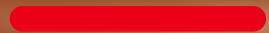




Systemtechnik

Digitale S-Bahn Hamburg

A safety concept to operate ATO over ETCS



European Rail Safety Days 30.09.2021 | Porto

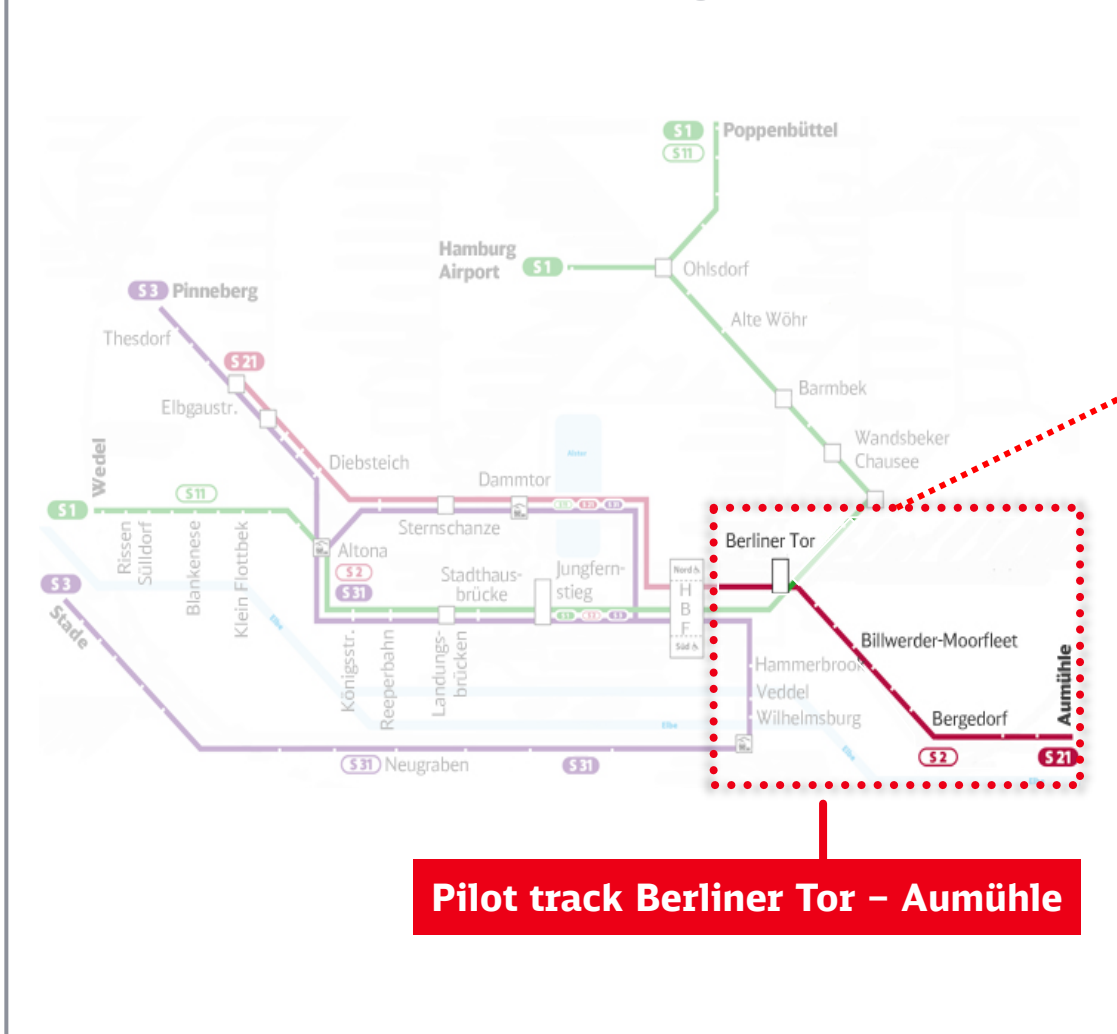
- 1. The project “Digital S-Bahn Hamburg”**
- 2. The safety approach**
- 3. The assessment**

