Methodology and Tools Definition for Automated Update of Test Environment

M3 SYSTEMS BELGIUM

15/10/2020

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CONTEXT

GATE4Rail works towards contributing to the GNSS application in the railway industry

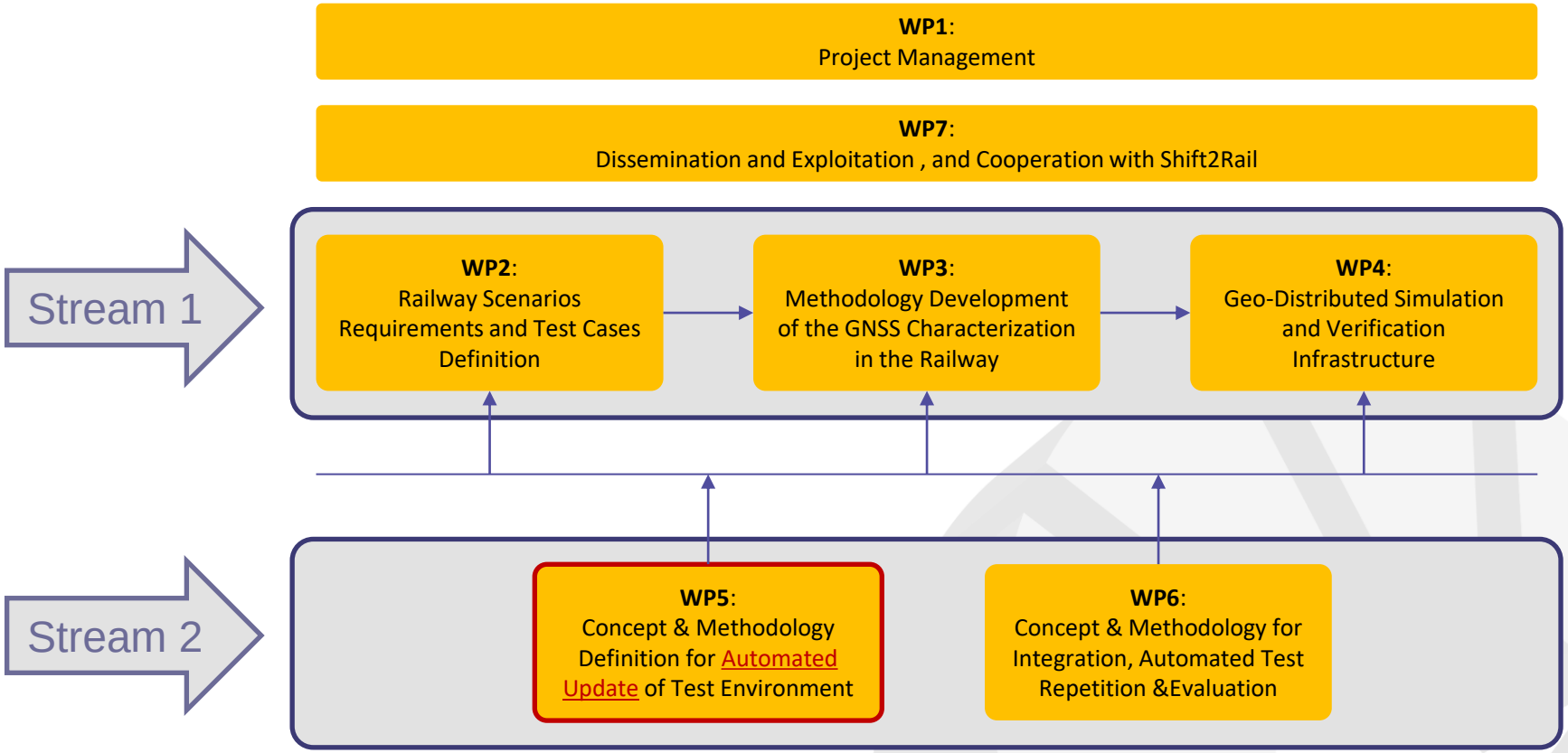
The main objective is to provide a laboratory test architecture where different scenarios for GNSS-based ERTMS applications will be run by integrating simulation blocks and defining their interfaces

