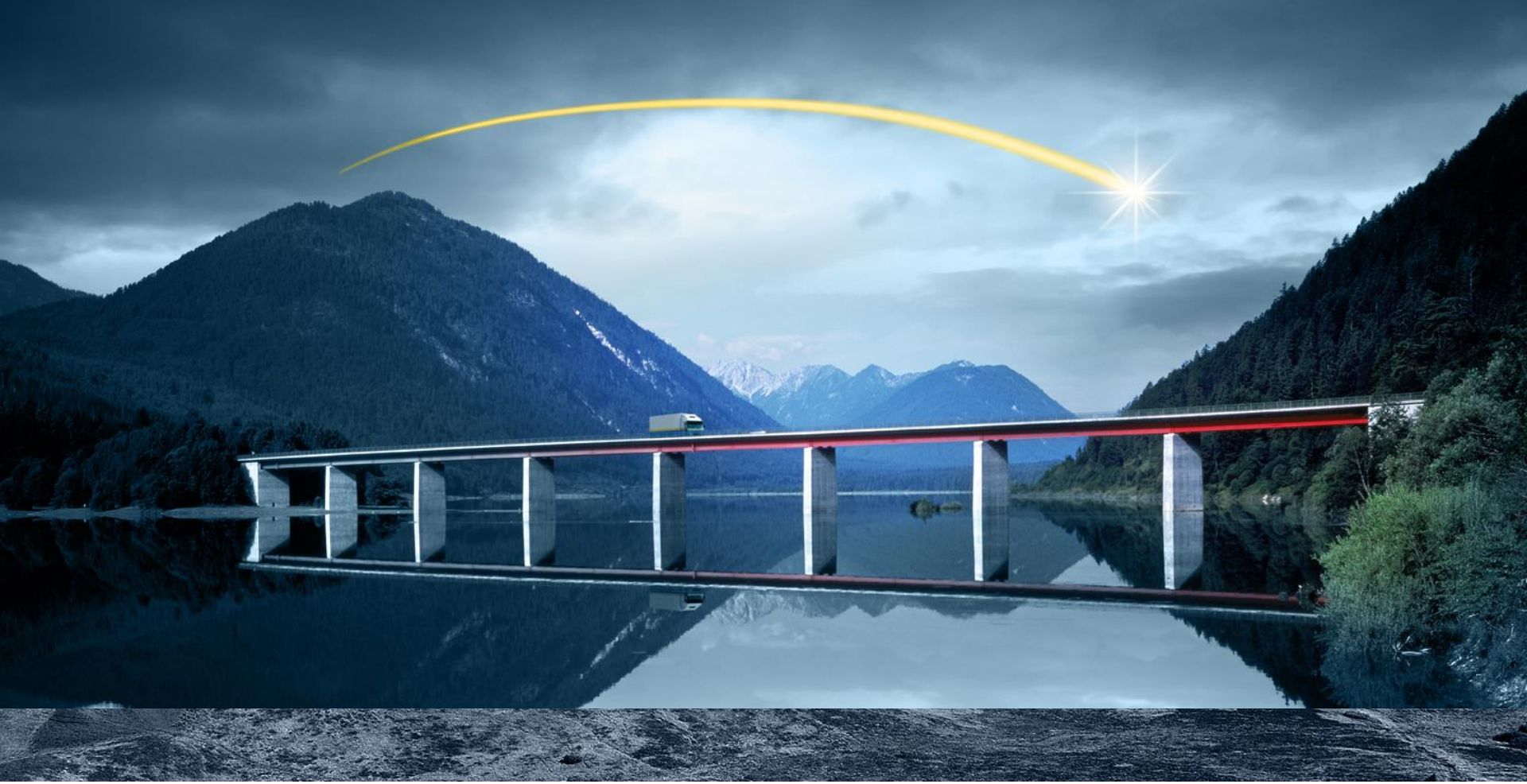


Galileo and EGNOS Programmes
Status Update

Pieter De Smet, European Commission

11th ICG Conference, Sochi, 7 November 2016

European Commission

GALILEO EGNOS

Navigation solutions powered by Europe

- **1. State of Play: EGNOS**
- **2. State of Play: Galileo**


EGNOS

EGNOS System Architecture and Service Area

Navigation solutions powered by Europe

6 Navigation Land Earth Stations

40 Ranging & Integrity Monitoring Stations (RIMS)

GPS signals

2 Support Facilities

4 Mission Control Centres

EGNOS Service Area

GEO Satellites

EGNOS Satellite Footprints

Geostationary satellites

- INMARSAT AOR-E 3F2 (15.5 W)
- SES 5 – operational (5 E)
- ASTRA 5B – commissioning phase (31,5 E)

Recap: EGNOS Services

EGNOS is delivering three services

Service	Characteristics	Service Status	
Open Service	accuracy ~1m, free	available since October 2009	
Safety of Life Service	accuracy ~1m, compliant to aviation standards	Available since March 2011	
EDAS	accuracy <1m, corrections are provided by terrestrial networks	Available since 2012	

