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FAQ – GALILEO, the EU's satellite navigation programme

Why is satellite navigation important to the EU?

Today, the positioning and timing signals provided by satellite navigation systems are used in many critical areas of the economy, including power grid synchronization, electronic trading and mobile phone networks, effective road, sea and air traffic management, in-car navigation, search and rescue service. Satellite navigation applications are now numerous and varied and play key roles both in business and in the daily lives of citizens and communities. European access to reliable and accurate satellite navigation services is therefore essential.

The satellite navigation sector also provides an enormous market offering the potential for growth and jobs in the EU. Like the internet, a global navigation satellite system is a service enabler rather than a standalone service. It acts as a catalyst for economic activities, leading to the creation of added value and jobs in a wide range of sectors such as space, receivers and applications industries. In 2013 the annual global market for global navigation satellite products and services was valued at €175 billion and is expected to grow over the next years to an estimated €237 billion in 2020. Independence in this area is important to the EU's economy: in 2011 it was estimated that already 6-7% of Europe's GDP, or €800 billion, relies on satellite navigation applications.

What is GALILEO? What does it consist of?

Galileo is the programme of the European Union to develop a global navigation satellite system (GNSS) under civilian control. Galileo will allow users worldwide to know their exact position in time and space with great precision and reliability.

Once complete, the Galileo system will consist of an array of 30 satellites and the necessary ground infrastructure to control the satellites and enable the provision of navigation services. Finally, users will need receivers to capture and process the signals.

And EGNOS?

EGNOS, the European Geostationary Navigation Overlay Service, is Europe's first venture into satellite navigation. It is the EU's Satellite-Based Augmentation System, and is used to improve the accuracy of and provide information on the reliability of the GPS signal.

EGNOS has been fully operational since 2011. Its data can already be used in a wide range of areas. For example, EGNOS makes GPS suitable for safety-critical applications such as flying aircraft. Its Safety of Life Service provides the integrity needed for more precise landings, fewer delays and diversions and more efficient routes.

Why don't we just use existing global satellite navigation systems?

We can and will continue to use existing systems as Galileo will be inter-operable or compatible with currently existing similar systems that cover Europe.

Galileo will however improve on these systems, as it will work to complement GPS signals, providing more accurate satellite navigation positioning signals for enabled receivers. Most of the new applications that will become available using data from Galileo will only be possible due to the increased positioning precision that Galileo or EGNOS can offer.

As opposed to many other satellite navigation systems worldwide, Galileo will be under European civilian control and the system will be entirely owned by the EU. We have become very dependent on services provided by satellite navigation in our daily lives. Should we rely on a foreign service that could be reduced or switched off without our prior consent, the potential disruption to business, banking, transport, aviation, communication etc. to name but a few areas, would be critical (e.g. in terms of revenues for business, road safety etc.).

Ownership also means the EU will retain control of all Galileo's assets – both tangible and intangible (e.g. research and development gains generated during the programme).

How will Europe benefit from the Galileo programme?

Once the system is fully deployed and operational, data provided by Galileo satellites could be used in a wide number of areas to improve quality of life and business across Europe, for example to avoid car crashes, help visually and motor impaired people navigate, transport dangerous goods, survey coastal water depth and intelligent salt-spreading during the winter. Other examples include helping navigate ships through narrow channels, enhancing transport logistical operations, and improving the speed of emergency services responses in critical situations.

The satellite-based service industry is of major importance for the EU economy as it turns the investment made in space infrastructures into concrete applications and services to benefit citizens. Exploitation of the data that will be provided by the Galileo programme presents a huge business opportunity, not just for companies delivering the satellites or ground segment - space infrastructures - but even more for downstream industry, the people who work in the areas of receivers, platforms, and the development of innovative services. Galileo gives equipment manufacturers, application developers and providers of 'reliability-critical' services the opportunity to create a range of new business opportunities.

What services will Galileo provide? When will these services be available?

Once Galileo is fully operational (before 2020), it will provide the following services:

- Open Service – a freely accessible service for positioning, navigation and timing, utilising the dual-frequency Galileo Signal in Space. The Open Service will also support position integrity monitoring for users of safety-of-life applications.
- Public Regulated Service – an encrypted, secure service with additional advanced features designed for greater robustness and higher availability, primarily directed at public sector operations.
- Commercial Service – a fee based service which will deliver authentication and high accuracy services for commercial applications.
- Search and Rescue Service – will assist in locating people, vessels and aircraft in distress.

