WHAT ARE THE DRIVERLESS TRAIN OPPORTUNITIES FOR RAIL BALTICA?

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Autonomous trains -

not a science fiction anymore, but a reality and necessity

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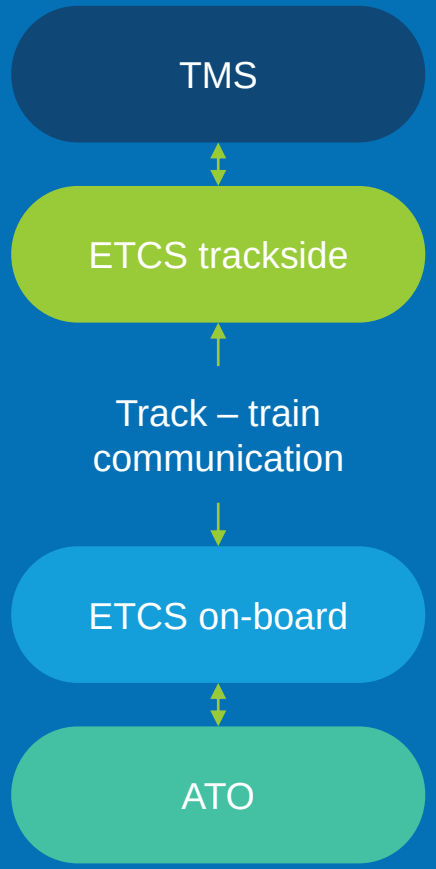
OPPORTUNITIES OF ATO

Overall system concept



Traffic Management System
Coordinates train movements

European Train Control System
radio block center and eurobalises
Provides safe movement authorities

ATS – ATO communications
via ETCS and GSM-R radio

European Train Control System
on-board equipment
Ensure safe train movements

Automatic Train Operation
on-board equipment
Ensure optimum train movements

OPPORTUNITIES OF ATO

	Type of train operation (Grade of Automation)	Setting train in motion	Stopping train	Door closure	Operation in event of Disruption
 Unequipped	ATP with driver (GoA1)	Driver	Driver	Driver	Driver
 STO	ATP, ATO with driver (GoA2)	Automatic	Automatic	Driver	Driver
 DTO	Driverless (GoA3)	Automatic	Automatic	Train attendant	Train attendant
 UTO	UTO (GoA4)	Automatic	Automatic	Automatic	Automatic

ATP – Automatic Train Protection

ATO – Automatic Train Operation

HORIZONTAL DOMAINS

Technology, digitalization and Innovation

Governance, Public Administration, Financial

Networking and partnership capability

What we expect from the outcome of investigation?

Technology scenarios

- **Candidates scenarios definition**, based on rail needs/opportunities assessment, in terms of network, rolling stock, capacity, technology readiness level for on board and wayside, investments plans.

- **Definition of solution implementation, technology level integration among specified ATO solutions:**
– remote control shunting
– driverless for freight
– full driverless in conventional rail

- Analysis of **implemented solutions and technology provider experience** at global level, including **benefit results.**

Risk & Opportunities

- **Consequences** of absence of EU framework Regulatory and safety aspects on railways ATO implementation.

- **Technology issues Analysis of implementation** level **Driverless and Unattended:**
– revealing of obstacles on main line,
– Crisis management and traffic recovery
– Radio communication reliability
– Cybersecurity
– CSS-Control Command and Signalling with onboard systems

Big picture

- **List of Components and capabilities at different ATO levels** for specific application environment (remote shunting, driverless freight, full scale driverless, etc.)

- **Market products comparison and evaluation** and preliminary spotting of best in class solution.

Roadmap to execution

- **ATO transformation plan** roadmap for implementation of ATO solution, depending from adopted context, taking in account project sustainability, in terms funding investments, profitability, technology competition

Alternative solutions investigation

- Investigation on similar investment solution for onboard train control and signaling, and for wayside components (Interlocking, Control Rooms)

What effect could be caused for the whole Rail Baltica?

Make Rail Baltica potential ATO - Experimentation Lab in selected routes for EU

Improve Freight transport system on dedicated lines, from–to sea to inland

Modernization of Railways infrastructure investment projects

Building innovation capabilities in the reagion railways, potentially to be exported to other regions

Improving railway market image as highly innovative mean of transport

Which good foreign country practices in autonomous rail applications may be applied in Rail Baltica?

