

# Galileo Programme UP!-date

*UN ICG*

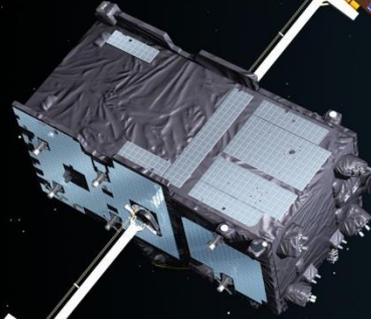
***Dominic HAYES***

*5 November 2018, Xi'an, China*





**GALILEO**



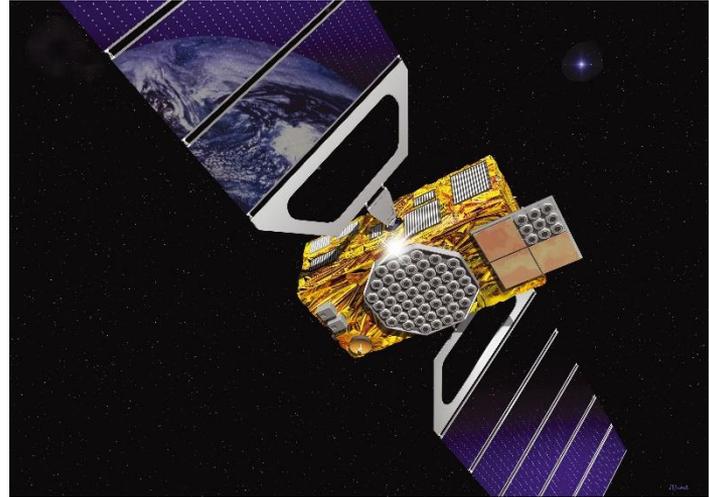
- 1- Infrastructure**
- 2- Services
- 3- Users/Applications



