

# DAIMLERCHRYSLER

Research and Technology North America, Inc.



Vehicle IT and Services Research

*driving connectivity*

## **DSRC for Vehicle Safety**

**12<sup>th</sup> ITS World Congress 2005**

**Special Session 32: Essential Radio Communications Technologies for ITS**

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Palo Alto, California



# Commitment to Safety: DaimlerChrysler's Vision of Accident Free Driving



People don't always see accidents coming. But their cars will.

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Your car will warn you before they do.

In the future, this is one kind of trouble we'll be able to help you avoid. That's because we're developing technology that enables cars to recognize stop signs, speed limits, no overtaking warnings and other traffic signs. By letting the driver know about them in advance, the car can help prevent dangerous situations and accidents occurring in traffic. At DaimlerChrysler Research, we're developing these intelligent technologies today. For the automobile of tomorrow.



You never see owls crash, do you?

It's easier to avoid accidents at night when you can see in the dark. Which is exactly what our intelligent infra-red system will do for your car in the near future.

DAIMLERCHRYSLER  
Answers for questions to come.



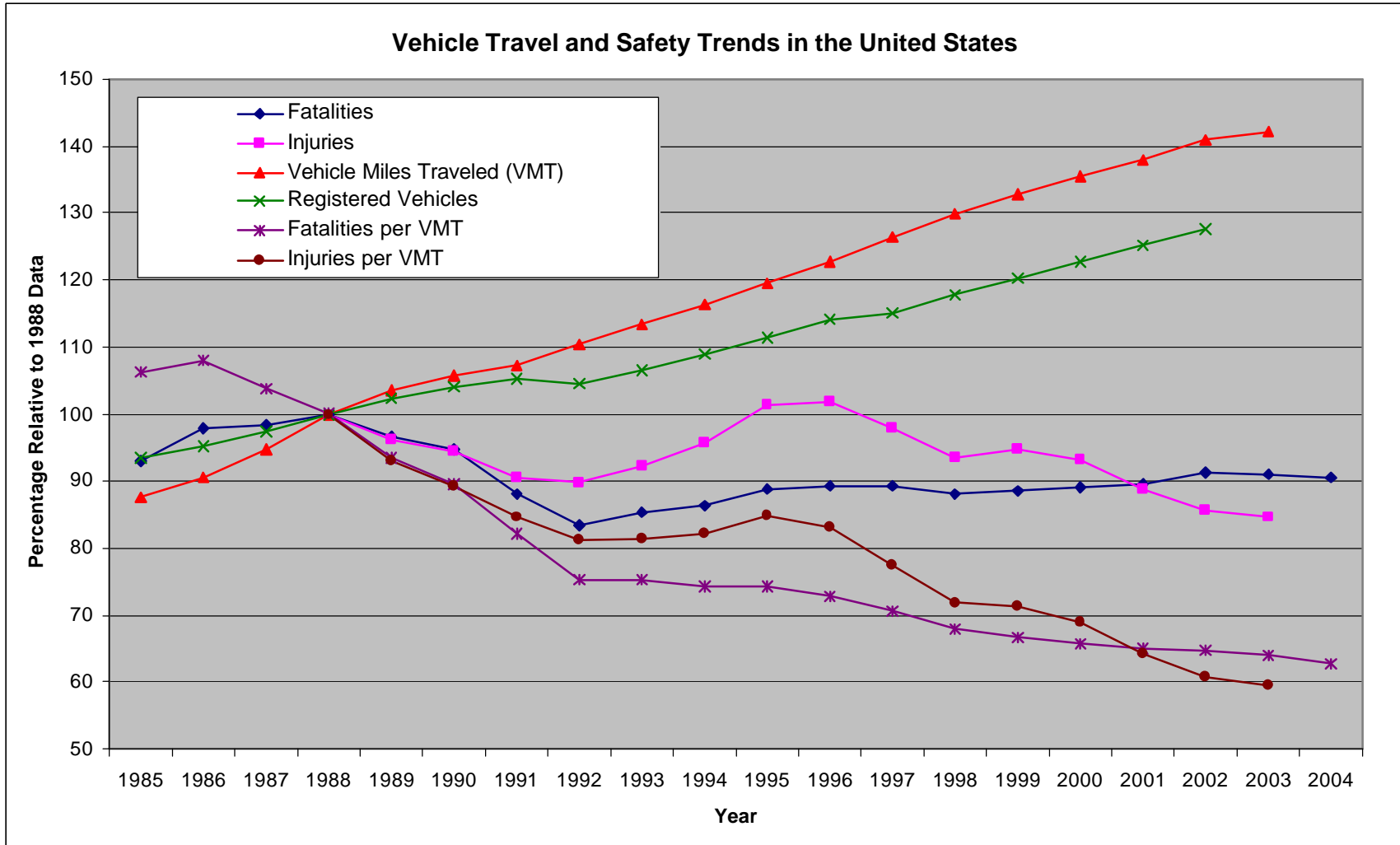
Your car will be watching the road, even if you're not.

