RAILFREIGHT FORWARD
EUROPEAN RAIL FREIGHT VISION 2030

20th Florence Rail Forum

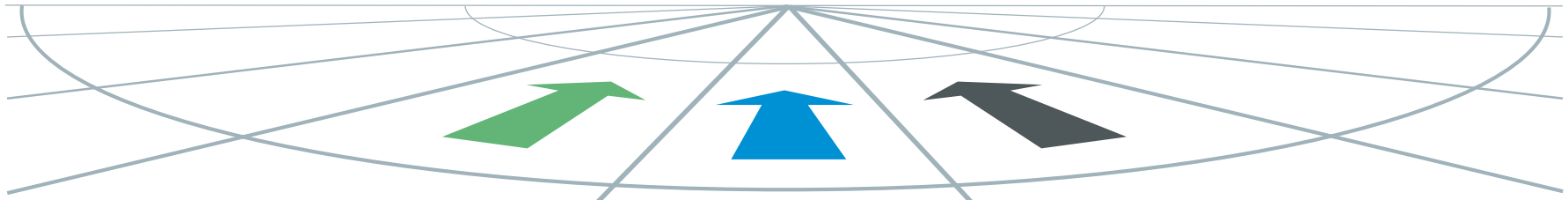
An RU perspective on
European Digital Capacity Management

Ulla Kempf | December 8th, 2020

The RFF coalition has committed to a rail model share of 30% by 2030 for which implementation of enabling key technologies is needed

Fields of action – Rail Freight Forward

30% rail freight modal share by 2030



1

RUs offer superior innovative products to seamlessly integrate into the value chain of customers

Automation and digitization
- Digital Automatic Coupling (DAC)
- Digital Platforms (DP)
- Autonomous Train Operations (ATO)

2

IMs need to provide sufficient capacity and service that makes running international trains "as easy as running trucks"

Technical harmonization, digitization and capacity expansion
- Harmonized ERTMS Level 3 rollout
- Digital Capacity Management (DCM)

3

Authorities need to provide level playing field for rail

Ensuring a level playing field,
provision of financing
- R&I
- Deployment

bls cargo · TX Cargo · CFL cargo · DB · green cargo · LINEAS · SBB Cargo · SNCF LOGISTICS · ZSSK CARGO · CER The Voice of European Railways

MERCITALIA RAIL · LTE logistics & transport · OST-WEST LOGISTIK · PKPCARGO · Rail Cargo Group · renfe Mercancías · VDV Die Verkehrsunternehmen · ERFA · UIC · FTE FORUM TRAIN EUROPE · CIT

RAILFREIGHT FORWARD

Capacity is the most expensive recourse we have in rail freight and therefore to be used most efficiently

Capacity alignment is only a first step to foster international rail freight

To ensure European rail freight flows in the future, the sector needs

- a European capacity model defining required freight transport capacity along the vision of modal shift

Dimensioning I

- international capacity coordination between national MoTs/ IMs/ABs guaranteeing harmonized capacity in
  - Trains per hour
  - with defined times at neuralgic locations (e.g. border crossings)

Planning II

- new capacity allocation rules on routes with capacity shortage according to defined capacity needs (today passenger traffic has a systematic advantage, pre-arranged corridor paths are not sufficient for international transport needs)

Safeguarding III

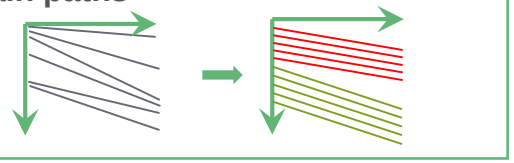
RAILFREIGHT FORWARD
EUROPEAN RAIL FREIGHT VISION 2030

European Digital Capacity Management provides an up to today unused lever to sector efficiency

Levers and Benefits through the means of Digital Capacity Management

Levers

1 Harmonization and bundling of train paths



- **Higher supply of capacity** on current infrastructure: ~+4%*

2 Optimization of train paths based on pre-constructed train path snippets

- **Less travel time:** ~ - 6% due to optimized train path*

Benefits

Infrastructure Managers (IM) | **Railway Undertakings (RU)**

More transparency on available capacity

Enables implementation of **long-term timetables and TTR (Time Table Redesign)**

Higher efficiency due to **automatic time tabling** and **train path assignment**

15% better utilization of drivers and locomotives due to optimized round trips and reduced synchronization times at borders**

