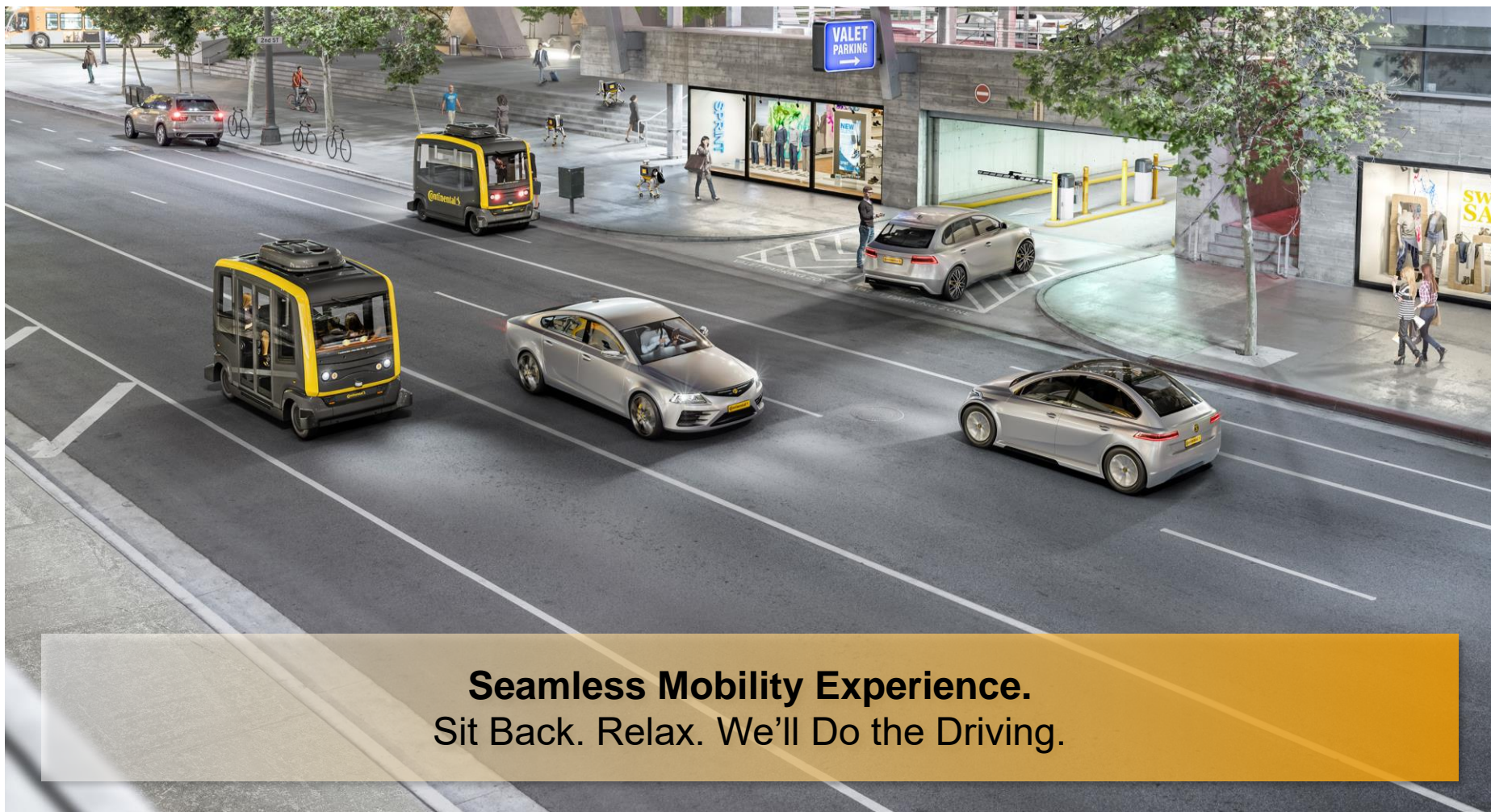




## Driverless Vehicles – Driverless – Are we there yet?

Dr. Andree Hohm

Autonomous Driving Program Continental



**Seamless Mobility Experience.**  
Sit Back. Relax. We'll Do the Driving.



# The Focus Will Move to Driverless Mobility

## Shift of Responsibilities from Man to Machine

**Technology**



**Homologation**



**Acceptance**



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# Technology: Building Blocks

## Requirements for Automated Driving Eco Systems

### Automated Driving Component & System Market



**OEM**



**Driverless  
Vehicles**



**Goods  
Transport**



**Mobility  
Service Provider**



**Infrastructure**

### Automated Driving Building Blocks

#### Key Technologies

- › Hardware Components
- › Functions

ADAS  
Sensors

Environment  
Model

Driving  
Functions

High Performance  
Computing

HD Map  
eHorizon

Positioning

Connectivity  
Over-The-Air

Holistic  
Human-Machine  
Interface

Dynamic  
Motion Control

Drive-by-Wire  
Actuators

Integrated Safety  
for Automated  
Driving

Security

#### Key Competencies

- › Methods
- › Processes & Tools

System  
Architecture

System  
Integration

System  
Validation

System  
Safety

Artificial  
Intelligence

Fleet Test  
Data

Data  
Management



# Technology: Comprehensive Environment Perception

## The Basis for Safe Mobility



# Technology: Comprehensive Environment Perception

## Key Elements

**“Classic” Sensor Technologies**

Camera

Radar

Lidar



  
**V2X Communication**

  
**Automated Driving  
Control Unit**

**Processing Power, Algorithms**



# Technology: Reality Check

Common Driving Scenarios Have to Be Performed Safely!

