

VMAD-SG1 (scenario)

December 4th, 2020 (12:30–14:30 CET)

Prepared by SG1 leader

Shumpei MIYAZAKI (MLIT, Japan)

[Summary of SG1 and note about this presentation]

- SG1 held meeting on 19th November.
- At the SG1 meeting, SG1 leader prepared the following presentation (except red text) to facilitate the SG1 meeting about remained issues from last VMAD-IWG and way forward.
- The results of the discussion are added with red text.

[Upcoming SG1 meeting]

- SG1 will have next meeting on 10th December to discuss functional scenario proposals submitted by members. (The deadline for proposals is 7th December.)
- SG1 will update the NATM MD through this meeting.

Provisional agenda

1. Remaining issues after 14th VMAD-IWG.
 - ① Definition of “Traffic scenario”
 - ② Scenarios not covered by scenario catalogue
→ Updated document will be submitted to VMAD
2. Introduction of literature review
→ Information sharing and explanation by OICA
3. Future work of SG1 (especially functional scenario development)
→ Discussion about how to proceed

Definition of traffic scenario

[Background]

There was a discussion about the definition of traffic scenario at last SG1 meeting and SG1 reserved the conclusion.

Original proposal from Netherland

5.7 What is a traffic scenario? **[A traffic scenario (or scenario for short) is a sequence or combination of situations used to assess the functional requirements for an ADS.]** . Scenarios can also involve a wide range of elements,; different roadway layouts; different types of road users and objects exhibiting static or diverse dynamic behaviours; and, diverse environmental conditions (among many other factors).

Last VMAD-IWG, it was agreed that the mention to “used to assess the functional requirements for an ADS” should be deleted because the whole document (NATM master document) is describing the assessment method of functional requirements for an ADS. However, the definition was agreed to keep discussion at SG1.

[SG1 leader proposal]

Consider the proposal raised by AAPC.

Note: Whenever we agree that the definition should be changed, we can discuss for modification.

[SG1 decision]

Continue discussion among interested members and propose directly to VMAD-IWG. 3

Proposal of definition of traffic scenario

[PROPOSAL]

5.7 **What is a traffic scenario?** ~~A traffic scenario (or scenario for short) is a sequence or combination of situations used to assess the functional requirements for an ADS. Scenarios include a DDT or sequence of DDTs.~~ **A scenario is a representation of one or more real-world driving situations that may occur during a given vehicle trip.** Scenarios can also involve a wide range of elements, such as ~~some or all portions of the DDT;~~ different roadway layouts,; different types of road users and objects exhibiting static or diverse dynamic behaviours,; and, diverse environmental conditions (among many others factors).

Add to the Definitions section:

“*Scenario*” means a representation of one or more real-world driving situations that may occur during a given vehicle trip.

“*Trip*” means the traversal of an entire travel pathway by a vehicle from the point of origin to a destination.

[Justification]

A scenario provides a description that may be used to engineer a physical test and/or to design a virtual test or simulation model. A scenario may represent more than one situation by providing a generic natural-language description (functional-level abstraction) or ranges of parameters (logical-level abstraction) covering a variety of similar situations. Therefore, the definition clarifies that a scenario is a representation that may describe one or more situations.

Scenarios represent situations encountered while driving a vehicle in real-world traffic. Scenarios should be based upon real-world traffic data. It is recommended to prioritize the development of scenarios based upon their frequency of occurrence in real-world traffic and the potential severity of outcomes in terms of collisions, injuries, or death in order to focus on improvements to road safety.

Scenarios relate to driving a vehicle between two points, involving elements that may be present along a given route. The proposed definition captures this space-time aspect with the reference to a trip. A definition of “trip” is provided based on SAE Recommended Practice J3016.

The proposal removes the references to DDT. The DDT as defined by J3016 refers to the functions required to operate a vehicle in traffic, such as monitoring the vehicle environment and controlling the vehicle motion. An ADS by definition continuously performs the entire DDT. Consequently, the DDT does not refer to particular driving maneuvers or actions and cannot be broken down into specific segments in the description of a driving situation.

Lastly, it is recommended that the development of the scenarios include an attribute addressing the legal status of the roadway. Roadways 4 may be under administration by public highway authorities or they may be held by private entities. Public safety authorities may only have jurisdiction over management of traffic on public roadways.

Definition of traffic scenario [result of discussion]

5.7 What is a traffic scenario? [A scenario is a description ~~representation~~ of one or more real-world driving situations that may occur during a given ~~vehicle~~ trip^[1].] SG1 will design scenarios for use under the NATM pillars. A scenarios can also involve a ~~wide range of~~ many elements, such as roadway layouts, types of road users, ~~and~~ objects exhibiting static or diverse dynamic behaviours, and diverse environmental conditions (among ~~many~~ other factors).

