Modelica on The Web

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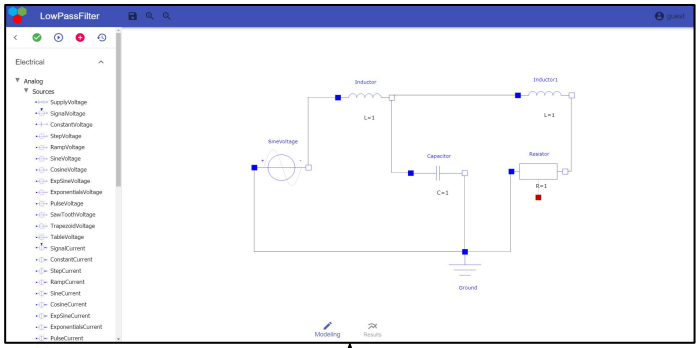
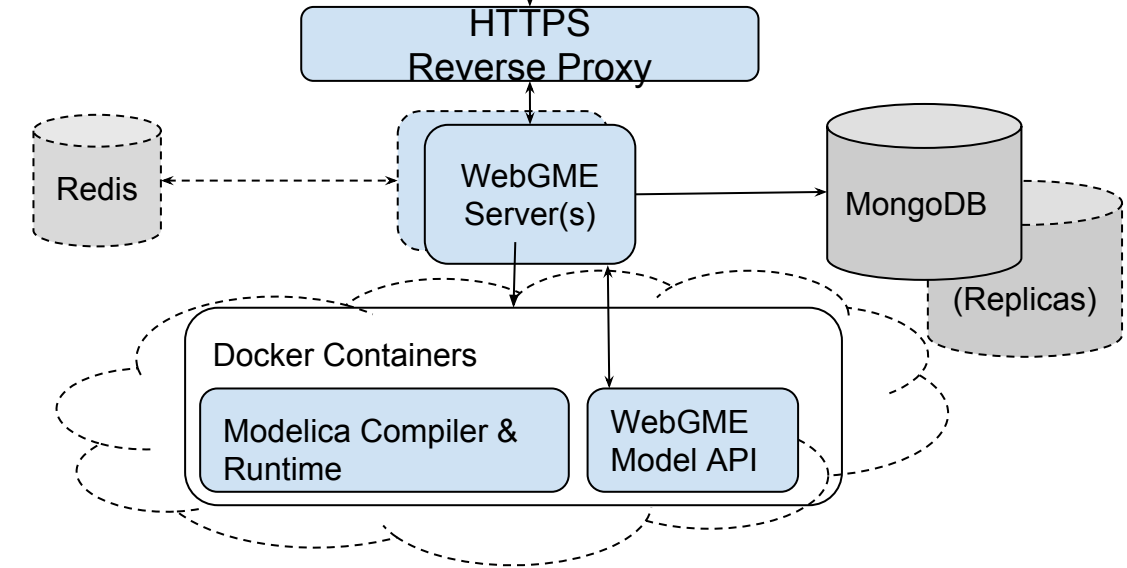
Motivation

