BUILDING DIGITAL TWIN ASSOCIATION

Driving innovation in Building Digital Twins!

Welcome!

SPHERE
BIM DIGITAL TWIN PLATFORM

SPHERE project has received funding from the European Union's H2020 programme under Grant Agreement No. 820805.

BDTIC
2ND BUILDING DIGITAL TWIN International Congress

What is the BDTA??
Non-profit created in Belgium

VISION

To allow the coordination of a multicriteria efficient decision-taking across all AECOO stakeholders by digitally duplicating EU building stock.

MISSION

Develop an Open & Trustworthy Technoeconomic Ecosystem to advance towards full implementation of Building Digital Twin Environments across all the stakeholders and lifecycles of AECOO* Smart and Connected Real State and Infrastructure Assets, including occupants, through professional development and community.

Architecture, Engineering, Construction, Owner & Operator

GUIDING PRINCIPLES

GP 1. OPEN
Develop an Open Technology Framework ready to evolve as a community along the lifespan of AECOO assets and cities

GP 2. ETHICAL
Provide a Citizen Centered Vision to guarantee Privacy and Ethical usage of the generated data

GP 3. RELIABLE
Synchronize updated information of smart and connected buildings towards an un-siloed complete information

GP 4. CIRCULARITY
Allow seamless environmental assessment across lifecycles for a circular management of building environment

GP 5. CLIMATE GOALS
Optimize Energy Performance in buildings by reducing gap projections between lifecycles

GP 6. ECONOMIC VALUE
Generate trustworthy baselines to generate economical guarantees to current and new business in AECOO sector

BDTA Origins → SPHERE PROJECT

SPHERE is a 48 months H2020 EU project, bound to generate an Open Building Digital Twin Environment

SPHERE
BIM DIGITAL TWIN ENVIRONMENT

BDTA is born in the cradle of the project SPHERE as a mechanism to gather and distribute the open knowledge generated by the project.

SPHERE project has received funding from the European Union's H2020 programme under Grant Agreement No. 820805.

SPHERE is the first european project about Digital Twins applied to the building environment

SPHERE BIM DIGITAL TWIN ENVIRONMENT

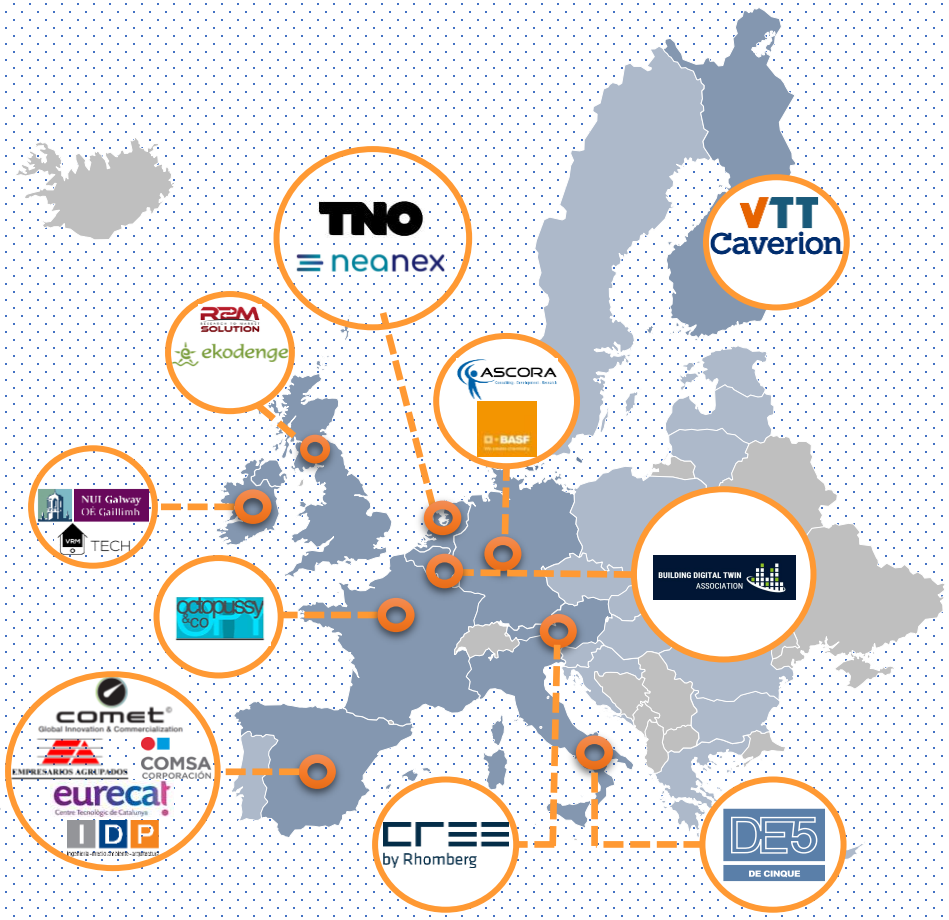
The project aims to develop a BIM-based Digital Twin Environment (DTE) to optimise the building lifecycle, reduce costs and improve energy efficiency in residential buildings.

PLATFORM AS A SERVICE (PaaS)	BUILDING SPECS & REAL TIME DATA
VERTICAL INTEGRATED PROCESSES	USER CENTERED DESIGN (UCD)

SPHERE project has received funding from the European Union's H2020 programme under Grant Agreement No. 820805.

SPHERE CONSORTIUM

Composed of 18 partners from 10 different EU countries, consisting of multi-purpose SME technology leaders as well as software tool providers and expert researchers.



BDTA FOUNDING MEMBERS

BDTA founding Partners are then the whole SPHERE consortium.

BDTA is currently an official new partner of the project.

SPHERE BIM DIGITAL TWIN ENVIRONMENT

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BDTA STRATEGIC AXIS → Community agreed developments in Processes, Skills and Tools!

- **METHODOLOGY:** Definitions, New Roles

- **PUBLICATIONS:** White Papers, Technology Insights

- **TRAINING: OPEN TECHNOLOGY**: Data governance Open Tools for curation and management (e.g. BDTE Ontology Network, SPHERE PaaS Open BDT API, SIMBOTS…)

- **BDT Community: Events and Working groups**

BDTA WORKING GROUPS ALREADY SET!

1. **Definitions and Roles** → Standardization roadmap, trainings and certifications

2. **Open Technology Framework** → BDT Data model and Open API development

3. **Building Lifecycle Management (BLM) Simulation** → SiL and SIMBOTS

4. **Ethics and Privacy Metrics → NEW**

WORKING GROUP #1: BDTE DEFINITIONS & ROLES

Ambition: To generate a community based common set of definitions, roles and their related procedures, to reach interoperable Building Digital Twins Environments *(Interrogative and Predictive Purpose)*.

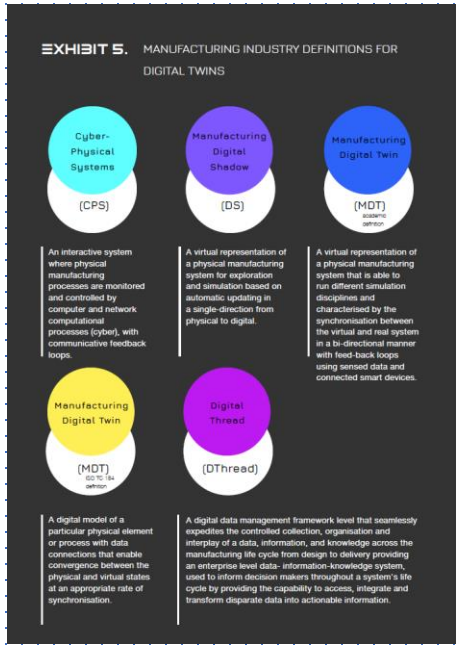
A set of **Building Digital Twin Definitions** generated under the SPHERE research where collected as an open White Paper in Q4 2019.

