Piotr's TechBlog

Code Quality with SonarQube

Source code quality analysis is an essential part of the Continuous Integration process. Together with automated tests it is the key element to deliver reliable software without many bugs, security vulnerabilities or performance leaks. Probably the best static code analyzer you can find on the market is SonarQube. It has a support for more than 20 programming languages. It can be easily integrated with the most popular Continuous Integration engines like Jenkins or TeamCity. Finally, it has many features and plugins which can be easily managed from extensive web dashboard.

However, before we proceed to discuss about the most powerful capabilities of this solution it is well worth to ask *Why we do it*? Would it be productive for us to force developers to focus on code quality? Probably most of us are programmers and we exactly know that everyone else expect from us to deliver code which meet business demands rather than looks nice 🙂 After all do we really want to break the build by not fulfilling not important rule like maximum line length – rather a little pleasure. On the other hand taking over source code from someone else who was not paying attention to any of good programming practice is also not welcome if you know what I mean. But be calm, SonarQube is the right solution for you. In this article I'll to show you that carrying about high code quality can be a good fun and above all you can learn more how to develop better code, while other team members spend time on fixing their bugs 🙂

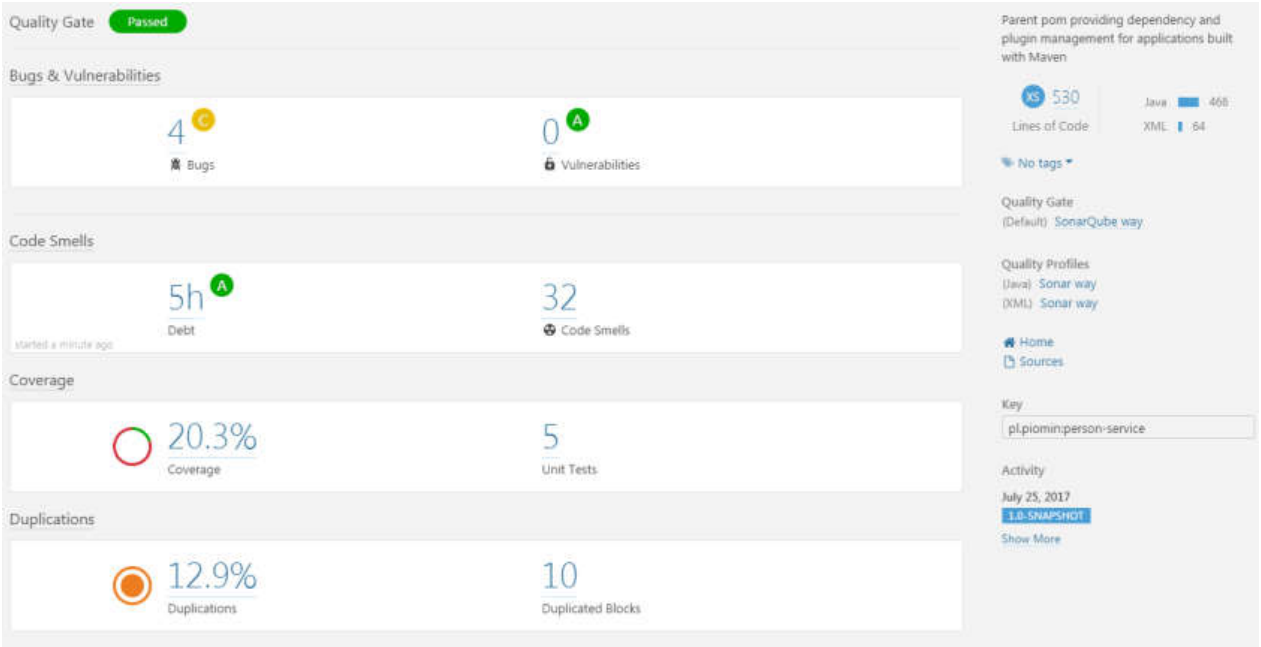
Enough talk go to action. I suggest you to run your test instance of SonarQube using Docker. Here's SonarQube run command. Then you can login to web dashboard available under *http://192.168.99.100:9000* with *admin/admin* credentials.

```
1 docker run -d --name sonarqube -p 9000:9000 -p 9092:9092 sonarqube
```

