



EUPOS

European Position Determination System

EUPOS

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EUROPEAN POSITION DETERMINATION SYSTEM INITIATIVE

Dr. Branislav Droščák

EUPOS chairman & Geodetic and Cartographic institute
Bratislava



CLGE General Assembly

March 22.-23. 2019. Sofia, Bulgaria

WHAT IS *EUPOS*[®]?

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

Workshop
Multifunctional GNSS Reference Station Systems for Europe
4 - 5 March 2002
Berlin



SAPOS®
German National Survey
Satellite Positioning Service

**European Academy
of the Urban Environment Berlin**

Berlin Geodesy
Senate Department
for Urban Development



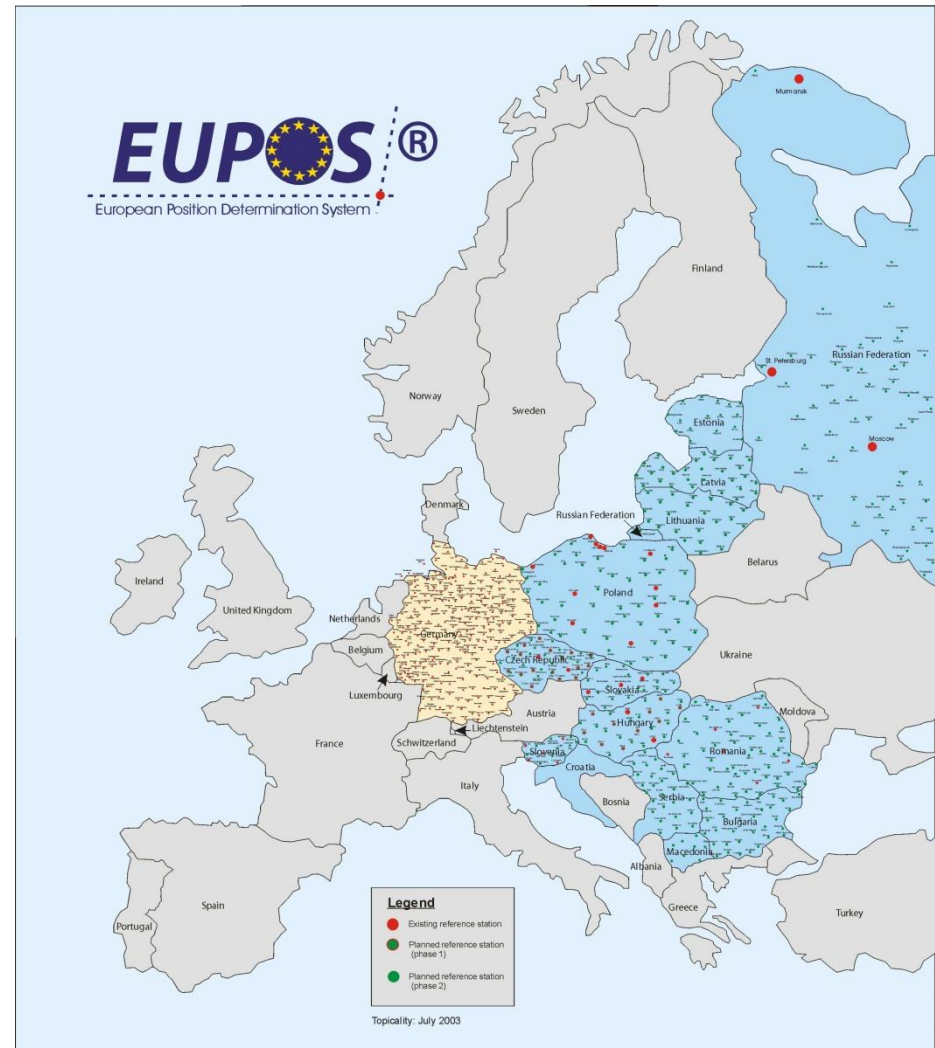
EUPOS FIRST GOAL = RUN THE EUPOS PROJECT

EUPOS Project aim

Set up common permanent station
GNSS networks and positioning
services on the territories of CEE
countries following the example of
German service SAPOS

EUPOS project parameters (in 2003)

