

# THE FUTURE OF BUILDINGS

HOW TO MAKE AN EXISTING  
BUILDING SMART AND SUSTAINABLE

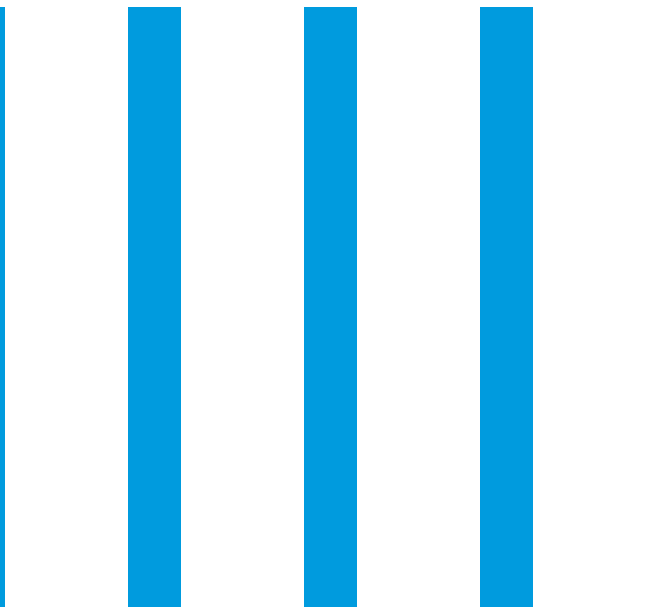
ECONOMY

ENVIRONMENT

COMMUNITY

SOCIAL

WHITEPAPER



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## MOTIVATION

### PROBLEM STATEMENT

The real estate market is the largest single contributor to the carbon footprint, accounting for 40% of total emissions. Of these emissions, around 70 % are caused by building operations.<sup>1</sup> The need to de-carbonize the real estate sector has become more pressing than ever before. In order to meet the Net Zero by 2050 policy set forth by the International Energy Agency, existing building stock must be zero-carbon-ready by 2030.<sup>2</sup> To get on track with the Net Zero Scenario, existing buildings must be retrofitted with energy efficient and clean technologies.

Whereas building renovations can be rather complex and bureaucratic by nature, it is indubitably a necessity for ongoing building resilience and compliance. Retrofits can include not only upgrading building materials, heating, air conditioning and lighting systems, but also integrating smart technologies to leverage sensor data and improve efficiency. These upgrades reduce energy consumption, lower operating costs, and decrease greenhouse gas emissions. However, retrofitting existing buildings can be a challenging process, particularly in older buildings with outdated infrastructure.

# 20%

of the existing building stock must be zero-carbon-ready by 2030.<sup>2</sup>



# 30%

of global energy consumption in 2022 is accounted for by the operation of buildings.<sup>2</sup>



## MOTIVATION

### GOAL STATEMENT

This paper sets out to put forward a holistic and flexible approach to modernize existing commercial buildings with smart and clean technology that positively impacts the economic, environmental, community and social aspects of the building. We aim to:

1. Improve the economic viability and resilience of the building by reducing operating costs and increasing asset value through energy efficiency measures.
2. Reduce the environmental impact of the building by decreasing energy consumption and greenhouse gas emissions.
3. Strengthen the community by creating a smarter, healthier and more sustainable living and working environment.



<sup>1</sup> Forbes 2022.

<sup>2</sup> IEA 2022.

# FLEXIBLE SOLUTION

Introducing a cutting-edge 3-step solution that prioritizes the decarbonization and energy efficiency of existing buildings through the use of smart building technology:

1

## AUDIT

Our team of experts conduct a meticulous and standardized analysis of your building's upgradeability. This will enable us to develop a comprehensive solution on how to reduce your building's carbon footprint and improve energy efficiency.

2

## REPORT

We understand that every building is unique, which is why we offer customized solutions that are tailored to your building's specific requirements. Our team will work closely with you to develop an offer that meets your needs and budget.

3

## COMMISSIONING

Our experienced Field Application Engineers will ensure a seamless integration of smartengine appliances with your existing IT and BMS hard- and software to enable your Smart Building.

