AŽD Praha s.r.o.

ATO GoA3/4 in the Czech Republic

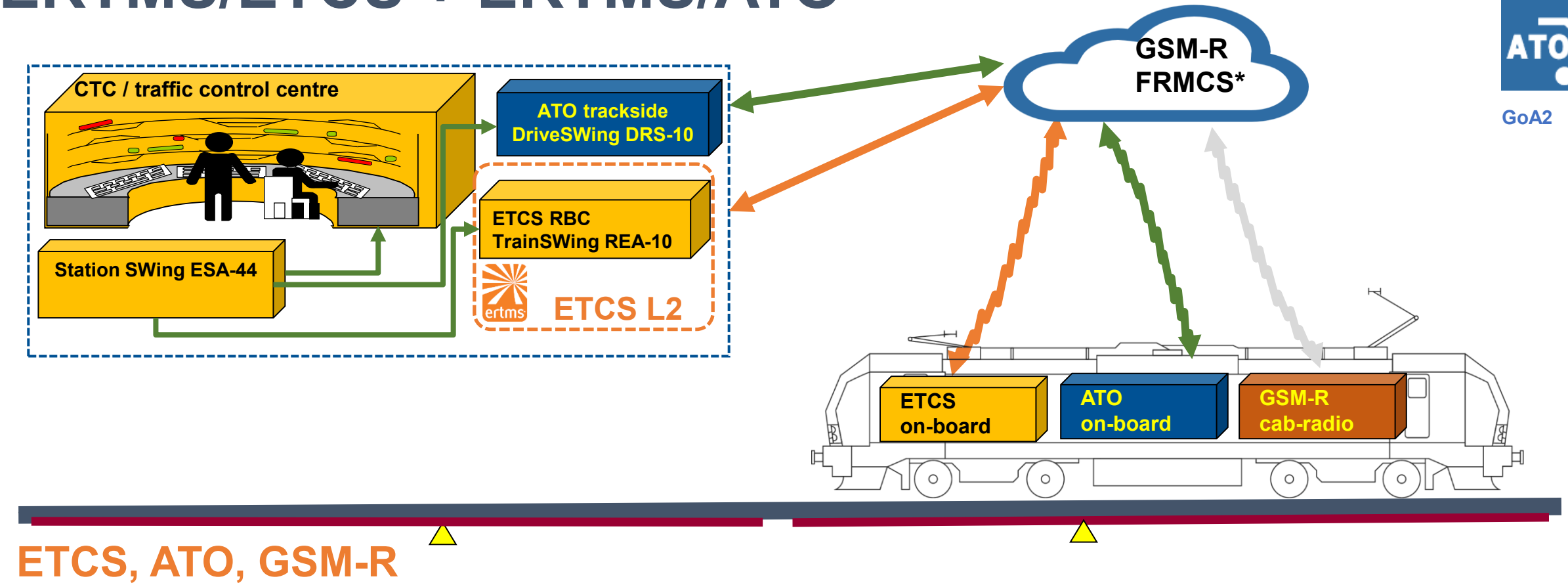
Vladimír KAMPÍK, MIRSE

ERTMS 2026 Conference, Valenciennes, France, 21–23 April 2026

At AŽD, our VISION is the Autonomous Railway

“Smart AUTONOMOUS trains on smart AUTONOMOUS infrastructure“

Where are we with specifications/legislation? ERTMS/ETCS + ERTMS/ATO



ATO
GoA2

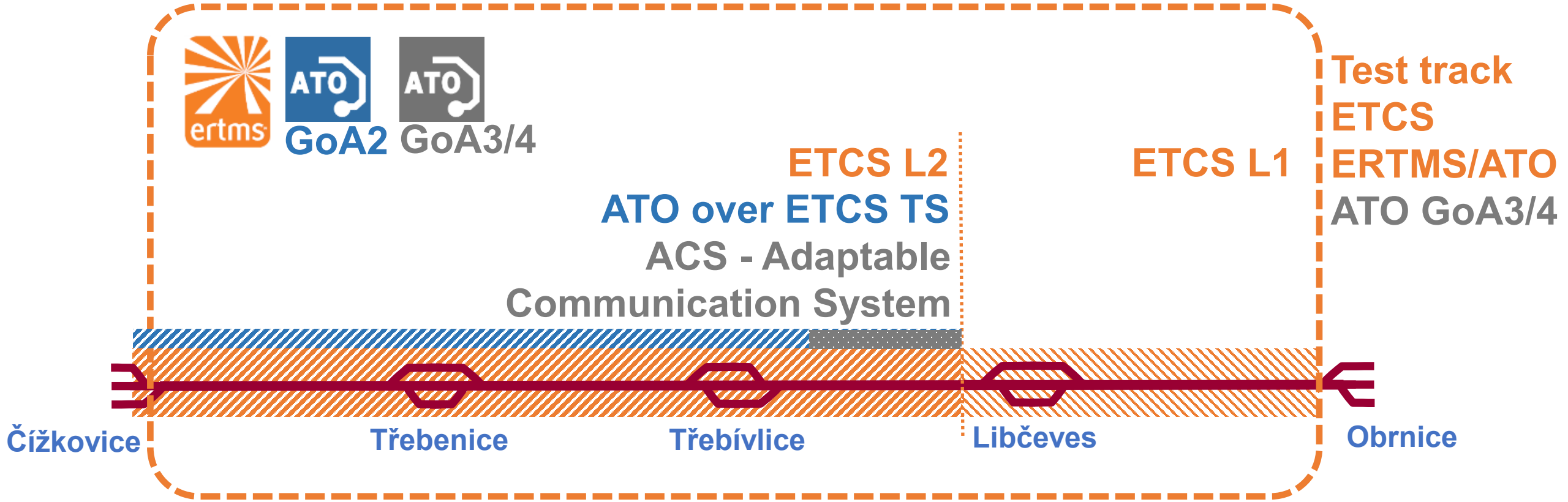
AŽD Praha s.r.o.

