mosaik - A modular Platform for the Evaluation of Agent-Based Smart Grid Control

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Abstract— Smart Grids rely on the use of ICT for managing large numbers of active components and sensors for keeping demand and generation of electricity at equilibrium while operating all the different resources within their operational limits. Due to the distributed nature of these resources, their heterogeneity as well as their sheer number, this is a challenging task. Control strategies as well as novel paradigms need to be developed and thoroughly evaluated through extensive simulations. In order to yield scientifically sound and reliable results, these simulations have to rely on valid and (ideally) established models e.g. from industry. Therefore, it is desirable to compose complex scenarios based on these models and established simulation setups and to reuse them as much as possible. The introduced mosaik framework presents a flexible architecture as well as a powerful modeling and specification language to automate the process of reusing existing models and platforms in orchestrated large scale simulations.

Index Terms—ICT, Integration, Modeling, Simulation, Smart Grid Control

I. INTRODUCTION

This is the introduction and motivation...

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II. RELATED WORK

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A. Smart Grid Simulation

GridLAB-D and friends...

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V. APPLICATION EXAMPLE

The application example is to integrate MOSAIK with Aristo (Power simulator) and implement control strategies using a multiagent system as shown in the figure xxx.

The use case is to construct different scenarios like load and wind generation profiles and analyze the resulting voltage and power flow level. Moreover, to analyse the impact of control strategies using agent based decision-making. Moreover considering the fact that the synchronization issues between the real time simulator and the agent system is a challenge due to the heterogeneity of the systems.

A. Power System Simulator

Aristo is a power simulator from Svenska Krafnet developed in 80's for TSO training purposes. It can simulate dynamic behaviour in real time with a time resolution of 20 milliseconds. It provide OPC-UA interface to interact with other software. Moreover, the output data can be exported to xml/text format for further post analysis.

The individual load profiles and production profiles are loaded into Aristo as a startup data for the power network model. The model adapted is a Danish Bornholm model as presented in the figure.

Figure: 1.2: Radial network modeled in Aristo

The basic data about the model is presented as

- A 60/11 kV distribution system
- 11 buses in total
- 7 loads (15 MW peak)
- 3 wind mill units (aggregated capacity is 7 MW)
- 1 transformer station with tap changer capability
- 9 overhead lines with various lengths

B. Component Models

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C. Control System

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D. Scenario Specification

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E. Results

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VI. CONCLUSIONS AND OUTLOOK

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