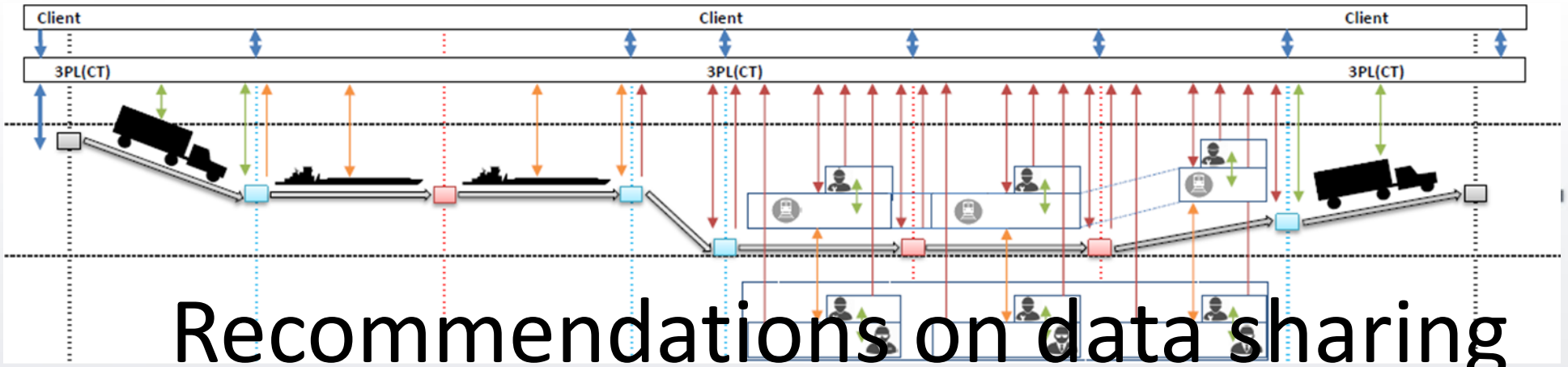



# Recommendations on data sharing

SMART RAIL

**Towards a system-of-systems for data sharing in rail freight**

Wout Hofman (TNO)

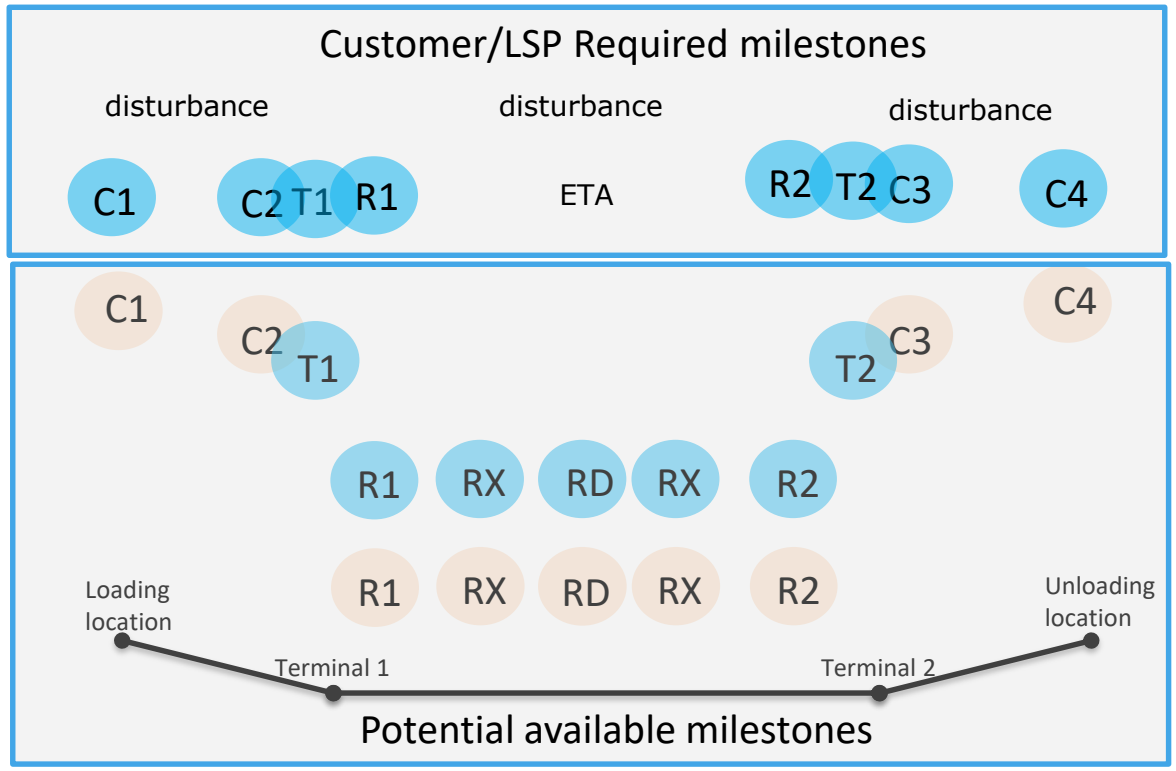
# Recommendation to (rail) freight logistics

