



lunch

EGNOS survey open!

<http://egnos-portal.gsa.europa.eu/egnos-users-satisfaction-survey>

7-8 October
Lisbon



The **EGNOS** Service Provision workshop



We certify you're there.



AGENDA (14:30 – 17:00)

14:30-16:15

EGNOS use in maritime domain

- ☞ Benefits of EGNOS/EDAS for inland waterway navigation
Gergely Mezo – Project Manager (RSOE Hungary)
- ☞ Steps towards Maritime application of EGNOS
Alan Grant – Principal Development Engineer (General Lighthouse Authorities of the UK & Ireland)
- ☞ Use of EGNOS in Maritime and SAR applications: the manufacturer perspective
(McMurdo)
- ☞ Cost Benefit Analysis in maritime: showing EGNOS benefits
Marco Bolchi – Senior consultant (VVA)

16:15-16:45

Coffee break

16:45-17:00

Conclusions

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Benefits of EGNOS/EDAS for Inland Waterway Navigation

Lisbon, 08.10.2014, EGNOS Service Provisioning Workshop



Gergely Mező
RSOE, Hungary



Tamás Horváth
Alberding GmbH, Germany



Outline

RSOE and Alberding GmbH

River Information Services

Benefits of EGNOS/EDAS for inland navigation

EDAS-based virtual DGNSS test results

Outlook/future plans

About RSOE



- 32-years-old non-profit association (NGO) based in Budapest
- main profile:
 - *operation and development of ICT systems, services (inland navigation and disaster management mainly),*
 - *project management and communication,*
- operation of Danube River Information Services (RIS) for Hungary (PannonRIS) commissioned by the National Transport Authority,
- operation of RIS centre (24/7 dispatcher centre) for the Danube,
- participation in 20+ EU-funded projects (Phare CBC, TEN-T, FP5, FP6 GJU, FP7, CADSES, SEE, IPA CBC programmes etc.).



RSOE and Alberding GmbH

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Outlook/future plans

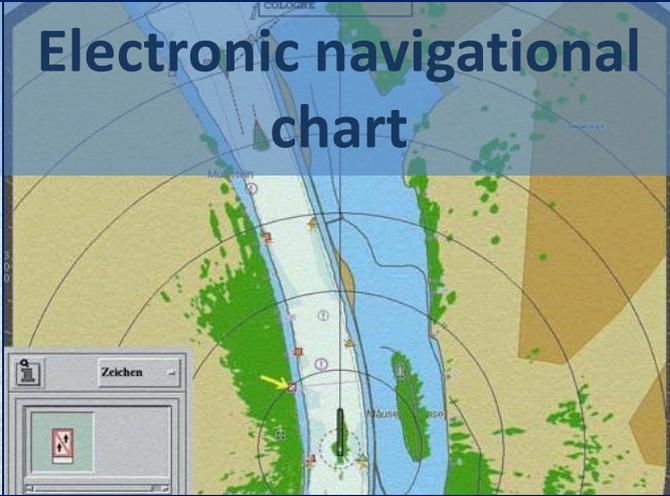
„‘river information services (RIS)’ means the harmonised information services to support traffic and transport management in inland navigation...” (2005/44/EC Directive, Article 3, a)

„For the purpose of RIS, for which exact positioning is required, the use of satellite positioning technologies is recommended.” (2005/44/EC Directive, Article 6)

Ship tracking and tracing



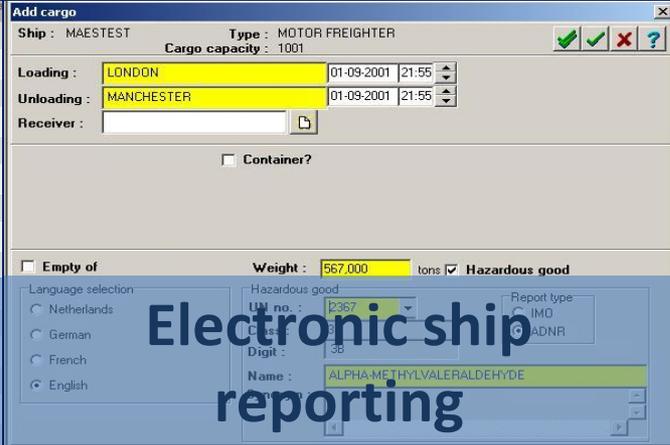
Electronic navigational chart



Azonosítás	Kiadás	Ervénység kezdete	Ervénység lejárata
2414 / 00 / 2011, részleges tilalom; javítási munkálatok	12.12.2011	15.12.2011	15.12.2011
2415 / 00 / 2011, veszélyes tilalom; szemle	12.12.2011	14.12.2011	14.12.2011
2413 / 00 / 2011, részleges tilalom; javítási munkálatok	12.12.2011	13.12.2011	13.12.2011
2412 / 00 / 2011, hirdetmény; munkálatok	12.12.2011	13.12.2011	13.12.2011
2411 / 00 / 2011, munkálatok; munkálatok	12.12.2011	12.12.2011	23.12.2011
2410 / 00 / 2011, találkozás tilos; építési munkálatok	12.12.2011	12.12.2011	16.12.2011
2409 / 00 / 2011, részleges tilalom; szemle	12.12.2011	14.12.2011	14.12.2011
2408 / 00 / 2011, részleges tilalom; szemle	12.12.2011	13.12.2011	13.12.2011
2407 / 00 / 2011, korlátozás; rendezvény	12.12.2011	12.12.2011	19.12.2011
2406 / 00 / 2011, zárlat; javítási munkálatok	12.12.2011	09.01.2012	16.03.2012
2405 / 00 / 2011, találkozás tilos; gázkezelés	09.12.2011	09.12.2011	
2404 / 00 / 2011, találkozás tilos; gázkezelés	09.12.2011	09.12.2011	
2403 / 00 / 2011, találkozás tilos; gázkezelés	09.12.2011	08.12.2011	
2402 / 00 / 2011, hirdetmény; kötrési munkálatok	08.12.2011	09.12.2011	23.12.2011
2401 / 00 / 2011, hirdetmény; üzemzár	08.12.2011	30.12.2011	30.12.2011

