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FIG WORKING WEEK 2023

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Protecting
Our World,
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New Frontiers



Galileo High Accuracy Service : a Contribution of Surveyors to GNSS

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GISCAD-OV Solution

- GNSS measurements are largely used in cadastral and property surveying as well as in mapping. GNSS features' attractiveness vs the conventional methods and techniques are well known.
- Nonetheless, at the current stage, cadastral and property surveying operations carried out through GNSS are limited by several factors such as the cost of the augmentation services (e.g. number of reference stations to be installed, maintenance costs, software licensing), the cost of professional GNSS receivers, the not easy-to-use services and the lack of customer care and supporting services.
- The main scope of the GISCAD-OV (*Galileo Improved Services for Cadastral Augmentation Development On-field Validation*) project is to design, develop and validate an innovative and cost-effective High Accuracy Service for cadastral and property surveying applications, based on GPS and Galileo High Accuracy Services (HAS) as well as advanced techniques of Precise Point Positioning-Ambiguity Resolution quick convergence (PPP-AR).
- The project aims also to set up a GISCAD-OV Service Operations Centre, able to fully integrate the existing augmentation and national infrastructures for improving efficiency and effectiveness of cadastral operations, reducing cadastral procedures' time for the benefit of its many users, including surveyors, and ultimately for the good of all European citizens.



Europe-wide Pilot Project campaign

- Since fall 2021, and after 18 months of software development and hardware settings, the project has entered its truly operational phase.
- A Europe-wide pilot project campaign was carried out in seven (7) countries (Italy, France, Spain Croatia, Czech Republic, Germany and Estonia) for validating the implemented solution, applying single countries cadastral regulations. These tests were conducted with the contribution of benevolent local surveyors who helped in selecting survey sites for each required cadastral scenario (division / sub-division of parcel, empty plot or building) and environmental condition (rural, peri-urban, dense urban,...).
- Cadastral Reference points and markers, as well as cadastral detail points, were surveyed, in order to produce a Cadastral Map Update act to be validated by the respective authorities, following their national regulations.
- Furthermore, an infrastructural monitoring campaign was held on a bridge in the centre of Italy, in collaboration with the Italian Civil Protection.
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Europe-wide Pilot Project campaign

- In response to the request expressed by the representatives of Ordnance Survey (UK) who were able to attend field measurements recently conducted in France, CLGE Project Team offers to Corporate Members to get involved in the final dissemination phase of project's results (no later than 31st May 2023). Depending on the resources available, this could take the form of a face-to-face or online workshop to present the results and/or make simulation with national cadastral scenario

