WELCOME

Welcome to the sixth newsletter of our project: *"Collaborative Holistic Design Laboratory and Methodology for Energy-Efficient Embedded Buildings" (eeEmbedded),* funded by the 7th Framework Programme (FP7). Its duration is 4 years. It started on the 1st of October 2013 and has a budget of nearly 11 M€.

Our project *eeEmbedded* has been running for three years now and interesting results are already coming out.

In this newsletter, you will find information about Scenario Manager tool, Multimodel Navigator tool Multimodel developments, as well as last project events and upcoming events.

We hope you enjoy this newsletter.

INTRODUCTION

Our project has been focused on the implementation of our eeEmbedded Virtual Lab during the last months. In this line, the mock-up days from March to May 2016, which were led by the Coordinator (CIB) and partaken by all partners, were a huge success towards realizing the platform. For the individual partner, the mock-up days presented an opportunity to discuss the requirements of the end users and narrow down significant implementation goals. This also benefitted the developers in such a way that they were able to explore all areas in which their tools are in need for improvements or further developments to better facilitate their individual function and their interoperability within the framework. In March, the preparation and end user pre-meetings were held, followed by one week of intensive, tool oriented workshops with end users and developers in the first week of April. The results were gathered and finalized by end users and developers until the beginning of May. Since then, the developers have been streamlining their implementation plans to include and partially extended the goals of the mock-up days. Additionally, since the Bratislava Meeting in June, the consortium had plenty of coordination and planning meetings regarding the full eeE scenario for the upcoming 2nd Review in October, which covers all of the important parts of the eeEmbedded technical workflows, the urban and early design processes as well as encompasses all of the partners' tools.

Following, we want to continue presenting the eeE Virtual Lab by introducing three main bones of it: Scenario Manager, Multi Model Navigator and Multi Model developments. After that, we want to inform you about our project events during the last months and planned for the next months.

SCENARIO MANAGER TOOL

The Scenario Manager (ScM) consists of a Project Explorer, Scenario Explorer and Messaging & Properties Explorer. The Project Explorer is used to access to all data (including requirements) stored in the project repository and inter-linked via Link Model. The Scenario Explorer is used by the project coordinator to define the process maps by dragging and dropping BPMN elements from the process setting palette (tasks, actors, Key Points, ER, etc.). Responsible persons can be assigned for every task in the process map, as well as for every Key Point and Levels of Information by double clicking on the BPMN element. New Exchange Requirements (ERs) can be created or existing ERs can be read, used or adapted. The tasks in progress are highlighted and the status is communicated via BIM Collaboration Format (BCF) Messages in order to monitor the process and facilitate collaboration. In addition, deviations are sent as BIM snippets via BCF to the authoring tool after verification of the models, so that the designer can adapt the model.

Therefore, Scenario Manager supports all participants in a BIM-based construction for:

- Project administration: create projects by specifying building type, address, budget, duration etc.
- User management: create and assign users to projects, define user permissions.
- Requirements management: create and assign project and data requirements.
- Workflow management: define workflows in BPMN, create tasks and assign users.
- Workflow control: a workflow engine controls the project workflows and notify users about tasks.
- Data management: the ScM checks data and shares it between users.

The Figure 1 shows a screen of the project setup where the end-users define the project location. The Figure 2 shows the screen where the process map of the project is visualized and modified.
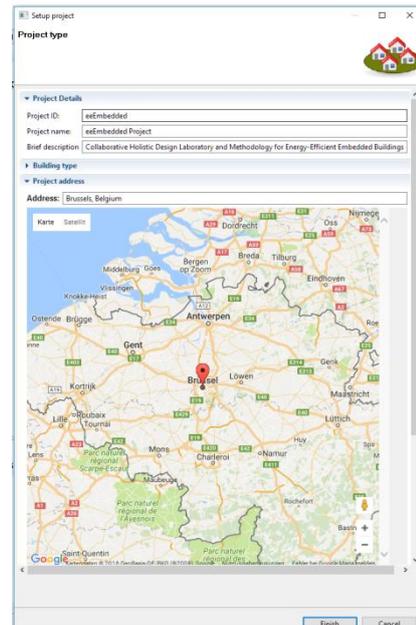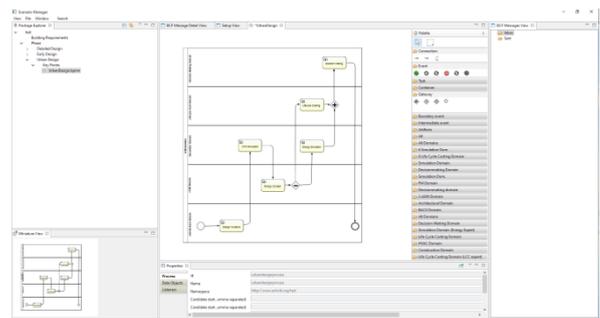

