Deltares
Enabling Delta Life

Delft-FEWS
Basic Configuration Course (continued)

Live systems

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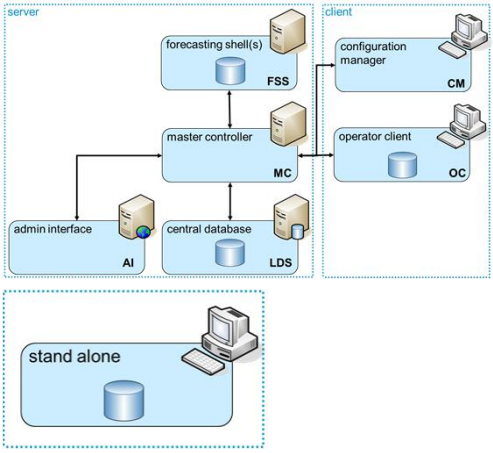
Delft-FEWS Configuration
Stand alone vs Operational envirionment

Configuration

- Database
  - Stored in different tables
  - in operational environment

OR

- File System (+ directory structure)
  - Stored in different files
  - Ordered in subdirectories
  - during development/testing



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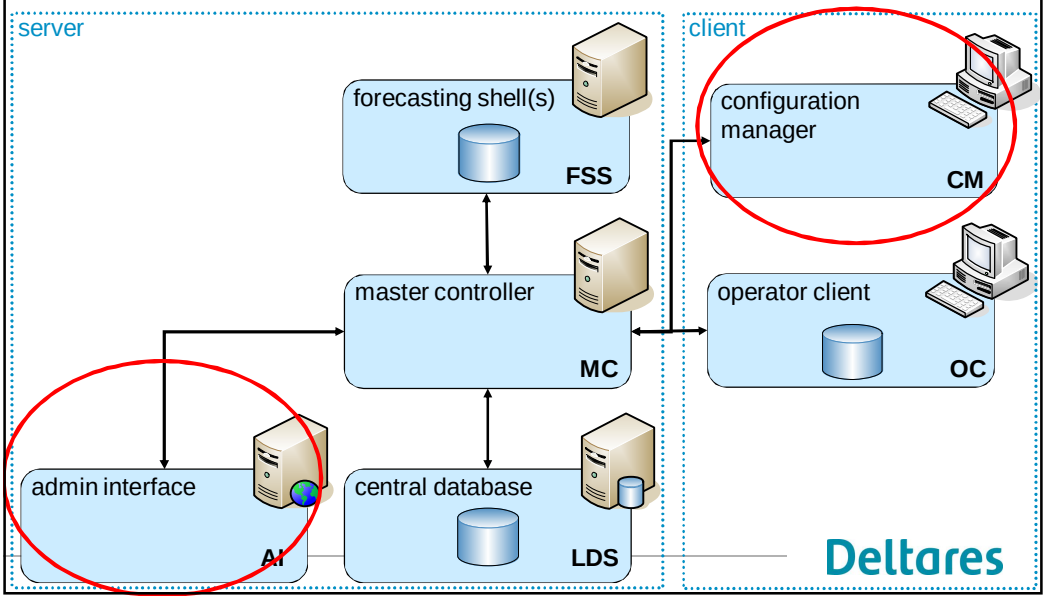
Delft-FEWS system overview



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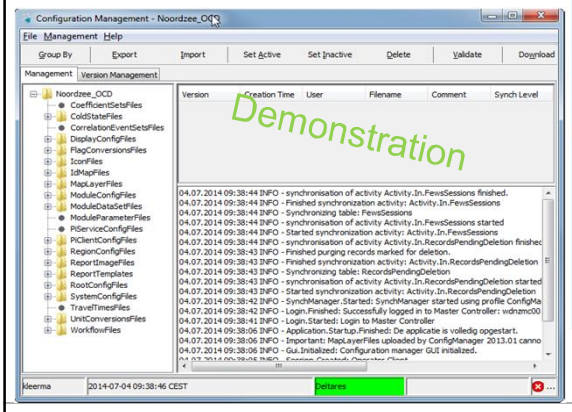
Tools operational system

- Configuration Manager
- Administrator Interface (AI)



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Tools – Configuration Manager

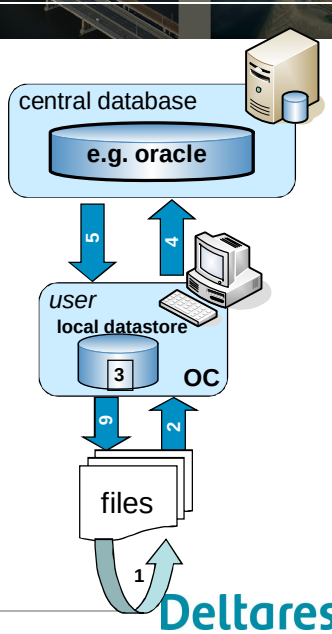
Management of the configuration files

To the central database

1. update XML-files
2. import to OC
3. set files (in-)active
   validate changes
4. upload config change to MC

To the file system

5. download configuration to OC
6. export from OC to file system
7. go to 1



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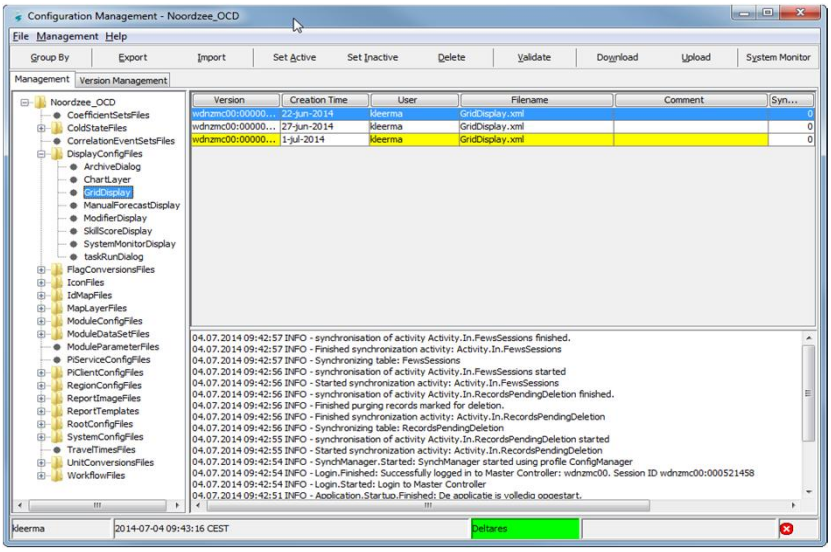
Tools – FEWS Configuration Manager



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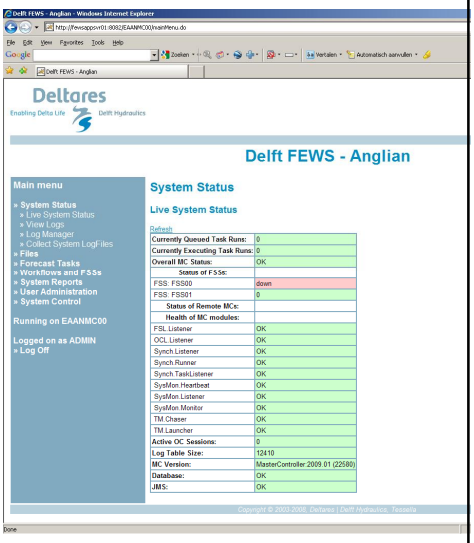
Tools – Admin Interface

Administration tool for live system

Direct access to Central Database

Main tasks

- Monitoring (health) of live system components
- Scheduling of tasks (*current*!)
- Monitoring of task queues
- Management of Forecasting Shell Servers
- Setting enhanced forecasting etc.



