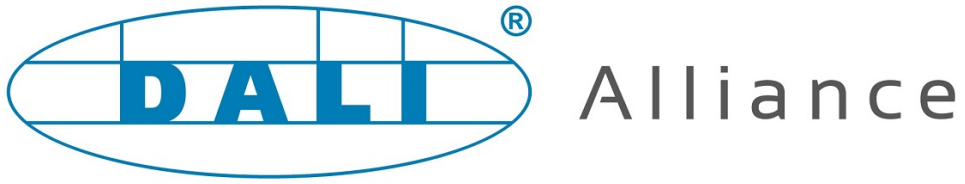
D4i Certification, DiiA Specifications & Zhaga-D4i



D4i and DiiA Specifications – 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 intra-luminaire DALI
  - Other D4i implementations are also permitted

- D4i luminaires are intelligent and IoT-ready
  - D4i simplifies addition of sensors and communication devices to luminaires
  - A rich data set is available from D4i drivers and sensors

DiiA specifications

DiiA Specifications

- DiiA creates new specifications that define additional DALI features and functions
  - Building on the IEC 62386 international standard.
- DiiA specifications are added to the DALI-2 certification program
- DiiA specifications will be transferred to IEC
  - For publication as new Parts of IEC 62386

Download DiiA specifications:
www.dali2.org/specifications/download.html

DiiA Specifications – Published

- The following specifications can be downloaded from the DiiA website

Specification	Name	Version	Certification?
Power supply specifications			
DALI Part 150	AUX Power Supply	v1.1, Oct 2019	✓
DALI Part 250	Integrated Bus Power Supply	v1.1, Oct 2019	✓
Data specifications for LED drivers & other control gear			
DALI Part 251	Luminaire Data	v1.1, Oct 2019	✓
DALI Part 252	Energy Data	v1.1, Oct 2019	✓
DALI Part 253	Diagnostics Data	v1.1, Oct 2019	✓
Specifications for control devices			
DiiA Part 351	Luminaire-mounted Control Devices	v1.0, Oct 2019	✓

DiiA power-supply specifications

DALI Part 250 – Integrated Bus Power Supply

- For control gear (e.g. LED drivers) with an integrated DALI bus power supply (PSU)
  - Suitable for powering some devices – such as sensors – on the bus

- PSU can be enabled or disabled – allowing use in systems with multiple bus PSUs
- For D4i certification, Part 250 must be included, with the bus PSU enabled by default

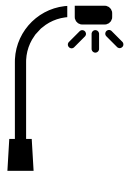
DALI Part 150 – AUX Power Supply

- 24V DC power supply
- Can be built into control gear, or designed as a stand-alone product
- Suitable for devices with higher-power requirements
  - e.g. City-wide wireless transceivers
- Provides 3W average, 6W peak

DALI data specifications for control gear

- Data for enhanced asset management & performance monitoring
- Data storage in DALI memory banks, with standardized format & locations

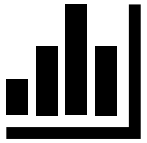
Luminaire Data



DALI Part 251 – Luminaire Data

- Information about the luminaire (e.g. ID code, light output, CCT & CRI, light distribution etc) can be stored in the control gear
- Enables asset management

Energy Data



DALI Part 252 – Energy Reporting

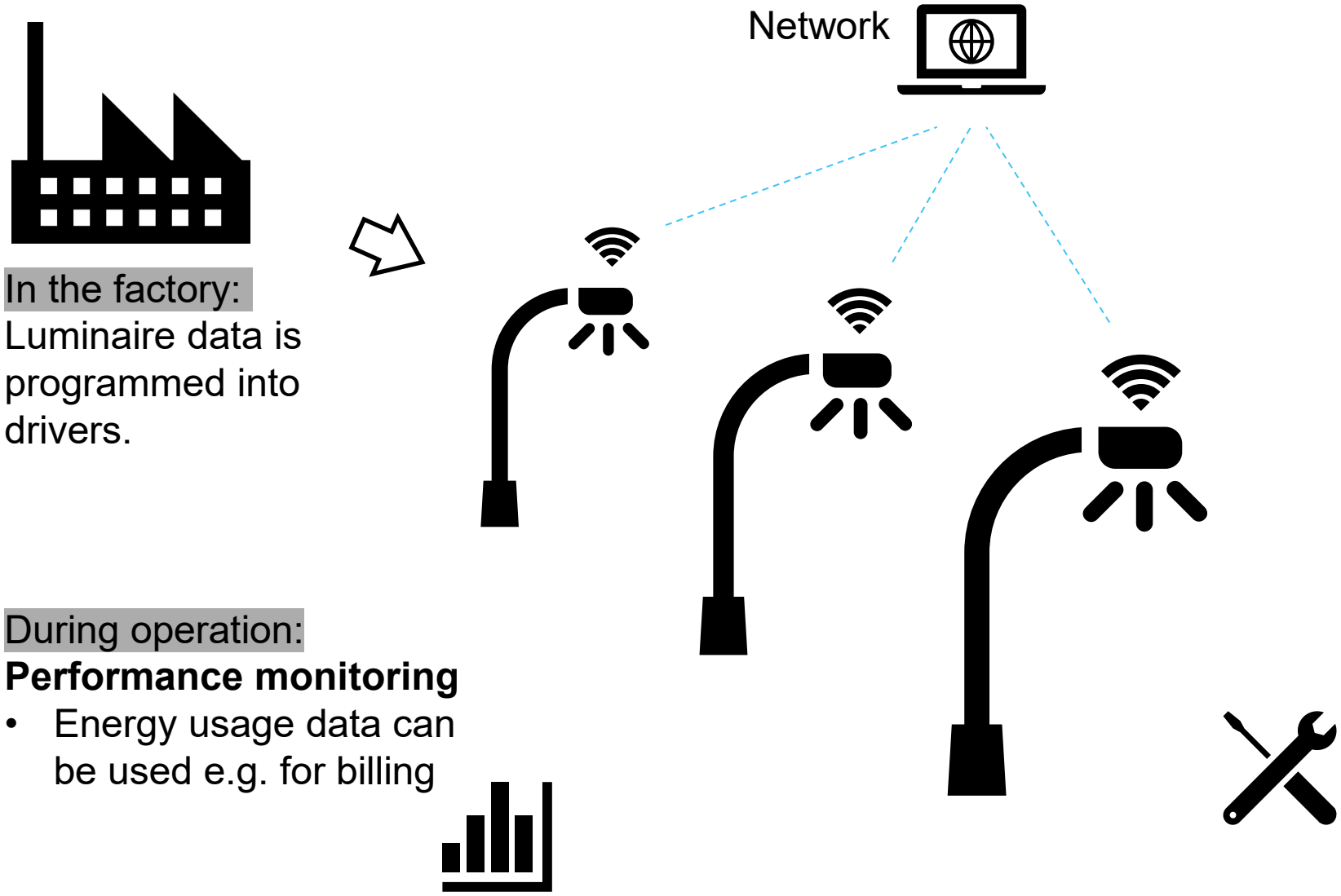
- Provides real-time power & energy usage for control gear

