

EU FP6 ECO-BUILDINGS PROJECTS

INNOVATIONS IN BUILDING MANAGEMENT SYSTEMS

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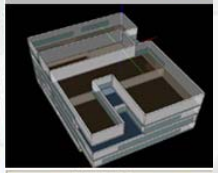
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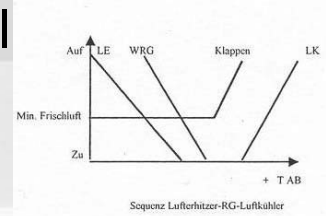
zentrum für angewandte forschung an fachhochschulen

nachhaltige energietechnik

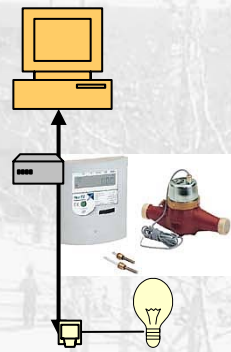


Energy consumption control in Building Management Systems

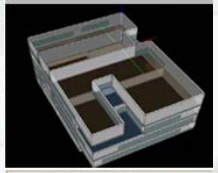
1. BMS → Building and energy supply system control
Only in some cases:
→ Monitoring of energy consumption



2. Problem of simple energy consumption monitoring:
→ Consumption depends on ambient temperature, solar irradiation, user behaviour
→ Only obvious system faults are detectable



3. Energy management methods: passive monitoring, active "manual" decision making



Model based monitoring and control

Active Energy management with improved fault detection and improving control strategies

Bring simulation from the planning phase into the operation phase
“Hardware – in – the loop” testing of controllers

Applications buildings

Optimisation of control strategy

→ Room comfort control: Simulate switch on/off times of heaters/coolers

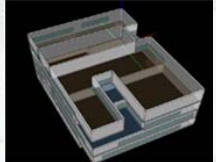
→ Simulate passive night cooling times using predictive control

→ Optimise heating/cooling strategies using weather forecast

Application energy supply plants

→ Detection of “hidden” system faults like slow degradation or mismatching control parameters

