EUPOS® - A GNSS-BASED REAL-TIME HIGH ACCURACY POSITIONING INFRASTRUCTURE IN CENTRA AND EASTERN EUROPE: CURRENT STATE AND OUTLOOK

Dr. Branislav Droščák, Jaroslav Šimek
EUPOS chairman,EUPOS executive board member

15th meeting of International Committee on Global Navigation Satellite Systems
Vienna, Austria. 27 September – 1 October

WHAT IS *EUPOS*®?

EUPOS®
European Position Determination System

- *EUPOS*® is a free association of European 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*® supports precise positioning and navigation (metre, sub-metre and centimetre in RT, centimetre and better in PP)
- *EUPOS*® collaborates with other international organizations and scientific institutions acting in the field of GNSS technology

MARCH 2002
EUPOS INITIATIVE FOUNDATION

EUPOS®
European Position Determination System

EUPOS initiated by the Berlin Senate Department for Urban development and supported by the European Academy of Urban Environment (EA.UE) in Berlin

OCTOBER 2014
EUPOS STRUCTURE AFTER REORGANIZATION

EUPOS®
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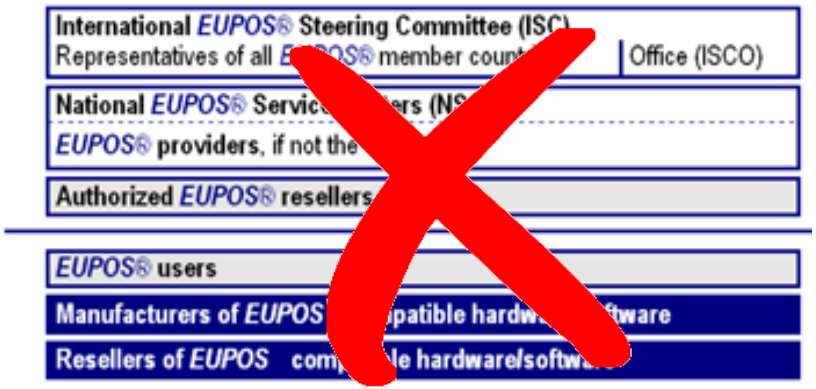
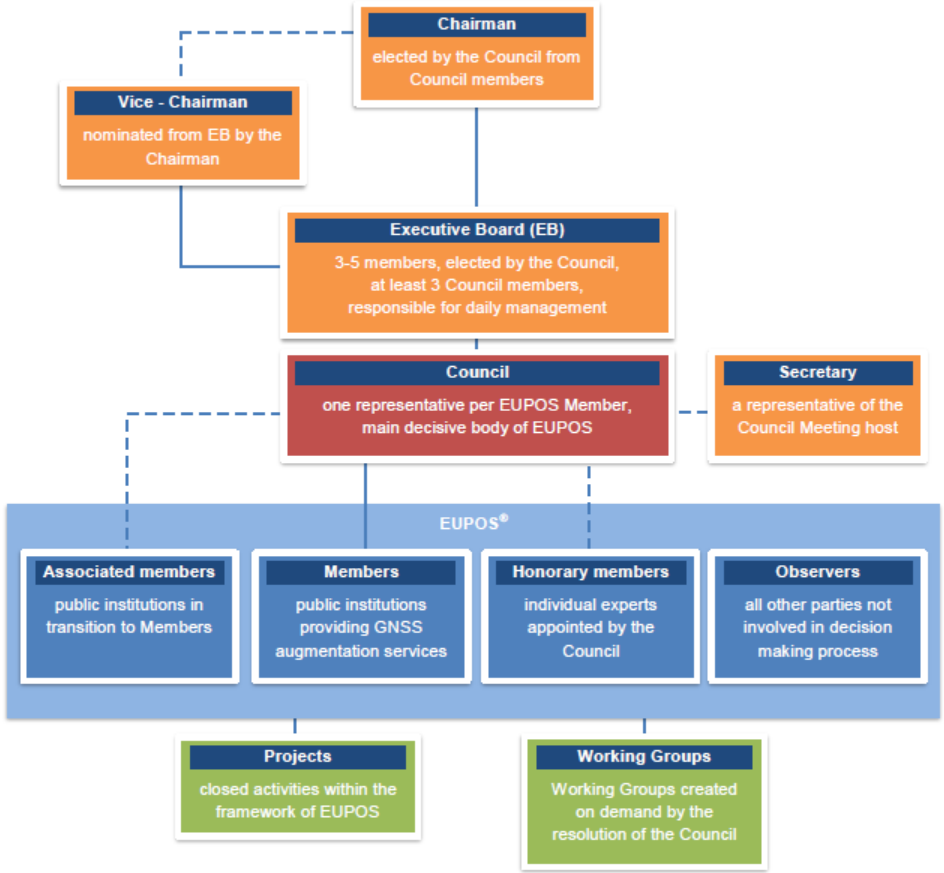
EUPOS meeting in Warsaw

