Standardized lighting and control interfaces for indoor and outdoor luminaires

Lightfair seminar by the Zhaga Consortium and DALI Alliance

21 June 2022

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Seminar Agenda - Zhaga

- Learning Objectives
- Introductions
- Value of Zhaga Interoperable Products
- Book 18: Smart interface for outdoor luminaires
- Book 20: Smart interface for indoor luminaires
- Data management for serviceable lighting
  - Book 24/25: Zhaga NFC programming of drivers
- Collaboration with standards development organizations

Learning Objectives

1. Identify key benefits of Zhaga-D4i certification
2. Compare D4i requirements for drivers and control devices (nodes) with the ANSI C137.4 standard
3. Explain the value and importance of specifying standardized lighting and control interfaces for indoor and outdoor luminaires
4. Recognize how to future-proof your luminaire designs and lighting installations

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Zhaga Consortium

Zhaga is an open industry consortium with >430 members from the lighting industry

Regular Member

21 regular members

Associate Member

129 associate members

Community Member

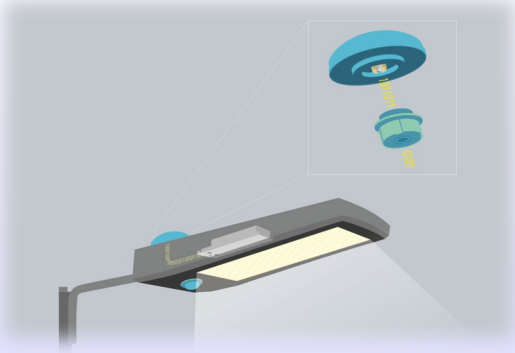
>280 community members

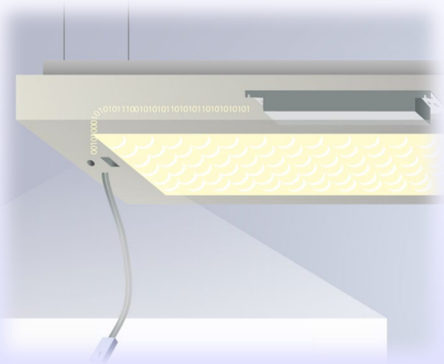
New Zhaga Mission

Create interface specifications for components of LED luminaires to

- enable multi-vendor eco-systems of interoperable products
- create trust in interoperability through a certification and logo program executed by third party test houses
- support sustainable lighting for smart cities and buildings
- promote formal standardization by offering Zhaga Specifications to Standard Development Organizations

New Zhaga Mission

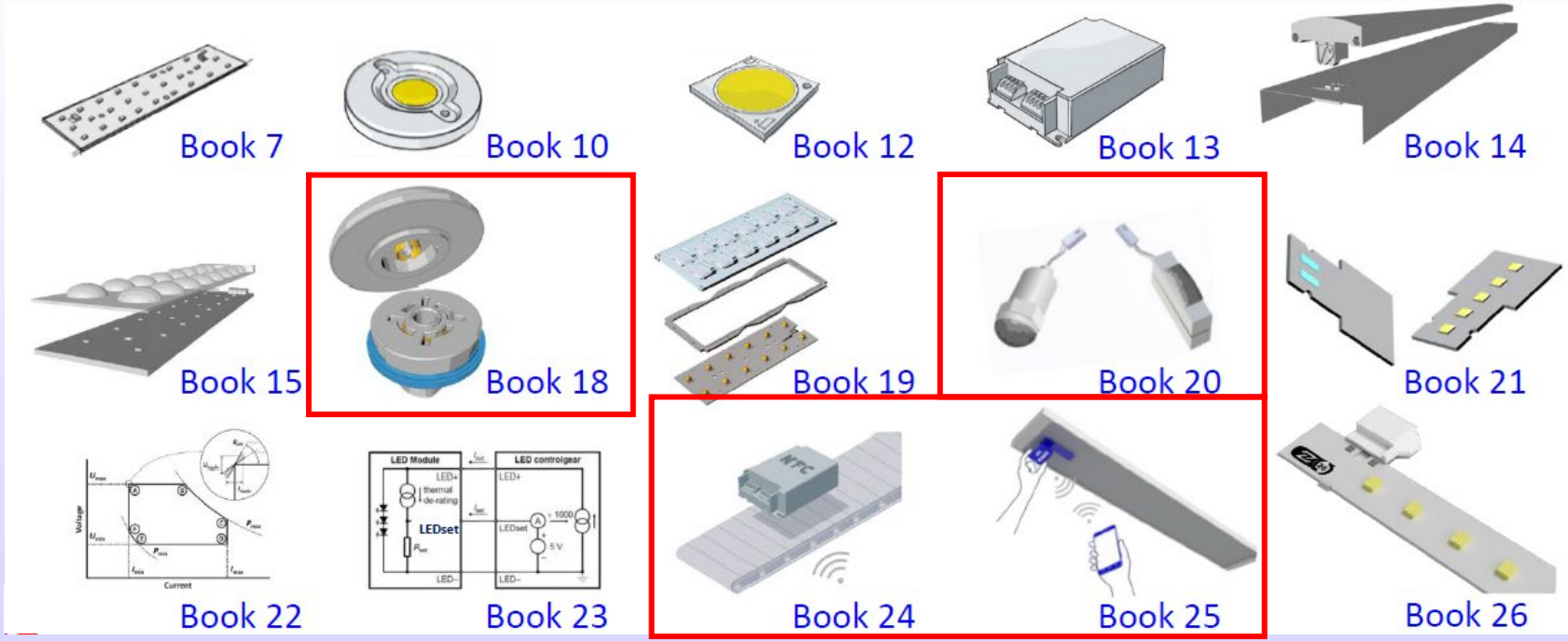




Old Zhaga: Facilitate OEMs and manufacturers

New Zhaga: Enable new markets for connected and serviceable lighting

Zhaga Books – Interface Specifications for Components of LED Luminaires

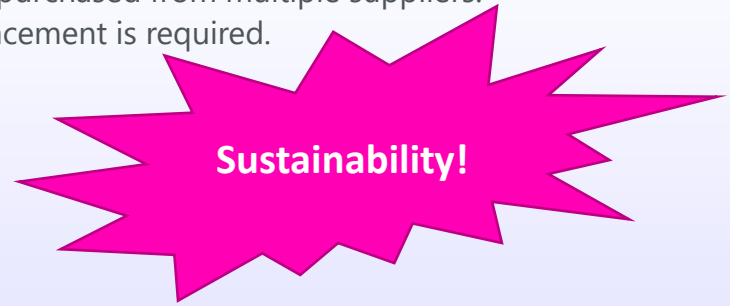


Value of Zhaga Interoperable Products

Benefits for Specifiers and End-users

Reduced risk and future-proofing

Zhaga-based luminaires are future-proof because light sources can be purchased from multiple suppliers.
Customer is not reliant on original supplier if maintenance and/or replacement is required.



Easier upgrades

Latest-generation technology can be adopted easily.
Luminaires are future-proofed against rapid LED technology evolution.

Avoiding installation/ specification of obsolete luminaires

Luminaires can be specified for future projects in the knowledge that a current, up-to-date LED light source can be fitted when the project is installed.

Easier procurement

If maintenance or upgrades are necessary, standardized parts will be in stock from numerous suppliers.

