

European
Global Navigation
Satellite Systems
Agency



EGNOS

NAVIGATION SOLUTIONS
POWERED BY EUROPE

Introduction to Galileo PRS service

Sweden webinar on GNSS – Interference/jamming/spoofing and security

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Role of GSA



- GSA is operating the EGNSS infrastructure, ground and space segments, to deliver reliable signals and associated navigation services, therefore contributing to
 - EU Independence and sovereignty
 - Safety of its citizens
 - EU Economic growth
- GSA website and the Galileo Service Centre (GSC) website contain unclassified information about the Galileo services in particular:
 - GNSS market study report available the “GNSS applications” folder
 - GSA Administrative Board presentations

EGNSS SERVICE REQUIREMENTS



- **AVAILABILITY:** *The percentage of time the position, navigation or timing solution can be computed by the user. Values vary greatly according to the specific application and services used, but typically range from 95-99.9%.*
- **ACCURACY:** *The difference between true and computed solution (position or time).*
- **CONTINUITY:** *Ability to provide the required performances during an operation without interruption once the operation has started.*
- **INTEGRITY:** *The measure of trust that can be placed in the correctness of the position or time estimate provided by the receiver.*
- **TIME TO FIRST FIX (TTFF):** *A measure of a receiver's performance covering the time between activation and output of a position within the required accuracy bounds.*
- **ROBUSTNESS TO SPOOFING AND JAMMING:** *A qualitative rather than quantitative parameter that depends on the type of attack or interference the receiver is capable of mitigating.*
- **AUTHENTICATION:** *The ability of the system to assure the users that they are utilizing signals and/or data from a trustworthy source, and thus protecting sensitive applications from spoofing threats*

EUROPEAN GNSS SERVICES



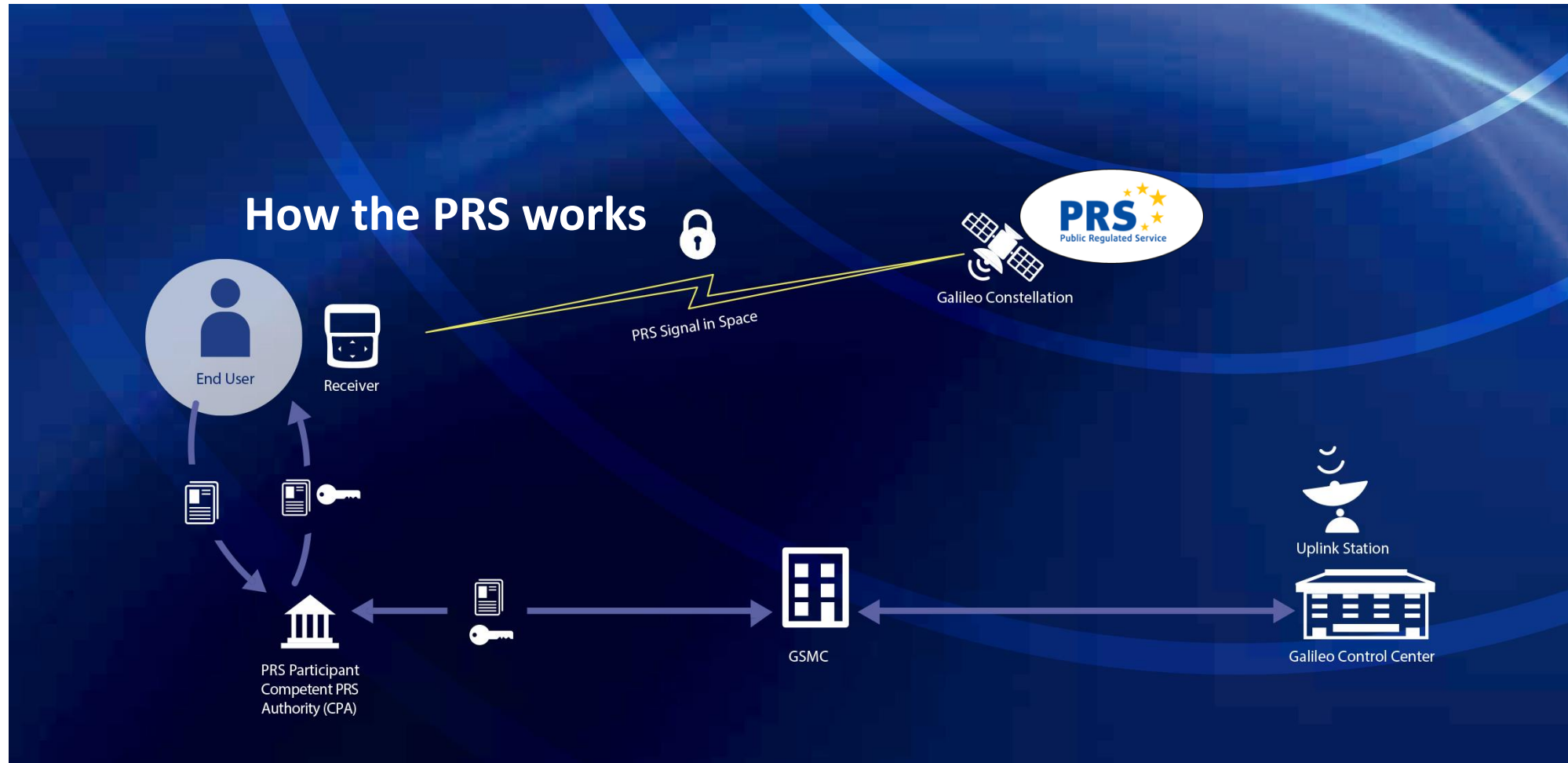
- On Galileo, 6 identified services:
 - Open Service (OS)
 - Public Regulated Service (PRS)
 - Open Service navigation Message Authentication (OSNMA)
 - High Accuracy Service (HAS)
 - Commercial Authentication Service (CAS)
 - Search and Rescue (SAR)
- On EGNOS, 3 services
 - Safety Of Life (SOL)
 - Open Service (OS)
 - EGNOS Data Service (EDAS)