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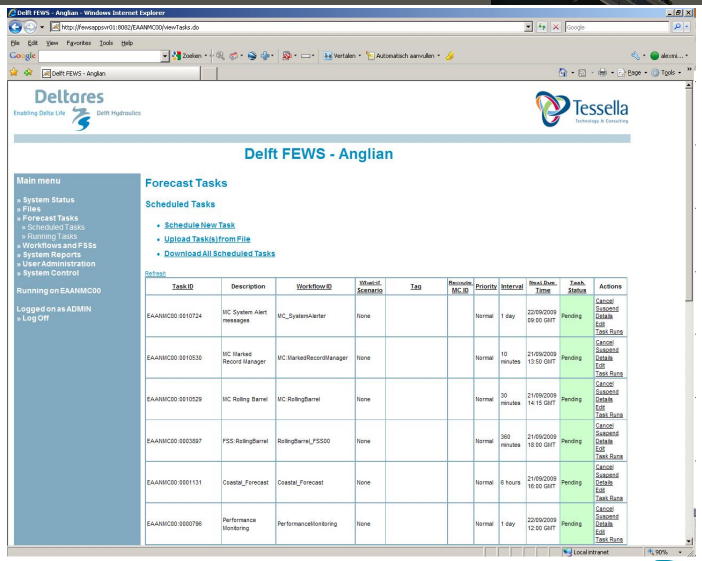
Tools – Admin interface



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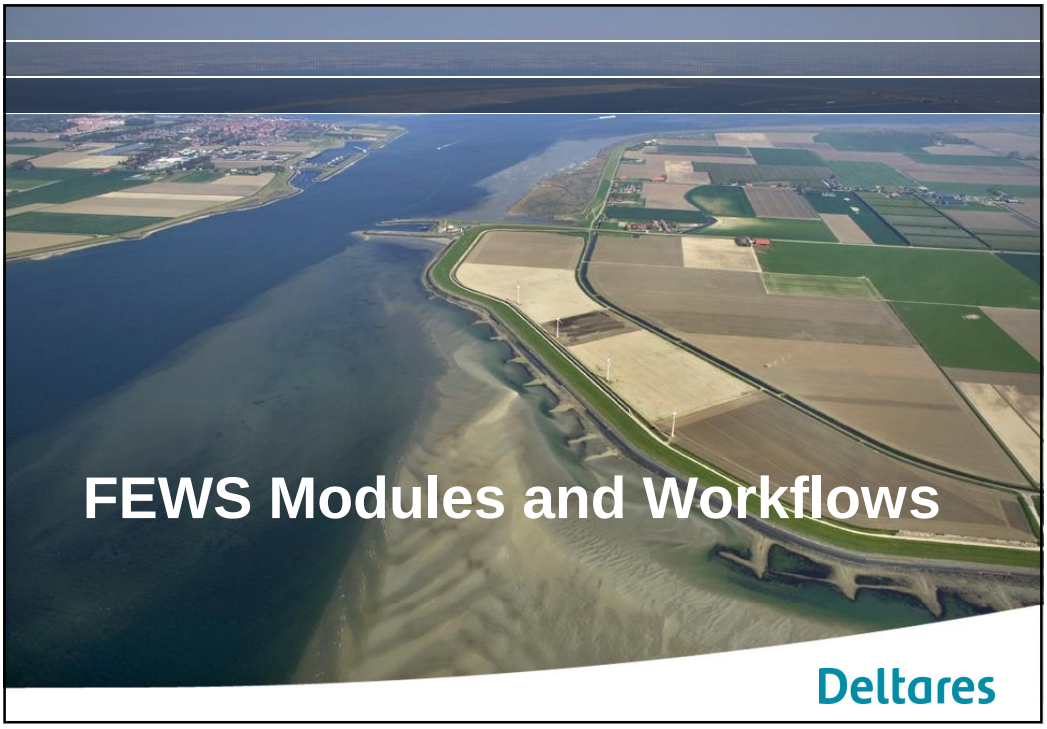
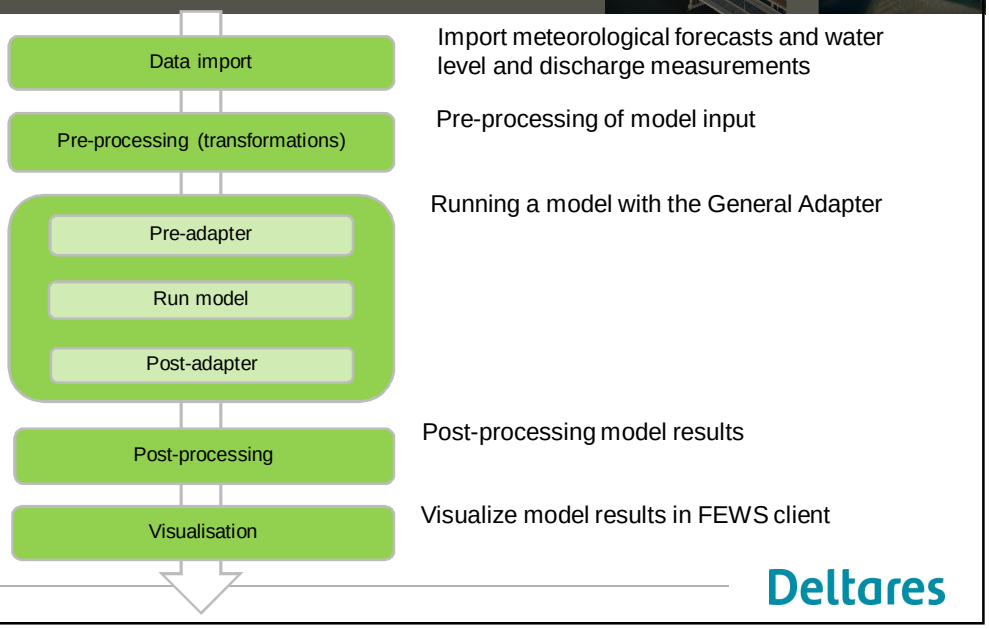


Generic workflow to run a model in FEWS



Modules and Module Instances

- Modules are
  - FEWS plug-ins that can be used in a workflow
  - registered in ModuleDescriptor file as Java Classes
  - part of the system configuration
- Module Instances are
  - configured modules of a particular module
  - registered in ModuleInstanceDescriptors file
  - part of the regional configuration

Module	ModuleInstance
Import	▪ HIRLAM data ▪ CSV data ▪ NetCDF…
Trans-formation	▪ Temporal Interpolation ▪ Spatial Interpolation ▪ Aggregation ▪ User Defined Transformation…
General Adapter	▪ Running a model, e.g. SOBEK, MIKE, HBV… ▪ Running a script, e.g. R, Python …
Export	▪ To HTML ▪ To XML…

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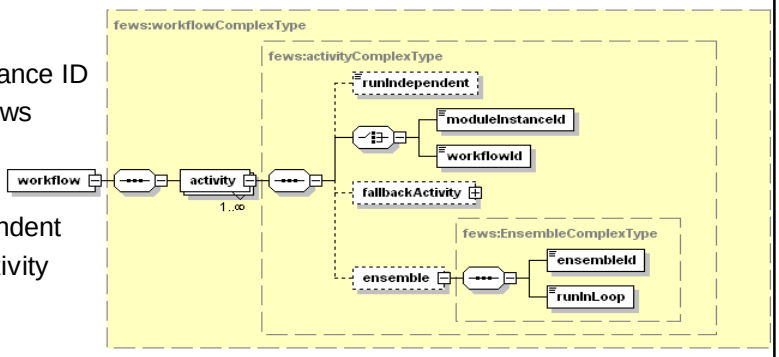
Workflows

- Workflows are logical sequences of running forecast modules
- Workflows must be registered in the WorkflowDescriptors file

– Module Instance ID
– Sub-workflows
– Run independent
– Fallback activity
– Ensemble



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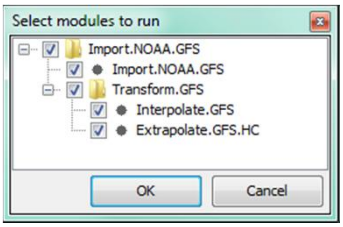
Workflows and sub workflows

Workflows can be nested:

- Workflow “Import.NOAA.GFS”
  - (sub)Workflow “Transform.GFS”

Where:

- (sub)Workflow “Transform.GFS”
  - ModuleInstance “Interpolate.GFS”
  - ModuleInstance “Interpolate.GFS.HC”



