# Wireless application guide

## OSRAM light management systems

OSRAM

# 1 General overview of wireless technologies

Today's wireless lighting systems open up a wide range of opportunities for efficient, comfortable and easy-to-use light management. We have developed light management systems (LMS) for any kind of application and project size. The following is an overview of common technologies and how you can benefit from our wireless solutions.

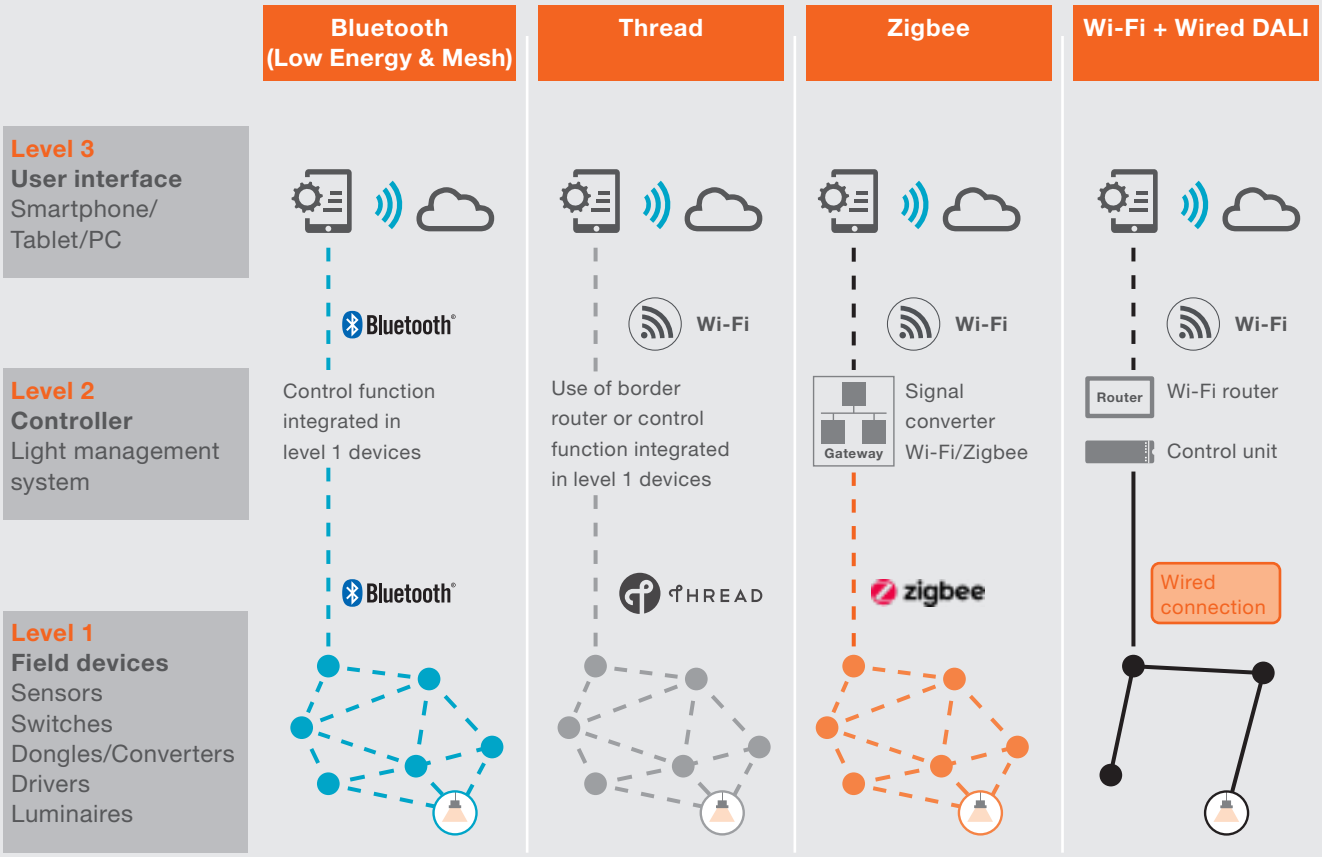
The utilisation of wireless light systems is growing constantly, as the technology provides advantages in certain areas of use compared to classic wired light systems. Additionally, wireless smart light systems incorporate advanced and multi-purpose sensors, actuators, and particularly communication infrastructures with the primary objective of illuminating areas in offices, shops or warehouses.

