

# Are you IoT Ready?

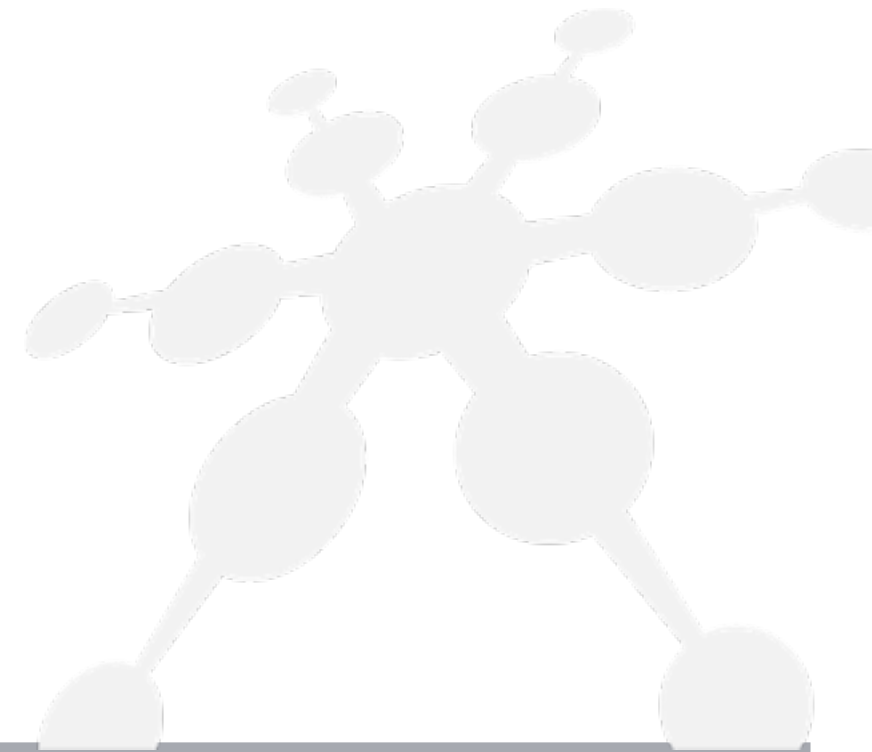
*Karl Jónsson – VP IoT Ready Alliance*



# Agenda



- Introduction to IoT Ready Alliance
  - History and why it's needed
  - Key Elements - What is specified
  - Current Members and Cost to Join
- Technical Overview
  - Connectivity Profiles
  - Interoperability
  - Connectors and Interfaces
  - Mechanical Specification
- IoT Ready vs. Powered DALI
- Future Plans
- Product Availability
- Case Study – Tridonic net4more



# Introduction to IoT Ready



# Vision



...Define the “USB” Equivalent for IoT Lighting Networks



# IoT in Commercial Real Estate



- **Customers benefit from high value IoT Use Cases**

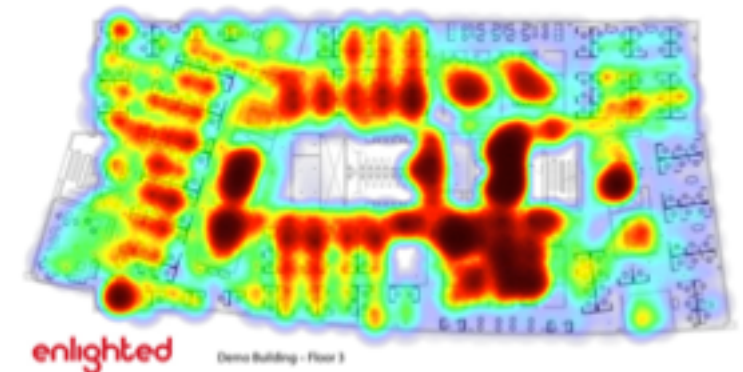
- Real Estate Consolidation & Optimization / Space Management
- Hoteling / Hot-Desk Office
- Asset Tracking
- Indoor Navigation
- HVAC Optimization
- Conference Room Management
- Janitorial Optimization
- Environmental Monitoring
- ...and more



- **Building sensors are needed for Data Gathering!**

- **LED Fixtures are ideal for sensor installs**

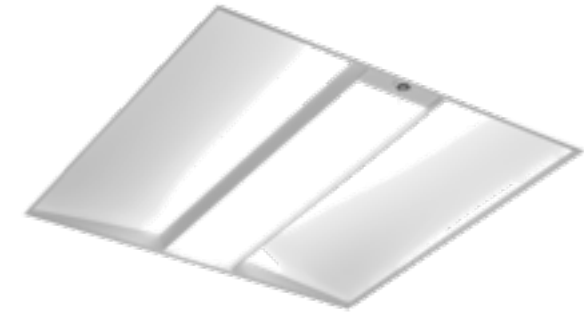
- Ceiling Location
- Spatial Density
- Power



# Customer Needs



- **Two buying centers with different needs**
  - Facility Managers (OT): focused on code and compliance
  - CIO/Operations/departments (IT): focused on IoT applications
- **IoT is in its infancy**
  - Evolving standards and technologies make customers fear adoption of any given solution
- **Single building, Luminaires from different manufacturers**
  - Any solution had to be across the industry, and not specific to a single manufacturer
- **Customers are investing in infrastructure for 15+ years with LED upgrades**
  - They need future-proof luminaires that can be upgraded easily



