Concept Study on Traffic Management Systems based on Mobile Communication Networks:

Centralized traffic management and virtual traffic signs

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Outline

- Deficiencies of Existing Traffic Concepts
- Shortcomings and Disadvantages of today’s situation
- Proposed Solution: A new traffic paradigm
  - Vision
  - System design
  - Advantages and value proposition
  - Business Case
  - Timeline
  - Feasibility
- Conclusion: Positive business case for relevant problem
Situation today: Existing traffic concepts show deficiencies

Overload

Complexity

Stress

Traffic Management

Problem awareness

Today’s traffic signs and traffic management can be optimized

Image Sources: c’t, Mobinet
Shortcomings of current Traffic Management

- Deficiencies and inconvenience for the driver
- Increasing need for dynamic traffic management due to increasing traffic
- High cost for existing traffic signs and dynamic traffic management installations
- Economic loss due to traffic inefficiency
- Advanced 3rd party traffic services complex to setup and still in their infancy

Need for disruptive solution
Vision: Virtualization of traffic signs and dynamic traffic management

- **Virtual Traffic Signs**
  - Replacement of conventional traffic signs by a display in the car
  - Provision via wireless communication system

- **Centralized Traffic Management**
  - End to end mobile solution with centralized traffic management system

- Cooperation of public authorities, the legislator, car manufacturers, wireless infrastructure providers, carriers and device manufacturers
- Large economic benefits and cost savings for the public and value added for the driver
- Introduction in several steps over a timeframe of 15 years.
- Positive business case

**New paradigm for traffic control**
Proposed System Design

Car subsystem
- Collect car data
- Collect position data
- Collect traffic data

Communication network
- Upload traffic data
- Upload context data
- Upload position data
- Dynamic traffic management
- Create current traffic rules

Management center
- Presence / User profile
- Acquire long-term traffic rules
- Acquire short-term traffic rules
- Calculate valid traffic rules for single car

Third party interface
- Show traffic sign in front panel

- Unicast
- Acquire long-term traffic rules
- Acquire short-term traffic rules
Advantages of the system lead to **value added** to the driver

**Direct advantages for the driver**
- Information can be **targeted efficiently** to the driver
- Information can be brought to the driver with **high usability**
- More convenience for the driver
- Higher efficiency in information absorption
- Less stress
- Less accidents

**Advantages through TM**
- **Traffic flow** and **safety** is improved
- Environmental and noise pollution are reduced

**Value added to the driver**
- Higher traffic speed
- Less stress
Advantages of the system lead to benefits for the public

Indirect economic benefits

- Less traffic congestions and environmental pollution due to better and cheaper traffic management
- Less accidents due to more convenience for the driver

Direct cost savings

- Traffic signs become obsolete (no cost for maintenance, grounding, signs)
- Improved workflow between authorities

Benefits for the public

- Reduced economic loss due to traffic congestions, environmental pollution and less accidents
- Cost savings due to obsolete signs and improved workflows
System can be a core for traffic oriented services & applications

Traffic signs core system
- Car
- Communication network
- Central Control

Advanced context aware value added services
- Infotainment
- Maintenance
- Emergency
- Logistics
- Inter-Car communication
- Traffic information
- mCommerce
- Fleet management
- Infrastructure pricing
- Toll collection
- ……

System may become a basis for advanced telematic services
Market for telematic applications is growing

Source: Frost & Sullivan. The European Automotive Telematics Market for Hardware and Services 2001

Penetration

<table>
<thead>
<tr>
<th>Service</th>
<th>Status 2002</th>
<th>Scenario 2010</th>
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<tbody>
<tr>
<td>Telematics enabled cars</td>
<td>2,5 Mio. vehicles</td>
<td>100 Mio. vehicles</td>
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<tr>
<td>Mobile</td>
<td>950 Mio. subscribers</td>
<td>2.5 Bio. subscribers</td>
</tr>
<tr>
<td>Internet</td>
<td>530 Mio. users</td>
<td>1.8 Bio. users</td>
</tr>
</tbody>
</table>


Market supports advanced telematic solutions
Value proposition and business case

- Economic benefits due to shorter time needed to travel, less accidents and pollution
- Convenience for the driver as value added
  - Cost for in-car hardware transferred to car buyers
- Cost savings due to obsolete signs
  - Dramatic reduction of investments in traffic signs
  - Dramatic reduction of efforts for maintenance of traffic signs
- Access to system can be sold to third party providers
  - Fleet management services
  - Location based services
  - Infotainment & Entertainment
- Possibility to support infrastructure pricing

Positive business case of 1 Bil. € NPV
Introduction in several stages

**Short-term**
- Pilot phase with trucks and luxury cars
- Limited set of signs and limited number of cars
- Limited pilot services
- Commercial traffic is less sensitive towards new legislative burdens
- Technology with GPS and DAB is available

**Mid-term**
- Extends services to larger market
- Introduction of unicast communication system and technological improvements
- Full coverage of motorways

**Long-term**
- Focus on all vehicles and all roads
- Dismantle classic traffic signs
- Save new TMS investment and realize macroeconomic savings

**Time**
- 2006-2012
- 2013-2017
- 2018-2026
High requirements

- **Reliability**: Devices, communication channels, positioning service and system architecture have to be highly reliable
- **Security**: Access to the system must be limited and malicious changes have to be prevented
- **Safety**: Fallback mechanisms and consistency checks enforce maximum safety for the driver
- **Accuracy**: Positioning and traffic rules must represent the actual situation of the car
- **Privacy**: Personal information of drivers has to be protected

Industry faces these challenges for all car IT
- Next generation communication networks (UMTS and beyond 3G) and positioning technologies (Galileo and beyond) offer needed functionalities
- Adaptation of laws possible to provide a safe framework

**Solution is technologically feasible**
Conclusion

- Virtual traffic signs and centralized traffic management
  - ... promise vast benefits
  - ... address the needs of a mobile society
  - ... are technologically feasible
  - ... allow a successful business case
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