Collaborative Research for Safe Connected Automated Driving

AMAA Conference, Berlin

September 26, 2017

On the road

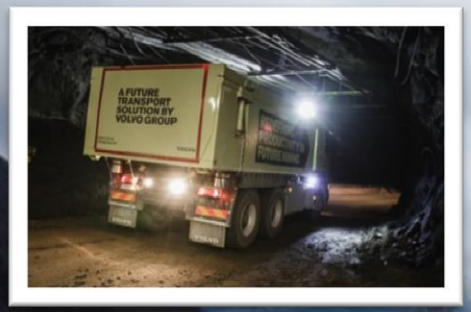
In the city

Off road

At sea

With the customer in focus

- Improving fuel efficiency
- Optimizing handling and maneuverability
- Improving security
- Preventing information overload
- Reducing weight
- Autonomous driving
- Exploring uptime services: Extended Vehicle technologies



For all Volvo Group brands

Dongfeng Trucks (SA)

Nova Bus

SDLG (JV)

UD

Eicher (JV)

Prevost

Sunwin (JV)

Volvo

Mack

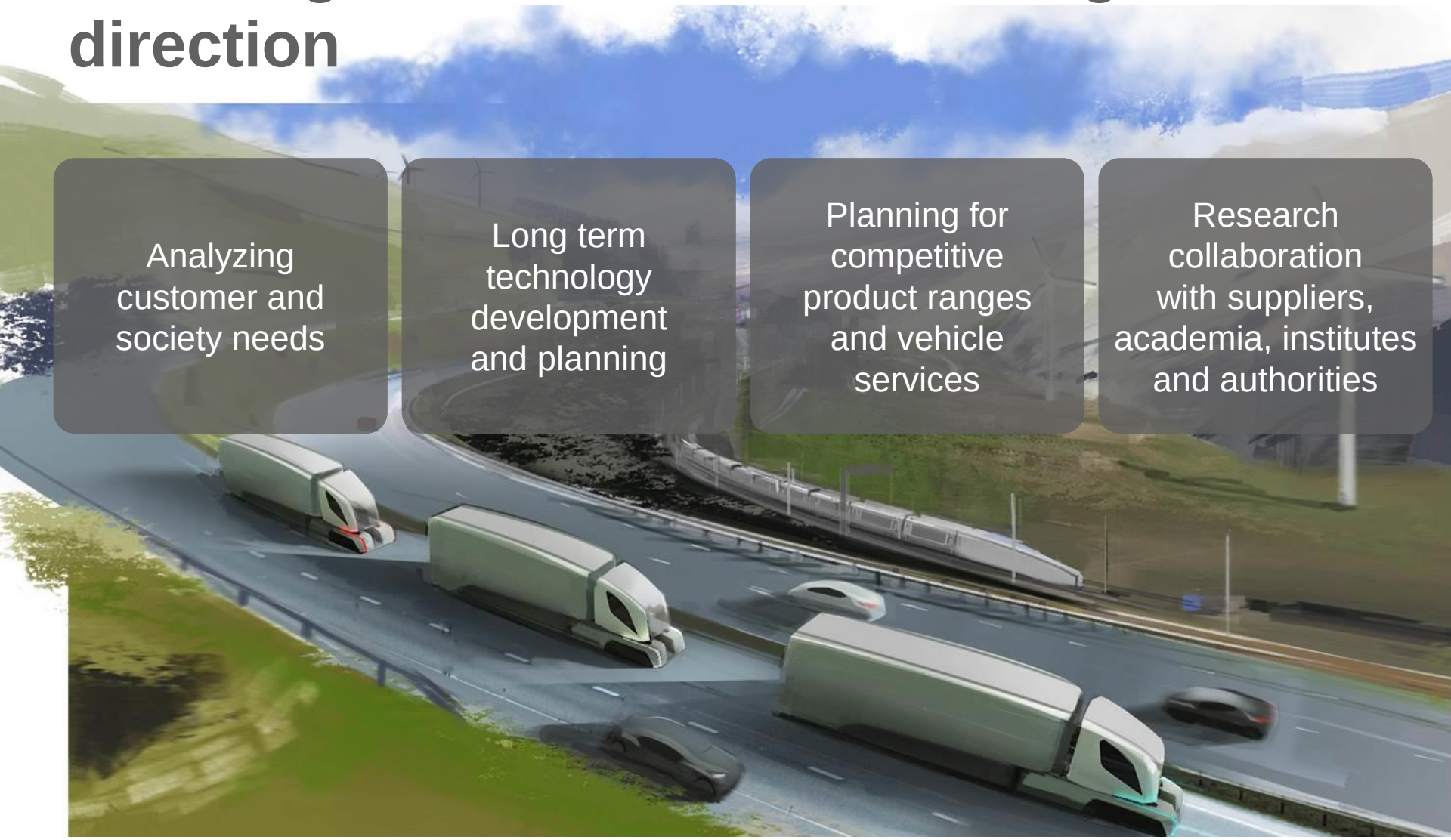
