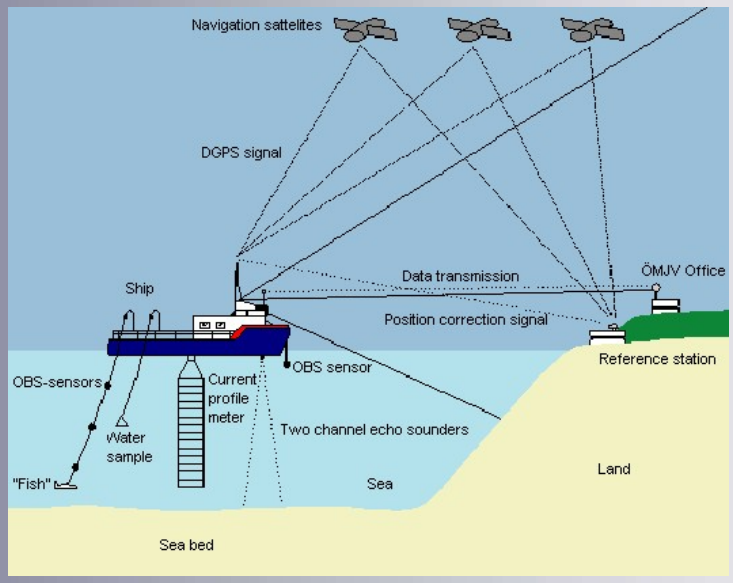
Hydroinformatic System

HIS (DSS)



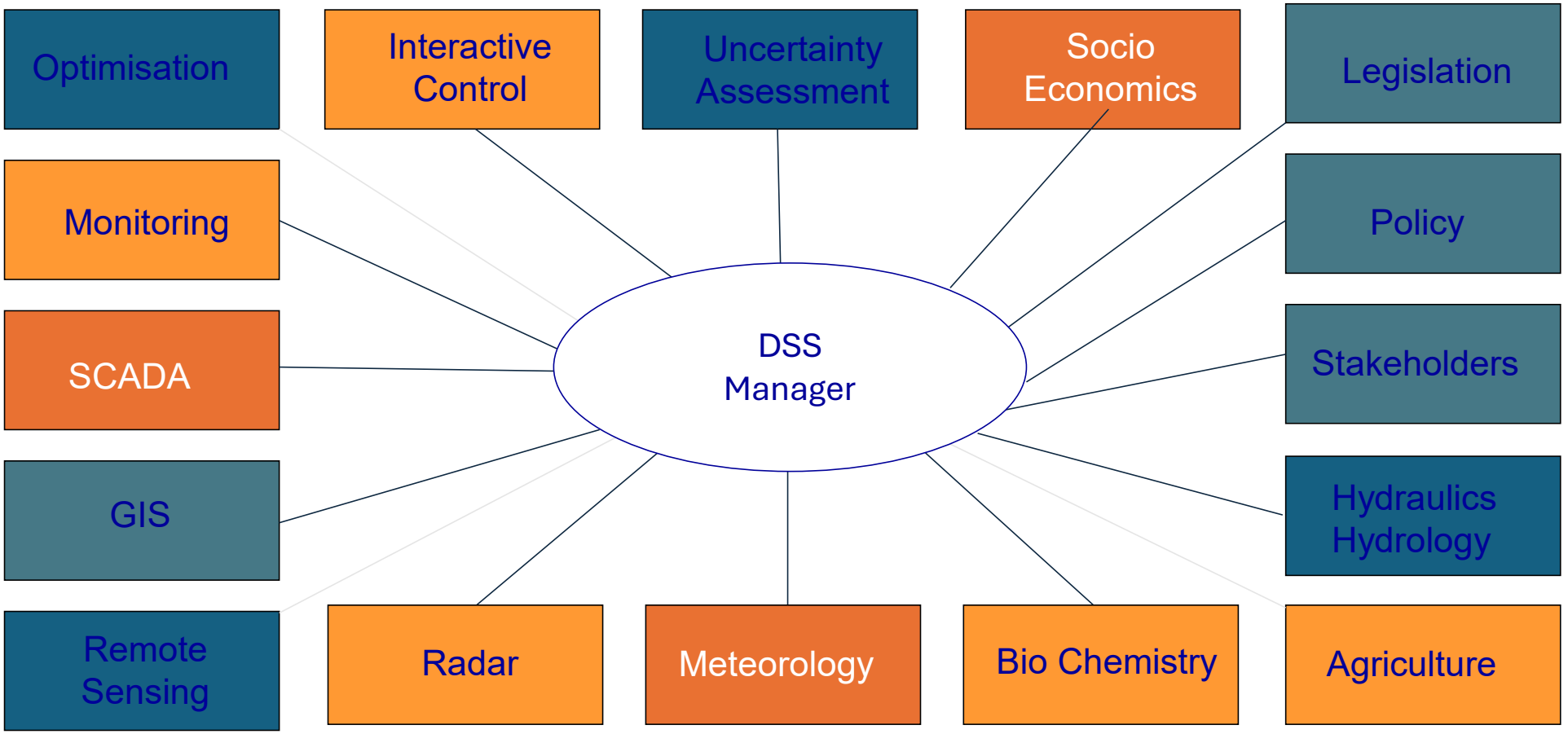
Hydroinformatic system (HIS)

Set of interconnected tools acting as one unified system and comprising substantial volume of information and knowledge in digital form originating mainly from

- hydraulics (fyzikální modelování)
- hydrology
- Results of applied research
- Area of law and legislation
- Area of social and economic espects
- Protection of environment (EIA)
- informatics
- Data collection and monitoring
- KBS (Expert system, Umělá inteligence, Genetické algoritmy, Inteligentní Agent)

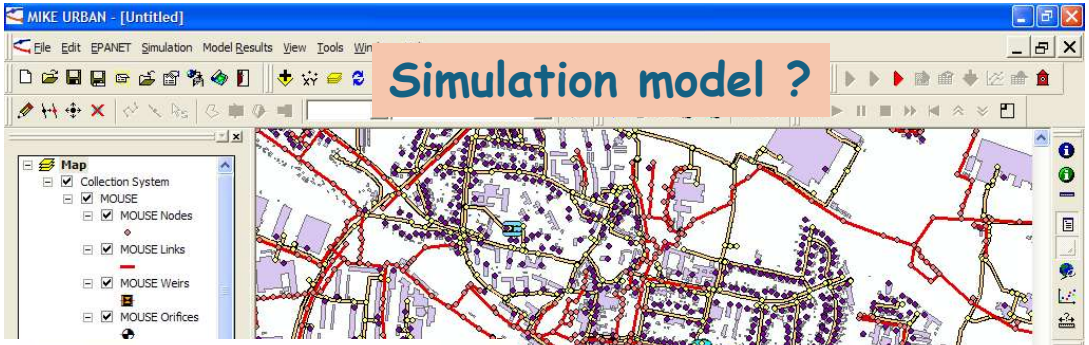
Hydroinformatic System (HIS) = Decision Support System (DSS)

Hydroinformatic System (HIS)

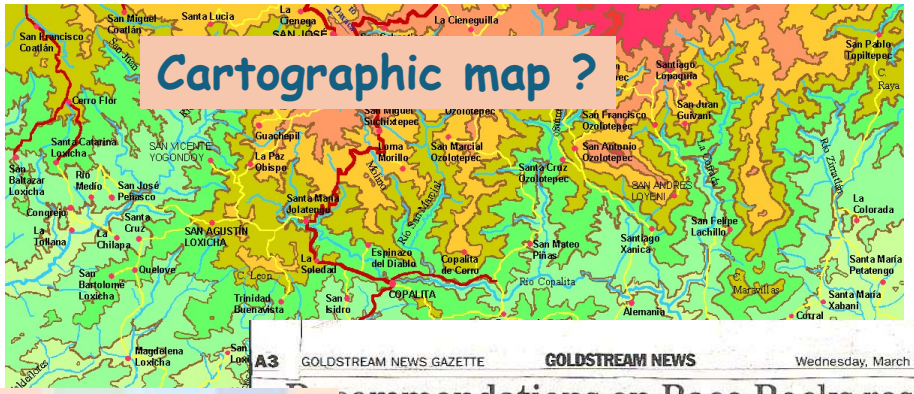


Decision Support Systems

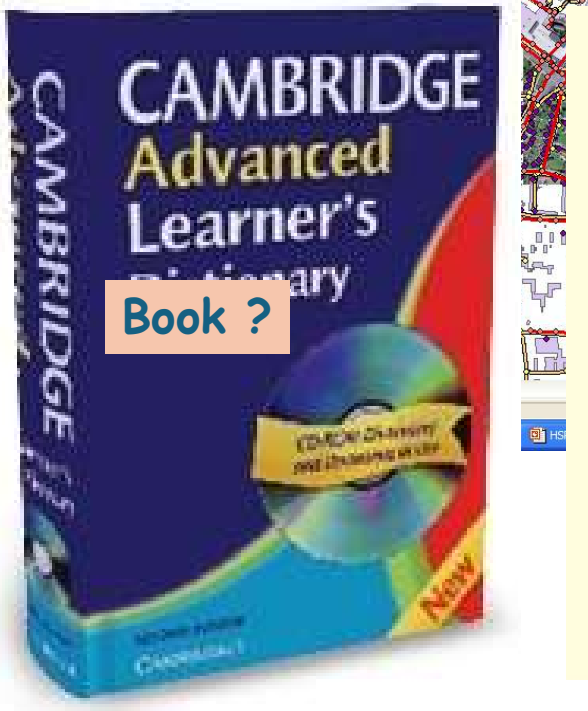
Decision Support System ?



