

EUPOS (European Position Determination System) a Cooperation of 17 European Countries for Union Use of Spatial Data

Ivo Milev
Technet GmbH
Berlin, Germany



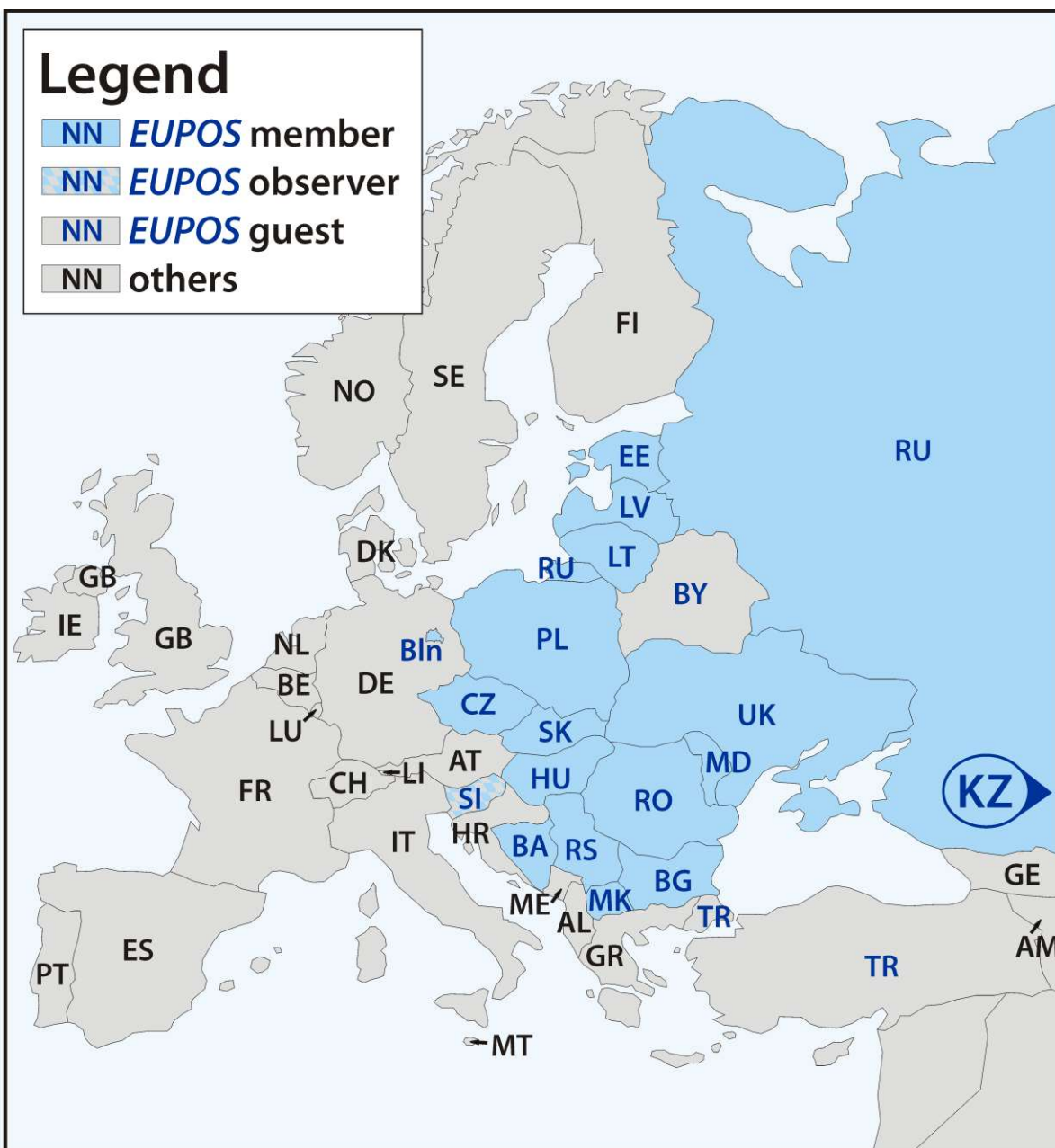
7th FIG Regional Conference - Spatial Data Serving People - Land Governance and
the Environment - Building the Capacity
Hanoi, Vietnam
19 -22 October 2009

Introduction

- About EUPOS
- Activities and Standardization
- Segments and Services
- Equipment and used transportation Layers
- International cooperation
- Exchange of Spatial Data
- Conclusions

