VOLKSWAGEN

AKTIENGESELLSCHAFT

KONZERNFORSCHUNG

AUTOMATED DRIVING IN EUROPE

SIP-ADUS WORKSHOP

TOKYO| 14.11.2017 | DR. HELGE NEUNER

HISTORY OF AUTOMATED DRIVING @ VOLKSWAGEN GROUP RESEARCH

Stanley

(2005)

Junior

(2007)

PAUL

(2007)

iCar

(2007)

HAVEit

(2011)

eT – Follow me!

(2011)

Race-Pilot (Bobby)

(2014)

Auto-Pilot (Jack)

(2015)

SEDRIC

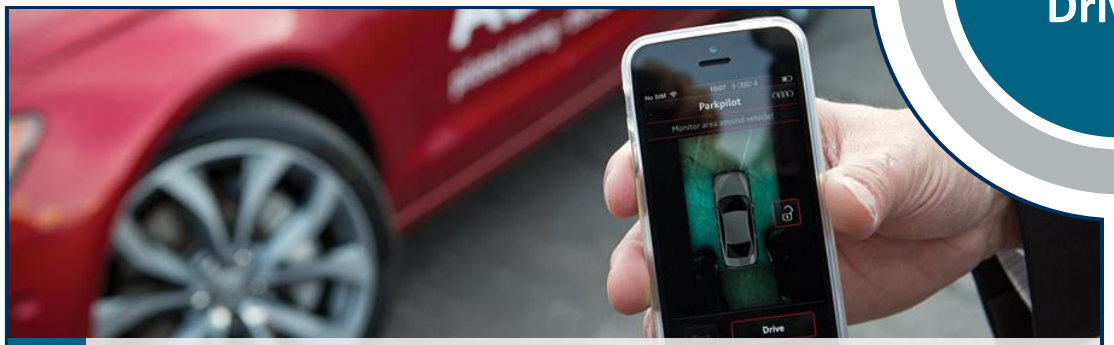
(2017)

