

Wireless
Gateways

and



DALI connectivity webinar
Wednesday 7th July, 2021



Alliance



Welcome to the DALI Connectivity Webinar

- Presentations will last for 40-45 minutes
- Followed by a Q&A session
- Please type questions into the “Q&A” box on your screen
- Presentation materials and a webinar recording will be available **after the event**:
 - www.dali-alliance.org/events
- We will also provide written answers to all questions



Agenda & Speakers

Part 1:

- Introduction: DALI, DALI-2, D4i and the DALI Alliance
- Key features

Part 2:

- DALI and Connectivity: Choice and flexibility with DALI+ and Wireless Gateways

Q&A:

- Type your questions into the “Q&A” box



Paul Drosihn,
General Manager,
DALI Alliance



Scott Wade,
Technical &
Certification Manager,
DALI Alliance

Introducing the DALI Alliance

Paul Drosihn, General Manager

DALI Alliance connectivity webinar

7th July 2021



Contents – Part 1 Introduction

- Introducing DALI, DALI-2 & the DALI Alliance
 - Introducing DALI
 - The DALI Alliance organization
 - DALI in the market
 - DALI trademarks and logos
- D4i and Zhaga-D4i
- Overview: What can DALI do?
- DALI for connectivity and IoT



DALI[®]

Alliance

Our new identity explains that we are the **global industry organization for DALI**
We are also known as the Digital Illumination Interface Alliance(DiiA)



Digital Illumination
Interface Alliance

DALI-2: Smart, digital lighting control




Digital Addressable Lighting Interface

- DALI® is an established protocol (language) for bi-directional, digital communication between lighting-control devices.
 - Technically managed in the open, global standard IEC 62386
 - Rich feature set, dedicated to lighting
- DALI-2™ is the certification program based on the latest version of the DALI protocol.
- DALI-2 is driven by the DALI Alliance (DiiA)
 - Ensures interoperability through testing and certification with trademark use
- DALI, DALI-2, D4i and DALI+ trademarks owned by the DALI Alliance

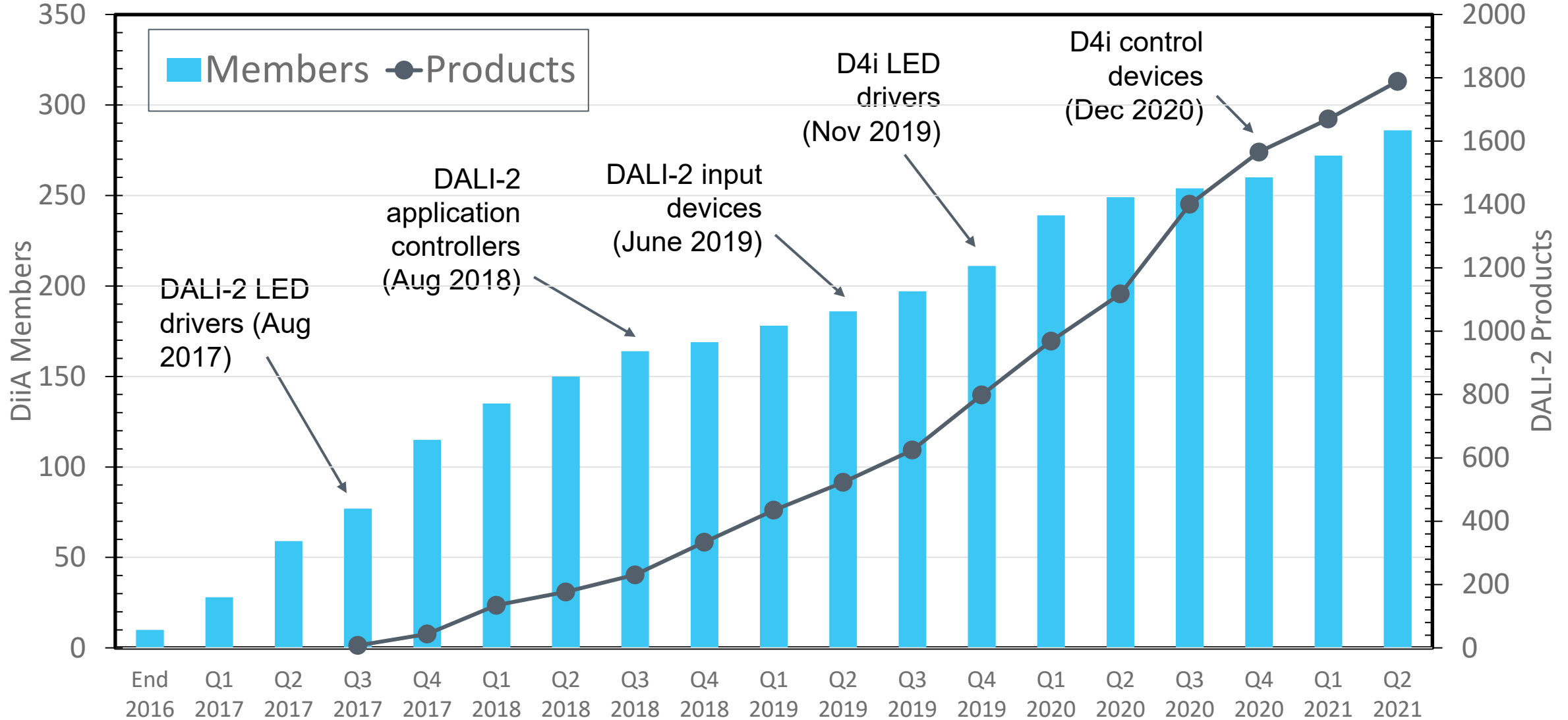


The DALI Alliance

- The DALI Alliance is an open, global consortium of lighting companies that aims to grow the market for lighting-control solutions based on DALI.
- Also known as  Digital Illumination Interface Alliance
- More than **290 members** worldwide, growing fast
 - Industry leaders in lighting and control
 - See www.dali-alliance.org/membership/member-companies.html
- Membership allows certification or registration of products:
 - Over **1,800 DALI-2 certified products**
 - Over 1,400 DALI version-1 registered products
- Membership allows **trademark use**



Members and DALI-2 certified products



DALI market

- Very large installed base of projects, spanning three decades
 - See www.dali-alliance.org/awards
 - Also www.dali-alliance.org/projects
- Used in major infrastructure projects
 - e.g. Crossrail in London, MTA New York City Transit, Manchester Airport and Beijing Airport
- DALI is “the **largest wired digital open protocol** in the world for lighting.”
 - *Pål Karlsen, research analyst, Omdia, LED Professional May/June 2020 issue, [Link](#)*
- “Open protocols will be the growth winners over the next few years in smart lighting and connected controls.”
 - *Ibid*
- “DALI is the **largest segment for smart lighting**, with **15% CAGR** expected over the next 5 years”
 - *Global Smart Lighting Market research report, [Link](#)*



D4i overview

- D4i is an extension of DALI-2 certification
- D4i components have a compulsory set of features
 - Based on power-supply and data specifications from DiiA
- All D4i LED drivers provide luminaire, energy & diagnostics data
- D4i enables DALI inside intelligent, IoT-ready luminaires
 - Other D4i implementations are also permitted
- D4i simplifies addition of sensors and communication devices to luminaires
- D4i enables plug-and-play interoperability when combined with a connector system
 - e.g. Zhaga Book 18 & 20 or NEMA/ANSI C136.41



Zhaga-D4i certification

A joint certification program based on complementary specifications

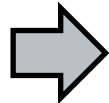


**Specifications from DiiA
enabling D4i certification**

**Book 18 & Book 20
specifications from Zhaga**



DALI Part 250: Integrated bus power supply
DALI Part 251: Luminaire data
DALI Part 252: Energy data
DALI Part 253: Diagnostics data
DALI Part 351: Luminaire-mounted control devices
DALI Part 150: AUX power supply



Book 18 for outdoor:
Book 20 for indoor:

- Mechanical interfaces
- Electrical pin assignment (Book 18)
- Electrical connectors (Book 20)
- References to D4i specs for power & control, and luminaire tests

What can DALI do?

