Welcome to the Smart Mobility panel

Moderated by
Maria Rimini-Döring | Robert Bosch
Daniel Watzenig | Virtual Vehicle

10 May 2017, Amsterdam
Panellists
Smart Mobility

Werner Damm
Member of the board - R&D division Transportation
OFFIS

Wolfgang Dettmann
Director Funding Projects & Coordination
Infineon Technologies AG & EGVIA Vice-Chairman

Bram Hendrix
Manager Smart Mobility
AutomotiveNL

Patrick Pype
Senior Director of Strategic Partnerships and External Relations
NXP Semiconductors

Bernard Strée
Europe Programme Director - Systems Division
CEA Leti

Send your questions to
mobility@dif2017.org
Focus
Smart Mobility

Future “Smart Mobility” needs both technical and societal cooperation to master the reliability, the connectivity and complexity challenges on the one hand and the acceptance, safety, security and privacy challenges on the other, in front of the whole value chain from system-on-chip to the vehicle and vehicle context. This workshop gives room for a discussion platform on the latest and most critical issues as well as emerging technologies along the way to connected, cooperative and automated mobility.

Send your questions to mobility@dif2017.org
The “Must-Haves” towards automated driving

Patrick Pype
NXP Semiconductors
The “Must-Haves” towards Automated Driving…

Patrick Pype
Digital Innovation Forum
Amsterdam, 10-11 May 2017
But: there is a major concern on security & privacy in society!

New-car buyers are broadly concerned about data privacy and the possibility of hacking when it comes to car connectivity.

% of new-car buyers that (strongly) agree with the statement:

- I am reluctant to use car-related connected services because I want to keep my privacy.
- I am afraid that people can hack into my car and manipulate it (e.g., the braking system) if the car is connected to the Internet.

From Fiction to Reality…

Voicing concerns about privacy in the age of the internet

Criminals hack into vehicle electronics to make them crash.

A society where comprehensive transparency and surveillance measures lead to total social control.
Hence, we need to build Trust in the entire Eco-System

• Study the Impact by Relevant **Societal & Business Use Cases**

• **Technology**: Develop reference architectures and components for automated systems, combining high **security** and **privacy** protection while preserving functional-**safety** and operational performance.

• Create a **Multi-Stakeholder Dialogue**, including large scale Pilots
1. Societal & Business Use Cases

Intervening
Supporting
Warning
Informing

Life threatening
Disruptive
User acceptance
Trust

Cyber-Attacks
Remote monitoring of driver
Parameter tuning of safety-relevant functions (calibration, engine tuning, remote settings)
Secure over-the-air updates of safety functions
Intelligent Parking Search

Trusted tamper-proof blackbox data collection
Breakdown of component driving on the highway
Secured Automated Driving
Swarm Learning
Essential element: **Defense-in-Depth** approach

- Multiple layers of protection, at different levels in the system
- To mitigate the risk of one component of the defense being compromised or circumvented

**APPLY BEST PRACTICES, SUCH AS:**

- Security-by-design & Privacy-by-Design (as opposed to being an afterthought)
- Lifecycle Management (incl. FOTA)
3. Multi-Stakeholder Dialogue

Dialogue on:
- Technology
- Use Cases
- Legislation
- New business models
- Societal Impact

In order to:
- Get to a common understanding
- Build trust
- Reach acceptance by all stakeholders
Truck Platooning Pilot... Important Milestone towards AD

New NXP Technology Allows Tighter Truck Platooning

Doug Newcomb, CONTRIBUTOR
Driving the conversation on the connected car and mobility

Opinions expressed by Forbes Contributors are their own.