Diagnostics Data

DALI Part 253 – Diagnostics & Maintenance

- Operating data for control gear and lamps, including failure conditions, run-time data
- Enables predictive maintenance

DALI data: An outdoor lighting example



In the factory:
Luminaire data is programmed into drivers.

During operation:
Performance monitoring
- Energy usage data can be used e.g. for billing

In the field:
Automated commissioning
- When installed, luminaire can automatically transfer data to remote network
- Reduces human error, saves installation time and cost
- Operator has a full map of asset information

During operation:
Predictive maintenance
- Diagnostics data allows network operator to anticipate need for maintenance
- Repair team has knowledge of location and type of fixture

Part 351 for control devices

- **DiiA Part 351 – Luminaire-mounted control devices**
  - Examples: Sensors, wireless communication nodes
- Control devices can be bus-powered or externally powered (e.g. by AUX supply).
- Part 351 specifies four types of control device (types A-D)
  - Covering both indoor and outdoor applications
  - Including devices such as wireless network lighting controllers (NLCs), photocells (light sensors), movement sensors and timers
- Specification includes:
  - Requirements for power consumption
  - A mechanism to arbitrate between multiple application controllers
  - A memory bank definition for multi-master devices
- Part 351 is mandatory for D4i certification

D4i certification

D4i certification – Overview

- D4i certification is an extension of DALI-2 certification, with certain mandatory features
- D4i LED drivers must include:
  - Integrated bus power supply (Part 250)
  - Luminaire, energy & diagnostics data (Parts 251-253)
- D4i control devices must implement Part 351
- D4i certification is carried out by the DALI Alliance

D4i on the DiiA website:
www.dali2.org/d4i

D4i certification and trademarks

- Detailed requirements for D4i certification are explained in the document “**D4i Certification and Trademark Use**”
  - Available from the DiiA website
- D4i certification enables the use of the **D4i trademarks**
  - D4i certification and trademark use is available for DiiA members only
  - D4i luminaires can also use the D4i trademarks
- D4i-certified products are listed in the DiiA product database

Control gear: DALI-2 and D4i certification

- **Parts 250-253 are mandatory for D4i certification** of LED drivers
  - Products must also meet the requirements in “D4i Certification and Trademark Use”
- These DiiA specifications are **optional for DALI-2 certification**
  - DALI-2 control gear can implement any combination of DALI Data Parts (251-253) and Part 250
  - Check the product database
- Other features (e.g. Part 209 colour-control) are optional for both DALI-2 and D4i

Specification	Name	DALI-2 requirement	D4i requirement*
DALI Part 150	AUX Power Supply (integrated)	Optional	Optional
DALI Part 250	Integrated Bus Power Supply	Optional	**Mandatory**
DALI Part 251	Luminaire Data	Optional	**Mandatory**
DALI Part 252	Energy Data	Optional	**Mandatory**
DALI Part 253	Diagnostics Data	Optional	**Mandatory**

* Part 207 is also mandatory for D4i control gear, making the product an LED driver.

