



Multi-Agent based HEMS framework

Authors: Aleksandra Aleksić, Milan Vidaković, Jelena Slivka, Aleksandar Kaplar

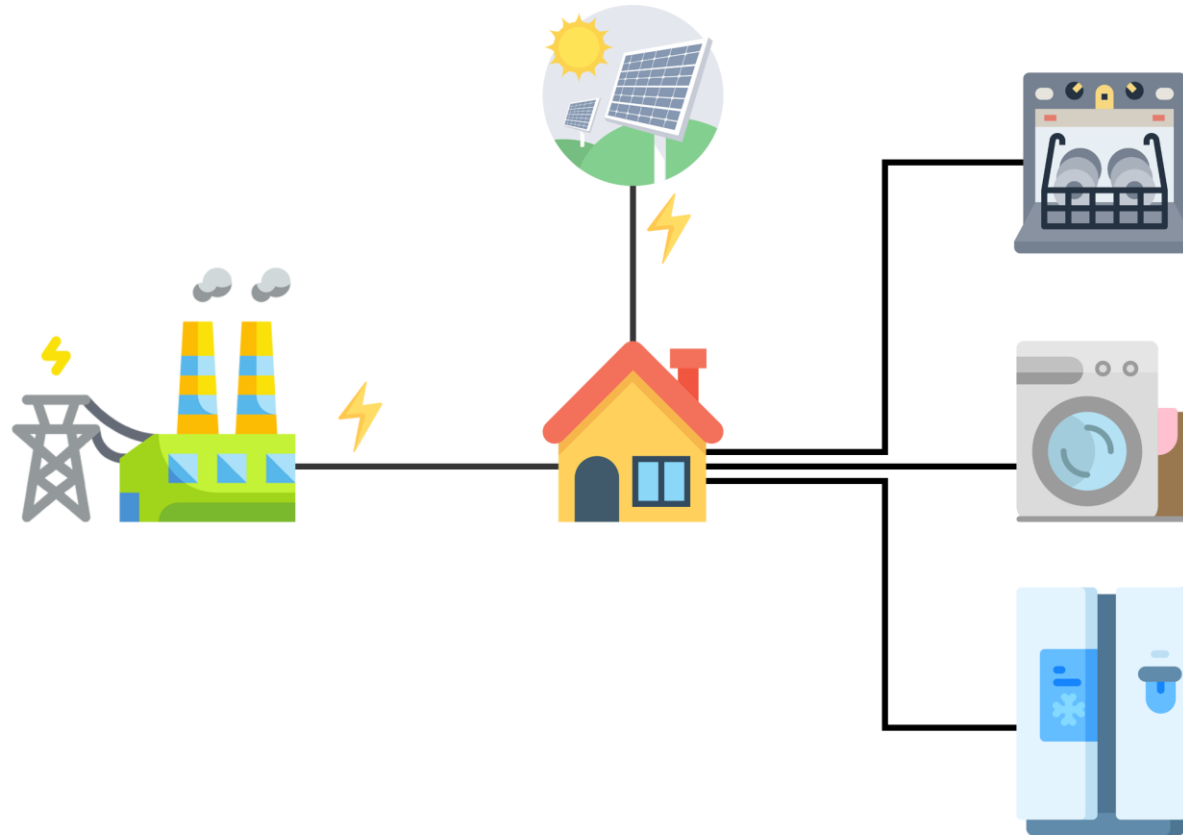
Chair of Informatics
Computing and Control Department
Faculty of Technical Sciences
University of Novi Sad

Overview

- What is HEMS (Home Energy Management System)
- Integrating Siebog and Typhoon HIL
- Presenting our MAS (Multi-Agent System) Siebog
- Communication Protocol
- Results
- Future Work

