

Smart Buildings Challenge Summary



Contents

| | |
|---|-------|
| 1. Introduction | - 2 - |
| 2. Challenge Roadmap | - 2 - |
| 3. Selection Criteria | - 3 - |
| 4. Challenge Stakeholders | - 3 - |
| 5. Use Cases | - 5 - |
| Use Case 1: Smart Space Flow Analytics | - 5 - |
| Use Case 2: Smart Metering in Multi-Tenant Commercial Buildings | - 5 - |
| Use Case 3: Smart Automated Building | - 6 - |
| Use Case 4: Smart Building Cockpit | - 6 - |
| 6. Dates and Locations | - 7 - |
| November 19th | - 7 - |
| 7. FAQ | - 7 - |

1. Introduction

Today's smart commercial buildings are beginning to leverage the industrial internet for improved business outcomes, such as better energy efficiency, improved tenant experience and lower operational costs. They may contain thousands of sensors measuring various building operating parameters including temperature, humidity, occupancy, energy usage, keycard readers, parking space occupancy, fire, smoke, flood, security, elevators and air quality.

The Smart Buildings Challenge brings together major industry players with selected start-ups and solution providers, helping to advance the digitalization of industrial buildings and the way they are operated. The industrial internet of things (IIoT) provides the foundation for the next generation of smart, sensor-based, connected building solutions. Trust-technologies like Distributed Ledgers (DLTs) enable secure and de-centralized data-exchange between IoT-enabled buildings and all other related IT systems.

The Smart Buildings Challenge is designed to give smart building technology suppliers the flexibility to collaborate with and better understand the needs of their target group to create more dedicated, outcome-based solutions. Our goal is to help overcome existing technology barriers to address the high volume of untapped opportunities in the market. Initial use cases for the challenge include:

- **Smart Space Flow Analytics:** We would like to understand the customer's behavior and needs within the mall by means of anonymized customer tracking and people flow analysis (i.e. Heat Map).
- **Smart Metering in Multi-Tenant Commercial Buildings:** Using smart meters in multi-tenant commercial buildings creates transparency on energy and water consumption on a detailed level. This transparency can be used to facilitate the billing process and identify energy efficiency measures. Deviation analysis from benchmarked consumption patterns can contribute to condition maintenance of energy systems.
- **Smart Automated Building:** Leveraging tracking and smart metering as well as external data, the HVAC and Lighting controls should be automatically monitored and managed to save energy and increase efficiency (i.e. through occupancy based regulation).
- **Smart Building Cockpit:** An overview or dashboard of the shopping center with data from all use cases enriched with additional internal data allows the key stakeholder to derive measures and take immediate actions

The current list of challenge sponsors includes ECE (Shopping Mall operator), Deka (Real Estate investor), Bosch (Building Technology) and Microsoft (Azure Cloud infrastructure).

2. Challenge Roadmap

The main goal of this initiative is to jointly develop solutions, which provide real value-add to the industry, owners, operators and tenants of commercial buildings, based on direct end-user feedback and field trials. We are aiming to build an ecosystem, which will jointly bring new solutions to the market, following a phased approach:

- Participants can apply to one or several use cases depending on the individual expertise and strengths.
- We will then run three ideation workshops in Hamburg, Munich and Berlin to allow stakeholders and contenders to closely interact and develop, review and refine the solution proposals for the defined cases. Should workshops within the shopping malls be needed, separate workshops can be scheduled.
- The contenders will submit their proposals, which are then evaluated by a jury consisting of industry experts. The winning proposals will be presented in a keynote at Bosch Connected World 2020 in Berlin.
- The winning proposals are intended to be implemented in the field, using shopping centers provided by the partners as pilot sites. Each pilot will be funded with EUR 25.000 by the challenge sponsors
- After a final desirability check, the pilot solutions are intended to enter the commercialization and productization phase. The goal is to create scalable solutions, which can be replicated with other customers/ end-users.
- Finally, the partner's ecosystem will initiate the joint go-to-market phase.



3. Selection Criteria

The submitted proposals will be evaluated according to the following criteria:

1. **Business-case strength:** How well does the proposal support the outlined use cases, provide value add for the partners, and deliver innovation?
2. **Technological feasibility:** How well does the proposal describe how it will ensure scalability and realistic rollout in an enterprise environment? Proof of concepts will be given bonus consideration.
3. **Community Contribution:** How well have the contributors supported the challenge events reflected in the timeline?

4. Challenge Stakeholders

The initial ecosystem for this challenge includes the following partners:

- Challenge Organizers
 - **Trusted IoT Alliance (TIOTA):** Non-profit foundation with 50+ members, focusing on the advancement of Trusted IoT technologies, including blockchain and

Distributed Ledger Technologies (DLTs). TIOTA will mobilize member companies and affiliated start-ups to contribute solution proposals based on trust-technologies.

