cosima

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OFFIS

communication simulation with agents

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Who are we?

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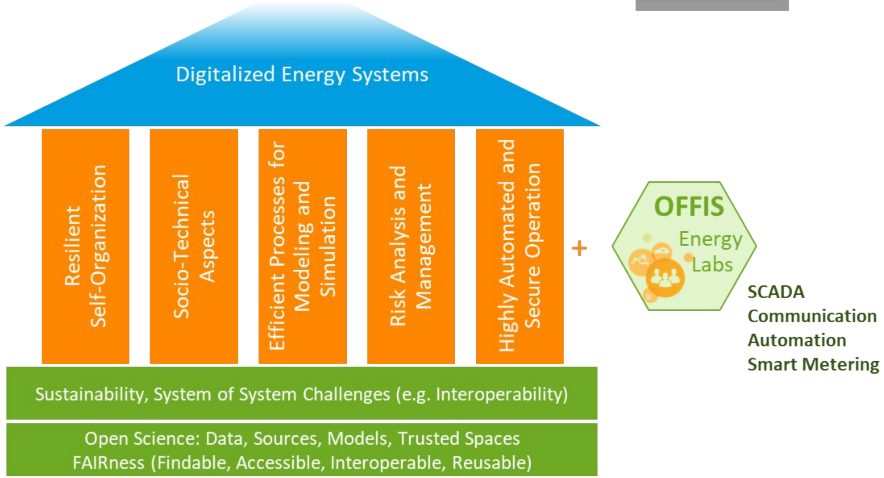
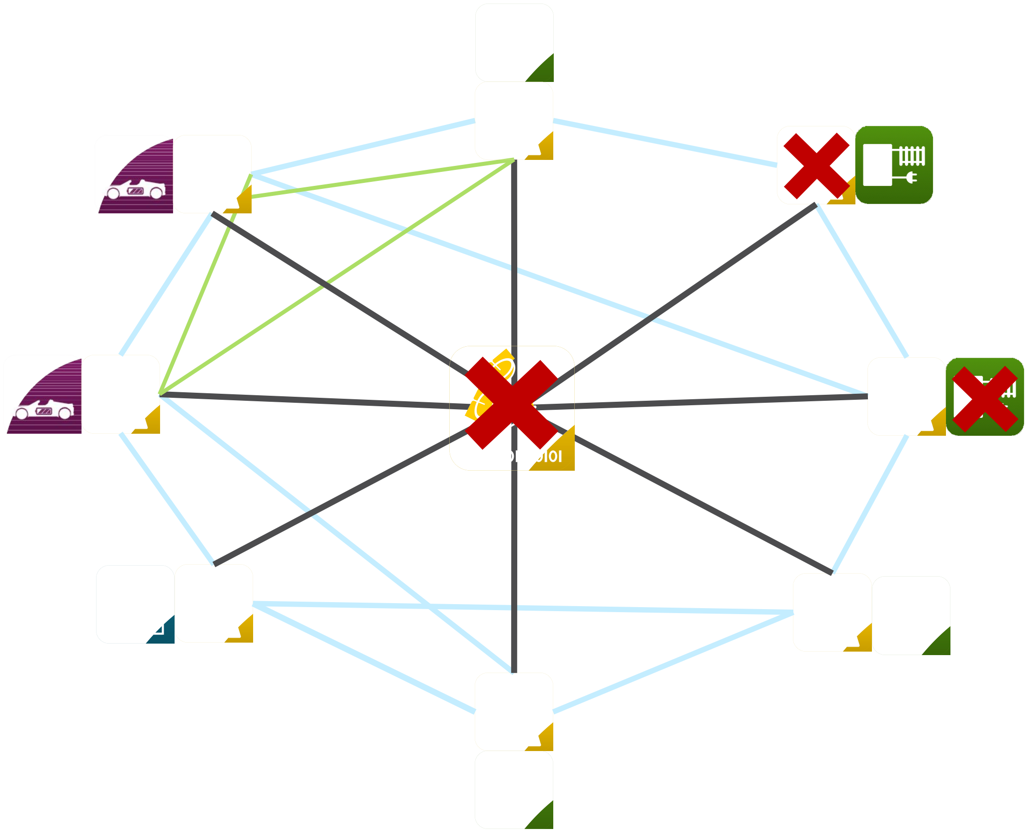
OFFIS – Institute for Information Technology

- State-funded Research Institute in Oldenburg, Germany (founded in 1991)
  - 250 Scientist in 4 R&D Divisions (Energy, Health, Manufacturing, Society)
- Energy Informatics at OFFIS & UOL
  - 2022: ~30 ongoing research projects
    - Largest EI team in D/EU (>100 researchers)

We're hiring Join us!

