Ukrainian GNSS-based Position-Timing-Navigation System (UAPOS)

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

Active Networks in Ukraine

UAPOS

UPGN

Configuration of UAPOS Network in 2008

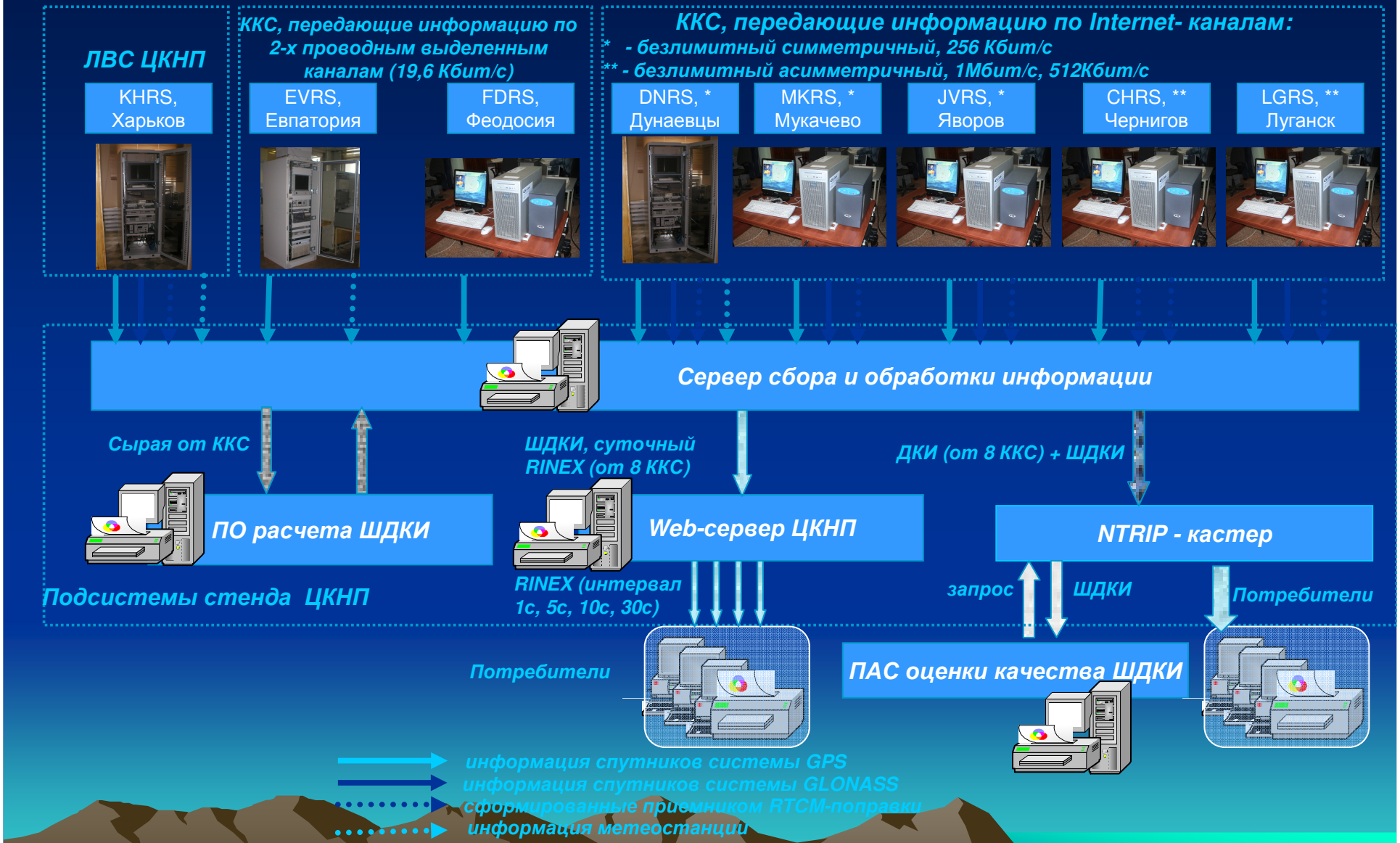
Characteristics of the UAPOS Network RSs in 2008

Name of RS	Location	Receiver, antenna	Information in real time	Information available on Web-site	Operation system	Working hours, registration	Channels to Centers
KHRS	Kharkiv (φ = 50°0.61', λ =36°19.02')	CPUPak-G2-L1/L2 (GPS/EGNOS), GPS-503, NovAtel	Raw GPS, DCI, METEO	Rinex GPS, EGNOS, METEO	Solaris 8	Monday-Friday, 08.00-18.00, 1 Hz	LAN
DNRS	Dunaivtsi (φ=48°51.27', λ = 26°42.76')	ProPak-G2-L1L2, (GPS/EGNOS), GPS-702 NovAtel, Z18 (GPS/ GLONASS), GPS CR Ashtech Inc.	Raw GPS, DCI, METEO	Rinex GPS, GLONASS, EGNOS, METEO	Solaris 8	Continuously operating, 1 Hz	Internet
EVRS	Evpatoria (φ=45°13.31', λ = 33°10.22')	MPC-4-L1/L2-W, (GPS/EGNOS), GPS-702 NovAtel	Raw GPS, METEO	Rinex GPS, EGNOS, METEO	Solaris 8	Continuously operating, 1 Hz	Assigned
CHRS	Chernigiv (φ=51°30.96' , λ = 31°20.81')	ProPak-V3-L1L2-G, (GPS/GLONASS/ EGNOS), GPS-702-GG NovAtel	Raw GPS, GLONASS, DCI	Rinex GPS, GLONASS, EGNOS	Solaris 9	Continuously operating, 1 Hz	Internet

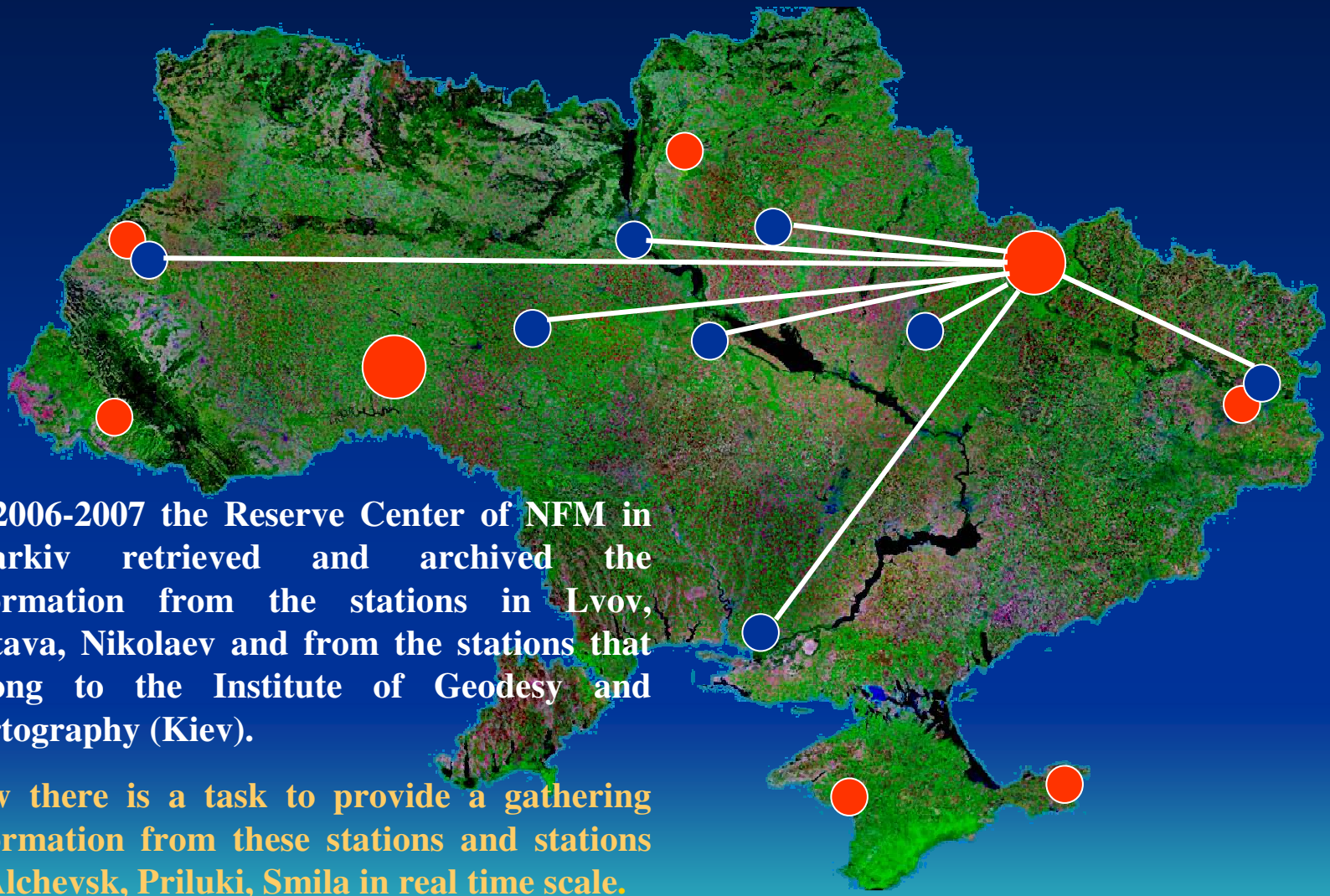
Characteristics of the UAPOS Network RSs in 2008

Name of RS	Location	Receiver, antenna	Information in real time	Information available on Web-site	Operation system	Working hours, registration	Channels to Centers
FDRS	Feodosia, (φ = 45°7.4' , λ = 35°30.28)	ProPak-V3-L1L2-G, (GPS/GLONASS/ EGNOS), GPS-702-GG NovAtel	Raw GPS, GLONASS, DCI	Rinex GPS, GLONASS, EGNOS	Solaris 9	Continuously operating, 1 Hz	Assigned
JVRS	Yavoriv, (φ = 50°0.28' , λ = 23°30.02')	ProPak-V3-L1L2-G, (GPS/GLONASS/ EGNOS), GPS-702-GG NovAtel	Raw GPS, GLONASS, DCI	Rinex GPS, GLONASS, EGNOS	RED HAT ENTERPRISE Linux version 5	Continuously operating, 1 Hz	Internet
MKRS	Mukachevo, (φ= 48°22.72', λ = 22°42.56)	ProPak-V3-L1L2-G, (GPS/GLONASS/ EGNOS), GPS-702-GG NovAtel	Raw GPS, GLONASS, DCI	Rinex GPS, GLONASS, EGNOS	RED HAT ENTERPRISE Linux version	Continuously operating, 1 Hz	Internet
LGRS	Lugansk, (φ=48°34.66' , λ = 39°19.13)	ProPak-V3-L1L2-G, (GPS/GLONASS/ EGNOS) GPS-702-GG NovAtel	Raw GPS, GLONASS, DCI	Rinex GPS, GLONASS, EGNOS	RED HAT ENTERPRISE Linux version	Continuously operating, 1 Hz	Internet

UAPOS In Operating



Planned UAPOS System Network in 2009



In 2006-2007 the Reserve Center of NFM in Kharkiv retrieved and archived the information from the stations in Lvov, Poltava, Nikolaev and from the stations that belong to the Institute of Geodesy and Cartography (Kiev).

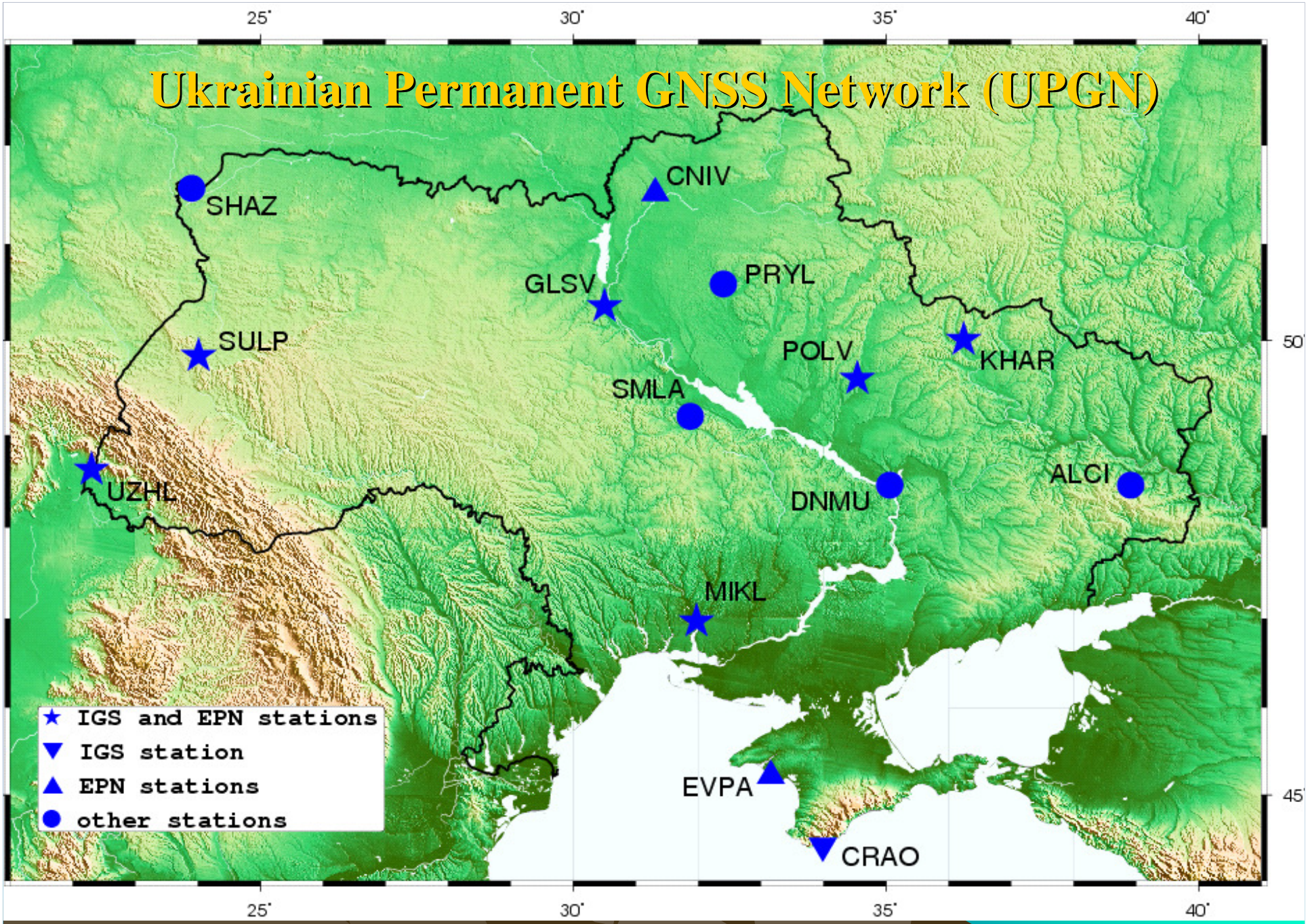
Now there is a task to provide a gathering information from these stations and stations in Alchevsk, Priluki, Smila in real time scale.

