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EDAS (EGNOS Data Access Service) for added-value applications

Juan Vázquez, Elisabet Lacarra
ESSP SAS

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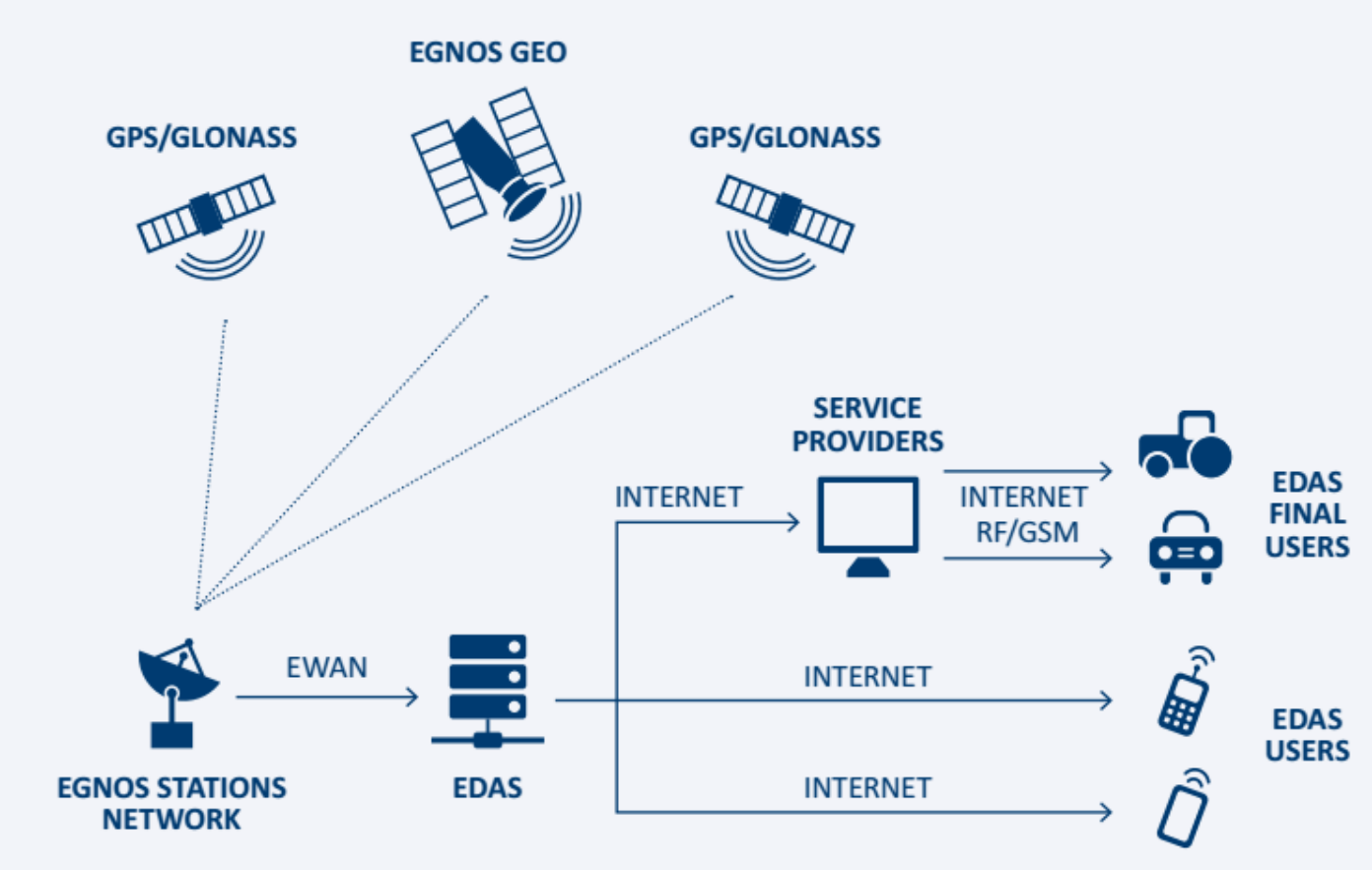
EDAS overview



EDAS Services

	EDAS Service	Type of Data				Service Description	
		OBS & NAV	EGNOS MSG	RTK MSG	DGNSS COR	FORMAT	PROTOCOL

- GPS and GLONASS observations and navigation data collected by the entire network of EGNOS ground stations.
- SBAS augmentation messages of EGNOS GEO satellites.
- RTK (Real-Time Kinematic) messages.
- Differential GNSS (DGNSS) corrections.

EDAS Services

	EDAS Service	Type of Data				Service Description	
		OBS & NAV	EGNOS MSG	RTK MSG	DGNSS COR	FORMAT	PROTOCOL
Real Time	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
Archive	FTP	✖	✖			RINEX, EMS, IONEX…	FTP

EDAS Services

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

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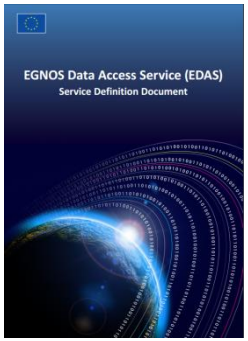
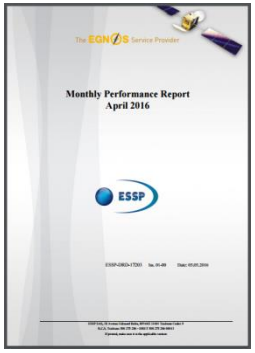
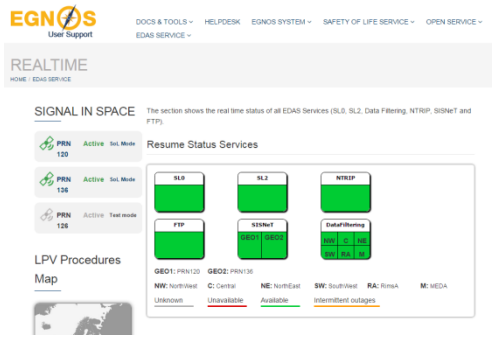
EDAS Information



EDAS SDD
(Services info & perfo commitment)

