EDDP WP 3 – Migration

1st DP-RAIL and DAC workshop

18 February, 2022

Agenda

11:00	Welcome and objectives
11:10	Introduction to DAC migration
12:00	High level IT requirements for DAC migration (1/2)
12:15	Bio break
12:25	High level IT requirements for DAC migration (2/2)
13:30	Evaluation of implementation requirements
13:55	Wrap up and homework assignment

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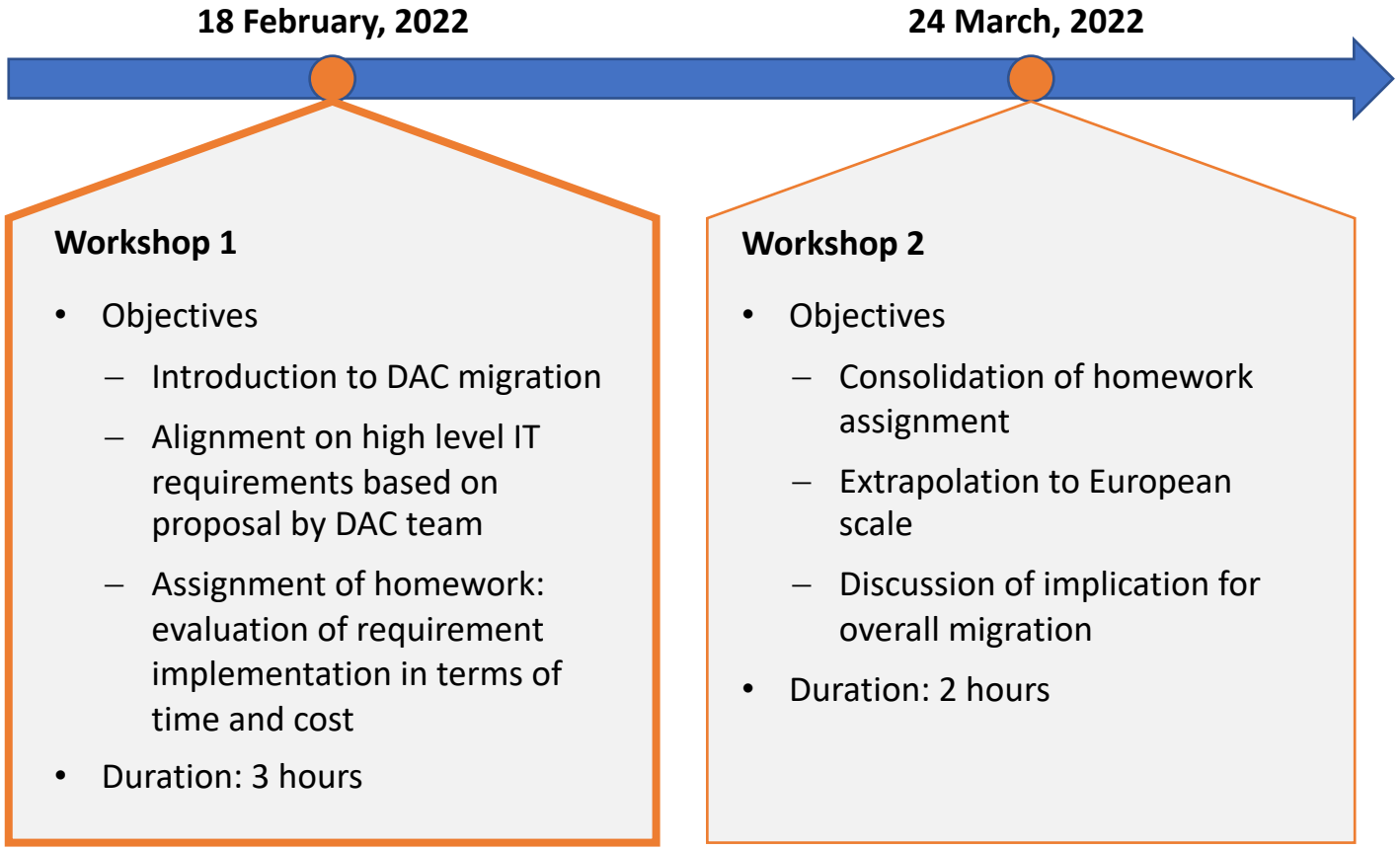
Focus of todays workshop is on developing IT requirements for DAC migration

Proposed approach

- EDDP WP3 Migration to work out the following aspects in Q1/2022
  - IT requirements for DAC migration
  - Approximate time required to prepare IT systems
  - Order of magnitude of required IT investments
- Opportunity for DP and DAC initiatives for close collaboration as DP-Rail …
  - Bundles the IT expertise of the rail freight sector
  - May benefit in terms of practical use cases
- Lean workshop based approach proposed



Source: EDDP WP 3

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The technical design for DAC is not compatible with screw couplers – migration feasibility to be checked

Complication

Wagons

Locomotives

- Chosen design (Scharfenberg) is not compatible with prevalent screw couplers
- Adapter wagons (SC/DAC) required to couple DAC wagons to a SC train
- Hybrid couplers foreseen for locomotives only (high cost / complexity)
- hybrid coupler tested at SBB Cargo can be mechanically switched into 2 different positions

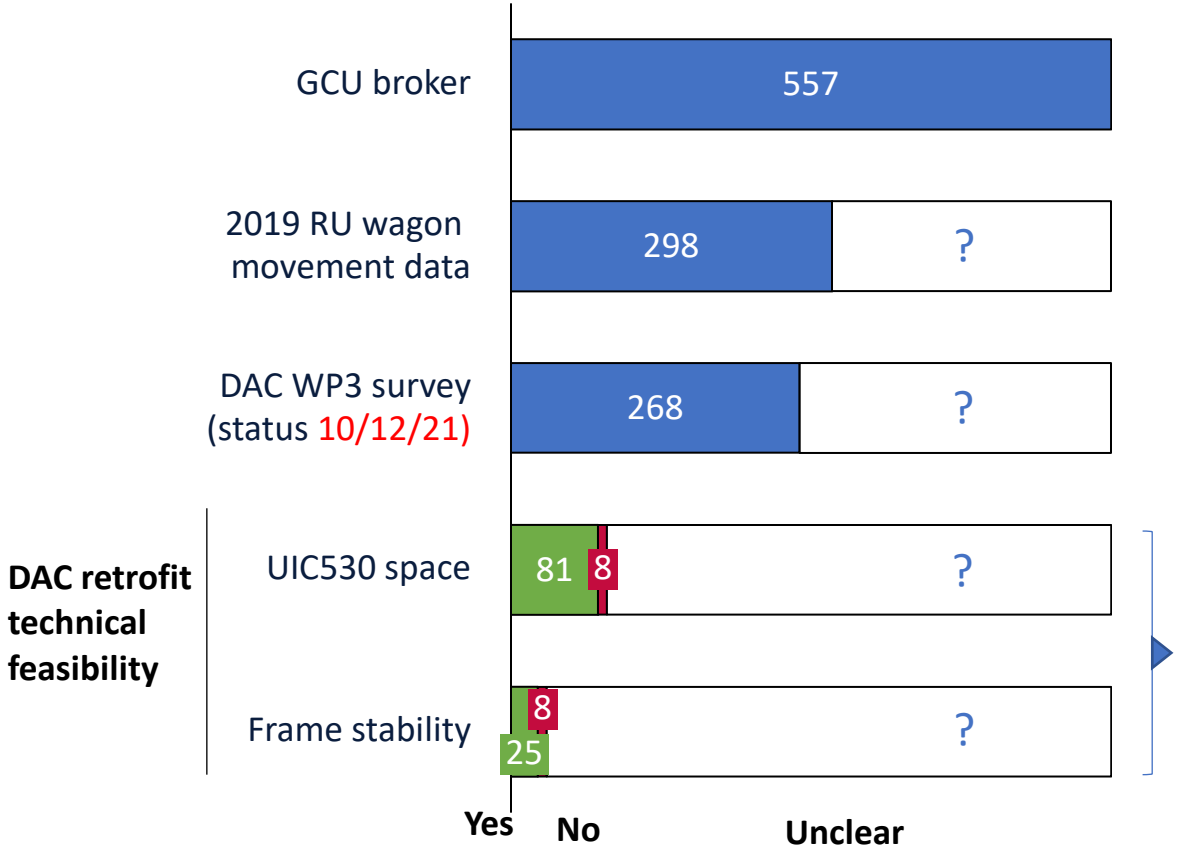
EDDP WP3 migration

- Feasibility-check of migration
- Development of alternative migration scenarios
- Evaluation of alternative scenarios, recommendation

Source: SBB Cargo; EDDP WP 3

The size and structure of the overall wagon fleet for migration is still not well understood!