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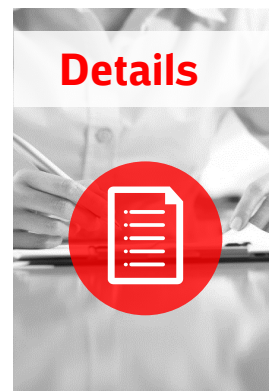
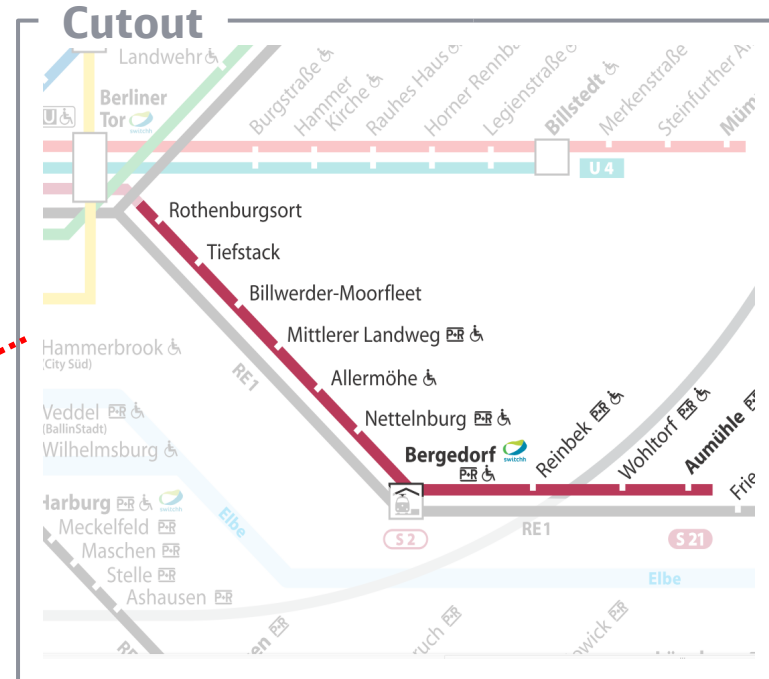
The Digital S-Bahn Hamburg project was a pilot for ITS World Congress 2021



