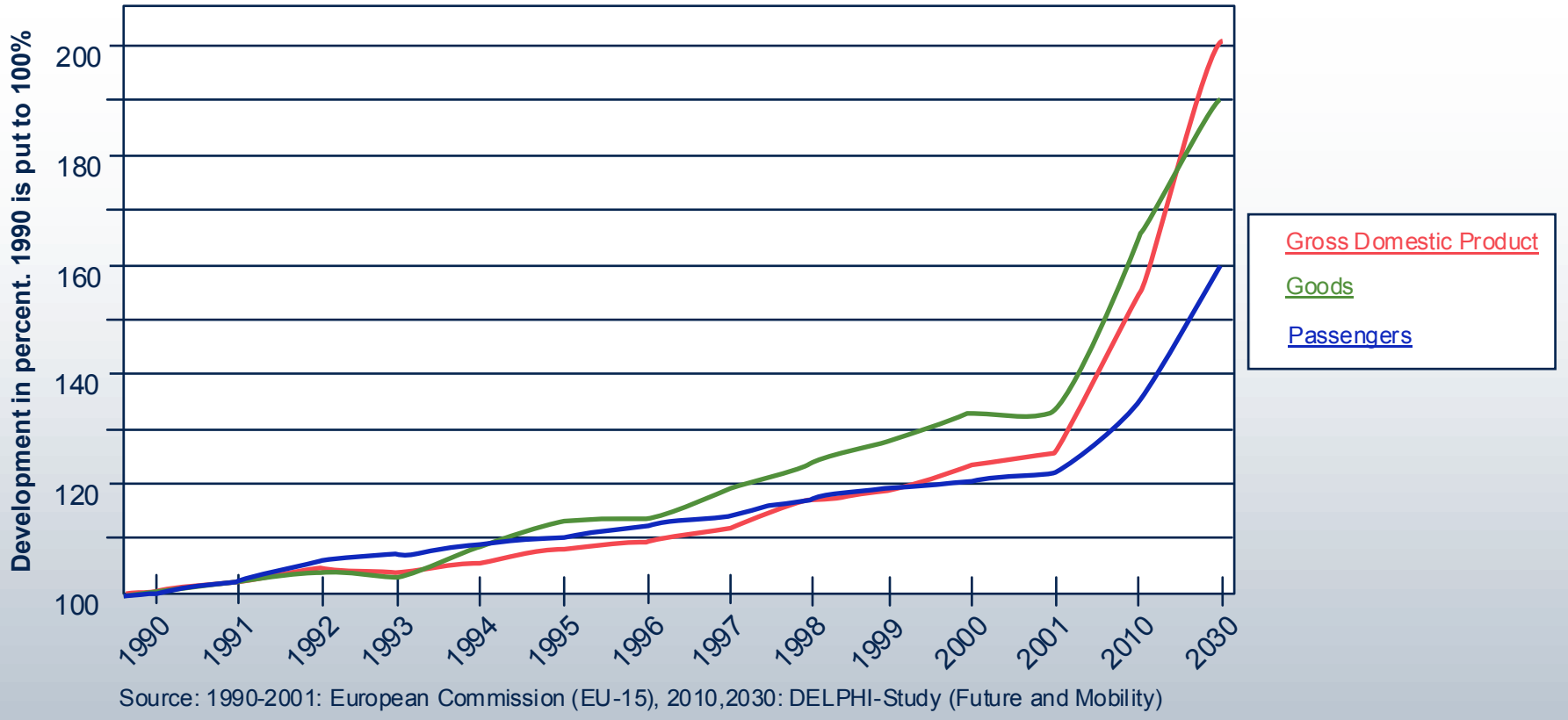
Car2Car Communication Consortium

Objectives and potential applications of Car-2-Car Communications

CAR 2 CAR COMMUNICATION CONSORTIUM

Transport Growth in the European Union

