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connected automated driving.eu

Comprehensive Roadmap for Level 4/5 Connected and Automated Driving

Gereon Meyer, VDI/VDE-IT

12 September 2018
Berlin

Safety in Automated Driving

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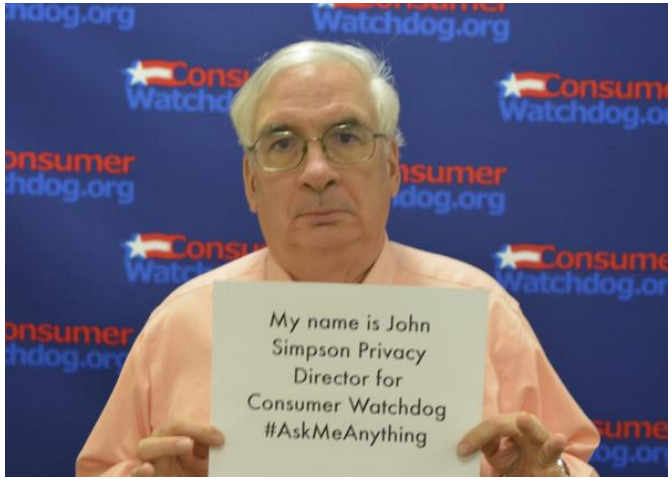
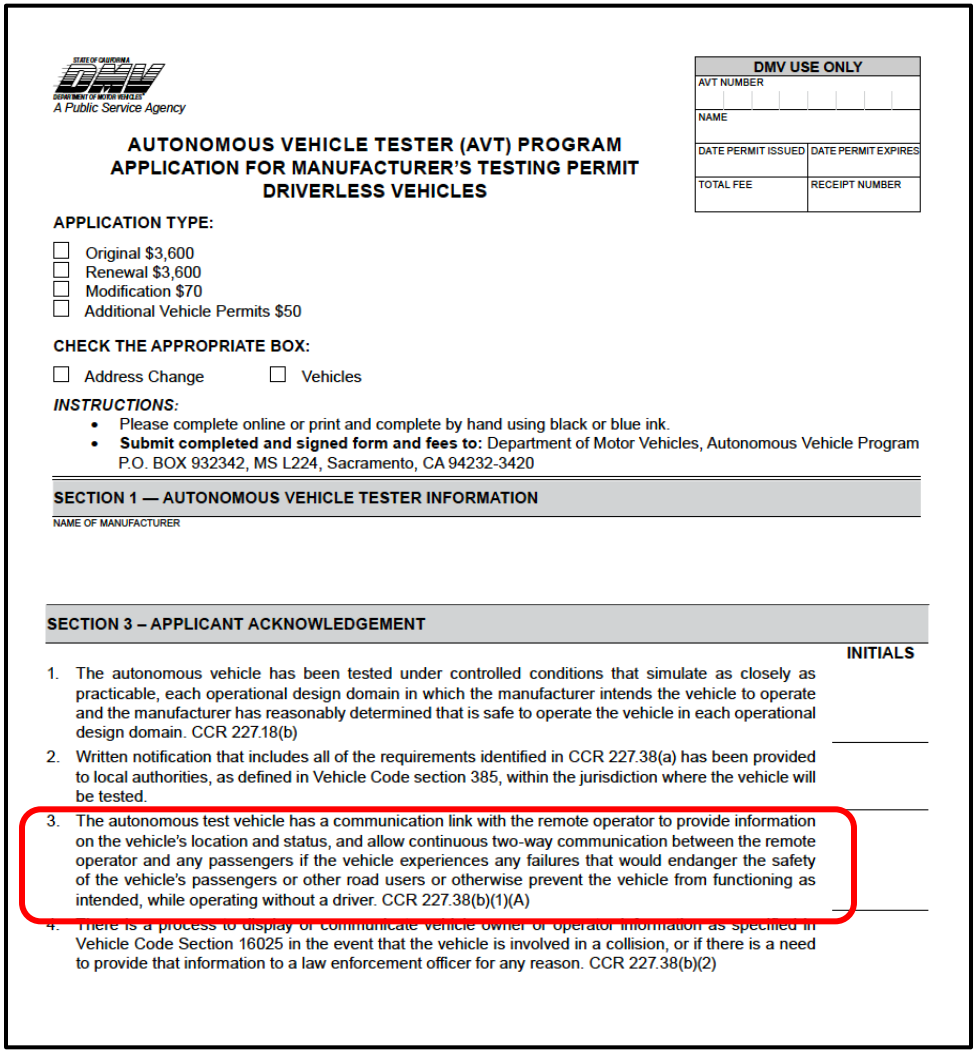
UBER, Tempe, AZ



„This will turn driving these vehicles into a video game except lives are at stake..“



A Public Service Agency

AUTONOMOUS VEHICLE TESTER (AVT) PROGRAM
APPLICATION FOR MANUFACTURER'S TESTING PERMIT
DRIVERLESS VEHICLES

DMV USE ONLY	
AVT NUMBER	
NAME	
DATE PERMIT ISSUED	DATE PERMIT EXPIRES
TOTAL FEE	RECEIPT NUMBER

APPLICATION TYPE:

- ☐ Original $3,600
- ☐ Renewal $3,600
- ☐ Modification $70
- ☐ Additional Vehicle Permits $50

CHECK THE APPROPRIATE BOX:

