Newsletter

29. Feb 2012 I Issue Nr. 2

Welcome to the second issue of the **HESMOS-Project Newsletter**. HESMOS is a so called STREP-Project funded by the EU under the 7th framework Programme. During the runtime of the project several newsletters will be published. For further information and downloads please visit our website. There you can also register if you want to receive this newsletter automatically. **In this issue**, HESMOS presents the **main objectives** of the specification phase which follows after the previous analysis phase. In each issue there will be introductions of the consortium partners. Today we continue with partners playing a technical role in the project.

HESMOS – PROJECT OBJECTIVES

HESMOS - **H**olistic **E**nergy Efficiency **S**imulation and Life Cycle **M**anagement Of Public Use Facilitie**S**. The overall objective of HESMOS is to develop an **Integrated Virtual Energy Laboratory** (IVEL) which allows decision makers to design and compare several energy and life cycle cost optimised alternatives as well as to optimize the operation of Public Private Partnership Projects (PPP). To achieve this objective **HESMOS IVEL** enhances existing Computer-Aided Design (CAD) and Facility Management (FM) tools with information from energy simulation and cost calculation as well as up-to-date data from the Building Automation Systems (BAS). To evaluate the functionality of the HESMOS IVEL, an extensive 30-month validation program will be **realized at two PPP projects**.

HESMOS – PARTNERS

IN THIS ISSUE

BIM ENHANCEMENT SPECIFICATION

With completion of the *BIM Enhancement Specification* the HESMOS consortium has reached a new milestone. It enables the development of the underlying energy-enhanced BIM (**eeBIM**) platform and the related link and transformation services. But it is a lot more than a technical guideline that defines how to implement the HESMOS use case scenarios. We also specified a conceptual framework that shows how to deal with a diversity of data required in the overall life-cycle processes and how to interoperate with the well-established openBIM schema from buildingSMART (IFC; ISO16739) and additional models based on a multi-model architecture. As our *BIM Enhancement Specification* provides an open and extensible framework we elaborated the general development process that has been adopted from the Information Delivery Manual (IDM) methodology.

Figure 1 shows the main eeBIM component models and the involved model transformations embedded in the building life cycle. At the top, the major relevant tasks in the building life cycle are shown, i.e. the Architectural Space Program developed in the early design phase where fundamental energy related decision are taken, the BIM-based Architectural and HVAC design, where decisions on material and component level are taken, and the Monitoring and Control via Building Automation System (BAS) in the Operation and Maintenance phase. At the bottom, the main related analysis tasks are shown, i.e. Energy Simulation – to forecast or check energy performance, and Life Cycle Costs Calculation – to include energy costs in the total life cycle costs and check eventual redesign, retrofitting or refurbishment decisions against the related investment and operational costs, thereby enabling informed decision-making. In the center, the eeBIM framework enabling the inter-operability and integration of all other components into a consistent platform is shown.

