

UN/UNECE/WP29/GRVA/VMAD Report from SG1 (scenarios)

May 18,19th, 2021 (13:00–16:00 CEST)

Prepared by SG1 leader

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[Summary of SG1 and note about this presentation]

- SG1 held meeting on 29th March and 27th April.
- SG1 updated the outstanding issues by considering the inputs from members. (Updated outstanding issues list is the table below)
- SG1 started discussing the open issues.
- New inputs are requested to SG1 members by 18th June and will be discussed at SG1 meeting on 29th June.

[Summary of last SG1 meeting (27th April)]

◆ Update of “Outstanding issues”

SG1 agreed to add the following two issues to the outstanding issues list.

- Should any template for scenario be defined? If so, how will it be?
- What is the maintenance procedure (e.g. regular update) of scenario catalogue? By whom?

◆ Discussion of each “Outstanding issues”

SG1 discussed the issues in the outstanding issues list.

Some of the comments were as follows:

- The use of each pillar should be based on the advantage/disadvantage of each pillar described in NATM. It may be premature to attribute scenarios to pillars in detail.
- “Scenarios not covered by scenario catalogue” should be assessed if they are necessary for ADS safety, but there are nonetheless concerns from the industry that unidentified scenarios may be required during certification.
- Random sampling can be justified in order to avoid overfitting.
- Although it is best to define the criteria for selecting scenarios whether to include in the scenario catalogue, currently it seems difficult to define such criteria.
- Scenarios for specific countries/regions should be applied flexibly by allowing to limit the target countries/regions.

SG1 will continue to discuss the issues at the following SG1 meetings.

Updated outstanding issues list

	Possible new issues	Target Completion date
1	Which pillars (simulation, track test, real-world test, audit) should be used to assess scenarios? [7*][8]	2021.9
2	What is "coverage" of scenario? What is "sufficient" coverage? How to ensure sufficient coverage?[10][13]	2021.9
3	Which scenarios are required to validate the functional safety requirements established by FRAV?[11]	2021.9
4	Scenarios not covered by scenario catalogue (Should authority require evaluation of scenarios that are not covered by scenario catalogue?)[12]	2021.9
5	How to deal with "overfitting" problem?[14]	2021.9
6	Should scenario catalogue includes unusual situations (e.g. wrong way driver)?[16]	2021.6
7	What aspect should be dealt with functional/logical scenarios?	2021.9
8	How to deal with various parameters (e.g. perception, vehicle disturbance(e.g. road surface condition, slope, wind)) during certification?	2021.9
9	How to deal with different scenarios for different countries/regions?	2021.6
10	What is pass/fail criteria for scenario-based testing?	2021.9
11	ODD based scenario generation and/or linking scenario coverage as a function of ODD (How to generate scenario based on ODD? How to consider coverage based on ODD?)	2021.9
12	Update of functional scenarios (i.e. Annex2 of NATM MD).[15]	Anytime
13	Should any template for scenario be defined? If so, how will it be?	
14	What is the maintenance procedure (e.g. regular update) of scenario catalogue? By whom?	

	Possible new issues	Target	Comments
1	Which pillars (simulation, track test, real-world test, audit) should be used to assess scenarios? [7*][8]	2021.9	(JP) Scenarios that are used to assess comprehensiveness and scenarios that have risk to cause accident should be assessed by simulation pillar, not by track test nor real-world test. It should be considered that real-world test cannot test specific scenarios. Although this issue cannot be concluded within SG1, SG1 can report the comments to VMAD. (RU) It is premature to discuss this issue now. The general methodology on which pillar to use to assess the specific scenarios could be discussed at the VMAD level once the scenario catalogue becomes available. The decision should be based on feasibility.
2	What is "coverage" of scenario? What is "sufficient" coverage? How to ensure sufficient coverage?[10][13]	2021.9	(JP) Coverage means how much proportion scenario catalogue cover compared to real world situations. Regrading highway case, 24 scenarios in NATM MD Annex2 "Interaction with other vehicles/objects" can provide sufficient coverage by considering various aspects by parameters. (By setting appropriate parameters, situations other than cut in can be described) Sufficient coverage can be ensured by setting appropriate parameters. (RU) We should not question the "coverage" of a specific scenario. We should consider a package of scenarios, which should cover traffic situations of a high probability of occurrence. This issue could be addressed when the scenario catalogue becomes available.
3	Which scenarios are required to validate the functional safety requirements established by FRAV?[11]	2021.9 Need FRAV output	(JP) Avoiding accidents and collision mitigation should be considered in the first step. Other aspects (e.g. HMI, failure) should be considered in the second step. (RU) It is not reasonable to discuss this issue until FRAV introduces the functional safety requirements. But in general, any specific scenario will allow validating the requirements partially. A combination of the assessment results would give more or less a full picture of vehicle behaviour and compliance with the requirements.
4	Scenarios not covered by scenario catalogue (Should authority require evaluation of scenarios that are not covered by scenario catalogue?)[12]	2021.9	(JP) It should be possible that authority can request additional scenarios in addition to predefined scenario catalogue. In this case, the request from authority should be reasonable. If "scenarios not covered by scenario catalogue" are identified, they should be included in the scenario catalogue. (RU) In general, the authority has a right to require validation regarding any scenario (included or not included in the catalogue), because the authority must be certain that a vehicle is safe on the road. To address this issue and not cause the authority to introduce its own scenarios, the scenario catalogue should be extended as much as possible and all new scenarios introduced by the authorities should be included in the general scenarios catalogue. (SAFE) The answer to this issue should address the question of geographically or country unique scenarios. (think about emergency vehicles differences - for example)

