

SYSTEM-OF-SYSTEMS THAT ACT LOCALLY FOR OPTIMIZING GLOBALLY

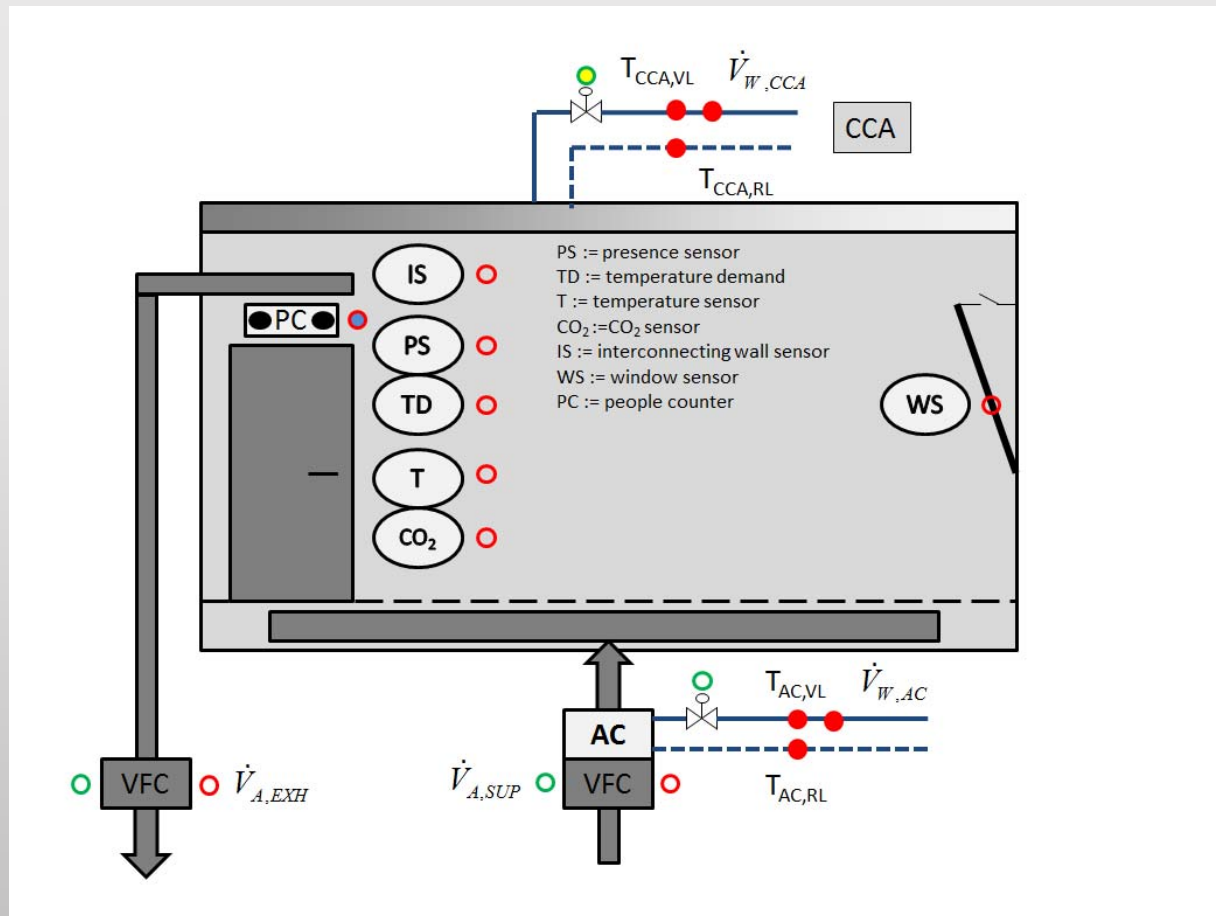
EU FP7 - SMALL/MEDIUM-SCALE FOCUSED RESEARCH PROJECT (STREP)
FP7-ICT-2013.3.4: ADVANCED COMPUTING, EMBEDDED AND CONTROL SYSTEMS
D) FROM ANALYZING TO CONTROLLING BEHAVIOUR OF SYSTEM OF SYSTEMS (SOS)

