



Open Building Services Reference Operations & Maintenance

April 2026



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1. Cooperation

Bosch Building Technologies Statement

The content of this document represents one of the strategic evolutions within the Building Intelligence as a Service (BlaaS) Program of Bosch Building Technologies.

This paper, the strategic elements, and the processes are designed and documented by Andreas Mauer, VP Chief Architect.

Autodesk Safe Harbor Statement

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2. Introduction of the Strategic Partners

Company Snapshot Bosch Building Technologie?

The Robert Bosch Group can be divided into four sectors:



Figure 1: The four business sectors of the Robert Bosch Group.

[Bosch Building Technologies](#) is part of the Energy and Building Technology Sector, serving customers in more than 60 countries with a clear focus on seven countries.



Figure 2: Information about Bosch Building Technologies.

Bosch Building Technologies – Keeping buildings safe, comfortable, and efficient

Your building can do more –with our smart solutions. For more than 100 years, we've combined technical expertise with a passion for protecting people and their environments. As one of the world's leading systems integrators, we deliver tailored solutions for building security, fire life safety, building automation, and energy efficiency. In addition to our own fire life safety technologies and digital services, we rely on the best products available on the market. From consulting and planning to implementation and ongoing support, we accompany you throughout the entire building lifecycle –always at your side.

Core Competencies and Service Portfolio

Bosch Building Technologies features a comprehensive portfolio covering the following key areas:

1. Security Systems:

- **Fire Detection Technology:** State-of-the-art fire alarm control panels, smoke detectors, CO detectors, and voice evacuation systems to protect lives and property.
- **Intrusion Detection Technology:** Innovative intrusion alarm systems, motion detectors, and access control solutions for protection against unauthorized access.
- **Video Surveillance:** Intelligent camera systems with video analytics functions for monitoring, analysis, and proactive security measures.
- **Access Control:** Flexible and scalable systems for managing authorizations and controlling the flow of people within buildings.
- **Evacuation Systems:** Reliable voice alarm systems and emergency call systems for quick and safe evacuation in critical situations.

2. Building Automation:

- **Building Management Systems (BMS):** Integrated platforms for central control and monitoring of all technical systems in a building (heating, ventilation, air conditioning, lighting, etc.).
- **Energy Efficiency:** Solutions for optimizing energy consumption and reducing operating costs through intelligent control and analysis.
- **Comfort Solutions:** Systems for creating an optimal working and living environment through intelligent light, temperature, and air quality control.

3. Professional Services:

- **Consulting and Planning:** Comprehensive support in the conception and planning of tailor-made security and building solutions.
- **Installation and Commissioning:** Professional installation and integration of systems.
- **Maintenance and Service:** Long-term support, maintenance, and fast repair services to ensure system availability.
- **Cloud Services and Software Solutions:** Innovative digital services for remote management, data analysis, and predictive & prescriptive maintenance.

Strategic Direction and Vision

Bosch Building Technologies pursues a clear vision to make buildings safer, more efficient, and more comfortable. The company achieves this through the following:

- **Innovation:** Continuous research and development of new technologies, especially in the areas of the Internet of Things (IoT), Artificial Intelligence (AI), and Cloud Computing.
- **Networking and Integration:** Creation of holistic solutions that seamlessly connect different systems and enable central control.
- **Customer Centricity:** Development of solutions precisely tailored to the individual needs and requirements of various industries (e.g., commercial, industrial, retail, education, and healthcare).
- **Sustainability:** Development of energy-efficient solutions that contribute to reducing the ecological footprint of buildings.

Significance and Market Position

With its global presence, high-quality products and services, and innovative strength, Bosch Building Technologies is a key player in the building security and automation market. The company plays a significant role in making buildings smarter and creating added value for operators, users, and the environment.

Company Snapshot Autodesk

Autodesk Inc. (ADSK) is an American multinational software corporation based in San Francisco that was founded in 1982. Autodesk is listed on the Nasdaq (STE) and had a revenue of USD 7.2 billion in 2025 (FY26, +18% YoY), 7.79 million users (+7% YoY), and about 14,100 global employees (2025). Autodesk serves three key industries with various products and services:

- Architecture, Engineering, and Construction Industry
- Design & Make Industry
- Media & Entertainment Industry

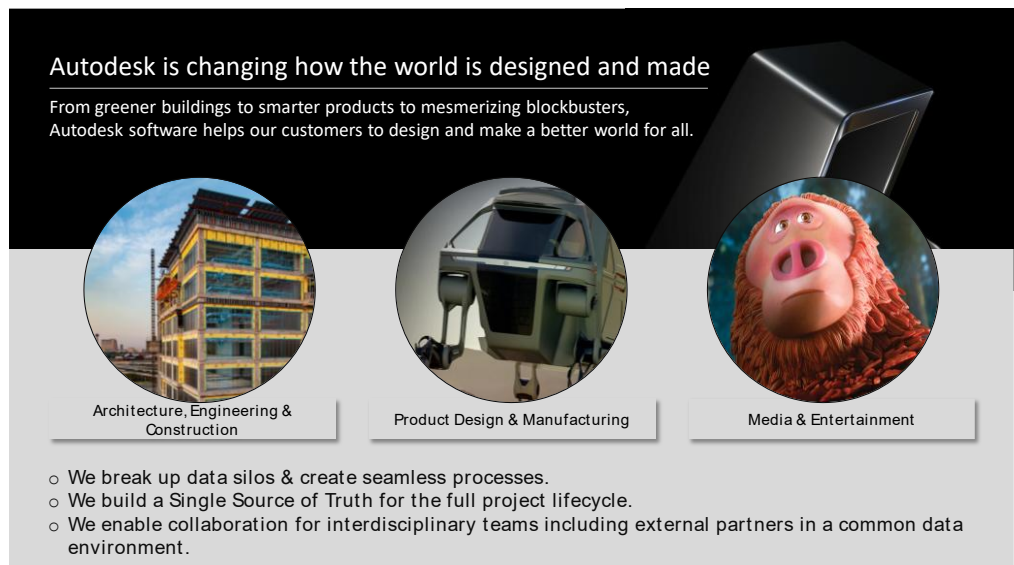


Figure 3: Autodesk Industry Segments and Strategy.

Autodesk started its business with its first and most renowned product called AutoCAD that is still in use. AutoCAD is a 2D CAD tool used in many ways and many industries, i.e., for mechanical design, electrical design, architectural planning, and plant and P&ID design. Due to its versatility, AutoCAD is still widely used even after more than 40 years. AutoCAD's additional desktop products like Revit and Inventor have been integrated into the Autodesk brand and support data management solutions and extensions for specific use cases. In total, Autodesk now supports more than 200 products. Autodesk was early to adopt cloud technology and offer several cloud platforms for improved collaboration and data sovereignty.

In 2022, Autodesk announced its transformation into a platform company, connecting all its industry segments with respective industry clouds, related data models, and Autodesk Platform Services (Figure 4).

With this transformation, Autodesk plans to bridge the gap between industry silos as well as to support working and collaborating with data instead of files. Autodesk's slogan is Make Anything, and the company is a leading provider of a Design and Make Platform!