(EDAS: EGNOS Data Access Service)

EGNOS services are being further enhanced

- ★ Full coverage of 28 EU Member States' territory
- ★ EGNOS version 3 with dual (L1/L5) frequencies, also to enable augmentation of Galileo and potentially other GNSS, procurement in 2016, kick-off in 2017
- ★ Subject to conclusion of necessary contracts and agreements, extension of the EGNOS coverage to EU neighbouring countries and regions, including Africa.

(SoL: Safety of life, LPV: Localizer Performance with Vertical guidance)

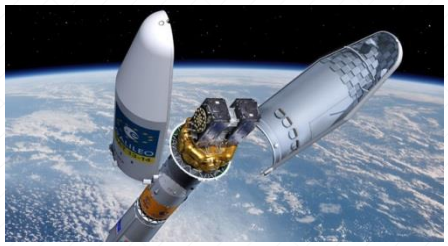

GALILEO

PROGRAMME PRIORITIES

- Deploying the infrastructure
- Providing services as they come on stream
- Establishing Galileo in the market
- Preparation of the future

2016 HIGHLIGHTS FOR GALILEO

- Complete two LAUNCHES of Galileo satellites
- Order of a final BATCH of Galileo SATELLITES
- Select a service OPERATOR
- Continue Galileo Service VALIDATION Campaign + start INITIAL SERVICES
- Contribute with Galileo and EGNOS to the SPACE STRATEGY for Europe
- Prepare strategic goals for Galileo 2nd GENERATION



