[Optimal Networks for Train Integration Management across Europe]

Collaborative Project

7th Framework Programme

Dissemination ON-TIME project results for Sweden, 2014-09-25.

Mr Magnus Wahlborg, Trafikverket

Dr Mrs Meena Dasigi, NetworkRail

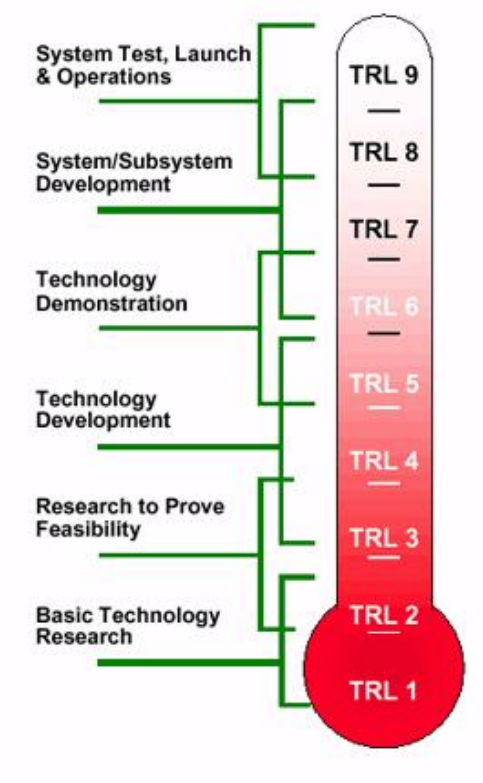
ONTIME Overview

Agenda

- ON-TIME Overview (9.30)
- Timetable planning
- Operations minor perturbations – decision support traffic control
- Decision support train drivers
- Lunch (12.30 – 13.30)
- Implementation into practice
- Operations handling major perturbations
- Demonstration and simulators
- EU research (16.50)

Purpose

- Dissemination of project results ⇔ Swedish research (KAJT) ⇔ Implementation into practice
- State-of-the-art
- Processes
  - Improve work Trafikverket
  - Improve work in Sweden Railways
- Improve methods and knowledge
- Innovations and products



Technical Work Packages

WP1 - User and technical requirement elicitation and validation (Network Rail)

WP2 - Examination of existing approaches and specification of innovations (Trafikverket)

WP3 - Development of robust and resilient timetables (Delft)

WP4 - Methods for real-time traffic management (Dresden)

WP5 - Operation management of large scale disruptions (IFFSTAR)

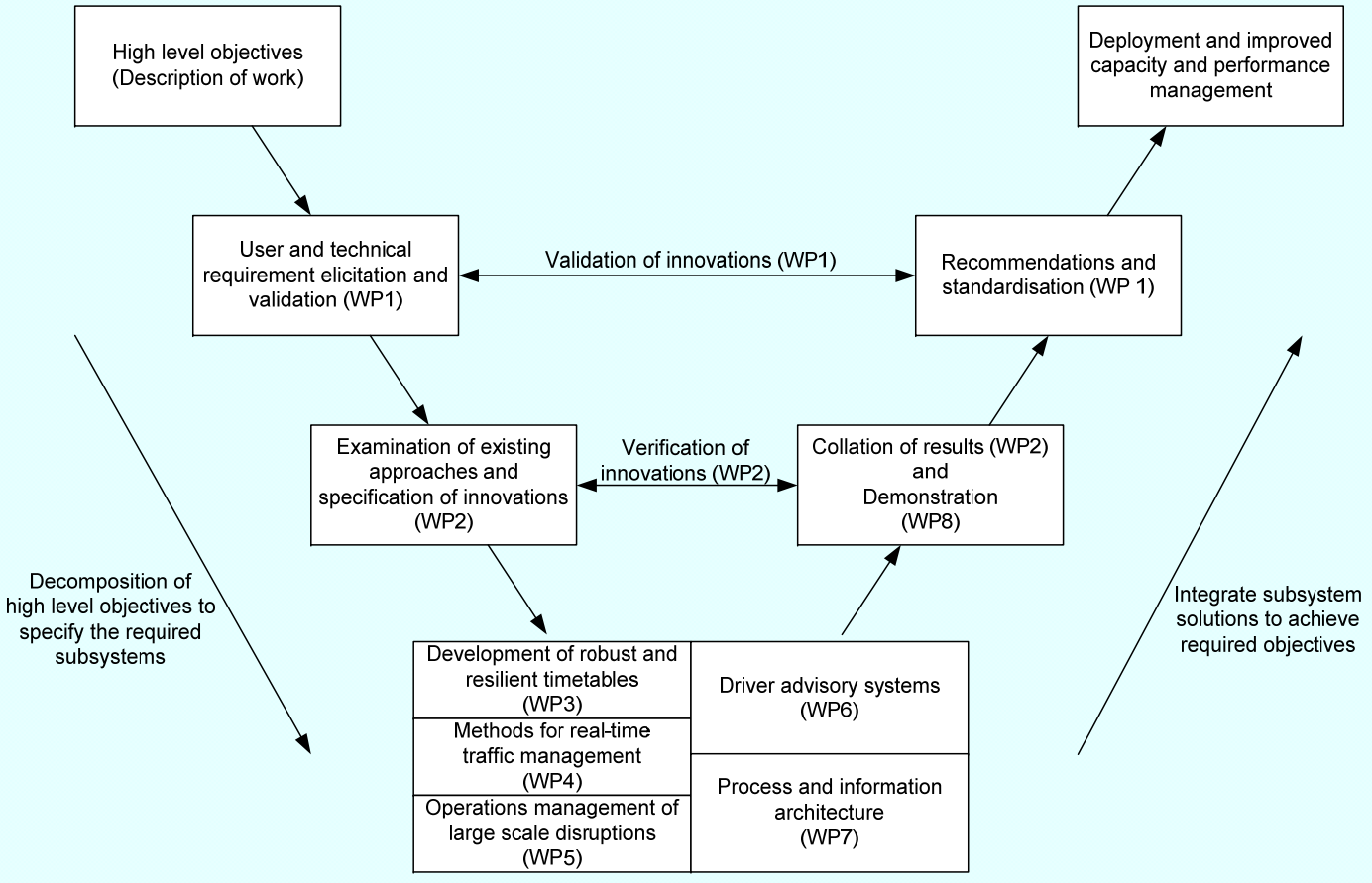
WP6 - Driver advisory systems (DB)

WP7 - Process and information architecture (NTT Data)

WP8 – Demonstration (Ansaldo)

WP9 – Dissemination (Birmingham)