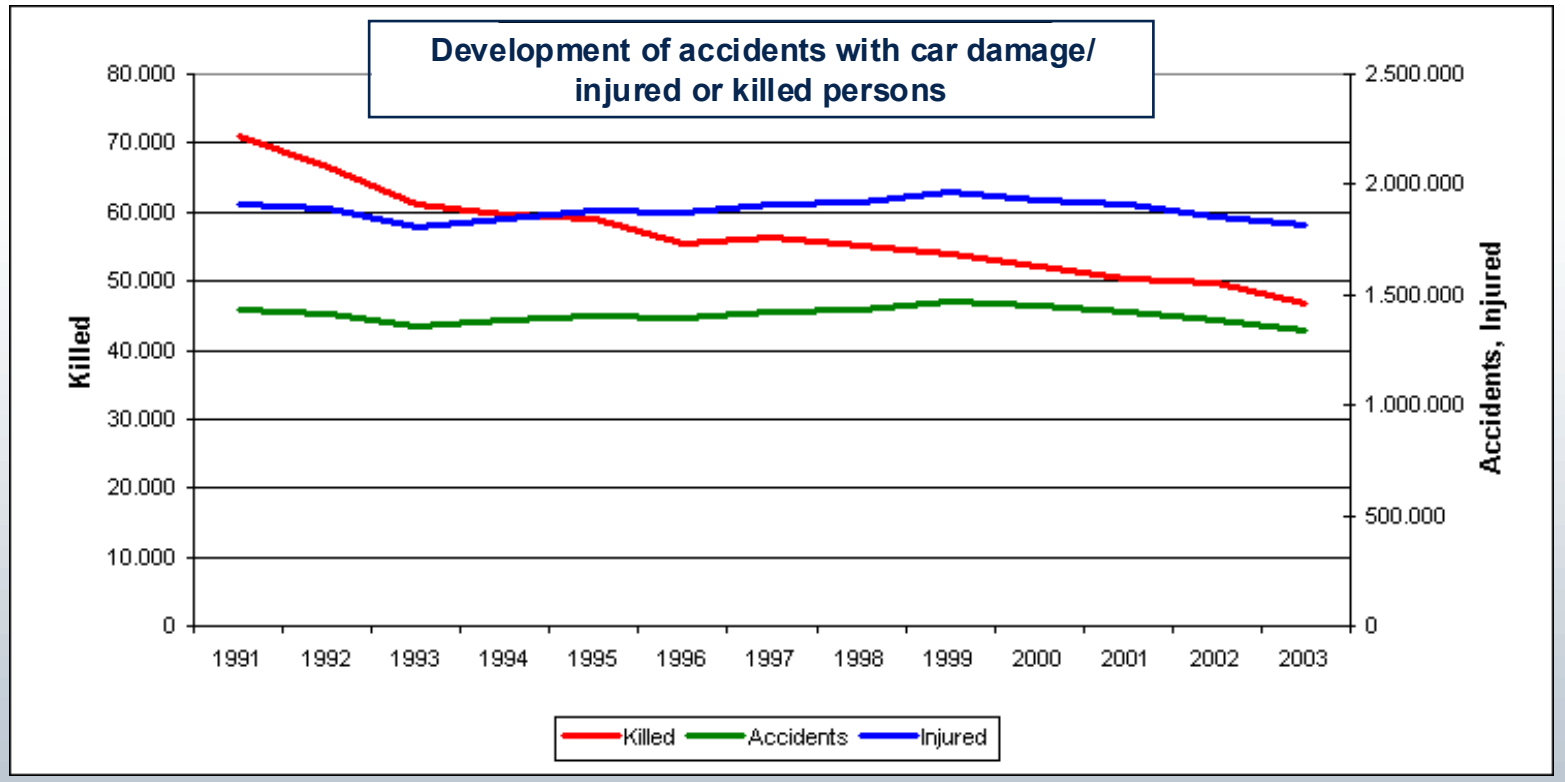


Source: 1990-2001: European Commission (EU-15), 2010,2030: DELPHI-Study (Future and Mobility)

- Economic Growth will lead to increased traffic volume
- Transport growth involves more traffic congestions