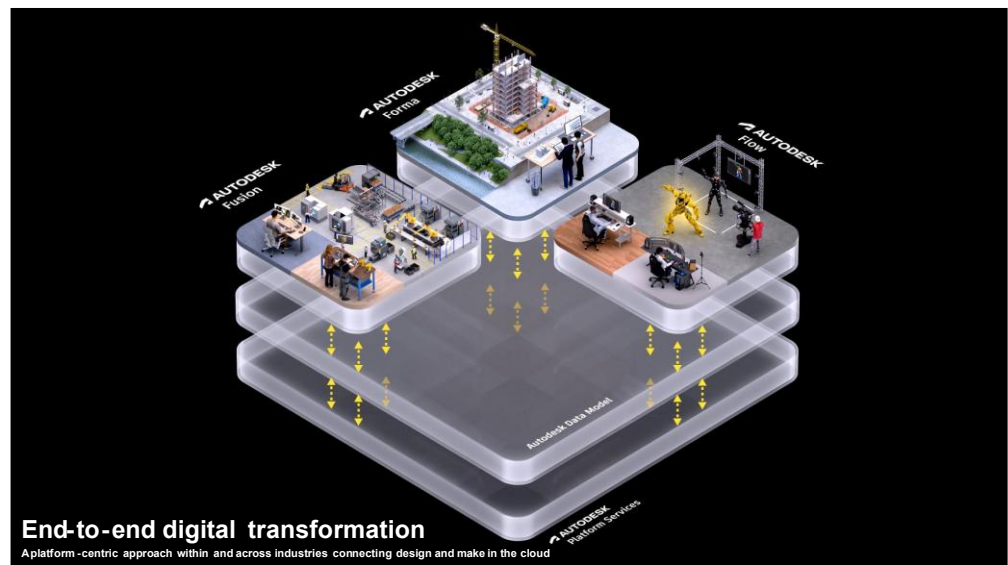


Figure 4: Autodesk Platform Vision & Strategy.

Autodesk will support the OBSR as a partner for identified AEC= (Architecture Engineering, Construction, Owner)-related content, meaning plans, point clouds, and models. Autodesk Docs will be leveraged as cloud storage for AEC data. Furthermore, Autodesk desktop applications, like AutoCAD and Revit, and Autodesk Platform Services (APS) will be leveraged for the building project services (see Figure 5), starting with the OBC (Onboarding Copilot, see following explanations). Autodesk is providing active support with co-creation activities, guidance, and strategy exchanges.

Initial Situation and Motivation

Bosch Building Technologies is facing a highly competitive market with other global players like Siemens, Schneider Electric, Honeywell, and JCI. Furthermore, due to inflation, global cost cutting, and supply chain disruptions, prices have become the most important differentiator in the building automation market. To differentiate from their competitors and become a long-term partner across the lifecycle of buildings, Bosch Building Technologies decided to revise its strategy ([Bosch expands service suite for digital building management](#)). First, Bosch Building Technologies created a first-class customer experience with NEXOSPACE ([Digital building management - NEXOSPACE | Building Technologies | Global](#)). Second, Bosch BT announced that it would focus on its integrator business as well as part with its product business ([Realignment: Bosch Building Technologies to focus on systems integration business](#)). By focusing on integrator business and services, Bosch BT is putting proactive intelligent building operations at the core of its activities. For Bosch BT, smart buildings are intelligent buildings that save energy, increase user comfort, and ensure safe operation by networking intelligent building technologies. Thanks to digitalization and the Internet of Things, smart buildings take a holistic approach to sustainability, safety, and comfort. Building services and systems exchange data with each other, creating the greatest possible added value for building users, operators, and the environment. Smart buildings thus give people more control over optimal working and living spaces through the intelligent use of technologies and data. Bosch Building Technologies has already identified various smart building use cases, e.g., space management, energy data monitoring, indoor navigation, digital access, smart video surveillance, and fire alarm system insights.

To enable these use cases, Bosch Building Technologies developed an ambitious future vision (see 3, which it is pursuing with its selected partners (see section 4). Its solutions are based on four key pillars that in turn comprise 11 different digital foundations. The four pillars are as follows:

1. Connectivity between devices and the cloud
2. Building digital twins
3. Time series for predictive maintenance
4. Simulation of ideal conditions

Bosch Building Technologies Business Context

To streamline and focus its efforts, Bosch Building Technologies is focusing on creating a dedicated customer experience. Bosch Building Technologies differentiates its market by industry/building types, customer types, and lifecycle.

Industry/Building Types

Bosch Building Technologies is focusing on large commercial buildings and infrastructure buildings and complex systems and large owners with special requirements. Bosch Building Technologies serves train stations, airports, convention centers, malls as well as government buildings and large business offices.

Customer Types

End customers of Bosch Building Technologies are owners and operators as well as occupants. As part of its years of experience, Bosch Building Technologies is highly involved in many green- and brownfield projects and designs and integrates its systems with the purpose of creating the highest value for the owners and/or users of the building. With special services, Bosch Building Technologies will empower owners, operators, and occupants with insights and enable live optimization to reduce cost and improve comfort and sustainability as well as limit risks.

Building Lifecycle

Bosch Building Technologies is focusing on delivering an end-to-end experience from design to refurbishment via construction and commissioning as well as building operations & maintenance. By leveraging a digital twin for operations and semantic time series data from building operations for a specific building as well as building categories, Bosch Building Technologies can offer its customers great insight, optimization services, and scheduled system upgrades/redesigns to optimize performance, sustainability, and comfort level.

3. Open Building Services Reference

Introduction to the OBSR

The Open Building Services Reference (OBSR) < Operations & Maintenance > defines an end-to-end, overall services blueprint for commercial buildings and the domain-specific systems installed for

creating new, modern digital service experiences for the operations & maintenance lifecycle phases. These new experiences aim to realize intelligent, proactive, and efficient operations that form the foundations to establish and create autonomous building service excellence. These perspectives include modern artificial intelligence-driven information technology and software design paradigms as well as human domain expert-based operational assistance.

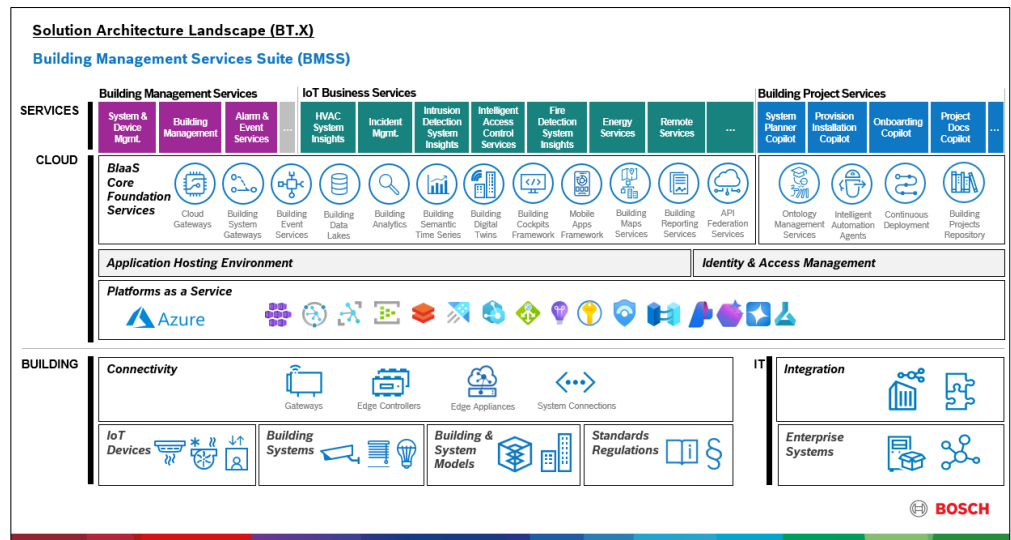


Figure 5: The target architecture business context (BT.X)

The OBSR is a projection into the overall Bosch Building Technologies target Solution Architecture Landscape called **BT.X**. In particular, this projection resides in the upper right-hand compartment of BT.X – the Building Project Services. These services serve the entire lifecycle of the domain-specific end-to-end IoT digital service product experiences. The service in question for the operations & maintenance lifecycle phase is the Onboarding Copilot (OBC) in combination with the Building Projects Repository and the Intelligent Automation Agents among other BlaaS Core Foundation Services as well as the Connectivity and Building Systems area in BT.X.