D4i certification by product type

Product type	Requirements for D4i certification	Testing
LED drivers	D4i certification is available for LED drivers that: • Implement **Parts 250** and **Parts 251-253** • Optionally implement **Part 150** • Meet the requirements in "**D4i Certification and Trademark Use**"	Testing is an extension of DALI-2, using ProbitLab2
Control devices	D4i certification is available for control devices that: • Implement **Part 351** • Meet the requirements in "**D4i Certification and Trademark Use**"	Testing is an extension of DALI-2, using ProbitLab2
Luminaires	Certification of luminaires is not offered. D4i trademark use is allowed on luminaires that: • Meet the requirements in "**D4i Certification and Trademark Use**"	n/a
Standalone AUX power supplies	DALI-2 certification is now available for products that: • Implement **Part 150**	Tests are manual and do not use the ProbitLab2

ANSI C137.4-2019 standard

- ANSI C137.4-2019 standard is aligned with D4i
  - "**American National Standard for Lighting Systems—Digital Interface with Auxiliary Power**"
- DALI Alliance represented on C137 committee, which develops the standard

DiiA specifications	Relationship with ANSI standard
DALI Part 250 – Integrated Bus Power Supply	Included in ANSI C137.4-2019
DALI Part 150 – AUX Power Supply	
DALI Part 251 – Luminaire Data	
DALI Part 252 – Energy Data	Expected to be included (by reference) in future version
DALI Part 253 – Diagnostics Data	
DALI Part 351 – Luminaire-mounted control devices	

D4i implementations

D4i for intra-luminaire DALI

- D4i is particularly suitable for intra-luminaire DALI applications
  - Intra-luminaire DALI refers to a DALI bus that connects LED drivers and control devices inside an individual luminaire.
  - Other D4i implementations are permitted, provided that power-supply restrictions are observed

- D4i enables intra-luminaire DALI for intelligent, IoT-ready luminaires:
  - D4i takes care of power-supply requirements, to simplify the addition of control devices such as sensors or communication nodes
  - Intelligent D4i LED drivers inside the luminaire have the capability to store and report a wide range of luminaire, energy and diagnostics data in a standardized format.

- D4i is compatible with socketed connector systems:
  - e.g. NEMA/ANSI C136.41 and Zhaga Book 18

D4i enables smart, connected luminaires

Intelligent luminaires:

- D4i drivers store and report important data relating to luminaire, light source and driver
- D4i sensors collect environmental inputs

Connectivity:

- D4i simplifies addition of wireless gateways or bridges to luminaires
  - Two-way communication between the DALI-enabled luminaire and the external lighting-control network
  - Stand-alone luminaires operate as IoT/network nodes

Future-proofing:

- D4i enables socketed systems (e.g. Zhaga-D4i)
  - Allows addition and replacement of modules for sensing and communication
  - Luminaires easily upgraded to keep pace with rapid developments in digital networking technology

Luminaires: Data and power

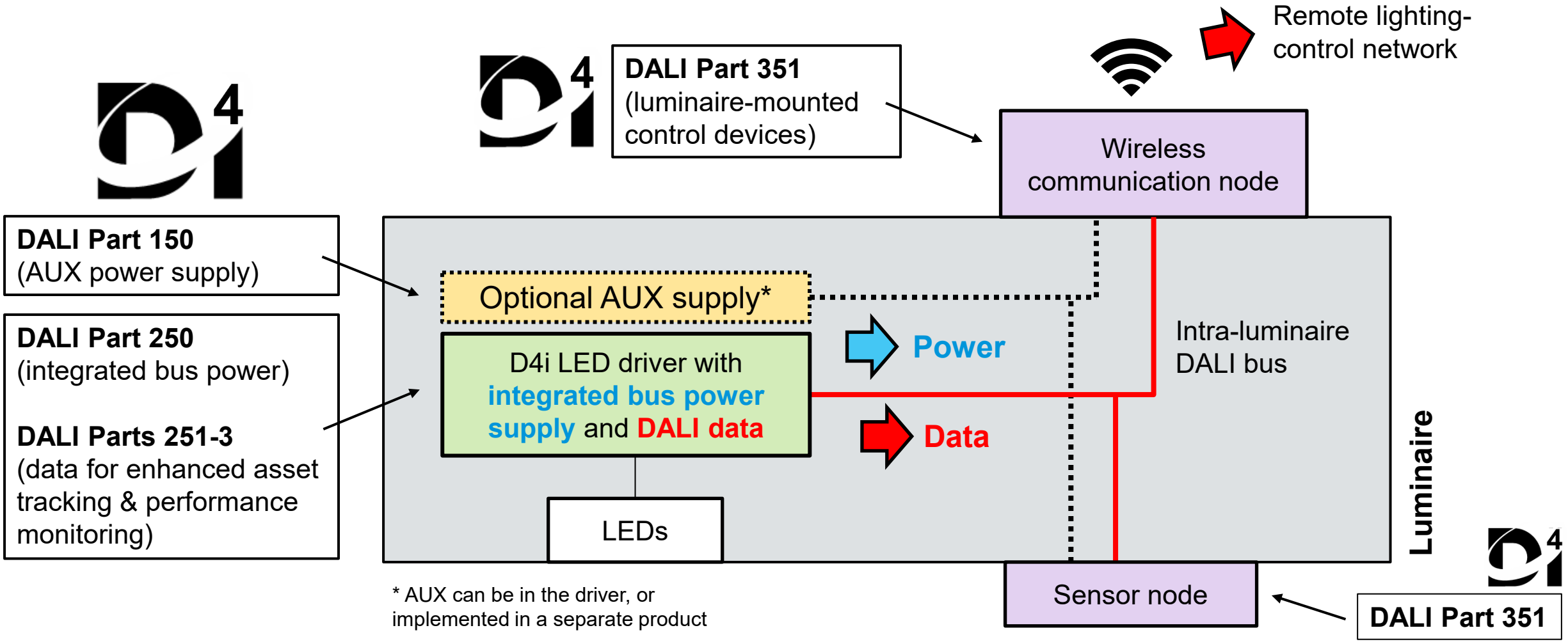
POWER – D4i takes care of **power-supply requirements** inside luminaires:

- D4i drivers with on-board bus power supply
  - Power available for DALI bus and some control devices
- D4i includes 24V auxiliary (AUX) power supply for higher-power requirements
  - e.g. city-wide wireless transceivers
- Eliminates components, simplifies designs, compatible with socketed systems

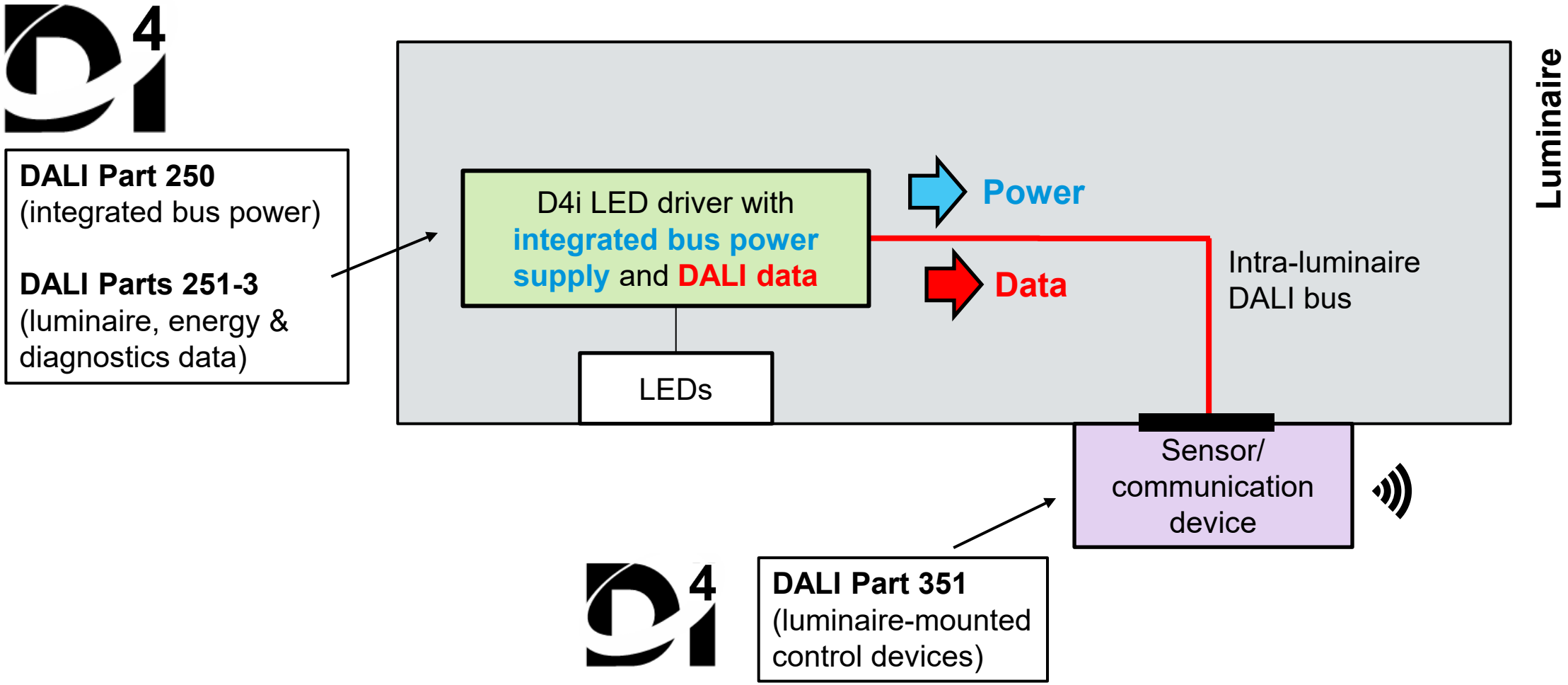
DATA – D4i includes LED drivers with **smart data** capabilities:

- D4i drivers can store and report data for:
  - Enhanced asset tracking
  - Performance monitoring (energy usage, diagnostics & maintenance)
- Data storage in DALI memory banks
  - Standardized format & locations
- Benefits include automated commissioning, asset tracking, accurate point-of-use billing, predictive maintenance etc