Renault Trucks

Terex Trucks

Volvo Penta

JV = Joint Venture
SA = Strategic Alliance

Planning for the future and setting the direction



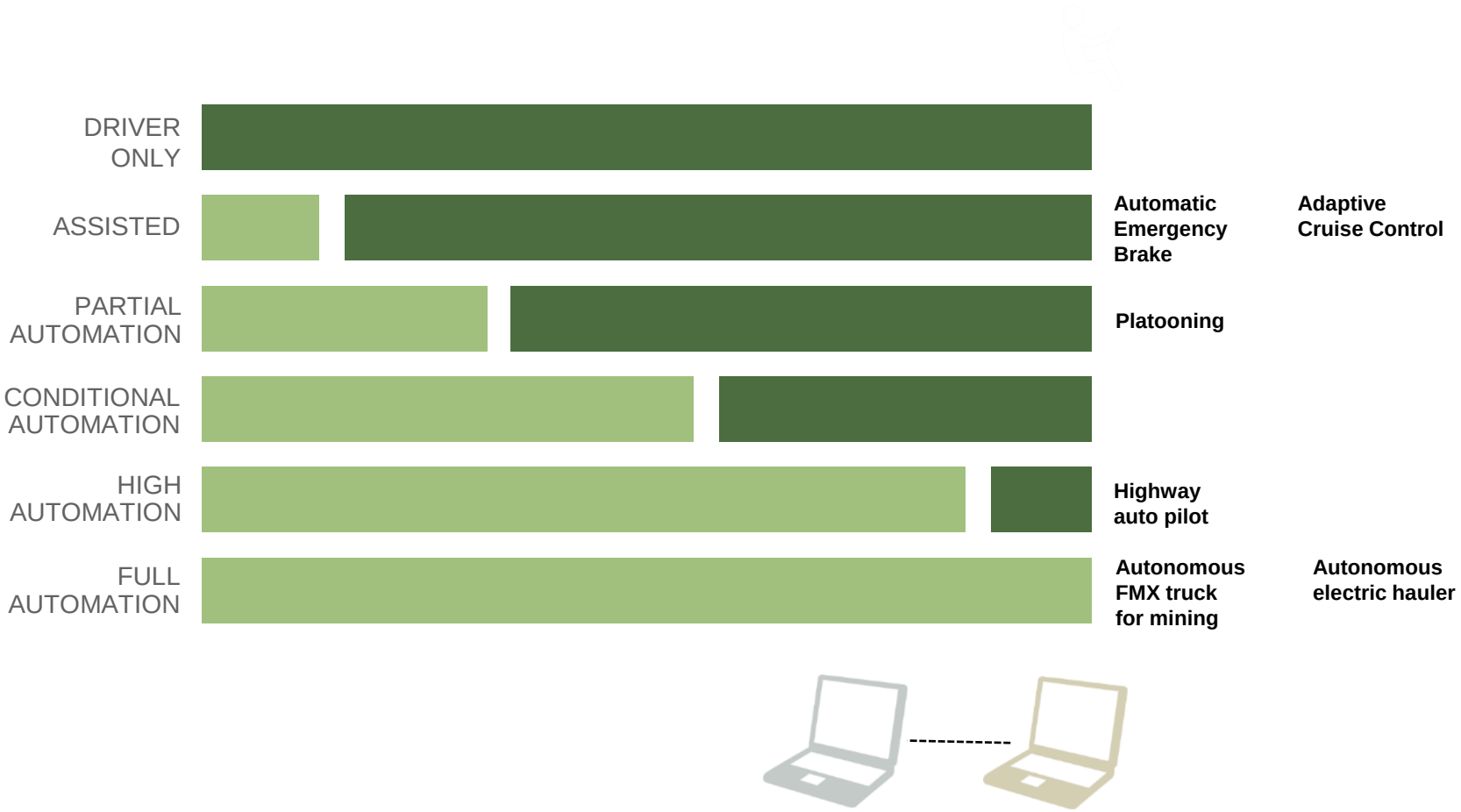
Analyzing customer and society needs

Long term technology development and planning

Planning for competitive product ranges and vehicle services

Research collaboration with suppliers, academia, institutes and authorities

Different levels of automation introduced in parallel



Different solutions for different needs

Automation in confined areas

Automated maneuvering

Urban automation

On-road automation

