DALI+™

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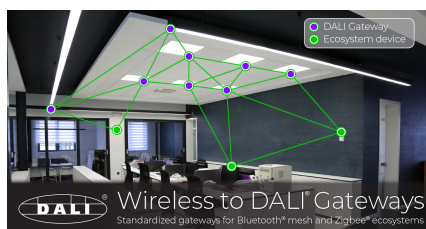# DALI+ and Wireless to DALI Gateways Increase Connectivity Options for DALI Lighting Networks

The launch of DALI+, a new brand for DALI over wireless and IP-based networks, along with new specifications for standardized Wireless to DALI Gateways, opens the door to greater choice and freedom for lighting specifiers, especially for IoT-based projects. Paul DROSIHN, general manager of the DALI Alliance, explains.

DALI is evolving to encompass both wired and wireless connectivity. Clearly, offering the industry greater choice is the right move because there are projects when one or the other solution (or a hybrid of both) is deemed the right fit depending on the specific requirements, environment and other factors.

In some instances, wireless lighting control may be identified as an ideal solution, especially in retrofit installations. One advantage of wireless is flexibility; it can be much easier to add sensors and new luminaires to an existing lighting network, or to relocate devices when a building is refurbished or repurposed. Not needing to lay new data cables through walls, ceilings or floors can be a considerable advantage in time and expense (although, of course, luminaires and other lighting devices still require power).

On other occasions, there will be a tendency to choose wired network connectivity, including in large-scale infrastructure installations. Wired systems offer predictable network behaviour, and avoid any potential connectivity issues that may arise in a built environment. Also, DALI wiring can be installed along with the power cables.

Working with prominent collaboration partners, the DALI Alliance is standardizing the way that DALI lighting controls can be combined with wireless networking, as well as with IP-based systems.

DALI+
DALI lighting control plus wireless and IP-based networking

Wireless to DALI™ Gateways
Standardized gateways for Bluetooth® mesh and Zigbee® ecosystems

DALI+™

DALI Lighting Control with Wireless and IP-based Networking

In May 2021, the DALI Alliance (DiiA), the global industry organization for DALI lighting control, launched DALI+ [1], a new brand that denotes DALI over wireless and IP-based networks.

DALI+ builds on the proven capabilities, features and advantages of DALI lighting-control features in wired (DALI-2 & D4i) options, and offers access to the same rich set of data from control gear, luminaires and sensors. DALI+ is differentiated by the method by which the DALI commands are transported, being carried over a wireless and/or IP-based medium rather than the dedicated 2-wire bus for communication used by DALI-2 and D4i.

The DALI Alliance has published a new DiiA Specification, which supports DALI+ across different carriers and enables certification of interoperable DALI+ devices. The first certification program will be DALI+ with Thread, a low-power, IP-based, wireless-mesh networking protocol.

In combination with a wireless carrier, DALI+ enables true wireless DALI, without any need to translate between protocols. The wireless DALI+ devices form a network, and a wired DALI link is not required. However, the new specification also supports bridges, which allow access to DALI wired luminaires or subnets from the DALI+ wireless network.

"The new DALI+ adds further flexibility and choice for all DALI users while retaining a focus on certification and interoperability"

PAUL DROSIHN

The introduction of DALI+ ushers in a new era of seamless, industry-standardized lighting control. DALI+ extends choice, flexibility and creative freedom to lighting designers and specifiers by supporting the development of wired, wireless and IP-based systems, using DALI throughout. DALI can now be specified, and designs can mix and match DALI-2, D4i and DALI+, according to the option that best fits. DALI+ enables lighting solutions that

can easily scale to building-wide networks, or even across multiple buildings, by using new addressing features. The implementation of IP-based networks in commercial buildings allows IT systems and building automation services, including lighting control, to operate on a common platform, with features such as end-to-end security, unlimited scalability, and easy connectivity to other applications.