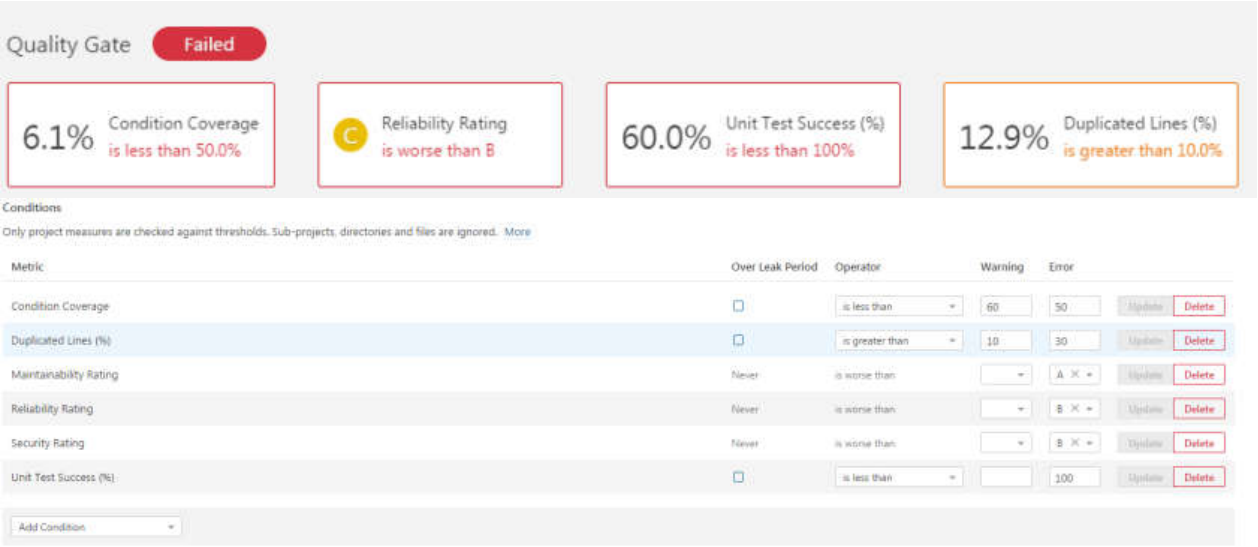
You are signed in to the web dashboard but there are no projects created yet. To perform source code scanning you should just run one command `mvn sonar:sonar` if you are using maven in the building process. Don't forget to add SonarQube server address in `settings.xml` file as you on the fragment below.

```
<profile>
    <id>sonar</id>
    <activation>
        <activeByDefault>true</activeByDefault>
    </activation>
    <properties>
        <sonar.host.url>http://192.168.99.100:9000</sonar.host.url
    </properties>
</profile>
```

When SonarQube analyse finishes you will see new project with the same name as maven artifact name with your code metrics and statistics. I created sample Spring Boot application where I tried to perform some most popular mistakes which impact on code quality. Source code is available on GitHub. The right module for analyse is named *person-service*. However, the code with many bugs and vulnerabilities is pushed to **v0.1** branch. Master branch has a latest version with the corrections performed basing on SonarQube analyse what I'm going to describe on the next section of that article. Ok, let's start analyse with mvn command. We can be surprised a little – the code analyse result for 0.1 version is rather not satisfying. Although I spend much time on making important mistakes SonarQube reported only some bugs and code smells were detected and quality gate status is 'Passed'.



Let's take a closer look on quality gates in SonarQube. Like I mentioned before we would not like to break the build by not fulfiling one or group of not very important rules. We can achieve it by creating quality gate. This is a set of requirements that tells us whether or not going to deployment with new version od project. There is default quality gate for Java but we can change its thresholds or create the new one. The default quality gate has thresholds set only for new code, so I decided to create the one for my sample application minimum test coverage set on 50 percent, unit test success detection and ratings basic on full code. Now, scanning result looks a little different 🙂