☐ Address Change ☐ Vehicles

INSTRUCTIONS:

- Please complete online or print and complete by hand using black or blue ink.
- **Submit completed and signed form and fees to:** Department of Motor Vehicles, Autonomous Vehicle Program P.O. BOX 932342, MS L224, Sacramento, CA 94232-3420

SECTION 1 — AUTONOMOUS VEHICLE TESTER INFORMATION

NAME OF MANUFACTURER

SECTION 3 – APPLICANT ACKNOWLEDGEMENT

INITIALS

1. The autonomous vehicle has been tested under controlled conditions that simulate as closely as practicable, each operational design domain in which the manufacturer intends the vehicle to operate and the manufacturer has reasonably determined that is safe to operate the vehicle in each operational design domain. CCR 227.18(b)
2. Written notification that includes all of the requirements identified in CCR 227.38(a) has been provided to local authorities, as defined in Vehicle Code section 385, within the jurisdiction where the vehicle will be tested.
3. The autonomous test vehicle has a communication link with the remote operator to provide information on the vehicle's location and status, and allow continuous two-way communication between the remote operator and any passengers if the vehicle experiences any failures that would endanger the safety of the vehicle's passengers or other road users or otherwise prevent the vehicle from functioning as intended, while operating without a driver. CCR 227.38(b)(1)(A)
4. There is a process to display or communicate vehicle owner or operator information as specified in Vehicle Code Section 16025 in the event that the vehicle is involved in a collision, or if there is a need to provide that information to a law enforcement officer for any reason. CCR 227.38(b)(2)

California Department of Motor Vehicles, 2018

SCOUT Project

Objectives:

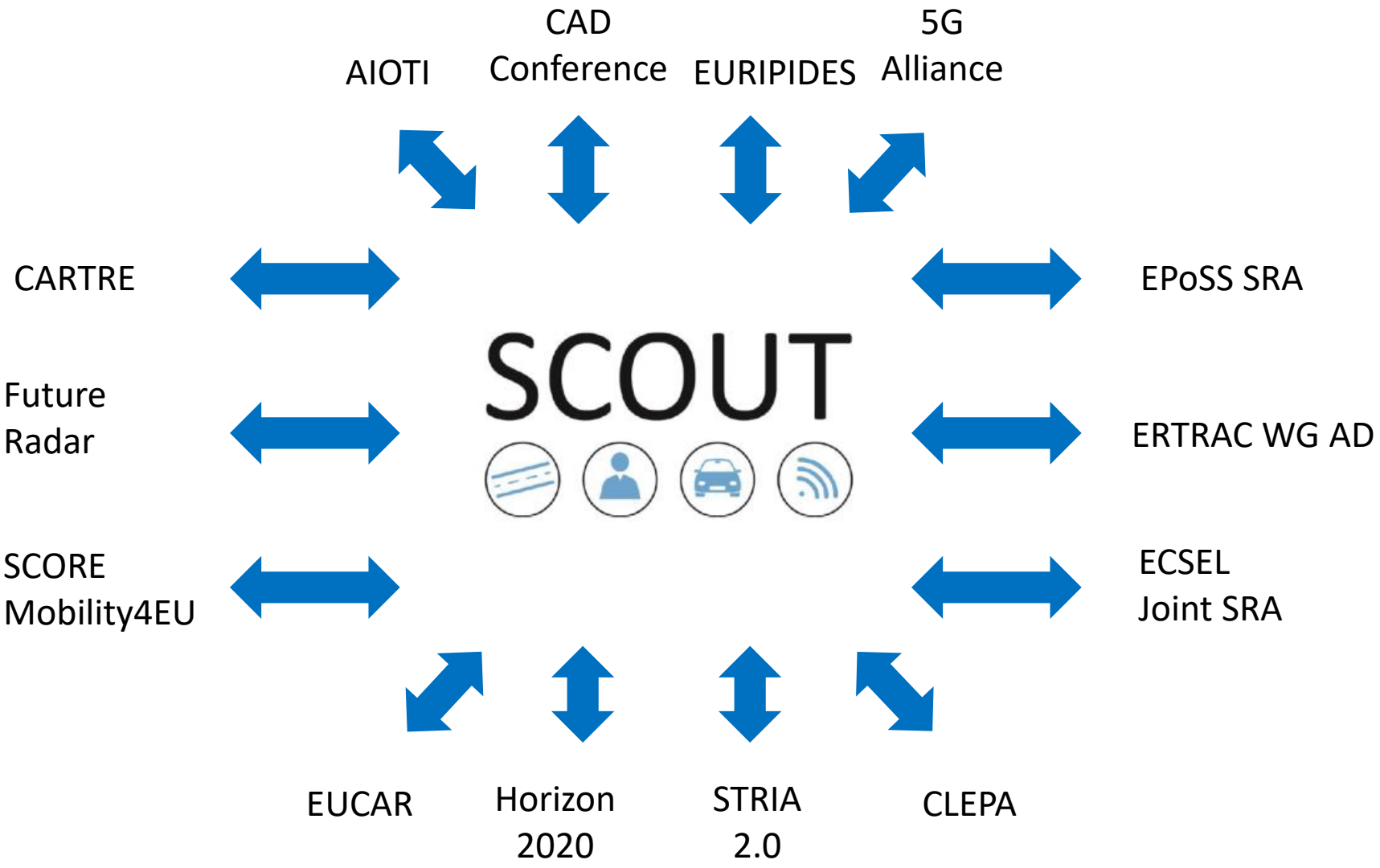
- To identify pathways for an accelerated proliferation of safe and connected high-degree automated driving (SAE 3-5)
- To take into account user needs and expectations, technical and non-technical gaps and risks, viable business models as well as international cooperation and competition.
- To help the automotive, the telecommunication and digital sectors need to join forces and agree on a common roadmap

