7-8 October

Lisbon

The EGNOS Service Provision workshop

ESSP

We certify you're there.

European Global Navigation Satellite Systems Agency

funded by the European Commission

AGENDA – October 8, 2014

09:00-09:30	Registration
09:30-10:00	Welcome and Introduction
10:00-11:15	EGNOS market status and adoption plan
11:15-11:45	Coffee break
11:45-12:15	EDAS for added value applications
12:15-13:30	EGNOS in land applications
13:30-14:30	Lunch
14:30-16:15	EGNOS use in maritime domain
16:15-16:45	Coffee break
16:45-17:00	Conclusions

AGENDA (09:00 – 11:45)

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09:30-10:00 **Welcome and Introduction**

Thierry Racaud *– CEO (ESSP)*
Gian-Gherardo Calini *– Head of Market Development (GSA)*

10:00-11:15 **EGNOS market status and adoption plan**

- Market overview and multimodal adoption plan
  Carmen Aguilera *– Market Development Officer (GSA)*
  Manuel López *– Market Development Officer (GSA)*
  Daniel Lopour *– Market Development Officer (GSA)*
- EGNOS Multimodal Adoption Action Plan
  Miguel-Ángel Sánchez *– Service Adoption and Support Mngr (ESSP)*
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11:15-11:45 **Coffee break**

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European
Global Navigation
Satellite Systems
Agency

MARKET OVERVIEW AND EGNOS MULTIMODAL ADOPTION PLAN

EGNOS Service Provision Workshop

Lisbon, 8th October 2014

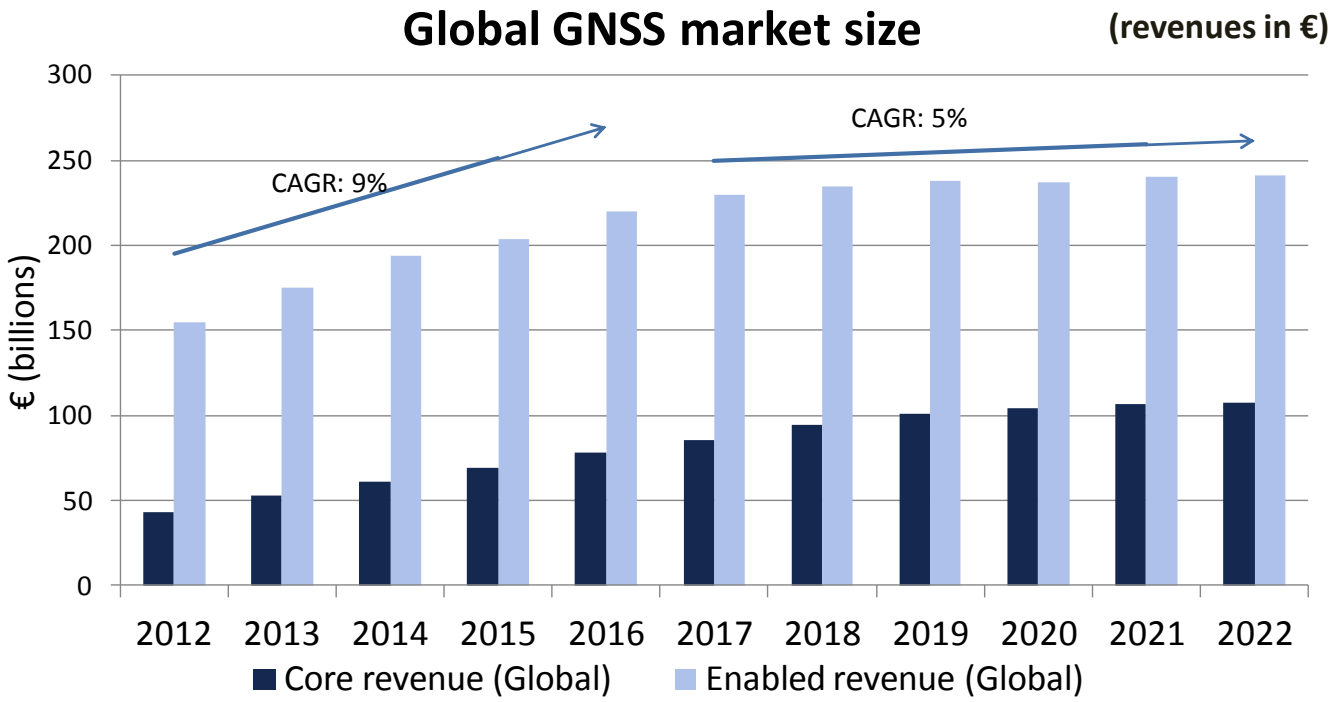
Carmen Aguilera
Manuel Lopez-Martinez
Daniel Lopour

Market Development Department

EGNOS Multimodal adoption plan

The growing GNSS market offers business opportunities in all market segments

7 bln GNSS devices by 2022 – almost one for every person on the planet



- The projected long-term growth gives significant business opportunities for GNSS market.
- Along with the rapid development of new services and applications, the business environment of GNSS market is **demanding constant innovation on the supply side**.

Recent E-GNSS adoption results in key markets

Aviation

- **EGNOS based procedures in 12 countries for a total of 209 EGNOS-based** (+ 13 procedures in the last 3 months)
- Sweden and UK published their first LPV procedure in the last month
- **Strategic alliance with Business Operators** to promote EGNOS based operations

Maritime

- **IMO recognition process initiated for Galileo as part of the World Wide Radio Navigation System**, following the acceptance of the EC proposal, drafted with GSA support, matching Beidou first move

Rail

- **Confirmed interest in EGNOS performance testing by UNISIG,** the leading railway signalling group, which will pave the way towards use of EGNOS in railway signalling

Surveying & Mapping

- Confirmed **interest of service providers in Galileo triple frequency capacities** in on-going consultation

Agriculture

- EGNOS adopted by **80% of EU farmers using GNSS**

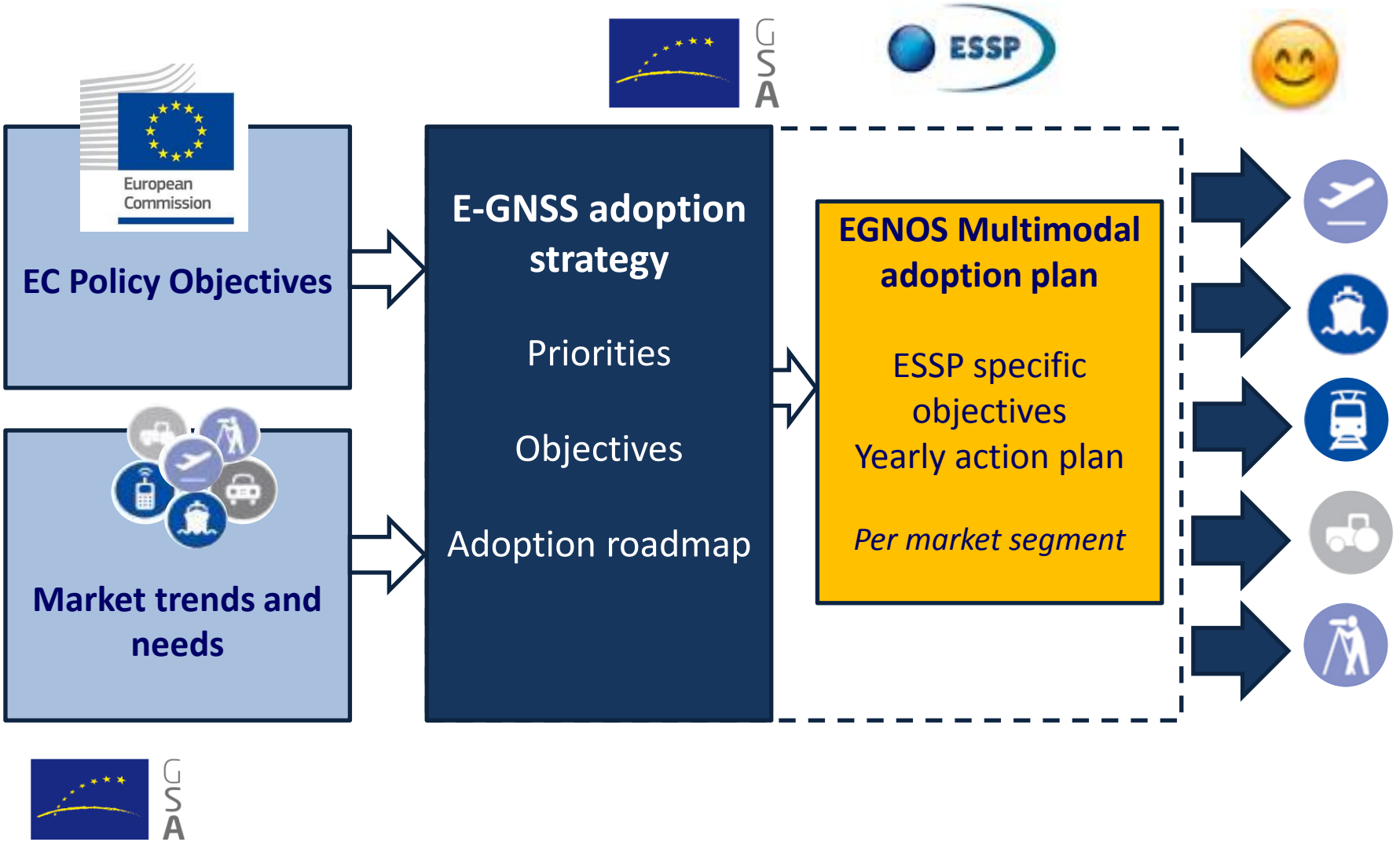
Road

- **Slovakia to adopt EGNOS this year in 17.500 Km** tolled roads
- **Belgium selected the consortium that will adopt a EGNSS based tolling** solution for trucks under operation in 2016

LBS

- Tests conducted by Rx Networks and the GSA confirm **Galileo value added in challenging environments** (i.e. urban canyon and indoor) when used in Multi-GNSS (to be used as a lever to stimulate EGNSS adoption in LBS)
- September 2th 2014: **first Galileo enabled smartphone** was presented to the market (Meizu MX4)

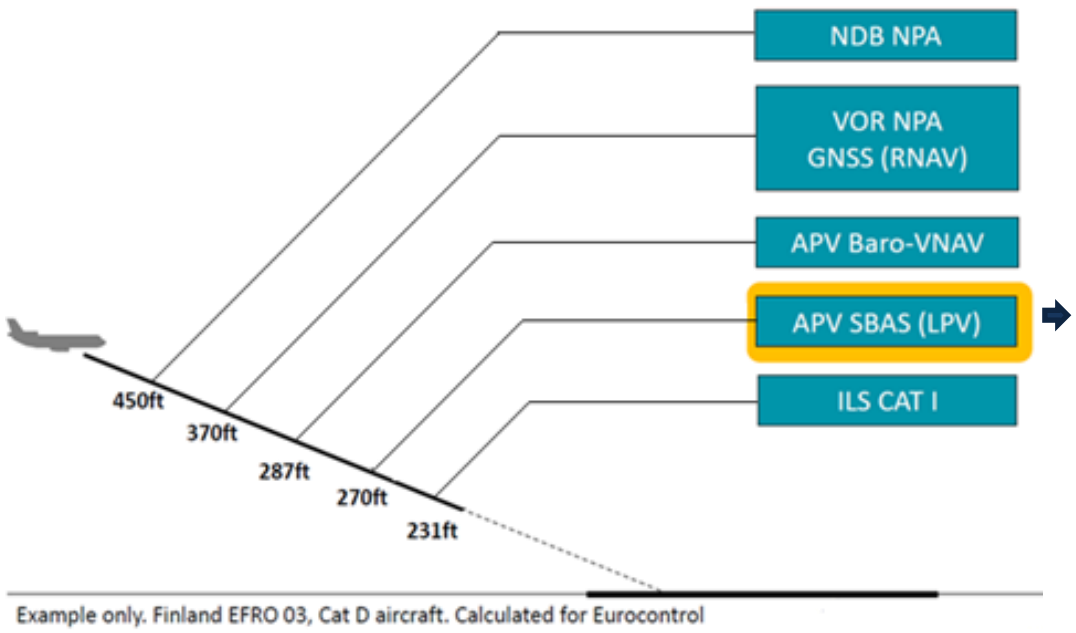
Yearly EGNOS Multimodal Adoption Plan integrated in the GSA Adoption Strategy for E-GNSS



Market overview and action plan for EGNOS adoption in aviation

GSA

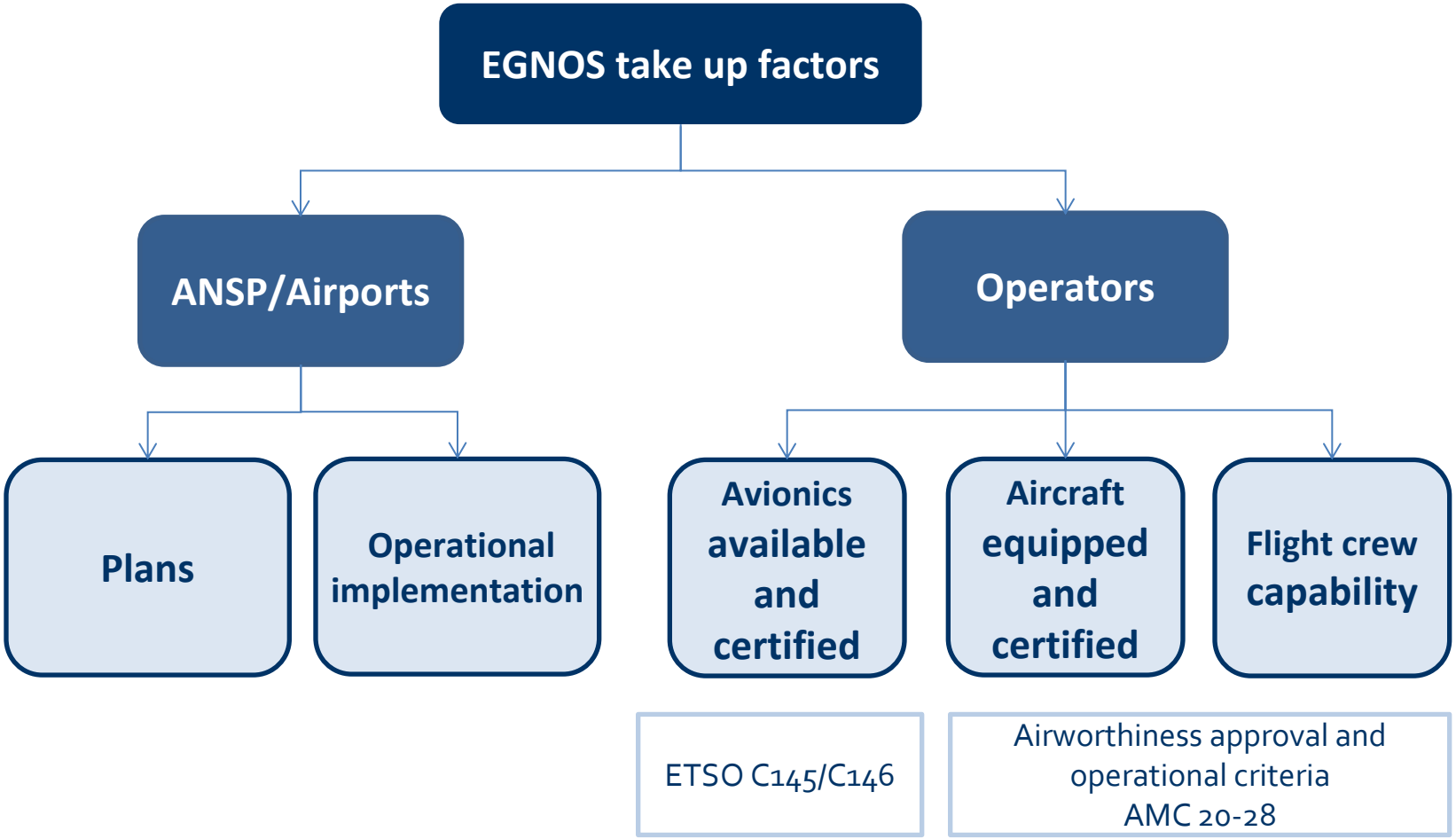
EGNOS enables a reduction in the decision height



Example of Decision Height Minimum

- EGNOS enables Cat-1 like approaches
- No need for ground infrastructure
- Decision heights can be reduced to:
  - NPA: 450ft
  - LPV: 250ft (200ft in 2016)
- Procedures can be implemented for all runways, both ends, at little or no extra cost
- Can be extended to other user, such as for helicopters
- Business case improved when upgrades are combined with datalink and ADS-B requirements

Market uptake factor for EGNOS adoption in aviation



GSA portfolio of actions to foster EGNOS adoption in aviation

Technical support

- Ad hoc assistance to implementation
- Dedicated training
- Co-funding
- Development of STC for most common avionics to reduce certification costs, e.g AML for GNS 430W/530W

Regulation evolution to meet user needs

- LPV implementation to non instrumental runways
- Evolution of training/approval requirements
- Contribution to standard development

Research and development (under EC delegation)

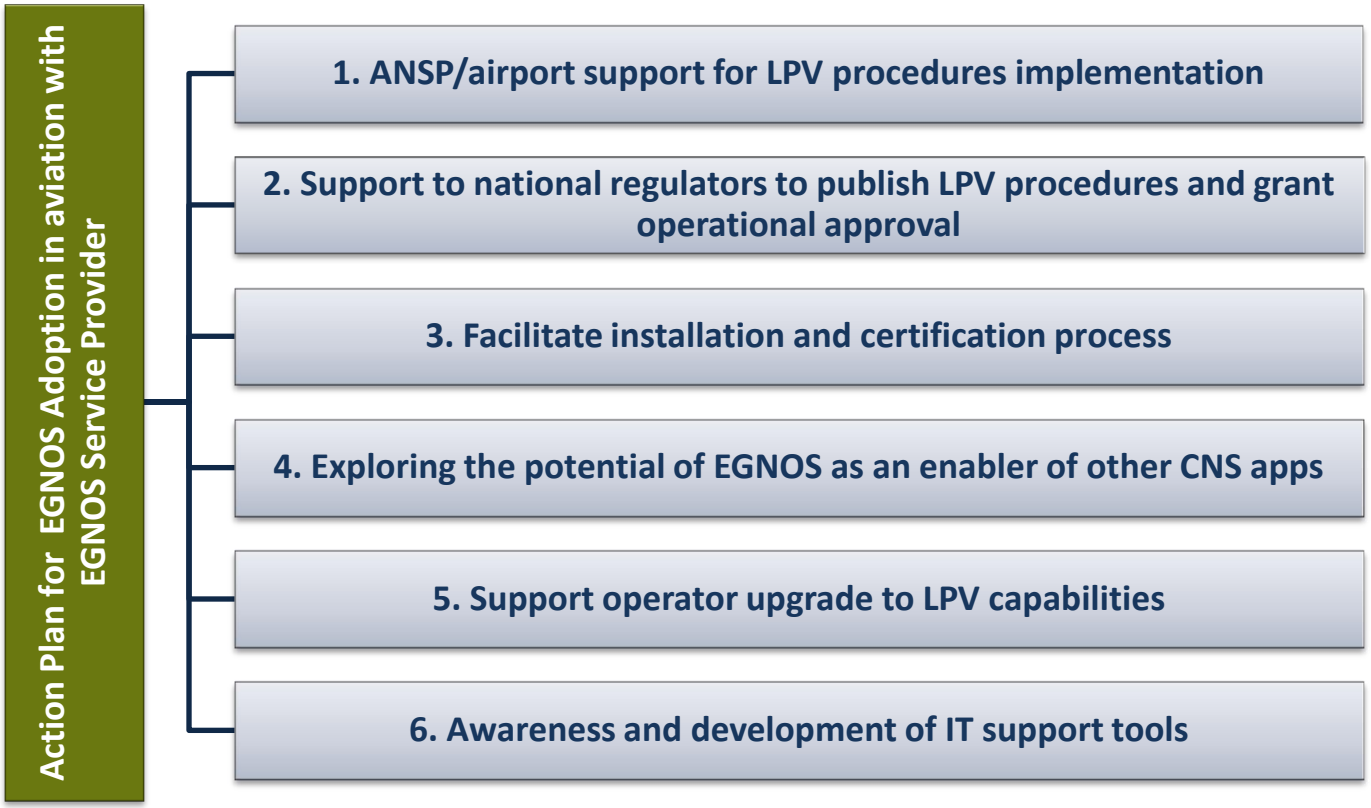
- Advanced operations trials
- Validation of new concepts
- Multiconstellation/multifreq receivers (coming soon)

User driven system evolution

- Market analysis
- User needs/satisfaction monitoring
- Requirements definition
- Cost Benefit analysis

EGNOS

Specific aviation activities for EGNOS Service Provider



Market overview and action plan for EGNOS adoption in maritime

Maritime market segment overview

Shipments dominated by leisure GNSS devices, general navigation and SAR leading in regulated

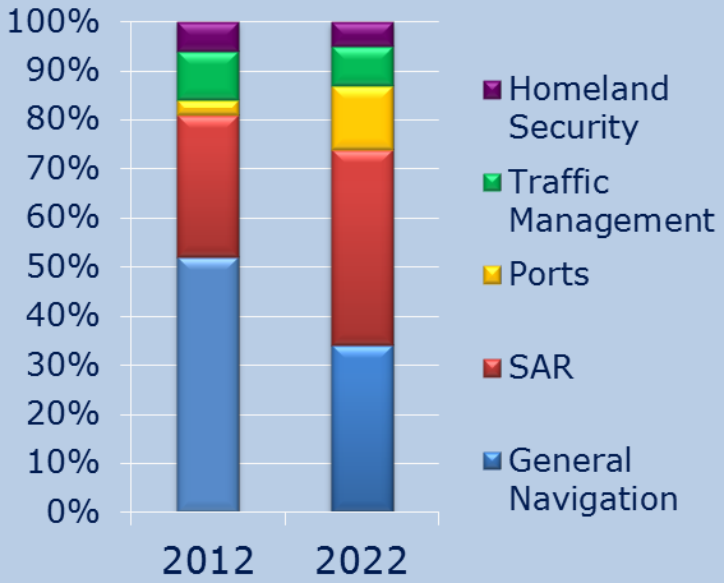
Maritime segment

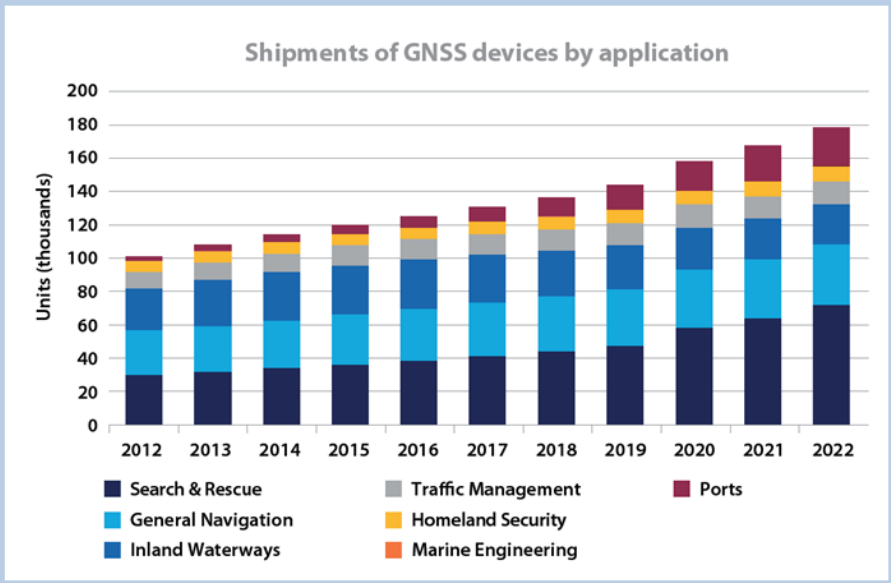
Regulated[1]

c.a. 65.000 vessels[2]

Unregulated / Leisure

c.a. 6M vessels in Europe





[1] IMO SOLAS Convention – International Maritime Organisation – Safety of life at sea

[2] Fisheries are not included (c.a. 80.000 in Europe)

Overall E-GNSS adoption depends on four main factors

REGULATED

Political -> Regulation

Current Status:
No IMO resolution regarding the EGNOS recognition as part as of WWRNS.

Multi-SBAS systems has to be compliant:

- IMO Resolution A.915 on Maritime Policy for Future GNSS
- IMO Resolution A.1046 World Wide Radionavigation Systems

Technological -> Standards

Current Status:

- No IMO resolution for the adoption of performance standards for EGNOS receivers.
- No IEC publication regarding EGNOS receiver equipment tests.
- No RTCM minimum performance standards for EGNOS for maritime use

Economical -> Ratio price/new functions

- **In regulated segment** there is the tendency to buy the cheapest devices compliant with regulations
- **In leisure segment** the main market drivers are first technology and then price

Social -> Legacy Systems

- **DGNSS- IALA radiobeacon** is the internationally accepted means of providing differential GNSS corrections and integrity information to maritime users

LEISURE

GSA strategy for EGNOS adoption in Maritime

Objective:

- Increase EGNOS market uptake in maritime navigation as a complementary system to DGNSS infrastructure ensuring its role in the future e-Navigation concept

Strategy:

- Support the recapitalisation and optimisation of DGNSS infrastructure using EGNOS
- Develop the required maritime receiver standards
- Increase EGNOS coverage by transmitting corrections via AIS/VDES and IALA beacons
- Increase awareness in the leisure market and promote EGNOS enabled receivers

Key action plan for EGNOS Service Provider

Regulated

Market Uptake

Unregulated Leisure

GSA

GENERAL NAVIGATION

EGNOS

1. Perform cost-benefit analysis of DGNSS optimisation using EGNOS
2. Analyse the existing certification/standards for IALA DGNSS and recommend actions for EGNOS
3. Investigate how to improve EGNOS v2 performances
4. Support GSA in definition of EGNOS v3 requirements for maritime

EDAS

5. Implement action plan on EGNOS transmission via AIS for Inland waterways and coastal waters

LEISURE

EGNOS

6. Provide support in communicating EGNOS benefits to users and receiver manufacturers/dealers

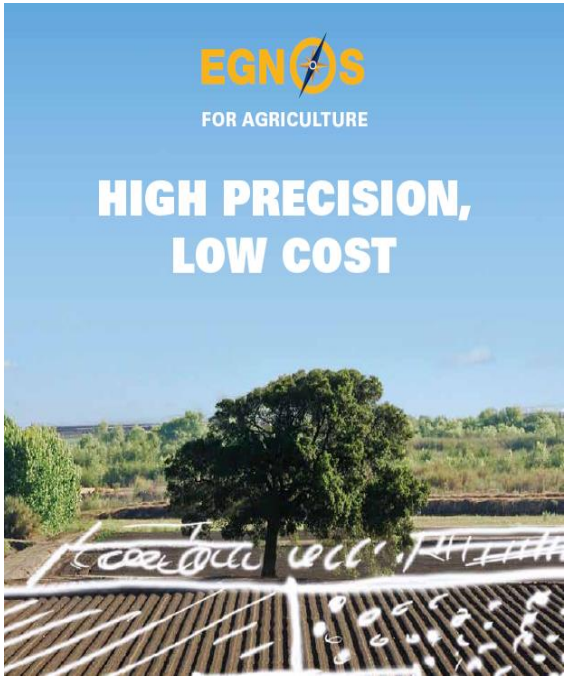
Key action plan for EGNOS Service Provider

ID	Action	Objectives
1	*Perform cost-benefit analysis of DGNSS optimization using EGNOS on the examples min. 5 selected Member States*	• Define list of priority countries • Perform CBA per country
2	*Analyse the existing certification/standards for IALA DGNSS network and verify, if the same standards can be applied for EGNOS*	• Analyse existing standards/certification of IALA • Recommend line of action for EGNOS
3	*Investigate the possibilities to improve EGNOS V2 performances*	• Propose ways to optimize EGNOS V2 accuracy and/or integrity (e.g. via K factor)
4	*Support GSA in definition of EGNOS v3 requirements for maritime*	• Transfer the user feedback to GSA • Provide technical support
5	*Implement action plan on EGNOS transmission via AIS for inland waterways and coastal waters*	• Design activities to foster adoption of EDAS in AIS stations in order to provide EGNOS corrections for inland waterways navigation
6	*Provide support in communicating EGNOS benefits to users and receiver manufacturers /dealers in non-regulated segment. Awareness has to be built to strengthen the use of EGNOS.*	• Explain EGNOS benefits to non-regulated segment supply chain and users • Promote EGNOS to receiver dealers • Leverage dissemination of results from FP7 R&D projects in user fora • Support EGNOS uptake in new applications and services for recreational vessels

Market overview and action plan for EGNOS adoption in agriculture

GSA

Agriculture market segment overview



- ✓ EGNOS Increases the ***accuracy*** of GPS positioning and provides information on its ***reliability***
- ✓ EGNOS is available in over **70%** of commercial receivers models
- ✓ EGNOS adopted by **80% of EU farmers using GNSS**

EGNOS has a wide range of applications

Application category	Application field	Required accuracy level
Arable	High-value crop cultivation (e.g. potatoes and vegetables) and/ or precision operations (sowing and transplanting)	c.2cm
	Low-value crop cultivation (e.g. cereals) and low-accuracy operations (fertilising and reaping)	c.1m
Dairy	Individual livestock positioning and virtual fencing	2-5m
Agro-logistic	Land parcel identification/ geo-traceability, post harvest pick-up and supervised tracking of livestock, manure, etc.	c.2.5m
Legislation/ management	Field measurement and boundary mapping and updating	c.2.5m

EGNOS application domain

GSA

Key adoption actions in Agriculture market segment

GSA main priority objectives for E-GNSS Adoption in Agriculture:

- Maximize E-GNSS public benefits by influencing the uptake of EGNOS and Galileo
- Encourage the adoption of E-GNSS by the agricultural user community.