Unprecedented flexibility

Socketable LED light sources enable tool-free interchangeability in the field. This allows different options for color temperature, CRI, and – in some cases – lumen levels

Value of Zhaga Interoperable Products

Zhaga-D4i Certification

A joint program from **Zhaga** and **DALI Alliance**

Certification of interoperable luminaires and sensing and/or communication modules

Based on complementary specifications from Zhaga and DALI Alliance

Zhaga **Book 18** or **Book 20** plus **D4i** specifications

Product certification will allow for use of Zhaga and D4i logos

For **luminaires, sensing** and **communication modules**

Logos indicate multi-vendor product interoperability

LED drivers are eligible for D4i certification from DALI Alliance

Book 18 and Book 20 **connectors** are eligible for certification from Zhaga

Look for the logo!

Value of Zhaga Interoperable Products

Zhaga-D4i Certification Features

Easy to add or upgrade sensors and/or communication modules:

Enables future-proof luminaires that can keep pace with rapid developments in digital networking and sensing technology.

Intra-luminaire DALI-2 bus:

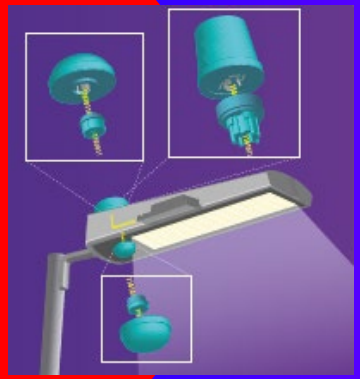
Enables bi-directional communication between sensors and/or communication modules and LED drivers using the well-established and standardized DALI-2 protocol.

D4i drivers are smart:

Able to report operational and diagnostic data to an external network, can provide inventory-related information about luminaires.

IoT connectivity:

With a suitable wireless communication module, the luminaire can interact with an external lighting-control network and to become part of the IoT.

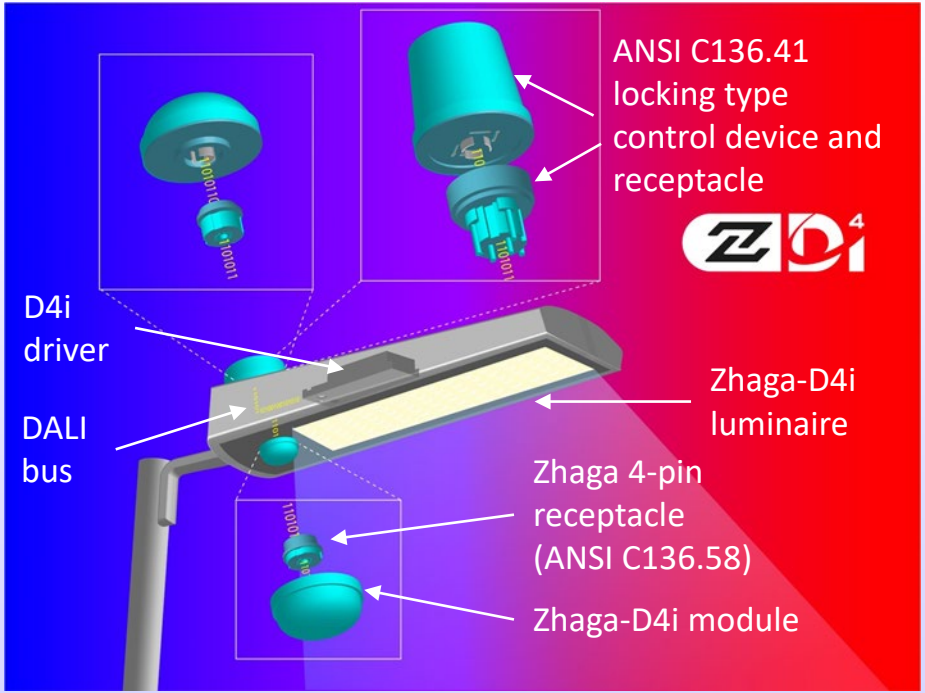


Zhaga Book 18 ED 3.0

Smart interface between outdoor luminaires and sensing / communication modules (April 2021)

Zhaga Book 18 Ed. 3.0 – Outdoor

- Edition 3: Combined Zhaga 4-pin interface with ANSI C136.41 interface in hybrid luminaires
- DALI D4i Controllable Luminaire
  (ANSI C137.4 harmonized with D4i)
- Plug-and-Play Interoperability
- Smart City Networks
  - Connection to IoT
  - City-wide communication
  - Energy usage monitoring/reporting
- Creative Sensors
  - Demand Response
  - Adaptive Street Lighting
  - Environmental sensing
  - Area security monitoring
  - Vehicular and pedestrian traffic detection
  - Emergency response
  - Parking space assistance



Zhaga Book 18 ED 4.0

Smart interface between outdoor luminaires and sensing / communication modules (Sneak preview)

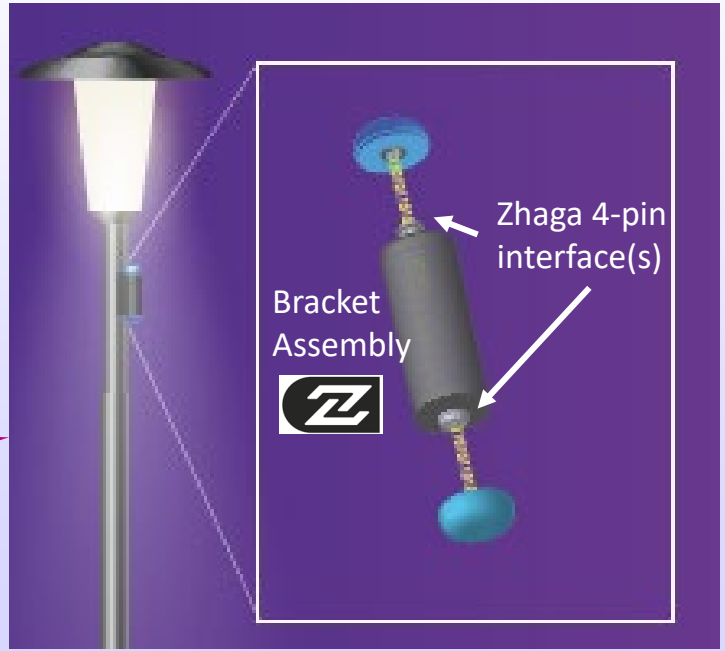
Zhaga Book 18 Ed. 4.0 – Decorative

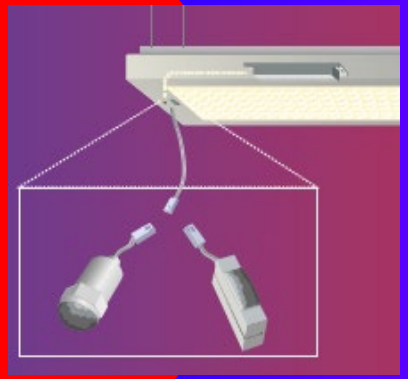
- Book 18 currently specifies one or two interfaces per luminaire (Zhaga or Zhaga/ANSI mix)
  - Intra-luminaire DALI bus contained in the luminaire → interfaces mounted on the luminaire
  - Ideal for cobra head form factors

Zhaga-D4i luminaire

- Challenge: Suitable mounting planes for other luminaire types
- Zhaga solution: Pole mounted bracket
- Use cases
  - Decorative luminaires
  - Heritage luminaires
  - Streetlighting

Zhaga innovates!



