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The return to the office –
the IoT as a crucial piece
of the puzzle

IBM: Make your office safe, smart
and cost-efficient

Thing-it: The digital transformation
of the office – teaching space how to think

aruba
a Hewlett Packard
Enterprise company

EnOcean
Self-powered IoT

EnOcean and Aruba –
the secure connection of IoT and IT

EnOcean's new IoT starter kit EISKx simplifies the integration of EnOcean wireless, self-powered sensors into already existing IT infrastructure with Aruba Wi-Fi access points – for a fast, easy and secure connection to the cloud.

Key benefits

- Two different versions:
  EISKA for Europe and EISKU for North America
- Makes the building flexible for different and changing scenarios
- High security standard for IoT projects in smart buildings
- Reduces IoT project costs by using the existing IT infrastructure
- Easy installation of EnOcean sensors in Aruba's Wi-Fi network
- Sensors operate wirelessly without batteries and cables using energy harvesting technology
- Access to the EnOcean Alliance network and thus to members' interoperable IoT applications
- Certified interoperability makes your IoT projects successful

www.enocean.com/en/aruba

Dear readers,

When I look at EnOcean, I of course see the world leader in energy harvesting, but I also see so much more.

EnOcean is a company that, thanks to its "magical" technology, enables the buildings and office spaces of all its customers to be more sustainable. This is leveraged through an ocean of partners supporting Bluetooth or Zigbee solutions and, of course, the EnOcean standard. The diverse ecosystem and associated interoperability make EnOcean an incredibly exciting partner for IoT solutions.

Our market focus is on the enterprise and commercial real estate segments, where replacing battery-operated IoT devices like sensors is simply not viable. These devices would have to be deployed on an extremely large scale throughout entire building complexes or across company campuses. Customers would need to substantially expand their IT departments to manage innumerable IoT devices and constantly replace their batteries. That's why our concept is to provide easy-to-deploy, maintenance-free, self-powered IoT devices.

For the above reasons, I'm very honored to have been offered the opportunity of leading EnOcean as CEO since August 1, 2021. I would also like to use this platform to thank my predecessor Andreas Schneider for his impressive work over the past few years – without his leadership, EnOcean would not be where it is today.

This latest issue of Perpetuum provides impressive examples of the diversity of the powerful applications where our technology is used.

One topic that's currently on all our minds is a safe return to the office and new forms of collaboration. Based on its Smart Spaces solution, T-Systems presents opportunities for companies to digitize buildings and spaces. Hybrid models consisting of a combination of in-person and remote working will play a major role in the future. IBM has implemented its own solution at IBM Watson Center Munich as an example of how sensors can analyze room usage in real time and send the current occupancy data to an employee app – naturally, while also complying with data privacy regulations.

Check out the latest issue and learn about the many impressive projects being implemented by our network of partners. Or would you rather read it online? Then take a look at the digital edition, which has additional articles.

Raoul Wijgergangs,
CEO of EnOcean

Read exclusive articles in Perpetuum online!

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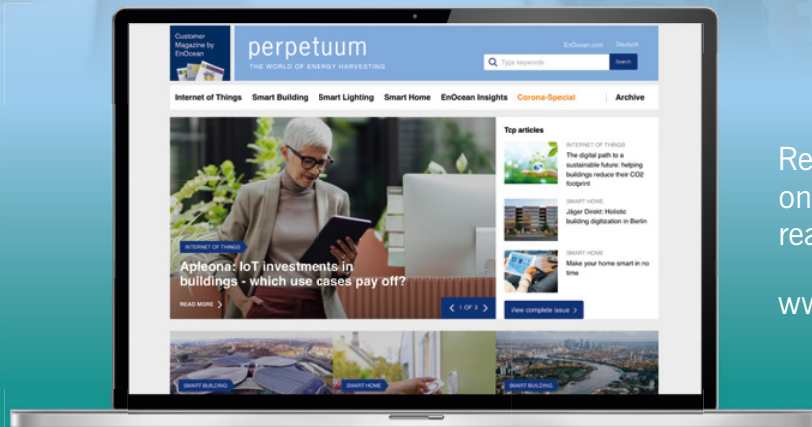Read exclusive articles
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Return to the office – the IoT as a crucial piece of the puzzle

Wi-Fi access points as game changers in the fast and cost-effective rollout of flexible workplace solutions

It's no longer just a matter of speculation: The home office is here to stay. Before the pandemic, around 4 percent of all employees in Germany worked from home. According to statistics, this rose to about 30 percent during the first lockdown. Recent surveys show that most companies and employees will be opting for a mixture of in-person and at-home work in the future. Given that there's no going back to the days before the coronavirus, it's time to rethink our earlier concepts of workstations and space.

By Armin Anders, *Vice President Business Development, EnOcean*

IoT solutions as data source

IoT solutions supply the data necessary for analyzing and optimizing the utilization of space. One example is the growing introduction of flexible desktop sharing models for handling the future mix of days at home and in the office. Their basis is IoT solutions that use sensors to intelligently network buildings. Previous projects have shown that it isn't just a matter of reducing costs by minimizing utilization of space. The primary objective is for employees to be able to work together productively. In hybrid models, the most important factor is the function of space. More interaction, creativity, and comfort for the employees in the office results in higher productivity.

Application examples

IoT solutions in buildings are coming of age and offer a number of interesting applications that have been proven in practice:

Room and workstation reservation
Especially, employees who can and want to use the option of remote working do without a fixed workplace in return. In this way, the trend toward more remote working generates employee acceptance of new working environments. Improved teamwork, increased company attractiveness for high potentials and avoidance of demotivating vacancies are the result.

Apps provide real-time information about the occupancy status of a room or workstation.

The simple example of "reserving meeting rooms" illustrates the advantages. In real time, sensors transmit data on desk or room occupancy to the IoT application that analyzes space utilization and sends the current room occupancy to an employee app. In this way, work environments dynamically adapt to demand.

Demand-oriented cleaning

Smart cleaning has become a valuable IoT application in public spaces like railway sta-tions, but also in businesses. Based on sensor data, cleaning staff are notified when the soap dispenser is empty or after a defined number of people have entered the room. Smart cleaning increases visitors' satisfaction and saves money by utilizing staff exactly when and where they're needed.

Employee well-being

Although it's difficult to objectively measure employee well-being apart from counting sick days, it clearly impacts a company's productivity. However, basic definable conditions like a comfortable room climate with automatic measurement of CO2 levels are determining factors that are easily controlled. This includes a practical desk sharing model that meets employees' needs for flexible work schemes.

Energy savings

The classic problem of building automation is how to save energy and thereby reduce CO2. Buildings continue to be the largest source of carbon emissions in Europe. Companies are being judged more and more by their sustainability. It's relatively easy to reduce a building's carbon footprint. For example, automatically switch off lights in occupied rooms, switch off the heat when windows are open, don't heat unoccupied rooms, etc.

Integrating infrastructures

For years, the above-mentioned IoT applications have been functioning flawlessly in numerous proofs of concept. One major cost driver so far has been the large number of gateways and especially the huge quantities of cabling required. With its IoT Connector, EnOcean has found a way to significantly cut costs by using the Wi-Fi interfaces of the existing IT infrastructure to transmit data. Having formed a partnership with Aruba and Cisco, EnOcean is now able to connect with around 70 percent of all existing Wi-Fi solutions in companies.

Employees can adjust the indoor climate, such as the room temperature, via app.

Briefly, sensors transmit data to the network provider's existing – or in any case necessary – Wi-Fi access points via an installed USB stick. From there, the data is forwarded to the IoT application running, for example, in the cloud. The IoT data channel is completely decoupled from the Wi-Fi data channel, eliminating all concerns about security. As a result, additional wireless gateways are no longer required in these environments.

Sample calculation

Together with our partners e-shelter, NTT, and Thing-it, we implemented a comprehensive IoT project for a global company in the sporting goods sector. The goal was to implement a highly flexible system for utilization detection and the reservation of workstations, conference rooms, and break rooms. In this application, desk and room occupancy sensors as well as people counters detect current occupancy in real time and forward the information to the cloud-based reservation and visualization system.

The project involved equipping nine buildings distributed over three locations in Europe and the U.S. and with a floor area totaling 150,000 square meters with about 8,000 self-powered sensors. e-shelter has calculated that IoT gateways, and especially the associated cabling, are responsible for about 50 percent additional project costs on top of actual sensor costs. These infrastructure costs are completely eliminated just by using the existing Wi-Fi access points!

A partner network like the EnOcean Alliance is extremely valuable in a project of this type. Some 400 members guarantee the interoperability of the products and system components that have to interact seamlessly.

Is the death of the office in sight?

A dedicated workstation for every employee is no longer a realistic expectation. It was never really efficient even before the pandemic, but the motivation to change wasn't there. Calculations show that even before the coronavirus, a desk workstation was utilized only about 60 percent of the time due to vacations, illness, and business trips. This will significantly increase now.