- **Industrial Internet Consortium (IIC):** Non-profit industry alliance with 200+ members, focusing on Industrial Internet of Things (IIoT). IIC will mobilize member companies and affiliated start-ups to contribute solution proposals based on IoT-enabling technologies.
- **MachNation:** Global independent IoT research and benchmarking firm. MachNation will analyze and benchmark submitted proposals.
- Principals and Technology Partners
 - **Principal(s)** (sponsor and define Challenge) and **Technology Partners** (provide enabling technology) are identified on the [IIC](#) and [TIOTA](#) Smart Buildings Challenge web pages.
- Start-ups and solution providers
 - Main goal of the challenge is to bring together start-ups and other solution providers (e.g. system integrators) who will work alone or in small groups to provide solution proposals, PoCs and eventually pilot implementations to fulfill the requirements outlined by the challenge (see below).

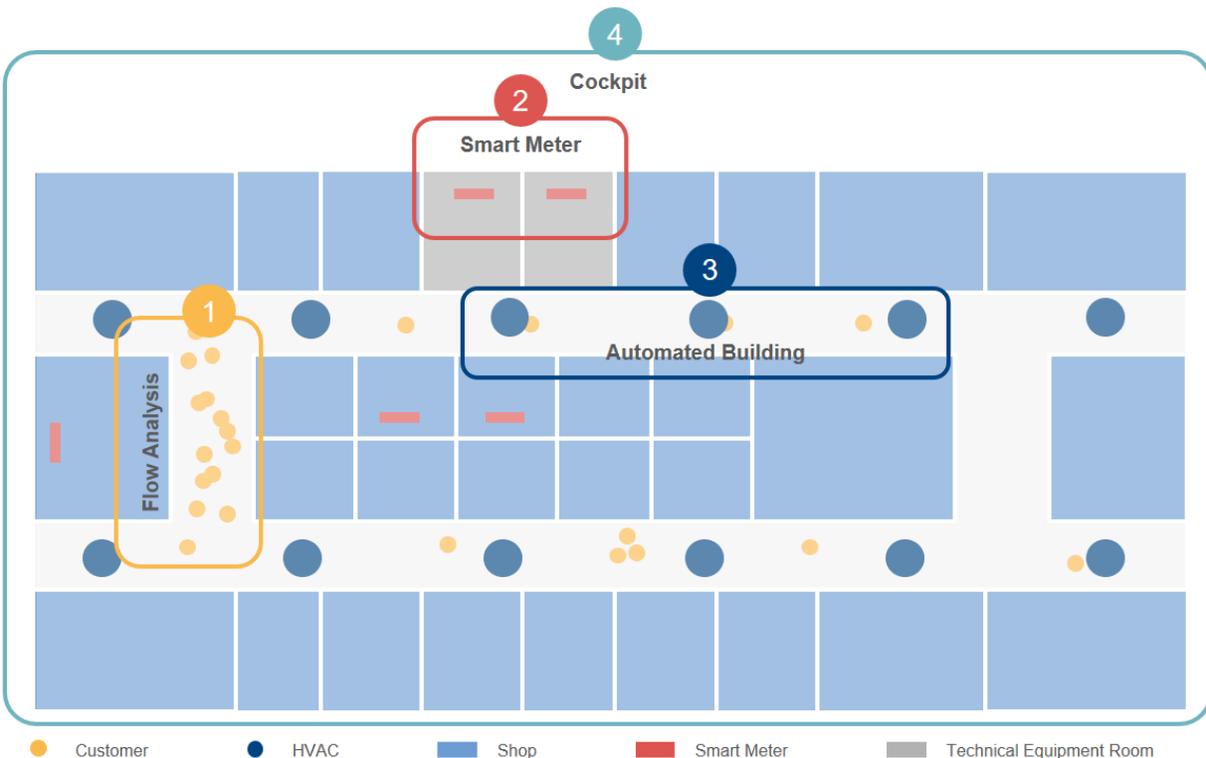


Figure 2: Overview

5. Use Cases

Use Case 1: Smart Space Flow Analytics

In order to analyze and understand consumer behavior and to carry out customer-specific marketing measures, customer tracking plays an important role in obtaining information on consumer behavior. Tracking of consumer behavior on websites, for example, is already done based on click rates, length of stay, bounce rate, etc. These indicators can be used both to analyze customer behavior and to measure the impact of individual advertising campaigns. We now want to transfer this from the online world to the offline world and track the customer directly while shopping in the shopping center. This does not only include marketing and advertising but also a better understanding of the customer itself and its journey in the center. This could include flow analysis, heatmaps, time spent, absorption rates between tenants, focus areas, etc.

Within the context of this use case, the consumer is to be tracked in shopping centers regarding the following goals:

- Analyzing customer flows within the shopping mall: Which ways do customers go, which shops do they visit, how long do they stay at which shop/area in the mall?
- Developing of heat maps to visualize key areas: Where is the highest density of visitors in the shopping mall and when are the most customers at these locations?
- Analyzing absorption/conversion rate: How many visitors to the individual stores have and how many of these buy anything?
- Analyzing impact of marketing: Which marketing activities within the mall have an influence on the customer? For example, is the advertised shop visited more frequently?