The Project Organisation



Project Overview

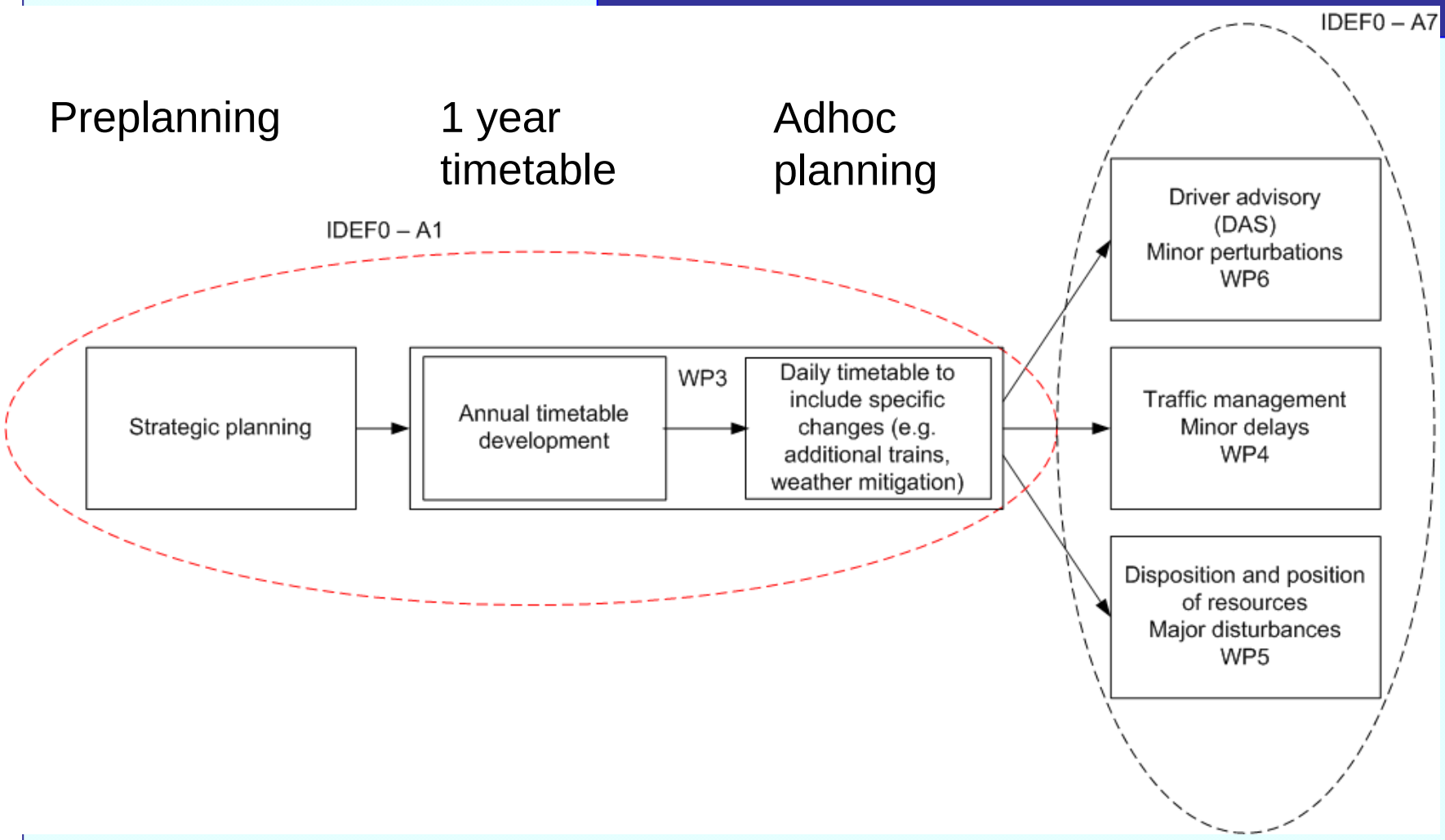
- The high level aim is to improve ‘capacity’ on European railway networks
- Project team has developed six innovations:
  1. Standardised definitions, methods and processes to create interoperable processes
  2. Improved methods for timetable construction
  3. Real time traffic algorithms
  4. Improved decision support – handling major perturbations
  5. Centrally guided train operation
  6. Standardised ICT architecture supporting interoperable operational data between industry stakeholder