### 1.1 Topology comparison

First of all, it is necessary to compare existing wireless technologies to explain their basic operating principle. In general, there are four technologies commonly used in the lighting industry: Bluetooth (Low Energy & Mesh), Thread, Zigbee and Wi-Fi. For developers of smart home and smart building installations, numerous wireless protocol options are available.

These topologies provide a communication protocol suitable to transfer data wirelessly between two or multiple points of communication. The differences between the four technologies are shown below.

**Topology comparison**



Regarding the three levels of control – user interface, controller and field devices – only the user interface unites all four topologies (Bluetooth Low Energy & Mesh, Thread, Zigbee and Wi-Fi). The light management system can be controlled via smartphone, tablet or personal computer. The user interfaces make a difference in terms of built-in technology, as smartphones and tablets typically have integrated Bluetooth and Wi-Fi chips. If direct data transmission between the user interface (Level 3) and the field devices (Level 1) is not possible due to the technology differentiation, an additional component (Level 2) is required to ensure data transmission.

### 1.2 Technology comparison

The five technologies are based on different functional principles and differ in their technical features, costs and energy balance. The table below shows the differences between these systems.

#### Bluetooth Low Energy

This technology is designed for low-power point-to-point communication between central devices (e.g. PC, smartphone, tablet) and peripheral devices (e.g. headphones, fitness trackers, luminaires). There is no need for a gateway or additional tools. It is often used as an interface for direct communication between Level 1 and Level 3 without the need for a gateway, router or separate controller.

#### Bluetooth Mesh

This is a robust standard lighting control interface designed to minimize power consumption and to be future-proof for data exchange between multiple nodes in a QBM network. There is no single point of failure because the control function is integrated in Level 1 devices. The technology is based on Bluetooth Low Energy.

#### Thread

This technology is a low-power wireless mesh networking protocol based on the universally supported Internet Protocol (IP) and built using open standards. Thread has secure end-to-end communication – device-to-device, device-to-mobile and device-to-cloud. Thread can be used with or without a border router connecting the system to the building IP network. There is no single point of failure.

#### Zigbee

This system is a low-cost, low-power wireless mesh network standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications. Low power consumption provides longer lifetime with smaller batteries.

#### Wi-Fi

This wireless network protocol is based on the IEEE 802.11 standard, commonly used for local area networking of devices and internet access. High power consumption causes low energy efficiency.

| Technology | Bluetooth Low Energy | Bluetooth Mesh | Thread | Zigbee | Wi-Fi |
|---|---|---|---|---|---|
| **Standard** | IEEE 802.15.1 | IEEE 802.15.1 | IEEE 802.15.4 | IEEE 802.15.4 | IEEE 802.11n (Wi-Fi 4) |
| **Maximum distance [m]** | 10 (40 with Bluetooth 5 @ 125 Kbit/s) | 10 (40 with Bluetooth 5 @ 125 Kbit/s) | 10 | 10 | 20 |
| **Network architecture** | Point-to-point | Managed Flooded Mesh | Routed Mesh | Routed Mesh | Star |
| **Battery life** | Between months and years. Battery life depends highly on the type of application. Moreover, all low-power protocols support EnOcean energy harvesting which provides completely battery-free operation. | | | | Days – months |
| **Power consumption** | Low – medium | Low | Low | Low | High |
| **Maximum data rate** | 250 Kbit/s – 1 Mbit/s (2 Mbit/s with Bluetooth 5 @ ~8 m range) | 250 Kbit/s – 1 Mbit/s (2 Mbit/s with Bluetooth 5 @ ~8 m range) | 250 Kbit/s | 250 Kbit/s | 11 – 600 Mbit/s |
| **Operating frequency** | 2.4 GHz | 2.4 GHz | 2.4 GHz | 2.4 GHz | 2.4 and 5 GHz |
| **Typical latency time** | 2 ms | 20 ms | 20 ms | 50 ms | 1 ms (link local) |
| **Application focus** | Cable replacement (audio with Bluetooth 5.1) | Monitoring and control | Monitoring and control | Monitoring and control | Web, e-mail, data transfer, audio, video |