GALILEO SPACE SEGMENT

FIRST FOUR SATELLITES (IOV) LAUNCHED IN 2011 AND 2012

SATELLITE 5 & 6 ARE RECOVERED AND ON IMPROVED ORBITS

SATELLITE 7 & 8 LAUNCHED ON 27 MARCH 2015

SATELLITE 9 & 10 LAUNCHED ON 11 SEPTEMBER 2015

SATELLITE 11 & 12 LAUNCHED ON 19 DECEMBER 2015

SATELLITE 13 & 14 LAUNCHED ON 24 MAY 2016

30 SATELLITES IN ORBIT BY 2020

Nov. 17 **Ariane 5 • Galileo 15-18**

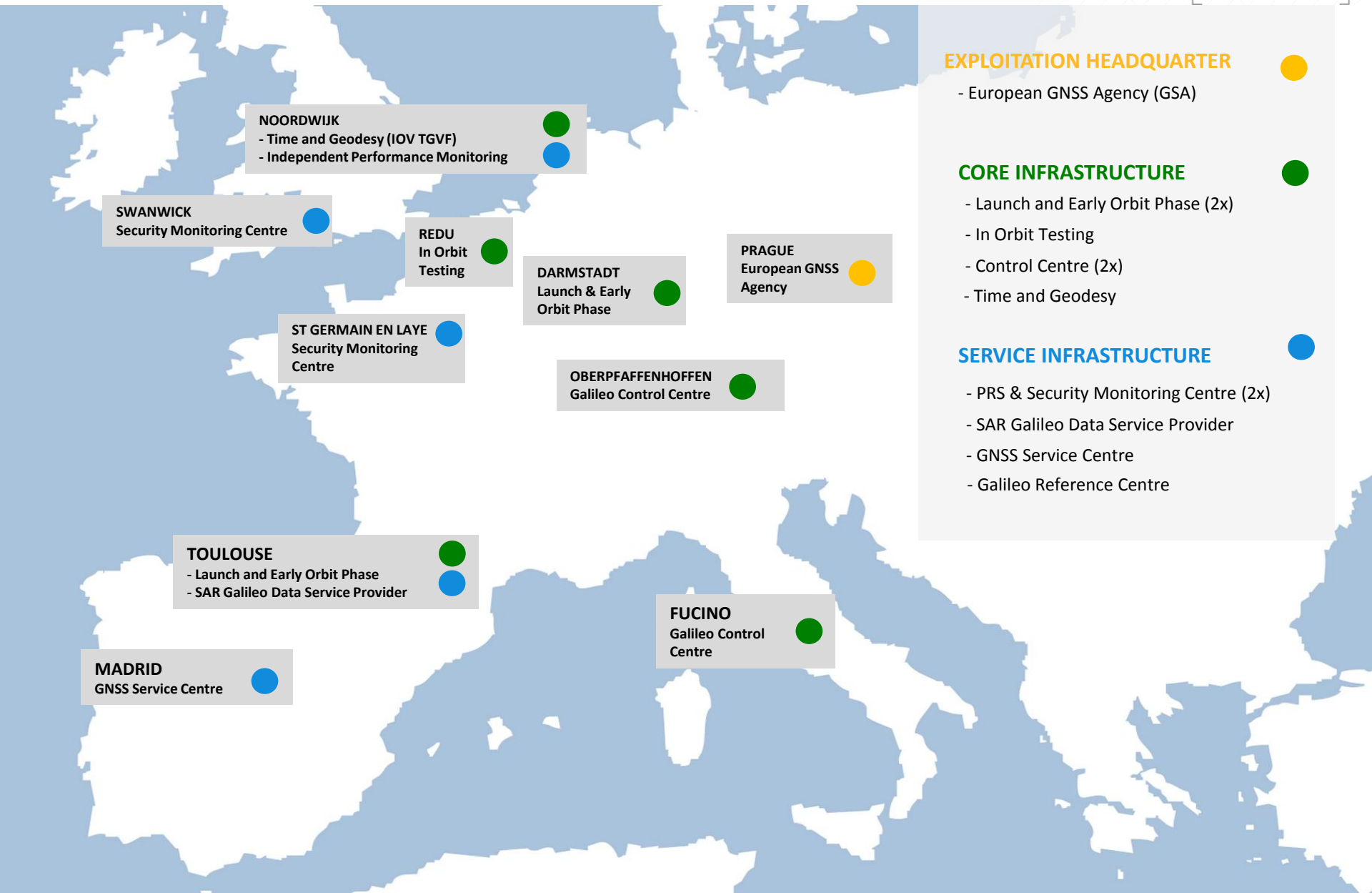
Launch window: TBD

Launch site: ELA-3, Kourou, French Guiana

ARIANE 5

esa
©2016 ESA-CNES-ARIANESPACE / Optique vidéo du CSG - JM GUILLON

GALILEO GROUND INFRASTRUCTURE



EXPLOITATION HEADQUARTER

- European GNSS Agency (GSA)

CORE INFRASTRUCTURE

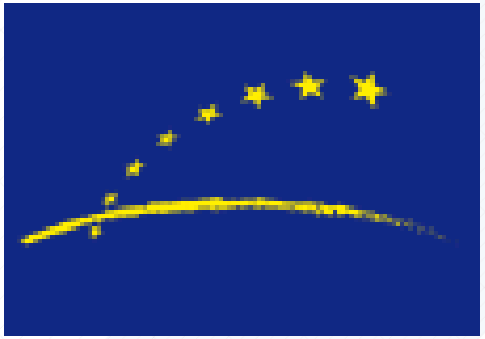
- Launch and Early Orbit Phase (2x)
- In Orbit Testing
- Control Centre (2x)
- Time and Geodesy