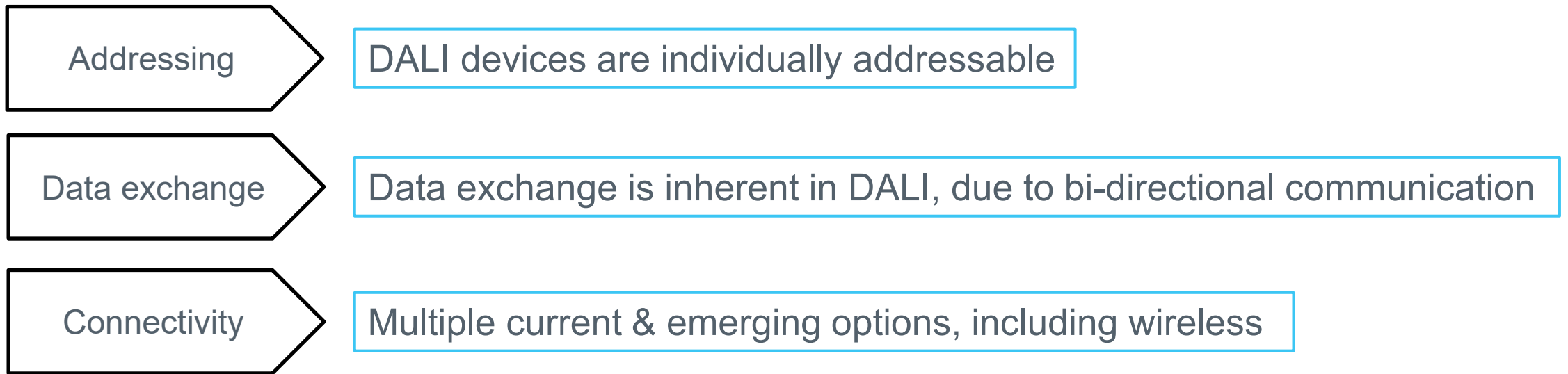
Digital control of light quality with intelligent feedback

- **Interoperability**, backed by rigorous testing and certification, with trademarks
- Precise, repeatable **light-output control** and standardized dimming curve
- **Occupancy and light-level sensing**
 - DALI-2 sensors and other input devices provide information to the system
- **Luminaire, energy & diagnostics data**
 - Data for enhanced asset management & performance monitoring
- **Emergency lighting**, automated tests
- **Colour control** for human-centric-lighting, enhanced comfort and well-being
- DALI is already positioned to participate in the **Internet of Things**
- New specifications to enable DALI connectivity via **wireless networks and IP-based networks**

DALI in an IoT world

How does DALI fit with this simple IoT definition?

- IoT: A system of devices with unique identifiers and ability to transfer data over a network



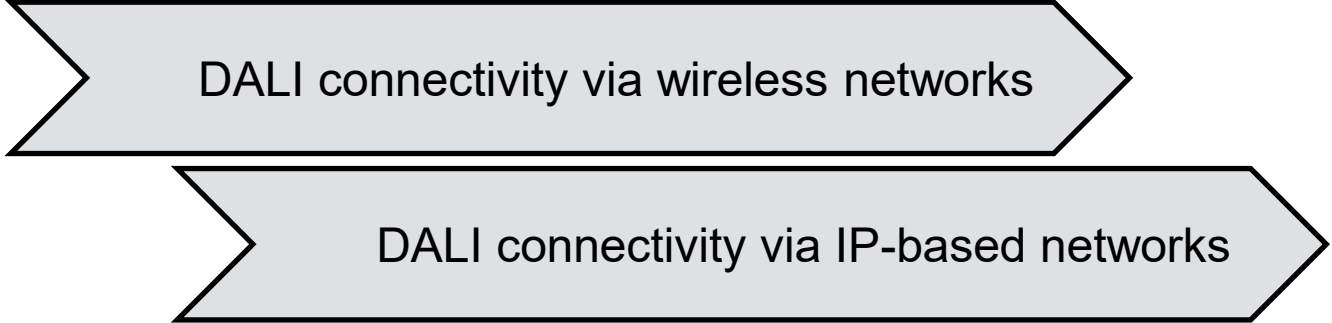
DALI is already positioned to participate in the Internet of Things

DALI in an IoT world – Connectivity

Current DALI capabilities:

- Multiple DALI subnets can be networked together, for building-wide control
 - A single application controller can control multiple DALI subnets
 - Several application controllers can be connected together via a backbone e.g. Ethernet-based
- DALI systems can connect with other networks via non-standardized gateways
 - e.g. Gateways connecting with building-management systems (BMS)
- D4i facilitates addition of wireless nodes (network lighting controllers) to luminaires
 - Standalone luminaires can participate in remote lighting-control networks

Emerging DALI capabilities:



DALI connectivity via wireless networks

DALI connectivity via IP-based networks

Agenda & Speakers

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DALI and Connectivity – Choice and flexibility with DALI+ and Wireless Gateways

Scott Wade, DALI Alliance

7th July 2021



Agenda

- DALI connectivity – Two new solutions
- **DALI gateways**
 - Architecture
 - Supported ecosystems
- **DALI+**
 - Architecture
 - Supported wireless carrier
 - New trademark
- Developing, testing and certifying products
- Finding products in the product database



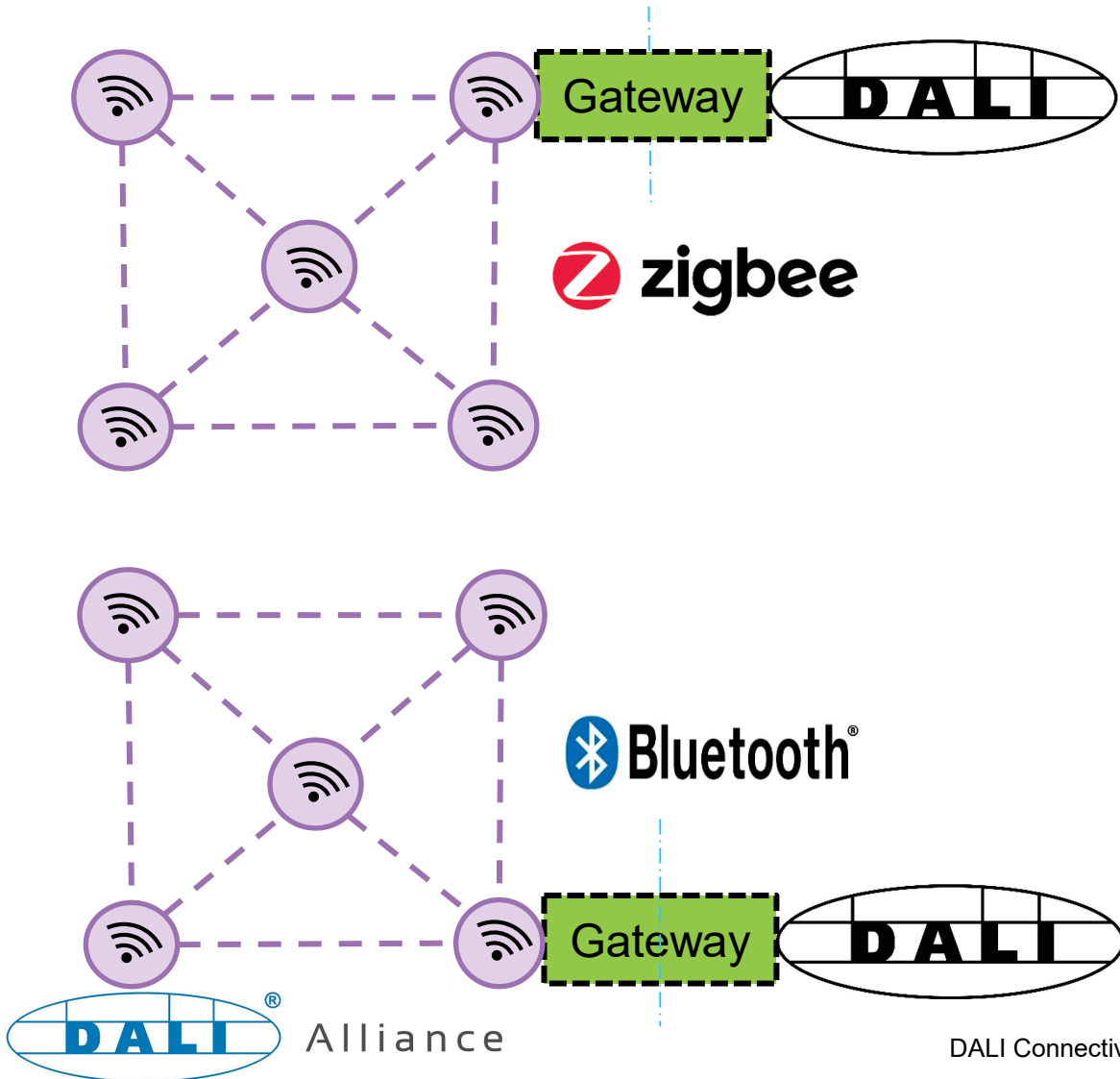
Scott Wade,
Technical &
Certification Manager,
DALI Alliance