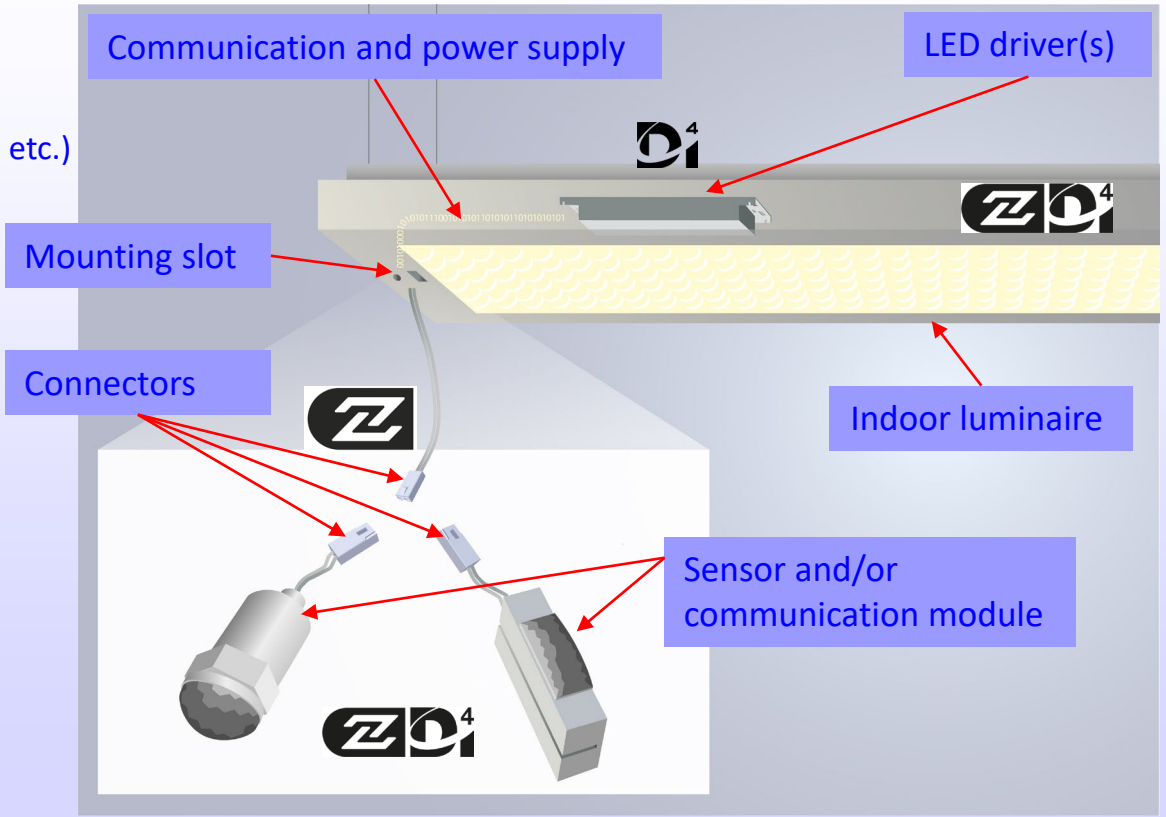


Zhaga Book 20 ED 1.1

Smart interface between indoor luminaires and sensing / communication modules (May 2021)

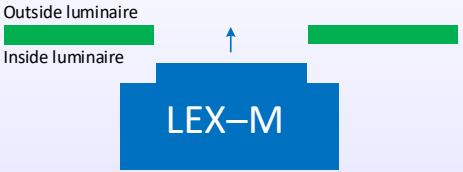
Book 20 Ed. 1.1 – Indoor

- Intelligent Building Management
  - Networked Lighting Systems
  - Building CMS
  - Energy monitoring and reporting
  - Illumination control (spectrum, scenes, etc.)
- Plug-and-Play Interoperability
- Add Control/Sensor functions easily
- IoT Upgradeable
- Many module options
  - Presence Detection
  - Daylight Harvesting
  - Security
  - Emergency response
  - Hazard detection
  - Wireless Communication
- Publicly Available
- Check out the video: https://youtu.be/qAF4FymbUJw

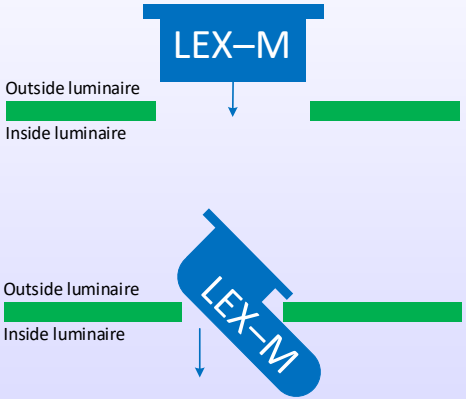


Book 20 – Fitting system configurations

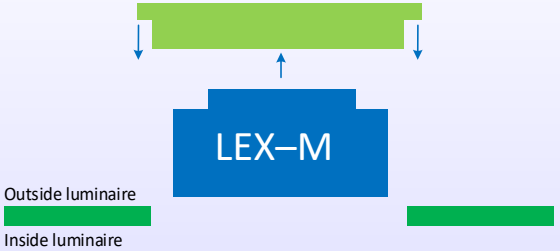
Luminaire extension modules (LEX–M) are fitted into slots



Module is mounted from the inside of the luminaire into the slot



Module is mounted from the outside of the luminaire into the slot



The module is mounted from the outside of the luminaire using a bracket fitting into the slot

Book 20 – Fitting system configurations

Five different categories for the mechanical interface facilitate flexible luminaire and module designs:

- R44x17 (44 x 17 mm)
  → Rectangular modules with small volumes and indifferent orientation

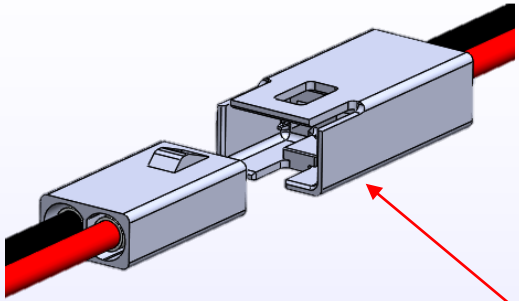
- R60x22 (60 x 22 mm)
  → Rectangular modules requiring more volume and surface, e.g., gas detectors or complex presence detectors

- C22-T1A (Ø 22 mm):
  → Cylindrical modules as already widely used in the field, adjustable orientation, minimum surface

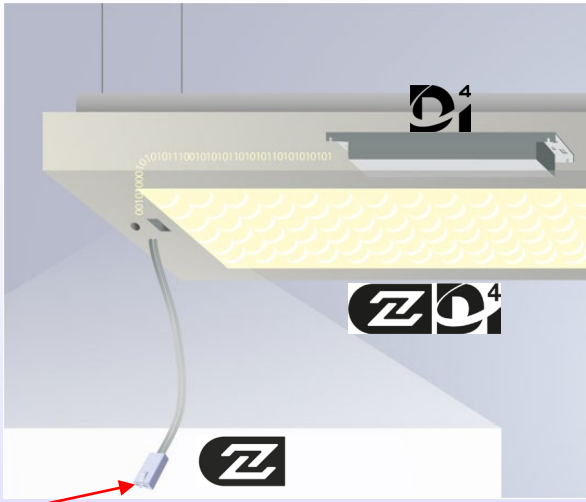
- C22-T1B (Ø 22 mm):
  → Cylindrical modules as already widely used in the field, adjustable orientation, larger lenses

