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ERA’s vision for data and digitalisation

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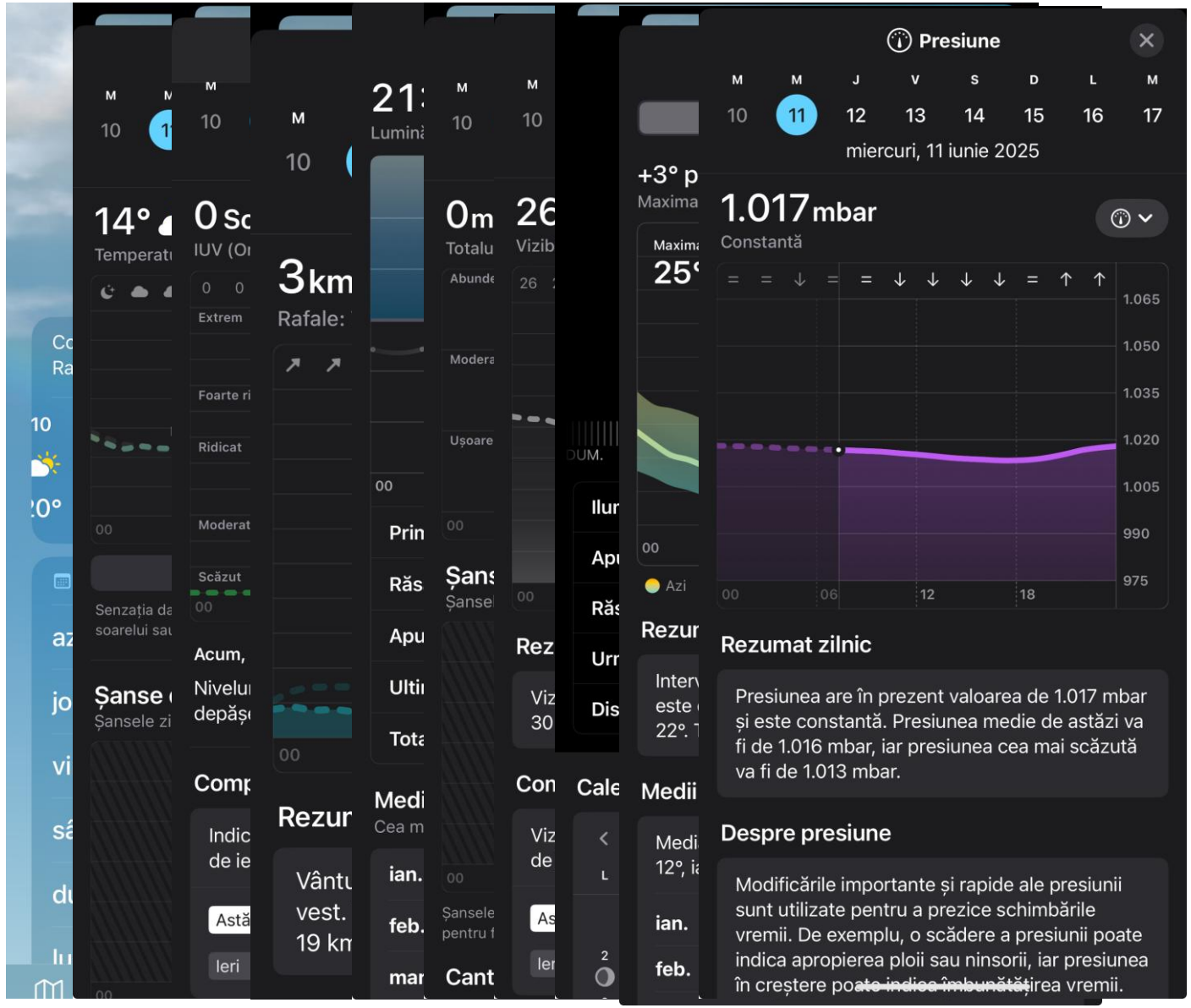
Before we discuss rail… let's discuss data habits today

- Data archeology is gone
- Large quantities of data with few clicks
- Use cases generated on the go

- **No tailored** applications
- **Open** standards
- **No additional code** for new queries
- Same query gives the **same semantics and logic** when I check weather for Warsaw tomorrow



