



DEVSimPy : A Collaborative Python Software for Modeling and Simulation of DEVS Systems

University of Corsica Pasquale Paoli
UMR Environmental Science
Project Information technology and communication

Institut Telecom; Telecom SudParis
June 27th-29th, 2011 Paris, France



Jean-François SANTUCCI, Laurent CAPOCCHI, Bastien POGGI and Céline NICOLAI¹

Objective

To define a collaborative approach based on
M&S frameWork:

DEVSimPy



Validate your approcah through a Hydrolic
Network complex system

Plan

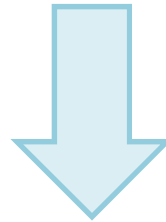
1. Introduction	Presentation
	DEVS
2. DEVSimPy	Software's presentation
	Software's feature
3. Hydraulic network M&S	Description
	Collaboration M&S process
4. Conclusion and future work	

1. Introduction

Presentation

- Deriving and using reusable design components.
 - Developing collaborative modeling and simulation.
-

To simulate complexe system



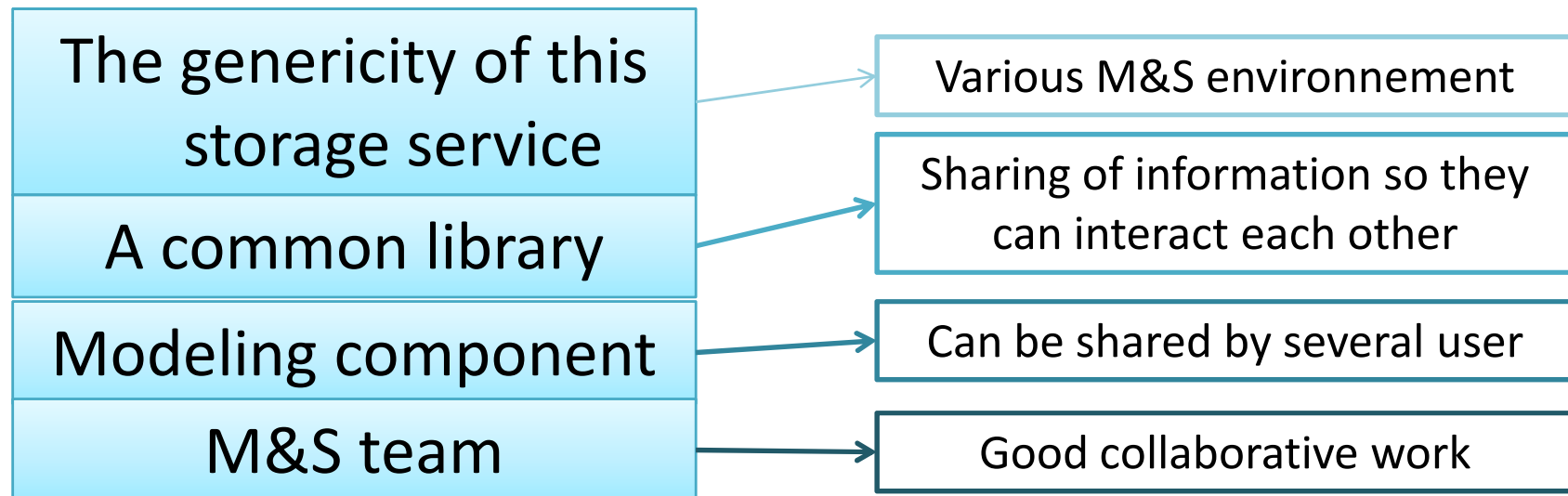
Multidisciplinary approach

1. Introduction

Presentation

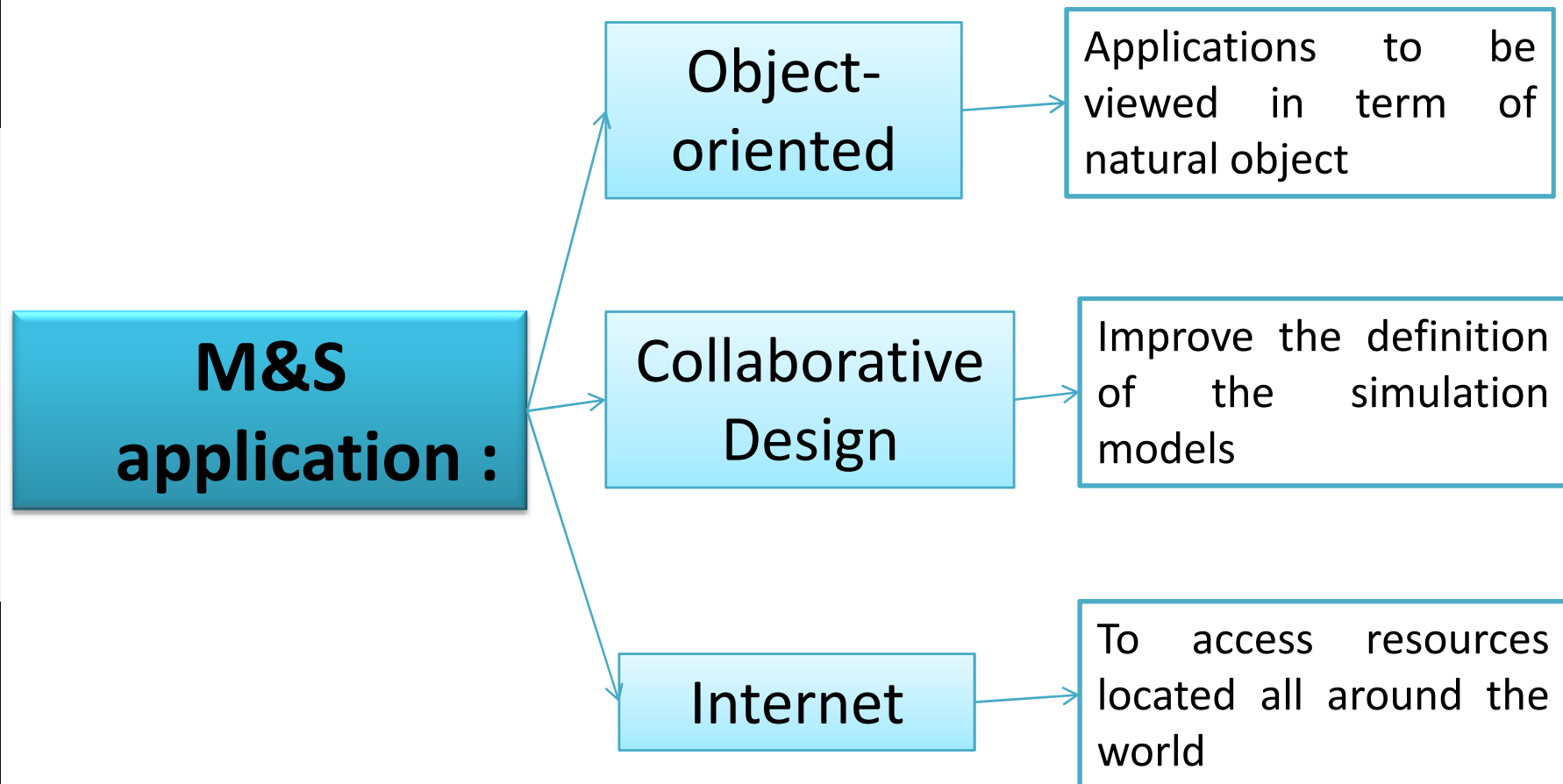
M&S tools are associated with libraries of reusable modeling components

