deti universidade de aveiro departamento de eletrónica, telecomunicações e informática

TQS: Quality Assurance manual

Pedro Ramos [107348], ***João Luís [107403]***, **Daniel** ***Madureira [107603]***, ***Rodrigo Aguiar [108969]***
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1 Project management

1.1 Team and roles

Role	Name	Email	NMEC
Team Manager	Rodrigo Aguiar	rodrigoaguiar96@ua.pt	108969
Product Owner	João Luís	jnluis@ua.pt	107403
QA Engineer	Daniel Madureira	daniel.madureira@ua.pt	107603
DevOps Master	Pedro Ramos	p.ramos@ua.pt	107348

1.2 Agile backlog management and work assignment

We work on weekly sprints and we do all backlog management on Jira.

At the start of each sprint, the team gathers and decides what user stories will be worked on during this sprint.
The team manager then distributes tasks for each of the team members to work on the sprint, making sure that they are distributed fairly.

When we start the development of a user story, we first create various subtasks assigned to it.

These subtasks are directly related to the development and testing effort of the user story, being for example the development of the backend code needed to support this feature or the functional tests of the frontend component.

2 Code quality management

2.1 Guidelines for contributors (coding style)

All contributions to our code repository should follow these rules:

- All the class names must be in pascal case (HelloWorld.java, for example);
- Package names must be declared at the start of the file, without upper case or numbers;
- Use specific imports, without * ;
- Use of camel case in variable declaration (someVariable, for example)
- Proper code formatting and linting, with the use of the Prettier code formatting tool;
- Limit the scope of variables to the least needed
- The use of lombok to auto generate constructors, getters, setters and toString functions
- The code should be properly commented so it's easy to understand
- All code contributions should be supplied with automated tests using the JUnit framework.
- Use of the Sonarlint VSCode extension is highly recommended to prevent code smells or security issues

2.2 Code quality metrics and dashboards

For the *static code analysis*, we use Sonar Cloud with the Quality Gate "Sonar Way", which is the default QG defined. The dashboard can be consulted on this link.
We didn't feel the need to define a personalized Quality Gate as this one perfectly fits our needs and assures good quality in the developed code.

This QG has the following conditions, that need to be respected in order to pass the QG:

- No new bugs are introduced;
- No new vulnerabilities are introduced;
- New code has limited technical debt;
- All new security hotspots are reviewed;
- Coverage is greater than or equal to 80.0%;
- Duplicated Lines (%) is less than or equal to 3.0%.

The analysis is done every time a pull request is made or a push to the main branch and the results are automatically published to sonarcloud.

3 Continuous delivery pipeline (CI/CD)

3.1 Development workflow

GitHub flow is the workflow adopted for development.

For each task created on the Jira platform, a branch is created to develop that task, and when it's done, it's created a Pull Request to the main branch of that submodule. The pull request must then be reviewed by another member of the team, to ensure that it meets the necessary quality standards and pass the automatic code analysis done by Sonarcloud in order to be merged into the main branch.

For a user story to be considered done, the team complies to the following criteria:

- The developed solution meets **all** the requirements for the user story;

- It is supplied with automatic tests, both unit and integration tests;

- If its a frontend functionality, functional tests must also be provided;

- Test coverage must be above 80%;

- The performance of the solution must be within reasonable standards for the given story;

- The user interface must be developed according to the story's criteria;

- The given solution cannot have known unsolved bugs;

- Code must be reviewed by at least 1 different team member;

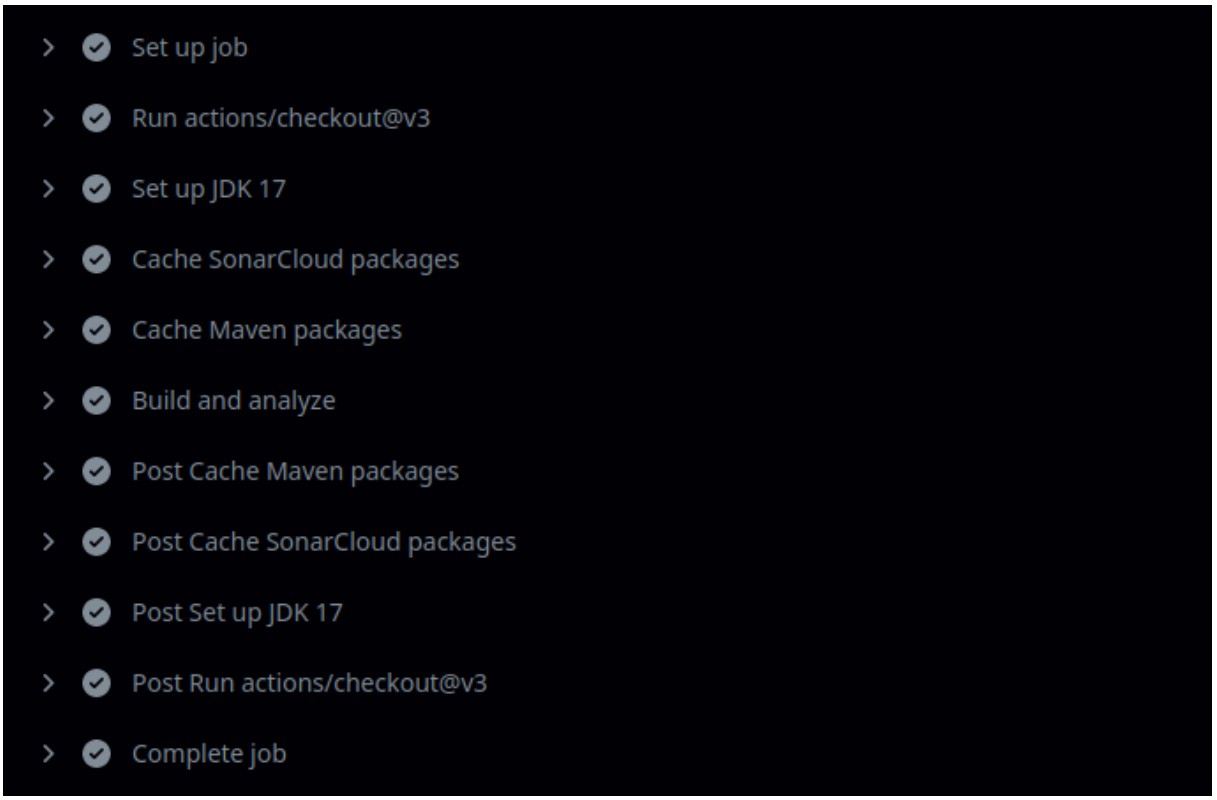
- Code must comply with the security requirements and standards of the Phihub Enterprise.