MOTIVATION FOR PILOTED DRIVING

Piloted Driving

1 Increased Safety

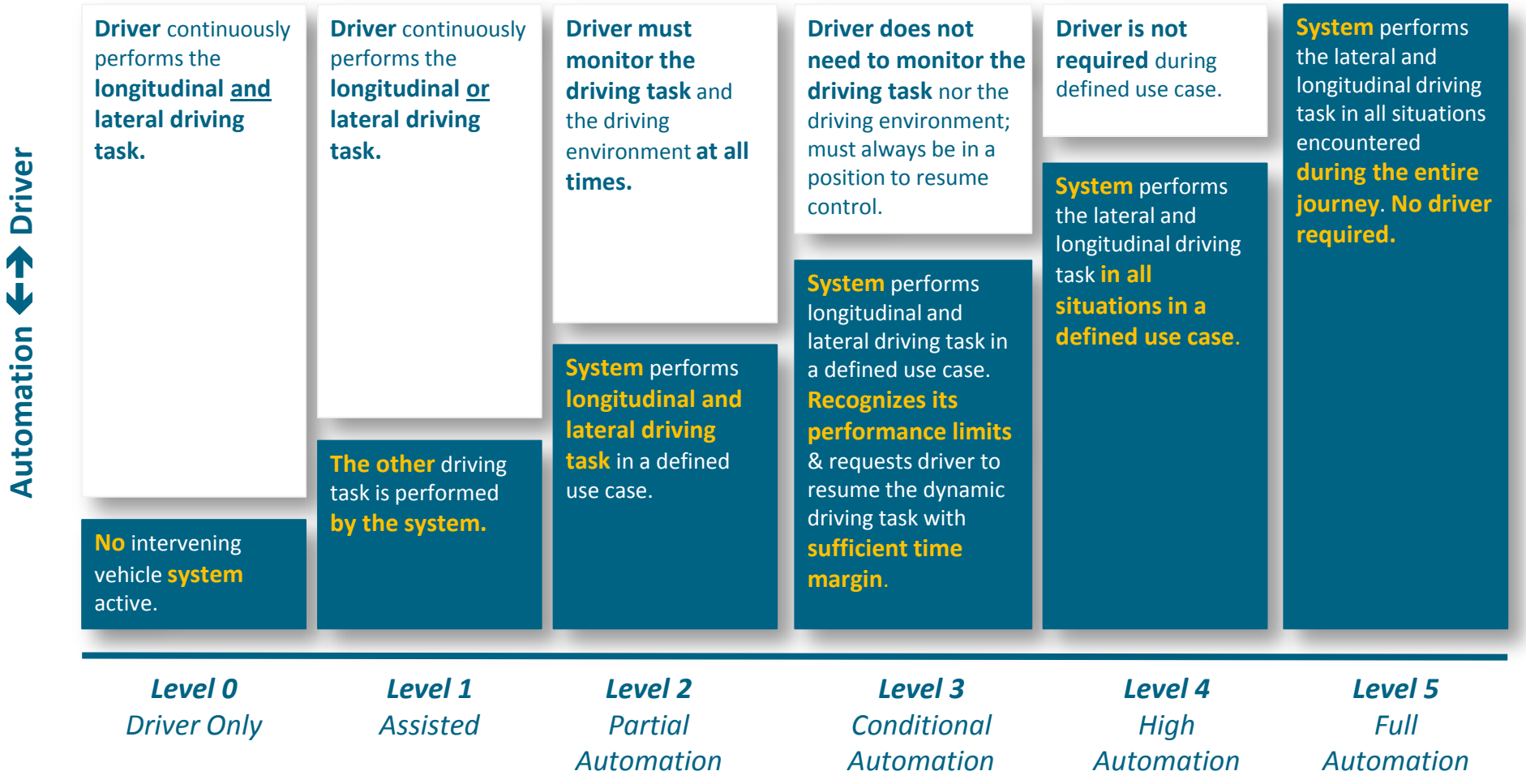
2 Resource-efficient Driving



3 Increased Comfort

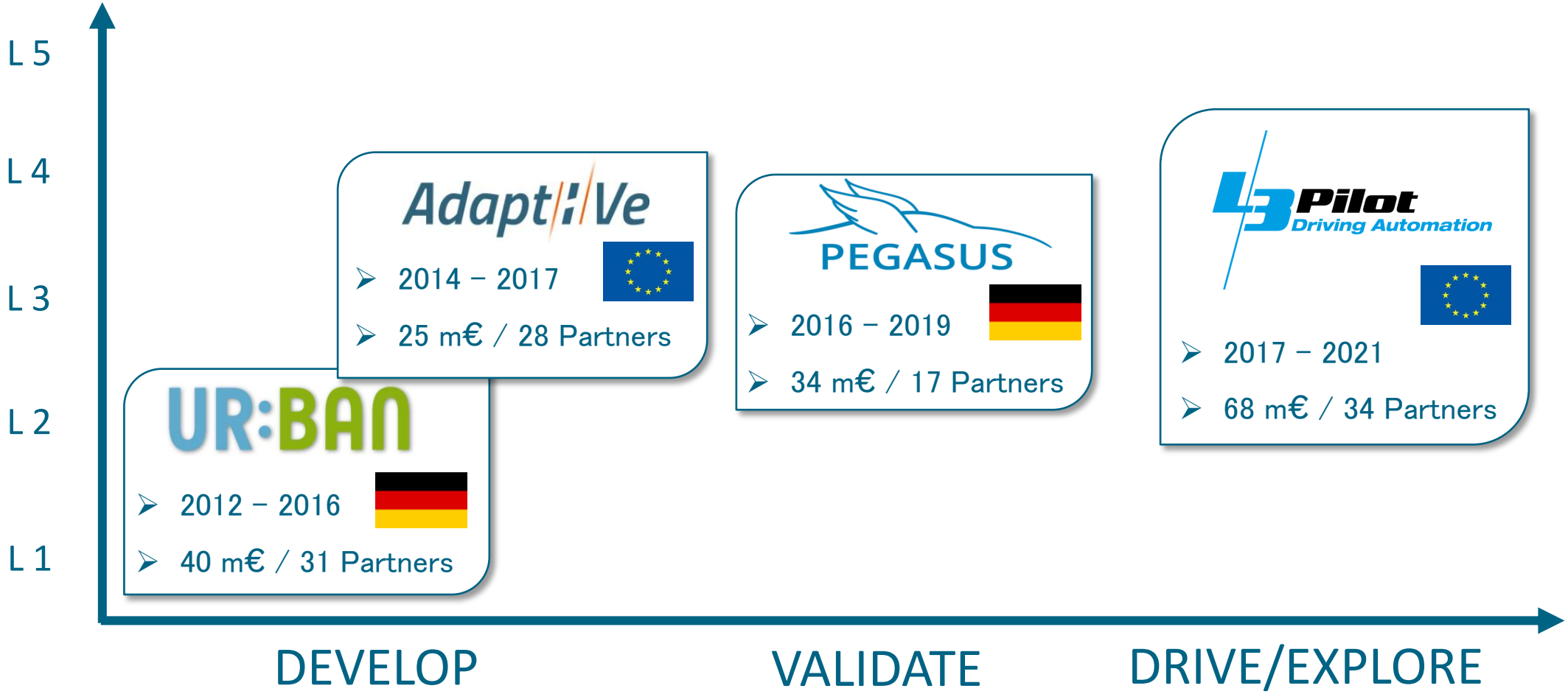
4 Efficient Use of the Infrastructure