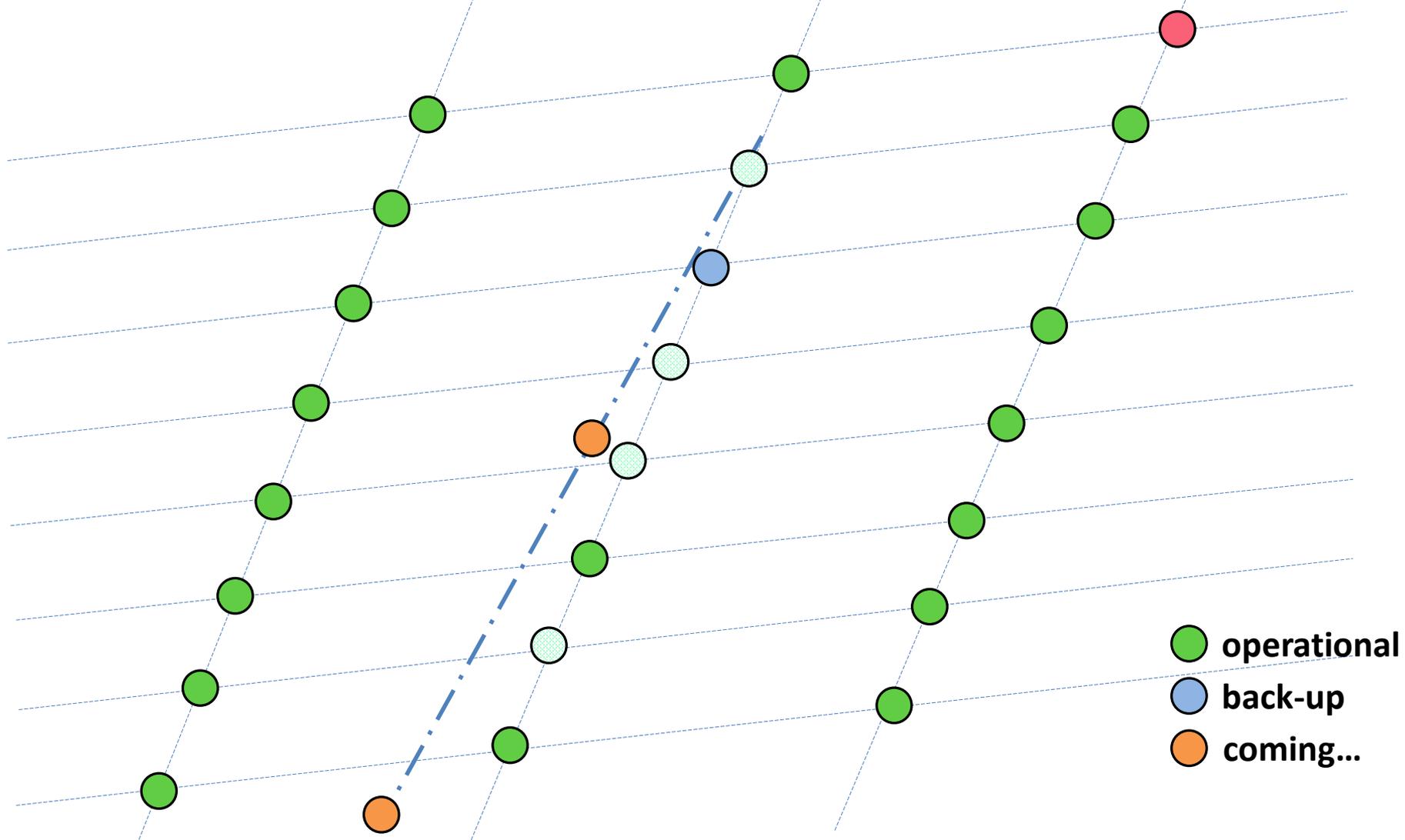


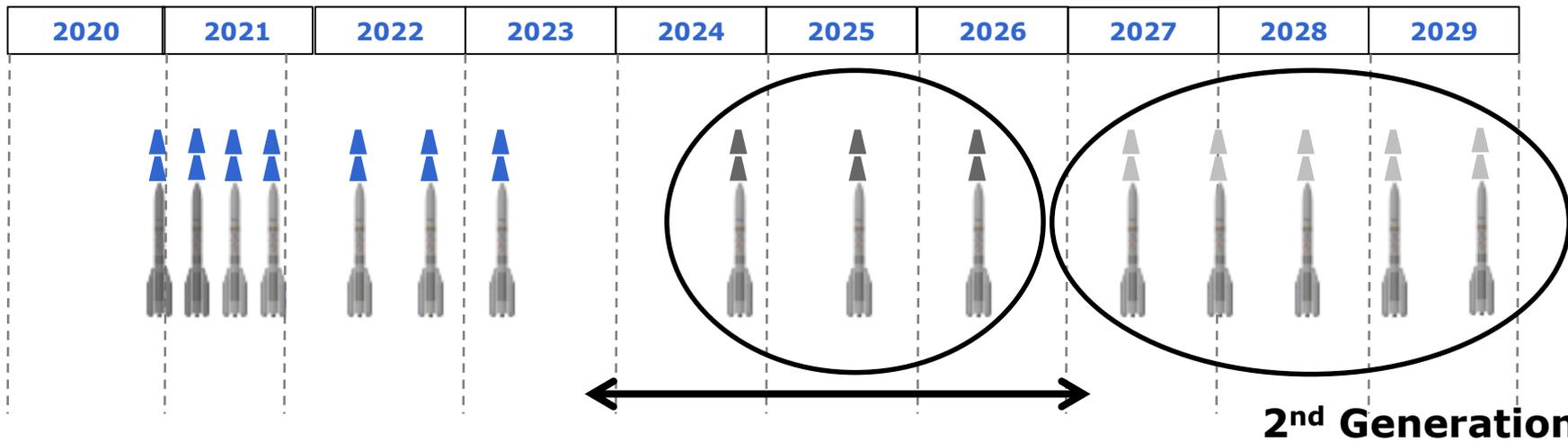