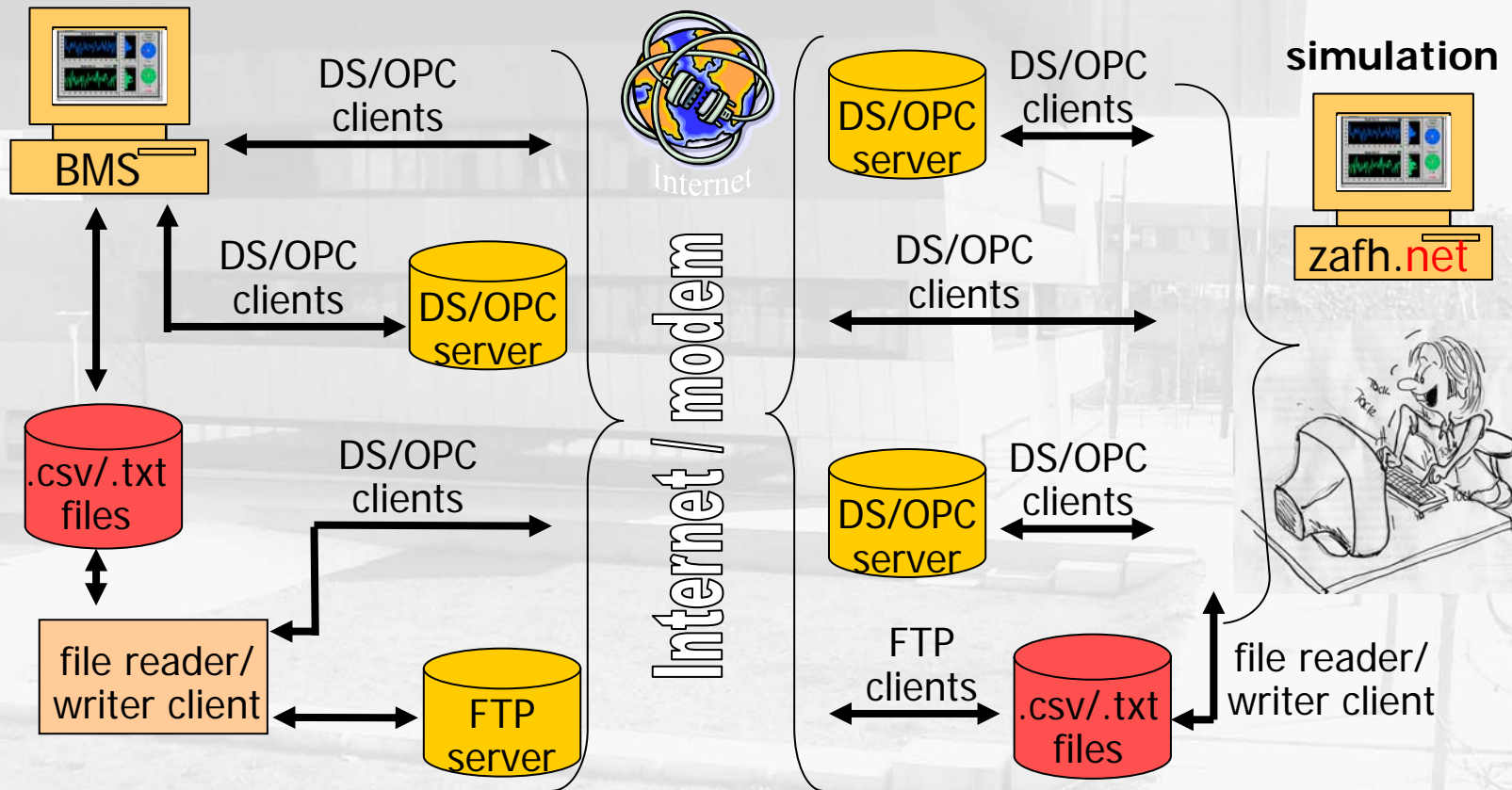
Question: Static/dynamic models, detail of modelling



