



TECHNIEK  
EN MANAGEMENT



# Introductie RTC-tools

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**Deltares**

Enabling Delta Life

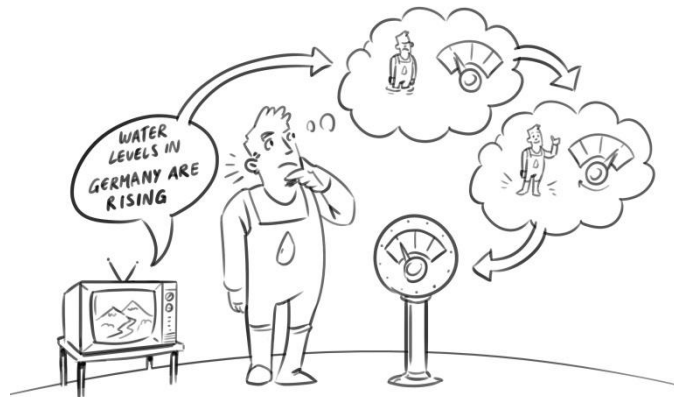


# Real-time Control

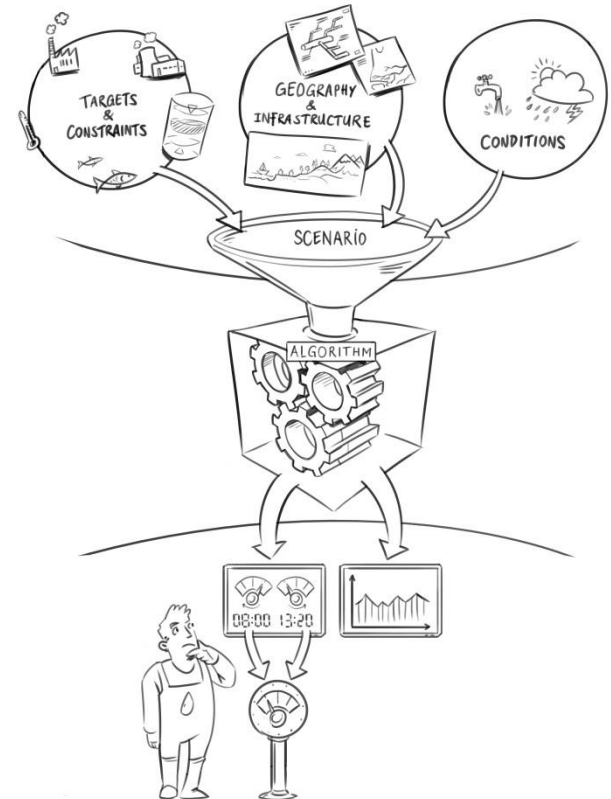
## FEEDBACK CONTROL



## FEEDFORWARD CONTROL



## MODEL PREDICTIVE CONTROL





# RTC programmering

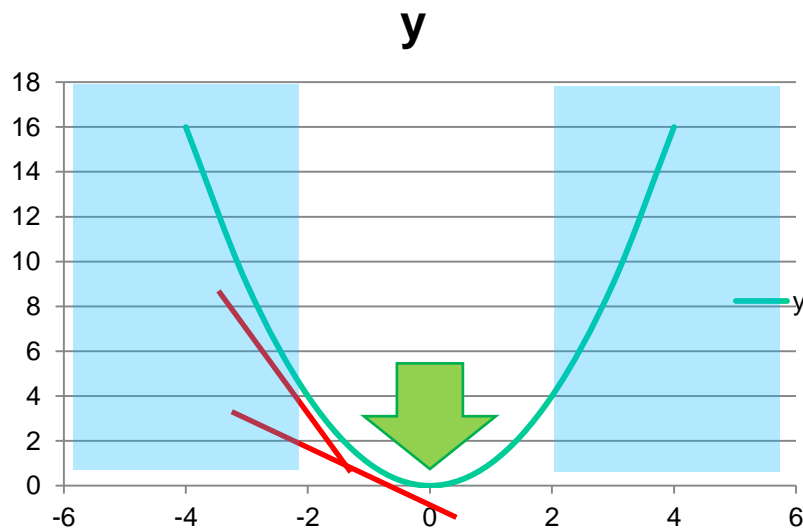
- In telemetrie:
  - Als-dan regels (rules)
  - Controllers (PI, interval, ....)
  
