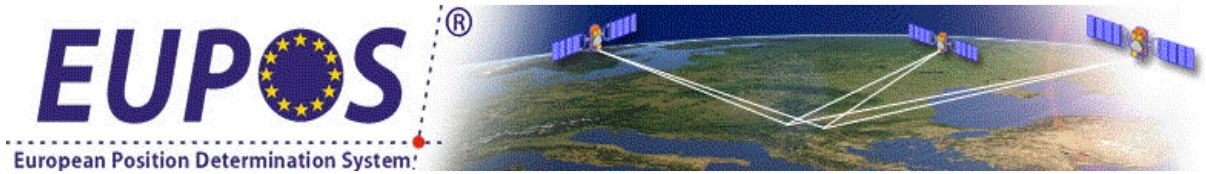

EUPOS® in Context of Current European GNSS-based Positioning Infrastructures

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OUTLINE

1. What is *EUPOS®?*
2. History
3. Structure and Membership
4. Observational Segment
5. Technical Issues
6. Outreach Activities
7. Achievements
8. Challenges
9. Conclusions and Outlook

What is *EUPOS*® ?

- *EUPOS*® is a free association of Eurpean public institutions aiming at establishing a uniform DGNSS based infrastructure in Central and Eastern Europe
- *EUPOS*® is a ground based European regional GNSS augmentation system
- *EUPOS*® is a mosaic of national DGNSS segments operating according to common standards
- *EUPOS*® provides DGNSS correction data for real-time positioning and navigation and the data for post-processing
- *EUPOS*® supports precise positioning and navigation (metre, sub-metre and centimetre in RT, centimetre and better in PP)
- *EUPOS*® is evolving in both intensive and extensive way by accepting new technical developments
- *EUPOS*® collaborates with other international organizations and scientific institutions acting in the field of GNSS technology

