

CELSIUS Talk: OPTi-mising district heating solutions

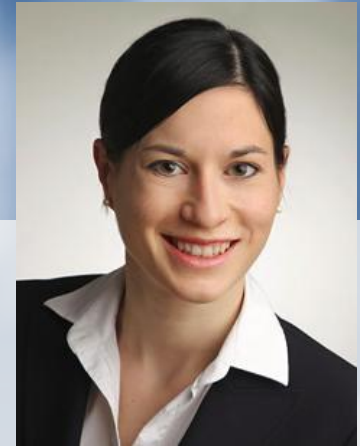
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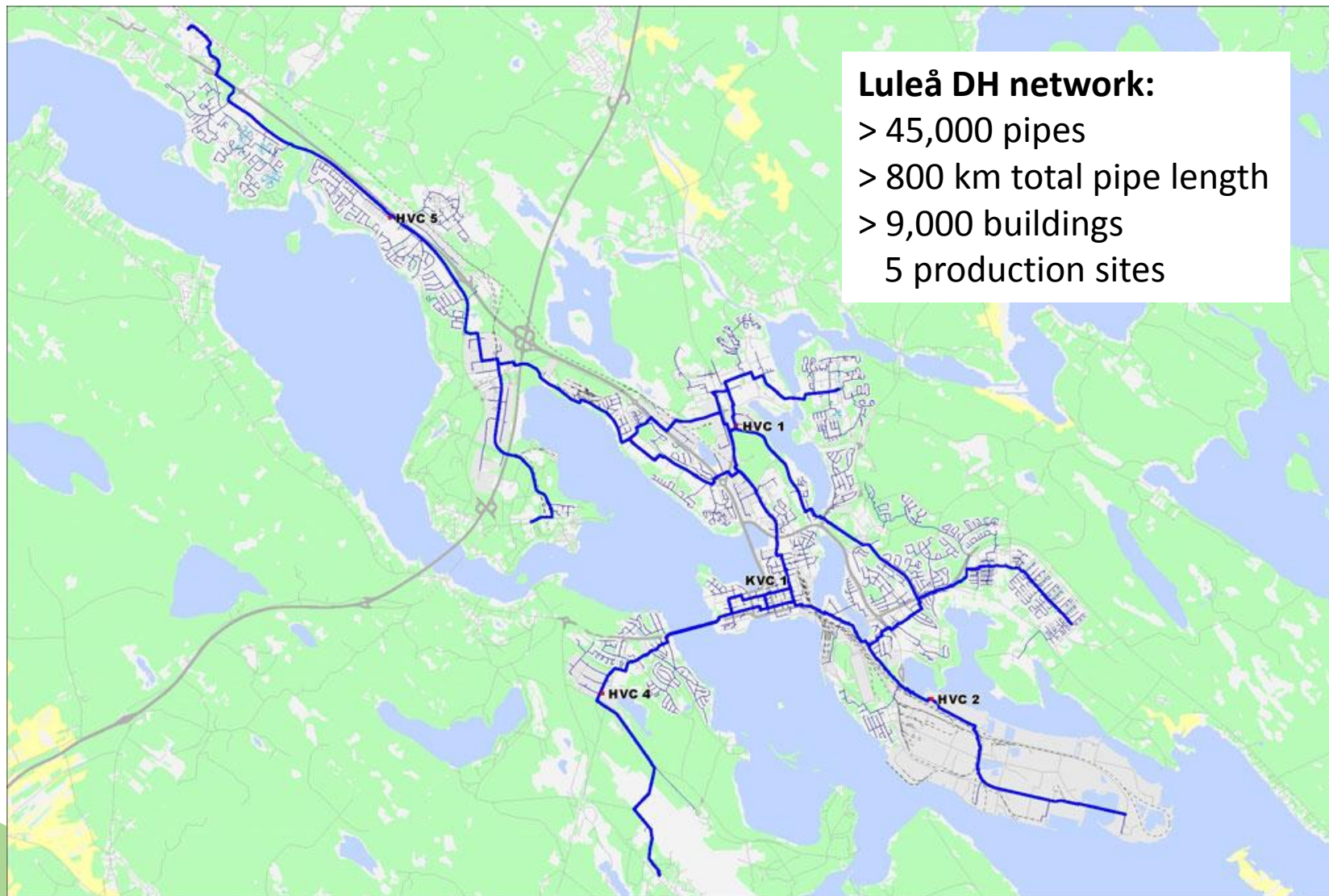