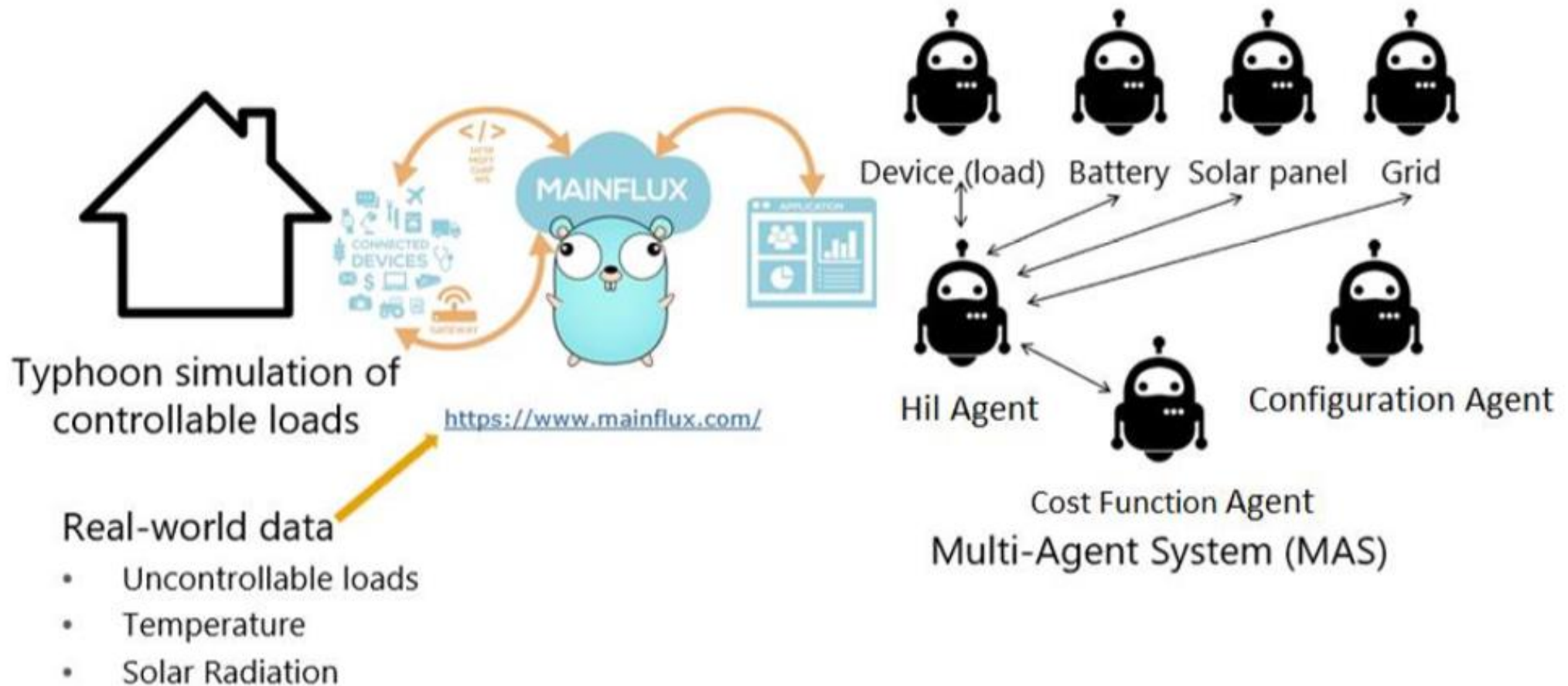
HEMS

- Smart homes



- HEMS has the task to relieve users of the burden of monitoring and managing household appliances
- Intelligent HEMS is responsible for the automatization and management of a household in an intelligent manner