Autodesk's key area of expertise is located within the Building Project Services block. The Onboarding Copilot (OBC), System Planner Copilot (SPC) as well as Provision & Installation Copilot offer opportunities for Autodesk technology to play an integral part. As Bosch BT shares the same vision as Autodesk, which is to support customers during the entire lifecycle, there is not only a technological match but also a mindset match. Furthermore, the idea of automation and augmentation of the planner and operator is a key target that both partners share and will focus on to achieve as part of this project. In general, the complete Autodesk AECO Industry Platform Forma is in scope, in particular, Autodesk AECO flagship products (Revit, AutoCAD, and Autodesk Docs). Additionally, Autodesk Platform Services (APS) (Viewer, Model Derivative, Design Automation, Data Exchange, and Autodesk Data Model) are a focus of these copilots.

The OBC serves the process of onboarding a physical commercial building site and its domain-specific systems that are served by the individual *IoT Business Service* products and the *Building Management Services* into a corresponding digital representation for operations & maintenance. One important aspect of creating these digital service experiences is the understanding of the building and system structures, meaning the topologies of the building and the systems themselves. In an optimal world, all these topologies are perfectly captured in 3D models. The reality, however, is quite different as 70–90% of this structural information comes in different formats, and so far, very few buildings are captured in 3D or even high-quality models (LOD 300+). The importance of these *Building & System Models* is essential for creating proactive, intelligent commercial building systems operations & maintenance.

So, for instance, it is important to know which floor and which room has an air handling unit to heat and cool a certain zone and rooms so that an efficient and energy-friendly HVAC process can be served. Leveraging several different information models that provide topology information for the building and the domain-specific system serves as the baseline to create a digital twin for operations & maintenance.

As of today, there is no civilized and standardized approach to process the different information models in order to create twins and their visualizations for this digital experience. The OBSR is an initial standardized approach and process to semi-automatically create this onboarding experience by using a variety of different technologies, methods, and architecture to create such an experience anchored around the concept of agentic AI-powered copilots. Once onboarding of the target commercial building site has been completed, end-to-end digital service experiences powered by BT.X will be enabled through the following:

- bidirectional context exchange routes driven by a set of educated information agents;
- domain-specific agentic AI systems, which will drive semi- and full-autonomous operations;
- end-to-end customer services for operations as well as predictive and prescriptive maintenance.



Figure 6: The 360° digital service experience powered by BT.X for commercial buildings.

Context

Bosch Building Technologies serves and powers 360° lifecycle perspectives (see Figure 7 **Fehler! Verweisquelle konnte nicht gefunden werden.**) for commercial building service experiences for the core domains and verticals in selected regions. It is important to understand the individual activities and processes that are involved in an overall end-to-end digital service play. This version of the OBSR focuses on the lifecycle phases *Operate and Maintain*. The lifecycle phases *Design, Replace, and Recycle* will be served by the *System Planner Copilot* (SPC), and the *Construct, Install, and Configure* phases will be served by the *Provision & Installation Copilot* (see BT.X diagram above in Figure 5).

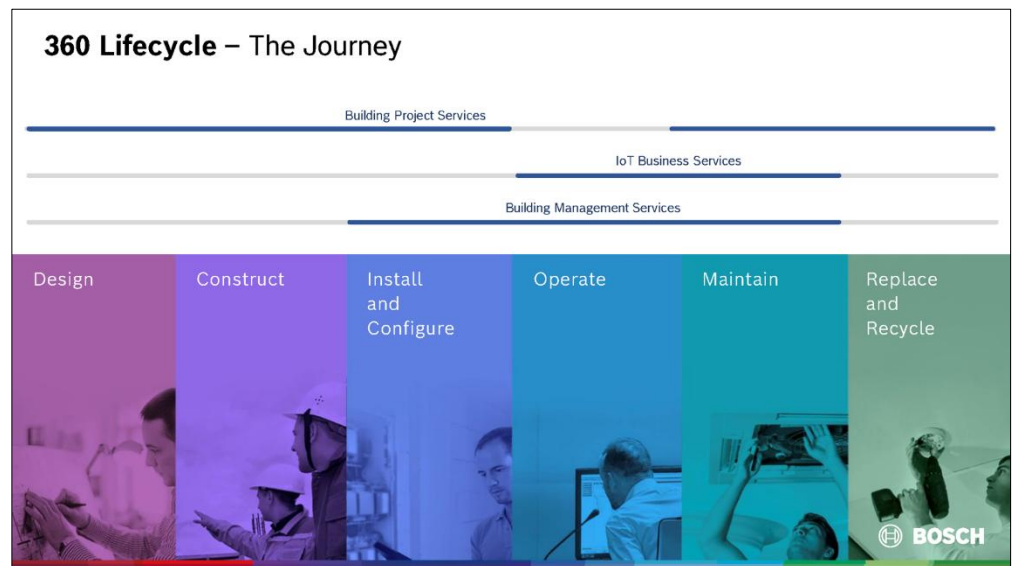


Figure 7: The 360° lifecycle phases of commercial building systems and services.

The diagram of the OBSR strategic elements illustrates the complete contextual building service node blocks and how they are interconnected. When they are all orchestrated intelligently, they serve the ultimate goal to create proactive and intelligent commercial building experiences.

The **Open Building Services Reference (OBSR)** blocks and their interconnections are described below under the Strategic Elements Clusters subsections.