Planned UAPOS Configuration in 2012

Active Networks

UAPOS

UPGN


Ukrainian Permanent GNSS Network (UPGN)
25°
30°
35°
40°
50°
45°
SHAZ
CNIV
GLSV
PRYL
SULP
POLV
KHAR
SMLA
UZHL
DNMU
ALCI
MIKL
EVPA
CRAO
IGS and EPN stations
IGS station
EPN stations
other stations

GLSV (Kiev/Golosiiv)

Supported by MAO

Receiver: NovAtel DL-V3

Antenna: NOV702GG

Obs. interval: 1 sec

On-site PC

- OS: Linux
- Software: NovaRS, becrux, teqc

Networks: IGS, EPN

KHAR (Kharkiv)

Supported by MAO

Receiver: NovAtel DL-V3

Antenna: NOV702GG

Obs. interval: 1 sec

On-site PC

- OS: Linux
- Software: NovaRS, becrux, teqc

Networks: IGS, EPN

PRYL (Pryluky)

Supported by MAO

Receiver: NovAtel DL-V3

Antenna: NOV702GG

Obs. interval: 1 sec

On-site PC

- OS: Linux
- Software: NovaRS, becrux, teqc

Networks: —

SMLA (Smila)

Supported by MAO

Receiver: NovAtel DL-V3

Antenna: NOV702GG

Obs. interval: 1 sec

On-site PC

- OS: Linux
- Software: NovaRS, becrux, teqc

Networks: —

UZHL (Uzhgorod)

Supported by MAO

Receiver: Trimble 4000SSi

Antenna: TRM29659.00

Obs. interval: 30 sec

On-site PC

OS: Linux

Software: becrux, R-utils, teqc

Networks: IGS, EPN

EVPA (Evpatoria)

Supported by MAO

Receiver: Trimble 4000SSi

Antenna: TRM29659.00

Obs. interval: 30 sec

On-site PC

OS: Linux

Software: becrux, R-utils, teqc

Networks: EPN

CNIV (Chernihiv)

Supported by MAO

Receiver: Trimble 4000SSi
Antenna: TRM29659.00

Obs. interval: 1 sec

On-site PC

- OS: Linux
- Software: becrux, R-utils, teqc

Networks: EPN

POLV (Poltava)

Supported by RIGC

Receiver: Trimble 4700

Antenna: TRM29659.00

Obs. interval: 1 sec

On-site PC

OS: Linux

Software: becrux, R-utils, teqc

Networks: IGS, EPN

MIKL (Mykolaiv)

Supported by RIGC

Receiver: Trimble 4700

Antenna: TRM41249.00

Obs. interval: 1 sec

On-site PC

OS: Linux

Software: becrux, R-utils, teqc

Networks: IGS, EPN

SULP (Lviv)

Supported by RIGC

Receiver: Trimble 4700

Antenna: TRM41249.00

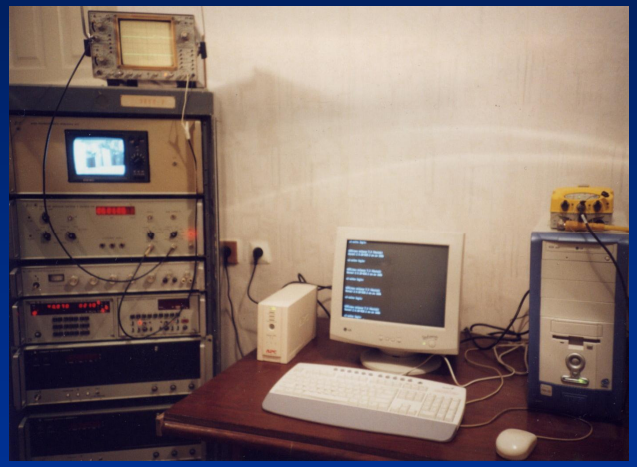
Obs. interval: 1 sec

On-site PC

- OS: Windows 98
- Software: TRS

Networks: IGS, EPN

ALCI (Alchevsk)



Supported by RIGC

Receiver: Trimble 5700

Antenna: TRM41249.00

Obs. interval: 30 sec

On-site PC

OS: Linux

Software: becrux, R-utils, teqc

Networks: —

CRAO (Simeiz)

Supported by MIT (USA)

Receiver: Rogue SNR-8000

Antenna: AOAD/M_T

Obs. interval: 30 sec

On-site PC

- OS: Linux
- Software: GNEX

Networks: IGS, MGN

SHAZ (Shatsk)

Supported by NU "LP"

Receiver: Trimble 5700

Antenna: TRM41249.00

Obs. interval: 30 sec

On-site PC

- OS: Windows 98
- Software: TRS

Networks: —

DNMU (Dnipropetrovsk)

Supported by DNMU

Receiver: Trimble 7400MSI

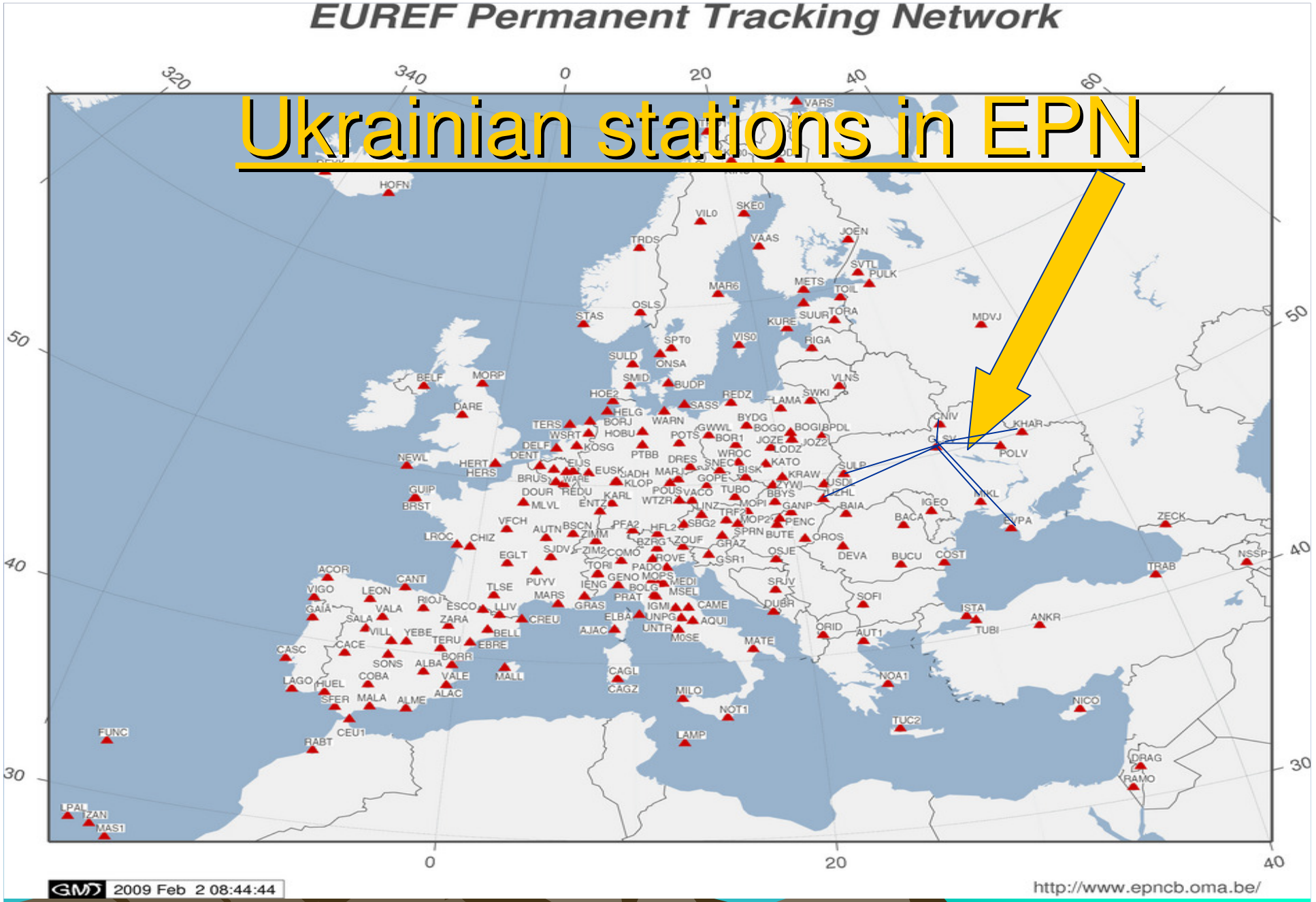
Antenna: TRM14532.00

Obs. interval: 1 sec

On-site PC

- OS: Windows
- Software: TRS

Networks: —

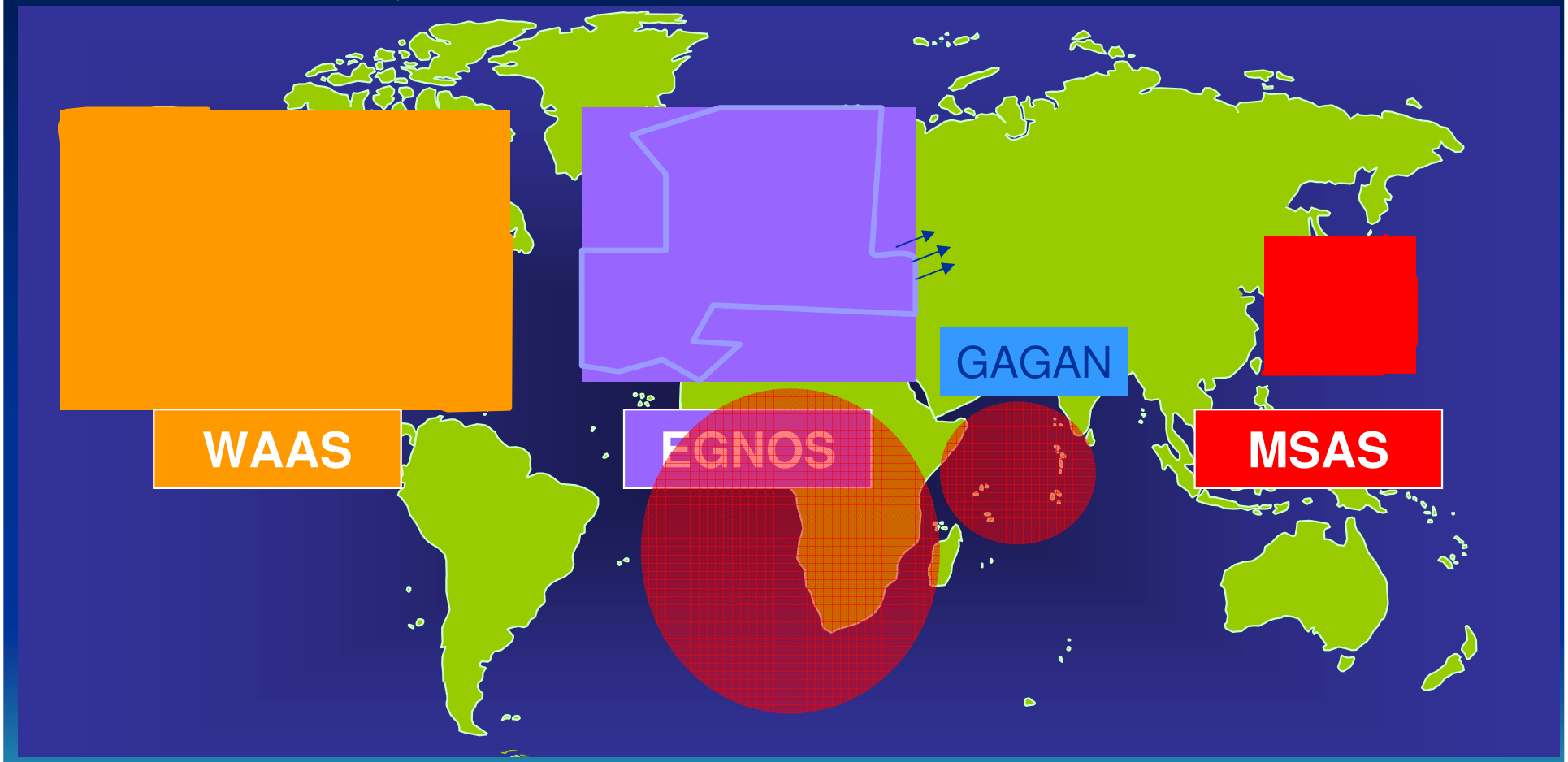

EUREF Permanent Tracking Network
Ukrainian stations in EPN
GMT 2009 Feb 2 08:44:44
http://www.epncb.oma.be/

Ukrainian stations in IGS

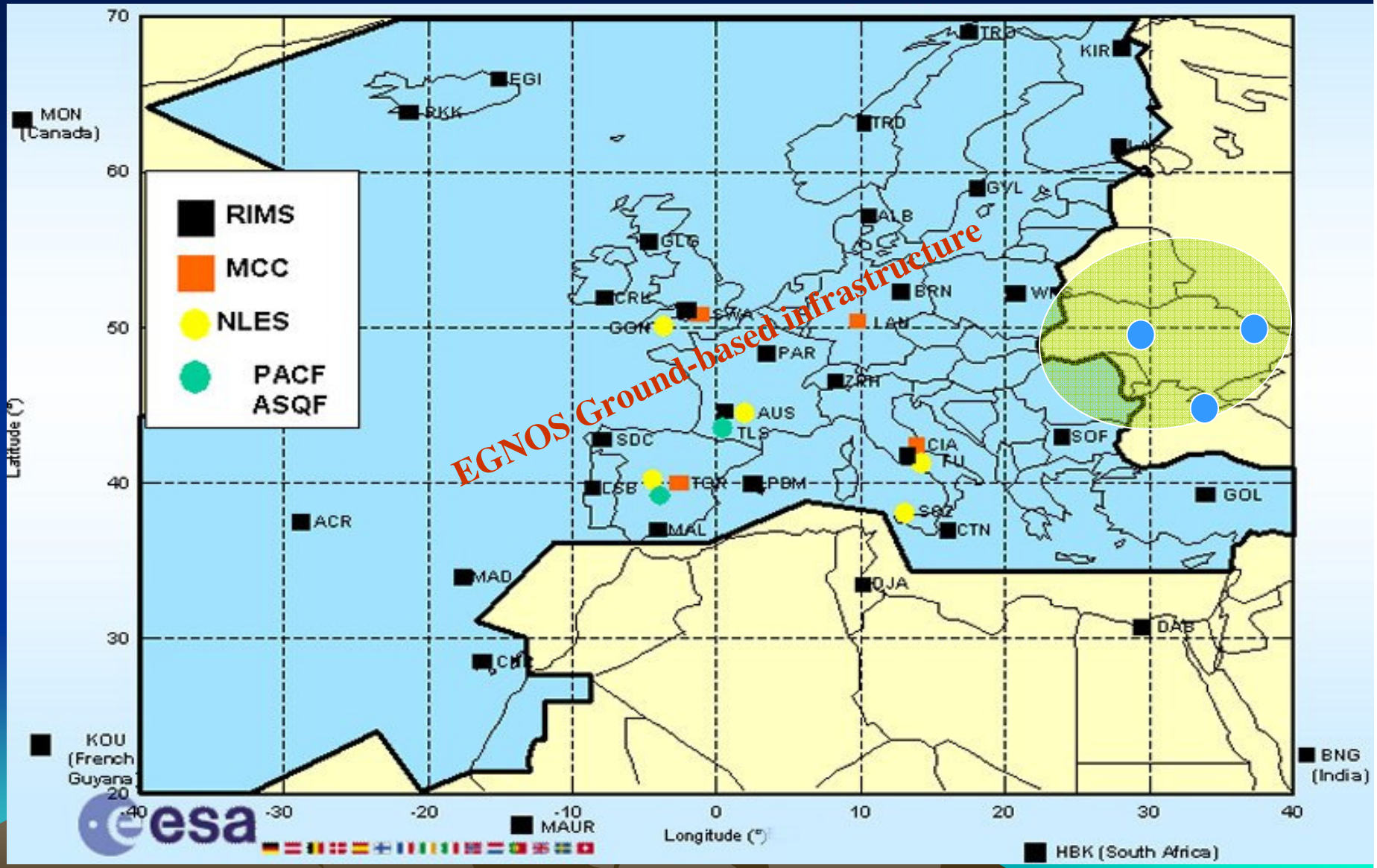
Two Concepts of GNSS-based PTN for Ukraine

