



BIMy Project:

D5.2 Demonstrations Available Online

Document metadata

Date 2020-06-20
Status Final
Version 2.0
Authors Alper Kanak (AKA) – ERARGE
İbrahim Arif (İA) – ERARGE
Stijn Goedertier (SGO) – GIM
Olivier Gillin (OG) - Aproplan
Sergio Ristagno (SR) – Aproplan
Steven Smolders (SS) – GIM
Hashmat Wahid (HW) – Willemen Construct
Dieter Froyen (DF) - Willemen Construct
Lise Bibert (LB) – Willemen Construct
Thomas Goossens (TGO) – ASSAR Architects

Coordinator Alper Kanak - ERARGE
Reviewed by Gözdenur Yeşilyurt (GY)- NETAS

Version history

Version	Date	Author	Change
0.01	2019-03-22	AKA	Introduction and scope
0.02	2020-01-28	SGO	Add reference to business models in D4.2
0.03	2020-02-28	SGO, OG, TGO	Belgian demos first inputs
1.0	2020-06-01	AKA	First main draft
2.0	2020-06-20	AKA	Finalised

Table of Contents

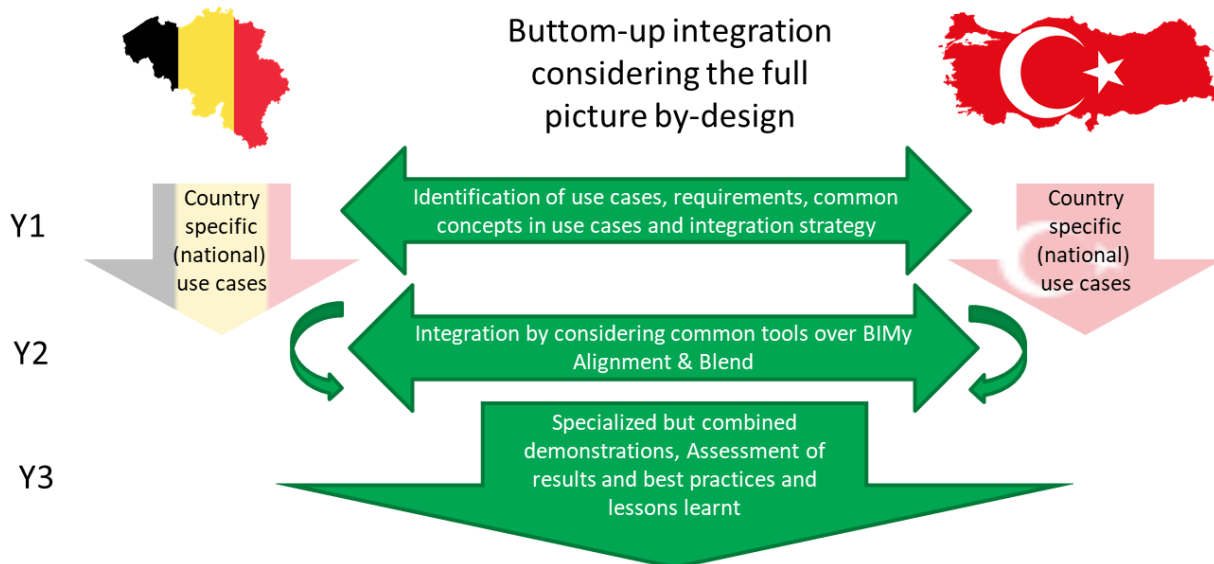
Table of Contents	2
1. Rationale and Motivation behind the Demonstrations	3
1.1. Introduction	3
1.2. BIMy Rationale and Motivation - Revisited	3
1.3. Business models	4
2. Demonstrations & Trials	5
2.1. Summary of the Demonstrators/tools/applications	5
2.2. Demonstration (Demo-0) / BIMy in Smart City Expo World Congress (SCEWC) 2019, Barcelona	6
2.3. Demonstration (Demo1) / BIMy Web Viewer integrated with BIMy API	9
2.4. Demonstrator (Demo 2 & 3) / Digital building permit on-site inspection set-up and execution & BCF API for interoperability between BIMy and other BIM platforms	11
2.5. Demonstrator (Demo 4) / VR Disaster Training Simulator	15
2.6. Demonstrator (Demo 5) / Revit model checker	17
2.7. Demonstrator (Demo 6) / BIM-based minimal daylight criterion & acoustic insulation checks	19
2.8. Vision (Vision 7) / Long term vision – circular economy (concept)	21
2.9. Demonstration and Vision (8) / Digital building permit app	23
2.10. Demonstrator & Vision (Demo 9) / Facilitate integration of urban context into BIM for architectural design 25	
2.11. Demonstrator (Demo 10) / Security demo	28
3. Conclusion	32
Bibliography	33

1. Rationale and Motivation behind the Demonstrations

1.1. Introduction

This deliverable aims to give a short summary of the tools, services or any software that are being prepared to be demonstrated in various platforms. The demonstrations have been planned in a bottom-up integration strategy. As depicted in the following figure, in the first year of the project country-specific use cases and related standalone demonstrations were planned. D5.1 gives an overview of the presented standalone tools. These tools are the first results of re-elicitation of the available capacity in the consortium and the reflection of possible re-usable technologies or first developments.

The second year considers an integration over the BIMy platform. Here, the presentable tools and demonstrations are expected to be integrated up to some extent. The third year will finally present the combined demonstration and assessment of results, best practices and lessons learnt.



This deliverable will give an inventory of

- the demonstrations presented online,
- the outcomes of the workshops where project outputs are presented,
- the reflections of public events (exhibitions, conferences, fairs, etc.),

in a nutshell.

1.2. BIMy Rationale and Motivation - Revisited

The BIMy project aims at providing an open collaborative platform for sharing, storing and filtering Building Information Models among different BIM owners/users and integrating and visualizing them in their built and natural environment. BIMy can be seen as an open and generic intermediary that enables interactions between existing and new applications through a unique standardized open API platform. Such a platform

will provide a secure collaborative working environment where different stakeholders can benefit and/or utilize BIM models not only at a single building level but also at larger levels that can be scaled up to wider-area smart city applications.

BIMy will overcome the limitations of current BIM exchange platforms, providing the following features: BIM with scale and time (supporting different levels of details and different stages of the building lifecycle), BIM/GIS semantic and dynamic integration (integrating BIM in their built and natural environment), BIM filtering (providing relevant information according to stakeholders and applications), cooperation (supporting stakeholder interactions), simulation and 3D visualization (mixed and augmented reality through different devices). BIMy is bringing into the consortium all the actors necessary to the successful completion of the platform. There are large companies that can provide a Cloud infrastructure for hosting the BIMy platform and contribute with bigger resources when needed. The smaller companies offer more focused know-how to specified tasks as collaboration or BIM sharing and visualization. The research partners will support companies with more complicated problems such as creating simple API and modeling and integrating BIM and GIS at different scales and times. BIM owners/users have an important role in the definition of the requirements, modelling, in offering their expertise for different applications and business models as well as the evaluation of demonstrators. The demonstrators in both countries improve the chances to make BIMy more replicable to new countries and environments. This enhances remarkably the market potential of BIMy.

1.3. Business models

In deliverable 'D4.2 v1 Report for business and exploitation models' (BIMy consortium, 2020, p. 2) we have analysed in detail several business models for the BIMy platform, such as:

- **Online tendering: BIM4Facility Management;**
- **BIM/GIS data broker: integrate urban context information into BIM models;**
- **BIM/GIS data broker: BIM4Insurance data extractor;**
- **BIM/GIS data broker: BIM4utility data extractor.**

The business models have been analysed on the basis of literature review and validated via interviews and surveys with key stakeholders. In this deliverable, we summarize the demonstrations that we have made available online. These demonstrations intend to further check the validity of the business models

2. Demonstrations & Trials

Aligned with the use cases eleven online demonstrations, trials or exhibitions have been developed aiming to present a baseline for further extensions to a wider community. This section gives an overview of these demonstrators all of which have been planned and demonstrated mainly during the first (year) and second (year) iteration of the project.


2.1. Summary of the Demonstrators/tools/applications

Summary of the demonstrators and related use cases are given in Table 1.