**Luminaire 1.0**



**Sensor 1.0**

**Sensor 2.0**

**Sensor 3.0**

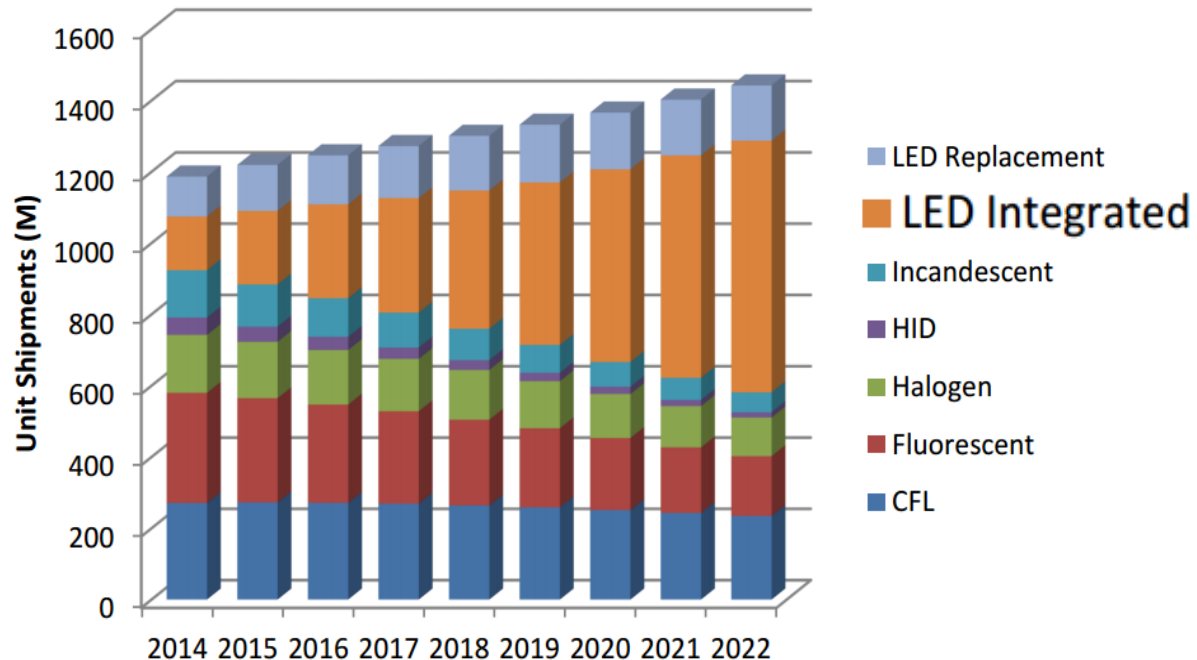
**Sensor 4.0**

15-20 years

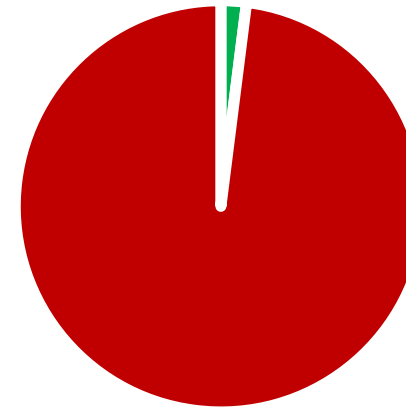


Now that's Integration!

## Rapid LED Luminaire Market Growth



## Limited Adoption of Advanced Sensors



**98%+**

of fixtures don't have  
advanced  
lighting control

**It's expensive to install sensors after luminaire installation**  
**Need to future proof LED Lighting Infrastructure**



- 0-10v Dimmable (98%)
- Smart /Digital (2%)



- DALI (75%)
- Smart/Other (25%)



- Non-Dimmable (70%)
- DALI (23%)
- Smart/Other (7%)

# LED Drivers – Relative cost comparison in "Gummy Bear" currency



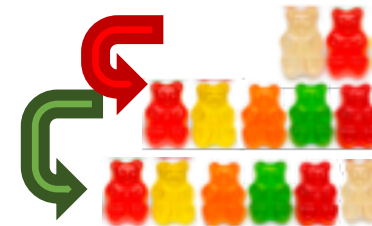
Mass Market



- 0-10v Dimmable (98%)
- Smart /Digital (2%)



- Non-Dimmable (70%)
- DALI (23%)
- Smart/Other (7%)





## Solution...

Define a luminaire-sensor interface standard so every LED fixture is ready to accept standard sensors

### **Alliance Mission:**

Industry Alliance

Independent and Neutral

Royalty Free

Non-profit

Affiliate Members join for free

# IoT Ready - Customer Benefits



- **Low Risk investment**

- Allow lighting specifiers & A&E firms to future-proof customer infrastructure

- **Specification and Design freedom**

- Allow facility managers to choose LED Luminaires and Lighting Controls **independent of future applications** and focus on immediate needs for cost and code compliance

- **Sustainability**

- Make upgrading sensors in the field extremely cost effective: as simple as changing a light bulb



# Key Elements – What's Specified

- **Mechanical Interface**

- For the case where the sensor is integrated with the luminaire
- Connectors for luminaire-integrated and luminaire-associated cases
- Optional use for exterior / plenum mounts

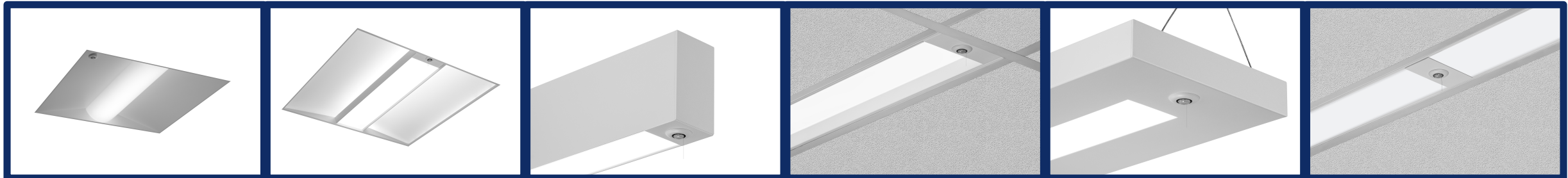
- **Electrical Interface**

- Power to the Sensor
- Luminaire <-> Sensor Communication
  - local (out-of-band) communication protocol