DALI connectivity – Two new solutions

- Two very different solutions allowing wireless connectivity have been developed by the DALI Alliance with our members.
 - These provide two different “ways of working” – explained later.
 - These solutions were developed in line with the requests from our members.
 - They cover the various lighting applications, considered by our members to be the priority for enabling standardised wireless connectivity.
- The next slide will show the two solutions in examples:
 - **DALI gateways** (left side)
 - Allow existing DALI wired products to be used in a non-DALI wireless ecosystem.
 - **DALI+** (right side)
 - Devices communicate using existing DALI commands, carried over a wireless medium.

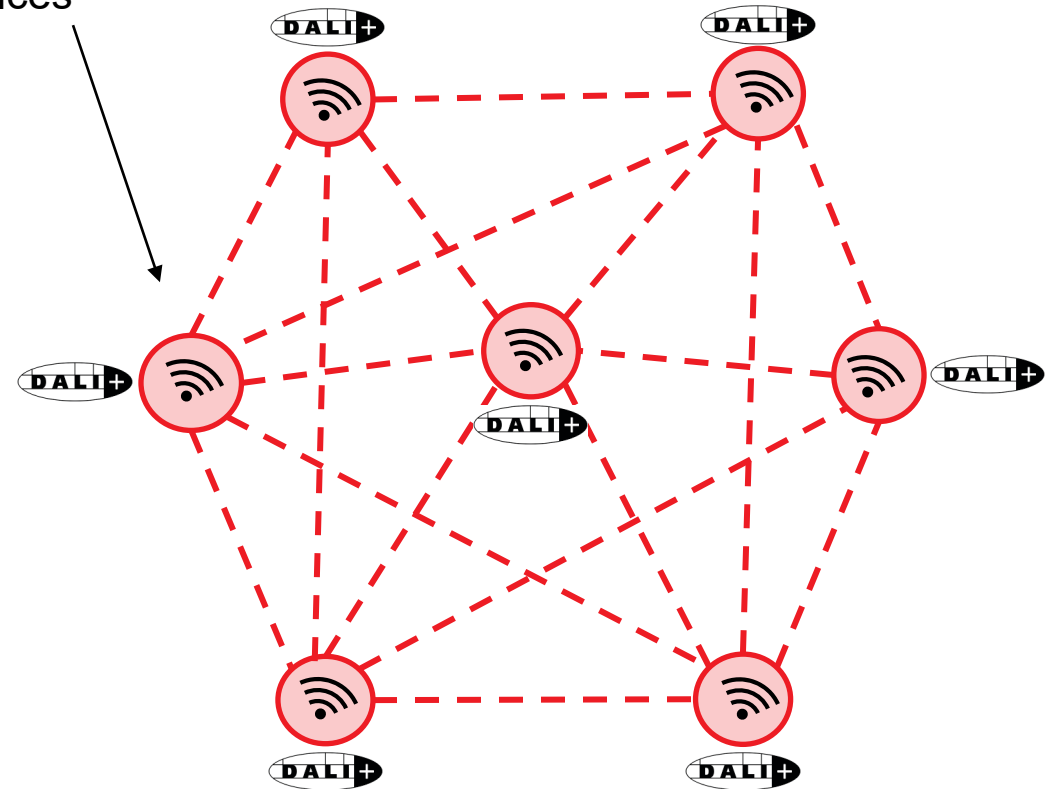
Wireless solutions for DALI

DALI Gateways



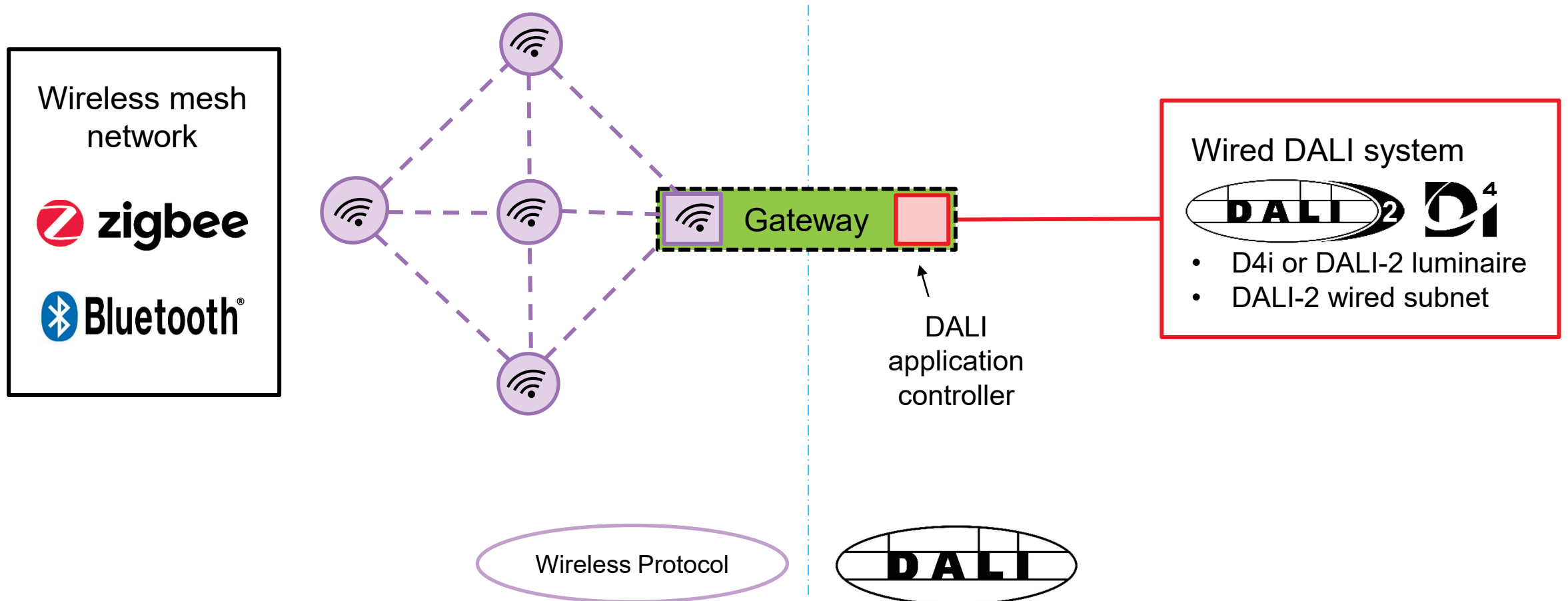
DALI+

DALI+ with θ HREAD devices




DALI Gateways

- Gateways translate between DALI and a wireless protocol
- Initial support is for Bluetooth mesh lighting and Zigbee lighting

