ROMANIAN ACTIVE GEODETIC REFERENCE NETWORK. THE EVOLUTION OF THE ROMANIAN POSITION DETERMINATION SYSTEM – ROMPOS

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Abstract: *This paper propose a general presentation of what ROMPOS means for surveying in our country. Also, highlights the evolution of the system in last period and the future prospects to develop the system and provide better quality services for our users. The article ends with some conclusions about ROMPOS capabilities.*

1. GENERAL OVERVIEW

ROMPOS represents a GNSS augmentation system, which has as the main framework a network consisted of 75 GNSS reference stations (see figure below):

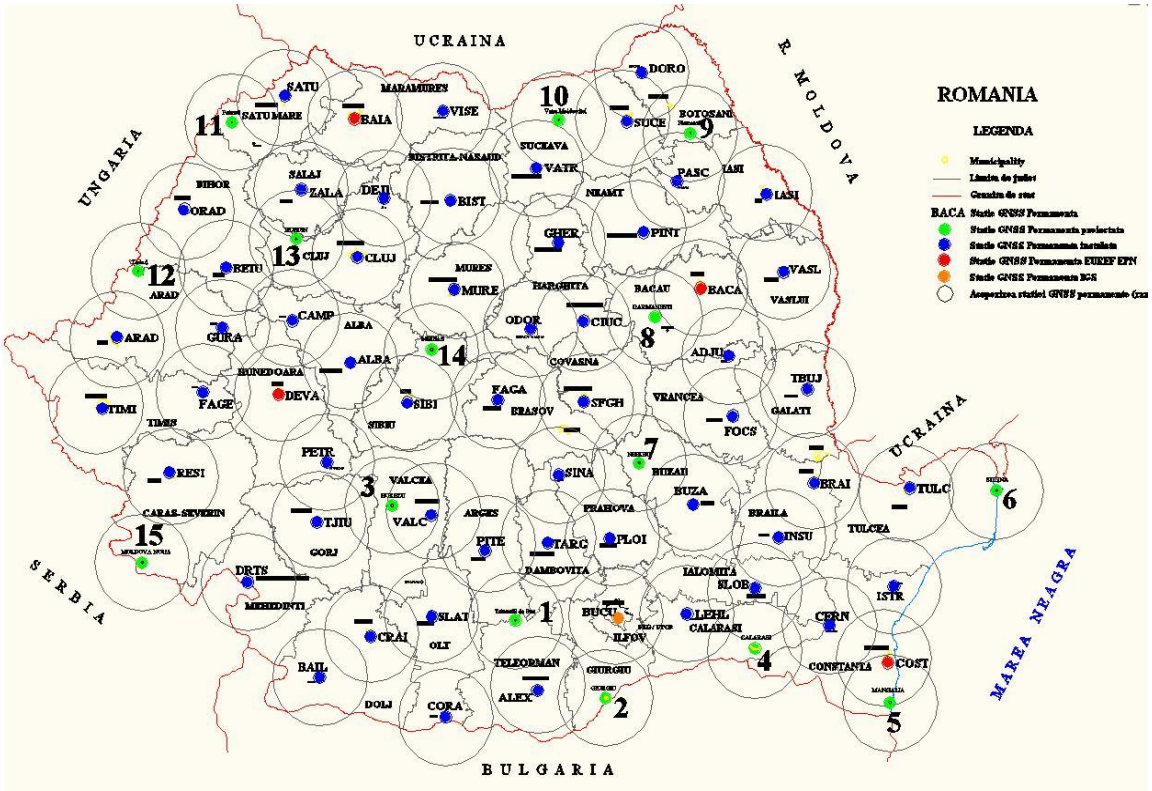

Fig. 1 – The 75 ROMPOS GNSS reference stations

These 75 reference stations are included in A - class National Space Geodetic Network (see table 1):

Table 1 – Main features of the Romanian GNSS Space Geodetic Network

Applications	*Class*	*E (cm)*	*Realization by*
First class national geodetic network Regional and local geodynamic, deformation projects, engineering surveying, et al.	**Ao/A**	**1.0**	***Permanent stations 74 ANCPI*** ✓ ***+1 TUCE*** ✓
Second class national geodetic network connections to primary network, engineering surveying, landslides	**B**	**2.0**	***Epoch stations 306 points*** ✓ ***(2003)***
Third class national geodetic network engineering surveying, cadaster	**C**	**3.0**	***about 4750 points (1pt/50km^2)~100 pts/county*** *Realization 100%*
Fourth class national geodetic network cadaster, GIS et al.	**D**	**5.0**	***(1pt/5km^2) (Finalized only for Bucharest area)***

For real time precise positioning, it is used the principle of differential corrections (see figure no. 2):