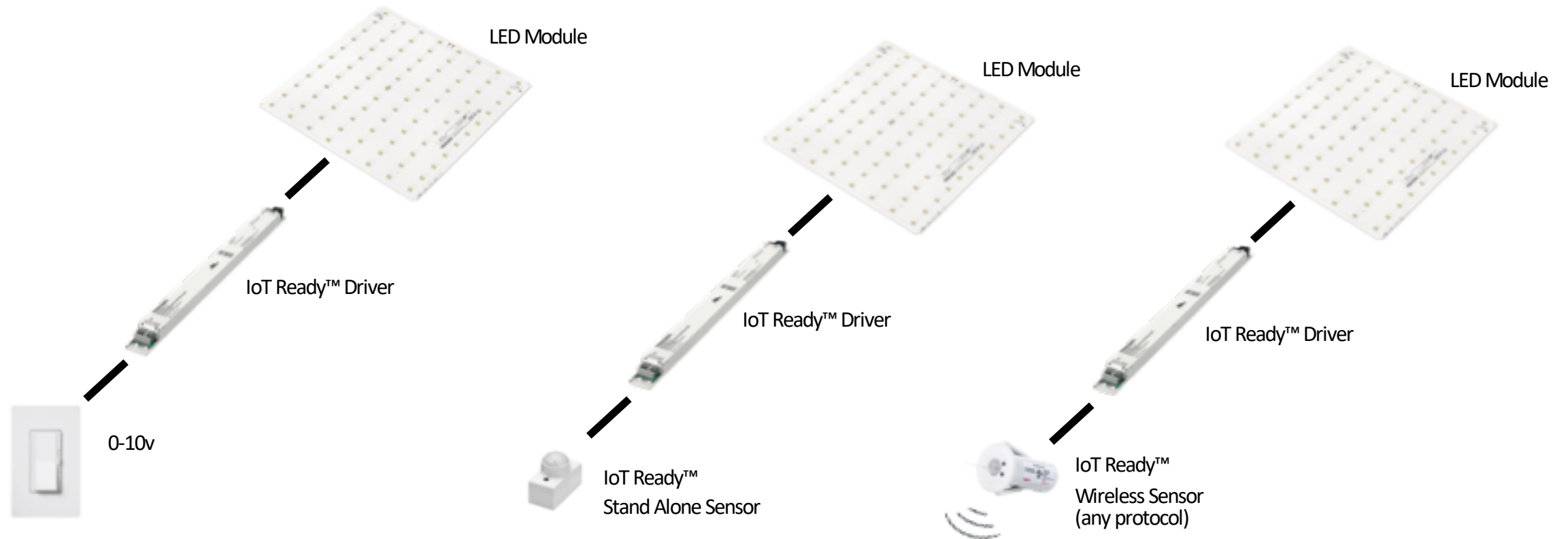
# How does the IoT Ready World Look Like?



- IoT Ready Luminaires
- Socket/connector with or without a sensors
- Can be upgraded by adding IoT-Ready sensors
- Stand-alone / Room-based / Advanced
- Can be upgraded by changing the sensors



# How does the IoT Ready World Look Like?



# IoT Ready – Design Considerations



- **Future-proof**
  - Decouple luminaire design from Sensor design
  - Allow room to grow functions of IoT systems
  - Allow for future enhancement of the IoT Ready specification
- **Wide applicability**
  - Different luminaires, sensors, networks, drivers
- **Low Cost**
  - Minimal incremental luminaire production cost
- **Efficient**
  - Minimal incremental luminaire power consumption
- **Easy Upgrade**
  - No electrician required
- **Maintain network-neutrality**
  - Any Protocol
  - Market will sort this out, eventually....



# IoT Ready – Future Proof



- **Network-agnostic**

- Topology-agnostic
  - Bottom-of-luminaire network (eg radio)
  - Top-of-luminaire networks (eg LVDC, PoE)
- Protocol-agnostic
  - Network protocol standardization still immature
  - Use cases for non-lighting IoT are still emerging

- **Scalable Data capacity**

- Interface bandwidth:
  - Initially modest, low cost
  - Allow extension beyond 100Mb/s for future applications



# IoT Ready Members



- 20 Members (and growing) as of July 2018
- Open to all interested companies
- Strong industry support: 100+ organizations expressing interest
  - Technology companies, luminaire OEMS, IoT, BMS, lighting control, Driver Manufacturers
- 1<sup>st</sup> Specification defined and released to all members on 1<sup>st</sup> year anniversary – April 2018
- Apply for membership at <http://iot-ready.org>

DOUGLAS  
LIGHTING CONTROLS

ERP  
POWER

NEUTEX LIGHTING  
LEADING MANUFACTURER OF LED LIGHTING

flex.

LUTRON®

TN TDOT  
Department of  
Transportation

HATCH  
Precision Power. Perfect Light.

selux

Q·DIS

illumPure.

Universal  
Lighting Technologies

enlightened

FSP

bridgelux®

TRIDONIC

Panasonic

arm

amatis™

FOCAL POINT®

Waldmann W  
ENGINEER OF LIGHT.