Notices to Skippers

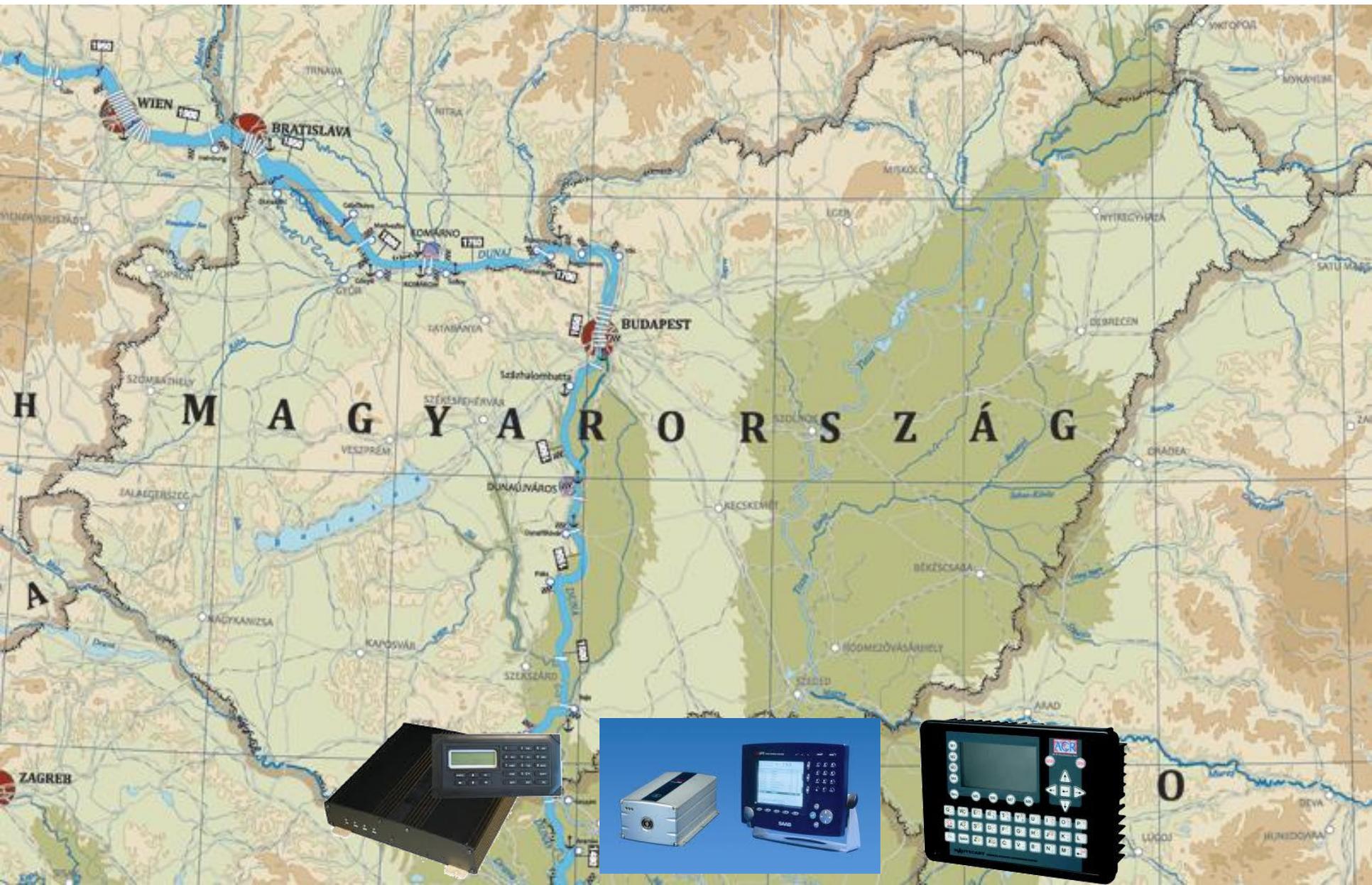
Electronic ship reporting



PannonRIS – the Hungarian RIS system



-  AIS Base Station
-  AIS DGPS Base Station
-  AIS Monitoring Station
-  AIS Control Centre



Hungarian AIS (Automatic Identification System) network:

- covers the 400km long Hungarian Danube stretch
- complies with inland AIS standard (415/2007 EC regulation)
- 11 AIS base stations along the Danube
- 3 base stations are generating corrections with own algorithm using SBAS enabled GPS receivers and distributing DGNSS data via AIS (Message17)
- data processed in the Budapest centre and can be accessed via internet on secure web interface (strict access rights)
- AIS use is mandatory since 01.01.2012 above 20m vessel length



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River Information Services

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EDAS-based virtual DGNSS test results

Outlook/future plans

EGNOS/EDAS pros and cons



- EGNOS advantages
 - Free of charge service
 - Wide coverage area through GEO satellite transmission
 - Meets IMO accuracy requirements for inland waterways
 - Integrity monitoring
- EGNOS limitations
 - Geostationary satellite signals may be obstructed (terrain, buildings, bridges)
 - EGNOS/EDAS corrections can be re-transmitted via IALA radio beacons or AIS base stations
 - EGNOS enabled GNSS receiver required with SBAS raw data output
 - IP-based access via EDAS
 - IALA radio beacons and AIS base stations require RTCM input
 - EGNOS RTCA data has to be converted into RTCM SC-104 format

Benefits of AIS DGNSS use in IWT

Crucial areas

- River manoeuvres
- Accident investigation
- Law enforcement procedures

IWT requirements

- Improved integrity
- Higher availability and continuity
- Higher accuracy



Alberding Beacon.net with EGNOS

Data conversion module

- EGNOS RTCA data conversion to RTCM SC-104 corrections for user definable positions:
“EGNOS VRS”
- Input data sources:
 - EGNOS enabled GNSS receiver
 - EDAS via IP
- Rebroadcast via
 - IALA radio beacons, AIS, Ntrip
- Can be used as a backup solution to conventional DGNSS or even as primary system