Contractual Partners:
VDI/VDE-IT, Renault, FCA, BMW, Bosch, NXP, Telecom Italia, NEC, RWTH, Fraunhofer, CLEPA, Sernauto

Duration: 1 July 2016 - 30 June 2018

Funding Agency: European Commission, DG CNECT

Cooperation



Comprehensive Approach

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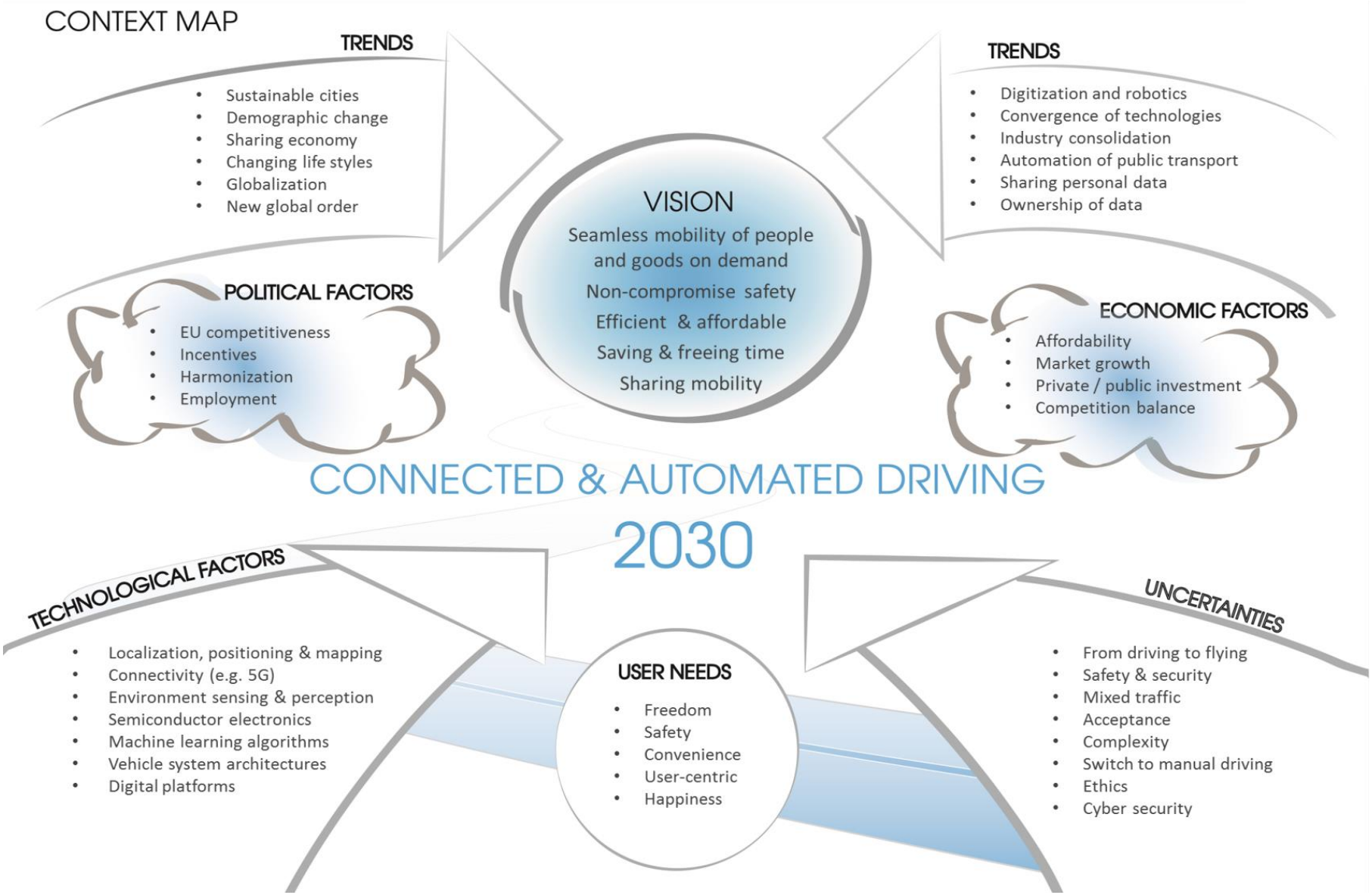