# IoT Ready – Current Membership Levels



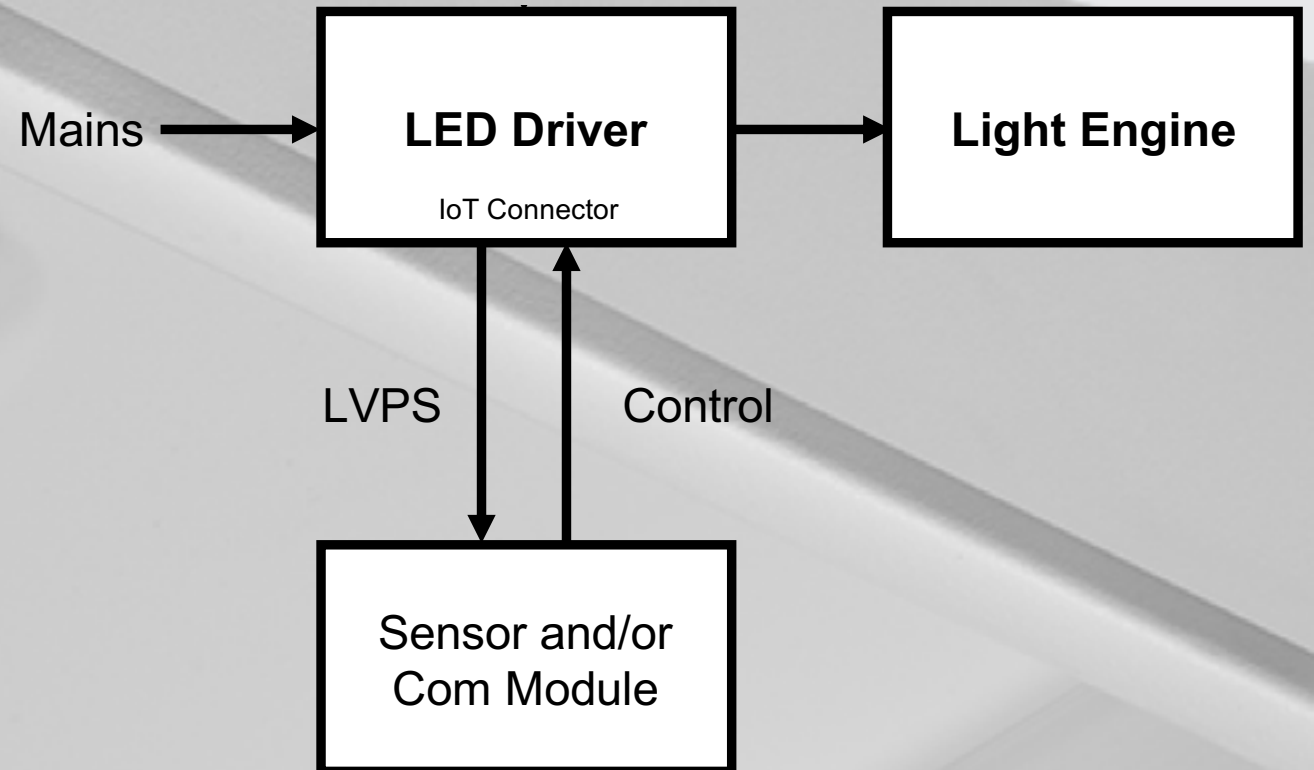
- **Adopter - \$3,000/yr**
  - Access to Specifications
  - Internal membership updates
- **Contributor - \$10,000/yr**
  - Optional participation in working groups
  - Freedom to form special interest and working groups within the framework of the alliance
- **Sponsor - \$100,000/yr**
  - Board Member
  - Strategic direction of the Alliance

# Technical Overview





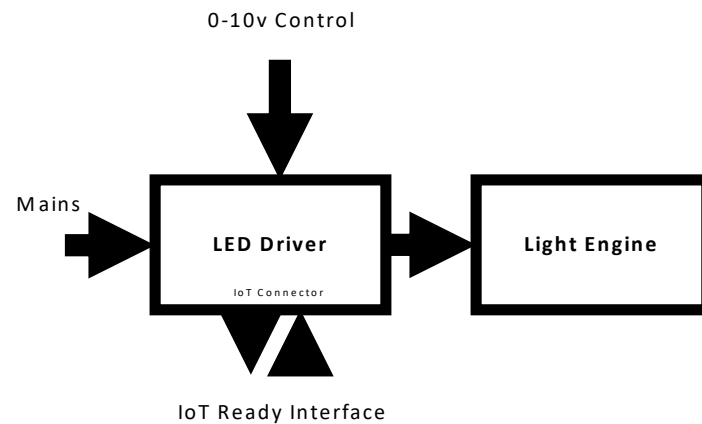
# Basic Overview



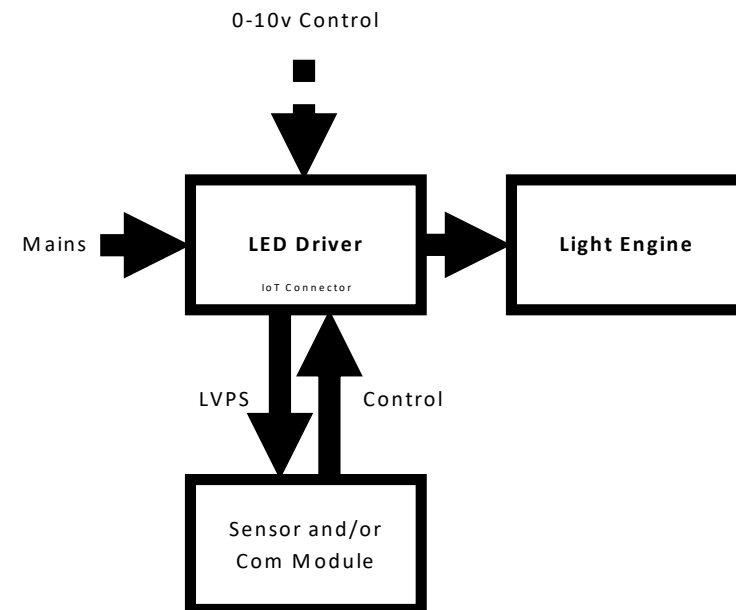
# Legacy Support



## IoT Ready Luminaire without Sensor or Com Module (no change aside from the IoT Ready Connector interface)



## IoT Ready Luminaire with Sensor and/or Com Module (added during or post installation)



# IoT Ready Profiles - Flavors



**PROFILE 0**

- Auxiliary power
- 0-10v Control



**PROFILE 1**

- Auxiliary power
- 0-10v & Digital Control
- Energy Metering



**PROFILE 2**  
*(Future)*

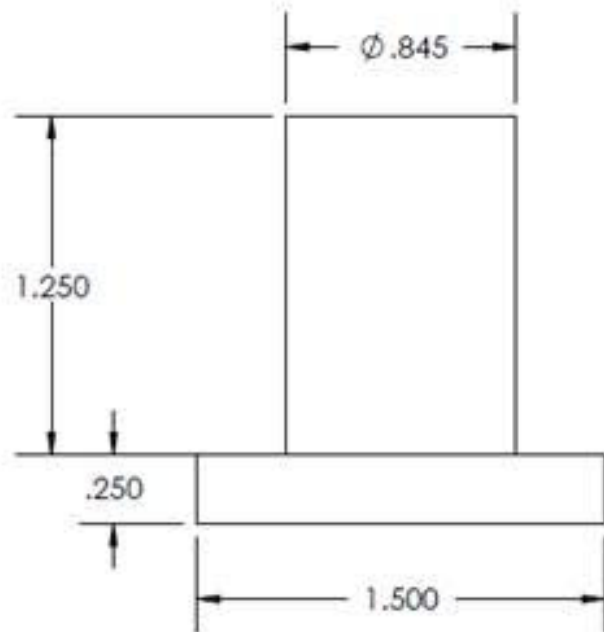
- Auxiliary power
- Digital Control
- Ethernet / PoE Support

