2nd International Conference on Smart Energy Systems and 4th Generation District Heating
Aalborg, 27-28 September 2016

Co-simulation for complex urban energy systems

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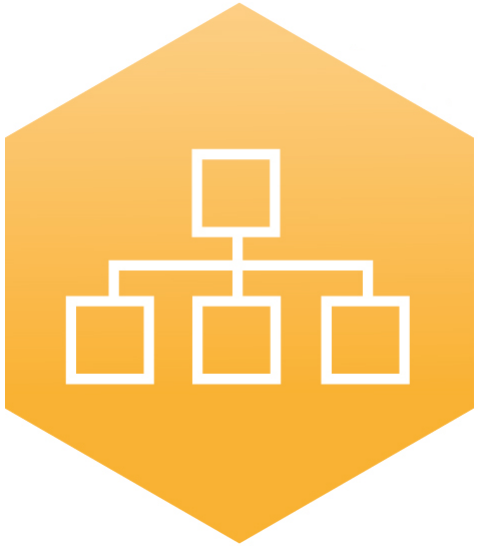

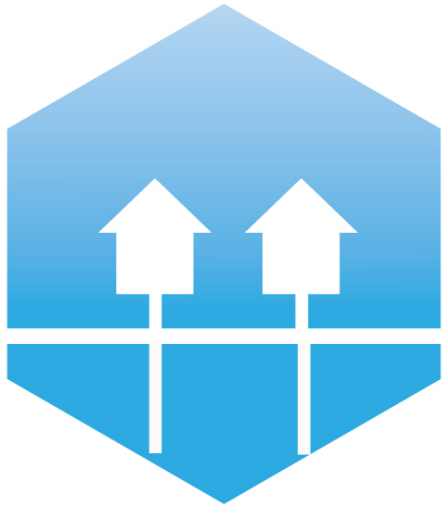

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Technologies and Systems

Observations and hypothesis

- Utilities tend to diversify
- Territorial energy systems become more complexe
- Optimisation tools exist but

  → operationnal and territorial constraints

- Multi-energy and multi-network

  → Exploiting synergies

  → Efficient, resilient and robust

  → Control strategies ?

→ Tool(s) ?

The IntegrCiTy project

EraNET Smart Cities

http://integrcity.epfl.ch/

March 2016 to February 2019 – 3.5M€

→ Decision support tool

- Design and planning
- Energy networks interoperability

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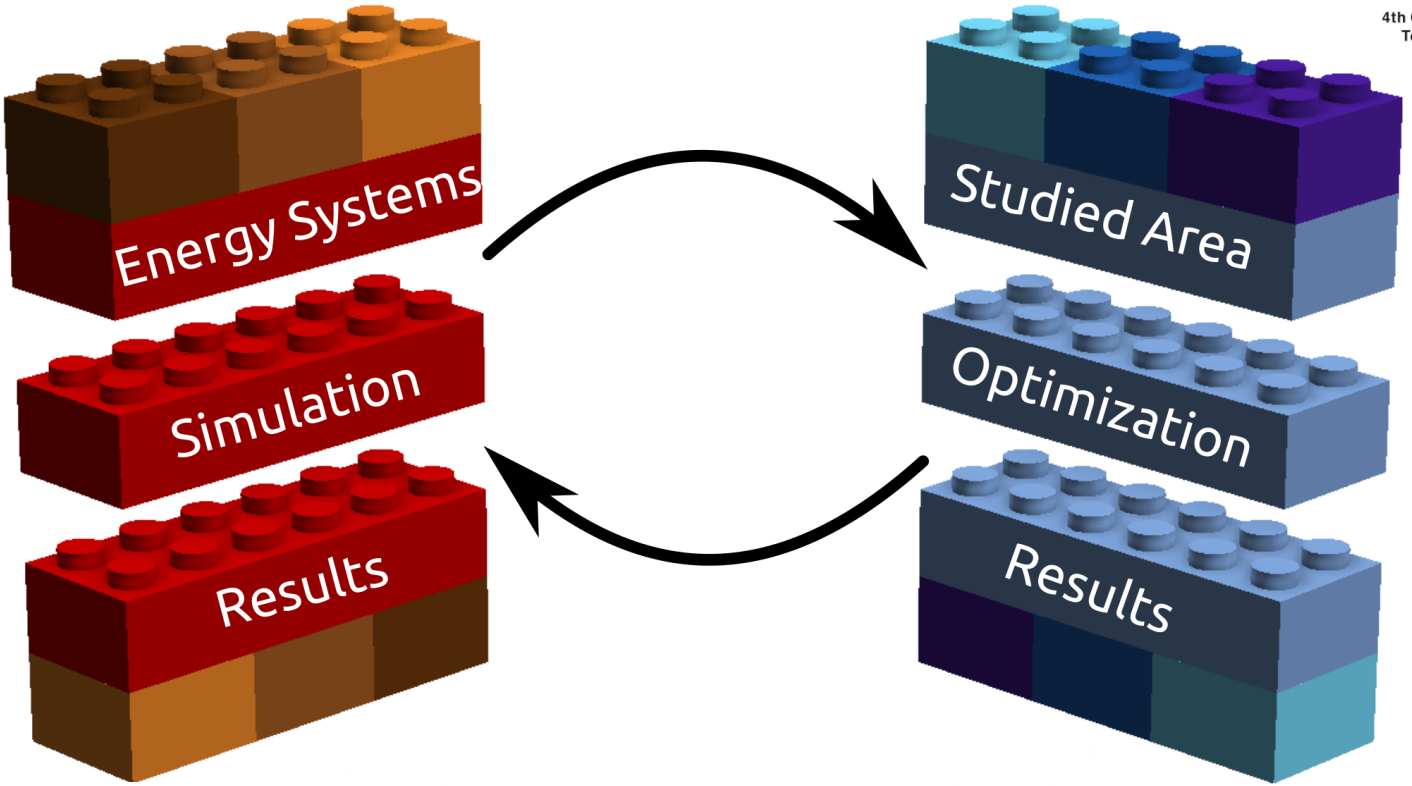
The IntegrCiTy project