Co-Creation of the Vision

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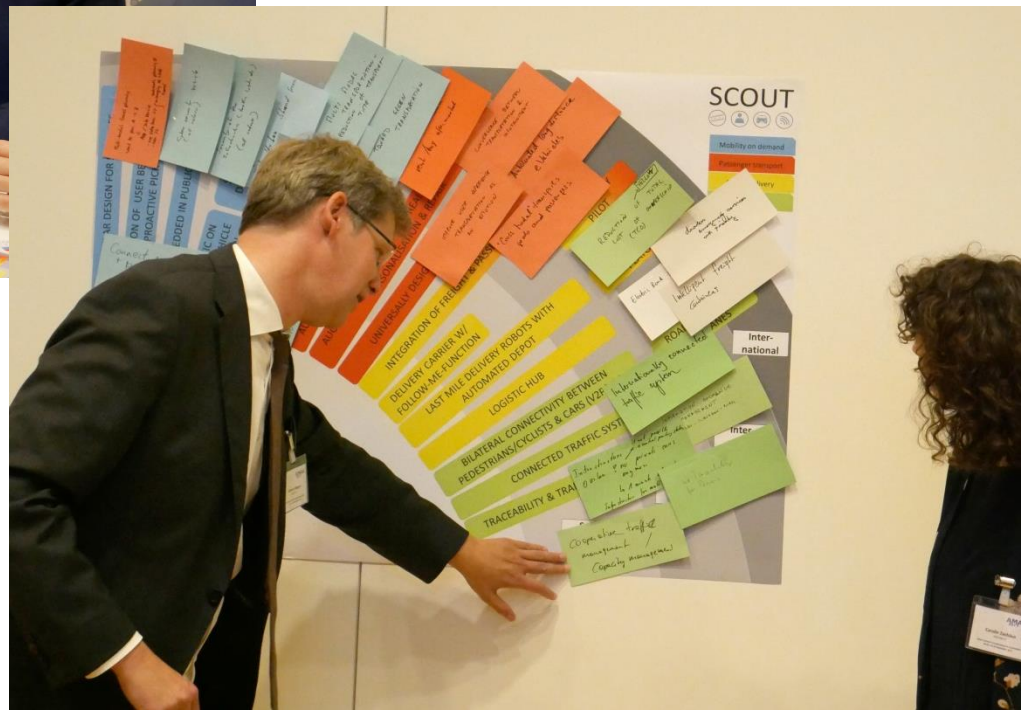

Validation exercise at the
AMAA 2017 Conference
25 Sept 2017, Berlin

Vision Development

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2030

CONNECTED MODULAR SHUTTLES WITH ACCESS FOR ALL
PREDICTION OF USER BEHAVIOUR & PROACTIVE PICK UP
CAD EMBEDDED IN PUBLIC TRANSPORT
MULTI MODAL TRAVEL PLANNING
SHARED SERVICES W/ AUTOMATED ON DEMAND VEHICLE DISLOCATION
AUTOMATED VALET-PARKING
ROBO TAXI W/ RIDE SHARING
AUTOMATED, LONG DISTANCE, LIGHT ELECTRIC VEHICLES
AUGMENTED, VIRTUAL & MIXED REALITY FOR COMFORT, PERSONALISATION & REPAIR
CONVERGENCE BETWEEN TRANSPORT & ENTER-/INFOTAINMENT
UNIVERSALLY DESIGNED VEHICLES + SERVICES
INTEGRATION OF FREIGHT & PASSENGER VEHICLES
CROSS MODAL TRANSPORT FOR GOODS & PASSENGERS
DELIVERY CARRIER W/ FOLLOW-ME-FUNCTION
LAST MILE DELIVERY ROBOTS WITH AUTOMATED DEPOT
LOGISTIC HUB
HIGHWAY PILOT
TRUCK/COACH/CAR PLATOON
ROAD-TRAINS ON FAST LANES
CONNECTIVITY BETWEEN ROAD USERS
COOPERATIVE TRAFFIC MGMT (INFO EXCHANGE, ...)
CONNECTED TRAFFIC SYSTEM
INFRASTRUCTURE FOR MULTI MODAL TRANSPORT
DIGITAL PLATFORMS
CYBER/DATA SECURITY

