EUROPE’S RAIL SYSTEM PILLAR

WEBINAR n°1

FDFTO - FULL DIGITAL FREIGHT TRAIN OPERATIONS ENABLED BY THE DIGITAL AUTOMATIC COUPLER DAC
Webinar Guidelines

The meeting is recorded, the link for “replay “ will be made available after the session,

also this presentation support
Webinar Guidelines

Please make sure to keep your microphone and video off during the webinar
Webinar Guidelines

Please use the chat tab to write a message if necessary
Objectives of the webinar

Introducing D2.1 Preliminary Operational Procedures

In cooperation with EU-Rail Flagship Project 5 Sounding Board EDDP-European DAC Delivery Programme

The focus of this webinar is just referencing to the harmonised operational procedures, one of the preconditions to enable the use of new technology uniformly on the one hand, and on the other to keep the complexity of FDFTO requirements as low as possible.

During the webinar, the preliminary Target Operational Procedures will be explained in terms of general content and structure. This will enable all interested parties to examine them and to provide further input to the DAC related activities with operational standards UE.
Agenda of the webinar

10:00 - 12:30

Introducing D2.1 Preliminary Operational Procedures

- Introduction (Mr Javier Ibáñez de Yrigoyen)
  Senior Programme Manager EU-Rail
  - 10 min

- Context and opening (Mr Jens Engelmann)
  EDDP Programme Co-Manager
  - 15 min

- Preliminary Operational Procedures presentation (Mr Andreas Haller)
  EU-Rail TRANS4M-R Lead of System Architecture
  - 100 min

- Next steps/outlook (Mr Frédéric Hénon)
  EU-RAIL System Pillar lead of task 4 & "Harmonisation of FDFTO Operations"
  - 10 min

- Conclusion (Mr Jens Engelmann)
  EDDP Programme Co-Manager
  - 5 min
Introduction
# Europe’s Rail: One Integrated R&I Programme

## System Pillar

- **Operational Concepts**
- **Functional System Architecture**

## Innovation Pillar

1. **European Rail Traffic and Mobility Management**
   - Manage and improve rail traffic at EU level
   - Adjust rail traffic management in function of the mobility demand

2. **Digitalisation & Automation in Train Operations**
   - ATO implementation
   - Digital train operations

3. **Sustainable and Digital Assets**
   - Integrated assets testing & life-cycle framework
   - Zero-emission, silent rail system

4. **Competitive, Digital, Green Rail Freight**
   - New digital customer interaction & innovative rail freight services
   - Multimodal and rail freight innovation integration

5. **Regional Rail Services in Low Density Areas**
   - New system approach to regional rail services in low density areas

## Deployment Group

Future solutions deployed in a coordinated and consistent way at European level, taking into account alternative rollout scenarios, behavioural and organisational changes, synergies with other modes of transport.
Network management planning and control & Mobility Management in a multimodal environment
Network management planning and control (new processes and automation for decision support) & rail management in a multimodal environment (real-time demand-driven operations, including demand from other transport modes)

Digital & Automated up to Autonomous Train Operations
Digital “Automated & Autonomous” Train Operations building upon the next gen Automatic Train Control based on ERTMS + enhancements on TCMS for integration at the on-board level

Intelligent & Integrated asset management
Knowledge from the digital transformation will feed back into the design, construction, manufacturing as well as into operation and maintenance processes.

A sustainable and green rail system
Innovative solutions and services based on leading edge technologies to minimize the overall energy consumption and environmental impact of the railway system

Digital Enablers
Provide Digital Twins Design toolbox for design as well as for validation, verification and test + a Federated dataspace where all digital elements of the system can play together in a coherent and interoperable way

Innovation on new approaches for guided transport modes
Explore non-traditional and emerging flexible and/or high-speed guided transport systems, as well as to create opportunities for innovators to bring forward ideas for shaping those future systems

Regional rail services / Innovative rail services to revitalise capillary lines
Decreasing cost while offering a high quality of service and operational safety + increase customer satisfaction and attractiveness

Sustainable Competitive Digital Green Rail Freight Services
Digitalization and automation of operational functions (e.g. DAC) and processes as well as increasing the efficiency of the immaterial (information/data) layer of transport in logistics
Call: HORIZON-ER-JU-2022-FA5-01
Topic: Sustainable Competitive Digital Green Rail Freight Services
Type of action: Horizon JU Innovation Action (IA)
Call deadline: 23 June 2022
Info letter sent: 5 August 2022
Proposed Starting date: 01 July 2022
Duration: 45 months
Maximum JU contribution: 40,599,047.39 EUR
Reporting periods: 4
Coordinator: Deutsche Bahn AG (DB)
Number of participants: 71
Subject to the grant agreement conclusion, 2023 will mark the first steps of the first EU-Rail FP5, notably focusing on two work-streams and delivering the following by 2025:

**WS1 Full digital Freight Train Operations with DAC as enabler for full digital freight train operation**

- **European full digital freight train operations (TRL 8-9):** Large-scale demonstrator showing full digital freight train operations based on DAC Type 4 (incl. energy supply & data/communication solution and Type 5 upgradability **(and TRL 7 technical solutions)**)

- **European full digital freight train operations (TRL 8 – some functionalities at lower TRL):** Demonstration of Yard automation equipment, wagon identity system allowing automated shunting, video gates and way side check points with visual recognition and AI tools for yard automation.
WS2 Seamless Freight: with easy access and reliable (intermodal) transport service offering digital solutions.