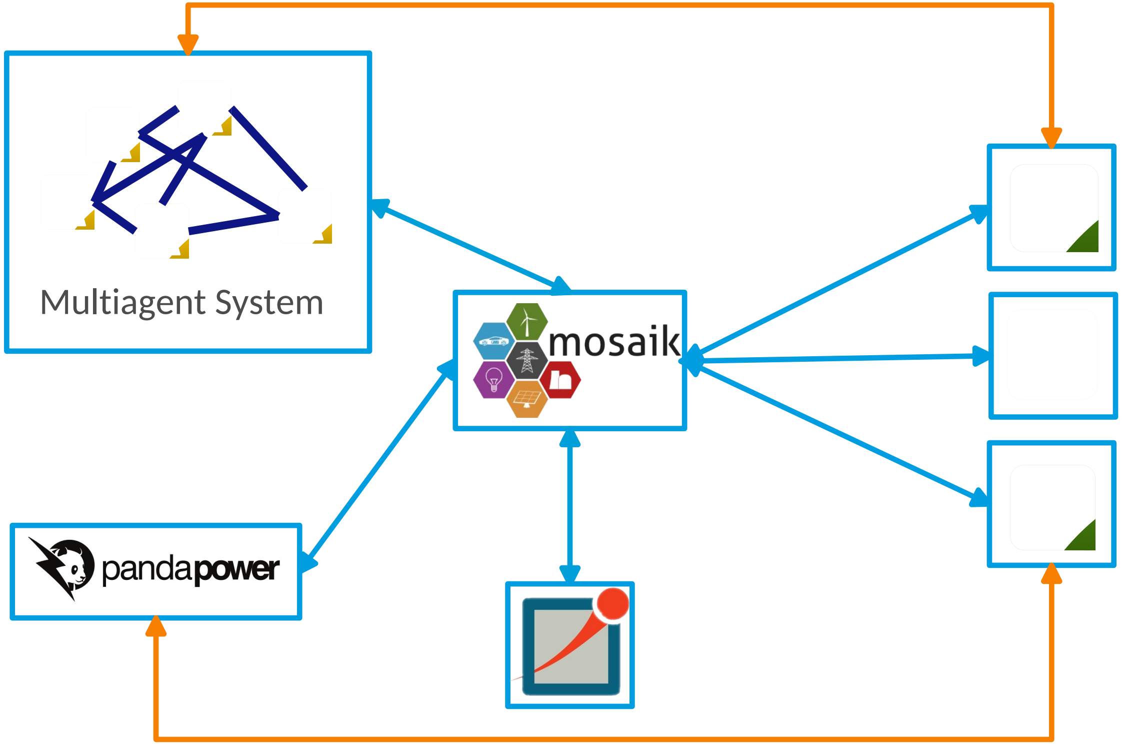


Communication Use Cases in Energy Informatics



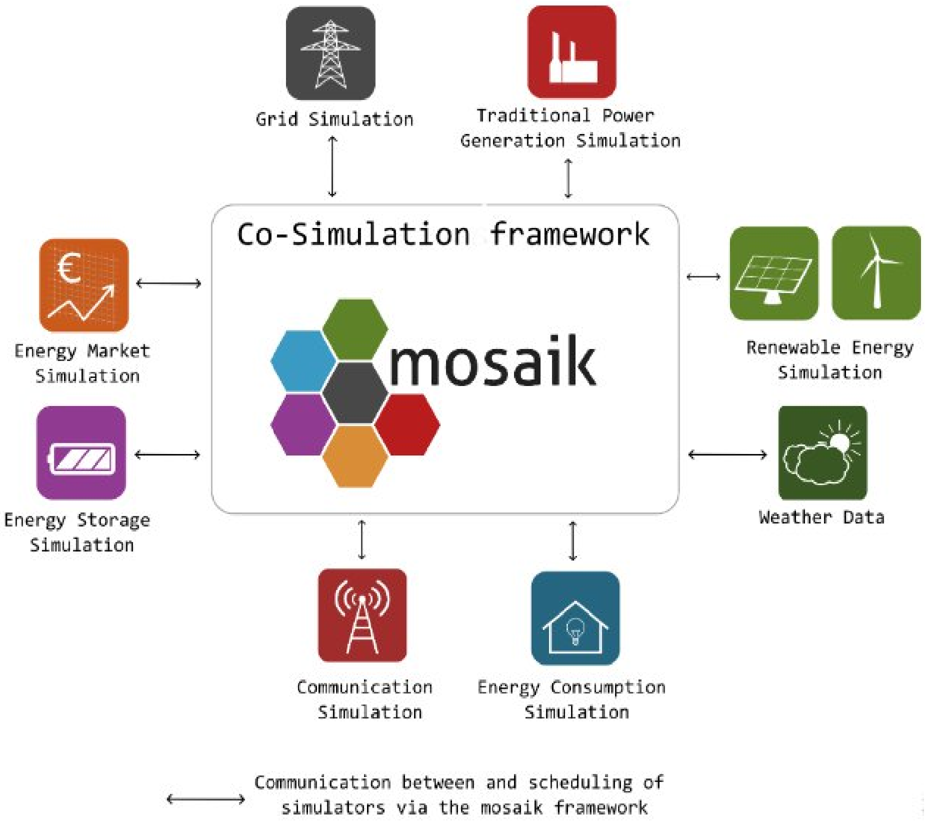
- Create MAS robust to failures
- Consider the interaction between power and communication system
- Optimize the communication flow for multiple smart grid applications