Inter-national
Inter-urban
Rural
Sub-urban
Urban

CONNECTIVITY
L4/L5 SYSTEMS
INTELLIGENCE
SENSOR TECHNOLOGY

Mobility on demand
Passenger transport
Goods delivery
Infrastructure

Co-Creation of Roadmap

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Technical

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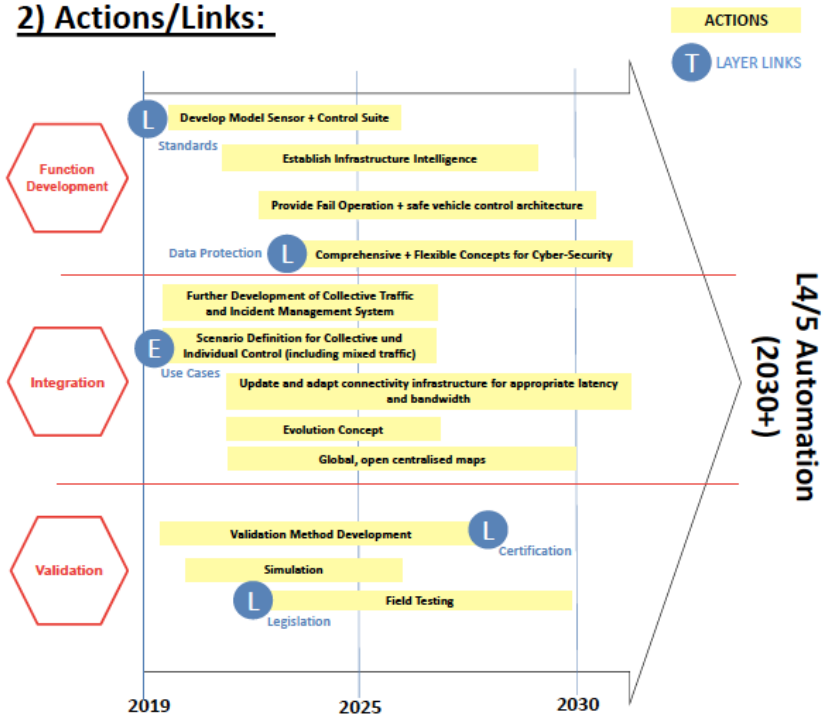
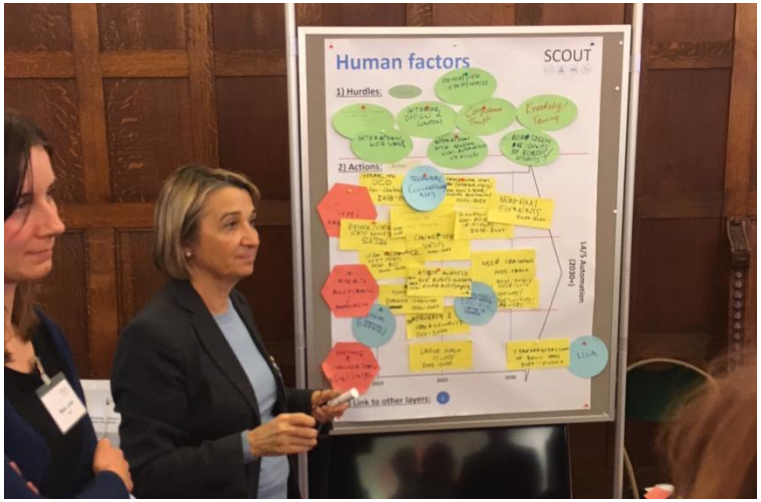
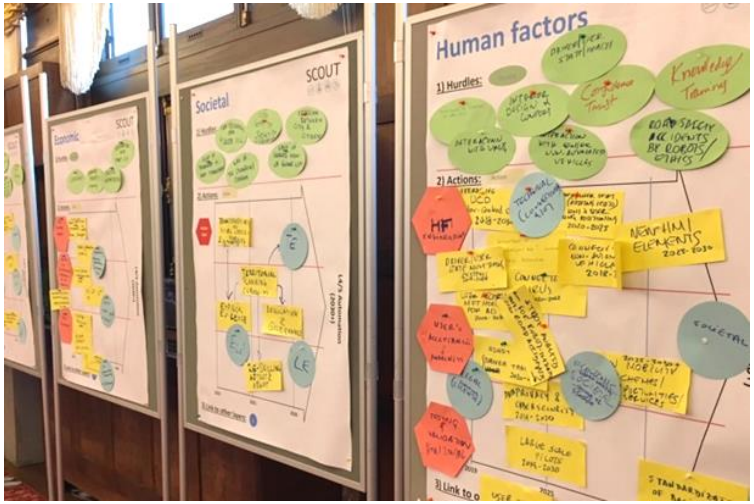
1) Hurdles:

- Vehicle environment perception and event prediction
- Integration in traffic management and control
- Communication with infrastructure (digital/ physical)
- Vehicle decision making (e.g. AI)
- Requirements for maps and localisation
- Reliability of functional safety and validation
- Failsafe operation and incident management
- Applicability in all weather conditions
- Privacy and cyber-security
- Adaptation to regulation needs
- Management of mixed traffic
- Interaction with other road users (VRU, animals)

2) Actions/Links:

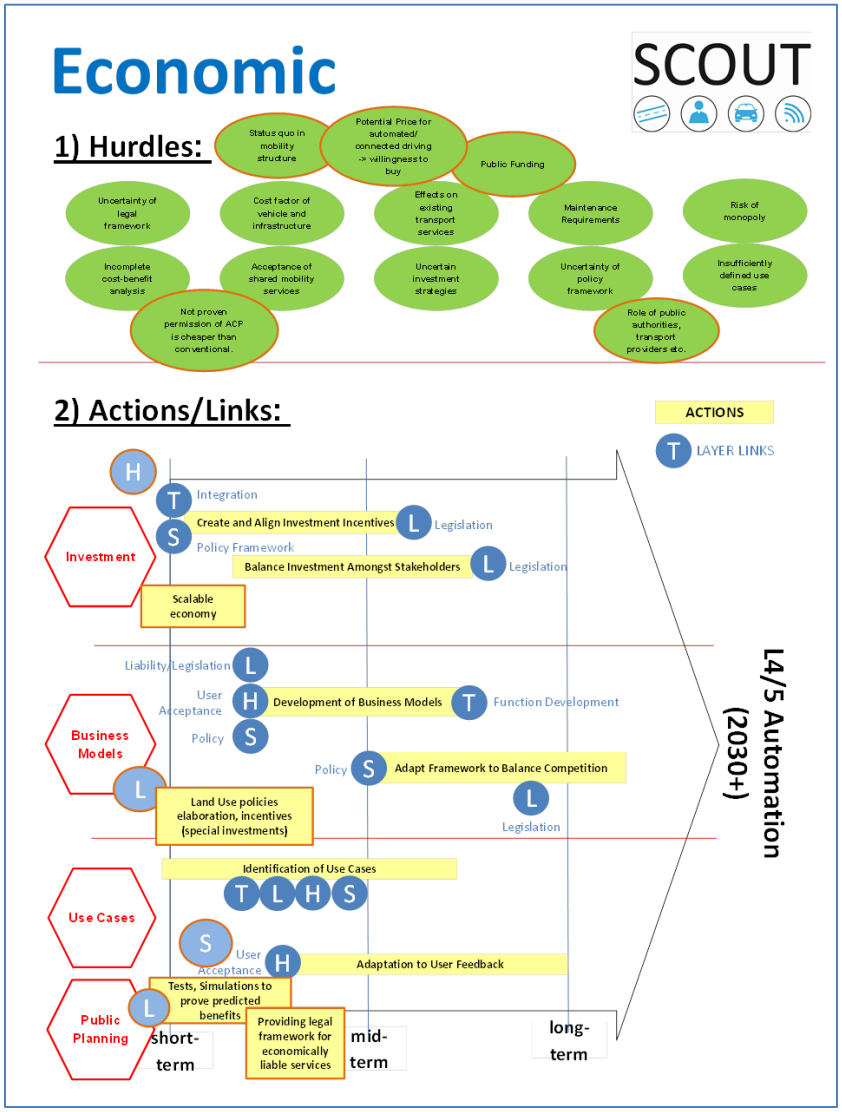






SCOUT Expert Workshop 7 Mar 2018

Co-Creation of Roadmaps



Lessons Learned

- 5-Layer Model appropriate to describe the challenges related to CAD in a comprehensive way
- Dependencies (“links”) between the layers are manifold, creating a “Gordian knot”, i.e. development and deployment of level 4 and 5 connected and automated driving may be heavily delayed if it is not comprehensively coordinated
- Relation to time line makes no sense if the use case remains unspecified

Agile Roadmap Model

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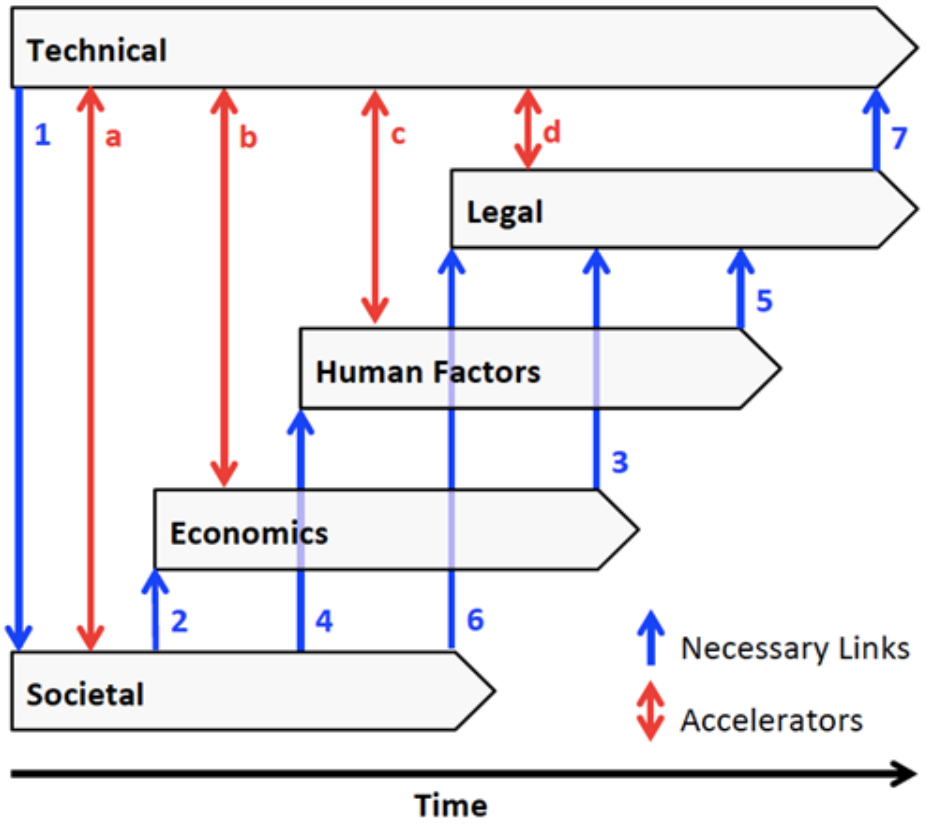
Updated Approach:

- Roadmaps need to be distinct for use cases, and focused on goals and milestones
- Innovation can be accelerated by agile shortcuts anticipating hurdles and roadblocks, e.g. living labs, pilots, sandboxes, hackathons



