# 5G Broadcast for Automotive

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Focus Group on Vehicular Multimedia

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# Content

5G Broadcast HPHT overview

In-Vehicle Network Architecture
- Telematics
- Domain controllers
- Automotive Ethernet

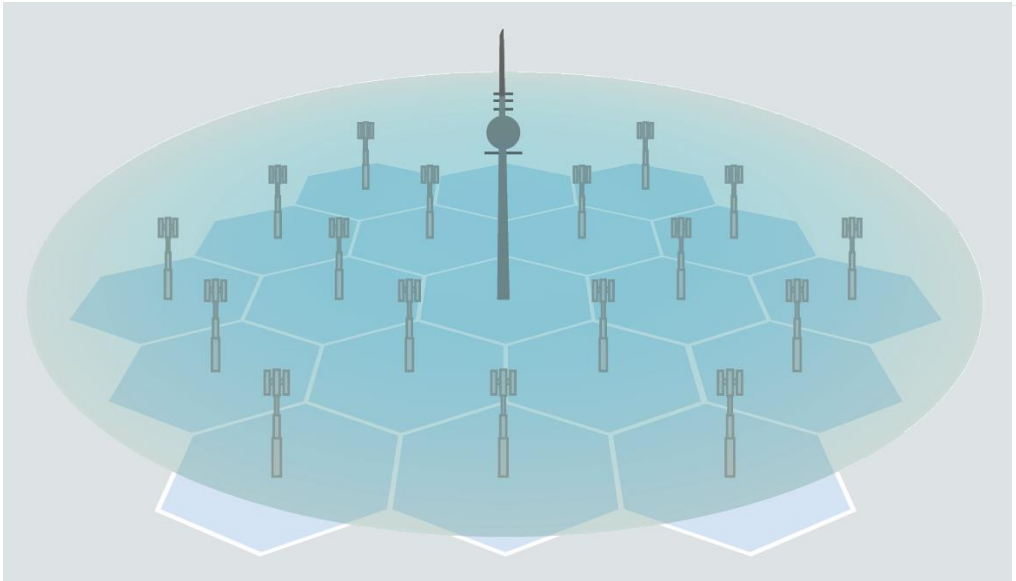
5G Broadcast for Automotive

# 5G BROADCAST: MEDIA DELIVERY VIA AN OVERLAY NETWORK

- **R&S 5G Broadcast Solution:**
  - Frequencies < 1 GHz
  - Large-scale cells
  - High Power High Tower (HPHT)
  - Multicast together with unicast