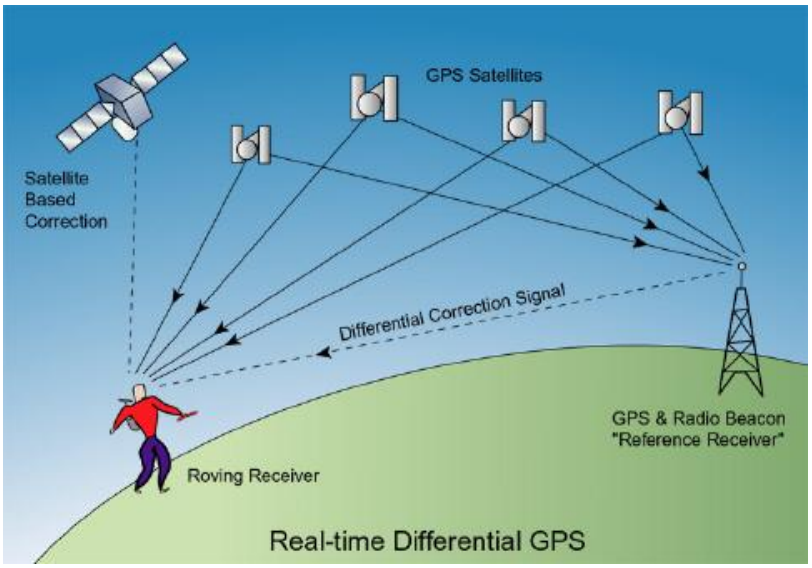

Fig. 2 – The general principle of differential corrections

The most GNSS permanent stations are installed on local offices for cadaster and land registry (OCPI). Also, a few reference stations are hosted by smaller cadaster and land registry bureaus (BCPI) and municipalities of the villages, towns or cities.

Technical University of Civil Engineering of Bucharest, through Faculty of Geodesy hosted the first GNSS reference station in Romania, which was installed in 1999. After that, in 2001 were installed another 6 permanent stations, such that in Romania in 2004 there were

14 GNSS equipment, in 2006, 28, in 2007, 48, in 2009, 58, in 2010, 60 and, finally, in 2012 the network is completed with 75 GNSS reference station.

ROMPOS – Romanian Position determination System – was officially launch in September 2008 and until today it has seen some major improvements.

2. ROMPOS TODAY

Nowadays ROMPOS is a modern solution for real time precise positioning. Please see in the bellows figure the main ROMPOS services and the accuracies for every service offered by GNSS permanent network:

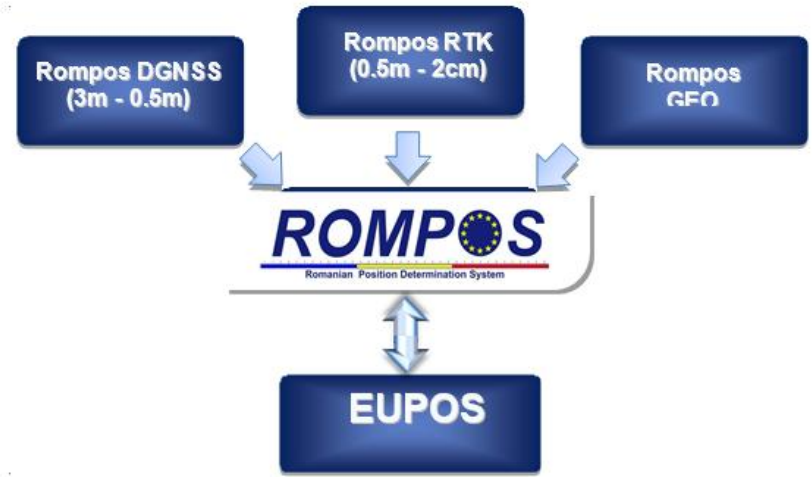

Fig. 3 – ROMPOS services

Also, Romania, through ROMPOS which is a registered mark, is an active member of the Central – East European GNSS network, EUPOS (fig. 3):