New work schemes need to be established that require a different utilization of space. IoT applications can help companies and facility managers to automatically analyze space utilization and flexibly adapt it to changing and future needs. This type of solution must use open interfaces to render it easily scalable, economical, flexible and, above all, maintenance-free. The ideal solution is self-powered sensors and a minimal use of resources thanks to their connection via Wi-Fi access points.

www.enocean.com

The digital transformation of the office – teaching space how to think

SENSOR AT CEILING

SENSOR AT WORKSTATION

Agility is determining today's workplace. Employees increasingly work independently of time and location. This development and the current challenges presented by the pandemic, such as social distancing and hygiene measures, require new digital office concepts. As a specialist in the design and furnishing of modern office and work environments, Bene has developed the SMART OFFICE by Bene in cooperation with the software specialist THING TECHNOLOGIES and the full-service provider GMS Global Media Services GmbH. **By Dr. Marc Gille-Sepehri, founder and CEO, Thing-it**

SENSOR AT CEILING

SENSOR AT WORKSTATION

Sensor intelligence permits precise space analysis

Since many companies have switched over to open space and activity-based working, most workstations are no longer assigned to specific employees. "With SMART OFFICE by Bene, we've developed a data-driven office concept – an office that learns," explains Michael Fried, Director of Sales, Marketing & Innovation at Bene.

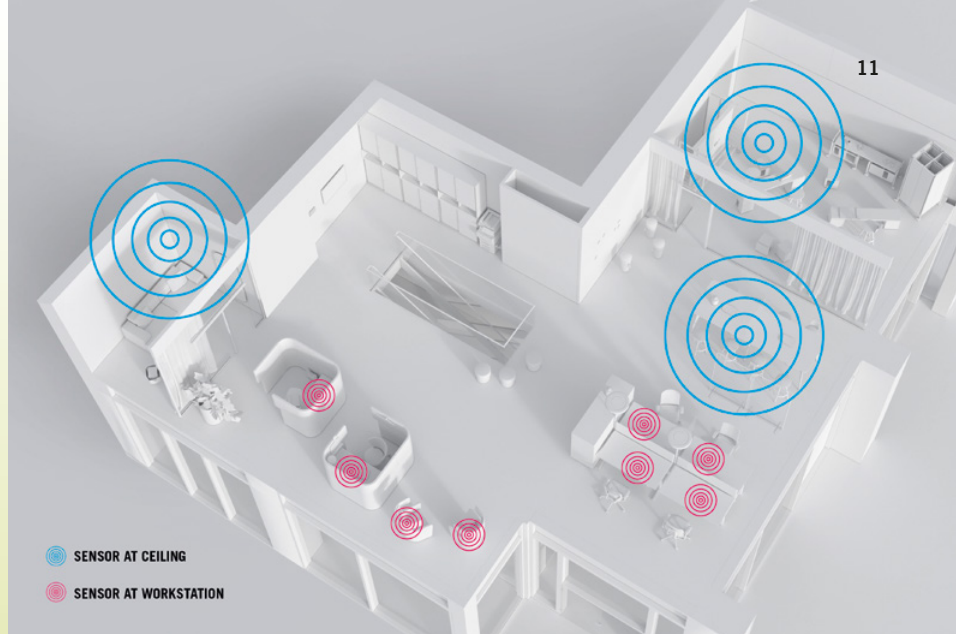## Organizing more than just the office routine with a smartphone

SMART OFFICE by Bene gives users a digital point of interaction that they can use to plan their everyday work routine from an app or the Web. At the press of a button, the reservation system shows which social distancing-compliant office spaces are available and when. Conference rooms, parking spaces, and lockers can also be conveniently reserved online. Other options include food ordering with a payment function, information on the surrounding area, display of the nearest break room, instructions on how to use the media equipment in the conference room currently occupied, and much more.

Complete solution from a single source

The customer's needs also determine how comprehensive the app will ultimately be. That's where GMS Global Media Service (GMS) comes into play. "In our capacity as a smart office system integrator, we provide complete support for every project. This includes comprehensive system design and implementation in new buildings as well as retrofits," says Tobias Enders, Managing Director of GMS.

Customers want to know more about their space

Many customers see the ability to analyze the use of office space as key. They want to know how their space is being used. This type of analysis can be made possible only by combining furniture with sensors such as EnOcean wireless sensors. These devices are maintenance-free and have a long lifespan because they generate the energy they need on their own. They're either solar-operated or convert movement into energy. As a result, they work completely independently of the power grid. The sensors can also be integrated into existing infrastructures with little effort.

Analyzing how offices are used in compliance with data privacy rules

Now more than ever, it's important to make a data-based assessment of which areas can still be used after people return to the office. The point is not so much to rent less office space as to learn how to make better use of the existing space. For this purpose, vibration sensors are mounted unobtrusively on or beneath the desk, and ceiling sensors are installed in meeting rooms. It's important to use only technology that protects privacy and thus complies with Europe's General Data Protection Regulation (GDPR).

Interacting with the office

Thanks to software from Thing-it, users see a virtual twin of the space and can locate all the resources that can be reserved, includ-

ing workstations, conference rooms, lockers, and phone booths. Users can see the status of a resource on their smartphone displays, and also whether it can be reserved, when it's occupied or, with their colleagues' consent, who has booked it and for how long. With the aid of EnOcean sensors, users can also control CO_2 levels in room air, room climate, lighting, and shading via the app.

Getting more out of office space with technology

When employees reserve a workstation via Thing-it, this is the first step toward managing the space efficiently. The company that uses the app can see which resources are most frequently used. This can then be linked to other processes like cleaning. Conference rooms that are rarely used don't have to be cleaned as often.

In this type of project, process-oriented issues are also important: Who has which rights to reserve what? Who's allowed to control what in the conference room? The solution used must be extremely flexible and customizable. This is the only way to make building and asset management truly efficient.
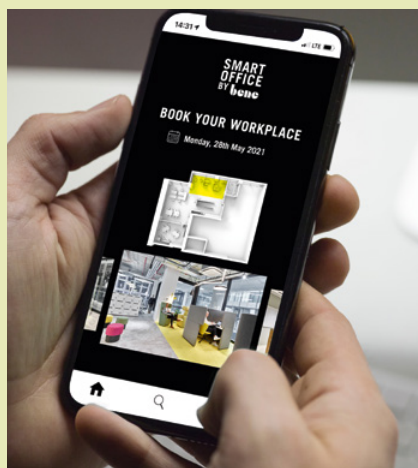
www.bene.com/en
www.gms-mediaservices.de/en
www.thing-it.com

The Hyperaware is open for business

A long-time employee, Monique, returns to her workplace for the first time since the out-break of the COVID-19 pandemic. Corporate infection management and contact tracing protocols are in place to ensure a safe employee experience. By Michael R. Tennefoss, Vice President of Strategic Partnerships, Aruba, a Hewlett Packard Enterprise company

As Monique enters the building, she wonders if any of the hot desking cubicles are clean and ready for use. The first cubicle has a yellow light indicating it's occupied. The second has a red light showing it needs cleaning. However, the third cubicle has a green light so Monique knows it's available for her use. She sets her smartphone on a landing pad, and instantly the light turns yellow and she receives a text reserving the space.

At lunch, the cafeteria starts filling up with employees. As she enters the room, Monique wonders if there's sufficient airflow to safely accommodate so many people. She soon feels the fresh airflow, and sees the current air quality rating – "Excellent" – displayed on a monitor.

App for effective use of space

After lunch, Monique needs to meet with a colleague for an impromptu conference. She looks at a smartphone app that displays which rooms are unoccupied and how to get there. She selects an empty room and when she enters it, the app updates to show that the room is occupied and a light outside the room turns yellow. Once the conference ends and the room is unoccupied, the light turns red and a cleaning crew is dispatched to clean the space.

Monique works in a hyperaware building with an IT infrastructure equipped with the Aruba Edge Services Platform (ESP), which converges IT, IoT, and operation technology (OT) to create situational awareness. Virtually every Aruba Wi-Fi 5 and Wi-Fi 6 Access Point ever sold supports EnOcean USB 800/900MHz adapters, meaning that EnOcean-based IoT devices can be quickly and inexpensively added to both new and existing deployments. ESP bi-directionally streams EnOcean IoT data to and from

Deuta Controls
EnoPuck Space
Monitor

Workplace

Aruba Edge Services Platform (ESP) infrastructure
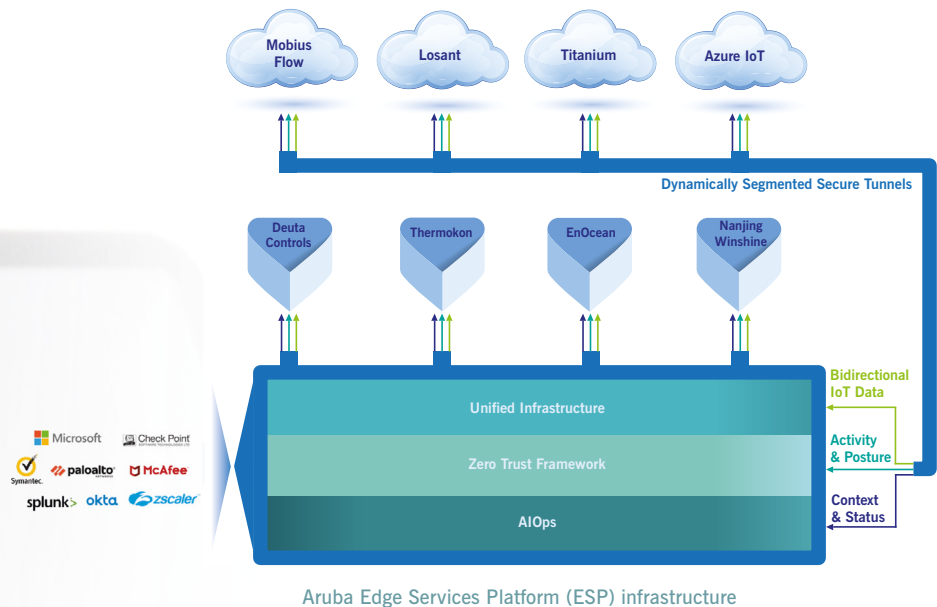
building automation and business applications, helping them understand the current environment and projected future environments.

