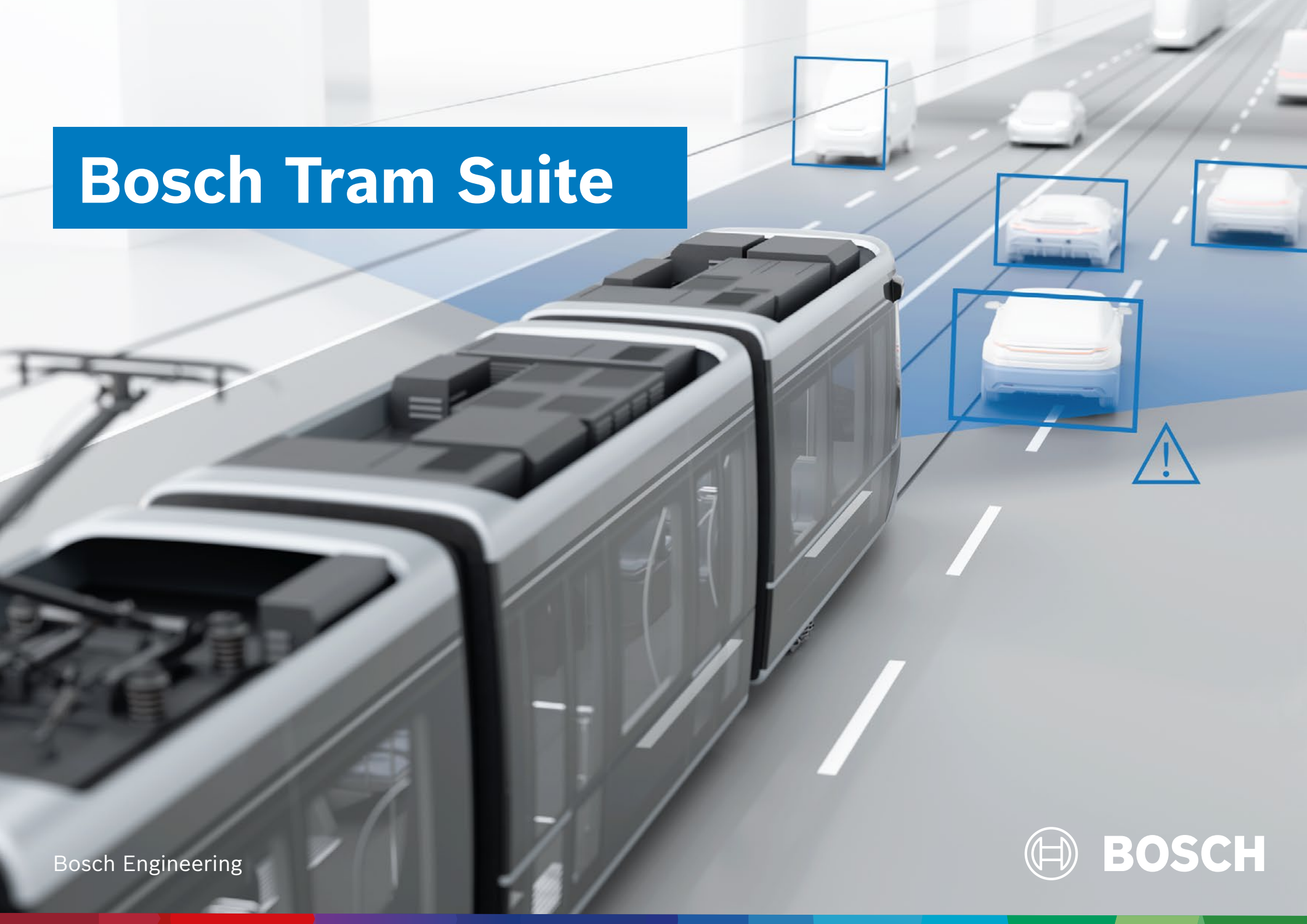


Bosch Tram Suite





On track to the future

Next-generation assistance systems for tram operators

Bosch Engineering leverages Bosch technology that has been tried-and-tested millions of times in vehicle manufacturing to develop assistance systems that are making rail transport safer. Since 2017, the Bosch tram forward collision warning (TFCW) system is worldwide in use and number one on the market, with several thousand systems delivered to customers.

We are now opening a new chapter in this success story – with the Bosch tram suite.

