PUBLIC TRANSPORT MARKET SEGMENT SESSION MOM'S

Meeting Date	04.12.2025	**Location**	Prague
Meeting Called By	EUSPA		
Minutes Taken By	Name: Joe Lampe (Prague), Carmen Laura Martin (Prague), Lamprini Papafoti (Barcelona)		
Representatives & Speakers	**EUSPA Representatives** ● Rodrigo da Costa, Executive Director (EUSPA) ● Carmen Aguilera (EUSPA) ● Valeria Catalano (EUSPA) **User Community Representatives (UCRs)** ● Iztok Štrukelj, Business Development & Key Account Manager (Arriva Slovenia d.o.o) ● Gianmaria Giaconia, European Market Development Director (Almaviva Transportation and Logistics) ● Jesús Pablo González, Senior R&D Lead (Nemi) ● Jochen Wendel, Charly FARADJI, Telespazio France (INIT) ● Murat Emre Duman, Co-Founder and COO (Adastec) ● Charly Faradji, Project Manager (Telespazio France) ● Fran Martin, Product Manager (EarthPulse) **Speakers / Moderators** ● Carmen Aguilera (EUSPA) ● Valeria Catalano (EUSPA) ● Joe Lampe, Lead Consultant (Factual Consulting) ● Carmen Laura Martin, GNSS Consultant (GSC) A complete list of attendees can be found under Annex 1.		
Distribution (in addition to attendees)	UCP attendees, Plenary session attendees, EUSPA, Public		

AGENDA

Agenda Items	Presenter
1. Welcome and introduction to the User Consultation Platform	Rodrigo da Costa, EUSPA
2. Presentation of Public Transport UCP presentation and objectives	Carmen Aguilera, EUSPA
3. Presentation of the session entitled *"Technology outlook: How innovative services from EUSPACE can drive users' needs evolution in Public Transport"*	Session moderated by Carmen Aguilera and Valeria Catalano, EUSPA Presentations provided by: ● Carmen Aguilera, EUSPA ● Joe Lampe, Factual Consulting ● Carmen Laura Martin, GSC
4. Presentation of the session entitled *"Market outlook: Emerging use cases in public transport related users' needs and requirements"*	Session moderated by Carmen Aguilera and Valeria Catalano, EUSPA Presentations provided by: ● Iztok Štrukelj, Arriva Slovenia d.o.o ● Gianmaria Giaconia, Almaviva Transportation and Logistics ● Jesús Pablo González, Nemi ● Jochen Wendel, INIT ● Murat Emre Duman, Adastec ● Charly Faradji, Telespazio France ● Fran Martín, EarthPulse ● Joe Lampe, Factual Consulting
5. Presentation of session entitled "User requirements on GNSS and EO – state of art and update of URD"	● Joe Lampe, Factual Consulting ● User requirement validation moderated by Carmen Aguilera and Valeria Catalano from EUSPA
6. Final remarks and conclusions on the UCP and public transport sector	Carmen Aguilera, EUSPA

SUMMARY

Summary

Context of the Session

This session took place during the 2025 EUSPA User Consultation Platform summit. As the culmination of the 2025 public transport workstream, this session gathered stakeholders from across the value chain, including operators, authorities, and technology providers, to share usage cases for Galileo and Copernicus. The primary goal was to identify operational pain points and validate updated requirements for the User Requirements Database (URD) to inform future EUSPA service evolution.

Major Outcomes

Across the presentations and discussions, several common messages emerged:

- GNSS, and particularly multi-constellation solutions including Galileo, already underpins the day-to-day functioning of public transport. Use cases include automatic vehicle location, real time passenger information, fleet and depot management, traffic and signal control, demand responsive transport, eco driving, ticketing and first pilots of automated bus and tram operations. At the same time, users are clearly moving from simply *"having GNSS"* to needing higher accuracy, better robustness in difficult environments, and trusted, authenticated positioning for safety-related, operational and commercial applications.
- New Galileo differentiators such as HAS and OSNMA, and future services such as SASS, are well aligned with emerging needs in public transport. They can support sub-metre and centimetre level positioning, integrity and spoofing protection, which are essential for use cases like autonomous buses, precise tram and depot positioning and secure hands-free ticketing. However, and given their recent introduction, these services remain relatively unknown to many transport operators and authorities and are not yet systematically reflected in procurement specifications or national guidance.
- Automated and demand responsive services are pushing requirements further. Level four automated buses require very stringent positioning and integrity performance and high update rates that go beyond traditional public transport requirements. DRT services require continuous, reliable tracking, realistic geofencing and tools to detect route deviations, all at a cost level that small and medium operators can afford.
- Earth Observation is increasingly seen as a strategic enabler rather than a core operational input. EO can support infrastructure monitoring and maintenance planning, climate resilience, flood and heat risk assessment and environmental intelligence around public transport corridors. However, current use in daily operations is limited. Latency, spatial resolution and integration effort remain key barriers, and many PTOs and PTAs lack internal capacity or awareness to make effective use of Copernicus.
- Many of the main obstacles are not purely technical. Adoption is also primarily influenced by structural factors, notably extended procurement cycles and departmental silos, rather than technical constraints. To bridge these gaps, a strategic focus is required to align transport planning with maturing EU Space capabilities through standardized tender specifications and collaborative pilots. This approach facilitates the transition from localized testing to widespread institutional deployment.