Create a system-of-systems based on
- Open standards!
- (Where possible) supported by regulations
- Organisations:
  - register and connect once to a system (platform) of choice
  - Need for protocols between systems/platforms

This presentation will explain how we got to this recommendation
- What have we done – data sharing implemented in two ways (Seacon and blockchain)
- Rail freight as part of (multimodal) logistics chains

.. and what these recommendations consist of.

# The objective of Seacon: visibility and predictability to reduce costs by preventing fines and synchronize processes




Terminal/Private IM

Railway Undertaking

Infrastructure Manager

Legend

C1: loaded
C2: Arrived at terminal
T1: Loaded on train
R1: Train departed

R2: Train arrived
T2: Discharged
C3: Departed from terminal
C4: Unloaded

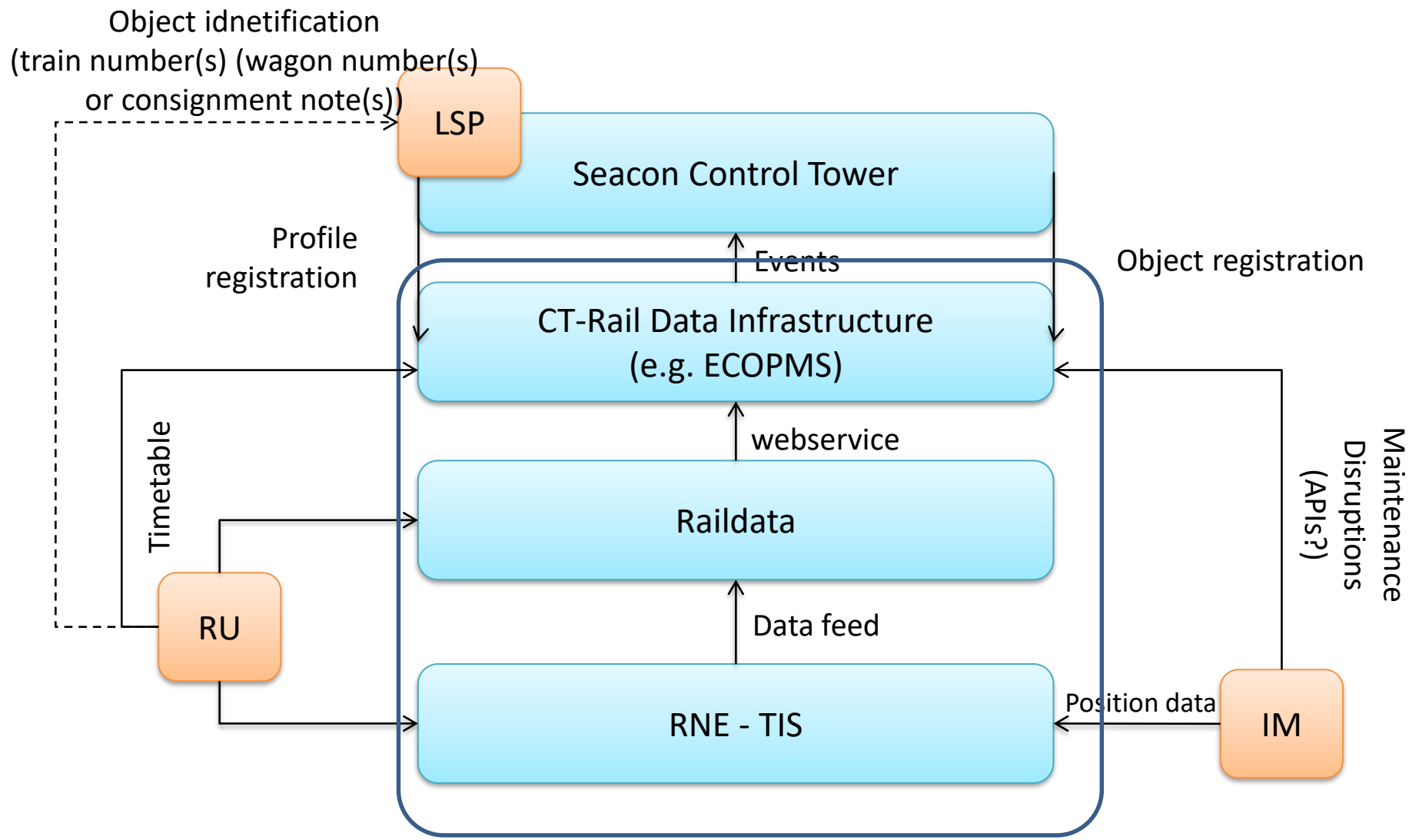
CD: Carrier disruption
TD: Terminal disruption
RD: Rail disruption
RT: Real-time information
RX: Predefined Critical points eg border crossings

