ASAM	**P2019-04** **OpenDRIVE Concept Project**

Project				
Number	P2019-04	Type	Concept Project	
Standard Name/ Project Name	OpenDRIVE Concept Project			
Current Version	n/a		Next Version	n/a
End Date	August 2020		ASAM Funds	61.600 €

Submitter			
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Change History		
Date	Author	Chapter + Description
22.01.2019	Joan Roca	Initial revision
06.02.2019	Joan Roca	Included review comments in chapters 1, 6 and 7
14.02.2019	Joan Roca	Cover page End Date and ASAM Funds
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Contents

Section 1: Project Proposal

1 Executive Summary

The OpenDRIVE Concept Project is started in the context of the transfer of the OpenDRIVE as an ASAM standard.

The purpose of the Concept Project is to address the features that will be included in the OpenDRIVE 2.0 standard. The features and requirements discussed in 2.3 Requirements and in 3 Technical Content were extracted from the presentations and discussions that arose during both the Kickoff workshop and the proposal workshop held by ASAM.

There's a total of 8 features that will be discussed for inclusion in the OpenDRIVE 2.0 Concept Project. These features were discussed and prioritized during the proposal workshop. Additionally, during that workshop the idea to split the concept project in two part was explored:

- First, there will be a concept exploration for each one of the features.

  During the concept exploration, the project members will discuss the meaning and fit of these features in the OpenDRIVE standard.

- After that, the concept project will start, when applicable

  During the concept project, the basis for an implementation of the feature in the future standard will be set.

Additionally, it was also agreed that for each one of these features, a concept project may be spawned at any moment (e.g. one does not need to wait until all the concept explorations have been finished to start working on a concept proposal).

Therefore, there will be a minimum of 2 deliverables:

- A Concept Paper
- A Concept Proposal

With an undefined number of concept proposals.

Due to the sense of urgency of the members of ASAM, the deadline for this project was set in December 2019, with a meetup frequency of 2-day meetings every 6 weeks.

However, and given that meeting frequency that barely allows for a meeting per month, the project planning shows a possible extension of the work up until mid-2020.

The biggest work packages as discussed during the workshops will be the: Junction Model, Road Geometry Model and Parametrization and Variation. The size of the work package is estimated taking into account technical complexity as well as observed opinion convergence/divergence during the workshops.

Given the complexity of the topics and the amount of work needed in this concept project, the collaboration of a service provider is preferred to write the *concept paper*. The amount of hours estimated for the writing of this paper sums up to 88 man-days, which results in a budget of 61.600 €.

The total amount of work estimated for the ASAM members sums up to 271 man-days which results in a budget of 189.700 €.

Given these numbers, this concept proposal meets the requirements for budget approval by the TSC.

2 Motivation

2.1 General Description

In the context of the transfer of the OpenDRIVE standard to ASAM, two different projects are started:

- A standard transfer project
- A concept project

While the standard transfer project is focused towards a fully transferred and stable OpenDRIVE standard (based on the latest released 1.5 standard) 1.6 in the context of ASAM, the concept project will explore several improvements and gaps to be filled that the community has already identified.

The concept project that this document concerns, targets the development of the **OpenDRIVE 2.0** standard. The features that will potentially form the **OpenDRIVE 2.0** standard are extracted from the presentations of different companies taking part in the OpenDRIVE workshops held by ASAM during 2018 and collected into the *ASAM OpenDRIVE – List of Features and Requirements* document. Since these concepts and features are still vague, it was decided during the kick-off workshop held in Höhenkirchen on the 15th and 16th of January of 2019 to start a concept project to clarify their scope and extensiveness.

Another one of the outcomes of the discussions held in those days was to split this concept project in two parts:

1. **Concept exploration and evaluation phase**
2. **Concept project**

The understanding is that during the ***concept exploration and evaluation***, the concerned topics will be evaluated against the existing standard. Furthermore, experts and newcomers will share knowledge and experience and decide on the technical gap to be filled. The output of this phase will directly be fed into the ***concept project***, were the technical work on the feature will be started. The outcome of the concept project will then be fed into a **standard project** were the standard is written with the new features.