- **Highly efficient** spectrum use by Multicast data distribution

➔ **Significant reduction of costs**



IoT updates
Car updates
Live events free to air
Emergency alerts
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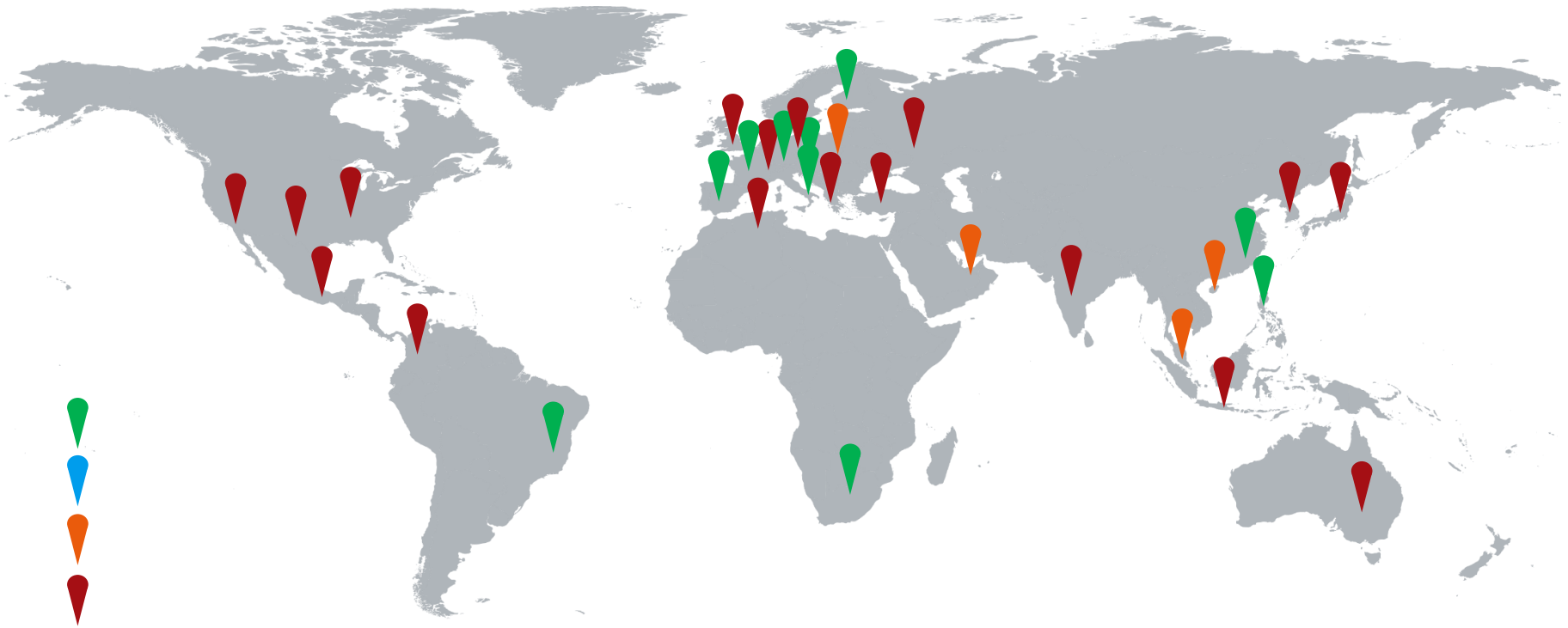
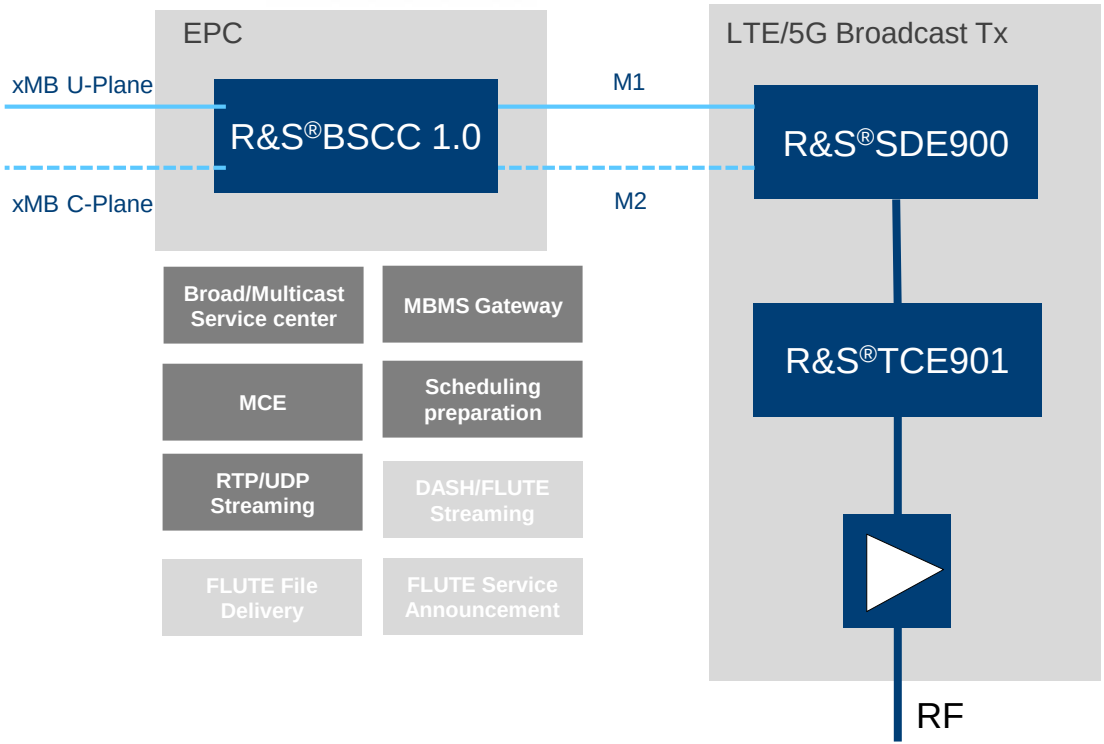
AURORA
SAMSUNG
MIRAE ASSET
SUPER BRAND MALL

