



# Development of the harmonised European specifications for mainline ATO

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# Grades of Automation

## GoA1

- **Non-automated train operation**
- Manual driving with DAS advise
- Driver in cab

## GoA2

- **Semi-automated train operation**
- Automatic driving
- Driver in cab, still responsible for train operation

## GoA3

- **Driverless train operation**
- Automatic driving
- Train attendant responsible for some operational tasks

## GoA4

- **Unattended train operation**
- Automatic driving
- No staff on-board for operational tasks

# EUROPEAN PROJECTS FOR ATO SPECIFICATIONS

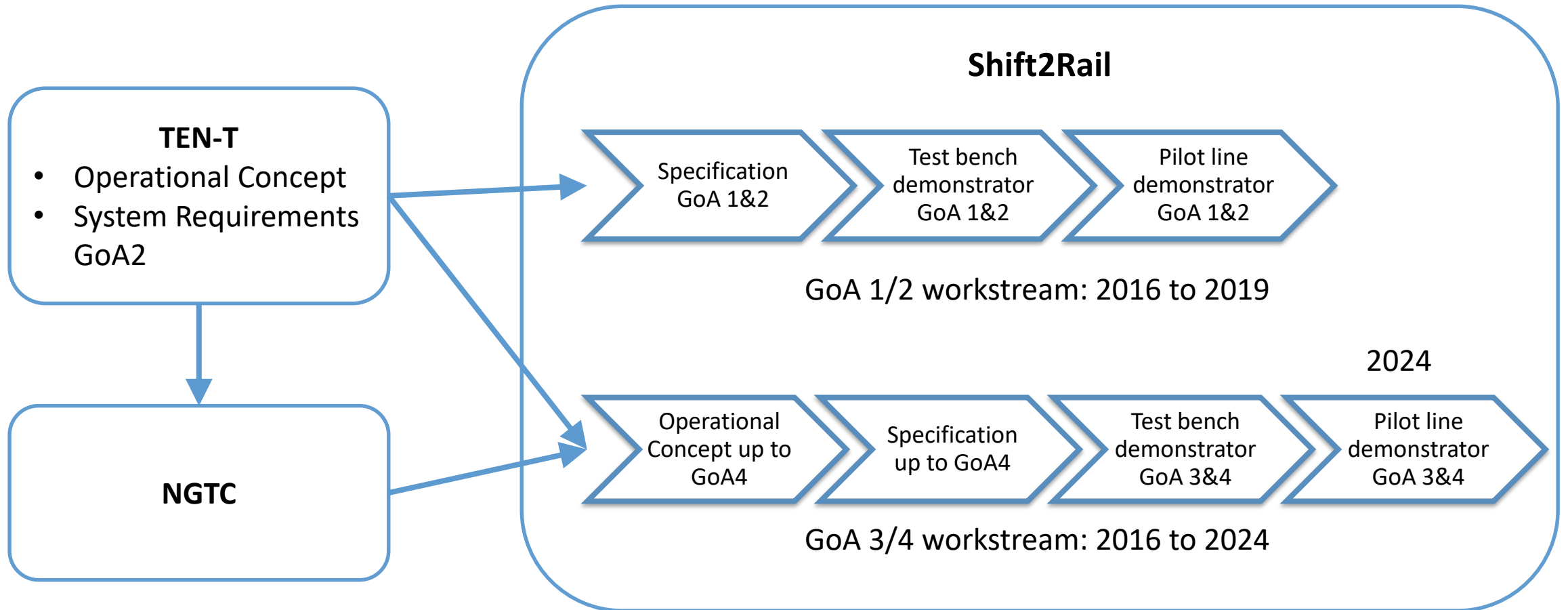
# TEN-T 2011 WP12

- 2011 to 2014
- Feasibility study concluded that higher capacity and lower energy consumption is achievable with ATO over ETCS
- EUG developed Operational Concept GoA2 to GoA4
- UNISIG developed technical specification for GoA2
- Output delivered to ERA for inclusion in B3 R2, but this appeared not feasible, therefore postponed mid 2015