Virtualization of district heating systems

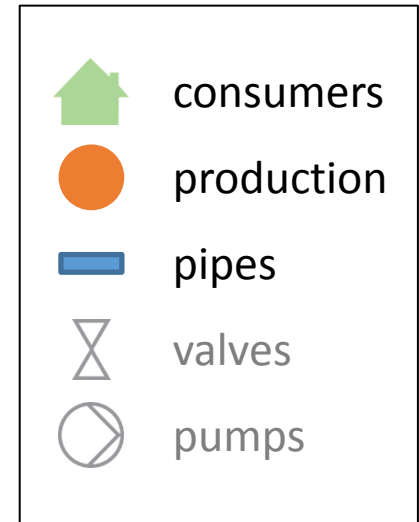
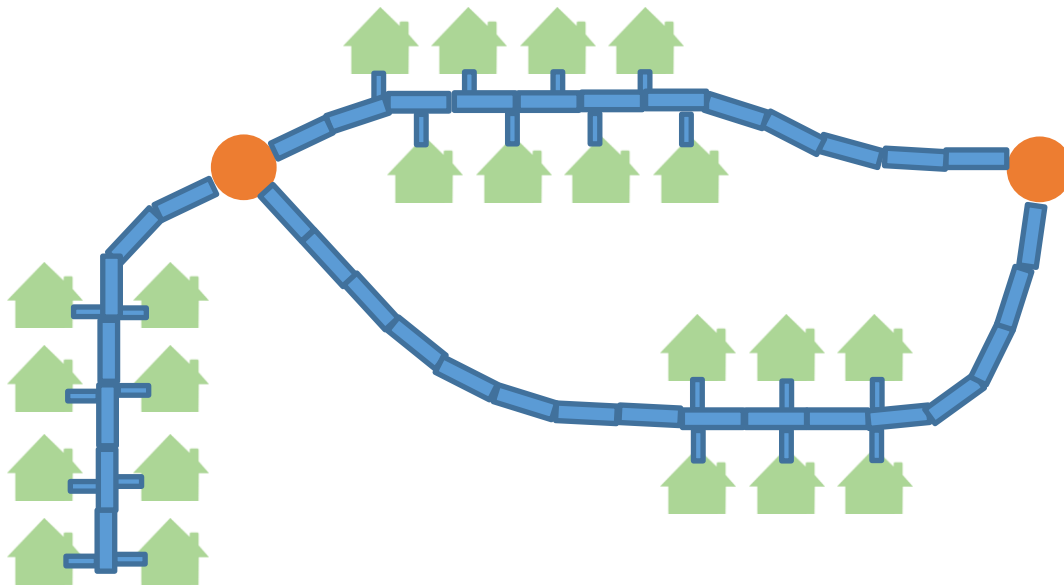


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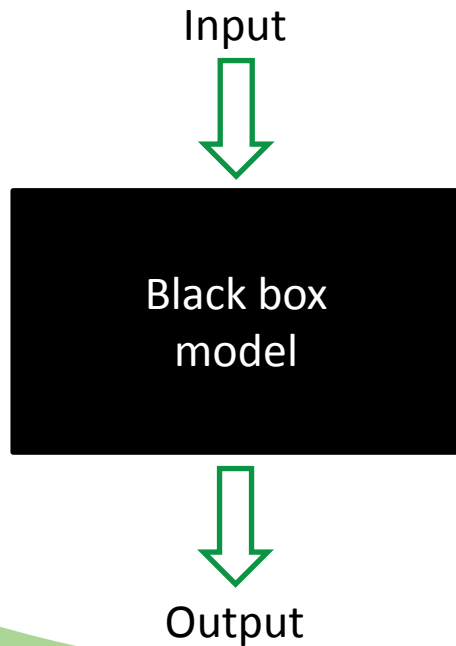
How to create a virtual DH network?



Black box modelling



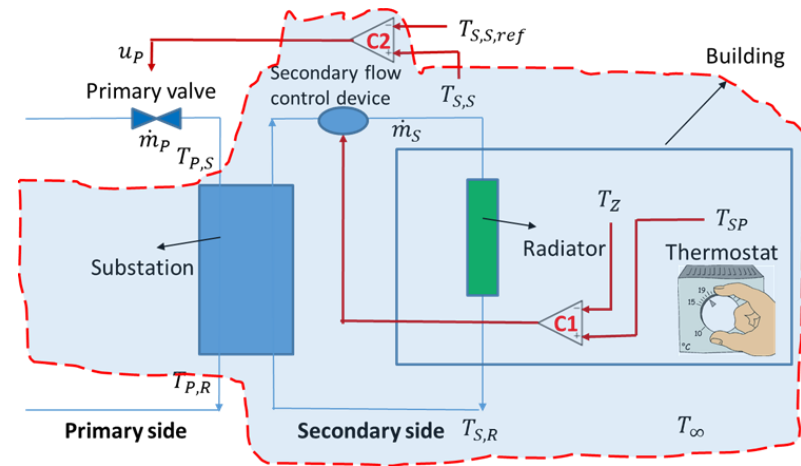
- Estimation of consumption from plain time series (no physics)
- Output: consumption of hot water and/or heating



