Digitalisation of infrastructure data
RINF

Marina Aguado

Porto, March 2025

EUROPEAN UNION AGENCY FOR RAILWAYS

SCAN ME

development of trans-European networks in the areas of transport, telecommunications and energy infrastructures

Sustainable and Smart Mobility Strategy

a COMMON TRANSPORT POLICY

EU railways and EU law

FROM

fully integrated State railways
lack of market orientation
increasing costs
outdated technologies

POLICY ACTIONS

4th Railway Package 2016

TO

high quality, customer oriented transport services
a level playing field
cost efficient operations, lower need for public funding
market driven innovation

2014

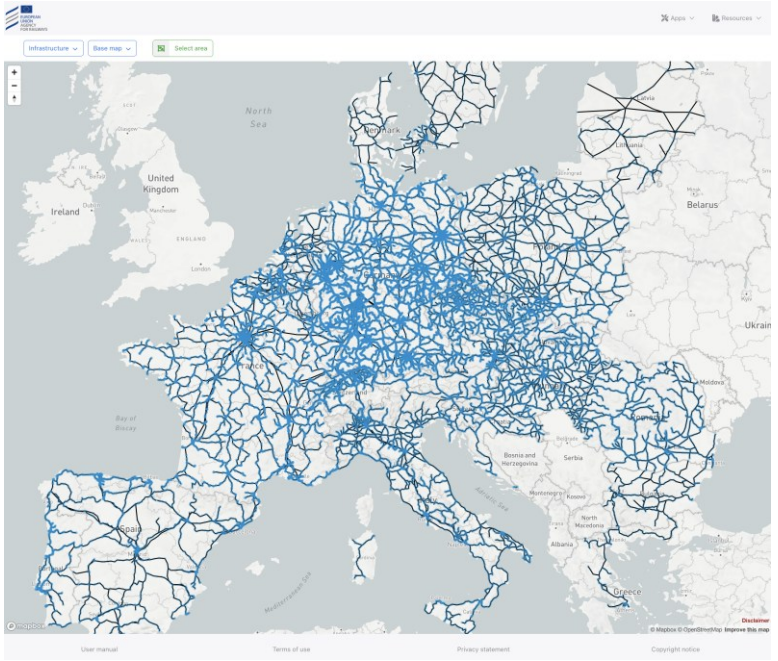
Initial Creation:
Implementing Decision 2014/880/EU

2019

Reform & Upgrade:
Regulation (EU) 2019/777

2023

Latest Revision:
Amendment (EU) 2023/1694



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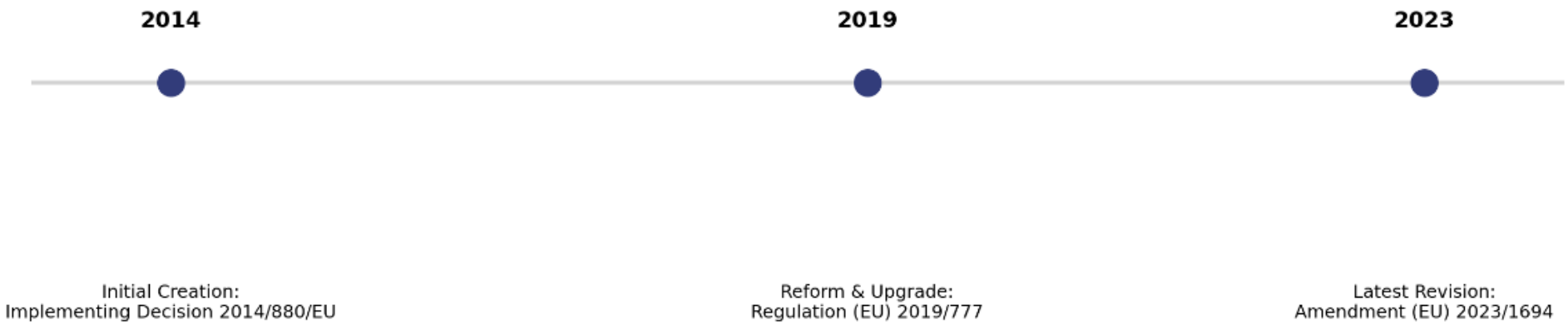
RINF Regulation Evolution



to **ensure the transparency, interoperability, and coordination of railway infrastructure data** across the EU

- Facilitating the safe and efficient operation of trains across borders.
- Supporting the design and authorization of railway vehicles.
- Enabling compatibility checks between infrastructure and rolling stock.
- Monitoring the progress of EU rail system interoperability.
- Enabling reuse of infrastructure data in other IT tools and services.

supports the **Single European Railway Area (SERA)** by enhancing cross-border interoperability

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RINF as the data layer supporting cross border digital services

EU-wide digital Once-Only Principle for citizens and businesses

Route Compatibility Check Service

Digital Route Book Service

Rail Freight Portal

PLC and SLC Service allocation

Digital Network Statement

PRIME KPIs Catalogue on Capacity

TEN-T

RNE RIS & Capacity Planning Tools

ERSAD

ISS

Digital Map

ERA KG (RINF + other registers)

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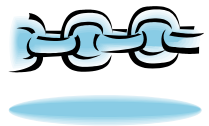
RINF data quality

Country	Data Provider Code	Data Provider Name from OCR	Last Import Date	Overall data completeness	Completeness over the core parameters	Completeness over the RCC parameters	Number of OPs	Number of SOLs	Total length of lines (kilometers	Total length of tracks (kilometers
Austria	3786	Raab-Oedenburg-Ebenfurther-Eisenbahn AG	28/10/2024	100.00%	100.00%	100.00%	13	12	26	26
France	NRE	-	28/01/2025	99.01%	98.72%	99.04%	11,050	12,866	26,902	51,061
France	CY76	TSO	07/02/2025	98.82%	100.00%	97.71%	6	5	35	35
Austria	0081	ÖBB-Infrastruktur AG	18/12/2024	98.43%	99.82%	96.88%	1,728	1,917	5,142	7,333
Czech Republic	NRE	-	08/01/2025	98.35%	96.36%	96.38%	3,677	3,901	9,675	11,818
Latvia	NRE	-	22/11/2021	98.20%	96.41%	98.06%	36	40	1,505	1,853
The Netherlands	0084	ProRail	10/01/2025	97.98%	99.94%	98.15%	775	871	3,152	5,735
Luxembourg	0082	CFL Gestionnaire Infrastructure	22/01/2025	97.12%	93.32%	98.13%	102	99	263	438
Bulgaria	NRE	-	10/09/2024	96.79%	93.00%	98.25%	322	350	3,766	4,755
Italy	3572	Ferrovie del Sud Est e Servizi Automobilistici S.r.l. (	31/10/2024	96.48%	96.02%	95.63%	97	100	473	473
France	3436	LISEA	15/07/2024	96.15%	96.20%	94.95%	29	28	332	1,325
Portugal	0094	Infraestruturas de Portugal	01/08/2024	96.03%	95.79%	91.46%	786	791	2,504	3,204
Italy	3525	Ferrovie Emilia Romagna S.r.l.	17/01/2025	94.05%	94.00%	94.48%	133	125	351	351
Italy	0083	Rete Ferroviaria Italiana RFI	28/01/2025	93.04%	96.47%	94.63%	2,770	3,183	16,131	24,318
Finland	3109	Finnish Transport Infrastructure Agency	27/01/2025	92.74%	92.98%	88.00%	754	790	5,784	6,591
Finland	0010	VR-Yhtymä Oyj	21/03/2024	92.24%	85.49%	96.73%	38	0	0	0
Slovenia	NRE	-	28/01/2025	89.99%	83.99%	95.81%	319	319	1,192	1,515
Italy	3379	SOCIETA FERROVIE UDINE CIVIDALE srl	17/10/2023	89.41%	91.43%	83.25%	7	6	15	15
Italy	3456	La Ferroviaria Italiana S.p.A.	15/10/2024	89.12%	100.00%	92.48%	25	24	84	84
Italy	3908	Gruppo Torinese Trasporti S.p.A	18/08/2022	86.21%	94.29%	78.51%	7	6	21	21
Italy	3856	Ente Autonomo Volturno S.R.L	20/10/2023	85.46%	93.28%	76.89%	26	24	1,726	1,726
Norway	NRE	-	24/10/2018	83.05%	76.61%	77.68%	375	378	3,907	3,907
Greece	NRE	-	30/01/2019	82.51%	91.86%	93.66%	188	193	3,021	3,606
Poland	NRE	-	18/05/2022	77.94%	92.65%	81.78%	4,213	4,911	19,817	28,608
Romania	0053	Compania Naţională de Căi Ferate Române	03/12/2024	76.34%	58.58%	74.68%	2,192	2,330	10,542	13,498
Germany	NRE	-	30/10/2024	75.12%	79.98%	76.82%	23,601	13,845	38,376	60,005
Sweden	NRE	-	30/01/2025	75.09%	82.91%	68.23%	1,095	1,166	10,764	13,021
Slovak Republic	0056	Železnice Slovenskej republiky	10/12/2024	71.31%	71.34%	75.53%	1,040	1,074	3,128	3,976
Italy	3857	Ferrotramviaria S.P.A.- Divisione Infrastruttura	25/07/2023	70.18%	78.23%	67.58%	28	28	103	177
Belgium	NRE	-	10/01/2025	69.78%	84.01%	76.47%	1,308	1,746	3,963	6,888
Spain	NRE	-	17/12/2024	66.82%	67.89%	59.79%	2,360	2,541	15,497	22,090
Denmark	NRE	-	27/01/2022	59.42%	47.82%	58.71%	563	352	2,048	3,068
Italy	0064	Ferrovienord	29/11/2023	53.21%	61.85%	50.78%	126	125	318	496
Lithuania	0024	AB "Lietuvos geležinkeliai"	21/12/2023	53.03%	97.28%	62.46%	177	181	1,742	2,355
Switzerland	NRE	-	18/11/2024	47.27%	88.36%	49.85%	3,281	1,570	4,401	62,300
Croatia	NRE	-	12/02/2025	42.85%	77.68%	43.04%	578	581	2,446	2,689
Hungary	NRE	-	07/11/2023	34.72%	51.02%	23.94%	1,836	1,977	6,592	7,875
Estonia	NRE	-	20/03/2019	31.69%	39.11%	52.05%	101	106	1,011	1,108
Ireland	-	-	never	0.00%	0.00%	0.00%	-	-	-	-

Facilitate Automatic Data Provision



Added Value Use Cases

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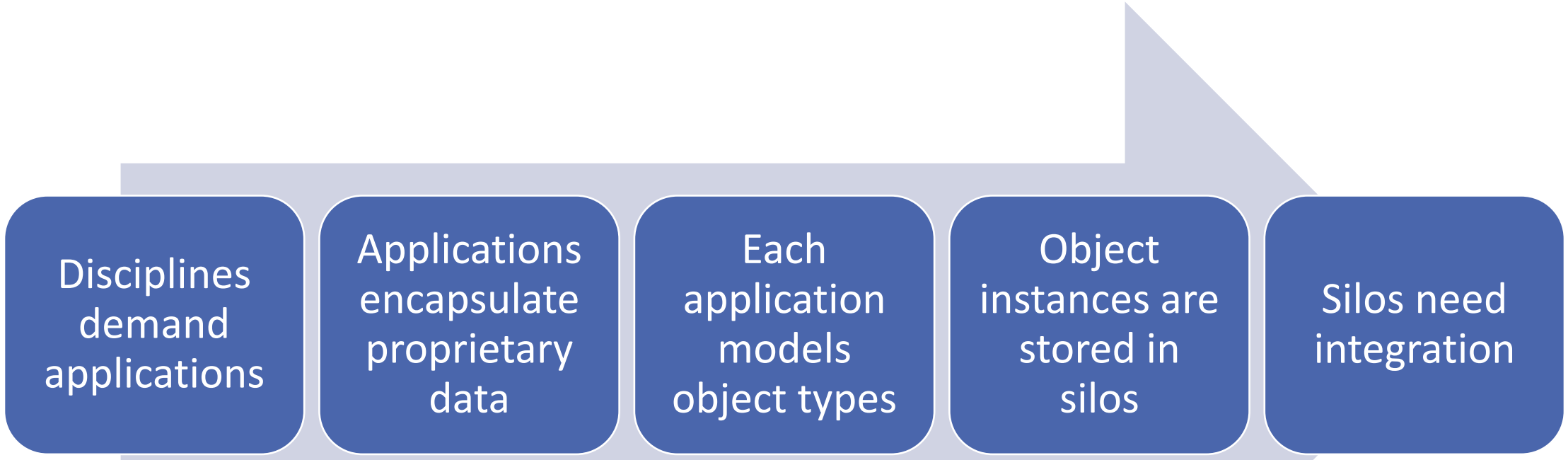
Today's general problems with data