Simulation model ?



Cartographic map ?



Book ?

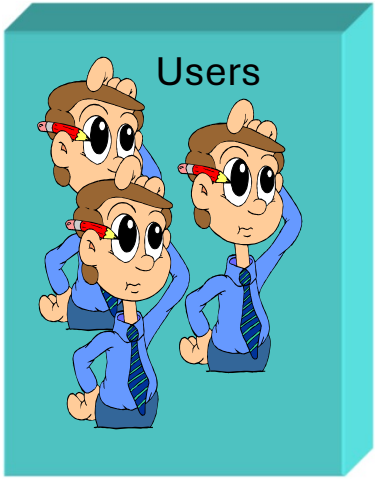
Menu from restaurant ?

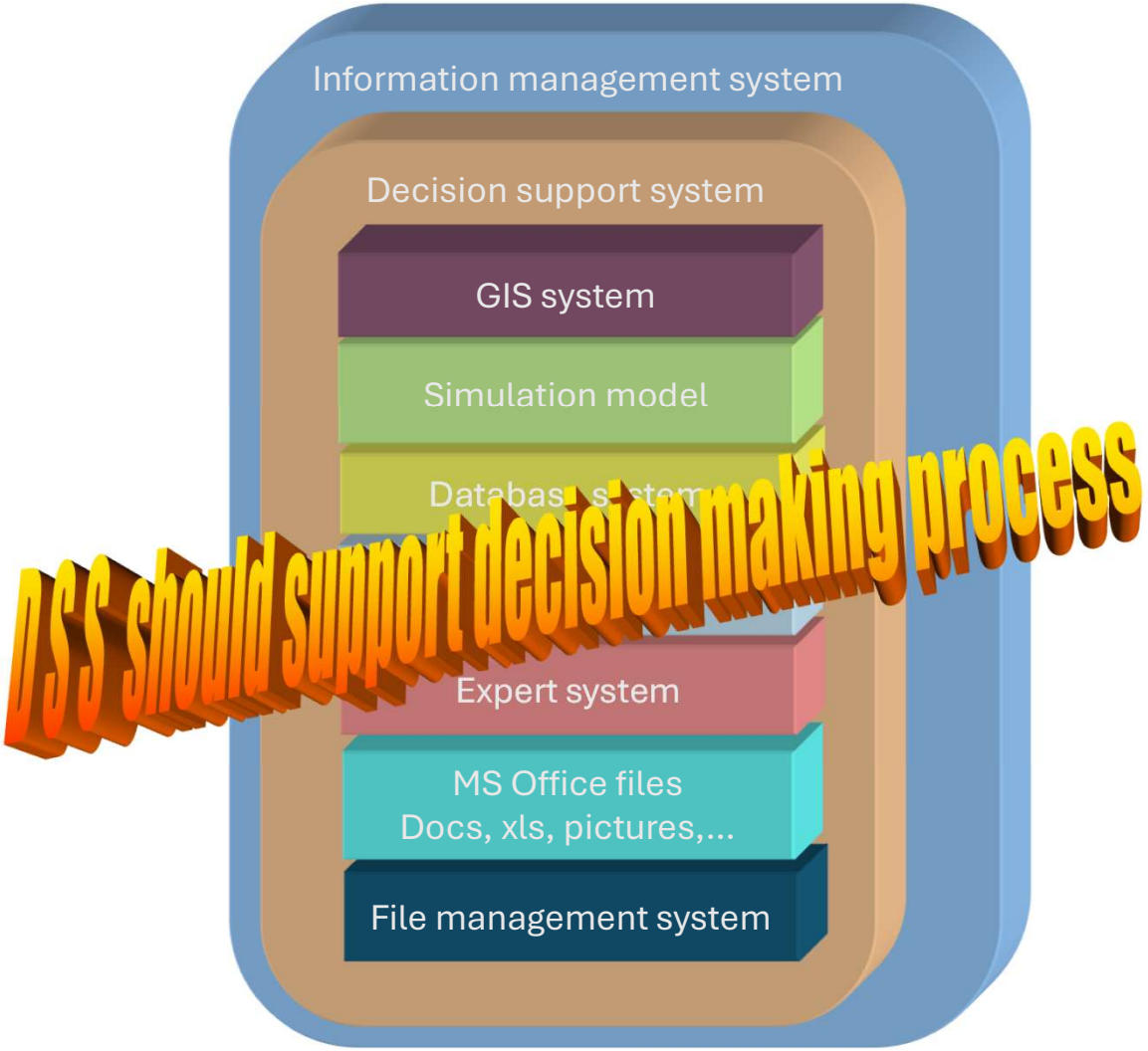
Newspaper ?

Understanding of DSS and ADSS

DSS ?

- Simulation model ?
- Database ?
- GIS ?
- Paper files ?
- Project team ?





Understanding DSS

Decision Support System ?

Decision Support Systems are a class of computerized information systems that support decision making process.

Decision Making Process ?

Decision making is the cognitive process of selecting a course of actions from among multiple alternatives.

Decision Making in Complex Environments ?

Decision making process in complex organizations takes a form of group work in a form of :

1. Dictatorship
2. Democracy
3. **Consensus**

Decision support in complex organizations

Decision Support Concept

Team Work Support in selecting a course of actions from among multiple alternatives while :

- Disclosing **controversies**
- **Negotiating** facts
- **Convincing** partners in team
- Using same **semantics**
- Using same **working environment, scale, limits**
- Coping with distinct **knowledge states**
- Coping with distinct **domain problems**
- Guiding team to **consensus**

DSS Functions

- library function,
- management function,
- analysis function
- communication function

DayWater project

EU RTD 5th Framework Programme project

Adaptive Decision Support System *(ADSS)* for the Integration of Storm Water Source Control into Sustainable Urban Water Management Strategies

1. *Ecole Nationale des Ponts et Chaussées (ENPC.CEREVE), France*
2. *Middlesex University (MU), Great Britain*
3. *Danish Technical University (DTU), Denmark*
4. *TAUW - Netherlands*
5. *Chalmers University of Technology, Sweden*
6. *DHI Hydroinform (DHI HIF), Czech Republic*
7. *National Technical University of Athens (NTUA), Greece*
8. *Ingenieurgesellschaft (PSI), Germany*
9. *Laboratoire Central des Ponts et Chaussées (LCPC), France*
10. *Lulea University of Technology, Sweden*

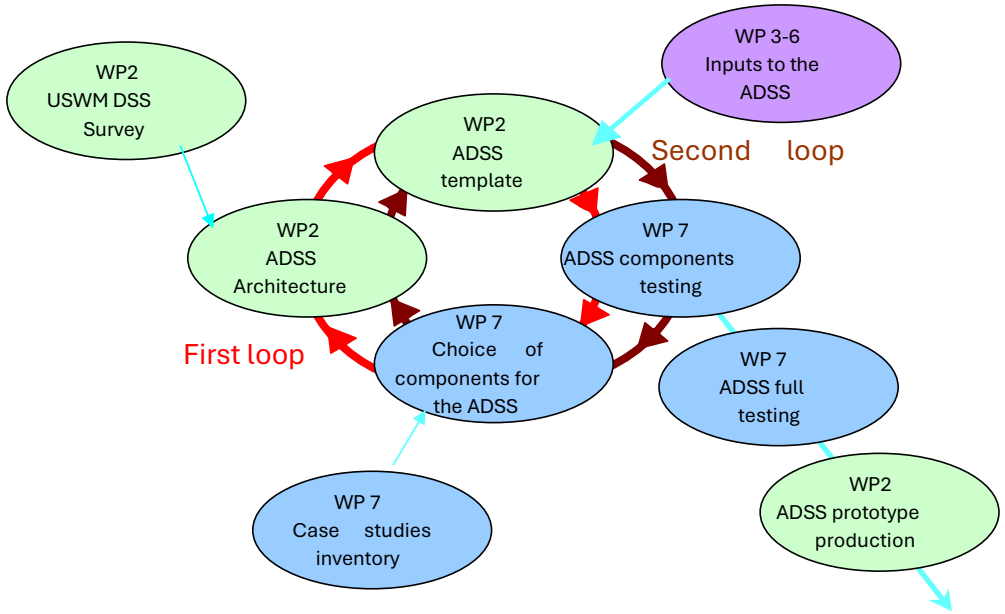
Project structure and goals

Project duration: 2002 – 2005

ADSS GOALS:

- to focus problems concerning hydrology and pollution as well as decision making process under the socio-economical and political context
- to offer and improve the knowledge with systematic representation of USWM in a form DSS adapting its structure, content and environment.

