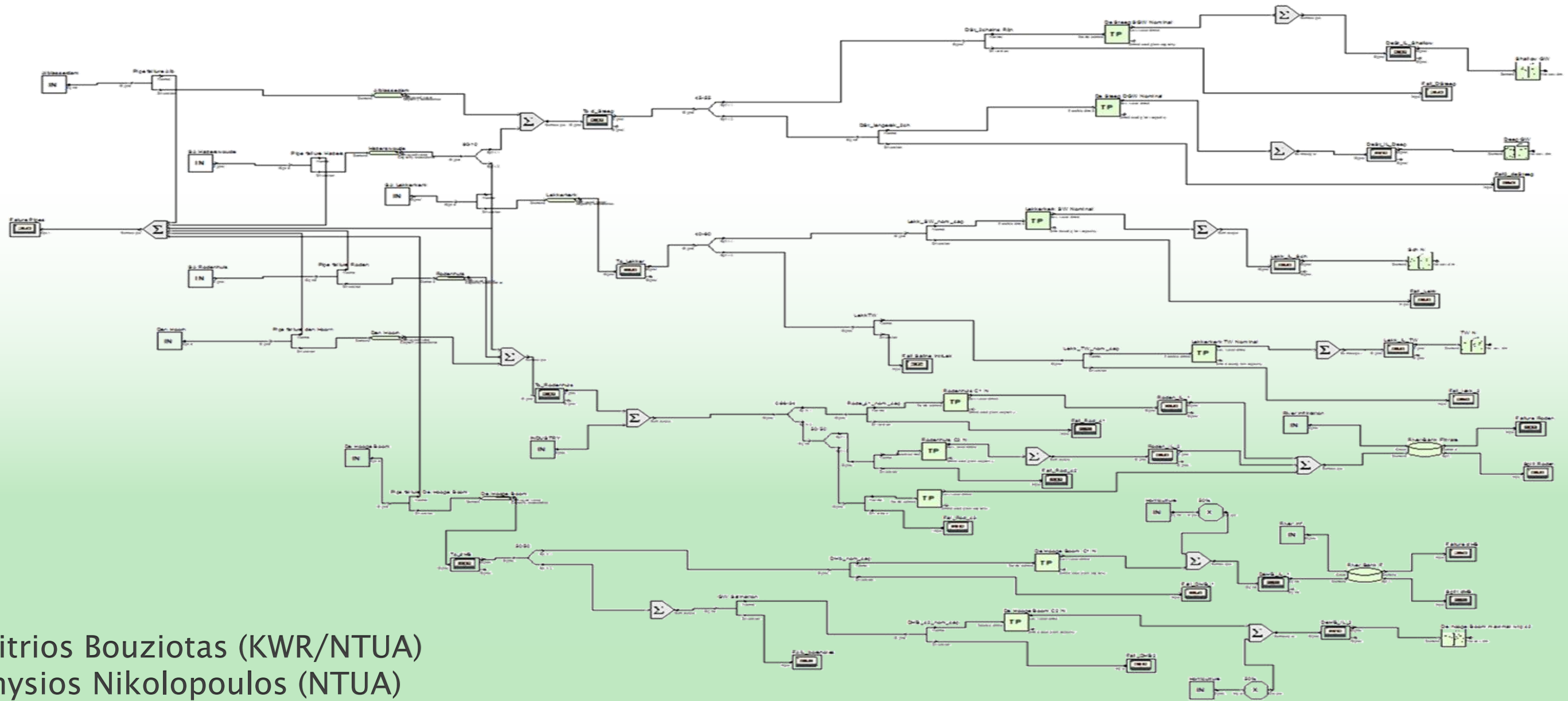


# UWOT hands-on training: Part I



Dimitrios Bouziotas (KWR/NTUA)  
Dionysios Nikolopoulos (NTUA)

# UWOT hands-on training: Part I

## UWOT Download

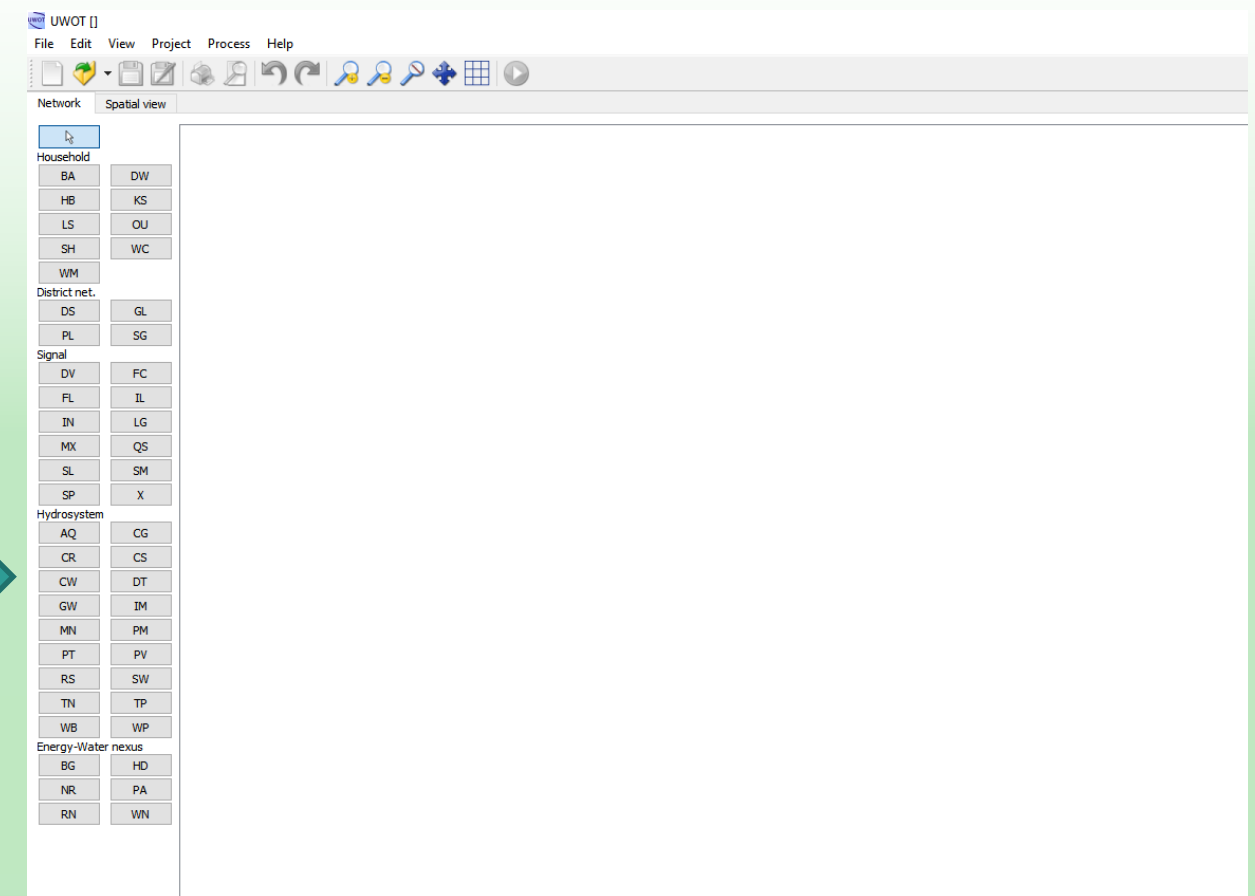
Κατεβάστε τα εξής αρχεία από το σύνδεσμο [https://drive.google.com/drive/folders/1t-V6-1sDjrd4d4hvf3fsH\\_7Soxwx\\_PWP?usp=sharing](https://drive.google.com/drive/folders/1t-V6-1sDjrd4d4hvf3fsH_7Soxwx_PWP?usp=sharing) ή το σχετικό link στο [mycourses.ntua.gr](http://mycourses.ntua.gr)

- *UWOT\_2021.zip* : περιέχει το εκτελέσιμο του UWOT.
- *demo\_timeseries.zip*: περιέχει τα αρχεία των χρονοσειρών για το demo.