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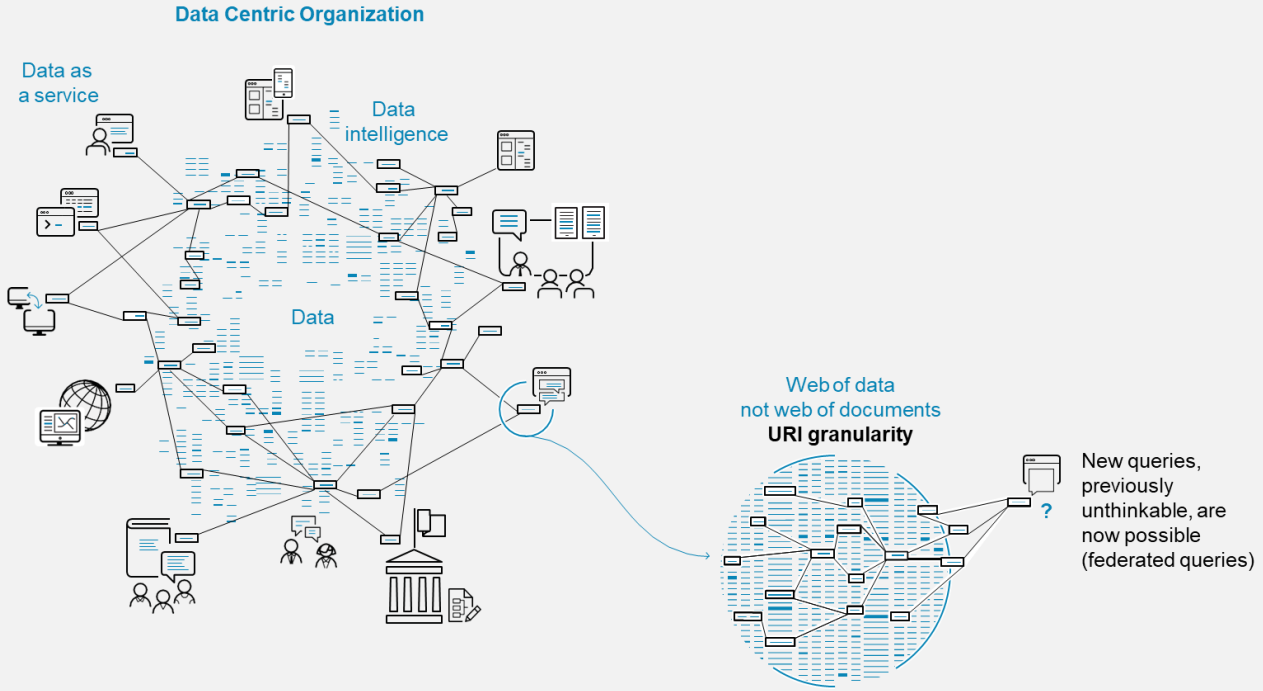
Rail is special.
But rail data consumers are no different than weather data consumers.

What do consumers expect?

- No Agency centricity
- No legislation centricity
- No rail centricity
- Linking datasets across borders and organisations around use cases
- Making data speak the same language, through ontology and semantics
- Having answers to new operational questions without rewriting code. Endless query possibilities with few clicks
- Enabled automation



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At ERA we have been early observers and ada/(o)pters

🚆 1. Standardized Data Representation

Using **ontologies** (ERA Rail Ontology), rail infrastructure, vehicles, and operations can be described in a **machine-readable, standardized format**. This ensures:

- Consistent terminology across countries and systems.
- Easier integration of data from different sources (e.g., infrastructure, rolling stock, safety).

🔗 2. Linked Data for Interoperability

Linked data connects datasets using **URIs** and **RDF triples**, allowing:

- Seamless linking of infrastructure data (e.g., tunnels, electrification) with vehicle data (e.g., train types).
- Cross-border coordination (e.g., France ↔ Romania ↔ Poland) using shared vocabularies.
- Integration with external datasets (e.g., weather, logistics, maintenance).

🧠 3. Knowledge Graphs for Decision Support

Railway knowledge graphs (**ERA Knowledge Graph**) enable:

- Complex queries (e.g., “Which tunnels over 5 km are electrified with 25 kV AC?”).
- Visual navigation of relationships between assets.
- AI-driven insights for planning, safety, and optimization.