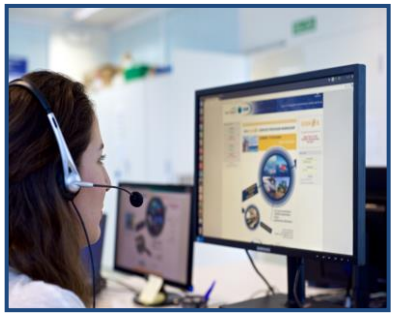


Monthly Performance Report
(EDAS Monthly performances)



EDAS section
(EDAS info & Real-time performances)

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



EDAS Registration Website

EGNOS Helpdesk
EGNOS-Helpdesk@essp-sas.eu
+34 911 236 555

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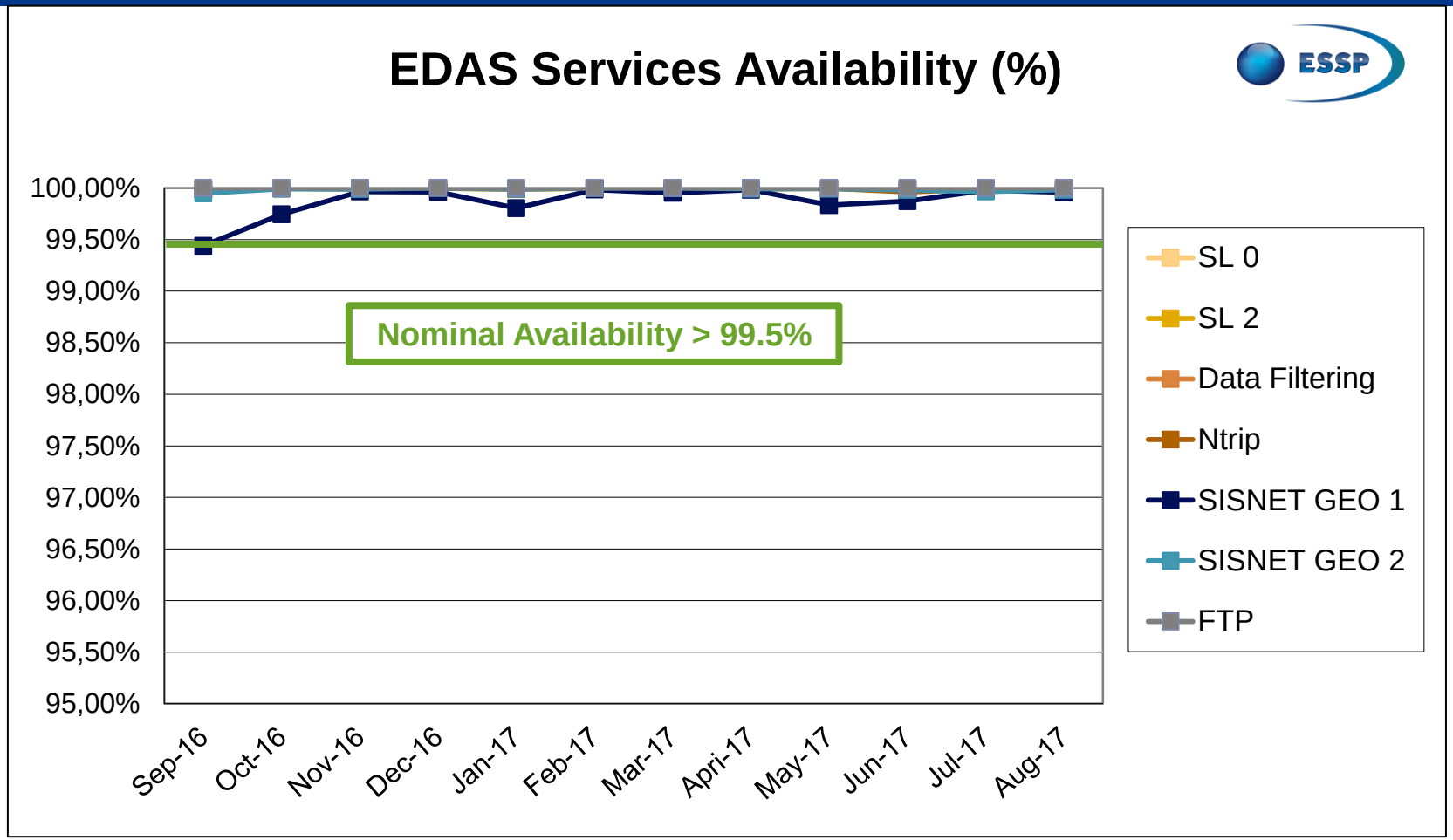
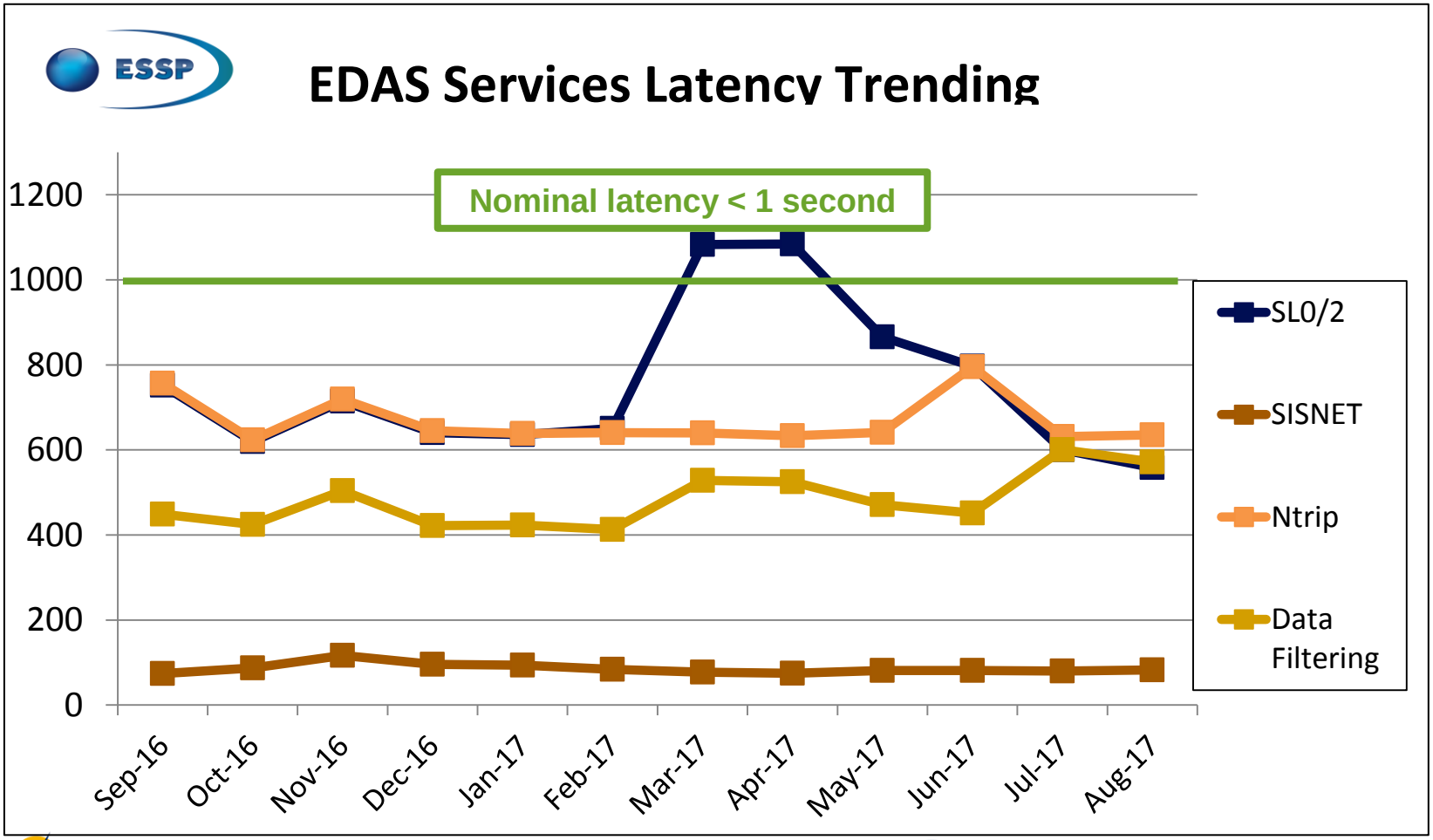
EDAS Services Availability