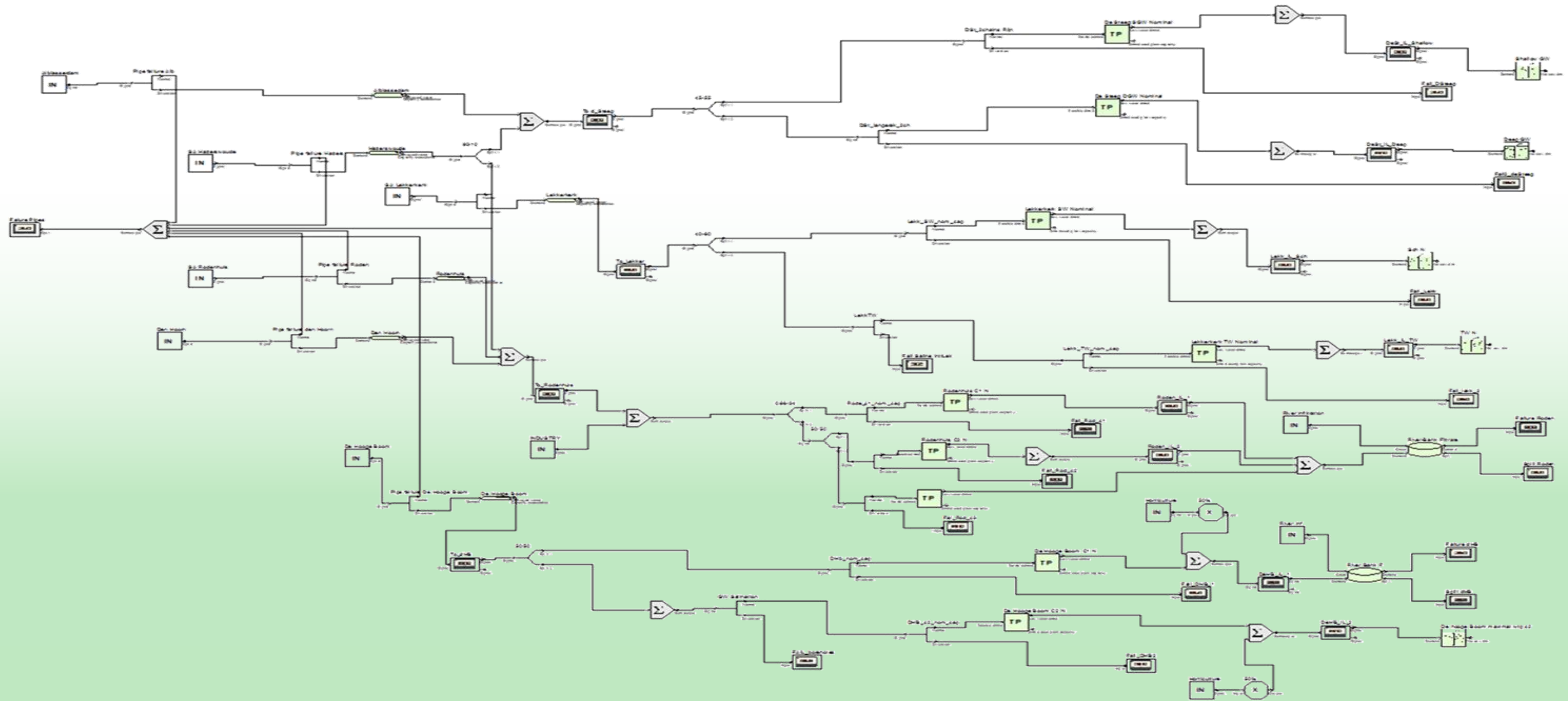
Κάντε τα unzip (σε κοινό φάκελο) & τρέξτε το *main.exe*.

Ακολουθήστε τα βήματα στο *UWOT\_short\_guide.pdf*.

Θα πρέπει να βλέπετε το user interface που εμφανίζεται και στα δεξιά.



# UWOT household modeling basics



# UWOT hands-on training: Part I

## UWOT Household modelling

Household category micro-components:

**BA:** Bath

**DW:** Dish Washer

**HB:** Hand Basin

**KS:** Kitchen Sink

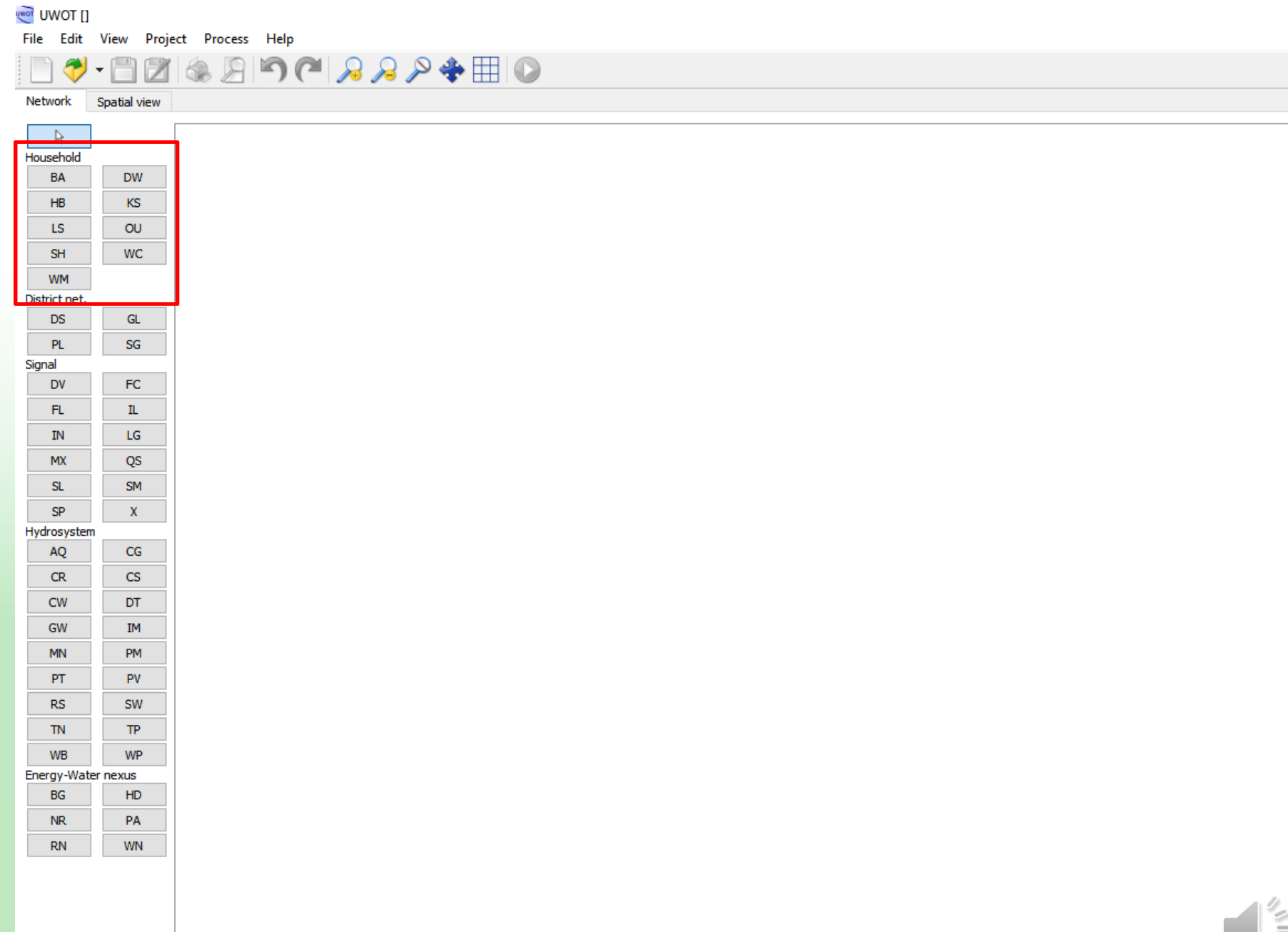
**SH:** Shower

**WC:** Toilet

**WM:** Washing Machine

**OU:** Outside uses

**LS:** Local Suds



# UWOT hands-on training: Part I

## Adding Components

❖ *Select HB and click on the drawing space*

The HB component has two signal ports:

- Graywater (+), push signal

- Demand (-), pull signal

Components are of a specific **Brand** and belong to a **Group**.

The screenshot displays the UWOT software interface. On the left is a component palette with categories: Household (BA, HB, LS, SH, WM), District net. (DS, PL), Signal (DV, FL, IN, MX, SL, SP), and Hydrosystem (AQ, CR, CW, CG, CS, DT). The central drawing space shows a hand basin component with two signal ports: 'Greywater (+)' and 'Demand (-)', both indicated by red arrows and the text 'Signal ports'. On the right, the 'Add new component...' dialog box is open, showing 'Type: Hand basin', 'Brand: Deactivate appliance', and 'Group: New untitled group'. The dialog also includes fields for Title, Specs., Edit, Add, Comments, Accept, and Cancel.



