Change toolkit for digital building permit

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V1.0	Final version	01/10/2025	Siham El Yamani

Contents

1. Executive Summary

The CHEK Final Digital Event, held online on 2 September 2025, marked the conclusion of the Horizon Europe project *Change Toolkit for Digital Building Permit (CHEK)*. The event brought together 174 participants out of 206 registrations, representing municipalities, software vendors, researchers, policy makers, and standardization bodies across Europe.

Over three years, CHEK developed and demonstrated a comprehensive toolkit to support municipalities in adopting digital building permit (DBP) processes. The final event showcased achievements across the five project objectives: (1) novel DBP processes, (2) interoperability of BIM and geospatial standards, (3) upskilling and training, (4) integrated software tools, and (5) Scalability results over European countries and policy recommendations for scaling DBPs across Europe.

2. Introduction

The CHEK Final Event was designed to present the project's main achievements, demonstrate the pilot results, and share the lessons learned on interoperability, scalability, and adoption. It also provided a platform to connect with sister projects such as **ACCORD** and **DigiChecks**, as well as international standardisation bodies including **buildingSMART, OGC** thereby situating CHEK within the broader European roadmap for digital building permits (See Figure 1).

While the event marked the conclusion of the CHEK project (2022–2025), it also looked ahead. The discussions identified next steps for municipalities, vendors, and policy makers in adopting DBPs, while aligning with wider EU digitalisation agendas such as the **European Green Deal**, the **Digital Europe Programme**, and the **New European Bauhaus**.

The full recording of the event is publicly available at: CHEK Final Event Recording.

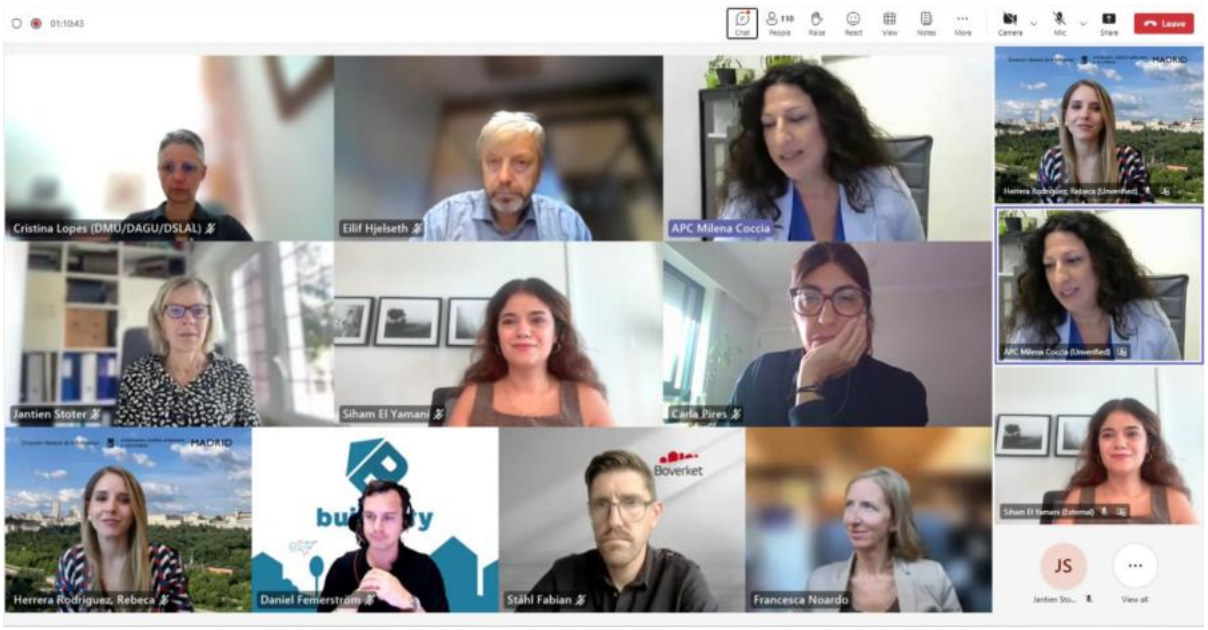

Figure 1: Illustrates the CHEK Final Event opening, showing the diversity of participants.

3. Agenda and Sessions

3.1. Agenda Overview

The CHEK Final Digital Event featured a structured agenda, combining presentations, demonstrations, and panel discussions. This allowed the consortium to communicate results across all five project objectives, while engaging municipalities and external stakeholders in dialogue about adoption and scalability.

Figure 2 presents the detailed agenda of the event, showing the sequence of technical showcases, pilot panels, and policy discussions. This structured approach ensured that participant.

Figure 2: The agenda overview provided participants with a clear structure of sessions, from opening and project results to technical tool demonstrations, pilot panels, and policy discussions.

3.2.Session Highlights

This section presents the core content of the CHEK Final Event, structured around eight sessions that combined presentations, technical demonstrations, and panel discussions. Each session addressed a different dimension of the project, from the overall CHEK vision and municipal pilot experiences to the technical backbone of GeoBIM interoperability and the alignment of results with international standardisation. Together, these highlights show how CHEK achieved its objectives, validated its tools in practice, and laid out a roadmap for the future of digital building permits in Europe.

3.2.1. Opening

The event opened with an introduction by Prof. Dr. **Jantien Stoter** (TU Delft), who highlighted the importance of digital building permits for Europe's digital transition. Interactive mentimeter polls engaged the audience by asking about their organizational background, current permit processing times, and priorities for digital permitting.

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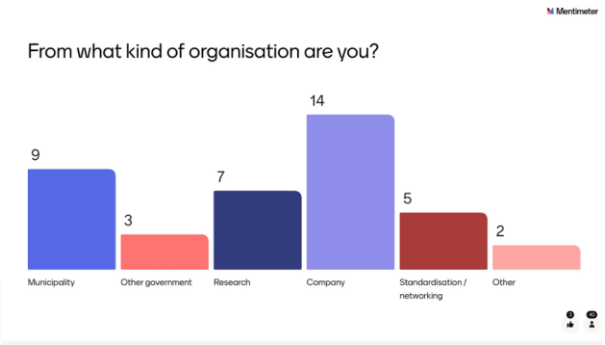

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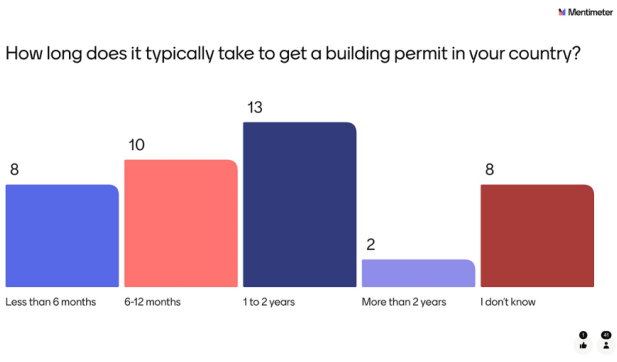

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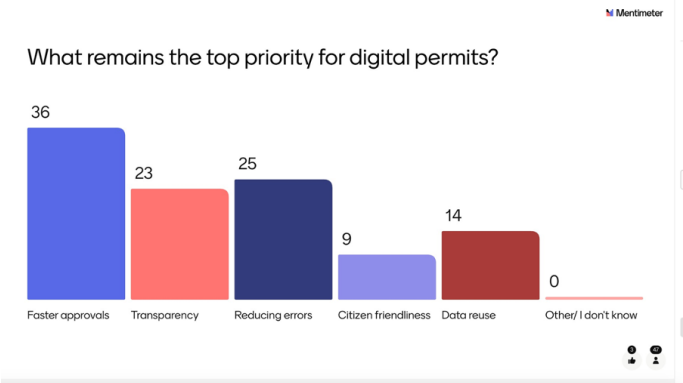

(d)

Figure 3: The results of interactive polls, including (a) (b) participants' organizational and geographical background, (c) (d) permit processing times in their municipalities, and priorities for digitalisation. It highlights the diversity of perspectives and the common demand for efficiency and transparency in permitting - Presented by Prof. Dr. Jantien Stoter (TU Delft)

3.2.2. Chekdbp change Toolkit: An Innovative Vision for Digitalization

Francesca Noardo (OGC) presented CHEK's vision and overall results, structured around five pillars: process, interoperability, technology, scalability, and upskilling. She underlined lessons learned from the consortium of 60 partners across 19 countries, emphasizing that regulations, data, and tools must converge to achieve automation.

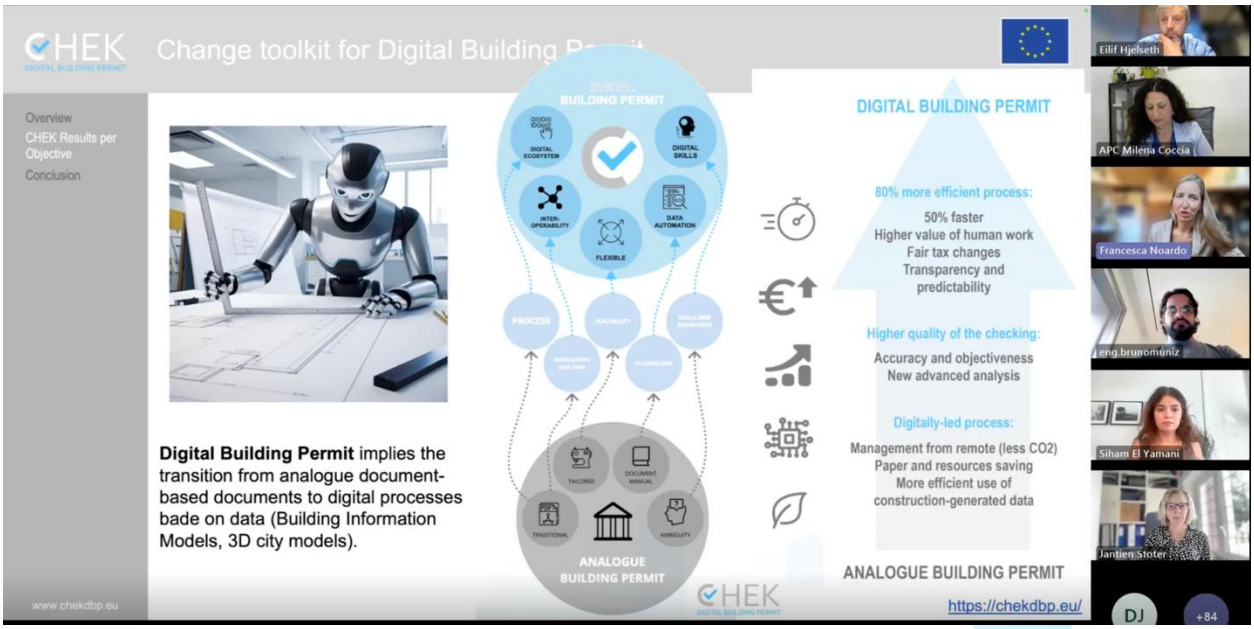

Figure 4: The five CHEK pillars: process, interoperability, technology, scalability, and upskilling. It captures the consortium's vision of aligning BIM, GIS, and regulatory rules into a coherent, digital permitting workflow - Presented by Francesca Noardo (OGC).

This session provided an overview of the project's methodology, pilots, and KPIs. Partners demonstrated how CHEK supported municipalities in transitioning from analogue to digital workflows, with measurable improvements in efficiency and transparency.

Results were reported against project objectives:

O1 (Process): DBP process map and maturity model helped municipalities assess and plan their digital transformation.

O2 (Interoperability): Development of CHEK IFC and CityGML profiles, validators, and converters enabled seamless GeoBIM data flows.

O3 (Upskilling): Training courses and e-learning materials were launched, addressing both municipal officers and technical experts.

O4 (Technology): Integrated checking tools such as IFCEnvelopeExtractor, VC Map plugin, CYPE Urban, and Verifi3D supported automated rule checking.

O5 (Scalability): Demonstrations in Lisbon, Gaia, Prague, and Ascoli Piceno confirmed transferability across diverse municipal contexts

3.2.3. Panel 1 – Cities Shaping the Future of Building Permits, and how CHEK helped in this journey?

This panel gave the floor to municipalities, highlighting their direct experiences with digitalisation and the role CHEK tools played in supporting their journey. The discussion was moderated by Dr. **Siham El Yamani (TU Delft)** and brought together voices from Spain, Italy, and Sweden, ensuring that diverse contexts and scales of implementation were represented (See **Figure 5**).

Rebeca Herrera (Madrid) shared insights from the city's ongoing DBP platform development, reflecting Madrid's leadership in embedding digital permitting into daily practice. **Milena Cosia (Ascoli Piceno, Italy)** reflected on the pilot implementation of CHEK tools in a smaller municipality, noting both the opportunities for efficiency and the challenges of limited resources. From a national perspective, **Fabian Stahl and Daniel Femmer-Storm (Boverket, Sweden)** discussed the reusability of CHEK solutions, emphasising the importance of scalability and adaptability across different governance contexts.

Figure 5 Panelists and moderator of Panel session I.

The discussion was framed by a guiding question: *"Looking back at your city's digitalisation journey, what worked well, what was most challenging in terms of DBP implementation, and how have the CHEK results supported (or could support) your transformation? Based on this experience, what advice would you give to other municipalities just starting out?"*

Rebeca Herrera (Madrid) explained how Madrid has embedded CHEK results into its broader digital permit strategy, particularly through the development of the MadridDBP platform and tender open now. She highlighted the importance of aligning municipal IT infrastructure with open standards, noting that CHEK's IFC and CityGML workflows provided a solid foundation for ensuring data interoperability in practice.

Milena Cosia (Ascoli Piceno, Italy) shared the perspective of a smaller municipality piloting CHEK tools. She emphasised the tangible impact of having automated validation for basic rules such as height and footprint, which helped streamline tasks despite limited staff capacity. At the same time, she underlined that resource constraints remain a key barrier for small cities, making European support and collaboration critical for scaling.

Fabian Stahl and Daniel Femmer-Storm (Boverket, Sweden) reflected on the national perspective. They confirmed that CHEK solutions are not only useful for municipalities but also adaptable at a national scale. In Sweden, the value lay in the **reusability** of CHEK outputs — like the IFCEnvelopeExtractor and the IFCgeoreferencing toolms — which can be applied across municipalities with diverse digital readiness.

The panel confirmed that municipalities are at the heart of digital building permit adoption. Larger cities such as Madrid highlighted integration into long-term digital strategies, while smaller municipalities such as Ascoli Piceno underlined the need for targeted support and resources. The Swedish perspective showed that national agencies view CHEK's outputs as reusable components for broader frameworks. Together, these contributions demonstrated that CHEK tools are flexible enough to support municipalities of varying sizes and maturity levels, making them an essential steppingstone toward EU-wide adoption.

3.2.4. Digitalization Process & Maturity Model

This session focused on how municipalities can assess their current state and plan a structured transition toward digital building permits. It brought together research on European permitting systems and practical tools for guiding digitalization. Figure 6 below shows the presenters and moderator of this session

Figure 6: Presenters and chairing session related to Digitalization process and maturity model presenting CHEK results by Orjola Braholli and Europe research by Judith Fauth.

Dr. Judith Fauth *(TU Munich, EUnet4DBP)* presented the findings of a comparative study covering 17 countries, which revealed systemic inefficiencies, fragmented regulatory frameworks, and large variations in processing times. She introduced the OntoBPR framework as a way to standardize permit review through ontology-based information containers, and stressed the need for shared KPIs and benchmarks to make processes comparable across Europe (see **Figure 7**).

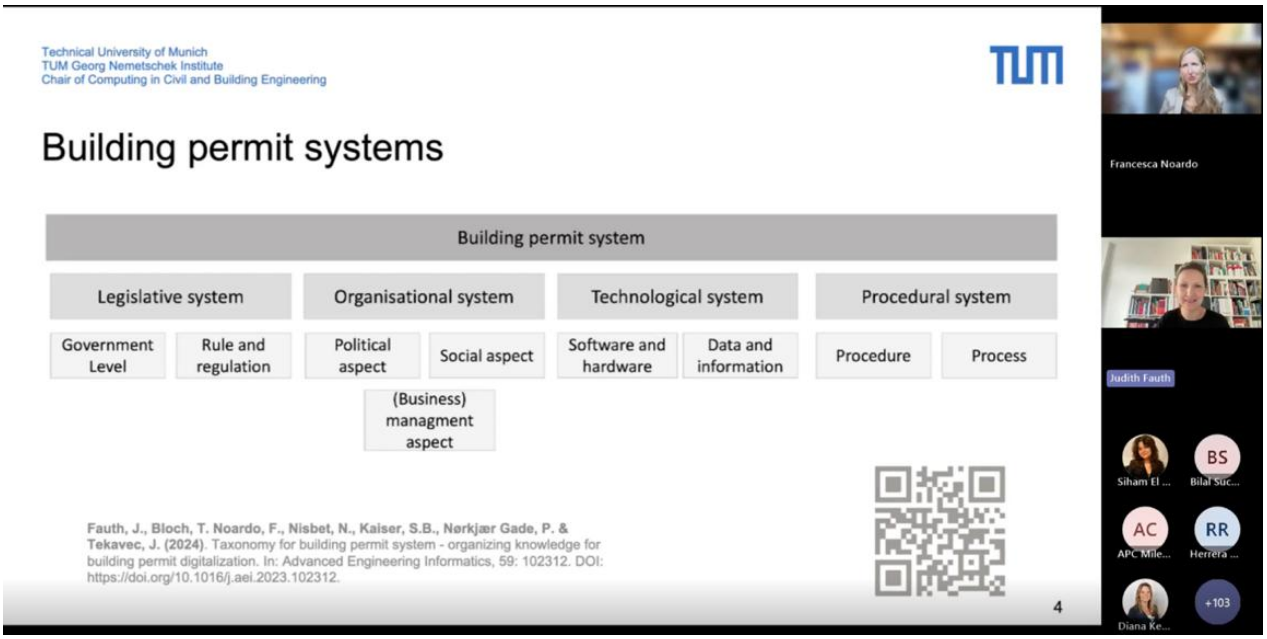

Figure 7: Digital building permit process research around Europe – Presented by Judith Fauth

Orjola Braholli *(Fraunhofer Italia)* then introduced the CHEK maturity model and Virtual Assistant, which were co-developed with four pilot municipalities through eight workshops. The model provides a reference framework to measure organisational readiness, while the Virtual Assistant supports municipalities in analysing workflows, assessing maturity, and producing tailored roadmaps for transformation (see Figure 8).

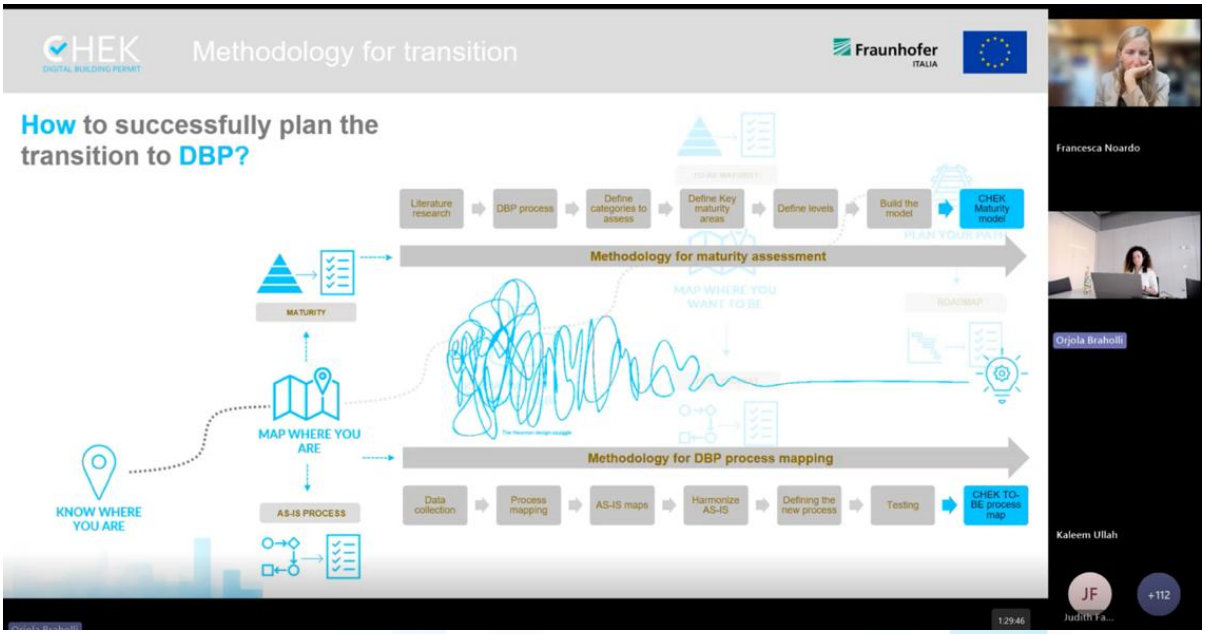

Figure 8: CHEK dbp process map, maturity models achieved via the support of the virtual assistant tool – presented by Orjola Barholli.

The main outcome of this session was the confirmation that maturity models can harmonise diverse starting points among municipalities and provide a common language for digital transformation. The live demonstration of the Virtual Assistant showed that it can translate assessment results into concrete, incremental actions, directly supporting municipalities in their transition. This work contributes strongly to CHEK's objective of developing novel DBP processes by equipping local administrations with structured change-management methodologies.

3.2.5. CHEKdbp Platform & Rule Checking Workflow

This session showcased the CHEK digital building permit platform and its connected rule-checking compliance tools, presented by different consortium partners. Together, they demonstrated how an open, API-based architecture can integrate multiple services into a single workflow.

Figure 9: CHEK consortium partners presenting the sessions related to CHEKDBP plateform and rule checking results.

CYPE presented the **BIMserver.center** as the backbone of the DBP platform. It enables submission, storage, and data exchange based on open APIs, ensuring interoperability and modularity across tools. Figure 10 illustrates the platform interface and data flow management.

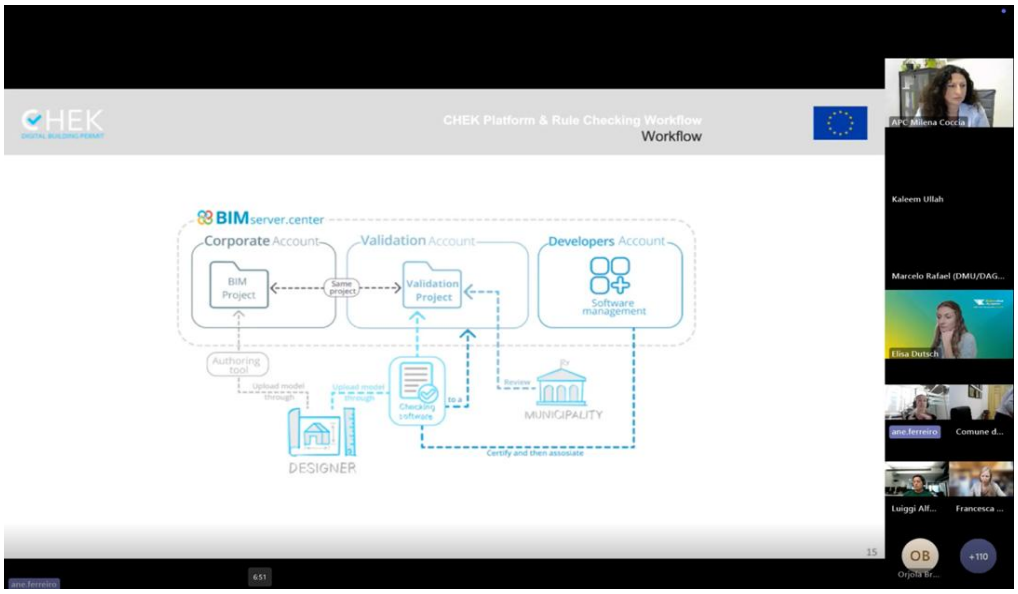

Figure 10: Technical workflow, showing how data validation, conversion, and checking modules connect through the CHEK platform using OpenAPI standards - Presented by Ane Ferrerio Sistiaga

CYPE and Verifi3D demonstrated how rule-based checking can be carried out both from BIM authoring tools and via web interfaces, ensuring that design models are validated against regulatory requirements at different stages. *Figure 11* presents a screenshot of this workflow.

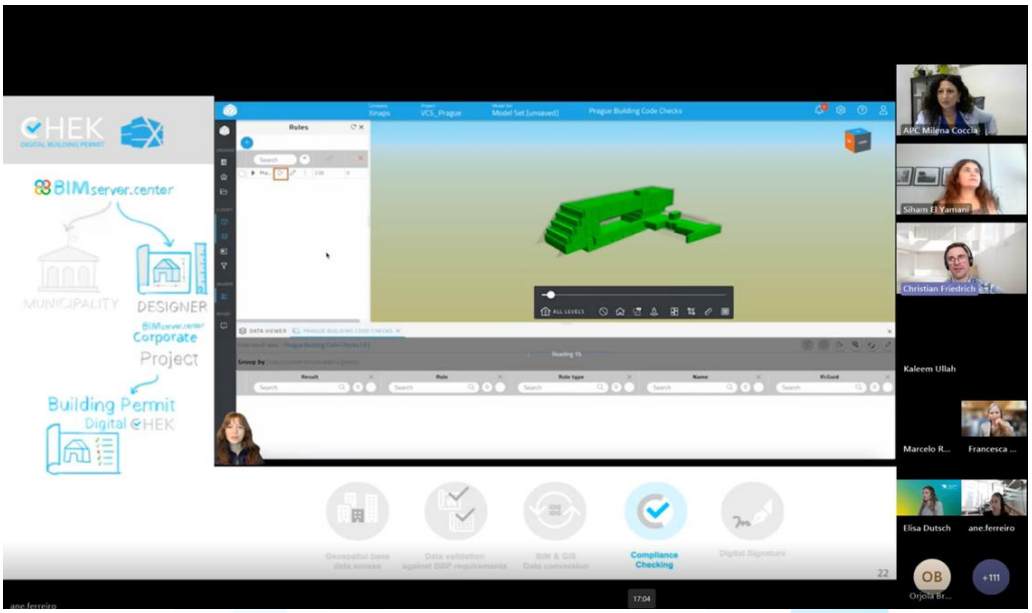

Figure 11: CHEK dbp compliance CHEKing via Verifi3D solutions developed by Xinaps- presented by Christian Friedrich

Virtual City Systems (VCS) presented the **VC Map Plugin**, which provides automated compliance checks in a 3D geospatial viewer. This integration allows municipalities to visualise proposed projects in their urban context while directly validating compliance. *Figure 12* shows an example of VC Map in action.

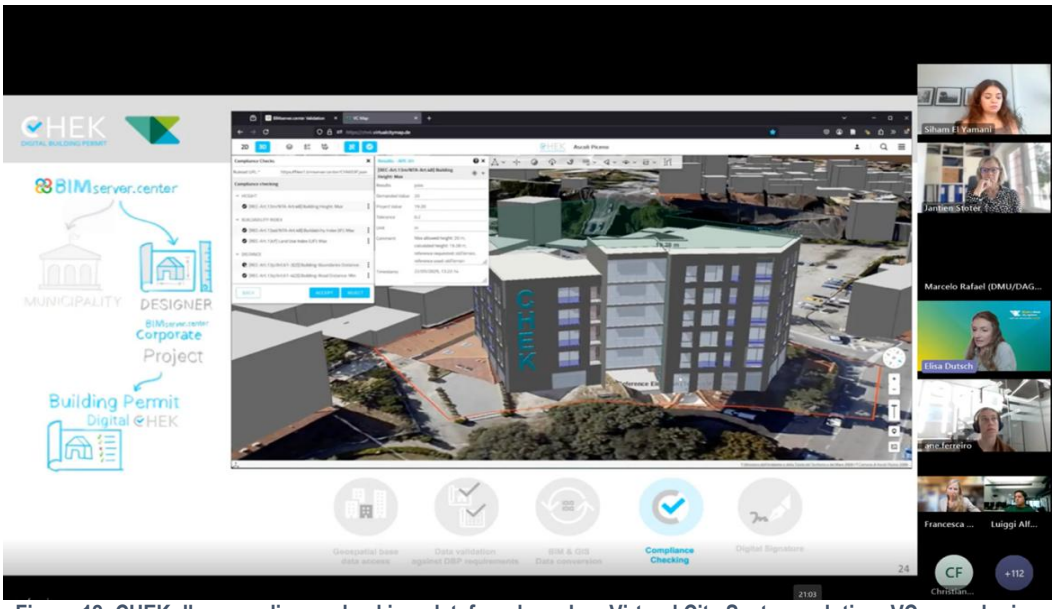

Figure 12: CHEK dbo compliance checking plateform based on Virtural City System solution: VC map plugin - Presented by Elisa Dutsch.

Finally, the consortium demonstrated the **Digital Signature Module**, which enables secure submission of IFC files in compliance with EU eIDAS standards. This ensures that submitted models are authentic and legally valid. Figure 13 captures the module's interface.

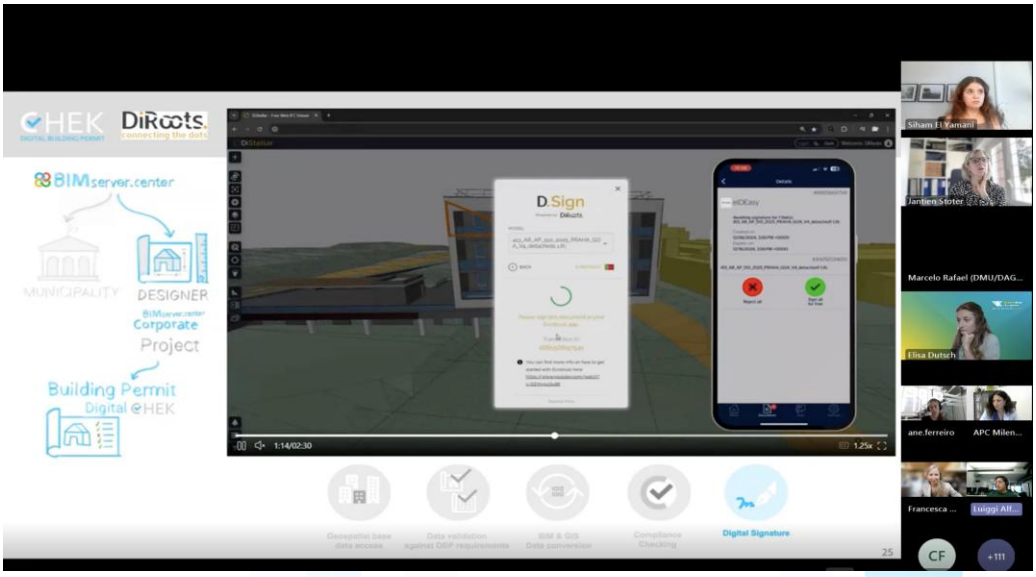

Figure 13: CHEK dbp IFC signature tool for authoring tools developed by Diroots - presented by Luiggi Alfaro.

The main outcome of this session was the demonstration that the CHEKdbp platform provides municipalities and designers with an integrated, user-friendly environment for rule checking. By linking BIM and GIS data with automated validation and digital authentication, the platform directly addressed project objectives **Technology/interoperability and scalability,** confirming the feasibility of a scalable European solution for digital building permits in the next section the integrated tools for interoperability purposes, to this DBP platform are presented in detail.

3.2.6. GeoBIM Interoperability Solutions – Making Data Speak the Same Language

This session explored the technical backbone of CHEK, namely the tools that make BIM and GIS data interoperable for regulatory checks. The presenters showcased how conversions, georeferencing, and validation workflows allow data to be exchanged consistently across domains **(See Figure 14)**.

Figure 14: Presenters of the GEOBIM interoperability session

Peter Bonsma (RDF) – presented Geo2BIM converter and workflows enabling CityGML → IFC transformation for design environments that has been developed during the project (**Figure 15**) after that *Jasper van der Vaart (TU Delft)* – presented the BIM2Geo converter (IfcEnvelopeExtractor + CJT) enabling integration of IFC into CityGML/CityJSON and *Amir Hakim (TU Delft)* – IFC georeferencing tool (IfcGref), supporting consistent local/projection CRS alignment. These two interoperability tools for integrating BIM2 GEO workflows in DBP and developed by Technology University of Delft teams (**Figures 17, 16**). The last presentation of *Abdoulaye Diakité, Alejandro Villar, Alper Akin (TUD/OGC)* – was about GIS data validation, based on validation workflows using RDF and SHACL, demonstrating checks on semantic/topological correctness of CityGML data (**Figure 18**).

CHEK Geo2BIM interoperability tools

In this part of the session, **Peter Bonsma (RDF)** presented the **Geo2BIM converter**, which transforms CityGML datasets into IFC models for use in BIM environments. He showed how generated IFC files can be combined with existing IFC datasets, creating a seamless bridge between geospatial and design contexts. This tool supports municipalities and designers by ensuring that planning data can be directly reused in architectural workflows.

Figure 15: CHEK Geo2BIM interoperability tools developed by RDF – presented by Peter Bonsma.

CHEK BIM2GEO interoperability tools

Jasper van der Vaart (TU Delft) demonstrated the **BIM2Geo converter (IfcEnvelopeExtractor + CJT library)**, which converts IFC building models into CityGML/CityJSON representations. The tool supports multiple Levels of Detail (LoD), including LoD2.2, enabling municipalities to visualise proposed buildings in their 3D city models and check compliance with urban regulations. This directly contributes to CHEK's objective O2 by enforcing data and service interoperability.

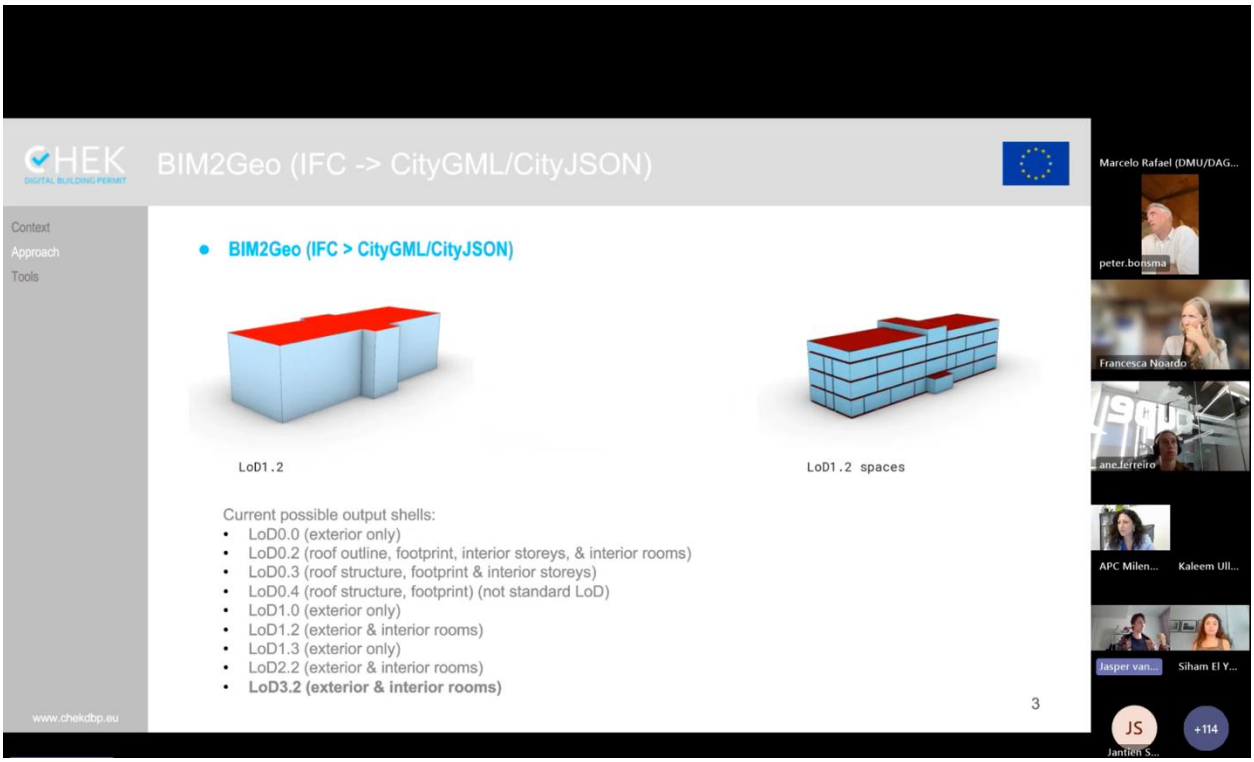

Figure 16: The IFCEnvelopeExtractor conversion into CityGML LoD2.2, enabling municipalities to visualize proposed buildings in their geospatial context (Objective O2 of CHEK project: enforce data and service interoperability).

CHEK IFC georeferencing Tool

Amir Hakim (TU Delft) introduced the **IfcGref tool**, which addresses one of the most critical challenges in BIM–GIS integration: georeferencing. The tool allows BIM models to be aligned with local or projected coordinate systems using existing metadata or surveyed points. This ensures that IFC datasets are spatially consistent when imported into GIS or city model environments, a prerequisite for automated compliance checks.

Figure 17: CHEK Georeferencing tools developed by TU Delft – presented by Amir Hakim.

CHEK City Validty Tools

Abdoulaye Diakité (TU Delft) and Alejandro Villar (OGC) presented the **City Validity Tools**, which validate CityGML and CityJSON datasets against regulatory and semantic requirements. They demonstrated how RDF and SHACL were used to define validation rules, ensuring that city model data meets the necessary quality and structural constraints for use in rule-checking workflows. These tools play a key role in guaranteeing reliable compliance checks.

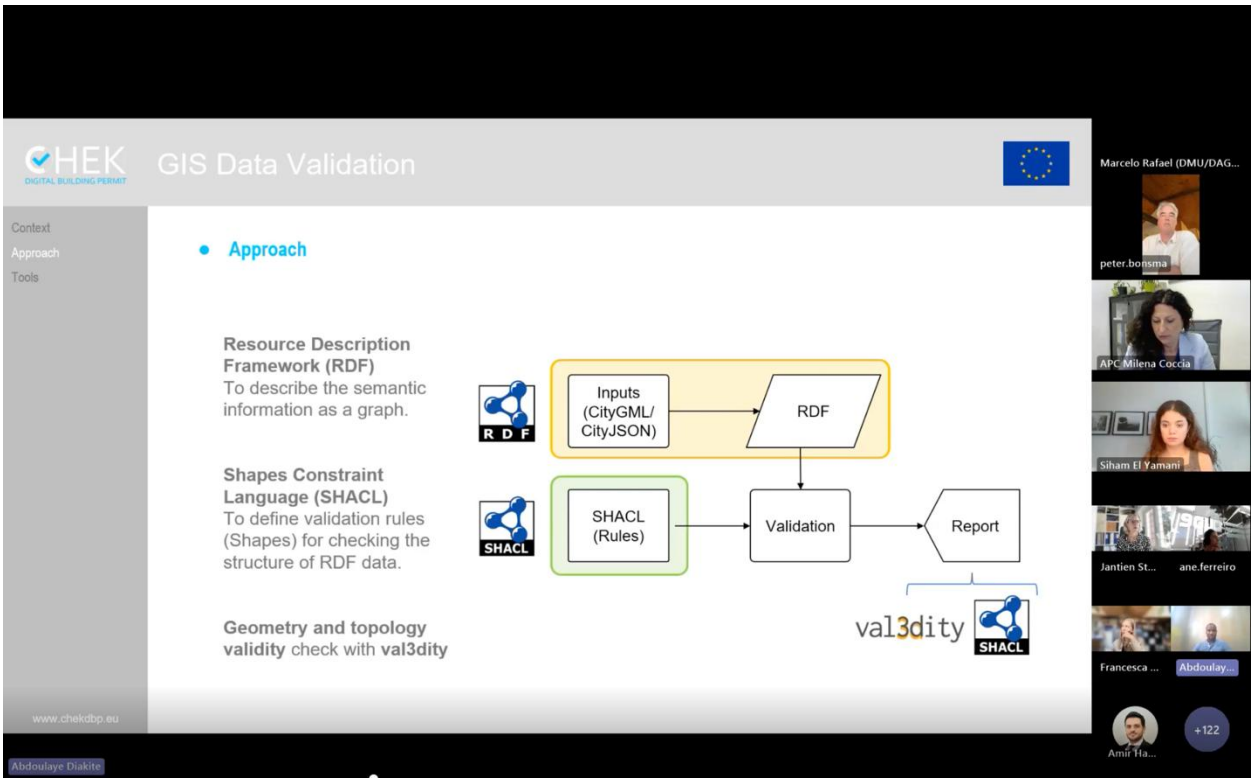

Figure 18: CHEK Validator tool developed by OGC and TU Delft – presented by Abdoulaye Diakité.

The session demonstrated that interoperability is not only technically feasible but essential for scalable rule checking. The tools showcased allow regulations such as height limits or footprint restrictions to be applied consistently across different data sources and cities. At the same time, limitations such as missing semantic attributes and the complexity of certain geometries were identified, with feedback directed to international standardization organizations. These contributions underline CHEK's impact on interoperability and scalability, ensuring that municipalities can rely on robust, standard-based workflows to implement digital permits.

3.2.7. Panel 2 – After CHEK: Standardisation and What's Next?

Moderator: Mayte Toscano (OGC)

Panelists:

- Francesca Noardo (OGC / CHEK Standardisation Coordinator)
- Léon van Berlo (buildingSMART International, Technical Director)
- Rita Lavikka (ACCORD, VTT)
- Eduard Loscos (DigiChecks, ITeC)
- Ane Ferreiro Sistiaga (CYPE, BIMserver.center)
- Peter Bonsma (RDF, openBIM standards expert)

This panel focused on the future of digital building permits beyond the lifetime of the CHEK project. Moderated by **Mayte Toscano (OGC)**, it gathered representatives from **ACCORD, DigiChecks, OGC, buildingSMART International, and CHEK's software vendors (CYPE, RDF)**. The aim was to debate how CHEK results can continue to influence European and international standardisation, and what actions are needed to ensure continuity (See **Figure 19**).

Figure 19: Panelists and moderator of the second panel related to standardisation actions.

The discussion centred on three key themes. The first was the **future of standards**, with panellists emphasising the need for coordinated BIM–GIS standardisation efforts that extend beyond CHEK and its sister projects. The second theme was **continuity and best practices**, highlighting how links with ACCORD and DigiChecks can provide pathways for CHEK methods to be further validated and disseminated, as well as opportunities for joint follow-up in future Horizon Europe calls. The third theme reflected the **vendor perspective**, where software developers such as CYPE and RDF underlined the importance of adoption and scalability, sharing lessons from integrating CHEK tools into real-world environments.

The guiding question that framed the debate was: *"CHEK is closing, but the digital building permit journey is only starting. From your perspective—as a standardisation organisation, a sister project, or a software vendor—what is the single most important enabler to ensure Europe continues this momentum?"*

Francesca Noardo (OGC) emphasized CHEK's concrete contributions to standards, such as DBP-specific IDS profiles, CityGML/CityJSON zoning extensions, and LoIN guidance, highlighting CHEK's role as a testbed that is already influencing OGC and bSI updates. Léon van Berlo (buildingSMART) stressed the need for stronger BIM–GIS alignment and confirmed that CHEK's lessons on IDS modularity and IFC4.3 are being integrated into bSI's roadmap, underlining that DBPs will only scale if standards converge.

Rita Lavikka (ACCORD) and **Eduard Loscos (DigiChecks)** highlighted continuity, showing how sister projects build on CHEK's outputs and create a joint European voice for validation methods. From the vendor side, **Ane Ferreiro Sistiaga (CYPE**) shared lessons on adoption and scalability when integrating CHEK into BIMserver.center, stressing the importance of APIs. **Peter Bonsma (RDF**) added that validation-first workflows are essential, as CHEK revealed thousands of schema errors even in certified IFC exports, making open APIs critical for trust and scalability.

The outcome of this panel confirmed CHEK's role as a **bridge between research and formal standardisation**. The roadmap discussions highlighted that sustaining results requires a consolidated effort through **EUnet4DBP**, in close collaboration with sister projects such as ACCORD and DigiChecks. The participants agreed that only by aligning standards, tools, and policies at the European level can the digital building permit become a widely adopted reality.

3.2.8. CHEK dbp video : dissemination and summary of CHEK resuts

This short item showcased the communication video used to disseminate CHEK results to a broader public audience (See **Figure 20**).

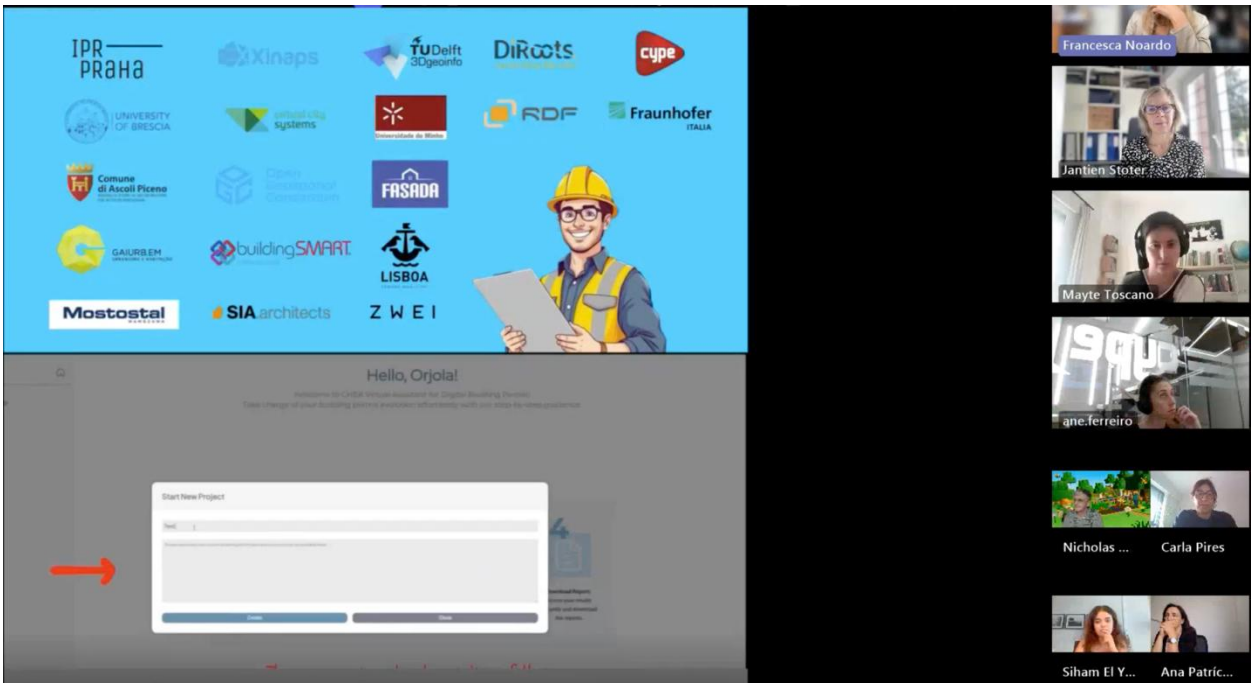

Figure 20: The visualization of the CHEK final video on the Digital Event.