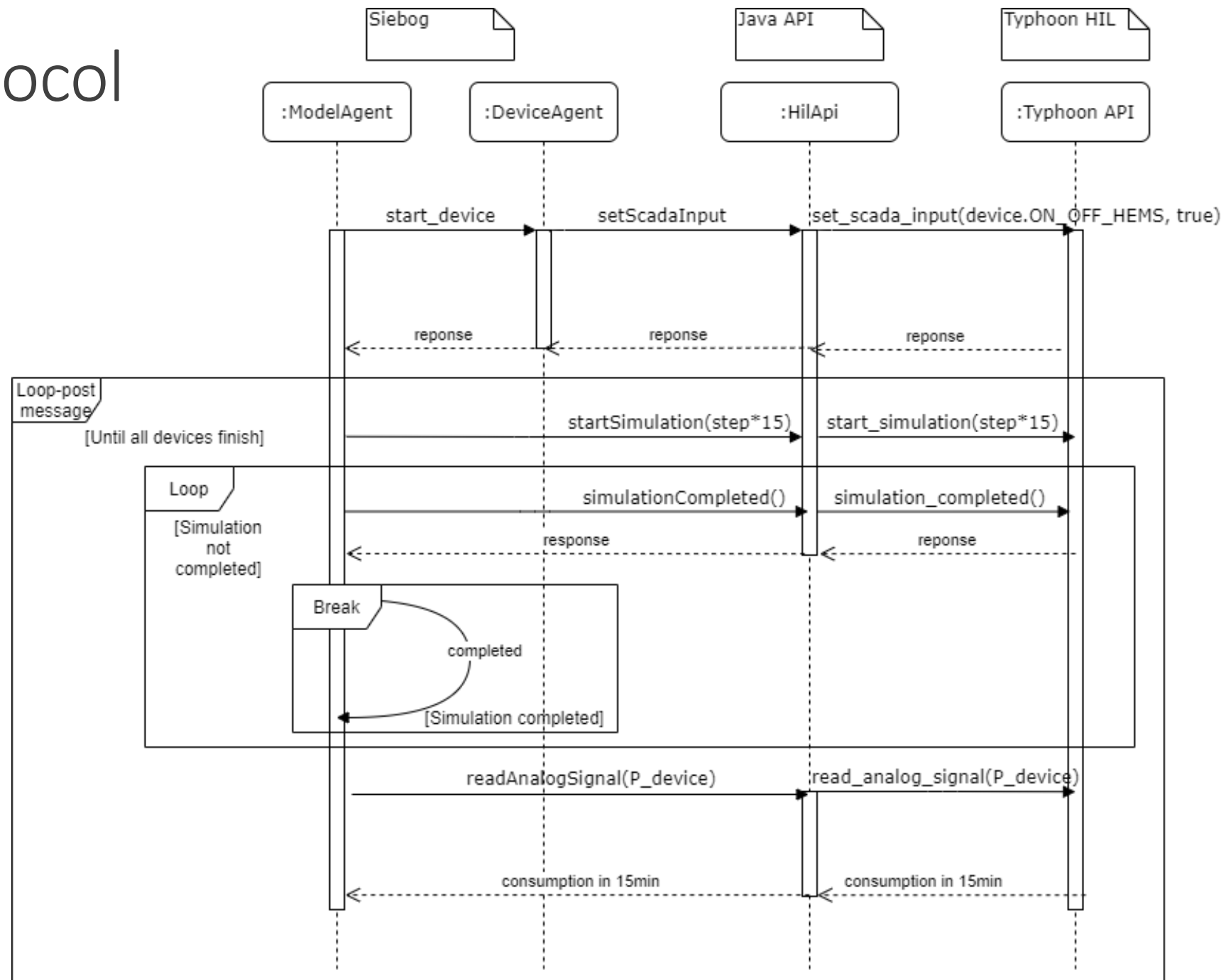
Siebog and Typhoon Integration



Siebog

- MAS – Multi-Agent System
 - Distributed intelligent system
 - Agents execute tasks in parallel
 - A great number of autonomous intelligent agents that can represent household appliances
 - They can communicate with one another in the form of exchanging messages
 - They have a defined common goal
 - Evaluate the cost function (in the future, to optimize energy consumption)
 - Currently supported operations:
 - Turning the devices on and off
 - Tracking:
 - the energy consumption of a device in a defined period
 - the state of the device, such as availability

Communication Protocol



Results

- Defined a solid architecture solution for the realization of communication between agents in order to evaluate the cost function in different scenarios
- Developed a system for introducing Reinforcement Learning in the future
- An in-sight how the time of day impacts the overall cost of energy consumption in a household
- How different factors (household devices, renewable energy sources, etc.) evaluate different cost functions
- The factor of the end user's preference when a certain appliance is scheduled to work (or not work)

Future Work

- Expanding the energy management problem on a wider, more complex grid
- Defining a form of AI for personalizing a user's comfort and cost reduction
- Defining and implementing security