



Bluetooth® Networked Lighting Control Communications Guide

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This communications guide includes Bluetooth® Networked Lighting Control (NLC) key messages and positioning details. Bluetooth SIG members are encouraged to visit the Bluetooth® NLC webpage to learn more: bluetooth.com/bluetooth-nlc.

This document is intended for use by Bluetooth SIG member companies to understand the messaging the Bluetooth SIG is using in its promotion of Bluetooth® NLC. Members are encouraged to leverage this messaging within their own promotional activities. In addition, this document provides guidance for members on how to communicate qualified support of Bluetooth® NLC within their products.

Summary

Ensuring global interoperability requires standardization across all three layers of a wireless lighting control solution --- the radio layer, communication layer, and device layer. Over a decade ago, the lighting industry began a journey towards standardization of wireless lighting control using Bluetooth® technology. First, the industry standardized the radio layer using Bluetooth Low Energy (LE), bringing much-needed economies of scale that only the most widely deployed wireless radio standard in the world can provide. Bluetooth® Mesh then added communication layer standardization, increasing innovation by allowing manufacturers to focus their engineering efforts on higher-level, value-added capabilities.

Yet, a wireless standard to define functionality at the device layer did not exist, limiting global mainstream adoption and preventing the market from reaching its full potential. Bluetooth® Networked Lighting Control (NLC) solves this challenge. Specifically designed to meet the scale, reliability, and security demands required in commercial settings, Bluetooth® NLC is the only full-stack standard for wireless lighting control. By offering standardization from the radio through the device layer, Bluetooth® NLC enables true multi-vendor interoperability and mass adoption of wireless lighting control.

What is Commercial Lighting Control?

Lighting control systems feature an intelligent network of individually addressable and sensor-rich luminaires and control devices that allows each component of the system to send and receive data. Increasingly deployed in offices, retail, healthcare, factories, and other commercial facilities, lighting control solutions deliver a combination of energy savings, an enhanced occupant experience, and more efficient building operations.

Three key benefits are driving the demand for advanced lighting control solutions.



Significant Energy Savings

Lighting control implementations can reduce building energy costs by up to 75 percent.¹ In addition to providing more refined scheduling and demand response, networked lighting controls feature intelligent sensors to monitor occupancy and daylight levels and adjust light usage in real-time, allowing for more efficient energy consumption.



Better Occupant Experience

Quality of light is essential to occupant well-being and productivity. Traditionally, lighting systems have fallen short in achieving energy efficiency without compromising a building's occupant experience. Lighting control solutions enable task tuning and personal control for light-level management, striking the ideal balance between energy savings and occupant comfort.



Improved Building Operations

Commercial lighting solutions are evolving into much more advanced and sophisticated systems. Luminaires are now capable of providing performance data that can help better tune the system as well as critical health data that enables predictive maintenance. Occupancy, temperature, humidity, and air-quality sensors integrated into the lighting control system are also helping enable more efficient operation of other building systems, including HVAC and security.

Why Wireless for Lighting Controls?

Figure 1 highlights that wireless lighting control shipments will overtake wired lighting control shipments by 2027.

