EGNSS for safety-critical railway applications – still a long way to go?

Uwe Wendland (DB Netz AG)
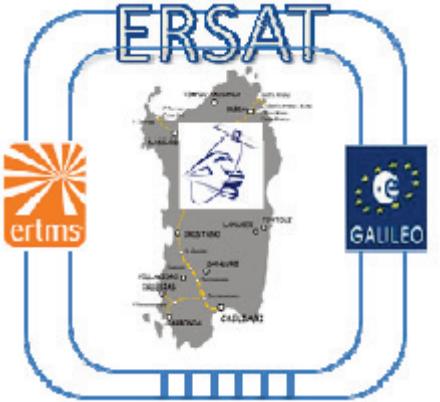
Christian Rahmig (DLR Institute of Transportation Systems)

Knowledge for Tomorrow

Overview ERSAT project

- **ERSAT EAV** (ERTMS on Satellite – Enabling Application & Validation)
- EU funded project (H2020) under control of GSA (European GNSS Agency)
- Budget: 5.5 million EUR; project run time: 01.02.2015-30.06.2017
- Coordinator: Ansaldo STS
- Partner:
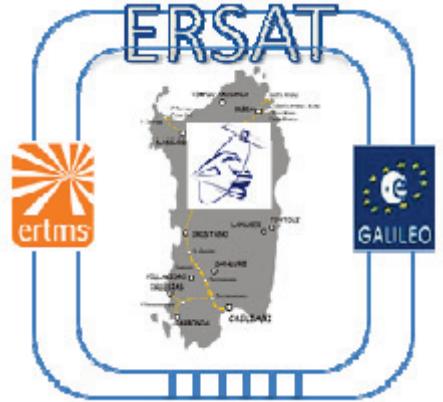
Figure: Ansaldo STS   *More information available at project website: http://www.ersat-eav.eu/*

Overview ERSAT project
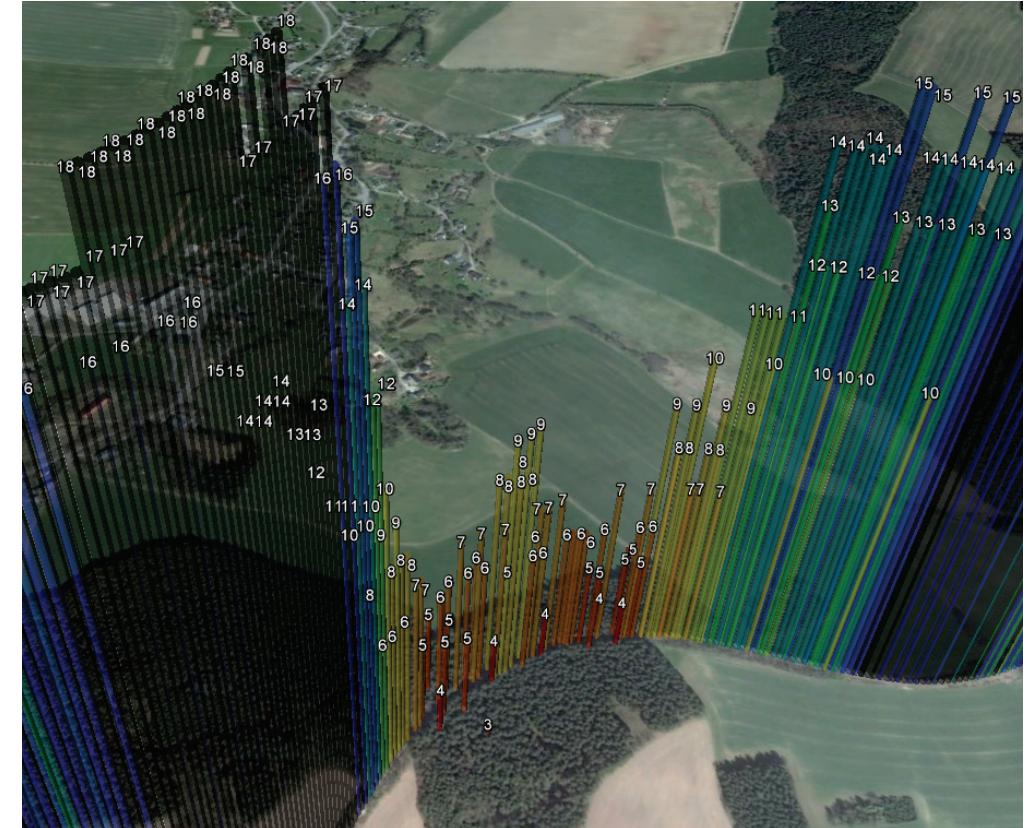
- Project goal:
  - Verify the suitability of **EGNSS (incl. EGNOS and Galileo early services) for safety railway applications**, in particular for a regional line scenario with a pilot line as reference
- Achievements
  - The technical feasibility of Virtual Balise principle with Satellite Positioning has been proven.
  - A high positioning accuracy has been achieved, thanks to developments such as Multi-constellation GPS/GALILEO, Augmentation, Integrity Monitoring, Complementary Positioning System (CPS), etc. With CPS even GNSS denied areas can be bridged.
- Next steps from DB Netz AG's point of view
  - Sustainable Cost Benefit Analysis will clear benefits for infrastructure managers and railway operators
  - Develop interoperable interfaces on EU level and adding them to the existing ETCS specifications