EDAS Services Latency



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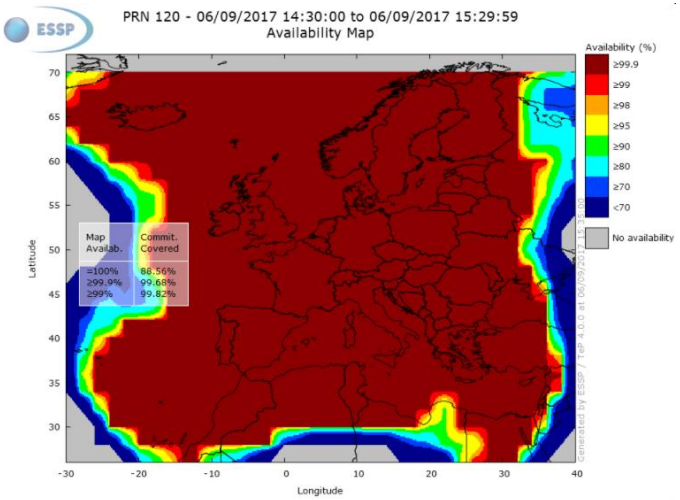
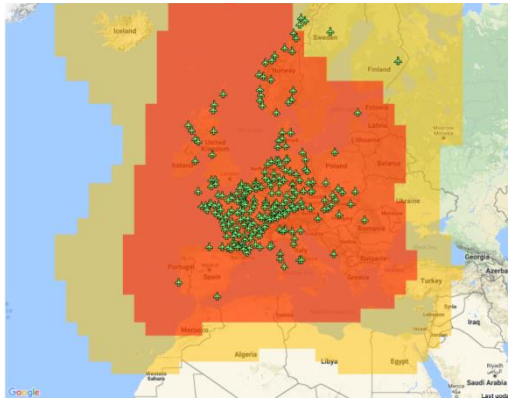
GNSS performance monitoring

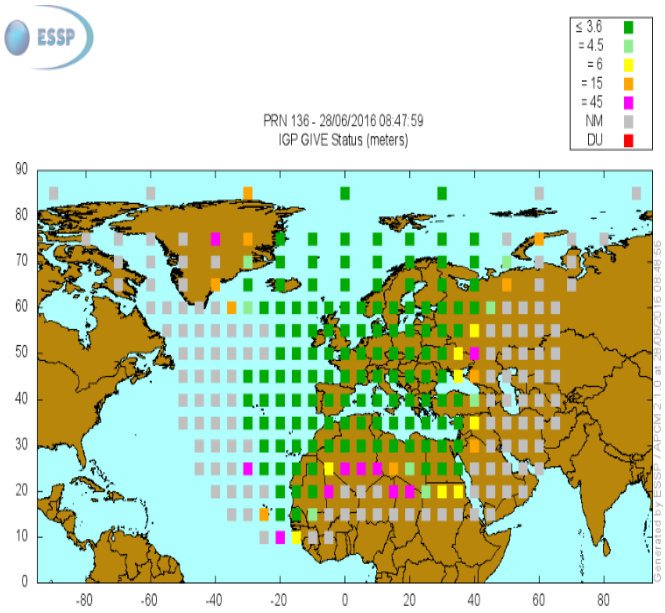
- **GNSS data** obtained **from EDAS** Services are used as input **for GNSS performance monitoring and assessment**:
  - Analysis of different GNSS navigation solutions at the EGNOS stations.
  - Several GNSS performance tools are customized to use EDAS Services, especially NTRIP, SISNeT and FTP.
  - GNSS performances can be computed in real time and in post-processing (EDAS FTP Service).