- Revision of the organizational structure
- Revision of the membership





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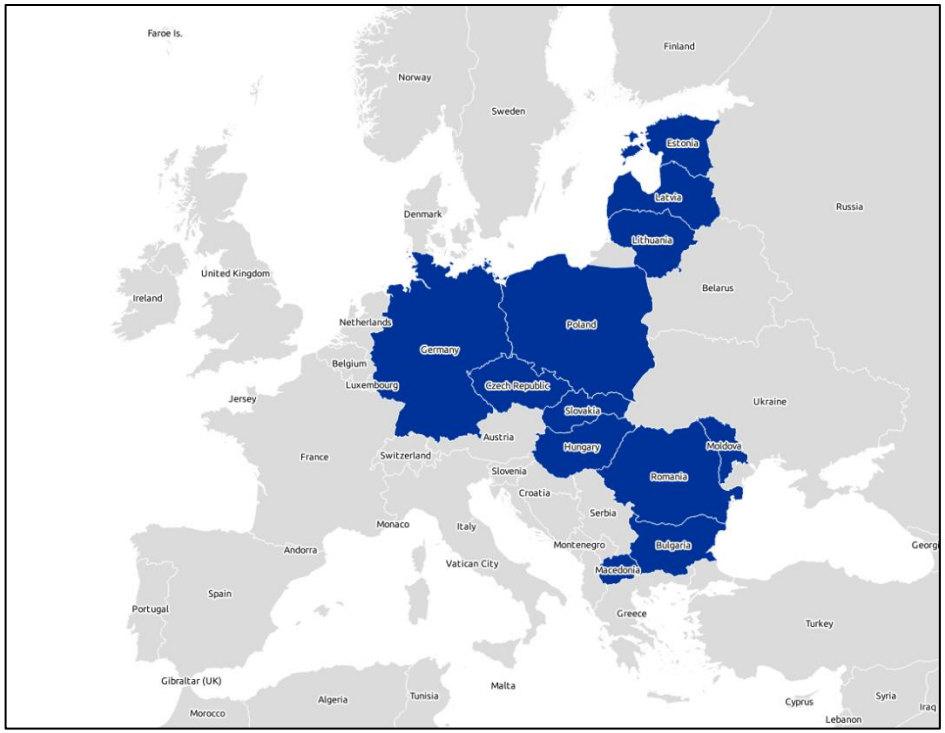

EUPOS GOALS AFTER REORGANIZATION

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- **Act as a EUPOS members DGNSS service providers branch organization**
- **Collaborate with international organizations and bodies to represent European DGNSS service providers**
- **Collaborate with scientific institutions and promote scientific use of EUPOS data**

EUPOS GOALS

- **Act as a EUPOS members DGNSS service providers branch organization DGNSS service providers branch organization to:**
  - *protect the common interest of DGNSS service providers on the GNSS market,*
  - *further influence the GNSS manufacturers with development requests for a significant customer group,*
  - *identify and share within members common problems with software or hardware to better serve customers and quicker resolve the support requests to manufacturers,*
  - *provide common standards and guidelines for the providers or specific user groups,*
  - *identify the development directions in which networks should evolve to be competitive,*
  - *revitalize the EUPOS brand introducing service certificates and the brand identification system,*
  - *share best practices and improvements focused on DGNSS service administration and operation within members.*