Planning – Operational process

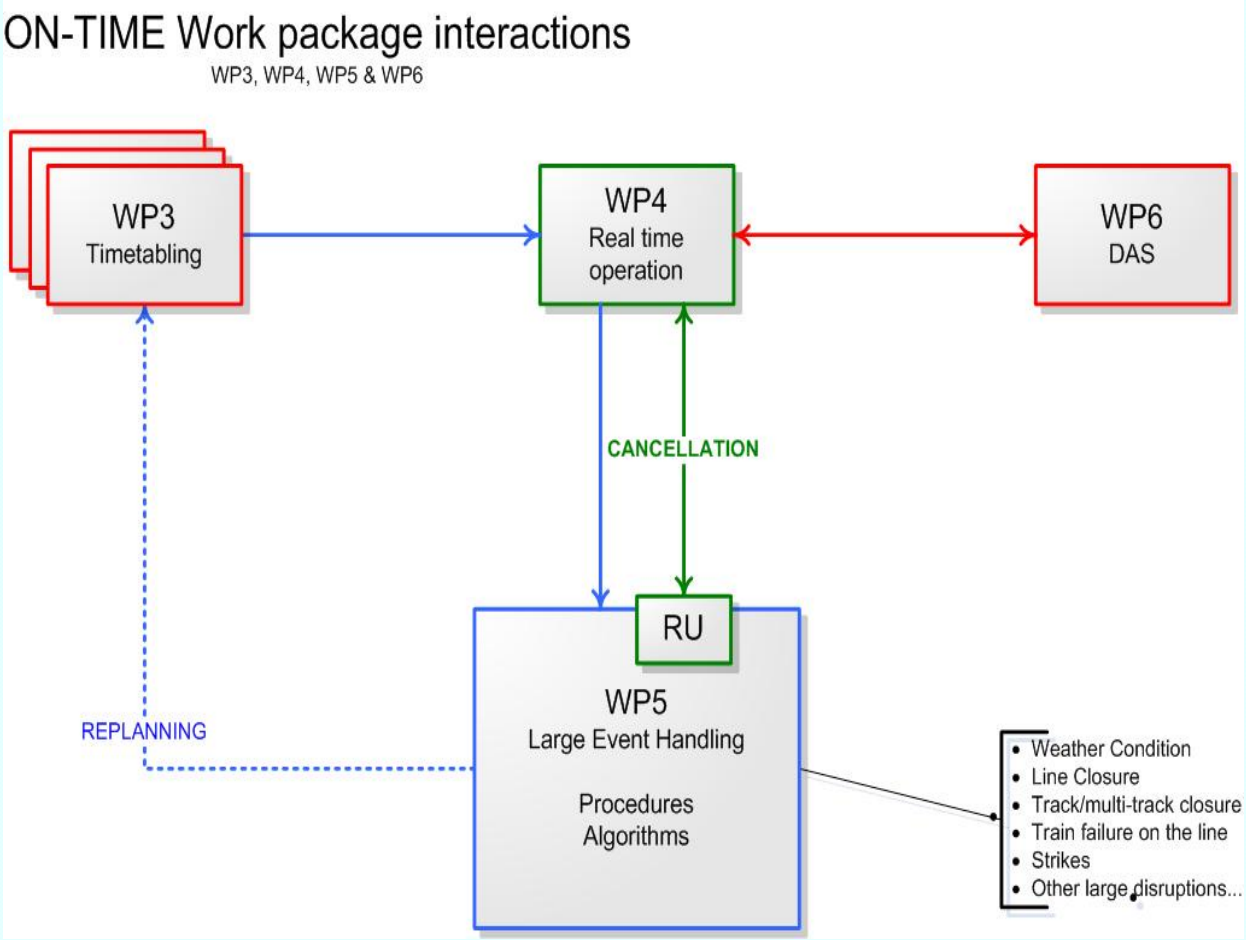
Preplanning

1 year timetable

Adhoc planning



Smaller perturbations – large disturbances



Processes and TRL

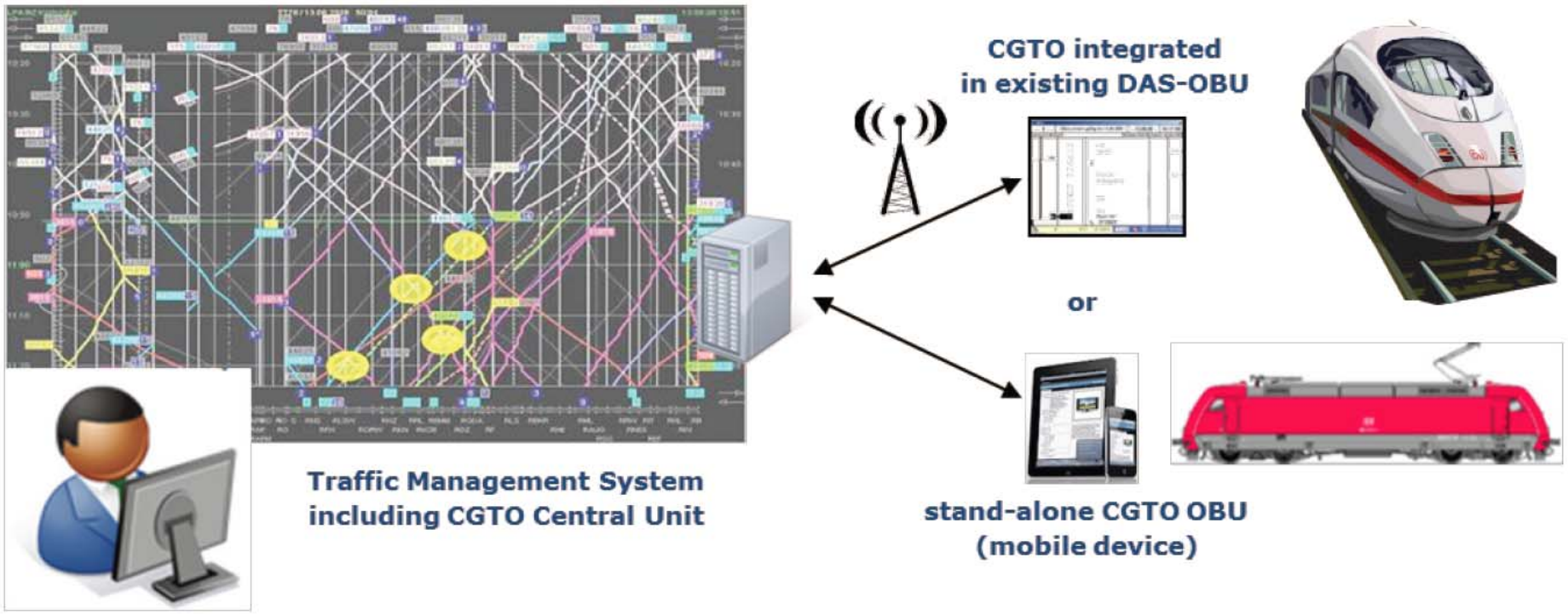
1. Functional process description 6 countries

   Sweden, United Kingdom, Germany, Italy,

   Netherlands and France

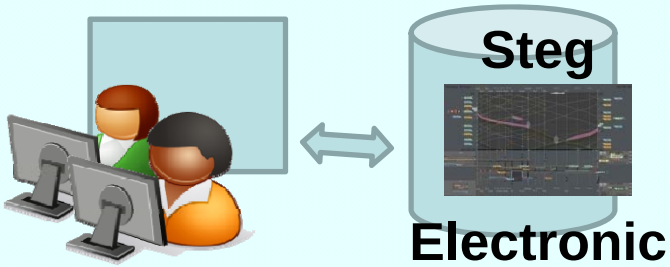
2. State-of-the art WP 3 – wp 6, 6 innovations
   1. Timetable planning TRL3
   2. Traffic control minor perturbations TRL 3
   3. Operational management larger disturbances TRL 3
   4. Driving advisory systems TRL 5

Centrally Guided Train Operation (CGTO)



Uppsala University

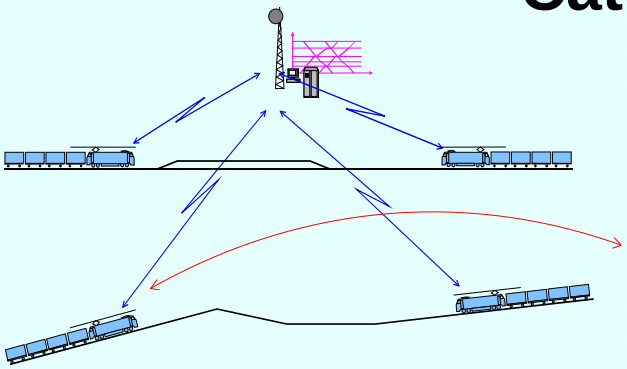
- Research in traffic control 1995 – 2010
- Steg concept



