PATROL

POSITION AUTHENTICATED TACHOGRAPH FOR OSNMA LAUNCH

PATROL (Position Authenticated Tachograph foR OSNMA Launch) is the European GNSS Agency's procurement for the development of the first external GNSS facility for smart tachographs, with Galileo Open Service Authentication (OS-NMA). Key objectives include the development of:

- A User Terminal (UT), the external GNSS facility with advanced GNSS protection techniques
- A Validation Platform (VP) to test GNSS attacks and disrupted environments

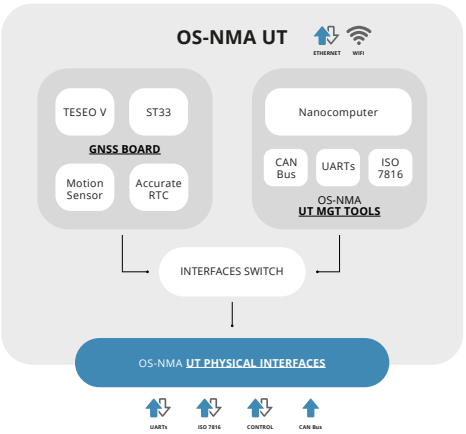
GALILEO OS-NMA

The User Terminal benefits from the use of Galileo and Galileo Authentication. The Galileo Open Service (OS) will soon provide a Navigation Message Authentication feature (OS-NMA), allowing users to verify that the navigation data received from the satellites is genuine, and therefore contributing to increase the security of satellite navigation applications. OS-NMA targets the protection of the navigation messages and additionally, due to the nature of unpredictable data, it offers the opportunity to design techniques for detecting attacks also at signal level (e.g. detection of SCER[1] attacks).

THE PATROL USER TERMINAL

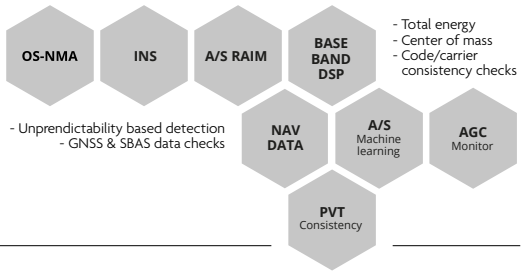
The User Terminal (UT) is a close-to-market prototype, compliant with the new tachographs regulation[2] entering into force on the 15th of June 2019. It provides trusted position and time using satellite navigation systems, acting as an External GNSS Facility (EGF) for smart tachographs with the following additions:

- A set of debug interfaces, to log various information and control the board
- An external interface to in-vehicle sensors
- A Central Authentication Management software
- An accurate Real Time Clock that provides a backup time source when GNSS is not available



The PATROL User Terminal:

- Fully supports Galileo OS-NMA
- Interfaces with smart tachographs to provide a trusted PVT
- Implements effective Spoofing Detection and Mitigation techniques
- Generates logs to allow the performance analysis



Implemented GNSS attack detection and mitigation techniques.