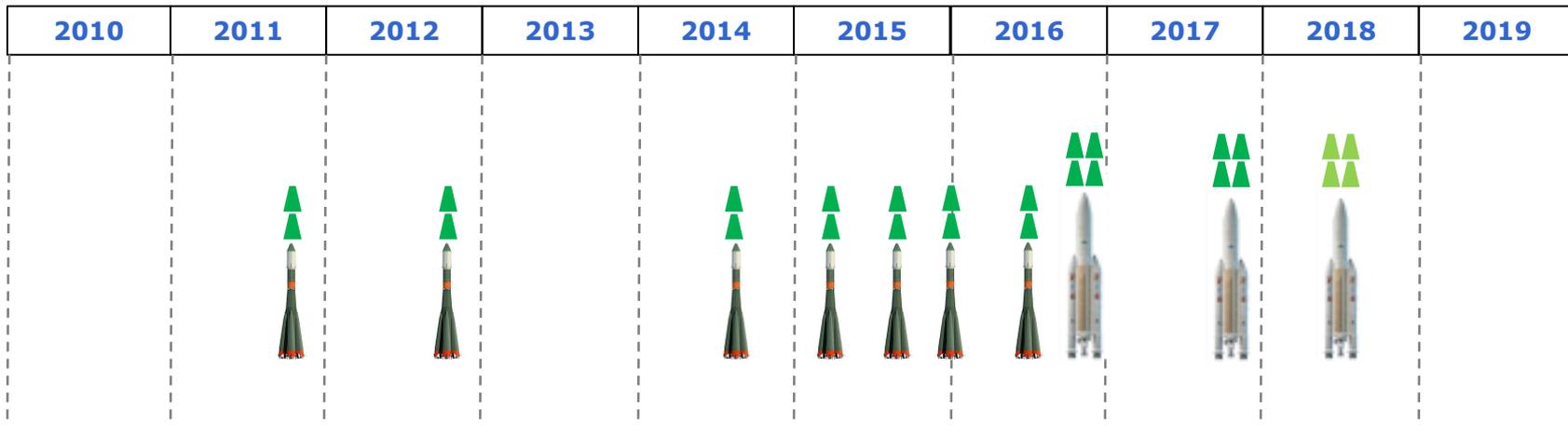
esa  
ariane

