

Status of Galileo Commercial Applications

Compiled by Joachim J. Kehr, Editor, March 2021

The outset of the following article was – as the headline announces - to shed some light on the contributions of the European Galileo/EGNOS system (European Geostationary Navigation Overlay System) to the overall International GNSS Service (IGS) federation. As it turned out this is not possible using the data available on the internet and from the multitude of existing GNSS (Global Navigation Satellite System) organizational, technical and commercial webpages and participating organizations (see also References, below).

To grasp the enormity and importance of this international body I try to describe the organization in a very superficial manner, moving on to the 2019 status of the “Global GNSS downstream market concluding, that our “digital” future will be dominated by those GNSS services – unthinkable to do without them.

Let’s talk about the organizational structure first.

The International GNSS Service (IGS)

The International GNSS Service (IGS) ensures open access, high-quality GNSS data products since 1994. These products enable access to the definitive global reference frame for scientific, educational, and commercial applications – a tremendous benefit to the public and key support element for scientific advancements. A voluntary federation of over 200 self-funding agencies, universities, and research institutions in more than 100 countries; by working peacefully together they provide the highest precision global positioning system satellite orbits in the world.

As of September 2020, the United States’ Global Positioning System (GPS), Russia's Global Navigation Satellite System (GLONASS), China's BeiDou Navigation Satellite System (BDS) and the European Union's Galileo/EGNOS are fully operational GNSSs. [1]

Japan's Quasi-Zenith Satellite System (QZSS) is a (US) GPS satellite-based augmentation system to enhance the accuracy of GPS, with satellite navigation independent of GPS scheduled for 2023. The Indian Regional Navigation Satellite System (IRNSS) plans to expand to a global version in the long term.[2]

The European GNSS Agency (GSA) [3]

Global navigation satellite systems (GNSS) allow users with compatible devices to determine their position, velocity and time by processing signals from satellites. GNSS signals are provided by a variety of satellite positioning systems, including global constellations.

The GSA’s mission is to support European Union objectives and achieve the highest return on European GNSS investment, in terms of benefits to users and economic growth and competitiveness, by designing and enabling services that fully respond to user needs, while continuously improving the European GNSS services and infrastructure. The GNSS performance can be improved by regional satellite-based augmentation systems (SBAS), such as the European Geostationary Navigation Overlay Service (EGNOS). EGNOS improves the accuracy and reliability of GPS information by correcting signal measurement errors and by providing information about the integrity of its signals.

Open Services (OS)

Galileo Open Service (OS) is defined for mass-market applications. It provides signals for timing and positioning, free of direct user charge. The Open Service is accessible to any user equipped with a receiver, with no authorization required. While up to three separate signal frequencies are offered within the Open Service, cheap single-frequency receivers will be used for applications requiring only reduced accuracy. In general, Open Service applications will use a combination of Galileo and GPS signals, which will improve performance in severe environments such as urban areas.

The Open Service does not offer integrity information, and the determination of the quality of the signals will be left entirely to the users. There will be no service guarantee or liability from the Galileo Operating Company on the Open Service. [4]

Commercial Service (CS/HAS)

The original Commercial Service (CS) was aimed at market applications requiring higher performance than offered by the Open Service. It would have provided added value services on **payment of a fee**. [4]

This approach was revised by the European Union (EU). Since 2019 a **free-of-charge** High Accuracy Service (HAS) and Authentication Service is offered. HAS allows for the development of applications for professional or commercial use owing to improved performance and data with greater added value than that obtained through the open service. Developing commercial applications either by using the HAS signals alone, or by combining them with other Galileo signals or external communications systems, opens a wide range of possibilities. The worldwide coverage brings a strong advantage for applications requiring global data broadcast. However, HAS will not offer integrity-information. One of the reasons for this change is the European promotion of autonomous driving and its significance for our global future. [5a]