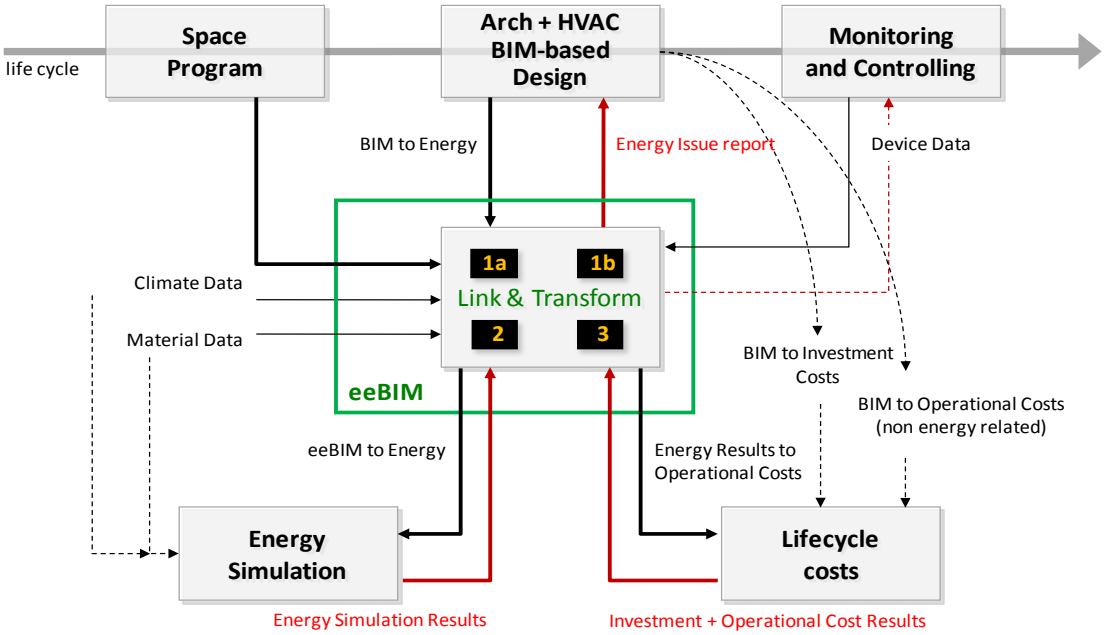

Figure 1: Generalised view of the suggested eeBIM framework

THE IVEL ARCHITECTURE AND THE eeBIM-FRAMEWORK

The objectives of WP2 of HESMOS are the development of the software architecture for the **Integrated Virtual Energy Laboratory (IVEL)**, the identification of required components to enable various energy simulations and lifecycle studies where a great part of the functionality will be provided via outsourced web services and remote access to third-party tools and, last but not least, the development of an eeBIM framework.

The IVEL is the overall HESMOS platform, which is developed using the service-oriented architecture (SOA) approach. It will include (1) services for energy and emission simulation that would typically precede decisions for design and retrofitting tasks initiated in result of detected under-performances in the facilities' management, (2) services for operative energy-related analyses regarding facilities control, operation and lifecycle management as well as (3) local background CAD and FM applications. The kernel of the platform will be provided by advanced BIM-based CAD and FM tools extended to support preliminary and final architectural design (including cost calculation and bills of quantities) but also capable of interacting with the energy analysis and simulation services.

CONCEPT OF THE IVEL

Many advanced ICT applications for the design of energy efficient buildings already exist. However, while it is generally understood that decisions on energy efficient building design and operation have to be taken in all life cycle phases, current applications are mostly developed for the use by energy experts in detailed design, where most building parameters affecting energy performance are already determined and optimisation capabilities are limited. There is little energy-related ICT support both for early design, where vital strategic decisions have to be met, and for the later operational phase, where improvement decisions have to be taken. As a result, ICT integration is poor and the provided decision support is on limited level. With projects, however, where public-private contracts of 25-30 years of building operation are usual, there are excellent chances to develop a more efficient, holistic approach for the realisation of innovative services and tools for energy efficient and low carbon buildings, enabling better consideration of a large number of life cycle issues. A central enabling aspect in that regard is the achievement of a consistent integrated platform that can handle energy-related tasks while being at the same time aligned with design, facilities management, cost estimation and other life-cycle activities. Such a platform can be realized by an Integrated Virtual Energy Laboratory (IVEL) providing a set of value-add and supporting ICT components and a coherent approach how such components can be further extended, adapted or, if necessary, replaced by others.

In the HESMOS-Newsletter #1 principal Use Case Scenarios for the envisaged improved PPP process named (1) *Design Phase*, (2) *Commissioning Phase*, (3) *Operational Phase,* and (4) R*efurbishment and Retrofitting Phase* had been introduced and outlined. Also the differences between the current 'AS-IS' situation and the envisaged 'TO-BE' process in the form of detailed BPMN diagrams had been developed. By examining these user scenarios, different technical scenarios for the IVEL realisation were derived. In *Figure 2* the main identified differences are synthesized.

By examining these user scenarios, different technical scenarios for the IVEL realisation were derived. Firstly, we created for the design phase the technical schema that would allow users like architects and building services engineers to predict energy and emissions behaviour properly. Secondly, we developed the principal approach to integrate actual device data from BAS with facility management

tools for the operational phase. Thirdly, we developed a general stand-alone scenario that would enable public access to the IVEL by owners, tenants or building authorities.

