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# **Characterization of Building Energy Performance involving Building Automation and Smart Grid Technologies**

Smart Grids Week 2016

Linz, Austria

*IEA Workshop “Thinking the Smart Grid from the Consumer End”*

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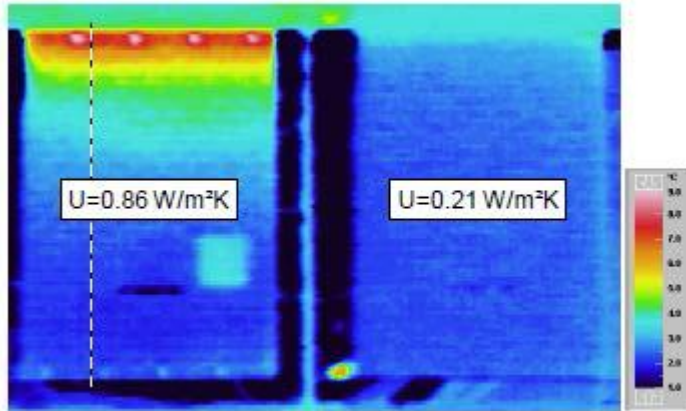
# Overview



- Background: IEA Annex 58
- Current Work in Process
  - BAS and Field Experimentation
  - Smart Meters and Data Acquisition
  - Smart Grid Optimization with Energy Models
- Outlook

# IEA Annex 58: Overview

IEA EBC Annex 58: “Reliable Building Energy Performance Characterization Based on Full-Scale Dynamic Measurements”



Source: KU Leuven, Proposal for IEA Annex 58.



FhG Test Buildings (Holzkirchen) and High-Rise Test Site (Hongkong).

## Measured Energy Performance vs. Design Computations of Buildings

*Objective:* Characterize Real Performance

- Issues with Craftsmanship
- Complexity of Variables Involved
- Uncertainties and Inaccuracies of Planning Tools

>> Update Field Protocols and Standards

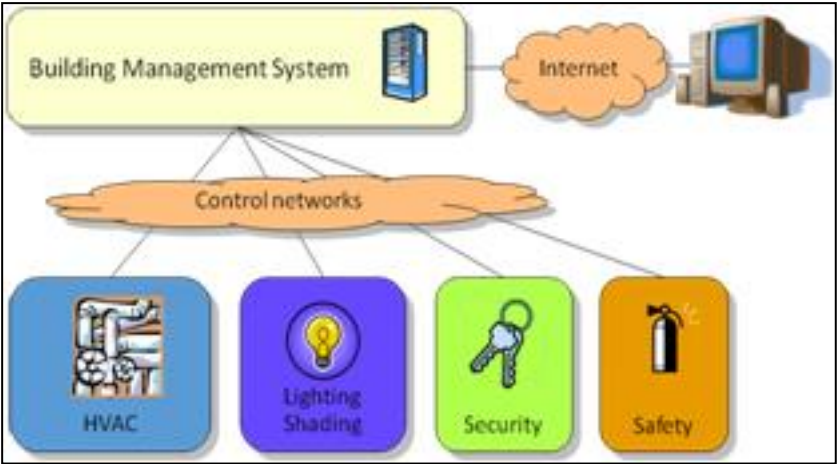
## Activities

- From Test Boxes to Individual Homes (Scale)
- International Cooperation on Field Measurements, Simulation and Advanced Modeling Methods (System Identification)

