



## USER CONSULTATION PLATFORM 2020

### PLENARY SESSION MINUTES OF MEETING

<b>Meeting Date</b>	07.12.2020	<b>Time</b>	10:00 – 12:30
<b>Meeting Called By</b>	GSA	<b>Location</b>	Online event
<b>Minutes Taken By</b>	Marie-Laure Mathieu (FDC)	<b>Next Meeting Date</b>	UCP 2022
<b>Attendees</b>	All participants to the User Consultation Platform Plenary Session		
<b>Distribution (in addition to attendees)</b>	All participants to the 2020 User Consultation Platform, GSA, Public		

Agenda Items and Guests		
<b>1. Opening</b>		
EU Space Programme Representatives	Timo Pesonen, EC, Director-General for Defence Industry and Space	
	Rodrigo da Costa, GSA, Executive Director	
<b>2. Panel Session I</b>		
Users' chairpersons	Vanessa Rullier, EBAA	Aviation and drones forum
	Captain Johan Gahnstrom, CompetenSEA	Maritime and ocean monitoring forum
	Gabriele Ridolfi, ERTMS Users Group	Rail forum
	Juan Luis Valero, EU Satellite Centre	Natural disasters and emergency response forum
EU Space Programme Representatives	Eric Guyader, EC	
	Jean-Marc Piéplu, GSA	
<b>3. Panel Session II</b>		
Users' chairpersons	Samuel Ryckewaert, Ubiscale	Mass Market / LBS and IoT forum
	Miguel Ortiz, CEN Working Group	Road forum
	Michele Tozzi, UITP	Public Transport forum
	Heinz Reichinger, RUAG	GNSS for Space Users forum
EU Space Programme Representatives	Ignacio Alcantarilla Medina, EC	
	Zuzana Mazanová, EC	
<b>4. Panel Session III</b>		
Users' chairpersons	Heiko Gerstung, Meinberg Funkuhren	Infrastructures (Telecom, Energy, Finance) forum
	Pablo Olmos, Leica Geosystems	Geomatics and Urban Planning & Agriculture and Forestry fora
EU Space Programme Representatives	Cristina Ananasso, EC	
	Guerric Pont, GSA	
<b>5. Conclusions and Next Steps</b>		
EU Space Programme Representatives	Fiammetta Diani, GSA, Head of Market Development Department	
<b>Plenary Moderator</b>	Dan Sobovitz	

## Opening

Dan Sobovitz, the plenary moderator, welcomed the participants to this third edition of the User Consultation Platform (UCP) Plenary meeting. More than a thousand of users participated on 1<sup>st</sup> and 2<sup>nd</sup> December 2020 to the online fora meetings, which covered twelve different market segments and all together represented 48 hours of users' consultation. The objectives of the Plenary session were to:

- Share the salient findings of the different fora sessions,
- Identify possible commonalities among the different sectors,
- Bring the fora results to the attention of the EU Space Programme decision makers for careful consideration and get their early feedback.

The Plenary was organised in three successive panels, inviting the users' chairpersons from 11 fora to share through an interactive session of questions and answers the key outcomes of their consultation and to exchange with some representatives of the EU Space Programme.

The Plenary session was opened by Timo Pesonen, Director-General for Defense Industry and Space at EC, who welcomed the participants to the European Space Week, organised this year as a virtual event due to the particular circumstances of the Covid-19 pandemic. The event is taking place at the right time, when the final stages of the European Union Space Regulation are under discussion and negotiations by the EU legislators and should be concluded in the coming weeks. This will lead to a new Space Programme with a significant budget and a new European Agency for Space Program, EUSPA in Prague, which will be continuing the excellent work of GSA. To understand how we get here, one can look a little bit backwards. The European Union started developing its Space activities in the 1990's. Since then, the EU strategy has remained the same, focused on the users. Only by bringing the benefits of EU Space assets to all European citizens, companies and public administrations can be effectively maximised the return to EU society and economy. Space is an enabler and the EU strategy has become a success story. Today, already two Billion smartphones are using Galileo around the world. EGNOS is continuing its success with more than 400 European airports using EGNOS-based operations. 72% of earth observations data exploited by European companies including SMEs are based on free Copernicus data. EU motto of putting users at the heart of the EU Space Programme will not change. New EU initiatives are indeed being designed keeping users and their needs at the forefront. These include a new Space initiative for secure connectivity system, which will provide high speed connectivity everywhere in Europe, including in the Arctic and covering the so-called dead zones too. It will also enable to better protect our critical infrastructures and more effectively support our surveillance, external actions and crisis management by using quantum and 5G technologies and a full European supply chain. Through these initiatives, the EU wants to offer business opportunities to the private sector all over Europe. The UCP reflects EU philosophy to shape two components of the EU Space Programme starting at user level. Timo Pesonen finally thanked the German presidency, the teams at EC DG DEFIS and GSA for the extensive work for the organisation of this online ESW 2020 and wished all participants an interesting and exciting five days event.