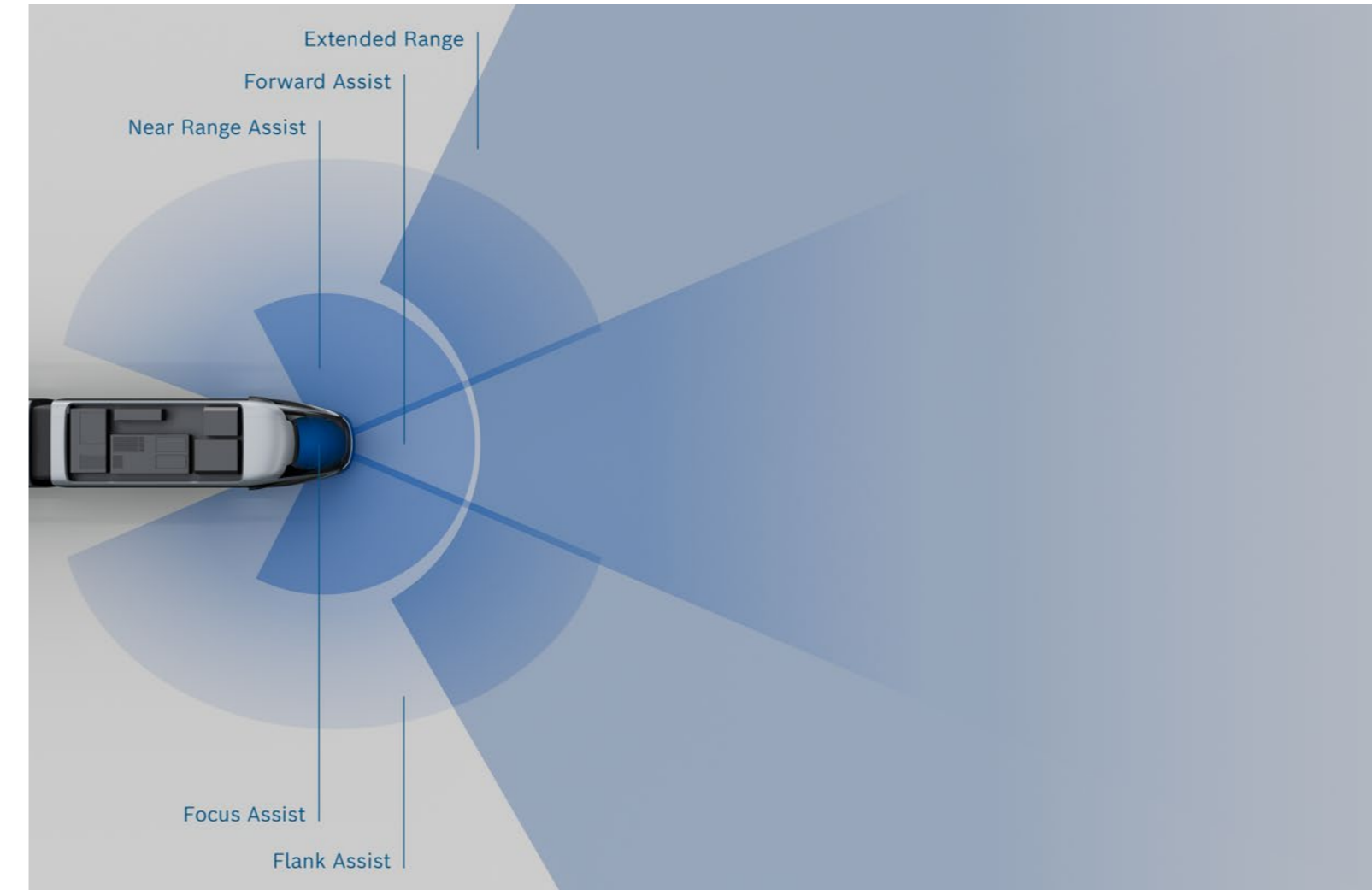
The Bosch tram suite at a glance:

- Bosch technology tested and proven a million times
- Thousands of TFCW systems in daily use by tram operators worldwide
- Available for new built trams and retrofit
- Suitable for use in all weather conditions
- Latest generation of surround sensing technology
- High-resolution 4D radar
- Enabling seamless all-round monitoring for tram operation

Seamless monitoring of vehicle surroundings

Bosch tram assist suite

Our latest-generation product portfolio makes seamless all-round monitoring reality for tram operation.



