EGNOS and GALILEO for ITS and ROAD TRANSPORT

High Flexibility, Low Investment

GALILEO EGNOS
NAVIGATION MADE IN EUROPE

European
Global Navigation
Satellite Systems
Agency



With total worldwide market revenue for road GNSS receivers and services estimated to reach EUR 78 billion in 2023, the future of EGNOS and GALILEO-related road applications looks brighter than ever.

European GNSS road applications today

Advances in satellite-based positioning are contributing to the development of better transport services and new applications for safe transport and smart mobility. With its flexibility, fast growing capability, low infrastructure costs and long-term sustainable use, GNSS is an important asset in the design of new Intelligent Transport System (ITS) infrastructure.

Smart mobility applications improve the efficiency, effectiveness and comfort of road transport through:

- **Navigation**, the most widespread application, provides turn-by-turn information to drivers via portable navigation devices (PNDs) and in-vehicle systems (IVS). Galileo will deliver signal authentication capable of improving the robustness of the positioning against spoofing attempts. Thanks to a **wider and stronger signal compared to GPS** Galileo provides better multipath mitigation and easier penetration through tree canopies – especially important both in urban and rural areas.
- **Fleet management** on-board units (OBUs) transmit GNSS positioning information through telematics to support transport operators in monitoring the efficiency of logistic activities.
- **Road traffic monitoring** services collect floating car location data from vehicles through PNDs, IVS and mobile devices to be processed and distributed to users and other interested parties.

Safety-critical applications leverage precise, reliable and secure positioning in situations posing potential harm to humans or damage to a system/environment:

- **Advanced Driver Assistance Systems** (ADAS) support the driver during the driving process and act as a first stepping stone towards **autonomous vehicles**. Galileo, in combination with GPS, guarantees high precision performance.
- In **cooperative ITS** and **connected vehicles**, GNSS positioning is a key element for providing situational awareness through vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications, enhancing the safety and comfort of the driver. Thanks to **reduced time to first fix**, it is possible to spot the location of a vehicle just starting a trip faster than GPS-only solutions.
- **Dangerous goods** can be tracked by transmitting GNSS-based positioning data, along with other information about the status of the cargo.

Liability- and payment-critical applications can have significant legal or economic consequences depending on positioning data:

- For **Road User Charging (RUC)**, GNSS-based solutions are designed to charge motorists for the actual distance travelled, without barriers or gantries, and provide interoperability between national cross-border schemes.
- For **Pay-As-You-Drive (PAYD)**, insurance telematics rely on GNSS data to increase the fairness of motor insurance for both insurers and subscribers.

Regulated applications apply the transport policies introduced by national and international legislation:

- GNSS-enabled IVS are used in the pan-European **eCall system**, which accelerates emergency assistance to drivers and passengers by sending an emergency call to 112 and also providing positioning information in the unlucky event of accident.
- **Smart tachographs** leverage GNSS positioning to support road enforcers, recording the position of a given vehicle at different points during the working day.

European GNSS Supporting Autonomous Driving

Autonomous vehicles can take over activities traditionally performed by the driver, thanks to their ability to sense the environment, navigate and communicate with other vehicles and road infrastructure, when combined with connected vehicle solutions. Widespread adoption of autonomous driving can reduce traffic accidents, reduce fuel consumption and improve traffic flow, as well as improve driver comfort.

Autonomous vehicles are enabled by the combination of different technologies and sensors, allowing the IVS to identify the optimal path of action. European GNSS plays a key role by providing relevant data for integrated navigation, such as precise and reliable vehicle location and speed.

The preferred solution for electronic toll collection

Satellite-based technologies such as EGNOS and Galileo enable quick implementation of tolling schemes for large road networks without the need for costly roadside infrastructure, together with a broad range of new applications.

Thanks to its flexibility, GNSS-based tolling is being increasingly adopted in national schemes. Users can be charged based on different criteria (type of road, time, distance, vehicle type, level of emissions), all of which are easily modifiable over space and time. Other benefits of GNSS in complex new networks include low transaction costs, minimal environmental impact and additional revenues from value added services.

EUROPEAN GNSS research & development

TransSec – intelligent road transport security system

HORIZON 2020

http://www.transsec.eu/

Autonomous Emergency Maneuvering and Movement Monitoring for Road Transport Security

The TransSec project aims to develop a solution targeting the recent rise in vehicle-based terror attacks across Europe, which often use heavy trucks to attack pedestrians. It aims to develop autonomous systems to detect and prevent such incidents from occurring.

