



European
Global Navigation
Satellite Systems
Agency

GALILEO STATUS

Opportunities for the Timing and Synchronisation
community

Gian-Gherardo Calini, Head of Market
Development

Agenda



GSA introduction and Galileo status



Timing and Synchronisation on-going projects and opportunities

European GNSS Agency (GSA)

GSA is an official EU Regulatory Agency responsible for:

Market Development

- Fostering E-GNSS application and service adoption.
- Managing EU GNSS Receiver/Application R&D.

Security Accreditation

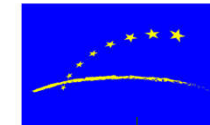
- Ensuring the security accreditation of the system and its operation.

E-GNSS Operations and Service Provision

- Programme operations and service provision for EGNOS as of 2014, Galileo in 2017.
- Provision of system-related information and helpdesk to user communities through the European GNSS Service Centre (GSC).

Security monitoring

- Security Monitoring through the Galileo Security Monitoring Centre (GSMC).



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Staff: 145

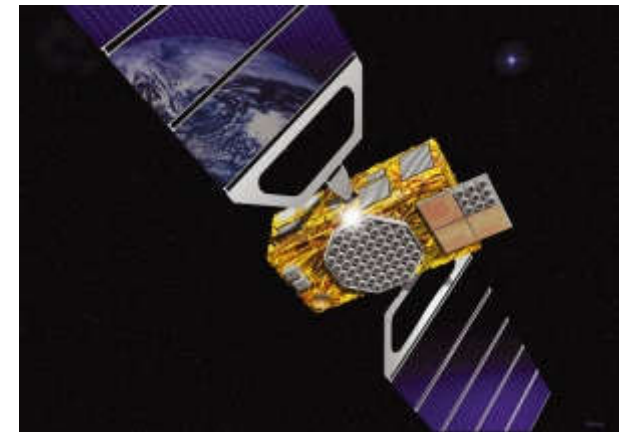
Nationalities: 21

HQ: Prague (CZ)



Galileo System

- European Global Navigation Satellite System (GNSS)
- Composed of a constellation of 24 operational satellites plus 6 spares
- Orbiting at 23 222 km
- **Passive hydrogen maser** clock as master clock
- Rubidium clock as backup



Galileo's implementation is progressing with Initial Services

2 additional satellites launched on 24 May 2016



4 more satellites to be launched by an adapted Ariane 5 launcher in November 2016



Galileo is implemented in a step-wise approach

- **14 satellites** have been launched
- **16 satellites** are in production/being procured:
 - ✓ 4 to be launched in Q4 2016
 - ✓ The remaining ones by 2020

Initial Services

Open Service (OS)
Search and Rescue Service (SAR)
Public Regulated Service (PRS)
and demonstrator for Commercial Service (CS)

2018/2019

Test signal for OS Navigation Message Authentication (OS-NMA)

2020

Full Operational Capability
All services, 30 satellites
An independent civilian infrastructure

Galileo Services are relevant to the Timing Community

- Open Service (**OS**): Position Velocity and **Time** determination free of charge using single or double frequency
- Public Regulated Service (**PRS**): Restricted services for government applications
- Commercial Service (**CS**): High accuracy and Authentication for paying customers
- OS Navigation Message **Authentication** (OS-NMA): Authentication of Signal in Space (SiS) to avoid spoofing



Timing is already available with the Galileo Initial Services

The minimum performances level expected to be published soon in the Initial Services Definition Document (Open Service), are:

Availability

- For each Single Frequency (SF):
 - ≥90% of time, a user is provided at least one healthy SF SiS
- For each Double Frequency (DF) combination:
 - ≥90% of time, a user is provided at least one healthy DF SiS combination

