

FOUNDATION FOR THE FUTURE RAILWAY TRAFFIC IS FORMED NOW



VÄYLÄ

WELCOME

17.12.2019 Digirail market discussion

We are here today to share information about study project DIGIRAIL Nothing said today is binding or set decissions We welcome open discussion – nothing binding is excpeted from the audience either

The aim is to talk about the Finnish direction regarding ERTMS and digitisation

AGENDA TODAY

Welcome – Juha Lehtola, Digirail project

Opening address – Maria Rautavirta, Ministry of transport and communication

Keynote – Michel Ruesen, ERTMS Users Group (EUG)

About digirail – Juha Lehtola & Jari Pylvänäinen, Digirail project

Discussion – All

Digitalisation of railways

17.12.2019

Maria Rautavirta, Director of Data Business Unit

MINISTRY OF TRANSPORT AND COMMUNICATIONS

Automation of transport – Central points 17.12.2019

New strategic planning platform for long-term development







Overview of the transport system



Overall picture of the transport system plan's impact assessment

ASSESSED IMPACTS Accessibility and quality of service for travel and transport Accessibility Finland's Internal accessibility Quality of Quality of services accessibility between of urban regions transport services on iournevs and internationally areas and areas and user benefits user benefits \sim Economic sustainability Social and Requirements Impacts economic on public for economic efficiency arowth finances **Ecological sustainability** Use of natural Climate impacts Exposure to traffic-Climate Sustainability Risks to Biodiversitv of transport related emissions, resources, of the urban change waters adaptation material-efficiency noise and vibration and soil system structure 8 Social sustainability Potential **Regional structure and** Living conditions, for mobility prerequisites for the the built environment

and landscapes

Safety of the transport system

development of regions

Safety of Safety of road traffic mobility environm

GISLATION

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Safety of Safety of railroad, mobility maritime, and environments air traffic

oad, Data security of transport

Goals of Digirail project

New Finnish rail traffic management and control system goals are:

- Increasing capacity
- Explore the possibility of ATO
- Improving the reliability and security
- Positive environmental impacts
- Enables use of artificial intelligence in railway sector
- Enables use of real-time data and big data



Technology neutrality

- Next generation railway management must be based on the principle of technology neutrality.
- Regulation should not dictate which method will be used. Both the needs and the technologies of the future should be taken into account in the regulatory framework.
- The choice of technology should be based on an evaluation of how to provide the best services in a cost-efficient manner.



Technology neutrality

 Communication in railways must be able to exploit public communication networks (currently including 4G/LTE networks, hereafter including 5G networks) and satellite navigation.

"In my opinion, the railway sector must avoid a '5G-R' and must convince the international standardisation organisations to consider railway requirements in their future 5G standards."

Christian Chavanel, Director of the Rail System Department at the UIC



Different levels of digitalisations

- Exploiting of innovations and automation is not based on an on/off switch. In railways, different levels of automation and digital solutions must be exploitable in different situations and environments
- In railways different countries have different needs for automation and new technological solution.
- Galileo-satellite system gives widely new opportunities to rail traffic management.

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Regulation sets a goal

- Automation of transport in all sectors, including railways, needs to be supported by internationally agreed approaches and standards. This regulation must be execution and risk based.
- The regulation must enable pioneership and new operating models. There is often a need for deconstructing existing barriers as opposed to creating new regulation.

Digital rail and EU

- EU new commission have launched vision: "<u>Digital rail</u> and Green freight TSI* revision package (2022 revision)".
- "TSI revisions must ensure Regulations are clear and enable to fully meet the essential requirements... TSIs must be complete to deliver a safe and efficient rail system to all EU citizens."
- "The next revision must achieve a flexible, efficient and reliable EU rail system, building on digitalisation and innovations developed under the Shift2Rail programme. It must contribute to making rail more attractive for passengers."
- *TSI- Technical Specifications of Interoperability

Data sharing infrastructure

- The distributed data sharing infrastructure that the railway sector needs must be developed further.
- There is a need to create a digital model of physical railway transport infrastructure in which data are to be updated as dynamically as possible.
- Transport-related static and dynamic data have to be more available for in need of that data.
- Open, interoperable and real time data enabling Alsolutions.



6. Data and digitalisation roadmap

European Union Agency for Railways have started project "Data and Digitalisation Roadmap 2019-2023"

"The Agency will make railways work better for the <u>digital</u> society, by moving towards shared ontologies, linked data and interoperable data systems for all the use cases under its remit."

"Any new information system needs to be user-centric and interoperable by design. All new systems should be designed targeting reusability of the provided services and data."

Closely together and less fragmented

- Major technical breakthroughs must integrate to railway monitoring and controlling (automation, AI, cybersecurity)
- Railway sector must stimulate its own cycle of innovation
- Take advance for modular architecture of the railway system, which based on the principle of the internet network
- To enable this kind of revolution, the railway sector needs to work even more closely together and be less fragmented

Thank you for your attention



Automation of transport – Central points 17.12.2019



ERTMS Deployment in Europe Presentation for Finland

Michel Ruesen Managing Director ERTMS Users Group



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What is ERTMS?