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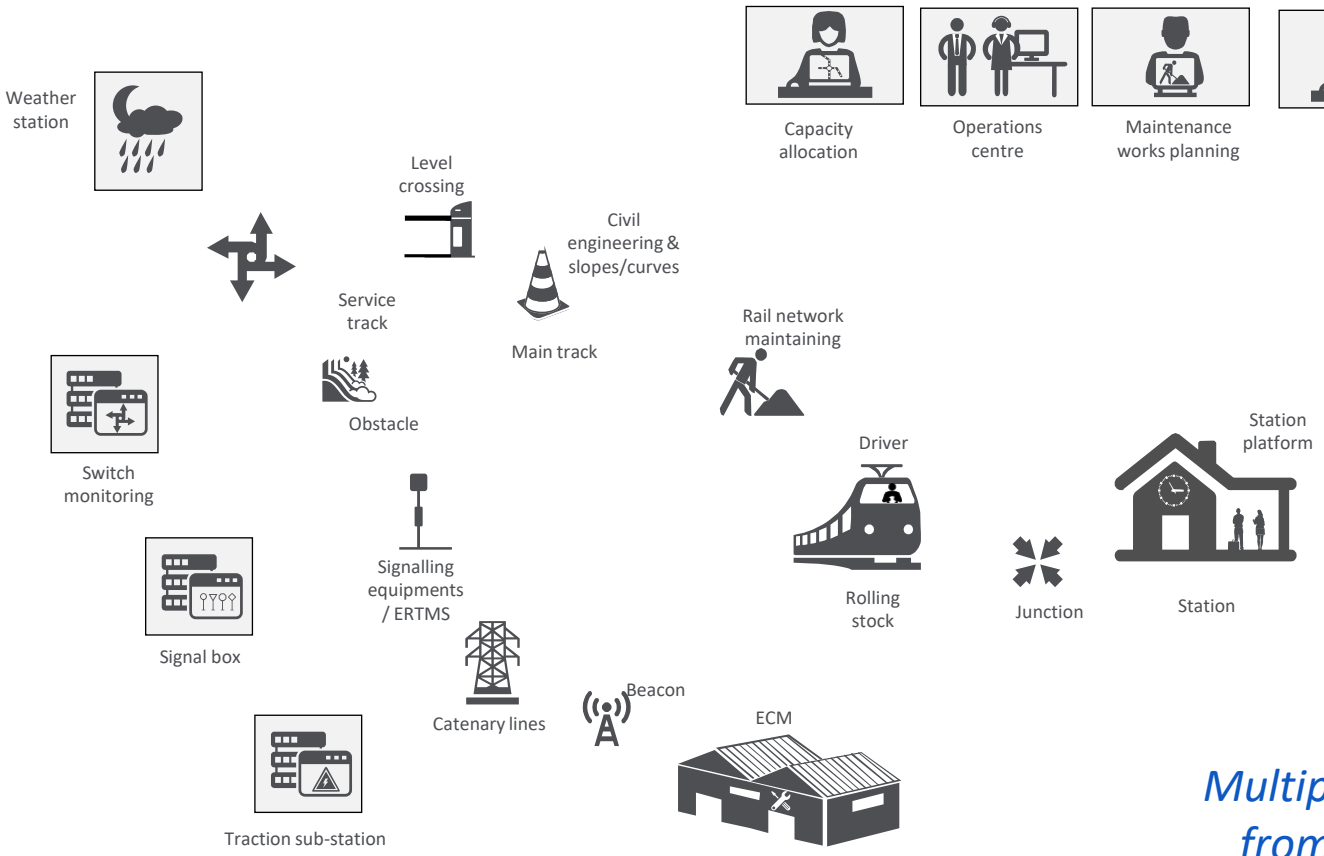
Interoperability for Mobility

The complex Rail data Landscape



Costly data transformations

==70% of the cost of European signalling deployment engineering hours

Multiple actors request and trust data from third parties to perform their business

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EU Legal railway ecosystem

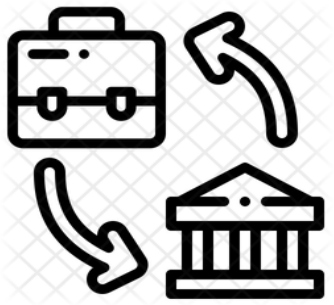
generating data stores, data elements, data flows and interfaces

- **Interoperability of the rail system** Directive (EU) 2016/797
  - Technical Specifications for interoperability (TSIs)
  - Functional and technical specifications for Agency registers (RINF, ERATV, ERADIS …)
- **Safety** Directive (EU) 2016/798
  - Information Sharing System (ISS)
- **Single European Railway Area (SERA):** Directive (EU) 2012/34/EU
  - Network statements and capacity path allocations
- **Rail Freight Corridors (RFCs)**
  - Regulation (EU) No 913/2010
    - Rail Facilities Portal
- **Trans European Network –Transport (TEN-T)**
  - Regulation (EU) No 1315/2013 Link

B2G data exchange

The Agency Data Landscape

Railway Sector legal Framework

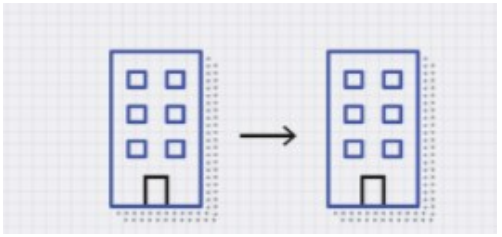


Business to Government Data Exchange

B2G

Railway Business to Business Data Exchange

B2B



- TAF/TAP (IM, RU exchange)
- ERTMS (Supplier IM, RU)

In-house Data Exchange

Registers
OSS
Statistics

BASE Registers

RINF
ERADIS
ERATV
EVR
VKM
Safety Related DBs

1st Meta Data – Common Ontology – Data Catalogue - Reference Data
2nd Data Access

The Agency acts as **a neutral agent** and as a data intermediary with a leading role in the field by validating, curating, storing and publishing register based information so it can be reused and exploited by the sector **to enhance data interoperability** between the different players.

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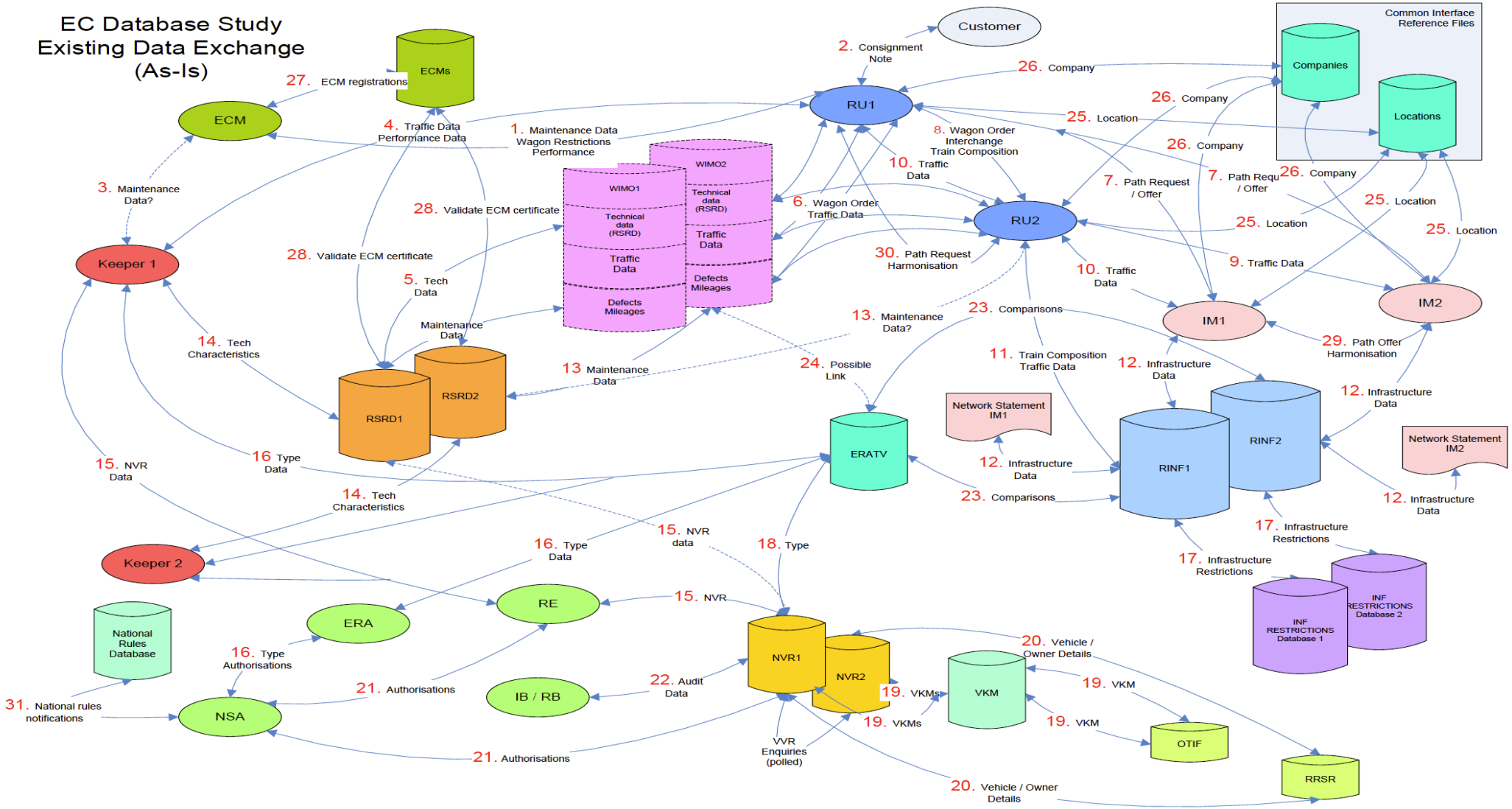
The EU regulatory rail data exchange ecosystem (*outdated*)



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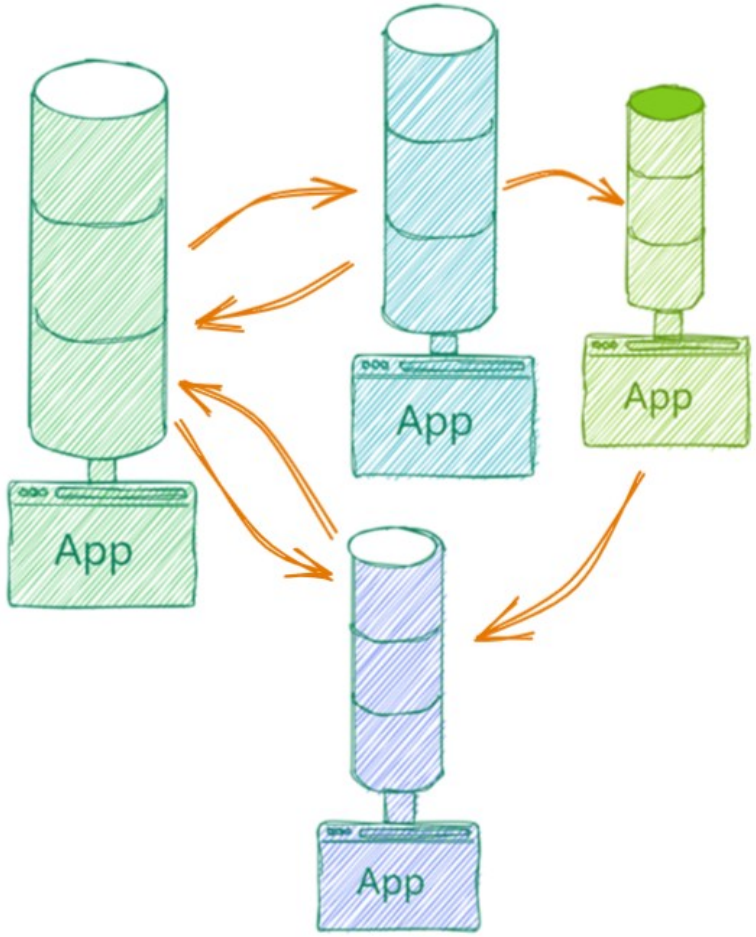
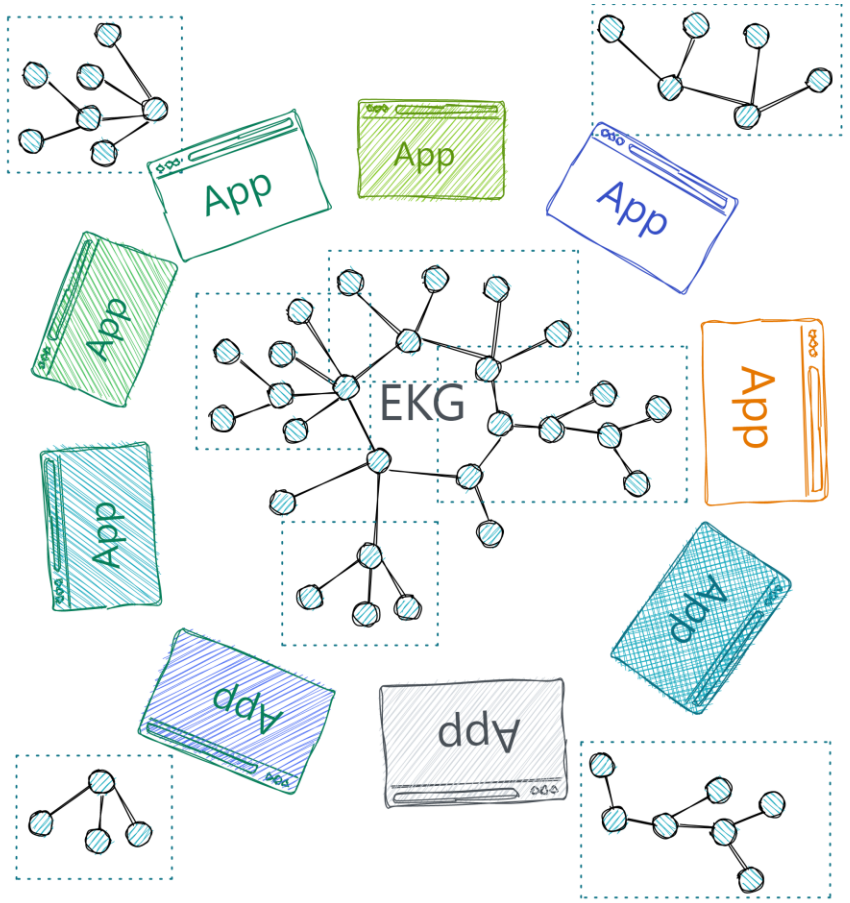
FROM