Table 1. Summary of the Demonstrators

Type	UCS ID(s)	Demonstration	Lead	Team
Demo	10, 11	Demo 0. SCEWC 2019 demo https://youtu.be/ezLQqI0orkU	Erarge	Netas
Demo	ALL	Demo 1. BIMy Web Viewer integrated with BIMy API	GIM	Indirect contributions w.r.t. BIMy platform developments
Demo	7	Demo 2. Digital building permit on-site inspection set-up and execution https://youtu.be/7xbCRpocRz4	LetsBuild	Indirect contributions w.r.t. BIMy platform developments
Demo	7	Demo 3. BCF API for interoperability between BIMy and other BIM platforms (Technical) https://youtu.be/d5GZSEggwZA	LetsBuild	Indirect contributions w.r.t. BIMy platform developments
Demo	10, 11, 14	Demo 4. VR Disaster Training Simulator https://youtu.be/s2QYIRiNrZc	Erarge	Assar
Demo	7	Demo 5. Revit model checker https://youtu.be/oyRASok7SIQ https://youtu.be/4bzk7oLsss8	Geo-IT	Indirect contributions w.r.t. BIMy platform developments
Demo	11	Demo 6. BIM-based minimal daylight criterion & acoustic insulation checks	BBRI	Indirect contributions w.r.t. BIMy platform developments
Vision	2	Demo 7. Long term vision – circular economy (concept)	Willemen	Aproplan, Assar, BBRI, CIRB, Geo-IT, Willemen
Demo + Vision	7	Demo 8. Digital building permit app	Sirris	Aproplan, Assar, BBRI, CIRB, Geo-IT, GIM, Willemen
Vision	8	Demo 9. Facilitate integration of urban context into BIM for architectural design	Assar	Willemen
Demo	ALL	Demo 10. Security demo https://youtu.be/kF4AEfqVLhE	Erarge	Netas

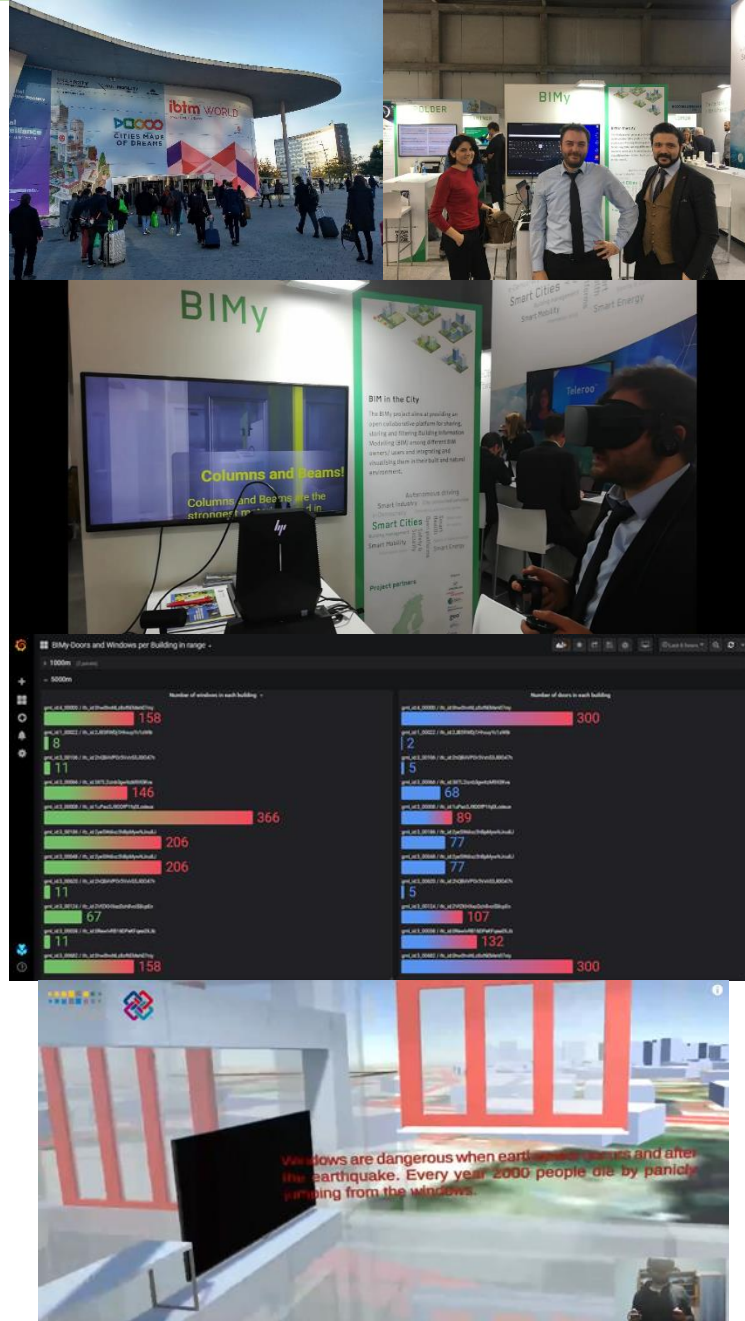
2.2. Demonstration (Demo-0) / BIMy in Smart City Expo World Congress (SCEWC) 2019, Barcelona

Name of the tool/Application/similar	BIMy in Smart City Expo World Congress (SCEWC) 2019, Barcelona
Link	https://youtu.be/ezLQgl0orkU 
Partners Contributing	ERARGE, NETAS
Responsible researcher(s) for technical discussions	<p>Alper KANAK Ph.D., ERARGE, alper.kanak@erarge.com.tr</p> <p>Osman Kumaş, NETAS, okumas@netas.com.tr</p> <p>Nagehan Çakır, NETAS, nagehanc@netas.com.tr</p>
Description	<p><i>This video presents the first-year achievements of BIMy, a EUREKA ITEA3 project with Project Nr. 16026. BIMy aims to integrate BIM and GIS models at semantic level and provides a cloud-based platform to utilise the well-known IFC and CityGML ontologies for smarter cities. This video presents an actual use of the integrated BIM-GIS framework and its use as a baseline for a VR-enabled simulation and training application. The VR application aims to increase the awareness of public in case of a disaster (earthquake or fire) occurs, help them to learn what to do or not to do during catastrophes, and prepare them to reach to the relief and assistance services in a city.</i></p>
Target Audience	<p><i>Expo participants including smart city experts, city authorities, first responder and relief organisation representatives, ICT experts, social innovators, investors, entrepreneurs, regular citizens or other potential contributors</i></p>
Dissemination status	Public demonstration
Statistics	<p><i>More than 500 participants were informed about BIMy in SCEWC'19. About 50 subjects tried the VR experience.</i></p>
Opinions & Feedback	<p><i>Nearly all visitors mentioned that they enjoyed the VR experience and shared their positive opinions about the BIMy idea. Although the demonstrated BIM cloud platform and the VR experience was reflecting the first steps, the visitors showed great interest. The idea of using BIM and GIS for critical infrastructure and surroundings protection, training of first responders, public awareness</i></p>

boosting by AR and VR, use of BIM in circular economy at urban transformation scale and the automation of building permit processes had been appreciated.

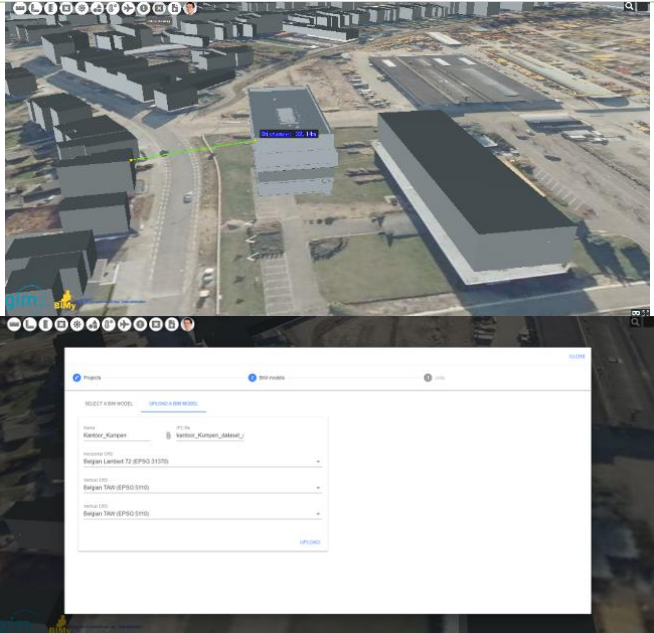
Some visitors also mentioned that if IoT and heterogeneous data processing and big data analytics improved the solution, BIMy could have a pioneering role in BIM-enabled smart city services. More effective transformation of old data formats (e.g. CAD) to BIM and standardisation of multilateral transformation of building and geophysical data formats was mentioned as the high potential extensions of BIMy in the smart city market.

Snapshots, Photos and Figures





2.3. Demonstration (Demo1) / BIMy Web Viewer integrated with BIMy API

Name of the tool/Application/ similar	BIMy Web Viewer integrated with BIMy API
Link	<i>To be demonstrated in Y2 review</i>
Partners Contributing	<i>GIM</i>
Responsible researcher(s) for technical discussions	<i>Stijn Goedertier, GIM, stijn.goedertier@gim.be</i>
Description	<p><i>Demonstrates connectivity with many other building blocks in the BIMy Platform.</i></p> <ul style="list-style-type: none"> ▪ <i>User stories:</i> <ul style="list-style-type: none"> ▪ <i>BIM data and GIS data according to BIMy Data Model: IFC, cadastral parcel, elevation model, ortho, building</i> ▪ <i>Authenticate using OAuth2</i> ▪ <i>Measure height, distance, surface</i> ▪ <i>Upload georeferenced BIM Model via BIMy API</i> ▪ <i>Create BCF topics</i>
Target Audience	<i>Use case: Digital Building Permit – Integrate BIM in urban context</i>
Dissemination status	<i>Consortium only Public trial or demonstration</i>
Statistics	<i>N/A</i>
Opinions & Feedback	<i>N/A</i>
Snapshots, Photos and Figures	 <p>The image shows a screenshot of the BIMy Web Viewer interface. The top part displays a 3D aerial view of a building complex with various structures and a road. A green line indicates a measurement or distance between two points on the model. The bottom part shows a data entry form with fields for 'Name', 'Address', 'City', and 'Country', each with a dropdown menu. The form is titled 'SELECT A BIM MODEL' and 'UPLOAD A BIM MODEL'.</p>

BIMy Platform API

The document describes how an application can use the API of the BIMy Platform. The BIMy API uses the OAuth2 Authorization code flow for authentication. Because all consortium members already have a GitHub account, it was decided that users of the API can authenticate on GitHub. In the future, other OAuth2 authentication providers could be added. To create an authentication session, you first need to request an authorization code on `/oauth2/github/authorize` endpoint. `https://bimy.gitlab.io/bimy-req/api/` With the authorization code, an access token can be requested on the `/oauth2/github/token` endpoint. See the documentation on the `GitHub OAuth2 Authorization code flow` for further documentation on the request parameters to use.