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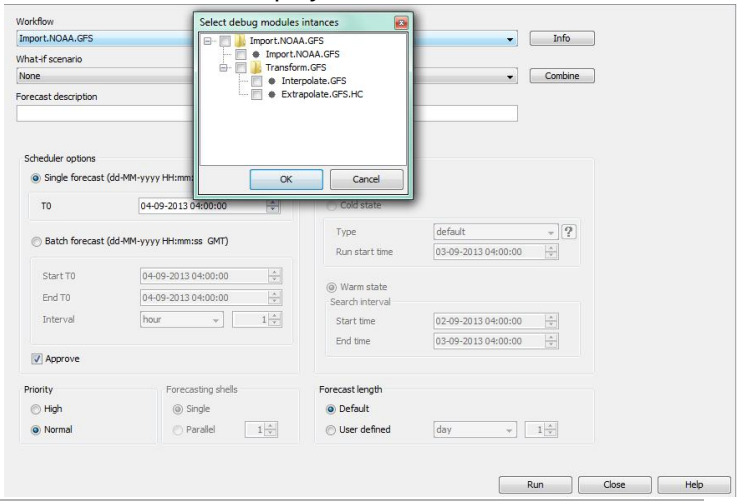
Workflows

Workflows can be run (and debugged) on module basis (ctrl-r or d) in Manual Forecast display



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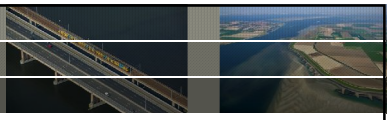
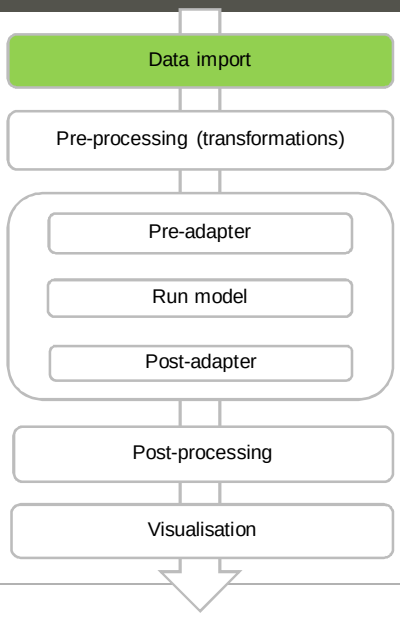
Importing data





Import meteorological forecasts and water level and discharge measurements

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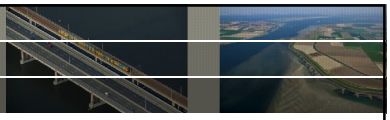
Importing time series data



In general terms, the following is relevant when importing data:

- To import data in FEWS, a timeSeriesImportRun module needs to be configured, and needs to be added to a workflow

- From the timeSeriesImportRun module, a wide range of data formats are supported

- When importing (or exporting) data, mapping of location and parameter names between FEWS and external applications can be done using IdMaps

- To import data for specific locations (scalar or gridded) and parameters, these need to be configured in FEWS

See http://publicwiki.deltares.nl/display/FEWSDOC/03+Import+Module

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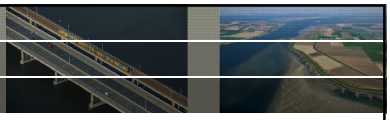
Importing gridded data



In order to use apply gridded data in Delft-FEWS:

- A grid definition needs to be included in RegionConfigFiles\Grids.xml
- A dummy location needs to be included in the RegionConfigFiles\Locations.xml fi

For more details, see http://publicwiki.deltares.nl/display/FEWSDOC/06+Grids

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OpenDAP

Delft-FEWS can import data directly from OpenDAP databases. OpenDAP is a database type commonly used in the world of coastal and oceanographic forecasting.

See http://publicwiki.deltares.nl/display/FEWSDOC/Import+data+using+OPeNDAP

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Visualization

Once available in Delft-FEWS, data can be visualized in various ways:

- Gridded data can be shown in de grid display
- Scalar data can be shown in the filters, predefined plots and grid display
- The layout of plots can be modified in various ways

See http://publicwiki.deltares.nl/display/FEWSDOC/07+Display+Configuration

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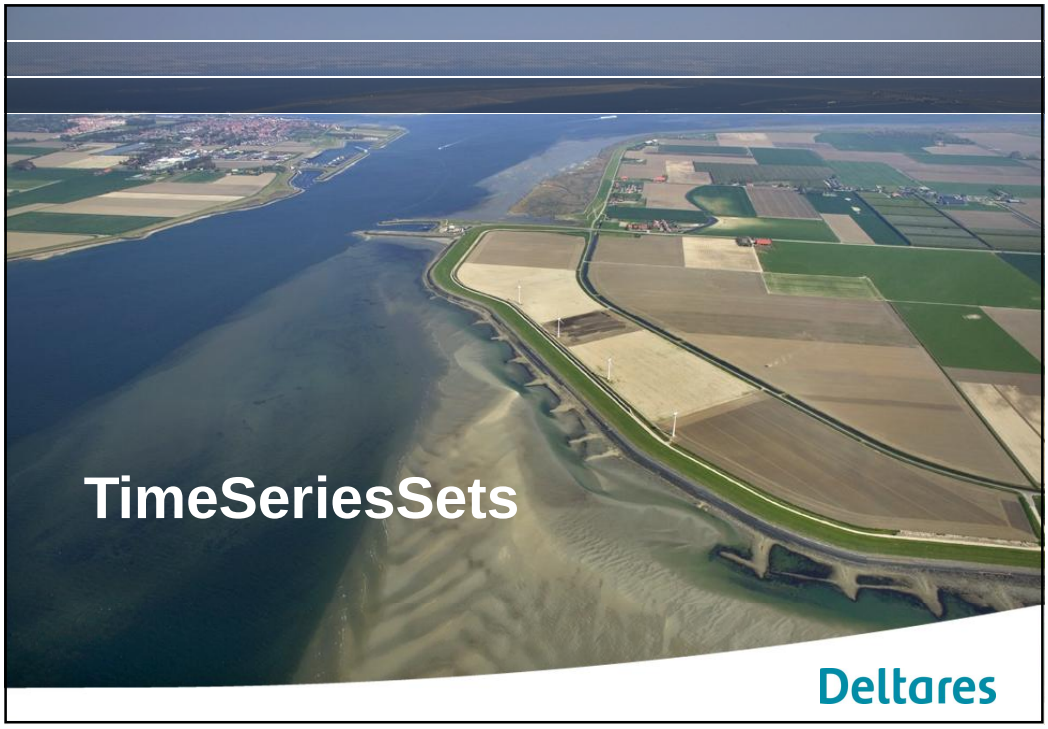


Time Series

Time series are available from two source:

- external
- simulated

Time series are in two categories in relation to time:

- historical (continuous in time)
- forecasting (characterised by its start time)

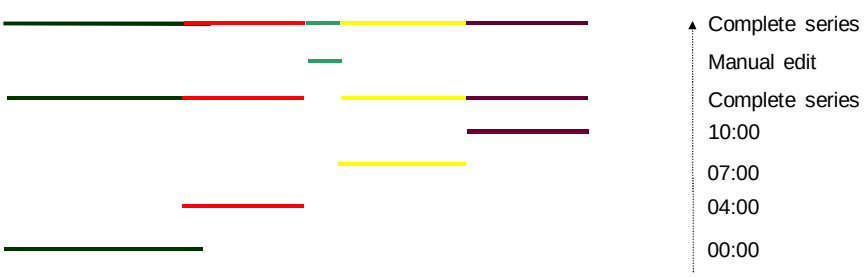
Time series can be in four formats:

- 0D – scalar
- 1D – vector or longitudinal profile
- 2D – grid
- 2D – polygon

Time Series are handled in the form of Time Series Sets

Time Series – external historical

- Added incrementally
- Can be edited by the user
- Only new and changed values are stored



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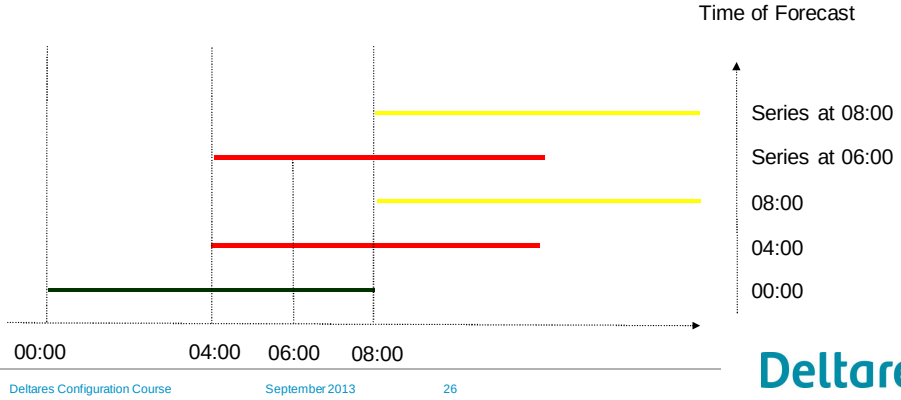
Time Series – external forecasting