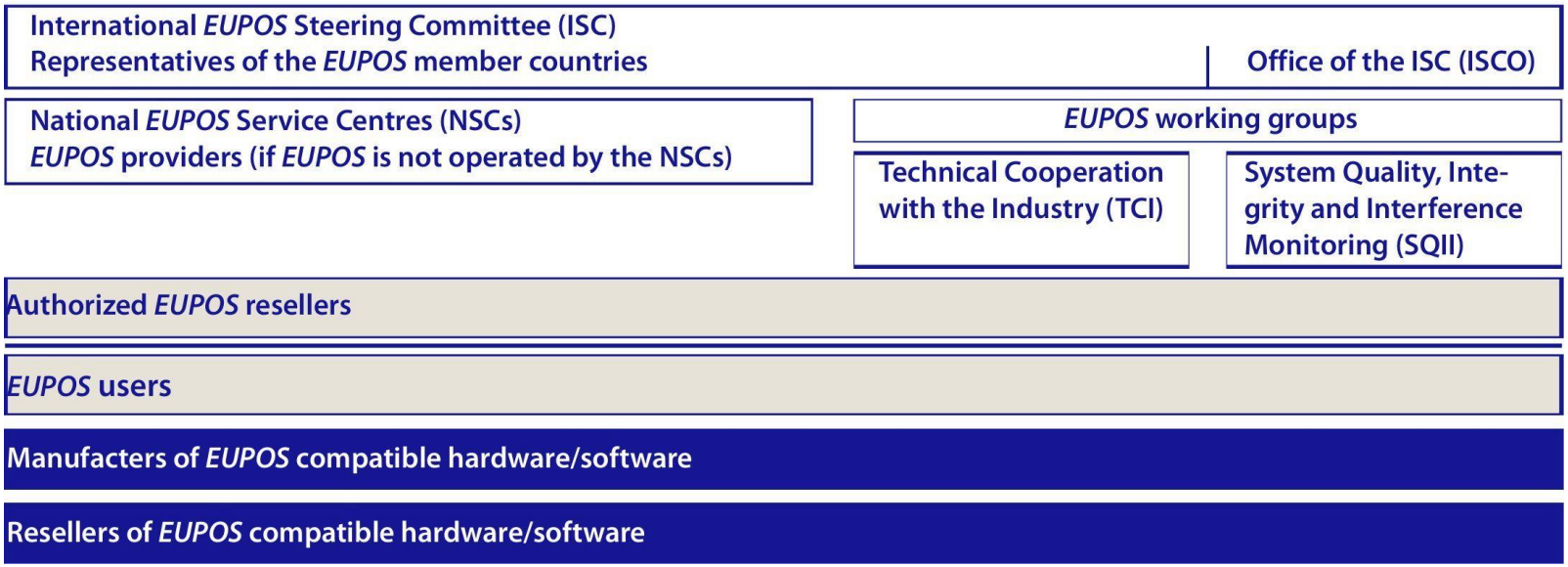
EUPOS® - a History

- Workshop *„Multifunctional GNSS Reference Station Systems for Europe“,* Berlin, 4 – 5 March 2002 – organized by the Berlin Senate Department for Urban Development and the European Academy for Urban Environment
- 60 participants from 16 countries
- Founding Committee (later ISC) + EUPOS® Office established (Berlin, Senat)
- 2014 – reorganization, new ToR, Chairmanship, Office relocated to Warsaw

EUPOS® Structure (1)

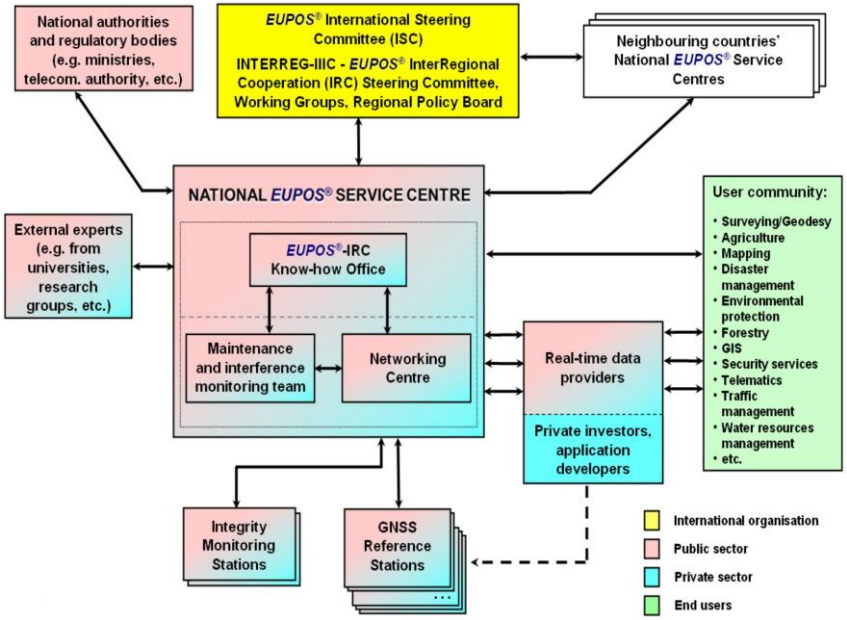
- Council – one representative nominated by each Member
- Executive Board – manages activities on daily basis
- *EUPOS* ® Office – coordination, organization, administration
- *EUPOS*® Working Groups (QM, ECC)
- National Service Centres – contacts with council delegates, contacts with national authorities and users, network operation, network integrity check, technical developments, personnel training, developing applications, public relations
- Authorized *EUPOS*® resellers
- Manufacturers of *EUPOS*® compatible hardware and software

