European GNSS using High Accuracy Services

The finalisation of the satellite constellation of the European satellite positioning system Galileo offers the surveying profession the opportunity to design a new system dedicated to its needs for cadastral works and demonstrating its expertise in the area of accuracy of measurement.

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 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.

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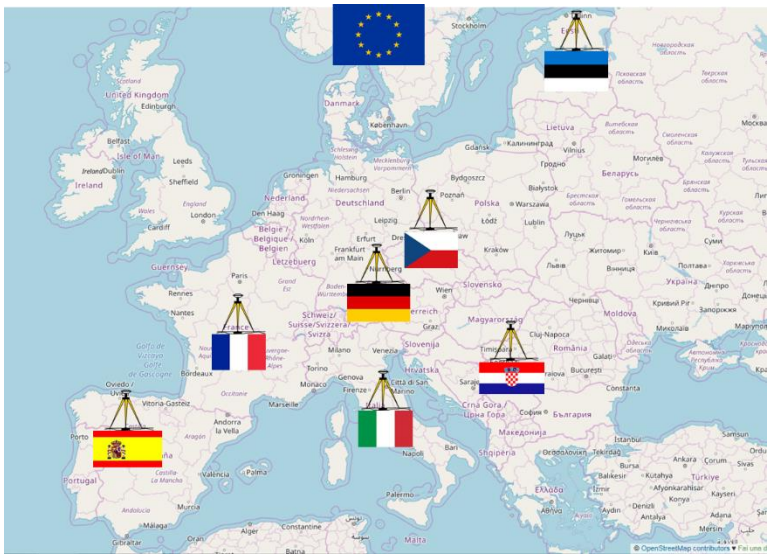
Furthermore, an infrastructural monitoring campaign was held on a bridge in the centre of Italy, in collaboration with the Italian Civil Protection.



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.

Promising preliminary results

To date, the preliminary results obtained from extensive tests carried out in all 7 selected countries are already promising:

- Multi-constellation PPP-RTK Surveying: accuracy better than 2 cm, fixing time: instantaneous;
- Pure Galileo HAS: accuracy better than 20 cm in 15 min convergence time;
- Multi-constellation RTK (used only for comparison): usual 2-3 cm accuracy, with a few seconds fixing time.

Example: first results from France :

Point	Company	E	N	H*	δE	δN	δH
RKN.1005	**Geodetic reference point**	**1644005,733**	**8155563,546**	**86,206**			
survey ma	Surveyors RTK	1644005,701	8155563,531	86,188	0,032	0,015	0,018
	GISCAD PPP-RTK	1644005,689	8155563,530	86,106	0,044	0,016	0,100
RKN.1175	**Geodetic reference point**	**1643905,666**	**8155612,716**	**86,774**			
survey ma	Surveyors RTK	1643905,648	8155612,700	86,768	0,018	0,016	0,006
	GISCAD-OV PPP-RTK	1643905,635	8155612,707	86,701	0,031	0,009	0,073
	GISCAD-OV Galileo HAS	1643905,718	8155612,857	86,686	-0,052	-0,141	0,088
AF.117	**Geodetic reference point**	**1642882,976**	**8153093,553**	**88,311**			
survey ma	Surveyors RTK	1642882,965	8153093,548	88,311	0,011	0,004	0,000
	GISCAD-OV PPP-RTK	1642882,972	8153093,538	88,278	0,004	0,015	0,033

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.

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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.

What new applications could result from GISCAD-OV solution, for the benefit of final users as for the European customers and citizens?

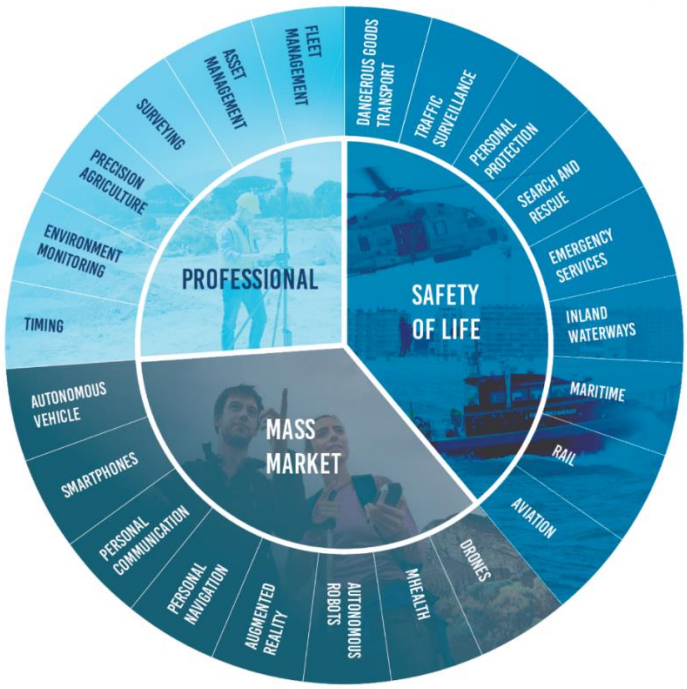
It is necessary to look further: the profession remains organised in very different ways in the different member countries of the European Union - and more broadly in geographical Europe. The GISCAD-OV project aims to provide cutting-edge technology, which will improve the efficiency of surveys specific 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 applications.

Examples of GNSS applications:



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

Maurice Barbieri, GISCAD-OV Project Director, maurice.barbieri@clge.eu

Ivars Nudiens, GISCAD-OV Chief Technical Officer, ivars.nudiens@clge.eu

Florian Lebourdais, GISCAD-OV Chief Financial and Administrative Officer, florian.lebourdais@clge.eu