OPEN SERVICE (OS)



- Double frequency E1 and E5 (E5a/E5b)
- Ephemeris and almanac of the Galileo satellites in OS messages
- Initial Service phase today, FOC planned in 2023
- For all types of users, and with processing of signals already present on billions of smartphones
- excellent performances, constellation average ranging accuracy below 45 cm (single frequency) and 22 cm (double frequency) and availability of positioning above 99.5% at worst user location
- Signal not encrypted

PUBLIC REGULATED SERVICE (PRS)

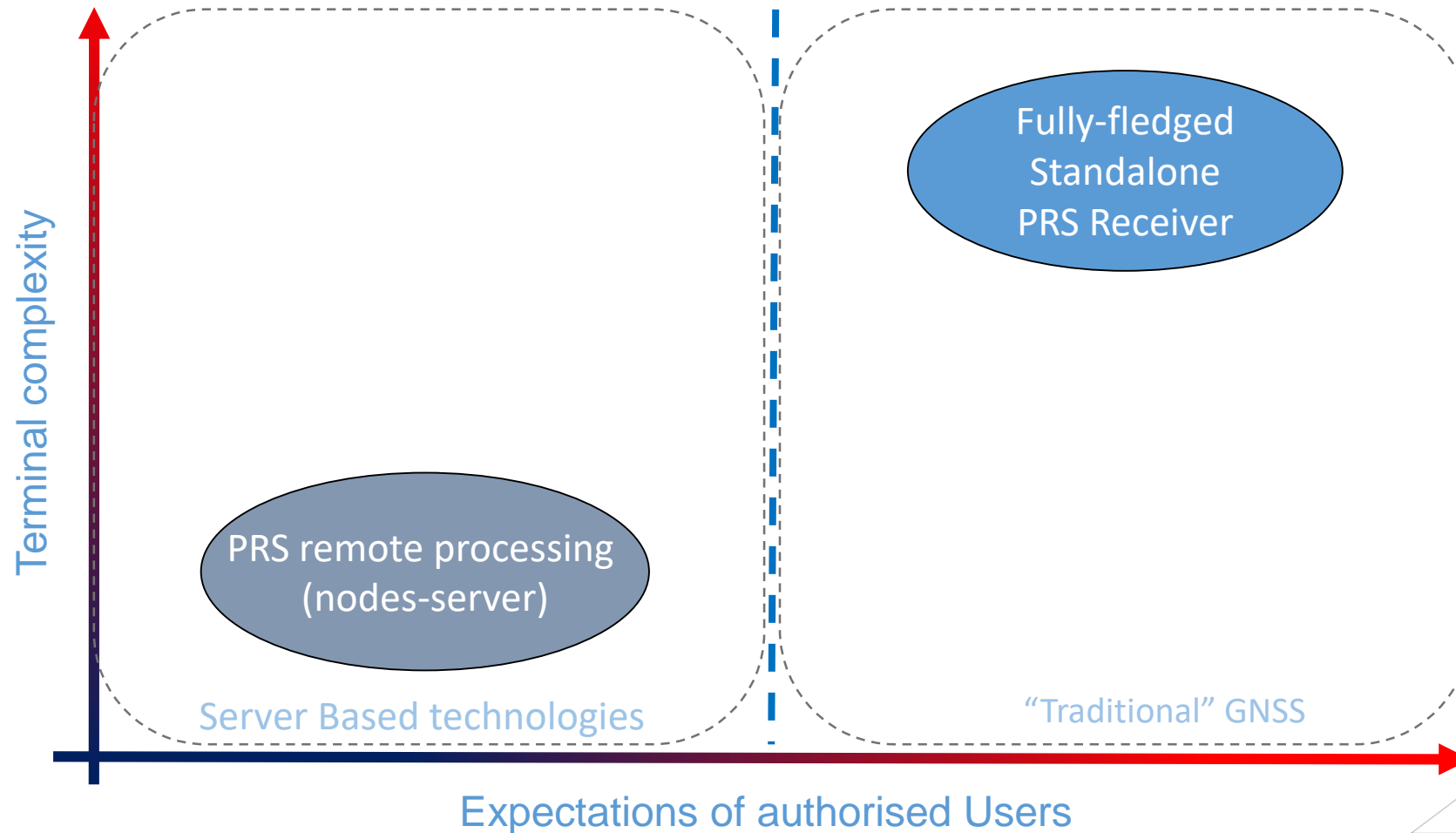


PUBLIC REGULATED SERVICE (PRS)



- Double frequency E1 and E6
- Ephemeris and almanac of the Galileo satellites in PRS navigation messages
- Initial Service phase since 2016, IOC in 2023 and FOC in 2024
- Targeted to Governmental users via Competent PRS Authorities
- Excellent performances, following by close the OS performances
- Encrypted Signal In Space messages for highest robustness
 - Robustness to spoofing with high security protection of all exchanges (key)
 - PRS Receivers contains a Security Module (SM)
- PRS ensures continuity of service to authorised users when access to other navigation services is denied
- Joint test Activity campaign (JTA) with almost all active CPA with the aim to support the awareness of PRS Use and the investments in PRS

PRS USER EQUIPMENT: 2 APPROACHES



P3RS2 - COUNCIL APPROVED



P3RS2, performed under GSA contract, has developed ***the first pre-operational PRS receiver***, which is ***approved by the European Council***.



OPEN SERVICE NAVIGATION MESSAGE AUTHENTICATION (OSNMA)