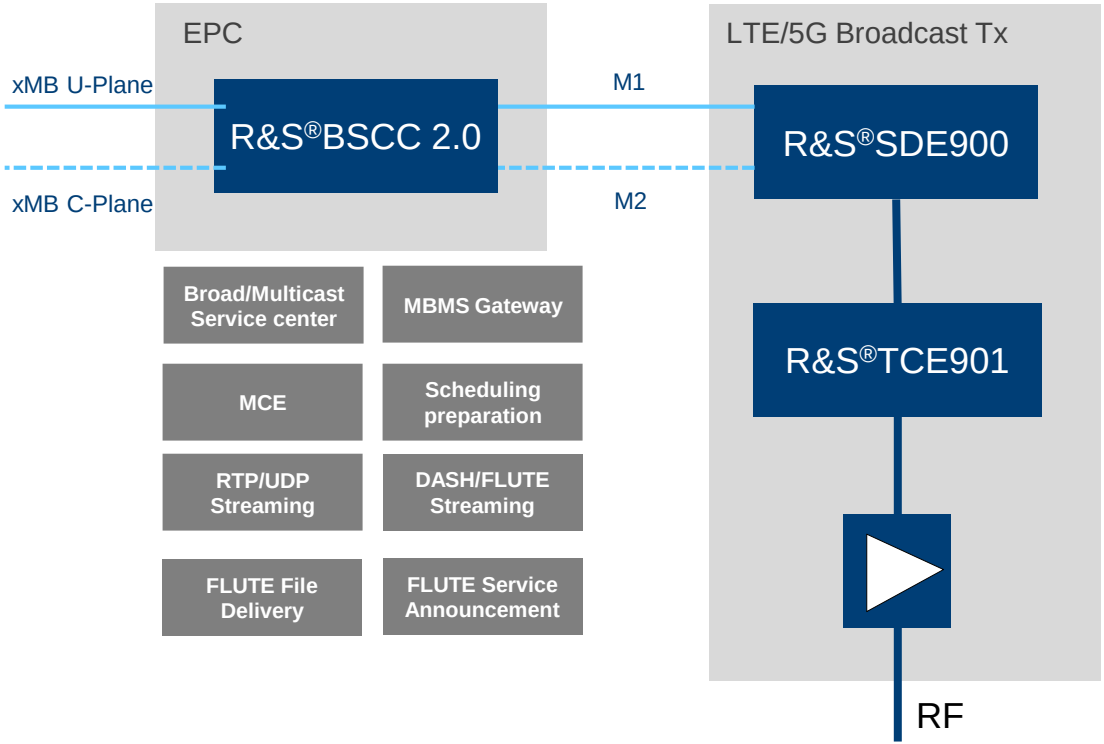
# TRIALS WORLDWIDE



# HPHT LTE/5G BROADCAST – HOW TO MAKE IT REAL?

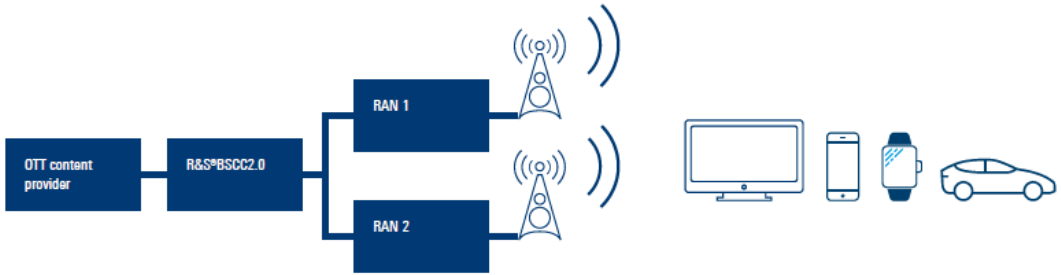


# HPHT LTE/5G BROADCAST – HOW TO MAKE IT REAL?



# R&S®5G Broadcast/Multicast Solution

## 5G BC Tx9 & BSCC2.0



Medical & Health
Internet of Things
Chipset Manufacturer
MNO
Device Manufacturer
5G
Media & Entertainment
Automotive
Industrial Applications