More information available at project website: http://www.ersat-eav.eu/

Challenges for using EGNSS in railways
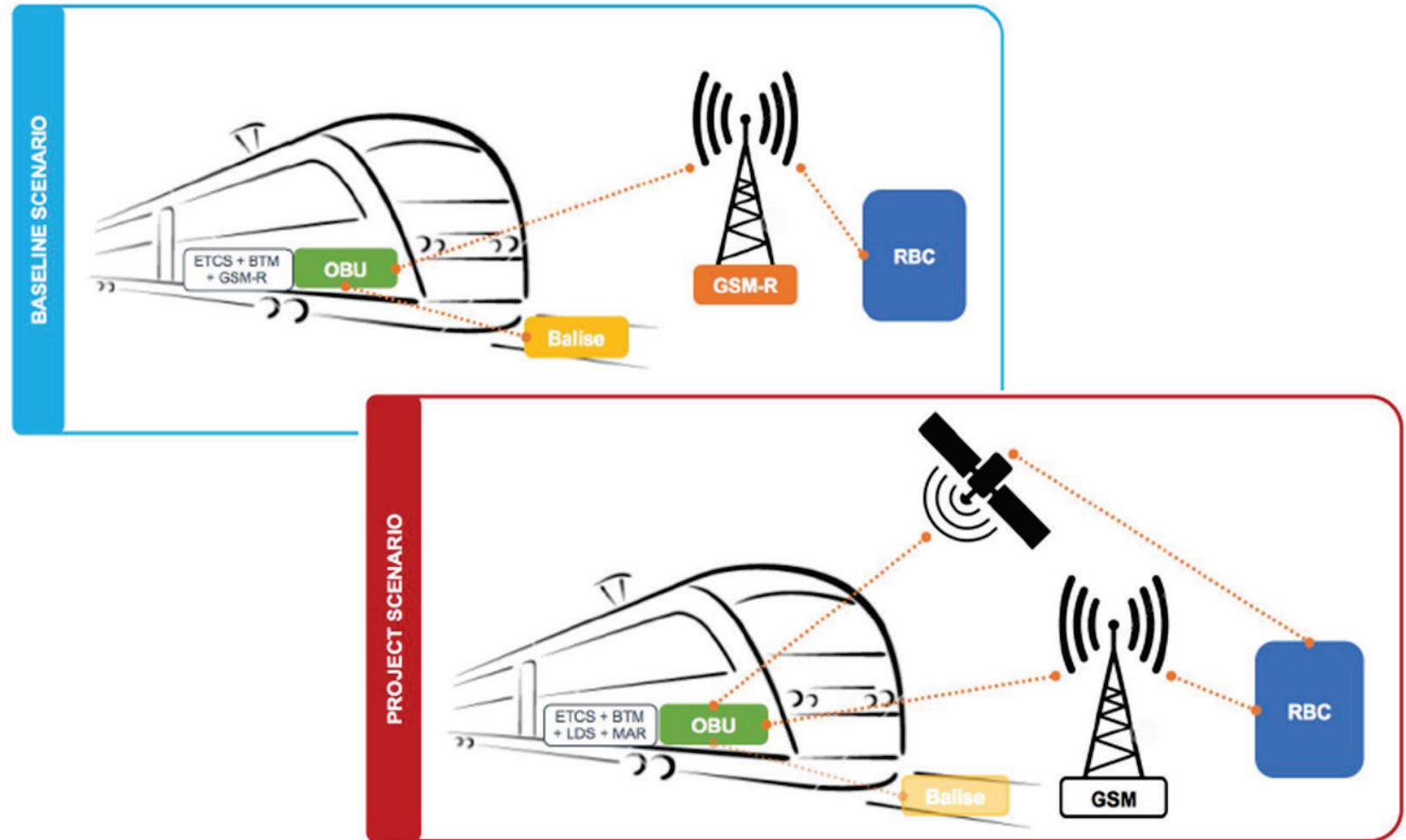
- GNSS measurement campaign together with DLR at Erzgebirgsbahn in May 2016


