

# Europacable – Whitepaper

## Single Pair Ethernet (SPE) for Smart Building Automation

PART 1

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This Whitepaper is divided in two documents:

- This first document addresses SPE as a new technology trend for smart building automation and explores related applications.
- The second document covers international and European standardisation, with respect to single pair cabling.

## 1. Executive summary

The rapid evolution of smart buildings and the multiplication of IoT sensors are transforming the landscape of building automation. In this context, Single Pair Ethernet (SPE) has emerged as a key technology that promises to deliver efficient, scalable, secure and future-proof solutions. However, SPE faces challenges, including competition from wireless technologies and the existing dominance of legacy protocols (such as BACnet, KNX, Modbus ...) for building automation.

The newly released international standard ISO/IEC 11801-1 Amd1 and European Standard EN 50173-10 address design and specification of single pair cabling.

This document explores the current state of building automation, the potential of SPE for the IT/OT convergence, the wired IP-based sensors, and the steps needed to promote technical awareness and adoption. We also examine the benefits of SPE, highlight the need for fire-resistant cabling solutions, and assess the environmental impact of SPE wired sensors and other devices compared to wireless alternatives.

## 2. About smart buildings

Smart Buildings are made up of Informational Tech & Operational Tech devices IT devices are for users and run on Ethernet protocol and OT devices are for the field devices having different proprietary protocols to function. The communication between these two technologies are carried out using gateways.

Both IT & OT technology have to work well together for a smart building to function effectively.

### What is the main aim of Smart Buildings?

Smart buildings aim to improve the overall efficiency of the usage of the devices/systems connected – reduce the maintenance of the devices & systems –and help lower operational costs

Smart Buildings must provide improved security of the interchange/exchange of the data & metrics between different systems operating together. And help in identifying quickly the problems associated with security breach and take precautionary actions immediately.

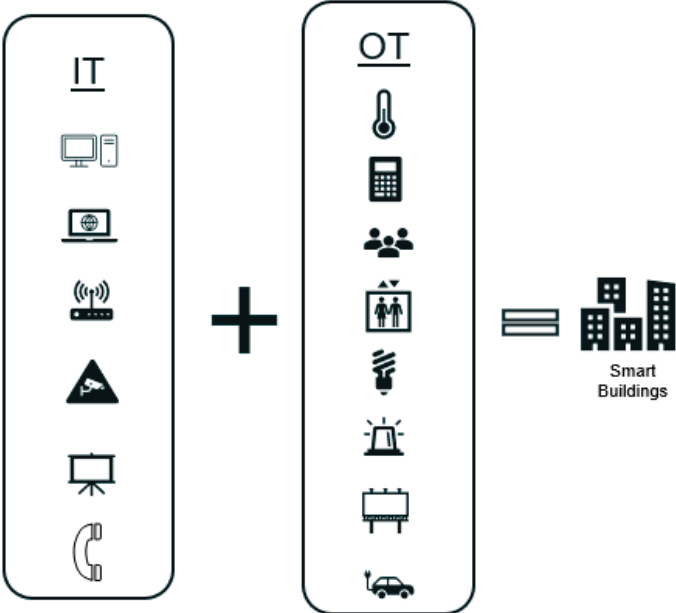
With devices like temp monitoring, blind management system to allow light in the building, smart lighting, HVAC systems etc. should provide the

right level of comfort for the workers/staff which in turn would help increase the worker/staff productivity.

Health & safety is a critical measure that needs to be monitored by ensuring fresh air & light is available. Also the emergency systems have to work in coordination with other system to ensure the safety of People.

With better efficiency comes reduced wastage, reuse of existing infrastructure in a better possible way and reduced emission which will contribute to the environment.

### 3. Market context and evolution of building automation for smart buildings



The rise of smart buildings is driven by the increasing need for energy efficiency, sustainability, and enhanced occupant experiences. Building automation plays a crucial role in managing lighting, HVAC\*, security, and other essential systems. As businesses and building owners aim to reduce costs and carbon footprints, the demand for sophisticated automation systems continues to grow.

Building automation is evolving from proprietary, closed systems toward IP-based solutions that enable seamless integration of devices and real-time data management. This shift is particularly important as buildings become more complex and interconnected, requiring greater flexibility and scalability.

## **4. Proliferation of IoT and sensors**

The Internet of Things (IoT) is reshaping the world of building automation. Smart sensors are being deployed across buildings to monitor environmental conditions, occupancy, energy consumption, and security. These sensors generate significant amounts of data, which must be transmitted reliably and efficiently to automation systems for analysis and control. They also use either local or remote power sources.

The growing number of sensors, especially in building automation, brings new challenges related to connectivity, power, and data transmission. While wireless technologies have seen widespread adoption, there is an increasing need for reliable, low-bandwidth, and power-efficient wired solutions, especially in areas where wireless coverage may be insufficient or where security and interference are concerns. Moreover, wireless technology requires local batteries that have to be changed generating costs and waste of time.