3.3. Feedback from the final CHEK event

The CHEK project actively engaged stakeholders throughout its lifetime via the Community of Practice (CoP), the Advisory Board (AB), and the Final Public Event. standardization bodies, during the digital event, two ways of collecting live feedback have been deployed: 1. Final event feedback about the most valuable insight that the audience gained from the event (see figure 21 below). Feedback has been discussed either in the Teams chat or the audience addressed the feedback verbally. The second form of feedback was shared in QR code to ensure external validation of the toolkit, combining perspectives from municipalities, designers, academia, technology providers, and international (See Figure 22).

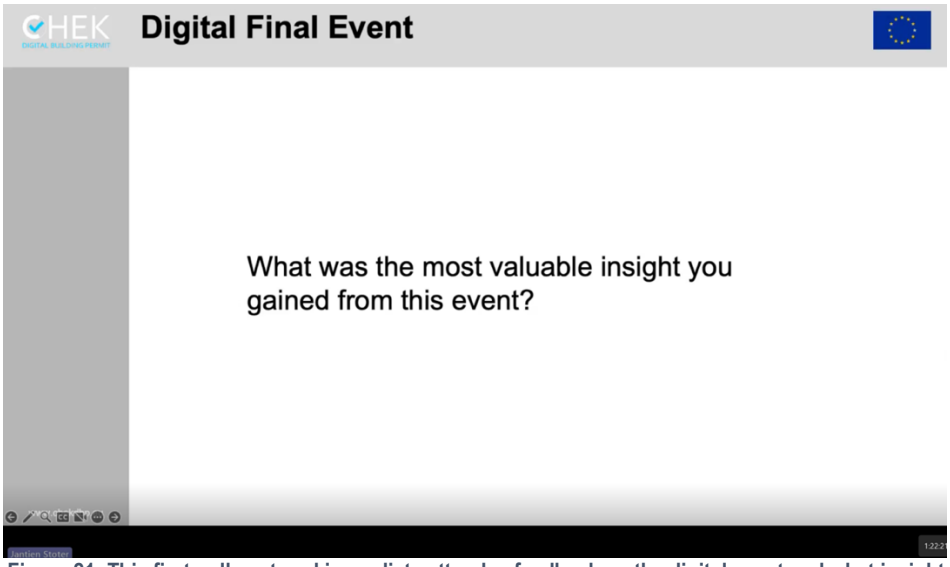

Figure 21: This first poll captured immediate attendee feedback on the digital event and what insight gained from it.

Respondent Profile

Final Event: 14 respondents completed the feedback survey (see Figure 22).

- Backgrounds: 5 municipal/public authorities, 6 architects/designers, 2 contractors/engineers, 1 technology provider, 3 academia, 2 others.
- Familiarity: 12 were familiar or very familiar with digital building permits before the event.

Participation: included municipal representatives, national authorities, and standards organisations, providing governance-level insights.

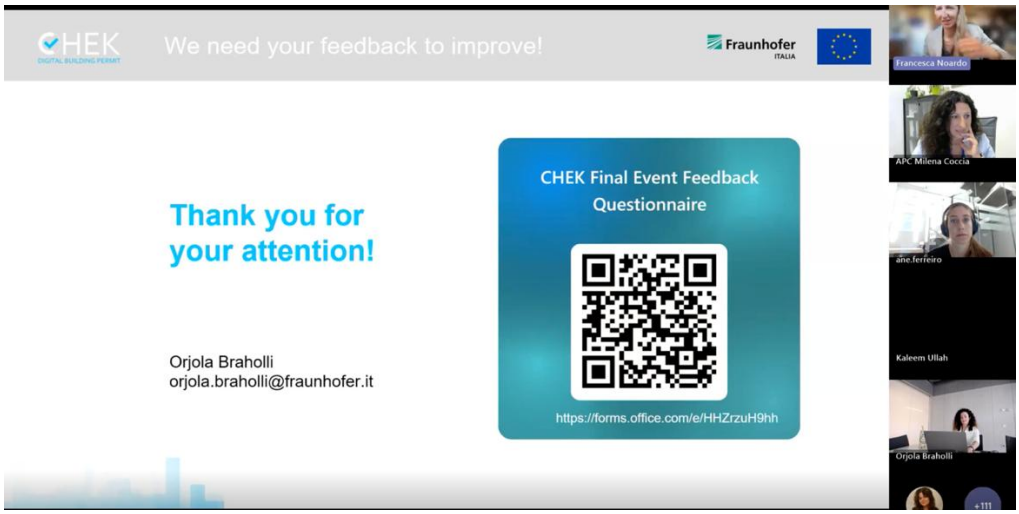

Figure 22: The second poll focused on adoption barriers and readiness. Respondents emphasised legal alignment and staff upskilling as the most pressing needs, followed by integration with municipal IT and collaboration features. These findings directly inform the follow-up actions listed below.

Feedback analysis:

General Impressions

Event quality: All respondents rated presentations as clear or very clear.
Most valued sessions: CHEK platform & rule-checking workflow (12 mentions), GeoBIM interoperability (8), standardisation actions (8), and CHEK Change Toolkit (8).
Shared perception: CHEK was consistently seen as a **pioneering initiative**, well aligned with the EU Green Deal and Digital Europe agendas. Stakeholders stressed that the toolkit is **TRL 6–7**: validated in pilots although requiring further refinement for full-scale deployment.

Perceived Value and Benefits

Usefulness: All respondents found the tools useful — 8 *extremely*, 7 *somewhat*.
Ease of use: Most rated them *somewhat easy* (9), with one *extremely easy*; only one rated them "not easy".
Valued features:

- BIM–GIS integration (most repeated feature).
- AI-based support for rule interpretation.
- Pre-checking for designers, enabling error reduction before submission.
- Specific tools cited: CYPE, VC Map, IFC envelope extractor, Verify 3D.

Municipal perspective:

- Low-maturity cities (Ascoli, Prague) found CHEK transformative, with potential to digitalise up to 80% of workflows.
- Higher-maturity cities (Lisbon, Gaia) valued improvements in IFC quality and pre-validation but were frustrated by limited encoded rules.

Barriers and Challenges

Feedback converged across pilots, CoP, AB, and Final Event on four main challenges:

1. **Legal/regulatory alignment** – identified as the top barrier by 11 respondents.
2. **Staff training & skills gaps** – 10 respondents highlighted this need.
3. **Technical integration** – 7 noted difficulties in embedding CHEK into municipal systems.
4. **Costs/budget constraints** – relevant but less decisive (5 mentions).

Qualitative concerns:

1. Lack of commitment from some public leaders and administrative cultures resistant to digital transition.
2. Insufficient collaboration features (annotations, partial approvals) to reflect real-world permitting workflows.
3. Need for **better and earlier training** for municipal technicians.

Willingness to Recommend

Final Event: 12 "very likely" and 2 "somewhat likely" to recommend CHEK solutions to colleagues.
CoP & AB: confirmed CHEK's conceptual soundness, stressing that scaling requires consolidation, regulation traceability, and stronger municipal involvement.

Synthesis of Stakeholder Priorities

Across all sources, five priorities emerged consistently:

1. **Expand regulation libraries** – more rules encoded with full legal traceability and national language support.
2. **Consolidate workflows** – unify fragmented tools into a seamless, municipal-first environment.
3. **Introduce collaboration features** – enable designer–reviewer communication, annotations, and partial approvals.
4. **Localise tools** – adapt UIs and workflows to national legal contexts and languages.
5. **Strengthen training and dissemination** – deliver early, role-specific, scenario-based materials, particularly for municipal staff.

The feedback from the Final event of CHEK participants (see **Figure 22**) confirms that CHEK's conceptual approach is highly valued and widely endorsed. However, the transition from pilot prototype to production-ready solution depends on addressing the same recurring issues: rule coverage, workflow consolidation, training, collaboration features, and legal alignment. The high willingness to recommend CHEK (100% positive responses) provides a strong mandate for scaling, provided these improvements are prioritised in the next development phase.

3.3 Key Messages / Lessons Learned

This section summarises the most important lessons from the project and articulates the impact and next steps for scaling DBPs in Europe. Digital Building Permits will only succeed if reliable city data, machine-readable rules, modelling guidelines, and open standards are connected into a coherent process. CHEK has shown the path forward. Now it is time to help municipalities, vendors, and standardisation bodies scale it.

One key message from the event is that **data is foundational**. Without high-quality, up-to-date city datasets, automation is impossible, as checks for distances or overhangs cannot be trusted without accurate models. The Lisbon pilot proved that even collecting a minimum set of geometric details enabled automated validation and reduced errors.

The role of **municipalities** also emerged clearly. Madrid is already integrating DBPs into daily practice and launched a tender for its municipal DBP platform. Ascoli Piceno reminded us that smaller municipalities need not only tools but also resources to manage the transition. Meanwhile, Sweden underlined the importance of reusability: solutions must be adaptable across different contexts. CHEK tools demonstrated that they can support this adaptability.

At the same time, **the regulatory bottleneck** was recognised as a real barrier. The technology is ready, but many regulations are still not "digital-ready." They require interpretation and mapping sessions with municipalities before they can be encoded in a computable format. This gap will need to be closed to achieve full automation.

The project also demonstrated that **AI is a valuable support but not a replacement**. CHEK integrated AI into its Virtual Assistant to map processes and assess maturity, and into a rule interpretation tool to accelerate encoding. In both cases, AI acted as an assistant, with municipalities and experts remaining in the loop to ensure accuracy and trust.

Another lesson is that **standards must accelerate**. IDS, LoIN, IFC/CityGML, and CityJSON are urgent foundations for the next wave of DBPs, and the next versions of these standards must be adapted to DBP data requirements. CHEK's contributions to OGC, buildingSMART, and CEN confirmed that standardisation is both possible and necessary.

Finally, **vendors are key to adoption**. Partners such as CYPE, VCS, Verifi3D, DiRoots, and RDF have shown that interoperable GeoBIM solutions, APIs, and rule-checking tools can move rapidly from research into municipal practice. Their involvement is essential for scaling CHEK results beyond pilots.

CHEK is concluding, but the journey to a digital, efficient, and transparent building permit process is just beginning.

4. KPIs and Communication Metrics

This section reports the key communication metrics and attendance statistics for the CHEK Final Event, reflecting both quantitative reach and qualitative engagement. The final event registered **206 participants**, of which **174 attended live**, representing an exceptionally high participation rate of nearly 85%. For the people who could not attended live, the recordings of the event are available. Among the attendees were 62 consortium partners, 6 Advisory Board members, 27 members of the Community of Practice, and 79 external participants. This composition ensured a strong mix of internal project stakeholders and external observers.

The event attracted a broad **stakeholder mix**, covering municipalities, software vendors, academic institutions, and standardisation bodies. The **geographical spread** extended across the EU and included international observers outside Europe, underlining the relevance of CHEK's results beyond Europe. Communication efforts through LinkedIn generated significant traction, with impressions, likes, and reposts of session clips highlighting the public interest in digital building permits. In addition, platform analytics confirmed high levels of engagement, with downloads of slides and toolkits, replay views of recorded sessions, and increased website traffic (see Annex 3 attached).

4.1. Attendance Analysis

A closer look at the attendance profile collected vie Mentimeter confirms strong representation across all target groups. Municipal authorities accounted for 9 registered participants, while 3 attendees came from other government organisations, 7 from research, 14 from companies, 5 from standardisation or networking bodies, and 2 from other categories. However, cross-checking with the participant list shows that these figures underrepresent the real level of municipal involvement. In fact, more than 25 municipalities were present, including Lisbon, Ascoli Piceno, Gaia, Prague, Madrid, Leiria, Olhão, AMB, and Dubai, among others.

Policy-making and government organisations were also engaged, with around 10 representatives, including the EU BIM Task Group, the Norwegian Building Authority, CRTI-B, and ministries from India, Vietnam, and Turkey. The research and academic community contributed around 20 participants, with strong representation from TU Delft, University of Brescia, NTNU, TUM, University of Poznan, University of Melbourne, and VTT. Companies and software vendors were well represented with around 20 participants, including CYPE, Virtual City Systems, Solibri, Xinaps, DiRoots, ACCA Software, Harpaceas, Construsoft, and Esri Portugal. Standardisation and networking organisations also participated, such as OGC, buildingSMART International, EuroSDR, EUnet4DBP, and the High-Level Construction Forum. Finally, around 15 independent professionals, including freelancers, architects, consultants, and NGOs, also took part.

4.2. Attendance Insights

From these statistics, several insights can be drawn. Municipalities were not only present but highly represented, much more than the raw Mentimeter polls suggested. This validates CHEK's credibility by showing direct engagement from permit authorities. The balance between research, academia, and companies also confirmed that the event combined innovation with strong market transferability. Standardisation bodies were present, ensuring that the results could feed directly into formal specifications. The under-reporting in some polls likely reflects classification issues, for example participants from municipal vendors or standardisation projects marking themselves as "Company." Importantly, the active involvement of both the Community of Practice and the Advisory Board confirmed that CHEK's results were externally validated by both implementers and reviewers.

5. CHEK digital event on Social media

Social media played an important role in extending the visibility and impact of the CHEK Final Event beyond its 174 live participants. The consortium used the official **CHEK LinkedIn channel** (CHEKdbp: | LinkedIn) as the central platform for outreach, supported by posts and shares from individual partners. This ensured a consistent message while leveraging the networks of municipalities, software vendors, and research organisations.

Prior to the event, a total of 6 LinkedIn posts were used to announce the programme, provide the registration link, and build anticipation among followers. This campaign helped attract the 206 total registrations and ensured strong representation from municipalities, standards organisations, and industry (See **Figure 23** below).

Figure 23: shows a pre-event LinkedIn post with registration details and a QR code, which successfully directed participants to the CHEK platform for deliverables and event materials. In addition to LinkedIn, the CHEK website provided access to the agenda, toolkit, and recordings, reinforcing the project's online presence.

During the event, 4 live updates and posts were shared, highlighting key sessions and speakers. Partner organisations actively reshared content, creating a multiplier effect and driving engagement across different stakeholder communities. This real-time communication kept the wider public informed and allowed non-attendees to follow discussions.

After the event, the LinkedIn channel was used to thank participants, share the YouTube recording, and make slides publicly available in 4 additional posts (See **Figure 24**).

The recordings of the event are uploaded to the dedicated YouTube channel of the project: Recording link :

https://www.youtube.com/watch?v=vOmhu8nFZ1Q&t=2s&pp=0gcJCfYJAYcqIYzv

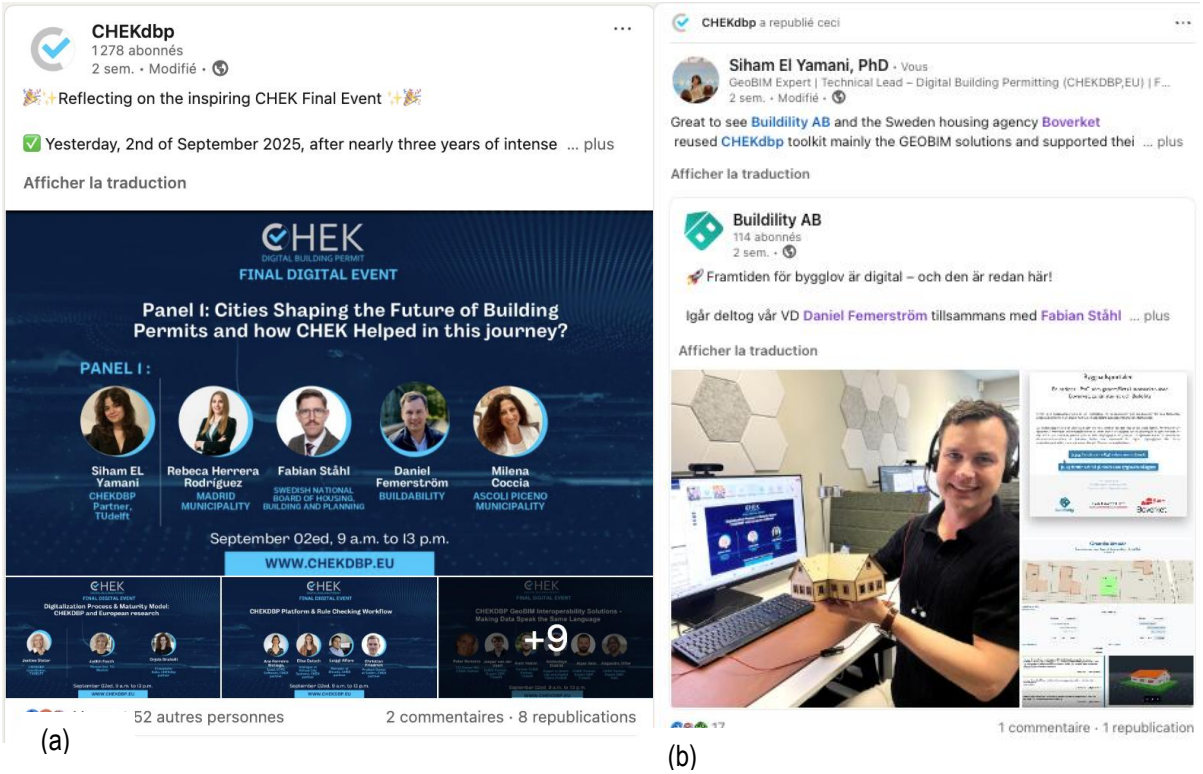

Figure 24: Post-event communication, which extended the visibility of CHEK's results well beyond the live audience.

These sustained activities led to measurable impact. The LinkedIn channel gained 34 new followers in the pre-event period (two weeks), 10 new followers during the event period, and 20 new followers in the post-event period of two weeks. Impressions and interaction rates (likes, comments, reposts) were significantly higher than average. Posts showcasing technical tools and pilot results received the most responses, confirming that stakeholders were particularly interested in practical, operational aspects of DBPs.

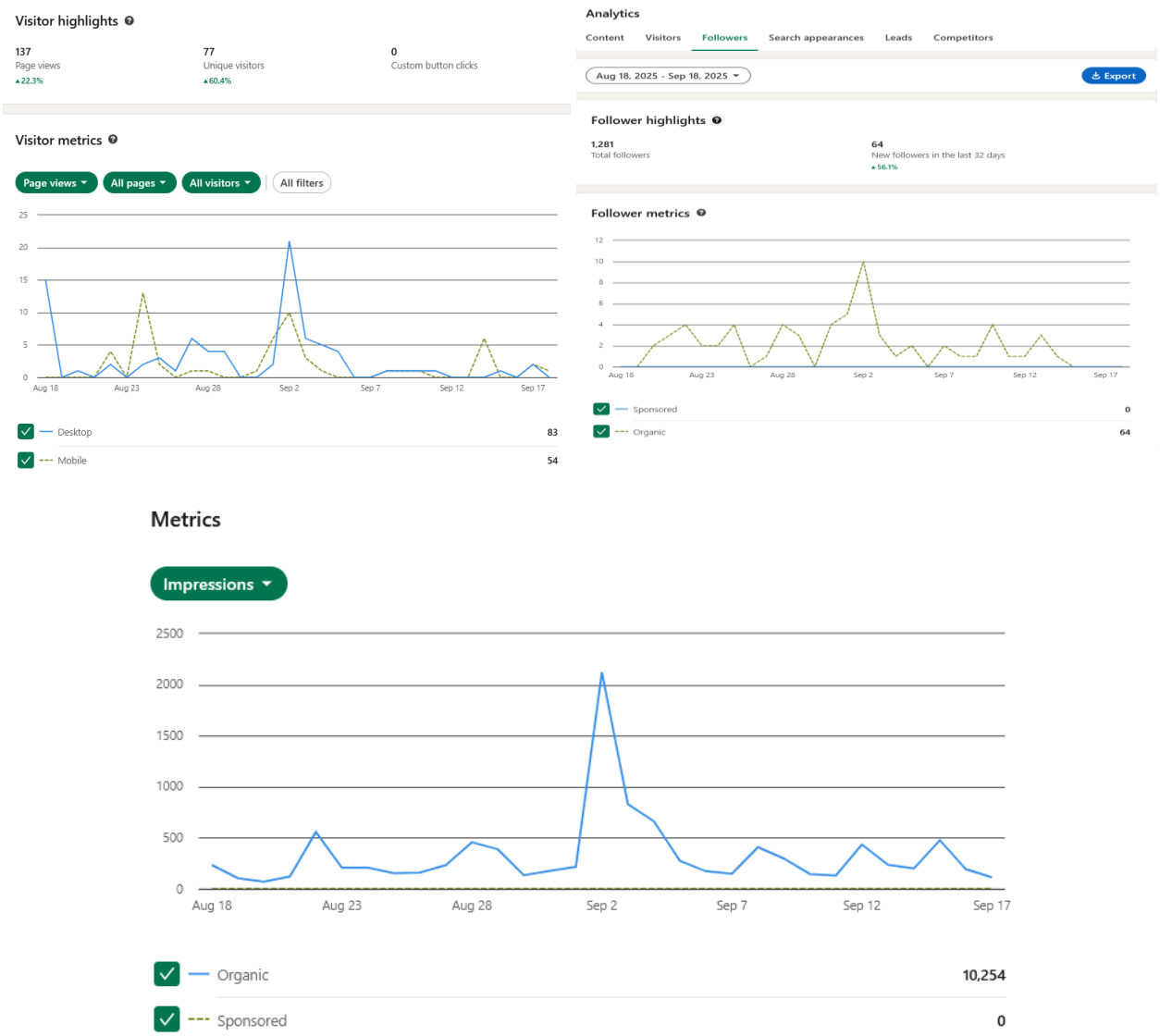

Figure 25: illustrates the Linkedin page views, new followers and impressions metrics two weeks before and two weeks after the Final Event

Overall, the social media campaign ensured that CHEK's final event reached a much wider audience than could attend live, while also leaving a permanent digital footprint of the project's vision, results, and tools in the public domain.

On CHEKdbp's LinkedIn channel, we were able to gain 64 new followers in the period of dissemination of the Final event and have also been able to increase the interaction rate on the day of the event.

6. Conclusion

The final event showed that CHEK has delivered a reusable, standards-based pathway for digital building permits. Its combination of process guidance (maturity model and VA), interoperable data flows (IFC/CityGML profiles, converters, georeferencing), and practical tools (platform, validators, rule checkers, digital signatures) has been validated with municipalities. Next steps include expanding rule libraries with legal traceability, consolidating workflows for municipal deployment, and sustaining standardisation efforts through EUnet4DBP and sister projects.

The event gathered a broad mix of stakeholders, including municipalities, software vendors, academic institutions, and standardisation bodies, all essential for scaling the results. Greater engagement from EU-level policy-makers (DG GROW, DG CONNECT, and national ministries) will support the further adoption of CHEK outcomes across Europe. In addition, private developers and the real estate sector, as the ultimate end-users of digital building permits, should be closely involved in future dialogues. Finally, universities and research institutes have a vital role in embedding DBPs into education, professional development, and licensing schemes and can reuse and extend the course and training materials that have been developed in the CHEK project.

The continued involvement of all these stakeholders is key to moving CHEK from a validated pilot into a fully operational European standard.

7. References

List of Figures

List of used abbreviations

API	–	Application Programming Interface
BPMN	–	Business Process Model and Notation
DBP	–	Digital Building Permit
DG CONNECT	–	Directorate-General for Communications Networks, Content and Technology (European Commission)
DG GROW	–	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (European Commission)
GeoBIM		Integration of Geographic Information System and Building Information Model
IDS	–	Information Delivery Specification
LOIN	–	Level of Information Need

Annex 1: Speaker bios

With over 12 years of experience in BIM–GIS integration and 3D standards, Abdoulaye Diakité focuses on turning complex building and city data into practical digital solutions. By combining open standards such as IFC, IDS, CityGML, City/GeoJSON and IndoorGML, he develops workflows that support cadastral registration, building permit validation, and 3D city model integration. His expertise helps cities and agencies reduce bottlenecks, ensure compliance, and build trust in digital transformation.

Amir Hakim is a senior technical consultant with a passion for BIM, digital twins, and software development. He enjoys working at the intersection of geospatial data, open standards, and innovative digital solutions, and has been part of both EU research initiatives and industry collaborations. Amir is especially interested in bridging technology and practice, creating practical and scalable tools that help people make smarter decisions."

Anne Ferreiro Sistiaga is an architect educated at the Polytechnic University of Madrid, with international experience at IIT Chicago and Chulalongkorn University in Bangkok. After working in studios in Spain and the U.S., I joined CYPE Software in 2017, where I lead the development of tools for architecture and urbanism and manage European and national innovation projects. Passionate about the intersection of design and technology, I believe architects are key drivers in shaping and using digital tools — from modeling and visualization to simulation — to expand the creative and technical possibilities of our profession.

Daniel Femerström is an engineer who started making building permits as a hobby, turned it into a business and began developing software aiming to create digital tools for a simpler, more streamlined building permit process.

Eduard Loscos is an R&D Manager at the IDP Group (Bureau Veritas) and President of the Building Digital Twin Association and Honorary Professor within the School of Computing, Engineering & Digital Technologies, Teesside University. BSc in Physics (UAB); master's in environmental engineering; Postgraduate in Quantum engineering (UPC),. With more than 25 years of experience in Business Development across several markets ranging from programming, printing, optoelectronics, tech transfer, and AECOO industry. Involved in more than 25 Horizon EU projects, acting in three of them as coordinator, with a special focus on Digitalisation in the construction sector. Currently convenor of the CEN TC442/WG9, leading at EU level the standardisation in the field of Digital Twins in the Built Environment

Elisa Dutsch holds an MSc in Geomatics from HafenCity University Hamburg. Since 2018, she has worked on EU and nationally funded research projects focused on driving innovation in the public sector through the use of geospatial technologies. In 2022, she joined Virtual City Systems (VCS), where she draws on her experience as a former municipal employee and research associate to bring a user-oriented perspective to the development of digital urban solutions. At VCS, Elisa has served as Project Manager of the CHEK project for the past three years and is currently part of the Product Management team for the VC Suite.

Fabian Ståhl is a Swedish architect with a degree from Copenhagen, Denmark. He has been working with BIM since 2008 and since 2019 for the Swedish National Board of Housing, Building and Planning. My role as a specialist in digital building information involves strategies for extracting GIS data from BIM, climate declarations, BIM adoption for national services and general infrastructure issues for building information

Dr. Francesca Noardo is a Researcher and Project Manager in the Open Geospatial Consortium (OGC).

Prior to join OGC she has developed her research in geomatics at the Politecnico di Torino (Italy), where she obtained her PhD, and in the 3D geoinformation group at the Delft University of Technology (NL), where she worked as a postdoc for more than 3 years. She has been working towards the interoperability and integration of multi-source spatial data, in particular, detailed 3D information systems (from survey or from design), in interoperable 3D maps, leveraging Open standards and adopting a user-centric approach for the concrete uptake of such technologies for urban applications. She is coordinating an international multidisciplinary collaboration as founder and leader of the European Network for Digital Building Permits (EUnet4DBP). She participates in various European projects and coordinated the CHEK project. She is co-chair of the ISPRS WG IV-1 ‘Spatial Data Representation and Interoperability’.

Prof. Dr. Jantien Stoter is Professor of 3D Geoinformation at Delft University of Technology, where she leads research on 3D city models, digital twins, and spatial data infrastructures. Her work focuses on bridging scientific innovation and practical applications in areas such as urban planning, environmental modeling, and data standardisation. In addition to her academic role, she has been involved in many national and international initiatives on 3D cadastre, 3D mapping, and urban data applications. She also works as a consultant innovation at the Dutch Kadaster and at the standardization organization for geoinformation Geonovum.

Dr.-Ing. Judith Fauth is Researcher at the Technical University of Munich (TUM) in Germany at the Chair of Computational Modeling and Simulation starting in April 2024. Before she joined her current position, she was Marie Skłodowska Curie Postdoc Fellow at the University of Cambridge (UK), postdoctoral researcher at Technische Universität Wien in Vienna (Austria) and researcher in the research project iECO at RIB Software GmbH in Germany. Judith completed several research stays abroad in the USA (University of Southern California), Italy (Fraunhofer Italia), New Zealand (University of Auckland) and Israel (Technion - Israel Institute of Technology). She obtained her Doctorate in Engineering from Bauhaus-Universität Weimar (Germany) from the Department of Construction Engineering and Management in 2021. She received various awards for young scientists in Germany and Austria for her dissertation. Judith graduated with a Bachelor degree in Architecture and a Master degree in Facility and Real Estate Management. Judith's research interest is on the digitalization of building permits starting in 2016. Her main focus lies on transdisciplinary perspectives of project and process management. She published several scientific journal and conference articles on the topic. Judith is member of the management committee of the EUnet4DBP. She chairs the scientific committee of the Digital Building Permit Conferences and is part of the organising committee.

Léon van Berlo is the Technical Director of buildingSMART International. He leads the development and implementation of openBIM standards and digital solutions for the built asset industry. With a background in engineering, software, and innovation, Léon is recognized for bridging the gap between technology and practical industry needs. He plays a key role in advancing interoperability, ensuring that digital construction workflows are open, scalable, and future-proof.

Luiggi Alfaro is a Project and Product Manager at DiRoots, with a background as a Civil Engineer and a Master's in BIM Management. I have experience building software for the construction industry and currently lead development projects at DiRoots, creating solutions that enhance workflows in the AEC sector. With years of hands-on experience in BIM, digital construction, and custom tool development, I specialize in bridging the gap between engineering challenges and innovative technology.

Mayte Toscano has over 19 years of experience in geospatial and web mapping projects. She is an expert in spatial analysis, Web GIS applications, data formats and conversion, as well as software development with a focus on standards, data quality, and best practices. She also has solid experience in project and team management, as well as cartographic design. Currently, she is a Project Manager at the Open Geospatial Consortium (OGC). In addition, she has taught technical courses at universities and public organizations and shares her expertise through articles on datos.gob.es about geospatial technology.

Milena Coccia: Civil engineer (Polytechnic Universitiy of Ancona), PhD in Architecture (University of Camerino), Master's Degree in Public Admnistration (University of Macerata).

Milena has worked at 3TI PRgetti, (design company) and in the technical office of one of the biggest construction companies in Italy: Società italiana per Condotte d'Acqua spa. From 2004 to 2011 she was an Engineer Captain at Arma dei Carabinieri. After her experience in the army, she went back to civil positions in different Municipality working both in building permit and public work offices. She has been a Director of the Sector 5 at Municipality of Ascoli Piceno since 2021 and deals with public works, maintenance, IT and data managing, sport, commerce and other.

Orjola Braholli is an experienced architect, BIM specialist, and researcher focused on digitalization in the construction industry at Fraunhofer Italia. She works on improving processes in the Architecture, Engineering, and Construction (AEC) sector and applying Industry 5.0 principles to enhance efficiency and innovation. Her research looks at practical methods for implementing Building Information Modeling (BIM) in Small and Medium Enterprises (SMEs) and public administrations. Orjola aims to improve collaboration and innovation by integrating digital tools and practices in construction.

Rebeca Herrera is an architect, BIM Manager and Head of Innovation in Building Permits at the Madrid City Council, where she coordinates the MADRIDdbp project, a pioneering initiative in the digitalisation of building permits in Spain. Her work focuses on driving innovative solutions in Digital Building Permits, promoting the use of BIM methodology, open standards, interoperability and public–private collaboration to achieve faster, more transparent and more accessible authorisation processes.”

Rita Lavikka, D.Sc. (Tech.) is a Research Team Leader in Data-Driven Circular Construction and an IPMA Level C certified project manager at VTT Technical Research Centre of Finland. Her research focuses on digitalising and decarbonising the built environment. Over her 20-year research career, she has published articles on the digital disruption of the AEC industry, the co-creation of digital services, and data platforms and ecosystems related to sustainability. She has coordinated several international R&D projects, such as the Horizon Europe ACCORD project, which digitalised building permit processes using Building Information Modelling (BIM) and other data sources, and automated compliance checking using Artificial Intelligence and other methods to advance a sustainable built environment. Before joining VTT, she worked as a post-doctoral researcher at Aalto University, a visiting researcher at Stanford University and co-founded a consultancy company that focuses on facilitating digital transformation in the built environment. She has received scholarships, best paper awards and a highly commended journal article in the 2018 Emerald Literati Awards. Her Scopus H-index is 15.

Dr. Siham El Yamani is a postdoctoral researcher in Geo-BIM and 3D geoinformation. She supports the coordination of the European CHEK project, leads BIM–GIS integration for digital building permits based on open standards, and advises municipalities as a consultant in digital transformation. She is also the founder of UrbanIQ, a consulting and software spin-off that helps municipalities, developers, and policymakers digitize and future-proof building processes with scalable GeoBIM workflows.

Annex 2: Attendance list

Partners of the CHEK project		
	Name	Organisation
1	Alejandro Villar	OGC
2	Alexandra Ferreira	Municipality of Lisbon
3	Alper Tunga Akın	TU Delft - 3D Geoinformation Group
4	Amir Hakim	Software developer
5	Ana Ó Ramos	Câmara Municipal de Lisboa
6	Ana Patricia Baptista	Gaiurb
7	André Espinho	Camara Municipal de Lisboa
8	André Luis Mantelatto Lisboa da Silva	Universiy of Minho
9	Ane Ferreiro Sistiaga	CYPE Software
10	Angelo Luigi Camillo CIRIBIN	UniBs
11	Arne Schilling	Virtual City Systems
12	Borja martínez	SIA.Architects
13	Bruno Muniz	University of Minho
14	Carla Pires	GAIURB
15	Chiara Gatto	UMinho
16	Cláudia Pinto	Câmara Municipal de Lisboa
17	Christan Friedrich	Xinaps / Solibri
18	Diana Keijzer	TU Delft
19	Diana Peralta	Câmara Municipal de Lisboa
20	Diogo Teixeira	Câmara Municipal de Lisboa
21	Eduardo Carvalho	Câmara Municipal de Lisboa
22	Elisa Dutsch	Virtual City Systems
23	Emanuele Mignone	Ibimi
24	Enrico Ottoni Comune AP	Municipality of Ascoli Piceno
25	Francesca Noardo	Open Geospatial Consortium
26	Graciete Nunes	CML - Epiou

Partners of the CHEK project		
	Name	Organisation
27	Iveta Victorova Bonsma	RDF Ltd.
28	Jantien Stoter	Tu Delft
29	Jasper van der Vaart	TUD
30	Joana Palma	Câmara Municipal de Lisboa
31	João Fragoso Januário	Câmara Municipal de Lisboa
32	João Palma Martins	Câmara Municipal de Lisboa
33	Jon Proctor	BuildingSMART International
34	José Luís Duarte Granja	University of Minho
35	Jose Oliveira (External)	DiRoots
36	Judita Eisenberger	Prague Institute of Planning and Development
37	Kaleem Ullah	TU Delf
38	Kavita Raj	UniBs
39	Lara Giovannozzi Comune AP	Municipality of Ascoli Piceno
40	Léon van Berlo	BuildingSMART International
41	Luciana Miranda	University of Minho
42	Lucie Kovaříková	IPR Prague
43	Luiggi Alfaro	DiRoots
44	Lutz Ross	Virtual City Systems
45	Marcelo Rafael	Municipality of Lisboa
46	Maria Duarte	Câmara Municipal de Lisboa
47	Maria João Barradas	Câmara Municipal de Lisboa
48	Mayte Toscano	OGC
49	Miguel Ângelo Dias Azenha	Universiy of Minho
50	Milena Coccia	Municipality of Ascoli Piceno
51	Nuno Moquenco	Câmara Municipal de Lisboa
52	Orjola Braholli	Fraunhofer Italia
53	Pablo Gilabert	CYPE
54	Peter Bonsma	RDF Ltd.

CHEK Final Event – 2 September 2025 – Attendance list

Partners of the CHEK project		
	Name	Organisation
55	Rosa Branco	Câmara Municipal de Lisboa
56	Sara Comai	University of Brescia
57	Siham El Yamani	Tu Delft
58	Sofia Ribeiro	Câmara Municipal de Lisboa
59	Tiago Santos	Câmra Municipal de Lisboa
60	Trajche Stojanov	ZWEI
61	Tzvetelina Zayakova	RDF Ltd
62	Ugo Galanti	Comune di Ascoli Piceno

	Members of the Advisory Board	
	Name	Organisation
1	Eilif Hjelseth	Norwegian University of Science and Technology - NTNU
2	Judith Fauth	Technical University of Munich
3	Konstantin Schneider	Tegel Project GmbH
4	Milena Feustel	EU-BIM task group
5	Øivind Rooth	Norwegian Building Authority
6	Thomas Krijnen	Software developer

CHEK Final Event – 2 September 2025 – Attendance list

	Members of the Community of Practice	
	Name	Organisation
1	Adam Glema	Poznan University of Technology
2	Alberto Crespo Lomas	FCC Construcción
3	Alberto SANTOS	Freelancer
4	Ali Ismail	Municipality of Dubai
5	Ana Júlio	CM Lisboa
6	Carlos Santos	Personal
7	Carolina Correia	Câmara Municipal de Lisboa
8	Cristina Lopes	Câmara Municipal de Lisboa
9	Diana Aguilar Jiménez	Ayuntamiento de Madrid
10	Fabian Ståhl	Boverket
11	Joao Cáceres Alves	Municipality
12	Jose María Boyano	Ayuntamiento de Madrid
13	Juan Jesus Cerezo Arillo	Municipality of Madrid
14	Lucina Carvalho	Secretaria de Estado da Habitação
15	Marco Morais	Câmara Municipal de Lisboa

	Members of the Community of Practice	
	Name	Organisation
16	Maria Duran Sancho	AMB
17	María Menor De Las Casas	Ayuntamiento de madrid
18	María Serena Gómez	Ayuntamiento de Madrid
19	Marta Parro	Madrid Municipality
20	Paulo António Ramos	Câmara Municipal de Leiria
21	Pep Coll	EiPM
22	Prashant Patil	PMRDA PUNE GOVERNMENT OF MAHARASHTRA INDIA
23	Rebeca Herrera	Madrid Municipality
24	Renata Nunes Aguiar e silva	Gaiurb EM
25	Rita Lavikka	VTT Technical Research Centre of Finland
26	Sara Rodrigo	Ayuntamiento de Madrid
27	Stefan Jaud	Jaud IT GmbH

CHEK Final Event – 2 September 2025 – Attendance list

Other		
	Name	Organisation
1	Abdoulaye Diakite	CityGeometrix
2	Adeline	Airplan
3	Alberto Alli	Harpaceas
4	Alexander Silva	Sanasa Campinas
5	Amin Hamidizadeh	CRTI-B
6	Ana Costa	Lisbon City Council
7	André Mendes	Lisboa SRU
8	André Poddubny	Civitta
9	Anna Moreno	BIM
10	Atila	MoECC
11	Azam Khan	Trax
12	Bilal Succar	ChangeAgents + BIM Excellence Initiative
13	Binh TA	Ministry of Construction Vietnam
14	Buket SAĞIROĞLU	MOEUCC
15	Casey Rutland	PropertyCortex
16	Chiara Marinai	HADEA
17	Daniel Femerstrom	Engineer
18	Davood Shojaei	Melbourne university
19	Dimitrios Theodorou	BTD
20	Eduard Loscos	IDP Bureau Veritas
21	Eymen Çağatay Bilge	İstanbul Ticaret University
22	Fabio Sireus	Harpaceas Srl
23	Ferran Bermejo	ITeC
24	Filippo Chiappini	University of Brescia
25	Francisco Santos	CML
26	Francisco Javier Diez	Tekniker
27	Fred Kloet	fredkloet.com
28	Gonçal Costa	La Salle Campus Barcelona

Other		
	Name	Organisation
29	Gonçalo Rosado	Milestone
30	GREGORIO SAURA LORENTE	European Commission
31	Ilkka Mattila	Cloudpermit
32	Irfan Pottachola	TNO
33	Jaan Saar	Future Insight
34	Jorge Vieira Repolho	Architect
35	Koray Kadas	Middle East Technical University
36	Lars Wederhake	credium GmbH
37	Manuel Pacheco	Município de Olhão
38	María Isabel Muñoz	EMVS Madrid
39	Marisa Isabel Mota	Câmara Municipal de Leiria
40	Micael Rodrigo Vieira Pinheiro	Câmara Municipal de Leiria
41	Michelangelo Cianciulli	ACCA software
42	Miguel Angel Coca	*Ayuntamiento de Madrid*
43	Miguel Frazão	Azores BIM Studio
44	Milda Sutkaityte	Construction Sector Development Agency (SSVA)
45	Milo	
46	Natalia Medrano Femerström	Buildility AB
47	Nelson Freitas	NSF
48	Nelson	
49	Nicholas Nisbet	Aec3
50	Nikoo Mirhosseini	UniMelb
51	Olalla Olalla Gomez Fontecha	EMVS Madrid
52	Oliver Bieniussa	Bieniussa/Martínez Architects

CHEK Final Event – 2 September 2025 – Attendance list

Other		
	Name	Organisation
53	Oluwaseyi Ogunrinola	Buildsafe Nigeria Limited
54	Pablo GUTIERREZ VELAYOS	Policy officer EC
55	Paulo Melo	Câmara de Lisboa
56	Pedro Martins	Lisboa SRU SA
57	Pille-Riin Peet	Tallinn University of Technology
58	Rafael Raposo	PROJECTOS
59	Ralf Becker	RWTH Aachen University, Geodetic Insitute and Chair for Computing in Civil Engineering & GIS
60	Ralf Vogelsang	None
61	Ricardo Torreão	IBIM
62	Rita Mendonça	BUILT CoLAB
63	Ruy Silva	Construsoft
64	Sara Garcia Romero	EMVS
65	Sigve Pettersen	Skogli digital AS
66	Simon Jayasingh	Yatzar Creations Private Limited
67	Stefanie Kaiser	Politehnica University Timisoara
68	Stepanka Tomanova	CAS
69	Susana Reis	Designer/Modeler
70	Tamay Gunduz	Arqio
71	Tanya Bloch	Technion

Annex 3: Event materials (slides, toolkit links)

CHEK DIGITAL BUILDING PERMIT

DBP FINAL EVENT

BUILDING PERMIT DIGITALIZATION JOURNEY AND WHAT'S NEXT?

CHEK Change Toolkit: An Innovative Vision for Digitalisation

2nd September 2025

Francesca Noardo

Funded by the European Union

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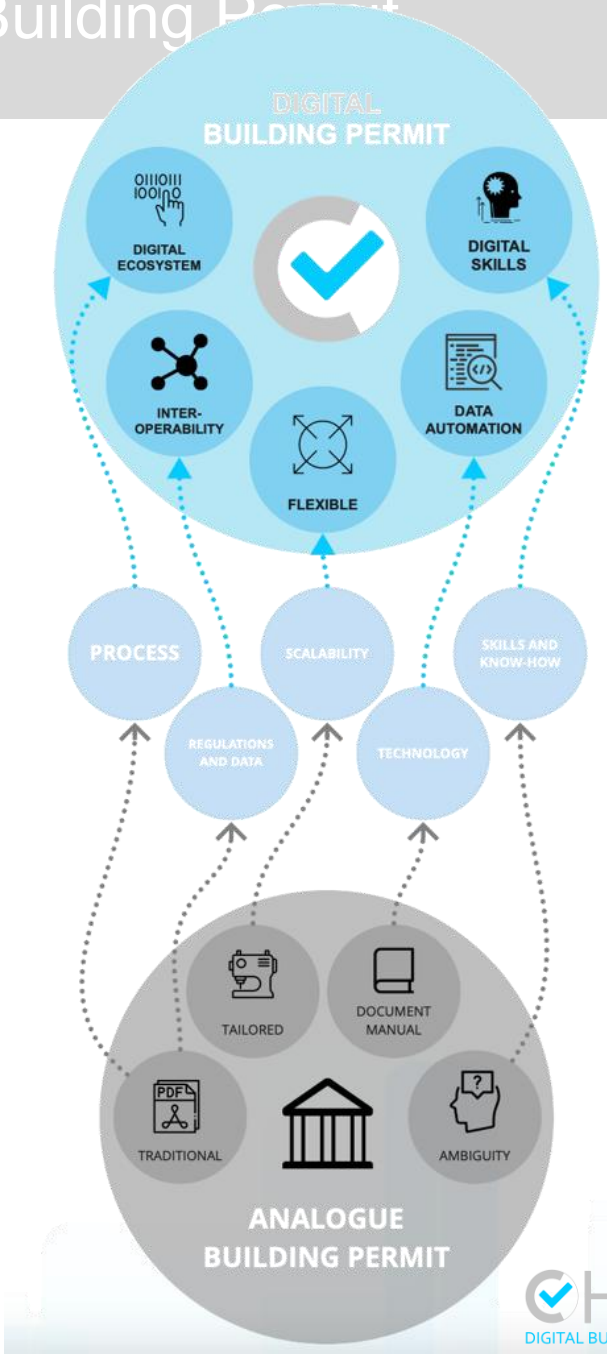
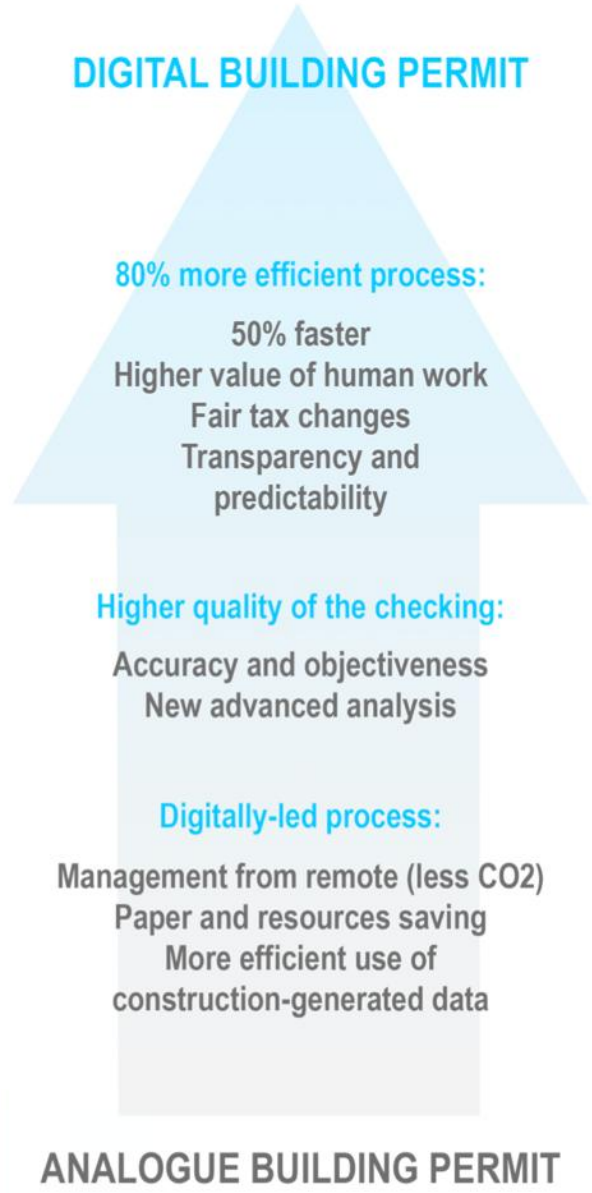
Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Health and Digital Executive Agency (HaDEA). Neither the European Union nor the granting authority can be held responsible for them

Change toolkit for Digital Building Permit

Digital Building Permit implies the transition from analogue document-based documents to digital processes bade on data (Building Information Models, 3D city models).