WP1 : project coordination
WP2 : ADSS development
WP3 : Urban Dynamics
WP4 : Risk and impact assessment
WP5 : BMP, Multicriterial analysis
WP6 : Source and flux models
WP7 : Field testing

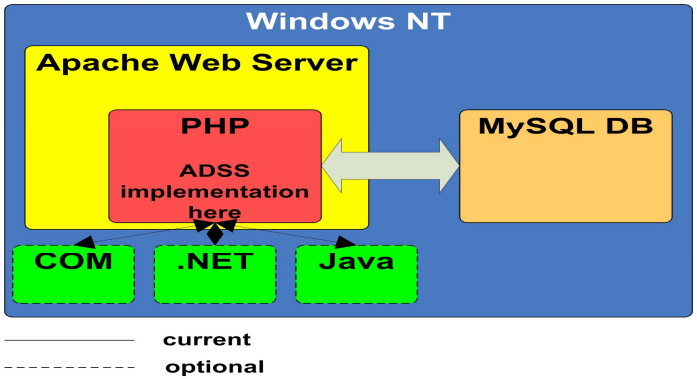


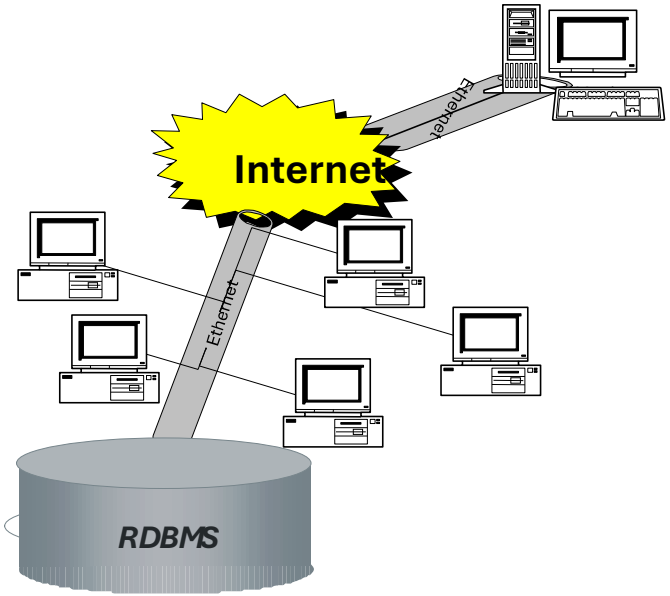
Adaptive (A)DSS for DayWater

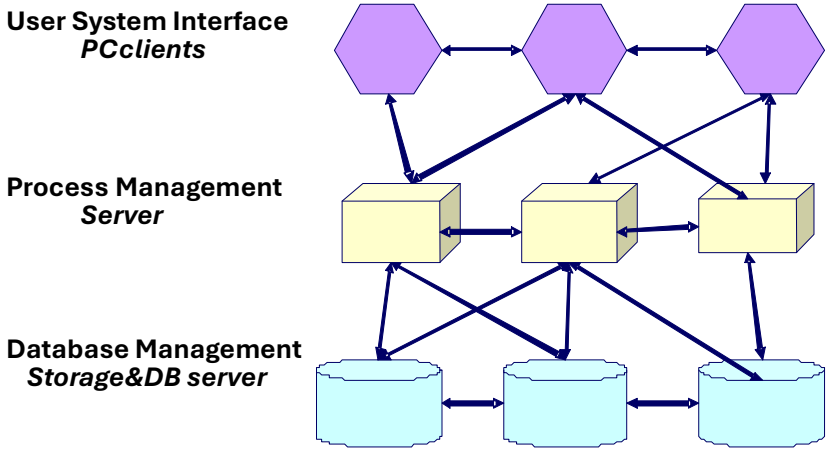
An Adaptive Decision Support System (ADSS) is generally understood as a „DSS that is **able to modify automatically or manually some aspects of its structure, functionality, or interface** to meet different needs of its users. “

ADSS Architecture

- Client server database architecture
- Web based architecture (IE6.0)
- Multi tier software architecture





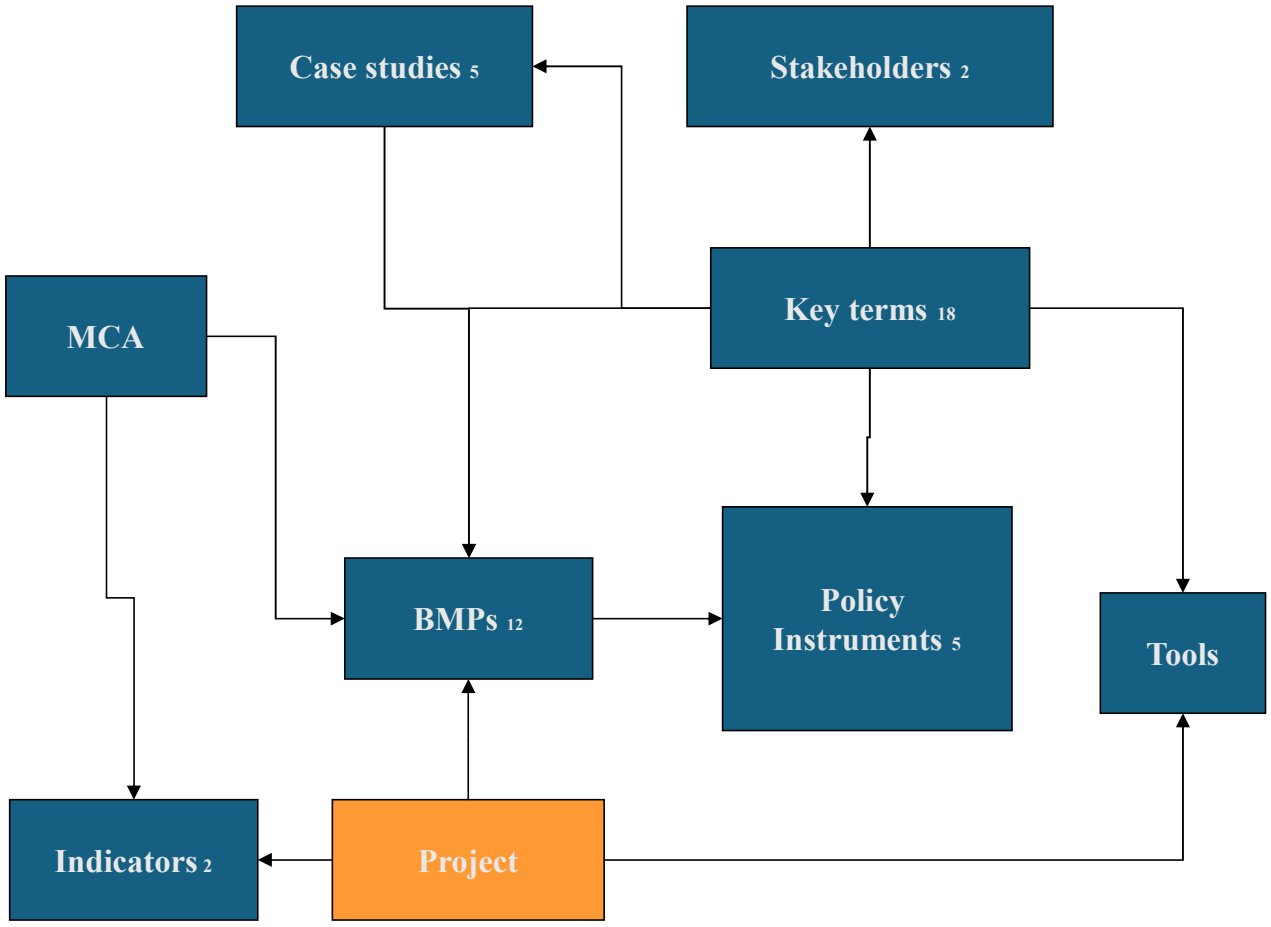


ADSS components

- Databases (...)
- Simulation models (STORM,SEWSYS)
- Multi-criteria analysis (MCC, MCA)
- Learning tools (Urban dynamics)
- Negotiation tools (Water Expert)
- Other tools
- GUI