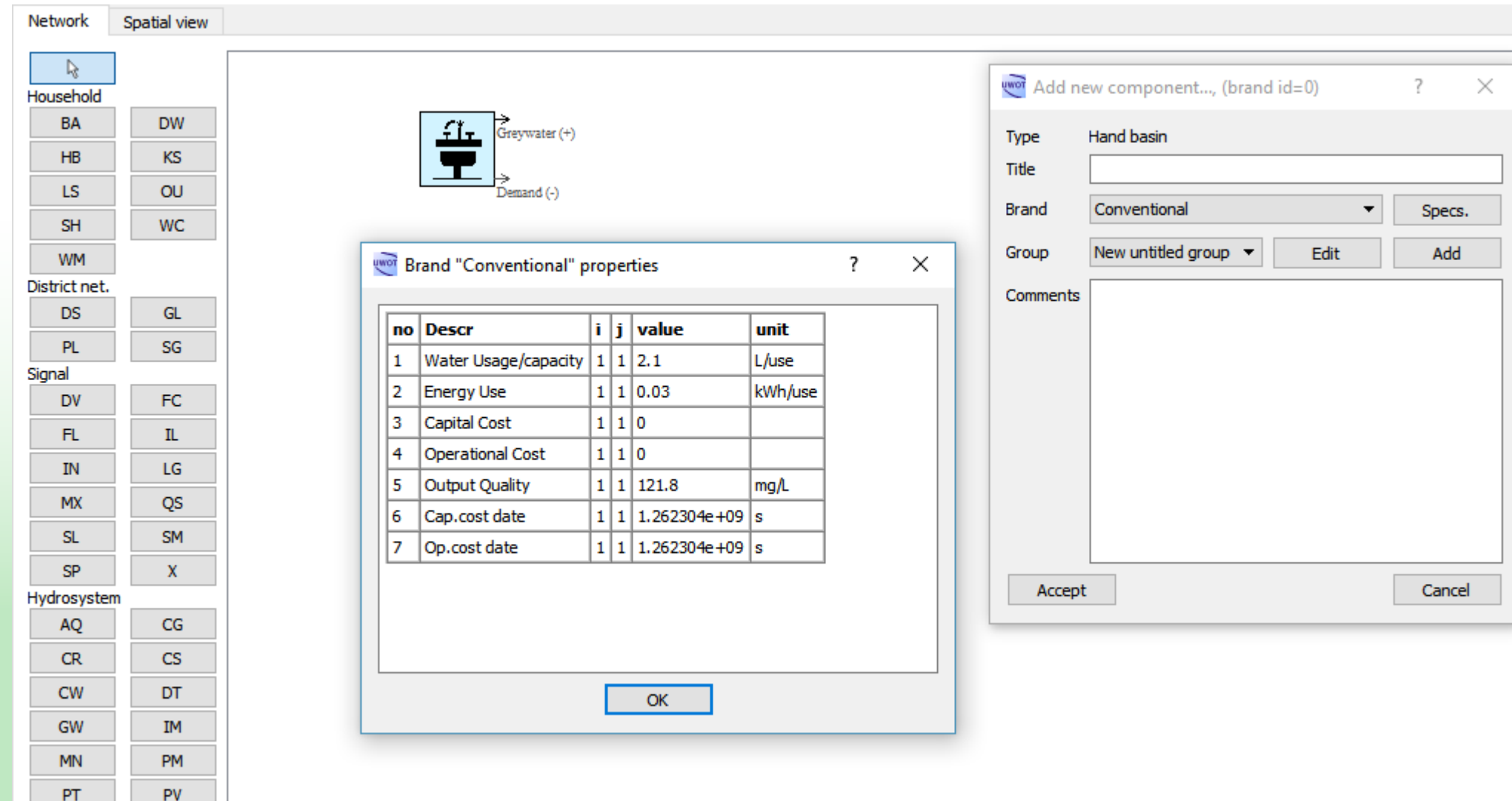
# UWOT hands-on training: Part I

## Brands & Groups

❖ Select the *conventional Brand* from the list and inspect its *Specs*.

Number of *uses* per person is affected by the global parameters of the component's group.

❖ Click *Add* to attach the component to a new *Group*.



The screenshot displays the UWOT software interface. On the left, a 'Network' panel shows a 'Spatial view' with a grid of component icons categorized into Household, District net., Signal, and Hydrosystem. A 'Hand basin' icon is selected. In the center, a 'Brand "Conventional" properties' dialog box is open, showing a table of specifications:

no	Descr	i	j	value	unit
1	Water Usage/capacity	1	1	2.1	L/use
2	Energy Use	1	1	0.03	kWh/use
3	Capital Cost	1	1	0	
4	Operational Cost	1	1	0	
5	Output Quality	1	1	121.8	mg/L
6	Cap.cost date	1	1	1.262304e+09	s
7	Op.cost date	1	1	1.262304e+09	s

On the right, an 'Add new component...' dialog box is open, showing the 'Type' as 'Hand basin', the 'Brand' as 'Conventional', and the 'Group' as 'New untitled group'. The 'Accept' button is highlighted.



# UWOT hands-on training: Part I

## Group editing

❖ Name the *Title* “Household Type I”

Right now, three *Time series* are available for editing, which affect all components in the *Group*:

- *Occupancy*: number of people using the Groups components (i.e. #people/household)
- *Demand fluctuation*: Multiplier of *Demand per usage* of the components
- *Frequencies*: Number of *uses* per person, of a *specific* component

UWOT Group properties (group\_id=2)

Title: Household Type I

Color: [Light Green Swatch]

Comments: [Empty Text Area]

Timeseries

Occupancy	[Empty Text Box]	Browse...	Clear	Const
Demand fluctuation	[Empty Text Box]	Browse...	Clear	Const
Frequencies:				
Hand basin	7.15	Browse...	Reset	Const

OK Cancel

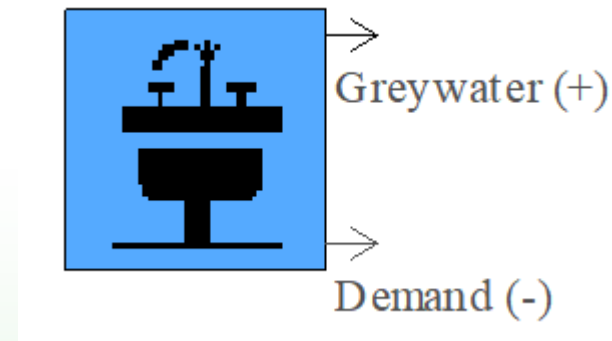
# UWOT hands-on training: Part I

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*Demand* signal value of the HB component in a daily time step = *Occupancy* × *Demand fluctuation* × *Hand Basin Frequency*.

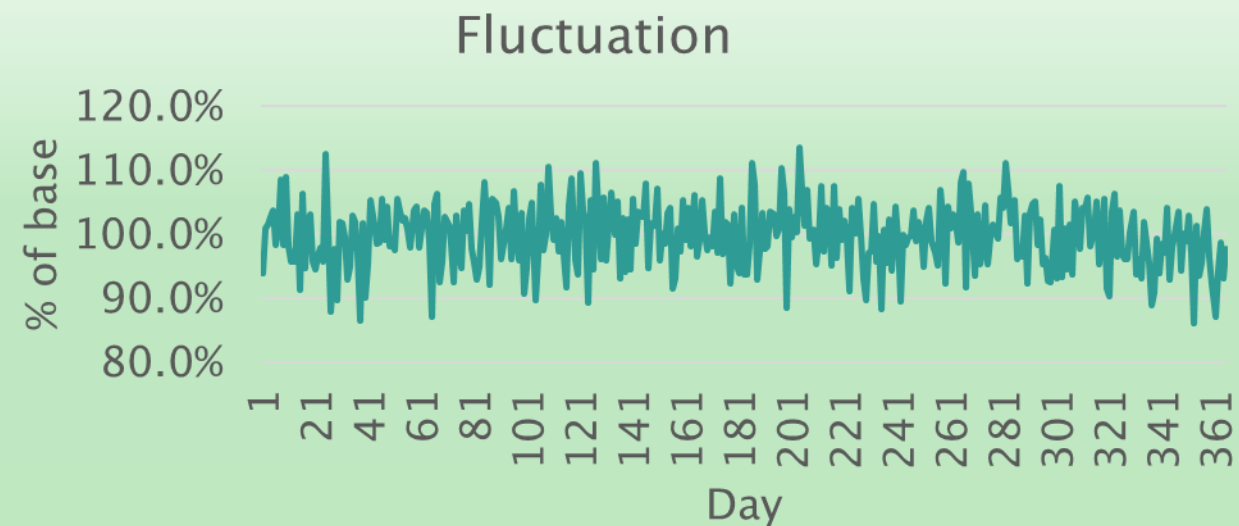
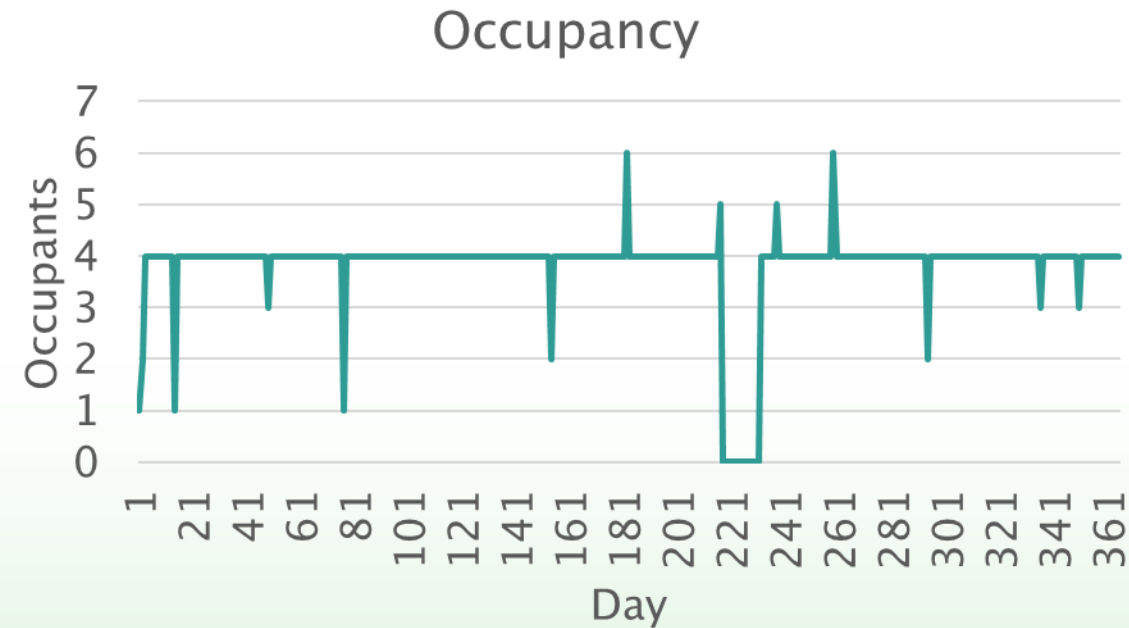
*Greywater* signal value is assumed to be the same.