Iron Ore line

- Steg, Controlcenter Boden
- Transrail
  - Cato system
  - Das

Cato

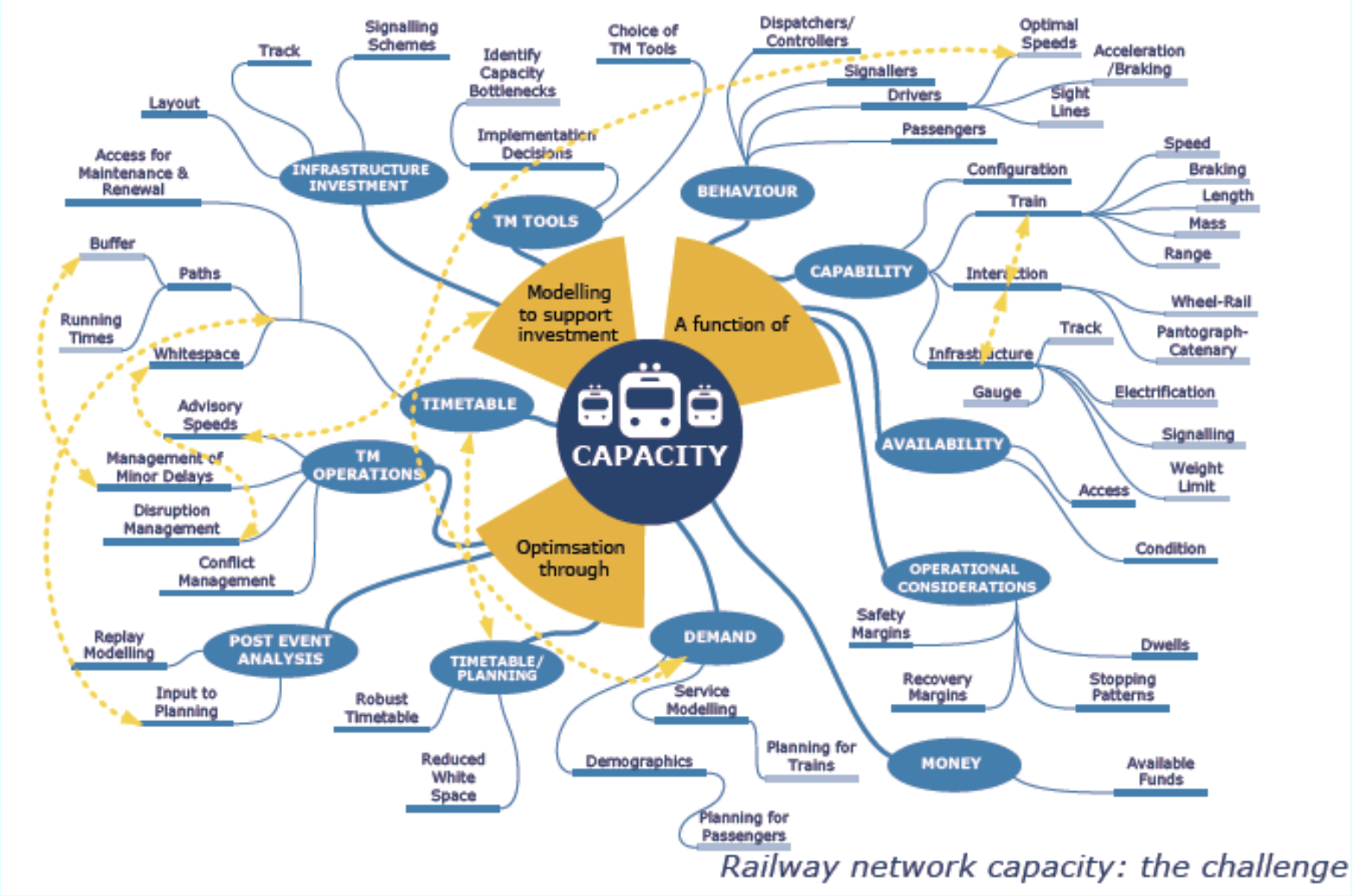


High Level Aims and Objectives

The aim of the project is to achieve a step-change in railway capacity by reducing delays and improving traffic fluidity. This has been achieved through a partnership between railway industry experts, system integrators, small dynamic knowledge led companies and academic researchers.

The project will draw on previous research projects and national trials. Previous relevant academic research has, in general, been based on algorithm development. To apply the results of such research needs an understanding of the practical operating principles and the nature of delay initiation and propagation.

The Challenge!



Railway network capacity: the challenge

Project Overview

Project team has developed six innovations:

1. **<u>Standardised definitions, methods and processes to create interoperable processes</u>**
2. Improved methods for timetable construction
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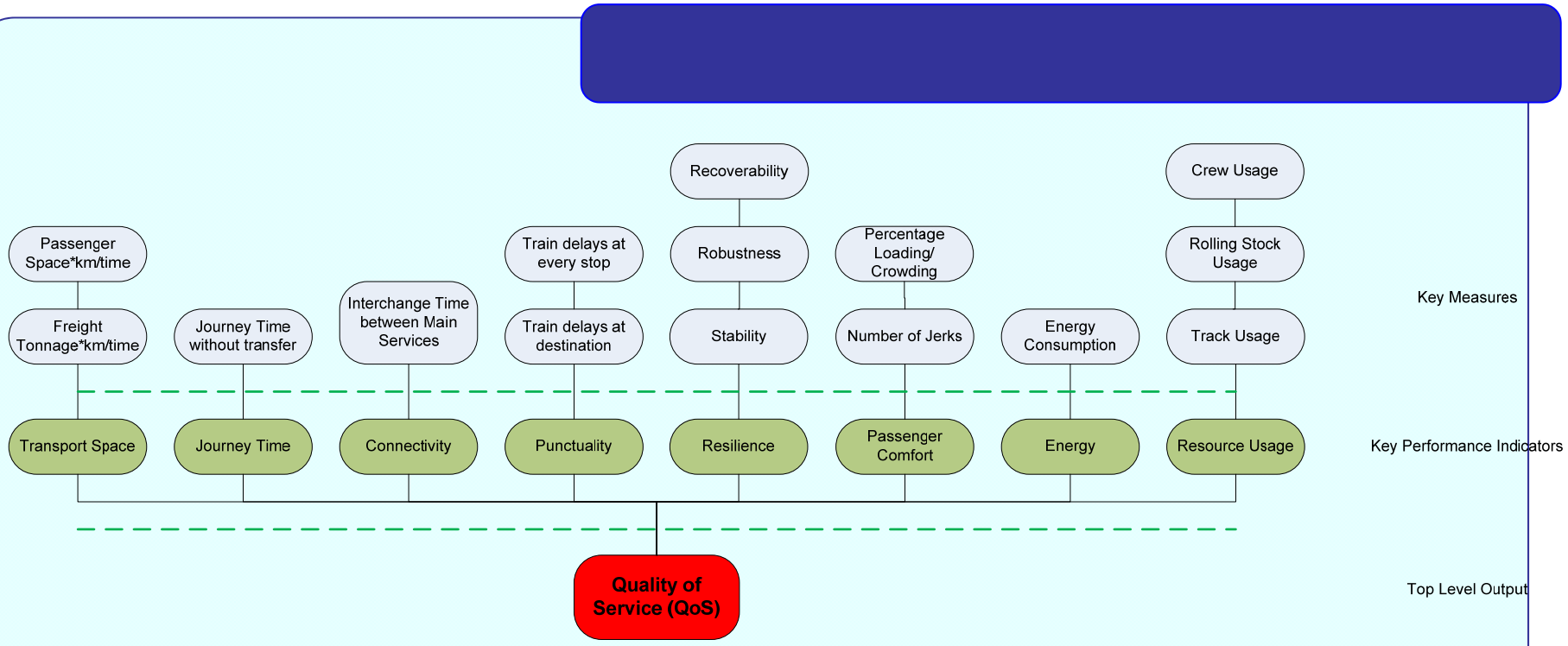
4. Improved decision support – handling major perturbations
5. Centrally guided train operation
6. Standardised ICT architecture supporting interoperable operational data between industry stakeholder

…. and four demonstrations



	TS	JT	Con	Pun	Res	PC	En	RU
Timetabling	✓	✓	✓		✓		✓	✓
Minor perturbation				✓			✓	
Major perturbation	✓	✓	✓	✓	✓			✓
Driver advisor				✓		✓	✓	