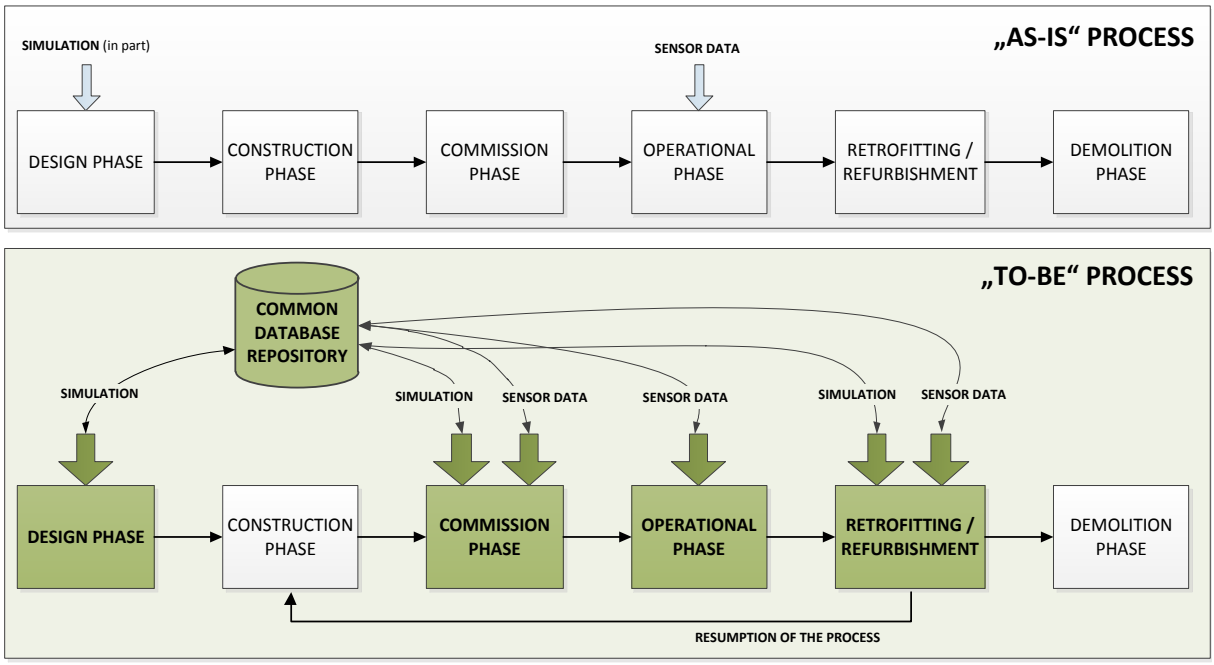

Figure 2: Comparison of the current "AS-IS" process and the envisaged HESMOS "TO-BE" Process in PPP projects

OVERALL SOFTWARE ARCHITECTURE

Using the IDM methodology (ISO 29481) and the defined "TO-BE" process mentioned above, the software architecture of the IVEL platform together with the related information exchange and interoperability requirements and the software components with their major features, APIs and GUIs were conceptually developed.

Figure 3 shows a generalised view of the architecture of the IVEL with its principal modules, services and applications. The shown modules, framed in the dashed boxes, are briefly examined in the following sections. The specification of their components on technical level is provided in Chapter 3. This marks the starting point of the actual software development in the WPs 3-7. UML component diagrams are omitted so that the presentation does not become overly verbose.

The IVEL core is essentially a service registry that controls user registration, data manipulation, calls to sensors and the workflow of energy analysis, CAD and facility management tools. It is responsible for various data manipulation tasks such as model mapping, model conversion, multi-model linking, filtering and model versioning, and can thus be generally seen as a data warehouse enhanced with explicit business logic to allow the adaptation and (semi-) automatic execution of user workflows. It comprises three sub-modules, namely *Platform Management*, *Model Management* and *Simulation Management*, thereby enabling separation of concepts, high level of modularity and parallel RTD work.

