

BMW GROUP TECHNOLOGY WORKSHOPS

AUTOMATED DRIVING-DIGITALIZATION

MOBILITY SERVICES

December 2016

**BMW
GROUP**

THE NEXT
100 YEARS 



Rolls-Royce
Motor Cars Limited

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AUTOMATED DRIVING

December 2016

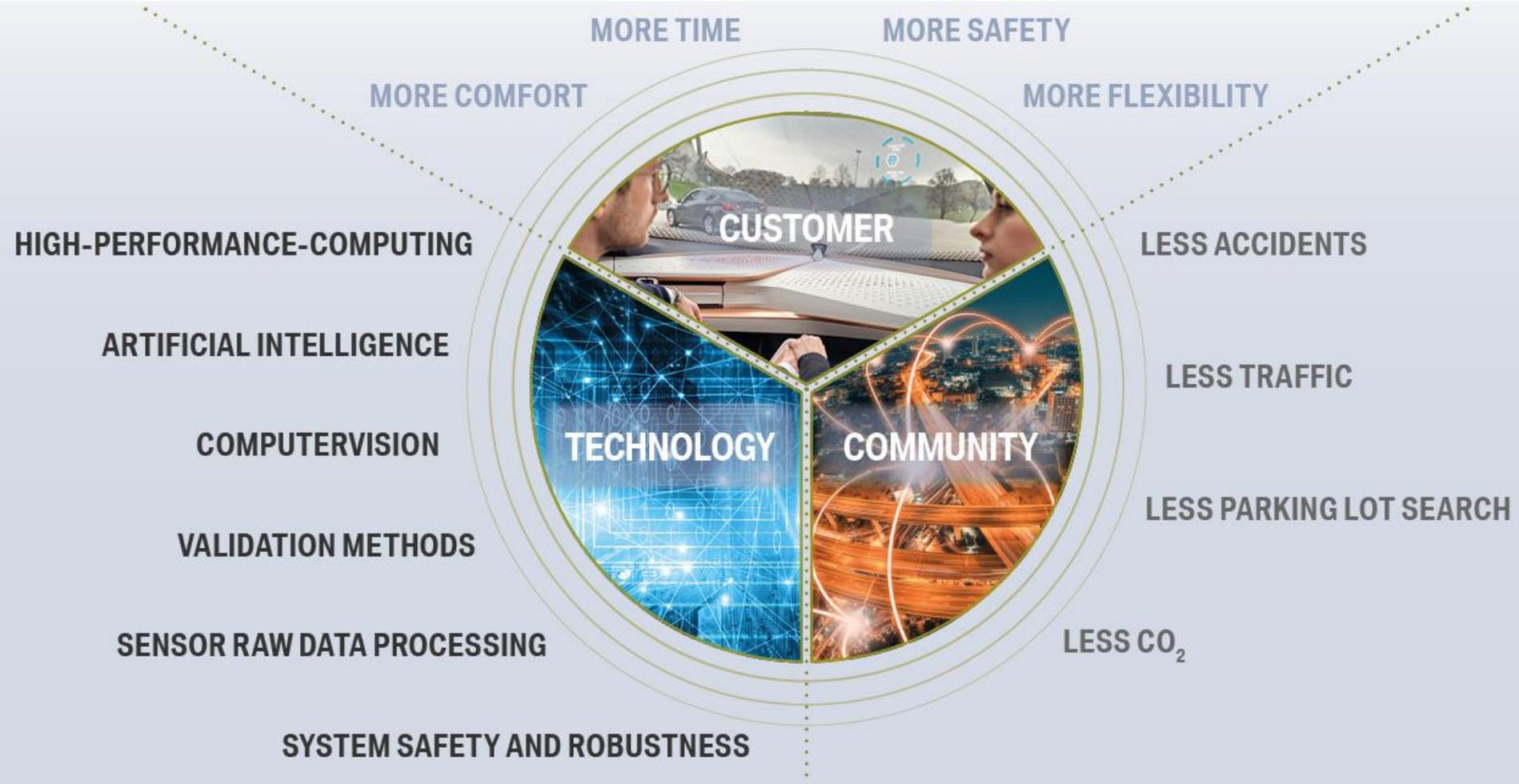
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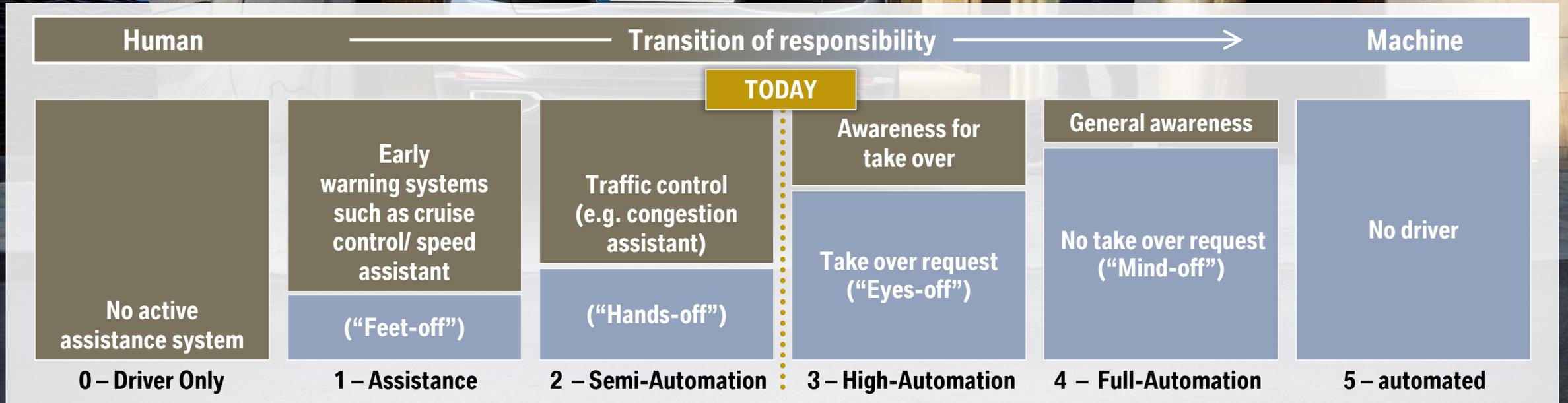