EUPOS GOALS

- **Collaborate with international organizations and bodies to represent European DGNSS service providers**
  - ~~*RTCM (SC-104)*~~ *– finished in September 2015 due to high fee and lack of interested person*
  - *UN (including ICG/UNOOSA) – EUPOS is ICG member,*
  - *EUROGEOGRAPHICS – founder of PosKEN,*
  - *EUREF – MoU signed in June 2014,*
  - *EUMETNET – MoU signed in May 2013,*
  - *EC (GSA) – GSA representatives are regularly invited to EUPOS meetings*
  - *GNSS manufacturers representatives are from time to time invited to EUPOS technical meetings. In past were invited to cooperation within EUPOS WG Technical cooperation with Industry (TCI)*

EUPOS GOALS

- **Collaborate with scientific institutions and promote scientific use of EUPOS data by:**
  - *identifying the scientific potential in EUPOS data and offering it to the science-oriented user groups,*
  - *introducing data policy guidelines,*
  - *creating common products for science or transforming them into production services.*

EUPOS CURRENT STRUCTURE (SEPTEMBER 2021)

- **Chairman**:

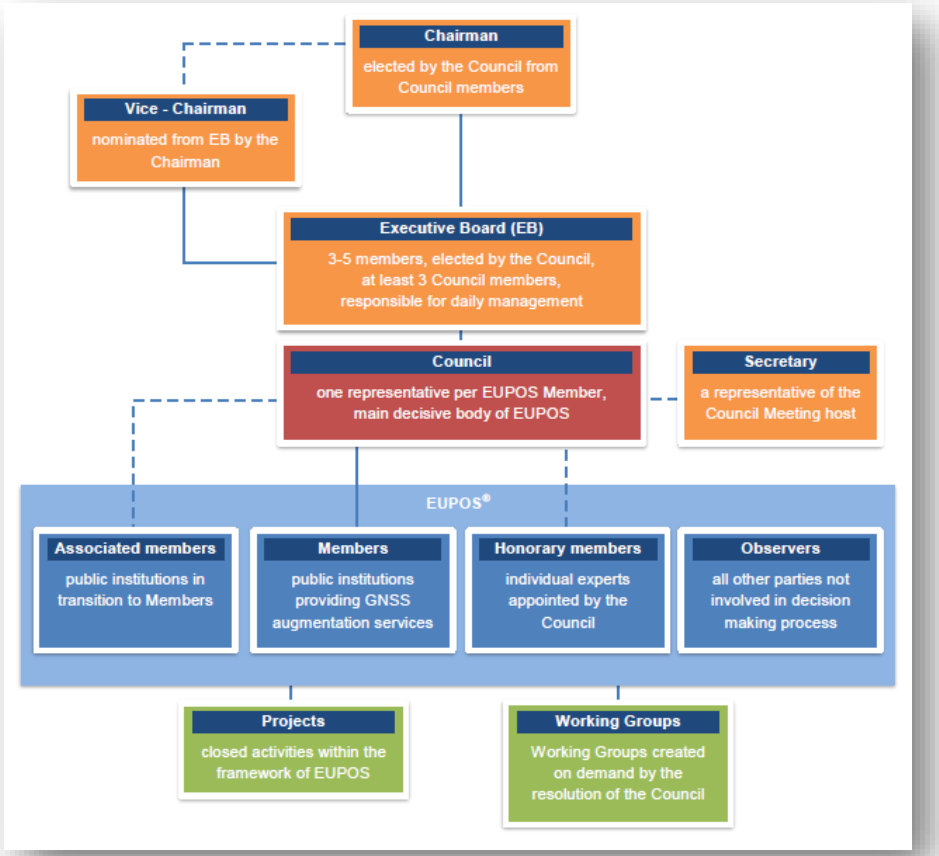
Branislav Droščák (Slovakia)

- **Vice-chairman**:

Ingus Mitrofanovs (Latvia)

- **EUPOS Executive board**:
  - Jaroslav Šimek (Czech rep.)
  - Ambrus Kenyeres (Hunagry)
  - Szymon Wajda (Poland)
  - Jan Řezníček (Czech rep.)