- C22-T2 (Ø 22 mm):
  → L-shaped modules enable ultraflat luminaire designs

Book 20 – Connector features

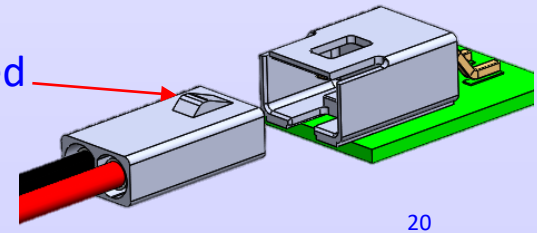


Wire-to-wire



- Two position plug and receptacle interface:
  - Easy to use separable connection provides reliable DALI connectivity
- Poka Yoke features prevent incorrect mating.
  - Enables connection with polarity ensured
- Connector provides finger proof protection
  - Housing provides touch proof protection for separable contacts
- Plug & play functionality can be installed by a generalist
  - Does not require a specialist to upgrade luminaire functionality
- Integrated latch feature provides 5N minimum retention when mated
  - Slim profile latch ensures that connectors remain intact over its lifetime

Wire-to-board



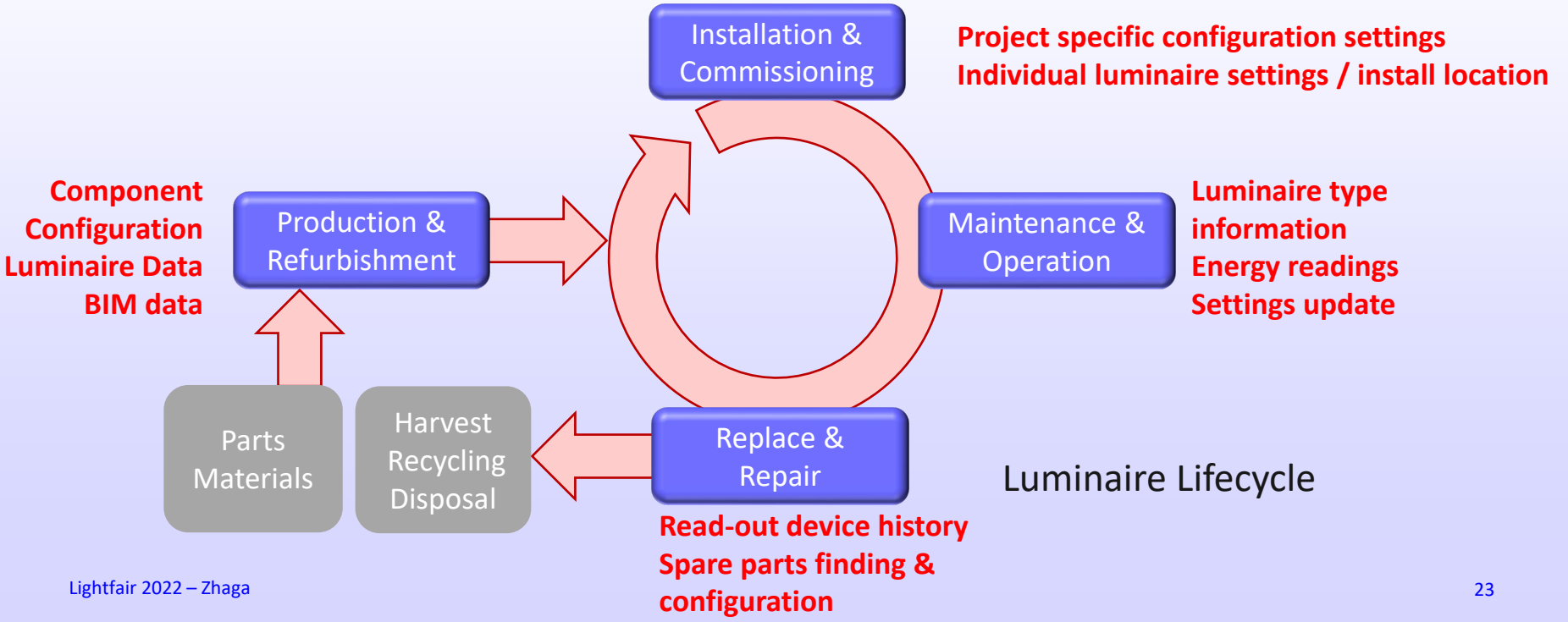
Zhaga-D4i certification: Progress

- Zhaga-D4i certification launched in **November 2019**
  - Book 18: Now 222 certified products (201 Z-D4i) available from 49 vendors
    - Izylum from Schréder (left), Luma Gen2 from Signify (middle-left), Jovie from Trilux (middle-right), SL11 & SL21 from Siteco (right)
  - Book 20: Certifications underway – US DOE L-prize credits available
  - Current overview always to be found on Zhaga website: https://www.zhagastandard.org/products.html?start=125

Data management over the product lifecycle made simple

Manage data over luminaire lifecycle

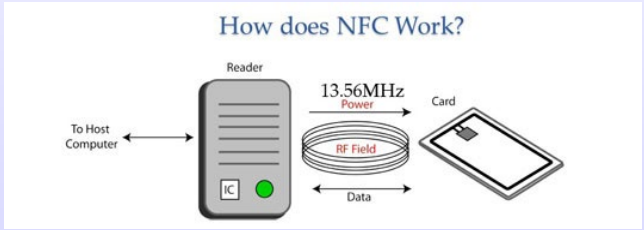
In support of sustainability, lighting applications are configuring LED drivers and reading parameters throughout the product lifecycle more frequently.



The data management issue

Manufacturers of LED luminaires currently use a variety of methods for configuring LED drivers and reading parameters throughout the product lifecycle.

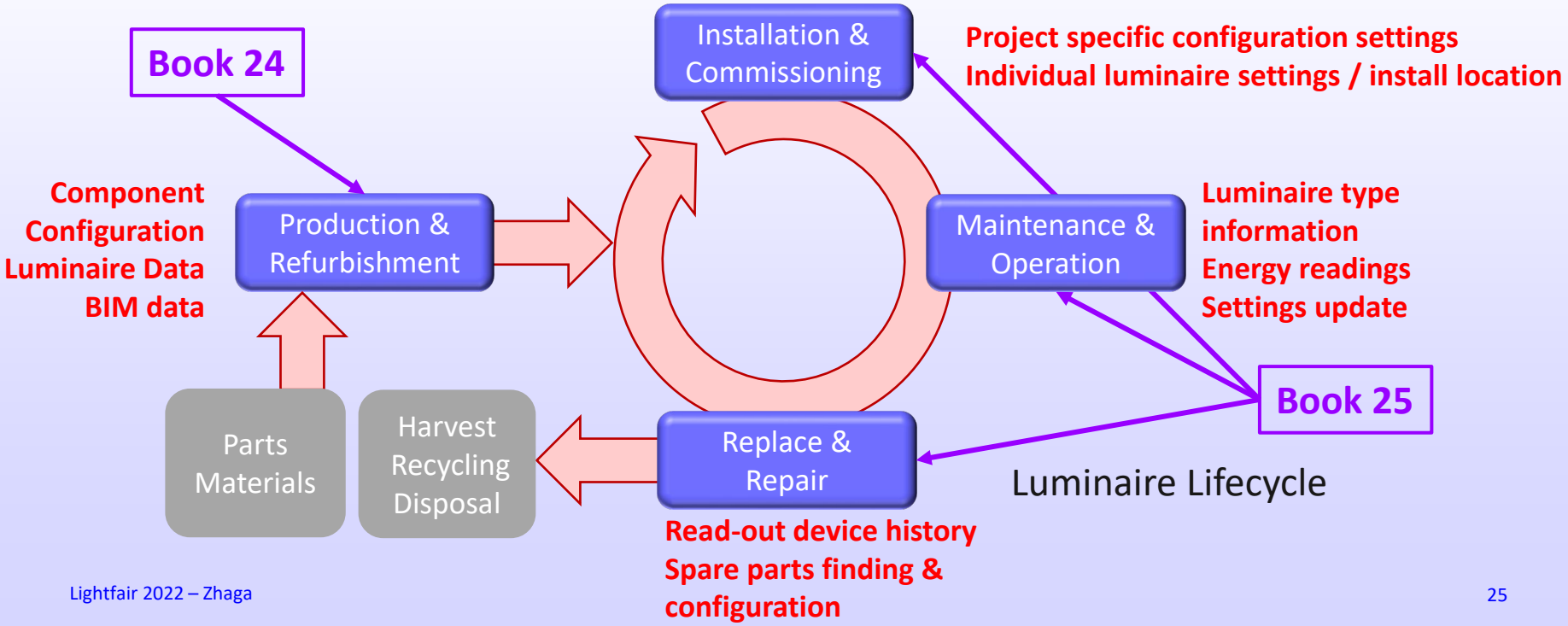
- Resistor (LEDset)
- DALI
- NFC (e.g., SimpleSet)