Finally, it should be noted that during one of the sessions of the OpenDRIVE kick-off workshop, the 9 features presented in the *ASAM OpenDRIVE – List of Features and Requirements* document were discussed and prioritized. The outcome of the same was the elimination of feature F009 due to the lack of interest of the participants and further prioritization of the other features as follows:

1. F001 – Junction Model:
   41 points
2. F005 – Environment Representation:
   38 points
3. F002 – Road Geometry Model:
   25 points
4. F004 – International Signs Model:
   19 points
5. F007 – Parametrization & Variation:
   17 points
6. F003 – Arbitrary Spaces Model:
   14 points
7. F008 - Georeferencing:
   7 points
8. F006 - Roundabouts:
   1 points

2.2 Features

The standard shall include the following new or revised features.

TABLE: FEATURES

Feature	Type
Junction Model	New
Road Geometry Models	New
Arbitrary Spaces Model	New
International Signs Model	New
Environment representation	New
Roundabouts	New
Parametrization and Variation	New
Georeferencing	New

2.3 Requirements

2.3.1 R001 – Add more model parameters

Specific elements of the data model shall receive more parameters to describe needed details for simulation. For example, lanes shall receive the following parameters:

- drivable (yes, no)
- driving direction (left, right)
- overtaking allowed (yes, no)
- turn (left, straight, right)
- special purpose lanes (pedestrian, bicycle, bus, shoulder, passing)
- drive restrictions (time, vehicle height)

The need for additional parameters, particularly in an international context, shall be reviewed for all data model elements.

Allow lanes to change their width.

Add parameters that describe the quality of road definitions.

2.3.1.1 Rationale

Additional parameters are needed for correct traffic simulation, and for testing and evaluating the results for ADAS and AD functions. For example, it is necessary to know the driving direction of a lane to judge, if an AD-car has chosen to drive on a lane with the correct driving direction.

If road descriptions originate from scanned real-world roads, then quality data shall provide information about the accuracy of the description.

2.3.1.2 Discussion outcome(s)

- It should be avoided to include too many parameters in OpenDRIVE. There should be a generic model just like in the traffic signs.
- This should be just a core model, allowing extensions and modelling of these extensions. Other standards may offer guidelines since they already incorporate such an extension mechanism.

2.3.2 R002 – Remove of reduce redundant information

Remove or reduce the number of parametric redundancy in modelling road networks. Define meaningful default values. Create a central data dictionary for the user to define default values.

2.3.2.1 Rationale

For example, in the current version of OpenDRIVE, junctions are assembled by multiple lanes. The parameters for the start- and end-points of lanes occur in multiple elements of the junction definition and have to be kept consistent. Road geometries require absolute x/y coordinates which have to be kept consistent with the previous geometry shape and length. Without keeping them consistent, the lanes would show overlaps, gaps or kinks. This causes high specification and error-resolution efforts. The model shall apply smart modeling methods that avoids parameter redundancies as much as possible.

2.3.3 R003 – Harmonize OpenDRIVE with other standards

OpenDRIVE shall be harmonized and usable with other standards:

- NDS
- OpenCRG, OpenSCENARIO, OSI
- cityGML
- glTF

2.3.3.1 Rationale

Data in the OpenDRIVE format may be converted in other formats, such as NDS. This shall be possible without loss of information or reduction of accuracy. Furthermore, OpenDRIVE shall be able to reference to data in other standardized formats, and vice versa. This is required for seamless toolchain interoperability.

2.3.3.2 Discussion outcome(s)

- The project group shall decide which standard should be harmonized with OpenDRIVE. The most important effort shall be directed towards easy mapping of data between standards.

