IPID4all Doctorate Research Exchange with OFFIS and University of Oldenburg

Feedback report

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Exchange topic: Mosaik for scalability testing of dynamic power system co-simulations

Introduction

This research visit fits in a larger research framework that aims at determining the consequences of coupling a large number of power system simulators in a co-simulation environment and to develop methods that solve/mitigate any encountered issues. In this context, the objective of the visit was to:

- Learn mosaik and from mosaik, and
- test mosaik for generating large scenarios of dynamic simulations.

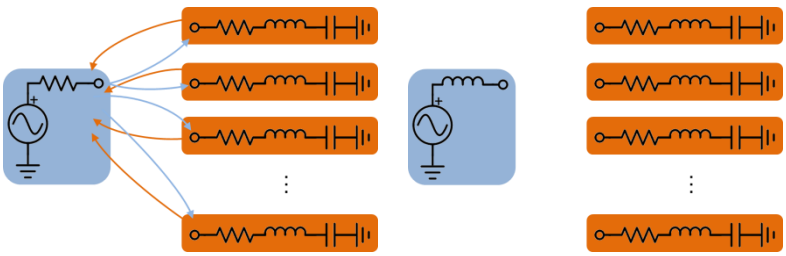
The idea is to extrapolate from the co-simulations of simple dynamic systems to determine whether mosaik is appropriate for large dynamic power system co-simulations.

Research Undertaken

The research undertaken can be summarized in two experiments:

- *Experiment 1:* Create a co-simulation where one of the systems is a resistive source and the other is an RLC branch. Co-simulate for different numbers of RLC branches (Fig. 1 (a)).
- *Experiment 2:* Same as Experiment 1 but using an inductive source (Fig. 1 (b)).

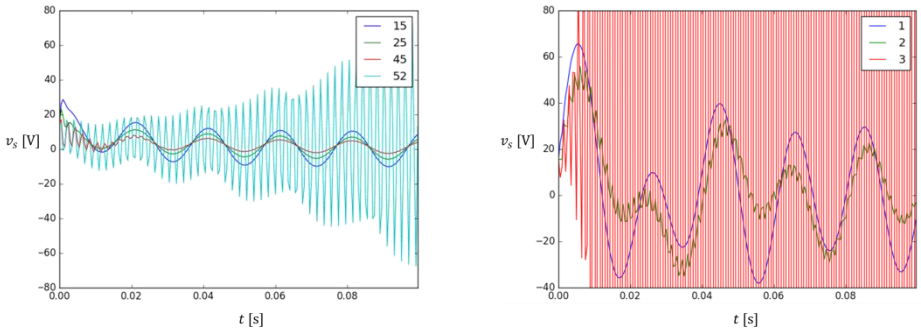
In both cases it is expected that the accuracy of the results decreases as the number of RLC branches increases, but the focus of the experiments is not on accuracy, but on the adequacy of mosaik as a tool for automatically generating experiments of this sort, but of higher complexity.



(a) (b)

Fig. 1: Diagrams of co-simulated systems.
(a) Resistive source and RLC branches; (b) Inductive source and RLC branches.

The results of both co-simulations are shown in Fig. 2, and as it was predicted, the accuracy decreases as the number of RLC branches increases, and it decreases particularly quickly in the cases of the inductive source (Experiment 2).



(a) (b)

Fig. 2: Results of both experiments.
(a) Experiment 1; (b) Experiment 2.

Personal Experience

The two weeks in OFFIS were a productive time. The host group was very welcoming and many interesting discussions took place during that time. There were also opportunities to meet and get to know the researchers in a more personal level.

Conclusions

The scenario generation capabilities of mosaik are an excellent tool for setting up experiments such as those carried out during the exchange period. The biggest weakness that mosaik showed is that it has been developed for static, and not dynamic co-simulations. This means that the flow of data between simulators is, by default, in one direction only, whereas in the case of dynamic simulations, a bidirectional data flow is required.

Outlook

Further exchange between both groups is planned. The groups are already cooperating in European projects (such as EriGrid). Other, smaller activities are also likely, as the expertise of both groups in co-simulations is complementary.

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