



Republika Hrvatska
Državna geodetska uprava



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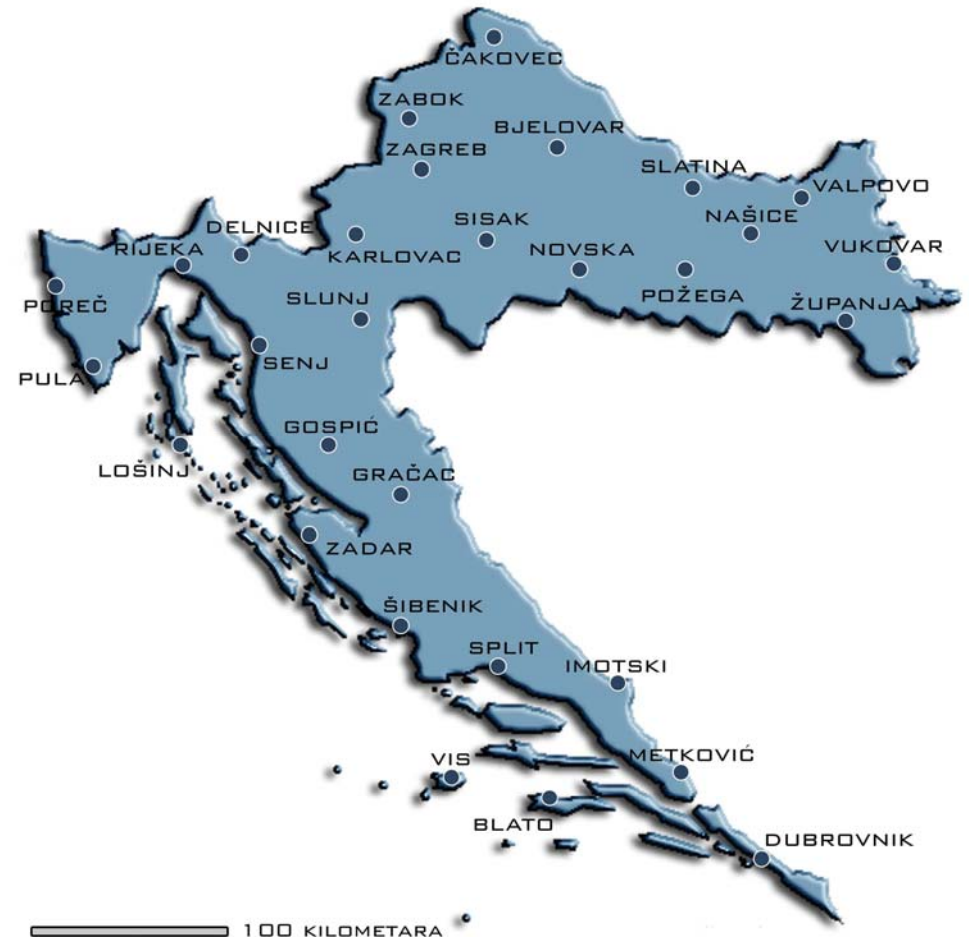
EUREF Symposium 2009
Florence, Italy, May 27-30

CROPOS®

- **CROPOS®** is a State network of referential GNSS stations of the Republic of Croatia enabling its users to determine a position in the real time with the accuracy of more than 2 cm in the entire territory of the Republic of Croatia.
- **launched on December 9, 2008**

CROPOS[®] Network

- collecting the data from the 30 reference stations
- reference station real-time GNSS data exchange with the neighbour countries
- networking and computing the real-time correction parameters
- distribution of real-time correction parameters to the users
- distribution of post-processing data
- 24/7 service availability



CROPOS[®] Project Budget

- **PHARE-2005 Programme – R3 CROPOS System:**
 - **Contract value 1.396.000,00 €**
 - **75% EU pre-accession funds**
 - **25% Croatian State Budget funds**
- **Croatian State Budget funds**
 - **Contracts value 120.000,00 €**
 - **manufacturing and placement of antenna constructions**
 - **establishment of the required installations and telecommunications lines**

CROPOS[®] Reference Frame

- Bernese GPS Software Ver. 5.0
- GPS Week 1503 (7 x 24 h)
 - 30 CROPOS GNSS Sites
 - 7 IGS Control Sites
 - 5 IGS Reference Sites
- ITRF2005, 2008.83 (1503)
- $\sigma_{\varphi} = 1.2 \text{ mm}$, $\sigma_{\lambda} = 0.8 \text{ mm}$, $\sigma_h = 3.4 \text{ mm}$
- ETRF00 (R05)

CROPOS[®] Network

Reference GNSS Station



- Trimble NetR5 GNSS Receiver
- Trimble Zephyr 2 Geodetic GNSS Antenna

Control Centre (SGA)