Tangible needs and areas for action

The discussion and the validation of user requirements highlighted several concrete needs where EUSPA and the wider community can focus efforts.

<u>GNSS</u>

- Affordable, low power, multi constellation and dual frequency receivers that support Galileo differentiators such as HAS and OSNMA as a default option. These receivers should ideally work reliably in dense urban environments and tunnels and provide sub metre and, where necessary, centimetre level performance without prohibitive additional costs for correction services.
- Better characterisation and communication of Galileo performance in real operational scenarios. This

includes representative information on HAS performance in dynamic and constrained user environments, not only in static open sky conditions, and clearer approaches to integrity and time to alert at higher accuracy levels for automated and safety related applications.

- Practical tools to embed GNSS requirements into public transport procurement and standards. This includes reference text for tenders, guidance on multi constellation and authentication requirements, and explicit consideration of DRT and SME operators that need low cost AVL and robust geo fencing solutions.
- Continued dialogue with commercial PPP and RTK service providers in order to make Galileo services such as HAS and SASS can complement existing correction ecosystems and help deliver more consistent performance across Europe.

EO

- Faster end to end chains from sensing to usable products. For critical events, operators need EO based information within hours, not days. This requires shorter revisit times for relevant use cases and more automated processing pipelines, so that maps and indicators are ready when key operational and planning decisions are being made.
- Higher spatial resolution and tailored products for public transport. Users expressed interest in ready to use layers for flood extent, terrain deformation along rail and tram lines, urban heat around corridors, vegetation overgrowth and construction changes. These should be delivered in formats that can be easily integrated into existing AVM, GIS, asset management and control room tools.
- Simplified access and integration. Public transport stakeholders need clean, analysis ready data, with built in cloud masking, atmospheric correction and change detection, exposed through simple APIs and plugins for commonly used transport software. They do not have the resources to manage complex multi sensor fusion on their own.
- Stronger communication and capacity building for PTOs and PTAs. Many actors still see Copernicus as a tool only for scientists or national agencies. There is a need to explain, in simple terms, what Copernicus can offer to public transport, what is available as a free public service and what requires commercial services, and how to build business cases that reflect avoided damage and improved resilience.

Taken together, the session confirmed that Galileo and Copernicus can play a central role in the future of public transport, but that targeted action is needed on performance communication, affordable hardware, integration tools and reference specifications to turn this potential into widespread operational use.

MINUTES OF MEETING

Agenda Item 1 - Welcome and introduction to the User Consultation Platform. (Rodrigo da Costa – EUSPA)

Rodrigo da Costa, Executive Director of EUSPA, opened the session by situating the User Consultation Platform (UCP) within the broader evolution of the EU Space Programme. He emphasized that the primary mission of the UCP is to gather and validate user requirements, ensuring that feedback from the public transport community directly informs future service updates and adoption strategies. Before concluding with a call for active participation, he outlined the structural and logistical framework for the day's discussions, explaining how participant inputs would be captured and utilized in follow-up EUSPA activities.

Agenda Item 2 - Presentation of Public Transport UCP presentation and objectives. (Carmen Aguilera and Valeria Catalano, EUSPA)

Carmen Aguilera introduced the Public Transport session presenting its objectives and structure:

- Collect and validate user needs and requirements from public transport stakeholders,

- Understand how end users and service providers currently use, or could use, GNSS and Earth Observation solutions,
- Identify gaps, barriers, and blockers that hinder wider adoption of GNSS and EO technologies in public transport,
- Gather suggestions and potential solutions for increasing the uptake of EU Space services in this domain, and
- Establish priorities for future EUSPA actions to support adoption in public transport.

Carmen then presented the organisation of the session.

Agenda Item 3 - Presentation of the session entitled "Technology outlook: How innovative services from EUSPACE can drive users' needs evolution in Public Transport". EU Space Programme components relevant to infrastructure. Carmen Aguilera, EUSPA / Joe Lampe, Factual Consulting / Carmen Laura Martin, GSC

Presentations

The technical session began with Valeria Catalano highlighting Galileo's established presence in public transport and its potential for growth through innovative differentiators. Carmen Laura Martín of the Galileo Service Centre then provided a detailed overview of the service portfolio, focusing on the Open Service, High Accuracy Service (HAS), and signal authentication through OSNMA. She reminded stakeholders that the GNSS Service Centre remains the primary resource for monitoring performance and registering for specialized services. Joe Lampe followed with a look at Copernicus, explaining that while Earth Observation (EO) is becoming a staple for planning and risk assessment, its integration into daily operations is currently limited by latency and spatial resolution constraints.

