45426 Teste e Qualidade de Software

TQS: Quality Assurance manual

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1 Project management

1.1 Assigned roles

The team consists of a team coordinator, a product owner, a QA engineer, a DevOps master, and developers.
The assigned person and the responsibilities of each role are as follows:

- **Team Coordinator (Filipe Sousa):** Ensure a fair distribution of tasks and that members adhere to the plan. Promote optimal collaboration within the team and proactively address any arising issues. Ensure timely delivery of the requested project outcomes.
- **Product owner (Daniel Simbe):** Represents the interests of stakeholders and possesses a deep understanding of the product and the application domain, the team will turn to the Product Owner to clarify any questions about expected product features. Should be involved in accepting incremental solutions.
- **QA Engineer (Gonçalo Calvo):** Responsible, in articulation with other roles, to promote the quality assurance practices and put in practice instruments to measure the quality of the deployment. Monitors that team follows agreed QA practices.
- **DevOps master (Filipe Sousa):** Responsible for the (development and production) infrastructure and required configurations. Ensures that the development framework works properly. Leads the preparation of the deployment machine(s)/containers, git repository, cloud infrastructure, databases operations, etc.
- **Developer (All members of the team):** Development tasks which can be tracked by monitoring the pull requests/commits in the team repository.

1.2 Backlog Grooming and Progress Monitoring

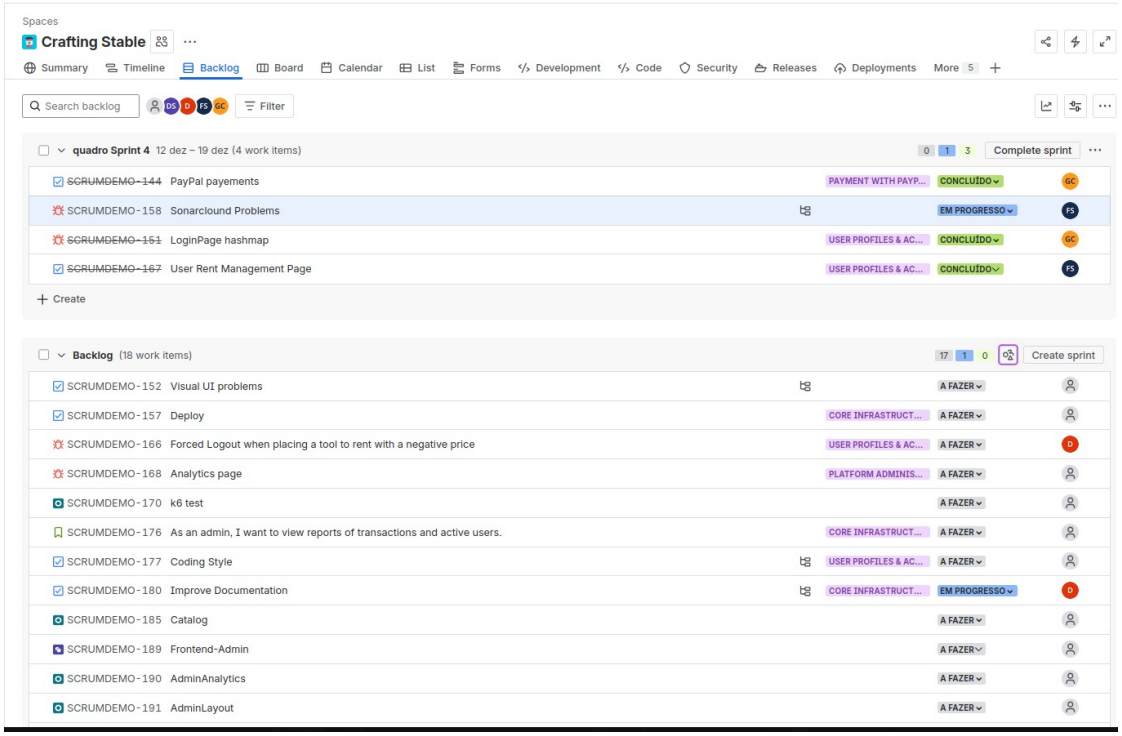
Backlog Structure:

Our project backlog is organized into iterations and categorized by statuses on the board:

- **IN DOING:** Tasks prioritized for the current iteration.
- I**N PROCESS:** Tasks currently in progress.
- **DONE:** Completed tasks.