Local4Global Consortium Meeting

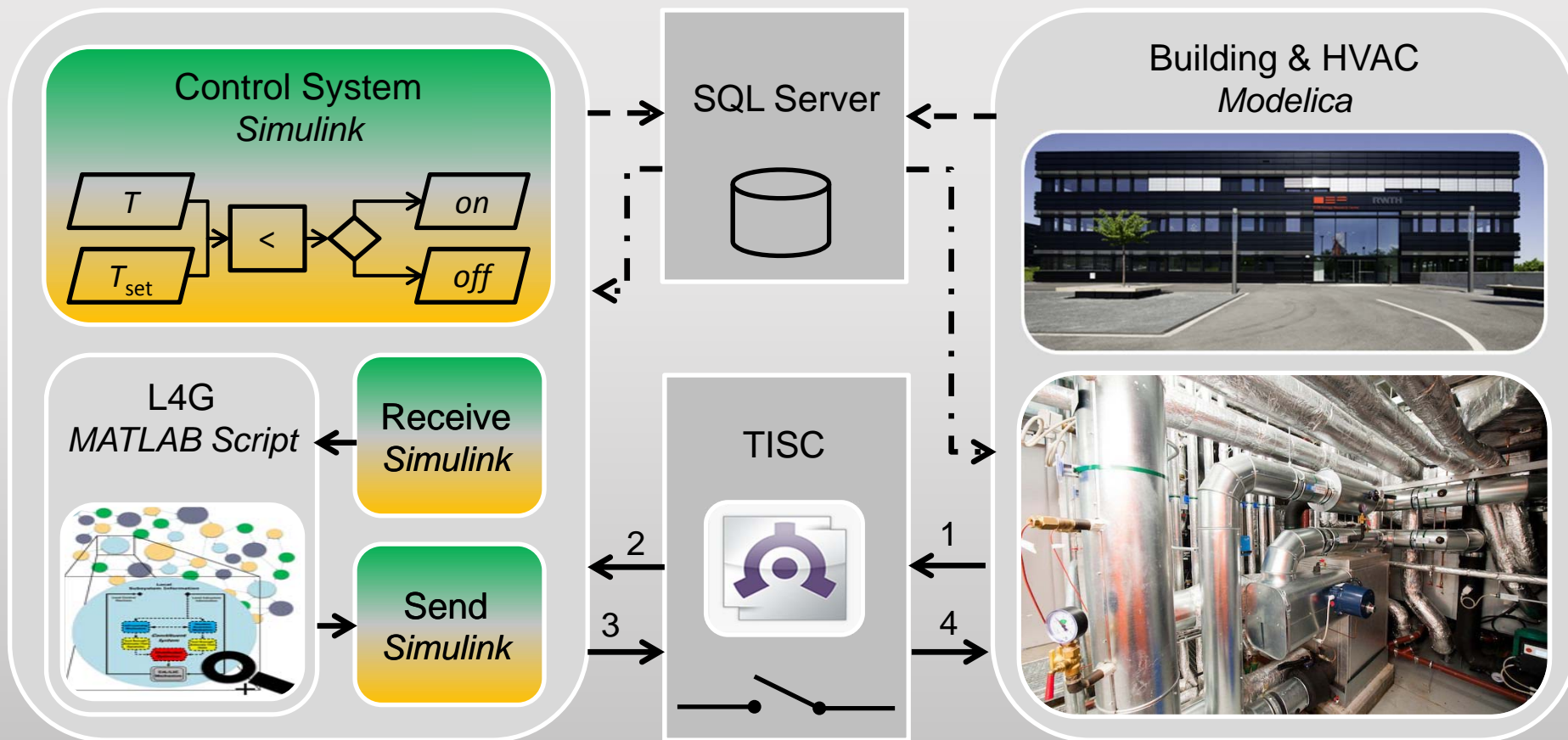
L4G implementation strategy
Roosbeh Sangi, RWTH Aachen University

