

*OpenDRIVE – a de facto standard for the  
description of road networks in driving  
simulation*



# VIRES? – VIRES at a Glance

OpenDRIVE  
managing the road ahead






**Founded** 10/1996

**Location** Bad Aibling  
Germany

**Size** 12+

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<b>Products</b>	Image Generators	X	X	X
	Visual Databases	X	X	X
	Database Editor	X	X	
	Traffic and Scenario Simulation	X	X	X
	Sound Simulation	X		X
	Instructor / Operator Tools	X	X	X
	Simulator Framework	X	X	X
	Tools for OpenDRIVE™ OpenCRG®	X		
<b>Systems</b>	Simulators for Engineering and Training	X	X	X
	Avionics Test Equipment			X
<b>Services</b>	Standardization OpenDRIVE OpenCRG®	X		
	System Design & Integration	X	X	X
	Project Management / Consulting	X	X	X

## Why OpenDRIVE?

For driving simulation applications, the road is **THE** key component.

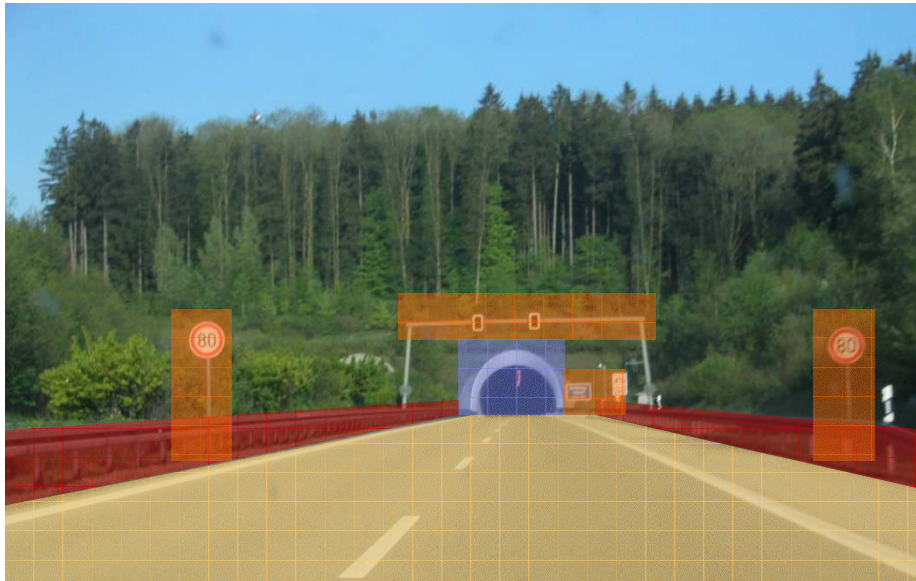
- Surface: feedback for vehicle dynamics
- Lanes and connections: paths for the routing and navigation
- Infrastructure: rules and restrictions

**Important note:** "road" in this context means the logical and physical properties of a road (network) not primarily its visual appearance.

There have been – and still are – many formats describing road networks for various types of applications, but basically

**A Road is a Road!**

## Road Elements



Lanes & Road Marks

Signs & Signals

Tunnels, Bridges etc.

Obstacles

Surface

## Road Network



## Junctions and Crossings

- connection matrix
- connection paths
- priorities
- controllers

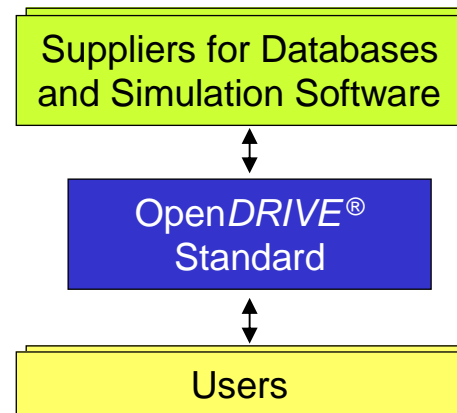
Exchanging road descriptions between various applications requires either

conversion  
or  
**standardization**

## Standardization

The benefits of a standardization of road descriptions are obvious:

- *one* format for many applications
- exchangeability of information between various users
- homogeneous road databases in heterogeneous simulation environments
- cost reduction:
  - users may select from a broader range of suppliers
  - suppliers don't have to adapt to each user



## What is OpenDRIVE?

**OpenDRIVE** is an **open format** for the description of **road networks**

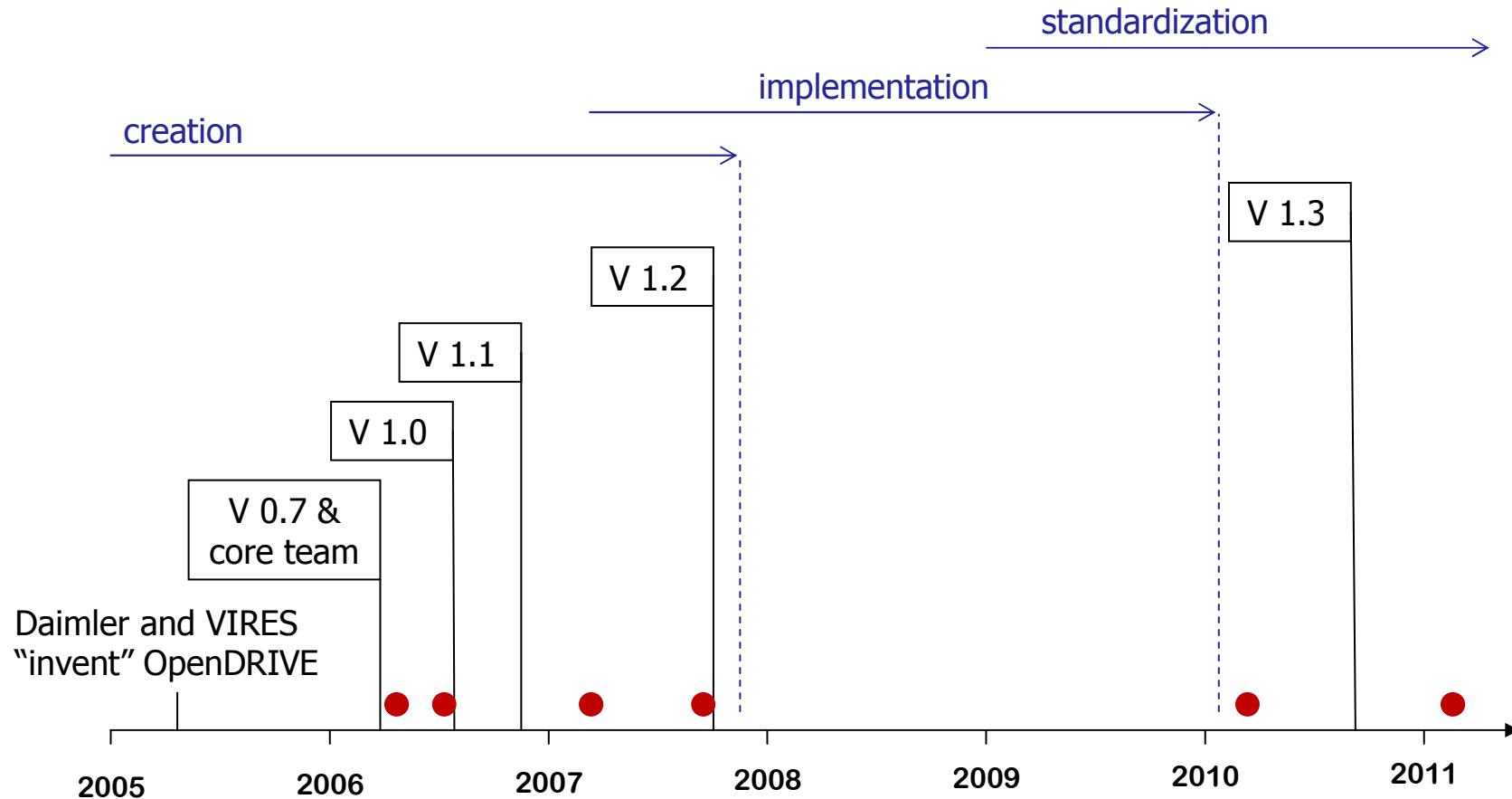
- free use
- XML-based
- human readable
- customizable
- extensible
- established