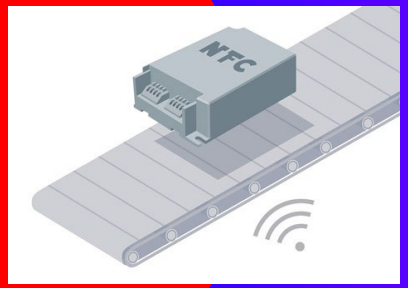


Maintenance staff needs to manage all these methods with different tools.

The Solution

Zhaga NFC based programming at the OEM and in the field covering the entire luminaire lifecycle with interoperable maintenance tools enabling easy to service, configurable luminaires





Zhaga Book 24 ED 1.1
Programming of luminaire components using NFC (February 2022)

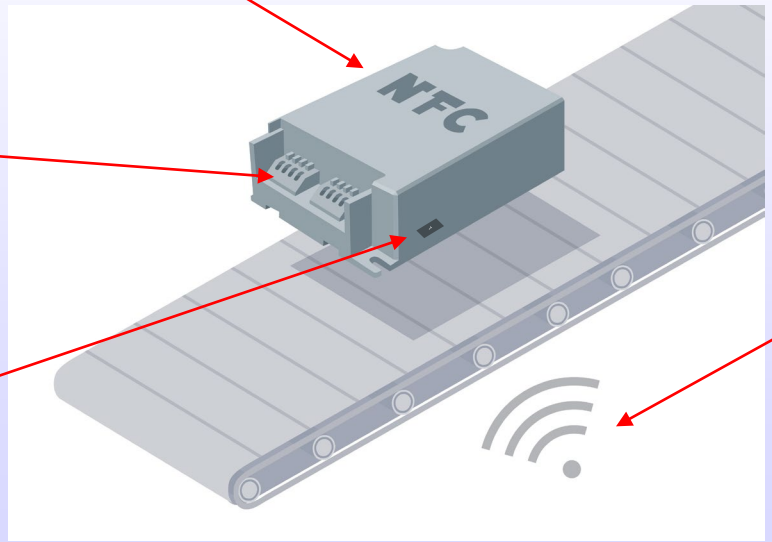
Book 24: NFC programming at the OEM

Luminaire production site

NFC capable component

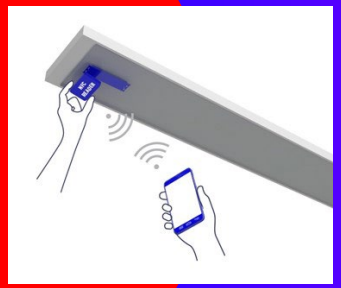
No need to power up

NFC Tag inside



Wireless programming using ISO 15693 standardized NFC protocol

Luminaire specific parameters + vendor specific data



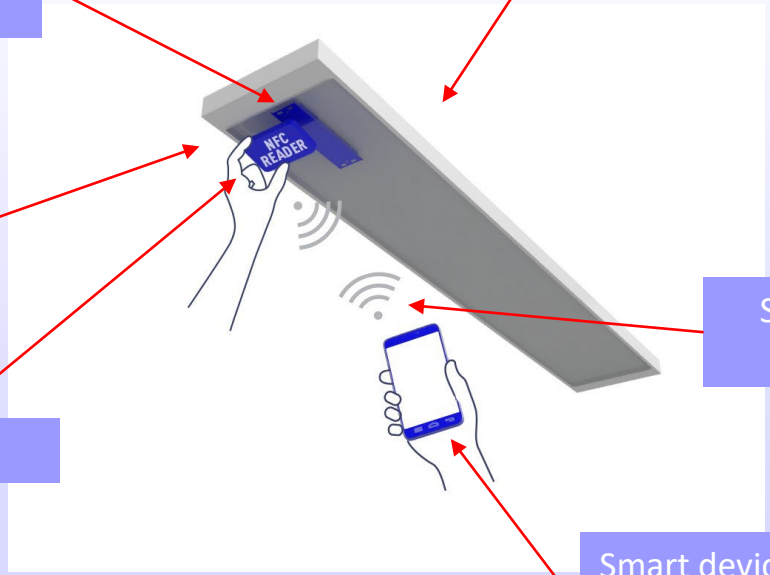
Zhaga Book 25 ED 1.0

Programming of luminaire components using NFC readers with Bluetooth LE interface (February 2022)

Book 25: NFC programming of drivers in the field

Luminaire at install location

NFC capable component with NFC tag inside



Wireless programming using ISO standardized NFC protocol

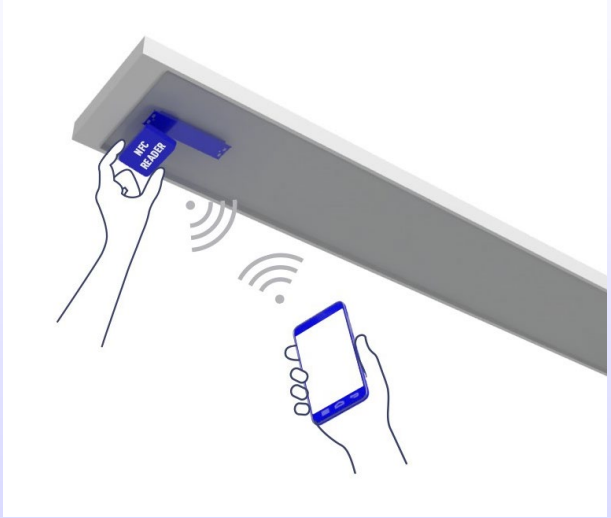
Standardized Bluetooth GATT Service

Mobile NFC reader

Smart device with vendor app enabling project specific settings

Book 25: NFC programming of drivers in the field

- Book 25 builds upon Book 24, which makes it easy for luminaire manufacturers to use NFC programming in a production line where multiple brand drivers are used one after the other.
- Book 25 takes this to in-field programming, by specifying a wireless reader and driver interface
  - Based on Bluetooth
- Vendor differentiation as in Book 24
  - Manufacturers develop own software and drivers
  - OEMs/installers/maintenance use one setup to configure the drivers
- Published for Zhaga members – February 2022



Benefits of Book 24 and 25 certification

- Certification builds trust in interoperability
  - Certification tests carried out by vendors and the letter of confirmation is inspected by an independent authority
  - Certified products are traceable in the publicly accessible Zhaga product databases
  - Certification logos are trademarked to prevent misuse

- Certification gives business advantages
  - Certified NFC readers available from multiple suppliers
  - Consistent NFC reader supply for luminaires with NFC programmable components
  - Certified NFC programmable components available from multiple suppliers
  - Easy to identify logo indicates that the NFC reader works with vendor software written for Zhaga NFC certified components
  - Certification logos provide an established brand for product marketing

