1st Advisory Board meeting

Alessia Vennarini – Radiolabs

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RAILWAY SCENARIOS REQUIREMENTS AND TEST CASES DEFINITION

CONTEXT

Satellite positioning: a game changer for the European Railway Traffic Management System

- Past projects on GNSS application in the rail domain (e.g. RHINOS, STARS, VITE, and ERSAT GGC): technology development
- A need for simulation and verification platform for GNSS-based ERTMS applications able to:
  - Define the requirements for testing ERTMS/ETCS and GNSS Scenarios and Test Cases in the railway environment
  - Reduce the need of long and expensive tests on field for the implementation of Virtual Balises in a railway line
  - Evaluate the GNSS performances in the railway environment with agreed methodologies and tools

GATE4RAIL ISSUES & TARGETS

ISSUES

- Who are the users?
- What are the railway use cases?
- How to define scenarios of interest, with typical railway environments and commons operations and procedures?

TARGETS

- Description of a collection of Test Cases to evaluate the Scenarios and evaluation procedures
- Definition of the main requirements in terms of geo-localization performances and key elements to be modelled in the simulations
- Definition at a high level of the GATE4Rail architecture and logic scheme

FROM POTENTIAL USERS TO OBJECTIVES

- Infrastructure Managers (IMs)
- Railway Undertakings (RUs)
- Manufacturers
- Notified Bodies (NoBos)

- Support for the new line design engineering (IMs, manufacturers);
- Validation of the line engineering (IMs, manufacturers, NoBos);
- Tests for the certification of different components (IMs, manufacturers, NoBos)
- Support for route compatibility tests (RUs)
- Support to the characterization of a railway line (from the GNSS point of view) (IMs, RUs, manufacturers)

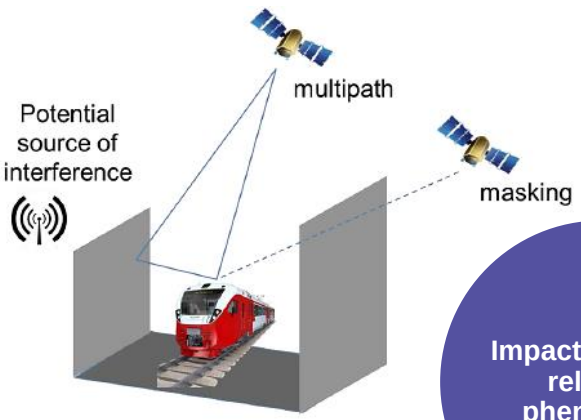
RAILWAY SCENARIOS SELECTION: MAIN TARGETS

Cost &Time reduction for on-field test campaigns of authorization for placing in service of vehicles and lines.

Approach for zero on-site testing by using real equipment installed in the laboratories

High degree of configurability of the simulators that allows to simulate configurations that are very difficult to reproduce on field (very rare fault events)

RAILWAY SCENARIOS SELECTION: CRITERIA



Different commercial typologies of lines

Different starting points

Relevancy from a GNSS point of view

Impact of GNSS-relevant phenomena

SCENARIOS SELECTION

- Train running in Full Supervision /On Sight/Limited Supervision mode through a low-density line with single track under a defined environmental conditions
- Train running in Full Supervision mode through high density commuter line with double track and directionally signaled under a defined environmental conditions
- Train running in Full Supervision mode through high speed line with double track and directionally signaled under a defined environmental conditions
- Start of Mission starting from a known / unknown / invalid position in the ETCS OBU

PERFORMANCE REQUIREMENTS

- Definition of proper requirements for the VBR in terms of positioning accuracy, availability and integrity (KPIs); requirements are divided based on ERTMS train conditions (Staff Responsible, Start of Mission, Movement Authority)
- Suitable THR definitions and evaluations with reference to on-board, trackside and transmission subsystems
  - THR shall be equally apportioned between
    - THR_ONBOARD
    - THR_TRACKSIDE
    - THR_TRANSMISSION

TEST CASES: INTRODUCTION

- The selected scenarios collect a high-level description of the ERTMS/ETCS and GNSS functionality together with relevant operational information
- The combination of both ERTMS/ETCS and GNSS functional and the operational aspects is necessary to evaluate properly the outcome of every Scenario
- A distinction between Test Cases for ERTMS/ETCS and for GNSS is necessary to cover all possible implementations of functionalities and conditions:
  - Collection of Test cases for ERTMS/ETCS: covering VB cases of study in the ERTMS field
  - Collection of Test cases for GNSS: covering GNSS phenomenon cases in the railway field