Energy management systems

Model based control

Possible communication solutions depend on BMS

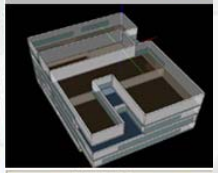


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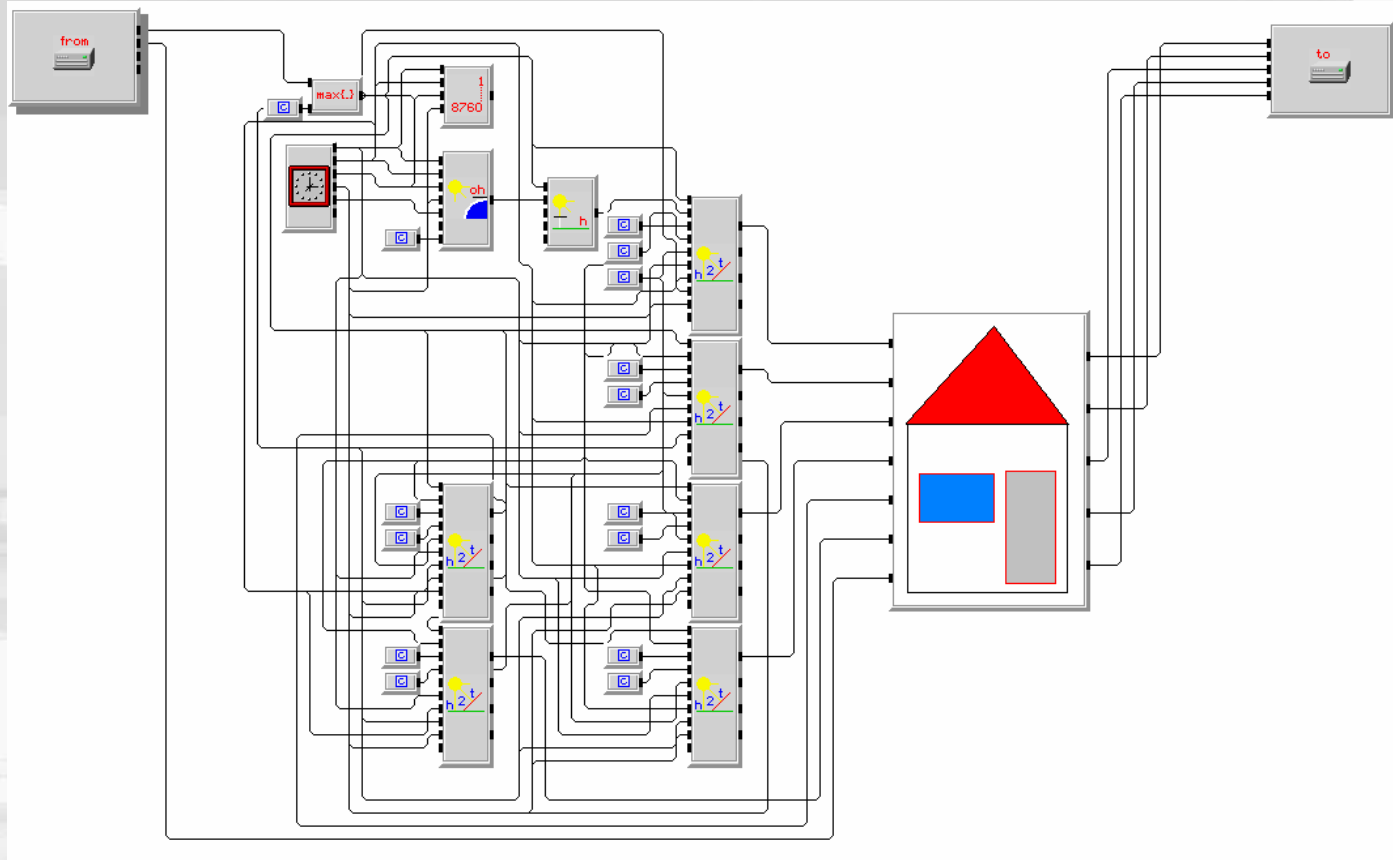
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Energy management systems

Model based control

Online building simulation model in INSEL

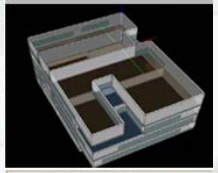


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Example Project SARA

Seven ECO-buildings with innovative BMS and control strategies



analysis and improvement of the implemented BMS control strategies

- development and integration of online simulation tools

→ Building simulation (static/dynamic)

→ Part of energy supply systems:

- PV-System all buildings
- Ventilation and cooling system some buildings



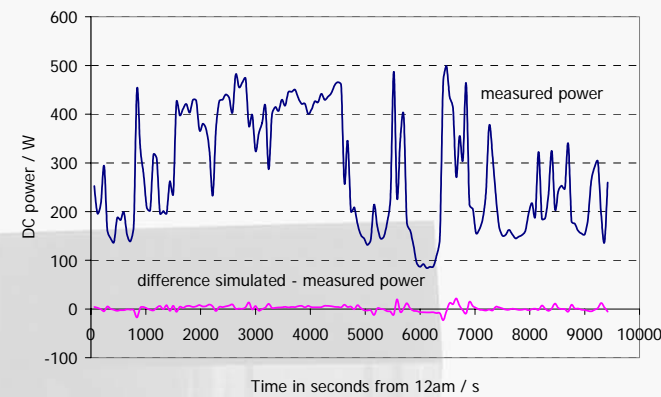
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Example Project SARA