Questions and Answers

Carmen Aguilera opened the discussion by asking participants how easy it is in practice to adopt Galileo differentiators such as HAS and OSNMA in public transport applications.

Q: How easy is it for public transport stakeholders to adopt Galileo differentiators such as HAS in their solutions?

A: Ismael Colomina, representing GeoNumerics, expressed satisfaction with HAS but noted a discrepancy between nominal specifications and operational reality. He pointed out that while specifications are defined for static, open-sky conditions, public transport is inherently dynamic and urban-based. In these environments, accuracy may deviate significantly from the 20 cm target. He urged EUSPA to provide indicative performance figures for kinematic and urban scenarios to better support commercial business cases and manage client expectations.

Carmen Aguilera (EUSPA) acknowledged that defining formal commitments for diverse dynamic environments is challenging. However, she confirmed that EUSPA is testing performance in representative sectors, such as agriculture and aviation, and aims to publish indicative results to assist users. Gianmaria Giaconia (Almaviva) added that while their dense urban tests showed accuracy in the 50–60 cm range due to multipath constraints, the service remains highly valuable for reducing processing time to near real-time. He also suggested expanding corrections to include other constellations, such as BeiDou, to accommodate multi-constellation receivers. Carmen Martin (GSC) noted these requirements, committing to more transparent communication regarding HAS performance across various environments.

Q: Carmen Aguilera (EUSPA) asked how will integrity and assurance be handled for HAS, especially considering its potential use in automotive and autonomous systems?

A: Carmen Martin (GSC) clarified that HAS is not a safety-of-life service and does not offer classical aviation-style integrity. However, EUSPA is currently developing the evolution of HAS toward a service known as SAS or SASS. This future service is designed to provide the higher assurances, quality indicators, and authentication necessary for autonomous vehicles and other safety-critical public transport applications.

Q: Carmen Aguilera (EUSPA) asked if is OSNMA relevant for public transport, and are there concrete cases of spoofing or interference affecting this sector?

A: Jochen Wendel (INIT) highlighted the relevance of OSNMA through the JULIA project, which is testing "be-in, be-out" ticketing applications. These systems use authenticated GNSS positions from bus-mounted receivers to automatically validate passenger boarding and alighting. The pilot results indicate that OSNMA provides essential assurance for secure, location-based payment and ticketing systems, even while the market awaits OSNMA-capable smartphones. Valeria Catalano (EUSPA) concluded the block by encouraging interested stakeholders to attend the dedicated expert panel on Galileo differentiators to explore further technical use cases.

Agenda Item 4 – Presentation of the session entitled "Market outlook: Emerging use cases in public transport related users' needs and requirements". Carmen Aguilera, EUSPA / Valeria Catalano, EUSPA / Iztok Štrukelj, Arriva Slovenia d.o.o / Gianmaria Giaconia, Almaviva Transportation and Logistics / Jesús Pablo González, Nemi / Jochen Wendel, INIT / Murat Emre Duman, Adastec / Charly Faradji, Telespazio France / Fran Martín, EarthPulse / Joe Lampe, Factual Consulting

Carmen Aguilera introduced the market outlook session, explaining that its purpose was to showcase concrete and emerging use cases for GNSS and other EU Space services in public transport and to derive user needs and requirements directly from operators, industry and service providers. Together with Valeria Catalano, she presented the list of speakers, representing different parts of the value chain, including public transport operators, technology providers and solution developers.

The session focused on how Galileo, GNSS and Copernicus are already being used in real systems, which gaps remain from the user's perspective, and which technical or institutional barriers still hinder adoption. The presentations under Agenda Item 4.1 illustrated practical applications ranging from nationwide bus tracking and mobility control centres to demand responsive transport, ticketing, tram positioning, automated bus operations and emergency warning systems. Please note that these presentation slides are available for review to provide more detail and insights into the UCP session for public transport.

Agenda Item 4.1 – Presentations on the sessions focusing on GNSS Emerging Use Cases in Public Transport (Presentation and Q&A). Iztok Štrukelj, Arriva Slovenia d.o.o / Gianmaria Giaconia, Almaviva Transportation and Logistics / Jesús Pablo González, Nemi / Jochen Wendel, INIT / Murat Emre Duman, Adastec / Charly FARADJI, Telespazio France.

Carmen Aguilera and Valeria Catalano introduced the block of presentations by explaining that this part of the session would present concrete GNSS based applications that are already in operation or under development in public transport. The goal was to show how Galileo and other GNSS services are being used today, what benefits they bring, and which technical or organisational gaps still remain from the perspective of operators, industry and service providers.

Presentation #1: Real-time tracking and monitoring of national bus fleet using GNSS solutions (Iztok Štrukelj, Arriva Slovenia d.o.o)

Iztok Štrukelj shared Arriva's extensive experience utilizing GNSS solutions to manage a large, nationwide bus fleet that serves approximately 1.5 billion passenger journeys annually across eleven countries. He framed the technology's impact through three primary stakeholder groups: passengers, who serve as the final judges of service quality; public transport authorities, who oversee the public interest and reporting obligations; and operators, who are responsible for financial sustainability and operational efficiency. GNSS is foundational to addressing these needs, providing accurate positioning that supports eco-driving initiatives by monitoring driving patterns and enabling control centres to provide objective feedback to drivers and depots.