Real-time information for a hyperaware system

The IoT and OT device data is the eyes and ears of these applications, while contextual information (identity, location, applications in use, and security posture) from ESP informs applications in real time about the occupants. The conjunction of data and context creates hyperawareness that better informs decision making. Plus, the hyperaware metadata can be shared, making it simpler to use new applications like Aruba's contact tracing solution without ripping out and replacing infrastructure.

Interoperable devices for many use cases

In Monique's building, ESP interfaces with Deuta Controls' EnoPuck workspace occupancy sensors, Thermokon's demand-oriented ventilation devices, EnOcean room occupancy sensors, and Nanjing Winshine cleaning management solutions. Occupancy management is handled by iaConnects' MobiusFlow application, while core building automation, lighting, energy, and security services are handled by Titanium Intelligent Solutions. Other application workloads sit in the Azure IoT cloud and use Aruba's IoT Transport for Microsoft Azure to securely stream data to and from the Azure IoT Hub.

Each vendor's solution has been certified by Aruba for interoperability, allaying the Chief Information Officer's concerns about compatibility. ESP dynamically segments IoT communications over secure tunnels, addressing the Chief Information Security Officer's mandate for a zero trust framework.

https://www.arubanetworks.com/solutions/hybrid-workplace/

Where do we go from here?
Work from home, everyone back to the office, or a little of both?

The COVID-19 pandemic gave a boost to the digital transformation strategies of companies. Business and management processes were put to the test and digitized. Employees were given the opportunity to access and process company data digitally. For a long time, work was centered on the home desk. **By Nicolle Quaitsch, Head of Center of Excellence Microsoft, T-Systems MMS and Tino Mager, Senior Azure Architect, T-Systems MMS**

The requirement to work from home in Germany was lifted on July 1, 2021. However, it's still necessary to adhere to the latest hygiene guidelines, with the result that in some circumstances not all workstations can be used at the same time.

How can office desks be distributed and assigned so flexibly that everyone who wants a workstation can have one and no one has to return home? Digitizing office space starts here and enables efficient management. It also makes sense to include the capacity utilization of cafeterias, meeting rooms and other gathering points such as break rooms in planning.

IoT-based post-COVID strategy for companies

Using IoT solutions, experts at T-Systems MMS and EnOcean worked with the customer to develop a concept for a post-COVID approach. The goal was to bring employees back to the office and monitor the number of people per square meter in compliance with the General Data Protection Regulation (GDPR). However, launching this type of "digital building" project isn't just a matter of attaching sensors to desks. Such a comprehensive change project entails a certain degree of complexity – for example, in terms

of "connectivity," "cloud platform," the "application" itself, "system integration," and "installation/activation/maintenance."

The first step is to consider the requirements. Which rooms will be equipped with sensors and why? Should the focus be on an effective use of space, on adapting energy consumption to utilization, on avoiding unused space, and/or on ensuring demand-driven cleaning and disinfection?
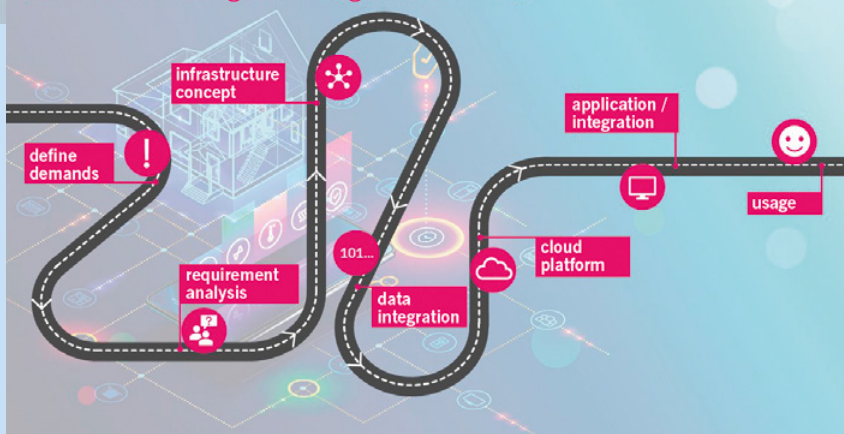
Next comes an analysis of the requirements. A digital floor plan might be necessary in order to digitally map rooms. As part of the requirements analysis, we also check which sensors are present and what kind of connectivity is available – for example, WLAN, LoRa (WAN), NB-IoT, or Bluetooth.

One highly relevant point that's often underestimated is the presence of data or data streams relating to the buildings and spaces. We need to clarify who they belong to and

How to start with digital buildings

infrastructure concept

define demands

requirement analysis

data integration

cloud platform

application / integration

usage

the extent to which they can be accessed, for example, to display capacity utilization on a dashboard.

Finally, we develop a concept that includes, for example, integration of the solution for booking individual workstations into an employee app or another existing system. For the provision of data, different approaches are also possible, depending on the existing connectivity system, cloud, or on-premise availability as well as the ability to integrate sensors and actuators.
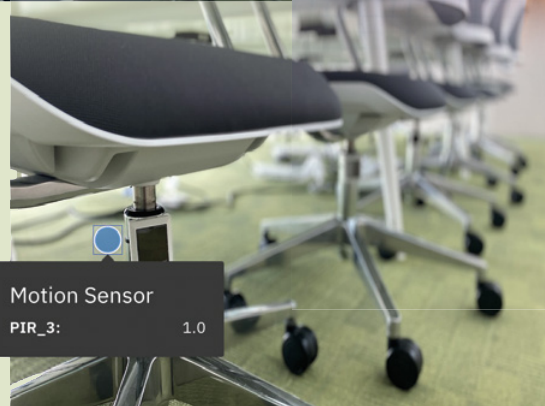
Interoperability for future upgrades

We collaborate with the customer, EnOcean, and the necessary partners to ensure the highest possible degree of utilization by employees as well as an efficient capacity utilization rate for facility management monitoring. If the customer uses the interopera-ble Smart Spaces platform from T-Systems MMS, the company will be able to integrate and implement additional use cases individually in the future. This is not possible with a manufacturer's proprietary system.

www.t-systems-mms.com/en

Activity percentage

| Activity: | 21.0 |
| Activity2: | 13.0 |
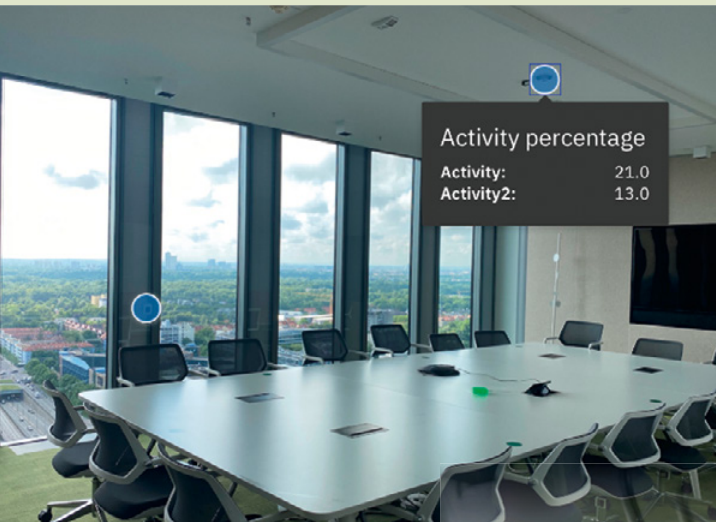
The green light lets employees know that it's OK to enter the room.
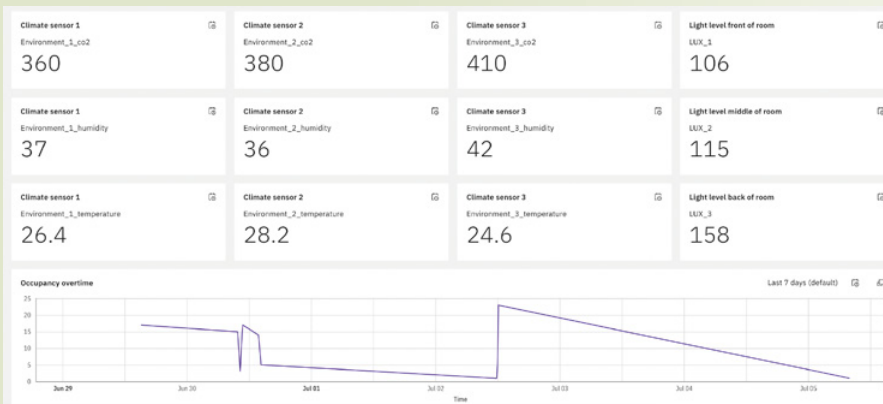
Motion Sensor

| PIR_3: | 1.0 |

Solar-powered motion sensors detect things like whether a chair is occupied.

