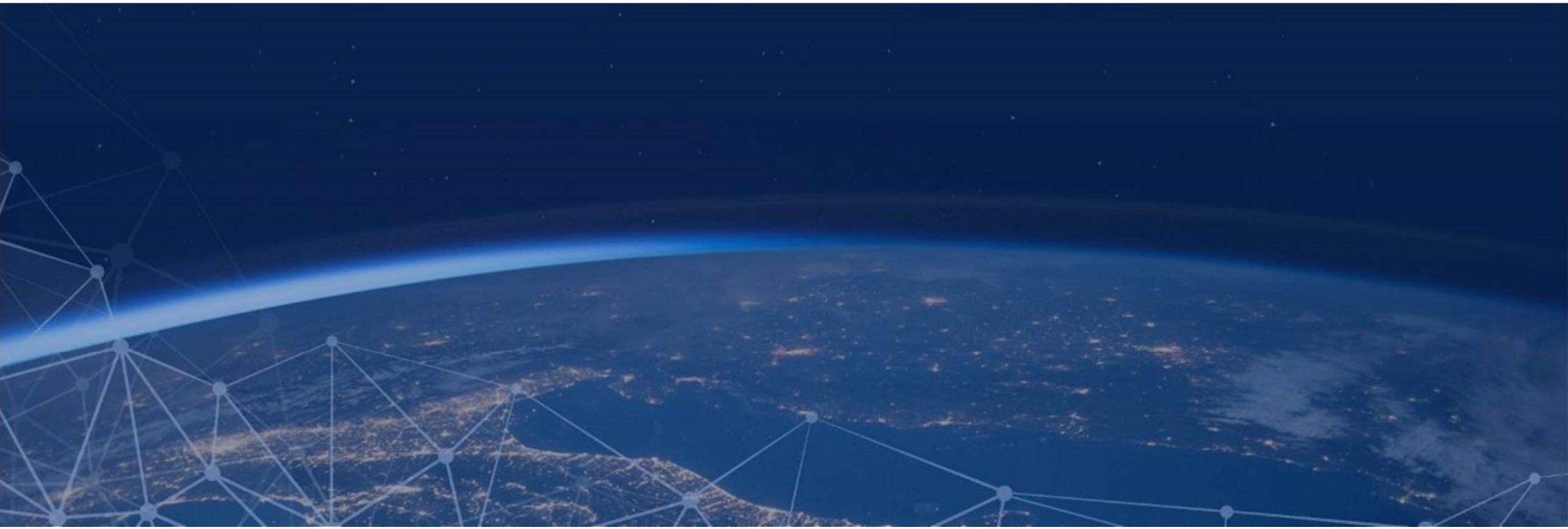


Using Space for Rail transport in Danube Macro-Region

The Danube Region Transport Days 2024

Ljubljana, 3 December 2024

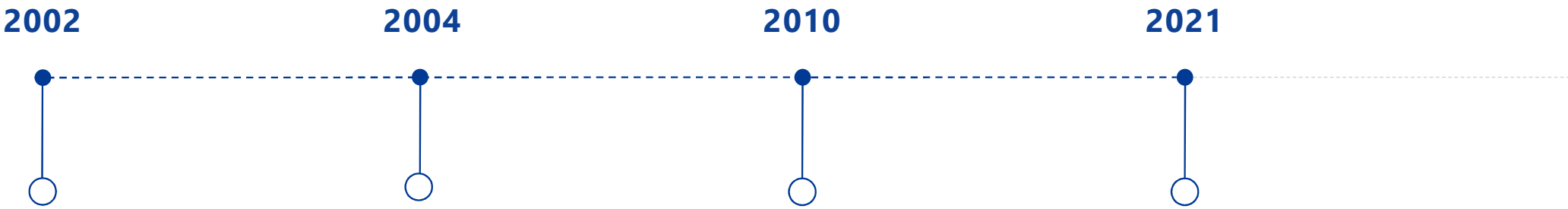
Presenter: Maximilian Bauernfeind (SNE), EUSPA

