Technical Guide

DALI Gateways Implementing Parts 341 or 342

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For any further explanation of the contents of this document, or in case of any perceived inconsistency or ambiguity of interpretation, please contact the DiiA:

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20 Sep 2021	1.0	Initial publication of document “DiiA(SW)263e DiiA Guide to DALI Gateways implementing parts 341 and 342”

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DALI Gateways Implementing Parts 341 or 342

1 Scope

This document is a technical guide to Gateways that implement either the part 341 or part 342 specifications from DiiA.

2 References

The following documents are adopted in whole, where the specification is implemented. The latest edition of the publication applies (including amendments) unless stated otherwise.

- IEC 62386 series of standards. For part 207, edition 1 applies.
- DiiA Specifications: part 150 AUX, parts 250-253 and part 351
- DiiA Specifications: part 341 and part 342
- DiiA Guidelines: Clarifications & Recommendations for IEC 62386
- DiiA Guide: Product Submission Guide
- Trademark Guidelines for Members - for DiiA Regular and Associate Members

3 Terms and definitions

3.1 DiiA

Digital Illumination Interface Alliance

NOTE Also known as the DALI Alliance.

3.2 gateway

control device implementing either of the DiiA specifications part 341 or part 342

3.3 ecosystem

network of devices communicating using the same protocol

NOTE Bluetooth mesh and Zigbee systems are two examples of wireless ecosystems supported by the gateways.

4 General

4.1 Types of gateways

DiiA specifies the following gateways, which are similar in the functionality they provide, except for the wireless ecosystems they implement:

- Part 341: Bluetooth mesh gateway
- Part 342: Zigbee gateway

4.2 What gateways do (Overview of gateway functionality)

Gateways allow DALI-2 and D4i control gear (drivers) to be controlled or queried from the ecosystem, as if the driver is part of the ecosystem. Support for DALI version-1 drivers is optional. Figure 1 shows a system of control gear (drivers) on the right, and an ecosystem on the left.

NOTE Support for smooth fading of DALI version-1 control gear is optional. This can be checked in the product database by selecting “Application controller/Supports DALI version-1 control gear”.

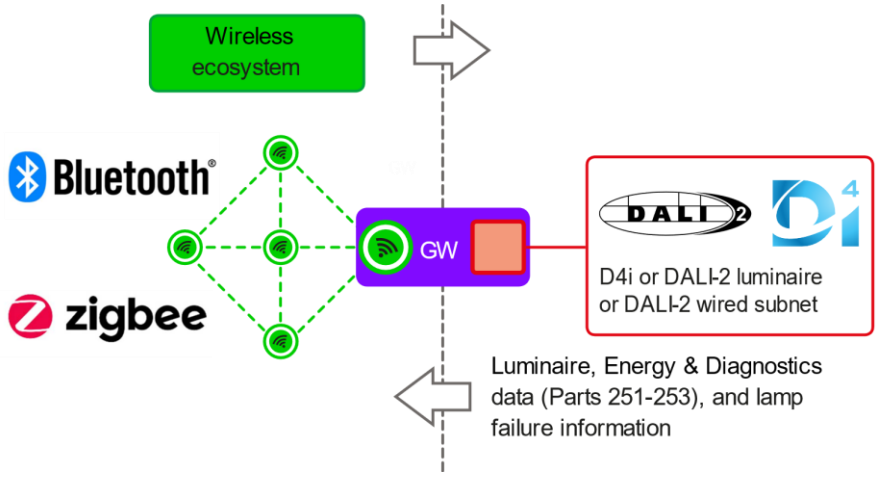

Figure 1 - Gateway between a DALI system and a wireless ecosystem

The main functions of gateways are the following:

- Devices in the ecosystem communicate using their existing protocol, and talk with the gateway.
- The gateway provides a wired connection to a DALI system (see section 5).
- The gateway **allows the ecosystem to control the light output and fading** of the drivers in the DALI system. See section 5.3.
- Some of the **DALI system data can be accessed from the ecosystem**. See section 5.4.

4.3 What gateways don't do

Gateways don't make ecosystem devices appear as if they are part of the DALI system. This means that application controllers in the DALI system are not able to control, configure or query ecosystem devices.

Gateways may allow input devices in the DALI system to appear as if they are inputs or sensors in the ecosystem. This functionality is optional – it is not currently included in the gateway specifications (parts 341 and 342). If this functionality is provided, it could allow sensors, push-buttons or other input devices in the DALI system to control devices in the ecosystem.

Support for colour control gear and emergency control gear is not currently included in the gateway specification, although basic control of the light output level (if controllable) is provided.