Backwards Compatible

# Connector Types

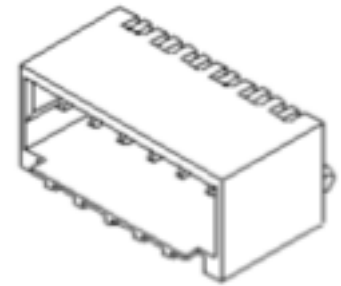


## Mechanical



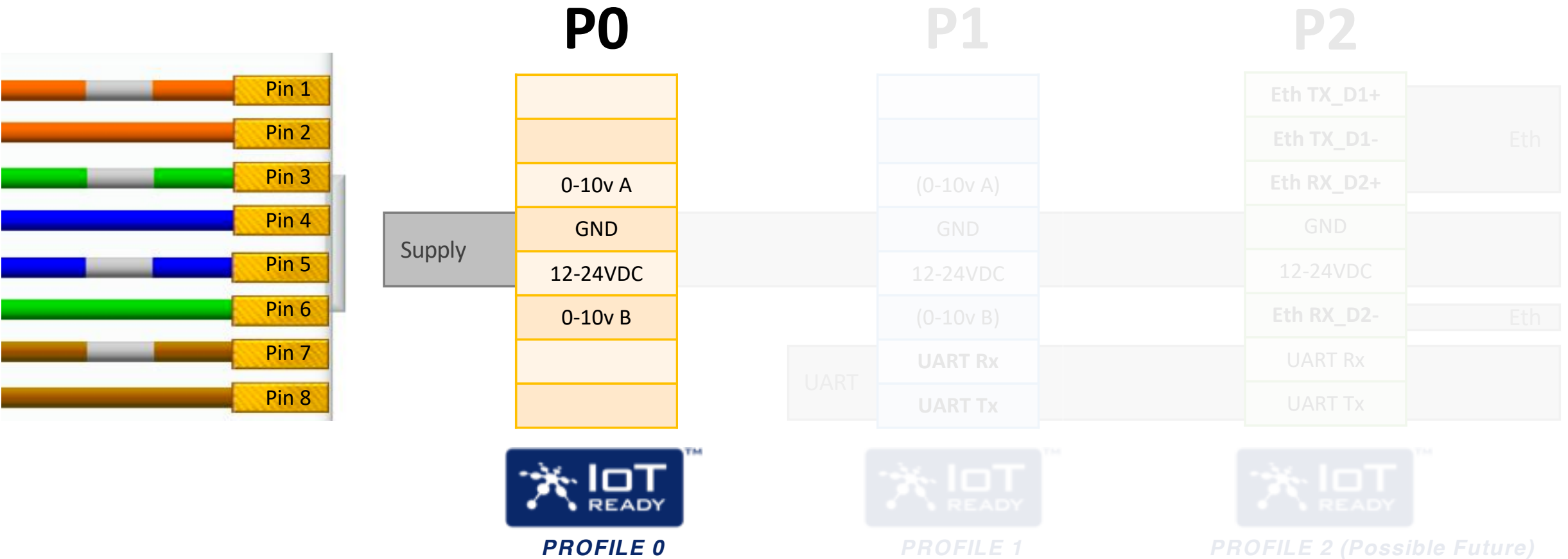
## Electrical

Type-A  
RJ-45

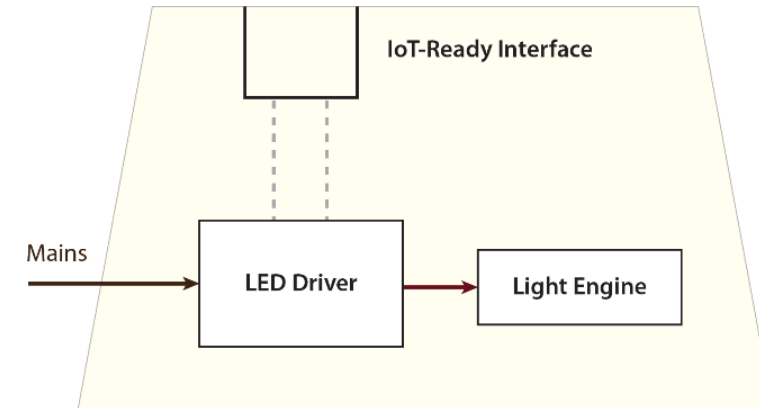
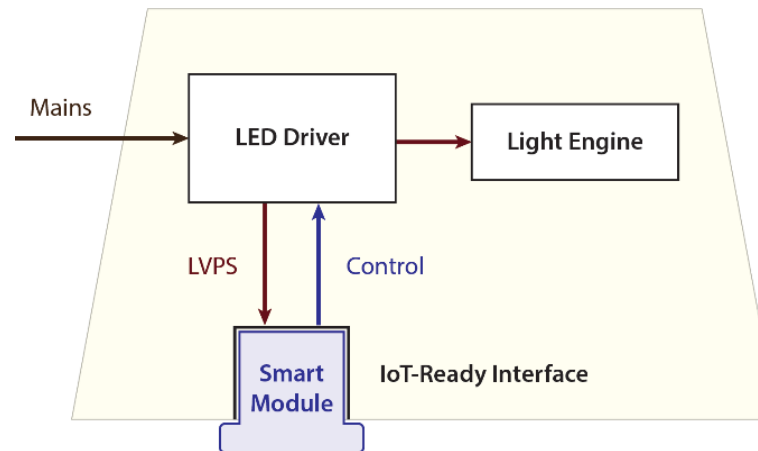
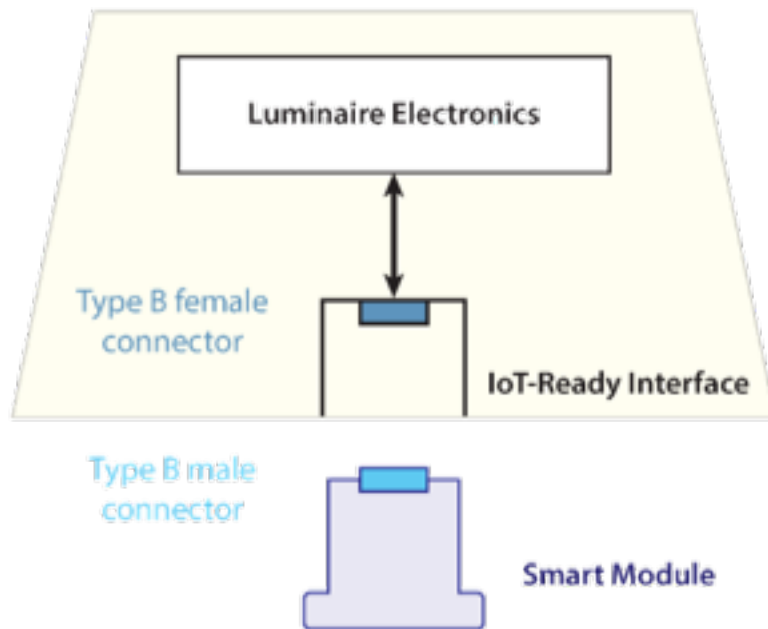


