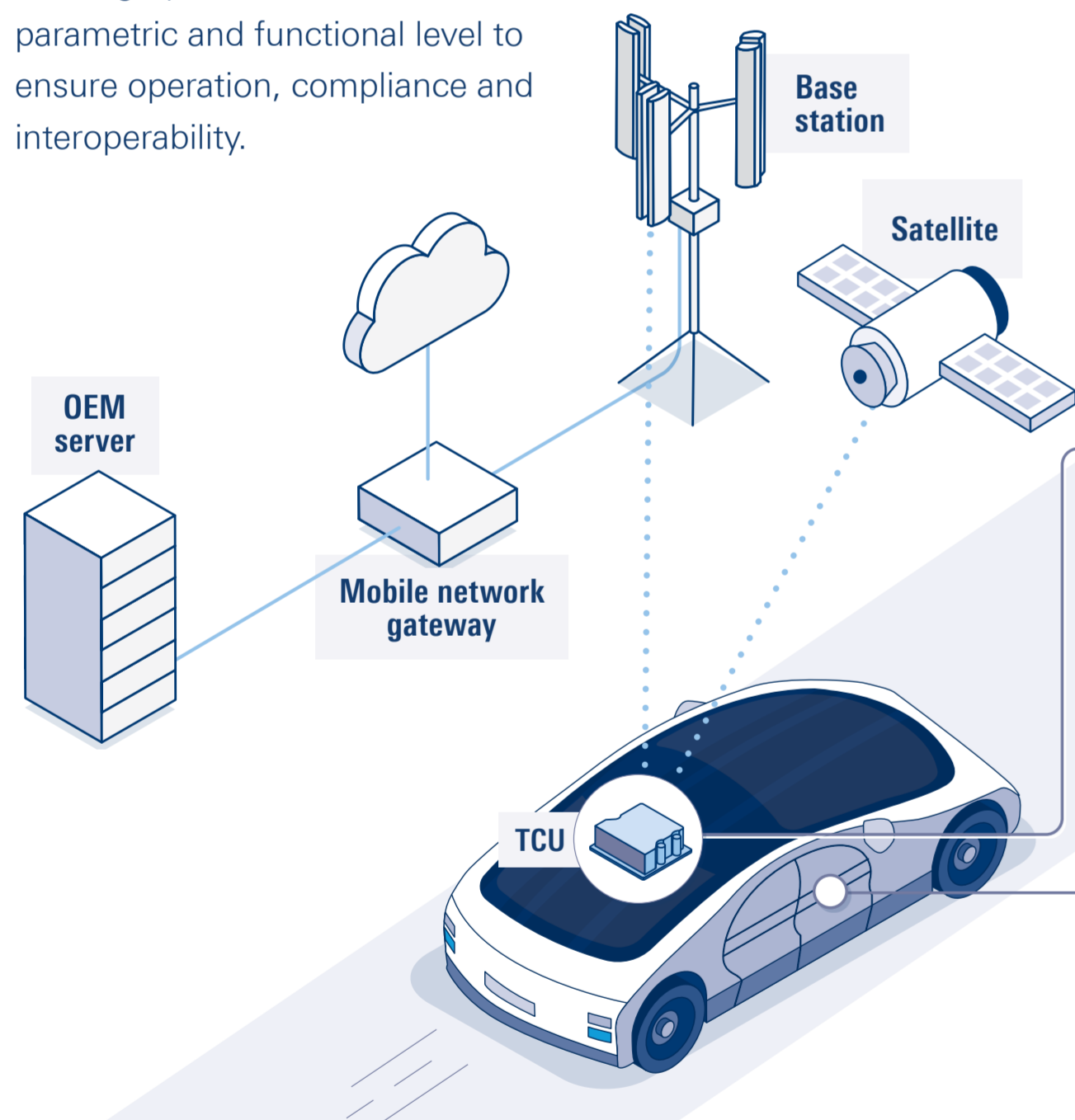


VEHICLE FEATURES SUPPORTED BY AUTOMOTIVE CONNECTIVITY

An overview of existing and future automotive functions and capabilities supported by wireless connectivity.

Vehicle manufacturers are integrating more and more advanced capabilities into the vehicle of the future to meet regulatory obligations and to provide their customers with new services and features. Most of them are enabled by one or more wireless standards that must be thoroughly tested end-to-end on a parametric and functional level to ensure operation, compliance and interoperability.