Collaboration with standards development organizations

Collaboration

- ANSI C136
  - ANSI C136.41 *Interface between an External Locking Type Control Device and Ballast or Driver*
  - ANSI C136.58 *Luminaire Four-Pin Extension Module and Receptacle*
  - Book 18 Ed 3.0 *Smart interface between outdoor luminaires and sensing/communication modules*
  - Zhaga adoption of the ANSI C136.41 interface in Book 18 Ed 3.0
  - ANSI C136 adoption of the Zhaga interface in ANSI C136.58
  - Outdoor luminaires with hybrid architectures
  - Collaboration supports smart cities
- NEMA
  - NEMA *Physical Interface of Luminaire Integrated Control Devices*
  - Zhaga Book 20 *Smart interface between indoor luminaires and sensing/communication modules*
  - Zhaga and NEMA cooperating to align their specifications
  - Collaboration supports smart buildings
- IEC TC 34
  - Copyright Agreements between Zhaga and IEC
  - Transfer of Zhaga Books 7, 10, 12, 14, 18 and 20 to TC/SC 34 for maintenance
  - Collaboration supports international standardization

Standards cooperation

Zhaga Specifications	Harmonized Standards	Status	Product
Book 7	IEC PAS 63166 *IEC 63356-2*	In transfer (CDV)	Rectangular LED modules
Book 10	IEC PAS 63324 *IEC 63356-2 (module)* *IEC 6xxxx Part 2-1 (array holder)*	Transfer proposed	Circular LED modules for spotlighting
Book 12	IEC PAS 63328 *IEC 63356-2*	Transfer proposed	Rectangular LED arrays
Book 14	IEC PAS 63329 *IEC 63356-1*	Transfer proposed (Amd 1)	GR6d linear double-capped lamps
Book 18 (Zhaga interface)	ANSI C136.58 IEC PAS 63421	Published – C136.58 IEC transfer proposed	Luminaire Four-Pin Extension Module and Receptacle
Book 18 (NEMA interface)	ANSI C136.10 ANSI C136.41	Published – Book 18 Ed 3.0	Seven-pin ANSI/NEMA plug and receptacle
Book 20	NEMA LS 20000 IEC PAS 63422	Published – NEMA IEC transfer proposed	Luminaire – Sensing/Communication Modules Interface

Thank You → Join Zhaga!!

Website: https://www.zhagastandard.org/

Lightfair 2022: Visit us at booth #1456

Zhaga creates interface standards for components in LED luminaires

Zhaga interface standards future proof your luminaire through interoperability for connected, serviceable and sustainable lighting

Multiple membership options available

- Regular
- Associate
- Community

Mark Duffy
General Assembly Chair of Zhaga

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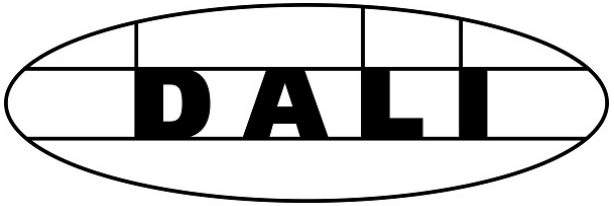
DALI-2 and D4i

What You Need to Know

Presented by:
Landon Miles – Inventronics
On behalf of the DALI Alliance

DALI® Alliance

What is DALI?



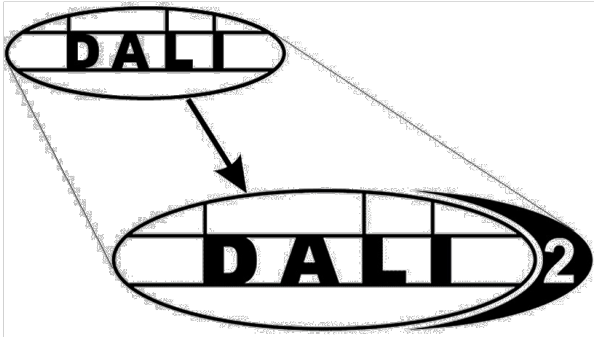
- DALI- **D**igital **A**ddressable **L**ighting **I**nterface
- Lighting control standard governed by the DALI Alliance
- Allows for control of individual fixtures, groups of fixtures, or all fixtures via DALI commands
- Can create and reconfigure lighting groups via software, instead of having to modify control wiring
- Used to control luminaires, create scenes, and store luminaire data

DALI® Alliance

What is DALI-2?

- 2nd Generation of DALI

- DALI-2 Allows For
  - Increased interoperability
  - More stringent test protocol
  - Extended Commands
  - Comprehensive DALI-2 Product Database



- DALI-2 requires that the certification test files be submitted to the DALI Alliance for approval
  - Fosters manufacturer accountability for adherence to DALI Standards
  - All registered DALI-2 products be found on the DALI Alliance website

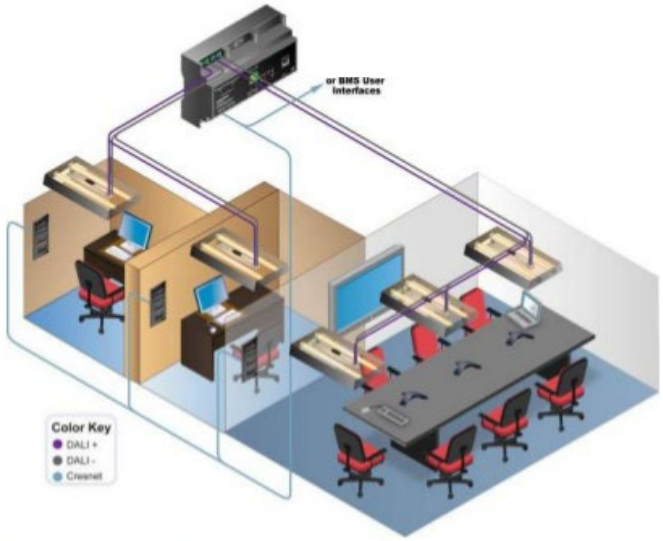
DALI-2 Driver Requirements

- At a minimum, for LED drivers DALI-2 requires the testing and certification to the following standards:
  - DALI Part 101: Standard DALI Requirements
  - DALI Part 102: Standard Control Gear Requirements
  - DALI Part 207: DALI for LED Modules

- ***So, what is D4i?***

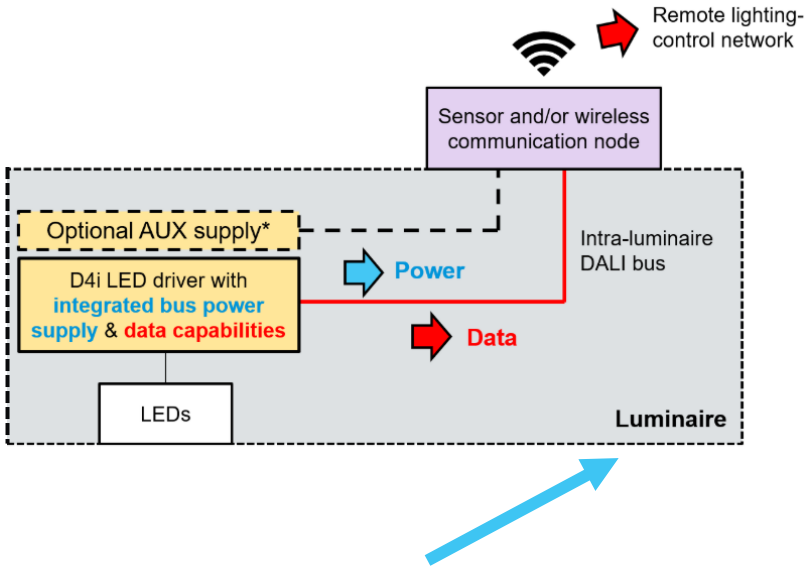
DALI-2: Applications

Traditional



DALI-2 bus is distributed to multiple fixtures throughout the building

Intra-Luminaire



*DALI-2 Bus does not leave the luminaire

D4i Overview

- DALI-2 is the standardized **data bus**
- D4i is the standardized **feature set**