# Implementation on multiple corridors planned

- Corridor 1 Bettembourg – Le Belou
  - 2-3 connections/roundtrips per day
  - Long distance pre/end haulage (Netherlands – Spain)
  - Reliable and visibilty crucial for both pre/end haulage and rail haul
  - Mixture of FTL and LTL shipments
  - Fast and short communication on events has large impact on  LTL optimization
  - IT departments of Terminal and RU are sequencing/designing milestone interfacing, first data is captured

- Corridor Rotterdam-Venlo
  - 23 connections/roundtrips a week
  - Impact on tens of thousands shipments on annual basis

# Objective – re-use of existing data sources



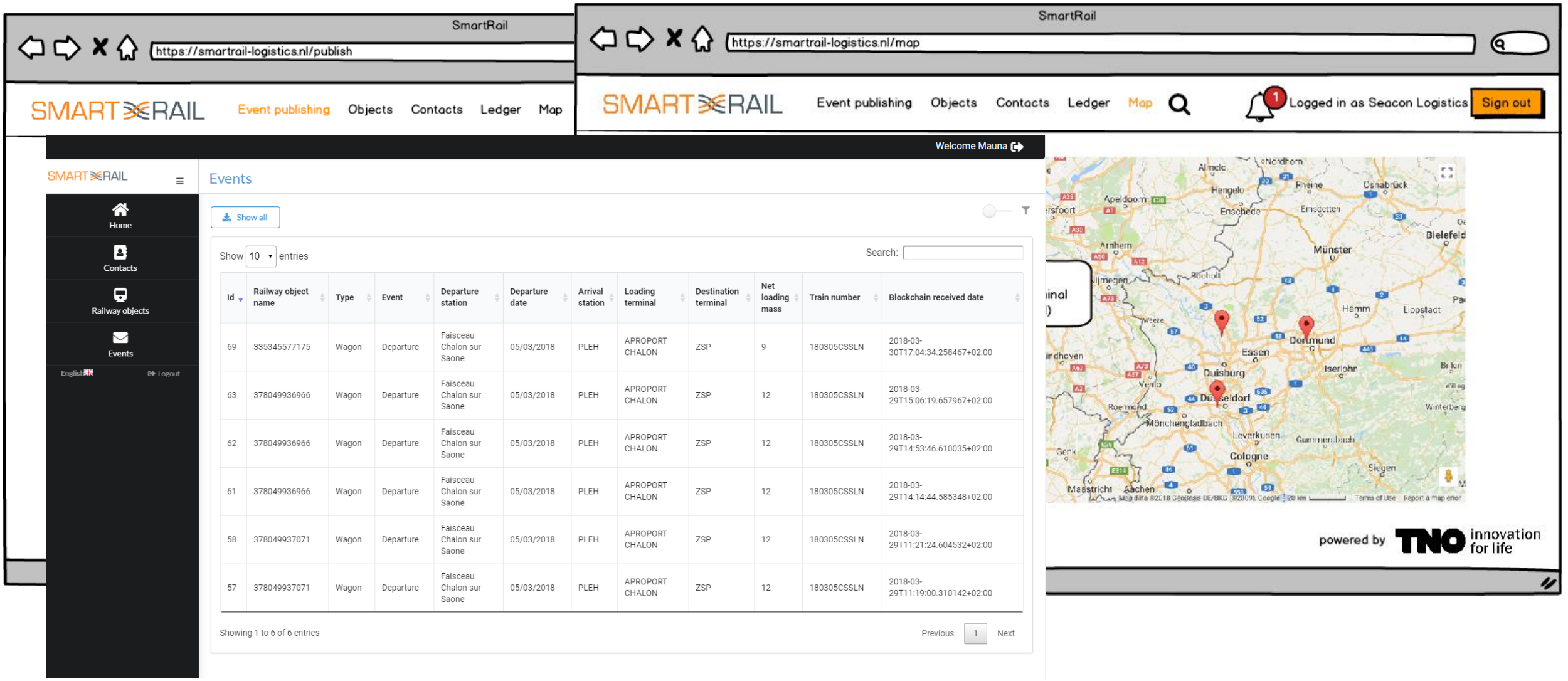
# Recommendations

- Need for an open standard for visibility (semantics and interactions) implemented by various stakeholders (RUs, IMs) and systems (RNE TIS, Raildata)
  - Alternative – attach own tracking devices to cargo, use satellite or mobile communication, and create a proprietary solution
- Dynamic governance structure requires clearly specified data governance rules and mechanisms
  - Alternative – proprietary solutions with ad hoc data governance rules

# Generic requirements for on-boarding of other customers

- Granularity: cargo-wagon-train
- Economic sensitivity: hide trade relations