Figure 1: Project setup

Figure 2: Workflow definitions in BPMN editor

MULTIMODEL NAVIGATOR TOOL

Multi Model Navigator provides together with the Scenario Manager the main user interfaces to the eeEmbedded virtual lab platform for all disciplines involved in the energy-optimised design of the building. Multi Model Navigator uses bim+ platform to provide flexible navigation in the information space, visual design control of project variants and the presentation of simulation results in detailed and aggregate form.

It is also possible to check and verify the level of detail (exchange requirements) and the Key Design Parameters (KDPs) after verification of the models. A GUI is required to visualize the results of this checking. For that reason, the result of the checking will be shown in Multi Model Navigator although the checking itself and the graphical encoding of the checking results will be done within the ontology and the ontology services. The KDP results will be presented on building level, floor level, room level and element level in the Multi Model Navigator.

The Figure 3 demonstrates the browser for the assignment of BIM Elements to Types. The structure of the Browser tree is freely configurable. In the above mentioned figure, the first structure has been used for the Variant node definition. As showed in this figure, the Semi-Transparency Mode has been activated in the Multi Model Navigator to isolate relevant objects with the same construction Type from others. The blue highlight color was assigned to the specific construction type.
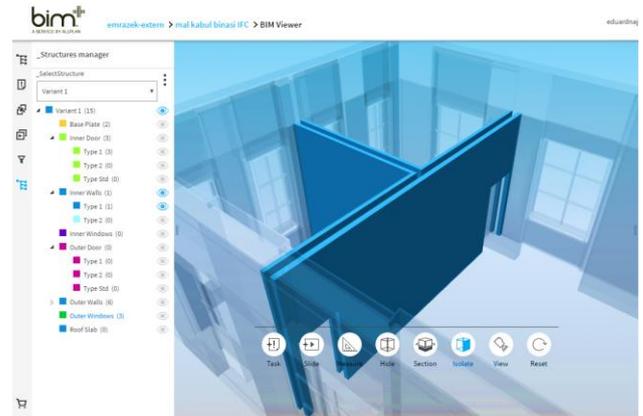

Figure 3: Browser for the assignment of BIM elements to types

The Figure 4 presents the browser for the Analysis of Key Design Parameters. The KDPs are activated from a given list and all related objects are highlighted in the animation window according to a color code. The example in Figure 4 shows the KDP U-Value (heat transfer coefficient) of the selected windows whereby all relevant windows, which do not fulfill the requirements are highlighted in red.

Figure 4: Browser for analysis of Key Design Parameters

MULTIMODEL DEVELOPMENTS

Multimodel developments cover Multimodel Manipulation Services, Multimodel Filter and the Multimodel Container.

The manipulation of the Multimodel Container (MMC) is realised by manipulating the comprised models individually. Triggered by the Model Manipulation Service as part of the Multimodel Management Services, these manipulations are taken care of by the Collaboration and Resource Access Management Services. They provide access to the underling information repositories and enable the retrieval and manipulation of model data. The relevant APIs are presented in Deliverable 4.4. Figure 5 gives an overview on the placement of the relevant modules and components in the overall architecture.
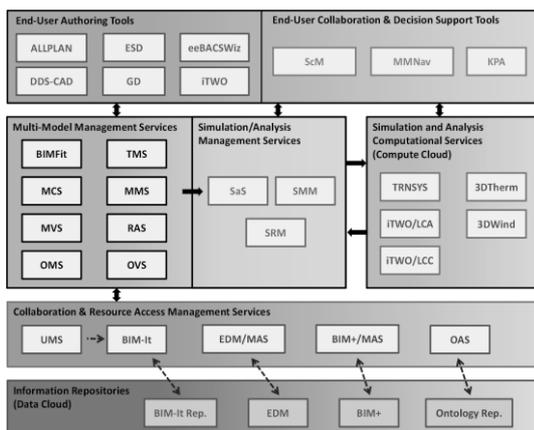

Figure 5: Extended and updated eeE Architecture "Virtual Holistic Design Lab"

The services developed for the Multimodel Filtering are presented in Deliverable 4.5. This covers a special filter toolbox for ee-functionalities that allows high reuse of the filter modules in many different use cases. New ee-functionalities are developed as well as new ee-query modules and modules needed for the new ESIM and BACS semantic model and the BACS data format.

