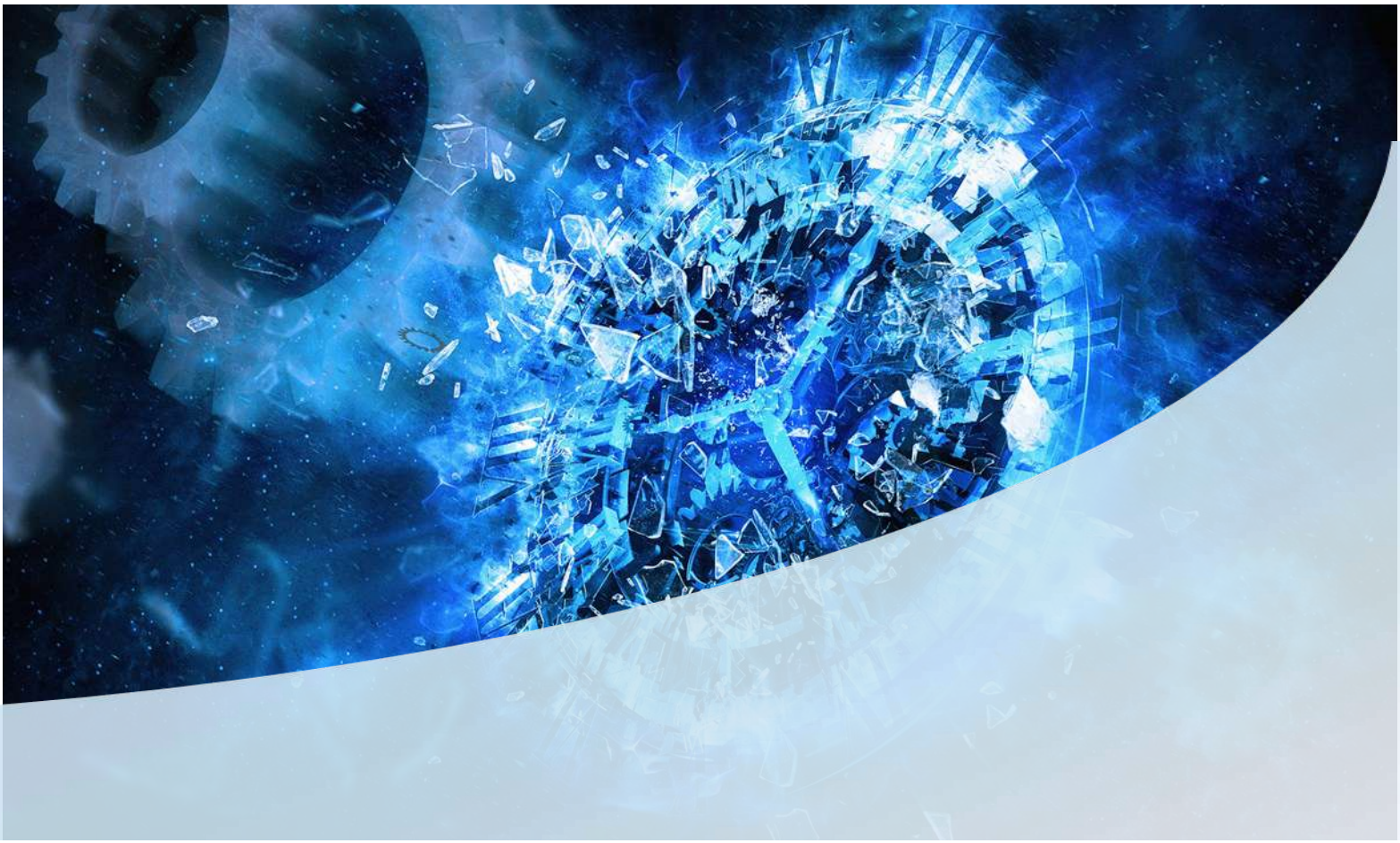


GIANO

Galileo-based
t**I**ming receiver for
critic**A**l i**N**frastructure
r**O**bustness

NewsLetter #1

NOVEMBER 2019

European
Global Navigation
Satellite Systems
Agency

http://gianoproject.eu/

Welcome Letter

Dear Reader,

This Newsletter is a starting point to explore the themes, investigated by GIANO project, facing Timing and Synchronisation (T&S) issues, with respect to European Satellite Navigation Technologies.

GIANO, that stands for Galileo-based tIming receiver for criticAl iNfrastructure rObustness, is a project that aims at bringing Galileo and EGNOS driven-innovation to the GNSS-based T&S domain. GIANO receiver will represent a next-level device that will boost both accuracy and robustness features of several T&S applications.

De facto, unavailability of synchronisation due to unintentional or intentional issues, such as interferences or attacks to GNSS signal, can cause huge economic losses caused by the disruption of services.