AUTOMATED DRIVING

EMERGENCY BRAKING
Wireless technologies as well as radar and lidar improve Automated Driving functions such as emergency braking by providing the vehicle's own position and detecting static and moving objects.

V2X GNSS

AUTOMATED PARKING
This feature refers to driverless parking of a vehicle, usually in a defined location such as a parking lot. It requires an appropriately equipped facility and vehicle.

V2X GNSS LTE 5G

TELEOPERATED DRIVING
Remotely controlling a driverless vehicle is particularly useful in dangerous environments such as mines, transport facilities such as ports and personal transportation such as car-sharing.

LTE 5G GNSS V2X

OEM VEHICLE CONNECTIVITY

OEM VEHICLE DATA SERVICES
This includes Over-The-Air software updates, diagnostic data from the vehicle, GNSS correction data, vehicle tracking and other services which enhance the customer experience.

LTE 5G GNSS Wi-Fi NTN

VEHICLE ACCESS CONTROL

VEHICLE ACCESS CONTROL USING A DIGITAL KEY
Unlock, start and control access to a vehicle either using line-of-sight wireless connectivity or remotely via the cellular network.

LTE 5G Bluetooth NFC UWB NTN

SAFETY AND MONITORING

IN-CABIN PASSENGER MONITORING
Passenger presence detection and health monitoring (breathing, heart rate) using 60 GHz radar or UWB radar.

UWB

TIRE PRESSURE MONITORING SYSTEM
Transmission of tire pressure data via Bluetooth™ from sensors embedded in the car wheels.

Bluetooth

EMERGENCY CALL
Automatic or manual transmission of a vehicle's location and status as well as voice call to emergency services over the cellular network (using 2G, 3G, 4G or 5G) in the event of a road traffic accident.

Lte 5G NTN

INFOTAINMENT SERVICES

HANDSFREE VOICE CALLING
Bluetooth™ is used to transmit the mobile phone call audio to the vehicle head unit, enabling safer driving.

Lte 5G Bluetooth

MAP NAVIGATION
Use of real time road network and positional information to provide navigational guidance.

Lte 5G GNSS NTN

IN-VEHICLE MULTIMEDIA PLATFORMS
Duplicating the features of a smartphone such as audio and video streaming onto a vehicle's screen and infotainment head unit.

Bluetooth Wi-Fi

ENHANCED DRIVER SERVICES
Augmented Reality information, e.g. local services, parking places and charging points in the vicinity, often shown on the heads up display.

Lte 5G GNSS

CAR RADIO
Car radio delivered by a multitude of standards from AM and FM to HD Radio® and IP over the cellular network.