DEFINITIONS – LEVELS OF AUTOMATED DRIVING



REALISING AUTOMATED DRIVING

SELECTED FUNDED PROJECTS IN GERMANY AND EUROPE



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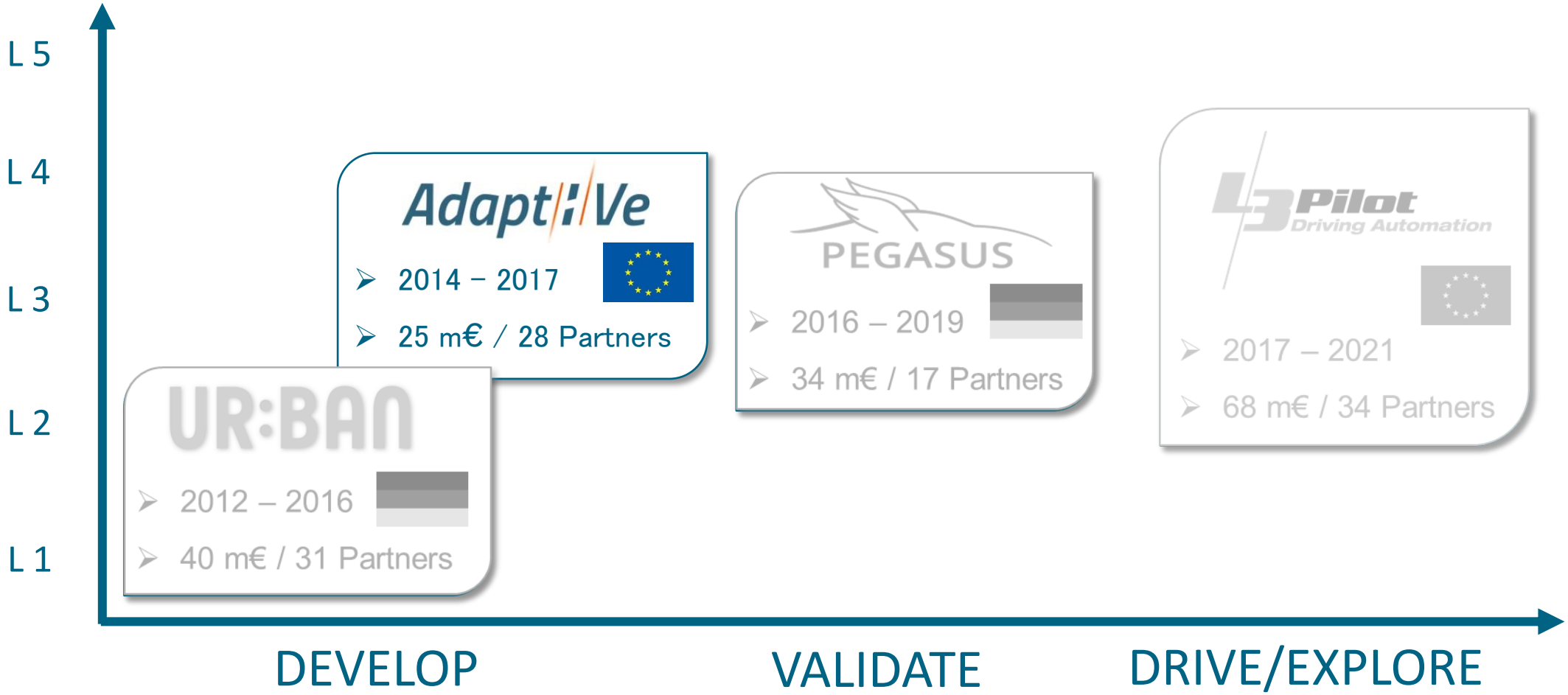
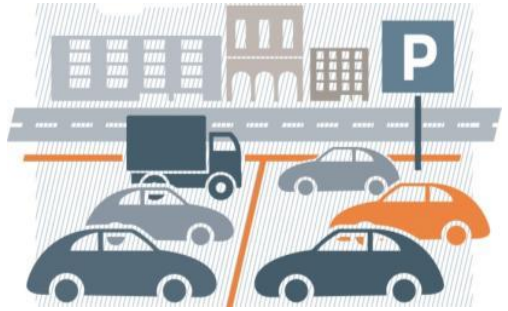


