

Strategy for EGNOS use in marine aids to navigation and potential use in ports and other maritime operations. A view from Spain

Juan-Francisco Rebollo
Head of the Spanish AtoN Service

Enrique Tortosa
Head of Port Services Department

Copenhagen, 30 SEP 2015

Puertos del Estado



GOBIERNO DE ESPAÑA

MINISTERIO DE FOMENTO

Scope

- PNT AtoN in Spain. Current status
- EGNOS as an alternative
- Demonstrative Pilot projects
- Summary of user requirements query
- Questions



AVAILABLE SYSTEMS

Marine Spanish DGPS Network.

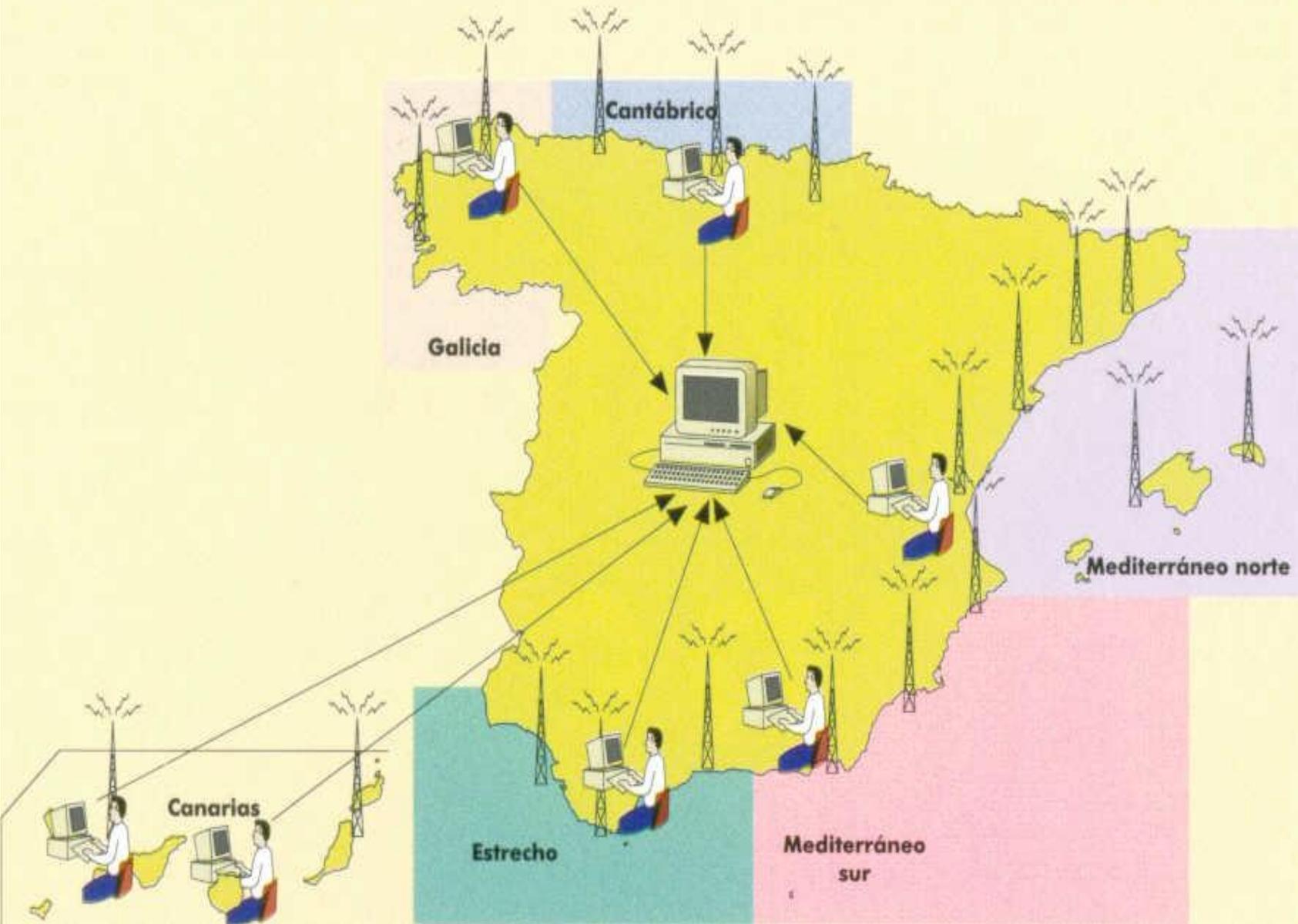
- 18 DGPS Stations with dual Reference Station and single integrity monitor
- Developed through 6 regional network
- 6 Remote monitors for signal in air (one in each regional network)

COMMITMENTS:

- Full coastal coverage for coastal navigation
- Range: 100 Km.
- Accuracy: better than 10m.
- Level of service: IALA Category 1.



