

# Design Considerations for PoE Lighting Networks

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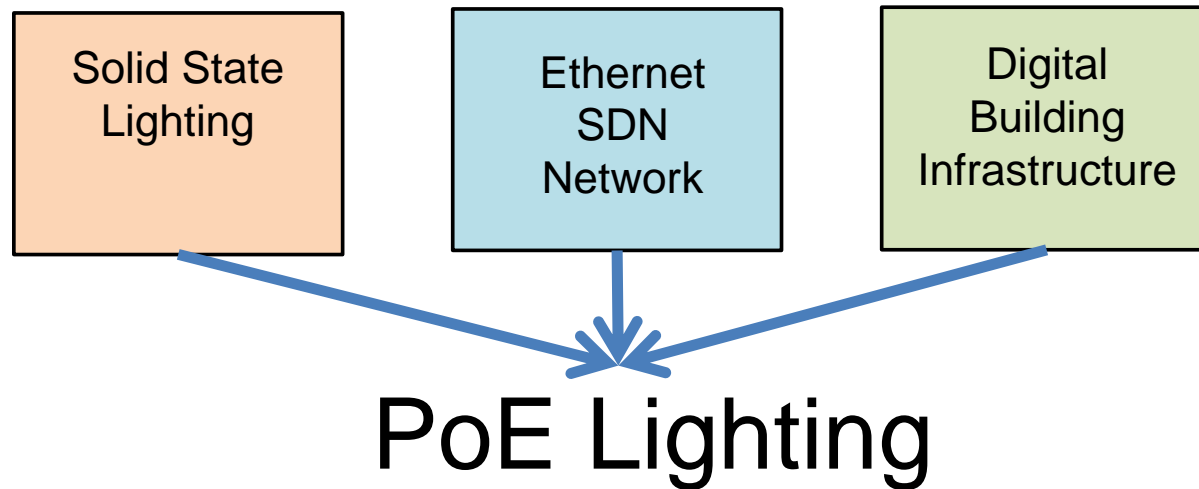
Hubbell Premise Wiring

# Design Resources

- It Takes a Team
  - BICSI ICT
    - RCDD (design), INSTC – TECH (installation)
  - NCQLP Lighting
    - National Council on Qualifications for the Lighting Professions
    - LC (lighting certified)
  - Networking
    - Cisco CCNA, CCDA, or equivalent
  - Licensed Electrician

