

# D4i – Data and Power to Connect!

DALI Alliance seminar at Lightfair 2021



# D4i – Data and Power to Connect!

## Sree Venkit

- System Architect for Connected Lighting, **Signify**

## Kevin Fitzmaurice, LC

- Principal Engineer,  
Lighting and Smart Services, **Georgia Power**

## Michael Davidson

- System Architect, **Synapse Wireless**

All presentations  
from the DALI  
Alliance seminar at  
Lightfair 2021 are  
[available here](#)



# What is “Connected Lighting”?

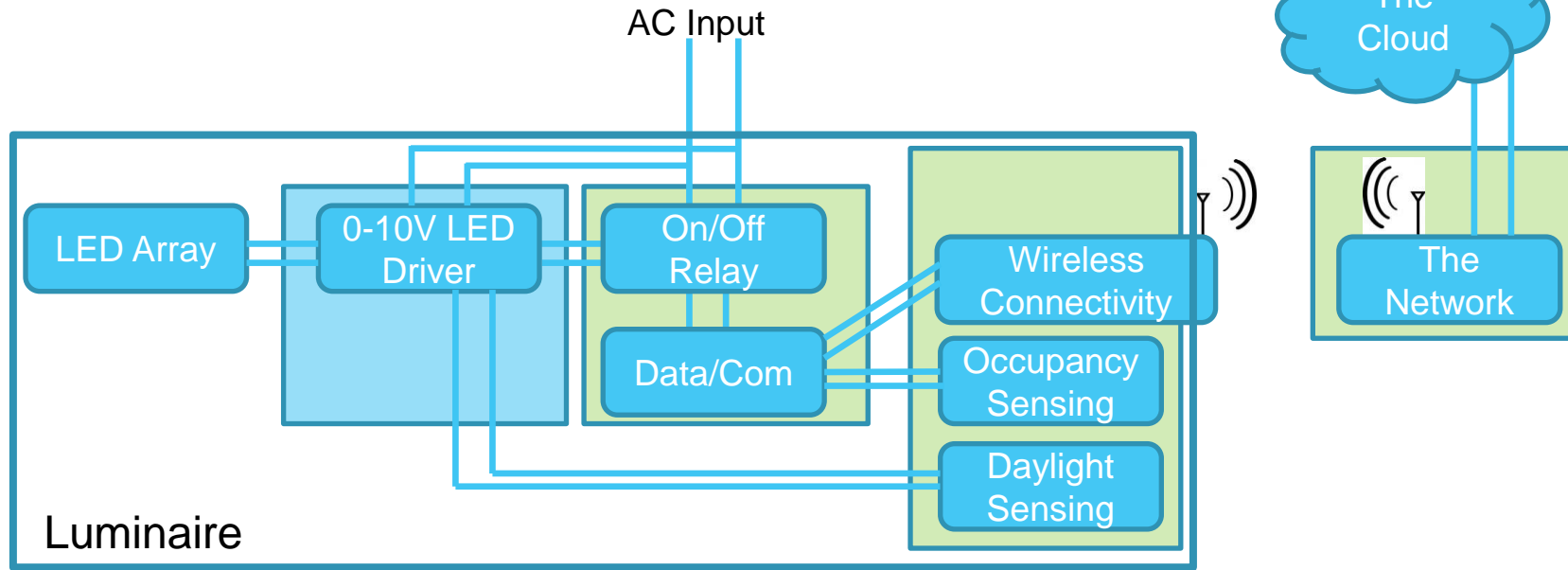
*Smart lighting fixtures will drive enhanced energy saving and make Lighting a key driver in the “Internet of Things”*

- **Lighting is everywhere where people are**
- **Focus will gradually shift from energy savings to data insights leading to new uses:**
  - Occupancy/space management
  - Building automation / control (HVAC, security, elevators)
  - Retail engagement
- **Lighting provides an opportunity for human centric data collection**
  - Luminaires become the collecting points for local information.....data nodes.....Luminaire OEMs uniquely positioned to be the carrier