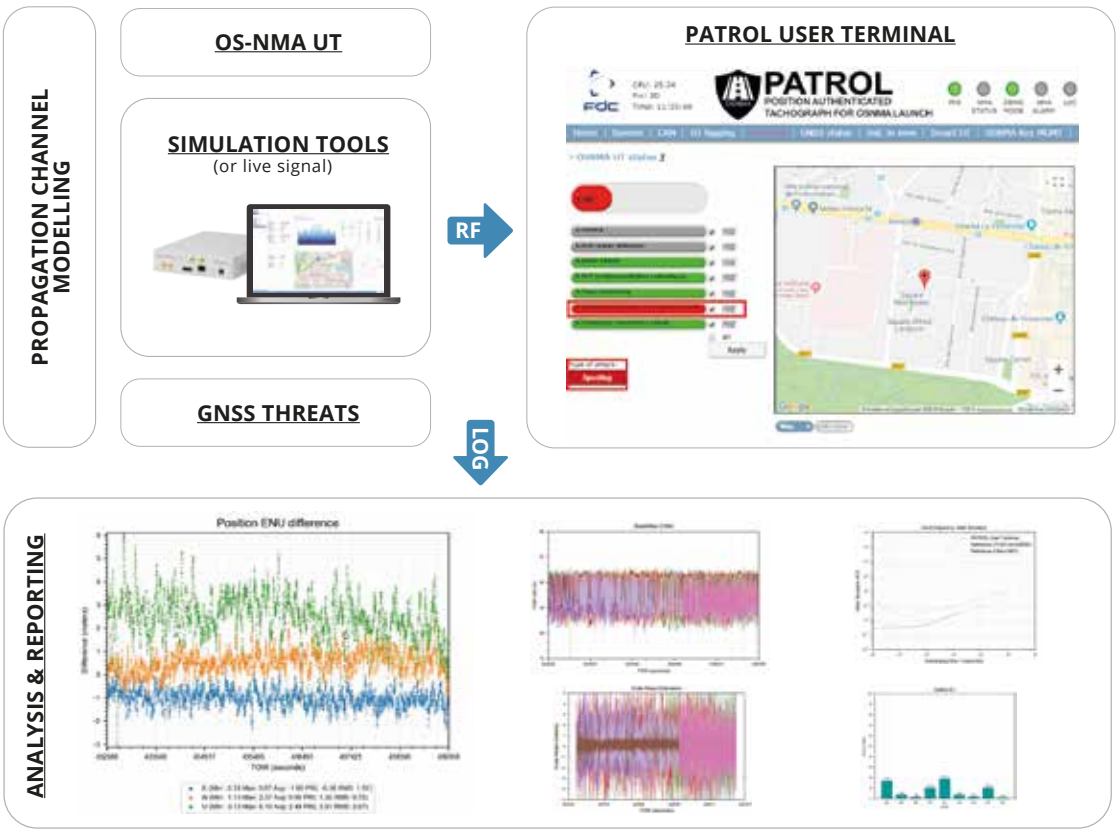
The User Terminal includes a dual-frequency L1 and L5 Galileo and GNSS receiver, a module for the use of Galileo OS-NMA, sensor fusion capabilities, a Centralized Authentication Management (CAM) software, tamper detection technologies and advanced GNSS spoofing mitigation techniques. The User Terminal features are complemented with a set of tools able to emulate a Smart Tachograph, provide CANBUS interface, generate synthetic CAN data for simulation purposes and interface to the GNSS Board for configuration and loading of the OS-NMA keys.

The PATROL (Position Authenticated Tachograph foR OSNMA Launch) project is funded by the European GNSS Agency through the Fundamental Elements programme, under procurement No GSA/OP/23/16 "Development, supply and testing of a Galileo open service authentication user terminal (OS-NMA) for the GSA".

European Global Navigation Satellite Systems Agency

Fundamental Elements

GALILEO



THE VALIDATION PLATFORM

The Validation Platform (VP) allows the end-to-end testing of the user terminal, supporting simulation of GNSS signals and advanced spoofing attacks, generation of OS-NMA data, modelling of user environments. The VP enables both simulated and real-field environments and provides automated tools for the generation of test results. It is composed by the following main elements:

Threat Simulator	Spirent SimSAFE™ to simulate GNSS multi-frequency spoofing attacks in simulated (sub-nano-second synchronization) and Live environment (tens nanosecond synchronization).
GNSS Simulator	Spirent SimGEN® and GSS9000 series Multi-GNSS simulator.
Advanced Threat Simulator	Qascom QA707 SDR Multi-GNSS Threat simulator to simulate feared events, interferences, simple (e.g. meaconing) and advanced spoofing attacks (e.g. SCER).
OS-NMA data generator	Qascom OS-NMA-SIM (and support for AALECS[3] PTB software) for the generation of OS-NMA data for testing, including interfaces for SimGEN® and QA707.
OS-NMA analyzer	Qascom OS-NMA analyzer generating reference OS-NMA receiver results and logs.
Narrow band channel modelling	A narrow-band channel model software (based on LMS[4]) including interfaces for SimGEN® and QA707.
Analysis and reporting tools	Software tools for measuring the Key performance indicators in lower case and the generation of plots and test reports.

TEAM AND CONTACTS

For additional information visit **http://www.patrol-osnma.eu**

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[1] Fernandez-Hernandez, Ignacio, Seco-Granados, Gonzalo. (2016). Galileo NMA Signal Unpredictability and Anti-Replay Protection.
[2] Commission Implementing Regulation (EU) 2018/502 of 28 February 2018
[3] Tool developed under AALECS (Authentic and Accurate Location Experimentation for the Commercial Service) project founded by the European Commission (http://www.galileo-csdemo.eu)
[4] Recommendation ITU-R P.681-10 (12/2017) Propagation data required for the design of Earth-space land mobile telecommunication systems