



United Nations/Moldova/United States of America
Workshop on the Applications of Global Navigation Satellite System (GNSS)

ESTABLISHMENT OF MOLDPOS

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CONTENTS

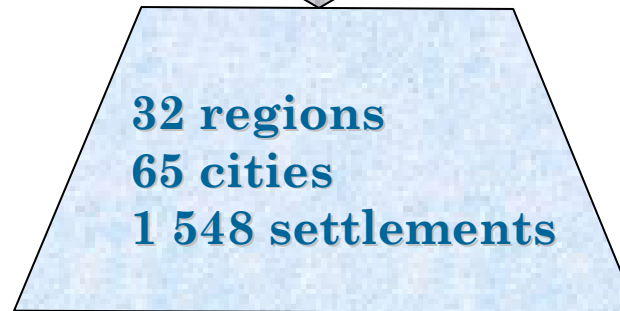
1. Introduction and general data
2. Project background
3. The scopes and objectives of the Project
4. The project components
5. Infrastructure and communication
6. MOLDPOS integration
7. MOLDPOS users
8. Conclusion



GENERAL DATA ABOUT MOLDOVA



- Total area – 33.000 km²
- Capital – Chisinau
- Population – 4,3 mln
- Properties – 5,7 mln





PROJECT BACKGROUND

The Norwegian Mapping Authority - Statens kartverk, has since 2006 administered a Norwegian funded project on the production and efficient use of photomaps in Moldova in close cooperation with the Agency for Land Relations and Cadastre of Moldova.

The Norwegian Ministry of Foreign Affairs, on behalf of the Norwegian Government, has on 28 September 2009 allocated a grant of up till NOK 8 470 000 towards the Project; 'Moldova – Line Maps for Development' that shall be implemented during 24 months starting from the date of the grant letter.



THE OBJECTIVES OF THE PROJECT

The project aims at providing access to reliable and up-to-date geographical information for governmental institutions at all levels, professional users in private sector, and for the public in general.

Facilitate Moldova's integration in the European geographic information service for environmental protection, response to hazards and natural disasters, etc., in compliance with the EU INSPIRE program.



THE PROJECT COMPONENTS

The project consists of two main components, which will be implemented in parallel:

Component 1: Establishment of a system for cost-effective utilisation of satellite based (GPS) surveying for ownership registration and other field activities.

Component 2: Preparing line maps for parts of the Moldavian territory along with establishing capacity at ARLC for subsequent full coverage of the entire territory of Moldova, as well as establishing capacity for quality control of produced maps.



THE PROJECT COMPONENTS

The purpose of Component 1 is to establish a network of continuously operating permanent geodetic reference stations, utilizing modern Global Navigation Satellite System (GNSS) technology, to provide real time position and navigation service on the territory of Moldova.



THE AREA OF THE PROJECT

The proposed network shall cover the territory of the country – 33.000 sq. km. (exclusive Transdnistria) with GNSS stations situated 40-100 km from each other.

The contract notice for the MOLDPOS procurement was recently made publicly available. The dead line for submitting tender offer is 25 June 2010. The contract with a winning company will be signed by the end of August 2010.

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CAPACITY FOR SATELLITE BASED SURVEYING

Component "Capacity for satellite based surveying", contains:

- procurement of 7 reference stations for control of satellite signals, to be installed in the planned project area;

- installation of a system - Control Centre, to deliver satellite signal corrections to professional users for precise surveying in real time, largely speeding up and simplifying surveying of ownership parcels and supporting infrastructure projects and other field activities involving geodetic surveying;

- development of a business model for the precise GPS service, including standard contract provisions and payment regulations, to ensure sustainable operation of the service based on cost recovery;

- execute training of ALRC staff and private surveyors in using precise GPS services.



GEODETIC DATUM OF MOLDOVA

- **The rectangular coordinate reference system for Moldova is called **MOLDREF99**.**
- **The geodetic datum for MOLDREF99 is ETRS89 and GRS80 ellipsoid;**
- **There are totally 495 points available based on MOLDREF99. These are divided into 3 classes/orders:**
 - i) **5 points of 0 class/order**
 - ii) **72 points of 1st class/order**
 - iii) **418 points of 2nd class/order;**
- **The coordinate system is UTM system for small scale mapping (1:25000 – 1:1000000) and the local Transverse Mercator Moldova (TMM) for large scale mapping (1:500 – 1:10000). TMM has following parameters:**
 - **the geodetic longitude of the axial meridian: $L_c = 28^\circ 24'$**
 - **scale factor on the axial meridian: $K_c = 0,99994$**
 - **the conditional abscissa: $X_c = - 5\ 000\ 000\ \text{M}$**
 - **the conditional ordinate $Y_c = 200\ 000\ \text{M}$**
- **The vertical datum is Baltic Sea Level based on Kronstadt zero point;**



THE MODERNIZATION OF NATIONAL GEODETIC NETWORK



In 2007 the Agency, in collaboration with Bundesamt für Kartographie und Geodäsie (BKG) , EUREF and EuroGeographics, has installed and jointly operate the first GNSS permanent station IGEO in Chisinau. This reference station is integrated into the EUREF Permanent Network (EPN) and the International GNSS Service array (IGN).