Furthermore, Iztok emphasized that because public transport is considered national critical infrastructure, GNSS acts as a vital catalyst for safety. Real-time geopositioning allows operators to trigger emergency alerts and direct assistance accurately during incidents. The technology also underpins standard requirements such as headway management and real-time passenger information. Beyond immediate operations, historical GNSS data is leveraged to adjust timetables and identify systematic delays, leading to optimized resource allocation. He concluded by stressing that GNSS has evolved from an optional add-on to a foundational technology and urged the industry to explicitly mention Galileo in specifications to leverage its enhanced resilience and differentiators.

Questions and Answers No detailed individual questions were recorded for this presentation, as the discussion on needs and requirements continued into the subsequent interventions and joint Q&A session.

Presentation #2: Galileo at the Heart of Mobility: The Rome Mobility Control Centre Experience (Gianmaria Giaconia, Almaviva Transportation and Logistics)

Gianmaria Giaconia detailed the Rome Mobility Control Centre's role as an integrated command and control hub that synthesizes data from environmental sensors, vehicle monitoring systems, traffic detectors, and AI-equipped cameras to support real-time mobility management. While Copernicus data is utilized for long-term planning and "what if" simulations, the centre relies primarily on Galileo and other GNSS signals for real-time operations due to the latency limitations of Earth Observation data. Currently, the system enables operators to intervene when traffic conditions deviate from the norm, such as by adjusting traffic light programs or disseminating information through variable message signs to manage congestion.

Almaviva is now working to scale these multimodal urban concepts to regional and national levels, increasingly incorporating data from a growing fleet of Galileo-enabled smart cars. Gianmaria noted that modern multi-constellation receivers have significantly improved operational timeliness compared to older GPS-based systems, as corrections are now handled directly within the receiver. Beyond traffic flow, the centre's architecture supports sophisticated ticketing applications, such as unified location-based tickets in the Campania region, which require high position integrity and authenticity for revenue apportionment and secure passenger tracking.

Questions and Answers

Q: Carmen Aguilera (EUSPA) asked how relevant is OSNMA for Almaviva's applications, particularly with regard to anti-spoofing and security?

A: Gianmaria replied that OSNMA is clearly relevant in contexts where spoofing or intentional interference are more likely, for example in certain border areas or in sensitive urban environments. For applications such as location-based ticketing and safety-related traffic management, having authenticated GNSS signals can strengthen cyber security and passenger safety. He noted that OSNMA could become a key feature in future deployments as compatible receivers become more widespread.

Q: Valeria Catalano (EUSPA) asked if, in the case of Rome, are Almaviva developing systems to warn drivers and encourage them to use public transport.

A: Gianmaria explained that at present the control centre mainly supports traffic control measures, such as adjusting traffic lights and managing variable message signs. These tools already allow the city to influence driver behaviour to some extent. Looking ahead, as connectivity increases, the centre aims to send more direct and personalised alerts to car drivers, for example to warn them about congestion or incidents and to suggest alternatives where public transport can provide a better option.

Presentation #3: GNSS Applications for Demand Responsive Transport (DRT) (Jesús Pablo González, Nemi)

Jesús Pablo González highlighted how Demand Responsive Transport (DRT) addresses "transport poverty" in rural and sparsely populated areas, where traditional fixed-line services often face high costs and declining accessibility. Nemi, which originated from the EUSPA-funded Galileo for Mobility project, provides flexible operational models ranging from digitized fixed lines to full door-to-door services.

GNSS is fundamental to these operations, not only for real-time tracking and route management but also for validating public service contracts based on distance travelled. Despite using a mix of hardware-based AVL units and mobile devices, Nemi faces technical challenges in rural environments, such as signal loss and positioning errors that cause virtual geofence "jumps" between stop zones. Jesús Pablo emphasized that current procurement frameworks lack DRT-specific requirements and stressed the urgent need for affordable, low-cost AVL solutions tailored for small and medium-sized operators.

Questions and answers

Q: Carmen Aguilera (EUSPA) asked how EUSPA and the EU Space Programme can help to close the gaps you have identified for DRT.

A: Jesús Pablo suggested two primary areas of support. First, EUSPA can help incorporate GNSS and DRT-specific performance requirements into public procurement and policy frameworks, ensuring flexible services are recognized in national systems. Second, the Agency can foster value chain collaboration through projects and calls that bring together GNSS providers and small operators to co-design solutions. He concluded that clearer requirements, better geofencing tools, and more accessible AVL technologies are essential to making DRT a robust and scalable component of public transport.