- Added and stored individually
- Can be edited by the user
- Usage of series depends on T0



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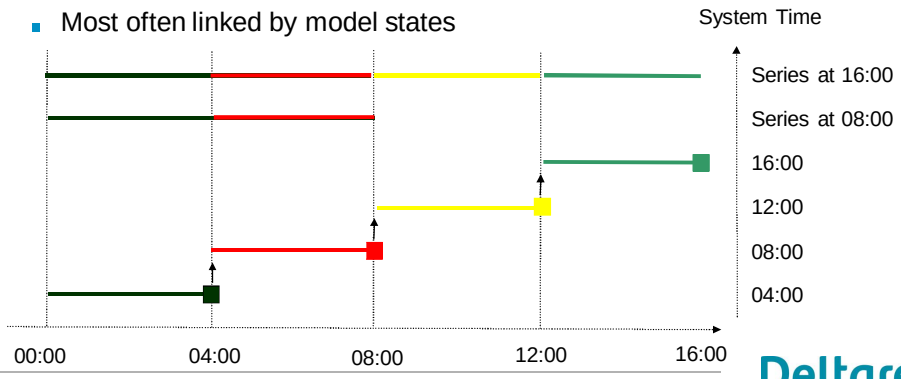
Time Series – simulated historical

- Continuous in time
- Referenced by the forecast model that produced them
- Approved series shown automatically (including history)
- Most often linked by model states



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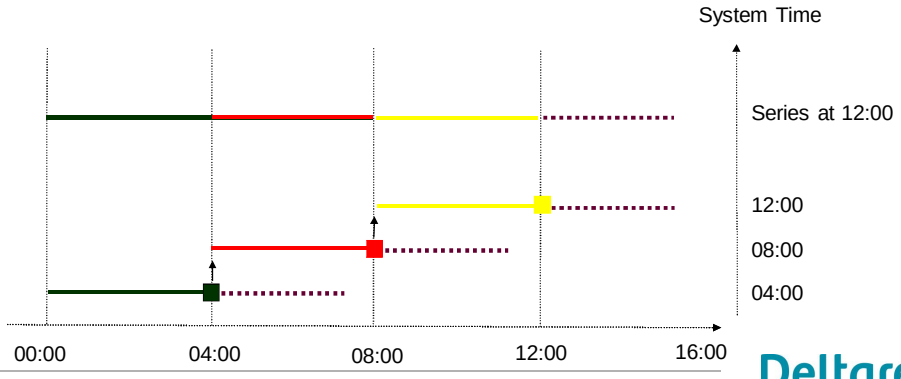
Time Series – simulated forecasting

- Continuous in time (in combination with simulated historical)
- Referenced by the forecast model that produced them
- Approved and selected series can be viewed



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Time Series – temporary

Temporary time series

- time series used in pre- / post-processing
- not stored in database

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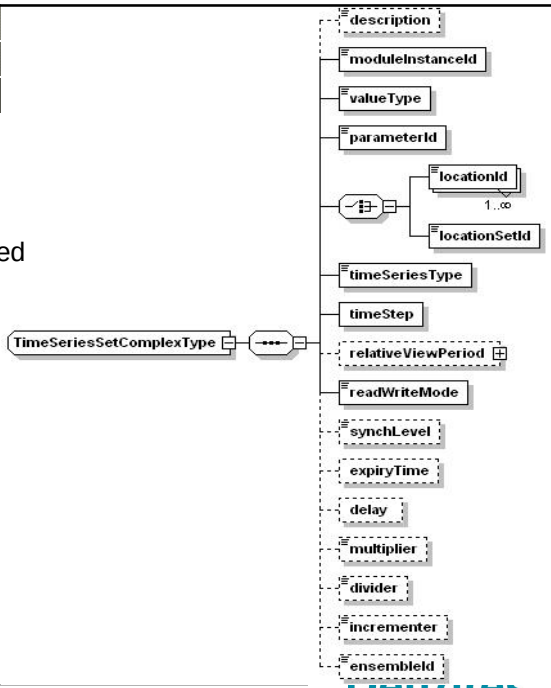
Time Series Sets

- Properties of a timeSeriesSet
  - Some elements are only used when retrieving time series, other elements only when storing data

All data handling is done through Time Series Sets



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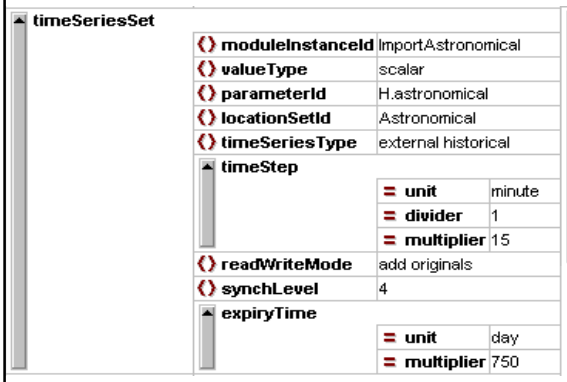
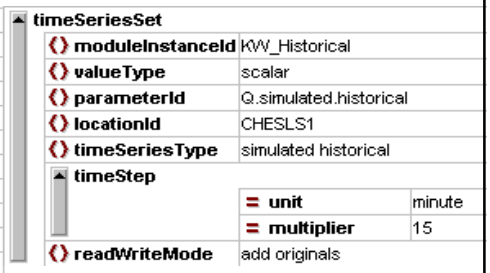
Time Series Sets - Examples

Import Run



General Adapter Run



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Importing data

Import Modules allows data from external sources to be imported

- Various Scalars – e.g. PI XML and Wiski
- ASCII grid time series
- Binary GRIB (grid) and BIL time series
- Currently around 50 data import types

FEWS imports files from directories specified in the global.properties file

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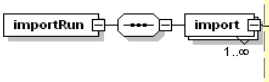
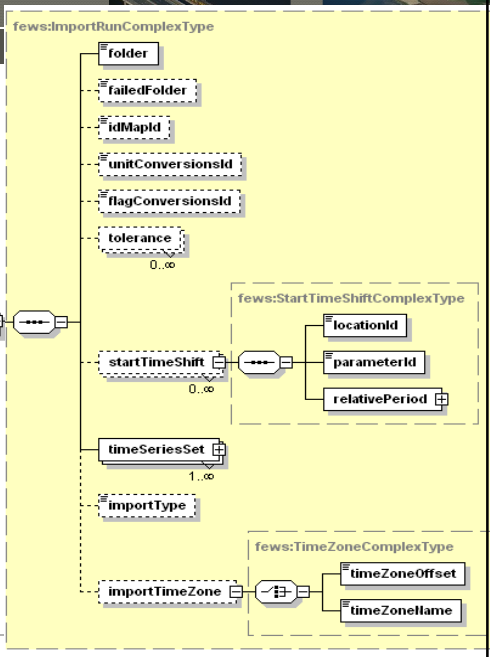
Import Module

Key Features:

- ID mapping > idMap.xml
- Units mapping > unitConversion.xml
- Flag mapping > flagConversions.xml



- Tolerance: when imported data is not exactly observed at the cardinal time step
- Time zone mapping: database stores all data in GMT, specify time zone when importing
- Validate: Imported files can be validated against their own schema



Import Module & Id mapping

- Matching 'outside world' to the 'FEWS world'
  - locations (ids)
  - parameter (ids)
- Three levels
  - direct mapping → location names AND parameter names differ

	internalLocation	internalParameter	externalLocation	externalParame...
1	NBBC1LLF	FMAT	NBBC1LW	MAT
2	NBBC1LLF	FMAP	NBBC1LWL	MAP