Benefits of storing models in common generic library :



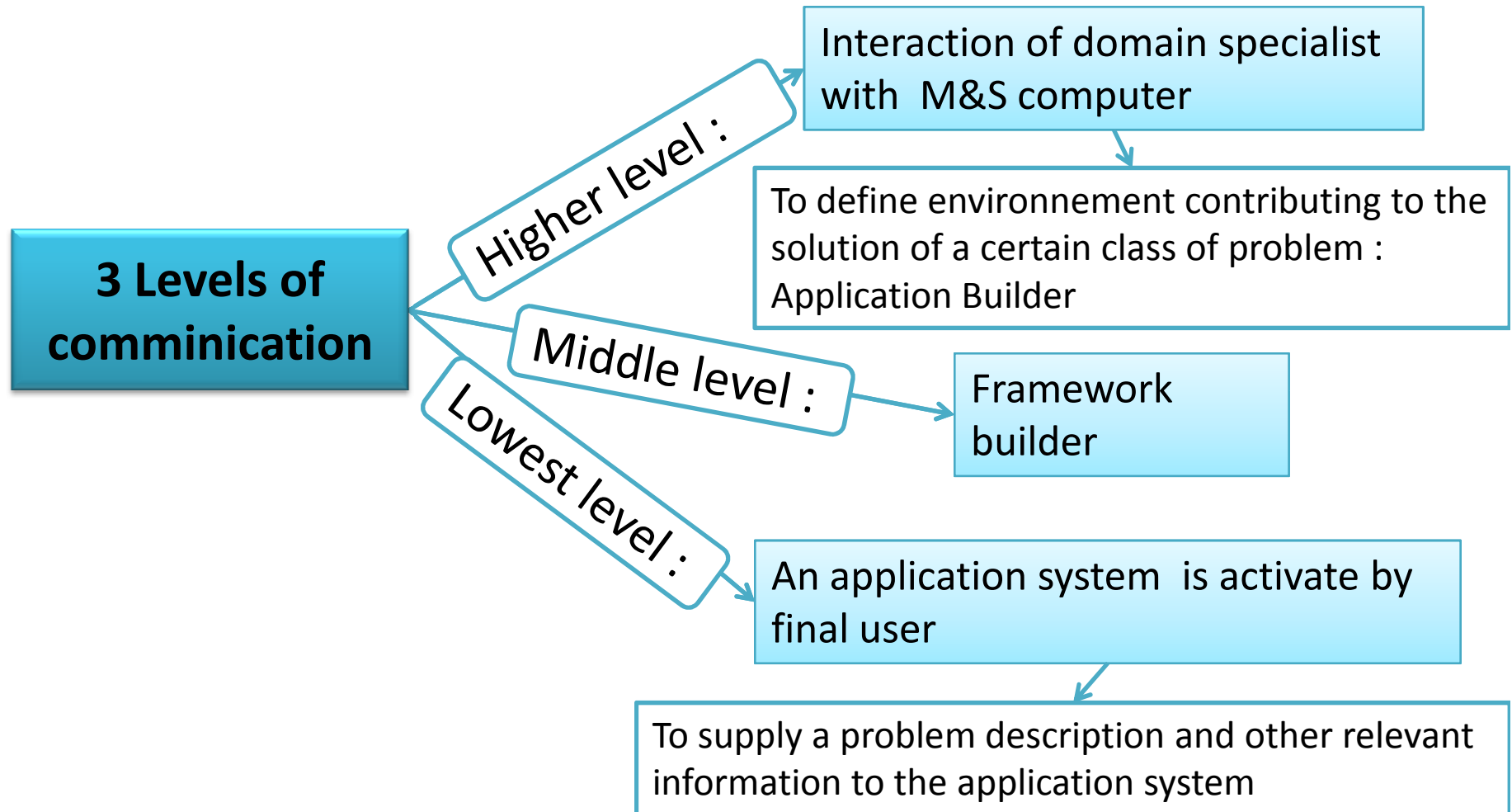
1. Introduction

Presentation



1. Introduction

Presentation



A collaborative M&S Framework based on DEVS

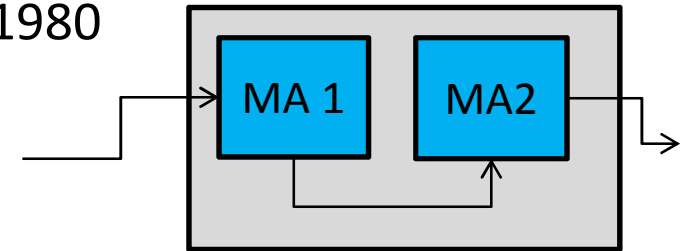
I. Introduction

DEVS

Discrete Event Specification introduced by Zeigler 1980

DEVS allows:

- **Modular and hierarchical modeling:**
 - Representation of a system as a "black box" with inputs and outputs.
 - Reusability of models.
 - Nested models (multiple levels of abstraction).
- **An implementation of models based on OOP** (object-oriented programming)
- An explicit **separation between the modeling and simulation** part
- **Automatic simulation models** using only the specifications
- **Mathematical manipulation** of the resulting models
- **Simplifies the behavioral modeling of complex systems** described in way no-formal.



I. Introduction

**An efficient
collaborative
M&S
framework
raises set of
problems**

First



The manipulation of the basic elements

Model can be generic and reusable
by users

Second



Management of errors

To propose the management
software design errors using a web
access

Third



To share basic elements

It concerne the way to share both
atomic model, coupled model and
testing developments