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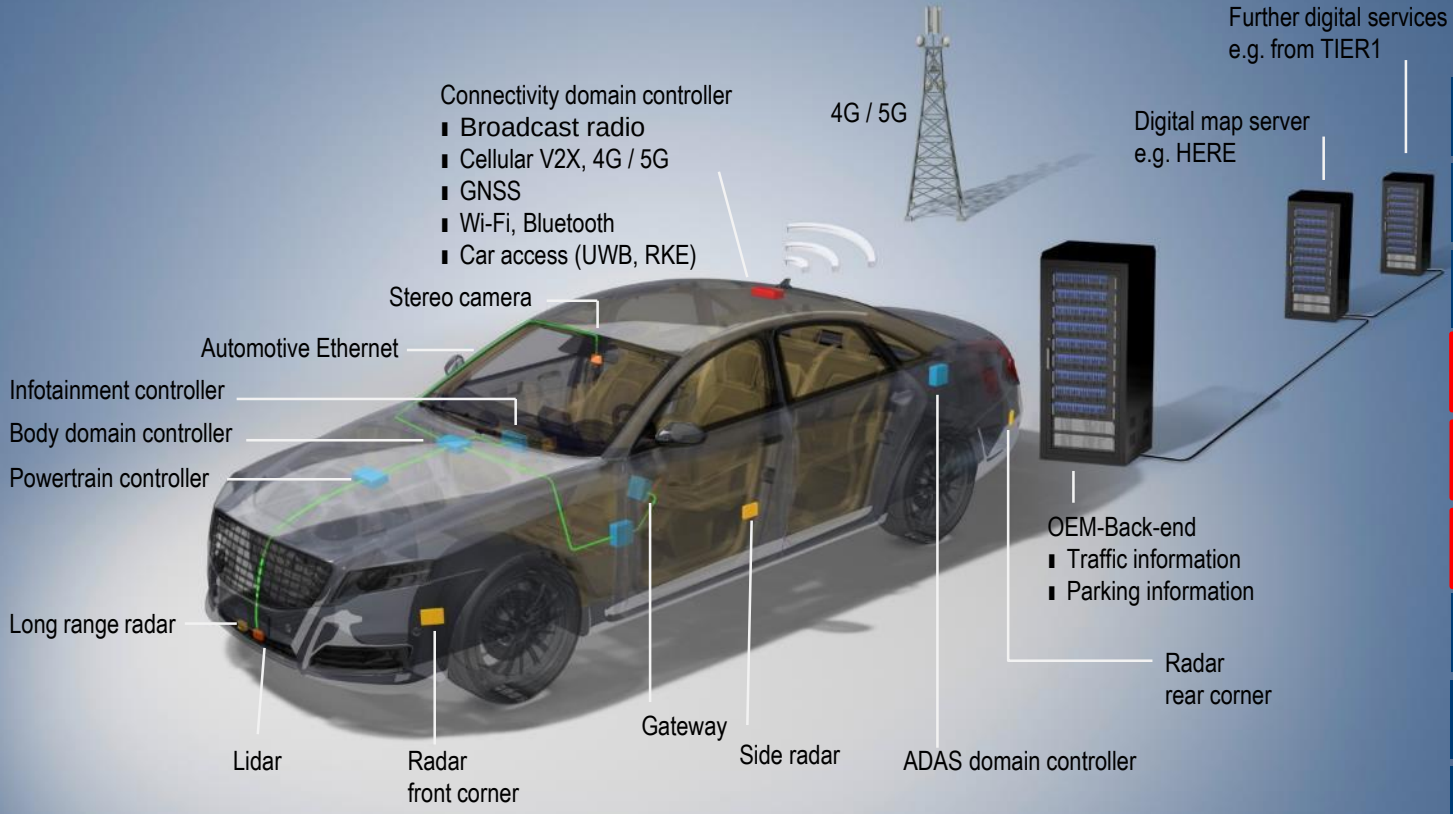
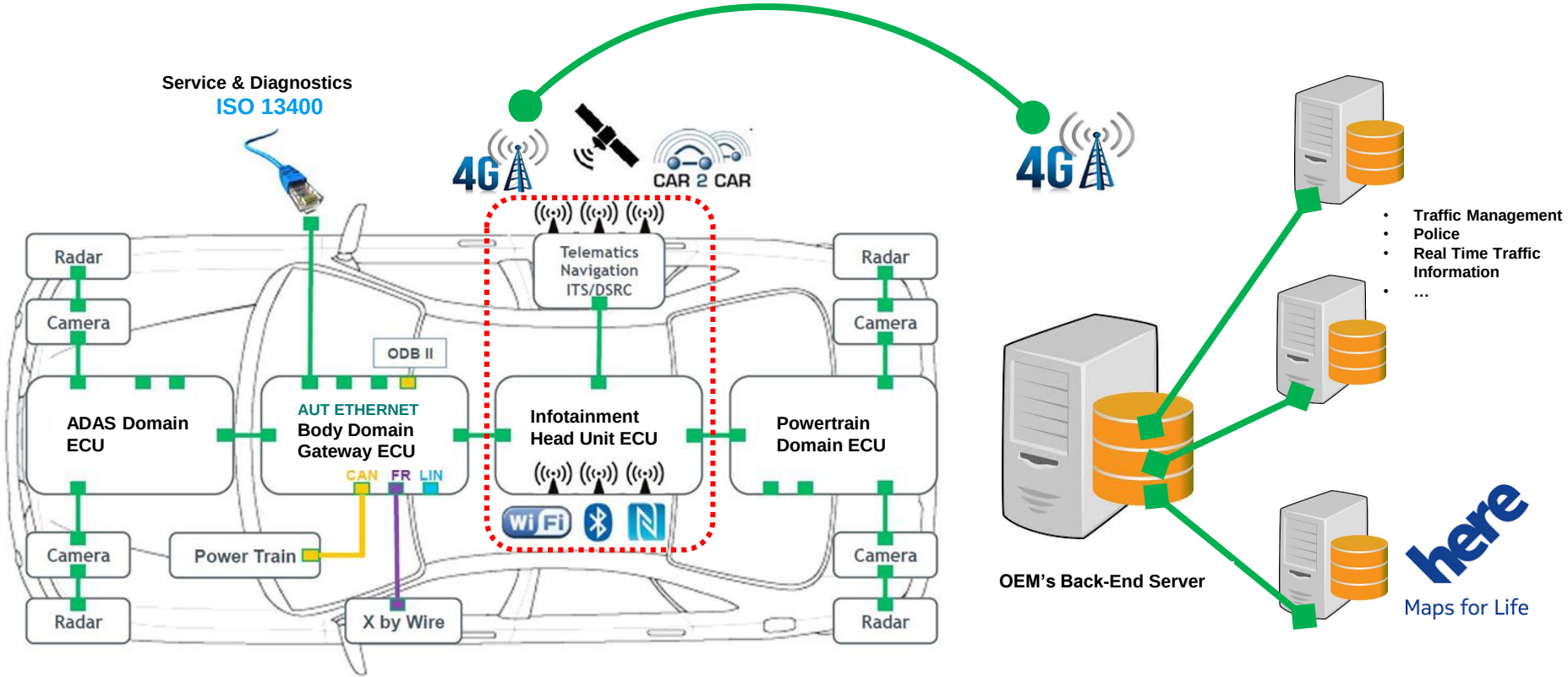
# VEHICLE ARCHITECTURE WITH HIGH PERFORMANCE COMPUTERS