- Open logistics network: multiple LSPs/customers alongside these corridors
- Trust: identity and authentication
- Data quality: correctness and completeness of published data

# Based on APIs, applications can be developed



# Potential blockchain applications

- Shippers/consignees, LSPs, RUs, IMs
  - trigger payment for rendered services based on agreed rates and conditioins (‘smart contracts’)
  - process synchronisation for improved visibility of goods flows, cost reduction, stock management, production planning, ….
- LSPs, RUs, IMs
  - Bottleneck/delay analysis
  - Dynamic Quality of Service including maintenance and disruptions
- Intermediairs (like LSPs)
  - focus on synchro-/multi-modal planning
  - Maintenance based on mileage, etc.
- RUs
  - publication of timetables and spare capacity
- IMs
  - dangerous cargo details integrated with visibility
  - Bottleneck analysis
  - Wagon maintenance, etc.
  - Available/not used paths

# Observation: current blockchain initiatives create the legacy of the future!

BIGCHAINDB

BLOCKSTACK

aws

ethereum

HYPERLEDGER FABRIC

Quorum

IOTA

HYPERLEDGER

RCHAIN COOPERATIVE

The Coco Framework
Powered by Microsoft

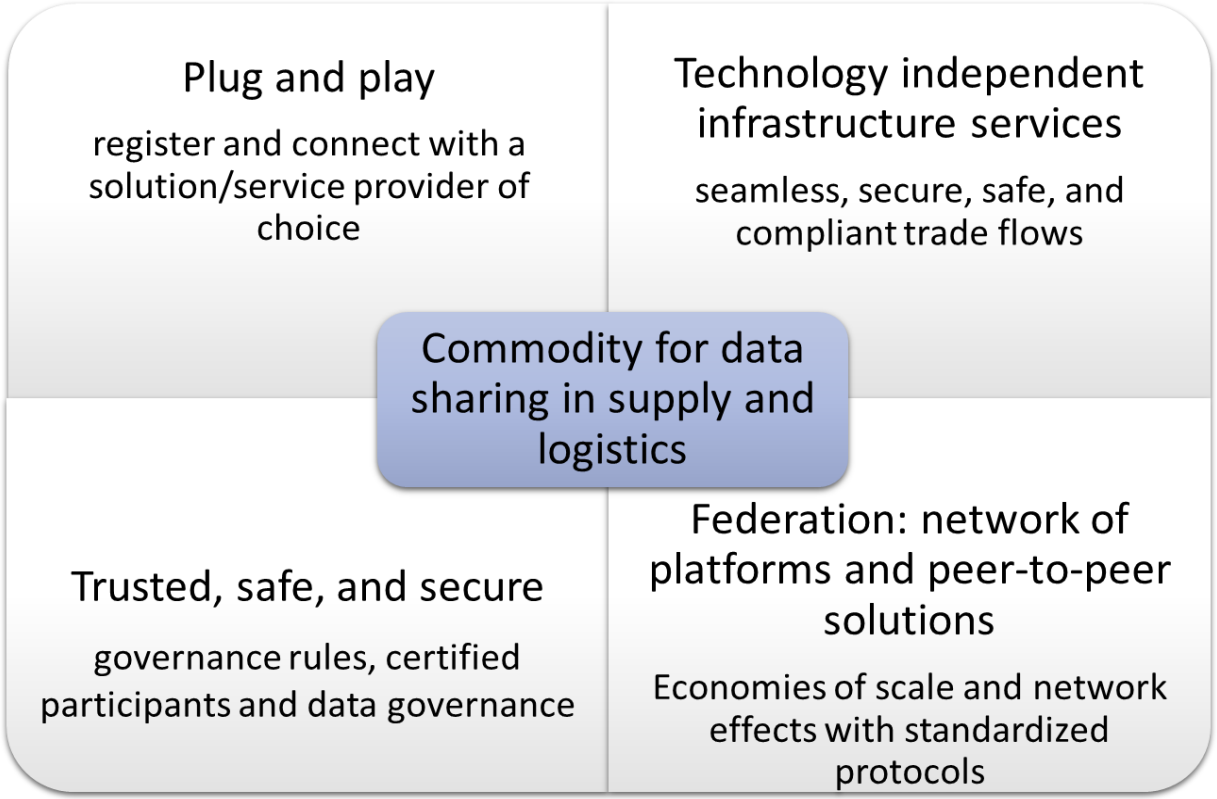
Semantic differences.
Differences in functionality.
Different technology.

