



## Project Results

# BIMy

## An innovation engine for integrated BIM and GIS

### EXECUTIVE SUMMARY

The ITEA project BIMy (BIM in the City) has created a shared space for digital representations of construction projects in their environments. This enables collaboration between multiple stakeholders within the smart city domain and paves the road for new applications.

### PROJECT ORIGINS

Smart city planning involves multiple players and encompasses diverse domains. Building Information Modelling (BIM) is an important enabler of this task, yet modelling conventions differ and BIM models are often designed independently. A lack of uniform process definitions, a plethora of modelling conventions, the shallow level of BIM serialisation format (IFC) standardisation, immature collaborative model editing and limited access to models designed by different stakeholders have all hindered true exploitation of BIM. Model integration within the natural/built environment (GIS – Geographic Information Systems) and the filtering of BIM models in terms of level of detail and in time were underdeveloped. These roadblocks must be overcome if BIM is to reach its full potential.

As a generic, open intermediary, BIMy is an enabler of collaboration between existing BIM platforms. Through a unique, standardised API, it offers BIM model sharing, storing and filtering among different stakeholders and their integration and visualisation in the built environment. Such interoperability allows multiple designers to exchange information quickly and accurately, regardless of differences in their file formats/workflows. Additionally, BIMy provides a secure working environment and a digital marketplace for storing and sharing BIM models and model data. These enable new applications and facilitate new interactions that increase the usage and value of BIM and thereby develop the smart city domain.

### TECHNOLOGY APPLIED

A key technological innovation of BIMy is the filterable integration of BIM with GIS to create previously unanticipated usage scenarios. The BIMy Platform allows BIM/GIS data querying and semantic filtering at various levels of detail and integrates with repositories of surrounding (GIS) environments. A data transformation layer prepares and transforms BIM and GIS data for use in new applications so that architects and city planners can download existing surroundings (BIM) and the environment (GIS) instead of redrawing these. Building regulations and fire safety compliance may be verified instantly when a BIM model is uploaded. Annotations on (parts of) a shared

model can be exchanged across stakeholders in the standardised BIM Collaboration Format (BCF).

Due to the BIMy platform's collaborative nature and high data sensitivity, security is key. Platform access is protected through two-factor authentication and managed user roles and an integrated hardware security module boosts communication security. Platform monitoring provides real-time anomaly detection and threat identification to detect (for instance) impersonation, replay attacks and brute force attacks. The BIMy platform can also be deployed in the cloud: a cloud-agnostic deployment has been designed to facilitate adoption and a prototype



Example applications of BIMy

has been deployed in Microsoft Azure as a proof-of-concept demonstrating the platform's flexible deployment and supporting multiple platform operators. As BIM can be bandwidth-intensive, this platform can be deployed closer to users.

## MAKING THE DIFFERENCE

BIMy holds the promise of technical, commercial and societal benefits through its multi-stakeholder use-cases. For building permits, it allows guidelines to be modelled and applied to BIM models, gaining lead time by knowing in advance if a building will fit a location and its urban regulations. For fire safety, BIMy allows inspectors to ensure that a building complies with regulations, such as by annotating a 3D model during inspection. Similarly, the combined BIM/GIS data (possibly enriched with IoT data) can be used in crisis management to identify evacuation routes and train citizens using virtual or augmented reality. For the circular economy and recycling, the project enables the modelling and mining of reusable materials within a building and the option to design buildings with future extraction in mind.

Already, BIMy has led to five permanent hirings and four training programmes, with commercialisation now beginning. LetsBuild's BCF API, for instance, began as an early prototype of buildingSMART but has been raised to a significantly higher level. GIM has created a system that generates the urban context for a construction site with one click in addition to BIM-GIS data transformers and an

integrated BIM-GIS visualisation and annotation tool. ASSAR launched a successful pilot project for BIM-based e-tendering in construction and helped develop standardised BIM modelling guidelines, while BBRI focused on alignment with local/European standardisation. Other promising results include the integration of insights into training by Geo-IT, which is currently implementing a model checker plugin for Autodesk™ Revit™ to validate model compliance with the Belgian Revit Standard; Willemen, meanwhile, will use BIM in all construction projects to further exploit BIM data and venture beyond time-based model implementation.

As BIMy's cloud-based solution lowers entry barriers for new tech adopters, the project will ultimately enable companies to set up new business cases in the European BIM and GIS markets –expected to be worth USD 2.43 billion at a 13.46% CAGR by 2023 (BIM) and USD 2.4 billion at a 12.2% CAGR by 2025 (GIS). Seven building blocks for standardisation have also been identified; one notable innovation is a standard on data dictionaries for semantic mapping, which would greatly boost the use and value of BIM data by replacing free text annotations with standardised definitions irrespective of the stakeholder's language. As insights and success stories will be shared in the upcoming book “BIM in the City”, the project is set to help stakeholders maximise their usage of BIM for many years to come.

## MAJOR PROJECT OUTCOMES

### Dissemination

- 13 publications
- Soon to be published book: “BIM in the City”

### Exploitation (so far)

7 new products:

- Automated generation of the urban context (GIS) for easy integration in a BIM modelling tool
- BIM-based tool for managing and executing on-site inspections on a construction site
- Tool to evaluate the minimum daylight salubrity criterion purely based on BIM
- Tool for integrated BIM/GIS visualisation
- Integrated semantic framework with IFC and CityGML
- Trusted BIM-GIS framework resilient to cyber attacks
- AR & VR based training tools for evacuation planning from buildings

### Standardisation

- 7 contributions to standardisation, among which:
  - CEN/TC442 and NBN 442
  - ISO 23386 and 23387
  - BuildingSmart
- 2 extensions to existing standards
- 2 de facto standards

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### Partners

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Assar Architects  
Belgian Building Research Institute  
Centre d'Informatique pour la Région  
Bruxelloise  
Geo-IT  
GIM  
LetsBuild  
Sirris  
Willemen Construct

#### Turkey

Erange  
Netas Telekomunikasyon  
Pendik Municipality

### Project start

April 2018

### Project end

March 2021

### Project leader

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