GALILEO STATUS

Opportunities for the Timing and Synchronisation community

Gian-Gherardo Calini, Head of Market Development
Agenda

1. GSA introduction and Galileo status
2. Timing and Synchronisation on-going projects and opportunities
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).
Galileo System

- European Global Navigation Satellite System (GNSS)
- Composed of a constellation of 24 operational satellites plus 6 spares
- Orbitting at 23,222 km
- Passive hydrogen maser clock as master clock
- Rubidium clock as backup
Galileo’s implementation is progressing with Initial Services

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

Galileo is implemented in a step-wise approach

- **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

2 additional satellites launched on 24 May 2016

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

1. GSA introduction and Galileo status

2. Timing and Synchronisation on-going projects and opportunities
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.

**Alternative timing sources**

- Time Broadcasting over TV/Radio links
- Certified Trusted Time Distribution using NTP
- Time & Freq. Distribution over Optical Link
- Time & Freq. Distribution via GEO Satellite
- User GNSS Receiver Calibration
- Certified Time Steering
- Time Monitoring & Steering
- Time Integrity
- All-in-one Time Synchronization Solution

**Galileo based**

**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.

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

www.gsa.europa.eu

Thank you