23.09.2015
Crete, Greece

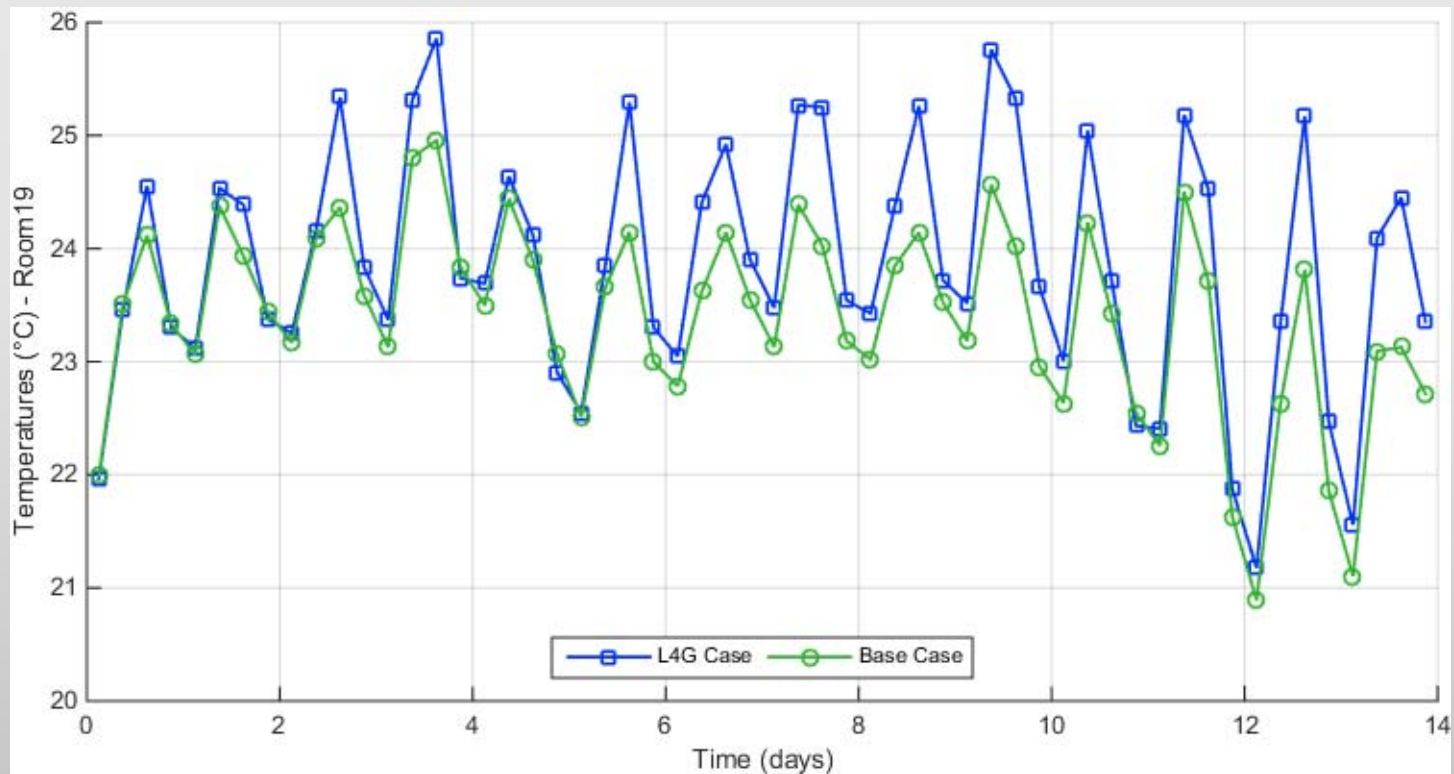
Conference constituent system



