a>	26	<div style="width: 21%;"></div>
<a href="#">BlaService.java</a>	25	<div style="width: 20%;"></div>

### Hotspots by Duplicated lines [More](#)

<a href="#">SomeViolations.java</a>	105	<div style="width: 86%;"></div>
<a href="#">LCOM4.java</a>	20	<div style="width: 16%;"></div>

### Hotspots by Issues [More](#)

<a href="#">SomeViolations.java</a>	22	<div style="width: 18%;"></div>
<a href="#">PMDTest.java</a>	11	<div style="width: 9%;"></div>
<a href="#">style.css</a>	10	<div style="width: 8%;"></div>
<a href="#">Pi.java</a>	8	<div style="width: 6%;"></div>
<a href="#">sonarviolations.js</a>	8	<div style="width: 6%;"></div>

### Hotspots by Complexity [More](#)

<a href="#">SomeViolations.java</a>	25	<div style="width: 20%;"></div>
<a href="#">style.css</a>	12	<div style="width: 9%;"></div>
<a href="#">Pi.java</a>	7	<div style="width: 5%;"></div>
<a href="#">sonarviolations.js</a>	6	<div style="width: 4%;"></div>
<a href="#">LoadService.java</a>	4	<div style="width: 3%;"></div>

# Planning issues

The screenshot shows the SonarQube interface for a project named 'DockerPiExample'. The top navigation bar includes 'sonarqube', 'Dashboards', 'Issues', 'Measures', 'Rules', 'Quality Profiles', 'Quality Gates', 'Administration', and 'More'. Below this, the project name 'DockerPiExample' is displayed with a star icon. A secondary navigation bar contains 'Technical Debt', 'Coverage', 'Duplications', 'Structure', 'Dashboards', 'Components', 'Issues', and 'Administration'. The 'Administration' menu is open, showing options: 'General Settings', 'Quality Profiles', 'Quality Gate', 'Custom Measures', and 'Action Plans'. The 'Quality Gate' section is highlighted with a red 'Failed' badge. It shows two metrics: 'Coverage on new code' at 0.0% (target < 80.0%) and 'Technical Debt Ratio on new code' at 28.1% (target > 5.0%). A large black arrow points from the 'Quality Gate' section down to the 'Action Plans' section in the next screenshot.

The screenshot shows the 'Action Plans' page in SonarQube. The top navigation bar is identical to the previous screenshot. The project name 'DockerPiExample' is shown on the left, and the user 'Administrator' is shown on the right. A blue notification bar at the top says 'Successfully created. [hide]'. Below this, the 'Action Plans' section is titled 'Action Plans' and includes a 'Create' button. The text below the title reads: 'Create and administer Action Plans for this project. Action Plans allow you to prioritize and group issues, and to monitor progress on those groups.'

ST.	NAME	DUE FOR	PROGRESS	DESCRIPTION	AUTHOR	OPERATIONS
➔	Release 1.0		No issues linked to this action plan yet.		Administrator	<a href="#">Edit</a> <a href="#">Close</a> <a href="#">Delete</a>



# Planning issues

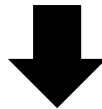
```
27 public int test(int var) {
28 if (var < 0) {
29 return 0;
30 }
31 int output = var + 1;
```

Remove this useless assignment to local variable "output". ...

Major Open Not assigned Not planned 15min debt Comment

Remove this unused "output" local vari

Major Open Not assigned Not planned Release 1.0 Comment



```
31 int output = var + 1;
```

Remove this useless assignment to local variable "output". ...

Major Open Not assigned Release 1.0 15min debt Comment

# Issues

The screenshot displays the SonarQube interface. At the top, the navigation bar includes the SonarQube logo and menu items: Dashboards, Issues (selected), Measures, Rules, Quality Profiles, Quality Gates, Administration, and More. On the left, a sidebar lists filters: Author, Language, Action Plan (checked), Release 1.0 (1 issue), and Not planned (34k issues). The main content area shows a list of issues. The first issue is highlighted with a red border and contains the following details:

- Issue ID: 1 / 1
- Buttons: Reload, New Search, Bulk Change
- Project: DockerPiExample
- File: src/main/java/com/dockerpi/helloworld/BlaService.java
- Issue Description: Remove this useless assignment to local variable "output".
- Severity: Major
- Status: Open
- Assignee: Not assigned
- Release: Release 1.0
- Debt: 15min debt
- Action: Comment

# Tips for using SonarQube in a project

- ☞ Create stories/tasks to improve the quality
- ☞ Perform manual code reviews
- ☞ Agree on a standard for items SonarQube cannot check
- ☞ Fix items or mark them as false positive
- ☞ Use separate logins
- ☞ Settings/reviews are project specific

# Tips for using SonarQube in a project

- ☞ Options to use SonarQube
  - Central server (commit AND nightly)
  - IDE plugin
  - Local in your development environment
- ☞ Check code quality before 'To verify' step
  - First merge your code so it is up to date
- ☞ Verifier should also verify the quality



# Accept failure, but improve continuously

“Once we accept our limits, we go beyond them.”

- Albert Einstein

# Questions

- ☞ Ask me!
- ☞ Sonarqube.org
- ☞ Nemo example dashboard
- ☞ SonarQube books



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