

# ContiGuard® - Innovations during Normal Driving, Hazard, Pre-Crash, and Post Crash Phases

Dean McConnell, Continental



# ContiGuard<sup>®</sup>: Driving You Safely



# ContiGuard®: Driving You Safely

## What is ContiGuard®?

ContiGuard® represents all Safety Functions by the integration of Active Safety, Passive Safety, Vehicle Surrounding Sensors, HMI and Safety Telematics.

### ContiGuard® Offers Five Interacting Functional Clusters:

- ❑ Advanced Driver Assistance Systems
- ❑ Global Chassis Control
- ❑ Integrated Occupant Protection
- ❑ Human-Machine-Interface (HMI)
- ❑ Car-2-X



# ContiGuard®: Driving You Safely

## The Path to an Accident-Avoiding Car

### **Vision Zero:**

ContiGuard® is the next level of driving safety technology by Continental.

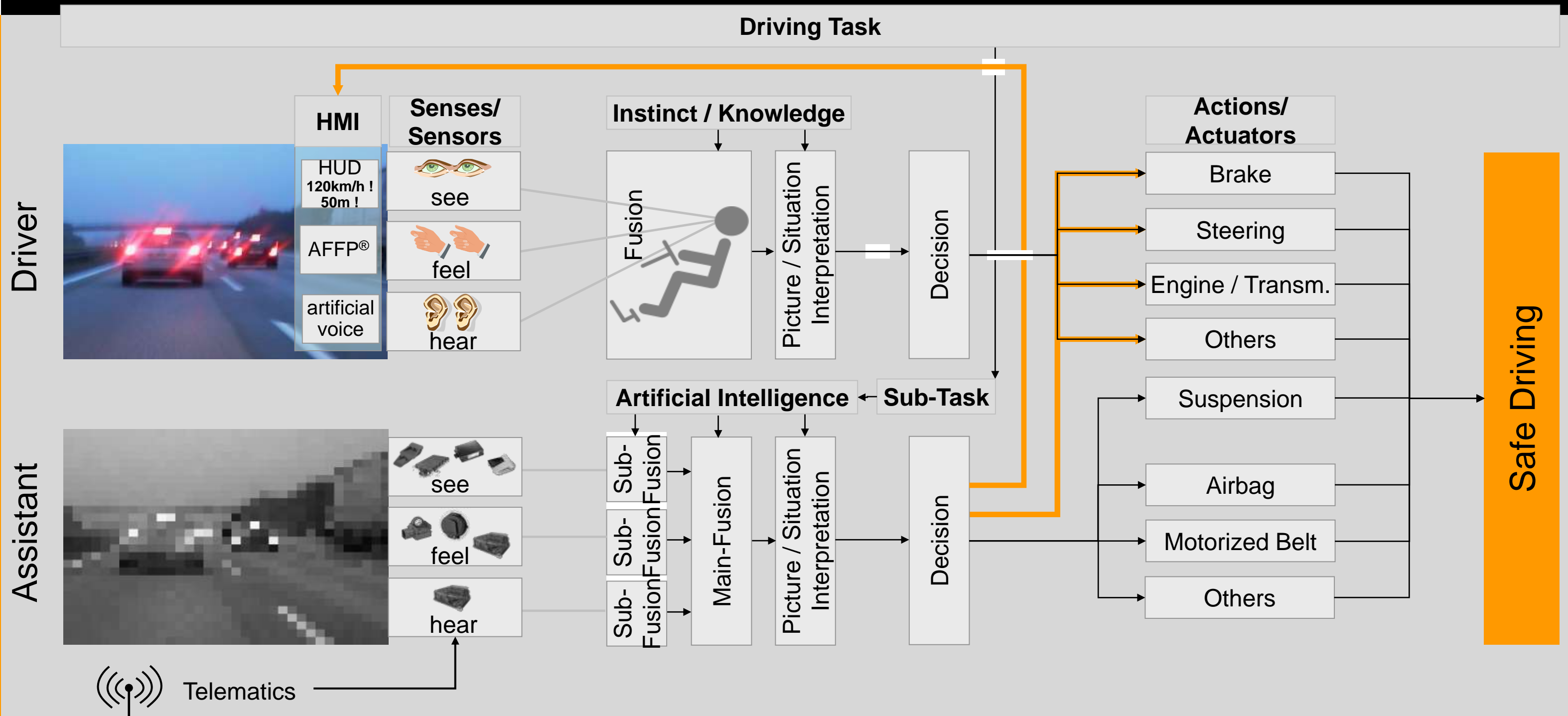
The vision of an accident-avoiding car (Vision Zero) is within reach: ContiGuard® is our contribution towards integrated safety for all traffic participants in the different phases of driving.

ContiGuard® is anticipating, intelligent, damage-avoiding, comprehensive, scalable, and therefore part of the „Safety for Everyone“ concept.

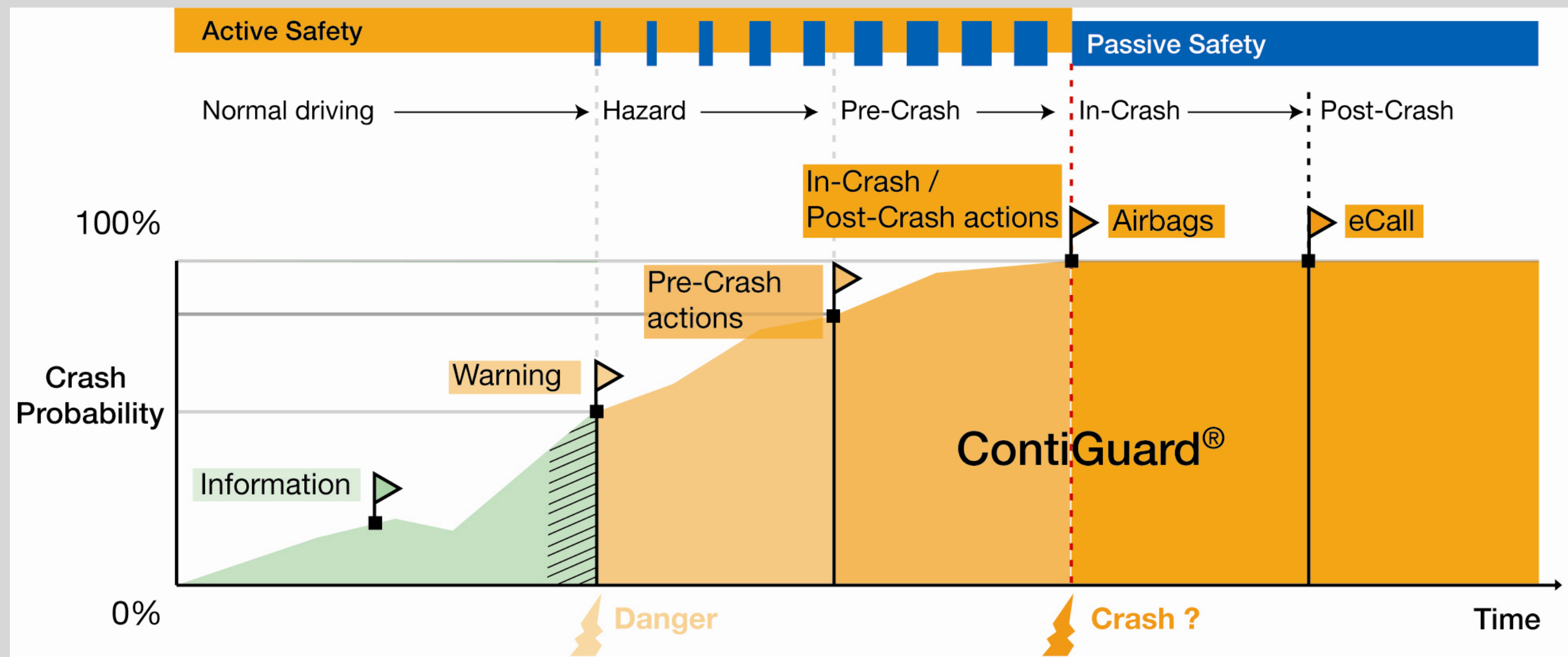
- ❑ ContiGuard® offers a new dimension of safer mobility
- ❑ Long-standing experience in the integration of systems and components
- ❑ A scalable safety approach which is modular and cost attractive to all markets
- ❑ Developed and engineered together with our customers and already in series production vehicles today
- ❑ Open roadmap for integrating new safety features and functionalities