Leveraging the existing features of the DALI protocol, DALI+ networks connect sensors, controllers and luminaires in a data-rich environment. This enables real-time monitoring of energy and power usage, and access to diagnostics information for predictive luminaire maintenance, among many other examples.

DALI+ is supported by a new DiiA Specification, available from the DALI Alliance website, entitled 'Part 104 Changes and Additions'. This provides updates to the published Part 104 of the international IEC 62386 standard. The first version of this specification supports IP-based protocols such as Thread, Ethernet and Wi-Fi.

Initially, the DALI Alliance is developing tests that will enable a new 'DALI+ with Thread' certification program. Further DALI+ certification programs utilizing other carriers will follow.
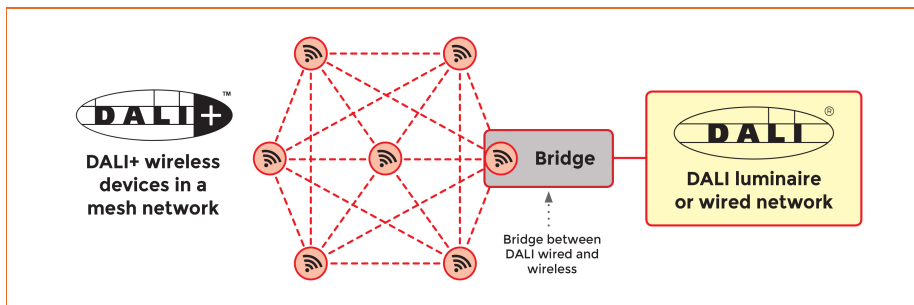

Figure 1: The new Part 104 Changes & Additions specification supports bridges, which allow a DALI+ wireless network to access DALI wired subnets or luminaires.

Wireless to DALI® Gateways

Standardized Gateways for Bluetooth® mesh and Zigbee® Ecosystems

The launch of DALI+ follows the release of two Wireless to DALI Gateway specifications [2] by the DALI Alliance. Gateways enable DALI lighting products to be incorporated into two widely-used, non-DALI wireless ecosystems, namely Bluetooth mesh and Zigbee.

Gateways effectively translate between protocols, with wired DALI devices on one side of the gateway and wireless ecosystem devices on the other side. In contrast, DALI+ solutions do not require translation, as the DALI protocol is used throughout.

Wireless to DALI Gateways provide the flexibility to incorporate DALI luminaires and other DALI devices into the control network, so it becomes very straightforward to

add lighting capabilities alongside the other features of the wireless ecosystem. The gateway specifications enable well-defined and consistent lighting behaviour, which is a fundamental feature of DALI lighting control.

Existing DALI devices can be used with these gateways, and there is already an extensive range of certified and interoperable DALI-2 and D4i products on the market. Additionally, the gateway specifications enable DALI control gear to report luminaire, energy and diagnostics data (as defined in Parts 251-253) to the wireless ecosystem via the gateway.

The two new gateway specifications published by the DALI Alliance are Part 341, covering Bluetooth Mesh to DALI Gateways, and Part 342, describing Zigbee to DALI Gateways. These specifications are also available from the DALI Alliance website. The Part numbers are aligned with the global, multi-part IEC 62386 standard for DALI technology. The specifications will be transferred to IEC for incorporation into IEC 62386.

D4i and DALI-2 Successfully Implemented in IoT Projects

While DALI+ and Wireless to DALI Gateways are now bringing wireless connectivity to DALI systems, DALI already contributes significantly to successful smart IoT-based lighting projects.

For example, multiple DALI subnets can be networked together to provide building-wide control. A single DALI application controller can control several DALI subnets, and application controllers can be connected together via an Ethernet backbone for example. Also, DALI systems can connect with other networks including building management systems (BMS) via non-standardized gateways.

Further capabilities are available from the use of D4i, which facilitates the addition of wireless nodes (also known as network lighting controllers) to luminaires. This enables standalone D4i luminaires to participate in remote lighting-control networks.