Migration scope - Wagon fleet analysis, in individual wagons



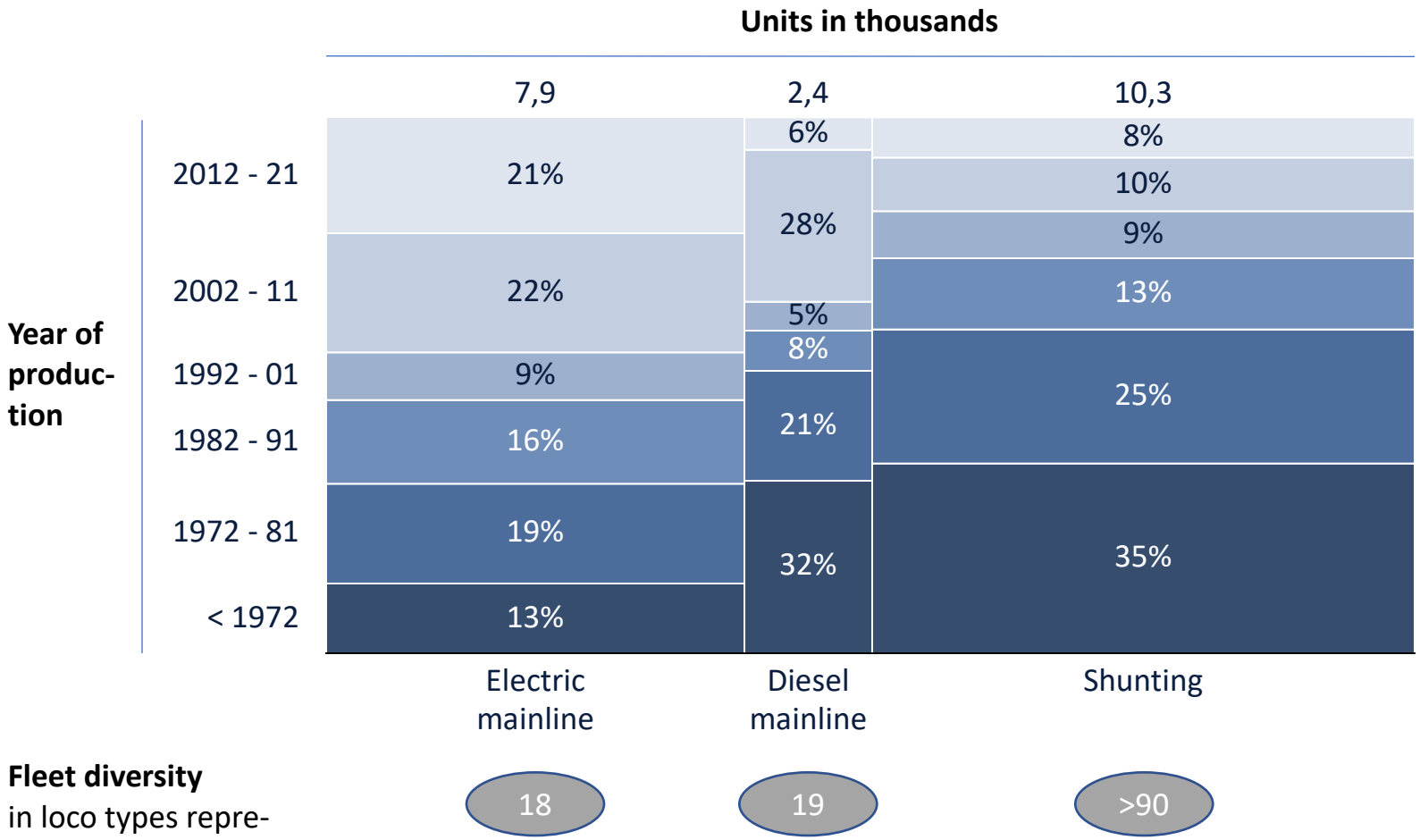
- Summary information according to web site, information on individual wagons not accessible to non-signatories
- Private wagon keepers: xxxT wagons; RUs and others: xxxT
- Based on data request to RUs, DB Cargo Deutschland, Lineas, RCA, SBB Cargo, SNCF fret have answered
- Includes *all wagons moved at least once*, should represent large part of central/western European fleet, extrapolation needed
- Based on data request to wagon keepers, xx of yy large keepers have provided information based on individual wagons
- Current information status highly unsatisfactory and too low for extrapolation

- Hypothesis: GCU broker might be significantly overstated
- Coordinated actions to improve situation are need (e.g., very early registration requirement for access to public funding)

Source: EDDP WP 3 survey

Assessment of DAC retrofit for locomotives is complex, as a high share of units are very old and fleet diversity is high

Locomotive fleet, in units by year of production

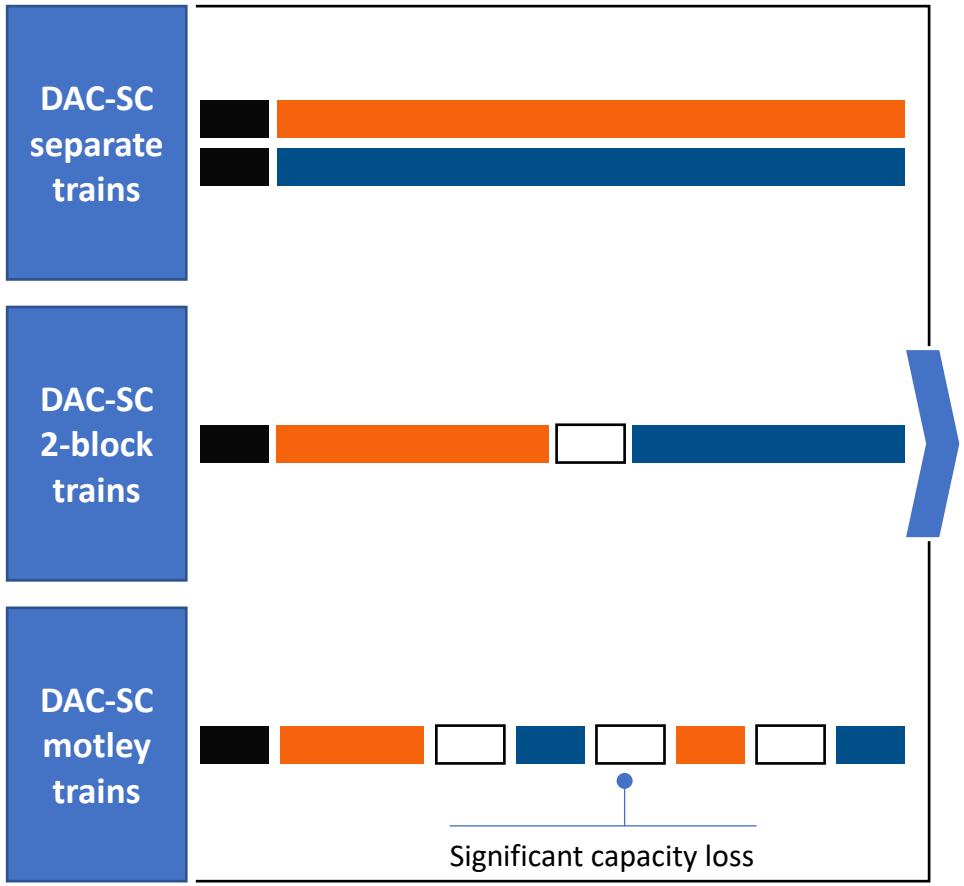


- European locomotive fleet overview gathered through provision of SCI database
- Assessment of DAC retrofit complex due to
  - High share of very old fleet esp. in diesel segment with missing vendor support
  - High fleet diversity
- As many loco types are used by multiple RUs / keepers, coordinated assessment of technical prerequisites for retrofit suggested in order to save time / effort
- Dedicated task force required