Rodrigo da Costa, Executive Director at GSA, shared the thanks to the organisers of the event. The needs and the requirements of the user community are dynamic and in constant evolution. As underlined by Timo Pesonen, users are central to the EU Space Programme and its EGNSS component in particular and this is the reason why the UCP has been created four years ago. This platform is very valuable because it helps decision makers to progress and develop new services and extend the existing ones. It is also valuable for industry and for policy makers. For instance, thanks to previous UCP editions, we understood how useful EGNOS is for helicopters, for example the



emergency ones landing often in difficult weather conditions for which specific procedures were designed. Users priorities for new EGNSS applications and disruptive user technologies are taken into account in Horizon Europe downstream activities. The need expressed by users to receive the correction data for the Galileo High Accuracy Service (HAS) not only from the signal in space but also via the internet has been heard and incorporated into the baseline. This year edition of the UCP brings new user segments and for the first time encompasses GovSatCom and Copernicus. The conclusions of the consultation will help decision markers defining the next steps of the services definition and services provision. Last but not least, Rodrigo da Costa underlined that since its beginning, the European GNSS Agency (GSA) has been a market-oriented EU agency, capable of shaping the design and delivery of advanced, safe and secure satellite services based on Galileo and EGNOS, that are now widely used throughout the different market segments. 2021 will mark an important evolution for the EU Space Programme and also with the transformation of the GSA into the EU Space Programme Agency (EUSPA). Like the GSA, EUSPA will continue being a user-oriented EU agency. Its goal is to foster the use EU Space services across a wide range of market segments while increasing the competitiveness of the EU downstream industry. This means to support the downstream actors with particular attention to innovators, SMEs and start-ups. Rodrigo da Costa finally pointed out being confident that the upcoming exchanges between the panellists will be valuable for all and wished all participants an interesting session.



<b>Panel Session I Participants</b>		
<b>Users' chairpersons by market segment forum</b>	Vanessa Rullier, EBAA	Aviation and Drones
	Captain Johan Gahnstrom, CompetenSEA	Maritime and Ocean Monitoring
	Gabriele Ridolfi, ERTMS Users Group	Rail
	Juan Luis Valero, EU Satellite Centre	Natural Disasters and Emergency Response
<b>EU Space Programme Representatives</b>	Eric Guyader, European Commission	
	Jean-Marc Piéplu, GSA	

The first panel addressed the consultation outcomes of the fora on the Aviation and Drones, Maritime and Ocean Monitoring, Rail and Natural Disasters and Emergency Response sectors.

The first question tackled the EU green deal and how EU Space Programme can support greener aviation and prepare aviation users for future operational needs.

Vanessa Rullier stressed that aviation has been a pioneer in the use of EGNSS. The availability of EGNOS has already provided a great opportunity for aviation to benefit from operational improvements and better access to airports in all weather conditions including bad ones. EGNOS use enables more constant descents and climbing profiles and limits trajectory deviations, thus allowing to decrease aviation footprint thanks to fuel and emissions savings. However, the aviation community also acknowledged that more needs to be done in this area. Indeed, in the recovery from Covid pandemic, the sustainability of operations will depend on improvements of meeting environmental and social obligations. Digitalisation and resilience are also considered as two other important topics, for which EGNSS and EGNOS in particular have a major role to play.

The forum participants have called for boosting the deployment of EGNOS based procedures further. This will enable to remove more operational inefficiencies such as multiple step downs and circling, and follow more direct trajectories, closer alternates, steeper approaches, curved approaches, and customised approach paths. It will in turn deliver environmental benefits in terms of decarbonisation and noise pollution reduction.

Accurate and reliable data are needed for flights planning and during flights for the pilots to find the most sustainable route, which might not be the shortest one. EGNSS and Copernicus will play a key role in finding this solution that both aviation stakeholders and European citizens need. Finally the aviation forum highlighted the need to work towards a smooth deployment of the European air transport navigation policy frameworks and regulations in particular to secure a proper level of performance of EGNOS V3 as well as Galileo in the future. It is also calling for having aircrafts and ground solutions to be developed and proposed at affordable costs.