# NGTC

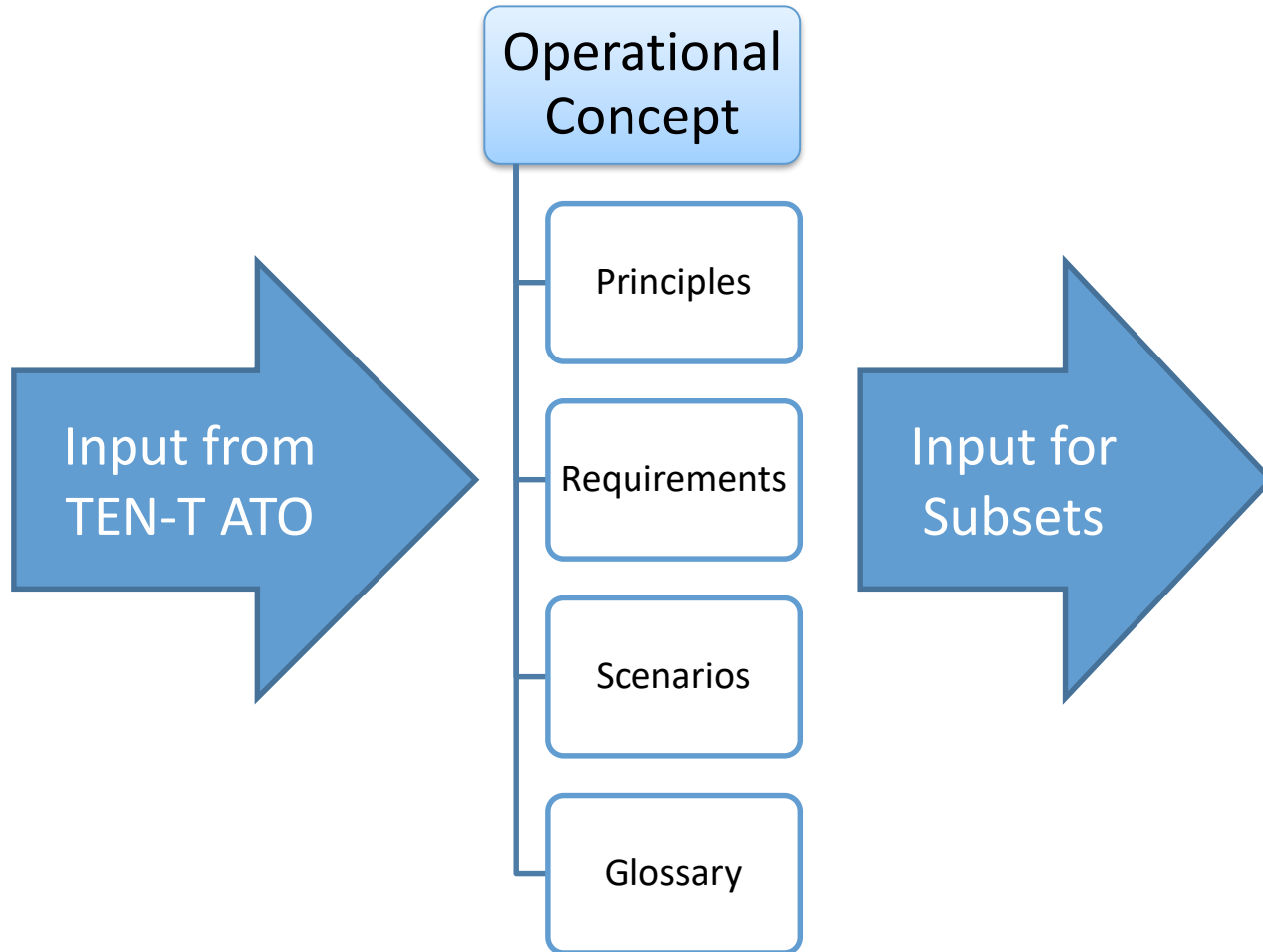
- Next Generation Train Control, 2013 to 2017
- Aim: Combined FRS and SRS for mainline and urban railways covering ATP and ATO
- Result:
  - No harmonisation of ATP
  - Common core of ATO functionality
  - Specification up to GoA4
- Benefit: Learning about ATO from urban world