Presentation #4: Future of Galileo services for public transport based on improvements in on-board hardware and sensors (Jochen Wendel, INIT)

Jochen Wendel provided an industry perspective on how GNSS and sensor data are converted into operational functions for global bus and tram networks. He highlighted that precise positioning is essential for several key use cases, including vehicle tracking within large depots, "bus nudging" at crowded stations, and "be-in, be-out" ticketing systems that rely on trusted location data for fare accuracy. A significant technical focus for INIT is a sensor fusion solution for tram positioning that combines multi-constellation GNSS with gyroscopes and digital network maps to detect track switches. This approach aims to reduce costs by replacing or augmenting expensive fixed trackside infrastructure.

Jochen noted that while sub-meter accuracy is critical, the sector faces long technology cycles and strict cost constraints, with vehicles often remaining in service for over ten years. Although the JULIA project successfully embedded Galileo High Accuracy Service (HAS) into on-board units, the lack of native implementation in major chipsets remains a barrier, increasing integration effort and expense. Furthermore, a significant awareness gap persists: many tenders continue to specify generic "GPS" rather than explicitly requiring multi-constellation support or Galileo's unique differentiators like HAS and OSNMA. He emphasized that addressing this through education and the inclusion of these services in reference documentation is vital for wider adoption.

Questions and answers

Q: Carmen Aguilera (EUSPA) stated that Jochen mentioned using geographic information system data for tram and rail use cases. Do you see potential for Copernicus data in these applications?

A: Jochen explained that for tram positioning and switch detection they require very high detail, corridor specific information on the infrastructure, which is currently obtained through dedicated mapping and engineering data. For these specific operational use cases, Copernicus products do not appear directly relevant. They remain focused on high resolution GIS data closely tied to the network.

Q: Carmen Aguilera (EUSPA) asked: how is this work being applied to ticketing, and what is the status of implementation?

A: Jochen indicated that the same positioning and authentication capabilities support be in, be out ticketing concepts. Technical solutions are already developed and tested, but in some networks full implementation still depends on procurement decisions and broader system upgrades.

Q: Iztok Štrukelj mentioned that awareness of Galileo differentiators seems to be a recurring challenge. How can this be addressed?

A: The discussion underlined that national public transport authorities and large operators have an important role in setting expectations and spreading awareness. Reference tender documents, guidance at national level and shared success stories can all help create a more robust ecosystem in which Galileo based services are understood and systematically considered in future investments.

<u>Presentation #5: Positioning requirements for automated bus operations (Murat Emre Duman, Adastec)</u>

Murat Emre Duman discussed Adastec's work deploying Level 4 automated bus services across eleven countries, including Norway, Germany, and Sweden. He explained that while the primary positioning architecture relies on lidar sensors and detailed 3D maps, GNSS is essential as an absolute reference

to correct sensor drift over time. The requirements for these systems are significantly more stringent than traditional public transport; they demand accuracy within the 1–2 centimetre range and high-frequency position updates at 20Hz to ensure smooth autopilot control.

Murat identified several critical hurdles for large-scale deployment, notably the high annual cost of commercial correction services and the lack of uniform service quality across different European regions. He also emphasized the regulatory necessity of "integrity", quantifiable assurance of position reliability, which remains difficult to define and deliver at the centimetre level. Exploring future security enhancements, he expressed interest in Galileo's OSNMA for authenticated positioning, particularly as cybersecurity requirements for autonomous infrastructure tighten.

Questions and answers

Q: Carlos Hernando (Ineco) mentioned that Murat mentioned that you require a position transmission rate of twenty hertz. Why is such a high update rate needed?

A: Murat explained that the twenty hertz update rate is driven by the needs of the autopilot. The automated driving system must receive position updates often enough to control steering, acceleration and braking smoothly and safely, particularly in complex urban environments and at higher speeds. Lower update rates would introduce latency that could degrade control performance.

Q: Ismael Colomina (GeoNumerics) mentioned that integrity appears to be necessary for automated buses. How do you see this being defined and achieved at the very high accuracy you require?

A: Murat responded that integrity is indeed a requirement, both for safety cases and for regulatory approval. However, delivering meaningful integrity information at the centimetre level is very challenging. Concepts from aviation do not translate directly to automated road vehicles, and there is still work to be done to define appropriate integrity metrics and services for this context. This is an area where guidance and service evolution from the EU Space Programme would be very valuable.

Q: Carmen Aguilera (EUSPA), asked if Adastec is experiencing many interference or cyber security incidents, and would authenticated GNSS signals help?

A: Murat stated that they have not seen many deliberate interference events so far. However, authenticated position solutions are of clear interest, especially as automated buses expand into more complex environments and as cyber security requirements tighten. He considered OSNMA and related services promising and indicated that he would raise them with his technical team.

Following this, Victor Álvarez (EUSPA) provided a brief overview of the forthcoming Signal Authentication Service (SASS). He explained that SASS builds upon OSNMA to ensure that signals originate from actual Galileo satellites rather than spoofed sources. While SASS does not improve accuracy, it significantly strengthens the system's protection against spoofing, addressing the increasing user demand for service robustness.