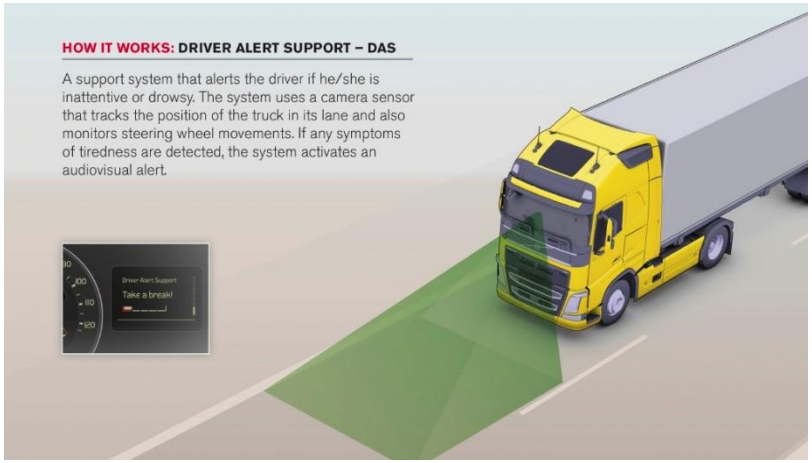
Traffic Safety
- In the hands of the human factor

Volvo's Accident Research Team has been learning from real life accidents since 1969

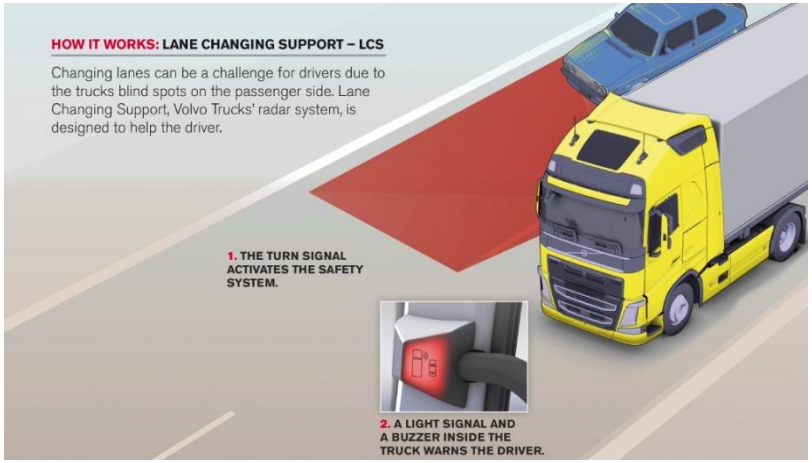
10%	30%	90%
		
Vehicle-related	Road environment	Driver-related

Active Safety products

Driver Alert Support

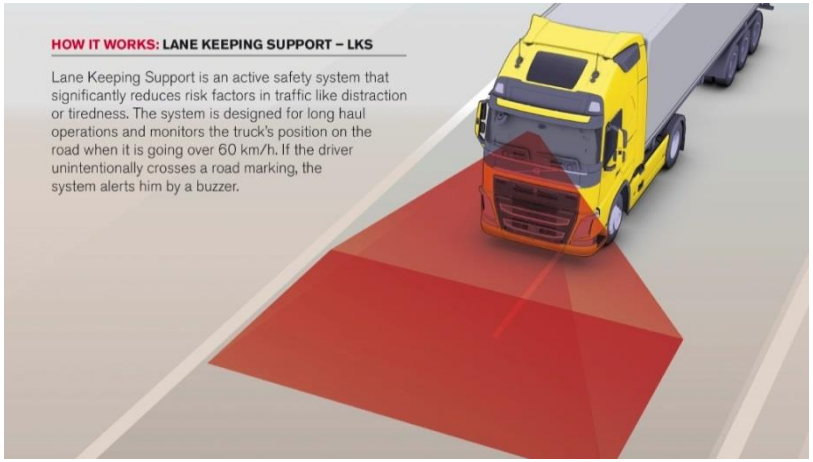


Lane Changing Support



Lane Keeping Support

Adaptive Cruise Control



On Road: ADAS towards Autopilot

Customer Value

- Safety, Productivity, Convenience

Technology

- Environment perception - sensor and sensor fusion
- Vehicle control and decision