Source: EDDP WP 3; SCI database

Mixed fleet in train (line) operations is feasible given adapter wagons and solution for damaged wagon handling

Operational implications (1/3) – train runs with mixed coupler fleets



Loco
DAC
SC
Adapter

Prerequisites for train operations

Hybrid couplers for locos

- Required to maintain productivity of loco fleet and operationally flexibility

Adapter wagons

- DAC on one wagon end, SC on the other
- Hybrid couplers – if available – would be more flexible

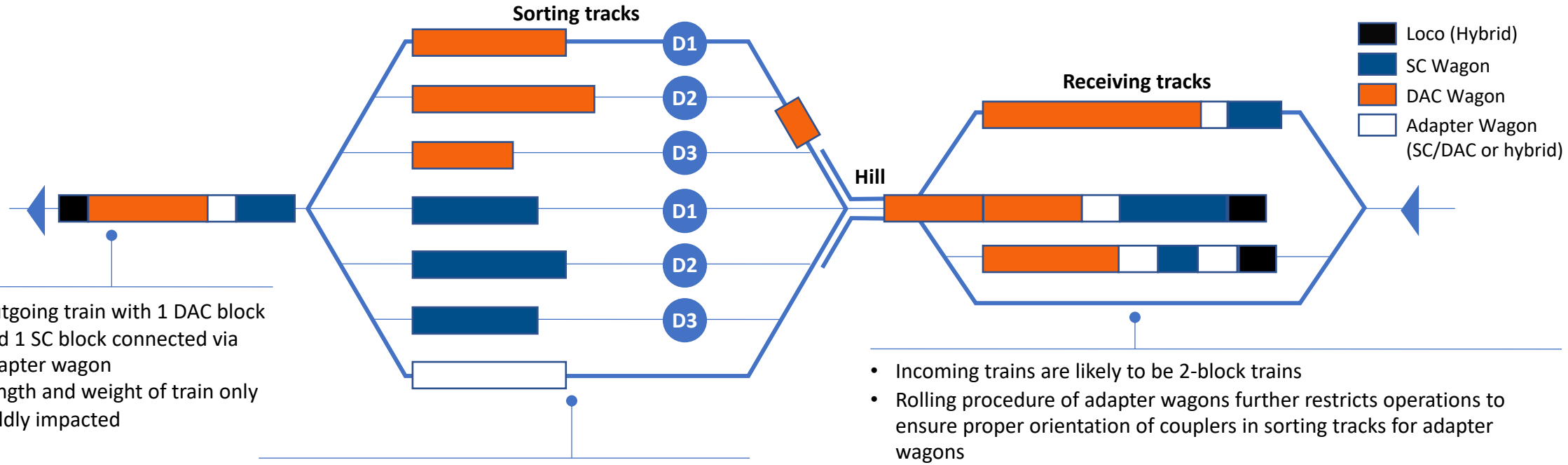
Damaged wagons handling

- Damaged wagon "logistics" to be ensured for wagons of between coupler types

Source: EDDP WP 3

Mixed coupler operations lead to strong capacity loss of yards – single coupler operations strongly preferred

Operational implications (2/3) – Marshalling / shunting yards



- Outgoing train with 1 DAC block and 1 SC block connected via adapter wagon
- Length and weight of train only mildly impacted

- Requirements of 2 sorting tracks for each direction, versus 1 sorting track in normal operations
- Coupling of blocks via adapter wagon prior to departure
- Lower utilization of sorting tracks if frequency per direction kept constant leading to reduced yard capacity
- Additional need of track(s) to collect adapter wagons

- Incoming trains are likely to be 2-block trains
- Rolling procedure of adapter wagons further restricts operations to ensure proper orientation of couplers in sorting tracks for adapter wagons

Evaluation

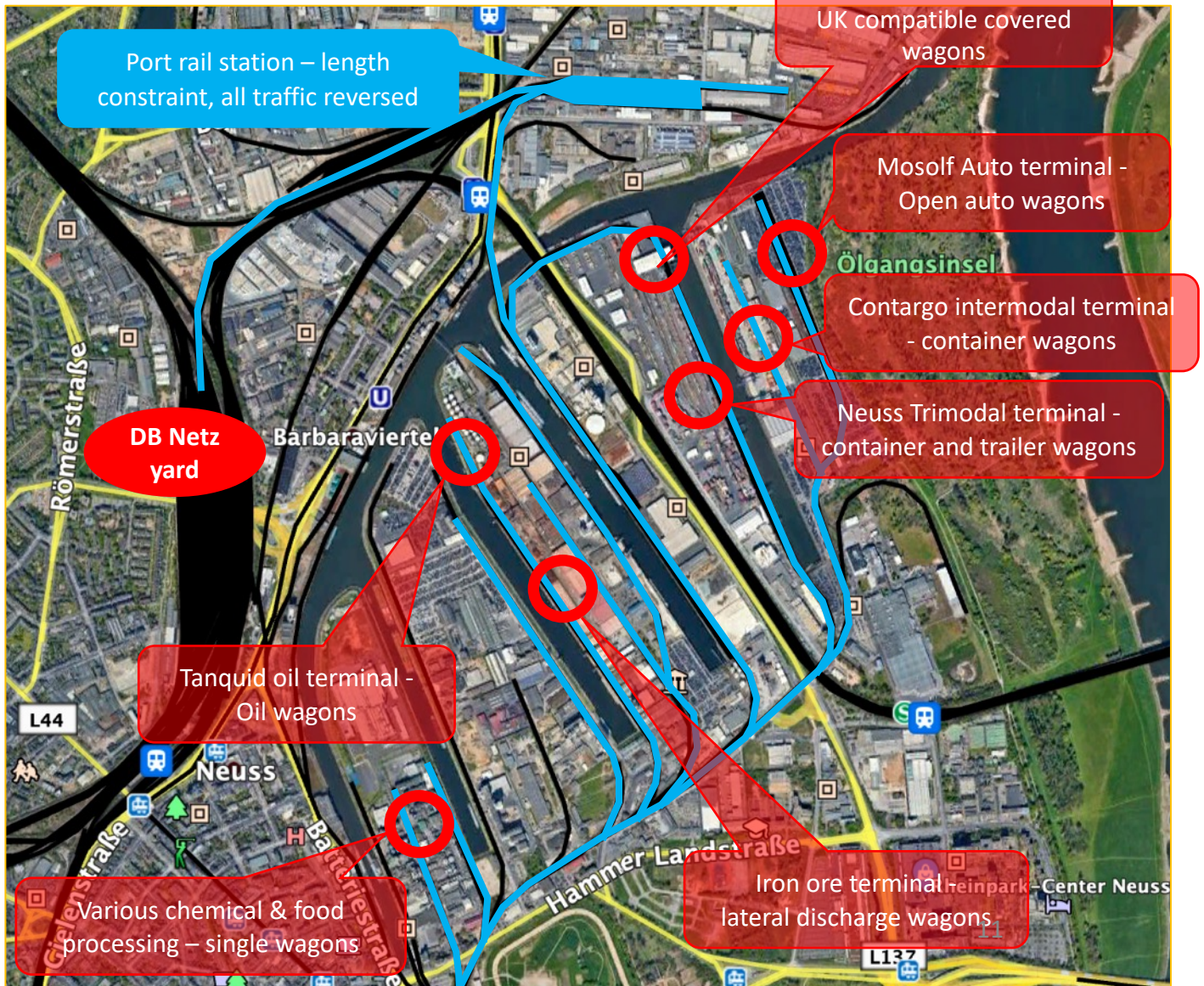
- Well suited strategy for yards with very low sorting track utilization
- Not suited for yards with high sorting track utilization, as destinations cannot be cut in half
- The use of hybrid adapter wagons would simplify yard operations
- "Motley train" operations with DAC and SC wagons on a single sorting track lead to massive capacity shortage of the hill (inserting of adapters)
- Validated by simulation of Munich Nord

