MIKE wrapper for Delft-FEWS

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Agenda

- History
- New MIKE wrapper for Delft-FEWS
- Architecture
- Existing projects / supports
- Extensions
- Possible future
- MIKE CLOUD computation wrapper
- FEWS in CHMI (Czech hydrometeorological institute)

History

- MIKE11 wrapper developed for version 2013
- All in One (one executable cover whole process)
- DHI.Engines.Mike11.RuntimeAdaptor.exe
- Only bin distributed
- Support old version of MIKE by DHI (lower than 2020)
- Main problem - > COM dependent
- Not supported any more – but still works with old versions of MIKE

New MIKE wrapper for Delft-FEWS

- Cover
  - Fully
    - MIKE11, MIKE HYDRO River, MIKE+ (CS and Rivers)
  - Boundary conditions and results only as time series
    - MIKE FM, MIKE FLOOD, MIKE SHE (some small changes needed)
- Component based (big flexibility)
- Open – source, documentation and example on GitHub
- https://github.com/DHI/MIKE.FEWSAdaptor

Architecture

- Set of individual components (exe) used in module configuration file
- C# using .NET Framework 4.7.3
- Description, syntax, module configuration templates for the individual components are included in GitHub
  - PIToDfs0 : Convert FEWS PI format to dfs0
  - Mhydro : Modify MHYDRO file (Py)
  - ModifyMhydroFile : Modify MHYDRO file
  - ModifyMIKESetupFile : Modify MIKE11, MHYDRO and 1D engine (MIKE+)
  - dfs0ToPI : Convert dfs0 to FEWS PI format
  - Res1dToPI : Convert res1d to FEWS PI format. Only selected data can be exported to PI using result selection XML file
  - GenerateAllXML : Generate XML file for all data in res1d file. Can be used to create result TS selection file
- Computation is executed using MIKE engine exe
  - different for different models for example c:\Program Files (x86)\DHI\MIKE Zero\2021\bin\x64\mike11.exe [model setup]

Extensions

MIKE Wrapper can be extended by creating new components

- Using Py
  - Config files modification (example included)
  - DHI provide public py lib for native files manipulation
    - MIKEIO https://dhi.github.io/mikeio/ - dfs files (0D, 1D, 2D, FM)
    - MIKEIO 1D https://github.com/DHI/mikeio1d - res1d file + cross section files
- C# using DHI nuget packages
- Any language
  - Modification of the text config files

Existing projects / supports

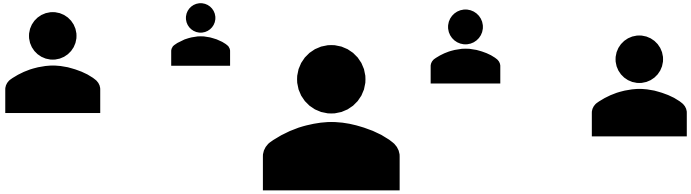
- DHI can provide support on consultancy basis
- On GitHub – full FEWS setup, including MIKE HYDRO River model exist
- DHI was part of the project “MIKE Hydro River – FEWS Adapter implementation for the river Oder” to the FEWS configured by Hydrotec where we did support and developed some extension for simpler configuration. Final client “State Authority for the Environment, Brandenburg”
- Support case for Deltares (Bas Stengs) – project in Vietnam. MIKE11 engine used.
- Maybe more – wrapper can be found in GitHub

Future

- Very near future
  - Source code / documentation on GitHub needs to be stabilized to cover extensions developed during support cases
- Based on the project / support cases needs
  - Model setup modification tool extended to fully cover more MIKE model types
  - More advance TS handling
  - Modify source code to be compiled in .NET 6.0 (Linux)
- Ideas
  - 2D (dynamic) model inputs and outputs
    - Grid
    - Flexible mesh

Vision – MIKE Platform (Cloud) computation wrapper

- DHI now provide possibility for cloud computation also for external users
- Computations are executed in Cloud (currently Azure) environment
- Authentication is done by Active directory
- Cost computed based on credits
- DHI provide set of prepared containers configured for the different MIKE engines (MIKE FM, MIKE1D, MIKE FLOOD…) and computer configurations (Linux). Engines are compiled using .NET 6.0
- Individual computation executed using Kubernetes on Azure nodes.



