User Consultation Platform 2020

Geomatics and Urban Planning Session

Eduard ESCALONA, European GNSS Agency (GSA)

December 1st, 2020

Organised by: Under the auspices of: EU Space Programme:
User Requirements
Clarifications on user requirements
User Requirements

Authentication
User requirements related to PNT Vulnerabilities

Authentication

Gives a level of assurance that the data provided by a positioning system has been **derived from real signals**

Radio frequency spoofing may affect the positioning system resulting in **false data as output of the system itself**
Why is Authentication needed?

GNSS is known to be vulnerable to jamming and spoofing

➢ Service disruption or denial incidents are more and more frequently observed
➢ Potentially severe consequences, especially for safety or liability critical applications

The role of authentication is to detect spoofing events
➢ Thus to avoid or mitigate their consequences
User requirements related to PNT Vulnerabilities

Jamming

Jamming is a synonym for intentional interference, which is the deliberate radiation of electromagnetic signals at GNSS frequencies.

Hereby, the aim is to overpower GNSS signals so that they cannot be acquired and tracked anymore by the GNSS receiver.
What is OS-NMA and how does it work?

OS-NMA is a data authentication function

➢ Worldwide, Free of charge, with no impact on OS performance or on existing receivers (backward compatible).

Based on transmission of cryptographic material in previously reserved fields on the I/NAV message on the E1B signal component

➢ Only OS-NMA ready receivers can decode these fields and authenticate the Galileo navigation data

Technical requirements
(i) Continuous E1B tracking
(ii) Availability of a trustable knowledge of time
(iii) Capability to store and ensure the integrity of a public key
OS-NMA Roadmap

You are all invited!

<table>
<thead>
<tr>
<th>PUBLIC NOTE</th>
<th>OS-NMA INFO NOTE v1.0</th>
<th>OS-NMA INFO NOTE v1.1</th>
<th>OS-NMA INFO NOTE v2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECHNICAL BASELINE</td>
<td>USER ICD, RX GUIDELINES FOR PUBLIC TESTING—AS DESIGNED</td>
<td>USER ICD, RX GUIDELINES FOR PUBLIC TESTING PUBLISHED</td>
<td>OS-NMA USER ICD, Rx GUIDELINES, SERVICE DEFINITION PUBLISHED</td>
</tr>
<tr>
<td>OBJECTIVE</td>
<td>SYSTEM READINESS OPERATIONS READINESS</td>
<td>(I) USERS FEEDBACKS (II) SUPPORT MARKET AND PRODUCTS DEVELOPMENT (III) FINE TUNING (UPSTREAM AND DOWNSTREAM)</td>
<td>BENEFIT FOR USERS AND SOCIETY</td>
</tr>
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User Requirements

High Accuracy Service
# Galileo HAS main characteristics

<table>
<thead>
<tr>
<th>HAS</th>
<th>SERVICE LEVEL 1</th>
<th>SERVICE LEVEL 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>COVERAGE</td>
<td>Global</td>
<td>European Coverage Area (ECA)</td>
</tr>
<tr>
<td>TYPE OF CORRECTIONS</td>
<td>PPP - orbit, clock, biases (code and phase)</td>
<td>PPP - orbit, clock, biases (code and phase incl. atmospheric corrections)</td>
</tr>
<tr>
<td>FORMAT OF CORRECTIONS</td>
<td>Open format similar to Compact-SSR (CSSR)</td>
<td>Open format similar to Compact-SSR (CSSR)</td>
</tr>
<tr>
<td>DISSEMINATION OF CORRECTIONS</td>
<td>Galileo E6B using 448 bits per satellite per second / terrestrial (internet)</td>
<td>Galileo E6B using 448 bits per satellite per second / terrestrial (internet)</td>
</tr>
<tr>
<td>SUPPORTED CONSTELLATIONS</td>
<td>Galileo, GPS</td>
<td>Galileo, GPS</td>
</tr>
<tr>
<td>SUPPORTED FREQUENCIES</td>
<td>E1/E5a/E5b/E6; E5 AltBOC L1/L5; L2C</td>
<td>E1/E5a/E5b/E6; E5 AltBOC L1/L5; L2C</td>
</tr>
<tr>
<td>HORIZONTAL ACCURACY 95%</td>
<td>&lt;20 cm</td>
<td>&lt;20 cm</td>
</tr>
<tr>
<td>VERTICAL ACCURACY 95%</td>
<td>&lt;40 cm</td>
<td>&lt;40 cm</td>
</tr>
<tr>
<td>CONVERGENCE TIME</td>
<td>&lt;300 s</td>
<td>&lt;100 s</td>
</tr>
<tr>
<td>AVAILABILITY</td>
<td>99%</td>
<td>99%</td>
</tr>
<tr>
<td>USER HELPDESK</td>
<td>24/7</td>
<td>24/7</td>
</tr>
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</table>
Galileo HAS addresses both traditional and emerging markets and applications