Source: EDDP WP 3

Customer sidings may also experience massive operational issues with mixed fleet ops – to be analysed individually

Operational implications (3/3) – customer siding example

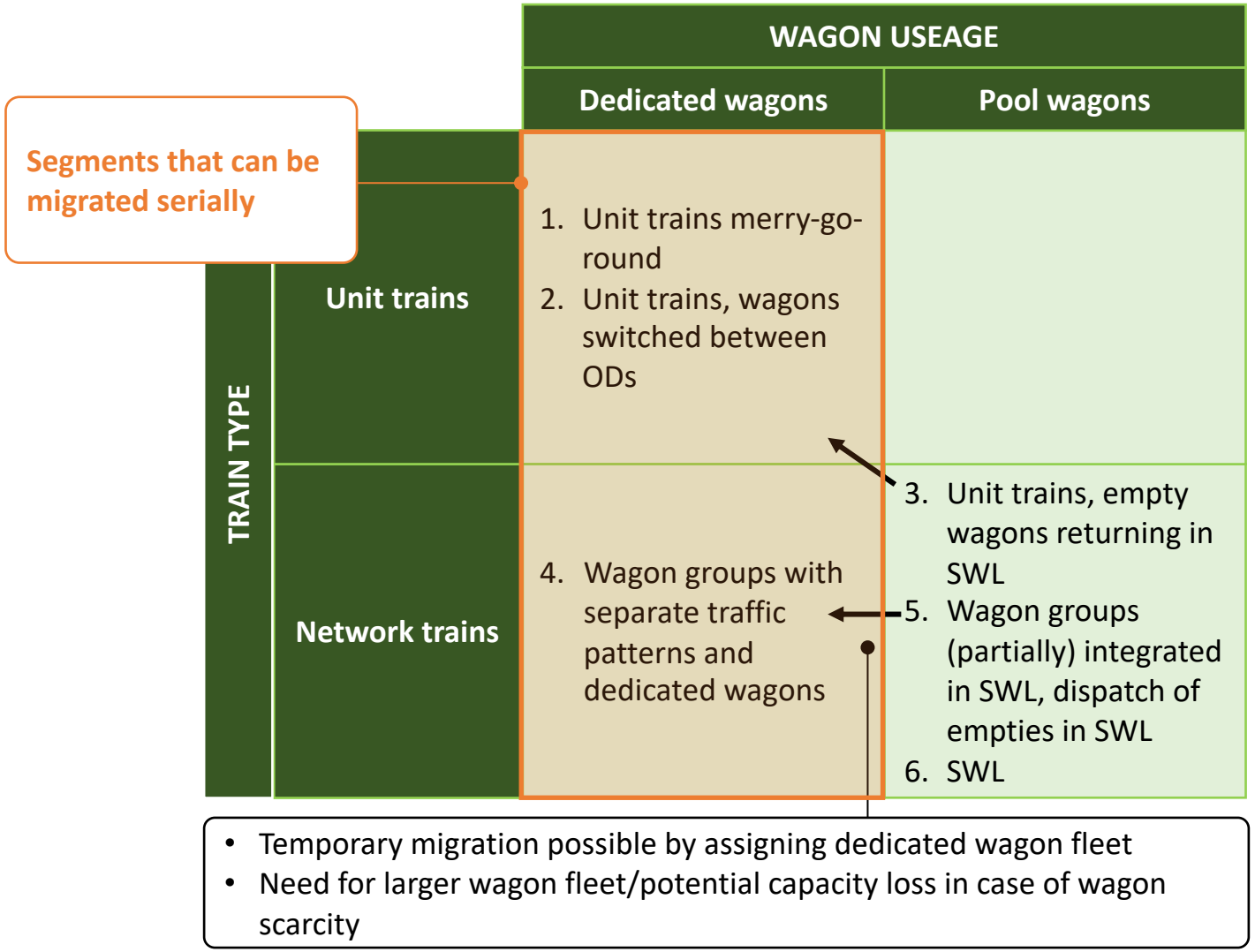
- Neuss harbour is a **typical fluvial port** with **multiple customer sidings, commodities, and rail transport products**
- **Main inbound**
  - unit trains – intermodal
  - wagon groups – finished cars
  - unit train – UK Aluminium
  - unit trains – Mineral oil prod.
  - single wagons – various
- **Main outbound**
  - unit trains intermodal
  - unit trains iron ore (not operated)
  - wagon groups – finished cars
  - wagon groups - aluminium
  - single wagons - various
- **Mixed coupler operations would lead to massive capacity loss in the customer siding operations**
- **Customer sidings to be analysed individually**



Source: EDDP WP 3

Segmentation of flows for migration should primarily be based on wagon usage and train type

Segmentation of transport flows



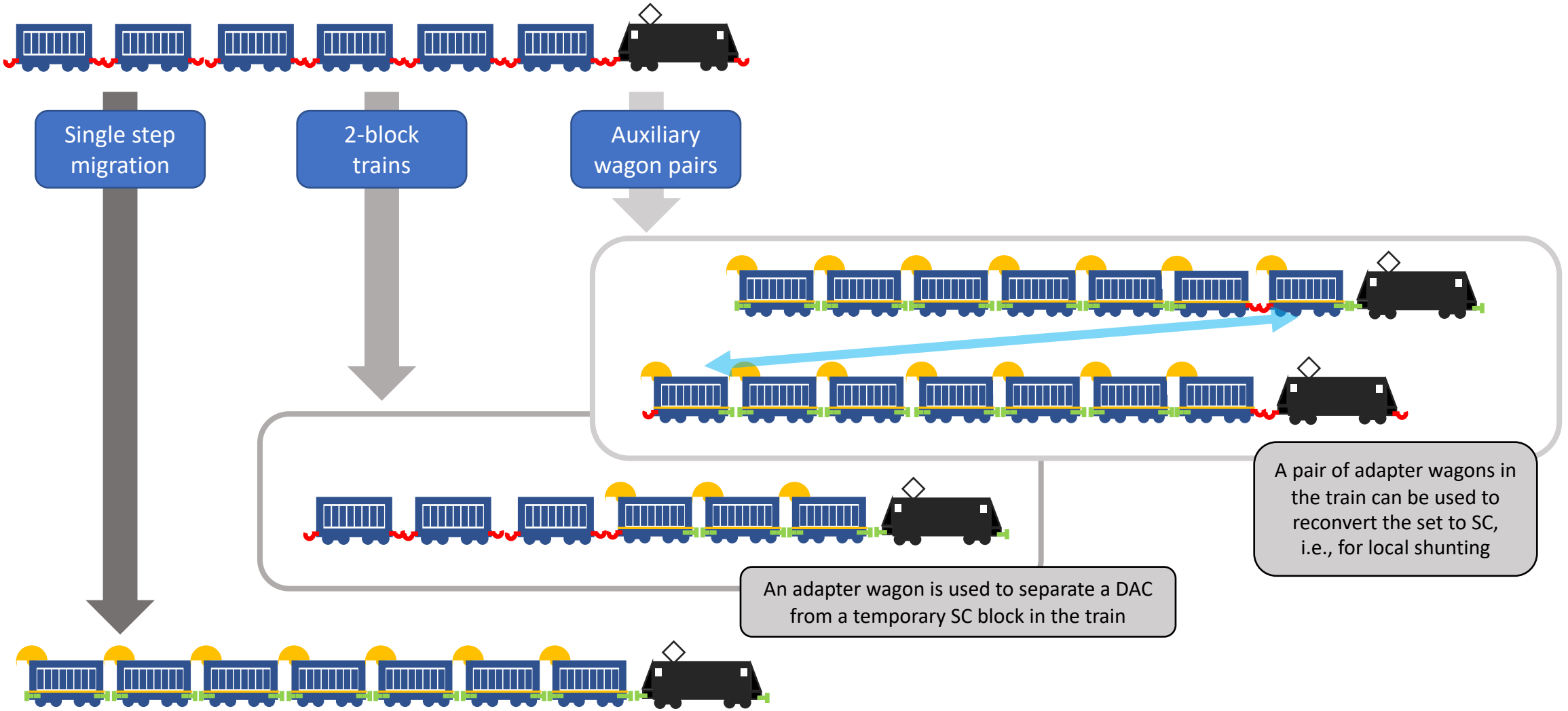
→ Opportunity for temporary migration

SBB Cargo successful domestic intermodal pilot is example for segment 4.

