

ECPPM



3rd Workshop on
eeBuildings
Data Models

Energy & Behavioural Modelling and Simulation at Facility Management

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Presentation outline

- **Context**
- **FIEMSER: an innovative BEMS**
- **Data modelling process**
- **FIEMSER Data Model**
- **Interoperability with BIM**
- **Data Manager**
- **Conclusion & perspectives**

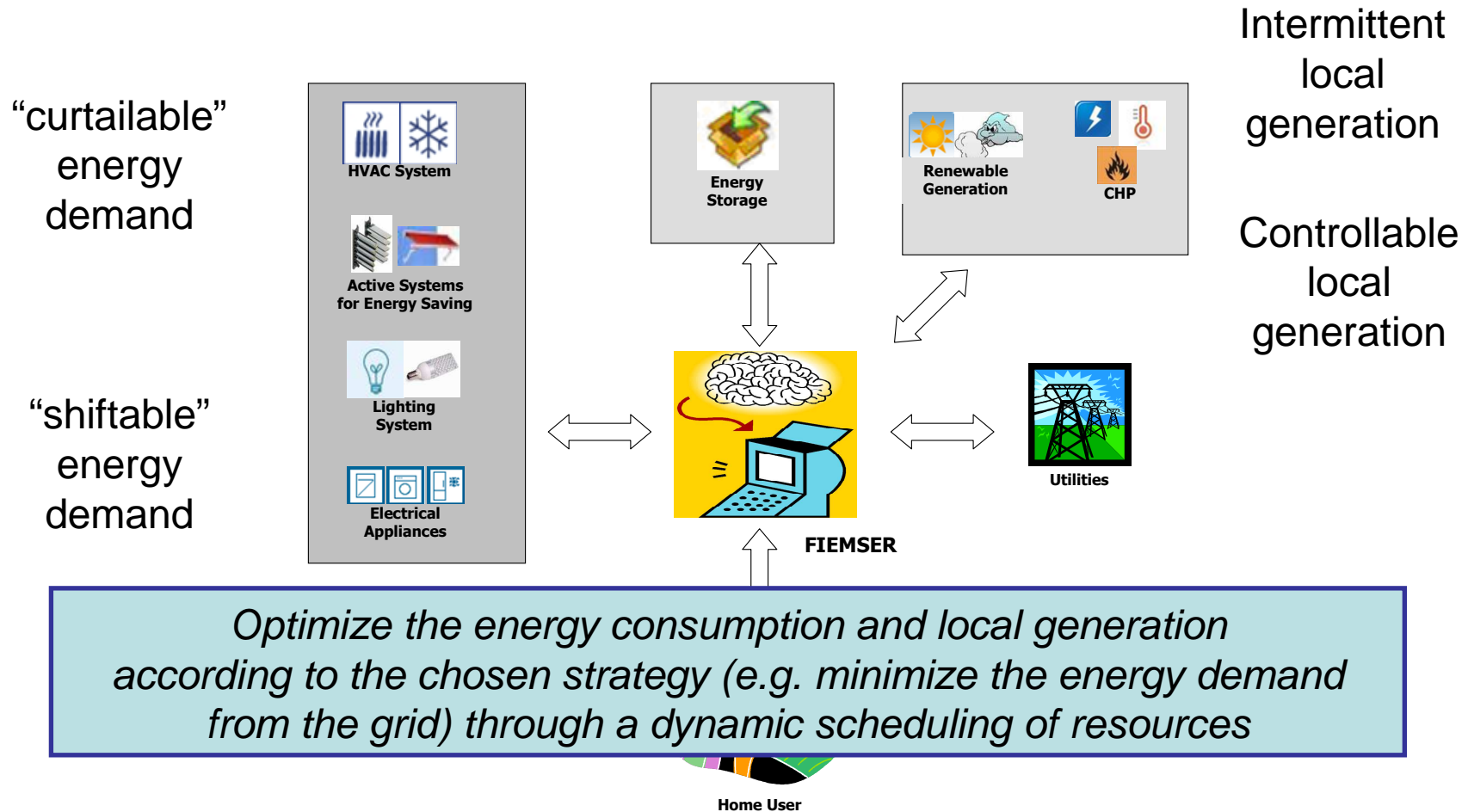
Context

- Buildings are responsible for up to 40% of energy use and GhG emissions in most EU countries
- Solutions to improve energy efficiency should be envisaged by considering buildings not isolated, but as components of larger systems, interacting through smart energy grids
- Improving **Demand Side Management (DSM)** is key to:
 - Reducing global energy consumption
 - Reducing energy demand (from the grid) at peak periods
 by placing the **well-informed consumer at the heart of the decision process**, with the support from intelligent Building Energy Management Systems (BEMS)
- The needed dialogue between energy producers and consumers require **integration** between **building-oriented views**, and **grid-oriented views**
- To achieve this **semantic interoperability**, specific reference data models need to be designed and shared, consistent with existing models (e.g. BIM)