In order to achieve these goals, the task within this use case is to

- Establish a new technology for tracking customers (e.g. sensors or cameras)
- Provide tracking data for detailed analytics
- Generate standard reports as heat maps, conversion rate per retailer, etc.

Special consideration of this use case has to be given to privacy issues and compliance with GDPR and similar regulations.

Use Case 2: Smart Metering in Multi-Tenant Commercial Buildings

In the context of this use case, the energy and water consumption for tenants and HVAC elements within the center is to be measured in real time with smart meters at component level. This means that the electricity consumption is to be determined

1. for individual tenants,
2. in total (total cost) and
3. for technical equipment.

The data must be sufficient to carry out consumption analyses such as the detection of anomalies and potential sources of defects. To make this possible, the relevance of individual technical systems must first be assessed regarding their contribution to energy consumption, the required infrastructure must be developed, and the collected data must then be imported into SAP. The infrastructure should make it possible to read the smart meters with the least possible effort (e.g. via WLAN, LoRa or similar wireless IoT relevant standard technologies). To ensure, that the smart meters can be integrated to existing software solutions, standard (fieldbus) protocols for IoT (MQTT, OPC UA and/or similar protocols) or fieldbus protocols (Modbus, BACnet and/or similar) have to be supported. The aim of this use case is to simplify the creation of service charge statements (ancillary costs), to make them comprehensible, to allocate them and to provide a basis for use case 3, in which a control of the technical equipment is to be made possible. This use case is also relevant for the compliance with the German calibration law.

Use Case 3: Smart Automated Building

The aim of this use case to make all technical equipment controllable within the center in order to create a system for reducing energy consumption. Some elements must be fitted with sensors and smart units. In addition, external data, such as weather data, are to be integrated with the data from use case 1 and 2. The data from use case 1 regarding the locations of the customers and those from use case 2 regarding the HVAC elements and external data can then be used to react to all eventualities such as weather conditions, unusual behavior and alarms. In order to control the technical equipment, a remote-access and remote-control solution must be developed (e.g. via wireless communication) and should be integrated into the Smart Building Cockpit.

Use Case 4: Smart Building Cockpit

In the context of this use case, a central platform which integrates the information obtained in use case 1-3 and serves a basis for analyses is to be established. Therefore, past and current meter readings and customer data must be prepared and displayed on a dashboard. In addition, external data from third parties, such as sales of individual stores and rental prices, are to be integrated. At the end the cockpit should be usable for different stakeholder:

- C-Level Management
- Center Management
- Investors
- Headquarters of the Retailers

For the realization of the dashboard, for example, data can be integrated into mall plans or 3D models of malls can be developed and used. To integrate the dashboard into an existing enterprise architecture, a standard API structure needs to be implemented.

6. Dates and Locations

Please mark your calendars as follows:

| Date | Topic | Location |
|----------------------------|---|--|
| September 17 th | Kick-off and Ideation, including visit to Shopping Mall | Hamburg |
| November 19 th | Speed dating with end-users | Munich |
| January 14 th | Review / refinement of solution proposals | Berlin |
| February, 19 th | Presentation of winning solution proposals and award ceremony | Berlin, Bosch Connected World congress |

7. FAQ

| Question | Answer |
|---|---|
| Who is eligible to compete? | Everybody who wants to submit a solution proposal: Start-ups of any growth phase and location, but also system integrators, etc. |
| When / how do you select? | The selection comes <i>after</i> the formal submission, i.e. there is no hard selection criteria for participation in the ideation workshops, etc. |
| Do I have to attend all ideation workshops? | In an ideal world: Yes. But since the world is not ideal – “best effort” applies (see community contribution as selection criteria) |
| How does the application process look like? | We will provide a lightweight submission form, consisting of a PowerPoint template with about 10 slides in it, where each slide presents on question / topic for the submission (functional, technical, and business-oriented). |
| What about confidentiality / NDAs? | This is an open challenge. Proposals should only contain information on a level of detail which the submitters are happy to publically share. In the later stage (e.g. for the pilots), individual solutions regarding confidentiality can be negotiated. |
| Do we have to work with others? | Yes and no. We like to see cross-fertilization in the ecosystem because in our experience a single supplier can only rarely provide a complete end-to-end solution. So this challenge is |

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| | <p>very much about co-creation and collaboration. However, this is not a must.</p> |
| <p>Can you guarantee the pilots?</p> | <p>The challenge sponsors are fully committed to making suitable pilot projects available and to provide at least one shopping center for field trials. However, this is based on the assumption that sufficiently attractive proposals are submitted by the winning teams, which not only convince the jury, but also the other required customer stakeholders. This is something that cannot be guaranteed before the final results are out, so this is a best effort approach by all sides. The same applies to the Go-to-Market phase.</p> |
| <p>Who is financing what?</p> | <p>The sponsors are financing the ideation workshops and the pilot projects (EUR 25K / pilot). The assumption is that after the pilot projects, individual commercial negotiations between partners and solution providers will start.</p> |