ComForEn 2021

ComForEn 2021 – Self-Optimization Challenge

Winner 2021

The conference team is proud to announce the following team as the winner of the Self-Optimization Challenge 2021:

TU Wien, ICT:
Valentin Bauer, Thomas Leopold
in the course of the project SONDER

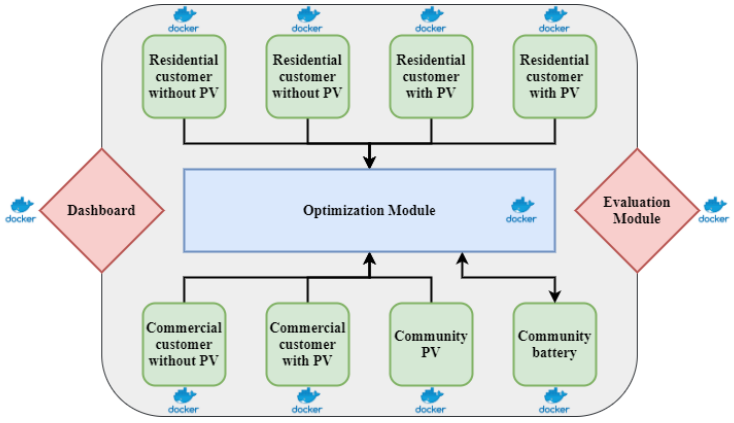
Challenge

Peer-to-Peer energy trading, energy sharing, self-optimization, or grid-supporting behavior are expected to become essential applications for energy communities and their participants. Due to the high complexity of physical and virtual energy flows, financial flows, and the optimization of controllable devices within a community, automated (digital) solutions are needed to handle these requirements.

ComForEn2021 will host a **"Self-Optimization Challenge"** for interested researchers to develop, deploy, and validate their own optimization module for energy communities – capable of considering various constraints and aiming to reach a dedicated optimization objective.

The submitted optimization approaches will run during 24 hours of the conference, the winner will be announced and awarded on the second day of the conference (23.11.2021).

Environment



A virtual environment (see Figure) is provided for the challenge, consisting of various Docker containers representing the community participants (see Section "Community Setup") as well as a mockup container for the Optimization Module. This container has to be implemented according to the challenge constraints. Furthermore, price information is provided within the environment. An Evaluation Module is available for plausibility checks and the evaluation of the solution based on the evaluation criteria. Therefore, the Optimization Module has to provide the relevant data within the environment, compatible with Prometheus, in each timestep (chosen within the range of 1 minute, 5 minutes, 10 minutes, 15 minutes). Further information about the data model can be found within the environment. Finally, a Dashboard is implemented to show the results of each participant within the conference duration.

The environment can be downloaded following the instructions and scripts available HERE

TECHNISCHE UNIVERSITÄT WIEN
OVE Österreichischer Verband für Elektrotechnik
AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

Community setup

The energy community consists of:

- ***two residential customers without generation***
- ***two residential prosumers with PV-generation***
- ***one commercial customer without generation***
- ***one commercial customer with PV-generation***
- ***one community-PV system***
- ***one battery storage system without pre-allocation of battery capacity.***

The following constraints must be considered:

- Residential customers can buy energy from residential customers and commercial customers.
- Residential customers can sell energy to other residential customers.
- Residential customers can buy energy from the community PV system.
- Commercial customers can buy energy only from other commercial customers.
- Commercial customers can sell energy to residential customers and commercial customers.
- Commercial customers are not allowed to buy energy from the community PV system.
- Residential customers must be preferred.
- All customers can buy/sell energy from/to the retailer.
- All customers can buy/sell energy from/to the battery storage system.

The prices for all transactions will be provided within the environment and will look like the following:

- Selling/buying energy within the community: 10/15 €ct/kWh
- Selling/buying energy to/from community battery: 7/17 €ct/kWh
- Buying energy from community PV: 15 €ct/kWh
- Selling/buying energy to/from the retailer: 3/20 €ct/kWh

Evaluation criteria

The evaluation of the submitted solutions will be done within the conference duration. The community simulation will run in real-time and will be started on 22.11.2021, 09:00, and will be stopped on 23.12.2021, 09:00. The evaluation criteria cover the following aspects (all of them calculated within the simulation time):

- ***Total community costs (€, aggregated)***
- ***Total energy exchange outside the community (kWh, aggregated)***
- ***Communication effort (number of messages within the virtual environment, aggregated)***
- ***Computational effort (CPU utilization within the virtual environment, average)***

Each participant will get [1 .. N] points in each category (N represents the number of participants of the challenge), the total points will be used for the determination of the winner(s). In case of a tie, several sub-criteria will be considered (e.g., number of categories with maximum points).

Each participant can select the time resolution of the environment (1 minute, 5 minutes, 10 minutes, 15 minute). This decision will impact all of the evaluation aspects (directly to the communication and computational effort, indirectly to the costs and exchanged energy due to potential averaging effects).

The evaluation will be done automatically during the evaluation. Therefore, the submitted "Optimization Module" has to provide the costs (revenues) as well as the exchanged energy with the grid of each community customer in each timestep to an "Evaluation Module." Additionally, communication and computational effort are monitored within the environment and provided to the "Evaluation Module", too. These four different values (for each participant of the challenge) will be shown at the conference venue in real-time.

Participation and submission

Individuals as well as teams can participate in the ComForEn Self-Optimization Challenge. Every individual and team must register at http://www.comforen.org/Registration/. However, it is not necessary for all team members to register (and pay), and it would be sufficient if only one of them did. The submission must be sent to challenge@comforen.org with "`Challenge Submission <your_team_id>`" in the subject line. The email's body should include the names and contact information for all team members (first name, last name, email-address, affiliation). The attachment, in a zip/compressed format, must include:

1. a `Readme` file with instructions on how to access the image, as well as a brief description of the solution,
2. the `docker-compose` file,
3. any environment and/or configuration files, and other files

It should be noted that ComForEn must be able to download and run the image. It is possible to "extend" the provided environment to include the developed solution. The deadline for submissions is November 17, 2021, at 18:00 CEST. After the deadline, any late submissions will not be considered.

Important dates

08.11.2021, 17:00	Official start and provision of virtual community environment
12.11.2021, 15:00	Q&A-online session
17.11.2021, 18:00	Submission deadline
22.11.2021, 09:00	Challenge start
23.11.2021, 09:00	Challenge end
23.11.2021, 10:20	Announcement of winners

Further information about the challenge will be provided at the conference homepage https://www.comforen.org/