26



**All planes now filled**





**"G1G"**  
**First Generation**

**"G2G"**  
**Second Generation**

**flexibility**

... backward compatibility

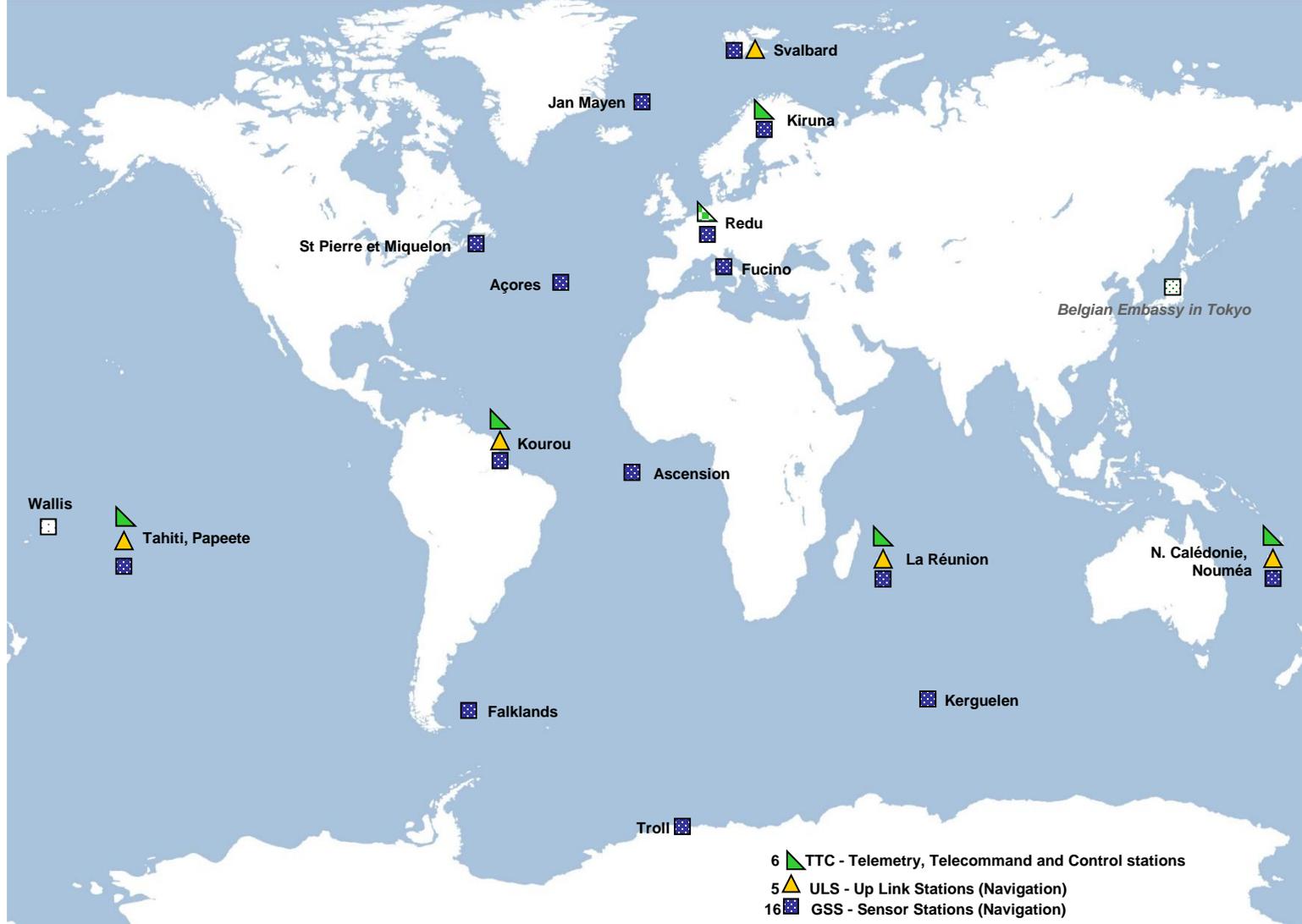


Transition

forward compatibility  
and extensibility...



- Automated operations
- Increased lifetime
- Further secured
- Optimize receivers
- Lower costs
- ...



**NOORDWIJK**

- Time and Geodesy (IOV TGVF)
- Independent Performance Monitoring

**REDU**

In Orbit Testing

**ST GERMAIN EN LAYE**

Security Monitoring Centre

**DARMSTADT**

Launch & Early Orbit Phase

**OBERPFAFFENHOFEN**

Galileo Control Centre

**TOULOUSE**

- Launch and Early Orbit Phase
- SAR Galileo Data Service Provider

**MADRID**

GNSS Service Centre

**MADRID**

Security Monitoring Centre

**FUCINO**

Galileo Control Centre

**PRAGUE**

European GNSS Agency

**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

## PERFORMANCE

### Galileo Reference Centre



### Reference products for OS performance assessment:

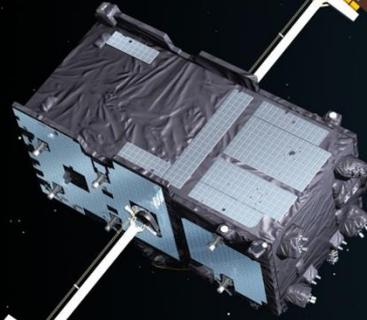
→ Daily/Weekly/Monthly/Quarterly Reports

