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TNO

Truck platooning: a significant impact
21st ITVHA meeting, Montreal, 29th of October 2017
TNO

• TNO
  – Netherlands Institute for Applied Scientific Research
  – Since 1932, 3.500+ employees world-wide
  – Global presence and projects

• TNO Automotive
  – Power Trains (PT)
  – Integrated Vehicle Safety (IVS)
    • To maximize the operational and functional safety of vehicles by implementation of connected automated driving through integrated control solutions that are robust and reliable for handling real-life scenarios.

October 29th, 2017
Multi Brand Platooning Ensemble

- Pave the way for the adoption of multi-brand truck platooning in Europe
- Improve traffic safety, throughput and fuel economy.
- Demonstrate six differently branded trucks in one (or more) platoon(s)
- Real world traffic conditions
- Across national borders.
Tactical Layer

Environmental Sensor Suite
Vehicle Dynamics Sensors

Platoon Coordinator
V2X Consistency Checker
Failure Detection & Identification

Vehicle Platform

Low-Level Control Systems (brake management, engine management)

OEM-specific

Platoon Comm Suite

V2X (ITS-G5) + Antennas
Cellular Comm. (LTE) + Antennas

Operational Layer

Sensor Fusion
Platoon Control Systems (cruise control, distance control)
Driver HMI

Failure Detection & Identification

White-Label

Platoon Comm Suite

OEM-specific

OEM-specific

V2X (ITS-G5) + Antennas
Cellular Comm. (LTE) + Antennas

White-Label

ITS WORLD CONGRESS 2017
Montréal | OCTOBER 29 - NOVEMBER 2
Impact

EU-wide accelerated deployment of multi-brand platooning

- CO2 emission
- Traffic Safety
- Road throughput
- Standardization
- Legal framework
- Business
- Market opportunities & Competitiveness
- Labour cost
- Fuel consumption
ROADART

• ROADART aims to improve robustness of wireless communication on hardware (antennae design, platform), software (beamforming) and also at the application side (WP5).

• Obtain robustness on the application layer against wireless communication impairments, in particular packet losses and (time-varying) latency, utilizing ROADART communication system characteristics.

• Cooperative Adaptive Cruise Control (CACC) is chosen as the cooperative driving application of interest, being both time-critical and safety-critical.
ROADART

• CACC design (nominal functionality):
  – CACC control design for a test truck.
  – Localization solutions for T2T-enabled platooning in tunnels

• Fault-tolerant cooperative driving
  Fault tolerance of the system, in particular with respect to packet loss and (time varying) latency of the wireless communication system.

• Fail-safe cooperative driving
  Ensure safety in the transient phase of fault-tolerance mechanisms, collision avoidance functionality must be present
Visit Monday’s session (SIS 30: 13:45h) to learn more about the EcoTwin III Project.
Truck Platooning - Real life cases
Intended to be elaborated in 2016 - 2018
(First inventory, 31 May 2016)
UK HGV Trials

Deliver Safety & Cyber Security Evidence
- For platooning drivers
- For other road users
- Cyber security V2V control systems
- Platooning risk rated Strategic Road Network map

Qualify Environmental Benefits
- Fuel consumption
- Emissions

Determine Commercial Viability
- Effects on logistics schedules
- Vehicle maintenance
- Driver workload

Evaluate & Assess Impact
- Infrastructure
- Traffic management
- Platooning operators
- Human factors & behaviour

Acceptance of Technology & Standards
- Engage and educate general public
- Inform industry bodies
- Influence standards & regulations

October 29th, 2017

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Deepening understanding of value

**BUSINESS VALUE**

- Fuel consumption
  - 1st truck 8% @ 0.3s~2.0 L/100 km
  - 2nd truck 13% @ 0.3s~3.3 L/100 km

- Asset utilisation optimisation
  - Reduced truck idle time; enhanced efficiency

- Labour costs
  - Driver efficiency optimisation driving/resting times

**SOCIETAL VALUE**

- Benefits of Truck Platooning
  - Emission reduction
  - Road capacity optimisation
  - Less congestion
  - Increased traffic efficiency

- Safety and damage
  - >90% of accidents and damages caused by human error

- Through mileage improvements
  - 2.6 kg CO₂/L diesel

2015

2017
Partners making the value case possible

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Rijkswaterstaat
Ministry of Infrastructure and the Environment

**CO-CREATORS**

Ministerie van Infrastructuur en Milieu

Port of Rotterdam

evo fenedex

**EXECUTION**

TNO innovation for life

Visit Tuesday’s session (SIS 57: 13:15h) to learn more about the Value Case for truck platooning

smartwayz.nl

INNOVATIE CENTRALE

ROADMAP NEXT ECONOMY

TKI DINALOG
Dutch Institute for Advanced Logistics

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Challenges for large scale deployment

• Facilitating **cross-border large scale pilots** on the public road (pre-competitive, multi-stakeholder) to speed up the development & deployment of automated vehicles in mixed traffic.

• Combining & processing **large amounts of vehicle data** from different stakeholders to enable the development of safe, robust and reliable automated vehicles & automated mobility solutions, while safeguarding confidentiality, cyber security and personal privacy.

• Increasing the mutual trust to **exchange information between different brands** to unlock the full potential of cooperative vehicle automation and minimize the accidents in safety-critical scenarios.

• Agreeing on a **clear legal and legislation framework** that supports efficient development, testing, validation and homologation, that is aligned with operational and functional safety requirements.
Assessment & validation methodology

- Validate & test AD functionalities using real-life scenarios, based on driving data sets from multiple contributors
- Extract characteristic parameters using Big Data Analytics
- Build parameterized events and scenarios
- Monitor the completeness of scenario sets
- All contributors can use the real-life scenario database

To speed up large-scale deployment of truck platooning we need to reinvent / redefine the safety assessment and homologation process:

TNO invites you all
to join the StreetWise initiative and build a scenario database for real-life safety assessment of automated commercial vehicles together.

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Questions

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