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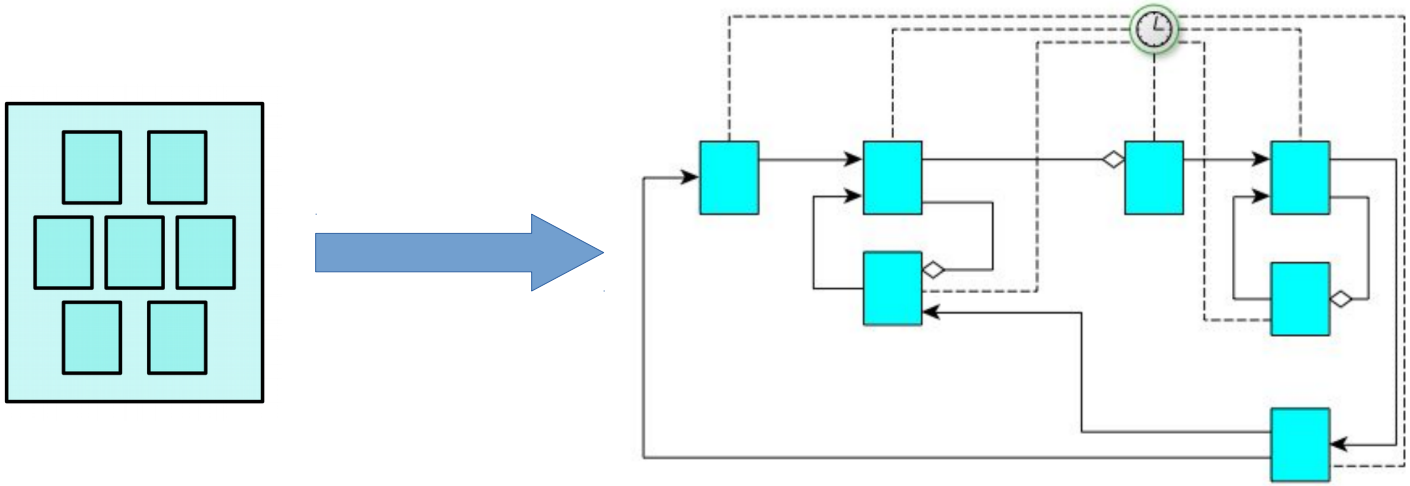
Why co-simulation ?