AdaptIVe

DEVELOPING AUTOMATED DRIVING TECHNOLOGIES

Widespread Application of Automated Driving to Improve Traffic Safety, Efficiency and Comfort



PARKING

URBAN

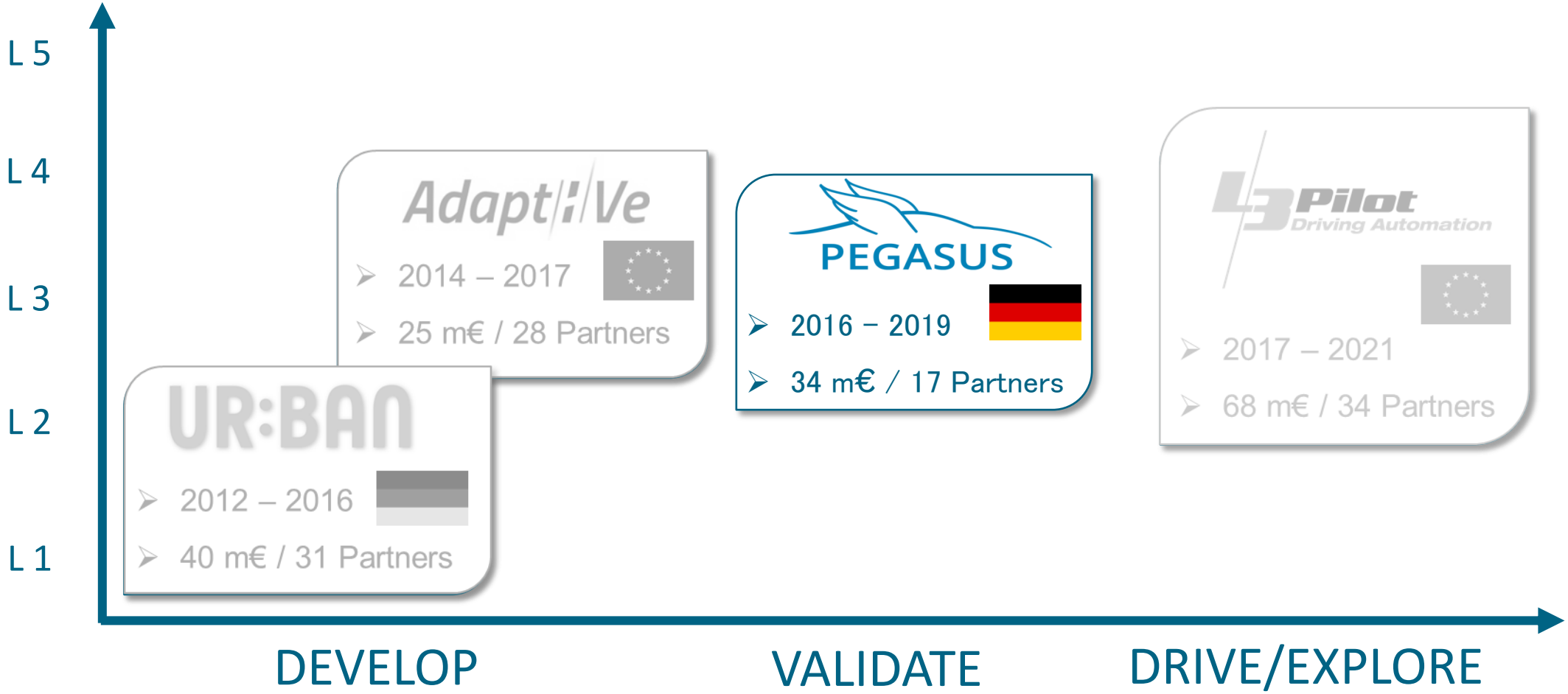
HIGHWAY

ADAPTIVE PROJECT: DEMONSTRATORS & FUNCTIONS

Parking Assistance, Garage, Special Areas, Multi-level Garage, Stop & Go	City Cruise, City Chauffeur, Supervised City Control	Enter & Exit Highway, Following Lane, Lane-change, Filter-in, Overtaking, Danger Spot Intervention, Stop & Go
Safe Stop		

REALISING AUTOMATED DRIVING

SELECTED FUNDED PROJECTS IN GERMANY AND EUROPE



HOW GOOD IS A HUMAN DRIVER?