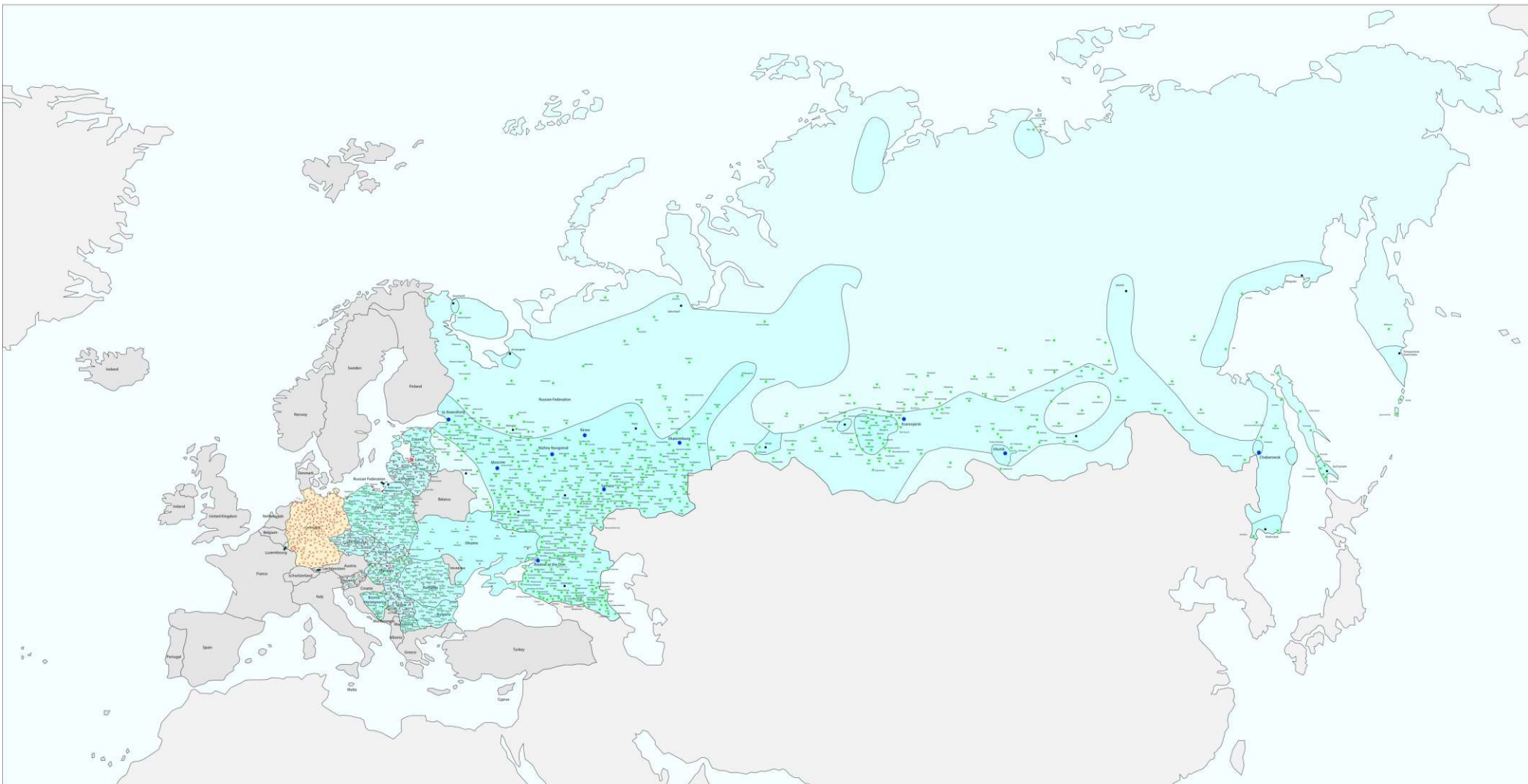
Legend

- NN **EUPOS** member
- NN **EUPOS** observer
- NN **EUPOS** guest
- NN others



EUPOS members

Bosnia and Herzegovina
 Republic of Bulgaria
 Czech Republic
 German state Berlin (ISCO)
 Republic of Estonia
 Republic of Hungary
 Republic of Kazakhstan
 Republic of Latvia
 Republic of Lithuania
 (FYROM) Republic of
 Macedonia
 Republic of Moldova
 Republic of Poland
 Romania
 Russian Federation
 Serbia
 Slovak Republic
 Ukraine
 Slovenia (observer)



Topicality: February 2008

Legend
Existing Reference Station
Planned Reference Station

Legend Russia	Topicality: May 2003
EUPOS® Geodetic (98 RS)	
EUPOS® DGNS, RTK, Geodetic (402 RS)	
EUPOS® Networking Centers (10)	
Reference Station	

Bosnia and Herzegovina, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Russian Federation, Serbia, Slovakia, Ukraine, Slovenia (observer status), Berlin, Hamburg (consultative)

Ivo Milev
International EUPOS® Steering Committee

7th FIG Regional Conference Slide 4
Hanoi, Vietnam, 19-22 October 2009

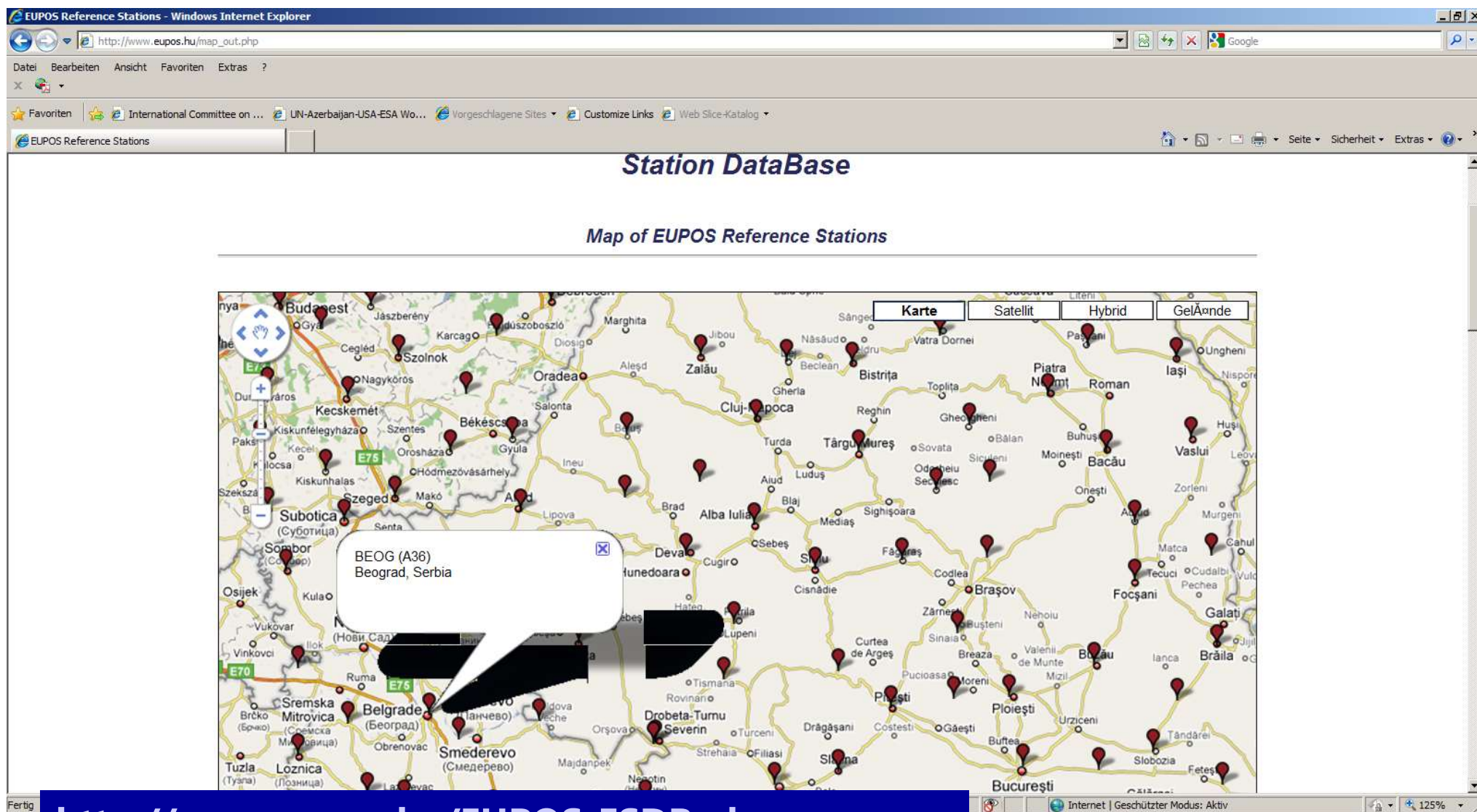
EUPOS Country (ISO 3166)	Areal [km²]	Planed RS	Realised RS	EUPOS Country (ISO 3166)	Area [km²]	Planed RS	Realise d RS
BA	51,000	26	(in 2009)	LT	65,300	25	25
BG	110,950	23	12	MK (FYROM)	25,434	14	7
CZ	78,870	27	27	MD	33,700	15	2
DE/ Berlin	891	4	4	PL	323,520	98	98
EE	45,220	17	9	RO	237,500	73	58
HU	93,030	36	35	RU	17,075,400	> 100	> 100
KZ	2,724,900	500	0	RS	88,360	32	32
LV	64,600	10	10	SK	46,025	21	21