NXP and DAF Trucks showcase truck platooning in Munich. Photo by NXP.
Chapter 2
“Privacy and Security in Autonomous Vehicles”
By Patrick Pype (*), Gerardo Daalderop (*), Eva Schulz-Kamm (*), Eckhard Walters (*), and Maximilian von Grafenstei (**)
A Systems Safety Perspective

Werner Damm
OFFIS
Smart Mobility Panel

A Systems Safety Perspective

Werner Damm
This presentation is based on the Findings of the SafeTRANS Working Group on Highly Automated Systems

Participating Organizations
AIRBUS DEFENCE & SPACE, AIRBUS DS ELECTRONICS AND BORDER SECURITY GMBH, ASES, ATLAS ELEKTRONIK GMBH, AVL LIST GMBH AVL SOFTWARE AND FUNCTIONS GMBH BMW AG, CONTINENTAL TEVES AG &CO. OHG, DLR, FORTISS, FRAUNHOFER, ITK ENGINEERING AG, KIT, ROBERT BOSCH, OFFIS, SAFRAN ENGINEERING SERVICES GMBH, SAFETRANS, SIEMENS AG, VIRTUAL VEHICLE

Links to executive summary
German
http://www.safetrans-de.org/?we_objectID=2

English
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The safety impact of object identification

Impact of perceptual insufficiencies on overall risk

- State uncertainty
- Existential uncertainty
- Classification uncertainty

- Inaccurate or counterfactual characteriz. of situation
- Inaccurate or counterfactual prediction of evolution
- Inadequate plans

- Inadequate actions & decision (trajectory, cooperation scheme, conflict resolution, level of automation, ...)

Operational situations
Feb. 16, resolution of European Parliament

- Highlights the **principle of transparency**, namely that it should always be possible to supply the **rationale behind any decision taken with the aid of AI** that can have a substantive impact on one or more persons’ lives;
- considers that it must always be possible to **reduce the AI system’s computations** to a form comprehensible by humans;
- considers that advanced robots should be equipped with a ‘**black box**’ which records data on every transaction carried out by the machine, including the **logic that contributed to its decisions**;

European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL))
System Context Modeling

• To propose a description method for all aspects of the system context (comprises representations for all possible relevant real world situations in which the vehicle will be acting) meeting the following criteria:
  – covering all relevant environmental factors
  – compliance to industry standards on the space of all artefacts in traffic situations (including identification of types of artefacts, physical characteristics of artefacts, behaviour prediction models of such artefacts) and quality attributes (confidence, accuracy) of such information
  – supporting compositional specification methods for required system reactions in a given set of traffic scenarios
  – supporting model based V&V methods for type certification of autonomous vehicles
Traffic Scenarios

- based on ontology of system concept modelling
- to provide a concise, intuitive specification language for capturing **expected** and **forbidden** behaviors of ego cars in the space of all possible traffic situations
- to prevent exponential blow up in requirement capture
- to serve as formal basis for scenario catalogues in type acceptance
- to serve as formal basis for testing on all levels (MIL, HIL, on-line monitoring)
Learning from Field Observations for Scenario-Based Type Approval Process
R&D&I Needs

• Methods to design the architecture for situational perception, cognition and actuation in such a way that it allows to decompose the V&V processes for the compliance of autonomous vehicles to specifications as given in scenario catalogues into

• V&V arguments insuring such compliance under the assumption of perfect and complete observation of surrounding traffic situations

• V&V arguments guaranteeing a sufficiently precise observation of all "relevant" artefacts in traffic situations with sufficiently high levels of confidence along the complete sensor chain including sensor fusion and sharing of traffic situations through vehicle to infrastructure or vehicle to vehicle communication
Recommendations I

• Develop an open European industry driven standard for models in the different domains with different levels of complexity and evolution steps.

