The Volvo Group is one of the world’s leading manufacturers of trucks, buses and construction equipment and drive systems for marine and industrial applications.
The Volvo Group, which employs about 100,000 people, has production facilities in 19 countries and sales of products in more than 180 markets.
Drivers for automation of commercial vehicles

Safety

Environmental

Productivity & Cost
Safety

CW-EB
Collision Warning with Emergency Brake
Active Safety Systems in Production

ESP

FCW - AEBS

ACC

LCA

LKS

VDS

Volvo Trucks’ new steering system ‘Volvo Dynamic Steering’ improves the truck’s manoeuvrability in any driving situation. It works through a precisely controlled electric motor. The motor is controlled 2000 times per second, based on the input from the driver and the on board sensors. This creates highly precise steering.
Evolution of automated vehicle systems

- Stepwise approach

- Important aspects
  - Speed regions
  - Road types & use scenarios
  - "Out of the loop" time perspective

- Driver - system HMI: a key factor for user acceptance

- Dependability & liability

Diagram:
- ABS ➔ CC ➔ ACC ➔ Stop&Go ➔ Highly Automated driving
- ~15 years ➔ ~? years

Volvo Group Trucks Technology
Advanced Technology & Research, Lars Bjelkeflo, 17th international task force on vehicle highway automation
Environment
Productivity & Cost

- Utilization rate
- Fuel & energy consumption
- Wear & Tear
- Personnel Cost
- Optimization – process control
- Quality

Safety
- Active safety
- Accident Risk control
- Insurance & societal costs

Environment
- Emissions
- Traffic flow

Controlled environments
A Production Process Approach
Automation a way to increase efficiency
Two main application areas for highly automated vehicles

Public roads

- Important factors
  - Type of road networks
    - Motorway, regional, city, and inter-regional
    - Infrastructure adaptation
  - Automation – scenarios based
  - Regulatory framework - legal aspects
  - Public acceptance

Controlled environments

- e.g.
  - Harbour areas
  - Goods terminals
  - Mine areas
  - Industrial and construction sites
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Volvo perspective
Automation & Active Safety

Business models, Public opinion & acceptance, Regulations & Legislation

External Influences

Controlled areas - Functions & Features

Automated functions - Features & Functions

Manual

Machine control

Public roads - Functions & Features

Automation

ACC, LKS, LCS, DAS

CW-EB (AEBS)

Technologies & Methods

Sensor technologies e.g. Laser, Vision, Radar

Maps and positioning technologies

Actuators

HMI

ITS, Control & communication platforms

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Volvo Group related business areas

**Volvo Trucks** - One of the world's largest manufacturers of medium and heavy trucks for long-haul and regional transportation, as well as infrastructure projects.

**Volvo Bus** - One of the world's largest manufacturers of heavy buses; also delivers chassis, transport solutions and telematic systems.

**Volvo Construction Equipment** - One of the world's leading manufacturers of construction equipment, such as articulated haulers, wheel loaders, excavators, compactors and pavers.

**Mack Trucks** - One of the leading manufacturers of heavy trucks in North America; one of the strongest brands in heavy trucks in the North American market.

**Vehicle Automation** - two ways forward with many synergies

**Controlled environments**

- Public roads
- Road machinery
- Graders
- Excavation equipment
- Crawler excavators from Lingong
- Pavers
- Asphalt milling machines

**Skidsteer loaders**

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The vision....
Automated Queue Assistance:

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Interventions Strategies (2010-2013)

- Collision avoidance
- Run-off road prevention by braking and steering
- Stability considerations for heavy vehicles
- Interaction and Warning Strategies
Example - SARTRE
- European Platooning project
SARTRE
Platooning (2009-2012)

• Led by Ricardo (UK) and with participation of among other partners Volvo Trucks and Volvo Car.

• SARTRE have developed a platoon lead by a commercial vehicle (Truck) and follow by one Volvo Truck and three Volvo cars

• All following vehicles are automatically controlled

• Main project objectives
  – Reducing environmental impact
    - by fuel consumption savings (~8-15%)
  – reducing congestions
    - by more efficient use of the road network
  – increased safety – the road train should be at least as safe as normal driving, and the platoon is lead by a professional driver
How the technology works

- The first truck is manually driven by a certified lead driver
- An electronic platton is created by the lead truck, communicated by the Wi-Fi link
- All following trucks and cars area following the breadcrumb trail, driving in the same wheel tracks as the truck in front
- The spacing between the vehicles is kept automatically at a defined distances, down to 5m using a combination of radar and Wi-Fi data
Japan Platooning trucks project
Demonstration vehicle – UD Trucks

JARI and UD Trucks (Volvo) together with 3 other Japanese truck makers built a CACC demonstrator to show that the technology can be deployed for different brands in combination.
Japan Platooning trucks project
Demonstration vehicle – UD Trucks

JARI and UD Trucks (Volvo) together with 3 other Japanese truck makers built a CACC demonstrator to show that the technology can be deployed for different brands in combination.

ITS WC sessions

- Executive session: ES01
- Host selected session: HS02
- Technical session: TS057
- Show case: N03
- Post congress tour: PT6
Interventions Strategies (2010-2013)

- Collision avoidance
- Run-off road prevention by braking and steering
- Stability considerations for heavy vehicles
- Interaction and Warning Strategies
AdaptIVe

Project overview

Budget: EUR 25 Million
European Commission: EUR 14.3 Million

Duration: 42 months (January 2014 – June 2017)

Coordinator: Aria Etemad,
Volkswagen Group Research

8 Countries: France, Germany, Greece, Italy, Spain, Sweden, The Netherlands, UK
Autonomous Wheel Loader
The Automation puzzle

Customer needs & application scenarios

User acceptance, liability & legal framework

Technology, opportunities, limitations & dependability

Production / logistic & fleet management
The Vehicle is an integral part of the customer’s production process

Thanks for your attention!

Lars Bjelkeflo, Volvo Group Trucks Technology, Advanced Technology and Research