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# Co-simulation Platform for Train-to-Ground communications

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## Introduction

The project SAFE4RAIL<sup>1</sup> (SAFE architecture for Robust distributed Application Integration in roLling stock) from the Shift2Rail Joint Undertaking will provide a co-simulation platform based on hardware/software co-simulation. The platform will be used for Train-to-Ground (T2G) test environments in the context of the validation of the new wireless Train Control Management System (TCMS) transmission over LTE technologies in order to evaluate performances with realistic services and under various railway traffic conditions.

## Architecture and Platform

The test environment (shown in Figure 1) for co-simulation combines the use of a discrete-event network simulator (Riverbed Modeler) and a LTE emulator (OpenAirInterface). We evaluate railway services running on a real mobile device (to mimic the MCG equipment). LTE communication is emulated under realistic conditions between the Mobile Communication Gateway (MCG) equipment and the LTE eNodeB/EPC. The backhaul network that interconnects LTE packet gateway to the Ground Communication Gateway (GCG) of the TCMS, is implemented under the simulated environment. Various network parameters will be evaluated regarding to their impacts on the TCMS performance, e.g., the data rate, the signal coverage, and error rate. Results from the co-simulation reflect measurements from real networks.

## Conclusions

We focus on presenting the testing framework as a system-level co-simulation for components of a Train Control Management System (TCMS).

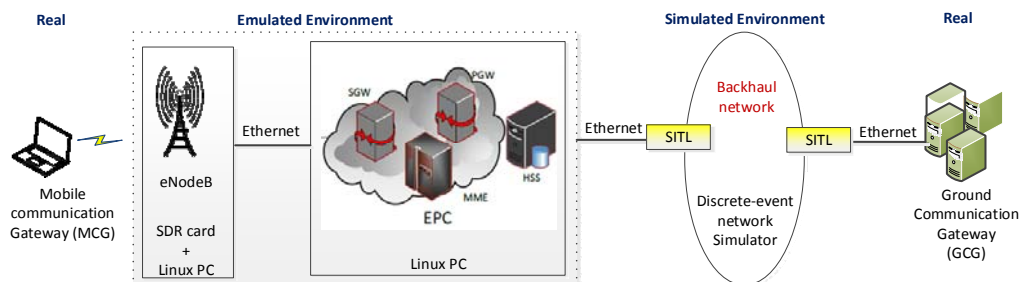


Figure 1 Co-simulation platform for T2G service

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