Authors: Daniel Lopour, Carmen Aguilera Rios, EUSPA

The road to EUSPA

EU Space Regulation (2021/696)

Acknowledgment of the growing role of space in supporting EU priorities in terms of growth, competitiveness, sustainability, and security



Galileo Joint Undertaking (GJU)

Managing the 1st phase of Galileo Development

European GNSS Supervisory Authority

European GNSS Agency (GSA)

EU Agency for the Space Programme (EUSPA)

#EUSpace

EU Space Programme 2021-2027

EU Space activities **under one umbrella**

EGNOS

EGNOS "Makes navigation signals more accurate and trustable for Safety-critical applications"

Operational in **480+ airports** & helipads in 26 countries

97% of new tractors with GNSS in Europe equipped with EGNOS

Galileo

Global satellite navigation and positioning system (GNSS)

More than **4 billion Galileo receivers** worldwide

Copernicus

Earth Observation (EO) and monitoring based on satellite & non-space data

Nr. 1 world provider of space data and information (16TB/day)

GOVSATCOM

Secure satellite communications for EU governmental actors

Rapid support over crisis areas

IRIS²

Infrastructure for Resilience, Interconnection & Security by Satellites

Sovereign multi-orbit constellation

Cutting-edge technologies focused on government service

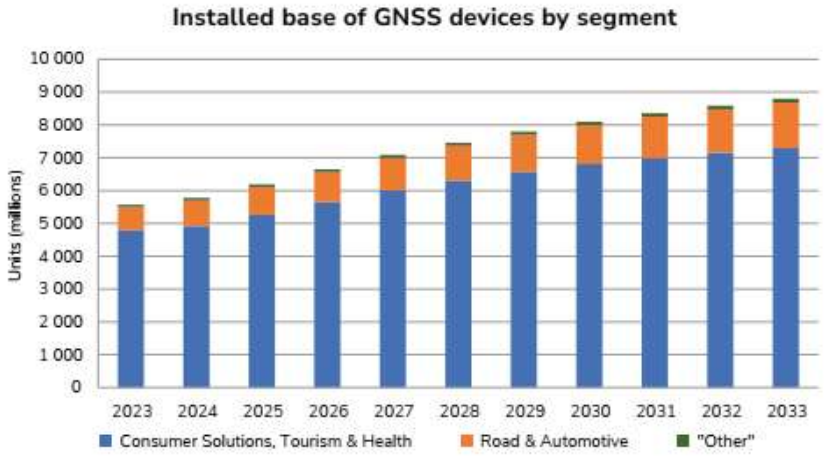
Space Situational Awareness (SSA)

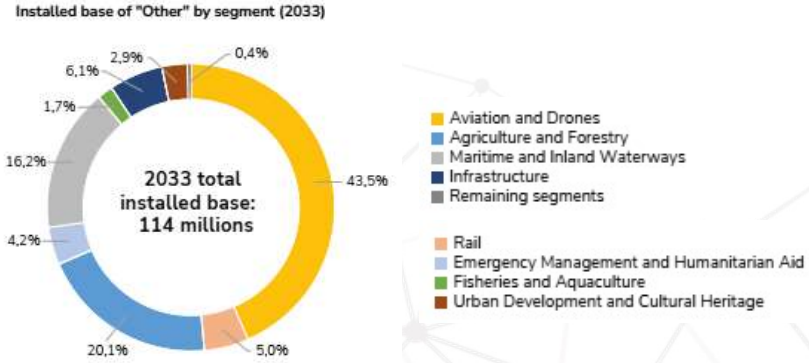
Space Surveillance and Tracking (SST)

Space Weather Events (SWE)

Near-Earth Objects (NEO)

Transport market: the largest GNSS Rx installed base, in non mass market segments, and high market share in EO data processing for EU companies





EO Regional market shares in data processing, by market segment - 2021

	Europe	North America	Asia+Russia		Europe	North America	Asia+Russia
	30%	50%	20%		30%	60%	10%
	85%	10%	5%		30%	60%	10%
	65%	20%	15%		80%	20%	0%
	10%	75%	15%		65%	20%	15%
	35%	40%	25%		30%	5%	65%
	50%	25%	25%		30%	70%	0%
	70%	30%	0%		35%	55%	10%

Note: Segment share for the 'rest of the world' is not shown nor accounted for in this table. Rounding is performed to the level of 5%.