Agriculture applications

- Farm Machinery Guidance
- Auto-steering
- Variable Rate Application (VRA)
- Asset monitoring
- Biomass monitoring
- Soil sampling
- Land consolidation
- Livestock tracking
- Virtual fencing
- CAP field boundary management
- Environmental management

Pictures' sources:
http://innovationstelevision.com
http://news.cision.com
http://agreport365.com

Adoption status and challenges ahead in Agriculture market segment

Agriculture Challenges

- Rise in the demand of crops:
  - Population increase
  - Bio-fuel demand
- Limited resources
  - Limited increase of the cultivable land
  - Water shortage
  - Energy prizes rise

Precision Agriculture Answers

- Enhance precision
- Eliminate waste and over-application of fertilisers and herbicides
- Save time and money
- Reduce fatigue
- Optimize crop yields
- Increase profit margins

Technology trends

- SBAS solutions opening markets at entry-level and prepare users for more advanced solutions
- Dual frequency and multi-constellation expected by Galileo and GPSIII (L1/L5 resp. E1/E5)
- Emerging role of PPP solutions vs. traditional RTK
- Use of big data for integrated farming across different equipment supplied by different hardware brands

GSA

Market overview and action plan for EGNOS adoption in mapping and surveying

Surveying and mapping market segment overview

E-GNSS in surveying often means centimetre level accuracy and substantial costs (e.g., infrastructure, equipment, software, service)…

EGNOS contributes in growing the use of GNSS in real time mapping
solutions by providing free accuracy that is widely available

Mapping

Surveying disciplines

Cadastral

Construction

Mine

Marine

Mapping market segment overview

Basic precision segment, consists in plotting maps and charts that contain locations of points of interest .

For many mapping applications meter level accuracy is sufficient. EGNOS satisfies the needs of mapping applications requiring enhanced GPS positioning , by providing **added value free of charge**

Applications such as thematic mapping for small and medium **municipalities**, **forestry** and **park management** as well as surveying of **utility infrastructures** benefit from EGNOS.

Key adoption actions in Mapping and Surveying market segment

GSA main priorities for E-GNSS Adoption in Mapping and Surveying:

- Refine and implement a market development approach for EGNOS
- Raise awareness and push for the adoption of EGNOS in mapping
- Raise awareness and push for the adoption of Galileo in surveying
- Increase uptake of EGNSS

KEY APPLICATIONS

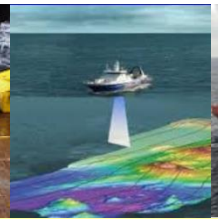
Land surveying

- Cadastral
- Mining
- Construction
- Mapping EGNOS



Marine Surveying

- Hydrographic survey vessels
- Off-shore vessels (anchor handling and tug supply, and other vessels).


GSA

Challenges in Mapping market segment

Mapping Challenges

- Metre level accuracy required
- Investment in infrastructure for service providers
- Complex and costly equipment and software solutions
- Availability in remote areas

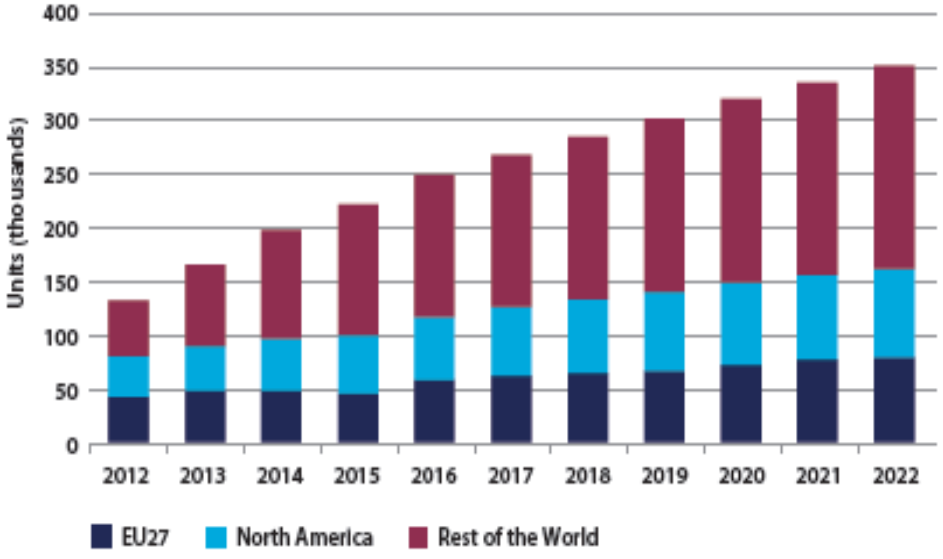
EGNOS added value

- Provides sub metre level accuracy
- Does not require subscriptions fees nor ground infrastructure deployment
- Enables affordable and simple solutions
- Wide coverage area around Europe
- Available in most of receiver models

GSA

Market and technology evolution in Surveying support mid-term growth

Shipments of GNSS devices by region



Market and technology trends

- New customers “insourcing” surveying operations (e.g., municipalities, utility companies) to map infrastructure and networks
- Continued use in conjunction with other surveying technologies (e.g. laser scanning)
- Emerging role of PPP solutions vs. traditional RTK
- Dual frequency and multi-constellation expected by Galileo and GPSIII (L1/L5 resp. E1/E5)
- Crowd-sourcing for Mapping applications

Market overview and action plan for EGNOS adoption in rail

GSA

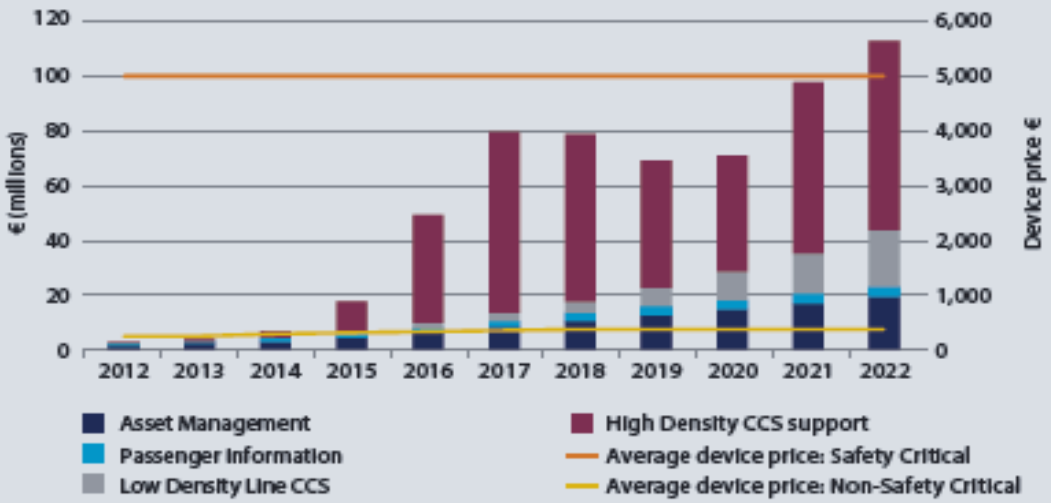
Rail market segment overview

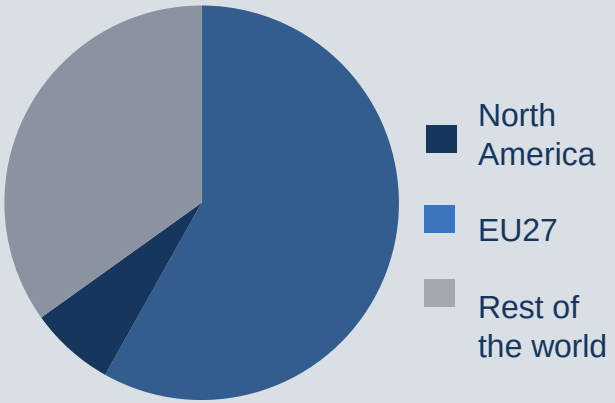
Safety critical applications

- Low density lines
- Main lines

Non safety critical applications

- Asset management
- Cargo monitoring
- Passenger IS





Potential E-GNSS benefits for Rail segment

Safety critical applications

Combination of E-GNSS with sensors for precise train positioning for use in safety of life CCS applications or with conventional communication technologies for logistics applications.

Non safety critical applications

Low density lines

Improve safety and **reduce the cost of signalling** (requires very few or no line side components)

Main lines

Reduce the number of physical balises and to improve the precision of the odometry

Asset management

Improve monitoring of the railway assets both for operators and IM´s

Cargo monitoring

Improve availability of the supply chain visibility information to the LSP/LSC.

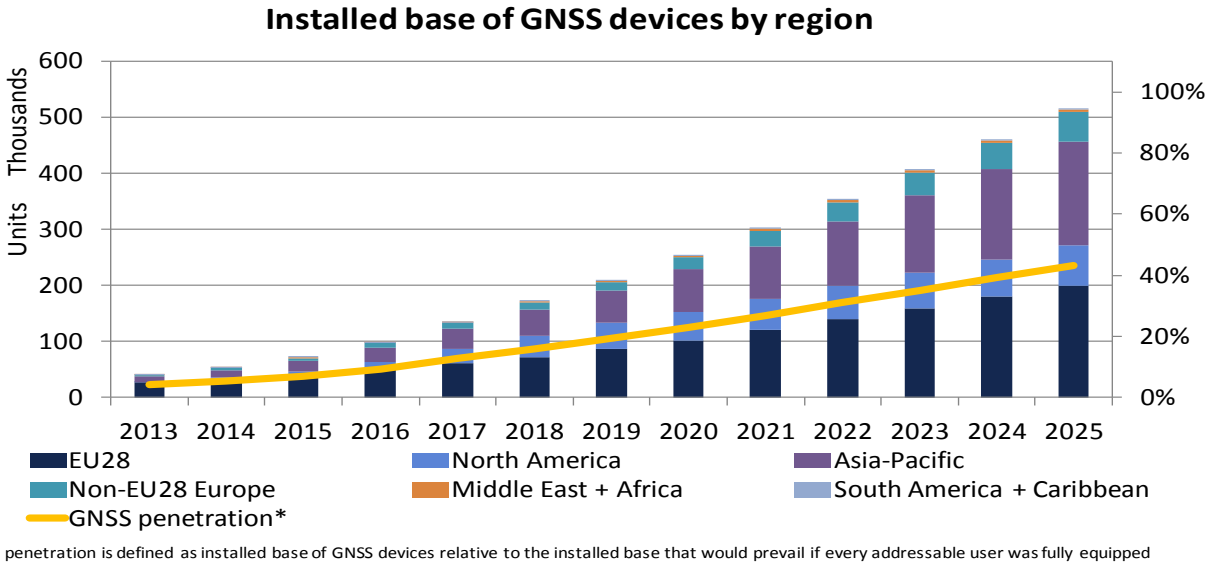
- Georeferenced cargo status monitoring
- Corridoring, Geofencing

Passenger information systems

Improve precision and availability of positioning for on board PIS

GSA

Adoption status and challenges ahead in Rail market segment



*: GNSS penetration is defined as installed base of GNSS devices relative to the installed base that would prevail if every addressable user was fully equipped

- Support UNISIG in drafting rail requirements and defining virtual balise
- Cooperate with railway initiatives and EC to **foster the role of E-GNSS in the evolutions of ERTMS standard**
- Support EC in the **standardization and certification of EGNOS receivers** as a component of the **train positioning subsystem**
- Collaborate with **logistics industry associations** supporting the role of E-GNSS in **supply chain standards**

Key actions performed by GSA/ESSP

ID	Action	Objectives
	Support GSA in working group GSA/UNISIG and in New Generation Train Control FP7 Project (NGTC) to provide expert advice on capabilities and limitations of EGNOS V2	• Provide consulting support and technical expertise to key rail stakeholders
	Support GSA and Rail stakeholders in the process of users requirements definition to feed into future evolutions of EGNOS	• Report on current status of EGNOSv3 User Requirements in Rail domain
	Technical Manual "Use of EGNOS V2 for Rail SoL applications" addressed to Rail manufacturer interested in experimenting and implementing equipment and signalling solutions based on EGNOS V2	• Technical Manual "Use of EGNOS V2 for Rail SoL applications
	Conduct performance assessment of an area upon request of users (e.g. infrastructure managers/TOCs) to map according to user community requirements and demonstrate results.	• Test campaign already performed. • Data analysis already performed (results are available). • Report still to be produced
	Monitoring/contributing present standardization activities in the domain, in particular the TAP-TSI that is presently under implementation.	• Report of the main activities, outcomes and feedback obtained from the contact and monitoring of the TAP-TSI activities

GSA

THANK YOU

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Daniel Lopour: Daniel.lopour@gsa.europa.eu

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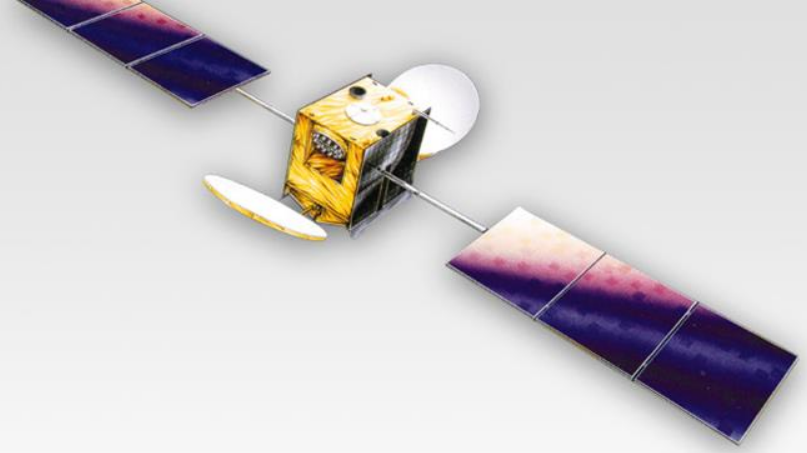

EGNOS Multimodal Adoption Action (EMA) Plan

Miguel Ángel Sánchez, Víctor Álvarez & Sofía Cilla, ESSP SAS,
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ESSP

The EGNOS Service Provider

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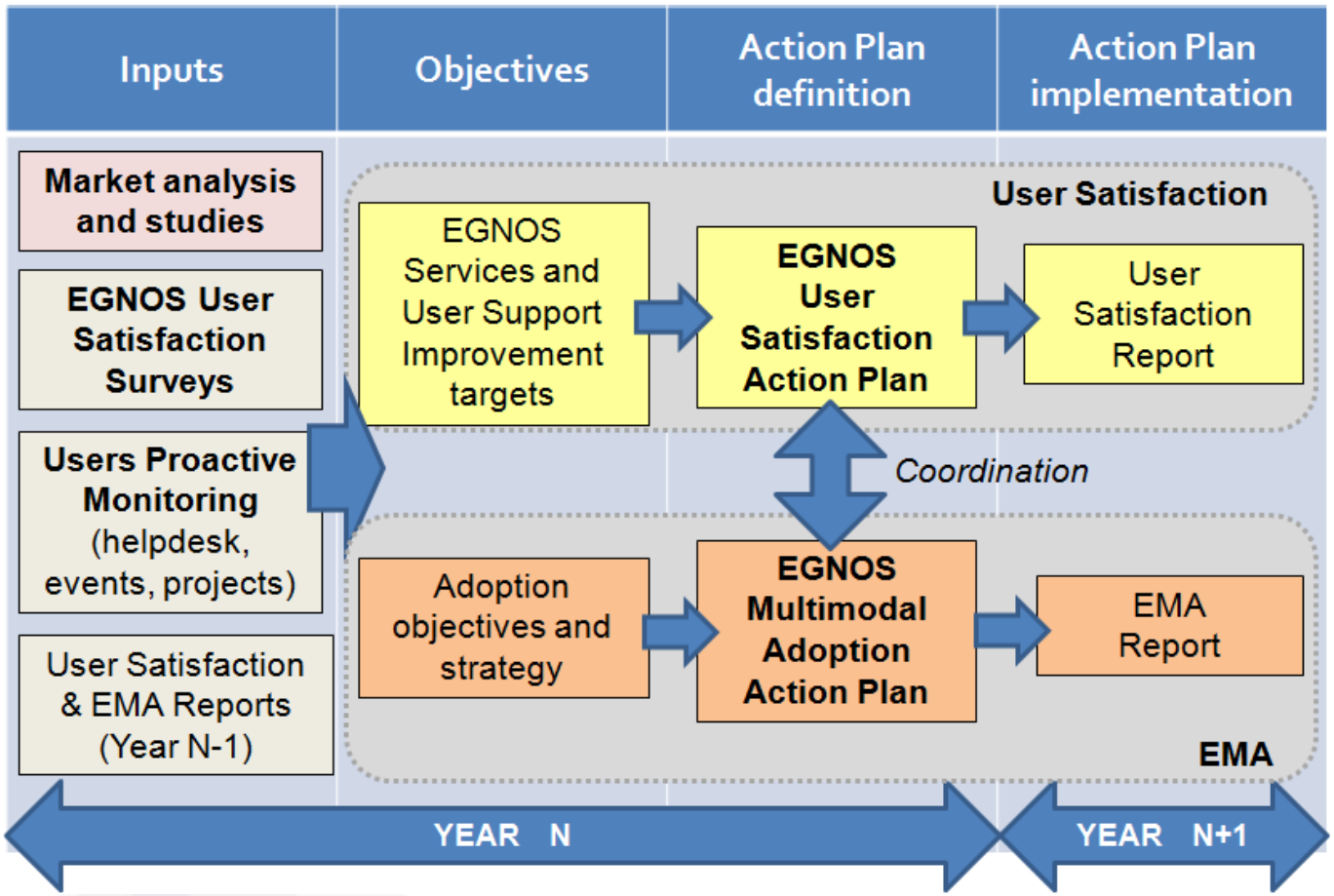
The need of an Adoption Plan

Adoption Plan

EGNOS time-line

User Support Improvement Process



User Satisfaction:
Activities addressed to improve users' perception on EGNOS service provision (especially those aspects directly related with ESSP & GSA responsibilities).

EMA:
Activities addressed to promote EGNOS and foster its adoption in different application domains.

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ESP contribution to Adoption Plan 2014

	Aviation	Maritime	Rail	Surveying	Agriculture
Regulatory & Standardisation	✓	✓	✓		✓
EGNOS v3 User Reqs identification		✓	✓		
Promotion and Awareness	✓	✓	✓	✓	✓
Contact and Engage stakeholders and users	✓			✓	✓
Support to users (CBA, guidelines, performance assessment)	✓			✓	✓
Market studies and surveys	✓				

Long-term

Link with System Evolution

Market oriented

ESP contribution to Adoption Plan 2014

	Aviation	Maritime	Rail	Surveying	Agriculture	TOTAL
ACTIONS	21	5	13	5	3	47

Major effort focused on Aviation

50% of rail actions are devoted to Inter Freight Transport (expertise provided by Telespazio)

ESP contribution to Adoption Plan 2014: action status

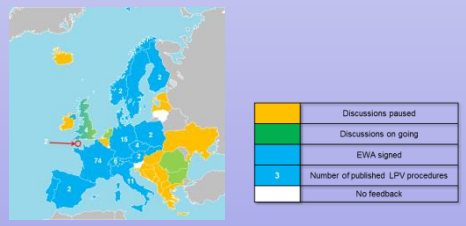
	Aviation	Maritime	Rail	Surveying	Agriculture	TOTAL
						
ACTIONS 	21	5	13	5	3	47
Completed	**5**	**1**	**2**	**3**	**1**	**12**
Initiated	**16**	**4**	**11**	**2**	**2**	**35**

Enhance EGNOS usage in aviation : Objectives for 2014

…More EWAs signed:

Target : 24

Today: Done!



…More LPVs published:

Target: 184

Today: 128 + 13

On 16/10/14

…More LPVs launched:

Target: 97

Today: 139

Foreseen for Q2 2015

…More aircraft certified or under certification for LPV APCH:

Target: 130

Today: 86+ 263

Pending confirmation

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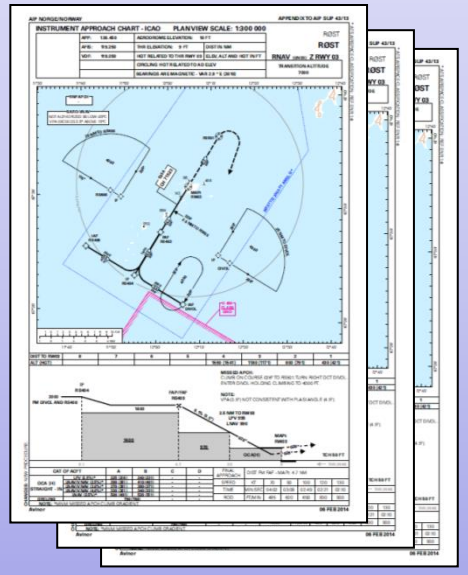
Enhance EGNOS usage in aviation means *increasing*…

…the number of published LPV procedures



…the number of EGNOS enabled aircrafts

…the number of EGNOS-approved airlines

Aviation: actions and objectives

Aviation objectives: more EWAs, more LPVs published, more aircrafts certified …..





- Guidelines to use EGNOS
- List of Services
- List of STC available
- Library
- Success stories
- Business Cases
- Performance Assessments
- **Technical Support to GSA for Incentive Scheme call**

ACTIONS

ACTIONS

- Workshops
- Events participation
- Articles in magazines
- Emails/calls
- Dedicated meetings and awareness actions

Example of actions conducted in aviation (1)

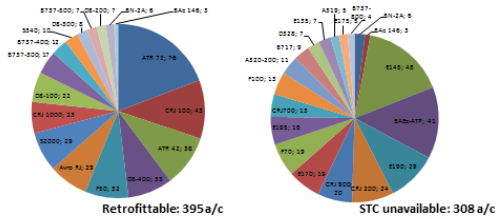
Starting to create the appetite for LPV in regional aviation…

(1) Workshop with IDRF (Interessengemeinschaft der regionalen Flugplätze)**:** German regional airports association **~70 airports**

(2) Seminar with ERA (European Regions Airline Association) **~50 airlines**

ESSP elaborated an assessment on the retrofitting capabilities of ERA's fleet

The analysis shows that



56% of the fleet is, or will soon be, retrofitable

(395 a/c out of 703)

Example of actions conducted in aviation (2)

Increasing awareness for LPVs in general aviation…

(1) Awareness package for PBN & EGNOS training development prepared and ready to be disseminated

(2) Article published in PPL/IR magazine

(3) Contacts stablished with several GA stakeholders : AOPA, EGAST ..

(4) First contacts with Flight Schools:

- Supporting them to equip their aircrafts…
- Asking about their simulators…
- Providing info on EGNOS…

Example of Actions conducted in aviation (3):

Offering Business Cases development for Operators

Benefits	DDC avoidance	Simple model
		Advanced model
	CFIT avoidance	Economic assessment of the average risk
	Mission savings	Fuel savings
		Maintenance savings
		Other commercial cost savings
Investment costs	Hardware	
	Integration	
	Installation	
	Crew training	
	Documentation	
	Certification	

First interested ones:

NetJets

LuxAir

Example of actions conducted in aviation (4)

Connecting people …

(1) Inaer (Helicopter operator in Spain) and CMC Electronics: equipment

(2) Aeropole (Flight school in Finland) with Finavia: LPV

(3) IDRF (German regional airports association) with procedure design companies

(4) Teruel (Spanish airport) with procedure design companies

Example of actions conducted in aviation (5):

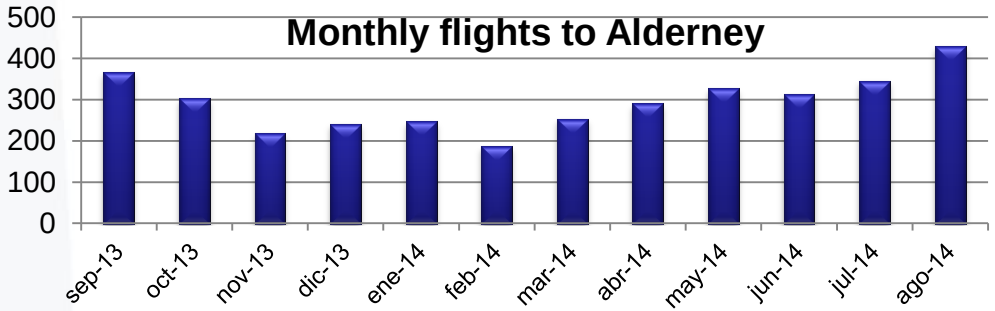
Finding success stories that allow to gain momentum…

What is the real use of EGNOS by Aurigny Air Services?

- **Facts**
  - Complete fleet (6) of Trislanders equipped and **approved for LPV** (GTN750 + Aspen displays)
  - **LPV** is the **preferred option** to land at Alderney
- **What do the numbers say?**
  - Analysis conducted using NMIR tool from Eurocontrol **for the period Sept'13-Aug'14**

➢ **Monthly average number of LPV flights to Alderney** **293**

➢ **Total number of LPV flights to Alderney** **3516**



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Promote EGNOS in maritime so it is used means…

… understand standards and regulation (IMO 1046/IMO 915, IALA R-121, ITU, IEC, RTCM…)

… Support GSA in fora/groups with technical info on EGNOS (EMRF)

…explore EGNOS possibilities

✓ *Sending EGNOS corrections (SIS or EDAS/SISNeT/NTRIP) through AIS & IALA Beacon*

✓ *Re-capitalisation analysis to assess EGNOS added-value in existing DGNSS networks*

…keep contact with stakeholders, gather feedback, attend key events

e-Navigation

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Promote EGNOS in rail so it is used means...

… support GSA in fora/groups with technical info on EGNOS

✓*NGTC*
✓*ERTMS user group*

… EGNOS Performance Assessments

✓*Specs for a simulator*
✓*Test campaigns for awareness*
✓*Perfo Asessments*
✓ *IFT possibilities*

…keep contact with stakeholders, gather feedback, attend key events

Example of actions conducted in rail (1):

Understanding needs in non-SoL applications

	Time-to-alert Requirements	
Accuracy Requirements	Low (TTA ≥ 30s)	High (10s < TTA < 30 s)
Low (>10m)	*Infrastructure charging* *Cargo monitoring* *Fleet management* *Energy charging*	
High (1-10m)	*Location of GSM-R reports*	*Hazardous Cargo Monitoring*
Very High (0.01-1m)	*Infrastructure surveying* ***Gauging surveys*** *Structural monitoring*	

Blue and bold blue: *need for integrity*

Example of actions conducted in rail (1):

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Very High (0.01-1m)	*Infrastructure surveying* ***Gauging surveys*** *Structural monitoring*	

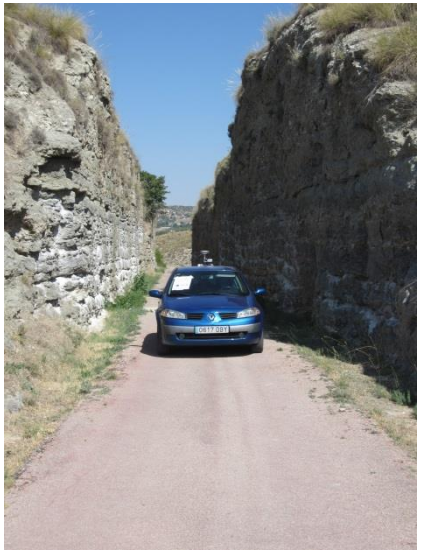
EGNOS applicability envelope

Blue and bold blue: *need for integrity*

Example of actions conducted in rail (2):

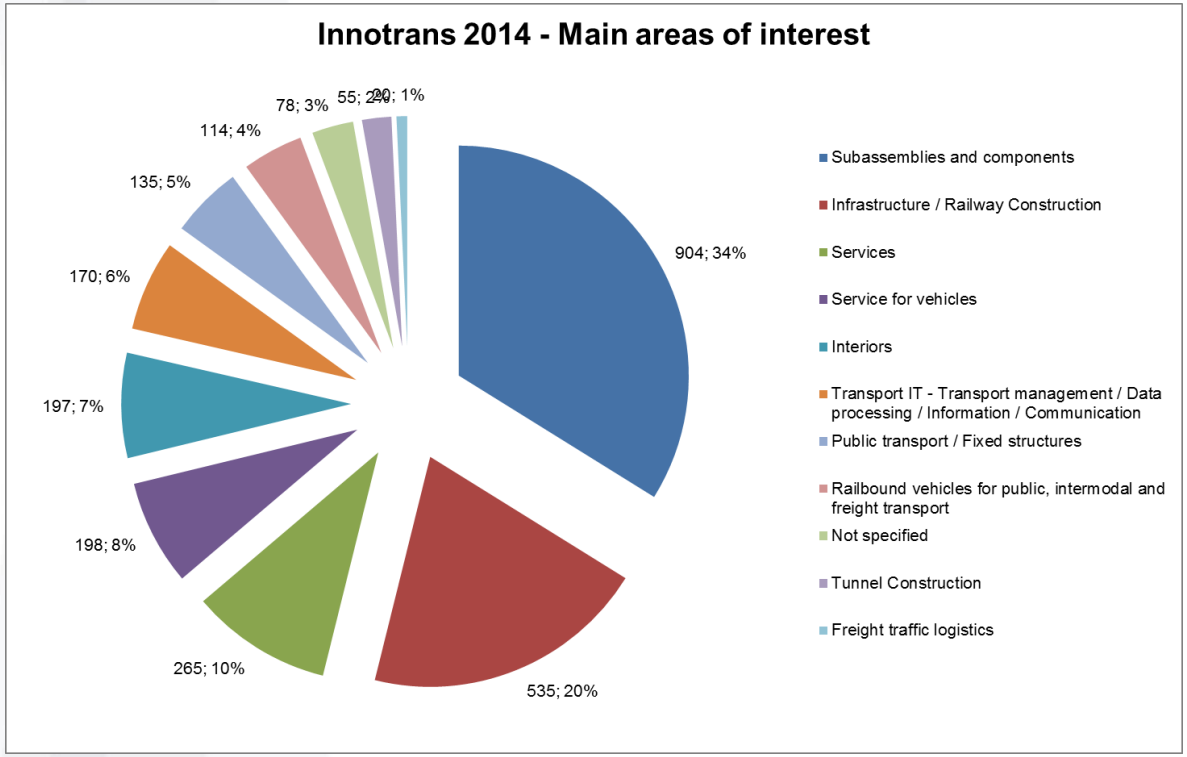
Helping industry in their adoption roadmap

(1) Measurements campaign (August 2014) to help on the characterisation of rail environment



Example of actions conducted in rail (3):

Increasing awareness amongst railway stakeholders



Out of the 904 exhibitors (mainly in subassemblies and components), there were targeted 83

Only 2 knew about EGNOS!