# 2 Advantages of wireless light management

Modern lighting systems play a vital role in the carbon footprint of public buildings, industrial plants or private homes. Energy-efficient light management is therefore a very effective tool for reducing energy consumption, making the best possible use of daylight and thus lowering the total operating costs.

But light management must not only be efficient, it is also crucial that the entire process – from planning and commissioning to installation and daily use – is intuitive, time-saving, simple and comfortable. This is how the advantages of wireless technology pay off for different target groups: for building owners as well as for architects, lighting designers, installers and end users.

## 2.1 Benefits for different target groups

### Facility managers and building owners

- Easy to **adapt to new space usage** concepts (new tenants)
- **Scalability** for system extensions and building/location expansions
- **Reduced downtime during installation/refurbishment** compared to wired installations
- **Robust** and transparent **security concept by design**, including user management
- **Maximum savings** in existing buildings thanks to motion detection and daylight harvesting
- Applicable in infrastructures **not prepared for rewiring** or general changes
- **Maximum flexibility** for new installations and especially for retrofitting or adaption of existing installations

### Installers

- **Ease of installation** and simple customization
- **Reduced complexity** during system set-up, no single point of failure, reduced planning effort
- Easily **scalable solution** and less training effort
- Simultaneous **multi-installer commissioning** to reduce labor time and costs
- **Pre-configuration service** allows to divide enhanced and basic commissioning work
- Complete **one-stop-shop solution** offering (hardware and software)

### Lighting solution providers

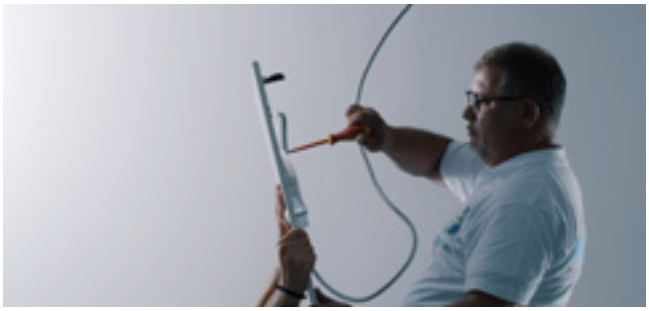
- Real **scalable solution** with less training effort
- **Sustainable investment** due to an open standard
- **New commissioning experience** enables new project opportunities
- **Remote commissioning service** possible
- Complete **one-stop-shop solution** offering (hardware and software)

# 3 Simple three-step approach

Our light management systems focus on simplicity, making it easy for anybody to plan, commission, install and use our solutions. Therefore, the three project steps go hand in hand and are very easy to accomplish.

## 1 Easy planning

With our light management systems, even large-scale projects can be realized without special knowledge. The first step is the creation of a floor plan for the project on a personal computer or tablet. Predefined lighting control profiles are assigned to individual zones which can also be modified. This work can be done in advance, which reduces the time required on site.



## 2 Fast and flexible installation

Compared to wire-based DALI systems, planning and replacement of existing lighting installations are made much easier. Our wireless control systems are suitable for existing infrastructures regardless of architectural conditions. Therefore, the system can be quickly adapted to new conditions and space usage concepts.