Challenges

- Safety
- Environment perception
- Acceptance
- Regulation
- Infrastructure
- Human factors
- Transistion of control

Collission Warning with Emergency Brake

Collaborative ACC towards Automated Platooning

Customer & society Values

- Safety, fuel savings & traffic flow

Definition

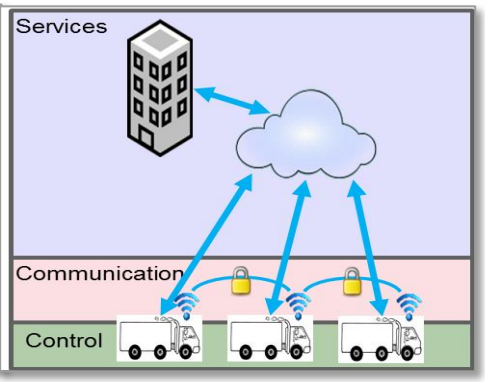
- Communication between trucks for cooperative driveline control and safety

Technology

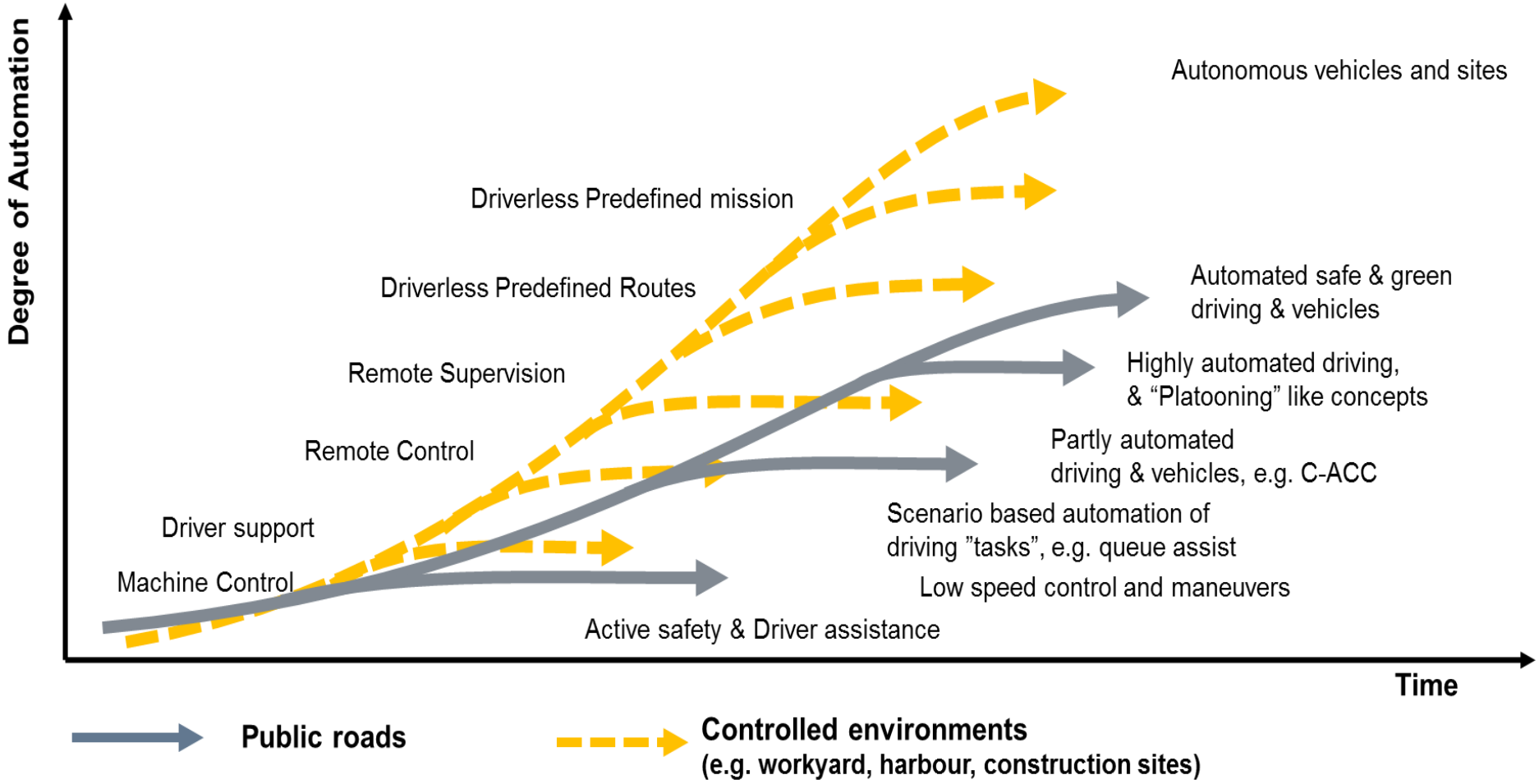
- V2X communication
- High integrity safety

