USER CONSULTATION PLATFORM 2020

MINUTES OF MEETING OF THE MARKET SEGMENT PANEL

Meeting Date	02.12.2020	**Time**	09:00-13:00
Meeting Called By	GSA	**Location**	Online event
Minutes Taken By	First & last name (company)	**Next Meeting Date**	UCP 2022
Attendees	**Justyna REDELKIEWICZ MUSIAL (GSA), Panel moderator** **Pascal CAMPAGNE (FDC), Panel coordinator** **User Community Representative** Samuel RYCKEWAERT, (Ubiscale), **Panel Users' Chair** Speakers: Cristina ANANASSO (European Commission) Tomas JONSSON (European Commission) Eduard ESCALONA (GSA) Akos NAGY (GSA) Flavio SBARDELLATI (GSA) Matteo PAONNI (European Commission, Joint Research Centre) Tomasz LEWANDOWSKI (Airbus Defence and Space) Nicolas HANSS (FDC) Marc LEMINH (Kineis) Grega MILCINSKY (Sinergise) Steve BECK (Sony) Thierry TORLOTIN (Syntony) Fabien MESSAGER (Thales Services Numériques) The session was attended by 85 participants, representatives of mass market applications industry and users.		
Distribution (in addition to attendees)	UCP Plenary, GSA, Public		

Agenda Items	**Presenter**
Welcome and introduction	Justyna Redelkiewicz Musial (GSA)
Consumer platforms: smartphones and wearables – Galileo optimization: single and dual frequency testing results – Copernicus data for mobile applications	Tomasz Lewandowski (Airbus Defence and Space) Cristina Ananasso (European Commission) Grega Milcinsky (Sinergise)
Internet of Things New emerging area: positioning user requirements in low power IoT in asset tracking – GeoNAV project	Pascal Campagne (FDC) Fabien Messager (Thales Services Numériques)

– Galileo of Things project – Apollo project – Kineis – Sony	Samuel Ryckewaert (Ubiscale) Thierry Torlotin (Syntony) Marc Leminh (Kineis) Steve Beck (Sony)
What is new in Galileo for mass market? – OSNavigation Message Authentication update – Update on High-Accuracy Service – New I/NAV Capabilities Enabling Faster TTFF for Galileo Open Service Users	Flavio Sbardellati (GSA) Eduard Escalona (GSA) Matteo Paonni (European Commission)
What's new for start-ups and SMEs? – Introduction to Cassini, funding and support for start-ups and SMEs	Tomas Jonsson (European Commission) Marta Krywanis (GSA)
Final Q&A	Justyna Redelkiewicz Musial (GSA)

Summary

The Mass Market segment panel of the third User Consultation Platform (UCP) took place on 2 December 2020 as an online event. The panel gathered 85 participants with comprehensive coverage in terms of value chain.

Mass Market applications are extremely diversified. Besides the presentation of planned Galileo signals and services evolutions, of the potential of Copernicus for mass market applications, of test campaigns on smartphones and wearables, and of the Cassini programme to be implemented to support start-ups and SMEs, a focus has been made on Internet of Things (IoT) applications and requirements. This domain encompasses a large variety of end-user applications. It ranges from tracking for optimization of logistics process, monitoring of smart cities, farming or fishing activities, to many consumer usages such as pet, sport or goods tracking. In all those Internet-of-Things use-cases, GNSS is used in an untethered device that is usually connected through a wireless network.

Low cost, size and even weight are often the major high-level user requirements and are tightly linked to the **power consumption**. When it comes to the design of a tracking device, many technical trade-offs have to be made such as the choice of the battery, the hardware design or the rates of position fix.
Authentication is not necessary for all applications, but could be crucial for many, and would be a strong differentiator for them. Implementation of **OSNMA** is a market enabler for specific uses cases (e.g. high value asset tracking or when life is at stake).
Many applications can deal today with a metric accuracy, but a majority of the audience considered **High Accuracy** as an important feature in some emerging uses cases, and which could open the door to new applications.