The second question focused on the main technological and market trends in the Maritime and Ocean Monitoring sector and their impact on user requirements evolution.

Captain Johan Gahnstrom pointed out that there is a clear trend towards the development of new assistance functionalities and services and first steps towards automated vessels, not only for maritime and inland waterways but also for maritime surveillance and fisheries control. GNSS is a mature technology and the central sensor to provide position, velocity and time for navigation and new applications do require high accuracy positioning, high integrity and resilience to jamming and spoofing threats, but they also need to consider redundancy in navigation systems. Both the international maritime IMO and IALA organisations have released guidance on the required resilience of PNT solutions.

The floor was then provided to Juan Luis Valero, who underlined that although the Natural Disasters and Emergency Response forum was for the first edition at the UCP, it was extremely well attended

with more than 200 participants, including representatives from civil protection entities and search and rescue teams from more than 21 European countries. Participants showed a great interest for the present and future emergency warning services offered by both Galileo and Copernicus. Questions raised during the session aimed at better understanding how the services will work when they will be operational and identify benefits and possible constraints associated with their implementation at user level. Moreover, some users spontaneously insisted on the synergies between the Galileo Emergency Warning Service (EWS) and the Copernicus Emergency Management Service at application level. Last but not least, the consultation enabled to gather very useful preliminary user feedback for dimensioning the future Galileo EWS, such as first indications about the number of alerts per year, the number of messages per alert or the need for message repetition.

Representatives from the EC and GSA were then invited to react to the consultations outcomes and raise questions to the panellists.

Eric Guyader first get back on the Galileo ESW, which is planned to be introduced in the Galileo services portfolio in the mid-term. The EC took good notes of users feedback and inputs that will in particular help to size the service capacity, taking into account the inherent limitations of Galileo in terms of message broadcasting. Exchanges with users also enabled to better understand how civil protection authorities would make use the EWS service. Indeed, making a parallel with Cospas-Sarsat, Jean-Marc Piéplu stressed that one of the key elements is how the user community will structure itself to make the link between the service as it will be delivered by the Galileo system and the way it will be used by the various stakeholders involved in emergency situations.

The first question focused on the expected impact of the main technological or market trends in the maritime sector on EGNSS and Copernicus services.

Captain Johan Gahnstrom pointed out that for autonomous ships development, there is high expectations for the Galileo High Accuracy Service (HAS), the EGNOS Maritime Service for integrity, and moving forward, the Galileo authentication (OS-NMA) is something that everyone will appreciate to increase security. When integrated to Copernicus Marine Monitoring services, these Galileo and EGNOS services could also benefit from the optimisation of routing as an example.

New applications for inland shipping, such as bridge collision warning, automatic guidance and mooring assistance will ask for improved performance requirements for PNT data provision, for example high horizontal position accuracy (<30 cm) and high integrity.

For fisheries control, a precise verified location would be essential for monitoring of vessels and use in legal disputes. Galileo - at meter level - and OS-NMA authentication would be very important to ensure undisputable positions. All in all, the developments looked at and used are highly appreciated in the maritime sector.

Jean-Marc Piéplu then seized the opportunity to address drone applications, which are growing rapidly and present unprecedented opportunities for EU industry and SMEs and asked how Copernicus and future evolutions of EGNSS can contribute to drone operations, having in mind also the progress on the regulatory requirements.

Vanessa Rullier confirmed that drones can support a wide variety of operations in different environments, not possible with traditional helicopters or fixed wing aircrafts or in a more cost effective manner. Navigation and positioning of drones can be even more challenging compared to manned aircraft especially in urban environment. Moreover, in the perspective of Urban Air Mobility, maintaining a reliable position becomes critical. Urban canyons and signal shielding within high multipath environments make the environment more challenging, and at risk of interference, jamming and spoofing. In such environments, the availability of EGNSS and services such as the Galileo High Accuracy service (HAS) will help to ensure the continuity of reception supporting

operations not only with the robustness of the service but also the availability of multiple frequencies and more satellites in view. With drone operations increasing beyond visual line of sight, knowledge of the lowest risk flight trajectory is required and is where EU Space Programme can assist. EGNSS and Copernicus data can be used at the start of drone operations in the planning phase to minimise overflight of people and properties and thus reduce risks. The aviation session also highlighted the possibility to use Copernicus coupled with visual acquisition systems on drones to supplement navigation information in the event EGNSS signals loss. Finally, going forward, the number of drones will increase with more interactions between drones and manned aviation. This will make the requirement for robust and reliable positioning from EGNSS more critical to support the navigation and surveillance capabilities of all vehicles, unmanned and manned ones and ensure a safe integration of all Space users in one sky.