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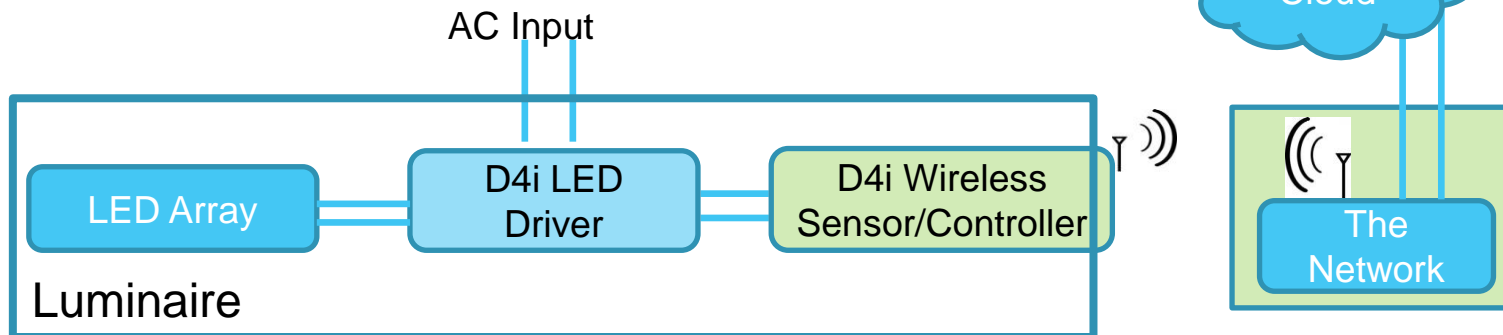
# Connected Luminaire Architecture:



## Analog 0-10V:

- Complex with many components
- Limited standardization
- No data capability from LED driver
- Reduced reliability - AC mains connection to multiple components

*0-10V Dim2OFF with Aux is in between, but still no data from LED driver.*



## Digital D4i:

- Simple with few components
- Standardized connection for power and digital data from LED driver
- High reliability – AC mains to the LED driver only

# 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
- D4i simplifies addition of sensors and communication devices (NLC) 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



# DiiA Specifications – Published



- The following specifications can be downloaded from the [DiiA website](#)

Specification	Name	Version	Certification?
<b>Power supply specifications</b>			
DALI Part 150	AUX Power Supply	v1.1, Oct 2019	✓
DALI Part 250	Integrated Bus Power Supply	v1.1, Oct 2019	✓
<b>Data specifications for LED drivers &amp; other control gear</b>			
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	✓
<b>Specifications for control devices</b>			
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

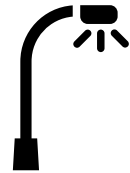
- 24V DC power supply
- Can be built into control gear, or designed as a stand-alone product
- Suitable for devices with higher-power requirements
  - e.g. City-wide wireless transceivers
- Provides 3W average, 6W peak

# DALI data specifications for control gear



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

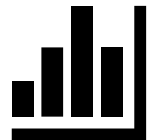
## Luminaire Data



### 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

# Benefit Summary – D4i Drivers vs 0-10V



Benefit	Driver Feature	Feature Description	0-10V	0-10V Dim2OFF w/Aux	D4i
Ease of maintenance and Asset Management	Asset management via DALI scenes	Use limited space in DALI scenes for unique vendor code and manual lookup tables to correlate to specific fixture			✓
	Asset management via MB1	Standardized method for storing vendor specific information in the driver; No lookup table required.			✓
	Memory Banks with Diagnostics Data	Data such as voltages, surges, currents and thermals made available back through NLC for analysis			✓
Ensure/monitor energy savings	Memory Banks with Power/Energy metering Data	Measured power and energy data. Supports DLC NLC QPL listing and thus qualify for utility rebates.			✓
High reliability	Integrated switching, and Low Voltage power supply	Eliminates mains protection and relay. No need for separate low voltage supply for the NLC.		✓	✓
Easy integration	Built-in DALI Bus Power Supply	Simple two wire connection from the driver to the NLC node to supply power and data			✓
System interoperability assurance	D4i Certification program	Testing assures DALI communication protocol robustness and D4i specified power and data availability to NLC.			✓

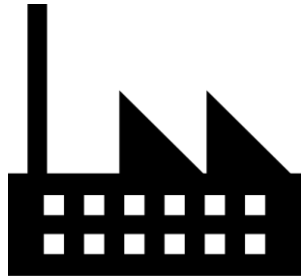
# Part 351 for control devices



- **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



# DALI data: An outdoor lighting example



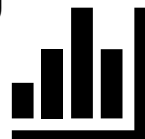
## In the factory:

Luminaire data is programmed into drivers.