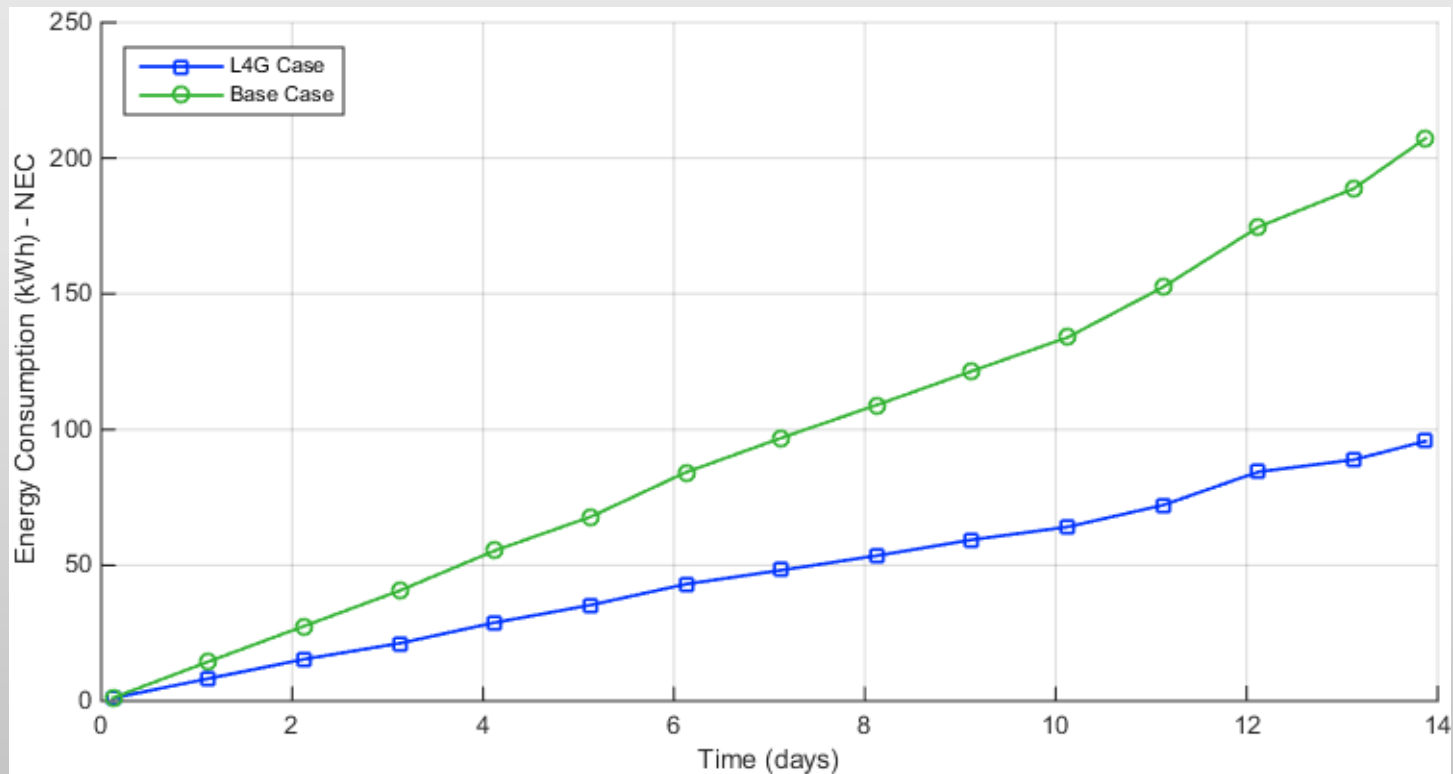
L4G implementation strategy



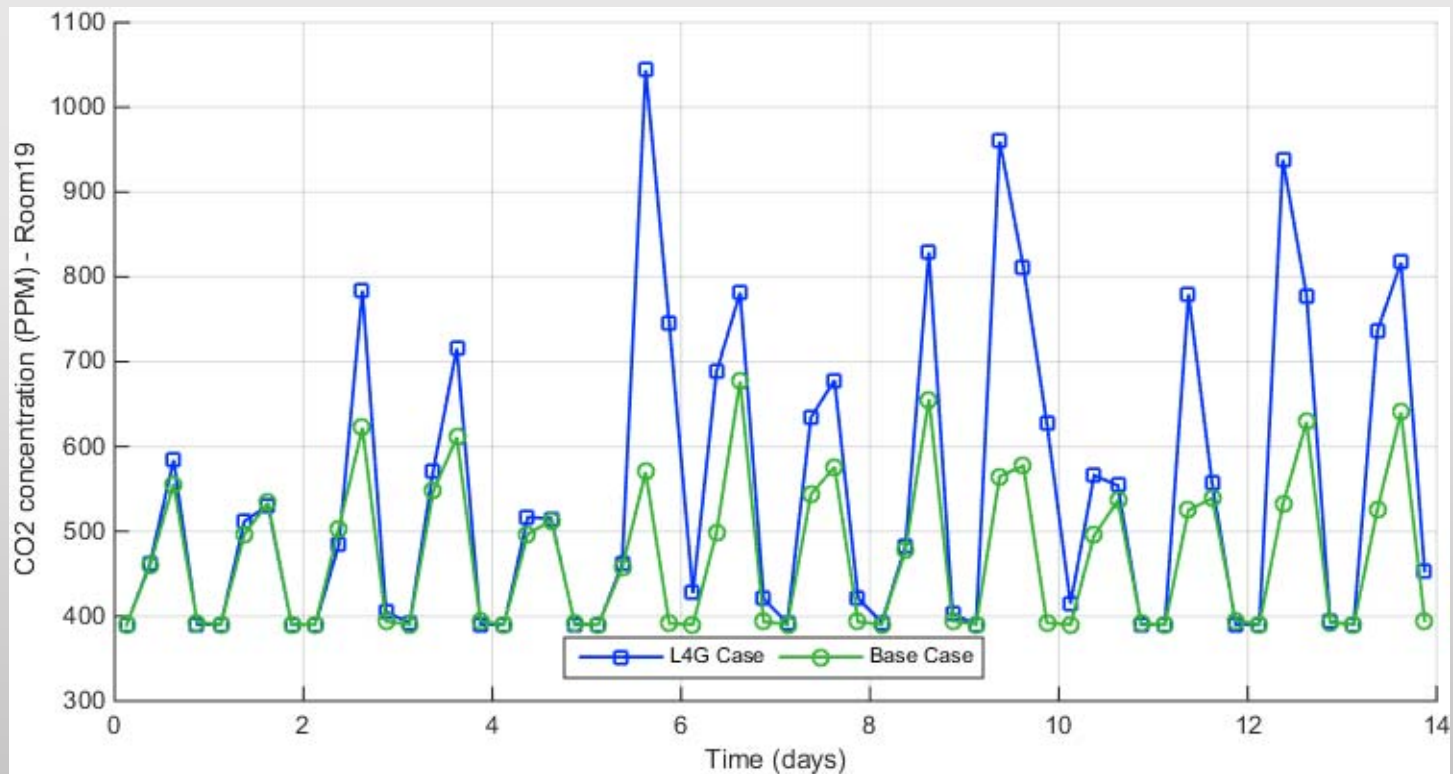
Results (Temperature)



