ASAM OpenDRIVE 1.8.1

Release Presentation

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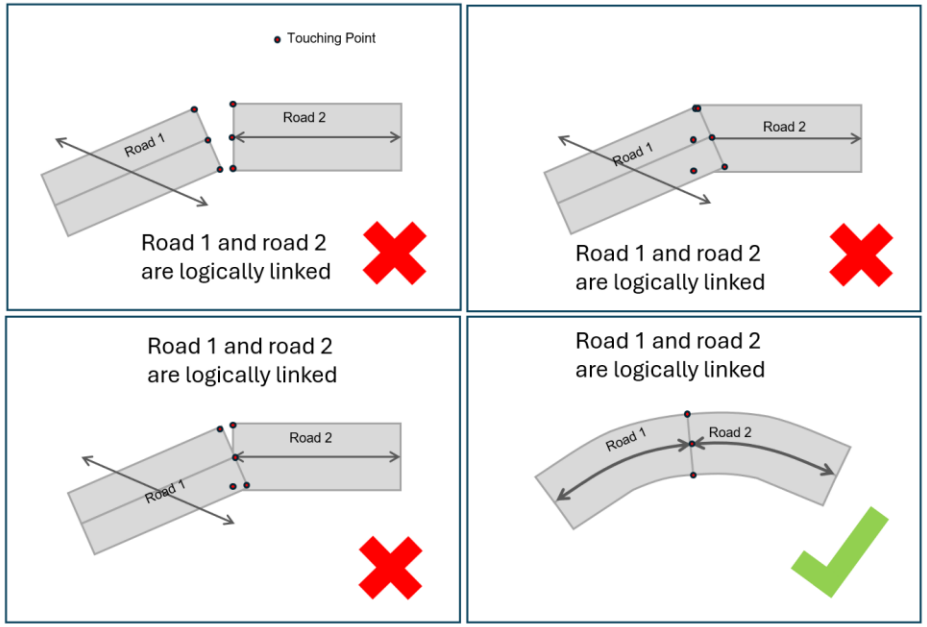
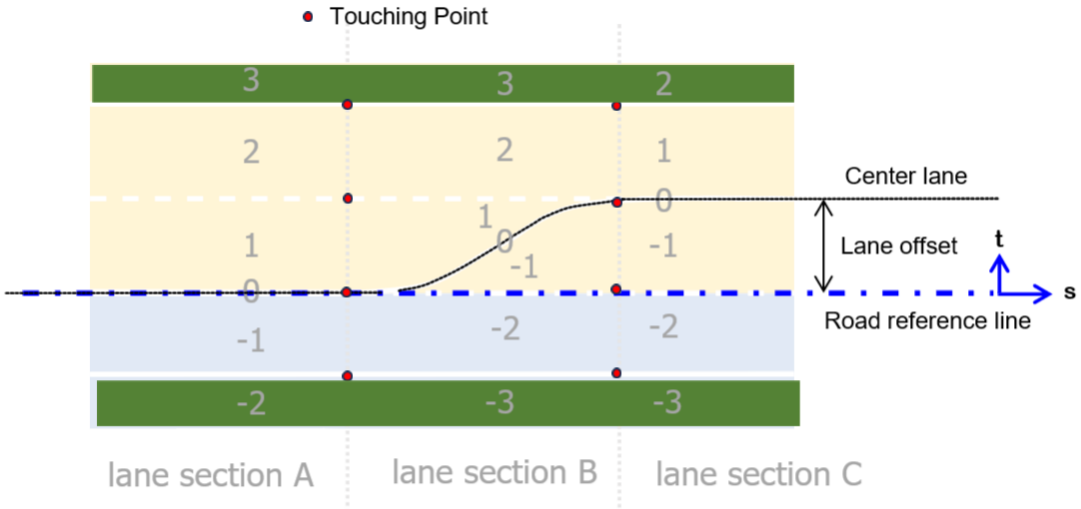
ASAM Association for Standardization of Automation and Measuring Systems

New content of ASAM OpenDRIVE 1.8.1

Extension of the documentation

- Annex D : Additional rules
- Smoothness of lanes - Definition of contact points, avoidance of gaps / kinks in horizontal and vertical direction
- Performance – avoidance of redundant elements
- Reference to related topics





New content of ASAM OpenDRIVE 1.8.1

Extension of the documentation

- Annex E: Checker rules
- Description of the Rule UID Concept
- Listing of all defined rules with UID and description
- Reference in the chapters to the checker rules
- Correction of rules, examples

Use of IDs

The following rules apply to the use of IDs in ASAM OpenDRIVE:

- asam.net:xodr:1.4.0:ids.id_unique_in_class: IDs shall be unique within a class.
- asam.net:xodr:1.4.0:ids.id_unique_in_lane_section: Lane IDs shall be unique within a lane section.
- asam.net:xodr:1.4.0:ids.only_ref_defined_ids: Only defined IDs may be referenced.

Annex E: Checker rules (normative)

Checker rule concept

Checker rules are semantic and syntactic requirements that shall be applied to a scenarios. ASAM OpenDRIVE defines a basic set of rules that enforce compliance with the standard, as well as additional rules with recommendations in accordance with ASAM OpenDRIVE. Rules consist of a name, an UID (a unique identifier of the check), and a description that specifies the requirements for the scenario.