Faster signal acquisition and easier tracking would make the application more attractive (fast fix) and would contribute to power consumption optimisation.

As it happened during the previous UCPs, there was a consensus that the **UCP was a useful exercise**. Participants are eager to contribute to the next UCP edition.

Election of the users' chairperson
Samuel RYCKEWAERT, (Ubiscale) was elected as chairperson to represent this market segment at the UCP Plenary.

General discussion notes

Consumer platforms: smartphones and wearables

Airbus DS presented the result of testing campaigns they performed on smartphones and wearables. Real- life testing has been realised on different conditions (car, pedestrian, bike) and JRC supported lab testing.
Smartphones testing confirmed that embedded GNSS receivers are able to provide a PVT with Galileo signals only. They also showed that dual frequency smartphone receivers take advantage of the L5/E5a signals to get better positioning solution.
Wearables testing confirmed that most of the smartwatches currently available on the market are able to use Galileo signals. There was no clear superiority detected on the different GNSS receiver configurations among the device tested. However, in many test cases, GPS+Galileo configuration was the best performing one, in particular with regard to accuracy.
More generally, these tests have shown that the consideration of Galileo in mass market receivers is continuously improving.
GSA reminded that 500 models of smartphones are already equipped with Galileo receivers.

The European Commission introduced the Copernicus programme and services. It was reminded that all Earth Observation Copernicus data provided are free and open. Atmosphere and the Marine monitoring services were presented. Applications (e.g. forecasts) already available on smartphones were taken as examples. Some of these applications are used by hundreds of millions of people worldwide. Answering to a question from the audience, it has been clarified that PM2.5 (fine particulate matter) data is part of the Atmosphere Monitoring Service.
Sinergise who is operating the Sentinel hub, presented their experience of using Copernicus data on mobile devices. Existing applications and potential uses cases where described.
Services are now available which make easy to integrate the petabytes of worldwide Earth Observation data in a mobile device, without necessarily needing complex back end processing. You can find an API easy to use, processing scripts and libraries available open source.

Internet of Things

Thales Services Numériques presented the GEONAV IoT project, providing a real-time Indoor/Outdoor precise (<1m) tracking available worldwide. In constrained areas, EGNSS Positioning is improved by deploying a light Ultra-Wide Band (UWB) infrastructure computing an augmented EGNSS-UWB PVT (Position Velocity and Time) information. Three use cases were

presented: localisation of individuals (e.g. armed forces or rugby players), autonomous vehicles (e.g. trains or drones) and asset tracking. Challenges comprise continuous, accurate and reliable positioning and real-time localisation monitoring.
A first application presented concerned elite sport. The example given is tracking of rugby players. The goal is to help the coach making the right decision at the right time. The environment is constrained (stadium), size, weight and shape of the device to be carried by the players provide other constraints. Consumption and size of the battery are therefore key. Metric accuracy is required (2m 2 sigma Horizontal).
A second use case is tracking of objects to improve the manufacturing process. The object must be tracked all along the assembly line or during transport between two sites. Battery size requirement is relaxed compared to the previous use case, accuracy is similar, and fix update rate is far less, about every 1 or 6 hours or even on-demand. However, although Time To First Fix (TTFF) is not clearly specified, fast acquisition is essential. The equipment potentially in a standby mode for a long time and traveling during this period, must be able to make a fix quickly to save the battery for an autonomy expected of 6 months in average. The use of several constellations increases the processing and consumption. The use of Galileo alone is a solution. Authentication provided by Galileo can provide new market opportunities, but can also simplify the authentication processing implemented on today's solutions. This would consequently decrease power consumption and save battery.

