GNSS

IS THE SKY THE LIMIT?

With the recent launch of EGNOS, many consider GNSS road pricing to be the future of congestion mitigation in Europe. However, this technology needs to be put through its paces - which is exactly what the GINA Project aims to do.
SARA GUTIÉRREZ LANZA reports

Congestion is becoming an ever increasing issue in many European cities. A possible solution that does not require extensive investment in new road infrastructure is to introduce demand management via pay-as-you-drive Road Pricing, which could facilitate a change in the way roads are paid for.

Users could be charged based on the type of vehicle they drive, the roads they use as well as when and how much they use them. By applying appropriate tariffs, drivers could then be encouraged to travel at less busy times or on less congested roads or even by a different transport mode. This should, in turn, reduce congestion on the most popular roads and reduce the environmental impact of transport as well as raise revenue to maintain and improve road infrastructure.

Mapping the future

The Eurovignette Directive (1999/62/EC amended by 2006/38/EC) is an example of a move towards European-wide charging of heavy goods vehicles for the use of some road infrastructure. It encourages charging based on the duration of the use of the infrastructures and even the types of vehicles using it.

However, satellite based Road Pricing schemes, also referred to as GNSS (Global Navigation Satellite System) based schemes, have a number of technical, economical and social hurdles that have proved difficult to overcome. Firstly, no one has ever attempted a national all-road all-vehicle GNSS based Road Pricing system before, so the technical and economical feasibility of such a system is not yet proven.

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Furthermore, the benefits of a GNSS based Road Pricing system relating to reduction in congestion and pollution are not yet fully understood on a national level. This can make it difficult to gain public support and generate general acceptance. There is often an overwhelming public perception that Road Pricing will be a way to further charge road users. Due to the limitations in accuracy and availability arising from GPS technology, especially in environments such as "urban canyons" (dense areas with tall buildings), it has been difficult to ensure that the probability of overcharging a user is sufficiently low. Issues with data integrity and security, as well as user privacy, also need addressing.

GNSS based Road Pricing is still considered to be in its infancy and there is a lack of standards for this application. Interoperability of Road Pricing systems is likely to become key in the future. Any solution adopted now should be in line with, and based on, the EC's European Electronic Toll Service (EETS) to enable interoperability with future tolling systems across Europe.

The GINA project

GINA is a GSA/EC co-funded FP7 project and one of the two contracts awarded by the European GNSS Supervisory Authority in Galileo first call for proposals in Framework Programme 7, topic Innovative GNSS road applications, with a duration of 24 months. GINA addresses the adoption of EGNOS/Galileo in the road sector considering its technical feasibility on a large scale, economic viability and positive impacts in aspects such as congestion and pollution, as a general scope.

The project pursues these objectives leveraging on four elements:

1. The analysis of the context (legal, regulatory, interoperability, standardisation) affecting a nationwide GNSS-based road pricing solution (and Value Added Services running on same platforms)
2. A thorough market and business potential analysis for the applications (road pricing and Value Added Services) to base a commercially feasible large scale adoption of the solution.
3. The implementation of a large-scale demonstrator of GNSS-based Road Pricing at national level and Value Added Services (PAYD for car leasing companies and traffic information generation, modelling and provision). The demonstrator will be fully based on the planned ABvM system being defined by the Dutch Government (as far as information is available and public) (being the Netherlands the first and unique nation deploying a nationwide road pricing scheme based on GNSS only).

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4. A solid dissemination strategy which contributes to the GNSS adoption for road pricing and Value Added Services and makes awareness of the benefits of the use of EGNOS and Galileo to the different stakeholders.

Being the first example of a nationwide GNSS based Road Pricing scheme, GINA proposes to use the current requirements of the Dutch model as a benchmark for setting up its large-scale trial. Furthermore, GINA can count on the active contribution of the consortium partners representing end users (ARVAL, a car leasing company and AENOR, a Portuguese road operator) to ensure realistic end user requirements and operation.

Following an in-depth and market-oriented analysis of the national context (in the Netherlands and using the future ABvM system as a reference model), the project will see the implementation of a nation-wide GNSS-based road pricing and Value Added Services demonstration in the Netherlands. More precisely, starting in spring 2010 and lasting for 6 months, 100 volunteer cars equipped with a sophisticated OBU will circulate on the Dutch network and have their travel data recorded.

Put to the test

GINA will put EGNOS technology through an end-to-end trial to ensure it is technically ready for deployment when the first all-road, all-vehicle system goes live. This demonstration will also test the technology's performance and cost effectiveness compared with standard GPS.

It is recognised that the GPS signal does not always meet the accuracy, integrity, availability, and continuity requirements critical to avoiding overcharging the driver or loss of revenue to the road operator. In this context, GINA's use of position integrity to prevent large position errors going undetected is expected to improve the accuracy of charge-calculation in Road Pricing systems.

The overall objective of the trials is to demonstrate how, and especially, with what performance, GNSS technology based on the European GNSS infrastructure can support the implementation of a Road Charging scheme as the one identified in the Netherlands.

The trials will address two levels:

1. Exhaustive performance analysis trials, where particular conclusions regarding the performance of EGNOS/Galileo (as compared with very accurate references) in terms of GNSS performance, distance measurement, GEO objects identification, charging performance, versus other systems (such as GPS or alternative technologies) will be obtained. Special attention will be devoted to the end-to-end charging performances in comparison with the existing requirements of the ABvM system (mainly charging accuracy and overcharging probability).

2. An end-to-end performance analysis, where an overall assessment of the capabilities of the system from different perspectives and an exhaustive analysis for variables where a reference system is not needed will be carried out.

A step closer

Today, although different tolling technologies already exist, an infrastructure-light system is undoubtedly ideally suited for large-scale deployment. However, much remains to be done to address the technical, commercial and social issues. GINA, through its work on the use of EGNOS to improve position integrity and guarantee acceptable level of overcharging in particular, is looking to address those issues and offer a solution. If successful, European GNSS could help to resolve many of the technical issues that up until now have been associated with GNSS based Road Pricing schemes.

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With the future adoption of the Eurovignette Directive, one can hope that the most innovative, flexible and cost-effective solution will be adopted. If so, the proposed GINA technology may become a future platform of choice for GNSS based Road Pricing.

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Project Information

GNSS for INnovative road Applications- the GINA project

The GINA Project is coordinated by the Spanish company GMV and carried out by a consortium of 12 partners, giving coverage to the whole value chain in Road User Charging and Value Added Services for the road, including GNSS experts, road pricing experts, road applications standardization experts, platforms representing the road user community, research and development centres, specialised consultancies and end users.

The organizations composing the consortium are:
- GMV, as project coordinator (ES)
- European Union Road Federation (BE)
- Ian Catling Consultancy (UK)
- Bain & Company (I)
- TRL Limited (UK)
- Nick Williams (as Denarius Professional) (UK)
- Mapflow (IR)
- Skysoft (PT)
- Navteq (NL)
- CENIT (ES)
- ARVAL (NL)
- AENOR (PT)