Open source integrated modelling environment Delta Shell

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Deltares
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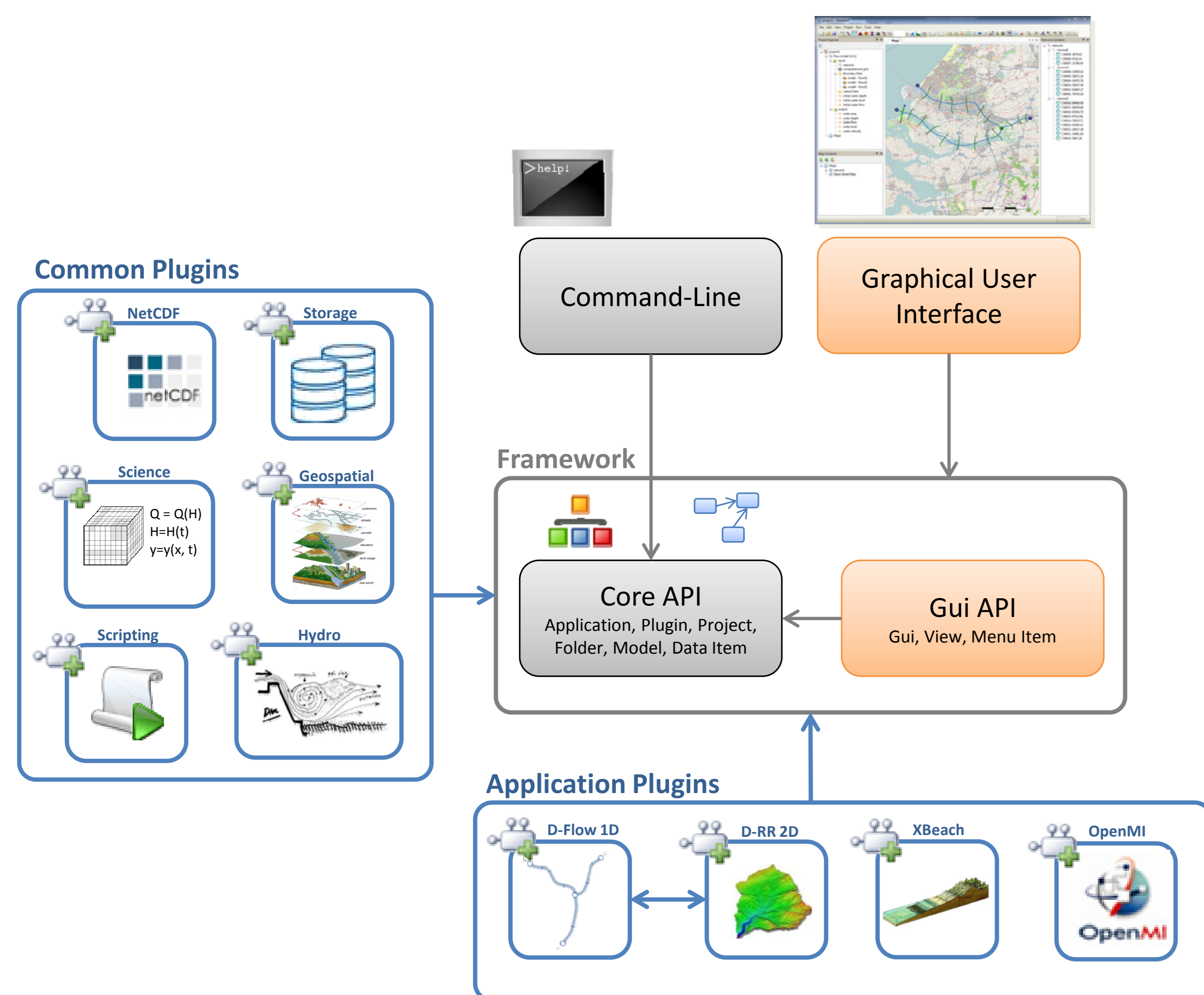
Introduction

During the last decade, integrated modelling has become a very popular topic within environmental modelling, since it helps solving problems that are difficult to simulate using a single model. However, managing the complexity of integrated models and minimizing the time required for their setup remains a challenging task.

The integrated modelling environment Delta Shell intends to simplify this task. The software components available within Delta Shell are easy to reuse separately, or as a part of an integrated environment. Both can run in a command-line or a graphical user interface mode. Most of the components are developed using the C# programming language and include libraries that are used to define, save and visualize various scientific data structures, as well as coupled model configurations.

Open Architecture

- **Core** and **Gui** application programming interface (**API**)
- **Common Plugins** (multi-dimensional data structures, domain-specific object models, scripting, unified hybrid storage, geospatial libraries)
- **Application Plugins** (data types, models, controls, import/export)
- **Front ends** (command-line and graphical user interface)

Example: SOBEK 3.0

Example: XBeach

350 km
50 years

Model Integration

- Initialize
- Execute Time Step
- Get / Set Parameter
- Get / Set Variable
- Clean-Up

Possible Uses

- Integrated environmental modeling (IEM) applications
- Geospatial applications including temporal GIS functionality
- Graphical user interfaces used for complete model setup
- Command-line applications involving scripting using Python
- Web-service applications (model as-a-service)

Next Steps

- Documentation, examples, tutorials
- Domain-specific object models (INSPIRE, ArcHydro)
- Concepts of *Hydro Region*, *Hydro Region Data* and *Hydro Model*
- Advanced, noninvasive model coupling library
- Support for asynchronous model runs
- Distributed applications
- 3D functionality
- Versioning of project items

Summary of Key Characteristics

- Open-source integrated modeling system
- Infrastructure for new IEM applications
- Most components are written in C#
- Works on Microsoft .NET and Mono (command-line version)
- Released under LGPL license (preview version)

References

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