Rule UID Concepts

The UID is a string that encapsulates a sequence of **concepts** that allow to identify immediately a rule across the different domains. The concepts are ordered and separated via the separation character `:`.

The concepts for a rule UID are:

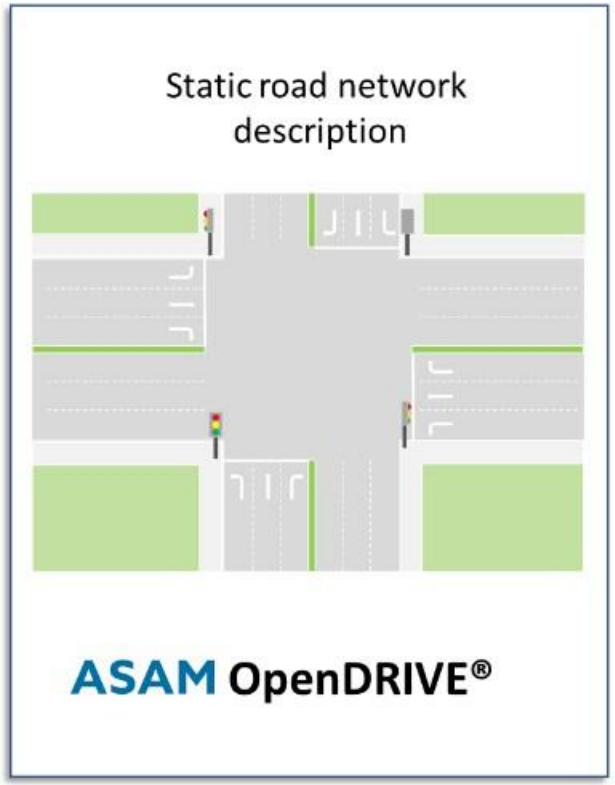
- **Emanating Entity**: a domain name for the entity (organization or company) that declares the rule UID
- **Standard**: a short string that represents the standard or the domain to which the rule is applied
- **Definition Setting**: the version of the standard or the domain to which the rule appears or is applied **for the first time**
- **Rule Full Name**: the full name of the rule, as dot-separated, snake_lower_case string. The full name of a rule is composed by the **rule set**, a categorization for the rule, and the rule **name**, a unique string inside the categorization. The rule set can be nested (meaning that it can be defined as an arbitrary sequence of dot-separated names, while the name is the snake_case string after the last dot of the full name)

To provide a visual description for a rule UID:

```
<emanating-entity>:<standard>:x.y.z:rule_set.for_rules.rule_name
```

Content in ASAM OpenDRIVE 1.8.0

Introduction



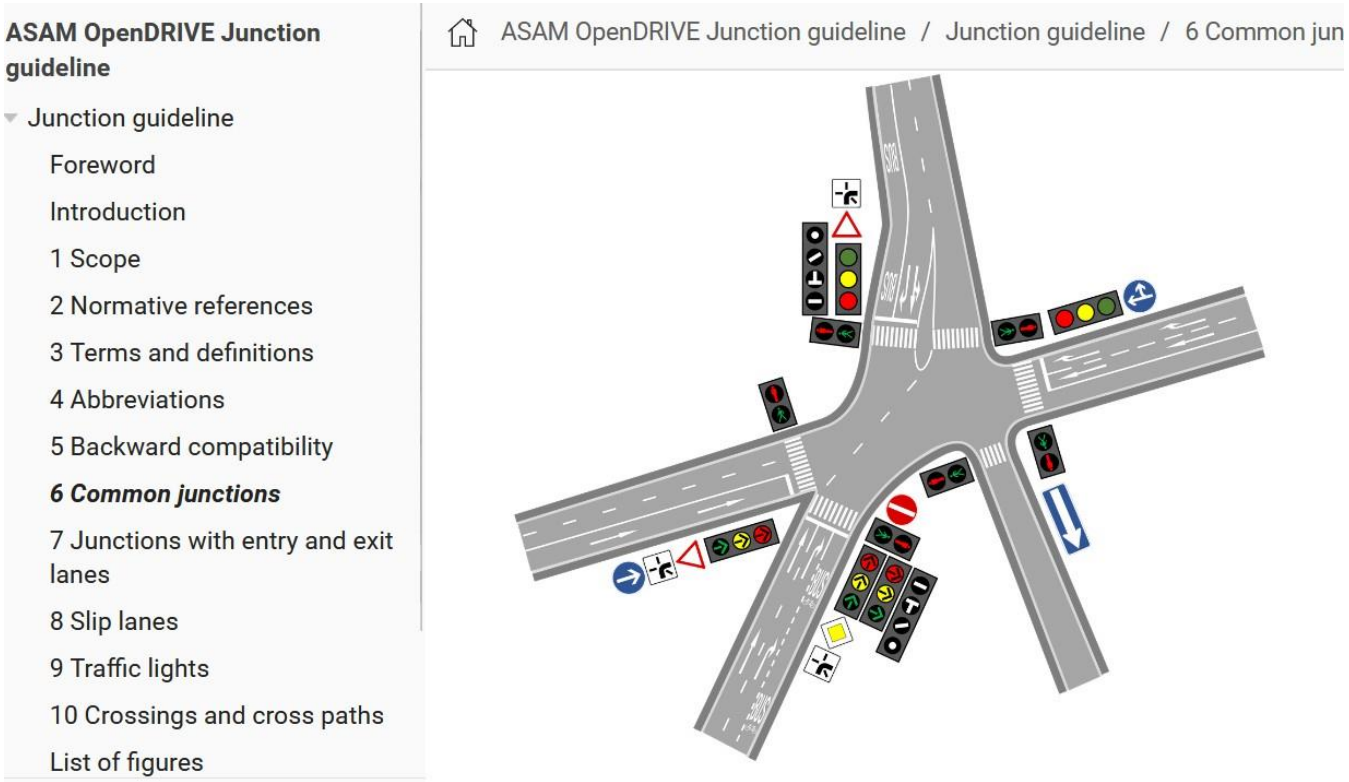
- ASAM OpenDRIVE provides the exchange format specification to describe static road networks for driving simulation applications.
- The primary task of ASAM OpenDRIVE is the road description including objects along the road.
- The OpenDRIVE Specification covers the description on how to model e.g. roads, lanes, junctions.
- Dynamic content like Cars and pedestrians are not covered by ASAM OpenDRIVE.