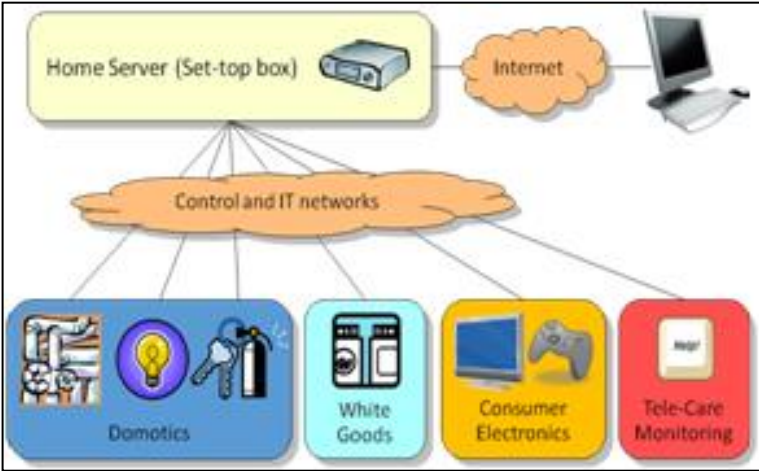
## Challenges

- Simplifications with Installed Information Systems (BAS, meters)
- Smart Grid Use of the Models