2.3.4 R004 – Remove of reduce different ways to model

Review the current data model under the aspect of modelling alternatives. Remove alternatives, which are deemed not necessary.

2.3.4.1 Rationale

The standard offers different ways how to model the same item, such as a multi-lane road or complex junctions. Tool vendors do not always support each alternative, which consequently leads to tool-chain integration problems and interoperability issues. End-users of the standard (e.g. road model creators) may be confused about what is the best way for modelling the same road and may create different styles of modelling within the same project. The standard shall not provide alternatives, when there is no good reason for it. If there is a good reason for alternative ways to model, then this shall be explained with examples in the "Style guide".

3 Technical Content

The following features and requirements were proposed during the OpenDRIVE kick-off workshop held in Höhenkirchen on the 9th and 10th of October of 2018. These features were further discussed during the proposal workshop meeting (15th and 16th of January 2019, Höhenrkirchen) and prioritized.

3.1 Junction Model

The junction model shall be revised, offering easier ways to describe complex lane geometries, while avoiding the need to keep redundant parameters consistent. New objects shall help to ease and unify the topology description of junctions. For example, introduce the new object 'Node', which stores information about lane connectivity at the junction's interior and perimeter. Add distinct junction height definition. Add distinction between left-side traffic (Germany, France, USA) and right-side traffic (UK, India, Japan). Add lanes with type "tram", "sidewalk", "median" and "not-drivable area", and consider that they link differently than lanes for cars. Consider easy parameter variation, i.e. local changes shall have no impact on other road sections. Consider easy modeling of standard junction types, such as 'crossing', 'drive-up', 'forking' and 'transition'.

3.1.1 Rationale

The specification effort of complex junctions is currently very high. In the current data model (OpenDRIVE 1.4/1.5), there is just one way to describe the lanes of a junction. For example, lanes must start and end at the same perpendiculars. As a consequence, complex junctions can only be described by 'tricky' modeling styles, e.g. 'invent' complex geometries, group simple junctions to one complex junction, etc. The concatenation of lanes in a junction regularly yields in over-laps. To avoid overlaps of nearby junctions, they actually must be merged to one junction, which increases the complexity of the description even more. This causes a complicated and unintuitive modeling style with many redundant parameters, which must be kept consistent. A better junction model shall ease the specification efforts and reduce the number of parameters.

3.1.2 Prioritization

This feature was prioritized as **first priority** by the attendants to the proposal workshop with 41 points.

3.1.3 Discussion outcome(s)

1. There shall be a link between OpenDRIVE and OpenCRG with respect to height definition for junctions.

3.2 Environment Representation

The standard shall include ways to specify the environment of the road network. This includes the description of areas between the lanes and outside the lanes of the road network. Different approaches have been proposed:

- Provide reference to an external 3D environment model
- Provide a data model for the specification of a simple environment in the immediate vicinity of roads

In case of the first choice (reference to external 3D environment model), OpenSCENARIO shall include some meta information about the objects, such as type, location, orientation, reference road and scale, and the reference to the third party 3D model library.

This shall include the specification of a horizon (end-of-terrain), e.g. city, mountains, forest, wall, fence, etc.

The chosen approach shall allow to add the following objects to the environment:

- Bridge
- Tunnel
- Noise barrier
- Bus stop
- Rails and streetcars
- Guide post
- Guard rail
- Street light
- Curbstone
- Roadside vegetation (bush, tree)
- Pedestrian
- Animal

The objects shall be scalable. Add hints for positioning. Animation shall be supported for some objects, e.g. walking pedestrians, switch on & off of street lights, etc.

Supported 3D environment standards shall be:

- OpenFlight (.flt)
- Wavefront (.obj)
- Collada (.dae)
- CityGML (.xml/GML3)

3.2.1 Rationale

The goal of this feature is to have the specification of a complete static scenario within OpenDRIVE. The current standard does not provide any means to specify the environment of the road network. This sometimes leads to odd renderings, e.g. roads with heightened elevations hovering in midair. Some simple parameters to create a default-environment shall avoid this. A library of 3D objects or link to an external 3D-environment model shall allow fully-featured environment renderings.