Make your office safe, smart and cost-efficient

After the coronavirus pandemic, 66% of employees would prefer to be in the office for at least a couple of days a week, as this IBM Institute of Business Value Study shows. Companies have to make sure that their employees can return to a safe and trustworthy workplace. They must ensure that critical workplace services are available where and when they're needed. At the same time, there is increased pressure to reduce costs and restructure their real estate portfolio.
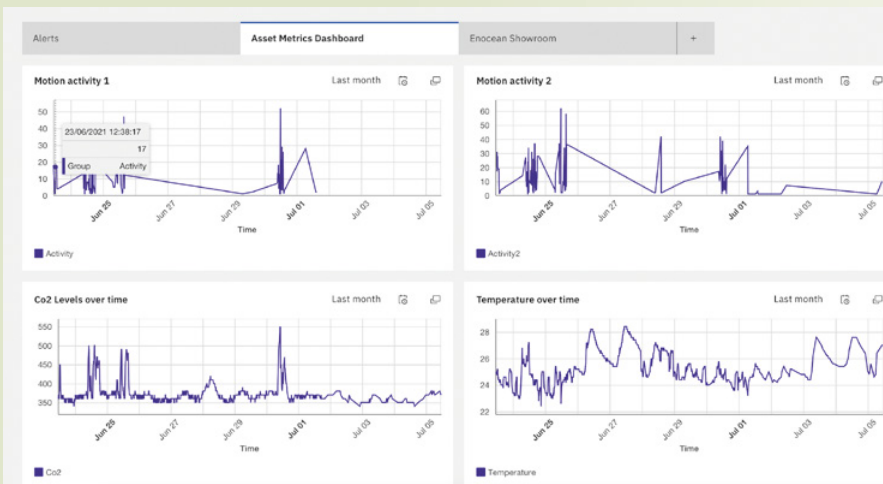
By Elena Kotljarova, Business Development for Facility Management & Real Estate, IBM Watson Center Munich and Joseph McKay, Client Engagement Leader, IBM Watson Center Munich

Climate sensor 1	Climate sensor 2	Climate sensor 3	Light level front of room
Environment_1_co2	Environment_2_co2	Environment_3_co2	LUX_1
360	380	410	106

Climate sensor 1	Climate sensor 2	Climate sensor 3	Light level middle of room
Environment_1_humidity	Environment_2_humidity	Environment_3_humidity	LUX_2
37	36	42	115

Climate sensor 1	Climate sensor 2	Climate sensor 3	Light level back of room
Environment_1_temperature	Environment_2_temperature	Environment_3_temperature	LUX_3
26.4	28.2	24.6	158

Occupancy overtime — Last 7 days (default)

Dashboard 1 displays a wide range of measurement data on temperature, humidity, and lighting.

Dashboard 2 provides information on things like the actual use of a meeting room.

Alerts | **Asset Metrics Dashboard** | Enocean Showroom | +

Motion activity 1 — Last month
23/06/2021 12:38:17 — 17 — Group — Activity — Activity

Motion activity 2 — Last month — Activity2

Co2 Levels over time — Last month — Co2

Temperature over time — Last month — Temperature

Consequently, it's essential that businesses know how their buildings are being used in terms of usage and environmental behavior. This can be achieved by leveraging sensor data. Sometimes data from the Building Management System (BMS) can be leveraged, but in some cases it makes more sense to install extra sensors.

EnOcean sensors linked to IBM IoT platform

At the IBM Watson Center Munich, we equipped a meeting room with a total of 36 EnOcean sensors and a variety of about 10 different sensor types. They run on the IBM IoT platform, which interconnects all the sensor data via the IBM Maximo Asset Monitor. The sensors – which can even detect noise in the form of sound pressure – monitor the activity level as well as the air quality. This data is fed into two dashboards. The first contains a large amount of data in the form of gauges. The second provides a more detailed view of several sensors as well as the associated activity in the room. With

the dashboard's alert function, users can monitor the room's CO2 level. This is extremely important because the CO2 level heavily impacts the air quality and can cause headaches, fatigue, or even worse.

The dashboards monitor in real time:

- How frequently and by how many people the room is used;
- The air quality in the room (based on temperature, CO2, VOC, noise level, etc.);
- Whether the room is empty despite being reserved or whether there's someone in the room even though there's no reservation.

On the one hand, this data permits more precise decisions in terms of space management, such as whether the room is being used efficiently or should be divided into two smaller rooms. On the other hand, the system forwards this information to the users – the employees – allowing them to check whether or not the room is occupied. By connecting the sensor data to the room booking system, it's possible to obtain a holistic overview of the digital reservations and physical world. This means that if the room is not booked but someone is in it, employees see this on their mobile phone and don't need to waste time going to the room only to find out that it's already occupied.

Improving air quality

With environmental data, it's also possible to provide an additional service to employees: By combining weather data with historical environmental data from the sensors and historical data about usage, a model can be trained to predict air quality in the future. With this feature, employees receive recommendations regarding which room to select for a specific number of people in order to ensure that the air quality will be just right.

https://www.ibm.com/business-operations/resources/munich-center

IoT technology brings more cost high-quality services

Founded in 1936, Aramark is a global leader in outsourced catering, facility management, and uniform services. Aramark China provides a full range of building management and support services such as cleaning, intralogistics, elevator escorts, security, and food service solutions to nearly 500 hospitals, schools, banks, and multinational corporations in China.

By the Marketing Department, Nanjing WinShine Network Technology

WinShine and Aramark China have established a partnership to integrate their workflows and concepts using wireless technologies such as EnOcean and Bluetooth in order to design innovative solutions for the areas of cleaning, intralogistics, meetings, inspections, and staff management. These solutions not only improve daily work efficiency, but also the experience of customers.

On-demand cleaning triggered by sensor data not only optimizes scheduling, but also reduces staff deployment and costs. In restrooms, sensors calculate the flow of people and push the work order to the cleaning staff as soon as a set value is reached, allowing on-demand cleaning to be performed in a timely manner. When the sensor detects an odor such as ammonia, it can automatically turn on the deodorizing machine and fragrance machine. In the daily cleaning of offices or wards, the intelligent equipment can monitor the working time of cleaning staff in different spaces. This makes it easier for managers to schedule cleaning and personnel.

The level of consumables like paper towels and hand sanitizer can be monitored at regular intervals by installing sensors. Replenishment is then performed as needed, greatly reducing the time required for this daily task.

-effective and

The WinShine smartwatch enables Aramark to instantly inform its employees of new work orders.

For indoor delivery services, the sensor can obtain the location of transport carts and boxes as well as wheelchairs at any time – a practical feature that significantly improves the efficiency of services.

In the area of space management, sensors record the occupancy status of spaces like restrooms, workstations, and meeting rooms. For optimal convenience, customers are guided to their destination by signposts and apps. Services can also be requested via buttons and QR codes.

WinShine uses wireless technologies like EnOcean and Bluetooth to provide Aramark and its customers with low-cost solutions that can quickly be implemented and enable them to stay one step ahead of the competition. The technologies are already being used in more than 50 hospitals, businesses, and universities.

www.win-shine.com
www.aramark.com

Design Offices –
a perfect synergy of Casambi and EnOcean

A combination of Casambi's Bluetooth-based wireless lighting control system and EnOcean's energy harvesting switches enhances flexibility in wireless lighting control. A prime example is Design Offices, the German leader in corporate coworking. **By Saara Guastella, Product Marketing Manager, Casambi**