- Hewlett Packard Servers (7)
- CISCO Communication Equipment
- CISCO Access Server
- Trimble GPSNet/RTKNet Software



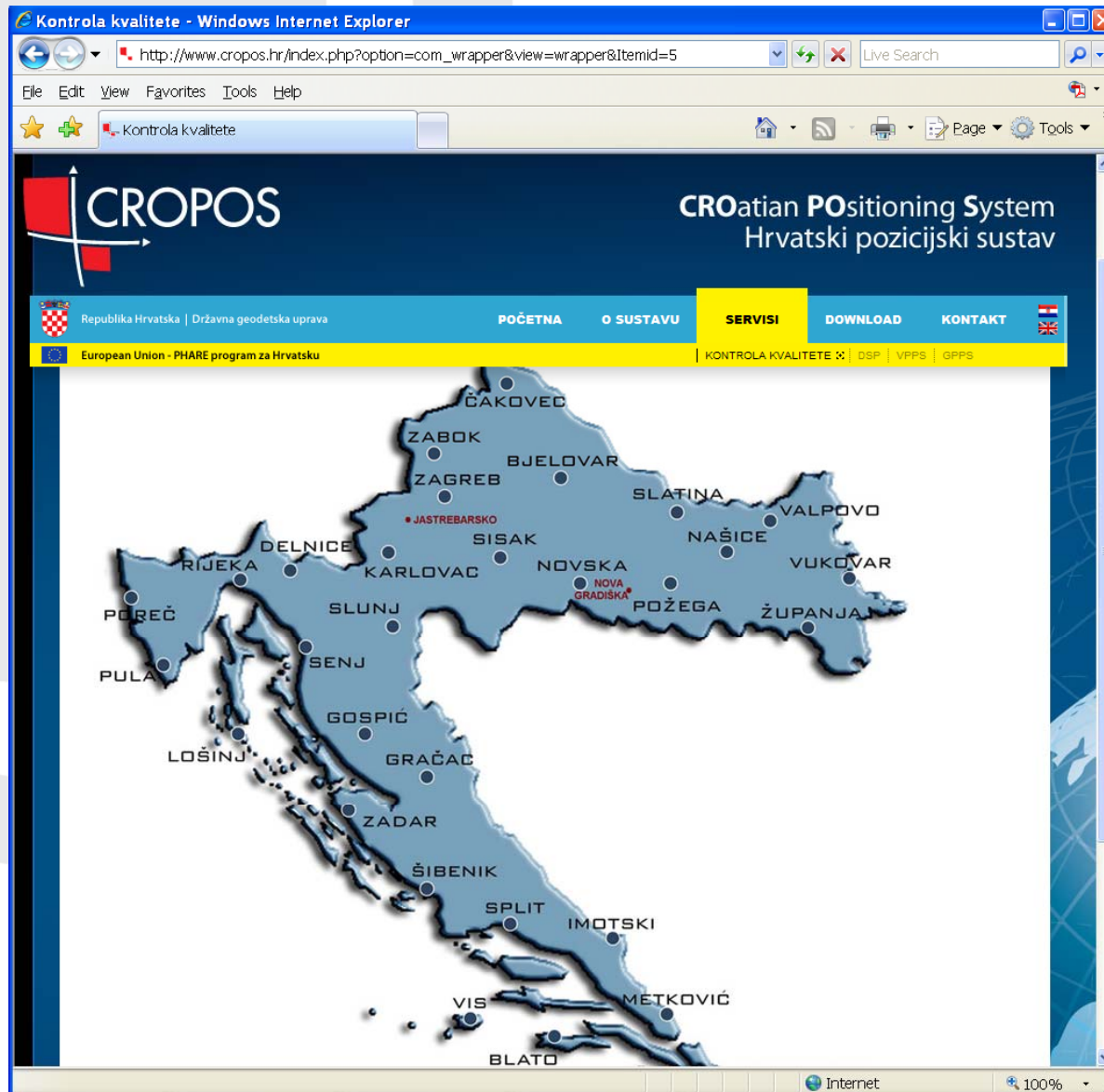
CROPOS[®] Services

CROPOS SERVICES	METHOD/ SOLUTION	DATA TRANSFER	ACCURACY	DATA FORMAT
DSP Differential positioning in real time	Network solution of code surveys in real time	Wireless Internet (GPRS, UMTS) NTRIP protocol	0.3 do 0.5 m	RTCM 2.3
VPPS High-precise positioning in real time	Network solution of phase surveys in real time	Wireless Internet (GPRS, UMTS) NTRIP protocol GSM	2 cm (2D) 4 cm (3D)	RTCM 2.3 RTCM 3.1
GPPS Geodetic precise positioning	<i>post-processing</i>	Internet (FTP, e-mail)	1 cm (2D, 3D)	RINEX RINEX VRS