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Enhance EGNOS usage in agriculture and low accuracy surveying/mapping means….

…being active in fora and enhance stakeholders relationship

- ✓ *Identify users*
- ✓ Vertebrate and keep relationships

  (CLGE, DLG, CLAAS, John Deere, TopCon, Trimble, Leica, etc..)

…understand this market segment and its technological evolution

…keep contact with users, gather feedback, attend key events

AGRI TECHNICA The World's No.1

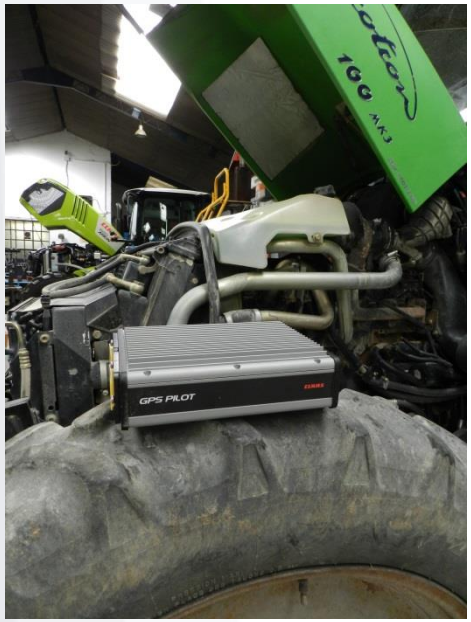
INTERGEO

GEOSPATIAL WORLD FORUM

Example of actions conducted in agriculture (1):

Understanding user needs and working scheme

Visit to a cereal exploitation on Spanish Highlands (Mozoncillo, Segovia) using CLAAS equipment on their tractors.



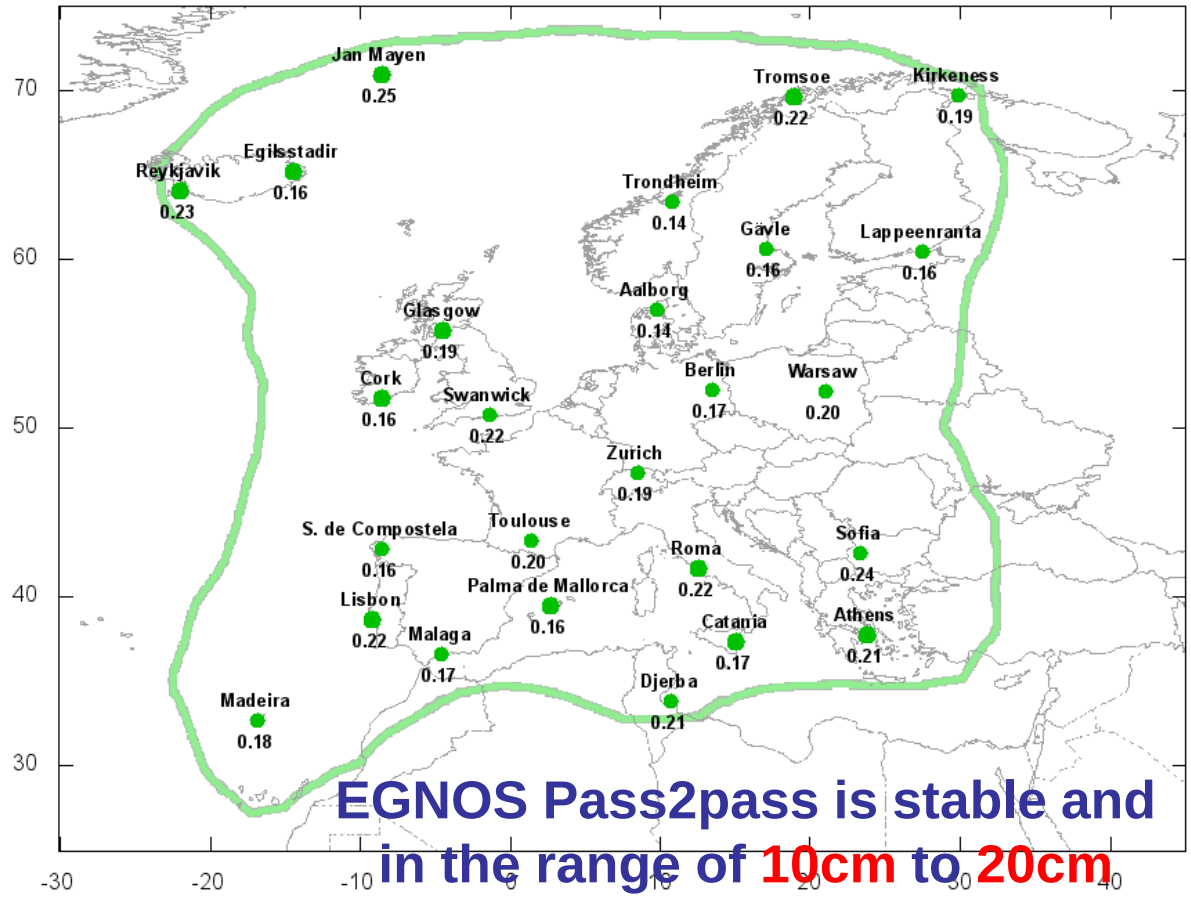

Agrotron
180.1

Example of actions conducted in agriculture (2):

Expressing performances in the terms users are familiar with

Pass to pass accuracy is the reference way of measuring the accuracy for agriculture.

Calculations of pass to pass accuracy are based on **ISO 12188-1**



EGNOS Pass2pass is stable and in the range of 10cm to 20cm

Example of actions conducted in agriculture (3):

Building business case methodology

EGNOS guidance : just a screen showing position from the receiver. Minimum investment ~ 2500 €

EGNOS autoguidance: reciever coupled with steering wheel. Medium investment ~ 5500 €

		Guidance		Autoguidance	
	Average Costs	Scenario 1 Saving		Scenario 2 Saving	
Field job and product	(€/ha)	(%)	(€)	(%)	(€)
Sprayer (machinery)	7,0	10%	0,70	12%	0,84
Insect./fungic. 2 l/ha (product)	15,0	10%	2,25	12%	1,80
Combine (machinery)	50,0			3%	1,50
Total cost (€) / ha	**401,0**				
Total savings (%) and (€) /ha		**(4%)**	**15,65**	**(6%)**	**24,17**
Total savings (€) in a farm with:					
100 ha			1.565		2.417
250 ha			3.913		6.043
500 ha			7.825		12.085
750 ha			11.738		18.128
1.000 ha			15.650		24.170

Example of actions conducted in mapping :

Finding success stories that allow to gain momentum…

(1) "Kilometre stone" marking of the secondary roads in Spain (around 120.000km out of the 165.000km) for "Dirección General de Tráfico"

Photo: courtesy of Geograma

7-8 October

Lisbon

The EGNOS Service Provision workshop

ESSP

We certify you're there.

European Global Navigation Satellite Systems Agency

funded by the European Commission

7-8 October

Lisbon

The EGNOS Service Provision workshop

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AGENDA (11:45 – 14:30)

11:45-12:15 **EDAS for added value applications**

- EDAS for added value applications
  Juan Vázquez *– Customer and Data Services Mngr (ESSP)*

12:15-13:30 **EGNOS in land applications**

- NGTC Project: Paving the way for GNSS use in rail
  Peter Gürnik *– Technical Affairs Mngr (UNIFE)*
- EGNOS/EDAS based solution for airport surface operations
  Antonio Salonico *– System Engineer (Telespazio)*
- EGNOS usage in Agriculture: facts and future perspective
  Julián Rioja *– European marketing and sales coordinator (TOPCON agriculture)*

13:30-14:30 **Lunch**

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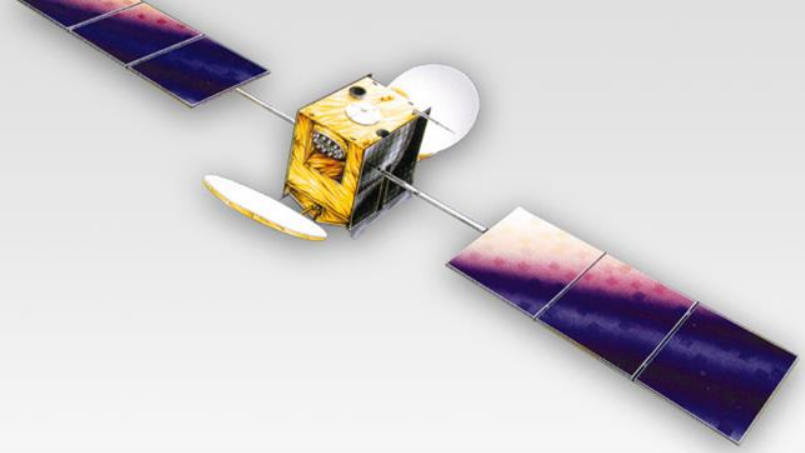

EDAS for Added Value Applications

Juan Vázquez, ESSP SAS, juan.vazquez@essp-sas.eu

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- Introduction
- EDAS Description
- Applications
- Conclusions

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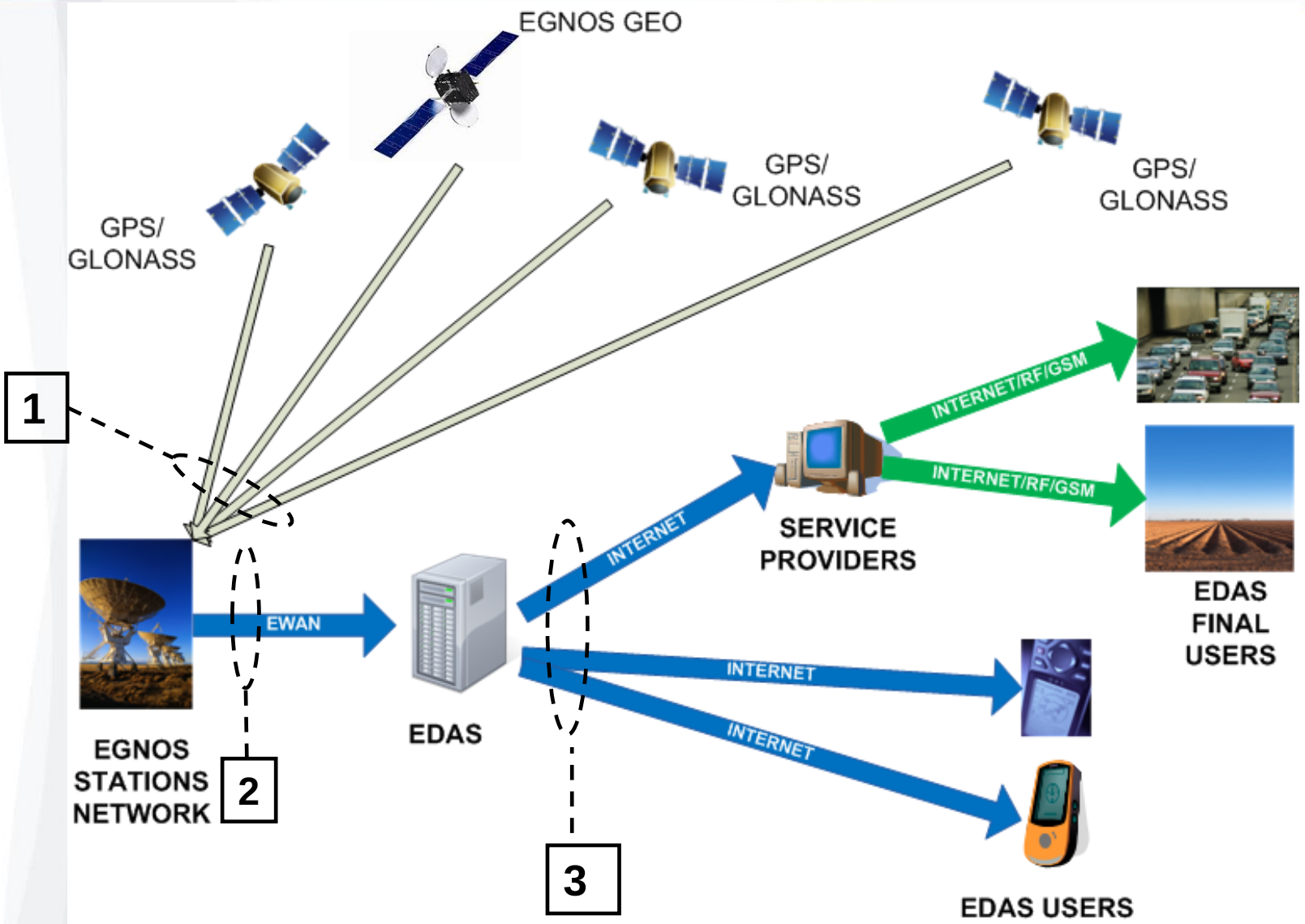
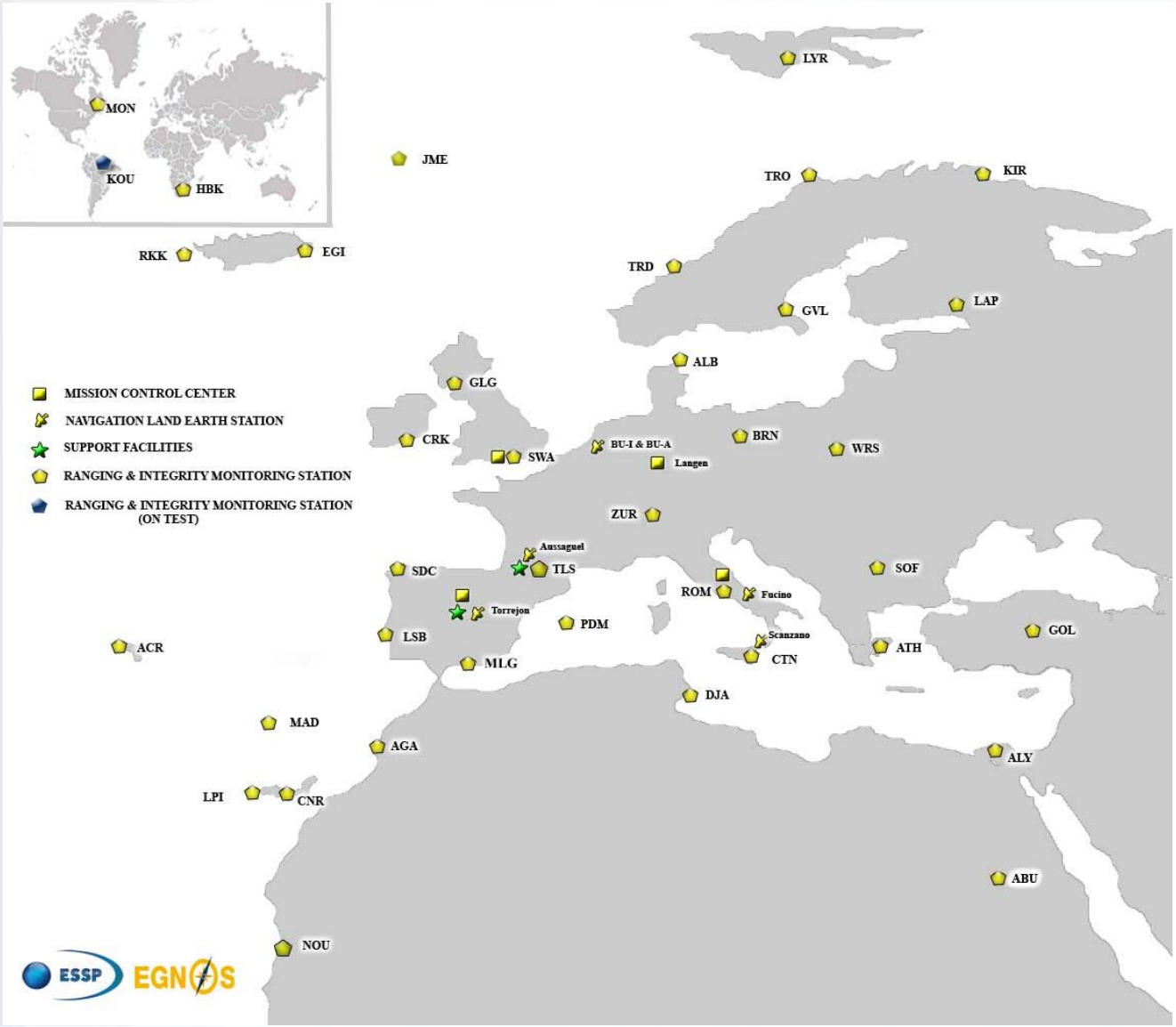
Introduction



Introduction



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EDAS Services

EDAS Service	Type of Data				Service Description	
	OBS & NAV	EGNOS MSG	RTK MSG	DGNSS COR	FORMAT	PROTOCOL
Service Level 0 Data Filtering SL0	✖	✖			ASN.1	EDAS
Service Level 2 Data Filtering SL2	✖	✖			RTCM3.1	EDAS
SISNET		✖			RTCA	SISNeT
Ntrip	✖		✖	✖	RTCM 2.x RTCM 3.1	Ntrip
FTP	✖	✖			RINEX, EMS, IONEX…	FTP

EDAS Services

EDAS Service	Type of Data				Service Description	
	OBS & NAV	EGNOS MSG	RTK MSG	DGNSS COR	FORMAT	PROTOCOL
Service Level 0 Data Filtering SL0					ASN.1	EDAS
Service Level 2 Data Filtering SL2			REAL-TIME		RTCM3.1	EDAS
SISNET					RTCA	SISNeT
Ntrip					RTCM 2.x RTCM 3.1	Ntrip
FTP			ARCHIVE		RINEX, EMS, IONEX…	FTP

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EDAS Information

EGNOS

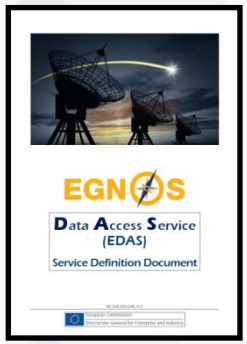
Data Access Service (EDAS)

Service Definition Document

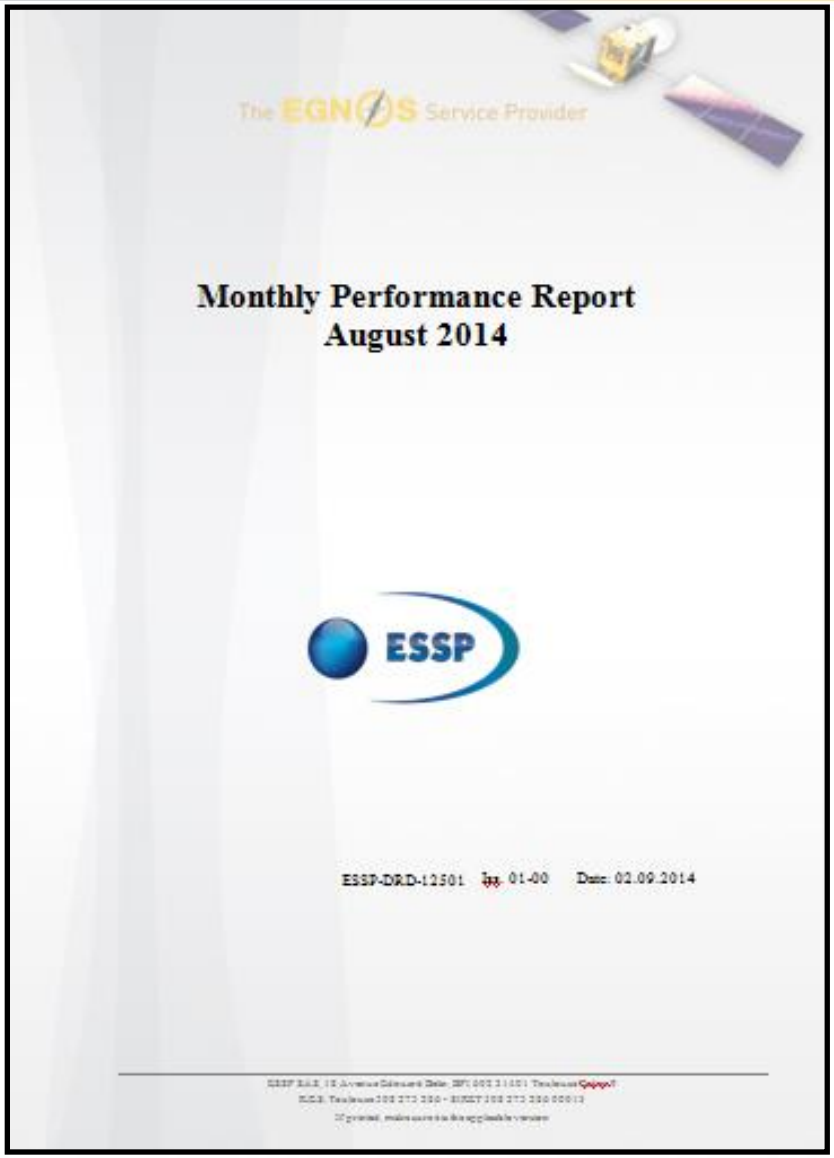
Ref.: EGN-SDD EDAS, V1.0

European Commission
Directorate-General for Enterprise and Industry

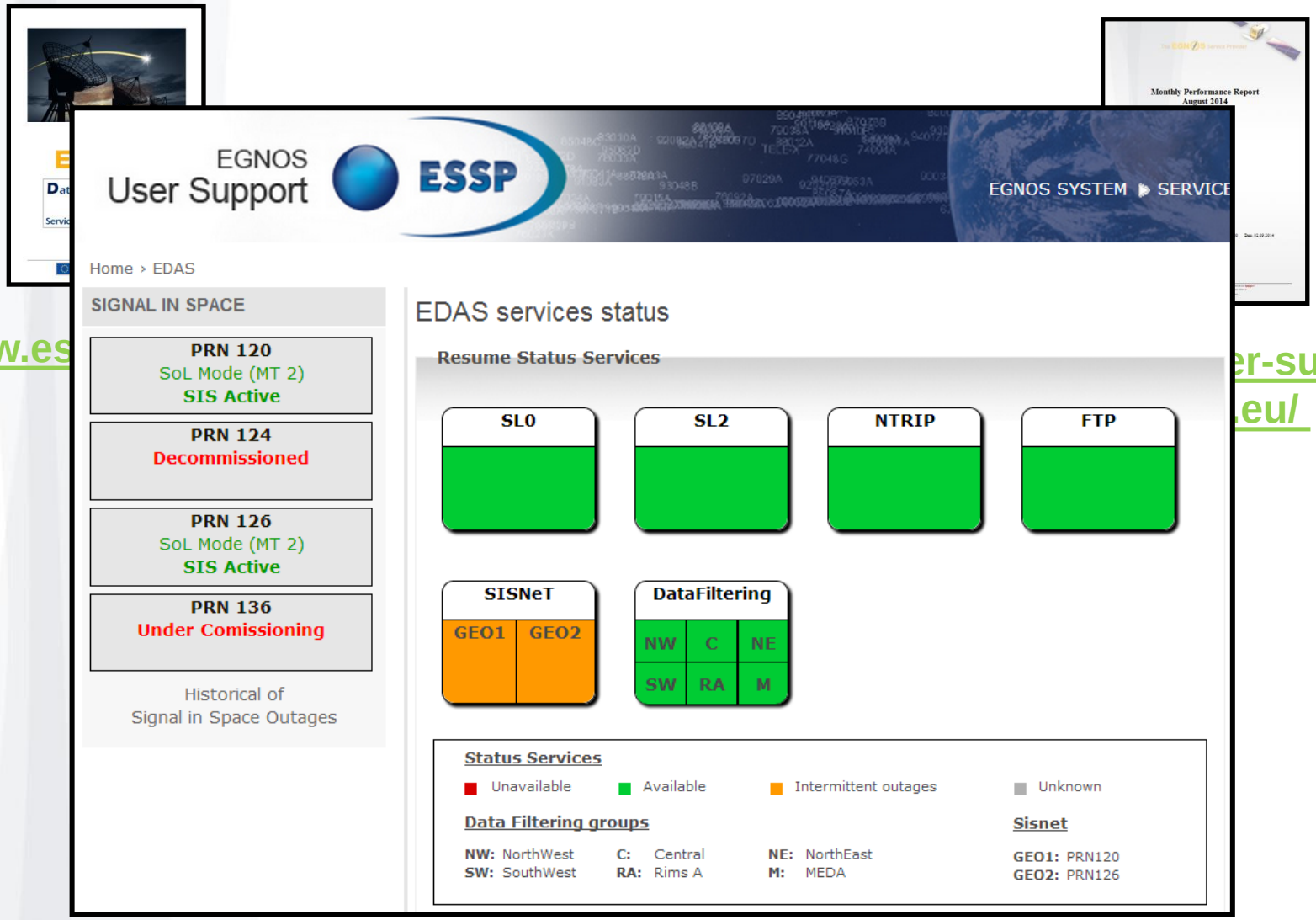
EDAS Information



www.essp-sas.eu



EDAS Information



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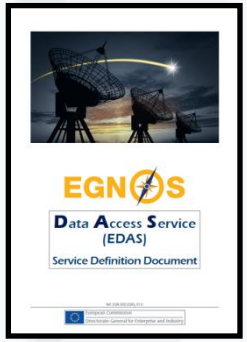
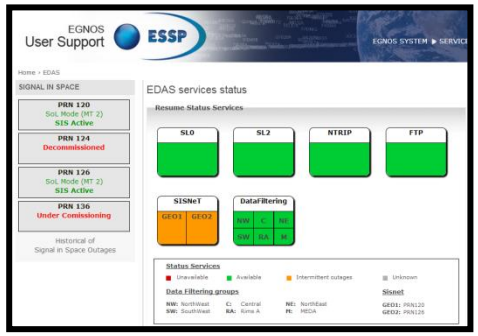
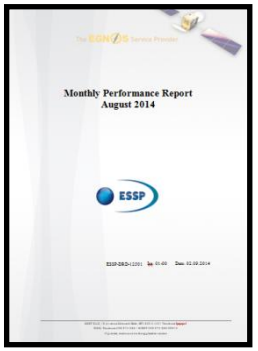
er-support.
.eu/

EDAS Information







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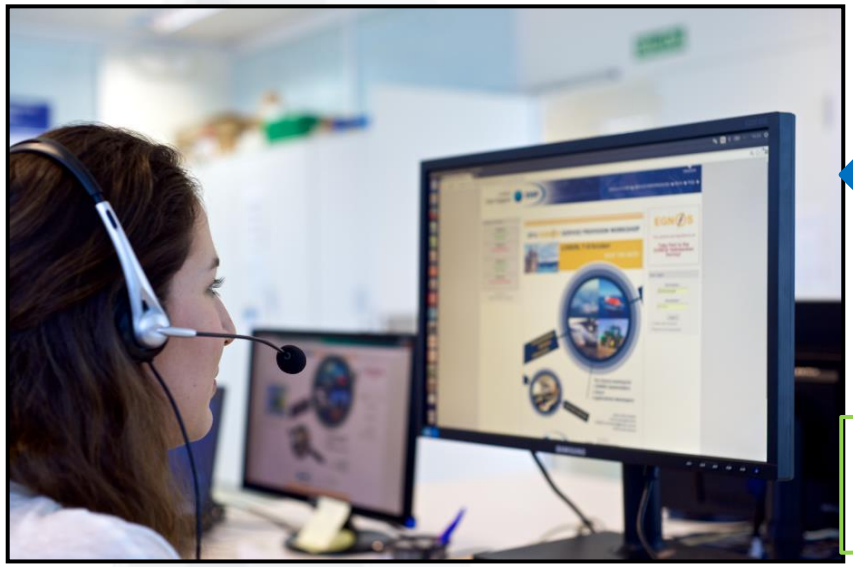
http://egnos-user-support.essp-sas.eu/