# Shift2Rail



# SHIFT2RAIL: SEMI-AUTOMATIC TRAIN OPERATION

# Operational Concept



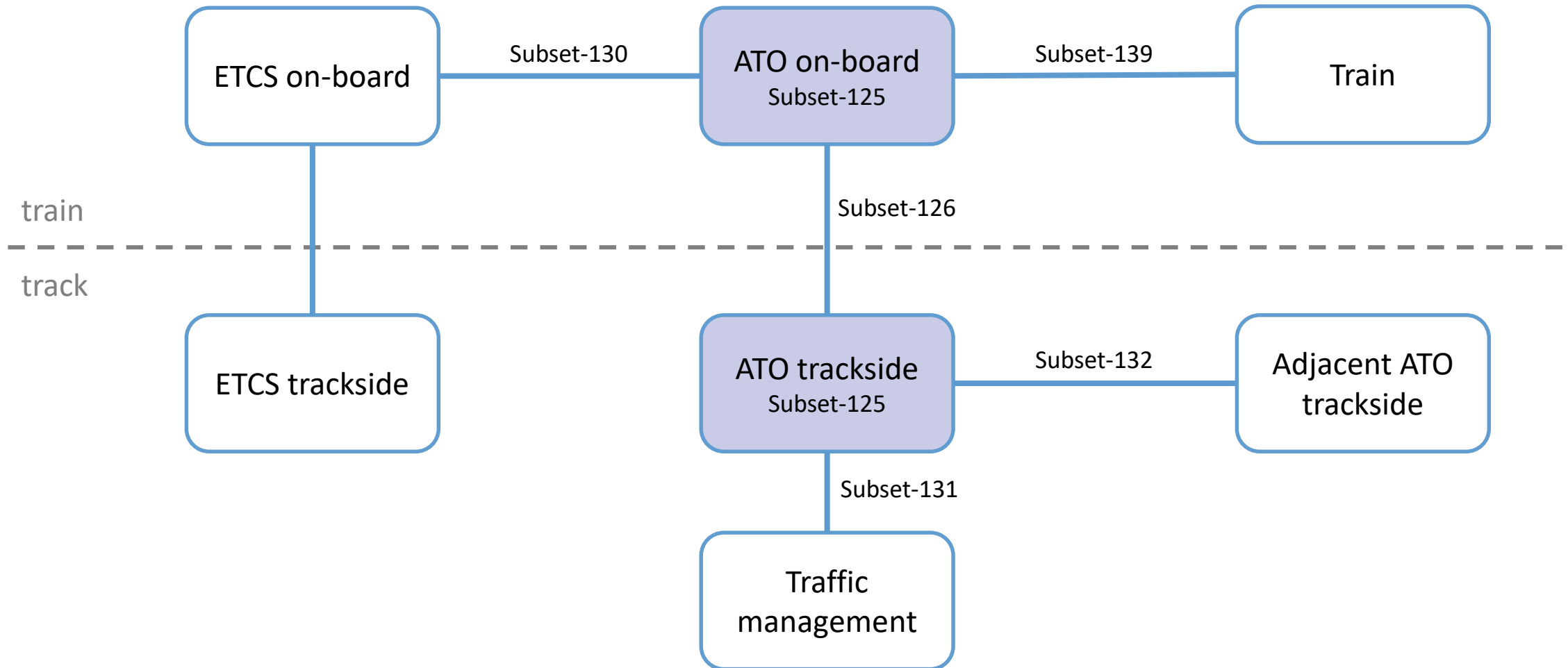
- Agreed for GoA 1 & 2
- GoA 3 & 4 kept for information only
- Maintained by EUG