Challenges

- Vehicle to Vehicle introduction cross brand
- Safety sets the limits on time-gap
- User and society acceptance (time-gap and platoon length dependant)
- Regulation and certification



Automation from Controlled Environments towards Public Roads



Confined Area & Terminals

Customer Value
- Productivity
- Safety
- Energy Efficiency

Definition
- Automated hauling systems
- Low speed scenarios

Technology
- Fully autonomous vehicles
- Site management & control

Challenges
- Localisation
- Site production system integration

Automated mining truck

Electric automated hauler

Autonomous Refuse Truck in the Urban Environment

Customer Value
- Productivity and Safety
- Improved working condition
- Lower environmental impact

Definition
- Automated refuse handling

Technology
- Automated vehicles
- Reversing operation
- Site management & control

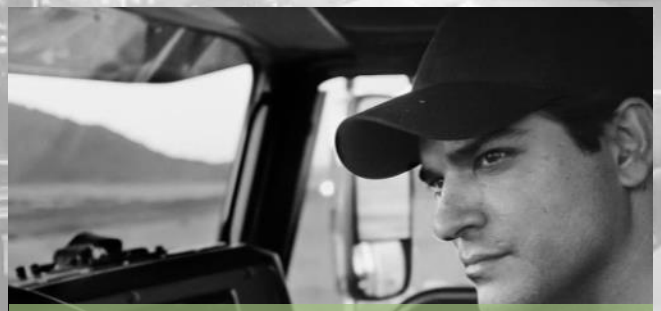
Challenges
- Localisation
- Manuvering
- Recycling system integration

***Volvo Group**, together with Swedish waste and recycling specialists **Renova**, is testing a pioneering autonomous refuse truck that has the potential to be used across the urban environment. The project explores how automation can contribute to enhanced traffic safety, improved working conditions and lower environmental impact*

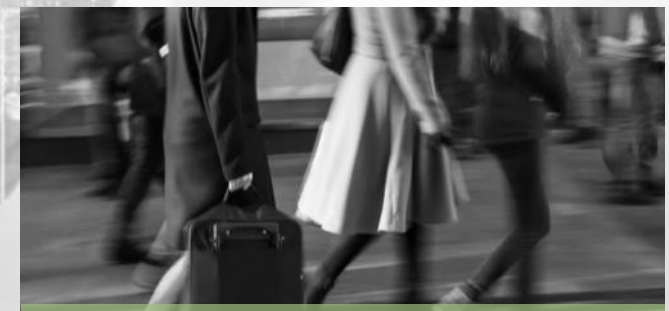
Industry and society need to work together

Standards, rules and regulations

Cyber security



The role of the driver



Social acceptance

Working Group:
Connectivity & Automated Driving
Roadmap Update in Progress

Automated Vehicle Development Paths for Freight Transport

Extract from the final version 7.0

29 May 2017

ERTRAC Roadmap on Automated Driving

New 2017 version: full update!

- ✓ Common definitions agreed by the industry
- ✓ Up-to-date development paths for 3 applications
- ✓ Updated information on EU and national initiatives
- ✓ New structure for 11 key challenges
- ✓ Recommendations for H2020 WP2018-2020

Why Automated Driving?