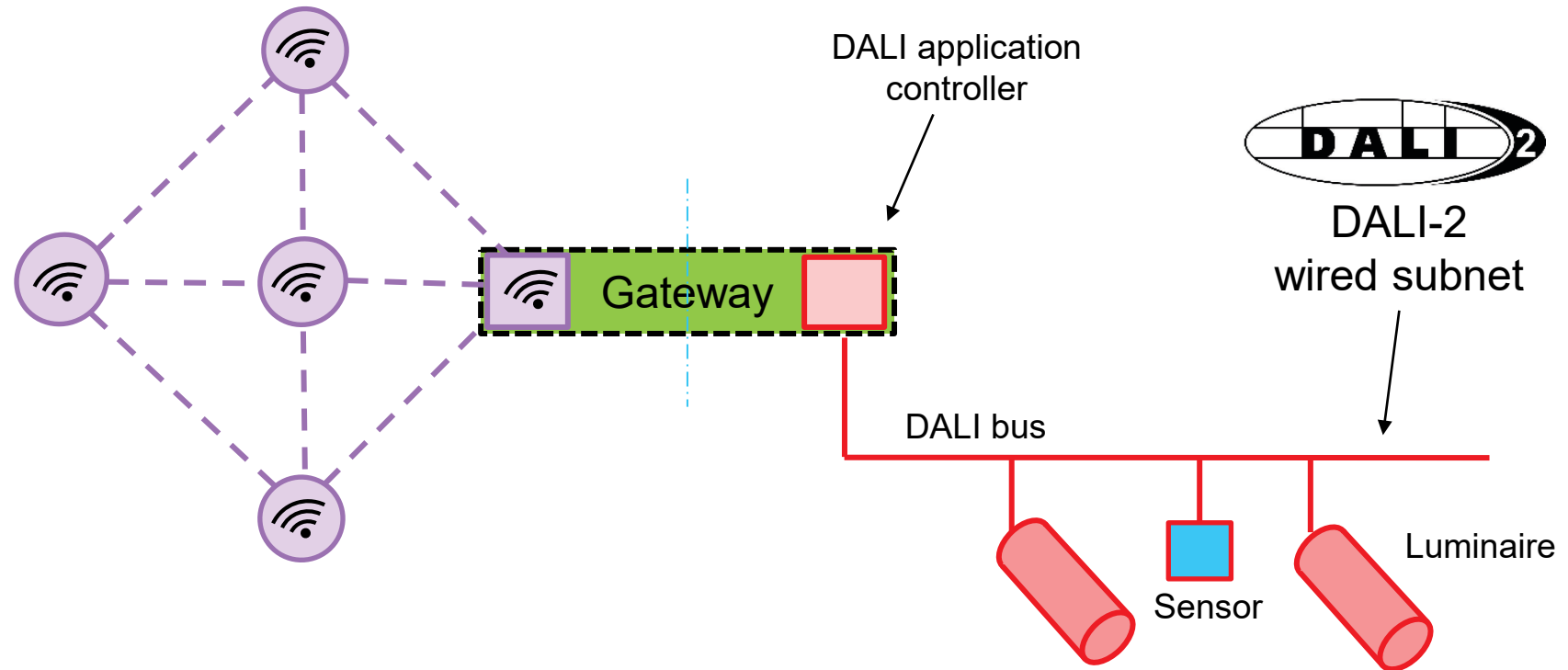


Gateway implementation: DALI-2 subnets

Wireless mesh network





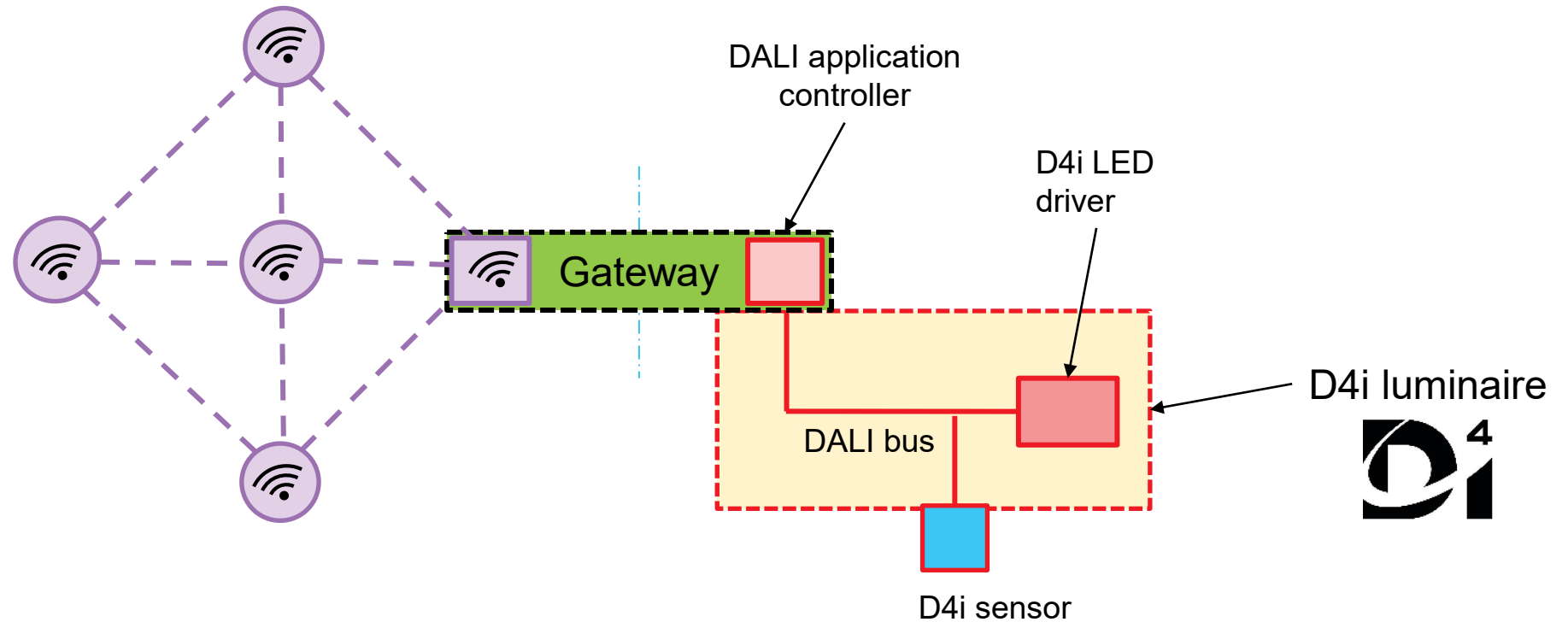
Bluetooth®



Gateway implementation: D4i luminaires

Wireless mesh network

-  **zigbee**
-  **Bluetooth®**



This implementation also works for DALI-2 luminaires

Wireless Gateways – Overview

- Allow existing wireless ecosystems to **control** and **query** DALI control gear:
 - Wireless devices communicate using their existing protocol, and can talk with the gateway.
 - The gateway provides a wired DALI connection, supporting at least 4 DALI control gear in the same luminaire or system (broadcast control).
 - Wireless devices can control light output and fading of the DALI devices.
 - Wireless devices can read lamp failure information, and data from parts 251-253, from the DALI devices.
- Two wireless ecosystems will be supported initially:
 - **Bluetooth Mesh lighting model**
 - New control device feature: DiiA Specification, **part 341** (feature type 41)
 - **Zigbee**
 - New control device feature: DiiA Specification, **part 342** (feature type 42)


