Updated Proposal for an Approach to Defining Rules of the Road:
United Kingdom Proposal

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Motivation

FIRST PART: ADS Safety Topics

FRAV DDT Workstream

The ADS should drive safely

1. The ADS should be capable of performing the entire Dynamic Driving Task (DDT)
2. The ADS should recognize the ODD conditions and boundaries of the ODD of its feature(s)
3. The ADS should detect and respond to objects and events relevant for the DDT
4. The ADS should comply with traffic rules
5. The ADS should interact safely with other road users

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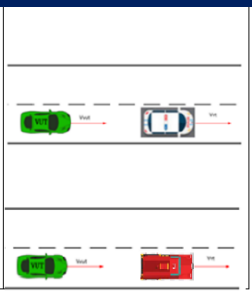
FRAV ORU Workstream

3	**The ADS should respond in line with traffic laws to markings and signals used to identify the functions and authorizations of ORUs.**	● The ADS should respond in accordance with traffic rules upon the operational status or dedicated signals displayed by emergency/enforcement vehicles.	**Scenario/Virtual test/Track test:** ● **Object:** Emergency/Special vehicle with visual signal (flash/painting), ego vehicle; ● **Case:** 2-lane road, an emergency vehicle moves at low speed (in operational state) ahead while test vehicle drives in the same lane.	

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5.1.2. The activated system shall comply with traffic rules relating to the DDT in the country of operation.

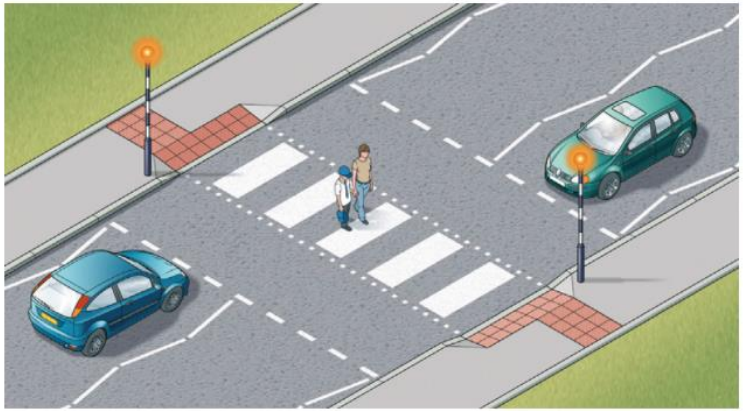
UNECE Reg 157

4.1.1. Verification of the function of "The System"

The Type approval authority shall verify "The System" under non-failure conditions by testing on a track a number of selected functions from those described by the manufacturer in paragraph 3.2. above, and by checking the overall behaviour of the system in real driving conditions including the compliance with traffic rules.

UK Highway Code: Rule 195

"As you approach a zebra crossing: look out for pedestrians waiting to cross and be ready to slow down or stop to let them cross; you MUST give way when a pedestrian has moved onto a crossing"



Rule 19: Zebra crossings have flashing beacons

How long to wait?

