# Safe4RAIL

IEC 61375-2-6 T2G

IEC 61375-2-6 **On-Board to Ground Communication** is a new standard (developed during the last two years) for the communication between the on-board subsystems and the ground subsystems. Called also Train-to-Ground (T2G) interface.

Specifies how to:
- Exchange commands & data between TCMS/OMTS applications and the applications installed on ground
- Do all the communication in a secure way (access authorization, data encryption)
- Select a wireless link on the basis of QoS required
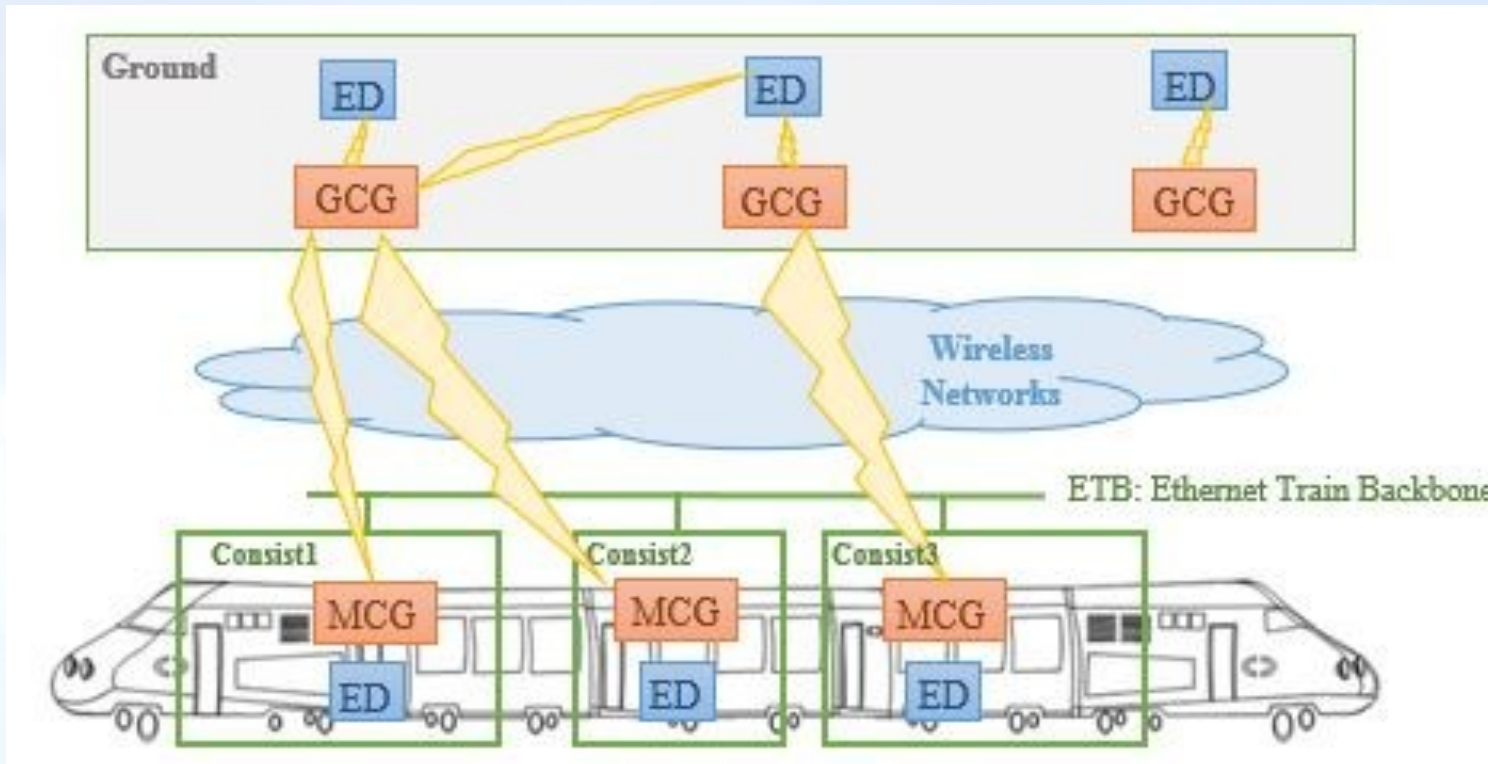
MCG
Mobile Communication Gateway is the train side system that provides communication to the ground.