REAL DRIVING TESTS WILL NO LONGER BE ENOUGH

	Accidents with Physical Injury	Vehicle Kilometers	Distance between Two Accidents with Injury
Germany – All Vehicles	300.000	$7.1\ 10^{11}$ km	2.0 Mio. km
Germany – Passenger Cars	180.000	$6.0\ 10^{11}$km	3.3 Mio. km
Highway – All Road Vehicles	ca. 18.000	$2.2\ 10^{11}$ km	12.0 Mio. km

- Approx. 240 Mio. kilometers of vehicle integration tests needed for statistical relevance.
- Appox. 240 Mio. km test kilometers on the road would be necessary to prove, that automated driving vehicles are as safe as human driven vehicles.

Quelle: Handbuch Fahrerassistenzsysteme 3. Auflage - ATZ/MTZ-Fachbuch – Springer Verlag 2015

WHAT LEVEL OF PERFORMANCE IS EXPECTED OF AN AUTOMATED VEHICLE?

HOW CAN WE VERIFY THAT IT ACHIEVES THE DESIRED PERFORMANCE CONSISTENTLY?

Scenario Analysis & Quality Measures

- What human capacity does the application require?
- What about technical capacity?
- Is it sufficiently accepted?
- Which criteria and measures can be deducted from it?

Implementation Process

- Which tolls, methods and processes are necessary?

Testing

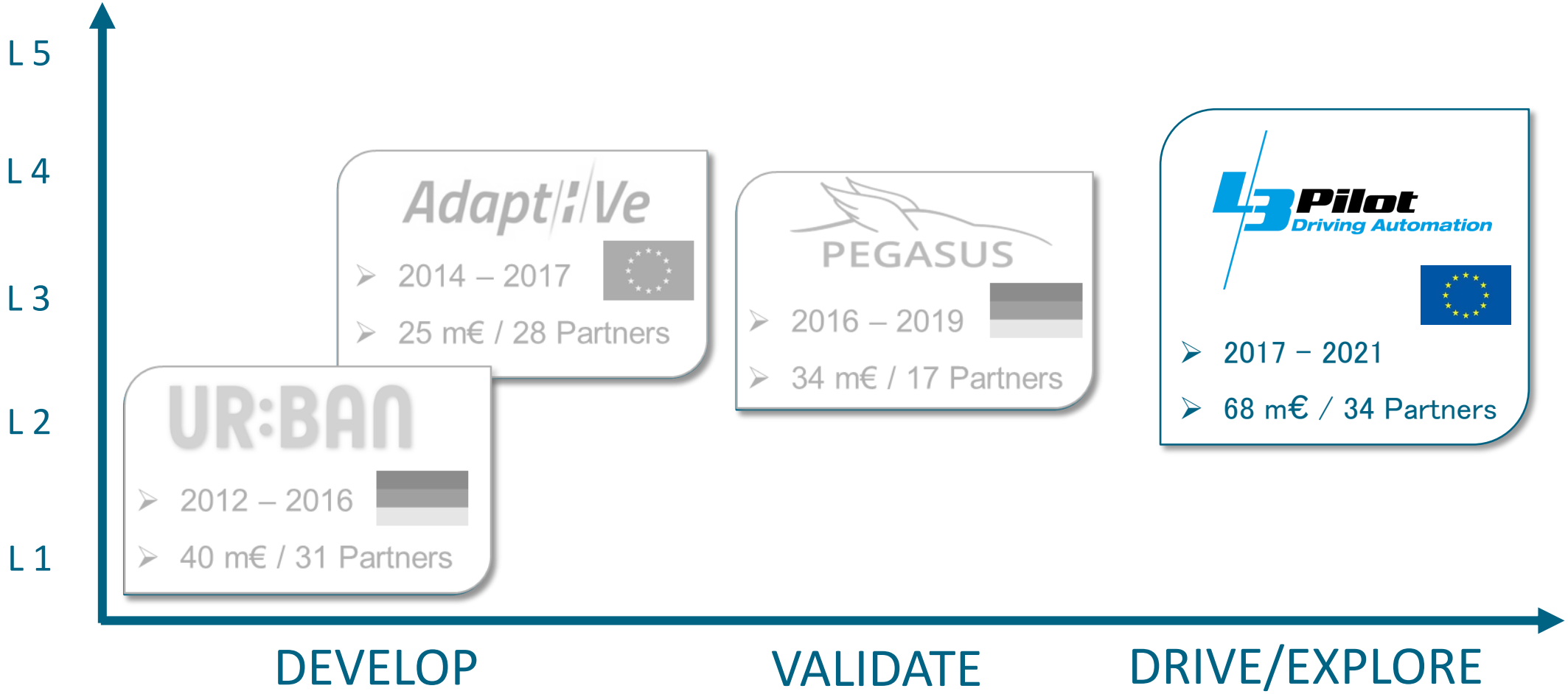
- How can complete-ness of relevant test runs be ensured?
- What do the criteria and measures for these test runs look like?
- What can be tested in labs or in simulation? What must be tested on test grounds, what must be tested on the road?