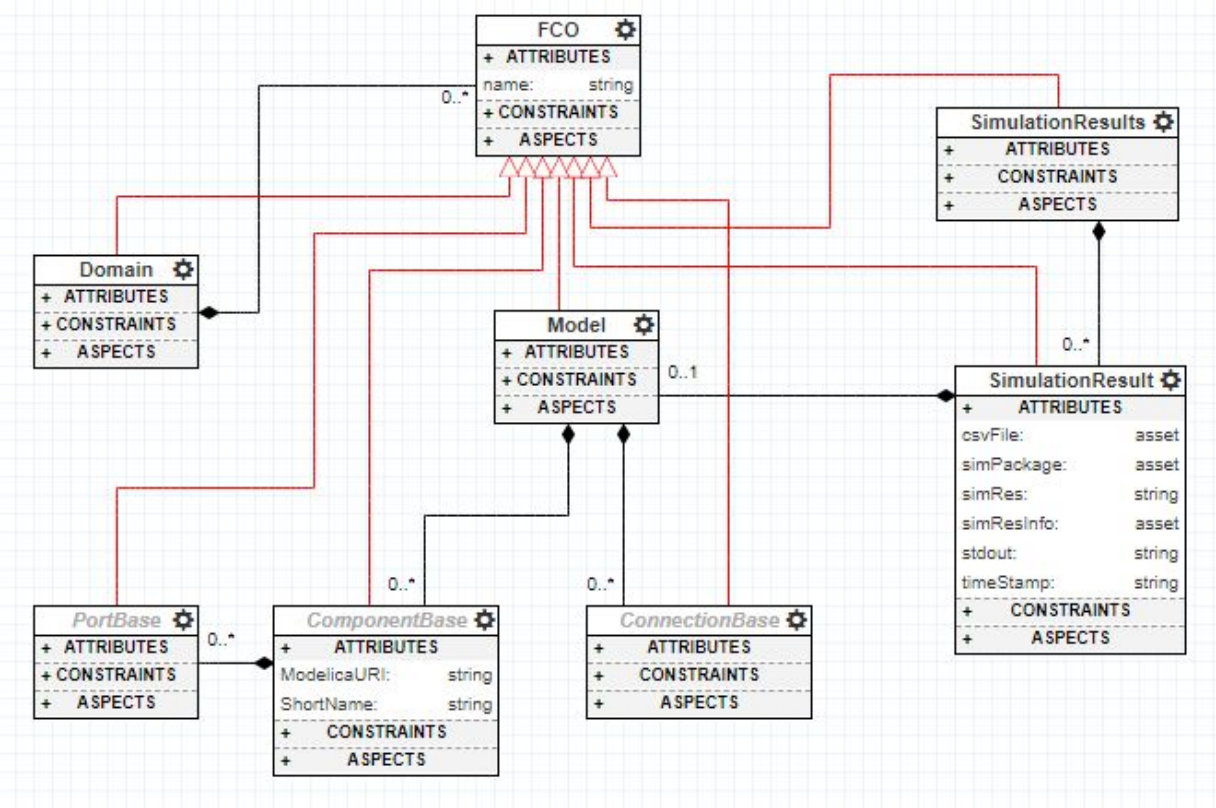
- Drawbacks of current Modelica solutions
  - Missing integrated collaboration features
  - No web presence
- WebGME was built around collaboration and web presence
- The meta-programmable modeling environment WebGME can model Modelica Standard Language and integrate many of its features into a Design Studio
- Tailored modeling and simulation experience for beginner Modelica users
- Foundation for post-simulation analysis (optimization, surrogate model training)