Design Offices' coworking spaces are often re-rented and modified. The flexible lighting concept is designed precisely for this purpose thanks to Bluetooth-based EnOcean sensors.
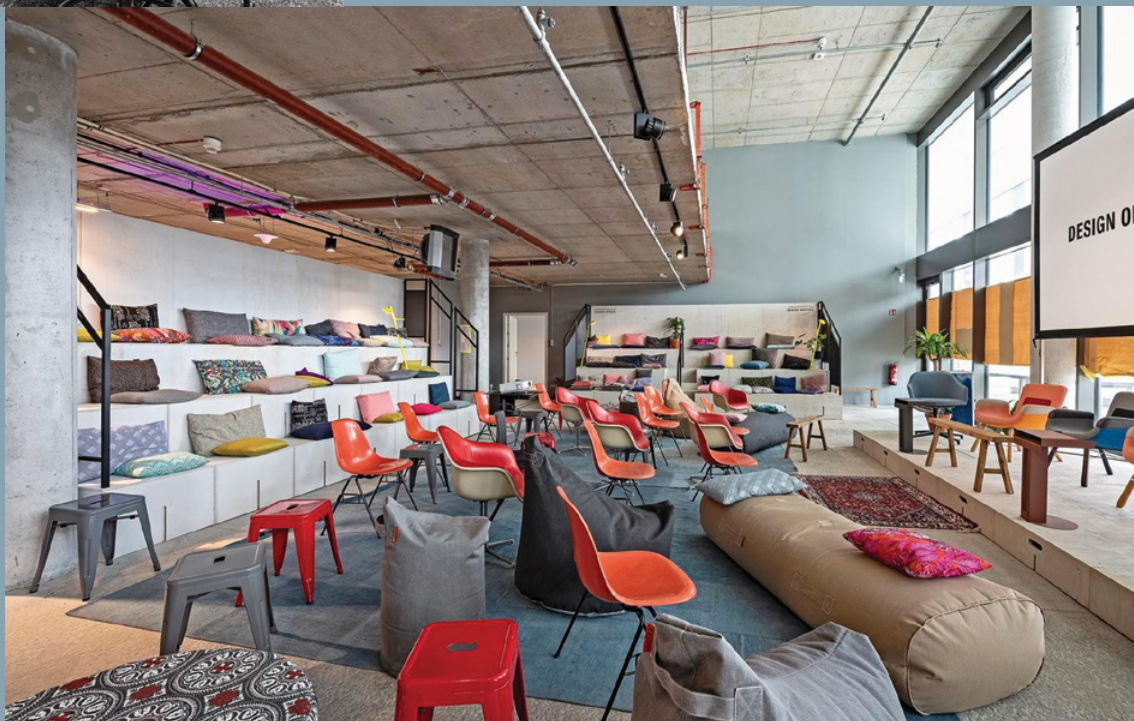
The hybrid working model has become a major attraction for many employees, including post-pandemic, and Design Offices knows this only too well. The thoughtful and flexible design of their spaces – courtesy of designer Alexander Veiel Licht and using the Casambi and EnOcean solutions – offers an attractive and dynamic option for on-site working. Design Offices currently operates spaces in more than forty locations in fifteen cities across Germany, with approximately 173,000 square meters of new working space.

The new normal given an illuminating boost

Because all Design Offices coworking spaces are part of an ongoing dynamic leasing process, the lighting concept has been designed with this in mind and planned as not fixed to any one static idea. Occupants are given the option of deciding on and then activating the best lighting environment for their individual needs – letting them assume the role of lighting designer. As a result, Design Offices has achieved maximum flexibility for offices, thanks to a completely wireless control solution. This flexibility becomes apparent when any layout changes are required, from simple adjustments in furniture placement to more substantial changes like adding/subtracting walls or partitions. Because there are no wires, EnOcean switches can be moved at any time. Everything else is pure software, which means that changes can be made very easily.

Casambi enables compatible products, including EnOcean switches, to create a wireless mesh network based on Bluetooth Low Energy. Casambi is also the only lighting control system in which wireless switches from EnOcean can be paired with the whole network, rather than just the nearest individual node, making the solution robust and smart.

Design Offices is well equipped to provide this kind of control, with the Hannover location alone having 2,500+ nodes and 200+ EnOcean switches – numbers exceeding those of normal office complexes.

Results that speak for themselves

There have been very noticeable, positive results from the combination of Design Offices' design ethos, EnOcean's energy harvesting wireless switches, and Casambi's control solution. According to David Sparfeld, House Manager for Design Offices Hannover, "Poor lighting is glaring and damaging to the eyes, which can make them tire quickly. All the better that we have large windows and can flexibly adjust room lighting – perfect for sustained concentration."

www.casambi.com

Energy-efficiency
made easy

Building automation with EasySens® wireless products at "Schwabinger Quartier 2" in Munich, Germany

The "Schwabing Nord" building ensemble is located near the BMW Group's Research and Innovation Center. When implementing Quartier 2, PKE Deutschland GmbH – an expert in building systems and building automation – relied on digital and analog measurement electronics from Thermokon. The EasySens® wireless system plays an important role. By Cornelius Berns, Head of Sales, THERMOKON Sensortechnik

In a gross floor area of 41,000 m², DIBAG Industriebau AG created an attractive commercial location that enriches this trendy district of the Bavarian capital. The goal was to develop a light-flooded, sustainable green building using modern construction methods.

DIBAG commissioned PKE Deutschland GmbH, a known specialist in user-friendly, innovative solutions for energy-efficient room and building automation, to implement a building automation concept for Quartier 2. In accordance with the client's specifications, PKE focused on developing a concept that saves resources while allowing the office space to be used in a variety of ways and easily rearranged at any time.

EasySens® enables flexible use of space

For the implementation, PKE selected solutions from Thermokon. The sensor expert had already distinguished itself in the course of various joint projects with high-quality measurement electronics "Made in Germany." Holm Ebermann, Senior Project Manager at PKE, reports: "The required room flexibility could be implemented with the help of innovative products based on EnOcean technology, among other things. We selected Thermokon because of its powerful overall package, product portfolio, and service, including reliable, trustworthy development work and the integration of new solutions. In addition, the energy-autonomous EasySens wireless system met important prerequisites for implementing customer requirements."

Integrated into DDC systems

This project used a total of three EnOcean-based solutions from Thermokon in the Schwabing Nord office and commercial complex. PKE's automation concept required that Thermokon's sensor technology work with two different DDC systems.

Reliable measurement of actual and target temperatures is provided by 180 SR07 P-type EasySens room control units. This stylish operating unit with potentiometer transmits its values to the central building automation system for further processing, thus ensuring a comfortable room temperature. The high degree of comfort is supported by 155 battery-free, wireless EasySens switches that control shading. An additional 200 EasySens wireless switches are used in rooms to change the lighting as required. Thanks to their wireless technology, all the solutions can be flexibly installed to permit a high degree of design freedom for architects, planners, and users.

Analog sensor technology from Thermokon also contributes to demand-oriented building automation in the building ensemble. Among other things, PKE selected Thermokon sensors for measuring the temperature in all heating and ventilation ducts and for pressure monitoring. The overall concept is rounded off by various condensation monitors and frost protection thermostats.

More than 500 EnOcean products in use

The main challenge in planning and implementing the building automation system was the large number of wireless-based EnOcean devices – more than 500 in total. To ensure full coverage, PKE used a tool in the planning phase that was suitable for mapping the various wireless ranges in the dwg and BIM plans.

Last but not least was the need for professional planning and organization of the implementation and installation. PKE was pleased with Thermokon's service orientation. Product deliveries were always on schedule and in the specified quantities based on a LEAN plan to optimize workflows. In addition, the pre-configuration contributed to a significantly shorter commissioning time.

Smooth implementation

PKE Senior Project Manager Holm Ebermann is extremely satisfied with the implementation of the EasySens solution. "The EasySens ecosystem allows for a very quick installation and easy commissioning due to the fact that no cabling is required and pre-commissioning is possible before being on site. This is what makes EasySens an outstanding solution."

www.thermokon.com

Contemporary Controls' EnOcean to BACnet gateway simplifies the bridging of two worlds

Contemporary Controls' EnOcean to BACnet gateway makes it possible to combine EnOcean devices and BACnet networks. Each EnOcean device appears in BACnet as a single virtual device via the gateway. By Bennet Levine, R&D Manager, Contemporary Control Systems

For example, to learn the status of an EnOcean temperature device, the user would first instruct the gateway to listen to messages from this device. EnOcean device discovery can occur when it transmits a message, or its information can be entered directly into the gateway. The gateway then creates a virtual BACnet device whose status is the value transmitted by the temperature device.

This process can also be applied in reverse by making the EnOcean gateway appear as a virtual EnOcean device in order to integrate and control real EnOcean devices, such as an EnOcean relay. This creates a virtual BACnet device which, when it communicates via BACnet, will cause the gateway to act like the virtual EnOcean device and transmit a message to the connected EnOcean relay. The gateway can control a large number of EnOcean devices based on commands from the BACnet network. For example, to program your building control system to automatically turn off facility lights at night, you can use EnOcean LED relays to control lights, use wireless switches to control the LED relays, and then connect the gateway to the LED relays.

The gateway can send a learn message to allow its virtual EnOcean device to be connected to any EnOcean output device. It can configure the link table of many EnOcean output devices and insert its own entry into the table via remote commissioning. It can also add other devices to the link table to simplify the EnOcean linking process. The gateway provides diagnostic information, including signal strength and time since the last message was received.

www.ccontrols.com

BACnet Client

EnOcean Relay

EnOcean Gateway

BACnet controlling EnOcean relay
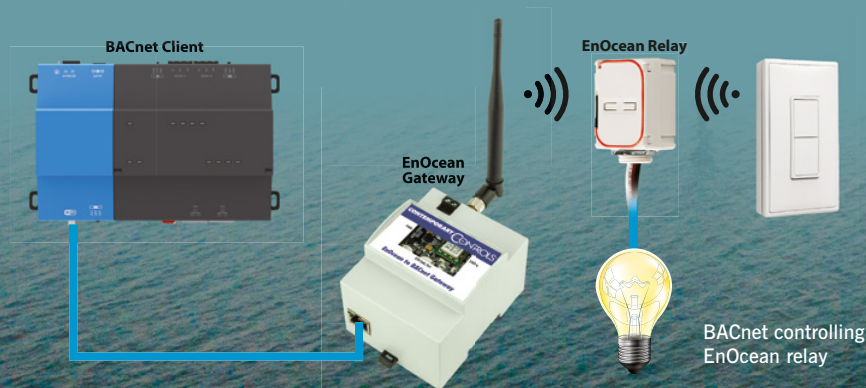
Easyclickpro –
a system for a wide range of applications

Wireless solutions in residential buildings are becoming increasingly popular. The reasons for integration often vary, ranging from comfort to cost savings. With its Easyclickpro system, Honeywell PEHA offers a solution that combines a number of different aspects.