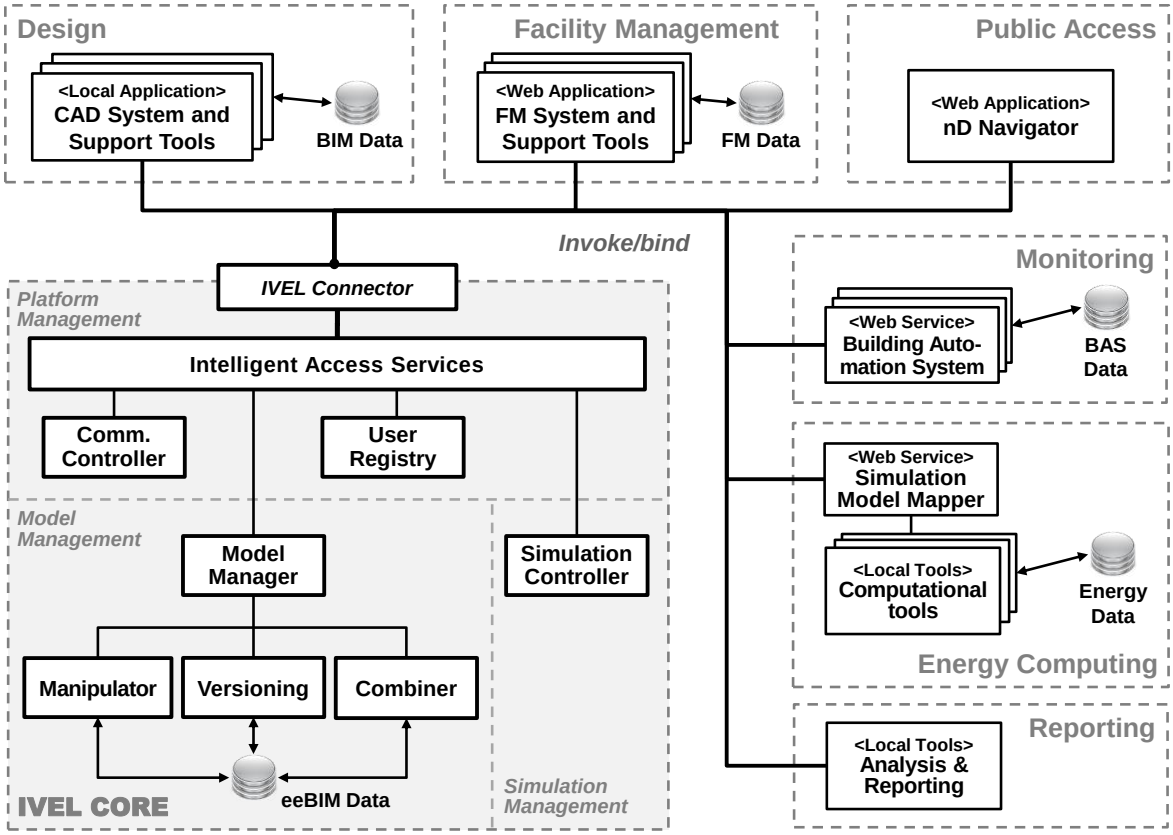

Figure 3: Software Architecture of the IVEL

The end user applications provide the productive environment and the GUIs for the users to the IVEL, where they can configure simulation parameters and control the overall simulation process and its results. The different users will have different access rights depending on their roles and each user can use her/his specific expertise to detail the workflow and refine the process. With regard to the identified user scenarios, we distinguish:

- Architectural design and Investment costs calculation
- Building performance, facility management and client requirements
- Varying simulation configurations and light-weight visualization for non-professionals

PARTNER PROFILES IN THIS NEWSLETTER: NEMETSCHEK AND AEC3

NEMETSCHEK

NEMETSCHEK Allplan GmbH, with headquarters in Munich, is a leading European vendor of software for the design and management of buildings. As a one-hundred percent subsidiary of NEMETSCHEK AG, the company develops intelligent IT solutions for architects, engineers, building contractors and facility managers. The flagship product, Allplan, is the platform for Building Information Modeling (BIM) and provides optimum support for the seamless process of designing and constructing buildings with regard to quality, costs and time. The software is currently used by 65,000 customers in 16 languages. Allplan covers all levels of a modern CAD system: from simple 2D drafting and 3D design to object-oriented building modeling with cost determination and quantity take-off. Additional information is available at www.allplan.com

NEMETSCHEK Slovensko, s.r.o., seated in Bratislava (Slovakia), was founded in 1992 by Prof. Georg Nemetschek. It has become since its creation a key technology and development subsidiary of NEMETSCEHK Allplan GmbH. As a wholly owned subsidiary of NEMETSCEHK AG, Allplan subgroup develops intelligent IT solutions for architects, engineers, building contractors and facility managers. NEMETSCHEK Slovensko, s.r.o. currently employs around 80 people, majority of which are software developers split into 10 closely cooperating groups.

AEC3

AEC3 is a consulting company specialising in research, development and application of Building Information Modelling (BIM) technologies since over 10 years. It is a leading organisation for developing and using open standards for the exchange and sharing of building information. AEC3 personnel provide leadership in the development of Industry Foundation Classes (IFC), the open BIM standard issued by buildingSMART and has profound skills in helping organizations to utilize it with their IT environments. The consulting expertise of AEC3 includes the soft success factors as well, supporting companies in understanding their required BIM process and information needs, utilizing the Information Delivery Manual (IDM) methodology. AEC3 also offers training to its clients that comprise public building organizations, large construction and engineering firms, and software companies.

AEC3 has worked in the area of data interoperability for energy models over a long time, recently working on an integration of the CAD tools of architects, engineers and operators with energy analysis tools and how to transform the different data models of the CAD tools and the energy analysis services. Automating this transformation is crucial to the efficiency and acceptance of frequent energy assessments and optimisations during the life cycle of buildings. Within the HESMOS project AEC3 is involved in the definition of process and data exchange specifications and responsible for handing-over these specifications to standardisation bodies, in particular buildingSMART.

Contributors to this Newsletter:

AEC3
NEMETSCHEK
Technische Universität Dresden

Your Contact to HESMOS:

Chief Coordinator: *Prof. Dr. Raimar J. Scherer (TUD-CIB)*
Deputy: *Dr.-Ing. Peter Katranuschkov (TUD-CIB)*
coordinator@hesmos.eu

Exploitation Manager and Newsletter Editor:
Prof. Rasso Steinmann (NEMETSCHEK)
publicrel@hesmos.eu
Design: *Dipl.-Ing. (Arch.) Romy Guruz (TUD-CIB)*

Website:
www.hesmos.eu *www.hesmos.org*