⇨ Efficiency must be improved

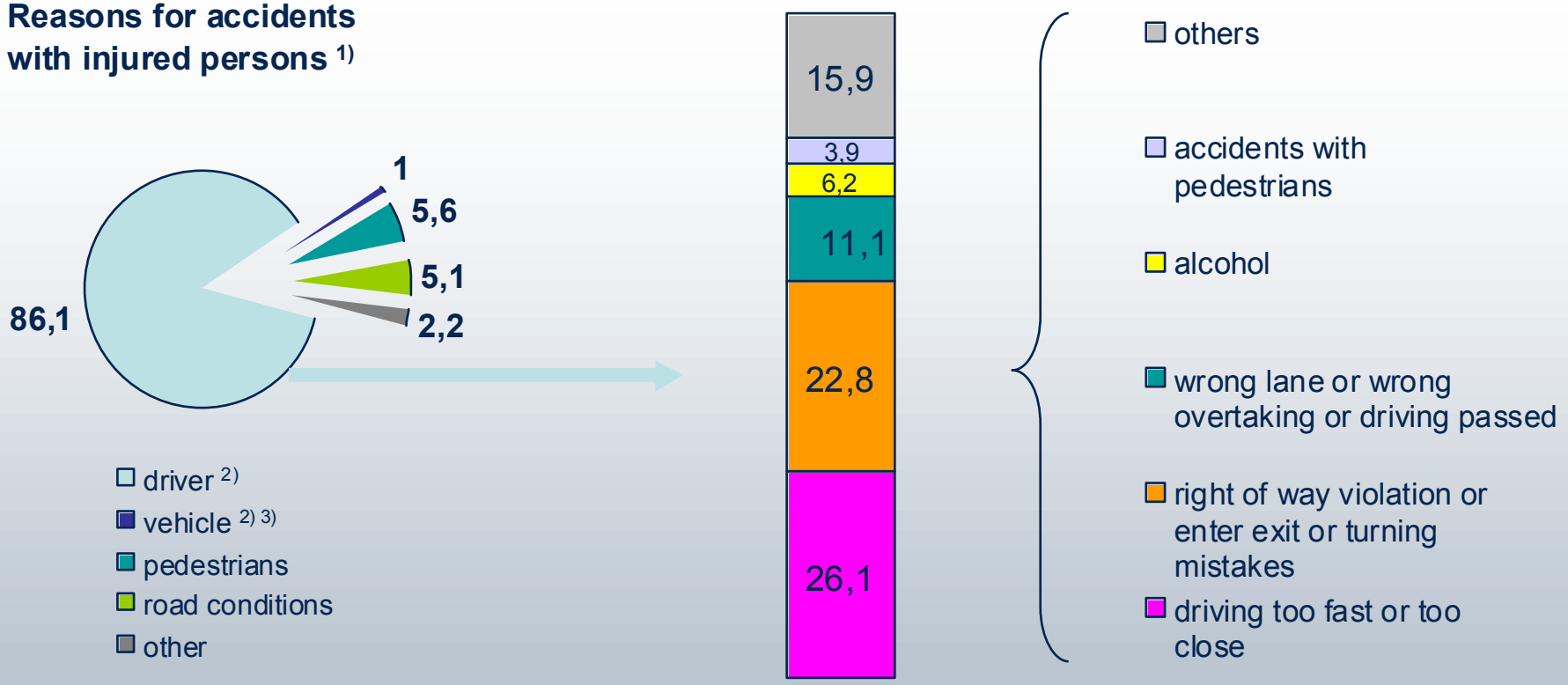
Traffic Accidents in the European Union



- Over the last decades passive safety systems have helped to reduce the number of fatalities.
- The further reduction of severe accidents will be achieved by adding active safety systems to vehicles.

Causes for Traffic Accidents

Traffic accidents - 2003
Reasons for accidents with injured persons [1)]



Source: Verkehr in Zahlen 2003, Deutscher Verkehrs-Verlag
1) Cause of accident determined by the police 2) motor vehicles, motor cycles, bicycles and others 3) technical faults

Causes for Traffic Accidents

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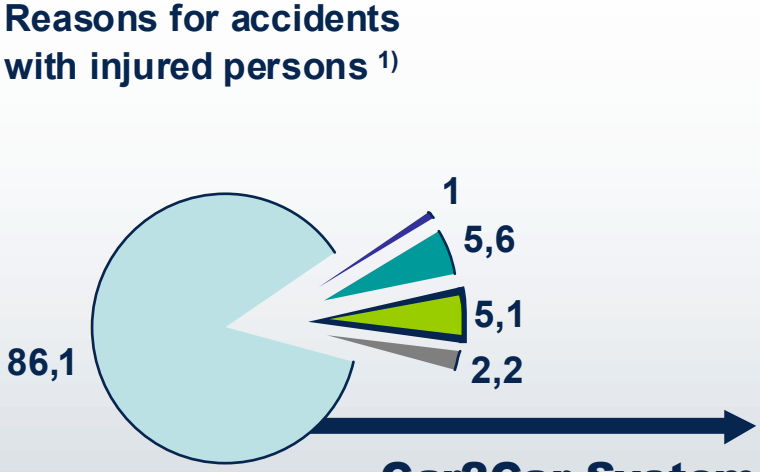