Harnessing sensor-rich lighting systems and standardized interfaces, building managers can benefit from new IoT capabilities including automated light-level and
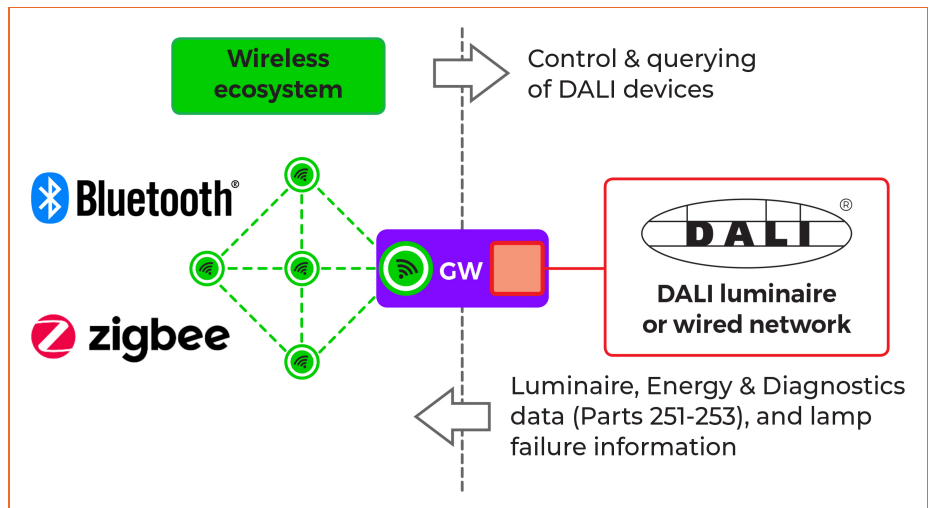

Figure 2: Gateways allow existing wireless ecosystems to control and query common DALI wired products. Devices in the wireless ecosystem communicate using their existing protocol, and can talk with the gateway (GW). DALI control gear can report luminaire, energy and diagnostics data to the wireless network.
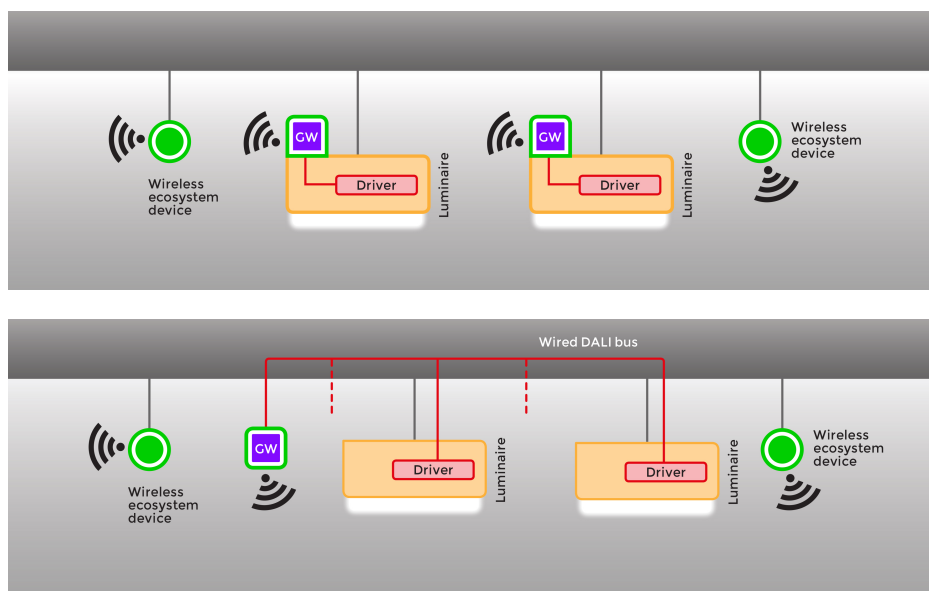