  - indirect → either location names or parameter names differ

parameter (2)

	external	internal
1	MAT	FMAT
2	MAP	FMAP

location (25)

	external	internal
1	IIFC1LW	IIFC1HLF
2	IIFC1UP	IIFC1HUF
3	MFTC1LW	MFTC1HLF

  - 1:1 → location and parameter names do NOT differ

enableOneToOneMapping	

- Used when importing and exporting time series

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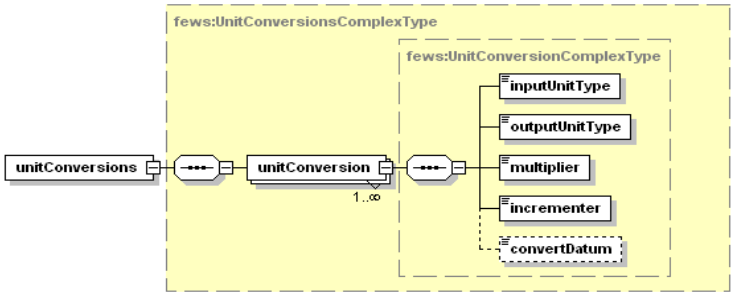
Import Module & Unit conversion

- Map internal units to external units
- Used when importing and exporting time series
- Extra option to convert datum of level recordings (external unit mAOD)



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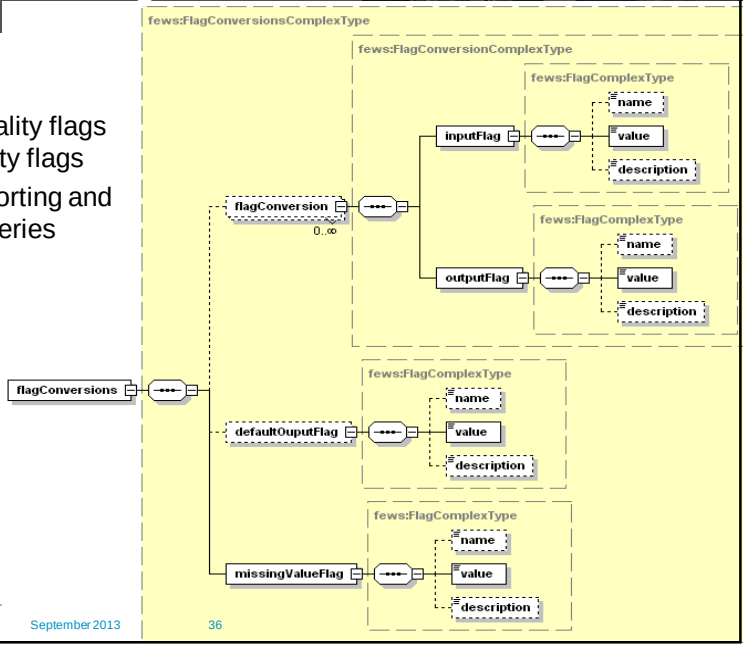
Import Module & Flag conversion

- Map internal quality flags to external quality flags
- Used when importing and exporting time series



Exercise

Exercise 5: Import time series

Import Time series from EA-XML format (specific Environment Agency format)

- Analyse the 5 time series
  - 2 * Observed_waterlevel for Hydro1 and Hydro2
  - 2 * Rainfall for Raingauge and Meteostation
  - 1 * Temperature for Meteostation
- Add elements to ID mapping table
- Run import workflow
- Analyse data with the Time Series Display

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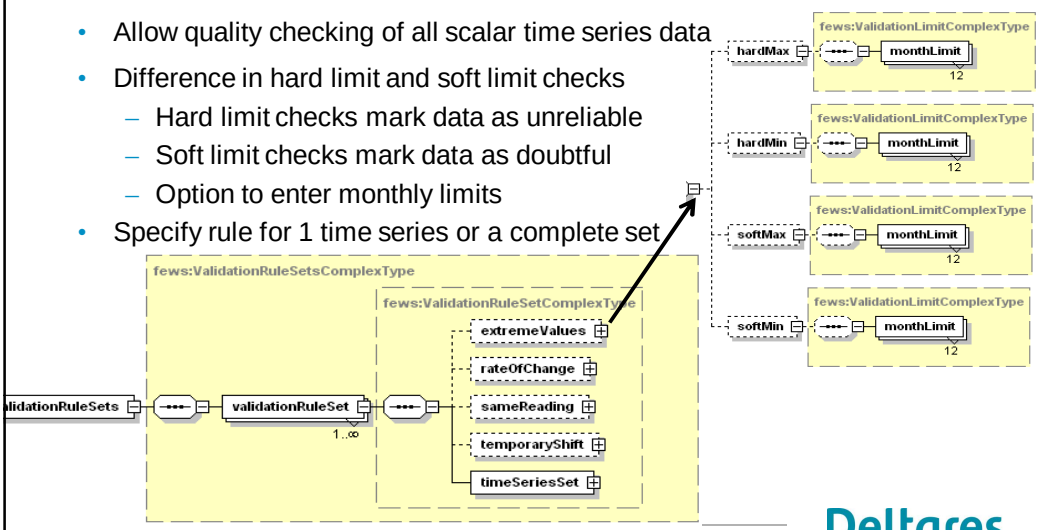
Validating Data

- Allow quality checking of all scalar time series data
- Difference in hard limit and soft limit checks
  - Hard limit checks mark data as unreliable
  - Soft limit checks mark data as doubtful
  - Option to enter monthly limits
- Specify rule for 1 time series or a complete set



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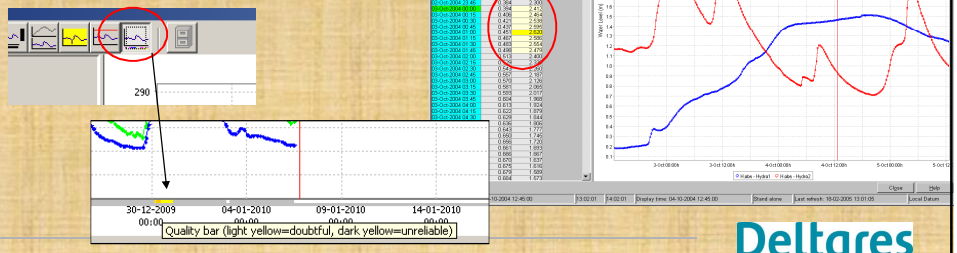
Exercise

Exercise 6: Add validation rules for imported data

- Check the data just imported
- Define validation rules
- Enter the rules in the ValidationRuleSets XML file
- Delete the data store
- Run import workflow
- View data
- Check the difference!



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Thresholds

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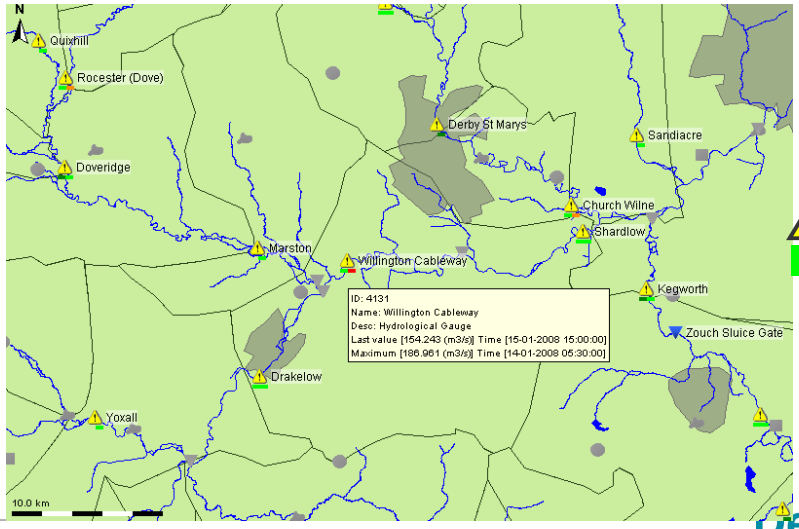
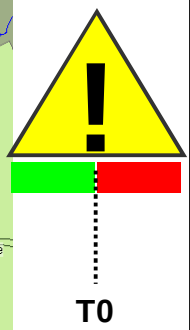
Example (Map)

Willington Cableway (Midlands, UK)