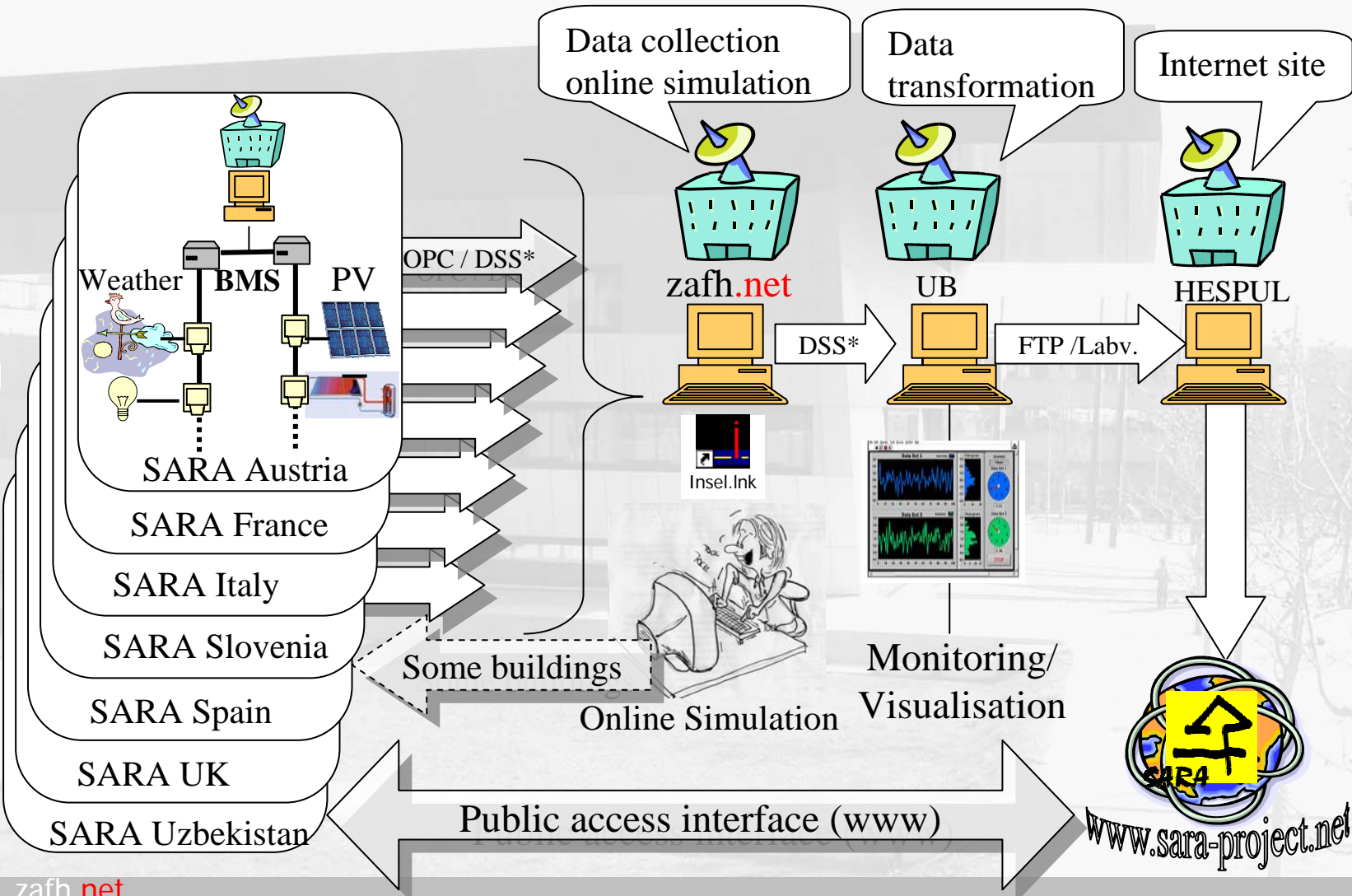
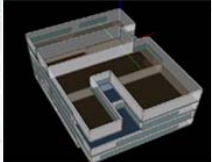
Online Simulation and monitoring



- PV-Systems educational office building in Southampton, UK and training centre in La Tour des Salvagny, France
- Heating energy demand of the educational office building in Southampton with special focus on the Atrium
- Cooling and ventilation system including the liquid desiccant air drying unit and a building model, primary health care centre in Barcelona, Spain

Example Project SARA

Communication and dissemination structure



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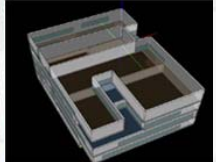
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Example Project