EUPOS Station Data Base

The screenshot shows a web browser window titled "EUPOS-ESDB - Windows Internet Explorer". The address bar shows the URL "http://www.eupos.hu/EUPOS-ESDB.php". The browser's menu bar includes "Datei", "Bearbeiten", "Ansicht", "Favoriten", and "Extras". The toolbar shows various icons for navigation and search. The main content area displays the EUPOS logo and the text "European Position Determination System". Below this, the title "Station DataBase" is centered. A grid of 18 national flags is shown, each with its corresponding country name below it: Berlin, Germany; Bosnia and Herzegovina; Bulgaria; Czech Republic; Estonia; Hungary; Kazakhstan; Latvia; Lithuania; Macedonia; Moldova; Poland; Romania; Russia; Serbia; Slovakia; Slovenia; and Ukraine. Below the flags, the text "EUPOS Stations Map" is displayed. At the bottom, there is a section titled "ESDB Club Login" with input fields for "User Name:" and "Password:", and an "Enter" button. The browser's status bar at the bottom indicates "Internet | Geschützter Modus: Aktiv" and a zoom level of "100%".

<http://www.eupos.hu/EUPOS-ESDB.php>

EUPOS Station Data Base



EUPOS Station Data Base

Poland - Windows Internet Explorer

http://www.eupos.hu/stations1.php?country=poland

Poland

EUPOS Reference Stations in Poland

Station ID	City or Town	RTCM ID	Approximate ETRS 89 Cartesian coordinates			Approximate ETRS 89 Geographic coordinates						
			X	Y	Z	Latitude			Longitude			Height
			[m]	[m]	[m]	[°]	[']	["]	[°]	[']	["]	[m]
BART	Bartoszyce	BART	3490900	1327100	5153200	+54	15	0	+020	48	60	90
BIAL	Bialystok	BIAL	3526500	1507000	5079500	+53	07	60	+023	08	20	190
BILG	Bilgoraj	BILG	3747400	1569000	4900800	+50	31	50	+022	43	10	240
BOGI	Borowa Gora	BOGI	3633800	1397500	5035300	+52	28	30	+021	02	10	140
BOR1	Borowiec	BOR1	3738400	1148200	5021800	+52	16	40	+017	04	20	120
BPDL	Biala Podlaska	BPDL	3616000	1544400	5005400	+52	02	10	+023	07	40	200
BRAN	Bransk	BRAN	3566400	1502000	5053300	+52	44	30	+022	50	20	170
BUZD	Busko Zdroj	BUZD	3805100	1439300	4896200	+50	27	60	+020	43	10	300
BYDG	Bydgoszcz	BYDG	3647200	1184600	5079600	+53	08	0	+017	59	40	100
CBKA	Warszawa	CBKA	3654400	1407800	5017600	+52	12	50	+021	04	0	130
CCHN	Ciechanow	CCHN	3610600	1357000	5062800	+52	52	60	+020	35	50	170
CHEL	Chelm	CHEL	3678800	1598100	4942800	+51	07	50	+023	28	50	260
CHOJ	Chojnice	CHOJ	3608500	1141400	5116900	+53	41	40	+017	33	10	200
CHOS	Choszczno	CHOS	3694300	1018600	5081600	+53	09	50	+015	24	50	110

<http://www.eupos.hu/EUPOS-ESDB.php>

Internet | Geschützter Modus: Aktiv

Some selected *EUPOS* activities

Development of Private Service Messages (RTCM data encryption) in the frame of the Radio Technical Commission for Maritime Services (RTCM).

To draft a definition of interoperability applicable to ground-based Differential GNSS (DGNSS) networks and services together with IGS (ICG/WGA/SEP2007).

“Full scale accuracy” DGNSS demonstration projects as example Ghana with Leica Geosystems

United Nations/Azerbaijan/United States of America/ Euro-pean Space Agency
Workshop on the Applications of Global Navigation Satellite Systems, Baku,
Azerbaijan,
11–15 May 2009

(Raw formulation of a recommendation) ... Recognizing the potential of space-based geodetic techniques, in particular the GNSS and DGNSS reference station networks, for the use of a modern and precise continental reference frame in Eurasian tectonic plate to reach interoperability between different countries, the Workshop promote following recommendations:

1. Use the reference frame ETRF in Eurasia.
2. Taking in account the progress of EUREF, EUPOS in Central and Eastern Europe, and SIRGAS in Latin America and the Caribbean, and willingness to follow this experience by some Eurasian countries, the Workshop encourages these countries to apply membership in EUREF and EUPOS. ...