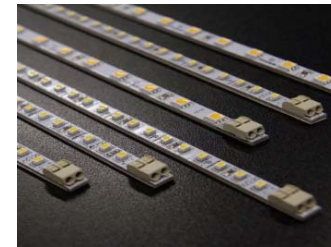


# Technology Merge

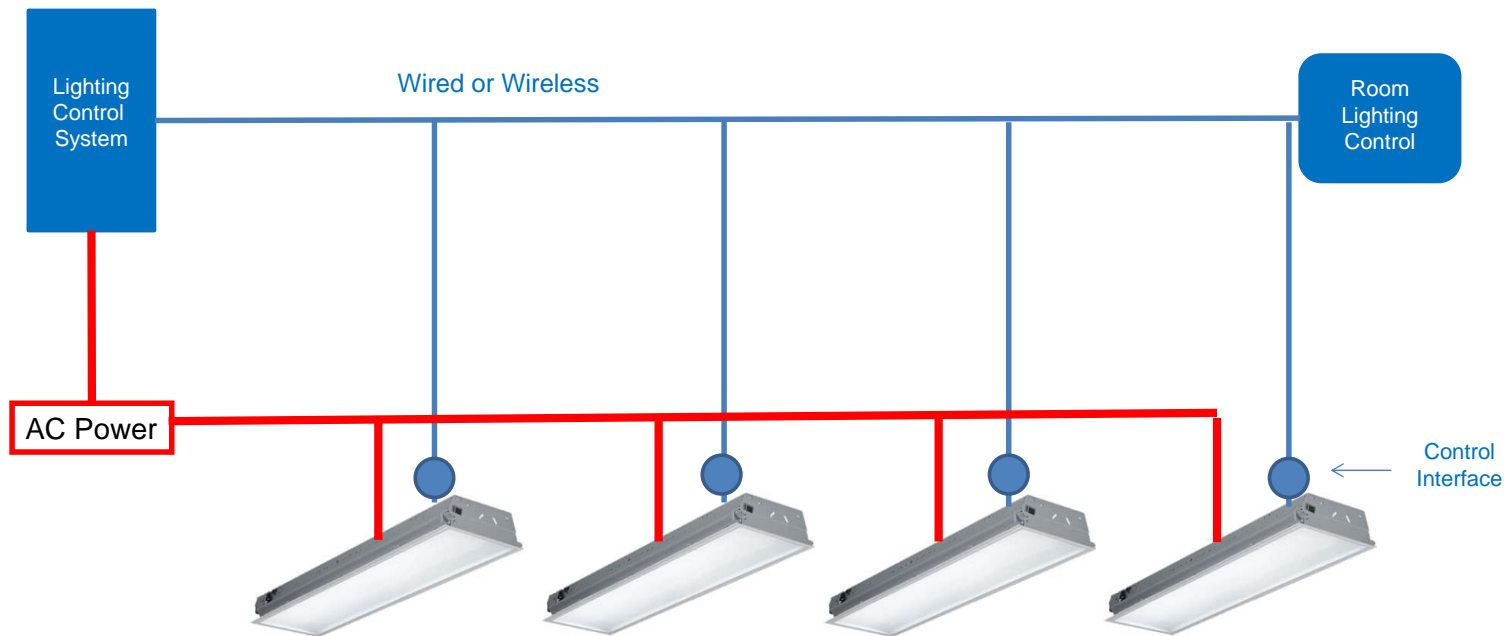


# Solid State Lighting

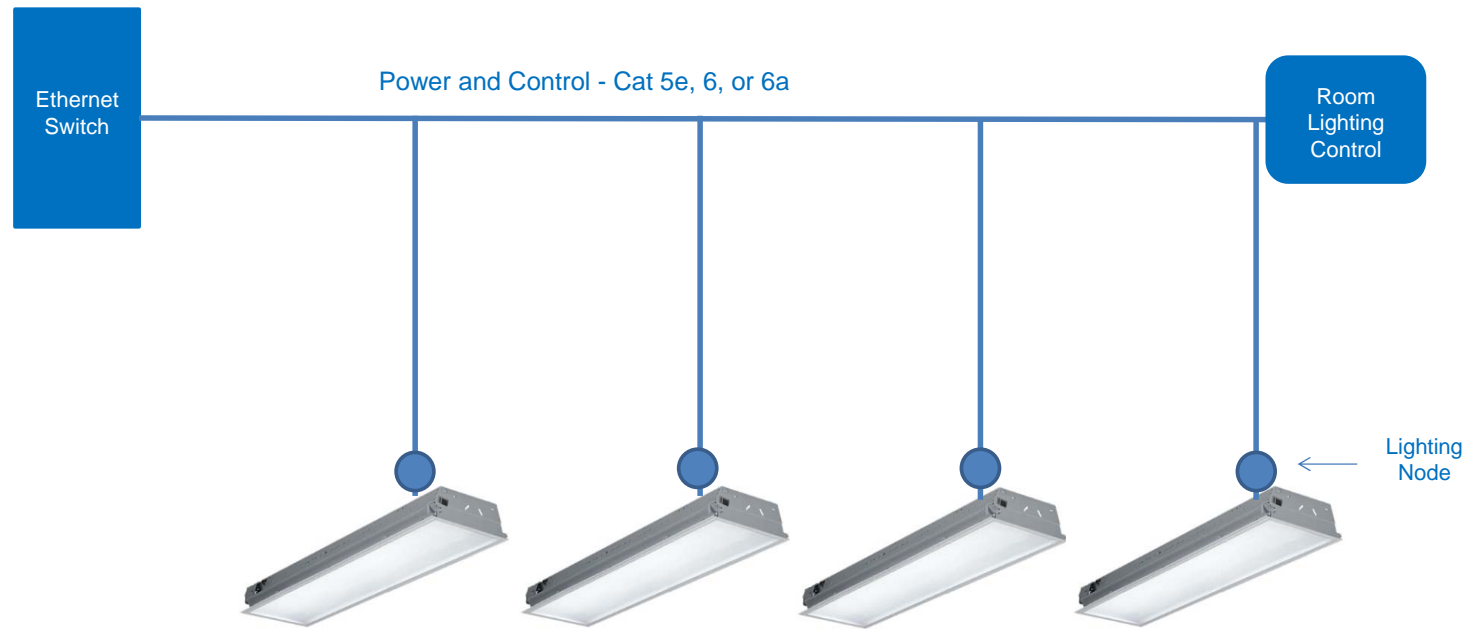
- No Lamps
- LEDs
- Traditional
  - AC Electrical Facility
  - Driver
- PoE
  - DC
  - Network Ethernet Connection
- Luminaires Require UL