Test polygons for Autonomous Train Operation

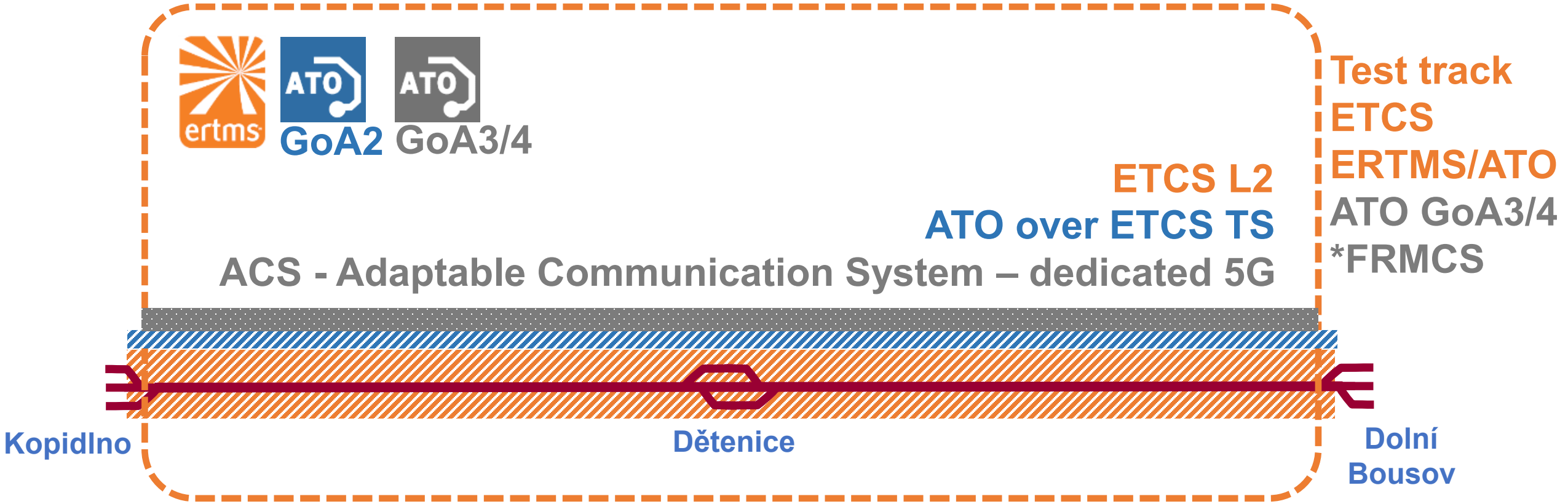
Švestková dráha

KOPIDLNKA

„Švestkovka“ line
Test Polygon for modern signalling systems



„Kopidlnka“ line
Test Polygon for Autonomous Train Operation



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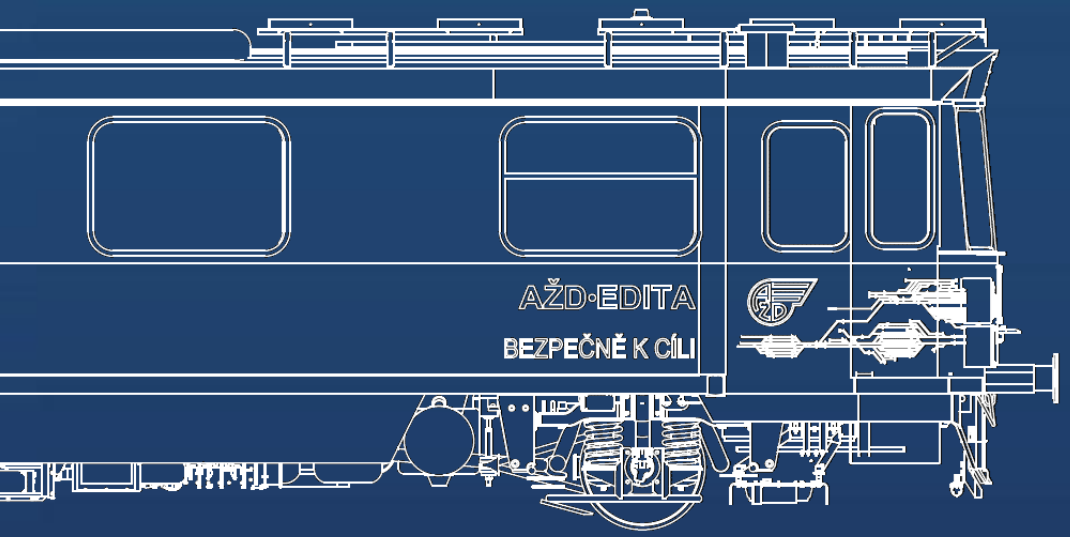
Autonomous Train



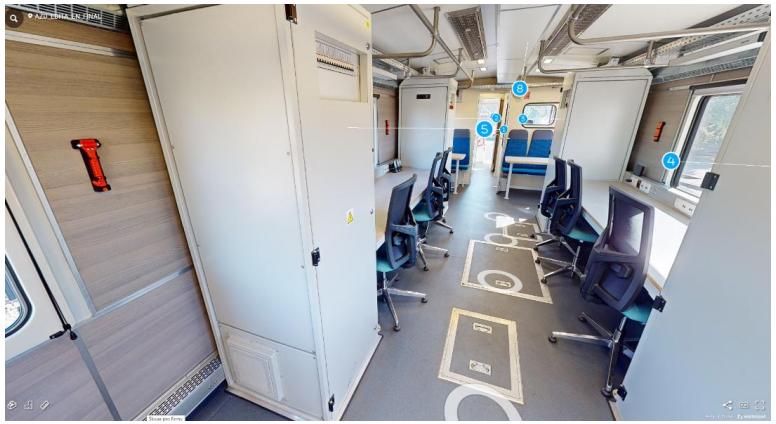
Autonomous train:
From „Blue Crocodile“ to „EDITA“