Automotive Solutions

- Radar
- Connectivity
- 4G / 5G Network Quality Analysis
- Infotainment
- In-Vehicle Networks
- Domain Controller & ECU Testing
- HV & Battery Testing
- EMC / Antenna Testing
- Drone Detection
- Storage solutions & Cybersecurity

# UPCOMING VEHICLE ARCHITECTURE WITH DOMAIN CONTROLLERS, ETHERNET AND BACK-END SERVERS



# TELEMATICS CONTROL UNIT (TCU): THE GATEWAY TO CONNECTED CARS

Image source: Ficosa

Important to know:

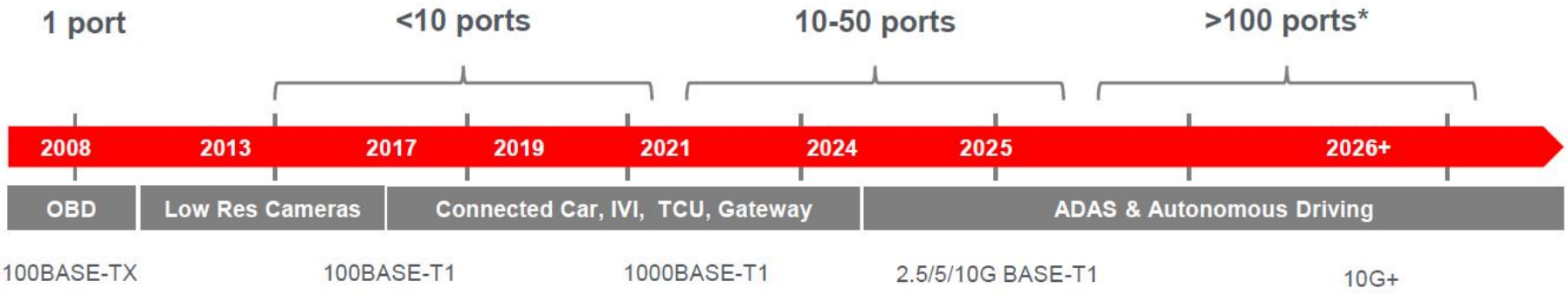
- Some automotive 4G LTE modems implemented in the TCU can operate at 300-400 Mbps

HUAWEI

- T-Box 3.0: DA2300 will support 5G speeds up to 1.6Gbps*

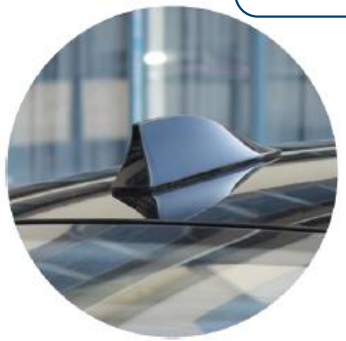
*Maximum theoretical download speed
Image source: Huawei Autonomous Show Shanghai Sept 2018