• Set up a public authority driven process and infrastructure for virtual system validation.
  – Accreditation Instance / Notified Bodies
  – Public accessible validation framework.
  – Additional specification for rest validation in the field

• Create a formal chain of argumentation for an overall safety case combining virtual releases and field-based release procedures accepted by public authorities
Recommendations II

• Set up a public authority driven process for learning from field situations.
  – Public accredited trust center
  – Self-engagement of the industry to provide the relevant data in an anonymous way to the trust center
• Feedback of the analysis result of the trust center to the validation suite.
Recommendations III

- Industry-driven standardization of the representation of exchangeable information for objects and situations to support the collaboration between systems including quality guarantees.
- Industry-driven standardization of a functional architecture of automated systems and its modules, supporting compositional safety proof and safe degradation ability with guaranteed minimal functionality according to SAE and related classifications in other domains.
- Publicly agreed safety and development process for highly automated systems, including safe upgrade ability
- Industry-driven standards allowing online validation that an E/E Upgrade is compatible with the existing E/E Architecture
- Safe, standardized degradation of systems with guaranteed minimum functionality
Recommendations IV

- Internationally negotiated evolution stages of architecture for highly automated systems and their interoperability.
- Introduction of certificates for architecture compliance by public authority accredited instances.
- Internationally agreed upon release processes for new evolution stages of highly automated systems.
Digitising Mobility – Vision and challenges

Bernard Strée
CEA Leti
1 CEA Leti
2 Multi modal traveller in the « smart » era
3 Technology fusions: managing new complexity
WHERE IS LETI LOCATED?

France
66.03 M people

Grenoble
Rhône-Alpes Auvergne Region
(#2 in France)
7.7 M people

Grenoble:
- 450,000 inhabitants
- At the heart of French Alps
- French highest ratio of engineers vs citizens
- Elected among top 3 cities for students
  (>60,000 students / 46,000 at Grenoble University)
- High tech industry & research infrastructure
  (25,000 research jobs)

5th in Forbes Magazine’s “Most Inventive Cities in the World” (2013)
LETI, A CEA-TECH INSTITUTE

**Science**
- Fundamental Research
- Defense Security
- Nuclear Energy
- Key Enabling Technologies

**Technologies**
- 16,110 People
- 10 Research Centers
- €4.4 Mds Budget
- 5,844 Patents Portfolio

**Speeding Innovation for Industry**

**LETI**
- Key Enabling Technologies
- Micro-Nano Technologies and Integration in Systems
- 4,500 People
- 8 Local Centers
- €650 M Budget
- 4,299 Patents Portfolio

**LIST**
- New Energy Technologies and Nano Materials
- Software-Intensive Systems
- 1,900 People
- 2 International Leti Offices
- €315 M Budget
- 2,572 Patents Portfolio

**CTRE**
- Disseminate the Kets Developed
CEA, the Most Innovative Public Research Organization in Europe, According to Reuters

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<th>TOP INSTITUTIONS</th>
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LETI AT A GLANCE

- 1967 creation
- 1,900 people
- 64 start-ups
- 315 total budget (M€)
- 2763 patents portfolio
- 350 Industrial partners
- 125 European projects
- 8,500 m² clean-room 200-300 mm
AT THE HEART OF DIGITALIZATION

Digital and analog worlds meet

Compute

Store

Communicate

Sens

Display

Secure

Optimize power
Interaction between Real World & Digital World

CPS
Smart Systems
Virtual Reality
Augmented Reality

New Paradigms of Digital World

Artificial Intelligence
Deep Learning

Diversification

Artificial Intelligence

System Components & Functions

Technological Core

STRATEGY
LETI DELIVERS AT A PRE-INDUSTRIAL STAGE
CONCEPTION OF INNOVATIVE SMART SYSTEMS

- SECURITY EVALUATION FOR CERTIFICATION
- SMART OBJECTS ANALYSIS & SECURITY
- SECURITY

- COMMUNICATION
  - RADIO LINK DESIGN, OPTIMIZATION & CHARACTERISATION
  - ANTENNAS MINIATURIZATION & INTEGRATION
  - IMPLEMENTATION OF RFID SOLUTION IN COMPLEX ENVIRONMENT
  - LOCALIZATION & NAVIGATION

- ENERGY
  - AUTONOMIZATION OF SENSOR SYSTEMS
  - ENERGY STORAGE MANAGEMENT & ENERGY GENERATION
  - HIGH GAP (GaN...) SEMICONDUCTORS VALORIZATION
  - ELECTRIC SYSTEMS PERFORMANCE MONITORING