Remote control of shunting locomotives	Driverless freight trains	Driverless metro	Full scale driverless train on convectional rail

What KPI`s could be used to measure the performance?

New technology has to be measured on performance, user perception and other implementation comparison base.

KPIs for railways trains performance

- Capacity increase (pax/day, ton/day)
- Punctuality (number of delayed train / alltrains)
- Operational cost reduction (workforce and maintenance costs)

Drivers Perception:

- Support on train control
- Safety and Security perception
- Confort Increase
- Driving quality

KPIs for ATO

- Energy consumption reduction
- Capacity (number of trains on same line/day)
- Safety (performance of safety technologies)
- Asset utilization (train km/network mk)

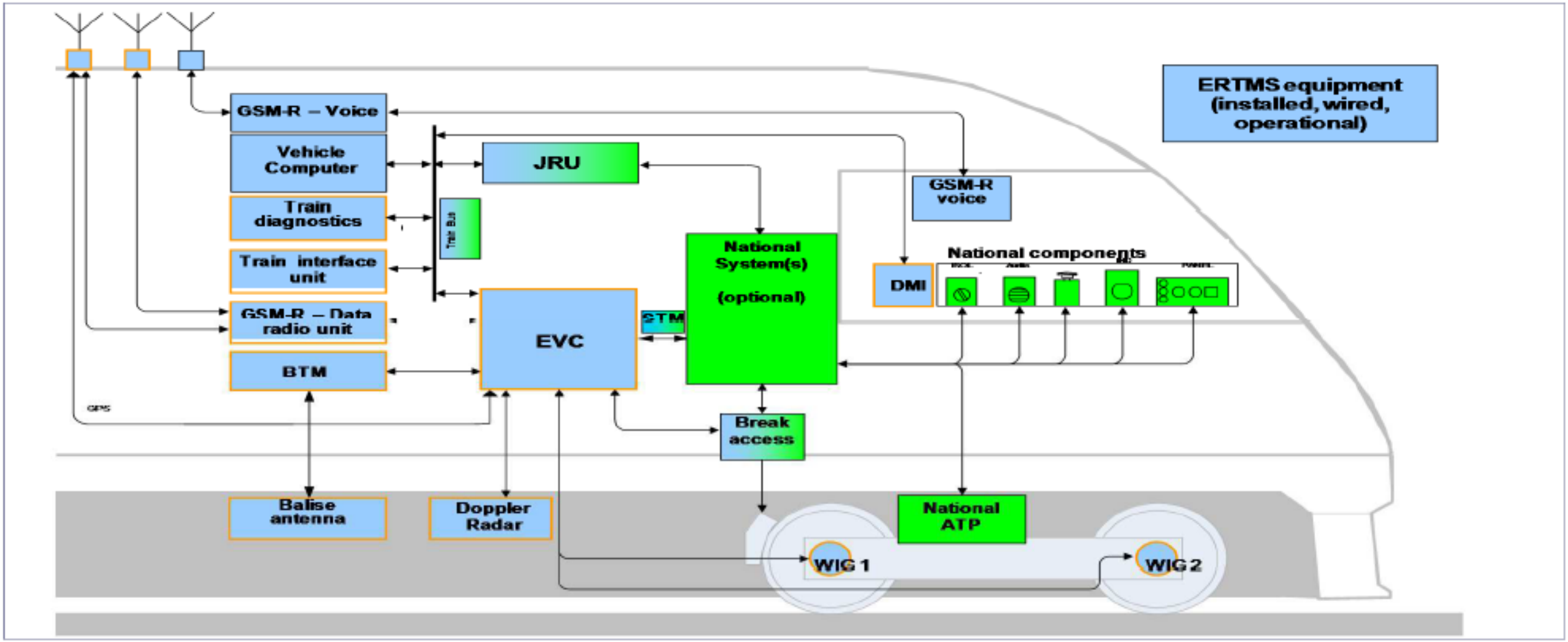
SIEMENS

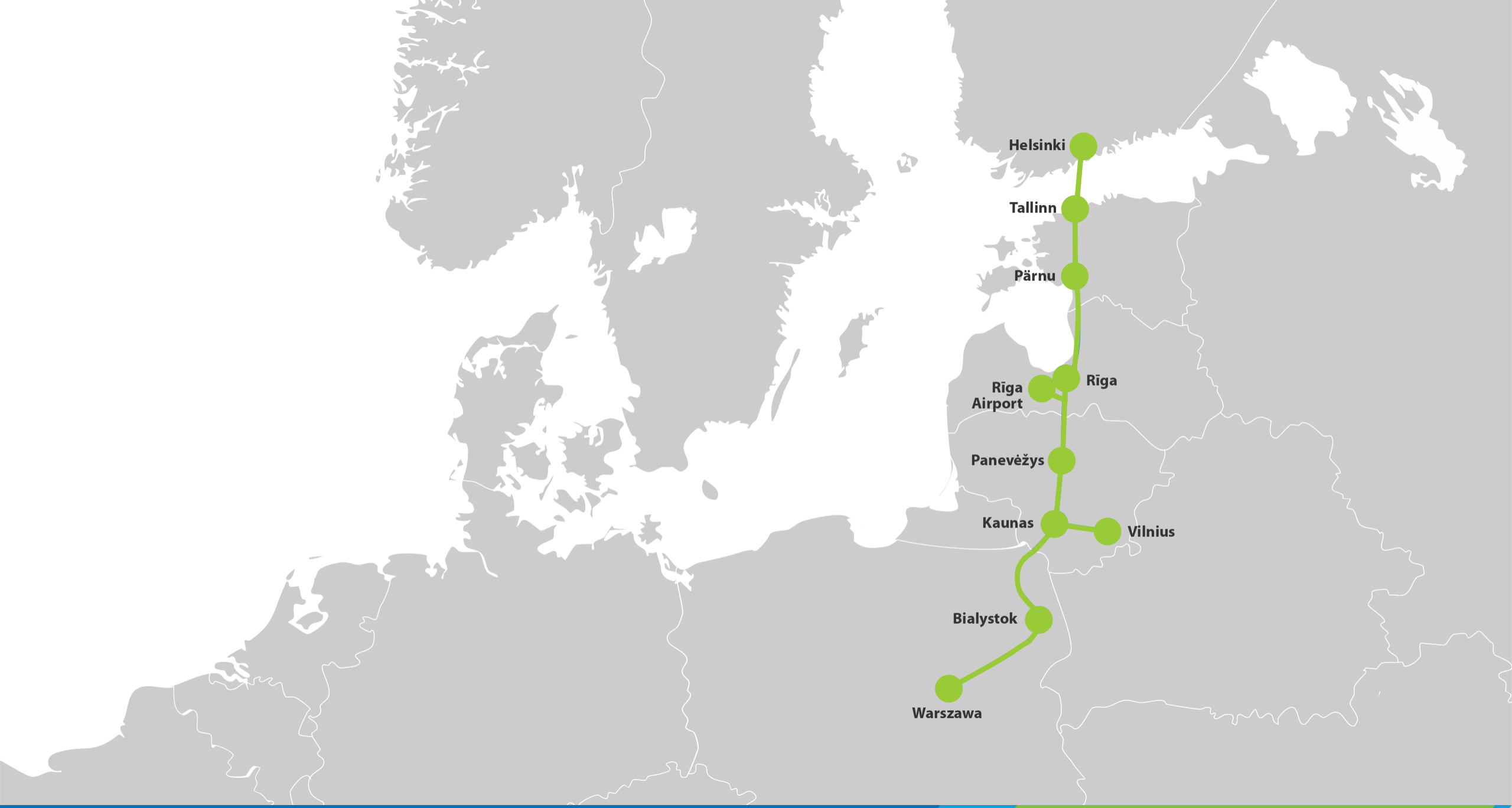
BOMBARDIER
the evolution of mobility

AŽD
PRAHA

THALES

Ansaldo STS
A Hitachi Group Company


ERTMS equipment (installed, wired, operational)
GSM-R – Voice
Vehicle Computer
Train diagnostics
Train interface unit
GSM-R – Data radio unit
BTM
JRU
Train Bus
EVC
STM
National System(s)
(optional)
GSM-R voice
DMI
National components
Break access
Balise antenna
Doppler Radar
National ATP
WIG 1
WIG 2
GPS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Vision 2050: the future of mobility will be exciting