4.4 System structure and architecture

Gateways support several system architectures.

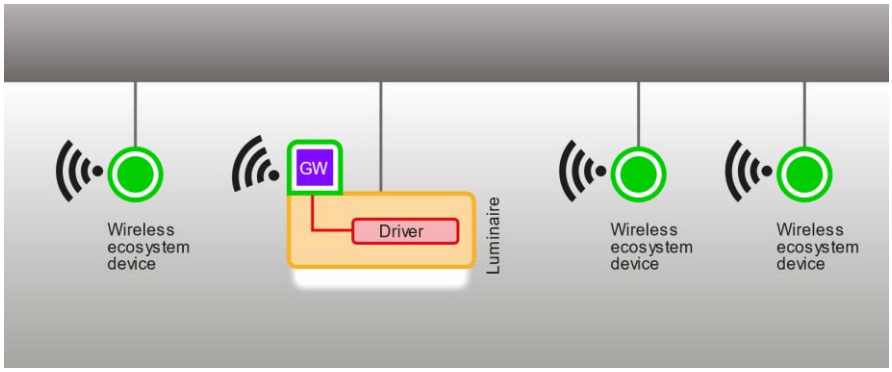

Figure 2 - Gateway with a single driver in a luminaire

Figure 2 shows the simplest case, where a gateway is used with a single D4i driver. In this example, the D4i driver provides sufficient power to the DALI bus to power the gateway. Ecosystem devices control the light level, and can access much of the data provided by the driver.

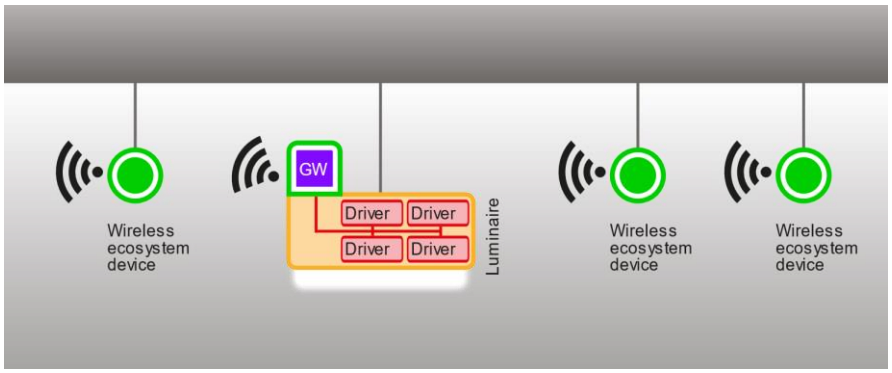

Figure 3 - Gateway with four drivers in a luminaire

Figure 3 is similar to the previous example, except there are now four D4i drivers. Again, in the example the gateway can be bus-powered.

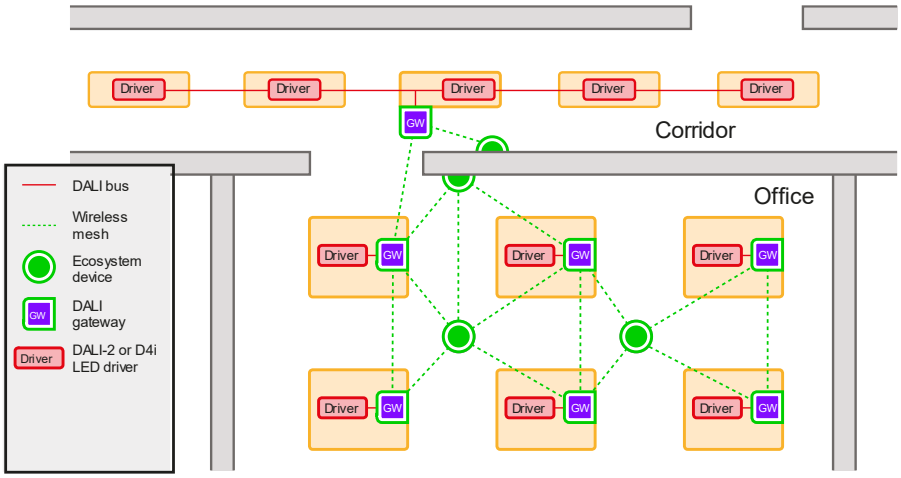

Figure 4 - Gateway with multiple luminaires

The example in Figure 4 has a greater number of drivers than previous examples. All drivers are controlled together, such that the light output level of all drivers is identical (within the physical limits of the drivers/connected lamps). Gateways are required to aggregate data from at least 4 drivers. With more than 4 drivers, the gateway will aggregate the data from at least 4 of the connected drivers, possibly supporting more than 4. The gateway may be bus-powered, or may be powered by an external supply such as 230V AC, or 24V DC.