Results (Energy consumption)



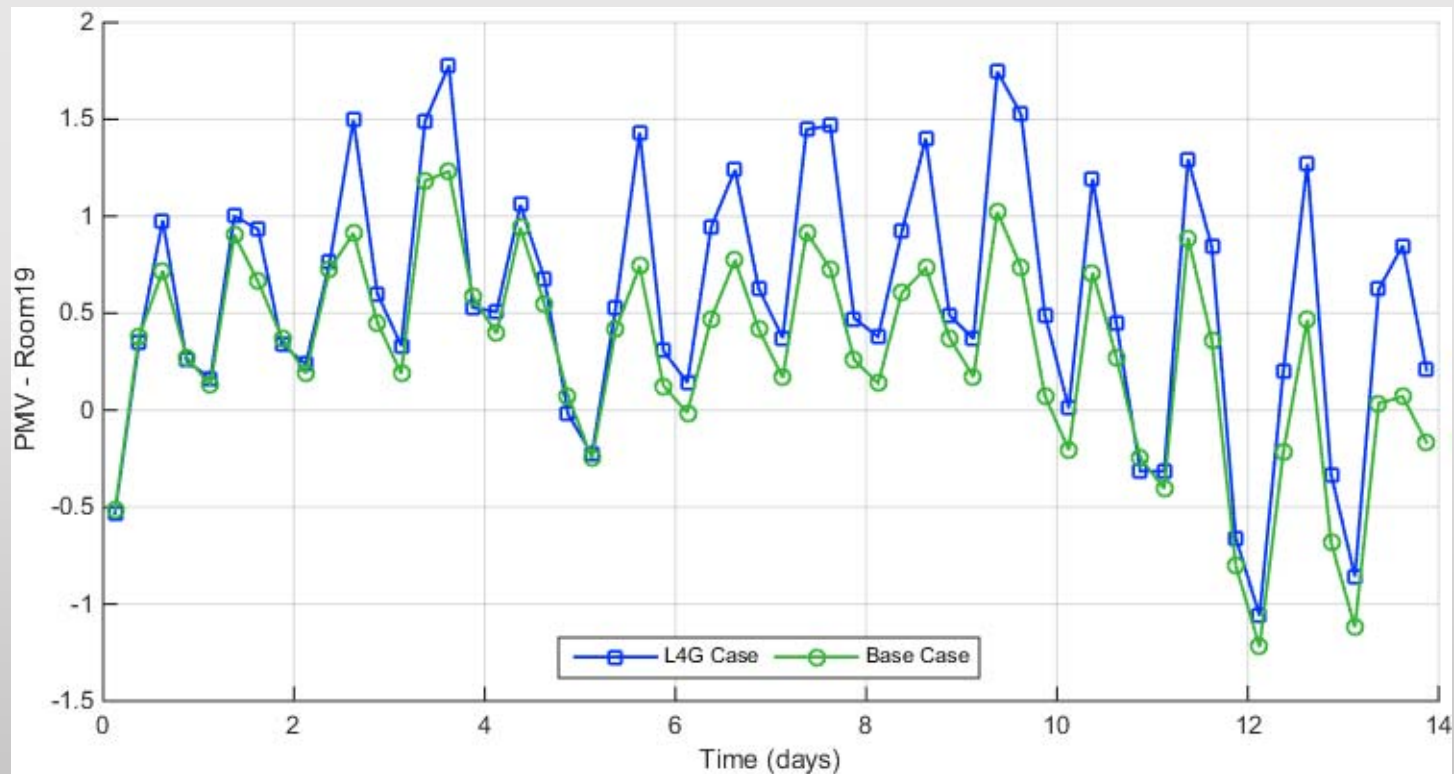
Results (CO₂ concentration)