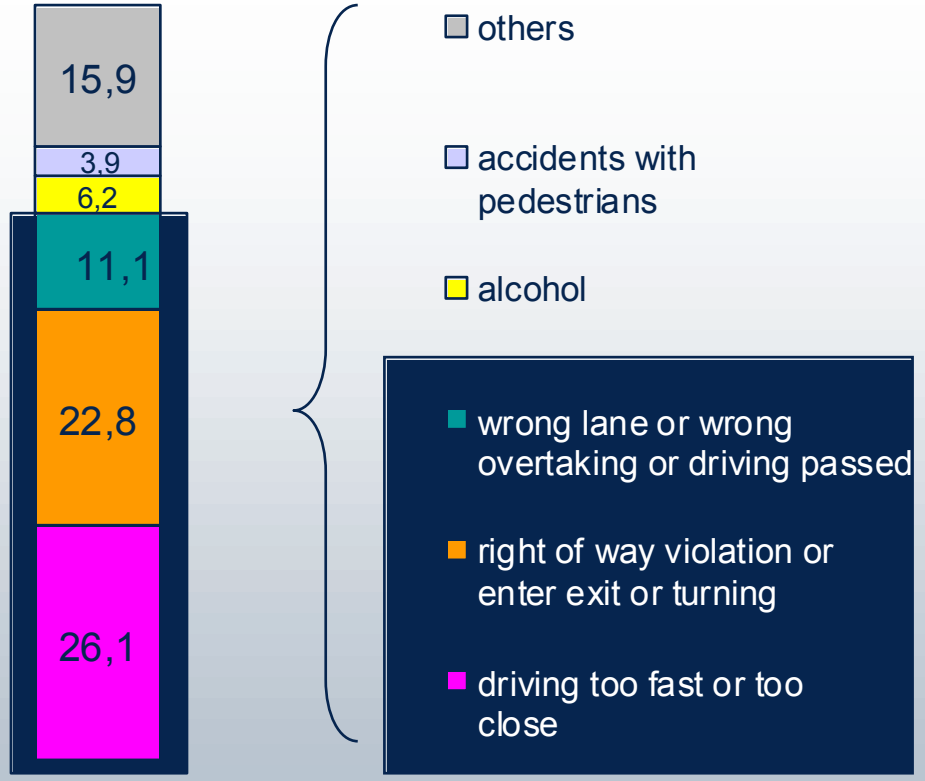

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Situations calling for more Information

What happened?

What's behind the bend?

Virtual Caravan

Conventional Sensors are Limited

Radar, laser scanner, ultrasonic or vision based systems support current safety and comfort applications such as

- Adaptive Cruise Control
- Parking Assistance
- Lane-keeping applications

Usual sensors have disadvantages, they …

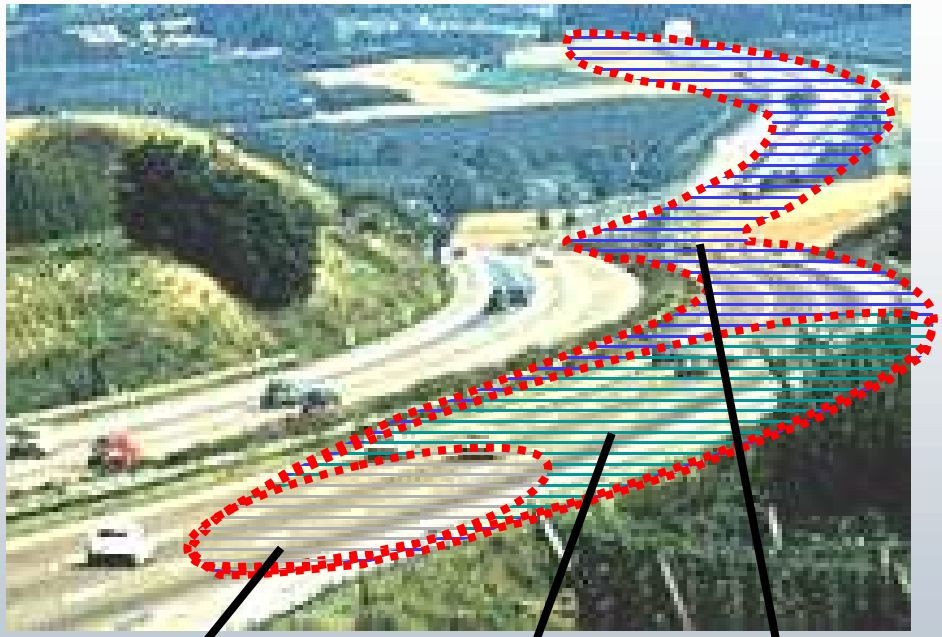
- Sense only close vehicles in the line of sight
- Don’t detect hidden and unrecognised relevant objectes
- Are expensive

Idea: Extending the Driver´s Horizon

The Car2Car Communication System is a new ‘sensor’:

- **look further ahead in distance**
- **get information earlier**
- **extract relevant information**

⇨ **Driver is one step ahead**



Simple sensors:
Worse than the driver

Communication:
Better than the driver

Complex sensors:
As good as the driver

Interconnection of Vehicles and Environment

Home-to-Car

Car-to-Infrastructure

WLAN

Car-to-Car

Car-to-Personal Equipment

Car-to-Enterprise (private / fleed business)

Car2Car Applications

Safety

- Inter-vehicle hazard warning
- Road construction warning
- Intersection assistance