Terms of service
Contact the developer
© copyright BIMy consortium, 2019-2020
Web page of the BIMy project

Server:

project Operations on project objects. See: <https://itea3.org/community/projects/bimy/bimya.html>

- POST** /project: Add a new project on the BIMy platform
- GET** /project/{id}: Find project a user has access to
- GET** /project/{projectId}: Get project by ID
- PUT** /project/{projectId}: Update a project
- DELETE** /project/{projectId}: Delete a project

model Operations on model objects. See: <https://itea3.org/community/projects/bimy/bimya.html>

- POST** /project/{projectId}/model: Upload (check-in) a BIM model for a project.
- GET** /model/{id}: Find all models the user has access to. Returns the model metadata, not the actual IFC.
- POST** /model/{query}: Query all models the user has access to. Returns a subset of the model's content. The results returned in the same format as the original model.
- GET** /project/{projectId}/model/{modelId}/(versionId): Get the metadata of model by ID.
- PUT** /project/{projectId}/model/{modelId}/(versionId): Update a BIM model for a project.
- DELETE** /project/{projectId}/model/{modelId}/(versionId): Delete model by ID.
- POST** /project/{projectId}/model/{modelId}/(versionId): Query a specific model the user has access to. Returns a subset of the model's content. The results returned in the same format as the original model.

job Operations to start long-running jobs on the BIMy platform. See: <https://itea3.org/community/projects/bimy/bimya.html>

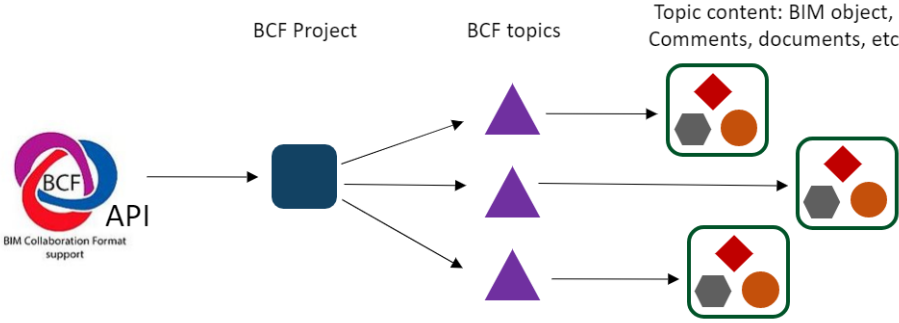
- POST** /project/{projectId}/job: Generate job for a project.
- GET** /project/{projectId}/job/{id}: Find jobs a user has access to. Jobs can be running or completed.
- GET** /project/{projectId}/job/{jobId}: Get the status and results of a job by its job ID.

USER Operations on user objects. See: <https://itea3.org/community/projects/bimy/bimya.html>

- POST** /user/{createWithId}: Create new users with given input array.
- GET** /user/{username}: Get user by username.
- PUT** /user/{username}: Update user.
- DELETE** /user/{username}: Delete user.

2.4. Demonstrator (Demo 2 & 3) / Digital building permit on-site inspection set-up and execution & BCF API for interoperability between BIMy and other BIM platforms

Name of the tool/Application/ similar	Digital building permit on-site inspection set-up and execution & BCF API for interoperability between BIMy and other BIM platforms
Link	<p>https://youtu.be/d5GZSEggwZA https://youtu.be/7xbCRpocRz4</p> <p>Content:</p> <ol style="list-style-type: none"> 1. Models management and tasks creation 2. Roof inspection set-up 3. Façade inspection set-up 4. Roof inspection execution 5. On-site inspections overview and results on BIM model
Partners Contributing	LetsBuild Aproplan
Responsible researcher(s) for technical discussions	<p>Olivier Gillin, LetsBuild olivier.gillin@letsbuild.com Erick Vasquez, LetsBuild erick.vasquez@letsbuild.com Sergio Ristagno, LetsBuild sergio.ristagno@letsbuild.com Daniel Pereira, LetsBuild daniel.pereira@letsbuild.com</p>
Description	<p>The videos and photos indicated here illustrate the collaboration and interoperability capabilities of the LetsBuild BIM Prototype. LetsBuild BIM Prototype acts as a tool to facilitate on-site utilisation of BIM data, as well as a medium to provide on-site activities updates back to Common Data Environments. In the context of BIMy, LetsBuild is targeting at substracting information of BIM models coming from the BIMy platfrom and connecting on-site inspection data to those.</p> <p>Considering that LetsBuild operates as an independent application, it is being developed to operate in an OpenBIM environemnt, currently supporting IFC models and soon supporting BCF issues.</p> <p>The prototype is aimed at supporting the digital building permit use case.</p> <ul style="list-style-type: none"> • Create inspections according to digital building permit details coming from the BIMy platform. • Provide efficient interfaces for on-site inspections (allow the attachment of annotations, pictures and documents to BIM objects) • Send on-site inspection results back to the BIMy platform as BCF topics.

	 <p>The diagram illustrates the BCF API workflow. It starts with the BCF API logo (BIM Collaboration Format support). An arrow points to a dark blue square labeled 'BCF Project'. From this square, three arrows point to three purple triangles labeled 'BCF topics'. From each triangle, an arrow points to a box containing three colored shapes (a red diamond, a grey hexagon, and an orange circle). A final arrow points from these boxes to a larger box containing the same three shapes, representing the final topic content: BIM object, Comments, documents, etc.</p>
<p>Target Audience</p>	<p><i>Existing clients and business leads</i> <i>BIMy consortium members</i></p>
<p>Dissemination status</p>	<p>Public demonstration</p>
<p>Statistics</p>	<p><i>Number of demonstrations to existing clients and business leads: 25</i> <i>Number of users currently enrolled for testing: 13</i> <i>Number of requests for testing: 9</i></p>
<p>Opinions & Feedback</p>	<p><i>Most clients and business leads are interested about the functionalities of the LetsBuild BIM prototype. The prototype facilitates the understanding of the utilisation of BIM models on site for inspections and issues management. In regards to the BIMy project specifically, demonstrations have illustrated the potential for collaboration by using LetsBuild as a complementary platform for on-site activities. The array of features and functionalities already existing in LetsBuild facilitate the implementation of on-site workflows related to the use cases of the BIMy project (Digital building permit, fire inspection, etc). Having an OpenBIM approach has been highlighted as crucial by many users, reason why the existing support for IFC models and the future development of BCF functionalities for issues management in the BIM prototype have been well perceived.</i></p> <p><i>Nonetheless, clients, business leads and BIMy consortium members have highlighted a few limitations of the BIM prototype: a) The 3D viewer is in early phases of development and needs more robust navigation and features. b) The 3D viewer is only available on the web version. Despite being integrated with the mobile on-site workflows of LetsBuild, users are looking forward to using the 3D model in mobile devices. c) Issues management and inspection workflows are powerful, but users would like to see extended functionalities for other construction processes (Planning, progress reports, quantity surveying, etc).</i></p>

Snapshots, Photos and Figures

LetsBuild - Our way to BIM May 2020

LetsBuild BIM workflow

1 - 2D drawings
- 3D models
- BIM Objects Metadata

2 Create tasks linking

- BIM objects
- Gantt charts
- Points and forms
- Documents
- More

3 Tasks available on site

- Linked to 2D drawings and 3D models
- Access to BIM metadata
- Assigned & scheduled
- In a collaboration workflow

4.1 BIM Objects with LetsBuild metadata

4.2 Interoperability for issue management

Object 1 - Wall
TopLevel: 100
Material: Conc
Area: 23m2
Volume: 8m3

Object 1 - Wall
TopLevel: 100
Material: Conc
Area: 23m2
Volume: 8m3
LetsBuild value 1: A
LetsBuild value 2: B

Object 1 - Wall
TopLevel: 100
Material: Conc
Area: 23m2
Volume: 8m3

LETSBUILD BIM > BIMy - Year 2 Rev

Search in assets tree

- vboerpas patio_8280
- +02 AR plafond
- dak b.k. ruwbouw_3180
- +03 dak nivo
- gsm/ingevul patio
- +03 AR 2
 - IFCAnnotation
 - IFcRoof
 - Basic Roof27-_dak
 - Basic Roof27-_dak
 - Basic Roof27**
 - Basic Roof27-_dak
 - IFcSlab

Basic Roof27-_dakbedeking:3184051

Non Conformities: 2 NC

Forms linked

1.07 **GOOD**

BIMy / On-site Roof Inspection

erick.vasquez

LETSBUILD BIM > BIMy - Year 2 Rev

Search all 6 results

Name	Level	Area	Category	Type	Confirm
AR_raam gvl type1AR_raam gl...	+00 AR		BuildingElementProxy	AR_raam gvl type1	CONFORM
AR_raam gvl type1AR_raam gl...	+00 AR		BuildingElementProxy	AR_raam gvl type1	NOT CONFORM
AR_raam gvl type1AR_raam gl...	+00 AR		BuildingElementProxy	AR_raam gvl type1	NOT CONFORM
AR_raam gvl type1AR_raam gl...	+00 AR		BuildingElementProxy	AR_raam gvl type1	NOT CONFORM
AR_raam gvl type2:AR_raam ...	+00 AR		BuildingElementProxy	AR_raam gvl type2LL	NOT CONFORM
AR_dakbed raam:AR_dakbed ra...	+01 AR		BuildingElementProxy	AR_dakbed raam	NOT CONFORM
Basic Roof27-_dakbedeking...	+03 AR 2		IFcRoof	Basic Roof 27-_dakbedeking...	NOT CONFORM

AR_raam gvl type2:AR_raam gvl type2L:2248477

Non Conformities: 3 NC

Forms linked

1.08 **GOOD**

BIMy / On-site Façade Inspection

erick.vasquez

The screenshot displays a software interface for managing inspection results. On the left, a sidebar contains navigation options: Home, Points, Forms, Documents, Participants, Dashboard, Settings, and Planning. The main area is titled 'ENTIRE PROJECT' and shows a table of '8 Results'. The table has columns for Status, Type, Number, Category, Name, Due date, and In charge. The results are categorized by time period: 'Last month' and 'This year'. The 'This year' section includes items with status indicators like 'DONE' (blue) and 'TODO' (orange).