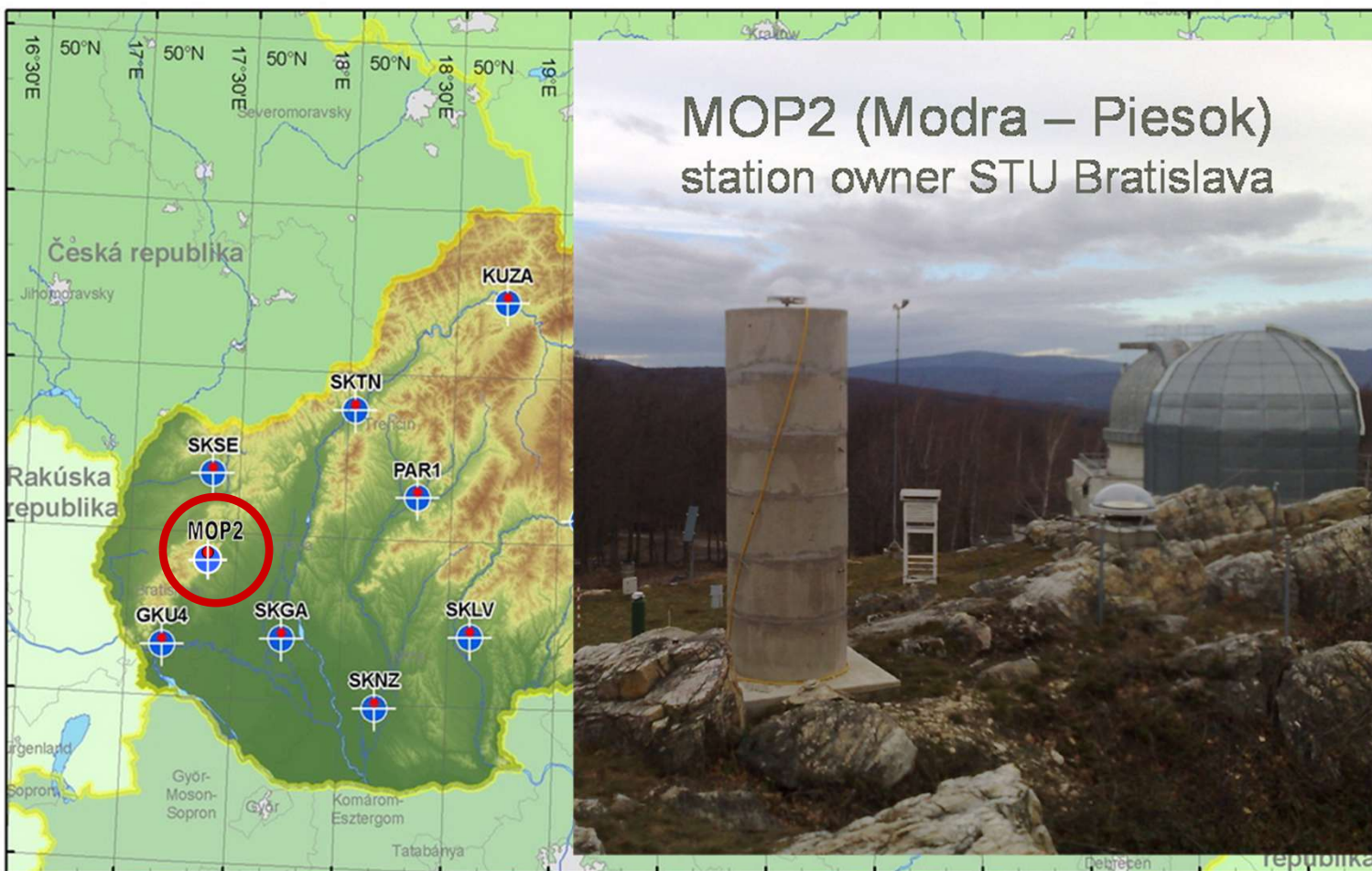
SC-104 Differential GNSS Standardization

Participants include vendors, service providers, and government agencies from around the world

Standards are subjected to performance and interoperability testing prior to adoption and publication