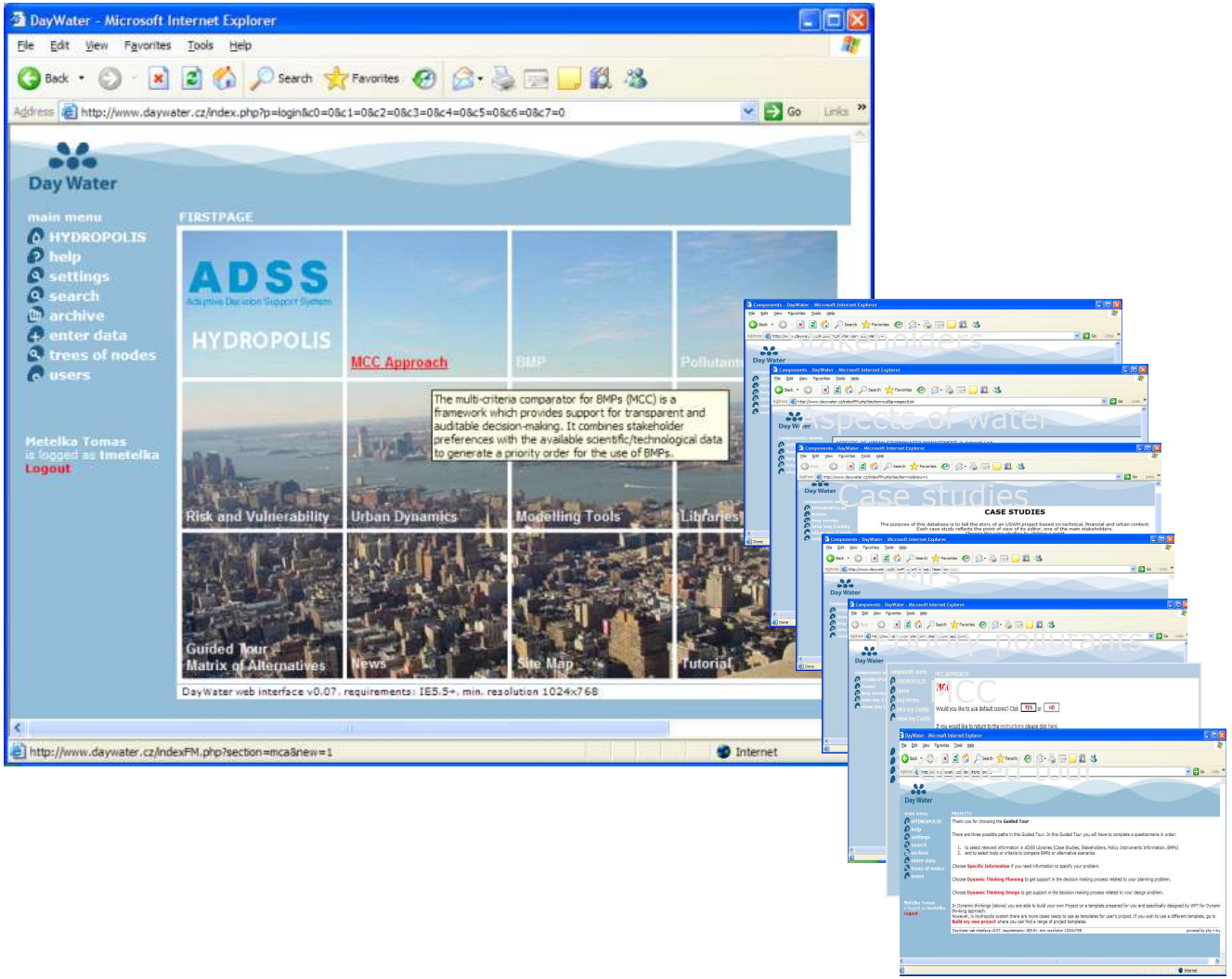
ADSS databases

- Case studies database
- Criteria and indicators database
- Policy instruments database
- Stakeholder database
- Priority pollutants database
- Tools database
- BMP database
- Key terms database



ADSS GUI "HYDROPOLIS"

- Interactive GUI
  - Pop ups
  - Help
  - User settings
  - Data editing
- Road map
- User rights
  - Administrator
  - Manager
  - User
  - Guest
- Modes of usage
  - Free
  - Smart guided
  - Guided
- Distinct navigations