1st EM implementation: Cityhall Scharnhauser Park

Building description:

- Completed end of 2003
- 4186 m² heated floor area
- Low energy standard 41 kWh/m²a
- Electricity consumption 43 kWh/m²a
- No active cooling device
- Mostly naturally ventilated
- Kieback & Peter BMS

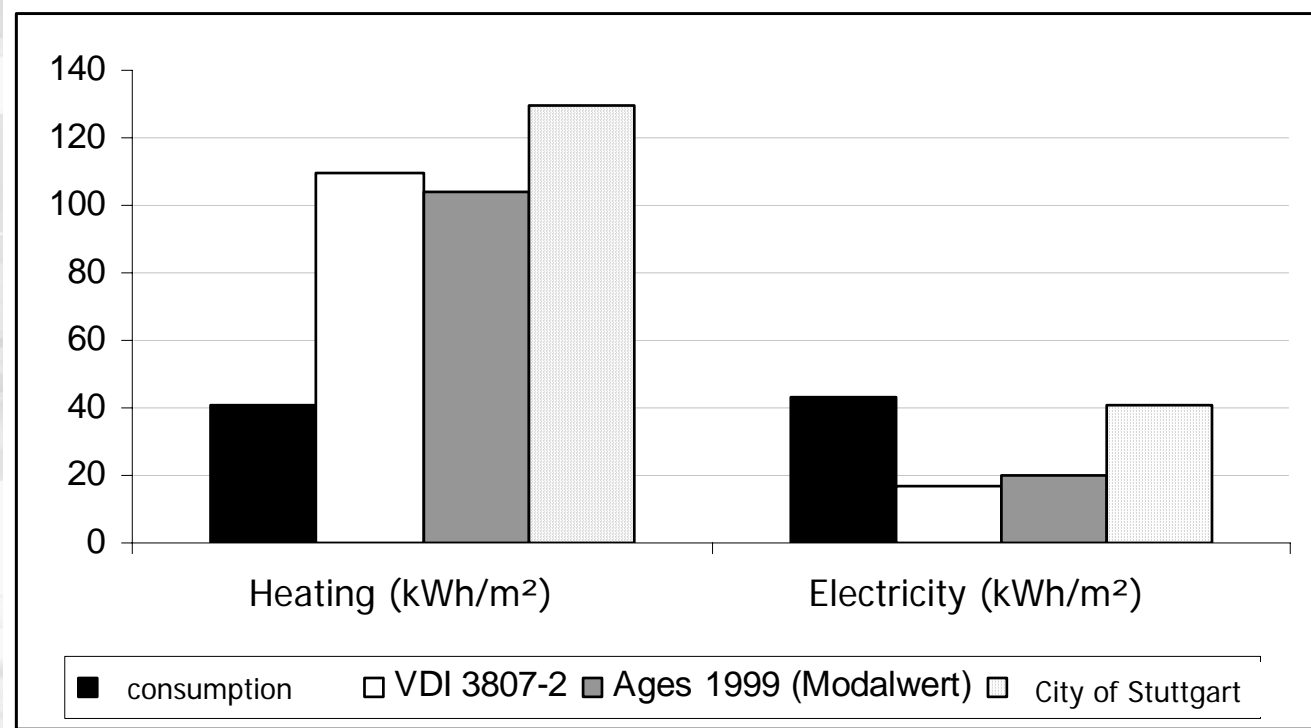


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Comparing energy indicators

- German engineering association VDI 3807-2 (1994)
- Ages GmbH 1999
- City of Stuttgart, energy report 2003