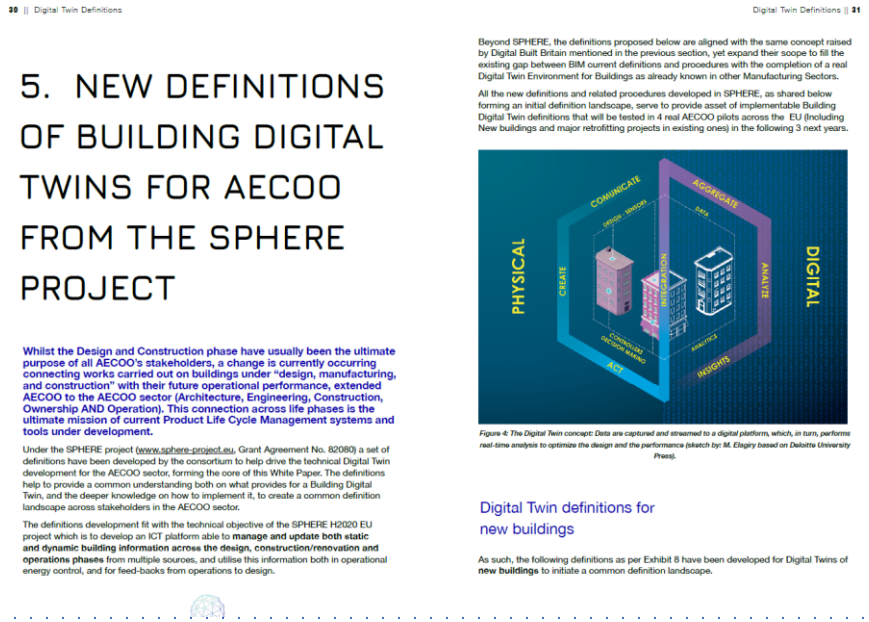
SPHERE BIM DIGITAL TWIN ENVIRONMENT

SPHERE project has received funding from the European Union's H2020 programme under Grant Agreement No. 820805.

WORKING GROUP #1: BDTE DEFINITIONS & ROLES

2019 BDTA whitepaper





WORKING GROUP #1: BDTE DEFINITIONS & ROLES

2019 BDTA whitepaper

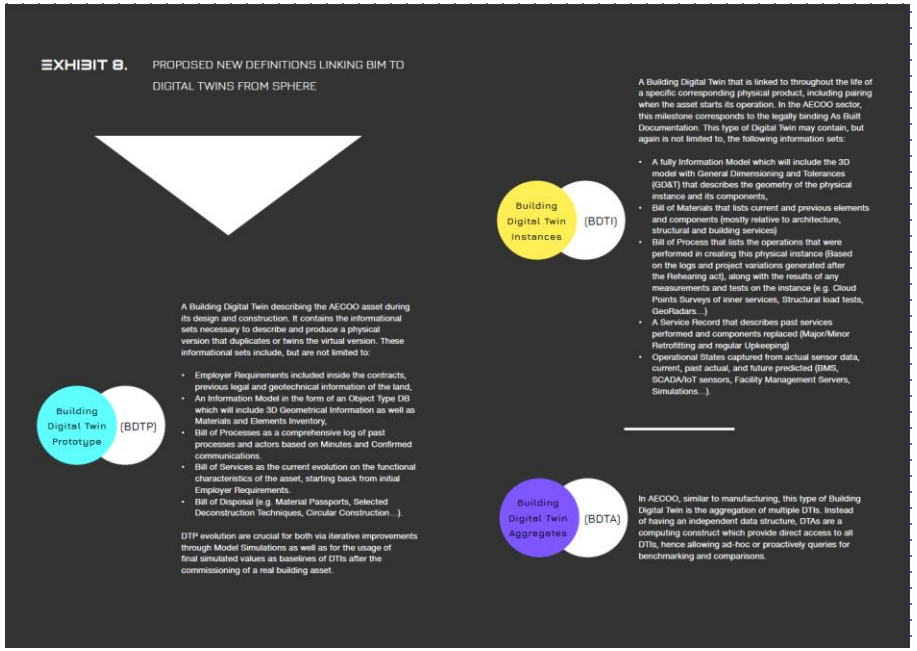


EXHIBIT 8. PROPOSED NEW DEFINITIONS LINKING BIM TO DIGITAL TWINS FROM SPHERE

Building Digital Twin Prototype (BDTP)

A Building Digital Twin describing the AECOO asset during its design and construction. It contains the informational sets necessary to describe and produce a physical version that duplicates or twins the virtual version. These informational sets include, but are not limited to:

- Employer Requirements included inside the contracts, previous legal and geotechnical information of the land,
- An Information Model in the form of an Object Type DB which will include 3D Geometrical Information as well as Materials and Elements Inventory,
- Bill of Processes as a comprehensive log of past processes and actors based on Minutes and Confirmed communications.
- Bill of Services as the current evolution on the functional characteristics of the asset, starting back from initial Employer Requirements.
- Bill of Disposal (e.g. Material Passports, Selected Deconstruction Techniques, Circular Construction…).

DTP evolution are crucial for both via iterative improvements through Model Simulations as well as for the usage of final simulated values as baselines of DTIs after the commissioning of a real building asset.

Building Digital Twin Instances (BDTI)

A Building Digital Twin that is linked to throughout the life of a specific corresponding physical product, including pairing when the asset starts its operation. In the AECOO sector, this milestone corresponds to the legally binding As Built Documentation. This type of Digital Twin may contain, but again is not limited to, the following information sets:

- A fully Information Model which will include the 3D model with General Dimensioning and Tolerances (GD&T) that describes the geometry of the physical instance and its components,
- Bill of Materials that lists current and previous elements and components (mostly relative to architecture, structural and building services)
- Bill of Process that lists the operations that were performed in creating this physical instance (Based on the logs and project variations generated after the Rehearing act), along with the results of any measurements and tests on the instance (e.g. Cloud Points Surveys of inner services, Structural load tests, GeoRadars…)
- A Service Record that describes past services performed and components replaced (Major/Minor Retrofitting and regular Upkeeping)
- Operational States captured from actual sensor data, current, past actual, and future predicted (BMS, SCADA/IoT sensors, Facility Management Servers, Simulations…).

Building Digital Twin Aggregates (BDTA)

In AECOO, similar to manufacturing, this type of Building Digital Twin is the aggregation of multiple DTIs. Instead of having an independent data structure, DTAs are a computing construct which provide direct access to all DTIs, hence allowing ad-hoc or proactively queries for benchmarking and comparisons.

Horizontal Building Digital Twin Aggregate (hBDTA)

This type of DT is following the same principle than in manufacturing use case, by linking similar DTIs. However, in general AECOO products presents a smaller number of assets and much more heterogeneity than manufacturing products. In addition, the legal persons involved in their production are many more than in manufacturing supply chains (e.g. OEMs and TIER1, TIER2) providing a much more distributed data ownership. These two inherent characteristics of AECOO use cases may hinder both the representativeness of the aggregated data as well as the potential of queries scopes.

Vertical Building Digital Twin Aggregate (vBDTA)

From the point of view of many related stakeholders of the AECOO sector (owners, tenants, Public Administrations, assurances…) a real state (container) has to be considered jointly as a container for the products held inside itself (contents) like appliances, furniture, and personal goods. These contents may, as well as important components of the building services and auxiliary systems (e.g. Buildings Automations), could have their own Digital Twin Instances. The connection among these multi-scale Digital Twin Instances will highly expand the boundaries of access to relevant information. On the other side, many actions are nowadays producing DTIs from Critical Civil Infrastructures and even whole districts are proposed, thus reaching infrastructure-scale and cities-scale. Building scale is then the hinge in between cities and its contents, and the synchronization of Building Digital twins across the Digital Twin scales will allow the vertical aggregation from appliances to districts. In there, vBDTA will put the focus on the AECOO stakeholders needs of relevant information and optimized queries.

Building Digital Twin Environment (BDTE)

Beyond this, by the creation of any DTE, two main purposes are sought: Predictive (intimately linked with simulation tools of DTPs and DTIs) and Interrogative (applying to DTIs as well as to DTAs in-depth analysis). As it happens to be in any DTE, these two basic drivers may include completely different requests depending on which is the role of the stakeholder interacting and the typology of the Digital Twin.

EXHIBIT 9. PROPOSED NEW DEFINITIONS LINKING BIM TO DIGITAL TWINS FROM SPHERE

BIM based Building Digital Twin Prototype

Using exiting containers of information related to AECOO projects under the ISO 19650-1:2018 will bring most of the desired features to create a BDTP during design and construction phases. The Project Information Model consist mainly on BIM Model developed inside the CDE will be the main source of the DTP, although not the only one, since BDTPs will include at least , although not limited to, a BEP legal document agreed by the main stakeholders involved in this phase, developing legal framework, standards, technical procedures, personnel, data property and the scope and all internal and external requirements (PIR+AIR, as well as the OIRs of the key organizations), previous files related to the setting, including terrain legal information (e.g. Cadaster, Historical…) as well as its geometrical information (topological surveys, geotechnical campaigns…), It also includes other not structures data, conforming an Information Model. Also a PIM moved to a BDTP should include links between other databases related to the model which are mare managed and updated dynamically. In relation to this managing the data of the PIM outside of the BIM Models itself is a challenge that BDTP should address.