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River Information Services

Benefits of EGNOS/EDAS for inland navigation

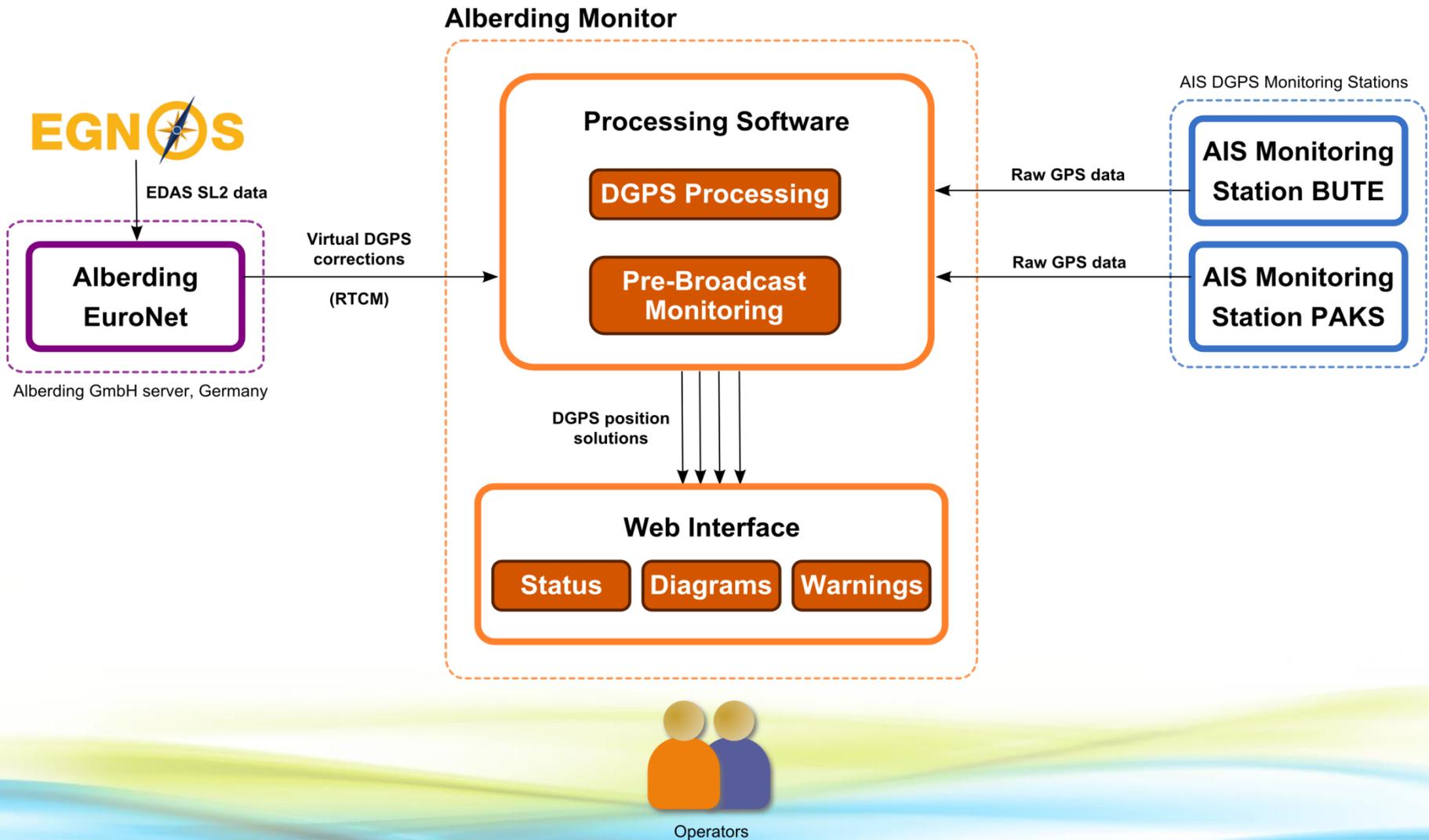
EDAS-based virtual DGNSS test results

Outlook/future plans

- IRIS Europe 3 is a multi-beneficiary TEN-T project focusing on further enhancement and fine-tuning of RIS key technologies, services and applications.
- Hungarian DGNSS pilot by RSOE (subcontractor: Alberding GmbH):
 - Assess the performance of the currently used AIS-based DGPS service and its alternatives for DGNSS correction generation and dissemination

