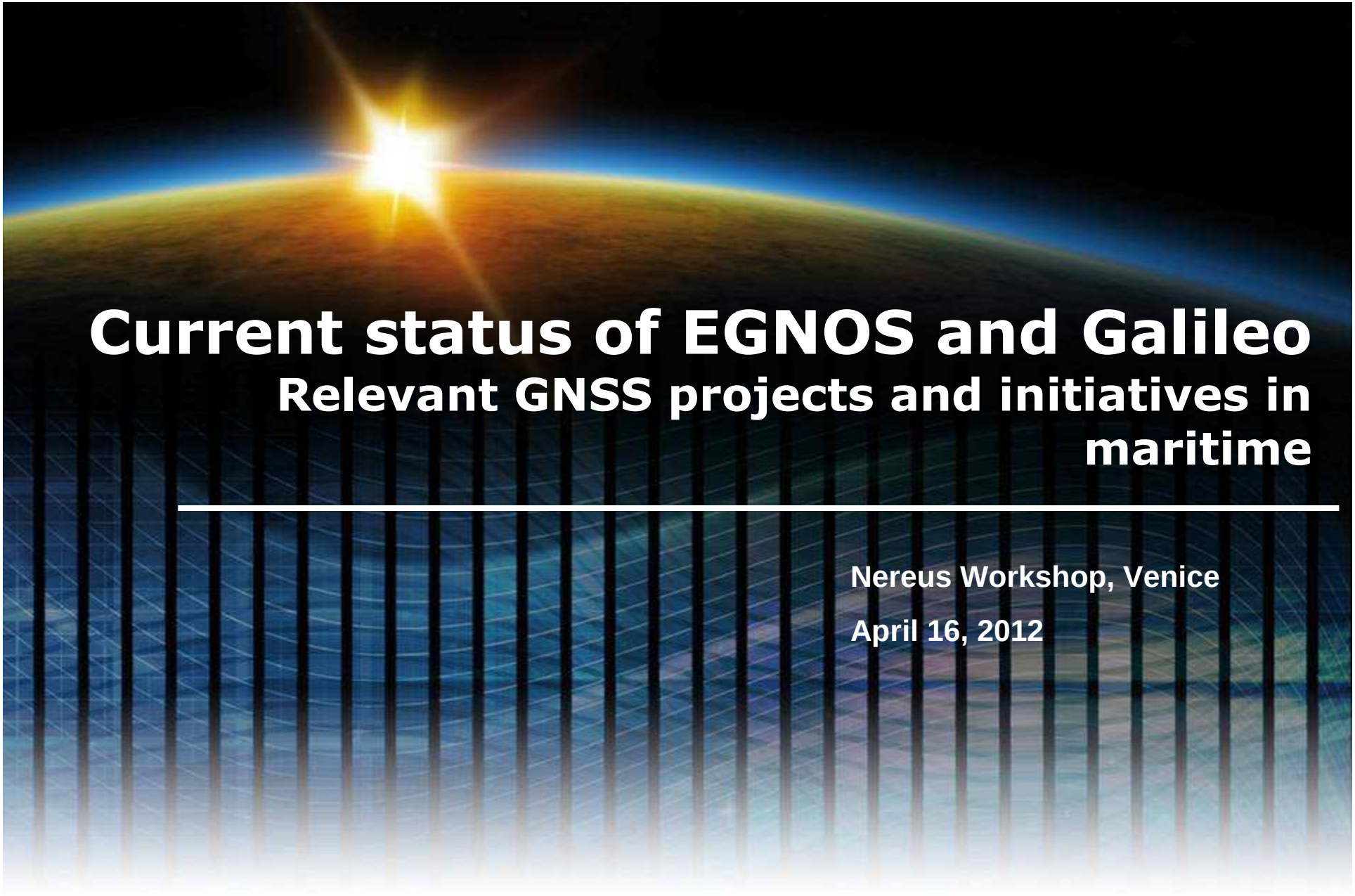


Current status of EGNOS and Galileo

Relevant GNSS projects and initiatives in maritime

Nereus Workshop, Venice

April 16, 2012

European GNSS Agency

The GSA today

Since October 2010: a new name, a new regulation.
Since February 2011: a new Executive Director.
September 2012: a new site in Prague.

A wide range of activities:

- Preparing for the **successful commercialisation and exploitation of the systems**, with a view to smooth functioning, seamless service provision and high market penetration.

- Ensuring the **security accreditation** of the system and the establishment and operation of the Galileo Security Monitoring Centres.

- Accomplishing other tasks entrusted to it by the European Commission, such as, managing **EU GNSS Framework Programme Research**; the promotion of satellite navigation applications and services; and ensuring the certification of the system components.

