A Contrary Perspective of VANET services

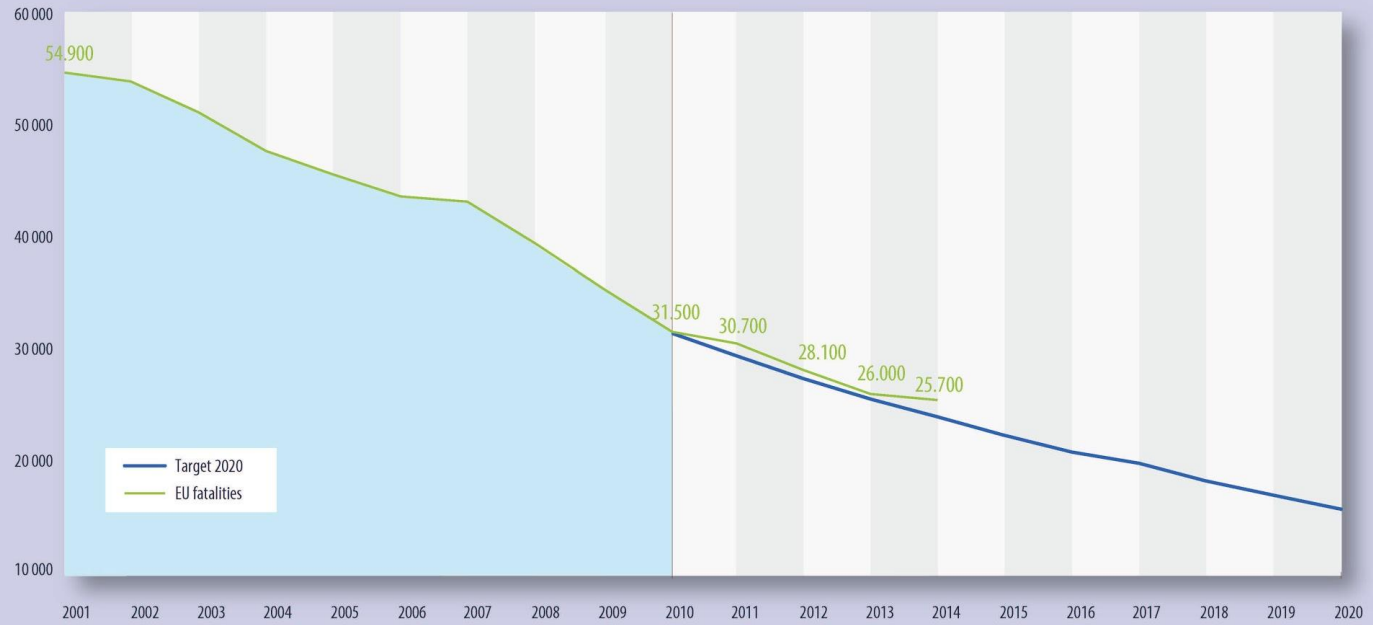
Arlind Bejta, Sascha Gabler, Jens Hinkelmann

VANET intro

- What is VANET (VEHICULAR AD-HOC NETWORK)?
- Purpose of introducing VANETs
- VANET: Applications
- Security and privacy concerns

European Commission

Road fatalities in the EU since 2001



Source: - CARE (EU road accidents database)