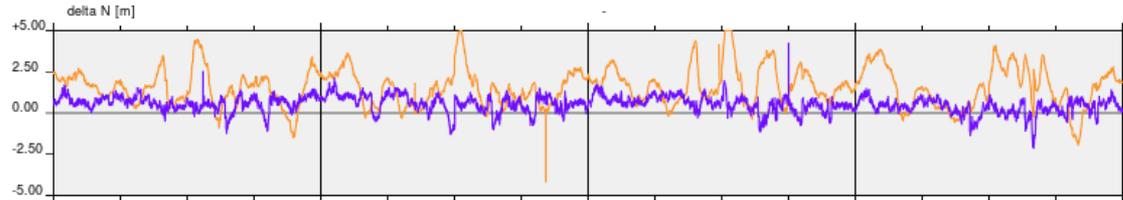


DGNSS performance monitoring

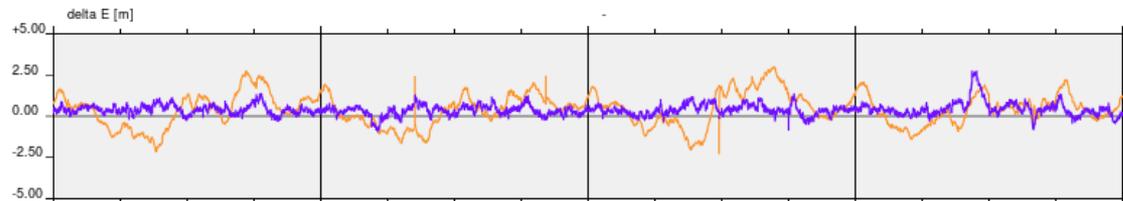


EGNOS VRS performance in Hungary

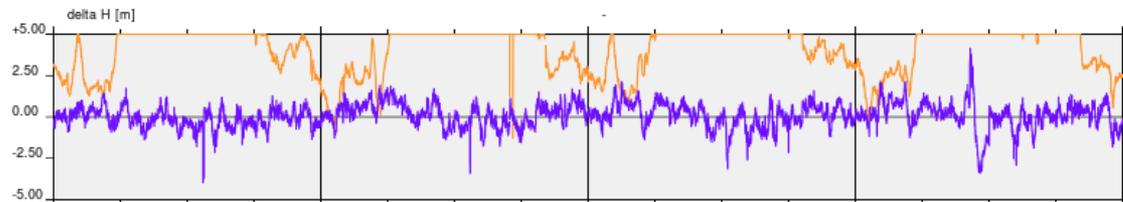
Delta North



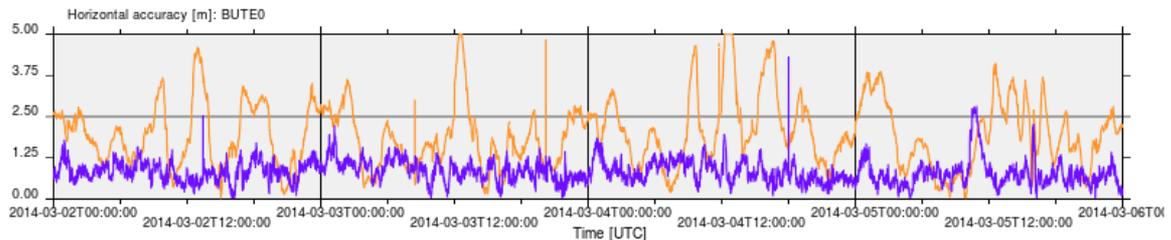
Delta East



Delta Height



Delta Horizontal

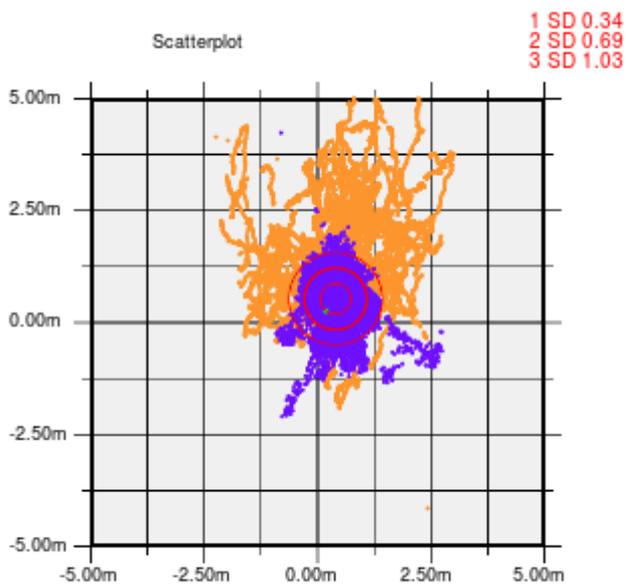


— EGNOS VRS
— Absolute GNSS

*DGNSS processing software: Alberding Beacon.net
 GNSS raw data input: geodetic grade GNSS receiver
 Correction source: EDAS SL2-based "EGNOS VRS"
 Date: 2014.03.02-06*

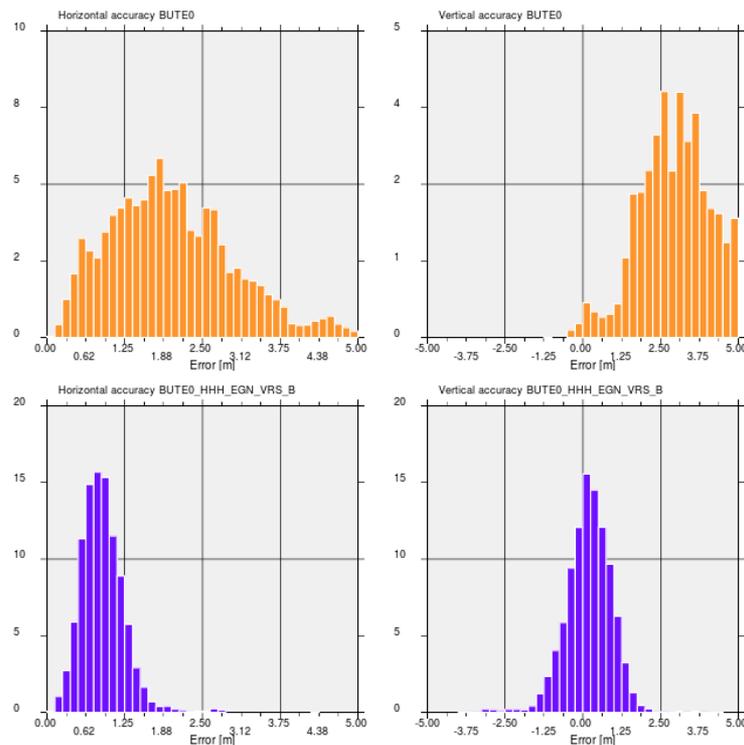
EGNOS VRS performance in Hungary

Horizontal scatter



Horizontal accuracy

Vertical accuracy



- █ EGNOS VRS
- █ Absolute GNSS

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Date: 2014.03.02-06

EGNOS VRS performance in Hungary

	EGNOS VRS in Budapest			
	Min.	Max.	Mean.	2 σ
Δ North [m]	-2.56	3.78	0.08	0.99
Δ East [m]	-1.45	2.20	-0.13	0.71
Δ Height [m]	-3.95	4.14	0.07	1.47
Δ Horizontal [m]	0.00	4.01	0.52	0.70

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Outlook

- **EDAS integration into the Hungarian AIS DGNSS system** as primary or backup correction source in order to improve the current quality of service
- Continue and strengthen **international cooperation** in the field of DGNSS (as inland navigation system operator)
- Regional cooperation for **harmonising AIS DGNSS services along the river Danube**





Thank you for your attention!



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Tamás Horváth
horvath@alberding.eu



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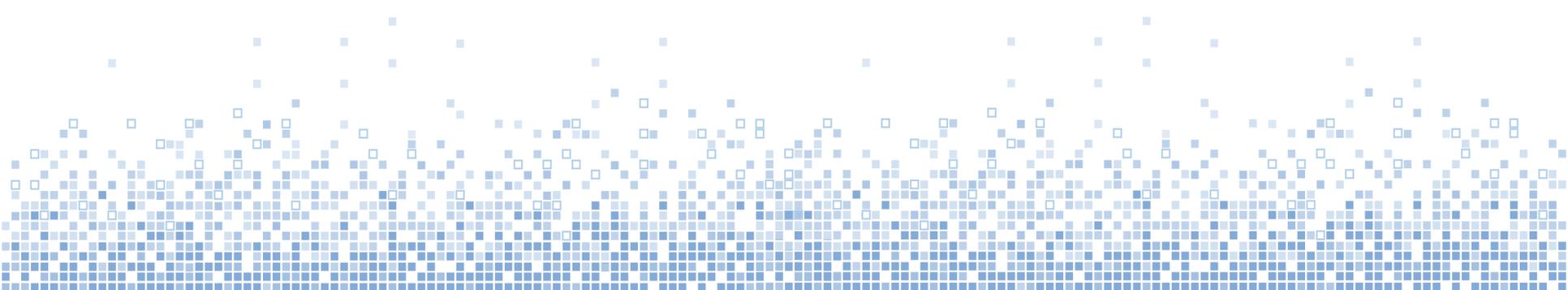
16:15-16:45 **Coffee break**

16:45-17:00 **Conclusions**

Steps towards maritime application of EGNOS

Alan Grant & Nick Ward, General Lighthouse Authorities

Date: 8 October 2014



Maritime navigation

- GNSS (actually GPS) is the primary system
- GPS does not have inherent integrity
- RAIM is not generally used
- SBAS is an option
- Beacon DGNSS is the accepted augmentation