Your benefits

Improved safety
thanks to reduced risk of accidents

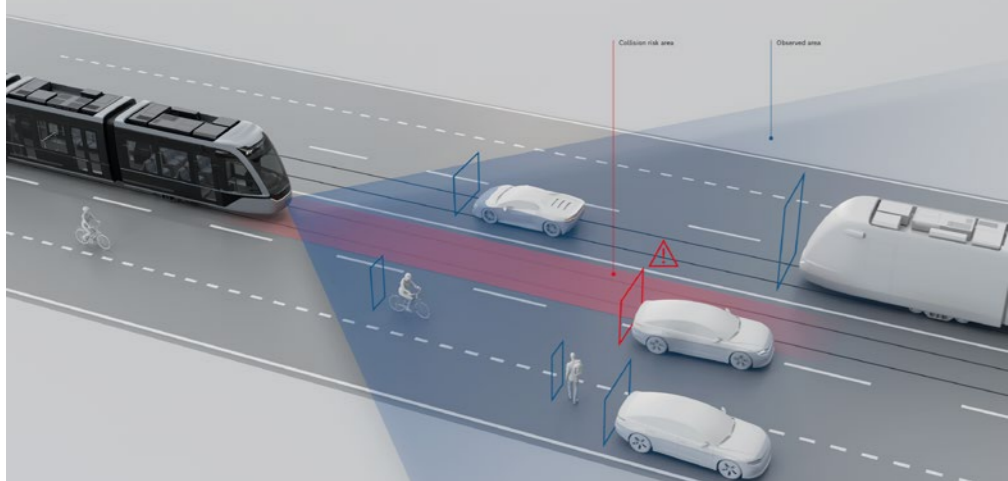
Higher availability
thanks to fewer accidents

Lower costs
thanks to fewer repair stops

Simple integration
thanks to compact, standardized components

Suitable for retrofitting
in existing vehicle fleets

Suitable for worldwide use
thanks to approval to international standards



Latest-generation front camera and front radar

Forward assist

Functions

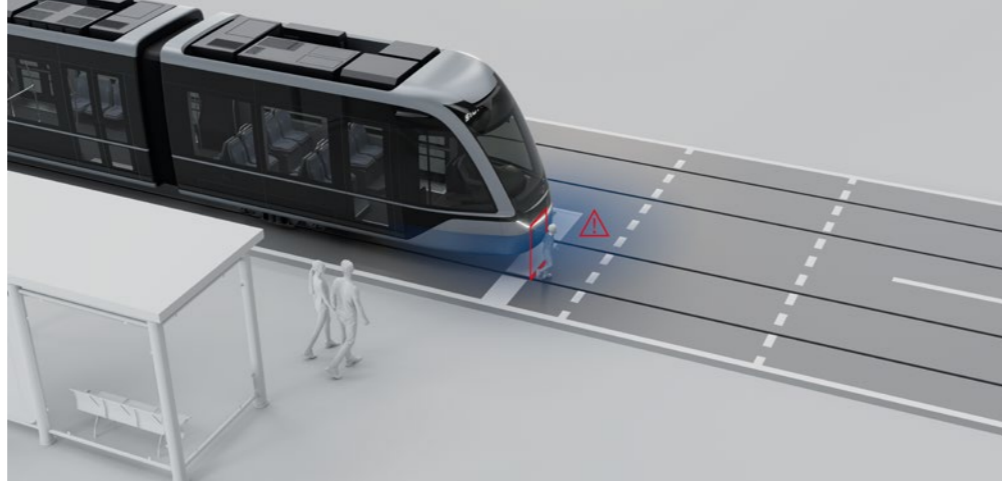
- Warning of head-on collisions up to 80 km/h
- Head-on collision avoidance up to 45 km/h
- Sign and signal recognition and speed limiter
- + Additional functions

User benefits

- Enhanced safety, fewer driver-related accidents
- Increased comfort and extra assistance for drivers
- Fewer delays, breakdowns, and repairs

Scope of supply

- Front radar premium gen5
- Multi-purpose camera gen3 (CV)
- High-performance processor
- + Optional add-ons