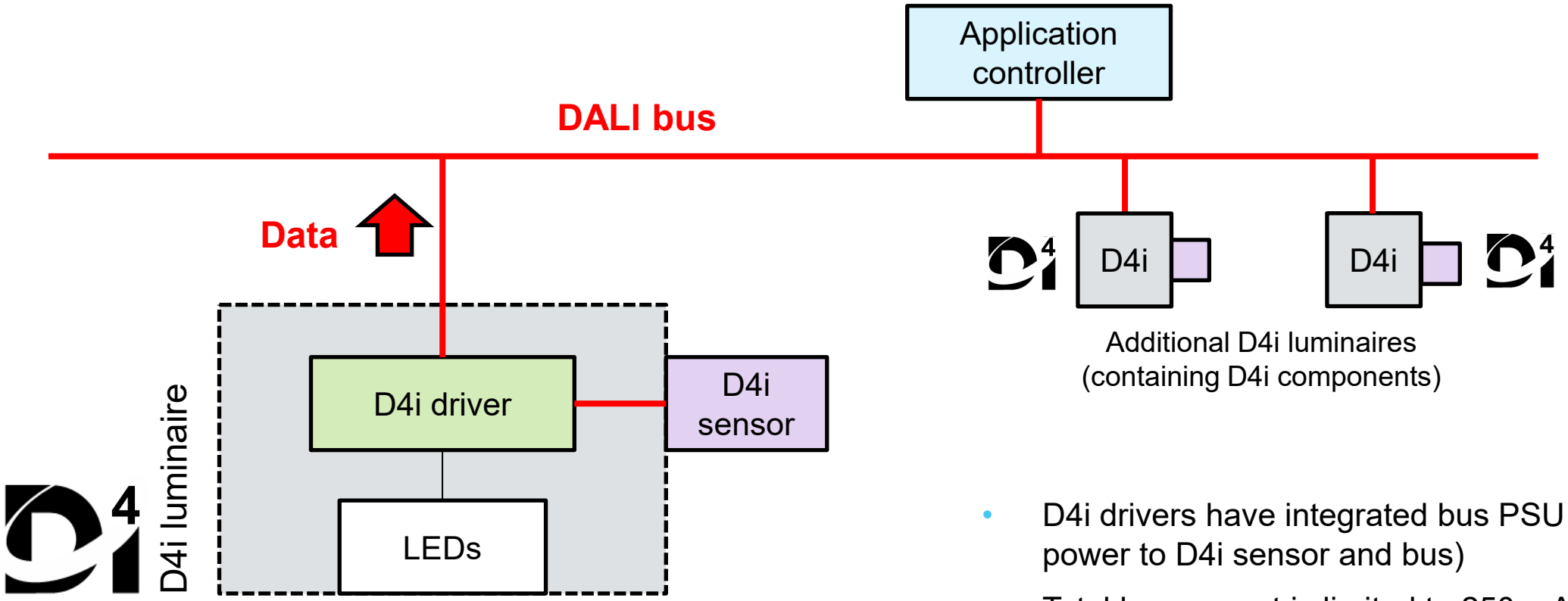
D4i example: Two-node outdoor luminaire



D4i example: Indoor luminaire



D4i example: Connected D4i luminaires



- D4i drivers have integrated bus PSU (provides power to D4i sensor and bus)
- Total bus current is limited to 250 mA
- D4i driver can store & report luminaire, energy and diagnostics data (Parts 251-253)