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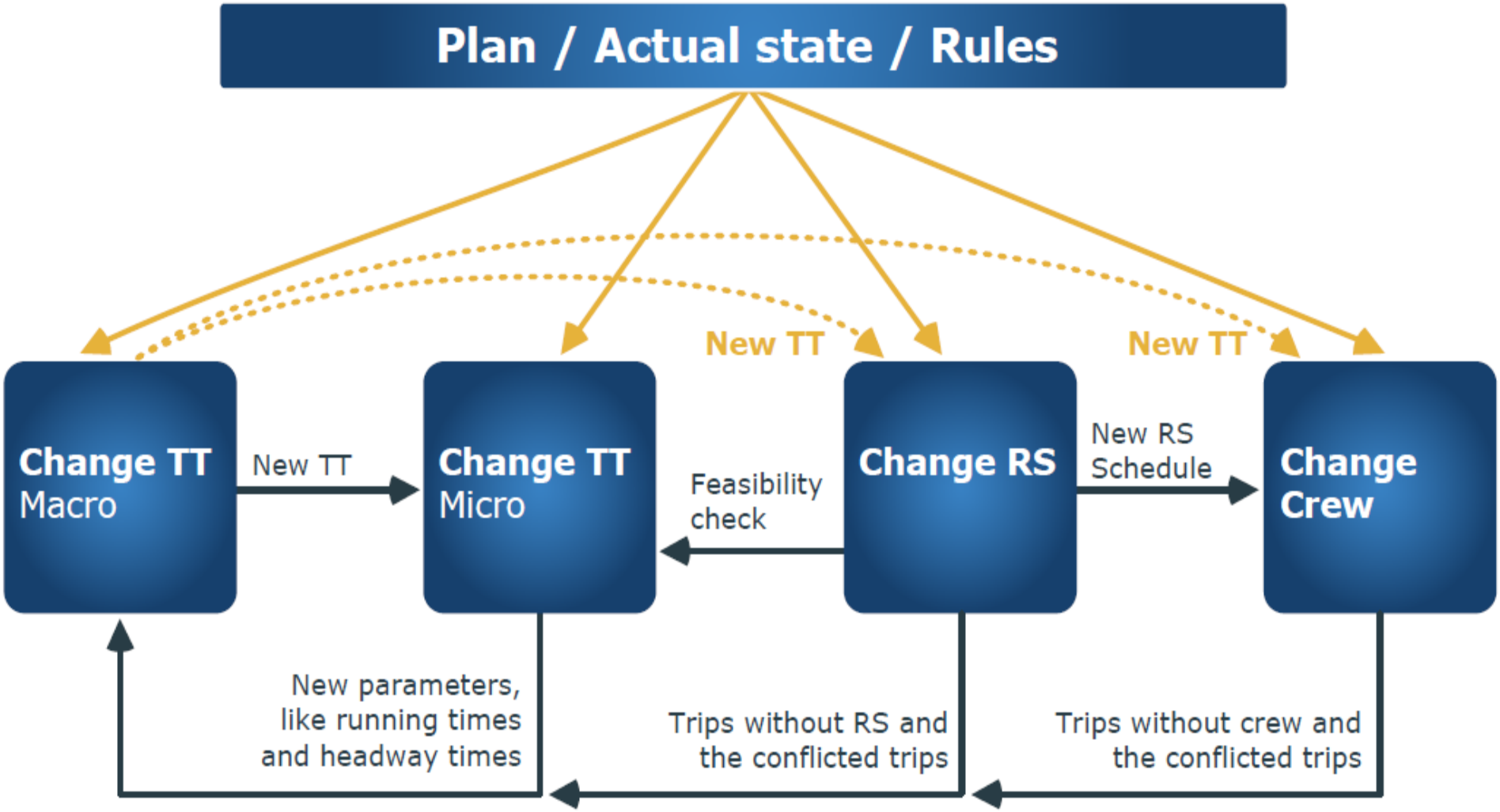
Plan / Actual state / Rules
New TT
New TT
Change TT Macro
New TT
Change TT Micro
Feasibility check
Change RS
New RS Schedule
Change Crew
New parameters, like running times and headway times
Trips without RS and the conflicted trips
Trips without crew and the conflicted trips

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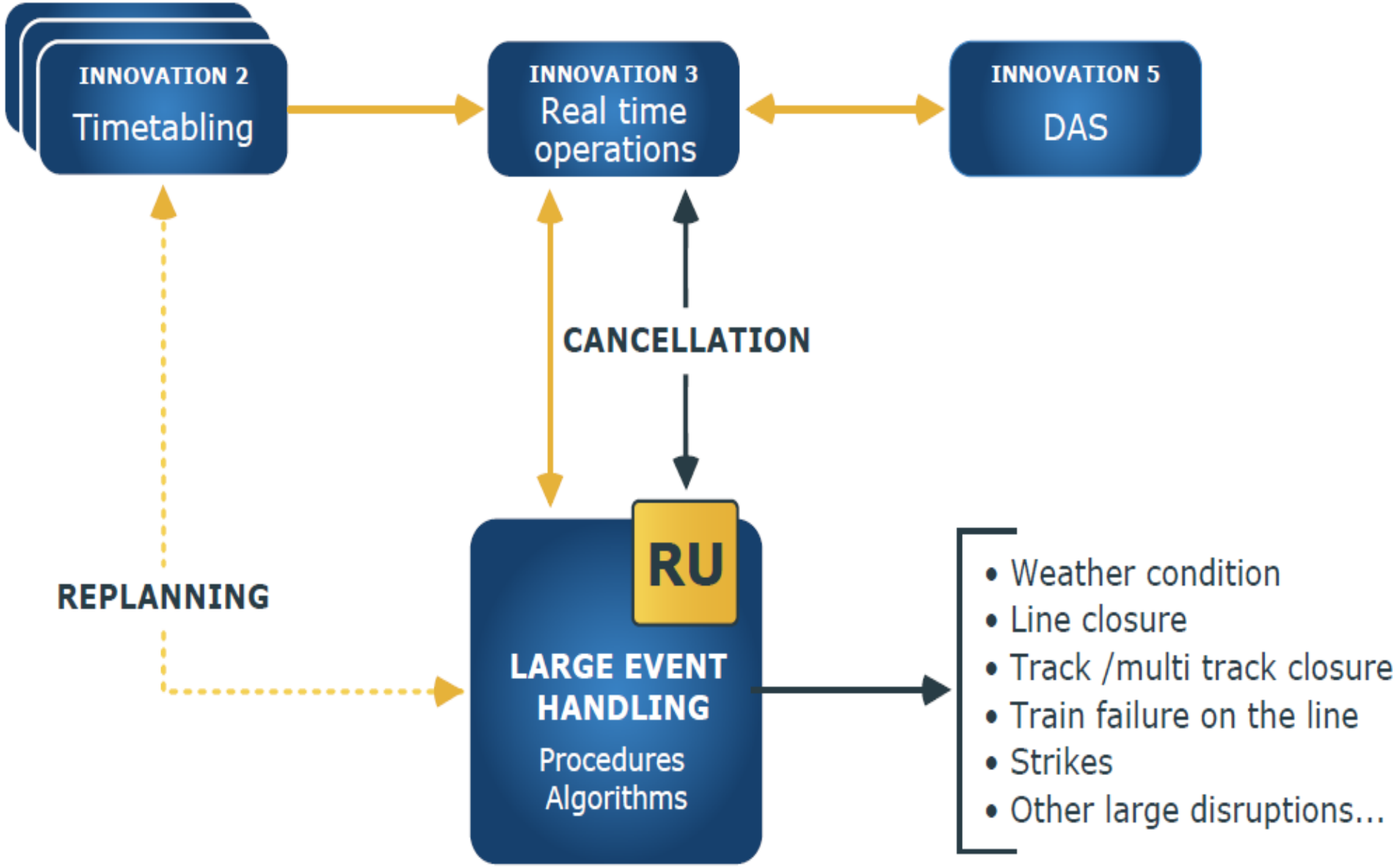
INNOVATION 2
Timetabling
INNOVATION 3
Real time operations
INNOVATION 5
DAS
CANCELLATION
REPLANNING
RU
LARGE EVENT HANDLING
Procedures
Algorithms
• Weather condition
• Line closure
• Track /multi track closure
• Train failure on the line
• Strikes
• Other large disruptions…