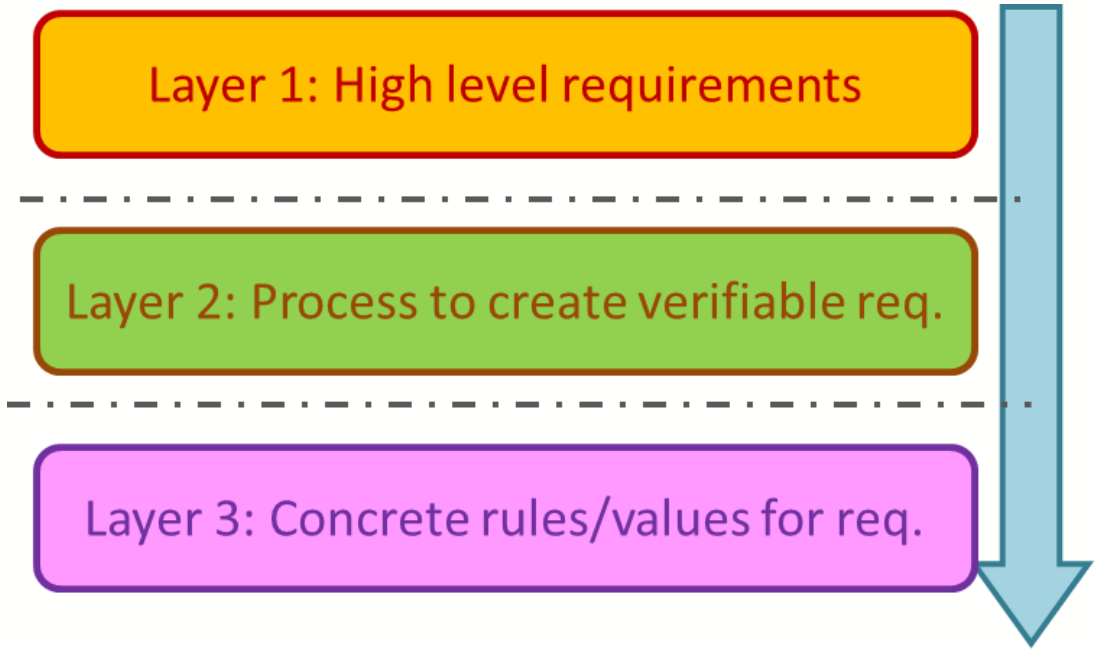
Behaviour | ODD | Assumptions

ODD based Codified Rules of the Road

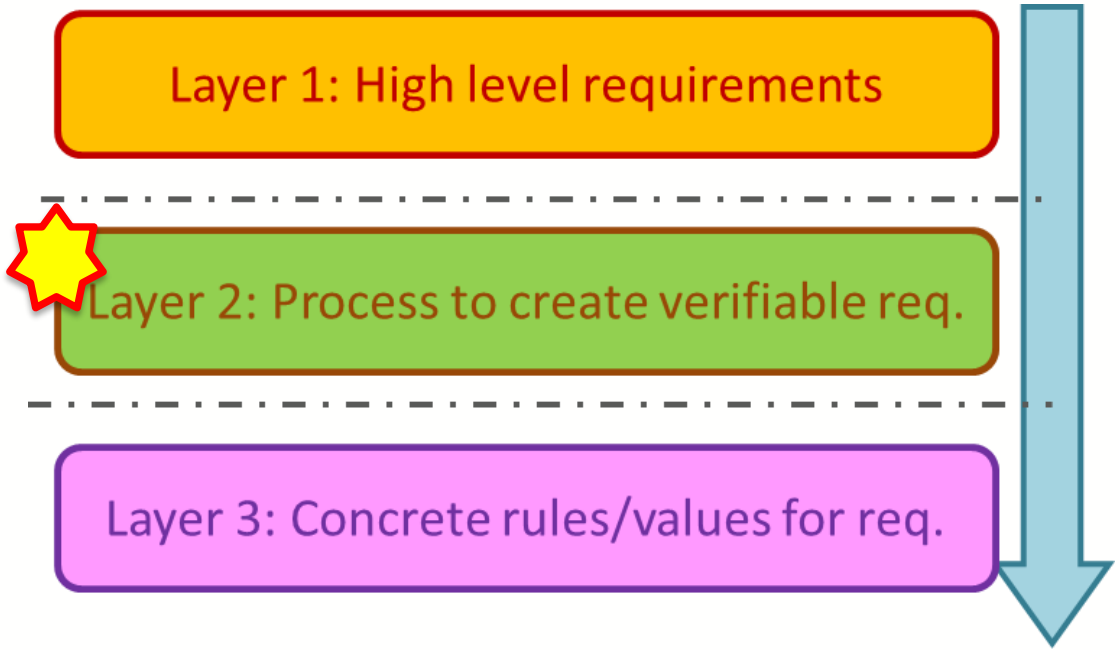
Current Rules of Road (for human drivers) = *f(Operating condition, Behaviour competency, Assumptions)*

Codified Rule of the Road = *f(Operating condition, behaviour competency, driving characteristics)*