BIM based Building Digital Twin Instance

BDTIs must integrate all the relevant information stored by the BDTP and will hence sequentially use past Information Models to structure this type of Digital Twin. By considering again AECOO projects develop under the ISO 19650-1:2018, a new asset entering in its operation and maintenance phase may include store the evolution of the AIM starting on from the previous As Built Model of Information. This initial AIM and its following recordings will hence provide the necessary Information of the current Instance including the General Dimensioning and Tolerances (GD&T), Bill of Materials and the Bill of Representative Processes (including evolutions in the BEP and BCF communications), along with the results of any measurements and tests on the instance (e.g. Cloud Points Surveys of inner services, Structural load tests, GeoRadars…), a Service Record that describes past services performed and components replaced (Major/ Minor Retrofitting and regular Upkeeping), and Operational States captured from actual sensor data, current, past , actual, and future predicted (BMS, SCADA/IoT sensors, Facility Management Servers, Simulations…). All of this information must be linked dynamically to the BIM Models that composes the AIM.

BIM based Building Digital Twin Aggregates

The computational construct of how to allow enough synchronization of an heterogeneous set of Digital Twins is the most undeveloped field of the Building Digital Twins. However, there are some developments in current BIM SoA indirectelly aiming to this concept, like the use of standardized libraries in order to homogenize the whole aggregation of information. Moreover, according to ISO-19650, AIR could be the way to develop specifications that allow to manage future BDTA, because it implies a set of standardized definitions of the model objects used in the AIMs.
SPHERE project is currently proposing horizontal BDTA by the usage of a Platform as a Service Architecture which will include at least the following services:

- Linked Data Semantics Ontology.
- Integrated IoT Platform
- IFC Reader
- Block Chain
- Digital Twin Object Libraries

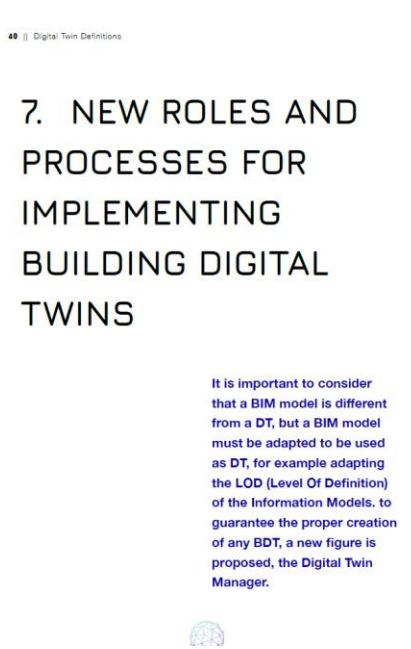
Assumptions based on the experience in manufacturing allow to forecast this will be the most rewarding by a complete multidisciplinary PLM assessment of horizontal and vertical Building-centered aggregations.

BIM based Building Digital Twin Environment

The BDTE will be able to expand any current CDE functionalities to be able to manage all the PIM and AIM information dynamically, plus the connection with the on-site monitoring devices and actuators, especially for the asset operational stage.

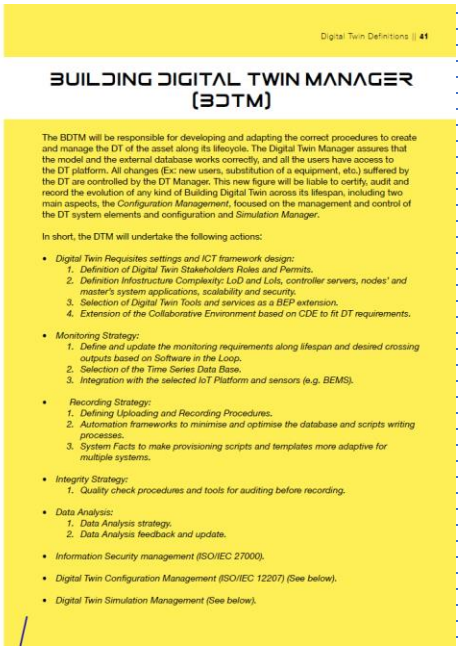
WORKING GROUP #1: BDTE DEFINITIONS & ROLES

2019 BDTA whitepaper



7. NEW ROLES AND PROCESSES FOR IMPLEMENTING BUILDING DIGITAL TWINS

It is important to consider that a BIM model is different from a DT, but a BIM model must be adapted to be used as DT, for example adapting the LOD (Level Of Definition) of the Information Models. to guarantee the proper creation of any BDT, a new figure is proposed, the Digital Twin Manager.

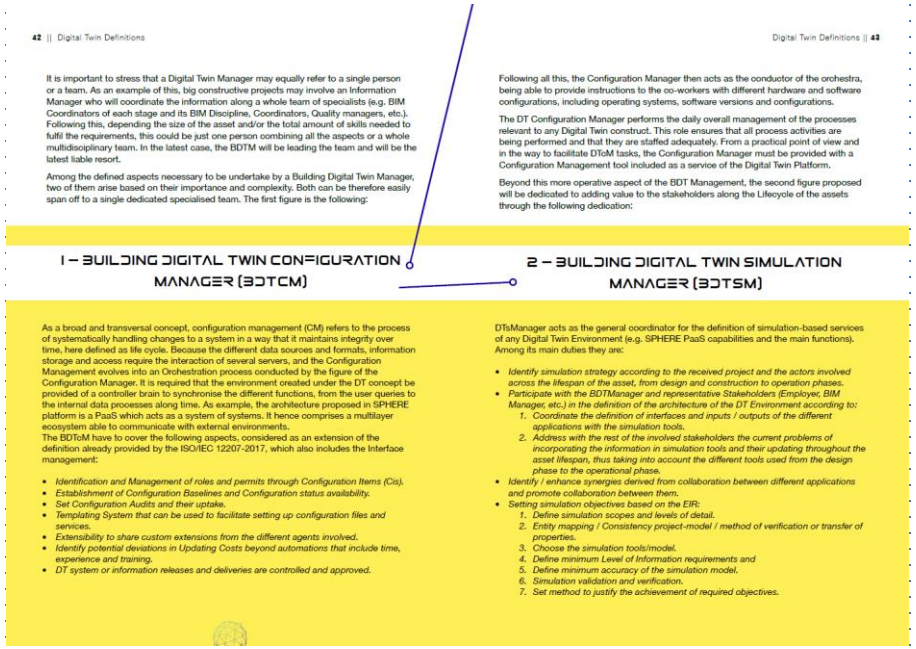


BUILDING DIGITAL TWIN MANAGER (BDTM)

The BDTM will be responsible for developing and adapting the correct procedures to create and manage the DT of the asset along its lifecycle. The Digital Twin Manager assures that the model and the external database works correctly, and all the users have access to the DT platform. All changes (Ex: new users, substitution of a equipment, etc.) suffered by the DT are controlled by the DT Manager. This new figure will be liable to certify, audit and record the evolution of any kind of Building Digital Twin across its lifespan, including two main aspects, the *Configuration Management*, focused on the management and control of the DT system elements and configuration and *Simulation Manager*.

In short, the DTM will undertake the following actions:

- *Digital Twin Requisites settings and ICT framework design:*
  1. *Definition of Digital Twin Stakeholders Roles and Permits.*
  2. *Definition Infostructure Complexity: LoD and LoIs, controller servers, nodes' and master's system applications, scalability and security.*
  3. *Selection of Digital Twin Tools and services as a BEP extension.*
  4. *Extension of the Collaborative Environment based on CDE to fit DT requirements.*
- *Monitoring Strategy:*
  1. *Define and update the monitoring requirements along lifespan and desired crossing outputs based on Software in the Loop.*
  2. *Selection of the Time Series Data Base.*
  3. *Integration with the selected IoT Platform and sensors (e.g. BEMS).*
- *Recording Strategy:*
  1. *Defining Uploading and Recording Procedures.*
  2. *Automation frameworks to minimise and optimise the database and scripts writing processes.*
  3. *System Facts to make provisioning scripts and templates more adaptive for multiple systems.*
- *Integrity Strategy:*
  1. *Quality check procedures and tools for auditing before recording.*
- *Data Analysis:*
  1. *Data Analysis strategy.*
  2. *Data Analysis feedback and update.*
- *Information Security management (ISO/IEC 27000).*
- *Digital Twin Configuration Management (ISO/IEC 12207) (See below).*
- *Digital Twin Simulation Management (See below).*



It is important to stress that a Digital Twin Manager may equally refer to a single person or a team. As an example of this, big constructive projects may involve an Information Manager who will coordinate the information along a whole team of specialists (e.g. BIM Coordinators of each stage and its BIM Discipline, Coordinators, Quality managers, etc.). Following this, depending the size of the asset and/or the total amount of skills needed to fulfil the requirements, this could be just one person combining all the aspects or a whole multidisciplinary team. In the latest case, the BDTM will be leading the team and will be the latest liable resort.