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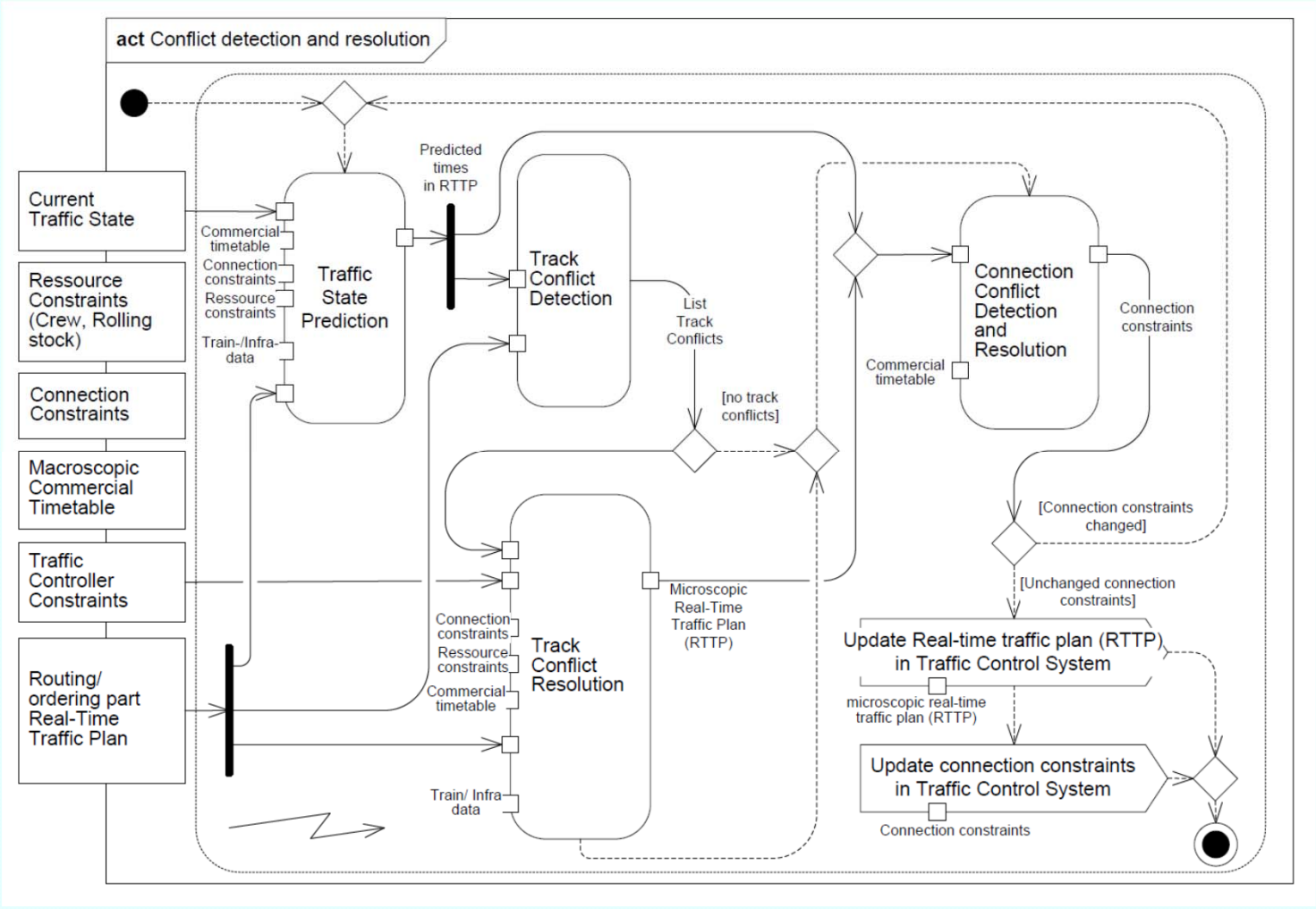
Handling Major Perturbations



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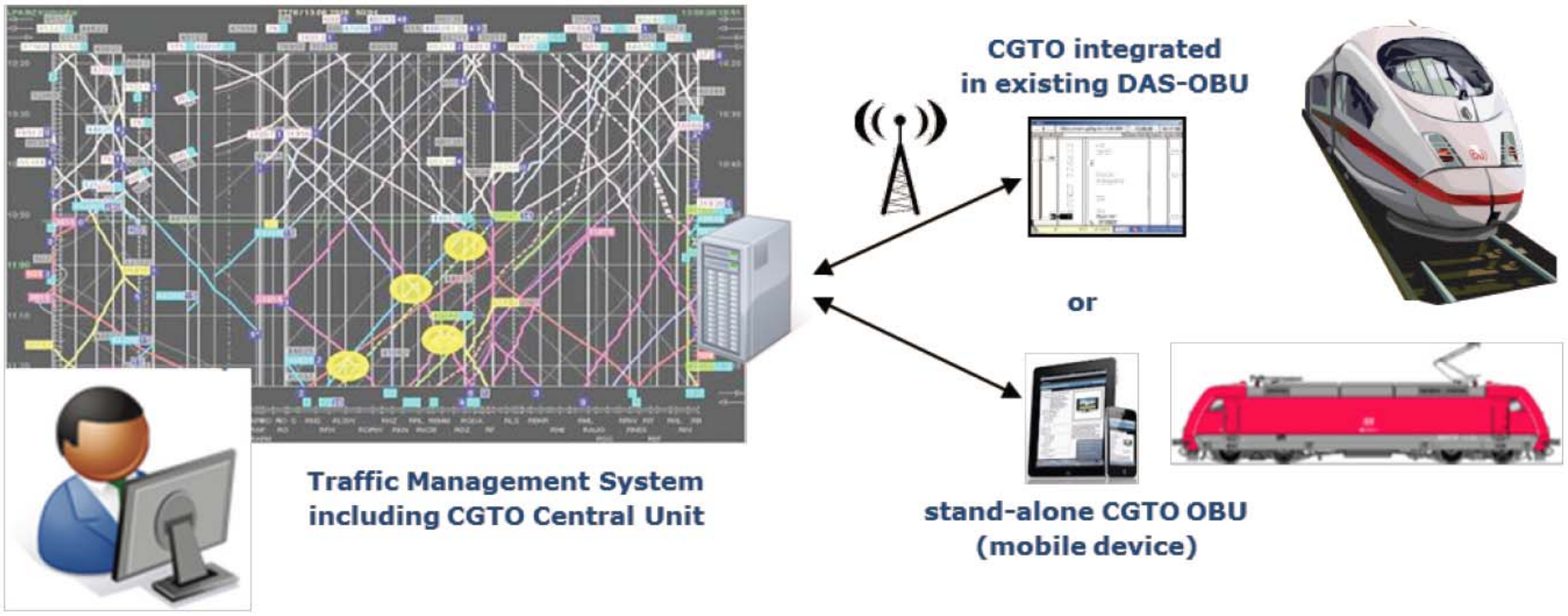
DAS Architecture alternatives

Alternative	DAS-C	DAS-I	DAS-O
Trajectory computation	Centrally	Centrally	Centrally
Advice generation	Centrally	On-board	On-board
Communication availability	Highest	Medium	Lowest
Messages	Small and frequent	Medium size and number	Large but few

Centrally Guided Train Operation (CGTO)