SERVICE INFRASTRUCTURE

- PRS & Security Monitoring Centre (2x)
- SAR Galileo Data Service Provider
- GNSS Service Centre
- Galileo Reference Centre

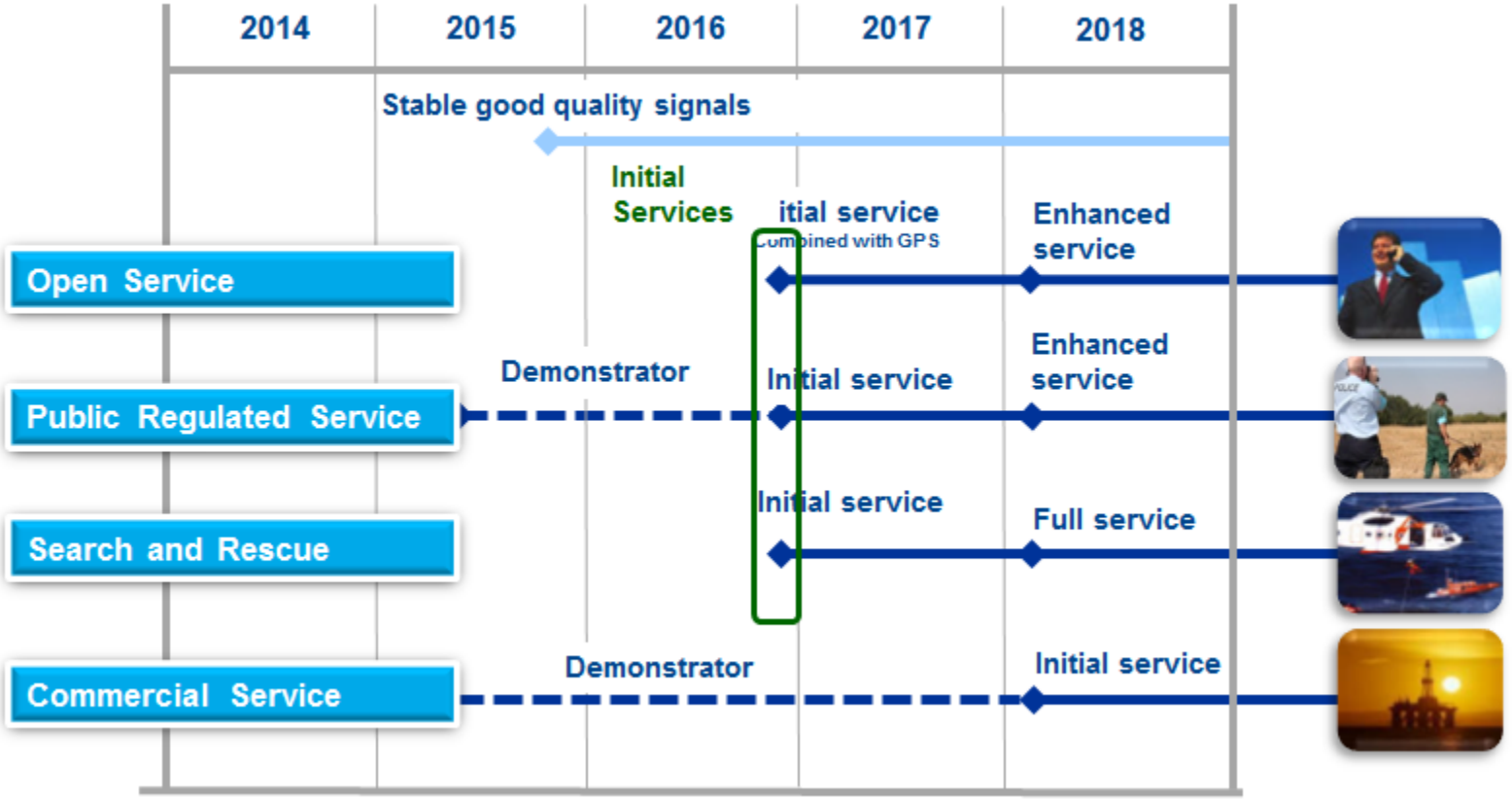
Galileo Service Provision

- Hand over of exploitation phase to the European GNSS Agency (GSA)
- On-going selection of the Galileo Service Operator (GSOp)
  - Contract signature before end 2016
  - Handover of operations by mid 2017
- New GNSS Service Center building in Madrid
  - One-stop shop for Galileo customers
- New Galileo Reference Center in Noordwijk
  - Independent monitoring of Galileo performance based on EU Member States infrastructure and competences



GALILEO INITIAL SERVICES

- Declaration of services will be gradual based on already deployed infrastructure



INITIAL SERVICES

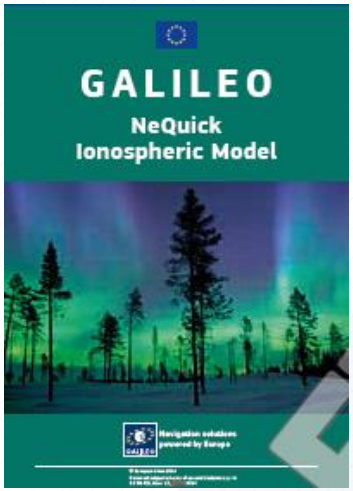
BASED ON AVAILABLE INFRASTRUCTURE IN 2016