- Dus: feedback en/of feedforward
  
- Maar ook MPC gewenst ?
  - *wat zijn voor/nadelen van*
    - *Feed-Back*
    - *Feed-Forward*
    - *Model Predictive Control*

# Doelfunctie

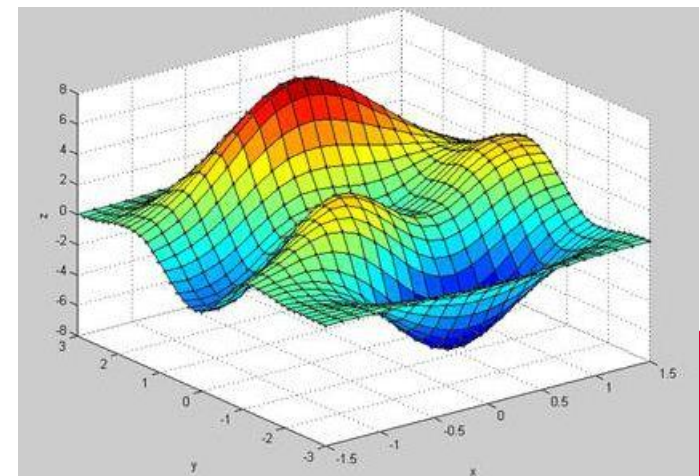
Zoek het minimum van een **objective function**

Bijv.: minimaliseer  $y = x^2$

Gradient gebaseerd optimalisatie algoritme gebruik de helling

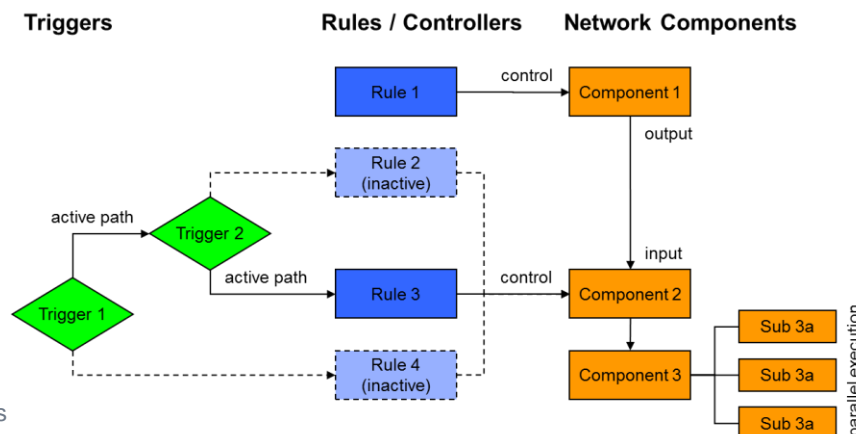


Bijv. 2 variabelen:



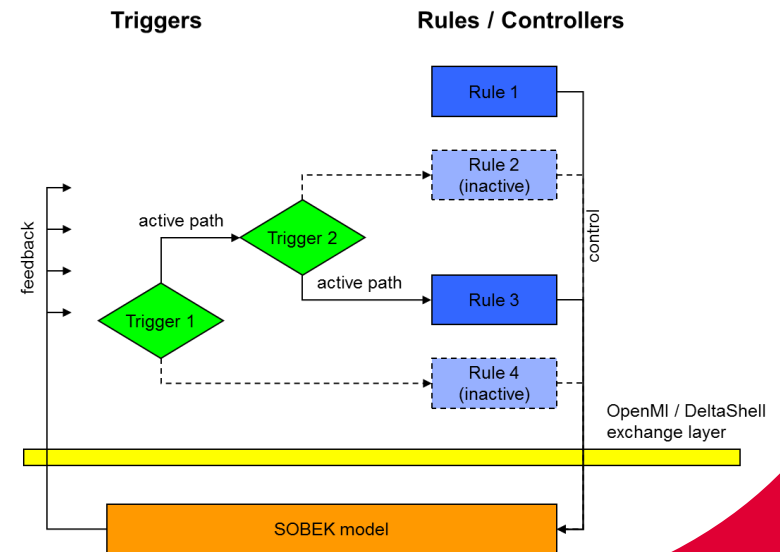
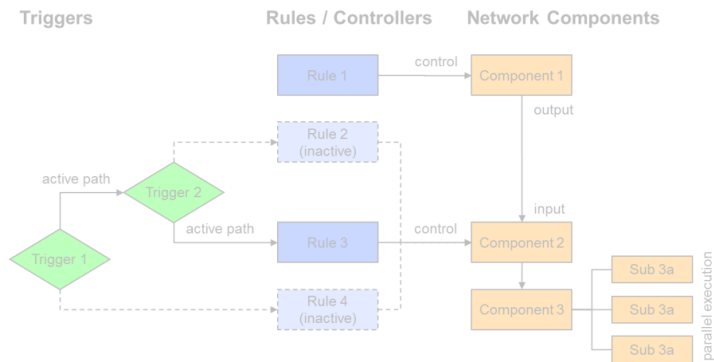
# RTC-Tools: als losse module