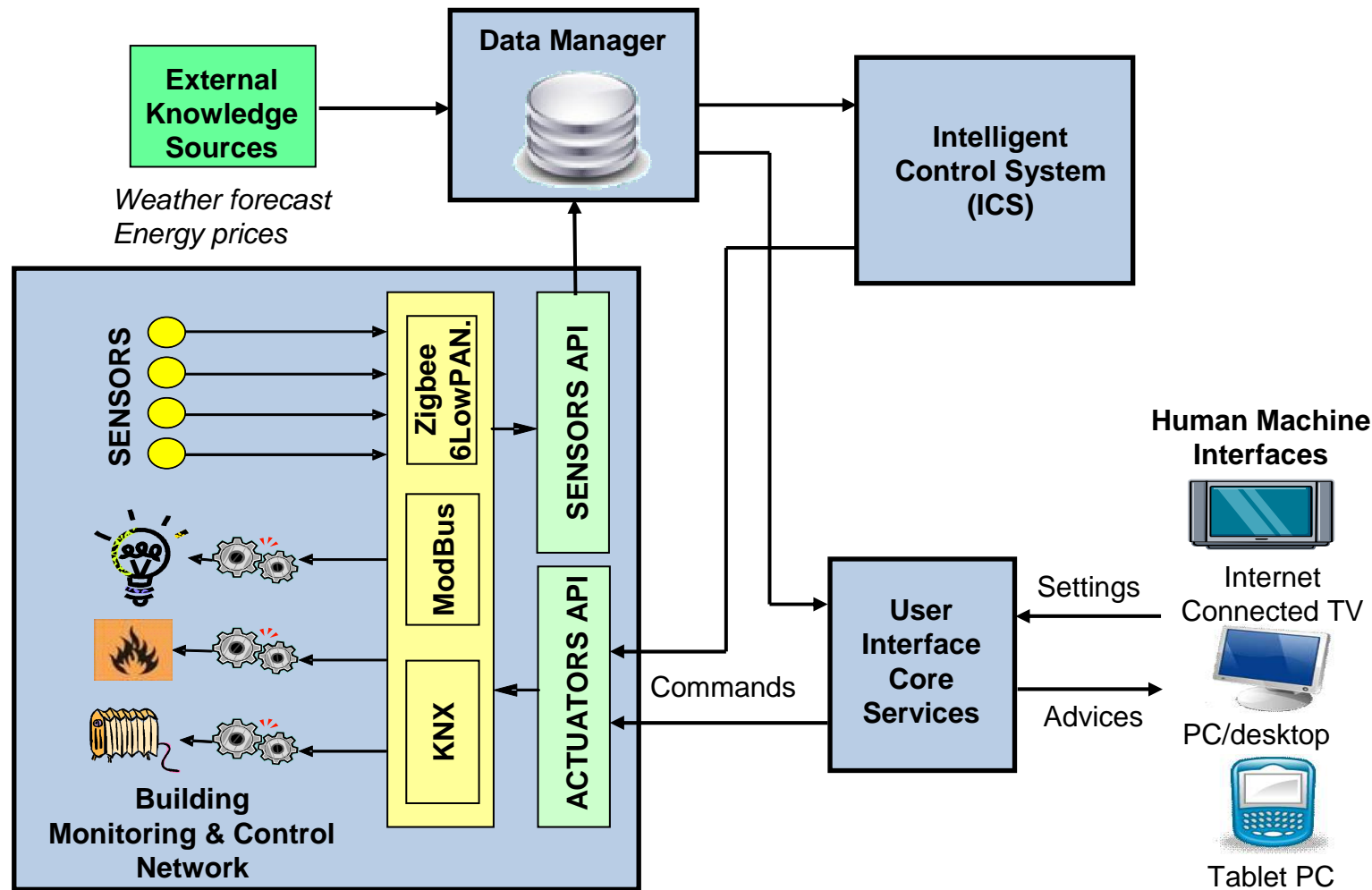
FIEMSER project

- **Main objective:**
 - Develop an innovative Building Energy Management System (BEMS) for **existing and new residential buildings** that:
 - increases the efficiency of the energy used
 - reduces the global energy demand, without penalizing user comfort
- **Two main strategies:**
 - **Minimize the energy demand from external resources**
 - reduce the energy consumption in the building
 - optimize the use of local generation (heat and electricity) and energy storage, by a relevant *scheduling of energy resources and loads*
 - **Enhance the interaction with the building user**
 - increase consumer's consciousness on his energy consumption and CO2 emissions (through PCs, smart phones, connected TV)
 - provide hints to make punctual changes in consumer's behaviour without major disruptions of his comfort conditions
- **Grid interaction:**
 - Minimize the energy demand from the grid, and its costs (by reducing demand at peak periods)
 - But no sharing of surplus energy