10% energy savings due to less energy – consuming stops for rail freight**

Easy and simple access to optimized train paths across Europe

Automated, standardized interfaces

*source: use case DB Netz AG, SBB

** source: RU estimation based on use case DB Netz AG, SBB

RAILFREIGHT FORWARD

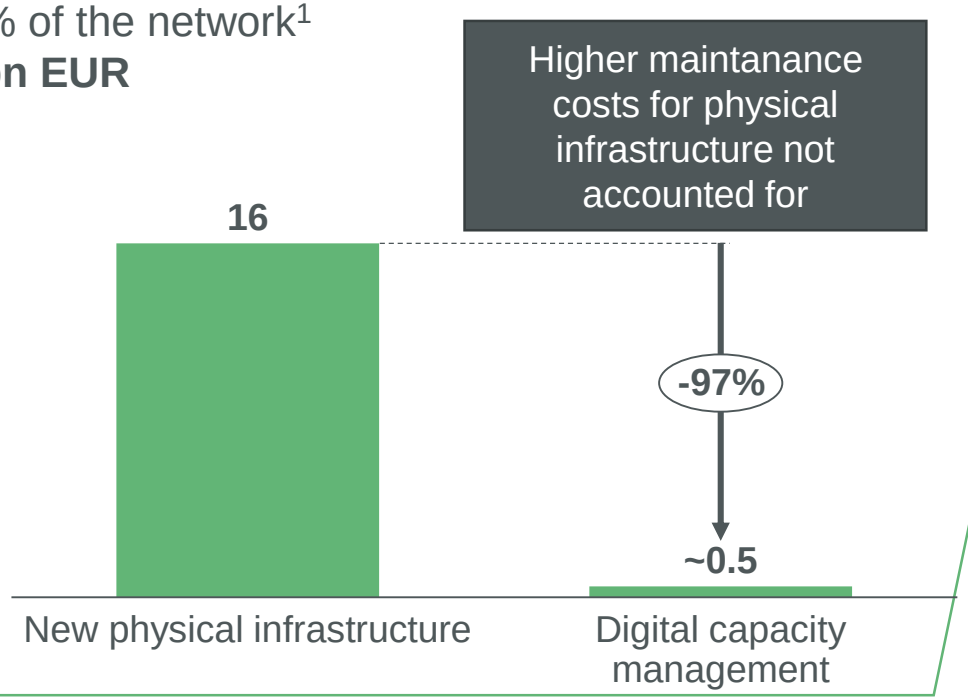
Investment in Digital Capacity Management is equal to investment in physical infrastructure

ROUGH ESTIMATE

Efficiency of Digital Capacity Management

High efficiency of investment in Digital Capacity Management (DCM)

Initial investment for capacity increase of **4%** on 50% of the network[1] in **bn EUR**



Investment of roughly 500 Mio. EUR[2]

- Cost of connecting all 10 European countries (IMs and Rus) on the main freight corridors to DCM – first validation bottom-up by IMs and RUs
- Funding for upgrading of IT needs to be provisioned for each individual country

Investment with same effect as actual investment in new physical capacity

- Implementation of DCM with significantly lower lead-time than investment in new tracks
- Current financing model, leave IMs with little incentive to provide pan-European Digital Capacity Management
- Digital Capacity Management in Germany was treated as investment in physical infrastructure and consequently financed by corresponding means

[1] Current European Railway net: 270,000 km, cost for additional capacity: 3 Mio. EUR/km
[2] The study “TTR migration concept and IT landscape” refers to 675 Mio. EUR, including costs for countries, which are not part of the first wave

SERA requires a harmonized European Digital Capacity Management, the opportunity to set this up is right now

Create tools and data that enable to develop and make use of capacity as a the European good it is

European rail capacity management is a key obstacle to deliver on successful growth of the rail sector

- **Todays management of capacity outdates…**
  - Heterogeneous and dispersed systems and processes for capacity management in Europe
  - 28+ legacy infrastructure management systems in Europe
- **…leading to “technically possible” instead “best” result**
  - Waste of capacity due to manual “make to order train paths that can not be optimized due to technical and timely restrictions
  - Suboptimal (cross-border international) train paths for freight
  - Long and not synchronised lead times for booking of train paths

… and therefore urgently needs updating to become digital

- Standardized interfaces and processes: implementation of TAF – TSI as scheduled until 2026
- Comprehensive digital representation of infrastructure for SERA
- Replacement of slow made-to-order processes with digitized, industrialized processes
- Step-change in process quality in terms of conflict elimination (e.g., infra works), speed, etc.
- Full transparency on capacity for multi-annual capacity modelling and rolling planning
- Easy allocation of integrated train path including international harmonization
- Providing means for more efficient investment targeting