Ultrasonic sensor technology monitors close surroundings

Near range assist

Functions

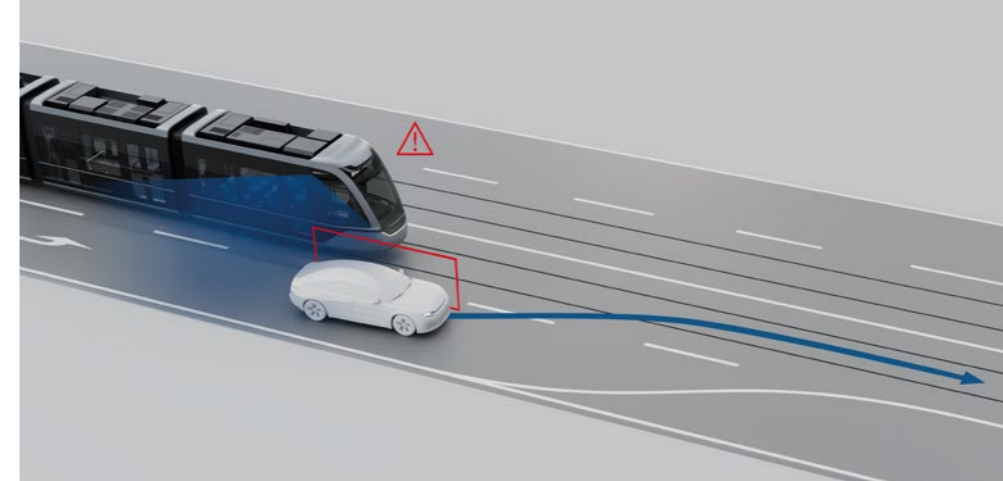
- Detection of people between coupled tram cars, e.g. coupling surfers
- Warning in case of obstacles close to the front of the tram
- Coupling assistance
- Platform detection prevents doors from opening on the wrong side

User benefits

- Enhanced safety, fewer driver-related accidents
- Increased comfort and extra assistance for drivers
- Fewer delays, breakdowns, and repairs

Scope of supply

- Ultrasonic sensors with CAN interface
- Number and position of sensors can be varied to suit their purpose



Radar systems monitor the sides of the vehicle

Flank assist

Functions

- Vehicle detection on the side of the tram
- Warning of any vehicles that may enter the track area
- Recommends the driver to slow down
- Extends the detection range of tram forward assist

User benefits

- Enhanced safety, fewer driver-related accidents involving turning vehicles
- Increased comfort and extra assistance for drivers
- Fewer delays, breakdowns, and repairs

Scope of supply

- 2 Corner Radar Gen 5 CR5TP + CAN interface
- Available as standalone system without integration
- Can be configured for the left and/or right side of the tram
- + Additional options



Near-range camera detects driver distraction

Focus assist

Functions

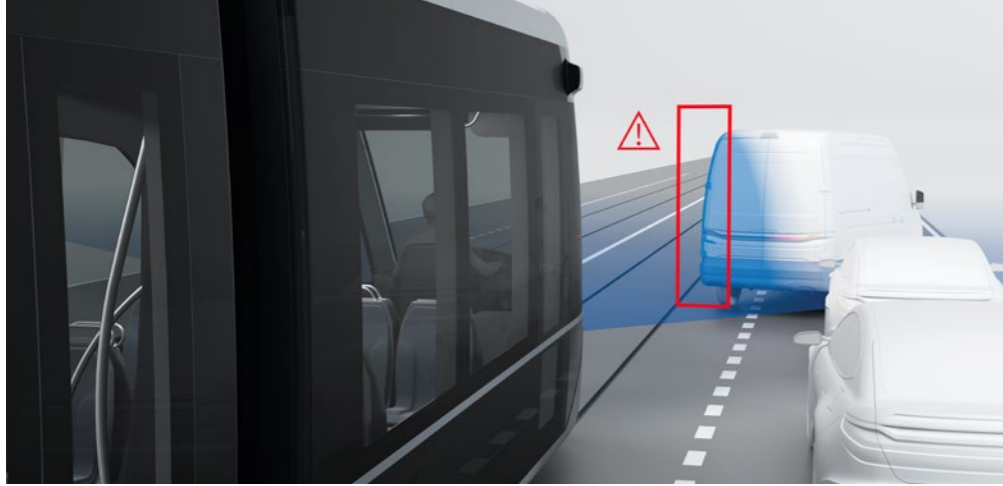
- Detection of driver distraction
- Detection of microsleep and drowsiness
- Detection if the driver is no longer in the correct seated position (e.g. medical emergency)

User benefits

- Enhanced safety, fewer driver-related accidents
- Extra assistance for drivers from a virtual co-driver
- Fewer delays, breakdowns, and repairs

Scope of supply

- Near-range infrared camera + electronic control unit
- Range of warnings – visual, acoustic, and with or without braking intervention
- Suitable for combination with tram forward assist and tram flank assist



Complementary LiDAR sensor extends the functionality

Forward assist plus

Functions

- Identical functions as tram forward assist, plus:
- Detection of obstacles protruding into the structure gauge, e.g. branches, parked vehicles
- Detection of damage to the catenary
- Detection of persons lying or sitting in the track area