More information:

<ftp://ftp.epncb.oma.be/pub/station/new>

<http://www.epncb.oma.be/trackingnetwork>

The GPS daily and hourly data of IGEO are available at the BKG and OLG regional data centers, SUT analysis centre and INGEOCAD data server:

<ftp://ftp.ingeocad.md>



SCOPE OF THE PROJECT

With MOLDPOS system it is targeted to enable all users all over the territory of the Republic of Moldova to determine positions through RTK.

It is anticipated that the coverage of the MOLDPOS RTK service will be available within 40 km from the nearest station.

Thus, the distance between the stations is to be 40-100 km on the whole territory of Moldova.



PROJECT COMPONENTS

The work consists of five major tasks:

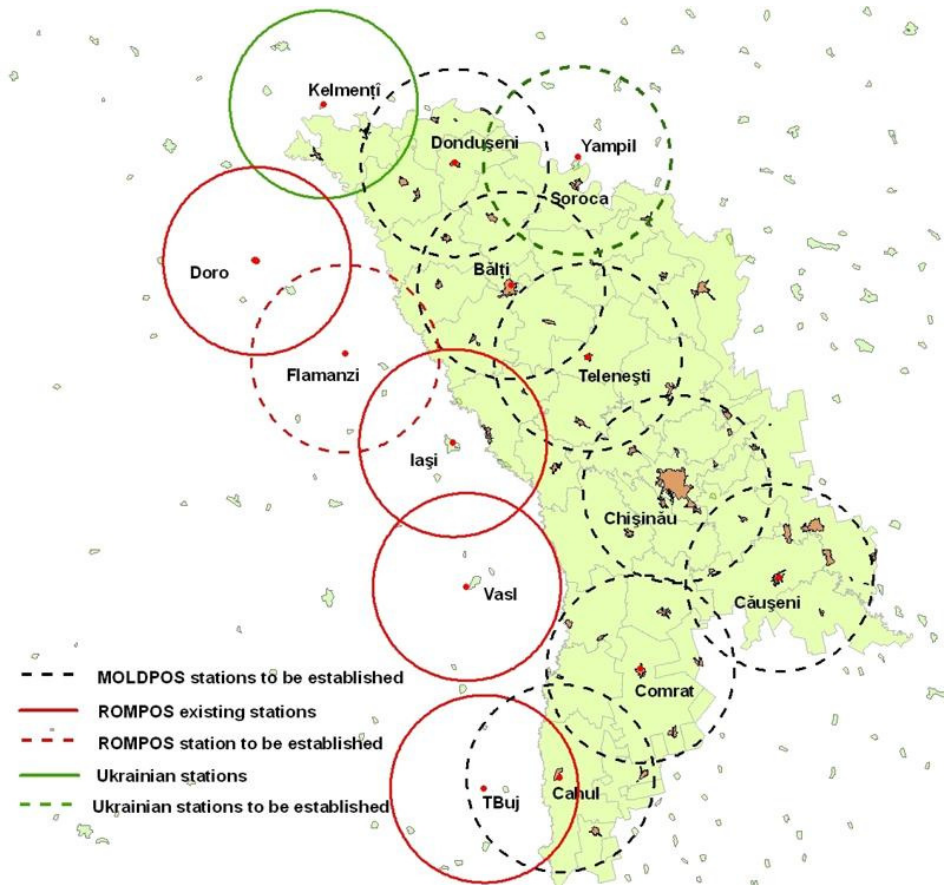
- **MOLDPOS Design and Monumentation**
- **MOLDPOS Site Preparation**
- **Selections of MOLDPOS Receivers and Antennae**
- **Establishment of Control Centre (CC) and**
- **Selection of Control Centre Software**
- **Establishment of MOLDPOS Infrastructure and Communication**



