Strategy for implementation of Galileo in the Swedish Geodetic Infrastructure SWEPOS™

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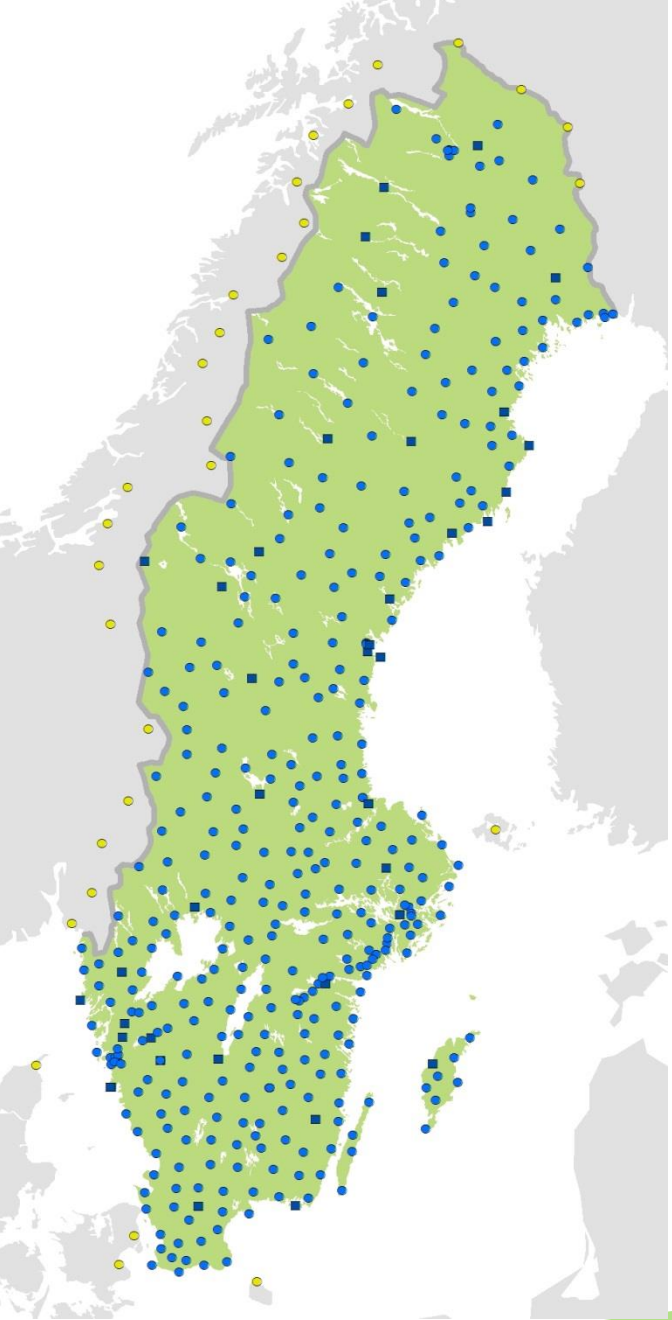

SWEPOS®

- A national network of permanent reference stations
- A part of the national geodetic infrastructure
- Investment covered mainly by governmental funds
- The operation costs and future upgrades covered by user fees
- Established in cooperation with Onsala Space Observatory/Chalmers

