FRAV and VMAD
What to expect and what to do (next steps)

The glue between FRAV and VMAD
(illustrative example of part of our 2024 output)

FRAV Requirements	VMAD validation pillar				
	Audit	Virtual	Track	Real-World	ISMR
Requirement 1					
ITERATION 1					
This is subrequirement A	No role in verification.	Virtual can verify in this way.	Maybe could be verified, but we have these questions.	Seems verifiable but need to decide how.	Seems verifiable but need to decide how.
This is subrequirement B	No role in verification.	Virtual can verify in this way.	Maybe could be verified, but we have these questions.	Seems verifiable but need to decide how.	Seems verifiable but need to decide how.
This is subrequirement C	Audit can verify in this way.	Seems verifiable but need to decide how.	No role in verification.	RWT can verify in this way.	ISMR can verify in this way.
ITERATION 2					
This is subrequirement A		Verified under Virtual in this way.	(Virtual testing is enough)		Maybe could be verified, but we have these questions.
This is a revised subrequirement B		Virtual can verify in this way.	Track can verify in this way.	RWT can verify in this way.	Seems verifiable but need to decide how.
This is subrequirement C	Audit verifies in this way.	Seems verifiable but need to decide how.		RWT verifies in this way.	ISMR can verify in this way.
ITERATION 3					
This is a subrequirement A		Verified under Virtual using this method.			ISMR can verify in this way.
This is a revised subrequirement B		Virtual can verify in this way.	Track can verify in this way.	(Track is a stronger way to test)	ISMR can verify in this way.
This is subrequirement C	Audit verifies in this way.	Seems verifiable but need to decide how.		RWT verifies in this way.	ISMR can verify in this way.

Requirement 2

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Legend	
	Not applicable
	Satisfactory
	Requirement needs more elaboration
	Translation to validation pillar needs more time

Explanation (1)

- We will deliver a matrix comprising of the relevant requirements defined so far, against the different validation pillars

- The objective is to elaborate both requirements and validation methods as much as possible to make them applicable within the given time frame (2024)

- Which validation pillars are used for a specific ADS, cannot be defined in advance and depends a.o. on the documentation/information provided by the manufacturer, outcome of other validation pillars

FRAV VMAD

Explanation (2): **Traffic scenarios** are an essential element for the development and application of validation methods and detailing of requirements

FRAV and VMAD work together

- **Scenario classification** - layers (classification by abstraction such as functional, logical and concrete) and types (aligned with requirements such as nominal, critical and failure)

- **Scenario Creation** - Scenario-generation methods based on ODD, OEDR (ORU safety) and other analyses, and examples of scenarios (i.e. limited initial Catalogue)

VMAD

- Template(s) of scenario

- procedures for maintaining catalogue(s)

    - Structure and/or requirements of catalogue(s)

- **Scenario Application** - to validation pillars

FRAV

- Behavioural competency definition
    - Global requirements
    - Traffic-rule conversions
    - Safety models
- **Scenario Application** - to safety requirements through behavioural competencies

Explanation (3)

- In order to reach the status "Satisfactory" we may need to develop/elaborate requirements/validation methods or clearly refer to existing documentation
- See the example of the FRAV User stream: [FRAV-31-10.xlsx (live.com)](live.com)

Context (1)

- Both requirements and validation methods are developed at a generic level supporting the '58, '97 and '98 Agreement (FDAV)

- Therefore, the output of FRAV and/or VMAD may require more detailing in the future for a specific ADS (due to ODD, functionality, technology)

- The outcome of these detailed requirements/methods will have to be considered for further incorporation in our delivered requirements/methods (2024)

- FRAV will provide not only (generic) requirements, but also a method to streamline the process of detailing requirements if within our mandate we do not manage to get to the desired level of detail

Context (2)

- We are breaking new ground in finding ways to validate ADS safety (i.e., **New** Assessment/Test Method).

- Given the infinite possibilities for driving conditions, the initial assessment of ADS **response** to driving conditions will have its limitation

- Validation of an ADS is to a certain extent validating the quality of the manufacturer's assessment (including testing)

- Introduction and further development of our new approach requires adequate and transparent **information-sharing** across Industry, Authorities and knowledge institutes, including WP.29.

- Many **unknown unknowns**—Our solutions must be **flexible and responsive** to safety needs as they are identified.

Relation with other WP.29 IWG's

- EDR/DSSAD: in principal, for functional requirements this group has no impact. However, for ISMR there is a relation with this group. If this would result in the amount or storage period of data, this could become an ADS requirement

- TF ADAS: for the sake of harmonization, it would be beneficial if TF ADAS takes over as much requirements and validation methods as possible from FRAV/VMAD. If, on the other hand, TF ADAS developes requirements/validation methods which could improve the FRAV/VMAD work, we should include this.

Relation with WP.1

- Information exchange on related topics such as:
  - harmonisation of traffic rules
  - digitalisation of traffic rules
  - requirements on behalf of law enforcement
  - requirements for external signalling to other road users
  - requirements for determining driving quality (universal traffic rules)
  - the trade-off between improvement of overall road safety against discriminatory solutions

Proposal next steps for 2023: finalize the high level model for FRAV and VMAD

- FRAV: provide concept of safety level for ADS and, on this basis, describe list of (sub)requirements including (where possible) pass/fail criteria and/or references

- VMAD: Indicate for each validation pillar if compliance with each requirement can be validated on basis of the existing NATM and if not, if the requirement needs to be detailed (FRAV) of if elaboration of the validation method is needed (VMAD)

- FRAV: describe the general process to support the future elaboration of requirements for those which cannot be tackled within our time frame

- VMAD: continue to finalize the open issues

- If we have completed our work at generic level and detailing for a specific level (e.g. 4 as requested by JRC) is possible, we could do so. This may help in developing and linking requirements and validation methods