- **Ad-hoc** installed sensors → **Embeded** sensors
- Proprietary architecture → ERJU architecture with new modules
- Improvement of the PERCEPTION software solution + increased robustness by independent threads



AŽD GoA3/4 test car „EDITA“

- EDITA = **E**xperimental **D**riverless vehicle for **I**nnovation and **T**echnologies of **A**ŽD
- Completed in 2024 as a complete refurbishment of 1976‘ diesel passenger railbus class 810, No seats for passengers
- Set of sensors, cameras and detectors **built-in** at the car
- Built specifically for **research**, **development** and **testing** of **autonomous technologies,** with dedicated cabinets for additional technologies



EDITA as part of regular passenger train

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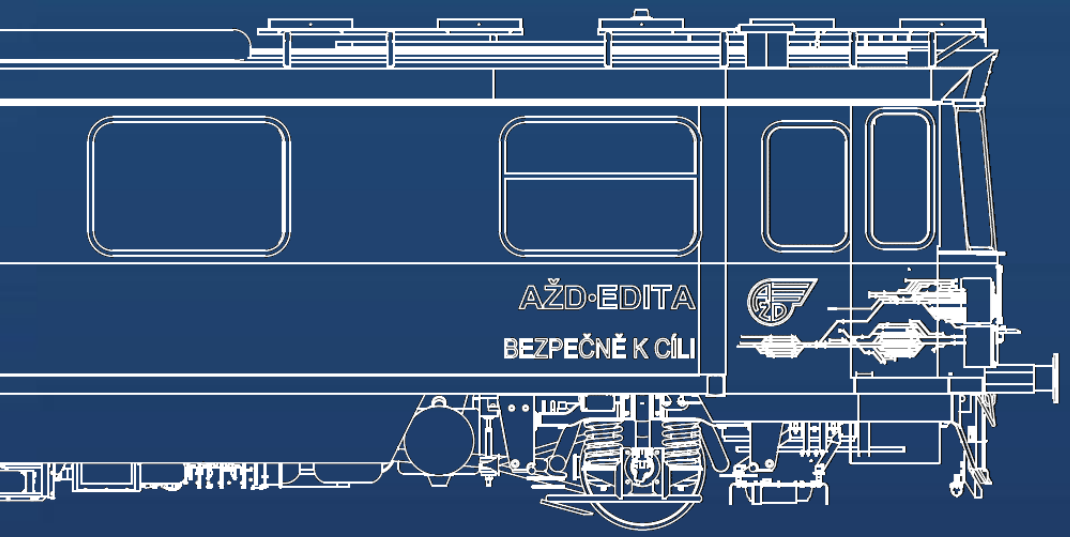
EDITA – systems and modules