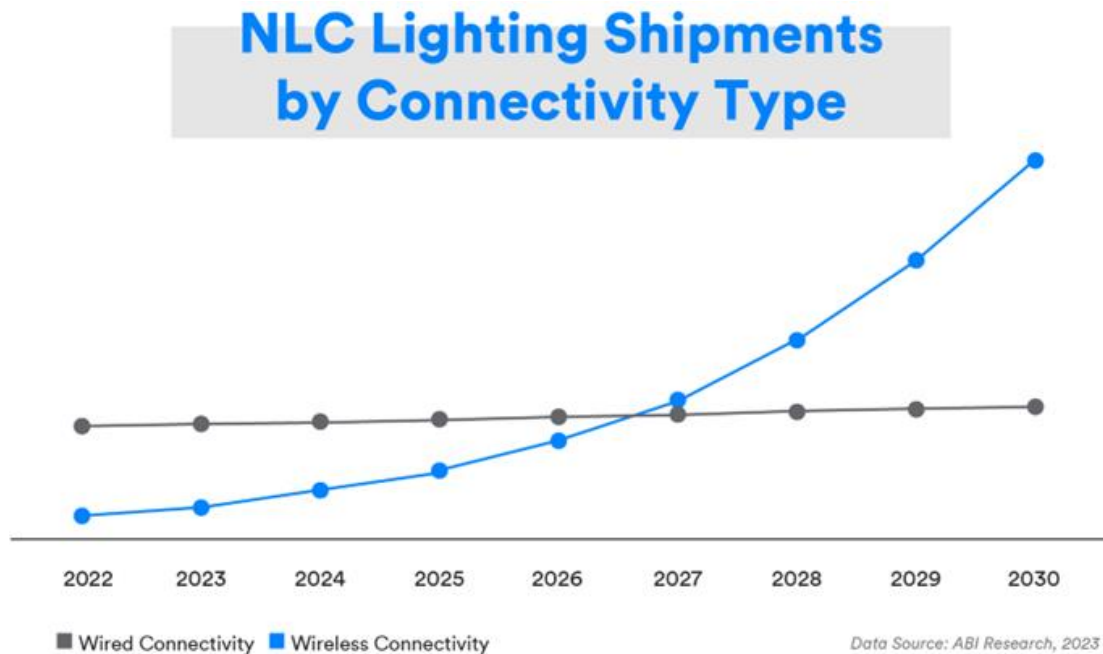


Figure 1: Wireless Shipments Trends

The shift from wired to wireless lighting control solutions is being driven by three main advantages of wireless systems.

Greater Design Flexibility

Wireless systems allow for optimal placement of switches, lights, and other equipment, including places where it would be impractical, if not impossible, for pre-configured wired systems. In addition, wires are fixed, but spaces and layouts change and lighting control systems must adapt with them. Wireless systems are more easily reconfigurable and provide superior flexibility compared to wired offerings.

Lower Cost of Deployment

Without the need to pull control wires, wireless lighting controls offer significantly lower deployment costs. Decreased labor and material costs, minimum disruption to business operations during installation, and reduced ongoing maintenance costs combine to bring substantial savings to building owners and managers, particularly in retrofits.

Future of Extensibility

Lighting control systems must often grow and evolve to accommodate changes in the size or layout of a building or space. Once deployed, wireless systems are far more extensible than wired counterparts and can more easily add advanced controls and expand to meet changing business needs and occupant requirements.

Lighting the Path to Wireless Lighting Control Standardization

The benefits of standardization are well documented and illustrated. With standardization comes interoperability, and with interoperability comes trust – trust that products from different manufacturers can work together seamlessly, making it easier to combine products from multiple manufacturers to create fit-for-purpose, value-added systems. Standardization also helps reduce the costs of development, expand the overall size of the market, and encourage innovation by allowing manufacturers to focus their engineering efforts on higher-level, valued-added capabilities.

In the lighting industry, the potential for greater design flexibility, lower cost of implementation, and the increased future extensibility offered by wireless control solutions began to pique the market’s interest over a decade ago. However, the lack of a wireless standard presented a barrier to adoption, and leaders across the industry turned to Bluetooth® technology to light the path to standardization, as displayed in Figure 2.