Space is a key enabler to efficient, safe and environmentally friendly mobility solutions for EU

Smart cities, ports and airports

Optimised traffic management

Automation of operations

Sustainability

Emissions monitoring

Intelligent routes

Digitalisation

Intelligent logistics

Virtual reality

Autonomous vehicles

New mobility schemes

New transport infrastructure

New traffic management systems

Across all transport modes: Aviation, Drones, Maritime and Inland Waterways, Rail, Automotive

Towards European Green Deal Objective: 90% reduction in transport-related greenhouse gas emissions by 2050.

ERTMS remains to be „in the focus“

European Parliament supports GNSS inclusion in ERTMS (resolution of 7 July 2021 on railway safety and signaling), calling on the EU rail industry to develop technical solutions in order for the GNSS to enable the ERTMS on a large scale

- ✓ Points out the need to ensure synergies between the ERTMS and the European Global Navigation Satellite System (GNSS) as soon as possible
- ✓ Calls on the EU rail industry to develop technical solutions in order for the GNSS to enable the ERTMS on a large scale
- ✓ Calls on the Commission to consider introducing the GNSS in the upcoming ERTMS TSI CCS revision in order to close the remaining technological gaps and embrace innovation
- ✓ Calls for cooperation between the Agency (ERA) and the GNSS Agency (EUSPA) to be stepped up in order to phase the GNSS into ERTMS standard

EU Space support to rail

- **Close coordination with ERA and ERJU**:
  - EUSPA participates as gateway to space within EU-Rail System pillar SG
  - **ERTMS Standardization and TSI input plan includes GNSS**: Activities on Enhanced Odometry and Absolute Safe Train Positioning present in STIP v1.0, outlining the possible inclusion of GNSS/EGNOS in the TSI in 2027 and 2032.
  - **EGNOS4RAIL project in progress:** cooperation between EUSPA, ESA, EU-Rail and EUG to close the residual gaps, including demonstration of the GNSS-based train localization feasibility within EU-Rail demonstrators with contribution of EGNOS
- Further progress achieved within adoption in non-safety relevant applications
- **EUSPA Fundamental elements programme**: 2 projects on receiver/antenna prototype development completed (TRENI and GALITS)
- EGNOS Adoption Grants in progress (BETRIAN & EGNOS AIR)
- **Continued support in frame of EUSPA R&D**
  - HORIZON-EUSPA – VICE4RAIL project kicked off in 11/2024, focusing on the development of a certification and standardization process for the use of EGNSS in ERTMS

Space enabled railway digitalization

Galileo uptake in freight wagon track&trace continues to ramp up with **more than 150 000 wagons already equipped with GNSS receivers**

European Parliament supports GNSS inclusion in ERTMS (resolution of 7 July 2021 on railway safety and signaling), calling on the EU rail industry to develop technical solutions in order for the GNSS to enable the ERTMS on a large scale;

Actions and next steps to support space use in rail:

- **Close coordination with ERA and ERJU and stakeholder associations**:
  - EUSPA participates as gateway to space within ERJU System pillar SG
  - EUSPA R&D as a technology driven contributor to the ERJU Innovation pillars
- **Defining EGNOS service for rail signaling**
- **Supporting penetration of COPERNICUS data in products for rail infrastructure monitoring**
- **Cooperation with stakeholders on use of EU SATCOM**

EUSPA R&D – active projects

Complementing the existing European Train Control System (ETCS) odometry system through an on-board GNSS+EGNOS-based multi-sensor fusion architecture enabling absolute safe train positioning and navigation whilst also transforming the way train localisation is done today.