# Some observations

- We have many (dynamically/synchromodal planned) business scenario's with a large number of stakeholders involved
  - open organizational network
- … and many different systems for different purposes
  - Specific to a modality like rail freight or (deep)sea transport
  - Regional systems like Port Community Systems
- ..with different technology and governance structures
  - Technology: blockchain, integration systems, etc.
  - Governance of the solution: single stakeholder (proprietary), commercial, community, authority
- .. , overlapping functionality
  - visibility, marketplace, booking/ordering)
- … , different data governance structures
  - Membership, static relationships, data push mechanisms (messaging)
- …, and different (implementations of) data standards

# We can create more, or develop open standards

- Challenge 1 – how to overcome proprietary implementations of open standards
  - Proposed solution – create a commodity for (rail) logistics data sharing like the Internet




Source: Digital Transport and Logistics Forum (2017)

- Challenge 2 – what type of governance is required?
  - Individual solutions – each have their own governance structure like Internet Service Providers
  - Commodity – a governance structure like the Internet
- Challenge 3 – what open standards are required?

# Challenge 2 – recommendation for governance

| | Legal code | Technical code |
|---|---|---|
| Privately governed | VISA rules<br><br>FOSFA rules (commodity trading)<br><br>Rotterdam -/the Hague-Visby Rules (sea transport) | Open (defacto) standards like UN/CEFACT<br>Proprietary - , commercial -, and community solutions<br><br>Bitcoin<br><br>Different technologies (push, pull, blockchain, …) |
| Publicly governed | Directive on the interoperability of the rail system<br><br>Directive on railway safety<br><br>(Framework) Reporting formalities Directive<br>…. | Internet protocols<br><br>TAF TSI (RU-IM), RNE<br><br>Service to customers as a basis for SmartContracts or APIs<br><br>Protocols (implemented by Smart Contracts) |