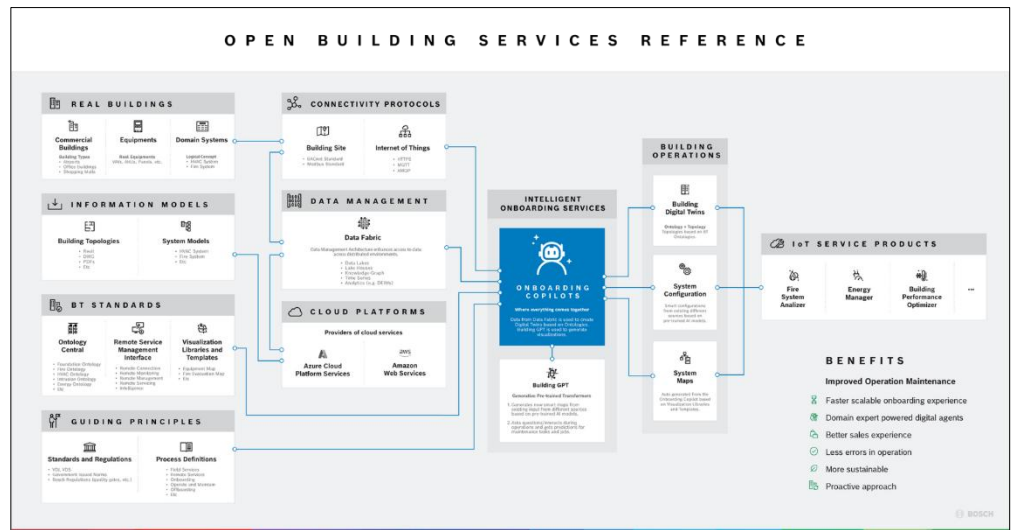


Figure 8: Visualization of strategic OBSR elements.

Strategic Elements Clusters

The strategic elements in Figure 8 are clustered into the following and will be explained in detail:

Real Buildings: the commercial building types and their corresponding verticals;

Information Models: the set of information required to connect and onboard the physical into the digital context;

Bosch Building Technologies Standards: domain-specific standards defined by Bosch Building Technologies to serve the end-to-end value chain;

Guiding Principles: the guardrails to comply with certain public laws, regulations, and processes for onboardings;

Connectivity Protocols: the physical connections to and from the field;

Data Management: the fabric to manage the complete set of information models and flows;

Cloud Platforms: the platform as a services stack;

Intelligent Onboarding Services: the assisted set of agents to onboard the physical into the digital context;

Building Operations: the composition that creates the base services for intelligent operations;

IoT Service Products: the final service products for domain-specific, proactive, intelligent operations & maintenance.

Please note that the interconnections among these strategic elements represent strategy connections and not any architectural or physical connections.

Real Buildings

Real buildings represent all the **Commercial Buildings**, such as airports, office buildings, shopping malls, railway stations, soccer stadiums, and power plants, which will be served by the overall proactive intelligent operational services.

The **Equipments** stands for all the corresponding domain-specific pieces to compose the end-to-end domain-specific system, such as VAVs, AHUs, panels, controllers, actuators, and sensors.

The **Domain Systems** represent the core concepts of end-to-end systems which serve exactly one concrete domain, such as HVAC systems, fire alarm systems, intrusion detection systems, video surveillance systems, light systems, energy systems, and others.

Information Models

In order to create holistic understandings across the domain-specific systems and also their potential cross-domain, integrated perspectives, it is important to adhere to a dedicated set of information models that capture a variety of different aspects.

The **Building Topologies** provide the structural information models of the buildings where the domain-specific systems are installed, such as information about the size of the building, the number of floors and rooms on each floor, stairways and elevators, and parking garage, and they are sometimes captured in 3D BIM models or just in 2D DWG models, and other times, they are just PDF-based models or even just paper maps.

The **System Models** are the equivalent of the building models; they are the structured set of information models that describe the topologies of the domain-specific systems, such as the fire alarm system with its detectors, buses, and panels and the HVAC system with its chiller plants, ducts, VAVs, AHUs, and thermostats. Essentially, it is the model that captures the geolocations of the domain-specific equipment installed in the physical building. These models are captured in a variety of different formats, such as 3D in RVT, 2D in DWG, Excel files, and third-party custom tool-based formats.

Building Technologies Standards

The core competence domains of Bosch **Building Technologies** are currently focused on *Security & Life Safety* with its sub-domains; *Building Automation* with its sub-domains; and *Energy Management* with its sub-domains and verticals. To increase and enhance the business throughput, it is important to standardize these core domains and processes to streamline a scalable multi-domain, multi-vertical, and multi-regional digital service business. The Building Technologies Standards are composed of several elements, which will be introduced below: Ontology Central, Autodesk Data Model, Remote Service Management Interface (RSMI), and Visualization Libraries and Templates.

The **Ontology Central** is a GitHub repository where the digital building foundation and the domain-specific ontologies are located and managed (encoded in *JSON-LD* and *RDF*). Ontologies capture the domain-specific expertise and their ubiquitous language (the vocabulary of a domain, their entities, and relations as well as constraints), and they serve as the underlying information schema in terms of normalizing the domain's information set. The *Bosch Building Technologies Ontology Central* is located at [GitHub](#). More background information can be found on the [internet](#).

In the OBSR, the *Ontology Central* connects to the *Onboarding Copilot* for onboarding commercial buildings to domain-specific digital services like the *Fire System Analyzer* or the *Building Performance Analyzer*. Additionally, it also connects to the *Data Fabric* and serves as the domain information schema provider.

The semantic domain connection via *Ontology Binding* will be performed in the **Autodesk Data Model** as part of the Autodesk Platform Strategy, which includes three Industry Clouds: Forma, Fusion, and Flow (Figure 4). The Forma Platform addresses the demands and needs of the AECO industry. Each platform consists of three key components:

1. Industry-specific workflows and capabilities available via the cloud-based UI;
2. An Autodesk-developed data model to encode files and enable power workflows on a meta-data level;
3. Autodesk Platform Services as an open API interface based on REST.

Today, the Forma Platform includes the Autodesk AEC Data Model ([AEC Data Model | Drive Efficiency by Democratizing Data](#)), which is already embedded in products like Autodesk Construction Cloud (ACC) to fuel its capabilities and function as a key enabler for Autodesk AI capabilities bundled in the Autodesk Assistant. The AEC Data Model automatically creates a hierarchical structure of all components and elements in a file, allowing information to be extracted as well as appended without accessing classical authoring tools.

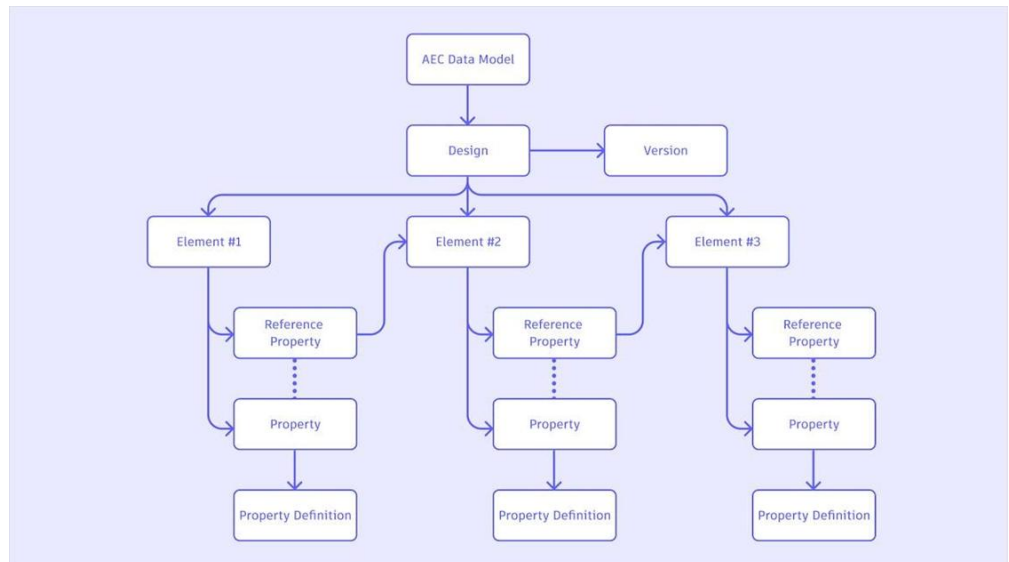


Figure 9: Structure of AEC Data Model

The **Remote Service Management Interface (RSMI)** (see Figure 10) is an architectural design and specification to standardize the remote abilities of the domain-specific systems so that a set of remote services, such as remote connectivity, remote monitoring, remote management, remote servicing, and remote intelligence can be offered through a unique single system and device management pane-of-glass experience. The architectural design and the entire RSMI specification will be open-sourced together with the OBSR specification itself. The five contracts of the RSMI specification are encoded in JSON-LD and can be easily adopted and implemented within a selected domain-specific systems context and scope.