# Information in Building Automation Systems

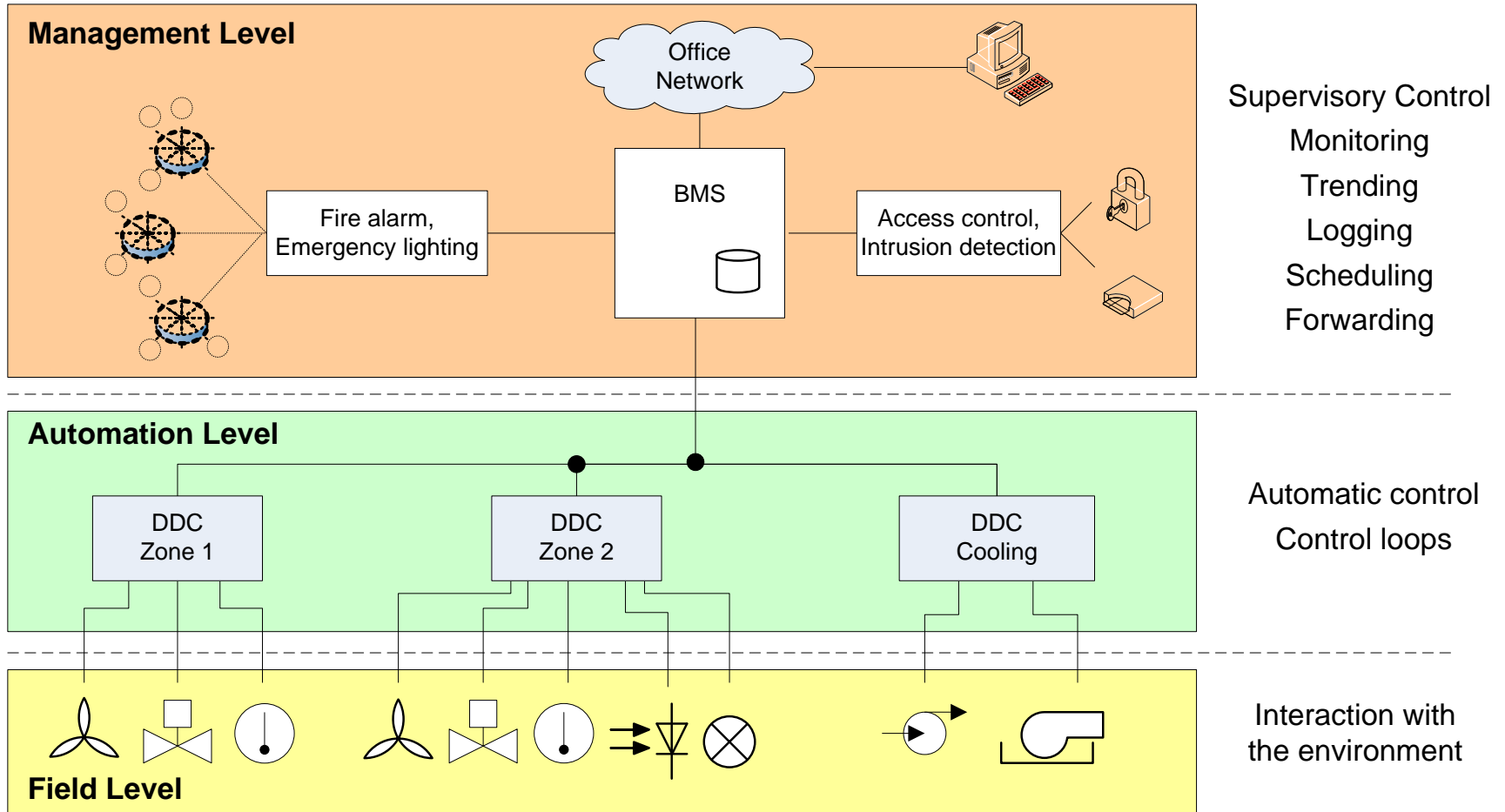


Information potential in buildings