To solve problems



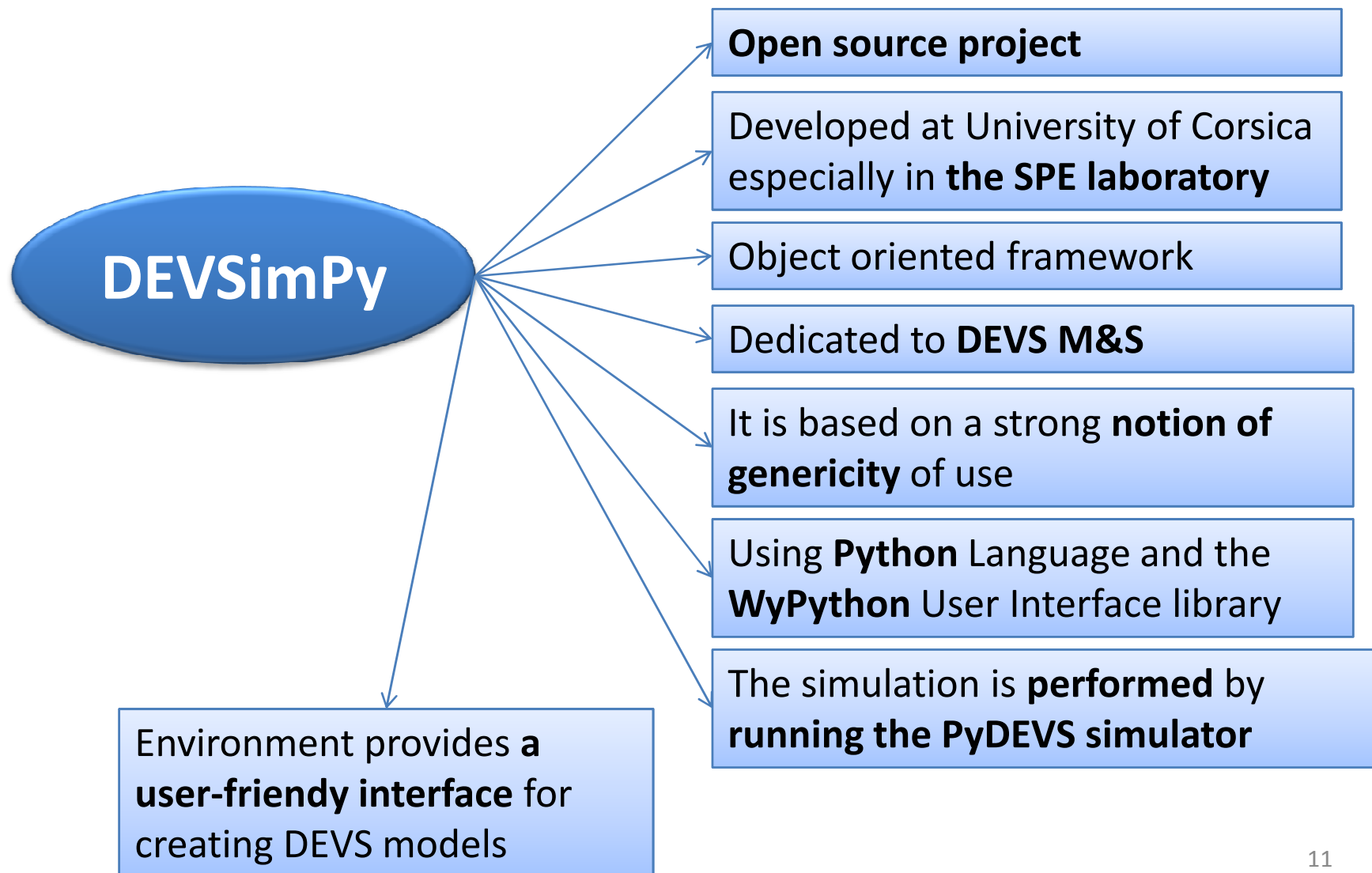
DEVSimPy

Plan

1. Introduction	Presentation
	DEVS
2. DEVSimPy	Software's presentation
	Software's feature
3. Hydraulic network M&S	Description
	Collaboration M&S process
4. Conclusion and future work	

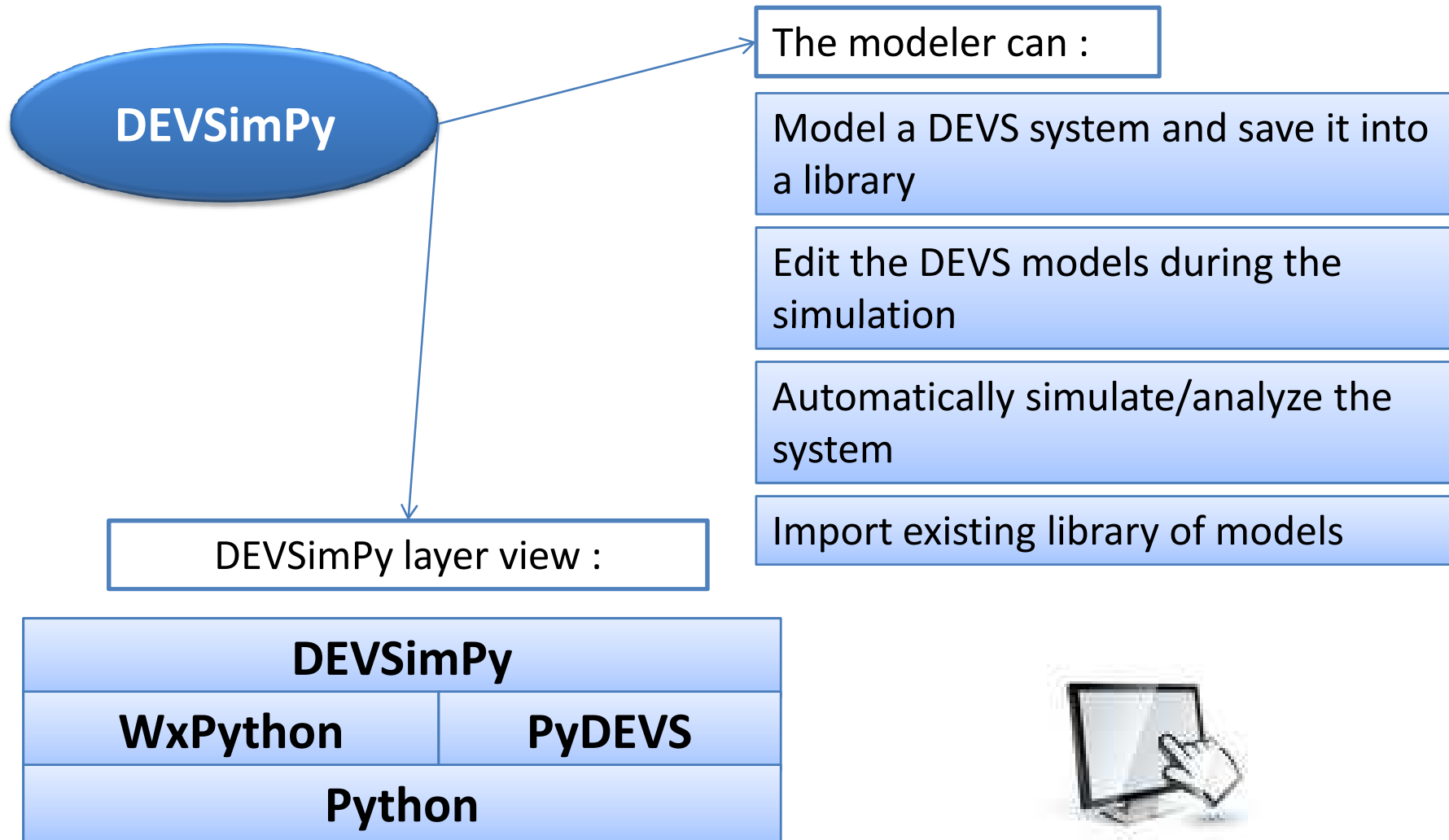
2. DEVSimPy

Software's presentation



2. DEVSimPy

Software's presentation



2. DEVSimpy

Software's features

Features of DEVSimPy:

- To facilitate collaboration of recherches during the DEVS modeling
- Files extension : .amd for atomic, .cmd for coupled and .dsp which represent a full model they correspond to validation scenario
- Can export in .amd or .cmd file in order to customize and save its graphic
- To Share component Dynamic Libraries
- To facilitate file handling
- To allow automatic documentation template
- To offer the debugging of models
- To facilitate simulation process
- Possibility to use plugging to have a good collaboration between all actors

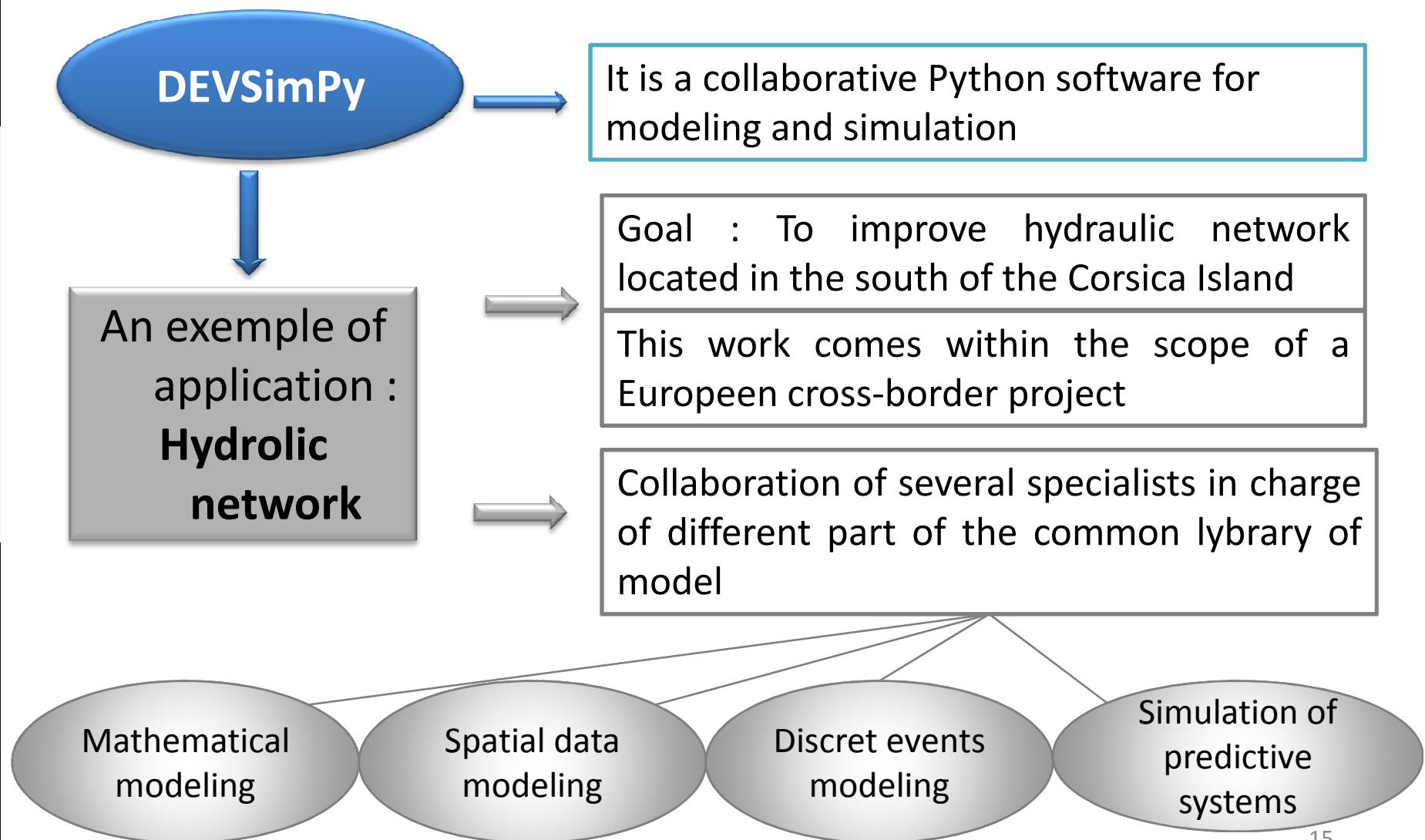


Plan

1. Introduction	Presentation
	DEVS
2. DEVSimPy	Software's presentation
	Software's feature
3. Hydraulic network M&S	Description
	Collaboration M&S process
4. Conclusion and future work	

