Software Development Organization

2025-2026

Project 2

Context

The LMS project will evolve through a decentralized/distributed architecture, where the system will be composed by several applications, each potentially running in multiples machines.

Each application will evolve individually both in terms of code and deployment, thus giving rise to potential interface/integration problems between applications constituting the system.

Goal

The goal of this sprint/project is to support the independent deployability and releasability of every application.

Requirements

Non-functional requirements

- The system must increase the performance by 25% when in high demand (i.e. >Y requests/period).
- The system must use hardware parsimoniously, according to the runtime demanding of the system. Demanding peaks of >Y requests/period occur seldom.
- Despite the decentralization/distribution and independent development of applications, each application must maintain (or improve) releasability.
- Despite the decentralization/distribution and independent development of applications, independent deployment of each application must be possible.
- Development, Staging and Production environments should be adopted.
- The system shall automatically roll back any production deployed service to its previous version in case of health check failures.
- System must not have a downtime when updating a service.

Functional requirements

- At least 3 services (4 services for groups of 3 students) running.
- For service A, the user triggering the pipeline must receive an email (or other type of notification) with the link to the deployed service (not the one in production) for accepting or rejecting.

Conditions

- Number of students per group: 2 (exceptionally 3 if accepted by faculty)
- Submission deadline: 2026-01-04
- Mode: Individual, synchronous, face-to-face
- Weight: 100%
- Cf. Evaluation criteria in Moodle

Project 1

Context
In a previous project, the Library Management REST-oriented backend service was developed.
This application provides REST endpoints for managing:
- Books
- Genres
- Authors
- Readers
- Lendings

Problem
The Library Management service has some limitations related to:
- Variability
- Configurability
- Reliability
- CI/CD
- Testing

Goals
The goals of this project (P1) are:
- Documenting
  - System-as-is
    - Reverse engineering design, including implementation and deployment
    - Test health metrics: quantity, and quality
  - System-to-be (deployment only)
  - Critical analysis on pipeline performance, with evidence of improvement over time
- To adopt a CI/CD automation process using Jenkins
  - Deployment of Jenkins in two of:
    - Local
    - DEI's remote servers (e.g. https://vs-ctl.dei.isep.ipp.pt)
    - Containers (e.g. Docker)
    - Other, e.g. Azure, GCP, AWS (no support is provided)
  - Build
    - Compile/Package (compilation, resolve dependency)
    - Artifact Creation (packaging)
    - Static Code Analysis (e.g. ES Lint, SonarQube)
  - Unit Testing (i.e. SUT = classes)
    - Run (different tests levels separately)
    - Test coverage
    - Mutation tests
    - Reporting results
  - Integration Testing (i.e. SUT = controller+service+{domain, repository, gateways})
    - Service testing
    - Data base testing

- Reporting results
- Deployment to 2 hosting environments
  - Local
  - DEI's remote servers (e.g. https://vs-ctl.dei.isep.ipp.pt)
  - Containers (e.g. Docker)
- In 3 environments: dev, staging, and production, other, e.g. Azure, GCP, AWS
- To improve automated functional testing:
  - Functional opaque-box with SUT= classes
  - Functional transparent-box with SUT = domain class
  - Mutation tests with SUT= classes
  - Functional opaque-box with SUT = controller+service+{domain, repository, gateways}
  - Functional opaque-box with SUT = system
  - Test health metrics of the improved tests: quantity, and quality

Conditions

- Number of students per group:
  - 2
  - exceptionally 3 or 1, if accepted by faculty, and implies differences in goals
- First evaluation:
  - Mandatory
  - Submission deadline: 2025-11-02
  - Mode: Individual, synchronous, face-to-face
  - Weight: 100% (or 30% if second evaluation takes places)
- Second evaluation:
  - Optional
  - Submission deadline: (as P2 submission deadline)
  - Mode: Individual, synchronous, face-to-face
  - Weight: 30% (or 0% if it does not take place)