# UWOT hands-on training: Part I

## Group editing

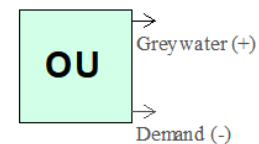
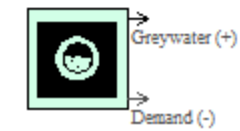
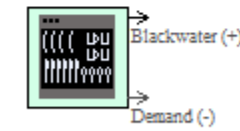
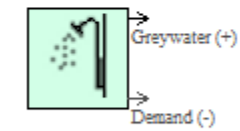
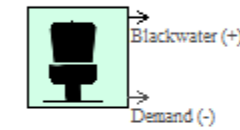
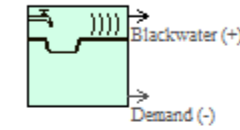
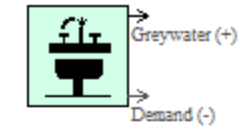
- ❖ *Browse the training material folder and select the file “Occupancy\_TS.csv” in **Occupancy** field*
- ❖ *Browse the training material folder and select the file “Fluctuation.csv” in **Demand Fluctuation** field*



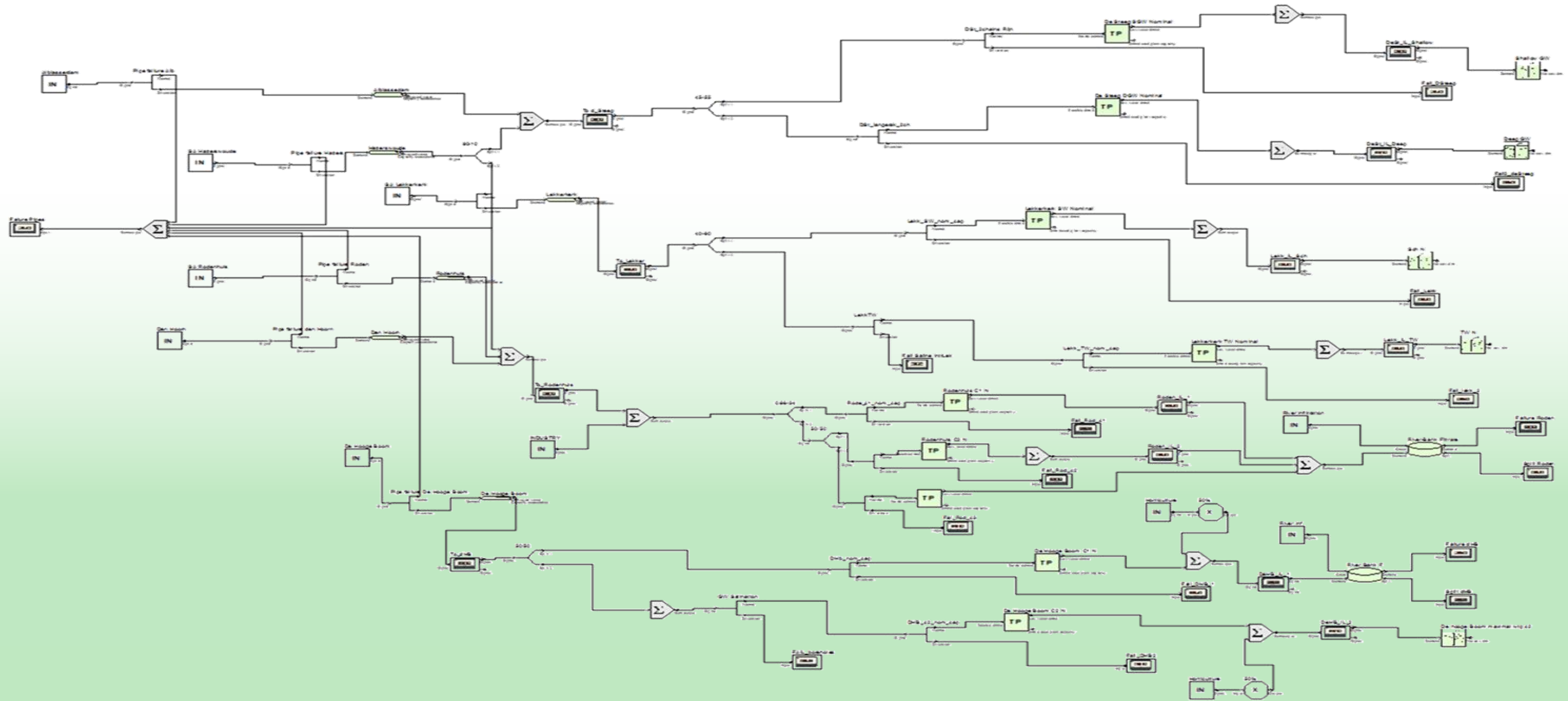
# UWOT hands-on training: Part I

## Add more components to define a Household type

- ❖ Add more *household UWOT components* of type Kitchen Sink (KS), Toilet (WC), Shower (SH), Dish Washer (DW), Washing Machine (WM) and make sure to use the predefined “Conventional” Brand and attach them to the same Group
- ❖ Add a component of type Outside Use (OU). From the predefined Brands select the “Decorative Water Feature”, and browse its specs.
- ❖ Inspect again the *group properties* and see how different frequencies were automatically added, as we add more devices to a group.