Architecture



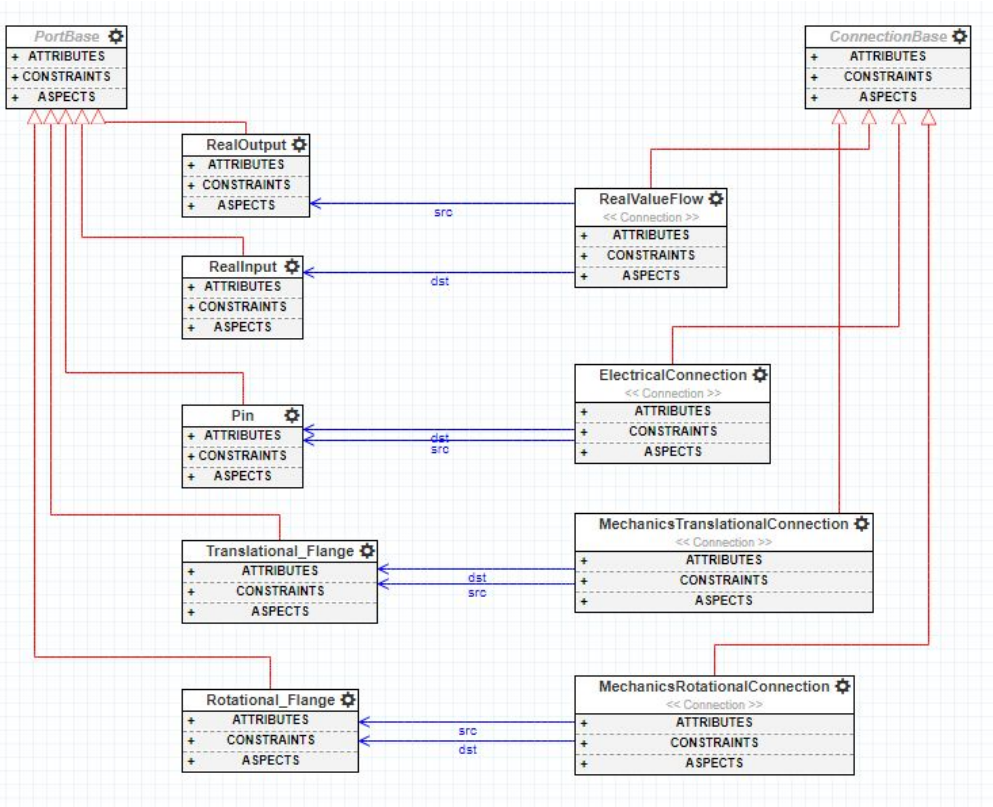


The Modelica Metamodel



- The basic elements of the domain that allow model creation and simulation
- FCO is the root of inheritance tree in WebGME
- Every new component can be defined by inheriting from the Component/Connection/Port bases
- The inheritance feature of WebGME allows extension of the domain later

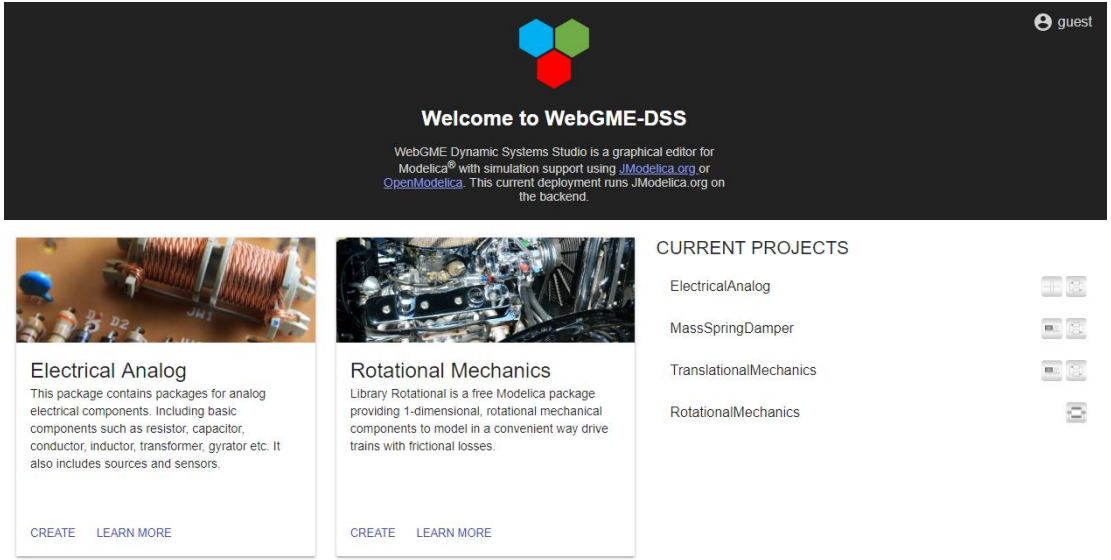
The Modelica Metamodel



- Connections in WebGME are defined by the use of two specific pointers (src and dst)
- Pointers are directed one-to-one associations
- These definitions will govern the UI of the end-user, so that only well-formed models could be created