Mobility and Efficiency

- Decentralised floating car data
- Traffic performance assistance

Benefits

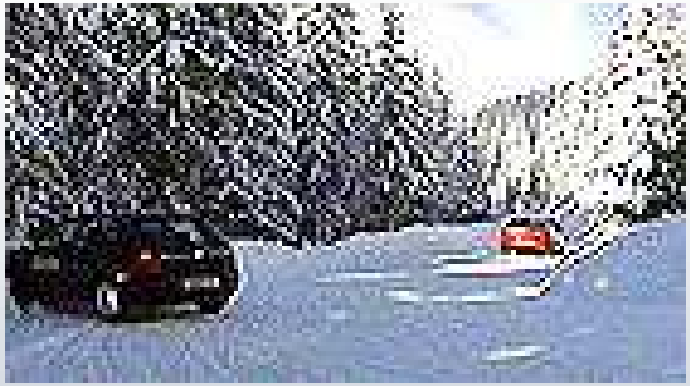
- ⇨ Increased safety by extending the driver's horizon
- ⇨ Higher mobility and improved traffic flow through up to date traffic data
- ⇨ Applications are reliable also on rural roads and urban areas

Examples

Car2Car Communication will help you in situations such as

- an obstacle behind a curve

- low friction on rural roads



- low visibility

- road construction

Wireless Local Danger Warning

Hazard Detection

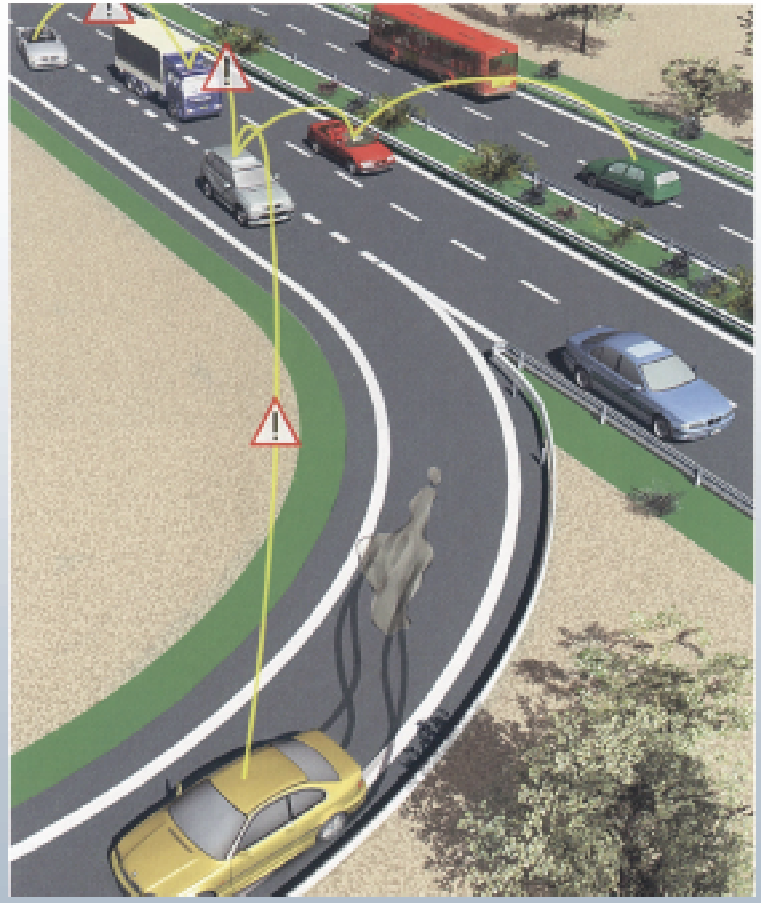
- By driver's action
- By sensor data fusion

Warning Distribution

- Sending standardised messages
- Direct and fast communication with vehicles in the vicinity
- Multi-hop communication with vehicles located farther away