**Standards address the use of all GNSS's, individually or concurrently
Standards address GNSS interoperability issues**

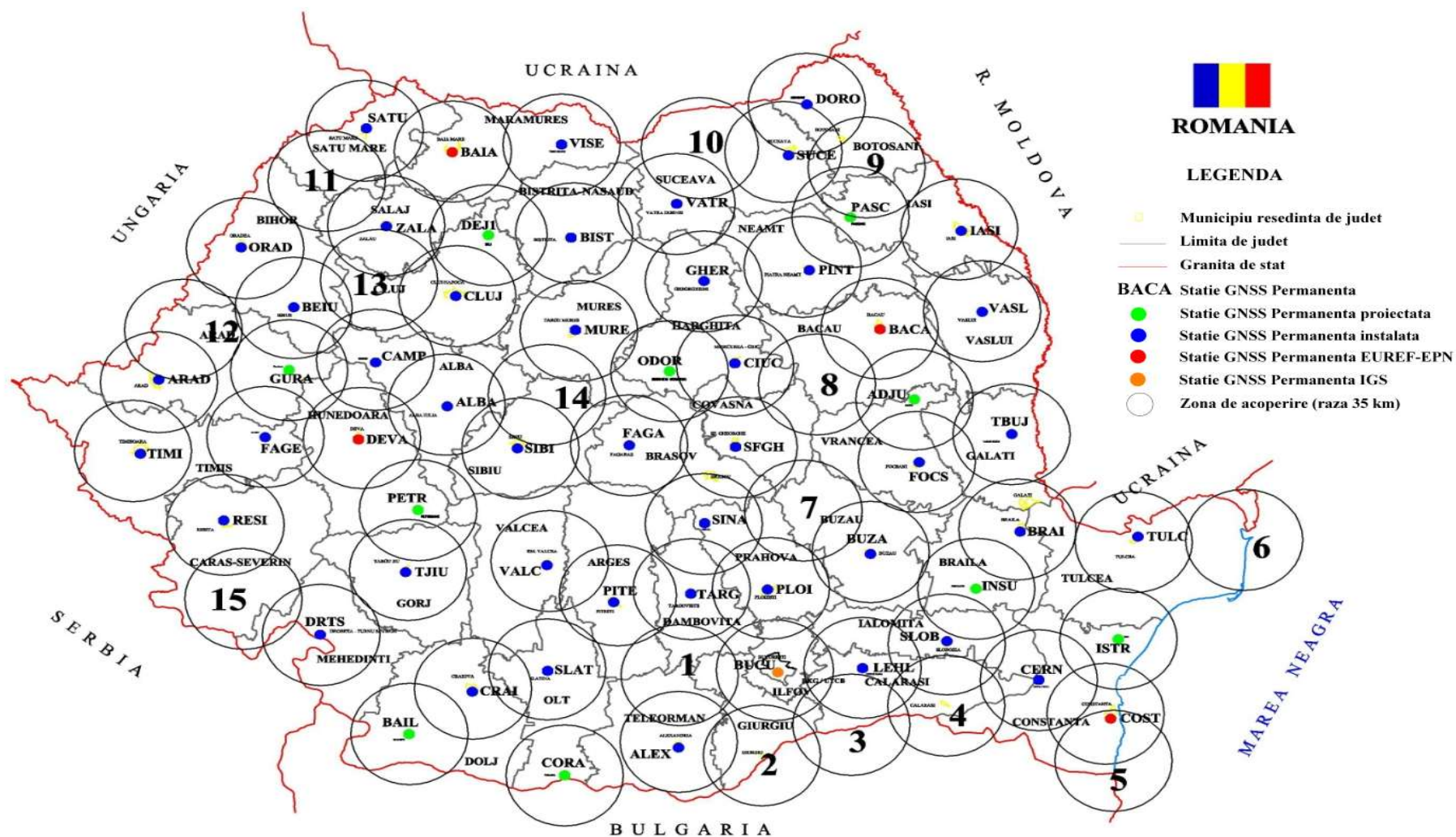
SKPOS Slovakia



EUPOS Transmitted correction models

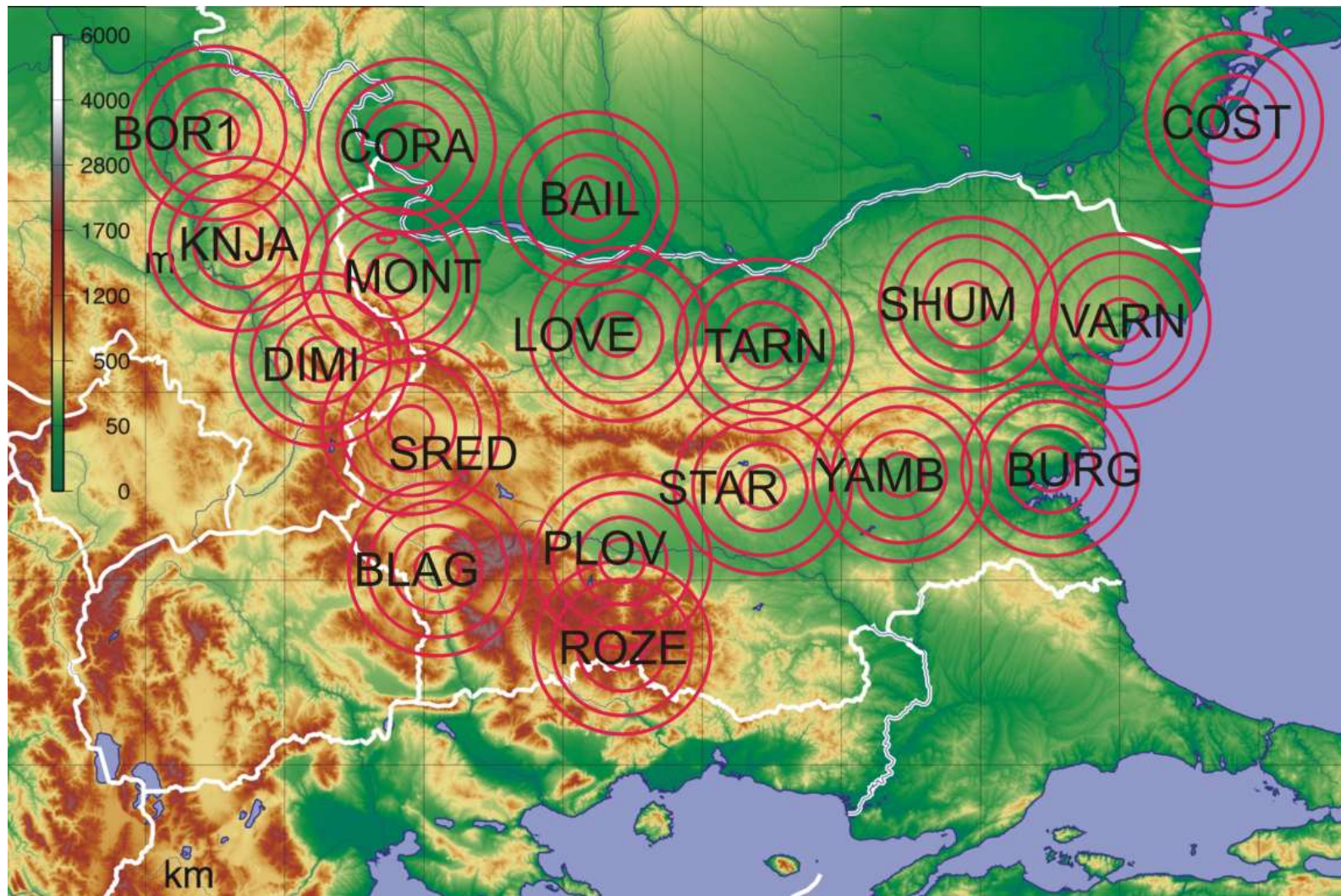
- FKP – area modeled corrections
- VRS – Virtual Reference Station (non physical ref. station)
- MAC – Master **Auxiliary Concept**