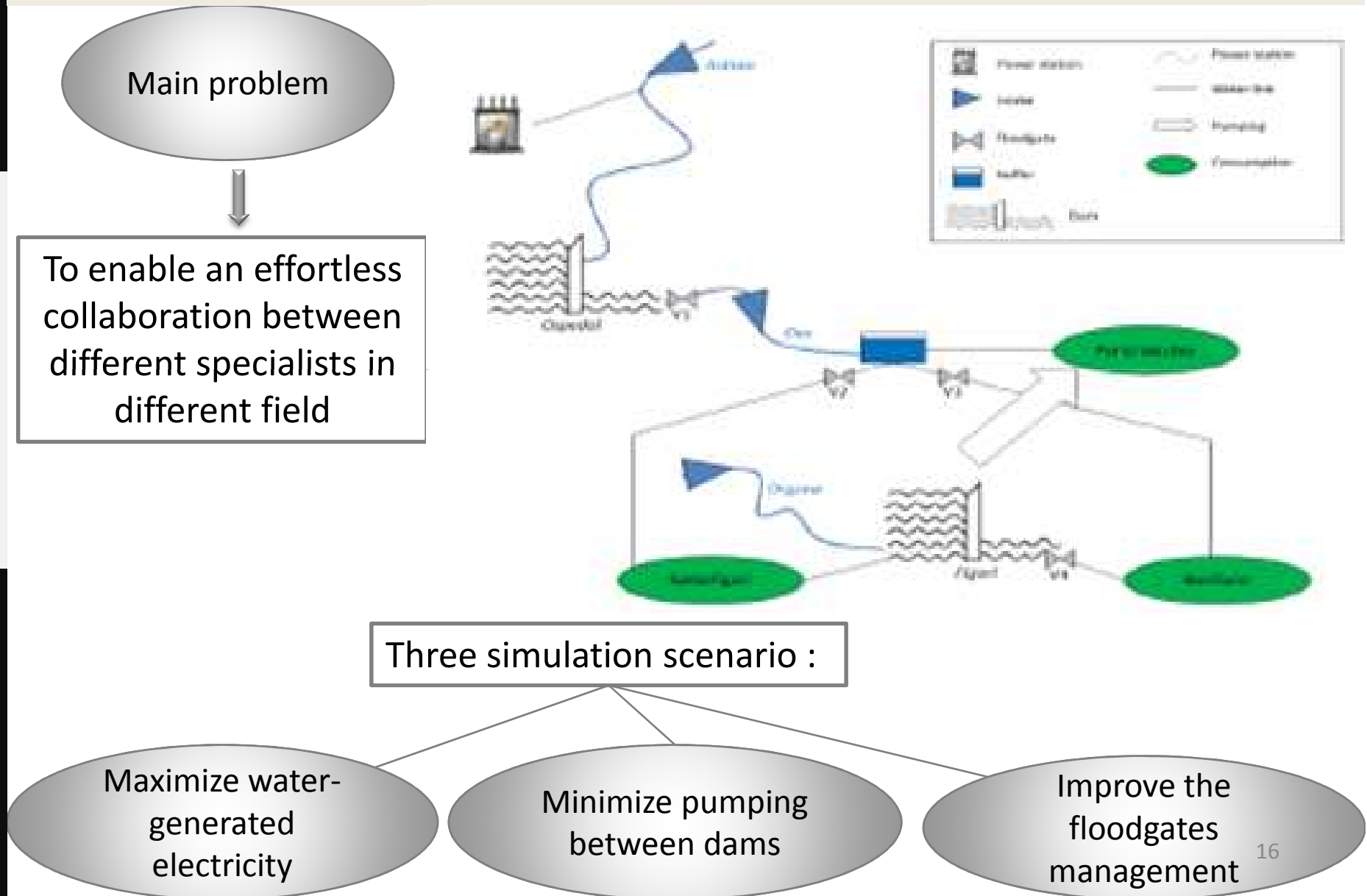
3. Hydraulic network M&S

Description



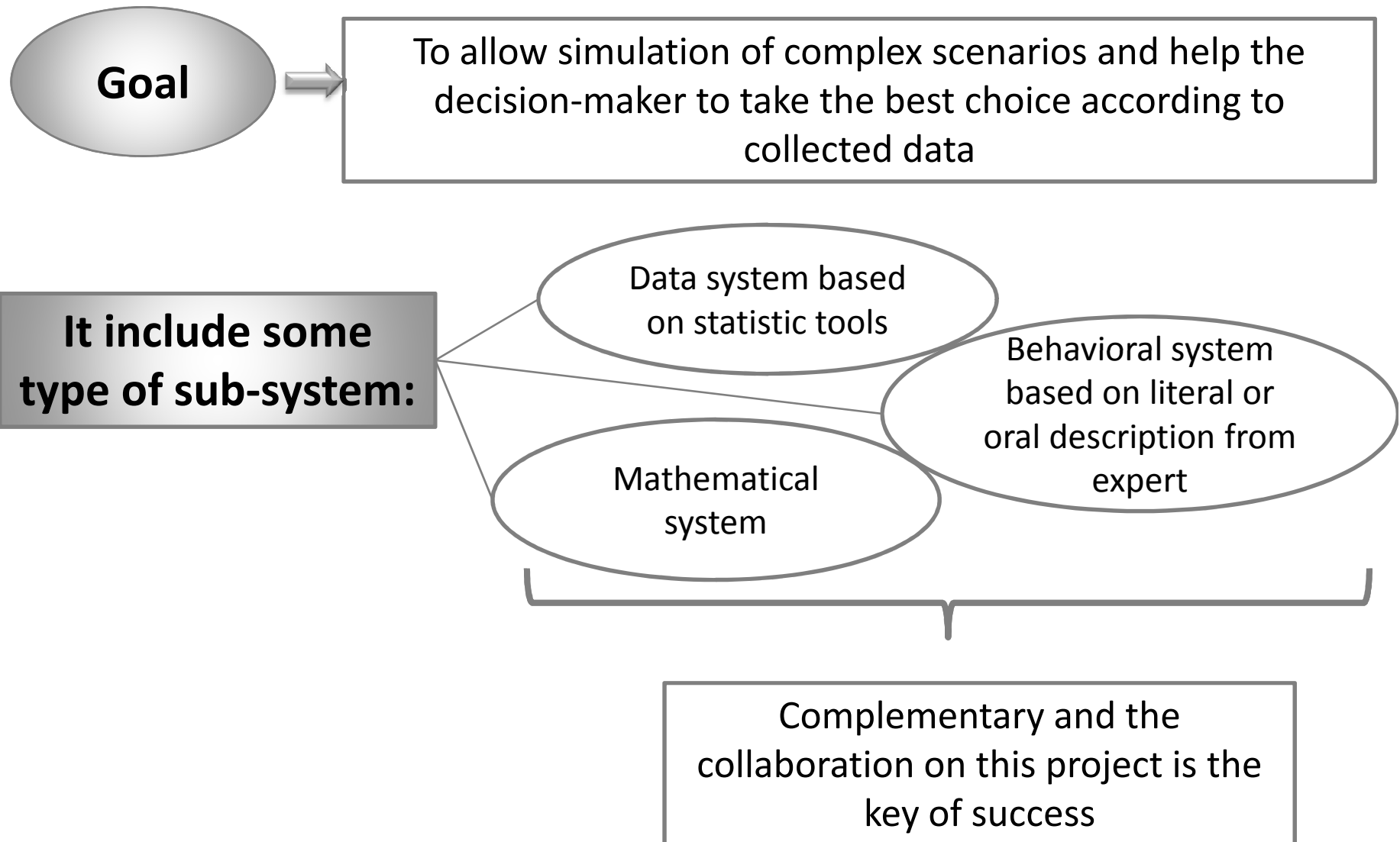
3. Hydraulic network M&S

Description



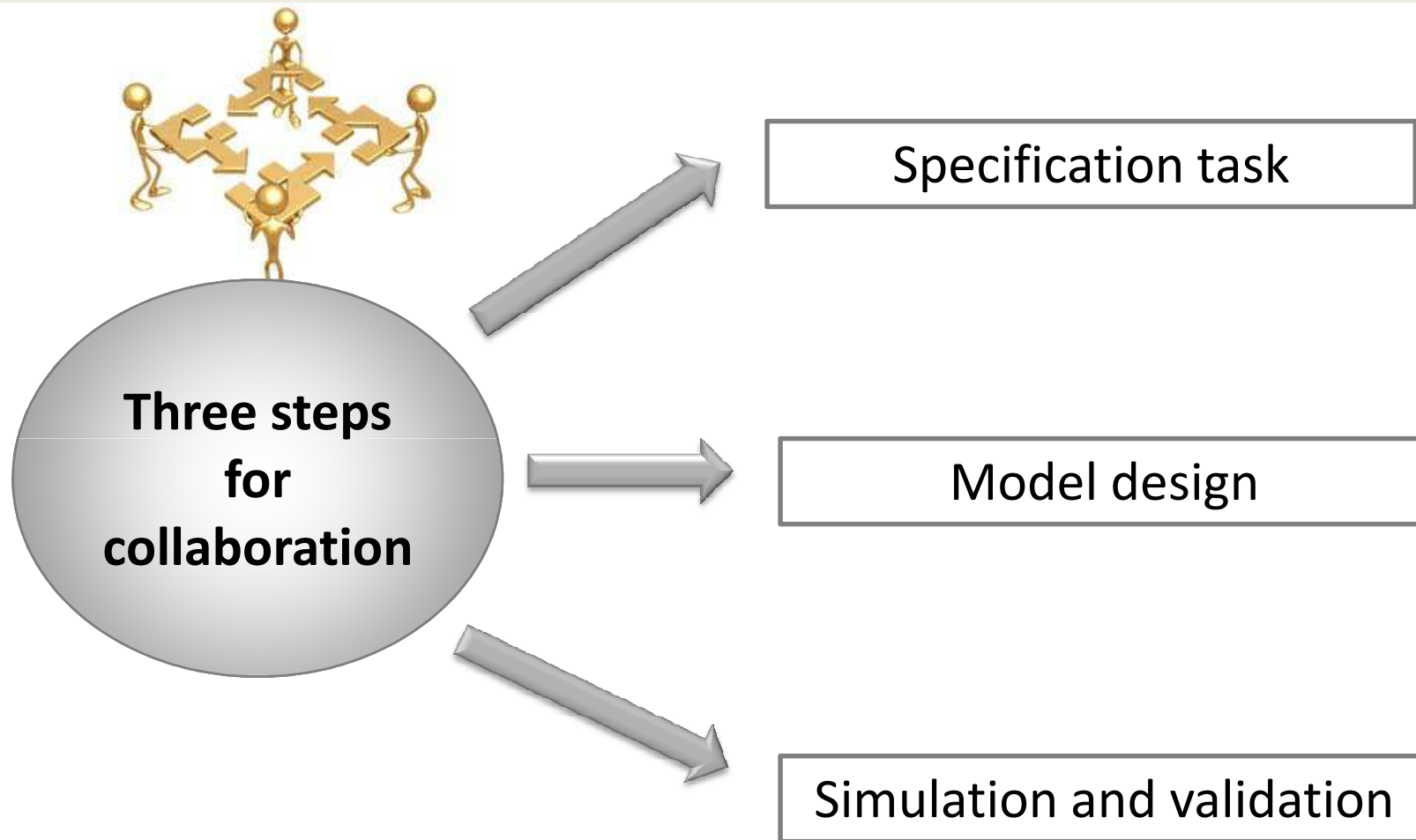
3. Hydraulic network M&S

Description



3. Hydraulic network M&S

Collaboration M&S process



3. Hydraulic network M&S

Collaboration M&S process

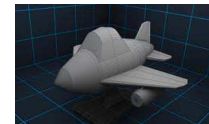
Specification task

- Concern the definition of modeling objective and require analysis
- The result of this first step has been obtained after a set of meetings with the Hydrologic Engineers
- The result consists in a list of literal descriptions of basic behavior



Model design

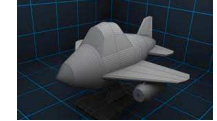