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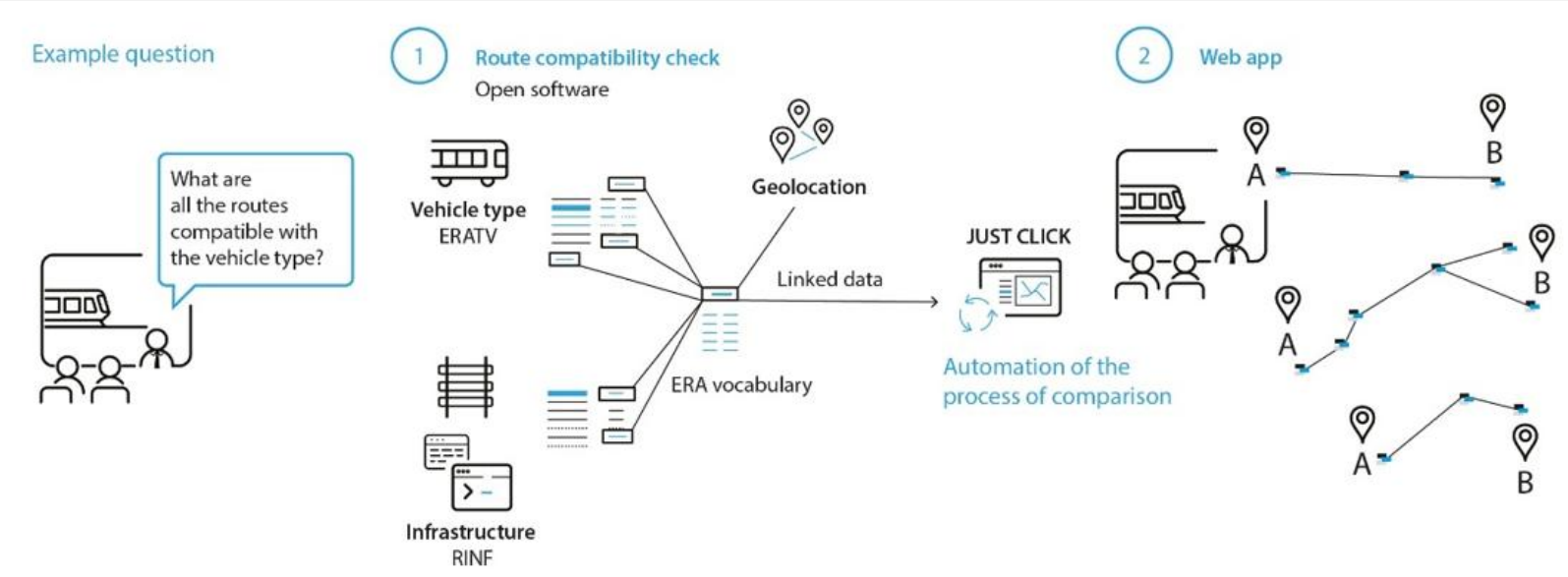
This works in practice (1)
Route compatibility checks



- Is this railway vehicle **compatible** with this route? (i.e., you can check if a vehicle can go from point A to B).
- What **are the requirements** for a vehicle to go on this route? (i.e., you can check the technical characteristics of a piece of railway network, which can be useful in designing a new vehicle type, for example).
- Which route passing by point X can be taken by this railway vehicle? (i.e., you can look for **alternative routes** for a given vehicle).

The ERA knowledge graph covers 27 European countries and describes over 2 000 vehicle types, 270 000 track segments and 50 000 train stations (‘operational points’).

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This works in practice (2)
Rail fact sheets

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ERA Railway Factsheet - Romania

European Union Agency for Railways (ERA)

Version: 2025-01-21

1. Transport statistics
2. Organisations
3. Rolling stock
4. Infrastructure
5. Safety
6. Market
7. Regulatory framework
8. Telematics

Disclaimer

Return to the overview of all ERA Railway Factsheets

Click on ▶ to see the visualisations

1. Transport statistics

	Indicator	Year	Unit	Value	Trend
▶	Passenger transport pkm	2023	million pkm	6151	
▶	Passenger transport modal share	2022	%	4.1	
▶	Freight transport tkm	2023	million tkm	12878	
▶	Freight transport modal share	2022	%	25.4	