http://ec.europa.eu/roadsafety

Mobility and Transport

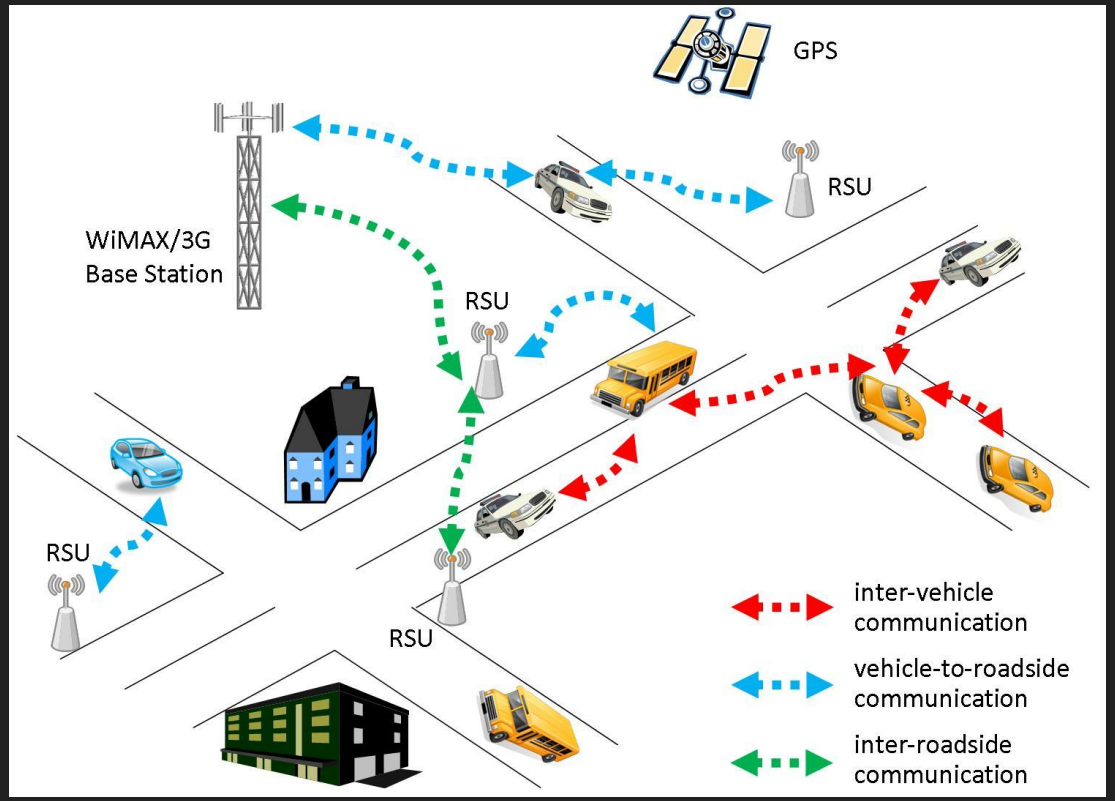
Worldwide stats

- Global Health Observatory
    - estimates 1.24 million deaths on the roads

- A proper warning system could reduce the number of deaths and related injuries drastically.

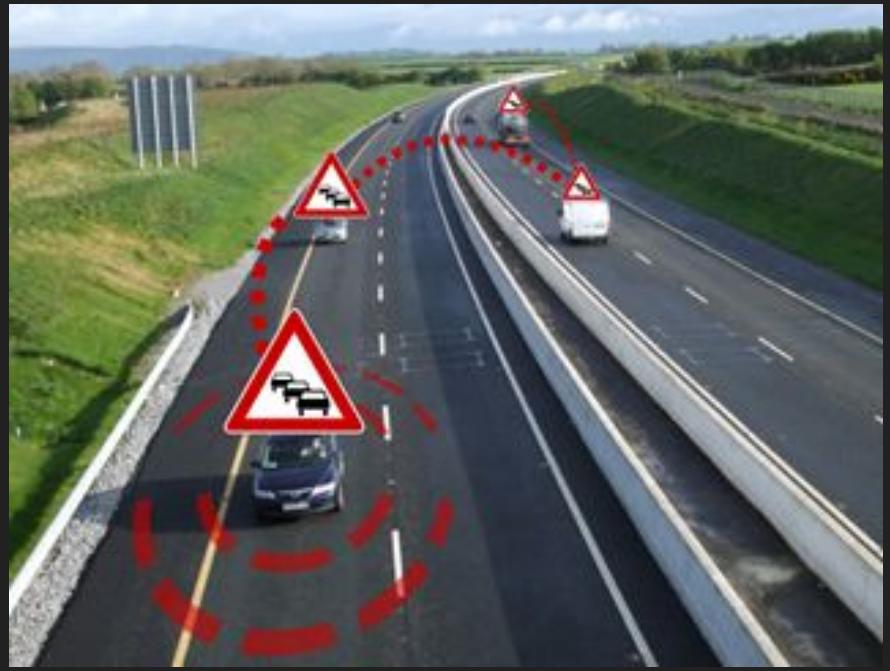
What is VANET?