- Concerns the design of the set of DEVS models which will be integrated under an overall coupled model
- To define which models have to be created and interconnected then this resulting is simulated
- The implementation has been performed using the DEVSimPy framework
- The result consists in a list of literal descriptions of basic behavior



3. Hydraulic network M&S

Collaboration M&S process

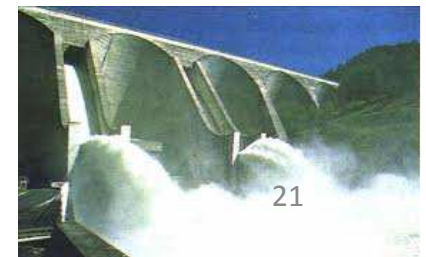
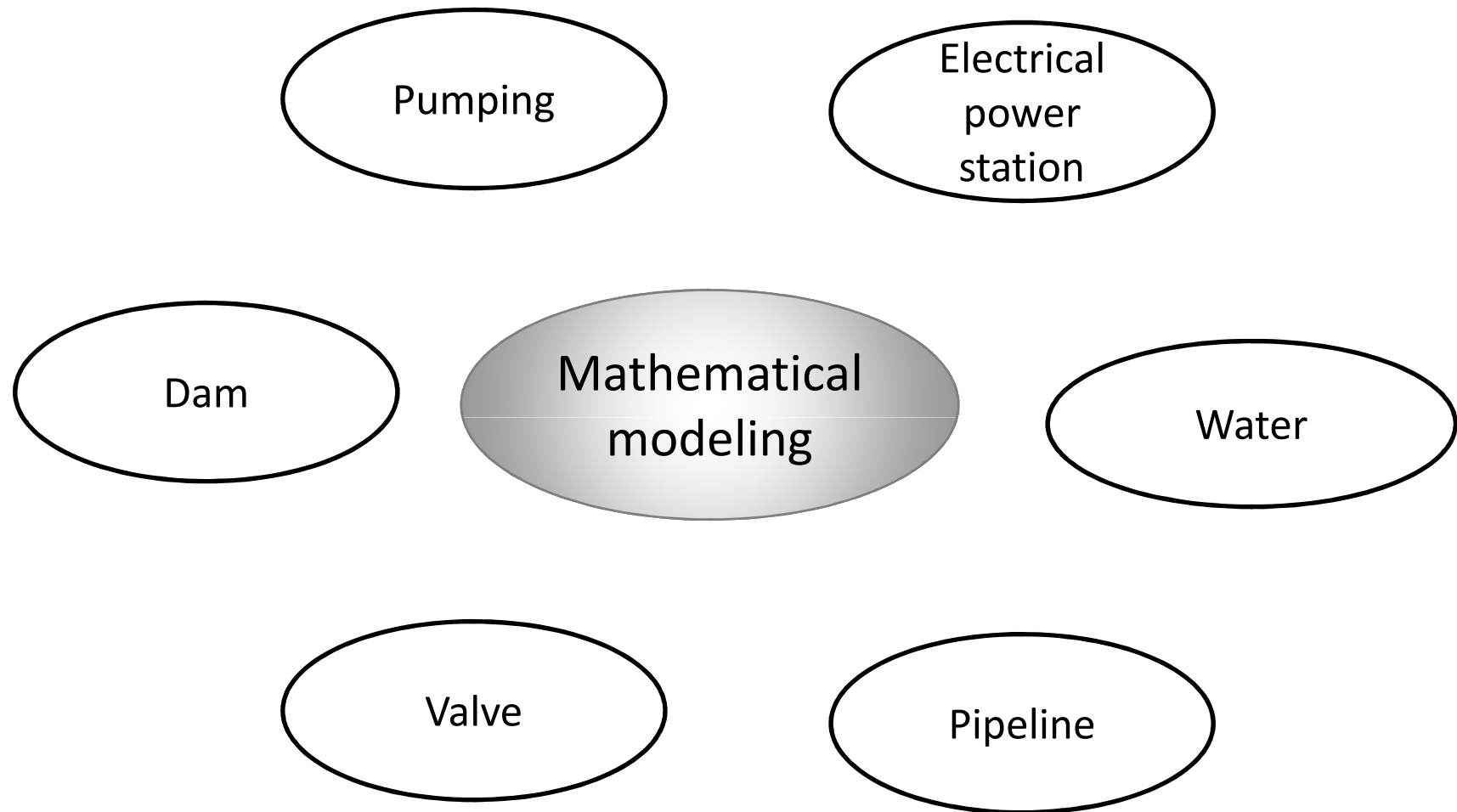
Model design



- Three features of DEVSimPY framework :
 - Automatic documentation of code : it is performed during code creation of the model with Epytext markup
 - The development libraries
 - The automatic generation of code
- Specialists have defined a set of basic atomic models that are going interconnected in an coupled model.