TEST CASES: CATEGORIES

ERTMS

- The collection of ERTMS Test Cases are intended to cover the VB cases by focusing on the verification of ERTMS/VBR functionalities
  - ERTMS cases considered for a train running in FS/OS/LS mode with linking information stored onboard (including VBs):
    - Single VB Group detection
    - Multiple VB Group detection
    - Cross-talk analysis

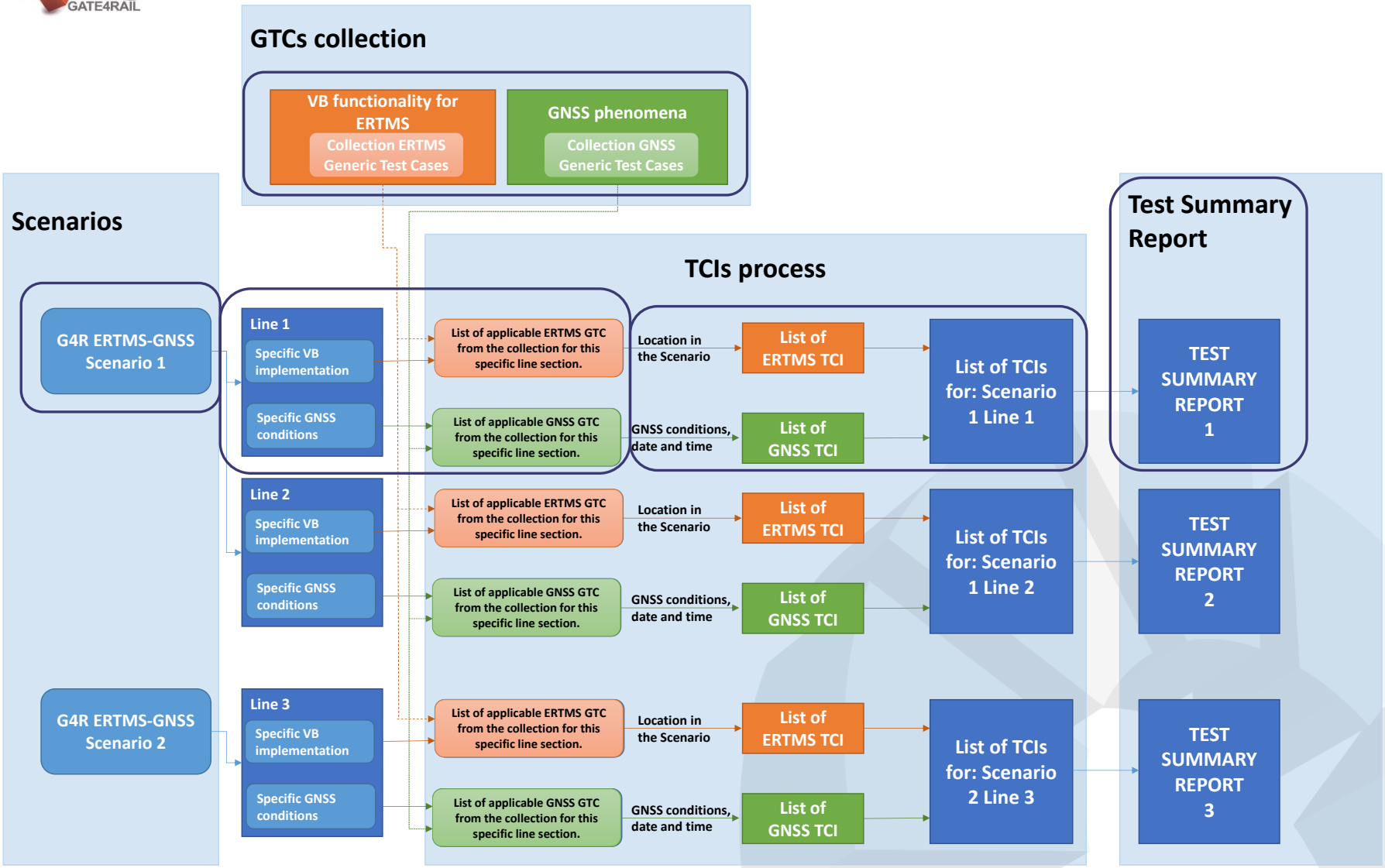
GNSS

- The collection of GNSS Test Cases considers the different GNSS conditions in terms of SIS reception due to the environment or global/local faults
  - GNSS railway operational environments considered for Hazardous and System Fault situations:
    - Open Sky Railway Operational Environment
    - Restricted Railway Operational Environment
    - Urban Railway Operational Environment

