

# IGNITE 2018.1 New Features



# IGNITE is a Modelica-based environment for the modeling and simulation of complex physics-based systems



## Complete Complex System Modeling

Thermal System Modeling

Duty Cycle Simulation



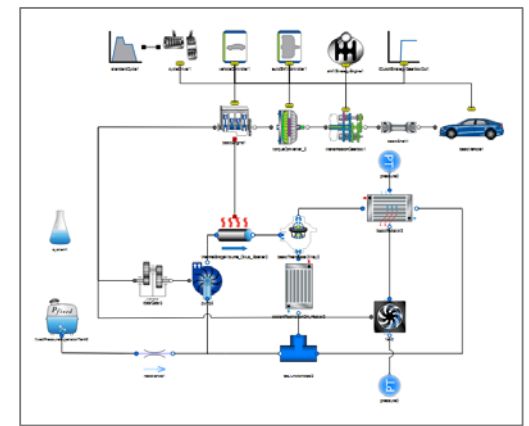
Vehicle Dynamics



Performance & Fuel Economy Prediction

Powertrain / Systems Integration

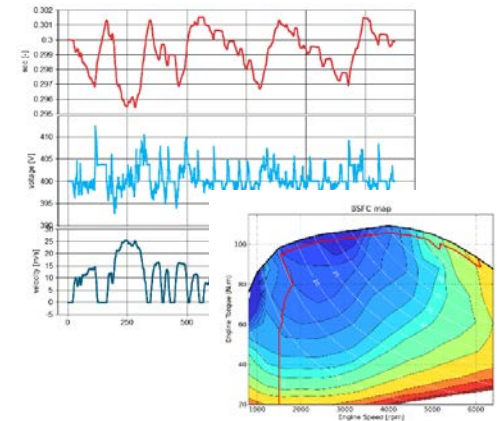
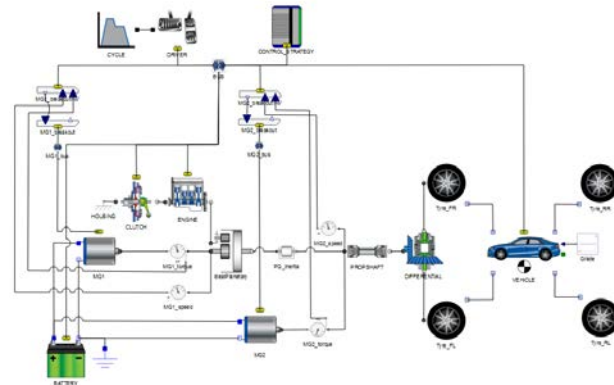
Hybrid System Design



# What is IGNITE?



## Modelica-based environment for modeling and simulation of (automotive) systems



A flexible, integrated Modelica based environment for multi-domain systems analysis  
Libraries to cover different cross domain problems containing various fidelity components

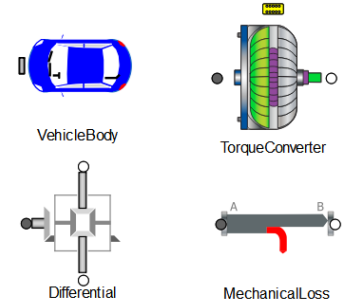
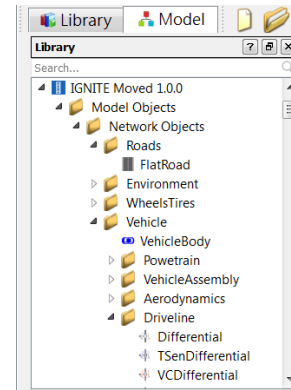


# IGNITE Key Characteristics



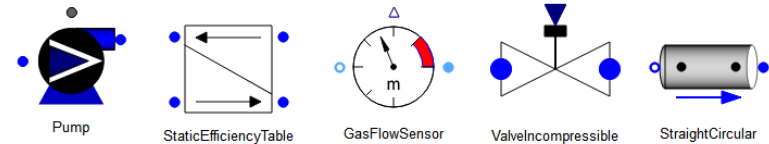
- Ricardo library development

- Powertrain
- Controls
- Vehicle Dynamics
- 1-D thermal fluid



- Growing Support for Modelon Libraries

- 7 Modelon libraries supported as of 2017.1



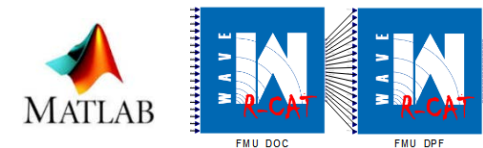
- Flexibility by Functional Mock-up Interface