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# Safety Trends: Very encouraging, but always room for improvement

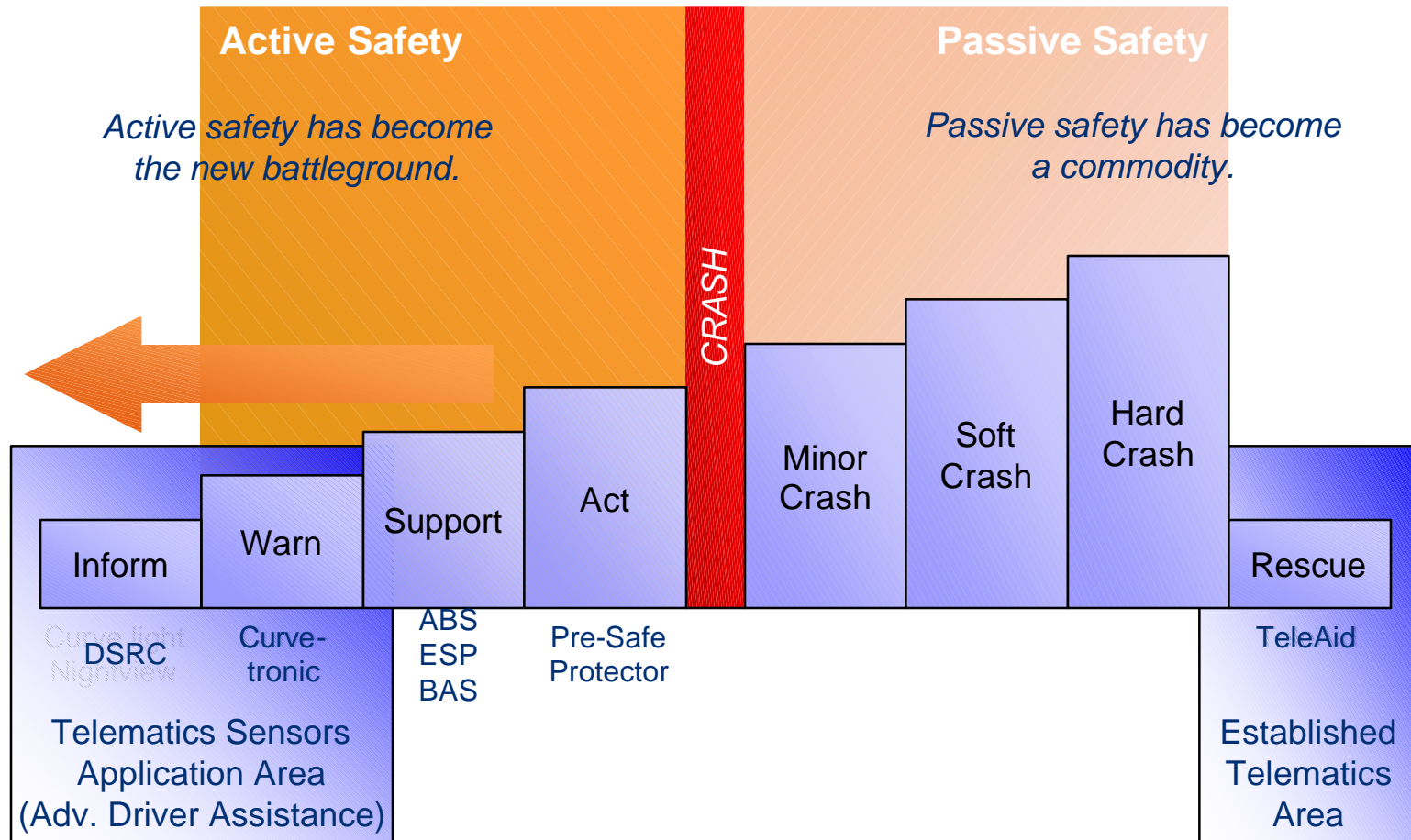


Source: Compiled from published data from National Highway Traffic Safety Administration, U.S. Department of Transportation



## Safety Application Areas

Focus in safety shifts towards accident avoidance and collision mitigation.





## The Next Logical Step in Vehicle Safety

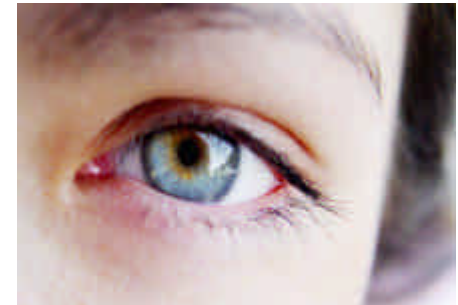