3.2.2 Prioritization

This feature was prioritized as second priority by the attendants to the proposal workshop with 38 points.

3.2.3 Discussion outcome(s)

1. A reference to an external object is preferred over the full definition of the object in OpenDRIVE (link via georeferencing)
2. OpenDRIVE contains the logical representation of the road, and it is not supposed to contain road environment representation
3. The proposal for a new standard defining 3D objects was put on the table
4. This standard would cover important simulation properties like material properties

3.3 Road Geometry Models

Extend the model to describe roads by further data model elements:

- DLM (detailed lane model)
- Polylines (as in NDS)
- Reference trajectory, aka centerline model
- Shape point list
- Beziers curve

3.3.1 Rationale

The current OpenDRIVE road geometry model is based on mathematical formulas and is mostly suitable for describing synthetic and manually created road networks, typically originating from road editors. When road descriptions originate from other sources, such as NDS or real-world measurements, then transferring this data to OpenDRIVE is very complicated. Other models shall be added to the standard to support those alternative data sources.

3.3.2 Prioritization

This feature was prioritized as third priority by the attendants to the proposal workshop with 25 points.

3.3.3 Discussion outcome(s)

1. OpenDRIVE networks shall be dub-dividable in tiles (separate feature).

3.4 International Signs Model

The standard shall have a model to describe traffic signs, traffic lights, electronic sign-bridges and painted signs on the road. Provide a picture for each sign. Provide parameters for signs, e.g. the 'Speed Limit' sign shall have a parameter for the actual value of the speed limit. Include traffic signs in all major jurisdictions, e.g. North America, Europe, China and Japan. The jurisdictions shall be stated in the separate country parameter (e.g. 'country=CHN').

3.4.1 Rationale

For simulation and testing of ADAS and AD systems, the rendering of traffic signs is essential. They must be correctly recognized and interpreted by the ego vehicle. The model shall consider international signs, not just the German StVO.

3.4.2 Prioritization

This feature was prioritized as fourth priority by the attendants to the proposal workshop with 14 points.

3.4.3 Discussion outcome(s)

1. It is currently not clear which point of the traffic sign the position references to. Example: If a coordinate is given on a round sign, then it is the center of the circle.

3.5 Parametrization and Variation

It shall be possible to generate variations of road descriptions from an OpenDRIVE file for the purpose of testing. This is primarily done by changing parameters of the descriptions, e.g. the width, length or curvature of roads. Two approaches have been suggested:

- Create a DSL (domain specific language), which models the variants. A generator then generates from the DSL-file multiple XODR-files.
- Parameter variants become part of the OpenDRIVE data model. Variants are directly derived from the XODR-file.

In case of parameter variants become part of the OpenDRIVE data model: Parameters shall optionally have an URI. Parameters shall have a defined name space. Besides standardized parameters, it shall be possible to have user-defined parameters.

3.5.1 Rationale

OpenDRIVE files are used in test-cases. For efficiency-purposes, multiple test-cases shall be automatically derived from one road description.

The URI attribute of a parameter shall allow to share parameters. The name space allows to distinguish between standardized parameters and user-defined parameters. The name space also allows to define country-variants of parameters.

3.5.2 Prioritization

This feature was prioritized as fifth priority by the attendants to the proposal workshop with 17 points.

3.5.3 Discussion outcome(s)

- There were arguments against including this feature. The foundation behind these arguments was that OpenDRIVE should describe a single static road. It was concluded that the concept project group would clarify whether this feature is inherent in OpenDRIVE, belongs in a new standard/tool or is not needed in OpenDRIVE.
- As an alternative, the generation of several slightly different OpenDRIVE files is possible, even by using a simple “search and replace” functionality.
- OpenDRIVE is a *concrete* format.