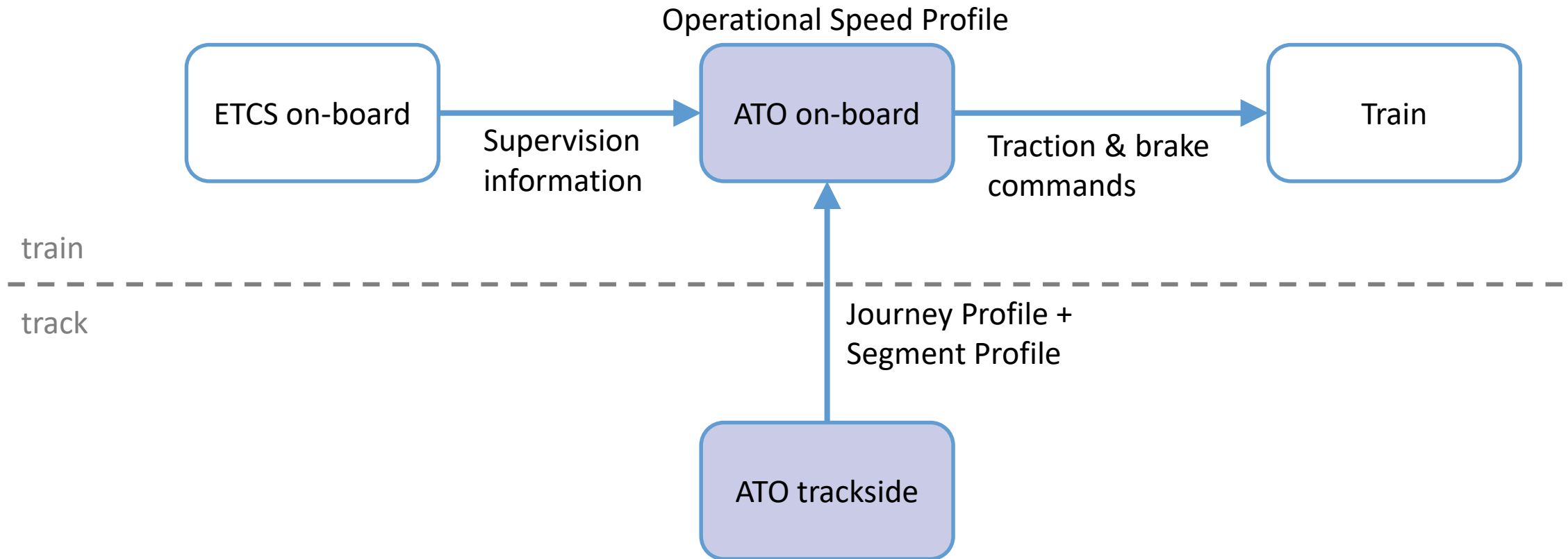
# Technical specification

- Covering GoA1 (C-DAS) and GoA2 (ATO)
- System requirements: Subset-125
- ATO airgap: Subset-126
- FFFIS ETCS-OB to ATO-OB: Subset-130
- Review of Subset-125/130 with ERA/EUG/UNISIG ongoing
- Expected impact on ETCS: Subset-26 (SRS) and DMI
- Optional Subsets produced by Shift2Rail: 131, 132, 139