The Multimodel Container (MMC) encapsulates all relevant domain models, meta data and the Link Models that describe the relations of the models and their elements. It provides a possibility to exchange relevant data between the different domains involved in the construction process in a concerted and effective way. The MMC content, this means the described domain models, etc., is represented as relational data model in the JASON format. The relational data model is easy to understand and easy to generate. So, the overall ontology model storing the complete project data, in situ or ex situ as reference, is transformed into such a relational data model for realizing the data exchange between the different tools. Changes done within these external tools are stored back in the relational data model and are written back into the ontology to keep it up to date (Figure 6).
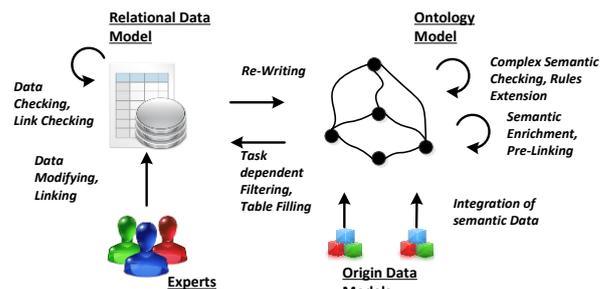

Figure 6: Relational Data Model and Ontology Model combined (Kadolsky M. & Scherer, R., ECPPM2016)

The ontology contains the semantic data of the different domain models; this means information such as geometry is only referenced. So, the content of the relational data model comprises also only semantic information with specific focus on the link information.
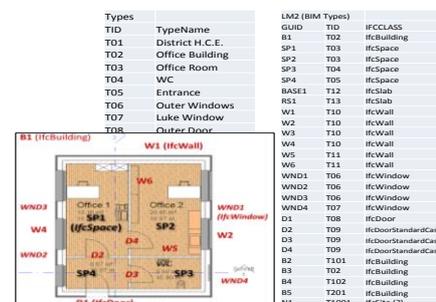

Figure 7: BIM Model with linked Types represented as Relational Data Model

eeE PRESENTED AT…

…CIB World Building Congress 2016

Tampere (Finland), May 30 – June 3, 2016

The 2nd expert seminar of eeEmbedded, led by CEMOSA, took place in Tampere, Finland, within the framework of the 20th CIB World Building Congress 2016. The main objective was to show results of the project and collect feedbacks from external professionals.

For that purpose, Mr. Tuomas Laine (Granlund) introduced the project providing an overview and highlighting the main expected results; Dr. Gloria Calleja-Rodriguez (CEMOSA) explained the Holistic Design Methodology based on Key Points, one of the highlighted outcomes of the project; Mr. Ken Baumgärtel (TUD) presented two essential tools of eeE platform, Multi Model Navigator and Scenario Manager; Mr. Francisco Forns-Samso (Granlund) demonstrated the advantageous Multi-criteria decision making tool for end-users support, and Mr. Pit Stenzel (Fraunhofer-EAS) showed the new Energy System Information Model, one of the principal results of the project. Ten external experts attended the successful event. The invited specialist and the eeEmbedded team were actively involved in worthy discussions motivated after each presentation. External experts showed their interest in the project and gave their opinion regarding the outcomes. Valuable feedbacks were also collected from the questionnaires filled by the attendants.

Additionally, eeEmbedded team participated in the exhibition booth supported by EeB-CA2 CSA at the congress where we showed posters and videos of our virtual lab and ICT based intelligent methodology, and Mr. Francisco Forns-Samso presented a paper in the congress called *"Visualization of Facilities Management KPIs during Early Design Using BIM"*.