Change toolkit for Digital Building Permit

CHEK DIGITAL BUILDING PERMIT

Funded by the European Union

Horizon Europe HORIZON-CL4-2021-TWIN-TRANSITION-01-10. G.A. 101058559

October 2022 – September 2025

https://chekdbp.eu

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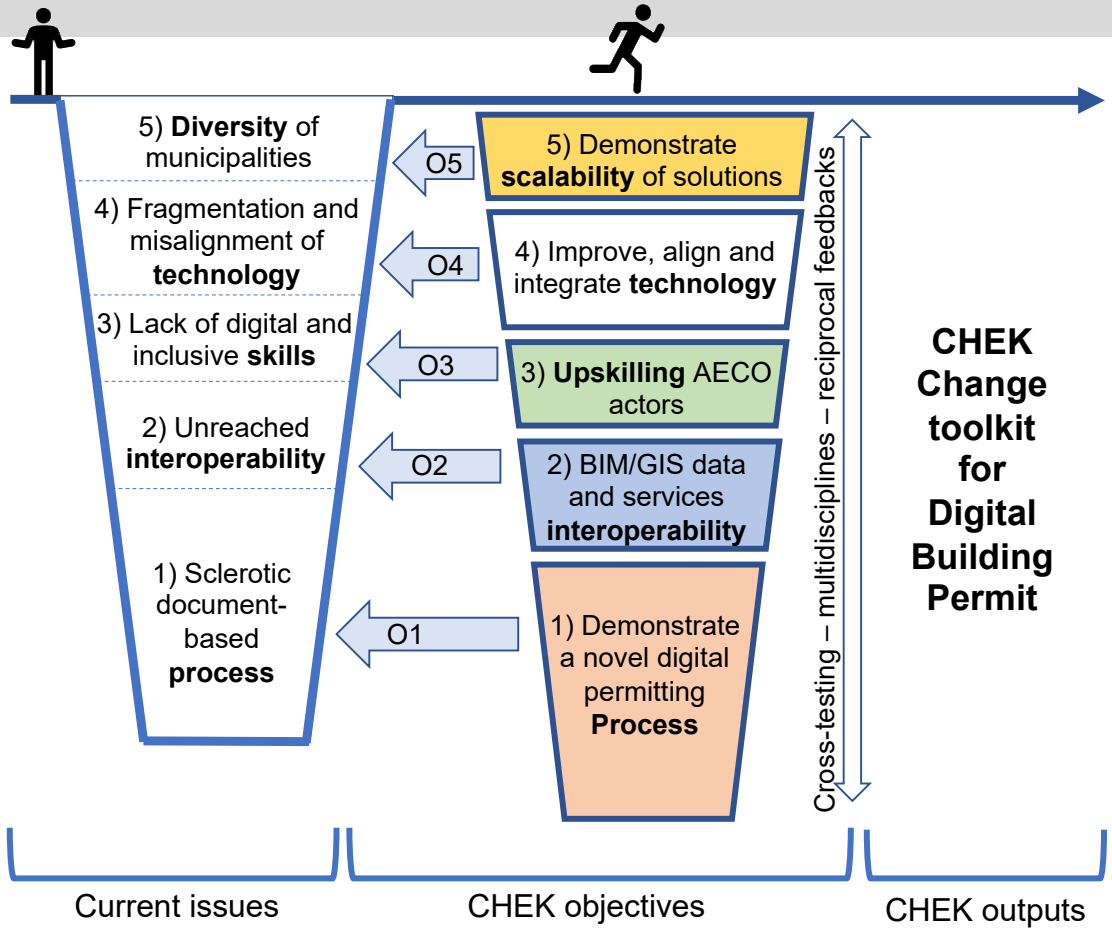
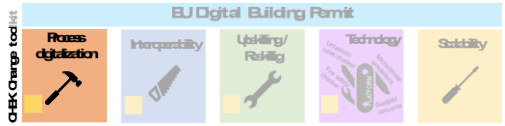


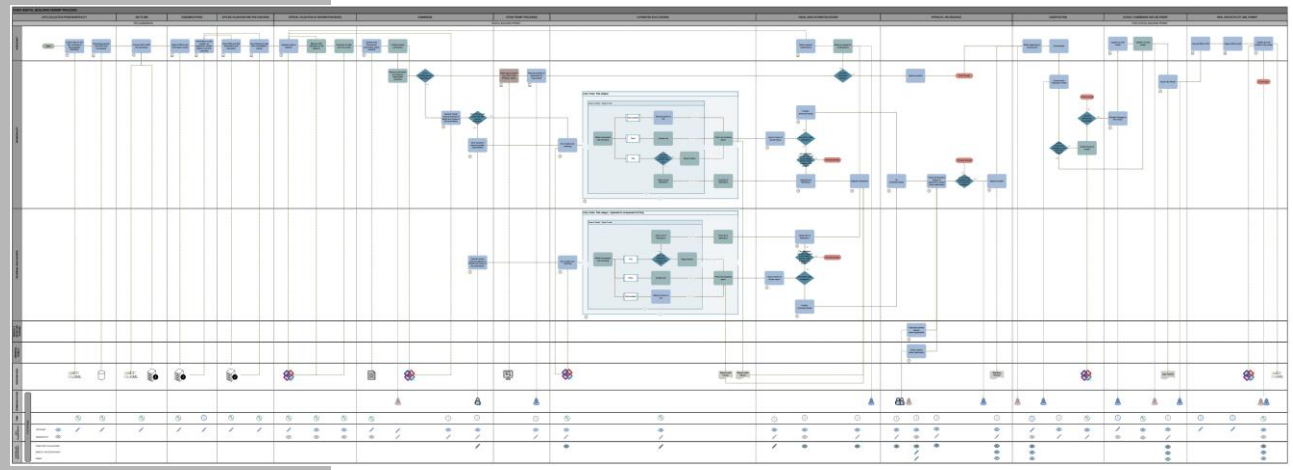
Introduction CHEK

Process change – Information requirements – GeoBIM – OpenAPI-based microservices – Training

Objective 1: To develop and demonstrate novel DBP processes



CHEK Process Map



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Zenodo.org will be unavailable for 2 hours on September 29th from 06:00-08:00 UTC. See announcement.

March 31, 2023 Dataset Open Access

CHEK To-be Digital Building Permit process map

Orjola Braholli; Mariana Ataide; Ilaria Di Blasio; Kavita Raj; Dietmar Siegele

Project member(s)

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Related person(s)

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Research group(s)

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To-be process map for digital building permit process as developed within the HORIZON EUROPE project 'Change toolkit for Digital Building Permit' (CHEK) https://chekdbp.eu

It is described in the CHEK project deliverable D1.1.

This project has received funding from the European Union's Horizon Europe programme under Grant Agreement No.101058559

The file is provided in
- SVG format, open vector editable format;
- Visio format, proprietary but editable format;
- PDF format.

Preview

Page: 1 of 1 Automatic Zoom

196 views 178 downloads

See more details...

Indexed in OpenAIRE

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Keyword(s): Building Permit, Digital Building Permit, digitalisation, BIM, GeoBIM, Process map

Grants:
European Commission:
- CHEK - Change toolkit for digital building permit (101058559)

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Versions

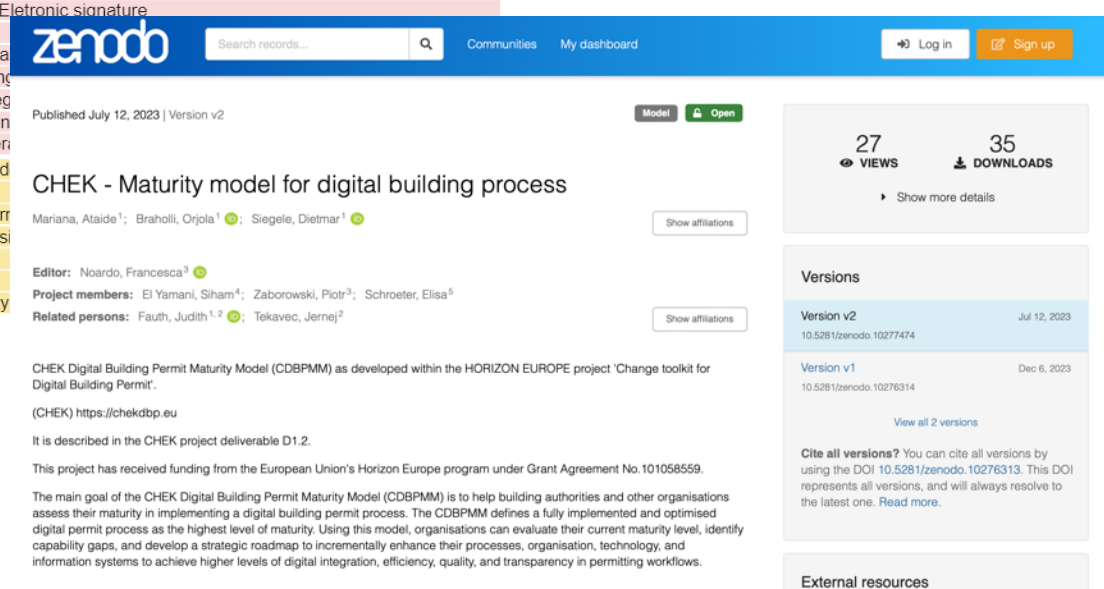
Version 1.0 Mar 31, 2023
10.5281/zenodo.7789036

Objective 1: To develop and demonstrate novel DBP processes

MATURITY MODEL STRUCTURE | KEY MATURITY AREAS

MM CATEGORIES	MM CAPABILITY SETS	KEY MATURITY AREAS
1. PROCESS	1.1 Process and Methods	1.1.1 Understanding of the process and mapping of steps
		1.1.2 Stakeholders are aware of the process steps and required information they must provide
	1.2 Regulatory	1.2.3 Benchmarks and key performance indicators
		1.2.4 Standardised process
		1.2.5 Data templates, use of common data formats, and documentation requirements
	1.3 Procedure	1.3.6 Timelines and response time
		1.3.7 Accessibility of stakeholders
		1.3.8 Transparency
2. ORGANISATION	2.4 Readiness for changes	2.4.9 Data technology awareness
		2.4.10 Internal staff
		2.4.11 Higher management
		2.4.12 Infrastructure
		2.4.13 Legislative system
	2.5 Organization structure of units	2.5.14 Strategic objectives for data driven process implementation
		2.5.16 Training, preparation and support
		2.6.17 Overall knowledge of technicians
		2.5.15 Dedicated personnel
	2.6 Social aspect	2.6.18 Stakeholders processes
3. TECHNOLOGY	3.7 Technology for data management	3.7.19 Data management environment and network platform
		3.7.20 Data storage/ repository
		3.7.21 Submission system and Eletronic signature
		3.7.22 Communication system
	3.8 Technology for data analysis	3.8.23 Data inspection and visua
		3.8.24 Data validation for buildin
		3.8.25 Content analyser and Reg
	3.9 Interoperability and open format	3.9.26 Interoperability componen
		3.9.27 BIM to GIS data interopera
4. INFORMATION	4.10 Data standardisation and quality	4.10.28 Data standards and guid
		4.10.29 Data quality control
		4.10.30 Data Richness and infor
	4.11 Data and information	4.11.31 Building/intervention desi
		4.11.32 City context data
	4.12 Codes and regulation	4.12.33 Regulations formats
		4.12.34 Regulations accessibility

CHEK Maturity Model



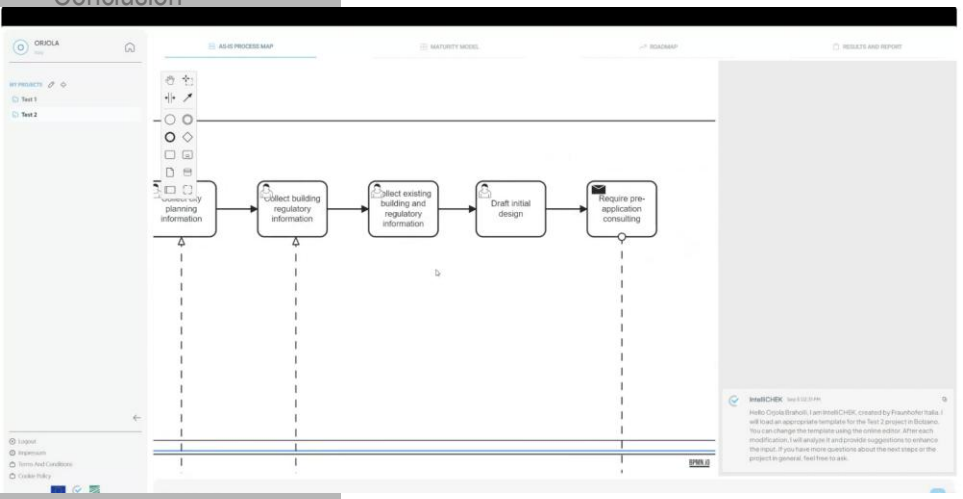
10:10

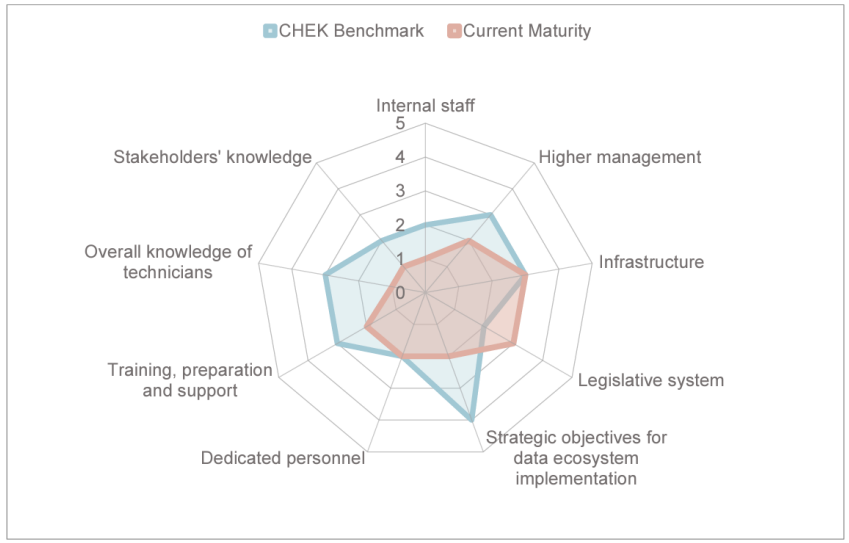
Digitalization Process & Maturity Model: CHEKDBP and European research

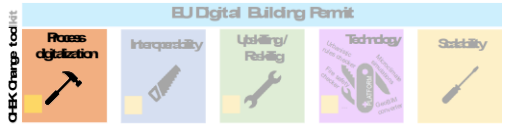
- Judith Fauth, Researcher, TU Munich; Chair, DBP Conference Committee
- Orjola Braholli, Researcher & BIM Specialist, Fraunhofer Italia, CHEKdbp partner

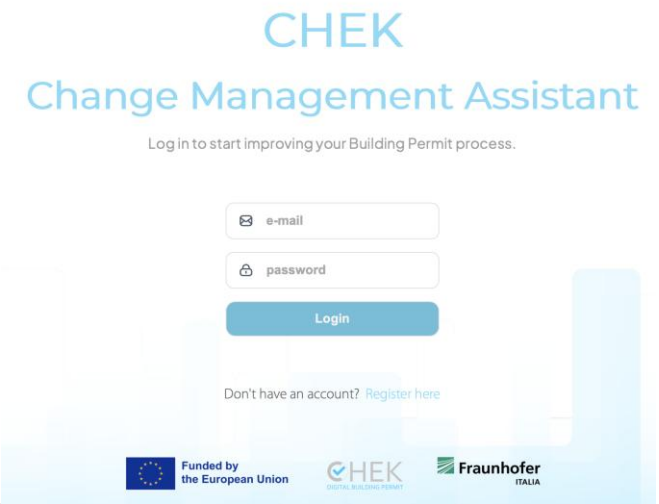
Objective 1: To develop and demonstrate novel DBP processes

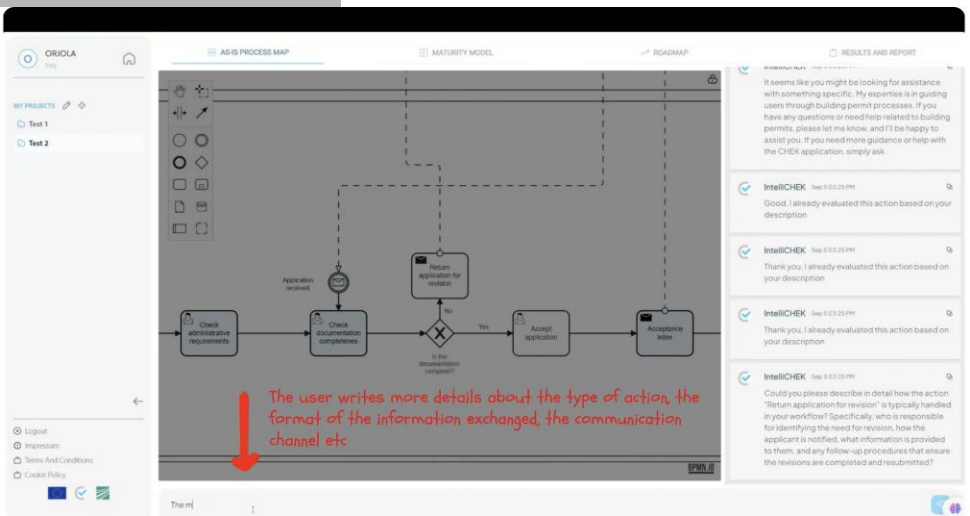
CHEK Change management Virtual Assistant











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Objective 2: To enforce data and service interoperability

Regulations interpretation and Formal Data requirements

RMUEL Art. 41, Paragraph 3

Text

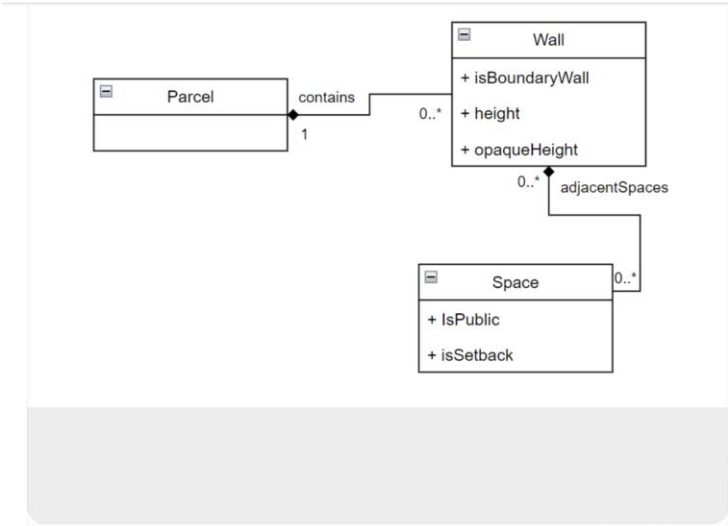
3 - Facing the public spaces, boundary walls may not exceed 1.20 metres in height, extending to the boundary wall on the side of the parcel in the part corresponding to the building's setback, where this exists, and boundary walls up to 2.0 metres in height are permitted, when supplemented with hedgerow.

Pseudocode

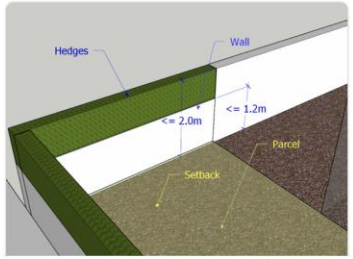
FOREACH BoundaryWall IN Parcel:
  IF isFacing(BoundaryWall, PublicSpace) OR isFacing(BoundaryWall, Setback):
    CHECK IF BoundaryWall *height* <= 1.2 *m*
    IF FAIL:
      CHEK IF *opaqueHeight(*BoundaryWall*) <= 1.2 m*

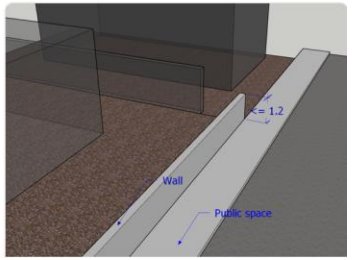
      CHEK IF BoundaryWall *height <= 2.0 m*

      ASK APPROVED "boundary walls up to 2.0 metres in height are permitted, when supplemented with hedges."



Image



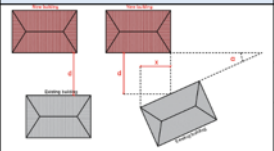
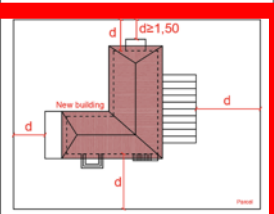


Change toolkit for Digital Building Permit

CHEK DIGITAL BUILDING PERMIT

Funded by European Union

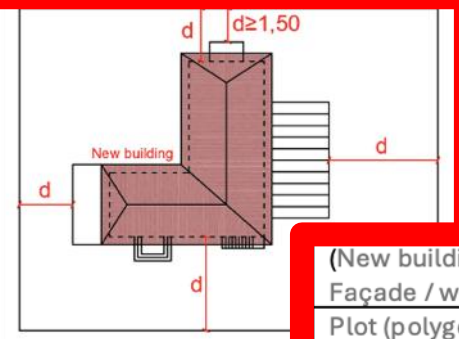
Regulation: Distances

Definitions - Regolamento edilizio comunale of the Municipality of Ascoli Piceno – Art. 13	Clarifications by municipality technicians (informal)	In New Building	In Context
Paragraph o – **Building-building distance**: Is the minimum distance between walls or building volumes facing the new building (considering all the building volumes and protrusions) except for the walls facing the *building interior spaces* Two walls are considered to be facing each other, when the angle formed by the extension of the respective *façade* projections on the plane is lower than 70 degrees sexagesimal and their overlap (i.e. orthogonal projection on each other) is higher than 1/4 of the minimum distance between the walls themselves. For graded buildings (i.e. buildings which are composed by horizontally or vertically articulated volumes), the distance is	 The sentence "For graded buildings (i.e. buildings which are composed by horizontally or vertically articulated volumes), the distance is measured at each setback." Just reinforces the idea that the minimum distance is considered among any possible protruding volume of the building, in any position of the façade.	Walls Façade Building Interior space? (Patio, yard, cloister)	(Existing in the context) Walls/Buildings (New building) Façade / wall surface Building Interior space? (Patio, yard, cloister)
Paragraph p – **Building- boundaries distance**. It is the minimum distance between the vertical projection of the wall of the building and the boundary of the *plot* (considering all the building volumes and protrusions), **Border**: - separation line of the different existing ownerships, - line defining the different *plots* or *compartments* of the implementation plans, - bordering line of public areas for services or equipment, identified in urban planning instruments.	 Public areas for services: see *primary and secondary infrastructure* above	Façade Road Public parking Utilities (sewerage, water supply, electricity and gas network)	(New building) Façade / wall surface Plot (polygon) Cadastral parcels (ownership) Implementation plans plots / compartments Road Public parking Utilities (sewerage, water supply, electricity and gas network)

Paragraph p – **Building- boundaries distance**. It is the minimum distance between the vertical projection of the wall of the building and the boundary of the *plot* (considering all the building volumes and protrusions),

Border:

- separation line of the different existing ownerships,
- line defining the different *plots* or *compartments* of the implementation plans,
- bordering line of public areas for services or equipment, identified in urban planning instruments.



Public areas for services *and secondary infrastru*

(New building) Façade / wall surface
Plot (polygon)
Cadastral parcels (ownership)
Implementation plans plots / compartments
Road
Public parking
Utilities (sewerage, water supply, electricity and gas network)

CityGML CityJSON

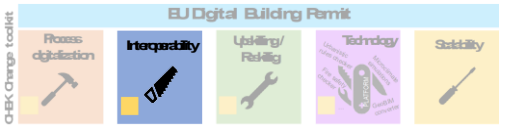
CHEK CityJSON profile for the municipality of Ascoli Piceno

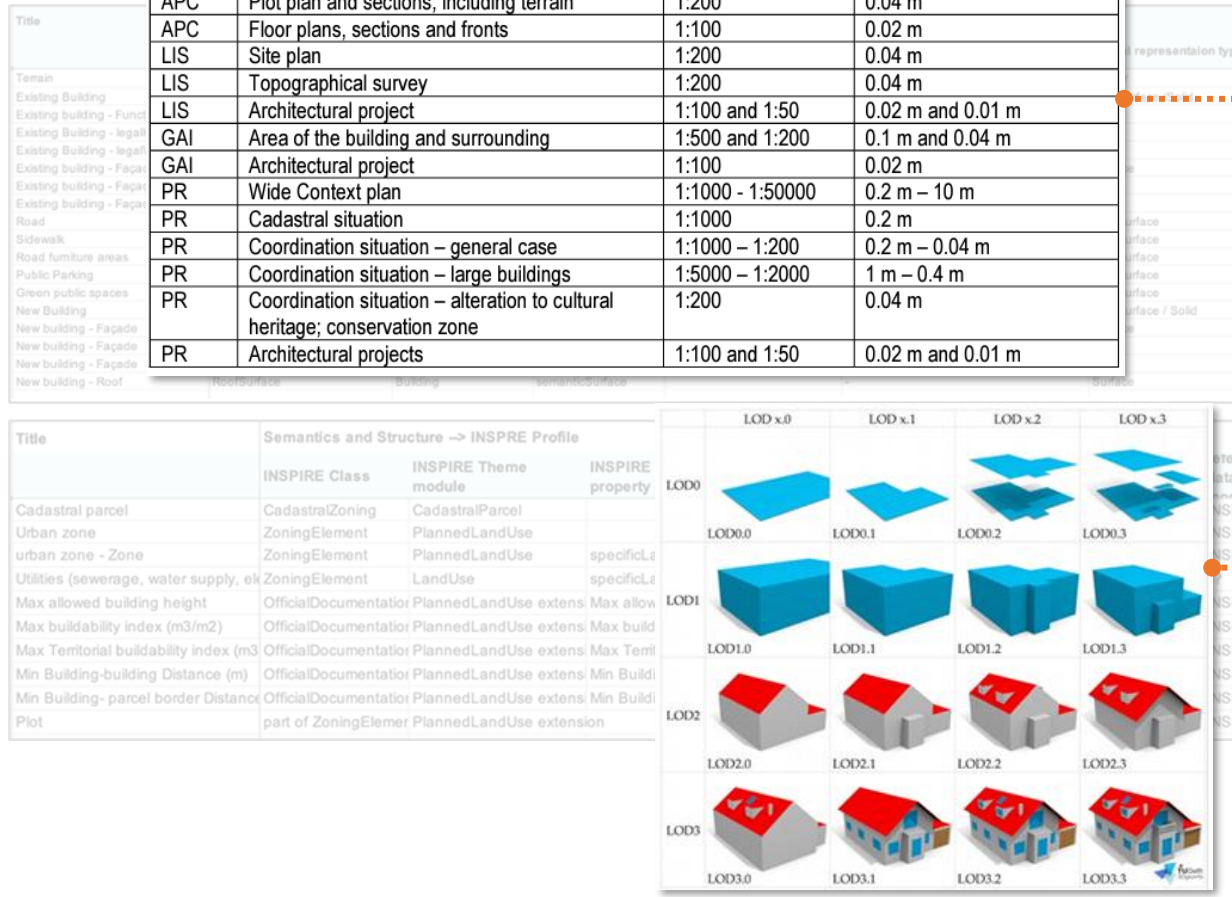
Title	Semantics and Structure --> CityJSON Profile							Geometry				
	CityJSON Class	CityJSON module	CityJSON property	notes	Attribute value type	spatial representaion type	reference data model	Accuracy	Spatial resolution	Reference system	Unit of measure	Data format
Existing building - Function	Building	Building	?		codelist 'APC_BuildingFuncti	-	CityGML v.3	-	-	-	-	JSON
Existing Building - legalHeight	Building	Building Extension?	legalHeight	attribute to host, in the future, the height mea		-						JSON
Existing Building - legalVolume	Building	Building Extension?	legalVolume	attribute to host, in the future, the volume of th		-						JSON
Existing building - Façade	WallSurface	Building	semanticSurface?		-	MultiSurface / CompositeSurface?	CityGML v.3	10 cm	LoD1.3???	projected national CRS	m	JSON
Existing building - Façade	WallSurface	Building	parent	to building	-	-	CityGML v.3	-	-	-	-	JSON
Existing building - Façade - hasWindows	WallSurface	Building Extension?	hasWindows		Boolean	-	CityGML v.3	-	-	-	-	JSON
Road	Road	Transportation	semanticSurface?		-	MultiSurface / CompositeSurface?	CityGML v.3	10 cm	LoD0 (3D)	projected national CRS	m	JSON
Sidewalk	TrafficArea (or Traffic square?)	Transportation	semanticSurface?		-	MultiSurface / CompositeSurface?	CityGML v.3	4 cm	LoD0	projected national CRS	m	JSON
Road furniture areas	AuxiliaryTrafficArea (or TrafficSquare?)	Transportation	semanticSurface?		-	MultiSurface / CompositeSurface?	CityGML v.3	4 cm	LoD0	projected national CRS	m	JSON
Public Parking	AuxiliaryTrafficArea (or TrafficSquare?)	Transportation	semanticSurface?		-	MultiSurface / CompositeSurface?	CityGML v.3	4 cm	LoD0	projected national CRS	m	JSON
Utilities (sewerage, water supply, electricit	?	?	?	?	?	?		10 cm		projected national CRS		JSON
Green public spaces	PlantCover	Vegetation	lod0MultiSurface??		-	MultiSurface / CompositeSurface?	CityGML v.3	10 cm	LoD0	projected national CRS	m	JSON
New Building	Building	Building	lod3MultiSurface		-	MultiSurface / CompositeSurface?	CityGML v.3	2 cm	LoD3.3/LoD1.X (sl	projected national CRS	m	JSON
New building - Façade	WallSurface	Building	semanticSurface?		-	MultiSurface / CompositeSurface?	CityGML v.3	2 cm	LoD2-3	projected national CRS	m	JSON
New building - Façade	WallSurface	Building	parent	to building	-	-	CityGML v.3	-	-	-	-	JSON
New building - Façade	WallSurface	Building Extension?	hasWindows		Boolean	-	CityGML v.3	-	-	-	-	JSON
New building - Roof	RoofSurface	Building	semanticSurface?		-	MultiSurface / CompositeSurface?	CityGML v.3	2 cm	LoD2-3	projected national CRS	m	JSON

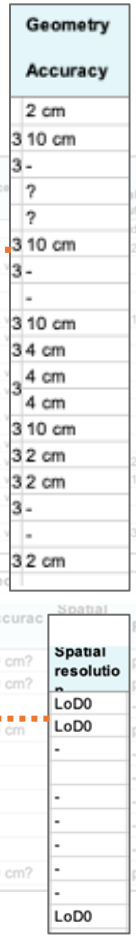
Objective 2: To enforce data and service interoperability

Regulations interpretation and Formal Data requirements

City	Objects represented	Scale requested	Corresponding accuracy
APC	General positioning of the intervention on cartography	1:2000	0.4 m
APC	General context plan, including heights, plot, roads, public spaces, protected vegetation, surrounding buildings	1:500	0.1 m
APC	Plot plan and sections, including terrain	1:200	0.04 m
APC	Floor plans, sections and fronts	1:100	0.02 m
LIS	Site plan	1:200	0.04 m
LIS	Topographical survey	1:200	0.04 m
LIS	Architectural project	1:100 and 1:50	0.02 m and 0.01 m
GAI	Area of the building and surrounding	1:500 and 1:200	0.1 m and 0.04 m
GAI	Architectural project	1:100	0.02 m
PR	Wide Context plan	1:1000 - 1:50000	0.2 m – 10 m
PR	Cadastral situation	1:1000	0.2 m
PR	Coordination situation – general case	1:1000 – 1:200	0.2 m – 0.04 m
PR	Coordination situation – large buildings	1:5000 – 1:2000	1 m – 0.4 m
PR	Coordination situation – alteration to cultural heritage; conservation zone	1:200	0.04 m
PR	Architectural projects	1:100 and 1:50	0.02 m and 0.01 m

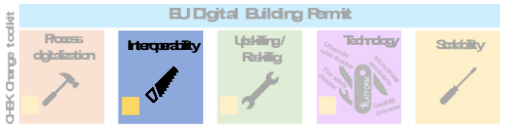






CityGML

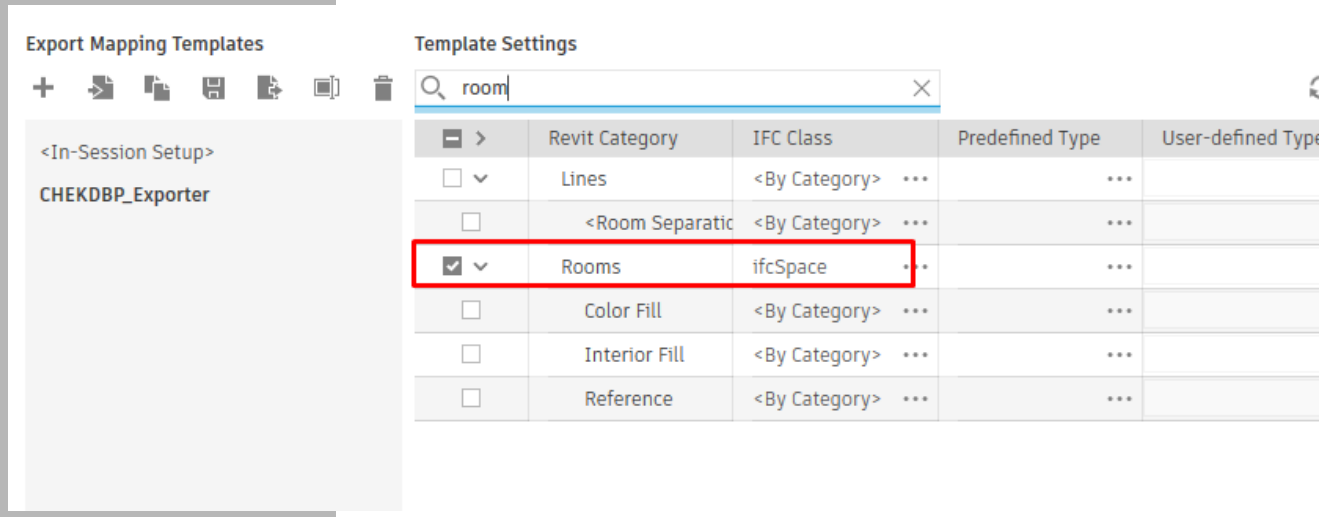
Objective 2: To enforce data and service interoperability



Key Standard Data models profiling tools

IDS → IFC CHEK profile and modelling guidelines

DiRoots Revit CHEK IFC Exporter



DiRoots connecting the dots

RDF

RDFApps / IDSChecker / CHEK / CHEK_Ascoli_Piceno.ids

Code | Blame | 303 lines (303 loc) · 14.6 KB | Code 55% faster with GitHub Copilot

```
            </ids:property>
        </ids:requirements>
    </ids:specification>
    <ids:specification name="Each building should have CHEK_common.TypeOfConstruction property" ifcVersion="IFC4">
        <ids:applicability minOccurs="0" maxOccurs="unbounded">
            <ids:entity>
                <ids:name>
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                </ids:name>
            </ids:entity>
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        <ids:requirements>
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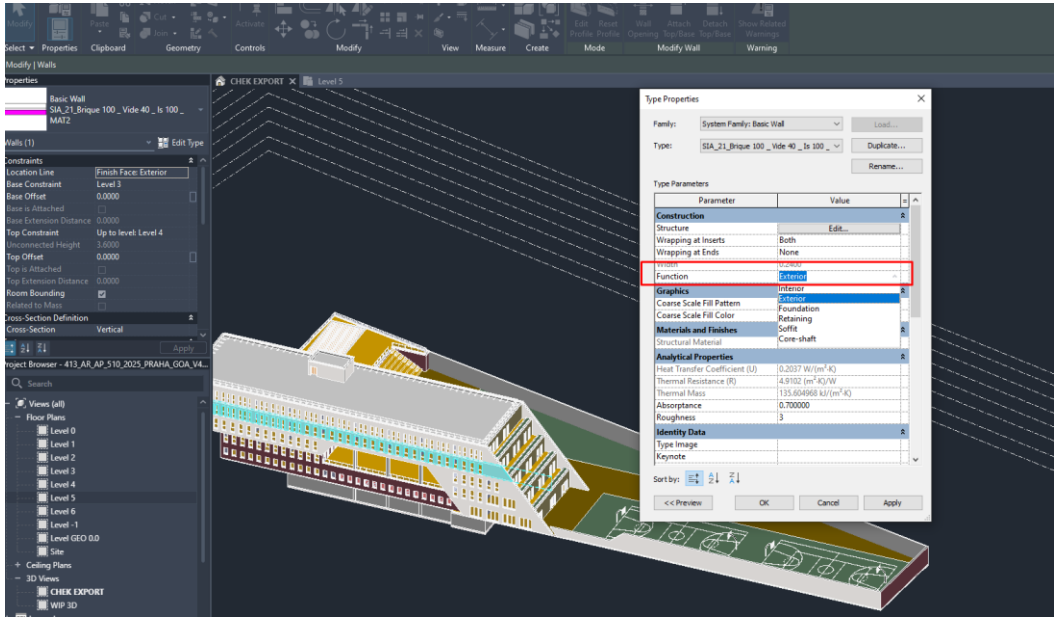
Objective 2: To enforce data and service interoperability

IDS → IFC CHEK profile and modelling guidelines



+ Simplicity, but limitations in expression power
+ IDS : From human to machine readable format
+ Combining IDS with **microservices** to extend its capabilities
+ IFC validator: validations of PSet's / IDS content
+ IDS > Diroots (automatic extraction)

RDF

RDFApps / IDSChecker / CHEK / **CHEK_Ascoli_Piceno.ids**

Code | Blame | 303 lines (303 loc) · 14.6 KB | Code 55% faster with GitHub Copilot

```
23                  </ids:property>
24              </ids:requirements>
25          </ids:specification>
26          <ids:specification name="Each building should have CHEK_common.TypeOfConstruction property" ifcVersion="IFC4">
27              <ids:applicability minOccurs="0" maxOccurs="unbounded">
28                  <ids:entity>
29                      <ids:name>
30                          <ids:simpleValue>IFCBUILDING</ids:simpleValue>
31                      </ids:name>
32                  </ids:entity>
33              </ids:applicability>
34              <ids:requirements>
35                  <ids:property cardinality="required">
36                      <ids:propertySet>
37                          <ids:simpleValue>CHEK_common</ids:simpleValue>
38                      </ids:propertySet>
39                      <ids:baseName>
40                          <ids:simpleValue>TypeOfConstruction</ids:simpleValue>
41                      </ids:baseName>
42                  </ids:property>
43              </ids:requirements>
44          </ids:specification>
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46              <ids:applicability minOccurs="0" maxOccurs="unbounded">
47                  <ids:entity>
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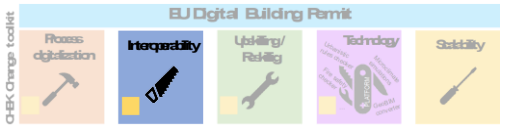
49                          <ids:simpleValue>IFCBUILDING</ids:simpleValue>
50                      </ids:name>
```

https://github.com/I-Sokolov/RDFApps/tree/main/IDSChecker/CHEK

Objective 2: To enforce data and service interoperability

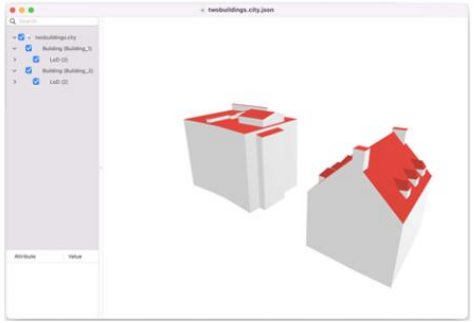


Key Standard Data models profiling tools
OGC Data Exchange toolkit → CHEK CityJSON profile

SHACL rule

```
<#Lod3.3>
    a sh:NodeShape ;
    sh:targetClass city:Building, city:BuildingPart, city:BuildingRoom, city:BuildingStorey,
     city:BuildingUnit, city:BuildingInstallation;
    sh:not [
      sh:sparql [
        sh:prefixes ex: ;
        sh:select """
          SELECT $this (city:lod as ?path) (?lod as ?value) WHERE {
            $this city:hasGeometry/city:lod ?lod .
            FILTER regex(str(?lod), '^(3.3|4.*)$')
          } LIMIT 1
      """ ;
      ] ;
    ];
    sh:message "Building has LoD < 3.3" ;
    sh:severity sh:Violation
.
```

Data example



```
<#city-objects-Building_1> a city:Building ;
    city:hasGeometry [
            city:hasSurface [
                a city:GroundSurface, gml:MultiSurface ;
                city:boundaries ( ( ( <#vertices-0> <#vertices-1> <#vertices-2> ) )
            ] , [
                a city:WallSurface, gml:MultiSurface ;
                city:boundaries ( ( ( <#vertices-11> <#vertices-9> <#vertices-12> )
            ] , [
                a city:RoofSurface, gml:MultiSurface ;
                city:boundaries ( ( ( <#vertices-20> <#vertices-19> <#vertices-21> )
            ];
            city:lod "3.3" ;
    ] .
```

```
{
  "type": "CityJSON",
  "version": "1.1",
  "metadata": {...},
  "CityObjects": {
    "Building_1": {
      "geometry": [
        {
          "boundaries": [...],
          "lod": "2",
          "semantics": {
            "surfaces": [
              {
                "type": "GroundSurface"
              },
              {"type": "WallSurface"...},
              {"type": "RoofSurface"...}
            ],
            "values": [...]
          },
          "type": "MultiSurface"
        }
      ],
      "type": "Building"
    },
    "Building_2": {"type": "Building"...}
  },
  "vertices": [...],
```

CHEK profile editor

Open Geospatial Consortium

PROFILE | DATASET REQUIREMENTS | CONTENT REQUIREMENTS

Profile title *

Dataset description

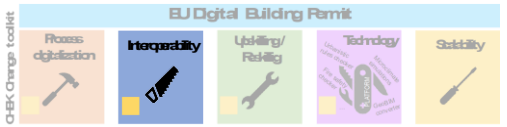
CLEAR | GENERATE PROFILE

Validation report