Driver Assistance

- In time with respect to actual situation



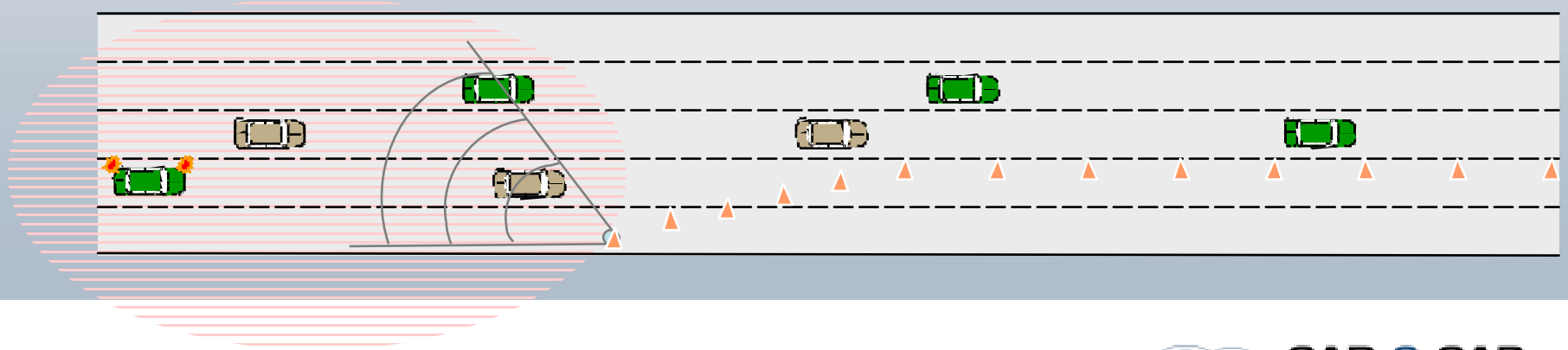
Road Construction Warning

Problems

- Many accidents occur in road construction
- Lane closures or speed limits are frequently changing information and cannot be provided by digital maps

Solution

- Special cones in road construction can be equipped with communication units sending out information about lane closures or speed limits
- The Car2Car Communication System receives this information and assists the driver



Intersection Assistance

Problem

- Complex intersection situations cause right of way violations or enter, exit and turning mistakes

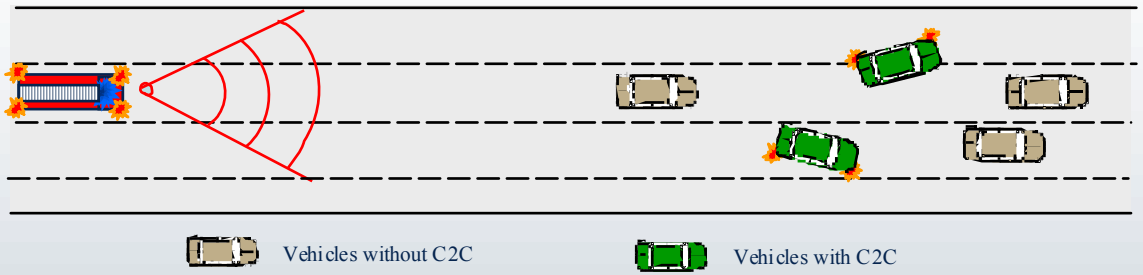
Solution

- An infrastructure system collects and processes the status of the traffic based on sensors and messages from vehicles
- The condensed information is transmitted
- The Car2Car Communication System receives this information and assists the driver

Special Vehicles in Operation

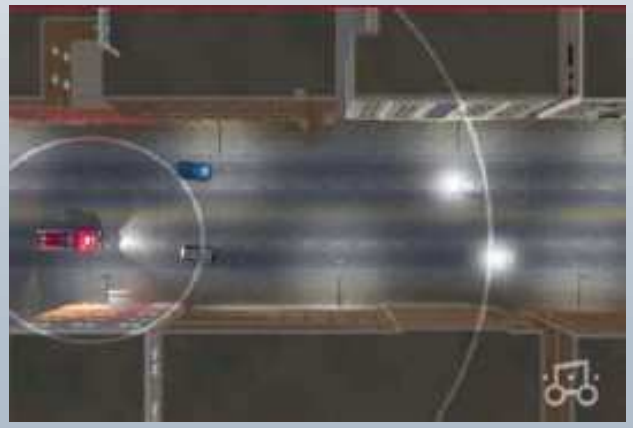
Problem

- Special vehicles in operation are often obstructed by other road users



Solution

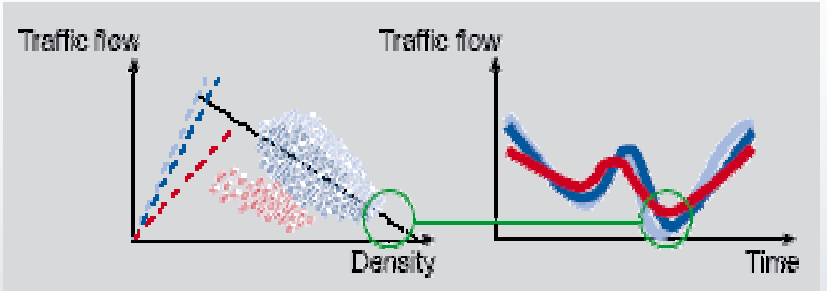
- Car2Car System warns the driver in time and assists him for proper reaction