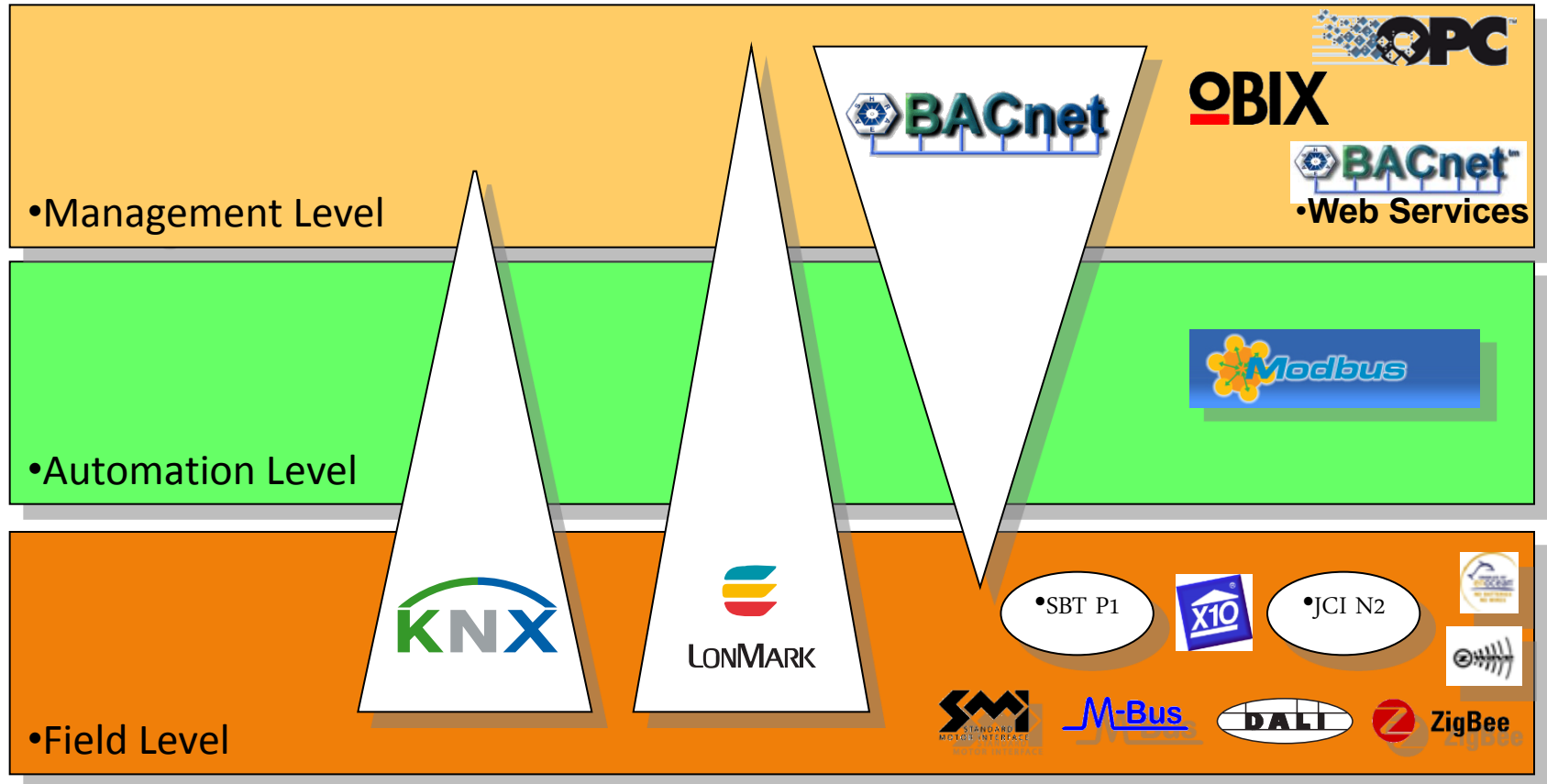


Information potential in homes

# Layer model: System Architecture



# Individual Solutions for