TO



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The Journey towards Data Centricity

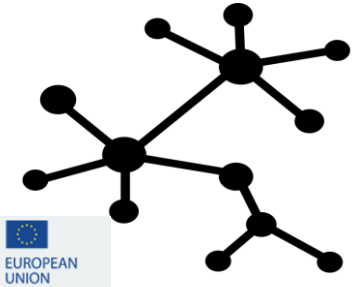
2019

Management Board
Linked Data
Mainstream Decision

2022

2024

Siloed data



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RINF - Register of Infrastructure

Register of Railway Vehicles

European Railway Occurrences Data *

Vehicle Authorization Data *

Connected

Each Register in a different legal text :

- rules/algorithmia embedded in closed programming with difficult maintenance and no transparency
- No shared definitions
- No shared taxonomies

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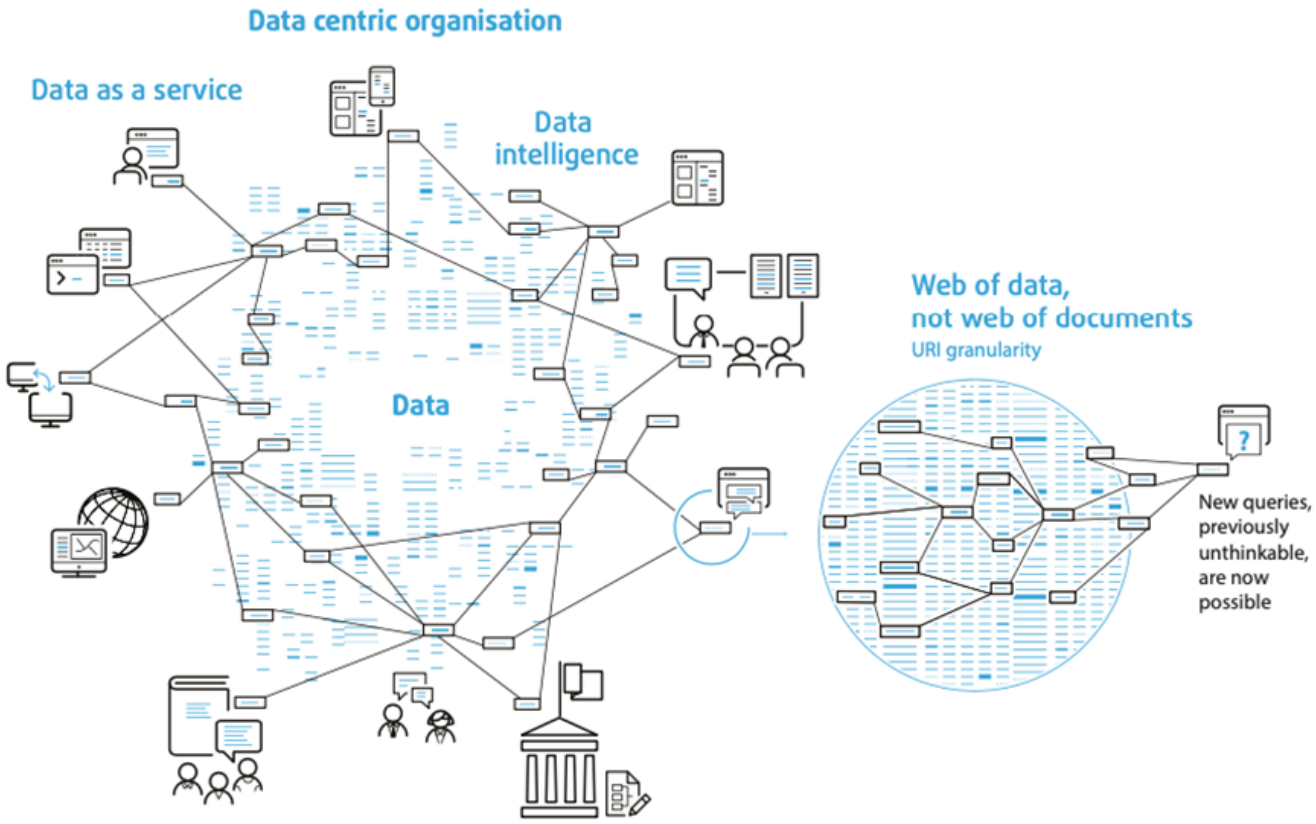
Data centricity @ ERA



To unlock the full potential of the data and to develop smarter systems we will need to move away from a system based on document exchange

Natural Language Queries

Automation requires digitalisation and climbing up in the data exchange model towards machine-readable meaningful data exchange to facilitate data exchange

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EC working documents & Communications

Rail

In the **railway sector**, infrastructure data are the basis for building up mobility data. The revised common specifications for the **register of railway infrastructure (RINF)** [53] establish the RINF as the common source of rail infrastructure data. It is based on the **ERA ontology** [54] which defines machine-readable and structured data elements of the rail system and is the **building block of the EMDS for rail**.

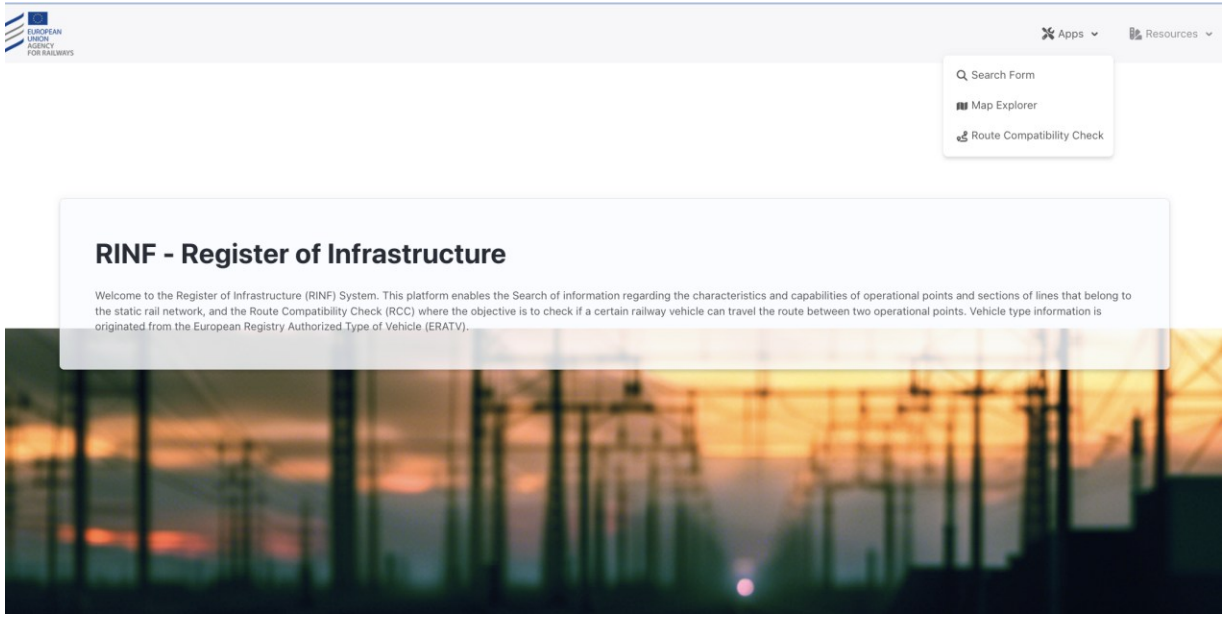
EUROPEAN COMMISSION

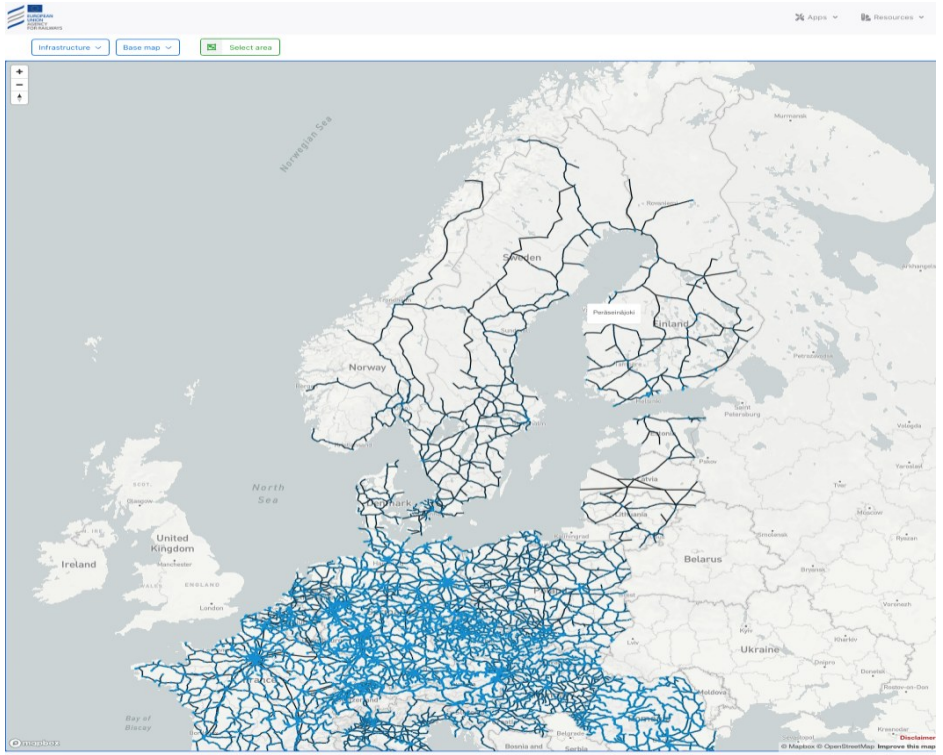
Brussels, 29.11.2023
COM(2023) 751 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Creation of a common European mobility data space