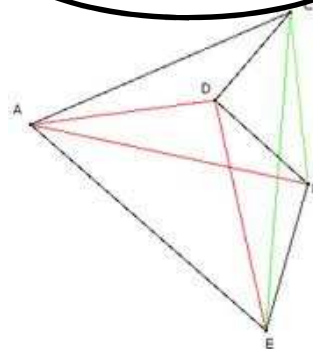
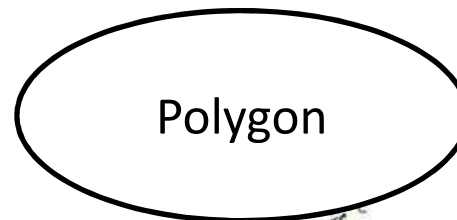
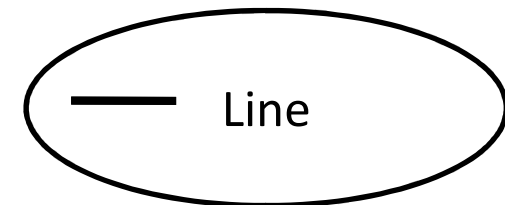
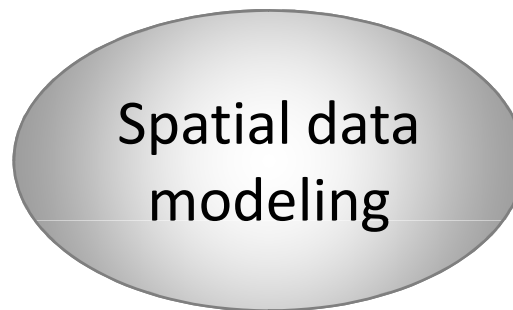
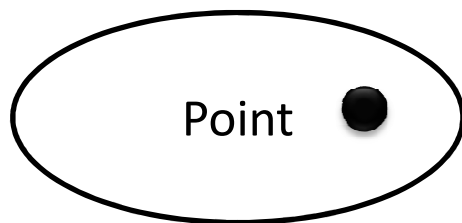
3. Hydraulic network M&S