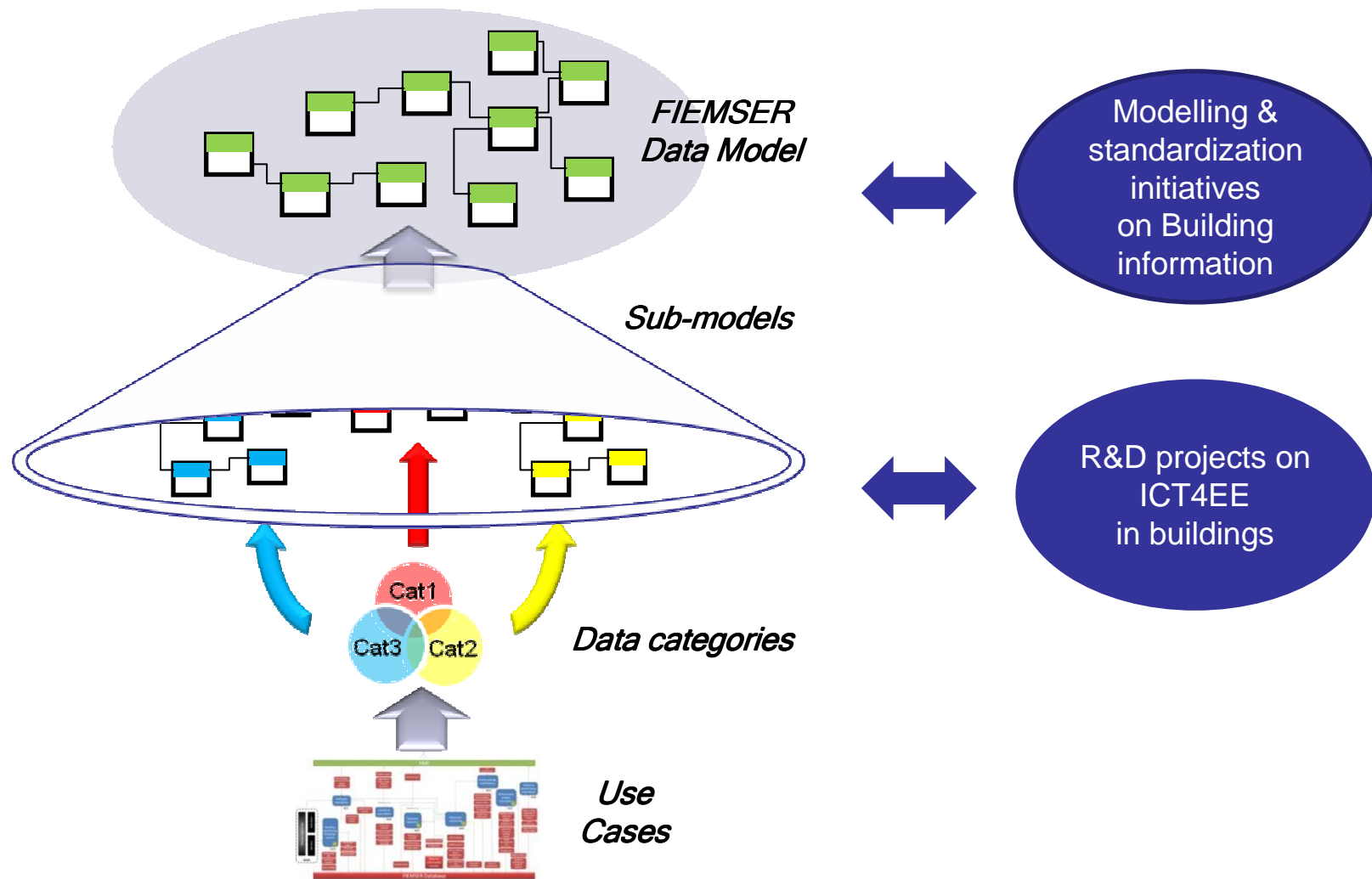
FIEMSER – Resources Overview



FIEMSER – Functional architecture



Data Modelling - Approach & methodology



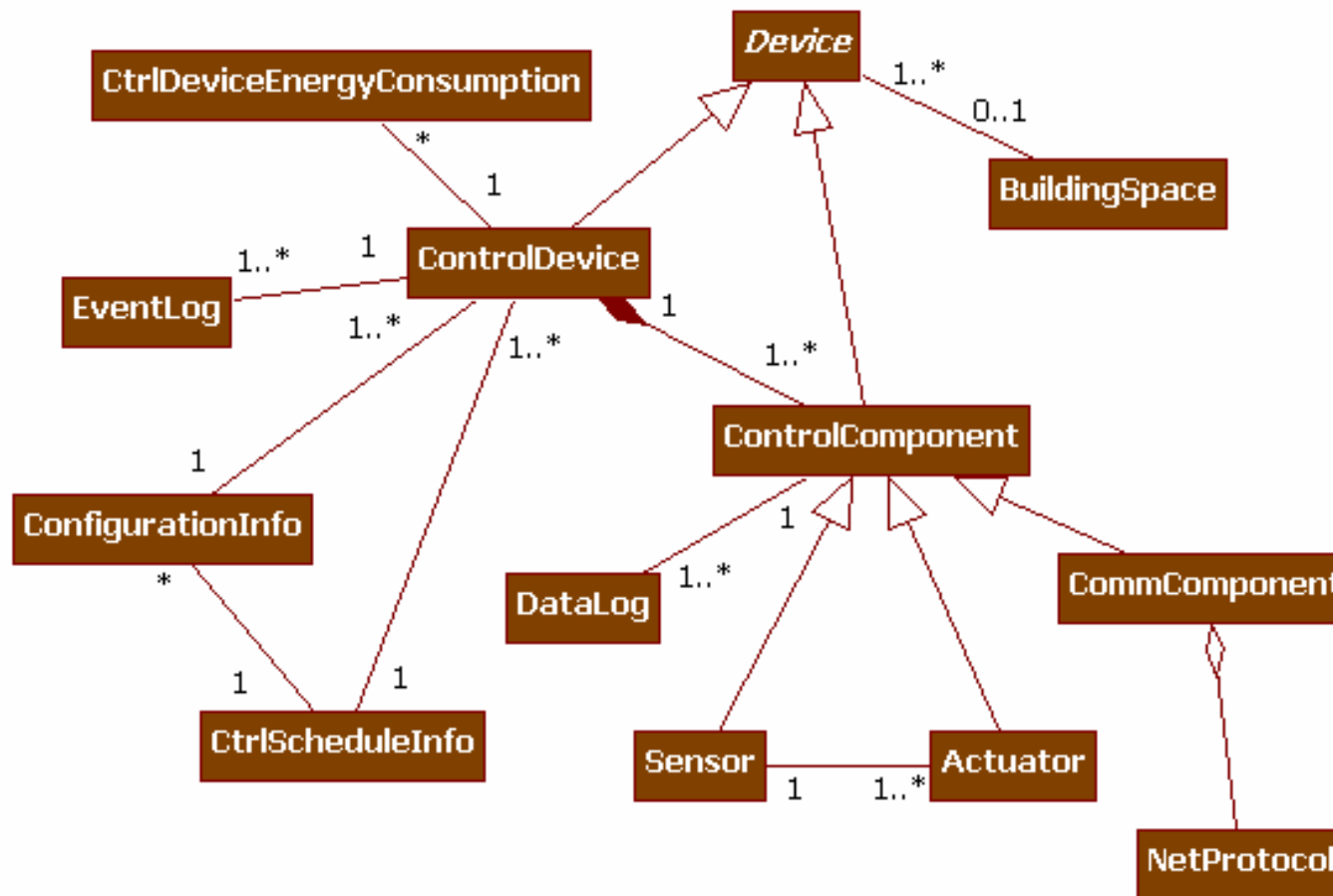
System specification – Use Cases

- **Process for updating the control system when a new device connects to the network (UC#1)**
- **Accessing to the home settings by the user (UC#2)**
- **Building monitoring and control actions (UC#3)**
- **Generation of a day ahead schedule of resources utilization (UC#4)**
- **Monitoring of the execution of a schedule and the reaction to events (UC#5)**
- **Control of devices by the user (UC#6)**
- **Performance index calculation (UC#7)**
- **Accessing to performances information by the user (UC#8)**