1. WEBSITE REGISTER
2. EDAS REGISTRATION FORM

EGNOS-Helpdesk@essp-sas.eu
+34 91 236 554

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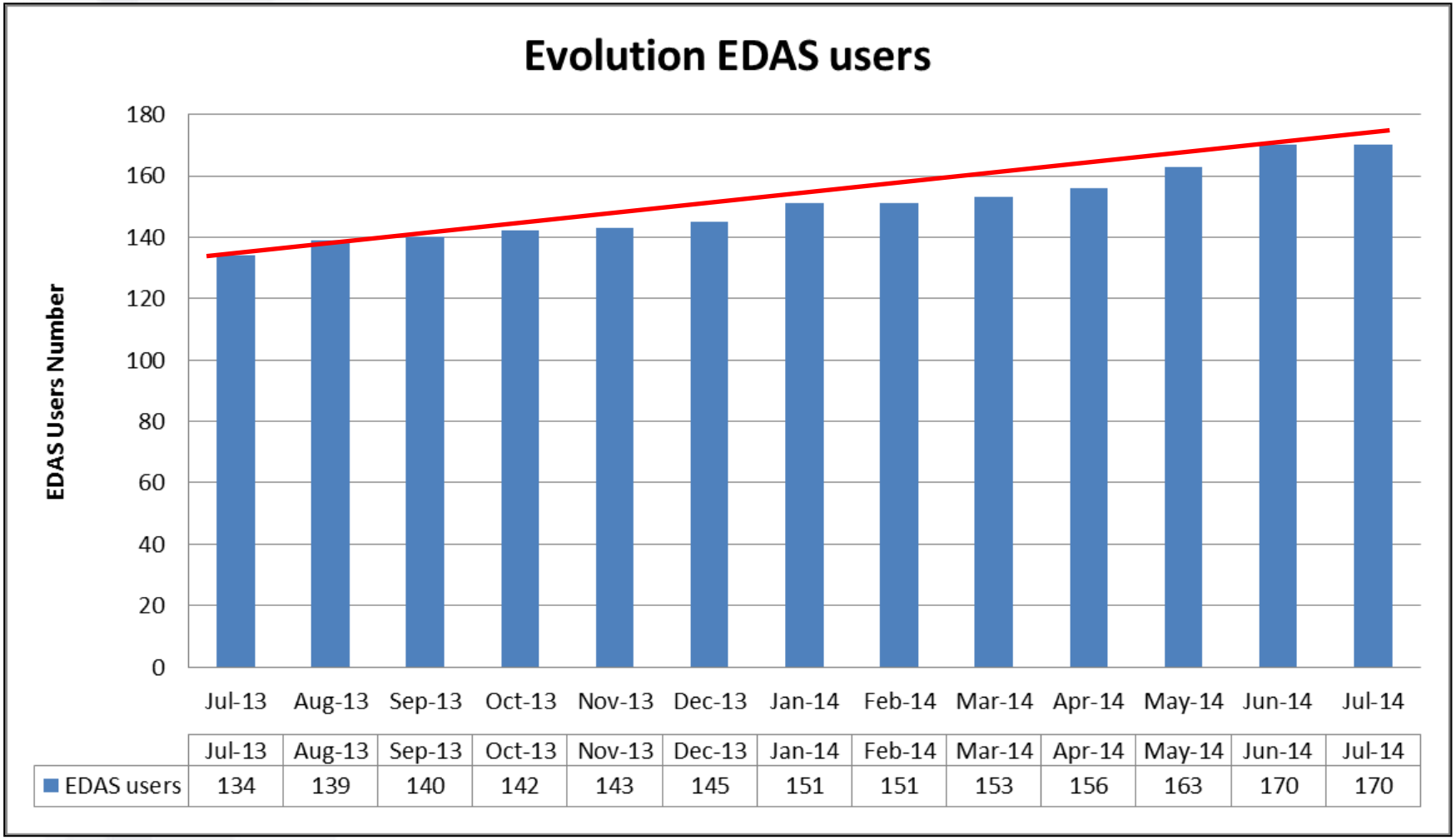
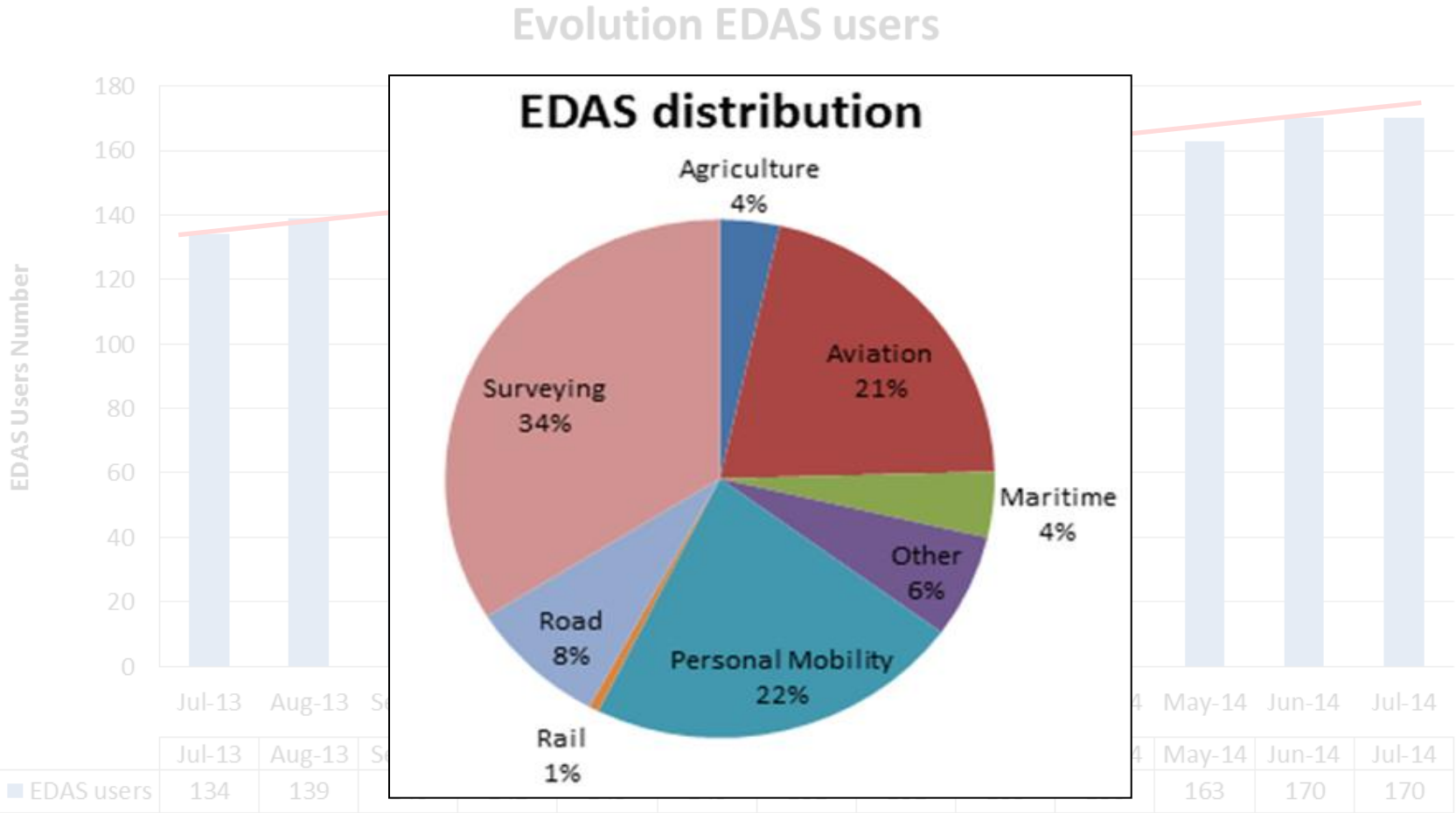
EDAS Users



	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14
EDAS users	134	139	140	142	143	145	151	151	153	156	163	170	170

EDAS Users


Evolution EDAS users
EDAS Users Number
180
160
140
120
100
80
60
40
20
0
Jul-13
Aug-13
May-14
Jun-14
Jul-14
EDAS users
134
139
163
170
170

EDAS distribution
Agriculture 4%
Aviation 21%
Maritime 4%
Other 6%
Personal Mobility 22%
Rail 1%
Road 8%
Surveying 34%

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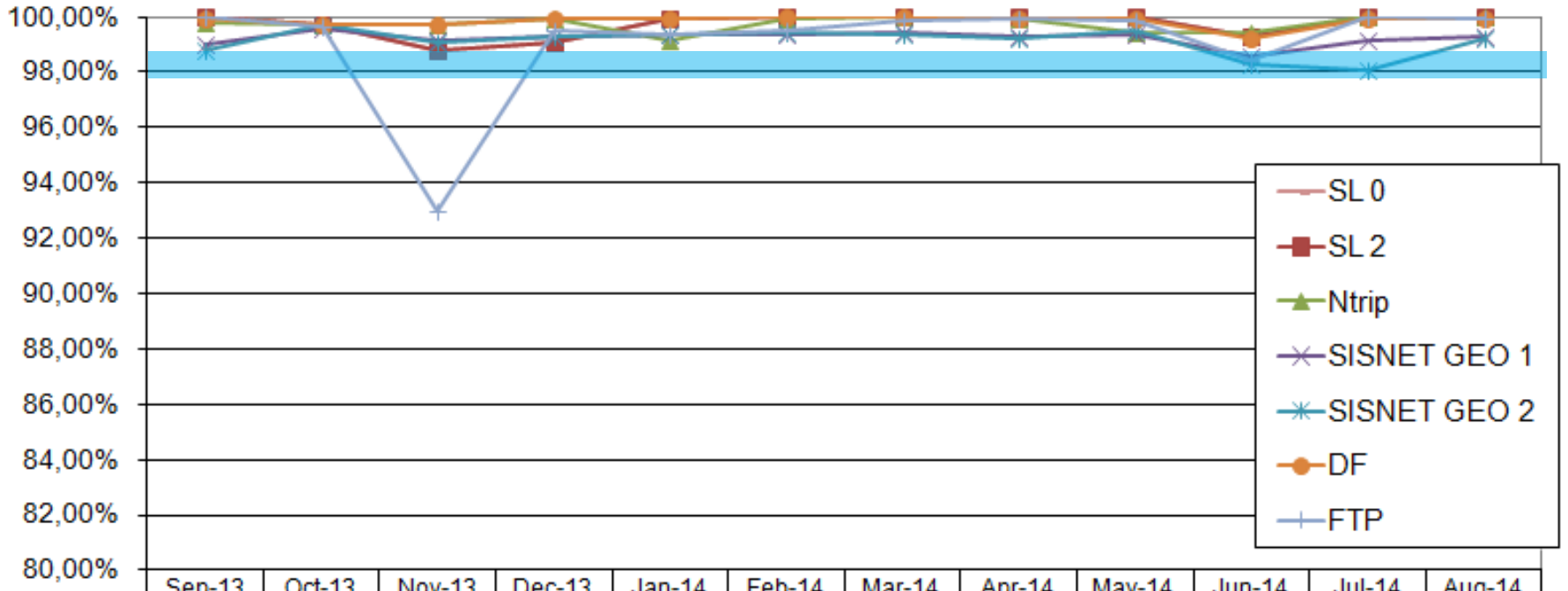
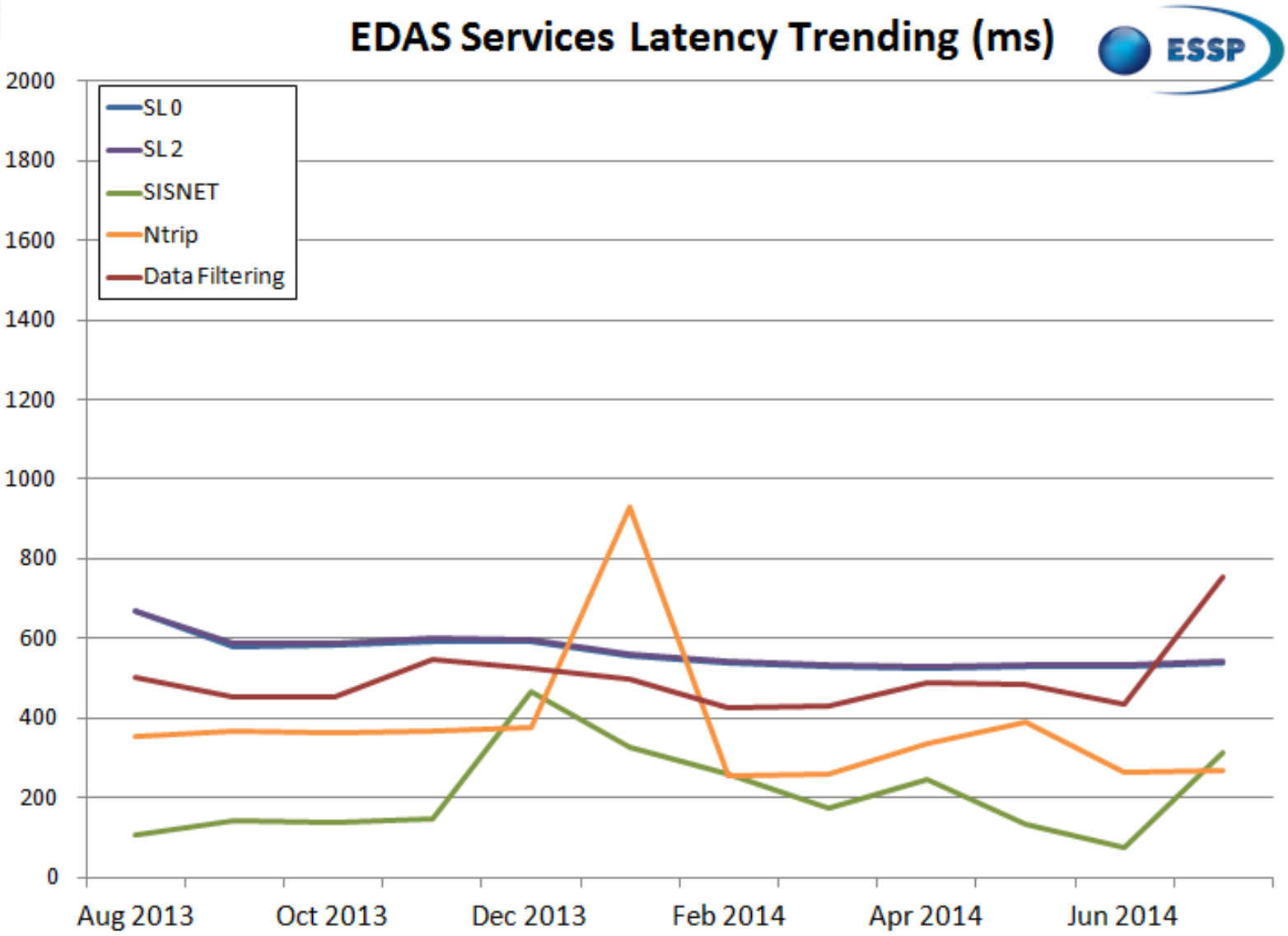
EDAS Performance

EDAS Services Availability Trending

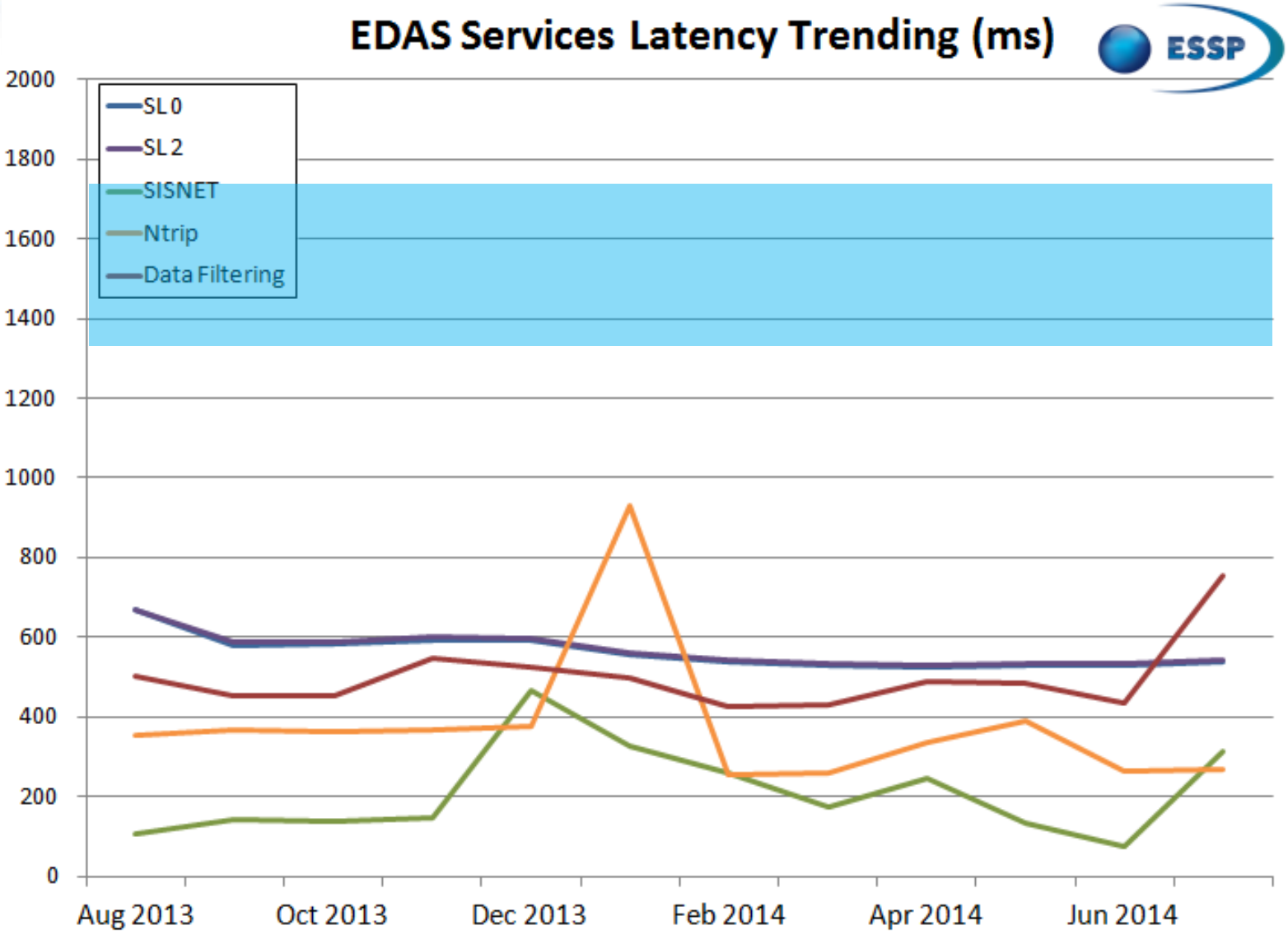


	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14
SL 0	99,99%	99,72%	98,79%	99,04%	99,95%	99,99%	100,00%	99,99%	100,00%	99,32%	100,00%	100,00%
SL 2	99,99%	99,72%	98,80%	99,10%	99,95%	99,99%	100,00%	99,99%	100,00%	99,30%	100,00%	100,00%
Ntrip	99,81%	99,71%	99,73%	99,94%	99,13%	99,96%	99,99%	99,96%	99,46%	99,41%	99,98%	99,99%
SISNET GEO 1	99,02%	99,59%	99,16%	99,30%	99,36%	99,38%	99,45%	99,29%	99,39%	98,58%	99,14%	99,26%
SISNET GEO 2	98,78%	99,71%	99,10%	99,30%	99,33%	99,41%	99,38%	99,25%	99,49%	98,27%	98,06%	99,25%
DF	99,93%	99,72%	99,71%	99,97%	99,93%	99,97%	99,97%	99,93%	99,96%	99,25%	99,95%	99,96%
FTP	100,00%	99,65%	92,97%	99,54%	99,35%	99,49%	99,85%	99,95%	99,87%	98,40%	100,00%	99,96%

EDAS Performance



EDAS Performance



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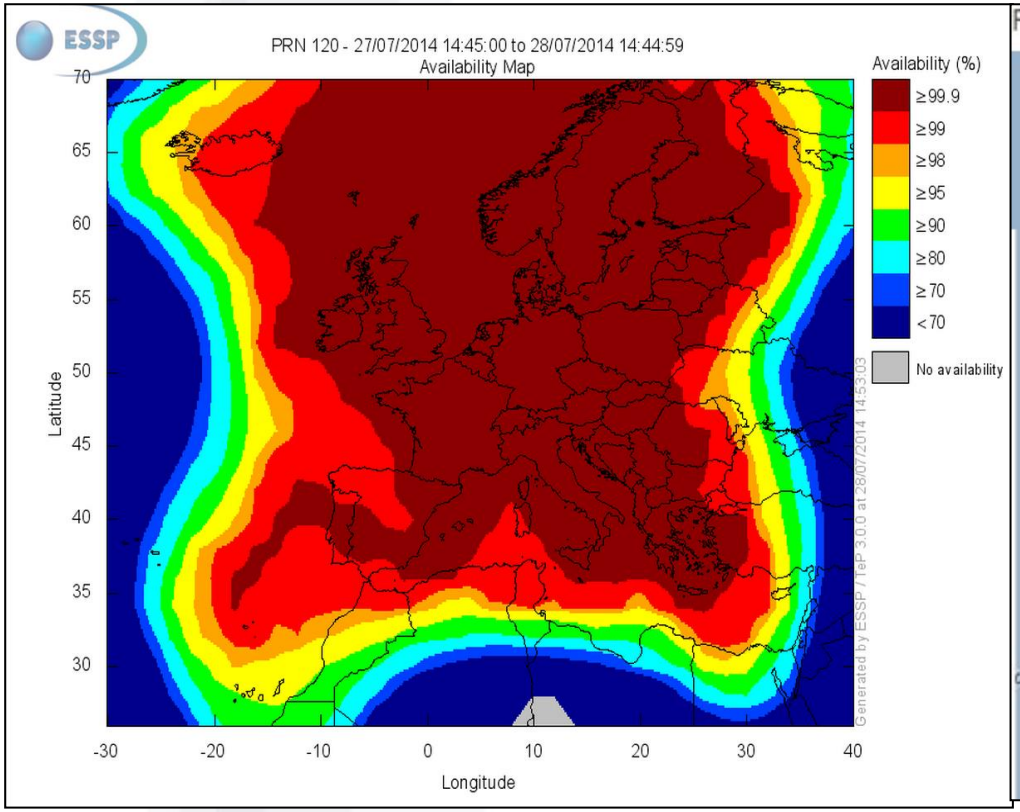
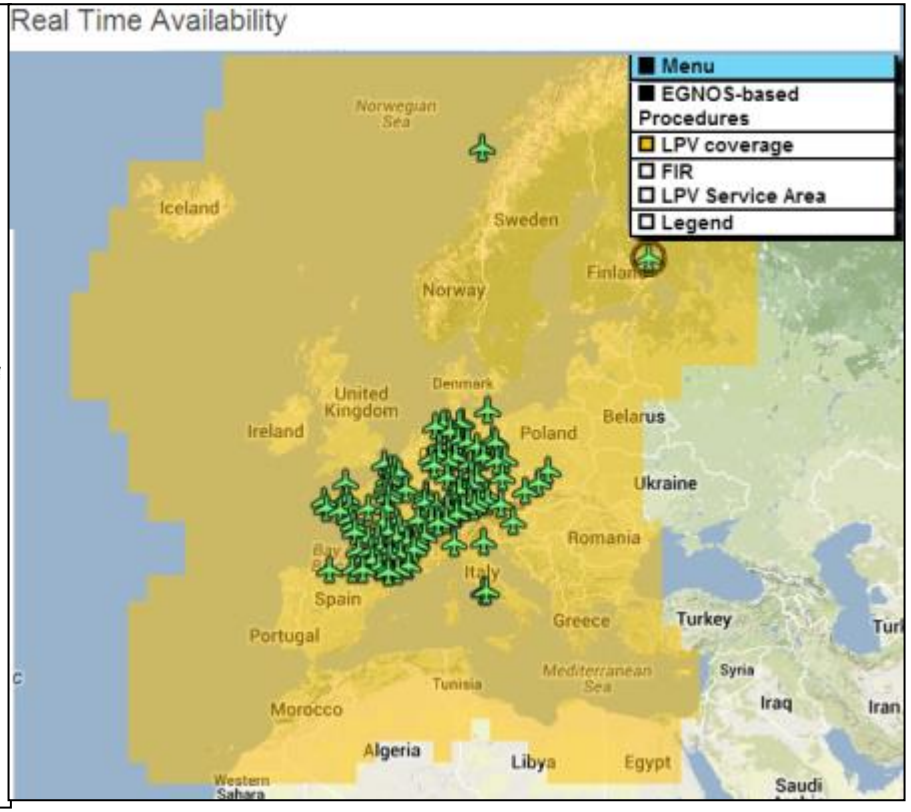
EDAS Applications

EDAS SISNeT for Real-time EGNOS performance monitoring





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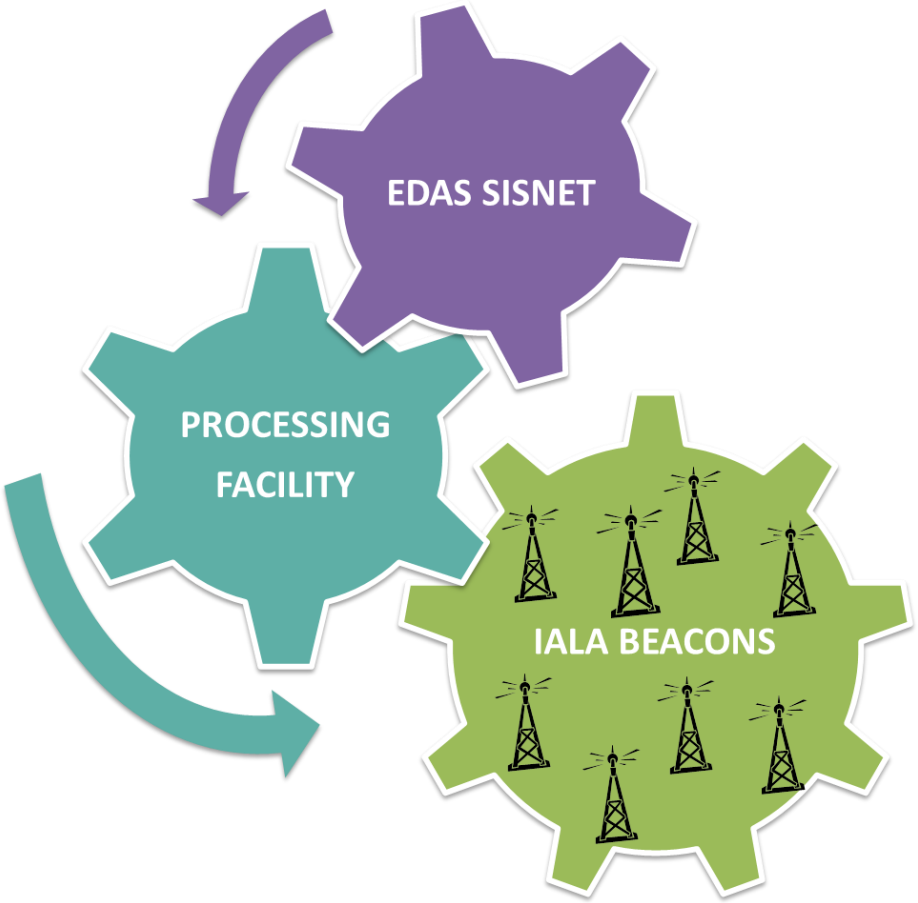
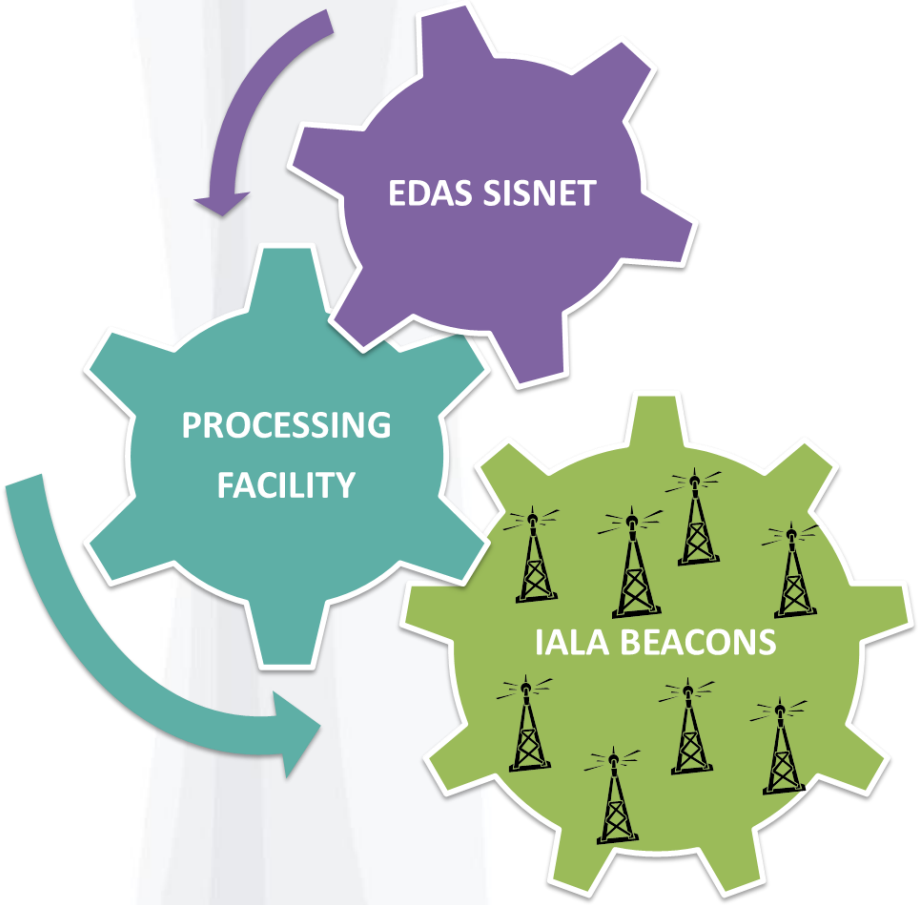
EDAS Applications