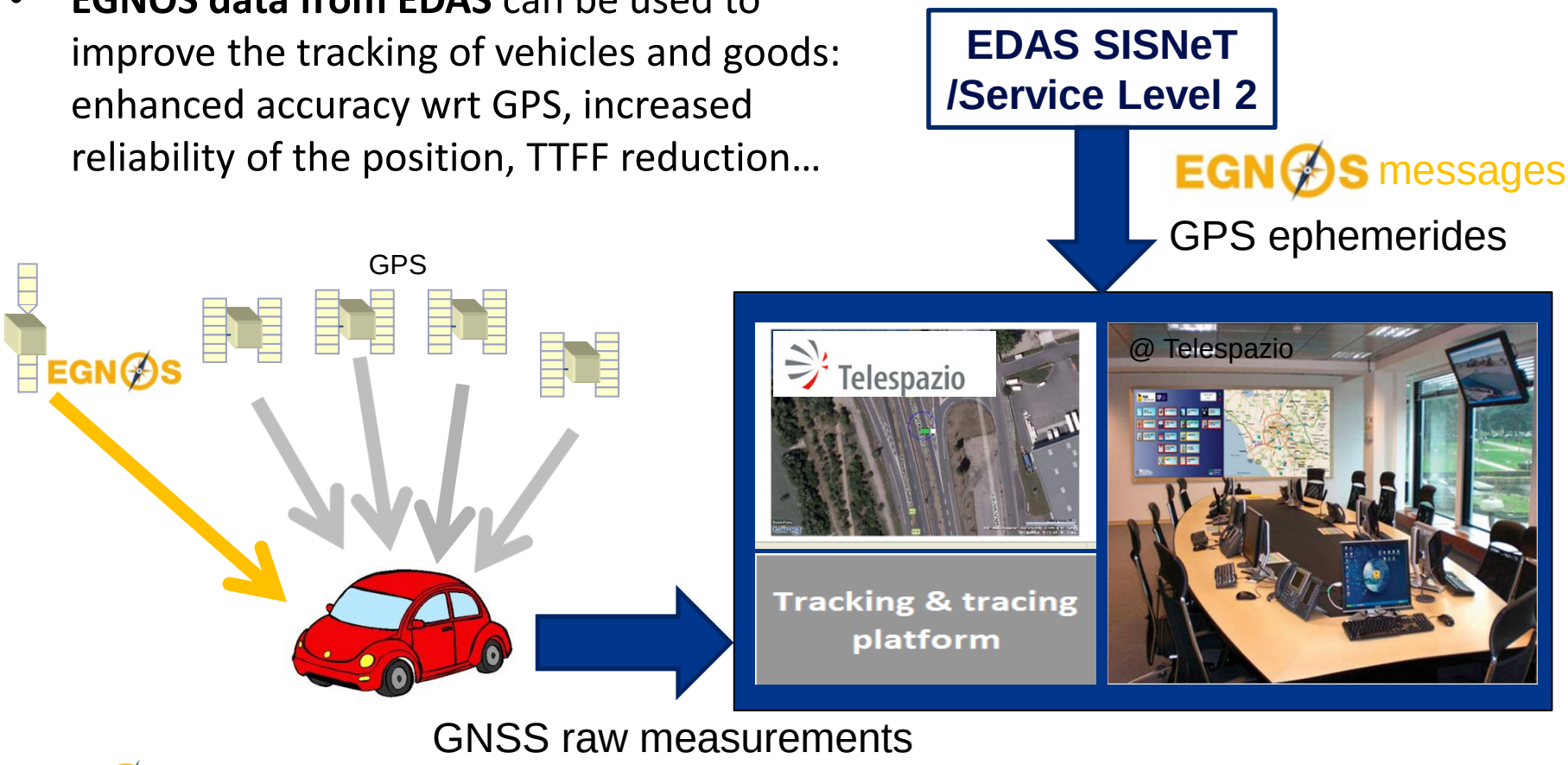
Development of GNSS algorithms or models.

- GNSS raw data obtained from EDAS Services are used as input for GNSS products development and atmospheric analysis:
  - Analysis of ionosphere using EDAS IONEX files based on EGNOS corrections.
  - Test of new ionospheric or troposferic models
  - Meteorological studies based on GNSS observation measurements.
  - Development of algorithms for GNSS Systems using EDAS GNSS historical data.



Tracking of assets

- **EGNOS data from EDAS** can be used to improve the tracking of vehicles and goods: enhanced accuracy wrt GPS, increased reliability of the position, TTFF reduction…



Contribution for GNSS CORS networks

- EDAS data can contribute to improve GNSS **Continuously Operating Reference Station (CORS)** thanks to the access to the EGNOS stations raw data.

- GNSS raw data from EGNOS stations can be used for different purposes:
  - Increase network density
  - Adding new stations without cost.
  - Extend the CORS network coverage area
  - Validation/testing of new SW upgrades
  - Independent performance monitoring and/or anomaly analysis

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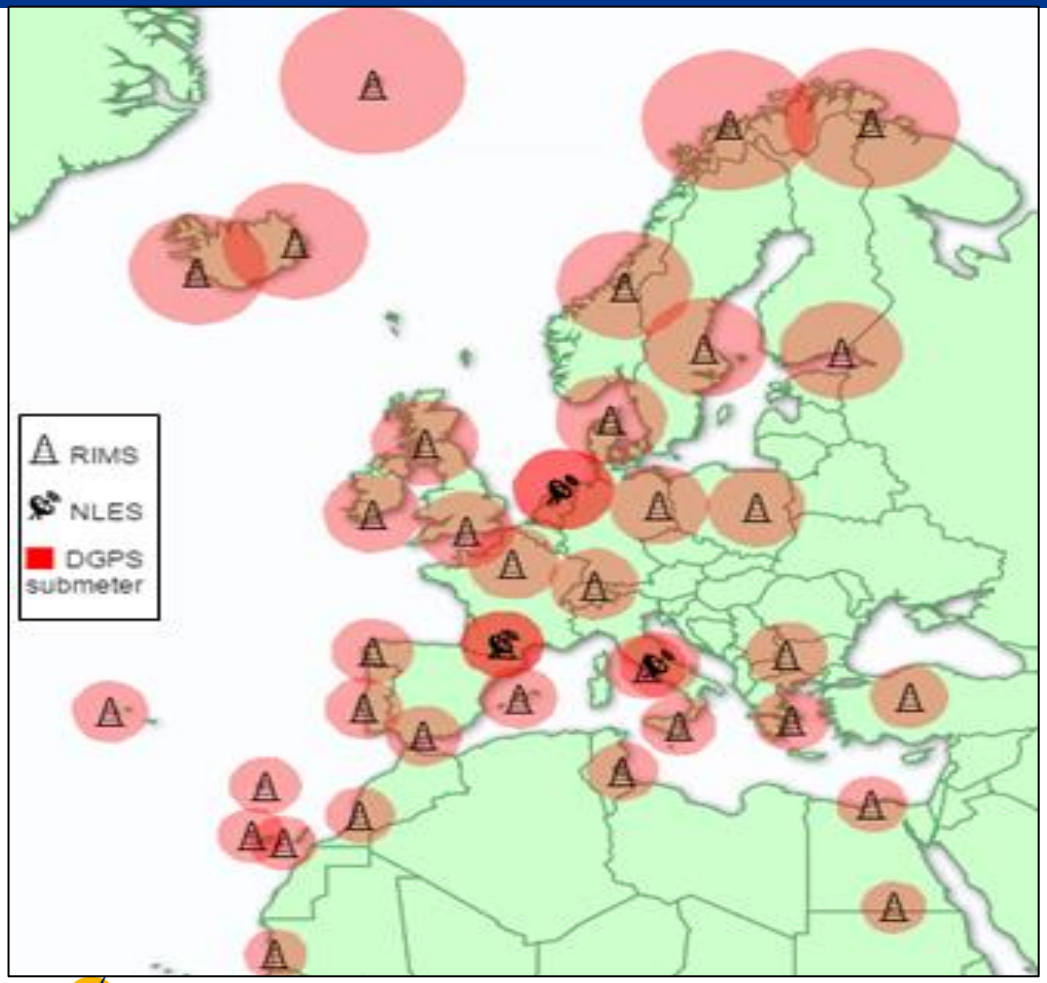
Enhancement of GPS standalone position for mobile applications