GNSS Market Segments

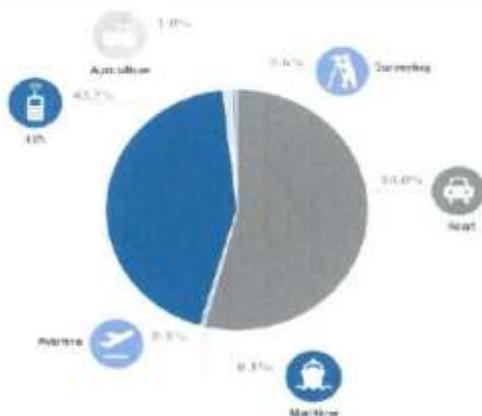
The following main market segments represent the highest number of users. They are:

- > Road / Rail / Maritime 54% of the market
- > Location Based Services (LBS) 44% of the market
- > Agriculture 1% of the market
- > Aviation 0.5% of the market [5]

The Road and Consumer Solutions segments dominate by far all other market segments in terms of cumulative revenue, with a combined total of 93.3% for the 2019-2029 forecasting period. In the Road sector, most revenues are generated by in-vehicle systems (IVS), advanced driver-assistance systems (ADAS) and fleet management, whereas Consumer Solutions revenues mainly come from the data revenues of smartphones and tablets using location-based services.

More than 50% of the remaining revenue will be generated by Agriculture and Geomatics. The main revenue-generating applications in Agriculture are variable rate technologies (VRT) and automatic steering, while the primary source of revenue in Geomatics is cadastral and construction surveying. The global GNSS *downstream* market revenues from both devices and services are forecast to grow from €150 billion in 2019 to €325 billion in 2029 with a Compound Annual Growth Rate CAGR of 8%. [3]

Global core GNSS market by segment (cumulated revenues 2010-2020)



Global GNSS market size (EUR bln)

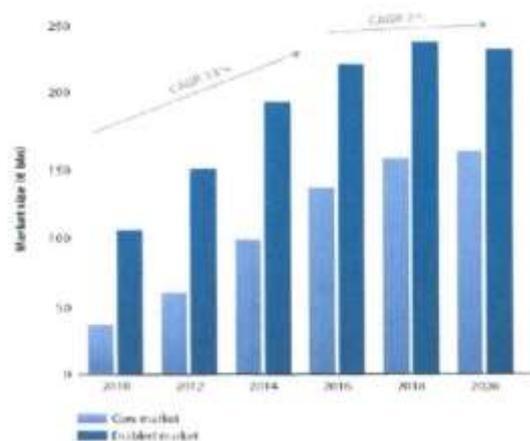


Figure 1: Global GNSS Market Analysis [5]

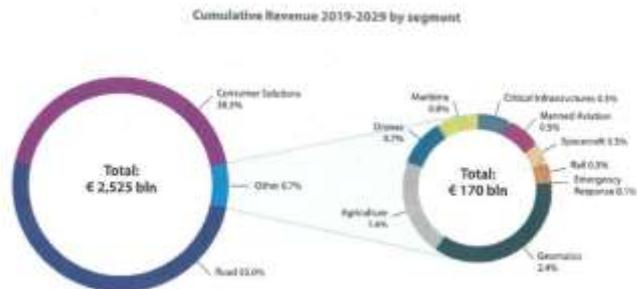
Global GNSS downstream market

The global GNSS downstream market revenues from both devices and services will grow from €150 bln in 2019 to €329 bln in 2029 with a CAGR of 8%.

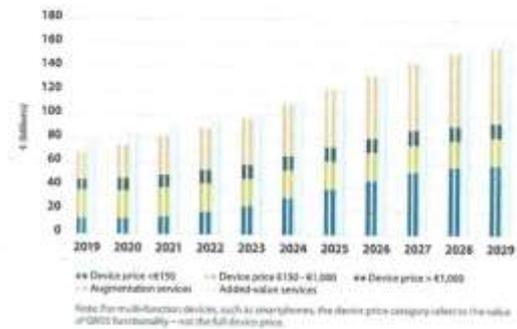
The growth is mainly due to the revenues from mass market and mid-end devices (<€150) and from augmentation services. Low-end receivers will record a significant growth of 16% per year between 2019 and 2029, while revenues from augmentation services are set to grow steadily from €23 bln to nearly €65 bln in 10 years.

