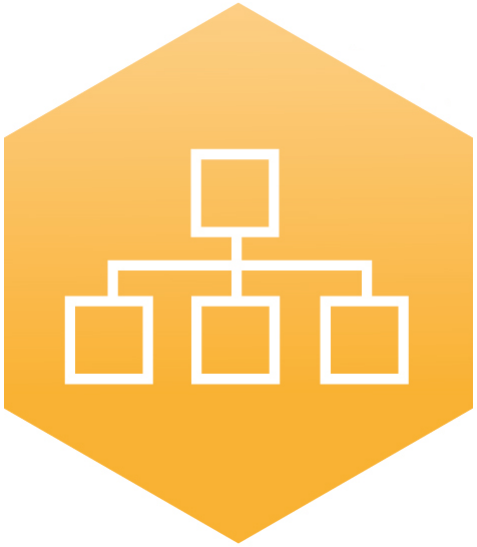
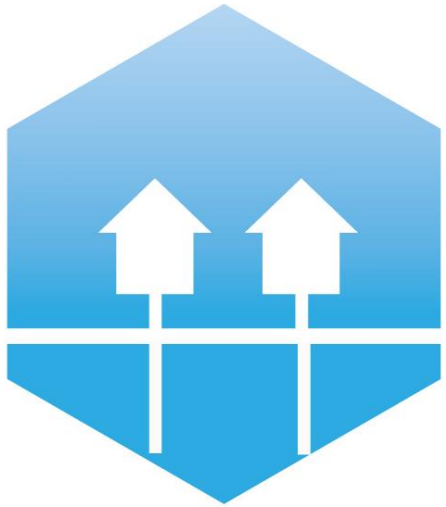
International Conference on Smart Energy Systems and 4th Generation District Heating
Copenhagen, 25-26 August 2015

Thermo-hydraulic simulation of district heating networks





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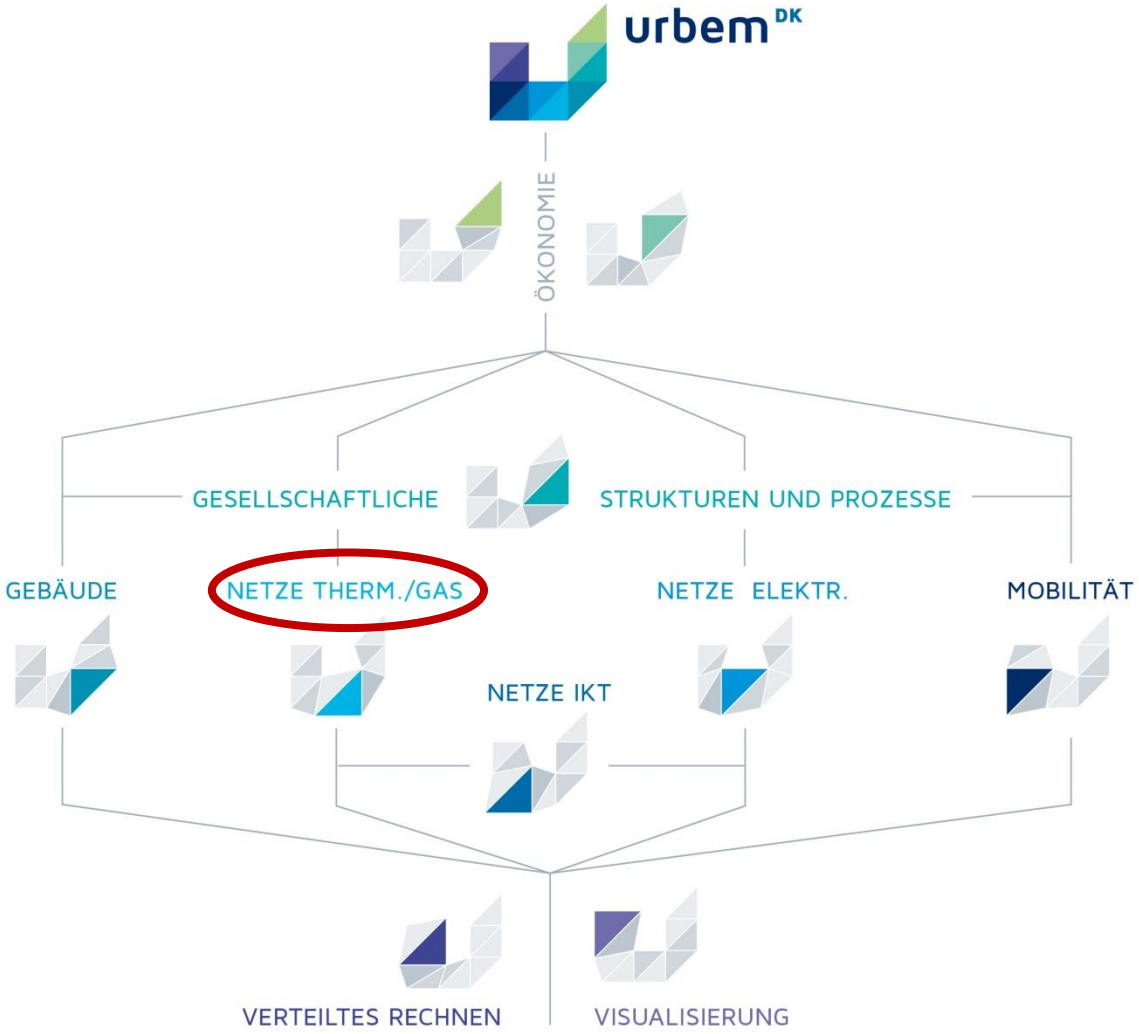
4DH
4th Generation District Heating
Technologies and Systems