Deliver by 2025 at least the following:

• **Seamless freight corridor (TRL 5-8)** The comprehensive innovations for planning and operation of cross-border freight trains should be demonstrated on (parts of) two European corridors.

• **Seamless customer freight (TRL5-8)** Seamless planning, management and booking of multimodal rail-based transport integrating multi-actors, should be demonstrated integrating rail in modern supply chains.
We are part of Europe’s Rail

... and part of the Innovation Pillar.

System Pillar

- Single European Rail Area (SERA)

Essential Elements

- Regulation/standardisation for uniform European technical equipment.
- Functional uniform system architecture - implementation of DSD at European level
- DAC

50 Mio. € Funding

Innovation Pillar

User Centric F&E

Flagship Areas (FA)

1. European Rail Traffic & Mobility Mgmt.
2. Digital & Automated Train Operations
3. Integrated assets management
4. Zero emission & silent rail system solutions
5. Competitive Digital Green Rail Freight
6. Regional rail services
7. New Mobility Solutions
8. Digital Twin & Distributed Data

550 Mio. Funding
16 technical enablers will be developed, tested and demonstrated

1. Interoperable DAC Type 5 ready
2. Dev. of DAC-enabled train functions
3. Prep. for additional DAC train functions
4. Autonomous Shunting Operations
5. Multi-source data fusion (TS+OB)
6. Interface for hand-over: main-line → yards
7. DAC for T3000 wagons
8. Specs for int. cross-border timetable planning
9. Models for int. cross-border timetable planning
10. Dynamic Yard Management System
11. AI-based prediction of ETA
12. Railway Checkpoints at borders
13. Multi-country driver concepts
14. Transport planners with easy booking
15. Framework for seamless data exchange
16. Platform of platforms for seamless experience
Approach of FP5–TRANS4M-R

HOW?

...working in two clusters/workstreams...

Seamless Rail Freight

2

Customer A
Port
Border
Terminal
Customer B

Seamless planning and dispatching
Intermodal integration and prediction

Cluster 1 enables Cluster 2

Full Digital Rail Freight Operations

1

Digital Automated Coupler
Automated Shunting Operations
Automated Train Functions
Yard Automation Equipment

Seamless planning and dispatching
Intermodal integration and prediction
Context and opening
EDDP, ERJU, FP5
European DAC Delivery Programme
enabled by Europe’s Rail

EDDP Programme Management

Mark Topal-Gökceli
(ÖBB)

Jens Engelmann
(railiable)

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• Javier Ibáñez de Yrigoyen
  Europe’s Rail
  javier.ibanezdeyrigoyen@rail-research.europa.eu

The different DAC actors and how they are connected
The different DAC-related EU actors involved

- Full Digital Freight Train Operations (FDFTO)
- Seamless Rail
- System Pillar
- Brussels (BE)

- DG MOVE
- Brussels (BE)

- Valenciennes (FR)
### Interconnection of all DAC-related activities

<table>
<thead>
<tr>
<th>Europe’s Rail JU Flagship Project 5</th>
<th>EDDP</th>
<th>EC/ERA</th>
<th>Europe’s Rail System Pillar</th>
<th>ESOs</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAC/“Full Digital Freight Train Operations”</td>
<td>development/follow-up of migration roadmap, sector-wide coordination, risk management, prep. of decision-making</td>
<td>Funding &amp; Financing plan</td>
<td>operational procedures standardisation (plan &amp; execution)</td>
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<td>Technology (mirroring &amp; sector feedback)</td>
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<td>Technical harmonisation: preparing TSI revision &amp; driving EU standardisation</td>
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<td>Testing &amp; demos</td>
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<td>alignment of rail &amp; DAC system architecture</td>
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<td>System architecture</td>
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<td>Tech. specification</td>
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**Notes:**
- DAC stands for Digital Freight Train Operations.
- ESOs refer to European Standardisation Organisations.
- EDDP stands for European Digital Delivery Platform.
- EC/ERA refers to the European Commission and European Railways Agency.
- The DAC migration roadmap includes various stages such as fleet analyses, retrofitting, funding, investment plans, and technical specifications.
- The roadmap is supported by sounding boards, technology (mirroring & sector feedback), operational procedures, and infrastructural & IT adaptations.
- The overall goal is to ensure efficient and suitable authorisation processes and requirements, along with technical harmonisation and operational procedures.
European DAC Delivery Programme (EDDP) – the European DAC platform

as per end-22

87 DIFFERENT ORGANISATIONS (06/22)

> 235 PARTICIPANTS

20 DIFFERENT COUNTRIES

ORGANISATIONS BY TYPE

<table>
<thead>
<tr>
<th>RUs/IMs</th>
<th>IMs</th>
<th>WKs</th>
<th>INDUSTRY</th>
<th>OTHER</th>
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<tr>
<td>13</td>
<td>3</td>
<td>16</td>
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<td>36</td>
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</table>