New Content of openDRIVE 1.8

Junction Guidelines

Advantages:

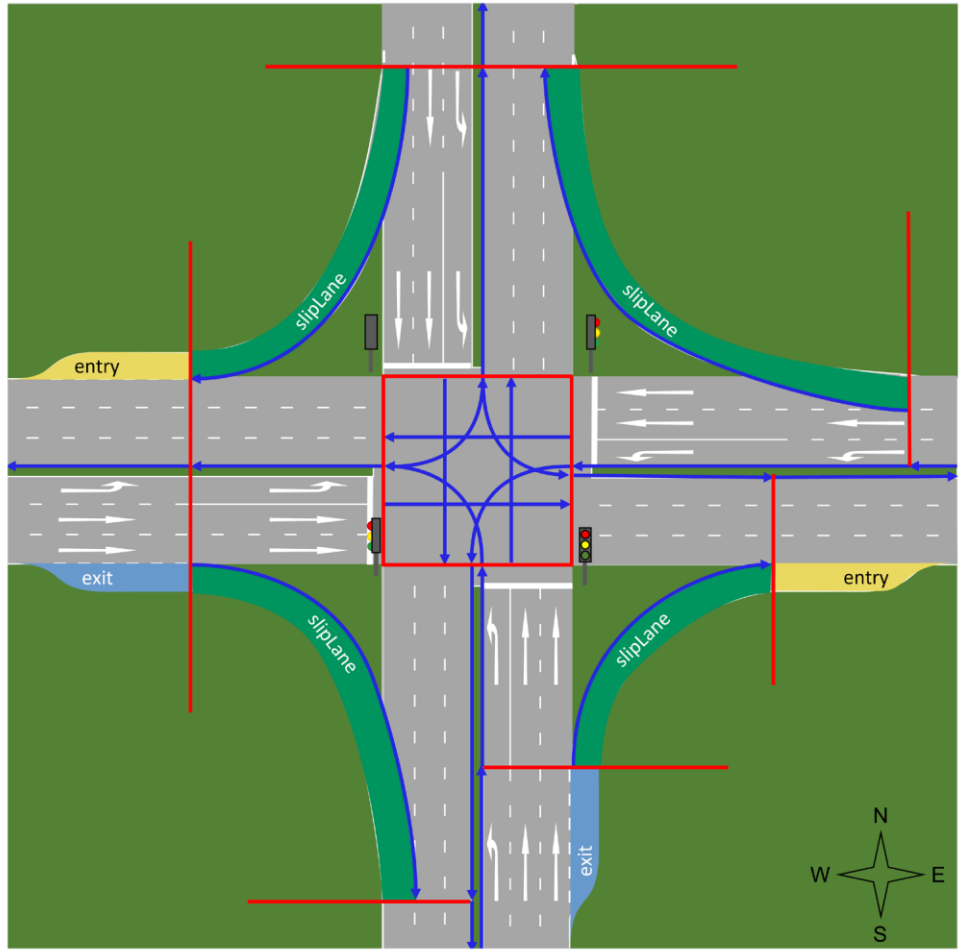
- **Better interchange ability of files**
- **Easier for people to make junctions**



New Content of openDRIVE 1.8

Slip Lanes:

- new lane type slipLane
- In guideline described where to place junctions
- In guideline described when to use entry and exit



Advantages:

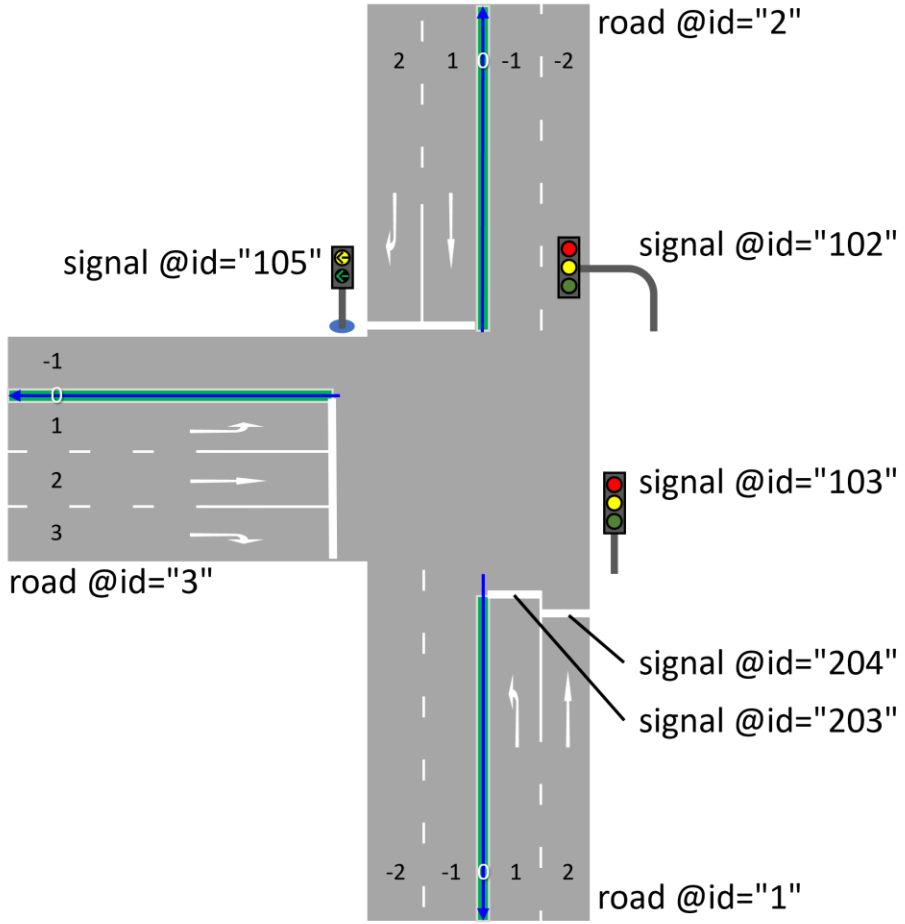
- **Better interchange ability of files**
- **Easier to make junctions with slip lanes**

New Content of openDRIVE 1.8

TrafficLights and Stop Lines:

- Deprecated physicalPosition from 1.5
- Use current dependency and reference

- **Advantages:**
- **Easier and identical implementation of traffic**
- **Easier sensor detection as traffic light is placed at its actual position**