Data categorization

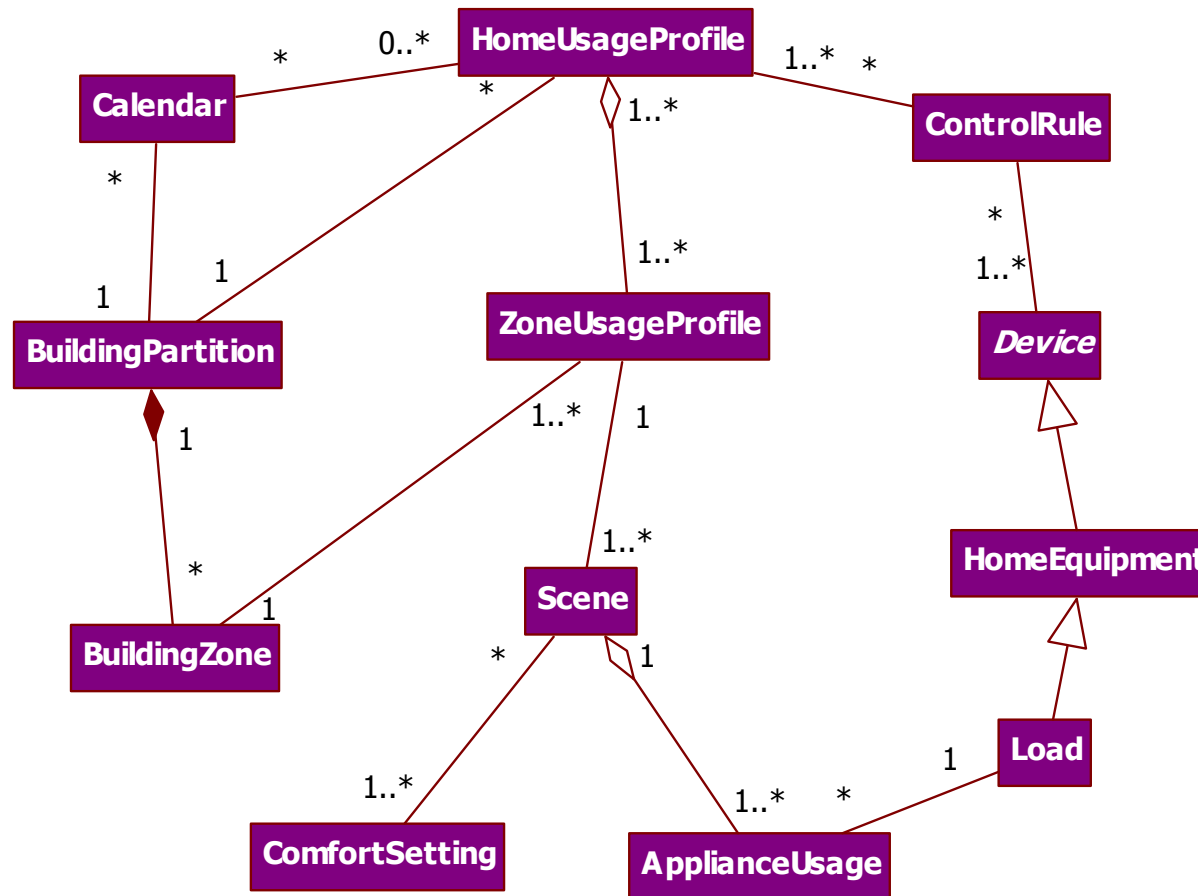
Data Category	Content
Environment	<ul style="list-style-type: none"> • Location, climate zone, shadowing, building orientation, etc. • Weather data, energy prices, etc.
Energy-focused BIM (Building Information Model)	<ul style="list-style-type: none"> • Space organisation / Envelope & partition • Home equipments (loads, generators, storages...)
Monitoring & Control network	<ul style="list-style-type: none"> • Sensors & Actuators • Data collected from sensors • Log of activations
User preferences	<ul style="list-style-type: none"> • Usage profile, definition of scenes, including comfort set-points and use of appliances • Control rules and energy strategy
Resources scheduling	<ul style="list-style-type: none"> • Scheduling of resources
Advices	<ul style="list-style-type: none"> • Advices, created as a result of an event, usually associated to an action of the user
Energy performance indicators	<ul style="list-style-type: none"> • Log of consumptions • Performance indicators
User Access Rights	<ul style="list-style-type: none"> • User rights regarding the access to FIEMSER functionalities