- Anticipated number of permanent stations: more than 870
- Anticipated costs: 86 mil. €
- Anticipated financial support:
 - EU funds:
 - ERDF – EU member countries
 - ISPA – pre-accession countries
 - CARDS – Balkan countries
 - TACIS - Russia



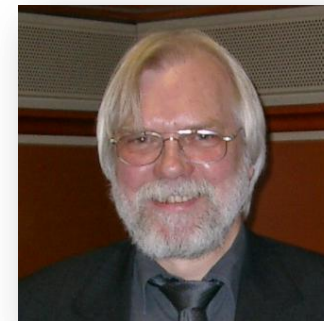
EUPOS BETWEEN 2002-2014 YEARS

- International **EUPOS®** Steering Committee (ISC)
Representatives of all **EUPOS®** member countries | Office (ISCO)
- National **EUPOS®** Service Centers (NSCs)
EUPOS® providers, if not the same
- Authorized **EUPOS®** resellers
- EUPOS®** users
- Manufacturers of **EUPOS** compatible hardware/software
- Resellers of **EUPOS** compatible hardware/software

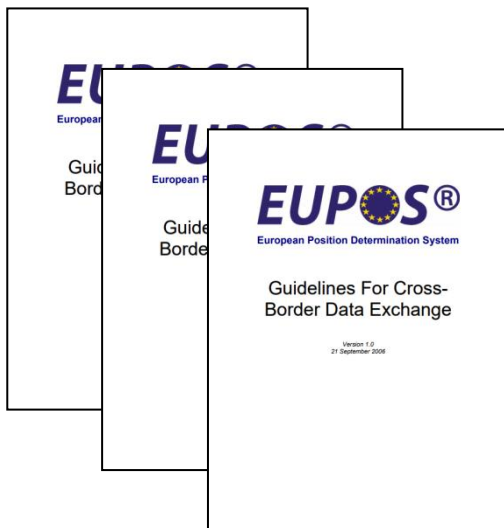
~~EUPOS
common
project~~



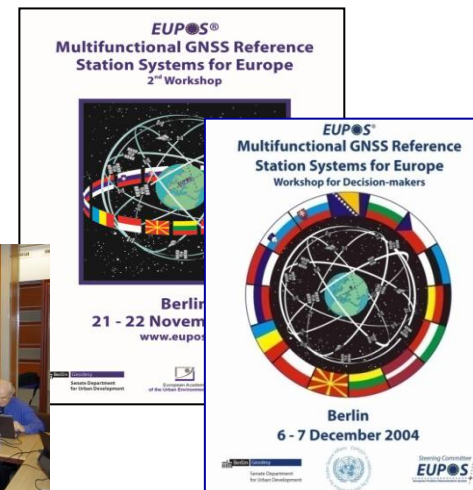
EUPOS Head till May 2013



Common Guidelines creation



EUPOS meetings, GNSS symposia organization



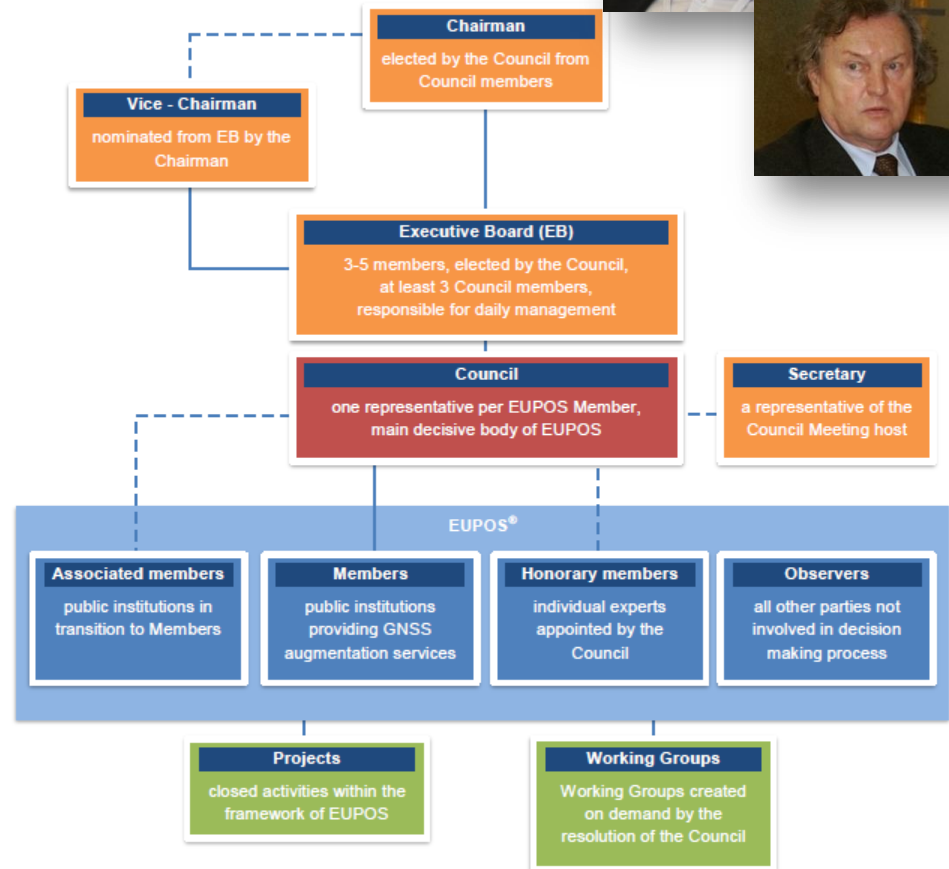
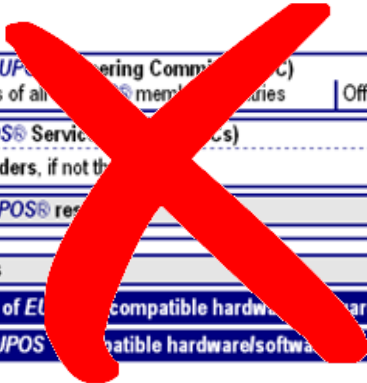