Figures: DLR

ERSAT system

- ETCS Level 2 (w/o signals)

- ERSAT


Figures: University of Bocconi

ERSAT system
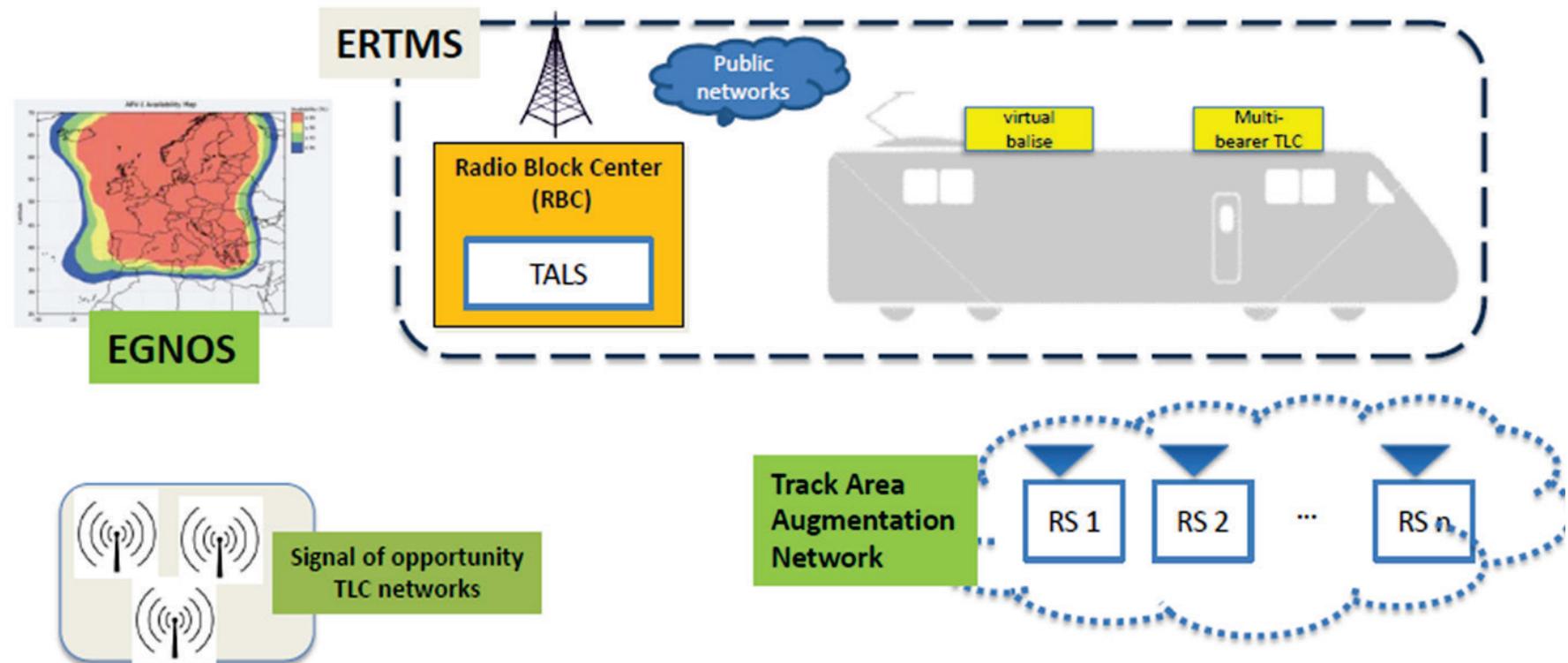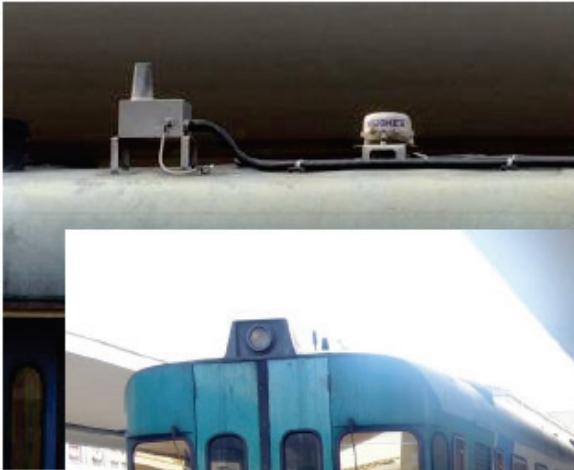
Figure: Ansaldo STS
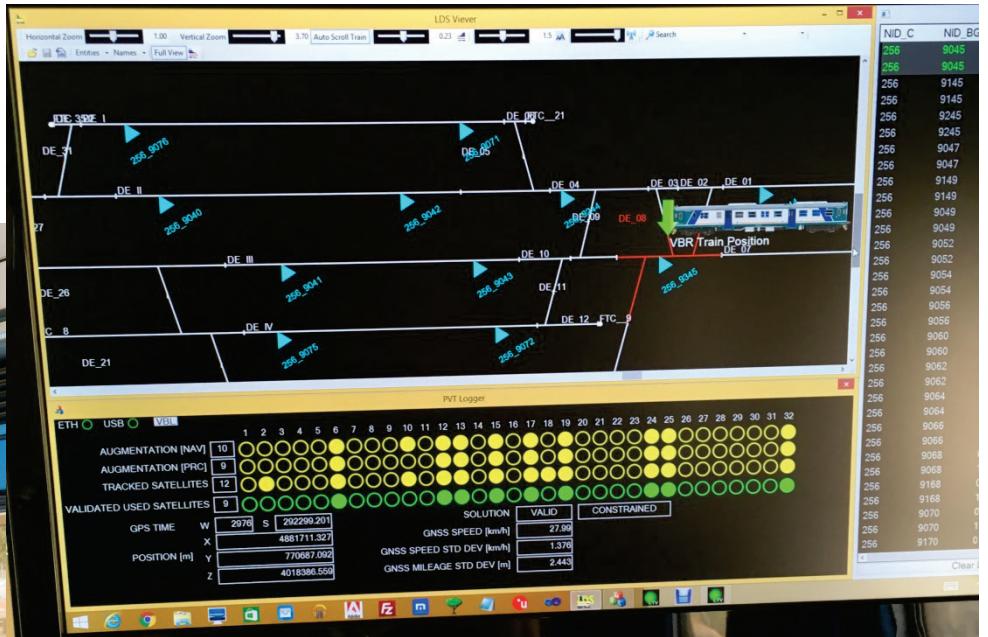
ERSAT prototype implementation in Sardinia