Status	Type	Number	Category	Name	Due date	In charge
Last month						
DONE	●	1.08	FAC/FI	BIMy / On-site Façade Inspa...	20/04/2020	erick vasquez
DONE	●	1.07	Roof/RINS	BIMy / On-site Roof Inspection	20/04/2020	erick vasquez
DONE	●	1.01	RS/CNG	Structural work - Pouring of ...	27/05/2020	erick vasquez
This year						
DONE	●	1.04	RS/IG	Quality control Façades + Ek...	28/04/2020	erick vasquez
DONE	●	1.03	S&HPEL	Finishing- Floor finishing	29/04/2020	erick vasquez
TODO	●	1.02	S&HPEL	Finishing- Floor finishing	29/04/2020	erick vasquez
TODO	●	1.01	S&HPEL	Finishing- Floor finishing	29/04/2020	erick vasquez
TODO	●	1.01		Quality Inspection		

The right side of the interface shows a detailed view for 'BIMy / On-site Roof Inspection'. It includes a 'PREVIEW' button, progress information (19/19 questions, 20/05/2020 due date), and a 'Quality' score of 2 non-conformities. Below this, there are thumbnails for 'Green roofs docume...' and 'Building Permit 231A'.

The detailed view is divided into three sections:

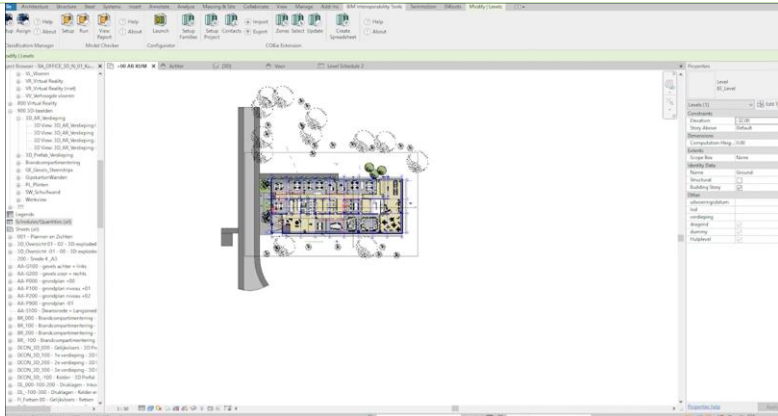
- Summary Of BIMy / On-site Roof Inspection**: Shows 'Quality' status, 'Questions 19/19', '2 non conformities', and '0 point'.
- Inspection details**: Lists questions 6/6 with answers:
 - 1.1. Building permit file code: 231A
 - 1.2. City planning inspector name: John Smith
 - 1.3. Inspector license number: (empty)
- Approval decision**: Shows question 1/1 with a '1' non-conformity indicator. Answer: '6.1. Is the roof approved? Conditionally approved'.
- Conditional approval details**: Shows question 1/1 with answer: '7.1. Describe the details for conditional approval: Verify compliance of radio antenna'.

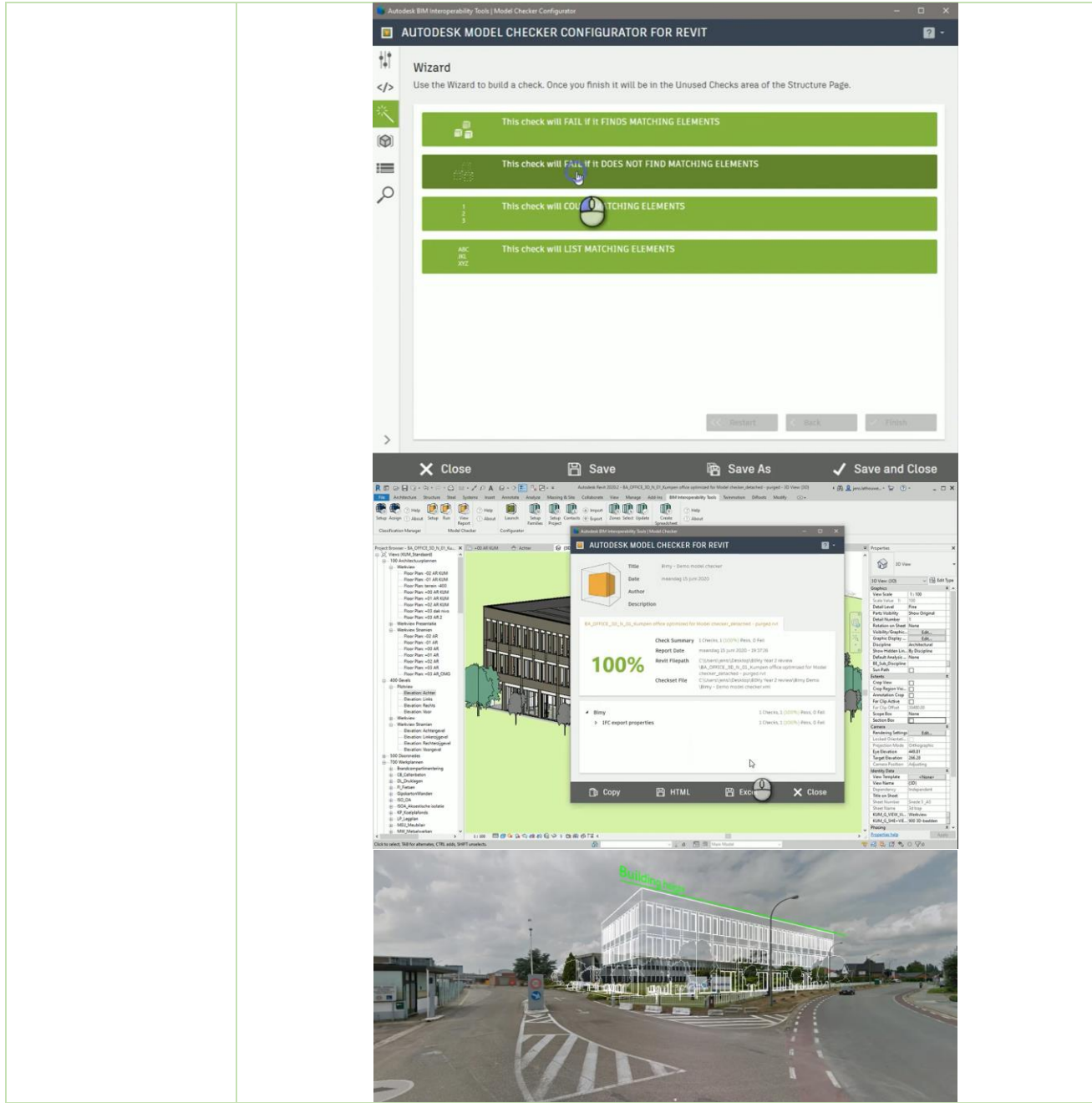
2.5. Demonstrator (Demo 4) / VR Disaster Training Simulator

Name of the tool/Application/similar	VR Disaster Training Simulation
Link	https://youtu.be/s2QYIRiNrZc
Partners Contributing	ERARGE, ASSAR, NETAŞ
Responsible researcher(s) for technical discussions	Alper KANAK Ph.D., ERARGE, alper.kanak@erarge.com.tr Ibrahim ARIF, ERARGE, ibrahim.arif@erarge.com.tr Thomas GOOSSENS, ASSAR, tgo@assar.com
Description	<p>An intermediary demo, as a result of joint study between ERARGE and ASSAR Architects in BIMy.</p> <p>The simulation effectively uses the BIMy platform by extracting virtual 3D layers with pre-queries. Semi-automatic content adaptation is applied by following these steps:</p> <ul style="list-style-type: none"> • Information model is retrieved by BIMy queries (what to be presented) • Models generated in ifc format • Ifc formats parsed into .dae format (automatic parser-dockerized). • Dae file saved on BIMy simulation folder. • Dae file imported to Unity (dockerized) • Dae file parsed elements by name and materialized and becomes prefab (automatic alignment and renaming for better organization of BIM & GIS content) • Props and Scenarios are created, refined (by development over Unity).
Target Audience	Municipalities, city planners, disaster trainees, fire brigade
Dissemination status	Public demonstration
Statistics	NA
Opinions & Feedback	Positive thoughts from consortium partners were shared, whilst additional improvements on the simulation were offered during the development.
Snapshots, Photos and Figures	 <p>The solution is elastic to create dynamic *.dae layers associated with</p>