Presentation #6: Galileo Emergency Warning Satellite Service on Urban Furniture – AWARE, be ready when every second counts (Charly FARADJI, Telespazio France)

Charly Faradji, joining remotely, presented the AWARE project, which develops civil protection solutions leveraging the Galileo Emergency Warning Satellite Service (EWSS). EWSS broadcasts alert messages directly from space, providing a uniquely resilient channel that remains operational even if

terrestrial mobile networks or power grids are disrupted during emergencies. A key advantage of the service is its precise geofencing, ensuring that alerts are only received by devices within a predefined area.

The project has demonstrated various warning components, including long-range acoustic devices and indoor systems, but Charly specifically focused on digital panels for public transport. These screens, located at stops or stations, can show real-time, evolving notifications, while alerts can also be sent directly to driver smartphones. Designed to complement existing national warning systems, EWSS offers a robust channel for urban environments, including airports, highway billboards, and train stations.

Questions and answers

Q: Manuel López (EUSPA) asked how Charly sees this system being installed in tram and bus stations to inform final users?

A: Charly invited audience feedback, leading Gianmaria (Almaviva) to note that while mobile-network-based alert panels are common today, they are vulnerable to network failures. He emphasized that the primary value of EWSS is enabling civil protection authorities to reach citizens through transport infrastructure when other systems fail. Charly reaffirmed that space-based delivery is critical in catastrophic scenarios where mobile networks are unreliable. Furthermore, he highlighted that the precise geofencing allows authorities to restrict alerts to very specific zones, such as one side of a road, reducing unnecessary alarm in unaffected areas.

Q: Carmen Aguilera (EUSPA) asked how do you see giving information to passengers through panels/digital billboards boards, and what about information for drivers?

A: Gianmaria (Almaviva) reiterated that while station billboards are valuable, the formal origin of messages must remain with civil protection authorities. Joe Lampe (Factual) suggested that a major benefit would be linking public transport control rooms directly with official alert systems so operational decisions, such as rerouting, can be aligned with official warnings. Katerina Antraki (OASA Athens) explained that their control rooms already receive messages from national authorities; however, she viewed the greatest potential of EWSS in its ability to message drivers and control rooms regarding which specific corridors to avoid during an emergency. This sentiment was echoed by the audience, noting that in catastrophic scenarios, providing targeted alerts to drivers to avoid dangerous zones may be even more critical than general public messaging. Charly concluded that EWSS supports both needs and that integration with existing urban systems is the logical next step for future demonstrations.

Agenda Item 4.2 – Presentation on the sessions focusing on EO (Earth Observation) Emerging Use Cases (Presentation and Q&A) . Fran Martín, EarthPulse.

<u>Presentation #7: Using EO and advanced analytics to assess public transport infrastructure resilience to improve safety and efficiency (Fran Martin, EarthPulse).</u>

Fran Martín advocated for Earth Observation (EO) and advanced analytics as critical tools for transitioning public transport from a reactive maintenance model to a proactive, preventive approach. As public transport assets face increasing exposure to environmental risks, EO provides unique value by revealing "invisible" hazards, such as terrain subsidence under tracks or corridor heat stress, and enabling proactive investment planning.

Fran highlighted two significant use cases:

- JULIA Project: An "Observatory" providing indicators on air quality and weather along transport networks, allowing operators to adapt to extreme conditions.

- RuralDrive Project: A routing tool for demand-responsive services that creates "safety layers" to avoid wildfires and "healthy layers" to minimize passenger exposure to pollution .

While Copernicus offers a reliable global historical baseline, its operational utility is currently hindered by the need for higher spatial resolution (<10m) and temporal frequency. Fran concluded that the future of EO in transport depends on simplified data access and the delivery of "analysis-ready" products through APIs that can be integrated directly into existing operator dashboards.

Questions and answers

Q: Carmen Aguilera (EUSPA), asked what is the current level of use of Copernicus in public transport, and what needs to improve to encourage greater uptake?

A: Fran responded that, at present, adoption of Copernicus in public transport is very limited and, in many cases from his experience, close to zero. Projects like JULIA are innovative precisely because they are among the first to bring Copernicus based services directly to public transport authorities and operators. From his perspective, improving data quality where needed, especially spatial and temporal resolution for relevant indicators, and simplifying access and integration are essential to increase uptake.

Q: Carmen Aguilera (EUSPA) then asked Fran and the audience how can EUSPA make Copernicus based services attractive and usable for traditional public transport clients?

A: Josep Laborda (Factual Consulting) emphasized that traditional transport organizations are often conservative and do not need to understand the technical complexities of space systems. Instead, the industry needs user-friendly services that focus on clear benefits and hide technical complexity. He cited the ARIADNA project as an example of the significant time and education required to change procurement practices and technical recommendations.

Q: From the operator side, how easy is it to change practices and adopt new environmental and resilience tools?

A: Katerina Antraki from OASA Athens explained that it is often difficult to convince drivers and staff who are used to existing systems to adopt new ones. In addition, many public transport operators lack environmental data altogether. When EarthPulse requested historical air quality data for Athens, for example, the operator had no such records. This underlines that the starting point for many operators is very basic, and that education and support are needed to move towards more data driven environmental management.