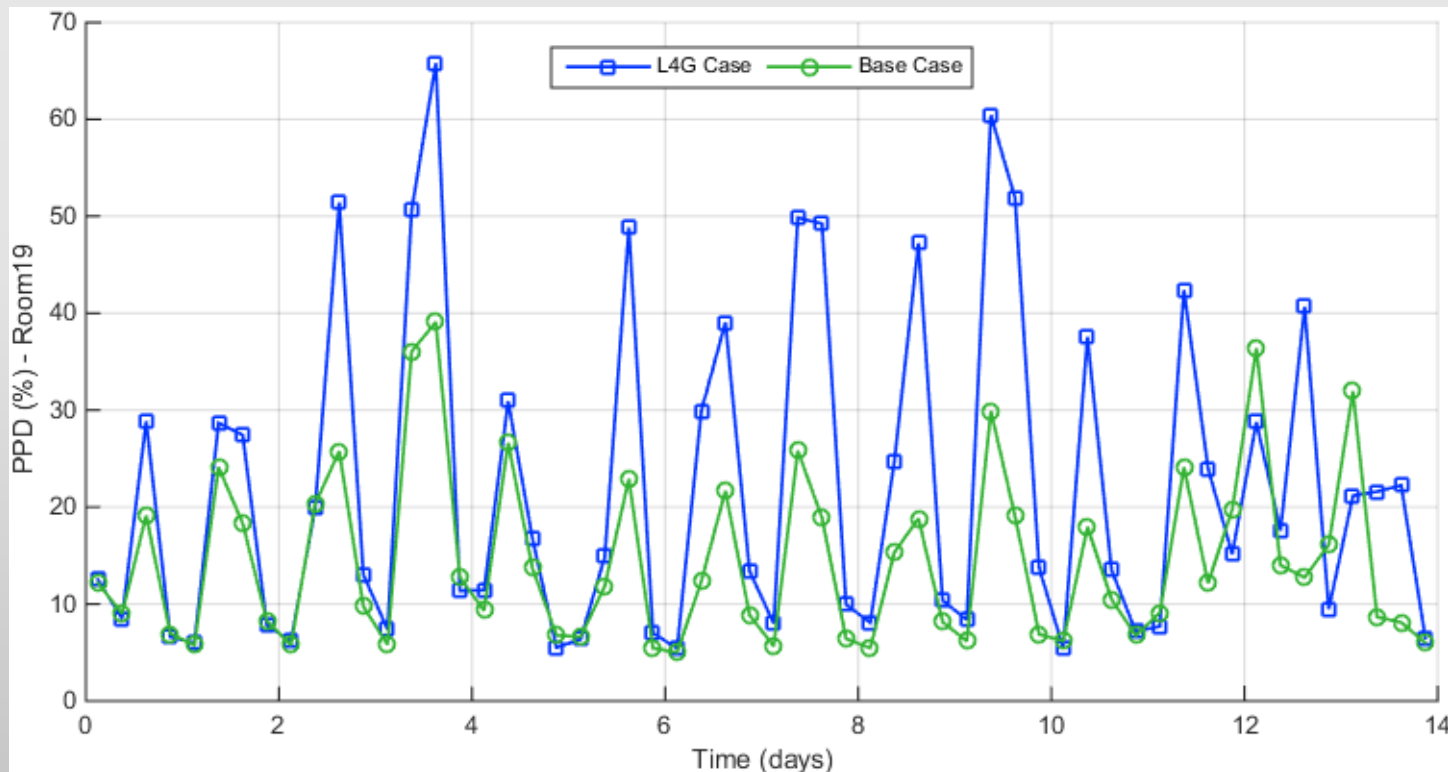
Thermal comfort models (Fanger)

- Predicted Mean Vote
 - The Predicted Mean Vote (PMV) refers to a thermal scale that runs from Cold (-3) to Hot (+3), originally developed by Fanger and later adopted as an ISO standard.
- Predicted Percentage of Dissatisfied
 - Predicted Percentage of Dissatisfied (PPD) predicts the percentage of occupants that will be dissatisfied with the thermal conditions. It is a function of PMV, given that as PMV moves further from 0, or neutral, PPD increases.