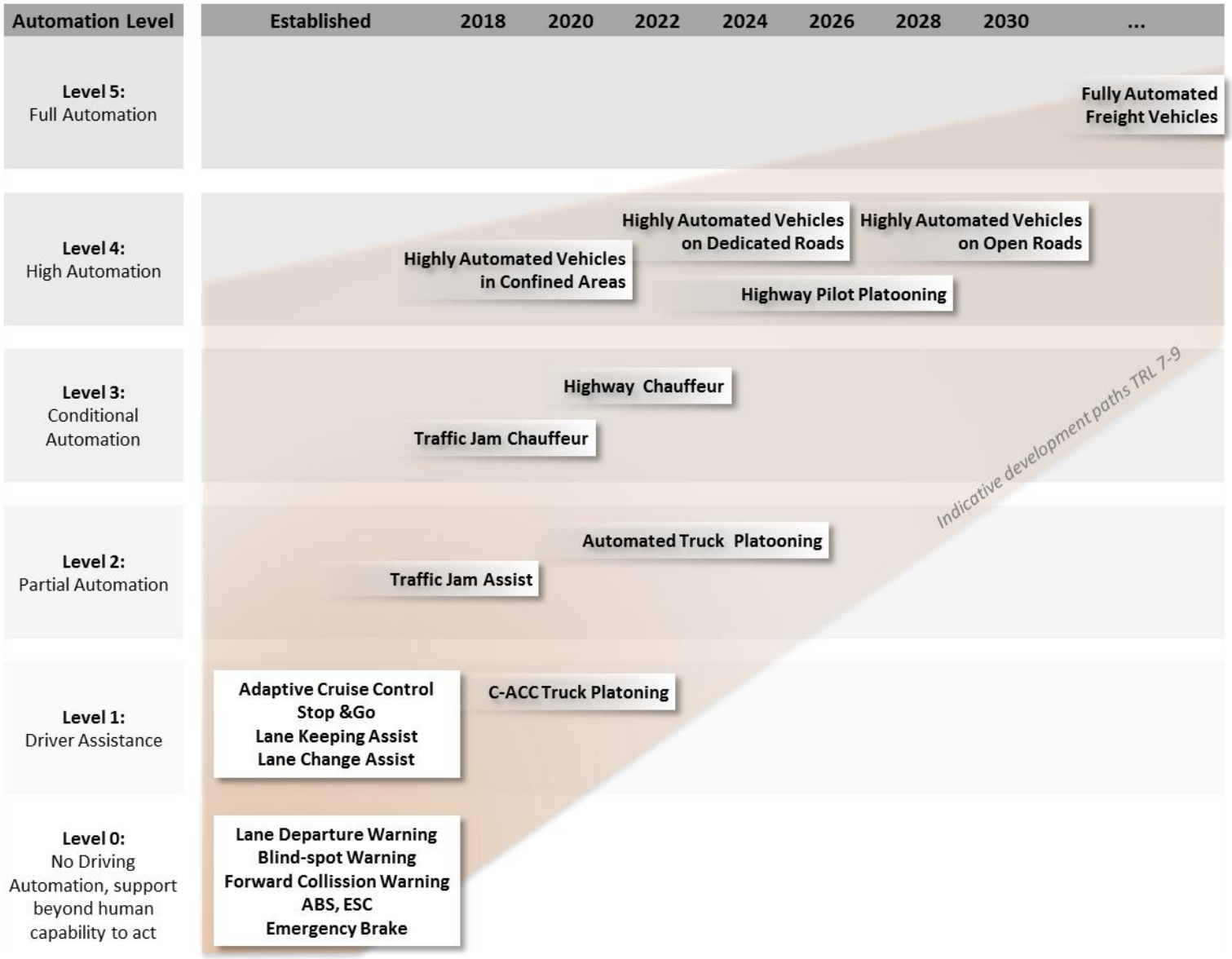
Automated Driving is seen as one of the key technologies and major technological advancements influencing and shaping our future mobility and quality of life. The main drivers for higher levels of Automated Driving are:

- **Safety:** Reduce **accidents** caused by human errors.
- **Efficiency and environmental objectives:** Increase **transport system efficiency** and reduce time in congested traffic. Smoother traffic will help to decrease the energy consumption and emissions of the vehicles.
- **Comfort:** Enable user's **freedom** for other activities when automated systems are active.
- **Social inclusion:** Ensure **mobility** for all, including elderly and impaired users.
- **Accessibility:** Facilitate access to city centres.