- OCT Solver

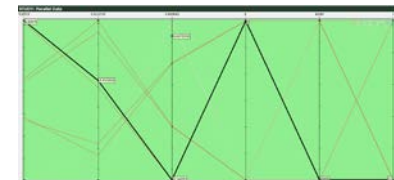


- Co-Simulation Interface

- WAVE-RT & RCAT ( 1-D gas-dynamics engine coupling, emissions)
- MATLAB/Simulink (detailed control system integration / development)



- Postprocessor / Design & Optimization via HEEDS

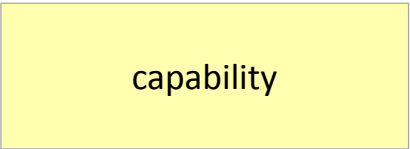


# IGNITE 2018.1

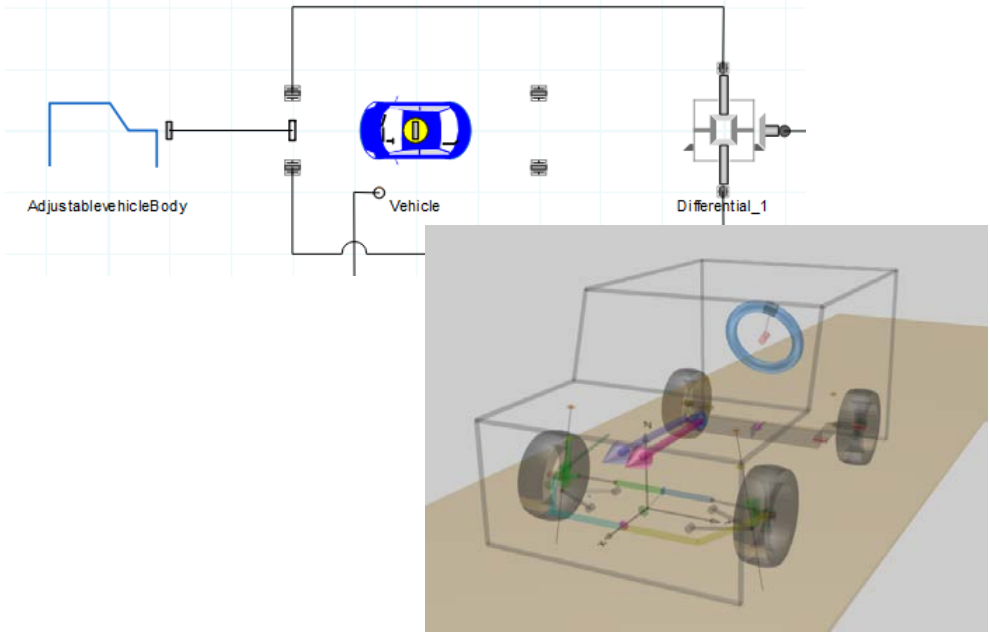


- Release featuring
  - IMoved library for vehicle dynamics applications
  - Powertrain library fixes

# 10 DOF Vehicle Assembly



- Prepopulated skeleton components
- Data access via reference objects
- Interfaces for external connections
- Visualization template
  - IMoved library for vehicle dynamics applications
  - Powertrain library fixes