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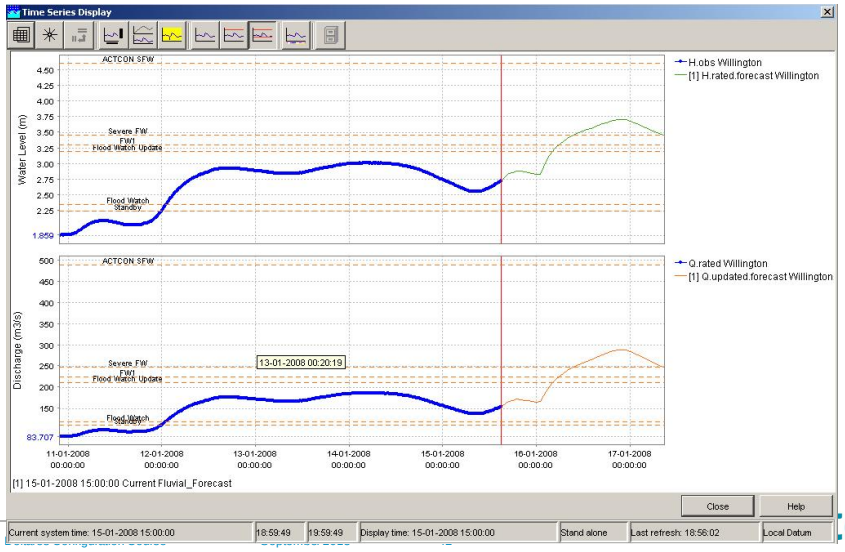
Example (Graph)

Willington Cableway (Midlands, UK)



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Thresholds Utility

The thresholds utility checks when time series cross thresholds

- Observed and simulated time series
- Icons are shown on the map
- Graphs/lines cross threshold lines
- Events can be triggered (MC)
- Up events and down events

Three configuration files

- `thresholdWarningLevels.xml` → definition of (unique) thresholds + details
- `thresholds.xml` → the grouping of the (selected) thresholds
- `thresholdValueSets.xml` → timeseries (loc/par.) and actual levels info

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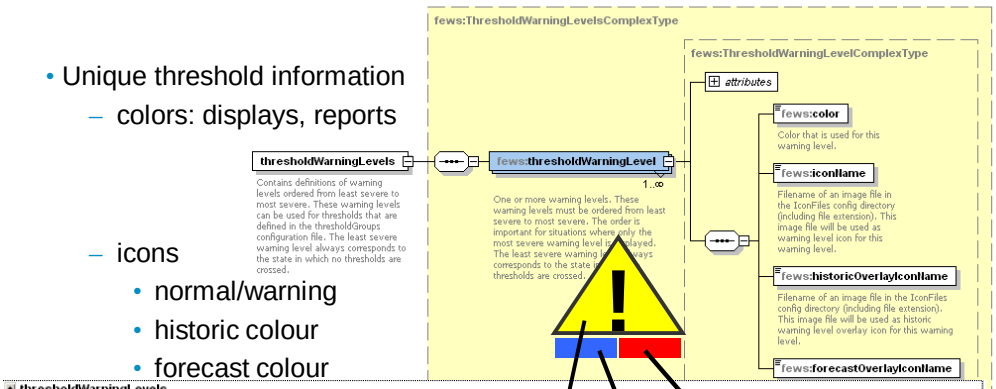
Thresholds - thresholdWarningLevels

- Unique threshold information
  - colors: displays, reports
  - icons
    - normal/warning
    - historic colour
    - forecast colour



thresholdWarningLevels

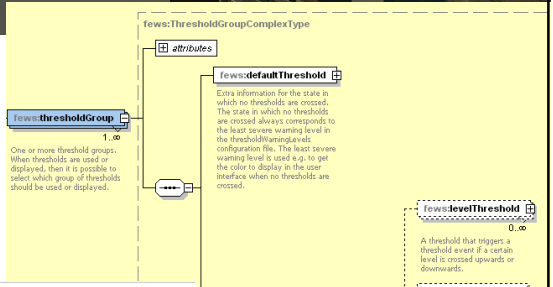
xmlns:xsi	http://www.w3.org/2001/XMLSchema-instance
xmlns	http://www.wldelft.nl/fews
xsi:schemaLoca...	http://www.wldelft.nl/fews http://fews.wldelft.nl/schemas/version1.0/thresholdWarningLevels.xsd

thresholdWarningLevel (5)

	id	name	color	iconName	historicOverlayIconName	forecastOverlayIconName
1	0	No threshold exceeded	green	default1.gif	default1.gif	default1.gif
2	1	Standby	blue	warninglevel.gif	historicwarninglevel_blue.gif	forecastwarninglevel_blue.gif
3	2	Flood Watch	yellow	warninglevel.gif	historicwarninglevel_yellow.gif	forecastwarninglevel_yellow.gif
4	3	Flood Warning	orange	warninglevel.gif	historicwarninglevel_orange.gif	forecastwarninglevel_orange.gif
5	4	Severe Flood Warning	red	warninglevel.gif	historicwarninglevel_red.gif	forecastwarninglevel_red.gif

Thresholds - thresholds

- Thresholds usage
  - groups
  - selection(s)



thresholdGroups

xmlns	http://www.wldelft.nl/fews
xmlns:xsi	http://www.w3.org/2001/XMLSchema-instance
xsi:schem...	http://www.wldelft.nl/fews http://fews.wldelft.nl/schemas/version1.0/thresholds.xsd

thresholdGroup

id	Fluvial_Flood
name	Fluvial Flood
defaultThreshold	shortName=AC

levelThreshold (4)

	id	name	shortName	upWarningLevelId
1	Standby	Standby	SB	1
2	Flood Watch	Flood Watch	FWt	2
3	Flood Warning	Flood Warning	FW	3
4	Severe FW	Severe FW	SFW	4

thresholdGroup

id	Coastal_Flood
name	Coastal Flood
defaultThreshold	
shortName	AC

levelThreshold (2)

	id	name	shortName	upWarningLevelId
1	Flood Warning	Flood Warning	FW	3
2	Severe FW	Severe FW	SFW	4

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Thresholds - thresholdsValuesSets

- Detailed threshold information
  - per location/parameter
  - actual values to be crossed for the different thresholds
  - 'triggers' (action events for up- or downcrossings)

thresholdValueSet (3)

	id	name	description	levelThresholdValue	timeSeriesSet
1	London	London	London thresholds	levelThresholdValue (2)	timeSeriesSet
2	Hydro1	Hydro1	Hydro1 thresholds	levelThresholdValue (3)	timeSeriesSet
3	Hydro2	Hydro2	Hydro2 thresholds	levelThresholdValue (1)	timeSeriesSet

levelThresholdValue (3)

	levelThresholdId	value	upActionLogEventTypeId
1	Standby	1	
2	Flood Watch	1.1	
3	Severe FW	1.4	Hydro.Alarm

levelThresholdValue (1)

	levelThresholdId	value
1	Flood Watch	1.9

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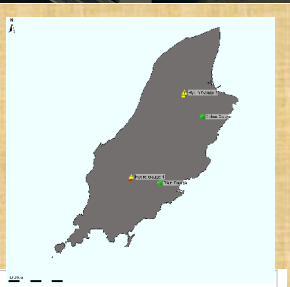
Exercise

Exercise 7: Add thresholds for imported data

Add thresholds for the hydro locations



thresholdValueSet (3)

	id	name	description	levelThresholdValue	timeSeriesSet
1	London	London	London thresholds	levelThresholdValue (2)	timeSeriesSet
2	Hydro1	Hydro1	Hydro1 thresholds	levelThresholdValue (3)	timeSeriesSet
3	Hydro2	Hydro2	Hydro2 thresholds	levelThresholdValue (1)	timeSeriesSet

levelThresholdValue (3)

	levelThresholdId	value
1	Standby	1
2	Flood Watch	1.1
3	Severe FW	1.4

timeSeriesSet

moduleInstanc...	ImportTelemetry
valueType	scalar
parameterId	H.obs
locationId	Hydro1
timeSeriesType	external historical
timeStep	unit=minute multiplier=15
relativeViewPeriod	unit=hour start=-36 end=0
readWriteMode	read only

levelThresholdValue (1)

