European Global Navigation Satellite Systems Agency

GALILEO EGNOS

NAVIGATION SOLUTIONS POWERED BY EUROPE

Update on EGNSS

6TH EUPOS COUNCIL AND TECHNICAL MEETING

ESCALONA ZORITA Eduard
Market Development

Budapest, 30th October 2019

The GSA in a Nutshell

- 202 Staff
- 21 Nationalities

- GSA (Prague)
- **Galileo Security Monitoring Centre (GSMC)**
  St. Germain en Laye, FR
  San Martín de la Vega, ES
- **European GNSS Service Centre (GSC)**
  Torrejón, ES
- **Galileo Reference Centre**
  Noordwijk, NL
- **EGNOS**
  Toulouse, FR
- **Liaison Office**
  Brussels, Be

Delivery of safe and secure satellite services

Provide market development for EGNSS programmes

Stimulate the development of business and companies

The GSA is evolving to EUSPA

A unique know-how of delivering satellite services and reaching the users

Synergies between the different components of the EU Space Programme

The European Parliament and **the European Council** agreed on a **new EU Space Programme Regulation** and enlarge the responsibilities of the GSA

January 2021:
GSA is becoming **the EU Space Programme Agency (EUSPA)**

Copernicus
GovSatCom
Space Situational Awareness (SSA)

Linking Space to User Needs

EGNSS is a European success

1 billion Galileo-enabled smartphones

17 car brands selling EGNOS & Galileo-enabled models

Over 11 million drones shipped in 2018

600+ EGNOS based approach procedures in 330+ airports in 23 EU countries

80% EGNOS OS penetration in maritime receivers' models

The 1st Galileo-enabled beacon introduced by Orolia in 2018

Galileo used in over 40,000 wagons in Germany and Austria for asset management

82% of new tractors in Europe using GNSS to optimize agriculture activities

400,000 GNSS-enabled T&S devices installed worldwide

EGNOS integrated in all mapping devices & Galileo in >50% of receivers' for surveying

More than 2,500 satellites rely on GNSS to navigate in space

Galileo is used today on the majority of professional devices and increasingly many consumer platforms

SONY LG SAMSUNG QUALCOMM BROADCOM lenovo HUAWEI ublox

USEGALILEO.EU

FIND A GALILEO-ENABLED DEVICE TO USE TODAY

Trimble NovAtel intel Leica Geosystems septentrio JAVAD TOPCON spectracom

GSA GNSS Market Report

Comprehensive source of knowledge and information on the dynamic, **global GNSS market**.

The report is published **every two years since 2010.**

Provides **comprehensive, in-depth analysis of global trends**, and the **latest developments** in terms of **shipments, revenues and the installed base of GNSS devices and applications** in key GNSS market segments

The report is free (650.000 downloads in 2017)

GSA GNSS Market Report

User Consultation

User driven E-GNSS

- The interaction with users is essential for the success of E-GNSS
- User needs drive E-GNSS
- During the UCP all available knowledge on user needs shared
- Discussed with industry leaders, users and experts to shape the future of Galileo Services

https://www.euspaceweek.eu/

European Space Week

Leading event for the European Space Programmes

WHERE

Helsinki Congress Paasitorni
Helsinki, Finland

WHEN

Tuesday to Thursday
December 3 to 5, 2019

The Galileo Reference Centre (GRC)

- Perform **independent monitoring** and assessment of service provision
- When feasible, assess the compatibility and **interoperability** between Galileo and other GNSS
- Provide service **performance expertise** to Programme
- Support **investigations** of service **performance** and service degradations
- Archive service performance data over nominal operational lifetime of system
- Integrate **data and products** from EU **Member States**, Norway and Switzerland (MS)