3.6 Arbitrary Spaces Model

Provide elements to define arbitrary spaces, such as parking spots or other drivable areas.

3.6.1 Rationale

The OpenDRIVE data model for roads is based upon defining a reference line with parameters for the width of lanes, effectively describing areas along this line. If any other areal object shall be described, which does not just follow a line, then this method is not well suited.

3.6.2 Prioritization

This feature was prioritized as sixth priority by the attendants to the proposal workshop with 14 points.

3.7 Georeferencing

The data model of OpenDRIVE shall be extended with geographic coordinates for road descriptions. The chosen georeferencing shall be independently usable with other standards.

3.7.1 Rationale

The current data model of OpenDRIVE describes roads based on a reference line. This method is well suited for editing tools, where artificial road networks are manually created by humans. When data from real-world measurements (camera and LIDAR) shall be transferred to the OpenDRIVE format, then this description method is not well suited. An alternative way of road description shall be provided using geographic coordinates, e.g. longitude and latitude. Elevation shall also be included. This data is typically directly available in the measurement dataset.

3.7.2 Prioritization

This feature was prioritized as seventh priority by the attendants to the proposal workshop with 7 points.

3.7.3 Discussion outcome(s)

The conclusions of the discussion are presented:

- There is data regarding georeferencing in the header of OpenDRIVE
- This georeferencing is missing orientation (up until this moment, everybody has been working with a “North” orientation of the scenarios, so this header happened to work).

3.8 Roundabouts

Add an easy way to describe roundabouts. Consider distinction between left-side traffic (Germany, France, USA) and right-side traffic (UK, India, Japan).

3.8.1 Rationale

In the current data model, roundabouts have to be assembled by using multiple junctions and curved lanes. This makes the modeling of roundabouts complex. However, roundabouts are a standard road feature in many countries. A special element that eases the specification of roundabouts shall be added to OpenDRIVE.

3.8.2 Prioritization

The conclusions of the discussion are presented:

- Roundabouts may be part of the junction
- As such, their representation may also be improved as part of F001 – Junction Model.

This feature was prioritized as eight (last) priority by the attendants to the proposal workshop with 1 point.

4 Quality Assurance

The following quality assurance measures shall be carried out by the project:

TABLE: QA-MEASURES

Check	QA-Measure	Responsible
☒	Peer reviews	Project Team
☐	Editorial review	Choose an item.
☐	Public review	Choose an item.
☐	Reference implementation	Choose an item.
☐	Implementation project	Choose an item.
☐	Validator project	Choose an item.
☒	Proof of Concept implementation (when needed)	Project Team

5 Deliverables

At the end of the project, the project group will hand over the following deliverables to ASAM:

TABLE: DELIVERABLES

Item No.	Description
1	Concept Paper
2	Project proposal(s)

6 Project Plan

6.1 Resources

Member companies contribute resource for the project as per the following table.

For standard development projects only: After the project end, the project group members are available to serve as Standard Expert Group members after the standard release. Those efforts are not included in the following table.