Reflection of Results & Embedding

- Is the concept sustainable?
- How does the process of embedding work?

REALISING AUTOMATED DRIVING

SELECTED FUNDED PROJECTS IN GERMANY AND EUROPE



L3PILOT - PILOTING AUTOMATED DRIVING ON EUROPEAN ROADS

FACTS

- Piloting SAE Level 3 functions; some Level 4
- 100 vehicles, 1000 drivers in 11 countries
- Budget: €68 million
- Funding: €36 million
- Start: September 2017
- Duration: 48 months
- Coordinator: Volkswagen Group Research
- Participants: 34 (OEMs, suppliers, research, SMEs, insurers, authorities and user groups)
- Countries: Austria, Belgium, France, Finland, Germany, Greece, Italy, Netherlands, Norway, Sweden, Switzerland, UK

Co-funded by the European Union under Horizon 2020 programme

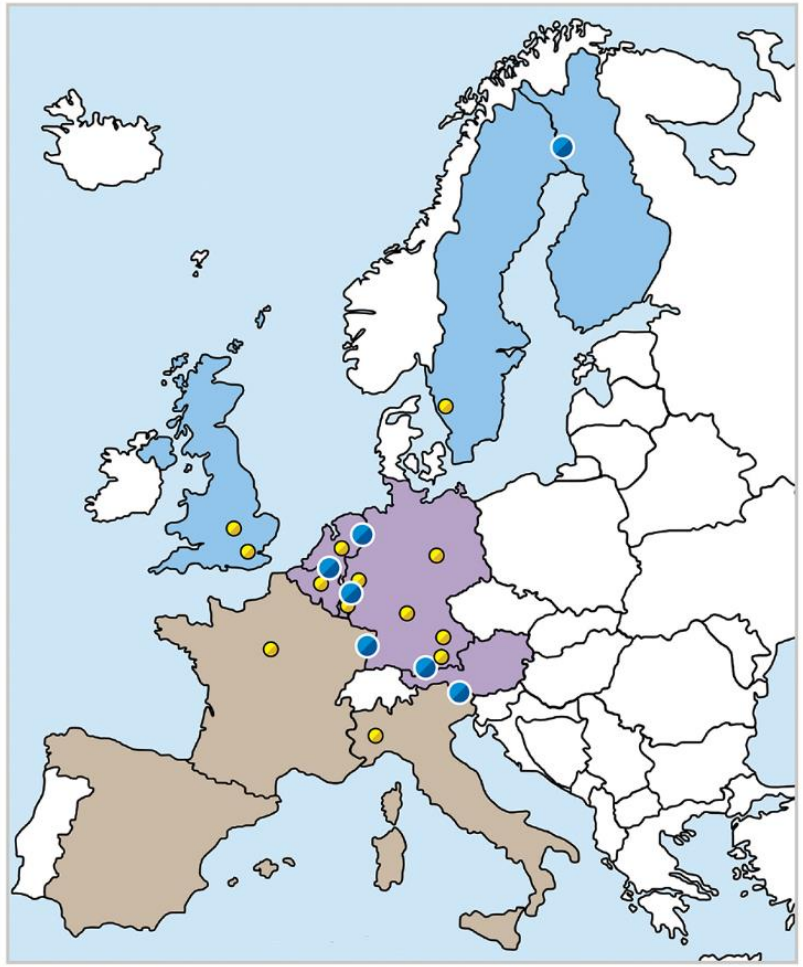
Supported by eucar EUROPEAN COUNCIL FOR AUTOMOTIVE R&D