The idea of GIANO is based on the key role that EU GNSS-based receivers can play for the so-called Critical infrastructures (CI). In fact, a more robust, reliable and accurate EU GNSS-based solution can bring to sensitive markets, such are the CI, a towering enhancement of performance, in terms of safety, security and reliability.

Welcome Letter

Telecommunications, Energy and Finance segments, but also Rail, Aviation and Research Communities and Operators, can make use of such disruptive and innovative product, guaranteeing a higher robustness of services.

Recently, GIANO Consortium achieved the third milestone of the project (Preliminary Design Review - PDR). The next exciting phase, starting from December of this year, will pave the way to the Critical Design Review (CDR), expected to be held at the end of January, after which GIANO prototype will be validated and implemented.

The project is currently on schedule, thanks to the teamwork performed by GIANO Team members. Further events will be attended by GIANO Consortium in the following months, which will be presented in the dedicated section of the Newsletter. We will discuss all these new activities and the attended events in the next issue of the Newsletter.

Do not forget to look out the fascinating section: the “4th Dimension”.

INDEX

Welcome Letter 2

News & Events 4

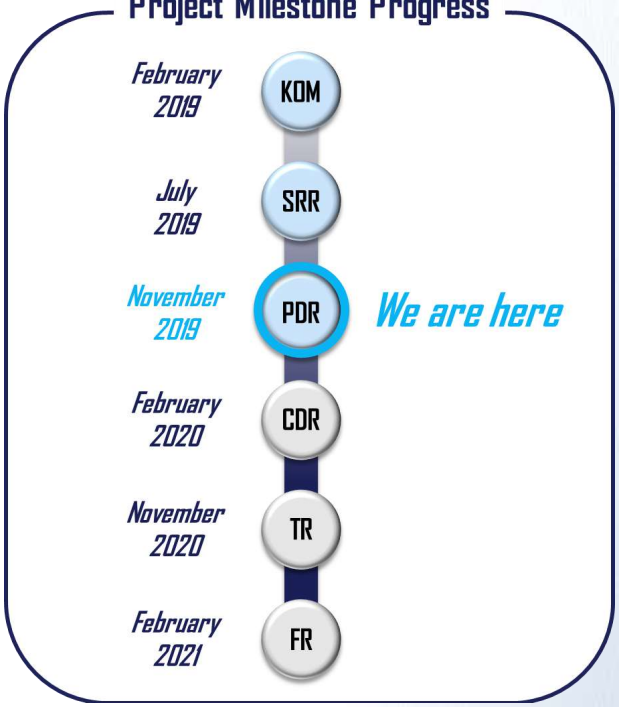
Fourth Dimention 6

Partners 7

Contacts 8

News & Events

Project Milestone Progress



After successfully closing the SRR in July 2019, the PDR has been performed in Prague on the 26th of November 2019.

The Consortium also presented GIANO at the ITSF 2019 held in Brighton, during *Generation GNSS & Time References* session, generating Timing and Synchronisation experts great interest .

Next week, GIANO solution will be presented again at the European Space Week in Helsinki (3rd December 2019).

The Consortium is also preparing and setting up a booth for New Space Economy event in Rome, in collaboration with SARA Consortium (Search And Rescue Aid and Surveillance using High EGNSS Accuracy).

Last month, GSA published the 6th edition of the *GNSS Market Report*, showing in-depth analysis of latest global trends and developments. This report is considered as a consolidated source of information in the GNSS world, providing useful insights in such fast-growing market.

Last week GSA released the updated versions of the *Reports on User Needs and Requirements,* thanks to direct consultation with users community of position, navigation, and time services and technologies.

During this week (27-28 November 2019) the Space 19+ (ESA Council at Ministerial level) has been taken place in Sevilla (Spain), discussing future European space activities and the budget of Europe's space agency for the next three years.

IFCS-EFTF 2019

(Joint Conference of the IEEE International Frequency Control Symposium & European Frequency and Time Forum)

Orlando (FL, USA), 14-18 April 2019

GIANO poster presented

NavSpace 2019

Padua (Italy), 18-19 June 2019

GIANO Project introduced during the *Application Track* Session

ITSF

(International Timing and Synchronisation Forum)

Brighton (UK), 4-7 November 2019

Presentation of GIANO solution during "*Next Generation GNSS & Time References* " session

European Space Week

Helsinki, 3-5 December 2019

The Consortium will present GIANO receiver during *E-GNSS user assembly* session

New Space Economy

Rome, 10-12 December 2019.