By Dominik Kirylo, Customer Marketing Leader EU, Honeywell PEHA

Building retrofits thanks to wireless solutions

The demands placed on modern electrical installations continue to increase. The aim is to improve comfort and safety while simultaneously saving on energy costs – always taking into account a smooth installation that remains flexible for further modifications in the future. Another aspect that needs to be factored in is the condition of the building. Regardless of whether the building is new or existing, both types have specific installation requirements. A classic electrical installation is associated with a great deal of effort and high costs. Depending on the type of building, it's even possible to perform only surface-mounting.

Time and cost advantages

As a centralized wireless solution, Easyclickpro is ideal for residential buildings where the modules in the distribution system are radio-controlled via one or more antennas. Easyclickpro can be used to control lighting, heating, and blinds, thus avoiding unnecessary energy consumption. Even the central monitoring and control of a building is easy with Easyclickpro. The solution is based on the EnOcean standard and combines the advantages of convenience and ease of installation. Classic chiseling work for cables to the switch is no longer necessary. This not only means considerable time and cost benefits, but also enormous flexibility in room design. The battery-free wireless switches are no longer installed, but are glued in place.

Benefits
• Flexible positioning of transmitters
• No switchboard cables in the walls
• Group/central functions
• Lighting scenes
• Time functions
• Mains cut-off possible
• Heating control
• Motion detector

www.peha.de

Application example
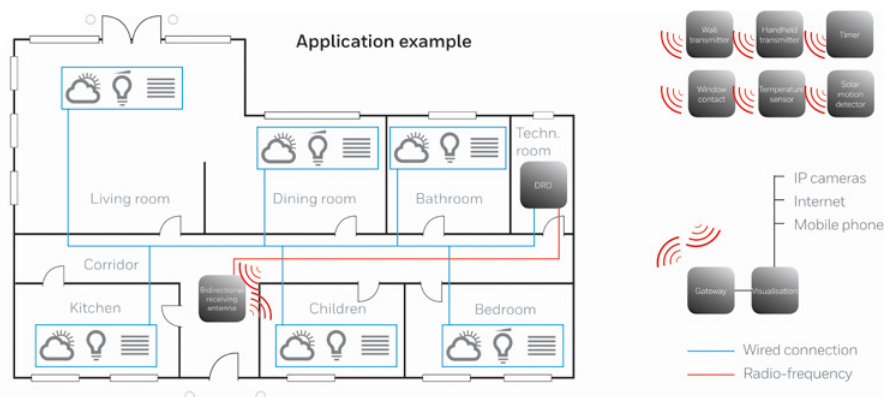
What aspects should be considered in the future planning of office space?

Interview with Isabel Scheidemacher, Head of Project Management, and Frank Lettmann, Divisional Head of Electrical Engineering Planning and Building Automation at LAE Engineering GmbH

What issues do you encounter today when you're discussing building planning with building owners or general contractors?

Isabel Scheidemacher: Currently there's a lot of discussion about the basic topics "home offices" and "available office spaces." Visions of what will happen next are very vague. Concepts and ideas regarding this situation are currently lacking.

What might a solution-based approach look like?

Frank Lettmann: We're working on the assumption that the size of the spaces will remain the same, but they'll be used more flexibly.

In order to achieve this, technology must be installed to make the building smarter. With the help of self-learning algorithms, employees can use office spaces optimally and flexibly.

At the moment, there's still a room called the "office" and it can't be anything else. But if I redesign the technology, it can be a meeting room or a project room. Radio-based and battery-free sensors that can be flexibly installed at any time can provide support here.

What role does sustainability play in this solution-based approach?

Isabel Scheidemacher: If the office space is not fully utilized, it's of fundamental importance that the unused space independently adjust to minimized energy consumption.

This can be achieved through an optimized user space based on actual requirements. If an employee holds a meeting with four participants, they don't need a meeting room designed for 20 people.

At the same time, there must also be something on offer for employees that makes them want to use the available spaces. In the future, people will decide more independently whether they want to work from home or in the office.

What was once compulsory is evolving into an option. This requires agility. What should I offer my employees so that they use the space I have? Meeting rooms, silent rooms, telephone rooms, workstations, etc.

How do you evaluate the human factor in this process?

Frank Lettmann: Currently, we're still operating from a "here is your workstation"
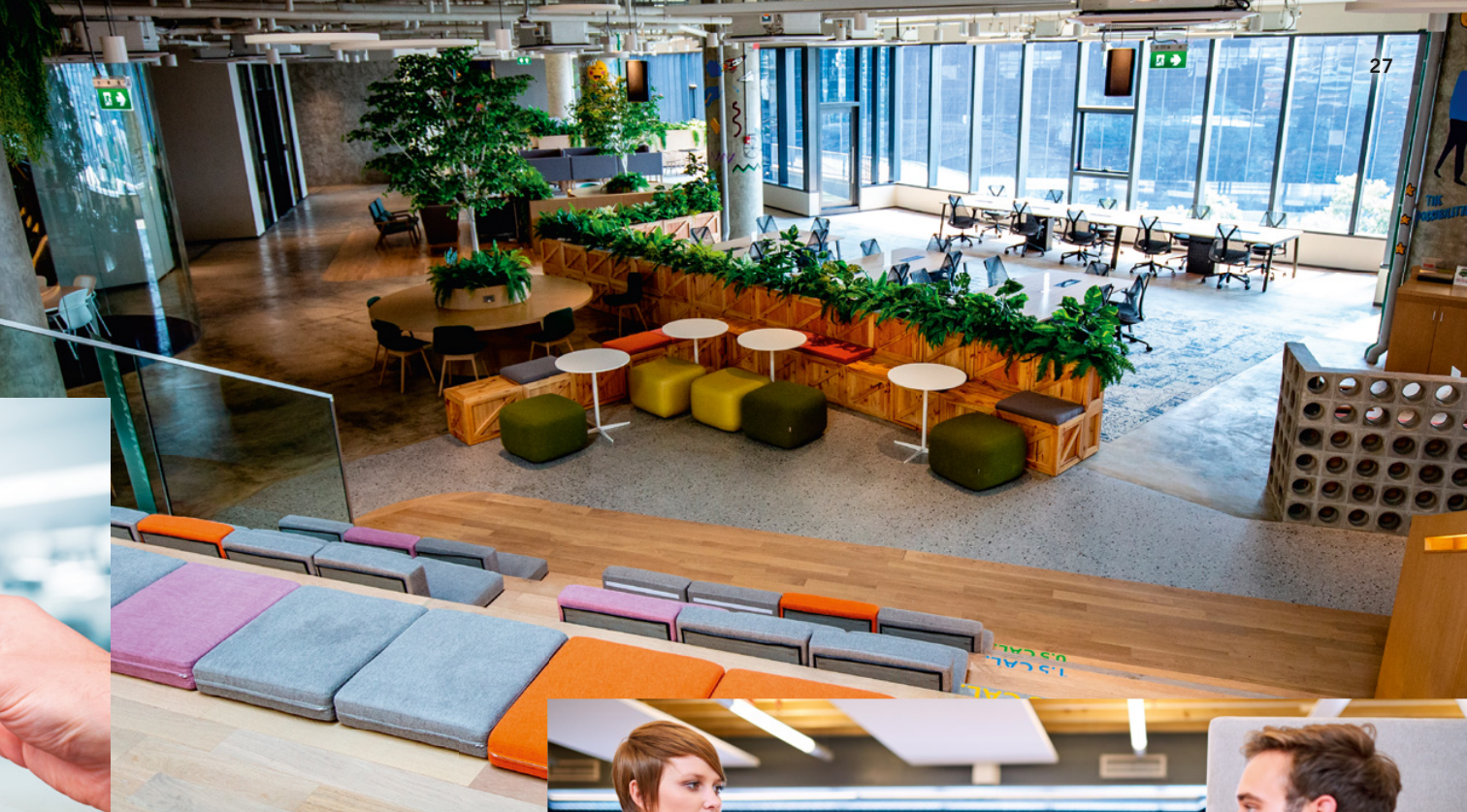
mindset. But the younger generation will require a workstation that is not simply used to do their work, but is increasingly a place of well-being. This can be achieved with the aid of the necessary and existing hard skills relating to light and room climate. However, it will be the soft skills that transform the building into an attractive place for employees. The architecture and envelope play a role, as does the technology.

How exactly can technology provide support?

Isabel Scheidemacher: We already have a lot of data generated within the building. The interesting thing is how we work with the data. In this respect, the catchword is "Internet of Services." What do I do with the data, how do I link it in a meaningful way? The building must make decisions about the future based on all the collated data and historic data. The aim is for employees to enjoy coming into the building. The algorithms will take over operation so that the operator doesn't have to.