- Communication models
  - RSU (Road Side Unit)
  - Vehicle-to-vehicle
  - Vehicle to RSU
  - Inter-roadside
  - Every vehicle is a router
- CISCO, NXP, AUDI -> Cohda Systems

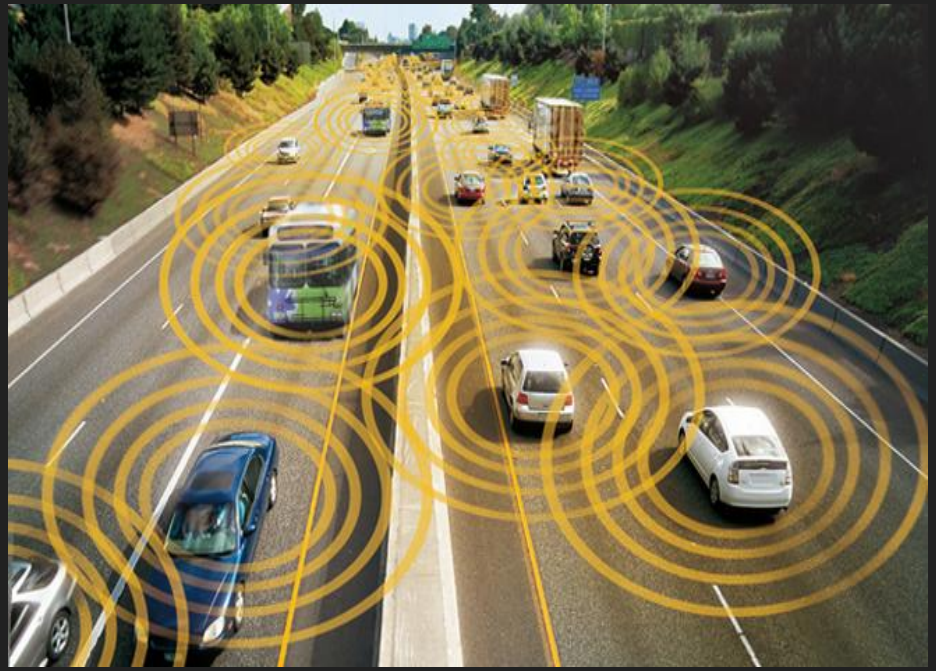


http://adrianlatorre.com/projects/pfc/img/vanet_full.jpg

Purpose of introducing VANETs



cover.png - http://www.ccs-labs.org/teaching/ms/2011w/



https://www.quora.com/What-were-the-new-innovative-things-research-in-the-automobile-and-mechanical-engineering-field-in-2014

- Safety purposes
  - decrease traffic accidents
    - fatal
    - non-fatal
- Economical purposes
  - lower the insurance payments

VANET: Applications

- Safety
  - Real-time traffic data
  - Quickly transferring warnings among vehicles
  - Accidents
  - Road hazards (icy road, nails, glass etc.)
  - Traffic sign violation warning
  - Emergency vehicle approach
  - Wrong way driving
  - SOS services
  - Blind Spot Warning

VANET: Applications (cont.)

- Non-Safety
  - Commercial
    - Location based services or POIs (petrol stations, restaurants, mechanics etc.)
    - Map downloading/update
    - Video/audio streaming
    - Internet access
  - Convenience
    - Instant messaging
    - Maintenance applications(software update, diagnostics)
    - Parking
    - Road toll points
    - Alternate routes

Technical Specifications

DSRC:

Dedicated Short Range Communication

WAVE:

Wireless Access in Vehicular Environments

- IEEE 802.11p

Security and Privacy Concerns

- Security breach
  - False message delivery
  - ‘Fake’ (RSU’s)
- Privacy concern
  - Global passive, global active
  - Local passive and local active

OnStar service

- Crash response
  - attempt connection with user
- Emergency services
- Emergency phone
- WiFi up to seven devices in a vehicle
- On-call navigation
- Operator controls (door locking, horn, hazard lights)

Voice ad-hoc network :)

VANET for improved awareness

Awareness

- Other vehicles
- Obstacles
- Road condition

Why VANET to improve awareness?