Route network S-Bahn Hamburg



Pilot track Berliner Tor – Aumühle

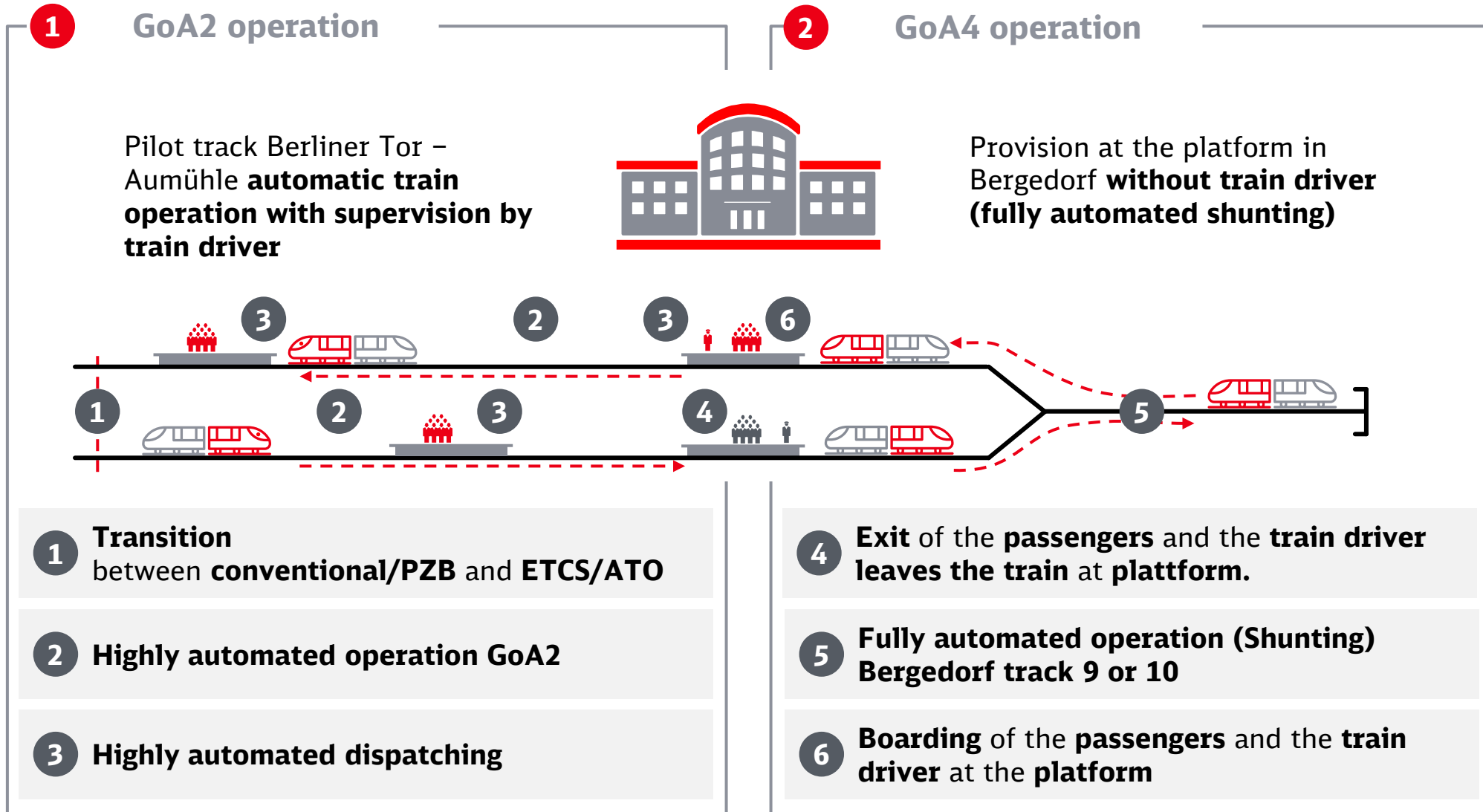


Details

- Length of the track: 23 km
- 10 train stations
- Modification of 4 vehicles