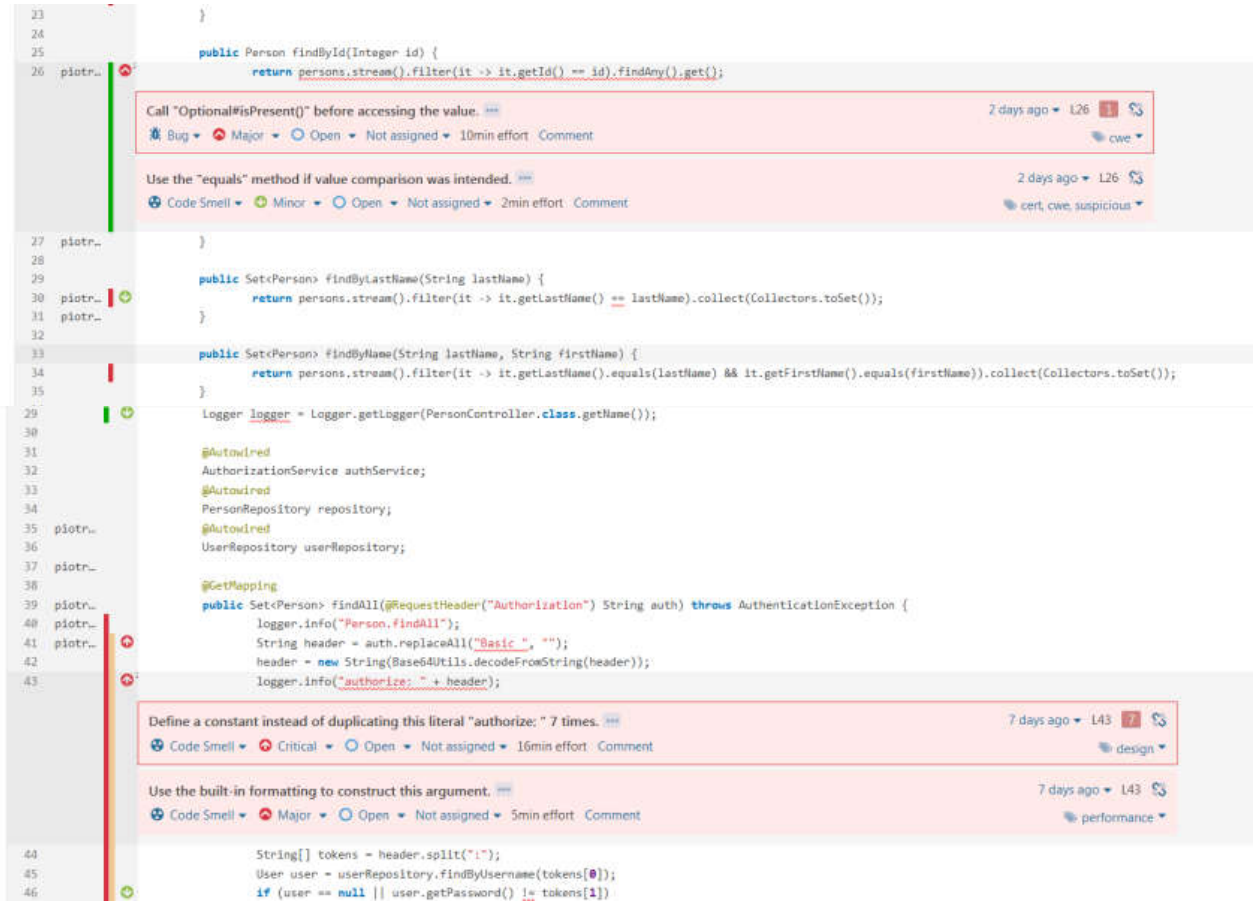


To enable scanning test coverage in SonarQube we should add jacoco plugin to maven `pom.xml` . During maven build `mvn clean test -Dmaven.test.failure.ignore=true sonar:sonar` the report would be automatically generated and uploaded to SonarQube.

```
<plugin>
    <groupId>org.jacoco</groupId>
    <artifactId>jacoco-maven-plugin</artifactId>
    <version>0.7.9</version>
    <executions>
        <execution>
            <id>default-prepare-agent</id>
            <goals>
                <goal>prepare-agent</goal>
            </goals>
        </execution>
        <execution>
            <id>default-report</id>
            <phase>prepare-package</phase>
            <goals>
                <goal>report</goal>
```