Simulation Environment



- So far, perfect communication conditions are assumed
- communication impairements can only be considered in an oversimplified model (e.g. static latency)
- Robustness of (fully distributed) control algorithms must be evaluated under more realistic communication scenarios

Co-simulation framework mosaik



Main Features

- **Combine available simulation tools from different domains**
- **Specification of simulation scenarios**
- **Coordination of data exchange and scheduling**

Open source (LGPL) https://gitlab.com/mosaik

mosaik ecosystem: lots of existing simulation models

- **https://gitlab.com/midas-mosaik/midas**
- **https://gitlab.com/mosaik/components**

Mosaik 3.0.0.: Discrete Event Capabilitites

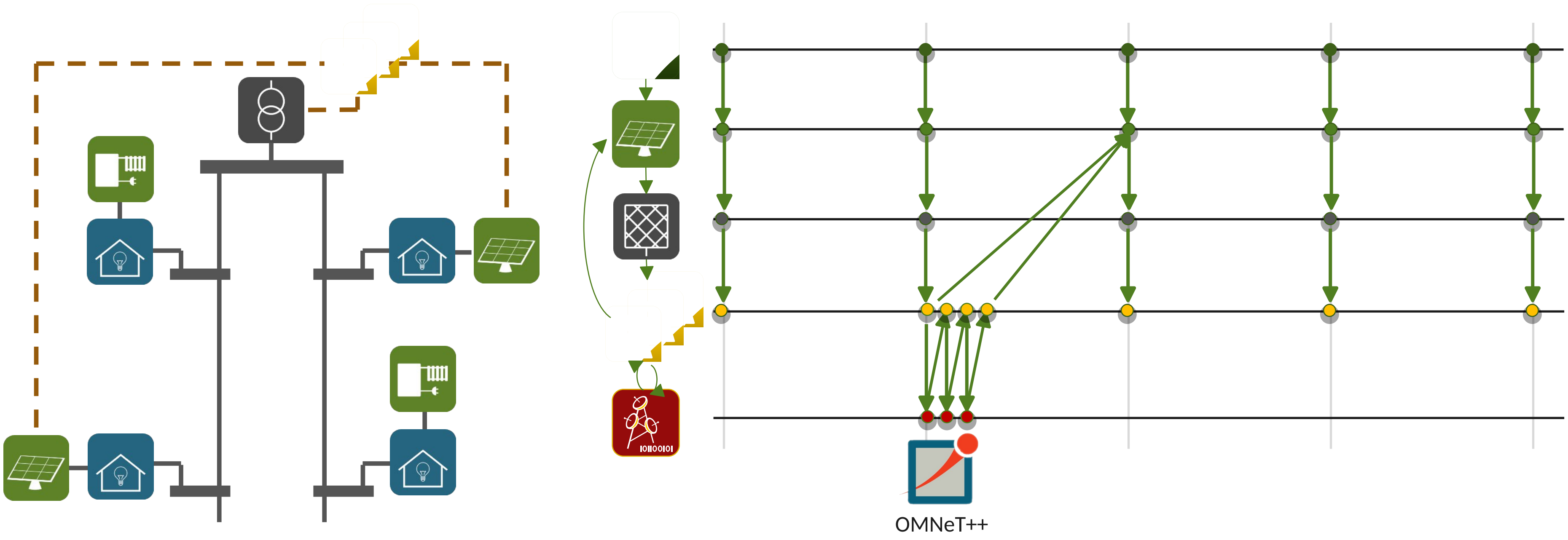
https://ieeexplore.ieee.org/abstract/document/9769116