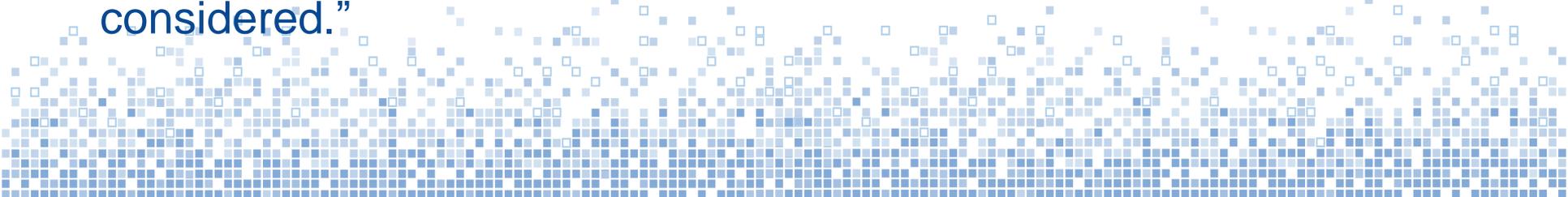
e-Navigation & Resilient PNT

e-Navigation is defined by the International Maritime Organisation (IMO) as:

“the harmonized collection, integration, exchange, presentation and analysis of maritime information on-board and ashore by **electronic means** to enhance berth-to-berth navigation and related services, for safety and security at sea and protection of the marine environment.”

The IMO Maritime Safety Committee has stated:

“e-Navigation systems should be **resilient** and take into account issues of data validity, plausibility and **integrity** for the systems to be robust, reliable and dependable. Requirements for redundancy, particularly in relation to **position fixing systems** should be considered.”



SBAS can provide integrity

- Satellite Based Augmentation Systems
 - EGNOS, WAAS, MSAS, GAGAN, SDCM, QZSS, BeiDou
- Generally use Geo-stationary Orbit satellites (GEO) to provide corrections and integrity warnings
- Coverage runs out above 70 deg latitude
- QZSS uses quasi-zenith (highly elliptical orbits) satellites
- BeiDou has a combination of GEO, MEO and LEO

Maritime significance

- Most of these systems were developed for aviation applications
- MSAS was intended to have cross-sector applications
- Receivers for non-SOLAS applications may be enabled for EGNOS and WAAS (users may not be aware)
- Some SOLAS receivers may also be using SBAS
- There is no recognition of SBAS by IMO
- There are no maritime standards for SBAS receivers
- There are no channels of communication for informing maritime users about the status of SBAS

Potential consequences

- Users may believe that they are using IALA beacon DGPS (as provided by the GLA) when they are actually using SBAS
- Users may attribute problems to IALA beacon DGPS (which does warn users if it is not functioning correctly)
- Users may be unaware of a disruption to SBAS
- Erroneous information may be provided by SBAS, without warning
- Position accuracy may be degraded by SBAS (compared with uncorrected GNSS)

Not a satisfactory situation!

- So what can we do about it?
- Steps towards maritime recognition of SBAS
 - IMO WWRNS – regional systems, need for joint submission?
 - Development of receiver standards, lengthy process
- Service considerations
 - Establish lines of communication, e.g. GSA/EMRF
 - Need for formal Service Level Agreement?
 - Coverage area considerations
 - Awareness of use across the maritime sector
- EMRF meeting at IALA, 28 Nov., opportunity to progress

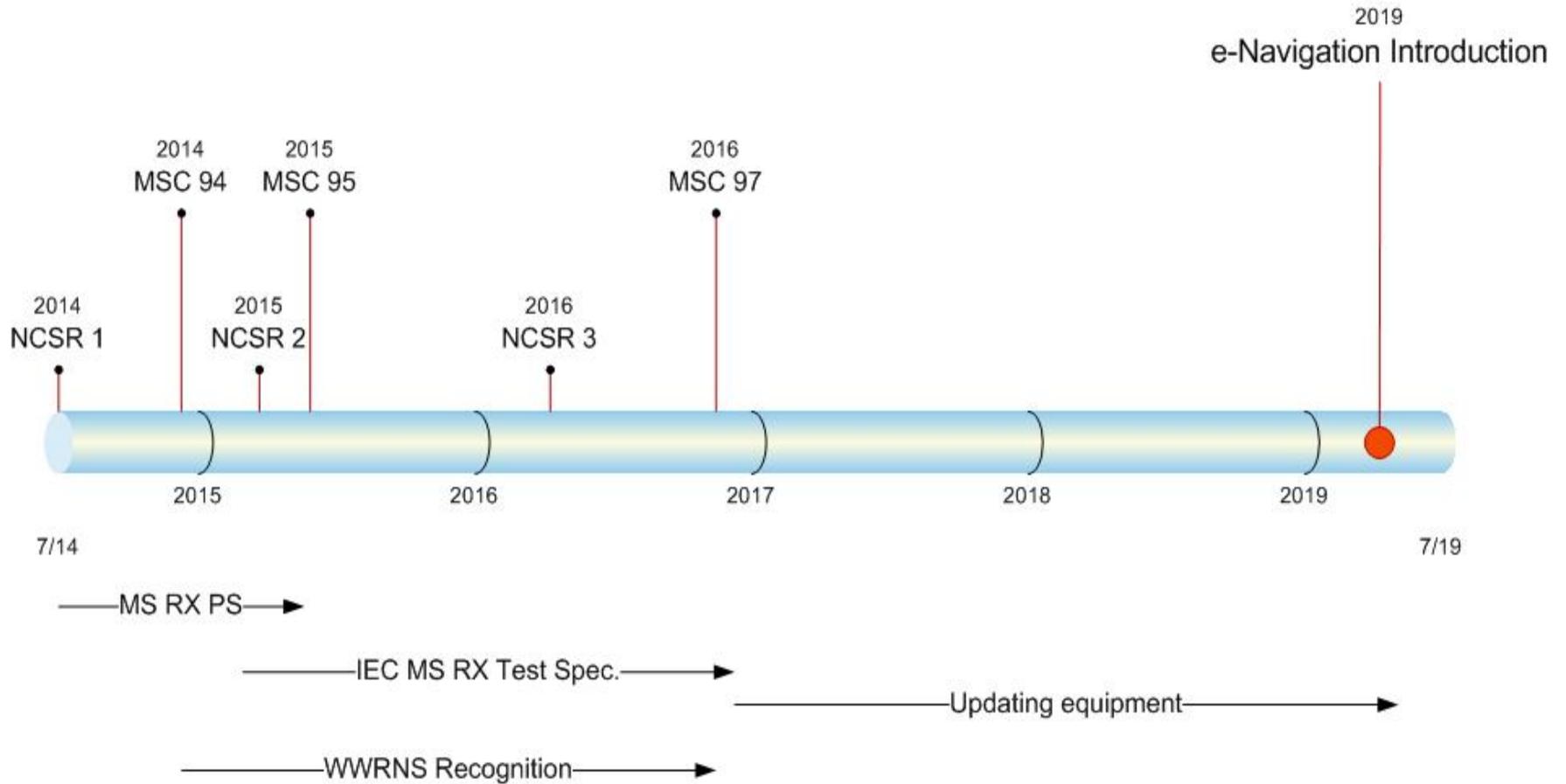
Maritime recognition of EGNOS as part of WWRNS