OCTOBER 2014

EUPOS REORGANIZATION

EUPOS meeting in Warsaw

- Revision of the organizational structure
- Revision of the membership

International EUPOS Steering Committee (ISC)	Representatives of all EUPOS member countries	Office (ISCO)
National EUPOS Service Centres (NSCs)	EUPOS providers, if not the NSCs	
Authorized EUPOS resellers		
EUPOS users		
Manufacturers of EUPOS compatible hardware/software		
Resellers of EUPOS compatible hardware/software		



OCTOBER 2014

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- **Act as a European-wide 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**

- **Act as a European-wide 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.*

- **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 ISG 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)

- **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.*

■ Chairman:

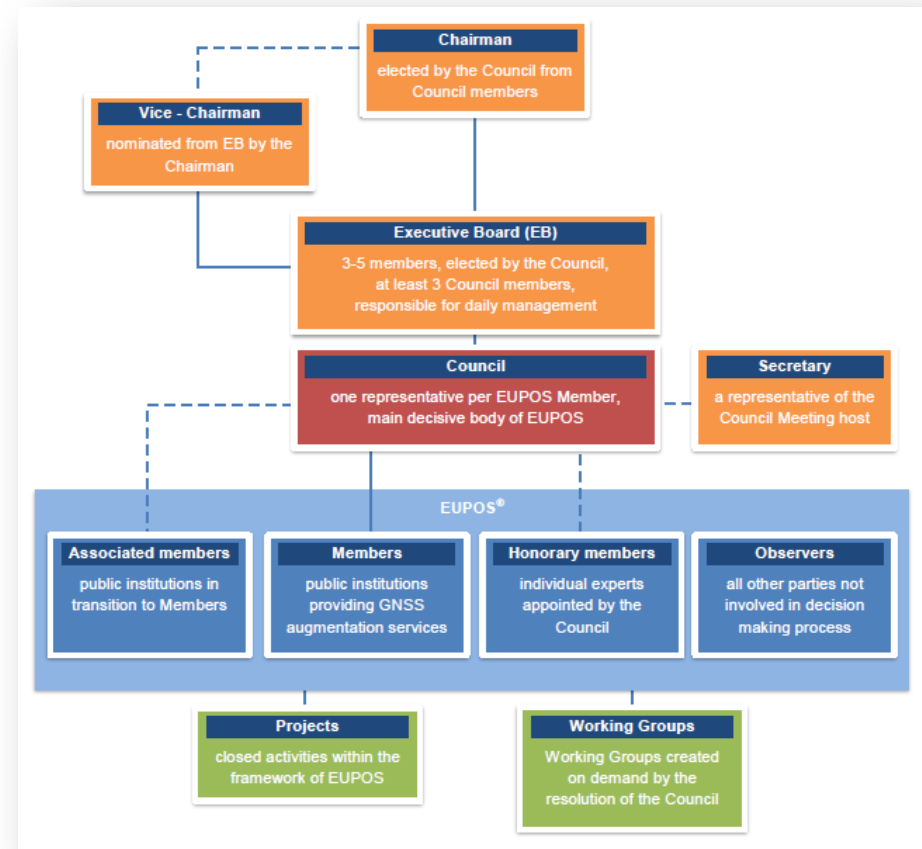
Branislav Droščák (Slovakia)