USA: 2 observers
EDDP Governance – Programme Board
All DAC-related activities

Europe’s Rail Flagship Project 5

EDDP
Development/follow-up of migration roadmap, sector– wide coordination, risk management, prep. of decision-making

EC/ERA
Europe’s Rail System Pillar

ESOs

DAC migration roadmap

11 actions

- Fleet Analyses & rtf Engineering (rtf readiness)
- Retrofit capacity plan (workshops, workforce, components)
- Funding & Financing plan
  - CBA (updates)
- Infrastructural & IT adaptations
- Retrofitting plan (traffic & customer sidings analysis, operational plan)
- Investment plan & procurement framework plan
- Other regulatory & legal framework plans
- TSI revision
- DAC/“Full Digital Freight Train Operations”
- Technology (mirroring & sector feedback)
- Operational Procedures (mirroring & sector feedback)

DAC migration roadmap

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**Europe’s Rail Flagship Project 5**

**EDDP**
- development/follow-up of migration roadmap, sector-wide coordination, risk management, prep. of decision-making

**Funding & Financing plan**
- development of efficient & suitable authorisation process & requirements

**CBA** (updates)
- Infrastructural & IT adaptations
- Retrofitting plan (traffic & customer sidings analysis, operational plan)

**Investment plan & procurement framework plan**
- Other regulatory & legal framework plans

**TSI revision**
- technical harmonisation: preparing TSI revision & driving EU standardisation
- alignment of rail & DAC system architecture

**Operational Procedures** (mirroring & sector feedback)
- placing into service plan (safety, workforce training, rulebooks etc.)

**Fleet Analyses & rtf Engineering** (rtf readiness)
- Tech. development & testing & demos
- Tech. specification & authorisation dossiers

**DAC migration roadmap**
- 11 actions

**Here later the ope procedures will be standardised Europe-wide**

**FP 5 FDFTO sounding boards**
- Technology (mirroring & sector feedback)
- Operational Procedures (mirroring & sector feedback)

**DAC/“Full Digital Freight Train Operations”**
- target operat. proc. functional requ’mts system architecture tech. development testing & demos tech. specification authoris. dossiers

**Executive European Systemic Operators (ESOs)**
- executing European standardisation

**DAC migration roadmap**
- Operational Procedures (mirroring & sector feedback)
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**All DAC-related activities**

**Europe’s Rail System Pillar**
- operational procedures standardisation (plan & execution)

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## All DAC-related activities

### Europe’s Rail Flagship Project 5

- **FP 5 FDFTO sounding boards**
  - Technology (mirroring & sector feedback)
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### EDP «neo»
- Development/follow-up of migration roadmap, sector-wide coordination, risk management, prep. of decision-making

### EC/ERA

- Funding & Financing plan
  - Development of efficient & suitable authorisation process & requirements
  - CBA (updates)

### Europe’s Rail System Pillar

- TSI revision
  - Technical harmonisation: preparing TSI revision & driving EU standardisation
  - Alignment of rail & DAC system architecture

### ESOs

- Operational procedures standardisation (plan & execution)
  - Executing European standardisation

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### DAC migration roadmap

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**Here we are today**
DAC use cases
DAC is more than just a coupler

DAC is a key and unique enabler for numerous applications

DAC is not a stand-alone technology but the backbone for “full digital freight train operations” to achieve the ambitious transformation in European rail freight

This will allow the DAC to enable even more use cases and to generate a max. possible benefit

DAC for Full Digital Freight Train Operations
Use cases: DAC Core system and DAC applications
(Full Digital Freight Train Operations)

**DAC Core system**
- Automated coupling & manual uncoupling and digital backbone
- Recording of train composition
- Automatic (remote) uncoupling
- Heavier & longer trains (within existing infra limitations)
- Increased payload
- Increased speed via improved longitudinal forces

**DAC train preparation**
- Automatic brake test & calculation of brake capacity
- Automated technical wagon inspection

**DAC telematics** (wagon & goods monitoring)
- Predictive / preventive maintenance
- detection of cargo condition
- Cargo surveillance, intrusion alarm
- Wagon data & loading information on mobile device

**DAC shunting**
- Automated parking brake
- Draining of auxiliary air tanks
- Automated air valve
- Rear view camera for train driver
- Proximity detection
- Sound signals when train in motion

**DAC train run**
- Tail light (train integrity prior OTI function)
- Train end device (intermediate solution?)
- Vital on train integrity (OTI), enabling ETCS L3 moving block operations
- Increased speed via better braking performance
- Multiple loco traction and trains up to 1500m
- Derailment detection

**DAC loading & unloading**
- Automatic loading/unloading processes (replacement of hydr/pneum components, electro-mechanical actuators for bridge plates, automated cargo securing, heating elements for defrosting, ...) via ext. energy supply
- Illumination for worker’s safety & interior

**Benefits = gains in the processes**
- time, system time, cost savings, capacity, reliability, quality, safety
+ induced modal shift

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28
Introduction of D2.1
Motivation, Background, History, Methodology, Delimitation
Ing. Andreas Haller (M.Sc.)
Lead Architect Intelligent Freight Train & Digital Automated Coupling
Digital Automatic Coupling Project (L.CBX)