3.2 CI/CD pipeline and tools

The continuous integration and deployment pipeline is useful to ensure that updates are streamlined and that issues are found as soon as possible.
For our project, we implemented the principles of CI with the help of GitHub Actions.
With GitHub actions, the project can be tested and verified as soon as the new changes are committed into the main repository, either via regular edits or branch merges.
Since most of the project is subdivided into containers, the individual pieces of the final application are able to grow independently as long as the new changes do not break compatibility with the other services.
This containerization allows for the CD pipeline to be compartmentalized, dividing the remote Git testing to target only individual services of the codebase.

```yaml
name: SonarCloud
on:
  push:
    branches:
      - main
  pull_request:
    types: [opened, synchronize, reopened]
```

```
      SONAR_TOKEN: ${{ secrets.SONAR_TOKEN }}
    run: mvn -B verify org.sonarsource.scanner.maven:sonar-maven-plugin:sonar
```



3.3 System observability

As the project is still in development, there is not yet the need to implement System Observability mechanisms.
In the future, when a production state is nearer, we plan to implement an ELK stack (ElasticSearch + LogStash + Kibana) for log storage and analysis.
Nagios alarms will also be implemented in order to inform the team when there are problems within the production infrastructure.

3.4 Artifacts repository

For the backend component, there is only 1 maven project being used, with segmentation of functionality for the different roles, patients medics and staff and proper authentication and authorization.

Given this, there is no need for the managing of Maven artifacts, given that only 1 is used.

4 Software testing

4.1 Overall strategy for testing

For the overall development strategy used, it varied based on the service that was being altered.
For the backend of the application, a set of tools was used to create tests along with the development of the features, this means that the tests were mostly written at the same time as the actual feature.
Since most of the backend's components are internally separated into different sets based on the features they provide (ex: controllers, services, repositories, etc), different testing tools were used to take maximum advantage of their main feature set.
For the frontend, the tests will be written once the main functionalities of the application have been finished.
This ensures that any errors in the planned user workflows can be quickly dealt with without the need to re-write these tests.
As soon as most of the application is written, these tests will then be implemented to make sure that any additional changes do not break the final workflows used.
Once again, a mix of testing tools was used in the tests for this service, such as the use of Cucumber BDD and REST-Assured, which allows the test to simulate these user workflows.

The tests implemented make sure that almost all of the errors included in a change are found before they hit the final production environment.
The Code Quality Metrics used also allow the CI pipeline to stop any merges to the main branch if they do not comply with the Quality Gate. This is an important step in the verification of the implementation merit of the final changes into the production environment.

4.2 Functional testing/acceptance

Will be delegated to later to ensure that they don't need to be rewritten every time UI is changed.

4.3 Unit tests

[Project policy for writing unit tests (open box, developer perspective) and associated resources.]

Alongside the development of features, unit tests are developed in order to ensure that the specific features added by these components work correctly.
These tests are developed using the Junit 5 Framework, with the support of the Mockito framework for mocking.

Unit tests were developed for the various layers of the Spring Boot Application (controllers, services and repositories) as well as to the created parsers and authentication layers, to ensure that they have the desired behavior even when dealing with edge cases.

4.4 System and integration testing

For the backend service, the integration services allow testing both the individual components and the final communication layers between them, ensuring that the whole application itself can correctly implement the features provided.

For the purpose of this test, we used an internal in-memory database.
This database was chosen for two reasons, to allow a resetting the database to be made between tests, as to not "contaminate" the database with models added by previous tests and to allow the use of pre-loaded data that can be shared between testing instances. This ensures that the same database state can be obtained at the start of every integration test.

4.5 Performance testing [Optional]

[Project policy for writing performance tests and associated resources.]