The Galileo-of-Things project was presented by Ubiscale. This project is focussing on IoT devices and use cases that take benefit of Galileo, for which Galileo could be even used as the default constellation. This project intends to develop low-power and cost-efficient IP cores for a next generation of System-On-Chip embedding Galileo capability with Network Based IoT connectivity.
Three promising tracing applications were presented: logistics/containers tracking, sport trackers and smart farming. Power consumption is highlighted as a major issue, and positioning is representing more than 50% of the power budget in the first use case. Cost and size (e.g. wearables) are the other major constraints for these applications, and have a tight link with the power consumption issue. Fast acquisition is required for sport trackers (TTFF about 2s).
Other applications can also benefit from Galileo used in combination with connectivity, such as bike sharing, smart city mobility, pet trackers, good trackers and people trackers.
Concerning the planned new Galileo features: Authentication and High Accuracy, it was explained that Authentication is useful for high value goods tracking or high value service or when life matters; and High Accuracy will bring a much better user experience, but use of an HA service will remain a trade off with power consumption. These new features of Galileo must be integrated into the chipset, easy to use and cheap.

Syntony presented the Apollo project. It aims at providing a GALILEO-based geolocation solution for the IoT market by considerably decreasing the bill of material of the GNSS function and by dividing its power consumption by more than 10 or 20. To reach such performances, the consortium develops a software GNSS receiver able to run on any IoT application processor and implements cloud distribution methods to host most of the location processing on a remote server. Although the project concerns also other use cases, the container use case was taken as an example.
Containers battery life must exceed 5 years, for a few fixes per day and the expected accuracy is about 10 meters.
Acquisition time is amongst the major constraints. The application cannot wait more than a few seconds, there is a strong necessity to be faster, in particular to compete with GPS. Length of the code and repetition time is a major issue today when using Galileo. Code is four time longer than

GPS. Technical solutions have been developed at user level to overcome this issue, but improvements from the Galileo signal design would be really appreciated and helpful.

Kineis presented their 25-nanosatellite constellation tailor-made for IoT, with the goal of bringing IoT everywhere. The system will be operational worldwide in 2023. At user level, a small device will send and receive very short messages which can contain sensor data including positioning information. These data receive by the satellite will be forwarded to the customer via a network of ground stations. It targets applications which cannot use a terrestrial connectivity. Three use cases were detailed: artisanal fisheries, asset tracking (e.g. containers) and livestock monitoring. Again, the quest for ultra-low power and very small size is highlighted for a majority of applications. For some applications (e.g. container tracking), years of autonomy are expected with a small battery. Resilience to jamming and spoofing is mandatory for applications where control is at stake. For instance, in the case of artisanal fisheries, to make sure that the small vessels are in the right area at the right time, the system need to be resilient to jamming and spoofing.
Every improvement which can lead to decrease the power consumption and the size of the user device will open up new markets and new applications.

Sony presented their GNSS Integrated Circuits (ICs) designed for mass market. The primary focus of Sony originally was wearables, particularly sport and fitness wearables, and that drove the requirement for low power consumption. But this low power consumption must not compromise the accuracy or the Time To First Fix or sensitivity. Sony therefore used innovative technics, application customized algorithms and very-low voltage circuits. They also developed L1+L5 and multi-constellations devices. Driver behaviour and pay as you drive insurance is a rapidly growing market, and thanks to the achievable low consumption capability, the insurance companies are now starting to send out devices to the client directly that he can stick to the windscreen. The device last for 1 or 2 years and records their journeys, their behaviour and provide crash analysis, should the worst happen.
In addition to low power, fast start up time and 1 Hz tracking are required. Connectivity can be exploited in many cases. When IoT devices include a modem, cellular or LPWAN, the ephemeris data can be downloaded into the device which can achieve a 2s start-up time to get the first fix. Reliance on continuous wireless connectivity is however difficult in a lot of applications around the world, consequently local storage is needed.
In summary, the main requirements are therefore primarily power consumption, small cost, and small size. The ease of designing is also seen by Sony as a major asset for market penetration. Sony is therefore not only selling their ICs, but also partners with module makers to ease the task of the application developers. Sony considers that TTFF and the number of constellations that can be tracked constitute lower priorities.
Answering a question from GSA, Sony explained that for most of the IoT devices nowadays, the bigger power consumption is very likely in most cases related to the connectivity. It depends however on the implementation of the GNSS solution, and on how much you are using this connectivity, as well as the capability of the cellular networks to support the low power features.

