Key Technologies for the Automobile of the Future

Dr.-Ing. Jochen Langheim
« We have done projects since 25 years in EUREKA and it is the best environment for funded projects. »

Airbus, Thales, Gemalto, ST, ++
European Innovation Landscape

- **EUREKA**
  - Innovation Programmes following European Strategy
  - Complement critical national supply chains in a European /global environment

- **Trans-National Programmes following National Priorities**

- **EUROPEAN**

- **NATIONAL**

- **JTIs**
EUREKA members commitment

19 Members supporting:
Belgium, Canada, Czech Republic, Estonia, Finland, France, Germany, Ireland, Israel, Hungary, Norway, Monaco, Poland, Romania, South Korea, Spain, Sweden, Switzerland and Turkey

2 Members interested:
Austria and Malta
- Software Updates Over-the-Air
- Communication inside and outside vehicles
- Data Security
- Interaction with logistics
- Energy efficient system architectures
- Energy and power management
- High power charging
- Grid integration & Billing
- Testing and dependability
- Functional safety

- Artificial intelligence
- Smart sensors & actuators
- Environment recognition
- Localization, maps and positioning
- Interaction between humans and vehicles
- Driver activity monitoring, Predictive health management
- Online personalization of vehicles
- Smart mobility for elderly people, digital (non-)natives or handicapped
- Game changer is Asia
Development opportunities in Automotive

Engine Management: new microcontrollers; 28 nm EV & HEV motor control

Car radio: integrate «internet radio»

Smart Antenna: Data security and throughput

Power Transistors: New technologies and packaging

MCUs: Security, More MIPS «Consumer electronics»

ADAS: Neural networks Processing Power Solid state Lidar Sensor Fusion

V2X: Proliferation

EV: SiC and GaN technologies for high power applications

VIPower: next generation technologies and packaging

Braking: electric braking including EV motor braking energy recuperation

Power Transistors: New technologies and packaging

MEMS: further miniaturisation new sensors for pressure, humidity, air analysis, alcohol...

Front lighting: New BCD technologies for LED/Motor drivers 3D integration

Driver info and sound system: Robust systems for shared cars Full Digital Audio
ADAS Sensor Opportunities

360° Surround View

Traffic Signs
Collision Avoidance
360° Surround View
Lane Change

Vehicle Dynamics
Navigation
Safety
Parking

Camera
LIDAR
Long Range Radar
Short Range Radar
Ultrasound

Motion Sensors
Environment Sensors
Microphone

10/4/2017
Electrification Opportunities

**DC-DC HV**
- Converts DC from the high voltage batteries (150V-700V) to a DC voltage required by the traction inverter

**Battery management Systems (BMS)**
- Manages the batteries for longevity and performance

**DC-DC 12 V**
- Converts HV DC from the HV batteries to 12 V for use in legacy vehicle subsystems

**DC-DC 48 V**
- Converts HV DC from the HV batteries to 48 V for use in vehicle subsystems

**Traction Inverter**
- Converts DC Voltage into 3-phase AC at up to 200kW for the electric motor

**On-Board Charger (OBC)**
- Converts AC from the Grid 95-265 VAC and converts to a DC voltage required for battery charging 150-700 V

**Silicon Pervasiveness in Car Electrification**
- 500+ $ Silicon Content per Car
Software Updates Over-the-Air

Software and Firmware Updates

1st Wave
- Single-ECU
  - Infotainment
  - Navigation
  - TCU

2nd Wave
- Multi-ECU
  - Powertrain
  - Drivetrain
  - Etc.

Data Collection and Aggregation

- Vehicle Diagnostics
- Driving Behavior
- 3rd Party Data

Improving Automaker Profit, Accountability, and Customer Satisfaction

Recalls & Cybersecurity
- Reduced Recall Expenses
- Faster Recall Compliance Times
- Improved Cybersecurity Response

Performance & Operations
- New Driving Centric Services
- Post-Purchase Enhancements
- Increased Operational Efficiencies
<table>
<thead>
<tr>
<th>Year</th>
<th>Price</th>
<th>Weight</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>13,000</td>
<td>1,500 kg</td>
<td>4 - 6 l / 100 km</td>
</tr>
<tr>
<td>2017</td>
<td>13,000</td>
<td>1,100 kg</td>
<td>4.7 l / 100 km</td>
</tr>
</tbody>
</table>

Ford Fiesta 1976 Price including Inflation today: 13,000 EUR

LA CONCURRENTE ! FORD FIESTA 5CV.

Toute la robustesse et la sécurité de Ford dans une petite voiture : 17,900 F. clés en mains.

5 CV, traction avant, moteur transversal, 3,56 m, c'est la nouvelle Ford Fiesta. La petite derniè re (elle sera vite en tête) a rassemblé tout ce qui se fait de mieux dans chacune des autres 5 CV. Et, c'est une Ford... Volta pourquoi la Ford Fiesta 5 CV s'annonce comme une sérieuse concurrente.

5,6 litres aux 100 km  Weight: 750 kg

FORD Fiesta 2040
13,000 EUR
1,000 kg
< 2 l / 100 km

Electric / H2
Consumer vs. Automotive Grade

- Consumer technologies are quite frequently not designed and qualified for automotive use
- They typically do not meet stringent requirements for safety, reliability and ruggedness
- Result: CE-AE gaps
TRACE Project Consortium = Value Chain
Electronics and Semiconductor Industry Value Chain in 2016

Source: DECISION, ACSIEL, EURIPIDES² © EURIPIDES² 2017
Call 2017

EURIPIDES² is your partner
2 calls per year (Spring and Autumn)

Autumn call

Project Outline (PO): 20 September 2017
Full Project Proposal (FPP): 29 November 2017
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