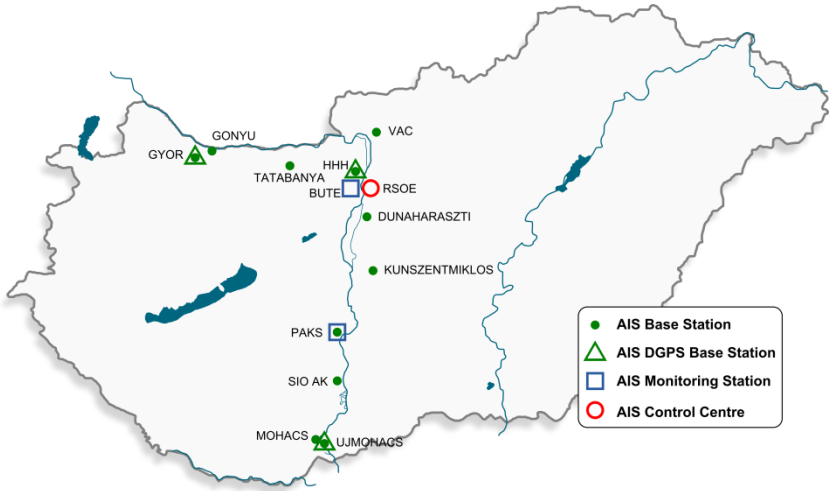
EDAS SISNeT (SL2) for EGNOS Based VRS



EDAS Applications

EDAS SISNeT (SL2) for EGNOS Based VRS





IRIS Europe 3 project – Performance Assessment

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EDAS Applications

EDAS SL2 for Tracking dangerous goods

EDAS Applications

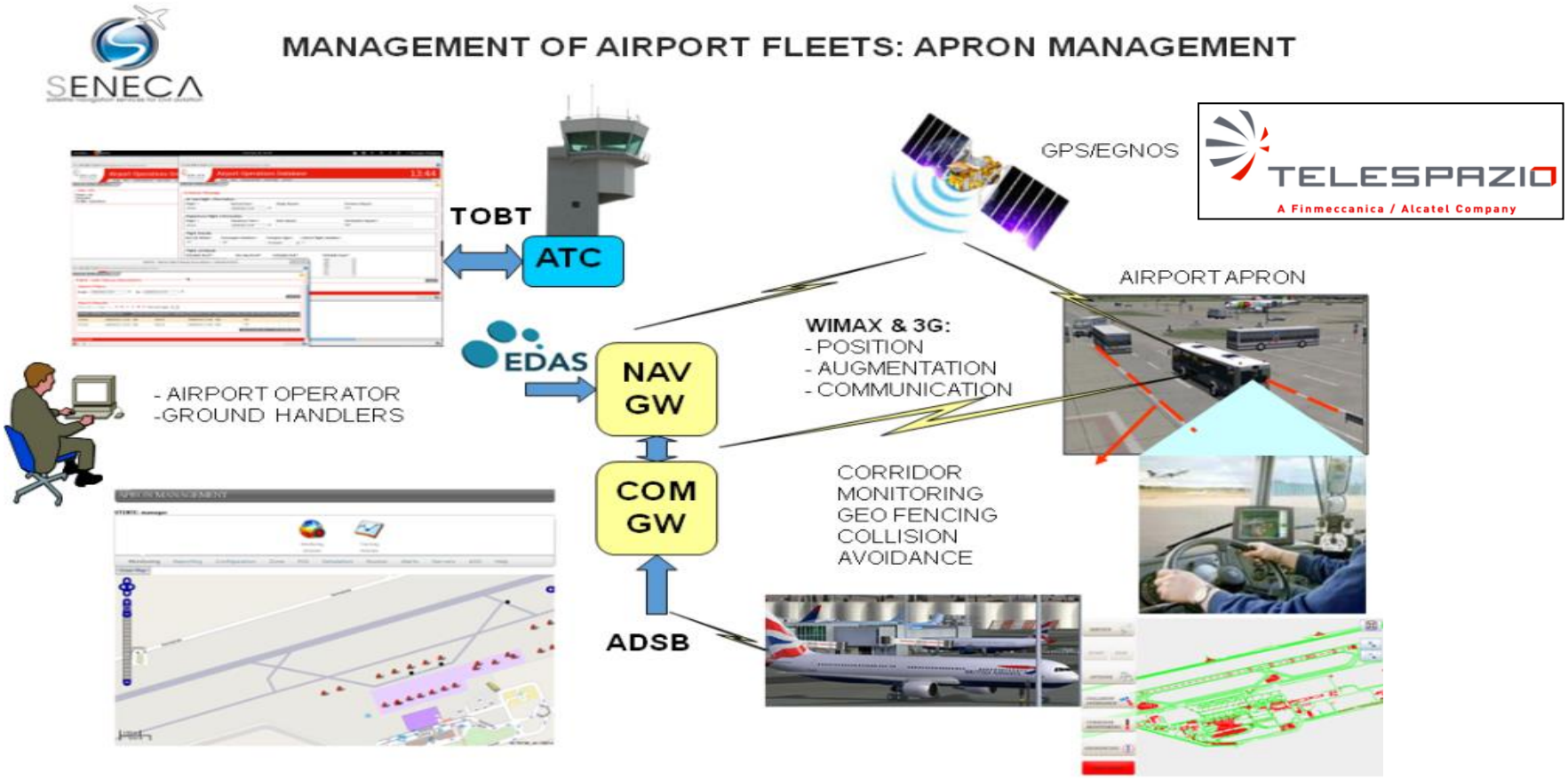
EDAS SL2 for Tracking dangerous goods

EDAS provides higher position accuracy, availability and a guarantee on the position information

TELESPAZIO
A Finmeccanica / Alcatel Company

EDAS Applications

EDAS SL2 for management of airport fleets



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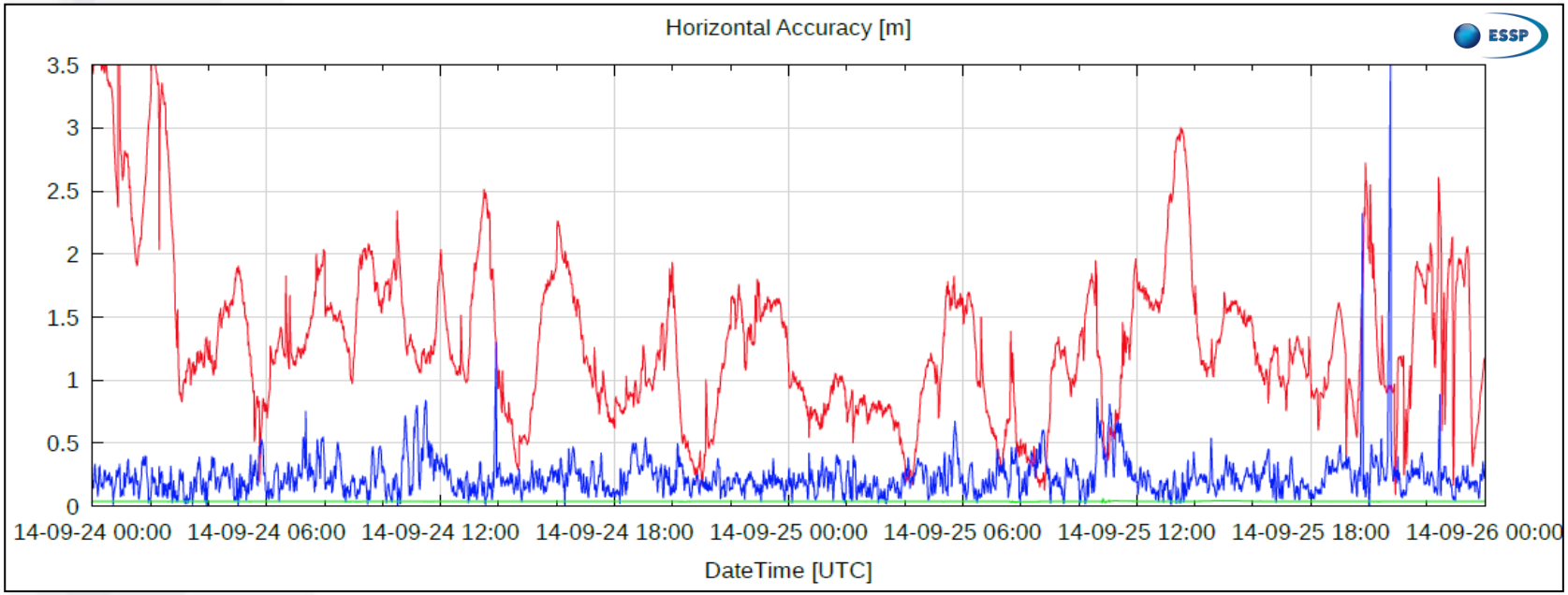
EDAS Applications

EDAS Ntrip for High Accuracy Applications

Berlin (Germany)
September 24th – September 26th 2014

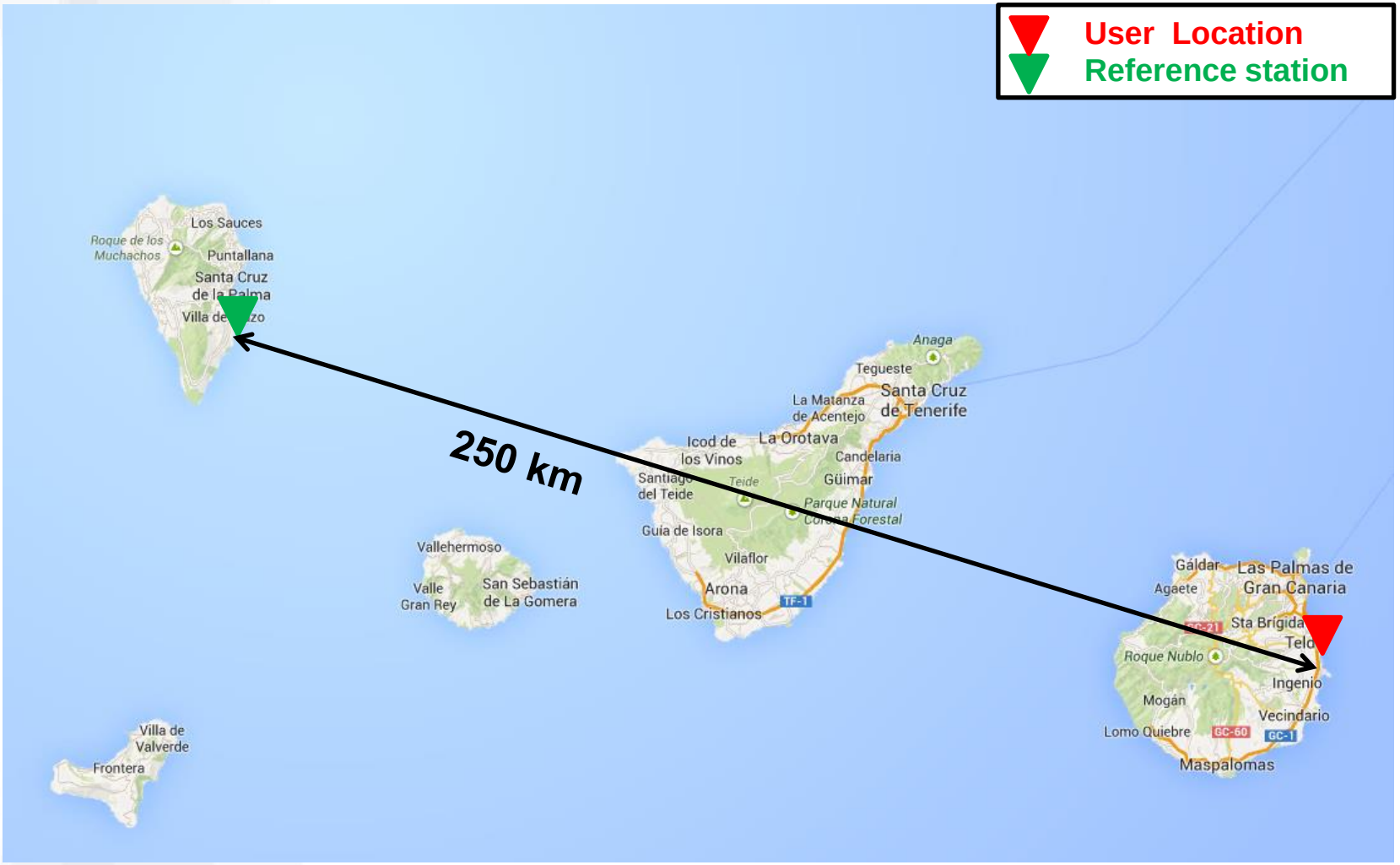


Mean horizontal accuracy

GPS 1,32 m DGPS 0,23 m RTK 0,04 m

EDAS Applications

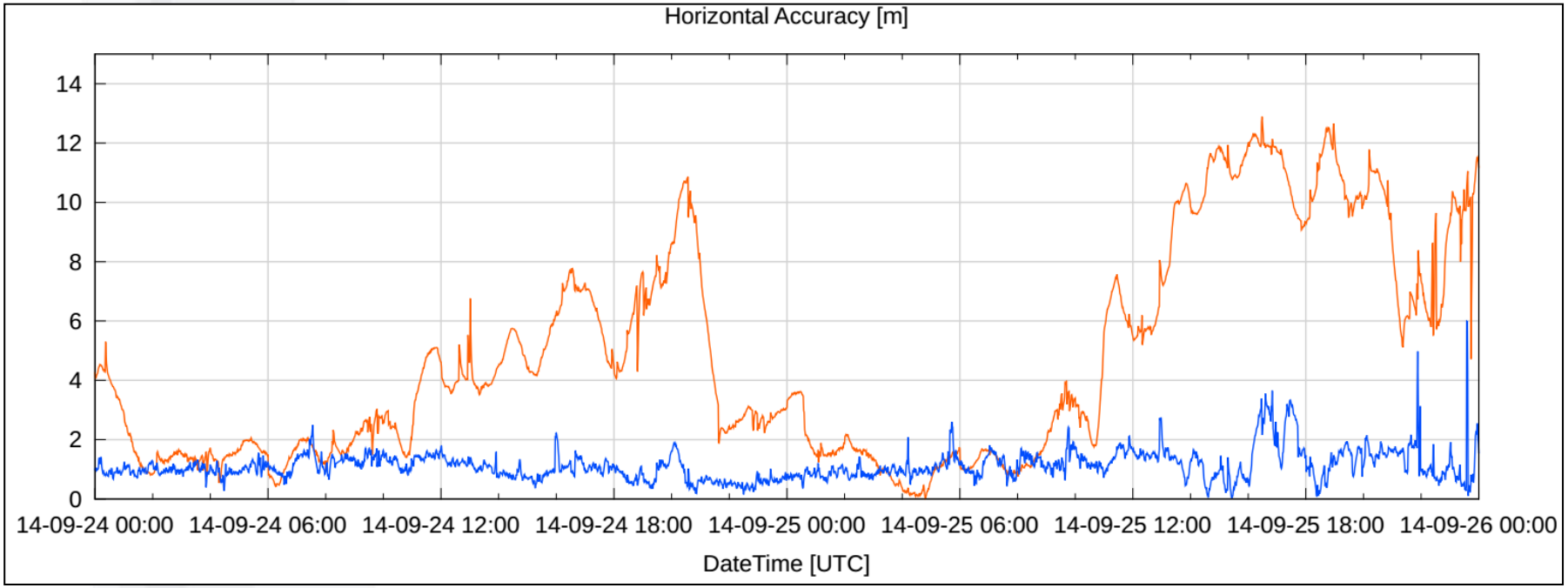
EDAS Ntrip for High Accuracy Applications



EDAS Applications

EDAS Ntrip for High Accuracy Applications

Gran Canaria (Spain)
September 24th – September 26th 2014



Mean horizontal accuracy

GPS 4,75 m DGPS 1,12 m

EDAS Applications

EDAS Ntrip for High Accuracy Applications

Warsaw (Poland)
June 12th – July 12th 2014

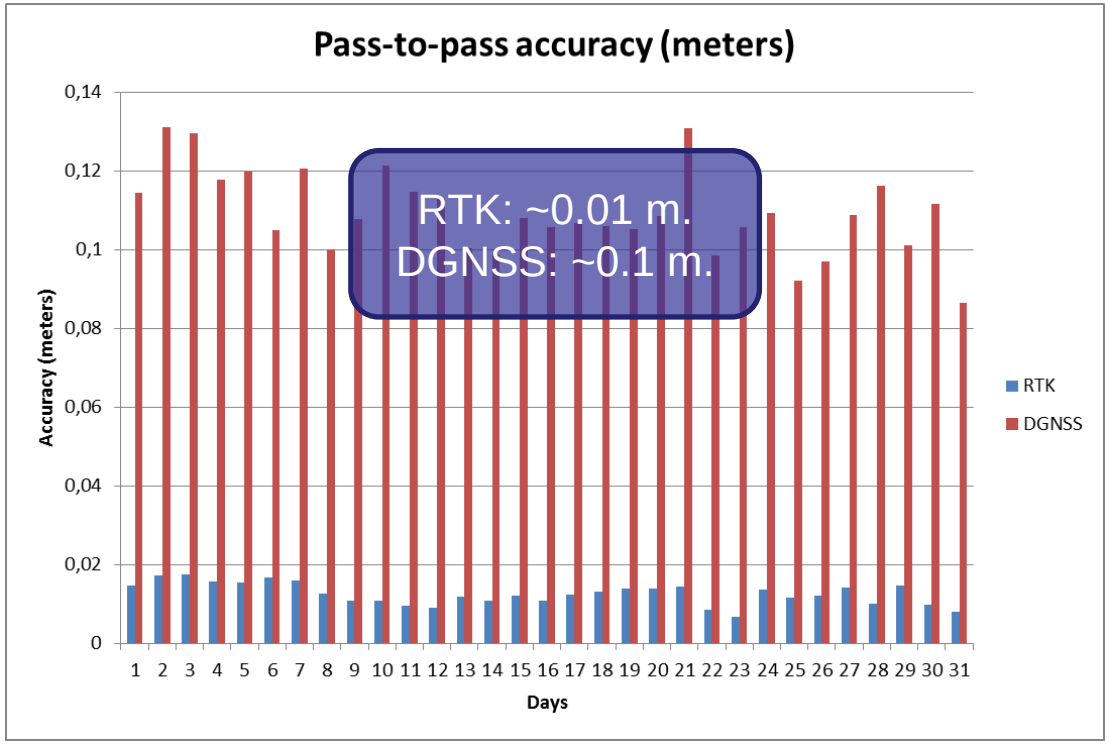


TABLE OF CONTENT

Conclusions

- **EDAS** provides access to the **GNSS data** generated and gathered by **EGNOS infrastructure**

- **EDAS available** for EU GNSS community:
  - **Minimum performance** defined
  - Wide variety of **formats & protocols**
  - Added value for **multiple application domains**

- **EDAS added value** has been shown for 4 use cases:
  - EGNOS real-time performance monitoring
  - EGNOS based VRS for maritime navigation
  - Fleet management
  - High accuracy applications

7-8 October

Lisbon

The EGNOS Service Provision workshop

ESSP

We certify you're there.

European Global Navigation Satellite Systems Agency

funded by the European Commission

AGENDA (11:45 – 14:30)

11:45-12:15 **EDAS for added value applications**

- EDAS for added value applications
  ***Juan Vázquez** – Customer and Data Services Mngr (ESSP)*

12:15-13:30 **EGNOS in land applications**

- NGTC Project: Paving the way for GNSS use in rail
  ***Peter Gürnik** – Technical Affairs Mngr (UNIFE)*
- EGNOS/EDAS based solution for airport surface operations
  ***Antonio Salonico** – System Engineer (Telespazio)*
- EGNOS usage in Agriculture: facts and future perspective
  ***Julián Rioja** – European marketing and sales coordinator (TOPCON agriculture)*

13:30-14:30 **Lunch**

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13:30-14:30 **Lunch**

Next Generation of Train Control systems

NGTC Project: Paving the way for GNSS use in rail

Peter Gurnik (UNIFE)

8.10.2014

SEVENTH FRAMEWORK PROGRAMME

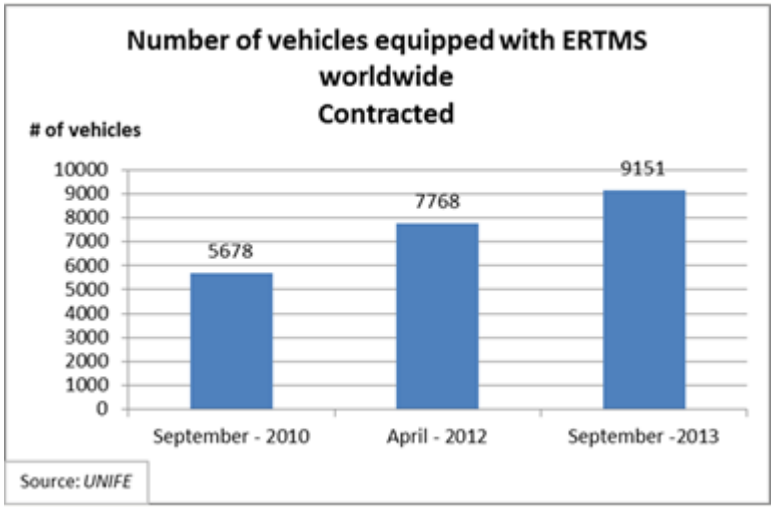
Grant Agreement n° 2013-605402

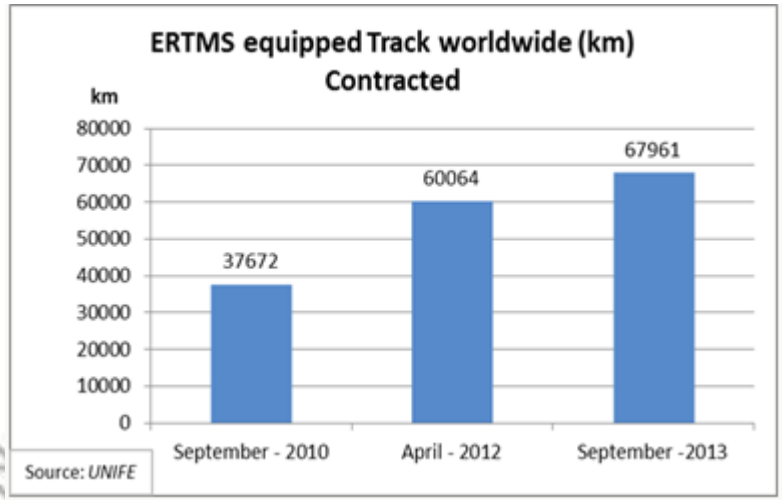
What is ETCS

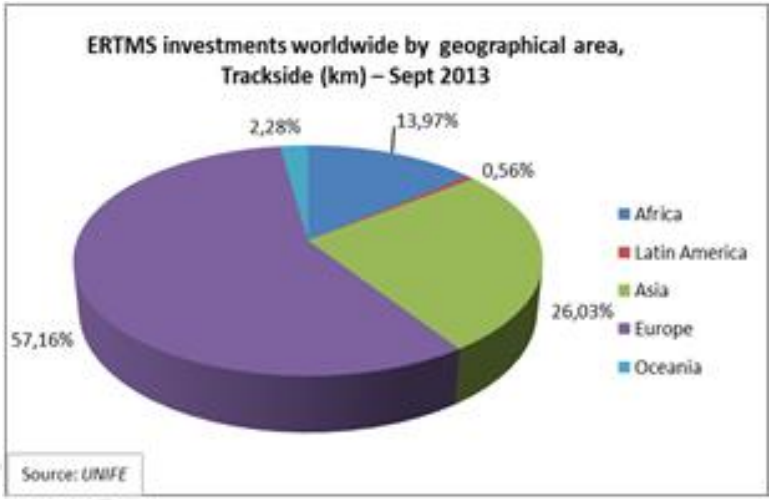
- ETCS is a train control system, developed to replace more than 20 existing systems in Europe
- ETCS provides the driver with signalling information, such as how fast he is allowed to drive and until where
- ETCS supervises the movement of the train and prevents the driver to exceed the indicated limits
- ETCS complies with highest safety standards, permitting operation at very high speeds and traffic density, and without traditional optical lineside signals
- Compatible ETCS equipment is available from multiple suppliers

Where ETCS is being used

- ETCS is being rolled out across Europe as the mandatory future train control system for mainlines
- It is however also very successful in markets outside Europe





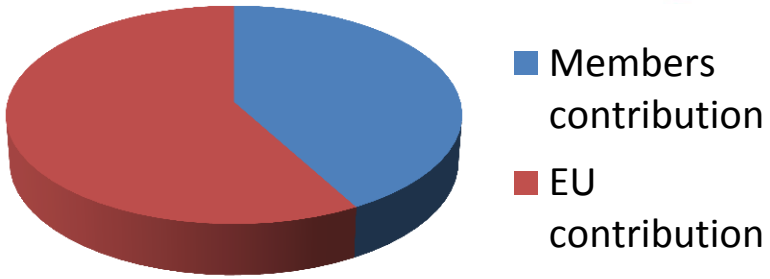


Urban rail systems

- Urban rail systems are using a variety of train control systems since the 1960s.
- In 1980s the first Communication Based Train Control (CBTC) systems were implemented and now they are used in 85% of urban signaling.
- CBTC systems usually include wide scope of functionalities and currently are the systems of choice for Unattended Train Operation (UTO). They are effectively dealing with high performance and capacity requirements for mass railway transit.
- CBTC based systems are proprietary solutions tailored for specific lines and thus lacking interoperability options. Closed system architecture doesn't allow interchangeability of system components supplied by different manufacturers.

Next Generation Train Control (NGTC) project: Basic Facts

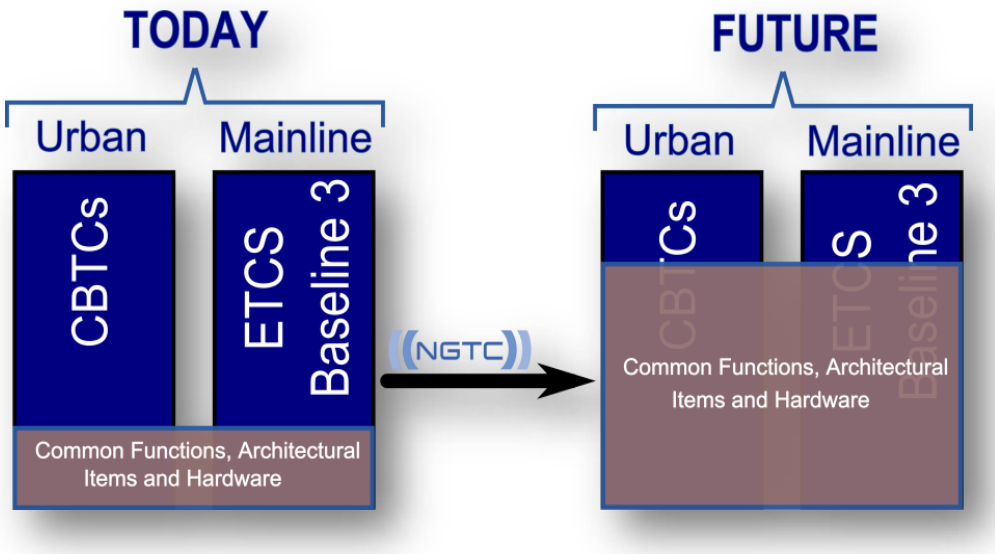
- NGTC project is supported by the European Community's Seventh Framework Programme (FP7/2007-2013)
- Coordinated by UNIFE
- Project budget:
  - Total project Budget: 10,96 €
  - Planned EU contribution: 6,36 €
- Timing
  - Started: 1.9.2013
  - 36 months



NGTC Goals & Objectives

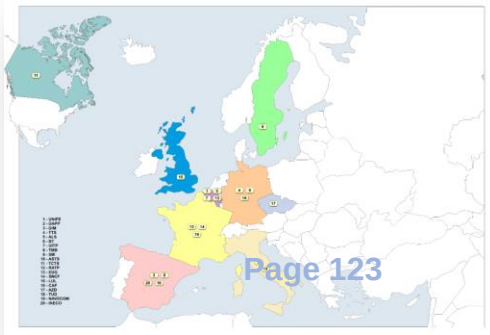
- To compare existing and future ETCS as well as CBTC functional requirements and to develop -> Common set of requirements for Next Generation of Train Control Systems
- To evolve ETCS functionalities to better reflect the needs of different group of applications.

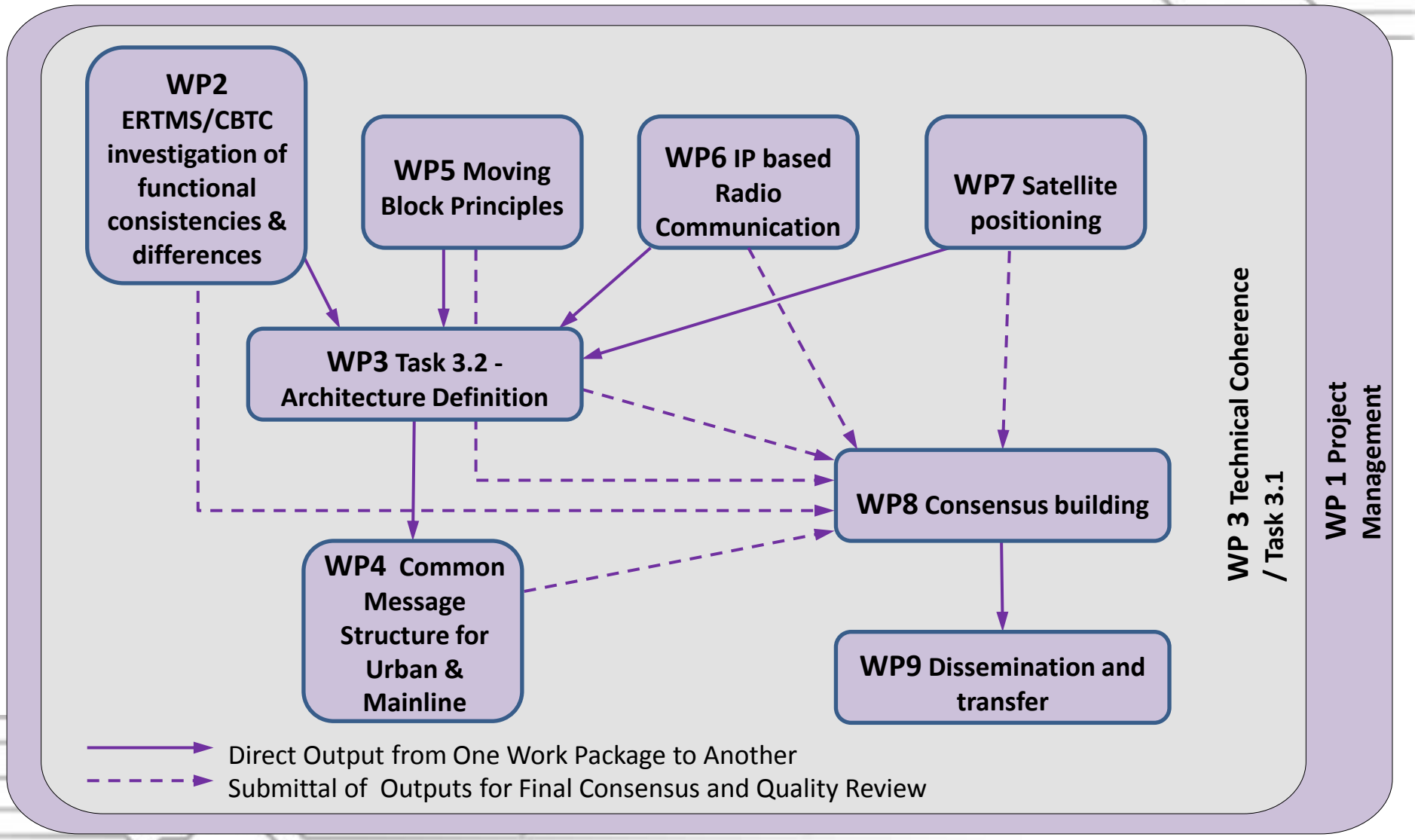
- Urban/suburban railways would benefit from future interoperability and interchangeability;
- The goal is not to develop the One-System-Fits-All, but provide the customers with additional technology options.