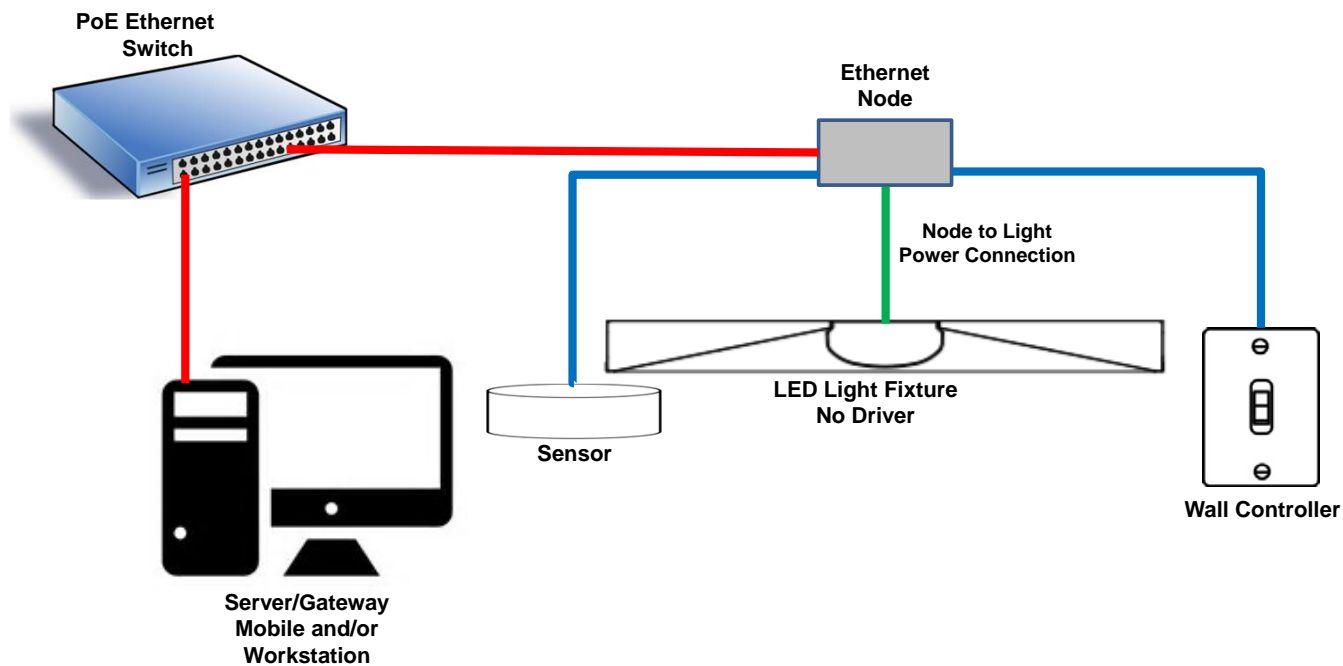
# Traditional Lighting Control



# PoE Lighting Control



# Architecture



# PoE Switches

Type	Standard	Max Current	Power Pairs	PSE	PD	Voltage	Date
PoE Type 1	802.3af	350 mA	2	15 W	13 W	44-57 V	2003
PoE + Type 2	802.3at	600 mA	2	30 W	25.5 W	50-57 V	2009
PoE ++ (4PPoE) Type 3	802.3bt	600 mA	4	60 W	51 W	50-57 V	2018
PoE ++ (4PPoE) Type 4	802.3bt	960 mA	4	100 W	71 W	52-57 V	2018
UPOE	Cisco	600 mA	4	60 W	51 W	42.5-57 V	2011

**Note:** Universal PoE (UPOE) was developed by Cisco in 2011. It ultimately became the 802.3bt (Type 3) standard when ratified Sept. 2018.

PD Available Power at 100m w/ 24AWG Cat. 5e





# PoE Switches

## Read the Specs

Switch manufacturer “A” has a 60W 24 port PoE switch with 820 available PoE power.

- 13 ports at 60 watts each ... or ... 9 ports at 90 watts each

Switch manufacturer “A” offers a dual power supply option providing 1640 watts available PoE power.