Source: EDDP WP 3

The segments with dedicated wagon pools may be migrated based on different alternatives

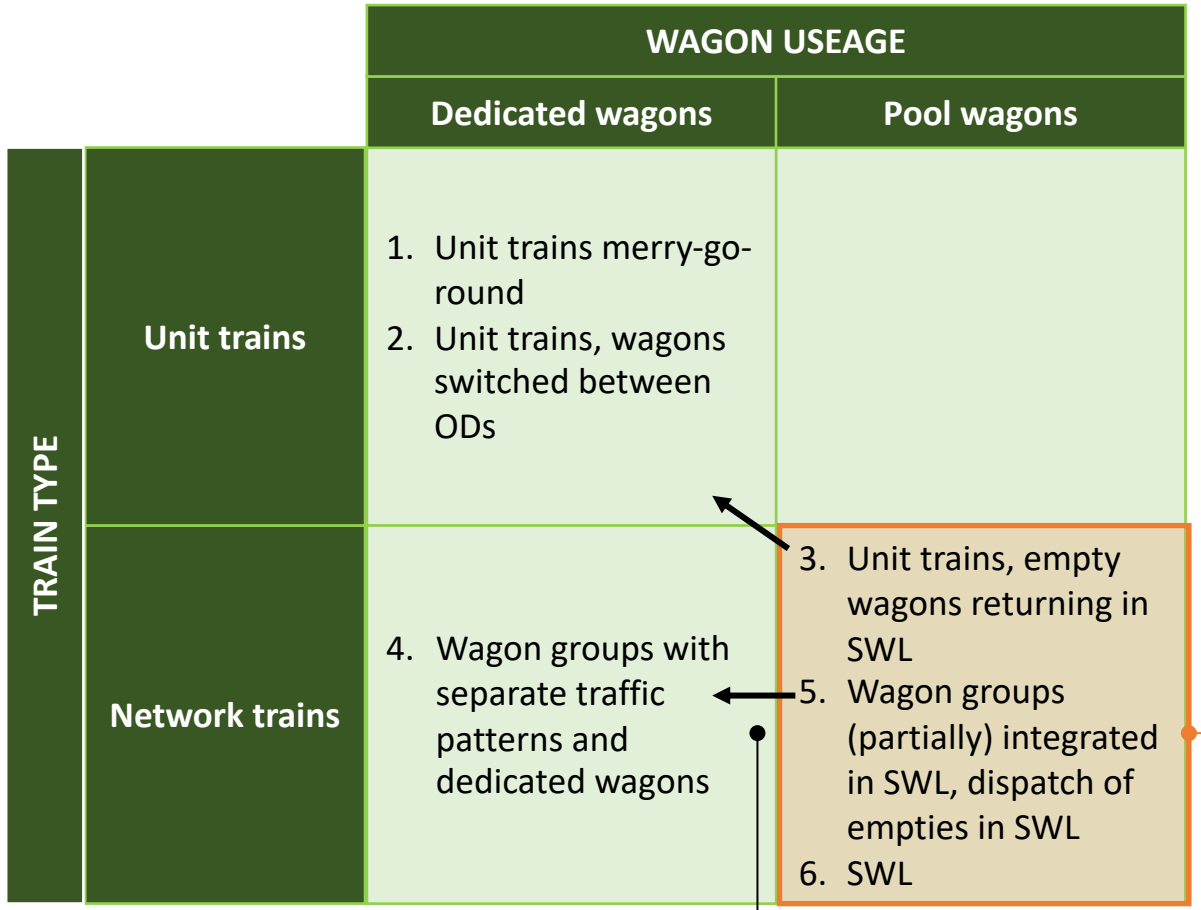
Migration alternatives



Source: EDDP WP 3

The main migration issue resides in the Core Wagonload System (CWS) that cannot be operated in a mixed mode

Segmentation of transport flows



→ Opportunity for temporary migration

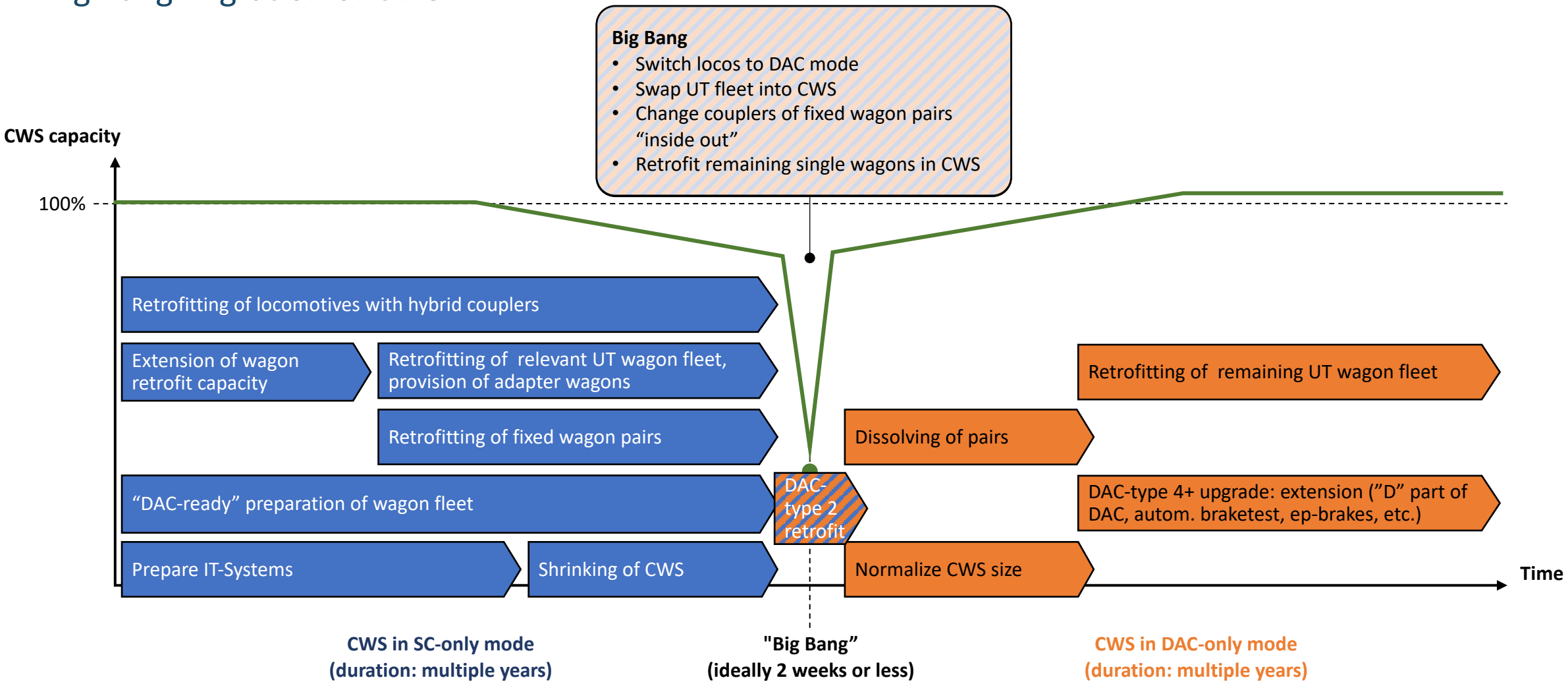
- Core Wagonload System (CWS) with main migration issues
  - Marshalling/shunting yards
  - Customer sidings
- Size of CWS currently being analysed, potentially around 200.000 wagons