Event-based (coming with mosaik 3.0.0)

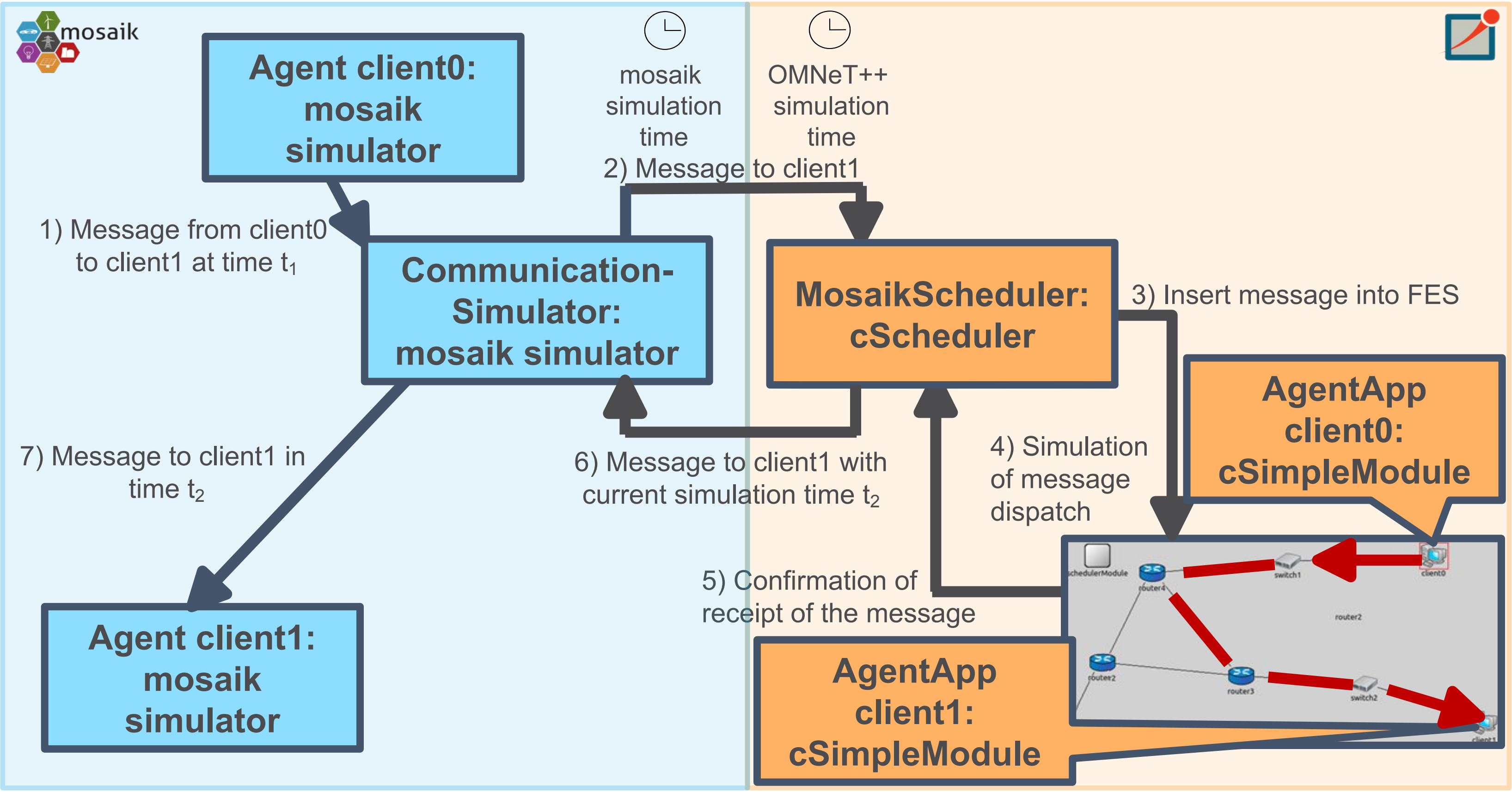
- Max_advance value
  - Information how far a simulator can advance in time without expecting new inputs
  - Simulator can progress until max_advance without being interrupted by mosaik and risking causality errors

