National report of SLOVAKIA

Karol Smolík, Branislav Droščák

Geodetic and Cartographic Institute BRATISLAVA

karol.smolik@skgeodesy.sk
branislav.droscak@skgeodesy.sk

5th EUPOS® Council and Technical Meeting
SKPOS stations infrastructure
Status in November 2018

- 34 Slovakian permanent stations
  - All stations with TRIMBLE receivers and antennas
  - All stations observe GPS + GLONASS + Galileo + BeiDou
- 21 foreign permanent stations (APOS, gnssnet.hu, CZEPOS, ASG-EUPOS, ZAKPOS)
SKPOS stations infrastructure
Receivers changes

- 4 new Trimble Alloy receivers
  
  Trimble NetR8
  
  Full Galileo capability
  
  CORS: GANP, SKNR, VELS
  
  Trimble Alloy
SKPOS stations infrastructure
2 stations relocation in 2017 year

- Reinforced-concrete pillar instead of roof monumentation
- Contribution to geokinematics research (multipurpose usage of CORS = GKÚ philosophy)
SKPOS stations infrastructure geodynamics research monumentation

- together 14 of 34 slovakian SKPOS permanent stations (41%) have monumentation suitable for geodynamic research purposes
SKPOS control software

- Trimble® Pivot™ Platform GNSS Infrastructure Software
  - Main software: version 3.10.5
  - Back-up software: version 3.10.5
  - RTXNet Processor

- Receivers firmware
  - Trimble receivers: version 5.37
## SKPOS – Galileo and BeiDou

Full capability Galileo and BeiDou

<table>
<thead>
<tr>
<th>SKPOS</th>
<th>Component</th>
<th>GPS + GLONASS + Galileo + BeiDou</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antennas</td>
<td>✔</td>
<td>34 (34)</td>
</tr>
<tr>
<td>Receivers</td>
<td>✔</td>
<td>34 (34)</td>
</tr>
<tr>
<td><strong>Software</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trimble Pivot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RINEX CORS, VRS</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>RTK VRS</td>
<td>📆 <strong>2018-10-16</strong></td>
<td>✔</td>
</tr>
</tbody>
</table>
SKPOS – User’s experience with Galileo

- More satellites = better precision
- Sufficient # of satellites in problematic regions
- Better accessibility for measuring in forests
- Better accessibility for measuring in urban areas
Experience with mixture of hardware brands

- All Slovakian stations equipped by Trimble receivers and antennas
- Foreign stations use Trimble or Leica hardware
  - Trimble Pivot support only Leica GR30 and Leica GR50
  - Extra Non-Trimble license needed
Only network solution (Network RTK in VRS concept) is provided.
No single RTK!

<table>
<thead>
<tr>
<th>Package</th>
<th>Content</th>
<th>Duration</th>
<th>Format</th>
<th>Flat rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKPOS_mm</td>
<td>RINEX 1000 h</td>
<td>year</td>
<td>RINEX 2.x, 3.x</td>
<td>50 €</td>
</tr>
<tr>
<td>SKPOS_cm (year)</td>
<td>RTK unlimited + 50 h RINEX</td>
<td>year</td>
<td>RTCM 2.3, 3.1, RTCM 3.2 MSM, CMRx, CMR+</td>
<td>50 €</td>
</tr>
<tr>
<td>SKPOS_cm (month)</td>
<td>RTK unlimited</td>
<td>month</td>
<td>RTCM 2.3, 3.1, RTCM 3.2 MSM, CMRx, CMR+</td>
<td>19 €</td>
</tr>
<tr>
<td>SKPOS_dm</td>
<td>DGNSS unlimited</td>
<td>year</td>
<td>RTCM 2.1, 2.3</td>
<td>20 €</td>
</tr>
</tbody>
</table>
SKPOS
number of users

- almost 1,600 registrations (Nov. 2018)
SKPOS

number of users – 100 new user license

- Most busy days only 40 licenses under limit
- Purchased 100 new licenses for simultaneous user connections – now 485 simultaneous licenses
SKPOS
Type of users (precise values from registration forms)

- Surveying fields (cadastre, surveying, mapping, GIS) – 73 %
- Other fields (precise agriculture, machine guarding) – 27 %
SKPOS
Type of users (precise values from registration forms)

- In 2017 more new SKPOS users were from non geodetic field
SKPOS web page
new items

- list of reference stations
- coordinates
- antenna calibration files
- sitelogs

### Reference stations

<table>
<thead>
<tr>
<th>#</th>
<th>Reference station</th>
<th>Location</th>
<th>Coordinates (ETRS99 (ETRF2000) epoch 2008.5)</th>
<th>Antenna</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>X (m)</td>
<td>Y (m)</td>
<td>Z (m)</td>
</tr>
<tr>
<td>1</td>
<td>BASV</td>
<td>Banská Štiavnica</td>
<td>4009952.2193</td>
<td>1374556.6500</td>
<td>4750511.3543</td>
</tr>
<tr>
<td>2</td>
<td>BBYS</td>
<td>Banská Bystrica</td>
<td>3980359.1445</td>
<td>1382291.8716</td>
<td>4772771.7709</td>
</tr>
<tr>
<td>3</td>
<td>BREZ</td>
<td>Brezno</td>
<td>3963889.0095</td>
<td>1414440.8746</td>
<td>4777131.8796</td>
</tr>
<tr>
<td>4</td>
<td>DOPL</td>
<td>Dolné Plachtince</td>
<td>4019049.1891</td>
<td>1408890.6541</td>
<td>4732383.5840</td>
</tr>
<tr>
<td>5</td>
<td>GANP</td>
<td>Gánovce</td>
<td>3929181.8684</td>
<td>1455236.5018</td>
<td>4793653.7059</td>
</tr>
</tbody>
</table>
New App – SKPOS Quality Control

- Time Series
- RINEX Data Quality
- Skyplots
- Data Availability
- Real-time Delay
- More features under development
Users’ feedback - most criticized issues

- Web survey for users
- 53% responses
- Average rating 1.8 (1 best, 5 worst)
- Only a few negative ratings:
  - Weak internet coverage
  - Notification of outages via SMS or e-mail
  - Problems with increased ionosphere activity
Thank you for your attention

Karol Smolík
Geodetic and Cartographic Institute BRATISLAVA
karol.smolik@skgeodesy.sk