Ukraine: Sqare=603,700km^2,
Population=46 mln

1st Concept: EGNOS is SBAS Positioning-Timing-Navigation System for Ukraine

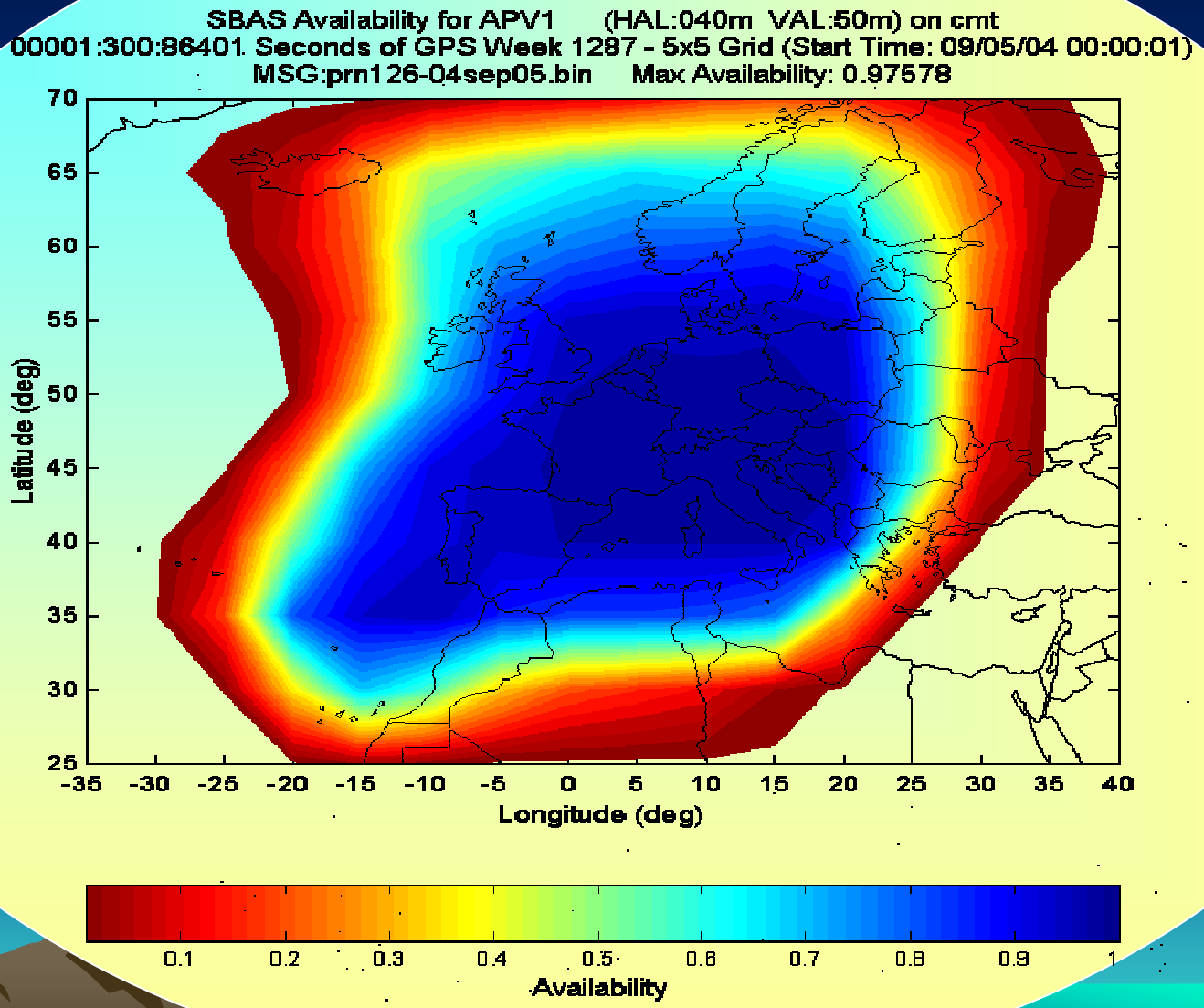


1st Concept: EGNOS is SBAS Positioning-Timing-Navigation System for Ukraine



Experimental availability of EGNOS

(05.09.2004, 26 RIMS from 34)

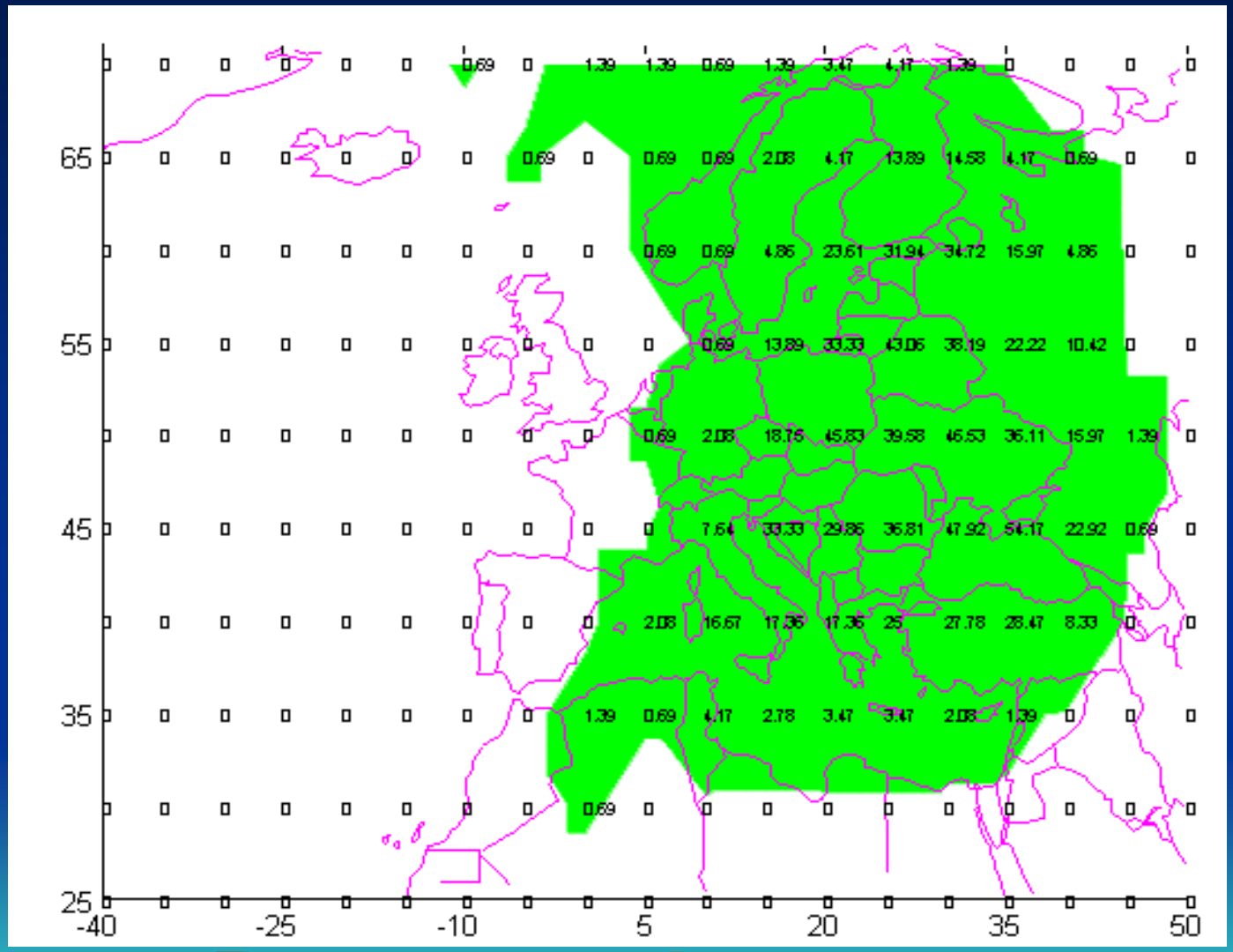


Accuracy estimation ESTB
(05.09.2004, 26 RIMS from 34)

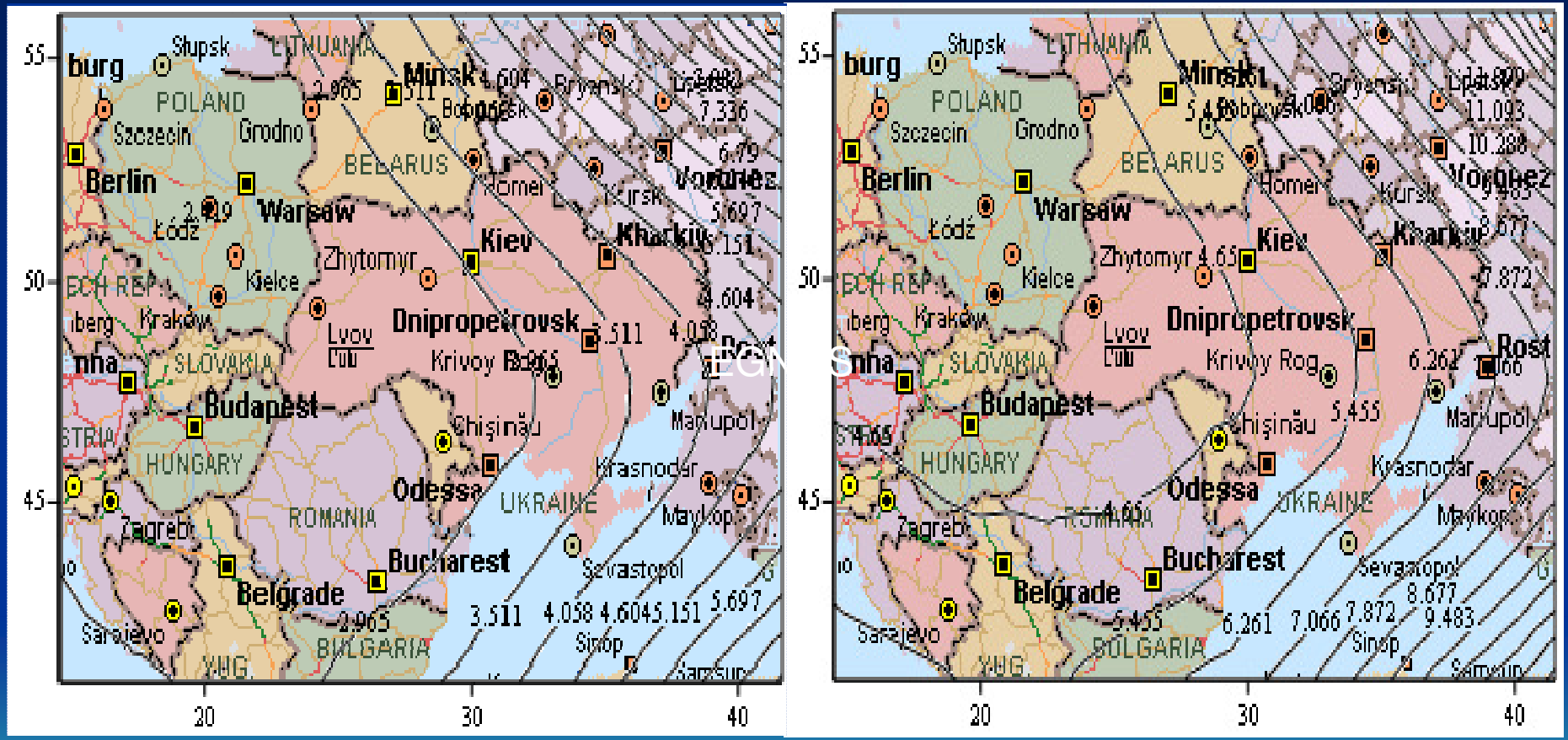
	Lissabon	Toulouse	Roma	Brussels	Paris
Horizon-tal err., m (2σ)	1.2 м	**0.9 м**	1.1 м	**0.8 м**	1.0 м
Vertical err.,m (2σ)	1.7 м	1.4 м	**1.2 м**	1.7 м	**1.3 м**

Estimation of positive effect of East Expanding

(by EGNOS Program Office, Toulouse, 2001)



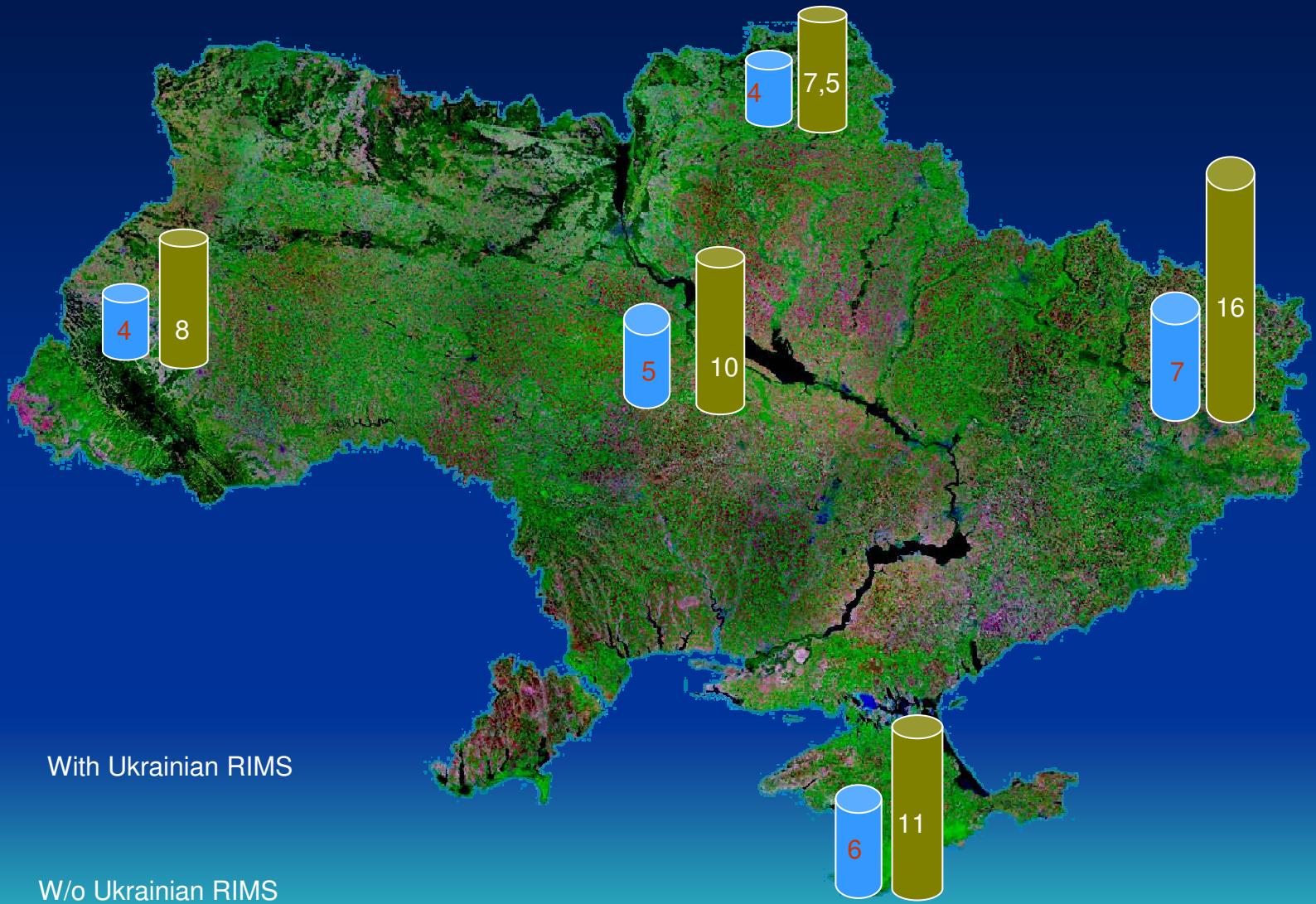
ПРИ РАЗМЕЩЕНИИ RIMS
НА ТЕРРИТОРИИ УКРАИНЫ



а) в плоскости горизонта (HNSE) в) по высоте (VNSE)

Accuracy estimation in Horizontal plane

Accuracy estimation on Vertical



Reference station (RS) НИ068

TECHNICAL CHARACTERISTICS OF THE RECEIVING EQUIPMENT

Accuracy of measurements:
- C/A, L1 – 60 mm;
- P L2 - 250 mm AS on;
- L1, carrier phase - 0.75 mm;
- L2, carrier phase - 2mm;
- time measurement accuracy - 20 ns.