EUPOS® Structure 2002 - 2014

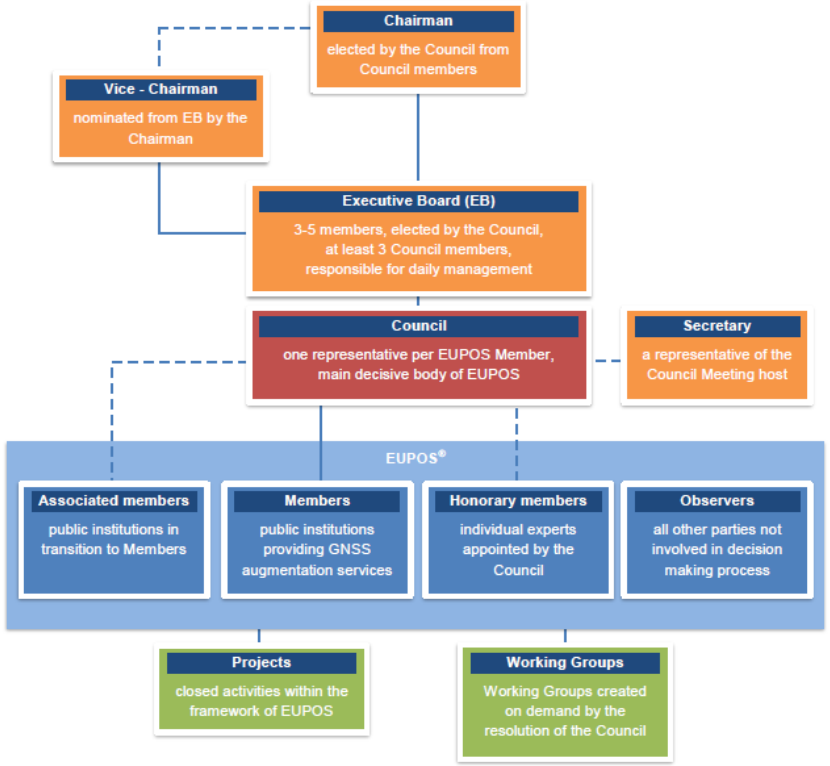


EUPOS® Structure (3)

Functional structure 2002 -2014



Membership and organisation since May 2014



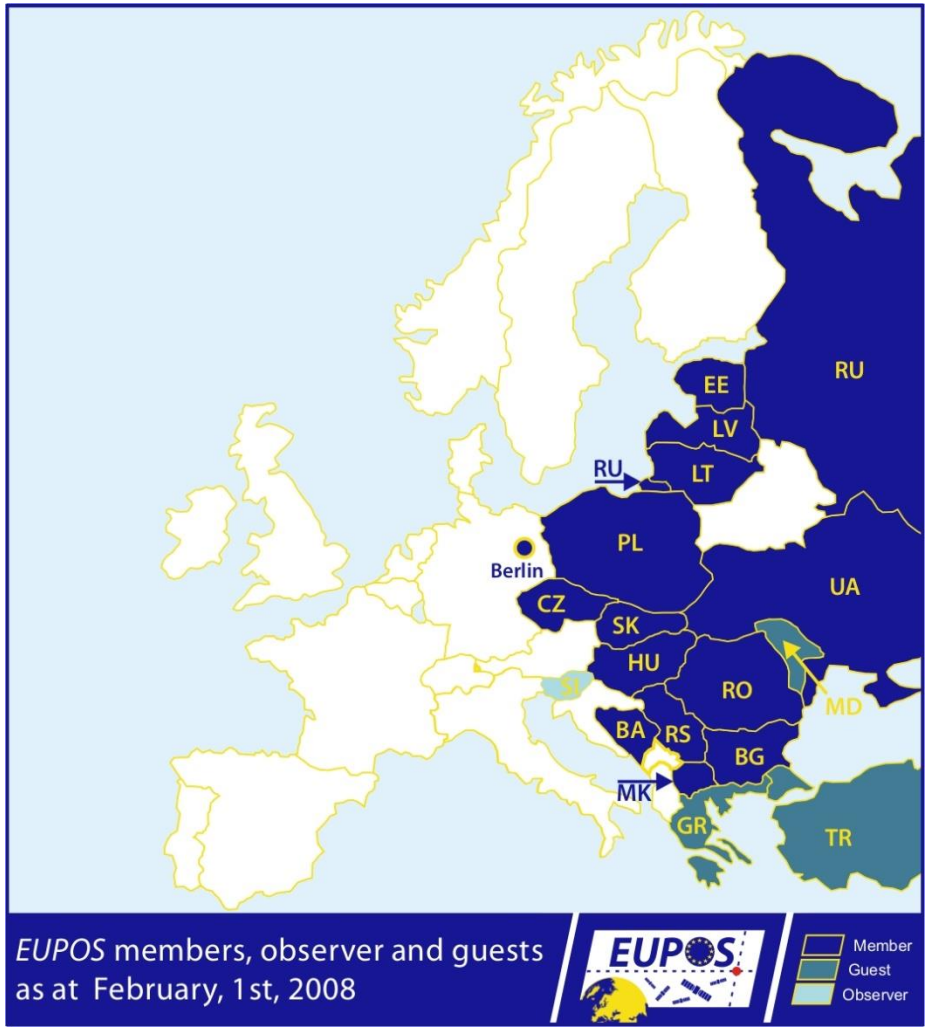
EUPOS® Membership (1)