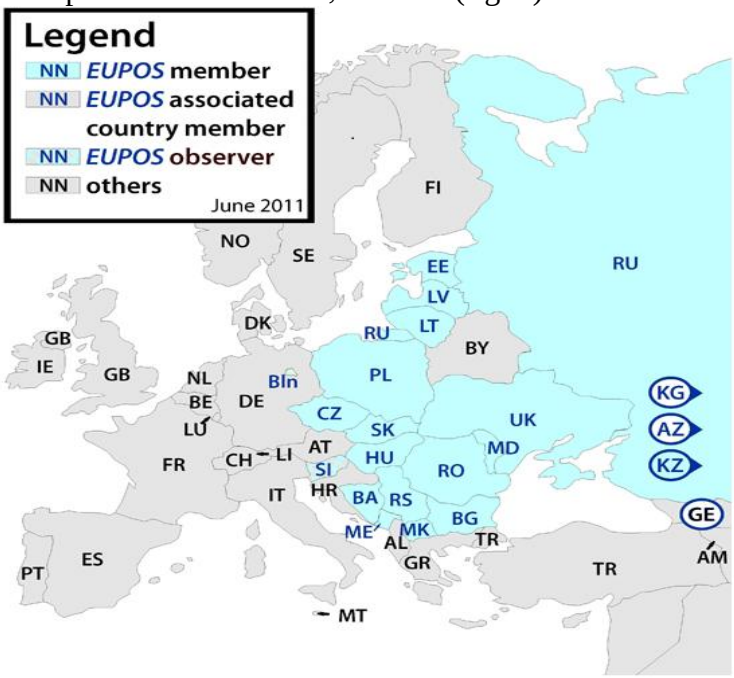

Fig. 4 – The EUPOS network

The network control and monitoring is realized from National Center for GNSS Services, structured accordingly to EUPOS standards (see figure 4):

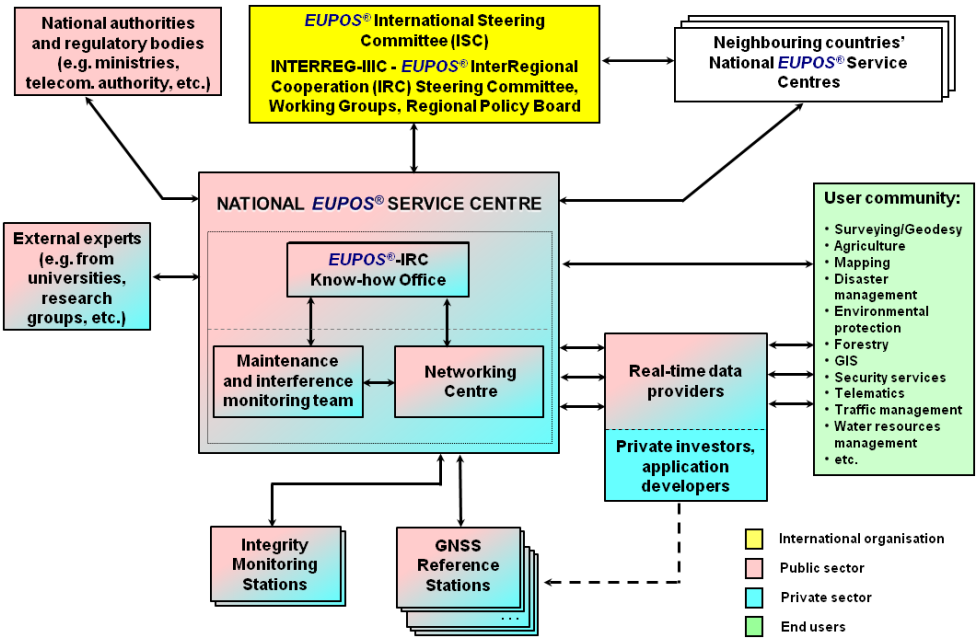

Fig. 5 – Romanian National EUPOS Center – National Center for ROMPOS Services

Information about ROMPOS permanent stations are stored in the EUPOS Station Database (ESDB - fig. 5):