	levelThresholdId	value
1	Flood Watch	1.9

Deltares

Presentation of data in FEWS

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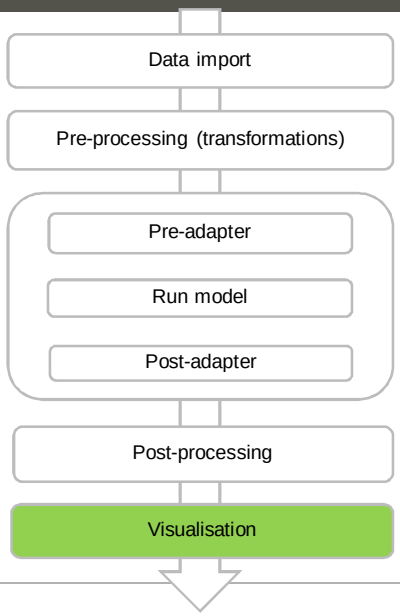
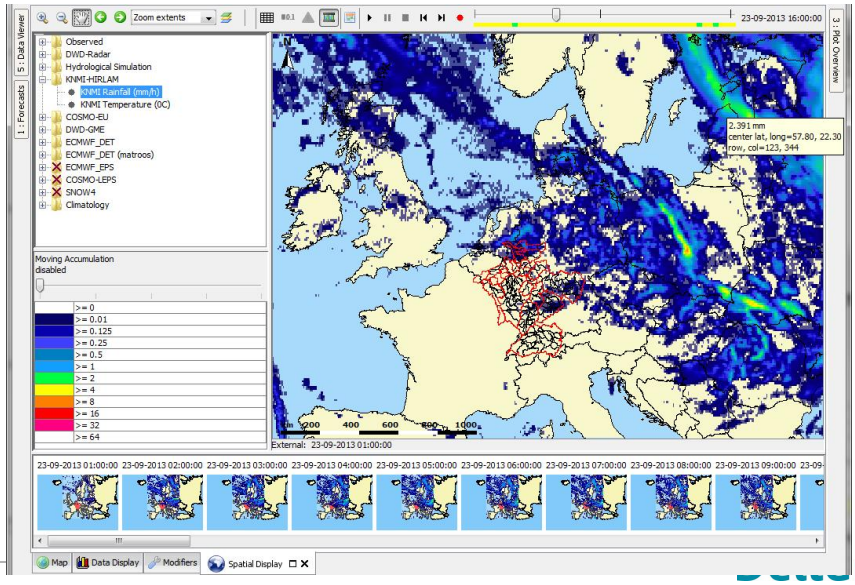
Visualisation



Visualisation of data in Delft-FEWS

Deltares

Spatial / Grid Display



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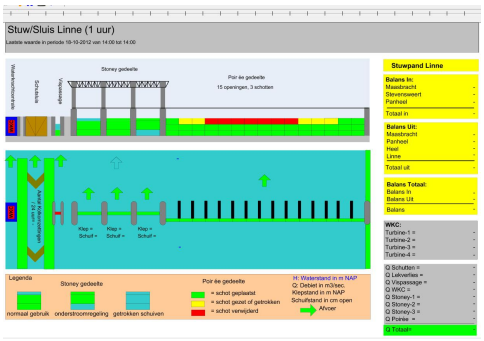
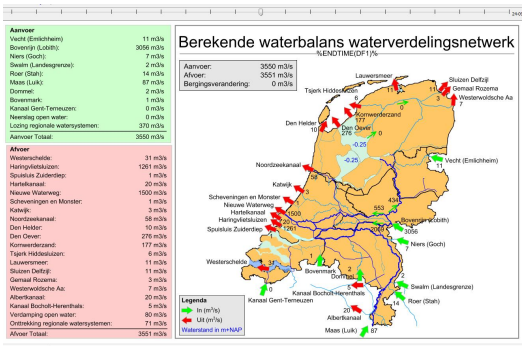
Schematic Status Display





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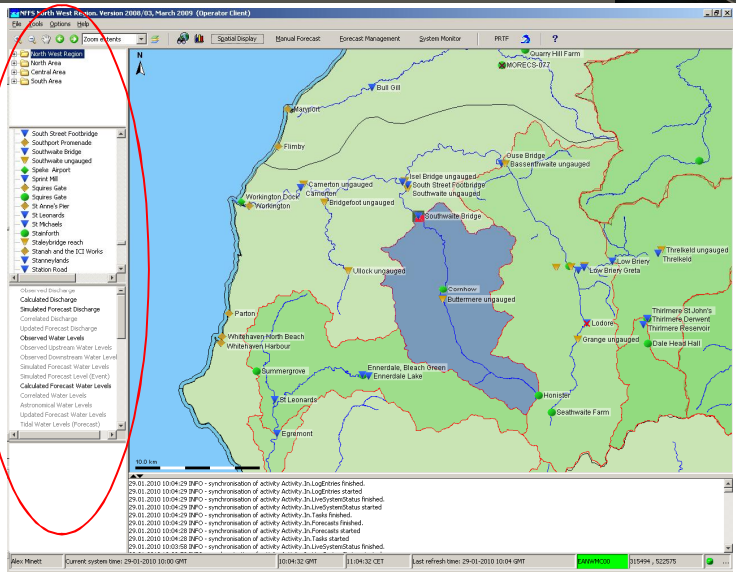
Display of data - Filters



Demonstration

Deltares

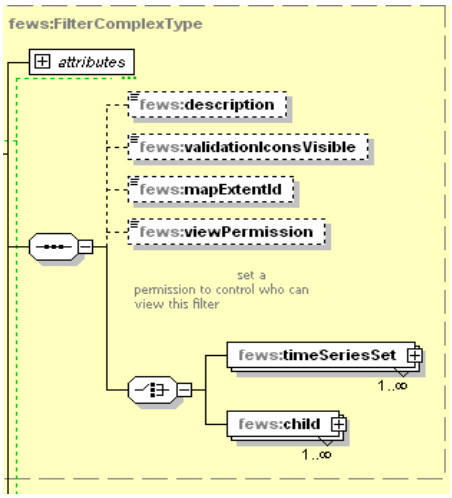
Display of data – Filter configuration

Filters are used to define the:

- locations displayed on the map
- locations displayed in the list box
- parameters displayed in the list box

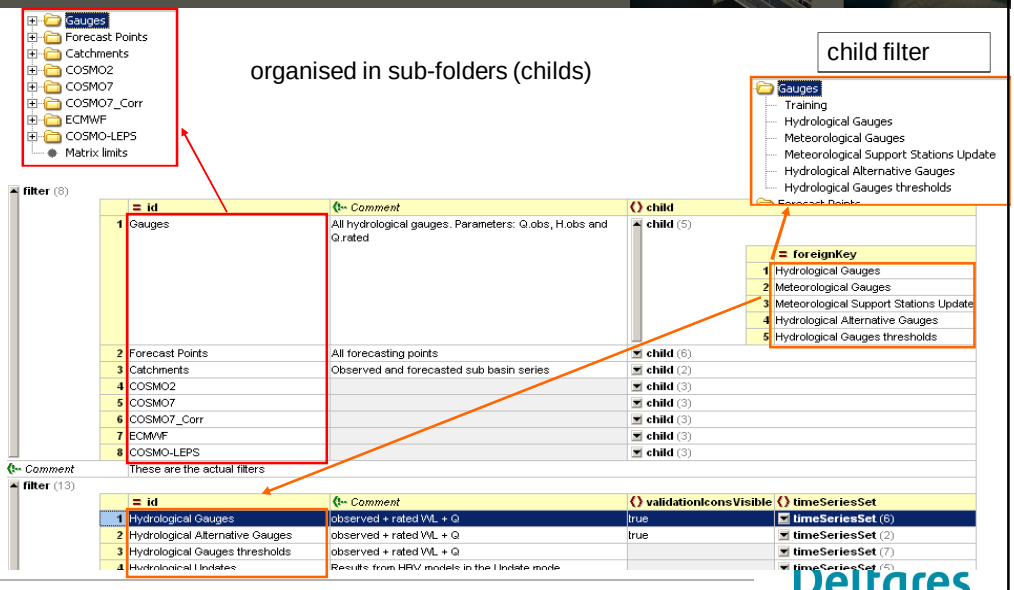
Filter:

- organised in folders with child filters
- arrange time series sets in logical groups
- import elements in the time series set
  - extra options
    - view permissions
    - validation icons visible
    - link to map extent