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AUTOMATED DRIVING. CHANGING FRAMEWORK LEADS TO NEW DEFINITION OF FUTURE MOBILITY.



DEVELOPMENT STAGES OF AUTOMATED DRIVING.



FIRST IDEAS BEING IMPLEMENTED TEN YEARS AGO.

**BMW Track Trainer
(2006).**



**Remote Controlled Parking
(2008).**



**Emergency stop assistant
(2009).**



**Highly automated driving on the
motorway (Gen1: 2011; Gen2: 2014)**



**Highly automated driving at the limits
of vehicle dynamics (2014).**



**Fully automated remote valet parking
(2015).**



THE NEW BMW 5 SERIES DRIVER ASSISTANCE PROVIDES COMFORT AND SAFETY AT THE HIGHEST LEVEL.

Top View Remote
Lane keeping assistant with active side collision protection
Active cruise control with Stop&Go function
Rear collision prevention

Crossroad Assist

3D View
Top View
Parking assistant

Active Park Distance Control
BMW Selective Beam
Remote Control Parking

Steering and lane control assistant
Speed limit and No Pass information
Panorama View
Speed Limit Device

Approach control warning with braking function

Speed Limit Assist

Wrong Way Assist
Lane change warning

Distance information
Lane departure warning

Crossing traffic warning rear / front

Night Vision

Lateral parking aid



ARCHITECTURE FOR AUTOMATED DRIVING. END-TO-END WITH ALL KEY-TECHNOLOGIES.



HD-MAP, SENSORS, AI/ENVIRONMENT MODEL AND MOTION CONTROL PLAY A KEY ROLE IN THE ARCHITECTURE OF AUTOMATED DRIVING.