The project implements an autonomous system into vehicles in order to perform emergency manoeuvring procedures to bring a vehicle to a safe halt in the event of a potential crash being detected. Vehicle movement will be monitored closely, especially during transport of dangerous goods. An alarm/eCall system will also be implemented by using a comprehensive situational analysis generated by a data fusion module that combines and processes vehicle monitoring data.

Secure and precise vehicle positioning is critical in TransSec. This includes both on-road (lane) and off-road positioning and navigational systems. In addition, the solution includes a highly-secure network of communication systems for V2V, V2I and V2P communications for critical information exchange.

PRoPART – satellite navigation for automated heavy commercial vehicles

HORIZON 2020

http://propart-project.eu

Precise and Robust Positioning for Automated Road Transports

The PRoPART system is a robust and accurate combined positioning solution based on the distinguishing features of Galileo signals combined with data from in-vehicle sensors. The positioning solution fulfils the requirements of a collaborative automated vehicle function, combining satellite signals with information from a distributed set of roadside sensors. Once this information is fused within the perception layer of the system, the environment model will be confident enough to plan and execute a safe and fully automated lane change for a heavy commercial vehicle.

The PRoPART positioning solution is supported by a low cost Ultra-Wideband (UWB) solution for ranging and baseline estimation, as well as base stations for communication using V2X (ETSI ITS-G5).

ESCAPE – innovative positioning engine

Fundamental Elements

www.gnss-escape.eu

European Safety Critical Applications Positioning Engine

ESCAPE is developing an innovative positioning engine that exploits the newly available capabilities of Galileo. The project is developing the first multi-constellation Galileo chipset receiver offering multi-frequency capability adapted to road applications and, in particular, to autonomous vehicles.

The ESCAPE positioning engine is built on five core features:

- A GNSS/Galileo multi-constellation, multi-frequency chipset for safety-critical road applications.
- Use of the precise point positioning (PPP) service.
- Hybridisation of cameras, maps, vehicle sensors and GNSS integrated into a tight coupling filter.
- Provision of an integrity layer to the technologies used.
- Authentication provided by Open Service Navigation Message Authentication (OS-NMA), an important Galileo differentiator enhancing the PVT robustness.

How does EGNOS work?

EGNOS, the European Geostationary Navigation Overlay Service, uses geostationary satellites and a network of ground stations to increase the accuracy of existing satellite positioning signals while providing a crucial 'integrity message' that informs users in the event of signal problems.

The EGNOS reference stations pick up signals from GPS satellites, which are processed in Mission Control Centres (MCC). The accuracy of the original signals is determined and confounding factors are corrected.

This data is then incorporated into EGNOS signals and sent to its three geostationary satellites. The satellites relay these signals back to users on the ground, providing greater positioning accuracy than would be achieved through GPS alone.

Galileo Initial Services

With the declaration of Initial Services in December 2016, Galileo - the European Global Satellite Navigation System (GNSS) - has moved from testing to the provision of live services. Users around the world can now be guided using the positioning, navigation and timing information provided by Galileo's global satellite constellation.

By working together with GPS, Galileo satellites provide better positioning and navigation for users, particularly in cities, where satellite signals can often be blocked by buildings. Plus, Galileo's excellent timing accuracy helps make the synchronisation of banking and financial transactions and telecommunication and energy distribution networks more resilient, allowing them to operate more efficiently.

Galileo's Search and Rescue service reduces the time it takes to detect emergency distress beacon signals from up to three hours to just ten minutes, potentially saving many more lives. The additional resiliency provided by Galileo is already helping to drive economic growth in Europe and beyond by enabling a range of new applications and services.

useGALILEO.eu

Mass-market devices containing a Galileo-enabled chipset, such as smartphones or vehicle navigation devices, can use Galileo signals for positioning, navigation and timing. The www.useGALILEO.eu tool helps you keep track of Galileo-enabled in-vehicle, portable, road tolling and fleet management systems, serving a variety of needs, as they become available.

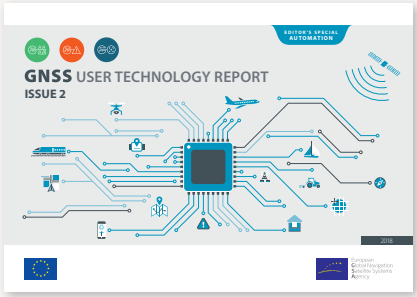
GSA: linking space to user needs

The GSA is the European Union Agency in charge of managing operations and service provision of Galileo and EGNOS, ensuring that European citizens get the most out of Europe's satellite navigation programmes in terms of innovation, competitiveness, economic growth, and benefit to users.

As Europe's link between space technology and user needs, GSA keeps users are at the centre of Galileo and EGNOS.

Download them now

GNSS User Technology Report, Issue 2



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Navigation solutions
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