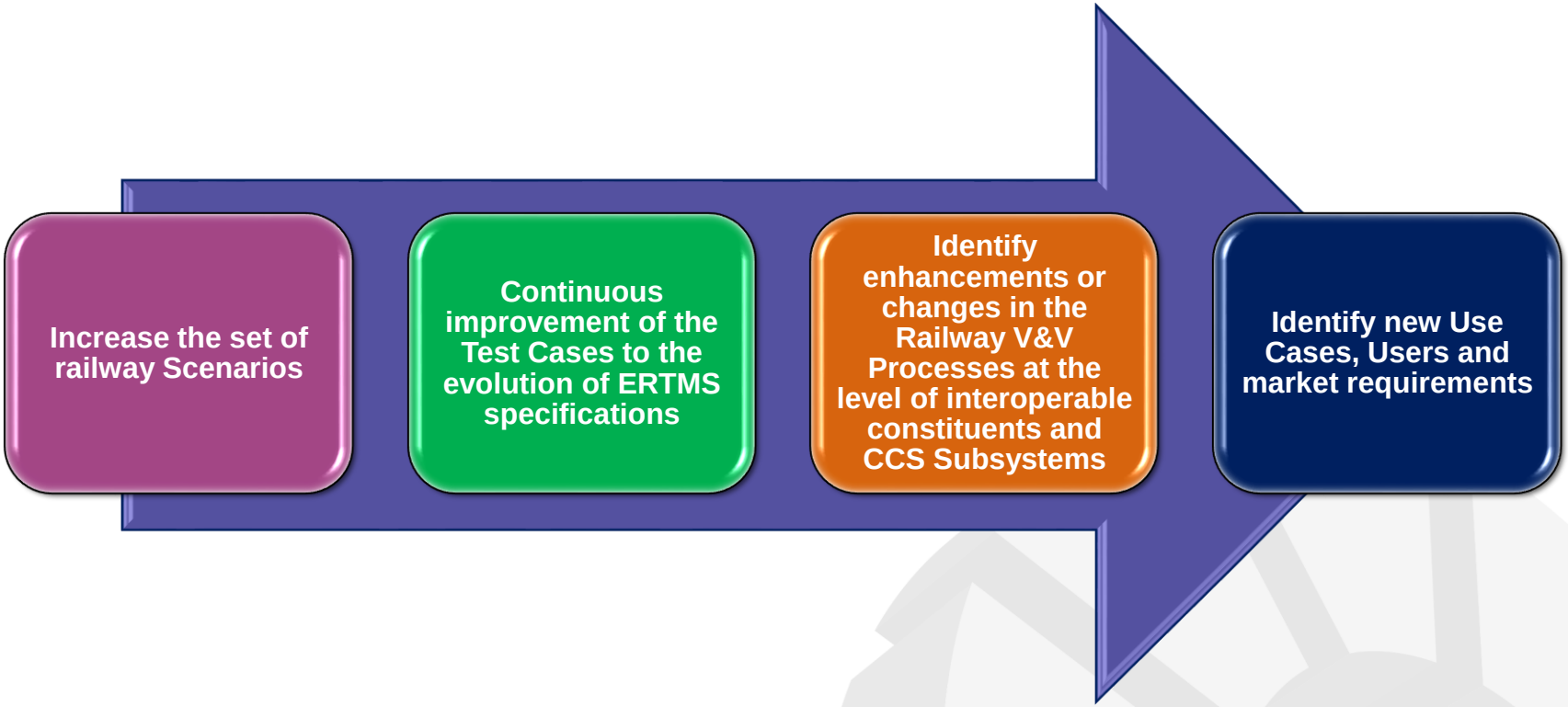
TEST CASES: PROCEDURE

- The Generic Test Cases (GTC) are a collection of test cases focused on covering possible functionalities/conditions in the ERTMS/ETCS and GNSS fields.
- The Test Cases Instantiation (TCI) are the test cases directly applicable in the Scenario, to test specific functionalities/conditions at an exact location in the line for ERTMS/ETCS and GNSS.
- The link between the GTC and the Scenarios is performed by the Test Case Instantiation (TCI) when, for a specific railway line implementation, characteristics and conditions, it is selected from the collection of GTC:
  - The specific ERTMS GTC applicable in the Scenario according to the VB functionality implemented in the line.
  - The GNSS GTC applicable in the Scenario according to GNSS effects and conditions of the line.

EVALUATION OF THE SCENARIOS



EVOLUTION - FUTURE WORK



QUESTIONS