- **EUPOS council**



EUPOS WEB PAGE, *EUPOS* CONTACT

Web page

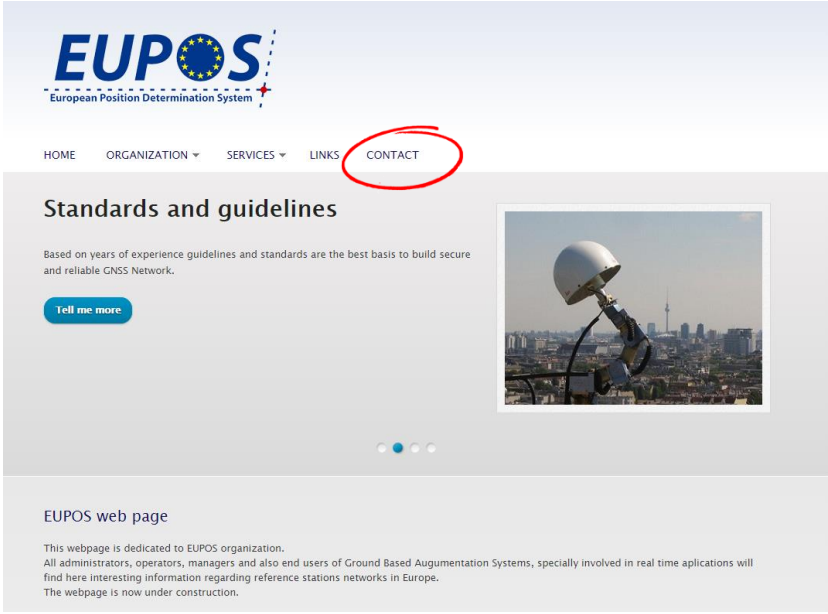
- www.eupos.org
- Administrator: Szymon Wajda

EUPOS contact

- email to chairman, vice-chairman
- via EUPOS web page
- email office@eupos.org

People responsible for EUPOS tasks:

- EUPOS chairman
- EUPOS vice-chairman
- EUPOS Executive board members



EUPOS MEMBERSHIP (SEPTEMBER 2021)

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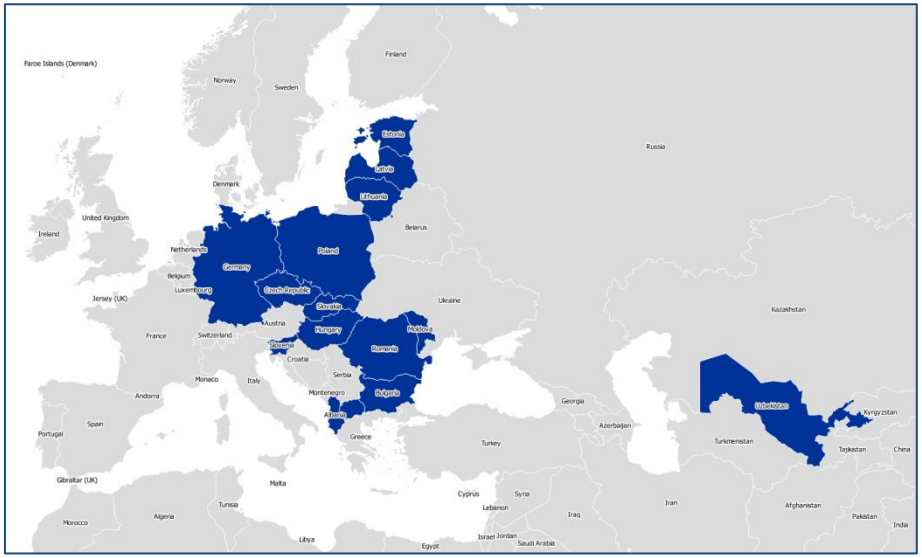
	Member / Abb. of the Institution	Country
1	GKÚ Bratislava	Slovakia
2	VUGTK Zdiby	Czech republic
3	ZÚ Praha	Czech republic
4	SGO Penc	Hungary
5	Land Board Tallinn	Estonia
6	GuGIK Warszawa	Poland
7	Academy of science	Bulgaria
8	NAfCaLR	Romania
9	University of Latvia	Latvia
10	Riga City Council DD	Latvia
11	LGIA	Latvia
12	AfLRaC	Moldova
13	AREaC	Macedonia
14	Senatstadt Berlin	Germany
15	Geodetic Institute	Lithuania
16	Surveying and mapping authority of Slovenia	Slovenia