TECHNICAL CHARACTERISTICS OF THE FREQUENCY STANDARD

Nominal frequency of output signal - 5 MHz.
Two-sampled mean square frequency deviation:
- 1 sec interval - no more then $1x10^{-11}$;
- 10 sec interval - no more then $8x10^{-12}$;
- 24 hour interval - no more then $2x10^{-12}$.

Average relative variation of frequency during 24 hour - no more then $1x10^{-12}$.

TECHNICAL CHARACTERISTICS OF THE METEOROLOGICAL FACILITY

Absolute error:
- temperature - ± 0,5 ^{0}C;
- humidity - ± 2%;
- pressure - ± 1 hecto-pascal.

USER INTERFACE

Up to 8 asynchronous/synchronous communication lines with rates of 115 Kbit/sec (EIA/TIA-232, EIA/TIA-449, V.35, X.21, EIA-530 DTE, NRZ/NRZI).
Ethernet up to 1Gb/sec.

POWER CONSUMPTION - 2000 watt
DIMENSIONS - 2600 x 800 x 900 mm.
WEIGHT - 320 kg

Kharkiv RS for ESTB

RS ARCHITECTURE

RS includes:

- two navigation receivers of a geodetic class;
- the Choke Ring antennas;
- computer;
- rubidium frequency standard;
- communication means and meteorological facility.

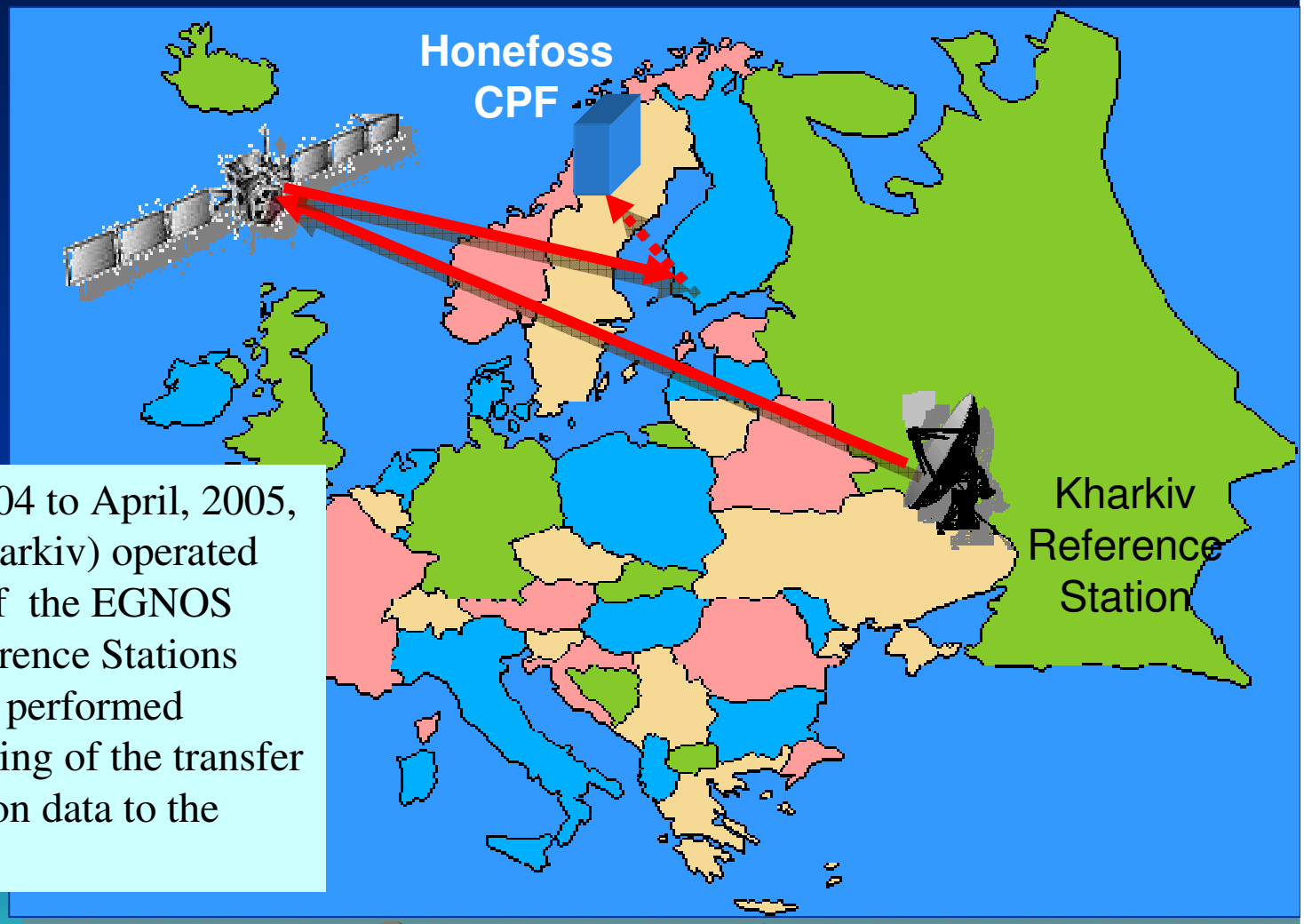
RS is located in thermostatically controlled chamber.

FUNCTIONALITIES

RS PERFORMS:

- receiving and processing of navigation signals derived from GPS (L1, L2), GLONASS (L1), EGNOS (L1) and meteorological measurement as well;
- distribution of raw data and (or) differential corrections in format RTCM SC 104 V.2.3 through leased lines which operates under TCP/IP protocol in real time with rate of 1sec.

Participation in EGNOS SYSTEM TEST BED

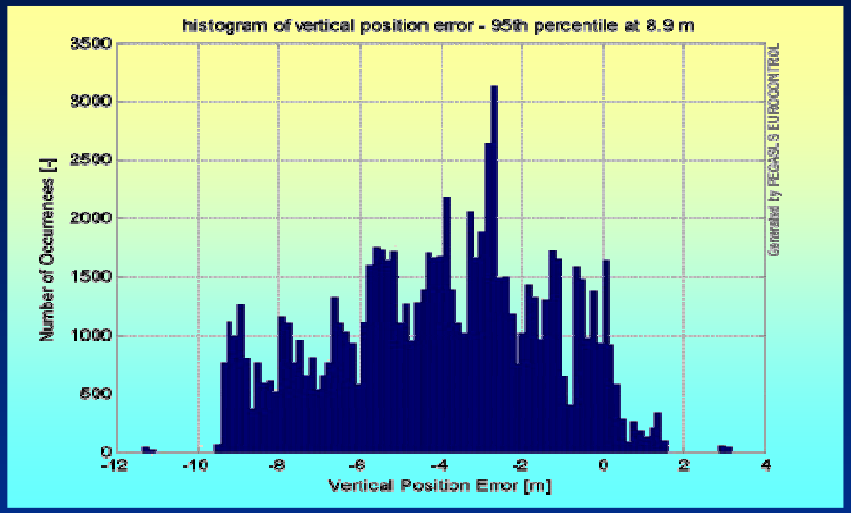


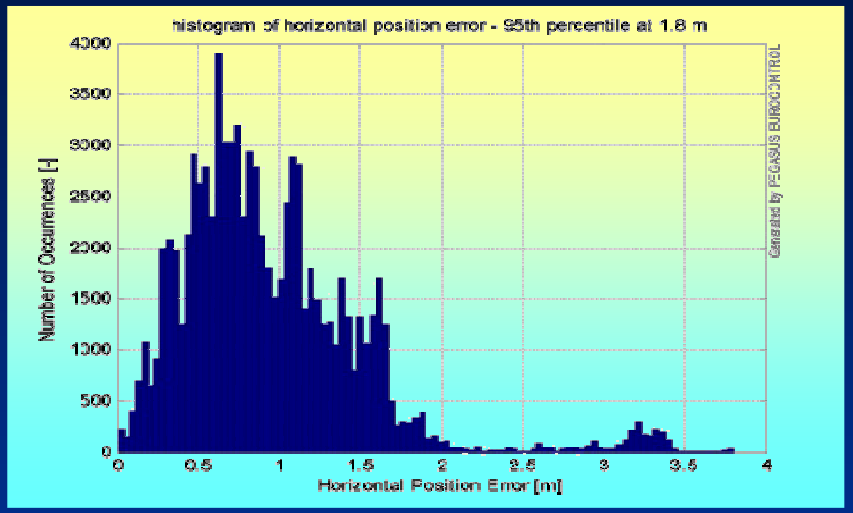
Within September, 2004 to April, 2005, Reference Station (Kharkiv) operated continuously as part of the EGNOS System Test Bed Reference Stations Ground Network. The performed activities included testing of the transfer of the Reference Station data to the ESTB system center.

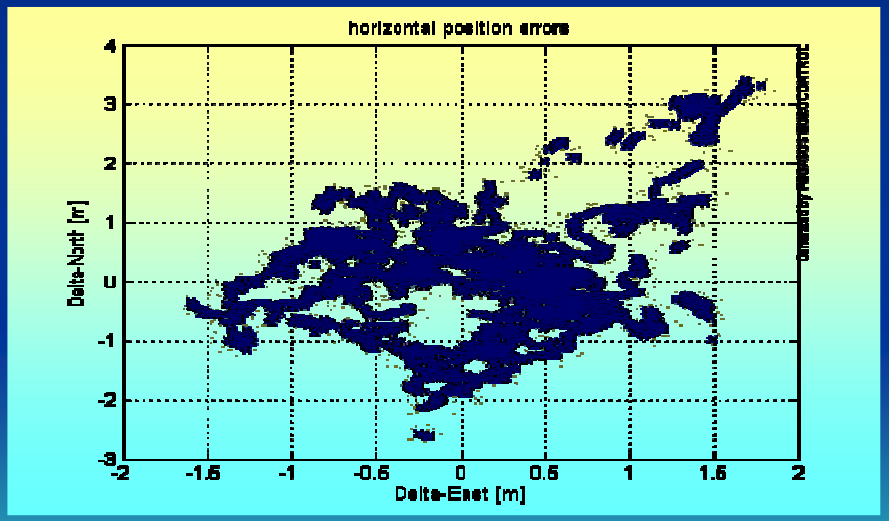
Accuracy estimation ESTB with Kharkiv RS

		01.11.04	05.11.04	09.11.04	10.11.04
w/o ESTB	Horizon-tal err., m (2σ)	3.5	2.4	2.9	3.5
	Vertical err.,m (2σ)	9.2	10.6	4.4	3.8
with ESTB	Horizon-tal err., m (2σ)	**1.9**	**1.6**	**1.6**	**1.6**
	Vertical err.,m (2σ)	**2.5**	**1.7**	**3.7**	**2.0**

Accuracy estimation ESTB with Kharkiv RS







Conclusions

1. An expanding EGNOS to Ukraine is feasible.

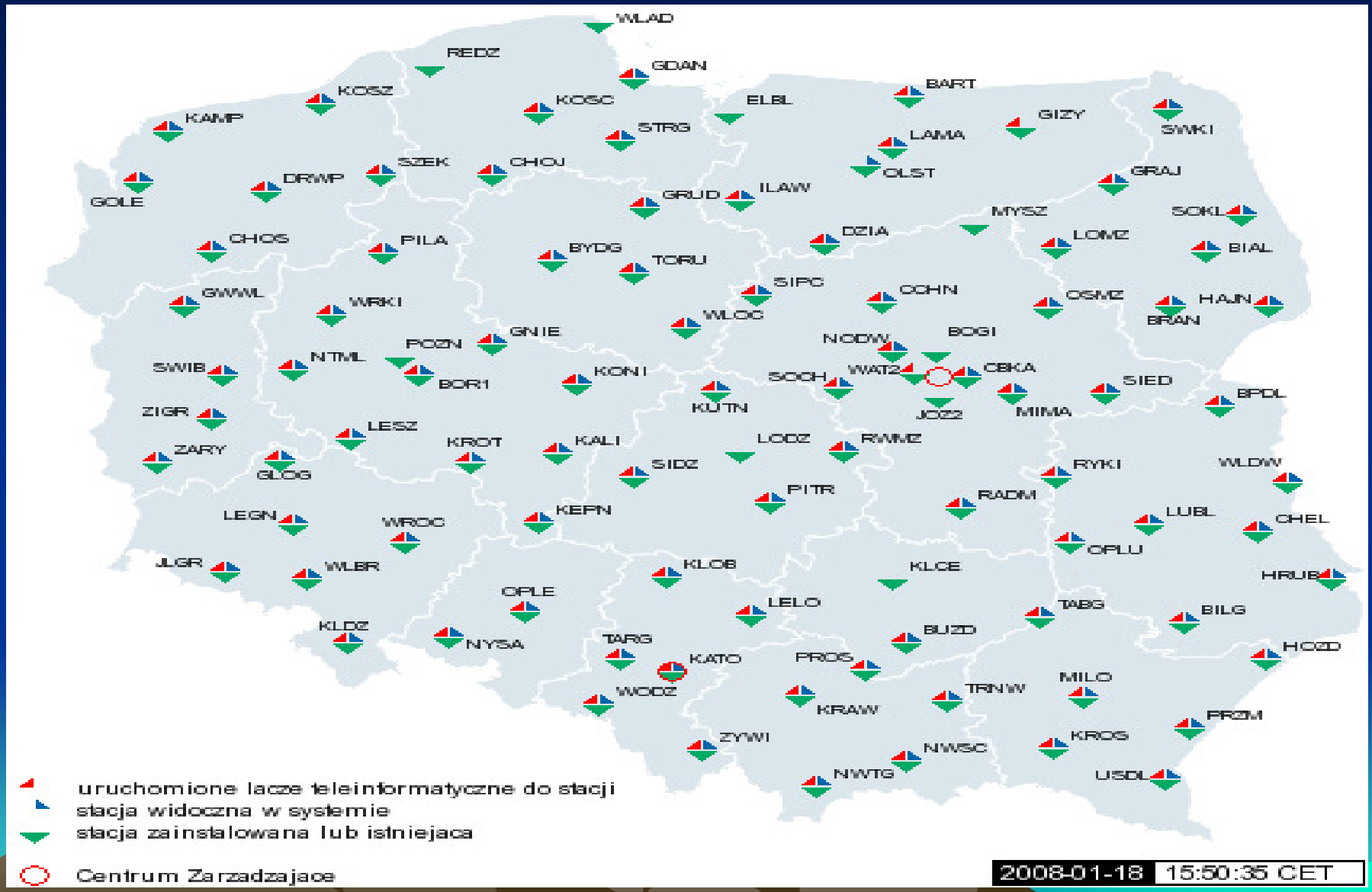
2. RIMS in Ukraine may be exploited by NSAU personal.