Source: Eurostat

2. Organisations

	Indicator	Year	Unit	Value

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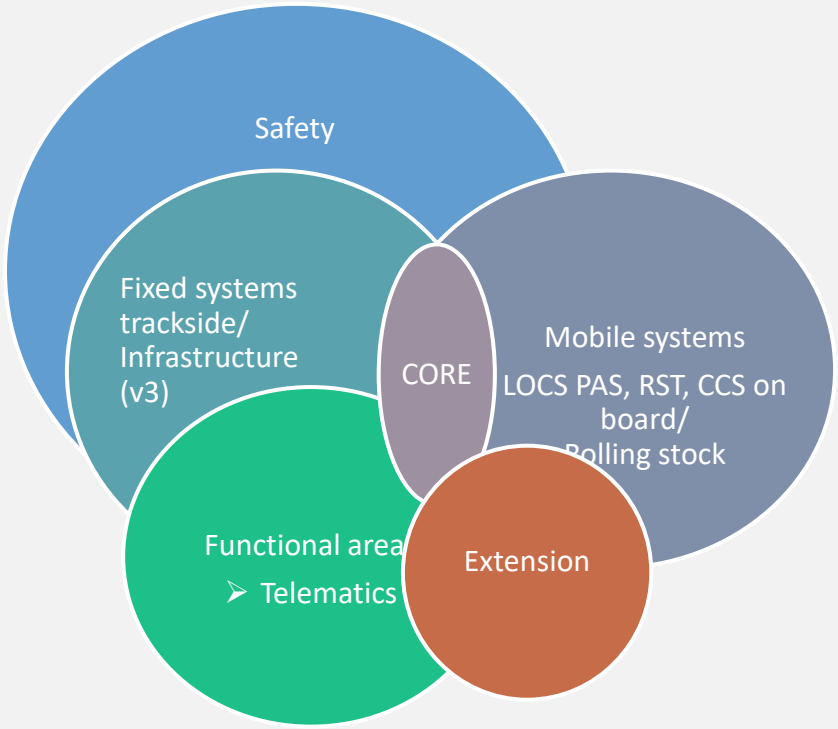
Future of ERA Ontology – a systemic view



Domains vs Registers

- Core:
  - Organizations' data: OCR (mainly)
  - Documents: ERADIS (mainly)
  - Other horizontal concepts: Directives, Regulations, Implementing Decisions, etc.
- Fixed systems trackside/Infrastructure: RINF
- Mobile systems, Rolling stock: ERATV, EVR
- Telematics: Technical documents and common reference data from TAF/TAP TSIs.

"Extension"