```
Validation Report
Conforms: False
Results (6):
Constraint Violation in NotConstraintComponent (http://www.w3.org/ns/shacl#NotConstraintComponent):
        Severity: sh:Violation
        Source Shape: <file:///github/workspace/ogc/chek-profiles/cityjson/paper/shapes.ttl#License>
        Focus Node: <http://example.com/twobuildings.ttl#city>
        Value Node: <http://example.com/twobuildings.ttl#city>
        Message: License does not support commercial usage
Constraint Violation in NotConstraintComponent (http://www.w3.org/ns/shacl#NotConstraintComponent):
        Severity: sh:Violation
        Source Shape: <file:///github/workspace/ogc/chek-profiles/cityjson/paper/shapes.ttl#Lod3.3>
        Focus Node: <http://example.com/twobuildings.ttl#city-objects-Building_2>
        Value Node: <http://example.com/twobuildings.ttl#city-objects-Building_2>
        Message: Building has LoD < 3.3
Constraint Violation in NotConstraintComponent (http://www.w3.org/ns/shacl#NotConstraintComponent):
        Severity: sh:Violation
        Source Shape: <file:///github/workspace/ogc/chek-profiles/cityjson/paper/shapes.ttl#RoadsRequired>
        Focus Node: [ ]
        Value Node: [ ]
        Message: Dataset contains no Road objects
```

CityJSON

Objective 2: To enforce data and service interoperability



GeoBIM

IFC Georeferencing tool

IFC version: IFC4
IFC file is georeferenced.

IFCProjectedCRS Data

	property	value
0	id	104
1	type	IfcProjectedCRS
2	Name	EPSG:3763
3	Description	None
4	GeodeticDatum	None
5	VerticalDatum	None
6	MapProjection	None
7	MapZone	None
8	MapUnit	None

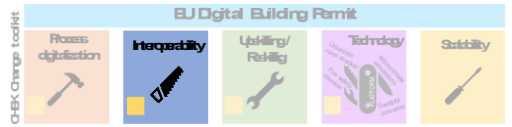
IFCMapConversion Data

	property	value
0	id	105
1	type	IfcMapConversion
2	SourceCRS	[None, Model, 3, 1e-05, [[(0.0, 0.0, 0.0)], None, None], [(6.123031769111886e-17, 1.0)]]
3	TargetCRS	[EPSG:3763, None, None, None, None, None, None]
4	Eastings	0.0
5	Northings	0.0
6	OrthogonalHeight	0.0
7	XAxisAbscissa	1.0
8	XAxisOrdinate	0.0
9	Scale	None

Show on Map

IfcGref

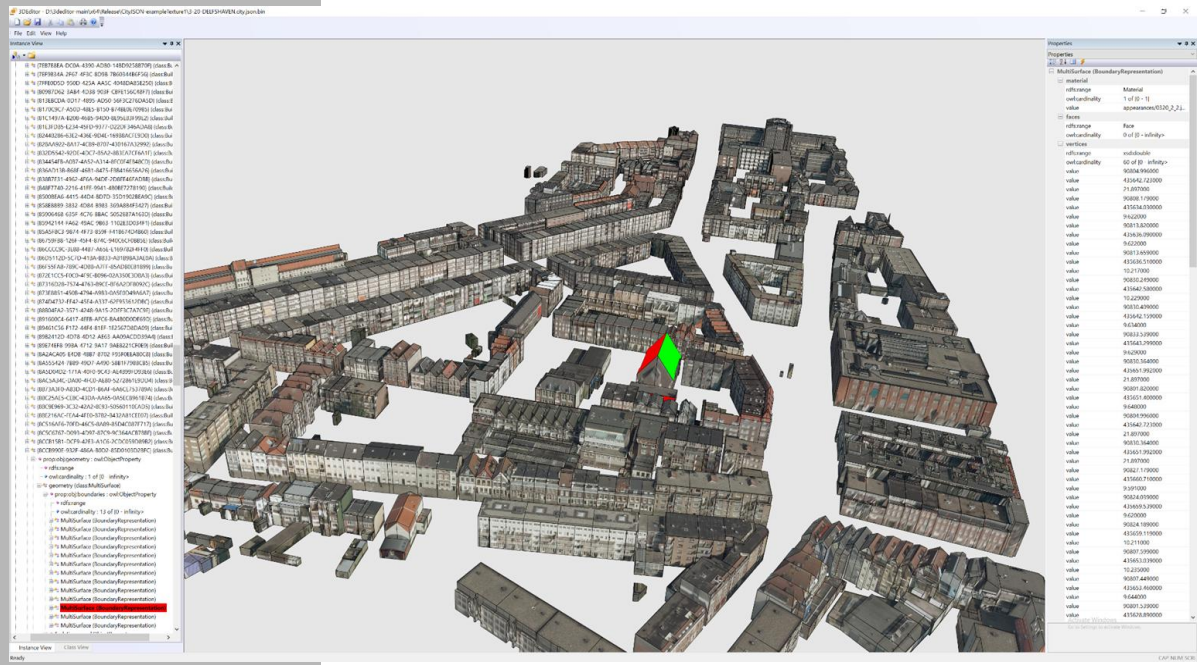
Objective 2: To enforce data and service interoperability



GeoBIM

Geo to BIM converter

BIM to Geo converter

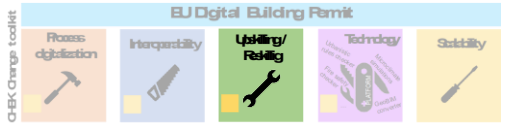


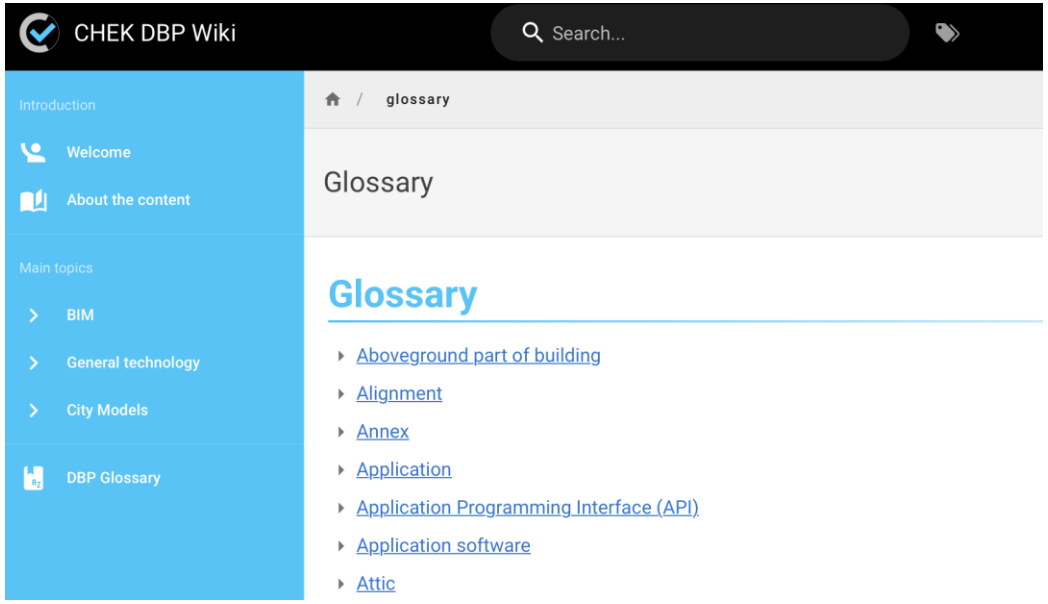
D3.4 Final GeoBIM CHEK Best Practices → Joint WG on GIS and BIM integration

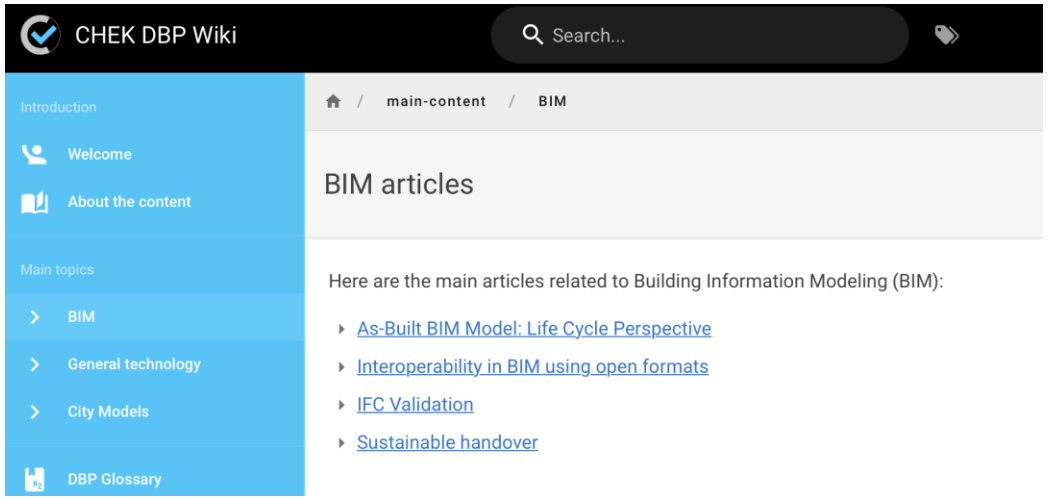
buildingSMART International

Open Geospatial Consortium

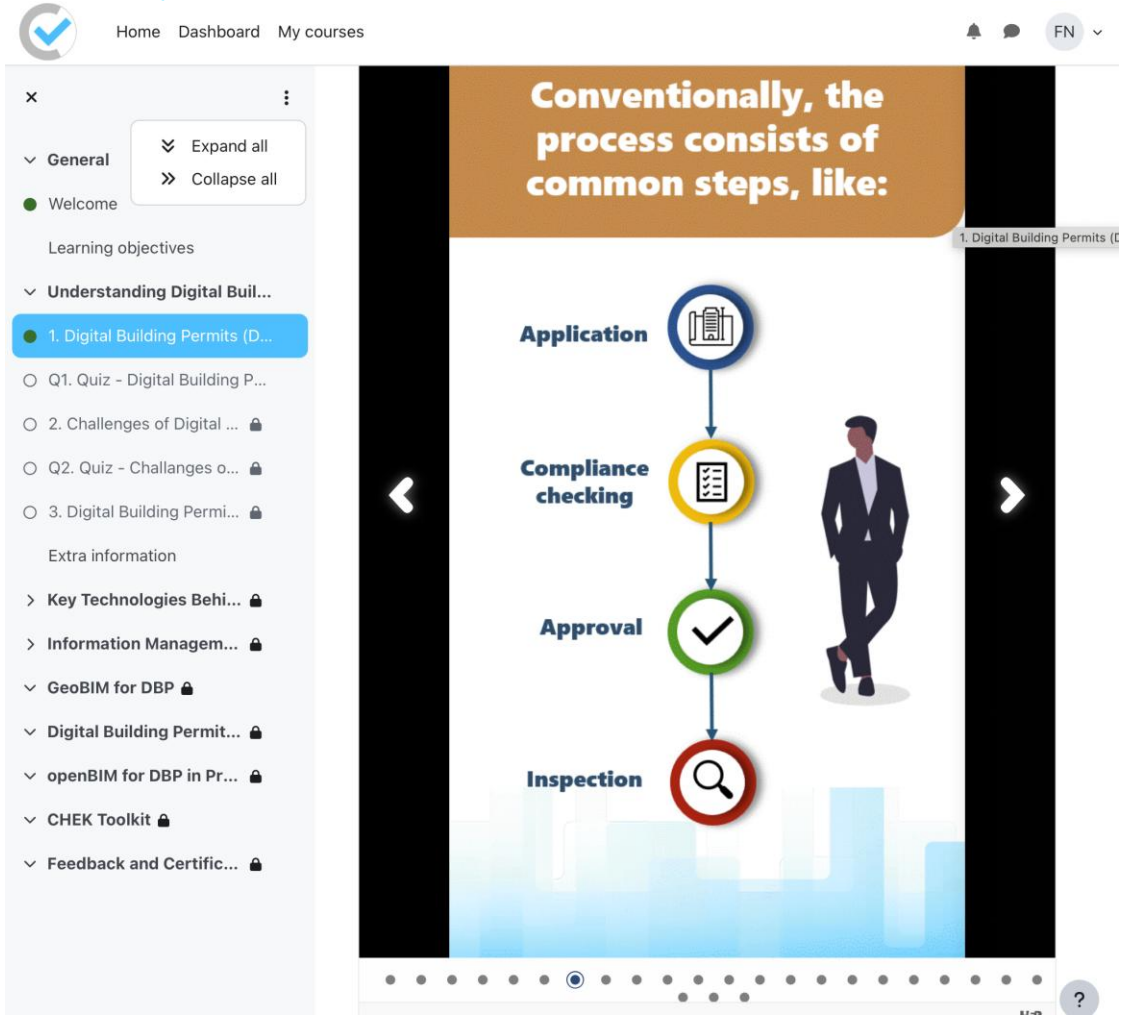
Objective 3: Fill knowledge gap, up/re-skill construction value chain





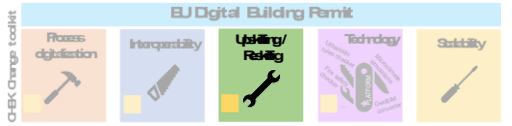


Glossary Wiki and materials https://wiki.chekdbp.eu



Overview

Objective 3: Fill knowledge gap, up/re-skill construction value chain



CHEK Project - eLearning Hub

Technical audience → Digital courses
Advanced course → Materials + Summer school

Available courses

Municipality Technicians

Explore the future of municipal permitting with our CHEK Toolkit Training for Municipality Technicians. This dynamic course is not just an exploration but a roadmap to the future, offering participants a comprehensive understanding of digital building permits and their pivotal role in modernizing municipal processes. With a focus on essential technologies such as BIM and GIS, participants will gain insight about the benefits, challenges, and methods of digitizing permit rules through real-world examples and hands-on exercises. By the end of the course, participants will not only gain skills, but also insights and methods for navigating the complexities of digital building permits with confidence and improved outcomes in their municipalities.

Designers (Applicants)

Through our CHEK Toolkit Training, you'll be able to engage in an exploration into the world of digital permitting that is specifically suited to designers. Throughout this training, participants will delve into the intricacies of digital building permits, with an emphasis on essential technologies such as BIM and GIS that are vital for designers. This course provides an in-depth examination of the benefits, challenges, and methodologies involved in digitizing permit protocols. Through a blend of theoretical discussions, practical demonstrations, and hands-on exercises, participants will gain practical insights into navigating the complexities of digital permitting systems. Real-world examples and case studies will be utilized to illustrate key concepts and best practices. By the completion of the course, designers will possess the necessary abilities and expertise needed to effectively deal with digital building permits.

Other stakeholders in the construction value chain

Explore the transformational potential of digital building permits with our CHEK Toolkit Training, which is targeted for construction value chain stakeholders. Learn about the benefits of digital permits through worldwide examples. Join us in leveraging technology to accelerate the construction permits process and improve efficiency and transparency in the construction industry.

https://elearning.chekdbp.eu/?redirect=0

Digital Transformation in Building Permits: Advanced GeoBIM practices and the CHEK framework

Digital Transformation in Building Permits: Advanced Practices and the CHEK Framework is an intensive one-week summer course designed to equip participants with cutting-edge knowledge and practical skills in the digitalization of building permit processes. Equivalent to 5 ECTS credits, this course delves into advanced topics such as BIM standardization, interoperability, GIS integration, legal frameworks, and the application of tools developed in the CHEK Digital Building Permits Project. Participants will engage with leading experts from the Academia and Industry, gaining insights into the latest developments and practices in the field.

Universidade do Minho

CHEKdbp
1.247 follower
1m •

🎓 CHEK Advanced Summer Course 2025 - Final Day Recap

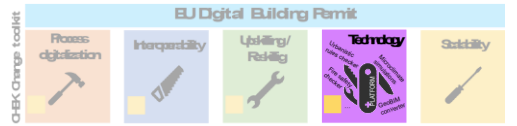
✅ Today marks the successful conclusion of the CHEK Advanced Summer Course, held from July 7 - 11 in Vila Nova de Gaia and Guimarães, Portugal. Titled as "Digital Transformation in Building Permits - Advanced GeoBIM practices and the CHEK framework" course, this intensive, week-long program brought together participants from across Europe to explore the latest developments in digital building permit workflows, BIM-GIS integration, and regulatory automation.

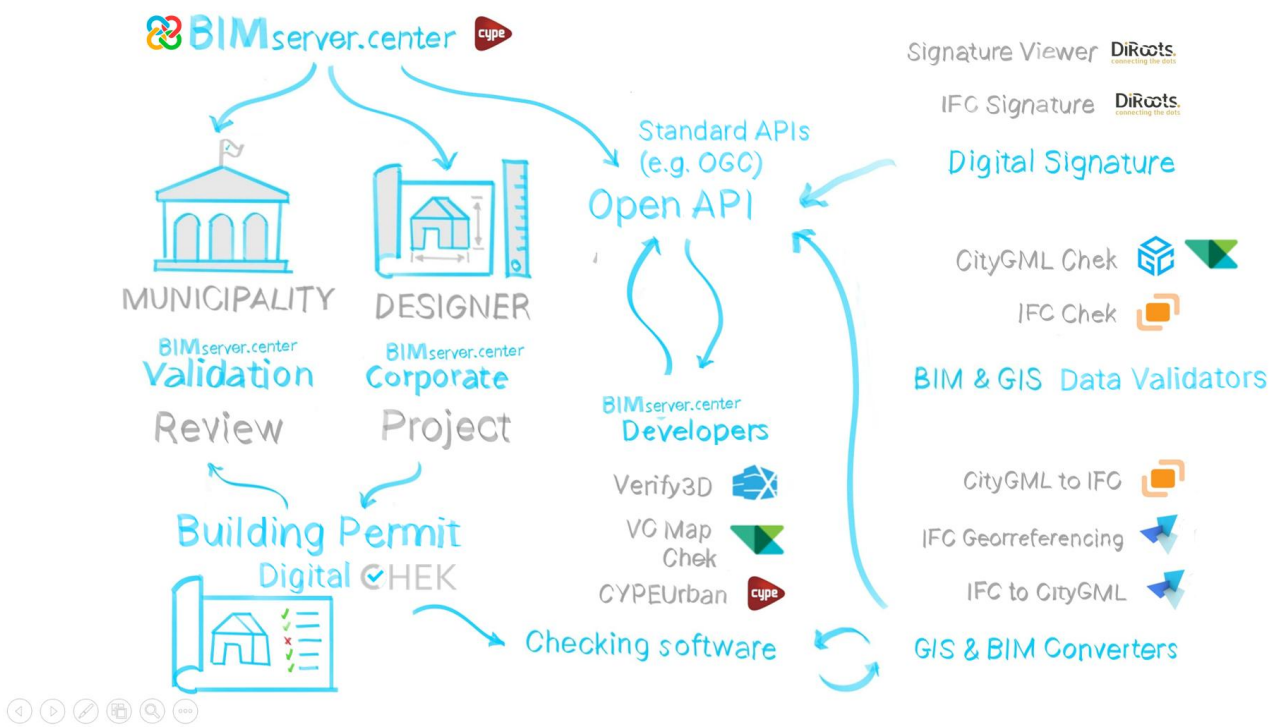
✅ Over the course of 5 days and 10 technical modules, participants were engaged in in-depth sessions on Digital Building Permits, OpenBIM standards, IFC, 3D city modeling, GeoBIM, Building Permits Laws as well as demonstrations of the full CHEK DBP software toolkit.

✅ Teaching staff was consisted of 19 well established professors, PHD researchers, industry experts as well as permitting officers, from Portugal and abroad.

✅ The energy, curiosity, and collaboration from all participants made this event a true highlight of the

Objective 4: Set of integrated software tools, for (Semi)Automatically check compliance to the CHEK regulations using 3D city models and BIMs as input



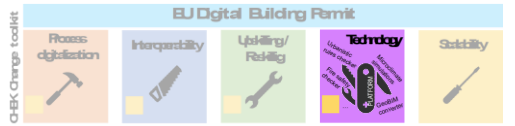


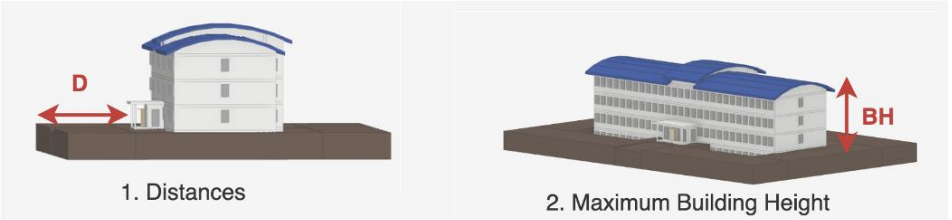
10:40

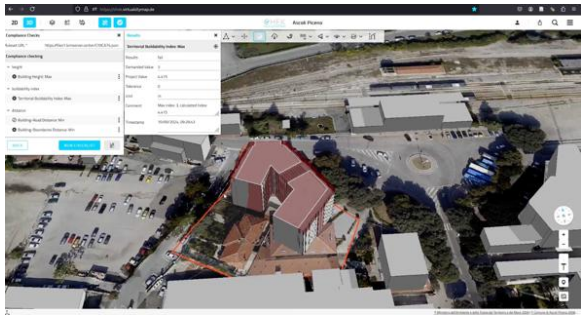
CHEKDBP Platform & Rule Checking Workflow

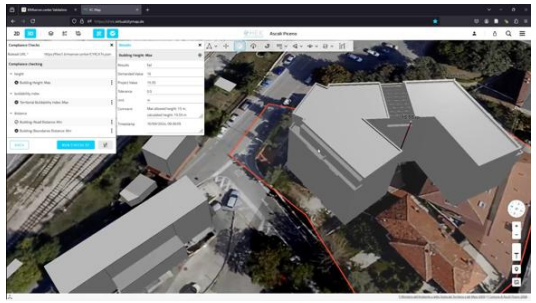
- Ane Ferreiro Sistiaga, Architect & Innovation Lead, CYPE Software, CHEK partner
- Luiggi Alfaro, Product Manager and Computational Designer at Diroots, CHEK partner
- Christian Friedrich, Product Owner Cloud Services at Solibri, CHEK partner
- Elisa Dutsch, GIS analyst and project manager at Virtual City Systems, CHEK partner

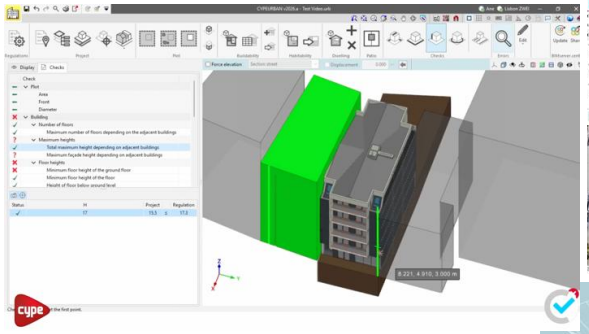
Objective 4: Set of integrated software tools, for (Semi)Automatically check compliance to the CHEK regulations using 3D city models and BIMs as input

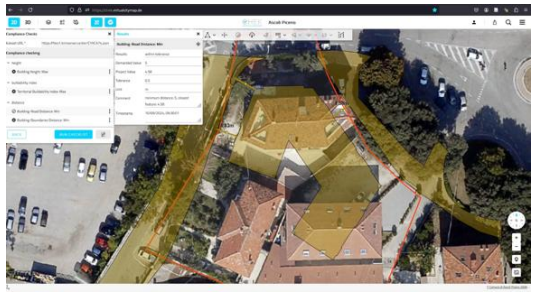


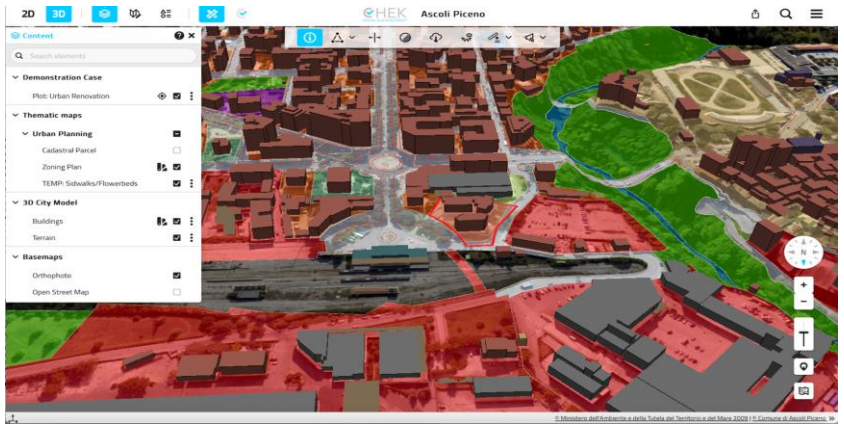


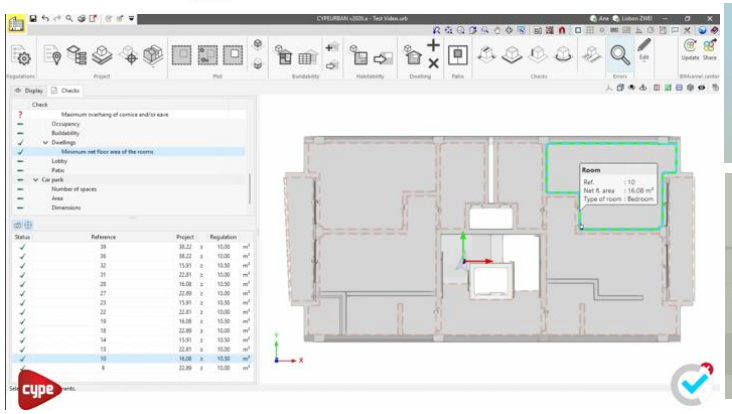


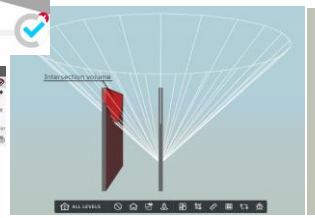


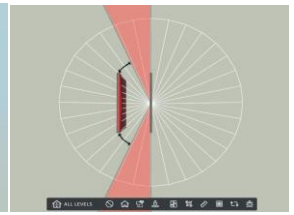


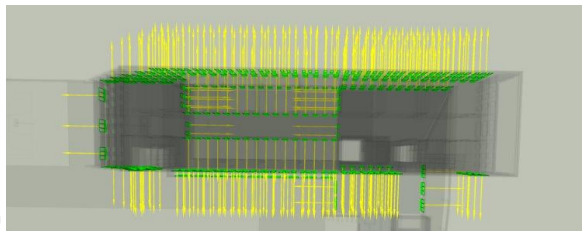




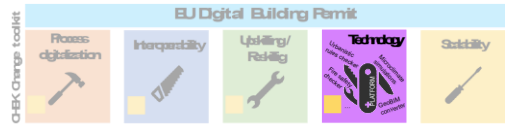


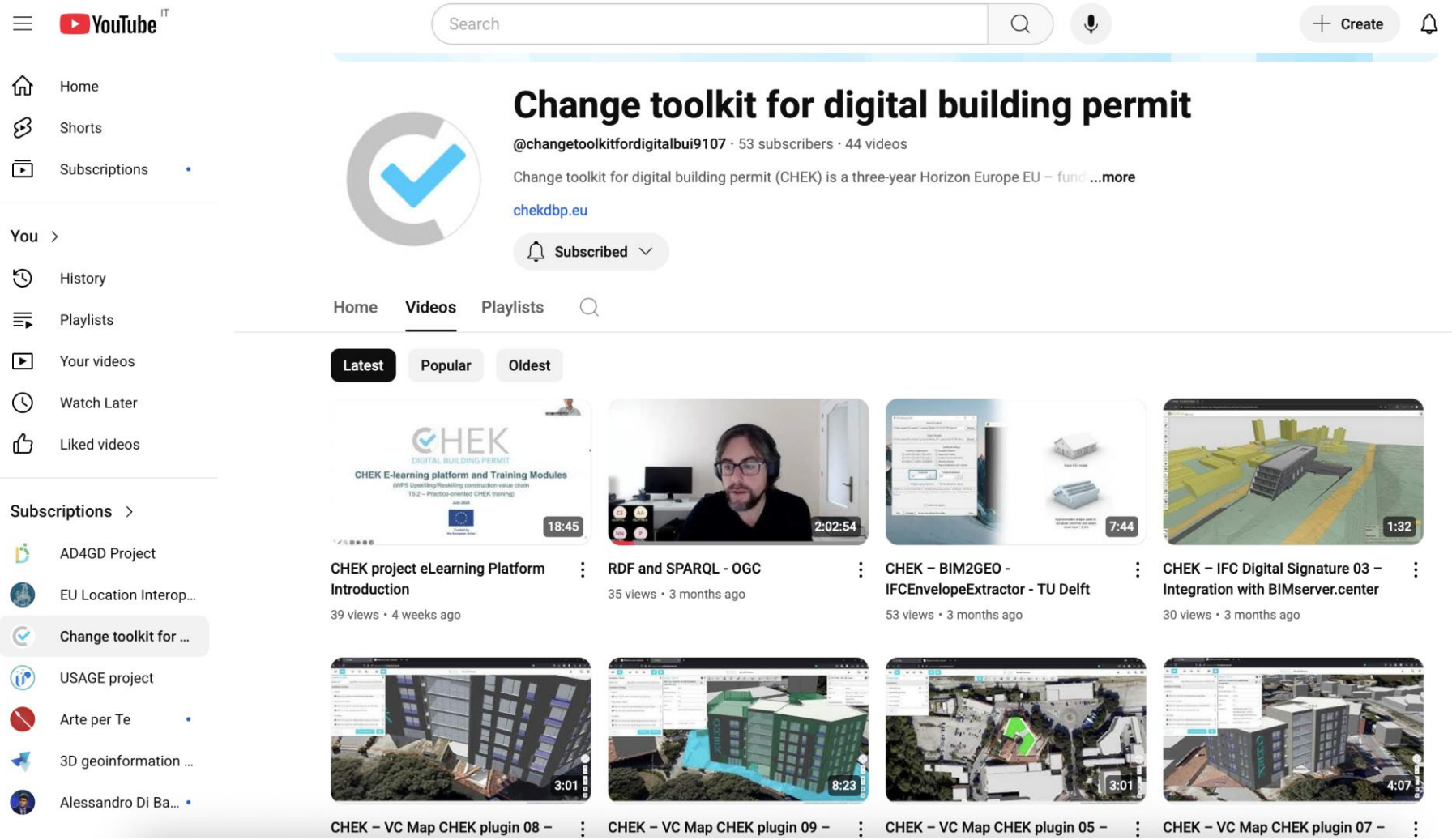




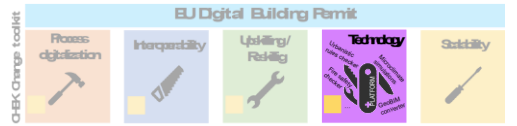


Objective 4: Set of integrated software tools, for (Semi)Automatically check compliance to the CHEK regulations using 3D city models and BIMs as input

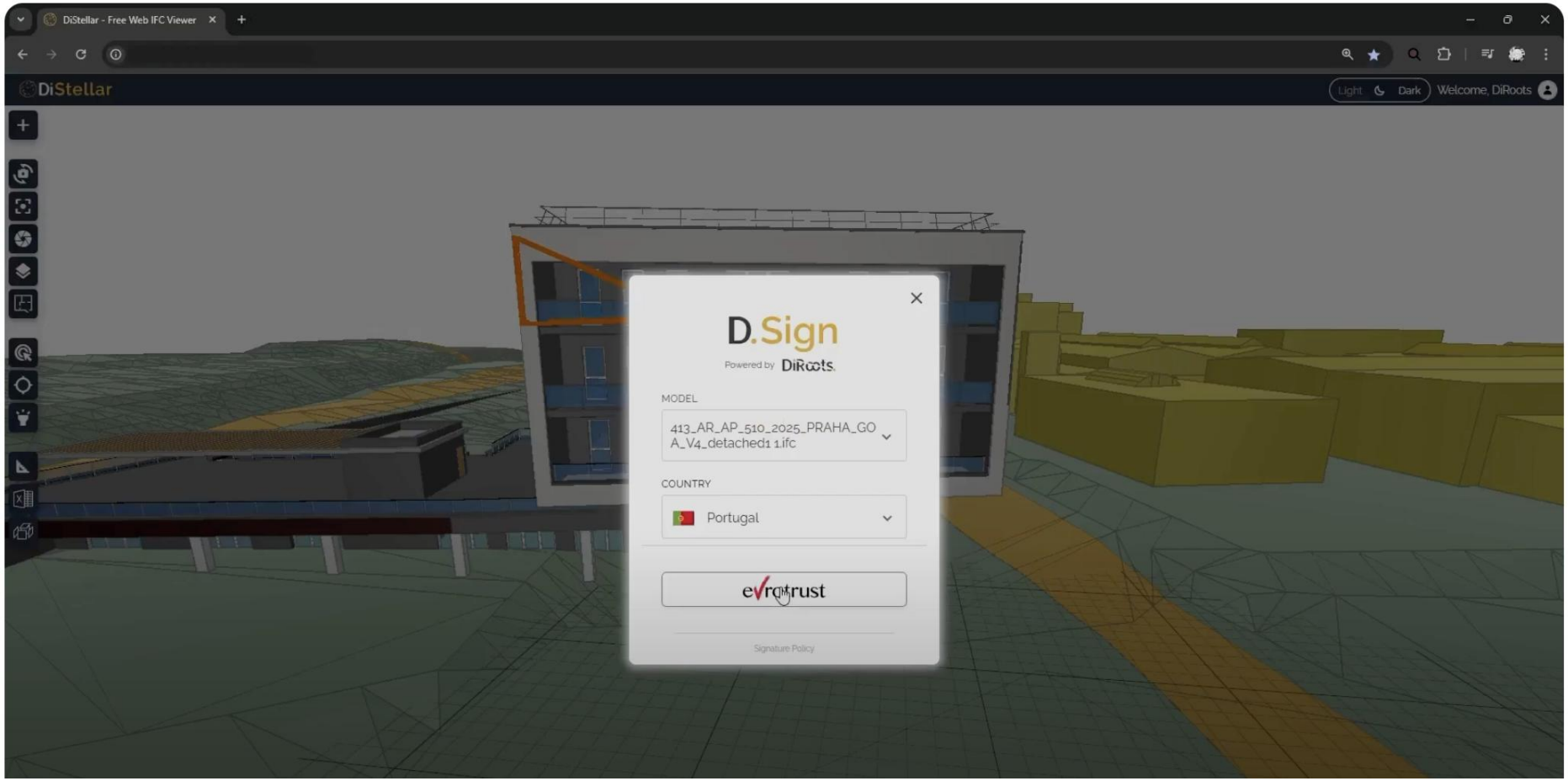




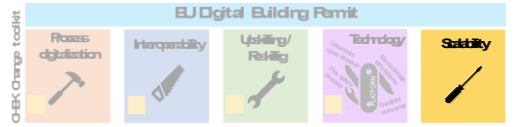
Objective 4: Set of integrated software tools, for (Semi)Automatically check compliance to the CHEK regulations using 3D city models and BIMs as input

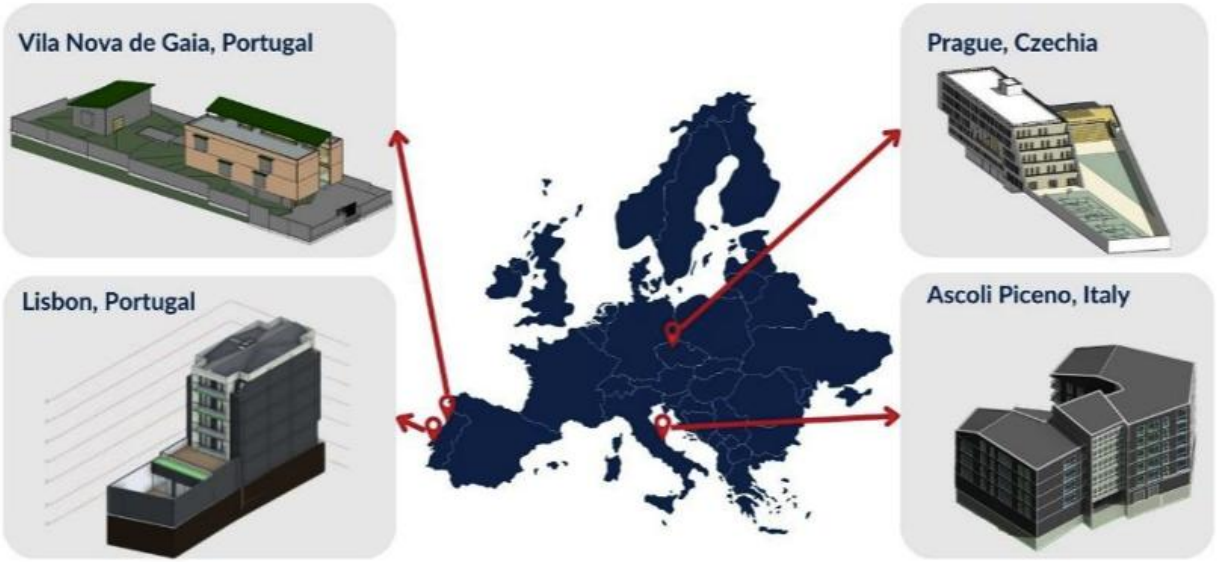


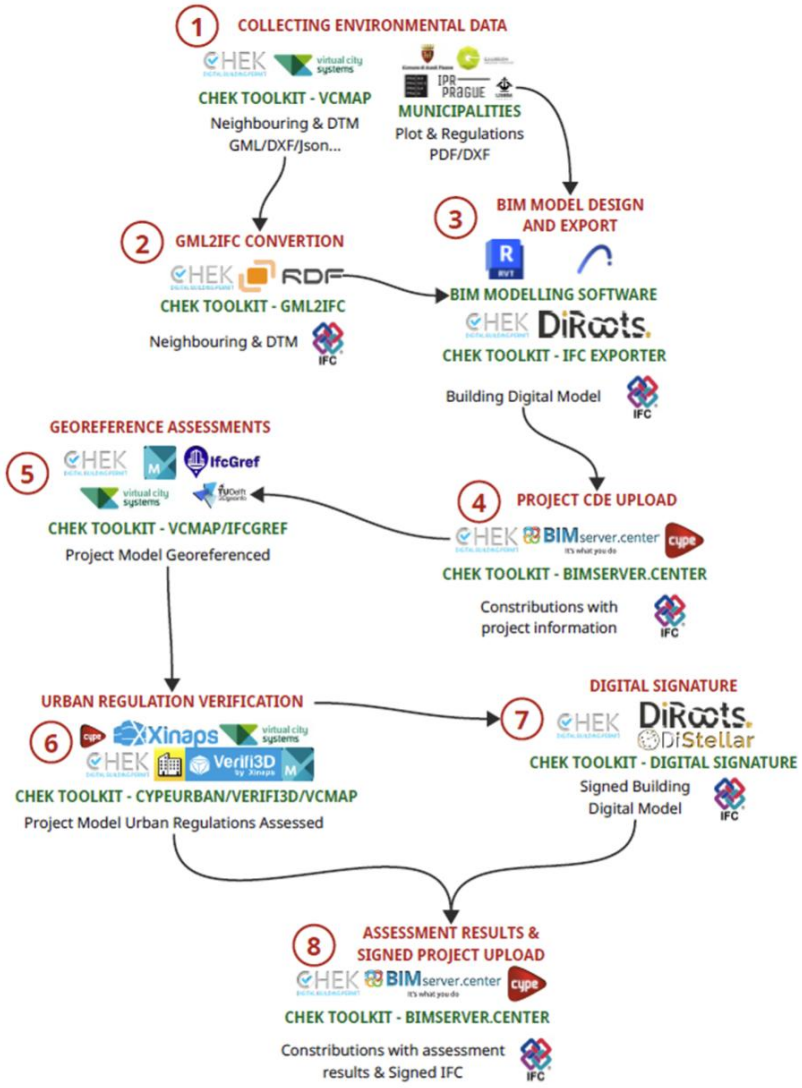
IFC Digital Signature



Objective 5: Demonstrate effectiveness and scalability of delivered solutions.







Lisbon (PT)

Vila Nova de Gaia (PT)

Ascoli Piceno (IT)

Prague (CZ)

Conclusions

You can find all the CHEK results at https://chekdbp.eu/?page_id=5267

Scientific Development

Name	Partner	Description
Process Maps	FHI	The TO-BE process map illustrates the CHEK DBP process from the information collection phase to the final update of the as-built model in the city model. It reveals that the digital building permit process is complex and involves multiple steps and stakeholders. Therefore, it is essential to have a clear understanding of each step to ensure that the process runs smoothly.
Maturity Model	FHI	The main goal of the CHEK Digital Building Permit Maturity Model (CDBPMM) is to help building authorities and other organisations assess their maturity in implementing a digital building permit process. The CDBPMM defines a fully implemented and optimised digital permit process as the highest level of maturity. Using this model, organisations can evaluate their current maturity level, identify capability gaps, and develop a strategic roadmap to incrementally enhance their processes, organisation, technology, and information systems to achieve higher levels of digital integration, efficiency, quality, and transparency in permitting workflows.
CHEKWiki	UMinho	The CHEKWiki has the main goal of helping the process of upskill/reskill in the construction value chain by gathering the multidisciplinary knowledge of the partners of the CHEK consortium. Furthermore, the base of knowledge also helps to improve the communication within the project, since it contains definitions concerning terms of the building permit process of the municipalities involved, as terms of the digital domain that are related to the technologies that are going to be implemented in the project.
Entities and Attributes	UBS	Summary of entities and attributes identified through interpretation of the normative text. The data within refer to the first four control sets (distances, maximum building height, buildability index and minimum area of interior spaces) described in deliverable 2.1. In addition to containing the list of identified entities and attributes, this table contains an in-depth analysis of attributes. Precisely, the type of data (e.g., numeric, alphanumeric, boolean), the unit of measurement, the type of value (e.g., float numeric, integer numeric, classification), the comparative (e.g., =,>,<), if the data is numeric, the value is specified, while if the data refers to a list, the classification is specified, and finally, the regulation and municipality in which the attribute emerges.

Communication & Dissemination

Scientific Papers & Publications
CHEK contributes to the global body of knowledge by publishing its findings in high-impact, peer-reviewed journals and presenting at international conferences

Conferences, Lectures, & Presentations
CHEK actively participates in leading industry events to showcase its outcomes and engage with a broader audience across Europe and more

Knowledge Sharing & Capacity Building
Workshops are the central pillar of CHEK's dissemination strategy, offering hands-on opportunities to understand and adopt project outputs, processes and tools

Published Papers

Title	Authors	ISSN