DB Cargo AG
Caroline-Michaelis-Straße 5-11, 10115 Berlin
Mobil: +49 152 374 052 79
Mail: andreas.an.haller@deutschebahn.com
The objective of this document is to provide the first agreed throughout Europe target operational procedures for rail freight. The procedures will define the basis for the development of the innovations for WP3-WP12. It describes the target of full automation of the freight sector, as well as a subset based on the agreed technical enablers in FP5-TRANS4M-R.
Chapter 3

Background & History

D2.1 Preliminary Operational Procedures have used the results from various projects, initiatives as input.
Chapter 5

Methodology

The Core Team:
- Andreas Haller
- Manfred Stobrave
- Stefan Zebracki
- Anton Vogel
- Lisa Ruiz
- Barbara Lunzer
- Manuel Rapold
- Aldo Smania
- Patrick Lefevre
Intensive coordination processes already during the creation of the document
• **Disruption/error process**
  Disruptive processes often introduce a high level of intricacy, involving multiple variables and uncertainties that can complicate the analysis and interpretation of results. Due to the inherent complexity, there are no disruption processes considered in this document.

• **Migration**
  The document does not cover any migration scenarios. These scenarios are subject of other initiatives. However, the document could be a base for the development of migration scenarios.

• **Border traffic/handover between countries and/or infrastructures**
  Handover between RUs or at border stations are not directly considered, as these processes are the responsibility of the RUs. However, the individual process steps should be included in the processes, whereas the order of the steps may vary.

• **Existing operational processes (Signaller, ETCS, ...)**
  Existing processes without impact of Full Digital Freight Train are not part of the document.
Chapter 7.2  

Delimination

- **IT interfaces only in a generic view**
  Not known at this time, this topic is partially addressed in other working packages within ER JU.

- **Maintenance processes**
  Only the operative shunting processes in the workshop are taken into account (supply/discharge). The maintenance/repair processes of the vehicle or components are not considered.

- **Consist functions**
  Train functions may be accompanied by consist functions, which are not described in this document.
Preliminary Operational Procedures
Terms and Actors
Definitions – FDFT

General:
• The abbreviation "FDFT" in front of descriptions means that they must be newly developed.
• The abbreviation "Legacy" in front of descriptions means that they already exist and are in use.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Description</th>
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<tr>
<td>FDFT Function</td>
<td>Function that does not exist today and <strong>needs to be developed to achieve the target state.</strong></td>
</tr>
<tr>
<td>FDFT function Prevent Coupling</td>
<td>• While the function is <strong>activated</strong>, the DAC coupler head must <strong>not allow coupling</strong>.</td>
</tr>
<tr>
<td></td>
<td>• Note: This function is required at all levels of DAC, even if the technical solution may be different.</td>
</tr>
</tbody>
</table>
### Definitions – FDF

<table>
<thead>
<tr>
<th>Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FDF System</strong></td>
<td>• Systems that do not exist today and need to be developed to achieve the target state.</td>
</tr>
</tbody>
</table>
| **FDF Wagon Base System** | • system on each wagon, which controls wagon components (e.g. DAC coupler heads, wagon wide power control system, battery management system, brake system, sensors).  
  • can communicate via FDF Link (network) e.g. with the Traction Unit, FDF Backend (if available), landside systems, with Personnel by using a Mobile HMI |
| **FDF Link**        | • Enables communication between FDF Systems  
  • connection can be physical or wireless.                                                                                           |
<table>
<thead>
<tr>
<th>Definition</th>
<th>Description</th>
</tr>
</thead>
</table>
| FDFT mode Train Run                           | • Coupled DAC coupler heads of Train **cannot be commanded to uncouple** & first and last DAC coupler heads of Train must have FDFT function Prevent Coupling deactivated  
• Power supply over DAC coupler heads can be enabled by Traction Unit.  
• An **operational train** run is carried out in FDFT mode Train Run.  
• Current state of discussion: Automated Parking Brake cannot be activated |
| FDFT mode Shunting (note: not ETCS Shunting Mode) | • **Allows electrical uncoupling** of DAC coupler heads, electrical activation of function prevent coupling and activation of Automated Parking Brake.  
• **Uncoupled: no harmful electrical power** on DAC coupler head is present, especially on electrical contacts.  
• **Uncoupling**: electrical connections of DAC coupler head must be **free of harmful electrical power or current**  
• **Coupling**: **harmful electrical power and current** is only **applied after successful mechanical coupling** of both DAC coupler heads including electrical coupler. |
# Definitions – Brake

## Today existing

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
</table>
| **Service Brake** | • *braking system used today* on freight trains (*compressed air brake)*  
  • slows down the vehicles by lowering the air in the main brake pipe or  
  • secures vehicles against rolling away for short periods of parking. |
| **Legacy braking means to secure wagon(s) against rolling away** | • braking means like *drag shoe, hand brake, track brake*, etc. |