Road Definitions

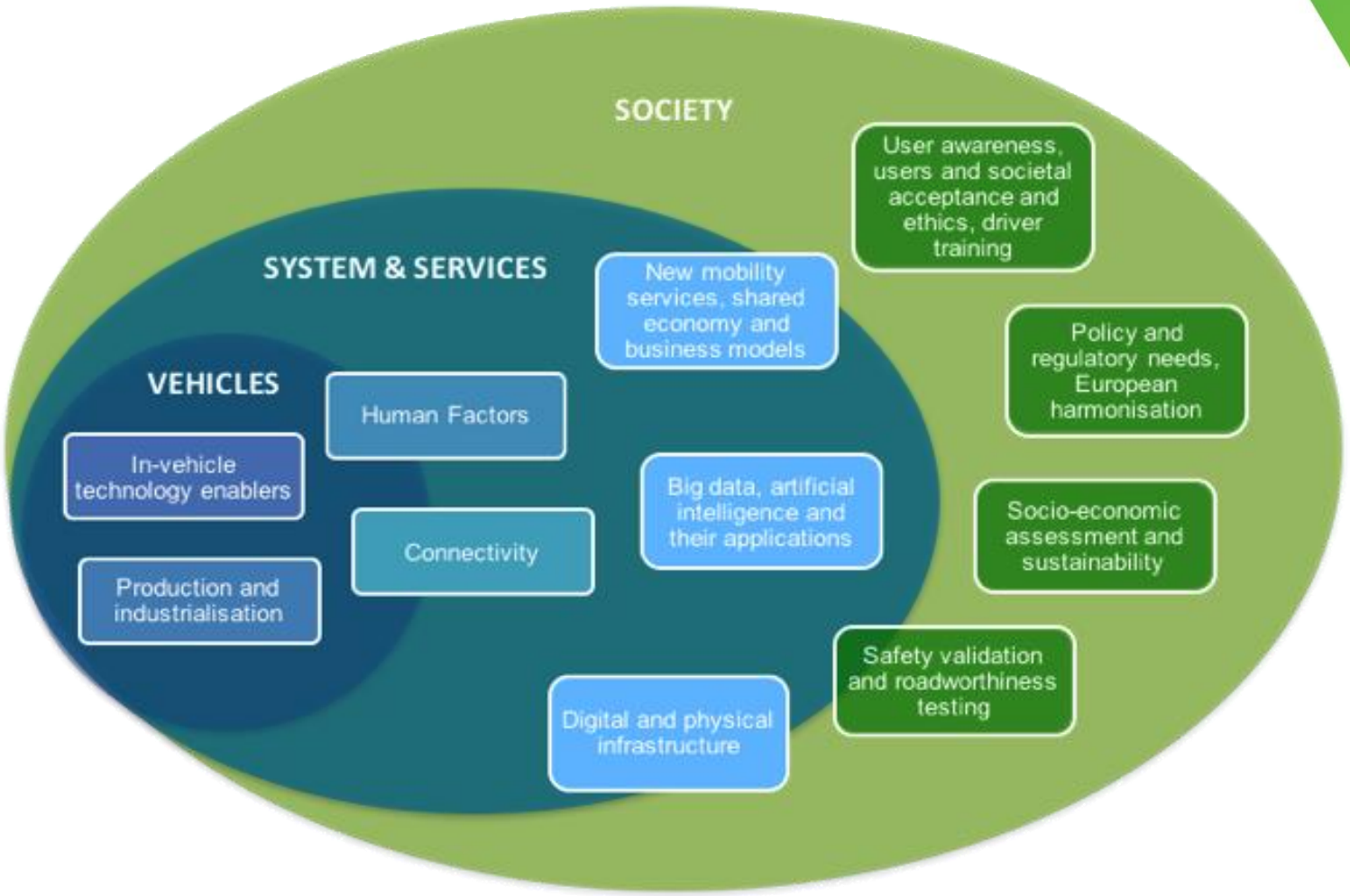
- **Public road** with mixed traffic in single or multiple lane operation on regional, and highway operation, various automation level vehicles. Local, regional, national and European and cross boarder regulation needs to be taken into consideration when targeting automation level.
- **Dedicated road/lane** where vehicles with defined automation level are allowed but the area is not confined, such as parking areas and dedicated lanes . Higher level of automation could be considered.
- **Confined areas** with restricted access control, such as terminal areas and ports. Full automation for autonomous vehicles could be considered.