MOLDPOS DESIGN

It is intended to establish

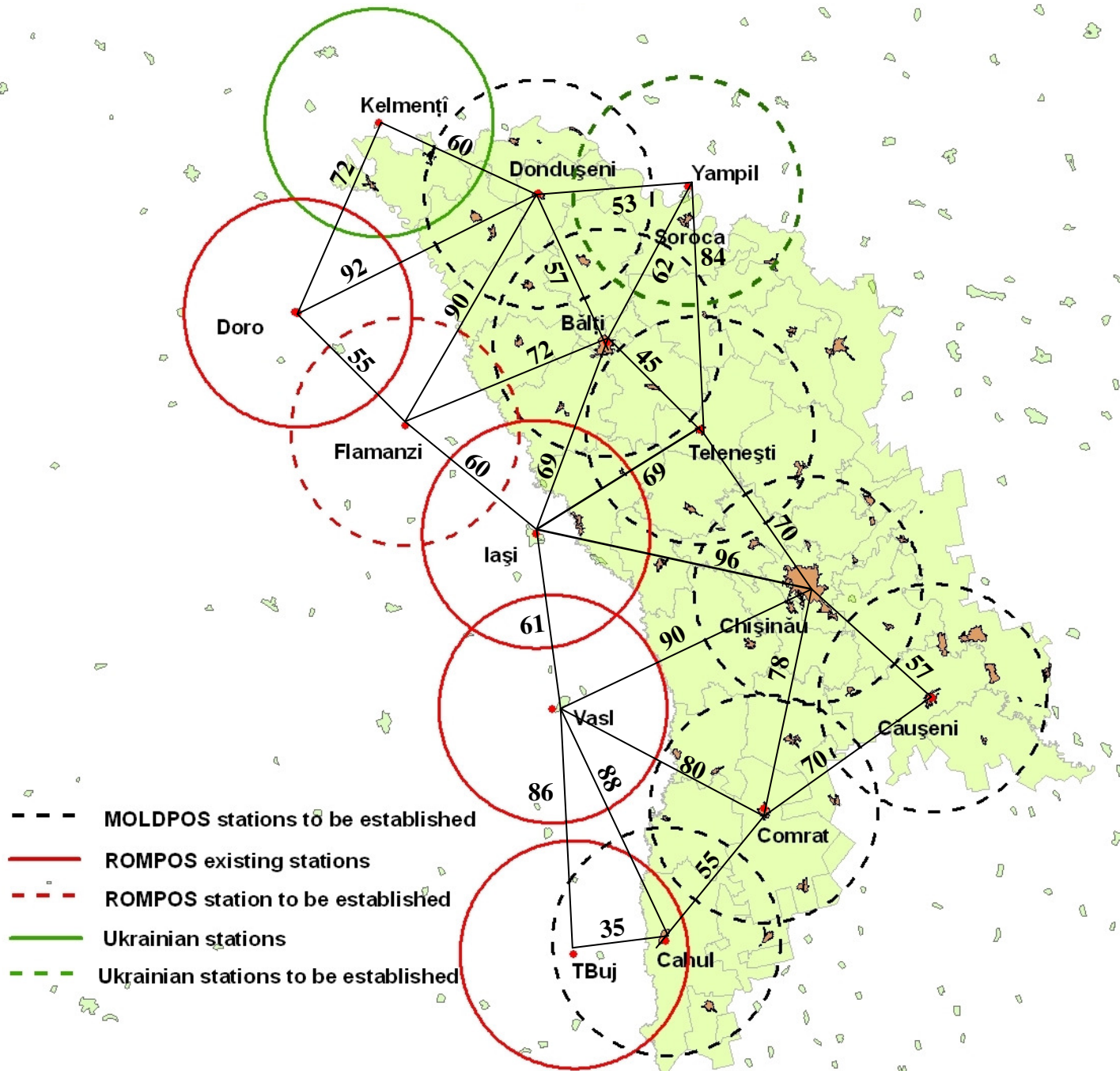
- 7 reference stations evenly distributed over the territory of Moldova, and
- One Control Centre located at the premises of the ALRC, Puskin Street, 47, in Chisinau.





MOLDPOS PERFORMANCE REQUIREMENTS

Ref.	MOLDPOS service	Procedure/ method	Data transfer manner	Accuracy	Data format
3.1	DPS Differential positioning	Code network (incl. phase smoothing) solution in real-time	Wireless Internet (GPRS, UMTS,) NTRIP protocol,	Up to ± 0.5 m	RTCM 2.3
3.2	VPPS* highly precise positioning	Network solution of phase measurements in real-time	Wireless Internet (GPRS, UMTS,) NTRIP protocol,	Up to ± 4 cm (2D) Up to ± 7 cm (3D)	RTCM 2.3 RTCM 3
3.3	GPSS** Geodetic highly precise positioning	Post – processing	Internet (FTP, e-mail)	Up to ± 1 cm (2D, 3D)	RINEX 2.11 RINEX 3



