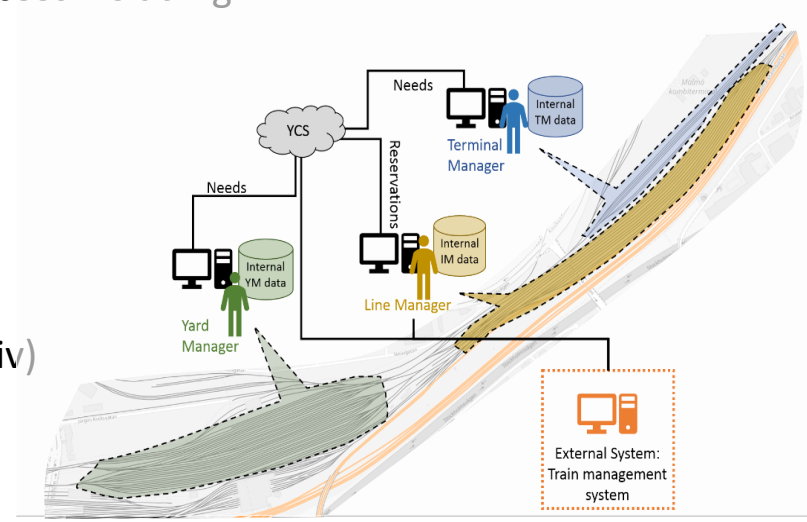
Målgång Shift2Rail och uppstart EuropeRail – KAJT, flaggskepp och Excellensområden

KAJT höstseminarium via skype 2021-11-23

Magnus Wahlborg Trafikverket

Resultat 2021 – KAJT Europé Rail

- Shift2Rail pågår till 2022 08 – KAJT är aktiva i 2 st pågående projekt, FR8Rail III och X2Rail 4
- The yard management system that is developed is now introduced to the workers and the planning and education for a live simulation test with the three main actors at Malmö yard that will take place in the beginning of 2022 has started.
- A model for ETD (Estimate Time for Departure) in Malmö has been constructed and will be tested next year. This model will be connected to the model made in the PlASA project in 2022.
- Basic maintenance and the newly introduced concept of maintenance windows has been studied in Sweden.
  - Maintenance windows are pre-allocated slots in the annual train timetable dedicated to performing, among others, periodic/frequent maintenance activities such as inspections, maintenance and repairs.
  - Using a cost-benefit approach, the maintenance windows are assessed using a total social cost including maintenance work costs, loss in traffic production and reliability gains in future traffic.
- Utveckling av kapacitetsmodeller, metoder och beslutsstöd
  - YCS, Indra och RISE
  - M2 – Timo, Rise och Linköping U
  - Plasa, KTH
- X2Rail4 deltar I utformning av framtidens trafikledningssystem (TRV huvudfokus MTO perspektiv)



Europe’s Rail – EU järnvägsforskning 2022 – 2030/2031

- Nytt partnerskap för Europas järnväg (Europe's Rail)
- Hög grad av digitalisering och automation.
- Stort fokus på nyttor för klimat, godstransporter och implementering.
- Initiativet bygger vidare på de resultat som tagits fram inom det europeiska partnerskapet Shift2Rail
- Trafikverkets projektvolym blir ca 500 Miljoner SEK under Europe’s Rails program
- Total projektvolym för Europe Rail är över 1 Miljard Euro
- Det mesta av Trafikverkets finansiering blir uppbundet i samarbetsgrupperingar

Excellensområden järnvägs foi

- Samverkan sker mellan svenska foi centra:
- KAJT
- JVTC
- Järnvägsgrupp KTH
- Charmec
- Samverkan sker även med JBS

EXCELLENSOMRÅDEN

TIO EXCELLENSOMRÅDEN

Akademierna kraftsamlar och bygger upp kunskap inom sina respektive styrkeområden.