Zhaga-D4i

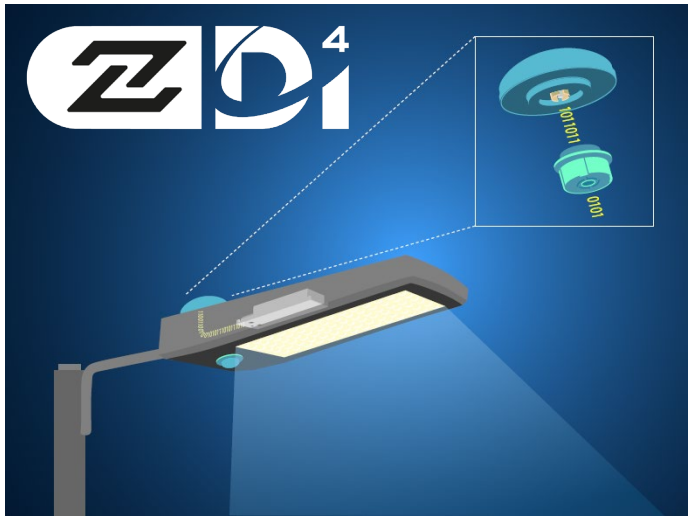
Zhaga-D4i certification

A joint certification program based on complementary specifications

Specifications from DiiA enabling D4i certification

Book 18 & Book 20 specifications from Zhaga

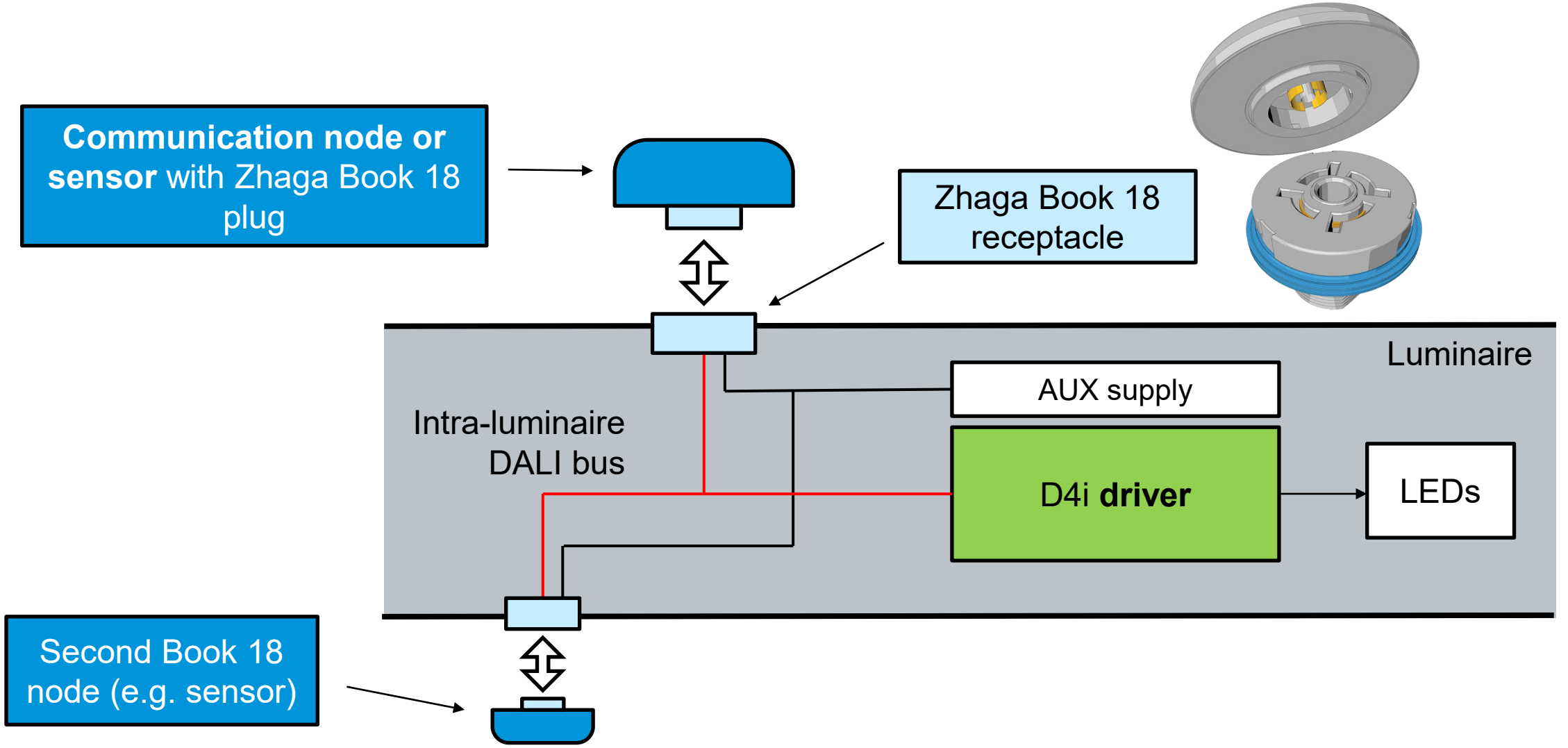
DALI Part 250: Integrated bus power supply
DALI Part 251: Luminaire data
DALI Part 252: Energy data
DALI Part 253: Diagnostics data
DALI Part 351: Luminaire-mounted control devices
DALI Part 150: AUX power supply