## "New" Definition

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Automated Parking Brake</strong></td>
</tr>
</tbody>
</table>
| **Controllable Brake** | Can be *one or more systems* covering the following functions:  
  1) *Securing the wagon(s) against rolling away*. This function can be realised on the one hand by the Automated Parking Brake (especially longer parking periods) or by the service brake (shorter parking periods, depending on national regulations).  
  2) *Targeted braking of the wagon(s) to a certain speed or standstill*, which takes place after the wagon (set) has separated from the traction unit (e.g. braking of the wagon(s) after hump shunting/fly shunting). |
<table>
<thead>
<tr>
<th>Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coupling Point of Shunting Composition/Wagon Set</td>
<td>Identifies the future <strong>connection between two DAC coupler heads planned for coupling.</strong></td>
</tr>
<tr>
<td>Uncoupling Point of Shunting Composition/Wagon Set</td>
<td>Identifies the <strong>connection between two DAC coupler heads planned for uncoupling.</strong></td>
</tr>
</tbody>
</table>

You can find more definitions in Deliverable 2.1 Chapter 6.
Actors

- In the processes, actors are used as the executing entity
- They are kept general so that the processes can be applied to various infrastructures as well as different RUs
- How to read the document will be presented later
### Actors / Swimlanes

<table>
<thead>
<tr>
<th>Actor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake Test Operator (BO)</td>
<td>On site personnel <strong>performing</strong> the <strong>brake test</strong>.</td>
</tr>
<tr>
<td>Consist (A) (B)</td>
<td>A consist is the <strong>smallest railway rolling stock entity</strong> for operation (e.g. wagon, traction unit, ...), containing one <strong>CCU</strong> (Central Control Unit) <strong>representing one node</strong> on DAC network. It can be a traction unit, single wagon as a fixed set of single vehicles (segments) which are not disconnected while operation. A consist own a <strong>unique vehicle identification number</strong>.</td>
</tr>
<tr>
<td>FDT Backend (BE)</td>
<td>Collection of <strong>new FDT functions</strong> on land side. Receives, supplies, and stores Consist Data (e.g. Wagon Target Track Data, Traction Unit Status Data, Wagon Set Data and Additional Wagon Data). FDT Backend provides and receives data to and from other systems (FDT Yard, Traction Unit, etc.) FDT Backend <strong>initiates different functions</strong>, e.g. coupling and uncoupling processes, in Target State.</td>
</tr>
<tr>
<td>Actor</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>FDFT Yard (FY)</td>
<td>FDFT Yard is infrastructure based and <strong>controls</strong> all infrastructure elements in its area. FDFT Yard <strong>provides current state</strong> of infrastructure to <strong>FDFT Backend</strong> if available. The interfaces between FDFT Backend and FDFT Yard will be defined in a later step.</td>
</tr>
<tr>
<td>Mobile HMI (HM)</td>
<td>(Locally) (remote) device for <strong>personnel</strong> to <strong>interact with FDFT Systems</strong>. Connection to FDFT Systems can be wireless and physical, even to FDFT Wagon Base System. For example, personnel can connect the Mobile HMI to a wagon in a wagon set and retrieve Wagon Status Data and Wagon Set Data of the entire Wagon Set.</td>
</tr>
<tr>
<td>Operator TU (O)</td>
<td>Personnel (remotely) controlling Traction Unit(s).</td>
</tr>
<tr>
<td>Personnel (P)</td>
<td><strong>Only for subprocesses</strong>. Refers to the originating swim lane actor in the main process. E.g. if subprocess activity was on the Yard Manager swim lane, Personnel refers to Yard Manager in the subprocess context.</td>
</tr>
</tbody>
</table>
## Actors / Swimlanes

<table>
<thead>
<tr>
<th>Actor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signaller (S)</td>
<td>Performer in charge of the route <strong>setting of trains/shunting movements</strong> and of issuing instructions to Operator of Traction Unit (see TSI OPE).</td>
</tr>
<tr>
<td>Stationary Device (SD)</td>
<td><strong>Infrastructure-sided device</strong> that provides air for (automated) brake test and measurement data (e.g. air pressure). For <strong>target processes</strong>: <strong>Power and data</strong> are <strong>also supplied</strong> and connected. Over this device, a connection between Wagon(s) to FDFT Backend or Legacy Systems is possible.</td>
</tr>
<tr>
<td>Actor</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Traction Unit (TU)    | A Traction Unit with DAC coupler heads that supplies traction power and moves itself and coupled vehicles. This also includes multiple traction units moving together.  
• The DAC coupler heads can also be hybrid couplers (is able to operate with screw couplers and DAC)  
• A Traction Unit can also have Distributed Power System functionalities  
• **ATO** (Automatic Train Operation) and **ASO** (Automated Shunting Operations) systems can be applied  
• A Traction Unit can be equipped with FDFT functionalities, e.g. allows retrieving Wagon Status Data or Wagon Set Data and can initiate FDFT Wagon Base System's functions, like secure against rolling away, bleeding, etc.  
• An unpowered Traction Unit is considered and behaves like a wagon with FDFT Wagon Base System  
• Traction Units can be main line locomotives, shunting locomotives, shunting devices, two-way vehicles, etc.  
• The traction unit (TU) supplies the electrical energy for all the wagons in a train, if technical available  
• User Interface is available |
<table>
<thead>
<tr>
<th>Actor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wagon Inspector (WI)</td>
<td>On site personnel performing technical inspection of wagon(s).</td>
</tr>
<tr>
<td>Wagon/Wagon Set (WWS)</td>
<td>Wagon: Single physical freight Wagon equipped with DAC coupler head at each end. Wagon(s) permanently coupled (just one UIC Number) together should behave like a single wagon and cannot be uncoupled. Wagon Set: Wagon(s) coupled together by DAC coupler heads.</td>
</tr>
<tr>
<td>Yard Legacy System (YL)</td>
<td>Today's technical systems used in yard operations.</td>
</tr>
<tr>
<td>Actor</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Yard Manager (YM)</td>
<td>Personnel responsible for operation of shunting yards.</td>
</tr>
<tr>
<td>Yard Personnel (YP)</td>
<td>On site personnel needed for shunting operations, e.g. for uncoupling / coupling rolling stock, for securing rolling stock and any other activities that require human intervention in shunting operation.</td>
</tr>
</tbody>
</table>
Preliminary Operational Procedures
General Assumptions and Premises
General Assumptions and Premises