Core Facility

- Situated in the Netherlands
- Stand-alone capabilities

MS Contributions

- Data
- Products
- Expertise

23 organisations from 14 countries

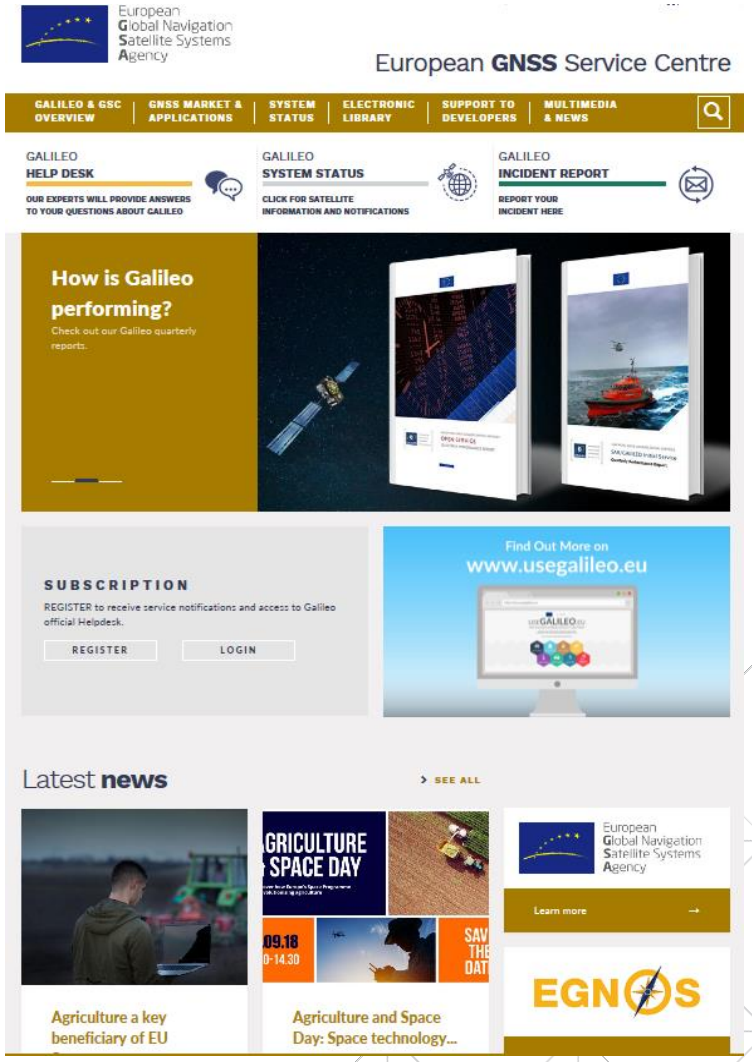
- Worldwide network of reference stations
- Reference products
- Timing labs
- Radio telescopes
- Laser ranging
- Vehicles, vessels and airplanes

The European GNSS Service Centre (GSC)

Single and unique interface with users

GSC Nucleus

- Web portal
- Information on:
  - system status
  - almanacs
  - and user notifications
- Electronic Library
  - Iono Doc, OS SIS OSD, OS SIS ICD, future SDD
- Helpdesk:
  - User queries
  - Galileo incident reporting
- EGNSS Dissemination Platform
- User surveys
- Galileo performance reports



www.gsc-europa.eu

Galileo: the European GNSS

26 | Galileo Initial Services since DEC 2016

- **Freely accessible** service for **positioning, timing** and **navigation message authentication**
- **Encrypted service** designed for **greater robustness** and **higher availability**
- Assists **locating people in distress** and **confirms** that **help is on the way**
- **Freely accessible high accuracy** positioning service
- Authentication service based on the **E6 signal code encryption and OS-NMA**, allowing for **increased robustness of professional applications**

Open Service (OS)

OS-Navigation Message Authentication (OS-NMA)

Public Regulated Service (PRS)

Search and Rescue Service (SAR)

High Accuracy Service (HAS)

Signal Authentication Service (SAS)

High Accuracy Service (HAS)

Commercial Service (CS) intended for broadcast of value added data, such as **high accuracy** and **authentication**

March 2018: EC implementing decision

→ **Galileo High Accuracy Service (HAS) FREE of charge**

- Allow innovation in consolidated and emerging markets.
- Minimize disruption to the current business models of established providers