How are you appealing to investors and building owners?

Frank Lettmann: They need to start changing their mindset now. The course has to be set for the generations of tomorrow and beyond, so that buildings remain functional in 5 years' time.

www.lae.eu

Intelligent buildings made faster and easier –
the new plug and play solution
from myGEKKO
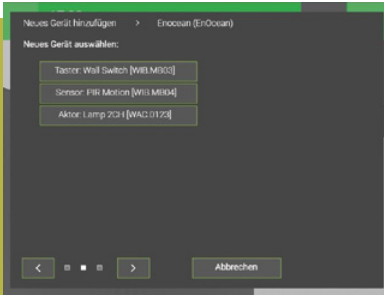
It has never been easier, less time-consuming, or less labor-intensive to digitize existing buildings. The new software version from myGEKKO offers a plug and play solution that allows electricians and integrators to do just that: quick and easy installation, no programming required, and a system that is up and running in just a few clicks.

By Stefan Holzer, Project Manager, myGEKKO

Regardless of whether it's residential buildings, hotels, office buildings, or educational institutions, the new software version from myGEKKO Building Intelligence simplifies the digitization of existing buildings and considerably speeds up the process. For example, five to ten workplaces in existing office buildings can be completely digitized in just one day.

This is made possible by an EnOcean-based plug and play solution that allows efficient, simple, and fast digitization. It eliminates all programming because the myGEKKO visual user interface guides the user step by step through the installation process. New components such as lighting can be integrated into the system in just a few steps. Once the device is selected, it's automatically connected to myGEKKO.

With just a few clicks, the system is up and running and all the technology of an existing building can be controlled and monitored digitally, including temperature, ventilation, shading, lighting, and alarms. This is an investment that will undoubtedly pay off for building owners. myGEKKO minimizes the effort required for operation and maintenance, optimizes energy consumption, and in this way lowers operating costs by up to 50 percent.

www.my-gekko.com

Retrotouch EnOcean switches bring
convenience and
style to office interiors

Retrotouch, a lighting solutions brand, has created a range of EnOcean smart switches to provide consumers with a stylish "always on" system for effortless touch-free control over their EnOcean lighting systems. By Amit Ravat, Co-Founder and Director of Retrotouch

The switches are wireless and can be fitted to replace an existing light switch or used as a wireless, battery-free solution. They can be stuck on any wall, wherever is most convenient for everyday use.

The switches don't need batteries or a power cable and are as durable and reliable as a traditional wired switch. Thanks to EnOcean's innovative harvesting technology, each press of the switch generates enough energy to send a radio signal to a relay for a totally wireless and robust control solution.

Retrotouch's wireless and battery-free switches also look great, with a premium glass finish that brings a stylish designer feel to a smart home's lighting controls. The switches come in white or black glass, with or without chrome trim, and an option of one or two buttons.

www.retrotouch.co.uk

IoT makes the office safer

It's time to return to the office. At Altyor headquarters in France, employees can do so with confidence. IoT solutions help prevent virus spread, respect the rules of hygiene, and ensure social distancing wherever necessary. NodOn presents a solution that has been installed in a 70-person office.

By Coralie Feillault, Marketing & Communications Project Manager, NodOn

Visitors can use the Floor Switch at Altyor's entrance to signal their presence.

Employee using the Floor Switch to open motorized gates.
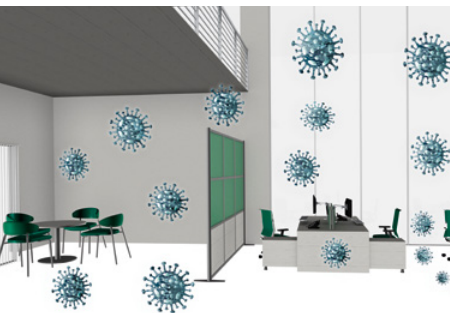
CO2 sensors measure air quality and sound an alarm if levels are critical.

New contactless procedures

COVID-19 has changed the way we live, work, and meet with other people. How we interact within a company and with suppliers and partners has been especially affected. That's why using a contactless button for visitors can be a helpful solution. At Altyor headquarters, the Floor Switch – a battery-free EnOcean switch – was installed for visitors at the entrance. For example, mail carriers no longer need to touch a bell. They simply press the button with their foot to notify reception. And that's not all: The floor switch can also be used to automatically open motorized gates in the warehouse when employees have their hands full. Even more scenarios are possible once the switch is paired with a compatible gateway.

Space and light management

Neither a switch nor a magic wand is needed for lighting control. When employees enter or leave a meeting room, the light is turned on or off automatically, thanks to an EnOcean motion sensor. In combination with a NodOn lighting relay switch, the sensor replaces the wall switch. In addition to controlling the lighting, the sensor indicates the availability of meeting rooms. A digital sign at the room entrance shows the room's current occupancy status. This has several benefits, including no disinfecting of switches and more flexible room management.

Safe air quality

Due to the pandemic, air quality management has become very important. The French Ministry of Health has recommended that rooms be ventilated twice a day for ten to fifteen minutes in order to replace the air inside the building. Altyor takes this recommendation very seriously. The company is already using an EnOcean-based CO2 sensor from Nexelec. As soon as the air needs replacing, an alert is sent via a gateway.

IoT solutions like this are an easy way to ensure employee well-being. The next steps will be to install more NodOn sensors in order to receive notifications when a window or door is left open and to add additional relay switches for connecting lights, heating, and open doors and windows. EnOcean devices offer plenty of possibilities for improving building management systems on an ongoing basis.

www.nodon.fr

CO2 measurement
and
targeted
ventilation

CO2 sensors are ideal for targeted ventilation, which is what a company in the Heilbronn district of Baden-Württemberg, Germany, was looking for as a way to deal with the COVID pandemic. The goal of the people in charge of occupational safety and domestic technology was to continuously measure the CO2 concentration in the individual rooms and inform employees if threshold values are exceeded. An effective solution was quickly implemented, thanks to the AFRISO smart home system.

By Frank Altmann, Head of Marketing, AFRISO

For this project, an AFRISO CO2 sensor was simply plugged into power outlets at eye level in the individual office and meeting rooms. Because the CO2 concentration was indicated directly on the sensor by an easily understandable LED traffic light (green – yellow – red), employees were immediately able to implement ventilation recommendations.

To ensure the best possible wireless connection in the smart home system, the corresponding ranges in the building were measured in advance. This made it possible to

install the AFRISOhome gateways at defined points and interconnect them. Thanks to EnOcean wireless technology and the "device-in-device" function of the AFRISOhome app, no laying of cables or other structural changes were necessary.

The app's authorization concept was used to create programs for individual users that send a push message to their smartphones or – for PC users – to the AFRISOhome web app when the threshold value of 1,000 ppm CO2 is reached. This means that in addition to the orange LED, a push message

also prompts employees to ventilate the room.

Approximately 20 gateways and more than 100 CO2 sensors were installed in this project. Additional threshold values with push notifications to supervisors were implemented by linking the gateways to a master gateway. All measured CO2 values are stored in the corresponding gateway for approximately four weeks and then overwritten by the new data.

www.afrisohome.de/CO2-en
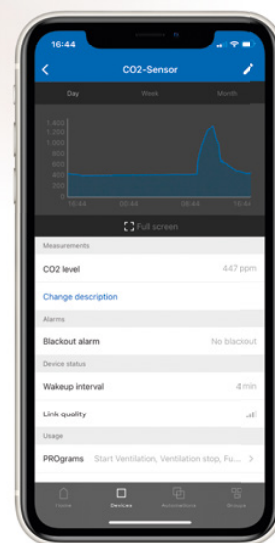
AFRISOhome Gateway HG 02 –
a genuine team player for smart versatility at home

By Frank Altmann, Head of Marketing, AFRISO

The new AFRISOhome Gateway HG 02 comes with a whole range of talents. With WLAN and EnOcean, it has two important wireless standards on board. For this new generation of devices, EnOcean also serves as the basis for the largely energy-autonomous operation of smart AFRISO sensors, which are part of the complete AFRISO smart home system. Users who appreciate the benefits of battery-free, wireless EnOcean technology will discover numerous additional sensors and actuators within the EnOcean Alliance that work directly with the gateway.

The gateway's interoperability is evident from the very start. On the top is a docking area with three slots that allow users to expand the smart home system to include additional wireless standards at any time. The cuboid modules are simply plugged in and a new wireless world is integrated that can be controlled via the AFRISOhome gateway. Zigbee and Z-Wave expansion modules are already available. In addition, users can plug in cubes from the partner company homee. There are currently more than 320 devices from different manufac-turers on the whitelist that can be linked to the AFRISO smart home and – provided a feature is available – can also be operated using Alexa voice control from Amazon.

The new control center also excels in terms of security: All user data and passwords are stored locally and directly on the AFRISOhome gateway without a cloud connection. The integrated WLAN interface is used for Internet access and for communicating with routers and mobile devices. It's also possible to operate HG 02 without an Internet connection, in which case an independent WLAN is created.

