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How to integrate a user-defined model of Elastic Cab mounts in TruckMaker?

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Integrating a user-defined model of Elastic Cab Mounts in TruckMaker

This is a guide on integrating a user-defined Simulink model for elastic cab mounts in TruckMaker. This example focuses primarily on the approach of using Simulink Coder (formerly RTW) to generate a Plugin from the customized model, which is then linked with the source code to build a custom CarMaker executable.

Technical Background

TruckMaker simulations which focus on driving comfort might require the consideration of elastic cab mounts for more accurate analyses. In addition to generic models for simulating such a flexible mount, TruckMaker also provides a DVA-based interface for integrating a user-model available in Simulink.

Solution

Step 1: Generating a Simulink Plugin begins with choosing the right model wrapper. As the Elastic Cab Mounts do not have a wrapper class of their own, the Generic Plugin Model approach is used.

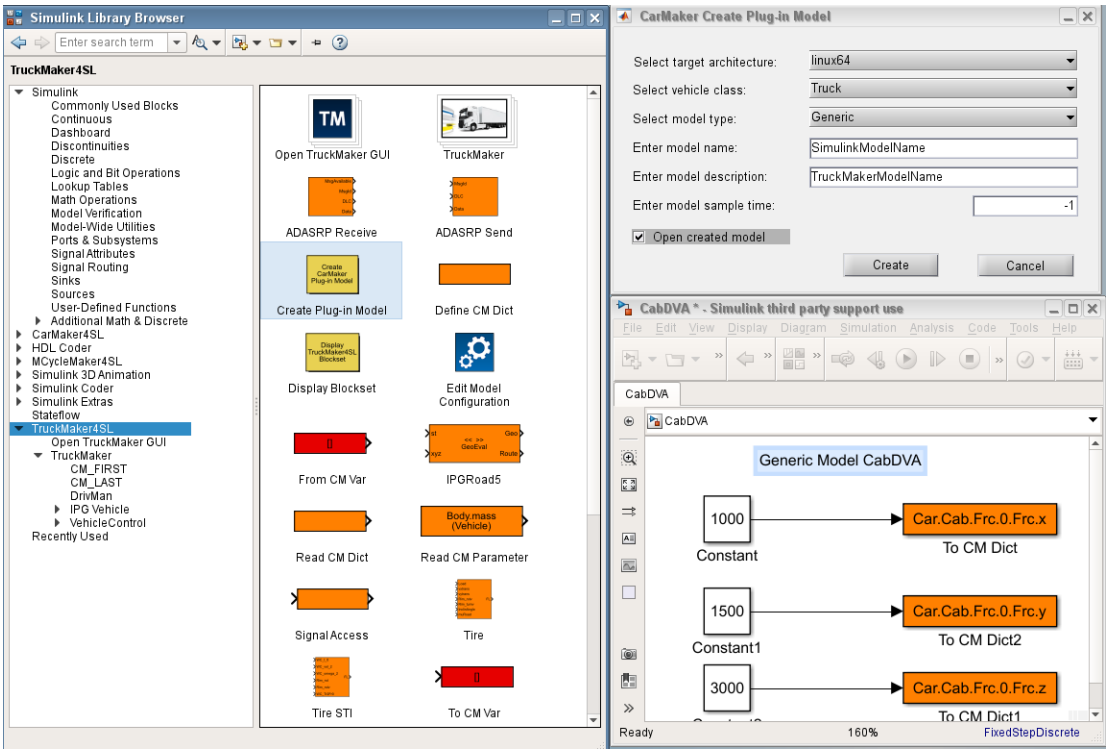

Figure 1: User-defined Model as Generic Plugin

In the Simulink model window that opens, the user-defined model is included. The elastic cab mount forces are written to the corresponding UAQs using the *Write CM Dict* blocks. (Figure 1 shows a simplified representation where constants are assigned). If required, *Read CM Dict* are used to read UAQs that are required as inputs for the user-defined cab mount model.

Detailed information on the UAQs of the elastic cab mounts are found in the TruckMaker Reference Manual.

Once the model is complete, Simulink Coder is used to compile it as a C-code library and further linked to generate a CarMaker custom executable in *src_tm* folder. This is selected in Application Configuration. The compile info shows the Plugin library among the linked libraries.