- Rules, triggers
- MPC (optimalisatie)
- Externe koppelingen (Matlab, OpenDA, OpenMI)
- Interne modellen
  - Hydrologische (HBV, sacramento, ...)
  - Hydraulische (zoals Sobek-CF)
  - Reservoirs en stuwdammen



# RTC-Tools: koppelingen

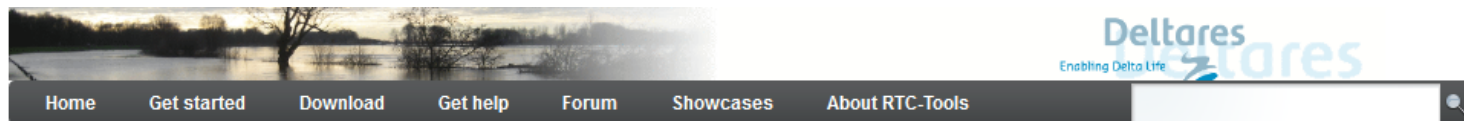
- Matlab, OpenDA, OpenMI
- RTC module van SOBEK 3.x  
→ Alleen rules en triggers (FeedBack, FeedForward)





# RTC-Tools community

- Open source: <http://oss.deltares.nl/web/RTC-Tools>



## RTC-Tools Open Source Community

RTC-Tools is a toolbox for the real-time control of hydraulic systems. It is open source software, available under the terms of the [GNU General Public License version 2](#).

With this portal, we invite the RTC-Tools Community to come together to share knowledge, brainstorm on new features and build working relationships.

Join our [LinkedIn group](#) to receive periodic updates on progress, applications, and new releases.

For more information, contact us at [rtc-tools@deltares.nl](mailto:rtc-tools@deltares.nl).



**11.000+** joined the Deltares  
[Open Source Community](#)

## News

### [RTC-Tools 1.4.1 released](#)



11/24/15 2:36 PM

Search

## Recent activities

November 24



[Jorn Baaven](#) wrote a new blog entry, [RTC-Tools 1.4.1 released](#).  
3:40 PM



# RTC-Tools versie 1.x

## Versie 1.4:

- Geen user interface
- Definitie in XML bestanden
- Continue optimalisatie

## Versie 2.0:

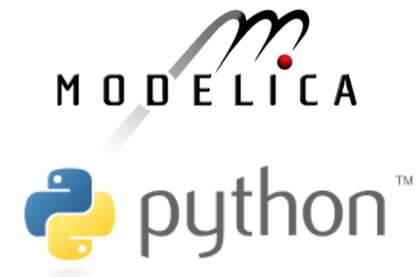
- user interface met modelica
- Definitie in XML bestanden





# RTC-Tools versie 2.0

- ontwikkeling in kader van TKI
- user interface met modelica
- koppeling met python
  
- inhoudelijk
  - Multi-objective functions
  - Treebased optimalisatie (onzekerheden)
  - Mixed-Integer optimalisatie





# Meer informatie

<http://oss.deltares.nl/web/RTC-Tools>

[rtc-tools@deltares.nl](mailto:rtc-tools@deltares.nl)