The last question focused on the three possible new Galileo services based on the Return Link Service (RLS) and likely to support Search and Rescue operations. They include the Remote Beacon Activation service, the Two-Way Communication service, and the Beacon Distress Positioning sharing service. Eric Guyader asked how users welcome the high-level concepts and if some challenges related to their implementation have been identified.

Juan Luis Valero indicated that the three high-level concepts have been very well received by the forum on Natural Disasters and Emergency Response participants. Their first reactions confirm that these concepts do correspond to operational needs as also evidenced by their identified numerous benefits. Among them, one can quote the reduction of intervention times, the improved detection of false alarms and the better dimensioning of rescue means. In a way or another, all the identified benefits would contribute to save more lives in the end. A few challenges associated with the implementation of these new services were identified. They relate to distress beacon and mainly concern power supply, user interface, and integration with platforms (e.g. boats). The cost of beacons was also mentioned. Finally, users also provided useful feedback for the refinement of the high-level concepts and the dimensioning of the RLS-based services. For instance, first indications were given about the size of the target area for Distress Positioning Sharing.

Dan warmly thanked the panellists for the interesting exchanges and apologised for the technical problems encountered likely due to the virtual mode of the session, which unfortunately prevented the audience to get the outcomes of the Rail forum consultation.



Panel Session II Participants		
<b>Users' chairpersons by market segment forum</b>	Samuel Ryckewaert, Ubiscale	Mass Market / LBS & IoT
	Miguel Ortiz, CEN Working Group	Road
	Michele Tozzi, UITP	Public Transport
	Heinz Reichinger, RUAG	GNSS for Space Users
<b>EU Space Programme Representatives</b>	Ignacio Alcantarilla Medina, EC	
	Zuzana Mazanová, EC	

The second panel focused on the consultation outcomes of the fora addressing Mass market, LBS and IoT, Road, Public Transport market segments and a new comer at this UCP 2020 edition, covering GNSS for Space users.

The first question from the plenary moderator tackled the Mass Market forum and the user requirements in the low power asset tracking and monitoring solutions.

Samuel Ryckewaert pointed out that asset tracking and monitoring solutions in general, is an area that 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 (IoT) use-cases, GNSS is used in an untethered device, that is usually connected through a wireless network, somehow similar to smartphones, but here the device is really fitting the given application. Low cost, size and even weight are 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. A poll made during the session demonstrated that IoT applications are various and their constraints may be different from one application to another. Still, power consumption is a recurring issue and captures the attention (91% of the audience considered it as crucial). GNSS reception, together with modem operation for the communication, is today a major element in the power consumption's budget. If the power consumption could be radically decreased, the battery and thus the device could be used longer (ideally without maintenance), the device size could also become small enough to enable new market applications today limited by size or weight. Finally, the device fix rate could be highly increased, improving considerably the opportunities offered by the device to its applications. Market uptake could thus be much improved.

Regarding the fast Time-To-First-Fix (TTFF), 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 need to rapidly make a fix for energy saving reasons, but only about one third (27%) of the audience considered it as crucial. Nonetheless, in addition, 45% of the audience regarded it as important.

Concerning Galileo, the forum participants raised the fact that the length of the codes is a burden. It has been suggested that a Galileo signal easier to acquire and track, necessitating less processing and memory, would lead to energy savings and less complexity. It would also improve Galileo signals reception in degraded receiving conditions, such as obstructed sky view or with non-optimal antennas. Such an improvement, in comparison with other GNSS, could change the market potential for Galileo.

The second question focused on the technical developments in the automotive sector that are expected to generate or change GNSS user requirements.

Miguel Ortiz pointed out that automated driving still acts as a locomotive in the automotive sector. Honda, for instance, announced a few weeks ago, that Japan has type approved level 3 autonomous



vehicles. Behind communication, the true race concerns fulfilling the demanding requirements of automated driving, in terms not only of accuracy, but also availability and robustness. Robustness here addresses both the safety element (through integrity requirements) and the security one (through authentication). To address these needs, several commercial initiatives are being brought to the market and the Galileo HAS will further support the fulfilment of user requirements.