• The present design of the Preliminary Operational Procedures reflects the current status of the discussion on operational procedures within the sector and specifically within FP5-TRANS4M-R

• Design premises
  These Operational Procedures are designed as processes for universal usage in Europe, so by definition generic. It is not target of these processes, to define the detailed individual processes of each RU, Wagon keepers, but it should serve as a foundation for the individual adaptions on locations and/or local rules, to be done by each and every company.

• The following has been excluded from this study:
  • Disruption/error process
  • Migration
  • Border traffic/handover between countries and/or infrastructures
  • Existing operational processes (Signaller, ETCS, ...)
  • IT interfaces only in a generic view
  • Maintenance processes
  • Consist functions
Definition of DAC hardware level and FDFT Functions

- The general and DAC level specific definitions of the hardware and the functions which are being developed in ER JU FP5-TRANS4M-R project are listed below.
- The general assumption is that DAC 4 is upgradeable to DAC 5.
- Note: Alignment process for allocation for functions to DAC level is still ongoing; updated version will be available in D3.1 System Requirement Specification FDFT.

<table>
<thead>
<tr>
<th>FDFT Hardware General</th>
<th>FDFT Hardware DAC Level specific</th>
</tr>
</thead>
<tbody>
<tr>
<td>• mechanical coupler</td>
<td>DAC 4:</td>
</tr>
<tr>
<td>• electrical coupler</td>
<td>• lever on wagon side</td>
</tr>
<tr>
<td>• power and data lines, battery, CCU, emergency release</td>
<td>DAC 4.5:</td>
</tr>
<tr>
<td>• Hardware of Functions (e.g. sensors, ...)</td>
<td>• electrical actuator</td>
</tr>
<tr>
<td></td>
<td>• push button on wagon side</td>
</tr>
<tr>
<td></td>
<td>DAC 5:</td>
</tr>
<tr>
<td></td>
<td>• electrical actuator</td>
</tr>
</tbody>
</table>
General Assumptions and Premises

- FDFT Functions are partially described in the document, but are considered developed in detail in other WPs.
- Train Functions: are needed to automize and accelerate the train operation especially in shunting mode.
  - are controlled or monitored by the leading consist of the composition or an FDFT System.
  - users can be: a locomotive driver / Personnel / an ATO system (Automatic Train Operation) or a train protection system of the leading consist or an FDFT System.

For all train functions a validated train composition is needed as precondition to execute train functions in a safe and correct manner.
General Assumptions and Premises

• **Differences between Target Process and Semi-Automated Process**
  • The target process represents fully automated operation.
  • Processes that are only partially automated, are called semi-automated processes.
  • Possible reasons:
    • the technical development is not yet ready
    • certain areas (e.g. customer siding) are not (yet) fully equipped
  • Therefore, a differentiation is made between the “Target State”, which represents the fully automated operations (Target Processes) and the “Semi-Automated State” (Semiautomated processes).

• **Differences between Target Process and ER JU Process**
  • Within the framework of ER JU FP5-TRANS4M-R, not all developments that can represent the target state are carried out. For this reason, semi-automated processes, called "ER JU Process", are defined in this document, which represents the status that can be achieved after developments in ER JU FP5-TRANS4M-R have been completed (Technical Enabler)
  • Most dominantly no development of European FDFT Backend
Preliminary Operational Procedures

How to read the document
Process overview with four main processes

**TP04 Train Run**
- TP41 Addition, Removal of Wagon (Set)
- TP42 Addition, Removal of Traction Unit
- TP43 Change Of Operator

**TP03 Train Preparation**

**TP01 Shunting Preparation**

**TP02 Wagon Processing**
- TP05 Hump Shunting
- TP06 Fly Shunting
- TP07 Flat Shunting Drop Off
- TP08 Flat Shunting Pick Up