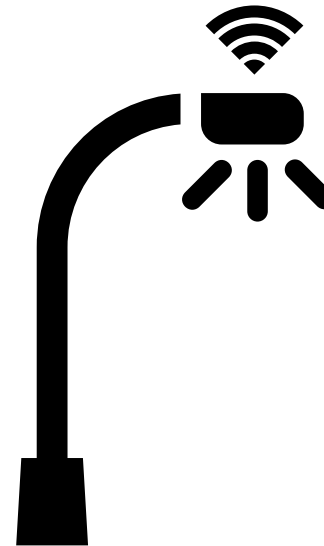
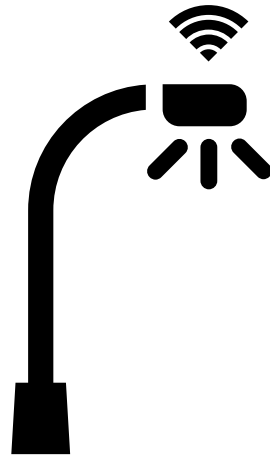
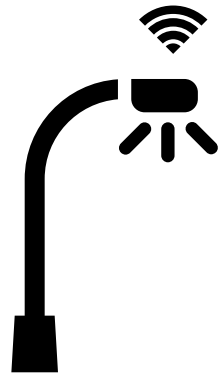
## During operation:

### Performance monitoring

- Energy usage data can be used e.g. for billing



Network



## 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



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# Technology standards driving connected lighting adoption



Introduced **North America standard** for *energy reporting, diagnostics, and asset management* for LED drivers (C137.4)



Defined **global requirements** for *energy reporting, diagnostics, and asset management* for LED drivers (D4i)



**Energy monitoring** is a *required* interior/exterior NLC system capability (V4.0)



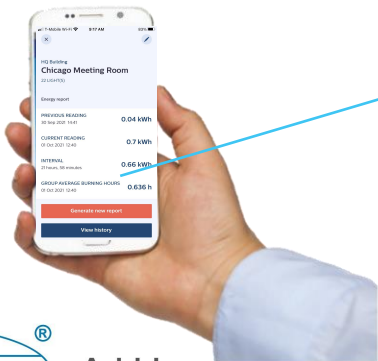
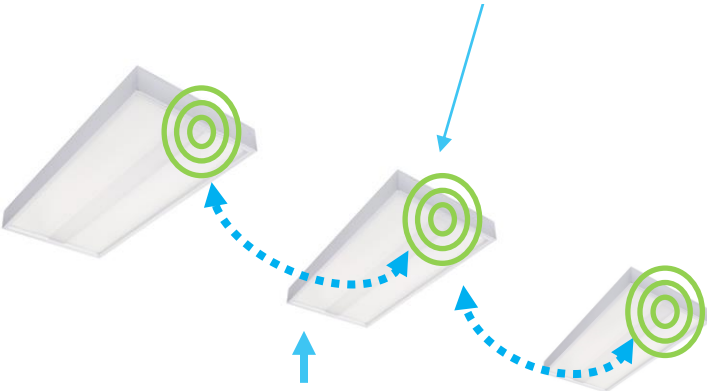
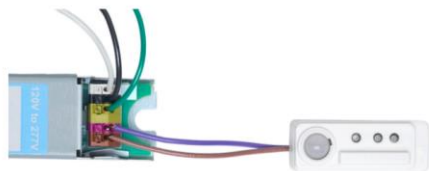
- Standardize luminaire data format (e.g. luminaire asset data)
- Encourage new usage of data
- Accelerate adoption of connected lighting
- Greater design flexibility in lighting control