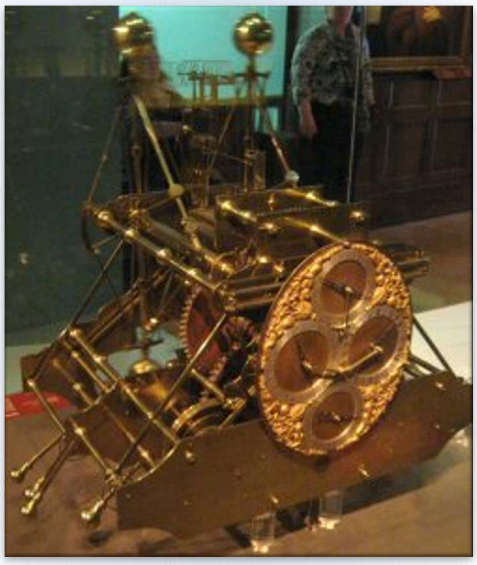
The Consortium will set up a dedicated booth, in which the GIANO project will be shown

Fourth Dimension

The fourth Dimension is our special section, we want to show to the large audience the importance in human being of the Time. In this view in each release we will publish a story, a theory or a piece of human history related to time. **Enjoy our 4° Dimension!**

Determining longitude on land was fairly easy compared to the task at sea. A stable surface to work from, known coordinates to refer to, a sheltered environment for the unstable chronometers of those days, and the ability to repeat determinations over time made for great accuracy.

For calculating longitude at sea however, early ocean navigators had to rely on dead reckoning, which involves triangulating several bearings of the same land feature from different positions. Once out of sight of land, longitude became impossible to calculate, which sometimes led to tragedies in stormy or foggy conditions.



The Greek astronomers could measure latitude as early as the third century B.C., but more than 2,000 years passed before the development of a reliable method for measuring longitude. Former New York Times reporter DavaSobel (coauthor, Arthritis: What Works, 1989, etc.) sets the stage by recounting the difficulties that early navigators had in determining their exact longitude.

In order to deal with not being able to calculate longitude, captains would sail to the known latitude of their destination, and follow the line of constant latitude home. This was known as running down a westing if westbound, or easting if eastbound.

Determining latitude was relatively easy in that it could be found from the altitude of the sun at noon with the aid of a table giving the sun's declination for the day. Latitude can also be determined from night sightings of Polaris, the northern pole star.

However, since Polaris is not precisely at the pole, it can only provide accurate information if the precise time is known or many measurements are made over time, which made developing an accurate chronometer for long ocean voyages even more vital.

Motivated by a number of maritime disasters attributable to serious errors in reckoning position at sea, the British government established the Board of Longitude in 1714.

British Parliament offered, through the board of longitude, a rich prize for a practical way to measure longitude at sea. British astronomers saw a solution in the stars, by making sufficiently accurate measurements of lunar positions and comparing them to positions calculated for a known reference point. But the calculations could take hours and were tricky even in the best of circumstances.

Longitude Prize were to be awarded to the first person to demonstrate a practical method for determining the longitude of a ship at sea. Each prize, in increasing amounts, was for solutions of increasing accuracy. These prizes, worth millions of dollars in today's currency, motivated many to search for a solution.

Fourth Dimension

Britain was not alone in the desire to solve the problem. Due to the international effort in solving the problem and the scale of the enterprise, it represents one of the largest scientific endeavours in history. "Precise knowledge of the hour in two different places at once—a longitude prerequisite so easily accessible today from any pair of cheap wristwatches—was utterly unattainable up to and including the era of pendulum clocks. On the deck of a rolling ship such clocks would slow down, or speed up, or stop running altogether. Normal changes of temperature encountered en route from a cold country of origin to a tropical trade zone thinned or thickened a clock's lubricating oil and made its metal parts expand or contract with equally disastrous results. A rise or fall in barometer pressure, or the subtle variations in the Earth's gravity from one latitude to another, could also cause a clock to gain or lose time. Before the 18th century, ocean navigators could not find an accurate way of determining longitude. A practical solution came from a gifted carpenter, John Harrison, who solved one of the most difficult problems of his time by creating an accurate chronometer.

Over a period of 40 years, he developed four increasingly precise chronometers capable of holding accurate time over a long, rough sea voyage. Comparing the chronometer's time to local sun time, a navigator could measure longitude with high precision in short order. Despite fierce opposition from astronomers Harrison's clocks were enthusiastically endorsed by every mariner who put them to the test (including such luminaries as Cook and Bligh). With the support of King George III, the clockmaker eventually prevailed and won the prize. This is a clear example on how time can be applied in different fields and how it is important to improve the precision and accuracy of the human instruments.

Reading suggestion :

Longitude

Dava Sobel

«In the theory of relativity there is no unique absolute time, but instead each individual has his own personal measure of time that depends on where he is and how he is moving.»