The Evolution of Bluetooth® Lighting Control

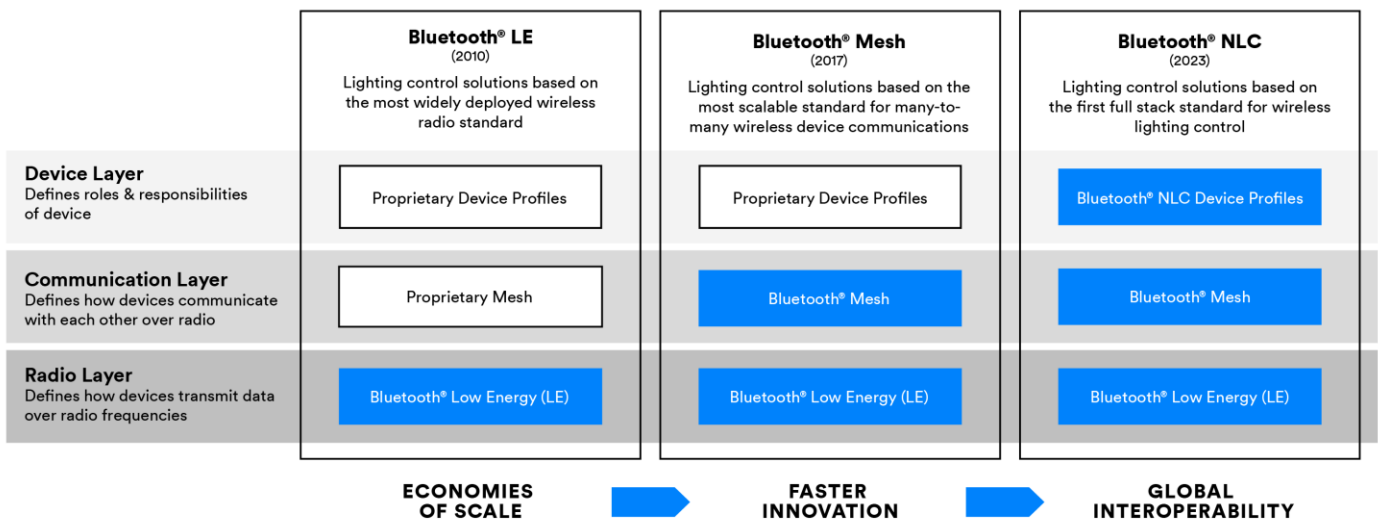


Figure 2: The Evolution of Bluetooth Lighting Control

Ensuring global interoperability requires standardization at all three layers of a wireless lighting control solution --- the radio layer, communication layer, and device layer. The radio lies at the base layer and defines how switches, luminaires, and other lighting control devices transmit data over radio frequencies. Sitting in the middle is the communication layer which determines how those same devices communicate with each other over the radio. At the top is the device layer. It defines the roles and responsibilities of devices in a lighting control network.

The standardization process began with the arrival of lighting control solutions that leveraged the ubiquitous Bluetooth Low Energy (LE) radio. Bluetooth LE brought standardization at the

radio layer, along with much-needed economies of scale that only the most widely deployed wireless radio standard in the world can provide.

The next step was the release of Bluetooth® Mesh in 2017. Bluetooth® Mesh added standardization at the communication layer, enabling the creation of lighting control solutions based on the most scalable standard for many-to-many wireless device communications. The introduction of Bluetooth® Mesh alleviated the burden of proprietary mesh development and increased innovation by allowing manufacturers to focus their engineering efforts on higher-level, value-added capabilities.

Yet, a wireless standard to define functionality at the device layer did not exist, limiting global mainstream adoption and preventing the market from reaching its full potential. Bluetooth® Networked Lighting Control (NLC) solves this challenge. Specifically designed to meet the scale, reliability, and security demands required in commercial settings, Bluetooth® NLC is the only full-stack standard for wireless lighting control. By offering standardization from the radio through the device layer, Bluetooth® NLC enables true multi-vendor interoperability and mass adoption of wireless lighting control.

The Benefits of Bluetooth® NLC

This section provides messaging to support discussions about the key benefits of Bluetooth® NLC.

Specifically designed to meet the scale, reliability, and security demands required in commercial settings, Bluetooth® NLC is the only full-stack standard for wireless lighting control. By offering standardization from the radio through the device layer, Bluetooth® NLC enables true multi-vendor interoperability and mass adoption of wireless lighting control.

There are a few key reasons Bluetooth® NLC is the technology of choice for lighting suppliers and buyers.

SUPPLIERS

Lower Cost & Faster Innovation

With more than five billion Bluetooth® enabled devices forecasted to ship in 2023 alone, Bluetooth® NLC developers will benefit from the economies of scale that Bluetooth technology affords, and increased supplier diversity will lead to more attractive component pricing, driving down overall product costs.² In addition, by adopting a standardized approach for wireless communications in lighting control systems, the need to develop and maintain proprietary technologies is eliminated, and developers can reallocate their engineering efforts to focus on more value-added, differentiating features and capabilities.

Increased Market Opportunity

The establishment of a true, global standard is necessary to enable any market to achieve its full promise. Wireless lighting control is no different. Bluetooth® NLC expands the supplier opportunity by instilling buyer confidence and peace of mind and increasing the likelihood of adoption, expanding the overall breadth of the market, and unleashing its total potential.

Additional Revenue Models

The same Bluetooth® radio embedded in lighting control devices can also be used to implement advanced building services, such as indoor navigation, space utilization, and asset tracking. With this shift from a single-function solution to a platform for data-driven smart building services, manufacturers can add recurring revenue streams while also leveraging additional benefits beyond illumination to differentiate with prospective customers.



BUYERS

True, Multi-vendor Interoperability

Bluetooth® NLC is the only full stack wireless lighting control solution that defines operations at all three layers --- the radio, communication, and device layers. Bluetooth® NLC establishes a true, global wireless standard that frees buyers and installers from vendor lock-in and gives them confidence that lighting components from different vendors will work seamlessly with each other.