Digital Transformation of Building Permits: Current Status, Maturity, and Future Prospects	Mariana Ataide, Orjola Braholli, Dietmar Siegele	ISSN 2075-5309

Outcomes

Open Events

CHEK Open Event 2023

Building the Basis to Launch Digital Building Permits

- Date: October 12th, 2023
- Time: 14:00-17:00 CET
- Duration: 3 hours
- Format: Online
- Platform: Microsoft Teams
- Participants: 60+

Open lecture

Open Science: What is it and what does it really mean

- Date: March 12rd, 2023
- Format: Online
- Platform: Microsoft Teams

Thank you for being here to celebrate with us!
Enjoy the event!


CHEK
DIGITAL BUILDING PERMIT

Technical University of Munich
TUM Georg Nemetschek Institute
Chair of Computing in Civil and Building Engineering

Studies on Building Permit Systems across Europe and Beyond

Dr.-Ing. Judith Fauth

TUM Georg Nemetschek Institute / Chair of Computing in Civil and Building Engineering

Technical University of Munich

02 September 2025

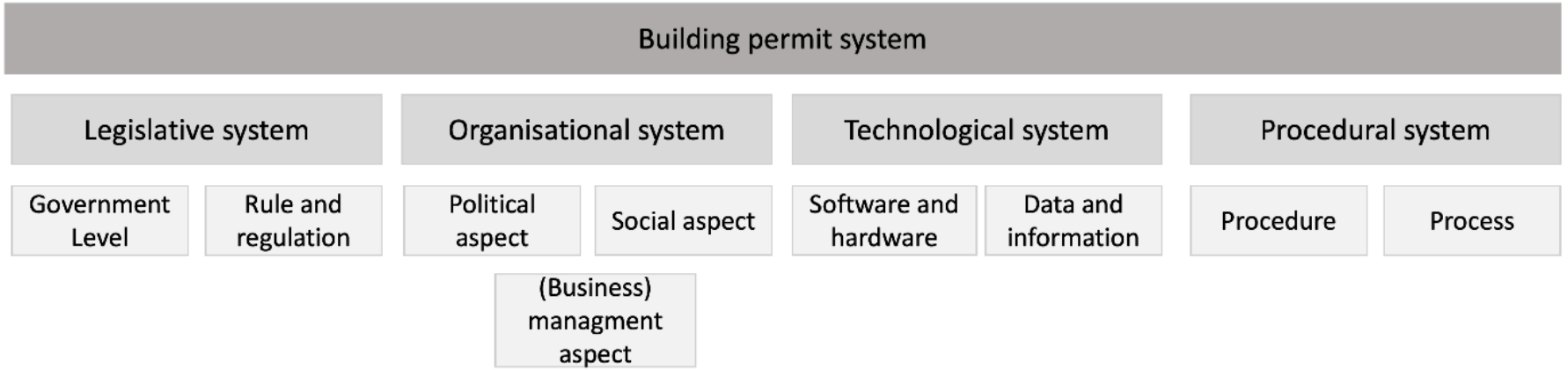
Agenda

- European building permit process and system analysis
  - Comparative process study (17 countries)
  - Descriptive report on systems (incl. BPMN diagrams) (19 countries)
- Ontologies for DBP
- Suggestions for Further Reading
  - KPIs, On-site inspections, Digital Building Logbook, SDGs in DBP

Introducing Myself

- Postdoc at TUM since April 2025
- Dr.-Ing. in Construction Management in 2021 from Bauhaus-Universität Weimar
- MSc in Facility and Real Estate Management, BA in Architecture
- Previous Postdoc positions at University of Cambridge (UK), TU Wien (Austria) and Fraunhofer Italia (Italy)
- Research stays at USC (USA), Technion (Israel), University of Auckland (New Zealand), University of Hong Kong (China)

Building permit systems

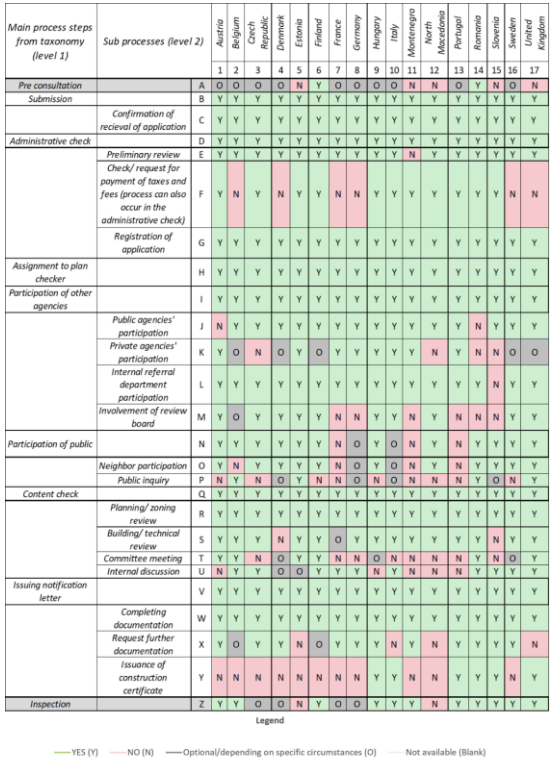


Fauth, J., Bloch, T. Noardo, F., Nisbet, N., Kaiser, S.B., Nørkjær Gade, P. & Tekavec, J. (2024). Taxonomy for building permit system - organizing knowledge for building permit digitalization. In: Advanced Engineering Informatics, 59: 102312. DOI: https://doi.org/10.1016/j.aei.2023.102312.

Comparative study on building permit processes (17countries)

Fauth, J., Nørkjær Gade, P., Kaiser, S.B., Raj, K., Goul Pedersen, J., Olsson, P.-O., Nisbet, N., Mastrolembo Ventura, S., Hirvensalo, A., Granja, J., Urban, H., Rutešić, S., Verstraeten, R., Raitviir, C.-R., Kallinen, A.-R., Schranz, C., Stojanov, T. & Tekavec, J. (2024). Evaluating Building Permit Processes Across Europe: Characteristics and Patterns. In: Building Research and Information, 53(4), 417–434. DOI: https://doi.org/10.1080/09613218.2024.2400467.

Process comparisons

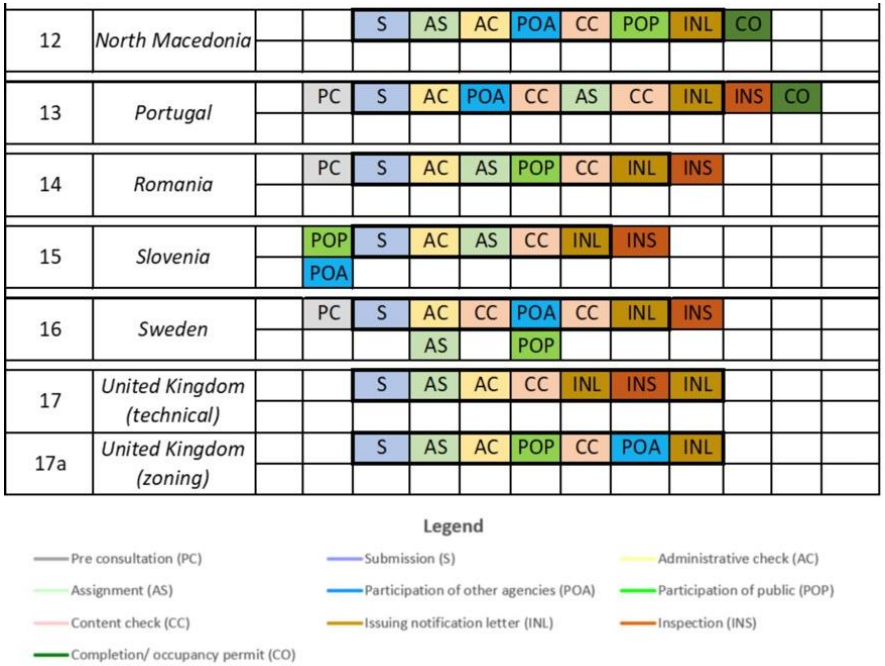


Main process steps from taxonomy (level 1)	Sub processes (level 2)		Austria	Belgium	Czech Republic	Denmark	Estonia	Finland	France	Germany	Hungary	Italy	Montenegro	North Macedonia	Portugal	Romania	Slovenia	Sweden	United Kingdom
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Pre consultation		A	O	O	O	O	N	Y	O	O	O	O	N	N	O	Y	N	O	N
Submission		B	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Confirmation of recieval of application	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Administrative check		D	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Preliminary review	E	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
	Check/ request for payment of taxes and fees (process can also occur in the administrative check)	F	Y	N	Y	N	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	N
	Registration of application	G	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Assignment to plan checker		H	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Participation of other agencies		I	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Public agencies' participation	J	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
	Private agencies' participation	K	Y	O	N	O	Y	O	Y	Y	Y	Y	Y	N	Y	N	N	O	O
	Internal referral department participation	L	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
	Involvement of review board	M	Y	O	Y	Y	Y	Y	N	N	Y	Y	N	Y	N	N	N	Y	Y
Participation of public		N	Y	Y	Y	Y	Y	Y	N	O	Y	O	N	Y	N	Y	Y	Y	Y
	Neighbor participation	O	Y	N	Y	Y	Y	Y	N	O	Y	O	N	Y	N	Y	Y	Y	Y
	Public inquiry	P	N	Y	N	O	Y	N	N	O	N	O	N	N	N	Y	O	N	Y
Content check		Q	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Planning/ zoning review	R	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Building/ technical review	S	Y	Y	Y	N	Y	Y	O	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
	Committee meeting	T	Y	Y	N	O	Y	Y	N	N	O	N	N	N	N	Y	N	O	Y
	Internal discussion	U	N	Y	Y	O	O	Y	Y	Y	N	Y	N	N	N	Y	Y	Y	Y
Issuing notification letter		V	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Completing documentation	W	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Request further documentation	X	Y	O	Y	Y	N	O	Y	Y	Y	N	Y	N	Y	Y	Y	Y	N
	Issuance of construction certificate	Y	N	N	N	N	N	N	N	N	Y	Y	N	N	Y	Y	Y	N	Y
Inspection		Z	Y	Y	O	O	N	Y	O	O	Y	Y	Y	N	Y	Y	Y	Y	Y

Legend

YES (Y) NO (N) Optional/depending on specific circumstances (O) Not available (Blank)

Europe Comparison



Stakeholders	Sub entities		Austria	Belgium	Czech Republic	Denmark	Estonia	Finland	France	Germany	Hungary	Italy	Montenegro	North Macedonia	Portugal	Romania	Slovenia	Sweden	United Kingdom
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Building Permit Authority		A	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Plan checker (technical)	B	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Urban planning checker	C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	Clerk (adm. Role in charge)	D	Y	N	Y	N	Y	Y	N	Y	Y	N	Y	Y	Y	N	N	N	
	Commitee	E	Y		N		Y	Y		N	Y	Y	N	N	N	Y		O	Y
External Experts		F	Y	N	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y		Y	Y
	Structural	G	Y	N	Y	Y	N	Y		O	Y	Y	Y	Y	N	Y		Y	
	Landscape architect	H	N	N	Y		Y	Y	Y	O	N		N	N	N	Y		Y	
	Architecture/design	I	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Sewerage/ sanitary	J	Y	N	Y	Y	Y	Y		Y	Y		Y	Y	N	Y		Y	Y
	Engineer	K	Y	N	Y	Y	Y	Y		O	Y	Y	Y	Y	N	Y		Y	
Neighbors		L	Y	Y	Y	Y	Y	Y	N	O	Y	N	N	Y	N	Y	O	Y	N
Public		M	Y	Y	Y		Y	Y		O	Y		N	N	N		Y	Y	Y
Boards		N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	O	N	N	Y	Y	Y	Y
	Rescue Board/ Health board	O	Y	N	Y	Y	Y	Y		N	Y		O	N	N	Y		Y	Y
	Board of town hall	P	N	Y	N	Y	Y	N	N	N	Y	Y	N	N	N	N		N	
	Planning appeals board	Q	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	
	National board of antiquities	R	N	Y	Y	N	Y	Y			Y		N	N	N	N	Y	O	
Authorities & departments		S	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	City government	T	Y	Y	Y	Y	Y	Y	Y	O	Y	Y	N	Y	Y	Y	Y	O	Y
	State road office	U	N		N	N	N	N		O	Y		N	N	N	N	Y	O	Y
	Road construction authority	V	Y	Y	Y	Y	Y	Y		O	Y		N	N	N	N	Y	O	
	Nature conservation authority	W	Y	Y	Y	Y	Y	Y		O	Y		N	N	N	N	Y	O	Y
	Consumer protection authority	X	Y	N	N		Y	N		O	Y	Y	N	N	N	N		N	
	Technical Regulatory Authority	Y	Y	Y	Y	Y	Y	Y	Y	O	Y	Y	N	Y	N	Y		O	
	Agriculture department	z	Y	Y	N	Y	N	N	Y	O	N		N	N	N	Y	Y	O	
	National board of antiquities	Z	N	Y	Y	N	Y	Y	Y	O	Y		N	N	N	N	Y	O	

Legend

YES (Y) NO (N) Optional/depending on specific circumstances (O) Not available (Blank)

Study report

19 European countries

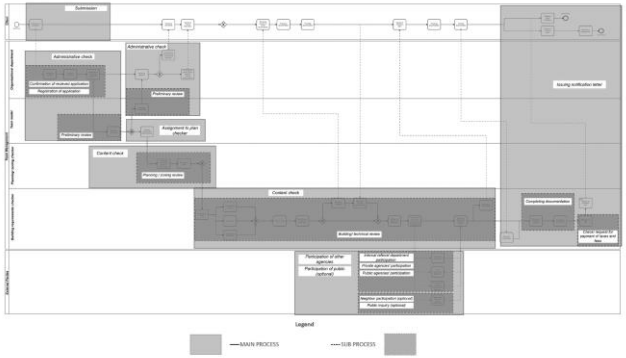
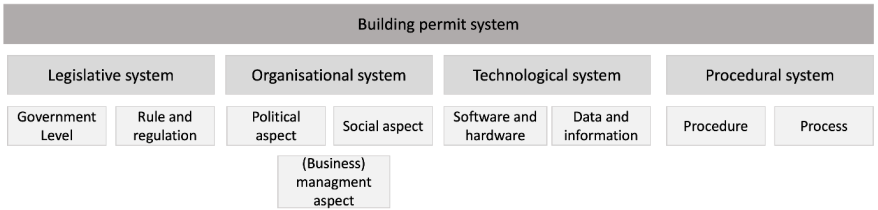


Figure 11: BPMN Diagram of Building Permit Process in Germany




EUnet4DBP

European Network for Digital Building Permit

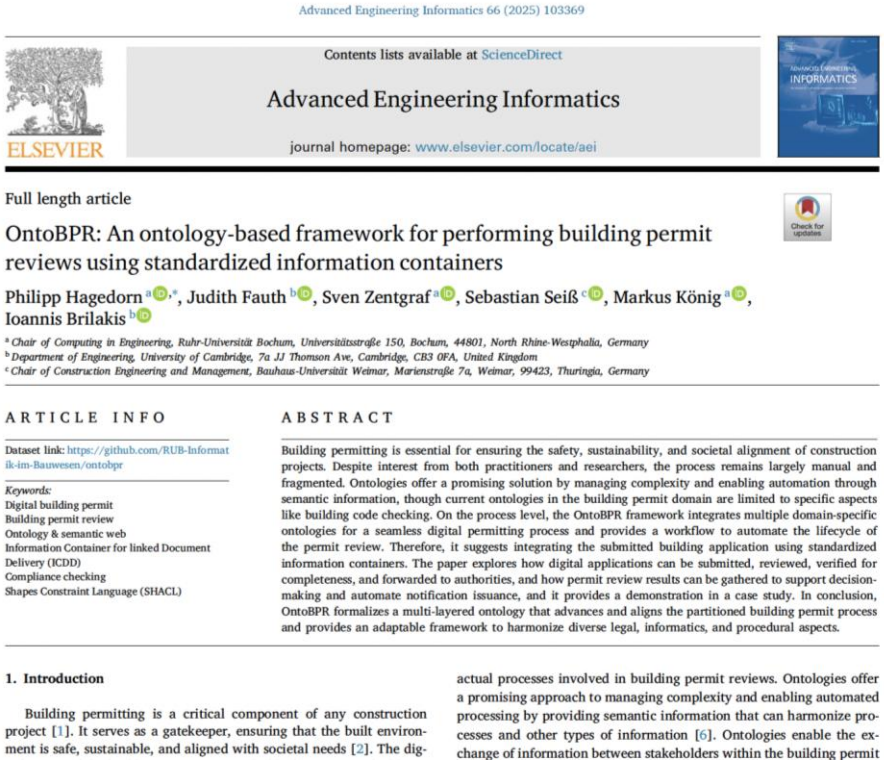
EUnet4DBP Publication Series

Comparative study on building permit processes in Europe

Judith Fauth[a], Stefanie-Brigitte Deac-Kaiser[b], Peter Nørkjær Gade[c], Kavita Raj[d], Jonas Goul Pedersen[c], Per-Ola Olsson[e], Silvia Mastrolembo Ventura[a], José Granja[f], Nicholas Nisbet[g], Antero Hirvensalo[h], Ruben Verstraeten[i], Snezana Rutesic[j], Céline Labrune[k], Christopher Raitviir[l], Harald Urban[m], Christian Schranz[m], Štěpánka Tomanová[n], Trajche Stojanov[o], Szilvia Pleskó[p], Éva Veronika Lőrincz[p], Anna-Riitta Kallinen[q], Ieva Misiunaite[r], Jernej Tekavec[s]

02/12/2024

OntoBPR



Advanced Engineering Informatics 66 (2025) 103369

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journal homepage: www.elsevier.com/locate/aei

Full length article

OntoBPR: An ontology-based framework for performing building permit reviews using standardized information containers

Philipp Hagedorn [a,*], Judith Fauth [b], Sven Zentgraf [a], Sebastian Seiß [c], Markus König [a], Ioannis Brilakis [b]

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ARTICLE INFO

Dataset link: https://github.com/RUB-Informatik-im-Bauwesen/ontobpr

Keywords:
Digital building permit
Building permit review
Ontology & semantic web
Information Container for linked Document Delivery (ICDD)
Compliance checking
Shapes Constraint Language (SHACL)

ABSTRACT

Building permitting is essential for ensuring the safety, sustainability, and societal alignment of construction projects. Despite interest from both practitioners and researchers, the process remains largely manual and fragmented. Ontologies offer a promising solution by managing complexity and enabling automation through semantic information, though current ontologies in the building permit domain are limited to specific aspects like building code checking. On the process level, the OntoBPR framework integrates multiple domain-specific ontologies for a seamless digital permitting process and provides a workflow to automate the lifecycle of the permit review. Therefore, it suggests integrating the submitted building application using standardized information containers. The paper explores how digital applications can be submitted, reviewed, verified for completeness, and forwarded to authorities, and how permit review results can be gathered to support decision-making and automate notification issuance, and it provides a demonstration in a case study. In conclusion, OntoBPR formalizes a multi-layered ontology that advances and aligns the partitioned building permit process and provides an adaptable framework to harmonize diverse legal, informatics, and procedural aspects.

1. Introduction

Building permitting is a critical component of any construction project [1]. It serves as a gatekeeper, ensuring that the built environment is safe, sustainable, and aligned with societal needs [2]. The digactual processes involved in building permit reviews. Ontologies offer a promising approach to managing complexity and enabling automated processing by providing semantic information that can harmonize processes and other types of information [6]. Ontologies enable the exchange of information between stakeholders within the building permit

Hagedorn, P., Fauth, J., Zentgraf, S., Seiss, S., König, M. & Brilakis, I. (2025). OntoBPR: An ontology-based framework for performing building permit reviews using standardized information containers. In: Advanced Engineering Informatics, 66: 103369. DOI: https://doi.org/10.1016/j.aei.2025.103369.

OntoBPR

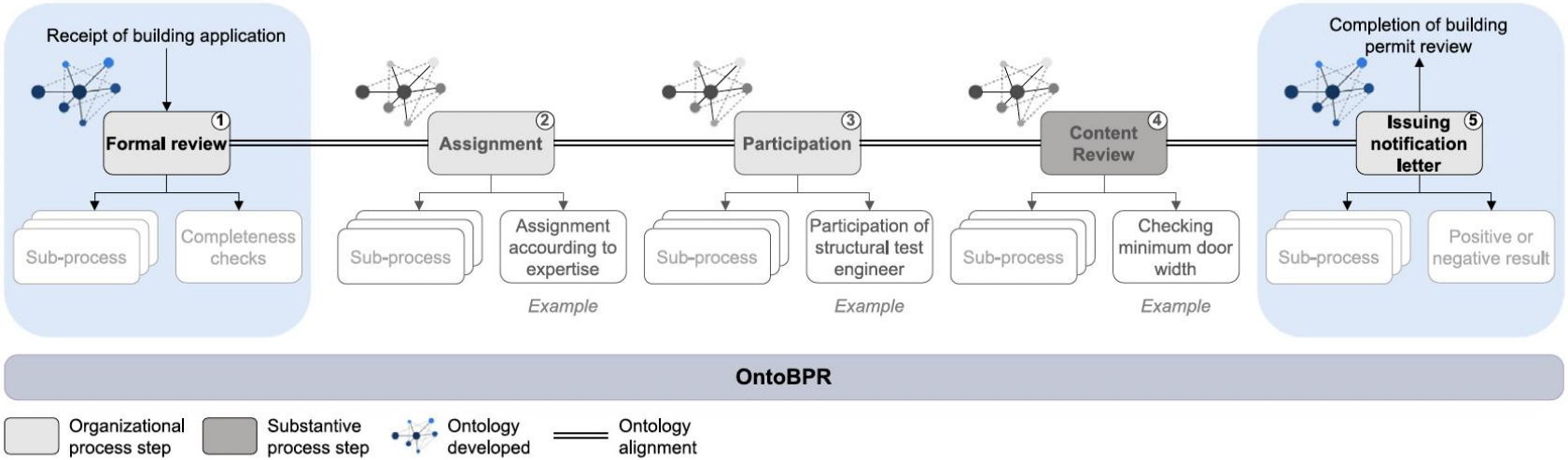

Fig. 2. Building permit process and mapping to ontological data schemas.

OntoBPR

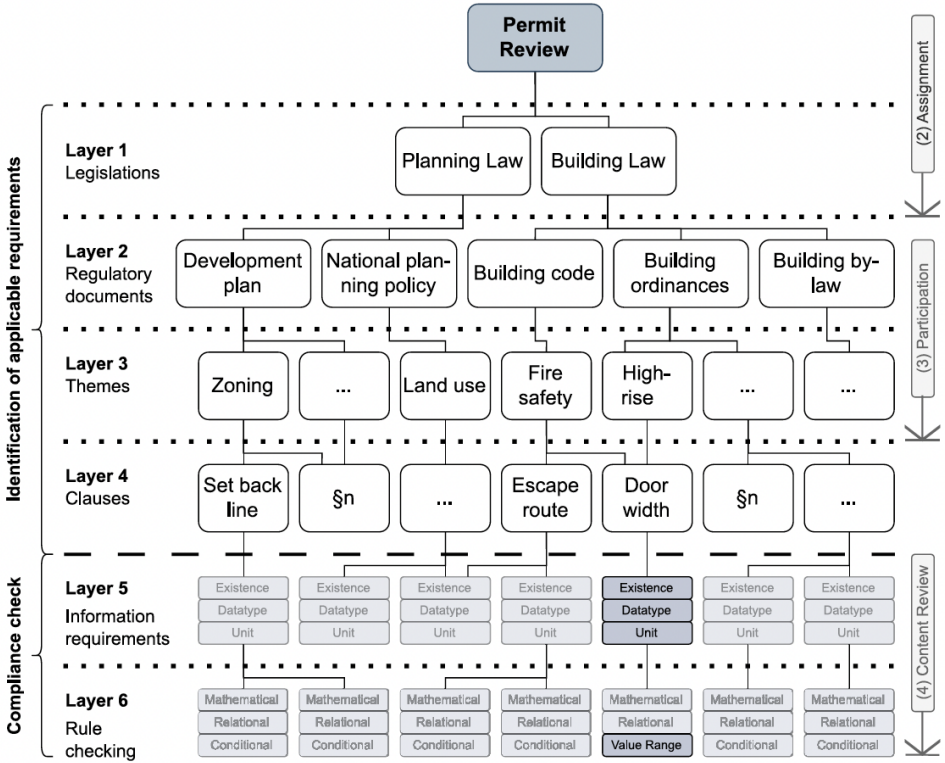

Fig. 5. Schematic multi-layer structure for a permit review process.

Further reading – KPIs on processes comparability

	Process map metrics		Explanation	Score
Processes	Handover processes (actions)	Between organizations	The action when a process will be continued by a different entity.	Count the connectors within a lane and between lanes
		Within an organization		
	Process steps	Level 1	Level 1 represents major process steps such as formal review, content review, etc.	Count process steps (on high level – surrounded by dotted lines in the BPMN maps in Appendix 1) (without applicants' actions)
		Level 2	Level 2 considers content-wise sub-processes. For example, the lower-level sub-processes within each of the major process steps	Count process steps (each action symbol (rectangle symbol in the BPMN maps in Appendix 1) (without applicants' actions)
	Repetition of process steps	Level 1	How often a process step will be repeated within a process chain depending on a certain level.	Count process steps on high-level which will be repeated