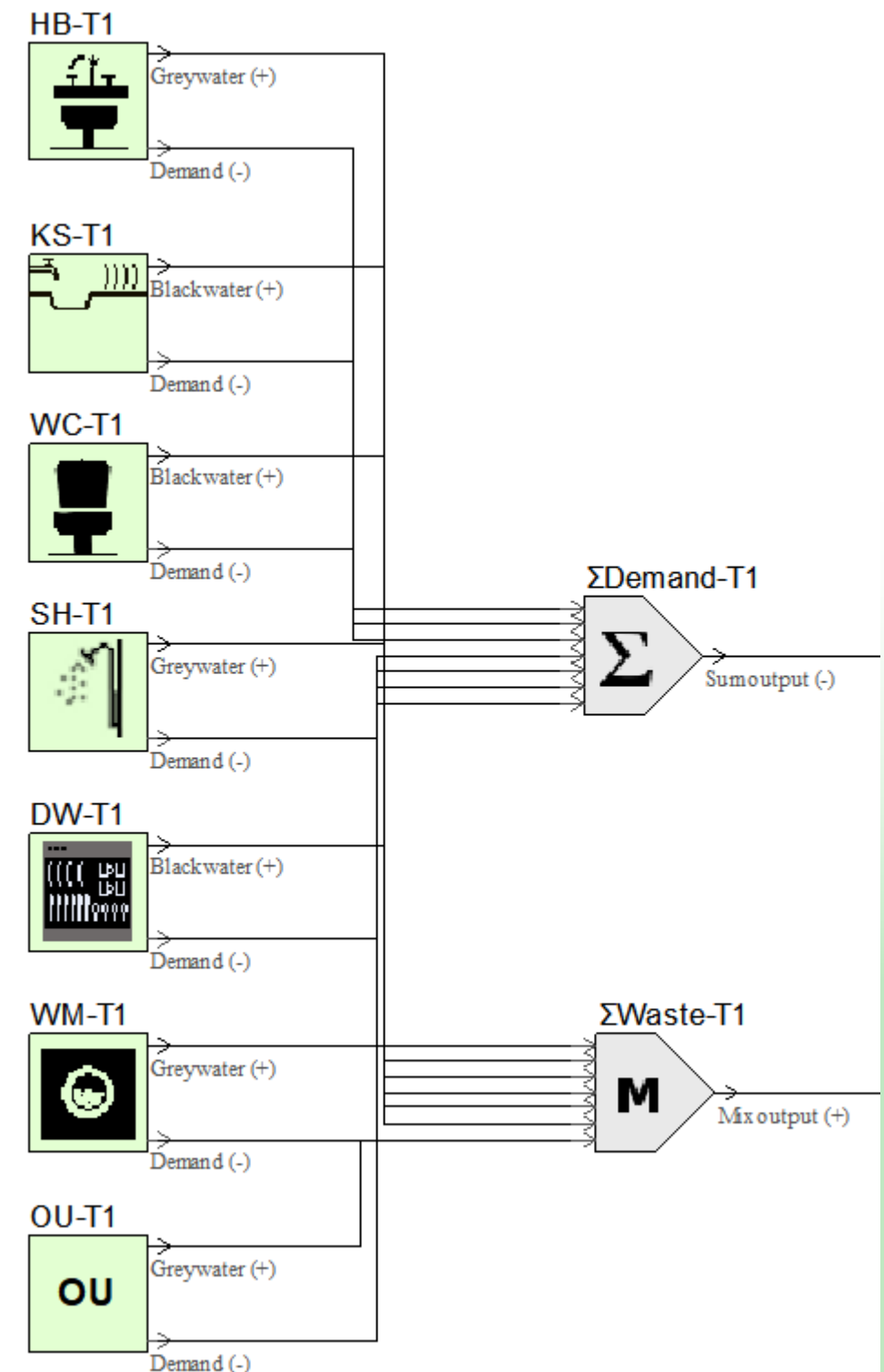
# Signal summation/mixing



# UWOT hands-on training: Part I

## Basic signal routing (summation)

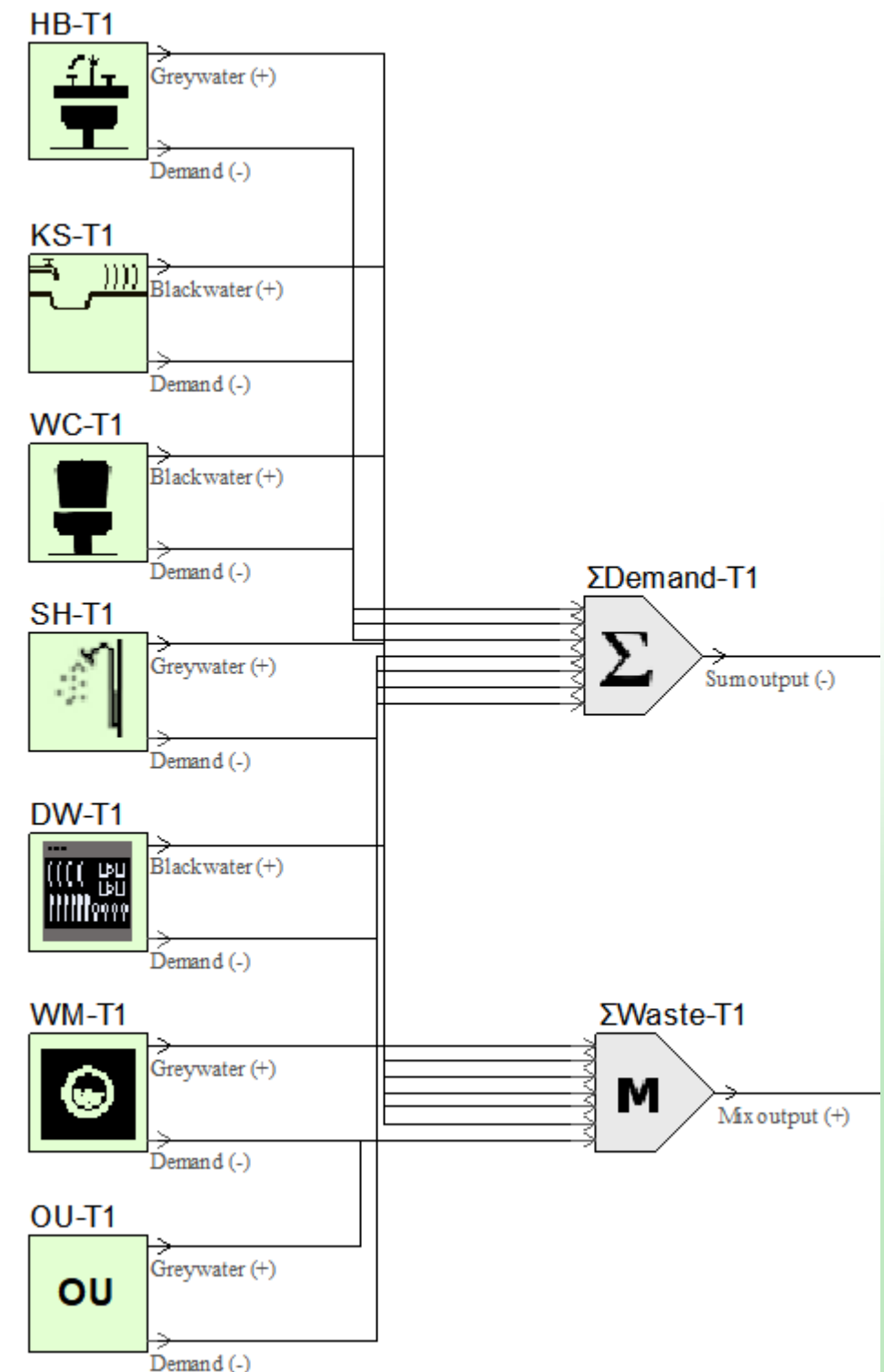
- ❖ Add a *Summation (SM)* component from the *signal panel*. This signal is used with *pull signals (-)* and sums only quantities.
- ❖ Connect the *Demand* output of every component by right-clicking, selecting “*Connect Demand (-)*” and then left-clicking on the *Summation* component and selecting “*Connect to Input(-)*”



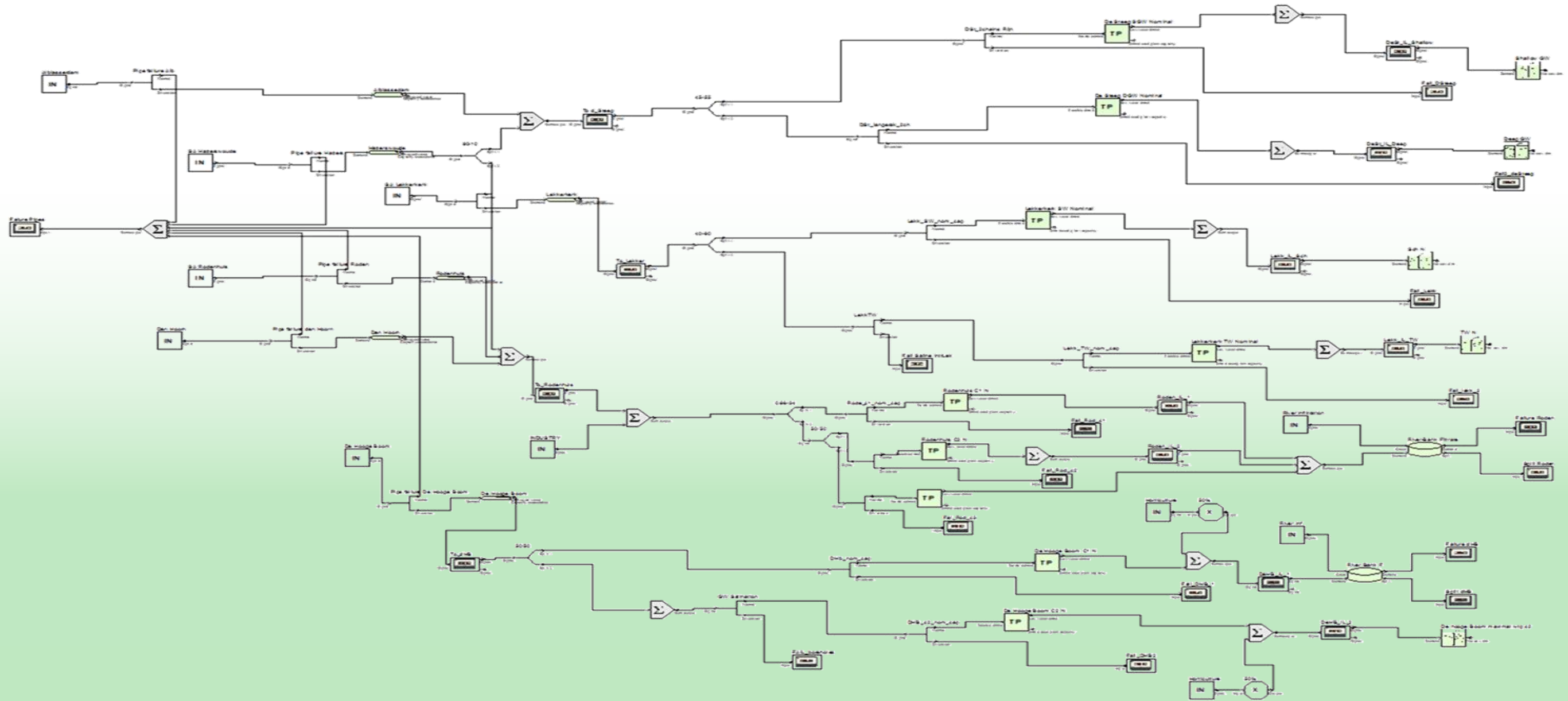
# UWOT hands-on training: Part I

## Basic signal routing (mix)

- ❖ Add a *Mix (MX)* component from the *signal panel*. This signal is used with *push signals* and sums quantities and mixes qualities (by a flow weighted average).
- ❖ Connect the *Greywater/Blackwater output* of every component by right-clicking, selecting “*Connect Greywater/Blackwater (+)*” and then left-clicking on the *Mix component* and selecting “*Connect to Input(+)*”