3. Political decision on an expanding EGNOS to Ukraine already exist and it have been noted in CO-OPERATION AGREEMENT ON A CIVIL GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) BETWEEN THE EUROPEAN COMMUNITY AND ITS MEMBER STATES AND UKRAINE of 01/12/2005

4. Real steps from European side for the boosting of process are needed!

Another way – EUPOS!

Poland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GRAJ
GOLE
GRUD
ILAW
MYSZ
SOKL
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LOMZ
CHOS
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BYDG
BIAL
TORU
SIPC
OSWZ
GWWL
WRKI
WLOC
HAJN
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GNIE
NODW
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CBKA
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RADM
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LUBL
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KATO
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uruchomione lacze teleinformatyczne do stacji
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Centrum Zarzadzajace
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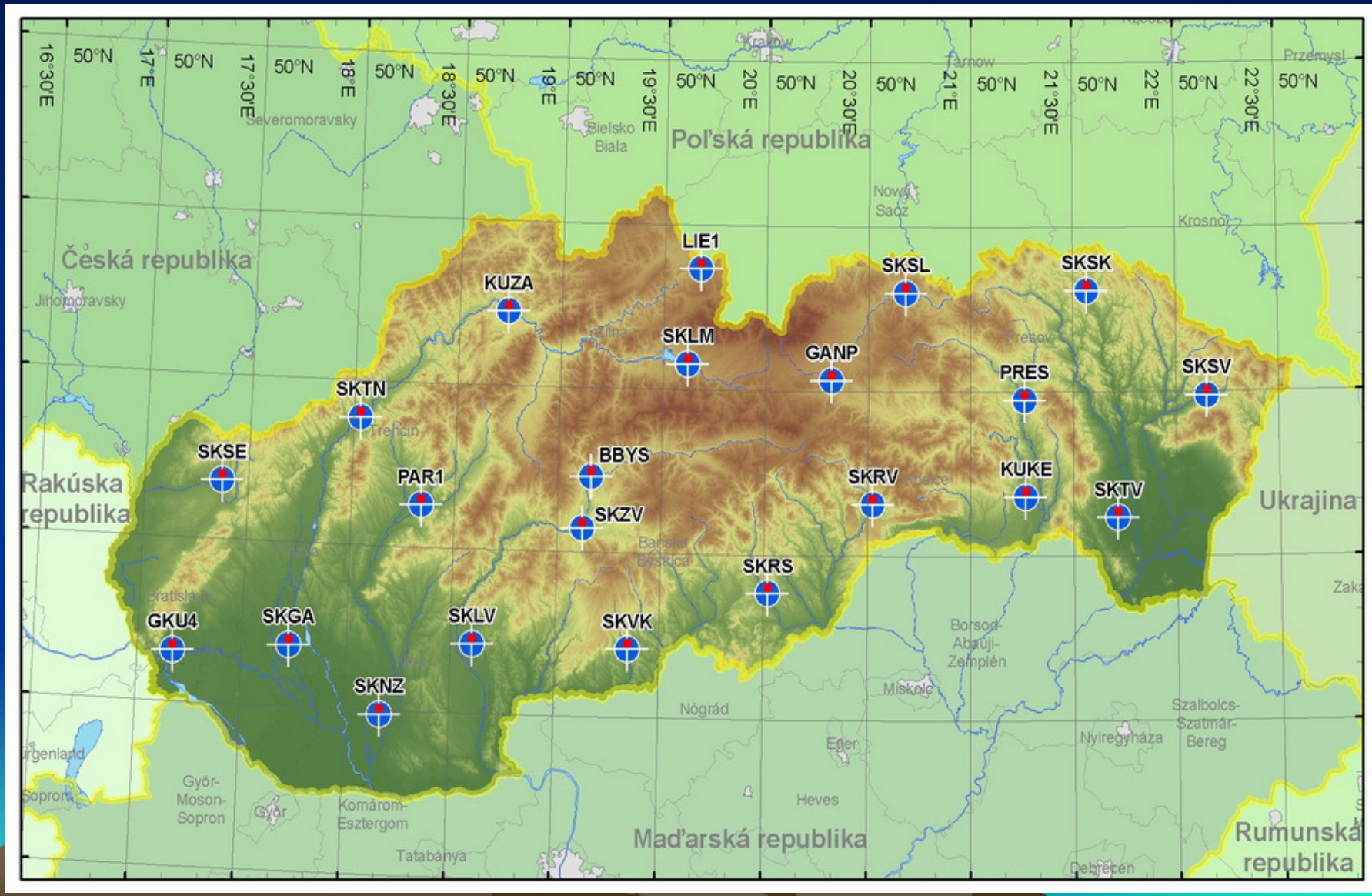
Slovakia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Česká republika
Poľská republika
Rakúska republika
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Maďarská republika
Rumunská republika
Severomoravsky
Jihomoravsky
Bielsko Biala
Krakow
Tarnow
Przemysl
Nowy Sącz
Krosno
Žilina
Prešov
Trenčín
Banská Bystrica
Košice
Bratislava
Zaka
Borsod-Abaúj-Zemplén
Miskolc
Nógrád
Eger
Heves
Szalbolcs-Szatmár-Bereg
Nyiregyháza
Debrecen
Burgenland
Sopron
Győr-Moson-Sopron
Győr
Komárom-Esztergom
Tatabánya
16°30'E
17°E
17°30'E
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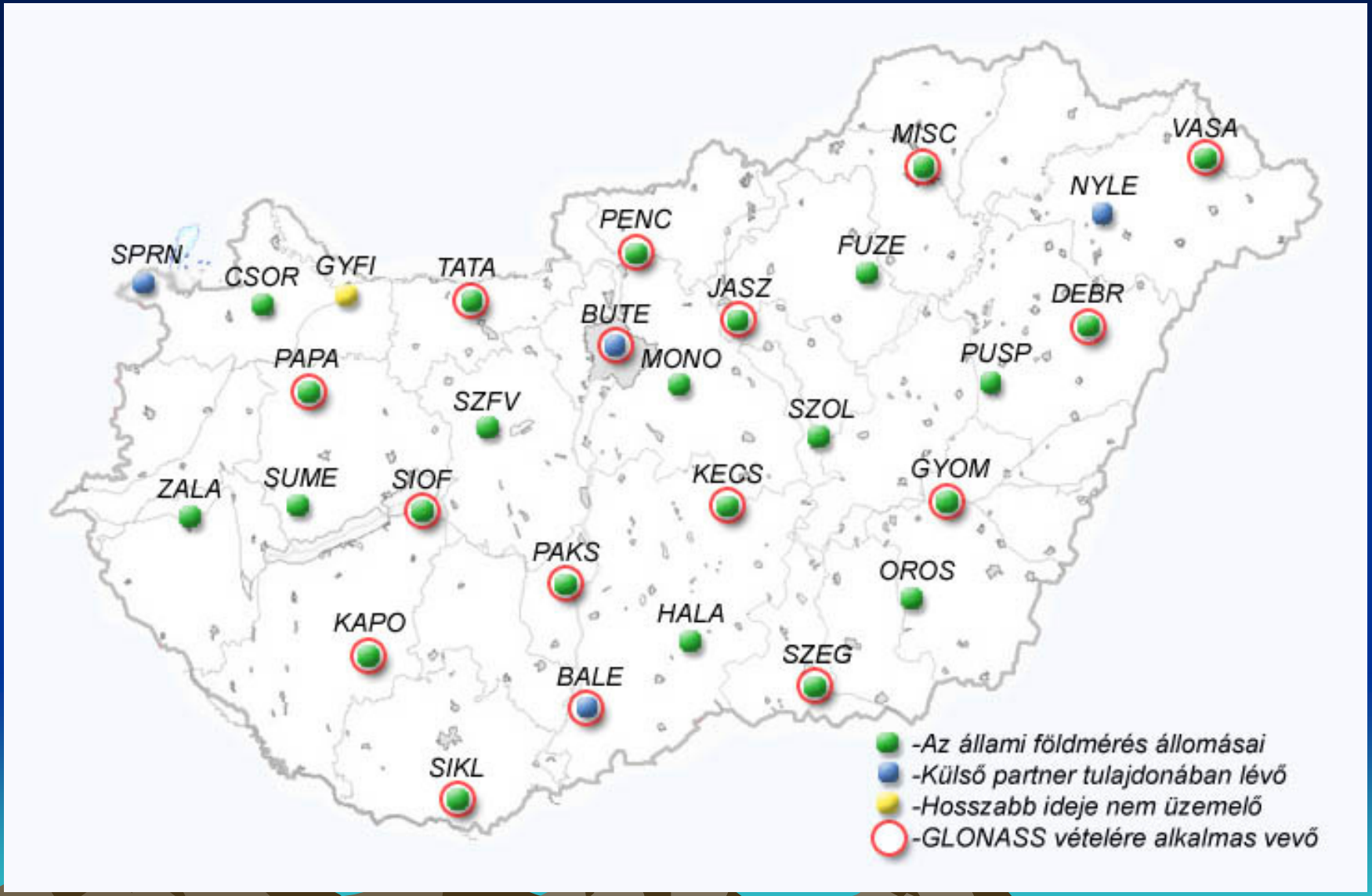
21°30'E
22°E
22°30'E
50°N

Hungary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GYFI
TATA
JASZ
DEBR
BUTE
MONO
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SZFV
SZOL
ZALA
SUME
SIOF
KECS
GYOM
PAKS
OROS
KAPO
HALA
SZEG
BALE
SIKL
-Az állami földmérés állomásai
-Külső partner tulajdonában lévő
-Hosszabb ideje nem üzemelő
-GLONASS vételére alkalmas vevő

ROMANIA


UKRAINE
R. MOLDOVA
HUNGARY
SERBIA
BULGARIA
UKRAINE
BLACK SEA
MARAMURES
SATU MARE
BOTOSANI
SUCEAVA
BISTRITA-NASAUD
SALAJ
BIHOR
IASI
NEAMT
CLUJ
MURES
HARGHITA
BACAU
VASLUI
ARAD
ALBA
HUNEDOARA
COVASNA
VRANCEA
TIMIS
BRASOV
GALATI
SIBIU
BUZAU
VALCEA
CARAS-SEVERIN
ARGES
PRAHOVA
BRAILA
TULCEA
GORJ
DAMBOVITA
IALOMITA
MEHEDINTI
CALARASI
OLT
ILFOV
TELEORMAN
GIURGIU
CONSTANTA
DOLJ

2nd Concept: GNSS-based Positioning-Timing-Navigation System for Ukraine

GNSS-based Positioning-Timing-Navigation System (GPTNS) for Ukraine is intended for:

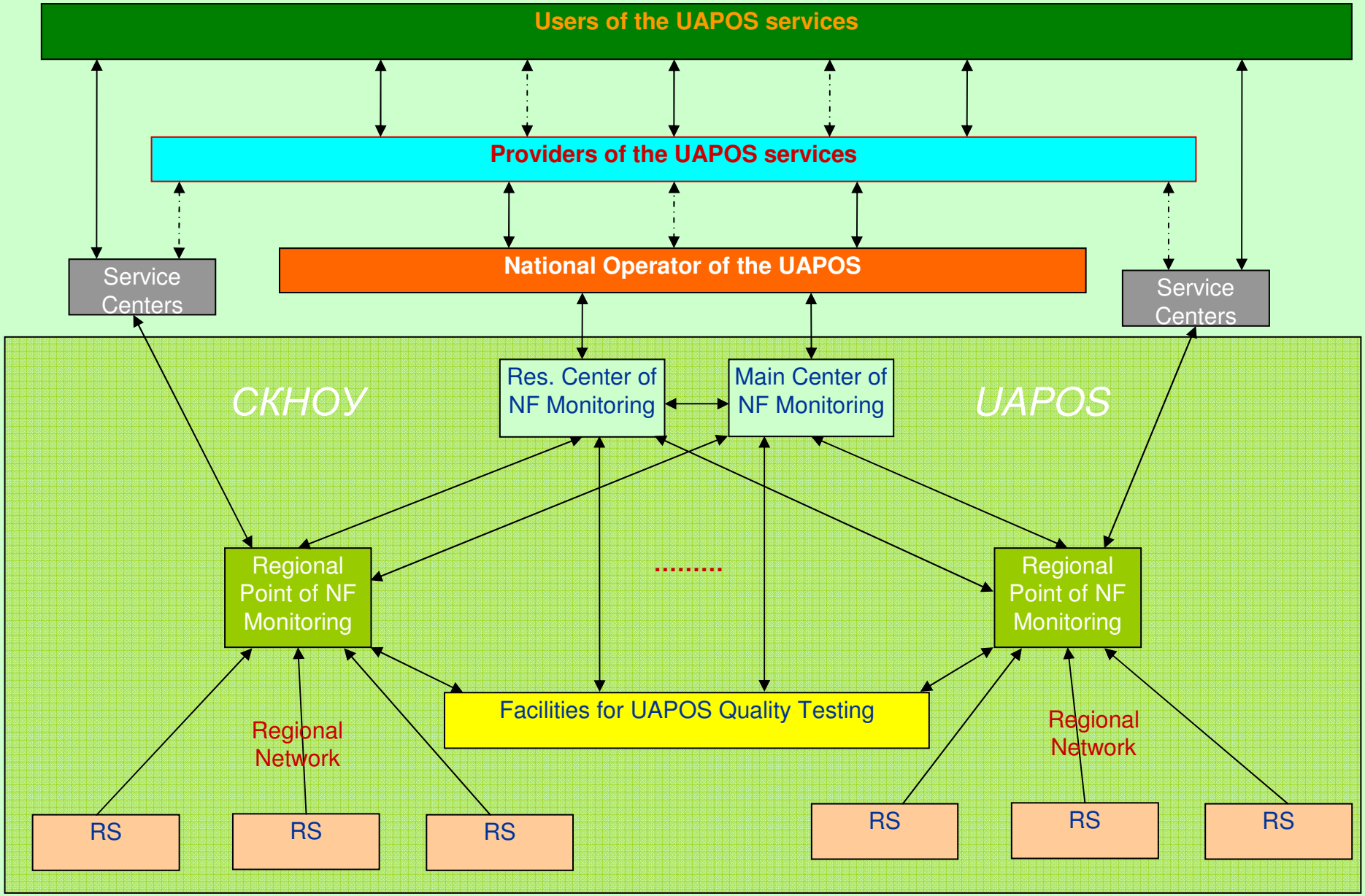
- conducting of the permanent monitoring of navigation fields, that are formed by GNSS GPS (USA), GLONASS (Russia), GALILEO (EU) and others;
- forming differential corrections (DC) for GNSS and information about their integrity as well;
- dissemination DC and integrity information to users

2nd Concept of GNSS-based Positioning-Timing-Navigation System for Ukraine

GPTNS for Ukraine consist of 3 main functional subsystems :

- Subsystem of Wide Area DC (SWADC) in real time, or 'UAPOS DGNSS';
- Subsystem of Precision Post-Processing Estimations (SPPPE) or 'UAPOS Geodetic';
- Subsystem of Regional and Local DC (SRDLC) in real time, or 'UAPOS Network RTK'

All above subsystems are based on networks that are deployed in Ukraine and in neighboring countries