EUPOS -ROMPOS

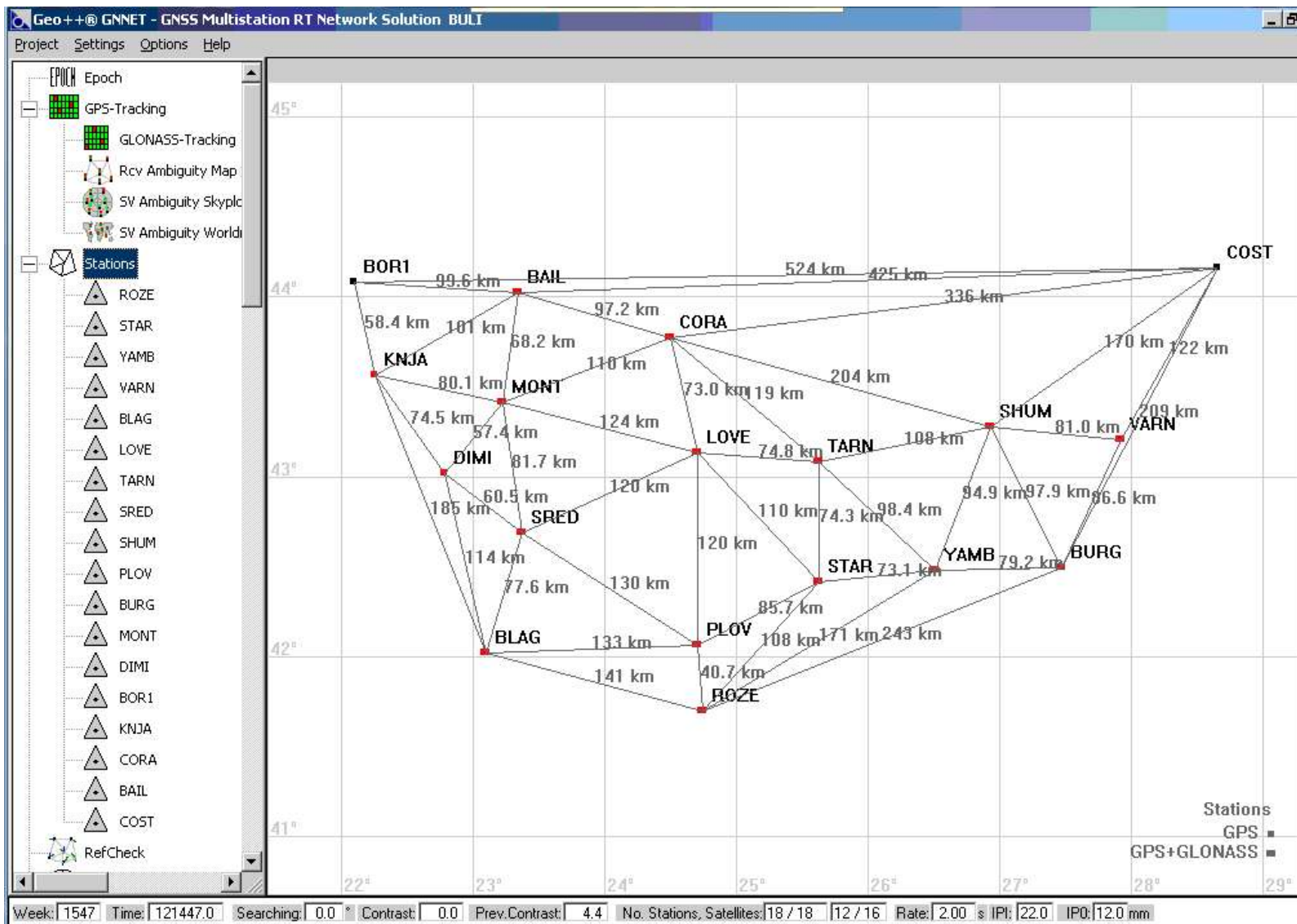


Flood and disaster management projects along the Danube river

BULiPOS (BULgarian Intelegant POSition determination System).



EUPOS Balkan Trans-border Interoperability



EUPoS Services

Service	Description	Accuracy	Format*	Transport Layer	DGNSS System
BULiPOS PP	Post processing	5 mm	RINEX	Internet	GPS+GLONASS
BULiPOS VS	Post processing virtuals station	5 mm	RINEX	Internet	GPS+GLONASS
BULiPOS RT Precise	Real time processing high accuracy	<2 cm	RTCM 2.x, RTCM 3.x	GSM, GPRS	GPS+GLONASS
BULiPOS RT	Real time processing	0,5-3m	RTCM 2.x, RTCM 3.x	GSM, GPRS	GPS+GLONASS

*Based on ETRS89

Typical used Rovers and standardized exchange formats

Topcon GRS-1	Trimble R6	Trimble Geo XH	Leica GPS 900	Magellan ProMark 500	Spectra Epoch 35
-----------------	---------------	-------------------	------------------	-------------------------	---------------------