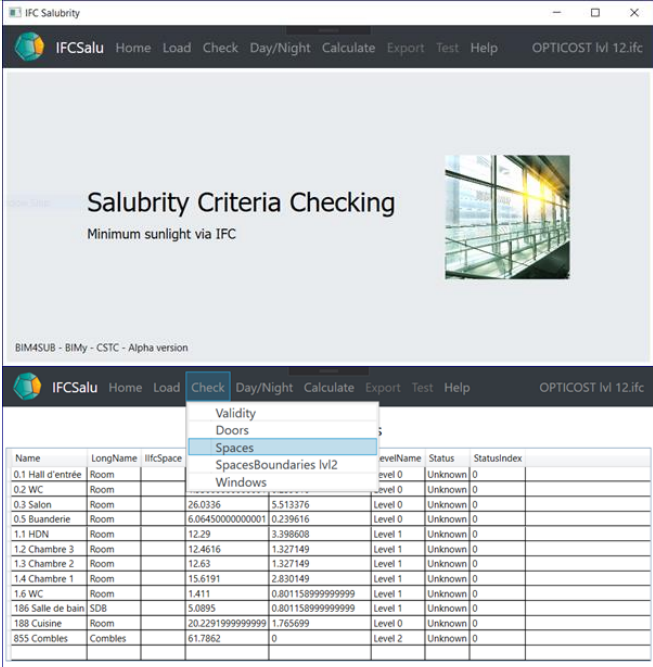


2.6. Demonstrator (Demo 5) / Revit model checker

Name of the tool/Application/ similar	Revit model checker
Link	https://youtu.be/oyRASok7SIQ https://youtu.be/4bzk7oLsss8
Partners Contributing	<i>Geo-IT, BIMy platform contributors</i>
Responsible researcher(s) for technical discussions	<i>Jens Lathouwers, Geo-IT, jens.lathouwers@geoit.be</i>
Description	<i>In the current situation, there's no widespread standardization, and there's no efficient way to check models on compliance with a bim protocol. From the beneficial aspect, the Revit model checker can be provided, together with a standardization method and modelling guidelines to give either the creator of the model, or the receiving party the possibility to check the compliance between those three documents.</i>
Target Audience	<i>Architects, designers</i>
Dissemination status	Public demonstration
Statistics	NA
Opinions & Feedback	<i>The following months the knowledge gained by working on the building permit use-case will be exploited to apply it to create a check-set for the fire regulation use case. The exported xml from the check should be exchangeable between the Revit model checker and the Bimy platform to use the same checks on both sides of the regulations.</i>
Snapshots, Photos and Figures	



2.7. Demonstrator (Demo 6) / BIM-based minimal daylight criterion & acoustic insulation checks

Name of the tool/Application/similar	IFC Salubrity Criteria Checking application																																																																																											
Link	NA																																																																																											
Partners Contributing	BBRI, Sirris																																																																																											
Responsible researcher(s) for technical discussions	Robberts François, BBRI, francois.robberts@bbri.be																																																																																											
Description	The application is based on the Order of the Walloon Government of 30 August 2007. It allows to verify one of the salubrity criteria presented by the document: the criterion of minimum natural lighting. To do this, the program extracts from an IFC file the necessary data available and allows the user to check the conformity of the model with the rules in effect.																																																																																											
Target Audience	Government authorities auditing this criterion, and entities subject to the audit																																																																																											
Dissemination status	Public demonstration Consortium only																																																																																											
Statistics	Not public yet																																																																																											
Opinions & Feedback	NA																																																																																											
Snapshots, Photos and Figures	 <table border="1"> <thead> <tr> <th>Name</th> <th>LongName</th> <th>IfcSpace</th> <th>SpacesBoundaries lvl2</th> <th>LevelName</th> <th>Status</th> <th>StatusIndex</th> </tr> </thead> <tbody> <tr> <td>0.1 Hall d'entrée</td> <td>Room</td> <td></td> <td></td> <td>Level 0</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>0.2 WC</td> <td>Room</td> <td></td> <td></td> <td>Level 0</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>0.3 Salon</td> <td>Room</td> <td>26.0336</td> <td>5.513376</td> <td>Level 0</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>0.5 Buanderie</td> <td>Room</td> <td>6.06450000000001</td> <td>0.239616</td> <td>Level 0</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>1.1 HDN</td> <td>Room</td> <td>12.29</td> <td>3.398608</td> <td>Level 1</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>1.2 Chambre 3</td> <td>Room</td> <td>12.4616</td> <td>1.327149</td> <td>Level 1</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>1.3 Chambre 2</td> <td>Room</td> <td>12.63</td> <td>1.327149</td> <td>Level 1</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>1.4 Chambre 1</td> <td>Room</td> <td>15.6191</td> <td>2.830149</td> <td>Level 1</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>1.5 WC</td> <td>Room</td> <td>1.411</td> <td>0.8011589999999999</td> <td>Level 1</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>186 Salle de bain</td> <td>SDB</td> <td>5.0895</td> <td>0.8011589999999999</td> <td>Level 1</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>188 Cuisine</td> <td>Room</td> <td>20.22919999999999</td> <td>1.765699</td> <td>Level 0</td> <td>Unknown</td> <td>0</td> </tr> <tr> <td>855 Combles</td> <td>Combles</td> <td>61.7862</td> <td>0</td> <td>Level 2</td> <td>Unknown</td> <td>0</td> </tr> </tbody> </table>	Name	LongName	IfcSpace	SpacesBoundaries lvl2	LevelName	Status	StatusIndex	0.1 Hall d'entrée	Room			Level 0	Unknown	0	0.2 WC	Room			Level 0	Unknown	0	0.3 Salon	Room	26.0336	5.513376	Level 0	Unknown	0	0.5 Buanderie	Room	6.06450000000001	0.239616	Level 0	Unknown	0	1.1 HDN	Room	12.29	3.398608	Level 1	Unknown	0	1.2 Chambre 3	Room	12.4616	1.327149	Level 1	Unknown	0	1.3 Chambre 2	Room	12.63	1.327149	Level 1	Unknown	0	1.4 Chambre 1	Room	15.6191	2.830149	Level 1	Unknown	0	1.5 WC	Room	1.411	0.8011589999999999	Level 1	Unknown	0	186 Salle de bain	SDB	5.0895	0.8011589999999999	Level 1	Unknown	0	188 Cuisine	Room	20.22919999999999	1.765699	Level 0	Unknown	0	855 Combles	Combles	61.7862	0	Level 2	Unknown	0
Name	LongName	IfcSpace	SpacesBoundaries lvl2	LevelName	Status	StatusIndex																																																																																						
0.1 Hall d'entrée	Room			Level 0	Unknown	0																																																																																						
0.2 WC	Room			Level 0	Unknown	0																																																																																						
0.3 Salon	Room	26.0336	5.513376	Level 0	Unknown	0																																																																																						
0.5 Buanderie	Room	6.06450000000001	0.239616	Level 0	Unknown	0																																																																																						
1.1 HDN	Room	12.29	3.398608	Level 1	Unknown	0																																																																																						
1.2 Chambre 3	Room	12.4616	1.327149	Level 1	Unknown	0																																																																																						
1.3 Chambre 2	Room	12.63	1.327149	Level 1	Unknown	0																																																																																						
1.4 Chambre 1	Room	15.6191	2.830149	Level 1	Unknown	0																																																																																						
1.5 WC	Room	1.411	0.8011589999999999	Level 1	Unknown	0																																																																																						
186 Salle de bain	SDB	5.0895	0.8011589999999999	Level 1	Unknown	0																																																																																						
188 Cuisine	Room	20.22919999999999	1.765699	Level 0	Unknown	0																																																																																						
855 Combles	Combles	61.7862	0	Level 2	Unknown	0																																																																																						

IFCSalu Home Load Check Day/Night Calculate Export Test Help
OPTICOST IM 12.ifc

Caractérisation des pièces

0.1 Hall d'entrée	Day Room
0.2 WC	Not a Living Room
0.3 Salon	Day Room
0.5 Buanderie	Not a Living Room
1.1 HDN	Day Room
1.2 Chambre 3	Night Room
1.3 Chambre 2	Unknown

IFCSalu Home Load Check Day/Night Calculate Export Test Help
OPTICOST IM 12.ifc

Criteria of Calculation

Type of building Existing Building

	Day Room	Night Room
Minimum (Vertical Glass Area) / (Room Area)	1/14	1/14
Minimum (Roof Glass Area) / (Room Area)	1/16	1/16

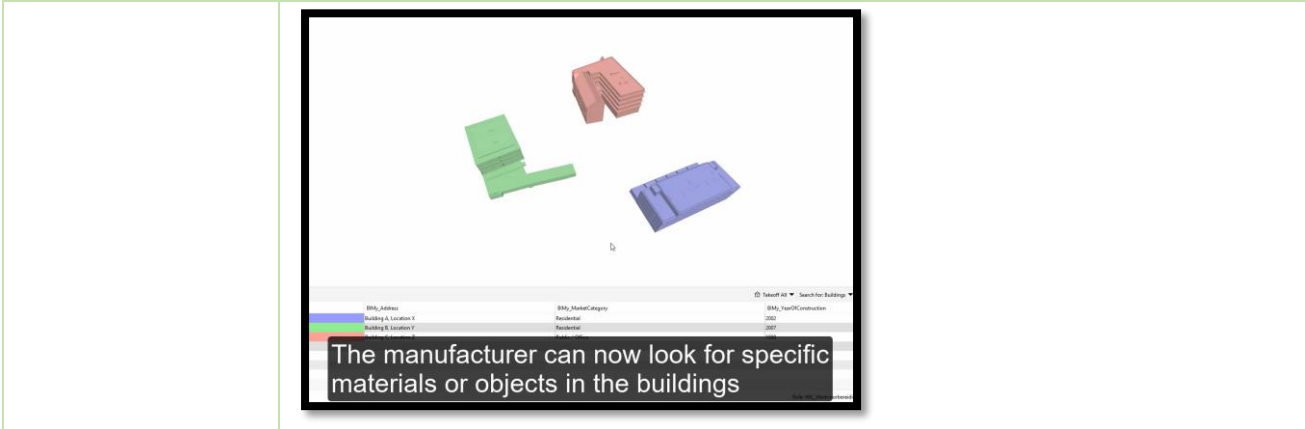
IFCSalu Home Load Check Day/Night Calculate Export Test Help
OPTICOST IM 12.ifc

