



DELIVERABLE REPORT

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Executive summary

The objective of the EU-funded project TRANSFORMERS is to demonstrate highly efficient truck-trailer concepts for long-haulage applications. Therefore, TRANSFORMERS combines a modular approach for mission rightsizing by means of hybridization, truck engine downsizing and a trailer design that addresses simultaneously aerodynamics and load efficiency improvements. The overall goal is to achieve a 25% higher load efficiency (in energy/km.tn) in a real world application, while taking the needs to maintain road infrastructure and traffic safety into account.

A key innovation of TRANSFORMERS is the so-called Hybrid-on-Demand-Driveline (HoD-Driveline). For the first time, this system enables an augmentation of conventionally driven trucks and tractors to fully functional mission-adaptable hybrid vehicles, simply by coupling them to an innovative trailer equipped with an electric driveline. Hence, the HoD-Driveline concept is applicable to many kinds of truck-trailer combinations.

In addition to the HoD-Driveline concept TRANSFORMERS develops a pre-standard HoD-Framework. The objective of this framework is

- to ensure the interoperability of the HoD-Driveline concept with today's and with future trucks featuring advanced energy management capabilities,
- to provide a slim common interface between trucks and trailers, that requires only minimal changes in trucks.

Deliverable D3.2 provides a first holistic draft of the Hybrid-on-Demand Framework including

- Specification of the logical and E/E-architecture of the HoD-Driveline,
- Specification of the involved interfaces, and
- Specification of the functions of affected electronic control units.

In conjunction with deliverable D3.1 the document at hand describes a multi-domain driveline architecture for the HoD-Driveline concept, which provides key features like

- Mission-based rightsizing,
- Modularity,
- Extensibility, and
- A high level of interoperability with today's and future trucks.

This objective is achieved by using standard communication busses only, which are widely adopted in commercial vehicles. However, the HoD-concept is not expected to be applicable to legacy trucks. Although, the technical adaptations are rather limited the required testing and validation costs for the new safety related HoD system probably prevents a retrofitting solution from a commercial point of view.

In order to foster the whole energy saving potential a new, high-bandwidth interface for truck-trailer communication is recommended. The current ISO 11992 (Second edition, released on 15. 04. 2003) is limited in both, bandwidth and in the transmittable signals, which are defined in the standard. A new interface enables a higher integration level of vehicle energy management system and HoD-Driveline, which in turn allows energy optimal control on a comprehensive scope.

The Transformers consortium will continuously refine the HoD-Framework description according to new findings expected to be revealed during demonstrator development. This could not only affect adaptations to the specified interfaces (parameters and messages) and ECU functions but also adaptations to the scope, capabilities and features described in deliverable D3.1.

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List of Acronyms

Table 0-1: List of Acronyms

Akronym	Description
ABS	Anti-lock Braking System
ASR	see TCS
CC	Cruise Control
DA	Destination Address
EBS	Electronic Braking System
EBSI	Electronic Braking System Interface
EMG	Electric Motor Generator of the trailer
EMGI	Electric Motor Generator Interface
ESU	Energy Storage Unit of the trailer
ESUI	Energy Storage Unit Interface
HoD	Hybrid-on-Demand
HoDD	Hybrid-on-Demand-Driveline
HoDF	Hybrid-on-Demand-Framework
ICE	Internal Combustion Engine
PDU	Protocol Data Unit (see e.g. ISO 11992 Part 3)
PF	PDU Format
PS	PDU Specific
PTO	Power Take-Off
SA	Source Address
SLOT	Scaling, Limit, Offset and Transfer function definitions in J1939
TCS	Traction Control System
TDMS	Trailer Driveline Management System
TEBS	Trailer Electronic Braking System
TEMS	Trailer Energy Management System
TDN	Trailer Drivetrain Network
VCU	Vehicle Control Unit
VCUI	Vehicle Control Unit Interface
VDC	Vehicle Dynamics Control
VEMS	Complete Vehicle Energy Management System

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