# ContiGuard<sup>®</sup> – Chain of Effects



# ContiGuard®: The Different Driving Phases – Normal Driving, Hazard, Pre-Crash, In-Crash, and Post-Crash



# ContiGuard® functions during Normal Driving

- ❑ Adaptive Cruise Control
- ❑ Speed Limit Monitoring
- ❑ Advanced Lighting
- ❑ Lane Keeping Support
- ❑ Advanced Driving Stability



Multi-function Camera



Electric Power Steering (EPS)



77 GHz Radar Sensor



Air Suspension



# Normal Driving – Speed Limit Monitoring (SLM)

Speed Limit Monitoring (SLM) recognizes the speed limit and displays it to the driver.

Key technologies:

- ❑ Camera System



# Normal Driving – Advanced Driving Stability

Pre-adjustment of the suspension and lateral stability systems with the goal to increase both comfort and stability of the vehicle.

Key technologies:

- Radar
- Camera System
- Air Suspension /  
Active Damper
- Roll Stabilizer
- Electric Power  
Steering (EPS)



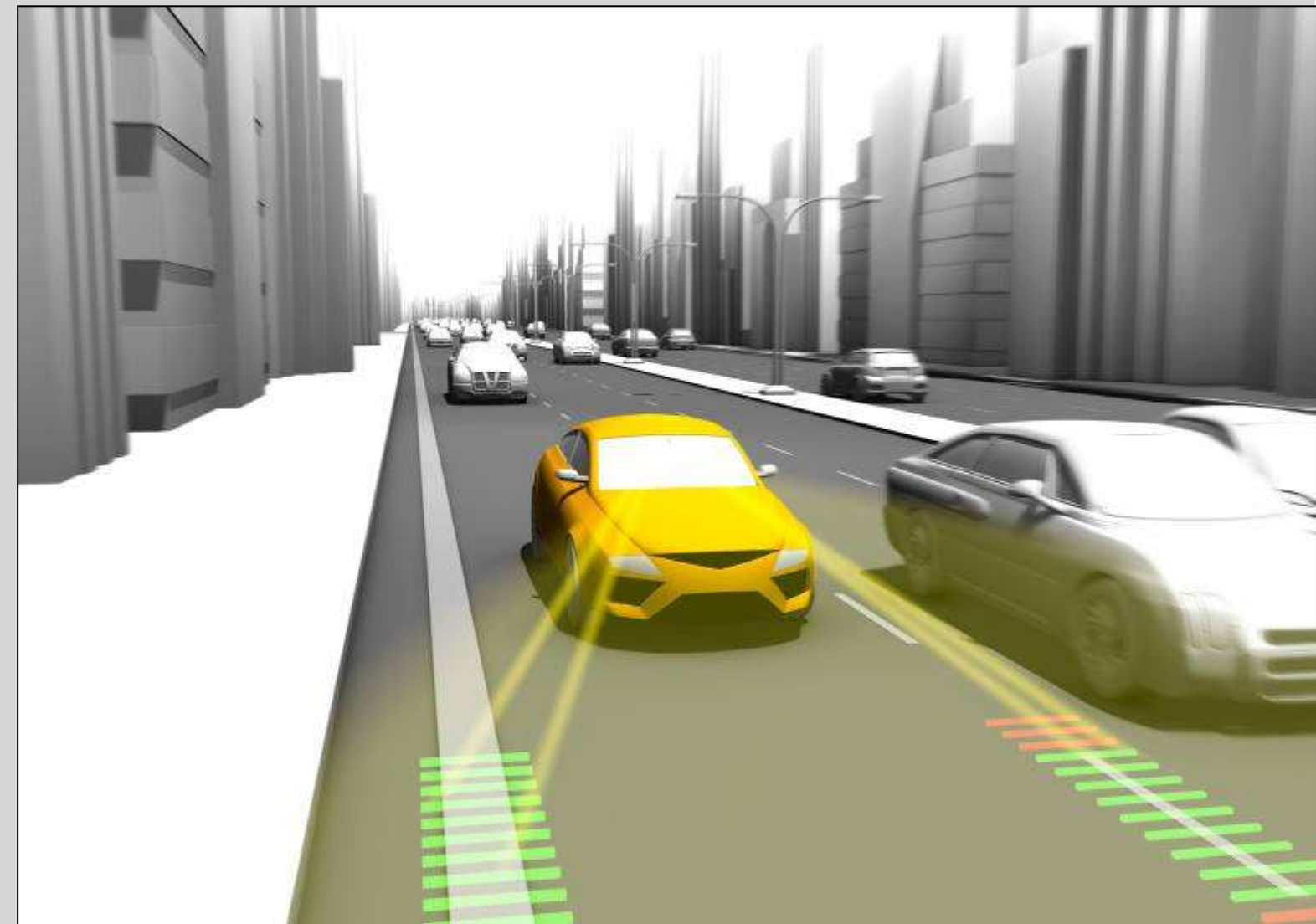
Air Suspension



# ContiGuard® functions during Hazard Phase

ESC and EPS are key technologies for all intervening ContiGuard® functions. Should the driver run into a hazardous situation, he will be at first warned before an intervention occurs:

- ❑ Electronic Stability Control (ESC)
- ❑ Forward Collision Warning
- ❑ Blind Spot Warning / Lane Change Assist
- ❑ Emergency Braking / Steering
- ❑ Local Hazard Warning /  
Intersection Assist (Car-2-X)