The GSA in the European GNSS Programme

Political Oversight

Council and Parliament

Programme Oversight

GNSS Programme Committee

European Commission

Implementation

European Space Agency

delegation

delegation assistance

European GNSS Agency (GSA)

IOV contracts

FOC contracts

Security accreditation

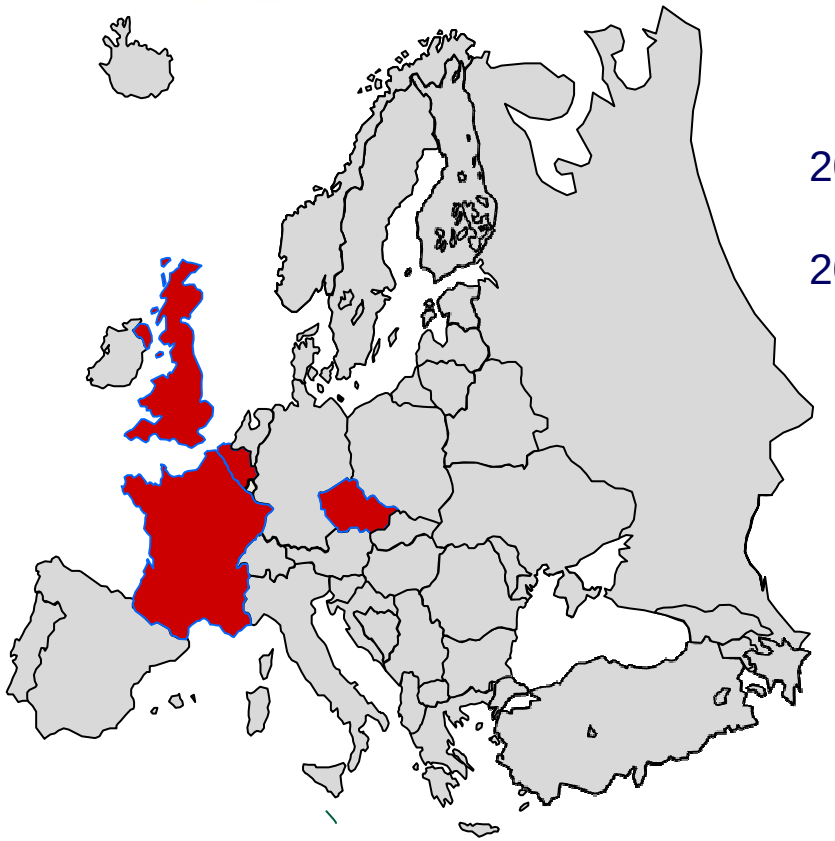
Market development and monitoring

Applications R&D programme

Upstream industry

Downstream industry

A growing organisation



2011 42 people and 1 site (HQ)

2012 59 people and 3 sites (HQ + 2 Galileo Security Monitoring operational centres) in 3 different Member states

GNSS is already central to the merchant maritime market

- GPS and GLONASS have long been accepted elements of the IMO World Wide Radio Navigation System (WWRNS) and are widely used for navigation either through a standalone receiver on the bridge or integrated with an electronic chart system.
- D-GNSS networks, operated by national lighthouse authorities provide additional accuracy and integrity in some coastal waters and is widely used in the merchant fleet.
- GNSS is increasingly finding its way into other maritime systems and can now be found on many vessels
  - Automatic Identification System
  - Search and rescue equipment
  - tracking for homeland security
  - marine engineering

The added value of new GNSS signals and frequencies

- **SBAS (EGNOS, WAAS, MSAS, etc)**
  - Already widely used amongst recreational vessels – standard capability
  - For adoption by commercial vessels, it's time to
    - reach consensus with stakeholders on SBAS (EGNOS/WAAS /…) being recognised by IMO as part of WWRNS
    - explore how DGPS and SBAS can be optimised
  - Clear added value to pilotage applications in restricted or inland waterways

- **Multiple constellations (ie Glonass, Galileo) and multiple frequencies (L1/L5)**
  - Long term potential to rationalise ground based infrastructure
  - More resilient PNT required for eNavigation
  - Multiple constellations ⟹ improved integrity
  - Multiple frequencies ⟹ service robustness

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EGNOS can become the preferred solution for pilotage applications

Strengths

- EGNOS can integrate existing RIS infrastructure offering a low-infrastructure solution and an improvement over GPS-only solutions
- EDAS could be integrated in the system to overcome EGNOS availability problems
- EDAS could be integrated in the system and sent out as a signal in space using already existing AIS system