	Observer / Abb. of the Institution	Country
1	BKG Frankfurt u/Main	Germany

	Associated member / Abb. of the Institution	Country
1	National Uzbekistan university	Uzbekistan
2	IPRO Albania	Albania



EUPOS MEMBERS (SEPTEMBER 2021)

EUPOS®
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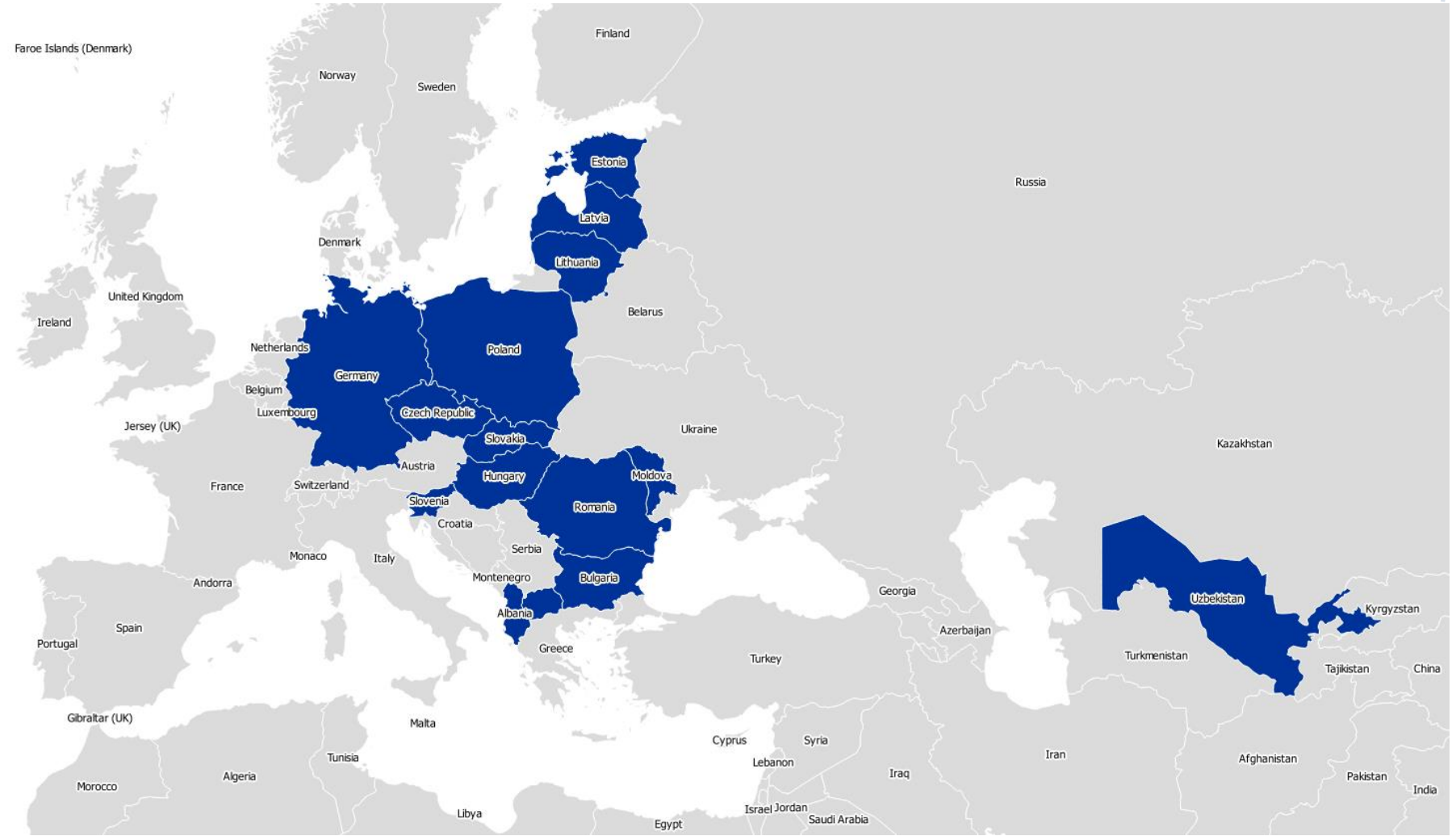