### Network of EU Member States

→ feed performance monitoring and anomaly analyses

### Performance monitoring for aviation:

→ cooperation with the European Aviation Safety Agency (EASA)



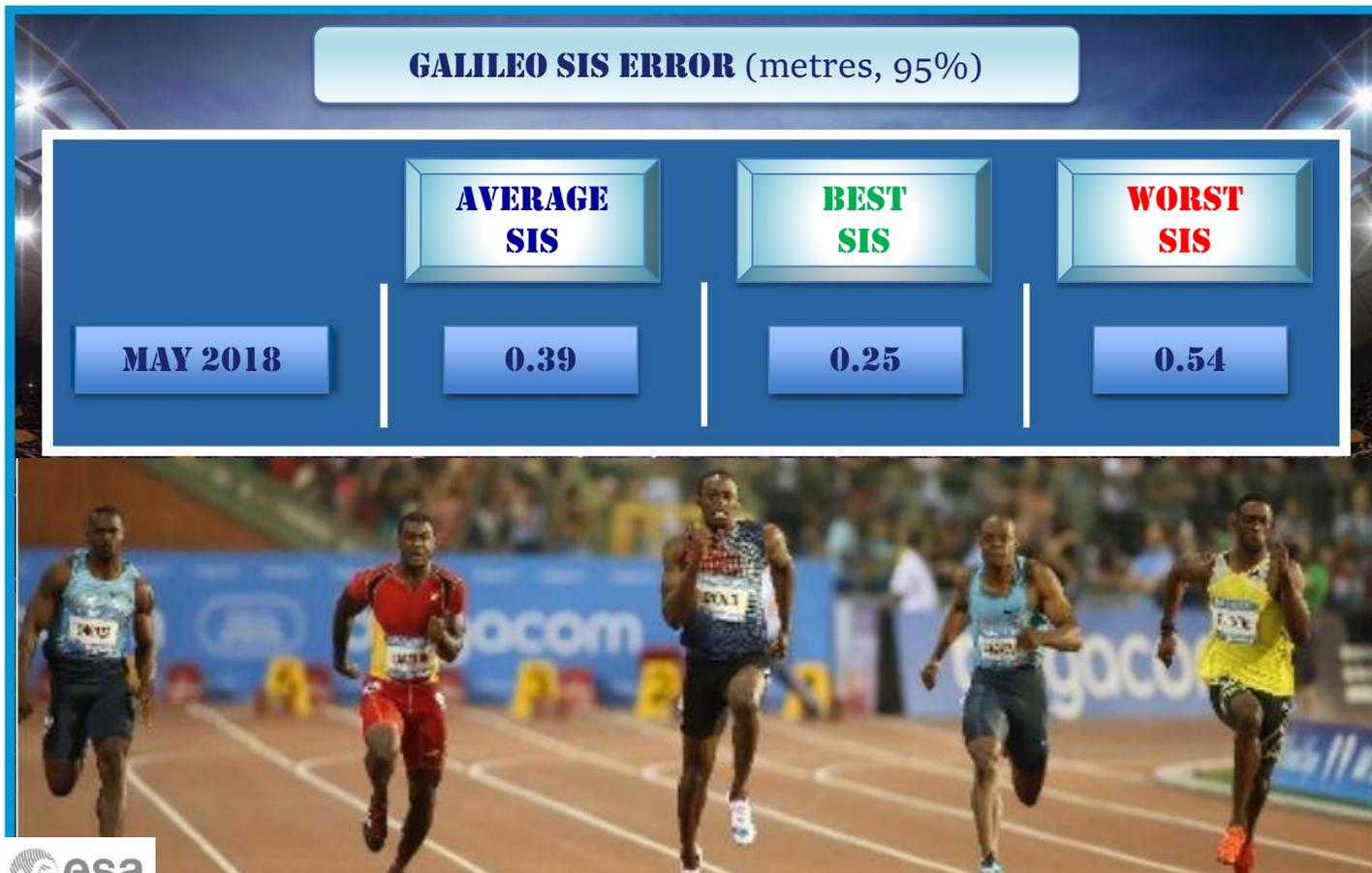
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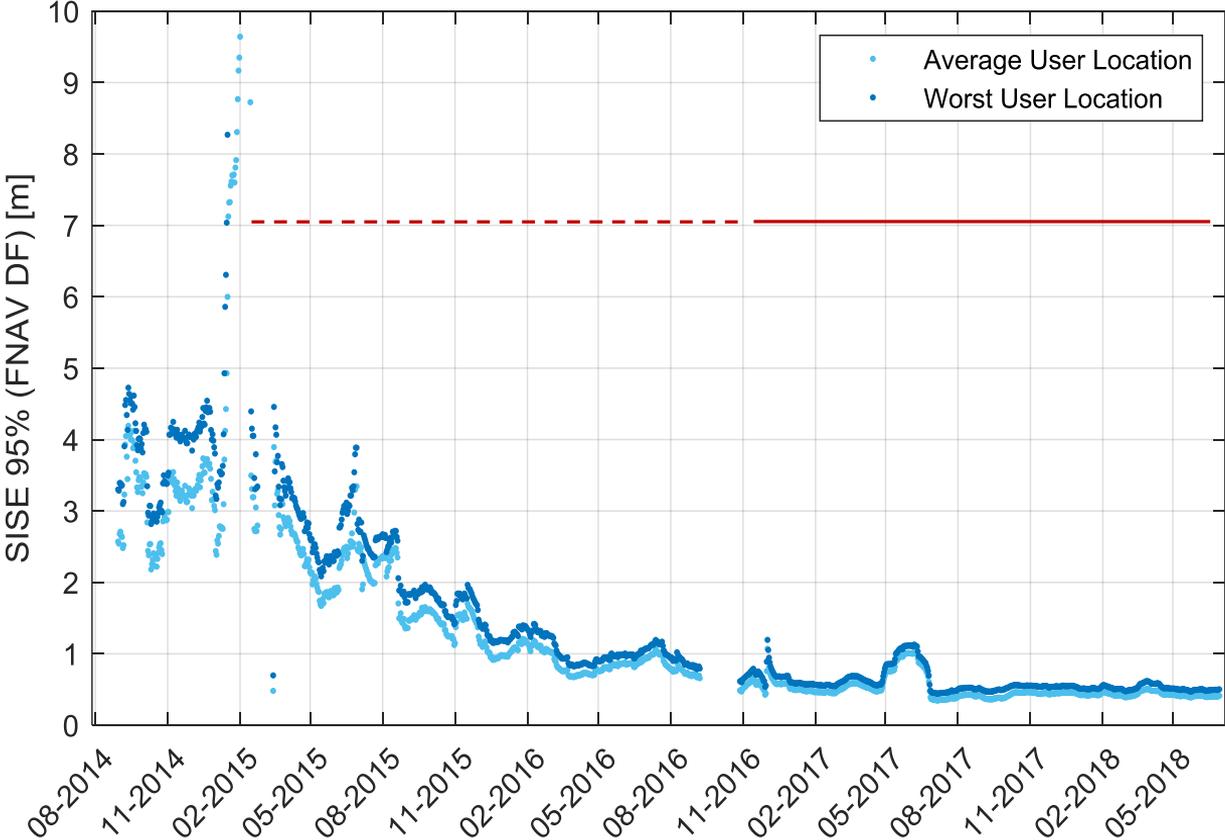
# GALILEO INITIAL SERVICES