The panel also benefited from very fruitful discussions on standardization initiatives, which are considered as lever arms to promote GNSS technology, whether it is for C-ITS domain with DATEX II or for the assessment of new GNSS-based systems with CEN standard, EN16803. DATEX II is the electronic language to exchange road traffic and travel related information. To anticipate future needs, high precision referencing GNSS is implemented in the language. EN16803 proposes methodologies to test dual frequency and multi-constellation GNSS receivers using or not PPP or NRTK services.

New R&D projects for automotive GNSS antennas and eCall for motorcycles were also presented. While research on GNSS antennas addresses a gap and a need in the product chain, eCall for motorcycles is a great example of user requirements discussed in anticipation to future EU policies that might come in the future, similar to how eCall R&D did for passenger cars.

The discussion then moved on the key outcomes of the Public Transport forum.

Michele Tozzi pointed out that EGNSS is key to deploy the potential of mobility, which is growing fast with services like MASS, urban mobility, which become more and more popular. At the same time, space data is extremely useful to improve efficiency of more traditional services such as planning, tracking or management of any public transport modes. Galileo multi-constellation and multifrequency receivers can already meet most of the requirements for non-safety critical applications such as passenger information. On the opposite, safety-critical applications have more stringent requirements in terms availability, accuracy, reliability and need to rely on solutions integrating EGNSS data with data from other sensors such as lasers, cameras, radars. In these cases, EGNSS is an enabler. Last but not least, additional EGNSS use cases were identified for further analysis, such as for theft enforcement or to regulate the parking of free-floating fleets in cities, for which high accuracy is certainly needed.

Finally, the outcomes of the forum on GNSS for space users were then presented focusing on the accuracy requirements raised by the Space community.

Heinz Reichinger pointed out that there are many different applications in Space, which all have different priorities and different accuracy requirements. For instance, the application of launchers is sub-divided in three sub-applications, including navigation receivers, safeguard receivers and receivers for return of upper stage, each having different accuracy needs. Nevertheless, following the analysis of the requirements, the space community agreed that 3.5 m (3 sigma) are a common accuracy requirement for many applications. The Galileo HAS is however definitely needed for several space applications, with stringent accuracy requirements such as Precise Orbit Determination (POD) in Low Earth Orbit (LEO), which require 0.6 m (95% sphere) accuracy typically for time-tagging and position-tagging of Earth observation data. Radio occultation and formation flying are two other application examples, requiring respectively 40 cm (95% sphere) accuracy and 15 cm (95% sphere) accuracy. With high accuracy GNSS service, Space users can rely on GNSS only solutions and then get savings on dedicated equipment (non-GNSS) for relative navigation between two or more spacecrafts in terms of cost, mass, size and dynamic.

Programme managers from the EC were invited to react to the consultation outcomes.



Regarding the Road market segment, Ignacio Alcantarilla Medina was happy to see that the work carried out by the EC to assess and enable EGNSS services for road are well demanded by users. Several studies assessing EGNSS use for safety and liability critical applications are about to conclude soon. Two new projects are going to be kicked-off to study integrity for high accuracy applications. There is indeed a demand from many market segments, not only to have high accuracy but to also a means to provide integrity. Regarding GNSS use for Space applications, the EC is happy to see this market segment included in the UCP and some consolidated user requirements as a result of this first consultation. Galileo, EGNOS and Copernicus are indeed key systems for space users, first because we are in a natural environment where space-based services serve space applications and where terrestrial services could have difficulties to comply with users' requirements. Secondly, because we expect very good performance from EGNSS services due to the absence of local errors such as multipaths and therefore be able to meet the accuracy requirement of 3.5 m (3 sigma) and deliver much better performances.

Zuzana Mazanová then get back to mass market applications, asset tracking and monitoring solutions in general. The EC has taken note that GNSS reception is one of the major element in the power consumption's budget and a limitation to the market uptake. With regards to Galileo signals, the length of the code has been raised as an issue. In this respect, the EC is currently working on the introduction of new features to the I/NAV message transmitted within the Galileo E1 OS signal . These changes will come very soon and will allow better and faster acquisition of the signals and shortened TTFB. Regarding public transport, Zuzana pointed out that the EC will publish in the coming days a so called Sustainable and Smart Mobility Strategy, in which urban mobility is going to be addressed.

As for the first panel, programme managers from the EC then raised questions to the panelists.

