4. Tagung “Sicherheit durch Fahrerassistenz”, München

C2X Communication and potential strategies for market implementation

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Evolution of vehicle safety

- Communications can play a key role in active safety

**Phase I**
Monitor vehicle and driver behavior to assess danger

**Phase II**
Monitor immediate environment around the vehicle to detect hazardous situations

**Phase III**
Gather detailed information on surrounding environment (vehicles and infrastructure) to extend the driver’s awareness of upcoming potential danger

“Feel”

“See”

“Communicate”
Foresighted driving

- Communications provide information
  - Beyond autonomous sensor range
  - Beyond the driver’s visual range
  - With enriched details and quality

- Creation of an information horizon
  - Pertinent to the driver
  - Extending safety time margin
  - Extending beyond the physical horizon
    - Non observable attributes
    - Traffic rules

Improved response time by foresighted driving
There are lots of potential applications …

... but a number of important questions are still open such as:

- Which are the most promising applications?
- What must a common European system look like?
- How to implement the system?
- Does it really pay off?
„Modern“ Understanding of C2X Communication

• In the past C2X communication used to be seen as WLAN based **direct communication** between vehicles and/or infrastructure.
• Recent trials have shown that for various applications between vehicles an **indirect communication link** based on **mobile communication** via an Internet server can be a useful complement.
• Hence „modern“ C2X systems are expected to consist of both communication modes.
Layout of the „Modern“ Onboard Unit

I. „Com“
- GPS & Inert. Sensors
- 3G / 4G
- DSRC / Wifi
- BT (optional)

II. „Map“
- Map Geometry

Detached solution implementing all necessary components into one ECU

Option for „Retrofit-solutions“

In production vehicles with OBUs as standard equipment distributed solutions might be found making use of already existing system components.
Estimated System Costs

Estimated bill of material: 150€
+ overheads for development costs, reserves for contingencies, costs of marketing, ...
Estimated total costs: 400€

Please note: This is a rough estimate based on the costs of components for consumer devices!

* Consumer Market price, non-automotive grade
Considerations for business models

- Assumptions:
  - **Penetration problem** does not allow to sell communication based driver information and warning systems as optional equipment.
  - Customer is not willing to pay for communication based safety functions.
  - European OEMs decide jointly to implement C2X technology into all new vehicles at a given time.
  - Data generated by C2X communication can be used as basis for attractive commercial services if the vehicle owner agrees.

- Consequences:
  - C2X communication is **no unique selling proposition**.
  - Business models are needed to re-finance investment into C2X systems that include data sales.
Potential Solution

- Functional split of the system
  - Use of safety applications and selected mobility applications based on DSRC and mobile communication free of charge
  - Advanced mobility applications, commercial services, internet and telephony via mobile communication for a fee
- Provision of access to C2X data for commercial service providers for a fee:
  - Single payment of service provider to OEM
  - Fee depending on amount of data

System Costs 400€

Reserve 100€

Customer 250€

Service Provider 250€

+100€ reserve to allow for customers, who do not want to use additional applications
Cash Flow for Commercial Services

Idealized depiction

- **Data/info transfer**
- **Money transfer**
- **Road side unit**
- **On board unit/ open platform**
- **Application unit**

### 3rd party providers (B2C)
- e.g. Telekom
  - **Customer access fee**
  - **Service usage fee**

### 3rd party providers (B2B)
- e.g. SAP
  - **Customer access fee**
  - **Service usage fee**
  - **OBU subscription fee**

### Backend Server (CMU)

### Internet

### OBU

### On board unit/ open platform

### Application unit
Example: Improved Claim Management for Insurance Companies

• Problem addressed:
  • All German vehicle insurer loose every year up to 10 Million Euro through delays in claim management (Source: iLab at University of St. Gallen, Schweiz)
  • HDI, Zürich, Mercedes Benz Bank and GDV confirm this estimate

Solutions:
• Dedicated data service for automated launch of claim management based on C2C data as soon as an accident happens.
  • Insurers willing to pay 10% of the savings as service fee
  • Software solutions already under preparation at various software houses
Examples for Further Commercial Applications

- Financial Services
  - Pay as you Drive
  - New lease concepts
  - Payment services
    - Parking garages
    - Fuel stations
    - ...
- Fleet management
- Customer Relationship Management
  - Improved processes in workshops
  - Better contact with customers
- Media Download
- Social Networks
- ...

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Our Partners in business model development

- Vehicle insurers
  - HDI
  - Zürich
  - Mercedes Benz Bank
  - GDV
- Finance
  - Mercedes Benz Bank
- Software houses
  - SAP AG
- Operators of parking garages
  - APCOA
- Internet service providers
  - Google Germany
Final Demonstration Event – Preparation for driving implementation and evaluation of C-2-X communication technology

When 10\textsuperscript{th}/11\textsuperscript{th} June 2010

Where Volvo Technology premises
Avenue du Hunderenveldlaan 10
1082 Sint-Agatha-Berchem
Brussels, Belgium

What
- Live demonstrations of several use cases in real traffic
- Static demonstrations and poster sessions

&
2\textsuperscript{nd} joint PRE-DRIVE C2X – EASYWAY workshop on perspectives of future mobility

Blue dots indicate planned demo track
Track length: 5,780 Km
Round trip time: ~10 mins

Blue indicates 3D fix
GPS Receiver: $\mu$-Blox EVK-5H
Questions?

preparation for driving implementation and evaluation of C2X communication technology