Among the defined aspects necessary to be undertake by a Building Digital Twin Manager, two of them arise based on their importance and complexity. Both can be therefore easily span off to a single dedicated specialised team. The first figure is the following:

Following all this, the Configuration Manager then acts as the conductor of the orchestra, being able to provide instructions to the co-workers with different hardware and software configurations, including operating systems, software versions and configurations.

The DT Configuration Manager performs the daily overall management of the processes relevant to any Digital Twin construct. This role ensures that all process activities are being performed and that they are staffed adequately. From a practical point of view and in the way to facilitate DToM tasks, the Configuration Manager must be provided with a Configuration Management tool included as a service of the Digital Twin Platform.

Beyond this more operative aspect of the BDT Management, the second figure proposed will be dedicated to adding value to the stakeholders along the Lifecycle of the assets through the following dedication:

1 – BUILDING DIGITAL TWIN CONFIGURATION MANAGER (BDTCM)

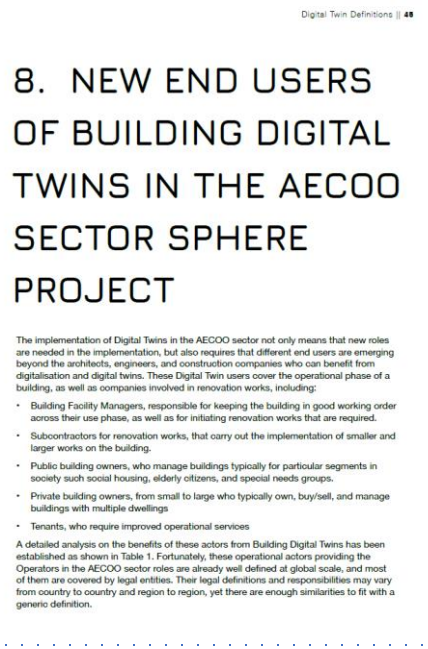
As a broad and transversal concept, configuration management (CM) refers to the process of systematically handling changes to a system in a way that it maintains integrity over time, here defined as life cycle. Because the different data sources and formats, information storage and access require the interaction of several servers, and the Configuration Management evolves into an Orchestration process conducted by the figure of the Configuration Manager. It is required that the environment created under the DT concept be provided of a controller brain to synchronise the different functions, from the user queries to the internal data processes along time. As example, the architecture proposed in SPHERE platform is a PaaS which acts as a system of systems. It hence comprises a multilayer ecosystem able to communicate with external environments.
The BDToM have to cover the following aspects, considered as an extension of the definition already provided by the ISO/IEC 12207-2017, which also includes the Interface management:

- *Identification and Management of roles and permits through Configuration Items (Cis).*
- *Establishment of Configuration Baselines and Configuration status availability.*
- *Set Configuration Audits and their uptake.*
- *Templating System that can be used to facilitate setting up configuration files and services.*
- *Extensibility to share custom extensions from the different agents involved.*
- *Identify potential deviations in Updating Costs beyond automations that include time, experience and training.*
- *DT system or information releases and deliveries are controlled and approved.*

2 – BUILDING DIGITAL TWIN SIMULATION MANAGER (BDTSM)

DTsManager acts as the general coordinator for the definition of simulation-based services of any Digital Twin Environment (e.g. SPHERE PaaS capabilities and the main functions). Among its main duties they are:

- *Identify simulation strategy according to the received project and the actors involved across the lifespan of the asset, from design and construction to operation phases.*
- *Participate with the BDTManager and representative Stakeholders (Employer, BIM Manager, etc.) in the definition of the architecture of the DT Environment according to:*
  1. *Coordinate the definition of interfaces and inputs / outputs of the different applications with the simulation tools.*
  2. *Address with the rest of the involved stakeholders the current problems of incorporating the information in simulation tools and their updating throughout the asset lifespan, thus taking into account the different tools used from the design phase to the operational phase.*
- *Identify / enhance synergies derived from collaboration between different applications and promote collaboration between them.*
- *Setting simulation objectives based on the EIR:*
  1. *Define simulation scopes and levels of detail.*
  2. *Entity mapping / Consistency project-model / method of verification or transfer of properties.*
  3. *Choose the simulation tools/model.*
  4. *Define minimum Level of Information requirements and*
  5. *Define minimum accuracy of the simulation model.*
  6. *Simulation validation and verification.*
  7. *Set method to justify the achievement of required objectives.*



8. NEW END USERS OF BUILDING DIGITAL TWINS IN THE AECOO SECTOR SPHERE PROJECT

The implementation of Digital Twins in the AECOO sector not only means that new roles are needed in the implementation, but also requires that different end users are emerging beyond the architects, engineers, and construction companies who can benefit from digitalisation and digital twins. These Digital Twin users cover the operational phase of a building, as well as companies involved in renovation works, including:

- Building Facility Managers, responsible for keeping the building in good working order across their use phase, as well as for initiating renovation works that are required.
- Subcontractors for renovation works, that carry out the implementation of smaller and larger works on the building.
- Public building owners, who manage buildings typically for particular segments in society such social housing, elderly citizens, and special needs groups.
- Private building owners, from small to large who typically own, buy/sell, and manage buildings with multiple dwellings
- Tenants, who require improved operational services

A detailed analysis on the benefits of these actors from Building Digital Twins has been established as shown in Table 1. Fortunately, these operational actors providing the Operators in the AECOO sector roles are already well defined at global scale, and most of them are covered by legal entities. Their legal definitions and responsibilities may vary from country to country and region to region, yet there are enough similarities to fit with a generic definition.

WORKING GROUP #1: BDTE DEFINITIONS & ROLES

TRAININGS GUIDELINES

To guarantee a solid ground to underpin BDT Environments, a set of Certifications will be developed under the BDT following the Definitions, Roles, Methodology and Open Tools developed.

Project Management Institute. Barcelona, Spain

SPHERE BIM DIGITAL TWIN ENVIRONMENT

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First Initiative in Certification will be the proposed New Roles:

- BDT Manager
- BDT Configuration Manager
- BDT Simulation Manager

WORKING GROUP #1: BDTE DEFINITIONS & ROLES

Next Steps → Creation of the Working Group 9 (Building Digital Twins) under 442 Technical Committee