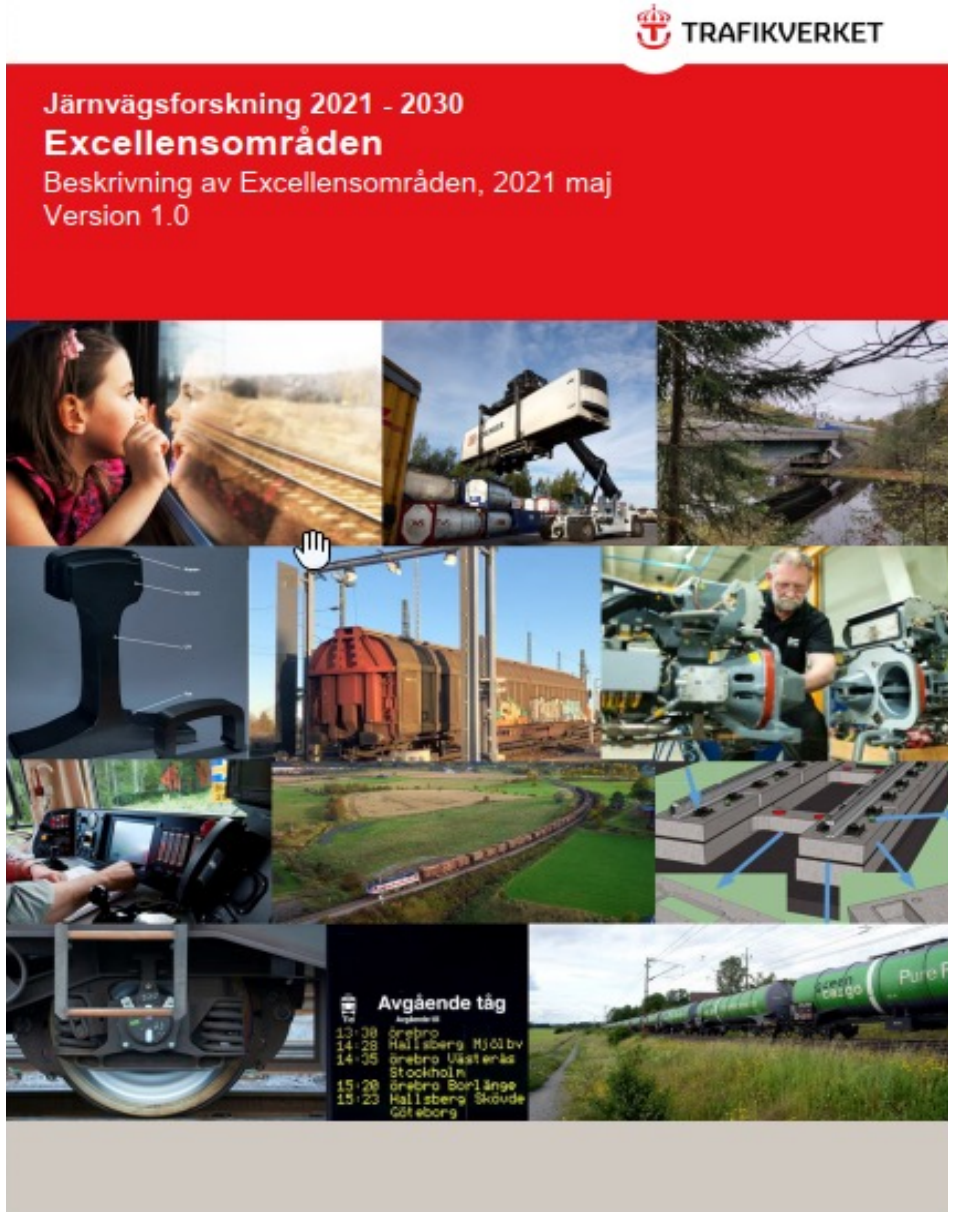
1. Fordonsteknik/Fordonsdynamik - KTH
2. Hjulpar och bromssystem - Charmec
3. Banteknik/Banmekanik - Charmec
4. Konst- och markbyggnad/Anläggningskonstruktioner - Charmec
5. Elkraft/Kraftförsörjning och traktionssystem - KTH
6. Signalsäkerhetssystem - KTH
7. Trafikplanering och Trafikstyrning - KAJT
8. Drift och underhåll - JVTC
9. Kapacitet och punktlighet - KAJT
10. Systemperspektiv (cross cutting) - KTH

1-6 teknikområden, 7–9 funktionsområden

FÖRVÄNTAT RESULTAT

- Bevisad Excellens inom spårburen forskning
- Upprättad plan för förstärkt och säkerställd kunskapsförsörjningen inom ny och hållbar teknik för framtiden
- Konkreta förbättringar av viktiga funktionaliteter i järnvägens system
- Storskaliga FoI-demonstratorer som minskat gapet till implementering
- Bibehållna och utvecklade nätverk med näringslivet