- Temporary migration possible by assigning dedicated wagon fleet
- Need for larger wagon fleet/potential capacity loss in case of wagon scarcity

Source: EDDP WP 3

A big bang migration is the only operationally feasible option for the CWS

Big Bang migration of CWS



Source: EDDP WP 3

To ensure feasibility of big bang, the technical migration of CWS wagons must be done in 3 steps

3-step technical migration of CWS wagons

EUROPEAN DAC DELIVERY PROGRAMME
Enabled by Europe's Rail
DACcelerate

VALIDATED VIA PILOT RETROFIT

Considerations

- 200+ thousand wagons of CWS to be retrofitted in short period in order to avoid mixed coupler operations
- Technical retrofit is main bottleneck for migration
- Migration principally requires only mechanical part of DAC (type 2)

	CWS in "100% SC mode"		CWS in "100% DAC mode"
	A	B	C
	"DAC ready" preparation	DAC type-2 retrofit	DAC type-4/5 upgrade
Objective	• Avoid surprises during retrofit* • Minimize work in/ prerequisites for step B and potentially C (e.g. no lifting) • Use planned maintenance slots to avoid additional non-availability	• Enable mechanical DAC operations • Maximize retrofit throughput through minimal requirements and minimized retrofit time per wagon	• Enable full "D"-benefits of DAC • Use revisions to avoid additional non-availability (do much as possible) • Optimal time frame still to be determined

Minimized requirements for big bang!

* E.g., non-conformity to specifications

Source: EDDP WP 3

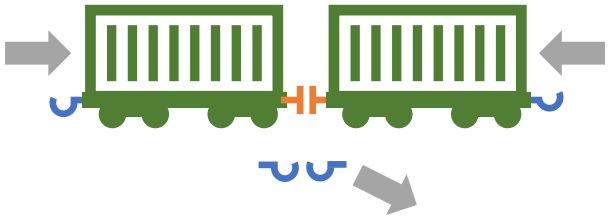
Retrofitting of fixed wagon pairs will further enhance chances for big bang migration substantially

Fixed wagon pairs in CWS

Screw coupler
DAC

CWS in "100% SC mode" → **Big Bang** → **CWS in "100% DAC mode"**

Pre-Big-Bang

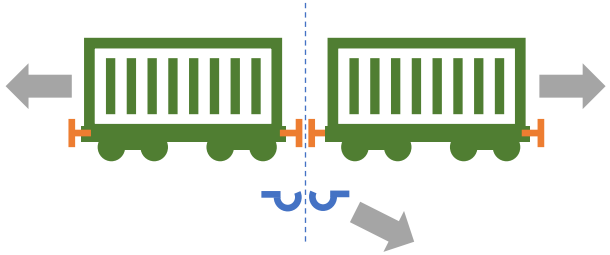


- Set-up of fixed pairs of identical wagons that cannot be split for operational purposes
- Migrate inner couplers to DAC

Big Bang

- Connect multiple fixed pairs of identical wagons
- Recouple so that DAC is now "outside" and SC is "inside"
- Pairs still to be kept fixed for operational purposes

Post-Big-Bang



- Retrofit remaining SC with DAC
- Dissolve fixed pairs after migration

First assessment: appears feasible for up to 75% of CWS fleet but strongly dependant on customer loading ops

Source: EDDP WP 3 Workshop 1

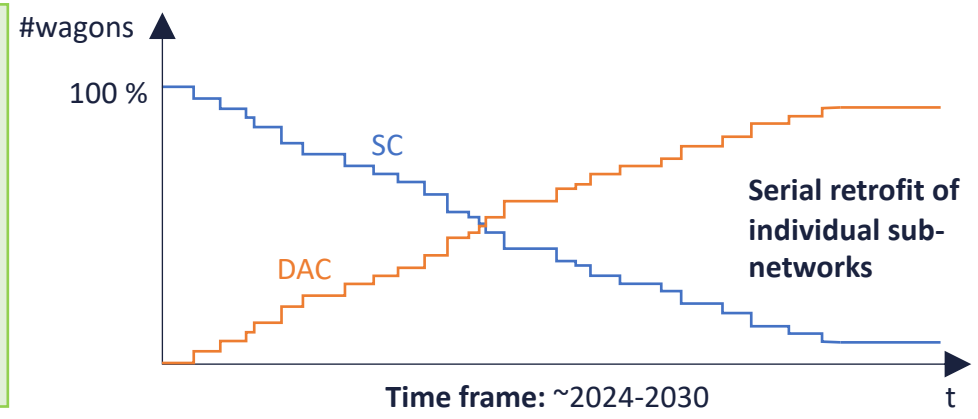
The overall migration path will be a serial migration of subnetworks with a CWS big bang at an earliest possible point in time