Source: DB Netz AG, SBB

DCM shall be developed across Europe in stages – accompanying the first wave of TTR in Central Europe

Most beneficial roll-out of DCM

	Phase 1: Staged implementation of DCM	Phase 2: Full implementation in SERA
Timing	~ 2025	2030 latest

- Introduce DCM in all countries, that are part of the first wave of TTR implementation along corridors (excluding Spain, due to different track gauge)
- Focus on capacity bottlenecks

- DCM in 28+ countries for comprehensive infrastructure representation
- Algorithmic optimization with focus on countries with capacity bottlenecks

Rollout Phase 1 PROPOSAL

General principles

- Introduce DCM first in countries with highest network density (number of train paths, capacity restrictions)
- Apply DCM optimization logic in each country
- Add additional bordering countries until all countries are connected

Implementation in hand with existing TTR program led by RNE and supported by FTE

- DCM Migration Concept is based on and in line with the existing TTR Concept
- Project is organized by RNE and participation is open for all IMs/ABs
- Those IMs/ABs not participating in the first implementation wave will have the possibility to join at a later stage
- Financial and all other resources necessary for implementation must be made available

RAILFREIGHT FORWARD

RAILFREIGHT FORWARD 2.0

EUROPEAN RAIL FREIGHT VISION 2030

Contact:

Ulla Kempf | SBB Cargo International AG

ulla.kempf@sbbcargoint.com

Digital Capacity Management industrializes the process of rail path planning and assignment

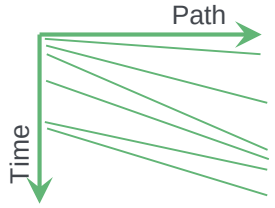
ILLUSTRATIVE

Steps in systemization of capacity management

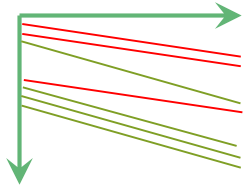
Digital Capacity Management

Increase of capacity

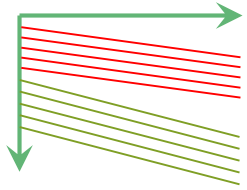
Manual train path planning & assignment



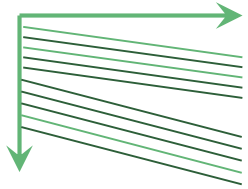
Standardized characteristics of train paths



Bundling of standardized train paths



Booking of pre-constructed train paths



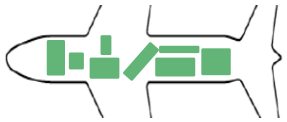
Make to order
- Every rail path constructed and assigned upon demand
- Long lead times and high usage of capacity

Standardized train path construction
- Standardized train paths (i.e., fast and slow) for different train characteristics

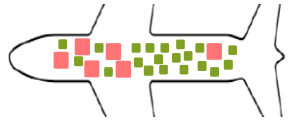
Assemble to order
- Combination of preconstructed train path snippets upon order

Make to order still possible

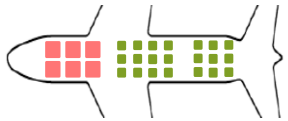
Analogy to airline capacity management



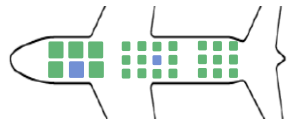
Provision upon request
- Customer takes along own seat and chooses place in plane



Standardization
- Size of seats is standardized (small, medium, large)