GCG
Ground Communication Gateway allows connection with multiple consists and trains from ground side.
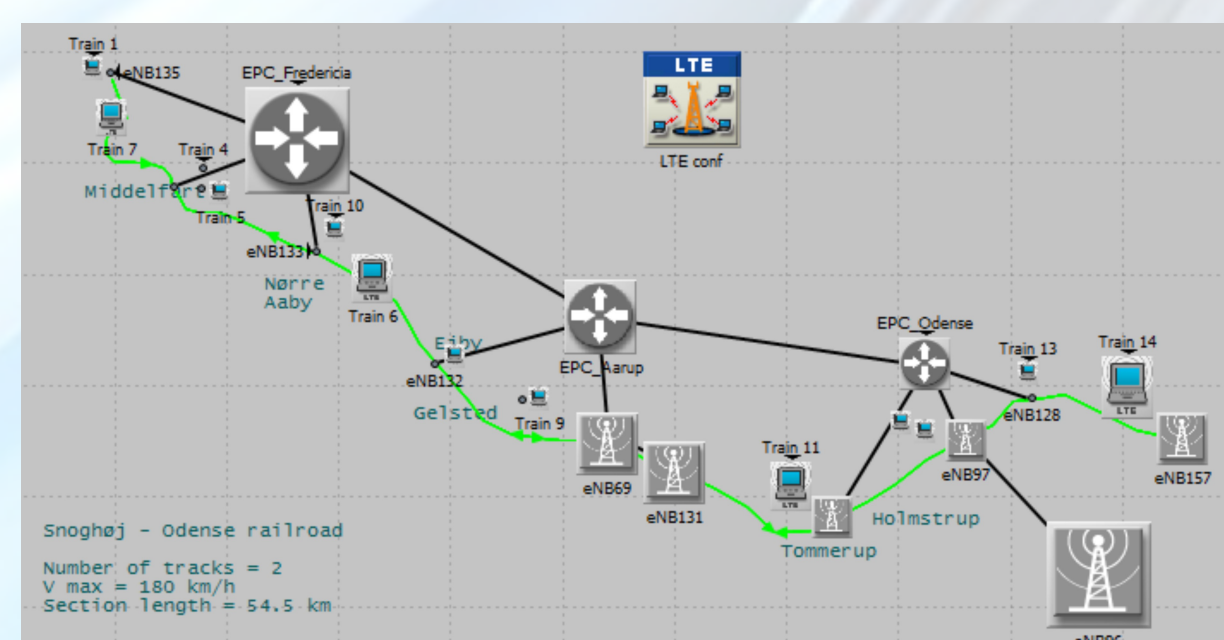
ED
End devices utilizing on-board to ground communication.

LTE Access Network Simulator

Pure Simulation:
The network simulator used for the test environment of the train to ground is the **Riverbed Modeler**.


Co-simulation platform:
The co-simulation platform has been built in order to assess an end-to-end T2G communication that uses data generated by an **LTE emulator (eNodeB + EPC)** and transmitted through a **simulated Backhaul Network** in the **Riverbed Modeler discrete-event network simulator**.

Wi-Fi Access Network Simulator

PC based simulator used for monitoring and managing the latency, jitter, throughput, message errors and link failure of the communication of the network.
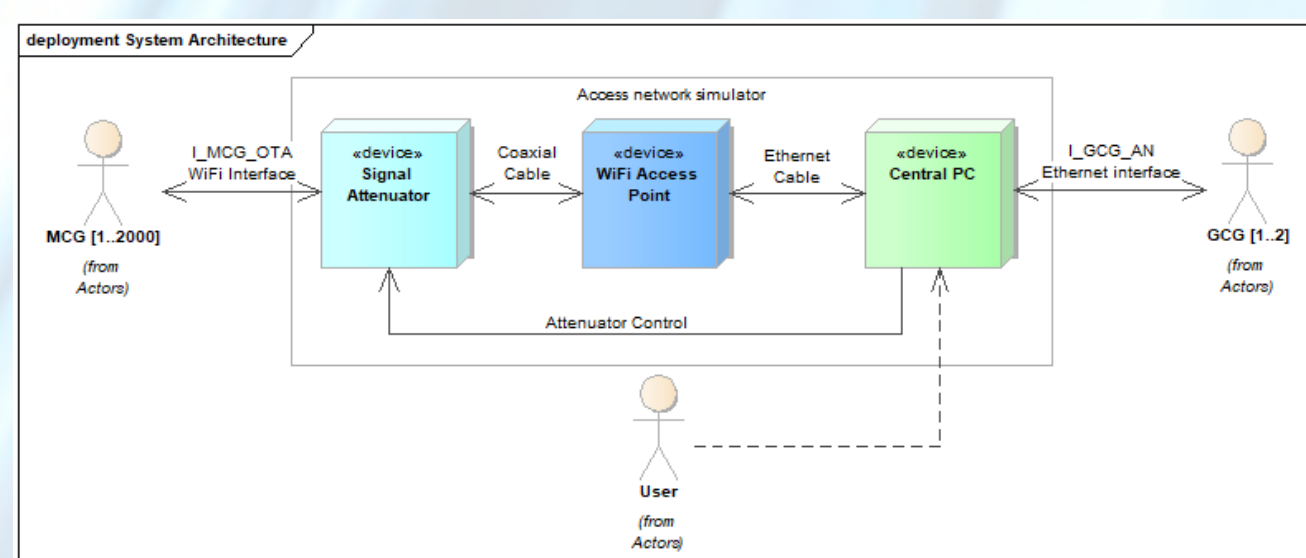
Test Environment for Train-to-Ground Communication IEC 61375-2-6

Test Environment for T2G

Safe4Rail WP3

In the tasks of Safe4Rail Work Package 3, the Test Environment for T2G Communication shall be designed and the proof-of-concept implemented.