# Trends in Automotive Ethernet



*average Ethernet ports per vehicle
** Photo courtesy of Marvell Technology Group

# 5G BROADCAST AND IAM (INTELLIGENT ANTENNA SYSTEM)



TV/Radio

WiFi ax/ad Access

5G NR (mmWave)

eMBB > 1Gbps

LTE/5G (sub-6GHz) (4x4 MIMO)

eMBB > 1Gbps

V2X (5G NR/DSRC)

URLCC < 1ms

Positioning (L1/L2 or L1/L5)

URLCC < 1ms

uP

2.5GBASE-T1

AVB/TSN etc.

Automotive Ethernet (STP)

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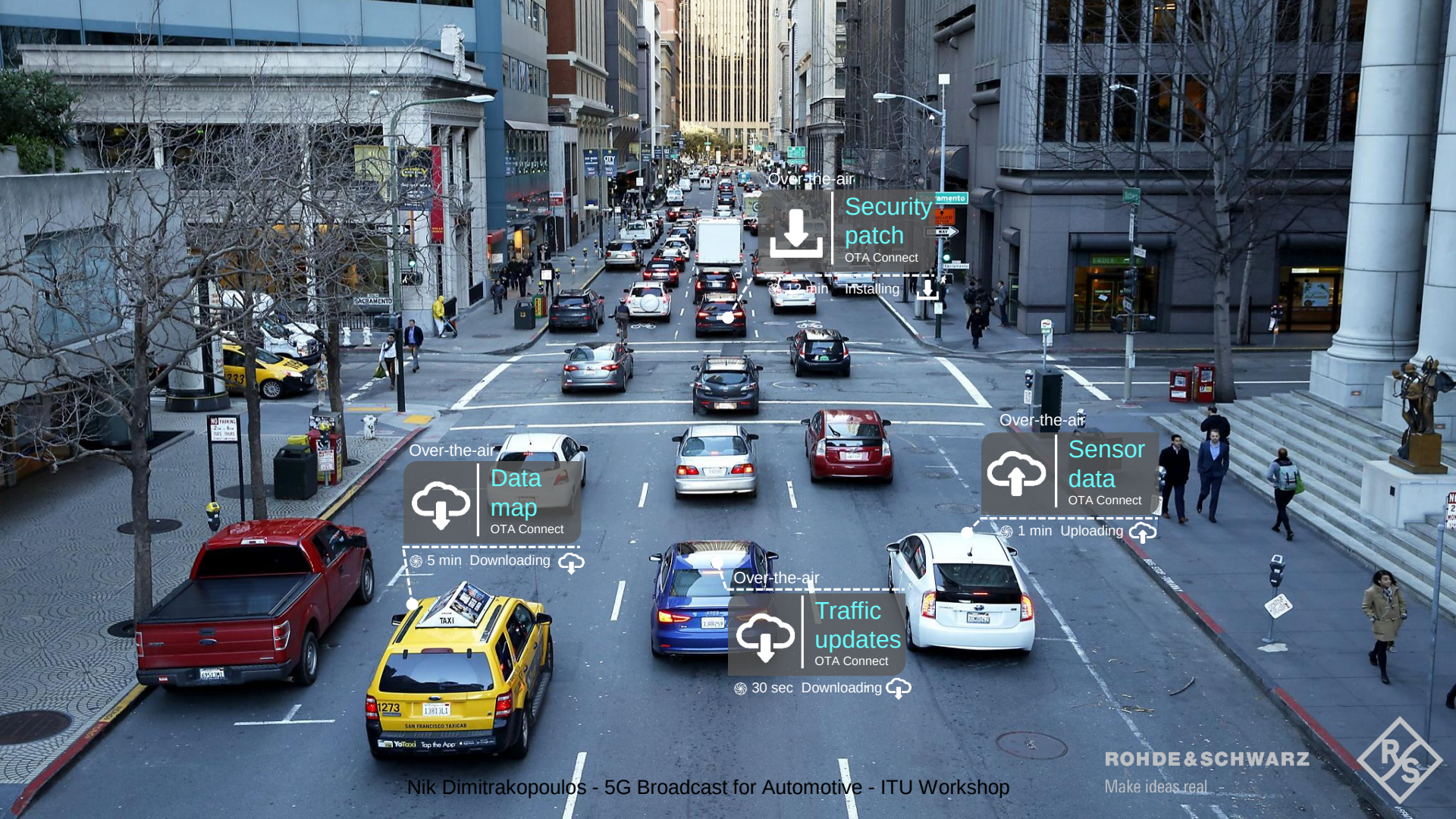
# USE CASES AUTOMOTIVE
## CARS TURN INTO COMMUNICATING ENTITIES