OS Navigation	Good ranging signals (Less than 2-3 m, more than 90% availability)	Excellent timing performance , more than 90%
SAR Forward Link	Contribution to COSPAS/SARSAT with shorter detection times (10min) and better localization accuracy	
PRS Access	Good ranging signals – Similar to OS	Manual distribution of keys to PRS participants
Security Monitoring	Centralisation of system security events in GSMC for analysis and reporting	

GALILEO REFERENCE DOCUMENTATION

Galileo Open Service Signal In Space Interface Control Document (OS SIS ICD)

Version 1.2 published
end 2015

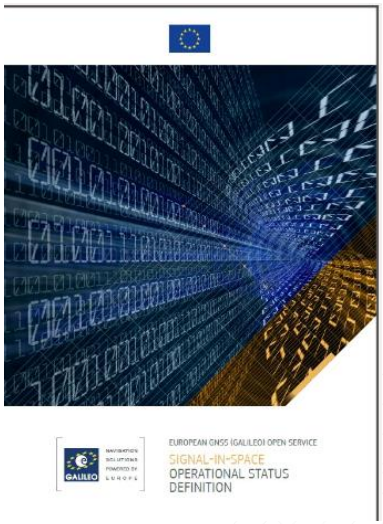


Galileo NeQuick Ionospheric Model

Version 1.2 published
in Sept 2016

Galileo SIS Operational Status Definition

Version 1.1 published in July 2016



Galileo OS Service Definition Document

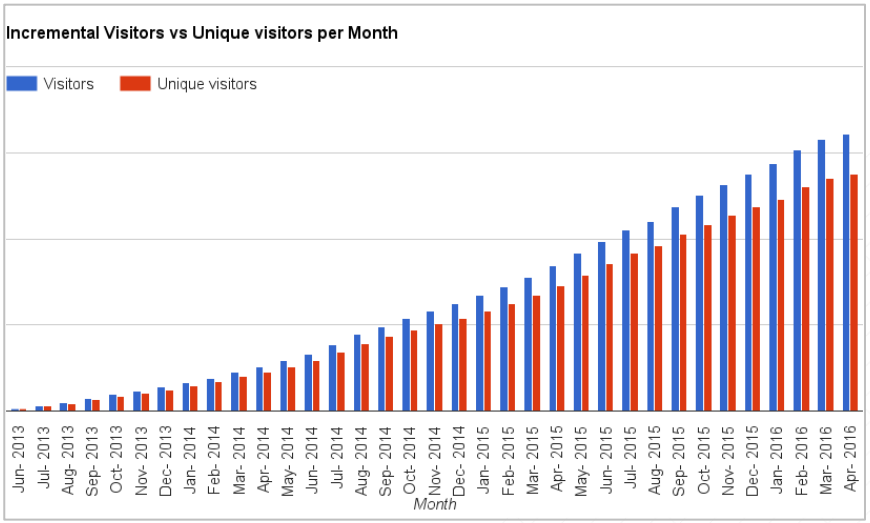
First version in 2016 with Initial Service performance

