



Development of the Delta Shell as an integrated modeling environment

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Many engineering problems require the use of multiple numerical models from multiple disciplines. For example the use of a river model for flow calculation coupled with a groundwater model and a rainfall-runoff model. These models need to be setup, coupled, run, results need to be visualized, input and output data need to be stored. For some of these steps a software or standards already exist, but there is a need for an environment allowing to perform all these steps. The goal of the present work is to create a modeling environment where models from different domains can perform all the six steps: setup, couple, run, visualize, store. This presentation deals with the different problems which arise when setting up a modelling framework, such as terminology, numerical aspects as well as the software development issues which arise.

In order to solve these issues we use Domain Driven Design methods, available open standards and open source components.

While creating an integrated modeling environment we have identified that a separation of the following domains is essential: a framework allowing to link and exchange data between models; a framework allowing to integrate different components of the environment; graphical user interface; GIS; hybrid relational and multi-dimensional data store; discipline-specific libraries: river hydrology, morphology, water quality, statistics; model-specific components

Delta Shell environment which is the basis for several products such as HABITAT, SOBEK and the future Delft3D interface. It implements and integrates components covering the above mentioned domains by making use of open standards and open source components. Different components have been developed to fill in gaps. For exchanging data with the GUI an object oriented scientific framework in .NET was developed within Delta Shell somewhat similar to the JSR-275. For the GIS domain several OGC standards were used such as SFS, WCS and WFS. For storage the CF standard together with NetCDF was used in combination with Object Relational Mapping using Hibernate and SQLite.

The use of the domain driven design and plug-in architecture resulted in a system where it is very easy to add or remove components. The system can be easily extended by the new models, data types, user interface or data processing components. The system itself (partially) plus plug-in API will be released as free software available for community.