Overall migration path for wagon fleet

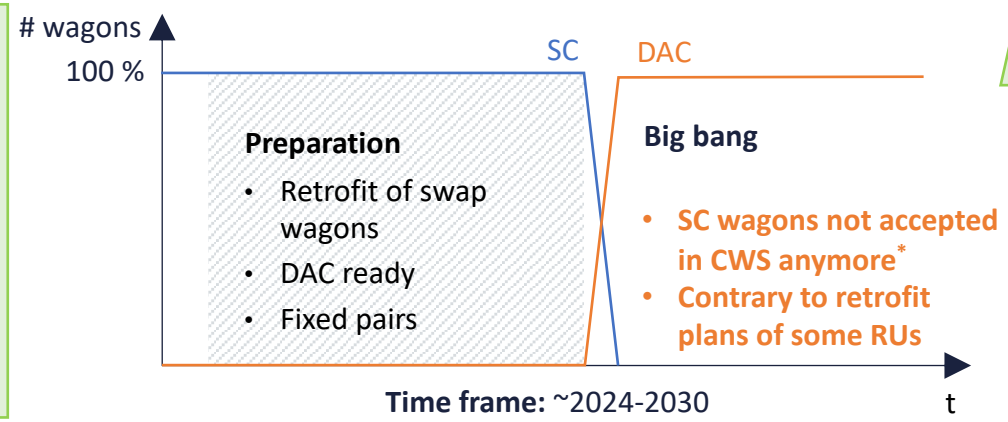
TIMING INDICATIVE ONLY

SCHEMATIC

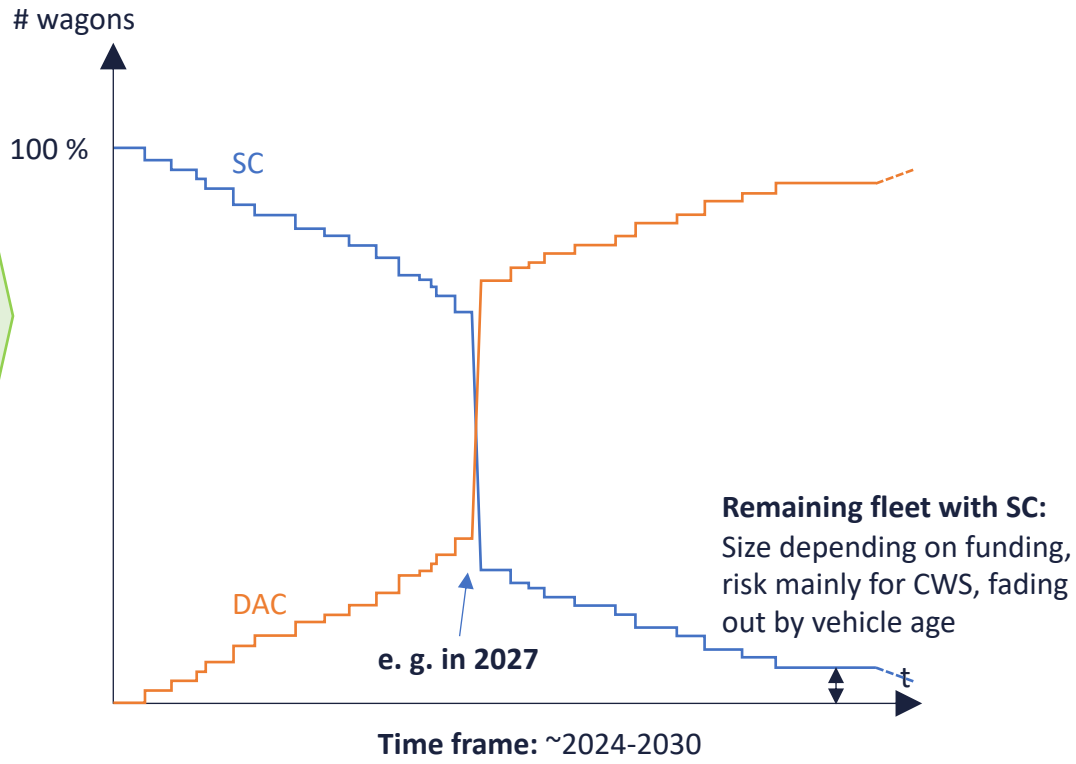
Seperately migrateable segments



CWS



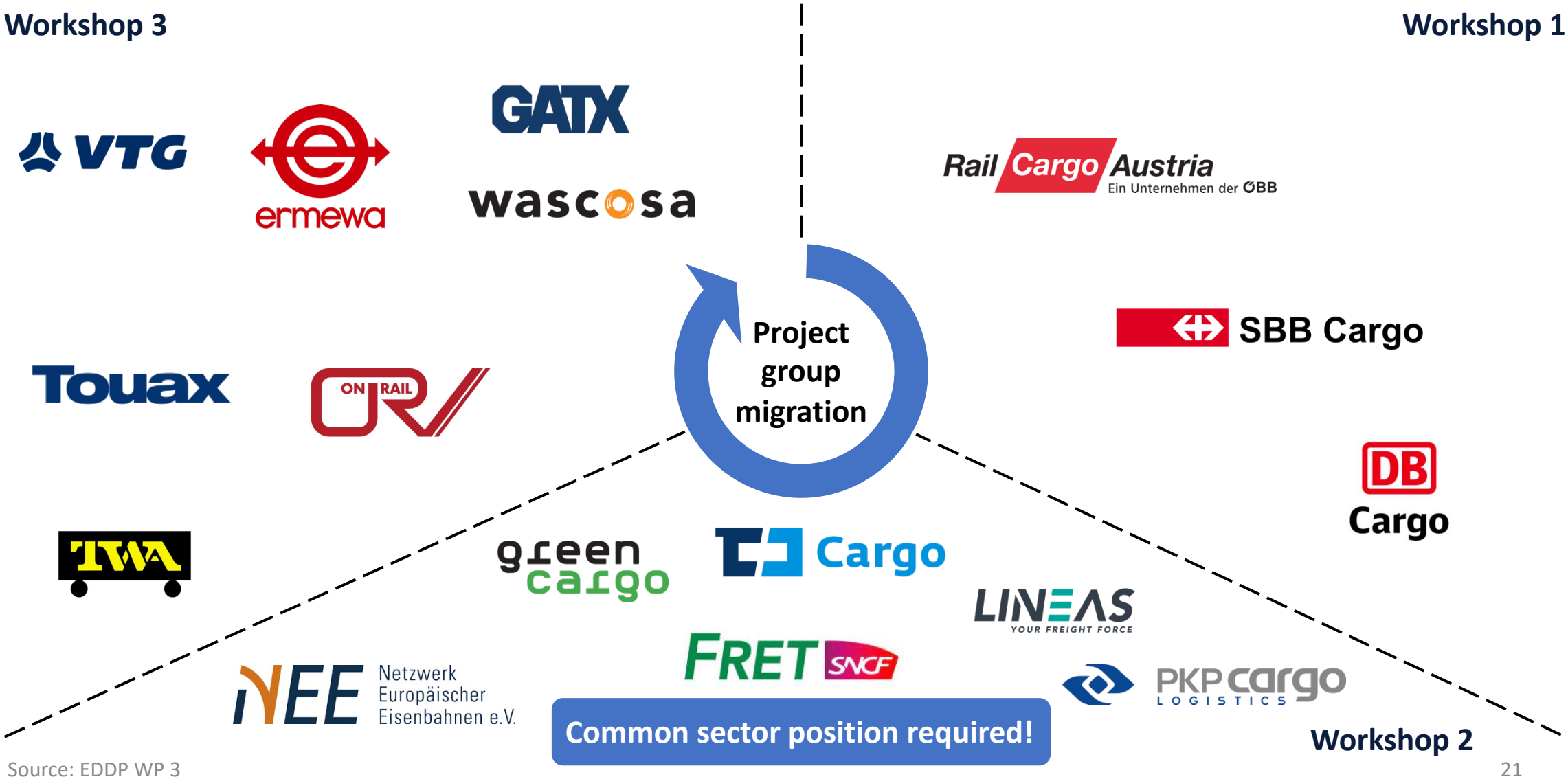
Resulting overall



* Share of SC wagons in CWS would strongly impact the economic viability of CWS operations and DAC business case benefits

Source: EDDP WP 3

The interim results of our work have been co-developed and discussed with many stakeholders



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We want to develop and evaluate high-level IT-requirements with you in 3 steps

High-level IT-requirements

Focus

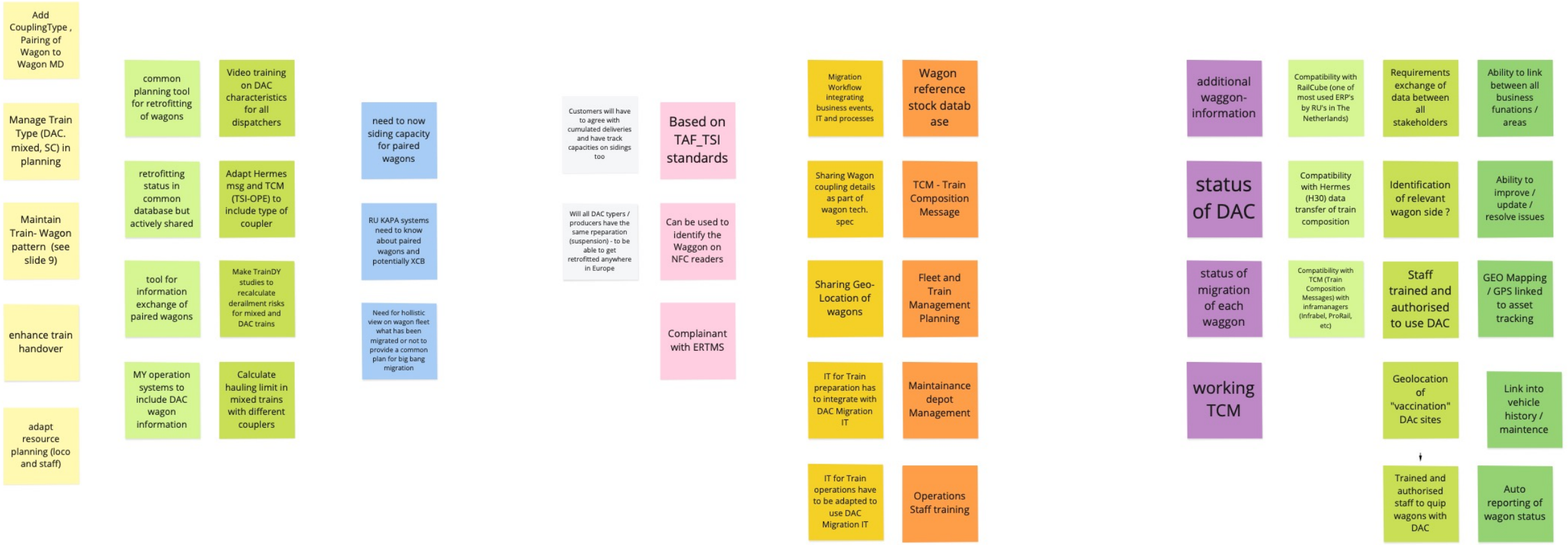
Scope: Migration requirements to DAC-2 only, i.e., without “D”igitalization use cases to reduce complexity