Link





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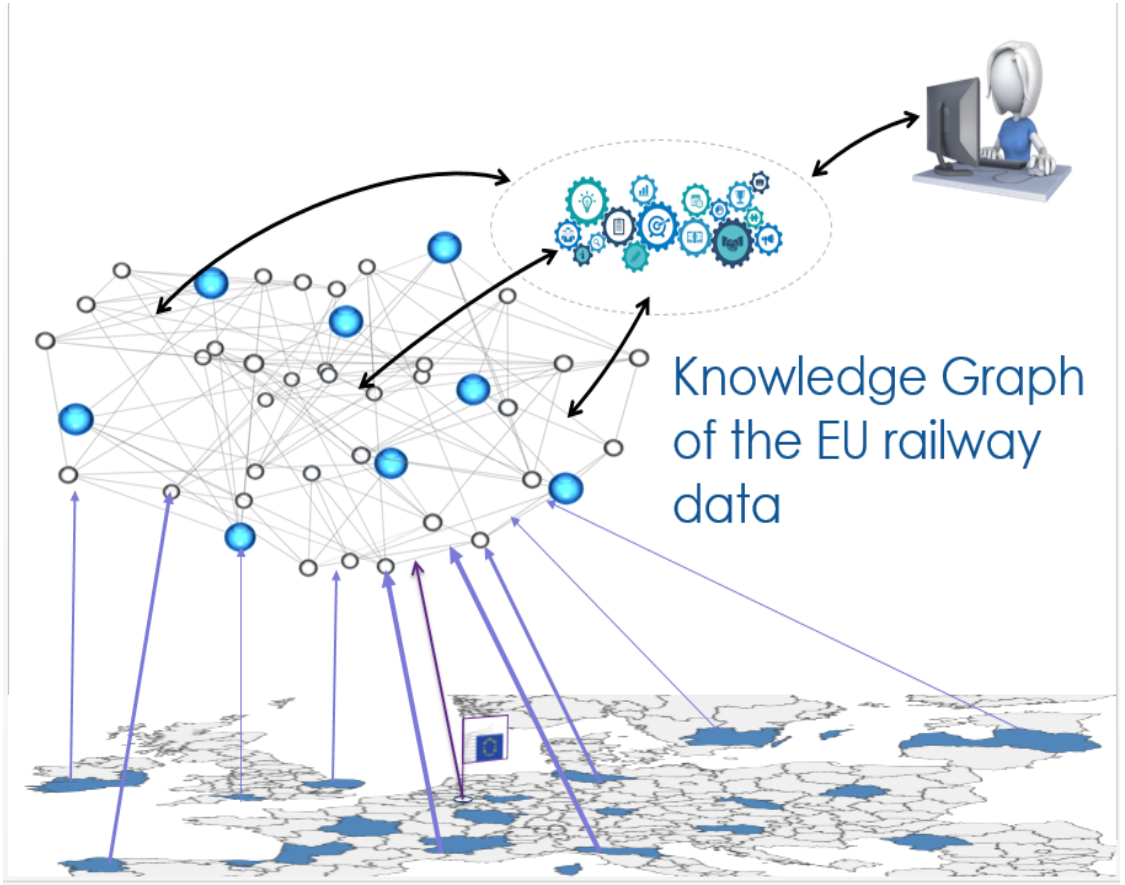
The ERA Knowledge Graph

Some numbers …

- More than 100 million triples
- More than 31k lines of mappings
- More than 500 SHACL shapes (property shapes and Sparql constraints)
- +270k track segments described
- +50k stations described
- +50k geo-referenced objects (lat/long)
- +2k Vehicle Types described
- 27 countries covered (EU countries)



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SKOS TAXONOMIES

SKOS concept schemes

back to ERA ontology

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ERA SKOS Concept Schemes. Version 3.0.1

This version:
https://data-interop.era.europa.eu/era-vocabulary/skos/index.html
Version:
v3.0.1 (released on 2024-06-18)
Publisher:
European Union Agency for Railways
License:

Cite as:
European Union Agency for Railways (2024) ERA SKOS Concept Schemes. Version v3.0.1. Retrieved from https://data-interop.era.europa.eu/era-vocabulary/skos/index.html

Summary

This is the set of SKOS concept schemes that are referenced from the ERA ontology, governed by the European Union Agency for Railways (ERA). They represent concepts and enumerations that are used in the RINF application guide and in the ERATV application guides, as well as those that are obtained from the ERATV database and manually curated by ERA.

List of SKOS Concept Schemes

This list of concepts will continously be updated with new versions of the ontology. -->

SKOS Concept Scheme	Source (in RDF Turtle)	RINF ontology property and RINF index	ERA ontology property and ERATV index	RINF-related values	ERATV-related values
AxleBearingMonitoring	era-skos-AxleBearingMonitoring.ttl		era:axleBearingConditionMonitoring (4.9.2)		link
BrakeParkingType	era-skos-BrakeParkingType.ttl		era:parkingBrakeType (4.7.3.2)		link
Categories (vehicle categories)	era-skos-Categories (vehicle categories).ttl		era:category (1.4)		link
Company code categories	era-skos-CompanyCodeCategories.ttl		era:companyCodeCategory	link	
CompliantPantographHeads	era-skos-CompliantPantographHeads.ttl	era:tsiPantographHead (1.1.1.2.3.1)		link	
ContactLineSystems	era-skos-ContactLineSystems.ttl	era:contactLineSystemType (1.1.1.2.2.1.1)		link	
ContactStripMaterials	era-skos-ContactStripMaterials.ttl	era:contactStripMaterial (1.1.1.2.3.4)	era:contactStripMaterial (4.10.10)	link	link
EddyCurrentBraking	era-skos-EddyCurrentBraking.ttl	era:eddyCurrentBraking (1.1.1.1.6.2)		link	
EndCouplingType	era-skos-EndCouplingType.ttl		era:endCouplingType (4.9.1)		link
EnergySupplySystems	era-skos-EnergySupplySystems.ttl	era:energySupplySystem (1.1.1.2.2.1.2)	era:energySupplySystem (4.10.1)	link	link
ETCSBaselines	era-skos-ETCSBaselines.ttl	era:etcsBaseline (1.1.1.3.2.2)	era:etcsBaseline (4.13.1.2)	link	link
ETCSEquipmentLevels	era-skos-ETCSEquipmentLevels.ttl		era:etcsEquipmentOnBoardLevel (4.13.1.1)		link
ETCSInfills	era-skos-ETCSInfills.ttl	era:etcsInfill (1.1.1.3.2.4)	era:etcsInfill (4.13.1.3)	link	link
ETCSLevels	era-skos-ETCSLevels.ttl	era:etcsLevelType (1.1.1.3.2.1)		link	
ETCSMVersions	era-skos-ETCSMVersions.ttl	era:etcsMVersion (1.1.1.3.2.10)		link	
ETCSSituations	era-skos-ETCSSituations.ttl	era:etcsDegradedSituation (1.1.1.3.10.1)		link	
ETCSSystemCompatibilities	era-skos-ETCSSystemCompatibilities.ttl	era:etcsSystemCompatibility (1.1.1.3.2.9)	era:etcsSystemCompatibility (4.13.1.8)	link	link
FreightCorridors	era-skos-FreightCorridors.ttl	era:freightCorridor (1.1.1.1.2.3 1.2.1.0.2.3)		link	
FrenchTrainDetectionSystemLimitations (deprecated)	era-skos-FrenchTrainDetectionSystemLimitations.ttl	era:frenchTrainDetectionSystemLimitation (1.1.1.3.7.1.4)		link	
FrenchTrainDetectionSystemLimitationNumbers	era-skos-FrenchTrainDetectionSystemLimitations.ttl	era:frenchTrainDetectionSystemLimitationNumber (1.1.1.3.7.1.4)		link	
GaugeChangeoverFacilities	era-skos-GaugeChangeoverFacilities.ttl		era:wheelSetGaugeChangeoverFacility (4.1.11)		link

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https://github.com/Interoperable-data

EU Rail Vocabulary
Interoperable-data

Unfollow

10 followers · **0** following

Achievements

Popular repositories

ERA-Ontology-3.1.0 Public
Extended version of the ERA Railway Infrastructure Ontology
☆ 13 ⑂ 9

ERA_vocabulary Public
ERA vocabulary is an ontology defined by the European Union Agency for Railways (ERA) to describe the concepts and relationships related to the European railway infrastructure and the vehicles auth...
HTML ☆ 7 ⑂ 4

VPA_Ontology Public
Verified Permissions ontology
JavaScript ☆ 2 ⑂ 2

ISS_vocabulary Public
Ontology for the Information Sharing System of the CSM/ASLP recommendation
HTML ☆ 1 ⑂ 1

RINF-TWG-CCS Public
Modelisation of CCS aspects in OP and SoL (as per micro-level ontology)
⑂ 1

automate-va
Requirements and open source collection for a Authorisations
HTML ⑂ 1

README

ERA Ontology version 3.1.0

> Caution
>
> **We are in the process of migrating this repository with era-vocabulary in a new Gitlab instance.**

This is a draft update of the RINF extension of the ERA Ontology. It defines the entities and their relationships within the domain of railway infrastructure. It includes concepts such as railway lines, operational points, tracks, signals, junctions, and other various components of the railway network.

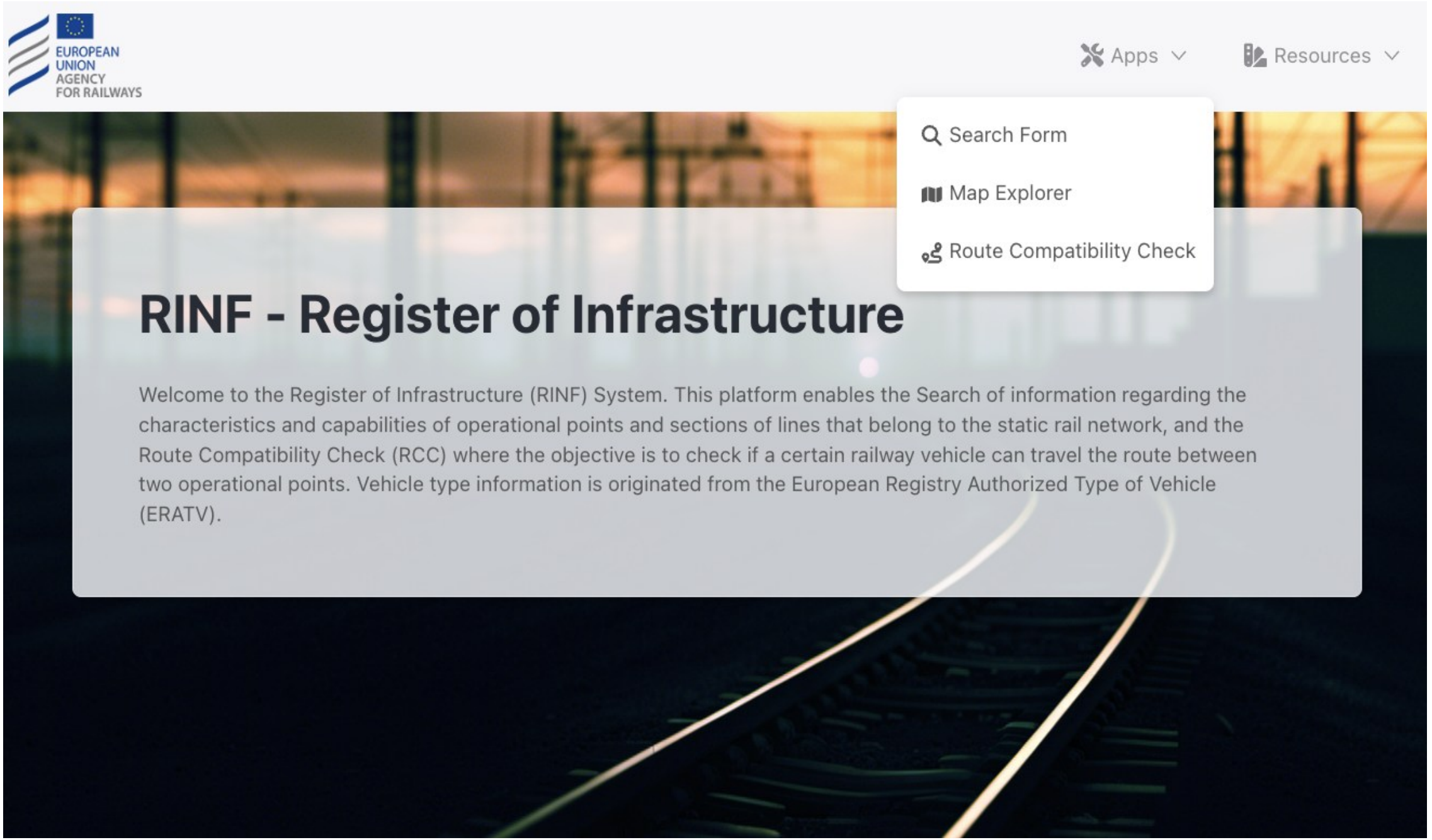
The previous version of the ERA ontology is here.

Documentation

Current documentation

Legal context

This version of the ontology reflects the collaborative efforts undertaken by the EU Agency for Railways within a specialized workgroup for the European Register of Infrastructure, dedicated to the multi level description of interoperable railway network, aligning and making RINF compliant to the most recent text of the Regulation (EU) 2019/777 of 16 May 2019 amended by Regulation (EU) 2023/1694 of 10 August 2023.


EUROPEAN
UNION
AGENCY
FOR RAILWAYS
Apps
Resources
Search Form
Map Explorer
Route Compatibility Check
RINF - Register of Infrastructure
Welcome to the Register of Infrastructure (RINF) System. This platform enables the Search of information regarding the characteristics and capabilities of operational points and sections of lines that belong to the static rail network, and the Route Compatibility Check (RCC) where the objective is to check if a certain railway vehicle can travel the route between two operational points. Vehicle type information is originated from the European Registry Authorized Type of Vehicle (ERATV).