The main target of HAS are emerging applications such as autonomous vehicles, drones or robotics, and other applications where 20cm positional accuracy is sufficient:

<table>
<thead>
<tr>
<th>Markets</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geomatics</td>
<td>GIS/Mapping, Cadaster in rural areas (Land consolidation), Hydrographic survey and Vessel navigation, Off-shore exploration</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Guidance, VRA-Low applications, Farm machinery positioning, Site-specific data analysis applications</td>
</tr>
<tr>
<td>Aviation</td>
<td>Drones: Positioning System (Urban), Drones: Navigation System (Urban)</td>
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<td></td>
<td>Drones: Geo-awareness System, Airport – integrated surface management systems</td>
</tr>
<tr>
<td>Road</td>
<td>Autonomous driving, Safety-critical applications (contribution)</td>
</tr>
<tr>
<td>Consumer Solutions</td>
<td>LBS, Gaming, Health, AR for leisure, Commercial (Geo marketing and advertising), AR Professional, Robotics- High GNSS use</td>
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<tr>
<td>Rail</td>
<td>Cold Movement Detection, Odometer Calibration, Door Control Supervision, Infrastructure surveying, Gauging surveys, Structural monitoring</td>
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<tr>
<td>Maritime</td>
<td>Merchant Navigation and Pilotage operations in Ports, Pilotage operations in IWW, Port operations, Port bathymetry, Riverbed survey, Coastal Seabed survey, Offshore supply vessels with dynamic positioning, Port Terminal Cranes and Straddle Carriers navigation, Autonomous Surface Vessels</td>
</tr>
<tr>
<td>Space</td>
<td>Precise orbit determination (e.g. for autonomous formation flying and in-orbit rendezvous and docking), Attitude determination, Civilian launchers (e.g. for precise orbit injection)</td>
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Galileo HAS will be gradually rolled out as of 2020

**Phase 0**: HAS Testing and Experimentation
- Validate dissemination capabilities
- HAS SIS tests and experimentation
- Leverage lessons learned for following phases

**Phase 1**: HAS Initial Service
- Use Galileo system data only (GSS)
- Relaxed performance targets

**Phase 2**: HAS Full Service
- Improved design / infrastructure
- Additional data (stations) to improve the performance
Milestones

MILESTONE

HAS testing Call for Expression of Interest
- Participating in the HAS SIS ICD public consultation
- Expressing interest in participating in ad-hoc HAS SIS testing campaigns
- Providing feedback on specific HAS user requirements

User Consultation Platform
- The User Consultation Platform (UCP) is a forum for interaction between users of position, navigation and time solutions and the organisations and institutions dealing, directly and indirectly, with Galileo and GNOS. The platform serves as a key tool for gathering user requirements and validating the Galileo HAS target performance
- The UCP 2020 will be held during European Space Week on 7-11 December 2020 (https://www.euspaceweek.eu/)

SIS ICD publication
- Following the finalisation of the testing phase, the final HAS message specification document will be made public

HAS Initial Service Operational Capability
- Based on the deployment and qualification of the necessary infrastructure

HAS Initial Service Declaration
- After the necessary service validation activities, the HA Service will be declared available and the HA Service Definition Document will be published

HAS Full Service Operational Capability
Survey

- Target applications
- HAS Performance
- Dissemination channels
- Support Functions
- Barriers and incentives

https://ec.europa.eu/eusurvey/runner/HAS_SurveyUCP2020
User Requirements

Integrity
Definition of Integrity

• A term used to express the **ability of the system to provide warnings to users when it should not be used.**

• It is the probability of a user being **exposed to an error larger than the alert limits without timely warning.**

• The way integrity is ensured and assessed, and the means of delivering integrity related information to users are **highly application dependent**.