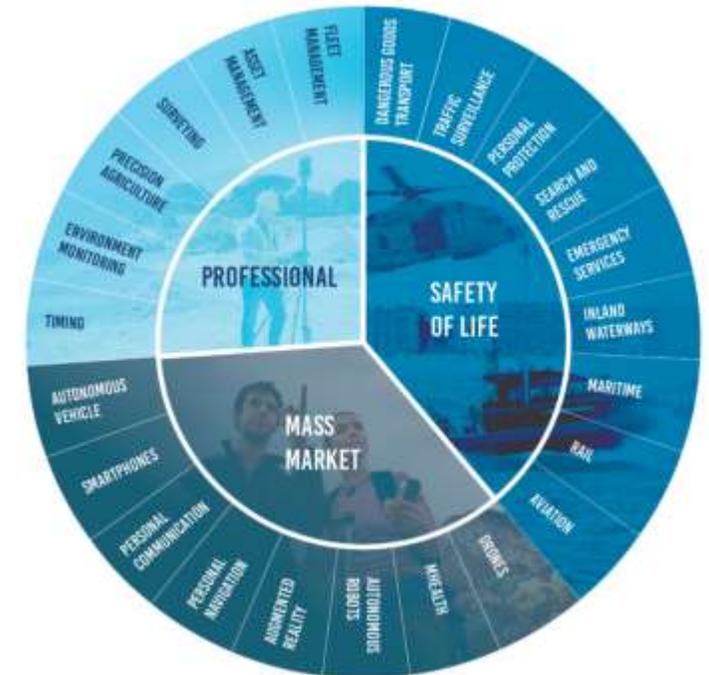


Expected Project Impacts for all Project's stakeholders

- Each stakeholder of the project each stakeholder expects a certain number of returns, benefits and gains, whether in terms of profitability (time, infrastructure) or new technical and commercial opportunities.
- These include:
 - For the Surveyors: improved availability in urban areas, one-time terminal configuration, opportunities of new markets due to HAS availability, etc.;
 - For National Mapping and Cadastral Agencies: harmonised GNSS service levels on a wide area, reduced time for cadastral acts approval, increase in the number of processed acts per year;
 - For the Services providers: optimised infrastructure and maintenance, communication burden reduction through HAS, Service Levels Differentiation;
 - For Receivers' manufacturers: market uptake due to lower barrier to entry for High Accuracy Users.

GISCAD-OV: benefit of final users as for customers and citizens?

- It is necessary to look further: the profession remains organised in very different ways in the different member countries of the European Union - and more broadly in geographical Europe. The GISCAD-OV project aims to provide cutting-edge technology, which will improve the efficiency of surveys specific to each vision of the surveyor's profession.
- In addition, the technologies can also find extraordinary applications in the monitoring of remarkable structures, for example in the analysis of risks or seismic damage, or in the monitoring of dams. The advances that are underway will serve all citizens of the European Union, not just the profession.
- The high-accuracy positioning market is very dynamic, currently driven by emerging applications such as autonomous vehicles and drones, but also by technological evolution (e.g. dual-frequency chipsets for the mass-market) and the market situation (cheaper or free-of-charge services in some countries), all of which is leading to the democratisation of high accuracy.
- Therefore, high accuracy is not only a domain for professional applications but is becoming a widespread commodity for a wide array of emerging applicationsn Civil Protection.
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Source : GSA – Galileo High Accuracy Service (HAS) – Info-note.

HAS Service Characterisation

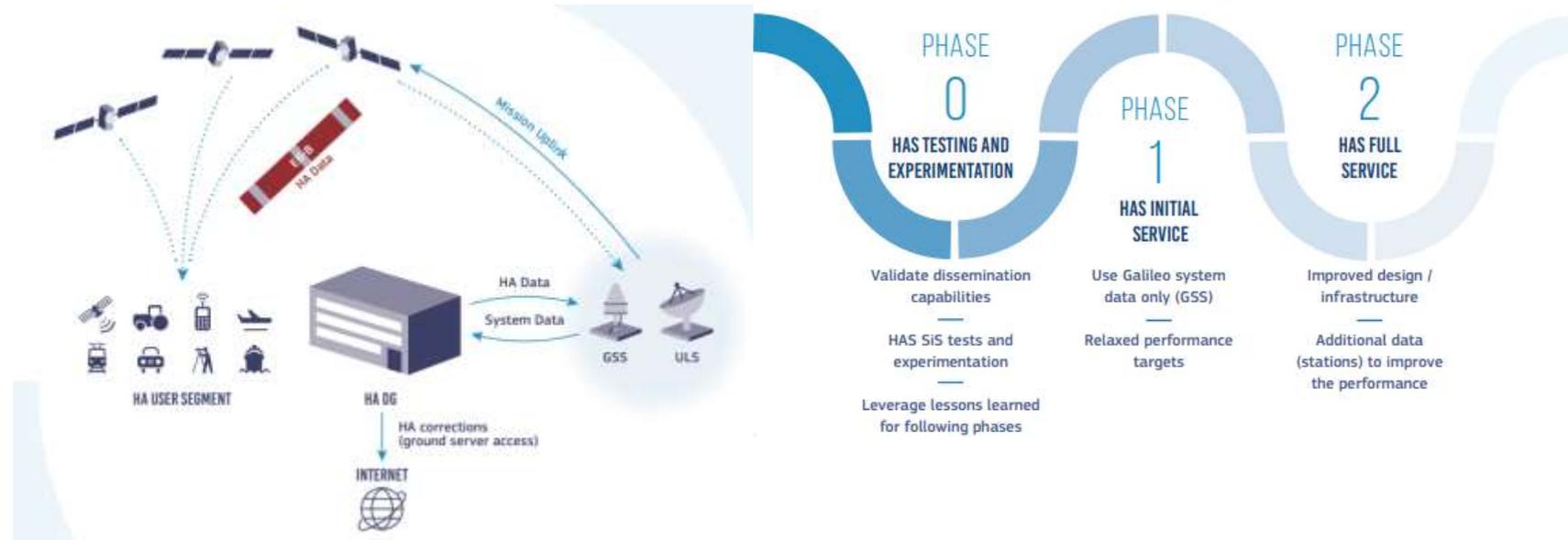
- The HAS will provide free of charge high-accuracy PPP corrections, in the Galileo E6-B data component and by terrestrial means, for Galileo and GPS (single and multi-frequency) to achieve real-time improved user positioning performances (positioning error of less than two decimetres in nominal conditions). The HAS comprises two services levels for global and regional coverage:
- Service Level 1 (SL1): with global coverage; providing high accuracy corrections (orbits, clocks) and biases (code and phase) for Galileo E1/E5b/E5a/E6 and E5AltBOC and GPS L1/L5/L2 signals.
- Service Level 2 (SL2): with regional coverage; providing SL1 corrections plus atmospheric (at least ionospheric) corrections and potential additional biases.
- Table on the right summarises the HAS full service characteristics and main targets for both service levels (note that the HAS initial service will provide a reduced performance level,).