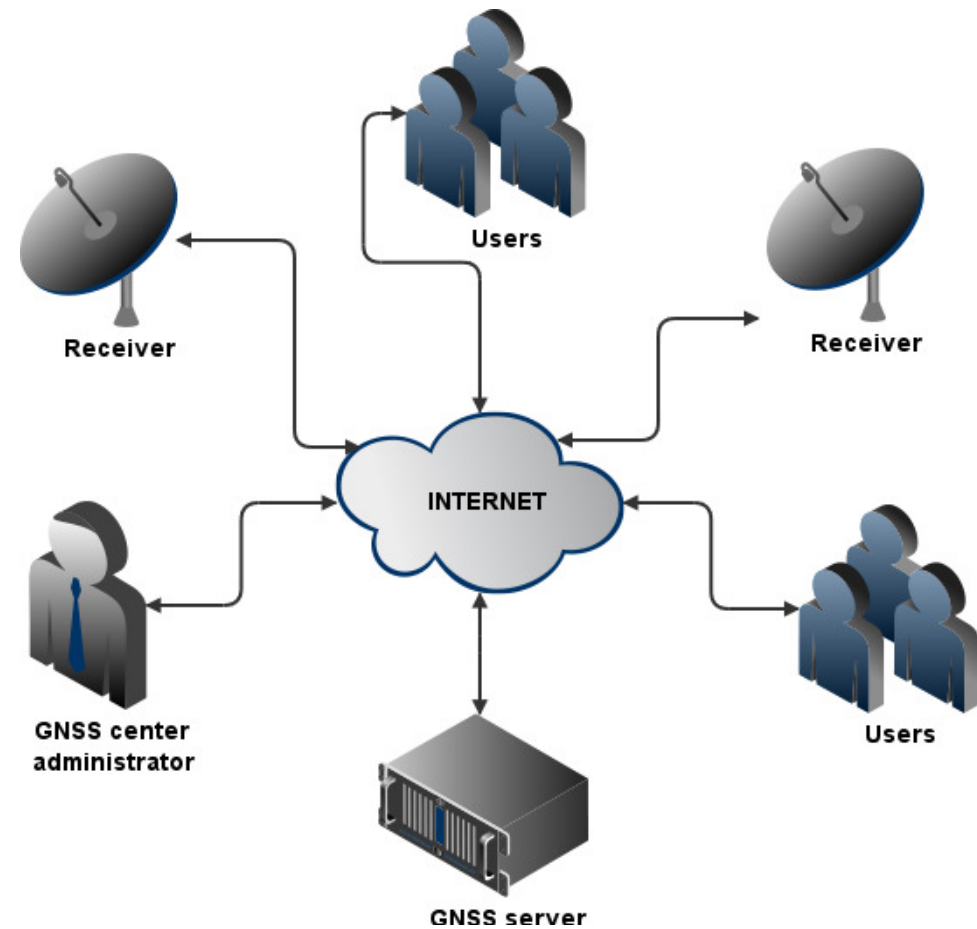


MOLDPOS CONTROL CENTRE

The administration of MoldPOS system will be conducted from one Control Centre.

Communications: RTCM 3.0 or higher and more advanced protocols will be used, e.g.

Transport of RTCM through Internet Protocol communications will be assured.





MOLDPOS INTEGRATION

Moldova is an active member of EUPOS – European Position Determination System; therefore the standards and requirements of MOLDPOS shall comply with those of EUPOS. When operational, MOLDPOS shall be able to provide correction data for real time positioning and navigation as well as observation data for post processing positioning.

As a part of EUPOS, MOLDPOS shall be able to support precise positioning and navigation with high accuracy - metre, sub-metre, centimetre in real time and centimetre and sub-centimetre in post processing, in another words MOLDPOS shall fulfil all accuracy requirements for geodesy and navigation and guarantee availability and quality of the services continuity.



MOLDPOS USERS

- **The Ministry of Agriculture**
- **The Ministry of Transport and Roads**
- **The Ministry of Education**
- **The Ministry of Health and Social Care**
- **The Ministry of Culture and Tourism**
- **The Ministry of Internal Affairs**
- **The Ministry of Foreign Affairs**
- **The Ministry of Defense**
- **The Ministry of Information Technology and Development**
- **The State Service of Standards and Metrology**
- **The Forestry Agency “MOLDSILVA”**
- **The Agency for Land Relations and Cadastre**
- **The Department for the State of Emergency**
- **The Institute of Geography**
- **The Municipality of Chisinau**
- **Private sector:**
 - **Construction Companies**
 - **Private surveyors: about 150 private surveying companies,**
 - **Private Transportation Companies**



CONCLUSION

Moldova has recently started the establishment of the national spatial data infrastructure. This requires the presence of the satellite positioning services being available in the country. When MOLDDPOS is established, it will support significantly the further development of the geodetic and other spatial data infrastructure in Moldova.

All governmental authorities, private sector and public in general will benefit from the project results when Moldova has in place its CORN – MOLDDPOS.

The Norwegian contribution is highly appreciated and support the development of the country.

THANK YOU FOR YOUR ATTENTION!

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