CROPOS[®] Quality Managment (1)

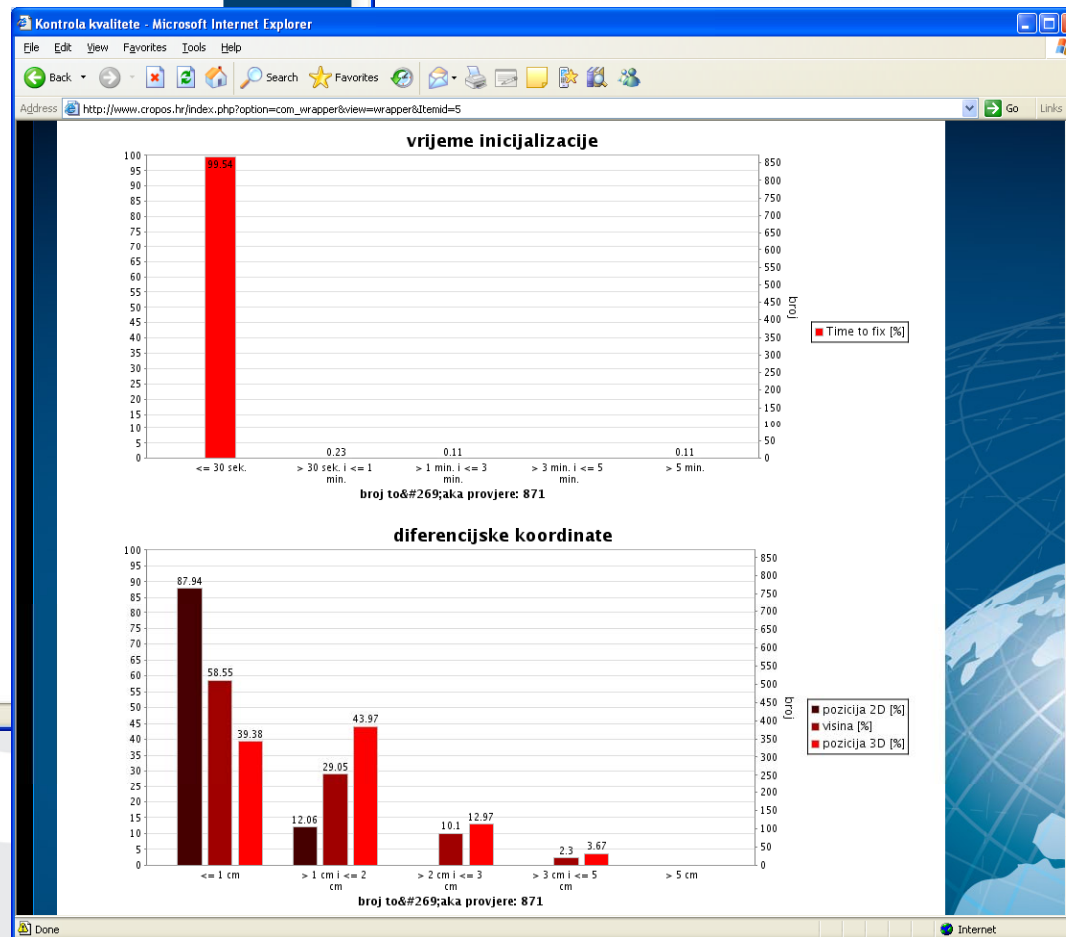
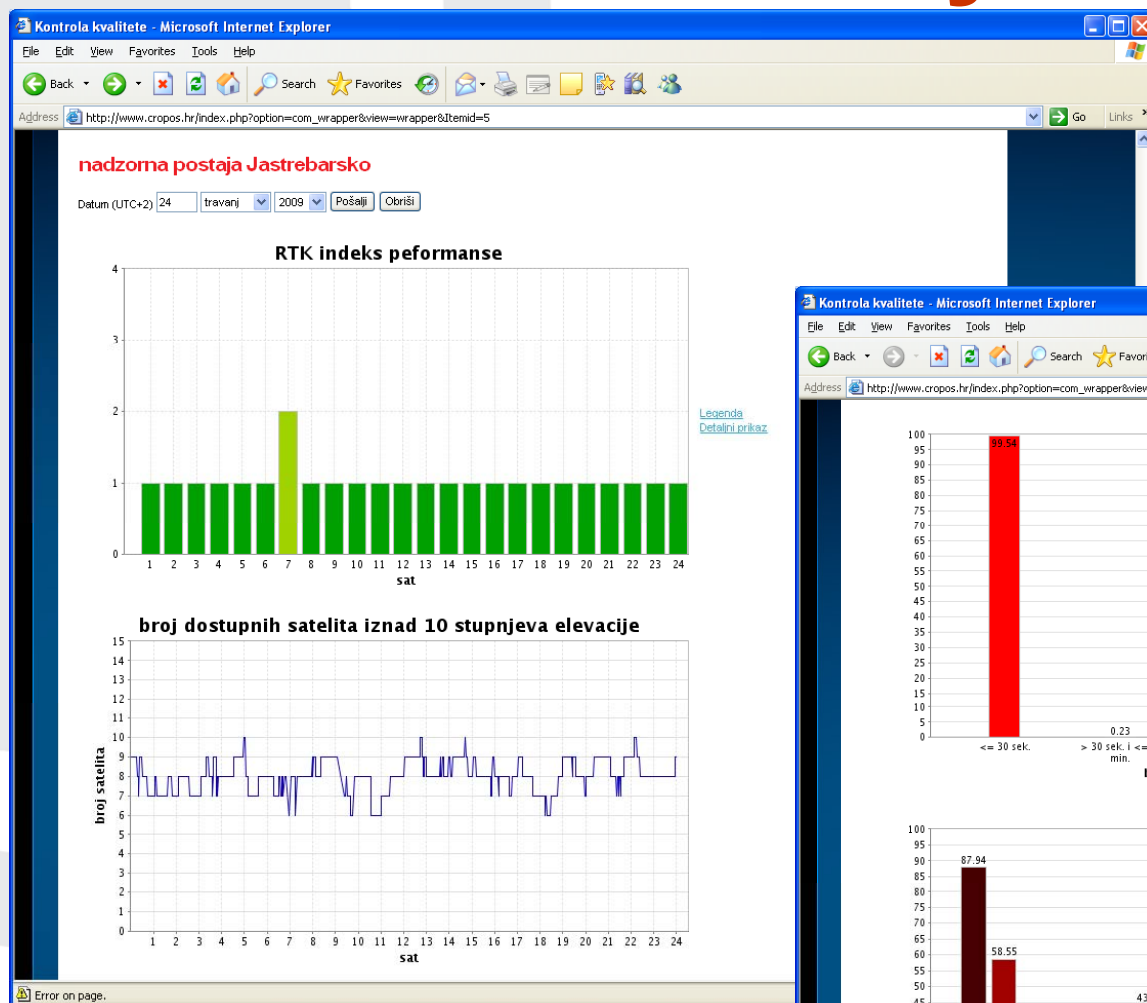
- The system operation is continuously supervised
- In order to obtain at any moment the information on the system operation quality in relation to the
 - **initialization time**
 - **accuracy**
 - **availability of the system**