- Safety of Life – a contribution to services monitoring the integrity of the satellite signals, in compliance with international standards.

Galileo's initial services will be available even before the full constellation of satellites is deployed. Once sufficient satellites are in orbit and operational, and the accompanying ground infrastructure is in place, the "exploitation" phase – in which companies can use the data from Galileo on a guaranteed basis – can start in earnest.

From 2015 Galileo will start offering an early version of its services, which includes:

- an early version of the Open Service that will be fully interoperable with GPS. It will therefore be used for many mass-market applications, including smartphones and in-car navigation.
- Galileo's contribution to the COSPAS-SARSAT service, the international tool used to locate people in distress. Galileo's Search and Rescue (SAR) service will enable quicker detection of distress beacons, as well as a new feature that sends an acknowledgement message to the sender.
- a pilot version of the Public Regulated Service (PRS), which is already in place since August 2013. Seven EU Member States are currently testing PRS enabled receivers
- a Galileo Commercial Service demonstrator. Underway since summer 2014, its early services are expected to start in 2016

What are the different phases in the Galileo programme?

The deployment of the complete Galileo infrastructure is a long process that will span several years. So far, the initial experimental phase and the In-Orbit Validation (IOV) phase have been completed. The IOV phase validated the system design using a reduced constellation of four satellites – the minimum required to provide exact positioning and timing at the test locations – along with a limited number of ground stations. This launch marks the start of the Full Operational Capability (FOC) phase, which will involve the deployment of the remaining ground and space infrastructure. It will use the satellites already in orbit plus an additional 26 FOC satellites.

When will the next launches take place? When will the system be completed?

The plan is to have the full constellation of 30 Galileo satellites (which includes six in-orbit active spares) in operation before the end of the decade.

In addition to the planned launch of two satellites in August 2014, it is planned to launch two more satellites before the end of 2014. Thanks to the knowledge and experience gained from the construction and use of the IOV satellites already in space, it is projected that satellite launches will now be able to continue at a faster rate than in the past. From 2015 onwards, using three of the fully European constructed ARIANE 5 launcher, an investment of €500 million, we will also be able to launch four rather than two satellites at any one time.

Where can companies find information on how to develop services using Galileo signals?

As Galileo will soon enter its exploitation phase, providers of services and products using data from Galileo must already start preparing for future market opportunities.

To support such companies, the Commission has created a GNSS service centre, based in Madrid. The service centre acts as an interface between the Galileo system and user

communities of the open and commercial services, to help ensure they can maintain the provision of any products or services they have constructed on the basis of the data flow from Galileo. The centre will initially provide information, and, as the programme progresses further, it will provide Commercial Service performance assessment and notices to users. The centre will also act as a centre of expertise for Open Service and Commercial Service and will be accessible to users via its Helpdesk and web portal.

Who does what within the Galileo programme?

The European Commission is responsible for the progress of GALILEO and EGNOS programmes and their overall management and supervision.

Galileo's deployment, the design and development of the new generation of systems and the technical development of infrastructure are entrusted to the European Space Agency.

The Commission has delegated the operational management of the programmes to an EU agency, the European Global Navigation Satellite Systems (GNSS) Agency, based in Prague.

Who pays for the EU's space programmes? How much will Galileo cost?

During the already completed definition and validation phases of the Galileo and EGNOS programmes, the EU and the ESA contributed.

The current deployment phase is entirely financed by the EU's budget, with contributions from Norway and Switzerland.

From now until 2020, the EU will spend €7 billion on satellite navigation. This amount is necessary to complete ground and space infrastructure and finance the current phase of programmes.

History of Galileo

Galileo was born in the 1990s when the European Space Agency initiated research and development programmes in that area, in partnership with the European Commission and the civil aviation community. Discussions on a European system started in the late 1990s and in 1999 the Council of the European Union called on the Commission to develop a global system managed by public civil authorities. After the failure of negotiations to create a public-private partnership, in 2008 the European Parliament and Council decided to complete the Galileo constellation using EU budget.

Since 2008 work has been ongoing in a number of areas, such as the construction of the satellites, the provision of launch services and operations and the creation of ground infrastructure. In 2011 the first two satellites were launched, followed by another two in 2012.

Why are the Galileo satellites named after children?

In 2011 the European Commission organised a drawing competition open to children born in 2000, 2001 and 2002. The winners, one per EU country, won the right to give their names to the Galileo satellites.