L3PILOT - PILOTING AUTOMATED DRIVING ON EUROPEAN ROADS

PILOT CENTERS FOR A PAN-EUROPEAN PILOT

Crossborder

Austria	Germany
Austria	Italy
Belgium	Germany
Belgium	Netherlands
Finland	Sweden
France	Germany
Germany	Netherlands



Country, region - OEM

BE, Brussels;
NL - Toyota

DE, Aachen - Ford

DE, Ingolstadt - Audi

DE, Munich - BMW

DE, Offenbach - Honda

DE, Wolfsburg - VW

FR, Paris and other regions - REN, PSA

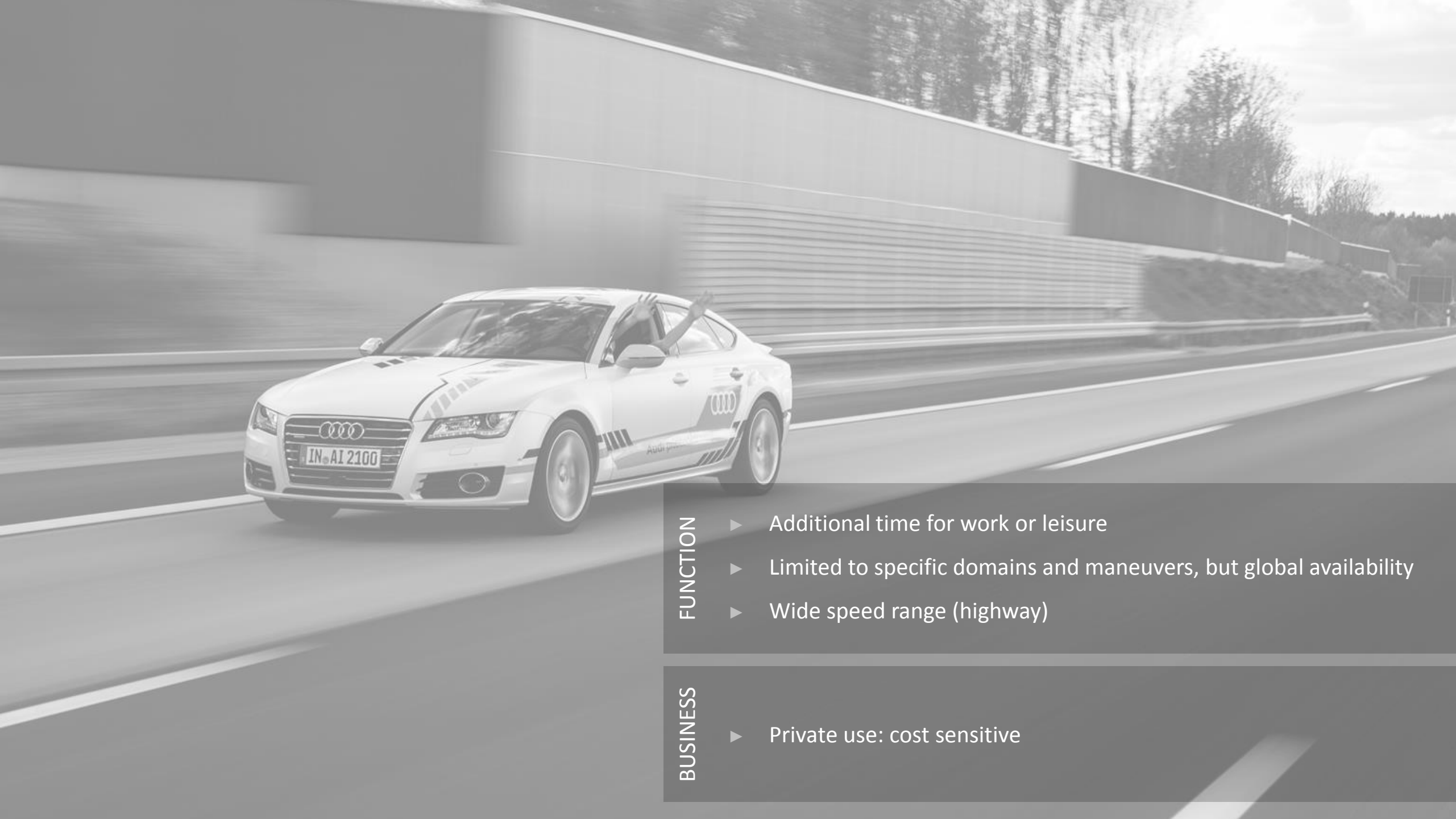
IT, Turin - CRF

LU; NL - Delphi

SE, Gothenburg;
UK, London - Volvo

UK, Coventry - JLR


IN AI 2100



FUNCTION

- Additional time for work or leisure
- Limited to specific domains and maneuvers, but global availability
- Wide speed range (highway)