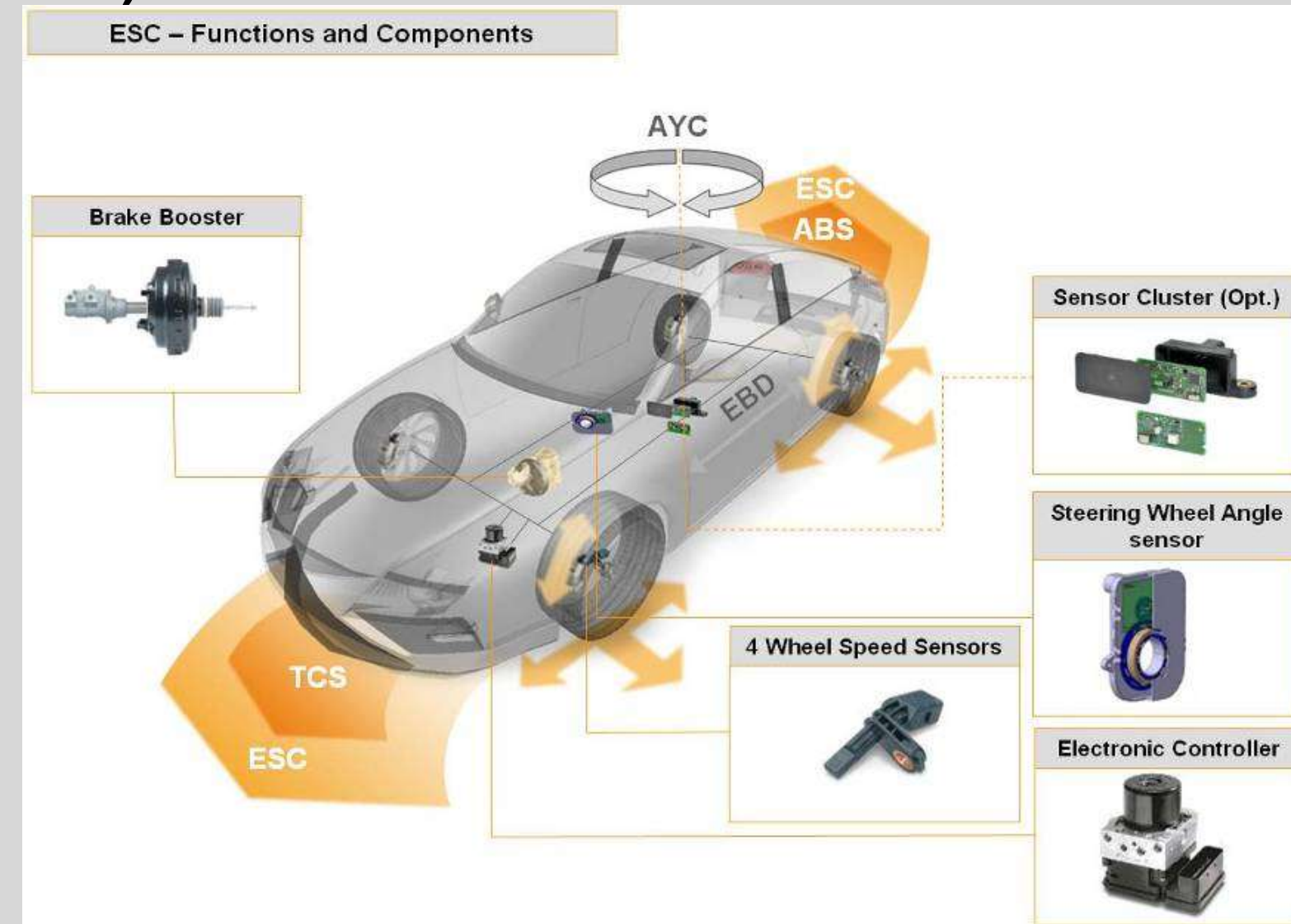


# Hazard Phase – Electronic Stability Control (ESC)

Should the driver get into a possibly hazardous situation, ESC will actively stabilize the vehicle.

Key technologies:

- ❑ Electronic Controller
- ❑ Brake Booster
- ❑ Wheel Speed Sensors
- ❑ Steering Wheel Angle Sensor
- ❑ Sensor Cluster



# Hazard Phase – Forward Collision Warning

If a driver overlooks the necessity to brake, the driver is warned of the imminent danger.

Key technologies:

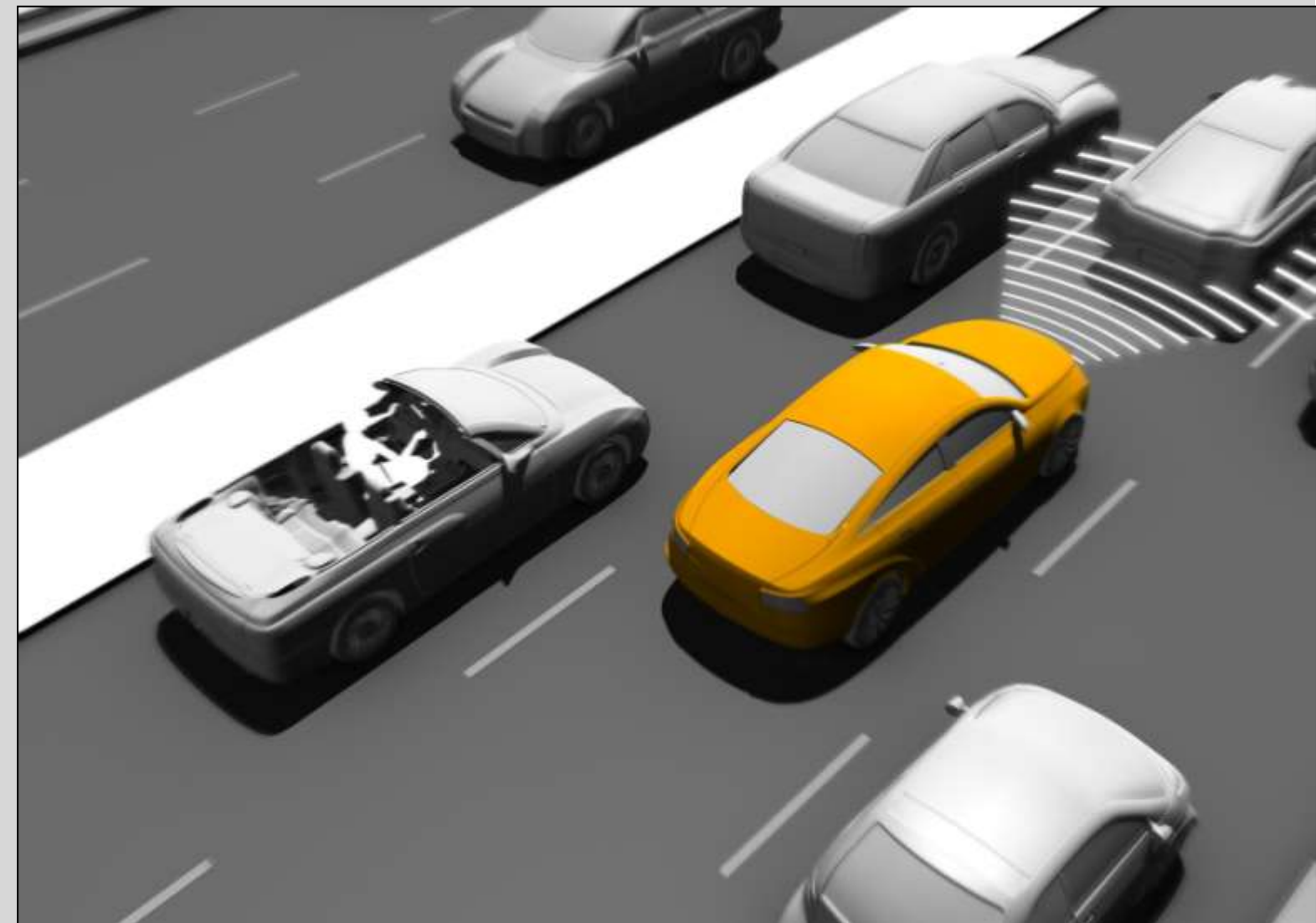
- ❑ 77GHz Radar Sensor
- or
- ❑ Mid-Range-Radar or
- ❑ Camera System