RAILGAP

Development of tools for designing high integrity and accuracy ground truth and digital trackside map indispensable for train positioning with EGNSS and other sensors including procedures for automated collection of in field measurement data with commercial trains.

radius

Development of a drone-based technology to monitor the physical status and electronic functionality of both non-safety-critical and safety-critical railway signalling assets and to execute specific maintenance activities

S5LECT
SatCom & 5G Link, Edge & CybersecuriTy

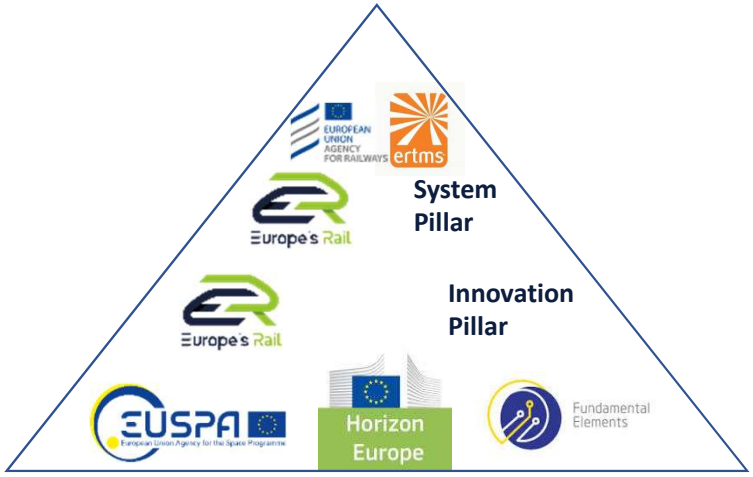
The S5LECT project will experiment a solution for seamless handover between 5G terrestrial network, Satellite link and GSM-R communication system and contribute to the development of solutions for the use of GOVSATCOM satellite communications in the railway domain

ERSAT

ERSAT GGC

RHINOS

Interinstitutional R&D coordination



EUSPA R&D as a technology driven contributor to the ERJU Innovation pillars

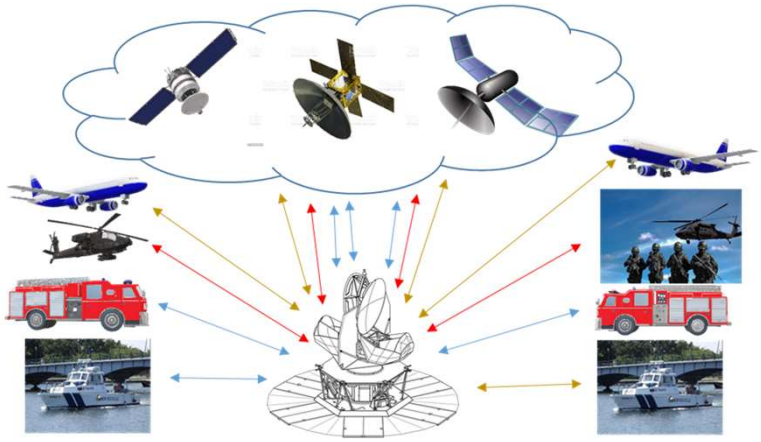
Examples of Copernicus contribution towards efficient rail transport

Vegetation monitoring
Copernicus data is present within the mix of Earth observation techniques for protection of train gabarit from risks associated with vegetation growth

Construction monitoring of railway infrastructure and its proximity
Copernicus can support monitoring of construction works on the infrastructure as well as construction around it with the objective to mitigate any possible negative effects on operations

Infrastructure maintenance
Copernicus can help to indicate changes in status and condition of railway infrastructure assets, supporting decisions regarding necessary corrective or preventive maintenance

GOVSATCOM (GOVermental SATellite COMmunications) – an alternative for terrestrial communication in ERTMS?