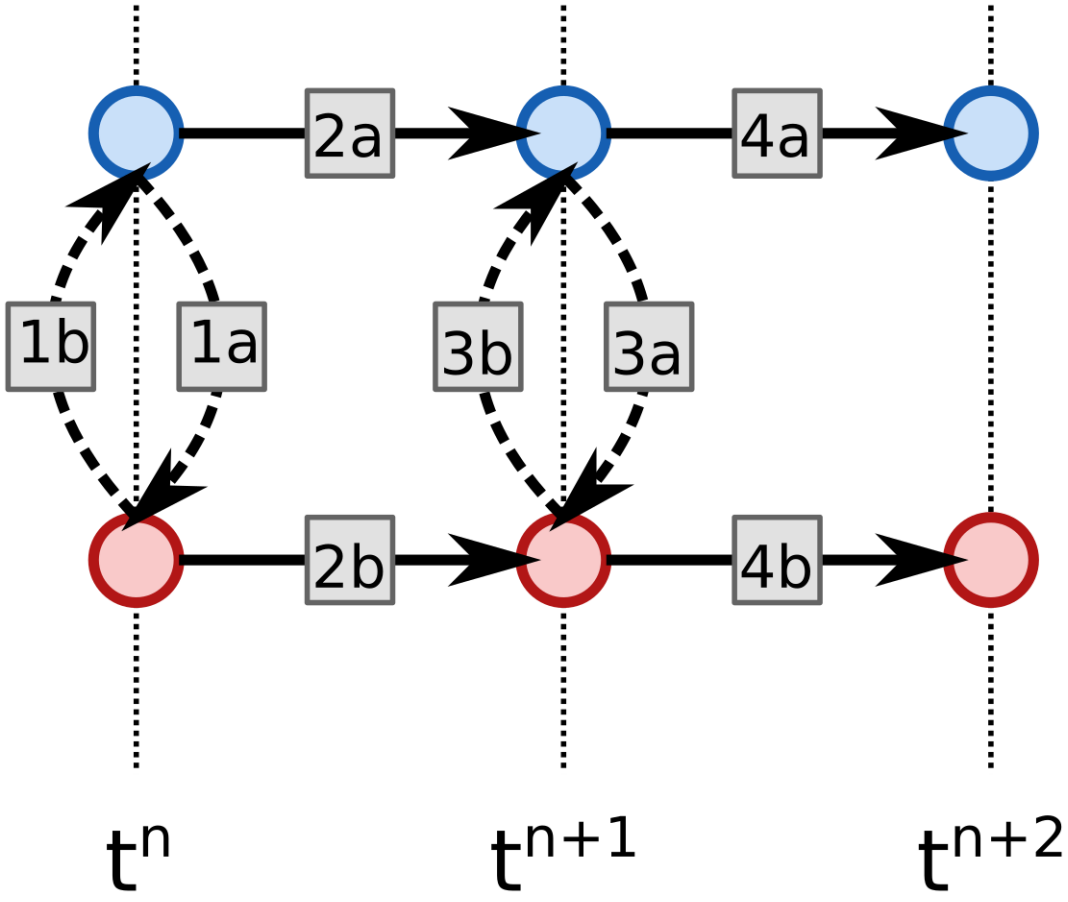
- Multi-disciplinary challenges
- Multi-energy and multi-network systems
- Multiple partners with existing dedicated tools