Using Rules of Road in wider Safety Assurance



Focus for FRAV:
Process for deriving requirements



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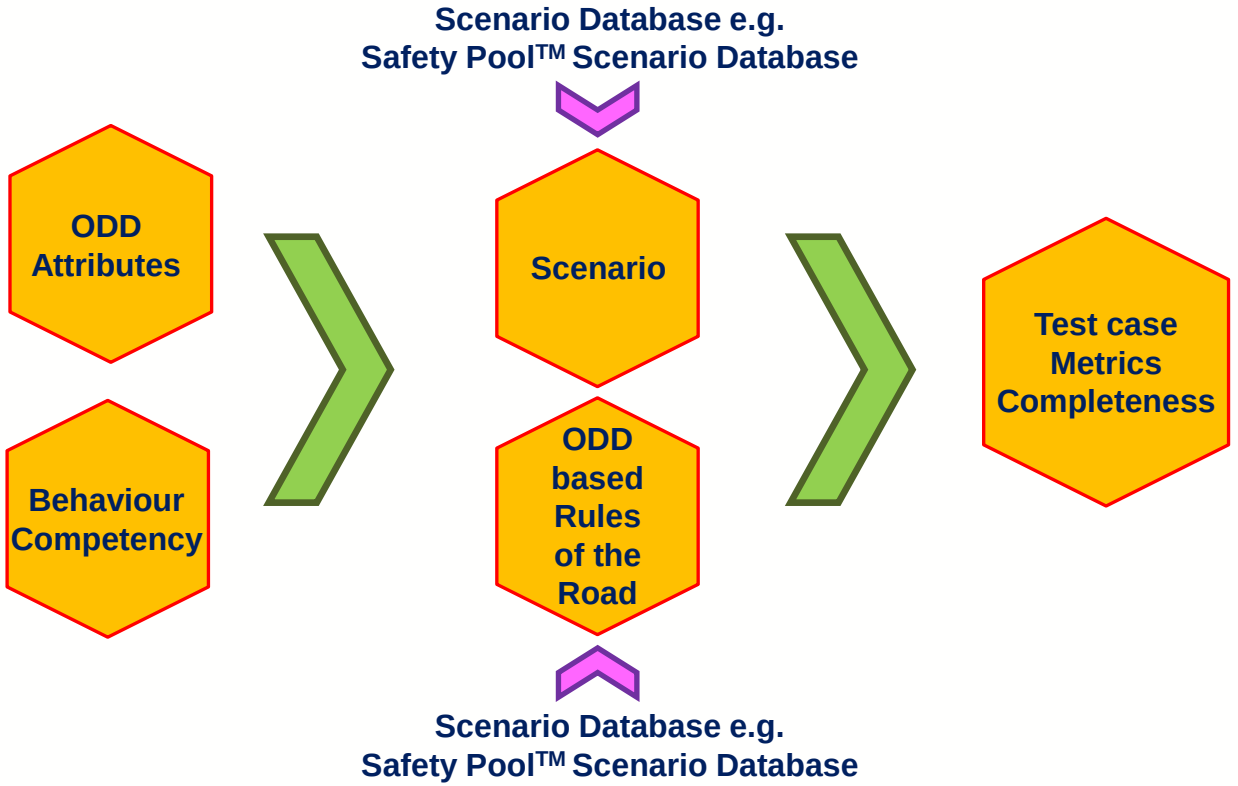

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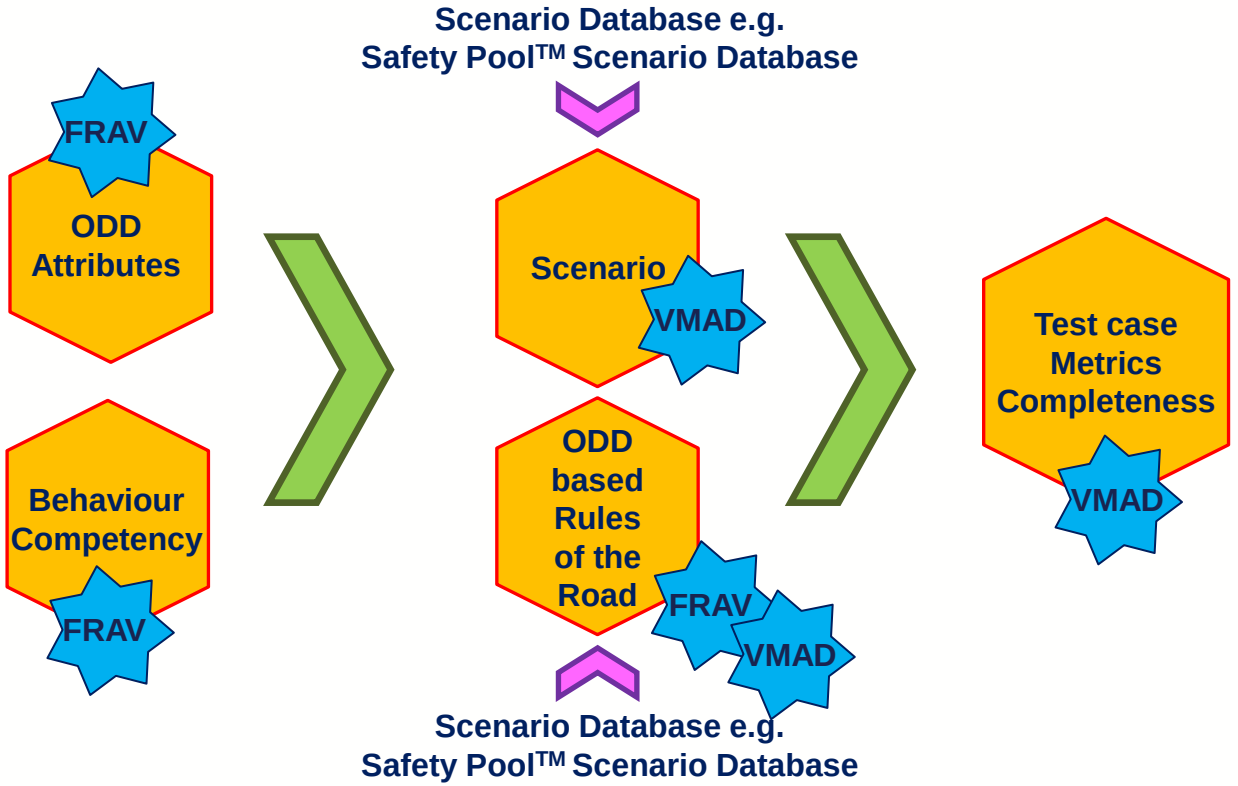