Type-B  
8-pin - 1.5mm pitch  
(Molex type 0874390800  
or equivalent)

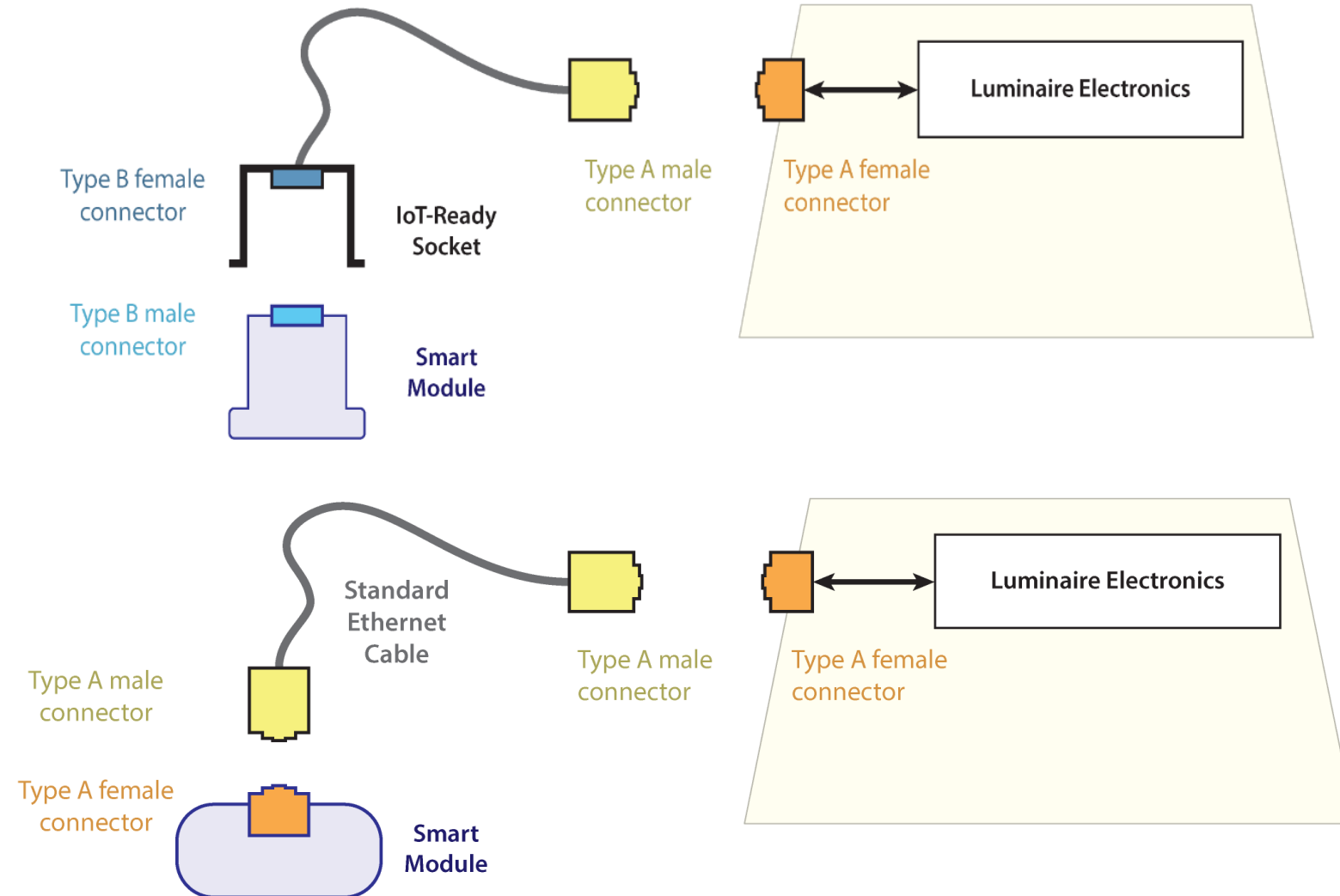
# IoT Ready – Connector Pin Out



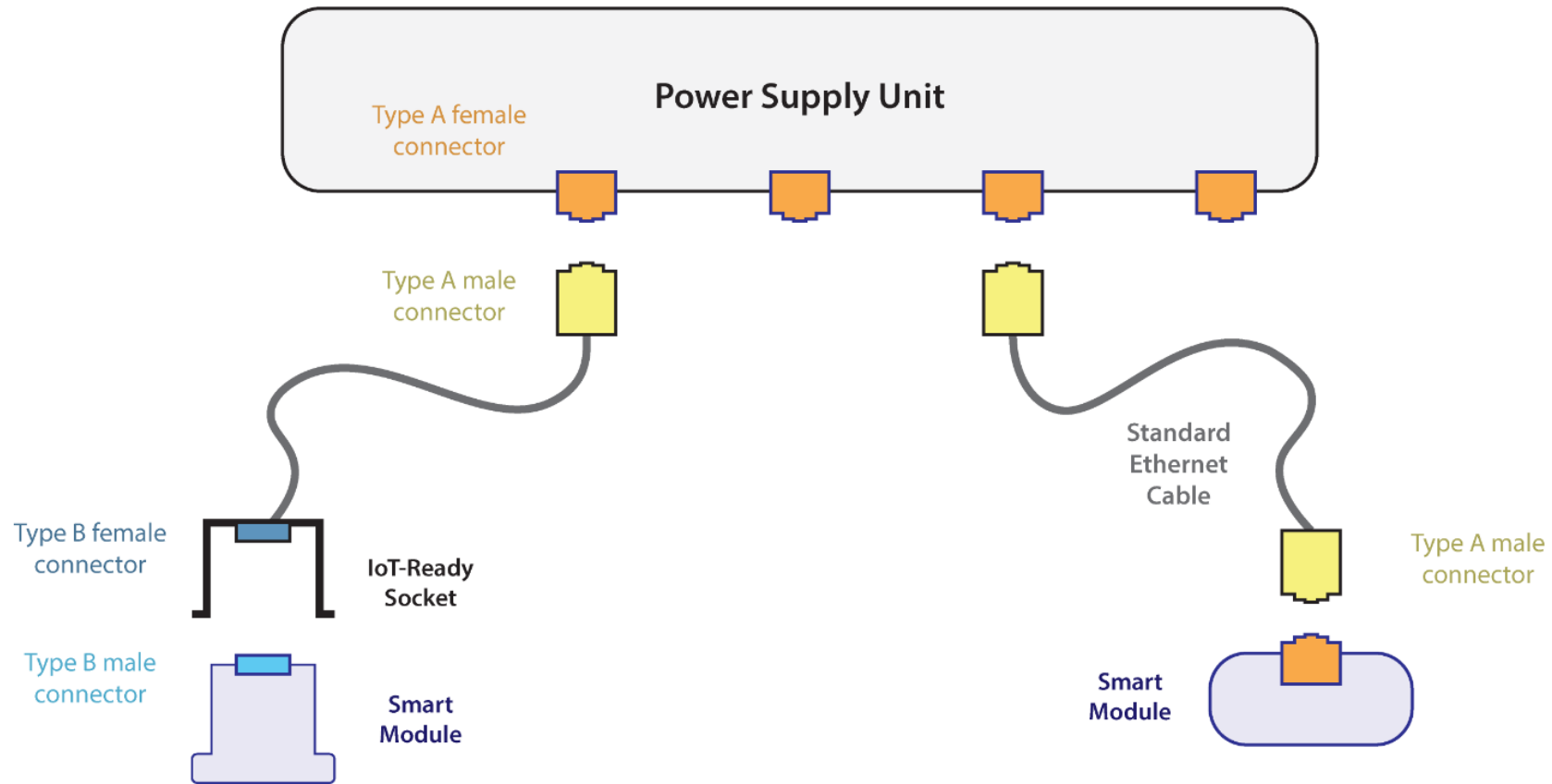
# Integrated Sensor



# External Sensor



# Sensor only





# Smart Module Interface (SMI)



- **Profile 1+ only**

- Local out-of-band Serial Protocol
  - UART was the lowest cost 2-way option
  - Supported by all micro controllers
- Works with or without 0-10v

- **Feature Highlights**

- Dimming controls
  - 2ch for Tunable White
- Energy Metering
- Driver Health
- Driver Logistics (hours on etc.)
- Driver settings
- Driver Alerts (heat, surge, etc.)
- Watchdog sensor reset

0x0000	Luminaire_Status_0x0000	No errors detected.
0x0001	Luminaire_Status_P	Luminaire power failure. AC power missing for 50 MS or more.
0x0002	Luminaire_Status_V	Luminaire power out is disabled or exceeds maximum range.
0x0003	Luminaire_Status_I	SM power out is disabled or exceeds maximum range.
0x0004	Luminaire_Status_M	LED drive power out is disabled or exceeds maximum range.
0x0005	Luminaire_Status_A	Reserved.
0x0006	Luminaire_Status_O	Reserved.
0x0007	Luminaire_Status_W	Watchdog timer expired.
0x0008	Luminaire_Status_L	Line reversal.
0x0009	Luminaire_Status_S	Voltage sag or "a dip" detected (typically when V <sub>L</sub> < 0.9V <sub>L</sub> ).
0x000A	Luminaire_Status_S	Voltage swell or "a surge" detected (typically when V <sub>L</sub> > 1.1V <sub>L</sub> ).