- EDAS Services can be used in mobile devices for enhancing the GPS standalone position in real time thanks to internet connectivity.
- The positioning techniques supported by EDAS are the following:

Positioning technique	EDAS Service	Comments
EGNOS (SBAS)	EDAS SISNeT	Important in areas when the visibility of EGNOS Geostationary satellites can be obstructed.
DGNSS	EDAS NTRIP (RTCM 2.X)	Submeter accuracy levels supported up to 250 km from the selected EGNOS stations.
RTK	EDAS NTRIP (RTCM 3.1)	Centimetre level accuracy can be computed when located within 40 km from the EGNOS station.

EDAS DGPS: tentative coverage Horizontal Accuracy



EDAS DGPS
(percentile 95th)
< 1m

250 km radius

Support to specific applications in ***mapping, transportation, emergency services*** and ***precision agriculture*** domains

**Estimated coverage based on performance assessment at specific locations and during a limited timeframe*

*** Performance improves as distance from the selected EGNOS station decreases*

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EDAS DGPS: Pass-to-pass results

From 2nd July to August 6th 2016.
Solutions with horizontal accuracy (percentile 95th) < 1 m

Location	Solution	Pass to Pass -15 min, 95th-
La Palma (Spain)	LPAL0_LPIA	13,9 cm
La Palma (Spain)	LPAL0_CNRA	10,1 cm
Cascais (Portugal)	CASC0_LSBA	15,7 cm
Hoefn (Iceland)	HOFN0_EGIA	12,4 cm
Onsala (Sweden)	ONSA0_ALBA	10,1 cm
Melilla (Spain)	MELI0_MLGA	11,2 cm
Oberpfaffenhofen (Germany)	OBE40_ZURA	20,6 cm
Borowiec (Poland)	BOR10_BRNA	13,7 cm
Ciboure (France)	SCOA0_TLSA	18,6 cm
Toulouse (France)	TLSE_TLSA	16,5 cm

Static data, percentile 95th, 15 minutes time window.

ISO 12188-1, Tractors and machinery for agriculture and forestry-Test procedures for positioning and guidance systems in agriculture-Part1: Dynamic testing of satellite-based positioning devices

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Pass to pass $\lessapprox$ 20 cm

Static data, percentile 95th, 15 minutes time window.

ISO 12188-1, Tractors and machinery for agriculture and forestry-Test procedures for positioning and guidance systems in agriculture-Part1: Dynamic testing of satellite-based positioning devices

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EDAS DGPS: Pass-to-pass results

EDAS DGPS in-field tests
conducted by **Topcon agriculture and ESSP**
in June 2017.

TOPCON Precision Agriculture

PRESENTATION COMING NEXT….

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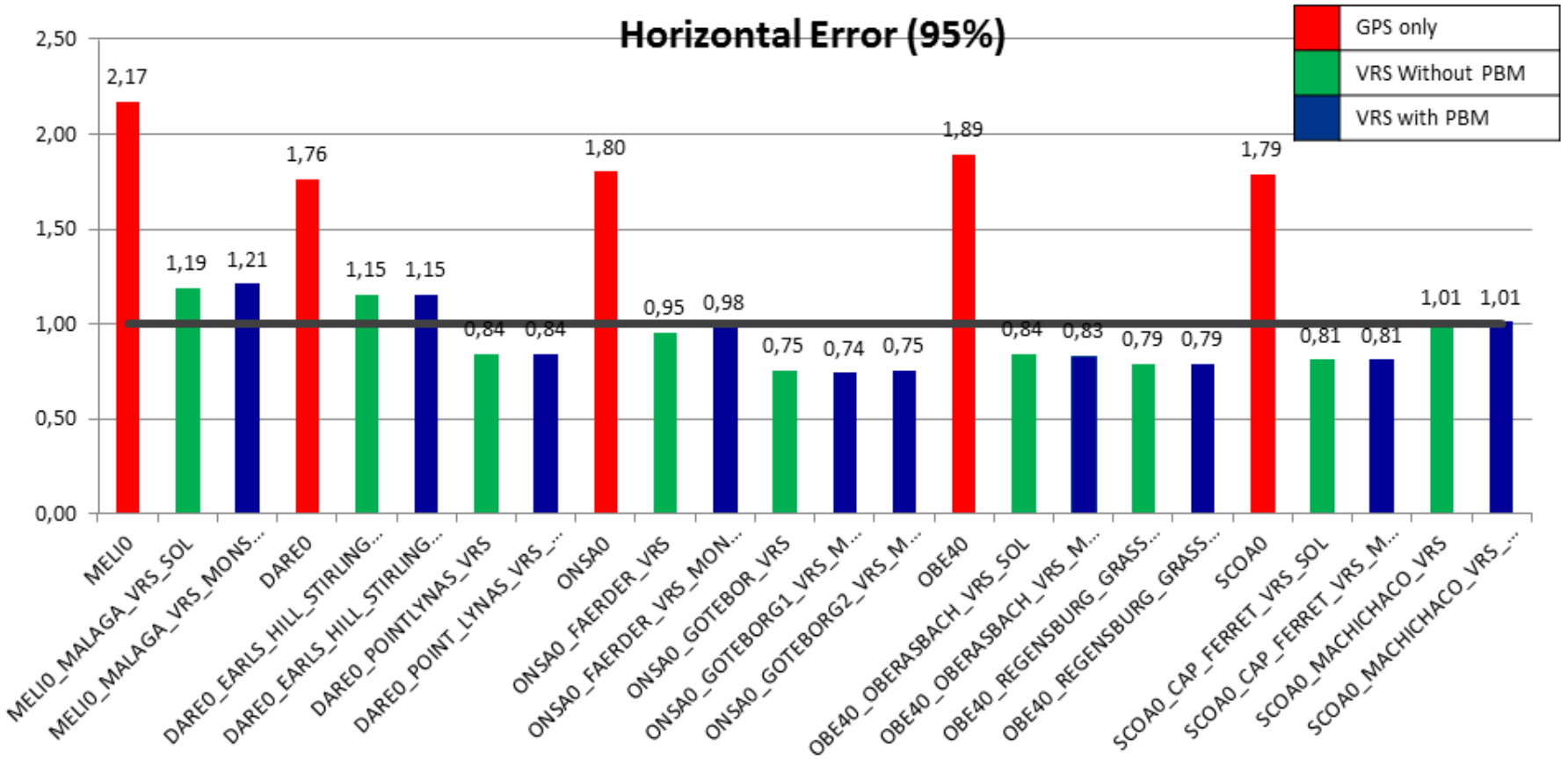
EDAS based DGPS maritime service (VRS concept)

