EUPOS (European Position Determination System) a Cooperation of 17 European Countries for Union Use of Spatial Data

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Introduction

• Standardization Activities of EUPOS
• Segments, Correction Types and Services
• Equipment and used transportation Layers
• International cooperation
• Exchange of Spatial Data
• Conclusions
SC-104 Differential GNSS Standardization

Participants include vendors, service providers, and government agencies from around the world

Standards are subjected to performance and interoperability testing prior to adoption and publication

Private Services Messages
The purpose of the private services messages is to have a secure coding/decoding mechanism which allows transmission of authentic data (charging...) and prevents re-broadcasting.
Private Massages Workflow

Operation

- During this phase the service provider broadcasts the RTCM messages through supported data links. The encryption of the messages is done with respective keys for different services and time periods. A registered user/rover selects the decryption key from the key table received through the registration phase which is indicated in the broadcasted messages. This phase is a pure broadcast (uni-directional) communication phase and does not require bi-directional communication between rover and service – “flat rate mode”.

- The transmission from the service provider consists of two basic parts:
  1. the encrypted data encapsulated in an RTCM message (1047), and
  2. message that informs the user of key-table changes (1048)
National Segments SKPOS Slovakia

MOP2 (Modra – Piesok) station owner STU Bratislava
EUPOS Transmitted correction models

- FKP – area modeled corrections
- VRS – Virtual Reference Station (non physical ref. station)
- MAC – Master Auxiliary Concept
Flooding and disaster management projects along the Danube river
BULiPOS (BULgarian Intelegent POSition determination System)
EUPROS Balkan Region Transborder Interoperability
### EUPOS Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
<th>Accuracy</th>
<th>Format*</th>
<th>Transport Layer</th>
<th>DGNSS System</th>
</tr>
</thead>
<tbody>
<tr>
<td>BULiPOS PP</td>
<td>Post processing</td>
<td>5 mm</td>
<td>RINEX</td>
<td>Internet</td>
<td>GPS+GLONASS</td>
</tr>
<tr>
<td>BULiPOS VS</td>
<td>Post processing virtuals station</td>
<td>5 mm</td>
<td>RINEX</td>
<td>Internet</td>
<td>GPS+GLONASS</td>
</tr>
<tr>
<td>BULiPOS RT Precise</td>
<td>Real time processing high accuracy</td>
<td>&lt;2 cm</td>
<td>RTCM 2.x, RTCM 3.x</td>
<td>GSM, GPRS</td>
<td>GPS+GLONASS</td>
</tr>
<tr>
<td>BULiPOS RT</td>
<td>Real time processing</td>
<td>0.5-3m</td>
<td>RTCM 2.x, RTCM 3.x</td>
<td>GSM, GPRS</td>
<td>GPS+GLONASS</td>
</tr>
</tbody>
</table>
Typical used Rovers and standardized exchange formats

<table>
<thead>
<tr>
<th>Topcon GRS-1</th>
<th>Trimble R6</th>
<th>Trimble Geo XH</th>
<th>Leica GPS 900</th>
<th>Magellan / Ashtec ProMark 500</th>
<th>Spectra Epoch 35</th>
</tr>
</thead>
<tbody>
<tr>
<td>72 RTCM 2.3, 3.* CMR/ CMR+</td>
<td>72 RTCM 2.3, 3.1 CMR/ CMR+</td>
<td>26 RTCM 2.3, 3.0</td>
<td>72 (54) Leica / CMR/ CMR+</td>
<td>75 RTCM 2.3, 3.1 CMR/CMR+</td>
<td>54 RTCM 2.3, 3.0 CMR</td>
</tr>
</tbody>
</table>
Spatial Data Definition

- Also known as *geospatial data* or *geographic information* it is the data or information that identifies the geographic location of features and boundaries on Earth, such as natural or constructed features, oceans, and more. Spatial data is usually stored as coordinates and topology, and is data that can be mapped. Spatial data is often accessed, manipulated or analyzed through Geographic Information Systems (GIS).
Why Homogenous Reference Frame ETRF89?

Spatial Data are:

- non-homogeneous, inconsistent databases and documentation
- network distortions in former systems
- inadequate for modern surveying techniques
- satellite-based techniques not easily integrated
- no uniform transformation regulations
- different coordinate systems applied national- and European wide
Non homogenous DHDN System ↔ ETRF 89

movement to the real track position by fixed point surveying

Vector size ~ 0.5 bis ~3 m
ETRS based railway spatial database for rising the quality and performance by the infrastructure maintenance
Railway Navigation – Intelligent transport system (ITS)
EUPOS/SAPOS-based Vehicle Scheduling and Control System by the German Railway Spatial Dataset

...stable communication

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International EUPOS® Steering Committee

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Georeferenced 3-D Multisensor System gen. 2
DGNSS Based Multi Sensor Navigator for Railway State Monitoring
Erosion and Bathymetric Monitoring on the Black See Coast by the Blom Remote sensing Group
Spatial reference
Conclusions

Reduce the costs by buying only a base – option - second rover.

Very quick solution fixing using a good reference network design

Reducing the need for searching reference points.

Easy agreement with the neighbor countries because it is a community based on the same interests

Full coverage in the border regions – homogeneous

The customer profits from this level of standardization

Action is needed in the spatial data exchange

EUPROS is a integrated part of the development of DGNSS infrastructure and rises the acceptance for the exchange and common use of spatial data use ITRF/ETRF as common Frames

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Thank you for your attention!

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