… Sustainable Places 2016

Anglet (France), June 30 – July 1, 2016

CIB and CEMOSA from eeEmbedded side participated in a Joint Workshop about BIM-BASED DESIGN together with HOLISTEC, Design4Energy and Streamer.

The workshop, which consisted of presentations and expert discussions from the above mentioned European projects, addresses the following topics: collaborative and integrated approach, BIM use since early design and performance-based approach. The workshop targeted stakeholders involved in the building design: building owners, construction managers, architects, engineers, etc. and aimed to show latest developments of best practices in building design methodology, latest advancements and examples from tools demonstration.

In the first session, *"Methodologies and KPIs for performance-based design"*, Prof. Raimar Scherer (project coordinator, TUD) presented an overview of the project and its focus as well as the collaborative design methodology and Key Point definition. In addition, Mr. Mathias Kadolsky (TUD) explained interoperability and interlinking among design models.

In the second session, *"Tools for performance-based design",* Prof. Scherer (TUD) explained eeBIM Lab and Collaborative Design Platform.

… ECPPM 2016

Limassol (Cyprus), September 7– 9, 2016

eeEmbedded partners participated in a special session called *"Energy Efficient Neighborhoods"* within the 11th European Conference on Product and Process Modelling eWork and eBusiness in Architecture, Engineering and Construction (ECPPM 2016).

Six eeEmbedded papers were presented:

- *"Collaboration requirements and interoperability fundamentals in BIM based multi-disciplinary building design processes"* by Prof. Rasso Steinmann (IAB).
- *"Task-Specific Linking for Generating an eeBIM Model based on an Ontology Framework"* by Mr. Mathias Kadolsky (TUD).
- *"Visual support for multi-criteria decision making"* by Mr. Tuomas Laine (Granlund).
- *"An IT-based holistic methodology for analysing and managing building lifecycle risk"* by Mr. Hervé Pruvost (TUD).
- *"Open eeBIM Platform for Energy Efficient Building Design"* by Prof. Raimar Scherer (TUD).
- *"Automatic ontology-based green building design parameter variation and evaluation in thermal energy building performance analyses"* by Mr. Ken Baumgärtel (TUD).

… CESBP/ BauSIM 2016

Dresden (Germany), September 15– 17, 2016

Two eeEmbedded papers were presented at the CESBP Central European Symposium on Building Physics / BauSIM 2016: *"Stochastic Analysis for Design Space Exploration and Building Performance Optimisation"* by Mr. Tom Grille (TUD) and *"eeBIM LAB – Towards a coherent green building design process"* by Mrs. Romy Guruz (TUD).

MEETINGS IN THE CURRENT PERIOD

…Intensive Workshop and GA Meeting

Bratislava (Slovakia), June 15 - 17, 2016

eeEmbedded team took part in an intensive internal workshop and general assembly meeting held in Bratislava on 15th - 17th of June and hosted by Allplan. The main goals of the meeting were 1) the presentation of MOCK-UP days results, 2) walkthrough the full eeE technical process to review implementation status, to solve open issues and to decide next implementation steps, 3) decide about validation steps by end-users, 4) discuss the technical scenario to present during the second review in Brussels and 5) address important general organization and partner training for the second working period.

Plenary sessions were combined with parallel sessions in small groups (timeboxes) to discuss and work on the targeted topics. The highlighted results were an updated implementation roadmap, an initial plan for the second review and a validation plan.

UPCOMING EVENTS…

…Lake Constance 5D – Conference 2016

Constance (Germany), October 25 – 26, 2016

The fourth Lake Constance 5D Conference aims to highlight current developments in 5D processes and methods and technologies of BIM in applied projects on a high international level. Individual contributions can address a wide range of issues, particularly practical implementation of BIM/5D processes, e.g. collaboration, safety, organization, legal and technical aspects and operations.

…2nd Review Meeting

Brussels (Belgium), October 28 - 29, 2016

The second review meeting of the project will take place in Brussels on the 29th of October, 2016. The eeEmbedded team will show the results of the project up to date to the European Commission.

…BIM World 2016

Munich (Germany), November 29 - 30, 2016

BIM World will present for two days the new structures around digital construction and planning. The two day conference with exhibition area will demonstrate the benefits and implementation of the digital processes, present essential software, technologies and best practices in BIM and outline the upcoming challenges for working with BIM.

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