The Austrian Project HA-GAL
Praque, 15/11/2016
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I. Brimatech Services

II. HA-GAL Project
Brimatech is a market research and consulting company specialising in technology markets.

We talk to experts and we observe users. We investigate trends and factors impacting market success. We develop business models and strategic concepts. We transfer technologies to new markets. We connect players in a given industry and we make them more visible internationally.

Brimatech was founded in 2008 in Vienna.
BRIMATECH brings together markets and Technologies

- Space
- Aviation
- Transport
- Technology transfer
- Safety
- Nanotechnology
- Energy
BRIMATECH

Services

Market and industry studies
- Market environment, trends
- Competition
- Competence maps

Technology transfer
- Trendsetting technologies
- Market needs
- Networking

Stakeholder analyses and user integration
- Surveying of market participants
- User needs
- User acceptance

Consulting and Coaching
- Strategy coaching
- Start-up consulting
- Financing models
- Design of web tools

Business models & business development
- Market release strategies
- Value chains
- Cost/benefit analyses

Training and education
- High-tech marketing
- Business to business marketing
- Market research
Experiences with Positioning/Galileo

Numerous national, FP6, FP7, H2020 and ESA projects related to

- Surveying
- Reference Station Providers
- Road, Dangerous Goods Transport, ITS, Maritime, Rail
- LBS
- Aviation
- Catastrophe Management
- PRS
The Project

HA-GAL – The ‘High Accuracy GALileo-Commercial Service’: Opportunities and risks for GNSS-reference station operators

Project duration: 01.01.2015-30.09.2016

Partners:

Austrian Space Applications Programme (ASAP):
Situation

Galileo Commercial Service (CS)

- A service with costs
- Expected from 2017/2018 (?)
- Two core areas:
  - High-Accuracy Service (HA)
  - Authentication Service (AU)

High-Accuracy Service

- Promises a positioning accuracy at the 1dm level or better
- Based on global satellite orbit and clock corrections and utilizing the Precise Point Positioning (PPP) concept

→ Competing regional reference station operators
Objectives

Technical objectives

- Analysis of technical requirements, barriers and options of Galileo-CS HA-Services
- Verification of how GNSS-reference network services can make use of internally available dense GNSS observations data to allow its customers a more efficient, more accurate and more rapid positioning (as compare to the CS-Service)

Market study

- Definition of new services for GNSS reference network operators to cooperate with or to distinguish from the Galileo CS HA-Services
- Analysis of promising strategies
Questions

- What are the chances and risks Reference Network Providers will face in the light of the Galileo Commercial Service?
- Which strategies are they developing? In which timelines?
- How will they position themselves?
- Which surrounding conditions are they expecting?
- What are their wishes towards the Galileo Commercial Service, what are they expecting?
- Which support/input do they wish?
- Do they wish for more cooperation/networking, maybe even joint projects?
# Overview DGPS – PPP Services

<table>
<thead>
<tr>
<th>Generic term</th>
<th>GBAS</th>
<th>SBAS</th>
<th>„SBAS“ Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colloquial term</td>
<td>Network RTK / DGPS</td>
<td>„PPP“ Services</td>
<td>EGNOS (EU)</td>
</tr>
<tr>
<td>Example for provider / brand name</td>
<td>AXIO-NET / FarmRTK</td>
<td>John Deere StarFire</td>
<td>WAAS (US)</td>
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<tr>
<td>06-GPS / MoveRTK</td>
<td>Trimble Omnistar / CenterPoint RTX</td>
<td>-</td>
<td>-</td>
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<td>Trimble VRSnow</td>
<td>Veripos / TerraStar</td>
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<tr>
<td>Topcon TopNet</td>
<td>Fugro / SeaStar</td>
<td>Regional</td>
<td>-</td>
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<tr>
<td>SAPOS</td>
<td>Hemisphere / Atlas</td>
<td>-50 Reference stations</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td></td>
<td>Uni-directional Coms</td>
<td>Satellite Link</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Satellite Link</td>
<td>-</td>
</tr>
<tr>
<td>Set-up, Infrastructure, characteristics</td>
<td>Local area</td>
<td>Global</td>
<td>-</td>
</tr>
<tr>
<td>Reference stations 50km distance</td>
<td>Bi-directional Coms needed</td>
<td>~100 Reference Station worldwide</td>
<td>1-2 meters</td>
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<tr>
<td>Mobile phone or local radio broadcast</td>
<td>-</td>
<td>Uni-directional Coms</td>
<td>within seconds</td>
</tr>
<tr>
<td>-</td>
<td></td>
<td>Satellite Link</td>
<td>-</td>
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<tr>
<td>Performance characteristic</td>
<td>2 centimeter</td>
<td>5-30 centimeter</td>
<td>-</td>
</tr>
<tr>
<td>within seconds</td>
<td>Within 5 – 30 minutes</td>
<td>-</td>
<td>within seconds</td>
</tr>
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29 September 2015

**AXIS NET**

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GBAS – Ground Based Augmentation System
SBAS – Satellite Based Augmentation System
PPP – Precise Point Positioning
RTK = Real Time Kinematic
Stakeholders in the project

Workshop
- Austrian Federal Railways
- Linz AG
- Energie AG
- EPOSA
- EVN
- TU Vienna
- Federal Office of Metrology and Surveying
- Ministry bmvi
- CZEPOS
- European GNSS Authority
- GUGiK
- ROMPOS

Interviews
- ÖBB (Austrian Federal Railways)
- EPOSA (Reference network, AT)
- LGLN (SAPOS - Reference network, DE)
- Axio-Net (Reference network, DE)
- 06GPS (Reference network, NL)
- Leica Geosystems (PPP, Hardware)
- Trimble (PPP, Hardware)
- Topcon (PPP, Hardware)
- Geo++ (Software)
Current User Groups for Reference Networks

- Surveying
- Agriculture
- GIS
- Construction
- Machine control
- Energy (onshore)
- More: Scientific, Police, Archaeology
- Upcoming:
  - Automotive
  - Drone control
Conclusions I

- cm accuracy is required for most applications
- Latency period of PPP at the moment too long for the majority of the existing users, but will come down to 1-2 min.
- CS is unclear with respect to: Target groups, Cooperation with local reference stations providers, Specifications, Business Model, Cost/Price, EGNOS, Equipment needed
- Reference stations are (being) upgraded for Galileo, different experiences for receivers
Conclusions II

- Receivers to use the best service option available at time
- Galileo CS and RTK could complement each other (local market access, rural areas without communication connection)
- User support is a big issue
- Different approaches for public or private RTK network providers
- More information and awareness is needed
- Timing is important now
- Reference network providers to join forces
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