### So far: „Feel“

- Sensing a critical situation by assessing vehicle state and driver actions
- PRE-SAFE® (since 2002)



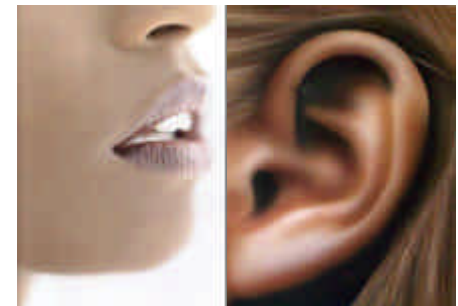
### Today: „See“

- Watching for obstacles on the road with radar
- PRE-SAFE® and Brake Assist PLUS (from 2005)



### In the Future: „Speak“ / „Listen“

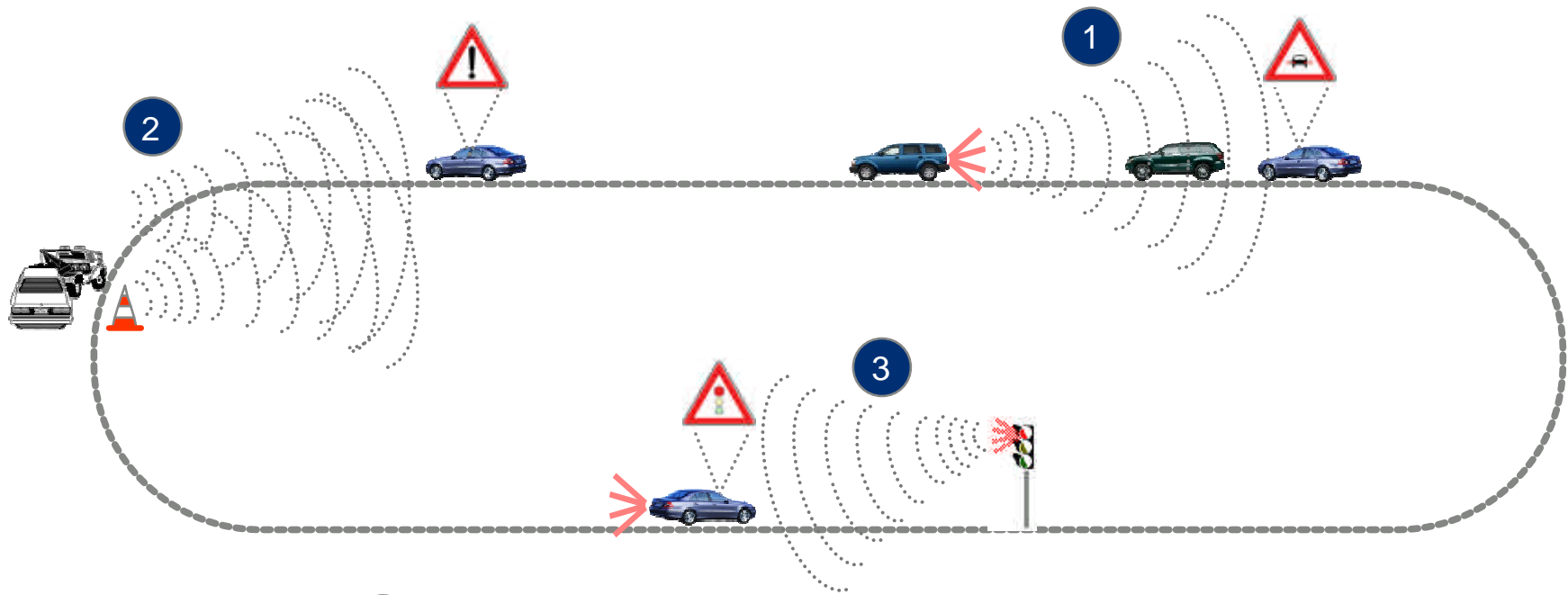
- Inform drivers about dangerous situations further down the road
- Warn others (to protect them and yourself)