Also note that the RSMI – IRemoteConnect – contract provides asset management information model capabilities. Each domain-specific system context that realizes the RSMI specifications contracts or parts of them will be consumable via a generic experience for a variety of different target persona, such as a system integrator, operator, service agent, and business agent, for different target user journeys.

Please note that the RSMI specification including DTDL and WOT encodings will be open-sourced just as the ontology central has been open-sourced.

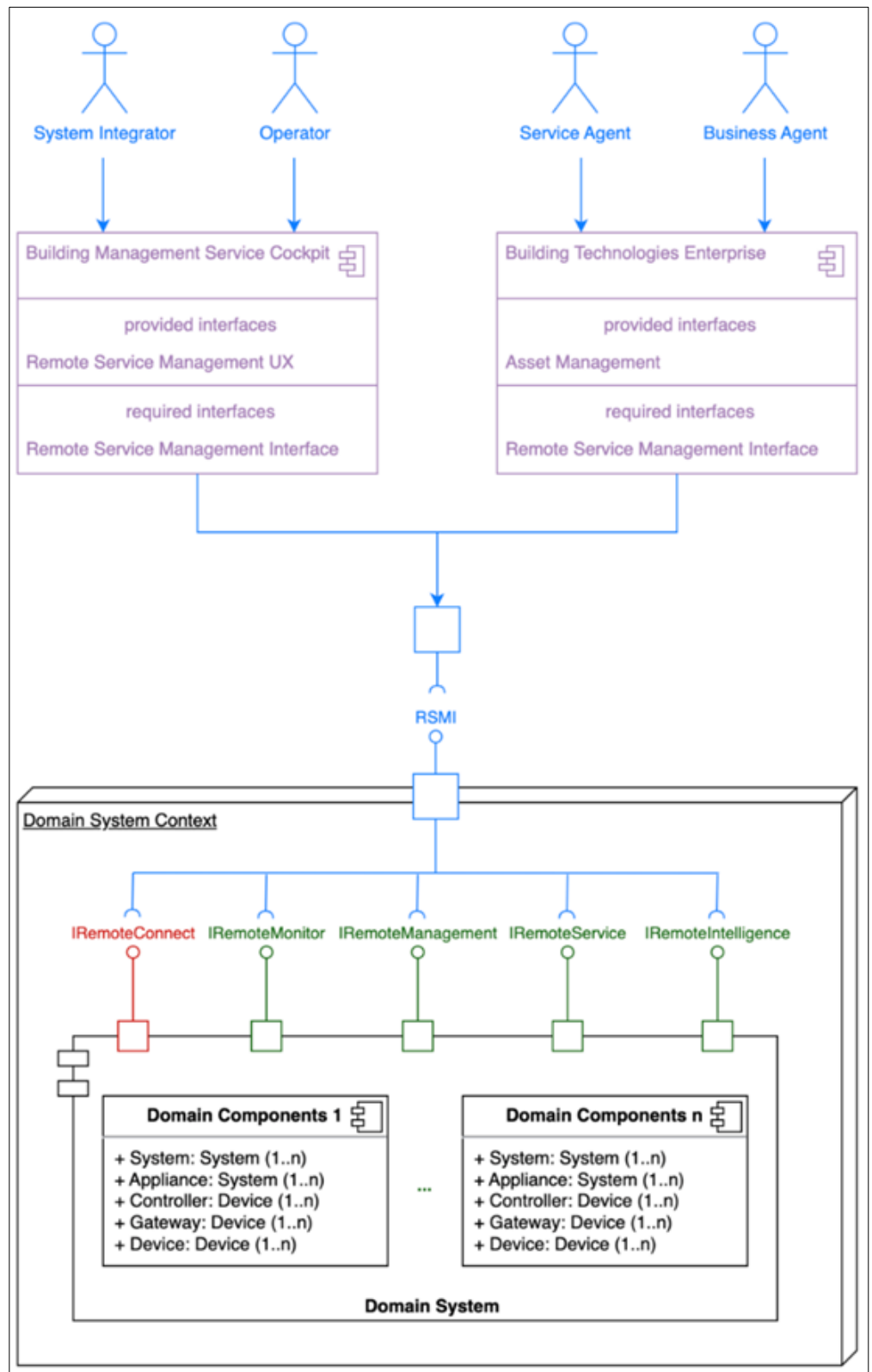


Figure 10: RSMI conceptual architecture.

Guiding Principles

One of the guiding principles for commercial building systems operations & maintenance are **Standards and Regulations** embodied by standard bodies, such as VDI, VDS, ISO, and ESG. Some of the commercial building systems must adhere to these standards and regulations, such as the fire alarm system or certain building automation and energy management systems.

The **Process Definitions** for the entire onboarding experience required to create the *Building's Digital Twin*, the *Systems Configurations* as well as the *Cockpit Frontend Experience* for operations & maintenance are visualized in the resulting OBSR end-to-end process flow.

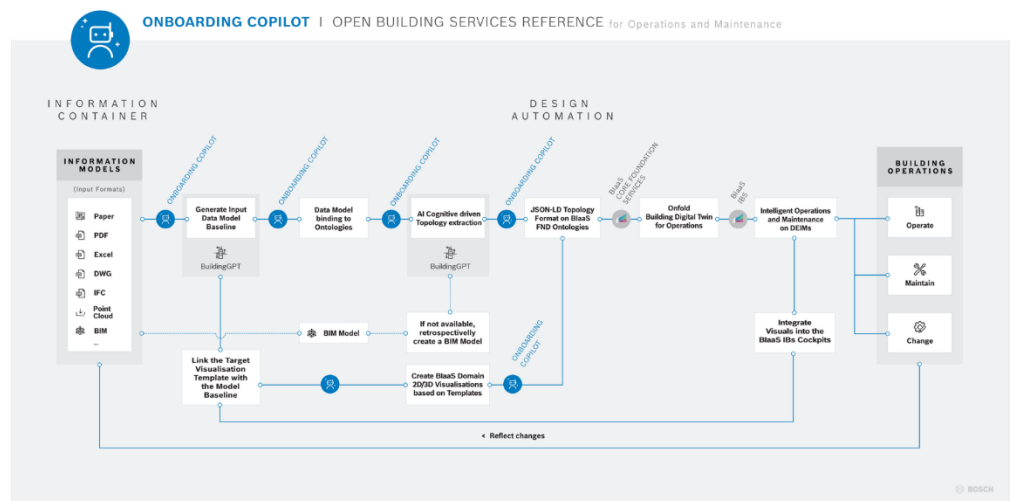


Figure 12: Visualization of the OBSR end-to-end process flow

Please note that the OBSR process for operations & maintenance will leverage technologies and services from our strategic partners such as Microsoft, Autodesk, and more.