	Possible new issues	Target	Comments
5	How to deal with "overfitting" problem?[14]	2021.9	(JP) Random sampling in the track test should be available to authority/TS with the condition that the request is reasonable and not too much burden to manufacturers. (RU) This is not a problem. It is expected and not bad, if manufacturers would "train" their vehicles to pass the scenarios. If a vehicle passes all the scenarios from the catalogue, one can assume that vehicle is safe. To reduce the associated risks, a vehicle should pass randomly selected scenarios, and the scenario catalogue should be extended as much as possible.
6	Should scenario catalogue includes unusual situations (e.g. wrong way driver)?[16]	2021.6	(JP) Inappropriate actions of other road users (e.g. wrong way driver, sudden crossing) should be included in scenario catalogue. However, it does not mean that every collision should be avoided because the requirement for ADS depends on the situation and required level of safety. In addition, it is not practical that scenario catalogue include every situation, scenarios should be defined with some assumptions. (RU) Yes, such unusual situations are scenarios, as well. The reason for the inclusion of those in the catalogue is the relatively high probability of their occurrence. (SAFE) The example of the wrong way is one example that is exercise the perception system of the ADS,.. In general, you need to test for reasonably foreseeable , unusual situation.
7	What aspect should be dealt with functional/logical scenarios?	2021.9	(JP) The detail of functional scenario should be defined in logical scenario. (e.g. curve, light, weather) (RU) In the case of a dispute around the content of the functional scenario, the arguable elements could be shifted to the next level of specification, i.e., logical scenario, because the final goal is the elaboration of a catalogue of concrete scenarios.
8	How to deal with various parameters (e.g. perception, vehicle disturbance(e.g. road surface condition, slope, wind)) during certification?	2021.9 Need FRAV output	(JP) Parameters should be dealt in logical scenario. (RU) Those are variables characterising scenarios. At the compliance assessment process, they should be selected randomly as the vehicle must be safe in all conditions that might happen.

	Possible new issues	Target	Comments
9	How to deal with different scenarios for different countries/regions?	2021.6	(JP) Scenarios for every country/region which are aimed for mutual recognition should be assessed. It should be allowed that the manufacturers can limit the target country/region in order to limit the applicable scenarios. (e.g. UNR157(ALKS) can limit the target country.) (RU) Different countries/regions may introduce specific scenarios reflecting on the traffic situation in those countries/regions. Those scenarios should be considered relevant for the vehicles supplied to the markets of those countries/regions. However, the number of such scenarios should be reduced as much as possible. As a countermeasure, the scenario catalogue should be extended as much as possible and all local scenarios should be included in the general scenarios catalogue.
10	What is pass/fail criteria for scenario-based testing?	2021.9 Need FRAV output	(JP) SG1 should wait the conclusion of FRAV. SG1 can discuss after the progress in FRAV. (RU) It is premature to discuss this issue now. In general, the pass criteria could be no accident occurrence and vehicle motion parameters (e.g., longitudinal deceleration) should not exceed the acceptable values. The Guidance on traffic disturbance critical scenarios for ALKS (UN R 157) should be taken into account as an example.
11	ODD based scenario generation and/or linking scenario coverage as a function of ODD (How to generate scenario based on ODD? How to consider coverage based on ODD?)	2021.9	(JP) Regarding the coverage, the situation is the same as "coverage issue (2 of this outstanding issues)". Regarding the ODD exit, the situations should be assessed as necessary. (e.g. "Highway ODD" can exclude urban road because ADS can exclude any possibility to run in urban road. "With lane marking ODD" cannot exclude disappearance of lane marking because lane marking can suddenly disappear.) (RU) In general, the scenarios should not be based on ODD. However, to verify the vehicle performance in the particular scenario, the variable parameters of that scenario should be adjusted as such to ensure that the vehicle would be within its ODD. Of course, a vehicle should go through different scenarios within its ODD. Besides that, the vehicle performance in some specific scenarios should be validated outside ODD and when reaching ODD limits to ensure the proper DDT fallback of the vehicle.
12	Update of functional scenarios (i.e. Annex2 of NATM MD).[15]	Anytime	(JP) This issue should be discussed after SG1 concluded above issues. (RU) The top priority and the general objective of SG1 is the development of traffic scenarios starting from functional scenarios to elaborate on a full catalogue of those. This is a complicated and long-lasting task, however, we should develop a methodology and start this activity ASAP. As the initial step please refer to the contribution by the Russian Federation VMAD-SG1-07-03. All other SG1 "outstanding issues" are considered of lesser priority and discussing those or seeking new ones is counterproductive time consumption for the time being.

Any further comments will be welcome by 18th June.

Next SG1 Meeting

[Meeting date]

29th June 13:30-15:30 (CEST)

[Provisional agenda]

1. Introduction
2. Discussion of each “Outstanding issues” (discussion based on input for each outstanding issues)
3. Discussion of “abstract scenario” (if necessary)
4. Any other business
5. Next meeting

[Request to SG1 members]

- SG1 members are requested to **submit any comments by 18th June** to VMAD-SG1-14-02-rev1.