The Future Networked Car
Paul Schockmel CLEPA CEO
Geneva, 5 March 2015
The European Association of Automotive Suppliers

- 109 Corporate members
- 23 Member Associations
- 18 billion € R&D per year
- 5 million employees
- 600 billion € sales
- Partner of the EU and the UN

Our vision is for the European Automotive Suppliers to be the leading provider of highly efficient and sustainable mobility worldwide.

Our mission is to increase the competitiveness of the European automotive suppliers’ industry and drive its sustainable growth while enhancing wealth and employment in Europe.
Relevant Drivers for Mobility Systems

Urbanization
- Within 2030 there will be more than 40 Mega-Cities
- A complete re-think of urban mobility will be required
- Smart-Cities and Smart Transportation Systems

Global Growth of Middle Class
- From 1998 to 2018 the Middle Class in Emerging Countries is growing by 255%
- The access to certain goods like cars will grow as well

Regulatory Framework: decarbonization of transport, Air Quality & Road Safety
- Severe legislation will drive the technology choices of Car Manufactures
- Governments will support the pioneering phase of zero emission vehicles by mean of heavy incentives
- Vision Zero will support both Autonomous and Cooperative Driving together with ADAS systems

Consumers attitude evolution
- Gen Y shows poor interest towards private cars and even driving license
- Car sharing will grow together with new business models offering services more than traditional goods
- Ageing society
Disruptive Technologies

- Internet of Things
- Cloud computing
- **Autonomous Driving**
- New materials
- Mobile Internet
- Automation of knowledge work
- Advanced robotics
- Next generation genomics
- Energy Storage
- 3D Printing
- Advanced oil and gas exploration and recovery
- Renewable Energy

Source: (McKinsey Global Institute – May 2013 – Disruptive Technologies: Advances that will transform life, business and the global economy)
Benefits of autonomous driving

The Autonomous Driving impact in USA

- Road accidents reduction 488 bn$/y
- Productivity Improvement 507 bn$/y
- Total Saving 1302 bn$/y
- Additional Productivity due to traffic avoidance 138 bn$/y
- Fuel Economy 158 bn$/y
- Additional fuel saving due to traffic avoidance 11 bn$/y

Source: Morgan Stanley
Automated Driving: enabling technologies

Perception
- Radar
- Camera (mono & stereo)
- Lidar
- Ultrasonics

Information
- Vehicle 2X Communication:
  - IEEE 802.11p
  - LTE Direct
  - BTLE
  - VLC (Visible Light Communication)
- Local Dynamic Map

Data Fusion
- Sensor Refinement (Sensor model, feature extraction)
- Object Refinement (Data Alignment & Association)
- Situation Refinement (Situation & Behaviour identification, Relationships, trajectories prediction)
- Supervisor (risk assessment, action planning, decision making)

Actuation

Path Planning

Positioning
- Differential GPS (SBAS, GBAS, RTK,..)
- Gyro, Accelerometer, Odometer fusion
- Visual Odometry
- SLAM (Simultaneous Localization and Mapping)

Veicle Control
The Vienna Convention stipulates that a vehicle needs a driver and that every driver shall at all times to be able to control his vehicle.

The governments of Germany, Italy, France, Belgium and Austria have submitted an amendment to the Convention.

The amendment would allow a car to drive itself, as long as the system "can be overridden or switched off by the driver".

A driver must be present and able to take the wheel at any time.
Final Step: integration between autonomous and cooperative driving

Convergence of ADAS and Connectivity
V2V and ADAS are expected to complement each other in their capabilities and shortcomings, neither being completely capable of enabling fully-automated driving; convergence can open up new business opportunities.


Vehicle Autonomy
- ADAS-based automated driving systems can significantly improve road safety.
- Limited perception range (due to line of sight obstructions or environmental conditions) can make the vehicles cautious and have a negative impact on traffic flow.
- There is a clear path for the technology development and deployment of ADAS-based automated driving systems.

Cooperative Driving
- The use of V2x enables cooperative driving, which can enhance vehicle safety and information systems.
- Gathering data from further ahead, from obscured vehicles, and from potentially vulnerable road users (VRUs) enables optimization of vehicle control and of overall traffic flow.
- There are still significant challenges for deployment including standardization, legislation, and market penetration.

Hybrid Model: Co-automated Driving
- V2V and ADAS are expected to complement each other in their capabilities and shortcomings.
- Generating driving-based Big Data for commercial use will become more systematic with large sample size.
- Telematics-based connectivity and V2X-based connectivity form necessary redundancies.
- V2I support still inevitable, but telematics can be used as a stop-gap option.

Source: Frost & Sullivan; MIRA Ltd
From just connected to cooperative vehicle use cases

Source: workshop on ITS Architecture for NL Sep 2014

Green Wave Navigation
Traffic Information Service
Intermodal Route Planner
Smart Parking Assistant
EV Charging Point Planner
In Vehicle Signage (IVS)
Priority Request
Incident Warning
Cooperative Adaptive Cruise Control (CACC)

Safety
Traffic Flow
Environment
Comfort

25 Km
1 Km
100 m
10 m
1 s
1 min
15 min

Red Light Violation
Warning
Electronic Emergency Break Light
Speed and Lane Advice (SLA)
Merging Assistant
Stopping Behaviour Optimization
Shockwave Damping
Probe Vehicle Data
Slow Vehicle Warning

Rerouting
Eco Route Planner
Road Works Warning (RWW)

Cooperative
Current Situation in connectivity

- Today the automotive connectivity is dominated by aftermarket devices;

- Rolling out new infrastructure is expensive, slow, and incomplete in coverage;

- Regional differences may hinder interoperability;

- Accompanying measures to bridge the communication gap towards increased penetration of systems is required;
Objectives for connected vehicles

- Increase market penetration with interoperable communication (DSRC and 4G-LTE) units;
- Ensure safety, reliability, privacy and security;
- Enable realtime ITS service provision;
- Enable a vivid ecosystem of ITS services by third parties;
- Enable early deployment recognizing customer interest;
- Focus on functionalities build on solid business cases;
- Enable access to sensor data by appointed authorities.

Increase market share of connected and communicating vehicles

Open in-vehicle platform architecture