- Technical implementation of automatic train operation by Industrial Partner Siemens

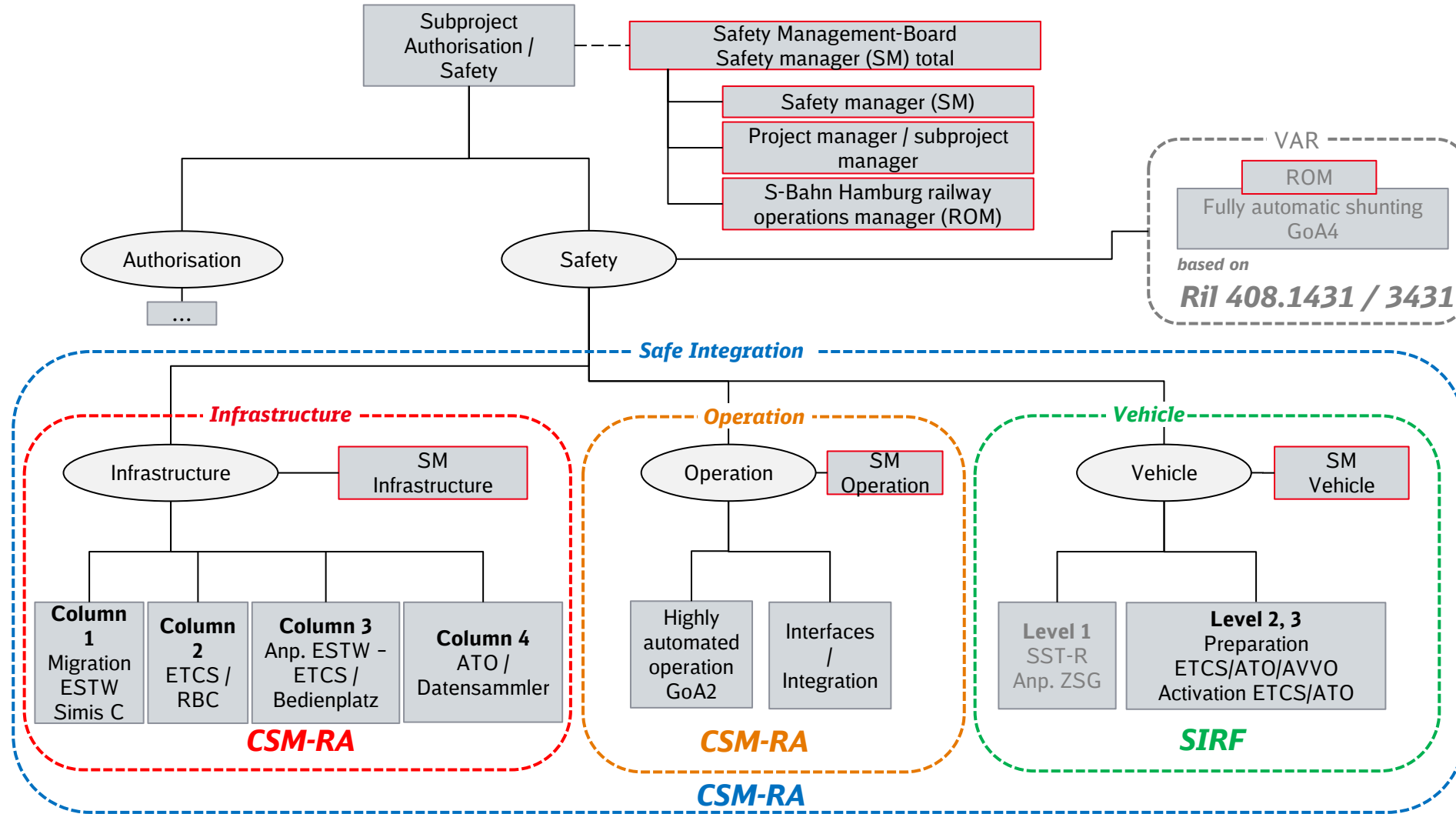
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The main use cases to show the GoA2 and GoA4 operation at the S-Bahn Hamburg