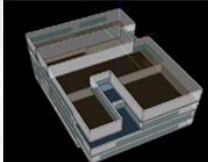
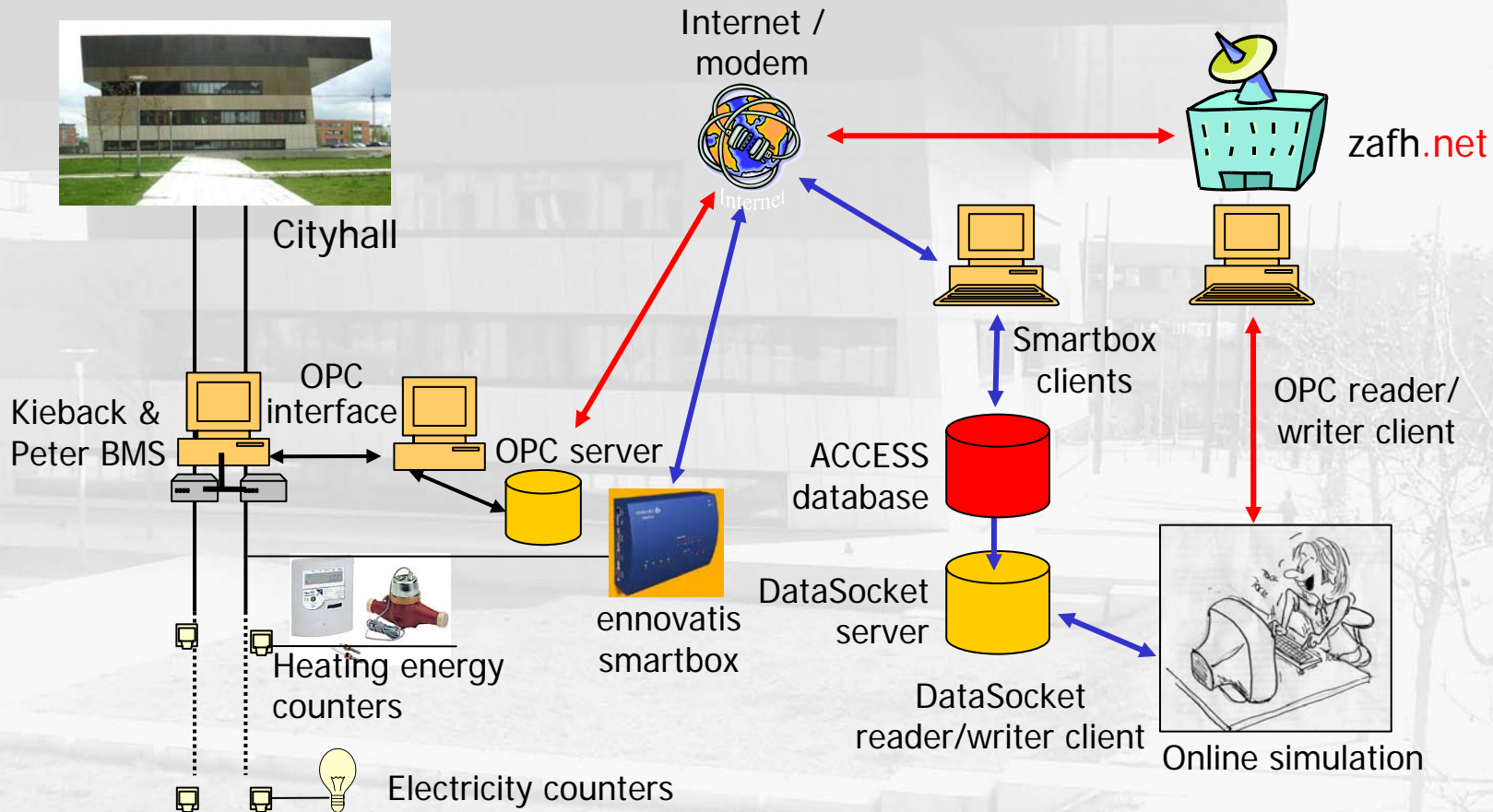