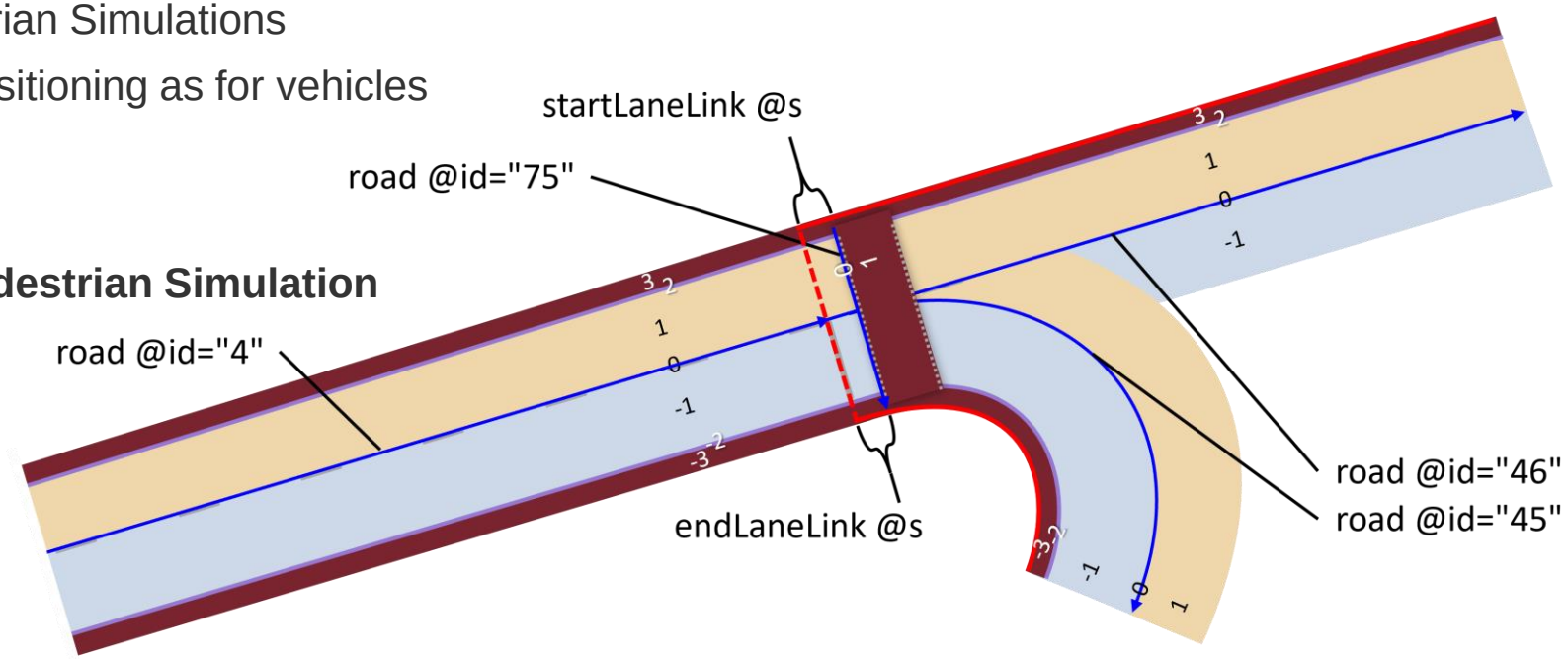


New Content of openDRIVE 1.8

Cross Paths

- new kind of (overlapping) road within a junction
- Lane linkages for Pedestrian Simulations
- Use similar traffic light positioning as for vehicles