RNAV AtoN in Spain. Current status



19 RS projected , 18 RS installed

MANAGEMENT AND FUNDING

- Service providers: Port Authorities (as an AtoN) through a regional agreement for the provision of this DGPS service.
- Coordination and technical leader: Puertos del Estado
- Estimated running cost (by year):
250.000, -€
- Funding by Port Authorities (as an AtoN). Puertos del Estado pays the control tasks.



CURRENT STATUS

- Technical devices and service is running properly, but the equipments are next to technical obsolescence.
- Funding constrictions from National Port System.
- No technicians with RNAV technologies knowledge or training (or not enough)
- This DGPS service is not considered by the users as a need for navigation and don't show interest

Comment: any PNT system require the use of a nautical chart. This matter is competency of the Hydrographic Institute for provision and the Maritime Administration for mandatory carry on and use.



METHODOLOGY

Using the flag information " position accuracy" on AIS message. If the position has accuracy better than 10m. This means that the ship has used a augmentation service for positioning (DGPS, EGNOS, private services,...)

Statistic (fishing and non-fishing vessels) of:

- Number of positions with flag in 1 (< 10m)
- Number of ships that have reported as least one position with flag in 1 (< 10m)



RESULTS

In a quick test the results for positions go from the 53'5% in the Cabo de Gata to 85.7% in the Strait of Gibraltar. While for vessels values are obtained from a 61'8% Stake of Bars to 93.2% in the Strait of Gibraltar.

Most ships have augmentation services positioning and most of the positions are reported using these services, therefore it can be concluded that the use is much wider than the users perception.

We will continue to work with this data in order to obtain more information on the use of augmentation services for positioning and also a quality test of service of the DGPS stations



- Full Spanish coastal coverage
- Accuracy for maritime use: the scale of a nautical chart for port or restricted waters is 1/5000, if minimum error for positioning in the nautical chart is 1 mm., equivalent to 5m.(in this scale)

EGNOS is able to provide an accuracy better than 5 m, being useful for marine **navigation** for coastal areas and also for restricted waters (but perhaps not for some added value services, as automatic docking and others)

- Not funding needed by the National Port System



- Public and open service, provided by public organization with national (state) participation and funding.
- It's well identified the service provider responsible.
- EGNOS is a multimodal service.



Puertos del Estado has offered to participate in two pilot projects in order to evaluate the efficiency of PNT service using EGNOS data to provide DGPS service through AIS and through IALA-DGPS Beacons

A first step for complementary use maintaining the current system (DGPS. Network), but with the possibility of EGNOS could replace the DGPS Reference Station.

OBJECTIVE PROJECT 1:

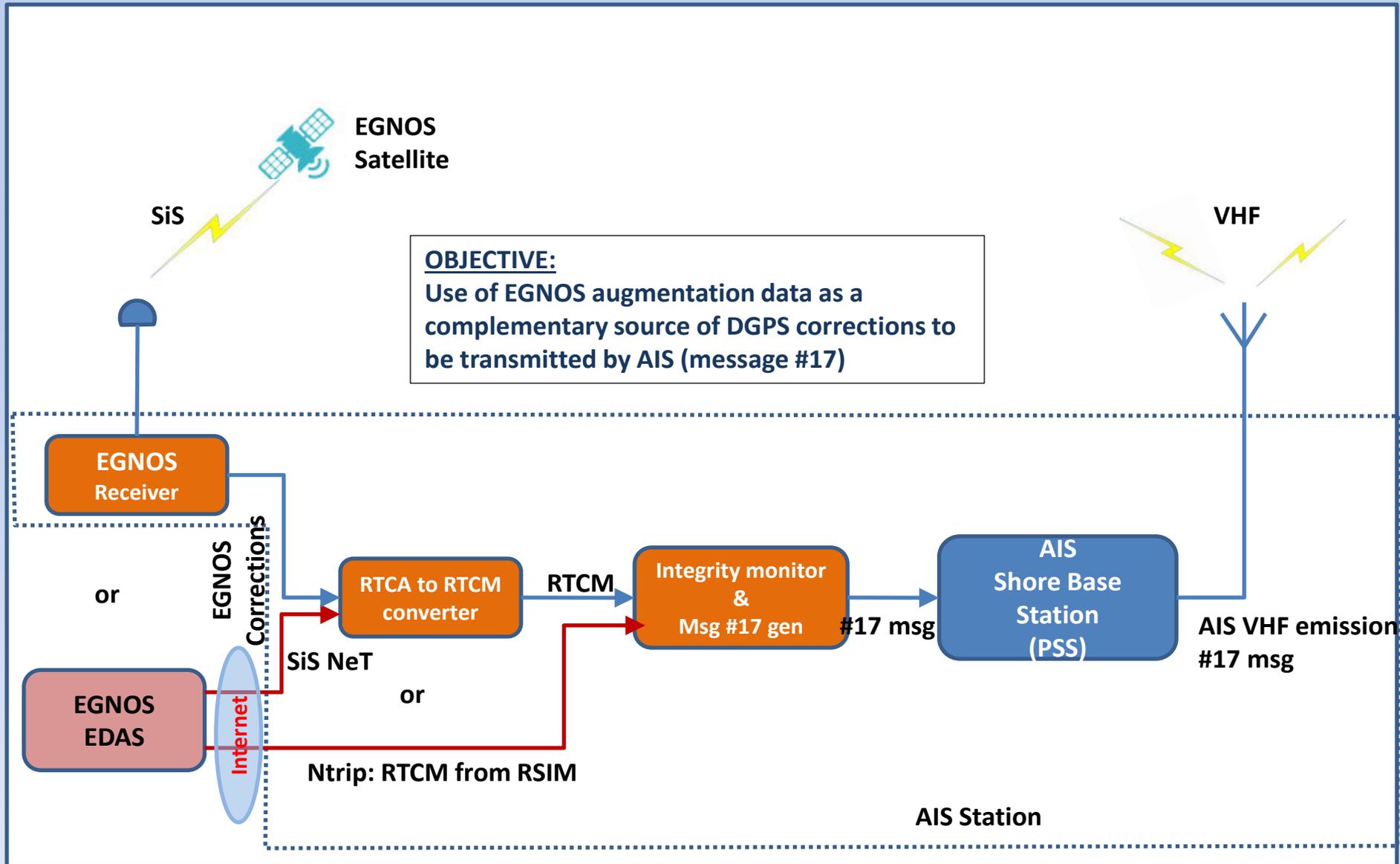
Use of EGNOS augmentation data as a complementary source of DGPS corrections to be transmitted by AIS (message #17)