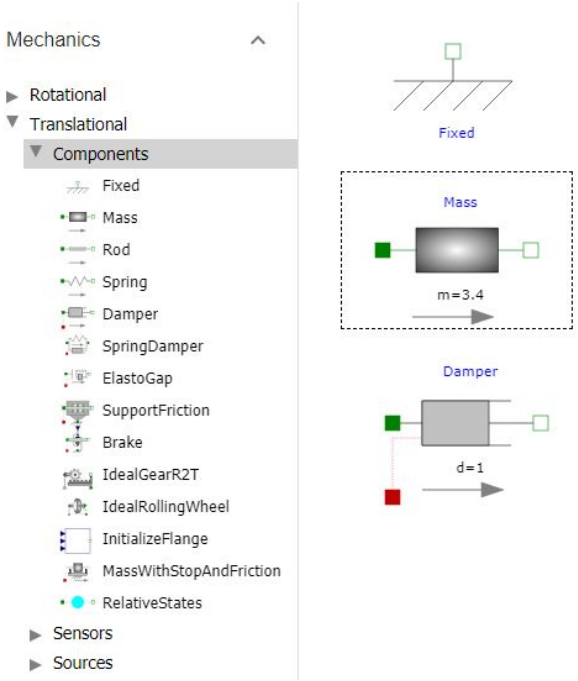
WebGME-DSS

- The user interface is clean and simple, focusing on model creation
- The start page allows project creation (by listing available modelica domains) or opening projects that are accessible to the user
- At project creation domains of MSL are selected (existing projects can later be updated with more domains)



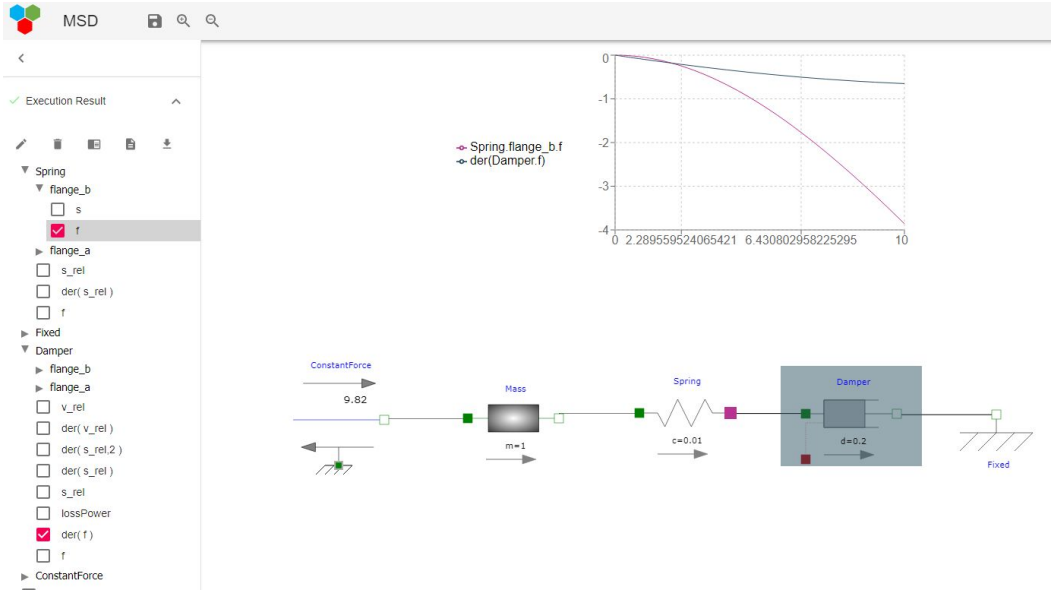
WebGME-DSS - Modeling View

- Standard editor features are available (create by drag-and-drop, edit parameters of elements, connect compatible ports)
- The user can initiate simulations from here
- Automatic history of the model is available (version control)
- Every change will generate an entry in the history
- The user can make additional entry points in the history with message
- Different versions of the project can be compared
- Changes can be reverted and earlier versions can be restored