Git and CI/CD Integration:

- **Branches:** Created in GitHub and linked to the corresponding issue.
- **Pull Requests:** Associated with tasks on the board.
- **Merge Criteria:**
    - Mandatory review by another team member.
    - Passing automated tests (CI Pipeline Action).
    - Passing CodeRabbitAi review



2 Code quality management

2.1 Team policy for the use of generative AI

Regarding AI we as a team decided to use it only in bug fixes when it took us too much time in our hands to deal with, and for generating boilerplate code examples, ensuring the code is always reviewed by a team member.

2.2 Guidelines for contributors

Coding style

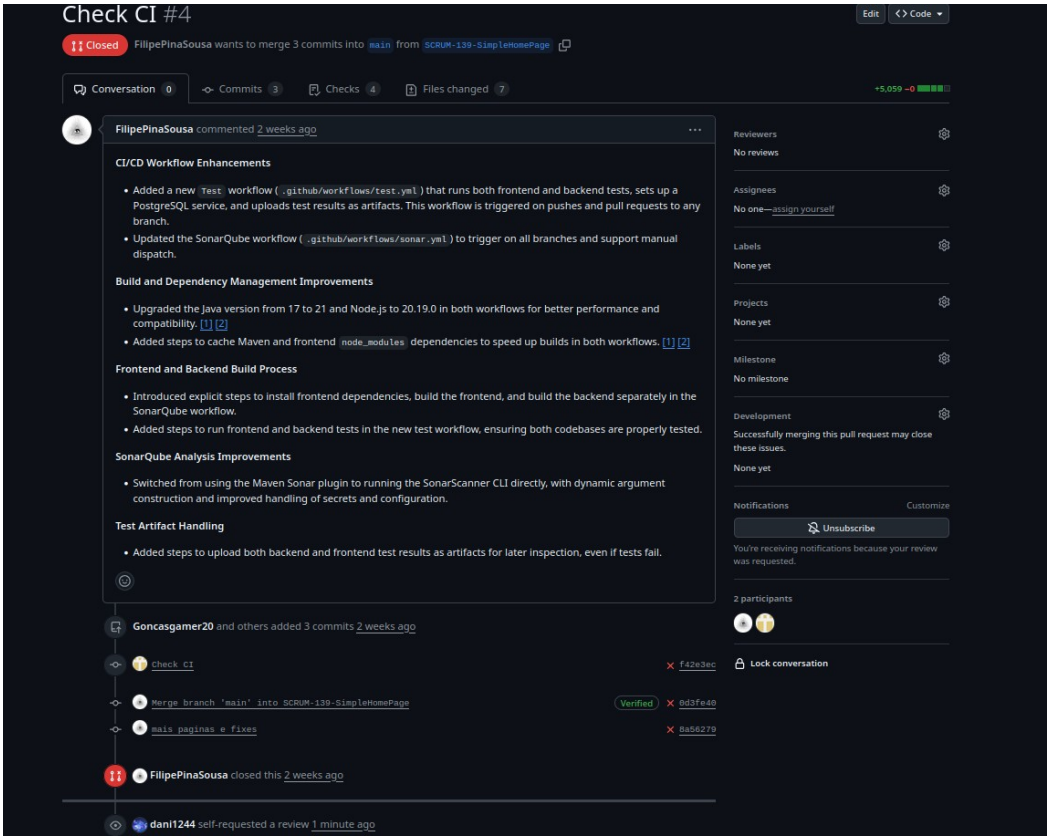
The code style adopted for this project is prioritized by uniformity and the consistency rule i n order to keep a more readable and consistent code.
As this project was developed in Java, Typescript programming languages after some thought we follow the Google Style Guide. For example, focusing on camelCase for variables and method, no line wrapping and use of optional braces on *if, else, for,..*

Tools to use:

- Java - Checkstyle
- TypeScript - ESLint + @typescript-eslint

Code reviewing

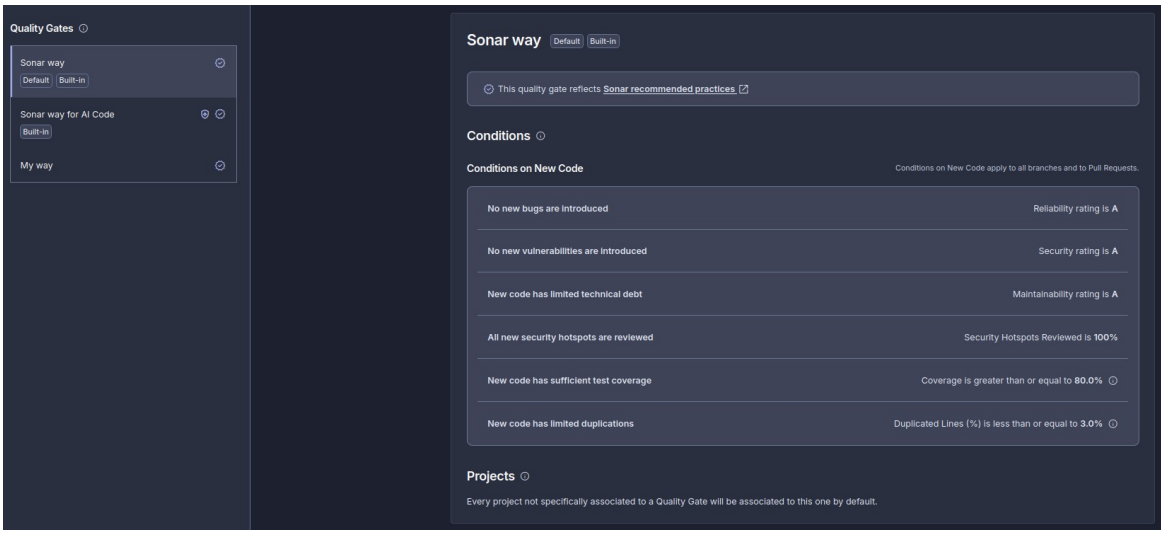
Using GitHub Copilot and CodeRabbitAi as a reviewer on push and pull requests on the master branch as a helper on code review.
Also have at least one team member to review pushes and PR to master branch of the project.



2.3 Code quality metrics and dashboards

For static code analysis we opted to have a workflow with GitHub Actions which runs every time a push or a pull request is executed. It runs all tests, sends the code to be analyzed with SonarQube Cloud Service integrated on Github repository and send it to CodeRabbitAi to be analised.

This creates issues in case the quality gate doesn’t pass and the developer must check and fix those issues. The default quality gate provided by the SonarQube is the used one with the duplicated code at 0.3% or greater and code coverage equal or greater than 80%.



3 Continuous delivery pipeline (CI/CD)

3.1 Development workflow

Coding workflow

Our project is organized in a single repository with the following modules:

- ├── backend
- └── frontend

Regarding the division of branches, we do it as follows:

- Main Branch: master (protected, merge only via Pull Request);
- Secondary Branches: Created from backlog tasks.

Therefore the work is done on different branches and commits are given to them. When the feature is completely implemented it is given pr, with reviews and tests passed to the master branch.

Definition of done

A user story is only considered ready when it meets all of these points:

- **Functionality Implemented:**
  - It does exactly what was requested in the task acceptance criteria.
- **Code Cleaned and Reviewed:**
  - Another team member approved the code in the Pull Request.
  - It passed SonarQube analysis.
- **Testing Done and Approved:**
  - Tests passed.
- **System Integration:**
  - The code was merged into the main branch (master).
  - GitHub Actions, SonarCloud and CodeQL executed everything without errors (build, tests, deploy).