Stephen Hawking

Partners

Thales Alenia Space in Italy (TAS-I) is the Italian division of Europe's largest satellite manufacturer, it operates in the security, aerospace, transportation, defense and space markets. TAS-I is the leader company of the project, being responsible of its development in each phase

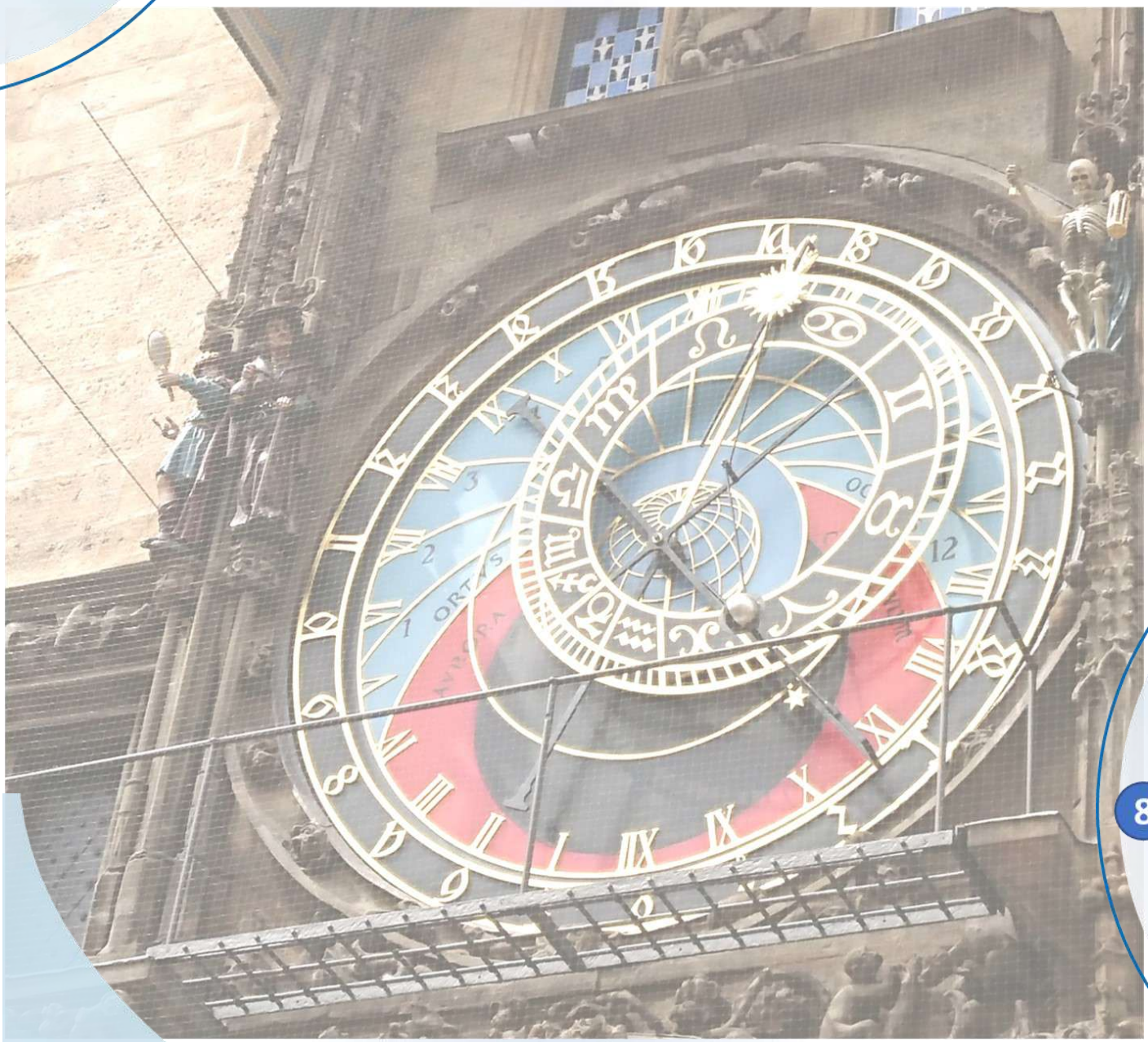
Business Integration Partners S.p.A (Bip) is an international management consulting company specialised in transforming the future of large and complex business realities. Bip will provide its wide expertise to business development and dissemination plan of GIANO project, thanks to its consolidated know-how on downstream sector

PIKTime Systems is a Polish company specialized in precise timing applications and time-based products & services. Piktime will design the timing distribution module of GIANO, providing accurate time synchronisation on the selected interfaces phase

Space Research Center of the Polish Academy of Science (SRC PAS) is an interdisciplinary research institute, which participates in space research, as well as development of space equipment in Poland. SRC will contribute to testing and validation phases of the platform prototype, evaluating the time transfer receiver performance with live signals at the Astrogeodynamical Observatory

DEIMOS is a lead engineering and space system provider in Europe. Deimos will be responsible for design and implementation of Galileo authentication algorithms and will support the architecture definition phase

Contacts



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