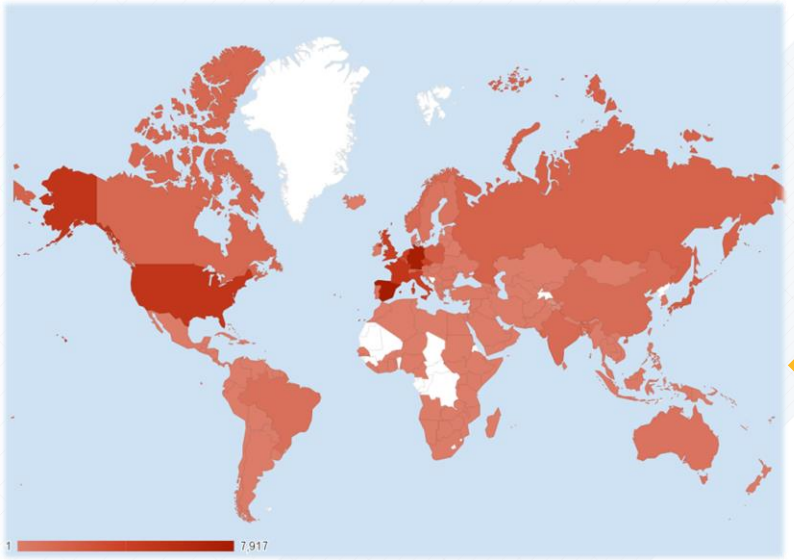
Updated version in 2017-18 with more consolidated FOC performance

GALILEO SERVICE CENTRE USER ADOPTION

Some GSC figures (from 1st Jun 2013 to 15st April 2016):

- More than **71k visits** from **181 different countries**!





- **143** user **requests** handled and **91 NAGUs** published
- **383 registered users** on the GSC web portal

NAGU : Notice Advisory to Galileo Users

REGULATED APPLICATIONS

- Digital Tachograph
  - To register time of driving and rest to comply with road safety legislation
  - Adopted in March 2016
  - Multi-GNSS solution as from 2019

- eCall
  - emergency call device mandatory in all new models of cars in Europe from 2018
  - Multi-GNSS solution

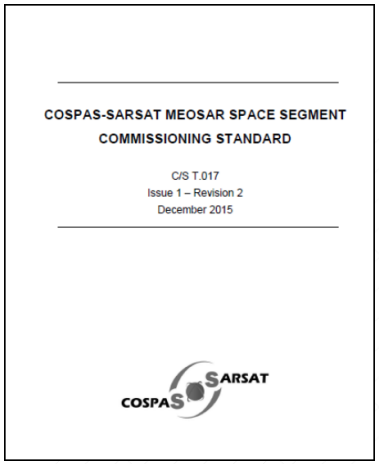
- World Wide Radio Navigation System
  - Recognition of Galileo as WWRNS
  - Maritime and Safety Committee – 11-20 May 2016