■ Vice-chairman:

Ingus Mitrofanovs (Latvia)

■ EUPOS Executive board:

- Jaroslav Šimek (Czech rep.)
- Ambrus Kenyeres (Hungary)
- Szymon Wajda (Poland)
- Jan Řezníček (Czech rep.)



EUPOS MEMBERSHIP (MARCH 2019)

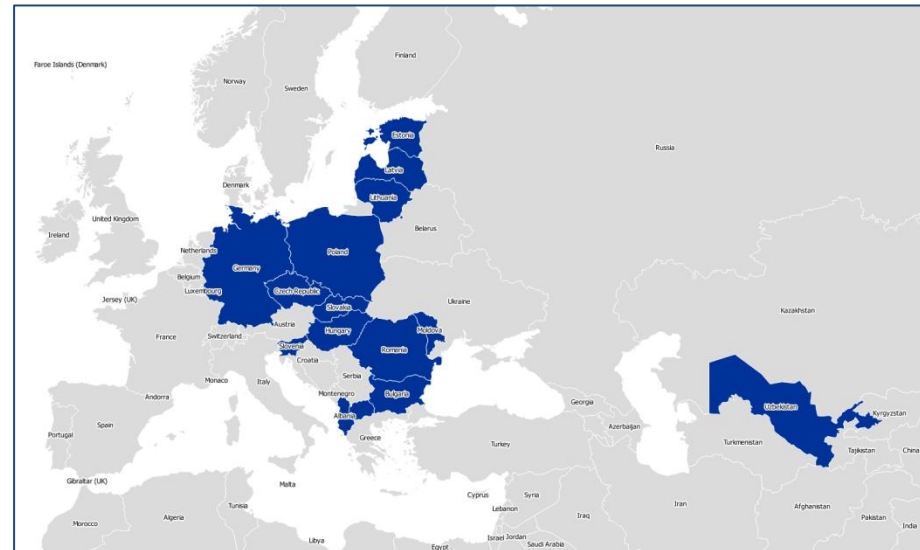
EUPOS[®]