Members of the NGTC Consortium

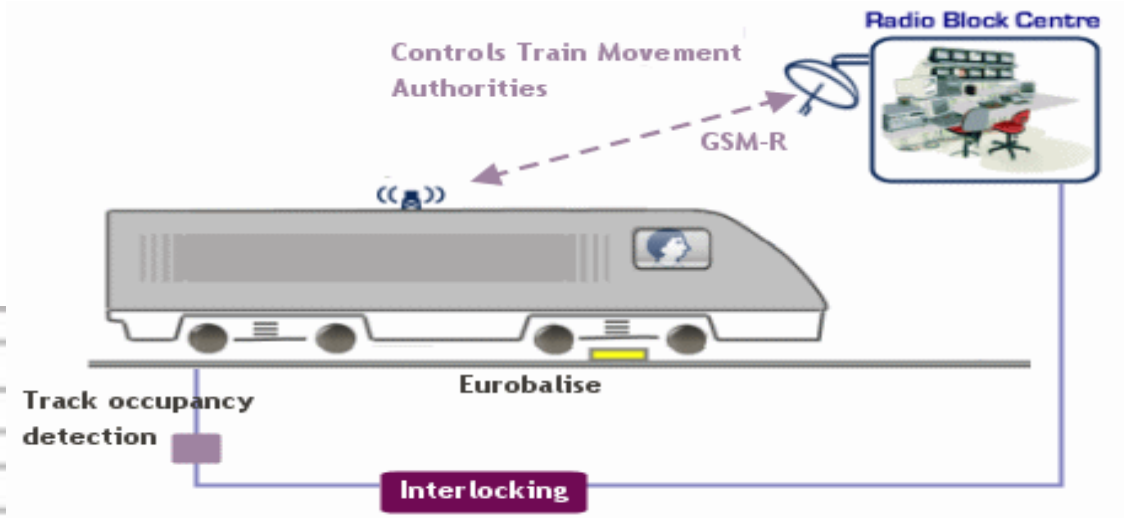
- 21 members of the Consortium
  - Manufacturers
    - UNIFE (Project Coordinator), Alstom, Ansaldo, AZD, Bombardier, CAF, Siemens and Thales
  - Urban Operators
    - UITP (large association of urban companies, e.g. operators), LUL, RATP and TMB
  - Mainline infrastructure managers and railway undertakings
    - EUG (representing a group of Infra Managers / Operators) and SNCF
  - Others
    - Universities: TUD
    - Consultants:, Ineco, D'Appolonia, NaveCom



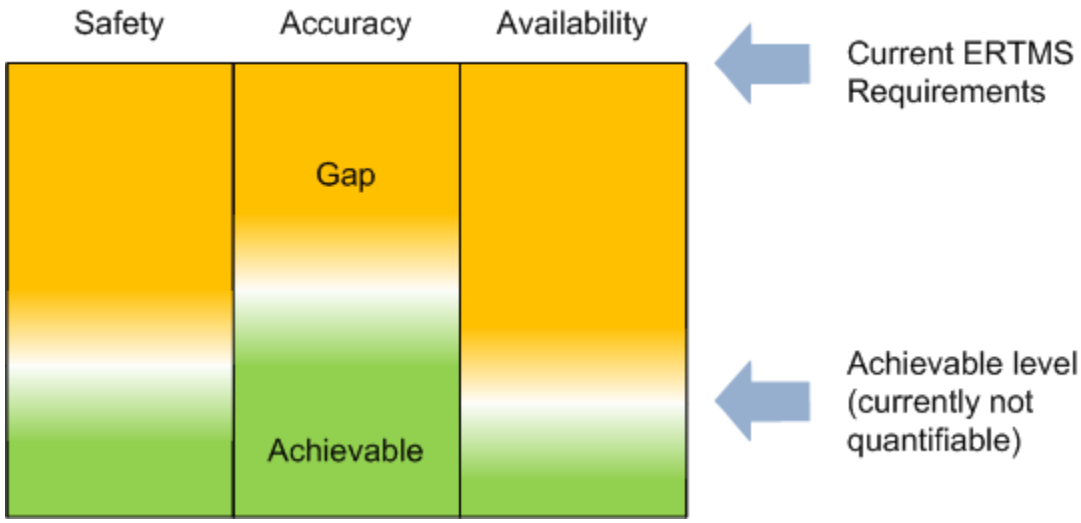

WP2 ERTMS/CBTC investigation of functional consistencies & differences
WP5 Moving Block Principles
WP6 IP based Radio Communication
WP7 Satellite positioning
WP3 Task 3.2 - Architecture Definition
WP8 Consensus building
WP4 Common Message Structure for Urban & Mainline
WP9 Dissemination and transfer
WP 3 Technical Coherence / Task 3.1
WP 1 Project Management
Direct Output from One Work Package to Another
Submittal of Outputs for Final Consensus and Quality Review

Why use GNSS with ETCS

- The aim is to **reduce cost** of ETCS trackside by reducing the number of (real) balises in the track, which would also increase availability, reduce exposure to theft, vandalism etc.
- To minimize the impact on ETCS the concept of “virtual balises” was developed, in which a GNSS based positioning system shall confirm train position at defined reference points
- This also allows handling of gaps in coverage, compared to a solution which requires permanent coverage



Challenges

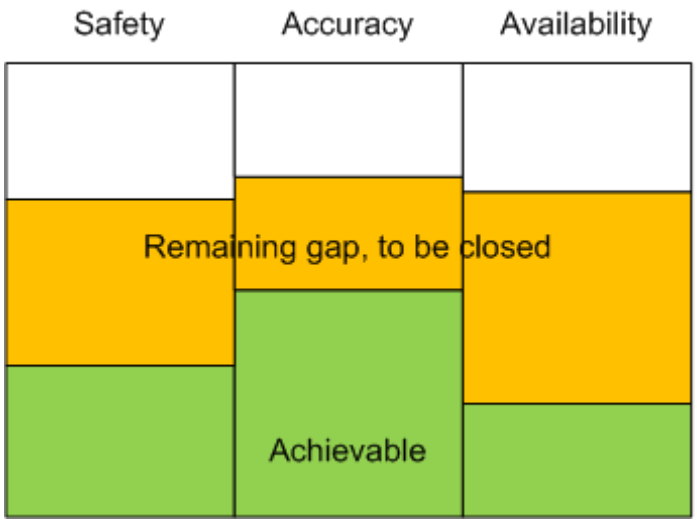


The requirements for train positioning in ETCS are well known:

- Safety Integrity Level 4 (SIL 4) according to CENELEC standards
- Track selectivity
- Predictable coverage with high availability (e.g. 10-7/hr to detect a balise)

Satellite positioning alone will not fulfill these requirements, a gap exists that has to be filled with other means (such as e.g. balises or additional sensors)

Challenges



Investigation of possible reduction of requirements

Investigation of achievable level

WP7 experts investigates to which extent the overall requirements can be reduced, e.g. by limiting the use of satellite positioning to certain applications.

- The specifications for virtual balise functionality should secure the interoperability between different suppliers of ETCS on-board units. The necessary extend of specifications should reflect various factors influencing the positioning information, such as: environmental factors, signal blockages, different quality level and concepts of available GNSS equipment, etc.

WP7 Satellite Positioning

- Activities
  - Investigation of GNSS performances in railway environment – impact on virtual balise functionality;
  - Definition of relevant GNSS parameters for railway applications and standard process for GNSS signal coverage and accuracy measurements;
  - Definition of engineering rules & operational management of the database for satellite positioning

  - Analysis of other applications of satellite positioning functionality
  - Safety Analysis for satellite positioning;

NGTC WP7 Links: UNISIG

- UNISIG is an industrial working group within UNIFE actively contributing to the technical specification of the European Train Control System (ETCS);
- UNISIG has started investigating the application of GNSS for ETCS in June 2011, when a global market study showed a significant interest in the possibility to reduce trackside infrastructure;
- To maintain and improve the ETCS specification UNISIG works closely with e.g. the European Commission, the European Railway Agency, the Community of European Railways and the European Rail Infrastructure Managers
- **NGTC is basing on UNISIG results and is in close permanent contact with UNISIG satellite positioning expert group**;
- It can also be noted that all developments of UNISIG are published as open standards, and are in the public domain.

ALSTOM

AnsaldoSTS
A Finmeccanica Company

AŽD PRAHA

BOMBARDIER

CAF

mermec group

SIEMENS

THALES

NGTC WP7 Links: SHIFT²RAIL

- An ambitious European **Research & Innovation Programme** that aims to:
  - increase the **competitiveness** of the EU rail industry to help it retain world leadership
  - increase the **attractiveness** of rail transport
  - support the completion of the **Single European Railway Area**

- A **public-private Joint Undertaking** under **Horizon 2020,** officially launched on July 2014

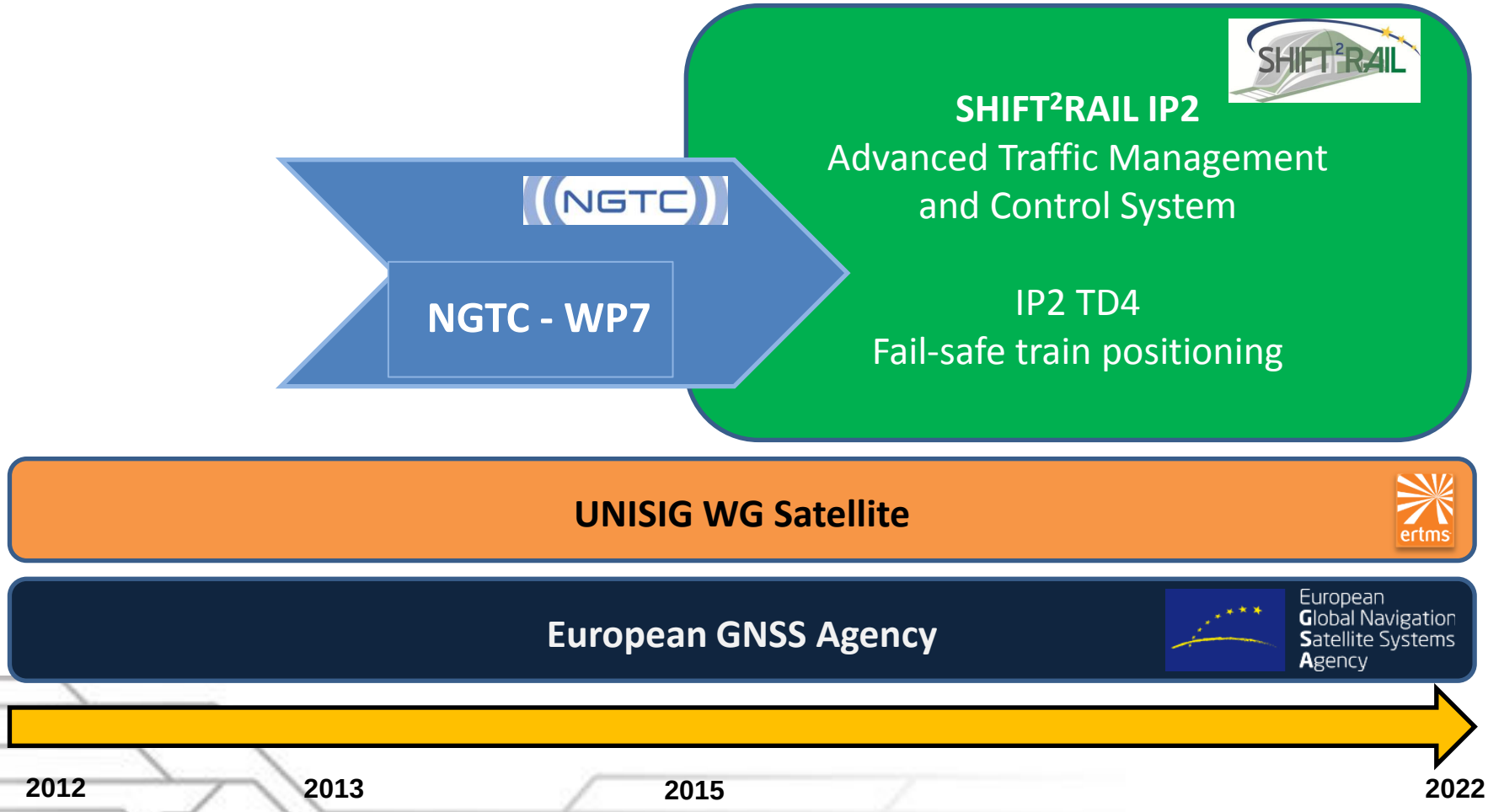
- A budget of **920 Million Euros** for **2014-2020**, including 450 Million from the EU and 470 Million from the Industry

- 4 years of intense work by the rail sector for the **technical preparatory phase**

NGTC WP7 Links: GSA

- NGTC has stared a close cooperation with GSA from the beginning of the project
- This cooperation is beneficial to both parties, as GSA can develop new applications for Galileo and EGNOS, while NGTC can benefit from the extensive knowhow of GSA and its partners such as ESSP
- This can even accelerate the use of GNSS in other safety critical rail and non rail applications

NGTC Links: Overall picture



Conclusions

- NGTC project focus is on investigation of similarities and differences between existing signaling solutions in order to evolve ETCS so as to achieve grater flexibility towards wider scope of railway applications;
- One of the area identified for the future of ETCS evolution is the satellite positioning functionality through the concept of virtual balise;
- Many development challenges were identified, including the performance gap between ETCS and GNSS localization, difficulties caused by harsh railway environment for GNSS signals and the requirement for interoperable positioning solution;
- NGTC is a part of the long term strategy for ETCS virtual balise developments with the strong links towards UNISIG and SHIFT²RAIL. NGTC is also in close contact with GSA, which is providing valuable expert support.

Thank you for your attention!

www.NGTC.eu

peter.gurnik@unife.org

AGENDA (11:45 – 14:30)

11:45-12:15 **EDAS for added value applications**

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13:30-14:30 **Lunch**

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EGNOS/EDAS based solution for airport surface operations

EGNOS Service Provision Workshop 2014
Lisbon, 8/10/2014

Telespazio
A Finmeccanica/Thales Company

OBJECTIVE

Description of the use of EDAS for:

- Airport surface operations
  - Turnaround process & user needs
  - EGNOS based Apron management
  - Test Results
- GNSS monitoring

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BACKGROUND

SatEllite Navigation sErvices for Civil Aviation (SENECA)
Italian Space Agency & ENAV

Demonstration of Space Services Benefits in Aviation Systems (S2BAS)
ESA - ARTES20

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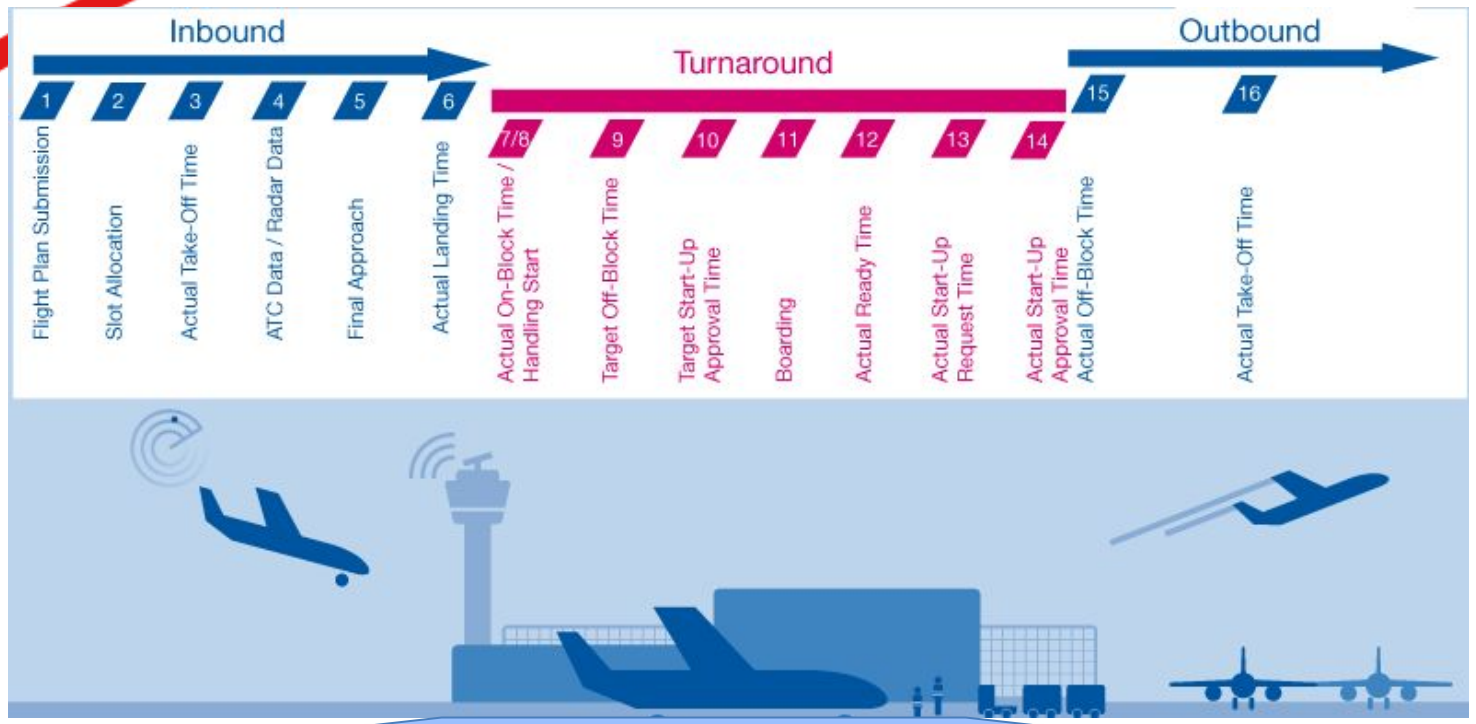
TURN AROUND PROCESS



All ground handling activities that need to be performed at an aircraft when parked at a stand

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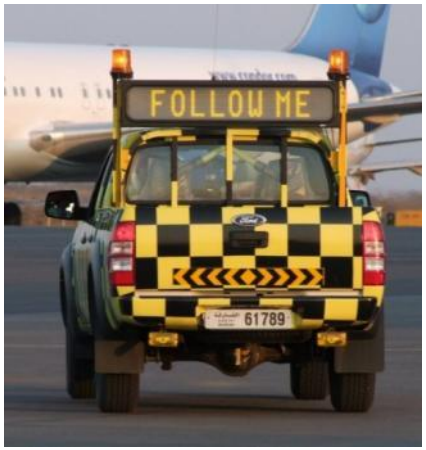
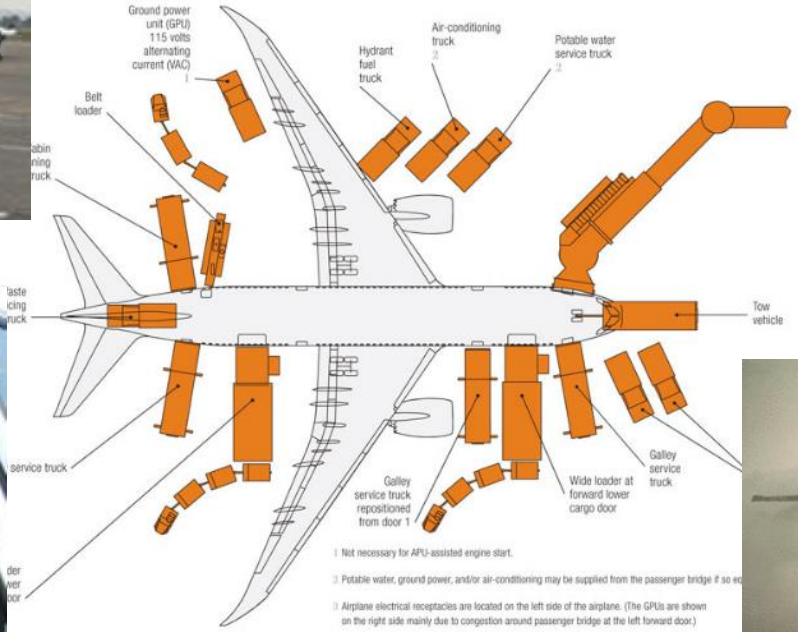
TURN AROUND PROCESS: AIRPORT FLEETS INVOLVED

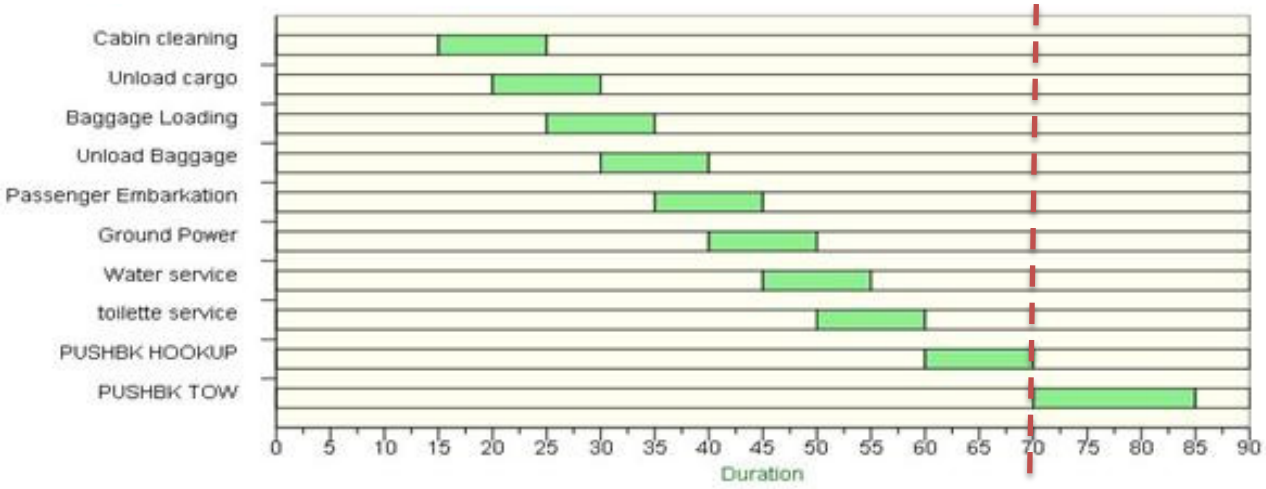
- A large number airport vehicles are moving in Airport APRON
- Coordination and management is today done mainly with VHF radio





USER NEEDS 1/2

- Increase airport EFFICIENCY
  - KPI: TOBT accuracy & predictability



TOBT

Target Off-Block Time: The time that an Aircraft Operator or Ground Handler estimates that an aircraft will be ready, all doors closed, boarding bridge removed, push back vehicle available and ready to start up / push back immediately upon reception of clearance from the TWR.

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USER NEEDS 2/2

- Improve SAFETY by reducing apron and taxiway congestion
- Operate during Adverse Conditions

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EGNOS BASED APRON MANAGEMENT

The EGNOS based apron Management solution aims to:

- Increase the safety of the vehicles and aircraft moving in the APRON
- Optimize the airport operation reducing the Turn Around Time
- Provide the ATC with an accurate and updated estimate of the time when ground operations will be completed (Target Off Black Time or TOBT)

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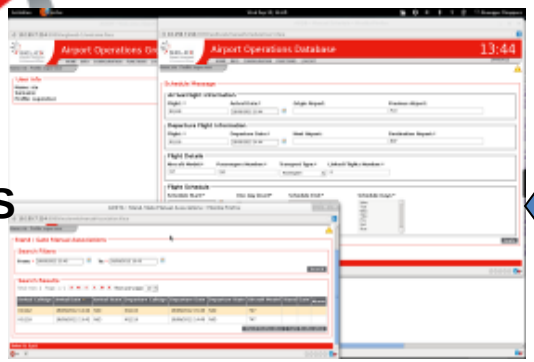
EGNOS BASED APRON MANAGEMENT: ARCHITECTURE



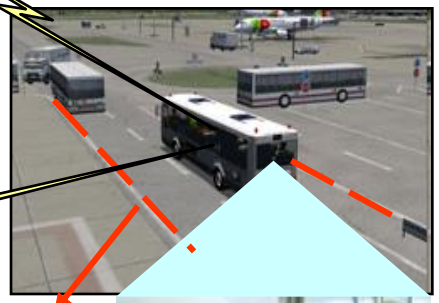
AOS

TOBT

ATC

GPS/EGNOS

AIRPORT APRON



EDAS

NAV GW

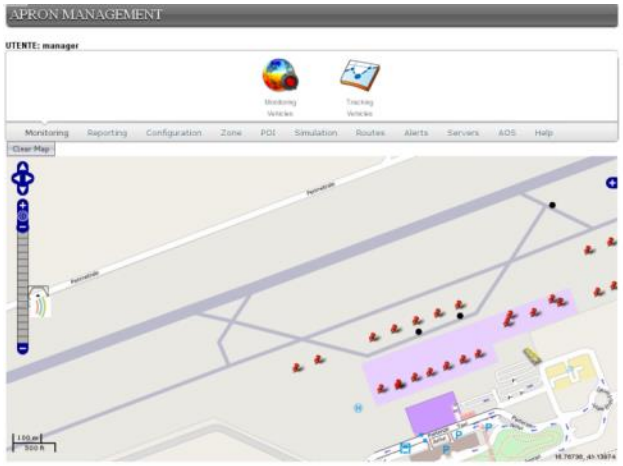
WIMAX & 3G:
- POSITION
- AUGMENTATION
- COMMUNICATION

- AIRPORT OPERATOR
-GROUND HANDLERS

COM GW

CORRIDOR MONITORING
GEO FENCING
COLLISION AVOIDANCE

TER

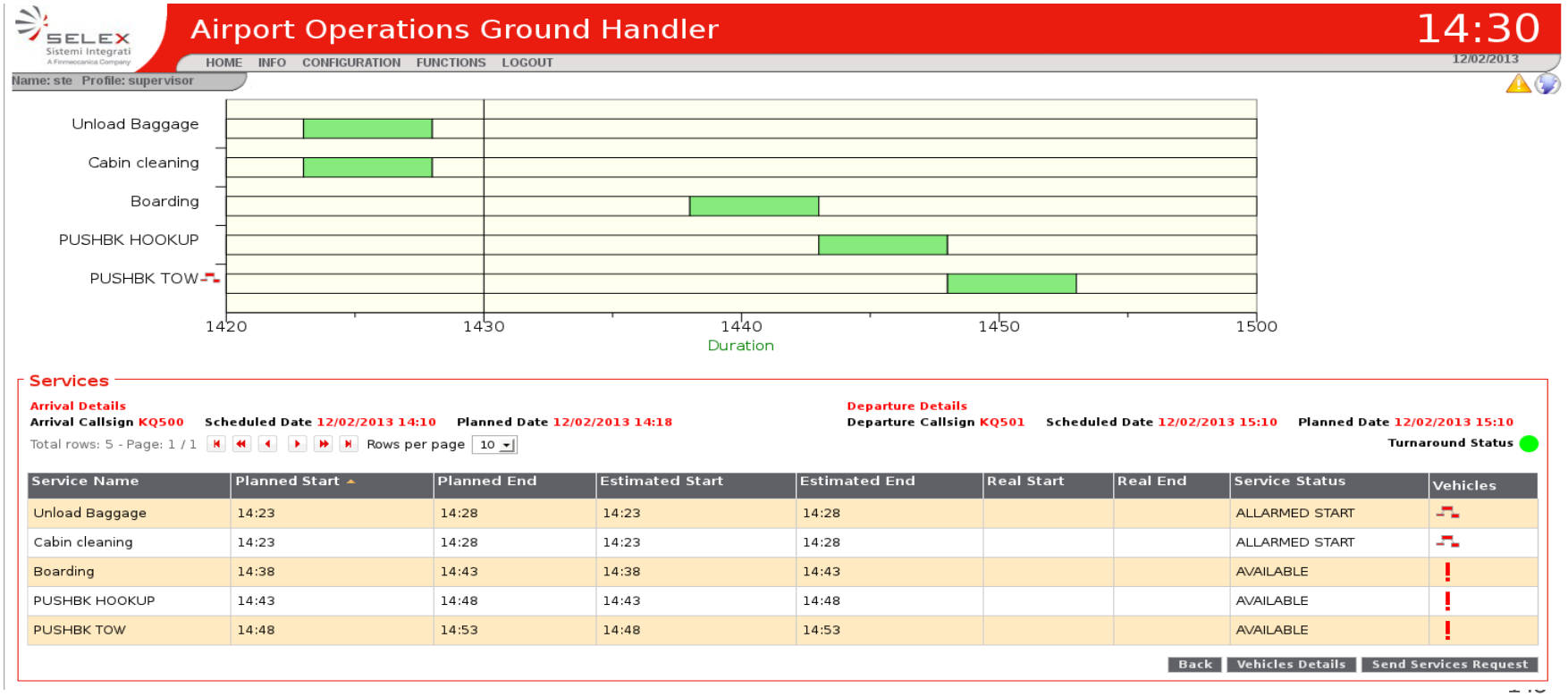


LBS

ADSB

EGNOS BASED APRON MANAGEMENT: AOS

- Fligth Plan acquisition
- Automatic aircraft/stand/gate/service vehicles association
- Planning and monitoring of airport services
- Notification of Target Off Block Time (TOBT) to the ATC



