How to Simulate a Drive with a Machine

Prerequisites

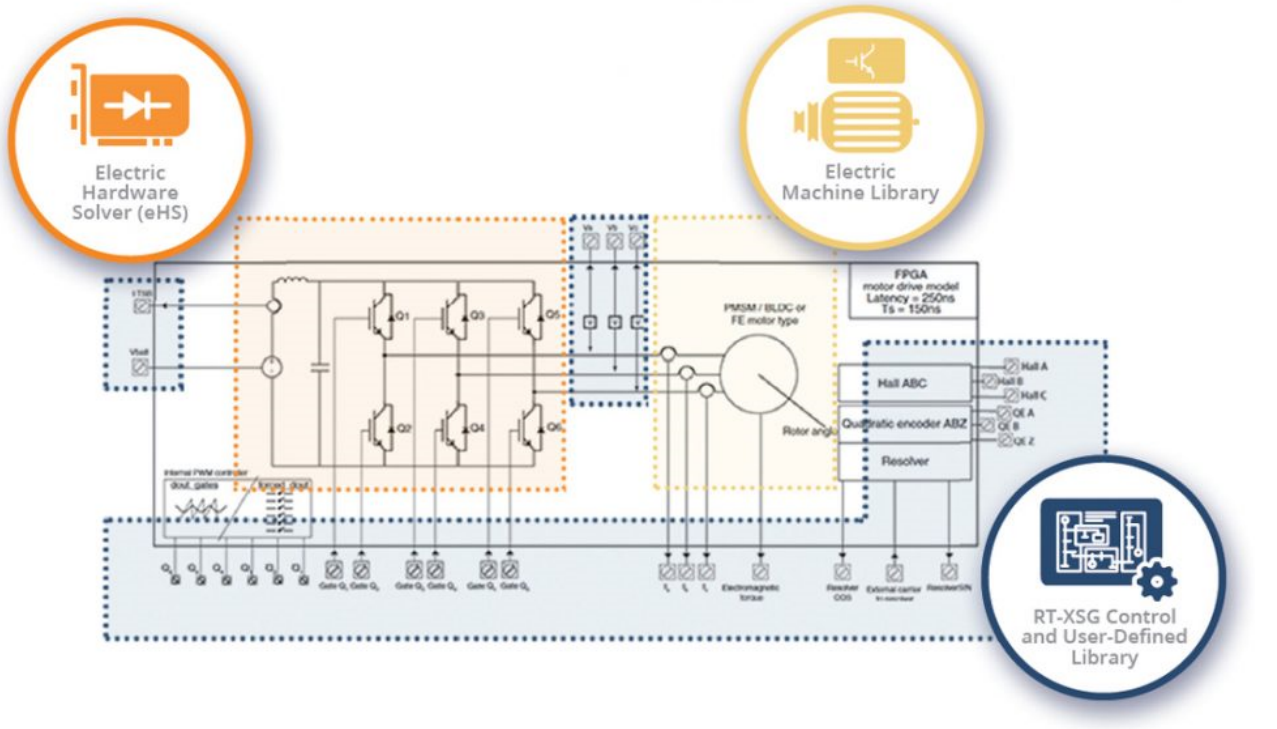
How to Add the Power Electronics Add-On to the System Definition

How to Create a Circuit Model

How to Add a Circuit Model to the System Definition

Procedure

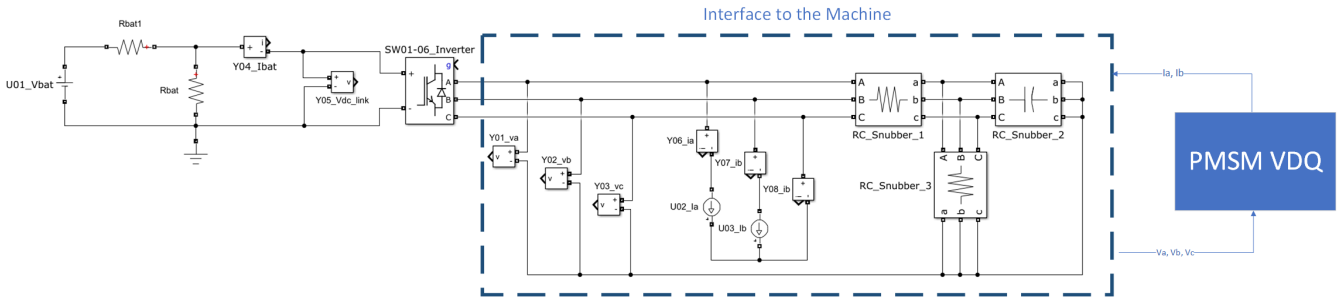
Different modeling resources within the FPGA design are used to simulate different parts of the electrical model. For example, in the case of a drive system, the circuit containing linear elements is simulated using the **eHS Solver**, whereas the machine configuration is simulated with a **Machine Model** (see image below). Due to this inherent decoupling of the two parts of the simulation, additional considerations must be made when simulating a drive coupled to a machine.