Outline

- **Introduction**
- **Simulation of networks**
- **Further steps**
- **Conclusion**

Introduction

Introduction



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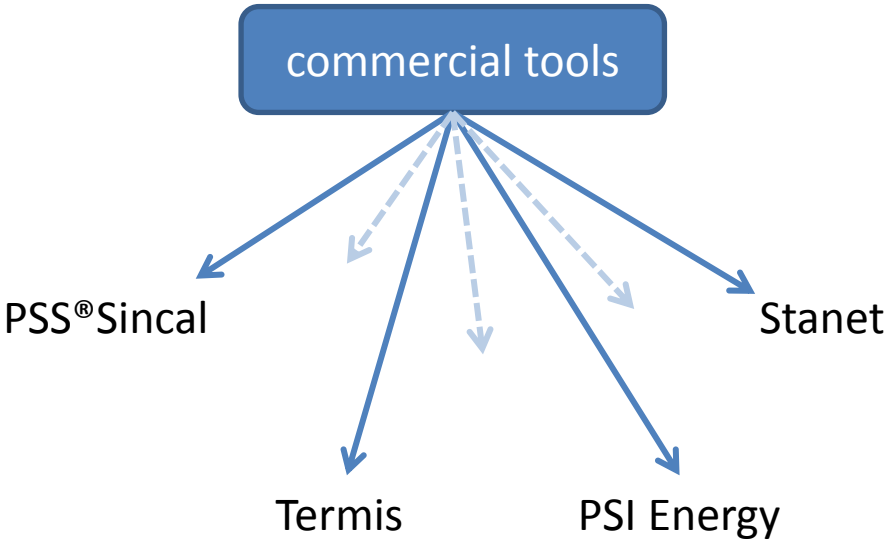
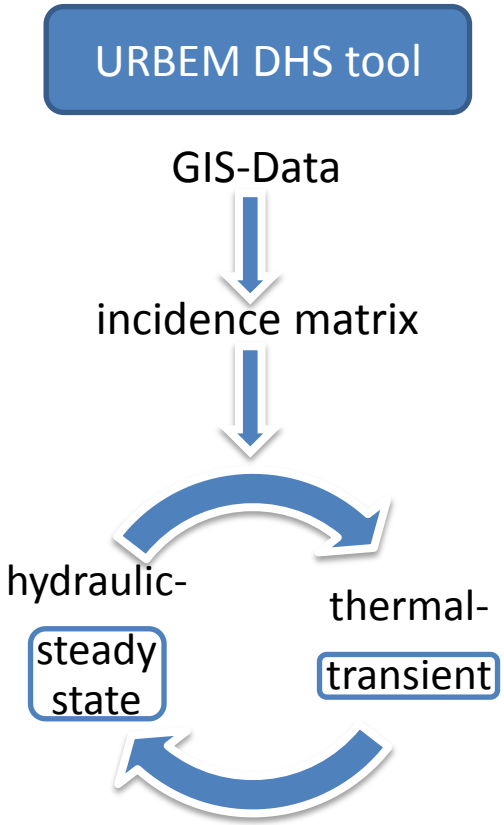
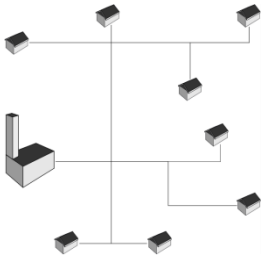
Simulation of networks