Wireless Gateways – Features

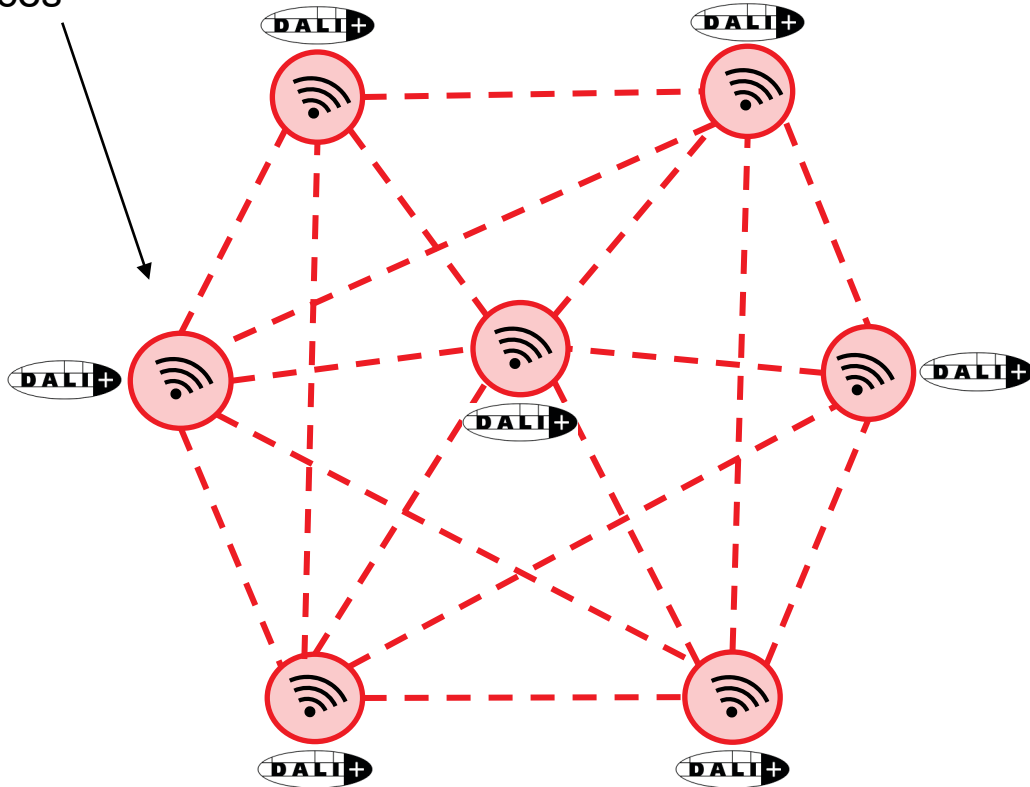
- **Lighting control**
 - Broadcast control of light output from the connected control gear.
 - The capability and limits of the ecosystem levels and fade times, apply.
- **Data**
 - Gateways provide the ecosystem devices with access to much of the data from:
 - parts 251 (luminaire data), 252 (energy/power), 253 (diagnostics), and
 - common control gear information: control gear missing/failure, lamp failure, light source type.
 - Data is aggregated from the connected control gear, and presented to the ecosystem as a single set of data.
- **Security**
 - Gateways are subject to the requirements of the ecosystem. This means that the security features of the wireless ecosystem apply.

Wireless Gateways – Features

- **System limits**
 - Gateway will support collection of data from 4 control gear, but manufacturers can design their gateways to optionally support more control gear.
 - In the first version, level commands are broadcast to all control gear.
 - The usual rules apply for bus power. It is likely that many gateways will have a DALI bus power supply integrated, avoiding the need for an external bus power supply.
- **Future additions under consideration**
 - Individual addressing and control of connected control gear.
 - Support for input devices (using event messages and polling).
 - Specific features of control gear device types, such as those described in parts 202, 207 and 209 (device types 1, 6 and 8).
 - Support for other wireless ecosystems may be considered.
- **Tests** are under development!
 - Gateways implement at least IEC 62386 parts 101 and 103, and either DiiA Specification part 341 or 342.



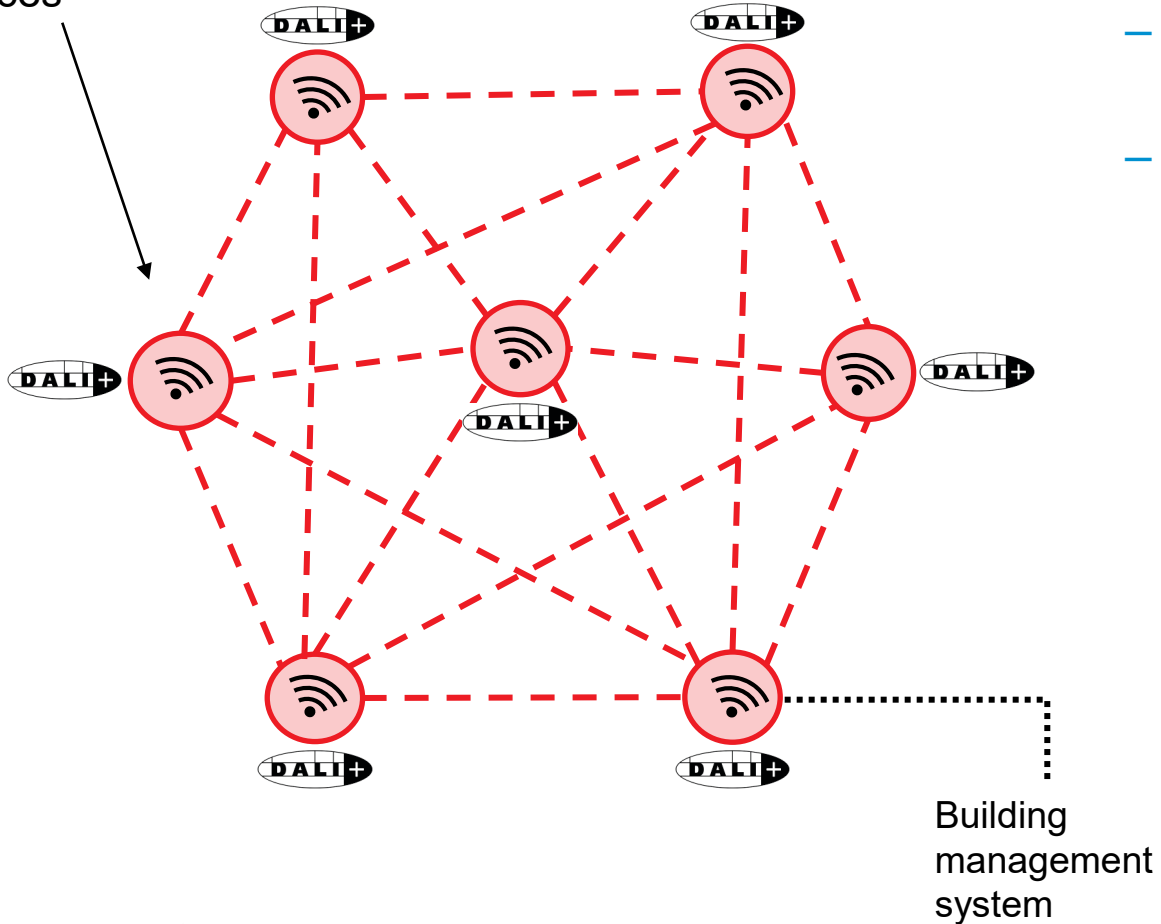
DALI+ with  HREAD devices



- **DALI+ system**
 - The entire DALI+ system communicates using the existing DALI language.
 - Commands are efficiently packaged into frames.
- **Wireless carrier**
 - Frames are transported using a carrier – **Thread** is supported initially.
- **DALI+ devices**
 - All DALI control gear and control devices from IEC 62386 can be implemented in DALI+. Examples include LED drivers, colour controllable drivers, emergency drivers, application controllers, buttons, and sensors.
- **Support for wired DALI**
 - A DALI+ **bridge** allows application controllers in the DALI+ system to control, configure and query devices in a DALI wired system.