		Level 2		Count process steps on detailed level which will be repeated
	Centralization/bundling of sub-steps		Bundle of process steps without breaking the organization or to another step	Identify (Yes/No) if processes are bundled/centralized or not

Organization	Entities involved (expertise)	Internal experts		Persons/roles within one organization, here mostly the building permit authority	Count the number of swim lanes within the building permit authority, and outside (without neighbors and public)
		External experts			
	Community involved	Who	Public	Community describes groups/people/entities influenced by the applied project	Identify (Yes/No) if and what kind of group is involved based on the swim lanes
			Neighbors		
			None		
		When	Pre	When the involvement takes place	Identify (Yes/No) when a community is involved
			Within		
			Post		
	Group decisions (internal)	Always		A decision is made by a group of people; internal means within the building permit authority	Identify (Yes/No) if a committee, or optional collegial meetings take place
		If needed (on special cases)			
		Never			
	Partici-pation	Who	By authority	The entity that initiates the involvement of other parties	Identify (Yes/No) if the authority or the applicant initiates the participation
			By applicant		
		When	Pre	When the participation takes place	Identify (Yes/No) at what stage the participation process takes place
			Within		
			Post		

Fig. 2. Measurable indicators.

Further reading – On-site Inspections

The current issue and full text archive of this journal is available on Emerald Insight at:
https://www.emerald.com/insight/2046-6099.htm

Understanding and conceptualizing inspections in the context of building permits

Smart and Sustainable Built Environment

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Accepted 22 April 2025

Abstract

Purpose – This study addresses the current knowledge gap in planning and executing building permit-related inspections, which are essential for ensuring safety, legality and compliance with building regulations. The complexity of these inspections arises from their multidisciplinary nature and the variability of inspection processes across different jurisdictions.

Design/methodology/approach – The research employs a systematic approach that combines desk research, literature review and expert interviews conducted across different countries. This mixed-methods approach enables the development of a conceptual framework that organizes the inspection processes into clear categories of responsibilities, processes and characteristics.

Findings – The study identifies and formalizes key elements of building permit-related inspections, including diverse national or jurisdictional contexts, processes, inspector management and inspection categorization, before synthesizing them into a comprehensive conceptual framework. This framework illustrates the complex relationships between the different aspects of inspections, providing a structured method to effectively manage these complexities.

Originality/value – This research contributes to the fields of construction management and building permitting by bridging theoretical knowledge and practical applications in the realm of construction inspections. By synthesizing dispersed knowledge into one coherent framework, the study establishes a theoretical foundation that enhances the efficiency and transparency of building inspections globally. The research also provides significant insights that will aid in the digital transformation of the building inspection processes that are crucial for compliance and quality assurance in the construction industry.

Keywords Construction, Inspection planning, Building permit, Inspections, Conceptual framework, Knowledge

Paper type Research paper

Seiss, S., Fauth, J., Zheng, Y. & Pötz, A. (2025). Understanding and conceptualizing inspections in the context of building permits. In: Smart and Sustainable Built Environment. DOI: https://doi.org/10.1108/SASBE-11-2024-0492.

Further Reading – DBP meets DBL

Developments in the Built Environment 20 (2024) 100573

Contents lists available at ScienceDirect

Developments in the Built Environment

journal homepage: www.sciencedirect.com/journal/developments-in-the-built-environment

Twinning the path of digital building permits and digital building logbooks – Diagnosis and challenges

Pedro Mêda [a,**], Judith Fauth [b], Christian Schranz [c], Hipólito Sousa [a], Harald Urban [c,*]

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ARTICLE INFO

Keywords:
Data sharing
Construction management
Efficiency
Twin transition
Sustainable built environment

ABSTRACT

In the context of the European Union's push for a sustainable and digitally integrated construction sector, this research explores the relationship between Digital Building Permits (DBP) and Digital Building Logbooks (DBL). The study aims to diagnose and identify the synergies and challenges in aligning these data-driven concepts throughout the building life-cycle. Using a focus group methodology, the research gathered qualitative data on the perceptions of DBP and DBL among professionals with diverse backgrounds. The findings reveal significant overlaps and potential for integrated data management, enhancing regulatory compliance, efficiency, and sustainability. While DBP and DBL can function independently, their full potential is realised through a cohesive framework that supports continuous data updates and stakeholder collaboration, facilitating the "golden thread" of information essential for effective digital twin applications. Future research should further explore the detailed processes and data exchanges necessary to implement this framework successfully.

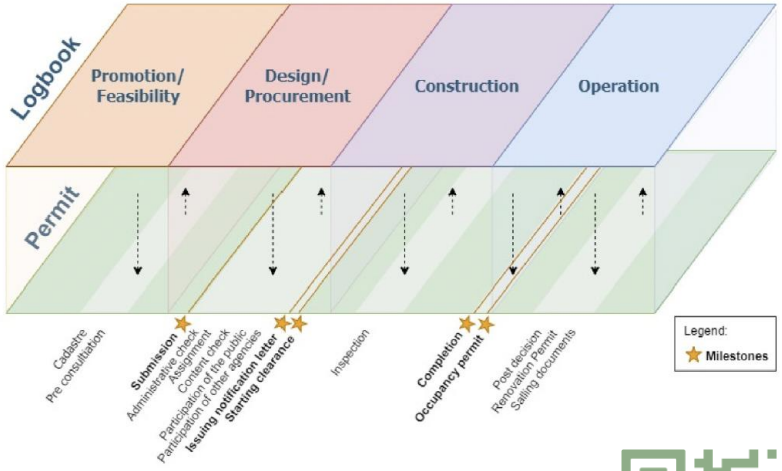

Fig. 8. Process level connections between DBP and DBL.

Meda, P., Fauth, J., Schranz, C., Sousa, H. & Urban, H. (2024). Twinning the path of Digital Building Permits and Digital Buildi
Logbooks – Diagnosis and Challenges. In: Developments in the Built Environment. 100573. DOI: 10.1016/j.dibe.2024.100573.

Further Reading - SDG <> DBP - Goals

RESEARCH ARTICLE

REVISED **Navigating the shift towards sustainable digital building permits and building logbooks**

[version 2; peer review: 2 approved with reservations]

Rita Lavikka[1], Judith Fauth[2], Mayte Toscano[3], Gonçal Costa[4], Thomas Beach[5], Pedro Meda Magalhães[6], Jantien Stoter[7], Stefanie Brigitte Deac Kaiser[8], Jeroen Werbrouck[9]

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[9]Ghent University, Ghent, Flanders, Belgium

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https://doi.org/10.12688/openreseurope.18553.1
Latest published: 04 Aug 2025, **5**:90
https://doi.org/10.12688/openreseurope.18553.2

Abstract

The architecture, engineering, construction, and operation sectors face significant sustainability challenges. These include high greenhouse gas emissions, resource depletion, worker safety concerns, and difficulties balancing cost efficiency with sustainable practices. Digital solutions, such as Digital Building Permits (DBP) and Digital Building Logbooks (DBL), are increasingly promoted as enablers of sustainable construction and building management. However, there is limited research on how they contribute to sustainability in practice. This study applied the United Nations Sustainable Development Goals (SDGs) as an analytical framework to assess the sustainability impacts of DBP and DBL. A four-phase methodology was used: (1) expert elicitation to identify relevant SDGs, (2) mapping of DBP and DBL practices to SDG targets, (3) documentation of supporting practices, and (4) validation through a hybrid stakeholder workshop involving 38 participants from across Europe. The study identifies DBP and DBL practices that contribute to ten SDGs, including Good Health and Well-Being, Affordable and Clean Energy, Decent Work and Economic Growth, Industry and Innovation, Sustainable Cities, and Climate Action. The automatic code-compliance checking of DBP speeds up approval times, reduces errors, increases

Open Peer Review

Approval Status ? ?

	1	2
version 2 (revision) 04 Aug 2025		
version 1 31 Mar 2025	? view	? view

1. **Rupesh Kumar**, Jindal Global University, Sonipet, India
2. **Muhammad Shafique**, Brunel University London, Middlesex, UK

Any reports and responses or comments on the article can be found at the end of the article.

Lavikka, R., Fauth, J., Toscano, M., Costa, G., Beach, T., Meda Magalhães, P., Stoter, J., Deac Kaiser, S.B. & Werbrouk, J. (2025). Navigating the shift towards sustainable digital building permits and building logbooks *[version 2; peer review: 2 approved with reservations]*. Open Res Europe 2025, 5:90, DOI: https://doi.org/10.12688/openreseurope.18553.2.

Thank you! Thoughts and/or questions?

Dr. Judith Fauth
judith.fauth@tum.de

DIGITAL BUILDING PERMIT

Digitalisation process & Maturity model

CHEK DBP and European Research

02nd September 2025

Funded by
the European Union

Where do we start?

Inefficiencies + Lack of Transparency + Impact on Urban Development

DRIVERS

CHEK DIGITAL BUILDING PERMIT

OBJECTIVES

KPIs

MUNICIPALITIES

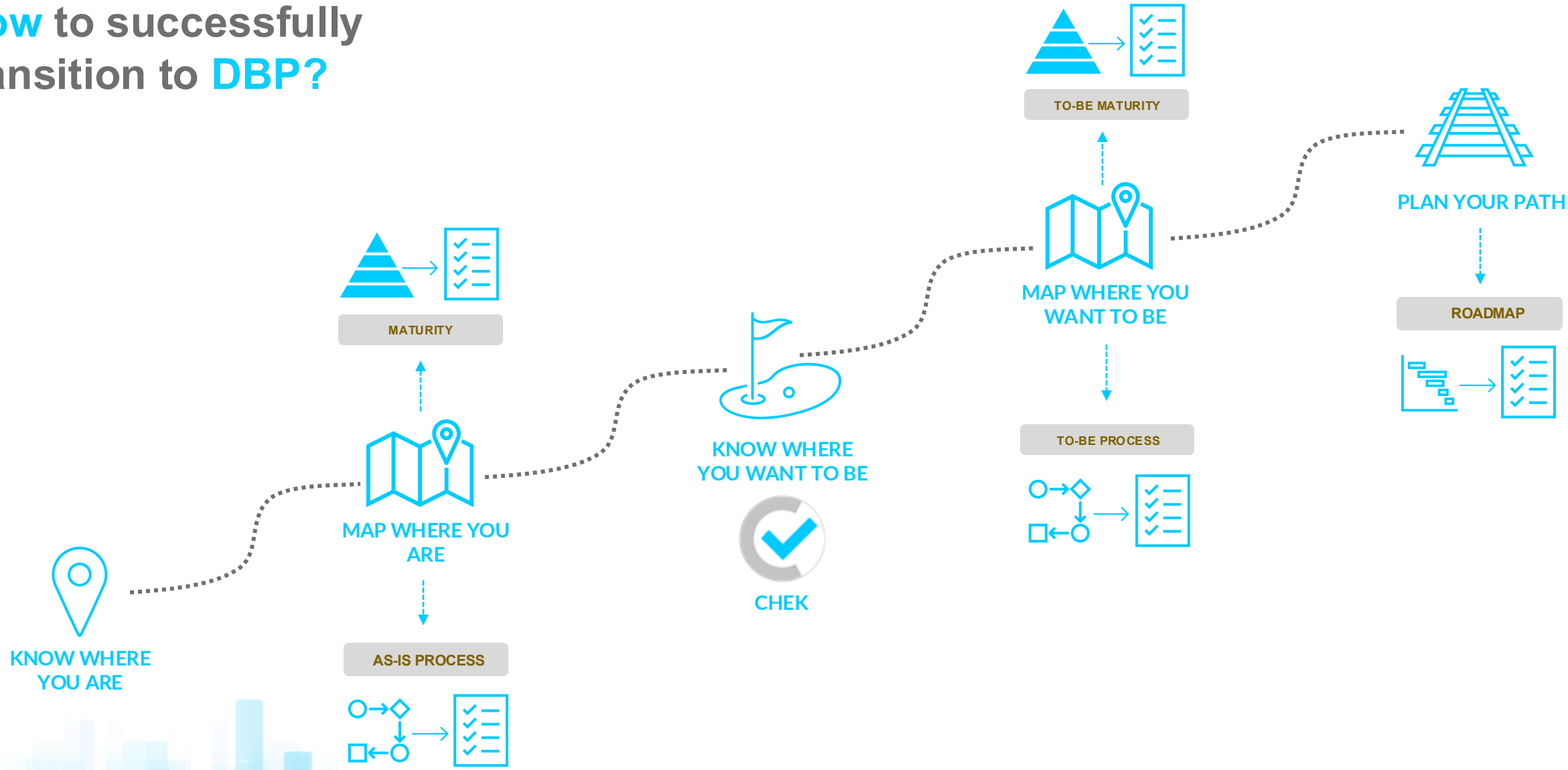
TRANSPARENT | EFFICIENT | SCALABLE

APPLICABLE | CLEAR | MODULAR

ADAPTABLE | EXTENDABLE | FLEXIBLE

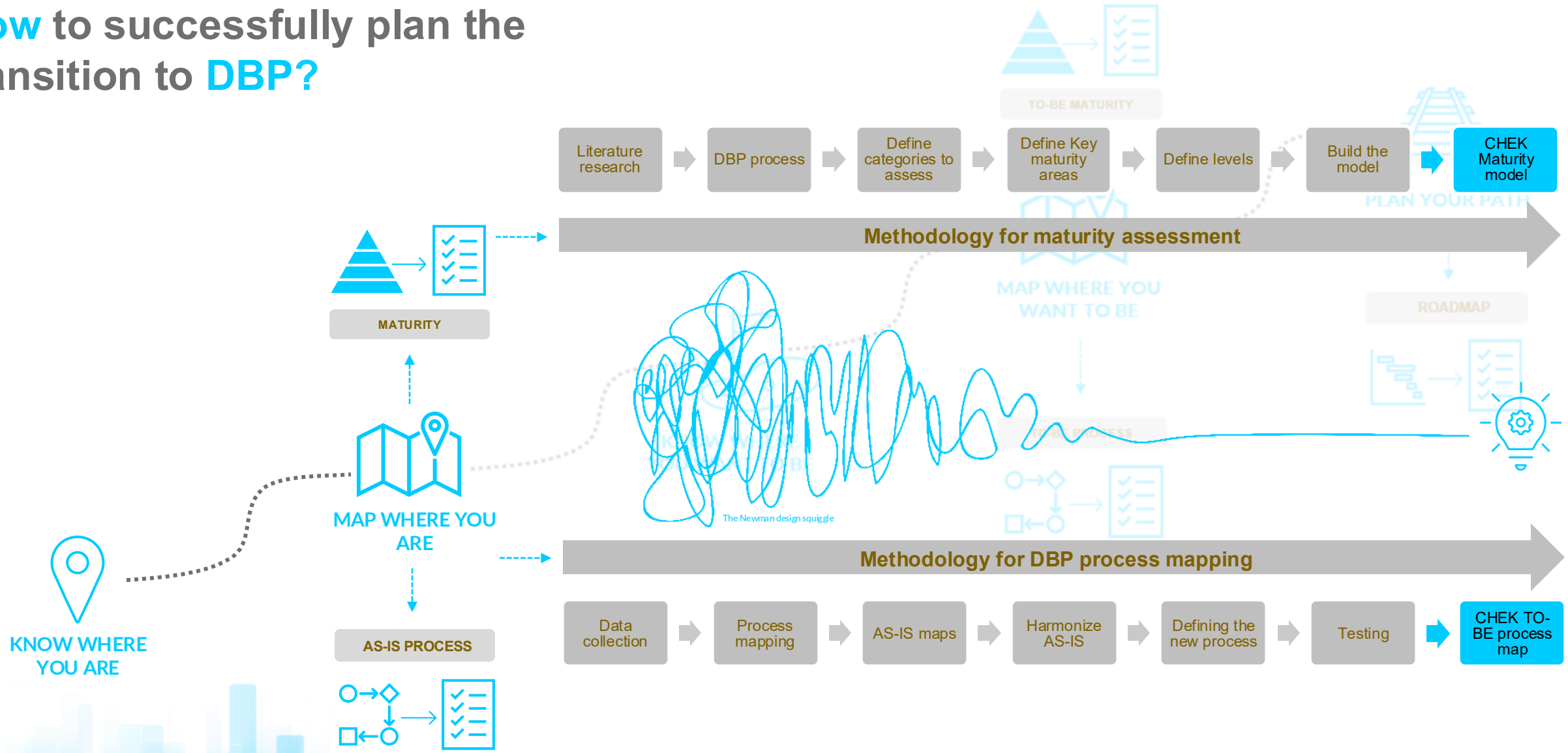
Now we know where we want to be!

How to successfully transition to DBP?



Methodology for transition

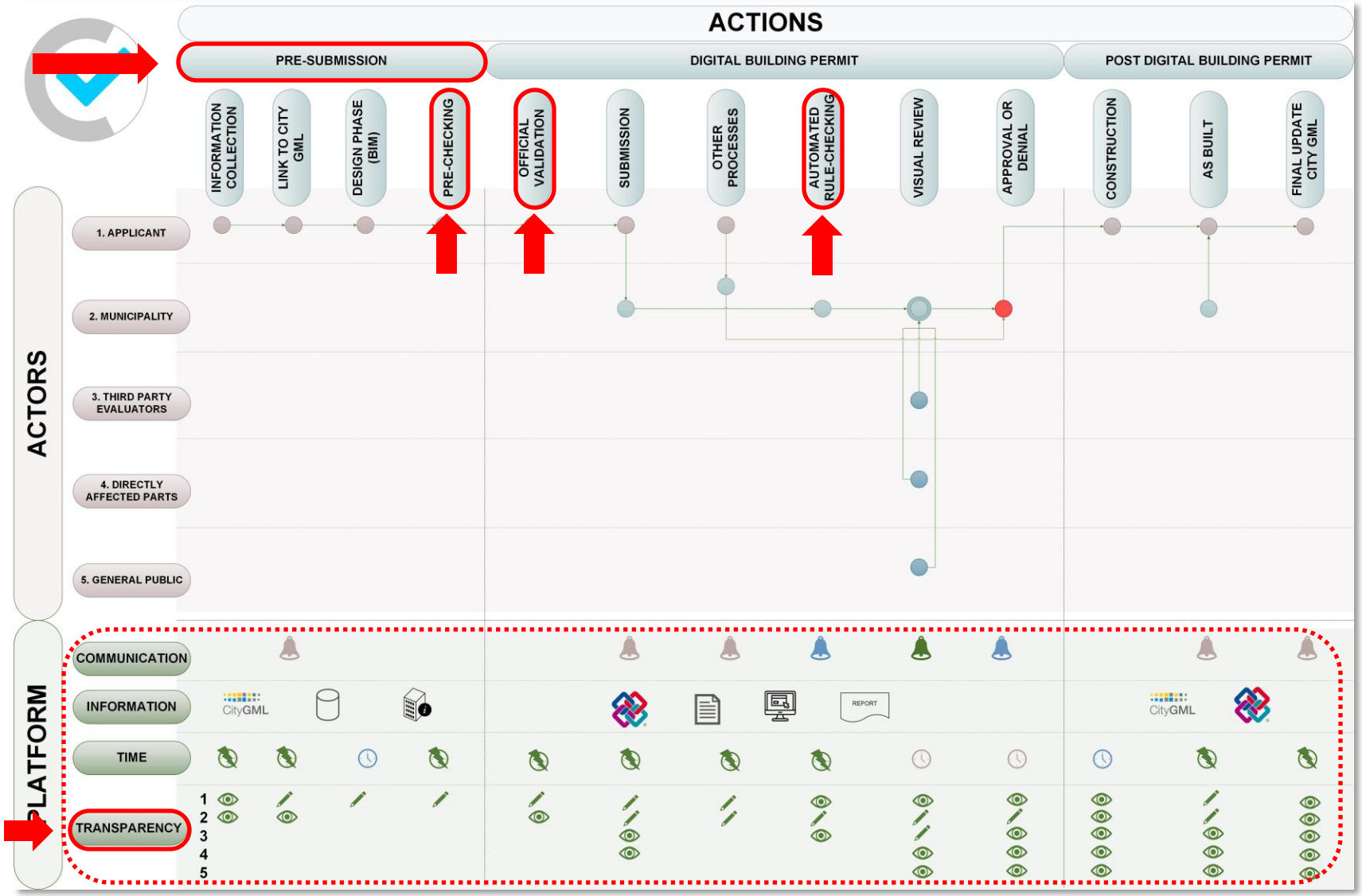
How to successfully plan the transition to DBP?



Digitalisation process & Maturity model

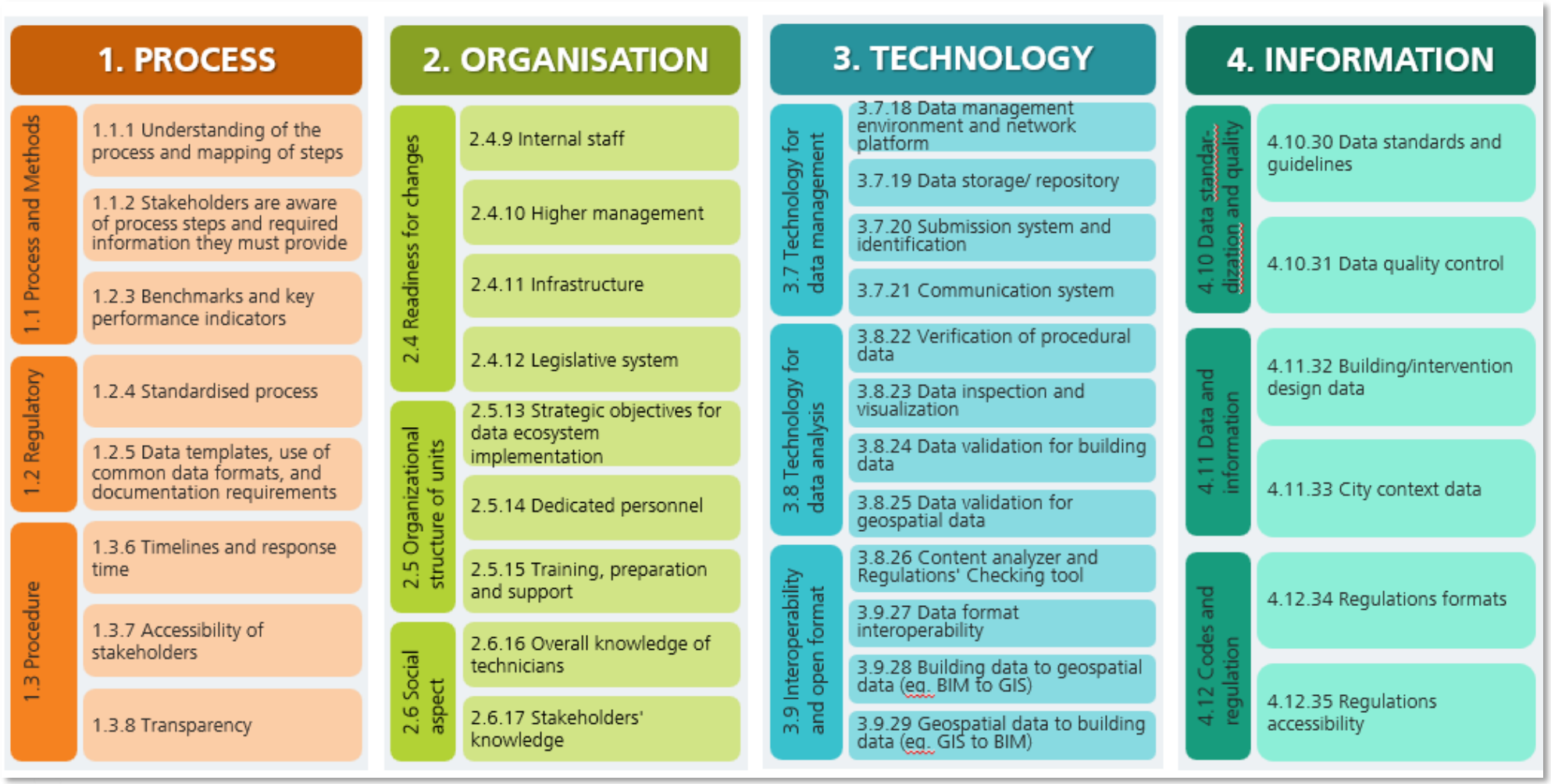
CHEK TO-BE process map

- ✓ Efficiency
- ✓ 100% digital process steps
- ✓ Digitalised regulations
- ✓ Accurate automatic validation and checking
- ✓ Documentation integration in the BIM model
- ✓ Flexible solutions (CHEK tools)
- ✓ IFC model verification and validation
- ✓ Improved user experience
- ✓ Training and competencies
- ✓ Transparency



Digitalisation process & Maturity model

CHEK
Maturity Model



Digitalisation process & Maturity model

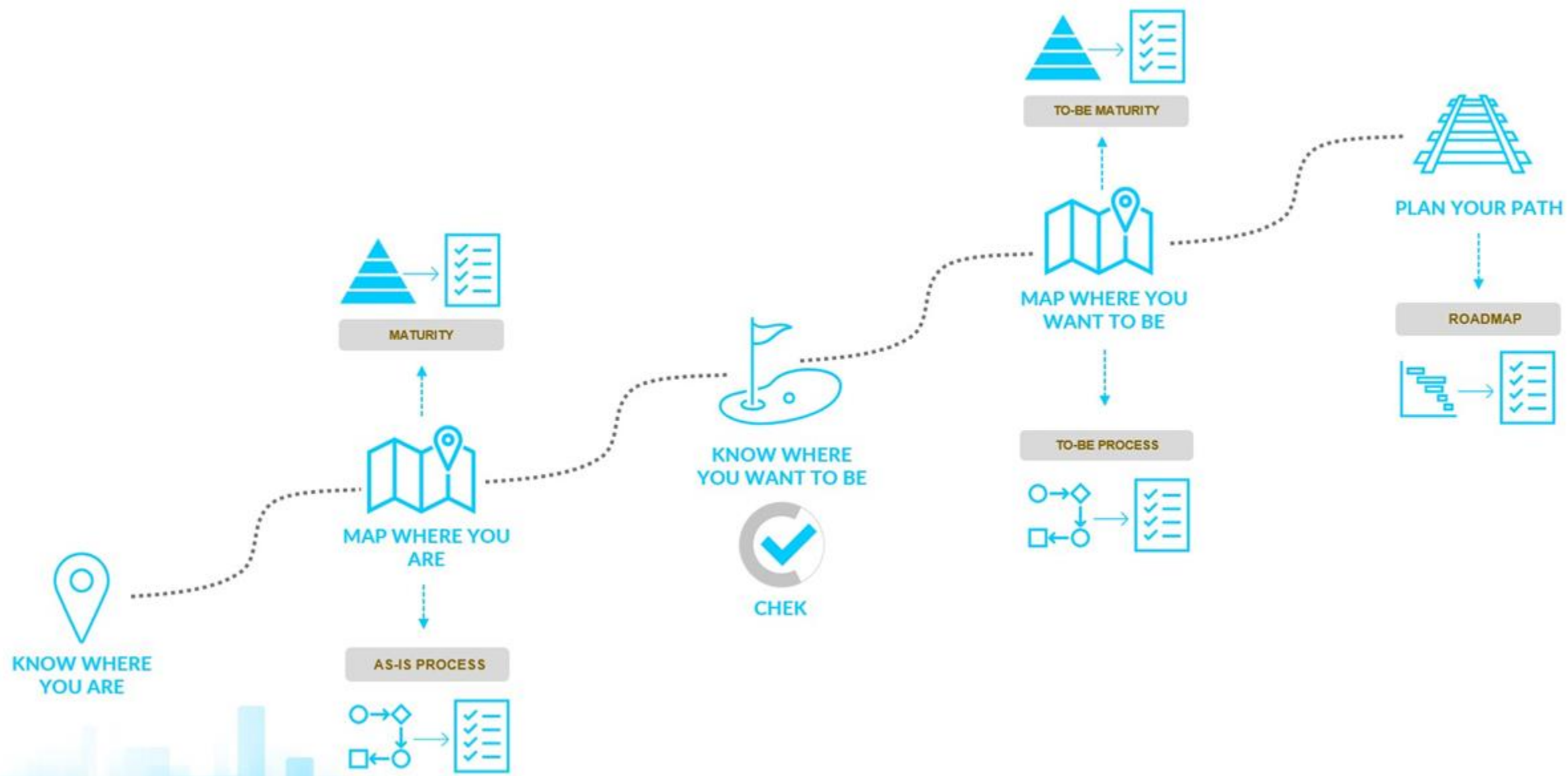
CHEK
Roadmap

Dependencies | Actions | Resources available* | Project control | Timeline

Key maturity areas

KMA	DEPENDS ON	ACTIVITY	CHEK TOOLS	AVAILABLE MATERIAL	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
1.1.1		Implement platform for tracking processes, connect all internal systems to the platform and allow time tracking.			1	5	0	0	0%
1.1.2	1.1.1	Create a detailed process map with steps of the process, using the CHEK VA. Make the process map public available.			6	3	0	0	0%
1.2.3.1	1.1.1	Define KPIs to be achieved			6	2	0	0	0%
1.2.3.2	1.2.3.1	Set up measurements of KPI's on the management platform			8	4	0	0	0%
1.2.4	1.1.2	Create guidelines for each step of the process (use CHEK guidelines as references). Make guidelines available for internal and external stakeholders. Control the privacy of external guidelines.			9	3	0	0	0%
1.2.5.1	1.1.1	Implement the use of BIMserver.centre to manage project models.			6	2	0	0	0%
1.2.5.2	1.2.5.1	Use APIs to connect BIMserver.centre to municipality's platform.			8	1	0	0	0%
1.2.5.3	1.2.5.1	Require IFC and GIS as data exchange files on the process. Follow CHEK guidelines for data structure and implementation.			8	2	0	0	0%
1.3.6	1.3.8	Communicate timelines for all steps of the process. Start monitoring and reporting the timelines of the processes managed on the platform.			19	2	0	0	0%
1.3.7	1.2.3.2 1.2.4 1.2.5.3	Implement data sharing on BIMserver.centre. Include stakeholders and manage their permissions inside the platform.			12	2	0	0	0%
1.3.8	1.3.7	Connect BIMserver.centre to stakeholder's platforms with the APIs			14	5	0	0	0%
2.4.9		Make online basic trainings available for staff members. The training should cover what is data technology, what are the advantages and how to implement. Require minimum participation of 50% of staff.			1	4	0	0	0%