2016

# GALILEO: UP AND RUNNING! BUT, HOW ARE WE DOING?



# Ranging performance



 **Initial Services**

# UTC dissemination performance

UTC(SIS)-UTC<sub>r</sub> offset [ns]

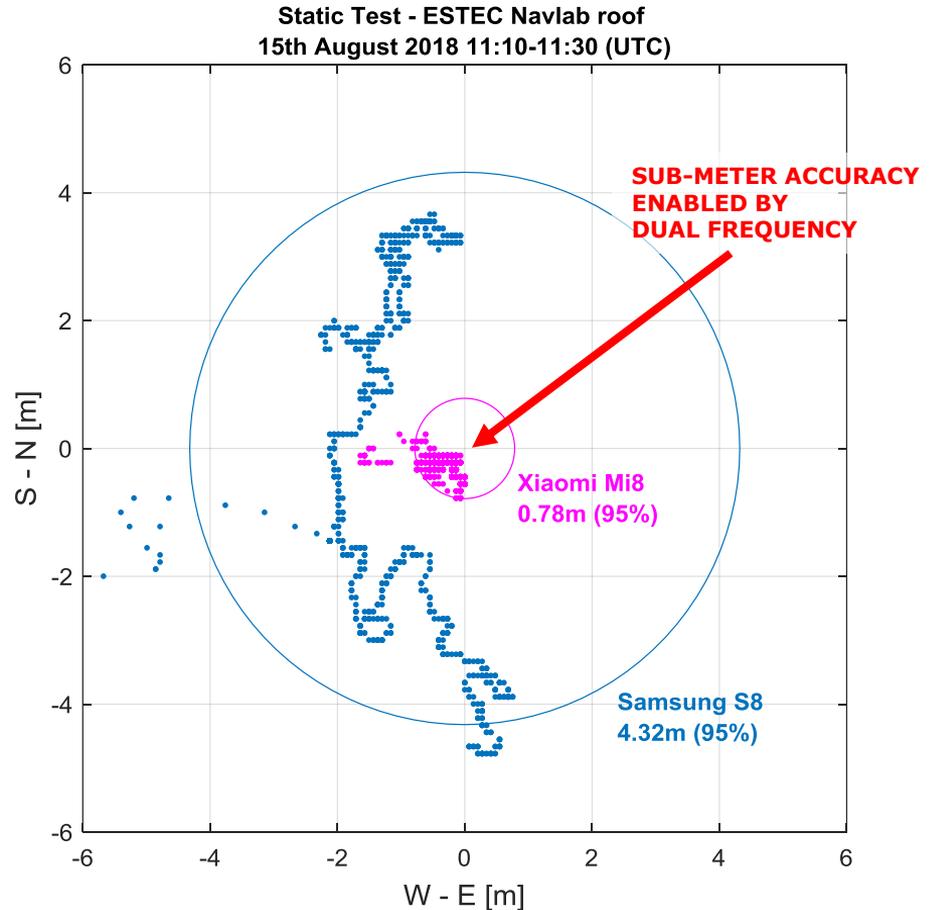


# DUAL FREQUENCY ACCURACY



**Multi-GNSS**  
**GPS+Galileo+GLONASS+BeiDou**

**Dual Frequency solution**



www.gsc-europa.eu



European  
Global Navigation  
Satellite Systems  
Agency

HOME LOGIN REGISTER FAQ



# European GNSS Service Centre



- GALILEO & GSC OVERVIEW
- GNSS MARKET & APPLICATIONS
- SYSTEM STATUS
- ELECTRONIC LIBRARY
- SUPPORT TO DEVELOPERS
- MULTIMEDIA & NEWS



## GALILEO HELP DESK

OUR EXPERTS WILL PROVIDE ANSWERS TO YOUR QUESTIONS ABOUT GALILEO



## GALILEO SYSTEM STATUS

CLICK FOR SATELLITE INFORMATION AND NOTIFICATIONS



## GALILEO INCIDENT REPORT

REPORT YOUR INCIDENT HERE



**How is Galileo performing?**  
Check out our Galileo quarterly reports.



**SUBSCRIPTION**  
REGISTER to receive service notifications and access to Galileo official Helpdesk.

[REGISTER](#) [LOGIN](#)