Study conducted by **Alberding GmbH and ESSP** in 2016

- EGNOS-based VRS corrections generated at **IALA beacons or AIS base stations** locations.
- **Pre-Broadcast** Integrity Monitoring
- Solution **Transparent to final users** (same format, integrity concept, signal and data content as current IALA Beacons / AIS stations).

EDAS based DGPS maritime service (VRS concept)



Reference: ESSP et al., ION GNSS 2016, "EDAS for a DGPS maritime service: EGNOS-based VRS performance with pre-broadcast integrity monitoring"

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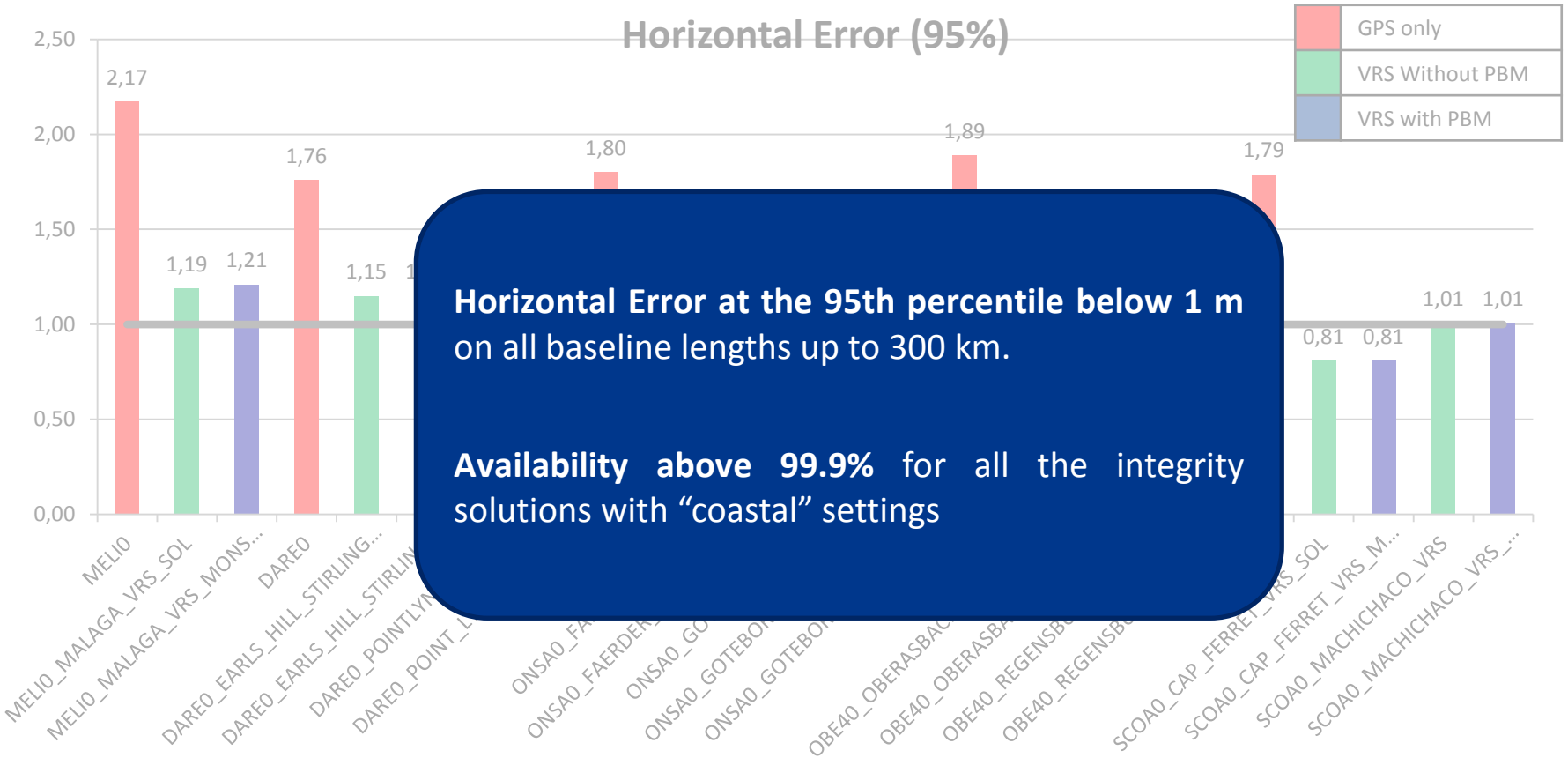
EDAS based DGPS maritime service (VRS concept)



Horizontal Error at the 95th percentile below 1 m on all baseline lengths up to 300 km.