- 15 countries / 19 institutions

EUPOS WORKING GROUPS

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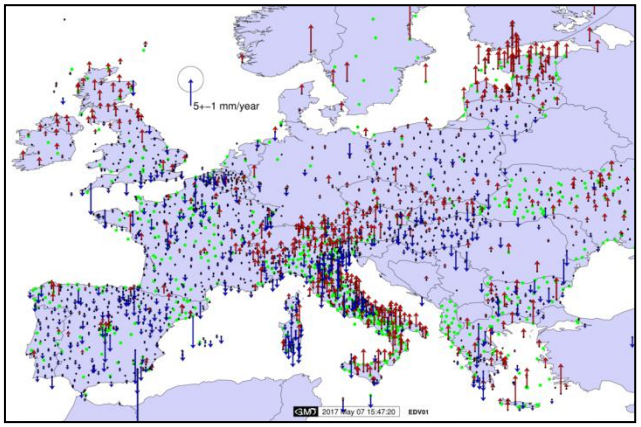
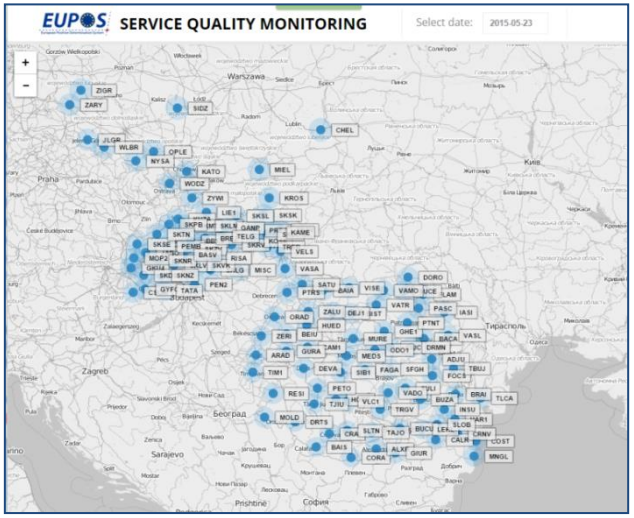
EUPOS Combination Center WG (ECC)

- head: Ambrus Kenyeres
- Aim: EUPOS combination of countries SINEX solutions, coordinates monitoring and estimation of the velocity fields
- Activity transform to EUREF densification project