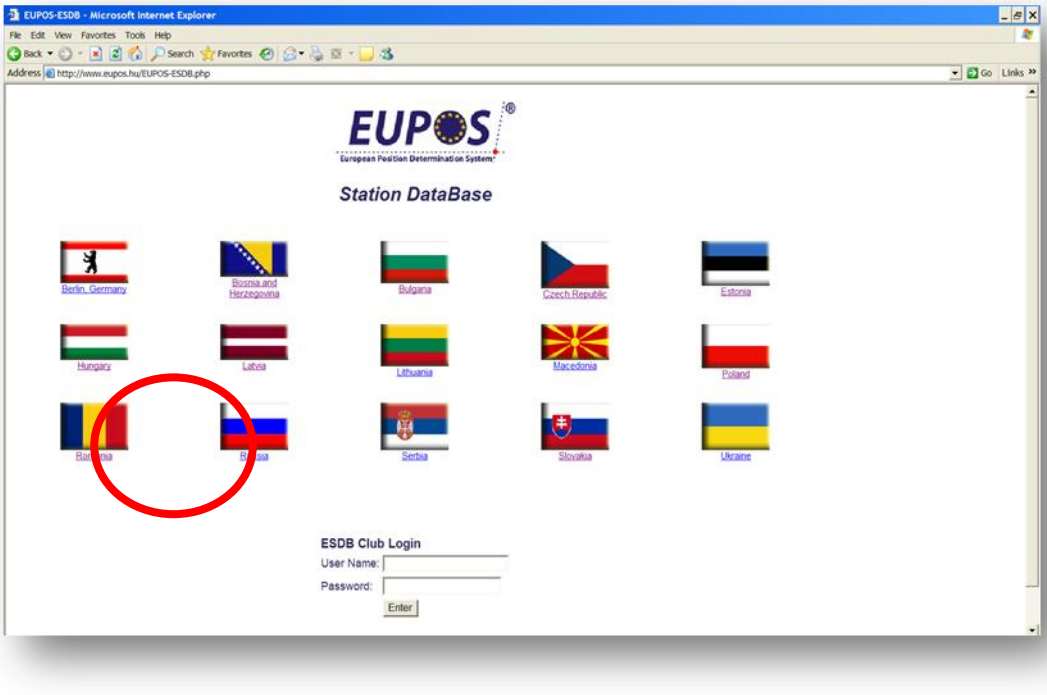

Fig. 6 – EUPOS Station Database (ESDB)

For improving the quality of services in the border areas, Romania signed GNSS data agreements with Hungary, Ukraine and Moldova. With Serbia and Bulgaria the agreements are in preparation. For example, in the bellows figure can be seen the Hungarian border with ROMPOS reference stations and Hungarian reference stations (the yellows):

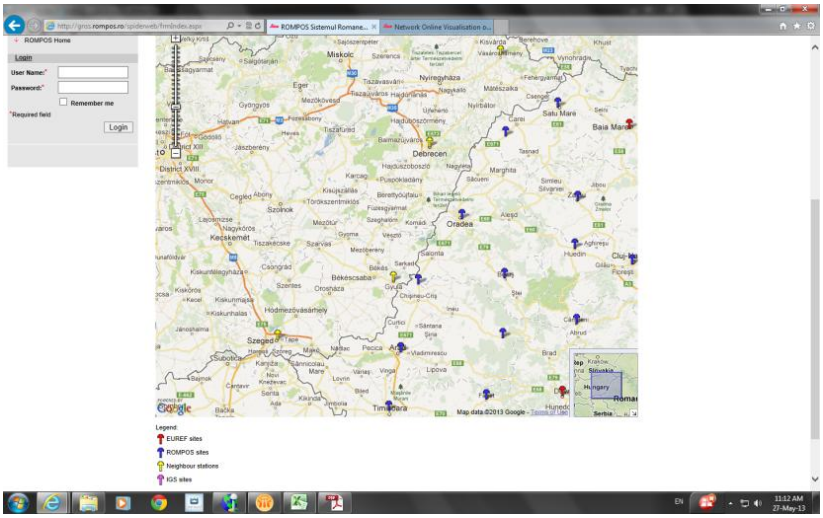

Fig. 7 – Romanian - Hungarian cross border data exchange (the Hungarian GNSS station are marked with yellow color)

3. FUTURE PERSPECTIVES

National center for ROMPOS services, through its specialists and Leica Geosystems specialists on the other side, identified three main ways to improve the quality of services:

a) To implement a completely automatic back-up solution for the central servers

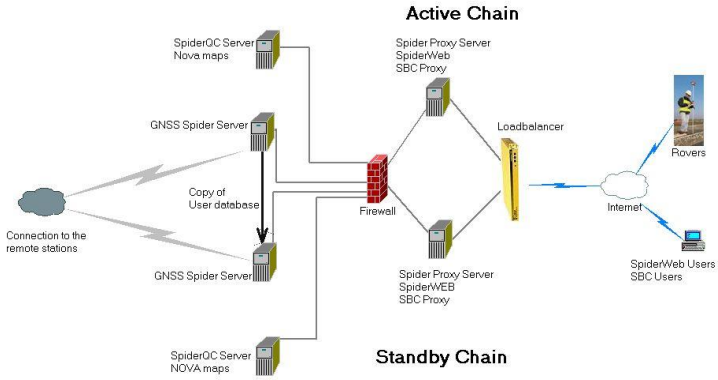

Fig. 8 – Proposed back – up solution for ROMPOS (HA – high availability, proposed by Leica Geosystems AG)

b) To implement a solution for on – line payment of the RINEX files

Fig. 9 – On – line services for RINEX files download

c) To use also ROMPOS real – time services for another kind of applications than cadaster, such as:
   - agriculture;
   - civil engineering;
   - navigation.

4. CONCLUSIONS

ROMPOS represents a ground – based augmentations system used for improving accuracy, reliability and availability of the main satellite navigation systems (GPS and GLONASS, a few stations having capabilities for GALILEO). It is one of the most modern solutions for precise positioning throughout the country and offers good perspectives for continuous development.

On the other side, ROMPOS can be used for another kind of activities that involve real time precise positioning, such as navigation, civil engineering, agriculture, earthquake studies, weather forecast and so on.

5. Bibliography

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