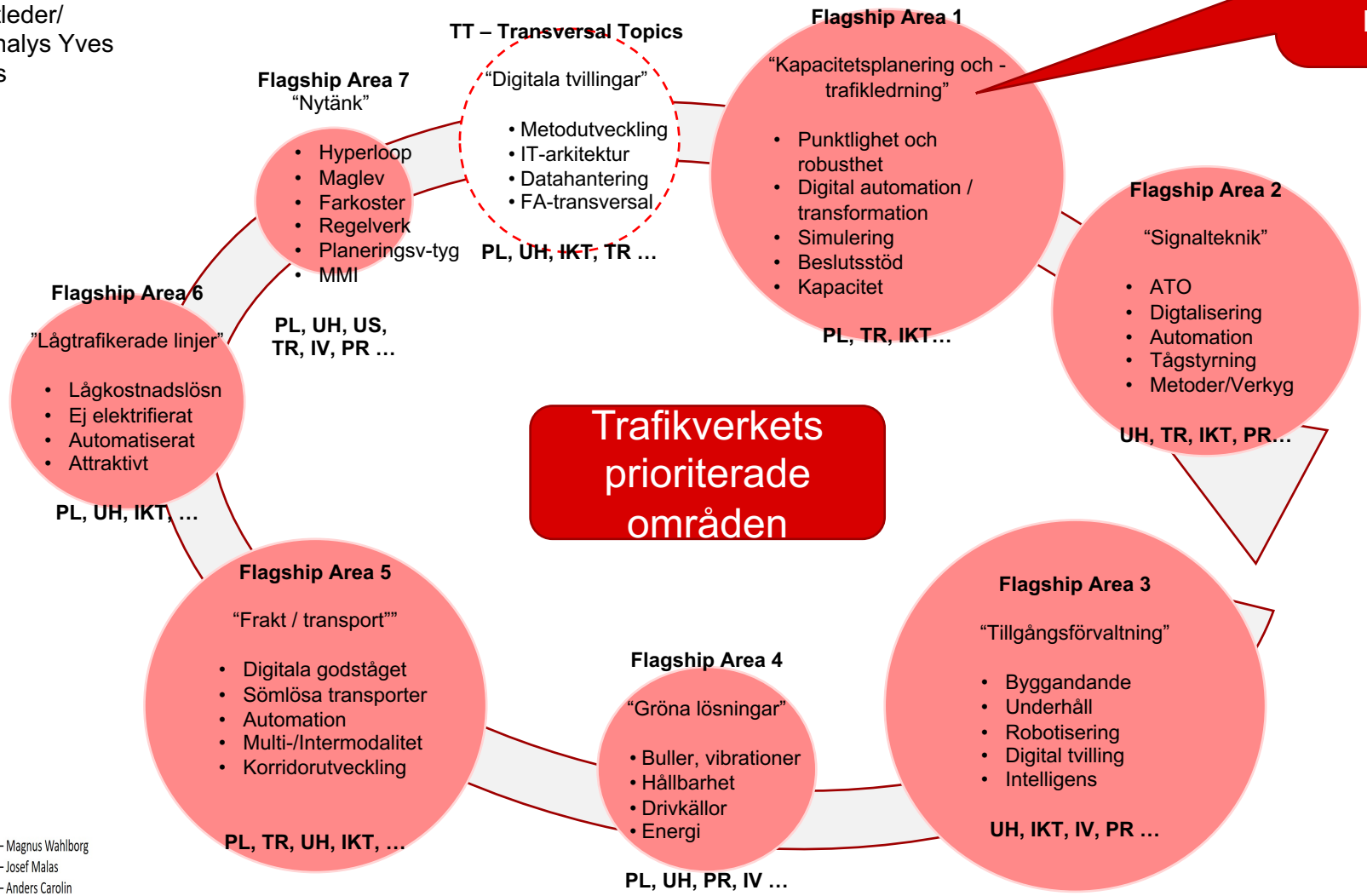
Kapacitet och robusthet | Punktlighet | Energieffektivitet och klimatneutralitet | Kunskapsökning | Innovationskraft | Hälsa och säkerhet