CROPOS® Quality Management (2)



- Two independent permanent control stations
- Jastrebarsko and Nova Gradiška which simulate the work of users in the field
- Every 10 seconds, the control stations connect to the CROPOS system and use the VPPS service for determining the position

CROPOS[®] Quality Managment (3)

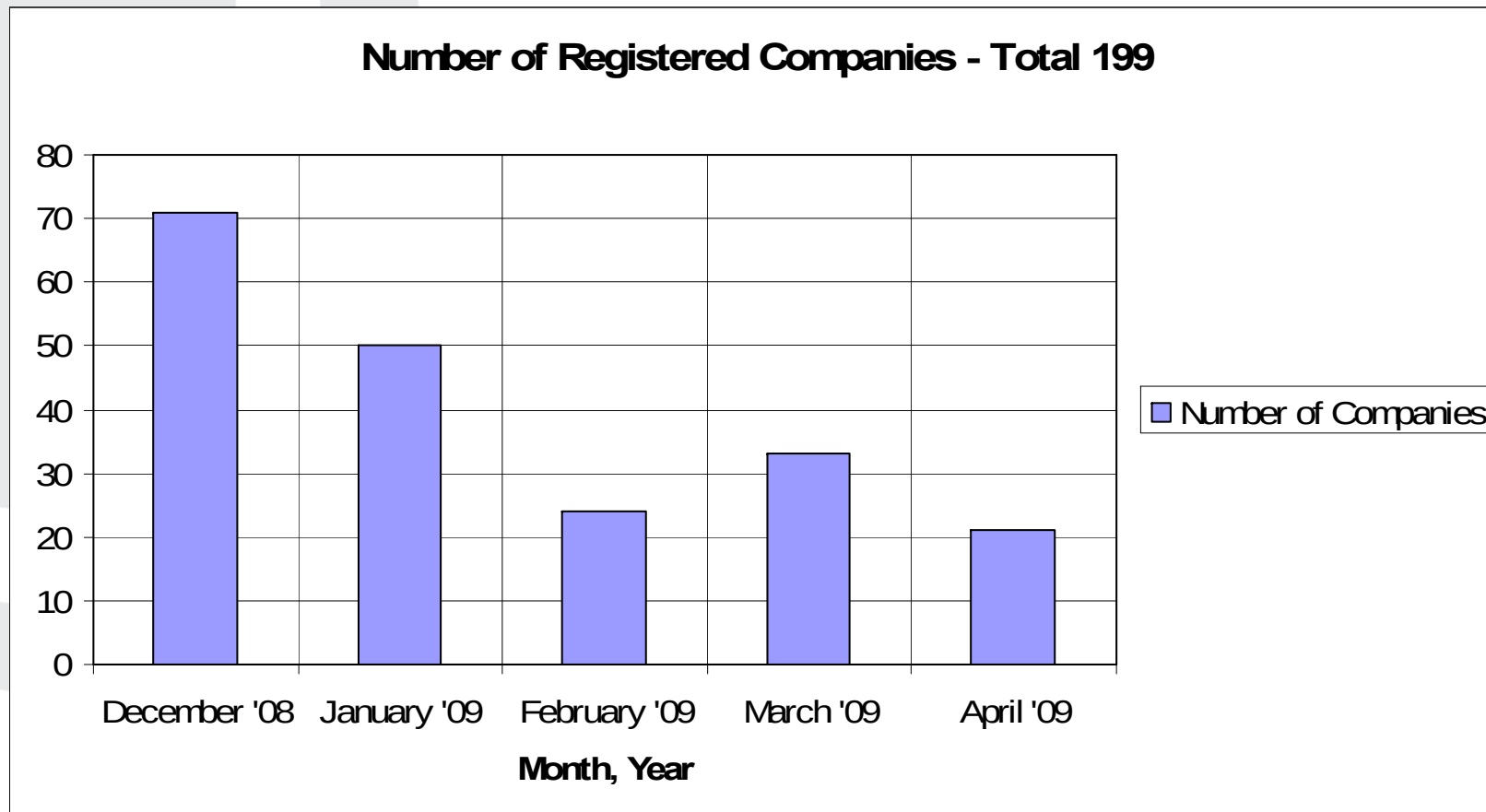