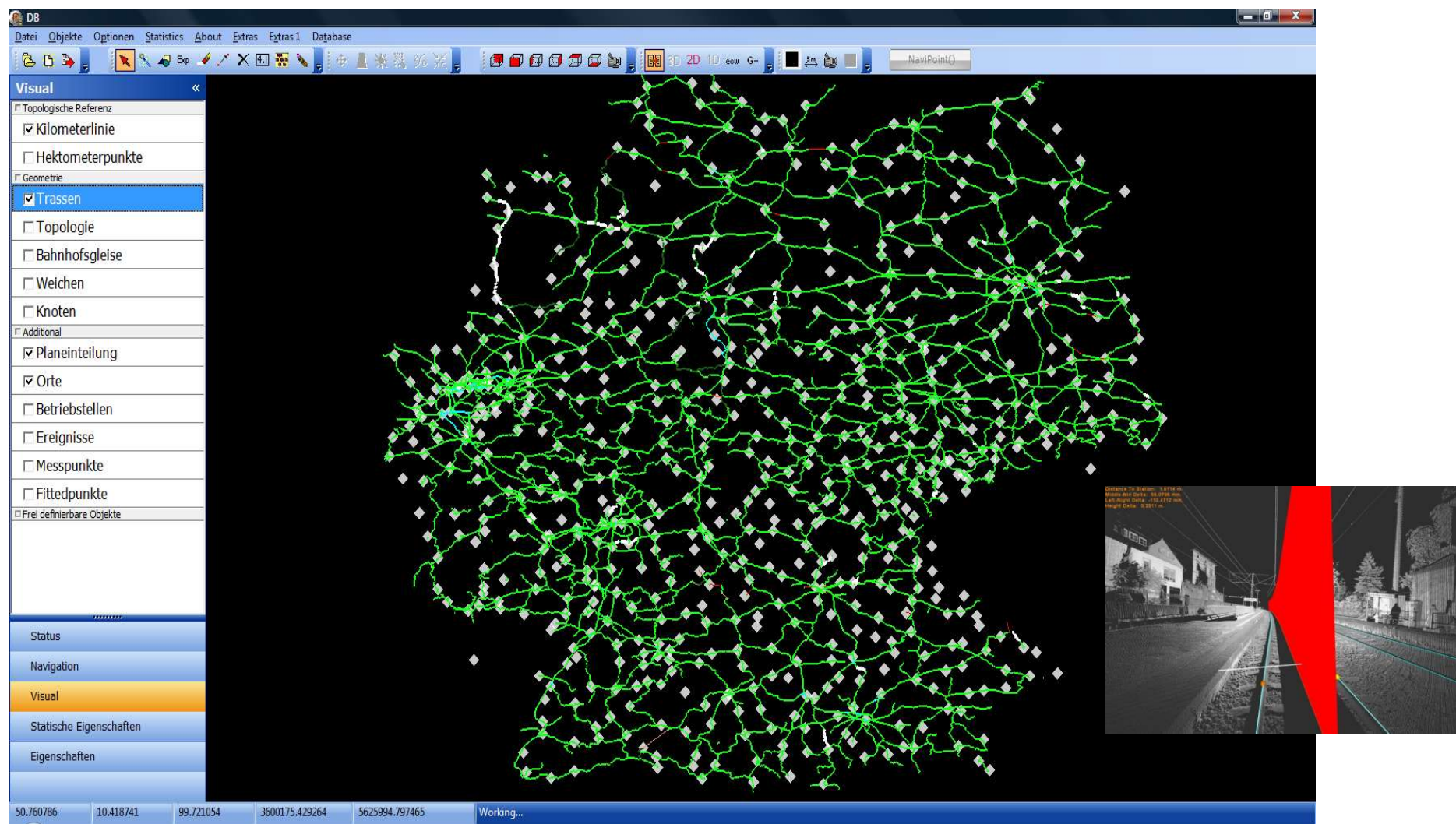


72 RTCM 2.3, 3.* CMR/ CMR+	72 RTCM 2.3, 3.1 CMR/ CMR+	26 RTCM 2.3, 3.0	72 (54) Leica / CMR/ CMR+	75 RTCM 2.3, 3.1 CMR /CMR+	54 RTCM 2.3, 3.0 CMR
----------------------------------	-------------------------------------	------------------------	---------------------------------	-------------------------------------	----------------------------

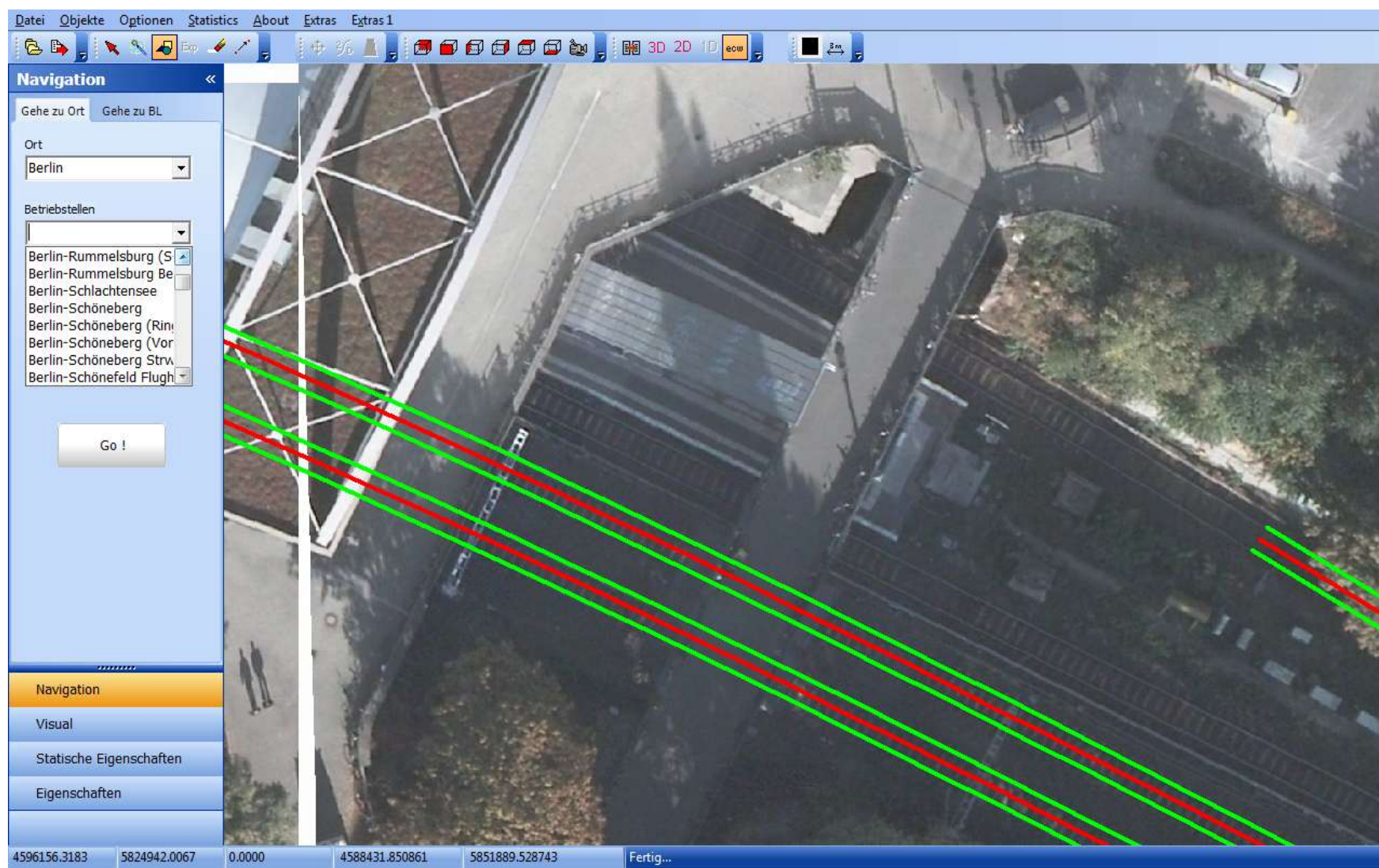
Spatial Data Definition

- Also known as *geospatial data* or *geographic information* it is the data or information that identifies the geographic location of features and boundaries on Earth, such as natural or constructed features, oceans, and more. Spatial data is usually stored as coordinates and topology, and is data that can be mapped. Spatial data is often accessed, manipulated or analyzed through Geographic Information Systems (GIS).