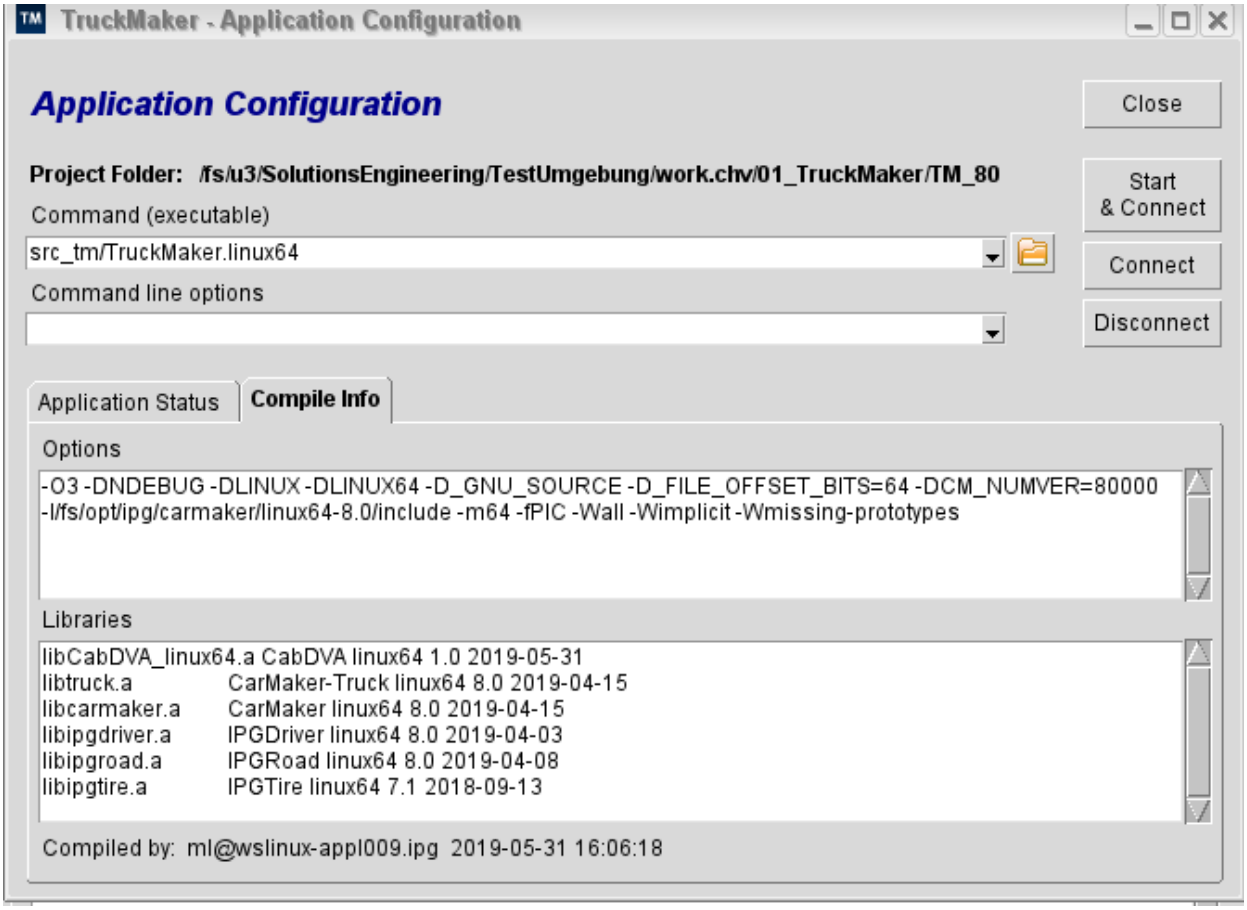

Figure 2: Application Configuration

Step 2: After compilation and selection of executable, the Vehicle Data Set has to be parametrized. To enable the user-defined model, the Mode of the Forces are set to DVA.

- *DVA*: The desired force element force is set using the Direct Variable Access on the quantities:
  - *GenFrc*: *Car.Cab.GenFrc.[x,y,z], Car.Cab.GenTrq.[x,y]*
  - *3xFrc ... 5xFrc*: *Car.Cab.Frc.[0..4].Frc.[x,y,z]*
    For the static equilibrium the forces are calculated with the model kind *Coeff*.

