Submitted by the IWG on FRAV

Informal document **GRVA-10-31/Rev.1**
10th GRVA, 25-28 May 2021
Provisional agenda item 4(a)

FRAV Status Report to the 10th GRVA Session

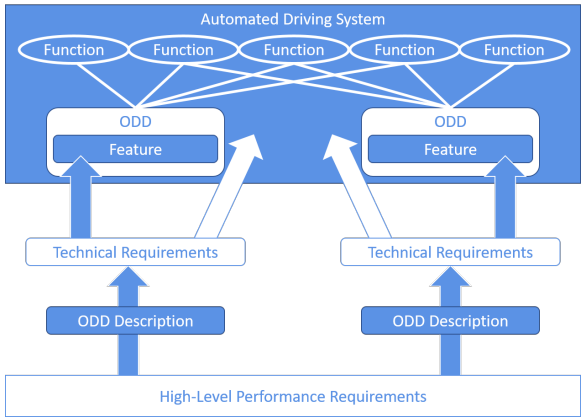
Web Conference

25 May 2021

FRAV

FRAV progression

Diversity of ADS and ODD → 142 safety proposals → Five “Starting Points” → List of “Safety Topics”



1. ADS drives safely
2. ADS interacts safety with user(s)
3. ADS responds safely to critical events/conditions
4. ADS safely manages damage/malfunction
5. ADS maintains safe operational state

Originally, 40 topics related to safety needs and goals for ADS performance across the five dimensions covered by the starting points

FRAV initially addressed the diversity of ADS applications and developed a framework to enable the application of safety requirements to any ADS configuration.

FRAV gathered input from across all stakeholders, including national and regional guidelines to develop a framework covering the full range of anticipated safety needs.

FRAV progression

Safety topics review	Tasks/Objectives	Common Understanding	Safety Needs
19 pages of comments on interpretation and elaboration of safety topics, covering 43 topics (FRAV-12-08). Multiple references to “DDT”, “ADS user(s)”, and “other road users” indicated need to reach common understanding. Comments included concept for “guardrails approach” to ADS driving requirements.	Three workstreams: 1. Dynamic Driving Task 2. ADS users 3. Other road users Three milestones: 1. Common understanding 2. Application to define safety needs 3. General requirements to address safety needs	**DDT**: FRAV-14-07/Rev.1 **ADS users**: Working on descriptions of user roles/ responsibilities **ORU**: Definition of common and special physical, functional, and/or behavioral properties based on ORU cases **New task**: Apply DDT understanding to relevant safety topics with aim to propose safety requirements	Identify safety needs relevant to the diverse roles human users may have across ADS configurations and to ORU based on the common and special properties, based on elaboration of safety topics. Consensus on approach(es) to addressing safe ADS performance of the DDT (nominal and safety-critical conditions) building from safety topics.

FRAV status: Workstreams

- DDT functions (FRAV-14-07/Rev.1)
  - Consensus understanding and framework based on Perception, Planning and Decision, and Control
- ADS users (FRAV-14-08)
  - Different user roles depending upon ADS vehicle configuration and relationship to user(s)
  - Role of user may vary even during a single trip
  - Requirements to ensure correct use and prevent misuse
- Other road users (FRAV-14-06)
  - ORU have different physical, functional, and behavioral properties
  - Safety needs and nature of interactions depend on these properties
  - Requirements to ensure safe interactions and ADS responses

DDT-related safety task

- Derive general safety requirements from the safety topics
- Based on the common understanding of the DDT
- Consider “guardrails approach” to safety requirements

Guardrails Concept

Safe driving involves multiple options for responses under dynamic conditions. Criteria for ADS safety should not prescribe exact driving maneuvers but should provide parameters within which safety is achieved.

The requirements should provide manufacturers with flexibility to design systems that perform within this safety domain and meet the safety objectives.

FRAV forward plan

FRAV

General Requirements	Specifications	ADS descriptions	Package Delivery
General safety requirements addressing safety needs based on starting points framework and elaboration of safety topics. "General safety requirements" means definition of what should be verified for what reasons. Specifications (e.g., criteria, limits, formulas) would follow.	FRAV has discussed several approaches to defining specifications, especially related to ADS performance of the DDT: • Careful & Competent Human Driver • State of the technologies • Mathematical formulas (e.g., "safety envelopes") • Positive statistical risk balance Specifications need to address traffic efficiency and safety (such as "string stability") so combinations of methods are likely in finding optimal solutions.	Based on understanding of requirements, FRAV can return to its original framework to develop guidelines regarding documentation required to understand each ADS (e.g., configuration, intended uses, and limitations on use) and application of requirements.	Package consisting of guidelines for ADS documentation, safety requirements, and other guidance as needed to understand application of safety requirements to individual ADS applications.
(GRAV-11 September 2020)			(GRAV-12 February 2021)

FRAV input on EDR/DSSAD

- EDR/DSSAD informal group request
  - Input on data collection requirements for ADS vehicles
- Account for diversity of ADS configurations
  - ADS performance data
  - ADS user roles and interactions
- Account for different purposes/uses of data
  - Crash event analysis and reconstruction
  - ADS performance data for research, NATM development (in-service pillar)
- Account for technical aspects
  - Data locked on board vehicle
  - Data transmitted for analysis and reporting

Data Elements Matrix (Illustration purposes only)

Purpose of Data Collection	Applicability of Data	Data Set	General Description
Accident analysis/ reconstruction	All vehicles	A	Data on vehicle state/performance
	Conventional vehicles (no ADS)	B	Data on actuation of manual driver controls
	Vehicles equipped with an ADS	C1	ADS data on DDT performance
	Vehicles equipped with an ADS designed to interact with a user	C2	Data on user behavior/interactions with ADS
Evaluation of system operations/research/ assistance with accident analysis (L3-L5)	Vehicles equipped with an ADS	D1	Non-crash ADS operational performance data
	Vehicles equipped with an ADS designed to interact with a user	D2	Non-crash user interactions with ADS

Elements in the data sets are mutually exclusive (i.e., no duplication) and may be combined depending upon the vehicle configuration, for example:

- Conventional (manual only) vehicle → A + B
- ADS with human driver controls → A + B + C1 + C2 + D1 + D2
- Driverless passenger vehicle → A + C1 + C2 + D1+ D2
- Driverless commercial vehicle (no occupants) → A + C1 + D1

Thank you for your attention.
FRAV welcomes questions, comments, or suggestions.