WebGME-DSS - Simulation View

- Is activated automatically whenever a new simulation is initiated on the modeling view
- Each simulation preserves the version of the model it was run on, allows for traceability of stored results
- Selection is also visually reinforced by coloring the corresponding part of the model (allows easy tracking of the plotted variables)



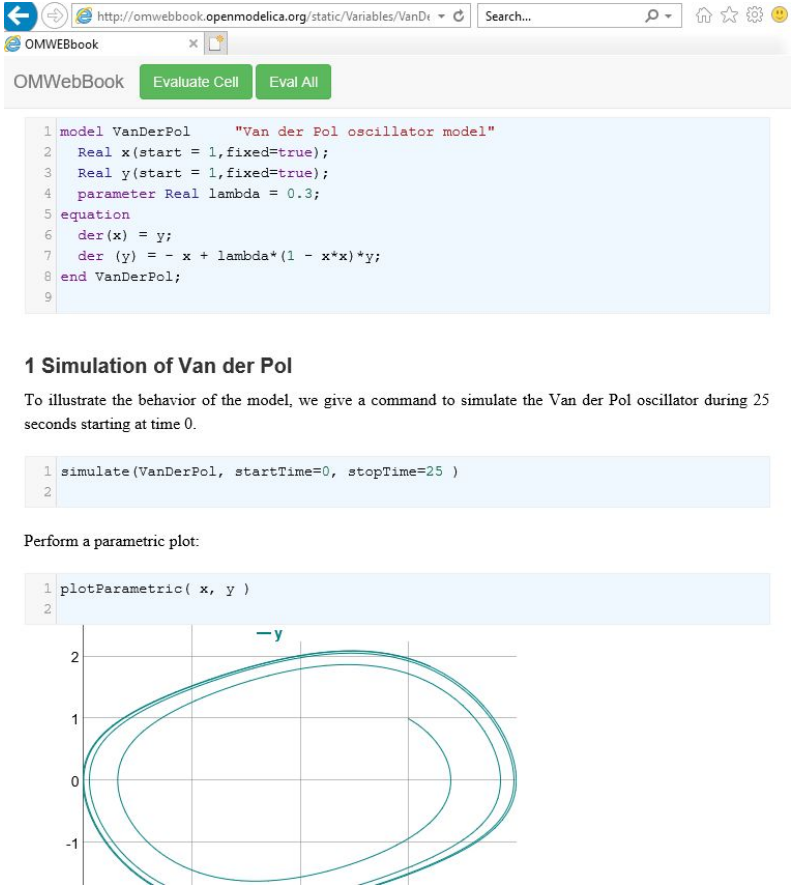
Availability

- Currently a proof of concept implementation
- Available as Open Source (under MIT license) at https://github.com/webgme/webgme-dss
- It is also live and anyone can try it out at https://cps-vo.org/group/modelica
- The virtual organization has other design studios as well
- That deployment uses JModelica.org as a Modelica back-end, but when someone downloads the source, OpenModelica can be configured as backend also

Future Plans

- Extending the coverage of Modelica Standard Language components
- Separate mode for building up components (currently system level composition)
- Extend with textual editing
- Integration with Modia/Julia (beyond Modia code generation)

Future with OMWebbook



- OMWebbok combines notebook and textual capabilities with computation (like Wolfram notebook or Jupyter notebook)
- http://omwebbook.openmodelica.org/
- Just like plotting, WebGME's visual editor could be embedded into a notebook and the user could choose the way how the models are defined (either visually or textually)
- Or even switching among different representations
- Also, the models then could be stored so alternatively be used among multiple notebooks