- CCS/TMS

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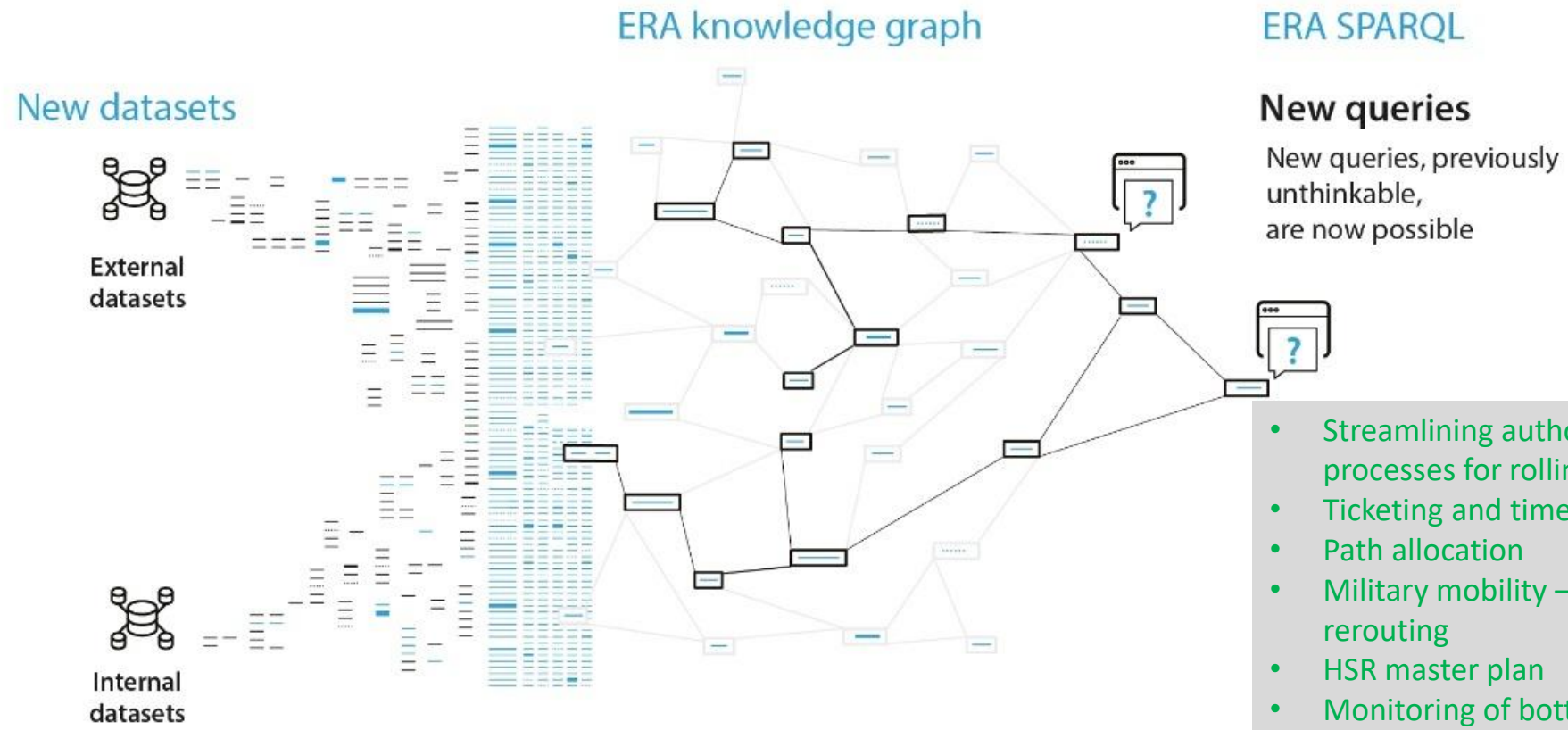
An open world of opportunities



- Streamlining authorization processes for rolling stock
- Ticketing and timetabling
- Path allocation
- Military mobility – routing and rerouting
- HSR master plan
- Monitoring of bottleneck to ERTMS implementation (trackside, onboard)