Collaboration M&S process



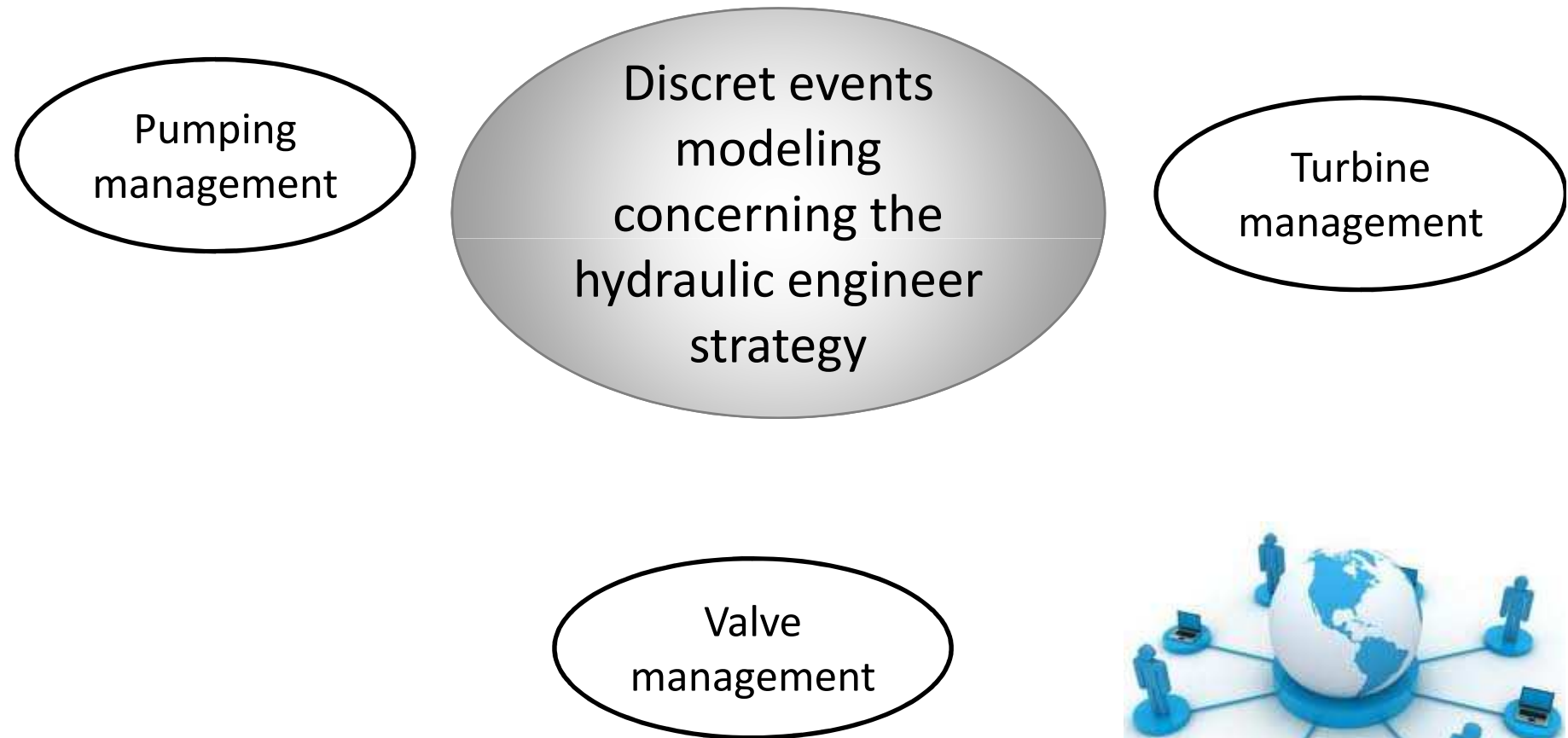
3. Hydraulic network M&S

Collaboration M&S process



3. Hydraulic network M&S

Collaboration M&S process



3. Hydraulic network M&S

Collaboration M&S process

Rainfall
prevision



Simulation of
predictive
systems

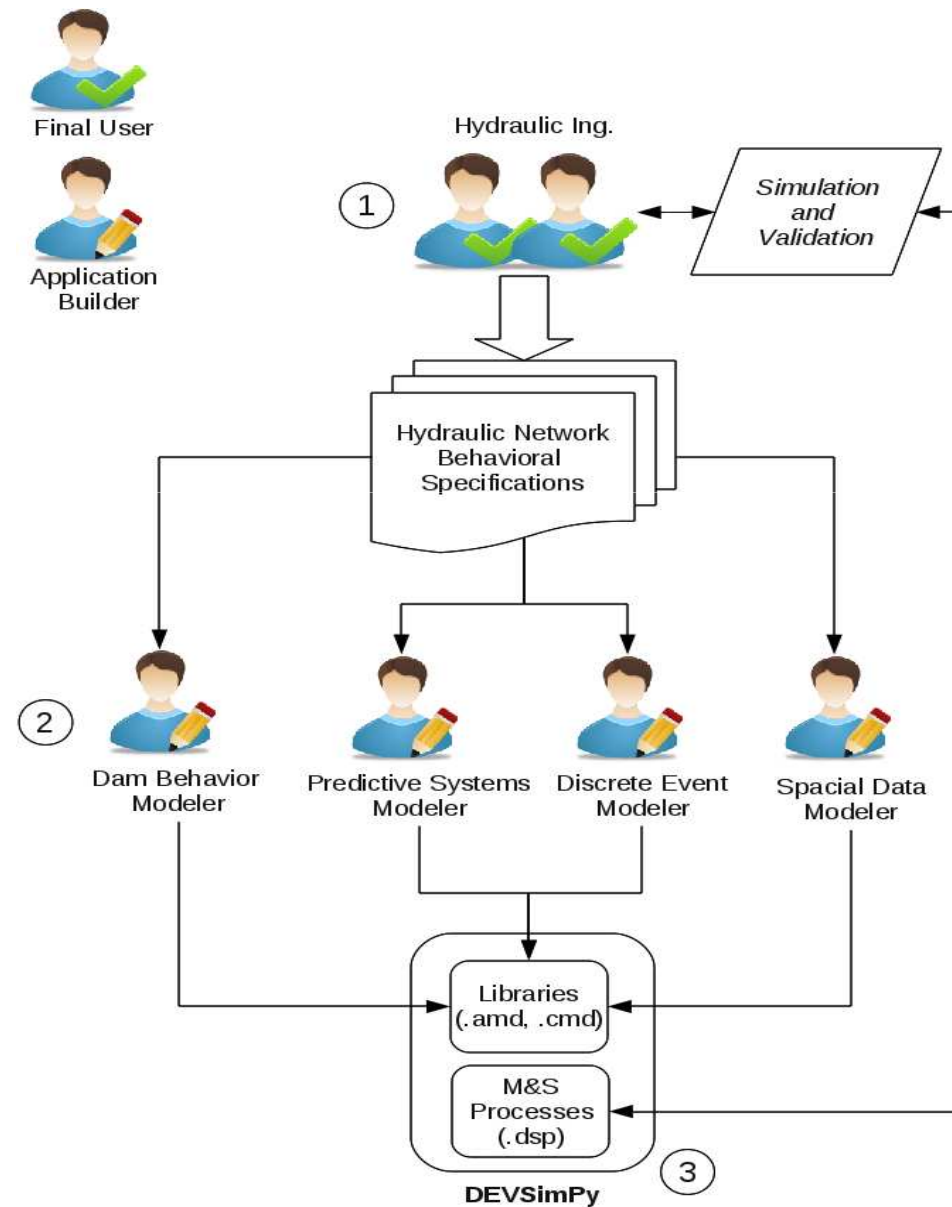


Water
consumption

3. Hydraulic network M&S

Collaboration M&S process

Collaboration
diagram of
hydraulic network
M&S

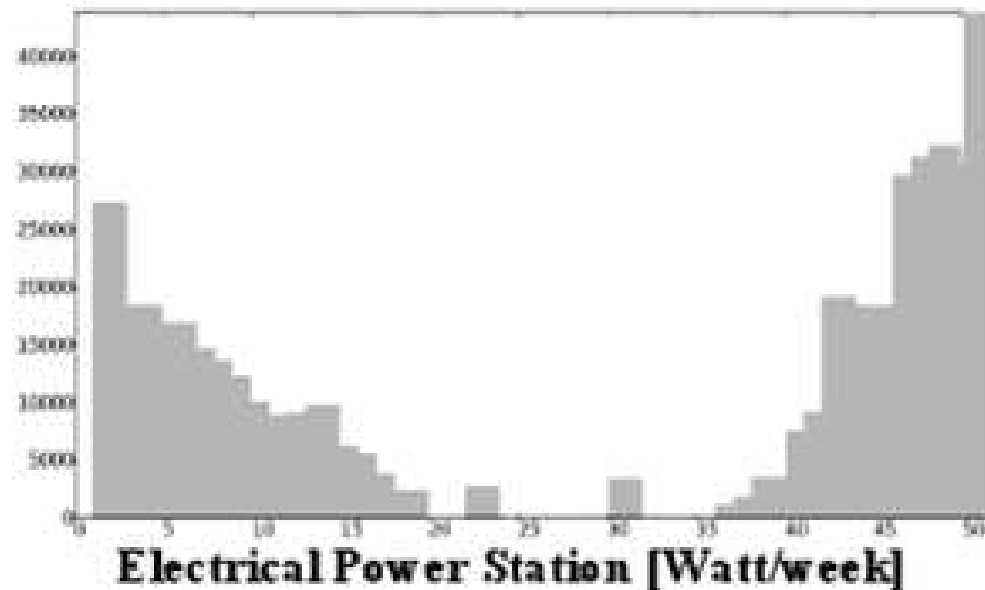


3. Hydraulic network M&S

Collaboration M&S process

Simulation task

- We show the simulation results through the QuickScope atomic model in three points: Asinao water flow output, Electrical Power station output and the dam output.
- Figure represents the Hydropower generated by the electrical power station depending on the data of the 'Asinao' water flow.



Plan

1. Introduction	Presentation
	DEVS
2. DEVSimPy	Software's presentation
	Software's feature
3. Hydraulic network M&S	Description
	Collaboration M&S process
4. Conclusion and future work	

4. Conclusion and future work

Conclusion

Allows a collaborative work

Allows the reusability and sharing of modeling components

Allows the model designer to animate their model design very quickly, once models have been introduced in a library

A set of APIs allowing user to process his models through some web-based APIs and graphical interfaces accessible using the DEVSimPy framework

4. Conclusion and future work

Future Work

To develop the possibility to associate several kinds of simulation associated with the library stored models

To study how to manage and maintain with the most efficiency a distribution of simulation models over a network and over multiple hosts