Ease of Deployment

With Bluetooth® technology native in 100 percent of smartphones and tablets, installers can use simple, user-friendly commissioning apps that communicate directly with nodes on the network, eliminating the need for specialized engineering expertise or internet and cloud platforms to support installation and operation of the system.² In addition, a remote provisioning feature makes adding new devices or maintaining or changing existing devices even easier.

Greater Scalability

The ideal lighting control system is often one that can start small and then scale, in both functionality and size, as spaces and layouts inevitably change and evolve. Bluetooth® NLC features a decentralized architecture that distributes control to all end devices, removing the need for centralized controllers and allowing Bluetooth NLC lighting systems to be more easily reconfigurable and far more extensible than other wireless lighting control options. This decentralized control architecture enables systems to easily expand or contract to meet changing business needs and occupant requirements.

Commercial Lighting Control Market Insights

70-75% reduction in energy costs achieve through connected lighting and advanced lighting controls

Source: Enterprise IoT Insights, 2020

28 million Bluetooth networked lighting devices will ship in 2027

Source: ABI Research, 2023

115% CAGR for Bluetooth® networked lighting control device shipments from 2022 through 2027

Source: ABI Research, 2023

28% of commercial lighting deployments will be connected by 2035

Source: U.S. Department of Energy, 2019

28% more energy savings achievable through NLCs with luminaire level lighting control than NLCs without luminaire level lighting control

Source: Northwest Energy Alliance and the DesignLights Consortium, 2020

Communicating Support for Bluetooth® NLC in Member Products

This section guides member companies on how to communicate support of Bluetooth® NLC within their products.

Bluetooth SIG member companies with products that complete the Bluetooth Qualification Process and include at least one Bluetooth® NLC profile specification in the product qualification may communicate support for Bluetooth® NLC. Following are sample expressions of this support.

Supports Bluetooth® NLC

Based on Bluetooth® NLC

Bluetooth® NLC

In addition to indicating support of Bluetooth® NLC in the product, the member company is encouraged to provide a list of the Bluetooth® NLC profile specifications for which the product completed the Bluetooth Qualification Process.

FAQ

Q: What is the advantage of a wireless lighting control solution based on Bluetooth® NLC compared to other solutions available on the market?

Bluetooth® Networked Lighting Control (NLC) is the solution to the closed ecosystem challenge that currently exists in the wireless lighting control market. By offering standardization from the radio through the device layer, Bluetooth® NLC enables true multi-vendor interoperability and mass adoption of wireless lighting control. Bluetooth® NLC is the only full-stack wireless lighting control standard designed to meet the scale, reliability, and security demands required in commercial settings.

Q: When are Bluetooth® NLC products expected to be available in the market?

We expect to see qualified enabling technology products (e.g., chips, modules, and stacks) in the first half 2024 and end products (e.g., luminaires, LED drivers, switches, and sensors) arriving by the end of 2024.

Q: How do I tell whether a product is qualified to support Bluetooth NLC?

A product of any type supports Bluetooth® NLC once it has been qualified against at least one of the NLC profile specifications. Qualified products can be found in [Launch Studio](#).

Q: Is Bluetooth NLC secure?

Bluetooth® NLC is designed with security as a top priority and provides industrial-grade security for protection against all known attacks. Comprehensive security that covers the entire network of devices and various groupings of devices is mandatory. Additional features are available to further enhance security and network device privacy. Furthermore, the complete Bluetooth® NLC security architecture is open and available for public review.

Q: What is happening with Bluetooth® Mesh now that Bluetooth® NLC is available?

Bluetooth Mesh remains the most ideally suited mesh networking technology for control, monitoring, and automation systems where hundreds, or thousands of devices need to communicate with one another. Bluetooth Mesh meets the strict requirements of commercial and industrial environments where performance, reliability, and security are of the utmost importance. Bluetooth® NLC simply builds on Bluetooth Mesh to deliver a full-stack standard for wireless lighting control.

Q: Will existing lighting control devices and products based on Bluetooth Mesh be upgradeable to Bluetooth® NLC?

Yes, Bluetooth specifications allow for upgradeability. However, you should check with your device and/or product manufacturers to ultimately make this determination.

1 Source: Enterprise IoT Insights, 2020

2 Source: ABI Research, 2023