## 3 Intuitive commissioning

Every project can be created and pre-commissioned in advance. Predefined lighting control profiles ensure fast customization in a broad range of applications. After the luminaires have been installed, they can be easily located and assigned to the respective zones. The assignment of luminaires can be carried out by several installers at the same time to reduce downtime.

REDUCED DOWNTIME

FLEXIBILITY

EFFICIENCY

SCALABILITY

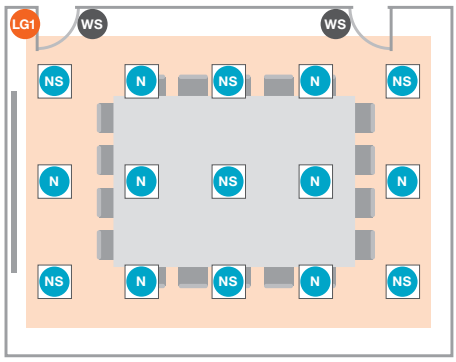
SECURITY

# 4 Application examples for diverse lighting requirements

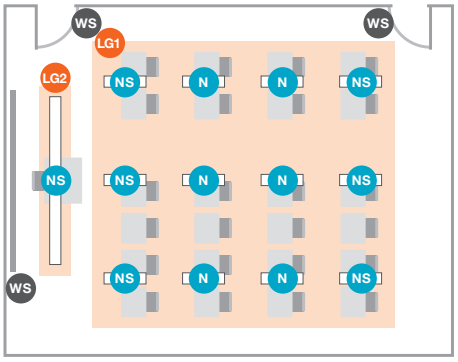
Modern office and industrial buildings, logistics areas, shops or public buildings such as schools or town halls require easily adjustable, intuitive and highly efficient control systems. Wireless installations offer a wide range of options to save energy and provide individual settings in any kind of application.

In meeting rooms, for example, it is important to have different options for setting the right lighting ambience according to varying situations – from dimmed light for a presentation to the motivating atmosphere in a creative team meeting. The following use cases show the range of possibilities in different locations. In every project, the system is characterized by simple installation as well as easy configuration and luminaire grouping.