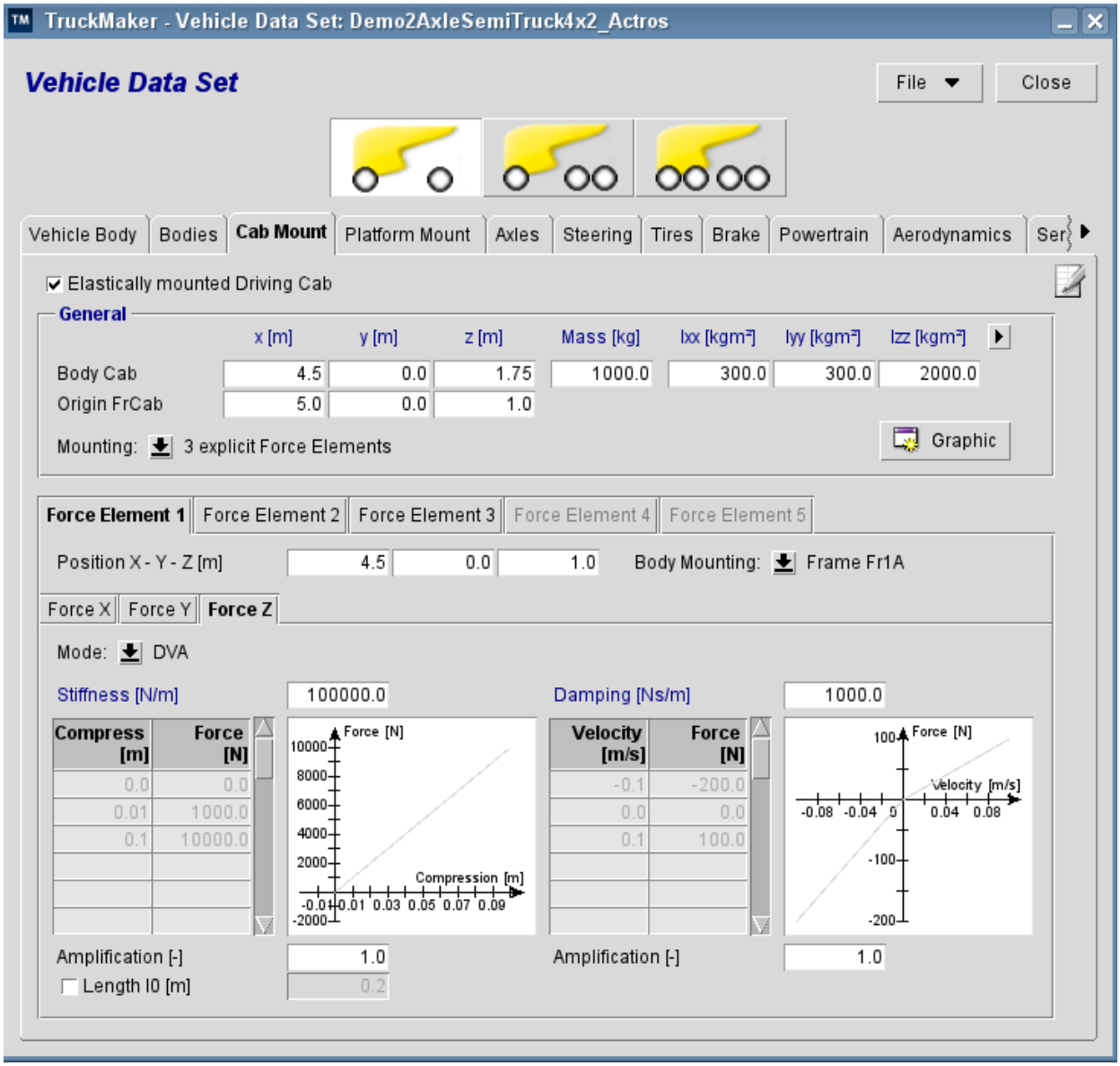

Figure 3: Vehicle Data Set Parameterization

Step 3: The point of DVA is set as an additional parameter. The optional parameters for a Generic Plugin are found in the Programmer's Guide.