- Membership is voluntary; members are obliged to observe the unified standards and *EUPOS*® ToR
- Membership status: full member, associated member, honorary member, observer
- Full membership is open to any public organization or institution that provides GNSS-based services
- Each member delegates a national representative to the Council
- Associated membership is intended to be transformed to the full membership

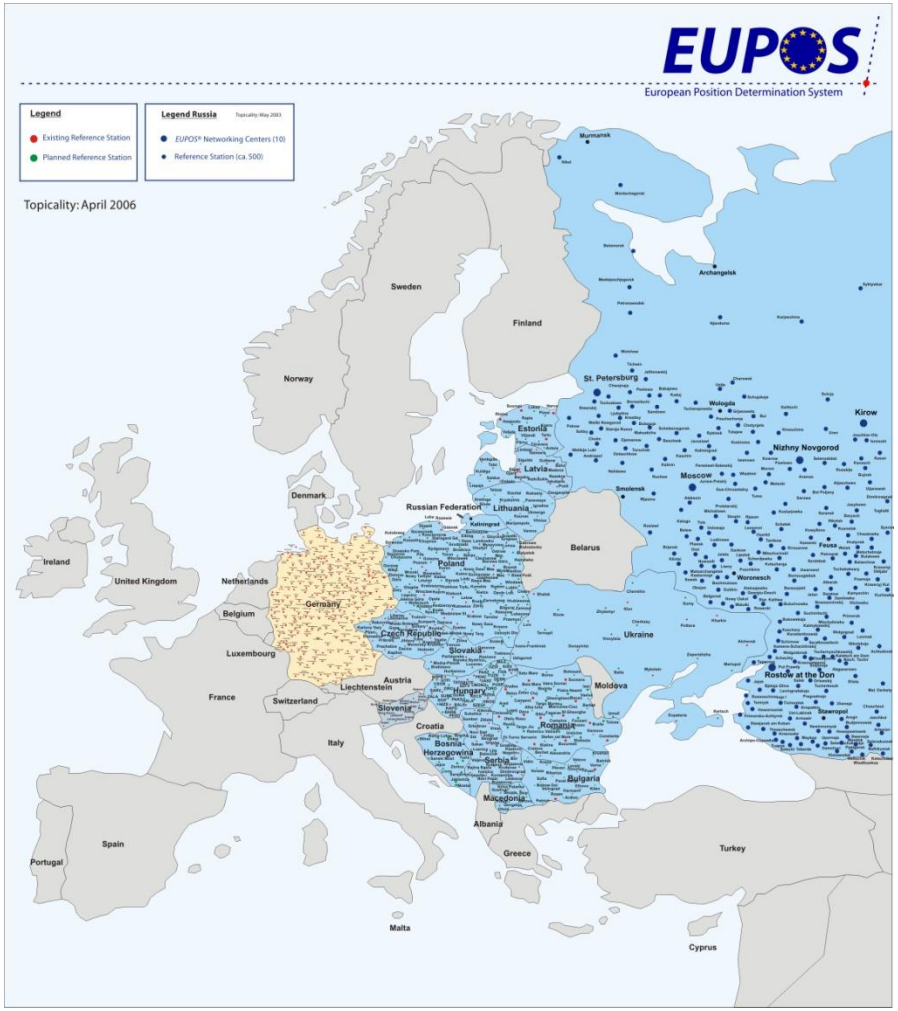
EUPOS® Membership (2)

- Full members: Bosnia and Herzegovina, Bulgaria, Czech Republic, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, FYROM, Moldova, Montenegro, Poland, Romania, Russian Federation, Serbia, Slovakia,Slovenia, Ukraine, FRG states Berlin and Hamburg (by the end of 2007)
- Later applied: Azerbaijan, Georgia, Kirghizstan