**Train Run** (Movement of Train)

**Preparation Processes**

**Shunting Processes** (Local Yard)
# Process overview

<table>
<thead>
<tr>
<th>TP01 Shunting Preparation</th>
<th>TP05 Hump Shunting</th>
<th>TP20 Uncouple</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP02 Wagon Processing</td>
<td>TP06 Fly Shunting</td>
<td>TP21 Couple</td>
</tr>
<tr>
<td>TP03 Train Preparation</td>
<td>TP07 Flat Shunting Drop Off</td>
<td>TP22 Secure Wagon (Set) Against Rolling Away</td>
</tr>
<tr>
<td>TP04 Train Run</td>
<td>TP08 Flat Shunting Pick Up</td>
<td>TP23 Remove, Release braking means</td>
</tr>
<tr>
<td></td>
<td>TP09 Automated Brake Test</td>
<td>P24 Bleeding</td>
</tr>
<tr>
<td></td>
<td>TP10 Confirm Wagon Set</td>
<td>TP25 Apply Parking Brake</td>
</tr>
<tr>
<td></td>
<td>TP11 Technical Wagon Inspection</td>
<td>TP26 Release Parking Brake</td>
</tr>
<tr>
<td></td>
<td>TP41 Addition, Removal of Wagon (Set)</td>
<td>TP30 Switch to FDFT mode Shunting</td>
</tr>
<tr>
<td></td>
<td>TP42 Addition, Removal of Traction Unit</td>
<td>TP31 Switch to FDFT mode Train Run</td>
</tr>
<tr>
<td></td>
<td>TP43 Change of Operator</td>
<td>TP32 Composition Detection</td>
</tr>
</tbody>
</table>
8.4.2 TP01 - Shunting Preparation

8.4.2.1 Target Process

**Actors**
- Yard Manager (YM)
- Yard Personnel (YP)
- Operator TU (O)
- Traction Unit (TU)
- Wagon/Wagon Set (WWS)
- FDPF Backend (DE)

**Process**

1. **T1 YM1.1**
   - check additional wagon data

2. **T2 O1.2**
   - confirm wagon set
   - is current traction unit planned for shunting preparation?
     - yes
     - no
     - is securing wagon set necessary?
       - yes
       - no

3. **P10 1 BE1.1**
   - check additional wagon data

4. **P10 2 BE1.2**
   - confirm wagon set
   - is securing wagon set necessary?
     - yes
     - no
Process description symbols

- **Actor**
  - actor with swimlane of process

- **Target State activity**
  - Target State activity
  - Semi-automated State activity
  - This activity is not executed within ERJU processes.

- **Subprocess indicator**
  - subprocess indicator with white flag at top right corner and referenced process id

- **Activity with operational necessity**

- **Start/end of activity flow path**

- **Decision**

- **End of decision paths**

- **Direction of activity flow**

- **Direction of information flow**

- **Information interface connection point**

- **Branch/Join of sequence-independent flow**

- **Branch/Join of semi-automated activity flows**
sequence-independent flow

start
sequence-independent flow

sequence-independent flow

end
sequence-independent flow
## Activity Description and Decision Description

<table>
<thead>
<tr>
<th>Activity</th>
<th>Short description of containing task(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition</td>
<td>conditions that must be fulfilled to begin the overall process</td>
</tr>
<tr>
<td>Conditions</td>
<td>conditions that must be fulfilled to start the activity without degradation. If not, a reference to an alternative degraded activity is given here or is indicated by a dotted yellow line in the process diagram</td>
</tr>
<tr>
<td>Tasks</td>
<td>description of tasks to be done in activity</td>
</tr>
<tr>
<td>Remarks</td>
<td>additional information to understand the context of the tasks</td>
</tr>
<tr>
<td>Rationale</td>
<td>additional reason for activity in process context</td>
</tr>
<tr>
<td>Postcondition</td>
<td>states or information that must be reached/fulfilled/sent/received after finishing the scenario or activity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ID</th>
<th>Decision</th>
<th>Short description of decision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Branch 1</strong></td>
<td>First option of branching according to decision</td>
</tr>
<tr>
<td></td>
<td><strong>Branch 2</strong></td>
<td>Second option of branching according to decision</td>
</tr>
<tr>
<td></td>
<td><strong>...</strong></td>
<td>Further options if necessary</td>
</tr>
<tr>
<td></td>
<td>Remarks</td>
<td>additional information to understand the context of the decision</td>
</tr>
<tr>
<td></td>
<td>Rationale</td>
<td>additional reason for condition in process context</td>
</tr>
</tbody>
</table>
Next Steps / Outlook
Next Steps / Outlook

Scheme for the elaboration of EU Harmonised Operation Procedures and second set of Ops Concepts (Syt.Pillar Task4/WP1)

- Questionnaire “on-line” will be addressed to all participants right after this Webinar n°1, to collect feedback
  => mid-october 2023

- System Pillar/Task 4 will analyse and elaborate conclusions, with an evaluation, and handover to FP5
  => mid-november 2023

- FP5/WP2 will provide a next revision v2.0, including first review-comments, improvements
  => planned release: 31/12/2023

⇒ Syst.Pillar/Task 4 to implement a "mirror group" in the frame of the next step ahead
Next Steps / Outlook

Elaboration of EU Harmonised Operation Procedures (FDFTO Rule Book) – based on results of Task4/WP1 and mature final input from FP5/WP2

Writing of the FDFTO Rule Book based on sector feedback and final mature input from FP5: 2nd evolution of FDFTO Rule Book draft

➢ 1st evolution of FDFTO Rule Book draft – 06/2024
➢ Collect and evaluate feedback via mirror group(s) until 09/2024
➢ 2nd edition of FDFTO Rule Book (pre-final deliverable of EU-Rail) - 12/2024
Conclusion
Summary

Key Take-Aways

General:

• The operational procedures are harmonised within FP5, but not yet finished and will be further improved

• ERJU processes describe a subset of the overall requirements

• These processes are the basis for UseCases, SystemArchitecture, SystemRequirements, UserRequirements, ...