Signal in Space UTC Frequency Dissemination Accuracy

< 3×10^{-13} (95%) over all ages of data

Signal in Space UTC Time Dissemination Accuracy

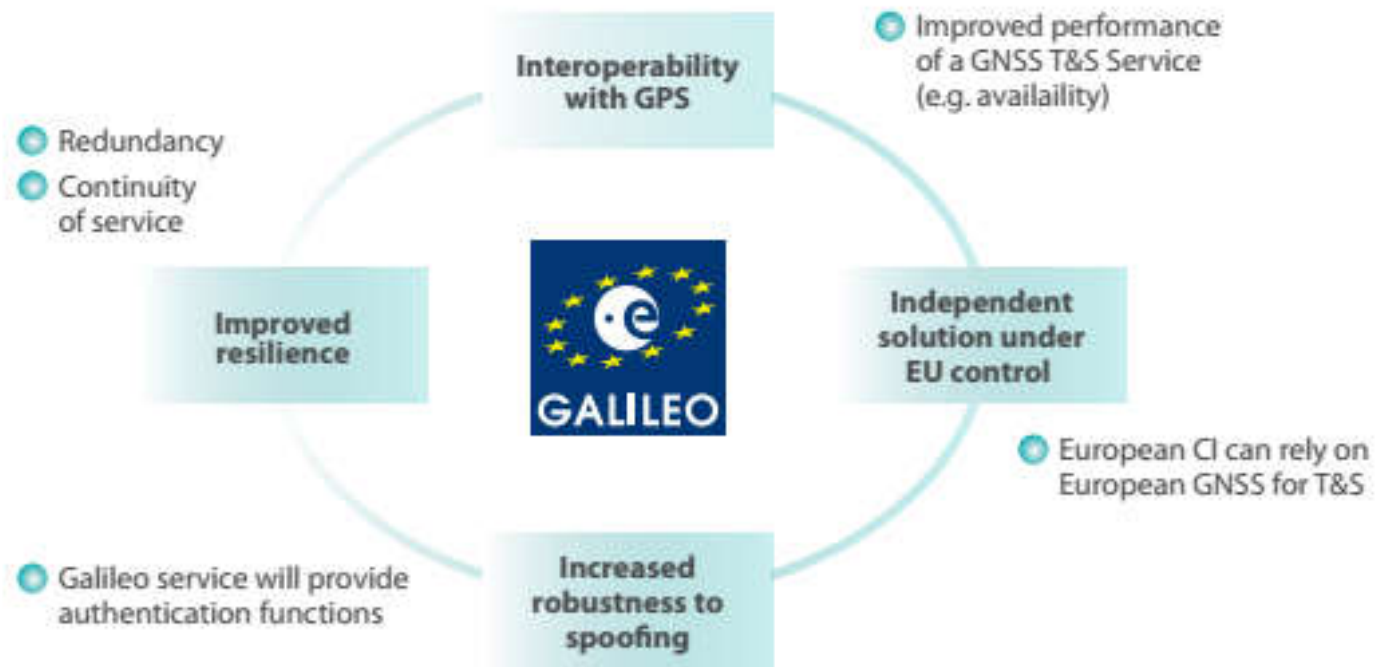
< 30 ns (95%) over all ages of data



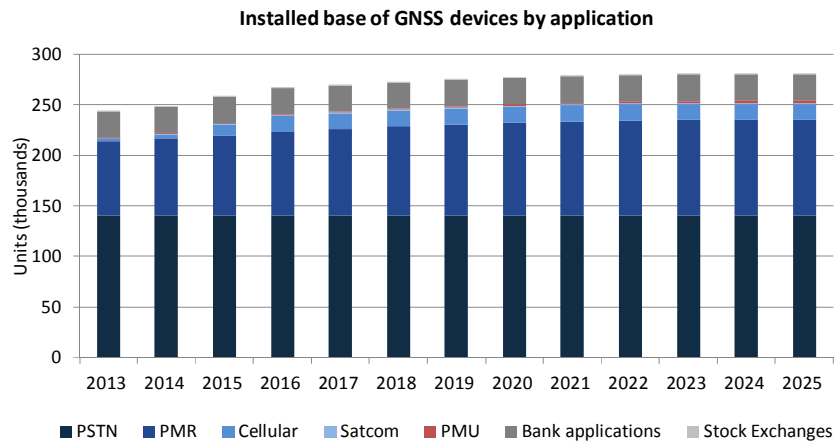
E-GNSS benefits for Timing & Synchronisation

European GNSS can bring benefits to Timing & Synchronisation.