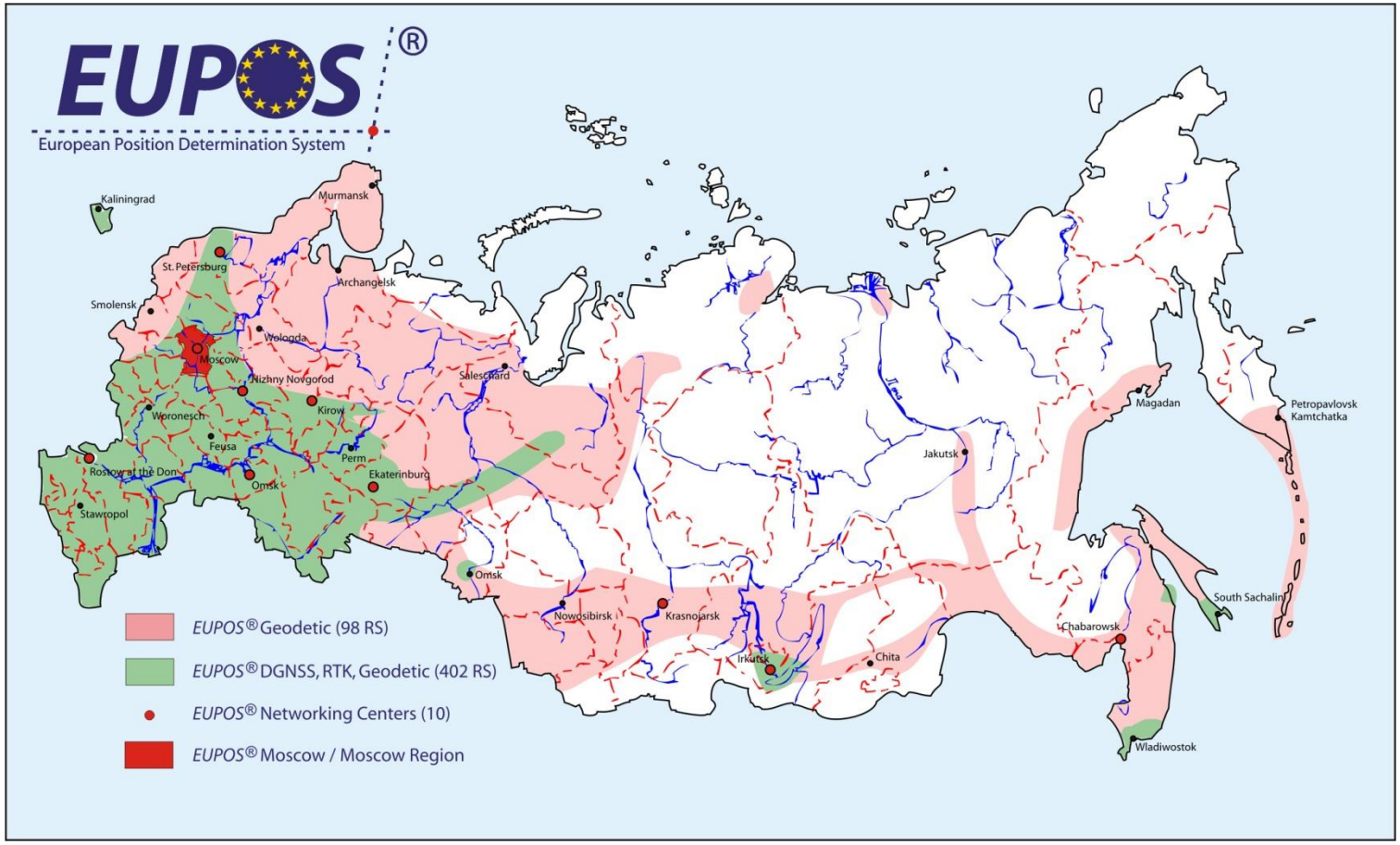
EUPOS® Membership (3)