Q: Carmen Aguilera (EUSPA), again asked Fran and the audience how can the value of Earth Observation based projects be demonstrated to clients, especially after pilots finish?

A: Laura Moreno (EarthPulse) noted that demonstrating value requires time, investment, and clear cost-benefit analyses showing potential savings or risk reductions. Valeria Catalano added that involving actual operational staff during the testing phase is essential to ensure feedback is grounded in reality and to foster "internal champions" who can sustain the service after the project ends.

Q: Carmen Aguilera (EUSPA) asked if the audience feels that public transport clients willing to share data that are needed to build and refine these services?

A: Laura explained that attitudes vary. Some clients are willing to share operational and environmental data, while others are more cautious because they consider the data sensitive or are concerned about how it will be used. Building trust and clear data governance frameworks is therefore important.

Q: Carmen Aguilera (EUSPA) asked how easy is it to replicate the solutions demonstrated in JULIA and RuralDrive in other regions, and what are the next steps?

A: Fran confirmed that these solutions are designed to be replicable across different geographies with proper calibration. He announced that JULIA will launch an open call around February 2026 to provide five additional public transport operators with access to these developed products.

Agenda Item 4.3 – Open discussion and identification of main obstacles towards EUSPACE adoption. Joe Lampe, Factual Consulting.

Due to time constraints, this session was transitioned into a focused open discussion facilitated by Joe Lampe, aiming to synthesize key messages and identify barriers to the adoption of Galileo and Copernicus. Lampe opened by emphasizing that events like the UCP are essential for bridging the silos between public transport stakeholders and space technology experts, noting that practical solutions require the combined brainpower of operators, authorities, and industry.

The discussion focused on three primary areas:

- GNSS Performance and Automation: Participants noted that while 1-meter accuracy is adequate for baseline operations, automated and advanced applications like Level 4 buses require significantly tighter thresholds. Key takeaways included the urgent need to improve awareness of OSNMA and HAS, the importance of characterizing HAS performance in dynamic urban environments rather than just static open-sky cases, and the necessity of clarifying integrity approaches for safety-related applications.

- Copernicus Perception and Integration: Stakeholders expressed concerns that Copernicus products are often perceived as being oriented toward long-term climate monitoring rather than immediate operational needs. In response, EO representatives highlighted Copernicus as a highly reliable, independent data source with unique global coverage and historical baselines. While there is clear interest in using EO for monitoring flooding and heat stress along transport corridors, the main challenge remains adapting these products to the specific temporal and spatial resolutions required for operational tools.

- Transversal Obstacles to Adoption: Several common barriers emerged across both GNSS and EO discussions:
    - Awareness and Communication: Limited familiarity with Galileo differentiators and practical Copernicus services prevents their inclusion in procurement and planning.
    - Technical Complexity: Operators require "decision-ready" services and clear benefit explanations rather than raw technical data.
    - Procurement and Silos: Slow, conservative procurement cycles and institutional silos between environmental, IT, and operations departments make adopting cross-cutting space tools difficult.

The group concluded that collaborative mechanisms, such as the UCP and open calls under projects like JULIA, are vital for testing solutions in real contexts and moving from pilots to sustained operational adoption.

Agenda Item 5 – Presentation of session entitled "User requirements on GNSS and EO – state of art and update of URD". Joe Lampe, Factual Consulting / Carmen Aguilera, EUSPA

Due to scheduling constraints and a room conflict, this session was compressed into a concise presentation and validation exercise. Joe Lampe provided an overview of the 2025 User Requirements Database (URD) update for public transport, which was developed through a desktop review and interviews with over 50 European stakeholders, including operators, authorities, and technology SMEs. The update covered operational and planning scenarios, such as real-time vehicle tracking, demand-responsive services, automated buses, and infrastructure monitoring.

The presentation highlighted that while GNSS is already a foundational tool for day-to-day operations like fleet management, users are increasingly demanding higher accuracy and security for automated functions. For Earth Observation (EO), interest is growing regarding resilience and infrastructure health, though its role remains primarily in background planning rather than active control rooms due to latency and resolution barriers.

Joe summarized the technical requirements as follows:

- GNSS Performance: Baseline operations require 1 m accuracy and 99.9% availability, while emerging automation use cases demand sub-metre or centimetre-level performance. Systems should support update rates of 1–10 Hz, a time to first fix under 10 seconds, and end-to-end latency below 10 seconds.

- GNSS Architecture: Future systems must utilize multi-constellation and dual-frequency signals, maintaining at least 5 m accuracy in urban canyons and recovering from tunnel outages in under 5 seconds. OSNMA authentication should be a default feature.

- EO Performance: Desired spatial resolution ranges from 0.25 m to 1 m for local assets, with revisit times every 4–8 hours during critical events. Users require "analysis-ready" data with built-in preprocessing (e.g., cloud masking) delivered via APIs.