[1] A trip is a traversal of an entire travel pathway by a vehicle from the point of origin to a destination.

Note: Whenever we agree that the definition should be changed, we can discuss for modification.

Scenarios not covered by scenario catalogue

[Background]

A concern was raised by AAPC that the provision requiring manufacturers to demonstrate scenarios not covered by scenario catalogue.

Present NATM master document text

5.9 Going forward, VMAD will establish a catalogue of a minimum baseline/non-exhaustive inventory of scenarios that should be considered (and built upon as required) to validate, using the NATM pillars, each functional requirement – given by FRAV - for an ADS. This work will be accomplished in consultation with VMAD subgroups and FRAV .

5.10 Manufacturers are responsible for demonstrating how functional requirements have been assessed across all foreseeable traffic scenarios. It is recognized that the scenario catalogue will serve only as a minimum baseline on which manufacturers should apply their own scenarios, as necessary, to assess each functional requirement.

The questions are;

Is it permissible that Authority request additional scenarios?

Are predefined scenarios enough for validation of ADS?

Last VMAD-IWG, this issue was not solved and SG1 should discuss further.

[SG1 leader proposal][SG1 agreed]

Since scenario catalogue is still not existed, we cannot conclude this issue.

SG1 can discuss this issue again once the scenario catalogue has developed.

Note: Some CPs consider additional scenarios are necessary. In order to persuade those CPs to conclude with the concept that additional scenarios are unnecessary, it is necessary that sufficient scenario catalogue should be proposed from industry side.

Scenarios not covered by scenario catalogue [result]

5.9 Going forward, VMAD will establish a catalogue of ~~a minimum baseline/non-exhaustive inventory~~ of scenarios that should be considered (and built upon as required) to validate, using the NATM pillars, each functional requirement – given by FRAV - for an ADS, ~~although~~ **considering that** it is ideal that scenarios (neutral to vehicle technology) comprehensively reflect the situation on world-wide public roads. In addition, scenarios shall not be limited to scenarios that are deemed preventable by the ADS. This work will be accomplished in consultation with VMAD subgroups.

5.10 [**Reserved**]~~[Manufacturers are responsible for demonstrating how functional requirements have been assessed. It is recognized that the scenario catalogue will serve only as a minimum baseline on which manufacturers should apply their own scenarios, as necessary, to assess each functional requirement.]~~

Literature review by OICA/CLEPA

[Background]

Canada proposed to conduct literature review.

OICA/CLEPA took a lead to this work and prepared a document.

[SG1 leader proposal] **[SG1 agreed]**

Ask OICA/CLEPA for explanation.

Report the document to VMAD-IWG.

[Background]

SG1 was requested by VMAD-IWG about developing examples of functional scenarios for divided highway.

[SG1 leader proposal] **[SG1 agreed]**

SG1 will request members to provide proposal of functional scenarios that should be included in the NATM master document.

SG1 will discussed the proposal at next SG1 meeting in early December.

The proposal should include

- Text proposal describing functional Scenarios in order to reflect to NATM
- Adequate justification

It will be preferable that proposal includes the issues listed in the table.

The deadline will be 7th Dec.

| Subgroup [↕] | Outstanding questions/issues/activities to address/develop [↕] |
|---|--|
| ↕ | 1. Initiate the development of illustrative examples of functional scenarios for divided highway driving to inform the development of other aspects of the scenarios catalogue and the NATM pillars. [↕] |
| ↕ | |
| ↕ | |
| ↕ | |
| ↕ | |
| ↕ | 2. Determine the scope/level of abstraction of the scenarios required for the broader VMAD catalogue (e.g., functional, logical, concrete). [↕] |
| ↕ | 3. Determine methods/best practices for identifying scenarios (e.g. derived from collision data, etc.). [↕] |
| Subgroup 1a (Scenarios) [↕] | 4. Determine methods for categorizing scenarios and develop timeline for further catalogue development (e.g., based on the ODD, such as highway driving, urban/rural, complex situations, such as construction zones, and edge cases, and micro ODDs). [↕] |
| ↕ | 5. Leverage existing scenarios resources and develop a VMAD engagement strategy to inform the development and maintenance of the catalogue (e.g., identify work by other organizations that can be used to assist VMAD to develop a scenarios catalogue. Establish partnerships with other organizations – where feasible). [↓] |
| ↕ | |
| ↕ | |
| ↕ | |
| ↕ | |