- European Rail Traffic Management System
- Comprising:
 - ETCS: European Train Control System, to prevent trains exceeding speed and location limits
 - Radio communication between trains and trackside installations (for ETCS and voice communication between trains and Traffic Management Control). At present GSM-R, to be superseded by FRMCS
 - ETML: European Traffic Management Layer, to manage the traffic on the railway network (hardly developed yet and not included in TSI CCS).



Baselines and Levels

- At present, two legal baselines:
 - Baseline 2: originally meant for high speed rail applications (e.g. no level crossing functionality). This baseline is frozen, but version 2.3.0d is still allowed to be used
 - Baseline 3: includes the functionality for conventional rail. Also many corrections of baseline 2 errors. Versions 3.4.0 (Maintenance Release 1) and 3.6.0 (Release 2) can be used. New version expected in 2022 (including game changers, e.g. ATO)
- Not to be confused with levels (trackside applications):
 - Level 1: based on information for line side signals. No radio connection
 - Level 2: radio connection between train and track. Trackside train detection
 - Level 3: as level 2, but without trackside train detection.



ERTMS Users Group (EUG)

- Created in 1995 as a European Economic Interest Grouping to demonstrate the concept of ERTMS (pilot lines)
- Mission: To help the railways in applying ERTMS/ETCS in a harmonised and interoperable way, to enable the free flow of trains and a competitive railway
- Added value: Platform for railway peers.



All EUG members deal with substantial ERTMS investments (> € 250 million) in their network;

EUG Members



Also connecting with Railway Undertakings on practical issues



Role and level



- Norway: Strategic decision to roll out Level 2 all over the country. Contracts signed in 2018. Planned to be finalised by 2034. Pilot Level 2 line in operation since 2015
- Sweden: ERTMS Level 2 B2 is running since several years on a few lines and planned to be upgraded to B3R2 during 2020. Pure Level 2 is planned to be rolled out on the complete network finalized 2035
- Denmark: roll out Level 2 all over the country in progress. First line in operation. Planned to be finalised by 2030,

- United Kingdom: national rollout of ETCS commenced in 2011 with Cambrian, followed by Thameslink introducing ATO over ETCS in 2018. Updated national deployment plan due to be released by member state shortly
- The Netherlands: Five ERTMS lines in operation (appr. 300 km double track). Decision about nationwide roll-out of ERTMS L2 only has been taken mid-2019. As a first step, 7 additional lines will be equipped with ERTMS L2 only before 2031,

- Germany: Feasibility study of a combined rollout of ETCS and Digital Interlockings across the entire German rail network has been completed in 2018. German government has taken a decision for the first projects (a.o. Stuttgart) in the period 2020 – 2024
- Belgium: Master Plan ETCS to roll out Level 1 FS, Level 2 FS and Level 1 LS all over the country via different contracts (last signed in 2015 for ETCS2). Planned to be finalised by 2025. Status end 2018 : 24% equipped, mainly in ETCS Level 1 FS. First line in ETCS Level 2 in service since October 2018,

 France: Level 1 equipment on corridor line Longuyon-Basel in progress (planned to be finalised in 2022). Pilot projects for "Level 2 only" on HSL Paris-Lyon (planned to be finalised in 2025) and conventional line Marseille-Vintimiglia (planned to be put in service in 3 steps : 2025, 2027 and 2030). Status end 2019: Six ERTMS double track lines in operation (110 km Level 1 on conventional lines and 1050 km Level 2 on high speed lines),

- Switzerland: whole network either L1 (Limited Supervision) or L2 equipped. Further deployment of L2 connecting to existing L2 lines only when no impact on fleet. Strategic goal is cab signaling for the whole network – deployment depending on future TSI and products
- Spain: Priority in the network corridor, high speed lines and commuter lines of the bigger cities.
- Italy: strategic decision to roll out ERTMS on the entire Italian railway infrastructure (16800 km) by 2035 and equipping 5,000 vehicles. Simultaneous decommissioning of Class B.



Deployment action plan

- Commission staff working document SWD(2017) 375:
 'Delivering an effective and interoperable ERTMS the way ahead'
- Focus on:
 - Interoperable and compliant infrastructure
 - Standardisation of On-Board Unit
 - Efficient Testing and Validation
 - Maintaining ERTMS in a reliable and consistent manner
 - Funding/financing of ERTMS: trackside and on-board
- Discussions take place in ERTMS Stakeholders Platform, chaired by DG-MOVE and EU Agency for Railways (ERA)
- Supported by MoU ERTMS Consortium (EUG, UIC, UNISIG, UNITEL and independent laboratories/INECO) under the umbrella of Shift2Rail.







- Low Life Cycle Costs
- Single modular framework
- Migrate-ability
- Adaptability
- Safe investment





Thank you for your attention

For more information:

www.ertms.be



Co-financed by the European Union

WHAT IS DIGIRAIL?