<u>What is new in Galileo for mass market?</u>

GSA gave an update of the Galileo Open Service Navigation Message Authentication (OSNMA).
This new feature of Galileo can protect against some spoofing threats and mitigate the consequence of a spoofing situation, and by the way increase the trustability of the GNSS solution, as well as market adoption.

Spoofing alteration of the signal can happen at two levels: at data level, i.e. the navigation message can be counterfeit, or at range level. OSNMA aims at protecting at data level. It is a first step towards a fully protected solution. It will be accessible through the Galileo Open Service, so by all user, free of charge and fully backward compatible with the legacy service. It doesn't require any major adaptation of the receiver. This adaptation will be limited to software or firmware upgrade, to implement an algorithm. The receiver must however be able to continuously track E1B, it must have access to a trustable knowledge of time (not necessarily accurate), and it has to ensure the integrity of a public key stored in the receiver. The current shape of the service is consolidated.
The subject of authentication is the navigation data, and more precisely the clock and ephemeris data. There is some latency for processing, so OSNMA is not a real time authentication function.
In 2021, the GSA will open up a big public observation phase, open for all to test and validate solutions, or check the suitability of the OSNMA capability for different use cases, applications and users. All information needed to perform testing will be made publicly available to all. Feedback will be welcomed and potentially considered for further service evolution.
GSA has funded the implementation of the OSNMA functionality in a number of receivers close to market. Following this public observation phase, the service will be consolidated. Some prototype receivers implementing this OSNMA capability already exist (ST Microelectronics, Septentrio, U-Blox) and will certainly be available on the market when the service provision phase is declared.

Answering a question from the audience regarding the capacity of 2020 smartphones, GSA recalled that a prerequisite to exploit the OSNMA is to have a receiver or a chipset which is able to decode E1B to retrieve OSNMA data on a continuous basis. All receivers are not able to do this, and in any case, this continuous decoding has to be forced as an advanced issue. Consequently, some adaptation might be needed in the case of smartphone to sustain OSNMA testing.
Answering another question about the public availability of reference documentation, GSA clarified that they will make available before the public testing all relevant technical baseline, consisting of Interface Control Document and another document explaining how to implement these OSNMA algorithms in the receiver, called receiver guidelines for receiver implementation.

GSA made a presentation on the status of the Galileo High Accuracy Service (HAS). There will be two different service levels. Although the service will be global, service level two will be more focussed on the European coverage area. Both will use PPP corrections, but service level two will also include ionospheric corrections helping to get a faster convergence time. There will be two ways to disseminate the HAS corrections, one through the satellites through the E6B channel, so the receiver will have to support the E6B frequency, and the other distribution channel will be through internet, particularly relevant for mass market and IoT. Both services will provide corrections for both Galileo and GPS. This may evolve in the future towards other constellations. The corrections distributed through the satellites will have a limitation of 448 bits per second. This limitation does not exist for the terrestrial distribution, so the inclusion of more corrections of more constellations should be available through internet. HAS will support the E1, E5 and E6 frequencies of Galileo, and L1, L5 and L2C frequencies of GPS. The target accuracy will be at least 20 cm Horizontal and 40 cm Vertical. The convergence time will be better globally than 300 s while in the European coverage area, it will be better than 100 s (better quality of the corrections due to the inclusion of ionospheric corrections and high density of the ground infrastructure in the European area).
HAS can contribute to many mass market applications.
Implementation is planned in three phases. We are in phase 0, consisting in testing and experimentation. This phase started in 2019 and will end in 2021. There will be a public testing campaign launched following a call for interest for receiver manufacturers who would like to