Example Project

Cityhall Scharnhauser Park



Implemented communication infrastructure



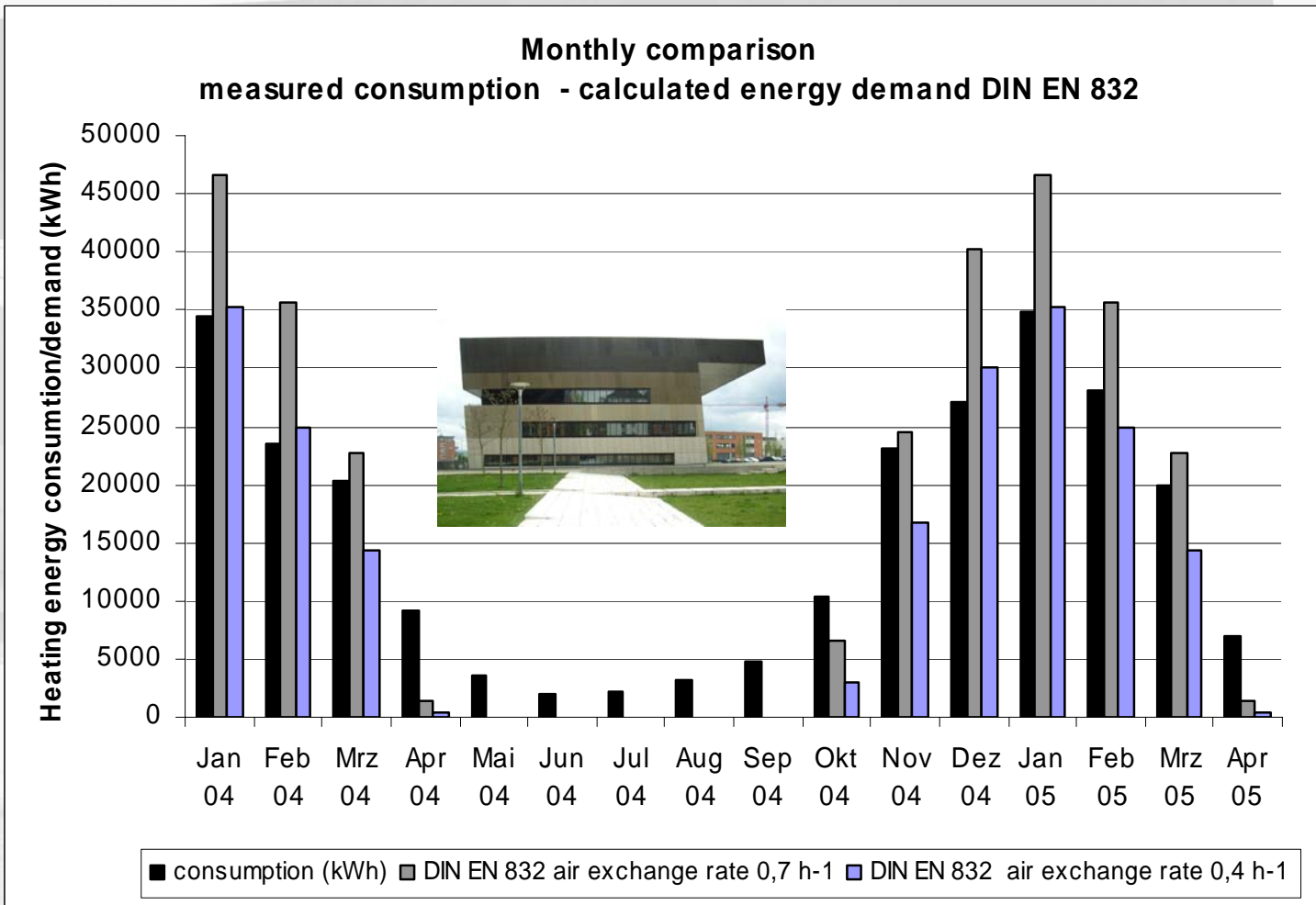
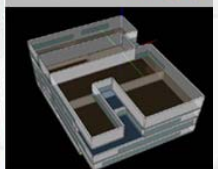