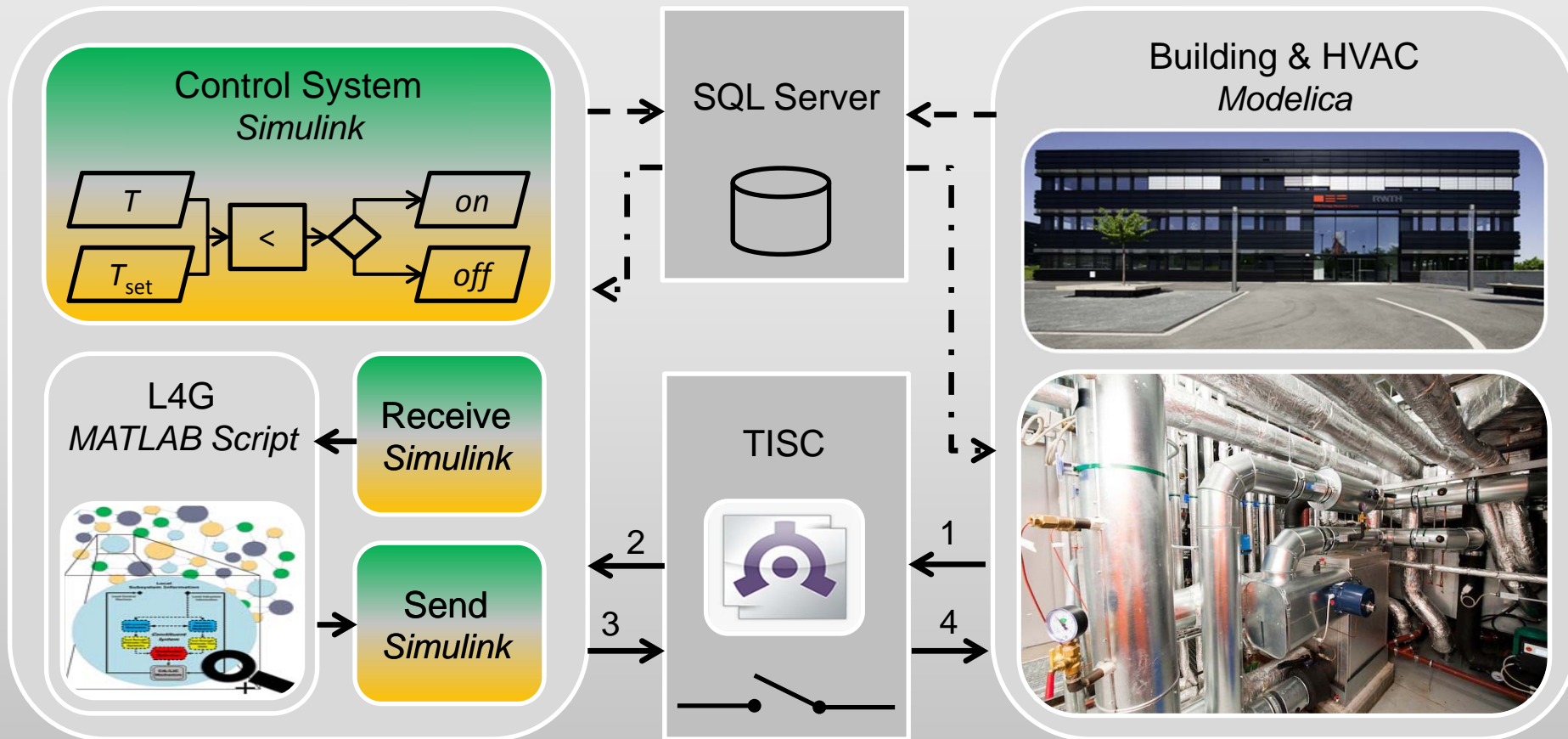
Results (Predicted mean vote)



Results (Predicted percentage of dissatisfied)