**Edit**

Label: Vehicle

General | **Steering** | Vehicle Body | Brakes | Initialization

animation

**Front Axle**

Front axle steerable model: **MacPhersonSteer**

Front axle anti roll bar: **AntiRollBarSimple**

Left Wheel: **WheelPac02**

Right Wheel: **WheelPac02\_1**

Position of front axle from frame\_a

Expression

Position of front axle from frame_a	
	[m]
1	0
2	0
3	0

**Rear Axle**

Rear axle non-steerable model: **TorsionBeam**

Rear axle anti roll bar: **AntiRollBarNone**

Left Wheel: **WheelPac02\_2**

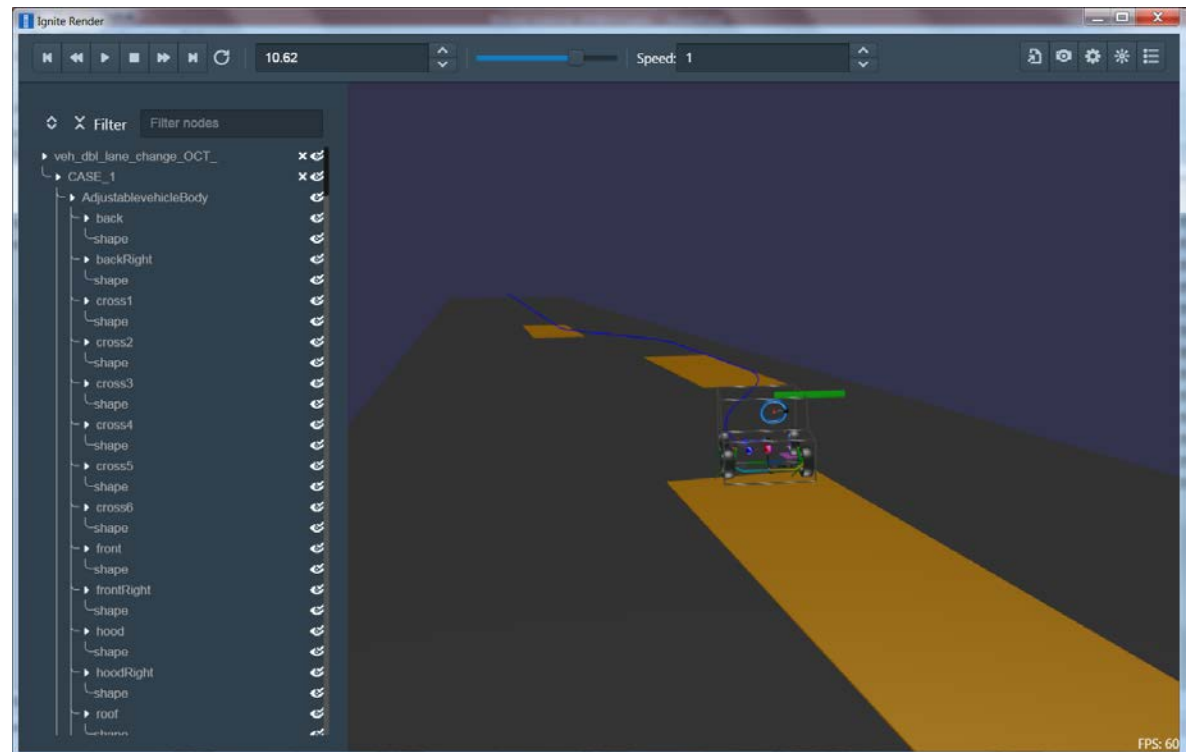
Right Wheel: **WheelPac02\_3**

# Vehicle Simulation - Animations

capability and usability



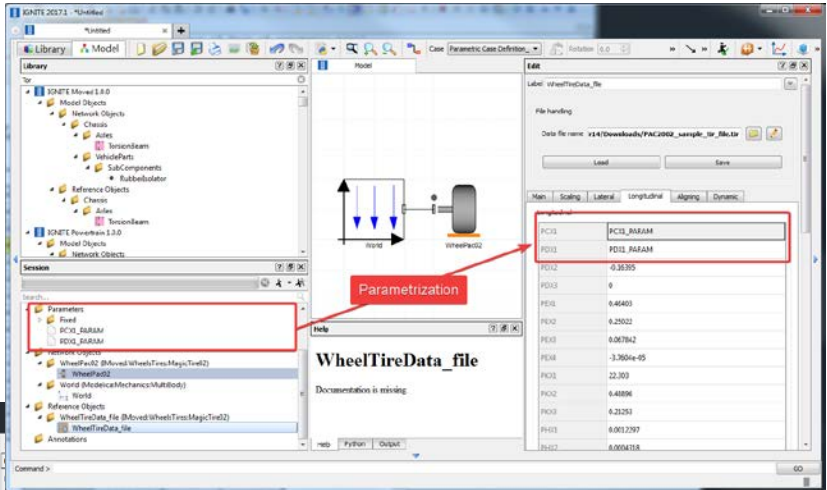
- Visualization
  - Road profile
  - Forces
  - Tire contact
  - Vehicle frame
  - Suspension geometry
  - Motion
- Results automatically generated from IGNITE
- Camera to follow objects
- Component tree
  - Case comparison
  - Visibility control
- Animation controls
  - Replay and loop
  - Animation speed



# Tire Data Import for Magic Tire



- Tire data container reading standard TIR file
- Data import via copy/paste from MS Excel
- Option to link the tire properties to IGNITE parameters for tire related parametric studies