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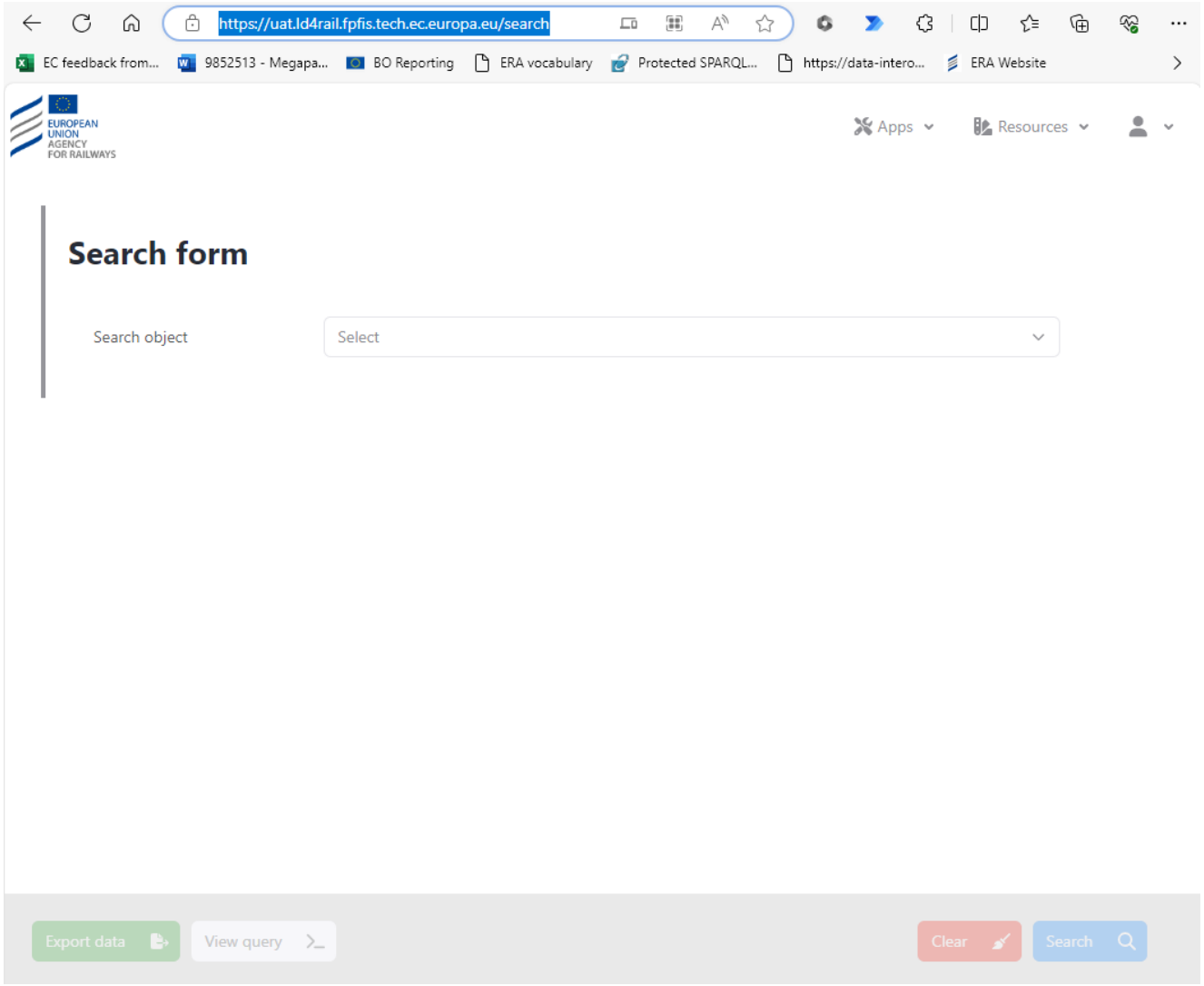
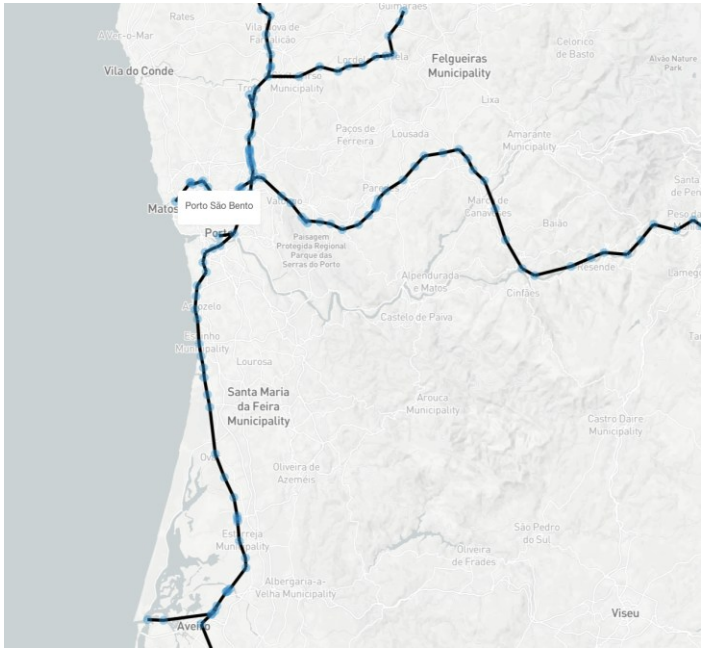
[ERA — Search form (europa.eu)]



RINF Map Explorer

Zoom IN



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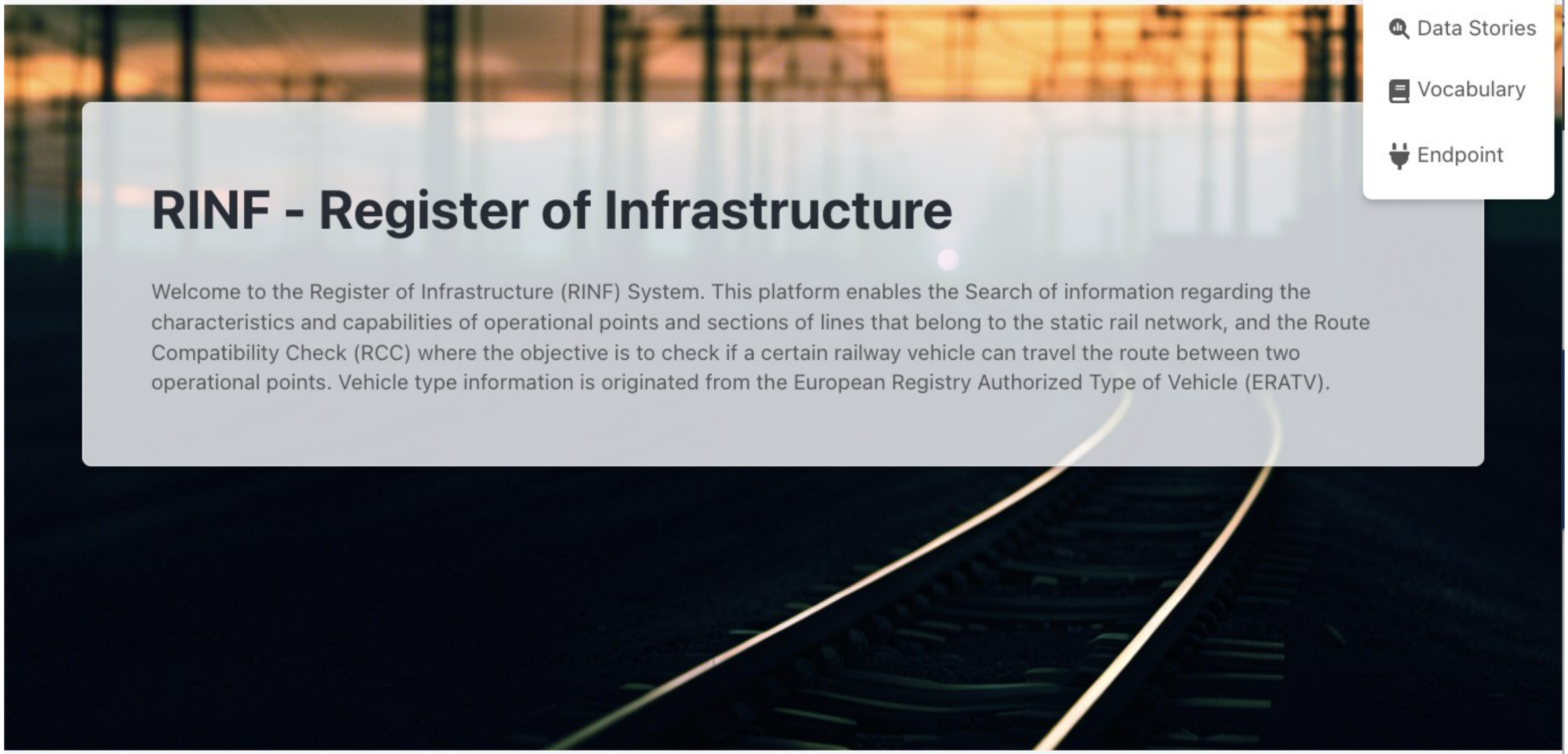
Apps

Resources

- Data Stories
- Vocabulary
- Endpoint



RINF - Register of Infrastructure

Welcome to the Register of Infrastructure (RINF) System. This platform enables the Search of information regarding the characteristics and capabilities of operational points and sections of lines that belong to the static rail network, and the Route Compatibility Check (RCC) where the objective is to check if a certain railway vehicle can travel the route between two operational points. Vehicle type information is originated from the European Registry Authorized Type of Vehicle (ERATV).

EUROPEAN UNION AGENCY FOR RAILWAYS

Apps Resources

Route Compatibility Check

From: [PRT] Entroncamento - PT34009

Via: [PRT] Pampilhosa - PT37002

Add via point

To: [ESP] SALAMANCA - ES30100

Vehicle type: EURO 4000 v España Portugal - 11-063-0001-3-001

Track: VD

Track length: 8.112 km

Vehicle: EURO 4000 v España Portugal - 11-063-0001-3-001

Summary: Compatible: 8 | Need manual check: 0 | Not compatible: 2 | Unknown: 22

Details

View all parameters

2 Lamarosa

Track: VD

Track length: 6.265 km

Vehicle: EURO 4000 v España Portugal - 11-063-0001-3-001

Summary: Compatible: 8 | Need manual check: 0 | Not compatible: 2 | Unknown: 22

Details

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Appendix D

Route compatibility and Route Book

D1 Parameters for the vehicle and train compatibility over the route intended for operation

▼B

Route compatibility check interface	Vehicle information (either from ERATV, the technical file, or any other appropriate means of information)	Route information available in Register of Infrastructure (RINF) or provided by Infrastructure manager until RINF is complete	Vehicle level	Train level	Procedure to check the vehicle and train compatibility over the route intended for operation
Running characteristics	Combination(s) of maximum speed and maximum cant deficiency to which the vehicle was authorised (operational envelope that the vehicle has been assessed for); Rail inclination.	1.1.1.1.4.2 Cant deficiency 1.1.1.1.2.5 Maximum permitted speed 1.1.1.1.4.3 Rail inclination	X		Comparison of the combination of maximum speed, maximum cant deficiency and rail inclination(s), to which the Vehicle is assessed, with the cant deficiency, speed and rail inclination(s) declared in RINF or information provided by Infrastructure Manager. In case vehicle characteristics don't match infrastructure characteristics and the compatibility between the vehicle and the route might be compromised, the Infrastructure Manager shall provide the exact combination of speed and cant deficiency for the specific points in which the compatibility might be compromised within one month, free of charge and in an electronic format. *Note:* The output of the check should be taken into account by the Railway Undertaking for the route book preparation. Operational conditions might be imposed as a result of this check (e.g. speed restriction for a section of line).
Wheelset	Wheel set gauge	1.1.1.1.4.1 Nominal track gauge 1.2.1.0.4.1 Nominal track gauge	X		Comparison of the wheelset gauge with track gauge of the intended route.
Wheelset	Minimum in-service wheel diameter	1.1.1.1.5.2 Minimum wheel diameter for fixed obtuse crossings	X		Comparison of the minimum wheel diameter between Vehicle and the intended route.
Wheelset	Type of changeover facilities to which the vehicle is designed for	1.2.0.0.0.5 Geographical location of Operational Point 1.2.0.0.0.4.1 Type(s) of track gauge changeover facility (ies)	X		Comparison of the type(s) of changeover facilities to which the vehicle is designed for with the type(s) of track gauge changeover facilities of the intended route.