**OpenDRIVE** is a  
de facto **standard**

- standardization by  
establishment in the  
market

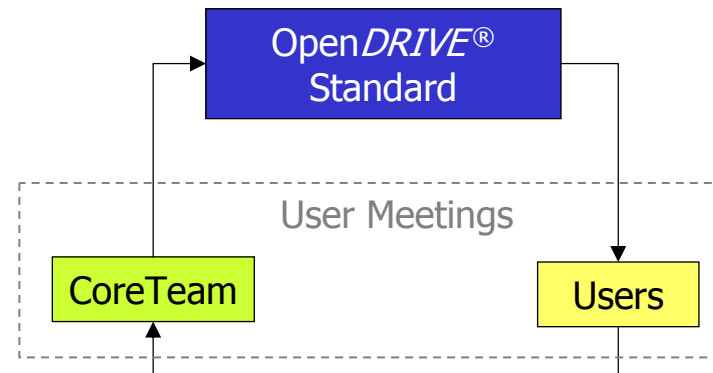


**A Brief History**



● user meeting

## A Well Managed Format








### Core Team

- Martin Strobl / BMW Forschung und Technik GmbH
- Hans Grezlikowski / Daimler AG
- Andreas Richter / Deutsches Zentrum für Luft- und Raumfahrt e.V.
- Dr. Günther Nirschl / Fraunhofer-Institut IVI
- Ekkehard Klärner / Krauss-Maffei Wegmann GmbH & Co. KG
- Dr. Bernhard Bock / Rheinmetall Defence Electronics GmbH
- Ingmar Stel / TNO
- Marius Dupuis / VIRES Simulationstechnologie GmbH
- Mats Lidström / VTI