Monitoring & Control Network



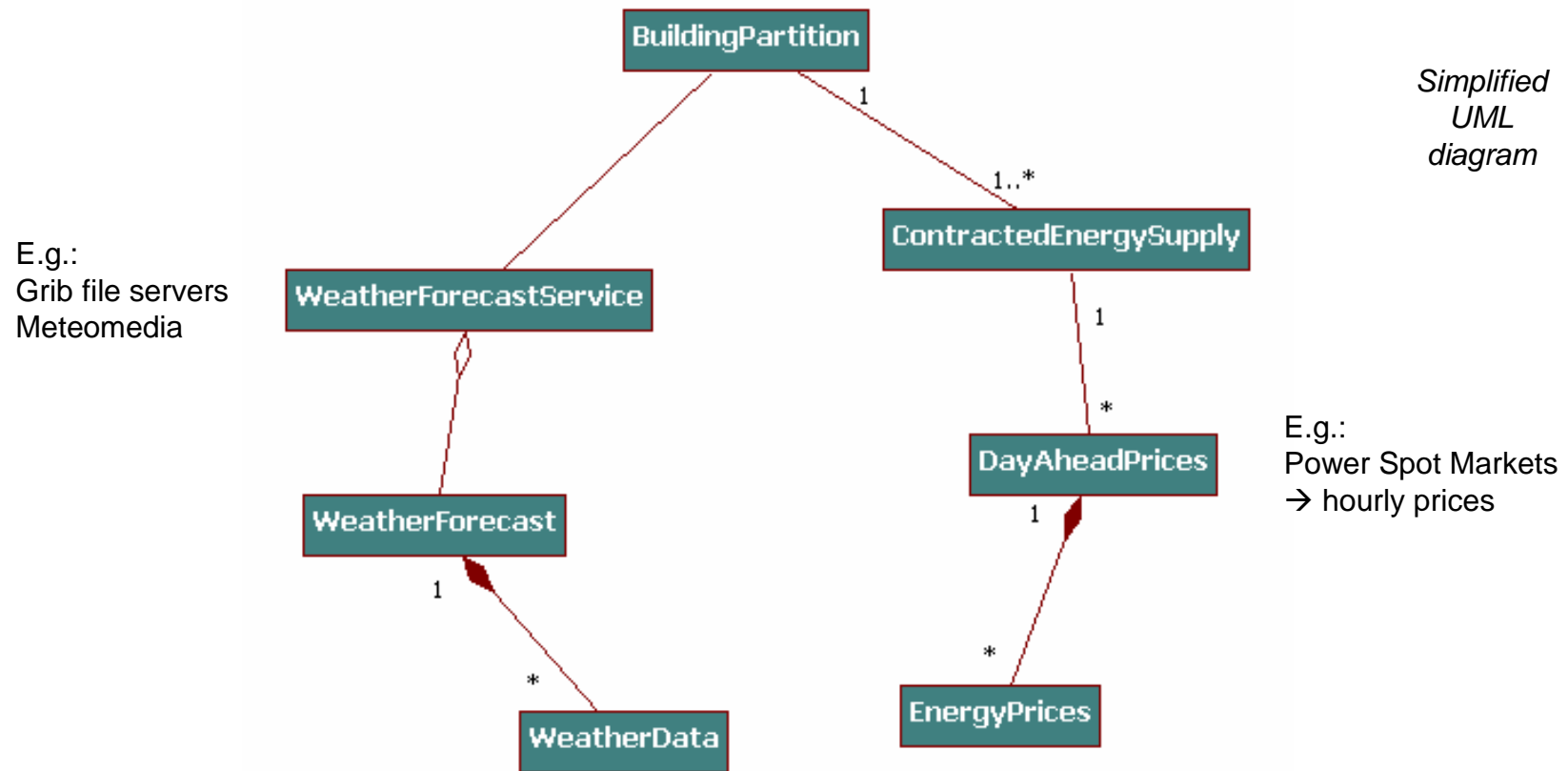
*Simplified
UML
diagram*

User Preferences