Traffic Performance Assistance

Problem

- High traffic load causes traffic jams and stop-and-go waves



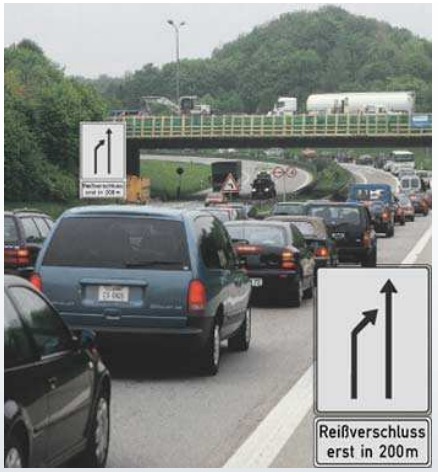
The Car2Car Communication System contributes to

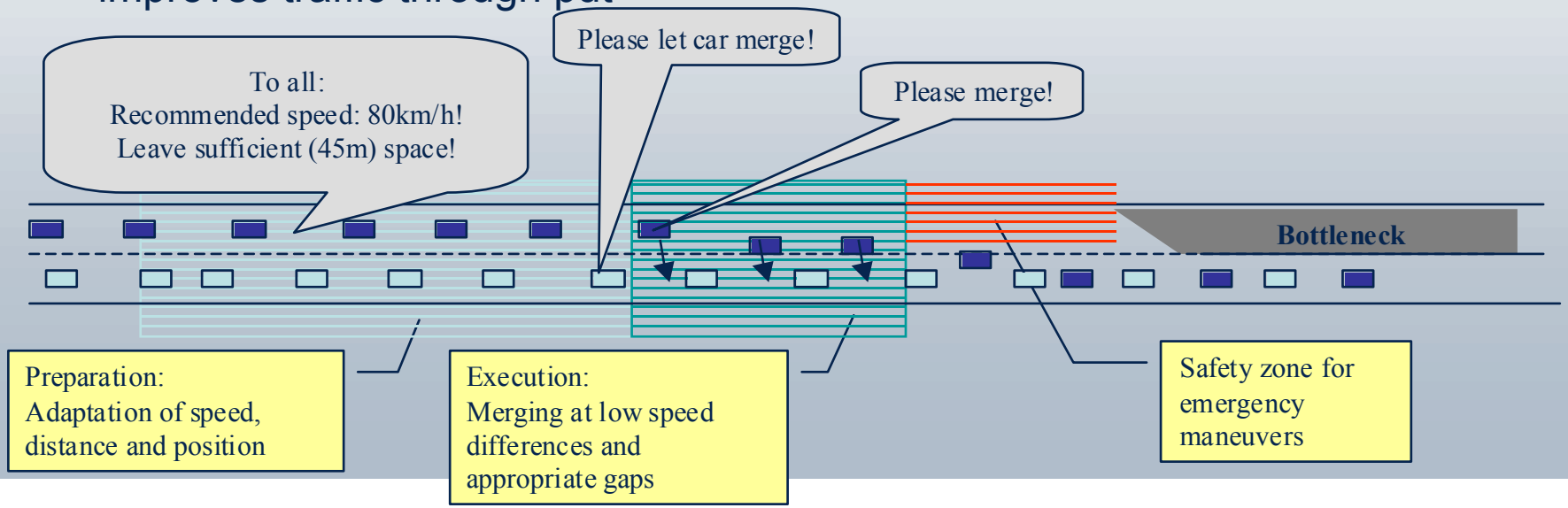
- maintaining high traffic flows in merging manoeuvres by communication and co-operation
- damping of stop-and-go waves by foresighted and traffic adaptive driving
- rapid dissipation of jams by inflow and outflow management

Merging Area Assistance

The Car2Car Communication System

- assists the driver to approach the merging area with an adapted speed
- assists the driver to optimally change to the un-blocked lane
- speeds up merging process at intersections and lane reductions
- improves traffic through put

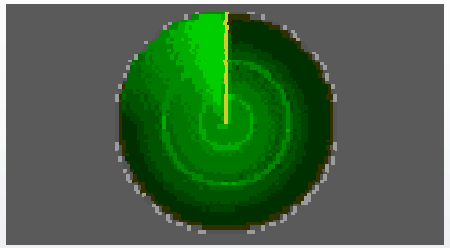




Predictive Driving

Driver is enabled to react earlier, in a safe and better way by

- Sensing,
- Data communication and
- Data fusion



providing relevant information earlier, even in conditions where drivers will not sense themselves.