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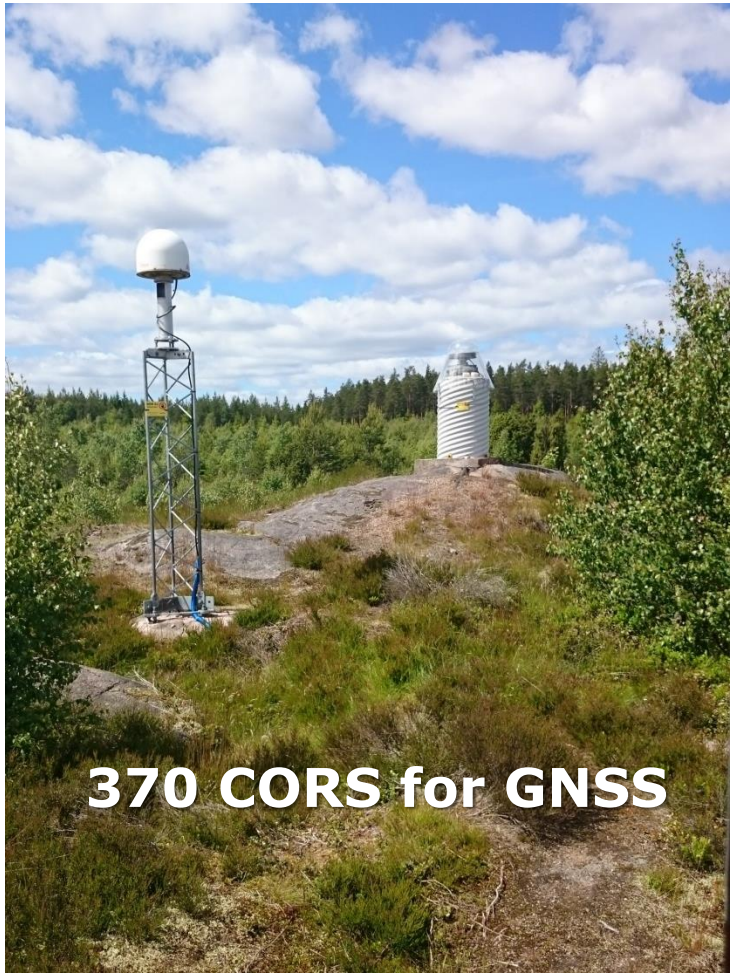
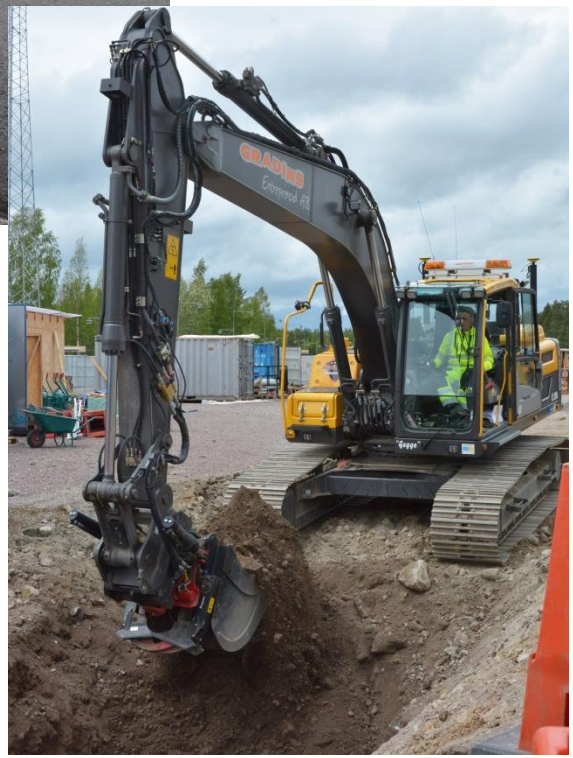
SWEPOS - Purpose



- Provide real-time and post-processing data for GNSS
- Provide connections to the national reference system SWEREF99
- Scientific studies, crustal motion, metrology, etc.
- Provide data to International organizations, IGS/EPN



SWEPOS® services

- Real time services
  - network RTK service for high precision applications
- More than 3500 users

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SWEPOS® services

- DGNSS service for sub-meter accuracy
- free of charge 2016-

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SWEPOS® services

- Post processing data (RINEX)
- Virtual RINEX
- SWEPOS Automatic calculation service based on the Bernese GNSS software ver. 5.2