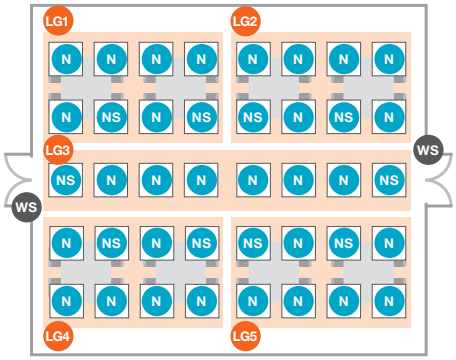
### Meeting/Conference room



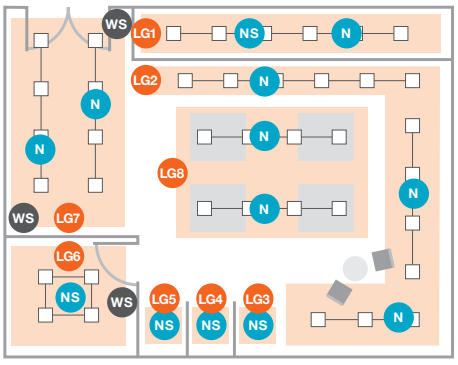

### Classroom/Training room




### Open-plan office




### Shop

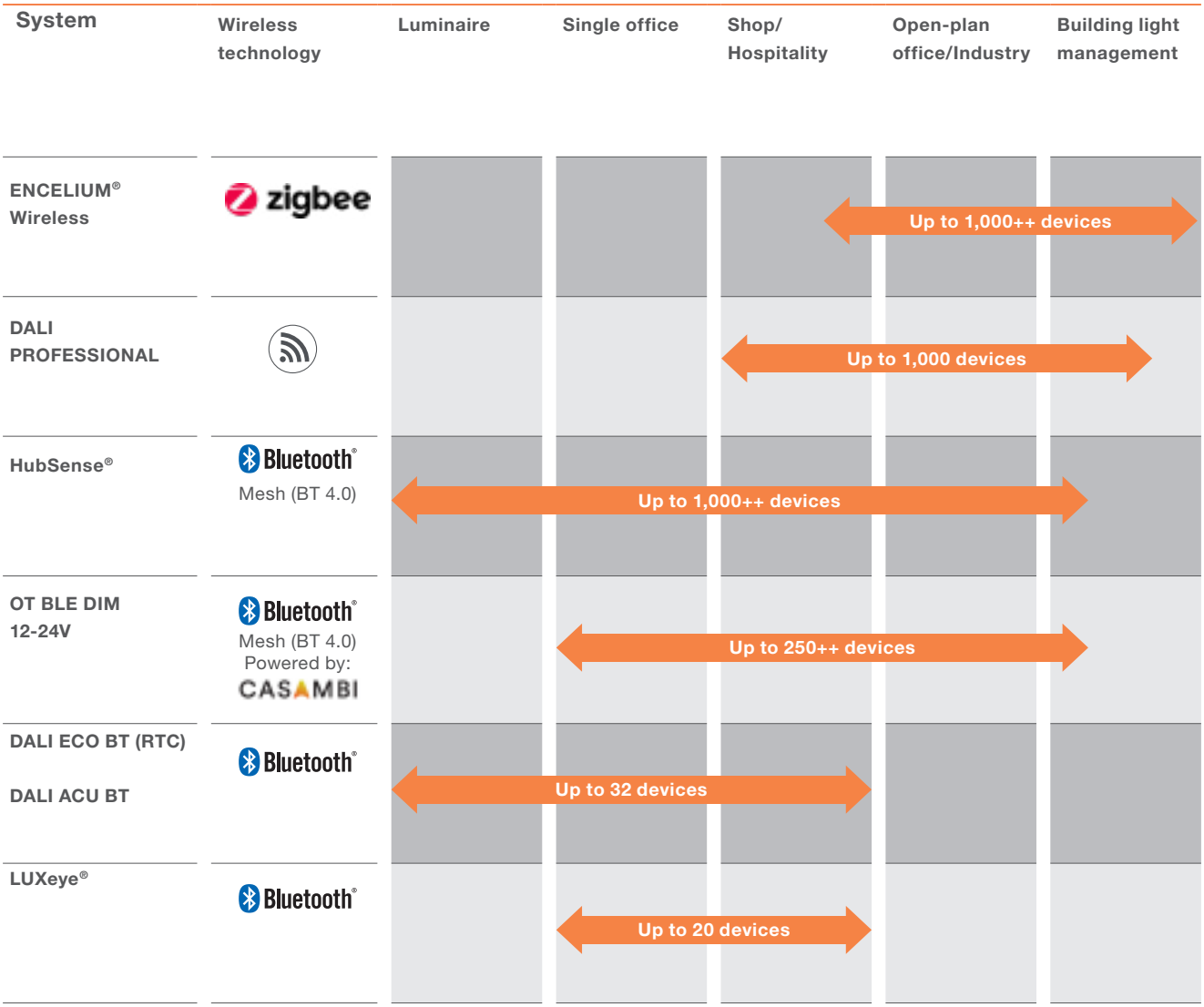



**Legend** N Wireless node NS Wireless node with sensor WS Wireless switch LGx Light group

# 5 Wireless portfolio overview

In view of the increasing demand for lower $CO_2$ emissions, wireless lighting systems are the perfect solution for future-proof, flexible and efficient installations. But these systems not only show their strengths in new building projects, but also in existing lighting structures. When renovating old technology, it is possible to bring buildings up to the latest state of digitalization with simple means and relatively low effort. We have developed several light management systems that are suitable for a variety of applications and projects of different sizes.

Furthermore, state-of-the-art wireless technologies provide data monitoring and self-healing capabilities, making the recognition and exchange of defective devices an easy task without the need of closing down the complete installation during maintenance. The table below provides an overview.



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