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Delft FEWS: an open interface that connects models and data streams for operational forecasting systems

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Many of the operational forecasting systems that are in use today are centred around a single modelling suite. Over the years these systems and the required data streams have been tailored to provide a closed-knit interaction with their underlying modelling components. However, as time progresses it becomes a challenge to integrate new technologies into these model centric operational systems. Often the software used to develop these systems is out of date, or the original designers of these systems are no longer available. Additionally, the changing of the underlying models may requiring the complete system to be changed. This then becomes an extensive effort, not only from a software engineering point of view, but also from a training point of view. Due to significant time and resources being committed to re-training the forecasting teams that interact with the system on a daily basis.

One approach to reducing the effort required in integrating new models and data is through an open interface architecture, and through the use of defined interfaces and standards in data exchange. This approach is taken by the Delft-FEWS operational forecasting shell, which has now been applied in some 40 operational forecasting centres across the world. The Delft-FEWS framework provides several interfaces that allow models and data in differing formats to be flexibly integrated with the system. The most common approach to the integration of modes is through the Delft-FEWS Published Interface. This is an XML based data exchange format that supports the exchange of time series data, as well as vector and gridded data formats. The Published Interface supports standardised data formats such as GRIB and the NetCDF-CF standard. A wide range of models has been integrated with the system through this approach, and these are used operationally across the forecasting centres using Delft FEWS.

Models can communicate directly with the interface of Delft-FEWS, or through a SOAP service. This giving the flexibility required for a state-of-the-art operational forecasting service. While Delft-FEWS comes with a user-friendly GIS based interface, a time series viewer and editor, and a wide range of tools for visualization, analysis, validation and data conversion, the available graphical display can be extended. New graphical components can be seamlessly integrated with the system through the SOAP service.

Thanks to this open infrastructure, new models can easily be incorporated into an operational system without having to change the operational process. This allows the forecaster to focus on the science instead of having to worry about model details and data formats. Furthermore all model formats introduced to the Delft-FEWS framework will in principle become available to the Delft-FEWS community (in some cases subject to the licence conditions of the model supplier). Currently a wide range of models has been integrated and is being used operationally; Mike 11, HEC-RAS & HEC-RESSIM, HBV, MODFLOW, SOBEK and more. In this way Delft-FEWS not only provides a modelling interface but also a platform for model inter-comparison or multi-model ensembles, as well as a knowledge interface that allows forecasters throughout the world to exchange their views and ideas on operational forecasting.

Keywords: FEWS; forecasting; modelling; timeseries; data; XML; NetCDF; interface; SOAP