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

Outdoor luminaire with Zhaga receptacles

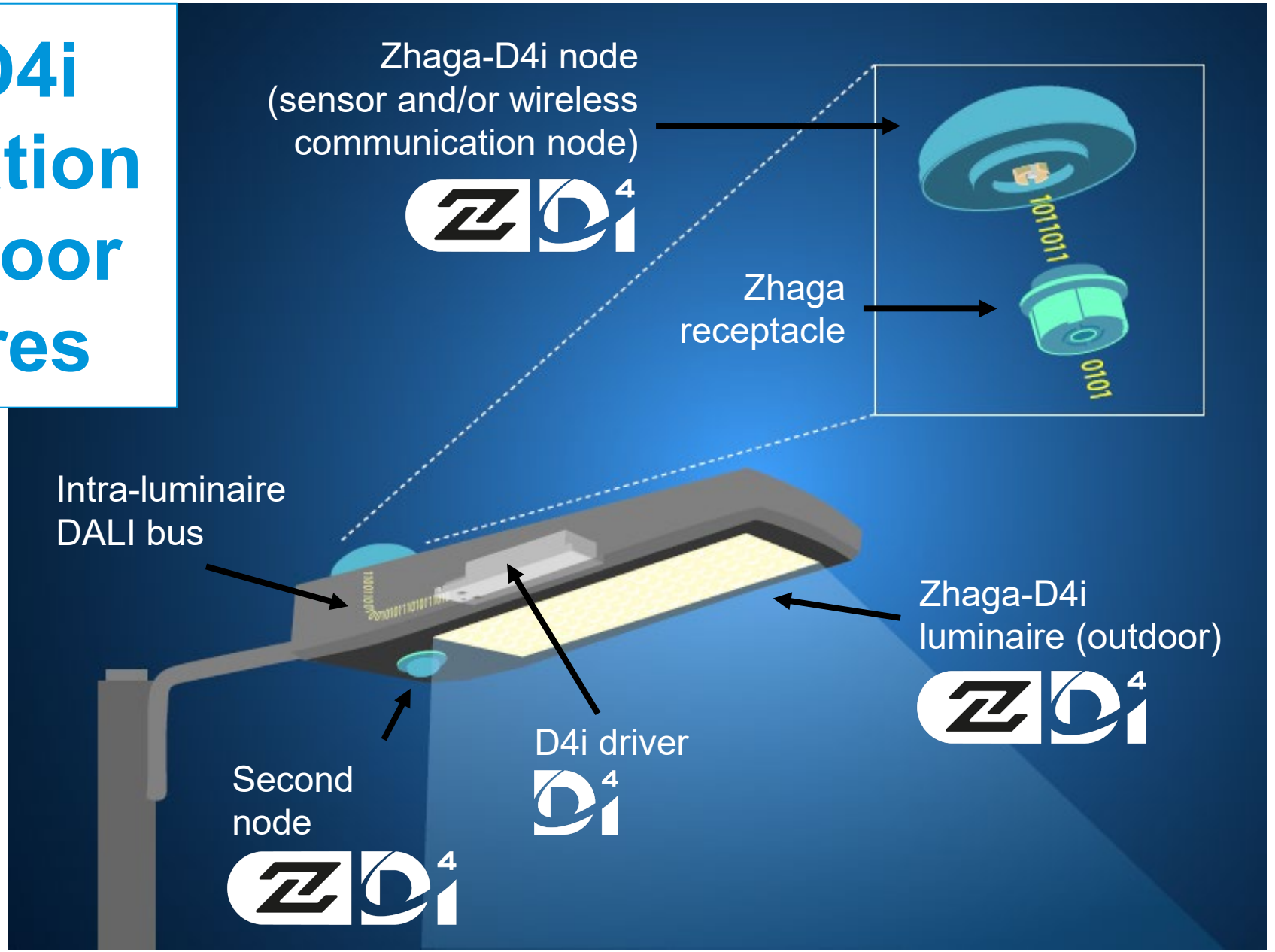


D4i and Zhaga–D4i certification

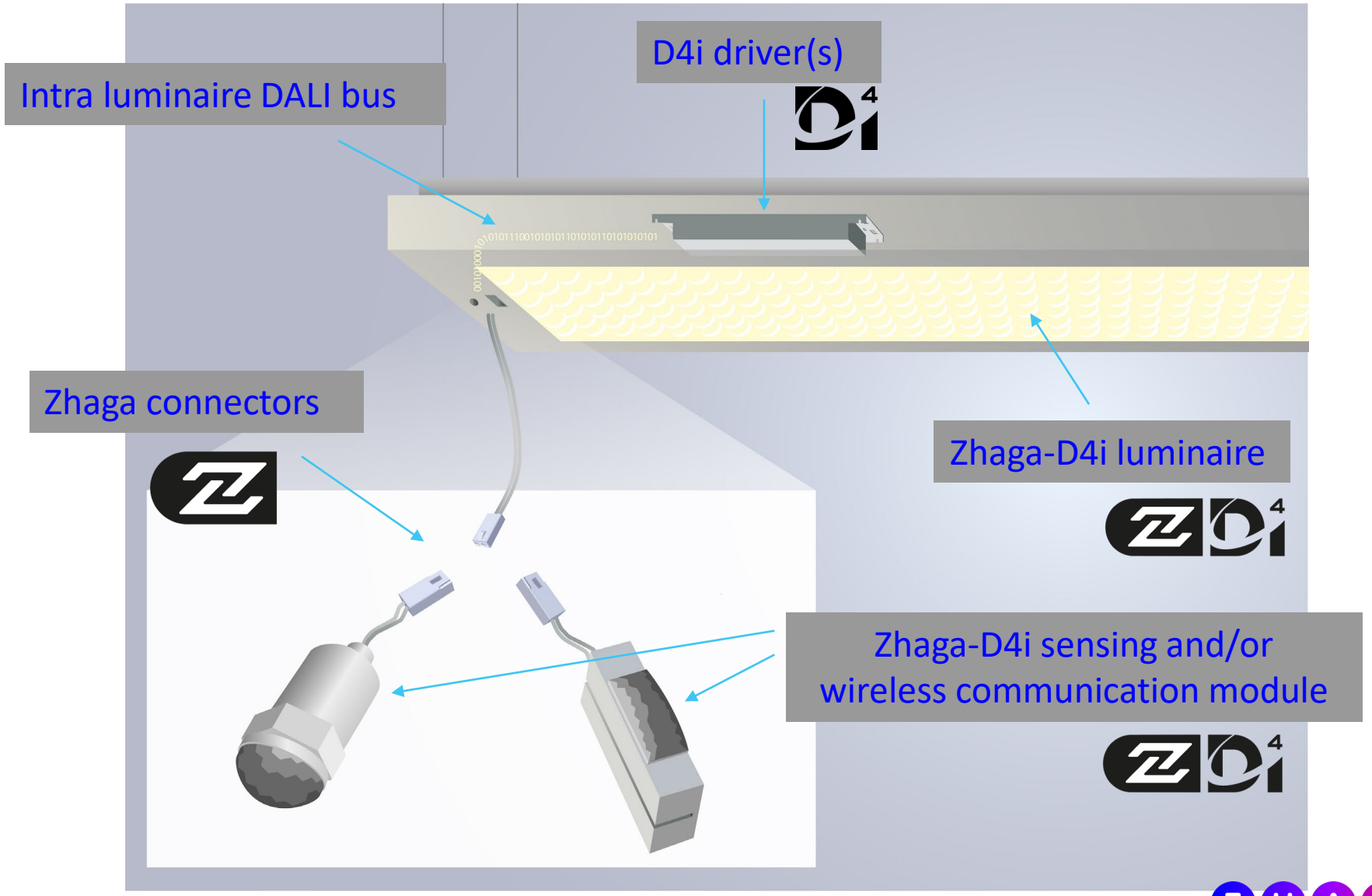
	DALI Alliance members	Zhaga members
LED driver	D4i certification ⇨	
Control device	(1) D4i certification ⇨	(2) Zhaga certification ⇨
Luminaire	*Trademark usage*	Zhaga certification ⇨
Connector		Zhaga certification ⇨

(1) + (2) both required

Zhaga-D4i certification for outdoor luminaires



Zhaga-D4i certification for indoor luminaires



Zhaga-D4i certification

- Zhaga-D4i certification (Book 18 or Book 20) is available for:
  - Luminaires:
  - Control devices (nodes)
- Zhaga-D4i certified products are listed on the Zhaga website

- Zhaga-D4i certification is available to Zhaga members

- For control devices:
  - First step is D4i certification; only available to DiiA members
  - D4i-certified products are listed on the DiiA website

- The Zhaga logo and the D4i logo are separate logos with separate trademarks. Usage is controlled by Zhaga and DiiA, respectively.