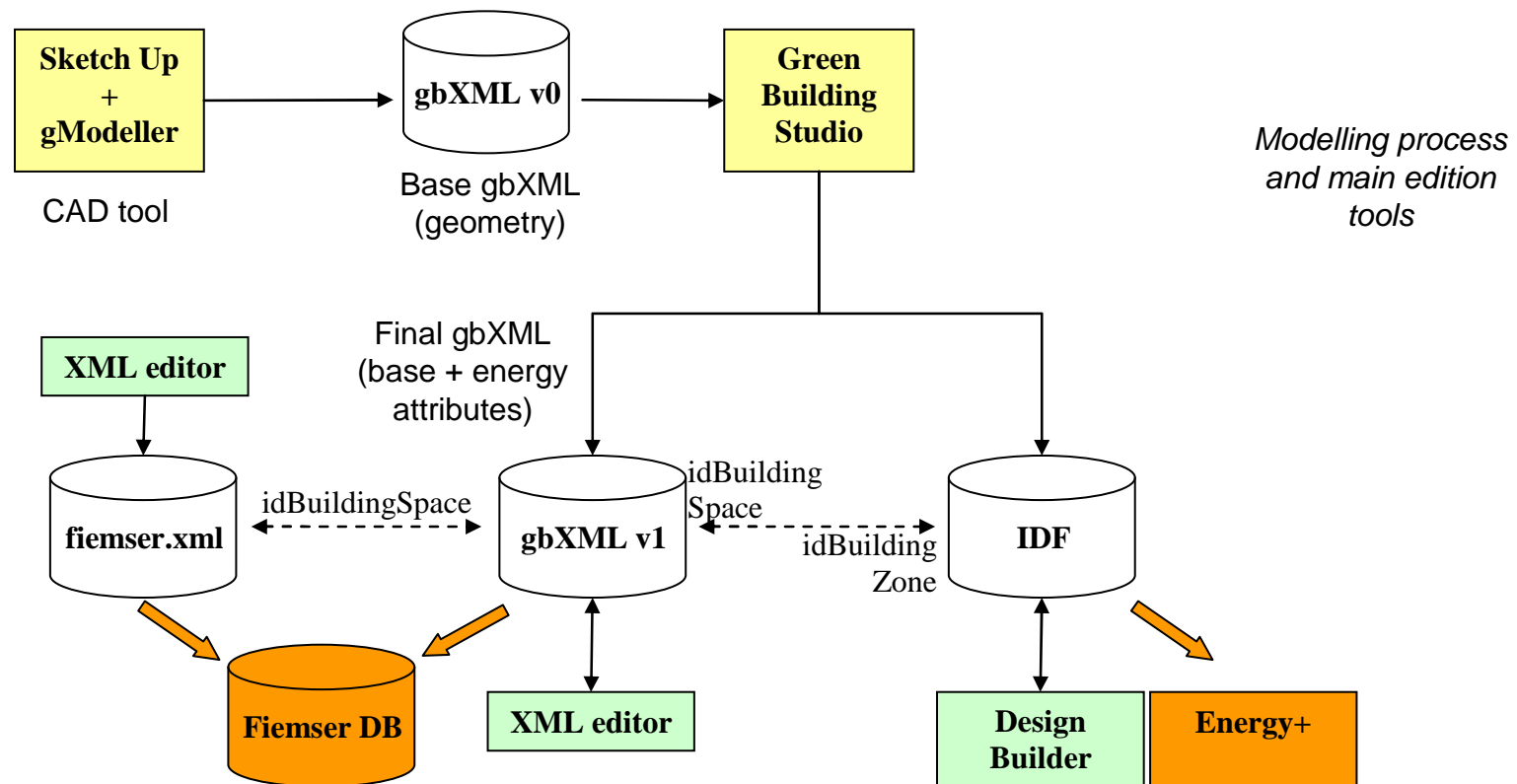
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Environment