Separating a problem into distributed sub-problems

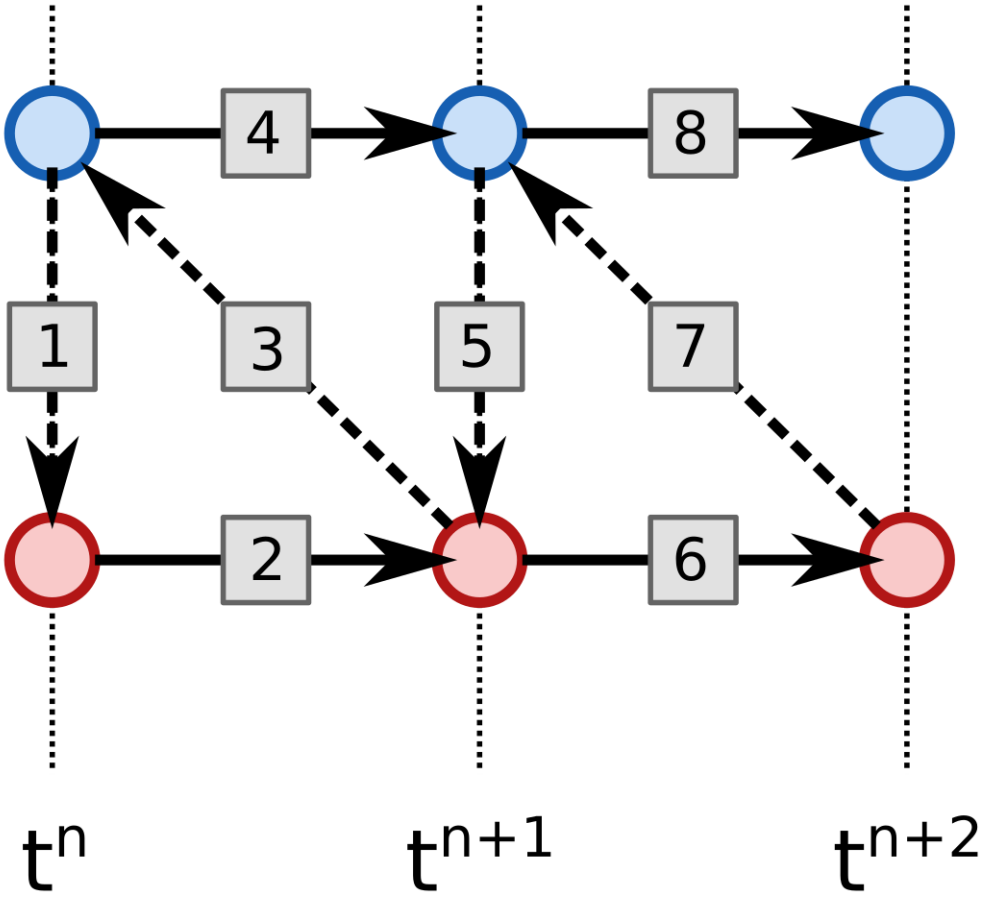
→ multi-rate and multi-method modular time integration



Jacobi method



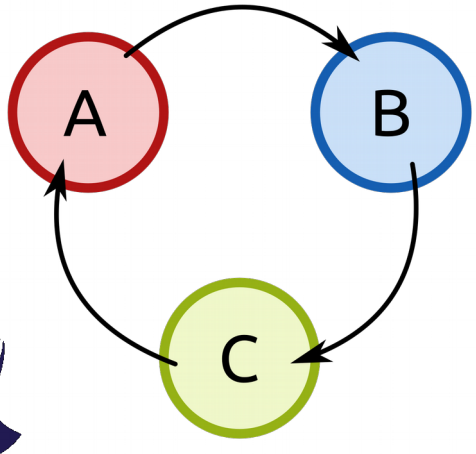
Gauss-Seidel method



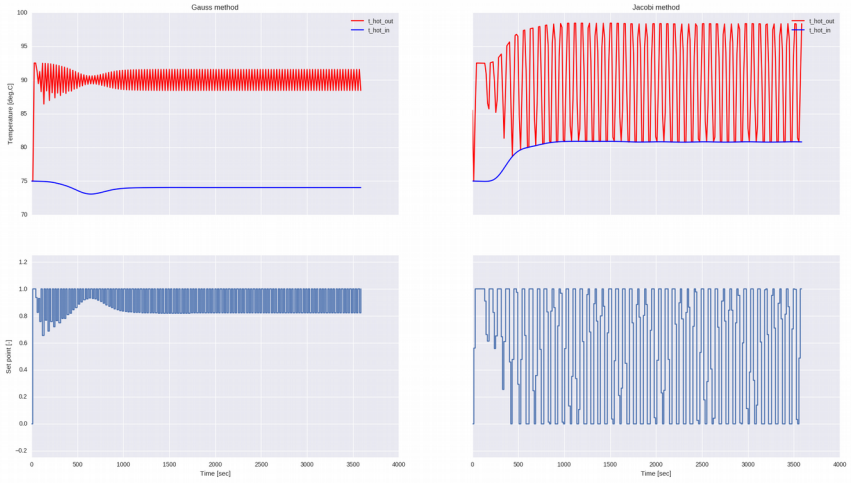
Problematics and challenges

Influence of:

- Sampling times
- Control strategies
- Dynamic/Static models
- Cyclic dependencies



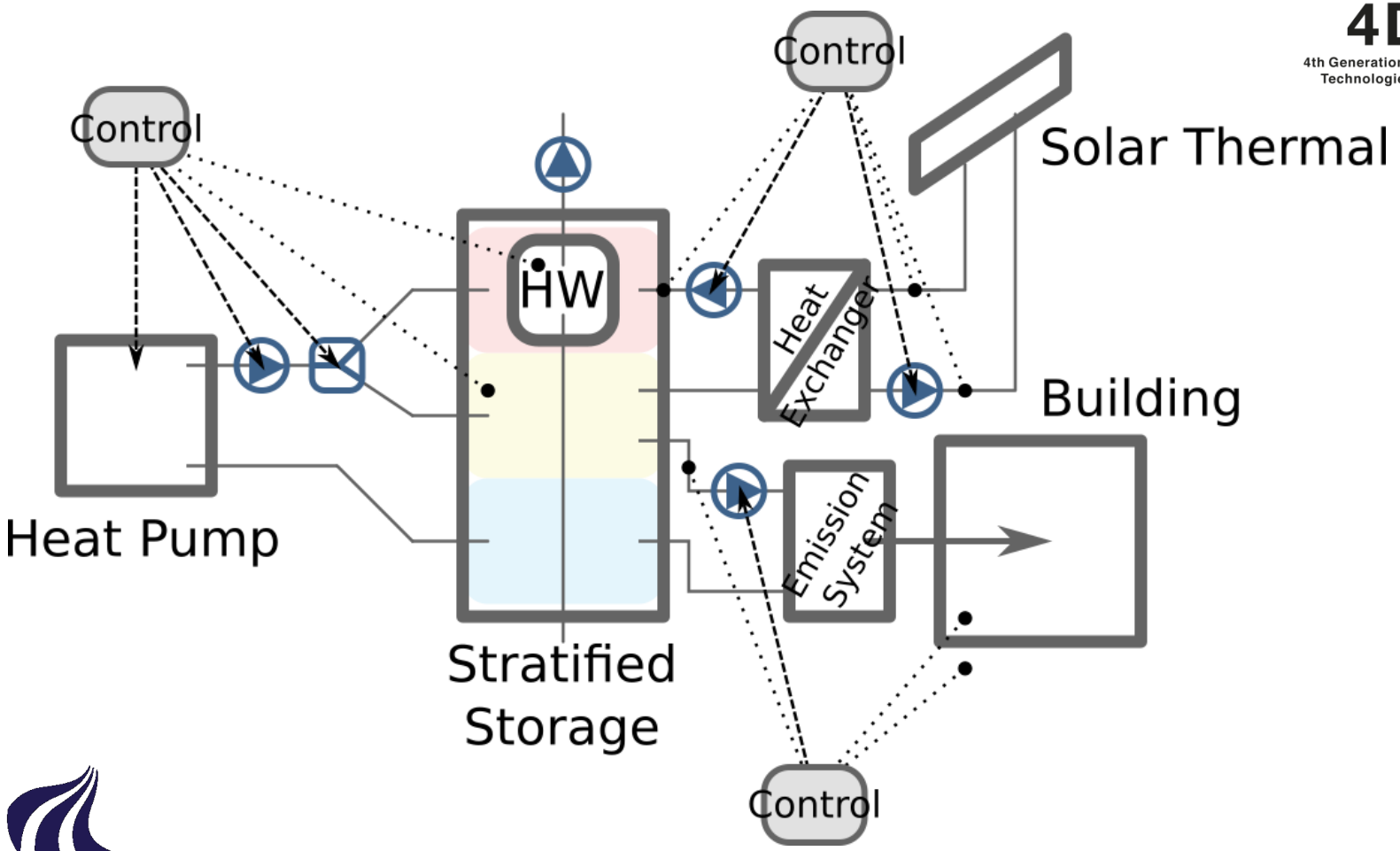
- Open loop
- Closed loop
- MPC



On:

- Stability
- Error
- Computation time

Proof of concept and solvers



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Tests, implementation and co-simulation tools