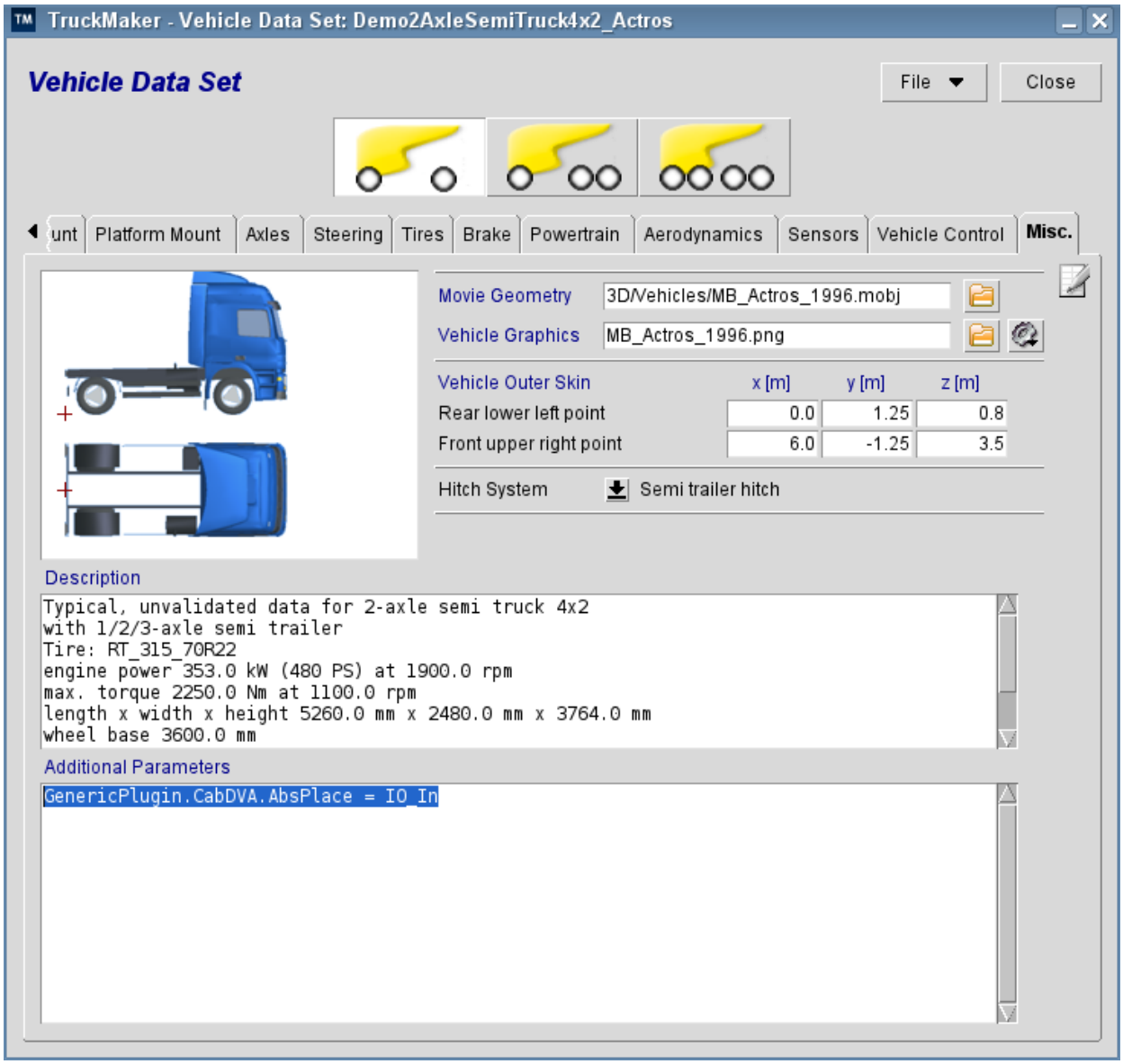

Figure 4: Additional Parameters for Generic Plugin

Disclaimer:
The example does not list all the steps in using MATLAB/Simulink for Plugin generation. Also, the user should be familiar with the basic features of TruckMaker such as Direct Variable Access (DVA) and User Accessible Quantities (UAQs). Detailed information on these are found in the TruckMaker Documentation.