Foster Rail – Roadmap "Control Command and Communication"

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Introduction

- The control, command and communication systems are pivotal to increasing the efficiency and safety of transport networks and operations
- High levels of safety are maintained when railways operate under a flexible, real-time intelligent traffic management system
- Secure customer information and communication technology provide seamless transition between transport modes for passengers and ensure the provision of a modern multimodal freight distribution system
- Predictive and adaptable operational control of train movements increases system capacity, conserves energy and reduces life cycle costs



Key issues and objectives linked to the SRRIA

- Increase capacity and reduce energy consumption through real-time intelligent traffic management systems, Automatic Train Operation (ATO), ensure interoperability.
- **Reduce life cycle costs** through cost effective standard design, test, installation and maintenance of signalling and communications need of an open architecture.
- **Dedicate a frequency bandwidth** or at least give the priority to urban railway.
- Keep the current level of safety in the rail networks and improve cybersecurity while increasing networked interconnections.
- Improve customer quality for both passengers and freight companies in the transition between transport modes: **enhance reliability and punctuality.**
- Maintain the **competitiveness** of the European suppliers.

• FP7

State of the Art, including innovation from within and outside rail

Specifications for a **new generation of interlocking systems**

A model of the complete on-board ERTMS system behaviour to eliminate interpretation differences

Research on a novel positioning system based on the combination of different techniques (**GNSS**, **UMTS and GSM-R**)



Research on intelligent rail systems (infra + on-board) to increase capacity and reliability; GNSS (Galileo); ECC/ITS initiatives; cybersecurity

The Roadmap (1/2) Challenges

INCREASE CAPACITY

- Reduce the need for infrastructure-based equipment
- Automatic Train Operation (ATO)
- o Moving block
- o New train localization/integrity

INTEROPERABILITY

• Trains that have on-board databases stored should be able to run autonomously: while the system is safer and less dependable on external physical signals, the cost of infrastructure should also decrease.

SAFETY

• Keep or increase current level of rail safety while increasing interconnections.

RELIABILITY AND PUNCTUALITY

o New radio-based control systems that allow for less signal failures

AFFORDABILITY

o Control command systems modularized: on-line tests minimized to almost zero

• ENERGY EFFICIENCY AND SUSTAINABILITY

• Cost-effective standard design, test, installation and maintenance of signalling infrastructure and on-board equipment

The Roadmap (2/2) Priorities for development

- 1. Real time traffic management capabilities for increased capacity, energy efficiency and sustainability.
- 2. Robust and cost effective standard design, test, installation and maintenance of signalling infrastructures.
- 3. Future generation of train control systems focusing on autonomy, enhanced train location knowledge and its impact in capacity, environmental gains and operational costs



Implementation Plan SHIFT²RAIL IP2 + Horizon 2020

- Develop a fail-safe, multi-sensors train positioning system, boosting the quality of train localization
- Automated advanced traffic management systems combined with Driver Advisory Systems (DAS) and automation functionality to allow for predictive and dynamic traffic management
- Moving blocks and train integrity
- Smart commissioning and testing
- Virtual coupling
- Cybersecurity
- Application of GNSS in ERTMS

Council

Visual Roadmap, milestones and deliverables overview (1/2)

	2015 2020	2030 2040	2050							
	Shift2Rail IP2 (Advanced Traffic Management & Control Systems) + H2020									
CAPACITY	new intelligent management systems	traffic management: Introduction of new intelligent management systems le of optimizing the use of the existing infrastructure	ints							
	Automatic Train Operation (ATO)	Automatic Train Operation (ATO) A new generation of ATO will increase capacity and minimise energy consumption								
	Develop and validate a high capacity, low cost, highly reliable signalling system based on moving block principles	Develop and validate a high capacity, low cost, highly reliable signalling system based on moving block principles for high density passenger services								
	New train localization/integrity: satellite-based rail positioning: GNSS	New train localization/integrity: satellite-based rail positioning: GNSS New train localization/integrity: satellite-based rail positioning: GNSS Increasing of capacity and efficiency for all rail users								
	Virtual coupling	Virtual coupling Virtual coupling Explore the concept of virtual coupling/uncoupling in order to maximise the flexibility of train operations								
RELIABILITY AND PUNCTUALITY	New radio-based control systems that allow for less signal failures	New radio-based control systems that allow for less signal failures								
INTEROPERABILITY	Trains that have on-board databases Trains that have on-board databases stored should be able to run autonomously run autonomously	pe able to 📢 While the system is safer and less dependable on external physical signals, the cost of infrastructure should also decrease								
			8							

Visual Roadmap, milestones and deliverables overview (2/2)

	2015	20	20				2	2030						20	40					2050
SAFETY	Keep or increase current level of rail safety while increasing interconnections While the system is safer and less dependable on external physical signals, the cost of infrastructure should also decrease																			
	Achieve a GSMR improvement for safety relevant communication links Achieve a GSMR improvement for safety relevant communication links Achieve a GSMR improvement for safety relevant communication links Achieve a GSMR improvement for safety relevant communication links																			
ENERGY EFFICIENCY AND SUSTAINABILITY	installation signalling	Cost-effective standard design, test, installation and maintenance of signalling infrastructure and on-board equipment Cost-effective standard design, test, installation and maintenance of signalling infrastructure and on-board equipment Need to have an open architecture to reduce energy consumption cost-effective design Image: Cost-effective design																		
AFFORDABILITY	Control command systems modularized: on-line tests mi to almost zero				minimized Control command systems modulari minimized to almost ze				ine tests		Each module also has a well-specific supplier independent systems can be desig					gned. This would open up the market,				
CYBERSECURITY	Achieve the optimal level of cybersecurity against any significant threat for the signalling and telecommunications systems				Ensure cyberecurity in central traffic control systems and automation systems										9					



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