CROPOS® Services Pricelist

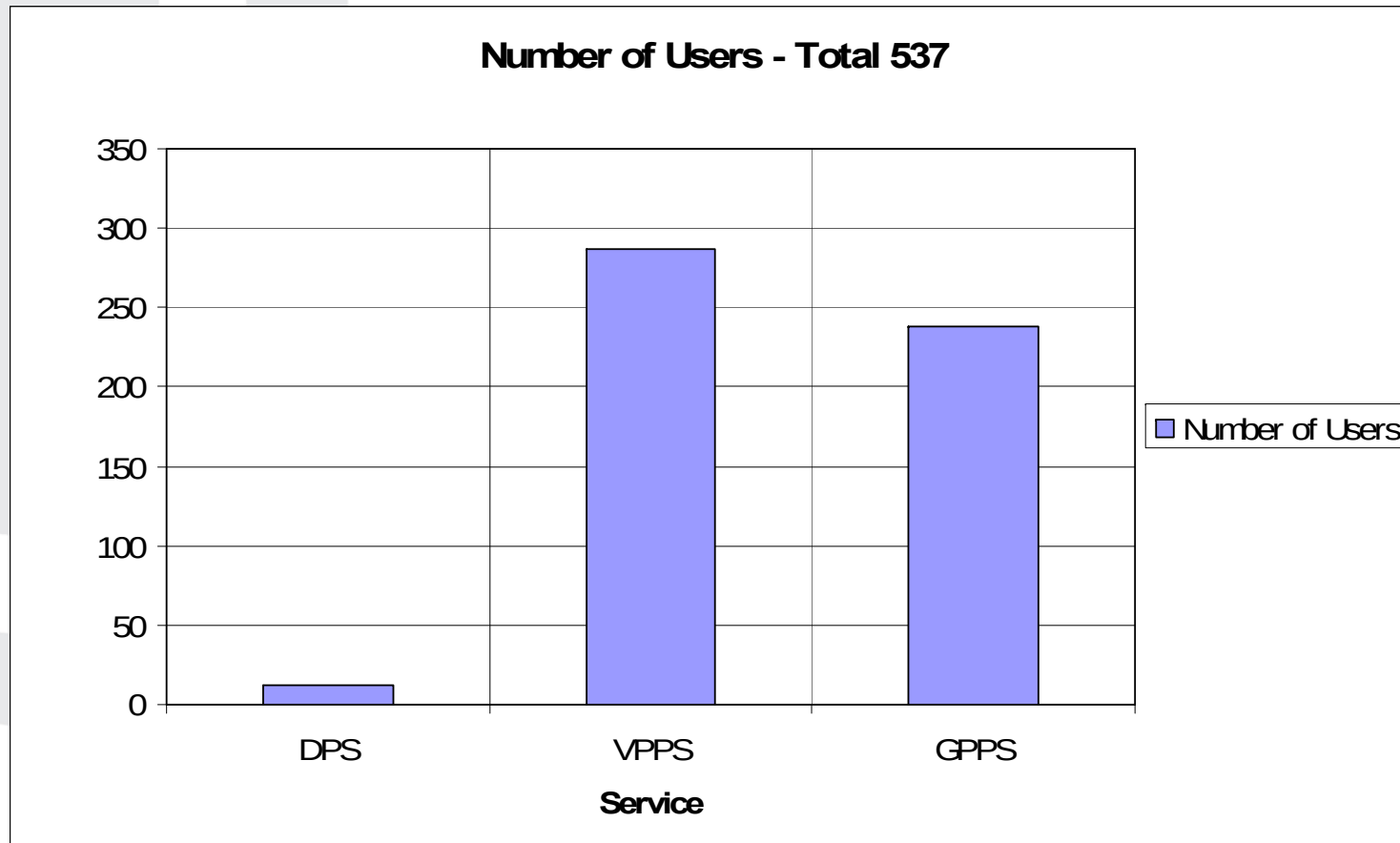
CROPOS SERVICE	DATA FORMAT	UNIT	PRICE
DPS Differential positioning in real time	RTCM 2.3	1 year	HRK 1.000,00 (~135 €)
VPPS High-precision positioning in real time	RTCM 2.3 RTCM 3.1	1 minute 1 year	HRK 0,35 (~0,05 €) HRK 5.000,00 (~675 €)
GPPS Geodetic precise positioning	RINEX RINEX VRS	1 minute	HRK 0,50 (~0.07 €)

