OpenSCENARIO

bringing content to the road

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1st OpenSCENARIO Meeting
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**Motivation**

**Fact:** De-facto standardization has been realized on lower levels

**Result:** Road Files may be transferred between various simulation tools
Motivation – Current Situation

• ADAS functionality requires **extensive testing** in various environments
• **Feature sets** of various tools are highly different
• Each tool is well suited for its **specific purpose**
• **Migrating** scenarios from one tool to another one requires high effort
• Independent **3rd parties** (e.g. authorities) are not able to provide scenario definitions in a format compatible with multiple tools

**Result:** Dynamic content may not yet be transferred in a standardized way and depends highly on the tools involved
Motivation

Assumption
All tools share a considerable fraction of common functionality

Conclusion
Description of dynamic content may be harmonized

OpenSCENARIO
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Static Content
Dynamic Content
Scenario

Objection
Same dynamic content does not implicate identical results!
Objectives

- Provide transferable XML **scenario definition** for various use cases
  - static content by reference
  - dynamic content
- Use **OpenDRIVE / OpenCRG** as basic layers
- Allow for independent content provision by 3rd parties
- Provide standardized / open **tool-sets** for validation of scenario definitions
- Establish **support** services
- Establish user **community**
OpenSCENARIO – Road Map

Definition Phase, Stage 1

- Vares
- ASC(S)
- HLRS
- Initial Team
- Reviews
- Results
- Format Specification
- Requirements
- Definition Phase, Stage 1

Associated Partners
- Daimler
- Opel
- Porsche

Tool Suppliers and 3rd Parties
- Research (DLR, fka, FKFS etc.)
- OEMs (Audi, BMW, Volkswagen etc.)
- Tool Suppliers (dSPACE, IAV, IPG etc.)

Tier1 (tbd.)

Tool Suppliers (dSPACE, IAV, IPG etc.)

OEMs (Audi, BMW, Volkswagen etc.)

Research (DLR, fka, FKFS etc.)

Tier1 (tbd.)

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OpenSCENARIO – Road Map

Definition Phase, Stage 2

Results
- Support/Website
- Test Tools
- Validation Tools
- Format Specification

Core Team
- VIRES
- Member B
- Member E
- ASC(S)
- Member C
- Member F
- Member A
- Member D
- Member G

Requirements

Partners and Users
- Tool Suppliers (dSPACE, IAV, IPG etc.)
- Assoc. Partners (Daimler, Opel, Porsche)
- OEMs (Audi, BMW, Volkswagen etc.)
- Tier 1 (tbd.)
- Research (DLR, fka, FKFS, HLRS etc.)
- 3rd parties (e.g. authorities)
OpenSCENARIO – Road Map

Definition Phase, Stage 2

Results
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Core Team
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- Assoc.
- Member A
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- Member F
- Member G

Who?

Requirements

Partners and Users
- Tool Suppliers (dSPACE, IAV, IPG etc.)
- Assoc. Partners (Daimler, Opel, Porsche)
- OEMs (Audi, BMW, Volkswagen etc.)
- Tier 1 (tbd.)
- Research (DLR, fka, FKFS, HLRS etc.)
- 3rd parties (e.g. authorities)

Review
OpenSCENARIO – Road Map

Maintenance Phase

Repositories
- Test Tools
- ValidationTools
- Test Data

Core Services
- Support / Website
- Format Specification

Core Team
- VIRES
- ASC(S)
- Member A
- Member C
- Member E
- Member F
- Member G

Requirements

Partners and Users
- Tool Suppliers (dSPACE, IAV, IPG etc.)
- OEMs (Audi, BMW, Volkswagen etc.)
- Research (DLR, fka, FKFS, HLRS etc.)
- Assoc. Partners (Daimler, Opel, Porsche)
- Tier1 (tbd.)
- 3rd parties (e.g. authorities)
Mid-Term Target

OpenSCENARIO will be a key element in PEGASUS project
-> we really have to deliver!
Where we are today:

Website: http://www.openscenario.org

Welcome to the World of OpenSCENARIO!

OpenSCENARIO is an open file format for the description of dynamic contents in driving simulation applications. The project is in its very early stage and will be made available to the public in the very near future. If you want to be informed about the initiative’s progress and major events, please register for the newsletter.

This website is maintained by VIRES Simulationstechnologie GmbH, Germany.
July 2015
Where we are today:

Download area:

OpenSCENARIO – Status

http://www.openscenario.org

Overview

OpenSCENARIO / OpenDRIVE / OpenCRG Product Data Sheet

Presentations / Overview

OpenSCENARIO presentation given at an automotive workshop on June 09, 2015
OpenSCENARIO poster presentation at DSC 2015 in Tübingen

Specification

OpenSCENARIO MindMap. DRAFT. Rev. C. For reading this file, we recommend XMind

Examples

pending...

