GISCAD-OV

Galileo High Accuracy for Cadastral Surveying

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R. Capua
User Consultation Platform 2020
1 December 2020
Project objectives

• **Objective:** design, development and validation of a complete Service Chain for reduced cost **High Accuracy Services** for Cadastral Surveying and Infrastructural Monitoring applications through Galileo HAS services, PPP and PPP-RTK integration

• Main activities:
  • **Cadastral Surveying Requirements for High Accuracy GNSS:** all Value Chain actors involved (Augmentation SP, Software Companies, NMCAs, Professionals)
  • **Design and Development of an Augmentation System** for affordable and reduced service price High Accuracy Services for Cadastral Operations, with Integrity Monitoring
  • **Cadastral Surveying Pilot Projects in seven EU Countries** Validation of Galileo Commercial Services and PPP through Cadastral Surveying and comparison with existing High accuracy techniques
  • **Scientific and Cadastral Validation:** GNSS performances and NMCAs quality check
  • **Business Analysis** Involvement of the whole Value Chain for defining an affordable and cost effective Services for Surveyors
  • **Standardisation:** contribution to RTCM (SC-104, SC-134) and ISO 19152 LADM (LanD Administration Domain Model) WGs for Augmentation, Mapping standard messages and procedures development
Project Organisation

- Horizon 2020 Project
- Started on December 2019
- Project Duration: 36 months

- Project Members:
  - International Organisation of Surveyors
  - Local and PPP Service Providers
  - Service Providers
  - PPP and NRTK Software Company
  - NMCAs
  - Surveyors Service Providers
  - Receiver Manufacturers
  - Universities
  - RTCM and ISO Standardisation Chairmen
  - Advisory Board, including NMCAs

<table>
<thead>
<tr>
<th>Organization</th>
<th>Type</th>
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<td>GEOWEB SpA</td>
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Cadastral Surveying procedures

- Distances and Angles measurements
- GNSS, Total Stations, EDM hybridisation
- Hidden Points
- NMCAs Validation
- Average Surveying duration more than 2 hours
- Surveys/year in single EU Countries: 10000-1300000
- National Reference Framework and INSPIRE
Galileo Improved Services for Cadastral Augmentation Development On-field Validation

GISCAD-OV Architecture

GPS, GLONASS, ...

Galileo GRC

Global PPP Service Providers

IGS

Precise Ephemeris Clock EOP

Precise STEC ZTD

RTCM SSR

Raw Measurements

Local Augmentation Service Providers

GALILEO

GISCAD-OV Control Centre

Surveying Service Provider

Galileo E6 nav message (Precise Eph., Clock, sat biases)
## GISCAD-OV Service Levels

<table>
<thead>
<tr>
<th>Cadastral Operation</th>
<th>Accuracy Requirement (1 σ)</th>
<th>Integrity</th>
<th>Availability</th>
<th>Time for Convergence/TTFA</th>
</tr>
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<tbody>
<tr>
<td><strong>SL1</strong> Suburban or rural areas, cadastral map updates</td>
<td>30 cm</td>
<td>$2 \times 10^{-3}$/hour (1)</td>
<td>High (97%)</td>
<td>Less than 10 min</td>
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<tr>
<td><strong>SL2</strong> Detailed Cadastral Points, Buildings insertion, boundary determination</td>
<td>&lt;5 cm</td>
<td>$2 \times 10^{-3}$/hour</td>
<td>High (93%)</td>
<td>5-10 min</td>
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<tr>
<td><strong>SL3</strong> Detailed Cadastral Points, Buildings insertion, boundary determination</td>
<td>&lt;5 cm</td>
<td>$2 \times 10^{-3}$/hour</td>
<td>High (93%)</td>
<td>1-5 min</td>
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(1) Derived from the maximum acceptable number of lost surveys/year
Pilot Projects

- Czech Republic
- Estonia
- Croatia
- France
- Germany
- Italy
- Spain

5 surveys/Country (NMCAs rules applied)

Real On-Field Cadastral Surveying

Galileo Based Infrastructural Monitoring on a bridge
Expected Project Impacts

- **Service Providers:**
  - Reduced infrastructure and maintenance costs (<150 km sparse RS)
  - Communication burdens reduction through HAS
  - Service Levels Differentiation

- **Cadastral Professional users:**
  - Improved availability in urban areas
  - One-time terminal configuration
  - Reduced Service costs

- **Receivers manufacturers:**
  - Market uptake due to lower barrier to entry for High Accuracy Users
  - Cost production reduction due to economy of scale

- **NMCAs:**
  - Harmonized GNSS service levels on a wide area
  - Reduced time for cadastral acts approval
  - Increase in the number of processed acts per year
Timeschedule and Next Steps

• Current Status (2020):
  • User Requirements
  • Architecture Design

• Next steps (2021-2022):
  • Pilot Projects development
  • Standardisation activities for GISCAD-OV within:
    • RTCM SC-104 and SC-134
    • ISO 19152 LADM
  • Scientific and Cadastral Validation
  • Business Analysis
Open discussion topics

• **Low cost multiple frequency and multiconstellation GNSS receivers for Land Surveying**: current status, main limitations and advantages

• **Smartphone surveying**: dream or reality? Current status of Multiple Constellation, Dual frequency code/phase equipped smartphone, crowdsourcing and the possible use in Land Surveying applications

• **The future of Surveyors Professions**: how SLAM, crowdsourcing, high accuracy positioning democratization, low cost mapping and on-board data acquisition will change the profession of surveyors?
Thanks for your attention

https://giscad-ov.eu/