⇒ To be achieved

"In the framework of the evolution of the simulation environment technologies*"

**S2R-OC-IP2-02-2018 - Modern methodologies and verifications for GNSS in Railways and virtual test environment*

CONTEXT – 2 Work Streams



CONTEXT

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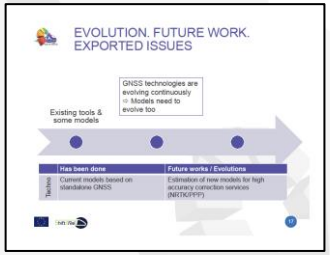
The main objective is to provide a laboratory test architecture where different scenarios for GNSS-based ERTMS applications will be run by integrating simulation blocks and defining their interfaces

It is key to ensure that the test architecture is designed and implemented in such a way it can easily be adapted, enhanced, maintained and upgraded, as:

- GNSS technologies are evolving continuously

WP3



CONTEXT

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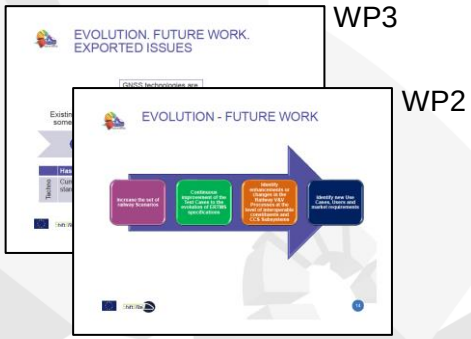
The main objective is to provide a laboratory test architecture where different scenarios for GNSS-based ERTMS applications will be run by integrating simulation blocks and defining their interfaces

It is key to ensure that the test architecture is designed and implemented in such a way it can easily be adapted, enhanced, maintained and upgraded, as:

- GNSS technologies are evolving continuously
- the regulatory framework for the use of such techno-logies in the context of ERTMS is under development



It is crucial to develop and deliver a simulation infrastructure able to follow these changes according to future needs and requirements.

OBJECTIVES

The purpose of this WP5 is to define the concept and methodology to have an engineered system that can be updated automatically with new inputs in the test environment and allow a GATE4Rail simulation infrastructure upgrade.

It will maintain the simulation environment up-to-date in line with new requirements, track configuration and ease the maintenance.

The key objectives are:

- To build a clear definition of the system as a set of functions and interfaces among them.
- To ensure the possibility to update every single function, as well as the addition of new function in the system.
- To foster the use of standards format and protocol to maximize the modularity of the system.

Achievements

- Benchmark of the State-of-the-art of Model-Based Systems Engineering approaches and the associated tools
  - IBM Rational Telelogic Harmony-SE
  - IBM Rational Unified Process-SE
  - JPL State Analysis
  - Vitech STRATA
  - INCOSE Object-Oriented Systems Engineering Method
  - ARCADIA