Résultats

Name	SquareMeterArea	SquareMeterGlassArea	LevelName	Status	Ratio	Evaluation
0.1 Hall d'entrée	3.529500000000002	0	Level 0	Not a Living Room	0	For info
0.2 WC	1.530000000000001	0.239616	Level 0	Not a Living Room	1.87934117647058	For info
0.3 Salon	26.0336	5.513376	Level 0	Day Room	2.54135086964538	Ok
0.5 Buanderie	6.064500000000001	0.239616	Level 0	Not a Living Room	0.474135048231511	For info
1.1 HDN	12.29	3.398608	Level 1	Night Room	3.3184130187144	Ok
1.2 Chambre 3	12.4616	1.327149	Level 1	Night Room	1.27798902227643	Ok
1.3 Chambre 2	12.63	1.327149	Level 1	Night Room	1.26094916864608	Ok
1.4 Chambre 1	15.6191	2.830149	Level 1	Night Room	2.17437547617981	Ok
1.6 WC	1.411	0.801158999999999	Level 1	Not a Living Room	6.81354216867469	For info
186 Salle de bain	5.0895	0.801158999999999	Level 1	Not a Living Room	1.88896905393457	For info
188 Cuisine	20.2291999999999	1.765699	Level 0	Day Room	1.04741601249679	Ok
855 Combles	61.7862	0	Level 2	Not a Living Room	0	For info

2.8. Vision (Vision 7) / Long term vision – circular economy (concept)

Name of the tool/Application/ similar	Circular Economy: Long term Vision – Online article in two parts
Link	<i>Web link to article to be added after publication</i>
Partners Contributing	<i>Willemen, Assar, GIM</i>
Responsible researcher(s) for technical discussions	<i>Hashmat Wahid, Willemen, Hashmat.wahid@willemen.be Dieter Froyen, Willemen, dieter.froyen@willemen.be Lise Bibert, Willemen, lise.bibert@willemen.be</i>
Description	<i>Article explaining the possibilities for applications regarding Circular Economy in the long term on the BIMy platform and the limitations that prevent current exploitation that need to be overcome. Includes a conceptual demo video of a future possible application.</i>
Target Audience	<i>Construction companies in the broadest sense of the word Manufacturers of construction materials Government or consulting bodies imposing BIM or building regulation Any other parties that have an interest in Circular Economy</i>
Motivation	<i>This article could create spirit with the target audience to contribute to better or more standardised workflows, agreements or requirements.</i>
Dissemination status	<i>Public demonstration (not yet published)</i>
Statistics	<i>NA</i>
Opinions & Feedback	<i>NA</i>
Snapshots, Photos and Figures	<p>VISION AND FOUNDATIONS FOR CIRCULAR ECONOMY IN THE BUILDING PRODUCT CYCLE: PART ONE</p> <p><i>What is circular economy and why is it important?</i></p> <p>Building and housing are important activities to accommodate for the needs in our everchanging society. However, construction activities have a major impact on the environment. According to the UNEP (United Nations environment, 2004) the construction sector is responsible for almost 40% of all energy consumption and half of the resource consumption globally. The global population will keep on growing continuously, hence putting significant stress on both the (built) environment and on our exhaustible resources. For this reason, we face a major challenge of rethinking the consumption of raw materials in the construction sector.</p> <p>Our current outdated practice of a linear construction market is a process of mining materials for fabrication, assembly, use, demolition and dumping. The circular economy model intends to minimize or avoid the last part(s) of this process and keep using products in a continuous cycle. In other words: the linear process should become a closed loop.</p> <p>LINEAR ECONOMY RECYCLING ECONOMY CIRCULAR ECONOMY</p> <p>The diagram shows three models: 1. Linear Economy: a straight line from 'EXTRACTION' to 'DISPOSAL'. 2. Recycling Economy: a loop from 'EXTRACTION' to 'RECYCLING' back to 'EXTRACTION'. 3. Circular Economy: a closed loop from 'EXTRACTION' to 'USE' to 'RECYCLING' back to 'EXTRACTION'.</p>



2.9. Demonstration and Vision (8) / Digital building permit app

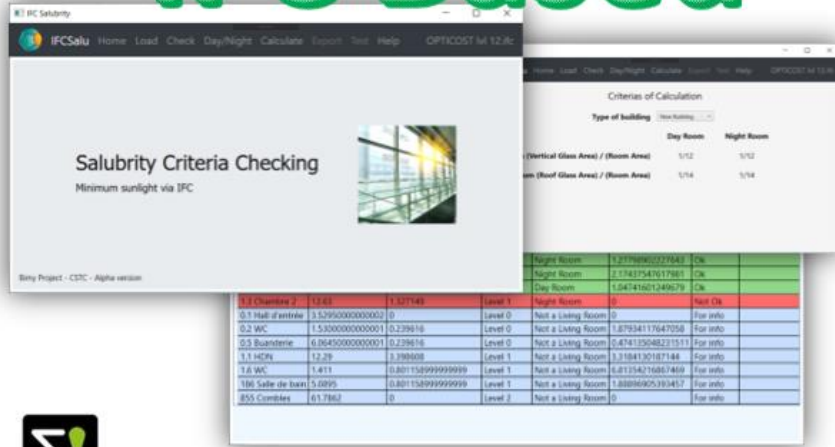
Requesting a building permit can be a tedious administrative task, in which information is often duplicated and later lost. This demonstrator shows how the process could be simplified/streamlined using a digital Building Permit Application supported by the BIMy platform.

The application is developed as a collaboration between all consortium partners. It highlights the different individual contributions, but also demonstrates a complete proof of concept of the BIMy platform. The motivation behind this vision is that the inclusion of BIM (or BIMy) in mandatory public processes such as building permit requests could be a catalyst for widespread adoption.

Name of the tool/Application/similar	Building Permit Application (Evacuation in case of a disaster)
Link	https://drive.google.com/file/d/1I_cXgDNVPjKJXEQa9OcgP0OxFu88Z0yW/view
Partners Contributing	ASSAR, BBRI, ERARGE, Geo-IT, GIM, Letsbuild, NETAS, Sirris, Willemen
Responsible researcher(s) for technical discussions	Olivier Biot, Sirris, olivier.biot@sirris.be Stijn Goedertier, GIM, stijn.goedertier@gim.be Thomas Goossens, ASSAR, tgo@assar.com François Robberts, BBRI, francois.robberts@bbri.be Erick Vasquez, Letsbuild, Erick.vasquez@letsbuild.com
Description	<i>Requesting a building permit can be a tedious administrative task, in which information is often duplicated and later lost. This demonstrator shows how the process could be simplified/streamlined using a digital Building Permit Application supported by the BIMy platform.</i> <i>The application is developed as a collaboration between all consortium partners. It highlights the different individual contributions, but also demonstrates a complete proof of concept of the BIMy platform.</i>
Target Audience	Architects, city planners, building owners
Motivation	<i>The inclusion of BIM (or BIMy) in mandatory public processes such as building permit requests could be a catalyst for widespread adoption.</i>
Dissemination status	Currently: Consortium only Later: public demonstrator
Statistics	NA
Opinions & Feedback	NA

Snapshots, Photos
and Figures

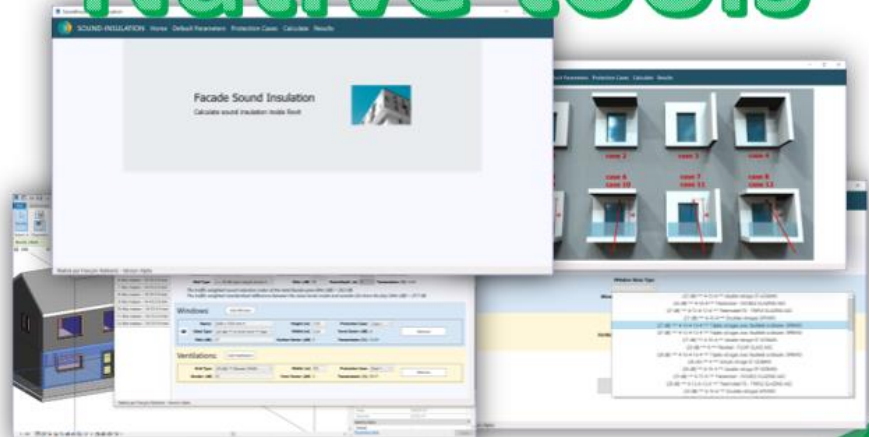
IFC Based



The screenshot shows the IFCSalu software interface. The main window displays "Salubrity Criteria Checking" with a sub-header "Minimum sunlight via IFC". A secondary window titled "Criteria of Calculation" shows a table with columns for "Type of Building", "Day Room", and "Night Room". Below this, a detailed table lists various room types and their corresponding values.