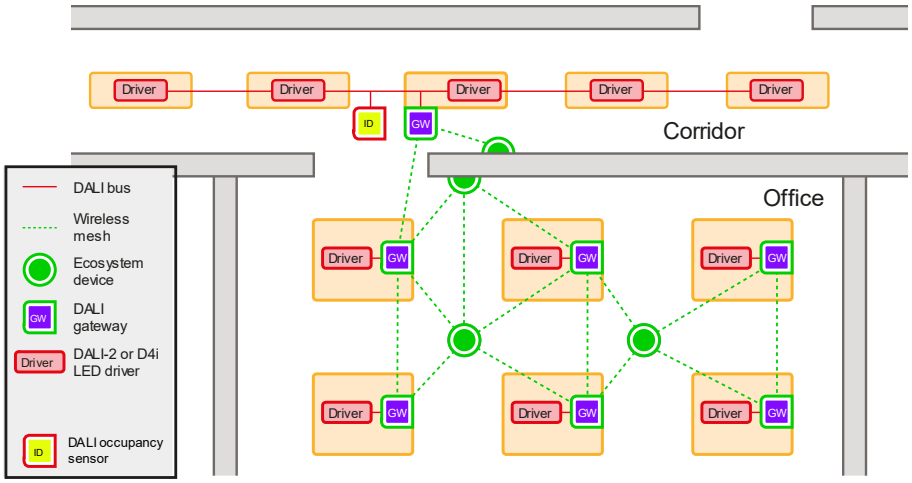

Figure 5 - Gateway with multiple luminaires and an input device

Gateways are not required to support input devices such as push-buttons, or sensors. Functionality provided by the gateway, if any, needs to be described by the gateway manufacturer. An example of such use is a multi-master gateway using occupancy event messages to trigger a change of light level on the DALI drivers. Figure 5 shows an example with a single occupancy sensor input device. In this case, the application controller in the gateway device can receive and act upon event messages from the occupancy sensor.

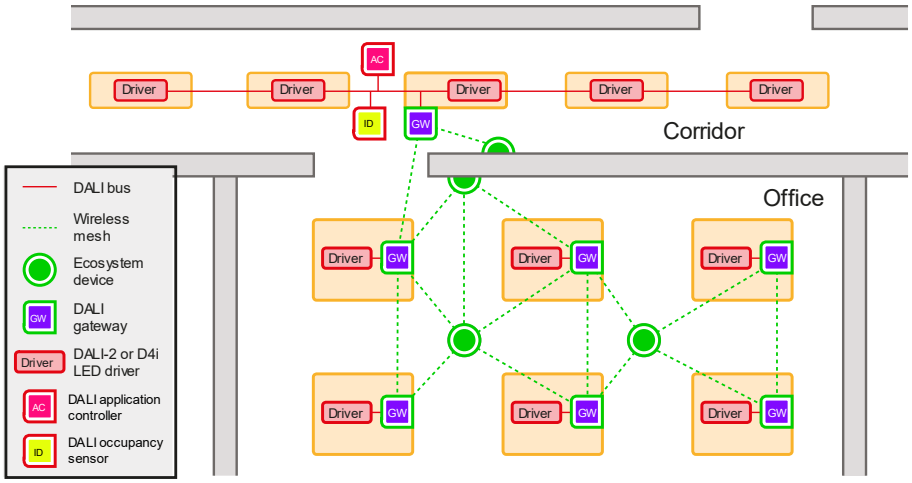

Figure 6 – Gateway with another application controller, multiple luminaires and an input device

Gateways are not required to support other application controllers in the DALI system. To allow this, the gateway and other application controllers must be multi-masters, and the manufacturers need to state that the application controllers, including the gateway, will work together. In the example in Figure 6, the application controller in the corridor DALI system, and/or the application controller in the gateway device, can act upon event messages from the occupancy sensor input device.

In all of these examples, there needs to be at least one DALI bus power supply. This may be integrated in the drivers, in the gateway, in another device on the bus, or a stand-alone bus power supply can be used. D4i drivers have integrated bus power supplies.

5 Method of operation

5.1 Overview of operation

The DALI side of the gateway includes a single-master (with a DALI receiver) or multi-master application controller, enabling the gateway to send forward frames to other DALI devices. Gateways may use any suitable DALI commands to achieve the required operation in the connected DALI system.

The ecosystem side of the gateway can be controlled or accessed from other products in the ecosystem, in the same way as similar ecosystem lighting products.