## BENEFITS OF SMART BUILDINGS

- Enhanced resource management and conservation
- Reduced operational costs and increased energy efficiency
- Increased property value and attractiveness
- Improved occupant comfort and healthier environment
- Enhanced security and safety
- Increased flexibility and space utilization
- Smart Building Applications, e.g. Indoor Navigation

- Up to 25 % less operational costs via HVAC/BMS integration<sup>3</sup>
  - Motion & temperature alerts
  - LEED, BREEAM, WELL & smartscore credits
  - Building audit by certified technicians
  - Single point of access to real-time smartsensor data via API
- BASE INSTALLATION



SPACE ANALYTICS

FLEX DESKING

LIGHT MANAGEMENT

WELLBEING DASHBOARD

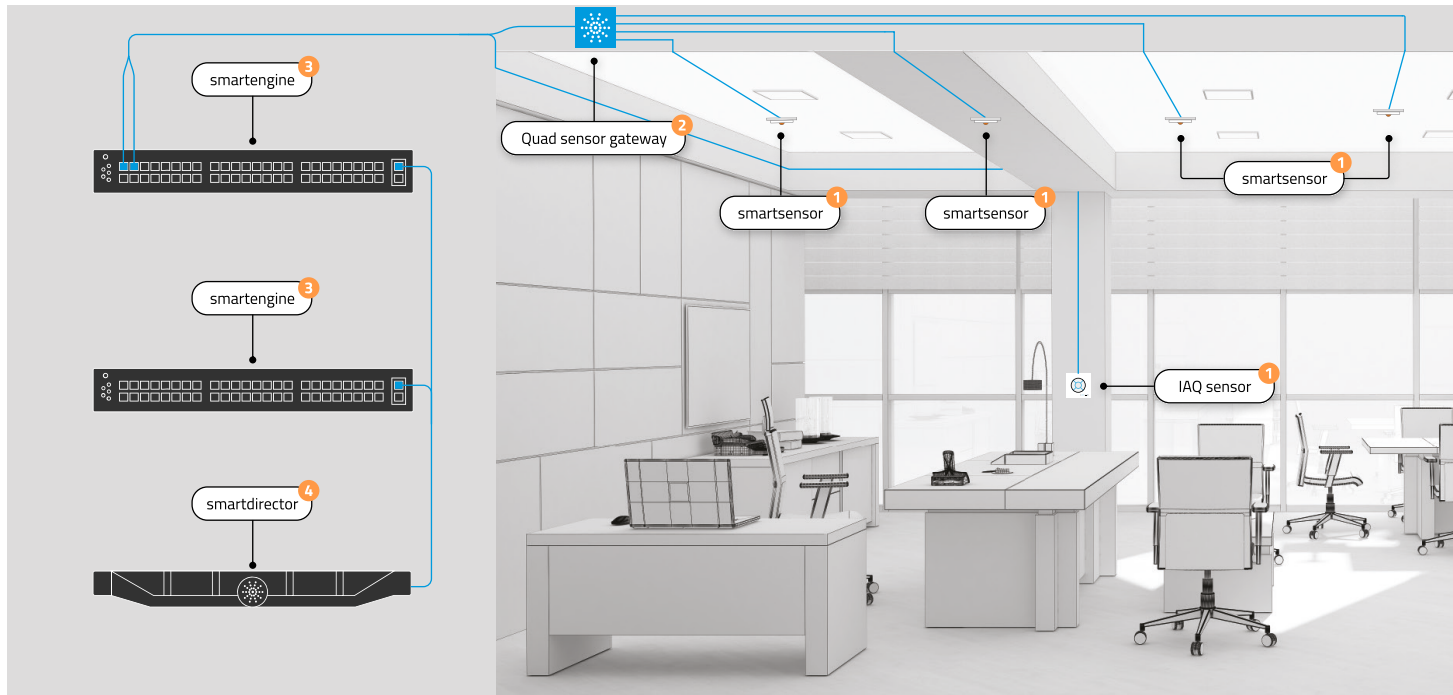
INDOOR NAVIGATION

ASSET TRACKING

<sup>3</sup> Certified by RWTH Aachen and ROM Technik.

# SMARTENGINE TECHNOLOGY

Our flagship product, smartengine, enables smart and user-centric building automation by distributing a fine-mesh smartsensor network throughout a given space. By leveraging the provided real-time smartsensor data, energy consumption and resource usage can be reduced significantly. In addition, the sensor data unlocks a myriad of smart building applications.



## ONE CABLE ONE ROOM

The smartsensor collects building data such as motion, temperature, brightness and can generate and detect beacons in the iBeacon format in real-time. Humidity, air pressure, CO<sub>2</sub>, indoor air quality, temperature and VOC concentration are measured by the IAQ sensor. Data can be accessed on a per sensor or per location basis, the latter being an accumulation of all sensors within a given location.