European Position Determination System

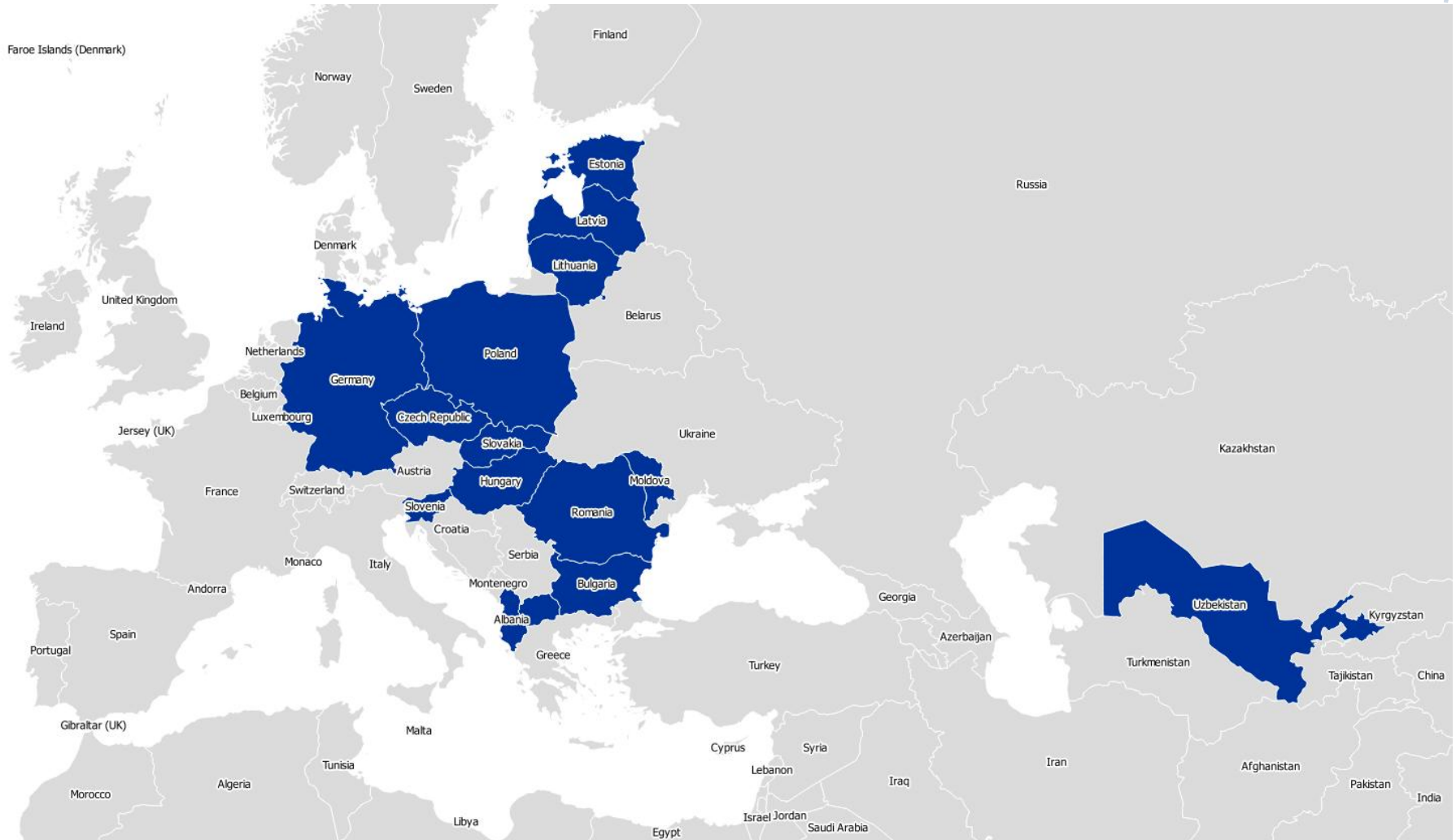
	Member / Abb. of the Institution	Country
1	GKÚ Bratislava	Slovakia
2	VUGTK Zdiby	Czech republic
3	ZÚ Praha	Czech republic
4	SGO Penc	Hungary
5	Land Board Tallinn	Estonia
6	GuGIK Warszawa	Poland
7	Academy of science	Bulgaria
8	NAfCaLR	Romania
9	University of Latvia	Latvia
10	Riga City Council DD	Latvia
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