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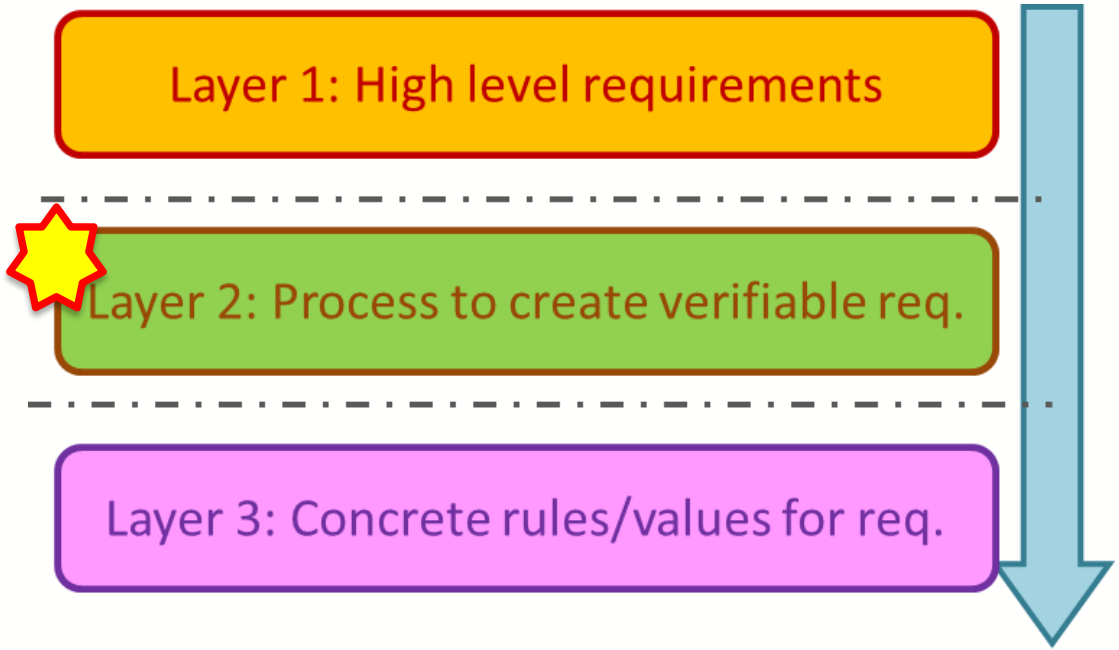

Deriving Requirements from Rules of Road
UK Highway Code Rule 125

- The speed limit is the absolute maximum and does not mean it is safe to drive at that speed irrespective of conditions. Driving at speeds too fast for the road and traffic conditions is dangerous. You should always reduce your speed when:
  - the road layout or condition presents hazards, such as bends
  - sharing the road with pedestrians, cyclists and horse riders, particularly children, and motorcyclists
  - weather conditions make it safer to do so
  - driving at night as it is more difficult to see other road users.

Deriving Requirements from Rules of Road
UK Highway Code Rule 125

- speed limit is absolute maximum **and** does not mean safe speed. reduce speed when:
  - road layout or condition hazards, bends
  - sharing the road pedestrians, cyclists and horse riders, particularly children, and motorcyclists
  - weather conditions make it safer
  - driving at night

Behaviour

Scenery

Actor

Environment

Rule/Parameter Qualifying

Problematic word use

Gray Text Non-Informative

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- isVehicle(x) → speed(x) < limit(speed)
- isVehicle(x) ∧ (isAtHazard(x) ∨ (near(x,a_1) ∧ isPedestrian(a_1)) ∨ (near(x,a_2)) ∧ isCyclist(a_2)) ∨ (near(x,a_3)) ∧ isHorseRider(a_3)) ∨ (near(x,a_4)) ∧ isChildren(a_4)) ∨ (near(x,a_5)) ∧ isMotorcyclist(a_5)) ∨ isUnsafeWeather(env) ∨ isNight(tod)) → action(reduceSpeed)

Define “near” ; “hazard” ; “UnsafeWeather”

(near(x,a_1) ∧ ¬isVehicle(a_1))

We define vehicle to be anything that is a four wheeler or larger

Need to define what reduceSpeed means
What would an acceptable “slow” speed mean?

Thank you…
Discussions…

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