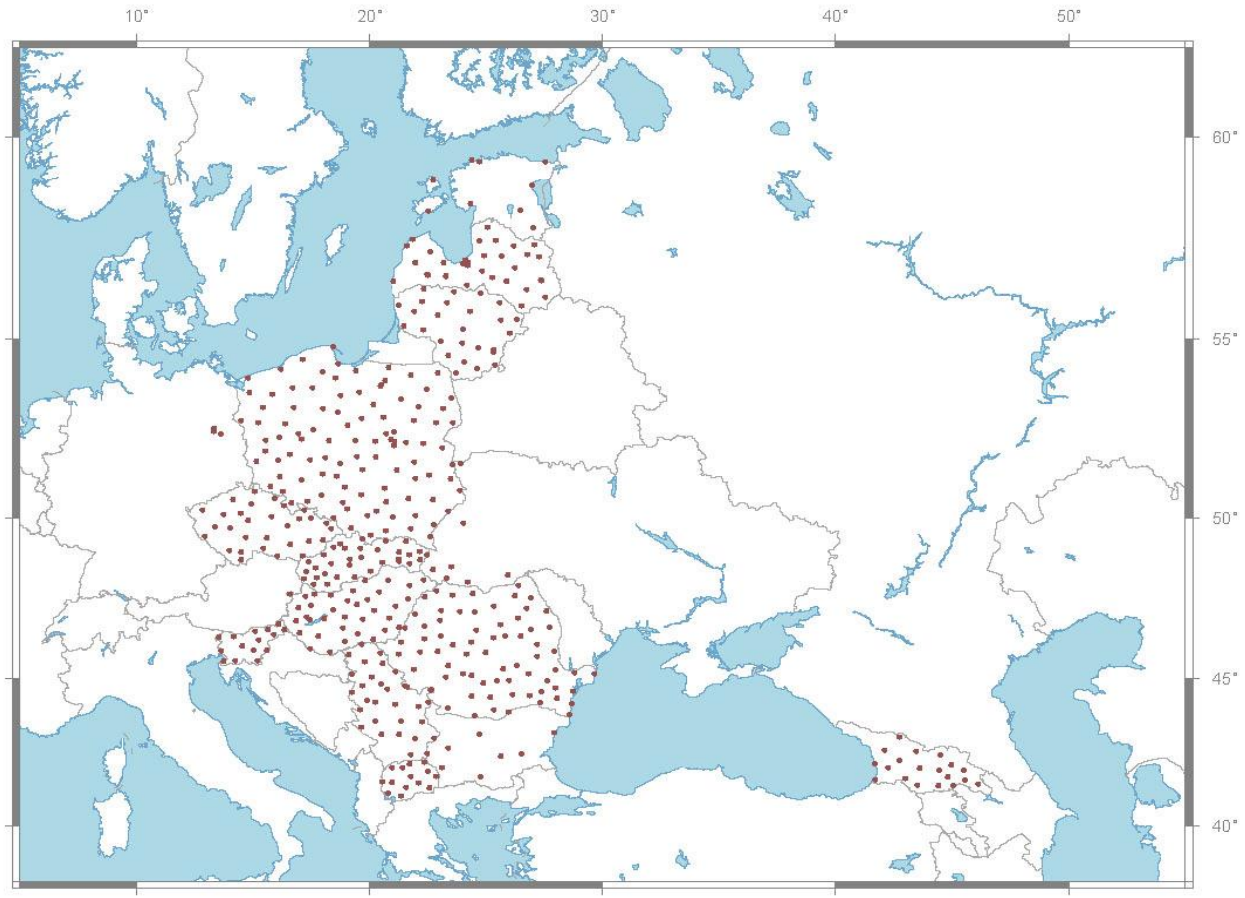
EUPOS® Observational Segment (1)



EUPOS® Observational Segment (2)