Zhaga-D4i luminaires:
(top) Luma Gen2 from Signify
(bottom) Izylum from Schréder

More information

- DiiA specifications – www.dali-alliance.org/specifications/download.html
- D4i overview and FAQs – www.dali-alliance.org/d4i
- D4i certification – www.dali-alliance.org/d4i/certification.html
- Zhaga-D4i – www.dali-alliance.org/zhaga-d4i
- DALI product database – www.dali-alliance.org/products
- Zhaga product database – www.zhagastandard.org/products.html

Contact the DALI Alliance – www.dali-alliance.org/contact

Alternative versions

DALI data specifications

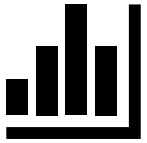
- Data for enhanced asset management & performance monitoring
- Data storage in DALI memory banks, with standardized format & locations

Luminaire Data

DALI Part 251 – Luminaire Data

- Information about the luminaire (e.g. GTIN, light output, CCT & CRI, light distribution etc) can be stored in the control gear
- Enables asset management

Energy Data



DALI Part 252 – Energy Reporting

- Provides real-time power & energy usage for control gear

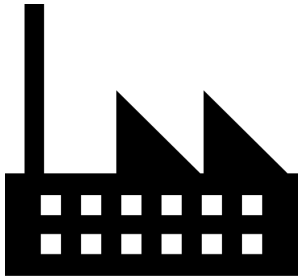
Diagnostics Data

DALI Part 253 – Diagnostics & Maintenance

- Operating data for control gear and lamps, including failure conditions, run-time data
- Enables predictive maintenance

These specifications are available from DiiA, and are also included in ANSI C137.4

Using DALI data



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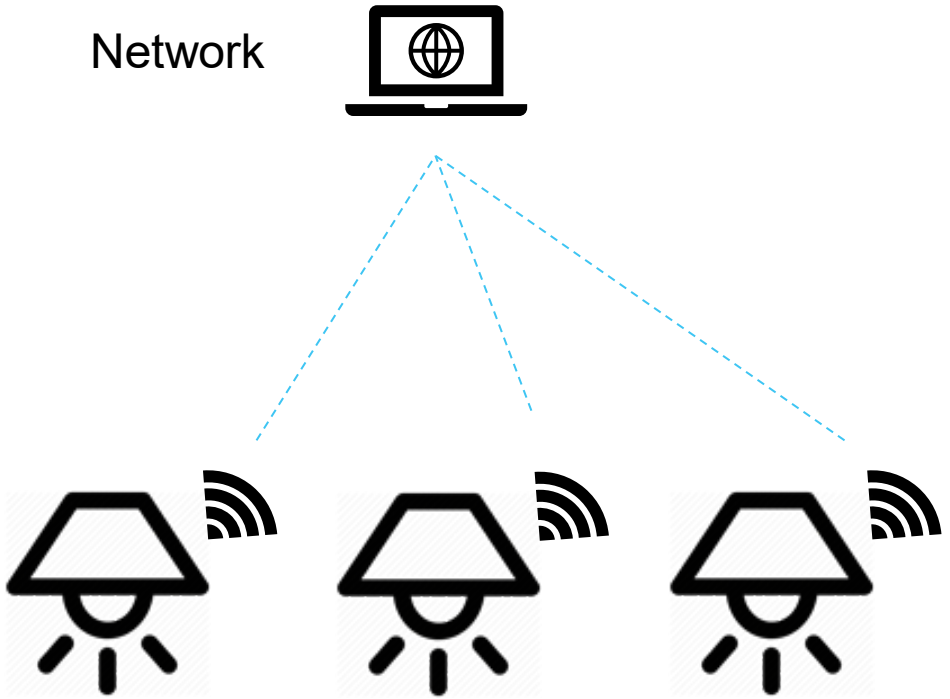
Luminaire data is programmed into drivers



In the field:
Automated commissioning

- When installed, luminaires can automatically transfer data to a remote network
- Reduces human error, saves installation time and cost
- Operator has a full map of asset information

During operation:
Performance monitoring

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During operation:
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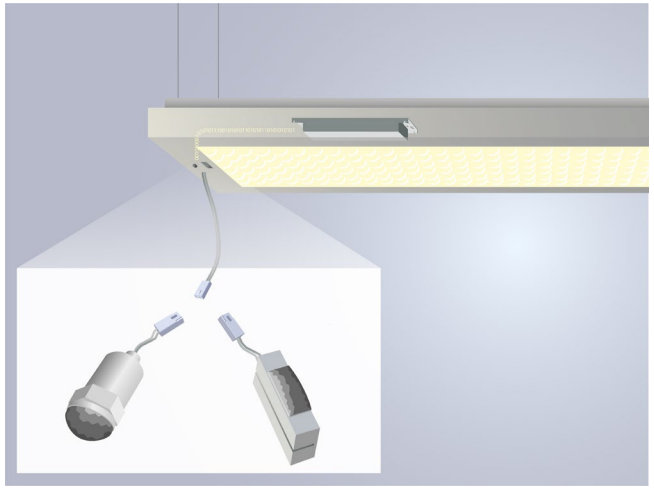
Zhaga-D4i certification

A joint certification program based on complementary specifications

Specifications from DiiA enabling D4i certification

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



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