



GAME-CHANGING TECHNOLOGY FOR A NETWORK-WIDE RAILWAY AUTOMATION

# Automatic Train Operation (ATO) in mainline

## A well-defined system architecture with standardized interfaces

The ATO overall system consists of an on-board ATO system (ATO-OB) and trackside ATO system (ATO-TS). The ATO-TS is additionally connected to a Traffic Management System (TMS).

### On-board ATO system (ATO-OB)

The ATO-OB continuously calculates the optimum speed profile based on the available data of infrastructure, track and timetable information and controls the traction and braking systems for automated train runs.

### Trackside ATO system (ATO-TS)

The ATO-TS collects dynamic information from the existing TMS and generates specific journey profiles. It also delivers static infrastructure data for the planned route (segment profiles with e.g. detailed track information, topology, geometry).

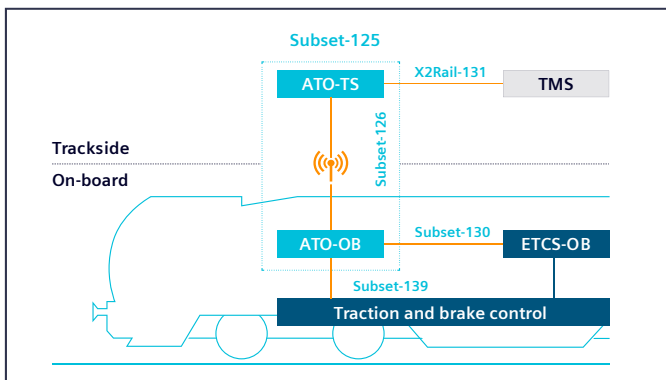
## Connecting ATO to a Traffic Management System is key to optimized train control

### Traffic Management System (TMS)

The TMS provides dynamic timetable data with detailed information about train movements as well as forecast and possible conflict information. Together with planned route data all information is transmitted to the ATO-TS.

## ATO over ETCS is a perfect match for performance-oriented customers

As ETCS (European Train Control System) monitors train movements and speed limits on track, ATO reliably controls the train's drive and braking systems for energy-optimized operation. ETCS provides interoperability, guarantees safety and sustainability, while ATO translates into maximum performance through greater capacity and network optimization: A perfect combination for mainline as well as cargo.



## Standardized European solution for interoperable operations

ATO is an essential goal of European standardization activities. While striving for harmonization, ATO in principal needs to fulfill the same requirements for interoperability as ETCS. With proven interfaces in line with European standardization frameworks, Siemens is at the forefront of establishing ATO over ETCS.

## Siemens is trusted partner for ATO projects worldwide



### Thameslink Program, London/UK

- World's first commercial ATO over ETCS application in mainline (2018)
- Increasing capacity for the north-south inner-city link of London
- Throughput for up to 24 trains per hour on existing tracks



### ATO Demonstrator for SBB, Switzerland

- First train runs with ATO over ETCS in adherence to UNISIG standards
- GoA2 successfully tested in joint project with SBB (two phases 2018/20)
- Proof of standardized interfaces and interoperability (Subset 125, 126, 130)



### Digital S-Bahn, Hamburg/Germany

- Blueprint for ATO over ETCS in Germany in cooperation with DB AG & S-Bahn Hamburg
- Implementation of highly automatic train operation based on European standards. Passenger service starting 2022
- Driverless turnback (feature of GoA4)

## Key benefits at a glance



**Improved network operation performance** by means of an improved traffic flow



**Energy savings** by means of an optimized driving strategy



**Boosted infrastructure and transport capacity** by decreasing headways



**Reduced mechanical wear & tear, less noise** by means of homogeneous driving with less braking



**Increased stopping accuracy** by means of an optimized localization and braking strategy



**Increased passenger comfort** by means of smoother, homogeneous driving



**Improved timetable stability and punctuality** by means of consistent driving behavior



**Optimized boarding and passenger management** by means of improved stopping and dwell strategy

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