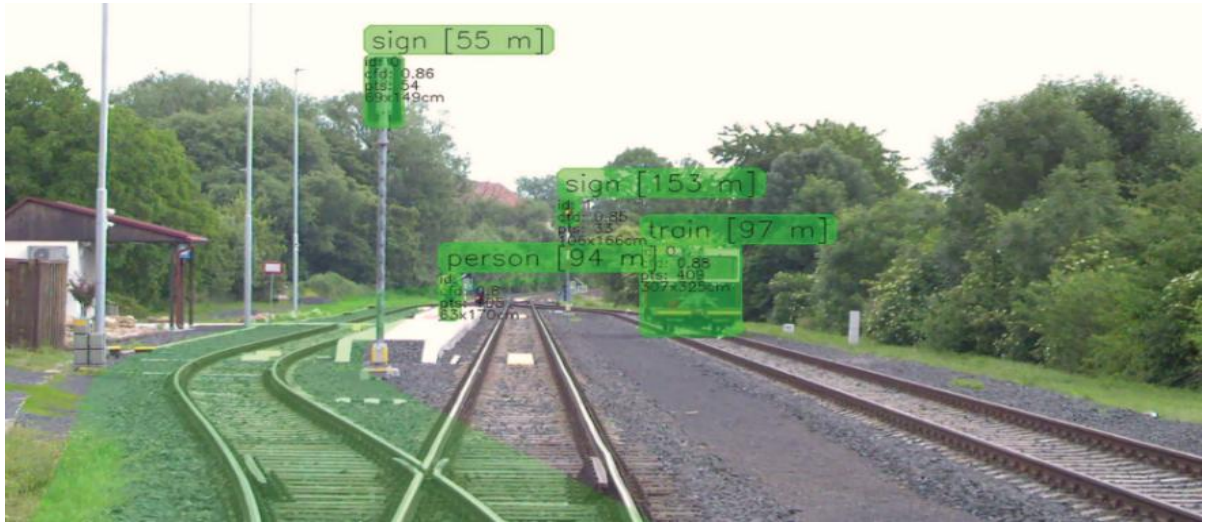


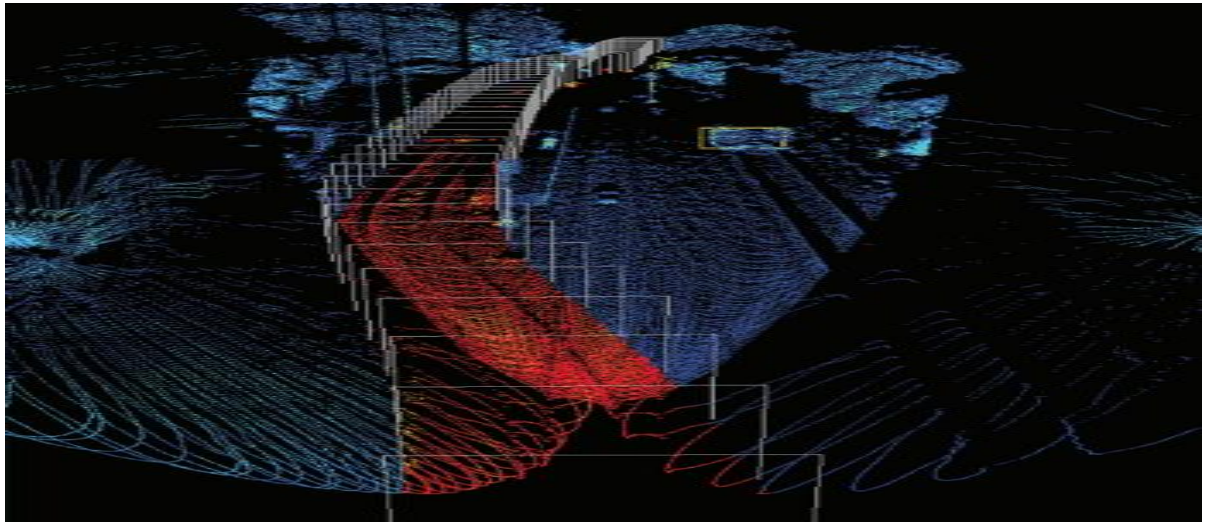
Automatic Driving Module (ADM) – GoA 3-4 ATO

- Extension of AŽD GoA 2 interoperable ERTMS/ATO to support fully autonomous operation
- Regulates traction and brake of the train to achieve fulfillment of the timetable (Journey profile) in an energy-efficient way, by taking into account the characteristics of given line description (Segment profile)
- Feedback between ADM/ATO and TMS through ATO-TS (ERTMS Subset-126)
- Built using our 30-year experience with GoA 2 ATO in commercial operation
