

European
Global Navigation
Satellite Systems
Agency



NAVIGATION SOLUTIONS
POWERED BY EUROPE

E-GNSS & Green cities

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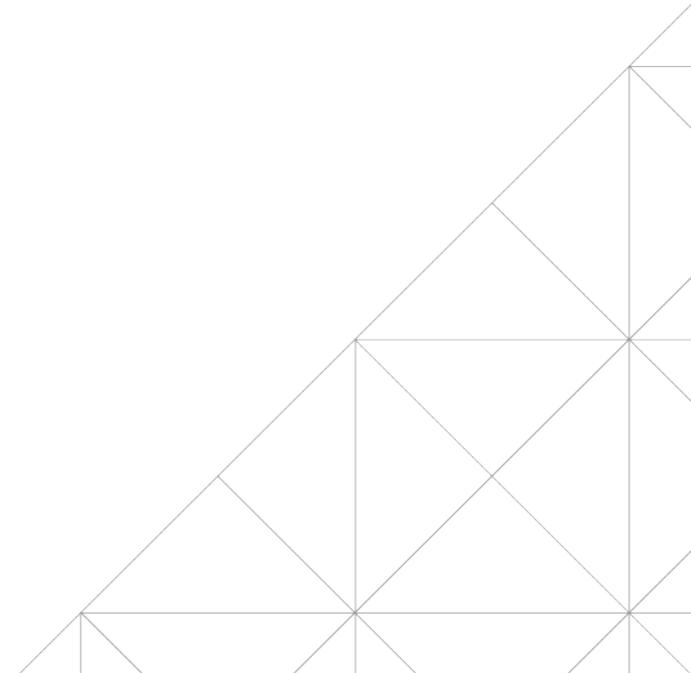
Outline



Galileo and EGNOS services

E-GNSS potential contribution to green cities

Next steps towards GNSS market uptake



The European GNSS Agency



Linking space to user needs.

Galileo is the European GNSS offering a wide range of services



Galileo Initial Services since DEC 2016

- Freely accessible service for positioning, timing and navigation message authentication
- Encrypted service designed for greater robustness and higher availability
- Assists locating people in distress and confirms that help is on the way
- Freely accessible high accuracy positioning service
- Authentication service based on the E6 signal code encryption and OS-NMA, allowing for increased robustness of professional applications



EGNOS already available serving EU citizens and industry



- Accuracy ~1m, free



Open Service (OS)

- Accuracy ~1m, **compliant to aviation standards** by providing correction data and **integrity**

Safety of Life Service (SoL)



- Accuracy <1m, **corrections provided via internet**



EGNOS Data Access Service (EDAS)

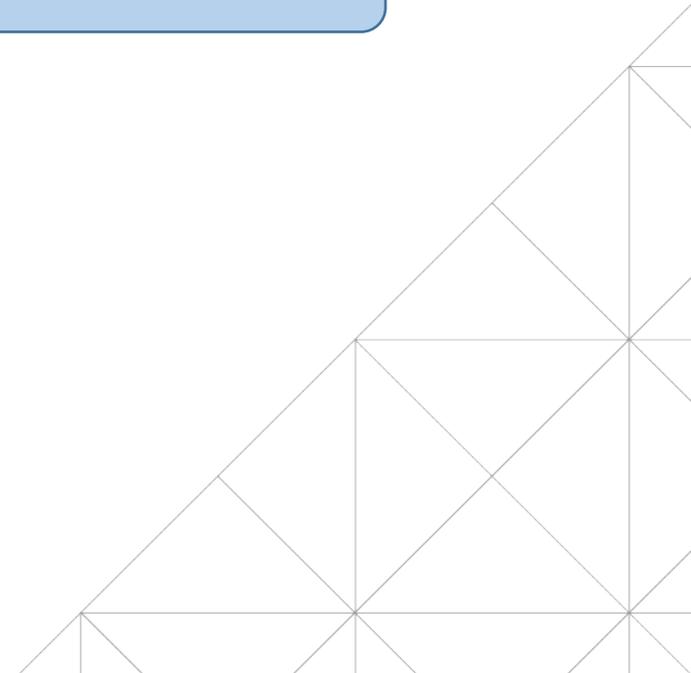
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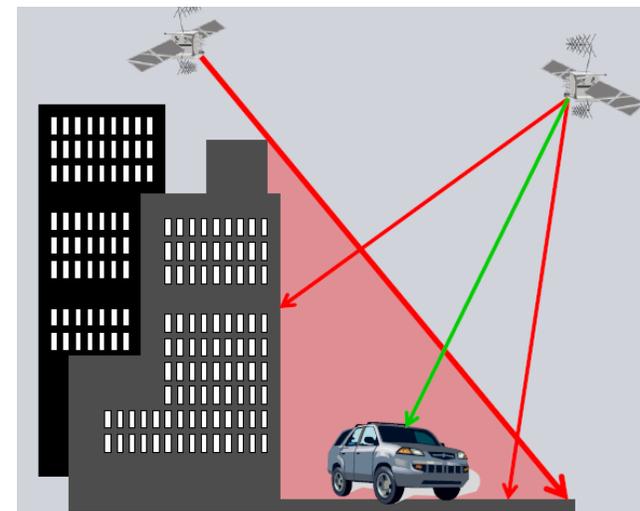
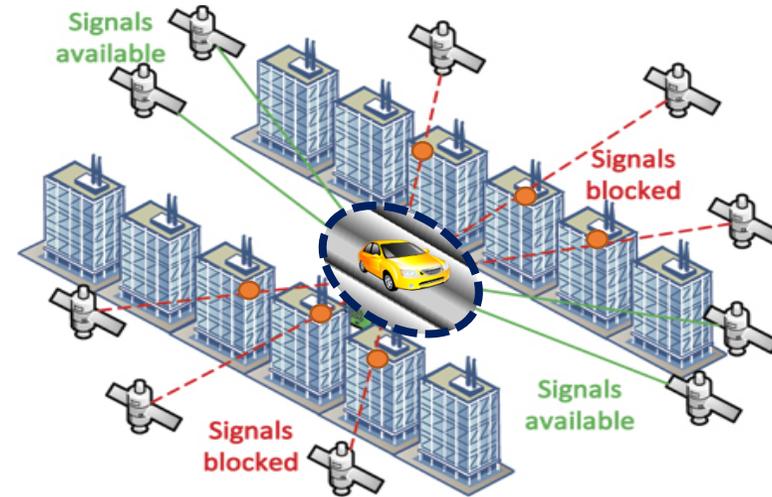