ADSS - modes of usage

Administration mode

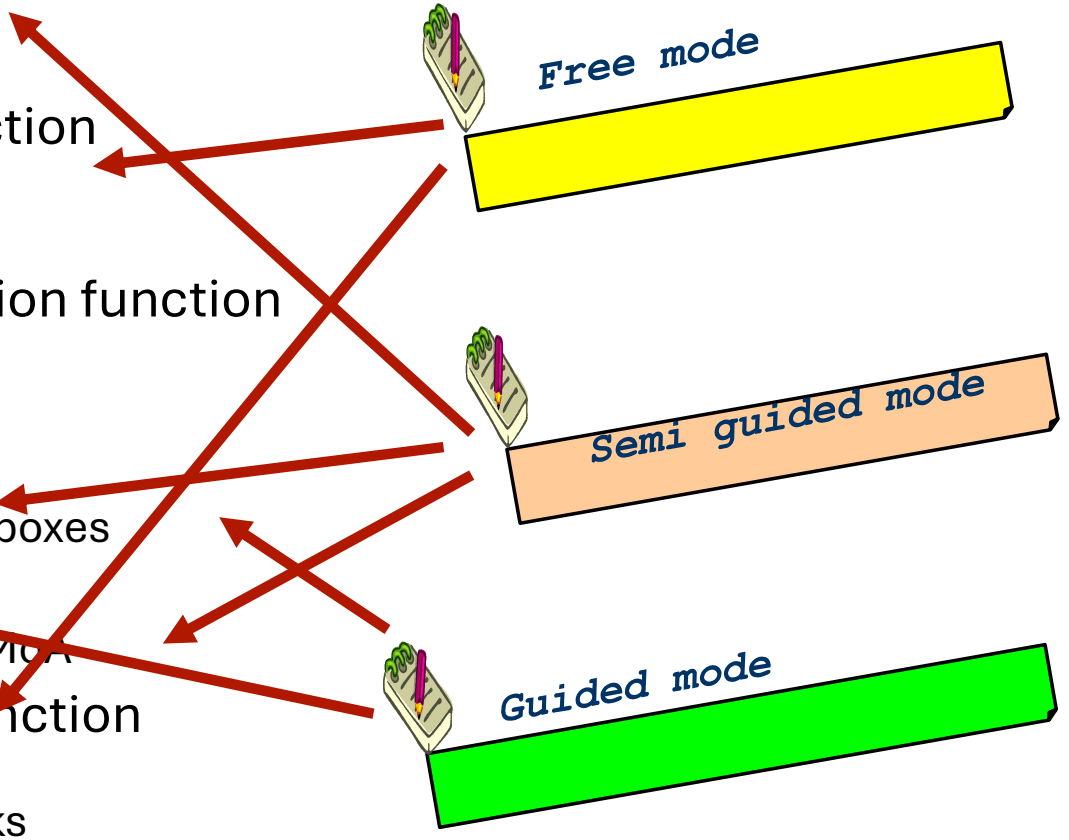
Guided mode

Smart Guided mode

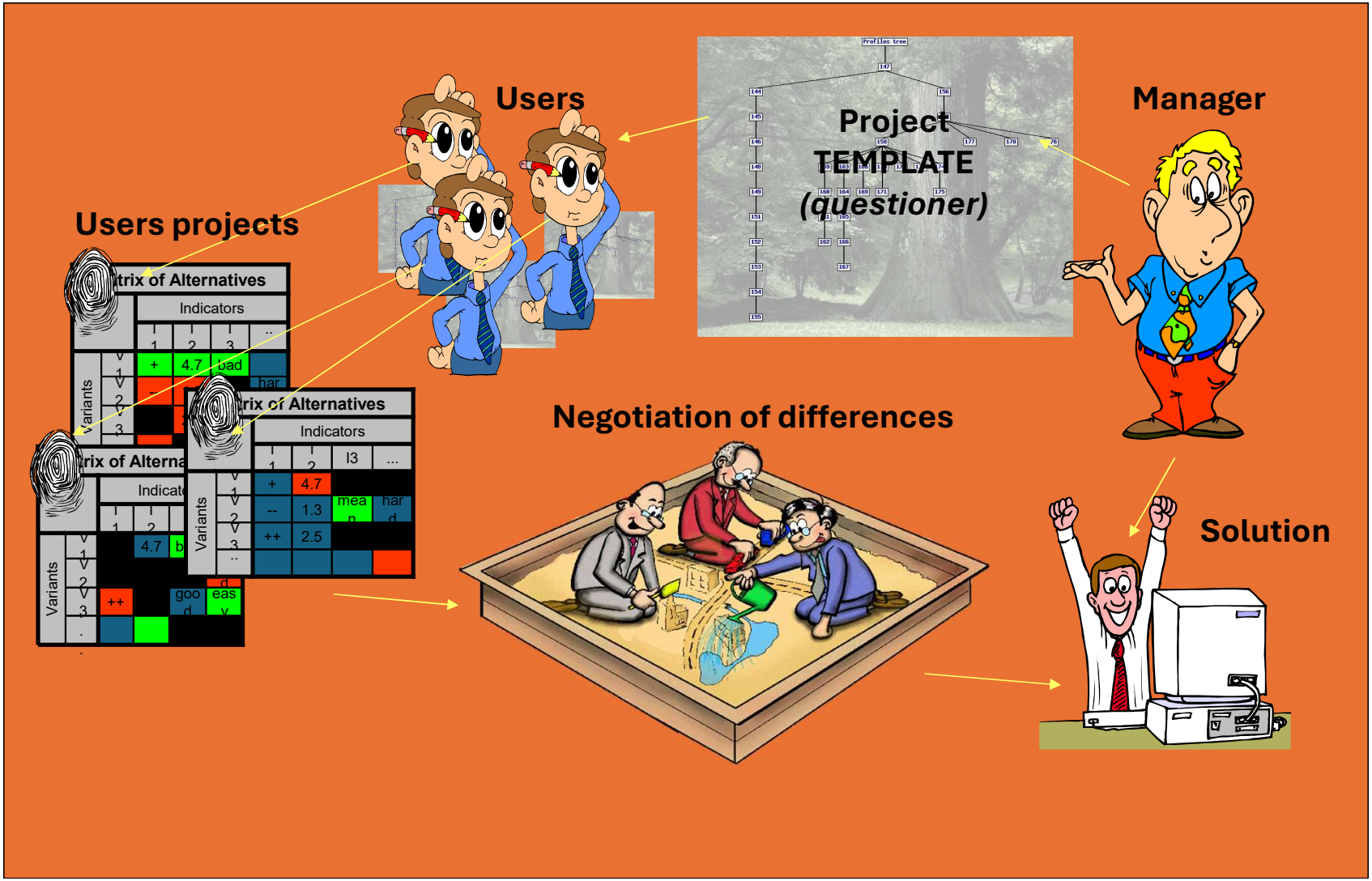
Free mode

ADSS functionalities

- Tracking function
  - Log file
  - Advanced search
- Free browsing function
  - “Google search”
  - “Caddy”
- User profile definition function
  - Fingerprint
  - Key terms
- Pop Up function
  - Defined message boxes
- Interfacing
  - XML interface for MoA
- Smart guidance function
  - Linked tables
  - sensitive hyperlinks

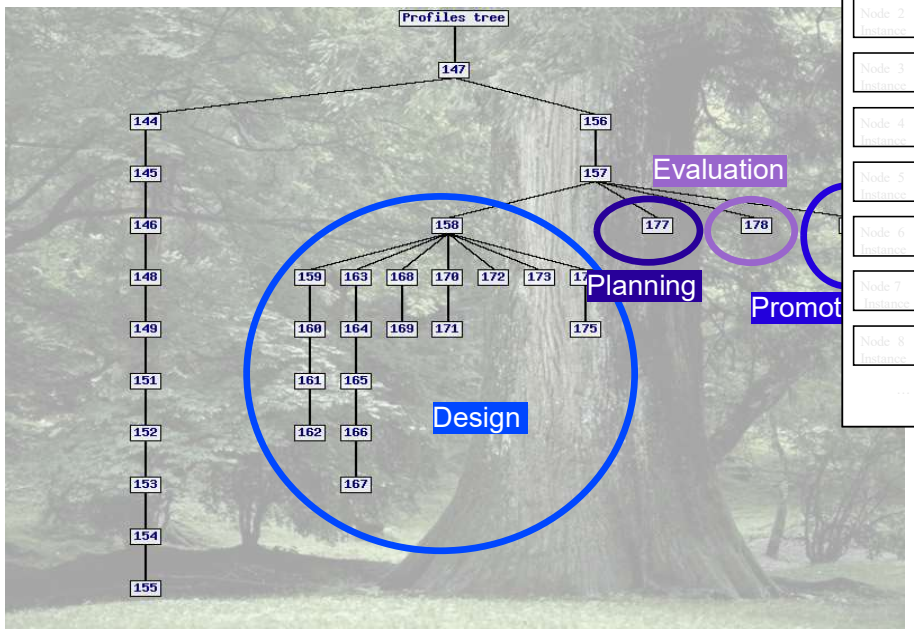


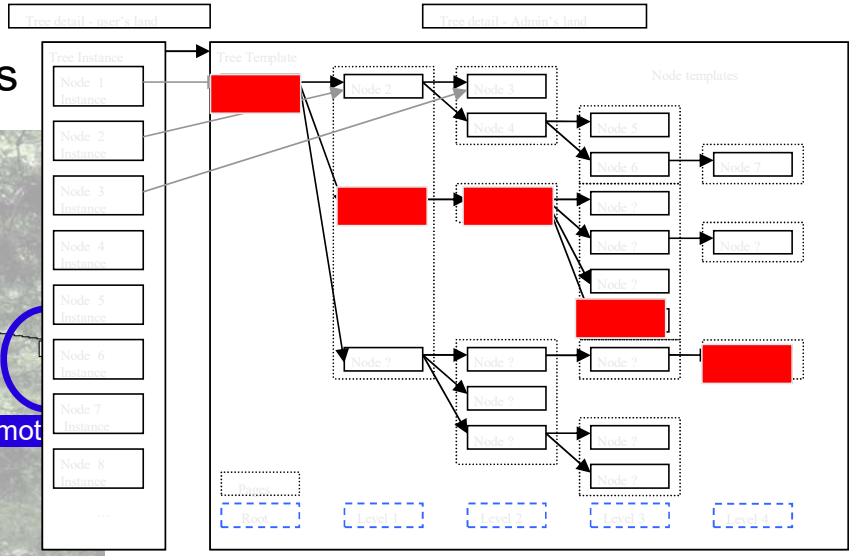
ADSS negotiation concept



Dynamic Thinking in Guided mode

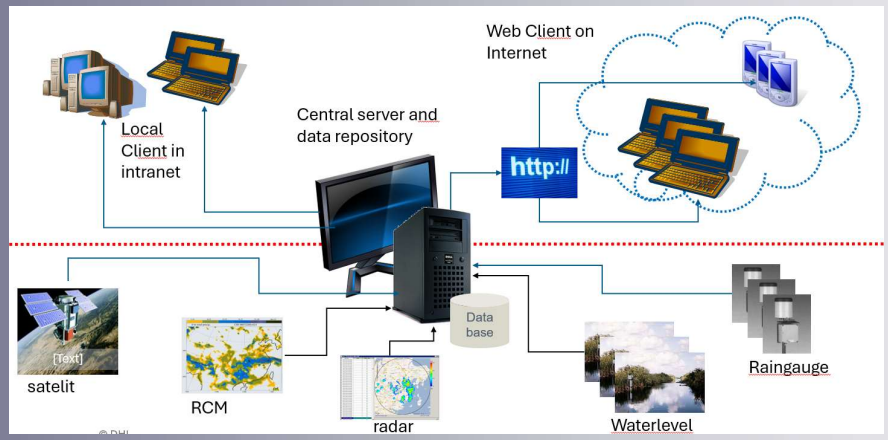
- Expert Knowledge stored in project template
- User receives his questioner instances
- Negotiation using Q/A
- Recommendation based on Answers





Hydroinformatic Systems

Early Warning and Flood Forecast

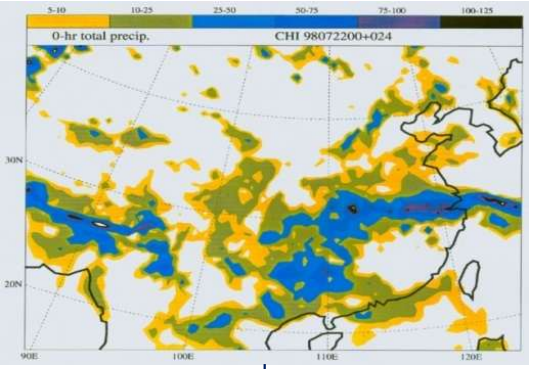


Principles of Local Flood Forecast Systems

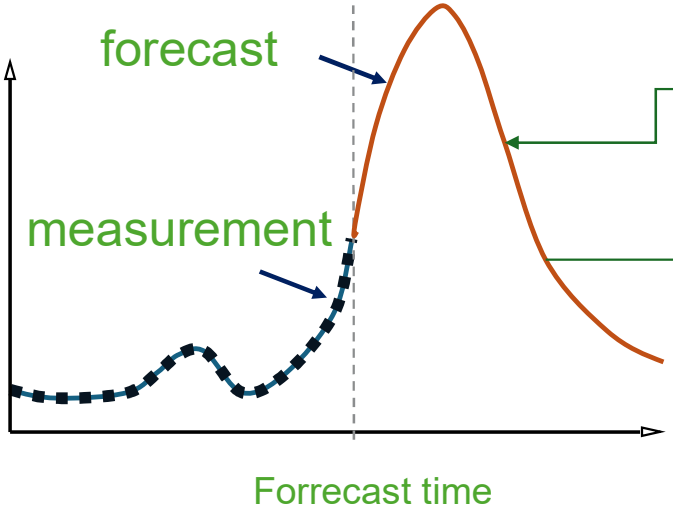
Remote automatic weather station in Switzerland