- ESA and the GSA want to expand EGNOS application to non-aviation sectors, including maritime
- One important step is to propose recognition of SBAS at IMO – to show how it meets the WWRNS requirements.
- This needs a proposal to the Maritime Safety Committee for an Unplanned Output for the NCSR Sub Committee
- If accepted (there is resistance to such proposals) it could be considered by NCSR 2 in July 2015
- Assessment then reports back to NCSR 3 in 2016.
Approval by MSC could take place by the end of 2016

Receiver standards

- Simultaneous submission for development of IMO Performance Standards for SBAS receivers would follow a similar timeline
- Proposal to IEC for a new Work Item developing Performance Requirements and Test Specifications
- Both these developments would require sponsorship and support from several national administrations
- At present, no apparent interest outside Europe (US has not taken any initiative on maritime use of WAAS)
- However, multi-system receiver standard (including SBAS) is already under development in IMO (completion at NCSR 2?)

Indicative timeline



EGNOS Standardisation timeline

Performance monitoring

- EGNOS infrastructure is designed for aviation
- GLA have monitoring sites in coastal locations
- GLA & others have carried out trials on ships
- Other organisations?
- Need to pool results



Demonstrations/test beds

- ACCSEAS
- MONA LISA 2
- EFFICIENSEA 2
- Other EU Projects?
 - PROSBAS follow-on?



Scope for integration

- IALA DGPS reference stations on coasts
- Potential to provide EGNOS corrections via 300kHz broadcast
- Extend coverage – VHF Data Exchange System
- Potential for Arctic region
- Inland waterways



Summary

- SBAS are quite widely used for maritime applications
- There is no international recognition for maritime use of SBAS, no standards in place for receivers and no channels of communication between service providers and users
- It would take at least three years for recognition and standards to be put in place
- GLA/EMRF/IALA providing assistance to ESA and GSA to improve situation
- More performance monitoring and demonstrations needed
- Possibilities of integration with beacon DGPS and expansion of coverage should be considered

Thank you



Contact Information

Dr. Alan Grant, Email: alan.grant@gla-rrnav.org, Phone: +44 (0)1255 245141

www.gla-rrnav.org

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Cost Benefit Analysis in maritime: showing EGNOS benefits

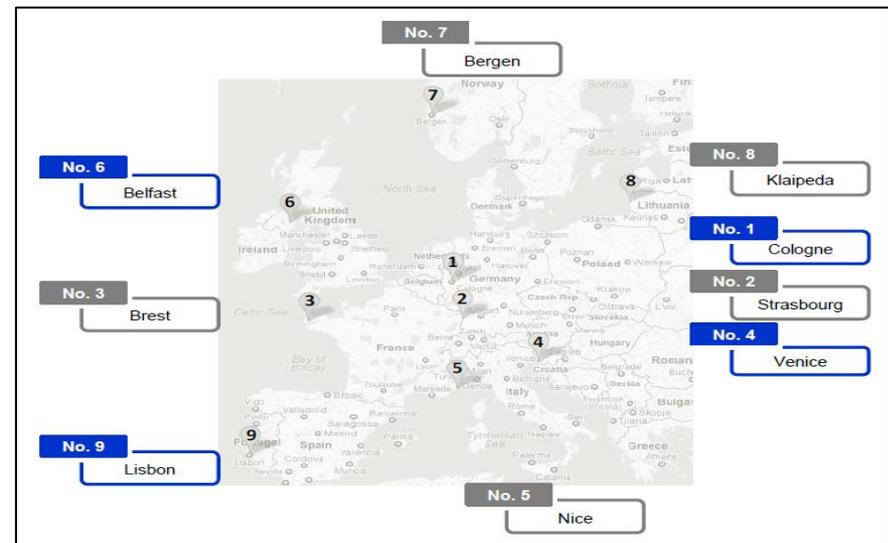
*Marco Bolchi, VVA
Lisbon, October 8, 2014*