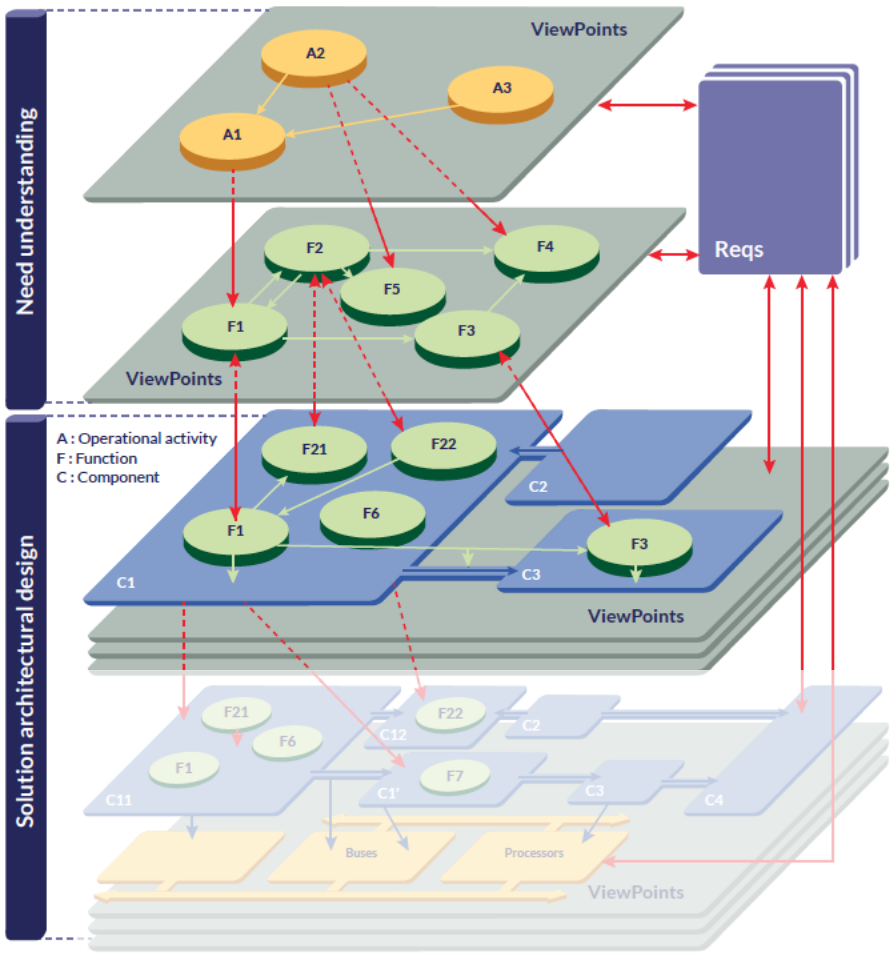
- SWOT analysis and evaluation of the most promising MBSE approaches

- Selection of the most suitable approach for the project: **ARCADIA/CAPELLA**
  - Selection criteria: open access, community support, user friendly, adopted as standard by AFNOR in 2018
  - Cons: user can easily get lost in detailing too much for each steps

- Demonstration of ARCADIA/CAPELLA usage on a specific use case of the project

WORK Illustration

- The different working levels of ARCADIA are:



Operational Analysis
What the users of the system need to accomplish

Functional & Non Functional Need
What the system has to accomplish for the users

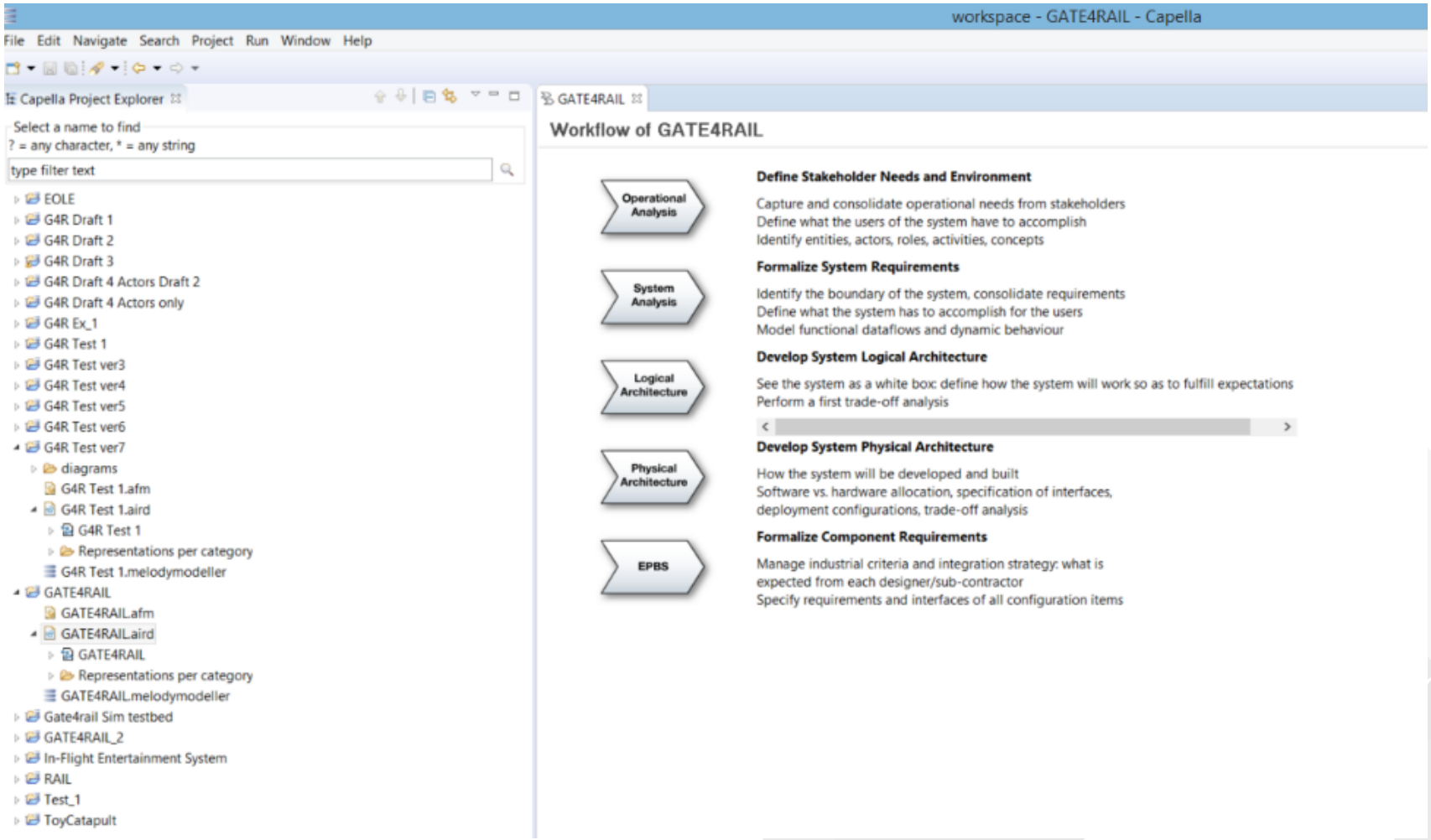
Logical Architecture
How the system will work to fulfill expectations