User benefits

- Enhanced safety, fewer driver-related accidents
- Increased comfort and extra assistance for drivers
- Fewer delays, breakdowns, and repairs

Scope of supply

- Based on the tram forward assist system
- + LiDAR sensor



Continuous updates throughout the entire product service life

Connected services

Functions

- Wireless software updates and service releases
- Remote monitoring, diagnosis, and configuration
- Software solutions for system performance diagnostics, reports, and analysis

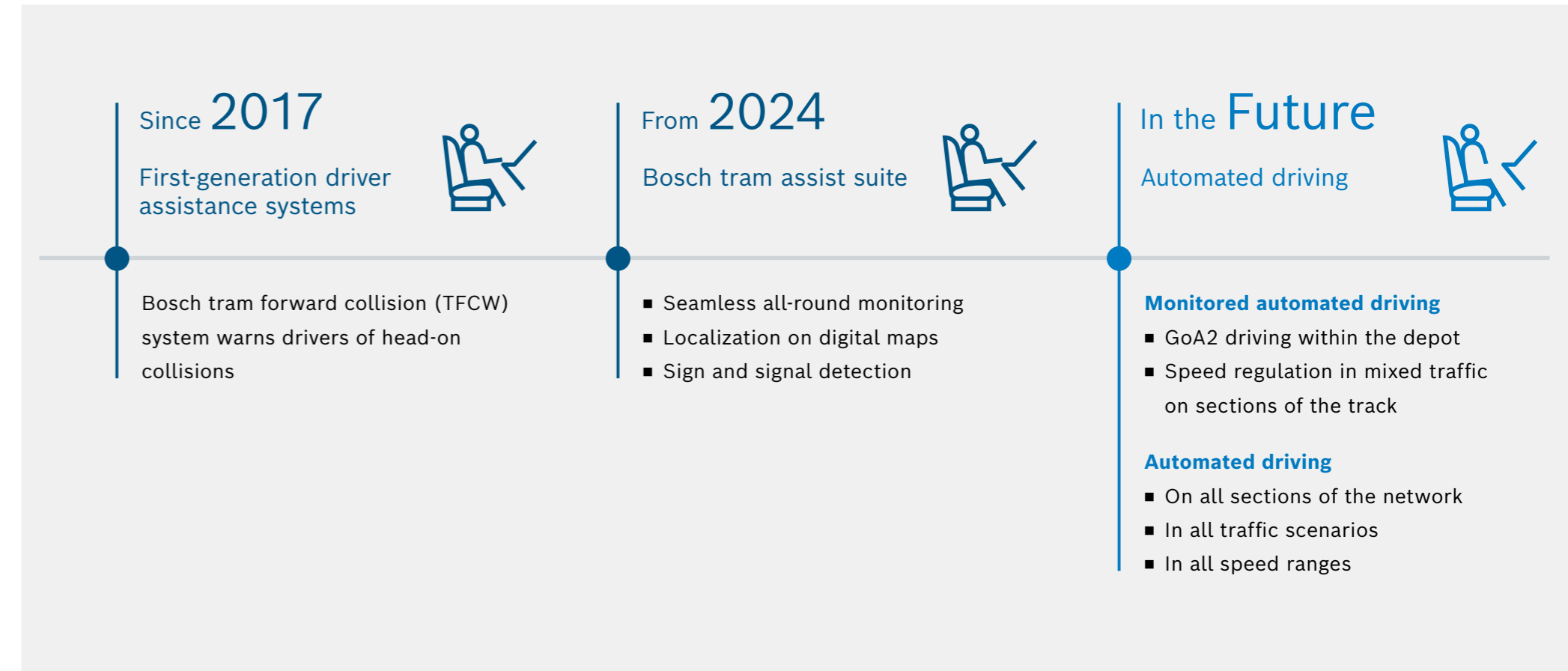
User benefits

- Product quality is enhanced because operating data from the tram assist suite can be analyzed continuously across all user operations
- Every user benefits from this operating data analysis in the form of product updates, distributed over the air
- Through this approach, Bosch Engineering is underscoring its commitment to quality throughout the entire product service life

Our vision – highly available and automated tram operations

Bosch tram automation suite

Intelligent and automated systems are the next step into the future for mass transit operators. They make tram operations safer and ensure high availability for services. The tram automation suite brings tram operators on track to the smart city.



Do you have any questions?

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