Figure 3: There are two main configurations for the DALI side of the gateway (GW).In the top diagram, the DALI-2 or D4i luminaires each have a gateway that participates in the wireless ecosystem, and also connects via an intra-luminaire DALI line to the LED driver. The bottom diagram shows a wired DALI subnet with several luminaires that are controlled by a single gateway (GW) to the wireless ecosystem.
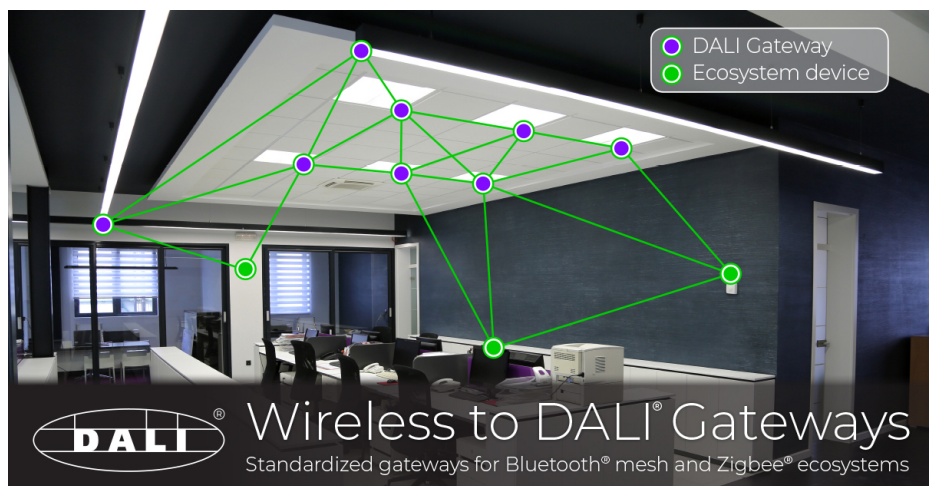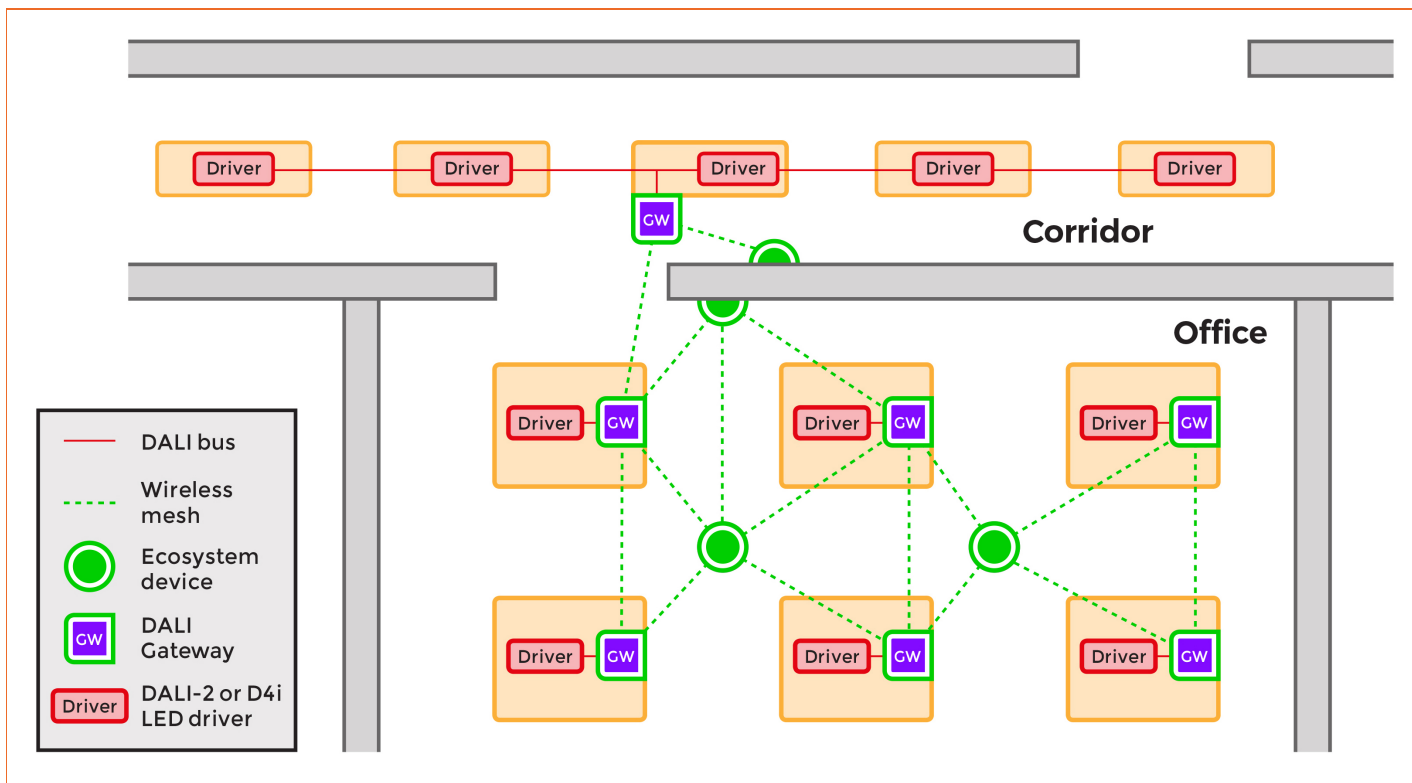
Figure 4: In this scenario, the office luminaires each have a gateway that forms part of the wireless network. In the corridor, a wired DALI line connects all the luminaires with a single gateway that also participates in the wireless ecosystem.