- Interfacing PAL & ETCS-OBU via ERTMS Subset-130
- Interfacing TCMS via ERTMS Subset-139
- Interfacing GoA 3-4 specific subsystems via draft X2R-4 and R2DATO interfaces

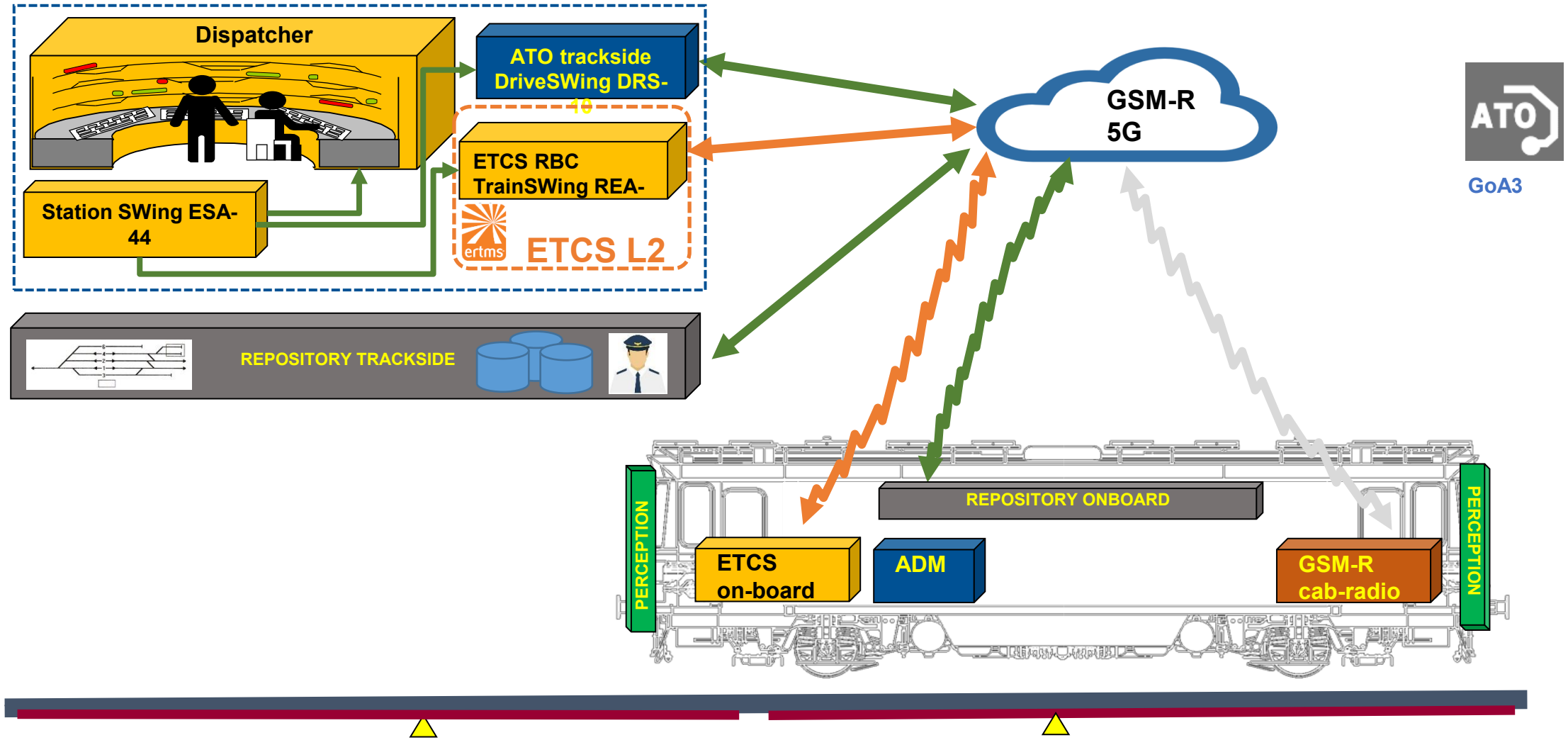
Perception On-Board module

- „System to replace driver‘s eyes“
- Based on Deep learning, neural networks, image and pattern recognition,
- set of sensors to evaluate clearance of the track ahead; to detect obstacles: **pair of cameras** with different focal lengths, two **LiDAR**s with IMU and an **infrared camera** on each head of train