Multi-function Camera



77 GHz Radar Sensor



# Hazard Phase – Blind Spot Warning / Lane Change Assist

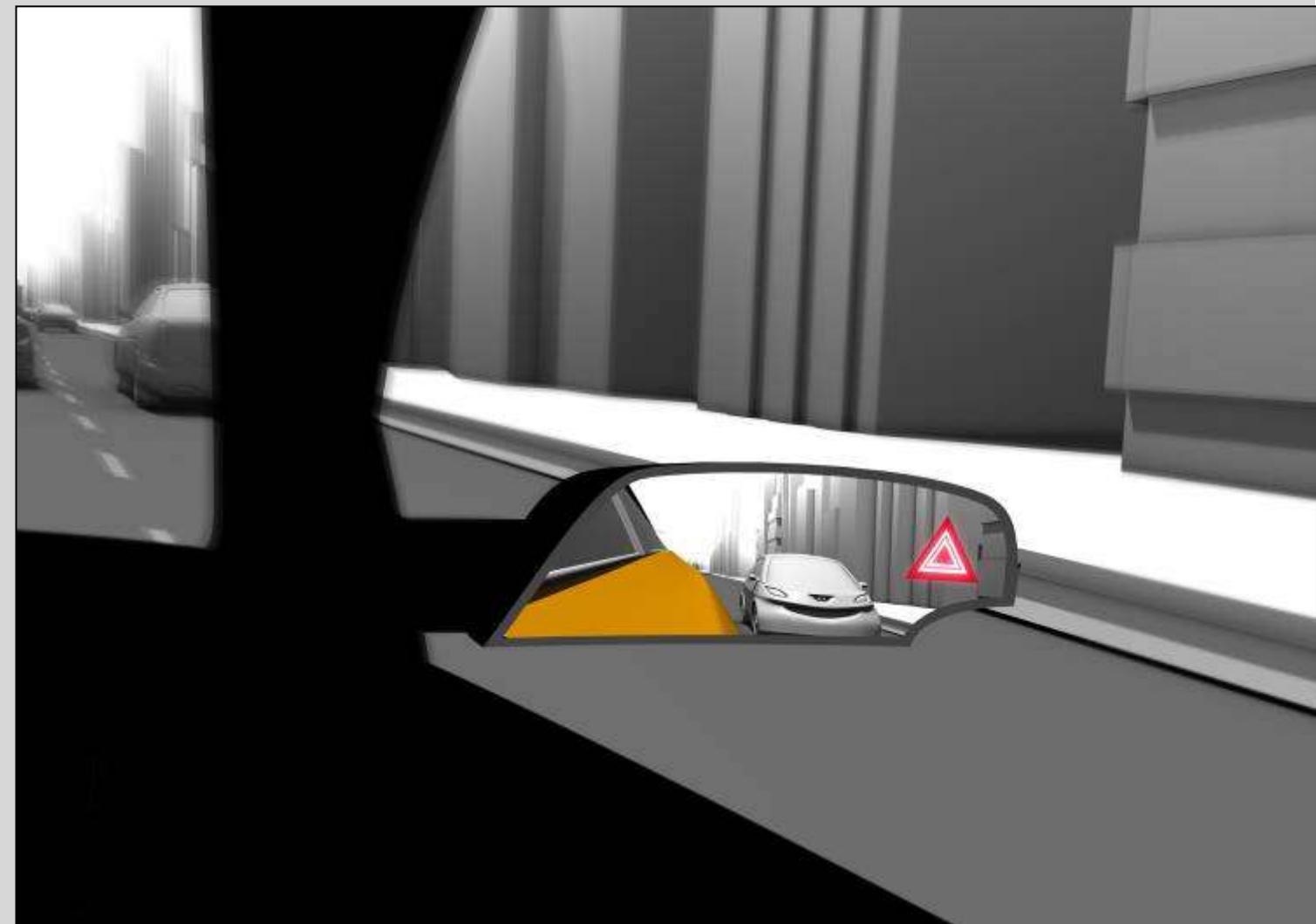
A vehicle can be quickly overlooked in the blind spot or from further behind. This is where Blind Spot Detection (BSD) and Lane Change Assist informs of the imminent danger.

Key technologies:

- ❑ 24 GHz Radar Sensor



24 GHz Radar



# Hazard Phase – Emergency Braking / Emergency Steering

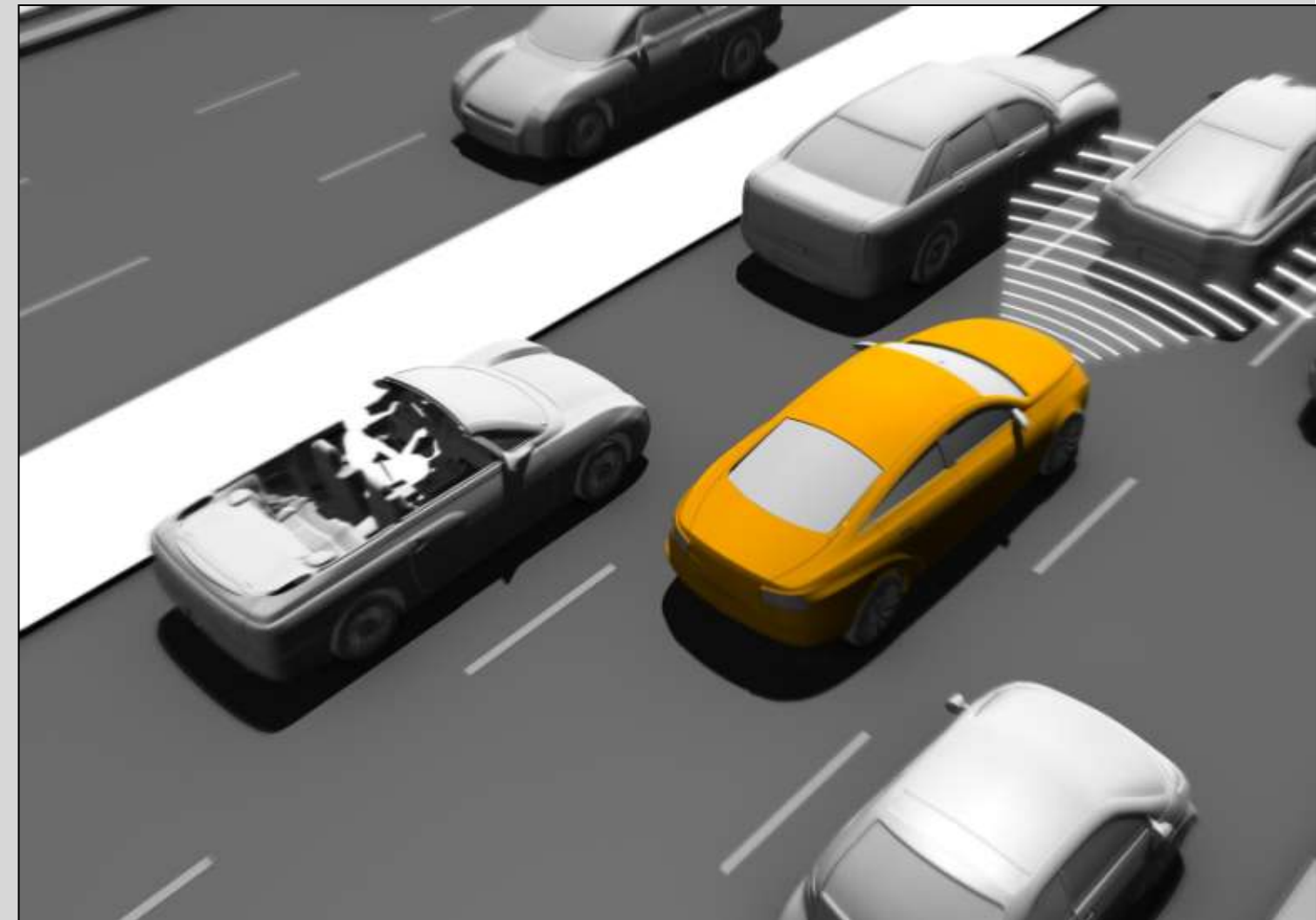
Should the driver oversee the necessity to brake, an autonomous braking or alternatively an emergency steering support is activated to help the driver to avoid the object.