## Application Examples : Benefits of D4i/DALI-2 Data

- *Next few slides show application examples from several Lighting Control system manufacturers*
- *Some of the controllers/systems are still under development as noted.*
- *Controllers may not be D4i/DALI-2 certified.*

# Indoor Application: Philips EasySense with Energy Report for a Room

Philips EasySense &  
Advance Xitanium SR - D4i LED Driver



T-Mobile Wi-Fi 9:17 AM 83%

X

HQ Building  
Chicago Meeting Room  
22 LIGHT(S)

Energy report

PREVIOUS READING  
30 Sep 2021 14:41

0.04 kWh

CURRENT READING  
01 Oct 2021 12:40

0.7 kWh

INTERVAL  
21 hours, 58 minutes

0.66 kWh

GROUP AVERAGE BURNING HOURS  
01 Oct 2021 12:40

0.636 h

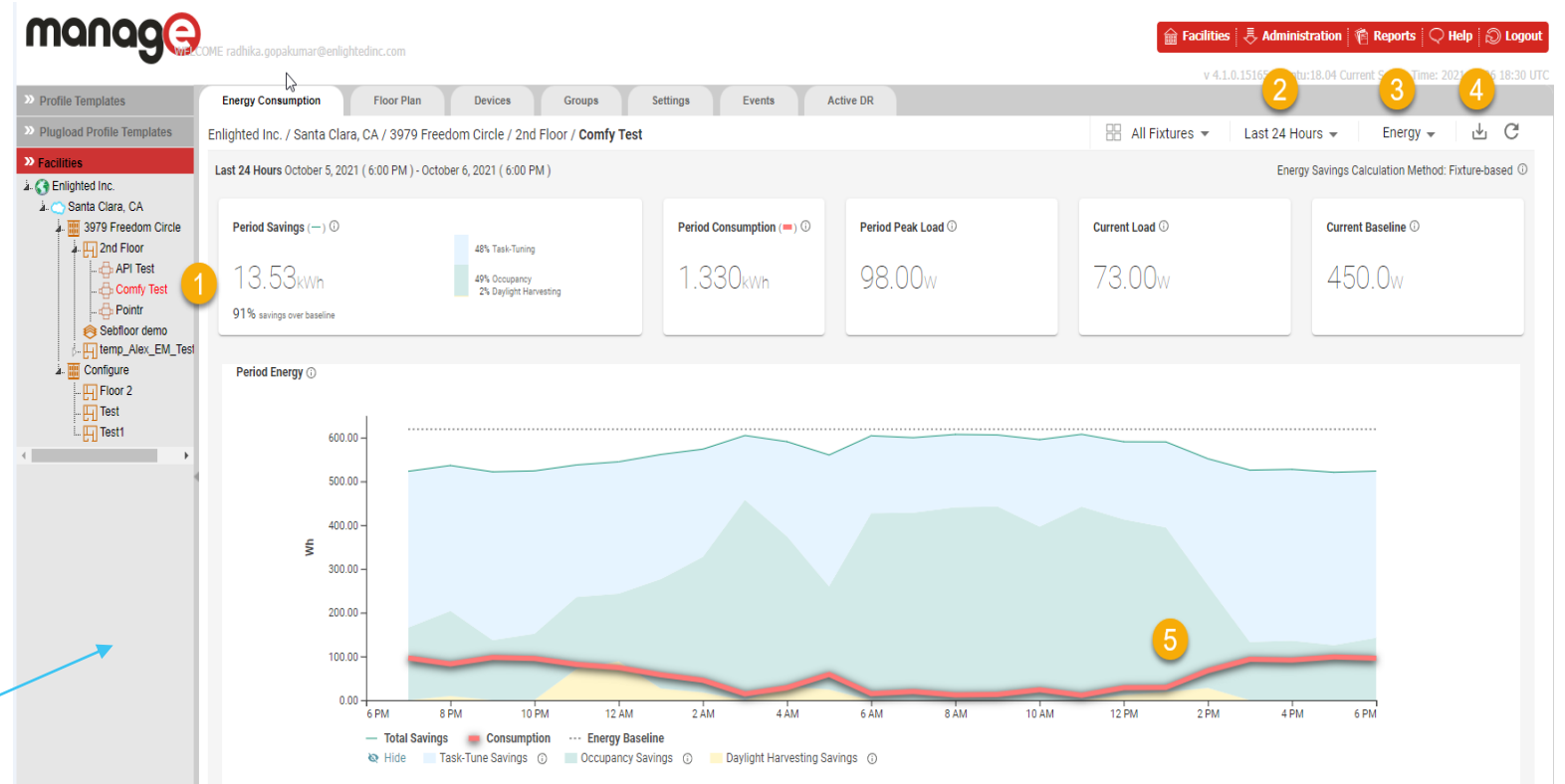
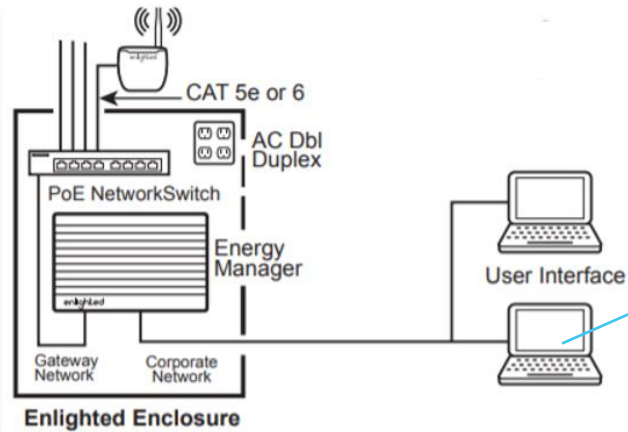
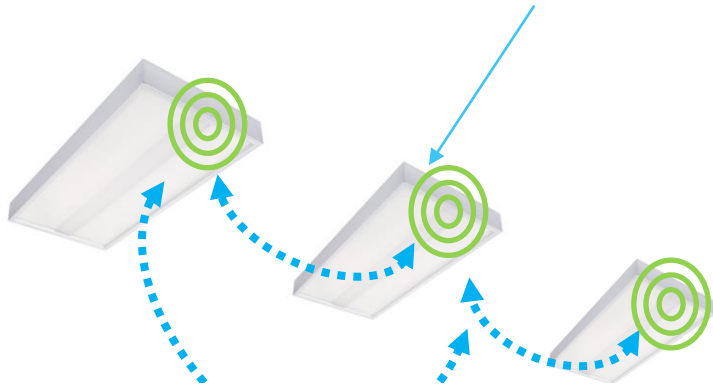
Generate new report