- SENSORS
  - SENSORS INTEGRATION
  - INNOVATIVE SENSORS DEVELOPMENT
  - SENSORS DATA FUSION FOR ADVANCED SYSTEMS DESIGN

SYSTEM INTEGRATION & DEMONSTRATION
**EXAMPLES OF DEVELOPMENTS**

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1. CEA Leti
2. Multi modal traveller in the « smart » era
3. Technology fusions: managing new complexity
A digitalised world: more sensors, more information available
New business models: incentivize the mobility
MULTI MODAL TRAVELLER IN THE « SMART » ERA

Emotional and functional mobility: adapt trajectory and speed to the user profile and aim
BONVOYAGE designs, develops and tests a platform optimizing multimodal door-to-door transport of passengers and goods.

It integrates travel information, planning and ticketing services, by automatically analyzing non-real-time data and real-time measured data; user profiles; user explicit and implicit (from sensors) feedback.

- Transport Mode Recognition, based on smartphone sensors
- Smartphone connection to wearable Empatica© wristband, for monitoring of the User’s Stress Level
• First bike pedal power meter under $100!
• The PUSH bike pedal features embedded power metering electronics. It measures the strength applied on the pedal and the pedaling cadence, and then combines these to deliver your power output in real time. It's accurate (within 8%) and reliable.
- Sensor integration: miniaturisation, lower cost, autonomy
- Sensor exploitation: overall accuracy
- Dynamic mapping: prediction capabilities
- 5G: new opportunities
1  CEA Leti

2  Multi modal traveller in the « smart » era

3  Technology fusions: managing new complexity
Wireless is key, electricity is key: more functions are possible and needed

Supporting the cost of the «smart» vehicle generation will change the ownership model
Transmission as a function: closing the gap between a sensor and its communication

5G is not about amount of data transmitted but it is about shifting the telecommunication from 2D to 3D
• Achieving high-precision car localization (~ 5cm to 25cm) and dynamic mapping of road users, obstacles, cars, etc.
• Combining various radio or non-radio localization technologies (IR-UWB, laser-scanner, cameras, GNSS, IMUs...) with Vehicle-to-X communications (ex. ITS-G5/IEEE 802.11p...).

- Cooperative fusion-based localization algorithms with low footprint onto Vehicle-to-X communications
- Extended Vehicle-to-X channel models (e.g., w.r.t. pedestrians)
- Co-simulation tools (traffic+channel/sensors+algos)
Delivers highly reconfigurable hardware (HW) platforms together with HW-agnostic software (SW) platforms targeting both network elements and devices and taking into account increased capacity, reduced energy footprint, as well as scalability and modularity, to enable a smooth transition from 4G mobile wireless systems to 5G.

- Implementation of cost-effective, high-throughput LDPC, based on imprecise computing and storage mechanisms
- Full Duplex Radio: a hybrid architecture has been proposed, combining a hybrid (RF+digital) canceller, followed by a pure digital canceller.
• Powerelectronics system integration (e.g. cooling…)  
• E-motor durability as a potential game changer  
• New design of sensors including the communication function  
• Embed diagnostic capabilities in the infrastructure  
• CPS bring flexibility with new programming possibilities, new type of interface…
Synergies of Automation and Electrification

Wolfgang Dettmann
Infineon Technologies AG & EGVIA
DIF2017 Smart Mobility panel session

Smart Mobility
Synergies of Automation and Electrification

Wolfgang Dettmann,
Infineon Technologies AG
EGVIA Vice Chair Smart Systems Industry
Drivers behind smart mobility

Reduction of emissions
- Green house gas emissions
- Pollution

Technology enablers are available & services + business with USP with value add identified

- Autonomous container trucks
- Agriculture vehicles
- First autonomous cars under restricted conditions
- ADAS systems for lower SAE levels