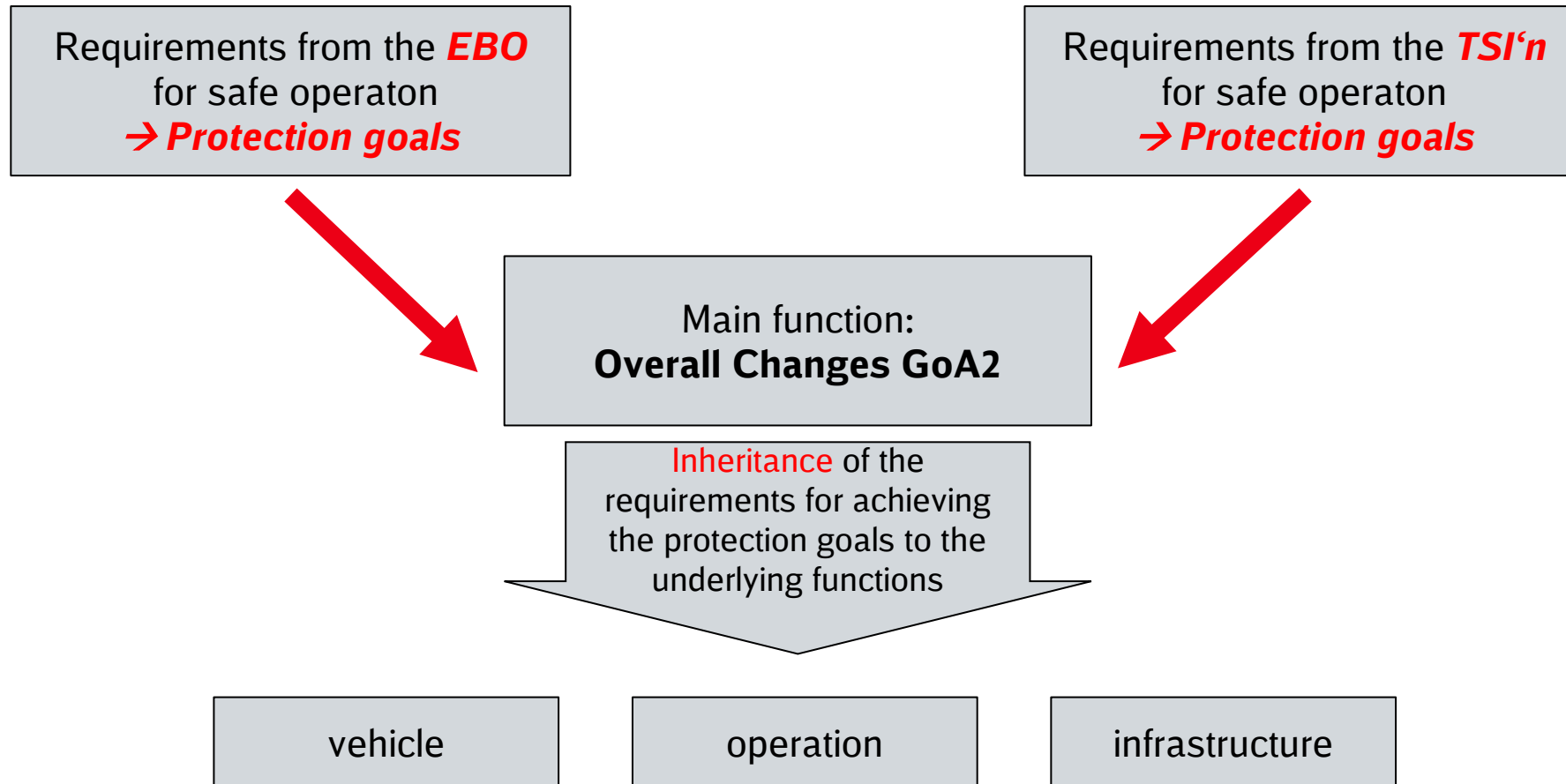
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Structure of the Safety Organisation