Weaknesses

- The availability of the EGNOS signal is low close to mountainous areas, or where the visibility of the signal is critical, and rivers for their geographical conformation are

Opportunities

- The market of inland navigation has been growing, supported by positive trends in goods production and tourism markets, up to 2008. The market is expected to start growing again in the next years
- The European Commission is supporting through the 30 TEN-T project the IW sector

Threats

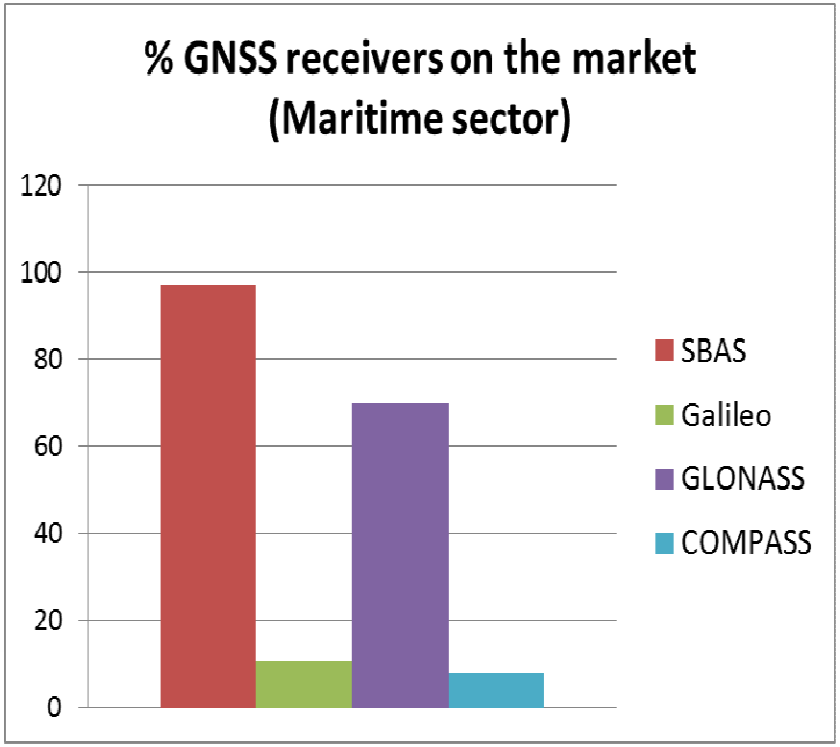
- The introduction of the GPS technology is relatively recent (5 years ago) and the operators could not be ready for a new technological adaptation
- In IW navigation there is a lack of knowledge about satellite navigation and integrity benefits

Pilotage applications include both inland waterways and restricted waters in ports. In both cases, the equipment is often provided by the port authority and is therefore free of the constraints that limit vessel borne capability. EGNOS enables shore authorities to avoid investment in local RTK or commercial DGPS.

Maritime - Dispelling the myths (1)

- The majority of maritime receivers in use today are **NOT** SBAS capable
  - Most receivers sold today are SBAS capable, but the 15 year replacement rate means a legacy population of GPS only
  - Most non-regulated recreational vessels are SBAS capable
- EGNOS cannot be recognised by IMO
  - It is a global network of SBAS systems that might gain recognition – backed by global stakeholders

GNSS suppliers are already anticipating market demand



Source: Analysis based upon GPS World receiver Survey (published in Jan 2012), assuming GPS has 100% penetration

- SBAS is widely adopted in recreational vessels:
  - improved accuracy, at no extra cost
- GPS/GLONASS/Galileo will offer enhanced accuracy/integrity:
  - Receivers need to make use of Galileo IOC capability in 2015/16
- We should have a combined constellation of over 50 CDMA satellites by 2016