Requirements:
- Validation of TCMS T2G interface implementation
- HIL (hardware-in-the-loop) testing of a MCG (being developed in the partner CONNECTA EU project)
- Simulation model of a wireless networks (Wi-Fi, LTE) for testing the influence of various aspects of the network link on T2G interface

TE Components

The Test Environment components allow building a modularized system for performing automated or semi-automated tests of the T2G interface implementation — for example the real MCG.

LTE Access Network Simulator
- T2G link model based on LTE

Wi-Fi Access Network Simulator
- T2G link model based on Wi-Fi

GCG Simulator
- Implements on-ground services of the T2G interface
- Acts as a remote communication partner for a MCG being tested
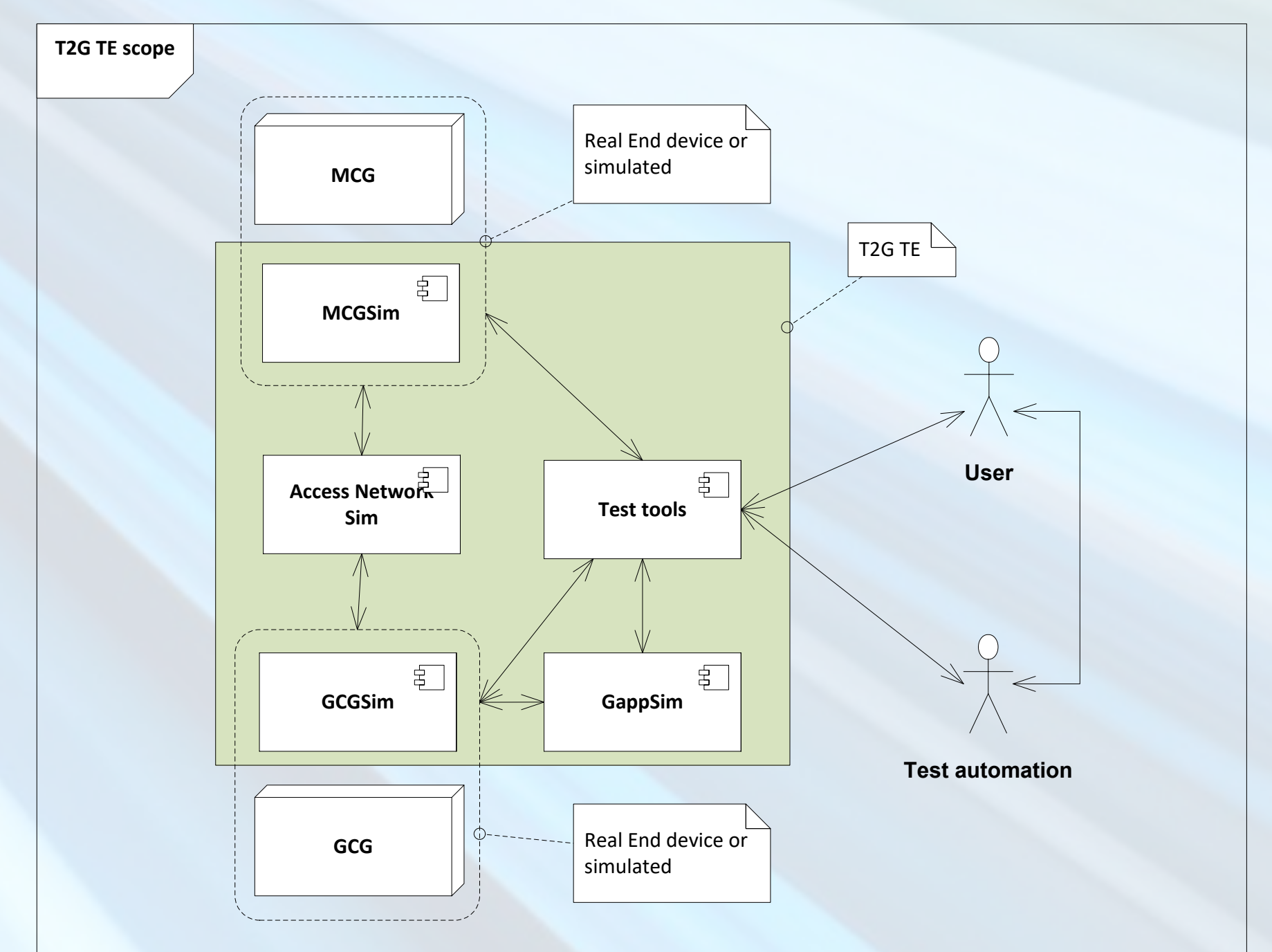
MCG Simulator
- Implements on-board services of the T2G interface
- Acts as a remote communication partner for a GCG being tested

GAppSim
- Simulates ground end device issuing commands to GCG

Test Tools
- Allow commanding and monitoring of the TE for tests execution

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