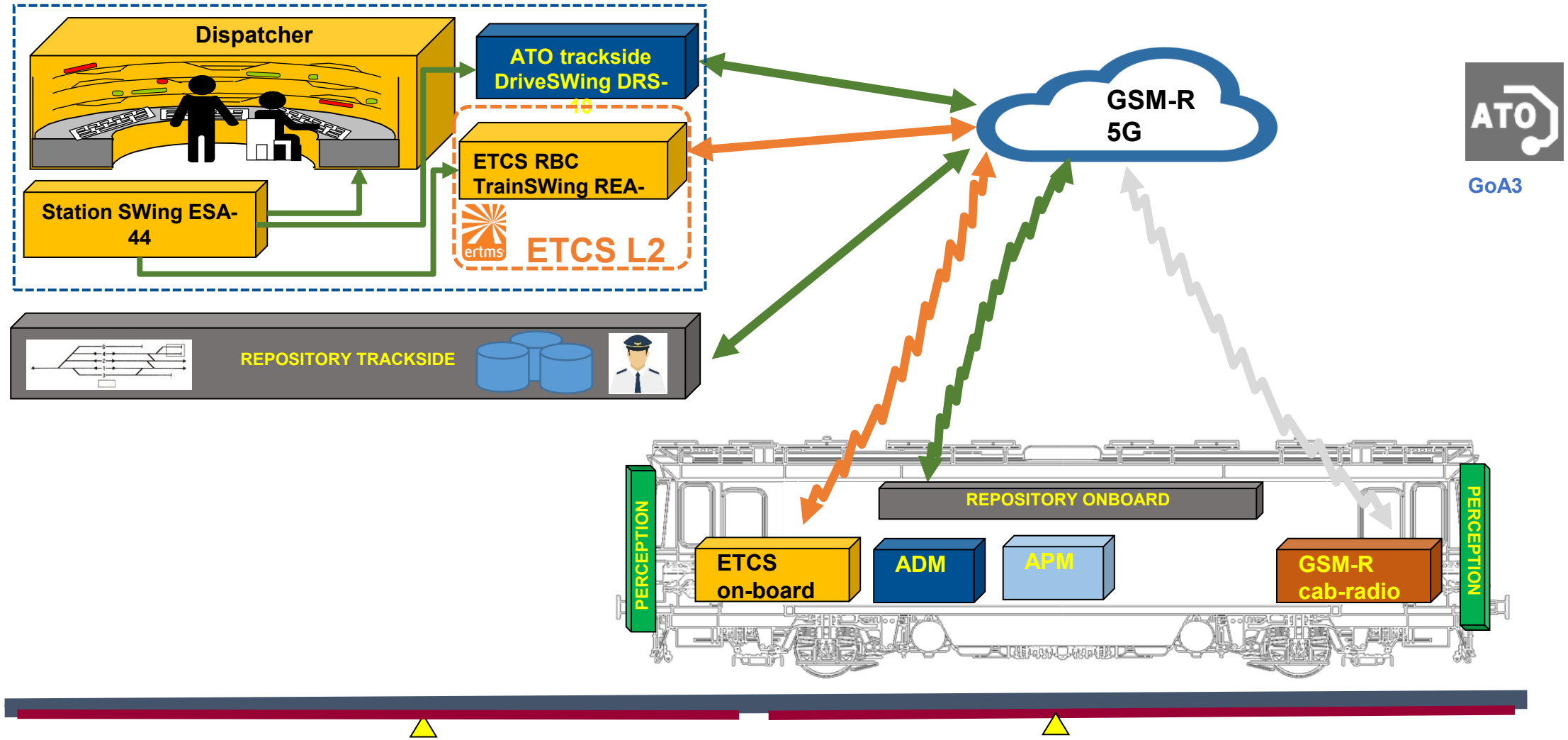




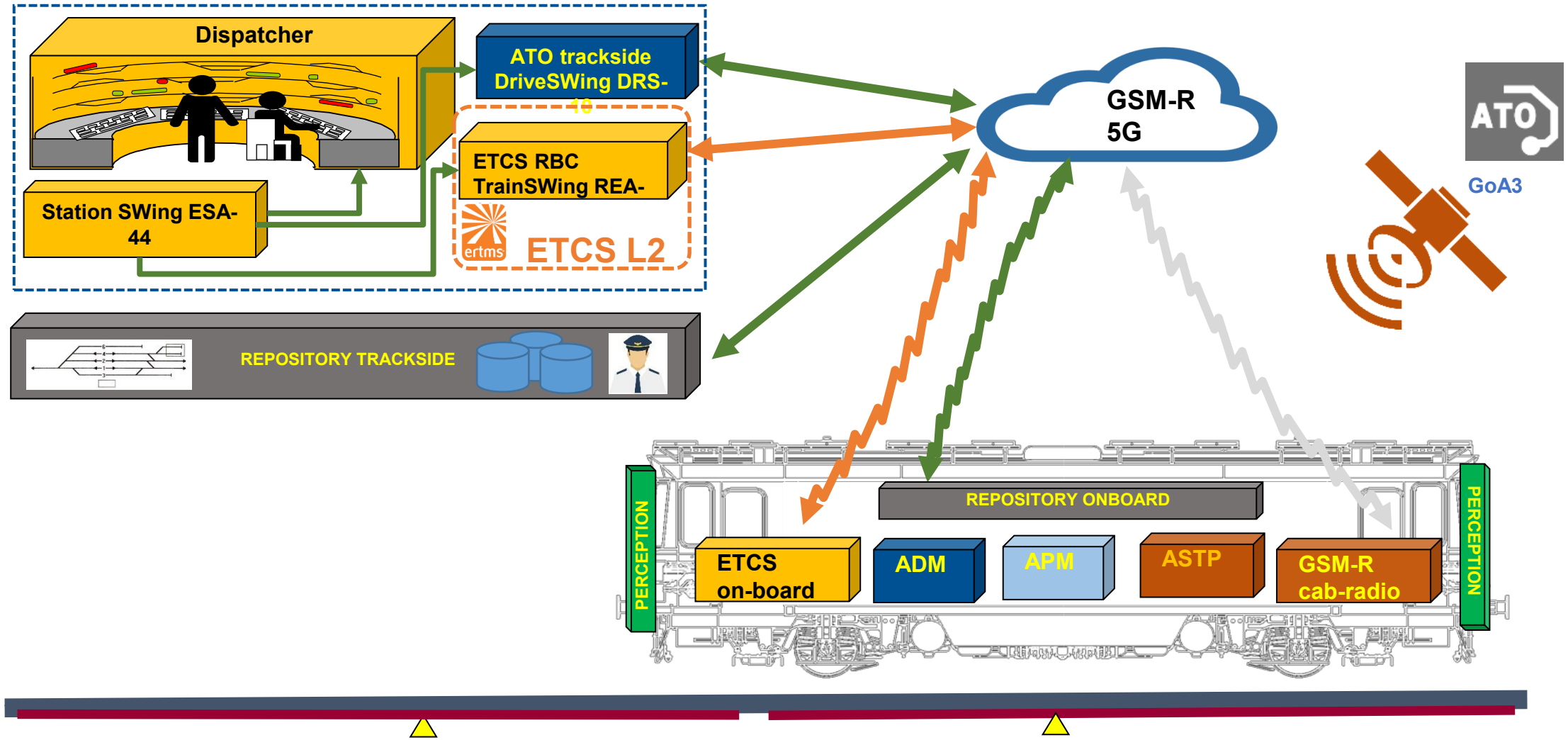
Repository (On-Board and Trackside)