Regarding mass market, Zuzana Mazanová was interested to know more about the balance between constraints characterizing mass market solutions in terms of power, size and complexity and the need for increased performances and the potential use of Galileo differentiators by mass market users.

Samuel Ryckewaert pointed out that a number of technologies and algorithms have already been developed to optimize the GNSS signals receiving process, the position accuracy and to adapt to various use cases. But engineers still need to investigate many technical trade-offs in the way GNSS is used in order to fulfil application objectives. Regarding Galileo differentiators, the evolutions presented by the JRC have been appreciated in particular regarding faster TTFB as it contributes to power efficiency goal. The participants are eager to analyse the I/NAV improvements when the future Galileo OS specifications will be released and to perform tests. The participants have shown high interest in High Accuracy (55% as very important). Anti-spoofing seems interesting only to a minority, although it may be important for them. 45% of the audience considers resilience to interference as important. Even if authentication and high accuracy are not seen yet as crucial features, they could open the way to new potential applications especially for smartphones. To that purpose, the raw measurements task force will explore how to use OS-NMA and the new I/NAV improvements.

The second question raised by Ignacio Alcantarilla Medina focused on road users' expectations and needs out of new EGNSS services.

Miguel Ortiz indicated that the panel hosted several very informative presentations about the new Galileo services features and scheduling, as well as ongoing R&D on the evolution of EGNSS services. In these presentations, it was clarified that the GSA is funding R&D projects and designing new Galileo features (OS-NMA, CAS, HAS,...) focusing on users and public interest, aiming to bring added-value to the competitiveness of EU companies.

The participants showed high interest in the presentations. Regarding the Galileo OS-NMA, users were eager to obtain information to get prepared for the upcoming public testing/observation phase. Regarding the HAS, the audience underlined the need to design new EGNSS services and to plan their evolution in alignment with the market landscape, in order to avoid entering into competition with commercial offers, while meeting the requirements of users in terms of both performance and price.

Considering that Public Transport was featured for the first time during the UCP, the next question addressed the engagement of the Public Transport ecosystem into the forum.

Michele Tozzi pointed out that the session was built around four segments namely FaaS, trams, trains and other services. The objective was to involve not only public transport operators and authorities but also transvers mobility providers able to cover the migration to MaaS and combined mobility. Overall, the session was attended by around 40 participants. The consultation highlighted that there is still a need to raise awareness on EGNSS benefits in the public transport sector. The International Association of Public Transport (and UITP) is working on this, through its involvement in GSA funded project such as ARIADNA. It was finally pointed out that the majority of public transport stakeholders as part of the Covid-19 recovery plan, believe that space data is extremely useful to implement a strategy to go greener in the future. There is therefore high potential for new applications based on EGNSS and Copernicus and for including EU Space Programme components use into future public procurements.

The last question tackled the relevance of Galileo differentiators (OS-NMA, CAS or HAS) for Space users.

Heinz Reichinger first highlighted that the community of Space users would appreciate more information on the implementation schedule of Galileo new services to allow consistent planning of introduction of their products and services into the market. The Galileo HAS is welcomed by Space users as it will allow to get down to position accuracy levels, which can otherwise only be obtained with POD processing on ground, which adds to delay. Indeed, earth observation data has a market for “fresh” data, which need to be accurately time-tagged and position-tagged. Galileo HAS is expected to provide several advantages over commercial service providers’ solutions. No extra data link hardware is required, the HAS is free of charge and guaranteed by Galileo and available over complete polar orbit, which is used by most earth observation satellites. The HAS service should be as good as possible to achieve competitive advantage with Galileo, no artificial degradation of service accuracy should be introduced. The Space community also expressed raising concerns about the resilience of GNSS receivers, in particular to jamming and spoofing threats. The authentication of signals and navigation message provided by the Galileo CAS and OS-NMA would be attractive options to make navigation more dependable and increase availability of trusted navigation solutions.

Dan warmly thanked the panellists for the interesting and useful insights into the consultation outcomes in the different market segments.

<b>Panel Session III Participants</b>		
Users' chairs by market segment forum	Heiko Gerstung, Meinberg Funkuhren	Infrastructures (Telecom, Energy, Finance)
	Pablo Olmos, Leica Geosystems	Geomatics & Urban Planning & Agriculture & Forestry
EU Space Programme Representatives	Cristina Ananasso, European Commission	
	Guerric Pont, GSA	

The third and final panel dived into the consultation outcomes of three new market segment fora, namely Infrastructures (formerly called Time and Synchronisation forum in previous UCPs), Geomatics and Urban Planning and Agriculture and Forestry.