The smartengine collects the smartsensor data and passes it onto the smartdirector in real-time. Each smartengine has 48 ports, which can supply up to 4 smartsensors each, allowing for up to 192 smartsensors to be deployed with a single smartengine.

The quad sensor gateway facilitates data transition from up to four smartsensors through a single network cable. Depending on the horizontal cabling already installed, non-allocated cables can serve as the backbone infrastructure, provided they are Cat. 5e or better. By combining quad sensor gateways with cable splitting, up to 8 sensors can be deployed over 1 horizontal network cable.

The smartdirector serves as the primary interface to the system. It is responsible for commissioning and managing sensors as well as providing sensor data to third party systems via REST, Unified, BACnet/IP and MQTT API's. The smartdirector adheres to security standards for sensor access and ensures that the data is stored locally and securely.

# SMARTENGINE TECHNOLOGY

Our solution offers a comprehensive and secure way for businesses to monitor and improve their building. With a network-based, smartsensor system that is both cost-effective and worldwide applicable, our solution provides real-time and historical data, ensuring businesses have the insights they need to make informed decisions. Additionally, our solution and data is easy to integrate into other systems, scalable, and compliant with industry standards, making it a trusted choice for businesses of all sizes and types.



## BENEFITS OF SMARTENGINE

- **Cost-effective:** By offering a multi-sensor solution in one central system, our solution is highly cost-effective compared to other alternatives in the market.
- **Global Reach:** Our solution is designed to be worldwide applicable, providing businesses with the flexibility to operate across different regions and countries.
- **Real-time Monitoring:** Our solution provides real-time motion, occupancy, indoor air quality and temperature monitoring as well as emergency alerts.
- **Historical Data:** Our solution offers both real-time and historical data, giving businesses access to insights and trends that can help improve their operations.
- **Easy Integration:** Our network-based solution is designed for easy integration with existing systems, minimizing disruptions and saving time and resources.
- **Compliance:** Our solution is certified by industry standards and regulations, ensuring that businesses can meet their compliance obligations and avoid penalties or legal issues.
- **Scalability:** Our solution is highly scalable, allowing businesses to easily add or remove smartsensors and devices as needed to meet their changing requirements.
- **No batteries:** Our smartsensors are connected via network cables and powered by smartengine, eliminating the need for any battery replacements.

## LIST OF REFERENCES

IEA (2022), Buildings, IEA, Paris <https://www.iea.org/reports/buildings>, License: CC BY 4.0

Carlin, David (2022), 40% Of Emissions Come From Real Estate; Here's How The Sector Can Decarbonize, <https://www.forbes.com/sites/davidcarlin/2022/04/05/40-of-emissions-come-from-real-estate-heres-how-the-sector-can-decarbonize/?sh=12be87b663b7>





## ANNEX A

# FINANCIAL CALCULATIONS

An exemplary cost breakdown of a deployment in New York City has been provided below for your reference.

<b>Building type</b>	Office		
<b>Total area</b>	11,000 ft <sup>2</sup> / 1,022 m <sup>2</sup>		
<b>Number of floors</b>	3		
<b>Number of conference rooms</b>	9		
<b>Number of desk level sensors</b>	12		
<b>Number of open office locations</b>	11		
<b>Deployment costs</b>	<b>per ft<sup>2</sup></b>	<b>per m<sup>2</sup></b>	<b>total</b>
<b>Hardware components</b> <ul style="list-style-type: none"> <li>▪ 1x smartdirector</li> <li>▪ 1x smartengine</li> <li>▪ 18x quad sensor gateway</li> <li>▪ 82x smartsensors</li> </ul>	\$0.99	\$10.45	\$10,931
<b>Installer services</b> <ul style="list-style-type: none"> <li>▪ Server rack</li> <li>▪ Cabling</li> <li>▪ Hardware installation</li> </ul>	\$0.97	\$10.45	\$10,684
<b>CapEx deployment costs</b>	\$1.97	\$21	\$21,615
<b>OpEx deployment costs*</b>	\$0.36 / year	\$4 / year	\$3,935 / year
<b>Included features</b>	<ul style="list-style-type: none"> <li>▪ Real-time and historical motion, temperature and brightness data</li> <li>▪ Real-time floor plan occupancy metrics</li> <li>▪ Space analytics</li> <li>▪ Reporting dashboard</li> <li>▪ Long range IoT smartsensors that generate and detect beacons in the iBeacon format</li> <li>▪ Access to sensor data via MQTT, BACnet/IP, REST &amp; Unified API</li> </ul>		

\* Three year plan. smartengine | wtec hardware, software and services only.