contribute. This phase may not be relevant for mass market as it will require E6, not currently implemented in smartphones or IoT applications.
Phase 1 will make the service available to all to allow testing of products before the declaration of the service. Phase 1 will be concluded by the HAS initial service declaration which is estimated to happen around second half of 2022. The accuracy performance of the service should be close to 20 cm in Europe. The accuracy outside of Europe will be much better than the OS accuracy, but not comparable with what could be achieved within Europe.
In Phase 2, the full service performance (e.g. 20 cm accuracy) will be reachable globally following an upgrade of the ground infrastructure.
GSA will organise a public consultation for the HAS ICD. Then, when the tests will be completed next year, GSA will publicly release the HAS ICD.
GSA confirmed that they are targeting 20 cm accuracy even in urban environment, knowing that it might however not be achievable in really harsh environment.
GSA launched a survey (https://ec.europa.eu/eusurvey/runner/HAS_SurveyUCP2020) during the UCP regarding the applications relevant for HAS, their requirements, dissemination channels, support functions, barriers…
GSA underlined the existence of the Raw Measurement task force (https://www.gsa.europa.eu/gnss-applications/gnss-raw-measurements) which is an expert group GSA is running. Participation is free of charge.

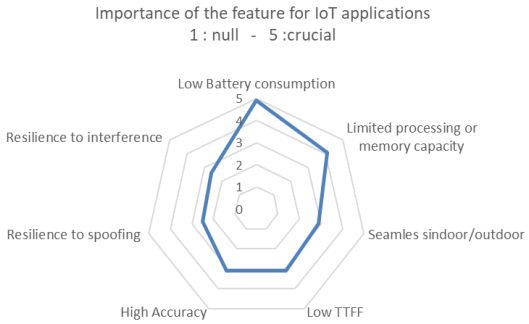
EC/JRC presented new I/NAV capabilities enabling faster TTFF for Galileo OS users.
An update of the OS SIS ICD (Issue 2) is being released soon (https://www.gsc-europa.eu/electronic-library/programme-reference-documents#open). The major update concerns the introduction of three new features to the I/NAV message transmitted within the Galileo E1 OS signal:
– Reduced Clock and Ephemeris
– Reed-Solomon Outer Forward Error Correction
– Secondary Synchronisation Pattern
These features will improve the Galileo E1 Open Service performance in terms of robustness and timeliness. They will allow to accelerate the access to clock and ephemeris data, also in challenging environment, improving TTFF of OS in cold and warm start. At the same time, there will be the possibility to enable a fast reconstruction of Galileo System Time, both for connected and non-connected users (i.e. both unassisted and assisted GNSS).
These new technical solutions will exploit currently unused message capabilities and be implementable with a low level of complexity: these solutions in principle just necessitate to access the navigation message level in the receiver. The Secondary Synchronisation Pattern solution should however also necessitate the access to the stream of the encoded symbol layer. These solutions are complementary but do not require to be implemented all together. Solutions to implement can be selected in accordance with the receiver targeted performance. Backward compatibility is guaranteed (no impact on legacy or non-participative receivers).
A testing campaign for receiver manufacturers will be organised in 2021-2022 by the GSA and supported by the laboratory of the JRC. Thanks to the release of this updated OS SIS ICD, receiver manufacturers have the possibility to access all the technical details concerning these solutions well in advance of the actual broadcast. The broadcast of the operational signal with these new I/NAV capabilities is planned by 2023.

What's new for start-ups and SMEs?