OBJECTIVE PROJECT 2:

Use of EGNOS augmentation data as a complementary source of DGPS corrections to be transmitted by IALA-Radiobeacons

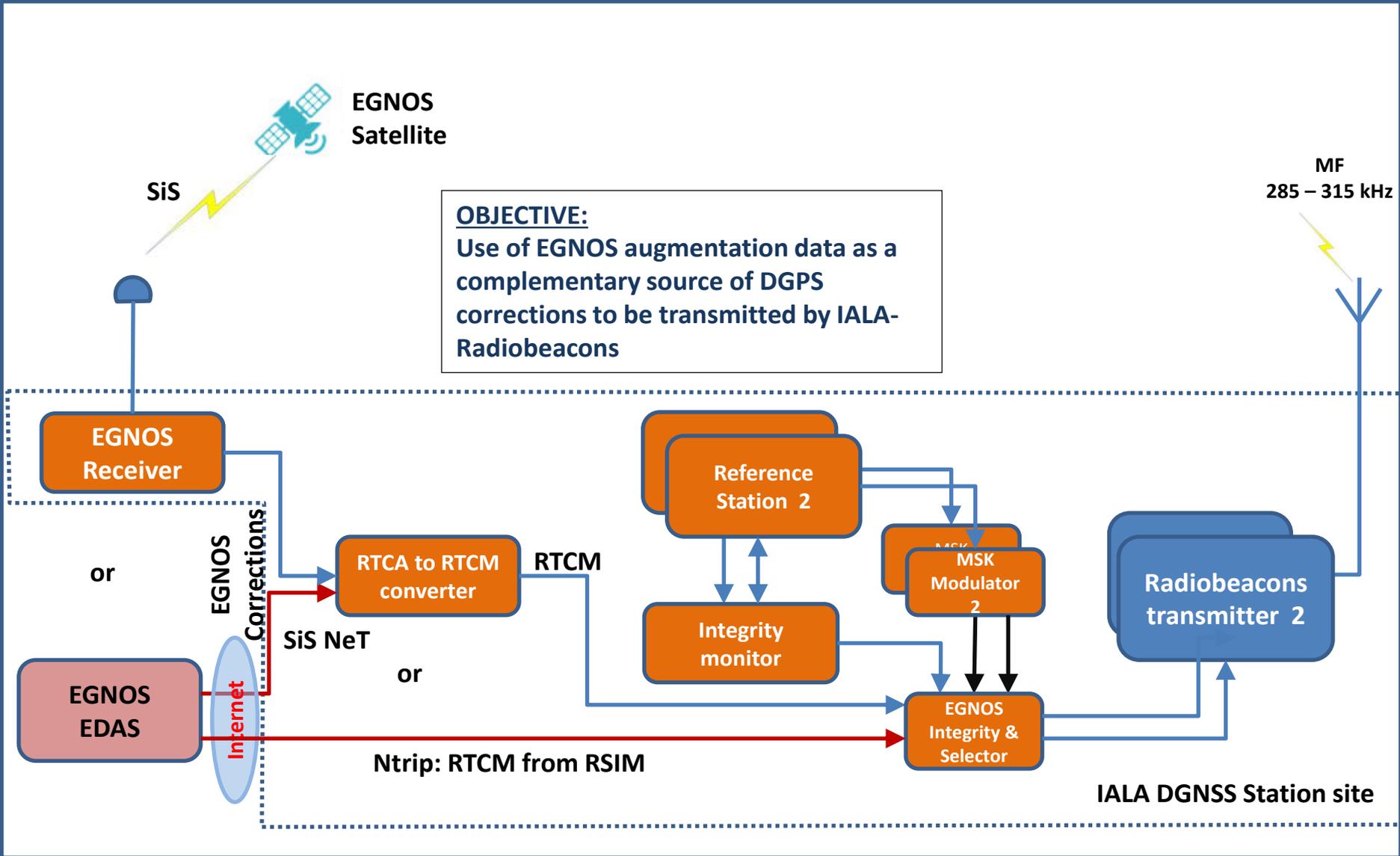


PILOT PROJECT 1: EGNOS DGPS CORRECTIONS EMISSION THROUGH AIS



PILOT PROJECT 2:

EGNOS DGPS CORRECTIONS EMISSION THROUGH IALA-Radiobeacons



ACTIONS

After the pilot projects demonstration:

- Meeting for presentation of results
- Open a time for operational trial in some countries, evaluating:
 - Service quality (availability and continuity)
 - Integrity
 - Accuracy
 - Running costs
 - Technical equipments and communications links
- Submit proposal to IALA and IMO, as well as the national bodies related with the safety of navigation.



Which are the main technological or non-technological means used to support navigation in ports?

AIS DGPS RTK Visual operations Radar
ECDIS Integration of several systems:
Other: ...

- 1) *Integration RNAV systems with visual surveillance*
- 2) *AIS+Radar+ visual surveillance*
- 3) *Only visual (only 1 answer)*

• **What systems are or can be used to increase safety when navigating in your ports? What is the accuracy required to those systems to support navigation in your ports? Could this requirement be relaxed for certain type of ports or areas within a port?**

- *10 m. Accuracy (H) and 1m (V); Only one, less than 3m.*
- *Reinforcement of AIS and radar information*
- *Bathymetric information available and updated.*
- *In some area can be relaxed the accuracy and inside the port the visual aids can be enough (1 answer)*



For the ports under your responsibility, which is the actual accuracy applicable (in use) for port operations?

- *The majority of responses don't answer this question. Some of them said “the same accuracy of AIS”*
 - *Less than 10 m , and less than 3 m (only one)*

Which are the reasons for the applicable accuracy (either 1 meter or other figure)? (if any)

- *In general, this question is not well answered*