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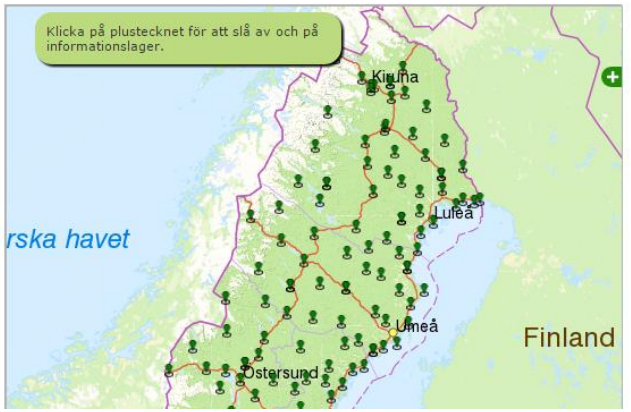
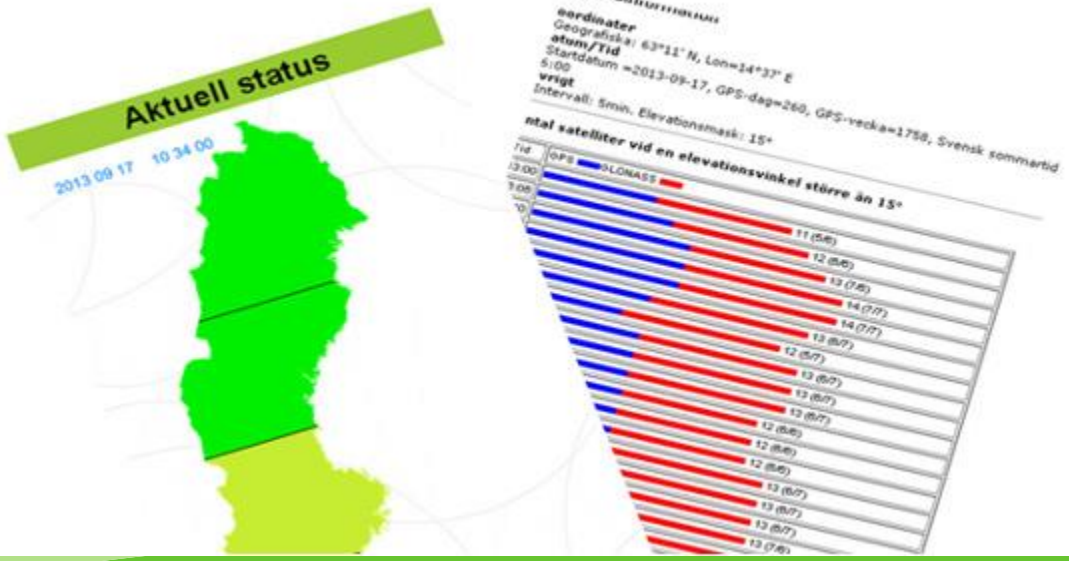
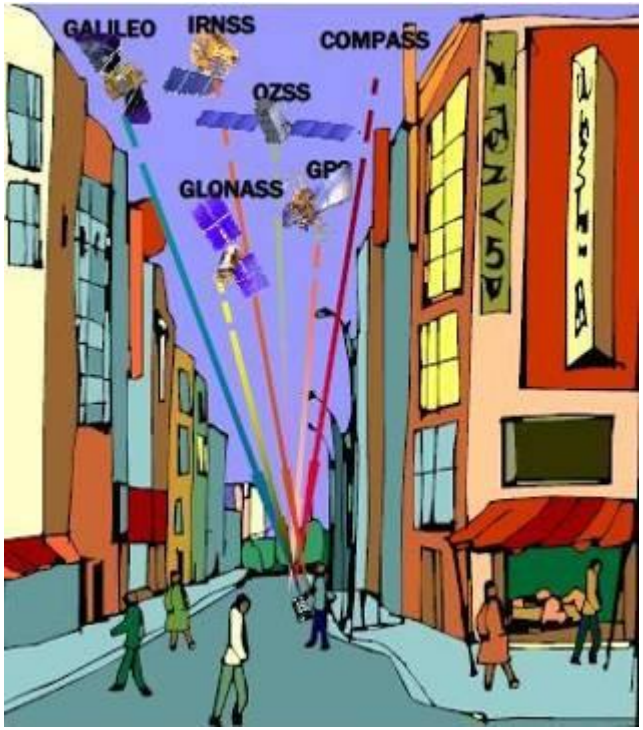
Support on www.swepos.se

- My pages
- Monitoring service
- Ionospheric monitoring service
- Maps
- Operational status
- Satellite predictions





Why do we need Galileo and more satellites?



- Easier to survey in difficult environments, e.g. city canyons and forests
- Improve the accuracy
- More signals makes it easier to exclude bad observations

Picture from Ken Alexander, National Coordination Office for Space-Based PNT

SWEPOS Infrastructure
GNSS modernization

- New truss pillar at all 21 fundamental class A stations to get an overlap of observation data series.

- All class B stations upgraded with DM Choke ring antennas for GPS, GLONASS, Galileo and Beidou

- GNSS receivers
  - Leica 1200 GNSS
  - Trimble Net R9
  - Javad Sigma
  - Javad Delta – will be replaced during 2016

Postprocessing data with Galileo, Beidou etc

- RINEX 2 data is stored from data streams at the control centre in Gävle, the RINEX files are also stored as a backup at the stations
- RINEX 2 (GPS and GLONASS), are available for all stations
- RINEX 3 (GPS, GLONASS, Galileo, Beidou) is today available for 3 stations , Kiruna, Mårtsbo and Onsala
- RINEX 3 will be available on some more stations before the summer 2016
- The plan is to have RINEX 3 available on all stations before the end of 2016

Status for implementation of Galileo in SWEPOS network-RTK service

- Today SWEPOS provides network-RTK corrections for only GPS and GLONASS
- Almost all SWEPOS stations are already prepared for Galileo
- The network-RTK software is prepared for Galileo and Beidou but cannot distribute corrections yet because of missing external satellite corrections for Galileo and Beidou. (Software provider is waiting for Galileo initial services). Software initially only supports one brand of receiver.
- Meanwhile ongoing tests with Galileo single station RTK setup and also tests with GPS L5, L2C

Summary

- Almost all SWEPOS stations already prepared for Galileo, Beidou
- During 2016 RINEX 3 will be stored on all SWEPOS stations in parallell with RINEX 2.
- The plan is to provide GPS L5 and L2C in the service during 2016
- The network-RTK software must support Galileo before Galileo can be implemented in SWEPOS network-RTK service

Thanks for your attention!

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