\*\*\* Pacejka Coefficient \*\*\*  
MF-Tyre 5.2 Formulation

Pure Slip Condition			ISO axis system		
Longitudinal Force	Lateral Force	Aligning Torque			
Pd01 1.464E+00	Pd01 1.235E+00	Qd01 1.747E+01			
Pd01 1.228E+00	Pd01 1.105E+00	Qd02 -4.497E+00			
Pd02 -3.610E-02	Pd02 -1.256E-01	Qd03 1.580E+00			
Pd03 1.750E+00	Pd03 1.623E+00	Qd04 3.053E-01			
Pd01 1.894E-02	Pd01 -1.183E-01	Qd05 1.314E-01			
Pd02 2.349E-01	Pd02 -7.973E-01	Qd09 2.999E-01			
Pd03 -1.389E-01	Pd03 1.535E-01	Qd09 0.000E+00			
Pd04 3.751E+00	Pd04 -5.637E+00	Qd11 1.240E+00			
Pd01 2.623E+01	Pd01 -2.518E+01	Qd11 8.056E-02			
Pd02 -2.400E-02	Pd02 2.529E+00	Qd02 6.394E-03			
Pd03 3.190E-01	Pd03 1.912E-01	Qd03 1.952E-01			
Pd01 7.969E-04	Pd01 2.100E-03	Qd04 3.417E+00			
Pd02 -9.294E-04	Pd02 3.657E-04	Qd05 4.638E-03			
Pd01 2.232E-02	Pd02 1.019E-02	Qd07 -3.089E-03			
Pd02 3.069E-02	Pd01 7.290E-03	Qd09 -1.957E-01			
	Pd02 -5.416E-03	Qd09 -8.894E-02			
	Pd03 -8.162E-01	Qd01 -5.905E-02			
	Pd04 1.505E-01	Qd02 8.136E-02			
		Qd03 0.000E+00			
		Qd04 -2.296E-01			
		Qd05 -2.050E+01			

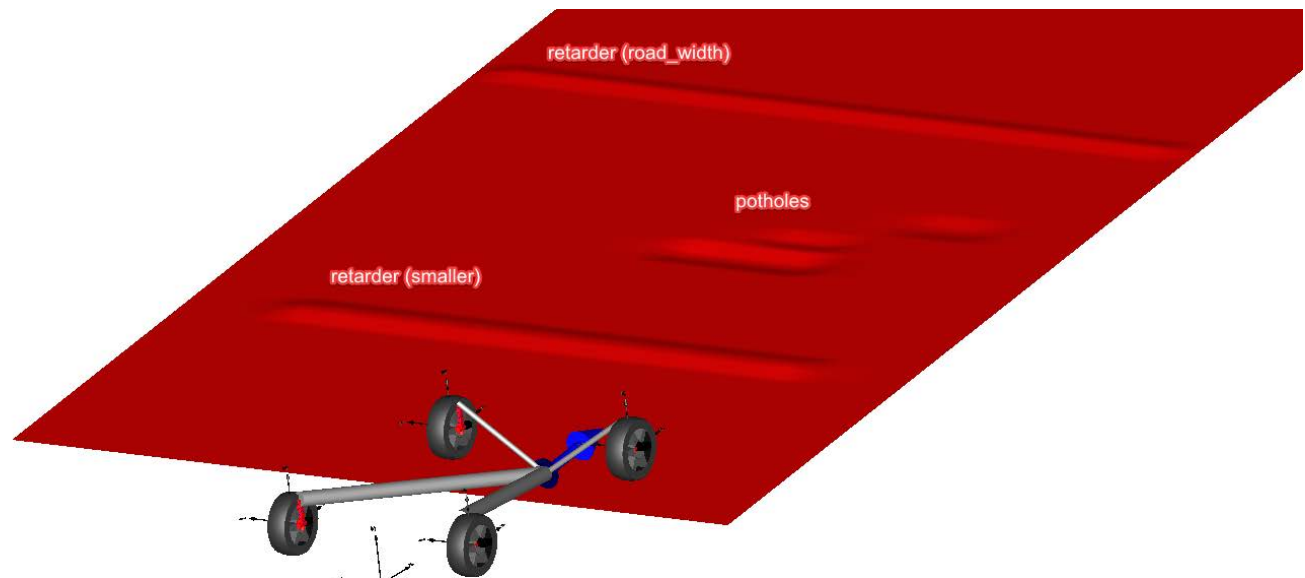


# Road definition and design

capability



- Road animation
- Path definition as a sub-element of the road
- Vertical profile imposed on the surface
  - Defined retarders or potholes on the road patch
  - Defined by the road data measurement
  - Currently a single point of contact (given by the tire model used)
- Bank angle and gradient profile