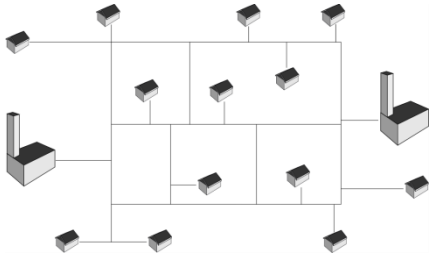


Simulation of networks

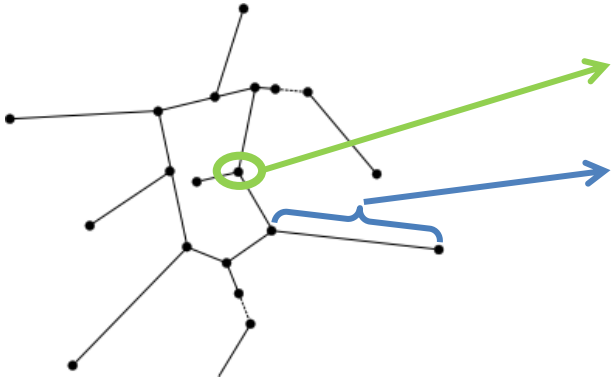
hydraulic calculation



radial network



meshed network



node: mass balance

string: pressure loss,
pumps,
valves

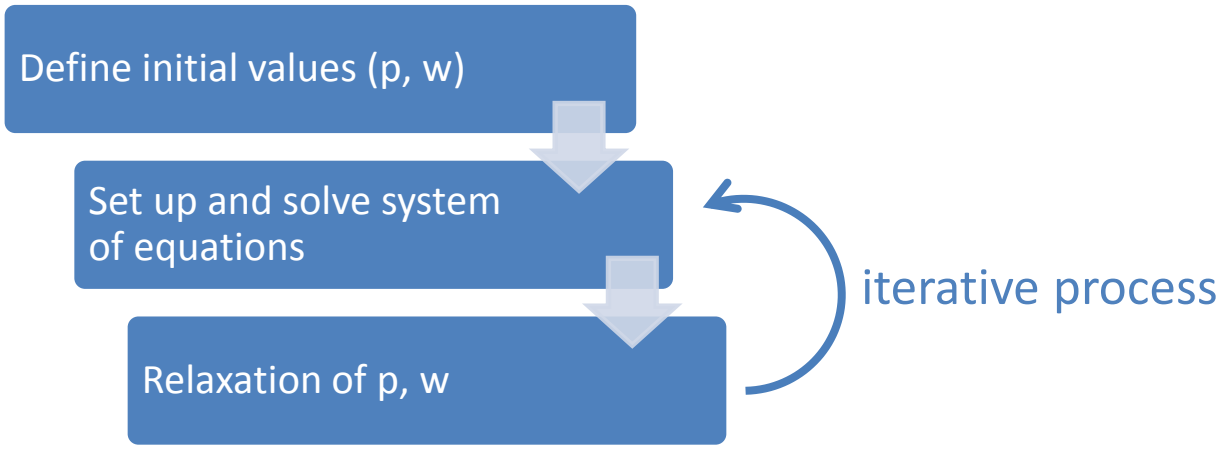
Simulation of networks

hydraulic calculation

String equations -> $f(w^2)$ lead to nonlinear system of equations

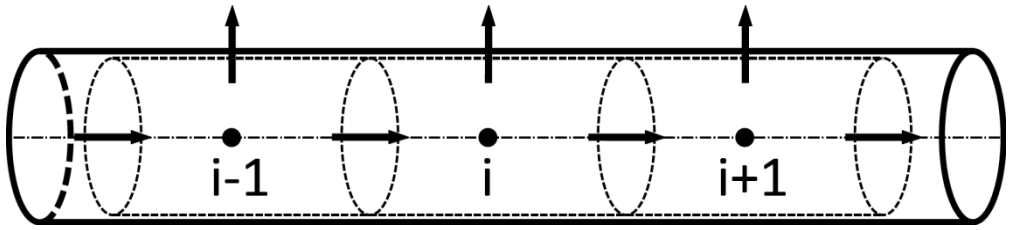
Simple linearization: $f(w^2) \longrightarrow f(w_{i-1} * w_i)$ (fixed, variable)