*Figures: Ansaldo STS*

ERSAT prototype implementation in Sardinia

Cagliari 24th February 2017

Figures: Ansaldo STS

ERSAT prototype implementation in Sardinia
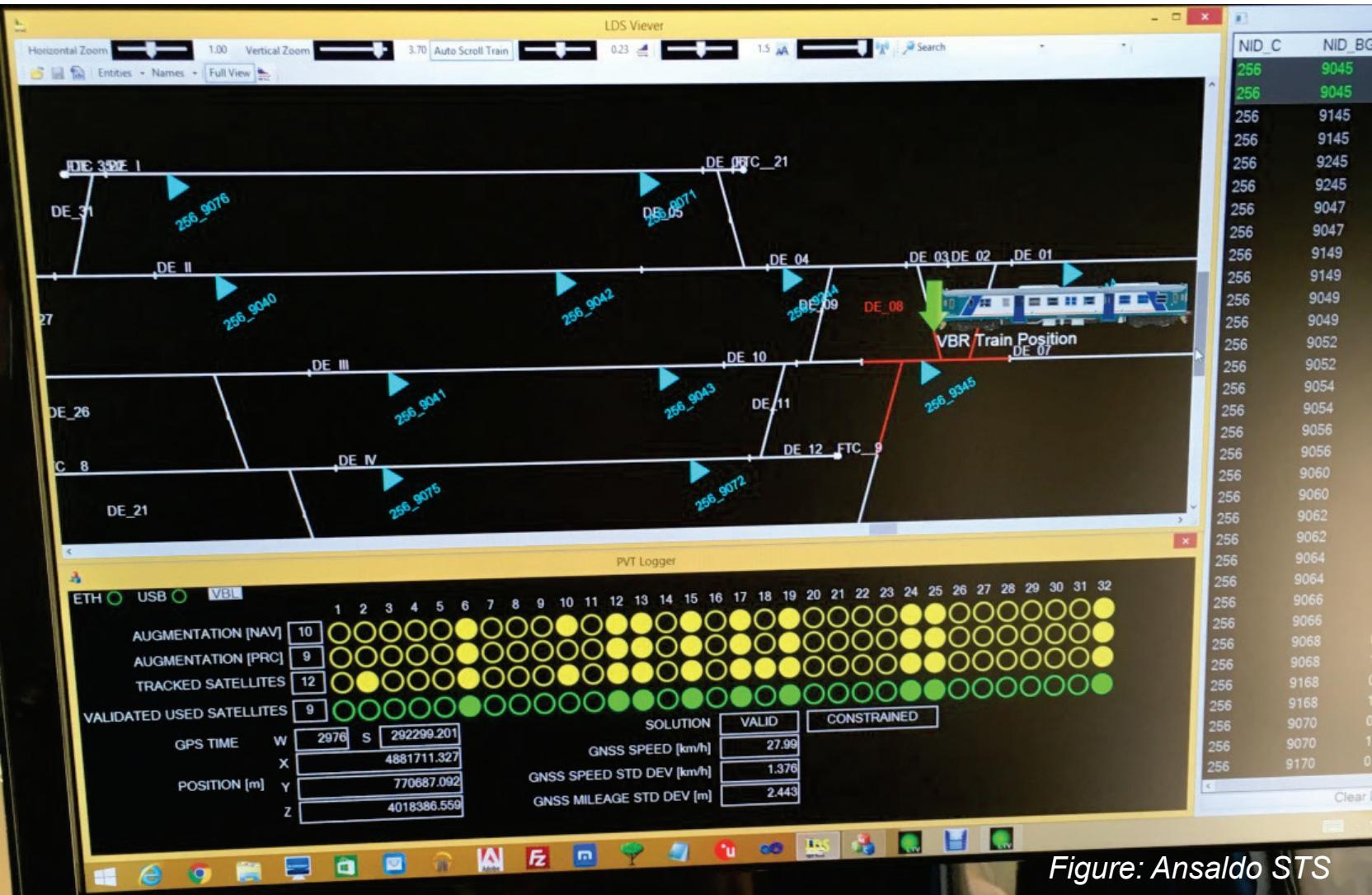