L4G implementation strategy



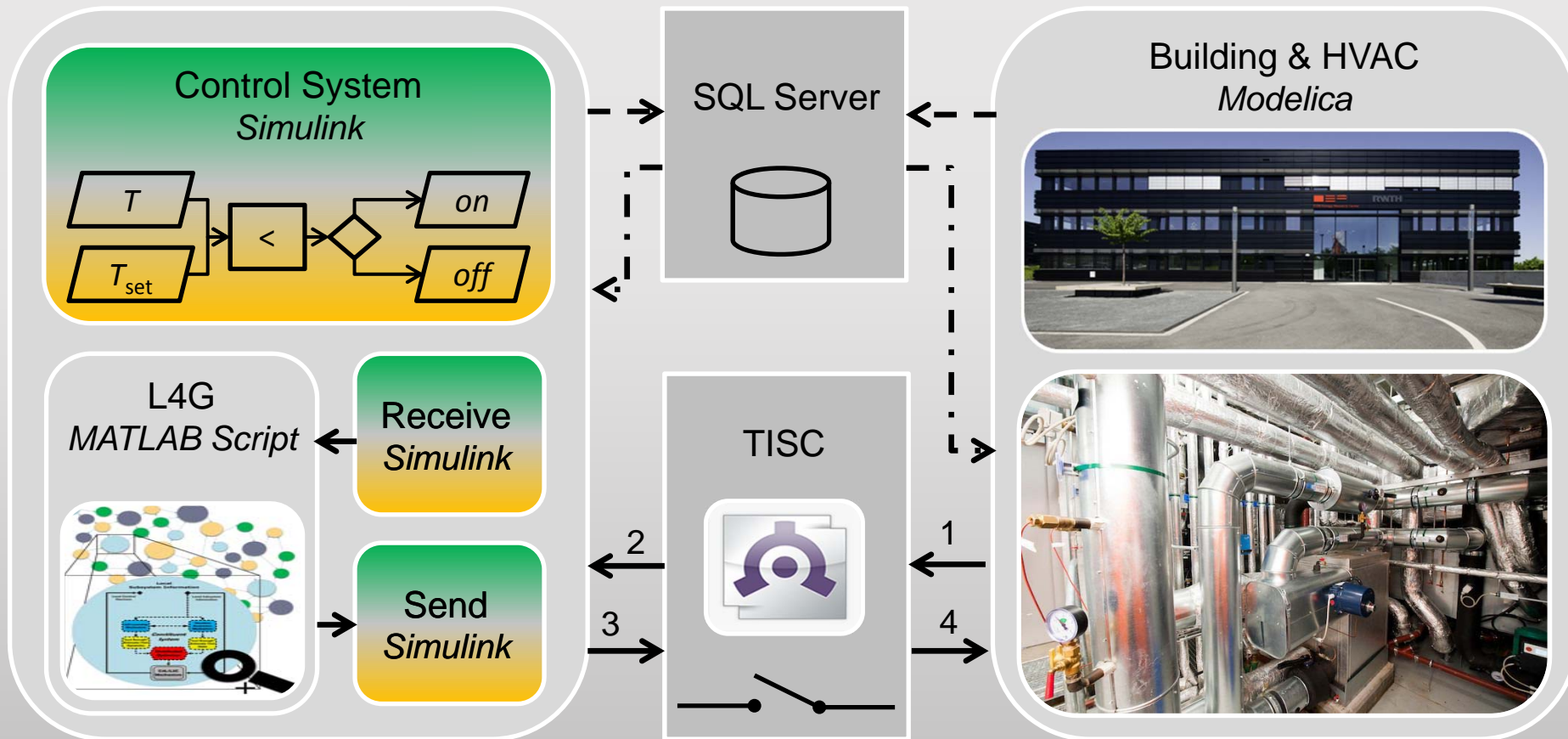
L4G inputs

- Outdoor data:
 - Temperature
 - Humidity
 - Solar Radiation
- Indoor data for each room:
 - Temperature
 - Humidity
 - Co₂ concentration
 - Occupancy
 - Energy consumption

L4G inputs

- Prediction data:
 - Outdoor temperature prediction
 - Outdoor humidity prediction
 - Outdoor solar radiation prediction
 - Occupancy prediction (for each room)
- Control data for each room (from the original control logic):
 - Supply air valve control value
 - Exhaust air valve control value
 - Air/water heat exchanger water valve control value
 - CCA control valve control value

L4G implementation strategy



Next steps

- Decentralized approach, but model-based
 - Optimization of the same system for many times
- Comparison with the centralized approach
 - Centralized optimization

Thank you for your attention!

Questions, suggestions and comments are welcome!