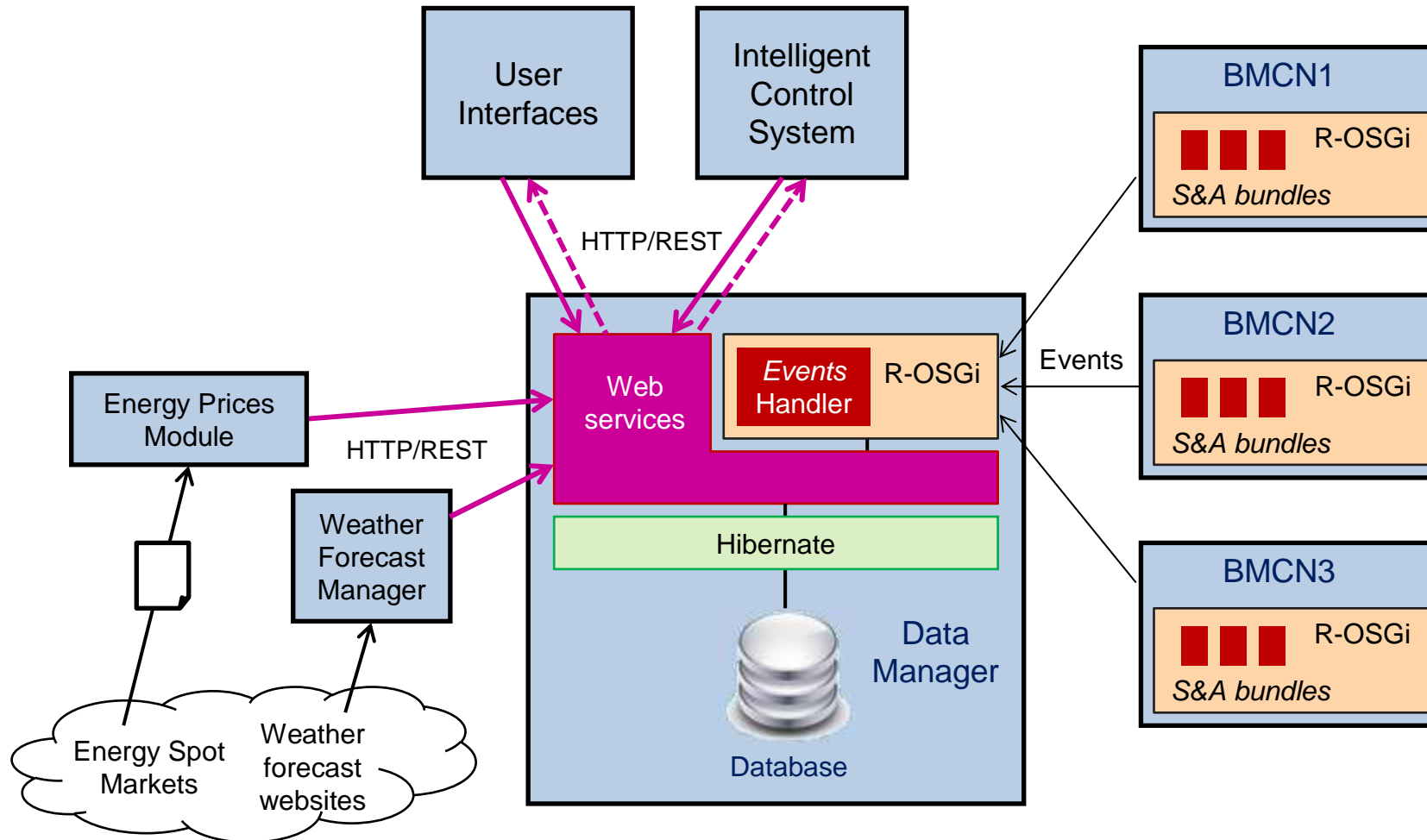


Interoperability with BIM

Choice of gbXML, preferably to IFC, as Building Information Model focusing on energy-related features



Data Manager – Communication with other components



Conclusion & perspectives

- **FIEMSER Data Model is at the heart of the system since it supports interoperability between FIEMSER modules**
- **The model proposes a semantic extension to standard BIM representations that integrates a set of concepts for energy management including user activities & environment (weather forecast, grid energy prices)**
- **The model holds around 100 different entities**
- **Data are collected and made available to other components by a Data Manager through Web Services**
- **Validation will start in September 2012 in two testing facilities with different climatic conditions (Spain & Germany)**

For more information

- **Project coordinator:**
Juan Perez (Tecnalia) – juan.perez@tecnalia.com
- **FIEMSER Web site: <http://www.fiemser.eu/>**

Thank you for your attention!