**New communication requirements**

- Enhanced Traffic Information
- Maps Updates
- Car Firmware Updates
- Security Patches

Media consumption in cars



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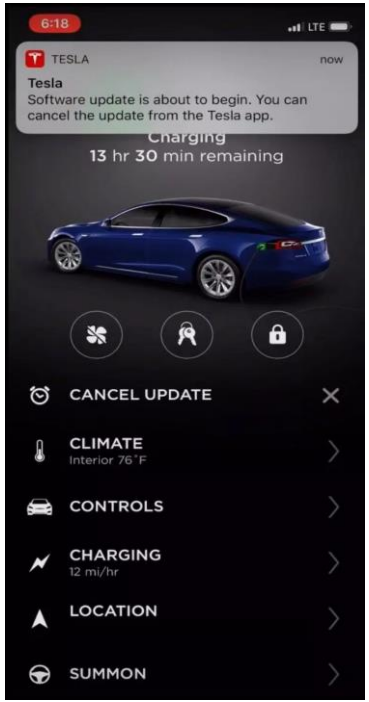
# AR AND AUTOMOTIVE

# 5G BROADCAST IN AUTOMOTIVE – EXAMPLE SOFTWARE AND HD MAP UPDATES



Data Offloading for common data

Image source: Tesla

Traffic updates on local area
+ Emergency warning system

# DIGITAL COCKPIT AN EXAMPLE OF OVER-THE-AIR (OTA)

## Example Mercedes GLE 2019

- Over-the-air-updates
- Continuously improved AI that adopts to driver behavior
- Augmented reality (AR) technology

## MBUX with AI

Image source: Daimler

# 5G BROADCAST AUTOMOTIVE – BUSINESS MODEL EXAMPLE

OFFICIAL

Mercedes owners can buy digital options after purchasing their cars

Mercedes-Benz joins BMW with a 'downloadable content' model

A-class
B-class
GLE models

Mercedes me

2.000€ for the Multimedia package*

- Navigation (Traffic Map updates, Traffic Sign Assist)
- Augmented Reality
- Digital Radio
- Smartphone integration

BMW ConnectedDrive

60€ annual subscription*

*approximate values

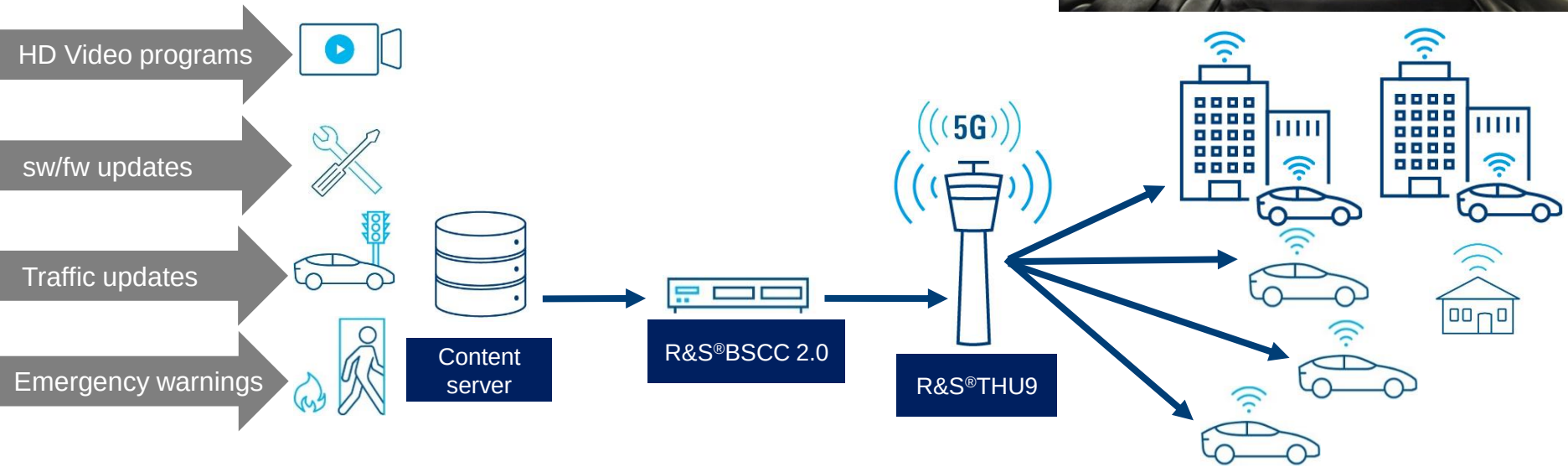
# “5G Media2Go” PROJECT

Consortium: SWR, Deutsche Funkturm, KATHREIN, Technische Universität Braunschweig, ROHDE&SCHWARZ Make ideas real, PORSCHE, fIN Institut für Nachrichtentechnik