Flaggskepp 1 Ansvarig: Magnus Wahlborg Trafikverket, Anders Johnson (konsultstöd US bistår) – Trafikverket projektleder/ koordinerar tillsammans med Thalys Yves Perrault (huvud pl) och Siemens

TRAFIKVERKET

KAJT
Primär Foi
miljö



Område och ansvarig person i Trafikverket

1. Europeisk järnvägstrafik & Mobility Management i multimodal miljö	– Magnus Wahlborg
2. Digital och automatiserad och/eller autonom tågdrift (ATO)	– Josef Malas
3. Intelligent och integrerad tillgångsförvaltning (Assets Management)	– Anders Carolin
4. Ett hållbart och grönt järnvägssystem (EUs Green Deal)	– Tohmmy Bustad
5. Konkurrenskraftig, grön och digital godstrafik på järnväg (Gods)	– Jan Bergstrand
6. Regionala och innovativa järnvägstjänster för lågtrafikerade banor	– Malcolm Lundgren
7. Innovation om nya tillvägagångssätt för guidade transportsätt	– Michel Gabrielsson
TT. Tvärgående ämnen (Transversal Topics) samt Digitala tvillingar	– Anders Carolin

Grov Tidplan uppstart

Europé Rail startade 2019 kv 3 ansökan, 2020 fortsatt arbete inkl strategisk innovationsagenda och beslut EU, 2021 EU ministerråd beslut EuropeRail 19/11

Arbete 2021

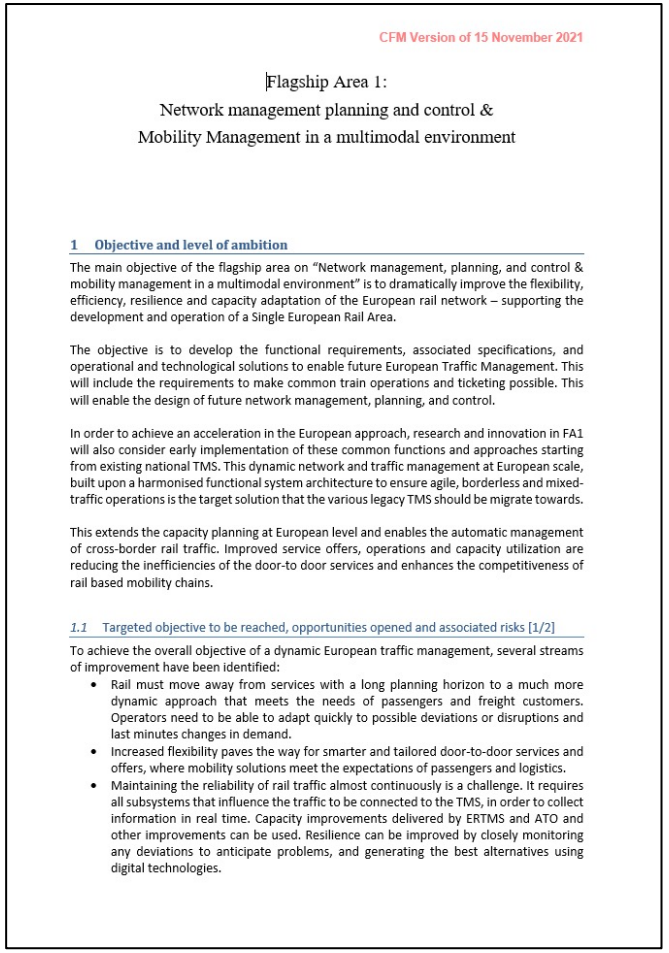
- Juni 2021 bildades 7 st flaggskepp
  - Trafikverket med och leder flaggskepp 1 Kapacitet och trafikledning
  - 22 organisationer – 10 infrastrukturhållare/Rail operators, 10 företag, 2 forskningsinstitut
- Framställande av plan 2022 – 2031 inkl ekonomi
  - September – November
- Flaggskeppsarbete Multi annual workplan innehåll och demonstratorer
  - September - december

Arbete 2022

- Flaggskeppsarbete call text 2022 – 2025 12
  - Januari – mars
- Proposal F1 2022 – 2025
  - Mars - juni
- Projektstart 2022 kvartal 4

TRAFIKVERKET

Flaggskepp 1 – arbete 15 juni – 30 november



CFM Version of 15 November 2021

Flagship Area 1:
Network management planning and control &
Mobility Management in a multimodal environment

1 Objective and level of ambition

The main objective of the flagship area on "Network management, planning, and control & mobility management in a multimodal environment" is to dramatically improve the flexibility, efficiency, resilience and capacity adaptation of the European rail network – supporting the development and operation of a Single European Rail Area.