Today the fragmentation of military, governmental and civilian users results in:

- suboptimal use of resources,
- interoperability issues

- Under EU GOVSATCOM the existing satellite communication capacities (nationally owned + commercial ones) and services will be combined into a common Union pool with appropriate security requirements.
- The pooling of satcom resources and the aggregation of user demand will optimise the match between the GOVSATCOM demand and the supply, will support additional security features and foster interoperability.
- **1 km of GSM-R infrastructure costs approximately 50k EUR – Could EU SATCOM serve as an alternative in the future?**

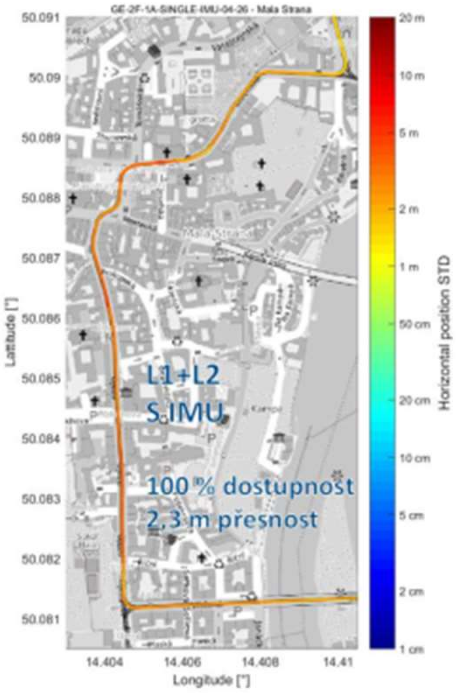
GOVSATCOM to support major infrastructures

where the absence of proper communication links can be detrimental to the security and safety of the EU, the Member States and its citizen, including transport (e.g. ATM or ERTMS)

Public Transport benefitting from Space

- In July 2022, ITxPT, association for interoperable Public transport ICT released **Technical Specifications recommends using multi-constellation GNSS receivers with GPS and Galileo** in order to improve the signal availability and accuracy in urban environment
- The recommendation will be applied worldwide by public transport operators within procurement of new vehicles

Prague trams towards 100% deployment of Galileo-enabled receivers



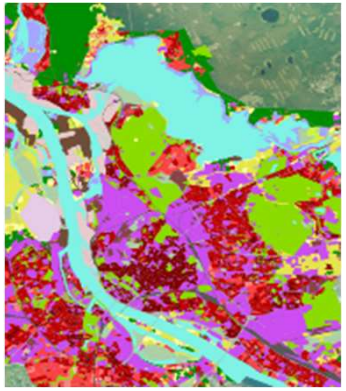
Examples of Copernicus contribution within urban mobility

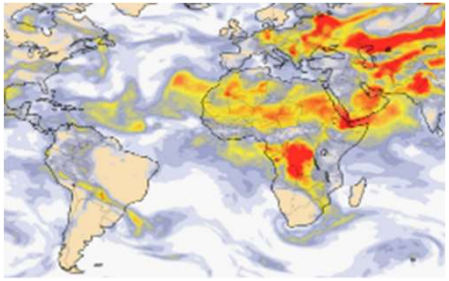
Green Cities pilot project

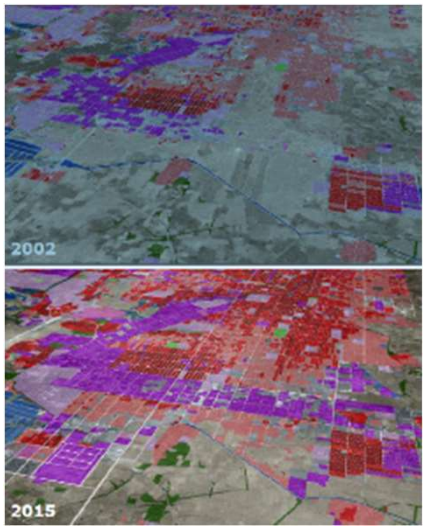
Monitoring and presenting various KPI´s, enabling assessment of the actions undertaken by local authorities to make European cities greener e.g.:

- Zero emission transport services
- Dedicated infrastructure for green transport modes
- Waste transport optimization
- Air quality monitoring – transport related emissions

Implementation ongoing







Linking space to user needs

How to get in touch:

www.EUSPA.europa.eu