APM – Automatic Processing Module

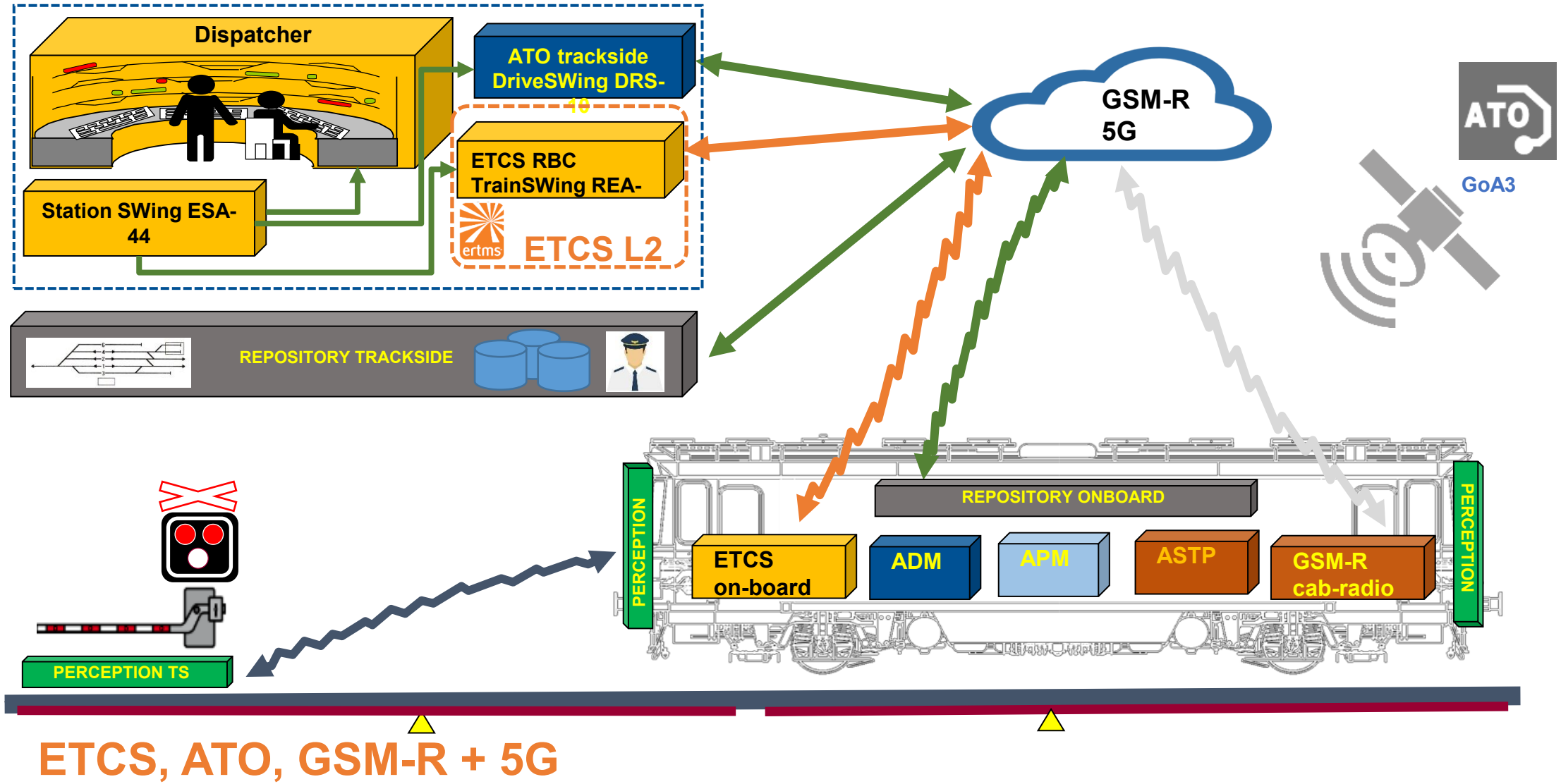


ASTP Absolute Safe Train Positioning

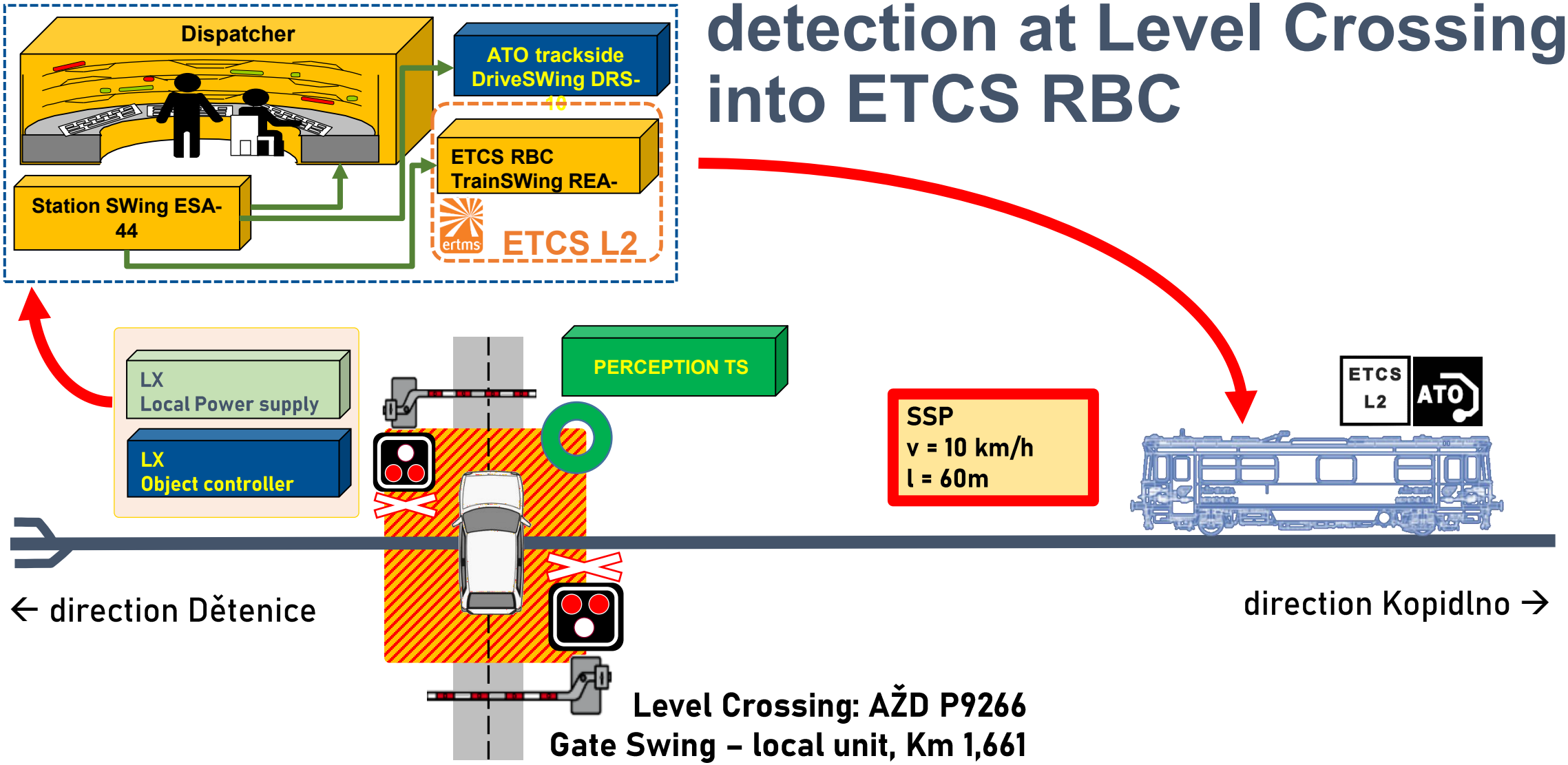


ETCS, ATO, GSM-R + 5G

Perception Trackside (TS)