December 2016

Impact on legislation

Opportunities for services

Source: Jochen Langheim, ST, APE conference April 2017
Smart Mobility – New Opportunities Synergies of Automation and Electrification

Sharing Economy, E-Mobility and Automation

my first experience about “sharing...” in 1998/99

Source: call a bike

Source: web, ”Telefonzelle”

Smart lock, payment system & maintenance + rules for users

1 + 1 = new
Vision: planet with e-mobility – "decarbonization of transport"

- Mars: 100% e-mobility
- Earth: needs some time... yesterday in the FAZ one full page for 3 different OEM models - FEV, HEV, PHEV and fuel cell.

1st Generation e-mobility on Mars

Europe 2020:
1st continent with two digit % e-mobility?
@ event in 2012 formulated....
In 2016 < 1% of the new cars

2nd Generation e-mobility on Mars
ETPs prepare the ground for H2020 Green Vehicle calls

European Roadmap Electrification of Road Transport: Four big R&I initiatives in view of customer expectations

- Operation System dependent EVs in the urban environment
- User-friendly affordable EV passenger car + infrastructures
- No compromise electric urban bus system
- Sustainable electrified long-distance trucks and coaches

Source: ERTRAC, EPoSS, Smart Grids, 2017

Input for GV call preparation by

© EPoSS 2017

DIF2017 Smart Mobility panel session
European Roadmap “Smart Systems for Automated Driving” – Revolutionary vs Evolutionary

Nanoelectronics, sensors, components & embedded intelligent systems by research initiatives

Source: EPoSS, 2015 - update under preparation due to huge progress in the last two years
Challenges to reach both for Smart Mobility: Electrification & Connect Automated Driving

- Both are already available, however….
  - Costs → “socialization of high tech!” – from the S-class to everybody!
  - Integration, miniaturization, availability & reliability
  - New service models to boost the economic side
  - Interoperability and availability of data – how, what, protection
  - Legislation – societal aspects - regulations…

1 + 1 = new
THANK YOU VERY MUCH!
Automotive industry and Technology the Netherlands

Bram Hendrix
AutomotiveNL
Automotive Industry and Technology
The Netherlands

Triple helix; cooperation between knowledge institutes – industry – government

Bram Hendrix
Manager Smart Mobility
SMART MOBILITY
DUTCH PLANS AND AMBITIONS

A LEADING ROLE AND A TEST ENVIRONMENT FOR (NEW) MOBILITY

- Be prepared for changing mobility demand
- Learning by doing!
- International testing ground
MOORE’S LAW BRINGS TECHNOLOGY AT THE RIGHT:

✓ Size ✓ Power ✓ Speed ✓ Price

Radar Sensors at the Size of a Postage Stamp

- Radar Signal Processing
- Dual MCU

- Radar Front-end
- RFCMOS: Tx, Rx, Signal gen, ADC on a single chip

NXPN
SECURE CONNECTIONS FOR A SMARTER WORLD

AutomotiveNL
16-5-2017
Bram Hendrix
5MB HARD DRIVE 1956

BIG
BIGGER
BIGGEST

DATA
TREND #1: AUTOMATISERING

???
???

YEARS FROM NOW
SMART MOBILITY IS NOT ONLY VEHICLES, BUT MOST OF ALL COMMUNICATION AND IT

TREND #2: CONNECTIVITY

• A modern car produces 100Tb data per hour
• The new Mercedes S-Class has more ECU’s and 100x more lines of software code compared to a Boeing 747
• The vehicle starts outsmarting the driver. After ESP and ABS, more and more functions are taken over by the vehicle
Connected, cooperative and automated driving developments should come together to harvest societal benefits.
Panellists
Smart Mobility

Werner Damm
Member of the board - R&D division Transportation OFFIS

Wolfgang Dettmann
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Send your questions to mobility@dif2017.org
Panel summary
Rapporteur summary slides
Feedback / suggestions?
Thank you for your attention