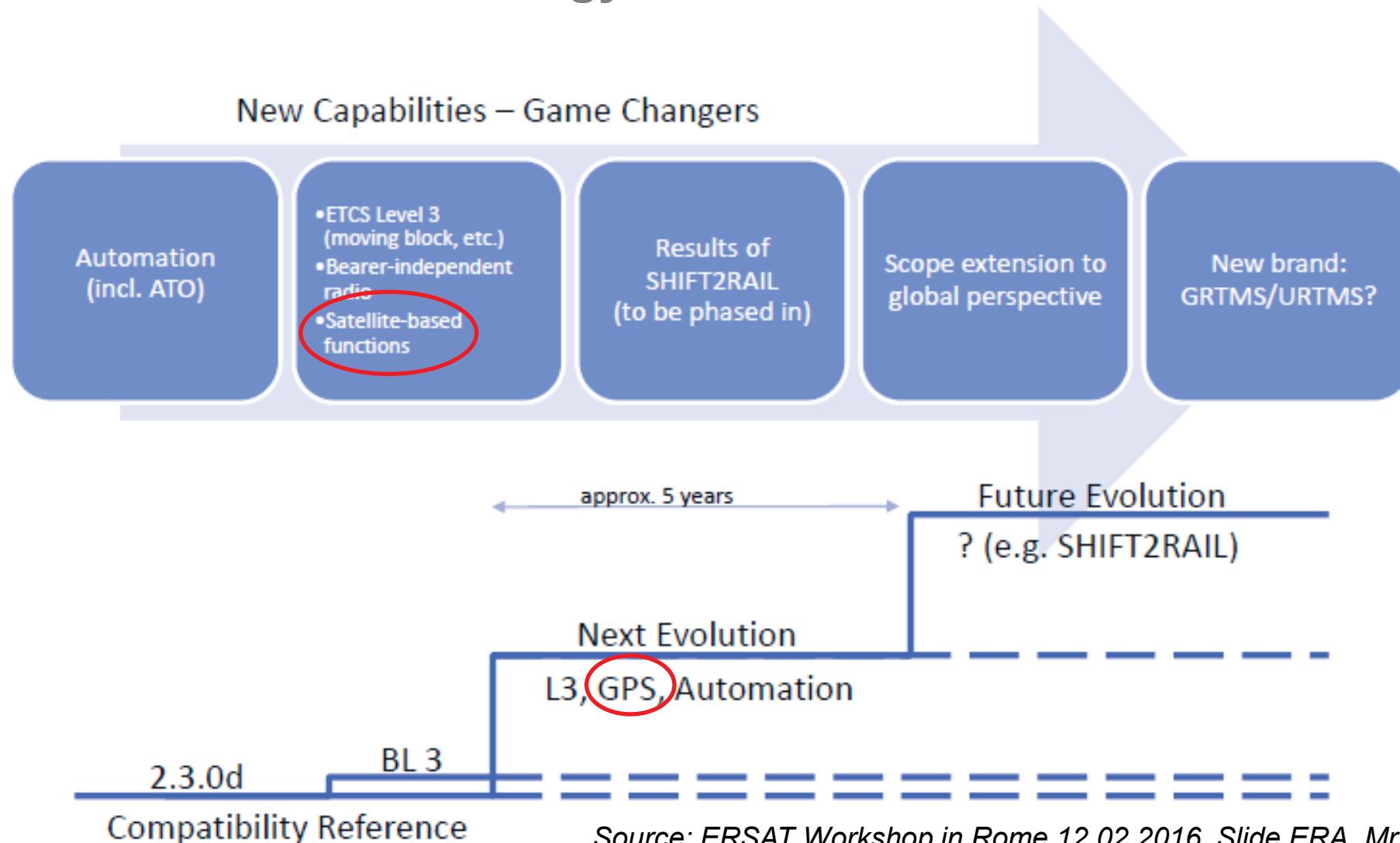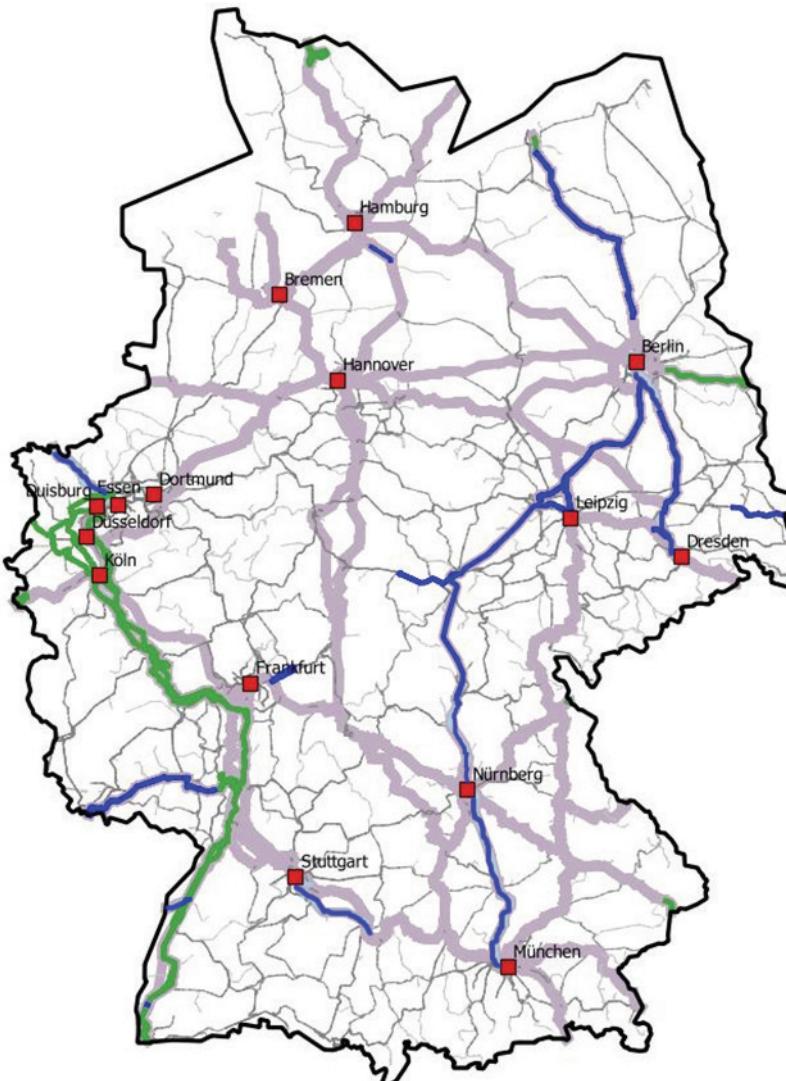
Figure: Ansaldo STS