Key technologies:

- 77GHz Radar Sensor
- or Mid Range Radar
- Camera System
- Hydraulic Brake Systems
- Electronic Brake System
- Electric Power Steering



77 GHz Radar Sensor

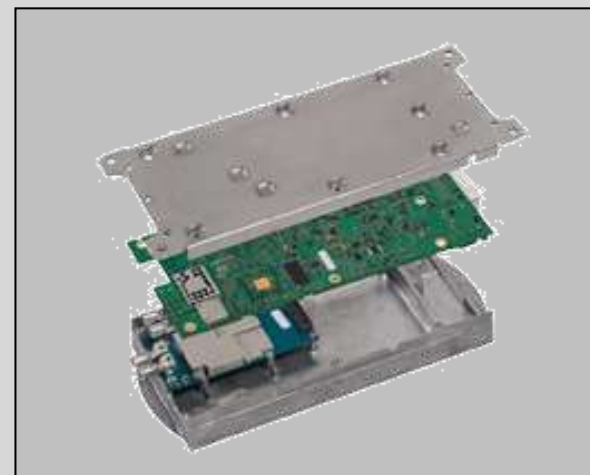


# Hazard Phase – Local Hazard Warning / Intersection Assist (Car-2-X)

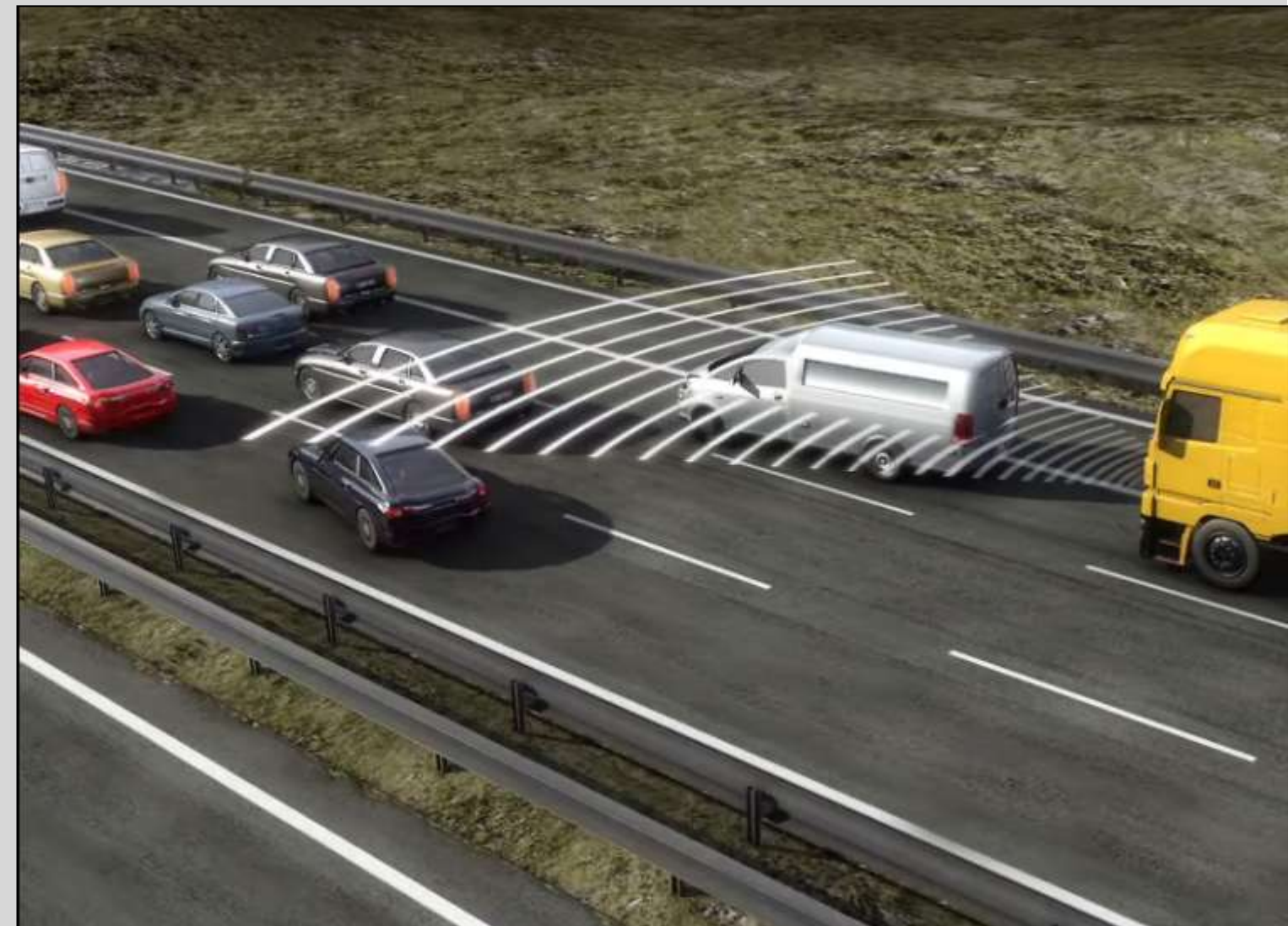
If a vehicle brakes down or if a vehicle is approaching the end of a traffic jam, or a dangerous intersection, telematics applications can send a respective message to warn other vehicles.

Key technologies:

- Telematics Control Unit



Telematics Control  
Unit



# ContiGuard® functions during Pre-Crash

If an accident is unavoidable and therefore imminent, additional protection measures are taken, in order to protect the occupants of the vehicles as best possible.

- Emergency Brake Assist
- Emergency Steer Assist
- Activation of the Reversible Seatbelt Pre-Tensioners
- Advanced and Active Occupant Safety