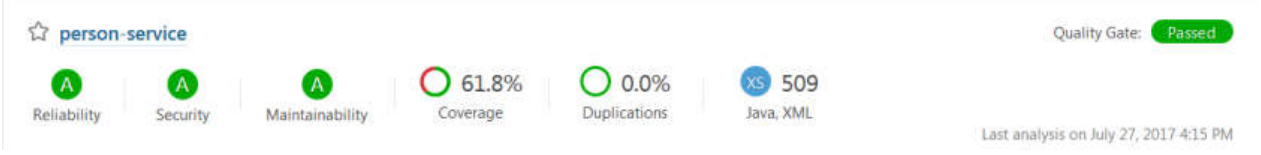
```
            </goals>
        </execution>
    </executions>
</plugin>
```

The last change that has to be done before application rescan is to installing some plugins and enabling rules disabled by default. The list of all active and inactive rules can be displayed in *Quality Profiles* section. In the default profile for Java the are more than 400 rules available and 271 active on start. I suggest you install *FindBugs* and *Checkstyle* plugins. Those plugins has many additional rules for Java which can be activated for our profile. Now there are about 1.1k inactive rules in many categories. Which of them should be activated depends on you, you can activate them in the default profile, create your new profile or use one of predefined profile, which were automatically created by plugins we installed before. In my opinion the best way to select right rules is to create simple project and check which rules are suitable for you. Then you can check out the detailed description and disable the rule if needed. After activating some rules provided by *Checkstyle* plugin I have a report with 5 bugs and 77 code smells. The most important errors are visible in the pictures below.



All issues reported by SonarQube can be easily reviewed using UI dashboard for each project in the *Issue* tab. We can also install plugin SonarLint which integrates with most popular IDEs like Eclipse or IntelliJ and all those issue will be displayed there. Now, we can proceed to fix errors. All changes which I performed to resolve issues can be display on GitHub repository from branches **v0.1** to **v0.6**. I resolved all problems except some checked exception warnings which I set to *Resolved (Won't fix)*. Those issues won't be reported after next scans.

Finally my project looks as you could see in the picture below. All ratings have a score 'A', test coverage is greater that 60% and quality gate is 'Passed'. Final person-service version is commited into master branch.



Like you see there are many rules which can be applied to your project during SonarQube scanning, but sometimes it would be not enough for your organization needs. In that case you may search for some additional plugins or create your own plugin with the rules that meet your specific requirements. In my sample available on GitHub there is module sonar-rules where I defined the rule checking whether all public classes have javadoc comments including `@author` field. To create SonarQube plugin add the following fragment to your `pom.xml` and change packaging type to `sonar-plugin`.

```
<plugin>
    <groupId>org.sonarsource.sonar-packaging-maven-plugin</groupI
    <artifactId>sonar-packaging-maven-plugin</artifactId>
    <version>1.17</version>
    <extensions>true</extensions>
    <configuration>
        <pluginKey>piotjavacustom</pluginKey>
        <pluginName>PiotrCustomRules</pluginName>
        <pluginDescription>For test purposes</pluginDescription>
        <pluginClass>pl.piomin.sonar.plugin.CustomRulesPlugin</pl
        <sonarLintSupported>true</sonarLintSupported>
        <sonarQubeMinVersion>6.0</sonarQubeMinVersion>
    </configuration>
</plugin>
```

Here's the class with custom rule definition. First we have to get a scanned class node (`Kind.CLASS`), a then process first comment (`Kind.TRIVIA`) in the class file. The rule parameters like name or priority are set inside `@Role` annotation.

```
@Rule(key = "CustomAuthorCommentCheck",
        name = "Javadoc comment should have @author name",
        description = "Javadoc comment should have @author name",
        priority = Priority.MAJOR,
        tags = {"style"})
public class CustomAuthorCommentCheck extends IssuableSubscriptic

    private static final String MSG_NO_COMMENT = "There is no com
    private static final String MSG_NO_AUTHOR = "There is no auth

    private Tree actualTree = null;

    @Override
    public List<Kind> nodesToVisit() {
        return ImmutableList.of(Kind.TRIVIA, Kind.CLASS);
    }

    @Override
    public void visitTrivia(SyntaxTrivia syntaxTrivia) {
        String comment = syntaxTrivia.comment();
        if (syntaxTrivia.column() != 0)
```

```
            return;
        if (comment == null) {
            reportIssue(actualTree, MSG_NO_COMMENT);
            return;
        }
        if (!comment.contains("@author")) {
            reportIssue(actualTree, MSG_NO_AUTHOR);
            return;
        }
    }

    @Override
    public void visitNode(Tree tree) {
        if (tree.is(Kind.CLASS)) {
            actualTree = tree;
        }
    }

}
```

Before building and deploying plugin into SonarQube server it can be easily tested using junit. Inside the `src/test/file` directory we should place test data – java files which are scanned during junit test. For failure test we should also create file `CustomAuthorCommentCheck_java.json` in the `/org/sonar/l10n/java /rules/squid/` directory with rule definition.