→ **Galileo will be the first constellation able to provide such High Accuracy service globally**

High Accuracy Service (HAS)

HAS will be based on the provision of accurate satellite data (**clocks, orbits and biases**) and **atmospheric data** (mainly ionospheric corrections) to **enable PPP**

HAS PPP corrections data will be transmitted through an **open format in the Galileo E6B signal**, using 448 bits per satellite per second (also, planned to be available through auxiliary channels)

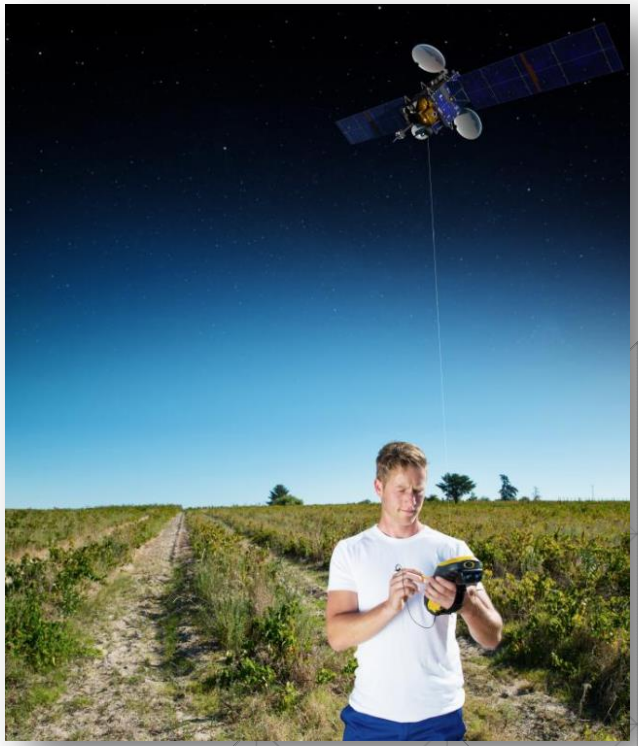
The format is based on **RTCM-CSSR** adapted to the Galileo E6B channel

Multi Constellation (at least Galileo + GPS)

Enabling **GLOBAL** Positioning with **Accuracies**
< 20 cm (H) / 40 cm (V)

Improved Convergence for the **Regional Service**

2 HAS Service Levels:
Global Service Area (SL1)
Regional Service Area (SL2)



The Galileo High Accuracy Service will be gradually rolled out as of 2020

Phase 0

- Validate dissemination capabilities
- HA SIS tests including pre-recorded data
- Leverage lesson learned for following phases

Phase 1

- Use of Galileo System data only (from GSS)
- New facility at GSC re-using CSP interface
- Relaxed performance targets

