Research in the area of co-operative systems

- **COOPERS**
  Infrastructure to vehicle link

- Autonomous vehicle systems research (e.g. AIDE, Prevent, Invent, EASIS..)

- Vehicle to vehicle research projects (e.g. SAFESPOT Car2Car communication consortium..)
VISION

Vehicles are connected via continuous wireless communication with the road infrastructure on motorways, exchange data and information relevant for the specific road segment to increase overall road safety and enable cooperative traffic management.
Project vision

TISP

Toll Operator

RDS-TMC

VMS

TCC

Surface temperature -2
Humidity >85%
EPS aktive
Long term vision
Information services - 01

- Accident/incident warning
- Weather condition warning
- Roadworks information
- Lane utilization information
- In-Vehicle variable speed limit information
- Traffic congestion warning
- Road charging to influence demand
- Support of navigational devices
Expected driver reaction

Change of **Speed**
Change of **Driving-Direction**
(change lane, take exit, use hard shoulder, no passing...)

- Very specific recommendations/instructions
- Reduction of information overload
- No interpretation of the information by the driver necessary

**Enhancement of driving safety**
The following communication media will be evaluated in COOPERS:

- DAB / DVB-H
- GPRS / WIMAX
- CALM IR / CALM M5

- Common message set and use of TPEG-RTM standard for all communication media
- Enhanced message set to cover all COOPERS services is developed

```xml
<road_traffic_message message_id="2049334"
start_time="2007-11-23T13:01:13+0"
<accidents number_of="1" />
<position position="driving lane 1" />
<restriction restriction="blocked" />
<WGS84 latitude="51.613156" longitude="-3.757987" />
<direction direction_type="eastbound" />
```
Information Service Generation

Environmental Data
- Temperature of Air
- Temperature of Road Surface
- Salt on Road Surface
- Water on Road Surface
- Rain/Snow
- Humidity
- Wind
- Fog
- Pollution
- Noise

Traffic Data
- Vehicle Speed
- Vehicle class
- Direction
- used Lane
Extended FCD

Data to be transmitted:

• vehicle GPS position
• vehicle kinematics (wheel speeds,..)
• safety systems (ABS, ASR, ESP event) activity, emergency flasher and alarm if a crash was detected.
• weather information (outside air temp, rain sensor status, fog lamp status)
xFCD - Conclusions

• xFCD will improve TCC data base significantly due to complementary nature
  – Benefits of different sensor data for specific services need to be investigated
  – Especially for segments with sparse roadside sensor infrastructure

• Standardized CAN data format necessary!

• Accurate position and timestamp tagged to xFCD are crucial for data quality
Test Sites

COOPERS demonstration sites:
1. Brennero corridor
2. Rotterdam Antwerp
3. Berlin, Darmstadt
4. France