Online monitoring
Rainfalls + flows

Meteorological forecasts



Simulation

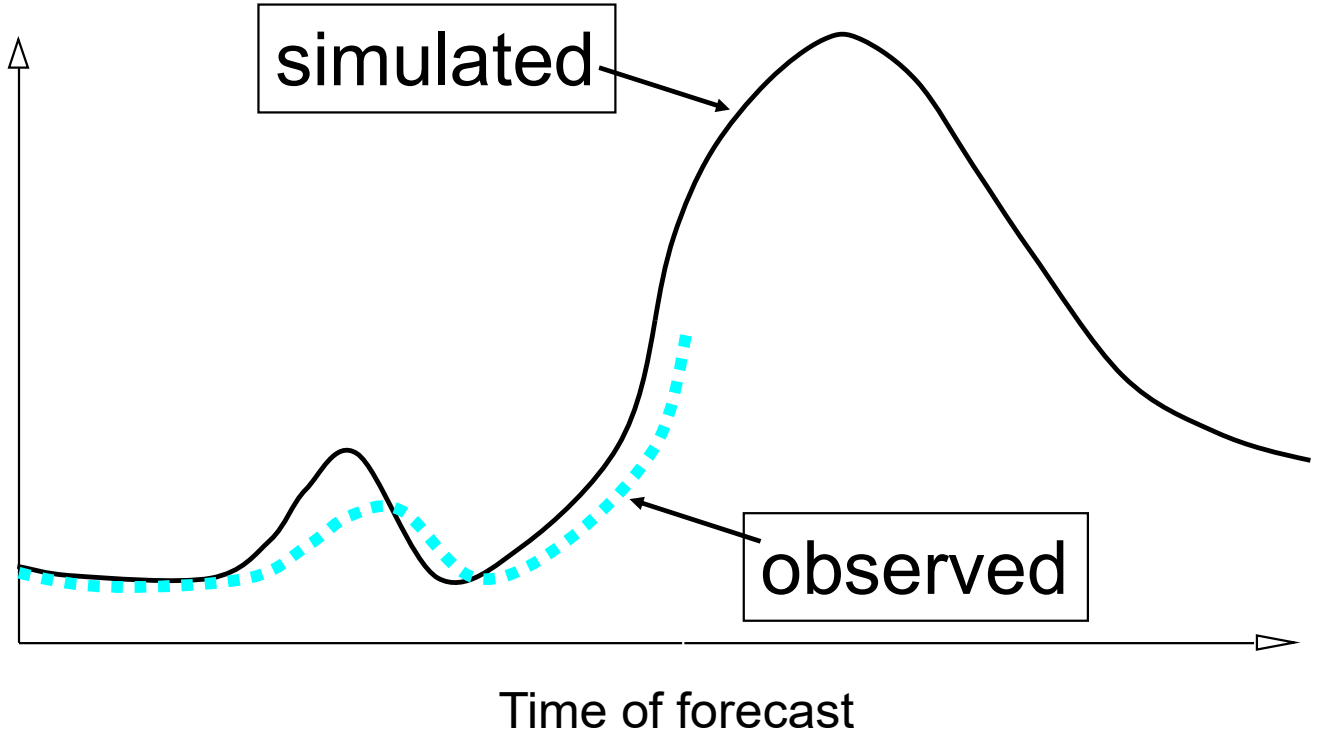


Simulation model

Flood forecast

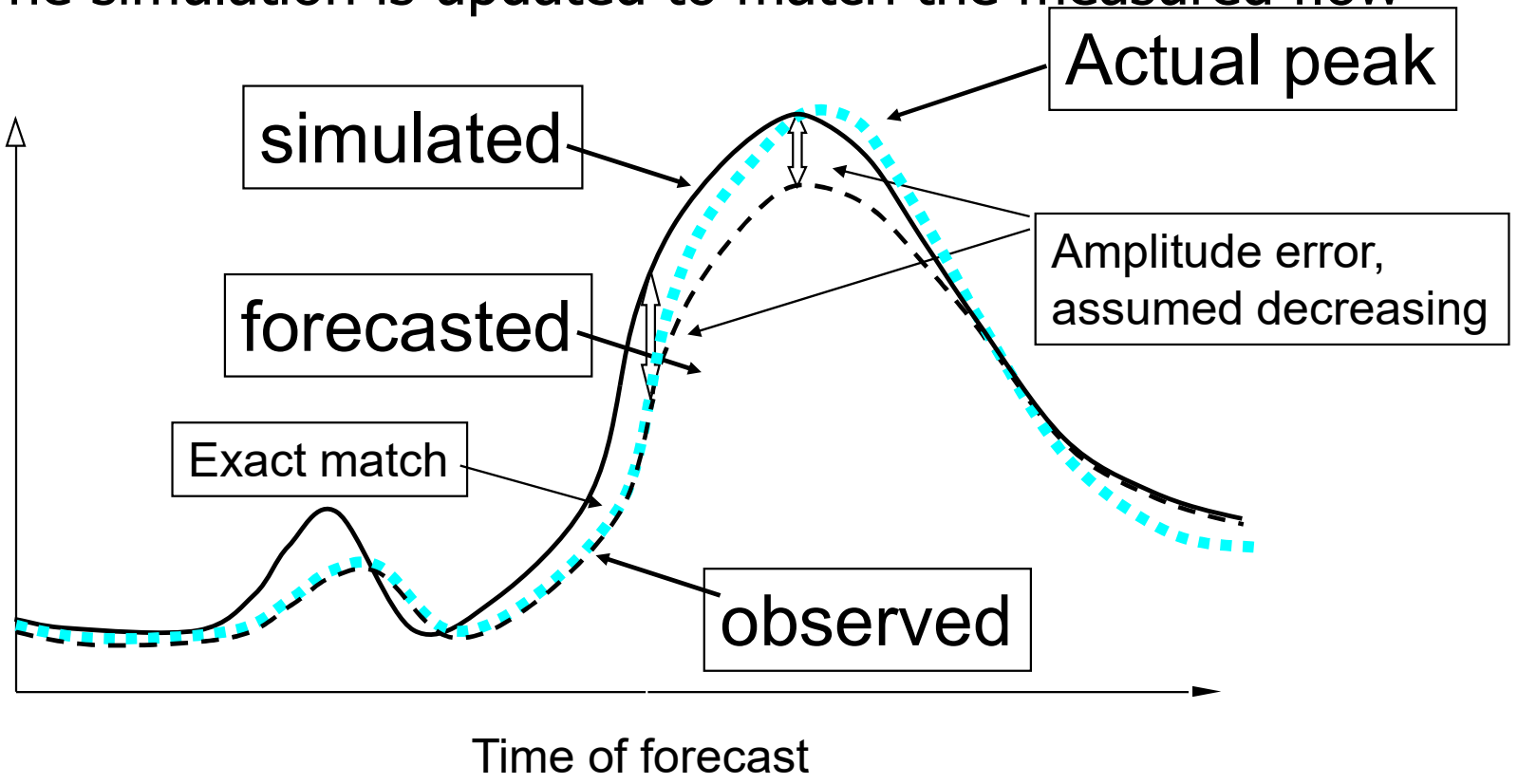
Flood Forecasting I.