color control. Once again, DALI users can tap into advanced luminaire performance monitoring including energy usage and predictive maintenance, as well as enhanced services such as asset tracking and indoor navigation.

Summary

With its rich feature set, DALI is already positioned to participate in IoT environments. And now, the new Part 104 Changes & Additions specification and the two Wireless to DALI Gateway specifications add further flexibility and choice for all DALI users, while retaining a focus on certification and interoperability.

Following the publication of the new DALI Alliance specifications, tests are already in development that will enable certification of interoperable devices from different vendors. When the tests are ready, gateways will be added to the DALI-2 certification program. For DALI+, the initial focus is to establish 'DALI+ with Thread' certification. Further DALI+ certification programs utilizing carriers other than Thread are likely to follow, delivering further standardization, future-proof reliability, and interoperability. ■

For more information, visit https://www.dali-alliance.org

AUTHOR: Paul DROSIHN
Mr. DROSIHN was appointed as General Manager of the DALI Alliance in May 2019. Paul is a highly qualified and experienced management professional with more than 30 years' experience in the electronics and LED lighting industries. He has held a number of senior roles in management, sales, operations, business development and strategic marketing, at companies involved in electronics distribution, semiconductor manufacturing, precision optics manufacturing and management consulting. He is a Member of IEEE and AMBA, and a Fellow of the Institute of Leadership and Management.

About: DALI Alliance
The DALI Alliance (also known as the Digital Illumination Interface Alliance or DiiA) [3] is an open, global consortium of lighting companies that drives the growth of lighting-control solutions based on internationally-standardized Digital Addressable Lighting Interface (DALI) technology. The organization operates the DALI-2 and D4i certification programs to boost levels of cross-vendor interoperability. As lighting continues to evolve and converge with the IoT, the DALI Alliance is also driving the standardization of wireless and IP-based connectivity solutions.

References

[1] https://www.dali-alliance.org/daliplus/
[2] https://www.dali-alliance.org/wireless/gateways.html
[3] https://www.dali-alliance.org