EGNSS differentiators



Overview of the Timing & Synchronisation market



T&S GNSS Market

- **GNSS market mainly driven by the telecom segment** (more than 90% of the overall addressable market). GNSS addressable market for telecommunications is **expected to benefit from the LTE (Long Term Evolution) deployment and PMR (Professional Mobile Radio) network infrastructure** continued growth. PSTN (Public Switched telecom Network) and SATCOM are considered to be mature.
- With the **upgrade of the power distribution network GNSS penetration is expected to reach 10%** in 2017 in this segment.
- **T&S use in financial services is a mature GNSS application.**

In addition to the above mentioned market sub-segments, precise time and synchronisation is increasingly used for **Internet of Things (IoT) and video distribution systems.**



Galileo can contribute to Timing and Synchronisation

- GNSS meets today the accuracy requirements of Power distribution, financial services, current telecommunication technologies (4G), and mass market (IoT) applications: Galileo has the potential to improve the timing robustness with its authentication services.
- New telecommunication technologies such as 5G or DVB will require even better accuracy performances for T&S as demand for higher data rates increases. Galileo will essentially contribute to meet these more demanding accuracy performances.

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Timing and Synchronisation on-going projects and opportunities

DEMETRA H2020 project delivering services to users

H2020 project DEMETRA aims to demonstrate the feasibility of delivering EGNSS improved **9 timing services** to end users by utilising an operational demonstrator and conducting tests with representative pilot applications and real users.



Time Broadcasting over TV/Radio links



Certified Trusted Time Distribution using NTP



Time & Freq. Distribution over Optical Link



Time & Freq. Distribution via GEO Satellite

Alternative timing sources



User GNSS Receiver Calibration



Certified Time Steering



Time Monitoring & Steering



Time Integrity



All-in-one Time Synchronization Solution

Galileo based

Core Infrastructure



Time Service Infrastructure

Opportunities for T&S: Fundamental Elements Project on Timing Receiver

- Fundamental Elements is a Research and Development program to foster Galileo receivers development.
- One project will be soon launched to develop and Galileo Timing receiver:
 - Uses Galileo as primary time solution .
 - Leverages Galileo time differentiators: expected higher accuracy, dual frequency, authentication.
 - Supports a multi-constellation solution for increased resilience.



Opportunities for T&S: The 2017 H2020 Call for Professional Applications

- Opening date: **8th November 2016**
- Deadline **1st March 2017**
- 8 €mln budget



Scope

Fostering application development and adoption with commercial impact in professional market.

Areas

Agriculture, Surveying and Mapping, **Timing & Synchronisation**, Other Professional Applications.

Expected Impact

Development of highly innovative applications taking advantage of EGNSS added value.



The screenshot shows the 'Participant Portal' for 'RESEARCH & INNOVATION' under the 'European Commission'. The main content area displays details for the 'TOPIC: EGNSS professional applications' call. Key information includes: Topic identifier: GALILEO-3-2017; Publication date: 14 October 2015; Types of action: IA Innovation action; DeadlineModel: single-stage; Planned opening date: 08 November 2016; Deadline: 01 March 2017 17:00:00. The page also features a sidebar with 'EU Programmes 2014-2020' and a 'Topic Description' section with a 'Specific Challenge'.



We would like to hear from you

GSA is working to develop the market for the Timing & Synchronisation segment.

- Galileo is an opportunity for the T&S community.
- The identification of specific and future needs of the T&S community will help GSA to address the Research and Development gaps and to shape future evolutions of European GNSS.



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**We invite to download the Technology
Report from the news room in the
GSA web site.**

www.gsa.europa.eu

Thank you

This presentation can be interpreted only together with the oral comment accompanying it.