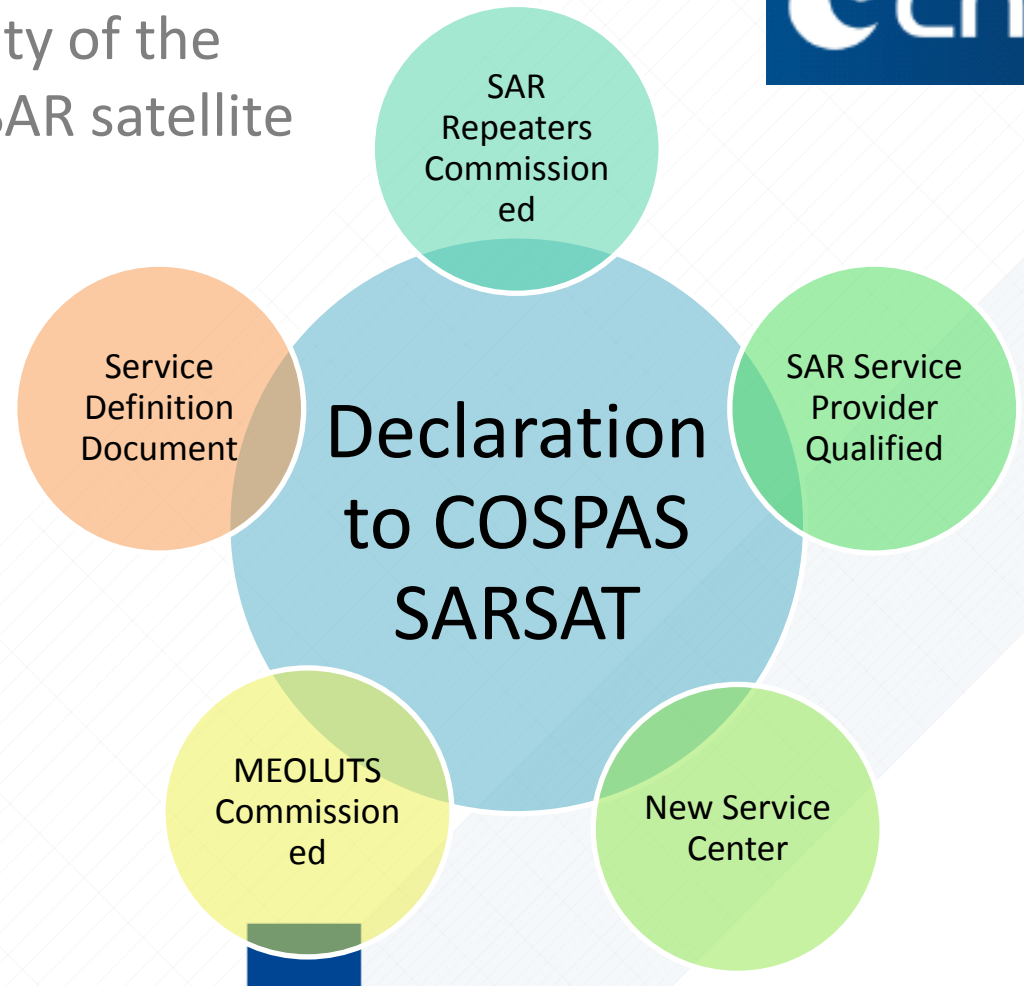
- Use of Galileo in Critical Infrastructures
  - Under analysis for timing and synchronisation

- Use of EGNOS and Galileo to improve safety and performance in automated driving

Search And Rescue

Declaration of Intent between the European Commission and Cospas-Sarsat on the Initial Operational Capability of the Cospas-Sarsat MEOSAR satellite system