The MAIN sequence path of the onboarding process flow is as follows:

0. The initial process step starts with providing the information models of the commercial building site that is to be onboarded. These models provide information on the geometry and structure of the site and the domain-specific systems therein. Here, a variety of different input formats must be stored in several information containers in a central *Building Project Repository* (see BT.X in the *Building Project Services* compartment). The processable format spectrum includes plain old paper maps; PDFs; Excel spread sheets with address schemas of an HVAC system, for instance; DWG files that have 2D plans of a building; IFCs files; scanned sites corresponding to Point Clouds; and sometimes 3D "dirty" BIM models and maybe even more in the future with new adjacent domains.



Because there is no industry standardization along with a broad range of customers and varying model currentness and input formats, the term “dirty” BIM is used to classify 3D models of mixed quality. Originally created 3D models and 3D models created from point clouds or remodeled from 2D data vary in detail, model setup, and accuracy. Basics like correct location information, optimized 3D element families, and certain LOD requirements cannot be expected and vary from model to model. Therefore, a decision was made to create a standardized LOD 300 3D model as an internal baseline and input for all further steps, which is called the “alibi” BIM model.

1. 1 Once the information models for the site are received, the *Onboarding Copilot* (OBC) will act as the process orchestrator for the steps to come. In step 1, the OBC will generate a corresponding input AEC data model baseline based on the received information models from step 0.

Note: Architecture Engineering Construction (AEC) is an industry segmentation of Autodesk with various products and service offerings for these three domains; the services part also provides access to underlying data model representations of the various input formats. To start with, a format type for the first end-to-end process, the 3D "alibi" BIM format, was selected as a prerequisite.

Within this step and the first selected format, this baseline is provided to the *Autodesk Construction Cloud – Docs (ACC Docs)* as this is one of the solution building blocks in the *Building Project Repository*. Once the "alibi" BIM has been put into the ACC Docs and is in an RVT format, the Autodesk AEC data model baseline for the building is available from there.

2. In this step, the AEC data model baseline will be enriched with Bosch BT ontologies (see Section BT Standards) from the GitHub ontology central. This is the ontology binding process activity; it projects the domain-specific meanings in the input information models that are required for operations & maintenance services. It joins the meaning of a building structure with the meaning of a specific existing domain, e.g., of a fire alarm system in that building, for instance, so that the OBC agents know where fire detectors are mounted, which buses connect them to which fire panels, etc., thereby assisting with establishing a digital twin for operations & maintenance in a later step.

3. In this step, the OBC will instruct an agent to perform the topology extraction out of the data model ontology-enriched baseline. Note that the ultimate goal is to do this by leveraging modern cognitive AI methods and frameworks, even though the starting point will leverage several domain-specific script agents against the *Autodesk Platform Services* (APS) APIs (e.g., the AEC DM APIs). Please note that in addition to the MAIN process sequence path, there is one optional SIDE path in the overall Onboarding Copilot process diagram (see Figure 12). This is an option that can be instructed by the OBC to retrospectively create an initial BIM model, leveraging the *Autodesk Design Automation APIs* and/or agentic systems through APIs or MCP servers, for the site to be onboarded based on the various information model formats provided in step 0 of the MAIN process sequence path.

4. In this step, the OBC will take the results from step 3 and instruct another agent to create a dedicated encoded format version (JSON-LD is the selected encoded format) of the extracted topology information set, which is based on the foundation ontology bindings for the building structure itself, to be used to build a digital twin. Next, the OBC will instruct parallel agent activity to create BaaS domain-specific 2D/2.5D/3D visualizations based on BT-defined templates. These templates on their own represent domain-specific visual languages for creating dedicated target user persona (owner, operator, and occupant) experiences for domain-specific operations & maintenance purposes. Furthermore, please note that this baselined AEC data model will be linked with the target visualization template instance for the cockpit experiences powered by the *Autodesk Viewer*. These visualizations for the site to be onboarded will then be dynamically incorporated into the *BaaS IoT Business Service* (IBS) *Cockpits*.

5. This step will be served by the *BlaaS Core Foundation Services*, and it will be instructed by the OBC to unfold the building's digital twin for operations & maintenance based on the topology information set encoded in JSON-LD from step 4. *Note that currently the digital execution environment for this twin is based on the Microsoft Azure Digital Twin (ADT) PaaS Service and is subject to change but is not relevant for the process itself.* After this process activity is completed, a digital twin building service instance based on the ontologies for the onboarded site is available for further consumption and user journeys.
6. This step is served by the individual domain-specific *BlaaS IoT Business Services* (BlaaS IBS) for proactive intelligent operations & maintenance based on the patented *Domain Expert Insight Models* (DEIMs). The concept of a DEIM is powered by ontology-driven knowledge graphs (the cross-domain, integrated, and specific building digital twins) plus by building semantic time series services plus by optional additional intelligent building agents such as deep reinforcement machine teaching educated brains or even hybrid semantic building controls. Note that the created visualization from the parallel activity in step 4 is being integrated into the IBS Cockpit and made available for intelligent operations & maintenance experiences.
7. The final main onboarding process step provides the end user *Building Operations* experiences to operate, maintain, and change building structure and / or domain-specific equipment.

This process flow was developed by Bosch Building Technologies together with an interdisciplinary Autodesk Team. This process is currently being tested and validated by Bosch BT with the help of Autodesk and forms the starting point of the Onboarding Copilot. The Onboarding Copilot will use a mixture of existing technology based on the Autodesk Platform Services (APS) like Model Derivative and Design Automation for file format conversation. Other elements like the object identification in 2D or the automated creation of a 3D model based on various inputs are being co-developed with Bosch BT as part of this project. Also, further services and copilots will be scoped and validated. All geometric data is currently planned to be stored in ACC Docs, meaning not only the Onboarding Copilot but also the general customers exchange of Bosch BT regarding geometric data will be handled via ACC Docs.

Connectivity Protocols

Connecting the domain-specific systems on the **Building Site** consists of protocols such as BACnet.IP, OPC UA, Modbus, DALI and KNX. These protocols are realized by the different connectivity options and / or equipment of those systems.

The connectivity to the cloud services represents an **Internet of Things** application context and is realized by protocols such as HTTPS, AMQP(S), and MQTT(S), which are then connected to cloud gateways such as IoT hubs or MQTT broker endpoints.

Data Management

The **Data Fabric** represents the central architectural and technological data system backbone for all information models that need to be processed throughout entire 360° lifecycle perspectives. This fabric element is represented by the solution building block *Building Project Repository* within BT.X.

It includes the initial customer request for a proposed information set, such as building site specifications and structural information models, configuration sets for domain-specific system equipment, telemetry information from the systems and equipment, maintenance information sets, semantic time series, semantic model-powered knowledge graphs, and analytical domain expert insight models plus asset and customer information sets.