**Recommendation – publicly produced technical code, supported by publicly produced legal code**

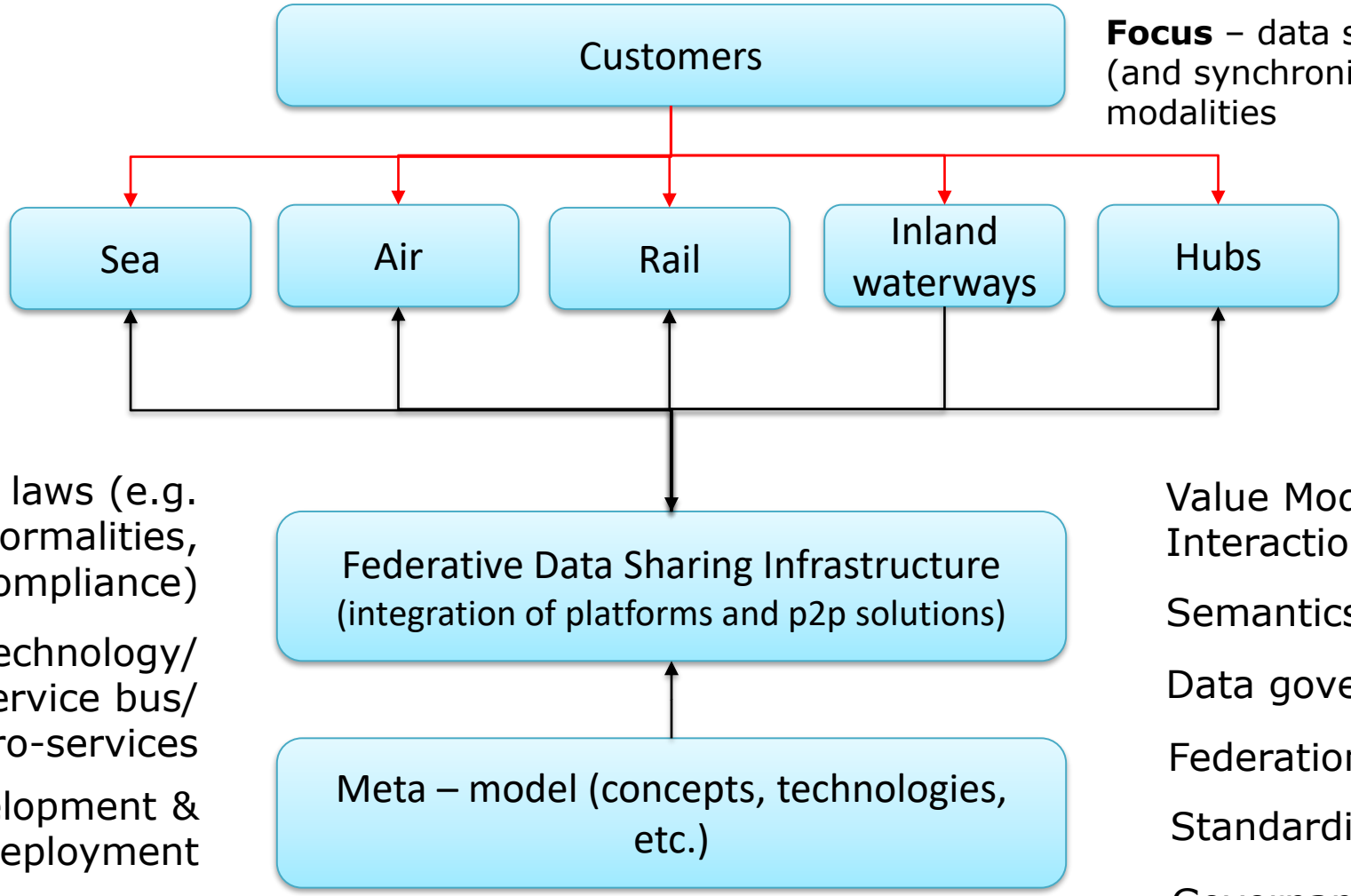
# Towards challenge 3 – open standards

- Main question:
  - Can we (do we need to) develop publicly governed solutions (legal – and technical code) as a basis to develop privately governed solutions to construct a system-of-systems?

- Additional questions on the solutions:
  - What is the **scope** of these solutions (functionality)?
  - What is their **scale** (EU, global)?
  - Which **organization**(al structure) needs/is able to develop them?

- Constructing a grand design by bottom up development with differences in innovation speed
  - How can **organisations** be supported in their need to innovate during development of these open standards?
  - Is it possible for **rail freight** to progress developments or re-use those of others, and align with other stakeholders lateron?

# Towards challenge 3 – standardize on the meta-model to support distributed innovation




**Focus** – data sharing with customers (and synchronization amongst modalities

Domain laws (e.g. Reporting formalities, compliance)

Blockchain Technology/ Enterprise service bus/ Micro-services

Software development & deployment

Identity

Value Modelling and Interaction patterns

Semantics (ontology)

Data governance

Federation protocols

Standardization

Governance

# Summary of recommendations

Create a system-of-systems based on

- Open standards (meta model)!
- Increase of data quality (open source for data validation)!
- Procedures for re-use and alignment of models used in implementation → different innovation speeds
- (Where possible) supported by regulations
- Public governed
- Individual organisations:
  - Register and connect once to a system (platform) of choice
  - Need for protocols between systems/platform
- Trust and identity!
- What is the role of existing organizational structures, systems, …?

# Final

- Supply and logistics is an open, organizational network
- Rail is a mode of choice as part of dynamically planned, resilient global supply chains.
- What is the role of existing organizational structures, systems, …?

**Questions**

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