mosaik

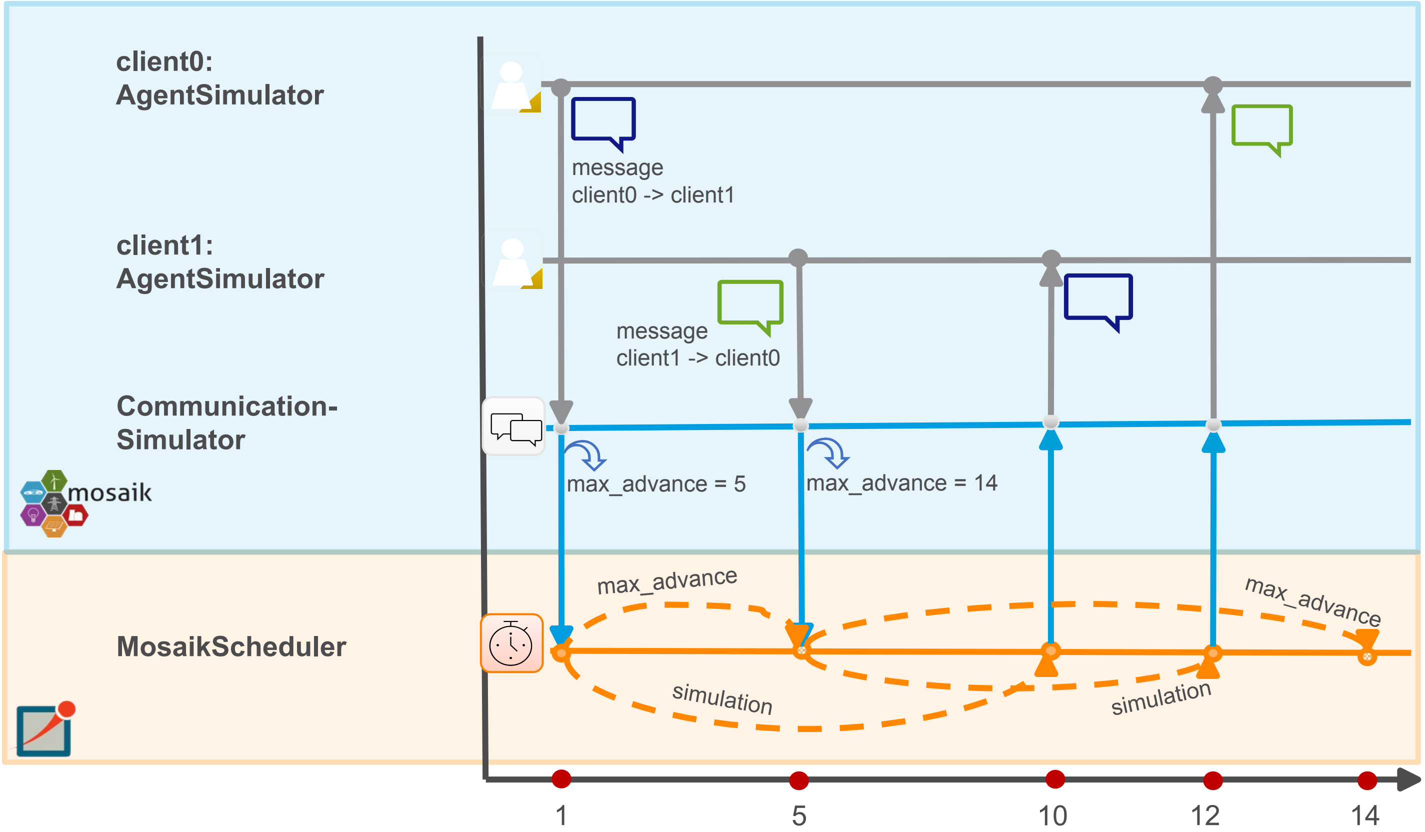
Integration of communication simulation

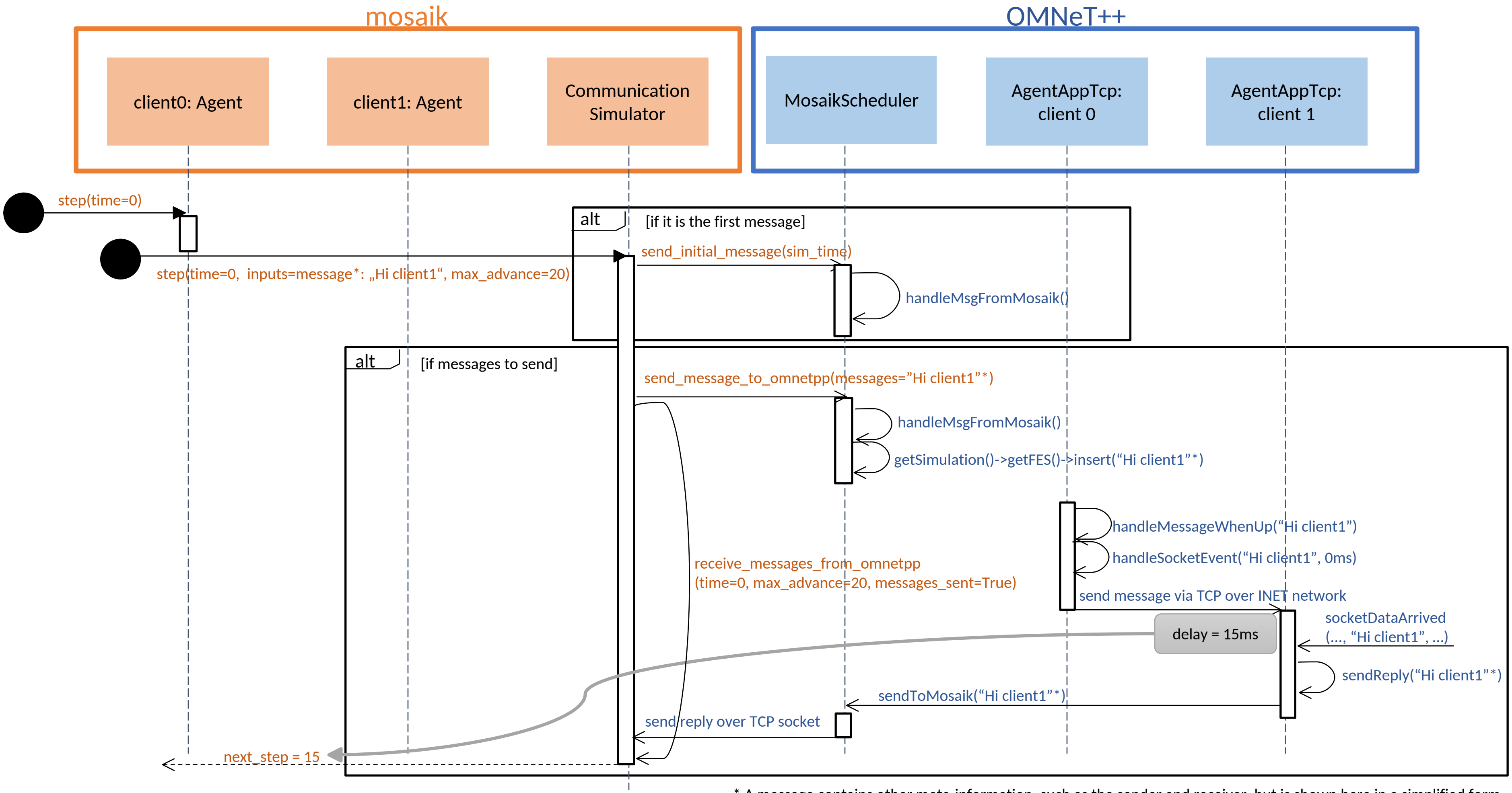


General Architecture



Synchronisation between mosaik and OMNeT++





* A message contains other meta-information, such as the sender and receiver, but is shown here in a simplified form.

Features

- Start modes using IDE or compiled executables (Qtenv or cmd)
- Adjust the number of agents
- Apply infrastructure changes (dis- and reconnects of clients, routers and switches) during simulation
- Connect PV plant simulators to agent(s)
- Multiple exemplary OMNeT++ networks
- Overview of the simulation based on collected information
  - e.g., number of simulation steps and evaluation graphs

Demo

- How to configure scenarios:
  - Number of agents
  - Network
  - Disconnects, Reconnects
  - PV device
  - ..
- How to start a scenario?

Further Information

- cosima.offis.de
  - https://cosima.readthedocs.io
  - https://gitlab.com/mosaik/examples/cosima
  - *Coupling OMNeT++ and mosaik for integrated Co-Simulation of ICT-reliant Smart Grids.* https://doi.org/10.48550/arXiv.2209.12550

- https://www.offis.de/en/applications/energy/distributed-artificial-intelligence.html

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