Physical Architecture
How the system will be developed and built

GATE4RAIL

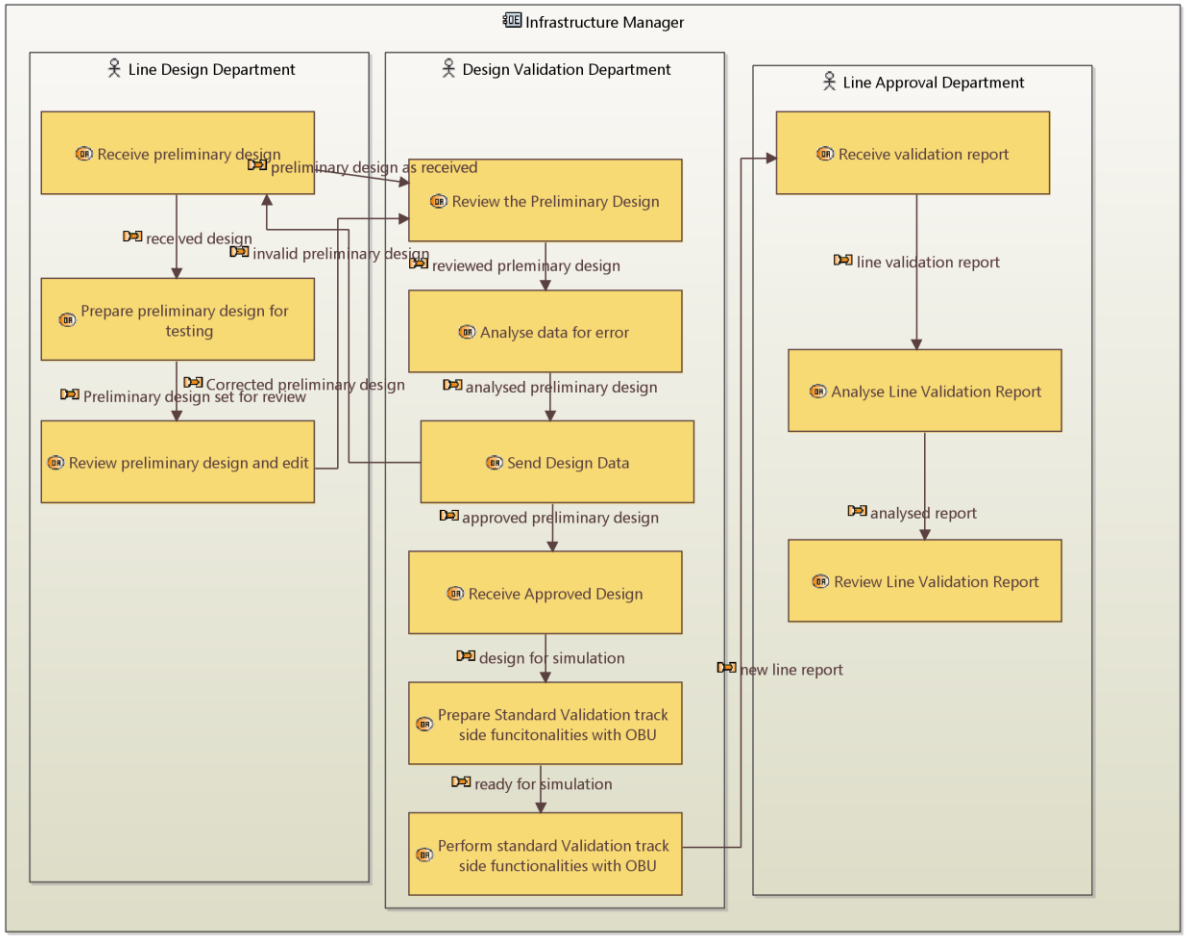
WORK Illustration

- CAPELLA overview



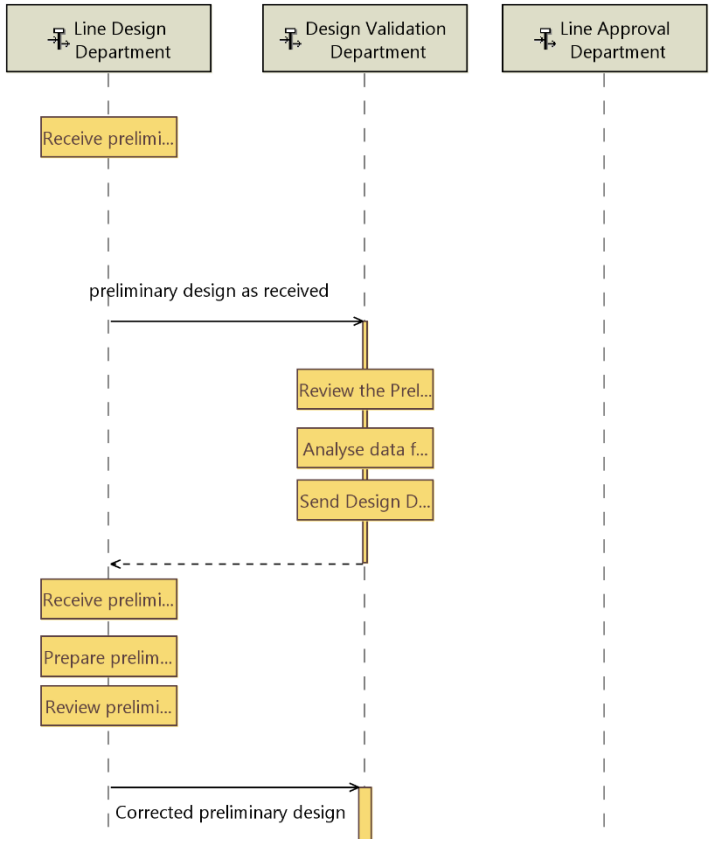
WORK Illustration

- ARCADIA application to GATE4RAIL – Operational architecture (USE CASE: Validation of the line engineering)



WORK Illustration

- ARCADIA application to GATE4RAIL – Operational scenario (USE CASE: Validation of the line engineering)