Ideation	High level specification	Evaluation
• 10 min brainstorming: every participant to create up to 5 IT-requirements • Grouping of ideas during bio break by DAC migration team	• Brief discussion of each idea • Provide high level description (not more than 2 bullets) • Jointly assess priority (mandatory, nice-to-have, not needed) • Identify potential candidates of IT-requirements for realization within DP-Rail	• By stakeholder, high level estimate of – Time to realization – IT-Budget need • Extrapolation to sector level

Source: EDDP WP 3

We have jointly developed ideas for IT-requirements in an online exercise …

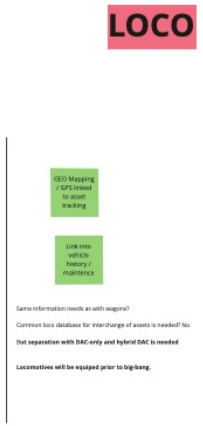
IT-requirements ideation (1/2)

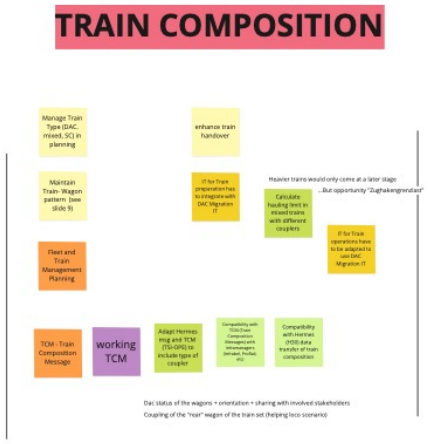


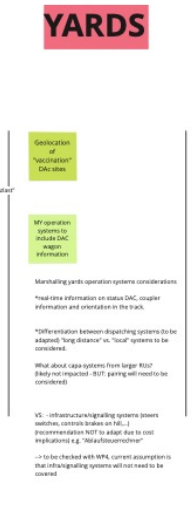
Source: DP-Rail / EDDP WP3 workshop 18 February, 2022

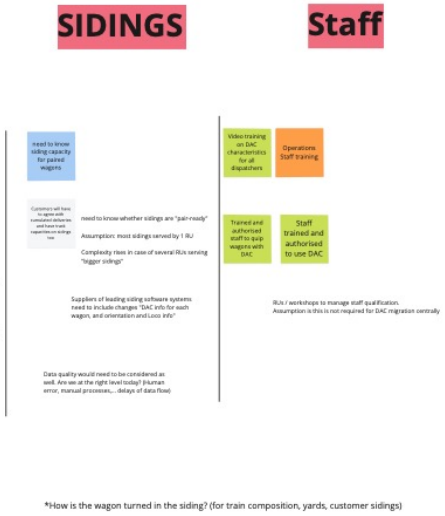
… and have clustered and jointly clarified the collected ideas

IT-requirements ideation (2/2)









The ideas have been further specified in a separate text document

Source: DP-Rail / EDDP WP3 workshop 18 February, 2022

Current DAC-related IT-requirements in TAF TSI are only rudimentary

DAC related IT-requirements in TAF TSI

BACKUP

In the TAF TSI Technical Appendices we have a record called "RollingStockReferenceData" where the element "CouplingType" contains references to the couplings. There is a Change Request underway here (N° 593 - see attached) that will be completed in 2022. This will change the possible values

40 = DAC4
41 = DAC4 and manual coupling 1 (non-reinforced coupler < 85 t)
42 = DAC4 and manual coupling 2 (reinforced coupler = 85 t)
43 = DAC4 and manual coupling 3 (ultra-reinforced coupler > 85 t)
44 = DAC4 and automatic coupling (non DAC)
50 = DAC5
51 = DAC5 and manual coupling 1 (non-reinforced coupler < 85 t)
52 = DAC5 and manual coupling 2 (reinforced coupler = 85 t)
53 = DAC5 and manual coupling 3 (ultra-reinforced coupler > 85 t)
54 = DAC5 and automatic coupling (non DAC)

Source: ERA (ERTMS and Telematrics Unit)

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High-level IT-requirements

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Source: EDDP WP 3

Each participant is asked to guesstimate the required budget and time to realize the identified requirements

Objective and methodology

Scope

- Includes the realization of the above IT-requirements in the planning and operations IT of your own company
- Excludes potential further IT requirements for DAC migration planning/execution (e.g., simulations, capacity planning tools, etc.) and for the integration of the digital capacities of DAC

Aspired accuracy

- We aspire to develop the first guesstimate for IT costs of DAC migration on sector level – so far no information is available at all
- Since this is a time-boxed exercise **(due date 18 March, 2022)**, we expect a first guesstimate of an order of magnitude. We are well aware that the guesstimate will have a high uncertainty
- We will aggregate the feedback of the various stakeholders and will not publish individual feedback of participants. Thus, we kindly ask you to be courageous and provide us your guesstimate on a best effort basis
- As the introduction of DAC does not go along with intensive data capturing,

Required information on company level

- Overall IT budget need for all parties involved in DAC
- Overall realization timeline (assuming budget is available)

Methodology

- You are free to choose a process to develop your guesstimate. Potentially, the following methodology could serve as guidance
  - Domain analysis for each IT requirements to identify IT applications impacted
  - Develop high level understanding of required changes
  - Estimate budget / time requirement based on analogy to previous projects
- Please provide estimates per requirement so that we can check completeness. We will not differentiate the resulting budget need on sector level by IT-requirement since we expect accuracy to be too low. Your estimates should focus on the cost of IT-development which we expect to be dominant
- Overall time requirement should be given as time span from a hypothetical fixed date on which budget will be confirmed

Please also see the separate Excel tool provided

Source: EDDP WP 3

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In the next workshop we will focus on the results of the evaluation of the IT requirements

Proposed approach

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  - IT requirements for DAC migration
  - Approximate time required to prepare IT systems
  - Order of magnitude of required IT investments
- Opportunity for DP and DAC initiatives for close collaboration as DP-Rail …
  - Bundles the IT expertise of the rail freight sector
  - May benefit in terms of practical use cases
- Lean workshop based approach proposed

18 February, 2022

Workshop 1

- Objectives
  - Introduction to DAC migration
  - Alignment on high level IT requirements based on proposal by DAC team
  - Assignment of homework: evaluation of requirement implementation in terms of time and cost
- Duration: 3 hours

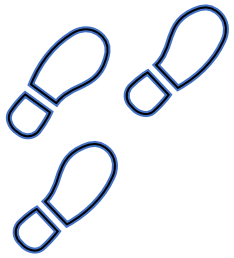
24 March, 2022

Workshop 2

- Objectives
  - Consolidation of homework assignment
  - Extrapolation to European scale
  - Discussion of implication for overall migration
- Duration: 2 hours

Source: EDDP WP 3

Next steps



List of high level IT-requirement provided to participants	DAC migration team	22/02/22
Assessment of IT-requirements for own organisation provided to DAC migration team	Participants	18/03/22
Synthesis of results as basis for workshop 2	DAC migration team	24/03/22

Source: EDDP WP 3