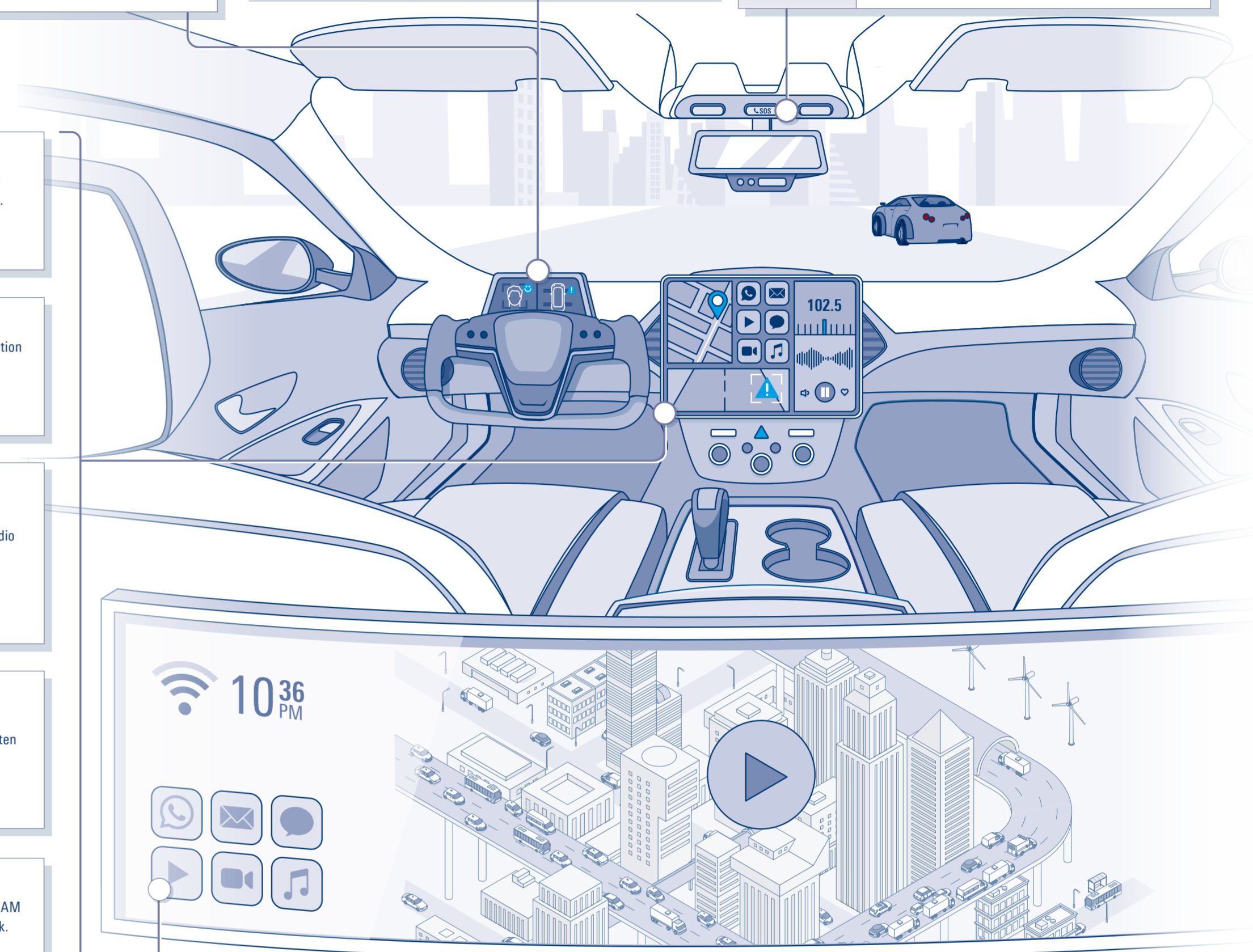
Lte 5G DAB+

WI-FI™-HOTSPOT
The provision of wireless broadband within the vehicle using Wi-Fi™.

Lte 5G Wi-Fi

IN-CAR THEATER
Provision of high-definition video to vehicle passengers.

Lte 5G DVB Wi-Fi



WIRELESS TECHNOLOGIES OVERVIEW

4G MOBILE COMMUNICATIONS	DIGITAL AUDIO BROADCASTING (DAB/DAB+)	ULTRA WIDEBAND (UWB)
5G MOBILE COMMUNICATIONS	GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)	WI-FI™
BLUETOOTH™	NEAR FIELD COMMUNICATION (NFC)	
CELLULAR V2X	NON-TERRESTRIAL NETWORKS	



To ensure correct operation of these features requires testing at a component, system and ultimately vehicle level. To discover more about automotive connectivity testing, use this link:

<https://www.rohde-schwarz.com/automotive/connectivity>

Test it. Trust it.





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 Vehicle features supported by automotive connectivity
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 trailblazers when it comes to paving the way for a
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VEHICLE FEATURES SUPPORTED BY AUTOMOTIVE CONNECTIVITY

An overview of existing and future automotive functions and capabilities supported by wireless connectivity.

Vehicle manufacturers are integrating more and more advanced capabilities into the vehicles of the future. These capabilities are categorized into existing and future functions. Existing capabilities are supported by current connectivity technologies, while future capabilities will be supported by next-generation connectivity technologies.

SAFETY AND SECURITY

- EMERGENCY CALL**: Automatic emergency calling (eCall) for faster response times in accidents.
- SECURITY**: Over-the-air (OTA) updates for security patches and software improvements.
- KEYLESS ENTRY**: Remote locking and unlocking of the vehicle.
- THEFT PROTECTION**: Real-time location tracking and immobilization capabilities.

PERFORMANCE ENHANCEMENT

- ADAPTIVE DRIVING**: Real-time traffic updates and route optimization.
- ADAPTIVE PARKING**: Remote parking assistance and space detection.
- ADAPTIVE DRIVING**: Real-time traffic updates and route optimization.
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NEW SERVICES

- NEW SERVICES**: Remote diagnostics and predictive maintenance.
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VEHICLE CONNECTIVITY

- 4G LTE**: High-speed data transfer for navigation and streaming.
- 5G**: Ultra-low latency for autonomous driving and real-time data.
- DSRC**: Dedicated Short-Range Communications for vehicle-to-vehicle (V2V) communication.
- C-V2X**: Cellular Vehicle-to-Everything for broader connectivity.

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