Room Type	Value 1	Value 2	Level	Room Type	Value 1	Room Type	Value 2
0.1 Chambre J	1.1241	1.127149	Level 1	Night Room	0	Night Ok	
0.1 Hall d'entree	1.529500000000002	0	Level 0	Night a Living Room	0	For info	
0.2 WC	1.5300000000000001	0.238616	Level 0	Night a Living Room	1.87934117647058	For info	
0.3 Buanderie	6.064500000000001	0.238616	Level 0	Night a Living Room	0.474135048221511	For info	
1.1 HCN	12.29	0.398008	Level 1	Night a Living Room	1.3184130167184	For info	
1.6 WC	1.471	0.201152999999999	Level 1	Night a Living Room	0.21154216857489	For info	
1.8 Salle de bain	5.0895	0.201152999999999	Level 1	Night a Living Room	0.8889605191417	For info	
8.5 Combles	61.7862	0	Level 2	Night a Living Room	0	For info	

Native tools



The screenshot shows the SOUND INSULATION software interface. The main window displays "Facade Sound Insulation" with a sub-header "Calculate sound insulation inside facade". A secondary window shows a 3D model of a facade with several windows, each labeled with a room number (e.g., room 2, room 3, room 4, room 5, room 6, room 7, room 8, room 9, room 10, room 11, room 12, room 13, room 14, room 15, room 16, room 17, room 18, room 19, room 20, room 21, room 22, room 23, room 24, room 25, room 26, room 27, room 28, room 29, room 30, room 31, room 32, room 33, room 34, room 35, room 36, room 37, room 38, room 39, room 40, room 41, room 42, room 43, room 44, room 45, room 46, room 47, room 48, room 49, room 50, room 51, room 52, room 53, room 54, room 55, room 56, room 57, room 58, room 59, room 60, room 61, room 62, room 63, room 64, room 65, room 66, room 67, room 68, room 69, room 70, room 71, room 72, room 73, room 74, room 75, room 76, room 77, room 78, room 79, room 80, room 81, room 82, room 83, room 84, room 85, room 86, room 87, room 88, room 89, room 90, room 91, room 92, room 93, room 94, room 95, room 96, room 97, room 98, room 99, room 100).


2.10. Demonstrator & Vision (Demo 9) / Facilitate integration of urban context into BIM for architectural design

Architects currently use a wide variety of incompatible tools to gather information about new project locations. This essential part of the design process often involves a lot of ‘digital labour’. A better integration of GIS and BIM could not only make this process more efficient, but also provide new, easy-to-use tools that support and improve the architect’s design process.

More broadly, it could be either interesting for everyone who has an interest in BIM and is professionally involved in building design, directly (architects, engineers, etc.) or indirectly (city planners, contractors, building owners, etc.)

The BIMy project integrates the worlds of BIM and GIS. Both developed independent of each other and have different (active) user bases. This visionary demonstrator aims to pique interest in GIS among building design professionals, by demonstrating how they might be using GIS already (without realizing) and how better integration of the two domains can support their work.

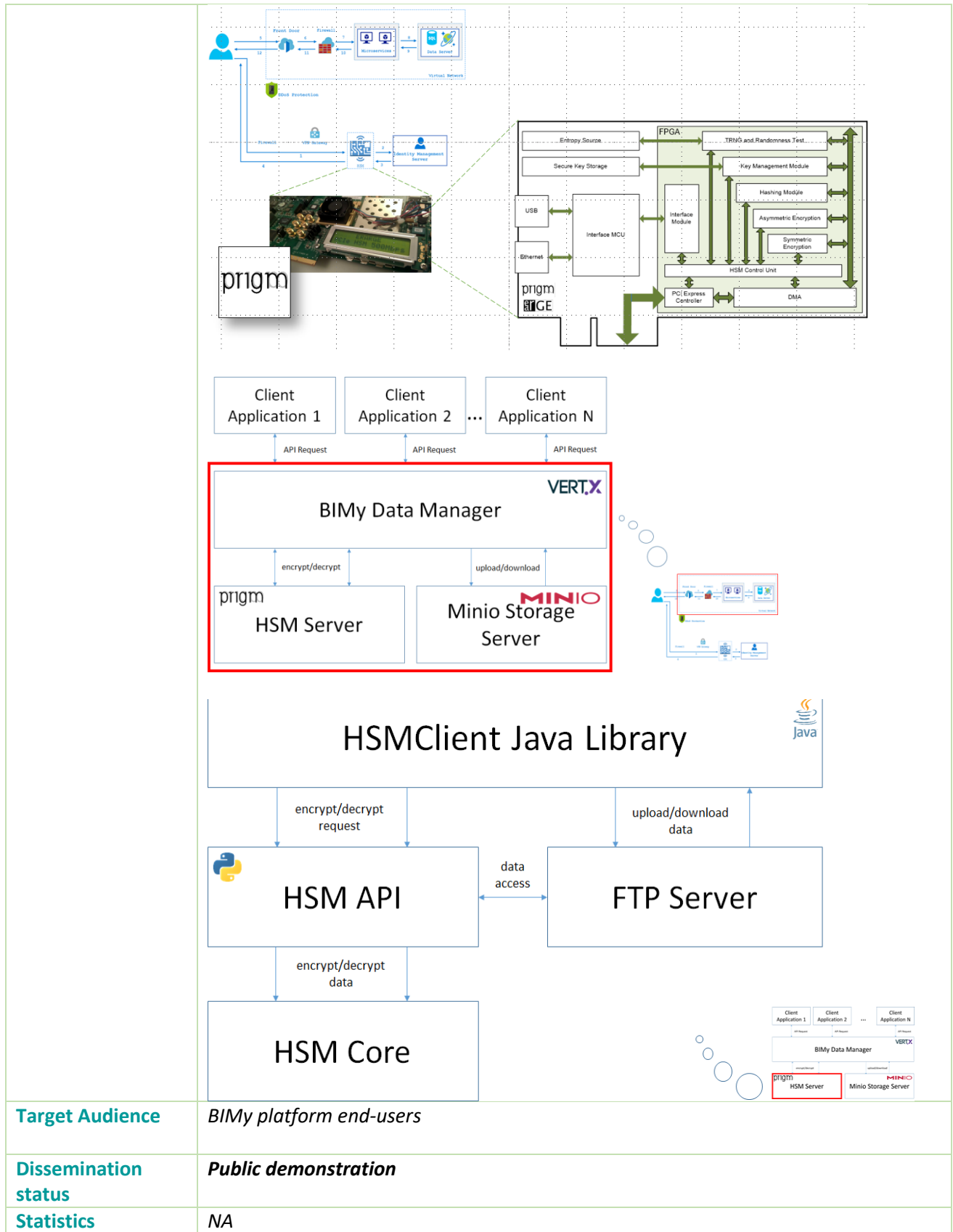
Name of the tool/Application/similar	Facilitate integration of urban context into BIM for architectural design
Link	<i>To be published</i>
Partners Contributing	<i>Assar, Willemen</i>
Responsible researcher(s) for technical discussions	Geert Bekaert, Assar, gbk@assar.com Thomas Goossens, Assar, tgo@assar.com Lise Bibert, Willemen, lise.bibert@willemen.be Dieter Froyen, Willemen, dieter.froyen@willemen.be
Description	<p><i>Urban context is an important source of information for building design and architects lack easy-to-use GIS tools compatible with BIM.</i></p> <ul style="list-style-type: none"> ▪ <i>Gathering context data:</i> <ul style="list-style-type: none"> <i>Site visit</i> <i>Desk research (free online data)</i> <ul style="list-style-type: none"> ▪ <i>Google Maps/Streetview</i> ▪ <i>Online cadaster</i> ▪ <i>Hiking/cycling maps</i> ▪ <i>Activity heatmaps (e.g. Strava)</i> ▪ <i>Etc.</i> ▪ <i>Improvement through governmental data platforms: GeoPunt, UrbIS, WalOnMap</i> ▪ <i>Resource intensive ‘digital labor’</i> ▪ <i>BIMy as tool for gathering data about project site and surroundings</i> <ul style="list-style-type: none"> ▪ <i>Easy search</i> ▪ <i>Large collection of datasets</i> ▪ <i>Preference templates</i> ▪ <i>Compatible file format</i>
Target Audience	<i>Architects</i>
Dissemination status	Public demonstration <i>NA</i>