The first question was on the most demanding applications in terms robustness and integrity requirements in the Infrastructure sector.

Heiko Gerstung first pointed out that there are increasing discussions within the Time and Synchronisation community about GNSS jamming and spoofing threats and providing a solution against these threats is one of the current biggest challenges. The importance of built-in GNSS authentication service such as Galileo OS-NMA - but also Galileo CAS and PRS, which will be important for protecting Critical Infrastructures (CI) - was highlighted to improve robustness against GNSS spoofing and is welcomed by the community. Several operators are looking forward to testing this unique capability next year. Obviously, other techniques will be implemented to face the new cyber threats, such as cross references with other timing sources and the use of terrestrial networks (comparing them e.g. with terrestrial networks' time). Moreover, natural disturbances can also affect GNSS, such as the solar activity that is expected to reach its maximum in 2025. GNSS integrity function could be of interest in this respect and the GSA introduced an interesting set of functions that would benefit Infrastructure operators. The "Time to Alarm" was discussed for the first time at the UCP as new requirement for the timing service. Some users commented that a TTA lower than 20 minutes would be preferable.

In terms of applications, 5G synchronisation appears to be the most promising and challenging one. Indeed, very high data rates, very low latency and massive type communications on the same mobile infrastructure leads to stringent time and phase accuracy requirements but also tight security and robustness requirements. Power grid synchronization is also among the more demanding applications. Bringing up more and more renewable energy, power generation is reshaping the way power grids are operating.

The discussion then moved on the latest trends in Geomatics and EGNSS role.

According to the Geomatics forum discussion outcomes, there is a clear trend towards miniaturizing surveying equipment. It might bring the Bring Your Own Device (BYOD) device approach to the point that many operations will be done via smartphones if GNSS technology (mainly on the antenna side) allows it. Innovation is also bringing automation to markets such as construction, where autonomous machinery is already a reality. In turn, this means that requirements such as authentication and integrity of positioning technologies, including GNSS, will become more and more important to ensure safe operations. Finally, the forum discussions made evident the increasing interest in the Galileo HAS, even for professional applications. Indeed, the Geomatics community is eager to be able to benefit from free high accuracy.

Last question from the plenary moderator focused on the main benefits of using Galileo and EGNOS in the agriculture and forestry sector.

Pablo Olmos pointed out that EGNSS has proven its value for multiple applications from the more traditional ones such as Variable Rate Applications (VRA) to the more cutting-edge ones such as robots for weeding and even mushroom-picking. As showcased in the test campaigns, EGNOS is the best free-of-charge main GNSS correction for both manual or auto-guidance systems, whilst Galileo provides superior accuracy for both cross-track and pass-to-pass accuracy.

Programme managers from the EC and GSA were invited to react to the presented outcomes.

Cristina Ananasso found these users feedback very interesting and for some aspects quite new for the Copernicus world. Copernicus can provide a lot as additional products and services to complement and enlarge the market segments. Moreover, it is interesting to see from the various sectors that GNSS and Copernicus can be jointly used to explore new and challenging applications.

She brought to the attention of the audience a new EC initiative called “Farm Sustainability Tool” (FaST), which is a digital service platform providing Space data for sustainable farming. FaST ambition is to become a world-leading platform for the generation and use/re-use of solutions for sustainable and competitive agriculture based on space data (Copernicus and Galileo) and other public and private datasets.

This is the first time that Copernicus was presented at the UCP and brought the contribution of core services to the different market segments. There will be new upcoming EO products that will join the existing ones, new launch of satellites in the next year. In this regard, Cristina Ananasso referred to two of the six high priority candidate missions of Copernicus that are the Land Surface Temperature Monitoring (LSTM) and the Copernicus Hyperspectral Imaging Mission (CHIME), that will bring added value to agriculture and forestry applications.

There are specific Copernicus products already available from the Copernicus Atmosphere monitoring Service such as the 30 m Digital Elevation Model (DEM), the European Ground Motion Service (EGMS), the urban atlas in 3D with high height information layer from LSTM or the high quality tool box for urban pollution monitoring to support urban planning. These products have been pointed out during the UCP fora meetings and are very important for several market segments.

All the suggestions collected during the UCP will feed back the EC Copernicus own users forum.