Galileo contributes to improve availability and accuracy



- ✓ Multi-constellation: When buildings block the signal and reduce the number of visible satellites, the availability of more constellations ensures a **much more accurate final position**
- ✓ Multi-frequency increases **robustness of the position against mass market jammers** because the interfering signal has a narrow bandwidth and the receiver can still calculate a correct position with the other GNSS signals. More so, it increases resistance to multipath and accuracy.
- ✓ Multipath: the strength of Galileo signal, together with an **advanced code modulations**, makes Galileo better mitigating multipath effects (especially in E5, but also E1: two times better than GPS L1*)

* Source: Broadcom tests



Galileo value proposition for green cities



- Thanks to its **superior performance in urban environments** (improved accuracy, faster positioning fix) Galileo fulfils urban transport requirements
- Being **interoperable and compatible** with GPS and most other technologies, Galileo can be seamlessly integrated into the foreseen service offering
- Multi-constellation, Galileo-enabled receivers (to be used on board buses, trams, cars, bicycles) are widely available in the market for **no or marginal extra cost**
- Galileo is an **essential enabler** for the achievement of city-level sustainable urban mobility

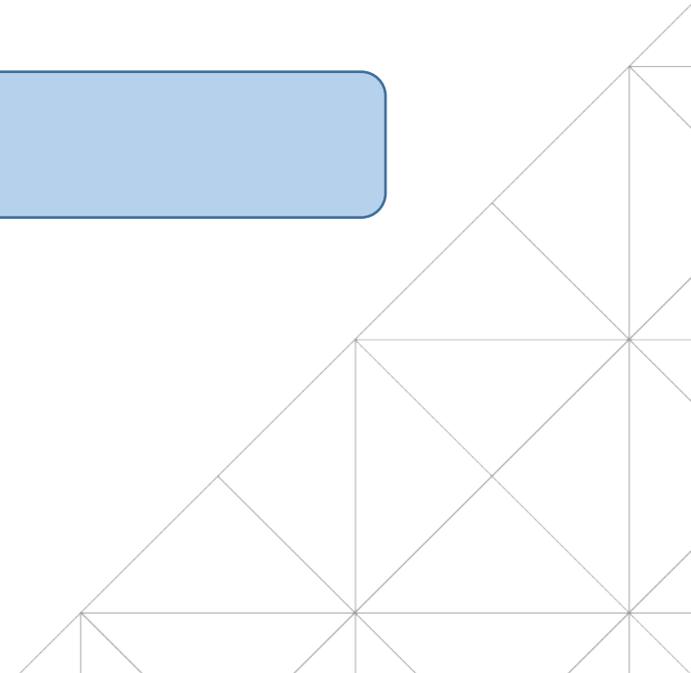
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Success stories



- Tender in progress for equipping of entire tramway fleet (>800 Trams) with multiconstellation Galileo-enabled receivers
- Test campaign carried out by Czech Technical university in Prague confirmed achievable accuracies of 2.7 meters along the entire network (combination of Galileo-enabled receiver and IMU)
- The additional accuracy will facilitate multiple applications from improved passenger information to automatic reduction of tram speed over the switches

- Galileo deployed in EMT Bus service on more than 2000 busses, serving 420 million users per year
- The addition of improved positioning has elevated the fleet, one of the most modern in Europe and boosts universal accessibility for both wheelchair using passengers and those with reduced mobility, to a new level.



How to improve localization applications performance within green cities



Companies need to ask from the solution providers:

- **Multi-constellation receivers supporting GPS L1 and Galileo E1 as a minimum** to achieve improvements in positioning availability and accuracy
- **Dual frequency support GPS+Galileo L1/E1/L5/E5** (optional - in case of need for further improvement of positioning accuracy, especially with regards to multipath)
- **SBAS L1: EGNOS** in case of increased requirements towards positioning integrity and accuracy



- Tailored position paper from GSA available for public transport authorities and operators
- Possibility of consultations with GNSS experts

Linking space to user needs



Get in touch:



www.GSA.europa.eu



EGNOS-portal.eu



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