DALI+ with φ HREAD devices

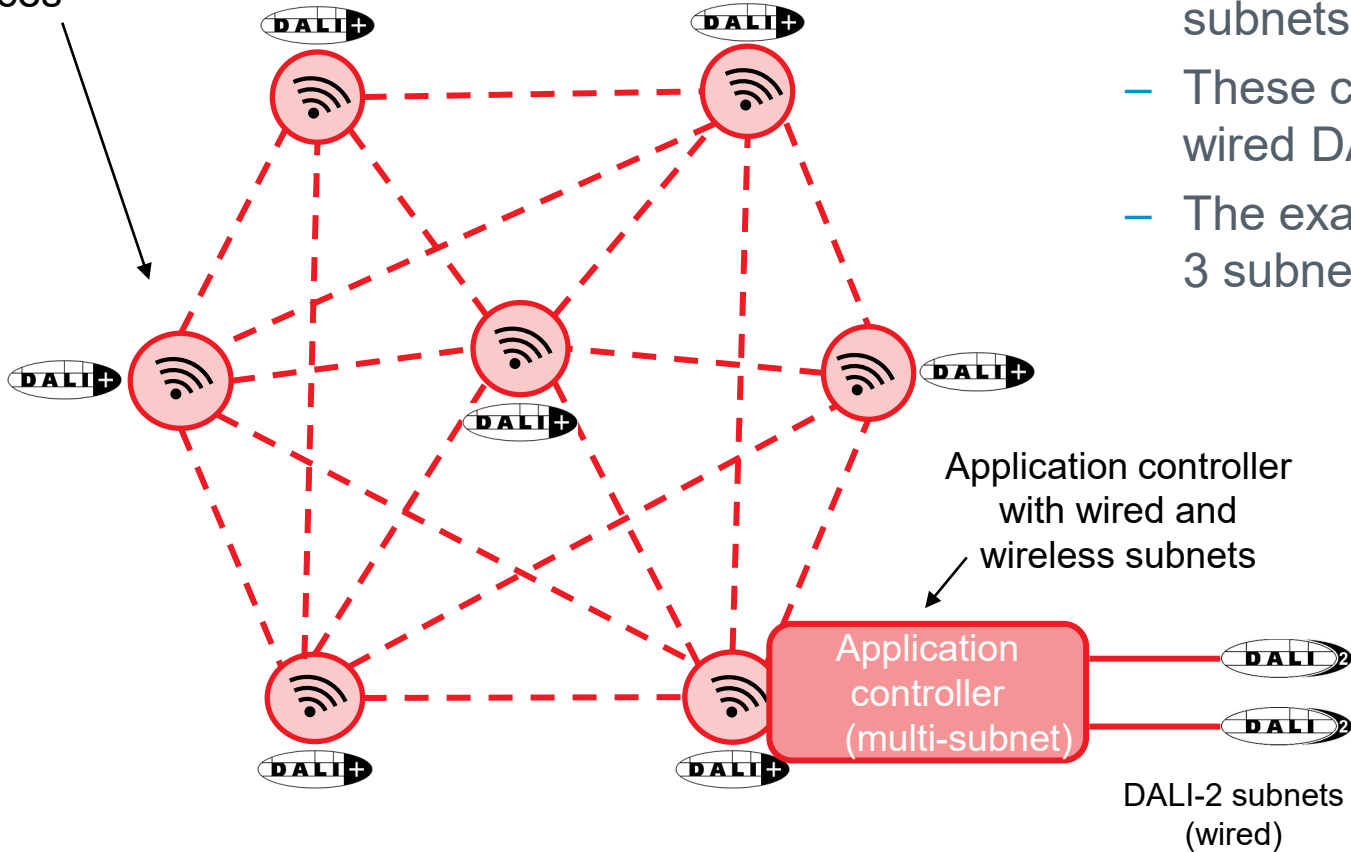


- **Connection to other systems**

- Just as with a DALI wired system, DALI+ systems may be connected to other systems.
- For example: connection to a BMS through a BACnet interface.
- Additionally, a backbone may be used to connect multiple DALI+ systems together. An example is using Ethernet.



DALI+ with φ HREAD devices

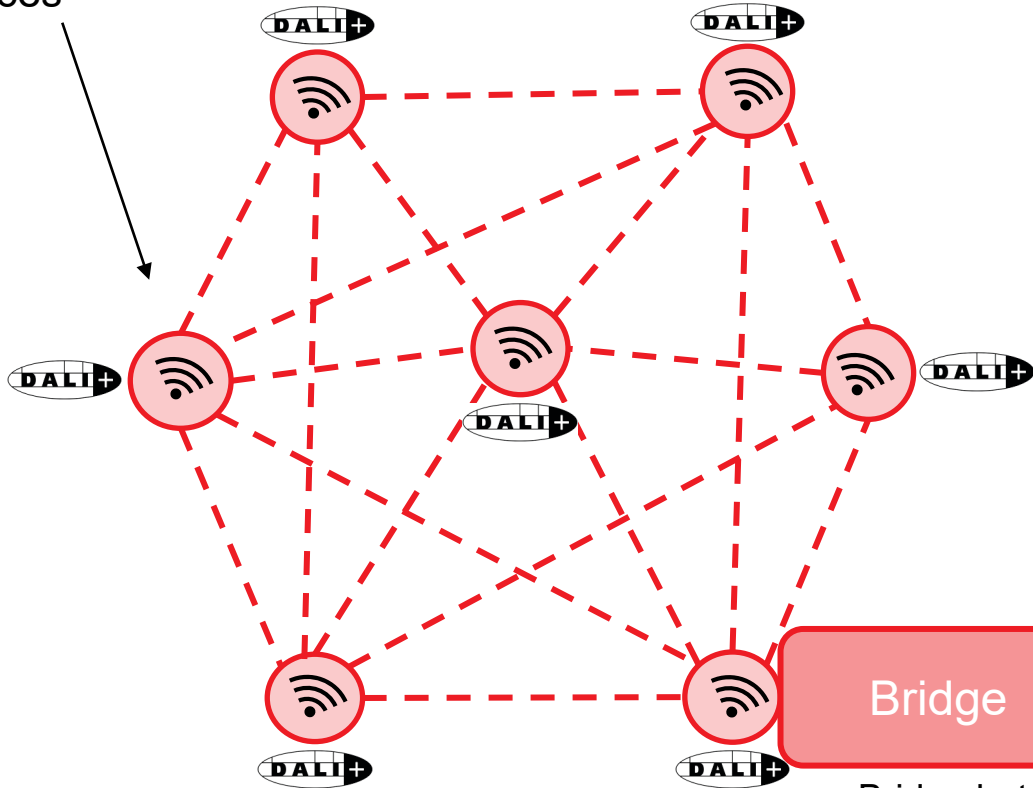


- **Support for multiple subnets**

- Just as with DALI wired systems, DALI+ application controllers may support multiple subnets
- These can be any combination of DALI+ and wired DALI subnets.
- The example shows an application controller with 3 subnets: 2 are wired DALI and 1 is DALI+.



DALI+ with φ HREAD devices



Bridge between DALI wired and wireless


D_i^4 D4i or Zhaga-D4i luminaire

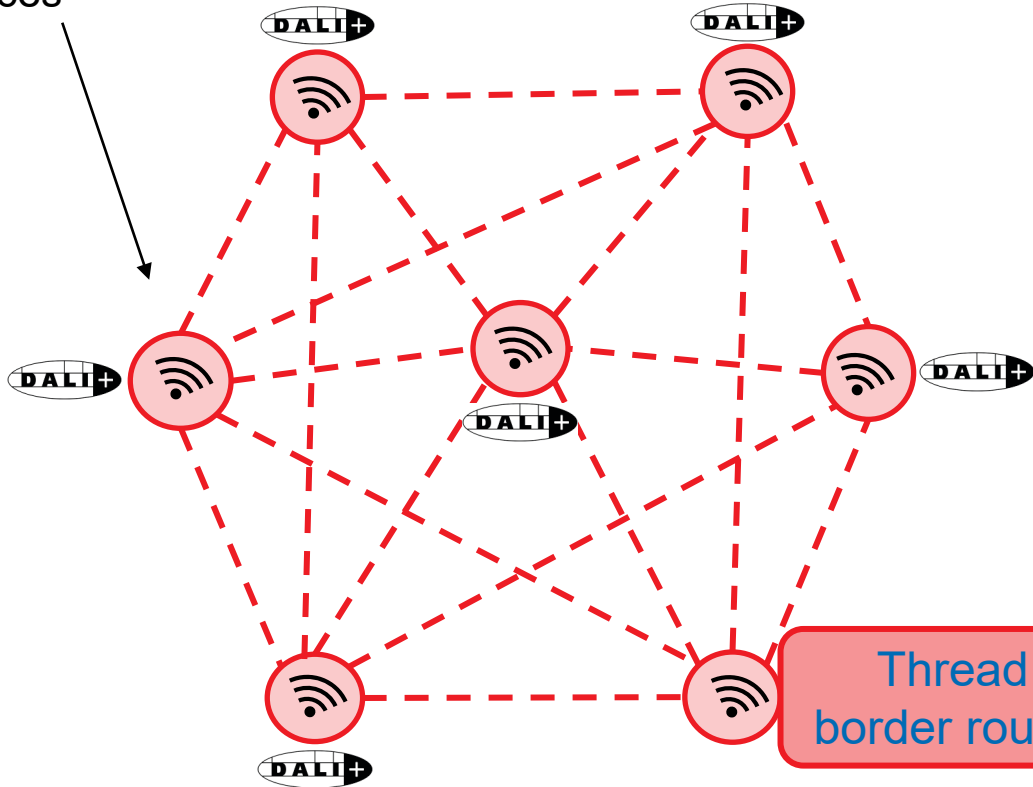
DALI-2
DALI-2 subnet
(wired)

- **DALI+ bridges**

- These allow one or more wired DALI subnets to be controlled or accessed from a DALI+ system.
- Application controllers in the DALI+ network can control, configure and query DALI wired devices.
- All types of DALI wired control gear and control devices are supported.
- Example: a luminaire containing a DALI+ bridge, and DALI wired devices – LED drivers and a sensor – can be controlled from the DALI+ system, and events from the sensor are transported across to the DALI+ system allowing application controllers to trigger lighting changes.