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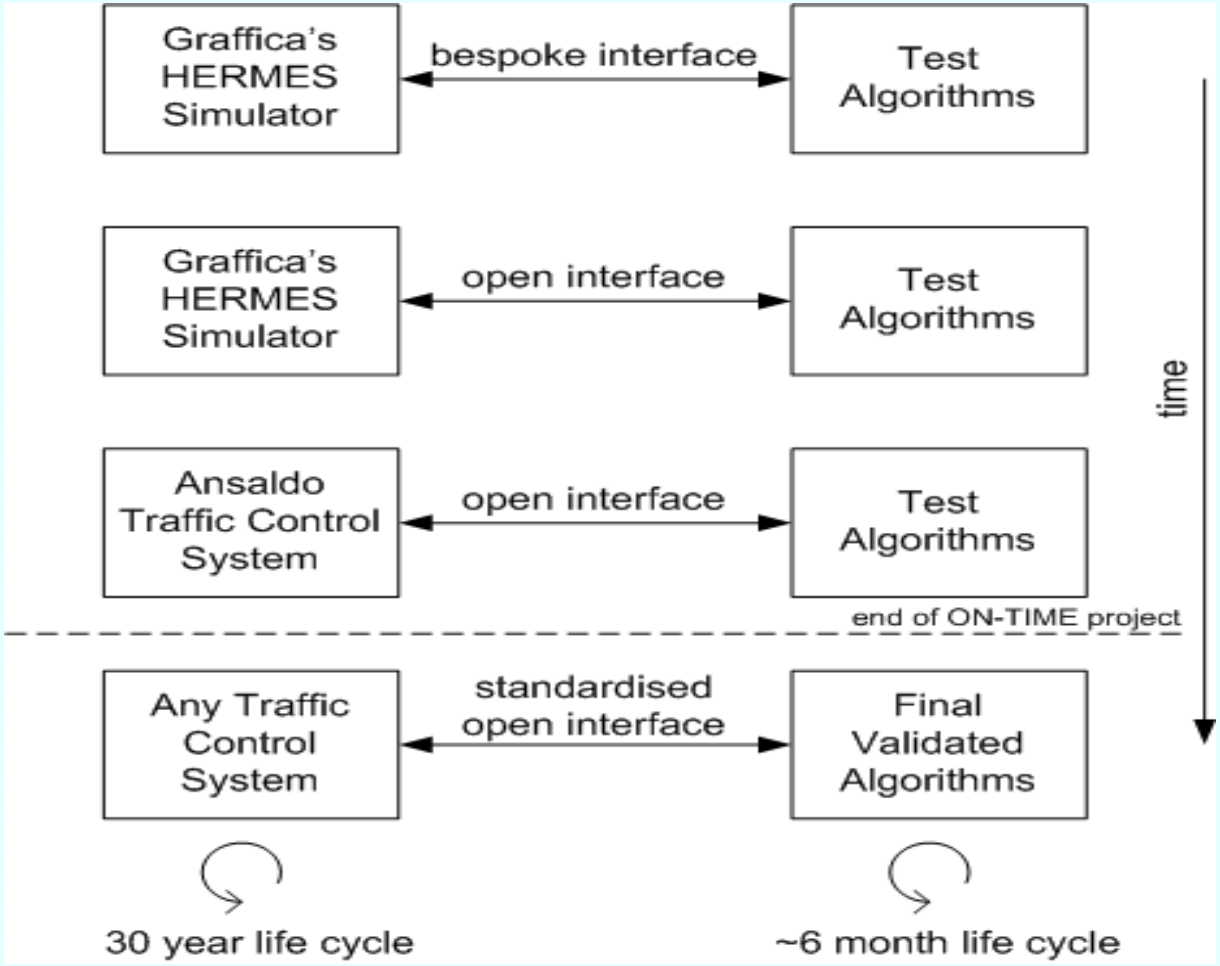
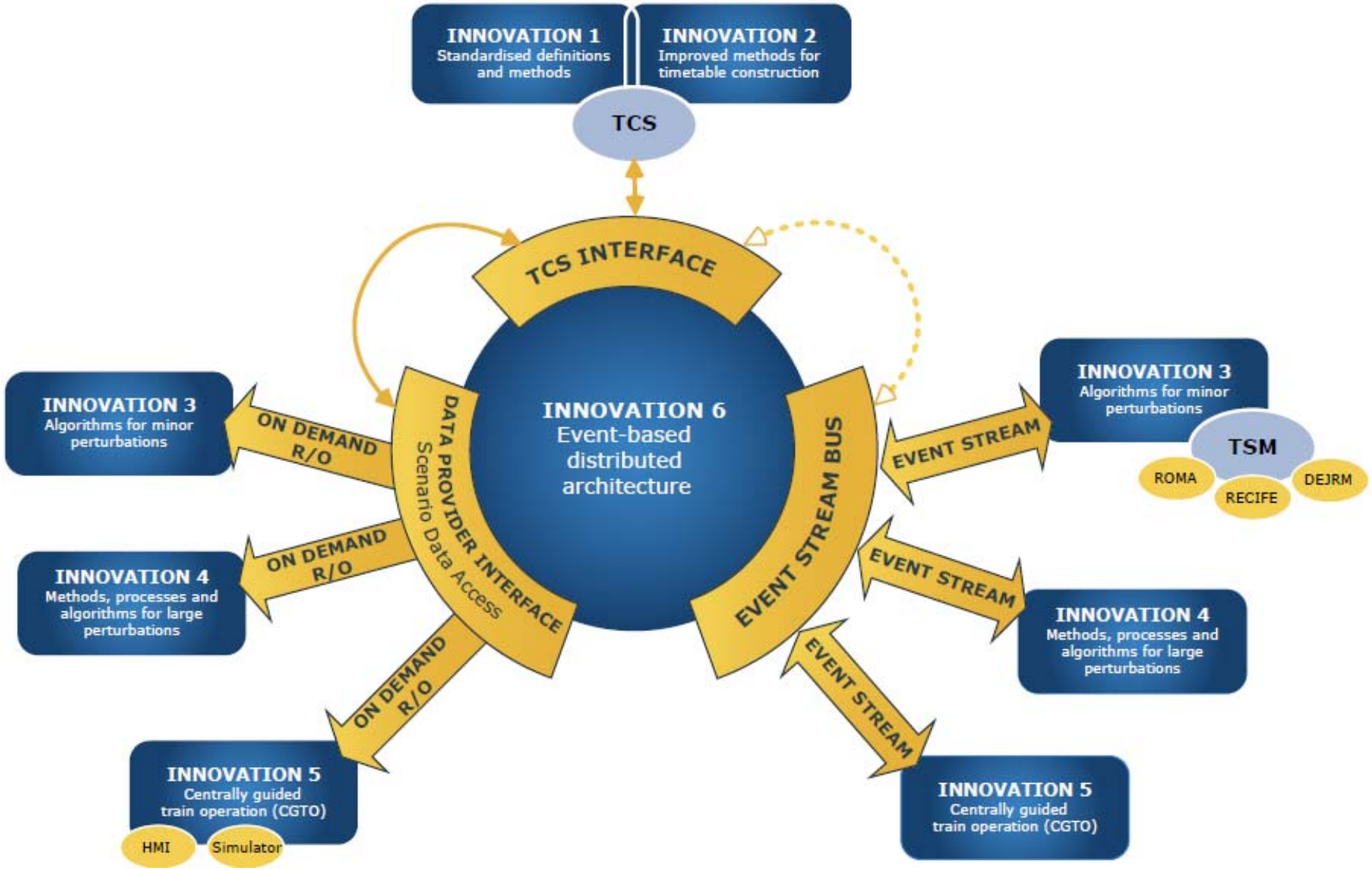
Standardised ICT architecture




INNOVATION 1
Standardised definitions and methods
INNOVATION 2
Improved methods for timetable construction
TCS
TCS INTERFACE
INNOVATION 6
Event-based distributed architecture
DATA PROVIDER INTERFACE
Scenario Data Access
EVENT STREAM BUS
ON DEMAND R/O
ON DEMAND R/O
ON DEMAND R/O
EVENT STREAM
EVENT STREAM
EVENT STREAM
INNOVATION 3
Algorithms for minor perturbations
INNOVATION 4
Methods, processes and algorithms for large perturbations
INNOVATION 5
Centrally guided train operation (CGTO)
HMI
Simulator
INNOVATION 3
Algorithms for minor perturbations
TSM
ROMA
RECIFE
DEJRM
INNOVATION 4
Methods, processes and algorithms for large perturbations
INNOVATION 5
Centrally guided train operation (CGTO)