The objective is to develop the functional requirements, associated specifications, and operational and technological solutions to enable future European Traffic Management. This will include the requirements to make common train operations and ticketing possible. This will enable the design of future network management, planning, and control.

In order to achieve an acceleration in the European approach, research and innovation in FA1 will also consider early implementation of these common functions and approaches starting from existing national TMS. This dynamic network and traffic management at European scale, built upon a harmonised functional system architecture to ensure agile, borderless and mixed-traffic operations is the target solution that the various legacy TMS should be migrate towards.

This extends the capacity planning at European level and enables the automatic management of cross-border rail traffic. Improved service offers, operations and capacity utilization are reducing the inefficiencies of the door-to door services and enhances the competitiveness of rail based mobility chains.

1.1 Targeted objective to be reached, opportunities opened and associated risks [1/2]

To achieve the overall objective of a dynamic European traffic management, several streams of improvement have been identified:

- Rail must move away from services with a long planning horizon to a much more dynamic approach that meets the needs of passengers and freight customers. Operators need to be able to adapt quickly to possible deviations or disruptions and last minutes changes in demand.
- Increased flexibility paves the way for smarter and tailored door-to-door services and offers, where mobility solutions meet the expectations of passengers and logistics.
- Maintaining the reliability of rail traffic almost continuously is a challenge. It requires all subsystems that influence the traffic to be connected to the TMS, in order to collect information in real time. Capacity improvements delivered by ERTMS and ATO and other improvements can be used. Resilience can be improved by closely monitoring any deviations to anticipate problems, and generating the best alternatives using digital technologies.

Flaggskeppet innehåller tre Sub Groups:
SG1 – Operations
SG2- Planning
SG3 - Integration

The main objective….. //is to dramatically improve the flexibility, efficiency, resilience and capacity adaptation and usage of the European rail network – supporting the development and operation of a Single European Rail Area.//

- **SG1: Improving strategic and tactical planning of the rail network**
- **SG2: Increasing the resilience of a connected 'real time' rail network:**
- SG3: Integrated rail traffic within door-to-door mobility

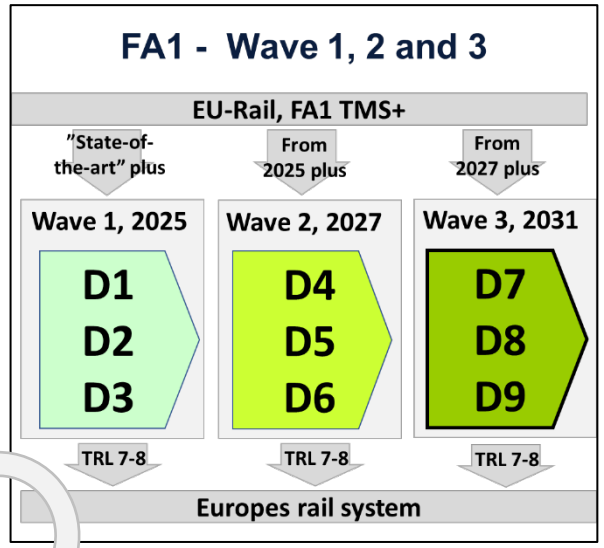
TRAFIKVERKET

FA1

TRL-listan med resultat 2025, 2027 o 2031

Table 1 – Technical readiness of the capabilities in FA1.

Capabilities (made of functions/services) enabling Operational objectives	Up to TRL		
	until 2025	until 2027	until 2031
Improve strategic and tactical planning	*D1*	*D4*	*D7*
1. Cross-border Planning:			
Towards European cross-border scheduling	*7*	8	9
Improved capacity allocation using rolling planning and TTR	7	8	*9*
2. Decision support and optimization:			
Decision support for short term planning	*6*	7	8/9
Optimization methods for capacity efficiency and energy saving	6	7	*8*
3. Simulation:			
Improvement of rail simulation models for selected Use Cases	7	7	*8*
4. Improved integration:			
Integration with yard capacity planning	*6*	7	8/9
Integration of station capacity planning	*6*	7	8/9
5. Operational feedback for planning:			
Planning using feedback loops from operations	6	*7*	
Integration of feedback loop with ATO/TMS for higher capacity	6	*7*	
Using ATO journey profiles for timetabling	6	*7*	
Develop resilience for a connected real-time rail network	*D2*	*D5*	*D8*
6. Cross-border operation:			
Real-time connection of the networks	7	*8*	
Improved modelling for cross-border	6	*7*	8/9
7. Improved integration:			
Connection TMS & CTC and automated yards	7	8	*9*