Bundling
- Clear order for different seat characteristics



Allocate to order
- Allocation of seats according to preference and availability

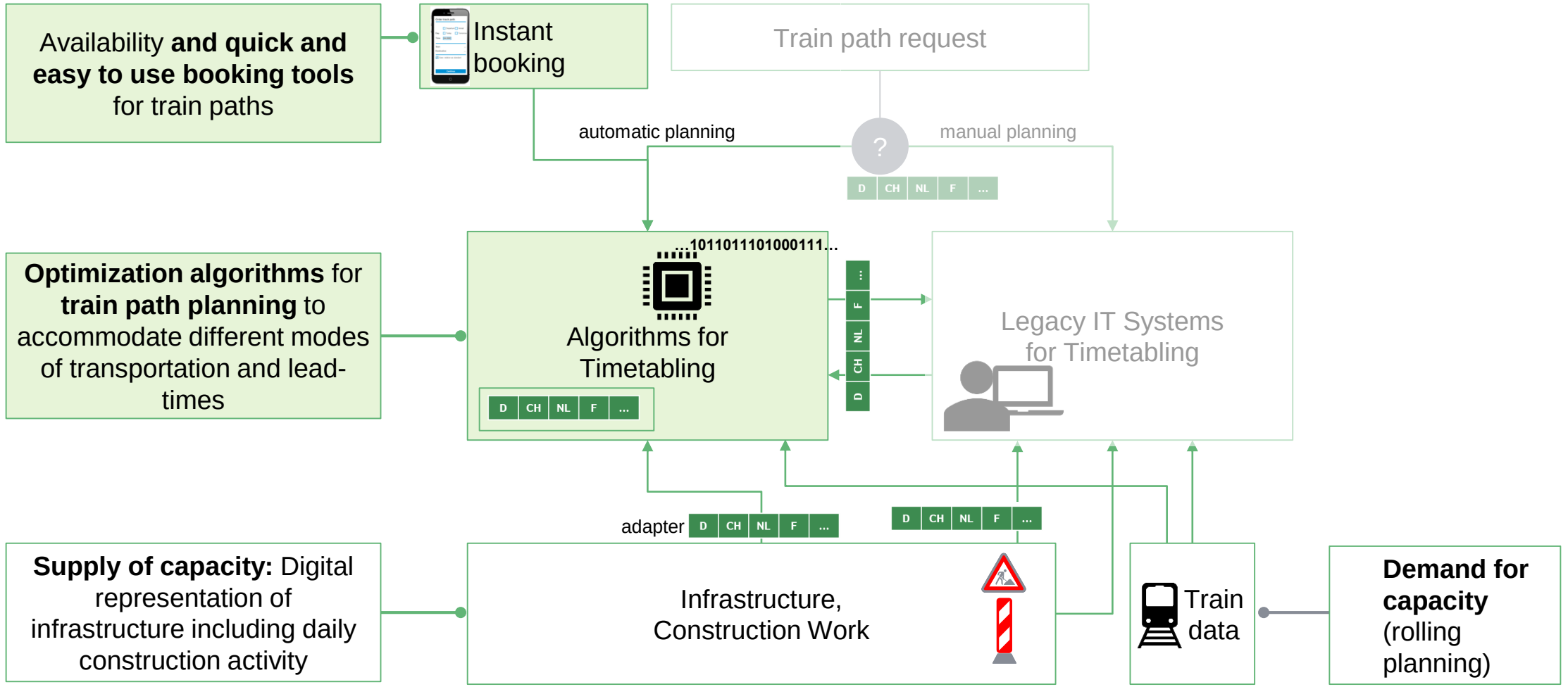
Source: DB Netz

RAILFREIGHT FORWARD

Pan – European access to harmonized capacity needs supporting systems

Reusable from existing DCM projects

Sketch of architecture for Digital Capacity Management

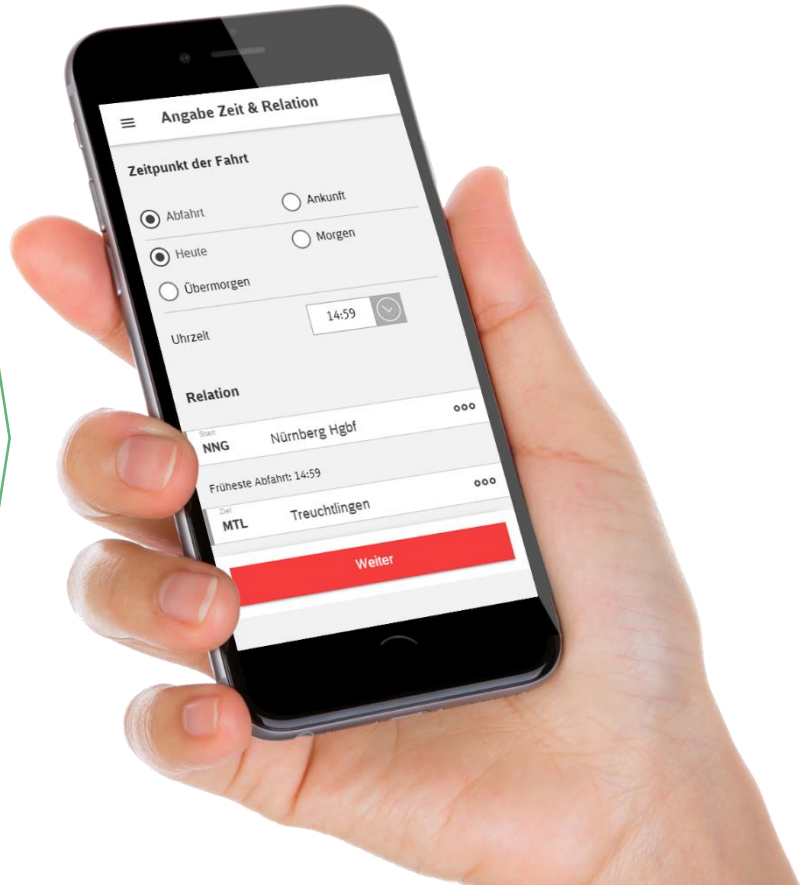


Source: DB Netz AG

Click&Ride – the first innovative product based on DCM has been introduced to the railway market

Example for short-term train path booking at DB Netz

- DB Netz started in 2015 to digitize Time table planning
- First tangible product with Click&Ride launched end of 2019



- Planning horizon: min 45 min and max 48 hours before the desired departure of the train
- Train path request with desired departure and / or arrival time is possible
- Train path and timetable within max 3 minutes instead of max. 48 hours by combining pre-constructed train path snippets
- Click&Ride is in full operation since December 17th 2019, more than 800 bookings via the app in the first two months Jan and Feb 2020
- Plan to automatise more than 200.000 path offers in 2020
- Implementation for yearly timetable in pipeline

Source: DB Netz AG

5 interlinked key technologies are prerequisites for substantial modal shift

Key technologies required for modal shift

Digital automated coupling (DAC)

- Automated coupling/ decoupling of assets
- Electricity and data bus line across train
- Automated brake test
- EP brakes
- Train consistency check

ERTMS

- One On Board Unit (OBU) to operate on main international freight relations equipped with technically harmo-nized ERTMS level 3

Autonomous Train Operation (ATO)

- Autonomous driving with supervision by driver (GoA[1] 2) on long haul
- Autonomous driving without driver (GoA 4) on last mile/shunting yards

Digital Capacity Management (DCM)

- Step-change to automated and digitized train path construction and allocation
- Dedicated freight capacity
- Fast access to (inter-)national train paths with higher quality