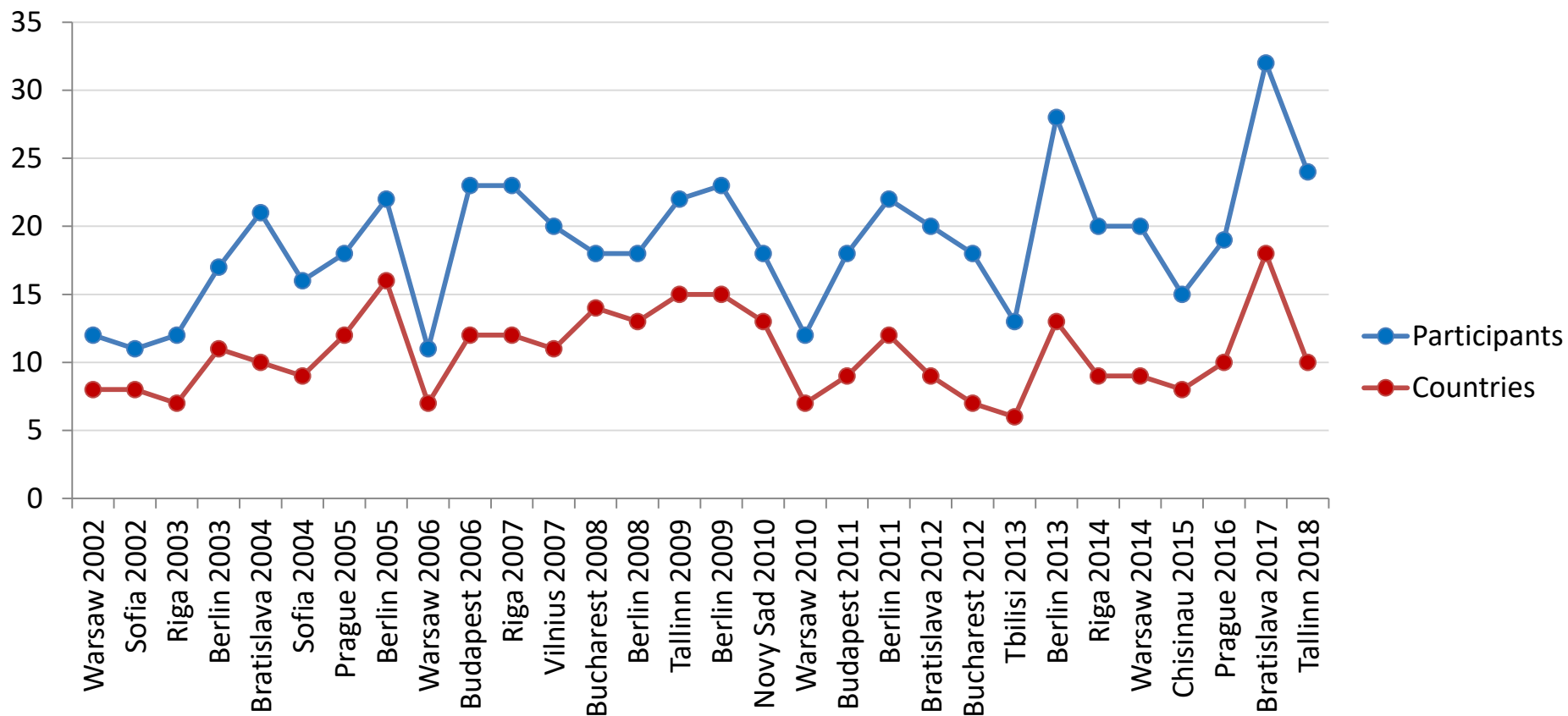


EUPOS MEMBERS (MARCH 2019)



- 15 countries / 19 institutions

EUPOS MEETINGS PARTICIPANTS EVOLUTION (2002 – 2018)



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

Web page

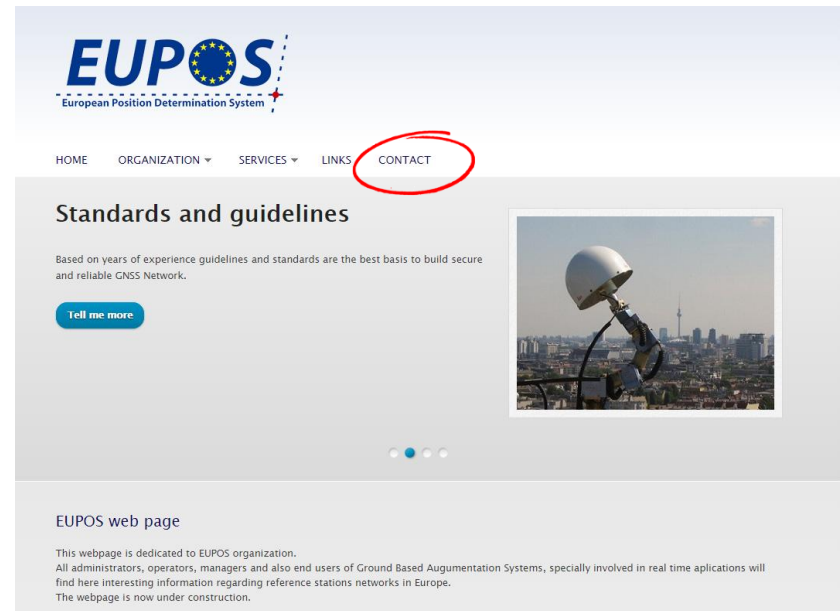
- www.eupos.org
- Administrator: Szymon Wajda