All geometric data is currently planned to be stored in Autodesk Docs, meaning not only the Onboarding Copilot but also the general customer's geometric data of Bosch Building Technologies will be handled via Autodesk Docs. This leads to a central repository asset, inside the *Building Project Repository* core foundation service, for all agents who require geometric input. Inside Autodesk Docs, customer input data as well as data created by Bosch Building Technologies or digital agents (recreated 3D models, specific system designs, and 2/2.5/3D visualizations) are separated and can be made accessible to human planners as well as customers (depending on use case). Furthermore, all Autodesk Docs users will benefit from the embedded 3D viewer as well as the Autodesk Assistant to ease work and collaboration in the cloud.

Cloud Platforms

Building Management Services, *IoT Business Services*, and *Building Project Services* as well as *BlaaS Core Foundation Services* are all built upon a variety of public **Cloud Platform** services such as *Azure Cloud Platform Services* and *Amazon Web Services* and other hyperscale platforms as well as the Autodesk Construction Cloud services.

Intelligent Onboarding Services

The **Onboarding Copilot** (OBC) is the key entry point into an intelligent onboarding service experience. The OBC is the orchestrator of the entire end-to-end process flow for onboarding physical building sites and domain-specific systems for the IoT Business Service experiences. Inside the OBC, all of the seven strategic elements described in the sections above come together and serve either as input elements or platform backbone elements. The domain expertise for onboarding the buildings and the various different systems is executed, and several outputs are generated for creating the building's digital twin, the configurations, and the system maps for operations & maintenance.

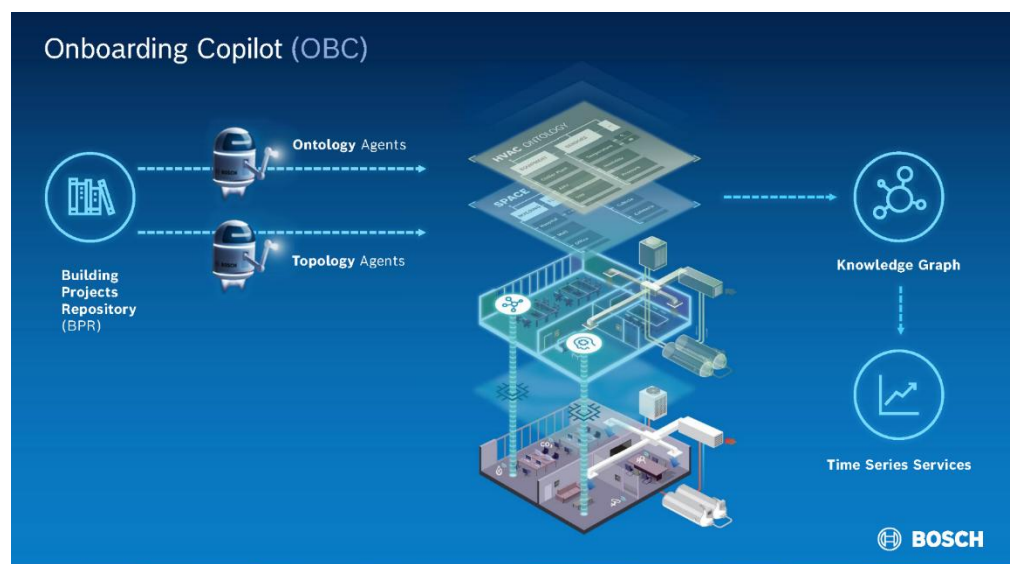


Figure 13: Onboarding an HVAC system with the OBC

An integral part of the OBC is the **Building GPT** that represents several domain-specific generative agents, based on modern agentic system designs, frameworks, and tools. Individual domain-specific transformers will be packaged and operated as *Intelligent Automation Agents* (see Figure 5 in the *Building Project Services* compartment), and their generated outputs will serve the onboarding process for extracting building and system topologies, generating system and equipment configurations and generating domain-specific maps based on the visual domain languages and the visualization libraries and templates used in the frontend cockpit and app experiences.

Building Operations

When it comes to the operational excellence of commercial buildings and their domain-specific systems, it is essential to understand these systems from their siloed domain perspective. It is equally important to understand the context within which a process was triggered by a human or technical persona and across which domain-specific systems these **Building Operations** happen. This is important because only then can systems and humans receive intelligent insights about those very complex interplays.

One important ingredient for proactive intelligent building operation is the **Building Digital Twin**, which represents the physical parts of buildings and the domain-specific systems of interest in a domain model's digital representation in the form of an online knowledge graph that can answer domain-specific questions for operational excellence. The baseline for those knowledge graphs is domain-specific ontologies, such as foundations, HVAC, or a fire alarm system ontology, which are applied to the corresponding commercial building site to be served with its building and system topologies.

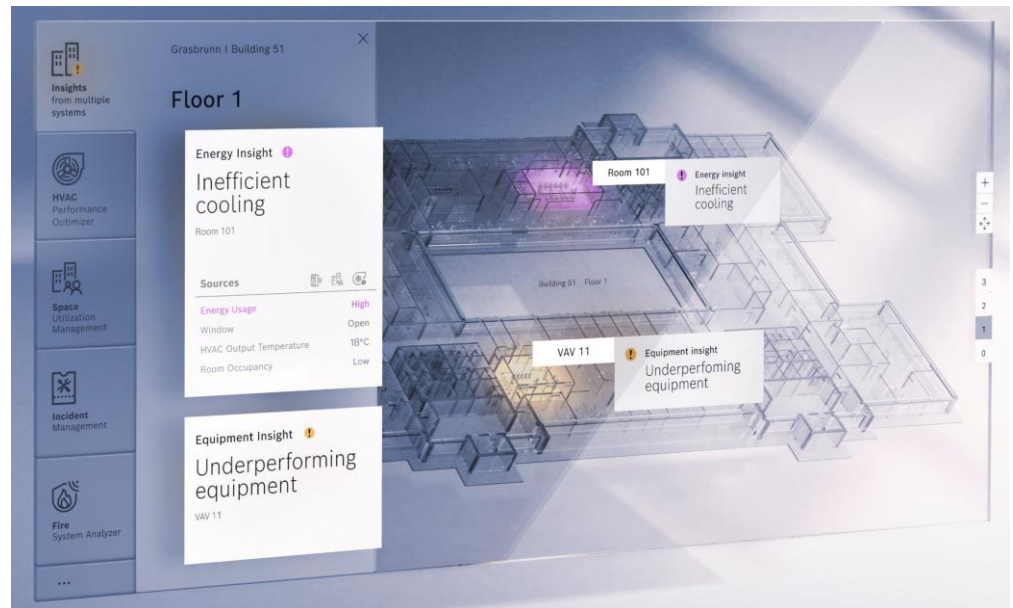


Figure 1: User experience for operations & maintenance.

Once the building site has been digitally onboarded and the building's digital twin unfolded, the required **System Configuration** for the corresponding system equipment, such as panels and controllers, will be semi-automatically generated for an online configuration experience. This experience will be served by the *Provision & Installation Copilot* (see Figure 5 in the *Building Project Services* compartment).

After successful onboarding and configuration of all system-relevant equipment, a visual representation of the domain-specific systems is provided by the **System Maps** that provide a domain-specific visual language for the different expert domain lenses. An operator has a different view, for example, of an HVAC system than an owner or an occupant has.