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Law as Code and.... Code as Law

	A	B	C	D	E	F	G	H	I
1	5/3/2021	ERATV			RINF			Compatibility process	Remarks
2		Index	Name	Data available	Index	Name	Data available		
3	Traffic loads and load carrying capability of infrastructure	4.5.3.1	Static axle load in working order	Yes	1.1.1.1.2.4	Load capability	Yes	How should we compare these parameters? For example: 4.5.3.1 < 1.1.1.1.2.4 4.5.3.2 < 1.1.1.1.2.4 4.5.3.3 < 1.1.1.1.2.4 ?	
4		4.5.3.2	Static axle load under normal payload	Yes	1.1.1.1.2.4.1	National classification for load capability	Yes		
5		4.5.3.3	Static axle load under exceptional payload	Yes	1.1.1.1.2.4.2	Compliance of structures with the HSLM	Yes		
6		4.5.2.1	Design mass in working order	Yes	1.1.1.1.2.4.3	Location of structures requiring specific checks	No		
7		4.5.2.2	Design mass under normal payload	Yes	1.1.1.1.2.4.4	Document with static and dynamic compatibility procedure	No		
8		4.5.2.3	Design mass under exceptional payload	Yes					
9		4.1.2.1	Maximum design speed	Yes					
10		4.8.1	Vehicle length	Yes					
11		4.5.3.4	Position of axles alog the unit (axle spacing)	Yes					
12		4.5.1	Permissible payload for different line catagories	Yes					
13									
14	Gauging	4.2.1	Reference profile	Yes	1.1.1.1.3.1.1	Gauging (only for SOLTracks)	Yes	4.2.1 <= 1.2.1.0.3.4 4.2.1 <= 1.1.1.1.3.1.1	Reference profile must be the same or compatible with the gauging of the track
15					1.2.1.0.3.4	Gauging (only for OPTracks)	Yes		
16					1.1.1.1.3.1.2	Location of points requiring specific checks	Yes		
17					1.1.1.1.3.1.3	Document with specific check procedure			
18									
19	Vertical radius	4.8.5	Minimum convex curve radius capability	Yes	1.2.2.0.3.3	Minimum radius of vertical curve	No	4.8.5 <= 1.2.2.0.3.3 4.8.6 <= 1.2.2.0.3.3	Vehicle minimum radius must be lower or equal to the minimum track radius
20		4.8.6	Minimum concave curve radius capability	Yes					
21									
22	Train detection systems	4.14.1	Type of train detection systems for which the vehicle has been designed and assessed	Yes	1.1.1.3.7.1.1	Type of train detection system	Yes	4.14.1 matches one of 1.1.1.3.7.1.1	At least one of detection systems supported by the vehicle must be available on the tracks.
23					1.1.1.3.7.1.2	Type of track circuits or axle counter to which specific checks are needed	No		
24					1.1.1.3.7.1.4	Section with train detection limitation	No		
25									
26	Hot axle box detection	4.9.2	Axle bearing condition monitoring (hot axles box detection)	Yes	1.1.1.1.7.4	Existence of trackside hot axle box detector (HABD)	Yes	4.9.2 NOT NULL and 1.1.1.1.7.4 == Y	Axle bearing must be monitorible on the vehicle (4.9.2) and an approriate detector must be available on the tracks (1.1.1.1.7.4)
27					1.1.1.1.7.5	Trackside HABD TSI compliant	Yes		
28					1.1.1.1.7.6	Identification of trackside HABD	No		
29					1.1.1.1.7.7	Generation of trackside HABD	No		
30					1.1.1.1.7.8	Railway location of trackside HABD	Yes		
31					1.1.1.1.7.9	Direction of measurement of trackside HABD	No		
32									
33	Running characteristics	4.6.4	Combination of maximum speed and maximum cant deficiency for which the vehicle was assessed	Yes	1.1.1.1.2.5	Maximum permitted speed	Yes	4.6.4 (speed) <= 1.1.1.1.2.5 4.6.4 (cant defficiency) <= 1.1.1.1.4.2 4.6.5 == 1.1.1.1.4.3	Both conditions must be true
34		4.6.5	Rail inclination	Yes	1.1.1.1.4.2	Cant deficiency	Yes		
35					1.1.1.1.4.3	Rail inclination	Yes		
36									

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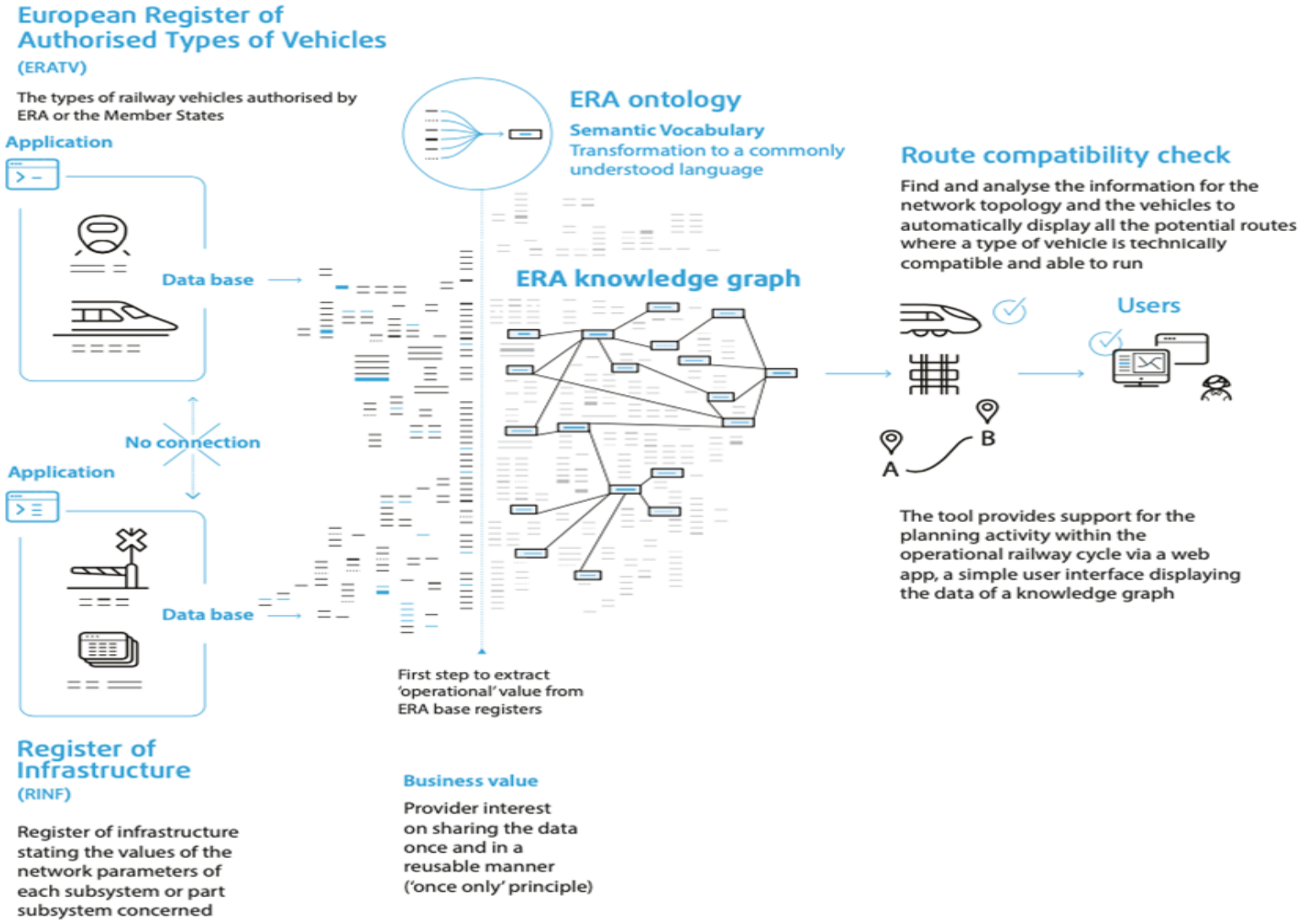
Route Compatibility Check



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Apps Resources

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Via: [PRT] Pampilhosa - PT37002

Add via point

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Track: VD

Track length: 8.112 km

Vehicle: EURO 4000 v España Portugal - 11-063-0001-3-001

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2 Lamarosa

Track: VD

Track length: 6.265 km

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Summary: Compatible: 8 | Need manual check: 0 | Not compatible: 2 | Unknown: 22

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Apps Resources

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Via: [PRT] Pampilhosa - PT37002

Add via point

To: [ESP] SALAMANCA - ES30100

Vehicle type: EURO 4000 v España Portugal - 11-063-0001-3-001

Wheel set gauge	1668	1668mm
Minimum in service wheel diameter	330	991
Minimum Horizontal Radius	551	90
Magnetic braking	not allowed	false
Eddy current braking	not allowed	false
Temperature range (maximum)	45	45

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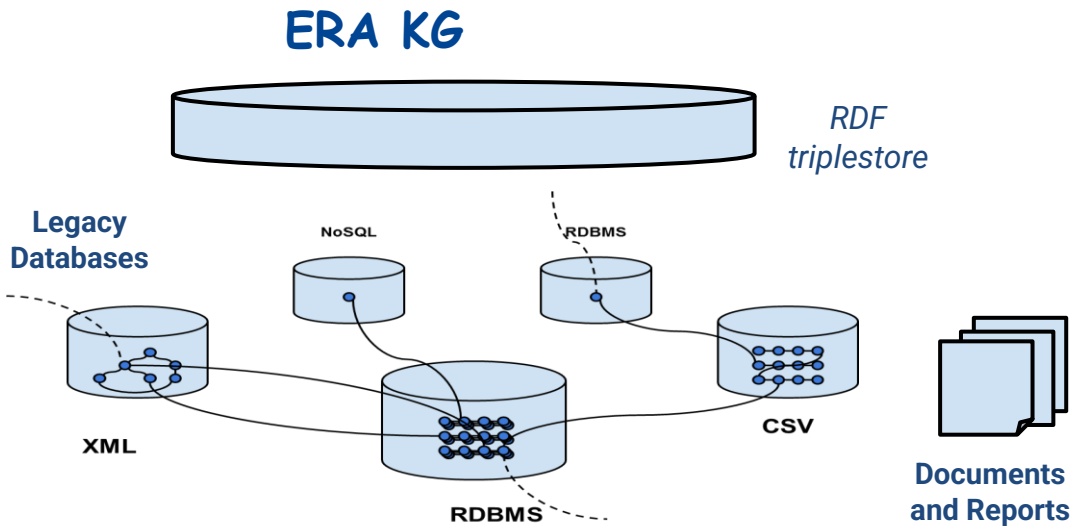
Law as Code and...Code as Law

Interoperability of the rail system	Safety Directive	Single European Railway Area SERA	Rail Freight Corridors (RFCs)	Trans European Network – Transport (TEN-T)

Ontology as an instrument to harmonize law glossary terms and taxonomies in the legal texts

- Organization Interoperability
- Legal Interoperability
- Semantic Interoperability
- Tecnical Interoperability

Linked data *is not a technology is a mindset, an enabler towards data centricity towards* ***knowledge management***



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Rail Ontologies in bloom

2019

Alone in the dessert

2025

Rail Ontologies blooming as Mushrooms

Rail Ontologies in bloom

Ontology Specification

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ERA Ontology. Version 3.0.1

This version:
https://data-interop.era.europa.eu/era-vocabulary/
Latest version:
https://github.com/Interoperable-data/ERA_vocabulary/releases/tag/v3.0.1
Previous version:
https://zenodo.org/records/12205825
Version:
v3.0.1 (released on 2024-06-18)
Publisher:
European Union Agency for Railways
Download serialization:
Format JSON LD | Format RDF/XML | Format N Triples | Format TTL
Browse SKOS thesauri:
Format HTML
Download SHACL shapes:
Format TTL
License:
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Cite as:
European Union Agency for Railways (2024) ERA Ontology. Version v3.0.1. Retrieved from https://data-interop.era.europa.eu/era-vocabu

Ontology Specification Draft

ISS vocabulary

Release: 2023-09-20

Revision:
v1.0.0
Contributors:
Emmanuel Ruffin
Marina Aguado
Publisher:
European Railway Agency (ERA)
Imported Ontologies:
geosparql
skos
Download serialization:
Format JSON LD | Format RDF/XML | Format N Triples | Format TTL
License:
License https://creativecommons.org/licenses/by/4.0/
Cite as:
ISS vocabulary. Revision: v1.0.0.
Provenance of this page

Abstract

This is the human and machine readable Vocabulary/Ontology governed by the European Union Agency for Railways accordance with the draft delegated act of the future CSM ASLP Regulation (hereinafter the 'CSM' or 'CSM ASLP).