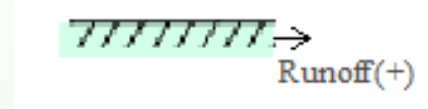
# Household roofs/impervious areas



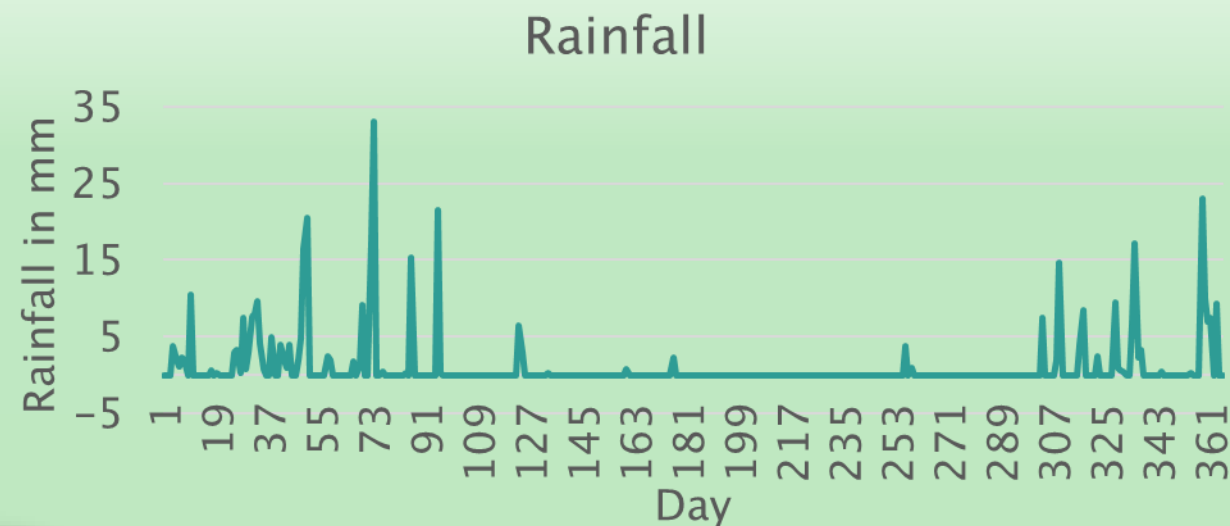
# UWOT hands-on training: Part I

## Household Impervious areas

- ❖ Add an *Impervious Area (IM)* from the *hydrosystem* panel that corresponds to the impervious areas of this Household Type, define the *area* in  $m^2$  as **100** and select the predefined “10% evaporates Brand”

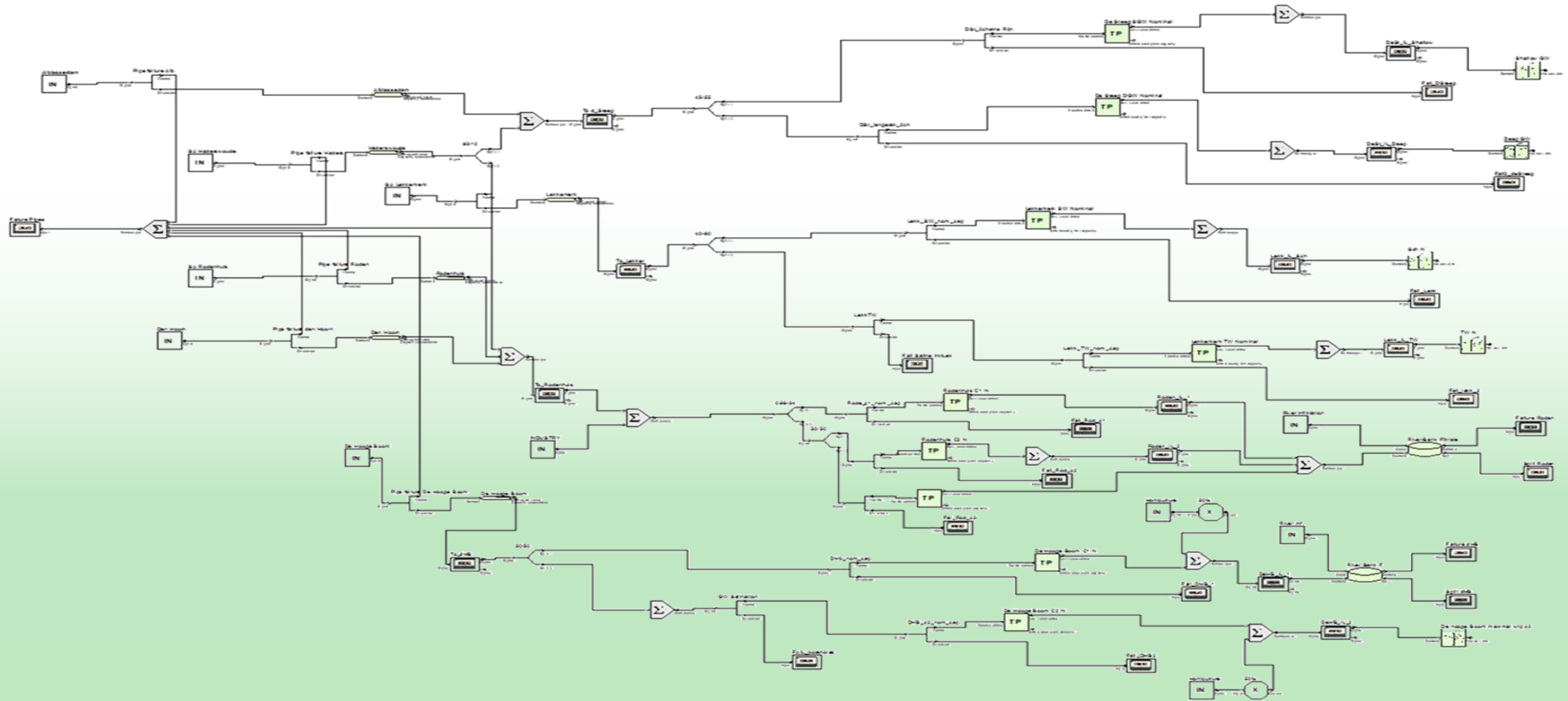


- ❖ Edit the *Group*. A new automatically created *Rainfall time series* is created. Browse the training material folder for the “*Rainfall\_TS.hts*” file.





# From household to district level

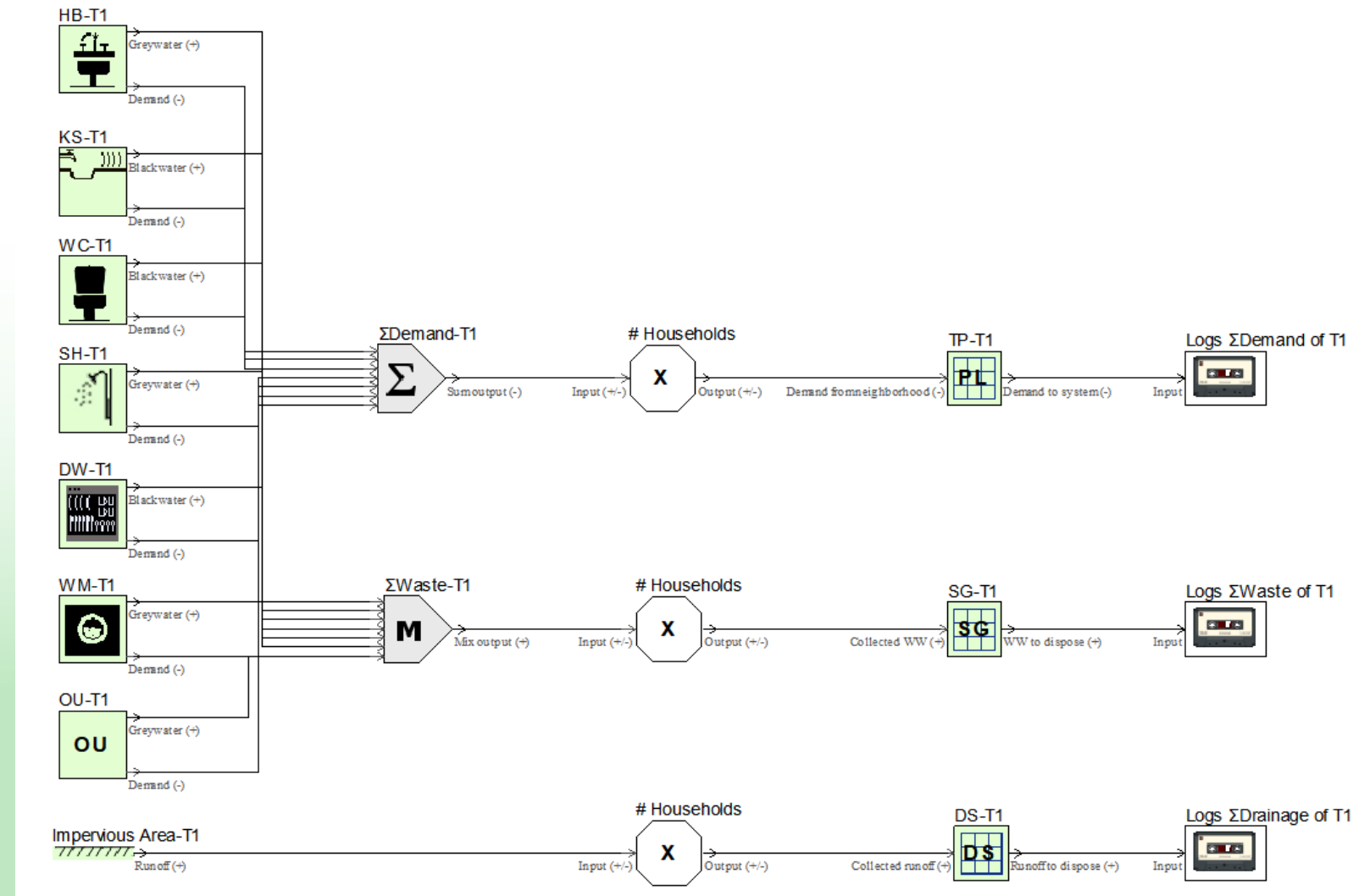




# UWOT hands-on training: Part I

## Define a district

- ❖ Right-click on the *SM*, *MX* and *IM* components and select *delete the respective type connections*.
- ❖ Add three *Multiplication (X)* components from the *signal panel*. Use a *constant value of 250*, to represent households in the district.
- ❖ Connect each of the *SM*, *MX* and *IM* to a *X* and then each *X* to *PL*, *SG*, *DS*.
- ❖ Perform a simulation again.