- ***A standardized data bus and feature set allows for the lighting controller to read back data from the driver***

- D4i Enables Smart Data capabilities
  - Standardizes what information is monitored by the driver
  - Standardizes what information is stored by the driver and, and where

D4i Requirements

- D4i requires the testing and certification to the following standards are met in addition to standard DALI-2 certification
  - DALI Part 250: Integrated DALI Bus Supply
  - DALI Part 251: Memory Bank 1 Extension for Luminaire Data
  - DALI Part 252: Energy Reporting
  - DALI Part 253: Diagnostics and Maintenance

- DALI-2 **can** exist without D4i
- D4i **cannot** exist without DALI-2

So, what can D4i do?

Memory Bank 1

- Luminaire Data that can be stored in the driver by the luminaire manufacturer
- DALI Part 251 defines 16 data points that can be stored in the driver about the luminaire.
- This information is valuable for ***Informed Maintenance***

- Memory Bank 1
  - Luminaire Color
  - Luminaire Identification
  - Luminaire CRI
  - Luminaire GTIN
  - Light Distribution Type
  - CCT (K)
  - Serial Number
  - Manufacturing Date Code
- Memory Bank 0 (Driver Information)
  - Driver GTIN
  - Driver Serial Number

Power Monitoring

- Reads back the power and energy usage of the driver
- Standardized by DALI Part 252
- This data can be useful for:
  - Verifying energy savings
  - Identifying problems

- Required:
  - Active Energy
  - Active Power
- Optional
  - Apparent Energy
  - Apparent Power
  - Active Energy Load-Side
  - Active Power Load-Side

Diagnostics and Maintenance

- Diagnostic and Maintenance Data monitored by the driver
- Standardized by DALI Part 253
- Allows for control systems to monitor luminaires for abnormalities, failure, and early signs of failure
- With advances in Artificial Intelligence, we expect control system failure prediction accuracy to continue to increase.

- What is Monitored:
  - Performance Data
  - Failure Flags
  - Failure Flag Counters
  - Lifetime Counters
  - Timers
  - Luminaire Operation Information

Integrated DALI Bus Supply & Auxiliary Supply

- DALI Bus Supplies:
  - All DALI Networks require a DALI Bus supply.
  - With DALI-2 D4i drivers, these are built into the driver.

- 24V Auxiliary Supply:
  - DALI Part 150 standardizes a 24Vdc 3W power supply.
  - This is not required by D4i, but most D4i drivers do have this feature.
  - Provides power the NLC
    - *A DALI Bus supply is still required if an auxiliary supply is present.

Integrated DALI Bus Supply & Auxiliary Supply

- *You already have one power supply in your fixture, why do you need to add another?*

- *Standardization of Auxiliary Supplies and the required inclusion of a DALI Bus Supply helps to make controls "Plug and Play"*

Value Adds of D4i

- Keep customers lights on
- Save money on maintenance
- Verify energy savings
- Asset Tracking

To Wrap Up…..

- DALI-2:
  - Standardized Data Bus
- D4i
  - Standardized Feature Set
    - ANSI C137.4 is Harmonized with D4i
  - Standardized Auxiliary Supply
- Zhaga ZD4i
  - ZHAGA Book 24
  - Standardized Connector

Plug And Play

What You Need to Know

Presented by:
Michael Davidson– Synapse Wireless
On behalf of the DALI Alliance

DALI® Alliance

IoT for Luminaires comes of Age

- Data is everywhere – Data has been everywhere
- Smart Phones, Cars, Door Bells, Appliances, Workout Machines, Smart Watches
- Where is the Data been in Lighting?

The Big Questions

- A Companies' Sustainable Lighting Story without Data?
- ESG Plan without Data? (Environmental, Social, & Governance)
- Circular Economy – Without Data, Luminaires will be in the Landfill.

IoT for Luminaires comes of Age

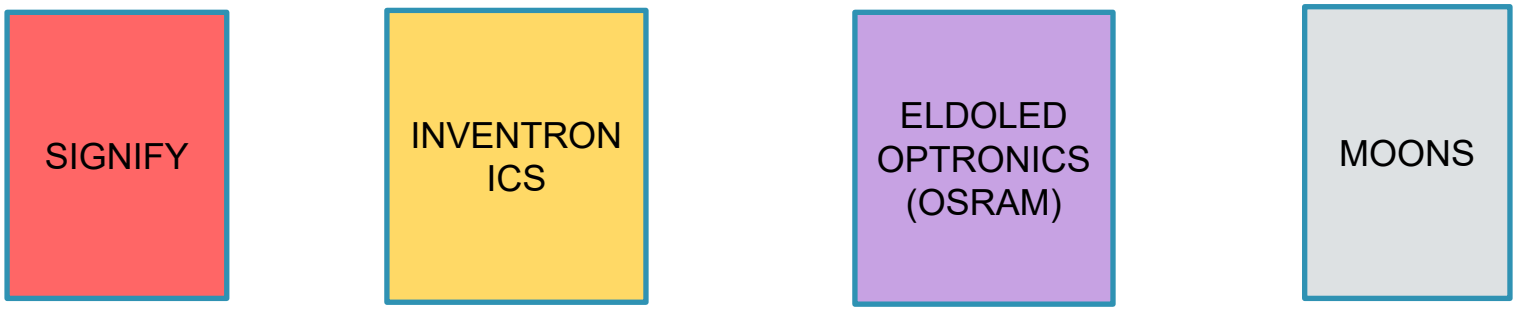
- Mark has demonstrated the need for a Standard for connections
- Landon has shown advantages of the D4i Certified Standard
- Question - Is IoT for Luminaires Here?

IoT for Luminaires comes of Age

- Answer -- Yes, IoT for Luminaires is here
- What is IoT for Luminaires Called? D4i
- Look for this logo for Certified D4i LED Drivers
- There are over 65 Certified D4i LED Drivers

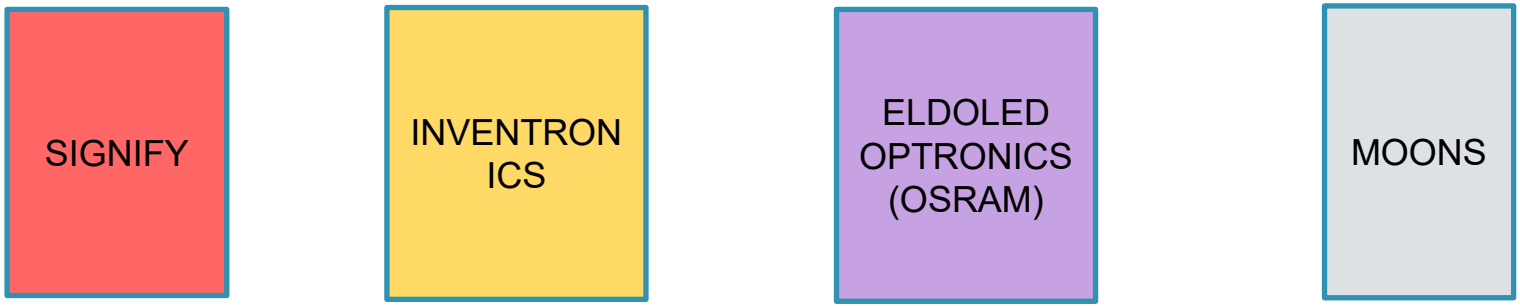
Before DALI-2/D4i
Things were a bit Primitive