Availability above 99.9% for all the integrity solutions with "coastal" settings

Reference: ESSP et al., ION GNSS 2016, "EDAS for a DGPS maritime service: EGNOS-based VRS performance with pre-broadcast integrity monitoring"

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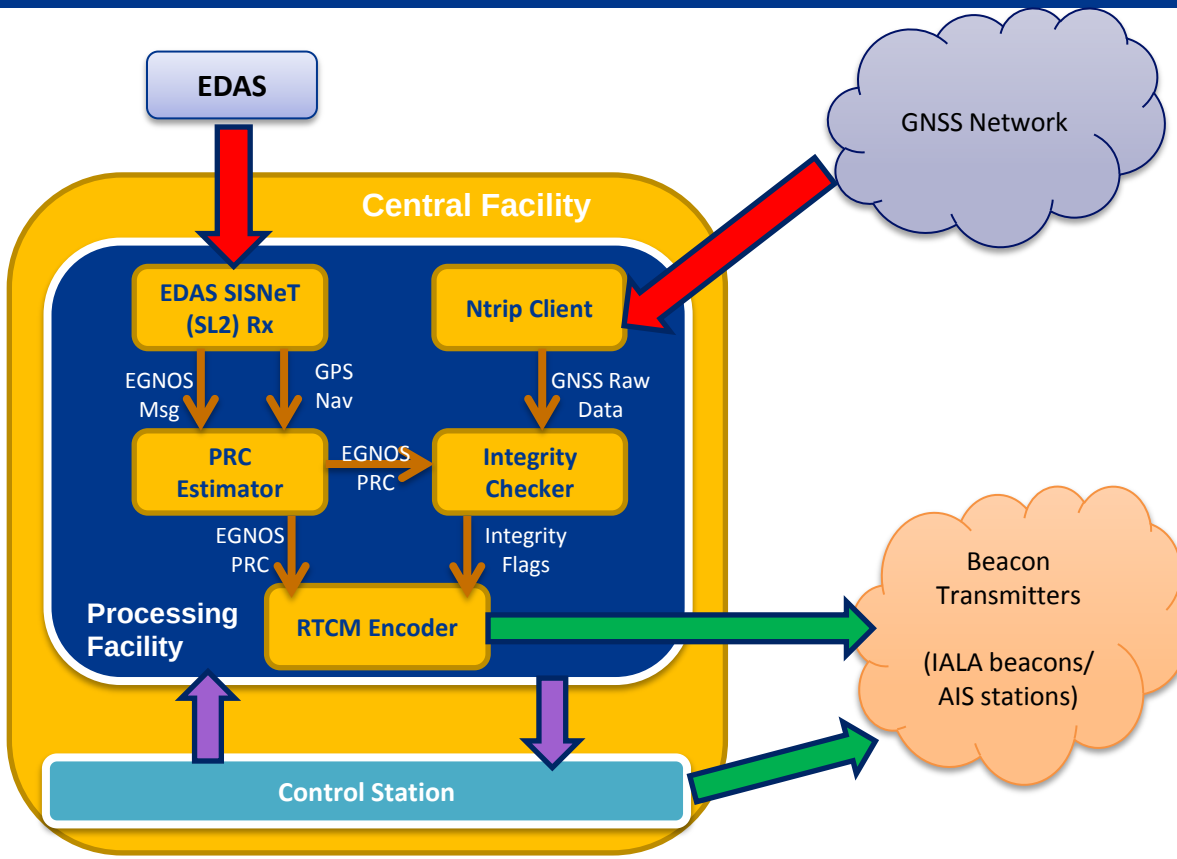
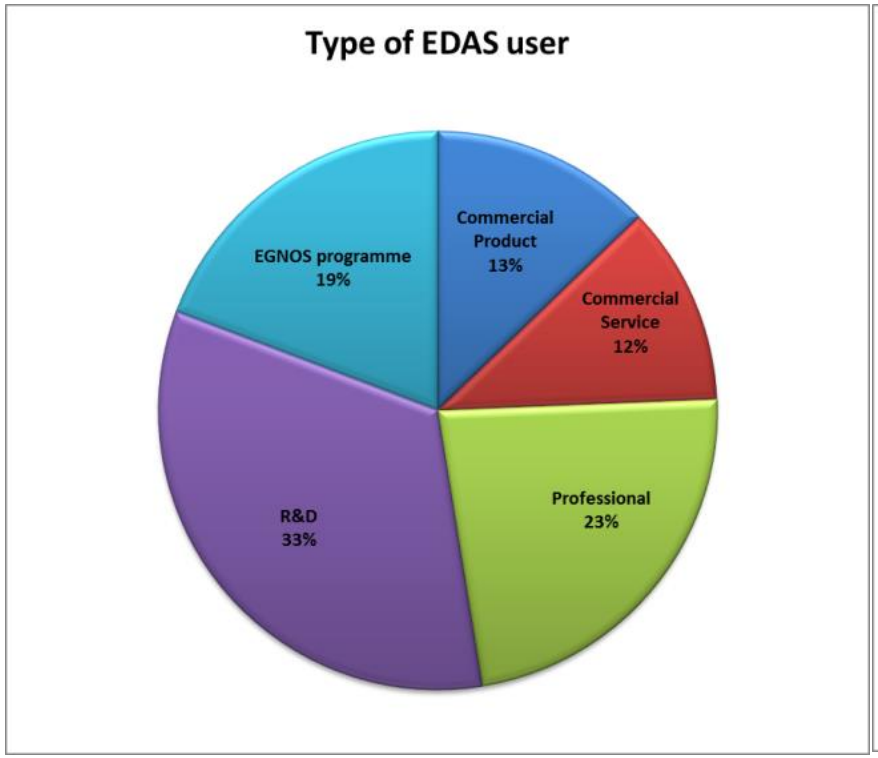
EDAS based DGPS maritime service (VRS concept)