0x001E	0x001E	Read	N	AM
0x001F	0x001F	Read	N	AM
0x0020	0x0020	Read	N	EM
0x0021	0x0021	Read	N	B
0x0022	0x0022	Read	N	AM
0x0023	0x0023	Read	N	AM
0xFF02	0xFF02	Read	N	B
0xFF04	0xFF04	Write	NA	B
0xFF0C	0xFF0C	Write	NA	B
0xFF80-0xFF88	0xFF80-0xFF88	Read	N	B
0xFFB9-0xFFFF	0xFFB9-0xFFFF	Read	N	B

# IoT Ready vs Powered DALI



# DALI & Powered DALI

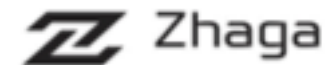


- **Original DALI:**

- Tridonic was one of the inventors and primary contributors to DALI in early 1990 based on Tridonic's original DSI bus
- DALI has been a popular open standard in Europe, covering 75% of dimmable drivers
- DALI has never had a certification program

- **DALIv2:**

- Being formed by the DIIA (Digital Illumination Interface Alliance)
- Will be certifiable
- Will allow enriched feature set (DALI objects)
- Will allow optional self-powered version (eg. Powered DALI)
- Close Alignment with Zhaga Alliance



- **Powered DALI**

- Self powered DALI -> LED Driver supplies it's own DALI power
- Mostly used for inter-luminaire Sensor/Driver interface
- Popular flavors include Philips SR and Osram Dexal
- Flavors expected to merge as a single standard under DIIA

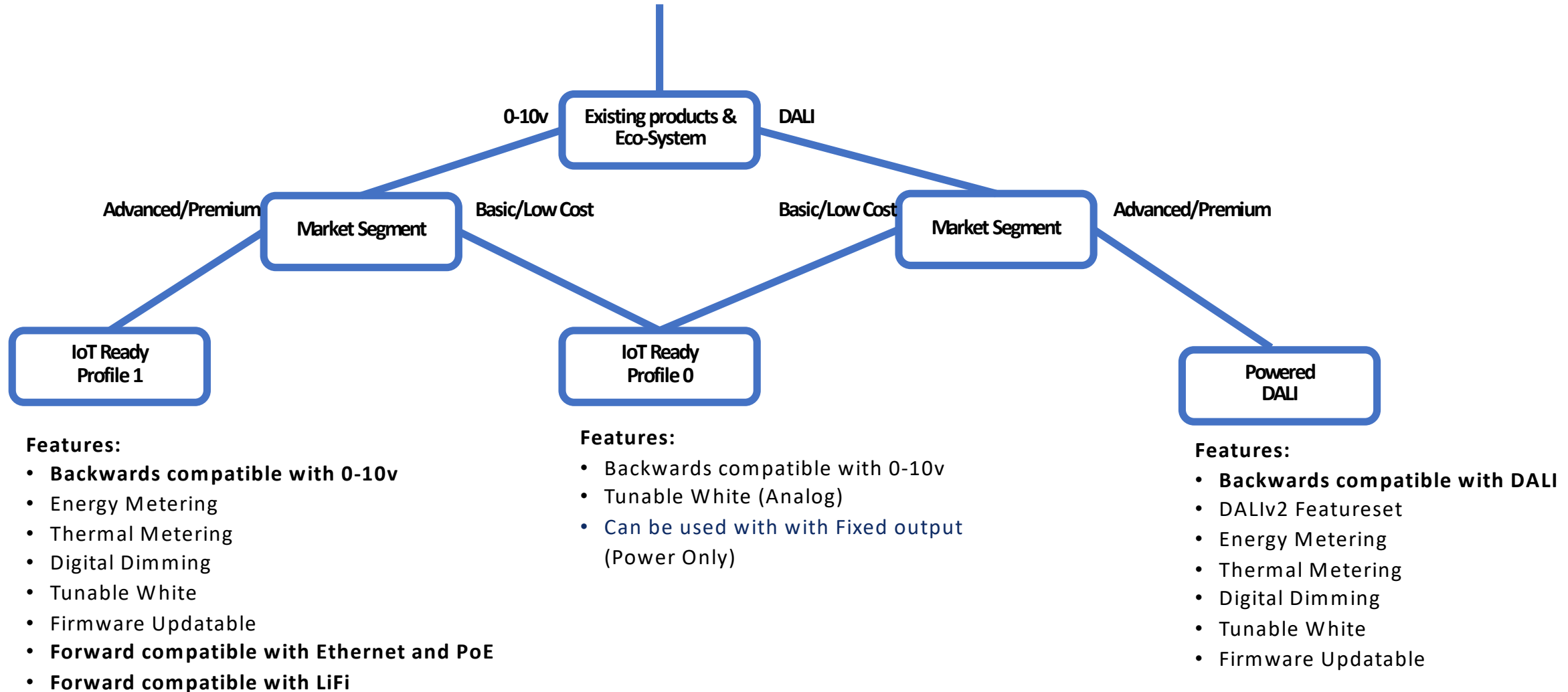


# Powered DALI vs IoT Ready



- **Common benefits**
  - Provide Powered interface to a sensor/communication device
  - Easy in-field replacement
  - Protocol independent
- **Powered DALI benefits over IoT Ready**
  - Legacy support for DALI
  - 2-Wire interface for power and 2-way communication
  - Rich set of defined lighting features / objects
  - Established eco-system for indoor in EU and Outdoor EU/US
- **IoT Ready benefits over Powered DALI**
  - Legacy support for 0-10v
  - Forward Compatible with high speed applications
  - Scalable to Wired infrastructures including LVDC, PoE and Ethernet
  - Scalable for LiFi
  - Lowest cost possible, addressing mass market
  - Object layer designed to grow beyond lighting features

# Selection Tree



# Future Plans



# IoT Ready Alliance - Agenda for 2018/2019



- Profile 2 (Ethernet / PoE Support)
- Alignment with industry alliances (DIIA, NEMA, Zhaga etc.)
- Integrated sensor connector
- Certification program
- Membership growth

# Product Availability





# Product Availability



- **Luminaires**

- Broad variety of existing portfolio from major suppliers due to the Enlighted Legacy.
- More dedicated IoT Ready luminaires expected in 2018

- **Drivers**

- 6 LED Drivers from various members launched at LFI 2018
- Multiple driver portfolios available soon including family of P0 drivers from ULT and Tridonic

- **Sensors**

Available from Enlighted today.

- Tridonic and other members launching more sensors and system options in 2018



A faint, light gray background graphic on the left side of the slide, depicting a network structure with a central node and several branching nodes, some of which are further connected to smaller nodes.

# Thank you!

Please join us at  
<http://iot-ready.org>