Interface Requirements to Couple a Drive and a Machine

To couple a drive circuit with a machine, such as a PMSM, a specific set of **Sources** and **Measurements** must be added to the circuit model. In the case of the PMSM, typically, it is important to include the following interface elements:

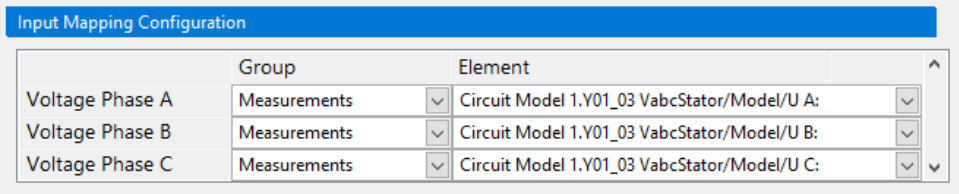
- Measurements for the three phase voltages (Va, Vb, Vc) that will be output from the drive model (eHS) and fed into the machine model
- Sources for the currents (Ia, Ib) that will be output from the machine model and injected into the drive model (eHS)
- RC snubbers to compensate for the decoupling of the two solvers on the FPGA. Please see **Tuning the Snubber Values** for more information.



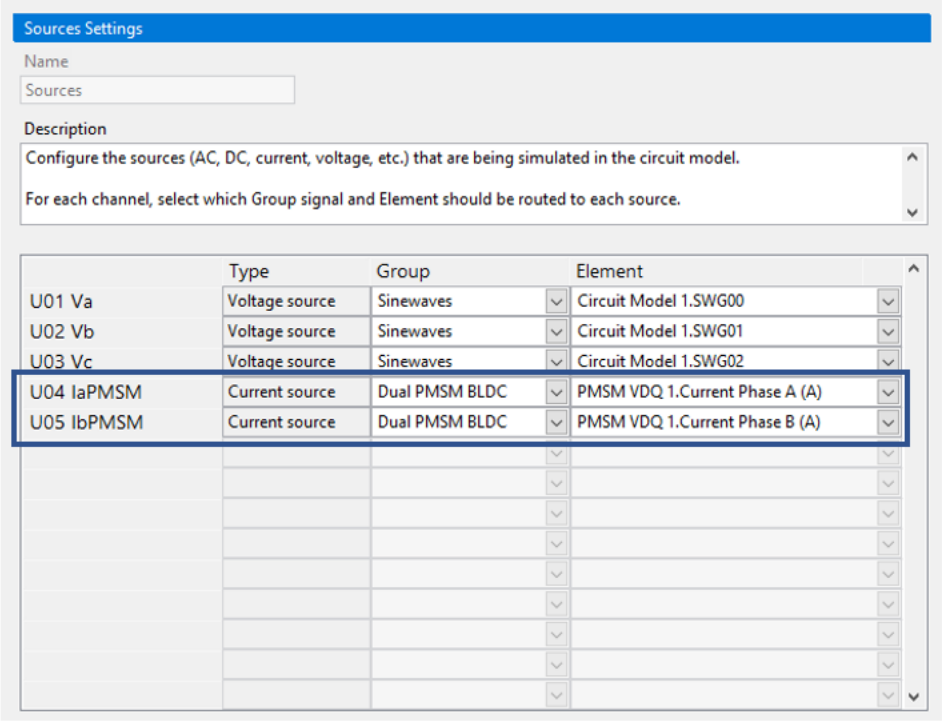
Configuring the Routing between the Drive and the Machine

To map the interface Sources and Measurements of the circuit to the Machine Model:

1. In the VeriStand System Definition, navigate to the **Machine Model** configuration page.
2. Under **Input Mapping Configuration**, map the three voltage measurements to the **Voltage Phase A**, **Voltage Phase B**, and **Voltage Phase C** inputs of the machine model.



3. Navigate to the **Sources** configuration page.
4. Map the **Current Phase A** and **Current Phase B** outputs of the machine model to the corresponding current sources in the circuit model.



Tuning the Snubber Values

An RC snubber is often used to stabilize the decoupling of two solvers on the FPGA (e.g. eHS solver & a machine). Ideal snubber values can be calculated based on the following parameters of the simulation:

- Nominal speed of the machine being simulated
- Power rating of the machine between simulated

For details on how to select a snubber value for your simulation, please contact **OPAL-RT Technical Support**.