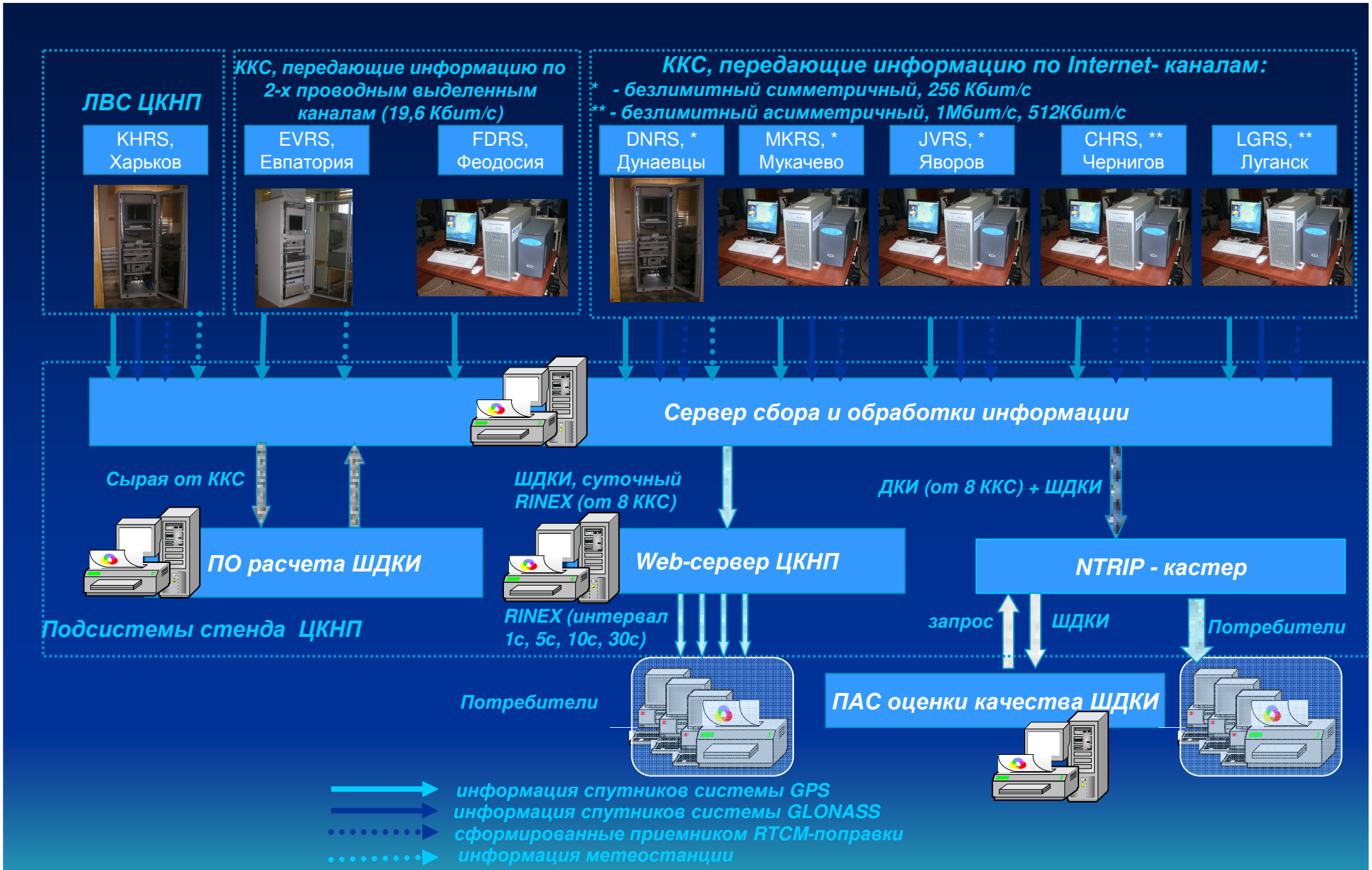

Users of the UAPOS services
Providers of the UAPOS services
National Operator of the UAPOS
Service Centers
Service Centers
СКНОУ
UAPOS
Res. Center of NF Monitoring
Main Center of NF Monitoring
Regional Point of NF Monitoring
.....
Regional Point of NF Monitoring
Facilities for UAPOS Quality Testing
Regional Network
Regional Network
RS
RS
RS
RS
RS
RS

WORKS STATUS

All the RSs, that are in UAPOS are designed and developed by «JSC RIREM». Two types of RSs are used in UAPOS:

- RIMS-type for the system EGNOS (RIMS NI068)
- RS-type for the system EUPOS (KKS NI074).


GPS
ГЛОНАСС
GPS L1, L2
L1, L2 GLO
ККС НИ074
GPS L1, L2
L1, L2 GLO
L1 GPS
L1 GLO
ККС НИ068
Компьютер
SUN Enterprise
220 R
CPF
Сырые
данные
CCF
Сырые
данные


ЛВС ЦКНП
KHRS, Харьков
ККС, передающие информацию по 2-х проводным выделенным каналам (19,6 Кбит/с)
EVRS, Евпатория
FDRS, Феодосия
ККС, передающие информацию по Internet- каналам:
* - безлимитный симметричный, 256 Кбит/с
** - безлимитный асимметричный, 1Мбит/с, 512Кбит/с
DNRS, * Дунаевцы
MKRS, * Мукачево
JVRS, * Яворов
CHRS, ** Чернигов
LGRS, ** Луганск
Сервер сбора и обработки информации
Сырая от ККС
ПО расчета ШДКИ
Подсистемы стенда ЦКНП
ШДКИ, суточный RINEX (от 8 ККС)
Web-сервер ЦКНП
RINEX (интервал 1с, 5с, 10с, 30с)
ДКИ (от 8 ККС) + ШДКИ
NTRIP - кастер
запрос
ШДКИ
Потребители
Потребители
ПАС оценки качества ШДКИ
информация спутников системы GPS
информация спутников системы GLONASS
сформированные приемником RTCM-поправки
информация метеостанции

Currently the Reserve Center of NFM provides

- gathering, archiving and quality control of the information in the real-time and in the post-session mode;

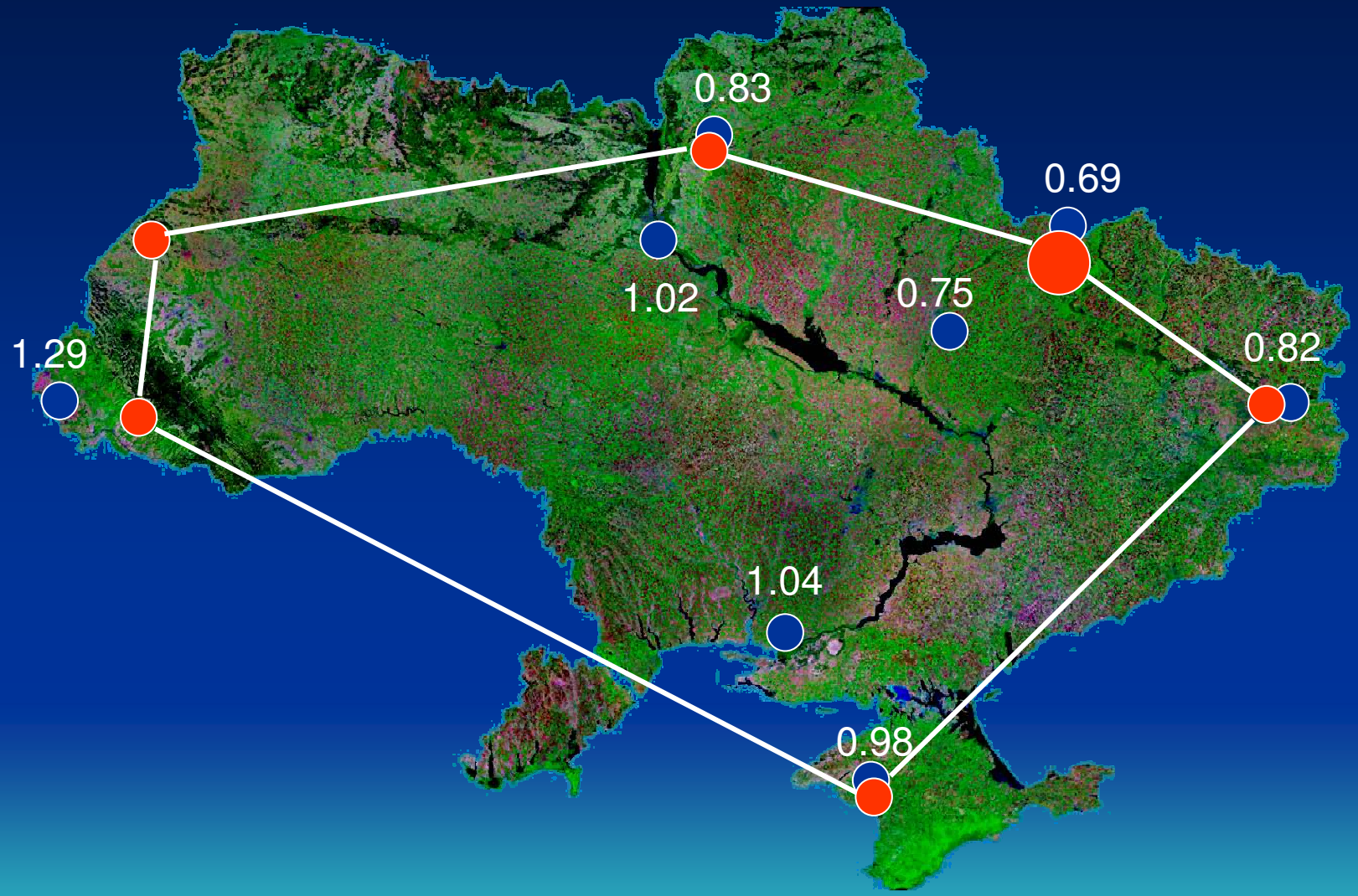
- maintenance of the web-site that contains “raw” and processed data that are retrieved from the UAPOS network's stations located in Kharkov, Dunayevtsy, Evaptoria, Feodosia, Chernigov, Yavorov, Mukachevo, Lugansk;

- generation of the FKP wide-area differential corrections;

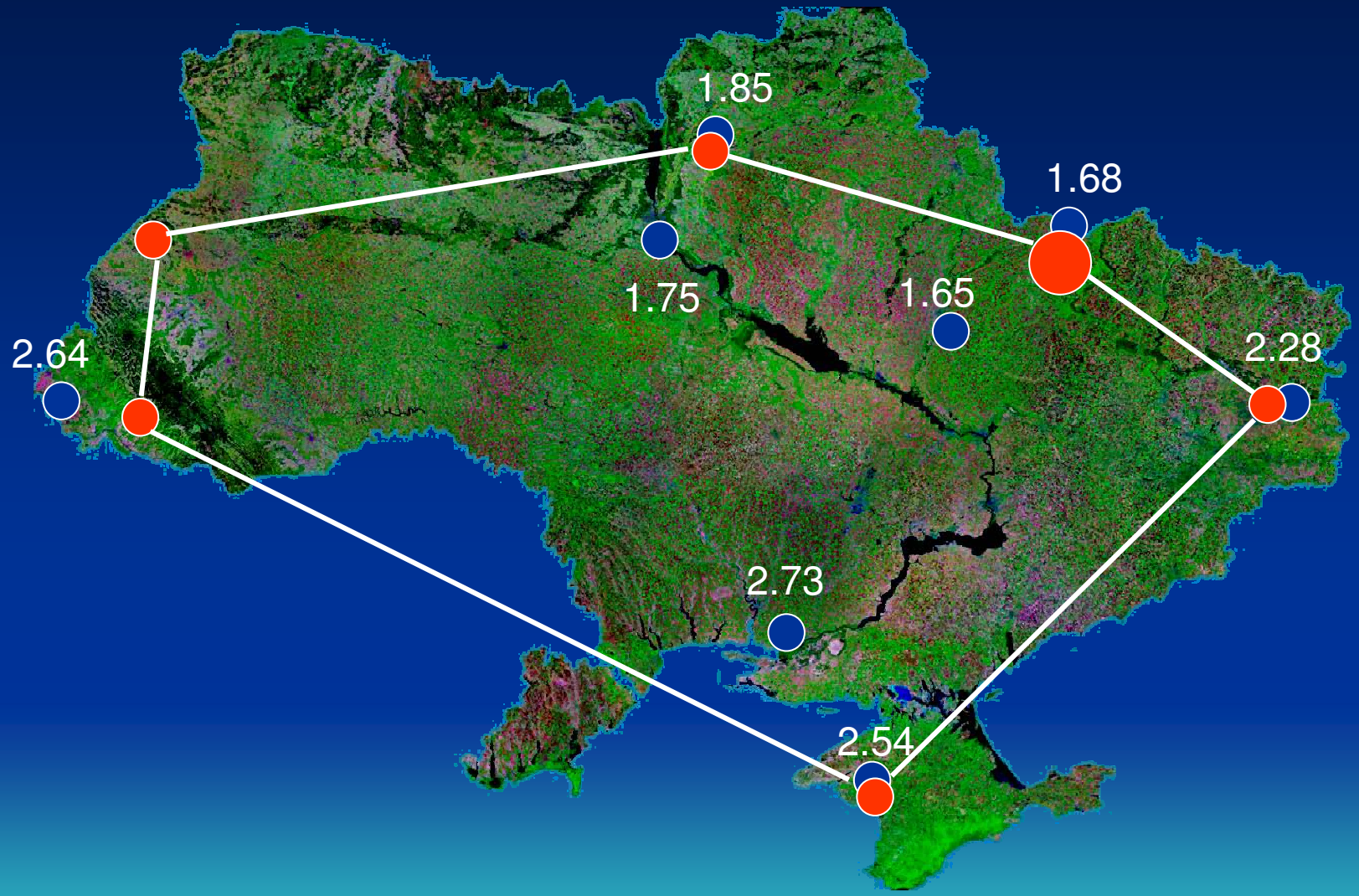
- providing the FKP via Internet with a separate program-technical complex (caster);

- antenna phase center coordinates monitoring for all the RS with the accuracy of binding to EUREF up to 5mm.

Accuracy estimation in Horizontal plane



Accuracy estimation on Vertical



The testing of a deployed fragment of UAPOS

Variant of UAPOS functioning	GNSS	Expected accuracy (2σ) of coordinates (due to the SoW)	Real accuracy (2σ) of coordinates (fact)	Note
WADC	GPS	1-3m	1,5-2,5m (1000km)	On the signals of GPS. (Software of the WADC for Glonass is being developed in 2008)
Local DC of one RS	GPS	0.5-1.4m (0-100km)	0,5-1,5m (150km)	
RTK mode	GPS	5-10cm (0-20km)	10-20cm (10-)	
In PP- mode	GPS	1-2 cm	0,6-2cm	

Currently the following services of the first stage of the system are available to the users

- In frames of the subsystem "UAPOS Geodetic" the information of the RS network (raw and processed information) for solving the tasks of the position determination in the post-session mode with the accuracy of 1-2cm while using the standard programs of processing and measuring of the two-frequencies receiver.

- "UAPOS DGNSS" - wide-area differential correction, distributed through the Internet and provides the possibility to precise the position of the single-frequency consumer with the accuracy of 1-3m on the territory of Ukraine that is constrained with the polygon with the apexes in Kharkov, Dunayevtsy, Evaptoria, Feodosia, Chernigov, Yavorov, Mukachevo, Lugansk (covers approximately 73% of the territory of Ukraine).

Currently the following services of the first stage of the system are available to the users

Besides that each RS of the network offers to the consumers (non-network mode):

- local differential correction distributed through the Internet for precising the position of the single-frequency consumer with the accuracy of 0.5-1.5m (covered radius of 150km around the RS);

- RTK-correction distributed through the Internet for precising the position of the two-frequencies consumer with the accuracy of 10-20cm (covered redius up to 40km around the working RS).

