

Designing Interfaces for Multi-Domain Simulations

– An extension to the Dune-PDELab Module –

Christian Engwer^a and Steffen Müthing^b

^a *WWU Münster*

^b *University of Stuttgart*

We are facing an increasing complexity in the models of scientific computing. Multi-physics applications, highly non-linear processes and domains exhibiting a complex shape are only some examples of such complexity. These changes pose a big challenge to the development of scientific software. On the one hand the requirements on the software are growing, e.g. broader feature sets, demand for easy parallelism. On the other hand the turn over times are getting shorter, which requires shorter development times.

To handle these requirements, DUNE provides a flexible framework for grid based methods for the solution of PDEs. Based on this framework different approaches for multi-domain simulations are available.

We discuss the design of a general multi-domain extension for the Dune-PDELab module. The new interface allows the user to program generic coupling conditions and easily use them in the very different multi-physics and multi-domain concepts. These interfaces allow flexible computations while still allowing an efficient, i.e. rapid, implementation of new simulations.