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Un partner per lo sviluppo

The study assessing EGNOS potential in the maritime and IWW

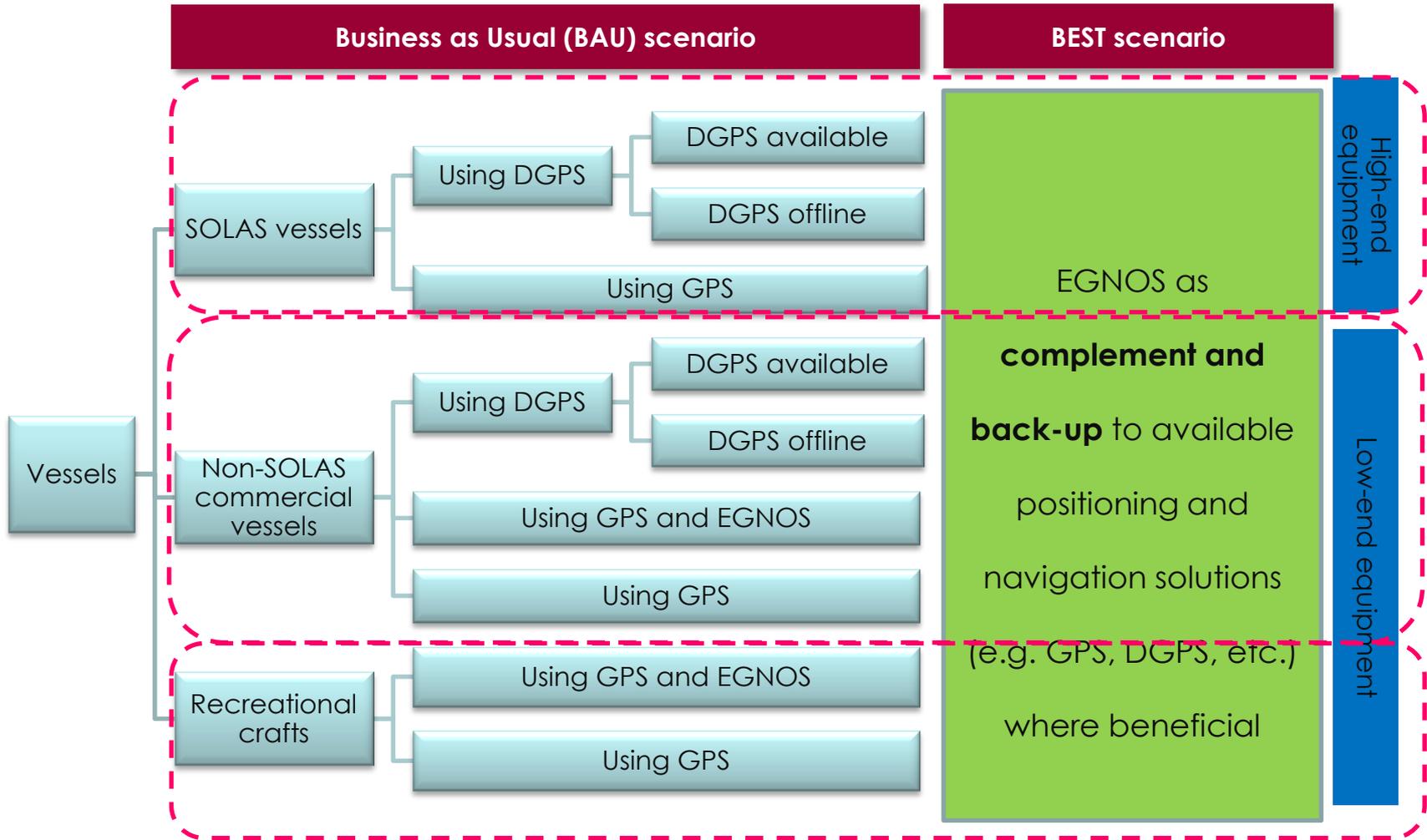
- The assignment (2012) for the European Commission aimed at getting views on the introduction of EGNOS in maritime and IWW and at testing the performance of EGNOS in different areas. It also aimed at delivering a roadmap towards the certification of EGNOS receivers for maritime use
- The study involved **interviews** with many entities, organizations and companies:
 - ✓ 4 Maritime administrations
 - ✓ 6 Inland waterway authorities
 - ✓ 8 Equipment manufacturers, technology solutions providers
 - ✓ 1 Industry association
 - ✓ 15 IALA DGPS operators, both IWW and Maritime
 - ✓ 2 Port and VTS Operators



- **Different tests** were performed across the EU comparing the performance of GPS, EGNOS and DGPS receivers on different ends of the market

The impact is diversified depending on equipment used on-board of vessels, taking into consideration various maritime sub-segments

Net Benefits = BEST scenario – Business As Usual scenario



Cost Benefit Analysis in maritime: showing EGNOS benefits

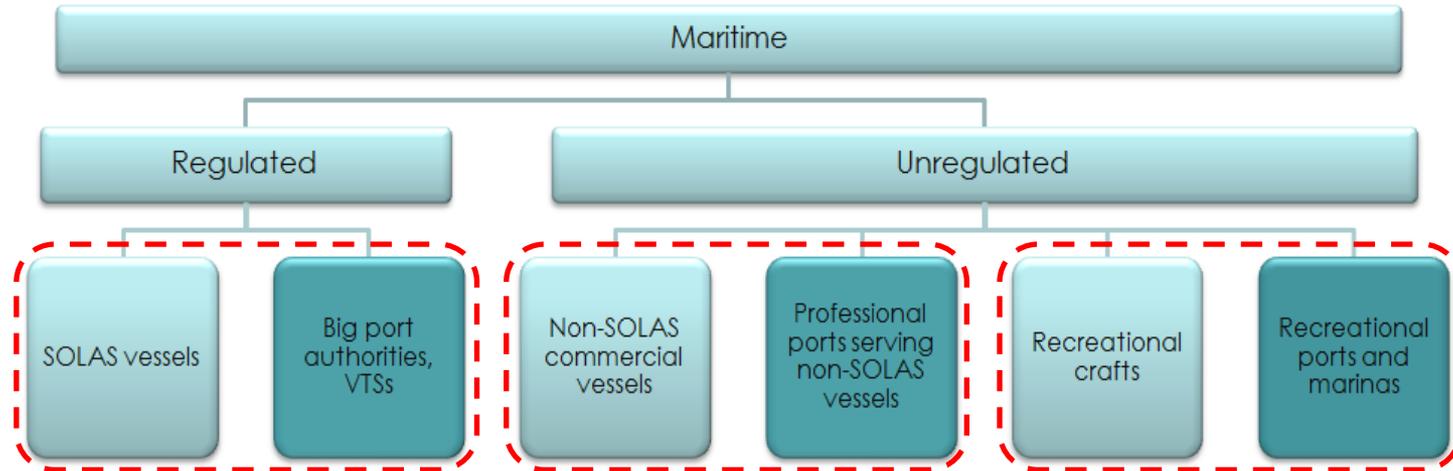
Where feasible, the identified benefits were quantified for the Maritime Regulated segment, as well as for the Unregulated one

	Open waters	Coastal and port approaching	Ports/Harbors
Maritime Regulated	Improved safety of navigation	Improved safety of navigation	
		Optimization of shore-based infrastructure	Optimization of ground-based nav aids
		Enhanced traffic management and collision avoidance	
Maritime Unregulated	Improved safety of navigation and collision avoidance		
			Operational efficiency (navigation, dock identification and reservation, assisted docking)
			Enhanced LBS applications (information, tracking apps) through mobile platforms