HD-MAP BACKEND



- centimeter precision
- real-time capable
- highly available and reliable

SENSORS



- camera
- radar
- lidar
- ultra-sonic
- inertial sensor

AI / ENVIRONMENT MODEL



- object fusion
- free space detection
- road model
- prediction
- driving strategy / planning

VEHICLE INTEGRATION



- motion control
- safe vehicle management up to the limits
- fail operational architecture

OEM-Cooperation



Trilateral Cooperation



HAD SENSOR SETUP – FOCUS ON LARGE-DISTANCE AREA COVERAGE.



Redundant Sensor Coverage Per View

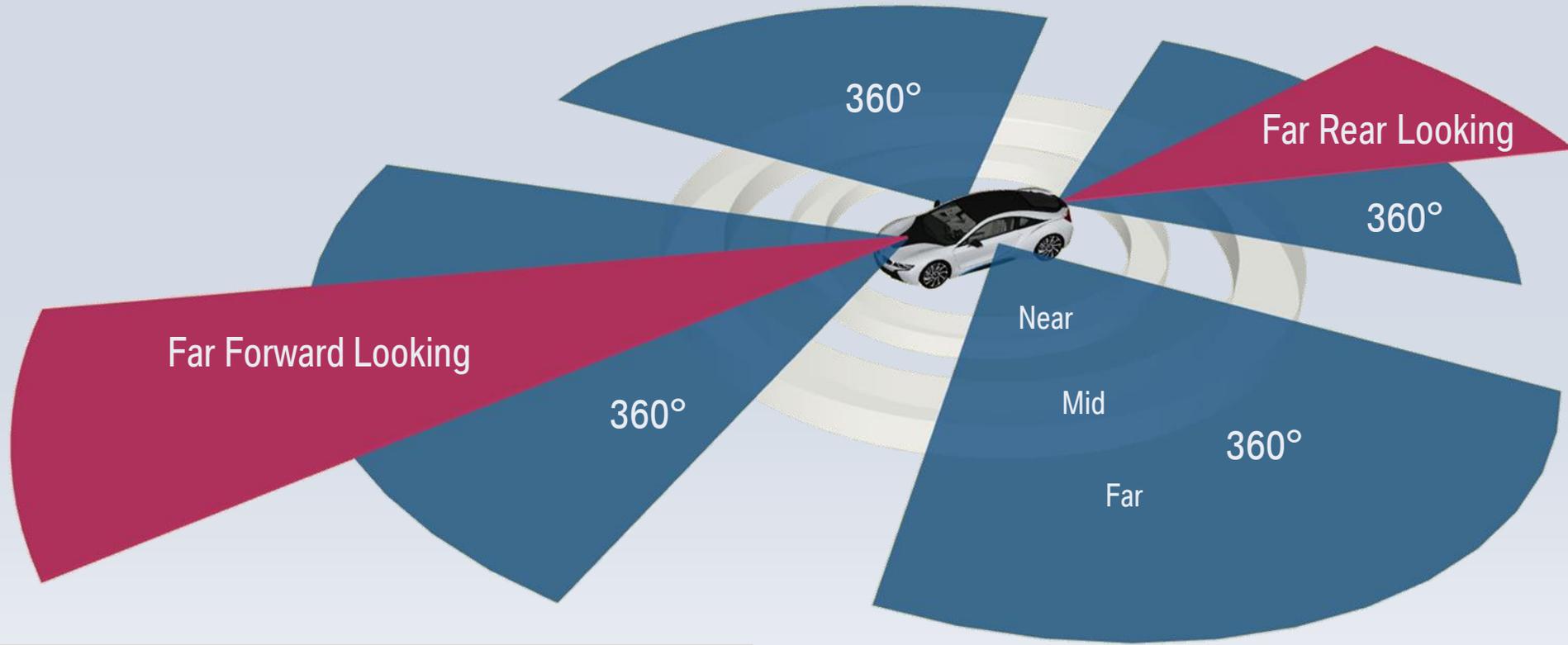
Lidar

Radar

Camera

Ultra-Sound

FAD SENSOR SETUP – FOCUS ON 360° COVERAGE.