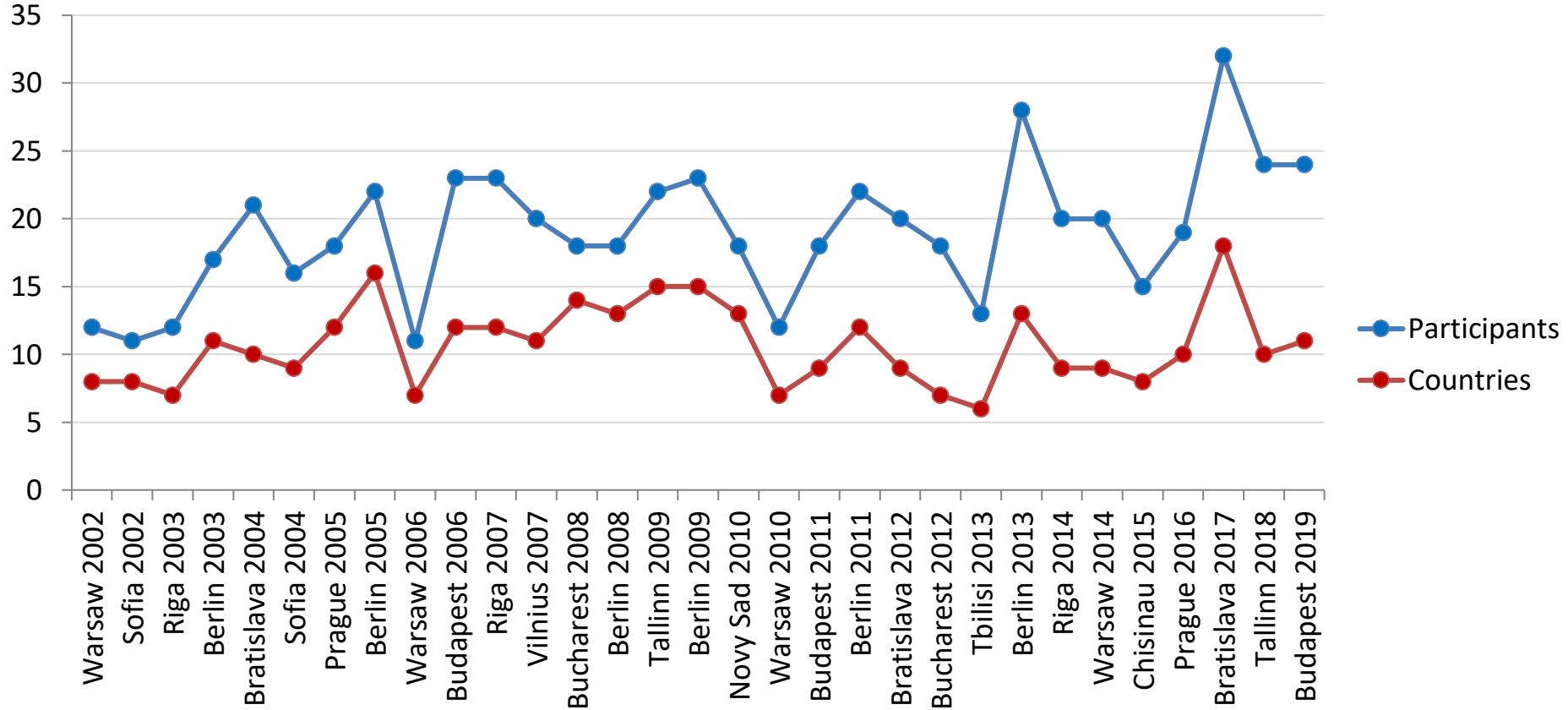


EUPOS WG on service quality monitoring (SGM)

- head: Karol Smolík
- Aim: common monitoring of countries network RTK solution
- http://monitoringeupos.gku.sk



EUPOS MEETINGS PARTICIPANTS EVOLUTION (2002 – 2021)