# Architecture concept

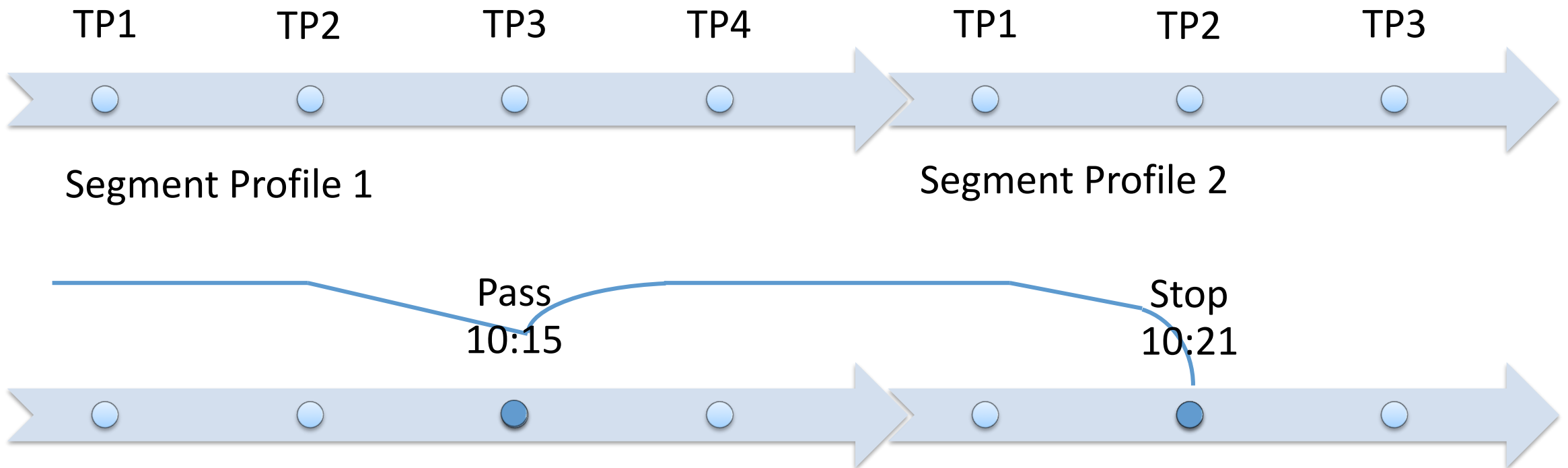


# Functional concept

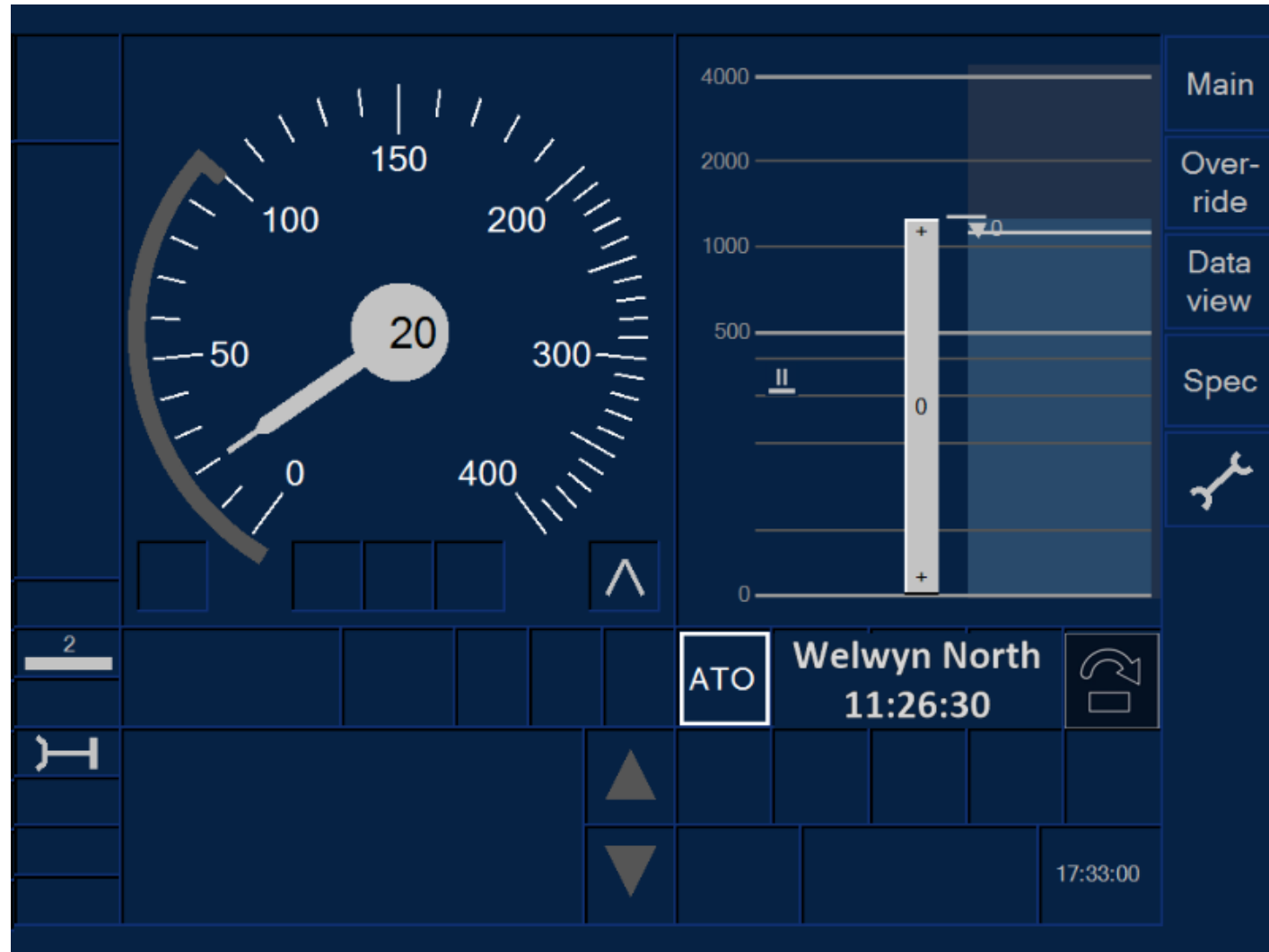


# Technical details

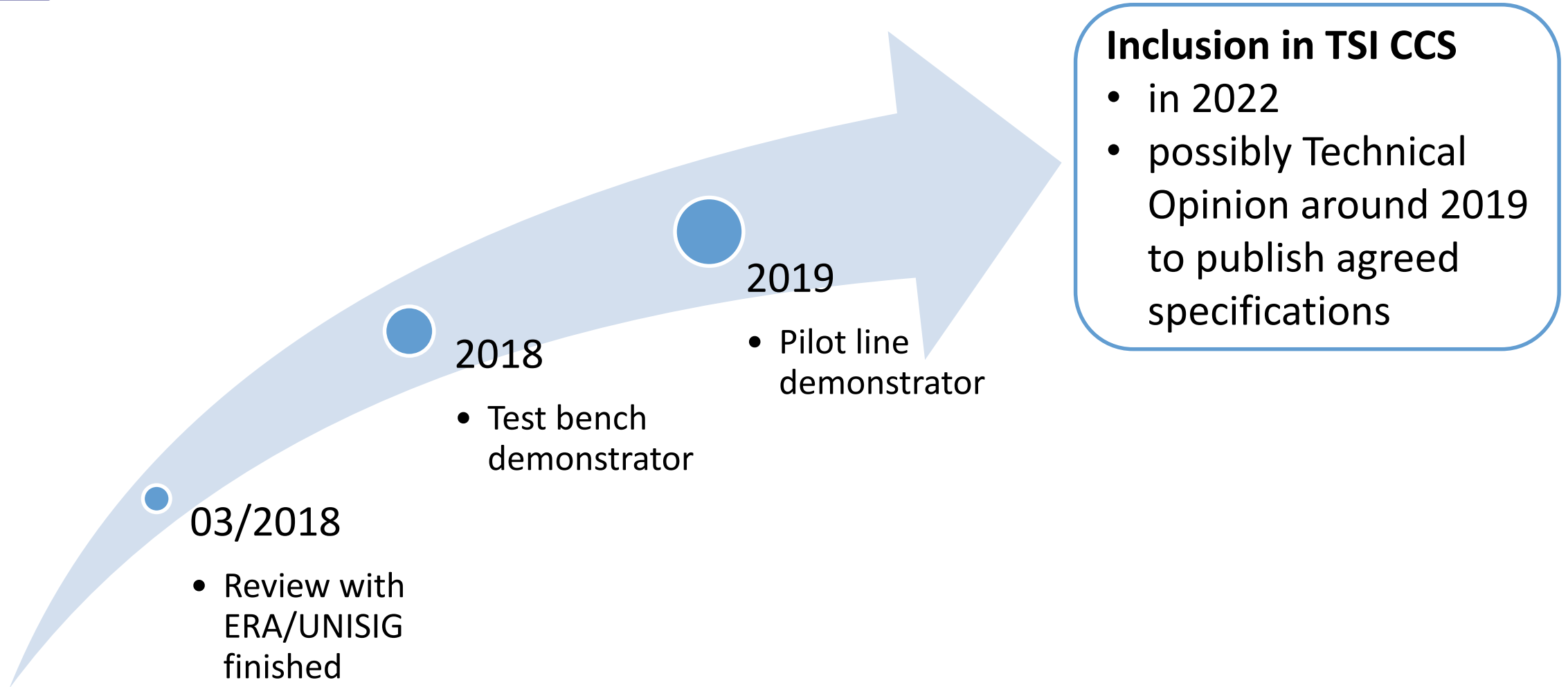
Journey Profile: pass SP1.TP3 at 10:15, stop at SP2.TP2 at 10:21



# Driver's perspective



# Planning



# **SHIFT2RAIL: UNATTENDED TRAIN OPERATION**

# Shift2Rail GoA 3/4 work stream

- Model based systems engineering
- CENELEC phases 1 to 5
- Development focused on GoA3/4, eventually one specification covering all GoA and transitions
- Operational Principles drafted  
(needs and mission, roles and responsibilities, contexts)
- Operational Requirements currently main work  
(Use cases with sequence diagrams)



# SUMMARY

# Summary