Redundant Sensor Coverage Per View

Lidar

Radar

Camera

Ultra-Sound

HIGHLY ACCURATE MAPS AND BACKEND CONNECTIVITY – TWO CORNERSTONES FOR HIGHLY AUTOMATED DRIVING.



EN-ROUTE APPROVAL



VARIABLE TRAFFIC SIGNS



TRAFFIC CONDITIONS



ROAD WORKS



HIGH-PRECISION DIGITAL MAPS



WEATHER CONDITIONS

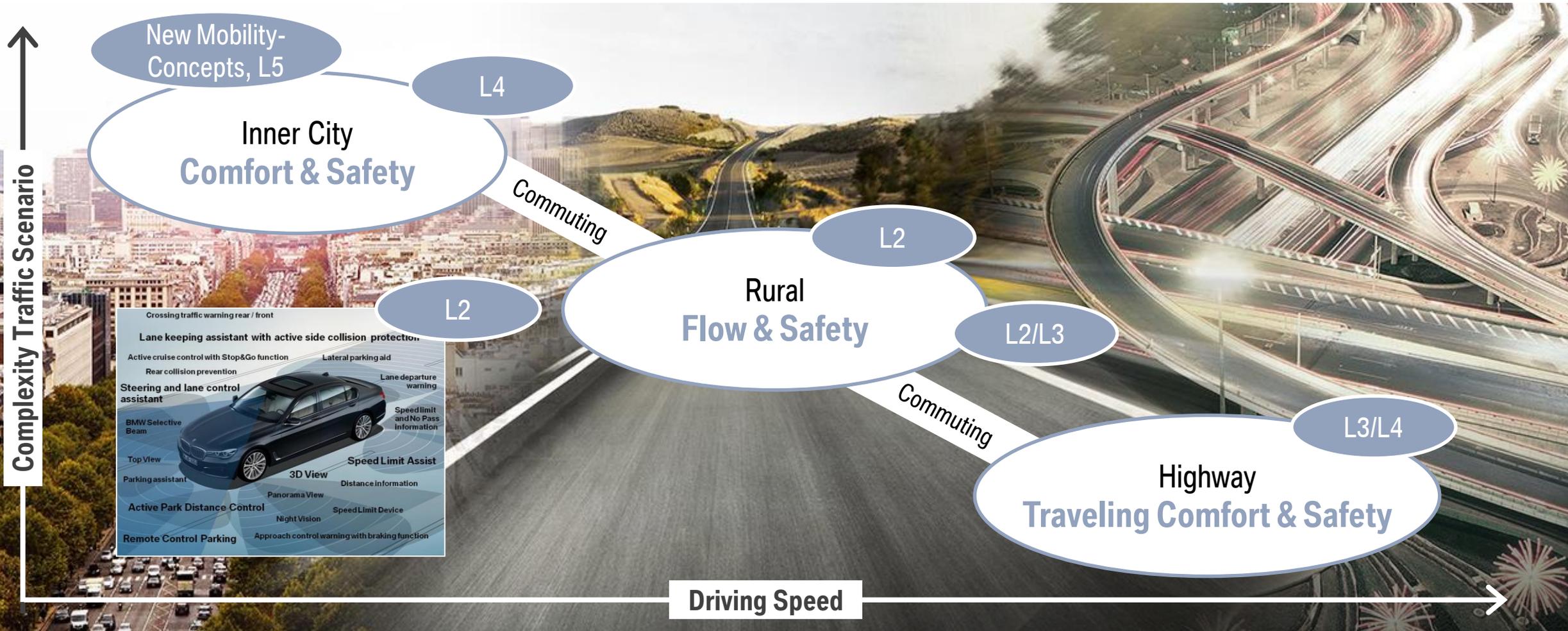


Foresight by Backend > 200 m

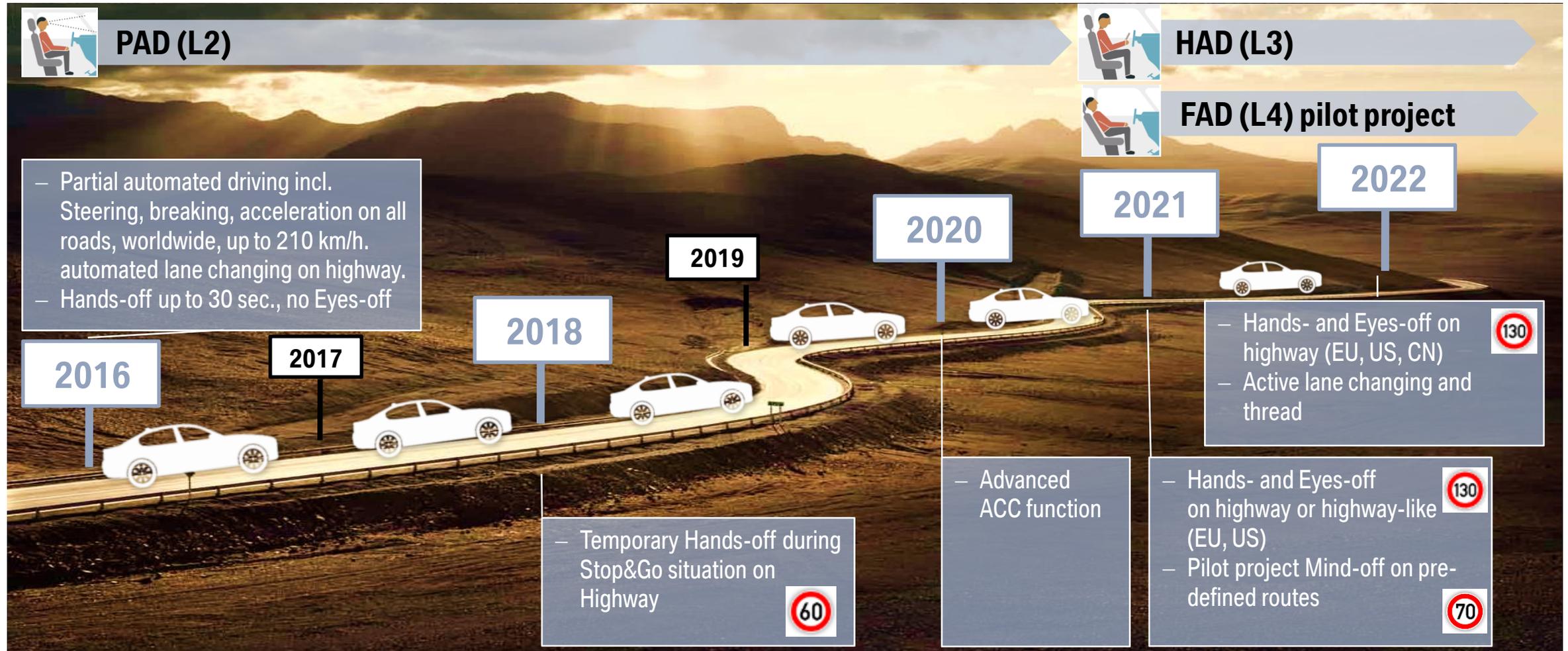
Far Range Sensors ~ 200 m

Short/ Mid- Range Sensors ~ 70 m

„PLAYGROUND“ AUTOMATION. ROLL-OUT LIMITED BY SCENARIO COMPLEXITY AND DRIVING SPEED.



ON THE WAY TO AUTOMATED DRIVING.



DIGITALIZATION AT BMW GROUP.

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STRATEGY NUMBER ONE > NEXT CONTAINS DIGITALIZATION AS A STRATEGIC DIRECTION.

” We leverage innovative technologies, digitalization and sustainability to deliver unique customer experiences.

We embrace the opportunities that the transformation of our industry offers. We are committed to expanding our technological competence in the years to come, to enhancing the interaction of individuals, vehicles and services and to driving progress in sustainable mobility. This will secure our success and set new standards amongst our competitors. “

Strategy NUMBER ONE > NEXT



AUTOMATED DRIVING ENABLES NEW (DIGITAL) BUSINESS OPPORTUNITIES.



MOBILITY SERVICES – THE URBAN REVOLUTION.