Questions and Answers / Validation Exercise

Because of the shortened format, the interactive debate was replaced by a live poll and a brief exchange of views among the practitioners present.

Q: How do stakeholders classify the proposed requirements (essential vs. nice to have)?

A: The live poll indicated broad agreement that the core GNSS parameters, such as 1 m accuracy, multi-constellation support, and urban robustness, should be considered baseline requirements for the sector. The more stringent 10 cm accuracy requirement was recognized as a critical constraint specifically for automated bus deployments rather than for all general public transport operations.

Q: Is the current resolution of Earth Observation data sufficient for operational public transport decisions?

A: Gianmaria from Almaviva reiterated a common concern that current EO usage is very limited because Sentinel spatial resolution is often too coarse for asset-level operational decisions, even if it remains valuable for long-term climate planning. This point was actively contested by a large number of experts in the room, who countered that Copernicus data is extremely relevant; the primary barrier is that operators fundamentally lack the knowledge of how to leverage and integrate this complex data into their systems.

Q: How does EUSPA intend to cooperate with private correction service providers (PPP/RTK)?

A: A question from ADASTEC highlighted the need for EUSPA to align Galileo's evolution with existing commercial augmentation ecosystems. Due to the room constraint, this point was noted for future follow-up but could not be discussed in depth.

Joe Lampe concluded the session by confirming that the requirement sets presented would be taken forward as validated inputs for the URD update. He thanked participants for their contributions, noting that their feedback is essential for aligning EU Space services with the real-world operational needs of the public transport sector.

Agenda Item 6 – Final remarks and conclusions on the UCP and public transport sector. Carmen Aguilera, EUSPA

Following the validation exercise, Carmen Aguilera delivered the final remarks for the session, acknowledging the high level of engagement and the richness of the day's discussions despite the constrained schedule. She noted that the insights provided by speakers and participants offered a comprehensive view of both the technological potential of EU Space services and the practical constraints currently faced by operators and industry.

Carmen summarized the day's central themes, noting that while Galileo services like HAS, OSNMA, and EWSS are increasingly aligned with needs for precise positioning and safety, sector-wide awareness must be strengthened. Similarly, Copernicus already provides significant value for climate resilience and infrastructure monitoring, but higher resolution and easier integration are necessary for it to play a larger role in operational decision-making. She emphasized that the primary obstacles to adoption are often non-technical, involving procurement language, standards, and internal organizational capacity.

The inputs gathered during the summit, including presentations, polls, and remarks, will directly support the following activities:

- URD Update: Providing validated data for the next update of the User Requirements Database for public transport.
- Service Evolution: Informing EUSPA's internal work on future services, guidance documents, and upcoming pilot activities.
- Continuous Dialogue: Shaping future UCP cycles to ensure an ongoing focus on the real operational needs of the transport community.

In closing, participants were encouraged to stay connected with EUSPA and the GNSS Service Centre and to participate in upcoming initiatives such as the JULIA and AWARE projects. The session concluded with a final thank you to all contributors for their time and expertise.

ANNEX 1: LIST OF ATTENDEES

In-Person

1. Carmen Aguilera Rios (EUSPA)
2. Valeria Catalano (EUSPA)
3. Manuel Lopez (EUSPA)
4. Martina Camicia (EUSPA)
5. Katarina Langer (EUSPA)
6. Iztok Štrukelj (Arriva Slovenia d.o.o)
7. Gianmaria Giaconia (Almaviva Transportation and Logistics)
8. Jesús Pablo González (Nemi)
9. Jochen Wendel (INIT)
10. Murat Emre Duman, (Adastec)
11. Fran Martín (EarthPulse)
12. Laura Moreno (EarthPulse)
13. Joe Lampe (Factual Consulting)
14. Josep Laborda (Factual Consulting)
15. Carmen Laura Martin (GSC)
16. Sibylle Meffre (POLIS)
17. Elisa Gomez (POLIS)
18. Laurens Dauwe (Osborne Clarke Belgium)
19. Ismael Colomina (GeoNumerics)
20. Guillem Lleida (GeoNumerics)
21. Carles Miralpeix Llorach (Ferrocarrils de la Generalitat de Catalunya)
22. Carlos Hernando (INECO)
23. Katerina Antraki (OASA)
24. Efstathios Triantafyllidis (CERTH)
25. Francesco Russo (TopView srl)

Virtual

1. Lamprini Papafoti (Factual Consulting)
2. Charly Faradji (Telespazio France)
3. Andreas Bauch
4. Luis Chocano Cano
5. Daniel Jílek

6. Afroditi Douka
7. Eduardo Arnesto Romero
8. Rosa Maria Fidalgo Bernardo
9. David García Gutiérrez
10. Tadeas Horak
11. Isabel Sainz
12. Kilian Hoeflinger
13. Laura Hentz
14. Luis Chocano
15. Omar Zadeh
16. Osamu Takahara
17. Mante Stasiulyte
18. Violeta Damjanovic-Behrendt
19. Kristýna Žáková

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