TABLE: RESOURCES - WORK AND FUNDS

Company (Name, Location)	Committed Work (Man-days)	Committed Funds (Euros)	Project member's name, phone, email
Siemens Product Lifecycle Management Software Inc., Rijswijk	21		• Joan Roca Nunez +31 (0) 6 8363 2132 joan.roca@siemens.com
Deutsches Zentrum für Luft- und Raumfahrt (DLR)	21		• Michael Scholz +49 295 3158 michael.scholz@dlr.de
Vires Simulationstechnologie GmbH, Bad Aibling	21		• Marius Dupuis, +49-8061-939093-0, marius@vires.com • Esther Hekele, +49-8061-939093-0, esther.hekele@vires.com
TUV SUD Asia Pacific Pte Ltd, Singapore	21		• Martin Slavik +65 9170 6084 martin.slavik@tuv-sud.sg
dSPACE GmbH, Paderborn	21		• Michael Kluge +49 5251 1638-538 mkluge@dspace.de
Toyota Motor Corp.,	10		• Miyoshi Katsuhiro +81-80-6986-8158 kats@mail.toyota.co.jp • Kohji Kawabata +81-90-7851-9928 kohji_kawabata@mail.toyota.co.jp
3D Mapping Solutions	21		• Philip Paulsteiner +49-8024-46041-00 philip.paulsteiner@3d-mapping.de
fka	10		• Arne Düselder arne.dueselder@fka.de
TESIS	21		• Andre Pinnel, andre.pinnel@tesis.de

RA Consulting	20		• Fank Hanschel +49-7251-3862-74 f.hantschel@rac.de
Daimler AG	21		• Marco Weiskopf, +49 176 3090994, marco.weiskopf@daimler.com • Klaus Daubner, +49 176 30971775 klaus.daubner@daimler.com • Pascal Bestle, +49 176 30922774, pascal.bestle@daimler.com
Honda R&D	14		• Shigeki Fujimoto, shi- geki_fujimoto@n.t.rd.honda.co.jp
Mazda Motor	20		• Takamasa Suetomi, suemori.t@mazda.co.jp • Atsunori Hirata, hirata.a@mazda.co.jp
CATS	16		• Yasuhito Arimoto, +81-45-473-2673 yasuhito_arimoto@zipc.com • Masanori Yokota, +81-45-473-2673 yokota-masanori@zipc.com
e-Sync	10		• Kikuo Muramatsu kikuo.muramatsu@e-sync.biz
Mitsubishi Precision	20		• Atsushi Araki aaraki@mpcnet.co.jp • Takeda Kazushi ktakeda@mpcnet.co.jp
Rheinmetall Electron-ics GmbH, Bremen	15		• Frank Bildstein +49-421-1080-4068 frank.bildstein@rheinmetall.com
BMW AG, Unter-schleißheim	21		• Markus.Schoenbeck markus.schoenbeck@bmw.de +49 89 382 52811
IPG Automotive GmbH, Karlsruhe	42		• Andreas Höfer +49 721 98520 513 andreas.hoefer@ipg-automo-tive.com • Martin Herrmann +49 151 544370 35 martin.herrmann@ipg-automo-tive.com • Volker Leonhard +40 721 98520 31

			volker.leonhard@ipg-automo-tive.com
Total:	366		

The following intellectual property will be transferred from member companies to ASAM:

TABLE: RESOURCES - INTELLECTUAL PROPERTY

Company (Name, Location)	Intellectual Property Description	Value (Euros)
-	-	-
-	-	-
	Total:	

6.2 Work Efforts

The project consists of the following work packages:

TABLE: WORK PACKAGES

WP-No.	Title / Description • Deliverable	Effort (Man-days)
1	Junction Model	
	• Concept exploration • Project proposal	60 2
2	Environment Representation	
	• Concept exploration • Project proposal	60 2
3	Road Geometry Model	
	• Concept exploration • Project proposal	30 1
4	International Signs Model	
	• Concept exploration • Project proposal	10 1
5	Parametrization and Variation	
	• Concept exploration • Project proposal	60 2
6	Arbitrary Spaces Model	
	• Concept exploration	20

	• Project proposal	1
7	Georeferencing	
	• Concept exploration • Project proposal	10 1
8	Roundabouts	
	• Concept exploration • Project proposal	10 1
	Total Effort of Work Group:	271

Projects may use optional service providers, which have the following tasks:

TABLE: SERVICE PROVIDER TASKS

Task No.	Title / Description	
	• Deliverable	Effort (Man-days)
SP1	Junction Model	
	• Concept paper	20
SP2	Environment Representation	
	• Concept paper	20
SP3	Road Geometry Model	
	• Concept paper	10
SP4	International Signs Model	
	• Concept paper	5
SP5	Parametrization and Variation	
	• Concept paper	20
SP6	Arbitrary Spaces Model	
	• Concept paper	3
SP7	Georeferencing	
	• Concept paper	5
SP8	Roundabouts	
	• Concept paper	5
	Total Effort of Service Providers:	88

The total work effort for the project is:

TABLE: TOTAL WORK EFFORT

	Formula	Amount (Man-days)
Total Effort of Work Group		271
Total Effort of Service Providers	+	88
Total Work Effort		359

6.3 Time Schedule

The work packages shall be carried out as per the following time schedule:

TABLE: TIME SCHEDULE

WP-No.	Title / Description	2019											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Junction Model	☐	☐	☐	☒	☒	☒	☒	☐	☐	☐	☐	☐
2	Environment Representation	☐	☐	☐	☐	☐	☐	☒	☐	☒	☒	☐	☐
3	Road Geometry Model	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☐
4	International Signs Model	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒

TABLE: TIME SCHEDULE

WP-No.	Title / Description	2020											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4	International Signs Model	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	Parametrization and Variation	☐	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐
6	Arbitrary Spaces Model	☐	☐	☐	☒	☒	☐	☐	☐	☐	☐	☐	☐

7	Georeferencing	☐	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	☐
8	Roundabouts	☐	☐	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐

6.4 Budget

The service budget to pay the service providers and the share of funds provided by ASAM are:

TABLE: SERVICE BUDGET

	Total Effort of Service Providers (Man-days)	Formula	Amount (Euros)
Service Budget	88	× €700 =	61.600
Total Committed Funds		-	
ASAM Funds			61.600

A budget for video conferencing can be requested, if the project group members originate from locations that would require long-distance (i.e. intercontinental) business trips to regularly participate at project meetings and if means for carrying out video conferencing are not available through the members themselves:

TABLE: VIDEO CONFERENCING BUDGET

	Number of Meetings (Days)		Cost per Meetings (Euros)		Amount (Euros)
Video Conferencing Budget		×		=	

6.5 Resource Checks

Funds provided by ASAM are subject to spending limits. The next table allows the requester to check, whether the ASAM Funds, as calculated in the preceding chapter, are within these limits. Please note that projects of type "Implementation Project" have no given spending limits, so the below check does not apply for this project type.

TABLE: ASAM FUNDS LIMIT CHECK

	Effort (Man-Days)	Formula	Amount (Euros)
Total Work Effort	271	× €700 =	189.700
Total Committed Funds		+	
Total Transferred IP		+	
Subtotal			189.700
Upper Limit for ASAM Funds		× Factor =	142.275
	Project Type	Factor	
	New, major, minor or revision standard development project	0.25	
	Study project	0.25	
	Concept project	0.75	
Check	ASAM Funds ≤ Upper Limit for ASAM Funds		☒

The total work effort required from the project group members shall be equal or less than the total committed work from member companies:

TABLE: WORK RESSOURCES CHECK

	Formula	Amount (Man-days)
Total Effort of Work Group		271
Total Committed Work		366
Check	Total Effort of Group ≤ Total Committed Work	☒

7 Relations to Other Standards, Projects or Organizations

OpenDRIVE is tightly related to all the other *OpenX* standards, namely:

- OpenSCENARIO
- OpenCRG

Additionally, there's several other standards discussed in the previous chapters, like for example:

- glTF (https://github.com/KhronosGroup/glTF)
- NDS (https://www.nds-association.org/)
- CityGML (http://www.citygml.org)

The interface and relationship between OpenSCENARIO and these standards is already covered by current features (OpenCRG and OpenSCENARIO) or by the topics discussed in 3 Technical Content.

Section 2: TSC Decisions

8 TSC Meeting No. <00>

<Text>