DALI+ with  HREAD devices



- **DALI+ with Thread**

- Thread is the first wireless carrier that will be used for DALI+ devices.
- Thread is a wireless protocol, transporting IPv6 packets using the low-power wireless technology, 6LoWPAN.
- Other Thread devices may be used in the same Thread network as the DALI+ devices.
- Thread **border routers** allow connection through other IP-based physical layers, for example Ethernet or Wi-Fi.
- This allows for highly scalable systems.

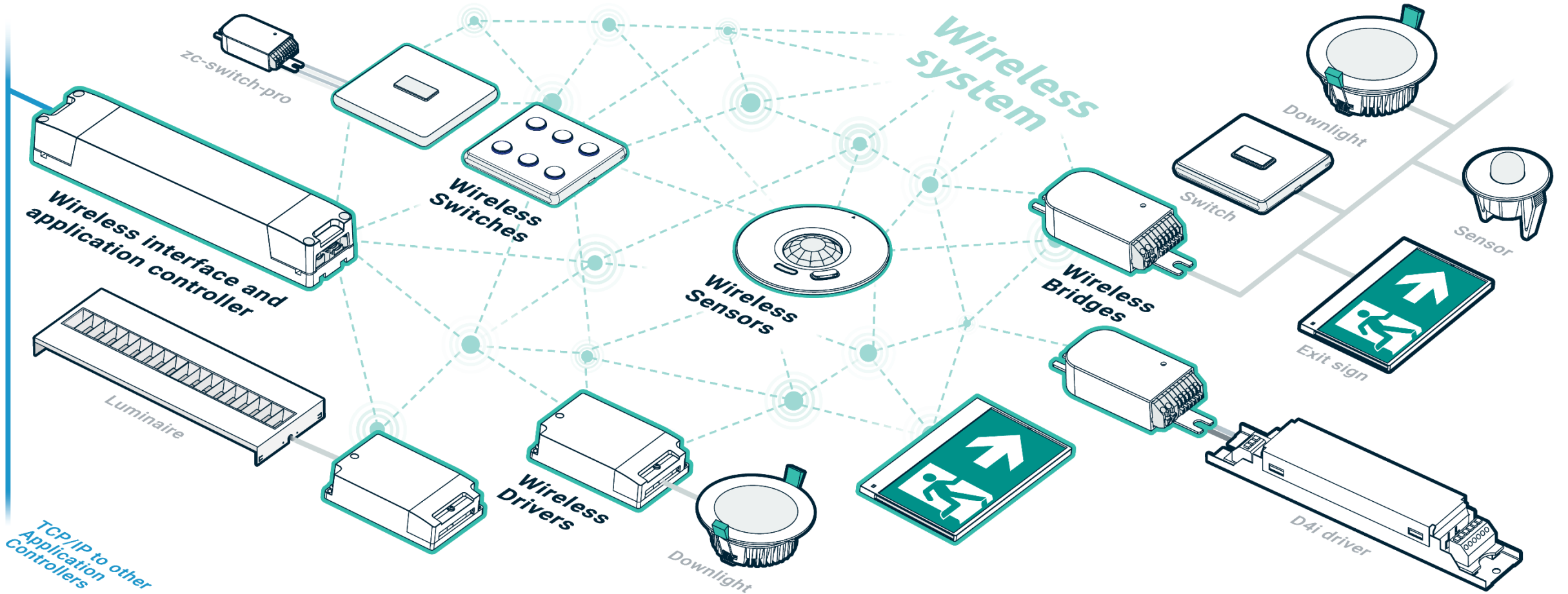


Summary

- Devices communicate using **existing DALI commands**, arranged into frames that are carried over a wireless medium.
 - There is **no wired DALI bus** (except for bridges).
- Each device implements IEC 62386-104, with the DiiA additions and changes.
 - Commands and features in the current and future IEC 62386 parts are used.
 - For example, a DALI+ colour controllable LED driver will implement parts 101, 102, 104, 207, 209 and the additions and clarifications from DiiA.
- **Bridges** allow access to DALI wired luminaires or subnets, from the DALI+ subnet.
- **Thread** will be the first wireless carrier that is supported in our testing and certification.
 - Thread border routers allow DALI+ communications through other IP-capable media, such as Ethernet and Wi-Fi.
 - In the future, DALI+ is likely to be extended to include other carriers such as Bluetooth Mesh, Ethernet and Wi-Fi.
- **Security** is provided by the authentication and encryption methods that are already part of Thread, with CoAPs providing further application level security and reliability.

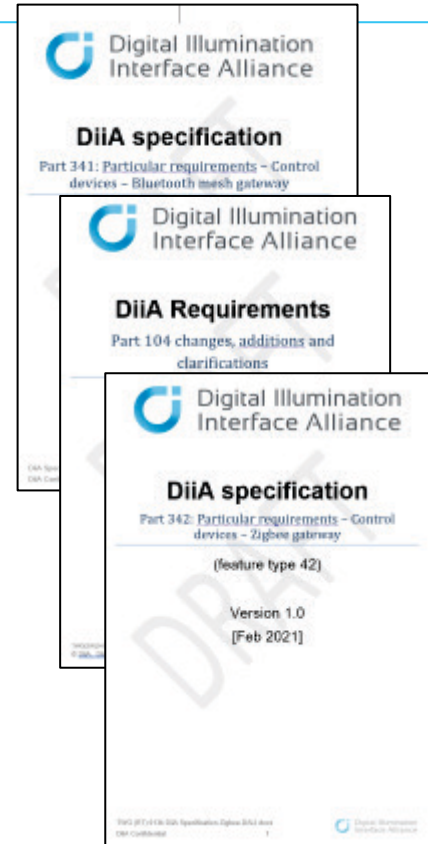


System example



Developing, testing and certifying products

- Use the **IEC 62386 & DiiA standards**:
 - <https://www.dali-alliance.org/dali/standards.html>
- In addition, check the DiiA's **Clarifications** document:
 - <https://www.dali-alliance.org/members/documents/>
 - Describes many clarifications, changes and additions to the IEC 62386 parts. These changes are fed back into IEC to make updates to the standard.
- For **DALI gateways**:
 - Bluetooth mesh: DiiA Specification – Part 341 Bluetooth mesh Gateway
 - Zigbee: DiiA Specification – Part 342 Zigbee gateway
- For **DALI+** products: DiiA Specification – Part 104 Changes and Additions
- Develop your product to meet these specifications, not simply to pass the tests!



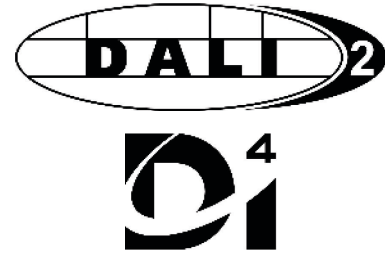
Developing, testing and certifying products

- **Test** with the latest version of test sequences:
 - <https://www.dali-alliance.org/members/test-sequences/>
 - There are several “**known issues**”. Check on the above web-page.
- The next release is expected to be made in August, and will include:
 - Part 202 – Control gear – Self-contained emergency lighting
 - Part 206 – Control gear – Converter to d.c. voltage
 - Part 209 – Control gear – Colour: the additional colour types RGBWAF and xy
- Test sequences for DALI+ and gateways are now in development, but are not expected to be ready until 2022.