# IN THE FUTURE...

- **Free of charge high precision: "20 cm"**
  - based on PPP transmission in E6B
  - Gradual introduction  
(coverage, accuracy, convergence time, etc)
  - ICD under final consolidation
- **Free electronic signature: "authentication"**
  - Integrated in "E1 OS"
  - Aimed at mass market users
  - Testing from mid-2019
- **Search and Rescue: "acknowledgment"**
  - Testing with beacon manufacturers in 2019

# SPACE WEATHER...

## Space weather: special relevance for GNSS

→ user need for prediction capabilities

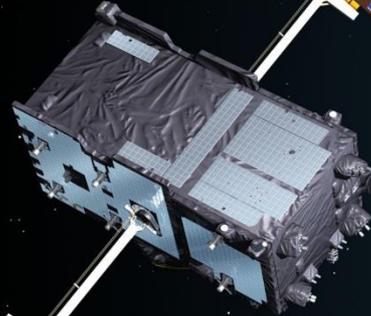


## Prototype prediction service developed

- Tailored products for various users
- On-demand notifications
- Added value service using scientific network data
- Demonstration capability available NOW !!!



ACCESS TO THE PORTAL  
[HTTP://IPS.GSC-EUROPA.EU](http://ips.gsc-europa.eu)



- 1- Infrastructure
- 2- Services
- 3- Users/Applications**

2010

# RECEIVERS



## BQ Aquaris X5

July 2016



## Sony

## iPhone



2018 95+% of global suppliers



## Samsung

## Huawei



## Xiaomi Mi8

May 2018

## Dual Frequency

# ADOPTION



# HIGHWAY



**400+ million smartphones**



**EU Legislation**

- eCall
- Digital Tachograph
- E112



**Timing  
(critical infrastructure)**



**50% of RTK networks**





# USE GALILEO.EU

FIND A GALILEO-ENABLED DEVICE TO USE TODAY

Galileo is Europe's Global Satellite Navigation System (GNSS), providing users with improved positioning and timing information.

*Click on the icons to find Galileo-enabled devices.*



Galileo has been operational since December 2016. Today European satellites are providing more and more users with global positioning, navigation and timing information. Forward-looking companies understand the benefits that Galileo brings and are introducing products with Galileo-enabled receivers, chipsets, devices and modules – many of which are on the market now!

This tool helps you keep track of Galileo-enabled devices as they become available. For more information on Galileo System status, contact [the European GNSS Service Centre \(GSC\) helpdesk](#).



European  
Global Navigation  
Satellite Systems  
Agency



# USERS AT THE CENTRE

## User Consultation Platform

Requirements published for:

- Aviation,
- Rail,
- Road,
- Maritime,
- Agriculture ,
- Time and Synchronisation,
- LBS and Surveying

## Galileo Annual Assembly

- Look back on service delivery
- Look ahead on plans



# Playing in the Global Symphony of GNSS

**Continuous involvement in multilateral discussions in UN-ICG**

→ Contribution to performance monitoring (IGMA initiative)

**Extensive bi-lateral cooperations:**

→ Deliver best multi-constellation services

**Adopting compatible solutions for innovative services:**

→ Search and Rescue Return Link

→ Advanced Receiver Autonomous Monitoring for Safety of Life

→ Emergency Warning Services

→ Authentication

→ Dual Frequency / Multi Constellation SBAS

**Protecting GNSS Spectrum**

**Increasing GNSS Resilience**

**Cooperating in international standardisation bodies**



# HIGHLIGHTS

- **3 quad launches:** most recent, Ariane-5, July 2018
- **satellites in orbit:** 26
- **Service performance:** well beyond expectation
- **12 (+2) subsequent satellites:** new procurement initiated
- **20 [cm] High Accuracy:** re-baselined
- **Emergency Warning Service:** under definition
- **User Consultation Platform:** initiated
- **2<sup>nd</sup> generation:** definition and decision process