SIRF – Safety regulation vehicle

The functions for GoA2 operation meet general safety requirements in order to maintain the existing level of safety



EBO: Leading national regulation to ensure safe operation in Germany

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Operational Settings and Technical Realisation ensure safe integration of the amended Sub-systems



Requirements for the change from the operational point of view:

Highly automated operation
(GoA2)

Fully automated operation
(GoA4)



Requirements from the operation



Safe integration of the Subsystems into the SMS of the S-Bahn Hamburg

Have to match each other



Safety characteristics

Sub-Systems

Vehicle

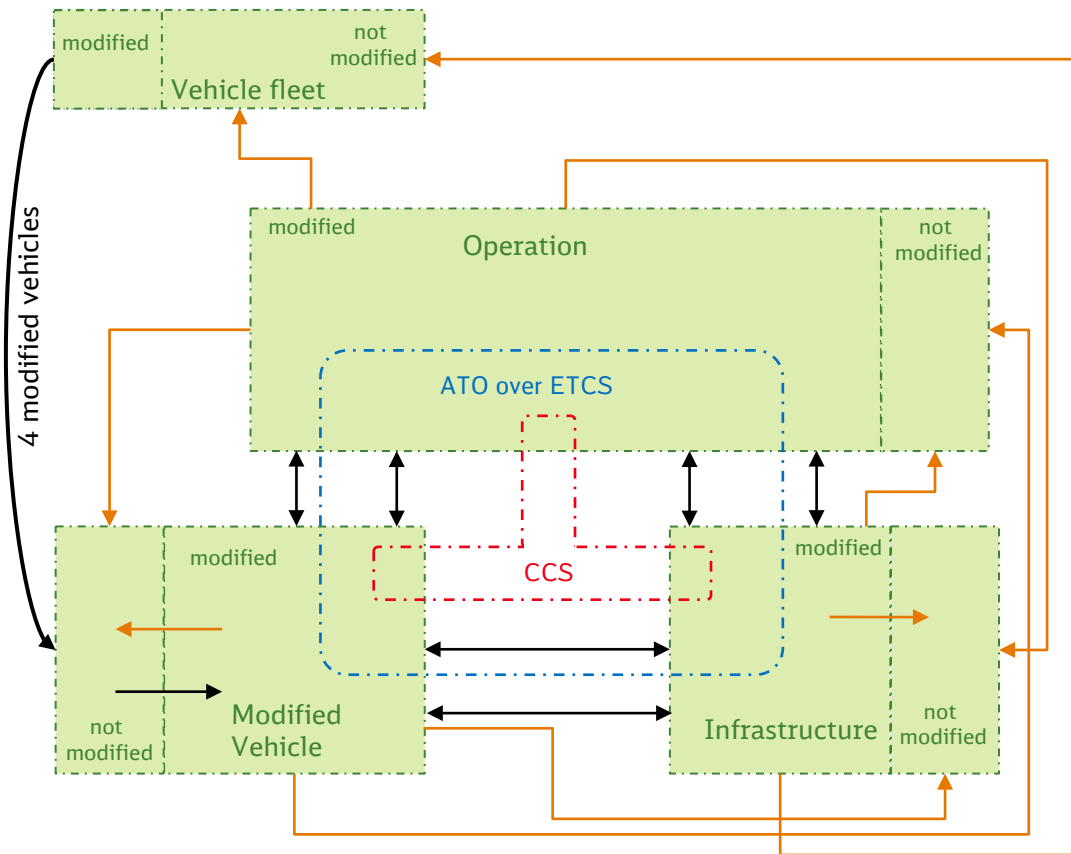
- Highly automated dispatch (GoA2)
- ETCS (GoA2)
- ATO (GoA2)
- Amended vehicle control unit (GoA2, GoA4)
- AVVO (GoA4)