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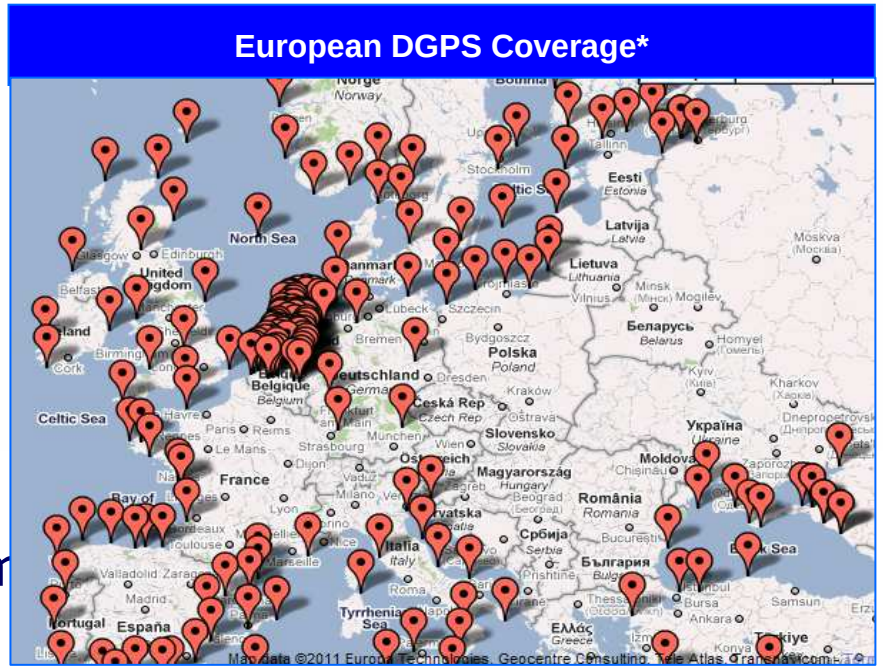
Maritime - Dispelling the myths (2)

- The DGNSS network is the incumbent solution for coastal navigation
  - Some agencies are looking ahead to its long term rationalisation as a result of multi-GNSS and multi-freq
- SBAS is not regarded as a competitor to DGPS by maritime stakeholders
  - In theory it offers improved integrity and wider coverage BUT not sufficient to justify replacement of vessel equipm



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Maritime – the arrival of Galileo

- Galileo has real long term value to the market
  - Dual constellation → robustness
  - Dual frequency → resilience
- Pace of take-up and regulation is slow and therefore now is the time to develop market entry strategy for Galileo IOC
- GLONASS has set a precedence for global recognition of GNSS
  - GLONASS take-up amongst receivers is already high – Galileo needs to duplicate

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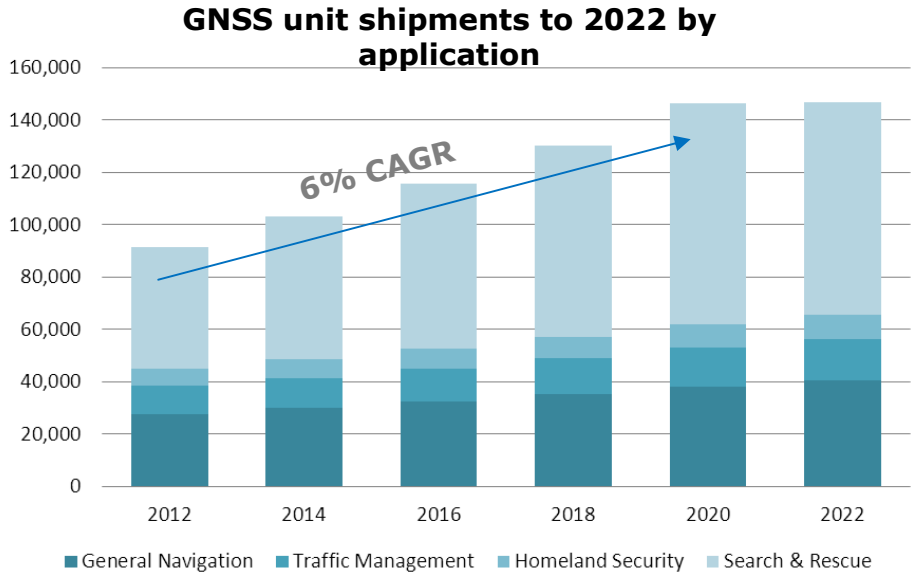
EGNOS with integrity information can replace obsolete DGPS infrastructure with no additional investment



- Regulations/certification is crucial in adoption of new technologies in maritime sector
- EGNOS SOL has potential in port operations, ship navigation and inland waterways. Currently the integrity information is provided by certified DGPS infrastructure.
  - EC Study kicked off Jan 24 to validate EGNOS as an alternative to DGPS

SAFEPORT improves vessel traffic management with EGNOS

SAFEPORT: Safe Port Operations using EGNOS SoL

- Safe and efficient transit of vessels, from the port entrance to their berths, and out again, using EGNOS SoL services.
- Development of Active vessel Traffic Management and Information System (A-VTMIS) to manage vessel movement within its jurisdiction.
- Development of an EGNOS enabled Portable Pilot Unit to ensure that harbour pilots can safely and efficiently navigate the courses provided by the A-VTMIS
- Successful prototype demonstration in Dublin port.

A-VTIMS

Path validation

Portable Auto Pilot

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Your vessel is equipped... use it!

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