HAS	SERVICE LEVEL 1	SERVICE LEVEL 2
COVERAGE	Global	European Coverage Area (ECA)
TYPE OF CORRECTIONS	PPP - orbit, clock, biases (code and phase)	PPP - orbit, clock, biases (code and phase) incl. atmospheric corrections
FORMAT OF CORRECTIONS	Open format similar to Compact-SSR (CSSR)	Open format similar to Compact-SSR (CSSR)
DISSEMINATION OF CORRECTIONS	Galileo E6B using 448 bits per satellite per second / terrestrial (internet)	Galileo E6B using 448 bits per satellite per second / terrestrial (internet)
SUPPORTED CONSTELLATIONS	Galileo, GPS	Galileo, GPS
SUPPORTED FREQUENCIES	E1/ESa/ESb/E6; ES AltBOC L1/L5; L2C	E1/ESa/ESb/E6; ES AltBOC L1/L5; L2C
HORIZONTAL ACCURACY 95 %	<20 cm	<20 cm
VERTICAL ACCURACY 95 %	<40 cm	<40 cm
CONVERGENCE TIME	<300 s	<100 s
AVAILABILITY	99 %	99 %
USER HELPDESK	24/7	24/7

Source : GSA – Galileo High Accuracy Service (HAS) – Info-note.

HAS Service Characterisation

- Along with the HAS corrections via the Signal in Space (SiS), it is foreseen that corrections will also be distributed using a terrestrial channel, aiming to provide users (both SL1 and SL2) with an alternative or complementary input source to the SiS.
- In addition, the European GNSS Service Centre (GSC)4 will deliver user support functions such as the provision of service status information, performance forecasts, incident management, and user helpdesk support. Furthermore, system and service performances will be regularly monitored by Galileo through an independent monitoring facility (Galileo Reference Centre - GRC) and by appropriate system tools.



Source : GSA – Galileo High Accuracy Service (HAS) – Info-note.

To learn more about:

- Galileo HAS / https://www.gsc-europa.eu/sites/default/files/sites/all/files/Galileo_HAS_Info_Note.pdf
- GNSS Market Segment - Mapping & Surveying / <https://www.euspa.europa.eu/category/gnss-market-segments/taxonomy/term/1389>

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Thank you for your attention

Questions ?