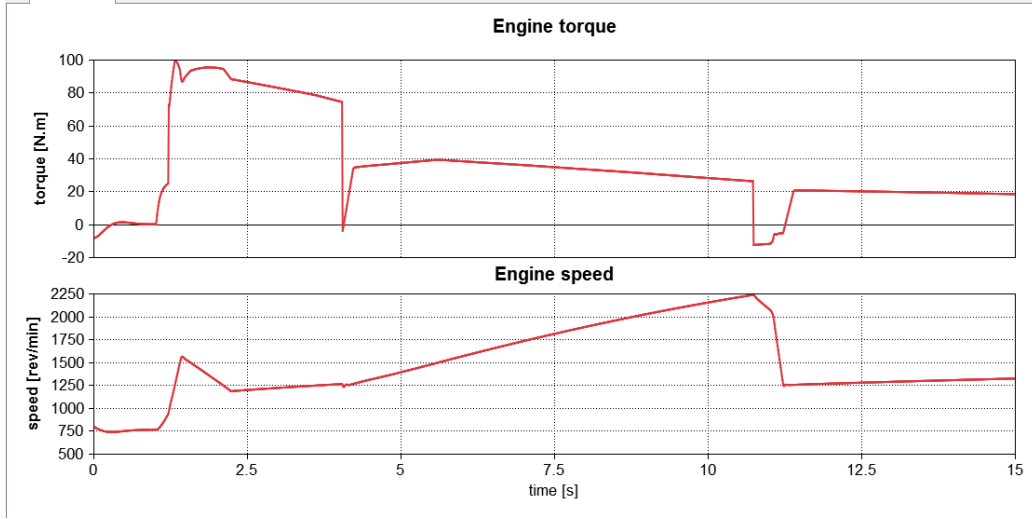
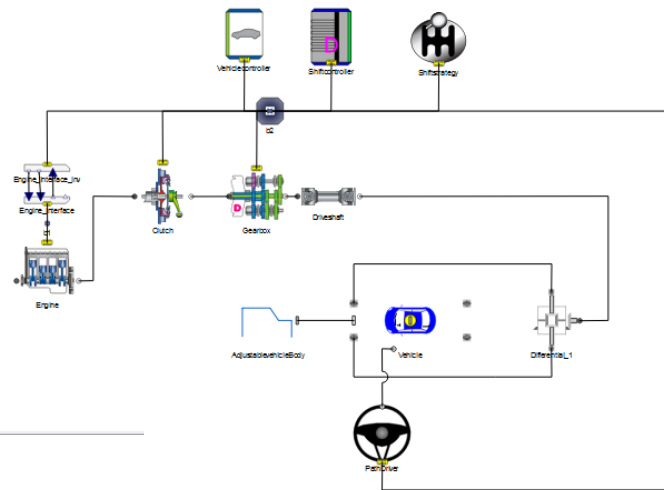