Guerric Pont also thanked the panelists for the summary of the salient outcomes of their fora. These users’ feedbacks are fundamental to shape the evolution of the EU Space Programme infrastructure in terms of services and functionalities, as they are designed to best serve the users’ needs. They will be encapsulated in the evolutions of the EGNSS systems.

As for the previous panels, programme managers then raised questions to the panelists.

The first question focused on EGNSS and Copernicus joint contributions into the Agriculture and Geomatics sectors.

Pablo Olmos confirmed that the combined use of Copernicus and EGNSS can significantly contribute to both markets. For example, in Agriculture, both EU Space Programme components are essential for the achievement of the Farm to Fork Strategy goals, which is a key component of the EU Green Deal. This will contribute to reduce the overall use of pesticides and fertilizers as well as nutrient losses.

In Geomatics, the two different data dimensions offered by both space components provide a much better understanding of the environment, which is essential for many activities, such as mining, mapping, or asset inventory. They will also unlock the creation of new applications and businesses.



The last question addressed the need for and feasibility of unified standardisation for timing and synchronization applications considering the distinct approaches from the different network operators.

Heiko Gerstung stressed that standardisation is a very important building block to help the market uptake and ensure that vendors and users have some sort of guarantee that things are interoperable. Unified standardisation is possible but requires some flexibility in the standard itself. For example, the IEEE 1588 standard is a universal standard for precision clock synchronization protocol, which specifies how devices on a network exchange time with each other. In one of its new revisions, a concept of industry specific profiles has been introduced that basically allows to narrow down a specific part of the standard and tailor it to specific industry or applications base.

Dan thanked the panelists for the very interesting exchanges and closed this panel session and the UCP Plenary Meeting.

## Conclusions and Next Steps

Fiammetta Diani, Head of Market Development Department at GSA, warmly thanked the thousand participants and the panellists to the Plenary for the valuable inputs, the EC for its support since the first UCP edition and GSA team for the tremendous work for preparing the event.

UCP 2020 edition was rich in new components. The edition has been enlarged to Copernicus with the double objective to promote Copernicus opportunities to the traditional users of EGNSS and to incite Copernicus users to take benefit of EGNSS. This edition was also extended to GovSatCom, even if the outcomes of the related forum were not presented at the plenary because of the security sensitivity of the topics. Finally, three new fora were welcomed, extending the UCP market sectors coverage to Public Transport, Natural Disasters and Emergency Management, and GNSS for Space Users.

Fiammetta Diani picked up two main commonalities across the fora sessions' outcomes.

The confirmation of the importance of Galileo and EGNOS new services and differentiators, including the authentication features of the OS-NMA and CAS but as well for some users, provided by the PRS. The HAS also received a lot of attention. The need for new elements and/or improvements were also raised, including more simple signal, easier to acquire and track, necessitating less processing and memory in particular for mass market, consumer market and IoT applications, still for better availability and also for dedicated services in certain areas especially where safety is involved.

The second commonality relate to the benefits of exploiting the synergies of EGNSS and Copernicus at application level. In the transport domain, in order to meet the sustainable mobility challenge, which is one of the main challenges of the European Green Deal, the common use of Copernicus and EGNSS needs to be fostered. In the emergency warning area, which is traditionally relying on the Copernicus Emergency Management Service (EMS) support, Galileo is coming up with a new Emergency Warning Service (EWS). The combined use of the two systems at application level open new perspectives for improved support to emergency stakeholders. Many use cases already relying on the combined use of EGNSS and Copernicus exist in several sectors such as in agriculture or in geomatics and this was illustrated by several users' testimonials shared during the fora meetings. We are in the right way and want to foster this area in the future.

Fiammetta Diani finally stressed that the UCP is the peak of the iceberg. The European GNSS Agency (GSA), which will become from January 2021, the Agency for the EU Space Programme, EUSPA, aims to be a user oriented agency, not only for EGNSS but also for Copernicus, GovSatCom and secure connectivity. Interacting with users is part of the agency daily activities. The UCP is just the place where to converge all inputs from downstream stakeholders. The existing public Reports on User Needs and Requirements related to PNT will be updated considering the inputs collected during the UCP. The discussions and main findings of the different fora will be reported in minutes of meetings and will be taken into account in EU Space Programme processes to improve current systems and services and shape the next generation of services. Interesting inputs were also collected on how to develop the new generation of downstream applications, at a time where a new financial perspective is starting.

Fiammetta Diani finally thanked once again all the participants to the UCP for their valuable inputs and closed the UCP 2020 event.

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