UAPOS Regional Networks

- **For maintenance of the international transport highways and railroads, which crossing Ukraine**
- In separate important economic regions of Ukraine
- In regions directly bordering with the EUPOS countries


Транспортные коридоры Украины
Беларусь
Россия
Польша
Словакия
Венгрия
Румыния
Молдова
Румыния
Россия
КИЕВ
ЛЬВОВ
ТЕРНОПОЛЬ
ИВАНО-ФРАНКОВСК
ЧЕРНОВЦЫ
ЧЕРНИГОВ
СУМЫ
ХАРЬКОВ
ПОЛТАВА
ДНЕПРОПЕТРОВСК
ДОНЕЦК
ЛУГАНСК
ЗАПОРОЖЬЕ
КРИВОЙ РОГ
ОДЕССА
НИКОЛАЕВ
ХЕРСОН
МЕЛИТОПОЛЬ
МАРИУПОЛЬ
КЕРЧЬ
СИМФЕРОПОЛЬ
СЕВАСТОПОЛЬ
ЯЛТА
АЗОВСКОЕ МОРЕ
ЧЕРНОЕ МОРЕ
Гданск Одесса
Европа Азия
Евроазиатский
ЧЕС
Автодороги Украины
Автодороги Украины международного значения (включая Европейские маршруты)
Автодороги Украины национального значения
"HIGHWAYS IN UKRAINE"
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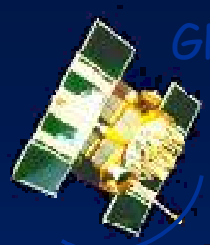
Regional Network in Kharkiv Region



Regional Navigation-information System

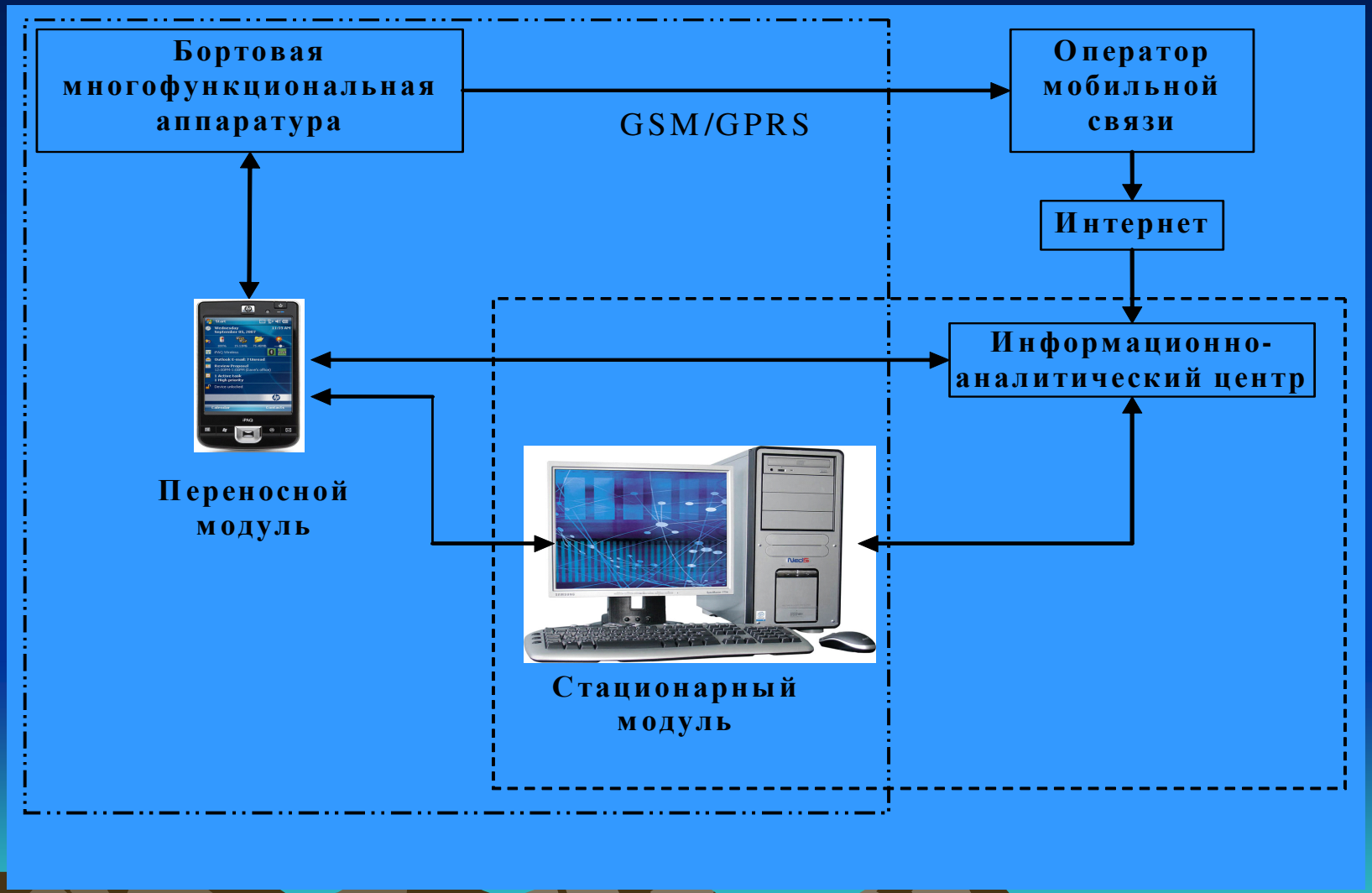
System of high-precision positioning

Решение геодезических / кадастровых задач

System of transportation monitoring

Information – Analytical Center for transportation monitoring in Kharkiv Region

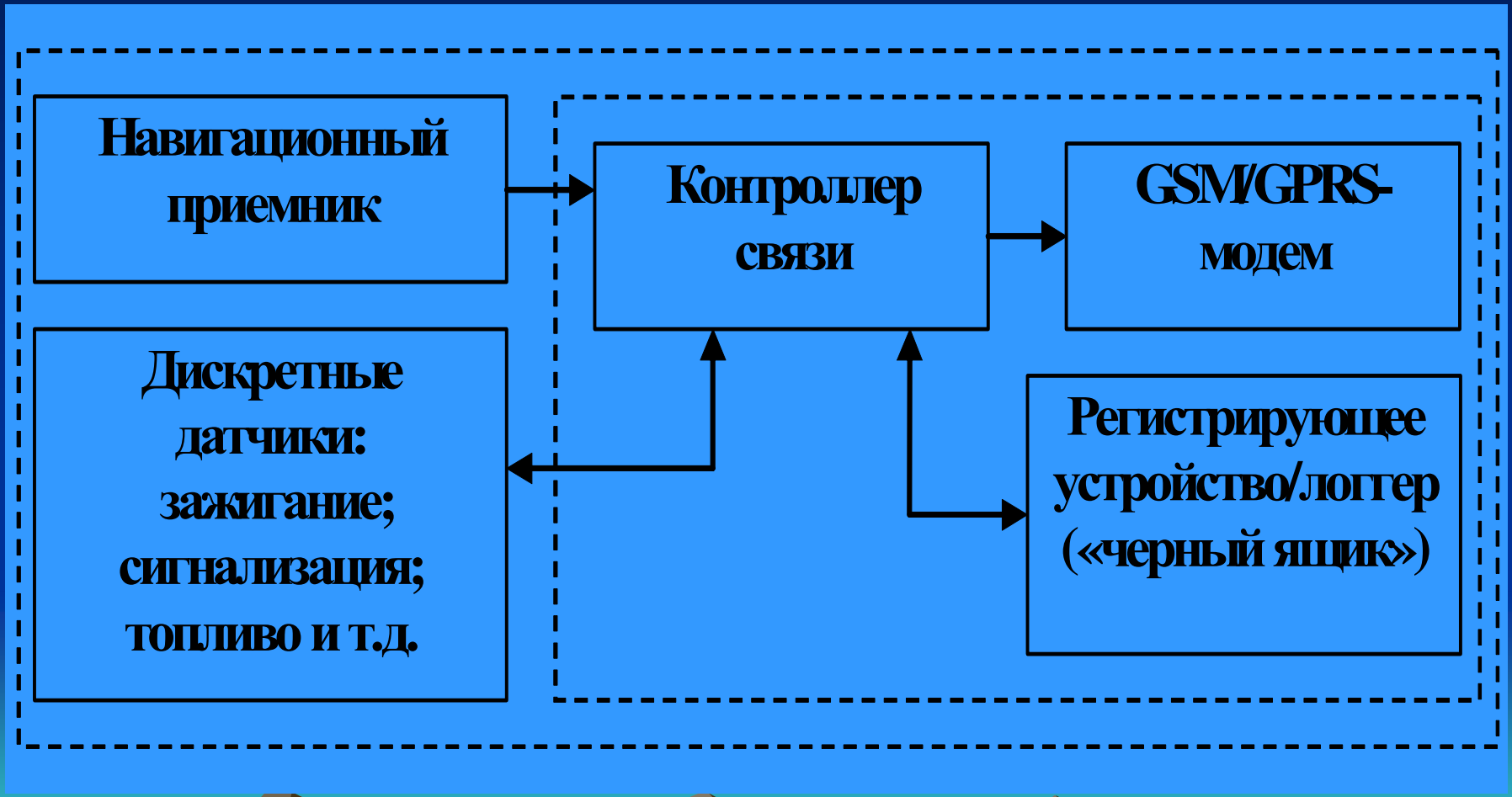
Взаимодействие элементов Региональной информационно-аналитической системы



Бортовая многофункциональная аппаратура контроля параметров движения и состояния автотранспортных средств обеспечивает:

- определение параметров движения автомобиля по сигналам ГНСС,
- фиксация в «черном ящике» нарушений правил дорожного движения,
- снятие показаний дискретных датчиков,
- установление в автоматизированном режиме факта попадания в ДТП и оперативное извещение информационно-аналитического центра,
- накопление информации, зарегистрированной на интервале нарушения правил дорожного движения, для последующего детального анализа.

Схема бортовой многофункциональной аппаратуры контроля движения



Система объективного контроля соблюдения ПДД на основе использования сигналов ГНСС

Принципы функционирования системы

- Бортовая многофункциональная аппаратура функционирует автономно.
- Переносной и стационарный модули системы эксплуатируются Госавтоинспекцией.
- Бортовая аппаратура анализирует параметры движения автомобиля и показания датчиков, фиксирует нарушения правил дорожного движения.
- При наличии признаков ДТП бортовая аппаратура выдает сигнал бедствия и последние зафиксированные координаты автомобиля.
- Оперативный анализ информации, записанной в «черном ящике», проводится во время текущего технического осмотра, при остановке по подозрению в нарушении правил дорожного движения или при возникновении ДТП.

Система объективного контроля соблюдения ПДД на основе использования сигналов ГНСС

- При оперативном анализе ДТП формируется заключение о траектории движения автомобиля, его скорости и ускорения на интервале времени, непосредственно предшествующем ДТП. При достоверных результатах анализа проезжая часть может быть освобождена от автомобилей участников ДТП.
- Накопленная в «черном ящике» информация о нарушениях правил дорожного движения и соответствующая измерительная информация при оперативном анализе извлекается и передается в ИАЦ для статистической обработки и принятия административных мер.
- Детальный анализ информации проводится в ИАЦ (стационарный модуль) при невозможности получения объективной оценки по результатам оперативного анализа. При обработке в ИАЦ используется информация перманентных и/или контрольных станций ГНСС (реализуется режим дифференциальной навигации).

Контроль соблюдения правил дорожного движения

Состав системы:

1.Бортовая многофункциональная аппаратура контроля параметров движения и состояния автотранспортных средств на основе спутниковой навигации

2.Переносные модули автоматизированного контроля соблюдения правил дорожного движения, используемые патрульными службами ГАИ

3.Стационар
автоматизи
правил до
входящие
аналитич

Примеры контролируемых ситуаций

Автоматизированная система управления дорожным движением

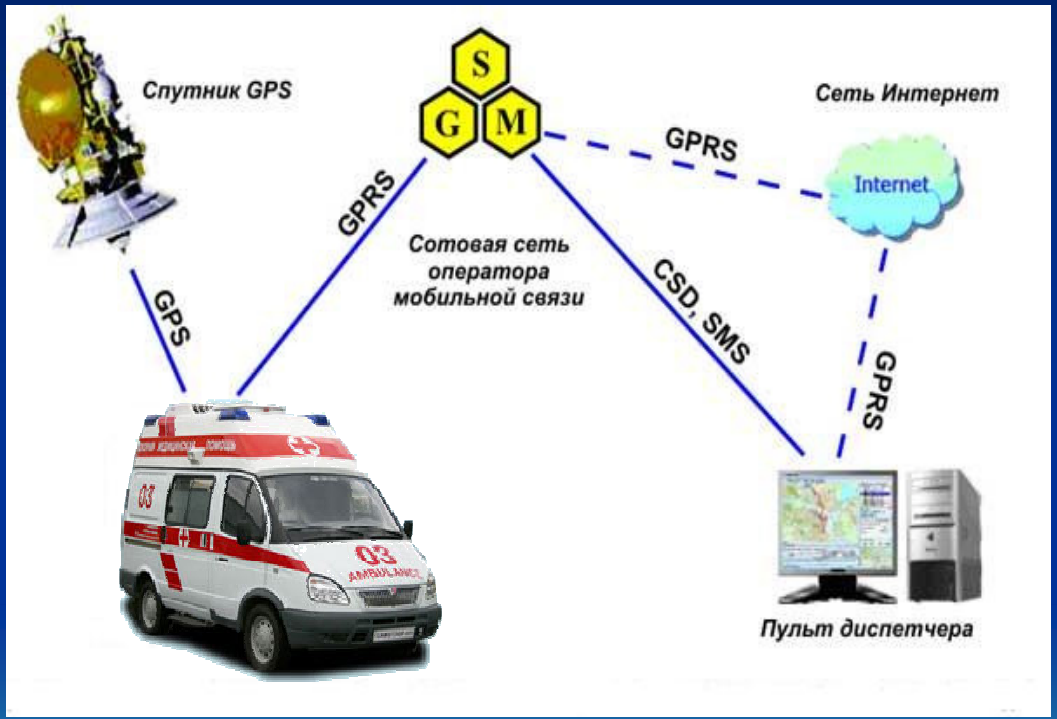
Задачи АСУ ДД:

1. Автоматизированный сбор информации о дорожной обстановке и параметрах движения транспортных средств
2. Централизованное управление работой светофоров с учетом дорожной ситуации
3. Информирование водителей относительно дорожной обстановки
4. Фиксация и оперативное реагирование на возникновение чрезвычайных ситуаций
5. Автоматизированное выявление нарушителей правил дорожного движения

AUTOMATED NAVIGATION-DISPATCHING CONTROL SYSTEM of AMBULANCE MOBILE BRIGADES

The purpose of system developing is to raise quality and delivery performance of ambulance service

Improvement of quality and delivery performance is reached by automation of processing of calls, rationalization and automation of decision-making process on a forwarding of ambulance brigade by means of ambulance-CAD, modern means of a radio communication, sensors of



The system from the beginning of 2008 is in trial operation at Kharkov's ambulance station

AUTOMATED NAVIGATION-DISPATCHING CONTROL SYSTEM of AMBULANCE MOBILE BRIGADES

System provides solution of following problems:

- **automation of registration of calls which is receiving from the population;**
- **location of the ambulance car with display it on the electronic map;**
- **calculation of key parameters of movement of the car;**
- **automation of a choice of brigades (sorting of calls on priorities, differentiation of brigades on a client specialization and closeness to a concrete call);**
- **accumulation of the archival information for any period of time**