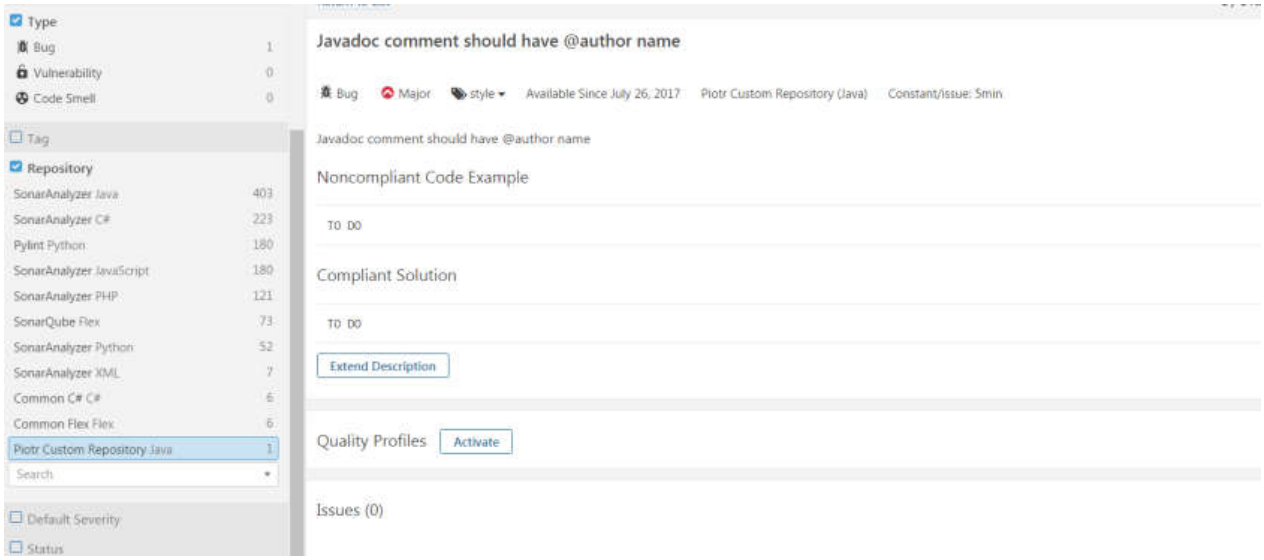
```
@Test
public void testOk() {
    JavaCheckVerifier.verifyNoIssue("src/test/files/CustomAuthorCo
}

@Test
public void testFail() {
    JavaCheckVerifier.verify("src/test/files/CustomAuthorCommentCh
}
```

Finally, build maven project and copy generated JAR artifact from *target* directory to SonarQube docker container into *$SONAR_HOME/extensions/plugins* directory. Then restart your docker container.

```
docker cp target/sonar-plugins-1.0-SNAPSHOT sonarqube:/opt/sonarqu
```

After SonarQube restart your plugin's rules are visible under *Rules* section.



The last thing to do is to run SonarQube scanning in the Continuous Integration process. SonarQube can be easily integrated with the most popular CI server – Jenkins. Here's the fragment of Jenkins pipeline where we perform source code scanning and then waiting for quality gate result. If you interested in more details about Jenkins pipelines, Continuous Integration and Delivery read my previous post How to setup Continuous Delivery environment.

```
stage('SonarQube analysis') {
    withSonarQubeEnv('My SonarQube Server') {
        sh 'mvn clean package sonar:sonar'
    }
}
stage("Quality Gate") {
    timeout(time: 1, unit: 'HOURS') {
        def qg = waitForQualityGate()
        if (qg.status != 'OK') {
            error "Pipeline aborted due to quality gate failure:
        }
    }
}
```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