- 30 meetings
- Average numbers: 19 participants / 11 countries

EUPOS DOCUMENTS

GUIDELINES AND STANDARDS

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EUPOS Terms of Reference

EUPOS Technical Standards

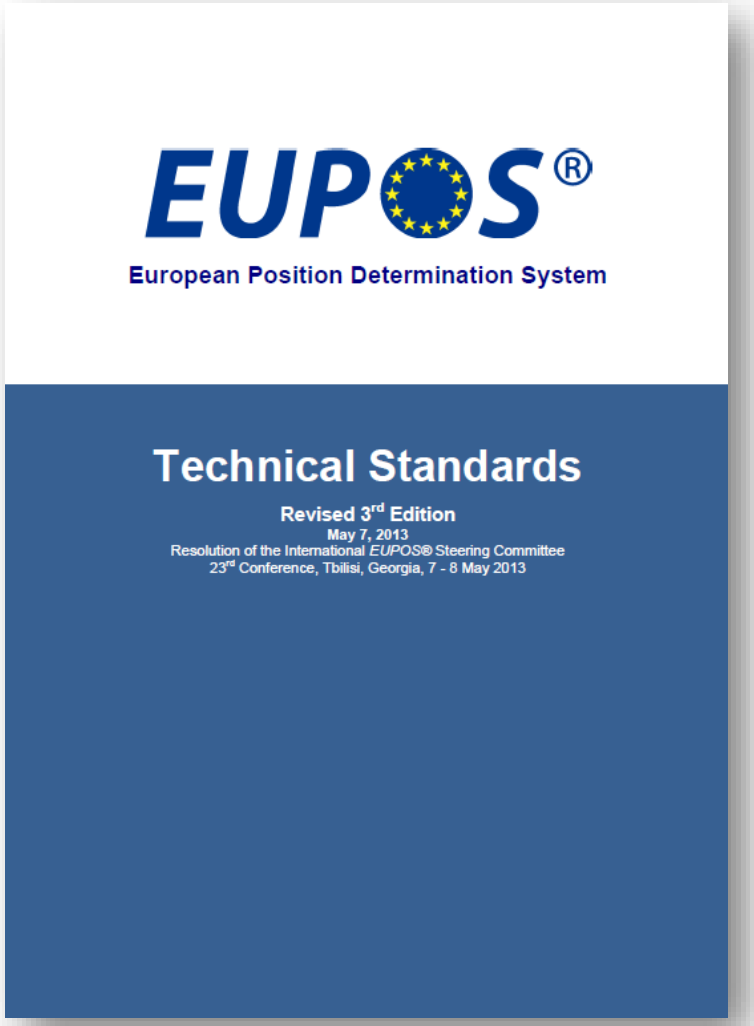
EUPOS Guideline for Single Site Design

EUPOS Guideline for Cross-Border Data Exchange

EUPOS TECHNICAL ISSUES

EUPOS technical standards

- Structure of the network
- Equipment and settings
- Quality measures
- User interface
- EUPOS services
  - 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



ACHIEVEMENTS AND CHALLENGES

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

- Challenges
  - EUPOS via members disposes with 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
    - …

SOME FREQUENTLY DISCUSSED TOPICS IN PERIOD 2017 - 2021

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- *Experience with Network RTK measurements also with Galileo, BeiDou (in Europe)*
- *GNSS signal interference, spoofing, jamming*
- *GNSS metrology – especially for user rovers*
  - *verification, validation, calibration, ...*
- *Common standard or Guideline for RTK/Network RTK surveying*
- *GNSS/InSAR collocation*

SOME FREQUENTLY DISCUSSED TOPICS IN PERIOD 2017 - 2021 - RESULTS

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- GNSS metrology for rovers
  - Czech version – calibration baseline
  - Hungarian version – static measurement

- Existence of Guidelines for users for RTK network surveying
  - Special guideline exists only in Slovakia
  - In other countries different type of instructions, information instead of solo guideline

Guidelines

- CORS collocation with InSAR – positive experience from Slovakia

SOME FREQUENTLY DISCUSSED TOPICS IN PERIOD 2017 - 2021 - RESULTS

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- Experience with Network RTK measurements with Galileo and BeiDou
  - Implementation e.g. in Slovakia show improvement

- GNSS signal interference by radio amateurs
  - It was recognised in Austria (APOS stations)
  - L2 GLONASS frequency was affected
  - Solution: radio amateurs switched from UHF 32 cm to different frequency
  - New Septentrio receivers with adoptive filter were not affected

- Problematic CORS HW/monumentation detection
  - life time of GNSS antennas caused degradation of stations coordinates time series
  - some antennas need to be changed every 10 years

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THANK YOU FOR YOUR ATTENTION

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