ChargeNow



ReachNow



ParkNow



DriveNow

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MAJOR TRENDS AND NEW TECHNOLOGICAL POSSIBILITIES ARE CHANGING THE RULES OF THE GAME.



BMW GROUP'S CORPORATE STRATEGY NUMBER ONE NEXT IS THE ANSWER TO THE CHALLENGES OF SUSTAINABLE MOBILITY AND CHANGING MARKET CONDITIONS.



**“We inspire people on the move:
We shape tomorrow’s individual premium mobility.”**

Strategy NUMBER ONE > NEXT

...already TODAY!

DRIVE NOW. PREMIUM, FREE FLOATING CAR SHARING SERVICE FROM BMW GROUP & SIXT.

DriveNow Customers are BMW Group's
youngest & most modern
target group

750,000 customers
in **11** cities

5,000+ cars
in the fleets



DRIVE NOW OPENS THE WAY FOR E-MOBILITY AND THE BMW i3.

200,000+

first electric rides with DriveNow

6 Mio.+

emission-free
kilometers with BMW i3

20%
of the DriveNow
fleet is
electric



REACH NOW. ON DEMAND MOBILITY SERVICES IN THE US.

Launch in April 2016 in

Seattle

Followed by

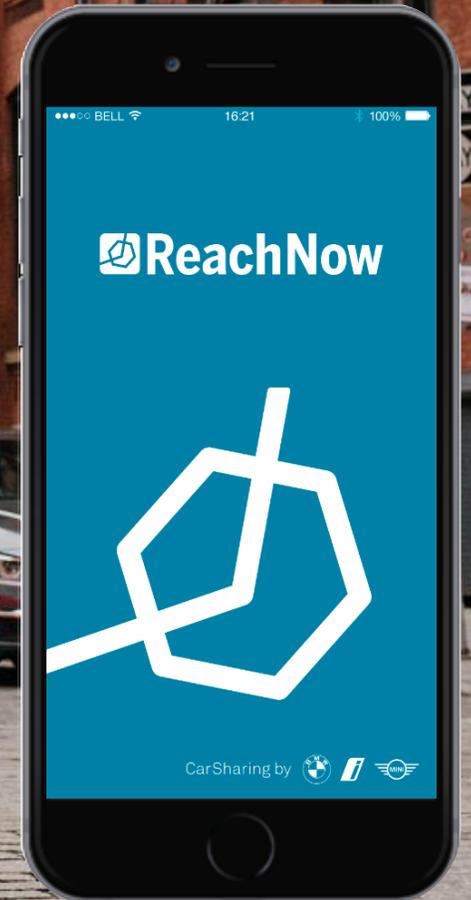
Portland and Brooklyn (NY)

1.000.000+
kilometers

32,000+ members

32,000+ members

Piloting **additional
features**



ON DEMAND MOBILITY ON A NEW LEVEL. REACH NOW TO INTRODUCE UNIQUE FEATURES FOR THE CUSTOMERS.

New features, as piloted in US from end 2016:



Ride: Car with driver

Reserve: For long period use of vehicles and delivery of car

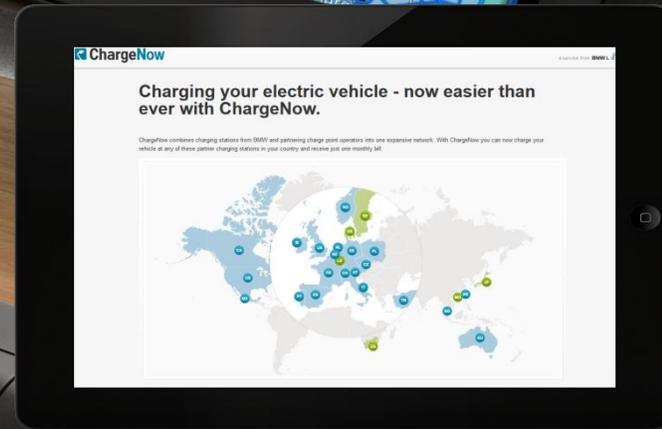
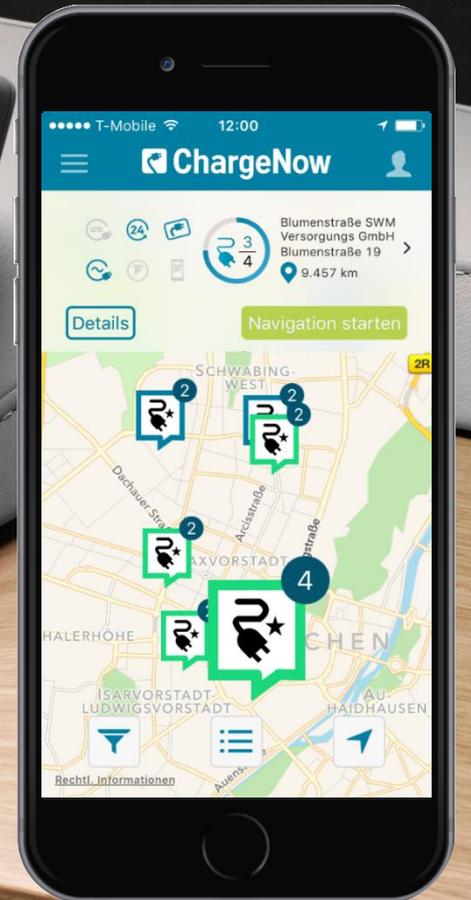
Fleet Solutions:

Individualized CarSharing offering for residential areas

Share: Renting out your own car



CHARGE NOW. THE SERVICE THAT MAKES CHARGING CONVENIENT AND EASY.



65,000+ charging points
in **29** countries

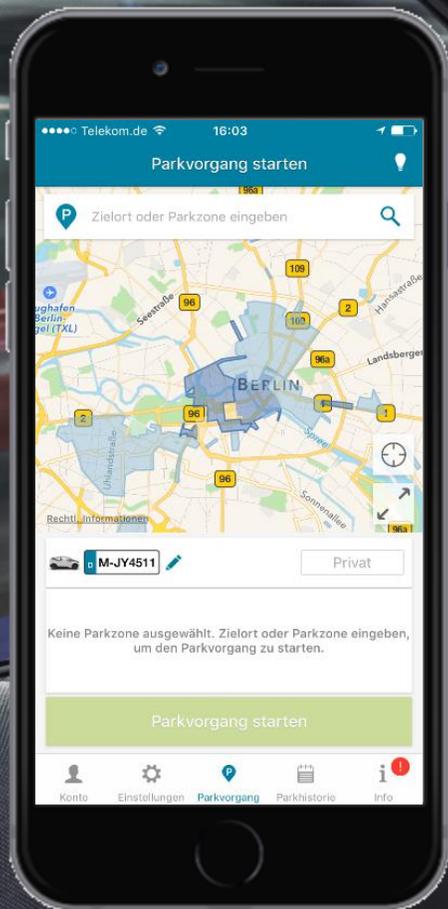
PARK NOW. OFFERING PREMIUM ON- AND OFF-STREET PARKING SERVICES.

On- and off-street parking

Time & cost **efficient**



**Launch
in 2016**
in Austria,
Germany & France



car integration
starting with all new BMW 5 Series

CENTER OF COMPETENCE URBAN MOBILITY: IMPLEMENTING SUSTAINABLE URBAN MOBILITY – TOGETHER WITH ALL STAKEHOLDERS.



Before...



...After

DIGITALIZATION AT BMW GROUP.

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MAXIMS FOR THE BMW GROUP IN THE CONTEXT OF DIGITALIZATION.

Responsible data handling for Personalization & convenience –
Data security & privacy first, business follows

Permanent updatability / disconnect between hardware and software
Constantly connected vehicle

Robust, scalable IT & software architecture

Speed through software development skills and
core in-house competence

Merger in the perception of product and service

X-functional collaboration



BMW WILL DRIVE DIGITALIZATION FORWARD ACROSS THE COMPANY.

We will lead the digital transformation of the automotive industry



**Connected /
Autonomous Vehicle &
Mobility Services**



**Digital Customer
Experiences**



**Business
Processes**