Phase 2

- Full service provision
- External data use targeted to improve performance

Tests started by mid Feb'19 and continued

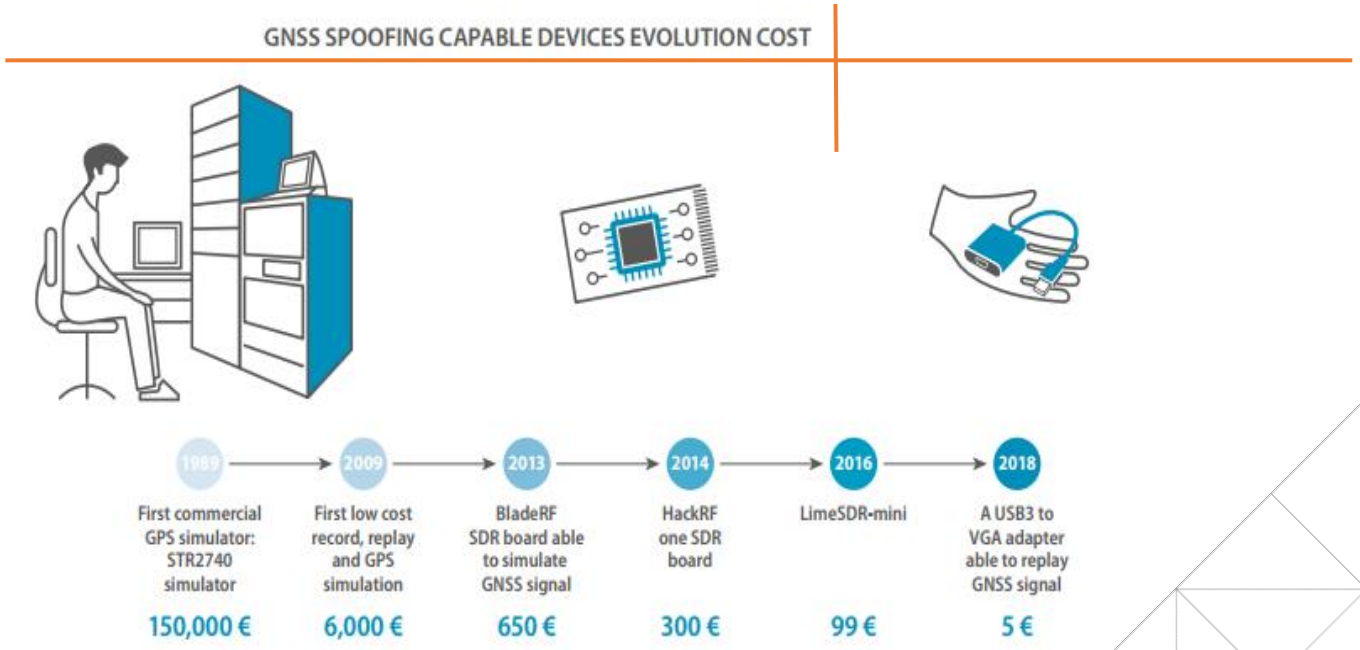
Under procurement
Based on existing infrastructure
By 2021 (signal)
2022 (service)
Not global - relaxed performances

Under design
Global (SL1), full accuracy service, possibly including ionospheric information to improve convergence regionally (SL2)

Spoofing, an emerging threat

The Galileo User Assembly
(Madrid 2017 and Marseille 2018)

The importance of protecting against vulnerabilities was strongly highlighted as a common theme of user demands across all segments



H2020 Strike 3 project

Support the increasing **use of GNSS within safety, security, governmental and regulated applications**

The aim of STRIKE3 was to **develop international standards** in the area of **GNSS threat reporting** and **GNSS receiver testing**

Monitoring stations in **23 countries around the globe**

About **73.000 interferences identified** and classified as major impact on GNSS, whereas **59.000** of these where identified as **jammer signals**

A central data base defined to store the characteristic parameters of the detected interference signals

Six different receivers from four categories such as mass-market, professional, integrated, and timing receivers tested

The draft standards on receiver testing against threats has been generated and issued and can get downloaded from this webpage.

FE: Development of an Advanced Interference Detection and Robustness Capabilities System

Open Procurement

Design, develop the IT infrastructure and **relevant software** for a **worldwide advanced interference detection system**

Run a pre-operational testing phase to verify the functionalities of the system

The purpose of the procurement is to **improve GNSS interference detection capabilities of spectrum management authorities**, which are currently limited (either geographically and in reporting capabilities)

Fundamental Elements

Budget: 3,2 Mil Eur

Deadline: Thursday, January 23, 2020

https://www.gsa.europa.eu/development-advanced-interference-detection-and-robustness-capabilities-system-0

OS-NMA

Ability of the system to **confirm to the users** that they are **utilising navigation data**, which **comes from Galileo satellites** (and not from any other sources).