# Connection to the Powertrain Library

flexibility and usability

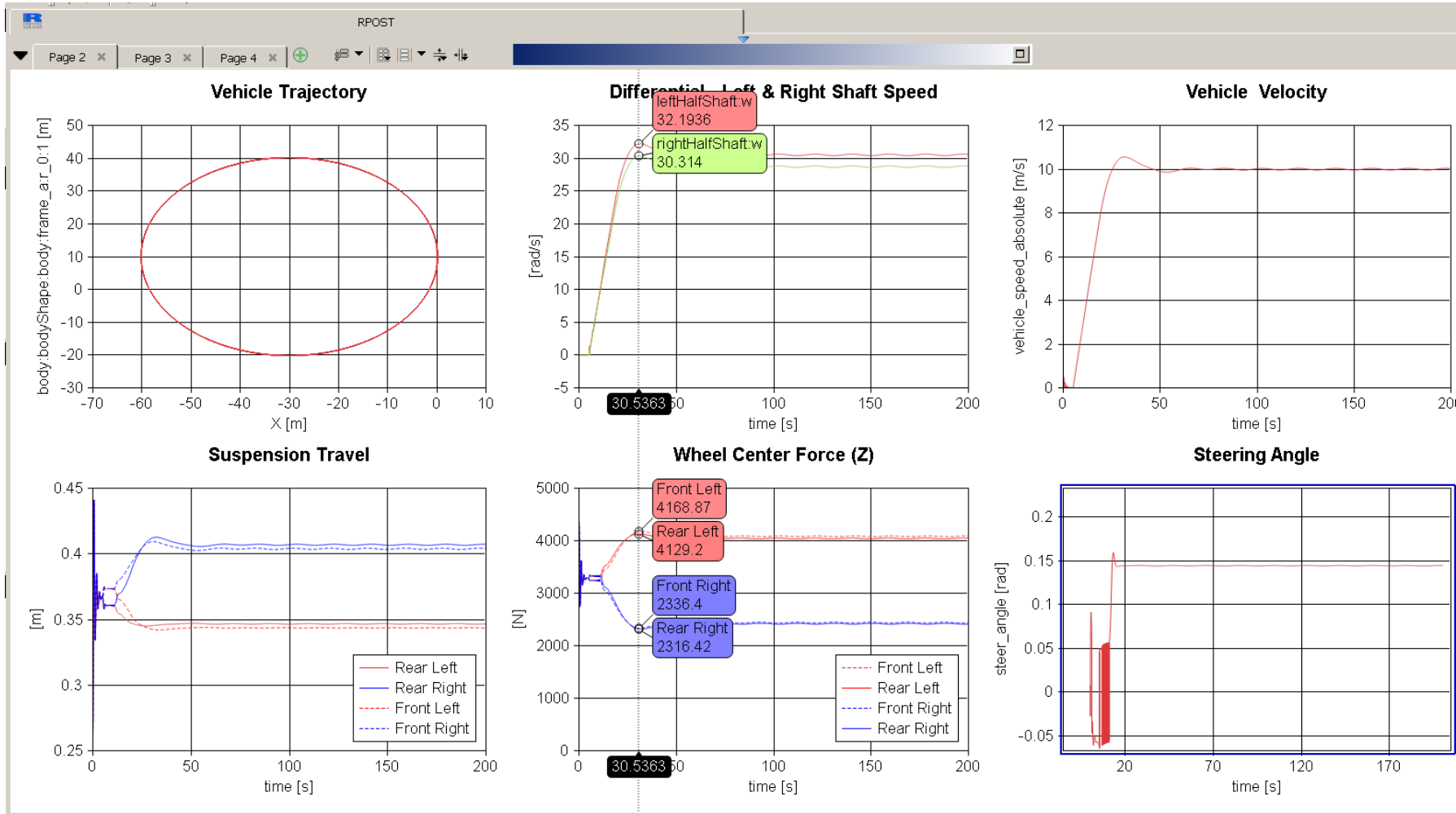


- Moved fully compatible with Powertrain Library
- Interfaces support building different layouts
- PathDriver replacing the CycleDriver
- The impact of the powertrain changes on the vehicle handling

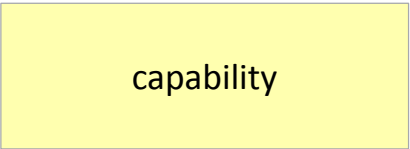


# Link to RPOST definition of the custom templates

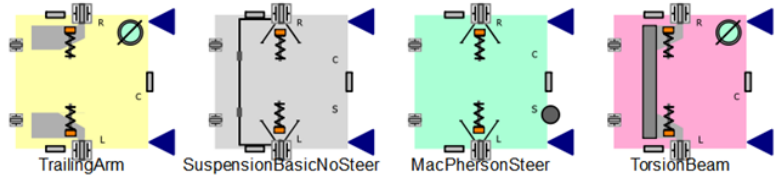
usability



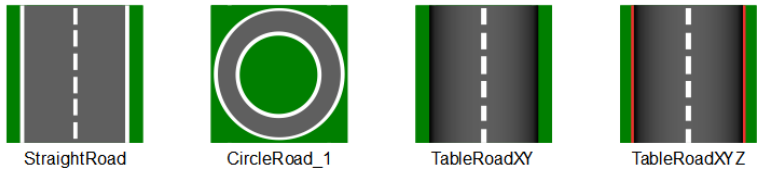
# Components overview



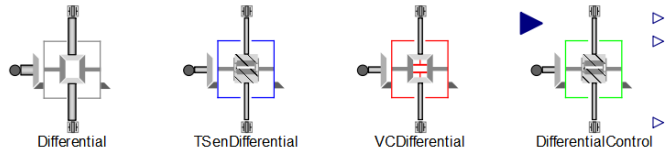
## Axles



## Roads



## Differentials



## Drivers