The gateway converts or translates operations requested from the ecosystem, to suitable DALI commands sent out by the gateway's application controller.

Example 1: Controlling the light output level

An ecosystem product requests the light output level to fade to 25%, over a time of 20 minutes. The gateway broadcasts suitable DALI commands to achieve this. Note: In this example of a 20 minute fade, the gateway will need to send more than just a single DAPC 25% command.

Example 2: Querying active energy

An ecosystem product reads the "Active Energy" from the gateway. The gateway periodically queries the connected drivers, and aggregates this in an internal variable that is immediately available when the ecosystem makes its query. Section 5.4 describes the data.

5.2 DALI system

Examples of DALI systems that could be used with a gateway include:

- A single driver, such as a single luminaire. See Figure 2.
- A luminaire with several drivers, such as an up-light/down-light. See Figure 3.
- A system of DALI drivers. See Figure 4.

5.2.1 Discovery of DALI devices

DALI devices are automatically discovered and addressed by the gateway before provisioning/joining to the ecosystem network.

After provisioning/joining, the gateway periodically checks if DALI devices have been added or removed, and flags or triggers an alarm if this is the case.

If a gateway that has already been provisioned/joined, is then unprovisioned/leaves the ecosystem network and is later re-provisioned/re-joined, any previously collected DALI system data will be lost. Systems that make use of the energy data reported by the gateway and are required to continue accumulating the reported energy without re-starting at zero, could achieve this by saving the energy value that the gateway reported before it was re-provisioned/re-joined, and accumulating this with the newly reported energy figures. An alternative method would be to accumulate energy based upon increments reported by the gateway.

5.3 Controlling the light output

Lighting operations in the ecosystem are translated into DALI commands so that all drivers provide the same light output level, except for limitations due to their physical minimum level. To achieve this, gateways may configure the DALI *minLevel* and *maxLevel* variables.

Fades on the ecosystem side also result in the DALI drivers fading together, to the same level. The fade times requested by the ecosystem are used, without being limited to DALI fade times.

5.4 DALI system data

The gateway makes the following data available to ecosystem devices:

- Control gear present/missing or failure
- Lamp failure
- Light source type (such as LED, OLED, HID…)
- Selected data from parts 251-253: luminaire data, power & energy data, diagnostic data, if such data is available from the control gear. See parts 341 and 342 for details of the included data.

In the case of multiple drivers (or multiple logical units), data is aggregated before being delivered to the ecosystem.

5.5 System limits

Gateways have the following system limits:

- Support for connection of 64 drivers (64 logical units or short addresses), provided the usual bus current limits are not exceeded.
- Broadcast control of all drivers in the connected DALI system. This means the light output of all drivers will be identical (see section 5.3).
- Aggregated data from 4 drivers. Optionally, some gateways may support data aggregation from more than 4 drivers – check the product data sheet.

5.6 Wireless security

Gateways are subject to the requirements of the ecosystem. This means that the security features of the wireless ecosystem apply.

5.7 Operation that is currently not provided by gateways

The following are some examples of functionality that is not currently included in the gateway specifications:

- Individual control of the light output of each driver. where there are multiple drivers.
- Access to data from individual drivers, where there are multiple drivers.
- Support for control devices (application controllers or input devices) is optional. If supported, such control devices are not visible from the ecosystem and may not be able to control any devices in the ecosystem.
- Representing ecosystem devices on the DALI system, such that an application controller on the DALI system “sees” the ecosystem devices as if they were standard DALI devices. An example is a sensor in the ecosystem, which will currently not be seen by any application controllers in the DALI system.

6 Future possibilities

The following changes and additions are under consideration:

- Support for individual control of the light output from each driver.
- Support for event messages from input devices.
- Support for control gear device types, such as those described in IEC 62386 parts 202 (emergency), 207 (additional LED specific features) and 209 (colour control) – device types 1, 6 and 8.

7 Testing, certification, and Trademark use

Gateways need to implement at least the following specifications:

- IEC 62386-101, and
- IEC 62386-103, and
- Clarifications & Recommendations for IEC 62386,

and either one of the following:

- DiiA Specification, Part 341: Particular requirements – Control devices – Bluetooth mesh gateway
- DiiA Specification, Part 342: Particular requirements – Control devices – Zigbee gateway

DiiA tests must be successfully executed for all implemented IEC 62386 and DiiA specifications. Testing and product submission details are given in the *Product Submission Guide*.

As well as successful test results, Trademark use on the gateways requires the product to be successfully certified and listed on the DiiA product database. Details on Trademark use are given in the document, *Trademark Guidelines for Members*.

Further information on ecosystem certification will be added later.

For more information, please contact us:

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