OpenSG Simulations Working Group

Modeling and Simulation Survey Documentation

Steffen Schütte, Martin Tröschel – OFFIS

Jason Taylor, Craig Rodine – EPRI

June 10, 2011

Table of Contents

[1 Introduction 3](#_Toc295468965)

[1.1 Document Purpose 3](#_Toc295468966)

[1.2 Definitions 3](#_Toc295468967)

[1.2.1 Inventory versus Repository 3](#_Toc295468968)

[1.2.2 Tool-Inventory versus Model-Inventory 3](#_Toc295468969)

[2 Survey design 6](#_Toc295468970)

[2.1 Goals of the survey 6](#_Toc295468971)

[2.2 Administrative tasks 6](#_Toc295468972)

[2.2.1 Recipients 6](#_Toc295468973)

[2.2.2 Survey distribution 7](#_Toc295468974)

[2.3 Tips for the design of the survey 7](#_Toc295468975)

[3 The Survey 8](#_Toc295468976)

[4 Literature 13](#_Toc295468977)

Document Revisions

|  |  |  |  |
| --- | --- | --- | --- |
| Revision | Date | Changes | Author |
| 0.1 | 2011-05-05 | Initial version based on a refactoring of the Tools-Inventory Document | Steffen Schütte |
| 0.2 | 2011-05-18 | Changes during call with Jason Taylor | Steffen Schütte |
| 0.3 | 2011-05-26 | Added additional questions regarding interoperability | Steffen Schütte |

# Introduction

## Document Purpose

It is the purpose of this document to describe a survey created by the WG that shall be sent out to different people/institutions that are working in the energy domain and in particular in the Smart Grid domain. The overall goal of the survey is to get information about how modeling and simulation technology (M&S) is used in day to day business and research and how it could be used, e.g. what obstacles currently exists.

In addition to this goal of a big picture, the survey shall help to establish the tool and model inventories the WG aims to create to have a set of tools and models that can be considered in the WGs further work. In the next section the tool and model inventory are confined.

## Definitions

### Inventory versus Repository

An inventory (this document) is a list of items that are to be found somewhere else whereas a repository stores the items itself. (is there an official definition somewhere?)

### Tool-Inventory versus Model-Inventory

Another deliverable that is being created by the OpenSGSimsWG in parallel to this tool inventory is a model inventory. To avoid confusion about these deliverables, the meaning of the term “model” in the context of the OpenSGSimsWG needs to be defined first. Figure 1 depicts different ways to study a system, e.g. a complex system like the electricity grid and especially a SmartGrid.

Experiment with the

actual system

Experiment with a model of the system

Physical

model

Mathematical model

Analytical model

Simulation

model

System

Figure 1: Ways to study a system according to [Law, Averill M.]

Experiments with the actual system are not within the scope of the OpenSGSimsWG. The actual system may only be observed to generate data for experiments with models of the real system. In particular, as actual Smart Grids arech ld be aystemthe Smart Grid) is yet to be fer Betrachtung der Elektromobilität stellt die elektrische Infrast still to be developed and are not yet available for experiments.

So we either have a physical model of the system that is used to study effects or mathematical models to experiment with. Additionally, we might also have a hybrid experiment setup including a physical model in a “Hardware in the Loop” fashion.

Existing implementations of physical and mathematical models (the green and orange elements of Figure 1) will be collected and described in the **model inventory**.

While at a first glance it might not make sense to include physical models in the model inventory, at a second thought these physical models might be used across companies as a paid service or used within new project partnerships.

Now that a first definition of the model inventory has been given, the relation to the tool inventory needs to be elaborated. Figure 2 depicts the relations between tools, models and simulation tools.

Tool Inventory

Model Inventory

Mathematical model

Tool

Simulation

Tool

executes

is a

Physical

 model

Model of a system

Figure 2: Relation between model and tool inventory

The model inventory can contain models that are only available as part of a special tool. This tool shall then be added and referenced in the **tool inventory** and described in detail there.

# Survey design

## Goals of the survey

The challenge thereby is to formulate a specific set of simple questions that the WG can use to address the overall big picture. Particularly, questions that elicit responses that are easy to quantify/qualify. In the following list a raw list of the questions of the survey are listed underneath the overall goals (1 to 5) that the survey pursues.

1. **Get a broad picture of how M&S technology is used in SmartGrid (planning) activities**
* Briefly describe how you incorporated Smart Grid technologies in your current/past modeling and simulation work.
* In what areas do you apply modeling and simulation (transmission, distribution, operations,…)?

• How much of your work focus on Smart Grid technologies?

• What top five Smart Grid technologies that you expect to impact system reliability?

* What is your professional title?
* Which of the following describes your place of work (utility, university, national lab, consultant, other)?

2. **Detect obstacles that prevent people from using M&S technologies**

* What are the obstacles that prevent you from using M&S either completely or up to a certain extend?

3. **Tool related questions / Find out what tools are being used**

* What simulation software platforms do you use?
	+ What are the tasks/questions you intend to answer with this tool (e.g. weather forecast/load flow calculation in low voltage grid, etc…)?
	+ What are the in- and outputs the tool needs to integrate with (content and format)?
	+ What is the overall business process?
	+ What automation interfaces are used (e.g. OPC UA)?

5. **Model related questions**

* What models are used?
* What things are not addressed by the models?
* What modeling domains are not covered sufficiently?

4. **Detect missing features/functionality**

* Are there any particular future modeling and simulation requirements/needs that you have identified for Smart Grid technologies?
* What tool features or simulation models are currently missing?