D2.1
Preliminary Operational Procedures

<table>
<thead>
<tr>
<th>Project acronym:</th>
<th>FPS.TRAN$4M-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting date:</td>
<td>2022-07-01</td>
</tr>
<tr>
<td>Duration (in months):</td>
<td>45</td>
</tr>
<tr>
<td>Grant agreement no:</td>
<td>GA 101102009</td>
</tr>
<tr>
<td>Due date of deliverable:</td>
<td>Month 10</td>
</tr>
<tr>
<td>Actual submission date:</td>
<td>2023-09-30</td>
</tr>
<tr>
<td>Responsible/Author:</td>
<td>Andreas Haller, DB</td>
</tr>
<tr>
<td>Dissemination level:</td>
<td>PU</td>
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<tr>
<td>Deliverable Type:</td>
<td>Report</td>
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<td>Doc Version &amp; Status:</td>
<td>V1.0 Submitted</td>
</tr>
</tbody>
</table>

Reviewed: (Yes/No)
We need you!

Review participation

Your participation is key!

Please review and comment the document!
FP5 Partners
Introducing
D2.1 Preliminary Operational Procedures

Online, 13.09.2023
The project is supported by the Europe's Rail Joint Undertaking and its members.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Europe's Rail Joint Undertaking. Neither the European Union nor the granting authority can be held responsible for them.
Anti-Trust-Statement

• While some activities among competitors are both legal and beneficial to the industry, group activities of competitors are inherently suspect under the antitrust/competition laws of the countries in which our companies do business.

• Agreements between or among competitors need not be formal to raise questions under antitrust laws. They may include any kind of understanding, formal or informal, secretive or public, under which each of the participants can reasonably expect that another will follow a particular course of action or conduct. Each of the participants in this initiative is responsible for seeing that topics which may give an appearance of an agreement that would violate the antitrust laws are not discussed. It is the responsibility of each participant in the first instance to avoid raising improper subjects for discussion, notably such as those identified below.

• It is the sole purpose of any meeting of this initiative to provide a forum for expression of various points of view on topics
  (i) that are strictly related to the purpose or the execution of the initiative,
  (ii) that need to be discussed among the participants of the initiative,
  (iii) that are duly mentioned in the agenda of this meeting and
  (iv) that are extensively described in the minutes of the meeting.
• Participants are strongly encouraged to adhere to the agenda. Under no circumstances shall this meeting be used as a means for competing companies to reach any understanding, expressed or implied, which restricts or tends to restrict competition, or in any way impairs or tends to impair the ability of members to exercise independent business judgment regarding matters affecting competition.

• As a general rule, participants may not exchange any information about any business secret of their respective companies. In particular, participants must avoid any agreement or exchange of information on topics on the following non-exhaustive list:

  1. Prices, including calculation methodologies, surcharges, fees, rebates, conditions, freight rates, marketing terms, and pricing policies in general;
  2. any kind of market allocation, such as the allocation of territories, routes, product markets, customers, suppliers, and tenders;
  3. production planning, marketing or investment plans; capacities; levels of production or sales; customer base; customer relationships; margins; costs in general; product development; specific R&D projects;
  4. standards setting (when its purpose is to limit the availability and selection of products, limit competition, restrict entry into an industry, inhibit innovation or inhibit the ability of competitors to compete);
  5. codes of ethics administered in a way that could inhibit or restrict competition;
  6. group boycotts;
  7. validity of patents;
  8. ongoing litigations.
## Introducing D2.1 Preliminary Operational Procedures

10:00 - 12:30

<table>
<thead>
<tr>
<th>Topic</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction (Mr Javier Ibáñez de Yrigoyen)</td>
<td>15min</td>
</tr>
<tr>
<td>Context and opening (Mr Engelmann)</td>
<td>15min</td>
</tr>
<tr>
<td>Preliminary Target Operational Procedures presentation (Mr Haller)</td>
<td>100 min</td>
</tr>
<tr>
<td>Next steps/outlook (Mr Hénon)</td>
<td>15min</td>
</tr>
<tr>
<td>Conclusion (Mr Engelmann)</td>
<td>5 min</td>
</tr>
</tbody>
</table>
System Pillar Task 4 will industrialize the specification process within their specification groups. This process implies avoiding iterative dialogues by employing direct moderation. The generic repeating workflow of all mission-critical activities shall have this form.

Sprint durations are to waiting periods. The advisor group meetings shall be open for participants of technical bodies and are on fixed days on every month, hosted by the Core Group Convenors.

The mirror groups (larger) will be involved at least every 6 months for reviewing and commenting the results.
Basic Workflow / Team

FP5 / WP2 will provide a next document version v2.0
• including first review-comments, improvements
• planned release: 31.12.23

Design of disruption/error process
• planned start in Q1/2024

• Intensifying work regarding interfaces IT