- Applicability
  - Requires low latency
  - Location dependent
- Relevance
  - Number 1 way of accident prevention
  - Improved driver experience

Emergency vehicles

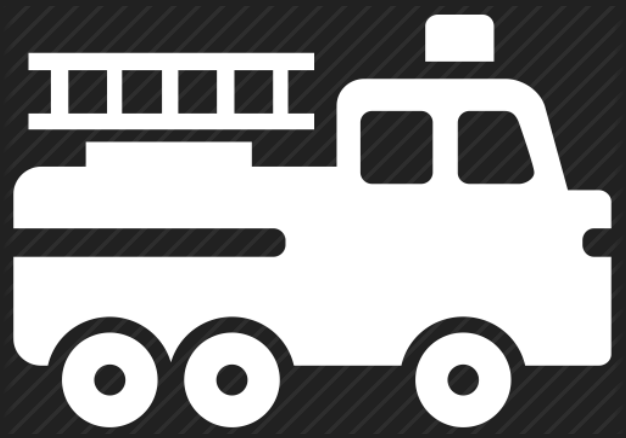
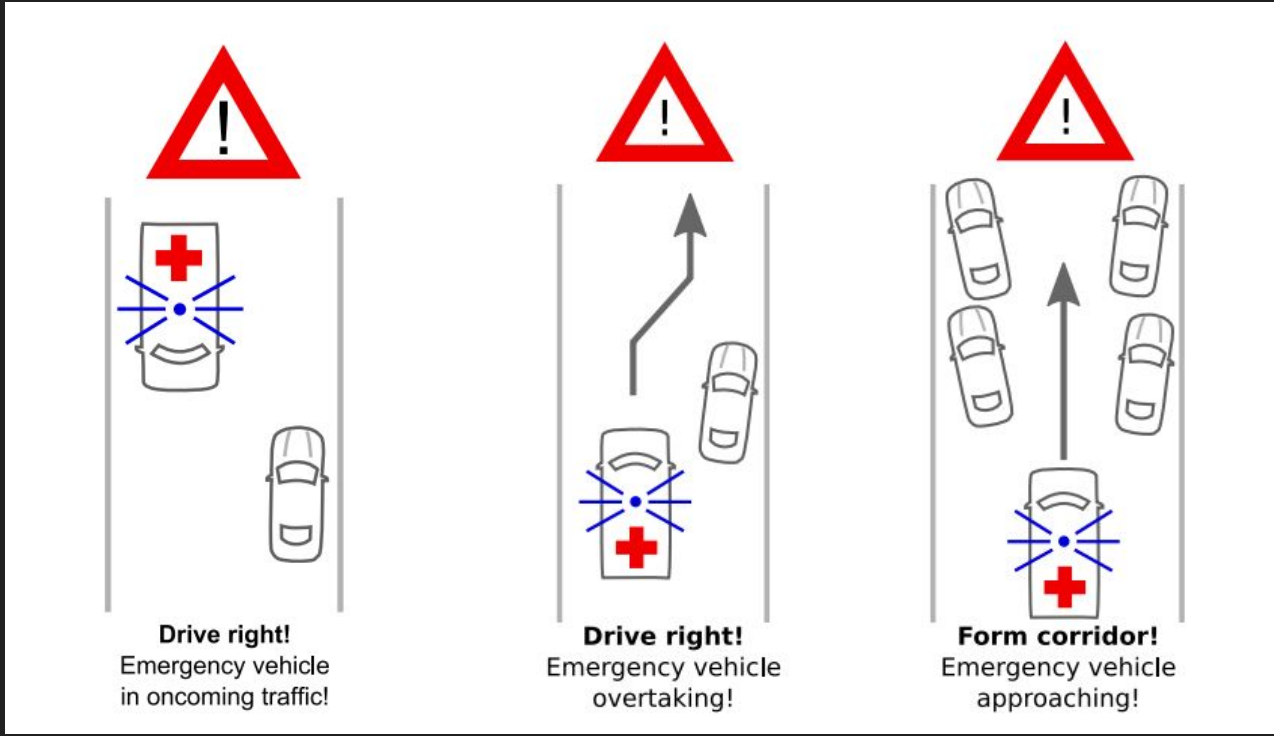