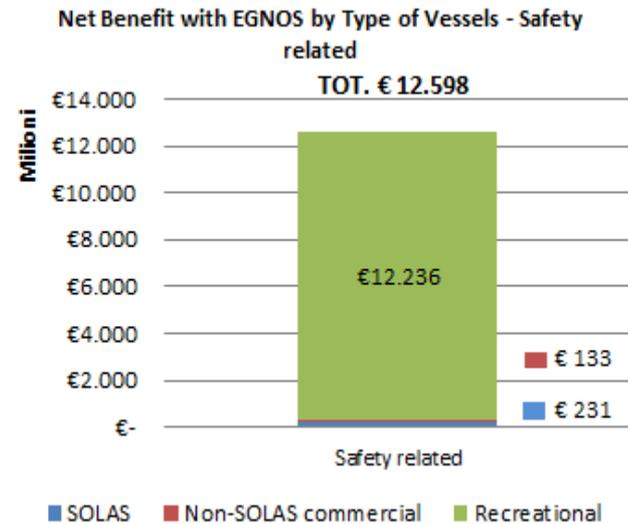
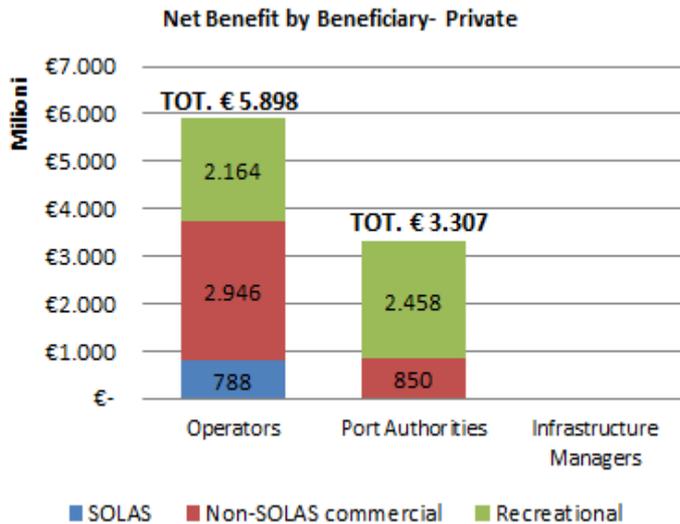
 Not quantified benefit

Cost Benefit Analysis in maritime: showing EGNOS benefits

Most of the benefits are generated by recreational vessels, due to the high number of crafts and accidents positively impacted

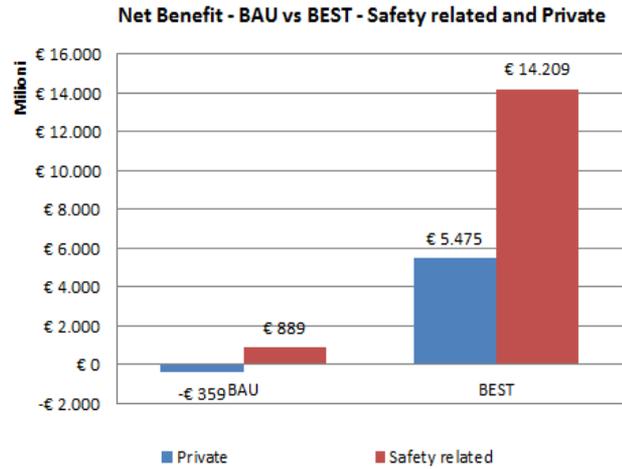


EGNOS Net Benefits (2012-2025) - cumulated

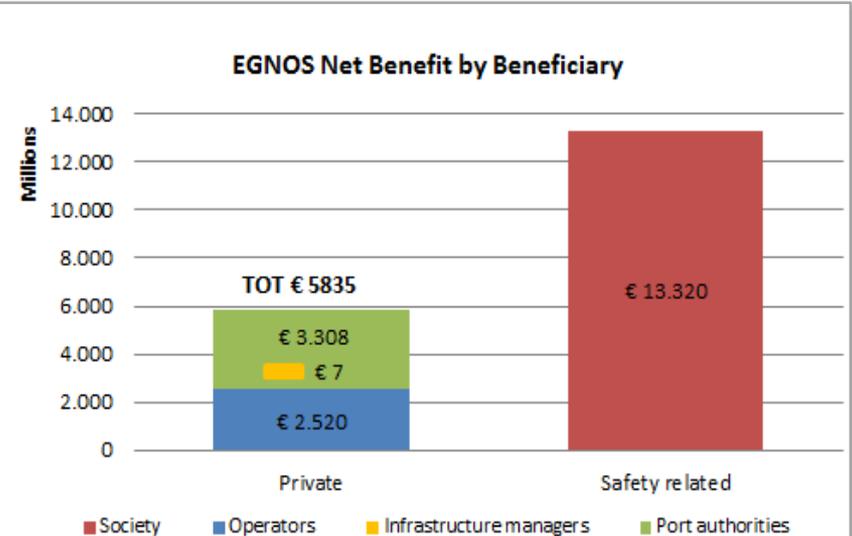


The identified impact of EGNOS shows that all the user groups considered will benefit from the increased EGNOS adoption

EGNOS Net Benefits (2012-2025) - cumulated



Average Annual Net Benefit			
Private(BAU)	€(26) million	Private (BEST)	€391 million
Public (BAU)	€64 million	Public(BEST)	€1.015 million



Average Annual EGNOS Net Benefit			
Society	€951 million	Infrastructure Managers	€0,5 million
Operator s	€ 180 million	Port Authorities	€236 million

Comments

- All the **user groups** (operators, ports, etc.) would benefit from an increased adoption of EGNOS
- EGNOS foreseen to mildly optimize investments for **Infrastructure Managers**
- **Society foreseen to achieve the biggest EGNOS Net Benefit** mainly because of improved Safety of navigation that leads to the reduction of accidents, which generates a positive impact on life losses, human injuries and external costs of transport

The study allowed us to identify a series of EGNOS benefits expected and/or perceived by the Maritime community

For Operators

For administrations and authorities

Performance

Integrity

- Enhanced safety of operations
- Improved reliability of data

Accuracy

- Enhanced safety of operations
- Increased efficiency of operations

Performance

Integrity

- Enhanced safety of operations
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Accuracy

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Coverage

- Complementary to GPS
- Complementary to DGPS services

Market aspects

Operating costs

- Low investments and operating costs

Source: interviews, VVA analysis



EGNOS shows a positive impact on activities of Maritime segment, the maritime community should better exploit it

- Most of the receivers produced by equipment manufacturers already **are EGNOS-ready**
- **Low additional investments** for Operators
- **Improved safety** of navigation, in particular in restricted waters
- EGNOS **regional coverage** to be exploited immediately
- EGNOS in the future could be a component of a **multi-SBAS global network**
- AIS ground-based infrastructure could be leveraged **to transmit EGNOS corrections via AIS Msg. 17**
- **Innovative applications**, such as professional LBS, tracking & tracing, fleet management, logistics operations **could benefit from EGNOS**





coffee break

EGNOS survey open!

<http://egnos-portal.gsa.europa.eu/egnos-users-satisfaction-survey>

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