# Users

**OpenDRIVE**  
managing the road ahead

 <b>Audi</b> Electronics Venture GmbH	<a href="#">Link to website...</a>
 <b>BMW Group</b> Research and Technology	BMW Group Research and Technology applies OpenDRIVE® and is convinced by its key benefits like the facts that OpenDRIVE® is a comprehensive and community proven approach for describing road networks as well as it enables the exchange of software components and databases. <a href="#">Link to website...</a>
<b>DAIMLER</b>	Daimler uses OpenDRIVE® in its driving simulators as an efficient road description standard and profits from well-proven utilization and exchange between different applications. <a href="#">Link to website...</a>
 <b>Deutsches Zentrum für Luft- und Raumfahrt e.V.</b> in der Helmholtz-Gemeinschaft	At DLR <i>Institute of Robotics and Mechatronics</i> , the OpenDRIVE® standard is used for road definitions in the context of simulations for the assessment of mechatronic vehicle components and vehicle dynamics control systems. <a href="#">Link to website...</a> DLR <i>Institute of Transportation Systems</i> uses OpenDRIVE® as road description for generating virtual landscapes based on real world data. <a href="#">Link to website...</a>
 <b>Fraunhofer</b> IVI	OpenDRIVE® supports the efficient development of road networks in the Fraunhofer IVI driving simulator and facilitates the exchange with other research partners. <a href="#">Link to website...</a>
 <b>KMW</b> KRAUSS-MAFFEI WEGMANN	<a href="#">Link to website...</a>
 <b>MBtech</b> Mercedes-Benz technology	The MBtech Group uses OpenDRIVE® in its tool suite along the automotive development and testing chain as it is a very clever, flexible and de-facto standard format for road networks. <a href="#">Link to website...</a>
 <b>Realtime Technologies, Inc</b>	RTI has found the OpenDRIVE® standard to be comprehensive in its coverage of features needed for our autonomous traffic driving on correlated data. <a href="#">Link to website...</a>
 <b>TESIS</b> DYNAware	<a href="#">Link to website...</a>
 <b>TrianGraphics</b> Intelligent Terrain Solutions	TrianGraphics GmbH has integrated OpenDRIVE® export into their database generation system Trian3D Builder. Thus the automatic urban generation with roads and complex crossings is usable in driving simulators. <a href="#">Link to website...</a>
 <b>TECHNISCHE UNIVERSITÄT MÜNCHEN</b>	The OpenDRIVE® standard facilitates efficient exchange of data between universities and industrial partners. <a href="#">Link to website...</a>
 <b>VIRES</b> Simulationstechnologie GmbH	With OpenDRIVE® we were able to standardize key components of our tool-chain and make them available to a broad customer base without further adaptations. <a href="#">Link to website...</a>
 <b>vti</b> FINDING A BETTER WAY	VTI, Swedish National Road and Transport Research Institute, is an independent and internationally prominent research institute within the transport sector. VTI is a world leader in several areas, for instance in simulator technology. VTI's high fidelity vehicle simulators use OpenDRIVE® as the standardized road database in order to enhance the software environment and be compatible with external simulator facilities. <a href="#">Link to website...</a>

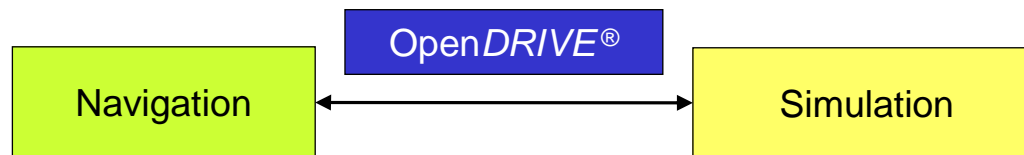
Please register!

It's free  
and  
without obligations.

...and quite a few more across the planet.