COMMERCIAL SERVICE

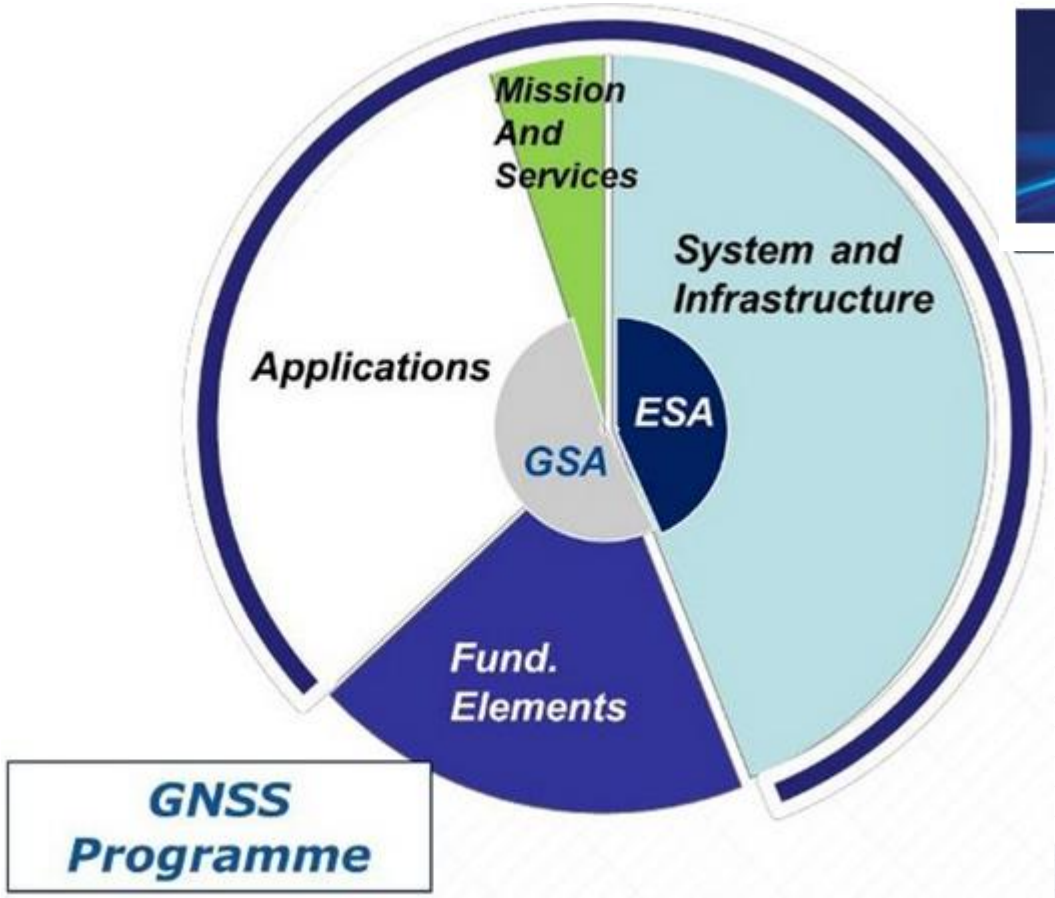
- Implementing Act expected to be approved by End September. Confirms that Galileo will provide **High Accuracy and Authentication**.

- Authentication will be based on a
  - **Navigation Message Authentication:**
    - Integrated in the E1 OS. Aimed at consumer users and offered for free. Already prototyped and under testing
  - **Commercial Service Authentication**: based on the E6 Spreading Code Encryption.

- **High Accuracy** will be based on PPP transmission in E6B

- Gradual implementation **starting from 2018**
  - 2018: First OSNMA SIS transmission (E1) and High Accuracy (E6)
  - FOC: Full OSNMA (E1) and CS (E6).

EVOLUTION - R&D



EVOLUTIONS - ROADMAP

Consult

- Users
- Industrial Stakeholders
- Member States and Institutional actors

2015-2016

Consolidate

- Mission Needs established by EC
- System scenarios established by ESA
- Cost Benefit Analyses conducted by GSA

2016-2017

Decide

- Space Strategy
- Budgetary Authority

2018

Implement

- G2G Design and First launch

FROM 2019

EGNSS in the SPACE STRATEGY FOR EUROPE

- The European Commission is developing a Space Strategy for Europe
- Regarding European GNSS, the main axes are

Deliver reliable and state of the art services matching the user needs

Ensure long term continuity of EGNOS and Galileo services and plan their evolution

Support market uptake

Secure European industrial capacity

INTERNATIONAL

- Continue to improve signal compatibility and service interoperability among GNSS Providers
- Cooperate in view of multi-constellation service provision

Via:

- Bilateral cooperation
- Involvement in multilateral discussions such as ICG
- Cooperation in international standardisation bodies
- Partnership with other SBAS providers for future multiconstellation solutions


Thank You
GALILEO
EGNOS
Navigation solutions powered by the European Union
http://ec.europa.eu/galileo