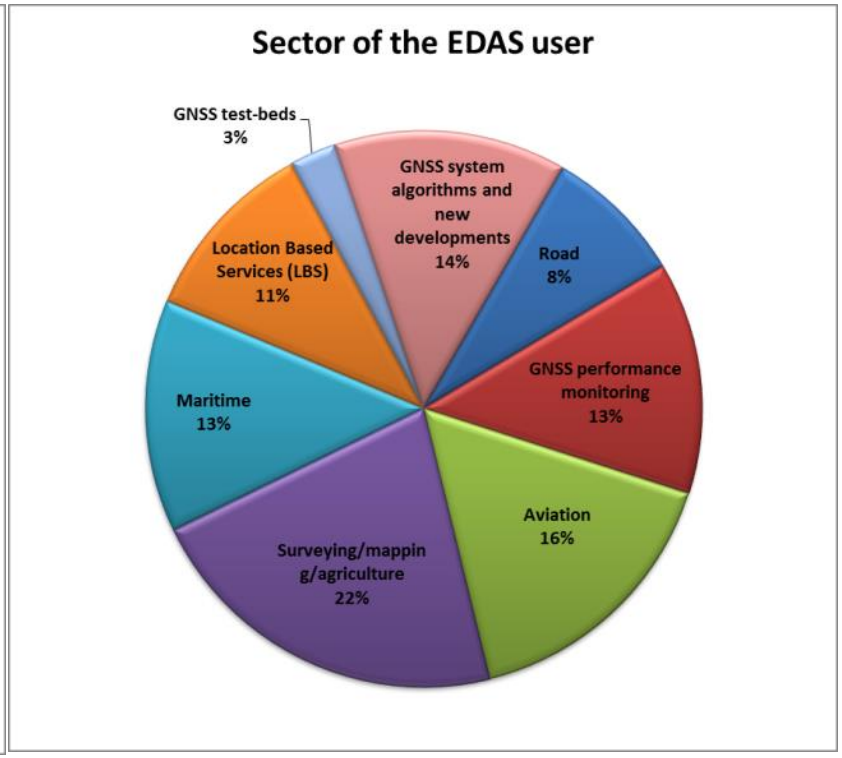
- **Several architectures options for EGNOS/EDAS based DGPS service** for mariners analysed by GSA/ESSP.
- Multiple **technical and/or cost related benefits** provided by EGNOS/EDAS based solutions



PRESENTATION COMING NEXT….

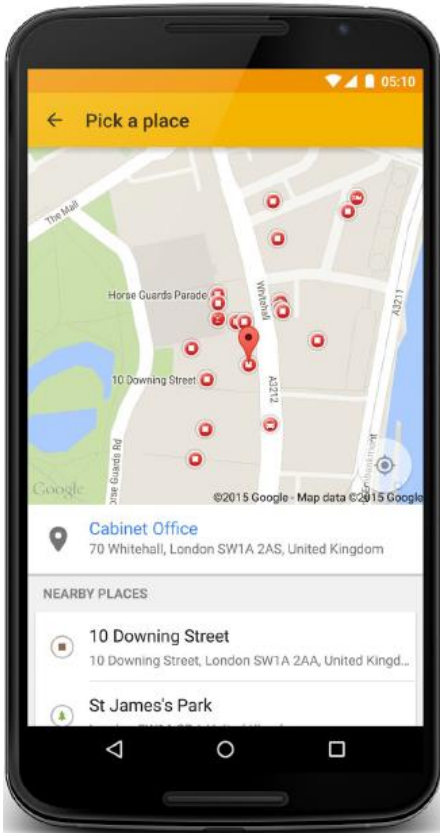
EDAS active users distribution





In the future…
EDAS in tablets and smartphones

- Android Nougat OS opens up the possibility of using the satellite pseudo-ranges received by the embedded receiver in a smartphone since May 2016.
- APIs:
  - android.location: Android
  - android.gms.location: Google Play

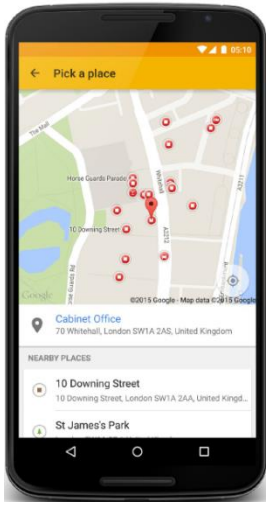


In the future…
EDAS in tablets and smartphones (II)

External GPS receiver

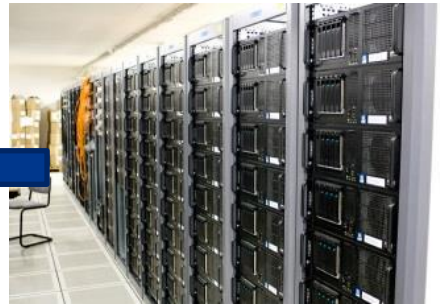
GPS raw measurements

Bluetooth

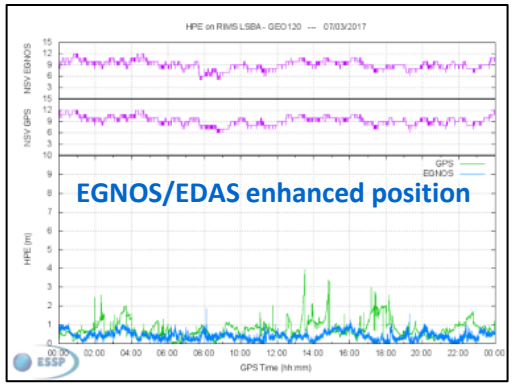


EDAS data:
- GPS nav data
- EGNOS messages…

Internet



EDAS



Benefits:
- Enhanced accuracy wrt GPS
- Increased reliability of the position
- TTFF reduction

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Conclusions

- **EDAS** provides **free-of-charge** access to the **GNSS data** generated and gathered by **EGNOS infrastructure** in real time and in form of archive.
- **Excellent performance** (EDAS SDD commitment exceeded).
- EDAS delivers **added value data** for EDAS users or Service Providers in a wide range of applications

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Thank you!

www.essp-sas.eu

elisabet.lacarra@essp-sas.eu

juan.vazquez@essp-sas.eu

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

egnos-helpdesk@essp-sas.eu

+34 911 236 555 (H24/7)

Corporate Video