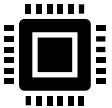
api.mike-cloud.com

Azure Active Directory

kubernetes

Azure Container Registry

Resources per execution



Up to 43 CPUs
Up to 340 GB RAM
Up to 2 x 32 GB GPU

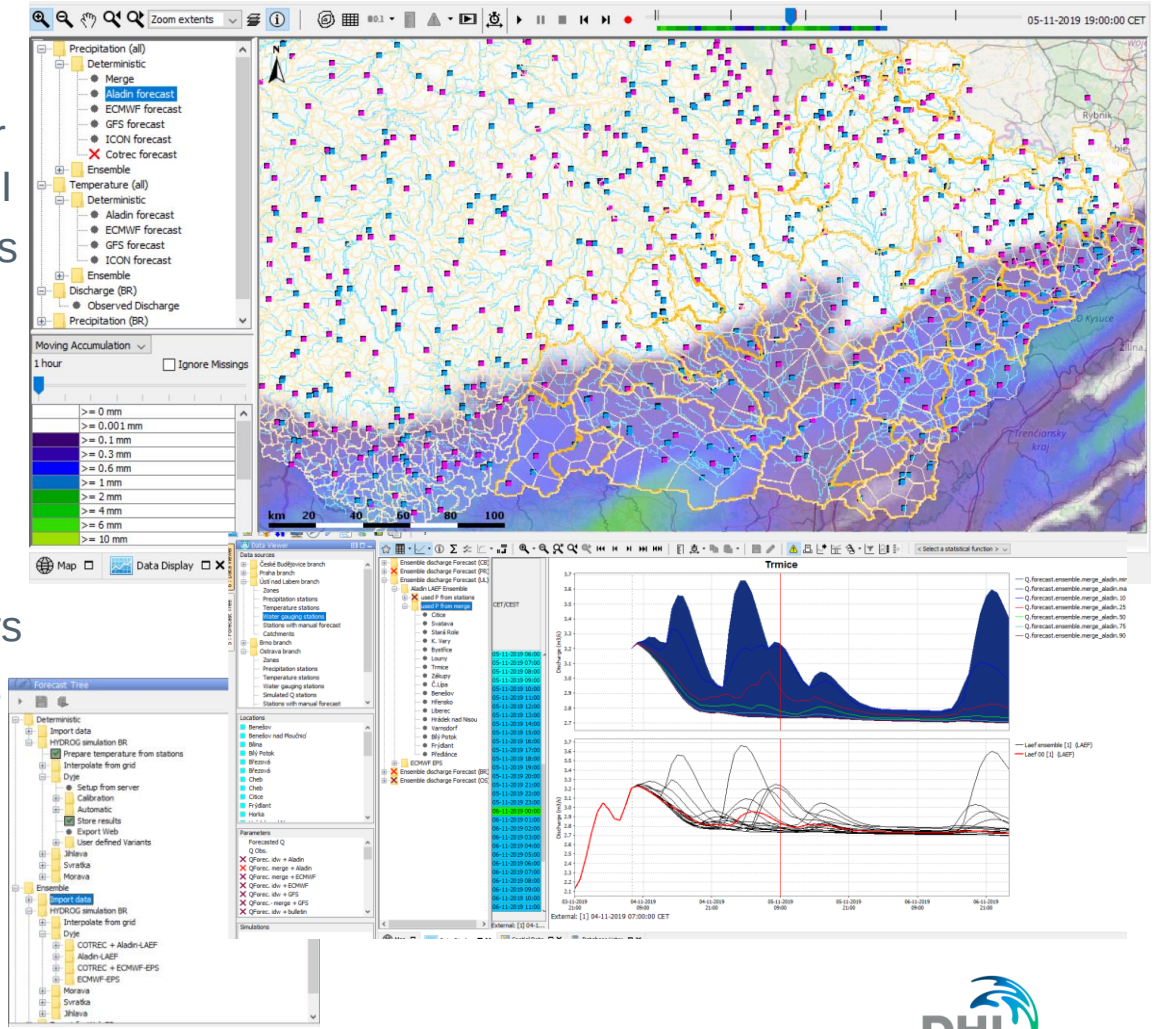
MIKE CLOUD computation wrapper

- One new components for existing MIKE Wrapper
- All model setup modifications will be done using existing components
- New component will upload setup to DHI platform in Cloud, execute computation on selected type of the container and download results
- All other steps will use the components from existing wrapper
- User need account in DHI Platform
- No installation of MIKE by DHI, licenses…
- Pay only what was used
- Big scalability, possibility to use different containers (computer configuration)

		18.Oct.22	
MIKE Cloud name	Azure VM	Cost (€/hr)	Credits/hr
VM-S-5	DS2 v2	0.276	0.4
VM-s-40	F16s v2	1.538	2
VM-s-100	F64s v2	6.149	8
VM-H-60	HC44rs	6.378	8
VM-G-5	NC6s v3	4.256	6
VM-G-40	NC12s v3	8.513	10

FEWS in CHMI

- FEWS is implemented and used for official forecasting services of CHMI
- Automated data processing routines – all standard meteorological data formats
- about 600 climatic stations, 400 water lever gauges, 300-400 forecasting stations
- Implementation of local proprietary RR models – programmed wrappers
- Automated and manual simulations executed on local PC or on server
- Ensemble simulations
- Export for Web presentation and other data consumers



Thank you