Tools

pending...
Where we are today:

Tracking System (public and "core team"):

http://tracking.vires.com

Newsletter: newsletter@openscenario.org
What we have: 3rd draft specification as XMind Mind map (see also www.openscenario.org/download.html)
OpenSCENARIO – Specification

Catalogs and References

OSCCatalogs

- vehicleCatalog
- OSCDirectory
- OSCUserData
- driverCatalog
- OSCDirectory
- OSCUserData
- objectCatalog
- observerCatalog
- OSCDirectory
- OSCUserData
- pedestrianCatalog
- OSCDirectory
- OSCUserData
- miscObjectCatalog
- OSCDirectory
- OSCUserData
- entityCatalog
- OSCDirectory
- OSCUserData
- environmentCatalog
- OSCDirectory
- OSCUserData
- maneuverCatalog
- OSCDirectory
- OSCUserData
- routingCatalog
- OSCDirectory
- OSCUserData
- OSCUserData
- Include
- OSCFile

roadNetwork

- OpenDRIVE
- SceneGraph
- OSCUserData
- include
- OSCFile

environment

- OSCCatalogRef
- OSCUserData
- include
- OSCFile

OSCFileHeader

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OpenSCENARIO – Specification

Catalogs and References

OSCCatalogs

objectCatalog

vehicleCatalog

driverCatalog

observerCatalog

pedestrianCatalog

miscObjectCatalog

entityCatalog

OSCDirectory

OSCUtility

root

OSCFObject

OSCFProc

OSCFProcRef

OSCFVehicle

name: string

car

taxi

transporter

class: string

bus

motorbike

bicycle

train

tram

manufacturer: string

model: string

color: string

license plate: string

maxSpeed: double

maxDeceleration: double

overall Efficiency: double

aerodynamics

airDragCoefficient: double

frontSurfaceEffective: double

type: string

engine

power: double

maxRpm: double

positionX: double

positionY: double

positionZ: double

mass: double

gearbox

type: string

3dGeometry

dimensions: OSCDimension

x: double

y: double

z: double

cog: double

gear: int

OSCFFileHeader

name: string

car

taxi

transporter

class: string

bus

motorbike

bicycle

train

tram

manufacturer: string

model: string

color: string

license plate: string

maxSpeed: double

maxDeceleration: double

overall Efficiency: double

aerodynamics

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overall Efficiency: double

aerodynamics

airDragCoefficient: double

frontSurfaceEffective: double

type: string

engine

power: double

maxRpm: double

positionX: double

positionY: double

positionZ: double

mass: double

gearbox

type: string

3dGeometry

dimensions: OSCDimension

x: double

y: double

z: double

cog: double

gear: int
OpenSCENARIO – Specification

Catalogs and References

- OSCCatalogs
  - objectCatalog
    - vehicleCatalog
    - driverCatalog
    - pedestrianCatalog
    - miscObjectCatalog
  - entityCatalog
    - OSCDirectory
    - OSCUserData

- OSCObserver
  - name
  - refId
  - type
  - frustum
    - near: double
    - far: double
    - left: double
    - right: double
    - bottom: double
    - top: double
    - objectType: string
    - filter (0..n): int
    - filterParam (0..n): double
  - OSCDirectory
  - OSCUserData
  - include: OSCFile
Catalogs and References

OpenSCENARIO – Specification
Catalogs and References

- objectCatalog
  - vehicleCatalog
  - driverCatalog
  - observerCatalog
  - pedestrianCatalog
  - miscObjectCatalog

- entityCatalog
  - OSCDirectory
  - OSCUserData

- OSCCatalogs

- OSCMiscObject
  - OSCFileHeader
  - name (string)
  - type (string)
  - mass (double)
  - OSCDimension
  - 3dGeometry
  - OSCFile
OpenSCENARIO – Specification

Catalogs and References

- OSCCatalogs
  - objectCatalog
    - vehicleCatalog
    - driverCatalog
    - observerCatalog
    - pedestrianCatalog
    - miscObjectCatalog
  - entityCatalog
    - OSCDirectory
      - OSCUserData
      - OSCDirectory
  - OSCDirectory

- OSCEntity
  - name: string
  - refid: int

- OSCObjectChoice
  - OSCVehicle
    - name: string
    - refid: int
  - OSCPedestrian
    - name: string
    - refid: int
  - OSCMiscObject
    - name: string
    - refid: int

- OSCControllerChoice
  - OSCDriverReference
    - name: string
    - refid: int
    - motion: string
    - walk
    - jog
    - run
    - dead
  - PedestrianController
OpenSCENARIO – Specification

Catalogs and References

**OSCCatalogs**
- **entityCatalog**
  - OSCDirectory
  - OSCUserData
- **environmentCatalog**
  - OSCDirectory
  - OSCUserData
- **maneuverCatalog**
  - OSCDirectory
  - OSCUserData
- **routingCatalog**
  - OSCDirectory
  - OSCUserData

**OSCEnvironment**
Catalogs and References

OpenSCENARIO – Specification

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Slide 23
OpenSCENARIO – Specification

Catalogs and References

- OSCCatalogs
  - entityCatalog
  - environmentCatalog
  - maneuverCatalog
  - routingCatalog

- OSCFileHeader
  - name
  - closed
  - include
  - userData

- OSCPosition
  - purpose
  - steering
  - positioning
  - polyline
  - curvature
  - curvatureDot
  - length
  - controlPoint1
  - controlPoint2
  - spline
  - shape
  - choice
  - route
  - strategy
  - fastest
  - shortest
  - leastIntersections
  - random

- OSCFile
  - include

- OSCDirectory
  - OSCUserData
Entities (own vehicle and others):

- **OpenSCENARIO**
  - Specification

Diagram showing the structure of entities with properties like `name`, `velocity`, `acceleration`, `initPosition`, `initDynamics`, `initState`, and `OSCUUserData`. The diagram also includes `OSCObjectChoice`, `OSCVehicle`, `OSCPedestrian`, and `OSCSign`.
Storyboard (by maneuver vs. by actor):
OpenSCENARIO – Specification

Conditions:
OpenSCENARIO – Specification

Maneuver List:
Coming back to one important question...
OpenSCENARIO – Road Map

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Next Steps

- Schema File
- Validator
- Examples
- Reference Implementations
That's it!

Thank you for your attention!

Questions?