Use-Case Specific Roadmaps

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ROAD MAP 1

USE CASE:
LEVEL 4/5 AUTOMATION
AUTOMATED
ON-DEMAND SHUTTLE

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STORY MAP

VISION

- Fully integrated
- Part of the transport system
- On-demand

Opportunities

Easy access | Cost effective | Rural lab | Transfer to freight

STATE OF PLAY

- First tests
- Fixed routes
- Low speed
- Controlled environment
- Stewards

TECHNICAL LAYER
LEGAL LAYER
HUMAN FACTORS LAYER
ECONOMIC LAYER
SOCIAL LAYER

Hurdles

Safety expectations | VRU | Certification | System integration

Use-Case Specific Roadmaps

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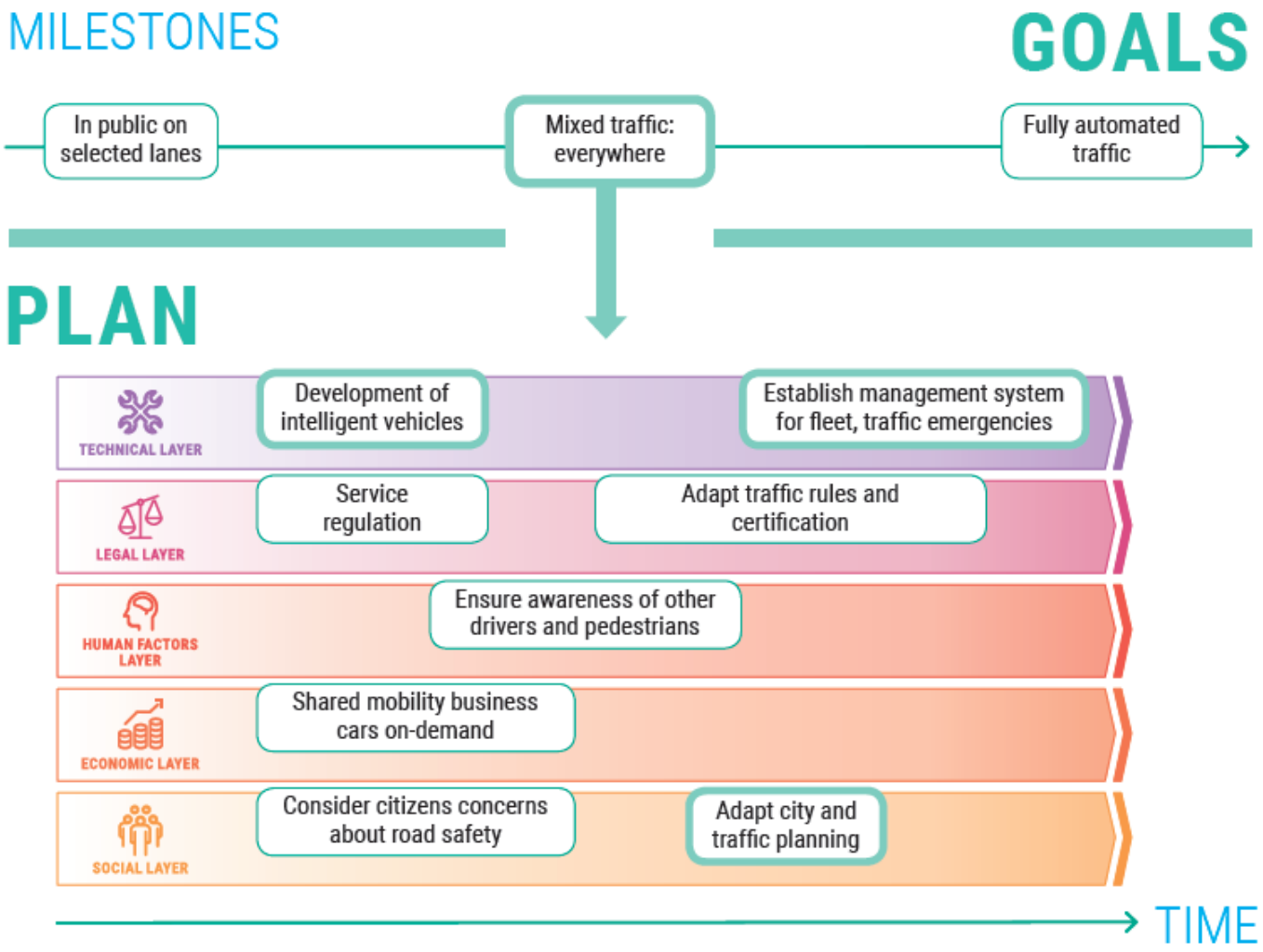
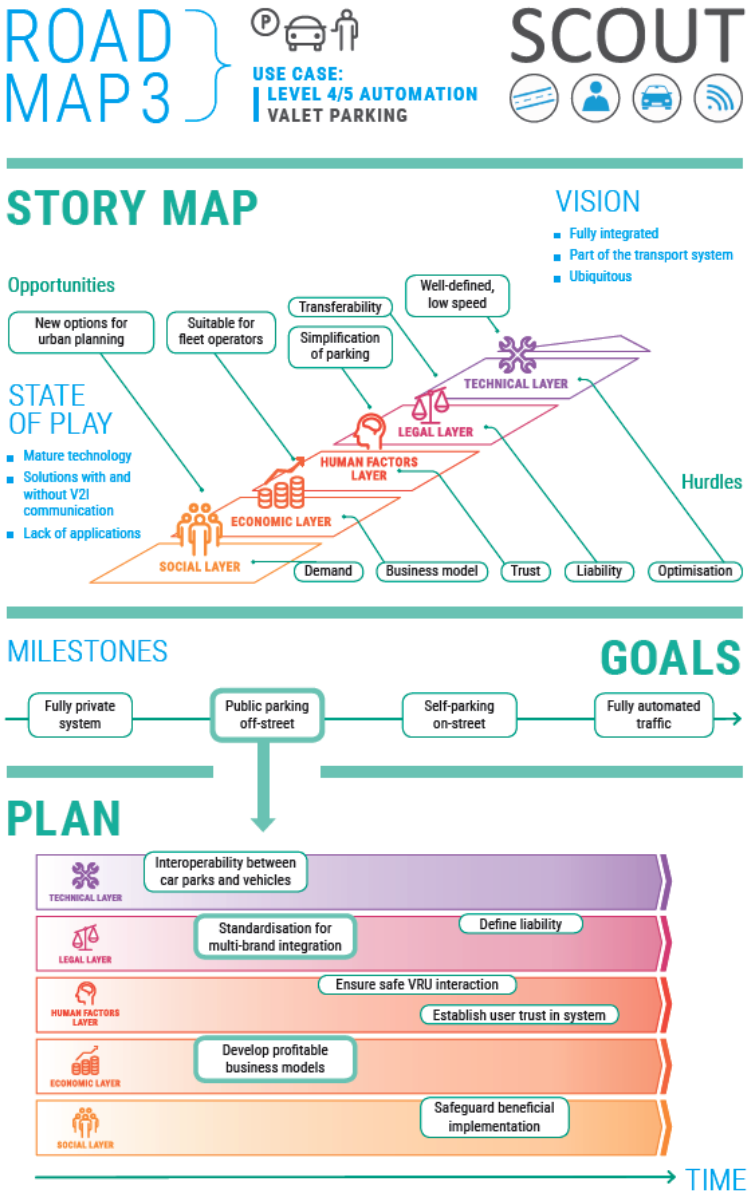
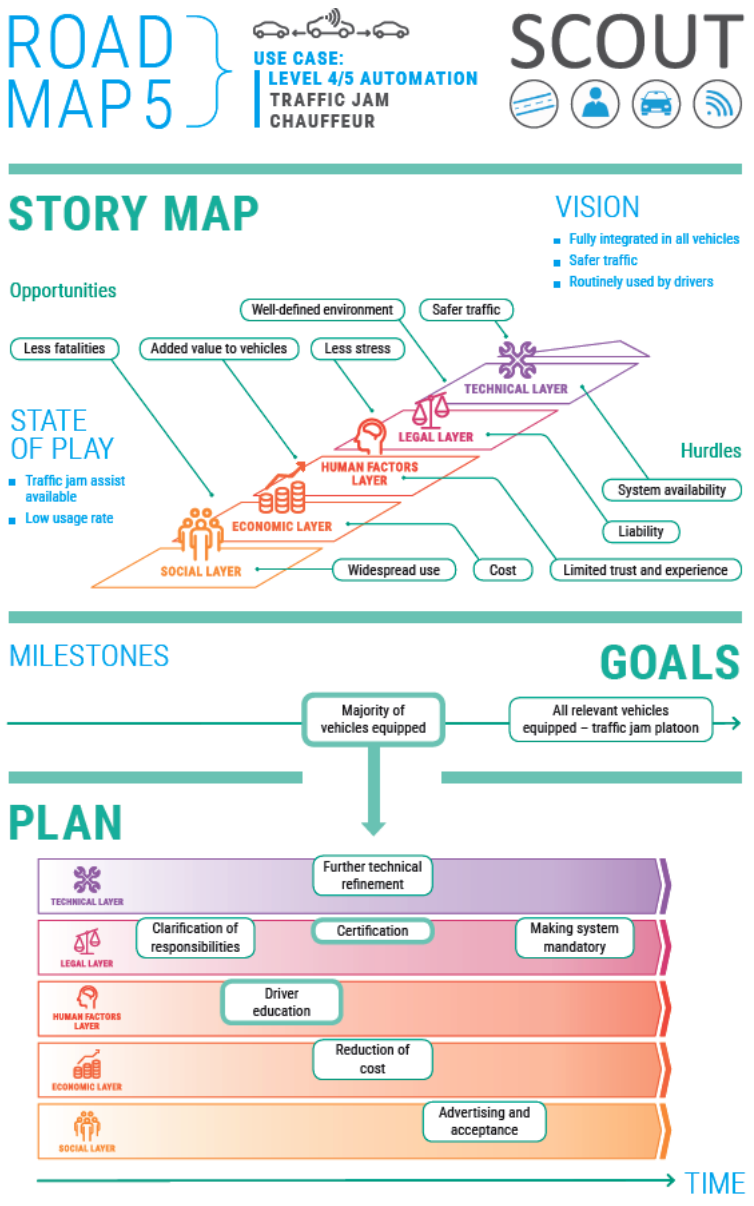


Use-Case Specific Roadmaps



Use-Case Specific Roadmaps



General Findings

EPoSS
European Technology Platform on Smart Systems Integration

- There are common technical needs in all level 4/5 use cases, e.g. reliable environment perception, 5G, high-precision digital maps, reliable positioning
- Safety is of primary concern related to level 4/5 automation, it refers to all five layers
- Technology oftentimes also is part of the economic equation as it responds to business models, e.g. for shared automated vehicles
- Connectivity is a necessary condition for a safe and convenient level 4/5 automated road transport
- Cyber security and safe operation have to be ensured.
- Large scale demonstrations are essential in order to achieve societal acceptance.

General Findings

EPoSS
European Technology Platform on Smart Systems Integration

- A standardization activity on a global data model and/or translation mechanisms between different specific models for the ITS is needed.
- In terms of legal frameworks, in general the Vienna Convention needs to be modified in order to reflect level 4/5 automation; also the passenger transport legislation and liability issues need to be solved.
- The use-case centered approach taken here can’t replace the development of specific roadmaps in the involved industrial sectors, but give inputs to them.
- SCOUT results should be used in the context of building the implementation plan for the EC’s Strategic Transport Research and Innovation Agenda on CAD.