- *The knowledge of the water under keel and position related to the other vessels.*
- *Avoid groundings and collisions, especially in narrow chanel.*



•For the ports under the Port Authority responsibility, do they share similar characteristics that could be used to group or classify them?

1)Type of aids to navigation available

2)Type of vessels/traffic entering the port, according to:

a)Size

b)Weight

c)SOLAS or non-SOLAS

d)equipment installed on-board

3)Type of goods: dangerous goods or not.

4)Volume of Traffic

5)Depth of water

6)Meteorology and seasonality (eg. tidal changes)

7)Type of approach channels

a)Size of the most restrictive (length, width, depth)

b)Size of the less restrictive (length, width, depth)



•What do ports with the same required accuracy have in common?

- *In general this question has not many responses*
- *By geographical areas*
- *All commercial ports in the country*
- *By port operations*

•Other comments

- *In the future the maritime control from shore will be improved*
- *Some port operators have an own commercial system based on GPS.*
- *EGNOS can be a good challenge*



CONCLUSIONS

The query was sent to responsible for port operations and AtoN services of each Port Authority, General Direction of the Merchant Marine, SASEMAR as well as pilot association (total 81 persons, 30 Organizations)

Answers received: 12

- *The visual aids and the pilot service, can be now enough inside the ports.*
- *The ports don't identify that AIS need a PNT system, and don't identify the accuracy needed.*
- *EGNOS, for some applications, can be an alternative to IALA-DGPS service.*

It's necessary to improve the knowledge of PNT services, EGNOS as well, in port and maritime administrations and users, in order to have a common knowledge and identify opportunities for improving the safety of navigation.





Thanks so much

Juan-Francisco Rebollo

jfrebollo@puertos.es

Puertos del Estado



GOBIERNO
DE ESPAÑA

MINISTERIO
DE FOMENTO