The European Commission introduced the Cassini initiative to stimulate entrepreneurship in the area of space technology and applications building on space data. Its aim is to align the funding instruments better to the need of entrepreneurs, trying to cover the whole life cycle of innovation creating ideas to start companies and making companies grow. There is a need also to connect space policy better with other policies areas such as the digital world and green deal. Institutions could help industry by improving business skills and access to venture capital financing.
Cassini will comprise hackathons and mentoring. Instead of having small hackathons events in local organisations, plan is to have a big event that will take place in ten different locations simultaneously and talking together via video link. There will then be a final pitching and prizes.
A second initiative will be to organize prizes where the winner can acquire sizeable amount of money, that will help them developing their applications and also to market them and to raise venture capital. The idea is to have predefined thematic challenges both on the downstream sector for various Galileo and Copernicus applications and also challenges on space technology in the upstream segment.
A business accelerator will be tailored precisely to the need of companies that are making digital applications using space data. The focus will be on generating sales revenues and raising risk capital. It will also provide networks for both industry and investors. This should be launched in 2022 approximately.
Improving access to seed funding and growth edge funding is a priority. InvestEU will continue in the next seven years.
Matchmaking activities to connect companies with entrepreneurs and large companies in various industry sectors is also planned. This will enable start-ups to piggyback on well established companies, providing a shorter route to customers.

Modifications to requirements already compiled in the Report on User Needs and Requirements (RUR) / New requirements to be added to the RUR:

GSA reminded that the report related to mass market user requirements, outcoming from the UCP: “Report on Location-Based Services user needs and requirements” will be updated taking account of the presentations and discussions of the session. In particular, IoT applications presented during the session will be considered. A compilation of the requirements concerning the applications presented is annexed to these minutes.
It is worth noticing that the use cases presented are existing uses cases built on GNSS today’s performance and limitations, and thus the requirements are obviously reachable for these applications. But it was made clear that evolution of the technologies and signals allowing lower power consumption, faster acquisition, higher accuracy and increasing resilience will push for new applications and new markets.
A poll was organised during the session. The results are summarized in the figure below.



Analysing the detailed results of the poll, the following can be noticed:

- Low battery consumption is crucial for 91% of the poll participants (and very important for 9%)
- 55% of the poll participants considers High Accuracy as very important.
- Resilience to spoofing is crucial for 9% of the poll participants and very important for 18%, confirming that this does not concern all applications but is a necessity for the applications concerned.
- Low TTFF is crucial for 27% of the poll participants and important for 45%. It definitely depends on the application. It is for instance crucial for applications staying with no satellite visibility or in standby mode for a long time, and which want to rapidly make a fix for energy saving reasons.
- Resilience to interference is important or very important for 63% of the poll participants.

Answers to the R&D questions (poll):

<u>What are the emerging EGNSS applications that are using synergies with Copernicus?</u>

- Fast observation of pollution/risk/accident to support citizen health Empower the citizens to contribute to green technology development

<u>What financing tools could be used to support further market uptake of applications in your market segment? (e.g. Grants, Innovation procurement, acceleration)</u>

- All financing tools are important, what is crucial is to have tools supporting each phase of the development of a product from R&D, up to and without forgetting tools to support the industrialization phase and procurement. With regard to Procurement, actions could target directly procurement agency, e.g. organise some communication and coordination among procurement agencies of all EU MS
- Coaching for start-ups related to access to funding.
- Support educational activities (MOOC and other) to facilitate access to Galileo funding for more people

<u>What large implementation projects are emerging in your market segment?</u>

- Big projects on Galileo HAS and Authentication services, supporting all steps from research and development of user Galileo devices and services, integration into professional systems and platforms, including up to operational testing with several user communities (involving many of their procurement agencies)
- Iot for container trackers

Conclusions

The third edition of the Mass Market Segment UCP session is successfully closed by the GSA. Key results of this working session were highlighted during the plenary UCP session on December 7th, 2020 by Samuel RYCKEWAERT.

Other Notes & Information

With the contribution of:

AIRBUS DEFENCE & SPACE

FDC

kinéis

SINERGISE

SONY

SYNTONY GNSS

THALES

UBISCALE

Annexes & Attachments

- UCP2020_Mass Market_Panel_Results_Summary.ppt
- IoT_user_requirements.xls

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