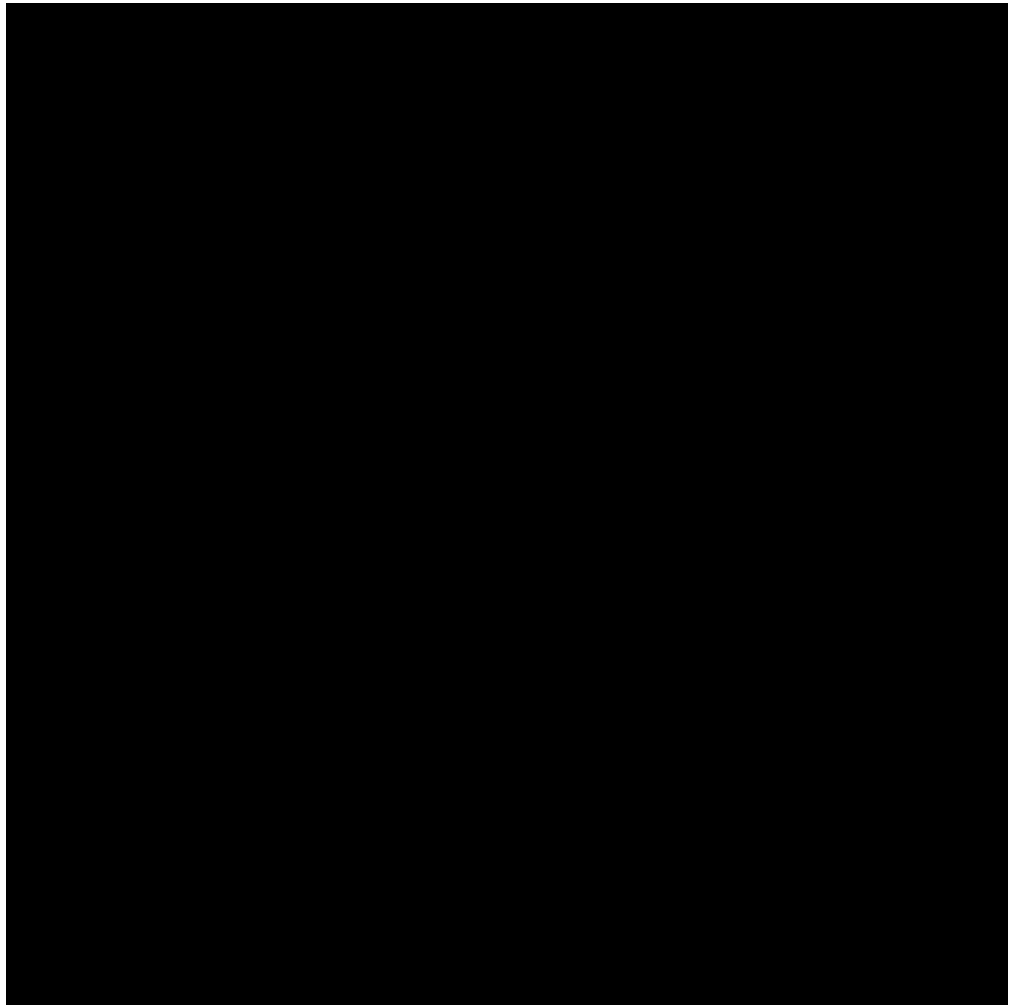


Perception Trackside: Integration of 3D Obstacle detection at Level Crossing into ETCS RBC



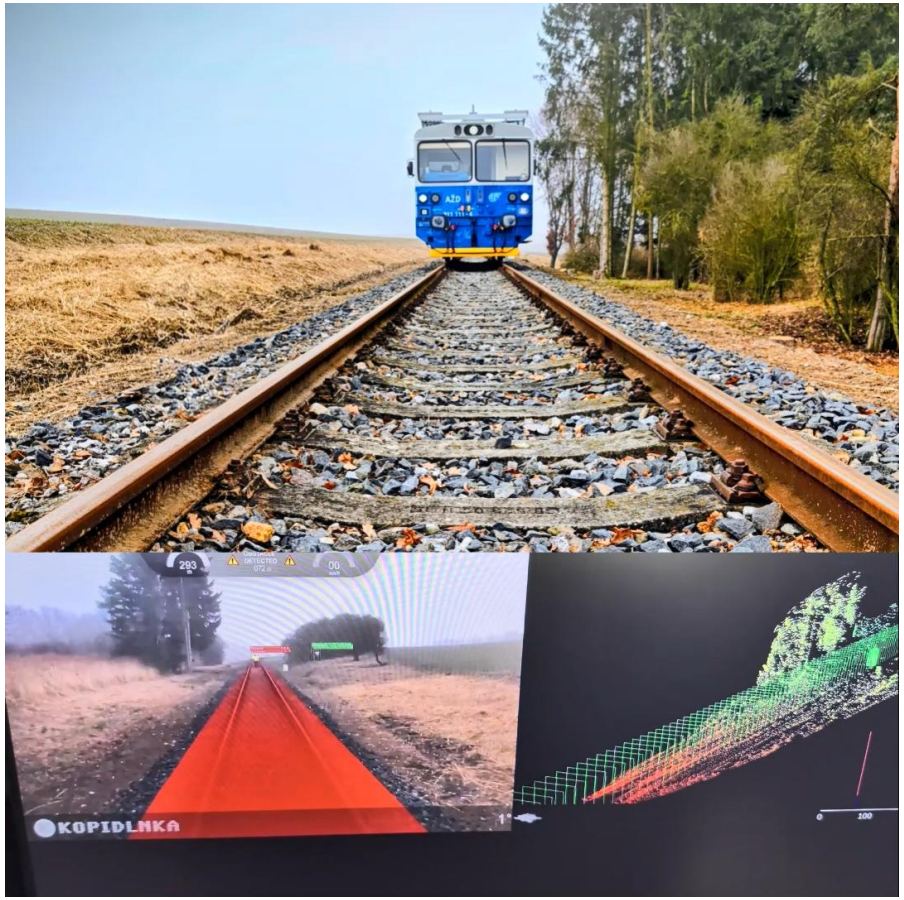
Perception TS: Obstacle detection at Level Crossing

- **3D obstacle detection system** monitors the full danger zone of level crossings
- **Detects obstacles** in under 0,6 sec
- **Automatic introduction of speed limit** to 10 km/h before the LX by new static speed profile (SSP)
- This innovation **enables earlier intervention** - up to 12 seconds faster than traditional systems and supports ATO operations under FS mode



WP46 Regional Line Demonstrator – GoA3/GoA4 Validation

- Trials validated the system architecture and technical specifications through **interoperability** testing of **autonomous train components** from **multiple suppliers**.
- Successful completion of trials conducted by partners: AŽD (lead WP46), Alstom, Indra, Wabtec Faiveley Transport, and Europe's Rail Joint Undertaking.
- See more at **Final Event**



FP2–R2DATO Final Event
Prague + “KOPIDLNKA” line live demo

3rd & 4th of June 2026

<u>The objectives of this event:</u>

- **Communicate and exchange the vision towards automated rail systems**
- **Highlight the maturity and readiness of ATO solutions**
- **Demonstrate the impact and added value**
- **Celebrating FP2-R2DATO Wave 1**