## **5. Building automation: A key tool for building and people efficiency**

Building automation is no longer just about controlling systems like lighting or HVAC. It has become a fundamental tool for improving operational efficiency and enhancing the experience of building occupants. Integrated building automation systems enable the monitoring and control of a wide range of functions, reducing energy consumption, improving indoor air quality, and ensuring occupant comfort and safety.

For building owners, automation offers operational savings through lower energy bills and reduced maintenance costs. For tenants, it translates to a more comfortable, safe, and sustainable living or working environment.

## **6. How building automation is made today and with which cabling?**

Building automation systems typically rely on a mix of wireless and wired technologies. Traditional legacy twisted-pair networks (such as RS-485, RS-232) are used for HVAC controllers, Access control, fire detection, lightning...

In today's smart buildings, there are different management systems for different applications which means different (proprietary) protocols (Such as Fieldbus, KNX, BACnet, DALI,...). All services deployed by industry so far are specialized / dedicated services that ensure one given function, without

providing interoperability, and no capacity to “talk” with other services or to take into account the full environment.

Gateways are needed for translating or interchanging the data’s between different systems. This leads to a complex management system often requiring highly skilled management team.



With proprietary systems and skilled workforce to manage them the operational costs of the smart buildings would increase. Not to forget that there is shortage of highly skilled workforce to manage these systems.

An open standard would be convenient for all the systems to work well together and reduce complexities in management. Bi-directional communication capabilities enable different systems to work together taking actions aimed at controlling and reducing energy consumption, improve energy efficiency or reduce energy peaks risks.

This is where Single Pair Ethernet (SPE) offers an interesting alternative. With all IP infrastructure, the communication, data exchange, management and interoperability between the systems become easier & cheaper, and gateways can be avoided.

Evolution from proprietary protocols to IP solves the shortage of skilled labour and reduce the OPEX.

## 7. How SPE and building automation will bring added value to building owners and tenants?

The adoption of SPE for building automation brings several key benefits:

- **Cost Efficiency:** SPE reduces cabling costs by requiring only a single pair of wires, lowering material, installation, and maintenance expenses. This is especially important for large-scale deployments in buildings.
- **Scalability:** SPE supports the growing number of low-bandwidth sensors needed for building automation, making it easier to scale systems as the number of connected devices increases.
- **Future-Proofing:** As building automation systems transition to IP-based communication, SPE offers a future-proof solution that integrates perfectly with existing IP networks and 4-pair generic cabling systems.
- **Power Delivery:** SPE supports Single pair Power over Ethernet (SPoE), enabling the transmission of power and data over a single pair, which is ideal for low-power devices like sensors and actuators in building automation.

SPoE provides power over twisted pair cable rather than relying on batteries or dedicated local power supplies.

- **Environmental Impact:** By reducing the amount of cabling needed, improving energy efficiency and eliminating the need for batteries and their associated maintenance, SPE contributes to more sustainable building automation systems.

For building owners, these advantages translate into lower operational costs and better control over building management systems. Tenants benefit from enhanced comfort, improved security, and greater energy efficiency in their living or working spaces.

## 8. Conclusion

As smart buildings evolve, the demand for efficient, scalable, secure and future-proof building automation solutions will permanently grow. Single Pair Ethernet (SPE) is in a position to play an important role in this evolution, offering a streamlined, cost-effective in combination with traditional 4-pair Ethernet cabling for low-bandwidth, IP-based sensors and devices.

However, there are challenges ahead, including the rapid development of wireless sensor and the lack of building automation devices equipped with SPE interface. To address these challenges, it is essential to create market awareness around the benefits of SPE for wired building automation systems, promote use cases, and develop partnerships with vendors in the building automation industry.

Moreover, the development of fire-resistant SPE cable solutions and an evaluation of the environmental impact of SPE wired sensors versus traditional and wireless sensors will be key to driving adoption in the market.

With proper support, SPE can become a game-changer for next-generation building automation systems, offering reliable, efficient, and scalable connectivity for smart buildings.

### **For further information please contact:**

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### **About Europacable**

Europacable is the voice of Europe's leading wire and cable producers. High-quality, sustainable power and telecommunication cables, produced by our members in Europe, empower electrification and digitalisation of our societies. Founded in 1991, Europacable represents the largest cable makers in the world providing global technology leadership, as well as highly specialized small- and medium sized businesses from across Europe.

With our future being ever more electrified and digitalised, cable technology will be the core backbone of Europe's energy and telecommunication infrastructures. Sustainable, low-carbon manufacturing and high-performance cables are essential to achieve Europe's climate neutrality objectives by 2050. Europacable is committed to the principles of free enterprise and fair trade. Our members employ over 80.000 people of which more than 50% in Europe, generating a worldwide turnover over €70 billion in 2024.

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*The content of the document is not legally binding and is not intended as a substitute for user's or manufacturer's own assessment and decision-making.*

*Readers of this document are encouraged to seek information on specific matters regarding Single Pair Ethernet from the manufacturer or provider and to consider the Technical Standards relating to the selected products.*

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