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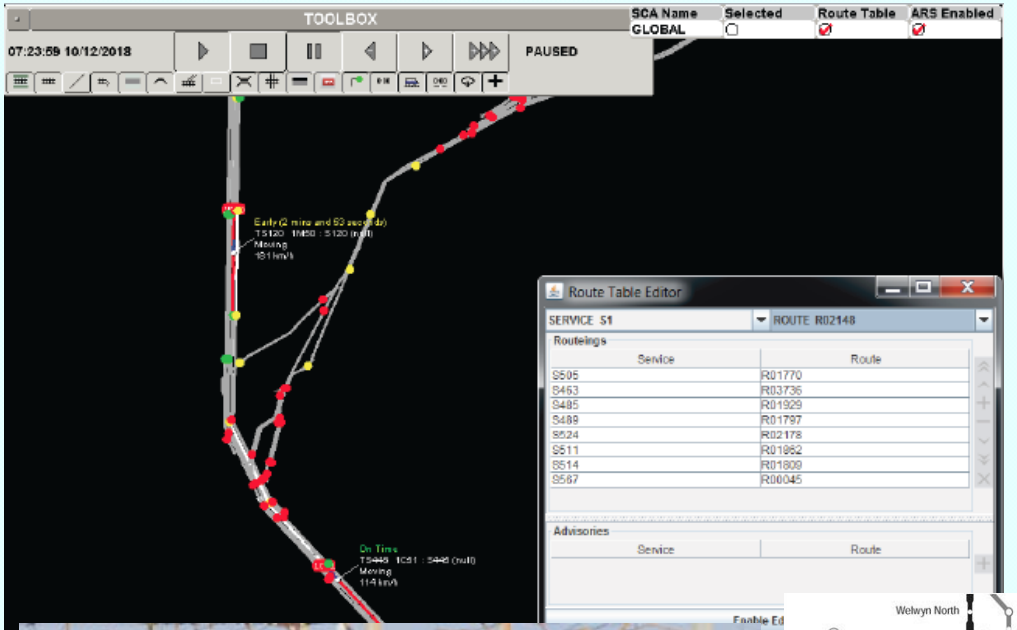
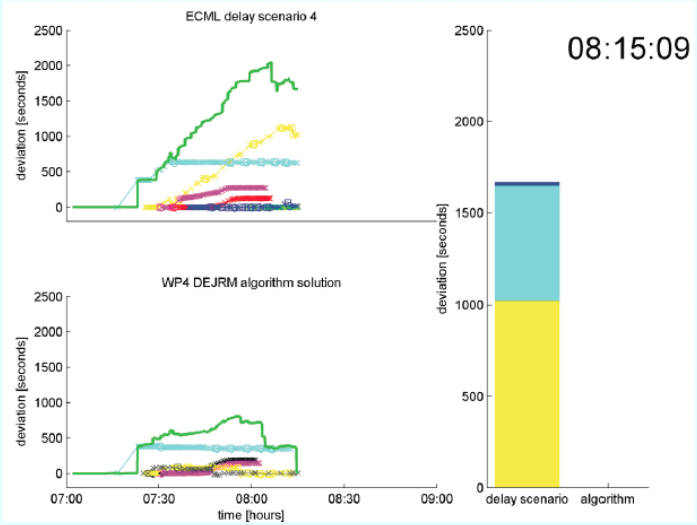
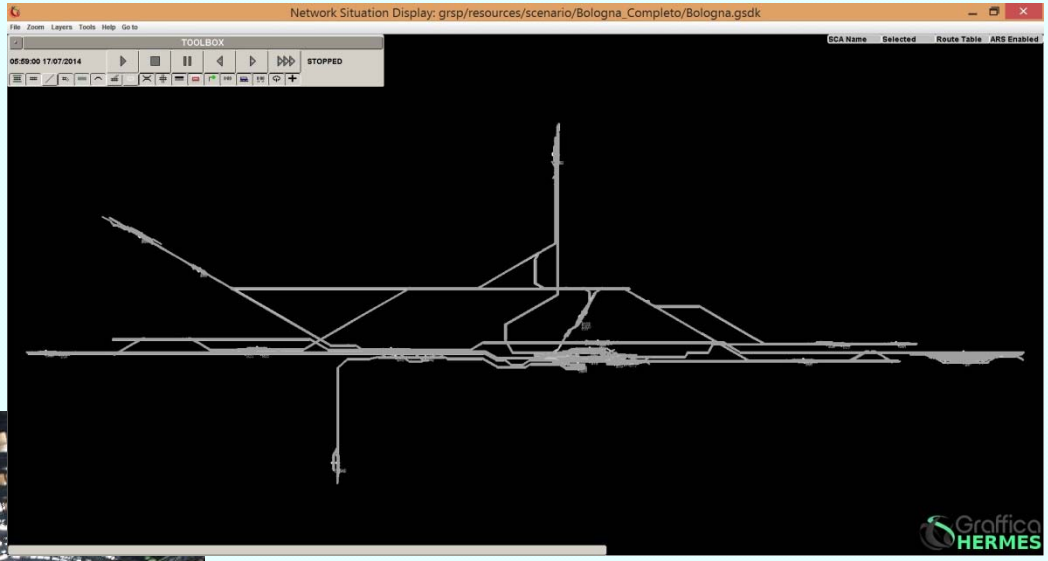
ECML Demonstration



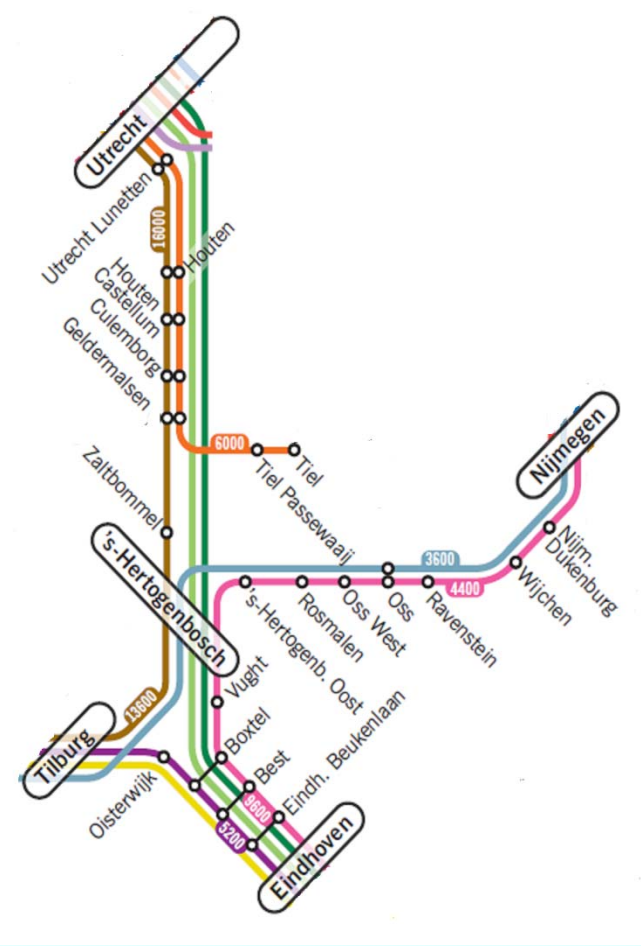


Iron Ore Demonstration

Bologna Demonstration



Utrecht Demonstration



Conclusions

- The ON-TIME project has made the first steps intergrating Traffic Control System, Conflict Detection Resolution and Driver Advisory Systems
- Standardised interfaces will lead to broader application of new technology
- Demonstrators in four countries have shown the potential of the developed technology
- Information is available on the website of the project

www.ontime-project.eu