# Pre-Crash – Emergency Brake Assist (EBA)

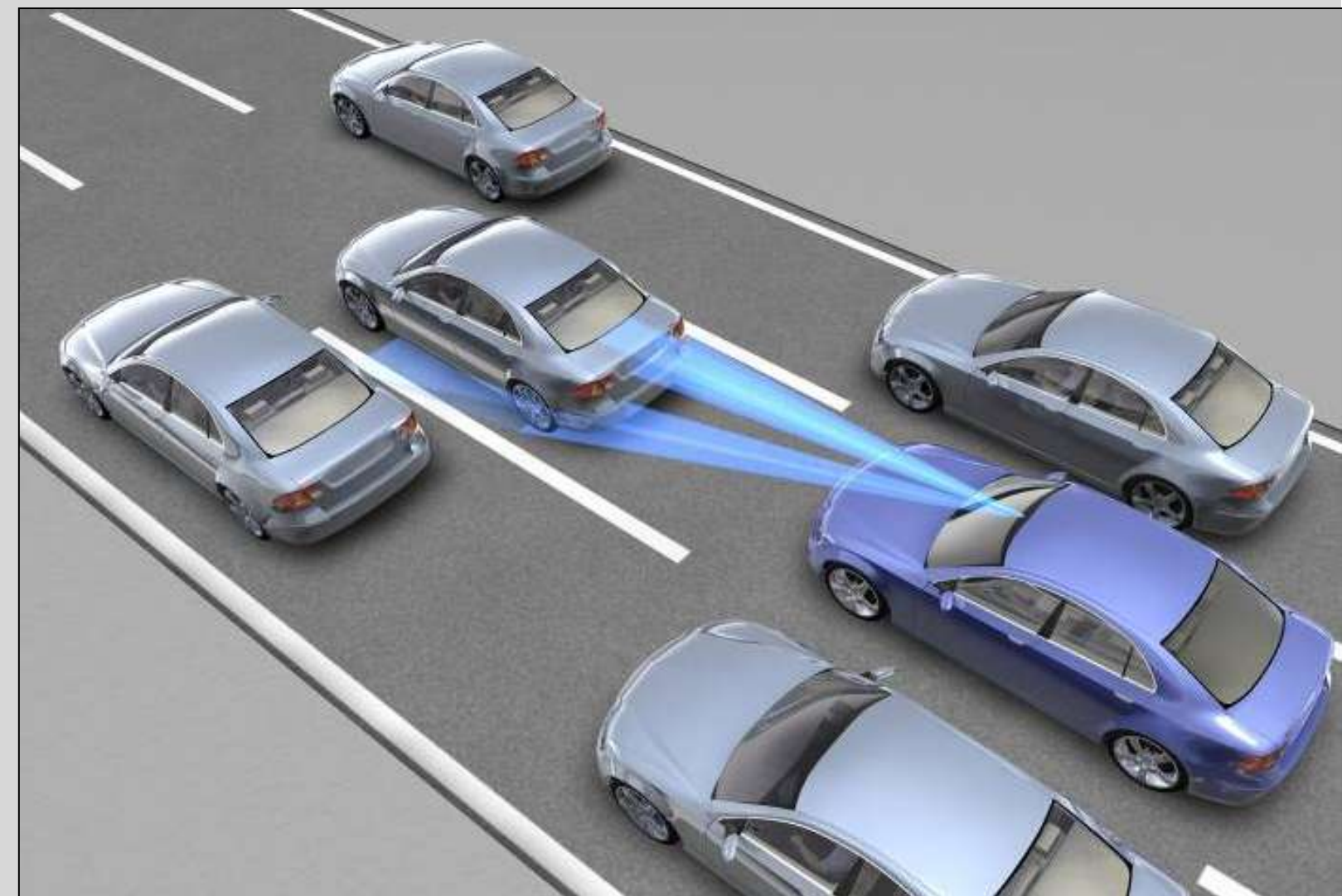
If an accident is unavoidable the EBA will autonomously brake the car in order to avoid the impact or mitigate its consequences.

Key technologies:

- ❑ Closing Velocity Sensor (CV-Sensor)  
or
- ❑ Mid Range Radar  
or
- ❑ 77GHz Radar System



CV-Sensor



# Pre-Crash – Emergency Steer Assist

Before an imminent impact the Emergency Steer Assist will help the driver to steer the vehicle clear of the object.

Key technologies:

- ❑ Electric Power Steering (EPS)
- ❑ Mid Range Radar or
- ❑ 77GHz Radar System
- ❑ Camera System
- ❑ Global Positioning System (GPS)



Electric Power Steering  
(EPS)



# Pre-Crash – Activation of the Reversible Seatbelt Pre-Tensioners

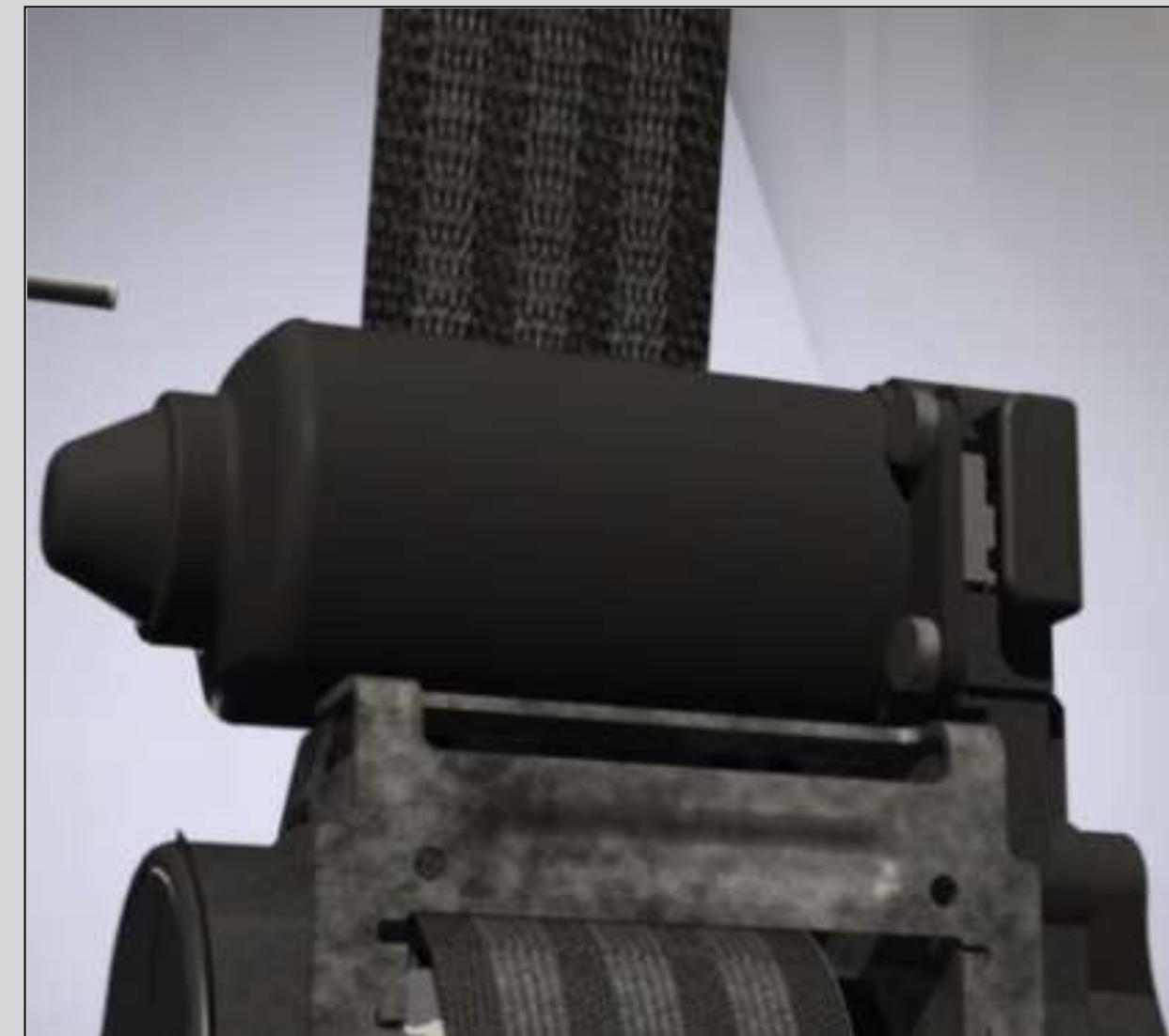
With an accident imminent, the reversible seatbelt pre-tensioners are activated.