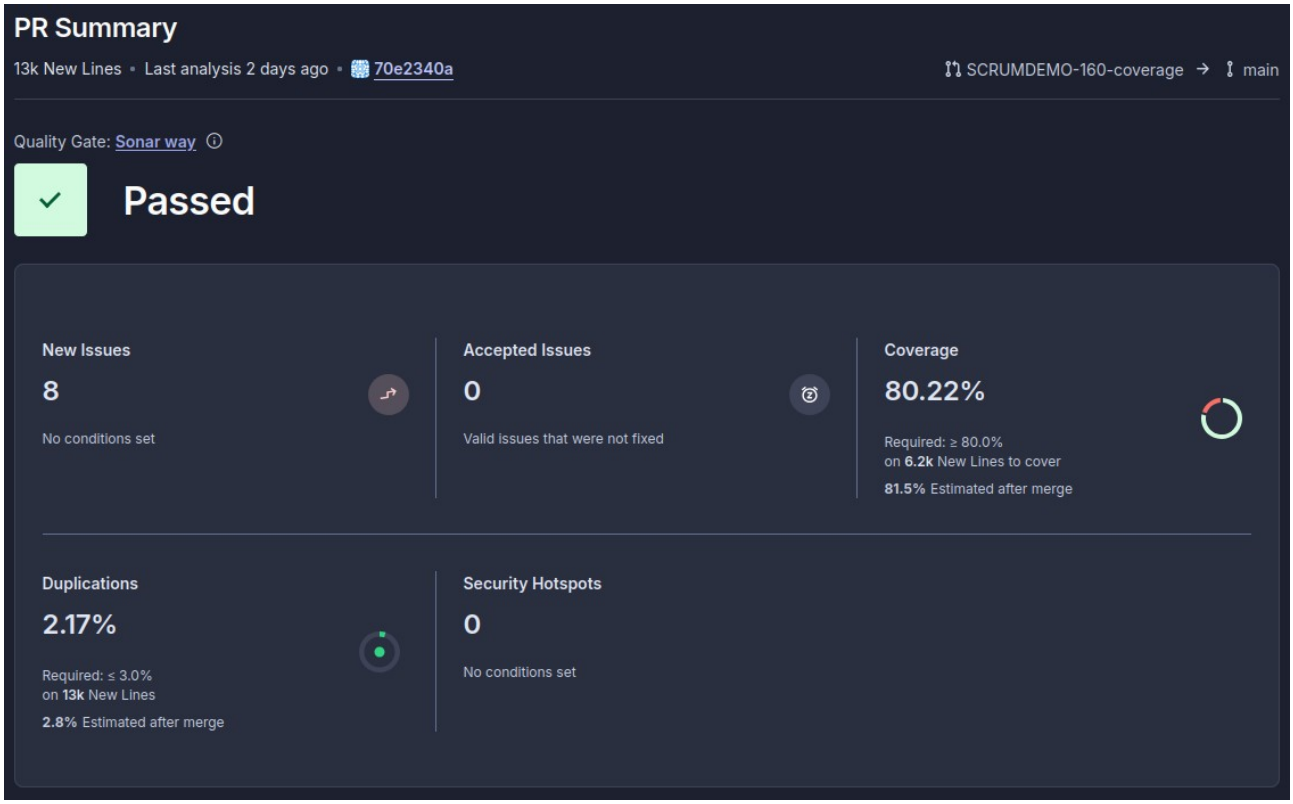
3.2 CI/CD pipeline and tools

Several CI/CD pipelines were implemented on GitHub Actions with the backup of SonarCloud quality tests.

For this project on GitHub it was created on a single repository it was created the following workflows:

- **Backend**
  - Unit and integration backend tests, using JUnit
  - Playwright and Cucumber tests for the frontend side
  - Upload of results to Sonar Cloud
  - Upload of results to Xray, testing user stories
  - GitHub's CodeQL analysis
- **Frontend**
  - SonarCloud analysis
  - Lighthouse performance and metrics evaluation
  - GitHub's CodeQL analysis

After tests are run, SonarCloud and Lighthouse comment on the Pull Request with the output of those tests.



4 Software testing

4.1 Overall testing strategy

To ensure coverage and efficiency, we adopted several strategies:

- **TDD (Test-Driven Development):** For critical components, unit tests were written before the code;
- Unit Tests;
- Integration Tests;
- **BDD with Cucumber:** Automated functional tests;
- **TestContainers** for integration with PostgreSQL;
- **Integration in CI:** All tests are executed in GitHub Actions. Merging is only allowed if they pass.

4.2 Functional testing and ATDD

- Tests focused on user behavior (black box).
- **When:** For each user story with clear acceptance criteria

- **Tools:**
    - Cucumber + Playwright (frontend);
    - Xray to link tests to USs in Jira.

4.3 Developer facing tests (unit, integration)

Unit Tests:

- Goal: Cover 80%+ of the code with JUnit.

Integration Tests:

- Goal: Validate communication between services.
- Tools: SpringBootTest + TestContainers.

4.4 Exploratory testing

Manual Testing with Real Users:

- Carried out by team members;
- Focus on scenarios not covered by automation, such as:
    - Usability;
    - Edge cases;
    - Compatibility.

4.5 Non-function and architecture attributes testing

Performance:

- Spring Actuator => Prometheus => Grafana
- Lighthouse for frontend metrics.

Security:

- SonarQube & Github CodeQL