2.4.10	1.1.2	Create strategic plan for implementing the digital process. Use CHEK tools to support the decision making. Use the CHEK VA to create an initial roadmap and the adjust according to available resources.			9	4	0	0	0%
2.4.11.1	1.1.1	Make an assessment of the hardware and software used on the steps of the process, defining the current situation of the infrastructure.			6	4	0	0	0%
2.4.11.2	2.4.10 2.4.11.1	Create a list of software needed for each step of the digital process. And the hardware/software requirements for them.			13	3	0	0	0%
2.4.11.3	2.4.11.2	Update the hardware and software of the organization based on the specifications needed.			16	4	0	0	0%
2.4.12		Activity 12 (Legislative system)			1	2	0	0	0%
2.5.13	2.4.10	Update vision and strategic plan to include digital processes and data technology. Share the vision and goals with the whole institution.			13	4	0	0	0%
2.5.14	2.5.13	Create a small dedicated team of 3-5 staff member with good knowledge in BIM or GIS, to be leading the implementation of the digital process ion the institution.			17	5	0	0	0%
2.5.15	2.5.14	Provide training to dedicated implementation group staff on BIM/GIS. Use CHEK training packages for support.			22	4	0	0	0%

Digitalisation process & Maturity model



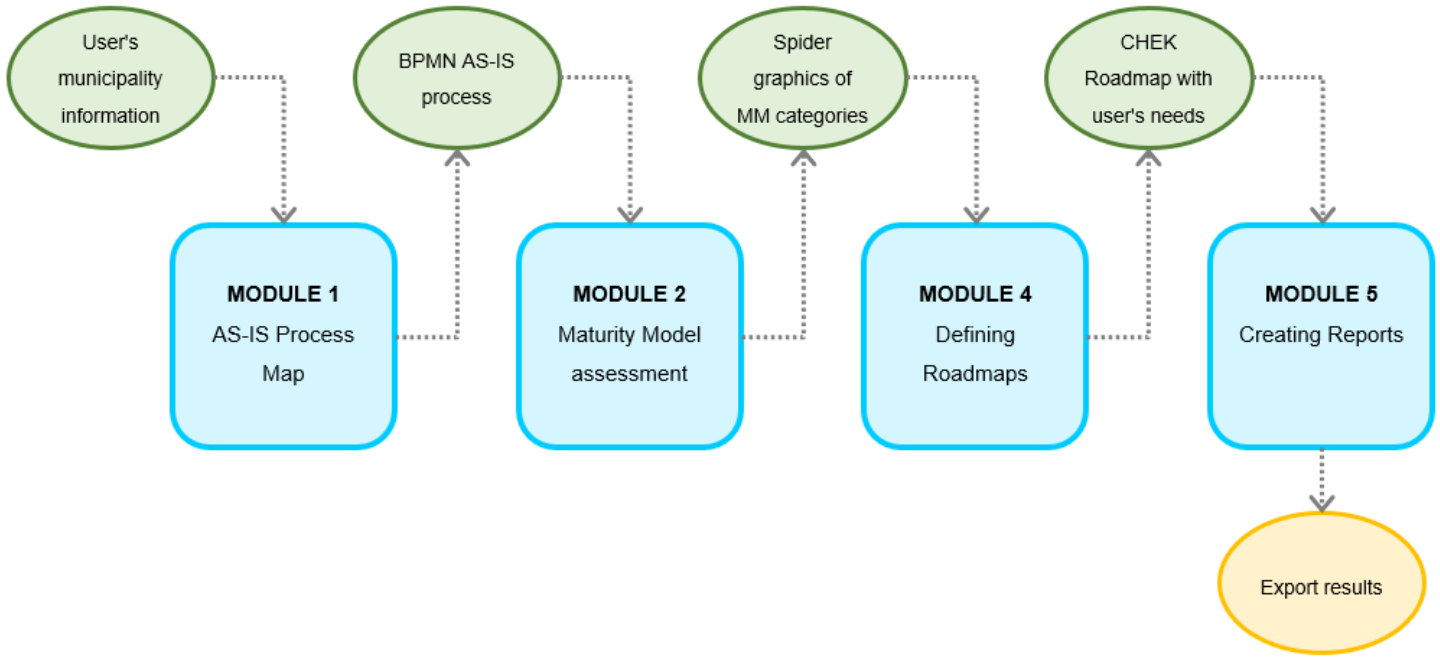
Digitalisation process & Maturity model

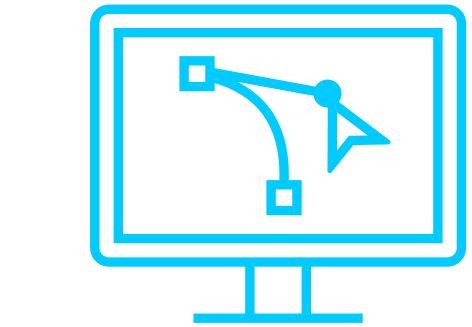
1 EU PROJECT
DBP & PROCESS EXPERTS
4 MUNICIPALITIES
MORE THAN 8 TECHNICIANS
8 WORKSHOPS
LONG ANALYSIS PROCESS
…
2 YEARS

HOW DO WE MAKE IT
SCALABLE?

Digitalisation process & Maturity model

How to successfully build a scalable transition process?





CHEK
Digital Assistant

AI supported

(6) CHEK – Change management virtual assistant tool - YouTube

CHEK Virtual-Assistant

https://forms.office.com/e/wjKXCRbY0A

CHEK

Change Management Assistant

Log in to start improving your Building Permit process.

e-mail

password

Login

Don't have an account? Register here

Funded by the European Union

CHEK

Fraunhofer ITALIA

We need your feedback to improve!

Q&A

https://www.menti.com/al42wm6pkkzi

We need your feedback to improve!

Thank you for your attention!

Orjola Braholli
orjola.braholli@fraunhofer.it

CHEK Final Event Feedback Questionnaire

https://forms.office.com/e/HHZrzuH9hh

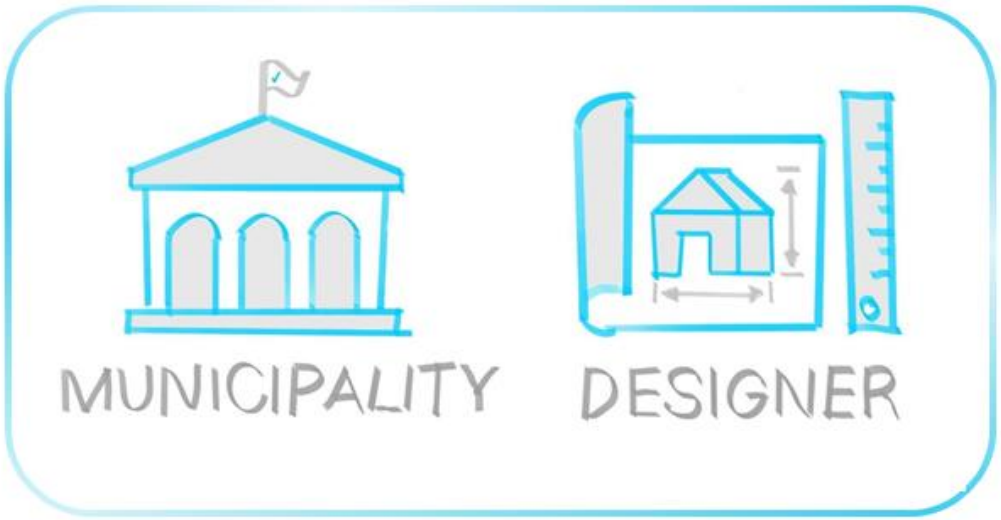
CHEK Platform & Rule Checking Workflow

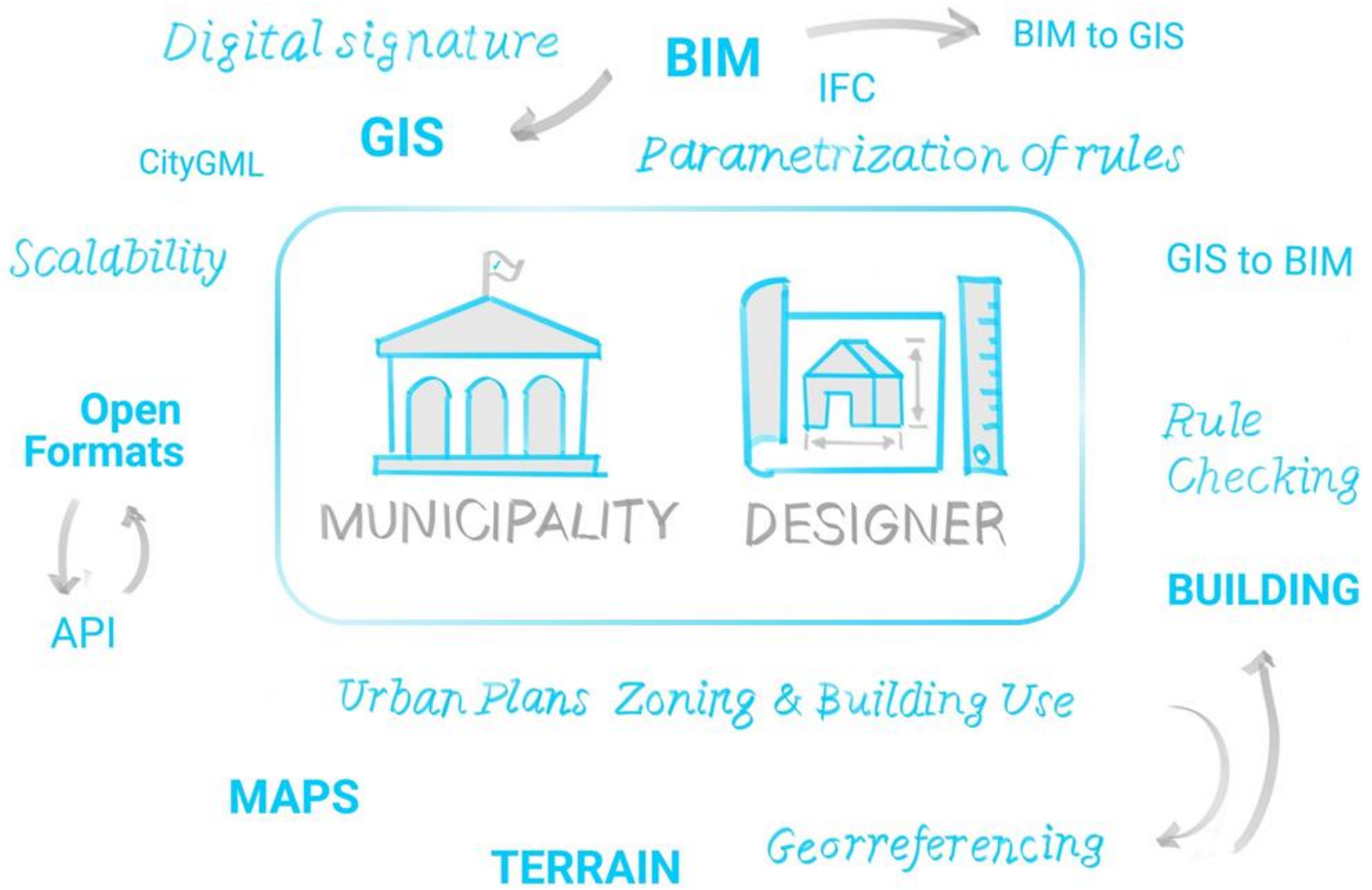
Achieving interoperability for a modular approach

CHEK Final Event – 2nd September 2025

Funded by
the European Union

Complexity of the DBP process and platform requirements




Digital signature
BIM
BIM to GIS
IFC
GIS
CityGML
Parametrization of rules
Scalability
GIS to BIM
Open Formats
Rule Checking
MUNICIPALITY
DESIGNER
BUILDING
API
Urban Plans Zoning & Building Use
MAPS
TERRAIN
Georreferencing

Complexity of the DBP process and platform requirements

CHEK TOOLKIT

DBP Platform

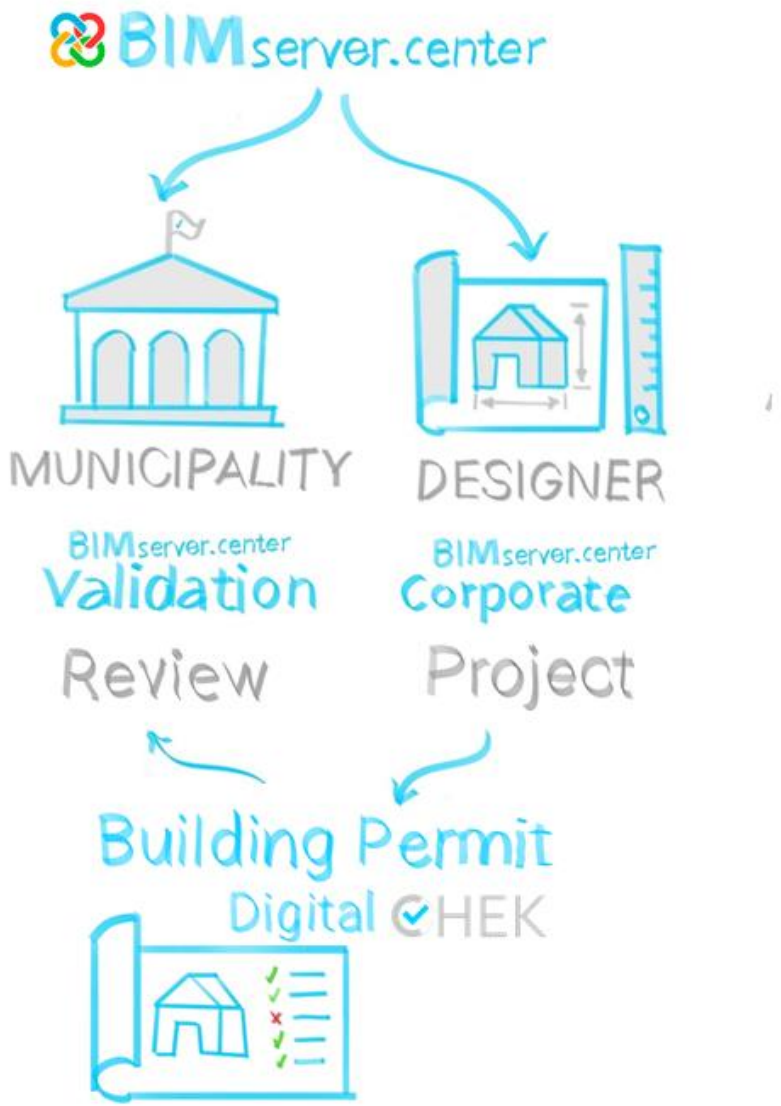
Geospatial base data access

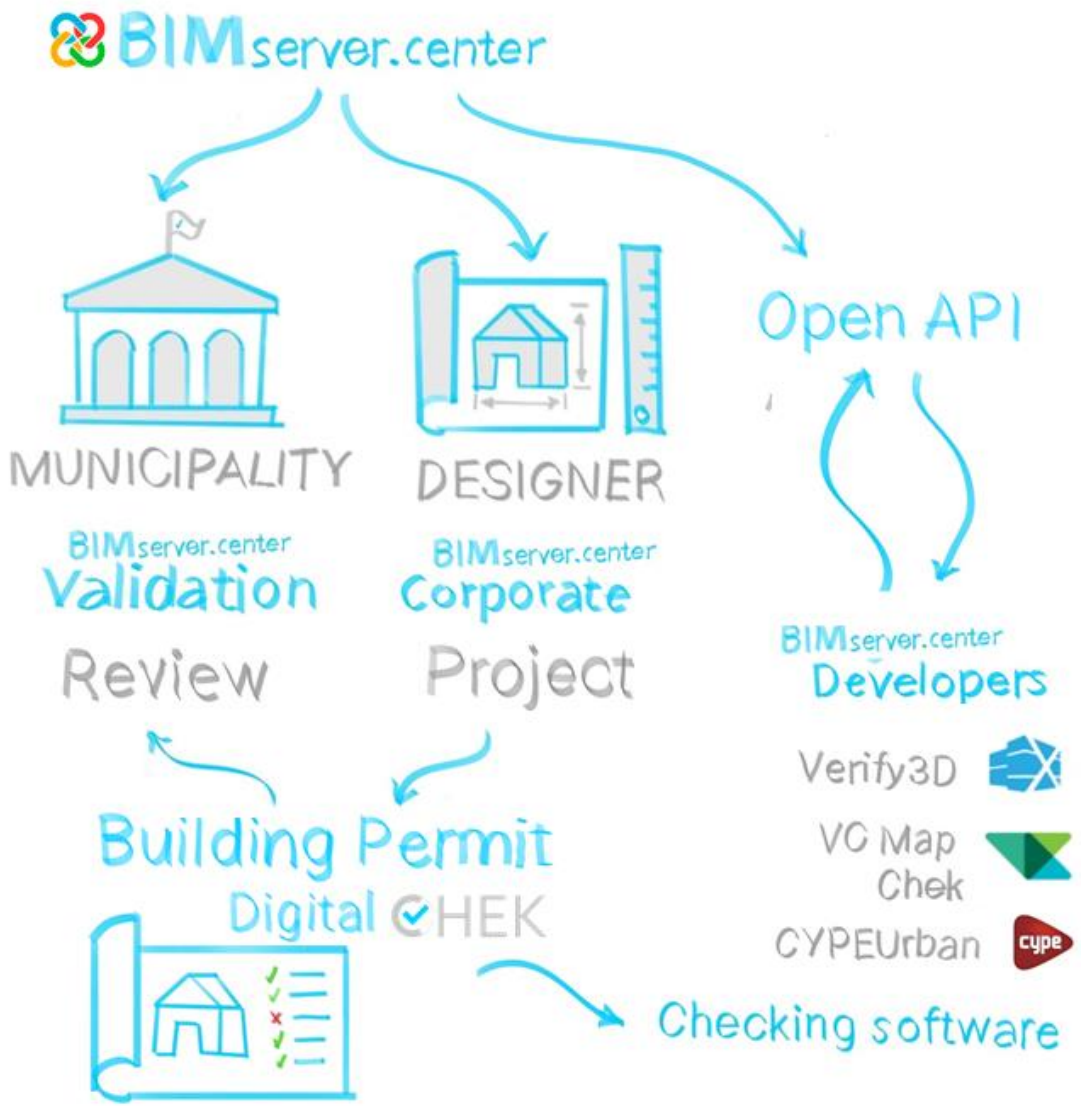
Data validation

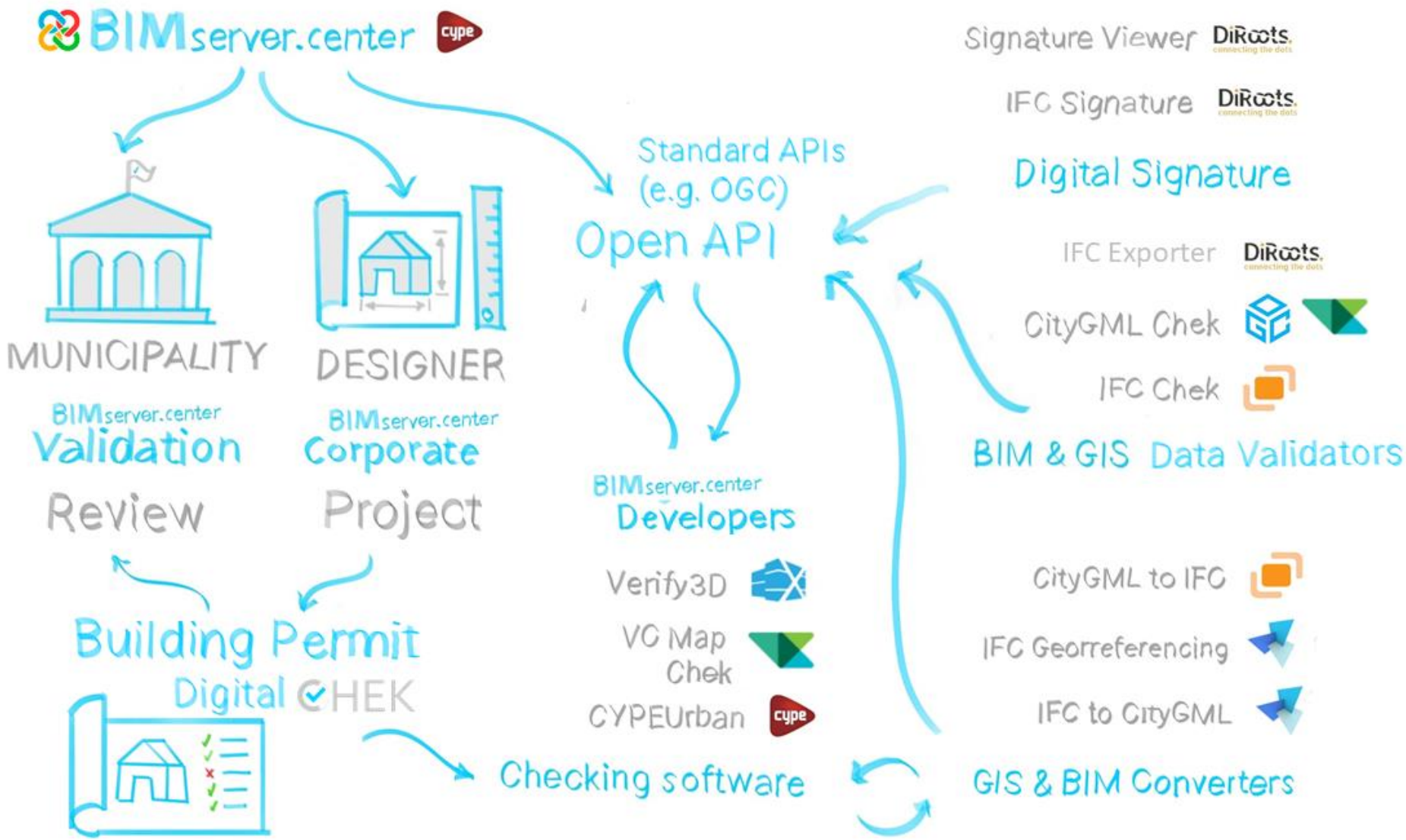
BIM & GIS Data conversion

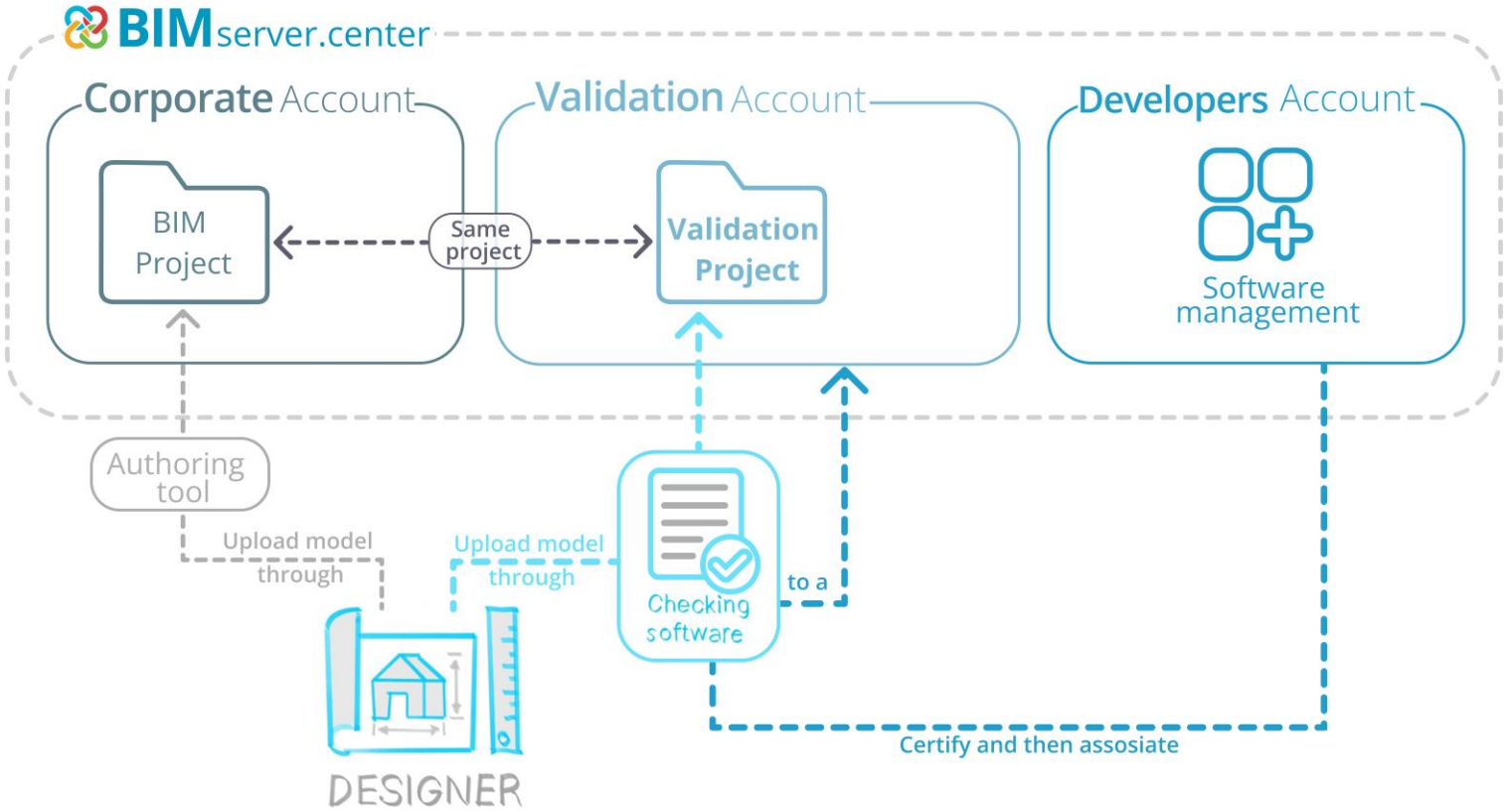
Compliance Checking

Digital Signature

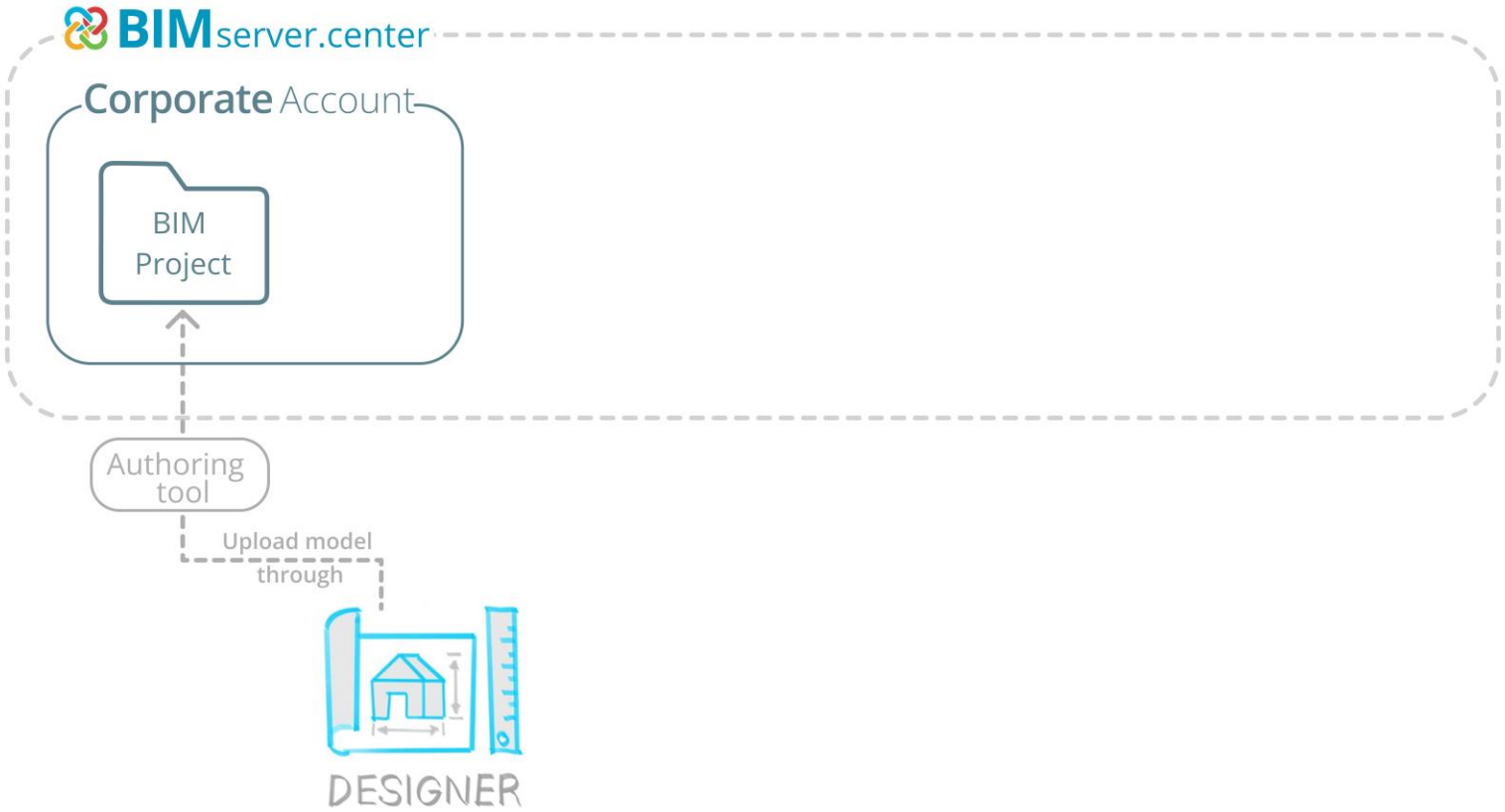

BIMserver.center
MUNICIPALITY
DESIGNER
BIMserver.center
Validation
Review
BIMserver.center
Corporate
Project
Building Permit
Digital CHEK


BIMserver.center
MUNICIPALITY
DESIGNER
Open API
BIMserver.center
Validation
Review
BIMserver.center
Corporate
Project
BIMserver.center
Developers
Verify3D
VC Map
Chek
CYPEUrban
cype
Building Permit
Digital CHEK
Checking software

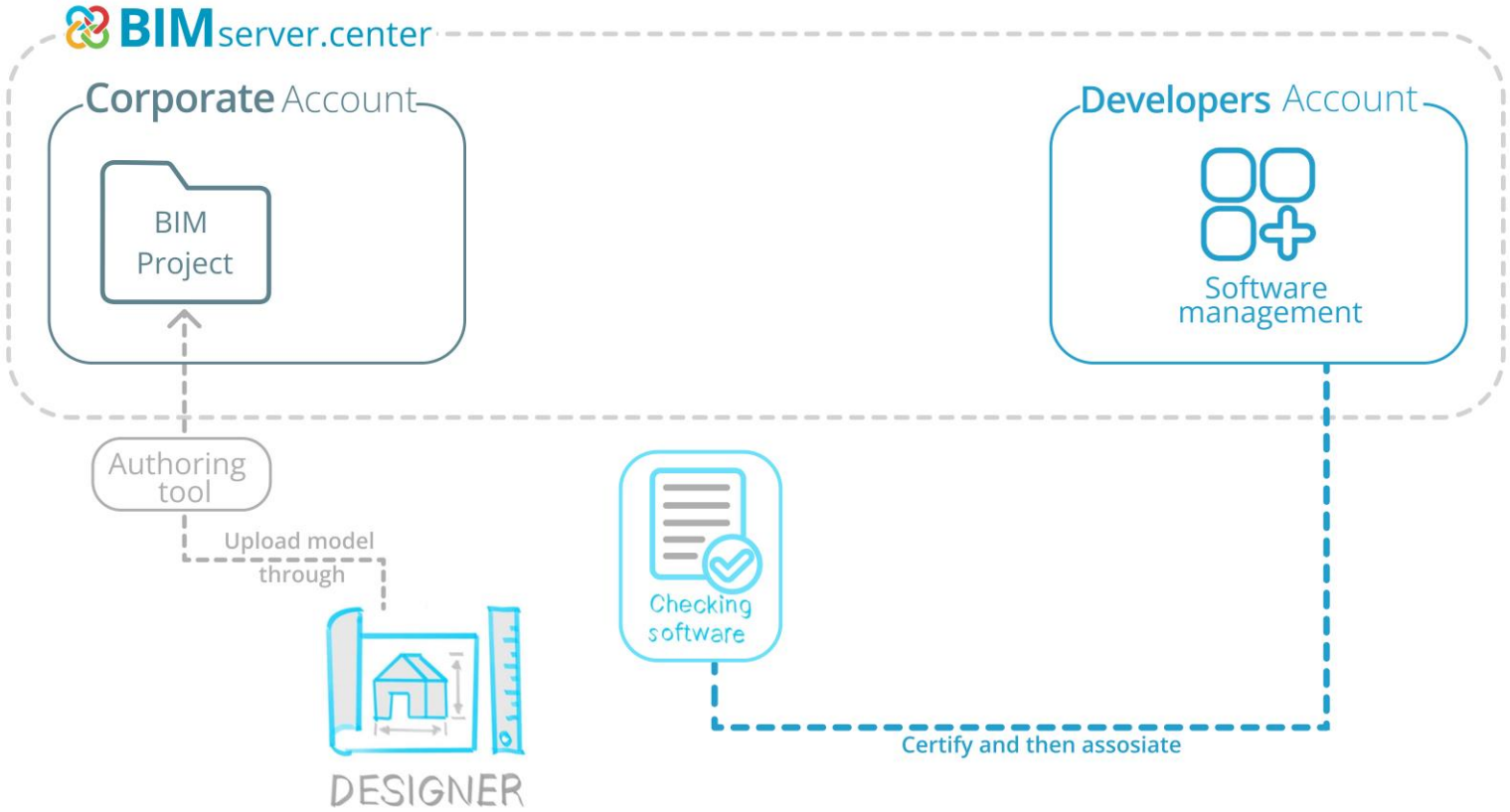

BIMserver.center
cype
MUNICIPALITY
DESIGNER
BIMserver.center
Validation
Review
BIMserver.center
Corporate
Project
Building Permit
Digital CHEK
Standard APIs
(e.g. OGC)
Open API
BIMserver.center
Developers
Verify3D
VC Map
Chek
CYPEUrban
cype
Checking software
Signature Viewer
DiRoots
IFC Signature
DiRoots
Digital Signature
IFC Exporter
DiRoots
CityGML Chek
IFC Chek
BIM & GIS Data Validators
CityGML to IFC
IFC Georreferencing
IFC to CityGML
GIS & BIM Converters

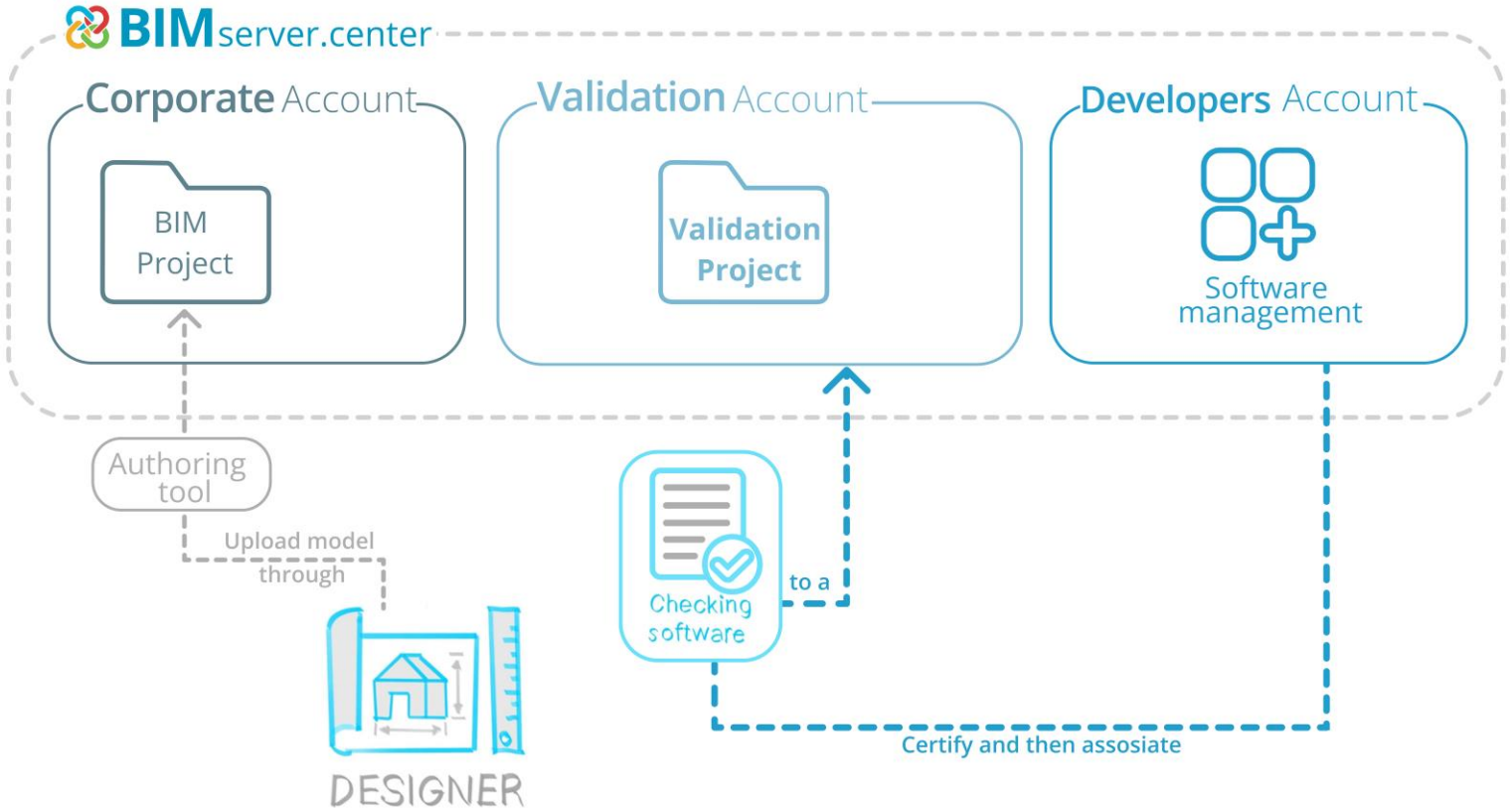

BIMserver.center
Corporate Account
Validation Account
Developers Account
BIM Project
Same project
Validation Project
Software management
Authoring tool
Upload model through
Upload model through
Checking software
to a
DESIGNER
Certify and then assosiate


BIMserver.center
CHEK
DIGITAL BUILDING PERMIT
PLATFORM


BIMserver.center
Corporate Account
BIM Project
Authoring tool
Upload model through
DESIGNER

Workflow


BIMserver.center
Corporate Account
BIM Project
Developers Account
Software management
Authoring tool
Upload model through
DESIGNER
Checking software
Certify and then assosiate


BIMserver.center
Corporate Account
BIM Project
Validation Account
Validation Project
Developers Account
Software management
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DESIGNER
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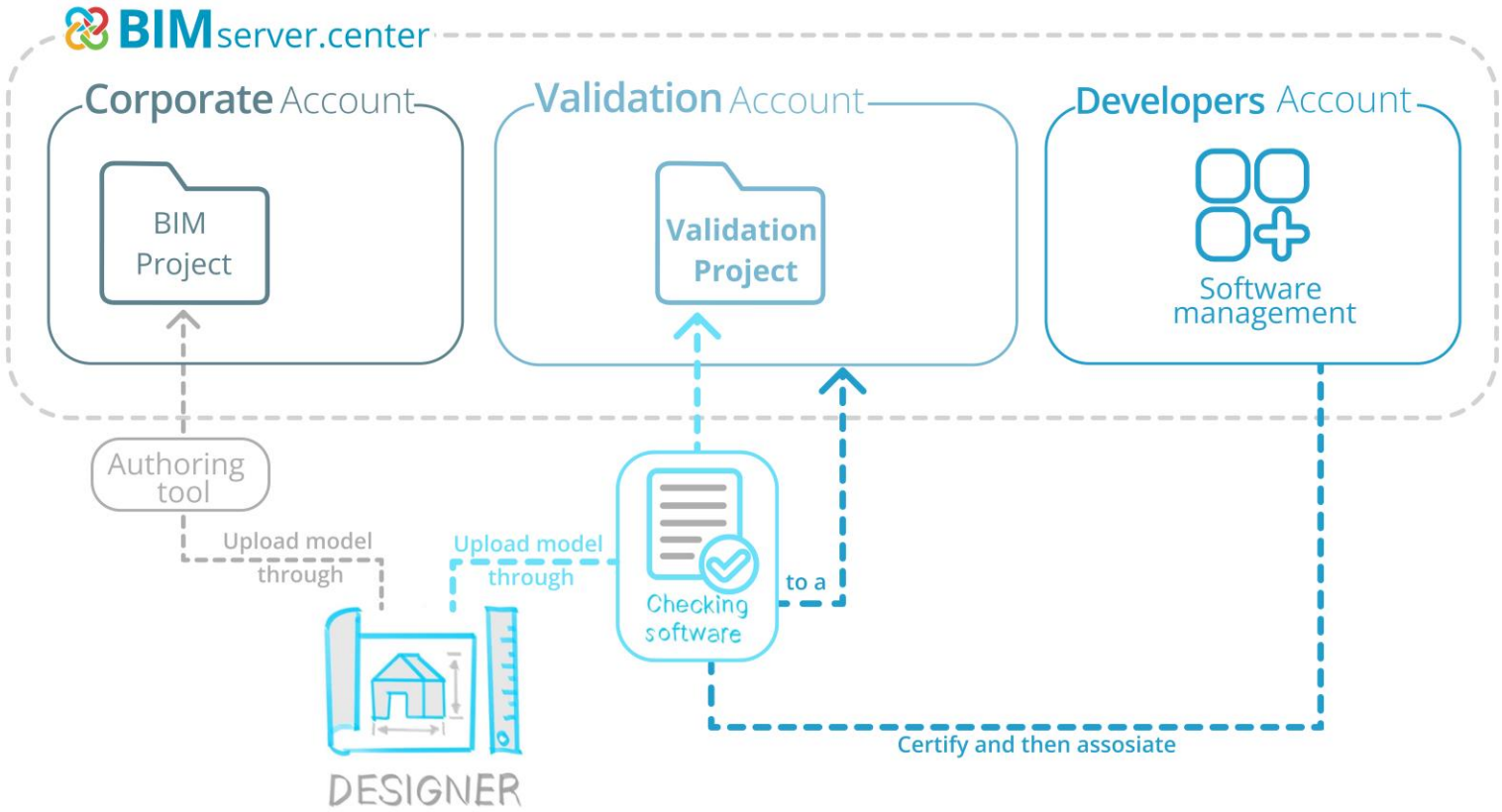
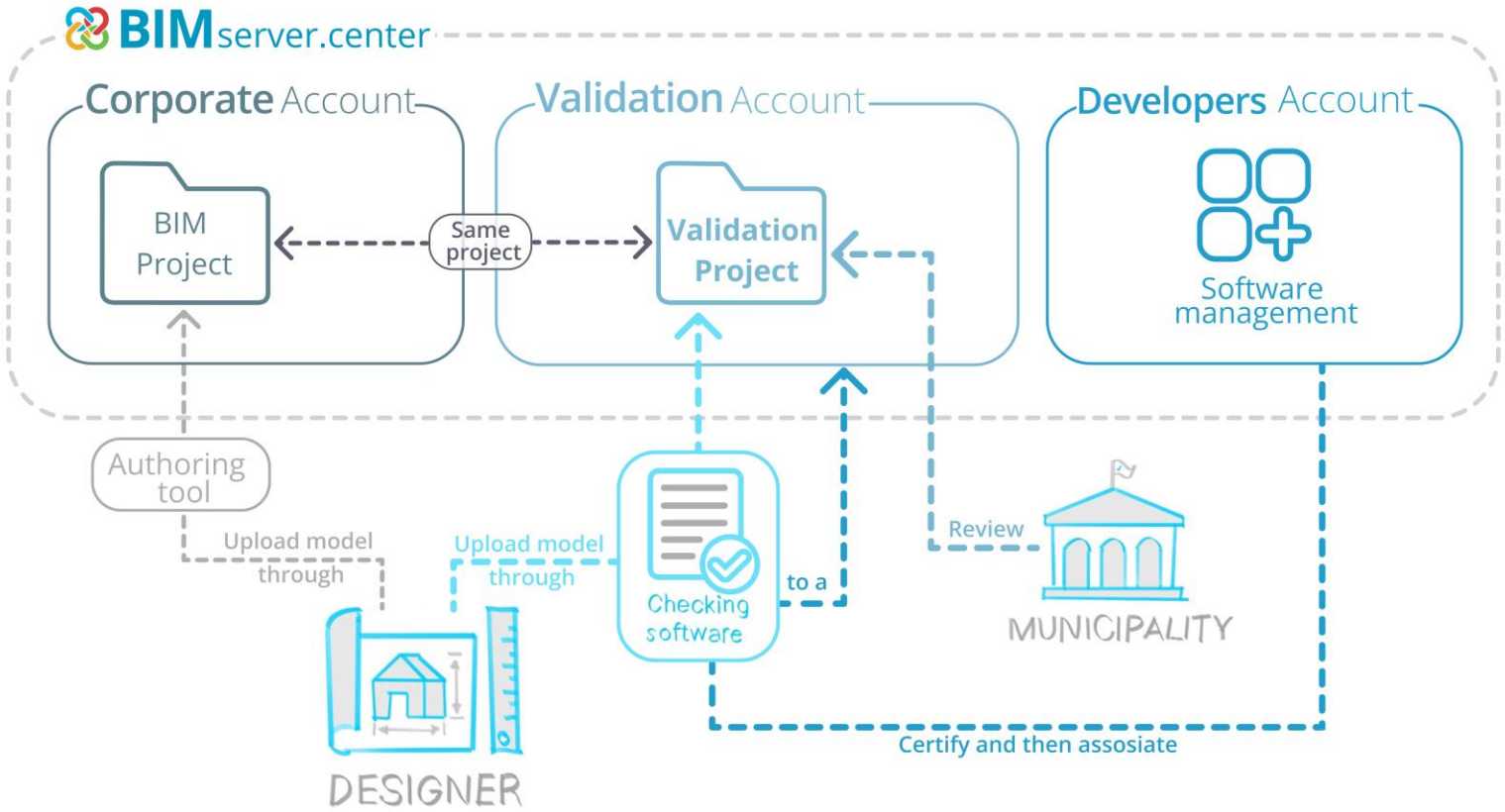

BIMserver.center
Corporate Account
BIM Project
Validation Account
Validation Project
Developers Account
Software management
Authoring tool
Upload model through
Upload model through
Checking software
to a
DESIGNER
Certify and then assosiate

Workflow


BIMserver.center
Corporate Account
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Upload model through
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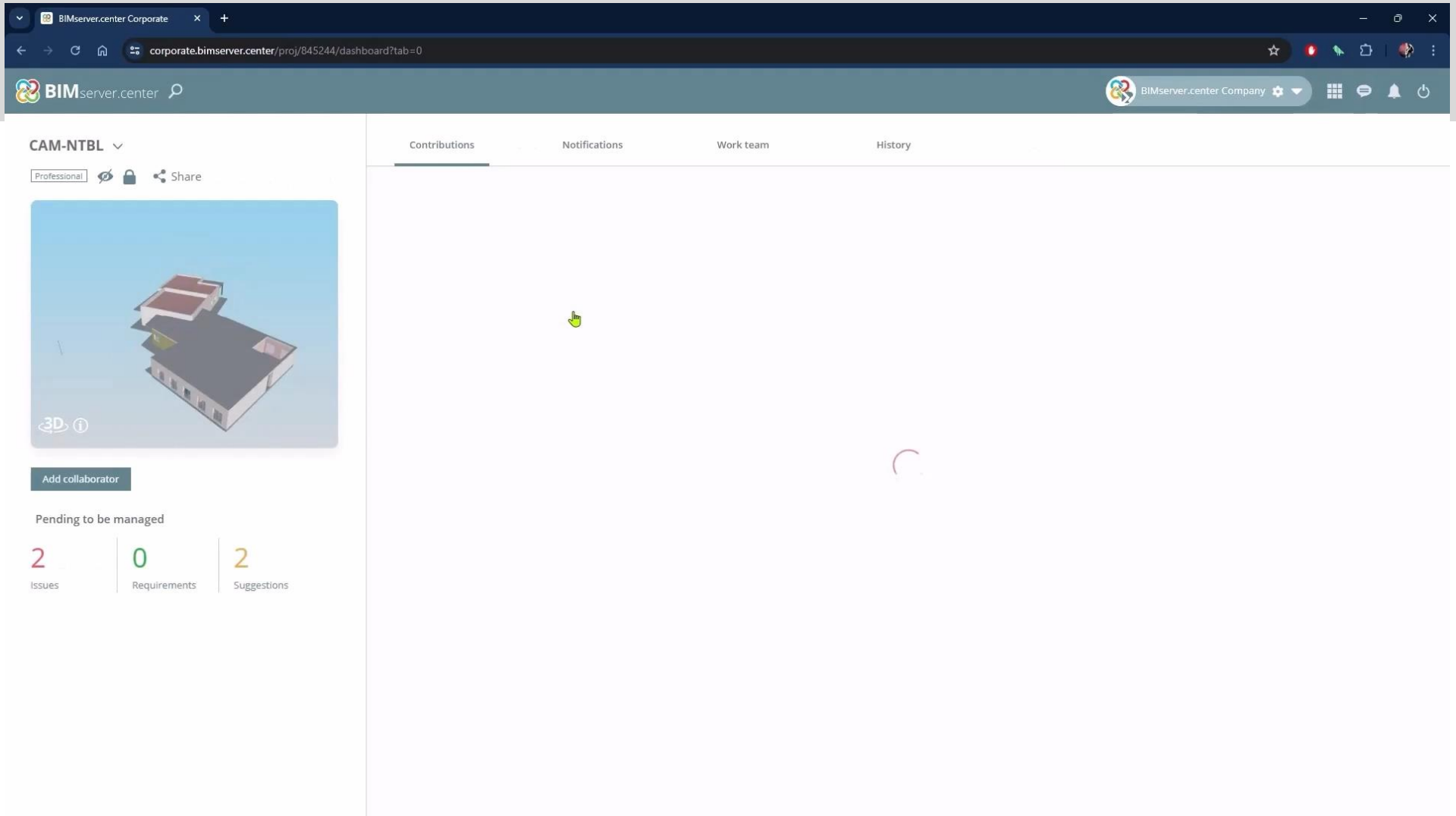
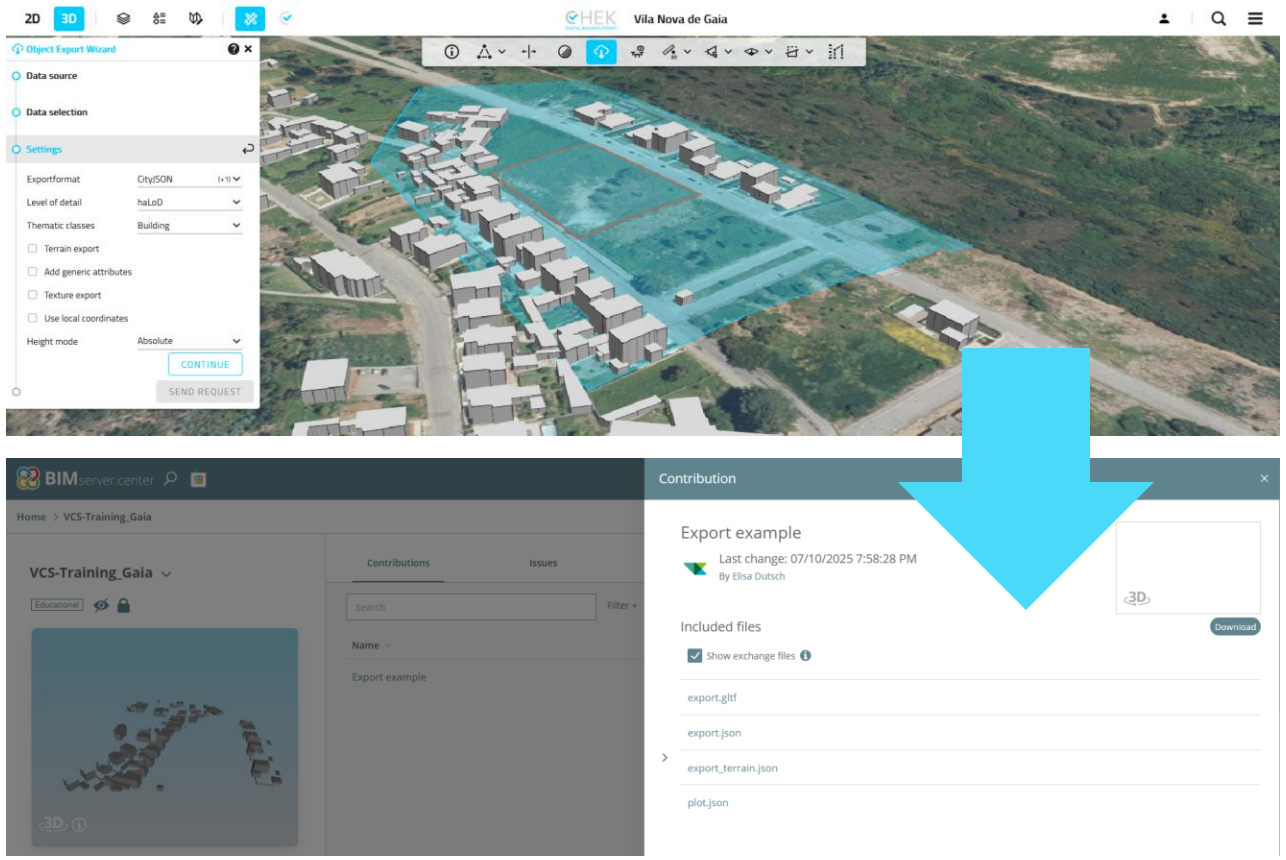
to a
Review
MUNICIPALITY
DESIGNER
Certify and then assosiate

CHEK DIGITAL BUILDING PERMIT

cype



Support design workflow trough integrated CHEKdbp toolkit



Geospatial base data access

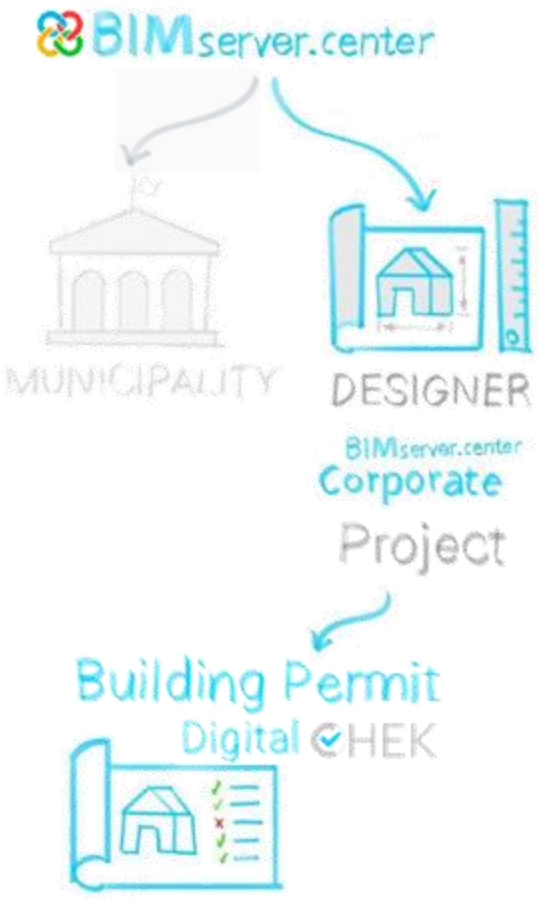
Data validation against DBP requirements

BIM & GIS Data conversion

Compliance Checking

Digital Signature

Support design workflow trough integrated CHEKdbp toolkit



11:10

CHEKDBP GeoBIM Interoperability Solutions – Making Data Speak the Same Language

- Peter Bonsma, Co-owner and Technical Director at RDF, CHEK partner
- Siham El Yamani, Expert consultant in DBP and GEOBIM(TU Delft), Jasper van der Vaart, CHEK partner (TU Delft)
- Abdoulaye Diakité, Expert in Smart city and Digital Twins, Alper Akin CHEK partner (TU Delft) and Alejandro Villar CHEK partner (OGC)
- Amir Hakim, GeoBIM Software Developer and Researcher, former CHEK partner (TU Delft)

Geospatial base data access

Data validation against DBP requirements

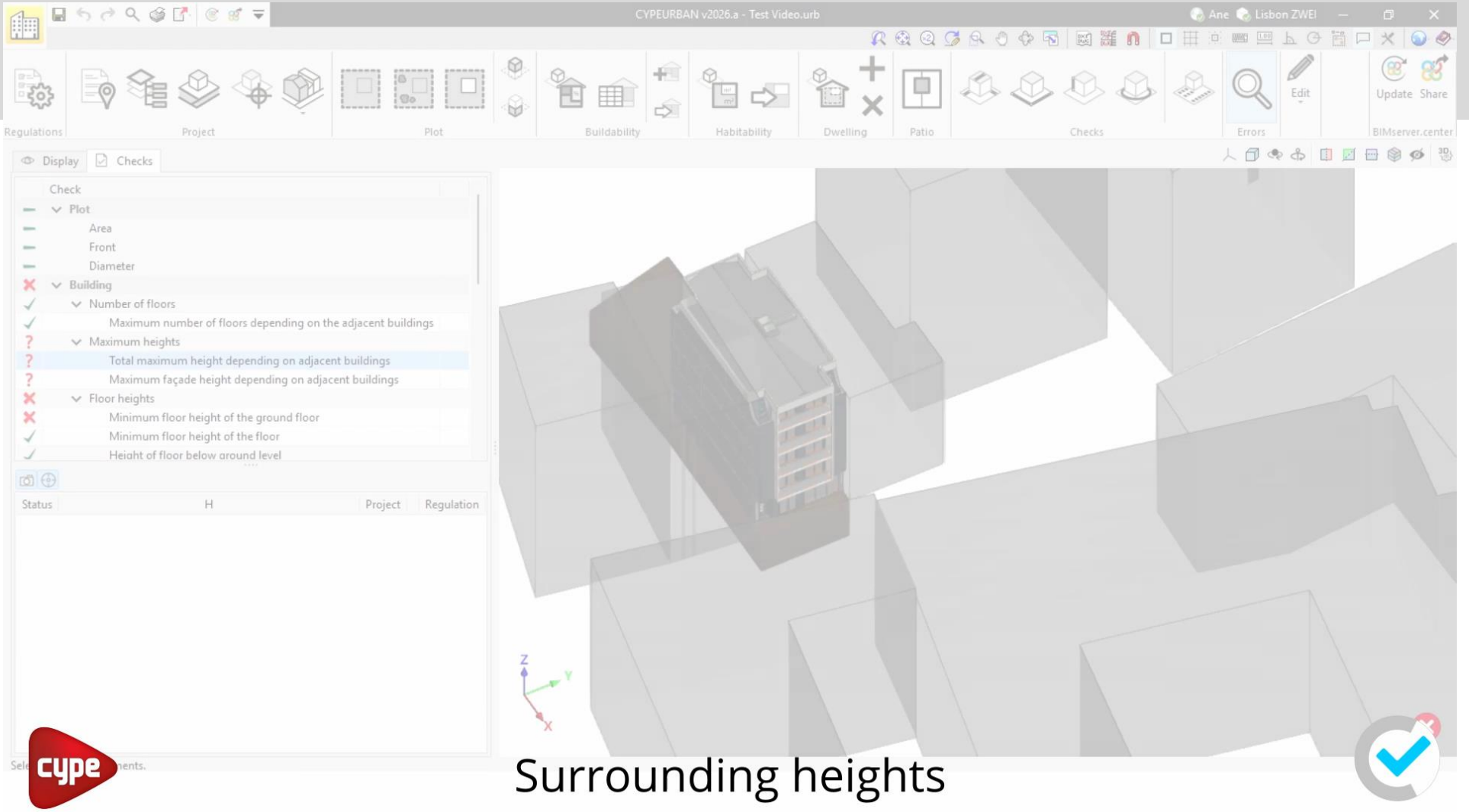
BIM & GIS Data conversion

Compliance Checking

Digital Signature

CHEK DIGITAL BUILDING PERMIT

cype



cype

Surrounding heights

Geospatial base data access

Data validation against DBP requirements

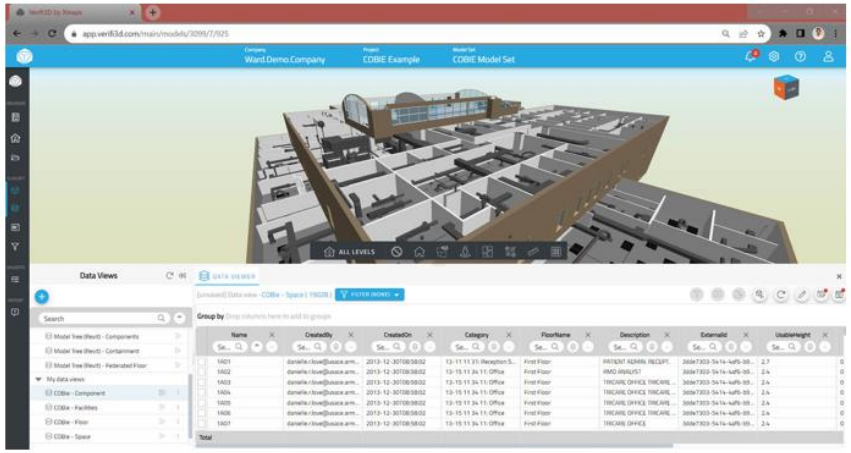
BIM & GIS Data conversion

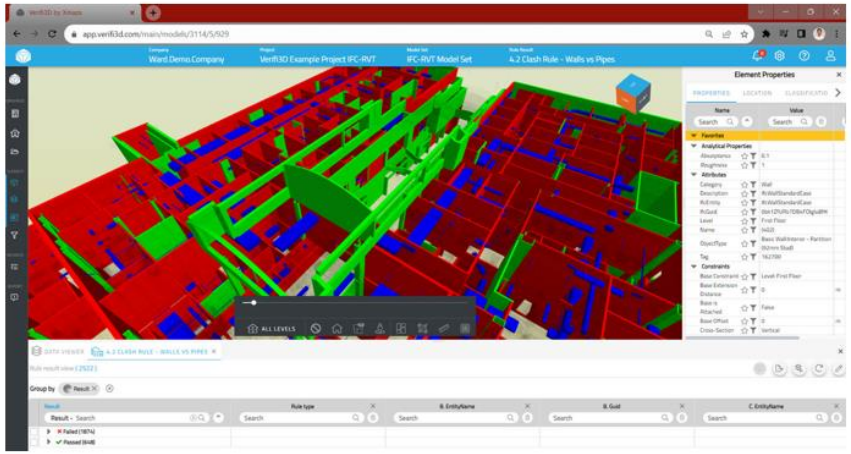
Compliance Checking

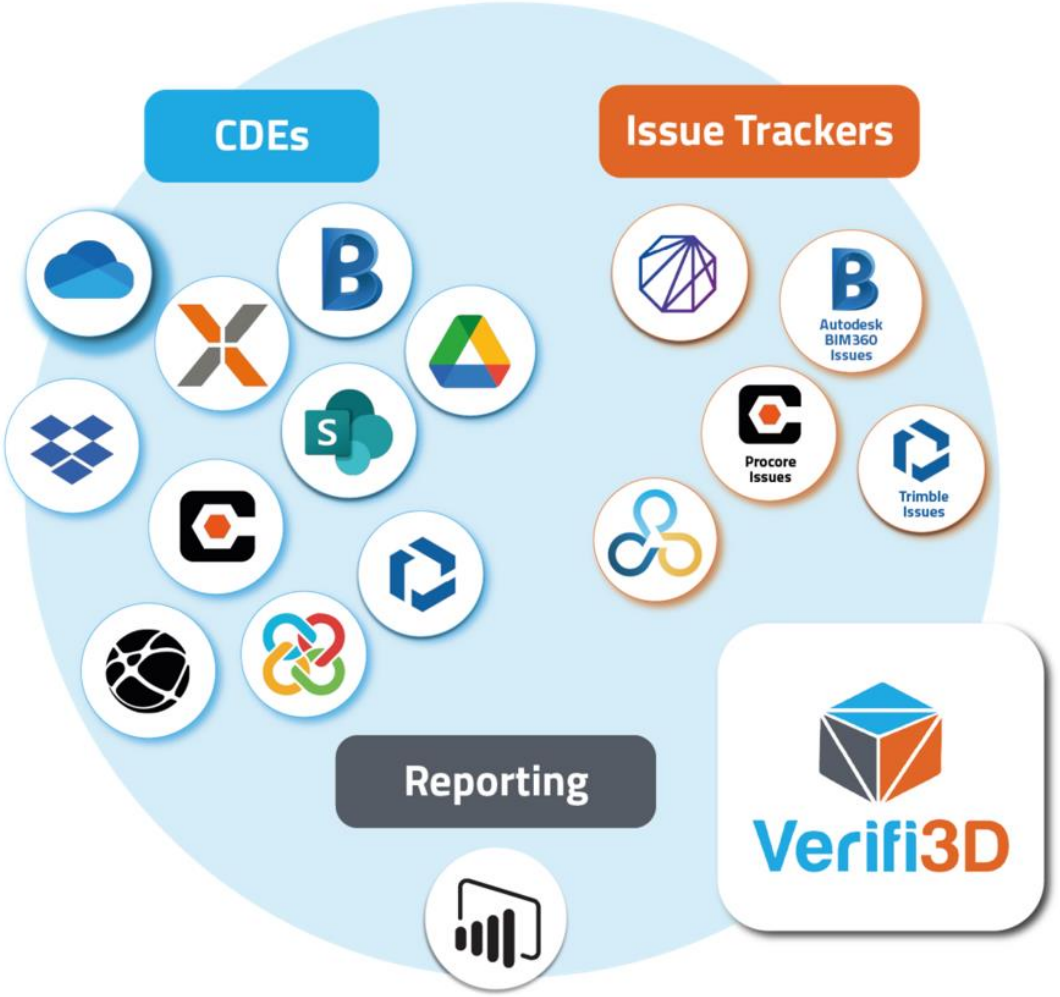
Digital Signature

Verifi3D by Xinaps — Rule-based BIM model checker in the cloud

CHEK DIGITAL BUILDING PERMIT







Geospatial base data access

Data validation against DBP requirements

BIM & GIS Data conversion

Compliance Checking

Digital Signature

CHEK
DIGITAL BUILDING PERMIT

BIMserver.center

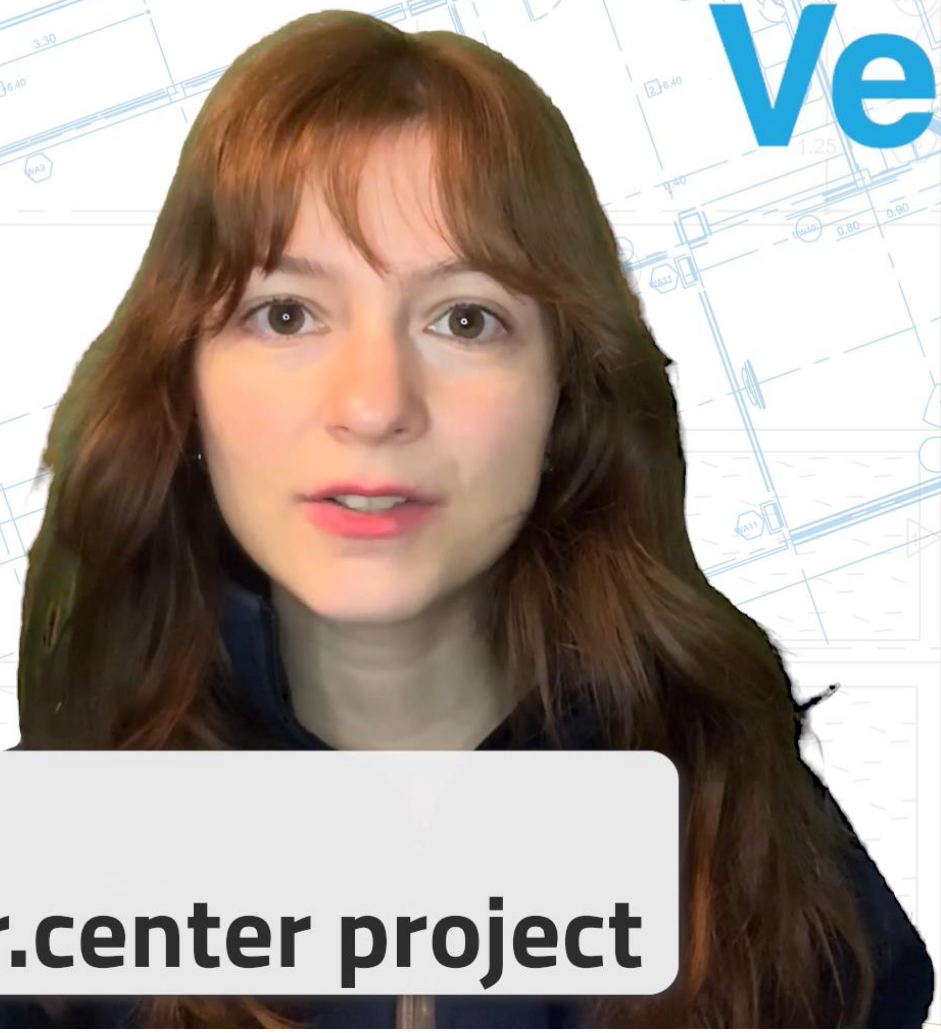
MUNICIPALITY

DESIGNER

BIMserver.center
Corporate
Project

Building Permit
Digital CHEK

Verifi3D
by Xinaps



Loading a bimserver.center project

Geospatial base data access

Data validation against DBP requirements

BIM & GIS Data conversion

Compliance Checking

Digital Signature

CHEK
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BIMserver.center

MUNICIPALITY

DESIGNER

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Corporate
Project

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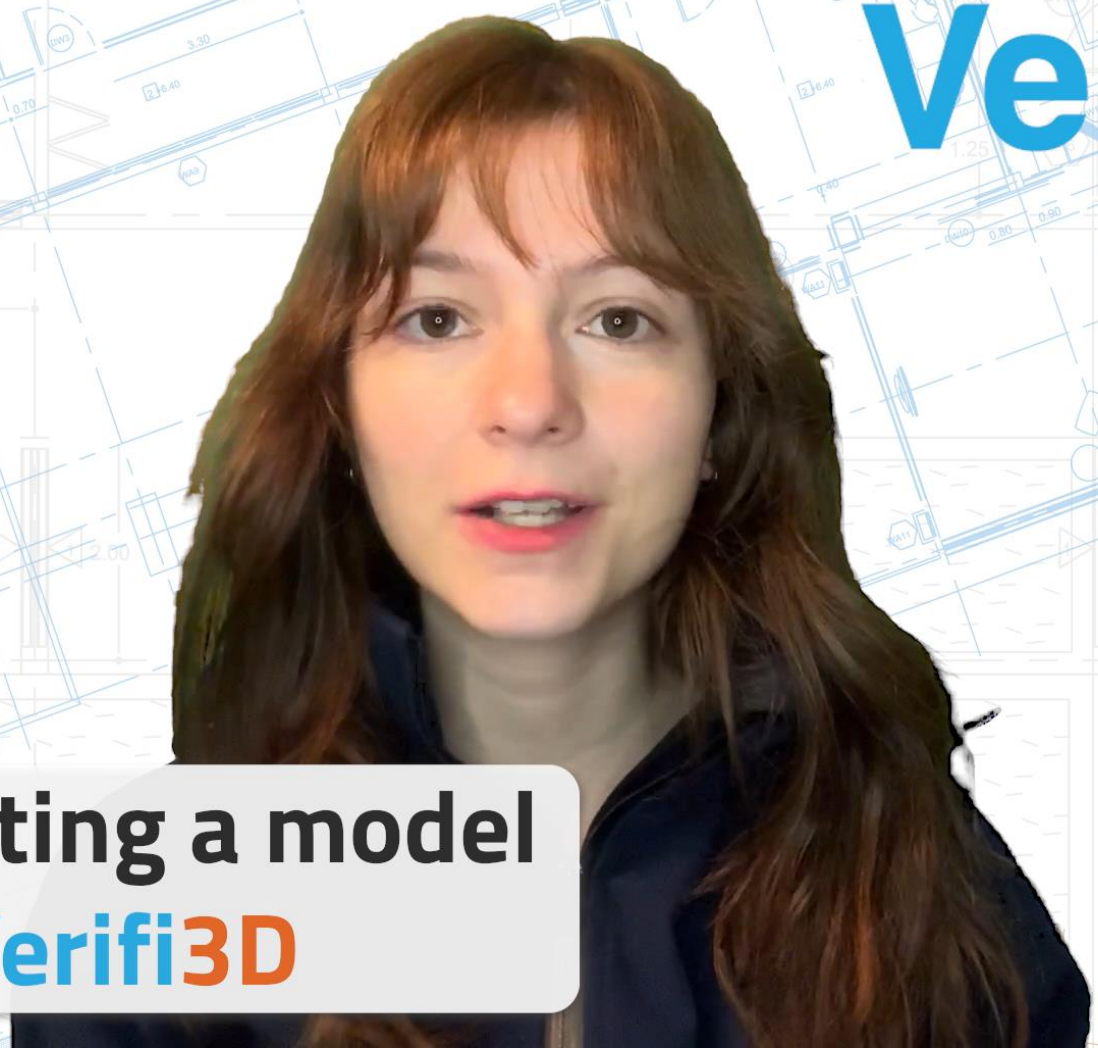
Verifi3D by Xinaps



Validating a model with Verifi3D

Geospatial base data access

Data validation against DBP requirements

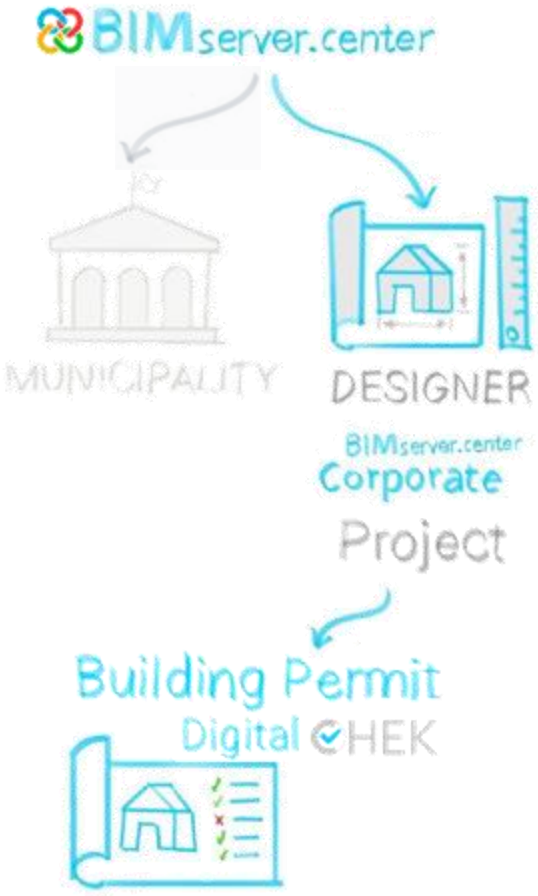
BIM & GIS Data conversion

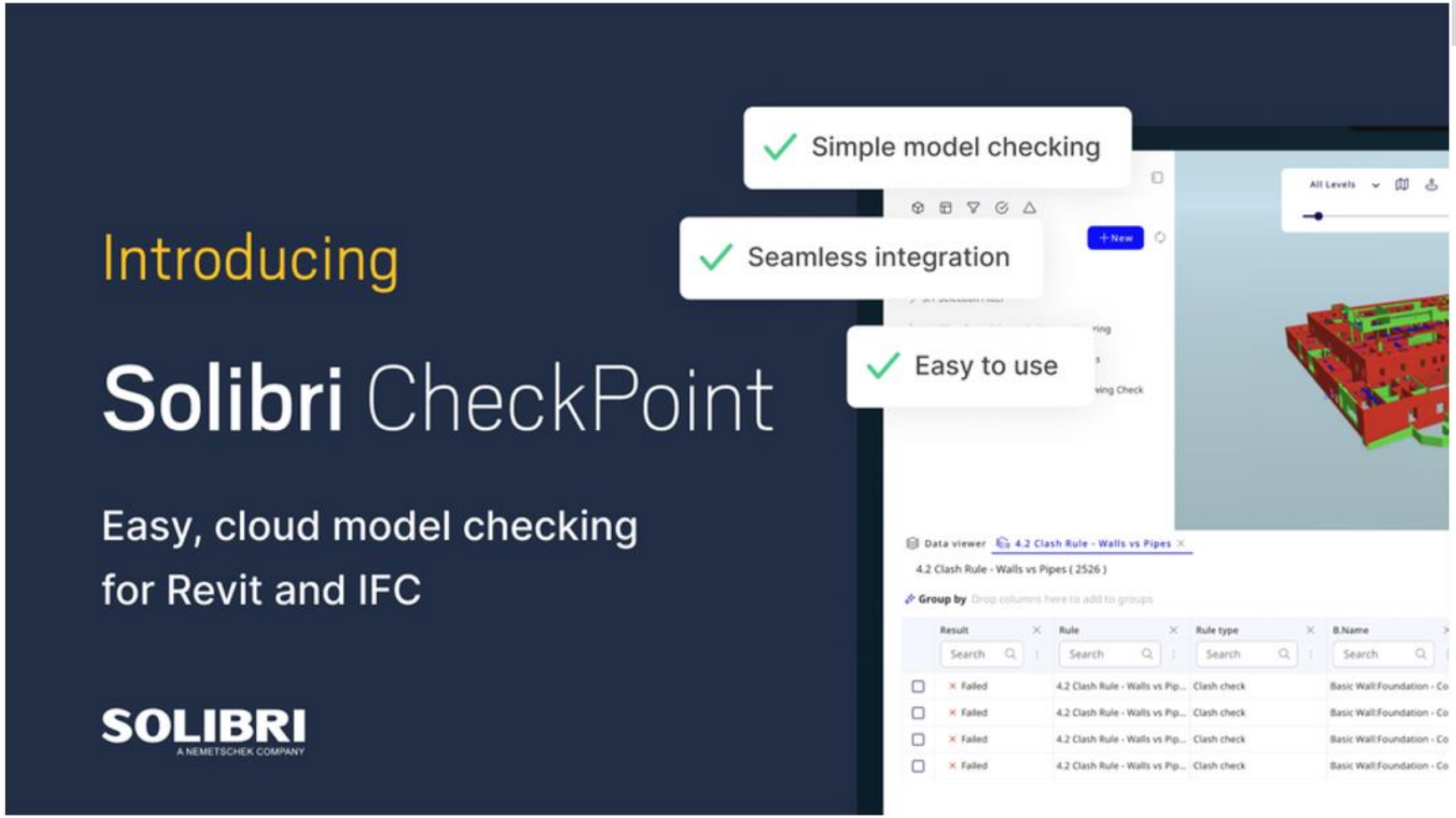
Compliance Checking

Digital Signature

CHEK Pla
Suppor

Xinaps has become part of Solibri





Geospatial base data access

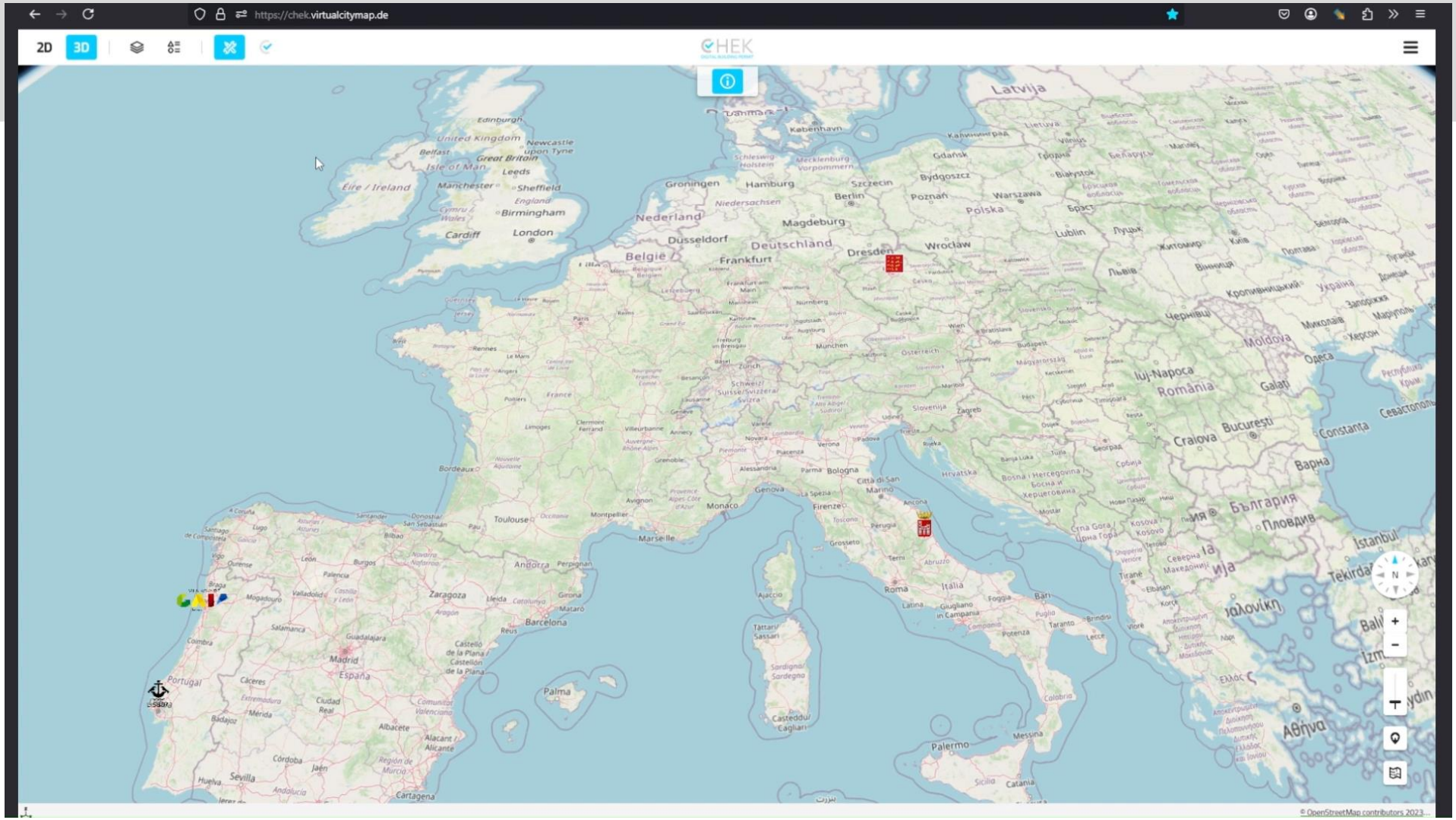
Data validation against DBP requirements

BIM & GIS Data conversion

Compliance Checking

Digital Signature

CHEK
DIGITAL BUILDING PERMIT



Geospatial base data access

Data validation against DBP requirements

BIM & GIS Data conversion

Compliance Checking

Digital Signature

CHEK DIGITAL BUILDING PERMIT

DiRoots. connecting the dots

BIMserver.center

MUNICIPALITY

DESIGNER

BIMserver.center Corporate

Project

Building Permit

Digital CHEK

Geospatial base data access

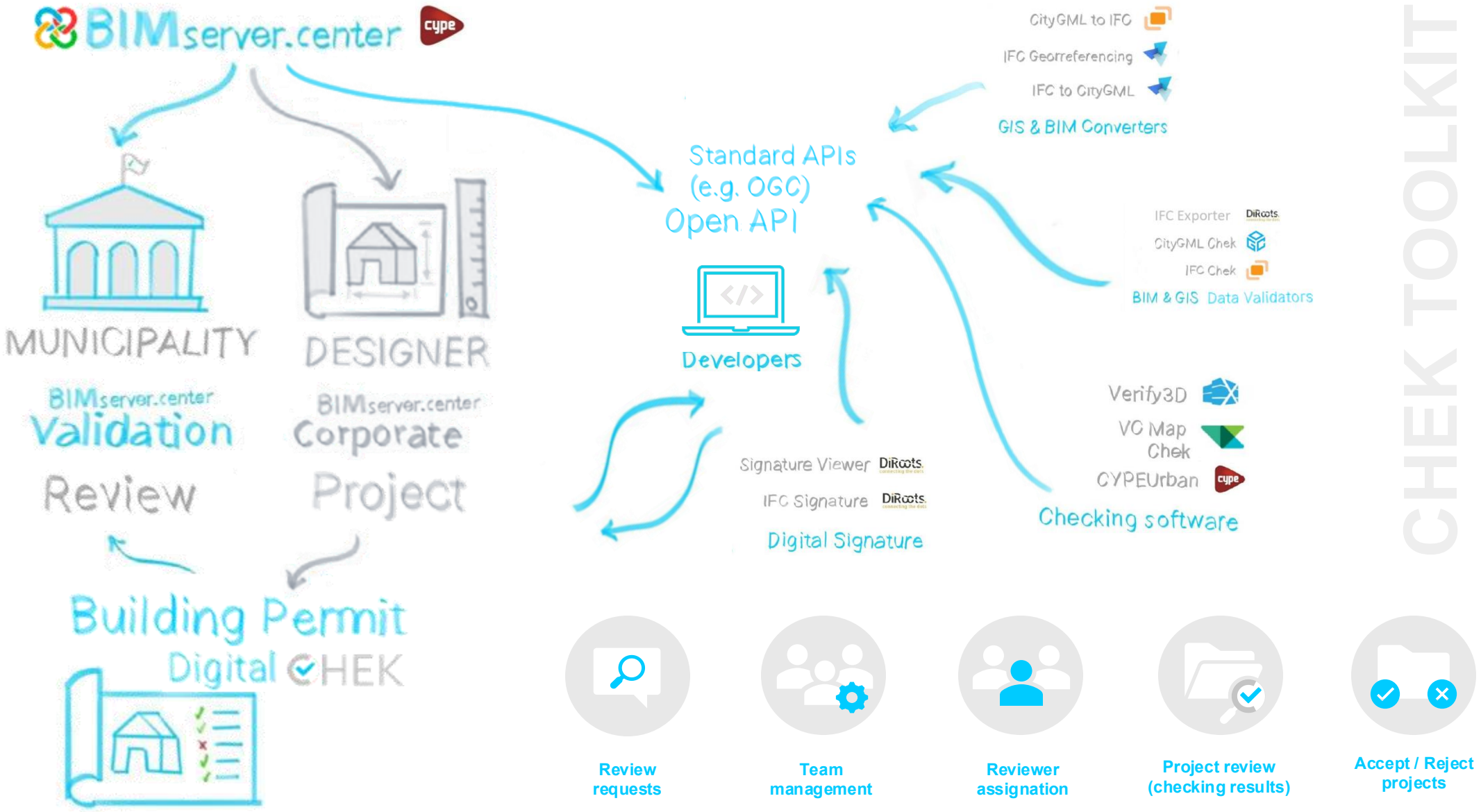
Data validation against DBP requirements

BIM & GIS Data conversion

Compliance Checking

Digital Signature

Support validation workflow trough results sharing and review options



Assigning reviewers

Review requests

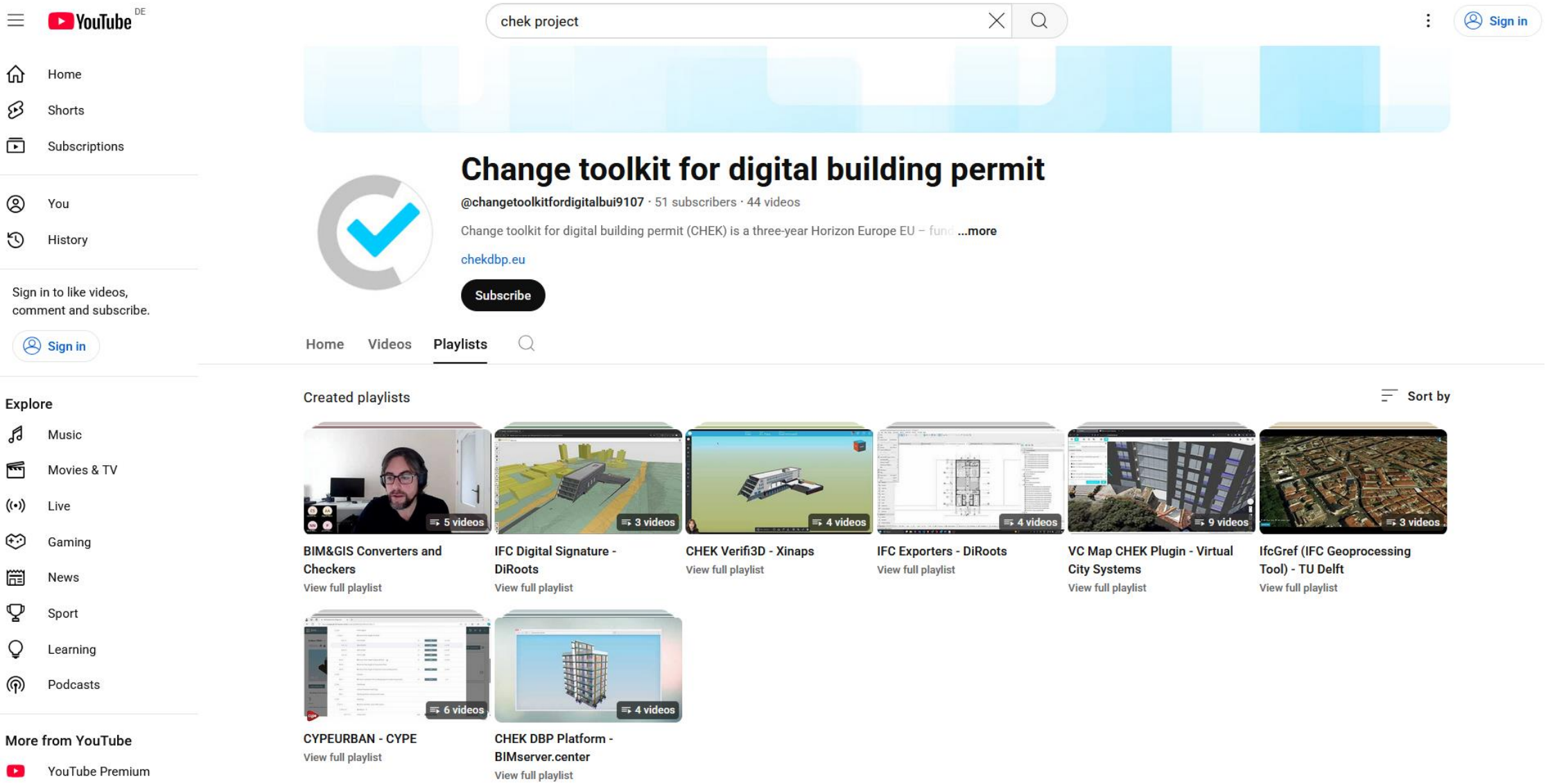
Team management

Reviewer assignation

Project review (checking results)

Accept / Reject projects

CHEK YouTube Channel



Ask and Discover: Your Questions, Our Answers

Thank you very much for your attention!

CHEK

DIGITAL BUILDING PERMIT

CHEKDBP GeoBIM Interoperability Solutions

Making Data Speak the Same Language

Funded by
the European Union

GeoBIM Interoperability

BIM

GIS

GeoBIM Interoperability

BIM

GIS

GeoBIM Interoperability

BIM

Open Standards
Widely accepted

GIS

GeoBIM Interoperability

IFC4

Open Standards
Widely accepted

CityGML

GeoBIM Interoperability

IFC4

CityGML

Open Standards
Widely accepted

BIM focus / GIS focus
File format support

GeoBIM Interoperability

IFC4

CityGML

Open Standards
Widely accepted

BIM focus / GIS focus
File format support

IFC4

CityGML

Open Standards
Widely accepted

BIM focus / GIS focus
File format support

Content Expectation
Validation

IFC4

CityGML

Open Standards
Widely accepted

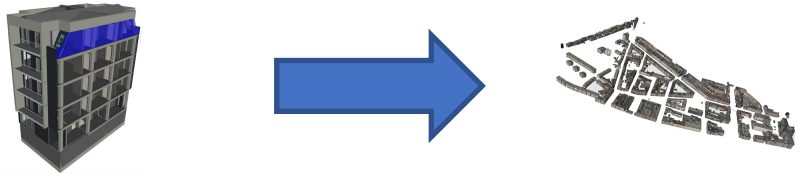
BIM focus / GIS focus
File format support

Content Expectation
Validation

GeoBIM Interoperability

- **Geo2BIM (CityGML > IFC4)**
  WP3 (D3.1)

- **BIM2Geo (IFC4 > CityGML)**
  WP3 (D3.3)



- **GIS data Validation (CityGML Validation)**
  WP2 (D2.4)

- **Geo-referencing (for IFC)**
  WP3 (D3.2)

DIGITAL BUILDING PERMIT

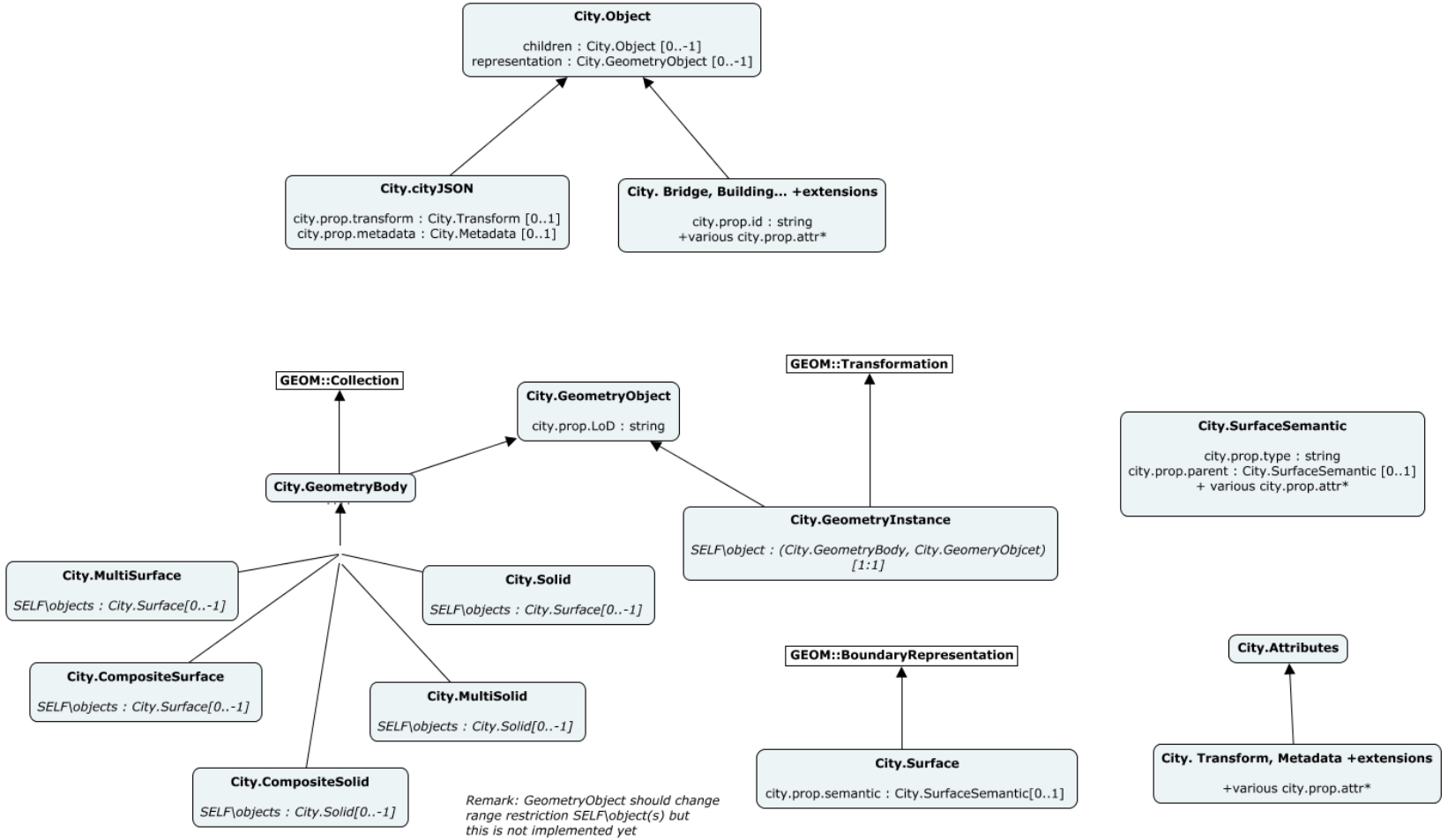
Geo2BIM (CityGML > IFC4)

Peter Bonsma (RDF)

Funded by
the European Union

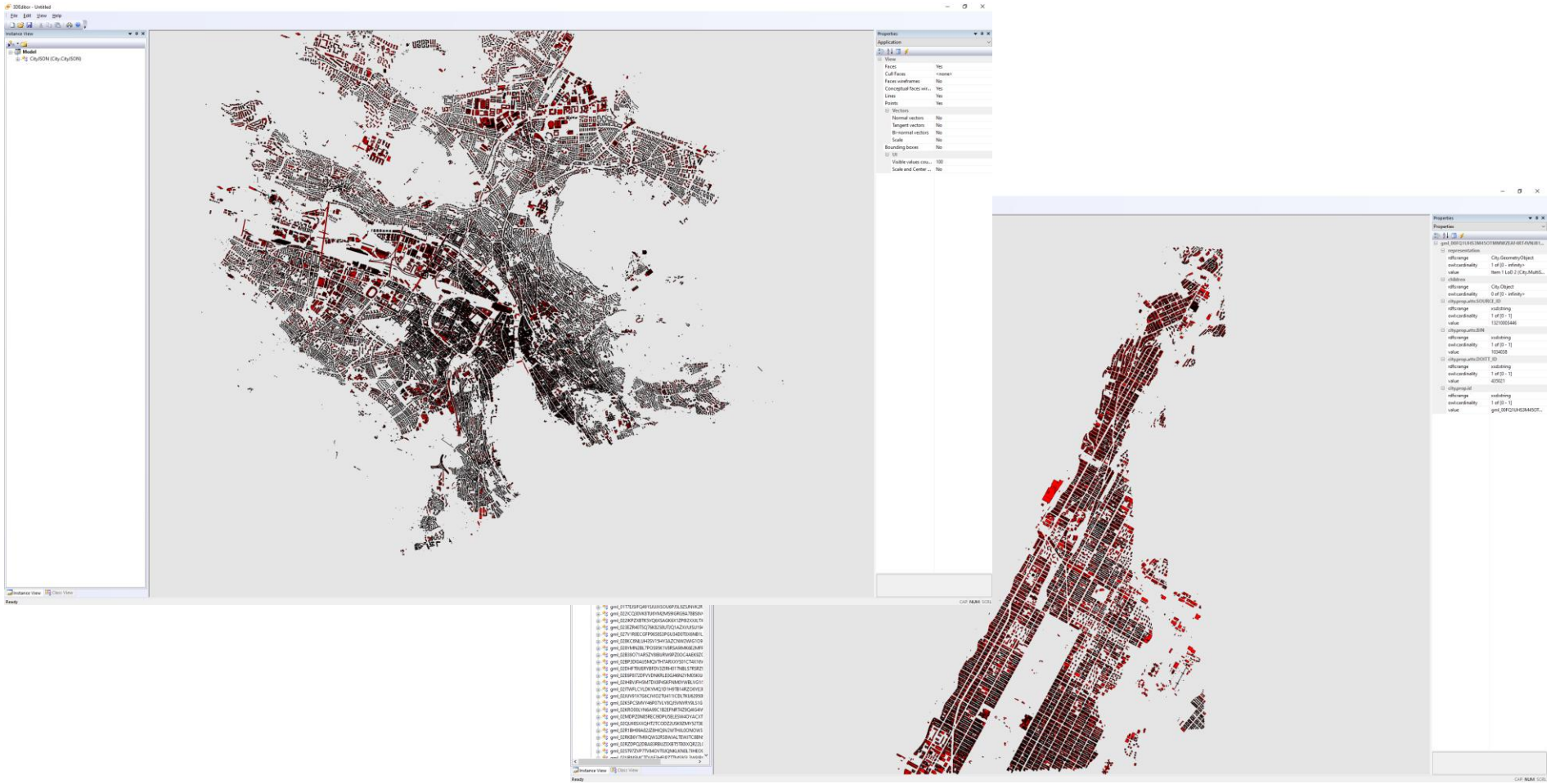
Geo2BIM (CityGML > IFC4)

- **GIS Library + CityGML 3D Viewer + CityGML + Profile Ontology**



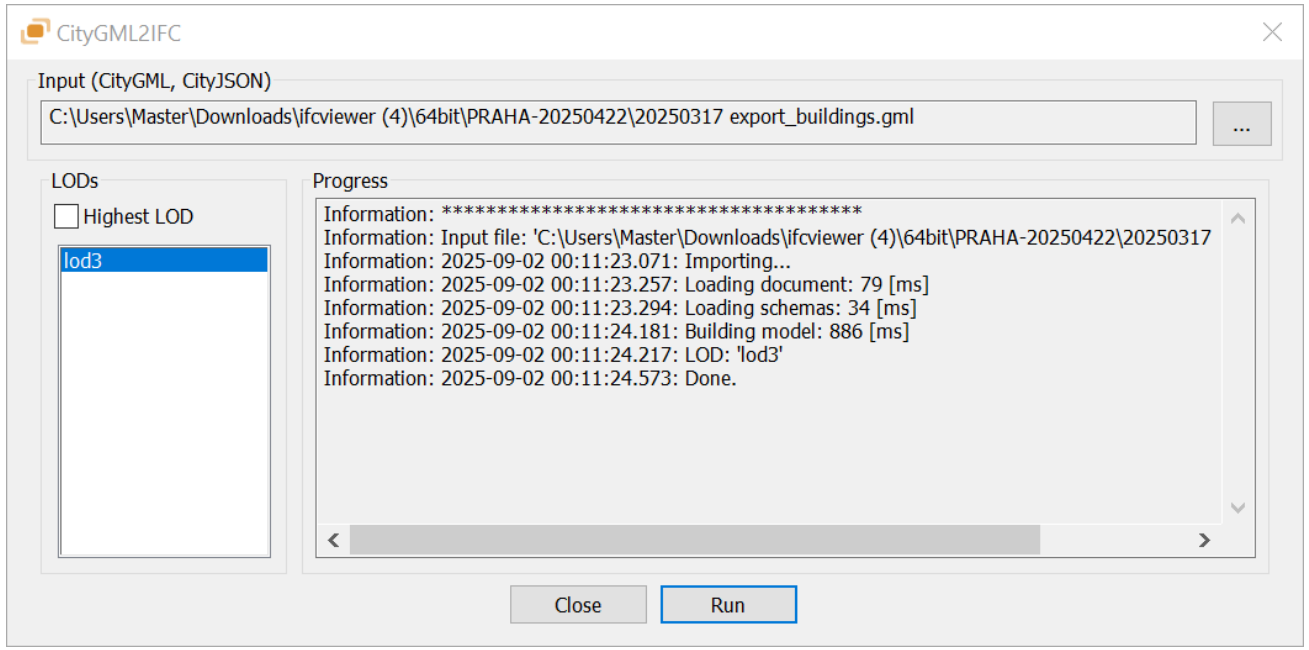
Geo2BIM (CityGML > IFC4)

- **GIS Library + CityGML 3D Viewer + CityGML + Profile Ontology**



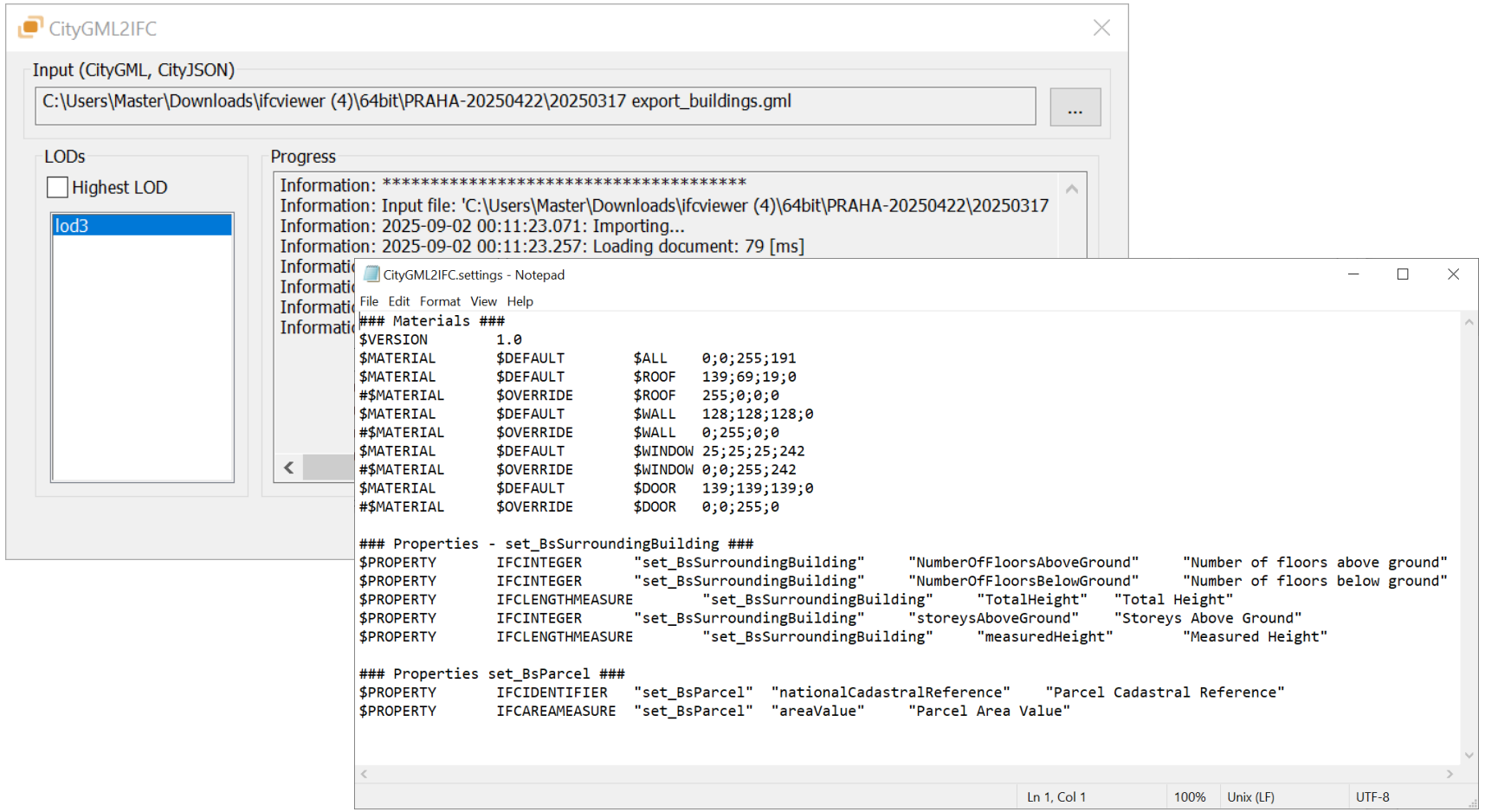
Geo2BIM (CityGML > IFC4)

- **Geo2BIM (CityGML > IFC4)**



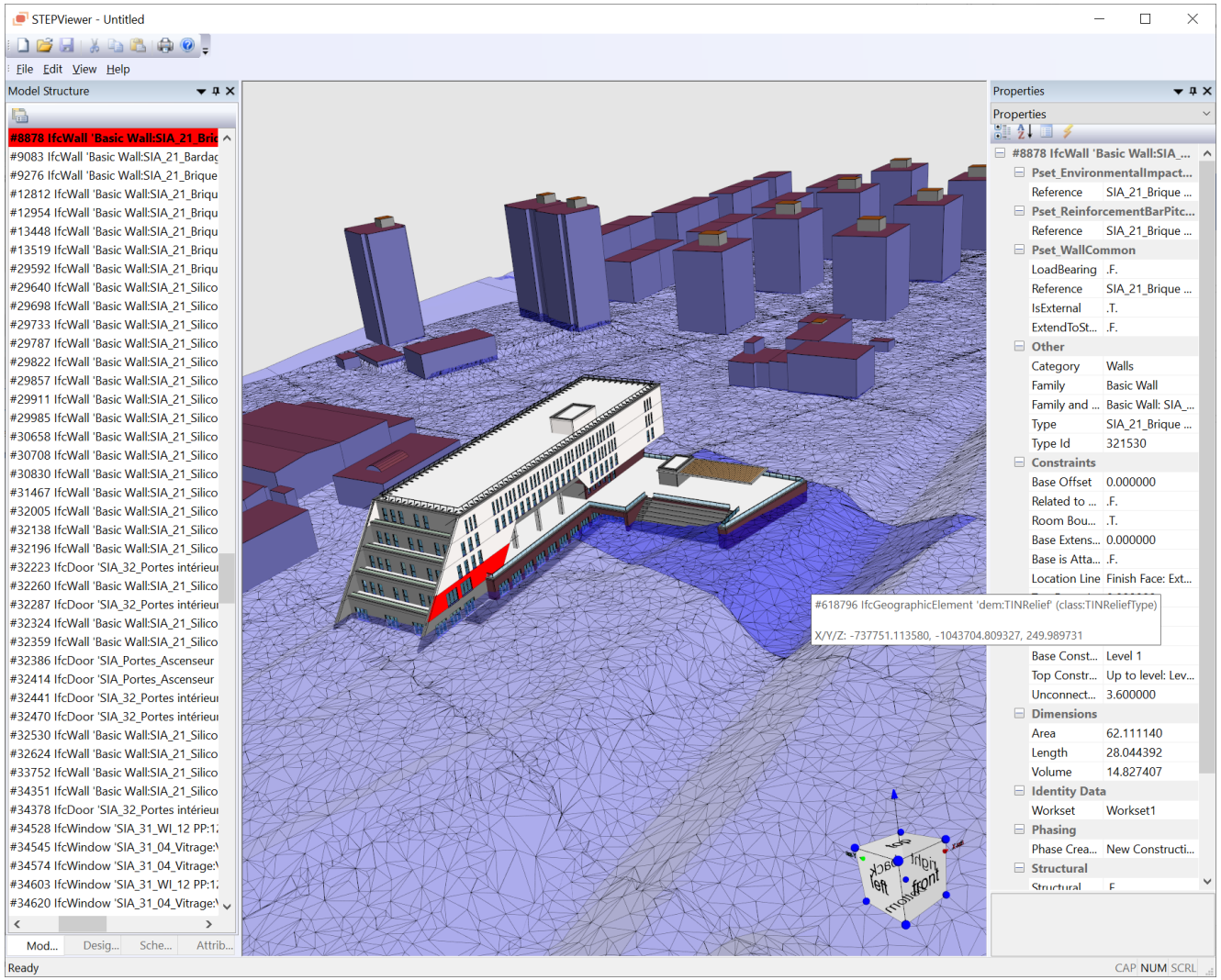
Geo2BIM (CityGML > IFC4)

- **Geo2BIM (CityGML > IFC4)**



Geo2BIM (CityGML > IFC4)

- **Combined view from generated IFC files + existing IFC files**



BIM > GEO

Context

Approach

Tools

BIM2Geo (IFC -> CityGML/CityJSON)

Jasper van der Vaart (TUDelft)

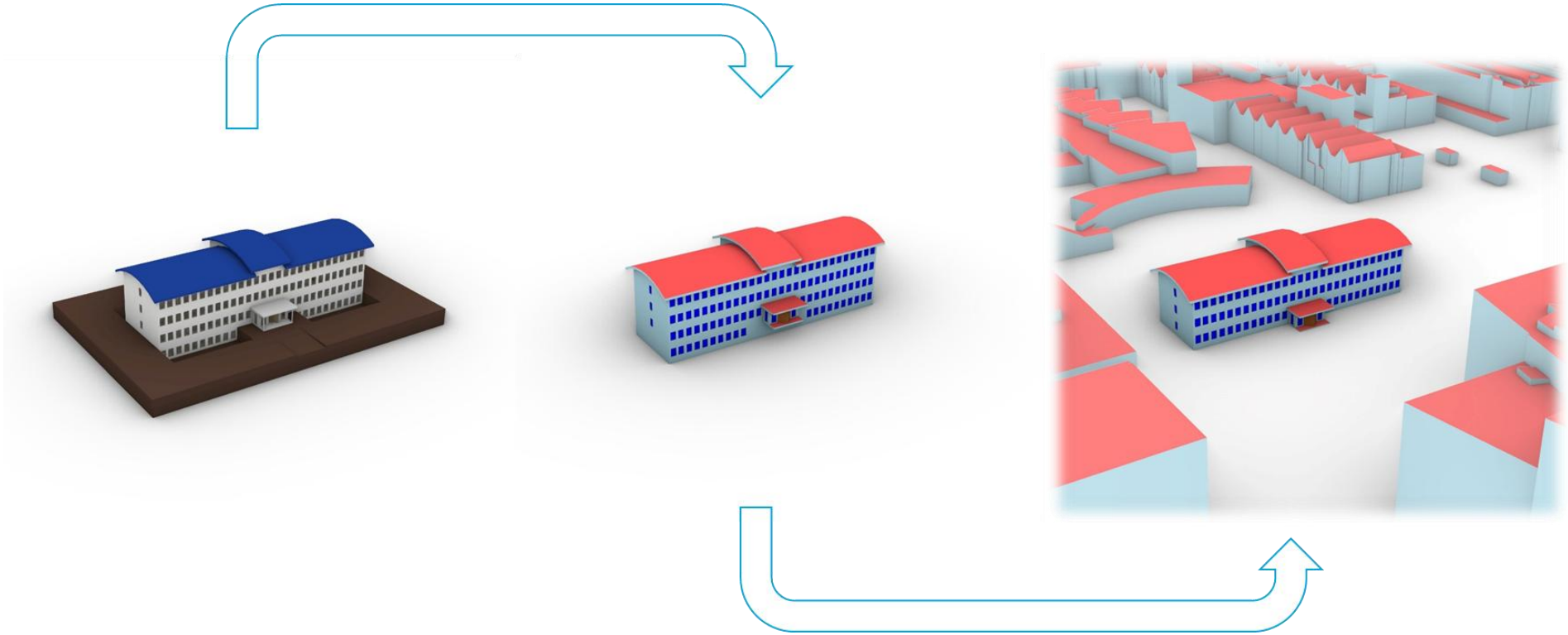
Funded by
the European Union

BIM2Geo (IFC -> CityGML/CityJSON)

Context

Approach

Tools



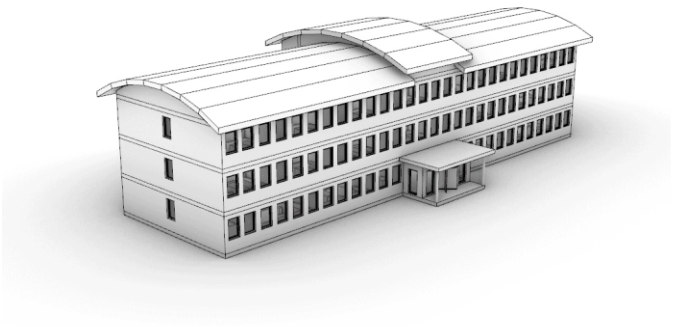
BIM2Geo (IFC -> CityGML/CityJSON)

- **Envelope Extractor**
  https://github.com/jaspervdv/IFC_BuildingEnvExtractor
  BIM to Geo converter

- **CJT (CityJSON Translator)**
  https://github.com/jaspervdv/CJT
  OpenCascade Technology to CityJSON supporting library

BIM2Geo (IFC -> CityGML/CityJSON)

- **BIM2Geo (IFC > CityGML/CityJSON)**



Input model

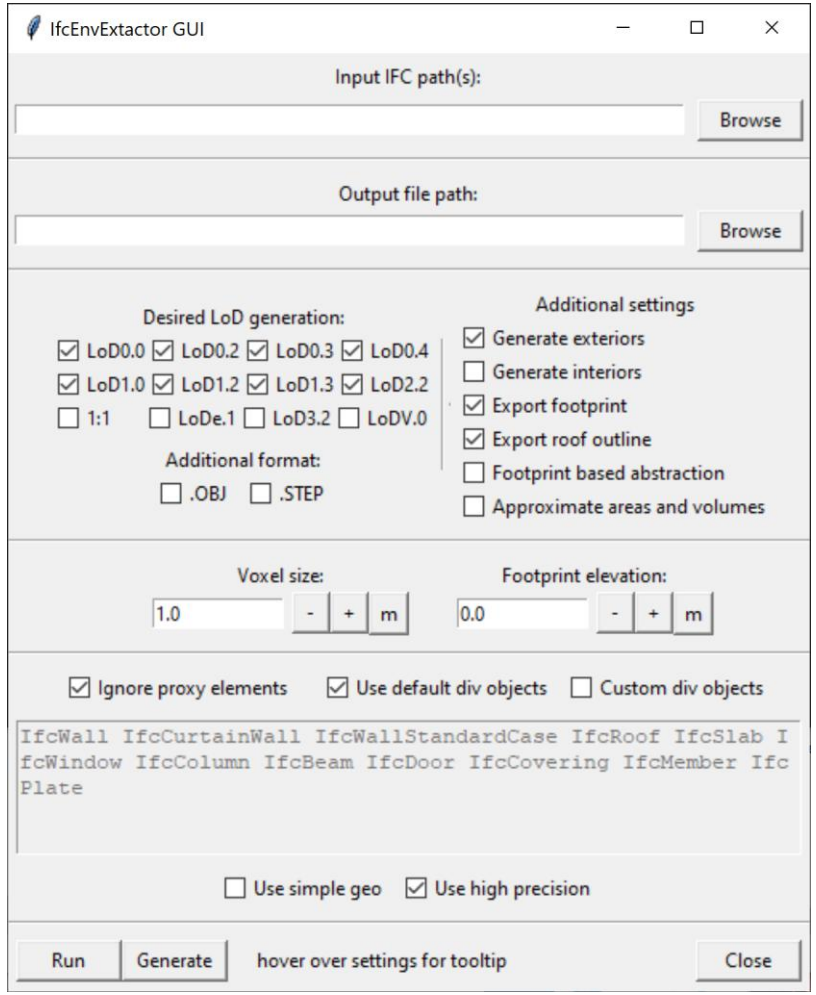
Current possible output shells:

- LoD0.0 (exterior only)
- LoD0.2 (roof outline, footprint, interior storeys, & interior rooms)
- LoD0.3 (roof structure, footprint & interior storeys)
- LoD0.4 (roof structure, footprint) (not standard LoD)
- LoD1.0 (exterior only)
- LoD1.2 (exterior & interior rooms)
- LoD1.3 (exterior only)
- LoD2.2 (exterior & interior rooms)
- **LoD3.2 (exterior & interior rooms)**

BIM2Geo (IFC -> CityGML/CityJSON)

x5 speed

BIM2Geo (IFC -> CityGML/CityJSON)