The simulated hydrograph may deviate from the observed



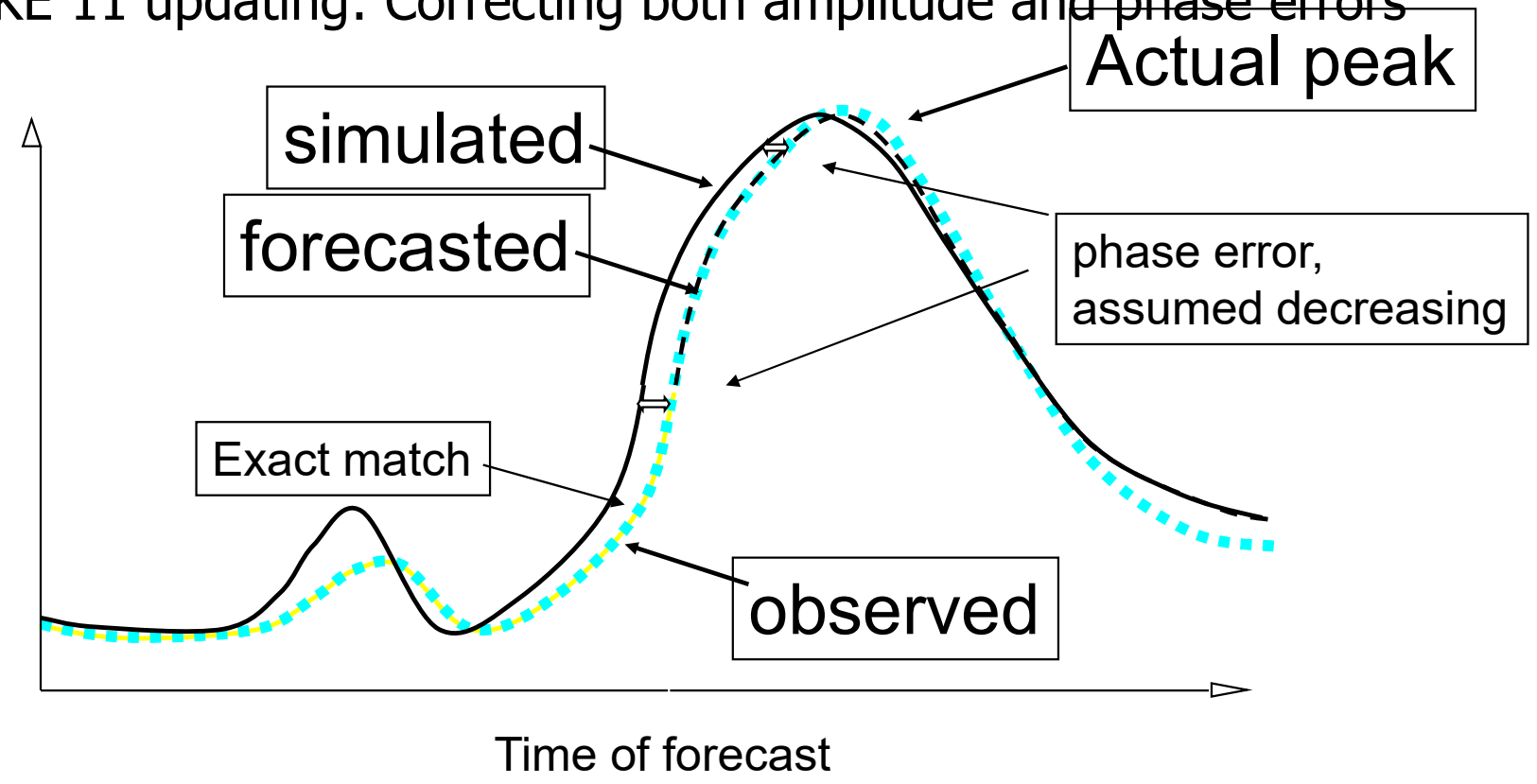
Flood Forecasting II.

The simulation is updated to match the measured flow



Flood Forecasting III.

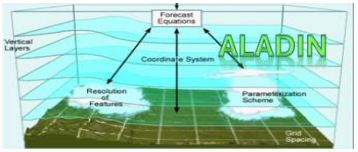
MIKE 11 updating: Correcting both amplitude and phase errors