Möjliggörare/förmågor och aktiviteter

Topic	State of the art including S	EU-RAIL JU innovation
Methods and algorithms for capacity planning and management	Advanced al… approaches ba… historical data, first AI implementations	Based on real-time information of the EU-wide TMS, based on AI, Machine learning, and statistical or other algorithmic approaches
Set of external data connected to Traffic management	Assets management, external resources (crew, rolling stock). X2R4, S2R Integrated Mobility Management (I2M), Optima using CDM data format	Extended with energy aspect, yard resources, ATO, other rail networks, but also other transport modes, real-time speed profiles, construction and maintenance plan
Target scope for Planning and Operation	National	European
Traffic management	Partial automatic algorithms on national level X2R4-WP8 enhanced TMS concepts	Train prediction, smart conflict resolution, decision support
Planning versus Operation	Iterations at local/national level, not real-time	Real-time feedback loop between Planning and operation
Real-time punctuality and capacity forecasts	National punctuality and capacity simulations (Plasa)	European networks punctuality and capacity simulations
Capacity interaction nodes and network	Simple functions with Human Machine Interface (TD5.2)	Node capacity and departure time prediction, conflict resolution, decision support
Demand forecast	Preliminary (business analytics in TD4.6)	Activity-based or AI-based models for the complete transport chain
Overall mobility approach	End-user perspective (IP4)	Offer perspective with rail integration in door–to-door, end-user benefit at connections (information, PRM)
Mobility orchestration with adapted rail as backbone for the mobility demand	None	Develop orchestration between rail sub-networks, in order to move to a more unified European network. Also developing open interfaces with other modes, so that rail can adapt its traffic

Varje demonstrator har en dedikerad uppgift

”State-of-the-art plus är inbyggt i systemet i varje ”Wave”

FA1 budget SG1, SG2 and SG3

Status 22 November

	TMS+	SG1	SG2	SG3
	FA1	Planning	Operation	Integration
ADIF	*10,21*	*4,40*	*5,21*	*2,20*
CD	*0,30*			
DB	*4,36*			
Group FSI	*10,00*			
NO Rail	*7,00*	*2,00*	*2,50*	*2,50*
OBB	*0,68*			
PKP	*1,48*		*0,48*	*1,00*
ProRail and NS	*10,00*	*2,50*	*7,50*	*0,00*
SNCF	*5,00*			
Tfkvkt	*10,00*	*4,50*	*5,40*	*0,10*
Alstom	*1,60*			
MERMEC	*3,37*	*1,13*	1,68	*0,56*
AZD	*3,10*			
CAF	*2,90*	*0,90*	*1,70*	
eSGR JV	*3,79*	*0,49*	*2,74*	*0,56*
Faiveley	*4,00*			
Hitachi Rail STS	*17,00*	*4,60*	*5,90*	*6,50*
Indra + Talgo	*8,81*			
KB	*0,00*			
Siemens	*14,30*			
Strukton	*0,00*			
Thales GTS	*15,00*	*1,00*	*7,00*	*7,00*
Voestalpine	*0,00*			
CEIT	*0,75*	*0,325*	*0,350*	*0,075*
DLR	*1,87*			
Total	*135,52*			

Flaggskepp 1 – 135 miljoner Euro

Ca 1,35 miljarder sek

TRAFIKVERKET

Topic	State of the art including S2R	EU-RAIL JU innovation
Methods and algorithms for capacity planning and management	Advanced algorithmic approaches based on historical data, first AI implementations	Based on real-time information of the EU-wide TMS, based on AI, Machine learning, and statistical or other algorithmic approaches
Set of external data connected to Traffic management	Assets management, external resources (crew, rolling stock). X2R4, CDM datamodel	Extended with energy aspect, yard resources, ATO, other rail networks, but also other transport modes, real-time speed profiles, construction and maintenance plan
Target scope for Planning and Operation	National	European
Traffic management	Partial automatic algorithms on national level	Train prediction, smart conflict resolution, decision support
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Capacity interaction nodes and network	Simple functions with Human Machine Interface (TD5.2)	Node capacity and departure time prediction, conflict resolution, decision support