Benefit starts at about 5% penetration rate

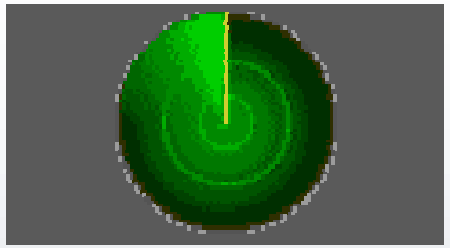
Harmonised Driving

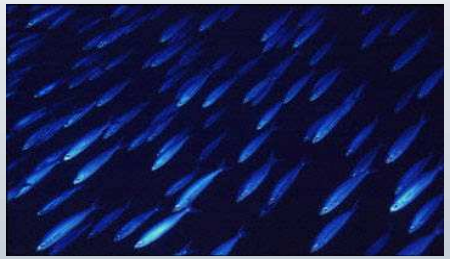
Acting to avoid detrimental behaviour

Drivers are assisted to adapt their drive style for

- higher traffic efficiency
- better fuel economy
- avoidance of safety-critical situations

Benefit starts at about 10% penetration rate





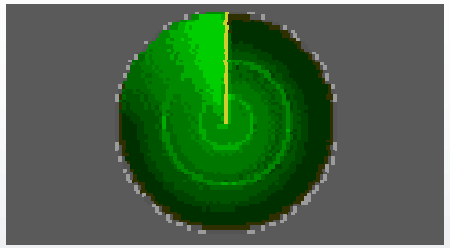
Cooperative Driving

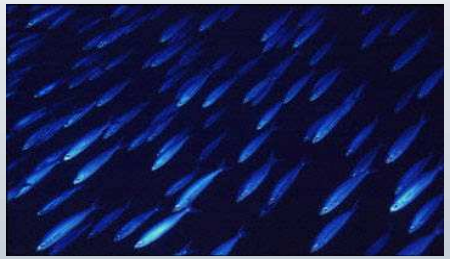
Driver Assistance bringing it all together

Car2Car Systems negotiate their driving manoeuvres for

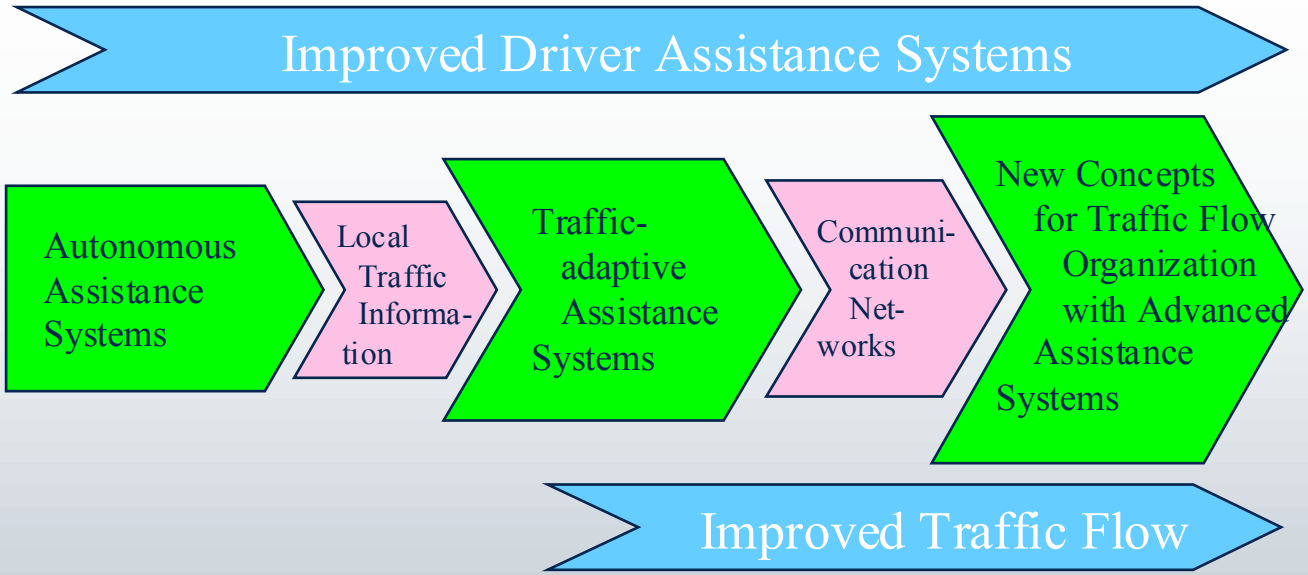
- higher road safety and
- Increased road efficiency.

Needs very high penetration rate up to 100%





Outlook



Traffic Performance Assistance is a first approach to Cooperative Driving and an application for Ubiquitous Computing in traffic!

Car2Car Communication will change the social system of traffic and will support more safe and efficient driving in future!