Creating a common vision

All parties involved

• Commitment to the results

Main objectives

- Enable full potential of digitisation on railways
- Connecting Finland to future ERTMS development
- Replacing the current ATP-system with ETCS

Megatrends and long term planning

• Preparing for the future, not just looking for current situation and quick rewards

WHO MAKE THE DIGIRAIL

Steering group

Responsible for steering and strategic decision making

Representatives from

- Chairing, Ministry of Transport and Communications (LVM)
- Finnish Transport and Communications Agency (Traficom)
- Finnish Transport Infrastructure Agency (FTIA)
- VR Group
- Helsinki Regional Transport Authority (HSL)
- Traffic Management Finland Group (TMFG)

Project group

Close-knit strategic level core group

Representing

- Juha Lehtola
- Jari Pylvänäinen
- Timo Nieminen
- Juha Artukka
- Johanna Wallin
- Esko Sandelin
- Marjo Brotherus

Ensures project quality, realisation of objectives and the comprehensive observation of safety

WHO MAKE THE DIGIRAIL

Project office

Operational management of the project, responsibility for the execution of the overall project according to the jointly prepared project plan.

Responsible for the execution of sub-projects; support functions are channelled through the project office

Operates in Big Room – working together

• Eight sub projects involving more than 30 people

Support functions: Finances, calculations, financing, PMO support, Safety and quality assurance, Communications, Development of competence, HR, Legal advice

Advisory group

Supports the project office, stakeholder cooperation

Comprehensive view of future developments and experience of extensive development projects as well as competence for the most important technological development targets

Why Digirail

Increasing environmental way of transportation

> Enabling new opportunities for developing services

Increasing capacity and cost efficiency

Improving safety

Looking for best possible ways to increase capacity from all point of views Improving reliability

Improving availability

Not just ERTMS

Developing competence on digitisation Feasibility – targets of the study

Need based analyses

Looking for the bottle necks of Finnish railways

- Current situation
- Looks on the future

Readiness for digitisation

Cost efficiency

Being part of the European trends reagrding signalling Searching for the answers to solve the bottle necks

Areal differences

- Capital area
- Core network
- Low density areas

Better services for the end-users

Environmental impacts

SCHEDULE



The survey project will propose a strategy and roll-out plan and that needs a political decision making for the long term implementation



DigiRail benchmark visits, Target in the future

Optimal utilisation of future digitalisation development including ATO



Scenario: Continuing Class B system lifecycle

Own national system, all development locally. No Global support



Scenario: Combination of ETCS L1 +L2

Common view with Spain and Belgium

Limits best development possibilities to certain part of the country.

Radio network needs modernisation anyway to both levels (minimum voice communication).



Scenario: Modern radio based ETCS

Radio based ETCS forms solid foundation for a system development in Finland

Better possibilities for future development and dynamic traffic controlling.

Opportunity to gather new knowhow and develop railway industry together with rest of the Europe.

SCENARIO: MODERN RADIO BASED ETCS

- All major European country specific development scenarios are planned with radio based ETCS systems and future benefits of digitalisation
 - For example RCA concept, where ATO interface is included, suggest to use ETCS L3 system for highest benefits
 - Aim is to reduce costs through standardisation. RCA is still a concept and discussion is theoretical.
- Satellite technology will be available in future for localisation.
- Continuous MA offers better possibilities for dynamic traffic controlling with support of other systems.
- Radio based system allows optimal capacity with proper design.
- ETCS onboard basic system and data radios needs to be equipped to all vehicles.
- Radio network and efficient data transfer is needed to entire country and requires investments, but maybe utilised for other purposes as well.
- Ensuring most efficient updatability of the systems.
- Vision kind of scenario.



Targets in a nutshell

- Capacity
- **ATO**
- Punctuality
- Reliability
- Safety
- Environmental impacts
- Competence
- Modern technology solution
- Optimisation of traffic control
- Technological optimisation
- Optimal investment timing

GAME CHANGERS (TSI)



GAME CHANGERS + ERTMS



ERTMS = ETCS + RADIO NETWORK + OPERATIONAL RULES

RADIO NETWORK





FOR FINLAND'S RAILWAY NETWORK

- Maximum utilisation of investments
- Proactive maintenance, also by digital methods
- Safety in e.g. railway maintenance and level crossings
- Simplifying the infrastructure, less trackside equipment

DigiRail

Foundation for the future railway traffic is formed now

A SOLUTION THAT STANDS THE TEST OF TIME

AI-based optimisation of traffic management

• real-time refining of data

continuously updated capacity and schedule data

dynamic reactions

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FOR PASSENGERS

- Punctual and safe journeys
- More connections and smooth travel chains
- Personalised passenger information

5G

FOR THE ENVIRONMENT

- Reduced CO2 emissions
- Shifting transport volumes to the rails from other modes of transport
- Energy efficiency through capacity optimisation and more economical and energy-saving driving

FOR BUSINESS

- More flexible transport services for industry
- A platform for the growth of new services
- Conditions for more sustainable business

THANKS FOR YOUR ATTENTION

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DIGIRATA

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