```
{
    "Filepaths": {
        "Input" :
        [
            "path to IFC file",
            "Potential path to other IFC file"
        ],
        "Output" : "path to export (City)JSON file",
        "Report" : "path to export report JSON file"
    },
    "LoD output": [
        5.0,
        0.0,
        0.2,
        0.3,
        1.0,
        1.2,
        1.3,
        2.2,
        3.2
    ],
    "Voxel":{
        "Size": 1,
        "Store values" : 0,
        "Logic" : 3
    },
    "IFC": {
        "Rotation angle" : 90,
        "Default div": true,
        "Ignore proxy": true,
        "Div objects" : [],
        "Ignore voids" : 0,
        "Simplify geometry" : true,
        "Ignore simplification" : [],
        "Correct placement" : true
    },
    "JSON" : {
        "Footprint elevation": 1,
        "Footprint based" : 0,
        "Horizontal section offset": 0,
        "Generate footprint": 1,
        "Generate roof outline": 1,
        "Generate interior": 0,
        "Generate exterior": 1,
        "Generate site": 0,
        "Georeference" : 1,
        "Merge semantic objects": 1,
    },
    "Output format" : {
        "STEP file" : 1,
        "OBJ file" : 1
    },
    "Tolerances" : {
      "Spatial tolerance" : 1e-6,
      "Angular tolerance" : 1e-4,
      "Area tolerance" : 1e-4
    },
    "Generate report": 1,
    "Threads": 12
}
```

BIM2Geo (IFC -> CityGML/CityJSON)

https://github.com/jaspervdv/IFC_BuildingEnvExtractor

DIGITAL BUILDING PERMIT

GIS Data Validation Workflows

Dr. Abdoulaye Diakite (TUD/CG) / Alejandro Villar (OGC) / Alper Akin (TUD)

Funded by
the European Union

GIS Data Validation

- **Context**

Pre-Submission:

✓ Municipalities provide applicants with information related to the respective plot.

✓ Spatial context comes from municipalities' GIS as a CityGML/CityJSON format.

Post DBP:

✓ Applicants provides the as-built model to municipalities for an up-to-date city model.

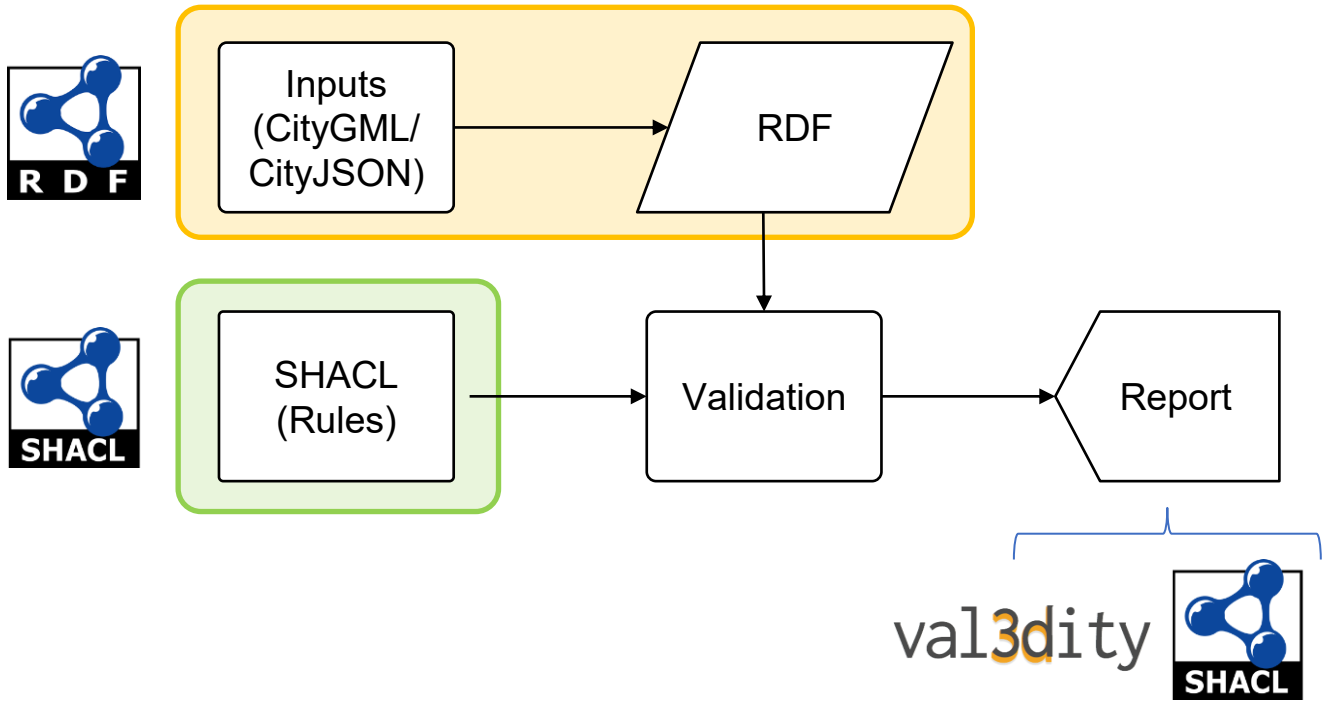
→ The **GIS data** needs to be **validated** against municipalities code requirements (rules).

Approach

Resource Description Framework (RDF)
To describe the semantic information as a graph.

Shapes Constraint Language (SHACL)
To define validation rules (Shapes) for checking the structure of RDF data.

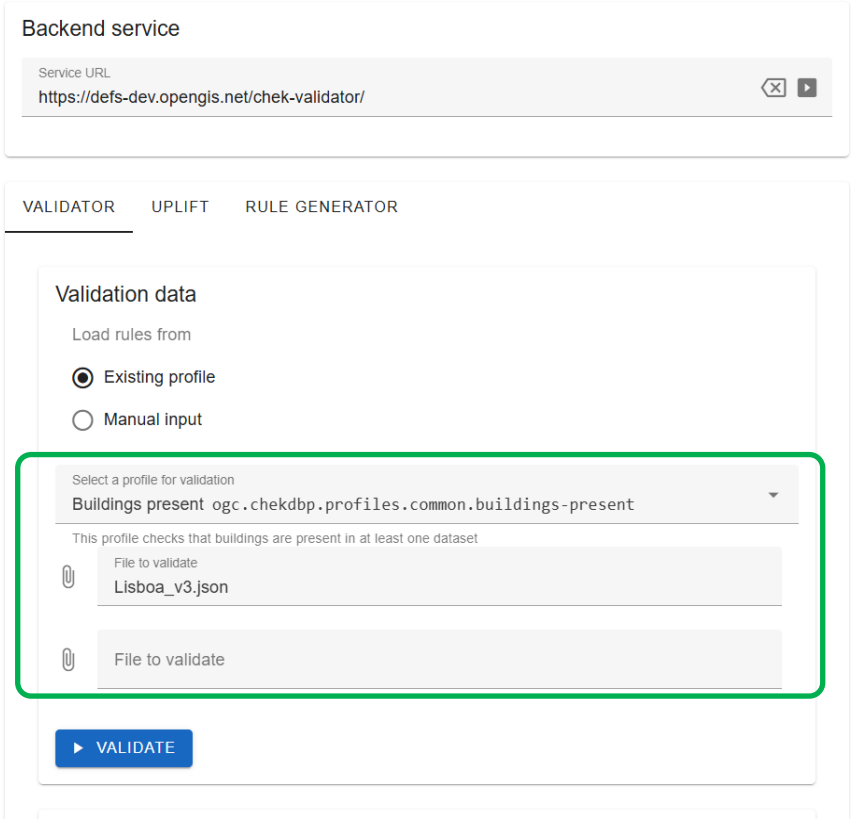
Geometry and topology validity check with **val3dity**

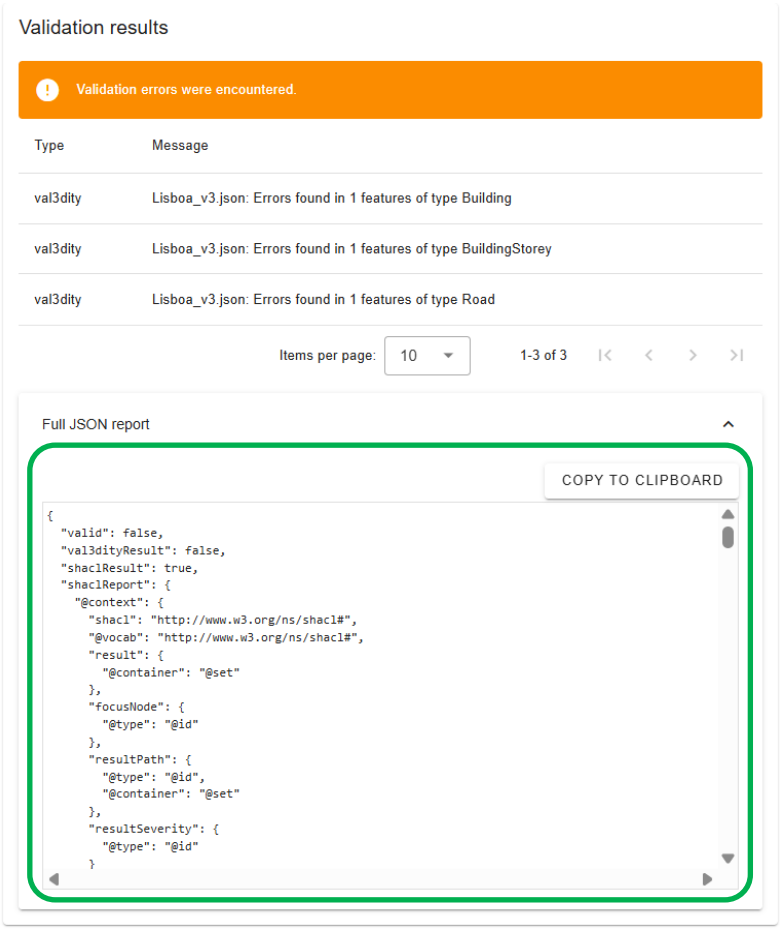


Tools

Three implementations were produced to demonstrate different workflows

1. CHEK default backend service





Tools

2. Server-side processing + Viewer

Set Building Profile

Get Available Building Profiles

ogc.chekdbp.profiles.portugal.lisbon

Upload Custom Profile

Run Validation

ID_59110_0

ID_25896_0

ID_69108_0

ID_57416_0

ID_78668_0

ID_9357_0

Invalid Features from val3dity

- **ID_25896_0** (Building)
  - **Primitive 5** (MultiSurface)
    - [104] RING_SELF_INTERSECTION — ring self-intersects or is collapsed to a line
- **ID_bcb2f89e-4a92-467a-8088-7c44da482100** (BuildingStorey)
  - **Primitive 0** (MultiSurface)
    - [104] RING_SELF_INTERSECTION — ring self-intersects or is collapsed to a line
- **UUID_Road_1161_203947_301243** (Road)
  - *Feature-level errors:*
    - [906] PRIMITIVE_NO_GEOMETRY —

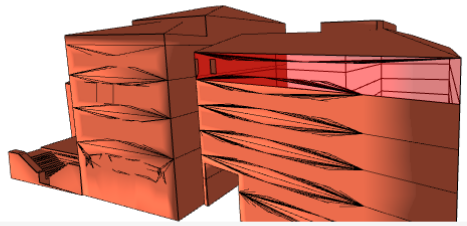
CityJSON File

Choose File temp_cityjson_1747312721.813726.json

View Model

CityJSON not uploaded yet

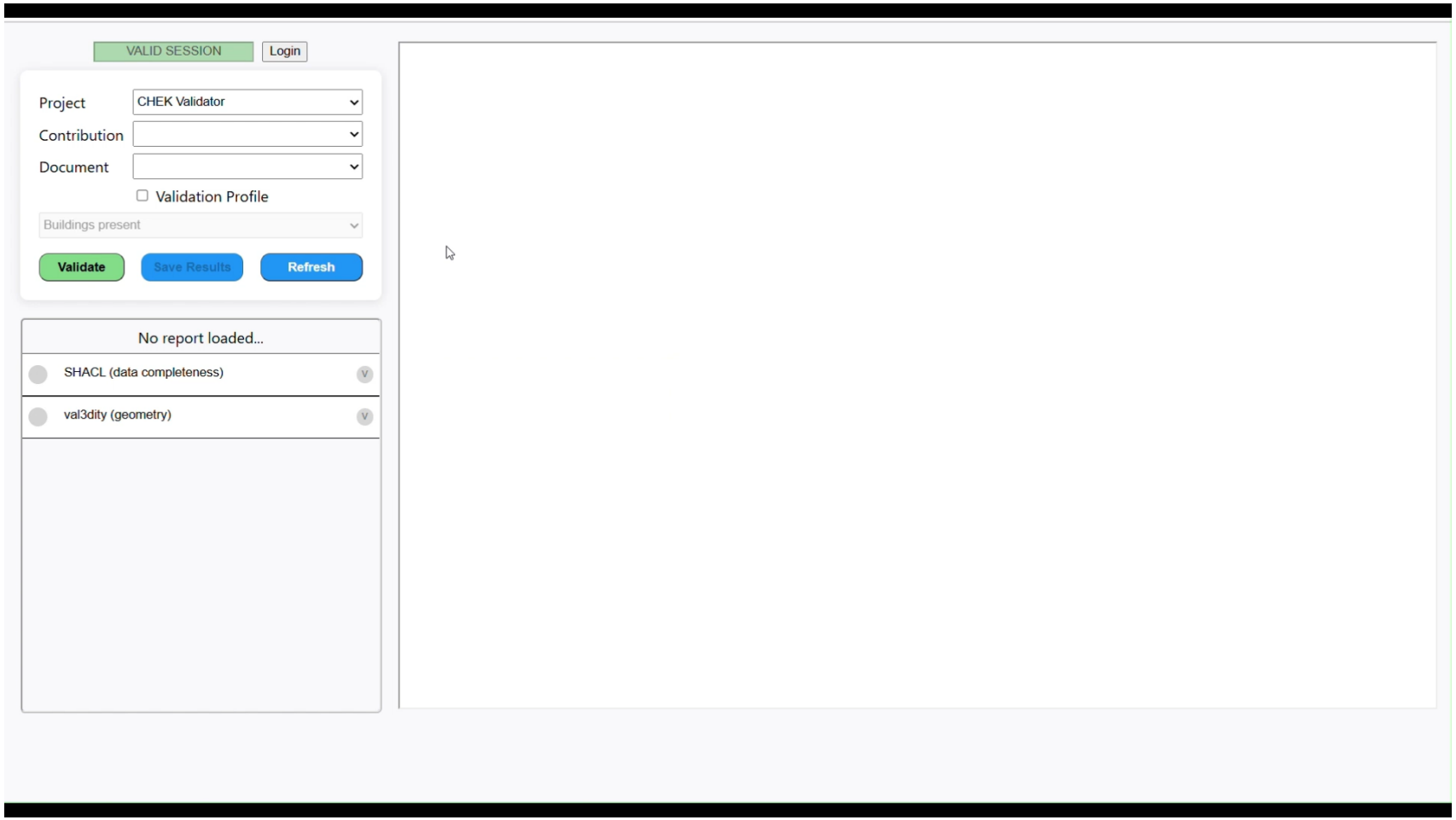
CityJSON model will appear here



GIS Data Validation

- **Tools**

3. Model and Report viewer connected to BIMServer (Fully client side)



GIS Data Validation

- **Tools**

1. Default OGC validator backend

2. With server-side processing

3. BIMServer connector + report browser

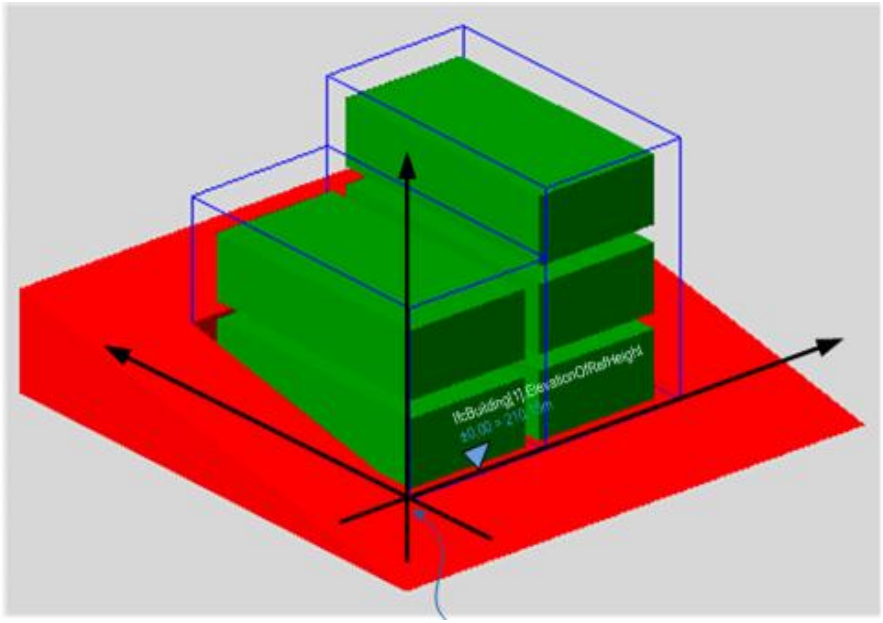
DIGITAL BUILDING PERMIT

IFC georeferencing tool (IfcGref)

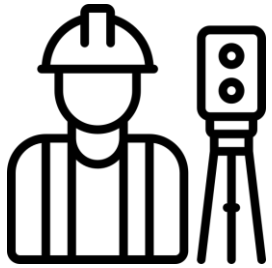
Amir Hakim(TUD)

Funded by
the European Union

Source CRS (BIM) vs Target CRS (Geo)



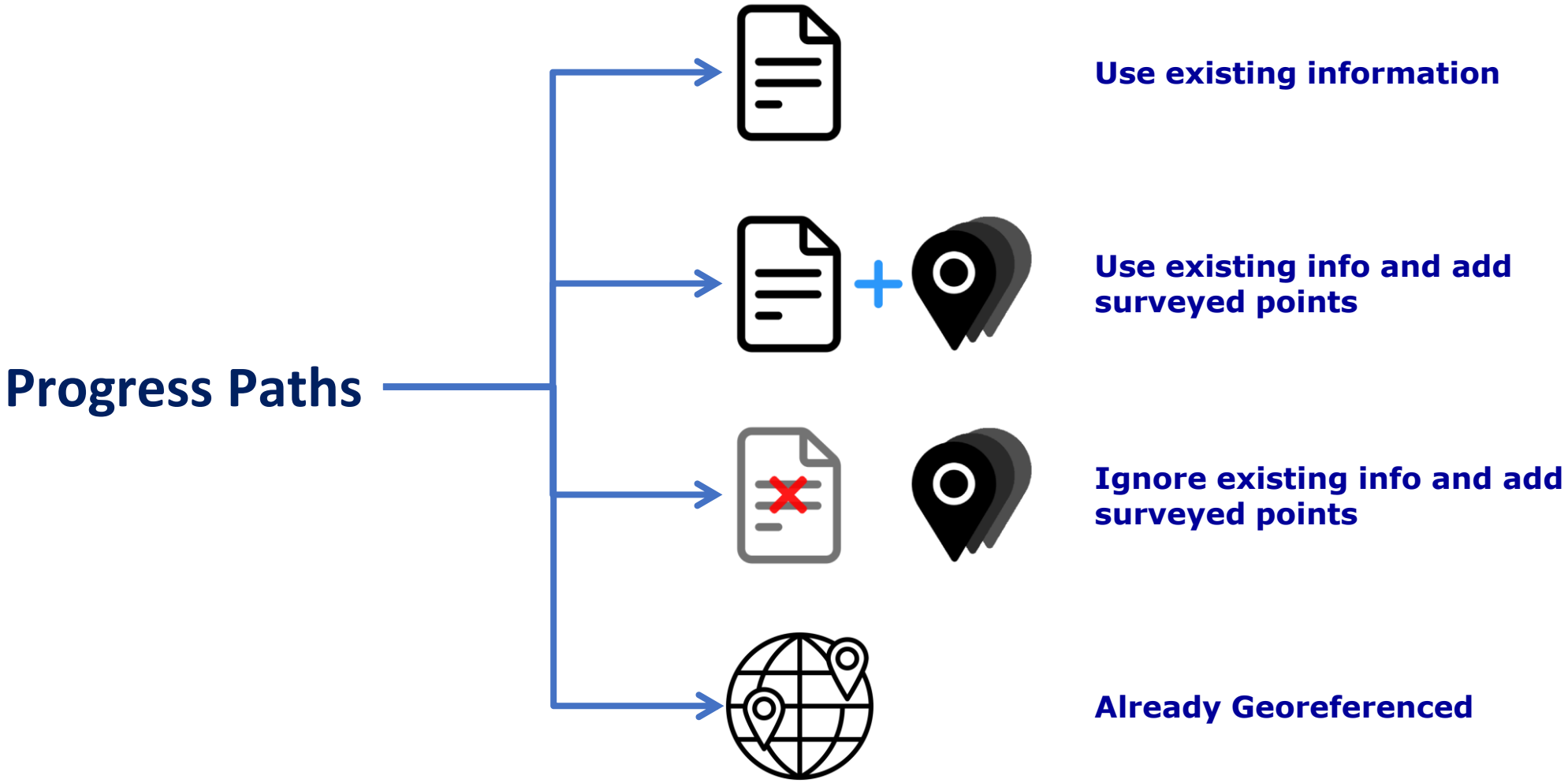
Main Sources for Georeferencing



Surveyed points

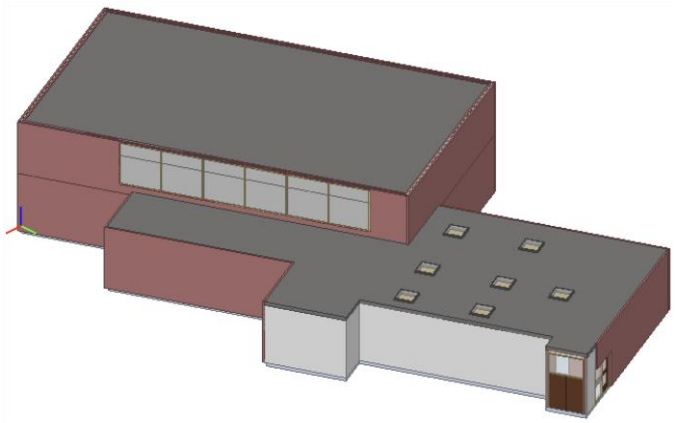
RefLatitude, RefLongitude, RefElevation

TrueNorth



Demo

Simplified workflow



IfcGref

IFC version: IFC4
IFC file is georeferenced.

IFCProjectedCRS Data

	property	value
0	id	103
1	type	IfcProjectedCRS
2	Name	EPSG:5514
3	Description	None
4	GeodeticDatum	None
5	VerticalDatum	None
6	MapProjection	None
7	MapZone	None
8	MapUnit	None

IFCMapConversion Data

	property	value
0	id	104
1	type	IfcMapConversion
2	SourceCRS	[None, Model, 3, 1e-05, [[(0.0, 0.0, 0.0)], None, None], [(6.123031769111886e-17, 1.0)]]
3	TargetCRS	[EPSG:5514, None, None, None, None, None, None]
4	Eastings	-737632.349029
5	Northings	-1043644.868193
6	OrthogonalHeight	249.37
7	XAxisAbscissa	1.0
8	XAxisOrdinate	0.0
9	Scale	None

Show on Map

Read → Validate → Collect → Calculate → Visualize

IfcGref

Funded by the European Union

Feedback Resources

WP3 biweekly meetings

In person and online meeting in Delft

CHEK Architects Review

Software Developers Review

Main Development Decisions by Feedback

Web Platform interface

Add Visualization

UI Change

Supporting 3D viewer

Tutorials

- **Web-Based Application:**

https://ifcgref.bk.tudelft.nl

IfcGref

- **GitHub Repository:**

https://github.com/tudelft3d/ifcgref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