Buildings



# 2-tier Architecture for Homes

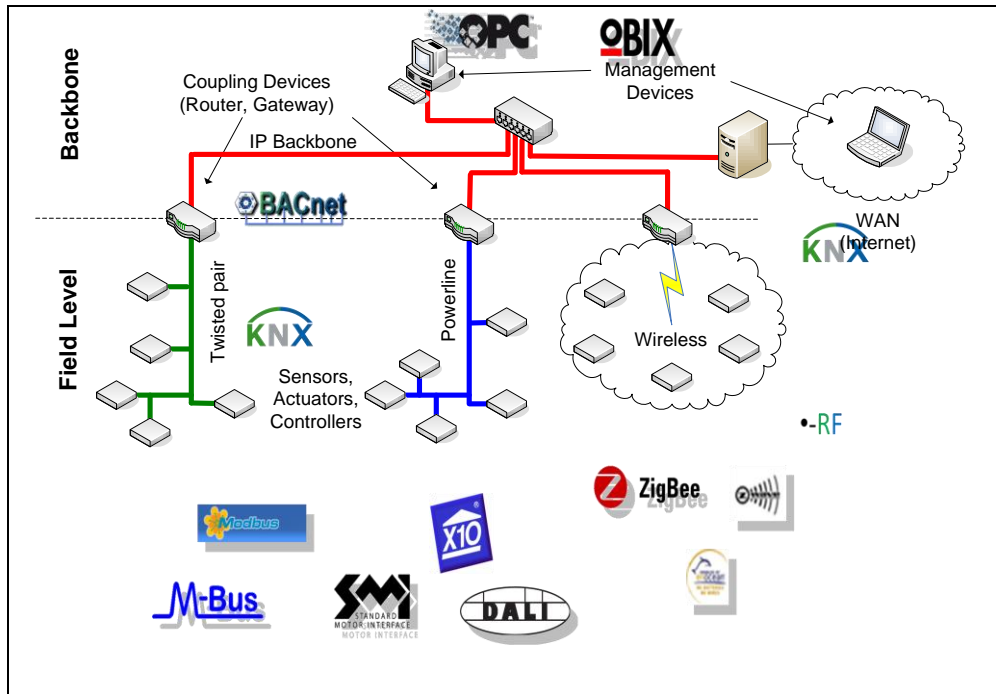
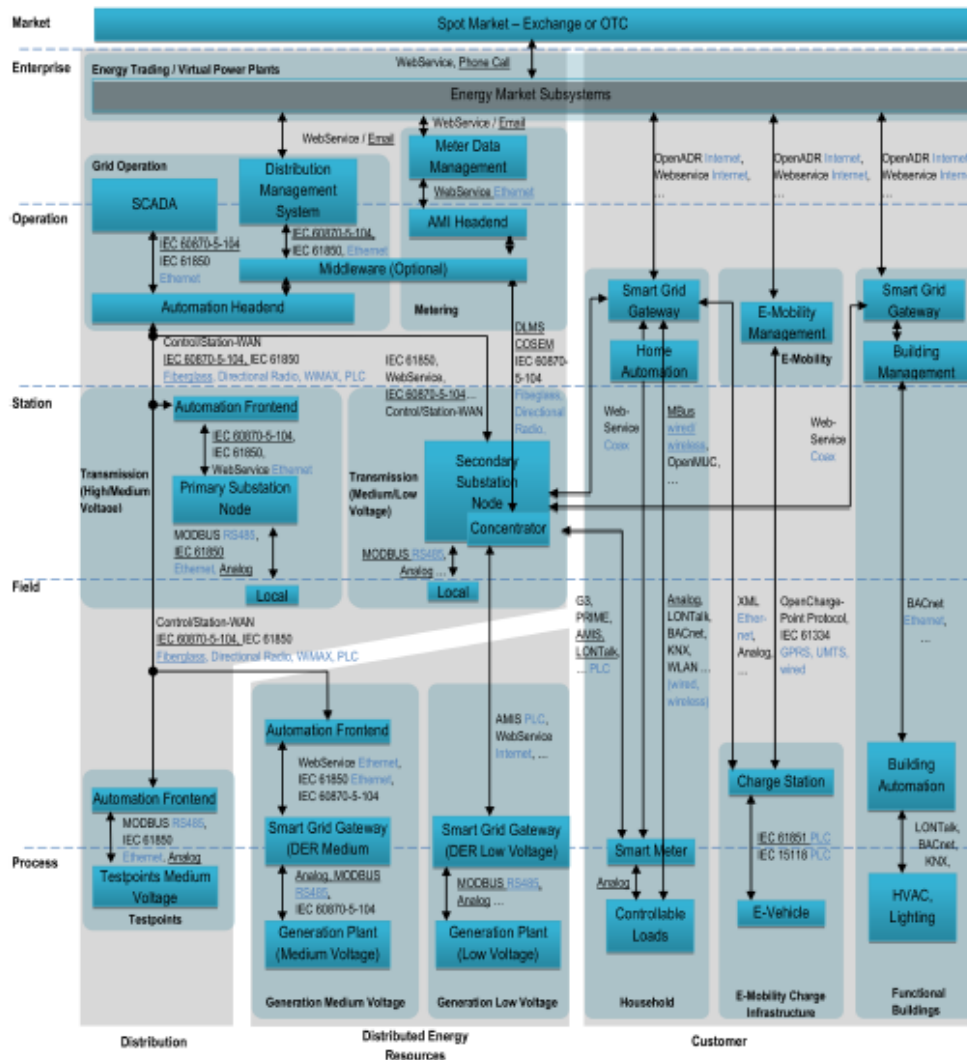