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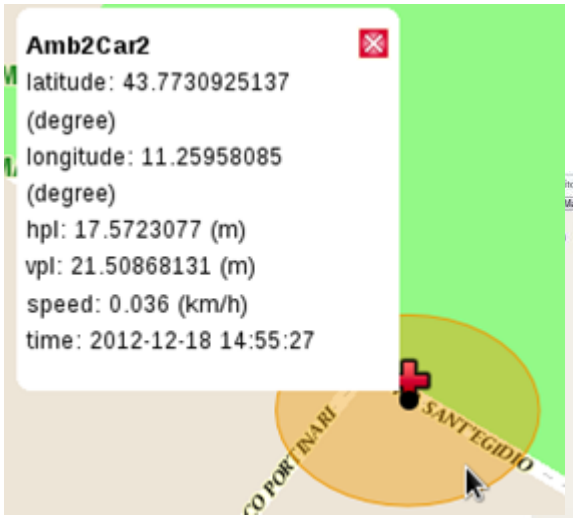
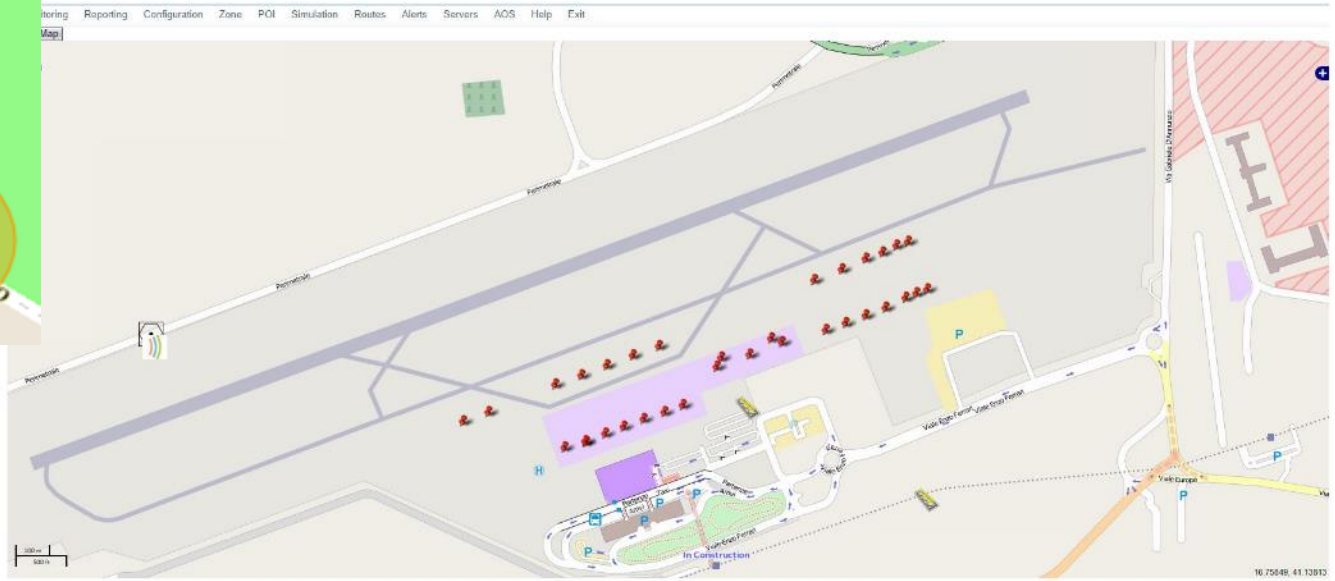
EGNOS BASED APRON MANAGEMENT: LBS 1/2

- Real time monitoring and map visualization of aircrafts and vehicles moving in the airport apron (through ADSB and EGNOS based positioning)
- Compute and send to driver terminal route guidance to the assigned stand





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EGNOS BASED APRON MANAGEMENT: LBS 2/2

Warning or Alarm generation to driver and operator in case of

- deviation from assigned route
- crossing user defined areas
- Risk of collision

POLICY CONFIGURATION

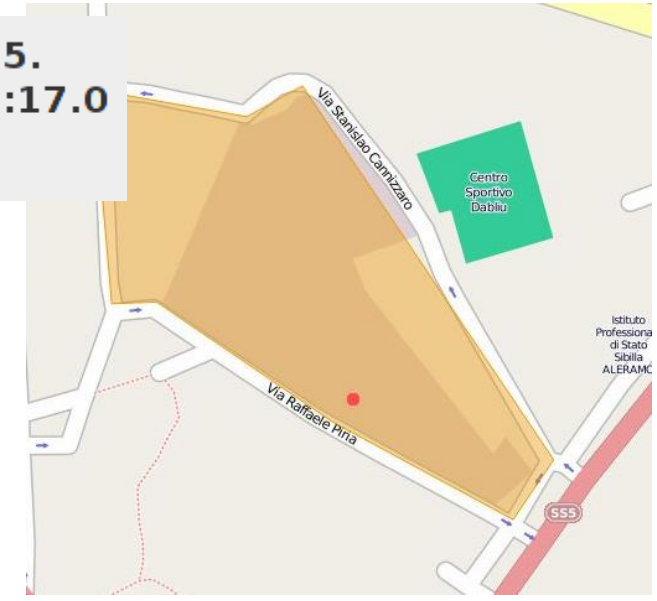
AOS_FLEET

Policies

ID	POLICY NAME	STATUS
5	EVENT.PROXIMITY	DISABLED
6	EVENT.GEOFENCING	DISABLED
7	EVENT.CORRIDORMONITOR	DISABLED
8	EVENT.TIMEMONITOR	DISABLED
16	EVENT.COLLISION	ENABLED

UNIT IS ENTERED INTO ZONE: 15.
ENTER TIME: 2012-11-16 11:45:17.0

Close



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EGNOS BASED APRON MANAGEMENT : TEST CAR AND TERMINAL

- Redundant WiMax & UMTS wireless link
- Awarness of surrounding aircrafts and vehicles
- Route guidance to the assigned service stand
- Touch screen and Audio alarms

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EGNOS BASED APRON MANAGEMENT : TERMINAL MMI

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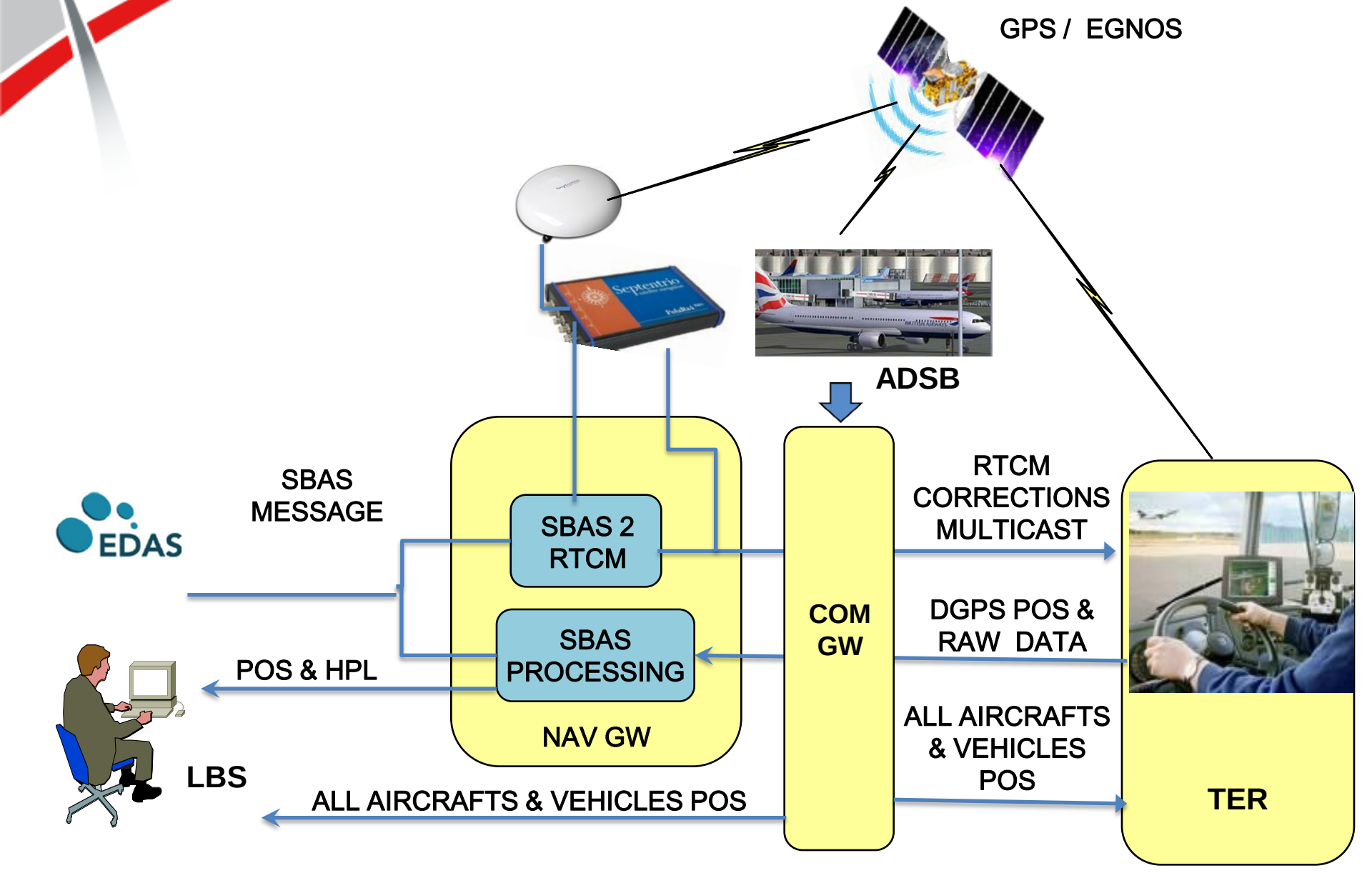
EGNOS BASED APRON MANAGEMENT: USE of EDAS



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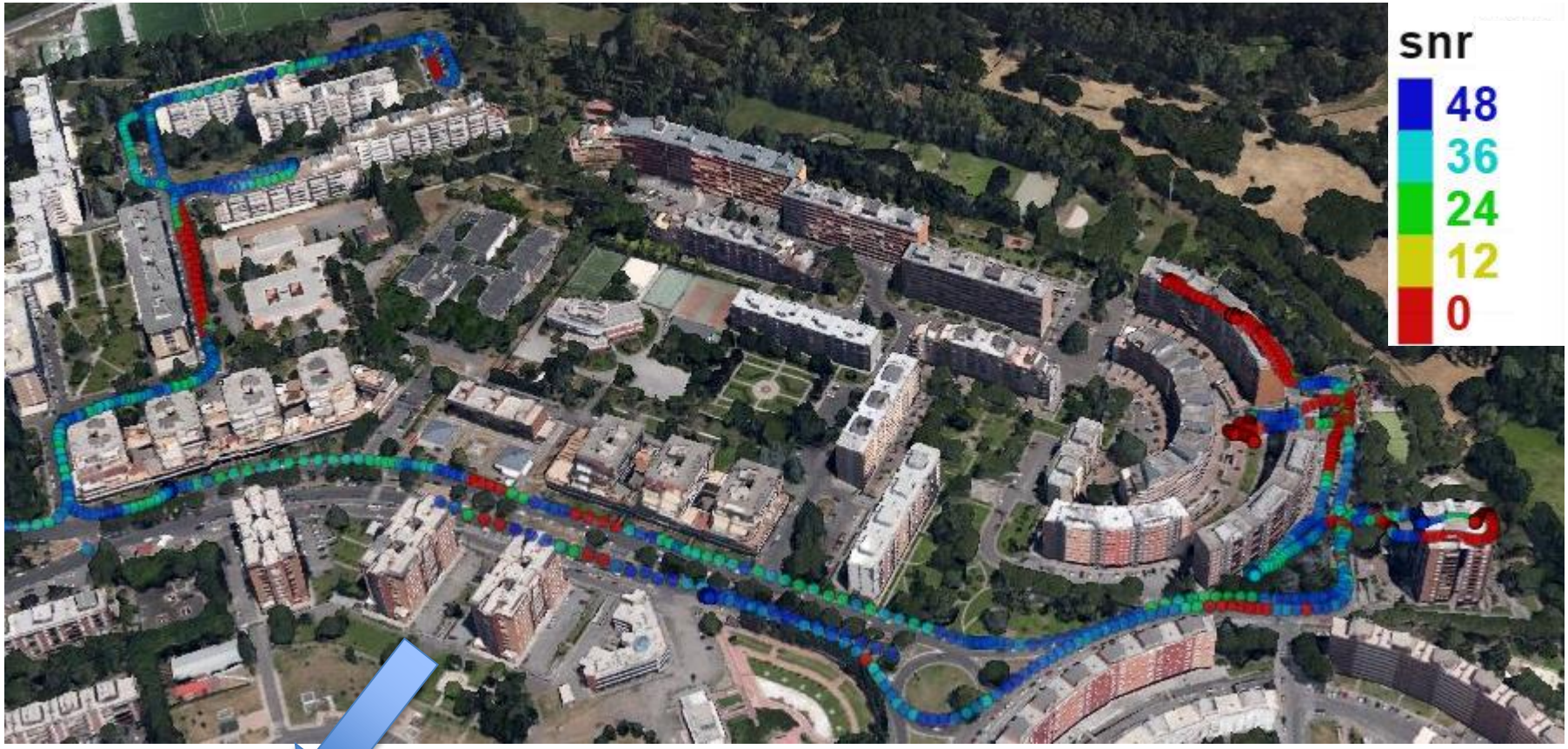
TEST RESULTS: SIGNAL TO NOISE RATIO OF PRN 120

- In Urban Environment the visibility of EGNOS satellites is easily lost



PRN120
AZ=218°

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TEST RESULTS: SIGNAL TO NOISE RATIO OF PRN 126

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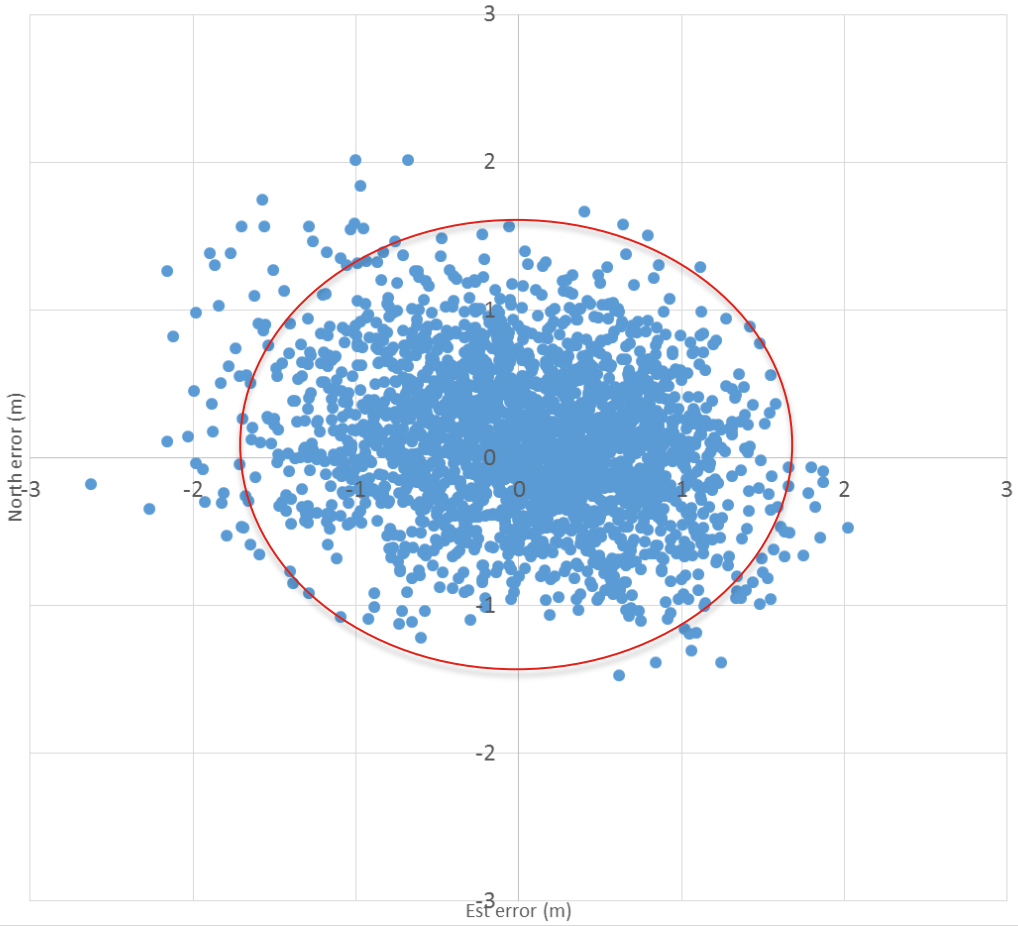
TEST RESULTS: EDAS BASED SOLUTION

- Using SBAS messages from EDAS and and the vehicle raw data the differential solution could be computed along all the trial path
- Horizontal error (95%) = 1.6m



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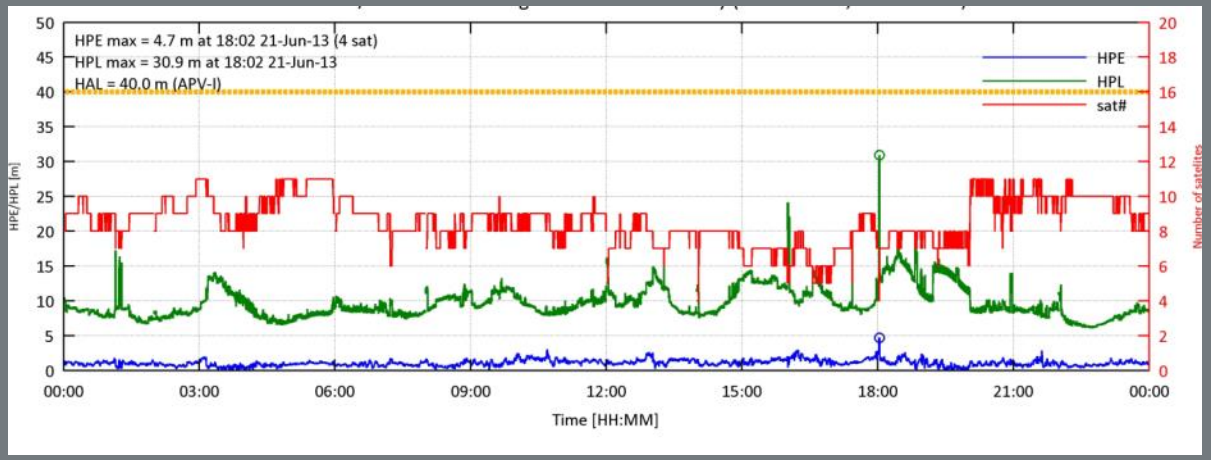
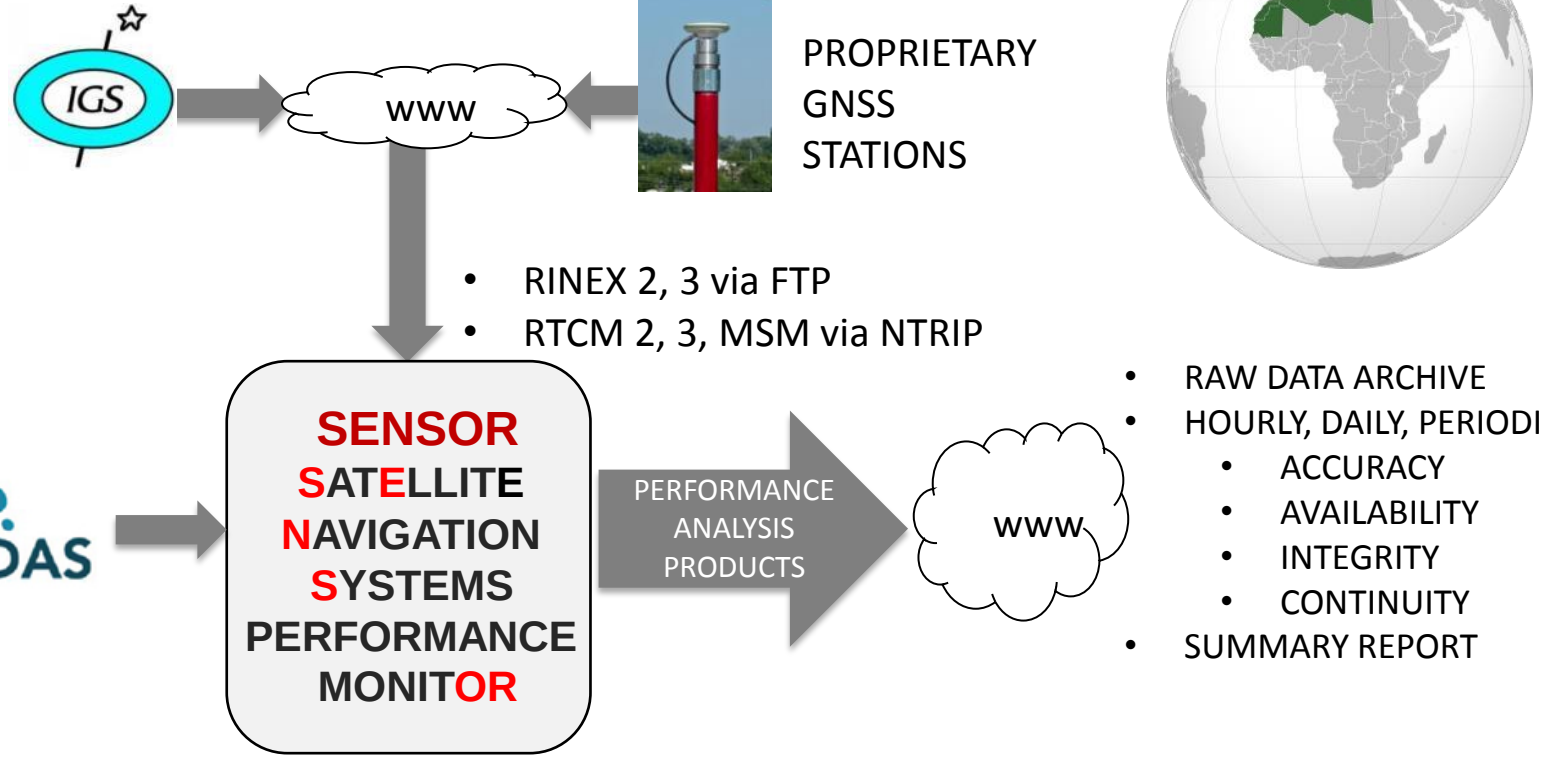
EDAS

for GNSS monitoring



EDAS FOR GNSS MONITORING

- Raw data acquisition and archive
- Automatic generation of RAIM and SBAS performance reports
- Real time performance monitoring



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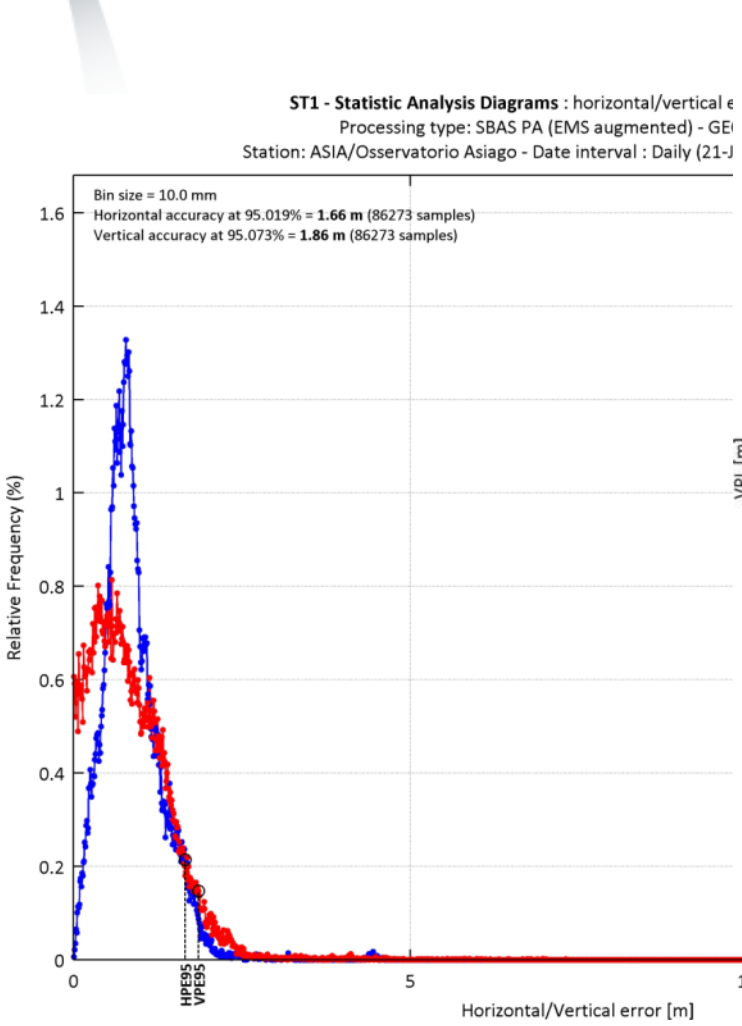
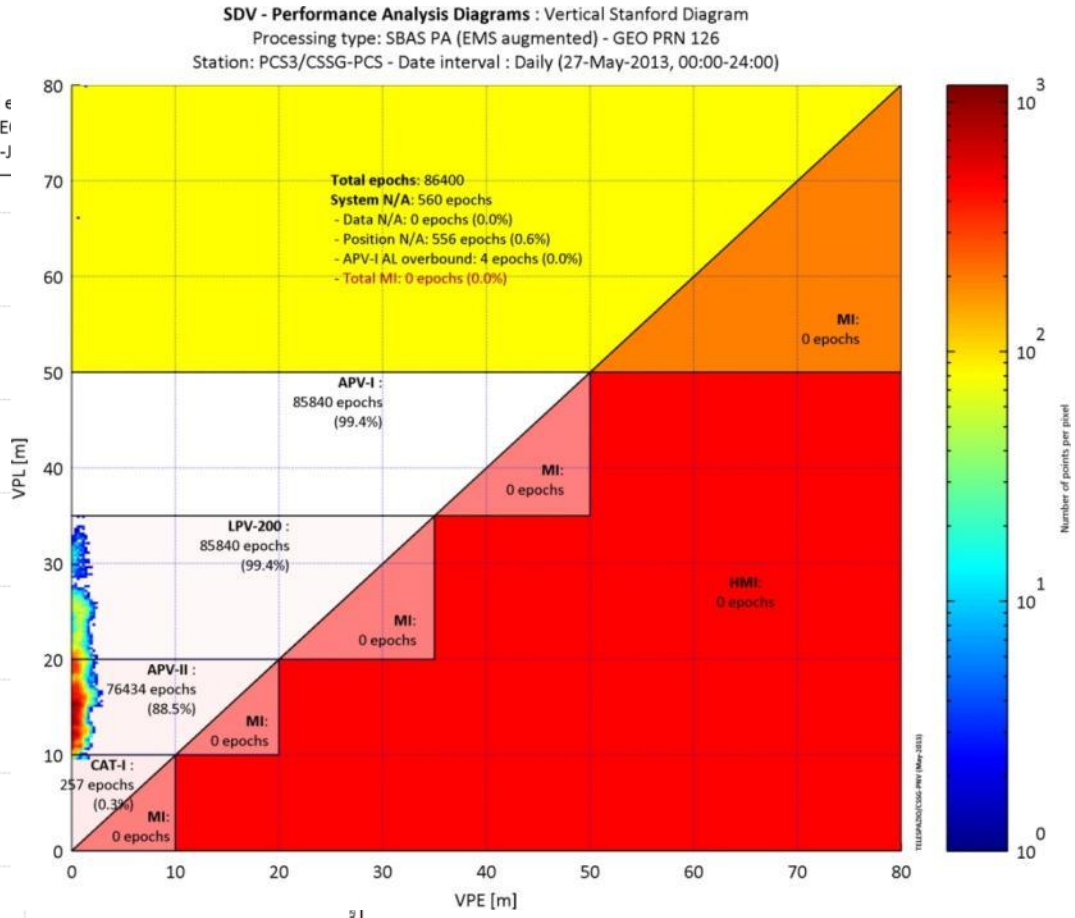
EDAS FOR GNSS MONITORING: ACCURACY AND INTEGRITY





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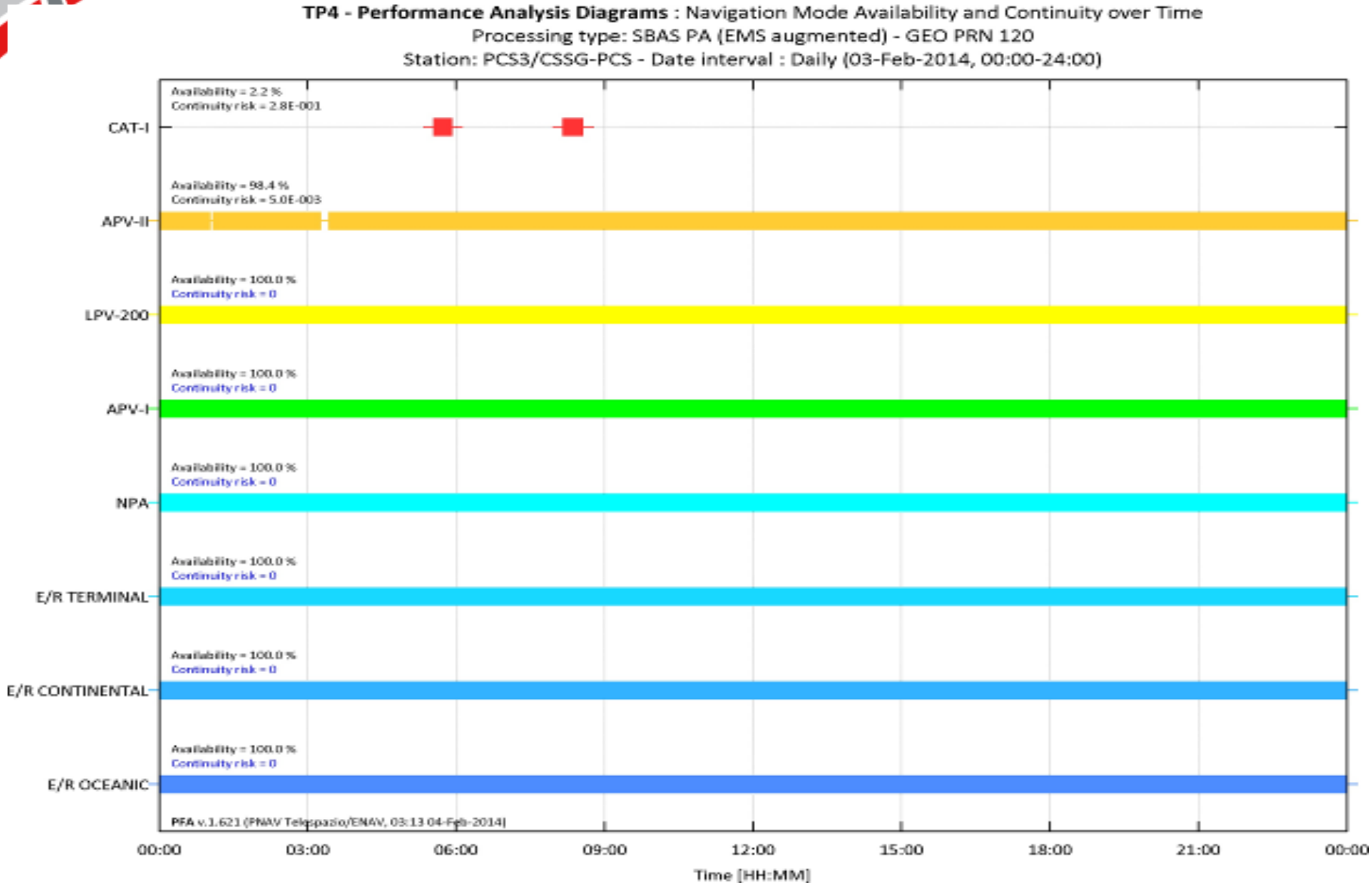
EDAS FOR GNSS MONITORING: AVAILABILTY AND CONTINUITY