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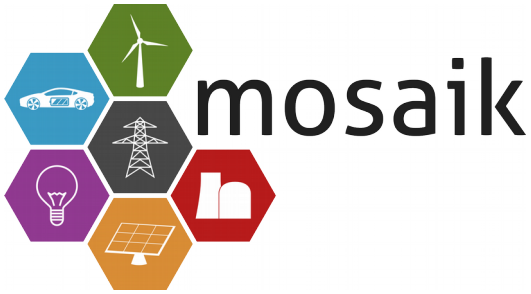
- **Mosaik**

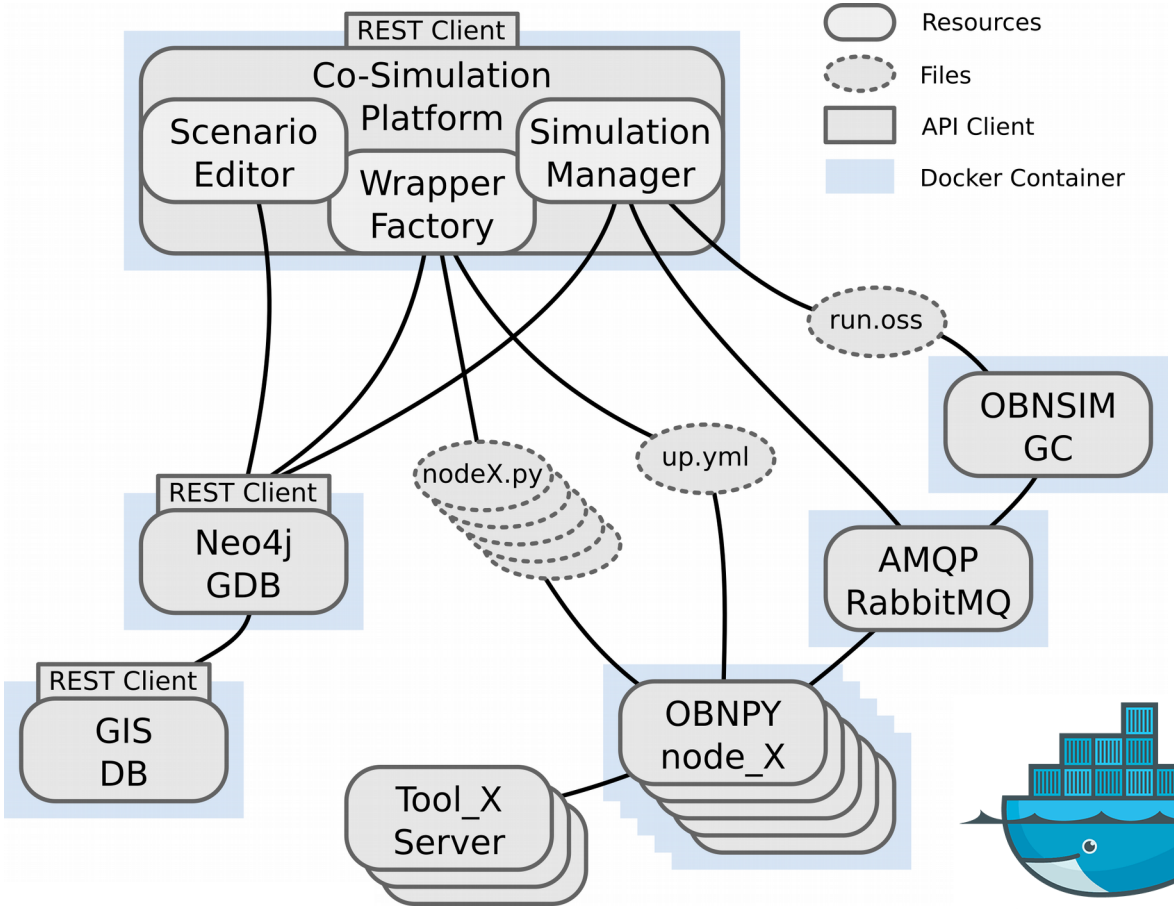
  → https://mosaik.offis.de/



- **OpenBuildNet**

  → https://sites.google.com/site/buildnetproject/software

IT structure - OpenBuildNet



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python

RabbitMQ

neo4j

docker

mongoDB

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Creating a tool

- OpenSource technologies
- Highly scalable structure
- Highly adaptive and modular architecture
- Distributed computation
- Academic work suited to industrial needs

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