EUPOS® Stations contributing to ESDB Status 2014



EUPOS® - Members and Operational Stations

EUPOS® member	Area [km²]	Number of realized EUPOS® or compatible reference stations
Berlin, Germany (DE)		4
Bosnia and Hercegovina (BA)	51.000	36
Bulgaria (BG)	110.950	7
Czech Republic (CZ)	78.870	28
Estonia (EE)	45.220	9
Hungary (HU)	93.030	36
Kazakhstan (KZ)	2 717.300	30
Latvia (LV)	64.600	29[1)]
Lithuania (LT)	65.300	26
Macedonia (MK)	25.330	14
Moldova (MD)	33.846	2
Montenegro (ME)	13.812	4
Poland (PL)	323.520	101
Romania (RO)	237.500	75
Russian Federation (RU)	17 075.000	31[2)]
Serbia (RS)	88.360	32
Slovak Republic (SK)	49.035	29
Slovenia (SI) (observer)	20.270	15
Ukraine (UA)	603.700	13

EUPOS® Technical Issues (1)

- *EUPOS*® Technical Standards, Rev. 3 (since 2013)
- DGNSS for RT positioning and navigation, accuracy 2m – 0.5m for moving objects and 0.2m for static
- Network RTK for precise RT positioning - 2 cm
- Geodetic, post-processing – 1 cm and better
- Data streams transmitted via Internet
- NTRIP technology, RTCM SC104 format
- Additionally radio or TV VHF broadcasting
- System availability on the level of at least 99%
- Availability upgrade up to 99.9% is realistic

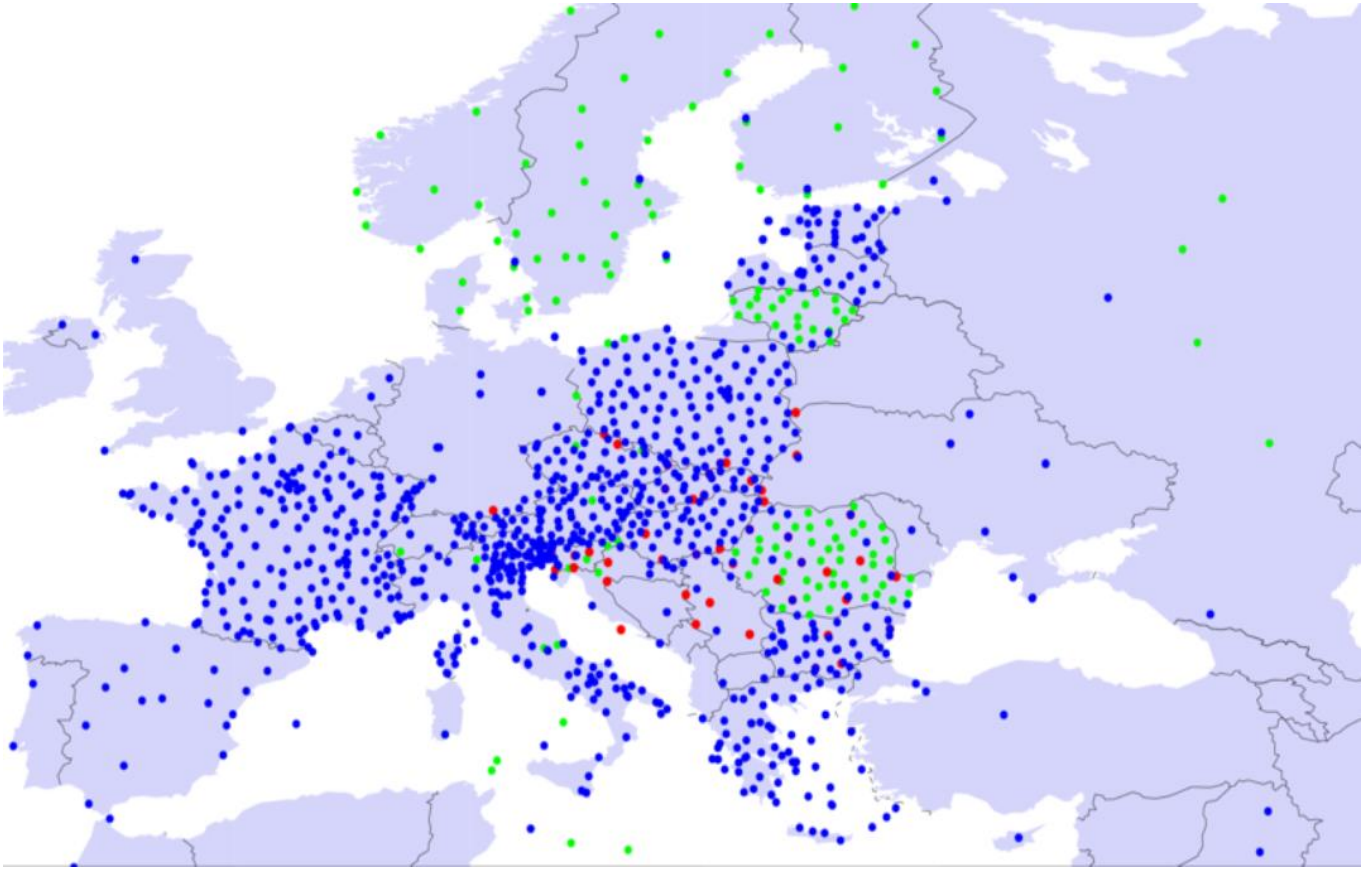
EUPOS® Technical Issues (2)