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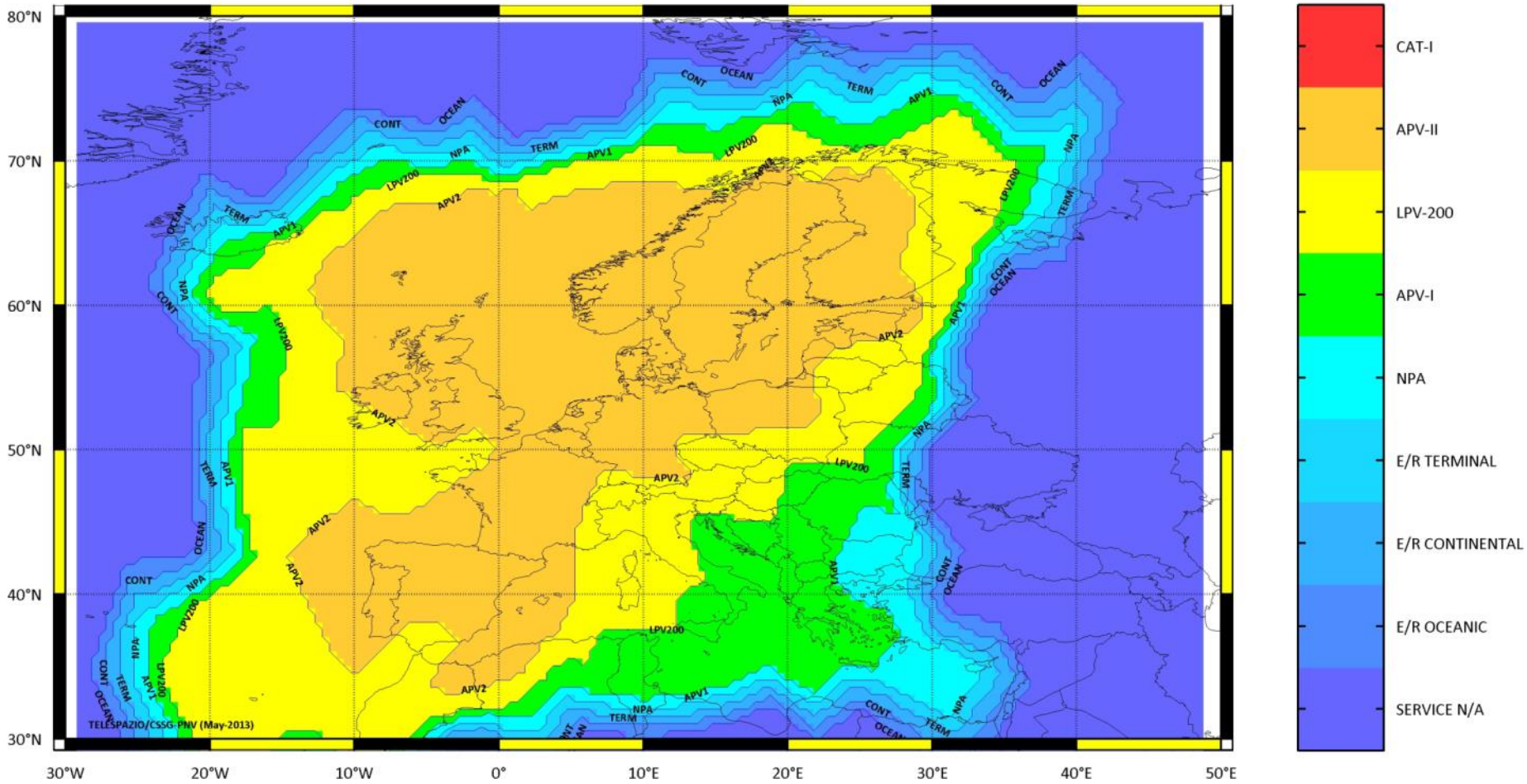
EDAS FOR GNSS MONITORING:

APPROACH OPERATION ALLOWED

XPW - SBAS Performance Diagram : Maximum Approach Class Achievable for PRN 126 (Worst Case)
Map type: EUROPE - Date interval: Hourly (27/05/2013, 08h00-09h00)



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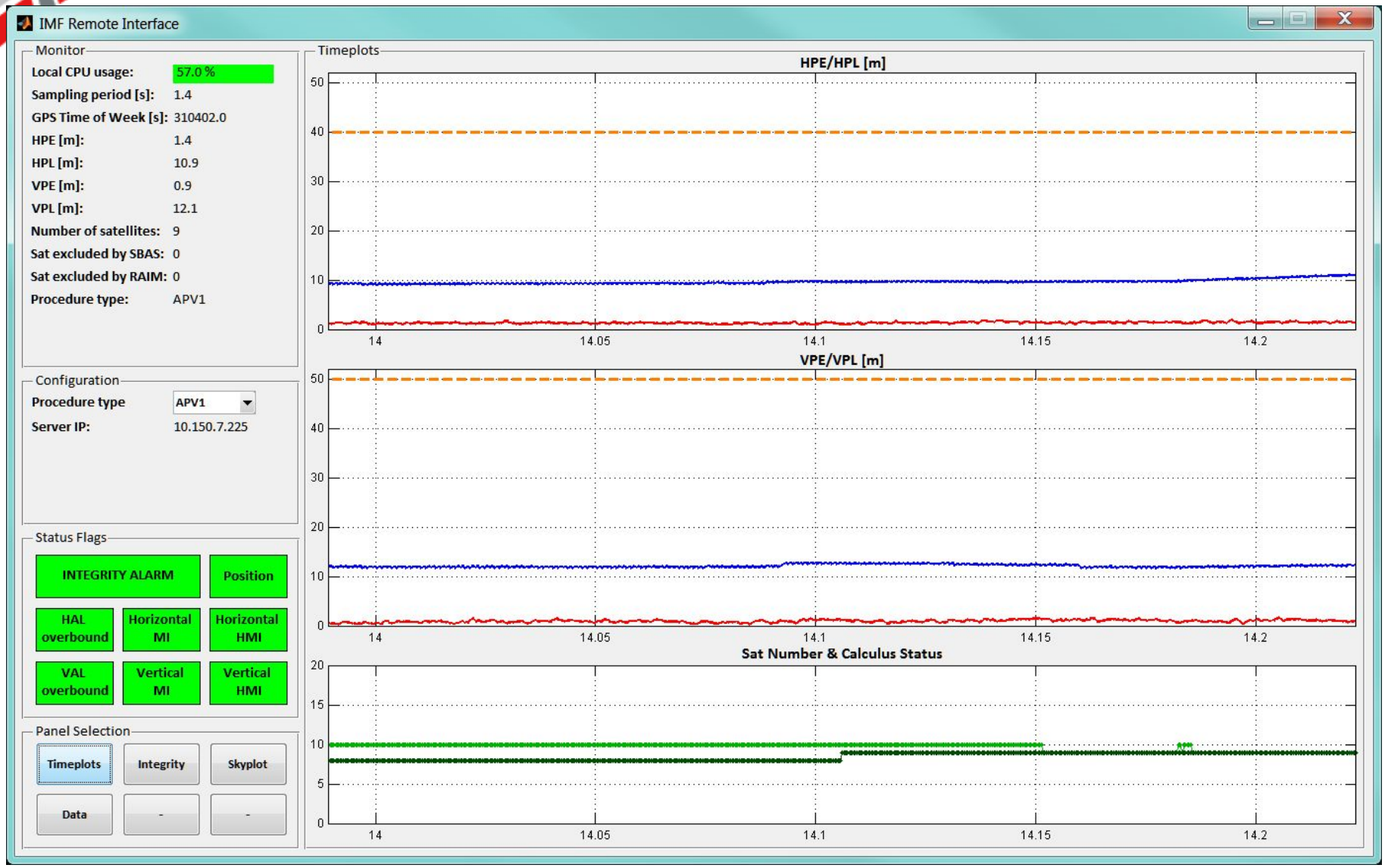
EDAS FOR REAL-TIME MONITORING



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Thank you for you attention!

A. D'Agostino, A. Loiero, A. Salonico, E. Episcopo, G. Chiapparo, G. Plaia, M. Lenoci, R. Ronchini, S. Cusimano, S. Di Rollo

antonio.salonico@telespazio.com

AGENDA (11:45 – 14:30)

11:45-12:15 **EDAS for added value applications**

- ☞EDAS for added value applications
  ***Juan Vázquez** – Customer and Data Services Mngr (ESSP)*

12:15-13:30 **EGNOS in land applications**

- ☞NGTC Project: Paving the way for GNSS use in rail
  ***Peter Gürnik** – Technical Affairs Mngr (UNIFE)*
- ☞EGNOS/EDAS based solution for airport surface operations
  ***Antonio Salonico** – System Engineer (Telespazio)*
- ☞EGNOS usage in Agriculture: facts and future perspective
  ***Julián Rioja** – European marketing and sales coordinator (TOPCON agriculture)*

13:30-14:30 **Lunch**

TOPCON
Precision Agriculture

EGNOS Meeting
Lisbon
October 7-8

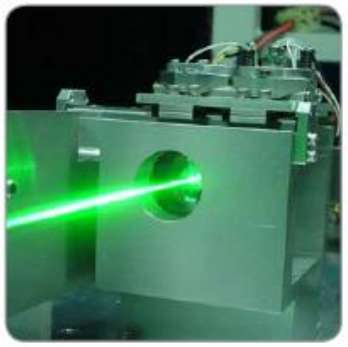
TOPCON
Precision Agriculture

Who is Topcon?

Today, Topcon is a leading manufacturer of Positioning Products, Medical Equipment, Industrial Measuring and Optical Components

1.6 Billion in Consolidated sales (JFY 2013)

Toshiba Corporation remains as dominate majority shareholder



TOPCON
Precision Agriculture

Topcon´s Headquarters

TOPCON Precision Agriculture

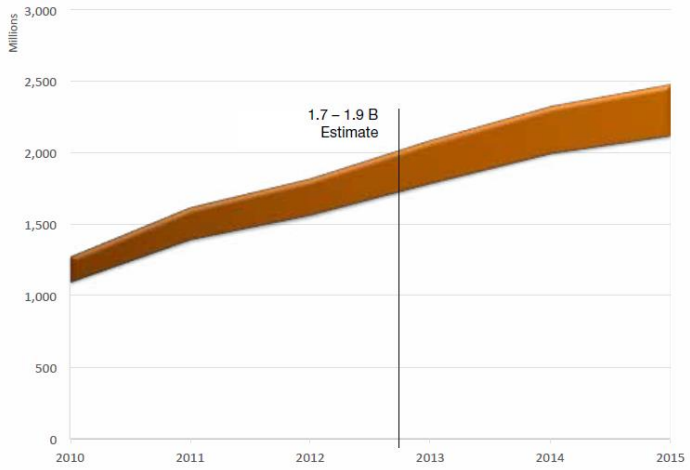
OEM Relationships of TOPCON

TOPCON
Precision Agriculture

Market Situation

Industry Growth from $700 million in 2006 to 1.8 billion in 2013

Market maturing from Steering to Application Controls and VRA

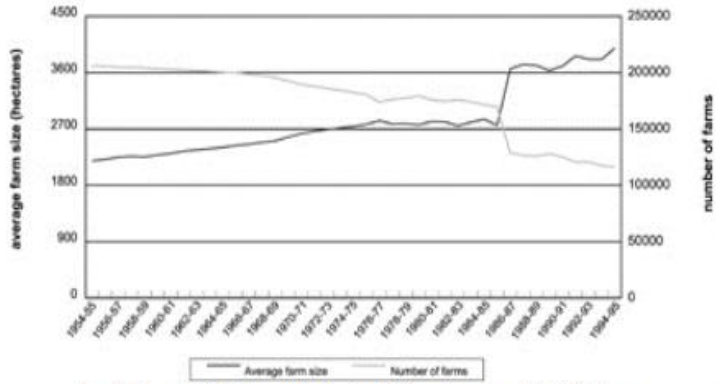


TOPCON
Precision Agriculture

Increased Use & Adoption

Land

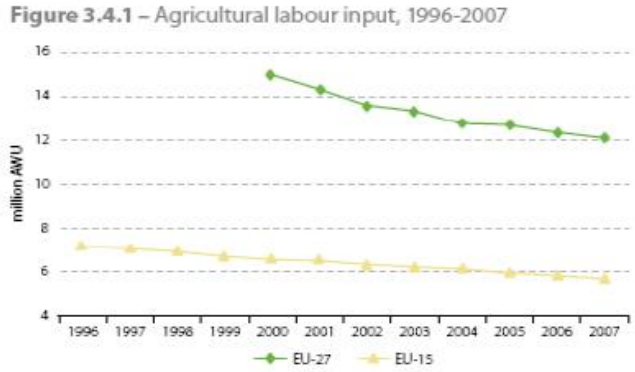
■ More efficient and productive use of equipment



*Lewis, P., et al (1998), Issues, **Indicators & Ideas**, Longman, South Melbourne.*

Labor

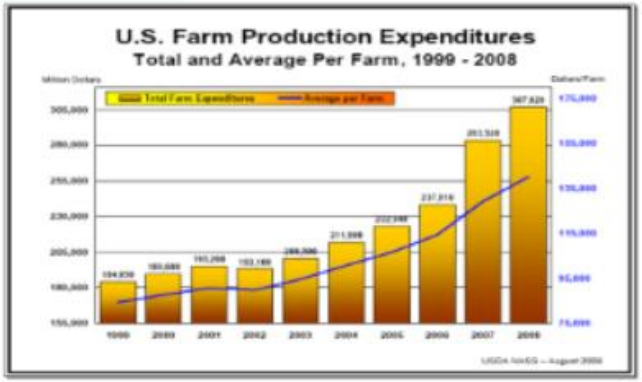
■ More efficiency with lower level of skilled labor



2008 Eurostat – Agriculture statistics Main Results 2006-2007

Input Costs

■ Reduce in-field and end-field overlap



2009 USDA– NASS - August

Gov't Reg

■ Manage business for better compliance

Sugar cane burning in Brazil

TOPCON
Precision Agriculture

What do you need to do?

Topcon offers the accuracy solutions to do it

Some crops require sub-inch accurate corrections to be produced with the most profitability, while others do not need such precision. Topcon offers correction accuracies from entry-level, sub-meter to high-accuracy, sub-inch.

All of the Topcon precision agriculture solutions start with GNSS accuracy. Topcon receivers are all standard with GNSS dual-constellation (GPS + GLONASS) satellite reception.

Topcon GNSS (Global Navigation Satellite System) also offers TruPass™ mode for improved autonomous pass-to-pass accuracies.

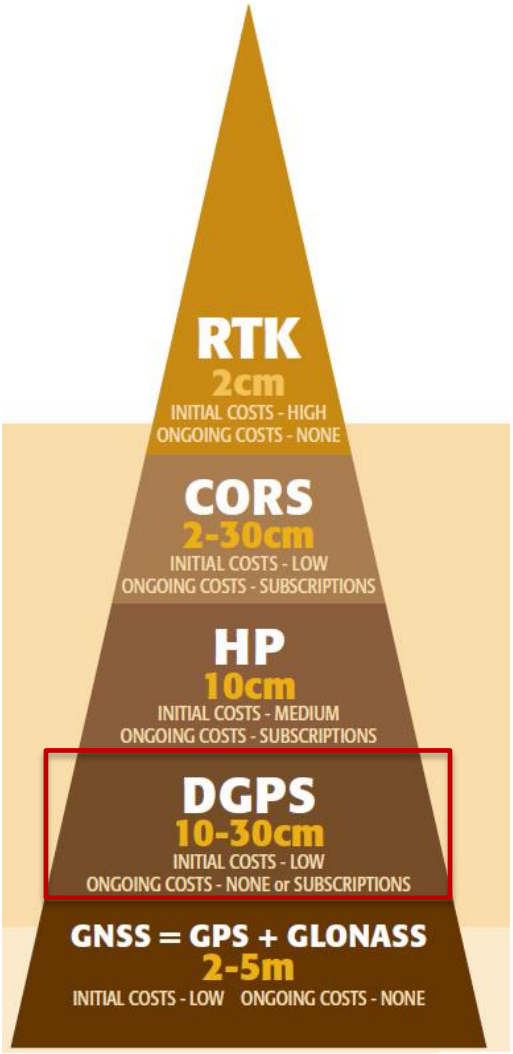
Whether you are after entry-level guidance or need sub-inch, repeatable RTK accuracy, Topcon modular-designed products let your GPS technology grow as your operation expands.

ACCURACY TYPE	PASS-TO-PASS*	TYPICAL USES	GNSS	DISPLAYS
RTK	1-2” 2-5cm Repeatable	Strip Tillage Landforming/leveling Topographic Mapping Listing/Planting Bedding/Ridging Cultivating	AGI-4 	X30 X25 X14 
CORS/NTRIP	1-12” 2-30cm	Listing Planting/Seeding Cultivating Bedding/Ridging	AGI-4 	X30 X25 X14 
OmniSTAR VBS XP/HP/G2 Dual Frequency (L1/L2)	3-4” 8-10cm	Tillage/Discing Mapping Spraying/Spreading Harvest Field Preparation	AGI-4 	X30 X25 X14 
DGPS WAAS EGNOS MSAS VBS L1 Only	4-12” 10-30cm	Tillage/Discing Mapping Spraying/Spreading Harvest Field Preparation	AGI-4 SGR-1 	X30 X25 X14 

*Pass-to-Pass accuracy based on 15 minute intervals.

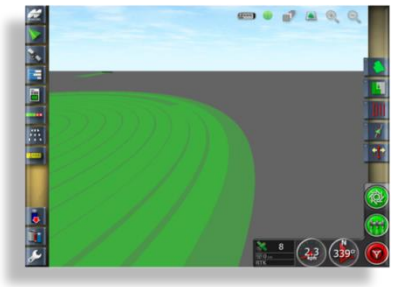
EGNOS Features

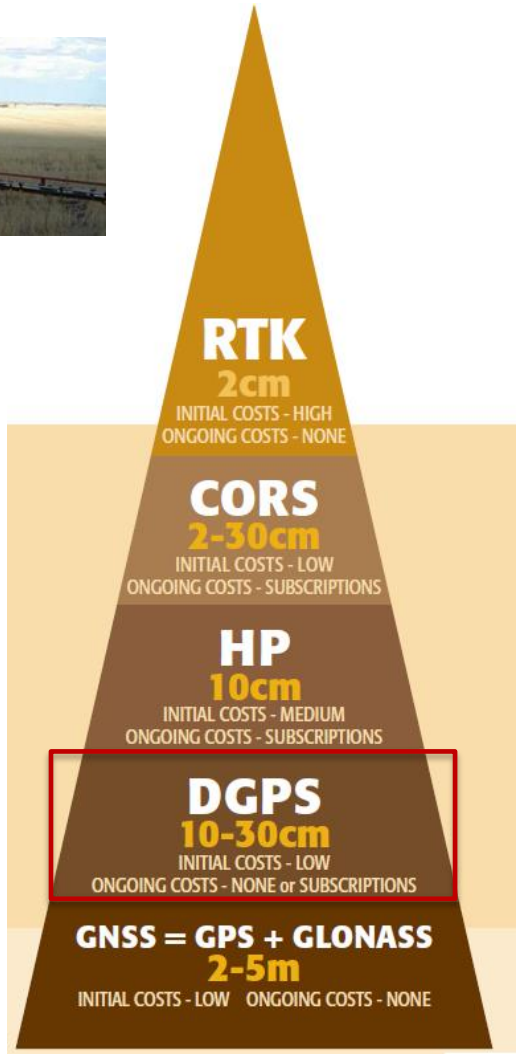
- Pass to pass accuracy of +/- 30 cm
- Ideal for Spraying, Spreading, Harvesting, Mapping, Field Preparation
- Initial Cost-Low
- Ongoing Cost-None
- Good precision farming start point for farmers



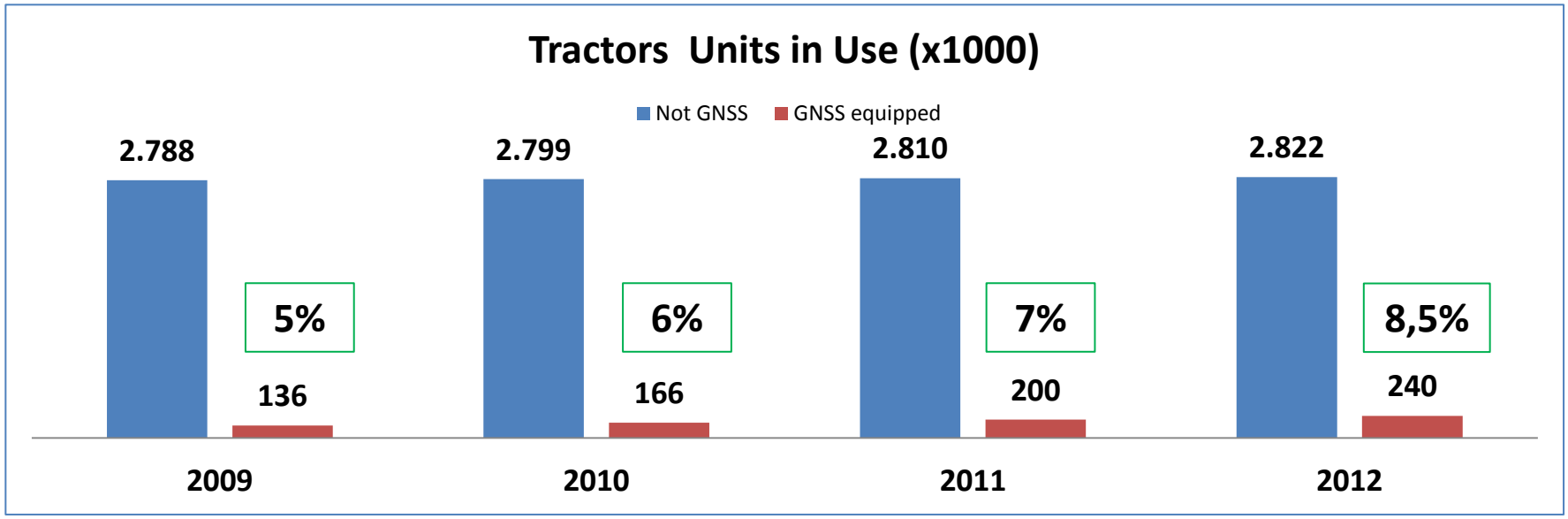
EGNOS Value Added

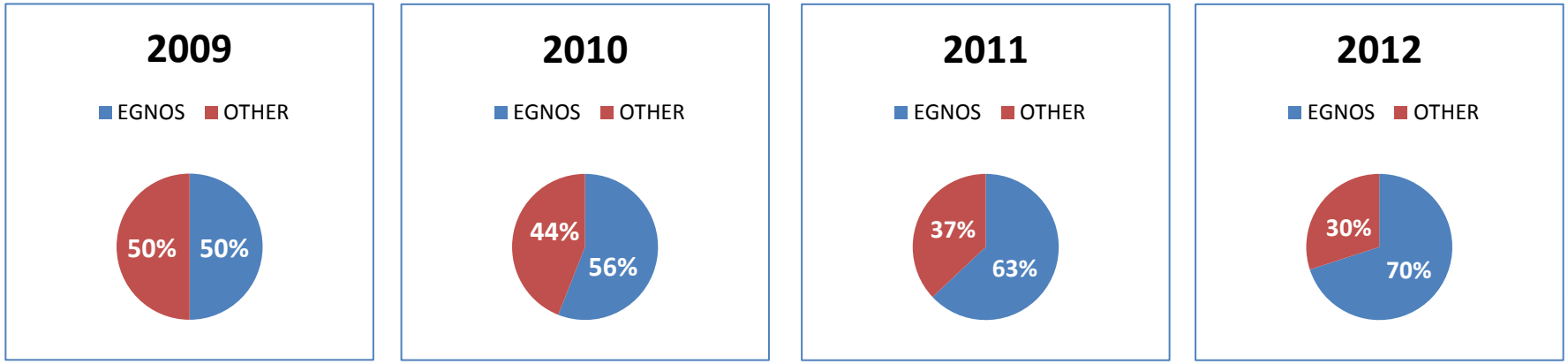
- Enhance Precision
- Reduce Overlap in applications
- Save Time and Money
- Reduce Fatigue
- Optimise crop yield
- Increase Profit Margin





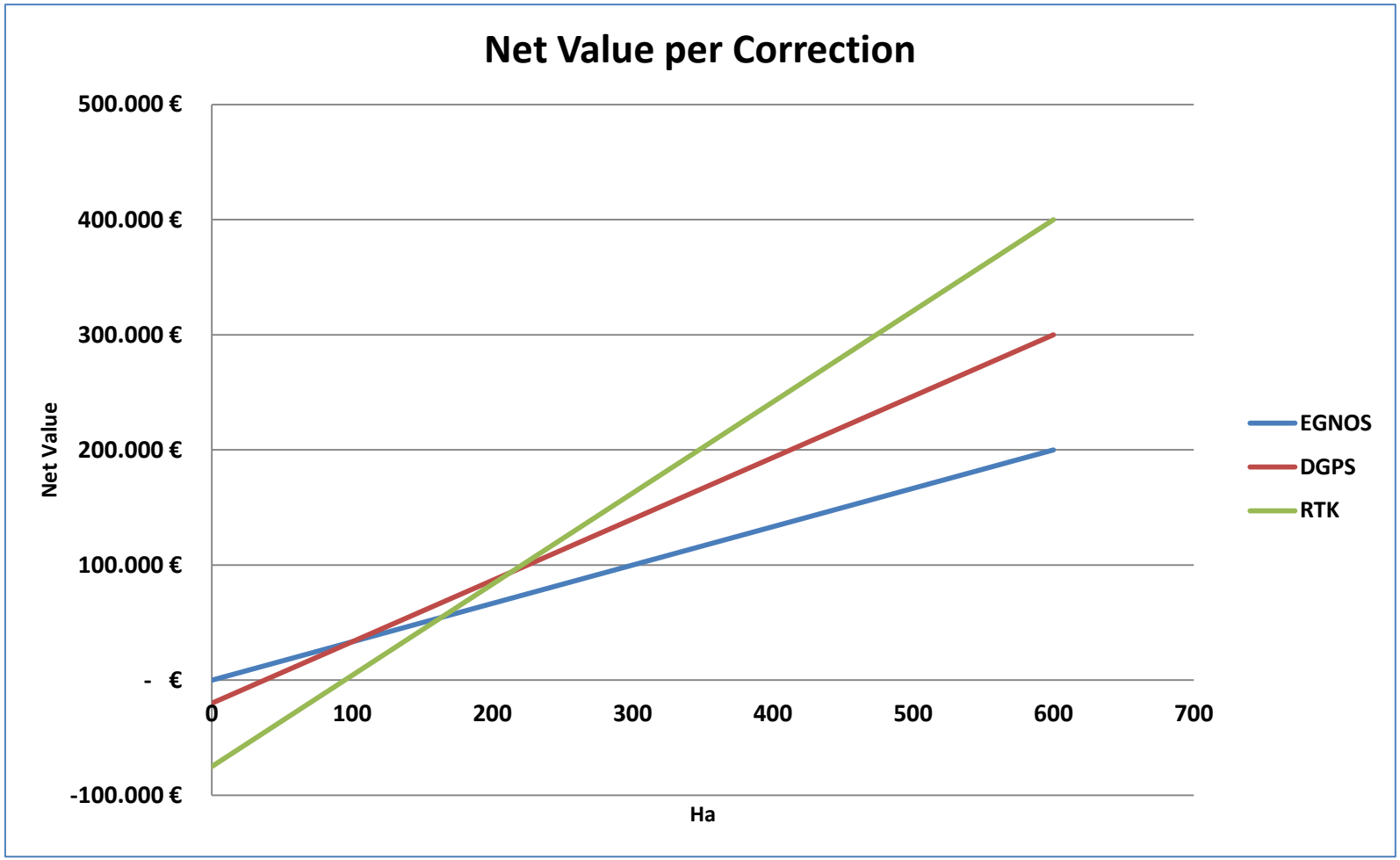
Tractors GNSS-EGNOS Status





Source: Tractor and Device Manufacturer/MMFP

Example For Cereal



Source: Topcon

TOPCON
Precision Agriculture

Touchscreen Displays

Take precision machine control to new levels of performance and ease-of-use

X30
12.1" Touchscreen

X25
8" Touchscreen

X14
4.3" Touchscreen

EGNOS Equipped

SGR-1 Receiver

SGR-1

SGR-1 is a GNSS receiver. (Global Navigation Satellite System) This means the receiver will receiver both GPS (American) & GLONASS (Russian) satellites.

Fast 32 channel receiver. More satellites gives us better autonomous performance.

SGR-1 features True Pass technology for higher more stable pass to pass accuracies in agriculture Applications.

WAAS, **EGNOS** & Omnistar VBS is also supported with the SGR-1.

EGNOS Equipped

AGI-4 Receiver

The first truly modular and ISO-compliant steering system.

The AGI-4 receives signals from all available satellites. More satellites means improved accuracy, better reception around hills and trees, and 24/7 round-the-clock operation.

AGI-4 is standard with WAAS and **EGNOS**, easily upgradeable to 2cm accuracy with RTK radio options. NTRIP capability allows you to tap into existing reference networks via mobile phone connection (dependent on local availability) and uses existing data plans and infrastructure to minimize costs.

The AGI-4 features industry-leading ISO11783 compatibility with virtual terminals.

The all-in-one, modular design incorporates the antenna, receiver, and steering controller in a single component, offering unmatched upgradeability.

EGNOS Equipped


TOPCON
Precision Agriculture

7-8 October

Lisbon

The EGNOS Service Provision workshop

ESSP

We certify you're there.

European Global Navigation Satellite Systems Agency

funded by the European Commission