View history

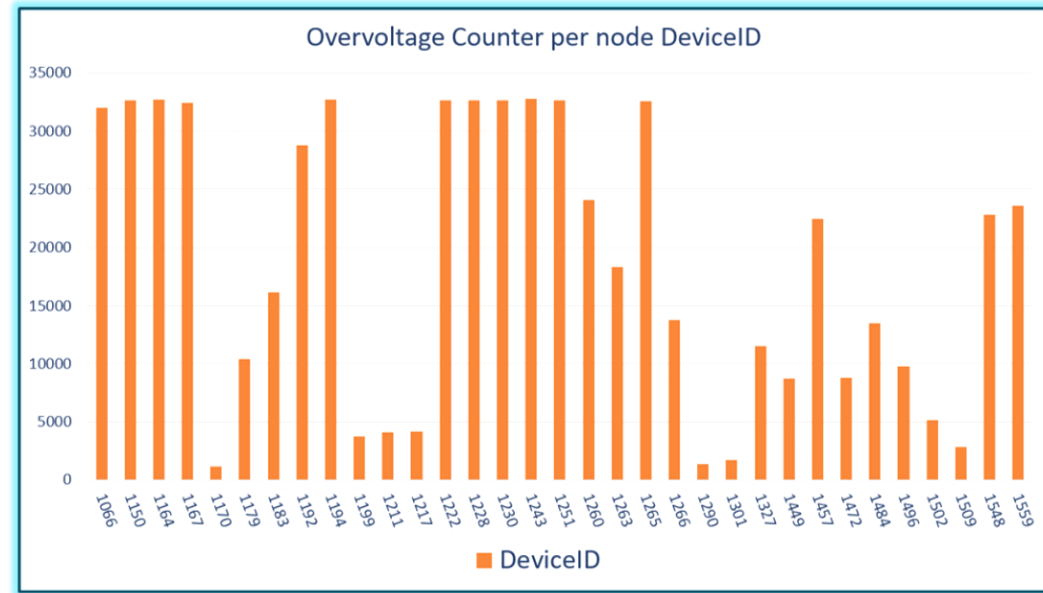
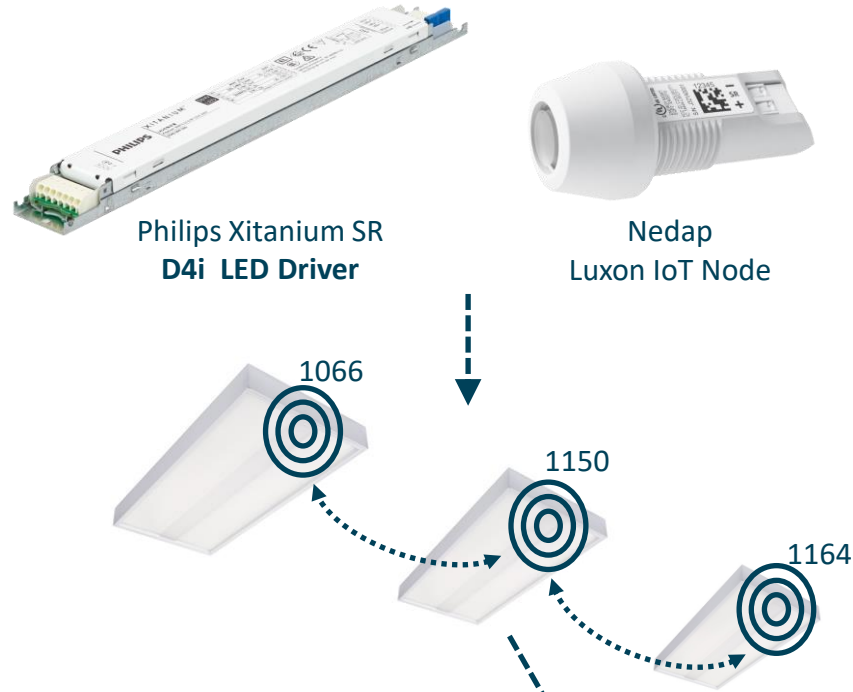
# Indoor Application: Enlighted System featuring Energy Report for full facility



Enlighted Sensor &  
Advance Xitanium SR - D4i LED Driver



# Indoor Application: Nedap System featuring Over-Voltage Diagnostics



Data from actual installation.  
Commercial Dashboard under development



# Outdoor Application: Comprehensive set of Luminaire data using McWong Wireless System

Advance Xitanium SR - D4i LED Driver



McWong DALI Wireless Fixture Controller\*  
\* Product under development / not certified



< Back DALI details	
DALI address	A0
DALI status	04, ON ✓
GTIN	781087158043
Serial	7448681585996202720
Device manufacturer	Signify
Device model	Xitanium 40W 0.1-1.1A 54V IN...
Device type	6:50:51:52
FW Version	1.0
HW Version	1.0
Manufacture Time	-
Last update (energy)	2021-04-13 13:15:39 ✓
Energy Total	0.18 kWh ✓
Active Power	30.5 W ✓
System Starts	88 ✓
Operating Time	332:39 hours ✓
Lamp On Time	3:21 hours ✓
Operating Temperature, C°	36 C° ✓
Power Factor (%)	-
Output Current	1094 mA ✓
Output Voltage	24.0 V ✓
Lamp Starts	147 ✓
Gear Failure Counter	10 ✓
Gear Status TS:TD:PL:OV:UV:GF	000000 ✓
Lamp Failure Counter	12 ✓
Lamp Status TS:TD:OC:SC:LF	00000 ✓
Input Voltage	116.0 V ✓

# Outdoor Application: Luminaire asset & power data using Synapse system

Advance Xitanium SR  
D4i LED Driver

Synapse  
Wireless DALI Controller