5. **Interoperability**

* Do your modeling & simulation efforts include coupled simulation models across different simulation platforms?
	+ If Yes, could you please name the platforms that were coupled?
	+ What was the use case, i.e. what models were coupled and why?
	+ What protocol/middleware was used for coupling the simulations?
	+ What were the obstacles of the chosen approach?
	+ What were the advantages?
	+ In how many of your projects do you have to couple simulation models across different platforms?

## Administrative tasks

### Recipients

Who are the recipients of the survey (his/her role in the company)?

* Members of the SimsWG
* Utilities, Labs, Universities
* People using M&S today
* People involved in SmartGrid activities
* Wind/renewable integration projects
* EV-Projects

**@Craig: Regarding your offer at our last call, it would indeed be nice if you could provide contacts of European utilities as we do only have contact to few utilities. We can cover the European university and lab sector.**

One idea is to distribute the survey in Germany via the different interest groups (BitKom, BDEW, …)

Other ideas:

* Sending it to the different EU-fundet SmartGrid projects or in general to projects via the different funds.

### Survey distribution

eMail (link vs. attached survey), regular mail

## Tips for the design of the survey

General points to consider for sending the questionnaire:

* People should only answer the points they feel comfortable with to avoid wrong answers
* It should be addressed in a personal fashion (Dear Mr….) and not be sent as a bulk mail to increase the response ratio.
* This can be increased even more when the recipient knows the sender. To achieve this we should try to cluster the sending process into regional groups, e.g. during the collection of the addresses.
* It should be logged who answered to a questionnaire to avoid redundant mails when sending reminders.
* A test with a small group (10%) of the final recipients should be carried out in order to estimate the response ratio. If it seems to low these people can be contacted via phone to ask for the reasons.
* In case the recipient has a question about the questionnaire there should be a contact address.

General remarks about the design of the questionnaire:

* For a web based query: 1 max. 2 questions per screen + a progressbar
* For potentially ambiguous choices we should supply detailed explanations to each option ease the selection rather than providing an example query.

# The Survey

In the end of 2010 the Open Smart Grid Subcommittee[[1]](#footnote-1), a member group of the UCA International Users Group, started the **OpenSG Simulations Working Group** (SimsWG). It is the **purpose** of the OpenSG Simulations Working Group to facilitate work on the modeling and simulation of modern electric power systems as they evolve to more complex structures with distributed control based on integrated Information and Communication Technologies (ICTs). The **goal** of the SimsWG is to develop a framework and requirements for modeling and simulation tools and platforms which support this evolution in power system design, engineering and operation.

To succeed in this effort, we rely on **your feedback** about simulation tools you use or have used or maybe even developed within your company. Thank you very much.

The SimsWG thereby pursues openness in design, implementation and access by promoting open source solutions. Also, collaboration amongst industry, commercial vendors and research as well as government organizations is pursued. This means that **you will** also be able to **profit** from the results and are welcome to join the effort of the SimsWG.

**Section 1: General Information**

Personal information is optional. However, if you fill in your details we can inform you about the result of the survey.

**Name of company** (optional): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Your name** (optional): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**E-mail address** (optional): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Function**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Your professional title:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Which of the following describes your place of work ?**

<Selection box: utility, university, national lab, consultant, other >

Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section 2: How is modeling & simulation technology used in the Smart Grid domain**

**Briefly describe how you incorporated Smart Grid technologies in your current/past modeling and simulation work.**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**In what areas do you apply modeling and simulation (transmission, distribution, operations,…)?**

**<Multiselection of:** Generation, Transmission, Distribution, Customer, Markets, Operations, Service Provider (List derived from “Report to NIST on the Smart Grid Interoperability Standards Roadmap—Post Comment Period Version”)**>**

Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**How much of your work focus on Smart Grid technologies?**

<Selection box: 0%, 25%, 50%, 75%, 100%>

**What top five Smart Grid technologies that you expect to impact system reliability?**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section 3: Obstacles that prevent you from using M&S technologies**

**What are the obstacles that prevent you from using M&S either completely or up to a certain extend?**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section 4: Tool related questions / Find out what tools are being used**

**What simulation software platforms do you use?**

**<For each tool>**

* + What are the tasks/questions you intend to answer with this tool (e.g. weather forecast/load flow calculation in low voltage grid, etc…)?
	+ What are the in- and outputs the tool needs to integrate with (content and format)?
	+ What is the overall business process?
	+ What automation interfaces are used (e.g. OPC UA)?

**<end foreach>**

**Section 5: Model related questions**

**What models are used?**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**What things are not addressed by the models?**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**What modeling domains are not covered sufficiently?**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section 6: Detect missing features/functionality**

**Are there any particular future modeling and simulation requirements/needs that you have identified for Smart Grid technologies?**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**What tool features or simulation models are currently missing?**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section 7: Interoperability**

**Do your modeling & simulation efforts include coupled simulation models across different simulation platforms?**

**<Yes/No>**

**If Yes, could you please name the platforms that were coupled?**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**What was the use case, i.e. what models were coupled and why?**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**What protocol/middleware was used for coupling the simulations?**

O Sockets / TCP/IP with custom protocol

O CORBA

O COM

O HLA interface

O Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**What were the obstacles of the chosen approach?**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**What were the advantages?**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**In how many cases of your projects do you have to couple simulation models across different platforms?**

<Selection: 0%, 25%, 50%, 75%, 100%>

**That’s all. Thank you very much for taking the time to complete this survey.**

# Literature

Law, Averill M. “Simulation Modelling & Analysis”, 2007, 4th ed., McGraw Hill

1. [http://osgug.ucaiug.org](http://osgug.ucaiug.org/) [↑](#footnote-ref-1)