Time Scales in Local Forecast Systems

1-2 days

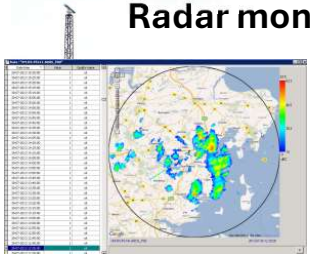
Meteorological forecast

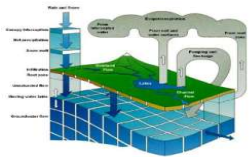


National meteorological service

2-12 hours

Radar monitoring of rainfalls





Local radar,
hydrologic simulaton model

0,5-2 hours

Direct measurement of rains and levels

Rainfall network, limnigraphs
Hydrodynamic simulation model

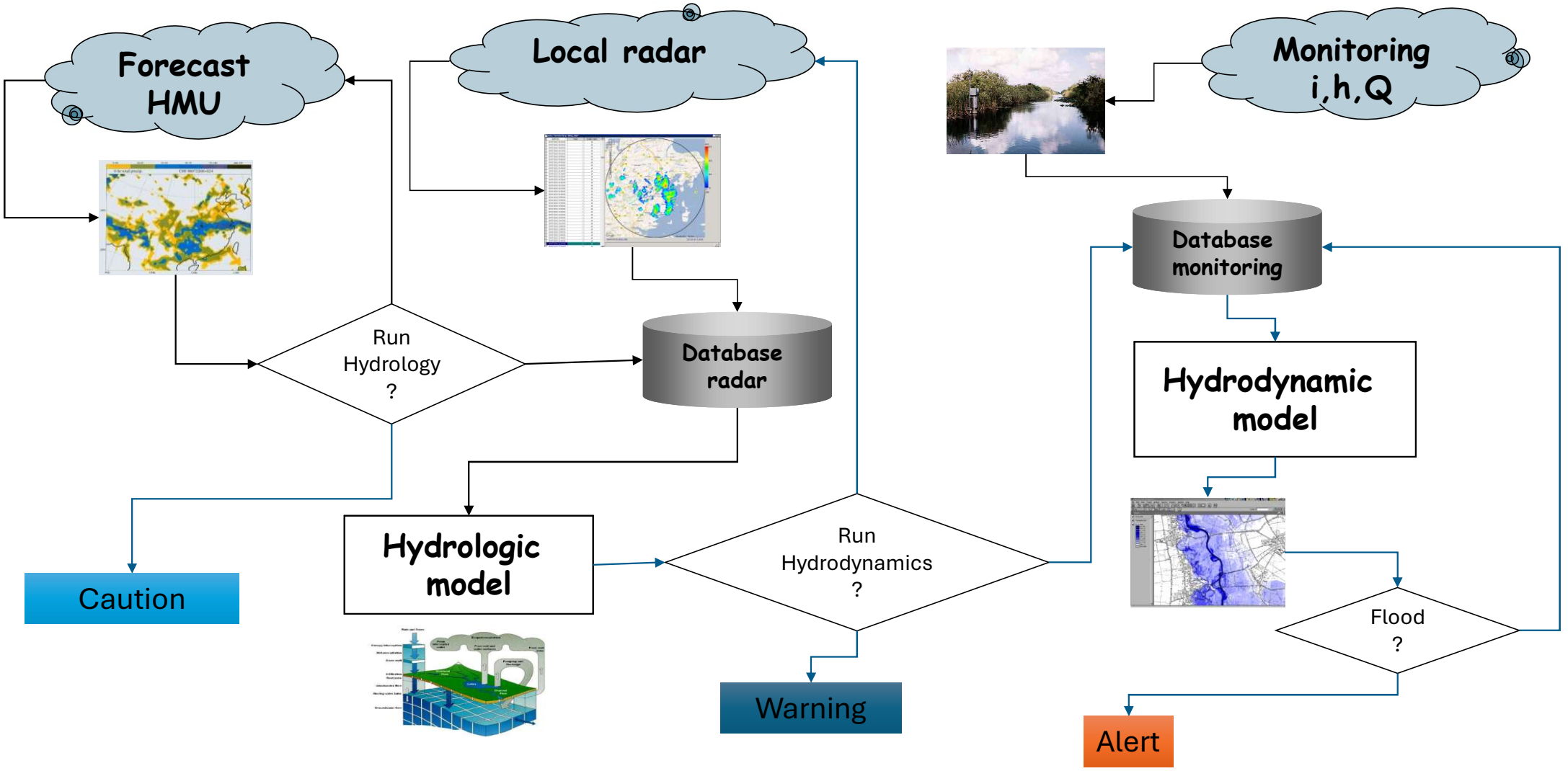
DSS – Forecast and Early Warning System

Caution

Warning

Alert

Decision Flow Chart



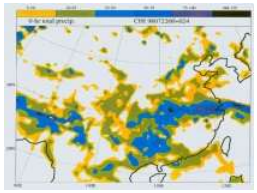
System Architecture

Local
Client in
intranet

Central server and
data repository

Web Client on
Internet

satelit



RCM

radar

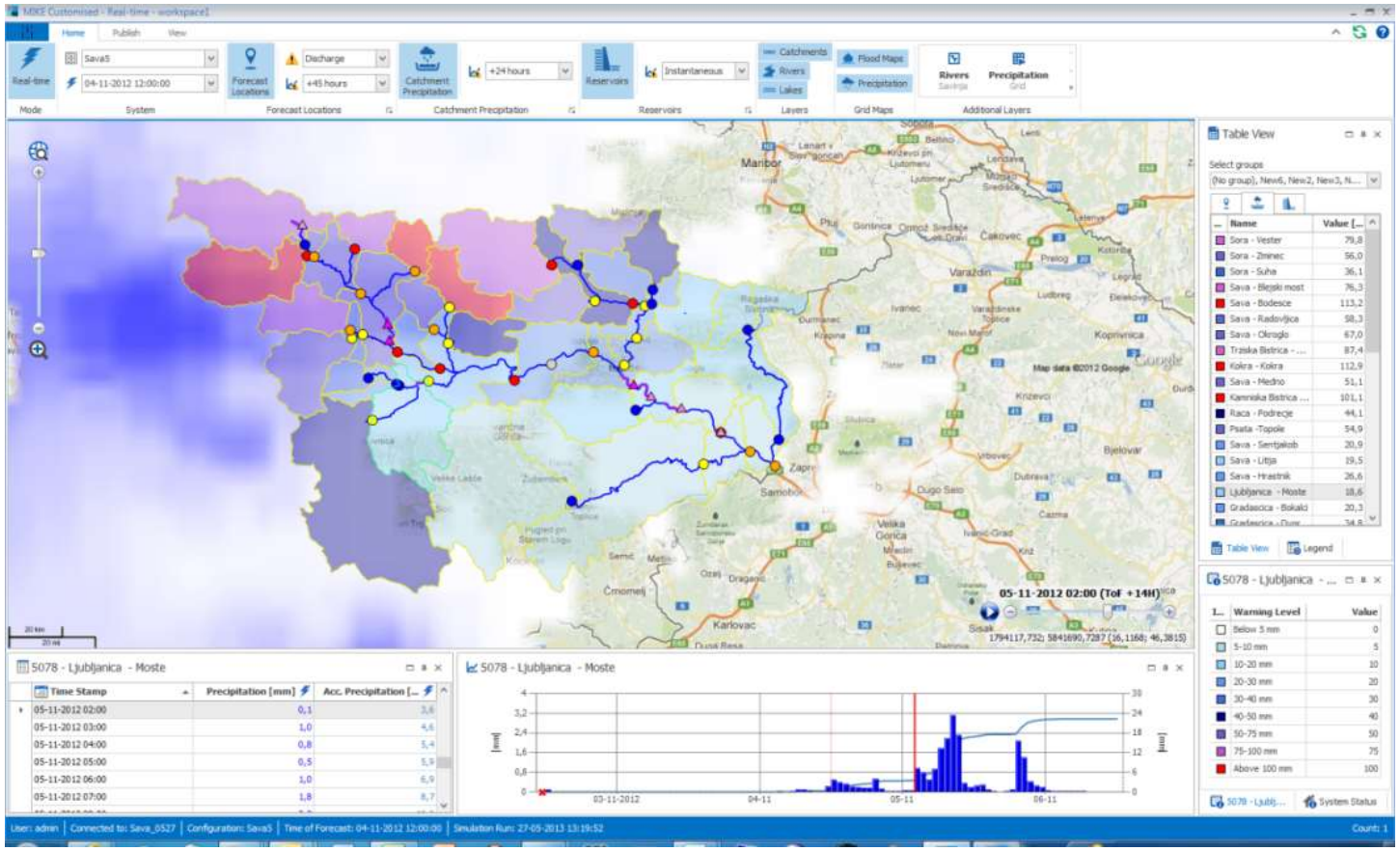
Data
base

Waterlevel

Raingauge

Flood Forecast & Early Warning system – Sava river

Slovenia



DSS Sáva working Environment

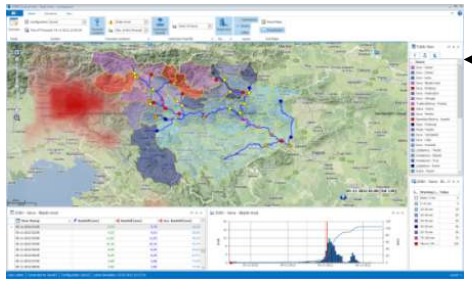
Dispatching room

Mobil solution

MIKE CUSTOMISED by DHI

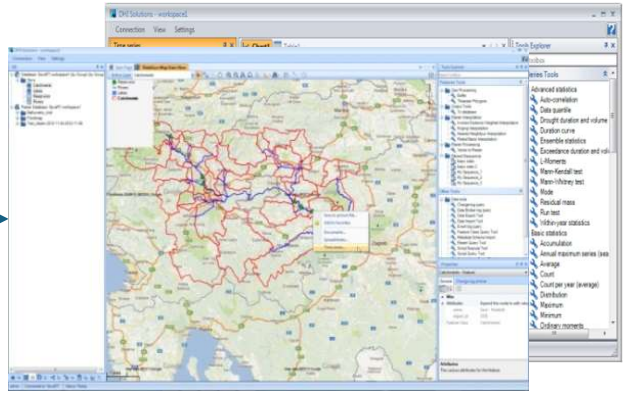
HIS - Floods and droughts forecast (SAVA river)

Administrator layer applications



Mobile solution

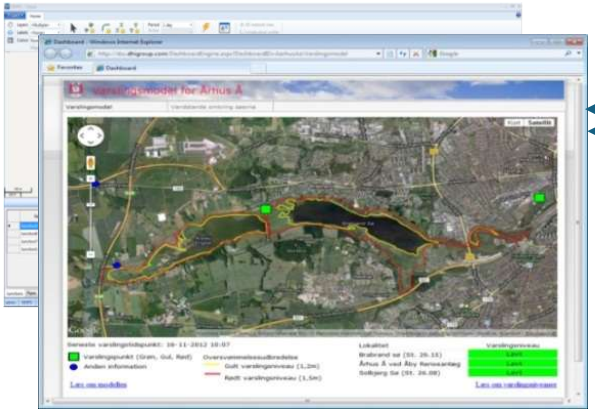
Specialised thematic application viewers



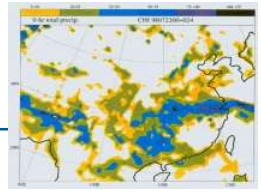
Simulation model

Data base

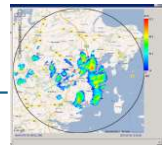
Web client applications



© DHI

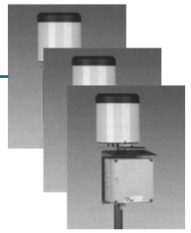


ALADIN



radar

monitoring Database DIMS

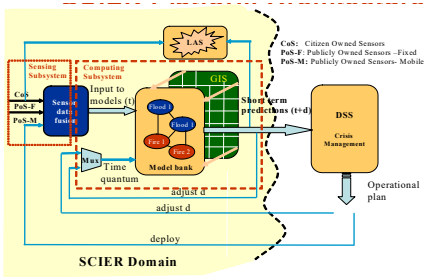


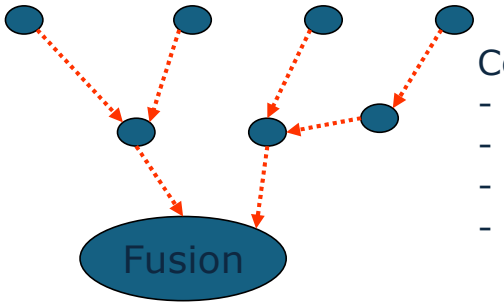
Raingauges

Water levels

Dispatching centre ARPA - Turin, Italy

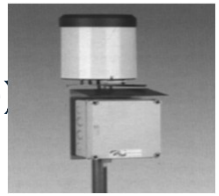
HIS example - SCIER





Sensors

Collect data (location+time+value)
- precipitation
- temperature
- humidity
- wind



User interface

ArcGIS

HTTP

SQL

File share, SQL

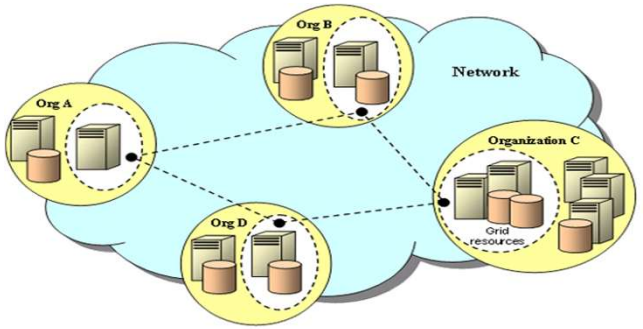
Web services

SCIER central point

Forwards data to storage
Issues simulation jobs
Runs web server with UI

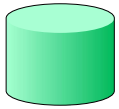
GRID

Executes fire modelling jobs



Services

Storage for:
- fire models executables
- model input data
- model structural data
- model output data
- Pre-prepared WS + CS scenarios



Simulation PC(s)

Executes 1D flood modelling jobs
Incorporates pre-calculated flood maps lookup