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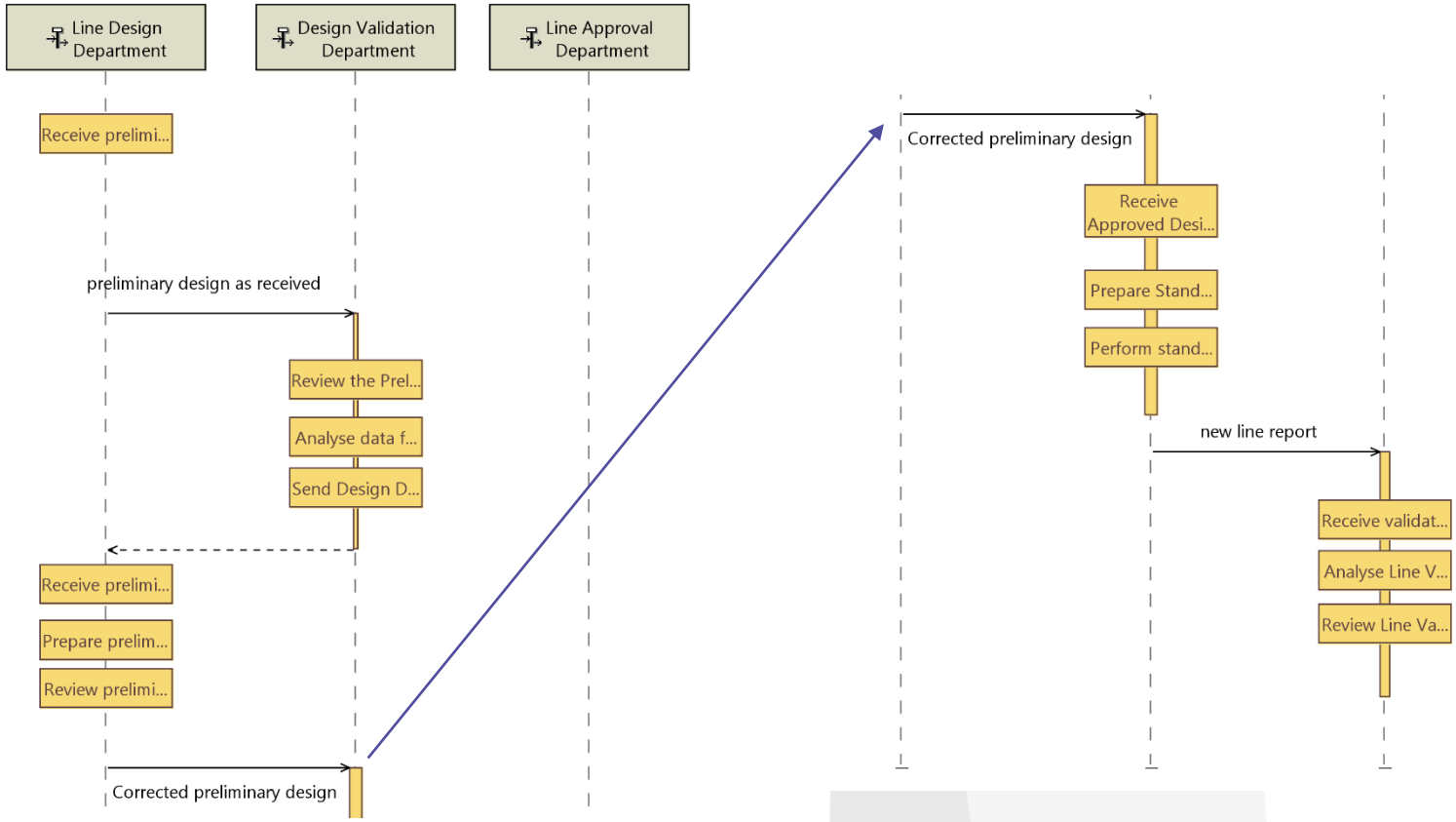
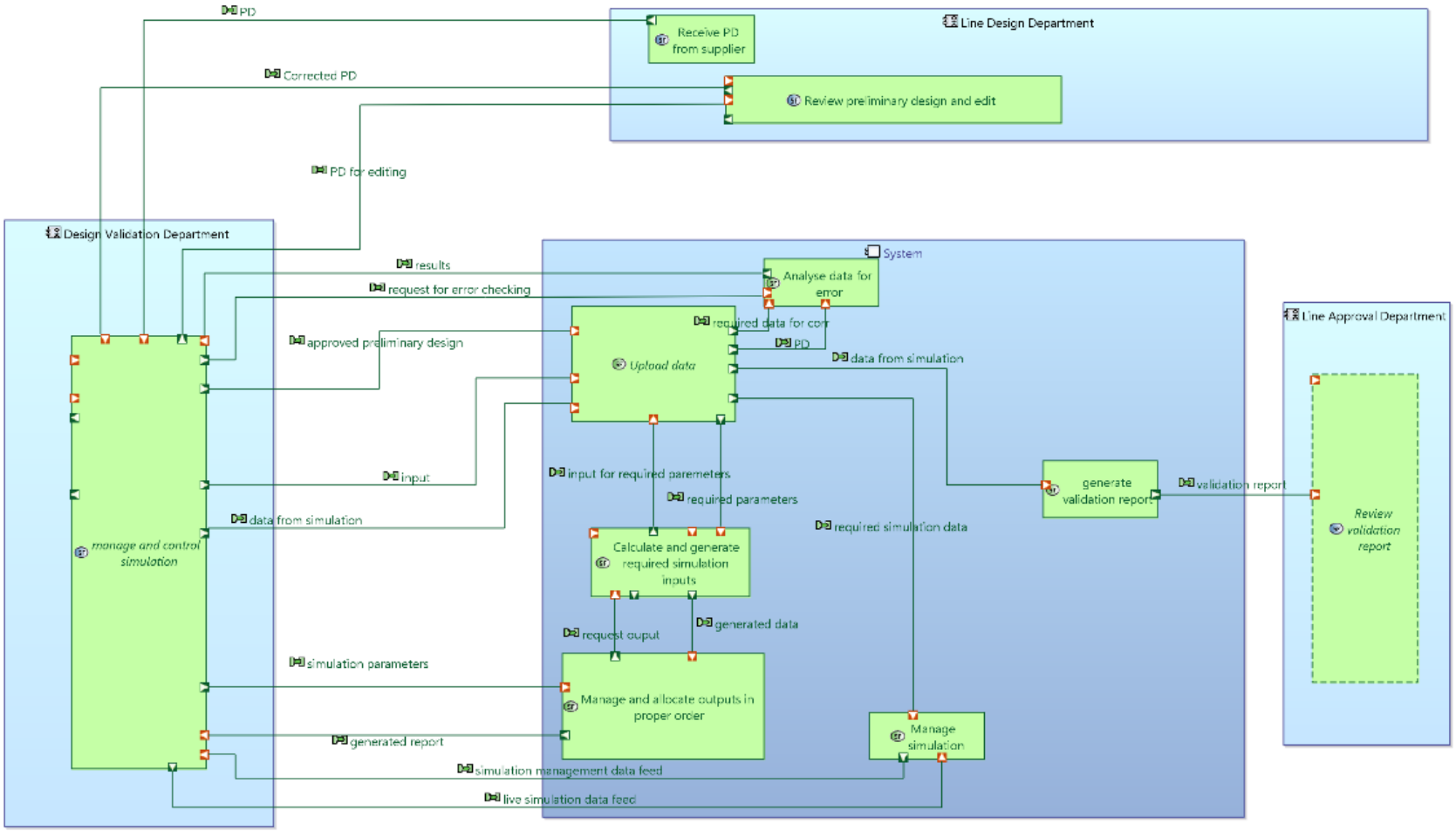


WORK Illustration

- ARCADIA application to GATE4RAIL – System Architecture (USE CASE: Validation of the line engineering)



EVOLUTION. FUTURE WORK. EXPORTED ISSUES

GATE4Rail is demonstrating the proof of concept of integration of GNSS and ERTMS modules

→ the methodology/tools have been defined for the implementation of future GATE4Rail platform evolution, ensuring higher TRL level solution (project target: TRL4)

QUESTIONS?