EGNSS in ETCS evolution strategy of EU

New Capabilities – Game Changers

| Automation (incl. ATO) | • ETCS Level 3 (moving block, etc.)
• Bearer-independent radio
• Satellite-based functions | Results of SHIFT2RAIL (to be phased in) | Scope extension to global perspective | New brand: GRTMS/URTMS? |

approx. 5 years

Future Evolution

? (e.g. SHIFT2RAIL)

Next Evolution

L3, GPS, Automation

BL 3

2.3.0d

Compatibility Reference

Source: ERSAT Workshop in Rome 12.02.2016, Slide ERA, Mr. Doppelbauer

DLR

DB NETZE

Outlook: ETCS in Germany until 2023

- Plan + Construction
- In operation
- TEN Core Network Corridors

- DB Netz AG's railway network length: approximately 33,300 km
- **ETCS Scenario 2023:**
  - About 2,500 km will be with ETCS in operation
  - Another 800 km will be with ETCS in planning or under construction
  - All those lines will be equipped with ETCS based on currently available specifications and technologies (without EGNSS)
- For new projects (beyond 2023) additional technologies (e.g. EGNSS, ATO, etc.) may be applied if:
  - Certified on EU level and on National level
  - Beneficial for infrastructure managers and railway operators
  - Available on the market

Figure: DB Netz AG

Conclusion: Key messages on EGNSS from railway perspective

Using **EGNSS for safety-critical railway applications is** generally **possible**, if

1. It is certified for railway usage on EU level and on National level
2. It is being integrated in existing ETCS architecture
3. It is possible to combine it with other technologies, in particular in areas without EGNSS visibility
4. It is beneficial for both, infrastructure managers and railway operators
5. It is available on the market

Thank You | Contacts

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Figure: DLR