image by www.iconsdb.com

Emergency vehicles - Issues

- Traffic safety
- Urgency of mission accomplishment

Goal



A VANET-based Emergency Vehicle Warning System, A. Buchenscheit et. al.

Building and accident sites

Building and accident sites - Issues

- Pollution due to traffic jams
- Wasted energy due to abrupt braking
- Traffic safety

Goal

Versatility

Adaptable to various scenarios

Timing

Relevance

Avoid unnecessary warnings

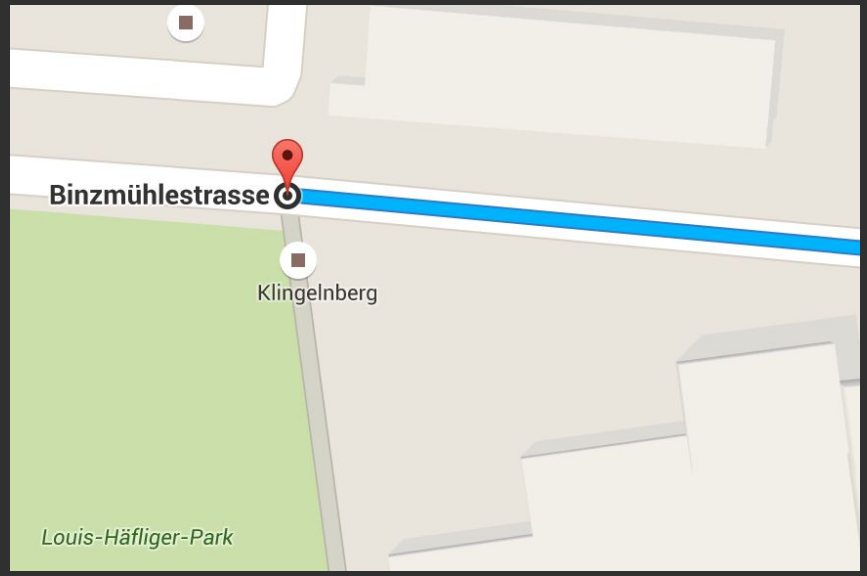
Dependability

Congruence with perception

Security

Authentication to prevent identity fraud

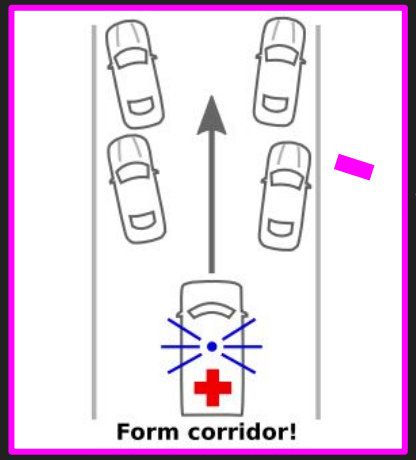
Privacy

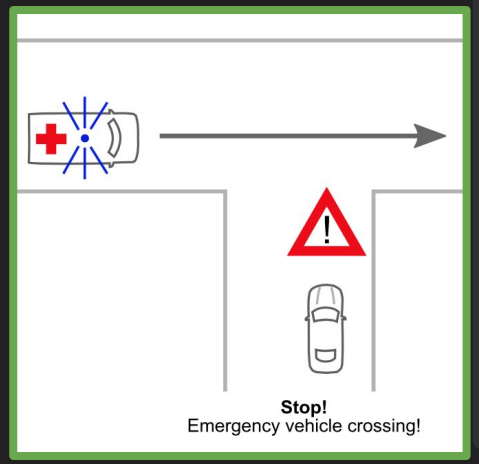


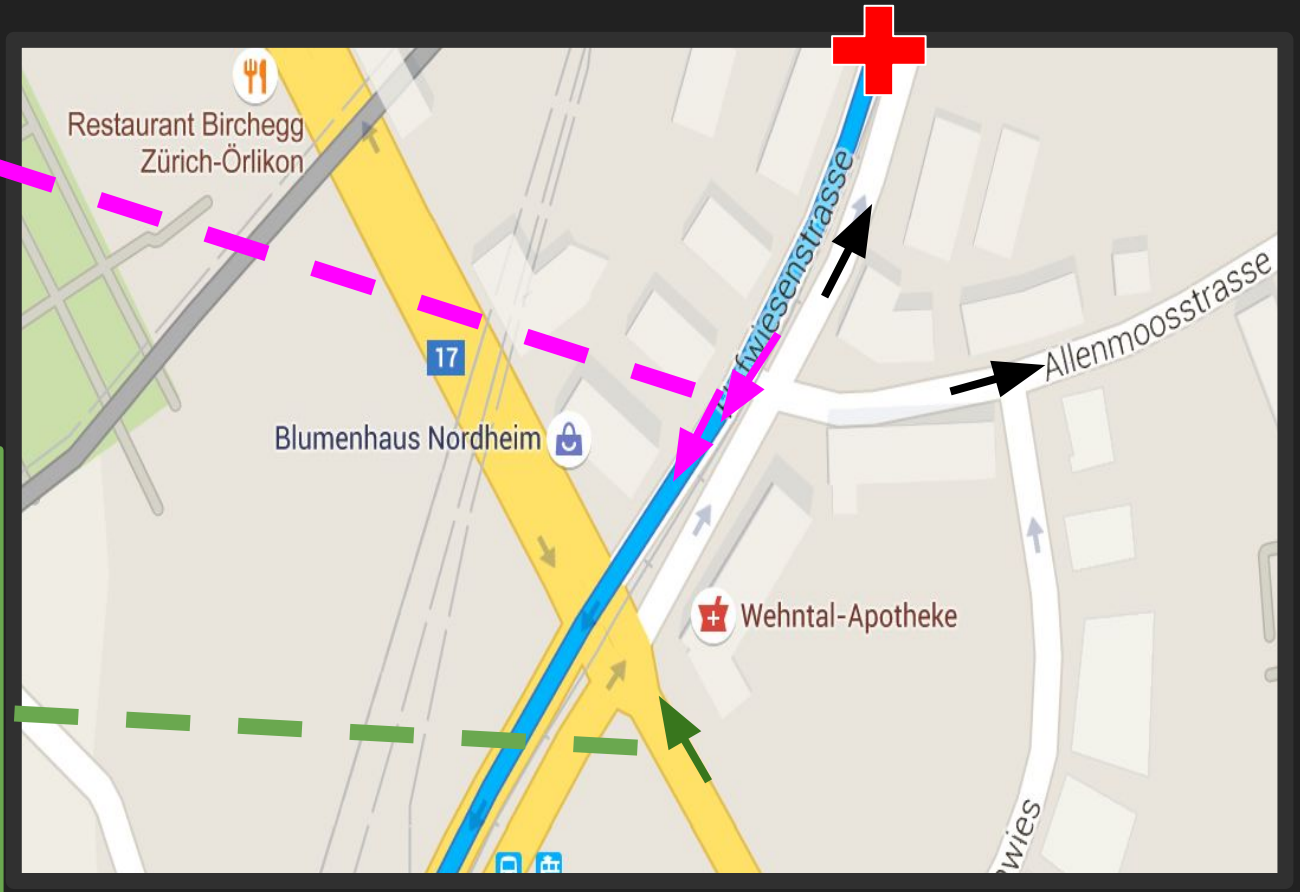
Coordination

Usability

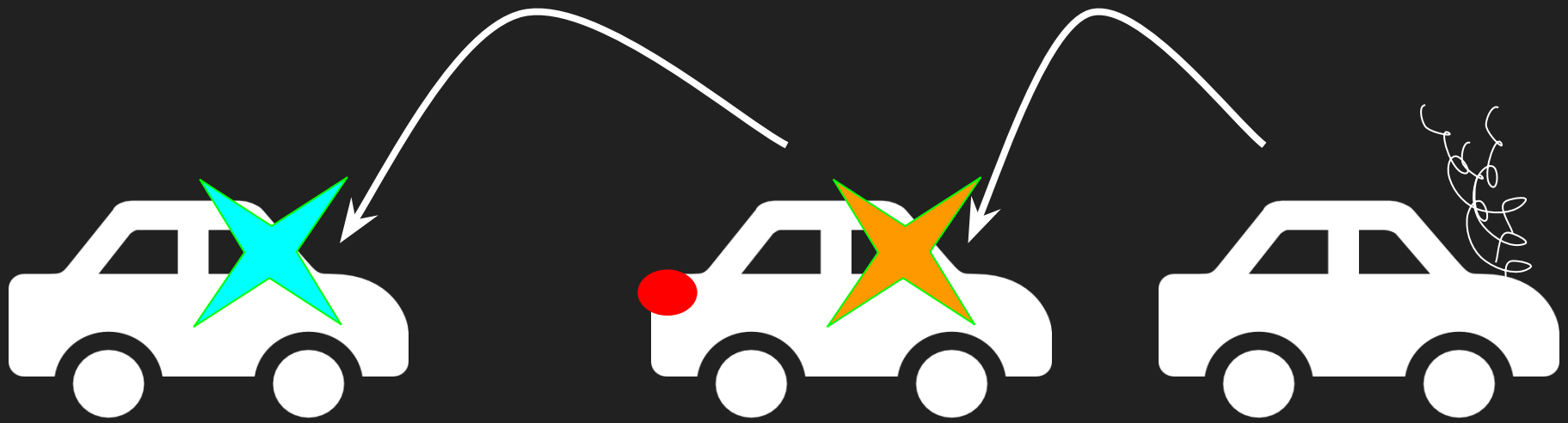
Implementation







Implementation



Implementation - Messages sent through VANET

- Forwarding only
  - Message is not shown locally
- Information only
  - No action to be taken