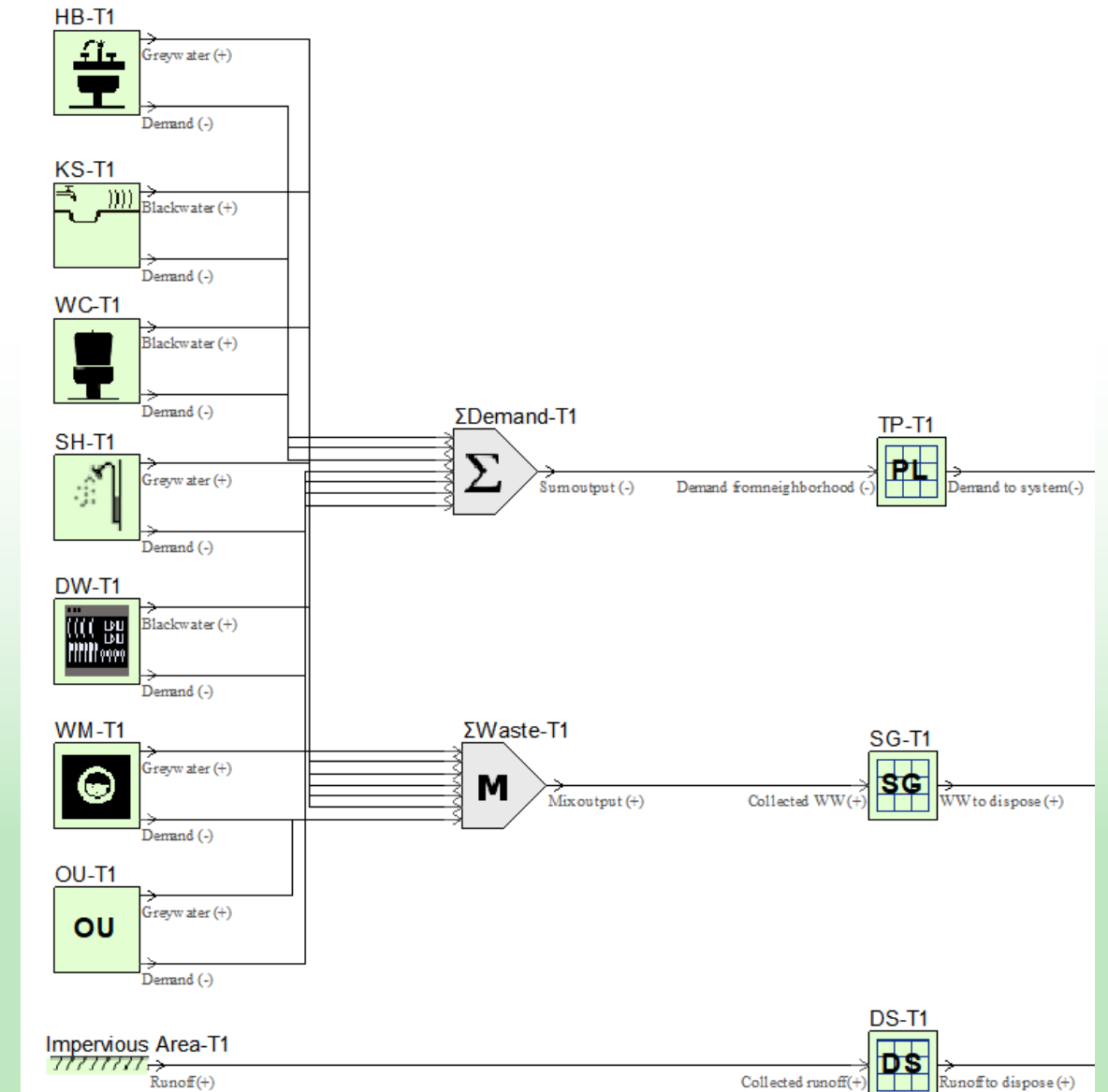
# UWOT hands-on training: Part I

## Tertiary network connections

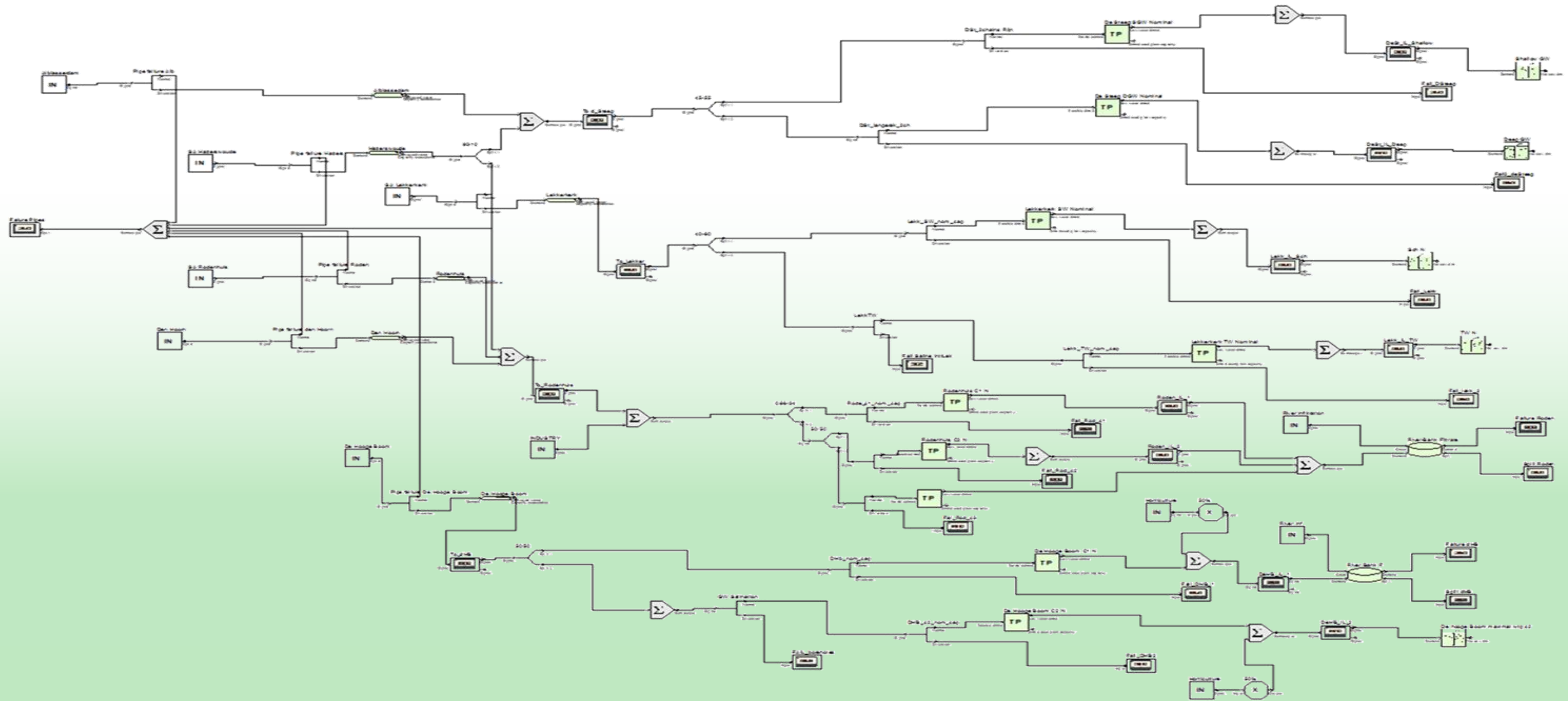
- ❖ Add from the *District network panel* the *Tertiary potable network (PL)*, *Sewage collection (SG)* and the *Storm drains collection (DS)* components. Make sure all belong to the same *Group* and select the predefined *Brand "PE"*.

These represent the water losses and energy use from the tertiary networks of a district.

- ❖ Connect the *SM* component to *PL*, the *MX* to the *SG* and the *IM* to the *DS*.