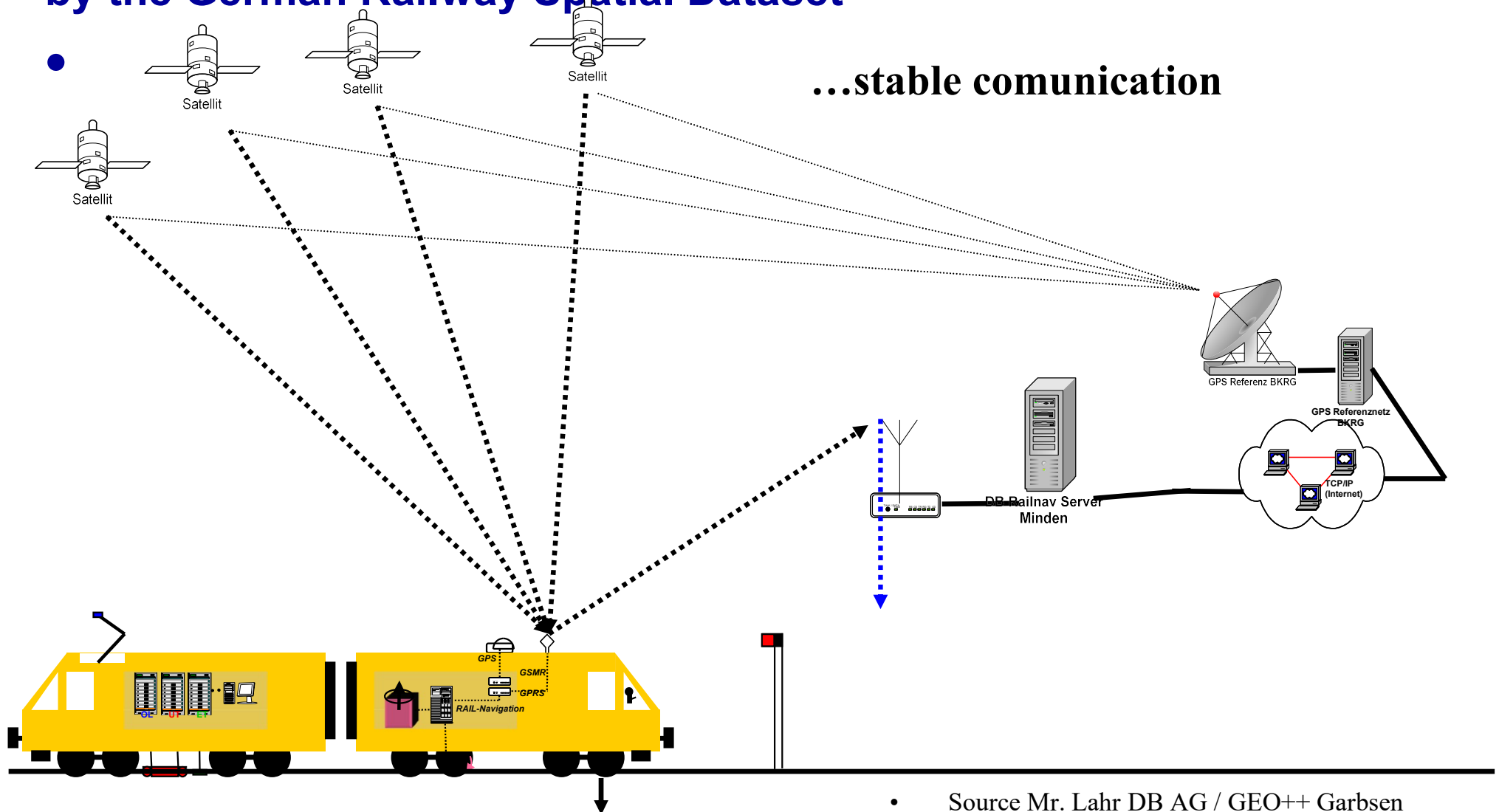
Railway spatial Database for rising the infrastructure maintenance performance



Railway spatial Database for rising the infrastructure maintenance performance



EUPOS/SAPPOS-based Vehicle Scheduling and Control System of by the German Railway Spatial Dataset



Länge: 9°24'23,43"
Breite: 46°48'37,20"
Höhe: 709,1m
Zeit: 12h33'07"

Erosion and Bathymetric Monitoring on the Black Sea Coast by the Blom Remote sensing Group



Spatial reference



0 0 573996.0419 4785770.679
 11755 0 575811.3473 4785770.679
 11755 7897 575811.3473 4783068.524
 0 7897 573996.0419 4783068.524

Reduce the costs by buying only a base – option – second rover.

Very quick solution fixing using a good reference network design

Reducing the need for searching reference points.

Easy agreement with the neighbor countries because it is a community based on the same interests

Full coverage in the border regions – homogeneous

The customer profits from this level of standardization

Action is needed in the spatial data exchange

EUPOS is a integrated part of the development of DGNSS infrastructure and rises the acceptance for the exchange and common use of spatial data use ITRF/ETRF as common Frames

Thank you for your attention!

Office of the International **EUPOS**® Steering Committee
c/o Senate Department for Urban Development, section Geodetic Reference
Systems

Fehrbelliner Platz 1, 10707 Berlin, Germany

phone +49 30 - 90 12 - 56 15, fax +49 30 90 12 - 37 09

gerd.rosenthal@eupos-isco.org and ivo.milev@technet-gmbh.de





**International Symposium on
Global Navigation Satellite Systems,
Space-Based and Ground-Based
Augmentation Systems and Applications
2009**



Berlin, Germany, 30 November - 2 December 2009

Location of the event is the Rathaus Wilmersdorf
Fehrbelliner Platz 4, 10707 Berlin, Germany

Contact: Senate Department for Urban Development IIIB
Fehrbelliner Platz 1, 10707 Berlin, Germany
phone: +49 30 90 12 56 15; fax: +49 30 90 12 37 09
e-mail: gerd.rosenthal@senstadt.berlin.de

www.stadtentwicklung.berlin.de www.eupos.org www.unoosa.org www.icgsecretariat.org