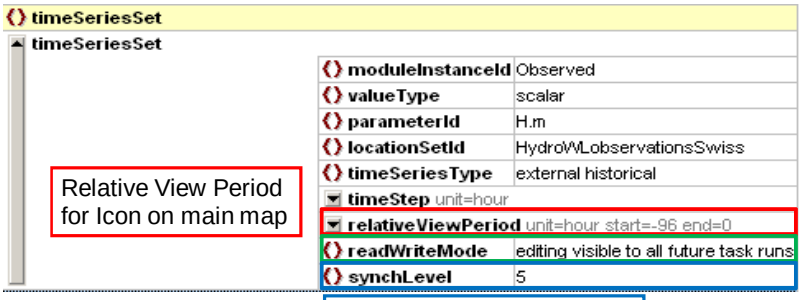
Deltares

Display of data – Filter Configuration



Deltares

Display of data - Filters - Extra options



Relative View Period for Icon on main map

Allow/Disallow editing

synchLevel – for live system (5 = edited data)

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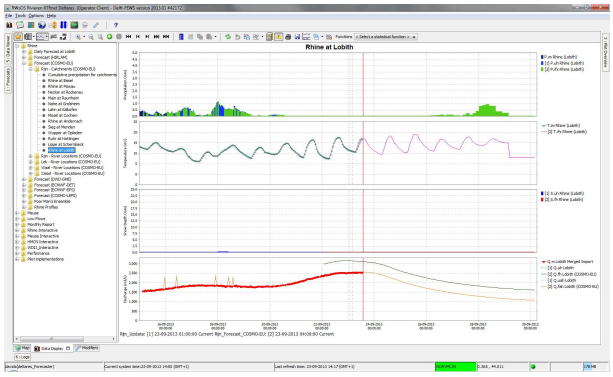
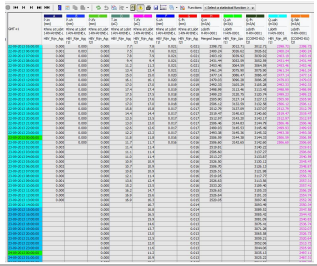
Time Series Display

Time Series Display is used to show data in a graph and in a table

- Editing and viewing data
- Pre-configured displays
- Thresholds
- Historic Events





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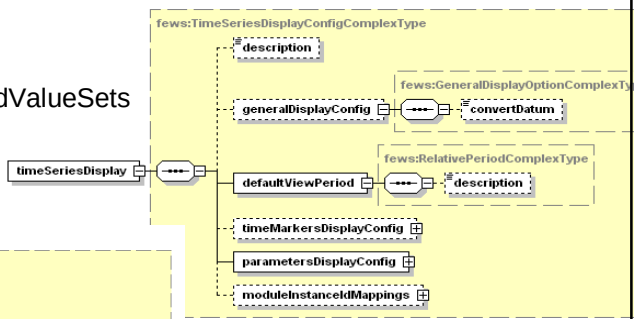
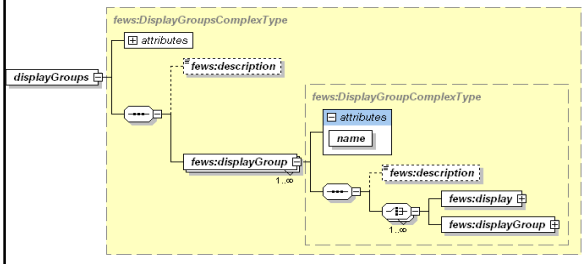
Time Series Display - Configuration

Time Series Display uses 4 configuration files

- TimeSeriesDisplayConfig
- Thresholds and ThresholdValueSets
- DisplayGroups
- HistoricalEvents





Display groups
- are pre-defined displays
- are used to create folder structure of displays
- can be nested

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Exercise

Exercise 8: Add pre-configured displays

Add pre-configured displays
- Add a new display group for the new locations
- Add a new display for the hydro locations
- Add a new display for the meteo locations

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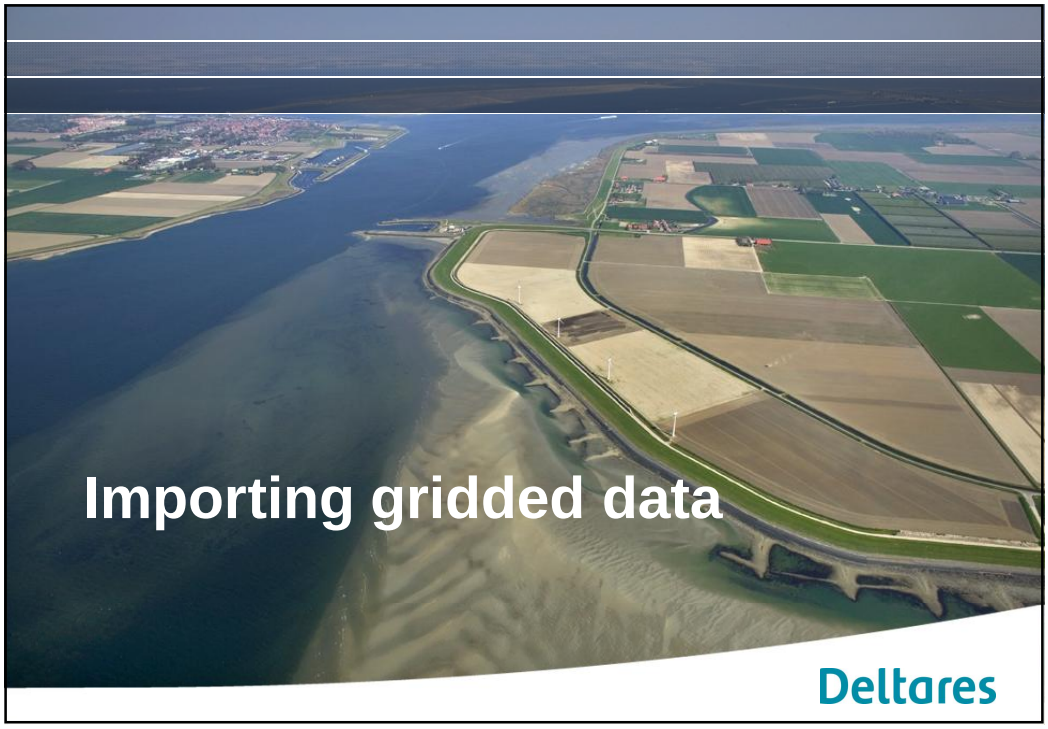

Importing gridded data

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FEWS Gridded Data

Fews supports the display of both irregular and regular grids

Available (common) Import types

- ArcInfoAscii
- BIL
- BUFR
- CSV
- PI
- HDF5
- NetCDF

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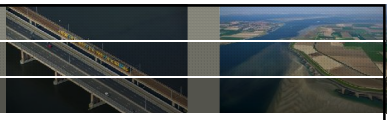
FEWS Gridded Data



Commonly used data types

- Precipitation
- Soil Moisture
- Pressure
- Wind
- Temperature
- Water level
- Wave height
- Surge

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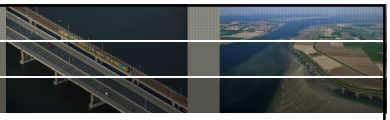
FEWS Gridded Data



Data can be manipulated using transformation modules

- Cookie cutter
- Interpolation
- Transformation
- Data hierachy

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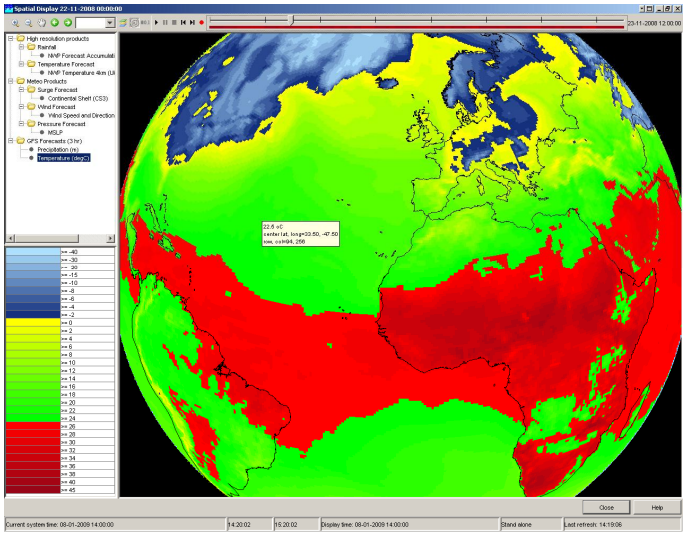
FEWS Gridded Data



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Exercise

Exercise 13: Importing NWP grids

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