- Expansion to real time capacity management (infrastructure operations) at later stage

Digital Platforms (DP)

- Creation of digital ecosystem for seamless operational data exchange between all players of Rail Freight Sector
- Innovation platform for 3rd parties

Full potential only reaped with coordinated, sector-wide rollout of all technologies across all geographies

[1] GoA = Grade of autonomy

These key technologies provide strong benefits in terms of product quality, cost reduction, and available capacity

Benefits of key technologies to rail

	Enabler	DAC	DP	ATO	ERTMS	DCM
A **Higher RU product quality**	RU	▪ Faster delivery, higher reliability and lower cost	▪ Seamless operational data exchange across countries/companies	▪ Higher reliability (~15%[2] higher punctuality)	▪ Higher punctuality due to less failures of trackside signalling	▪ ~-6%[1] travel time, better reliability (train path quality), instant capacity check, dedicated freight capacity
B **Cost reduction**	RU/IM	▪ Improved utilization of personnel and assets	▪ Reduction of manual data gathering efforts, better utilization of wagon/train capacity	▪ ~10%[3 4] lower cost for energy (GoA 2), reduced need for drivers in shunting and first/last mile	▪ Decrease of infrastructure maintenance costs	▪ Improved utilization of rolling assets and drivers (up to ~15%[3]) and rail path engineers
C **Better utilization of available infrastructure capacity**	IM	▪ Higher speed, enabler for ERTMS level 3, more capa-city in marshalling yards/terminals	▪ Optimized utilization of wagon capacity	▪ ~10%[2 3] on top of moving blocks (optimized distance between trains)	▪ Level 3 moving blocks: +~40%[2 3]	▪ ~+4%[1] through optimized rail path planning/assignment
D **Better working conditions**	RU/IM	▪ Higher safety and more ergonomic working conditions		▪ Reduction of on-train operations and better utilization of bottleneck resource driver	▪ Higher safety	

[1] DB Netz [2] S2R [3] Expert interviews [4] ÖBB
[2] GoA = Grade of autonomy; GoA 2 supervision by driver, GoA 4 without driver

RAILFREIGHT FORWARD
EUROPEAN RAIL FREIGHT VISION 2030