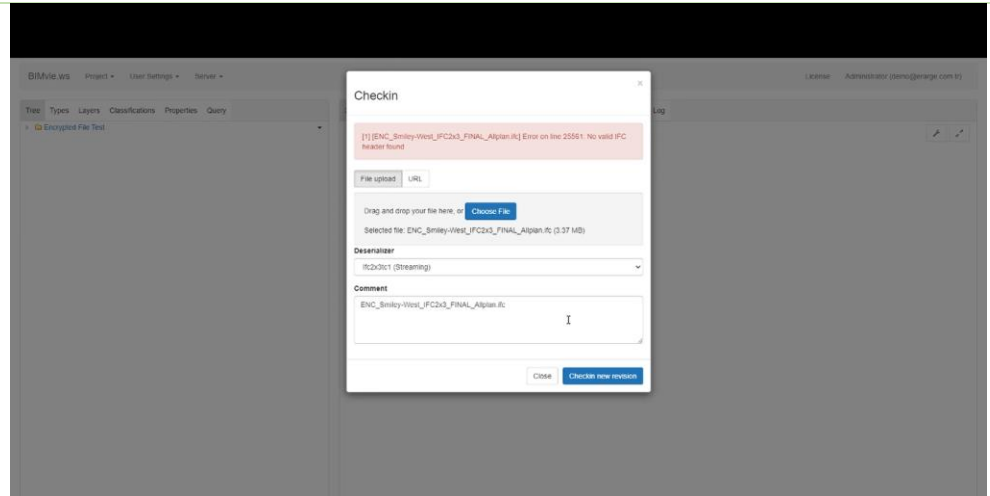
<p>Statistics</p>	<p>NA</p>
<p>Opinions & Feedback</p>	<ul style="list-style-type: none"> ▪ Advantages <ul style="list-style-type: none"> ▪ <i>Better workflow efficiency</i> ▪ <i>Improve design quality</i> ▪ <i>Consistent source of data</i> ▪ <i>Visualize projects in their environment (without having to recreate it)</i> ▪ <i>Lower risk of unforeseen problems during construction</i> ▪ Extended vision <ul style="list-style-type: none"> ▪ <i>Upload created design</i> ▪ <i>Access third party apps for analyses and services: line-of-sight analysis, shadow analysis, traffic impact, building permit, etc.</i>
<p>Snapshots, Photos and Figures</p>	 <p>The image displays a screenshot of a BIM software interface. The top portion shows a 3D perspective view of a building complex with white facades and some green roof sections. Below this, the software's ribbon menu is visible, containing various toolsets such as 'Modify', 'Analyze', 'Model', and 'Visualize'. The bottom portion of the screenshot shows a detailed site analysis view, likely a line-of-sight or shadow analysis, featuring a dense planting of trees and a terrain model with various colored zones. The software interface includes a standard Windows-style taskbar and a detailed property panel on the left side.</p>



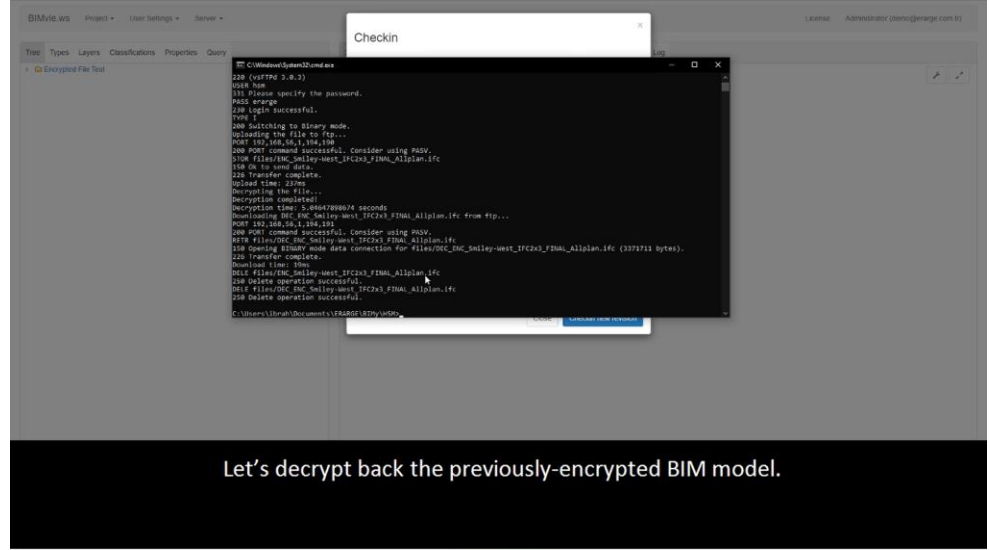
2.11. Demonstrator (Demo 10) / Security demo

Name of the tool/Application/similar	BIMy HSM based security																							
Link	https://youtu.be/kF4AEfgVLhE																							
Partners Contributing	ERARGE, NETAS																							
Responsible researcher(s) for technical discussions	Alper KANAK Ph.D., ERARGE, alper.kanak@erarge.com.tr Ibrahim ARIF, ERARGE, ibrahim.arif@erarge.com.tr Osman Kumaş, NETAS, okumas@netas.com.tr Nagehan Çakır, NETAS, nagehanc@netas.com.tr																							
Description	<p>The Hardware Security Module (HSM) integration to BIMy Platform enables secure authentication and authorisation management via One-Time-Passwords (OTPs) for multifactor authentication, and role and profile based authorization policy. Multiple profiles (Fireman, Building Owner, Architect, Administrator, etc.) are defined within BIMy end-users whilst every user has a role-based (Project Manager, Project Owner, Project Editor, Project User) access to the platform.</p> <p>On the other hand, data encryption and decryption for critical BIM models is applied by using AES-128bit algorithm. The BIMy Data Manager controls the encryption and decryption processes before updating and after downloading the model from Minio storage server. Thus, a server-side encryption is enabled on BIMy platform.</p> <p>OTP Mechanism:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;"></td> <td colspan="2" style="text-align: center;">Front-End Application</td> <td style="width: 10%;"></td> <td style="width: 60%;">The user should enter the valid OTP that is shown as a captcha during registration/login screen</td> </tr> <tr> <td></td> <td style="text-align: center;">Registration</td> <td style="text-align: center;">Login</td> <td></td> <td>During registration a role is assigned to the user. On both registration and further logins, an OTP is created for user validation</td> </tr> <tr> <td style="writing-mode: vertical-rl; transform: rotate(180deg);">HSM Based Cyber-Security</td> <td style="text-align: center;">Authentication</td> <td style="text-align: center;">Authorisation</td> <td style="text-align: center;">Authentication</td> <td style="text-align: center;">Authorisation</td> <td>The hardware based authentication and authorisation server provides OTP validation to the users for secure, role-based access to the BIMy platform</td> </tr> <tr> <td></td> <td colspan="2" style="text-align: center;">BIMy Platform</td> <td></td> <td>BIMy Platform applications are available only for authenticated users and authorised user roles</td> </tr> </table> <p><i>Overall Architecture</i></p>				Front-End Application			The user should enter the valid OTP that is shown as a captcha during registration/login screen		Registration	Login		During registration a role is assigned to the user. On both registration and further logins, an OTP is created for user validation	HSM Based Cyber-Security	Authentication	Authorisation	Authentication	Authorisation	The hardware based authentication and authorisation server provides OTP validation to the users for secure, role-based access to the BIMy platform		BIMy Platform			BIMy Platform applications are available only for authenticated users and authorised user roles
	Front-End Application			The user should enter the valid OTP that is shown as a captcha during registration/login screen																				
	Registration	Login		During registration a role is assigned to the user. On both registration and further logins, an OTP is created for user validation																				
HSM Based Cyber-Security	Authentication	Authorisation	Authentication	Authorisation	The hardware based authentication and authorisation server provides OTP validation to the users for secure, role-based access to the BIMy platform																			
	BIMy Platform			BIMy Platform applications are available only for authenticated users and authorised user roles																				

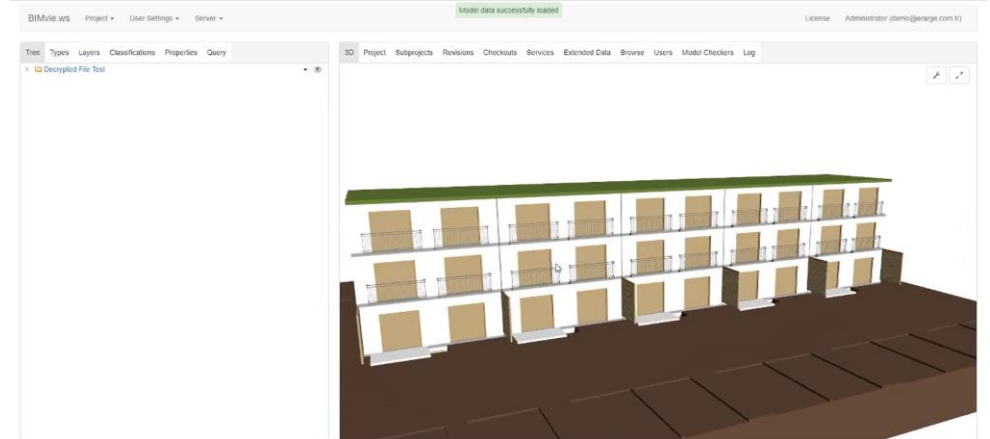




The upload operation is failed because the BIM model is encrypted



Let's decrypt back the previously-encrypted BIM model.



The decrypted BIM model is uploaded successfully because it is 100% same as its original version.

3. Conclusion

This deliverable presents an overview of the demonstrated project outputs which are presented during the iteration #1 and #2 (as of June 2020). These demonstrators mainly focus on the fundamental features of the BIMy cloud platform like BIM data filtering, visualization over WEB and basic visualization and interaction with augmented and virtual reality.

Due to Covid19 outbreak and in spite of the unforeseen latencies (including the delivery of this report), BIMy consortium managed the process successfully and and succeed to present influential demonstrators and visionary articles to increase the impact of the project. As contrary to the first year iterations (see D5.1 v1), the demonstrators presented in this report are significantly more collaborative as both Turkish and Belgian partners have worked in coherence.

These demonstrators will be supported in the last iteration where partners will focus more on evaluating the results and collect feedback from the stakeholders. Such a feedback will help BIMy partners to re-elicite and improve their research, marketing and business plans. These revisions will be a baseline for future large-scale projects or products and better engagement in standardisation and public-private partnership projects.

Bibliography

BIMy consortium. (2020). *BIMy—BIM in the City—D4.2 v1 Report for business and exploitation models.*