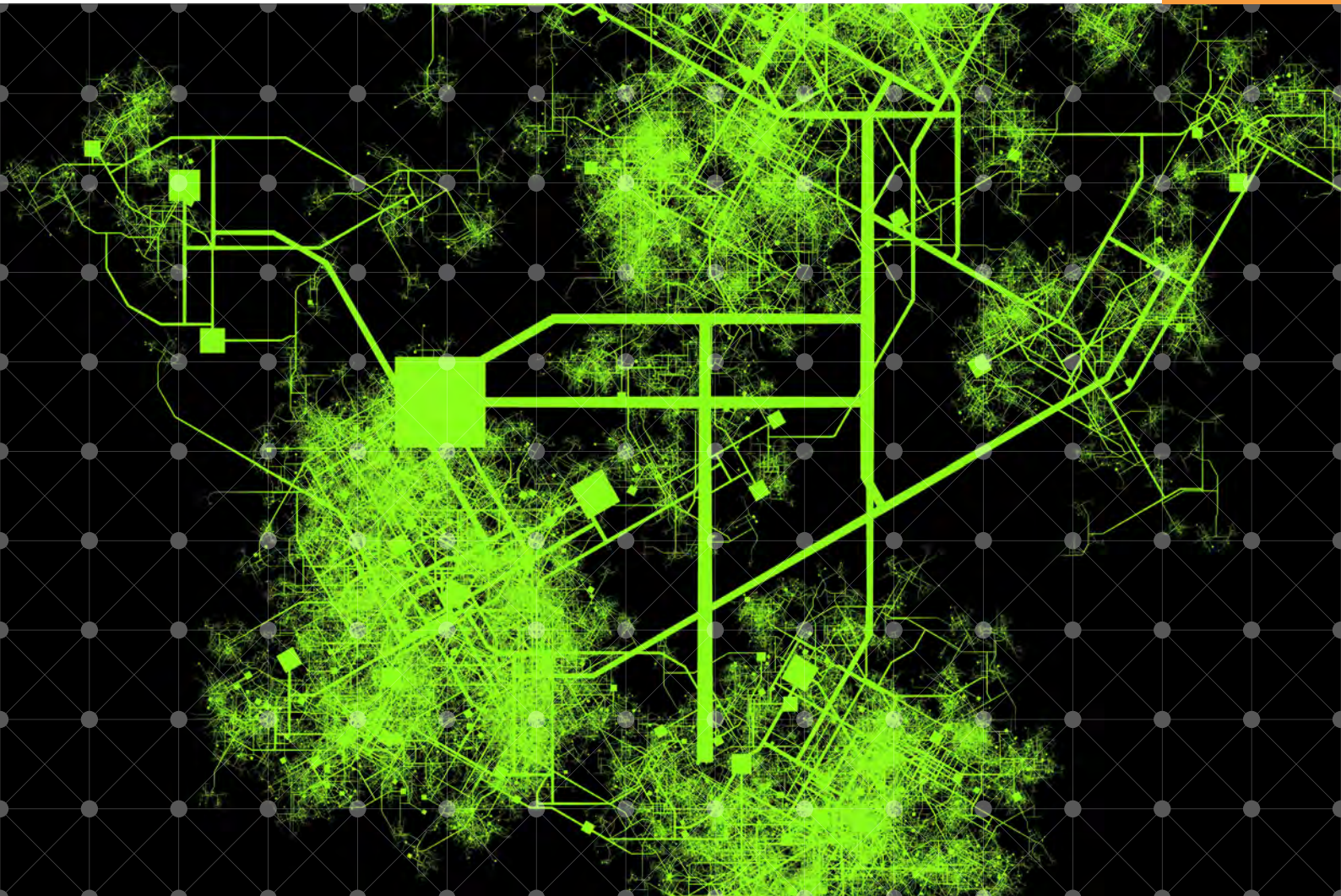


EGNOS and GALILEO for MAPPING & SURVEYING



High Accuracy, Widely Available





MAPPING

Free metre-level accuracy: EGNOS for Mapping

As an efficient tool for mapping and GIS applications, Global Navigation Satellite Systems (GNSS) are widely used by organisations such as utility companies and regional and local authorities.