BUSINESS

- Private use: cost sensitive


EfficientLine 2
MAN
M AN 4080

FUNCTION

- Additional time for **work**
- Limited to specific domains and maneuvers, but global availability
- Wide speed range (highway)

BUSINESS

- Commercial use:
  additional working time compensating higher costs


sedric
VOLKSWAGEN
GROUP

sedric

FUNCTION

- Mobility as a service
- Limited to defined urban environments
- Low/Medium speed

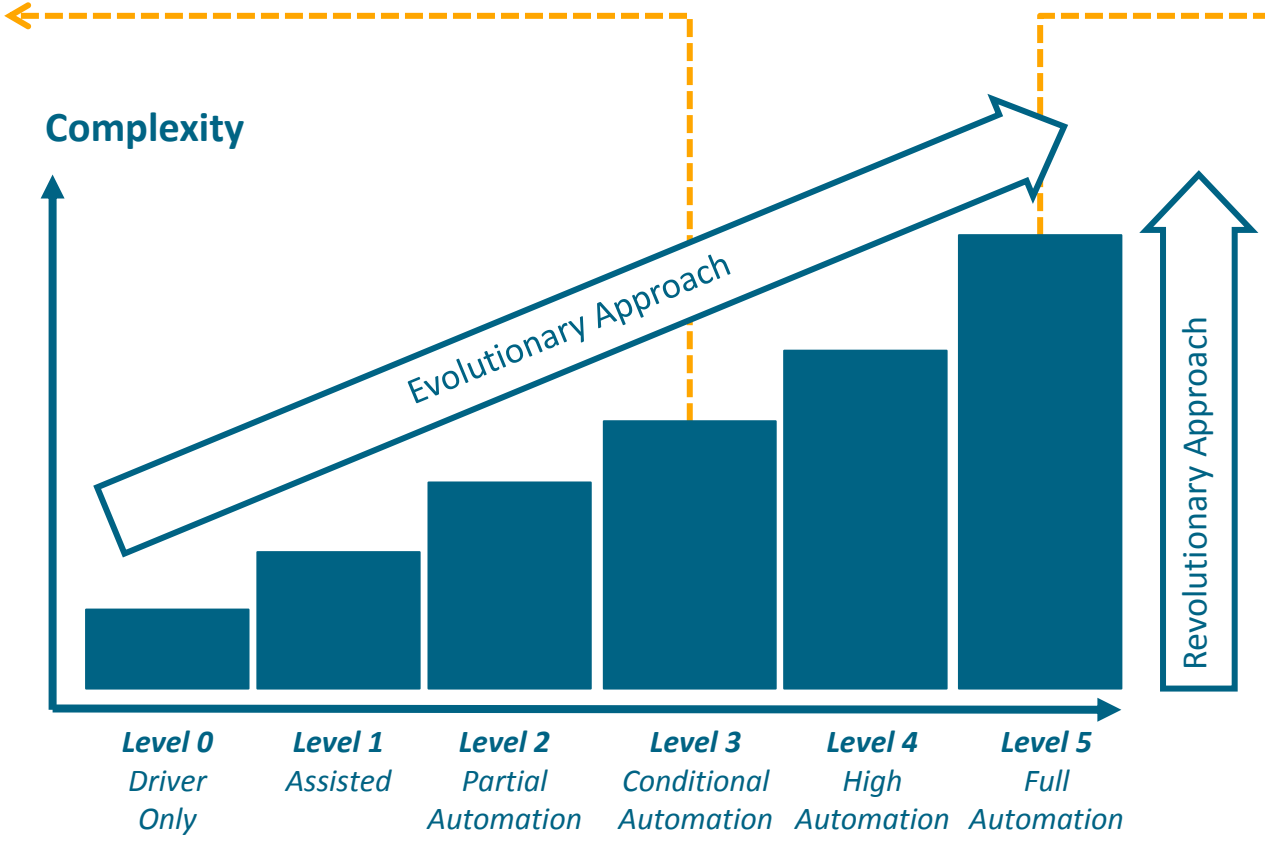
BUSINESS

- No driver costs
  → Less sensitive to system costs

EVOLUTIONARY VERSUS REVOLUTIONARY APPROACH

WHICH WAY TO GO?

sedric



TO BE CONTINUED.

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