UNE Normalización Española

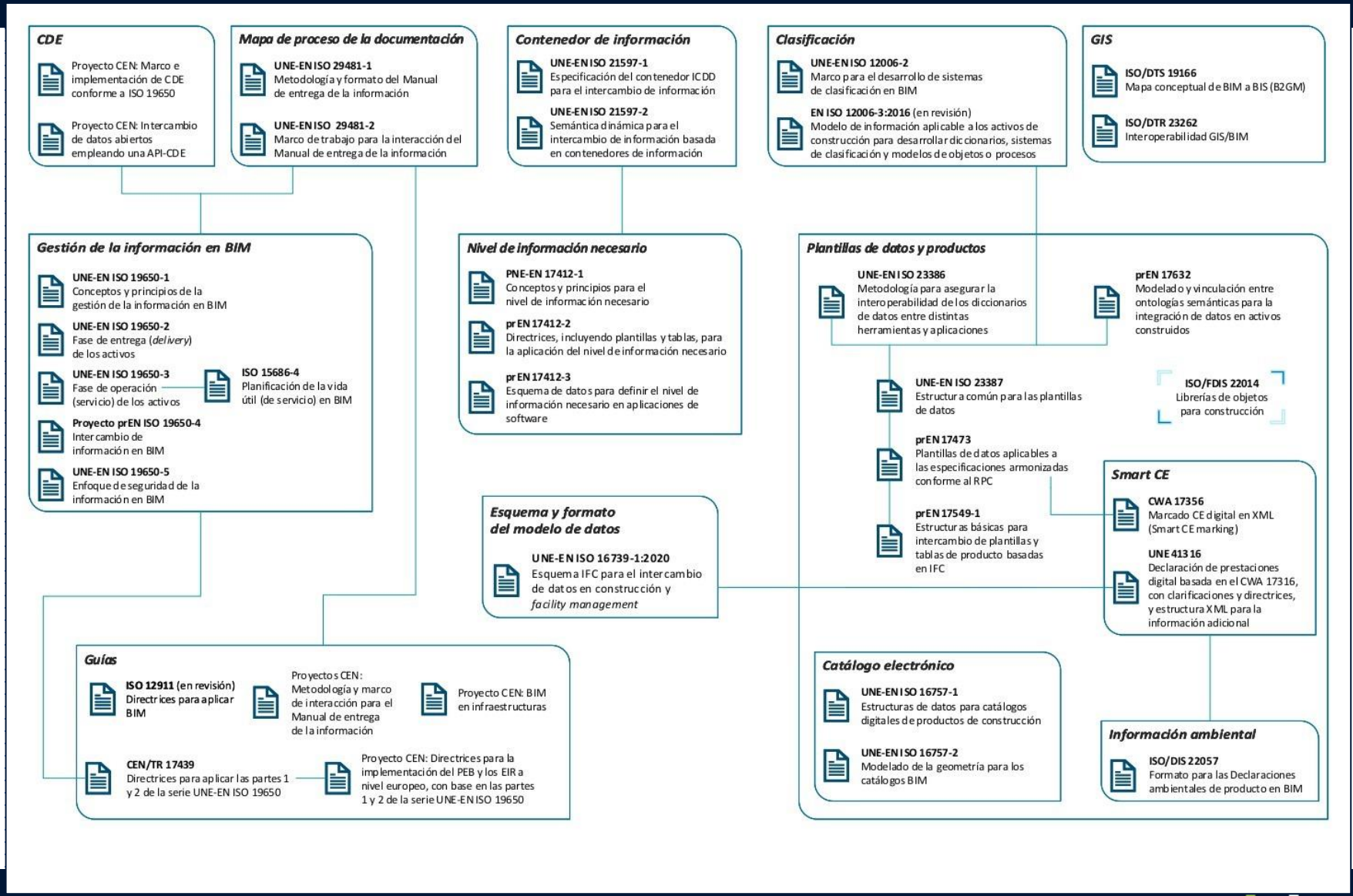
- **Spanish official National Standardization Body** since 1986 (formerly known as AENOR)

ISO IEC cen CENELEC ETSI COPANT

WORKING GROUP #1: BDTE DEFINITIONS & ROLES

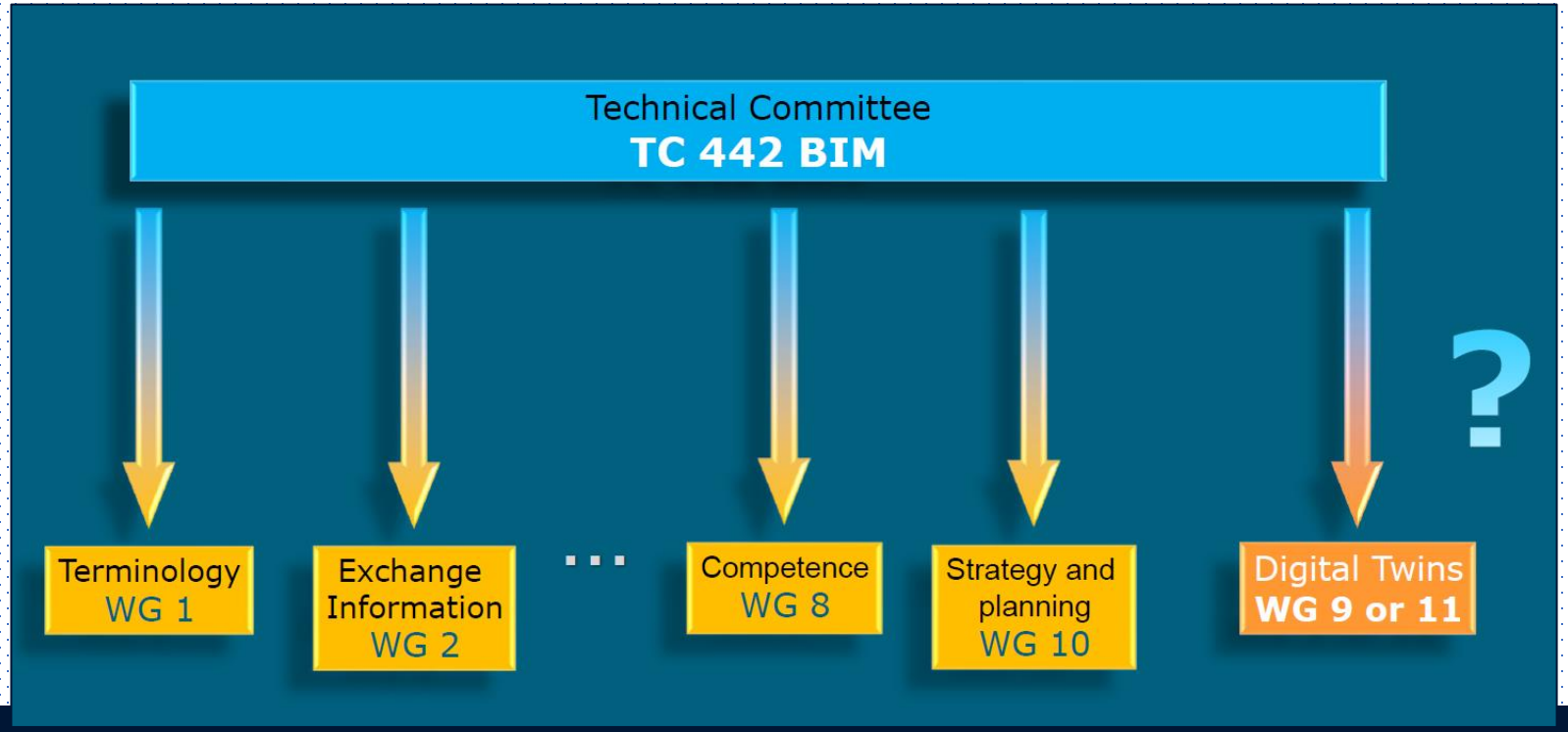
Technical Committee 442 (BIM)

BIM norms map 2020
(source UNE)



WORKING GROUP #1: BDTE DEFINITIONS & ROLES

Building Digital Twins Working Group 9



WORKING GROUP #2: OPEN TECHNOLOGY FRAMEWORK

Ambition: Generate an Open Technology Framework which will allow an improved interoperability across Building Digital Twins.

The technology backed by BDTA will follow our guiding principles to advance towards the proposed Vision and Mission.

Whenever possible, developments will consider external Open Standards.

Open knowledge generated in parallel EU projects welcomed!!!

WORKING GROUP #2: OPEN TECHNOLOGY FRAMEWORK

14th October → 1st meeting as Coorganised Event with ECTP

cibW78 LDAC 2021

11-15 October 2021

LUXEMBOURG

https://www.cibw78-ldac-2021.lu/programme/side-events/

Thursday, 14 October 2021 - Workshop Linking EU H2020 projects on digitization in the construction and maintenance industry: Linked Data and ontologies for BIM and Building Digital Twins

Date: Thursday, 14 October 2021

Room: José Ensch

Chaired by Mathias Bonduel, Neanex Technologies, and Pierre Bourreau, Nobatek/INEF4

In at least five finalizing European H2020 research projects** focusing on digitization in the building industry, Linked Data technologies are actively applied to tackle well-known interoperability challenges in the sector. Naturally, this resulted in the creation of a series of technical deliverables (ontologies, data modelling patterns constraints, processes, tools, etc) with both similarities and differences between the different ongoing projects. During the workshop, each of the five projects will share their technical insights on the subject through short technical presentations. The audience might expect to get a view on the reasons for applying Linked Data, the progress made during the project and the lessons learned. At the end of the presentations a roundtable discussion will be held between the different projects to discuss how the Linked Data related outcomes of the different projects can support each other and persist through the BDTA after the independent projects have ended.