Key technologies:

- ❑ Reversible Seatbelt Tensioner
- ❑ CV-Sensor or
- ❑ Mid Range Radar or
- ❑ 77GHz Radar System
- ❑ Airbag Control Unit



77 GHz Radar Sensor

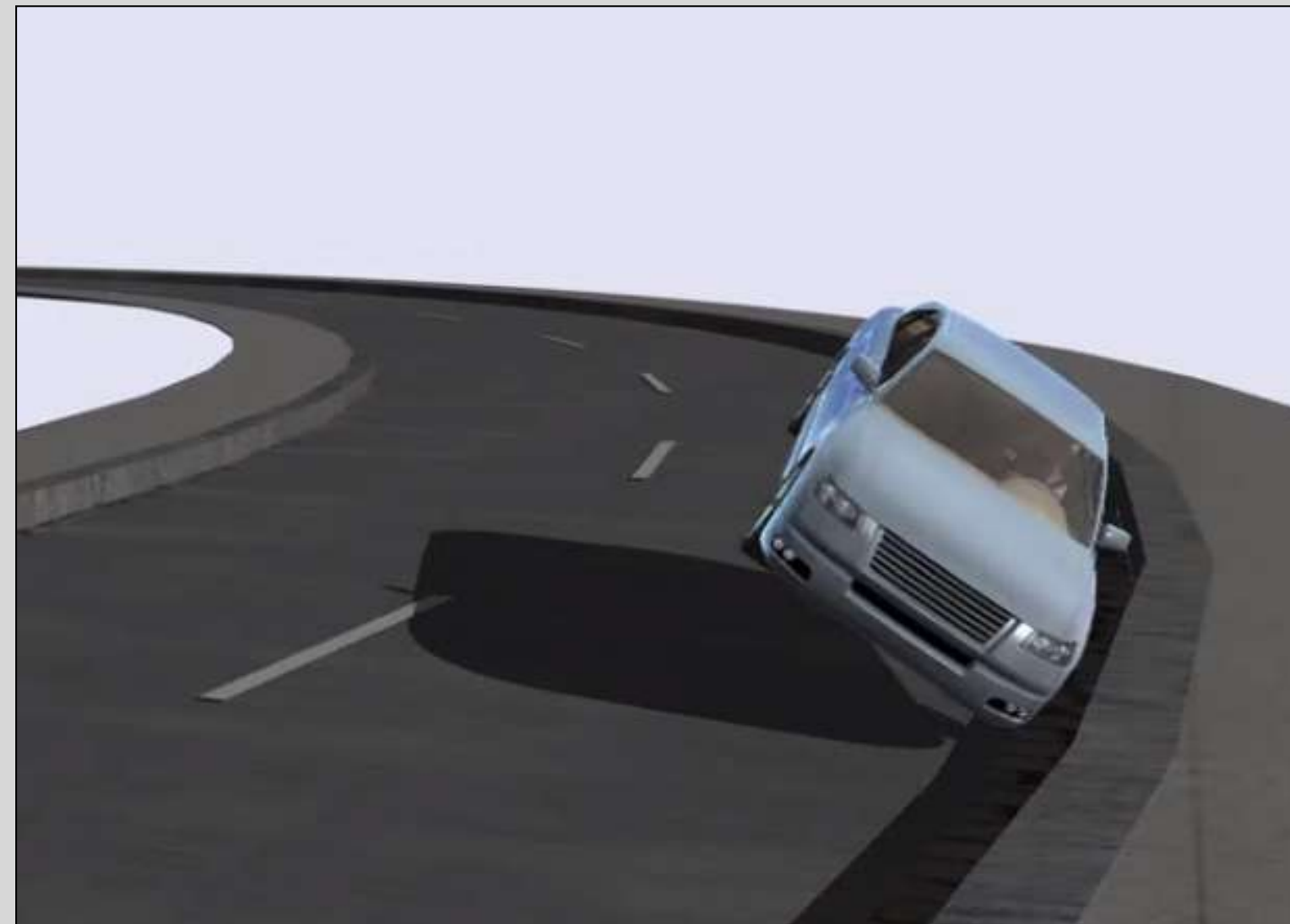


# Pre-Crash – Advanced and Active Occupant Safety

Based on vehicle surrounding sensors and vehicle state observing in the ESC, an adapted airbag deployment strategy is applied to the assessed critical driving situation.

Key technologies:

- Airbag Control Unit (ACU)
- ESC
- 77GHz Radar System or
- Mid Range Radar or
- CV Sensor

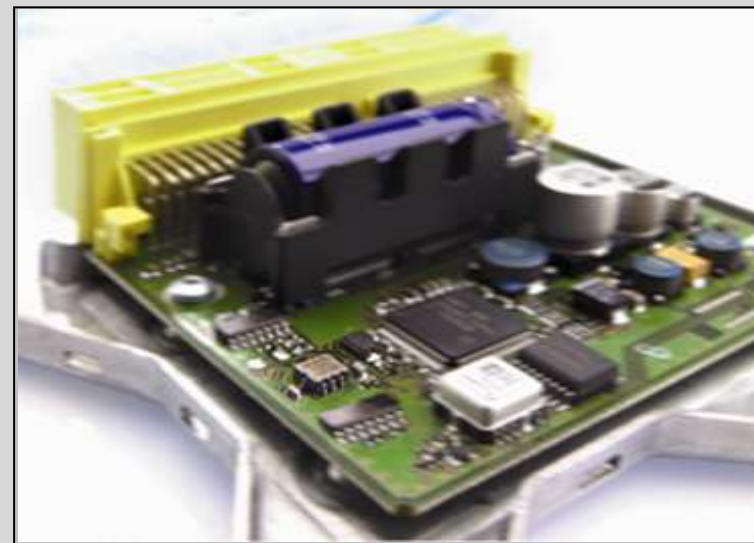


# ContiGuard® during In-Crash – Passive Safety Systems

The evaluated data from the Pre-Crash phase is used for the adapted deployment strategy of the Passive Safety Systems.

Key technologies:

- clipSat
- gSat
- Crash Impact  
Sound Sensing
- Occupant  
Classification System



Crash Impact  
Sound Sensing



# ContiGuard® during Post-Crash

The life-saving „eCall“ is an automatically generated emergency call that indicates the location of the crashed car and additionally provides the pre-defined Minimum Set of Data (MSD). This is Important for emergency services in order to locate vehicles, especially when an accident occurs at night, for example.

Key technologies:

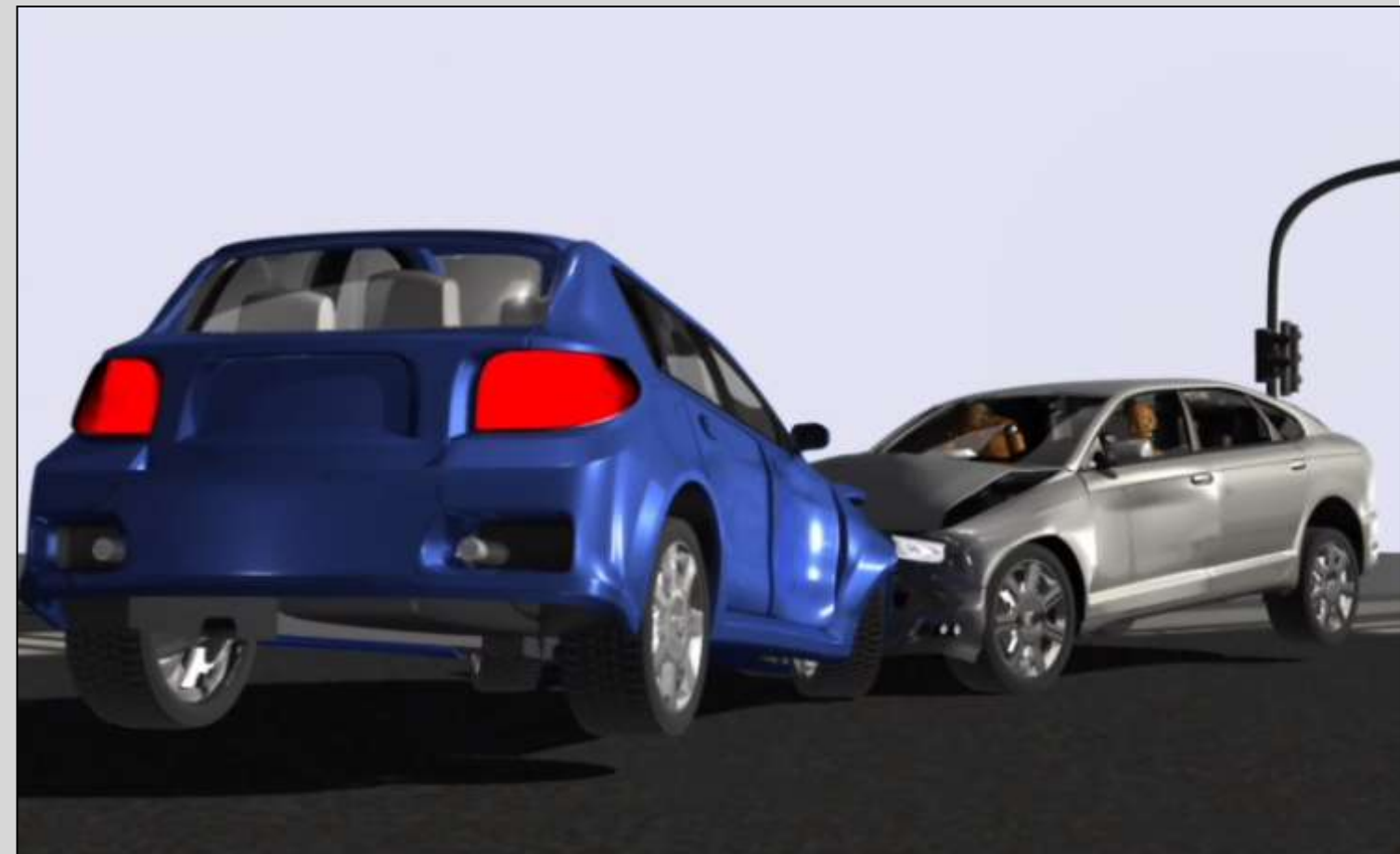
- ❑ Post Crash Braking
- ❑ Safety Telematics



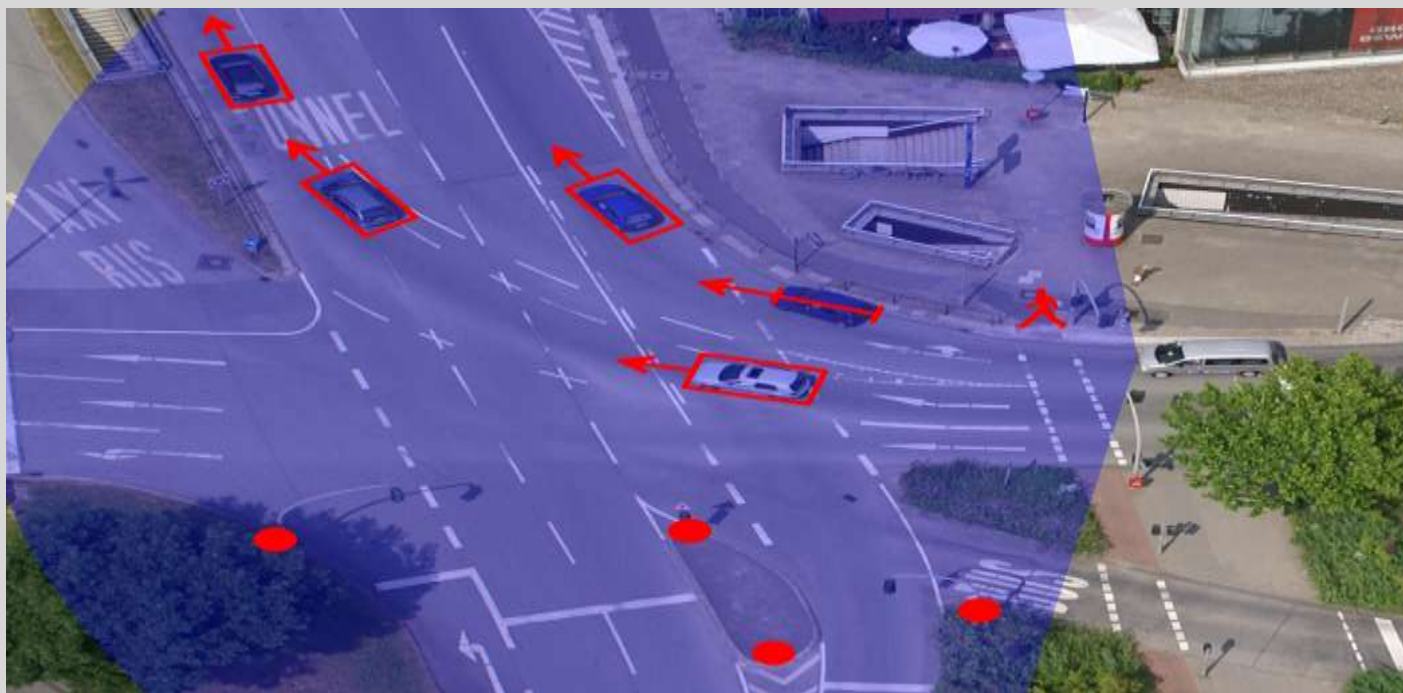
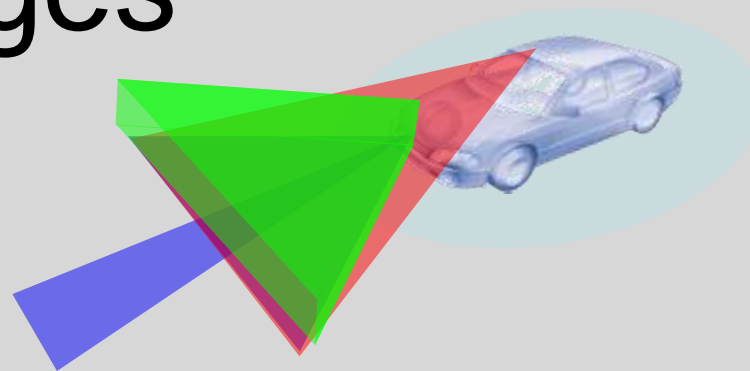
Telematics Control Unit



Electronic Brake System



# ContiGuard® : Future challenges



- Dynamic flow of traffic
  - lane change
  - cut-in / cut-out
  - Turn off
- Complex road scenarios
  - Narrow curves
  - Cross-ways
- Dense traffic
  - city traffic
  - construction areas
- Target classification
  - cars, bikes, pedestrian

# Sensor / Data Fusion Needed:

- **Digital Maps and GPS:**
  - ⇒ Reliability and aging
  - ↓ Construction areas
  - ↓ Active Traffic Signs
- **Transponder**
  - ↓ Expensive Infrastructure
- **Camera:**
  - ⇒ Recognition performance
  - ↑ Image can be used for other functions too



# ContiGuard<sup>®</sup>: Driving You Safely

- ❑ ContiGuard<sup>®</sup> offers a new dimension of safer mobility
- ❑ A logical, scalable safety approach which is modular and cost attractive
- ❑ Open roadmap for integrating new safety features and functionalities
- ❑ Innovation that adds value and safety to The consumer during all phases of driving