Registration Costs - HRK 300,00 (~40 €)

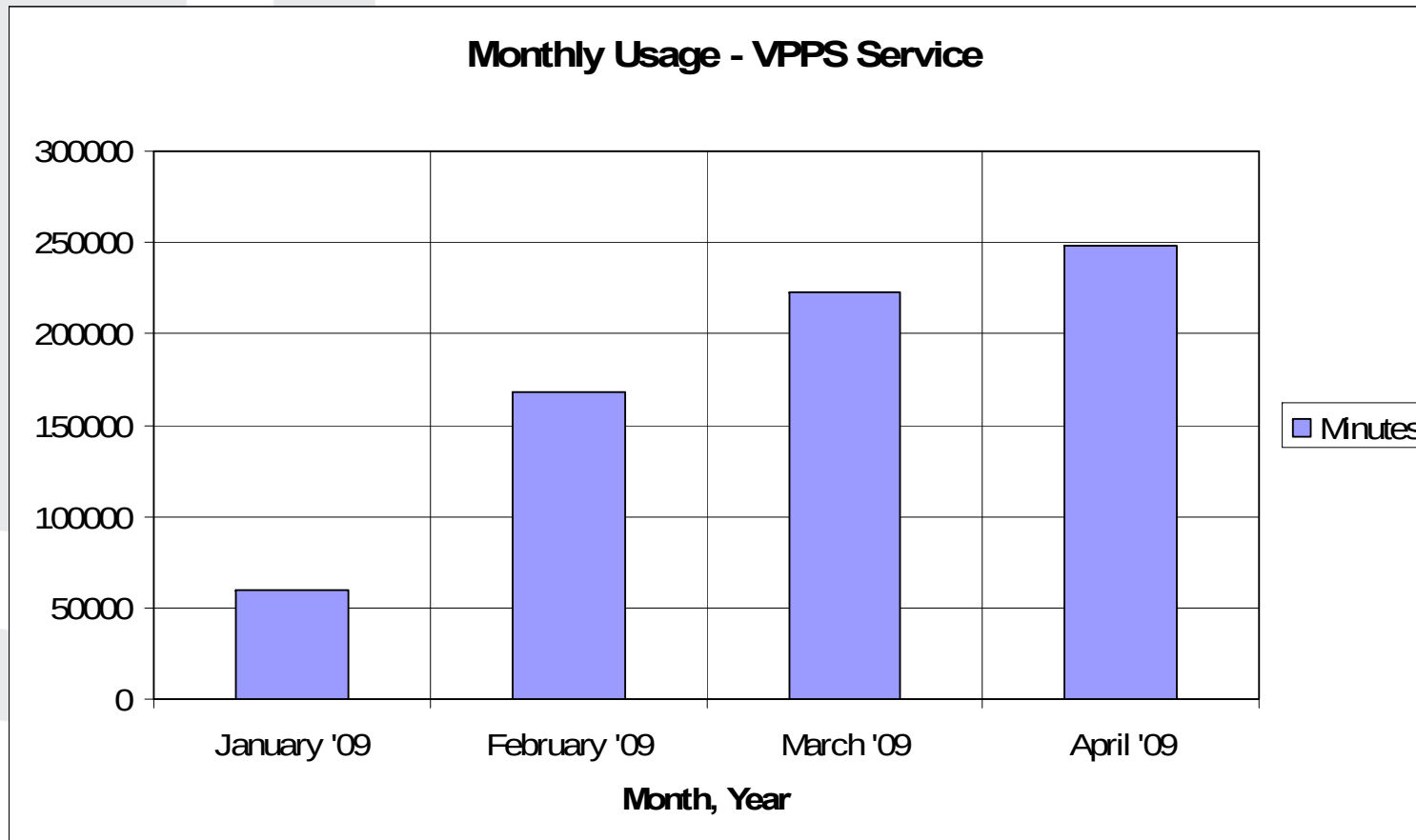
CROPOS® Registration



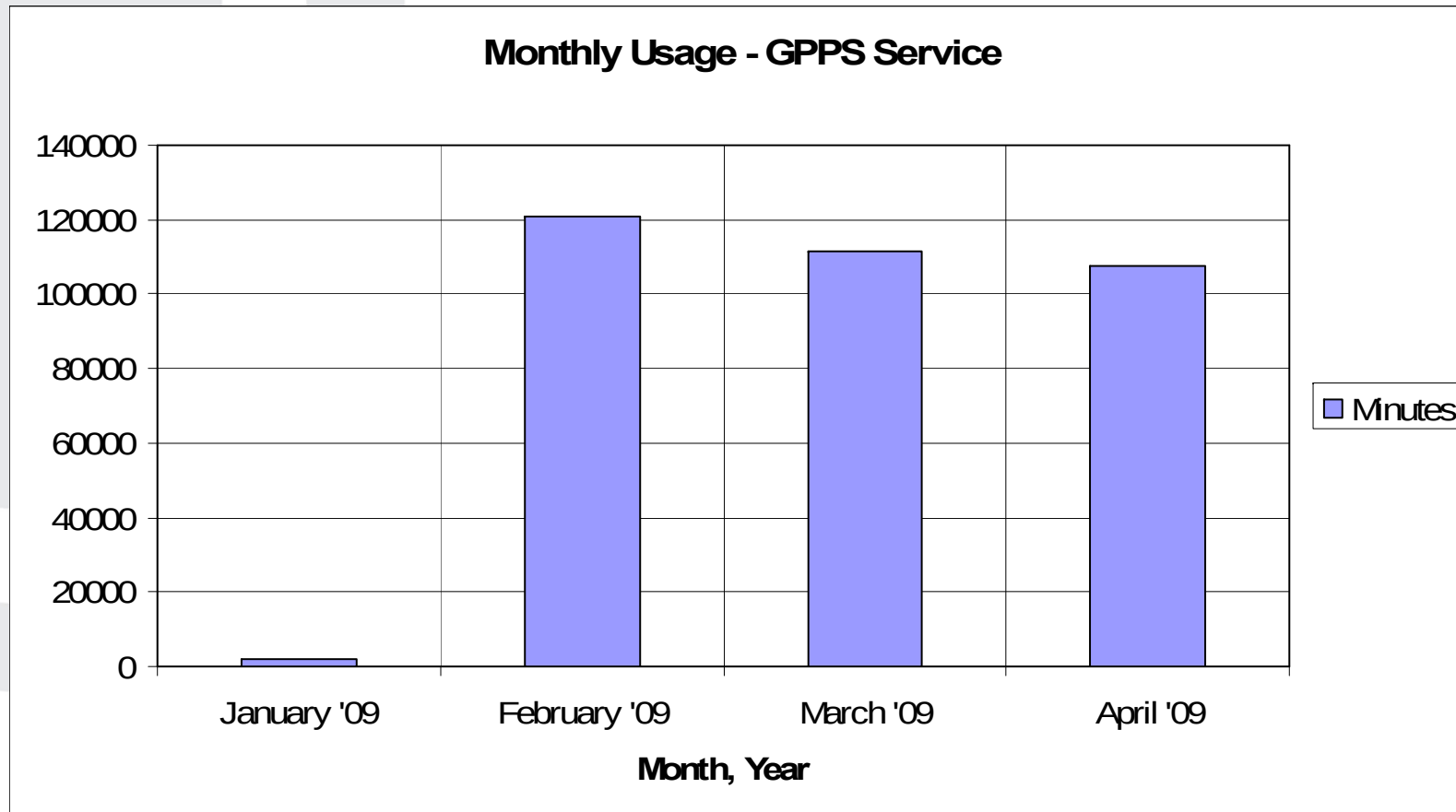
CROPOS[®] Users



CROPOS[®] Monthly Usage VPPS



CROPOS[®] Monthly Usage GPPS



CROPOS[®] User Information

- PHARE-2005 Programme – R1: Integrated Land Administration System in Croatia (ILAS)
 - CROPOS Flayer
 - CROPOS Brochure
 - www.cropos.hr, www.cropos.eu
 - Training-Information Workshops (Rijeka, Split, Zagreb, Vinkovci) > 800 participants
 - CROPOS – User Manual (Print + DVD)
 - CROPOS Video

CROPOS® Flayer

What is required in order to work with the system?