** H2020 research projects involved in the workshop:

- SPHERE: https://sphere-project.eu/
- BIM4EEB: https://www.bim4eeb-project.eu/
- BIM-SPEED: https://www.bim-speed.eu/en
- BIM4REN: https://bim4ren.eu/
- BIMERR: https://bimerr.eu/

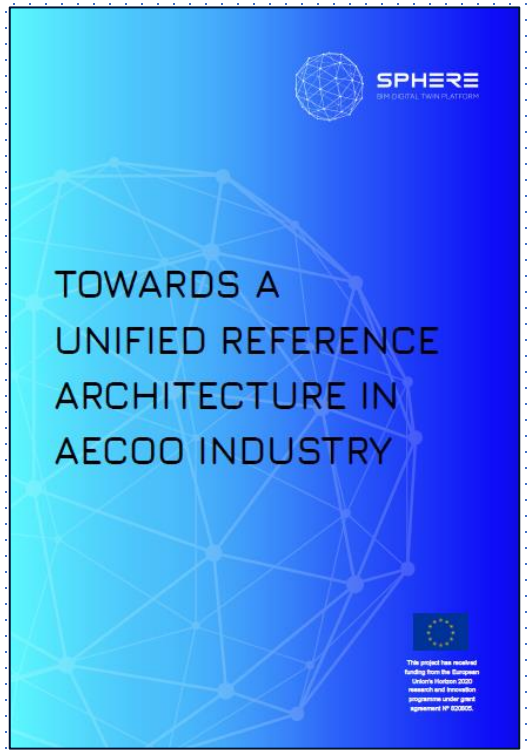
ECTP INNOVATIVE BUILT ENVIRONMENT

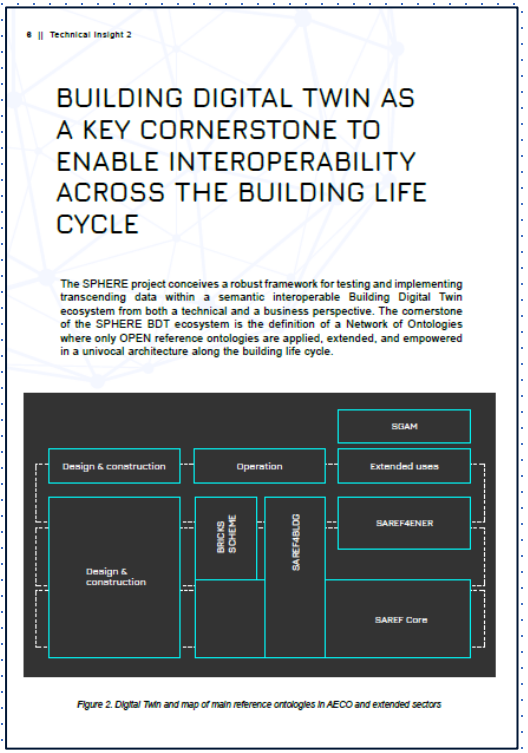
BIM SPEED BIM4EEB BIM4Ren SPHERE BIM DIGITAL TWIN PLATFORM BIMERR

WORKING GROUP #2: OPEN TECHNOLOGY FRAMEWORK

PUBLICATIONS 2022

Technical Insight #2
(published in May 2022)





WORKING GROUP #2: OPEN TECHNOLOGY FRAMEWORK

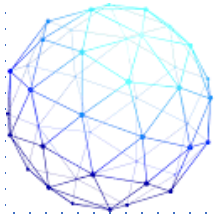
PUBLICATIONS 2022

White Paper #3

Ontology Network for BTDEs

(Q3 2022)

In collaboration with BIMERR

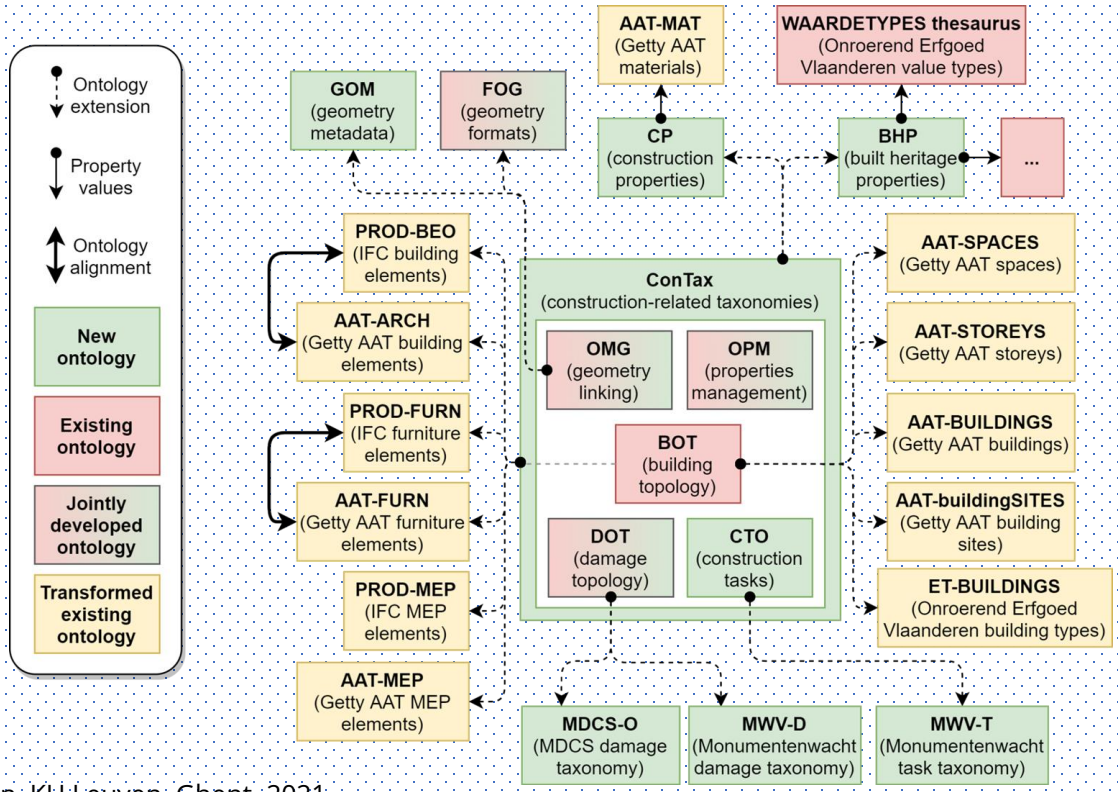


SPHERE
BIM DIGITAL TWIN PLATFORM

WORKING GROUP #2: OPEN TECHNOLOGY FRAMEWORK

First steps will be the sharing of two SPHERE developments:

- Maintain/Extend SPHERE Open API
- BDTA Ontology Network:
  a) definition of OTLs (domain expert knowledge)
  b) Application Profiles (glueing existing ontologies)



[X] M. Bonduel, 'A Framework for a Linked Data-based Heritage BIM', Ph.D. dissertation, KU Leuven, Ghent, 2021.

WORKING GROUP #3: VERTICAL AGGREGATION

Ambition: To generate liaisons and collaboration with other sectors to allow an improved interoperability across the hierarchy of Digital Twins, from Smart and connected Product Systems to Smart Districts and Cities.

The technology backed by BDTA will follow our guiding principles to advance towards the proposed Vision and Mission.

Whenever possible, developments will consider external Open Standards.

Open knowledge generated in parallel EU projects welcomed!!!

digital twin™ CONSORTIUM

GAIA-X

FIWARE

WORKING GROUP #4: SIMULATION ACROSS BUILDING LIFECYCLES

Ambition: To develop necessary procedures, tools and professionals towards a cost-effective simulation across buildings Life cycle. Main technical targets:

1. **Software in the loop (SIL) concept :** Real time simulation + Monitoring (Scada/BMS/sensors)
2. **SIMBOT** concept and development, including standard '**connectors for simulation**'

Oriented to **software developers, engineering firms and** equipment **manufacturers** but **open to any stakeholder of AECOO sector**

WORKING GROUP #4: Technical Insight → October 2021

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INTRODUCTION. REDUCING INVESTMENT RISK

AECOO industry has faced the challenge of digital transformation excited with the OpenBIM wave and the graphic integration of many disciplines that were before isolated and not well managed. Graphical representation of 'ideas' (not reality) is an excellent way to explain and communicate, but as soon as reality enters to scene those geometric models are unconfortable and complex. Planes are not so flat and pipes not so straight. Point clouds are heavy and moving and checking against entities of the project an exhausting task. Everything starts to degrade and what was an ideal representation tool gets useless and non practical.