## DSRC – The Enabling Technology for Vehicles to Speak and Listen

DSRC allows vehicles to communicate with each other and with infrastructure.



- 1 V2V: Extended Electronic Brake light
- 2 V2V (V2I): Hazard Warning
- 3 V2I: Traffic Signal Violation Warning



## Video





## Other Application Examples

### Applications between vehicles and infrastructure:

- Blind Merge Warning
- Curve Speed Warning
- Emergency Vehicle Signal Preemption
- Highway/Rail Collision Warning
- Intersection Collision Warning
- In-Vehicle Amber Alert
- In-Vehicle Signage
- Just-In-Time Repair Notification
- Left Turn Assistant
- Low Bridge Warning
- Low Parking Structure Warning
- Pedestrian Crossing Information at Intersection
- Road Condition Warning
- Safety Recall Notice
- SOS Services
- Stop Sign Movement Assistance
- Stop Sign Violation Warning
- Traffic Signal Violation Warning
- Work Zone Warning

### Applications between vehicles:

- Approaching Emergency Vehicle Warning
- Blind Spot Warning
- Cooperative Adaptive Cruise Control
- Cooperative Collision Warning
- Cooperative Forward Collision Warning
- Emergency Electronic Brake Lights
- Highway Merge Assistant
- Lane Change Warning
- Post-Crash Warning
- Pre-Crash Sensing
- Vehicle-Based Road Condition Warning
- Vehicle-to-Vehicle Road Feature Notification
- Visibility Enhancer
- Wrong Way Driver Warning

Source:  
*Vehicle Safety Communications Consortium, U.S.*





## DSRC Standardization

### Prerequisite No. 1:

#### Radio Frequency



#### FCC Rulings:

- Allocated exclusive spectrum for DSRC (5.850 – 5.925 GHz)
- Established licensing rules for the operation of roadside units (RSUs) and onboard units (OBUs)

### Prerequisite No. 2:

#### Communication Protocol



#### IEEE Standardization:

- Future part of the IEEE 802.11 family of WiFi standards
- IEEE 802.11p  
a.k.a. WAVE (Wireless Access for the Vehicular Environment)



