GINA

GNSS for INnovative road Applications

05/03/2010
Galileo Application Days, Brussels 2010
CONTENTS

1. Introduction
2. The GINA project
3. The use of integrity in road pricing
4. The project trials
5. GINA business approach
6. Conclusions
THE GINA PROJECT

- **CONTEXT**: Challenges in road sector. GINA proposes a step beyond in the adoption of EGNOS/GALILEO for RUC&VAS

- GINA: project co-funded by GSA/EC, FP7 GALILEO Call 1, coordinated by GMV. Topic GALILEO-2007-1.1-01 Innovative GNSS-based Road Applications

- Not another proof of concept: large scale demonstrator of a GNSS-based RUC & VAS scheme using the Dutch ABvM system and requirements defined by real end users as a reference

- GINA main **OBJECTIVES**:
  
  ✓ Analysis of context of a nationwide GNSS-based RUC (and VAS) with especial emphasis on market and business potential
  
  ✓ **Trials**: Dutch ABvM as a reference
  
  ✓ A solid dissemination strategy
THE USE OF GNSS FOR ROAD USER CHARGING

– GINA capitalizes on the use of **POSITION INTEGRITY** as a mechanism to compensate for large position errors and reduce incidence of overcharging.

– Basic **use of GNSS** to **identify** whether (and when) the **vehicle is within the geo-object**. Potential use to measure travelled distance:
  - ✓ Distance measurement error < threshold
  - ✓ False identification of geo-objects

– Vehicle is charged only when inside the geo-object: 1 or more PLs totally inside the geo-object => **geo-fencing based on PLs** (not on calculated position).
THE TRIALS

- Large scale demonstrator at national scale (in Netherlands) for RUC and VAS.

- **OBJECTIVE**: Demonstrate how and with what performance GNSS technology based on European GNSS infrastructure can support the implementation of a RUC scheme and justify its added value as compared with GPS-only (performance and cost improvement)

- 2 trials levels:

<table>
<thead>
<tr>
<th>Type of trials</th>
<th>Number of vehicles</th>
<th>Duration</th>
<th>Vehicle &amp; Drivers</th>
<th>VAS</th>
<th>Reference System needed</th>
<th>CAN BUS connection</th>
<th>Evaluation</th>
<th>Scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td>End to end</td>
<td>100</td>
<td>6 months</td>
<td>Volunteers (ARVAL customers)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Application level</td>
<td>Uncontrolled, not fixed</td>
</tr>
<tr>
<td>Exhaustive performance</td>
<td>2-3</td>
<td>4 weeks</td>
<td>Controlled by project</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>GNSS performance</td>
<td>Defined by the project</td>
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**THE EXHAUSTIVE TRIALS (I)**

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<tr>
<th>No. Vehicles</th>
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<td>4 weeks</td>
<td>Controlled by project</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>GNSS performance</td>
<td>Routes defined by project</td>
</tr>
</tbody>
</table>

**Objectives:**

1. **GNSS performance** evaluation: GNSS accuracy performance, GNSS integrity performance in terms of integrity risk, GNSS integrity performance in terms of size and availability of PLs.

2. **Distance measurement performance**: accuracy of distance measurements

3. **Geo-objects identification performance**: distance measurement once geo-object identified, wrong identification / misidentification of geo-objects

4. **Charging performance**: overall distance measurement accuracy, overall charging measurement accuracy, overcharging performance

4 configurations GPS/ EGNOS, CANBUS (yes / no)

**2 vehicles** (Navteq, GMV) equipped with I-20 OBUs + high performance reference equipment
THE EXHAUSTIVE TRIALS (II)

- **3 test routes** defined to challenge GNSS accuracy and/or availability and representative of conditions likely to be faced by drivers in NL
  - Route 1 – Motorway, urban
  - Route 2 – Urban
  - Route 3 – Urban, motorway

- Each route repeated >20 times => gathering sufficient data for statistically significant results
- **Geo-objects** defined for each route with challenging environments for GNSS
- **Post-processing** of data => increased flexibility in the analysis
- Vehicles I and II already equipped and performing calibration pre-trials in Netherlands. **Exhaustive trials already started (March 2010)**
THE END2END TRIALS (I)

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**Objectives**

1. **“Soft” analysis**: Overall assessment of capabilities of the system from different perspectives (including capability to generate invoices, evaluation of drivers reaction and feedback, provisioning of added-value services, effects of interferences in system performance etc.)

2. **Data analysis**: Exhaustive performance analysis for those variables with no need of a reference system (including estimation of overcharging performance, capability of getting repeatable results for same conditions etc.)

**100 vehicles** fitted with I-20 OBUs

- **Drivers**: ARVAL’s customers: volunteers driving as usual.
- **Periodic feedback** by means of anonymous questionnaires => soft & data analysis + relevant inputs for business and exploitation plan
THE END2END TRIALS (II)

- Automatic downloading of data recorded to Palview GMV’s platform, making data available for analysis
- No post-processing: geo-objects defined considering driving habits of drivers and programmed into OBUs

Where are we now?

Installation of I-20 in 100 vehicles currently on-going. Carried out by 3 technical services / garages in the Netherlands in close coordination with ARVAL and GMV. Running until September 2010

ADDITIONAL TRIAL IN PORTUGAL

AENOR (Portuguese highway operator). Summer 2010

Objective: to demonstrate how GINA and GNSS-based Road Pricing systems could be used for event based charging, such as motorway toll roads. Comparison of performance of GINA with existing DSRC-based Road tolling solutions. Use of GNSS for other VAS of interest for a highway
THE GINA BUSINESS APPROACH

Cars market (EU27)

Commercial Vehicles market (EU27)

RUC + VAS:

- Emergency Call
- PAYD services
- Fleet Management
- Freight/Transport Management
- Recovery after theft
- Traffic information
CONCLUSIONS

- **GINA**: a step beyond in introduction of EGNOS / GALILEO in RUC and VAS

- Not another proof-of-concept: **Large scale demonstrator**

- **Trials**:
  - Exhaustive trials: GNSS performance analysis
  - End2End trials: overall assessment from service perspective

- Great amount of data. Realistic scenario, realistic conditions and valuable feedback from drivers experimenting system in operational conditions

- Next step: definition of a **solid business and exploitation plan** based on preliminary model already proposed + interesting results of the large scale trial

- **GINA** will offer clear conclusions with respect to the added value of position integrity (EGNOS / GALILEO) for GNSS-based Road User Charging. Turning point towards adoption of GNSS in road.
Thank you!

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