Fig. 3 Home Automation: Two Layer Model and Communication Protocols

# Smart Meters and Data Acquisition



Kammerstetter et al. (2014): Smart Grid Device and Network Model



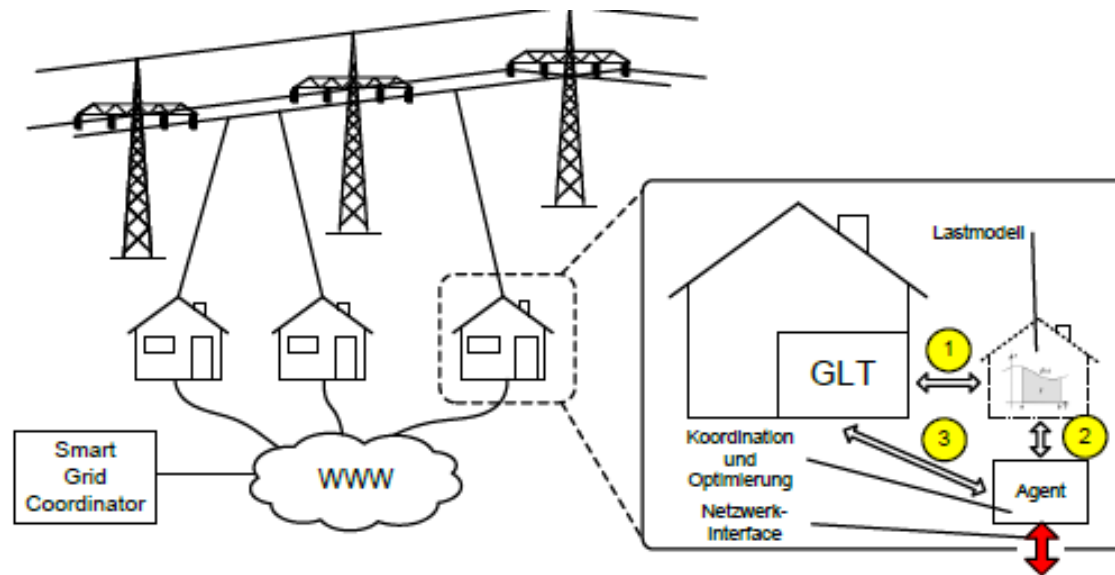
# Smart Meters and Data Acquisition



- Wireless M-Bus
- PC-based software and USB-stick: configuration & design monitoring
- Information from service provider for channel selection (permission)
- Time consuming
- Requires some communication background
- Recommendation: Integrate into BAS management systems

# Background: Building-to-Grid Research

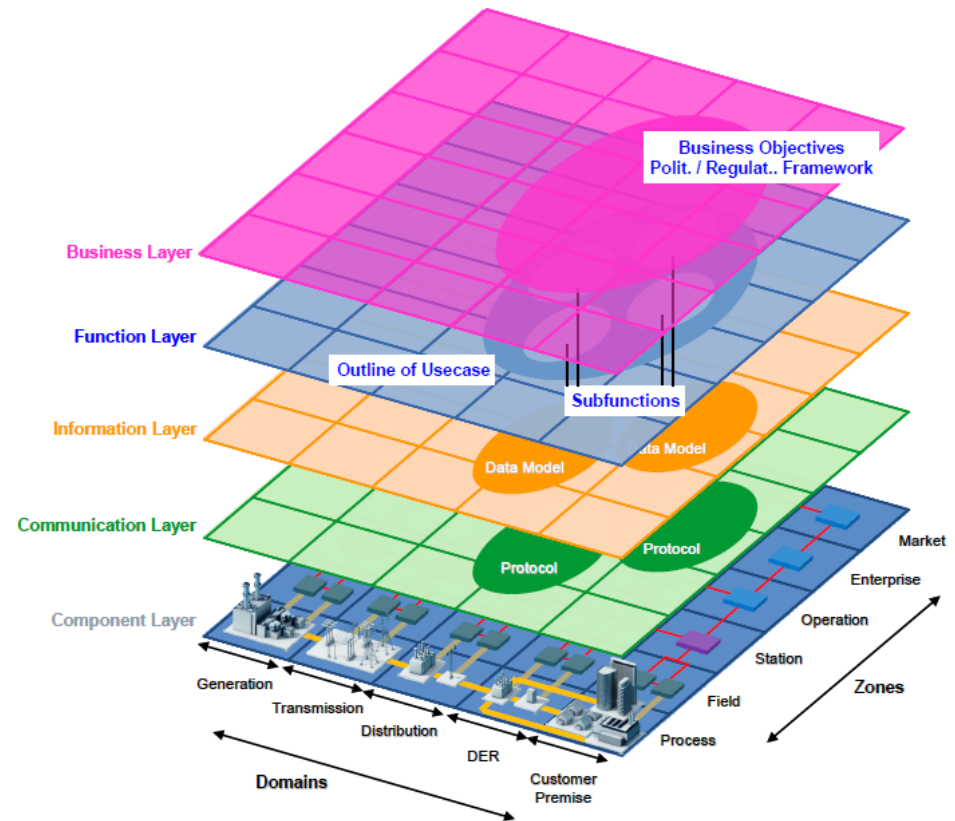
- Smart Grids Model Region Salzburg (Austria)
- Building-to-Grid Project (2010 – 2013)
- Load forecasts for demand side management based on limited thermodynamic building model (building design, energy pass)



Raudaschl et al. (2013)