Although the shipments of high-end receivers (more than €1000) are less than 1% of total shipments, they contribute more than 10% of global receiver revenues (€12 bln in 2029).

The services relying on GNSS technology to create added-value for users represent the biggest revenue stream for the GNSS market. In 2029, added-value service revenues will account for €186 bln, more than half of the total global GNSS revenues.



Total GNSS Revenues



Road and Consumer solutions dominate total revenues

Road and Consumer solutions dominate by far all other market segments in terms of cumulative revenue with a combined total of 91.3% for the forecasting period 2019-2029.

In the Road sector, most revenues are generated by In-Vehicle Systems (IVS), ADAS and fleet management, whereas Consumer solutions revenues mainly come from the data revenues of smartphones and tablets using location-based services.

Focusing on the remaining revenues, more than 50% of these will be generated by Agriculture and Geomatics. The main revenue-generating applications in Agriculture are Variable Rate Technologies (VRT) and automatic steering, while the primary sources of revenue in Geomatics is cadastral and construction surveying.

Figure 2: Global installed base by market segment [3]

Is Galileo inside your phone?

A Current search returned 1113 participating organizations, which raises the question, is Galileo inside your phone?

With over 30 smartphone models currently on the market being Galileo-enabled and many more on the way chances are your phone is already taking advantage of all that Galileo has to offer. But how exactly does it work? Here, the European GNSS Agency (GSA) pulls back the curtain on Galileo functionality in smartphones.

When it comes to Galileo and smartphones, it all starts with the chip. As the chip is what powers a smartphone, it is often considered the most important part of the phone. The chip inside your phone contains multiple components, each supporting a specific function, such as image processing, graphic processing, and location.

To calculate your position, the chip depends on data provided by GNSS constellations, such as GPS, Galileo and Glonass. Most of the chips in smartphones today are multi-GNSS, meaning they use data from more than one GNSS constellation. If the multi-GNSS chip inside your phone includes Galileo, then your phone will be automatically using Galileo.

Galileo is not an application that you download; Galileo is a native feature of the smartphone itself. [6]

Galileo compatible devices

Today, more than 30 companies produce Galileo-ready chips. Regarding the smartphone market, there are more than 20 manufacturers which have already started to produce Galileo enabled models. These companies include

Key chipset manufacturers like u-blox, Broadcom, Mediatek and Intel, STM, a leading European chipset manufacturer in the automotive sector, has announced Galileo-ready “Teseo” chips for vehicle telematics and navigation systems.

Qualcomm, the market leader for smartphone chips such as Snapdragon, has already built Galileo into its devices, meaning that many smartphones are Galileo-ready in the consumer market.

You can find up-to-date information on all available Galileo-enabled products at [7].

References:

- [1] IGS: <http://www.IGS.org>
- [2] GNSS: https://en.wikipedia.org/wiki/Satellite_navigation
- [3] GSA/GNSS: https://www.gsa.europa.eu/system/files/reports/market_report_issue_6_v2.pdf
- [4] Open Service: https://www.esa.int/Applications/Navigation/Galileo/Galileo_services
- [5] Commercial Applications <https://www.unoosa.org/pdf/pres/stsc2014/2014gnss-04E.pdf>
- [5a] [https://gssc.esa.int/navipedia/index.php/Galileo_High_Accuracy_Service_\(HAS\)](https://gssc.esa.int/navipedia/index.php/Galileo_High_Accuracy_Service_(HAS))
- [6] <https://www.gsc-europa.eu/news/is-galileo-inside-your-phone>
- [7] www.useGalileo.eu or <https://www.usegalileo.eu/EN/inner.html#data=smartphone>

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