- **Required for Swarm Pedestrian Simulation**

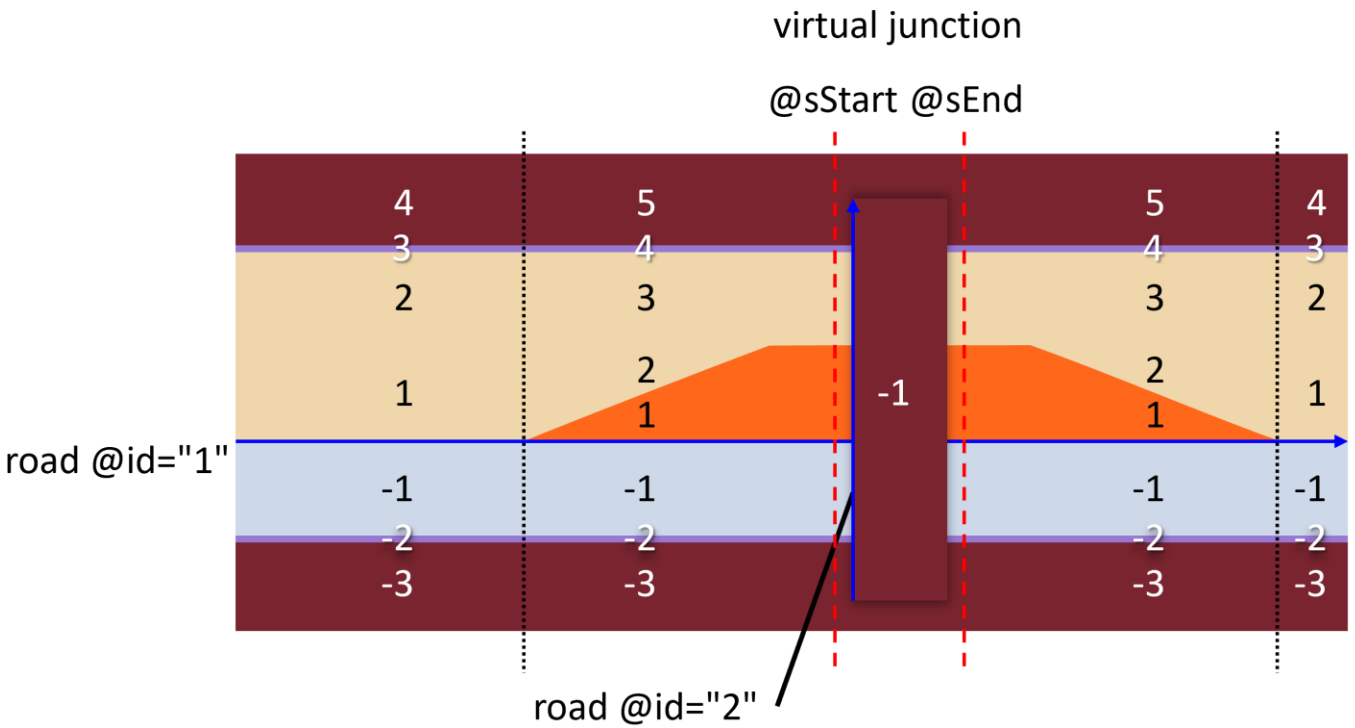


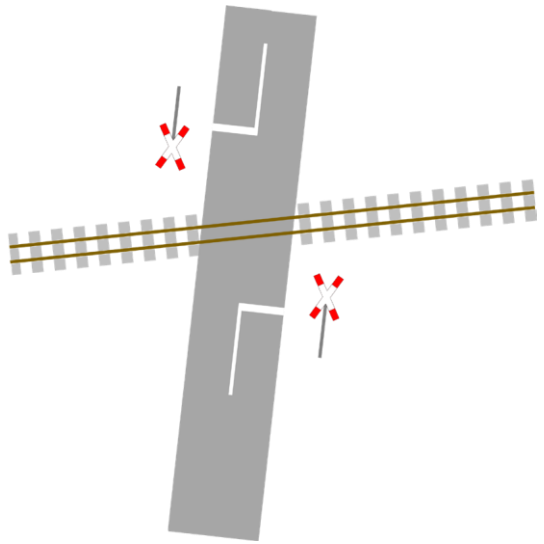
New Content of openDRIVE 1.8

Crossings outside a common junction

Required for swarm Pedestrian / Railway Simulation

- Railway crossings
- Pedestrian / bike crossings





<elevationGrid
<boundary>

New Content of openDRIVE 1.8

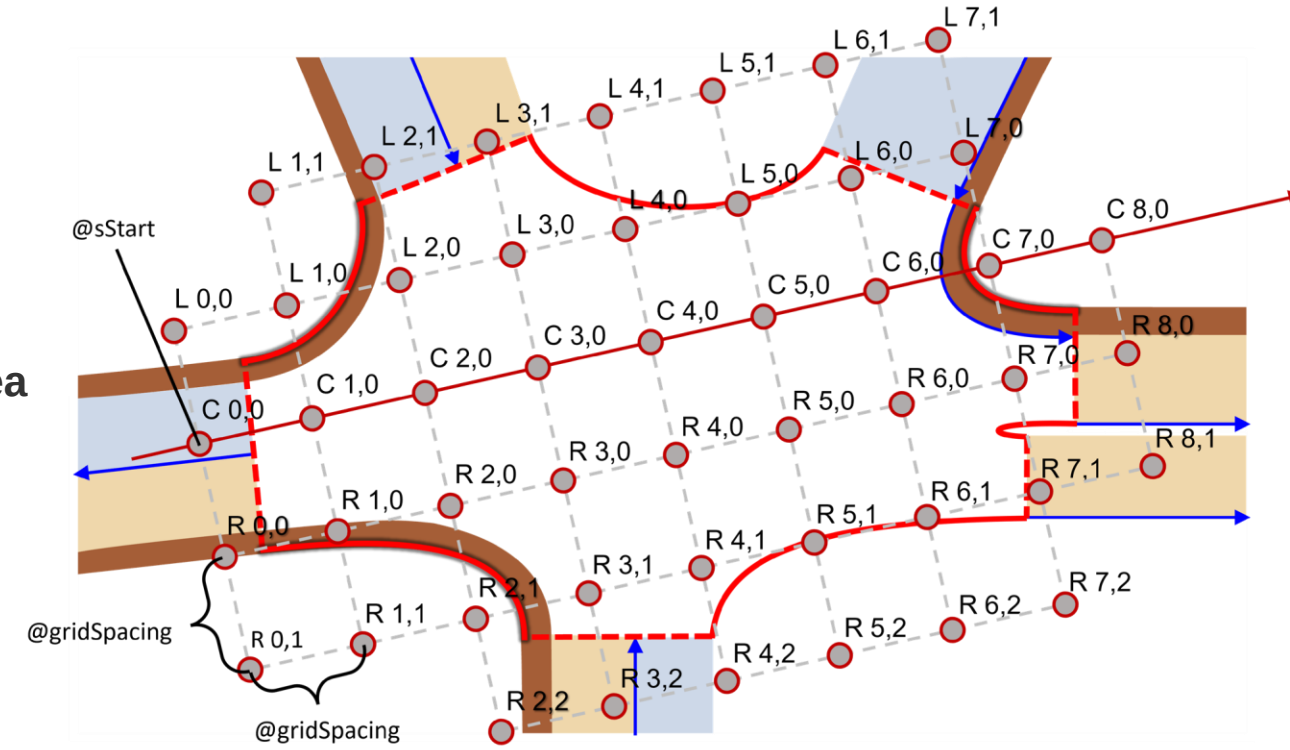
Extended existing junction definition:

Junction Boundary

Junction Reference line on which common objects can be placed
Junction Elevation Grid

Advantages:

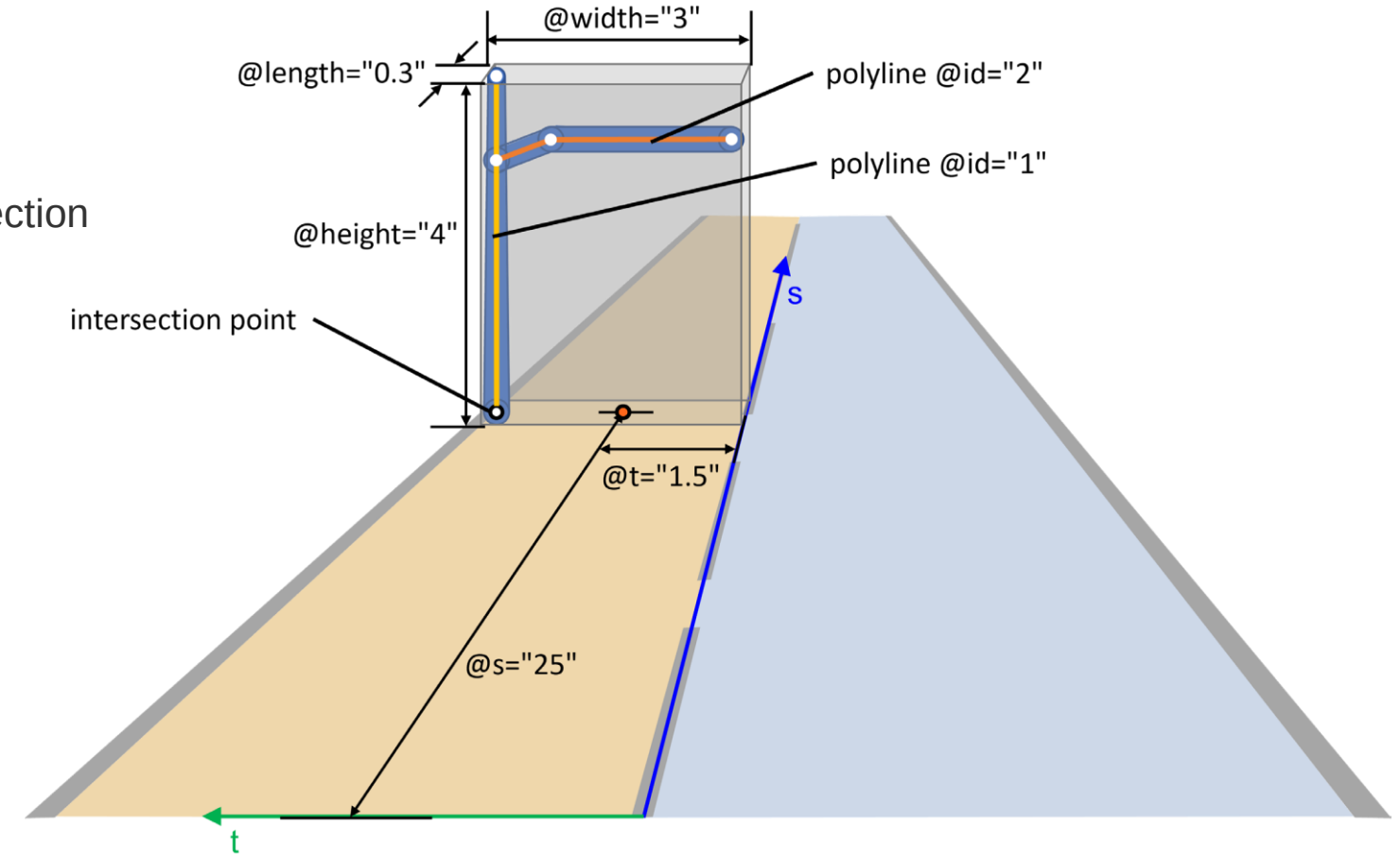
- **Common Junctions in slopes can now have unique z value at any x, y position.**
- **No gaps inside junctions anymore**
- **For simple junctions just need to define 4 points**
- **Sidewalks fit directly to the “asphalted” Junction area**
- **Easier sensor detection**



New Content of openDRIVE 1.8

Objects:

- Description of each object type and subtype
- Defined in which way each object type shall and may be defined
- Added insertion points for better sensor detection



Advantages:

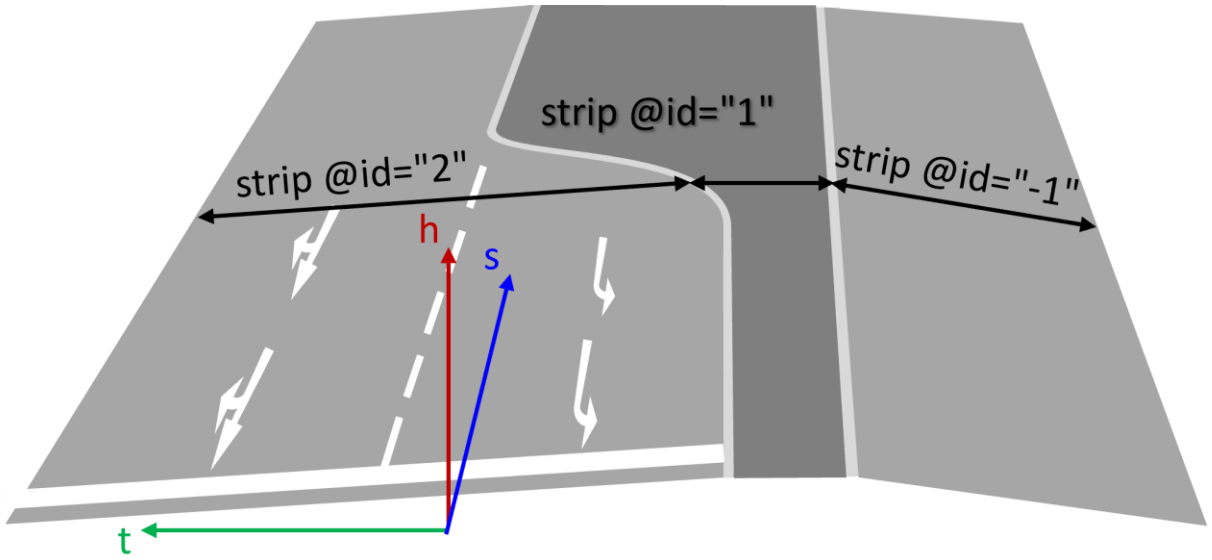
Better interchange ability of files

Better sensor detection

New Content of openDRIVE 1.8

Cross Section surface:

- Possible to define lateral profile in roads with changing lane width and offset along s



New Content of openDRIVE 1.8

Advisory lane

Variable lane directions and types

New Content of openDRIVE 1.8

Signal boards

- static board
- variable message board
- multi board with static and dynamic

Dynamic content of those boards are set via OpenSCENARIO

New Content of openDRIVE 1.8

Sign semantics and traffic rules

First simple possibilities to describe a semantic of a sign.
Not based on visualisation but on implication to traffic behaviour instead.