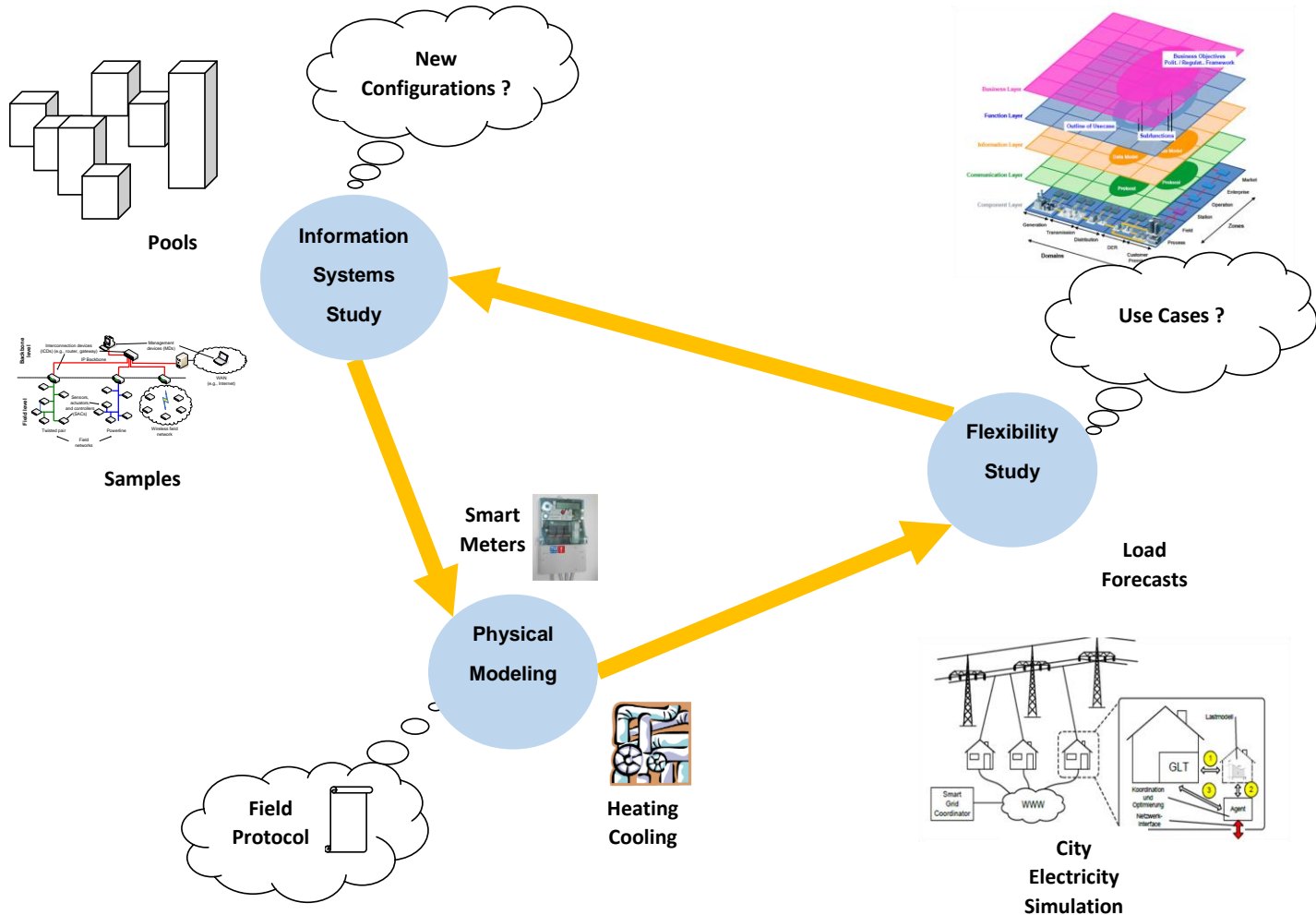
# Building-based Load Forecasts for DSM (FFG)

- New B2G project: Load forecasts with improved thermodynamic modeling
- Which parameters for SG?
- Austria, Belgium, Denmark
- Smart grid study: Generic High Level Use Case „Short Term Load and Generation Forecasting (WGSP-0301)
- Low voltage area
- Storage modeling (building)
- Monitoring information for DSM



Smart Grid Architecture Model (Source: SG-CG/M490/C)

# Co-Validation Experiment for Load Forecasts



# Outlook



- Results available by end of June 2016
- **IEA EBC Annex 67 – Energy-Flexible Buildings**

## References

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