We may think that a similar case can happen when we add a functional model to the projected geometry and associated data. Functional representation of a 'space' may look a priory an impossible objective as it involves fluids, gases mixtures, solar radiation, convection currents, contaminants and humans. But mathematical simulation offers a phantastic simplification methodology of that space, which may be adapted or not to the BIM representation. So we reproduce once again the incompatible data representation we found when we compared our 'ideal' project with reality measurements: BIM entities are not simulation components, and data structures used in each case are different.

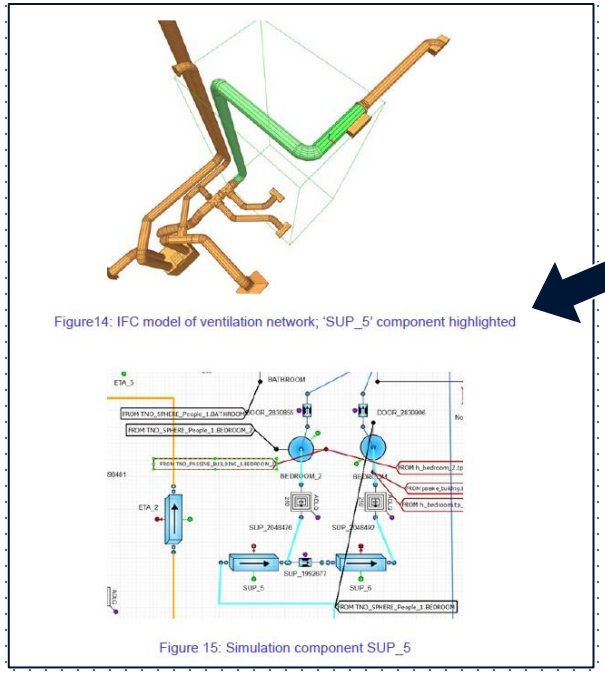
When planning ambitious digital twin platforms incorporating functionalities as real time simulation the rigth initial representation must be studied, and the corresponding simulation components as well. BIM models must be carefully checked and entities of MEP installations well studied. Naming of networks and systems are necessary, and the integration with spaces, doors and windows will be needed in its functional representation. If we want to be able to integrate different representations we need to prepare data structures in a very specific way, and geometry may be helping or not. Fascination about geometry and viewers has produced in the past terrible results. Lessons we should learn in building construction.

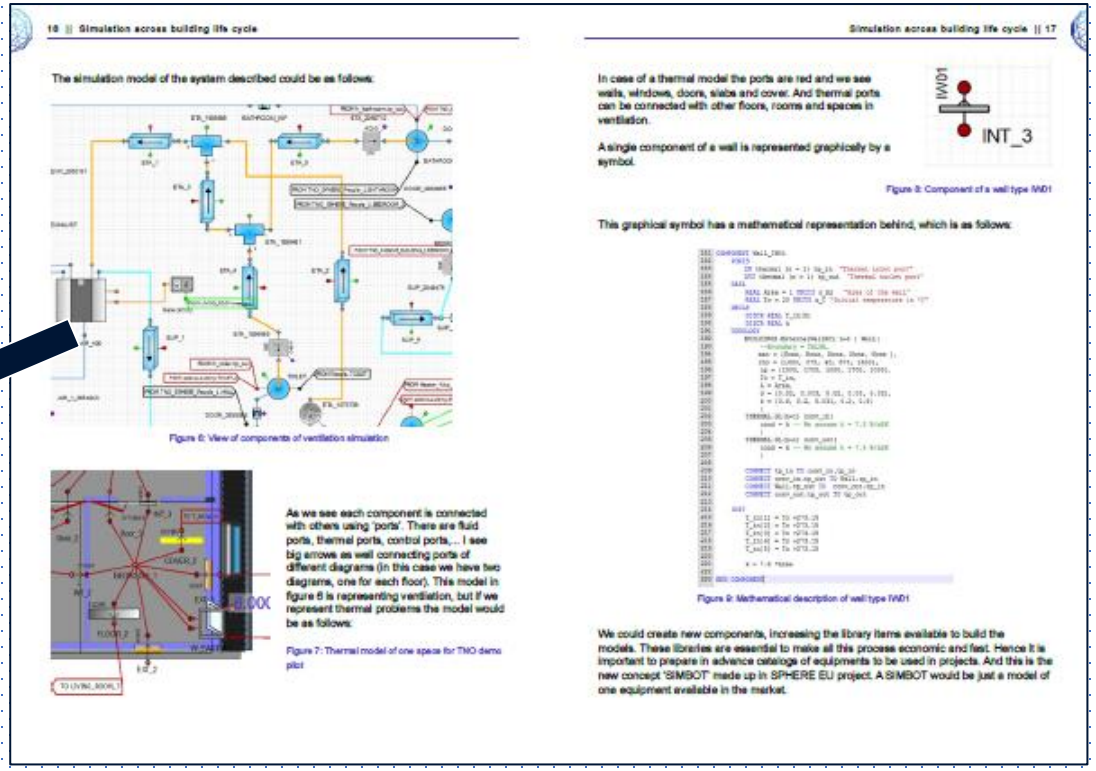
WORKING GROUP #4: SIMULATION ACROSS BUILDING LIFECYCLE

Q3 2021 - BDTA White Paper 2 →
BDTEs for seamlessly Decision Support Simulation across Buildings Lifecycle. Centered in the role of:

2 – BUILDING DIGITAL TWIN SIMULATION MANAGER (BDTSM)

WORKING GROUP #4: White Paper 2 – November 2021





WORKING GROUP #4: 2021 December 3rd!

ECTP CONFERENCE Madrid 2021

9th ECTP Conference

The EU Construction Industry at the heart of the Green and Digital Transitions

Simulations across Building Lifecycle in Building Digital Twin Environments

Chairs: Sami Kazi (VTT), Eduard Loscos (IDP / BDTA)

The concept of "Building Digital Twins" needs to be well defined to avoid another new diffuse and trendy topic. This session will be focused on how the simulation and its link with monitoring must be included along the Buildings Lifecycle.

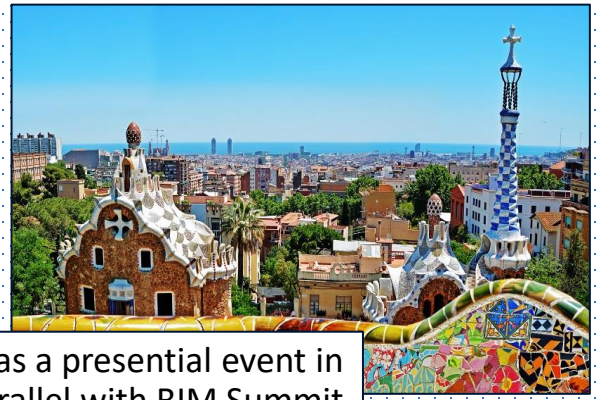
- Welcome and presentation of BDTA Working Group 4: Lifecycle Simulation under Building Digital Twin Environments - Eduard Loscos (BDTA) & Sami Kazi (VTT)
- Human Thermal Models and building interactions - Kalevi Piira (VTT)
- A profitable mathematical simulation in buildings using SIMBOTS. SPHERE project - Pablo Vicente (BDTA)
- DigiPlace: towards an EU Platform harmonization - Alberto Pavan (Politechnico de Milano)
- Simulation processes under Bim4EEB project - Claudio Mirarchi or Bruno Daniotti (Politechnico de Milano)
- Bim4Ren & BIM2TWIN projects, from BIM to Simulations Models - Eneritz Barreiro (Tecnalia)

Coorganised with:

ECTP INNOVATIVE BUILT ENVIRONMENT

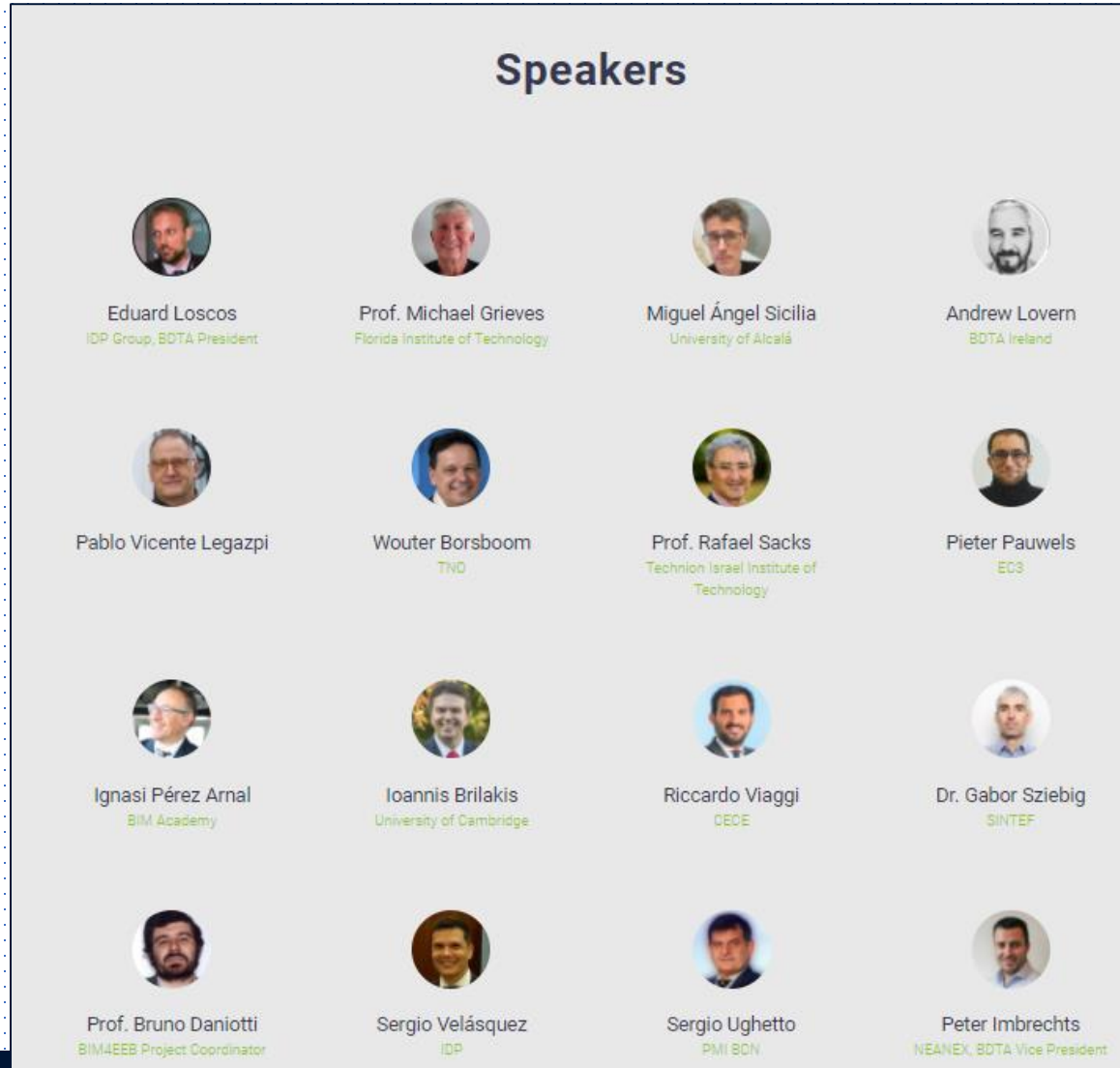
VTT

The BDTA successfully organized the First International congress fully dedicated to Digital Twin for the Building Environment (AECOO)

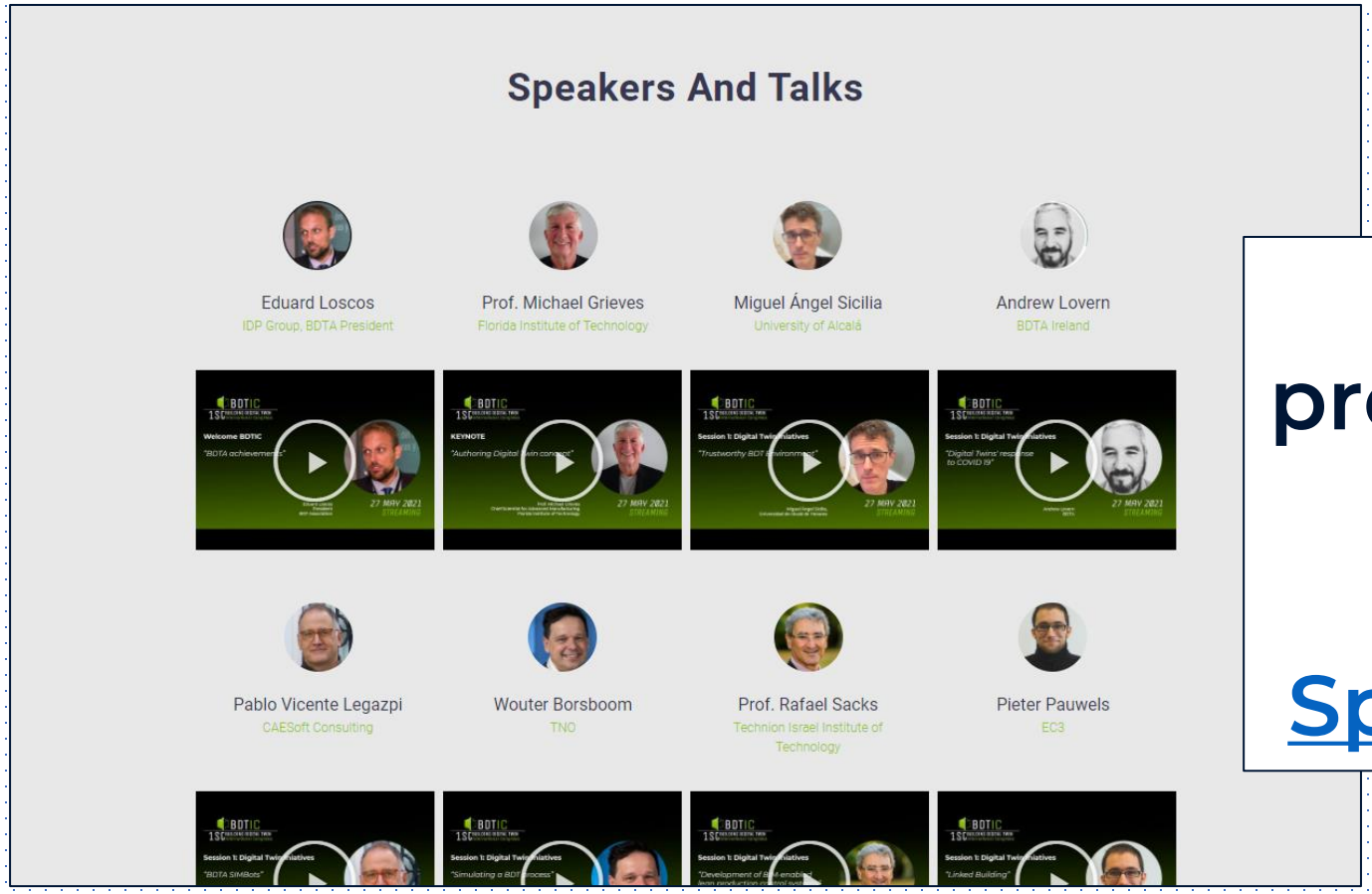


Originally planned as a presential event in Barcelona, running in parallel with BIM Summit 2021, due COVID restrictions it was set as an on-line event

Speakers



+500 registered participants from +20 countries



See all the presentations in our website! →

Speakers-and-talks

2nd BDT International Congress :

- 26th of May 2022 in hybrid format
- Joint event with REEBUILD

REBUILD
TRANSFORMANDO LA EDIFICACIÓN

COL·LEGI D'APARELLADORS, ARQUITECTES TÈCNICS I ENGINYERS D'EDIFICACIÓ DE BARCELONA

BDTIC 2ND BUILDING DIGITAL TWIN International Congress

Thanks for being here...!

Do you want to be part of our community?

Contact us → https://buildingdigitaltwin.org/

Figure 4: The Digital Twin concept: Data are captured and streamed to a digital platform, which, in turn, performs real-time analysis to optimize the design and the performance (sketch by: M. Elagiry based on Deloitte University Press).

Mr. Eduard Loscos
BDTA President

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Questions?

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BUILDING DIGITAL TWIN ASSOCIATION
MEMBER