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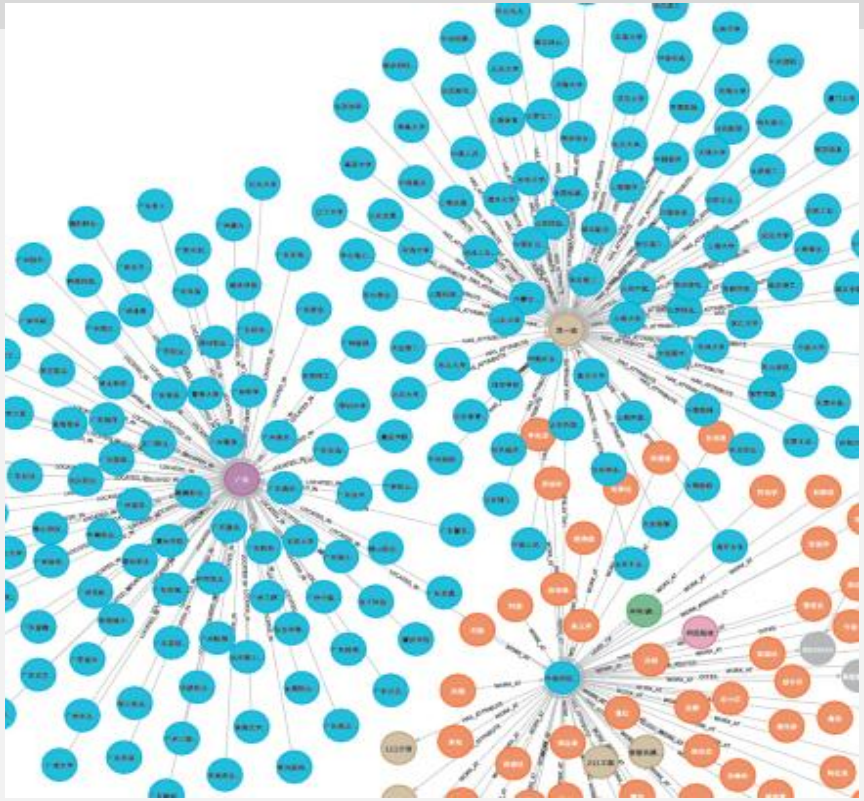
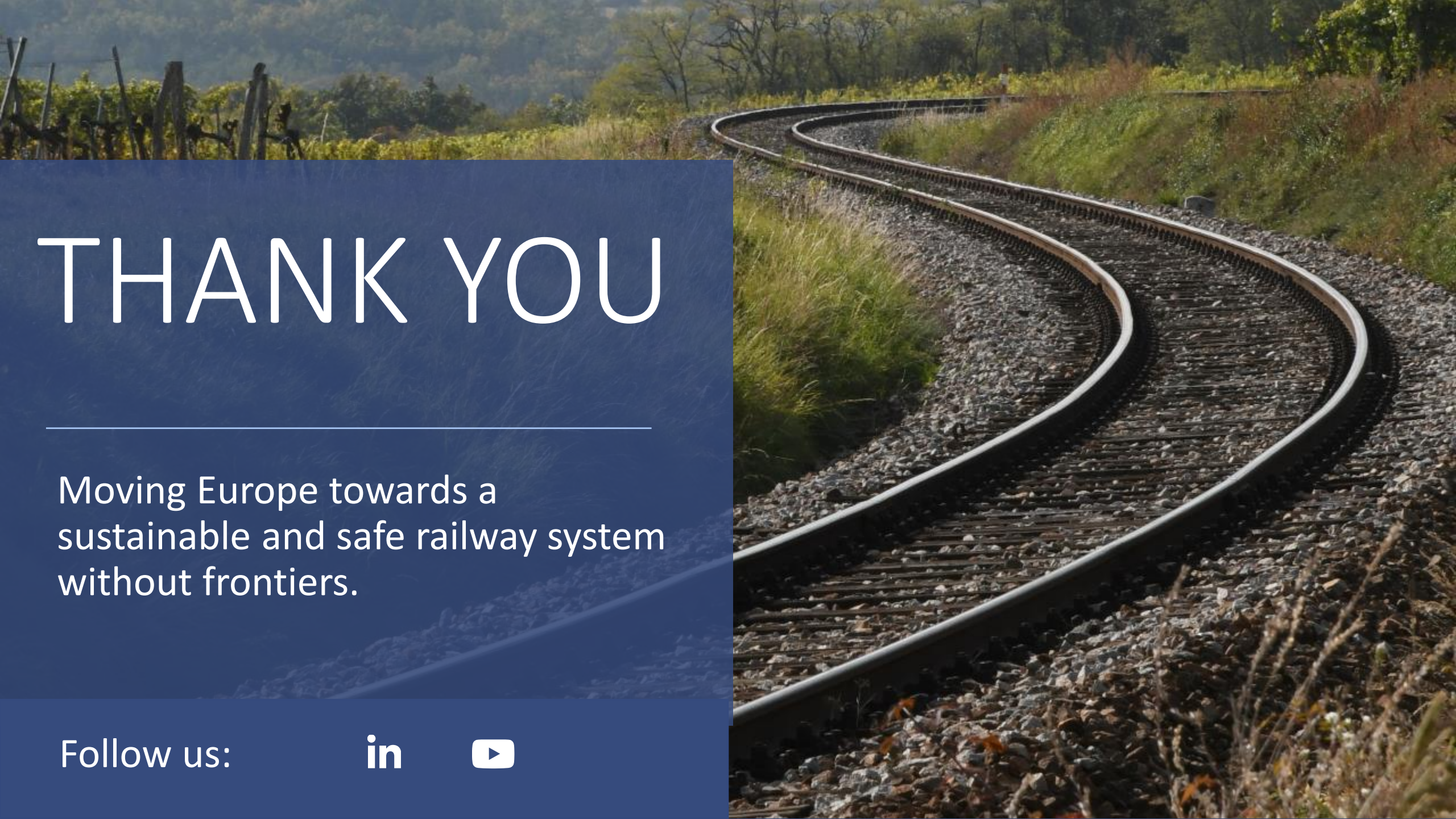
2 important conclusions and 1 caveat

☀️ 1. It does not always rain in Valenciennes

🚆 2. Rail is pioneering in semantics technology.



🔗 3. Data completeness and data quality are key



THANK YOU

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

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