# Basic Loggers and Simulation



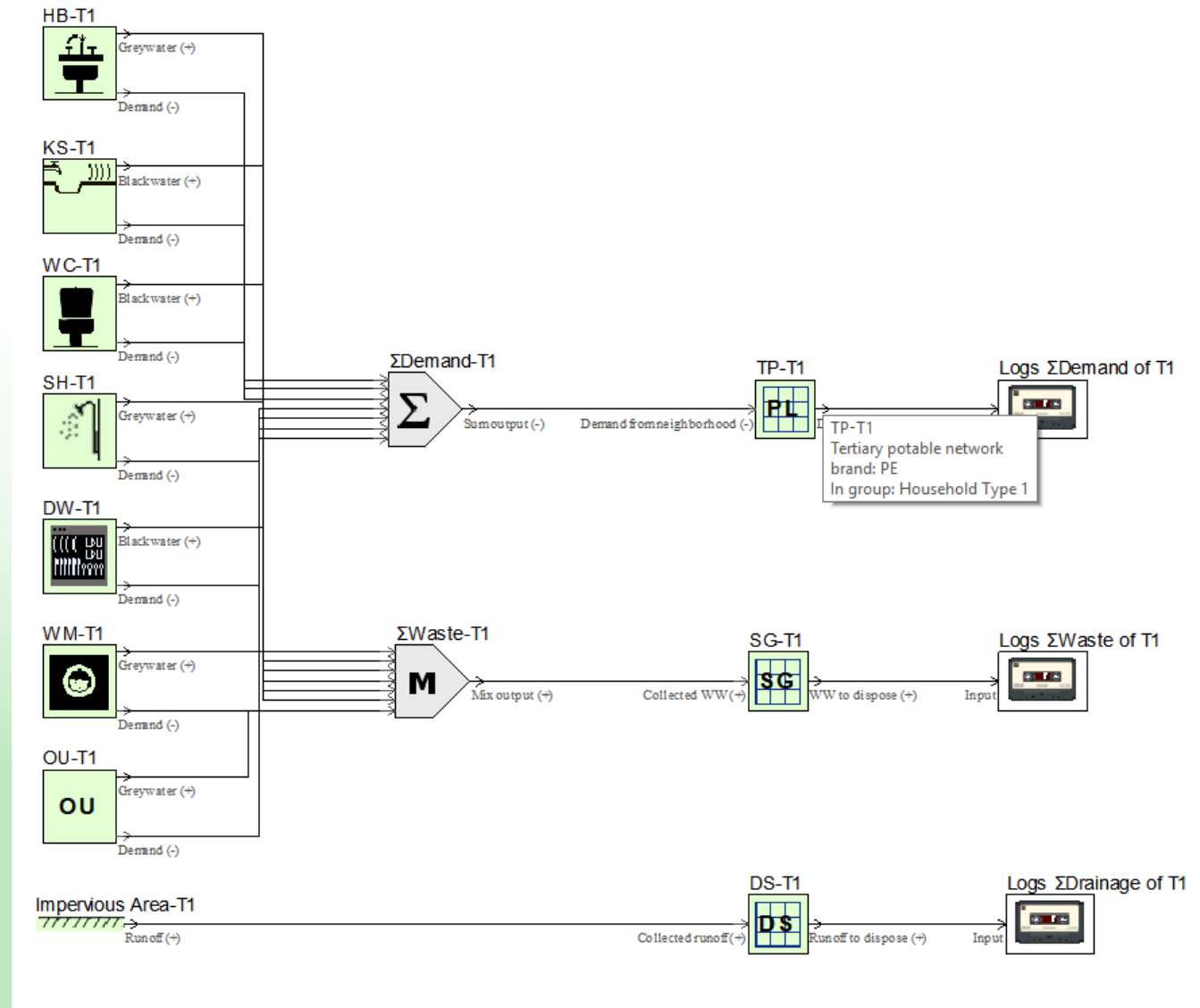
# UWOT hands-on training: Part I

## Logging signals

- ❖ Add three *Logger (LG)* components.
  - ❖ Connect each of the *PL*, *SG*, *DS* to a *LG*.
- These are used as final recipients that log incoming signals.


## Before simulating

- ❖ Check the group properties again to view all requested timeseries and parameters.
- ❖ Save your UWOT topology in the file “part1.uwot”

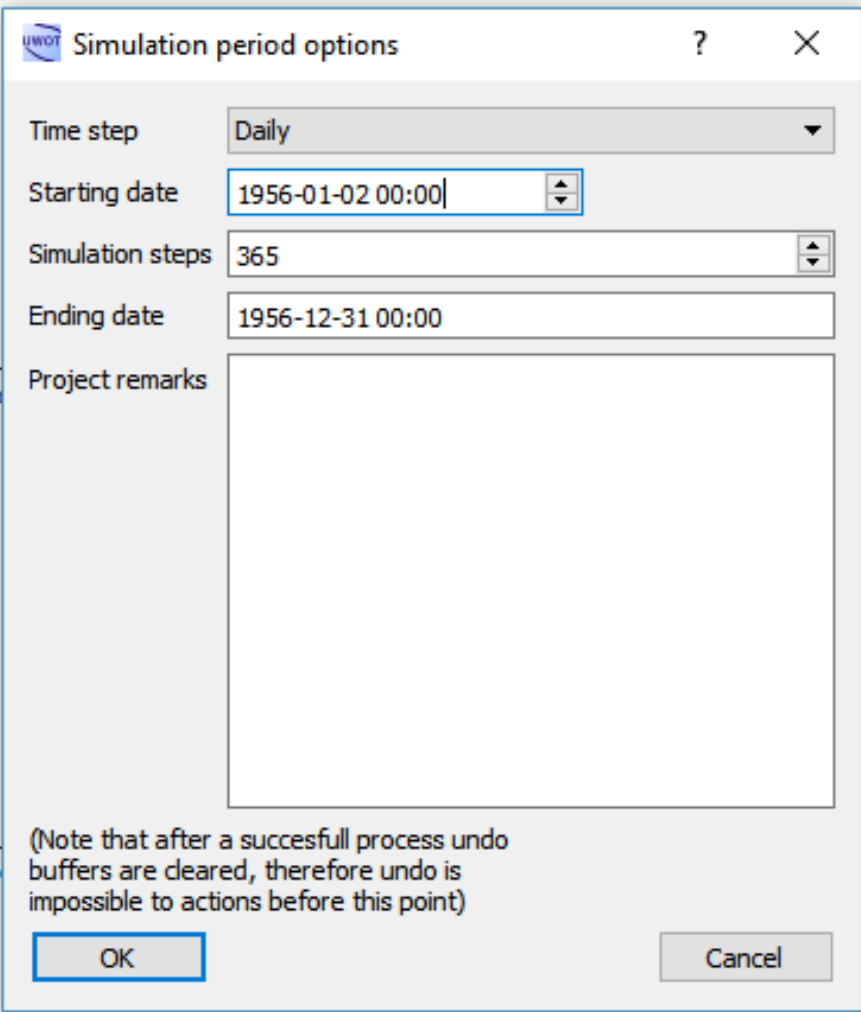


# UWOT hands-on training: Part I

## Perform a simple UWOT simulation

- ❖ Click the *Process*  button on the toolbar and hit *OK* to perform a simulation.
- ❖ You can view all logged signals by double-clicking *loggers*, clicking the *Output Timeseries Display* button and selecting the *Logged Quantity* or *Quality* type.

The loggers have captured the water cycle of a specific household (Demand, Waste, Runoff)



Simulation period options

Time step: Daily

Starting date: 1956-01-02 00:00

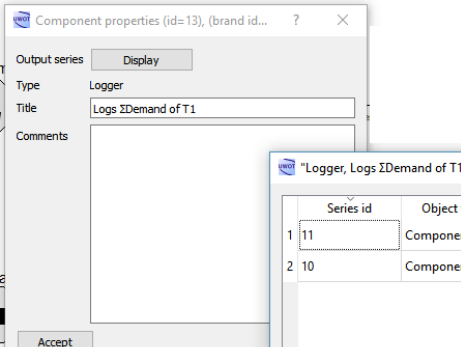
Simulation steps: 365

Ending date: 1956-12-31 00:00

Project remarks

(Note that after a successful process undo buffers are cleared, therefore undo is impossible to actions before this point)

OK Cancel



Component properties (id=13), (brand id... ? x

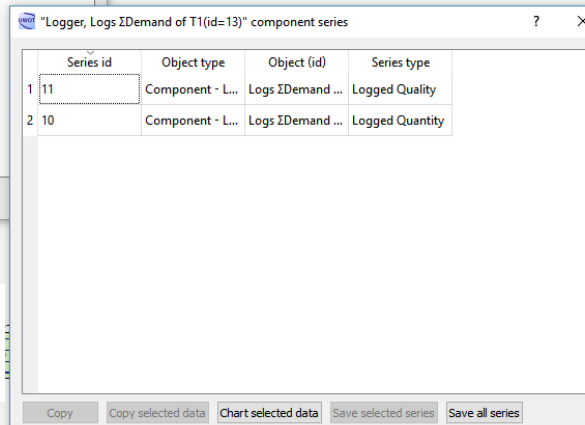
Output series: Display

Type: Logger

Title: Logs  $\Sigma$ Demand of T1

Comments

Accept



"Logger, Logs  $\Sigma$ Demand of T1(id=13)" component series

Series id	Object type	Object (id)	Series type
1 11	Component - L...	Logs $\Sigma$ Demand ...	Logged Quality
2 10	Component - L...	Logs $\Sigma$ Demand ...	Logged Quantity

Copy Copy selected data Chart selected data Save selected series Save all series