- Active warning
  - Action required

Requirements

- Versatility
- Timing
- Relevance
- Dependability
- Security
- Privacy
- Coordination
- Usability

Technical properties

- Sufficient sending range and speed
- Route information
- Car position and speed

Socio economic aspects of awareness improvements using VANET

Market introduction

- A visible added value of the technology for the customer
- A regulative order that does not leave alternatives requires its use.

Added value for the customer

- Vehicle Safety
  - 82.6%* of European Drivers in 2010 are concerned about Road safety
  - 3.3%* less than in 2002
- Reduction in fuel consumption
  - second most important factor while buying a new car
- Potential of faster rescue in emergency

*Sartre4

Regulative orders that leave no alternative

- Emergency Vehicle application
  - small gain by individual appliance
  - special laws, vehicles already regulated by the state
- Awareness improvement
  - Similar technologies already in use
  - other safety related technologies (ABS) are required by law

Potential Customer Reception

Safety applications

- Real-time traffic data
- Quickly transferring warnings among vehicles
- Accidents
- Road hazards

Non-safety applications

Commercial

- Location based services (petrol stations, restaurants, mechanics etc.)
- Map downloading
- Video/audio streaming
- Internet access

Convenience

- Parking
- Road toll points
- Alternate routes

Parking availability service

Parking availability service - Alternative

Toll collecting service

Toll collecting service

-

Alternatives

Roadstatus service / Alternate Routes

Roadstatus service / Alternate Routes - Alternative

Conclusion

Questions?

Discussion

What do you think about the proposed VANET-application?

What kind of VANET-Product would you like to build?

What kind of security breaches can occur?

Should the privacy concern be of top priority?