UAPOS Regional Networks

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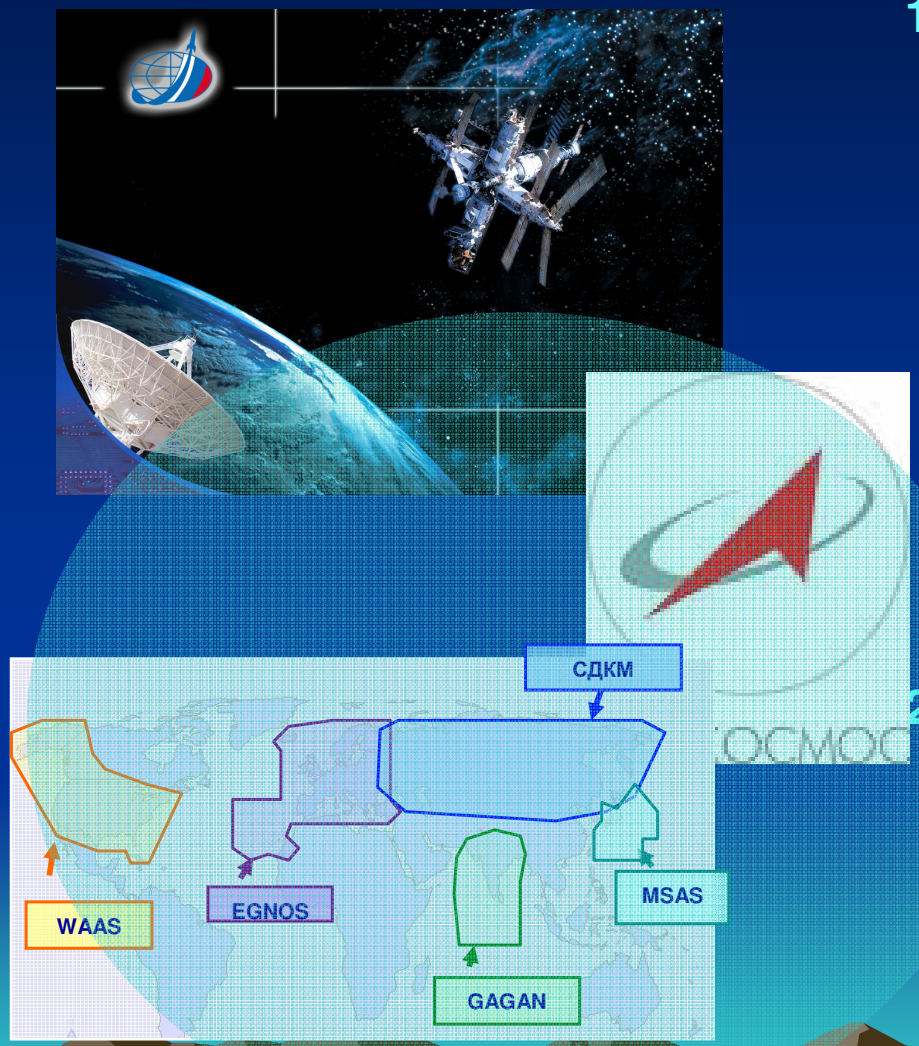
PLANNED REGIONAL UAPOS NETWORKS IN 2012

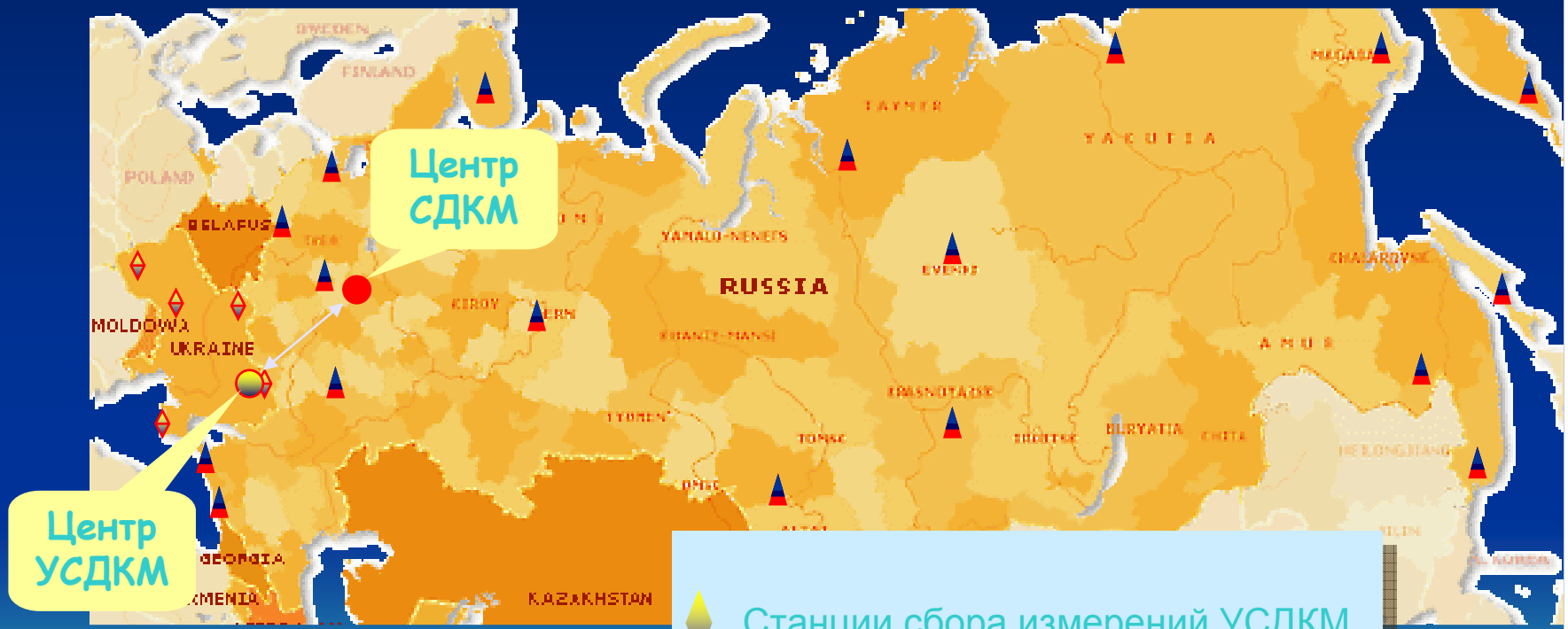
ВЗАИМОДЕЙСТВИЕ С РФ



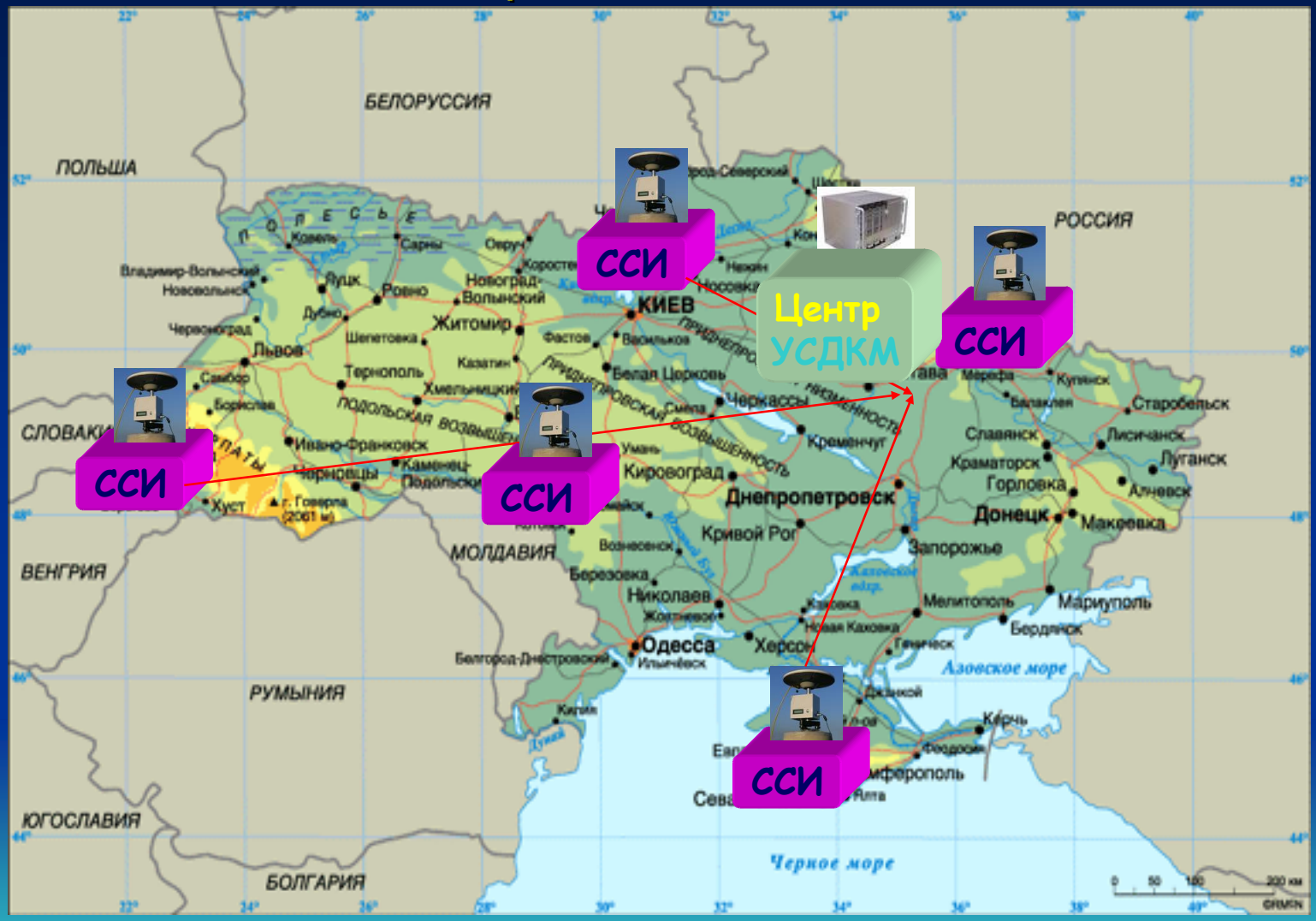
1. НКАУ и Роскосмосом подписана программа российско-украинского сотрудничества в области исследования и использования космического пространства на 2007-2011гг. Один из разделов этой программы предусматривает создание объединенной системы дифференциальной коррекции и мониторинга (ОСДКМ) на территории Украины и РФ.

2. Готовится межправительственное соглашение по данному вопросу. Срок подписания – конец 2009 г.

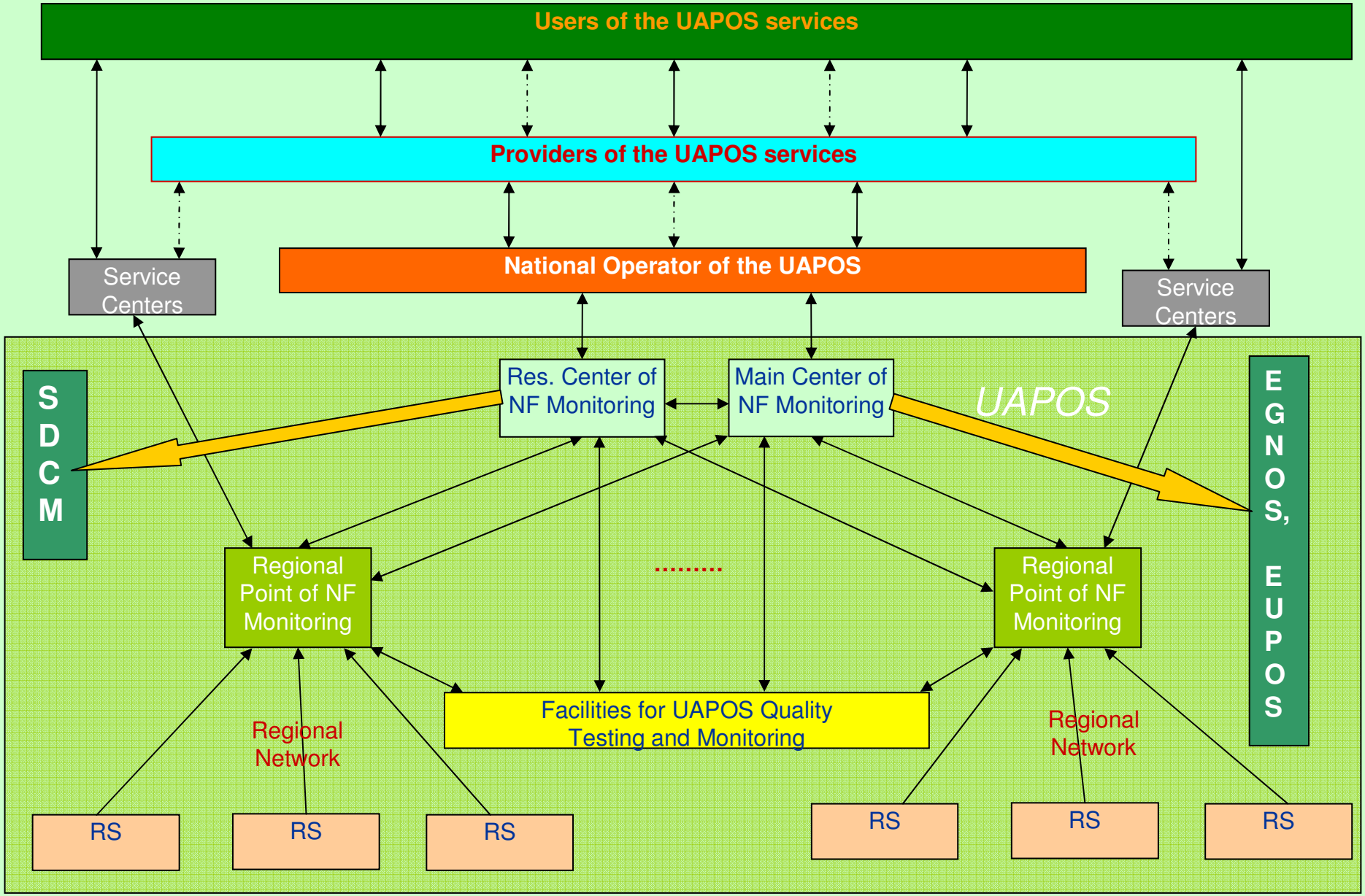
ОБЪЕДИНЕННАЯ СИСТЕМА ДИФФЕРЕНЦИАЛЬНОЙ КОРРЕКЦИИ И МОНИТОРИНГА



УКРАИНСКАЯ СИСТЕМА ДИФФЕРЕНЦИАЛЬНОЙ КОРРЕКЦИИ И МОНИТОРИНГА



ССИ – станция сбора измерений


Users of the UAPOS services
Providers of the UAPOS services
National Operator of the UAPOS
Service Centers
Service Centers
SDCM
Res. Center of NF Monitoring
Main Center of NF Monitoring
UAPOS
EGNOS, EUPOS
Regional Point of NF Monitoring
.....
Regional Point of NF Monitoring
Facilities for UAPOS Quality Testing and Monitoring
Regional Network
Regional Network
RS
RS
RS
RS
RS
RS

Thank You for Your Attention!

National Space Agency of Ukraine

8 Moskovska str., 01010, Kyiv, Ukraine

Phone: +380 44 281 62 79,

Fax: +380 44 281 62 73

E-mail:volokh@nkau.gov.ua