Infrastructure

- | | | | |
|---|----------------------------------|---|--|
| Column 1
Migration
ESTW
Simis C | Column 2
ETCS /
RBC | Column 3
Anp. ESTW -
ETCS /
Bedienplatz | Column 4
ATO /
Datensammler |
|---|----------------------------------|---|--|

For safe integration, the functioning of the interfaces in the overall context is necessary

Interfaces between sub-systems within the system under assessment and to the existing system

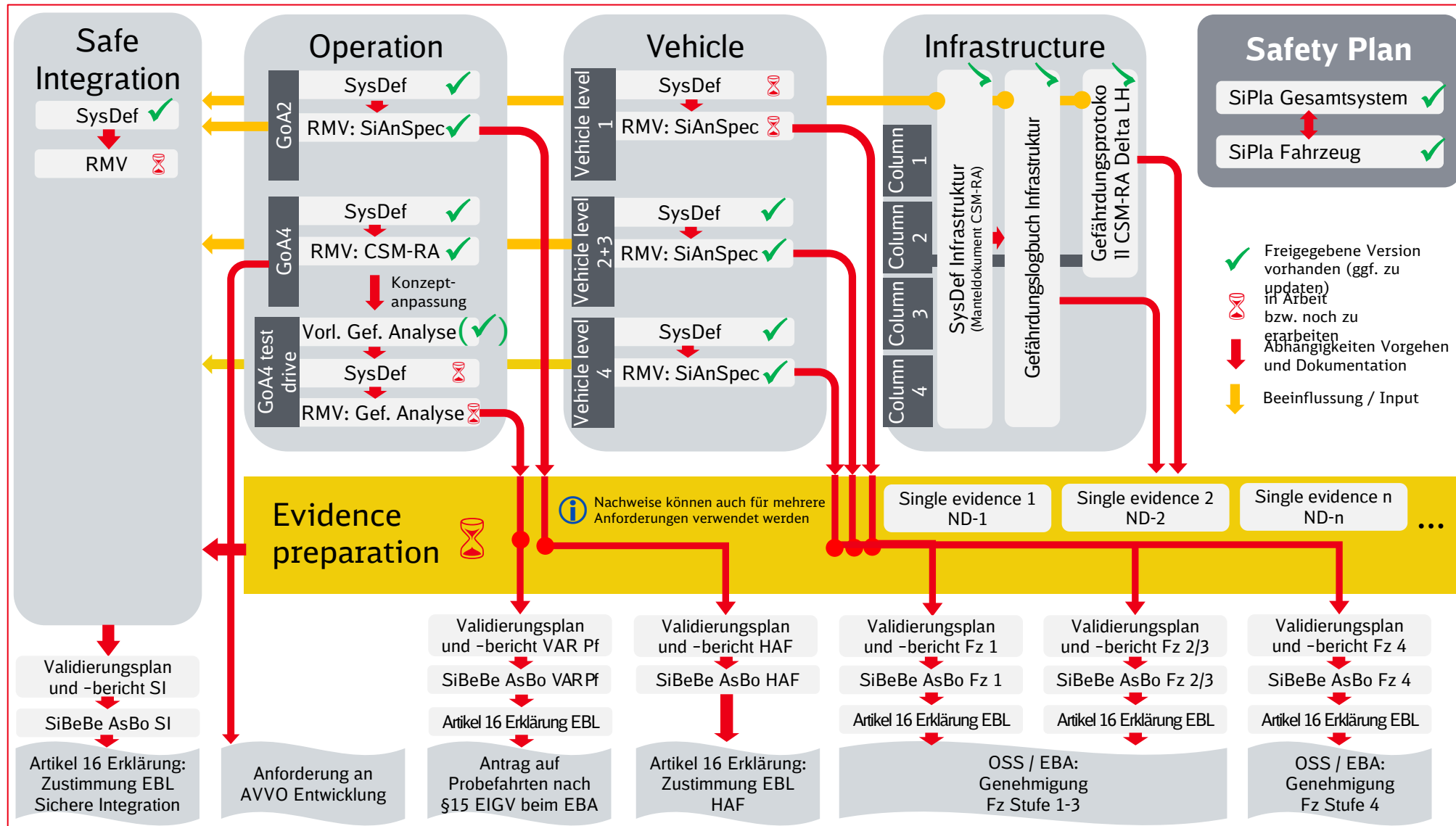


Black arrows: interfaces within the change

Orange arrows: interfaces to the existing system S-Bahn Hamburg (safe integration)

The CCS and ATO over ETCS subsystems are closed systems that are considered separately, but their function in the overall system must be taken into account.

Landkarte des Sicherheitsmanagements mit den diversen RMVs



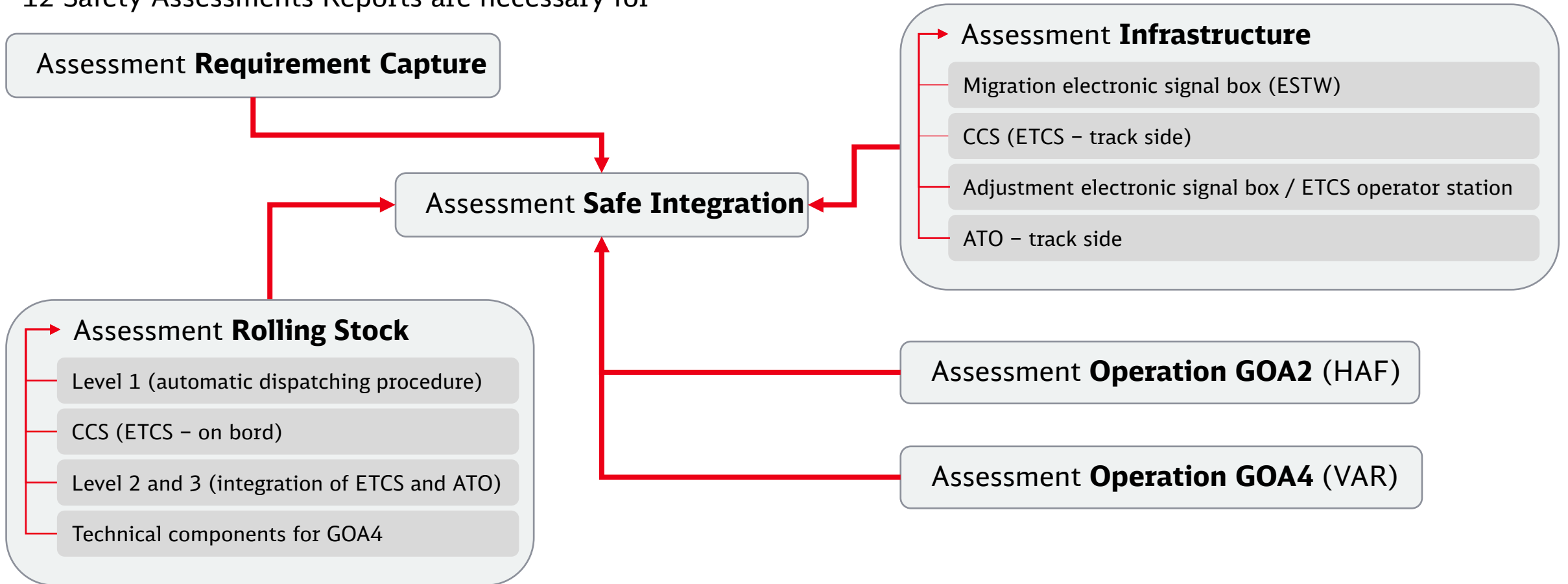
RMV – Risk Management Process
 SysDef – Systemdefinition
 SiAnSpec – Safety Requirement Specification
 SiPla – Safety Plan
 SiBeBe – Safety Assessment Report
 Validierungsplan und -bericht – Validation Plan and Validation Report

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Independent Safety Assessments and Conformity Assessments against TSI and NNTR



12 Safety Assessments Reports are necessary for



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