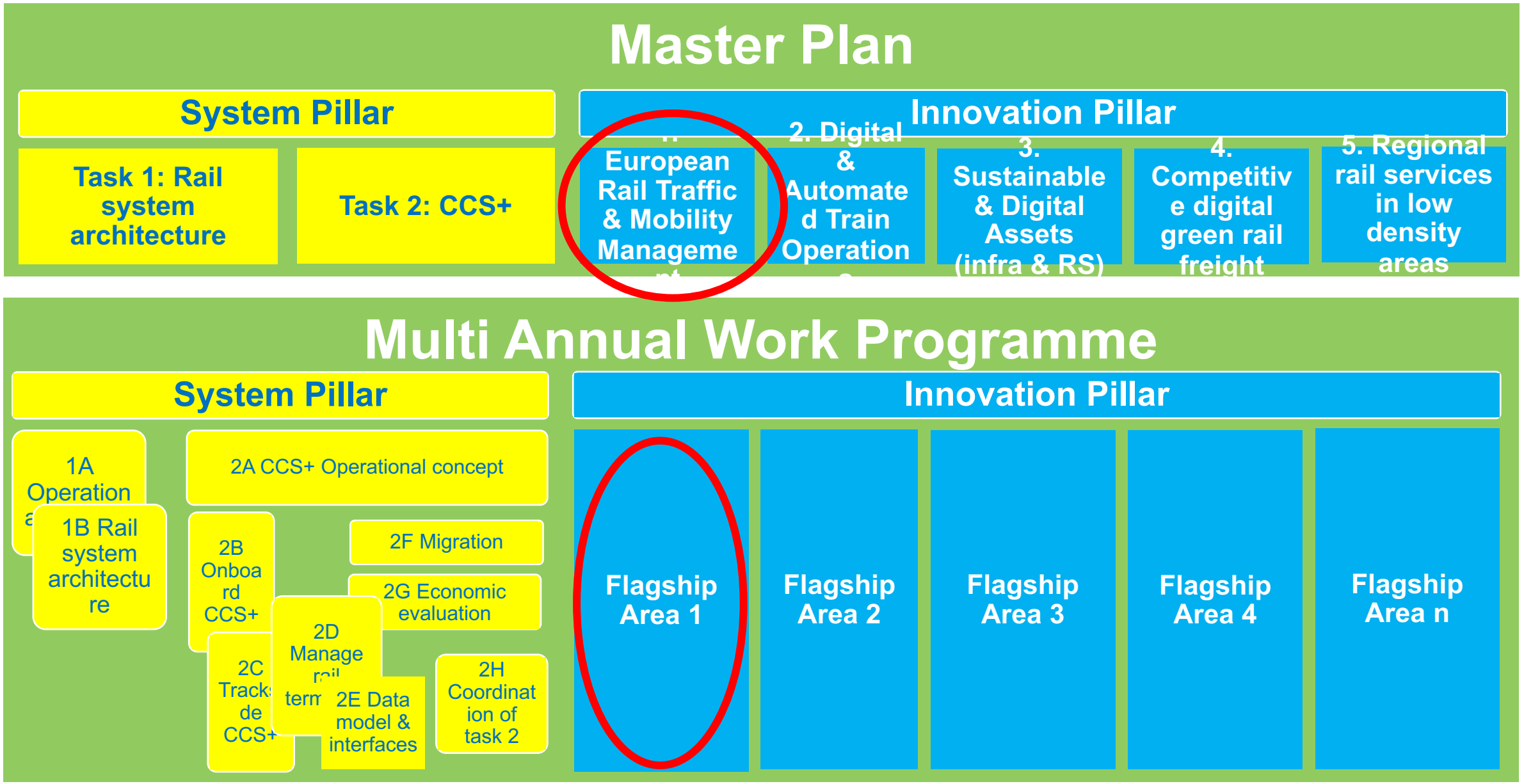
Gränsöverskridande modeller och beslutsstöd

Styra genom planering

KAJT resultat

KAJT, demo Malmö

EU-Rail Programme



Work in progress


TRAFIKVERKET
Tack!