The first DALI-2 LED DRIVERS were all different



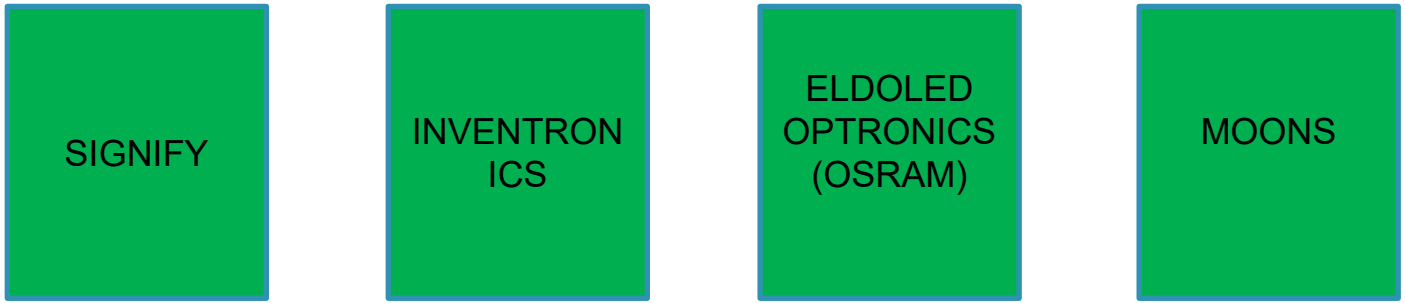
- Different Wiring Diagrams –
- Some Had DALI Power Supply – Some did not
- Some Had an AUX Power Supply – Some did not

KEEPING TRACK OF CUSTOM DATA



- Power Data was stored in different places - Different Software for every vendor
- Power Data was stored in different formats - Different Software for every vendor
- Memory Bank 1 did not Exist
- Diagnostics did not Exist

Guess What? PLUG AND PLAY IS HERE



CERTIFIED D4i LED Drivers – Gets rid on the inconsistency in Hardware and Data

PLUG & PLAY

ZHAGA INTERFACES FOR NLC (Networked Lighting Controls) and Sensors

PLUG & PLAY

DALI® Alliance

Decisions, Decisions, Decisions Which Controls

Affordability – Don’t have budget for NLC

Add a Cheap Zhaga Connector on a Luminaire and add controls later.

Can’t Decide which controls to go with

Bluetooth, SNAP, Zigbee, Thread, Protocol X

Decide Later, add a cheap Zhaga Socket

Don’t like your existing NLC

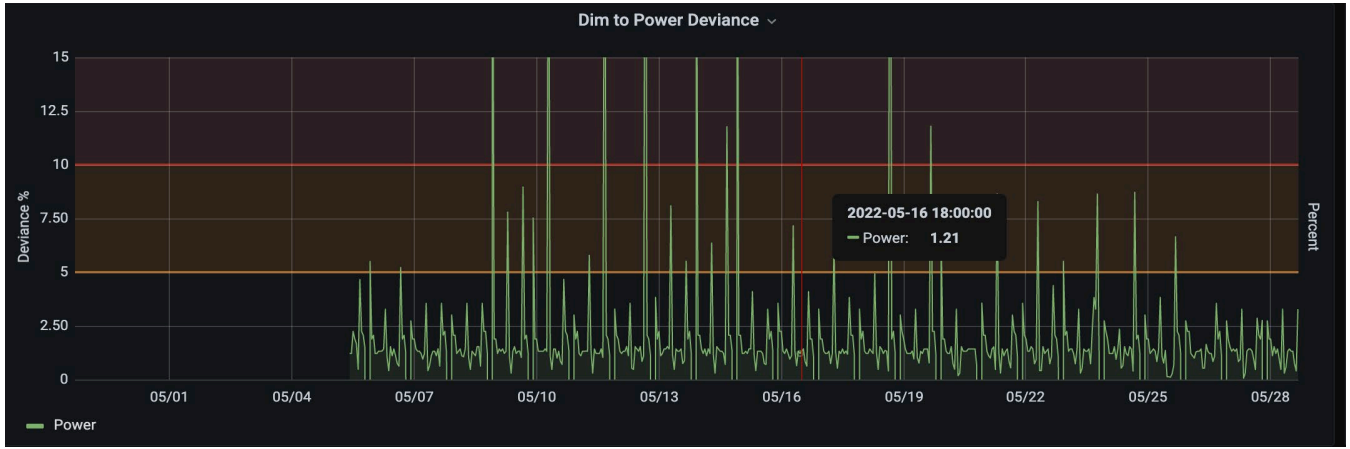
Swap out your controls if you have a cheap Zhaga Socket

Guess What Again? PLUG AND PLAY IS HERE

CERTIFIED D4i LED Drivers – Gets rid on the inconsistency in Hardware and Data
PLUG & PLAY

ZHAGA INTERFACES FOR NLC (Networked Lighting Controls) and Sensors
PLUG & PLAY

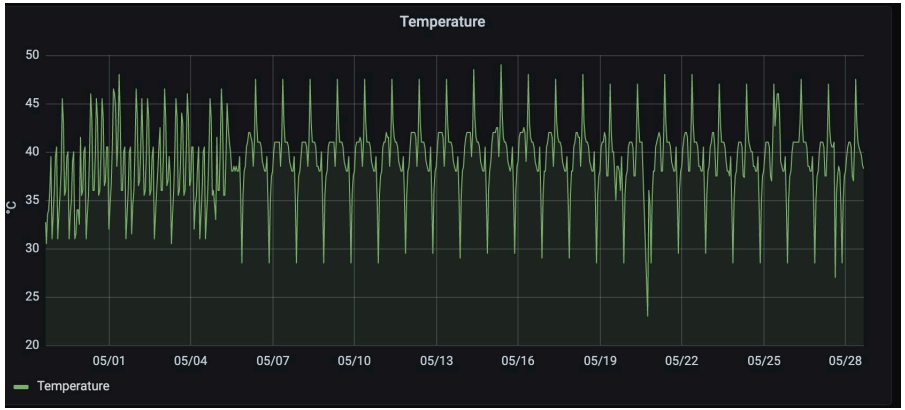
How are you doing Mr. Luminaire?

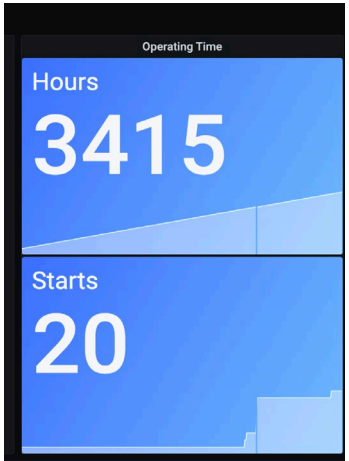


GTIN	123456789012
Serial Number	164722
Manufacturing Year	16
Manufacturing Week	51
Input Power	50
Power at Min Dim	2
Min AC Mains	120
Max AC Mains	277
Light Output	3500

Driver Information

Field	Value
Manufacturer	Signify
GTIN	781087167397
Product ID	161415478662837
Firmware Version	1.0
Hardware Version	1.0





Contact the DALI Alliance

www.dali-alliance.org