Grey box modelling



- Estimation of consumption from time series **and** physical principles
- Outputs: indoor temperature, water return temperatures, water mass flow rate

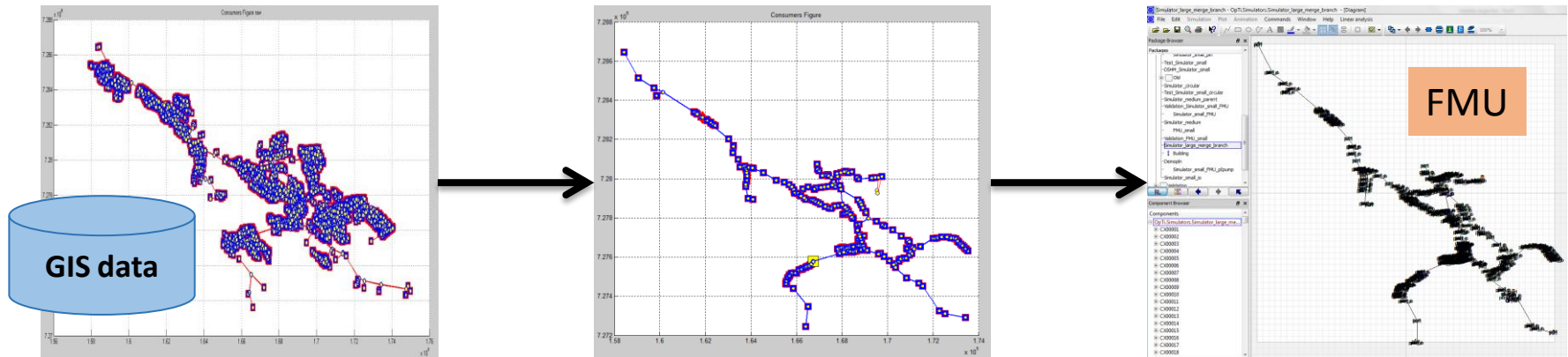


Network Modelling

- Coordinates and dimensions of all components as starting point
- Need for network reduction, simplification and automated model generation
- Approach enables simple updates of model when changes occur