## The Vehicle Infrastructure Integration (VII) Initiative

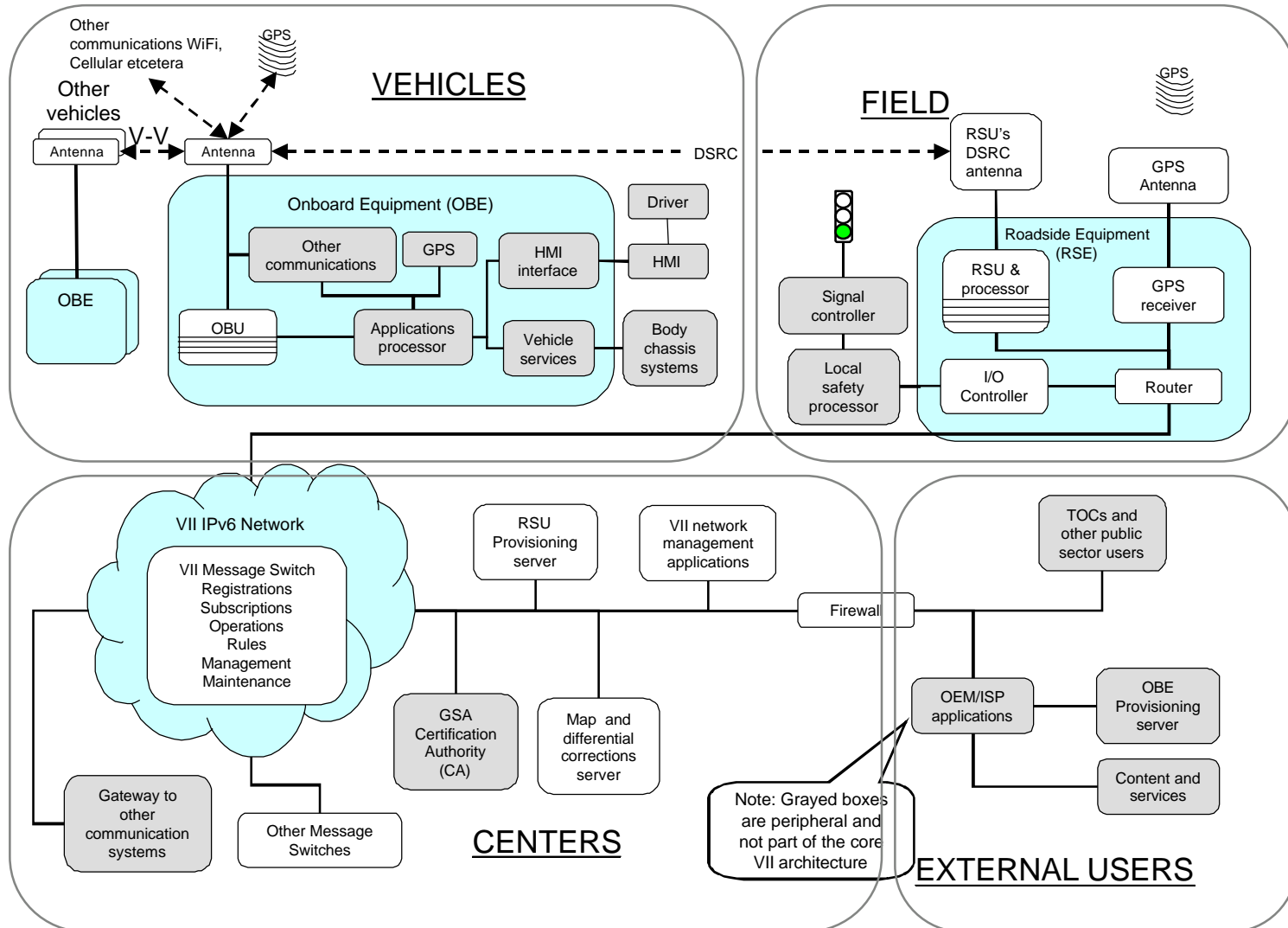
Transportation authorities and vehicle manufacturers will need to join forces to deploy DSRC. The VII Initiative forms the platform for this cooperation.



DaimlerChrysler will participate in the upcoming VII pilots over the next 4 years to prepare for a DSRC deployment decision before the end of the decade.



# Possible DSRC Network Infrastructure proposed in VII





## Conclusion and Outlook

- V2V and V2I Communication has the potential to have a significant contribution to the future of road safety and traffic efficiency.
- DSRC (IEEE 802.11p) is **the** enabling technology.
- VII (Vehicle Infrastructure Integration) will provide the necessary business and deployment framework over the next few years.
- There are still open issues to address before a widespread DSRC deployment:
  - DSRC Core Radio and Protocol Standardization and Validation
  - Overall VII Network Architecture Validation
  - Field Operational Trials including Applications, User and Acceptance Studies
- OEMs and Government Agencies will work together over the next years to be able to solve those issues and make an informed deployment decision before the end of this decade.