Contributes to **mitigate GNSS vulnerabilities**

Clear **differentiator w.r.t. other GNSS** available to the civil community

Disseminated on **Galileo E1B,** fully **backward compatible**

Follows crypto standards and recommendations

No need to store secret keys in the GNSS receiver, just **public key**

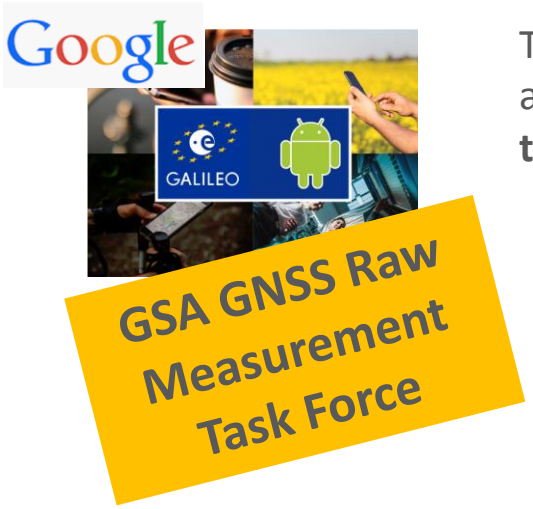
2019: Testing → **2020: Service declaration**

Is a smartphone the next generation of GIS mapping tool?

Android 7+ access to raw GNSS measurements

Dual frequency E1/E5 mass market receivers

Over 1 billion phones with Galileo



To **engage with leading experts** in navigation and positioning, and **boost innovation around this new feature:**

Workshops

White papers

Testing results

Guidelines

Mobile apps are becoming increasingly important in Geomatics

Is a smartphone the next generation of GIS mapping tool?

Android 7+ access to raw GNSS measurements

Dual frequency E1/E5 mass market receivers

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Leads to:

Advanced positioning techniques

Open the door to use of augmentation techniques in smartphones

(3GPP) standardisation of PPP-RTK corrections for assisted data in mobile phones

Sub-meter positioning with the smartphones

Mobile apps are becoming increasingly important in Geomatics

EGNSS R&D Programmes

New projects just awarded

HORIZON 2020

Aims to foster adoption of EGNSS via content and application development and supports the integration of services provided by these programmes into devices and their commercialisation

Fundamental Elements

Fundamental Elements projects focus on fostering the development of innovative Galileo and EGNOS enabled receivers, antennas and chipsets technologies

H2020 GIMS Project

Build and commercialise an **advanced low-cost system based on EGNSS, Copernicus SAR and other in-situ sensors**, like inertial measurement units for the purpose of **monitoring ground deformations** with a focus on landslides and subsidence

- **mm level** accuracies
- **Daily** acquisition rate
- **real-time alerts** in case of sudden movements

New Call: EGNSS market uptake 2020 H2020-SPACE-EGNSS-2020

Opening: 5 November 2019
Deadline: 5 March 2020

Type of Action*	Topic	Indicative budget (EUR mln)	Funding rate	Indirect costs
IA	EGNSS applications fostering green, safe and smart mobility	**10**	**70%** (except for non-profit legal entities, where a rate of 100% applies)	25% of the total eligible costs excluding: • Subcontracting • Costs of resources made available by 3rd parties • Financial support to 3rd parties
IA	EGNSS applications fostering digitisation	**4**		
IA	EGNSS applications fostering societal resilience and protecting the environment	**4**		
PCP	EGNSS applications for public authorities pilot	**3**		

Overall indicative budget: 21,000,000

***IA**: activities aimed at producing plans and arrangements or designs for new, altered or improved products, processes or services

PCP: Pre-Commercial Procurement actions aim to encourage public procurement of research, development and validation of new solutions that can bring significant quality and efficiency improvements in areas of public interest, whilst opening market opportunities for industry and researchers active in Europe. It provides EU funding for a group of procurers ('buyers group') to undertake together one joint PCP procurement, so that there is one joint call for tender, one joint evaluation of offers, and a lead procurer awarding the R&D service contracts in the name and on behalf of the buyers group.

Survey: Galileo Readiness of RTK providers

GSA targets to update the information regarding the status of the readiness of RTK providers for Galileo and to better understand the needs and evolution of the RTK providers

European
Global Navigation
Satellite Systems
Agency

GALILEO EGNOS

NAVIGATION SOLUTIONS
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Questions?

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