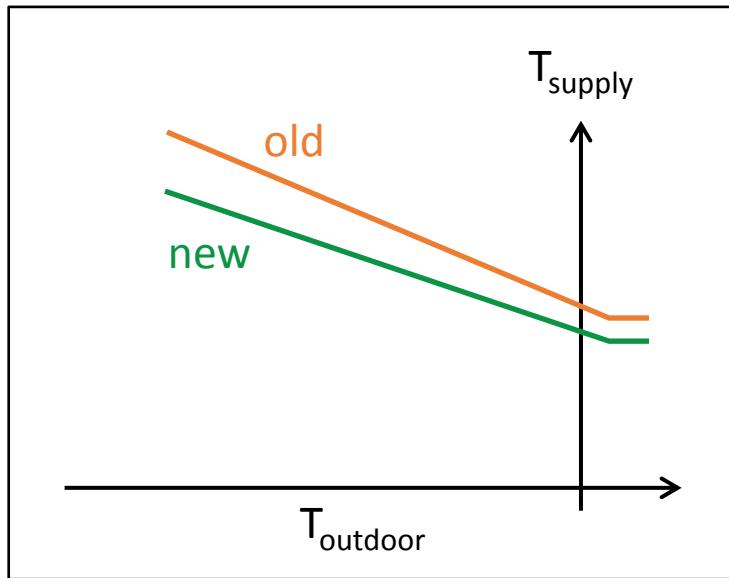
Reduction &
simplification
algorithms

Automated
model
generation

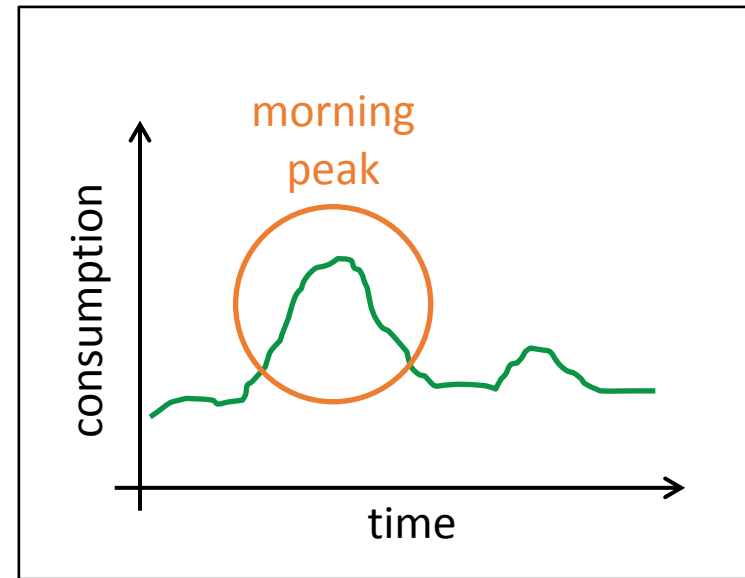


Model adjustment based on use cases

UC01: Decreased supply temperature

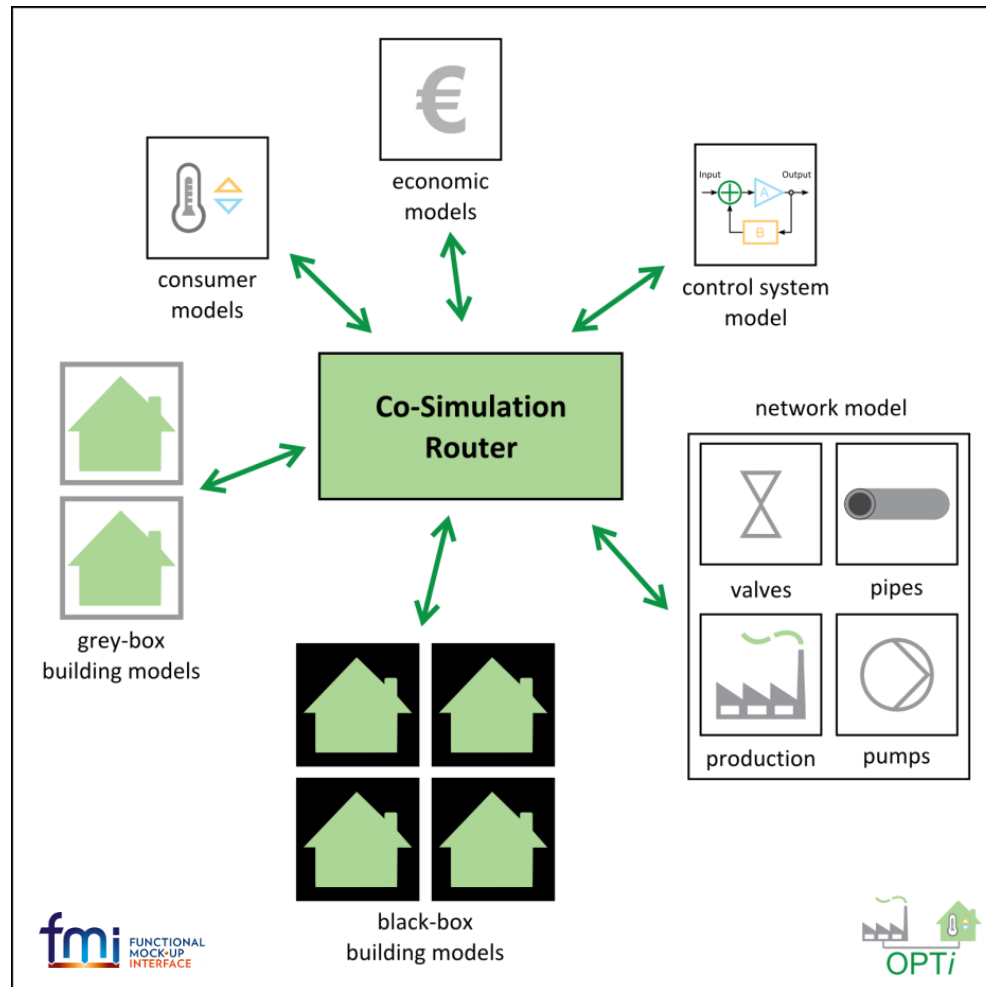


UC02: Peak load reduction



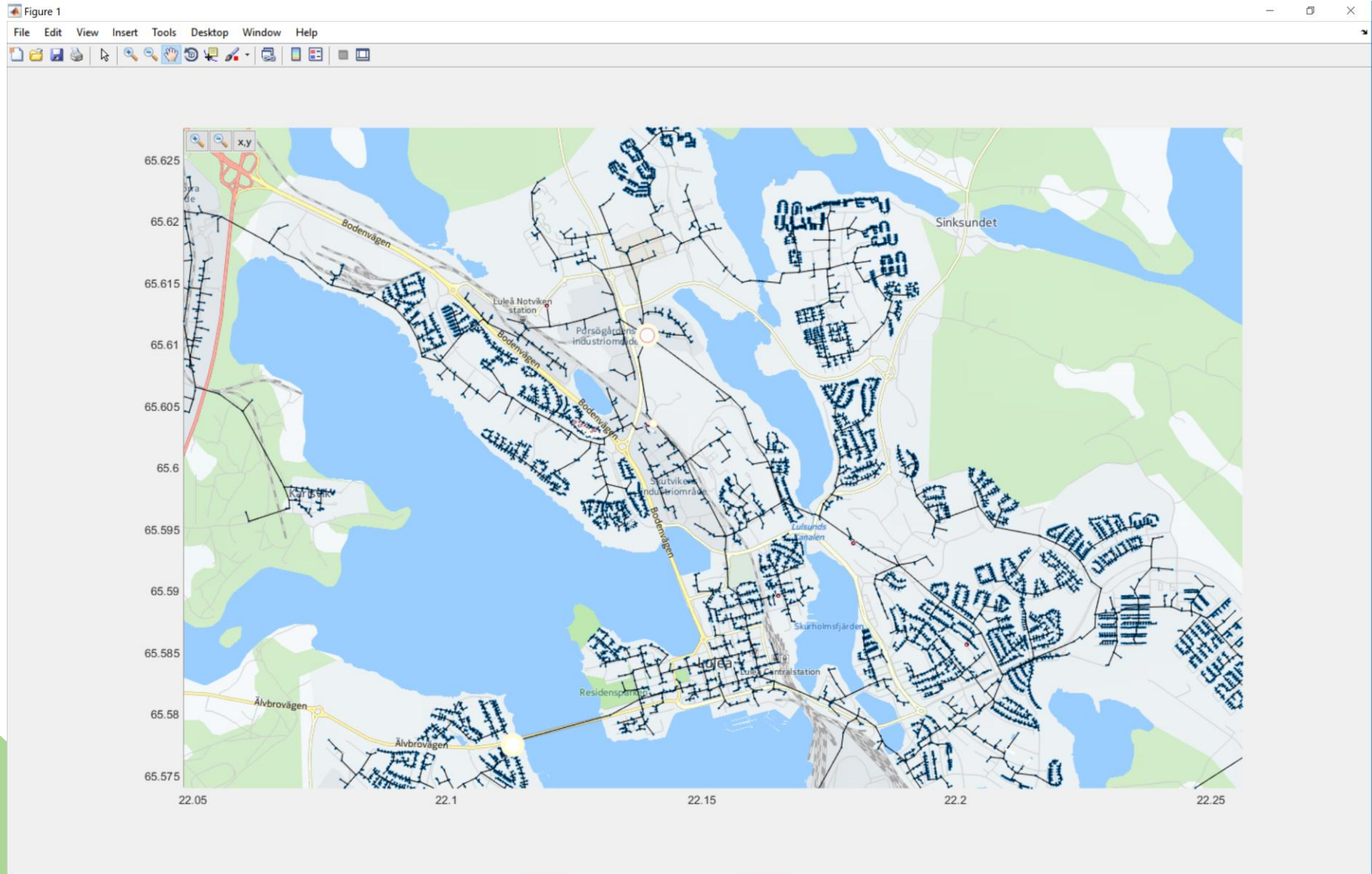
→ Tailoring of model based on use cases ensures simulation performance and flexibility of the approach.

OPTi-Sim: the virtual twin



→ Co-simulation approach secures flexibility and reusability.

OPTi-Sim: the virtual twin



- OPTi has developed a flexible and transferable workflow for creating a virtual DH system, including
 - consumer modelling approaches with different complexity,
 - tool for automated network model generation and simplification,
 - FMI compliant co-simulation integrating components of the DH system.
- The workflow and tools have been applied for the Luleå DH system, validation and first tests are ongoing.