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DE 2013 206 -1

JP 2019 330 B

US 2012 R1 -1

+

```
<semantics>
    <priority type="stop"/>
</semantics>
```

Advantages:

- **Easier and identical implementation of traffic**
- **Better exchangeability**

Changed XSD version in openDRIVE 1.8

Moved from xsd 1.0 to xsd 1.1

Advantages:

- **Can include many more tests via schema**
- **we have a much better overview of which attributes belongs to which xml element under which condition**

Old object class for <connection> junction

Table 43. Attributes of the junction element

Name	Type	Unit	Description
id	string		Unique ID within database
mainRoad	string		The main road from which the connecting roads of the virtual junction branch off. This attribute is mandatory for virtual junctions and shall not be specified for other junction types.
name	string		Name of the junction. May be chosen freely.
orientation	e_orientation		Defines the relevance of the virtual junction according to the driving direction. This attribute is mandatory for virtual junctions and shall not be specified for other junction types. The enumerator "none" specifies that the virtual junction is valid in both directions.
sEnd	t_grEqZero	m	End position of the virtual junction in the reference line coordinate system. This attribute is mandatory for virtual junctions and shall not be specified for other junction types.
sStart	t_grEqZero	m	Start position of the virtual junction in the reference line coordinate system. This attribute is mandatory for virtual junctions and shall not be specified for other junction types.
type	e_junction_type		Type of the junction. Common junctions are of type "default". This attribute is mandatory for virtual junctions and direct junctions. If the attribute is not specified, the junction type is "default".

New object class for <connection> in a common

Table 55. Attributes of the <connection> element

Name	Type	Use	Description
connectingRoad	string	required	ID of the connecting road. Only to be used for junctions of @type="default".
contactPoint	e_contactPoint	optional	Contact point on the @connectingRoad or @linkedRoad
id	string	required	Unique ID within the junction
incomingRoad	string	optional	ID of the incoming road

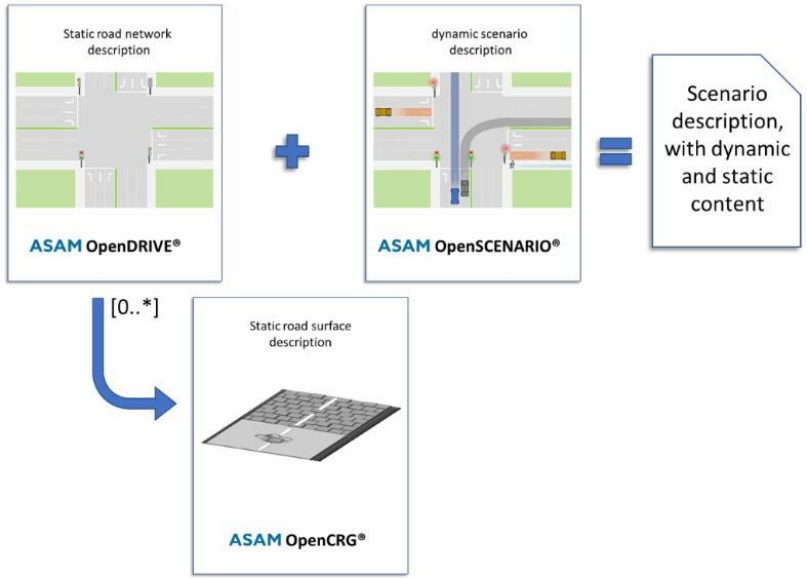
Backward Compatibility

•OpenDRIVE 1.8 is backward compatible to OpenDRIVE 1.4 and OpenDRIVE 1.5 OpenDRIVE 1.6.x and OpenDRIVE 1.7.x xml files (not the schema files).

Relation to Other Standards

Relation of ASAM OpenDRIVE to OpenCRG and OpenSCENARIO

- ASAM OpenDRIVE defines a storage format for the static description of road networks.
- In combination with ASAM OpenCRG it is possible to add very detailed road surface descriptions to the road network.
- To add dynamic content ASAM OpenSCENARIO is needed.



Combined all three standards provide a scenario-driven description of traffic simulation that contains static and dynamic content.

Deliverables

Documents

- OpenDRIVE 1.8 Specification
- OpenDRIVE 1.8 Junction guideline 1.0.0
- ASAM OpenDRIVE 1.8.0 Signal reference 1.0.0

Supplementary Files

- ASAM_OpenDRIVE_1-8-0_Enterprise_Architect_UML_model.zip
- ASAM_OpenDRIVE_1-8-0_example_implementations.zip
- ASAM_OpenDRIVE_1-8-0_examples_and_use-cases.zip
- ASAM_OpenDRIVE_1-8-0_xsd_schema_files.zip