The user interface, which is the heart of the smart home system, is the free AFRISOhome app. It is available for smartphones and tablets (iOS/Android) and as a web app for PCs. With this app, users can design their smart homes and, for example, display sensor data, switch actuators, create "If and Then" actions, including time conditions, and automate sequences of actions based on measured values or logical states. In addition, it's possible to assign groups of sensors to rooms or buildings, manage access rights, and receive user-defined push messages relating to special events on a mobile phone.

www.afrisohome.com
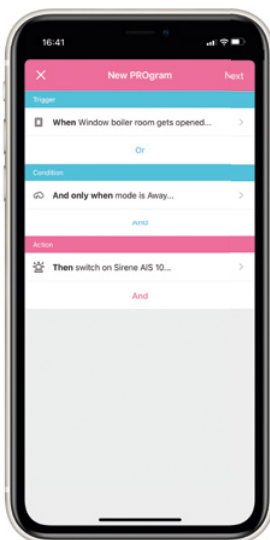
Old or new:
eTronic can handle both

Is your building new or has it been around for a while? The eTronic wireless sensor from MACO always cuts a fine figure. It's suitable for both new buildings and retrofits. eTronic simply makes windows smart.

By Thomas Seifried, Product Management, MACO Group

The future starts today. Many building owners would like to invest in a "smart home" from the very start. The eTronic window sensor makes things easy. The device can be installed in next to no time and be integrated into the smart home via EnOcean wireless technology. It takes very little effort to create a smart system that monitors windows and permits a wide range of fascinating functions that interact with an EnOcean-capable smart home system as well as other components in and around the house, such as roller shutters, heating systems and alarm sirens. It can even work together with wind and rain sensors.

Equally suitable for retrofits

eTronic is a master of flexibility. It fits practically any window, regardless of the material or profile. This means that almost any home can be transformed into a smart home, even existing and older buildings. What about optics? eTronic doesn't affect visual appearance. It is invisible when the window is closed or tilted. The sensor also features an attractive design.

Open or locked?

MACO eTronic is also impressive for its extremely long battery life. In its basic function, the sensor focuses on the essentials. It detects whether a window is open or locked, thus supplying information about the most relevant states. Its "big brother," the mTronic, additionally detects a tilted window as well as break-in attempts, both when locked and tilted. This makes this model especially suitable for those windows – or (sliding) doors – that offer little resistance to a clever thief.

www.maco.eu

Social housing
goes smart

In January 2020, the French social housing company Les Résidences Yvelines Essonne launched its own smart home label in order to bring real additional value to its dwellings by equipping them with a smart home solution, thereby offering new services to its tenants. The main purpose was to lower energy bills, increase comfort and security at home, and ensure better home care assistance for seniors. **By Vincent Rousseau, Communication and Marketing Manager, OGGA**

Les Résidences Yvelines Essonne plans to install the smart home solution in more than 80 percent of its building stock by 2025. By equipping over 3,000 dwellings each year, the housing association intends to proceed quickly with the deployment of the solution.

Requirements for the smart home solution

The social housing expert wanted to establish a long-term partnership because it aims to equip the entirety of its building stock (more than 32,000 dwellings). That's why Les Résidences chose OGGA, based on the simplicity of its products and its co-development approach. OGGA managed to adapt its solution, called Eco-Touch, in a manner that guarantees all tenants access to their energy consumption via a mobile application called YETI (Yvelines Essonne Intelligent Technology). Thanks to the solution's scalability, Les Résidences was also able to offer

Among other things, the app provides an overview of current energy consumption and controls the heating.

additional services based on supplementary products like smart sockets and smart smoke detectors.

Unlike many other solutions on the market, Eco-Touch doesn't need the Internet to function because it uses the EnOcean protocol to transfer data. That was one more reason to choose OGGA, because it was important to Les Résidences to offer a simple tool that could be very easily adopted by any user. Thus, with simple settings on a switch wall located near the entrance to their home, tenants are able to automatically lower the temperature and switch lights and devices to standby mode. The necessary data is provided by battery-free and wireless sensors based on the energy harvesting technology from EnOcean that is integrated in Eco-Touch. Moreover, tenants can also control Eco-Touch remotely via Wi-Fi if desired.

How is the project advancing today?

In just six months, OGGA was able to successfully comply with all delivery schedules and equip 1,000 dwellings in the housing association. Within the next few months, an initial evaluation will be made based on the energy consumption data collected from these dwellings. Tenants with Eco-Touch installed in their homes will also fill out a satisfaction survey in order to determine the active utilization rate. The partnership between the companies will continue until all the dwellings of Les Résidences are fully equipped.

www.ogga.eu

EnOcean products

EnOcean offers maintenance-free wireless sensor solutions for self-powered applications in the Internet of Things that are used for building and industrial automation, smart homes and LED lighting control.

868 MHz products:
EnOcean for Europe and other countries adopting RED

902 MHz products:
EnOcean for North America adopting FCC/IC
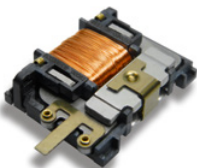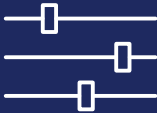
928 MHz products:
EnOcean for Japan adopting ARIB

2.4 GHz products:
for Bluetooth® and Zigbee networks (worldwide)

Energy harvesting wireless modules
for maintenance-free sensor solutions

Energy converter	For battery-free wireless switches	For energy harvesting wireless sensors	For controllers and actuators	Tools

Finished products for wireless and
self-powered IoT and lighting systems

EASYFIT
by EnOcean
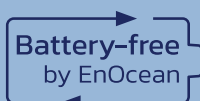
New product highlights from EnOcean

EnOcean is expanding its portfolio with two more exciting products: The EnOcean IoT Connector transmits sensor data to any IoT application, and the new PTM 535BZ combines two radio standards in one module for the first time. By Matthias Kassner, Vice President Product Marketing, EnOcean

PTM 535BZ transmits via either Zigbee or Bluetooth

PTM 535BZ is the first self-powered transmitter module from EnOcean that supports two different radio standards in one module. Depending on the configuration, the module communicates using Bluetooth® Low Energy (BLE) or Zigbee Green Power (ZGP). This gives users the option of selecting one of these two protocols for transmission, depending on their needs.

This is not the only innovation. PTM 535BZ is also the first module in the product range to be equipped with an NFC interface.

The use of NFC makes configuration much easier and also saves valuable time during installation. Selecting between BLE and ZGP is also very simple via NFC. All that's needed is an NFC-enabled smartphone or a PC with an NFC reader. The fact that the module supports two wireless standards means that the same end product can be used in various applications. This not only saves customers time but also reduces costs.

EnOcean IoT Connector – intelligent data transmission to IoT applications

Integrating EnOcean sensors and switches has never been easier. The new EnOcean IoT Connector software translates the raw data supplied by the sensors into ready-to-use data for IoT applications or data-driven business models. The process is extremely simple: The IoT Connector uses the existing IT infrastructure to collect, process, and feed the data to the customer application. And most importantly, there is no middleman with access to the data. The IoT Connector comes as a Docker container.

www.enocean.com

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EnOcean has a strong sales team in Northern Europe and North America

By Markus Florian, Vice President Sales, EnOcean and Oliver Sczesny, President EnOcean Inc.

John Corbett retired at the end of July 2021 after working for EnOcean for over 10 years as Sales Director for Northern Europe with added responsibility for the Middle East. When he started at EnOcean, there was only an initial relationship with Honeywell in his region. Now there are many strong partnerships throughout this region. He was also involved in a number of projects, most notably EnOcean's entry into the IoT market.

Fortunately, the EnOcean network doesn't have to miss out on his experience. He has already assumed a new role as Vice Chairman at the EnOcean Alliance for the EMEA region. We'd like to thank John for all his hard work and we're excited to see him back on board at the EnOcean Alliance!

A warm welcome to John's new successor, **Niels Ernst**, who has taken over the position as Sales Director for Northern Europe. Niels has already been successfully handling EnOcean business in Denmark, Sweden, Norway, and Finland for more than two years. In his new role, he will be supported by the team located in the UK in order to drive EnOcean's growth in Northern Europe. The team will also continue to expand its strong partnerships with key regional players.

We're also happy to welcome **Kamlesh Patel** to Technical Sales for Northern Europe. In addition to driving new business, he will also assist the regional team with technical support and consulting. Kamlesh has several years of experience in sales and has recently worked for General Electric Industrial Solutions – now part of ABB.

There is also an exciting update from the North American team. **Michael St. Louis** is now responsible for all sales activities in the eastern part of the U.S. and Canada. His focus is on managing existing customer business and developing new customers in his region. Michael was already part of the sales team at EnOcean and has a profound knowledge of the market.

www.enocean.com

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interoperable

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proven   flexibility

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www.enocean-alliance.org

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EasySens® Room Sensors / Operating Units NOVOS SR

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» **Flexible positioning:** flat on base using adhesive foil

» **Measured values:** temperature, relative humidity

» **Operating elements:** potentiometer, occupancy button

» **Available colours:** white, alu, black

NOVOS 3 SR Alu

NOVOS 3 SR P Black

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MORE INFORMATION *move.thermokon.de*

NOVOS move
Portable CO2 Sensors with Traffic Light Function

NOVOS 3 SR PT White

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email@thermokon.de – www.thermokon.de – T +49 2778 6960-0