- registration of users in the State Geodetic Administration
- username and password
- GNSS Receiver which supports operations and point positioning in **real time**
- GPRS or GSM modem for the receipt of correction parameters in **real time**
- Internet access in order to take the measurement data in RINEX format for data post-processing



What is CROPOS?

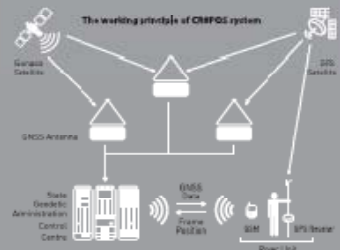
CROPOS (Croatian Positioning System) is a national network of reference GNSS stations of the Republic of Croatia. The purpose of the CROPOS System is to enable point positioning in real time with an accuracy of ± 2 cm horizontally and ± 4 cm vertically, on the entire territory of the Republic of Croatia.

The National PHARE 2005 Programme

As the Republic of Croatia became candidate for the European Union membership and after the EU adopted the Pre-accession Strategy, Croatia became a beneficiary of pre-accession programmes on October 6 2008. The CHODOS project is also funded through the National PHARE 2005 Programme.

The Concept of Networked Reference Stations

The GNSS system has introduced great changes and brought into the basic geodetic activities, the reference GNSS systems include the following: GPS—the American Global Positioning System, GLONASS—the Russian Global Navigation Satellite System, the European GALILEO system which is in the process of being established. The basic objective in the geodesic scientific work and practice has always been a high level of accuracy and reliability of data with minimal material expenditure. The achievement of this objective is best seen in the concept of networked reference GNSS stations.



The networked reference stations will enable continuous GNSS measurements (CORS - Continuously Operating Reference Station) and the transfer of measurement data into the Control Center, giving also the possibility of reference stations remote control from the Control Center. On the basis of measurement data, the correction parameters are computed for the measurements of different accuracy levels in real time. Also the source measurement data is computed for the post-processing when the higher levels of accuracy are required.

The CROPOS System Characteristics

The CROPOS System consists of 30 reference GNSS stations at the distance of 70 km one from another located in such a way to cover the entire territory of the Republic of Croatia with the purpose to collect the data from the satellite measuring and to compute the correction parameters. The correction parameters will be available to the users in the field through mobile Internet (GPRS/GSM).

CROPOS - the National Network of Reference GNSS stations of the Republic of Croatia



- Collecting the data from 3D reference GNSS stations
- Measurement data exchange of reference GNSS stations with the neighbouring countries in real time
- Networking and computing the correction parameters in real time
- Distribution of measurement data and correction parameters to the users in real time
- Distribution of measurement data to the users for postprocessing
- Monitoring the system operation and providing support to the users
- 24/7 system availability

CROPOS System Services

The users can access three CROPOS System Services which differ according to the solution method, manner of data transfer and availability time, as well as point positioning accuracy and data format.



CHORDS SERVICES	METHOD SOLUTIONS	DATA TRANSFER	ACCURACY	DATA FORMAT
DIP	Network solution of site measurement in real-time	Wireless Internet (GPRS, UMTS) NTRIP protocol GSM	± 0.3 cm (DIP), ± 0.1 m	RTCM
VPPS	Network solution of phase measurement in real-time	Wireless Internet (GPRS, UMTS) NTRIP protocol GSM	± 2 cm (DIP), ± 4 cm (VPPS)	RTCM
GPS	post-processing	Internet FTP, email	± 1 cm (DIP, VPPS)	RINEX

CROPOS® Web Site



CROPOS[®] User Manual



Republika Hrvatska | Državna geodetska uprava

EUROPSKA UNIJA - PHARE PROGRAM ZA HRVATSKU



CROPOS PRIRUČNIK ZA KORISNIKE

CROatian Positioning System
Hrvatski pozicijski sustav

CROPOS[®] Future Activities

- 1. CROPOS Conference – June 8.-9., 2009, Zagreb (CGS, SGA)
- T7D – Transformation Utility Program – Grid Datum Transformation
 - GNSS Measurements of Trigonometric Points (~2500 to ~7000)
 - New Geoid Model (1st HRG2000)
 - Trimble Transformation Generator > CROPOS