EUPOS Office

- no official EUPOS address
- virtual address via EUPOS web page (Contact item) and email office@eupos.org

People responsible for EUPOS tasks:

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



EUPOS DOCUMENTS

GUIDELINES AND STANDARDS

EUPOS Terms of Reference

EUPOS Technical Standards

EUPOS Guideline for Single Site Design

EUPOS Guideline for Cross-Border Data Exchange



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



Technical Standards

Revised 3rd Edition
May 7, 2013

Resolution of the International EUPOS[®] Steering Committee
23rd Conference, Tbilisi, Georgia, 7 - 8 May 2013

In EUPOS technical standards

- „EUPOS was designed ... to support multi-constellation GNSS Taking into account political and geographical associations, the primary GNSS constellationis European system Galileo.”



- 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 topics recently discussed within EUPOS technical meetings**
 - *Experience with Network RTK measurements with Galileo*
 - *GNSS signal interference*
 - *Cooperation with private permanent networks*
 - *GNSS metrology – especially for user rovers*
 - *verification, validation, calibration, ...*
 - *Common standard or Guideline for RTK/Network RTK surveying*

- 4th EUPOS council (only for members) and technical meeting (members + invited)
 - 32 participants / 18 countries



- “Country “ reports were focused on:
 - GNSS network infrastructure (status + news + ready for Galileo)
 - GNSS metrology – how is it solve in each country
 - Existence of Guidelines for users for RTK network surveying
 - GNSS permanent station protection – status in each country
 - EUPOS Technical standards fulfilment
- GNSS (RTK network) infrastructure software status (invited representatives from Trimble, Leica and Geo++):
 - Current status + news
 - Galileo ready and restrictions
 - Third party receivers support
- EUPOS WG status, Galileo status (GSA), Antenna calibration robot (Geo++)
- EUREF (Kenyeres) and RTCM news (Wubben)
- ...

- 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

- GNSS permanent station protection
 - Physically ensured, legislative nowhere



- GNSS (RTK network) infrastructure software status
 - all companies prepared for Galileo and all GNSS and their frequencies
 - each company has its own solution how to handle increasing number of satellites and frequencies to reduce processing time
- Antenna calibration robot
 - calibration robot will be able to compute PCV for Galileo in near future
- More results from presentations available on meeting web page: <http://www.skpos.gku.sk/eupos/>

- 5th EUPOS council and technical meeting was held in November 2018 in Tallinn
 - 24 participants / 10 countries



- “Country “ reports were focused on:
 - GNSS network infrastructure status + news
 - Galileo readiness
 - Experience with signal jamming, interference, ...
 - Experience with mixture of hardware brands
 - Users’ feedback - most criticized issues
- Experience with Network RTK measurements with Galileo (invited representatives from the Netherlands, Sweden)
- GNSS signal interference by radio amateurs (Austria experience)
- Problematic CORS HW/monumentation detection (Slovakia)
- Double stations and network densification experience (Sweden)
- CLGE needs for GNSS RTK service operators (Kakko)

- Experience with Network RTK measurements with Galileo
 - Implementation of Galileo in Sweden (2016) does not show and great improvement – we have to wait
- 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



- The nearest meeting will be held in autumn 2019 in Budapest
- Host organization: Satellite geodetic observatory Penc
- Topics under preparation:
 - Members networks news, status
 - Experience with
 - Galileo
 - jamming, interference
 - EPSG standards
 -

The logo for the European Position Determination System (EUPO) features the word "EUPO" in a bold, blue, sans-serif font. The letter "O" is replaced by the flag of the European Union, which consists of a blue circle with twelve yellow stars. To the right of the "O" is the letter "S" in the same blue font. A horizontal dashed line runs through the middle of the "O" and "S".

EUPO

European Position Determination System

THANK YOU FOR YOUR ATTENTION

Dr. Branislav Droščák

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