Procedure:



Simulation of networks

thermal calculation



FVM

implicit or explicit

hydraulic → pressure and velocity distribution → thermal

Simulation of networks

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analysis:

- pressure losses
- heat losses
- temperature management
- decentralized supply
- energy flow
- exergy flow
- usage of storages

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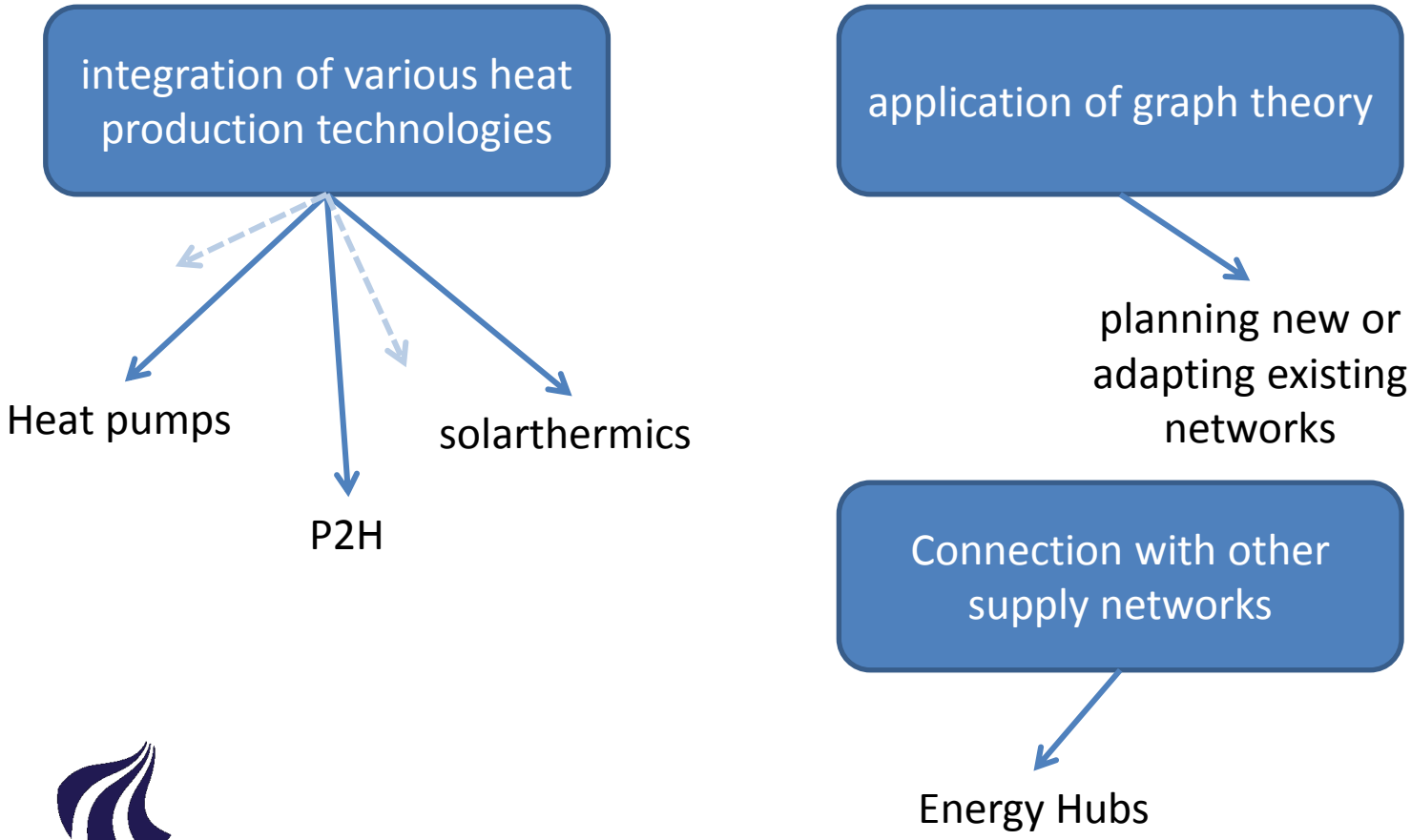
Further steps



conclusion

GIS-based network calculation tool

hydraulic -> steady state

thermal -> transient

basis for various analysis

exisiting and future DHN