- DiA V2 2.2.0.7
 - IEC 62386-101 System
 - IEC 62386-102 Control gear
 - IEC 62386-103 Control device
 - IEC 62386-202 Self-contained emergency lighting (device type 1) - Ed1 adapted to Ed2
 - IEC 62386-205 Supply voltage controller for incandescent lamps (device type 4) - Ed1 adapted to Ed2
 - IEC 62386-206 Conversion from digital signal into d.c. voltage (device type 5) - Ed1 adapted to Ed2
 - IEC 62386-207 LED modules (device type 6) - Ed1 adapted to Ed2
 - IEC 62386-208 Switching function (device type 7) - Ed1 adapted to Ed2
 - IEC 62386-209 Colour control (device type 8) - Ed1 adapted to Ed2
 - IEC 62386-250 Integrated Bus Power Supply
 - IEC 62386-251 Memory bank 1 extension
 - IEC 62386-252 Energy reporting
 - IEC 62386-253 Diagnostics And Maintenance
 - IEC 62386-301 Push buttons
 - IEC 62386-302 Absolute inputs
 - IEC 62386-303 Occupancy sensor
 - IEC 62386-304 Light sensor
 - IEC 62386-351 Luminaire-mounted Control Devices

Testing, certification and Trademark use on wireless devices

- As soon as test sequences are released, **certification** for these devices will start.
- **Gateway devices** will be included in DALI-2 and D4i testing and certification.
- **DALI+** devices will use the new trademark:
 - This will be used in conjunction with the Trademark relating to the carrier, for example Thread.
- Reminder: Only products that are listed as certified in the product database, can use the appropriate Trademarks, which include DALI, DALI-2, D4i and DALI+.



Finding certified products

- Once a product is certified, it is visible to the public in the **product database**:

– <https://www.dali-alliance.org/products>

- Use the search-filter to select specific properties

- The example shows the following selected:

– Control gear

- Colour control (part 209, DT8)
 - Colour type Tc

- With these “filters” selected, only products that meet all properties are shown in the results.

- Searching for DALI gateways and DALI+ will be included once certification starts.

Certified and Registered Products

Certified products have successfully completed the DALI-2 certification process, which is operated by DIA and includes verification of test results.

Registered products are DALI version-1 devices that have been successfully tested by the member or a test-house. There is no verification step for DALI version-1.

Dal certification is an extension of DALI-2 certification (all Dal devices are also DALI-2 devices).

DALI-2, Dal and Zhaga-Dal **luminaires** are listed separately >> [Luminaires](#)

Search the Database

In **Product Search** (below), select any of the main product types to see more search filters.

>> [More search tips](#)

Product Search

Clear filters

-- select brand --

Part number

Product name

Show all family products

Include all registered DALI products

Include discontinued products

Product ID

GTIN

Control gear

- Transceiver (part 209)
- Self-contained emergency (part 209)
- Discharge lamp (part 209)
- Low voltage halogen (part 209)
- Incandescent dimmer (part 209)
- Conversion to DC 15-100V interface (part 209)
- LED (part 209)
- Switching (part 209)
- Colour control (part 209, DT8)
 - Colour type xy coordinate
 - Colour type Tc
 - Colour type RGBW/RGB
- Bus powered
- Integrated bus power supply (part 209)
- Luminare data (part 209)
- Energy data (part 209)
- Diagnostics data (part 209)
- Dal certified
- Application controllers

Showing products 1-25

126 results total

Brand Name	Product Name	DALI Parts	Bus Unit Config	Initial registration date	Last Updated	DALI-2 Certified
Zhuhua Shengchang Electronics	DP2.TW.60W Series CV Driver	101.102.207.209.258		Jun 29, 2021	Jun 29, 2021	Yes
ERCO	6xXDKc	101.102.209		Jun 7, 2021	Jun 7, 2021	Yes
Enfily	1200EN860-DT8-00	101.102.207.209		May 24, 2021	May 24, 2021	Yes
HEP Group	LAD200W2AZ-TxCH	101.102.207.209		Apr 28, 2021	Apr 28, 2021	Yes
Zhuhua Shengchang Electronics	DP2.TW.150-200W Series CV Driver	101.102.207.209.258		Apr 21, 2021	Apr 21, 2021	Yes
OSRAM GmbH	OTI DALI 180/200-240/24 4CH DT6/8	101.102.207.209	4	Apr 20, 2021	Apr 20, 2021	Yes
OSRAM GmbH	OTI DALI 80/200-240/24 4CH DT6/8	101.102.207.209	4	Apr 20, 2021	Apr 20, 2021	Yes
OSRAM GmbH	OTI DALI 50/200-240/24 4CH DT6/8	101.102.207.209	4	Apr 20, 2021	Apr 20, 2021	Yes
Zhuhua Shengchang Electronics	DP2.TW.80-120W Series CV Driver	101.102.207.209.258		Mar 30, 2021	Mar 30, 2021	Yes
BEGA	PSU-0314-01	101.102.209		Mar 3, 2021	Mar 3, 2021	Yes
LOYTEC electronics GmbH	LIDALI-PWM4-TC	101.102.209		Feb 22, 2021	May 12, 2021	Yes
OSRAM GmbH	OTI DALI DM 1-4CH D	101.102.207.209		Feb 1, 2021	Feb 1, 2021	Yes
LTECH	MT-600-D2d3	101.102.207.209		Jan 27, 2021	Jan 27, 2021	Yes
LTECH	MT-300-D2d3	101.102.207.209		Jan 25, 2021	Jan 25, 2021	Yes
HEP Group	LAD200W2AZ-TxCH	101.102.207.209		Jan 13, 2021	Jan 13, 2021	Yes
XAL	MOVE.IT.25/4L Linear PWM Control Gear DALI VAR A 1W	101.102.207.209		Jan 11, 2021	Jan 11, 2021	Yes
UPSHINE	XSI-24W560-DATW	101.102.207.209		Dec 29, 2020	Dec 29, 2020	Yes
UPSHINE	XSI-48W560-DATW	101.102.207.209		Dec 29, 2020	Dec 29, 2020	Yes

Summary

- **New connectivity solutions:**

- [DALI gateways](#)
- [DALI+](#)

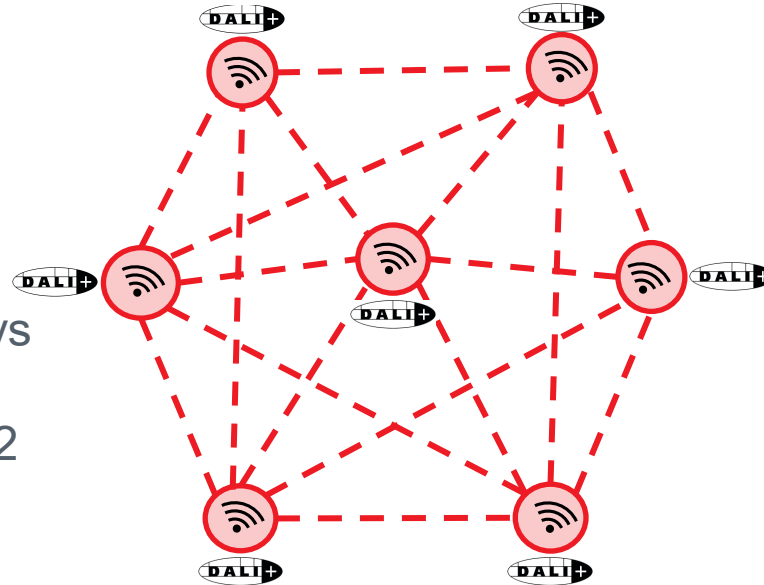
- **Coming soon:**

- Technical Guides for Gateways and DALI+
- DALI Lighting Awards 2021-22

- **Enquiries:**

www.DALI-Alliance.org/contact

- **Q&A**



DALI gateways