For this range of applications that include thematic mapping for small and medium municipalities, forestry and park management, and surveying utility infrastructures (e.g. electrical power lines) metre-level accuracy is sufficient.

The European Geostationary Overlay Service (EGNOS) augments GNSS signals providing metre-level precision free of charge over Europe.

Most of the receivers used for mapping are EGNOS-ready, hence enabling real time mapping solutions with free metre-level accuracy. EGNOS is easy to use and it eliminates the need for complex and costly equipment and software solutions of augmentation service providers.

EGNOS is widely available

The EGNOS signal provides a constant level of position accuracy across the EGNOS compliance area, which covers most of Europe.

Furthermore, EGNOS corrections can be received via different means:

- Directly via EGNOS satellites, using a normal EGNOS-enabled GNSS receiver without any communication cost.
- Via terrestrial communication means such as internet or cellular networks, thanks to EDAS, the EGNOS Data Access Service.

Why EGNOS?

1. An effective option for a wide range of mapping applications where metre accuracy is adequate.
2. It's free and does not require any installation of hardware or subscriptions.
3. Most new GNSS devices are EGNOS-enabled.
4. Covers the majority of Europe, with no white spots.
5. It permits real time positioning.
6. Via EDAS, EGNOS corrections can also be received via internet and cellular networks.
7. Provides system integrity, supplying information on the reliability of GPS signals.

Galileo for Mapping

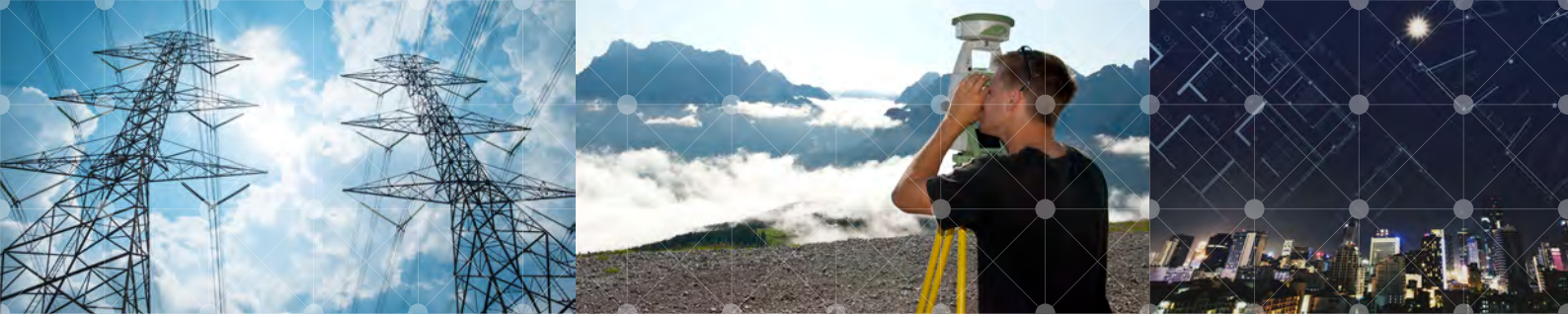
The Galileo Open Service, when paired with a dual frequency receiver, can achieve between 1 and 4 metre horizontal accuracy worldwide – of significant interest to mapping applications where metre range accuracy is adequate¹.

GNSS & Earth Observation

Users can also benefit from free Earth Observation data coming from Copernicus, the other European Union flagship space programme.

While EGNOS and Galileo provide precise information about the position, Copernicus gives valuable information about the surroundings – enabling a wealth of synergies beyond the isolated use of the two systems. In other words, EGNSS provides highly precise geo-reference information for high-resolution images generated by Copernicus.

¹ See Open Service Quarterly Performance Report January-March 2017: https://www.gsc-europa.eu/system/files/galileo_documents/Galileo-IS-OS-Quarterly-Performance_Report-Q1-2017.pdf



SURVEYING

Sub-decimetre level accuracy: Galileo for Surveying

The use of GNSS in surveying often means positioning services with sub-decimetre level accuracy, which can only be achieved using augmentation services (e.g. Real Time Kinematic (RTK), Precise Point Positioning (PPP), etc.).

Galileo, Europe's GNSS under civilian control, features excellent positioning and timing information that further improves high-accuracy applications.