Table of contents

- 1. Introduction
  - 1.1. Namespace declarations
- 2. ISS vocabulary: Overview
- 3. ISS vocabulary: Description
- 4. Cross-reference for ISS vocabulary classes, object properties and data properties
  - 4.1. Classes

RSM
railSystemModel

RailSystemModel (RSM) Version 1.2 ext

IRI:
http://ontorail.org/src/RSM/rsm12e#
Date :
13/01/2023
Current version :
v1.2 ext
Authors :
Aby MAGNIEN
Publisher :
UIC https://uic.org/
Other visualisation :
Ontology source

Abstract

RailSystemModel (RSM) provides a structural backbone model
to foster digital continuity across railway domains and business processes
RSM cooperates with Expert Projects in their respective domain/rim for example Eulynx for signalling, ifcRail for BIM process. ...).
Source Model: https://rsm.uic.org/doc/rsm/rsm-1-2/

Table of Content

1. Classes
2. Object Properties
3. Named Individuals
4. Annotation Properties
5. Namespace Declarations

Classes

railML ontology specification draft

railML ontology

language en

This version:
http://ontology.railml.org/railml3#0.6
Latest version:
http://ontology.railml.org/railml3#
Revision:
0.6
Date:
2025-01-21
Authors:
railML.org e.V., Dresden
Contributors:
railML.org ontology working group
License:
railML.org COMMERCIAL LICENSE
Download serialization:
Format JSON LD | Format RDF/XML | Format N Triples | Format TTL
Cite as:
railML.org. railML ontology. Revision: 0.6. Retrieved from: http://ontology.railml.org/railml3#0.6

Abstract

This document serves as documentation of vocabulary of railML ontology v0.6. Vocabulary is not to be used for reasoning or validating purposes. SHACL shapes and RML rules are under review and debugging.

For contributing refer to https://www.railml.org/en/working-groups.html

Table of contents

- 1. Introduction
  - 1.1. Namespace declarations
- 2. railML ontology: Overview
- 3. Cross-reference for railML ontology classes, object properties and data properties
  - 3.1. Classes
  - 3.2. Object Properties
  - 3.3. Data Properties
- 4. References
- 5. Acknowledgments

Eulynx vocabulary. Version 2023-03-09

IRI:
https://ontologies.ontorail.org/Eulynx/eul-230309#
Date:
09/03/2023
Current version:
09-Mar-2023
Publisher:
EULYNX Consortium publishes EULYNX DataPrep at https://eulynx.eu/index.php/dataprep under an EUPL 1.2 license.

Abstract

Extracted ontology from the release 1.2 of EULYNX DataPrep in XMI format.
The EULYNX DataPrep model has been designed to define the format that Infrastructure Managers and suppliers/engineering companies will use to exchange information about signalling engineering and configuration data.
EULYNX is an European initiative by 15 Infrastructure Managers to standardise interfaces and elements of the signalling systems.

Table of Content

1. Classes
2. Object Properties
3. Named Individuals
4. Annotation Properties
5. Namespace Declarations

Classes

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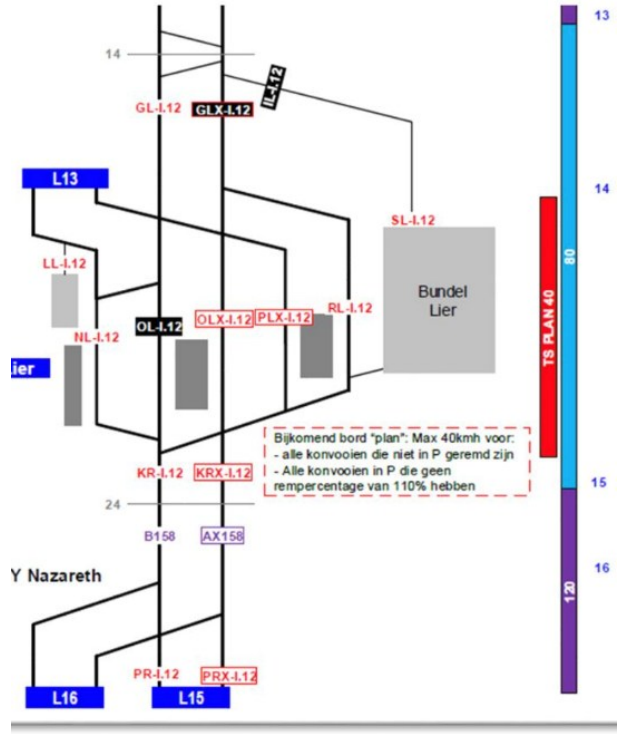
Routebook

IM

Agency's Knowledge Graph

RU



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RINF - Register of Infrastructure

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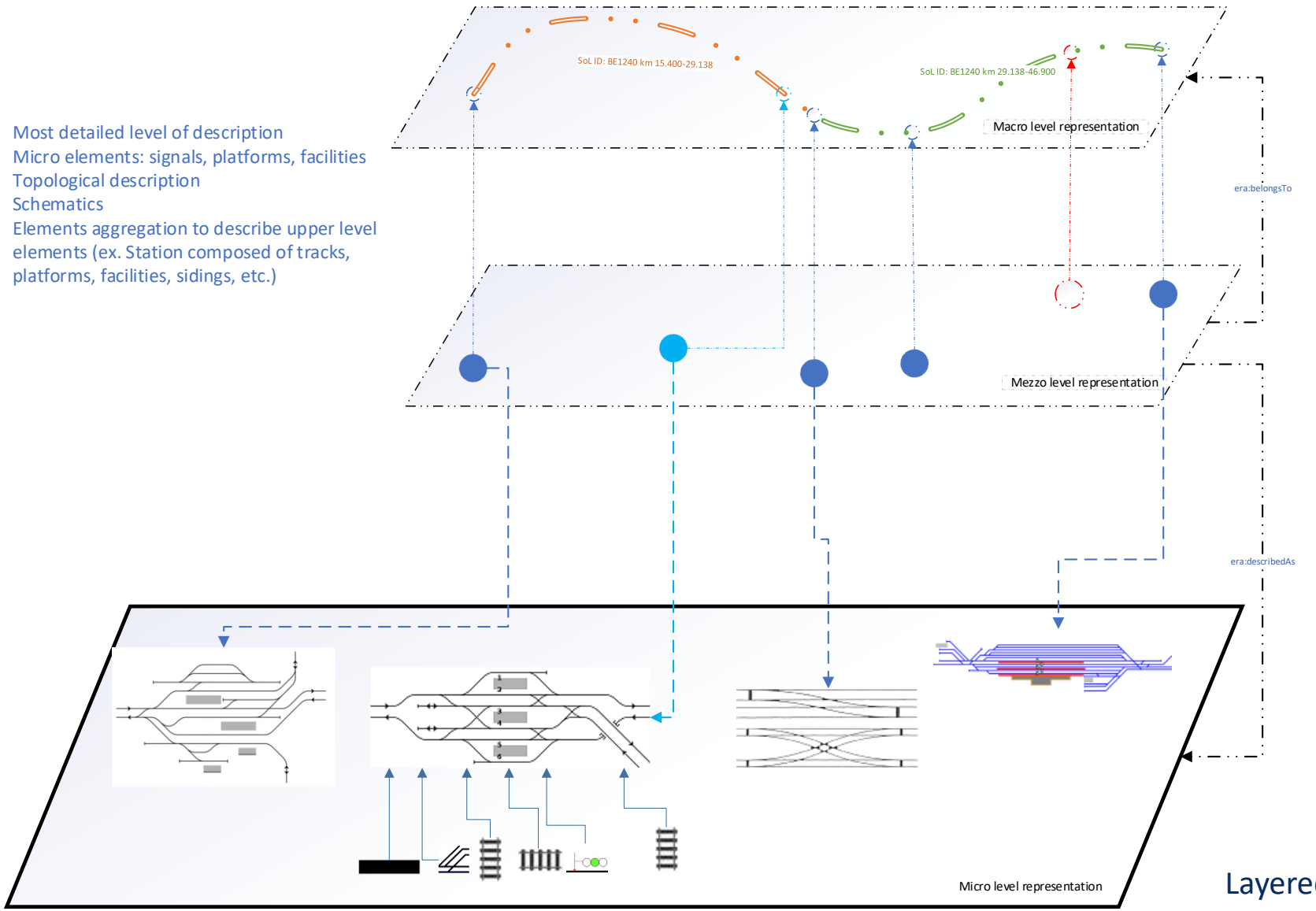
Challenges

Most detailed level of description
Micro elements: signals, platforms, facilities
Topological description
Schematics
Elements aggregation to describe upper level elements (ex. Station composed of tracks, platforms, facilities, sidings, etc.)



Layered view by Dragos Patru (ERA)

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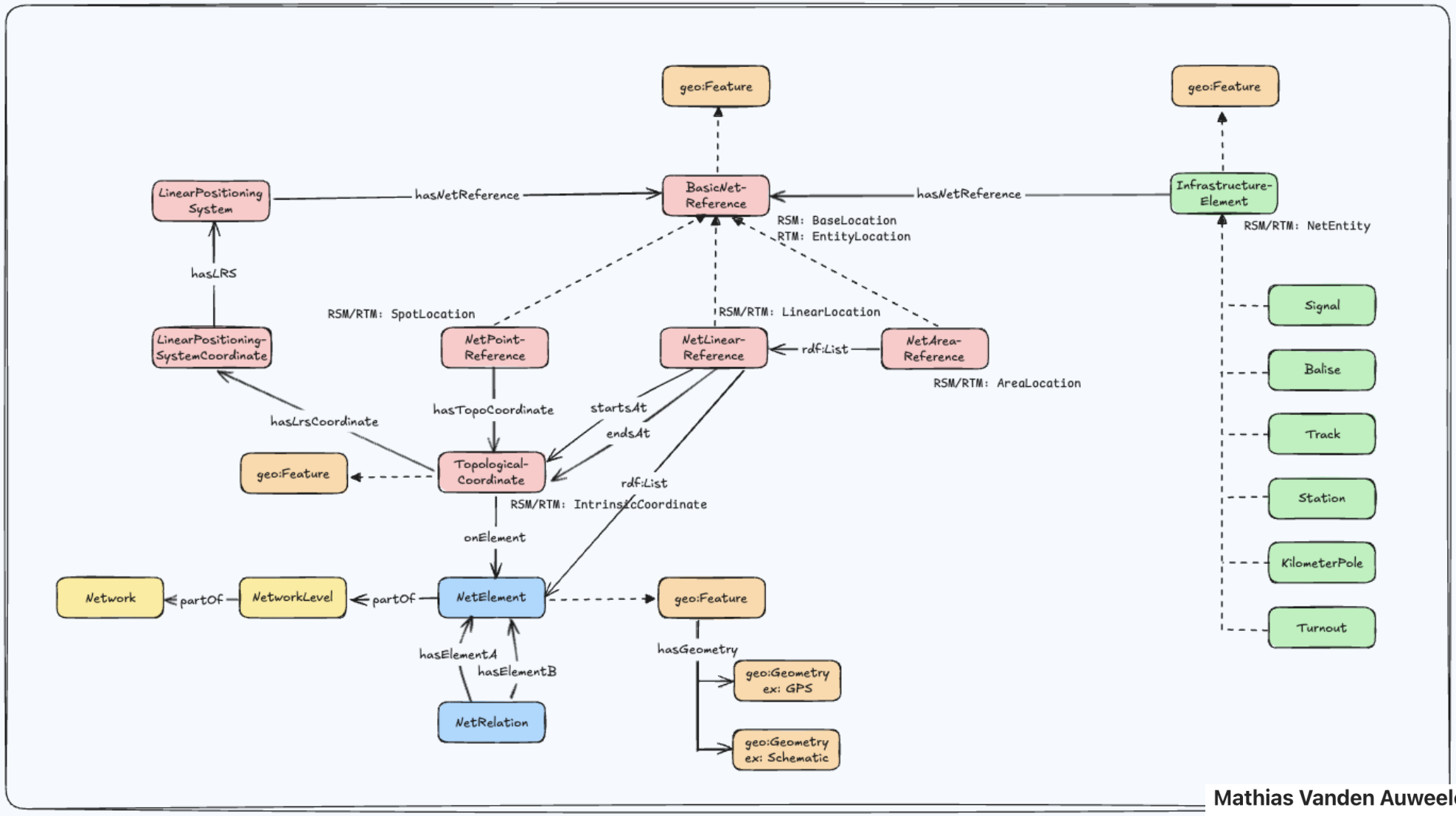
Challenges