Example Project

Cityhall Scharnhauser Park: Energy balances



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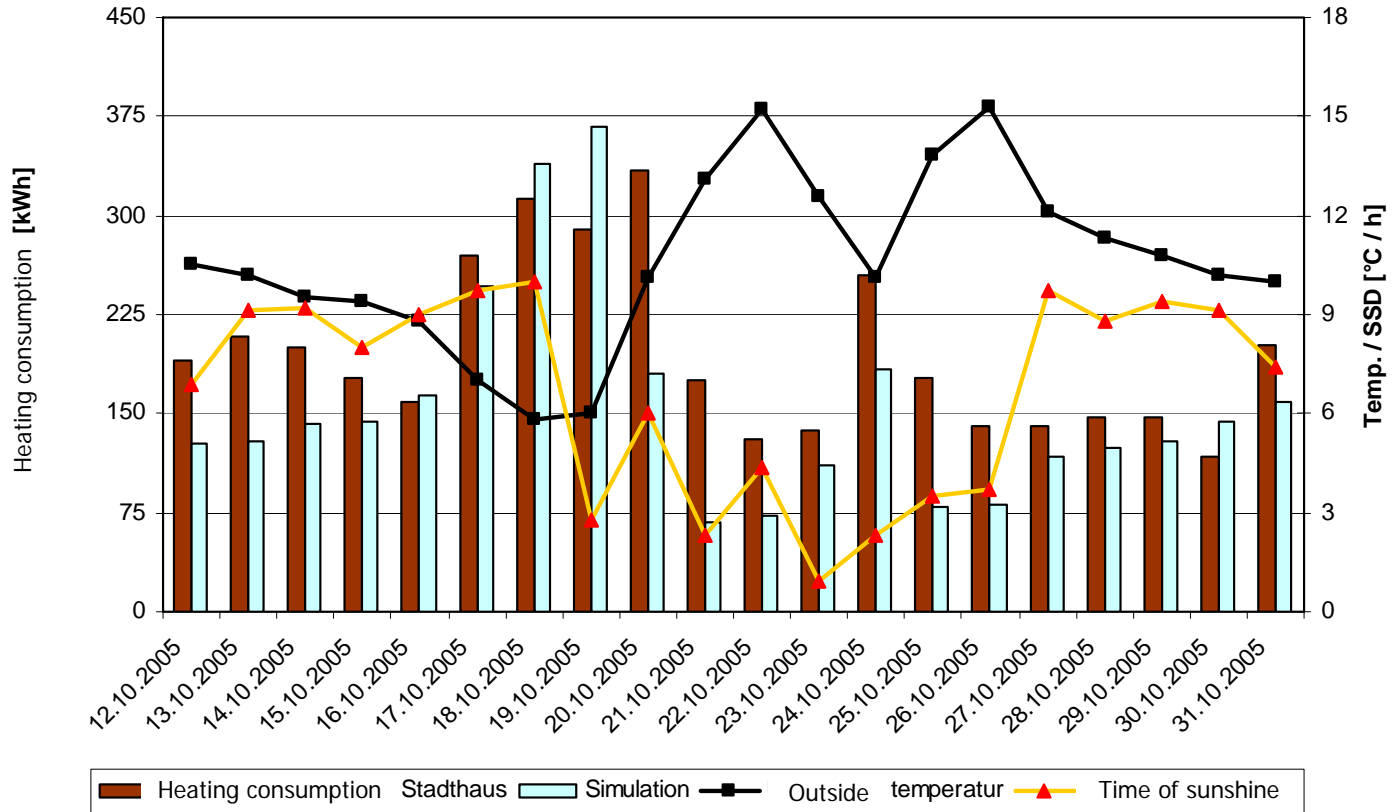
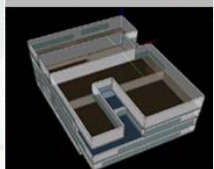
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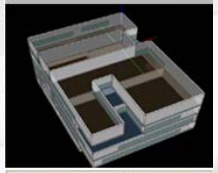
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Daily comparison of measured and consumed data



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Outlook and conclusions

..to determine modelling depth of different simulation models

..to analyse user behaviour (ventilation, internal loads)

..to use weather forecast data for energy demand prediction and control strategies

IN ORDER TO: reduce energy consumption and cost, as 80% of cost occur during building operation!