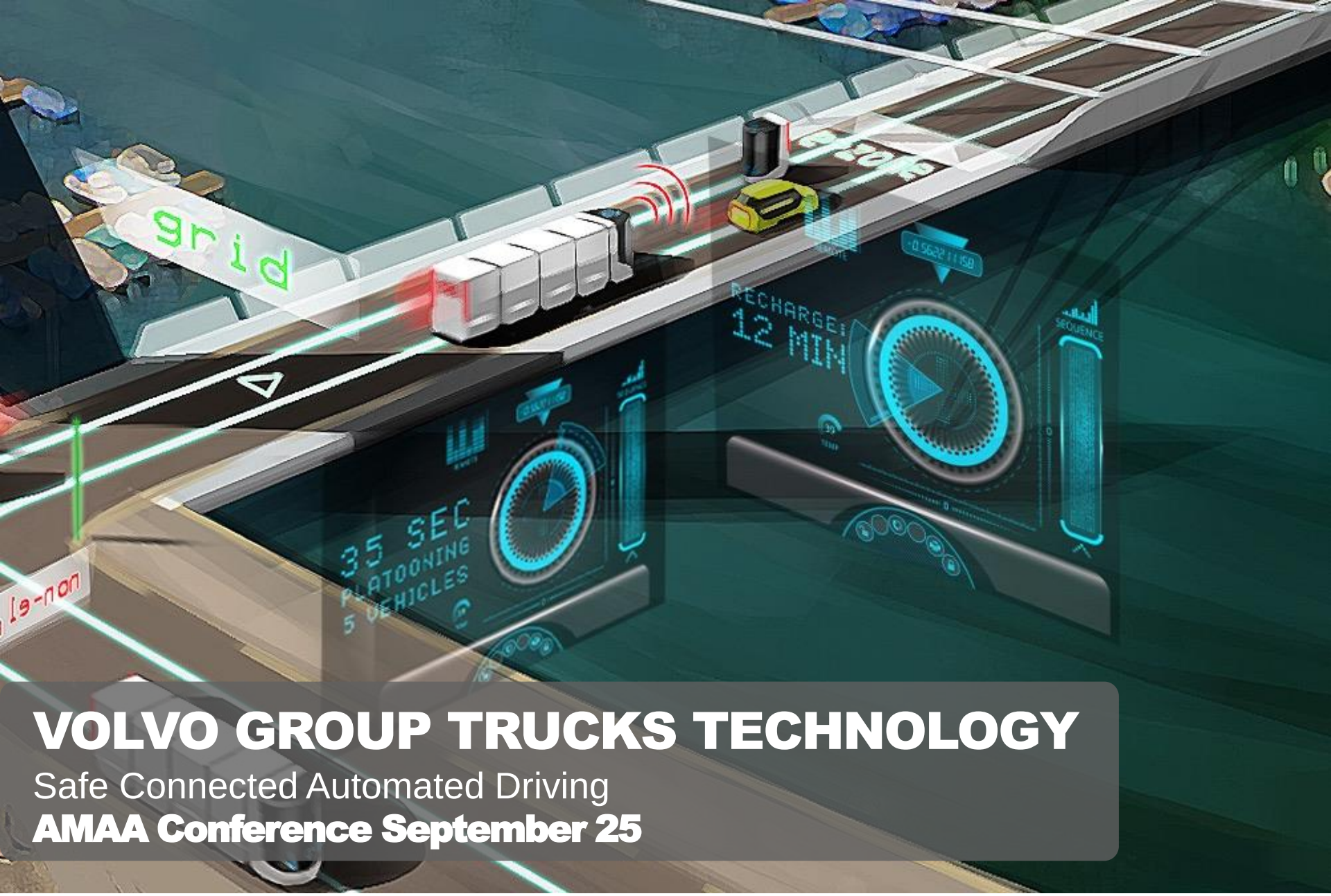
Automated Freight Vehicle Development Paths



Truck: Freight vehicle > 3.5 tonnes categorie N2 or N3

Key Challenges on the Path to Higher Levels of Automated Driving





VOLVO GROUP TRUCKS TECHNOLOGY

Safe Connected Automated Driving

AMAA Conference September 25