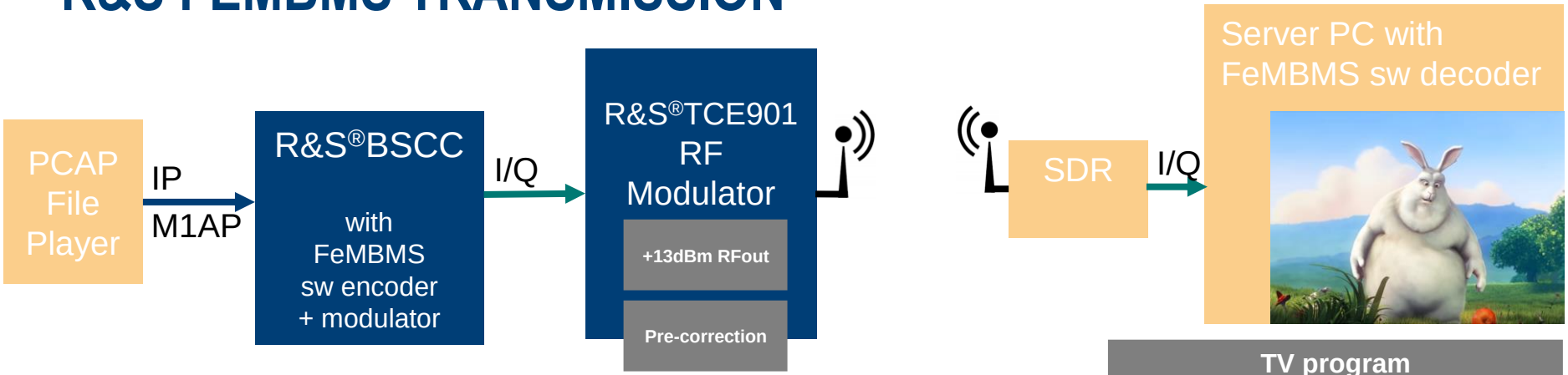
## Project objectives:

- Verification of the capability of 5G Broadcast to provide linear media services for mobile consumption in vehicles.
- Combination of two HPHT transmitters located at the broadcast network sites in Stuttgart and Heilbronn and LPLT transmitters at mobile network sites in terms of a SFN network to distribute linear TV programs using 5G Broadcast at UHF TV channel 40.
- Integration of linear and nonlinear broadcast content and services in the infotainment system of a car.
- Realization of a nonlinear media service based on geo-referenced recommendations (“Travelguide“).
- Execution of mobile measurement campaigns in order to investigate availability of services with regards to coverage and QoS.

# “5G Media2Go” PROJECT



# R&S FEMBMS TRANSMISSION




| RF parameters | |
|---|---|
| Freq | DL: 748-758MHz<br>10MHz bandwidth |
| Cyclic prefix | 16.67us |
| Subcarrier spacing | 15kHz |

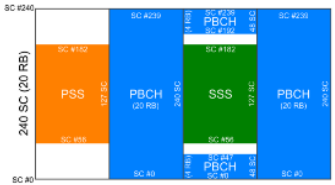
| TV program | |
|---|---|
| Codec | Video: H.264, main Profile, Level 4<br>Audio: AAC-LC<br>→ HEVC codec can provide further enhancements<br>Rel. 16 will support HDR & HFR |
| Resolution | Video: 1280 x 720p50<br>Audio: Stereo |
| Data rate | Video: 4Mbps<br>Audio: 128kbps |

# RF SCANNER TSMX / ROMES
## CONFIGURATION

rel. 16 ready

R&S®TSMA6 Autonomous Mobile Network Scanner
and R&S®ROMES Drive Test Software

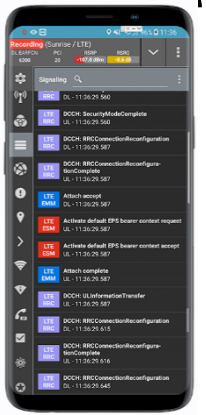
Battery Pack




Receive
antenna

R&S®TSMA6

R&S®ROMES Drive Test Software



R&S®QualiPoc

# Rohde & Schwarz

Experts of LTE technology

Experts of Broadcasting technology