Galileo Open Service

Galileo's free of charge Open Service offers single (E1) or dual frequency (E1/E5), to further improve such augmentation services as RTK/DGNSS or PPP. The resulting benefits to surveyors, especially in multi-constellation environments, include: easier mitigation of multipath errors, higher signal-to-noise ratio, increased availability, continuity and reliability, and better operation in such harsh environments as urban/natural canyons or under tree canopies.

In addition, Galileo is the only GNSS that provides Open Service spoofing detection, thanks to its Navigation Message Authentication function.

Galileo Commercial Service

Galileo's Commercial Service High Accuracy (CS-HA) is dedicated to high precision applications. CS-HA is planned to directly deliver corrections around the world via Galileo satellites and without the need for an additional communication channel. This will allow for the development of many high accuracy applications across all segments. Furthermore, CS-HA offers triple frequency with faster convergence time for surveying applications and with an achievable accuracy comparable to RTK.

Users may also benefit from the CS Authentication service for civil purposes, providing users with confidence that they are utilising signals and data from actual satellites and not from any other source (anti-spoofing).

E6 for ranging

In addition to single and dual frequency capability in the Open Service, the E6 channel will include an open, unencrypted ranging signal. This high-quality signal adds an excellent option for the third frequency required for the linear combination of GNSS observations made on three frequencies (e.g. for faster and more reliable ambiguity resolution in RTK and PPP processing).

Why GALILEO?

OPEN SERVICE

1. It's free.
2. Most new GNSS devices are Galileo-enabled.
3. It improves operations in difficult environments where the number of satellites plays a crucial role.
4. Single and dual frequency capability.
5. High quality open signal.
6. Adding Galileo OS capabilities to the RTK/DGNSS/PPP networks significantly increase the performance of the services.

COMMERCIAL SERVICE

1. Worldwide sub-decimetre level accuracy.
2. Does not require proximity to base stations to access corrections.
3. Corrections transmitted directly via the Galileo satellites (not dependent on additional communication channels).
4. Triple frequency to further reduce convergence time.
5. High quality signal.
6. Improved line-of-sight and better coverage at high latitudes.



How does EGNOS work?

EGNOS, the European Geostationary Navigation Overlay Service, uses geostationary satellites and a network of ground stations to increase the accuracy of existing satellite positioning signals while providing a crucial 'integrity message' that informs users in the event of signal problems.

The EGNOS reference stations pick up signals from GPS satellites, which are processed in Mission Control Centres (MCC). The accuracy of the original signals is determined and confounding factors are corrected.

This data is then incorporated into EGNOS signals and sent to its three geostationary satellites. The satellites relay these signals back to users on the ground, providing greater positioning accuracy than would be achieved through GPS alone.

Galileo Initial Services

With the declaration of Initial Services in December 2016, Galileo - the European Global Satellite Navigation System (GNSS)- has moved from testing to the provision of live services. Users around the world can now be guided using the positioning, navigation and timing information provided by Galileo's global satellite constellation.

By working together with GPS, Galileo satellites provide better positioning and navigation for users, particularly in cities, where satellite signals can often be blocked by buildings. Plus, Galileo's excellent timing accuracy helps make the synchronisation of banking and financial transactions

and telecommunication and energy distribution networks more resilient, allowing them to operate more efficiently.

Galileo's Search and Rescue service reduces the time it takes to detect emergency distress beacon signals from up to three hours to just ten minutes, potentially saving many more lives. The additional resiliency provided by Galileo is expected to help drive economic growth in Europe and beyond by enabling a range of new applications and services.

useGALILEO.eu

Mass-market devices containing a Galileo-enabled chipset, such as smartphones or vehicle navigation devices, can use Galileo signals for positioning, navigation and timing. The www.useGALILEO.eu tool helps you keep track of Galileo enabled receivers, surveying system integrators and augmentation solutions for cm-level precision, serving a variety of needs, as they become available.

GSA: linking space to user needs

The GSA is the European Union Agency in charge of managing operations and service provision of Galileo and EGNOS, ensuring that European citizens get the most out of Europe's satellite navigation programmes in terms of innovation, competitiveness, economic growth, and benefit to users.

As Europe's link between space technology and user needs, GSA keeps users at the centre of Galileo and EGNOS.

www.gsa.europa.eu

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