- *EUPOS* deploys unified standards and communication lines to achieve full interoperability and compatibility
- Reference stations receive signals from GPS and GLONASS satellites, Galileo expected
- Guidelines for single site design
- Guidelines for cross-border data exchange
- Guidelines for reference frame fixing (in 2014 recommended to use current EUREF guidelines)

EUPOS® Working Groups

- WG on Technical Cooperation with the Industry (TCI) (Chairman of *EUPOS*®)
- WG on System Quality, Integrity and Interference Monitoring (SQII) (J. Zvirgzds, Latvia)
- WG on Service Quality Monitoring (SQM) (B. Droščák, Slovakia)
- WG on *EUPOS*® Combination Centre (ECC) (A. Kenyeres, Hungary)
- *EUPOS*® Station Database (ESDB) (P. Braunmüller, Hungary)

ECC – Distribution of Stations included in Processing



EUPOS® Outreach Activities

- EUREF – MoU signed in June 2014
- EUMETNET – MoU signed in May 2013
- EuroGeographics – establishment of EuroGeographics Positioning Knowledge Exchange Network (PosKEN) → EuroGeographics + EUREF + EUPOS + CLGE
- UN OOSA
- International Committee on GNSS (ICG) established to promote GNSS infrastructure on global basis (endorsed by the UN General Assembly) - *EUPOS* is ICG member
- Technical Cooperation with Industry (TCI)
- RTCM Member – Special Committee 104

EUPOS® in European Programmes (1)

- INTERREG IIIC – interregional cooperation
- Promoting *EUPOS* services for regional development
- Integration of *EUPOS* services into regional decision processes
- 8 *EUPOS* countries, 9 institutions
- 4 work packages
- Duration: Oct 1, 2006 – Dec 31, 2007

EUPOS® in European Programmes (2)

- INTERREG IVC – follow up programme
- Component 2 – Communication and Dissemination
- Component 3 – Exchange of Experience
- Component 4 – Realization of Regional Development Tasks with *EUPOS*
- Component 5 – Improvement of *EUPOS* compatibility
- Not accepted
- GOCE Data Announcement of Opportunity – released by ESA in Dec 2006 – OK (e.g. Riga)
- INTERREG (2011) – not accepted

Achievements

- Incentive to building up CORS networks
- System of standards and guidelines
- Outreach activities
- *EUPOS*® symposia (impact on professionals from different fields of activities) – 2005, 2008, 2009 (Berlin), 2010 (Brussels), 2011 (Berlin)
- *EUPOS*® in international programmes and projects

Challenges

- *EUPOS*® disposes of a large observation data and product volume which represents a potential that can benefit a number of activities, among others in science
- Reference frames, velocities
- Ground based meteorology
- Geodynamics, neotectonics …
- Space weather, upper atmosphere studies
- Gravity field modelling
- Mixed problems (ionosphere x earthquakes)

Outlook

- To vitalize EUPOS® and its activities towards making full use of its potential
- To develop EUPOS ® as a multi-GNSS facility
- To extend EUPOS ® both geographically and in application sphere
- To keep and develop all outreach links, WGs, projects, centres but also EUPOS ® Symposia

Thank you for
your attention

http://www.eupos.org