## Existing

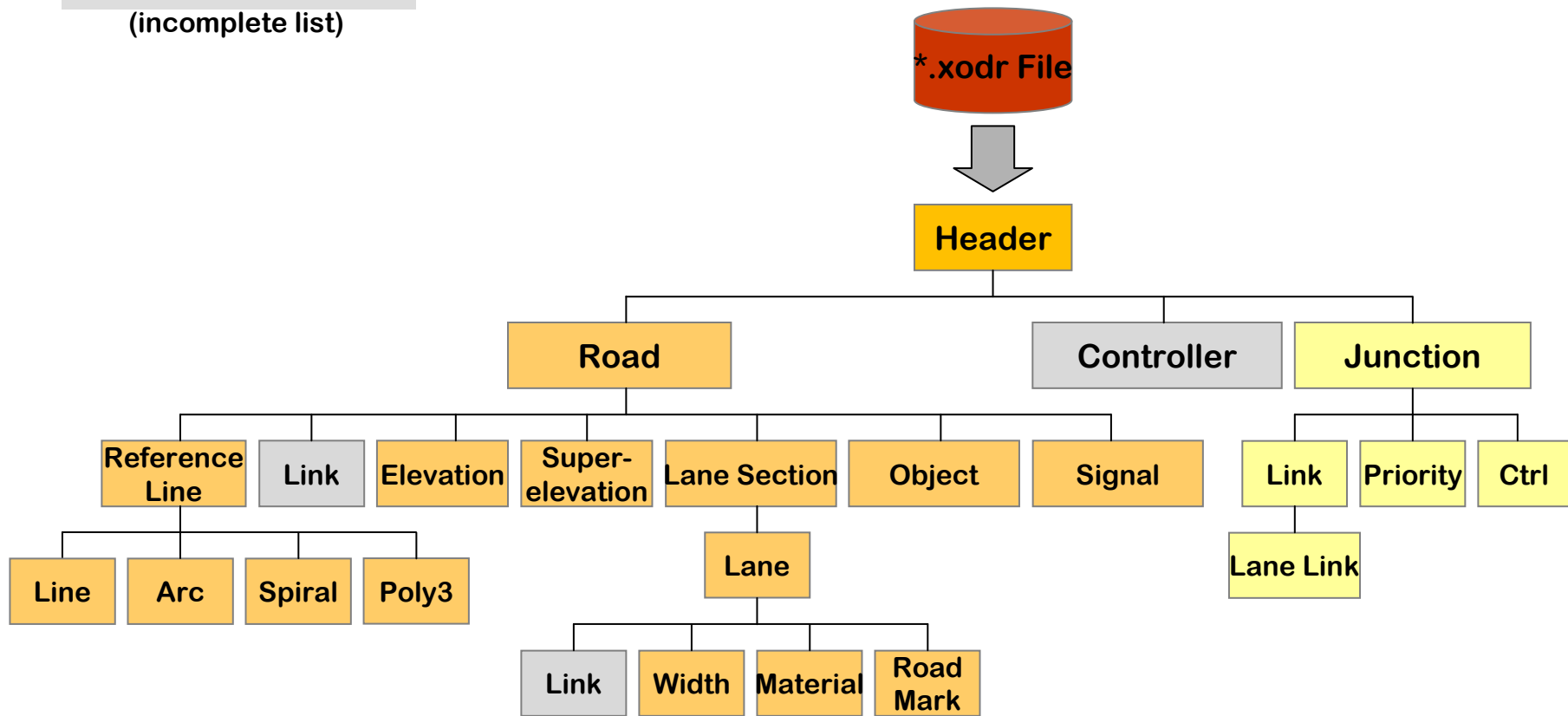
- Vehicle Driving Simulation
- Tram Driving Simulation
- Railroad Simulation
- Conversion and Export of Navigation Data



## New Fields

- Town and Country Planning
- Macroscopic Traffic Simulation
- etc.

**Elements**  
(incomplete list)



+ optional custom extensions at each node

# *Partner Project*

## Describing the Road Surface

- open format + open source
- tire and vibration simulation
- initially funded by automotive industry
- managed by VIRES
- release 1.0 in Q2/2010
- user meeting in June 2010
- available in
  - Delft tire
  - ADAMS
  - etc.
- [www.opencrg.org](http://www.opencrg.org)

OpenCRG®  
managing the road surface ahead



Image courtesy of Daimler

# *Back to OpenDRIVE...*

## Examples



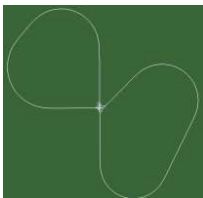
### VIRES Town

- Cross-country and inner-city roads with various OpenDRIVE elements
- Available since V 0.7



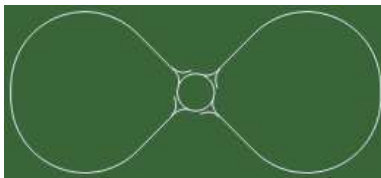
### VIRES 8 - simple

- simple crossing with traffic lights in endless course



### 8 - complex

- complex crossing with traffic lights in endless course



### VIRES 8 - roundabout

- roundabout in endless course

## Points of Contact

Specification, Overview, Documentation etc.

**[www.opendrive.org](http://www.opendrive.org)**  
**[www.opencrg.org](http://www.opencrg.org)**

Newsletter

**[newsletter@opendrive.org](mailto:newsletter@opendrive.org)**  
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Developers

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*Thank You!*