Mathias Vanden Auweele
mathias@matdata.eu

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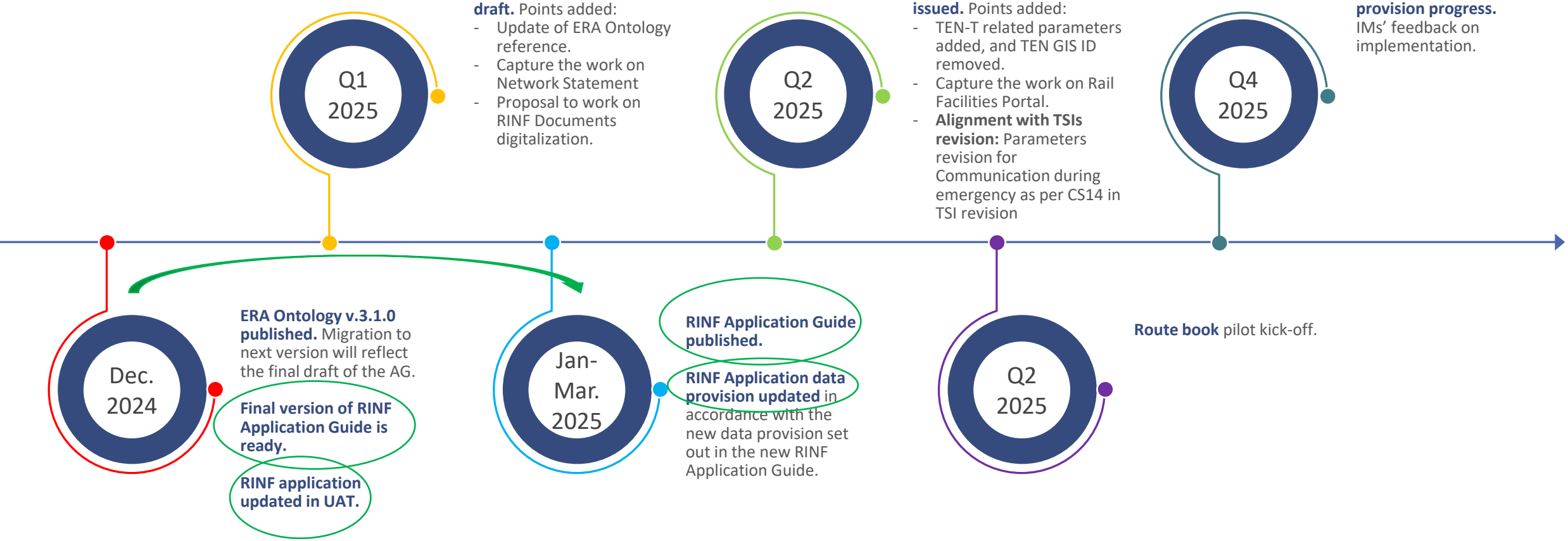
TIMELINE

2024-2025

Finalising the implementation of Commission Implementing Regulation (EU) 2023/1694, with the view to issue an ERA Recommendation to address the finding of the TWGs meetings workstream.



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Following the publication of the latest amended RINF Regulation, the RINF workgroup agreed to work with topical workgroups for the definition of the data presentation for the new parameters.

TWGs meetings

TWGs have been composed by October 2023.

Plan

Concluded before December 2024, so that the RINF AG and RINF application are ready.

Actual

RINF AG is being published on 31st March.

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Status

RINF Application Guide and RINF+ application

Since December 2024,

- Release candidate in **User Acceptance environment**
- Draft RINF application guide draft is available, split in two parts
  1. Technical Annex of RINF parameters in browsable version (HTML) and document.
  2. Document explaining further the RINF implementation
- Draft ontology v3.1.0 presented to CCM Board at kick-off without the need for position.

Targeting deadlines: End of March

- ERA Ontology 3.1.0 submitted to CCM Board for endorsement on 27th March;
- RINF application to production environment;
  - RINF app ready to accept data in accordance with ERA Ontology v.3.1.0 = IMs can provide the data.
  - Route book compilation can be initiated leveraging the data model.

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>162

Parameters defined

Micro-level ontology defined at 2 levels of detail.

ERA Ontology flexible, under control evolution.

Table 1 of parameters is moved to the Technical Annex of the Application Guide, in a browsable version.

~500

Comments adressed, AG on track changes.

~30

ERA Ontology CRs adressed

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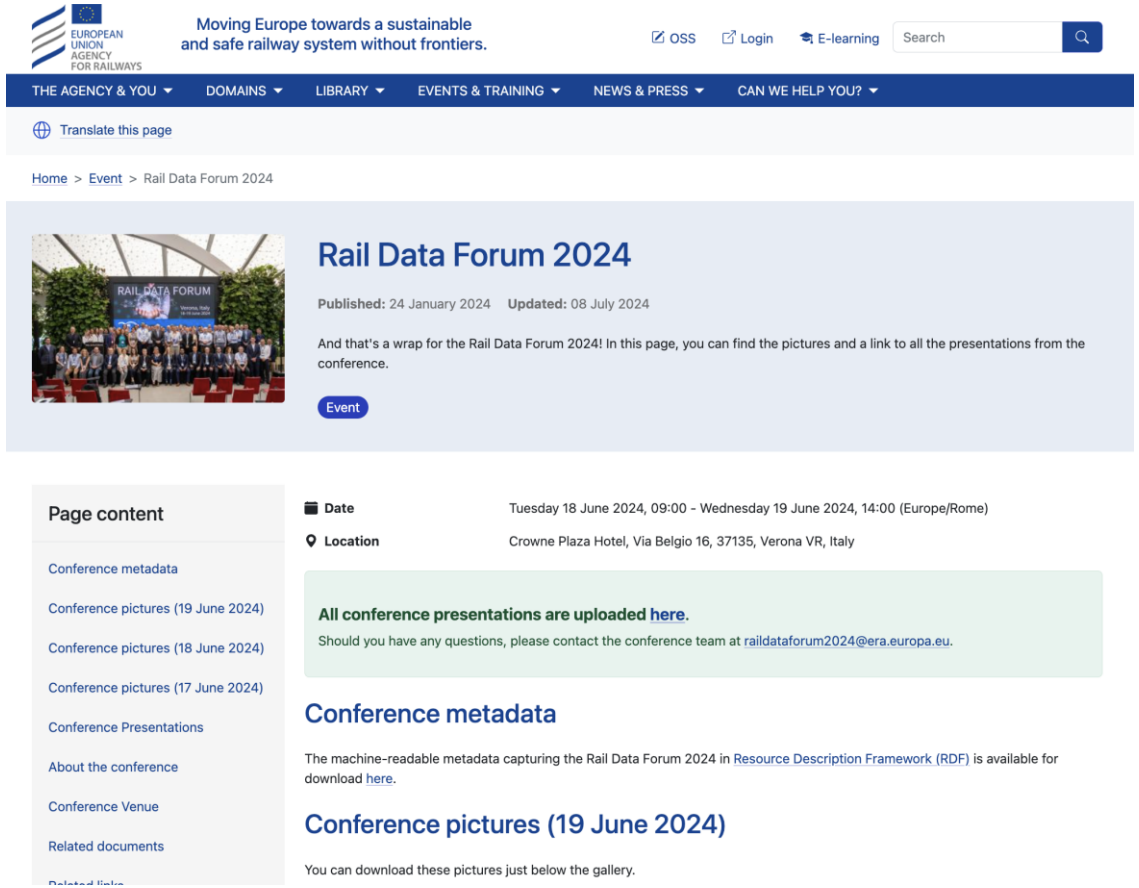
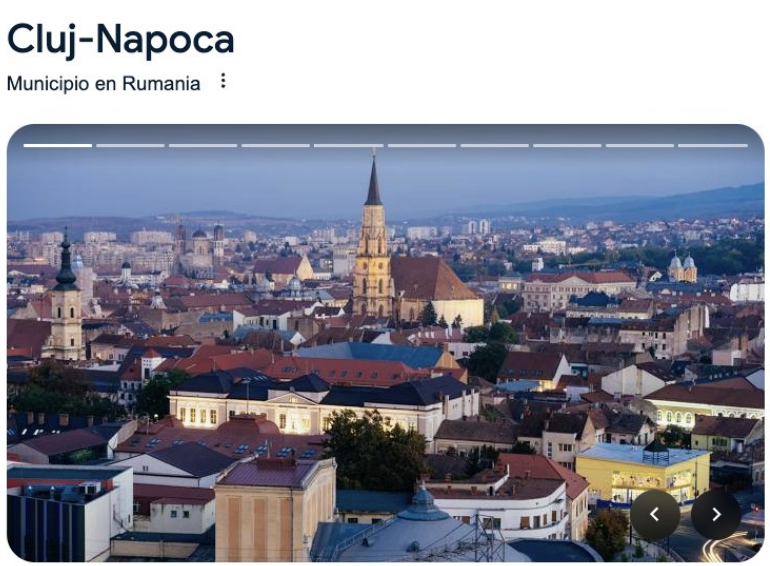
Community Building …



SAVE the date 12th 13TH and 14th June 2025 !!!!



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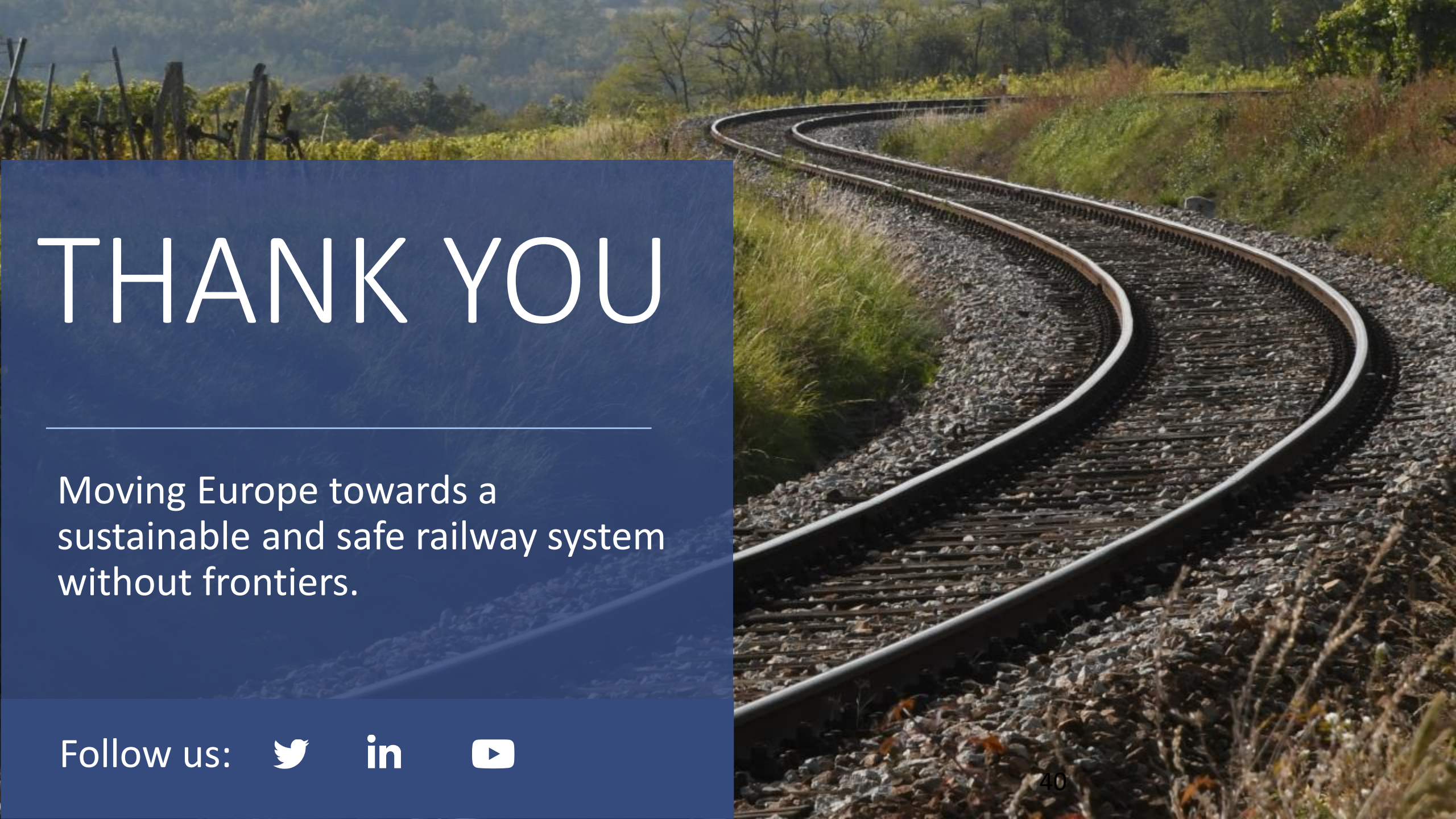

THANK YOU

Moving Europe towards a sustainable and safe railway system without frontiers.

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