IoT Service Products

The end-to-end composition of the results and outputs from the *Building Operations* element will then finally serve domain-specific, end-to-end **IoT Service Products**.

The NEXOSPACE **Fire System Analyzer** ([FSA](#)) basic package allows owners and operators of the fire alarm domain to have all relevant perspectives as an insightful digital experience available in a dedicated cockpit experience. It provides peace of mind when it comes to a guaranteed operational and fully functioning fire alarm system including proactive maintenance and budget planning for those commercial building sites, and it complies with public standards and regulations.

The NEXOSPACE **Energy Manager** ([EM](#)) basic package provides an end-to-end online energy monitoring service for a full transparent energy perspective for a variety of energy media. The required energy reporting standards and regulations are guaranteed, and optimization plans are generated.

The NEXOSPACE **Building Performance Optimizer** focuses on end-to-end services for the overall building automation domains, such as HVAC and many more to come. It monitors the building automation processes and semantically detects insights based on the domain expert insights model concept and patent, which is a combination of knowledge graphs, semantic time series, and deep learning networks.

And there are future NEXOSPACE services planned for other domains and purposes including holistic compositional building management services that will provide system and device management, building management and alarm and event services, with cross-domain integration experiences in single pane of glass cockpits.

4. Additional Partner Involved by Bosch Building Technologies

Microsoft

Microsoft ([MS](#)) is an American multinational software and technology company based out of Redmond, Washington. Starting in 1975, Microsoft developed and sold its first BASIC interpreters for personal computers. In the following years, Microsoft became a dominant player in the personal computer operating system market, first with MS-DOS, followed by various versions of Windows. Through continuous expansion, e.g., into writing and calculation software with Office, as well as acquisitions, Microsoft became one of the largest and most renowned IT companies in the world, today serving software, computer hardware, consumer electronics, social networking services, cloud computing, video games as well as internet technology. In an industrial context, Office, Teams, and OneDrive are widely used for day-to-day work, and the Microsoft Cloud Azure offers IaaS, PaaS, and SaaS services for various use cases, focusing on data management and storage services, as well as AI and IoT and Blockchain services. Microsoft is listed on the Nasdaq (Microsoft Corporation ([MSFT](#))) with a revenue of USD 281,72 billion in 2025.

With regards to the OBSR, Microsoft cloud platform services will be used in various areas of the solution architecture (see Figure 5). One innovation area where this partnership is utilized is within the *Building Project Services Copilot Family* in the SPC.



Figure 15: Assisted agentic system workflow of the System Planner Copilot

The SPC-assisted agentic system workflow in the infographic above shows the entire AI-powered and AI-driven end-to-end process for domain-specific system planning, designing, and dimensioning, for instance, for a fire alarm system. This process is required to provide customers with a commercially binding offer that also complies with the necessary legal and regulatory obligations.

The following business context diagram illustrates all the required aspects within the SPC agentic system.

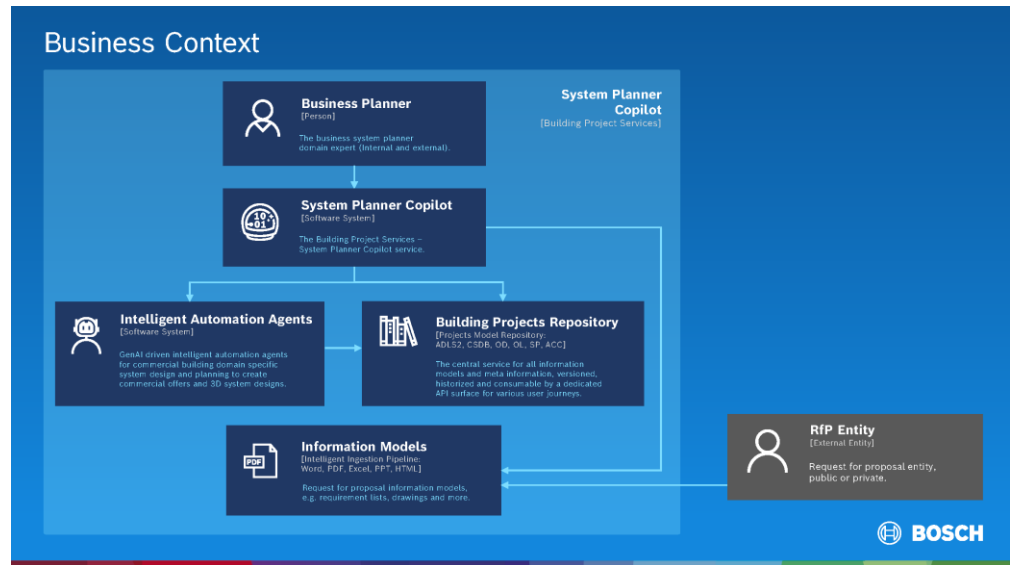


Figure 16: Business context diagram of the System Planner Copilot

PaaS and IaaS services are frequently used as solution building blocks for a variety of services, applications, and automations as seen in Figure 2. Microsoft provides active support with guidance, service roadmaps, and strategy exchanges.

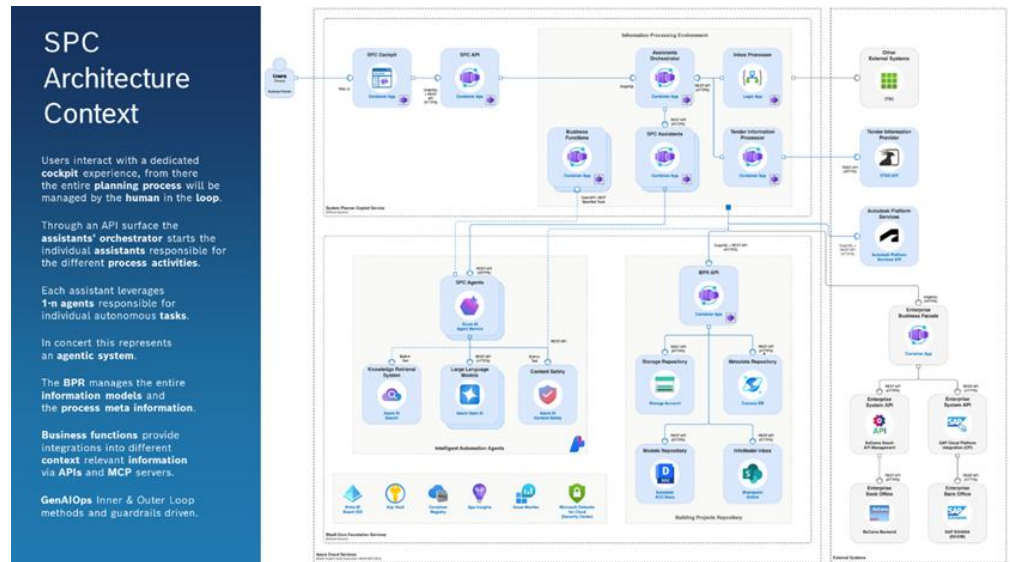


Figure 2: Solution architecture diagram of the System Planner Copilot

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As one of the world's leading systems integrators, we deliver tailored solutions for building security, fire life safety, building automation, and energy efficiency. In addition to our own fire life safety technologies and digital services, we rely on the best products available on the market.

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