- will allow users to verify that a navigation message comes from a Galileo satellite and not from a potentially malicious source
- Authentication based on asymmetrical crypto protocol transmitted in E1b and a public key
- Internal test signal phase planned soon

HIGH ACCURACY SERVICE (HAS)



- to be provided on E6 signal
- by additional terrestrial stations helping to compute more precisely the ephemeris and almanach of the Galileo satellites
- foresee to provide a target accuracy of 20 centimeters
- No signal encryption

COMMERCIAL AUTHENTICATION SERVICE (CAS)



- To be provided on E6 signal
- Authentication by decrypting the codes of the encrypted signals (E6C) using a private key
 - more robustness for users compared to OSNMA
 - more difficult to implement this service as well
- CAS Service Concept Review planned soon

SEARCH AND RESCUE SERVICE (SAR)



- COSPAS-SARSAT is the SAR service provider
- Galileo contributes to a SAR service and Return link
 - Industry under direct EC contract
- No signal encryption

EGNOS SBAS SERVICES: SOL, OS, EDAS



- SOL SAFETY OF LIFE Service
 - Augmentation of GPS and later of Galileo (version 3.0 in development) via geo-stationary satellite
 - Declared and operational since 2011
 - Integrity (6 sec alarm message if augmentation is outside accuracy limits)
 - For aviation originally
 - No signal encryption
- OPEN SERVICE
 - OS declared since 2009
- EGNOS DATA SERVICE (EDAS)
 - Delivery of SOL via ground means (data server)
 - Service declared in 2012
 - Post-processing applications (like transport of dangerous goods)

Linking space to user needs



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