**A reliable sensing in all driving scenarios**  
is the crucial foundation for driverless mobility.

**Reasonable step stones have to be built**  
to achieve a safe driverless mobility.



# Technology: Reality Check

## Which Risks of Driving are Socially Accepted?

### Manual Driving

#### Crashes \*

per 1 million miles traveled in the USA

Fatal crashes .....	0.01
Crashes with injuries .....	0.55
Property damages only ...	1.47
<b>All crashes together ....</b>	<b>2.03</b>

\* NHTSA reports, for 2015, a total of 3,095 billion of Vehicle Miles Traveled in the USA and 6,296,000 car crashes.

### Automated Driving

#### Disengagements \*\*

per 1 million miles traveled (CA, USA)

2015 .....	804
2016 .....	195
2017 .....	179
2018 .....	~90

\*\* Waymo's "disengagement report" collected by the California Department of Motor Vehicles, discloses an average of 5,596 miles between critical events in 2017.

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# Homologation: Agreements and Conventions



> 1949

**Geneva Convention  
on Road Traffic**  
Driving laws, traffic signs  
**Behavior**

> 1968

**Vienna Convention  
on Road Traffic**  
**Human driver is required**  
(74 countries signed ww)  
**Non-ratified countries:**  
USA, CAN, AUS and CHN  
**Behavior**

> 2015

**Driver can also be a  
“vehicle system”**

> 2021 in discussion !

**“Vehicle systems taking  
over all”**  
with / without  
geographical limits  
**Driverless Mobility**

> 1958

Agreement concerning the  
**adoption of uniform technical  
prescriptions** for wheeled  
vehicles, equipment and parts  
**Technical**

> 1998

Agreement concerning the  
**establishing of global technical  
regulations** for wheeled  
vehicles, equipment and parts  
**Technical**

> 2021

L3 Systems **can be  
approved** under UNECE  
regulations **up to 60kph**  
**Technical**



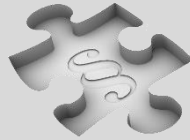
# The Focus Will Move to Driverless Mobility

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# Acceptance: Automated Systems

## Experiences from Other Transport Sectors



**Maritime Shipping**

**Aviation**



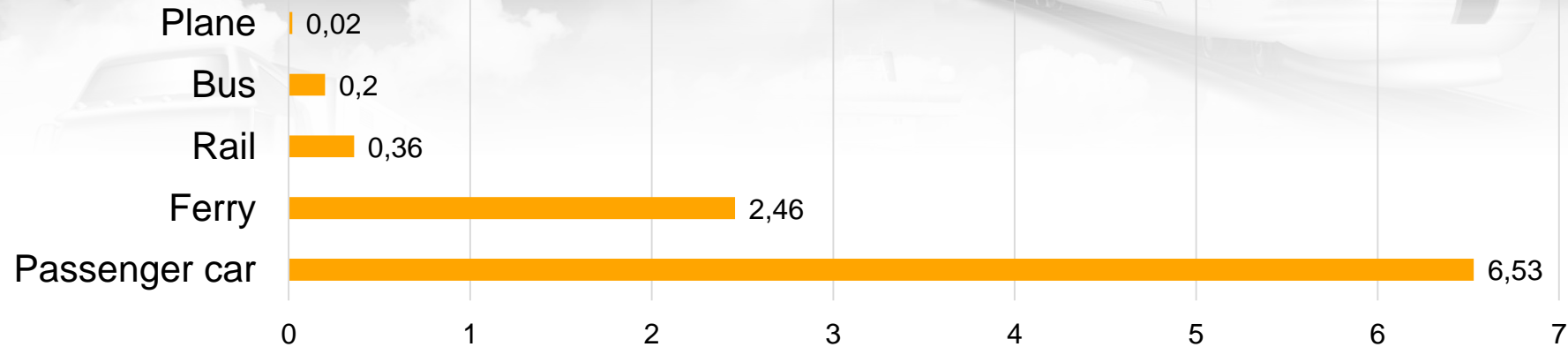
**Railway**



**Social acceptance need to be built  
by ensuring a safe and reliable behavior**

# Acceptance: Transport Safety within the US

## Fatalities by Means of Transportation



Source: [www.statista.com](http://www.statista.com) – Fatalities per billion passenger-miles traveled in the U.S. 2014



# The Focus Will Move to Driverless Mobility

## Summary / Outlook

- › Reliable environment perception remains as the major technical challenge to replace the driver completely

### Technology



### Homologation



- › Promising start
- › To give driverless mobility a significant push, a common agreement of all stakeholders is needed

- › Responsible, step-by-step technology introduction
- › Human-machine interfaces need to be further established

### Acceptance



- › To be successful, driverless vehicles should be used by people without any concern

**Thank you**  
for your attention!