- 24 ports 60 watts each ... or ... 18 ports 90 watts each



# Common PoE Ethernet Switches



CDB-8U

- 42U Cabinet Density
  - 20 switches
  - 160 ports
  - Special Rack Mount Kit
- Plenum Rated



CDB-3850-24U-L

- 42U Cabinet Density
- 16 switches
- 384 ports
- 4 Point Mount Kit

## Design Considerations:

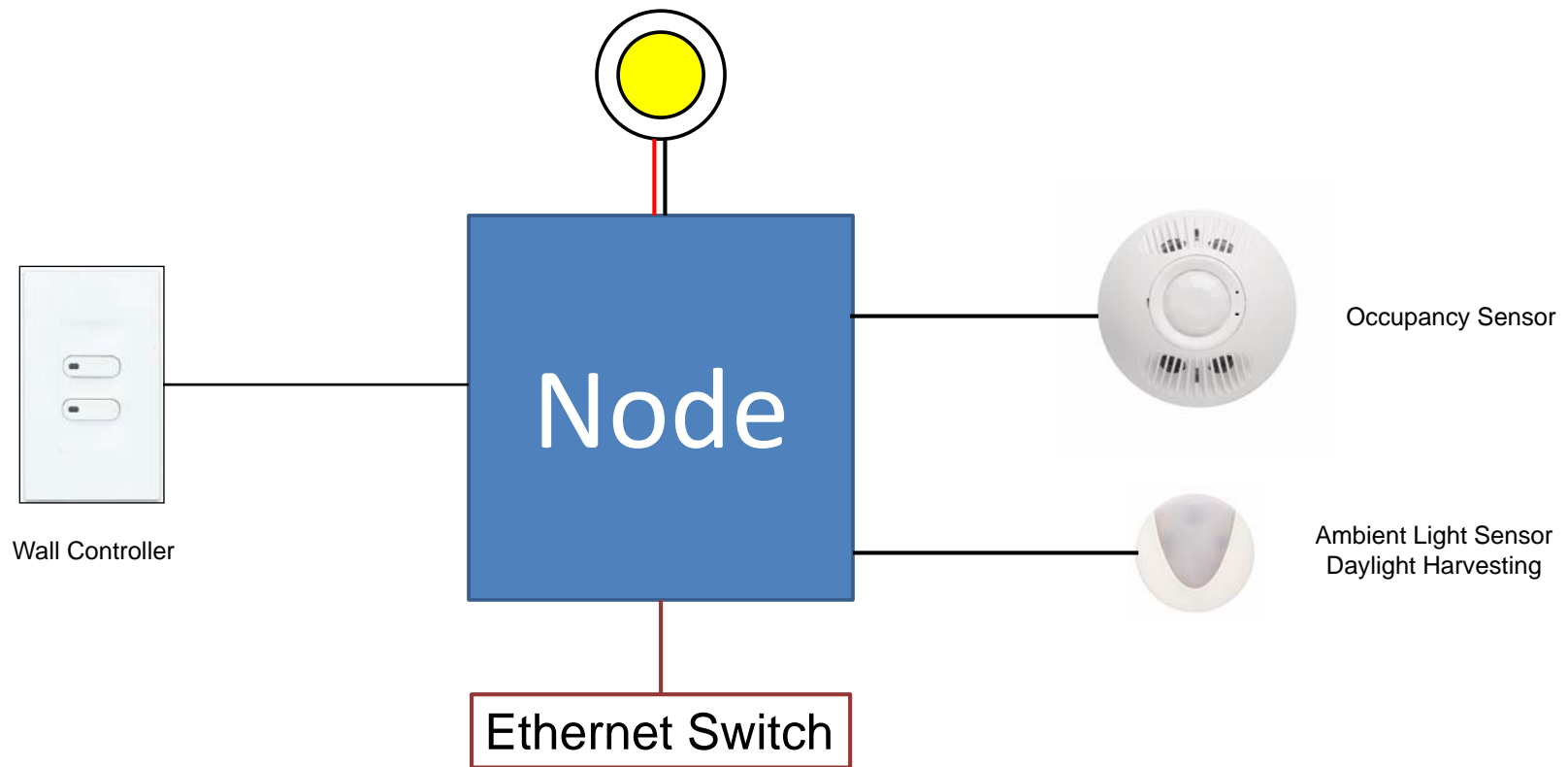
AC Power, Air Space (cooling), Patch Panels, UPS



# Node

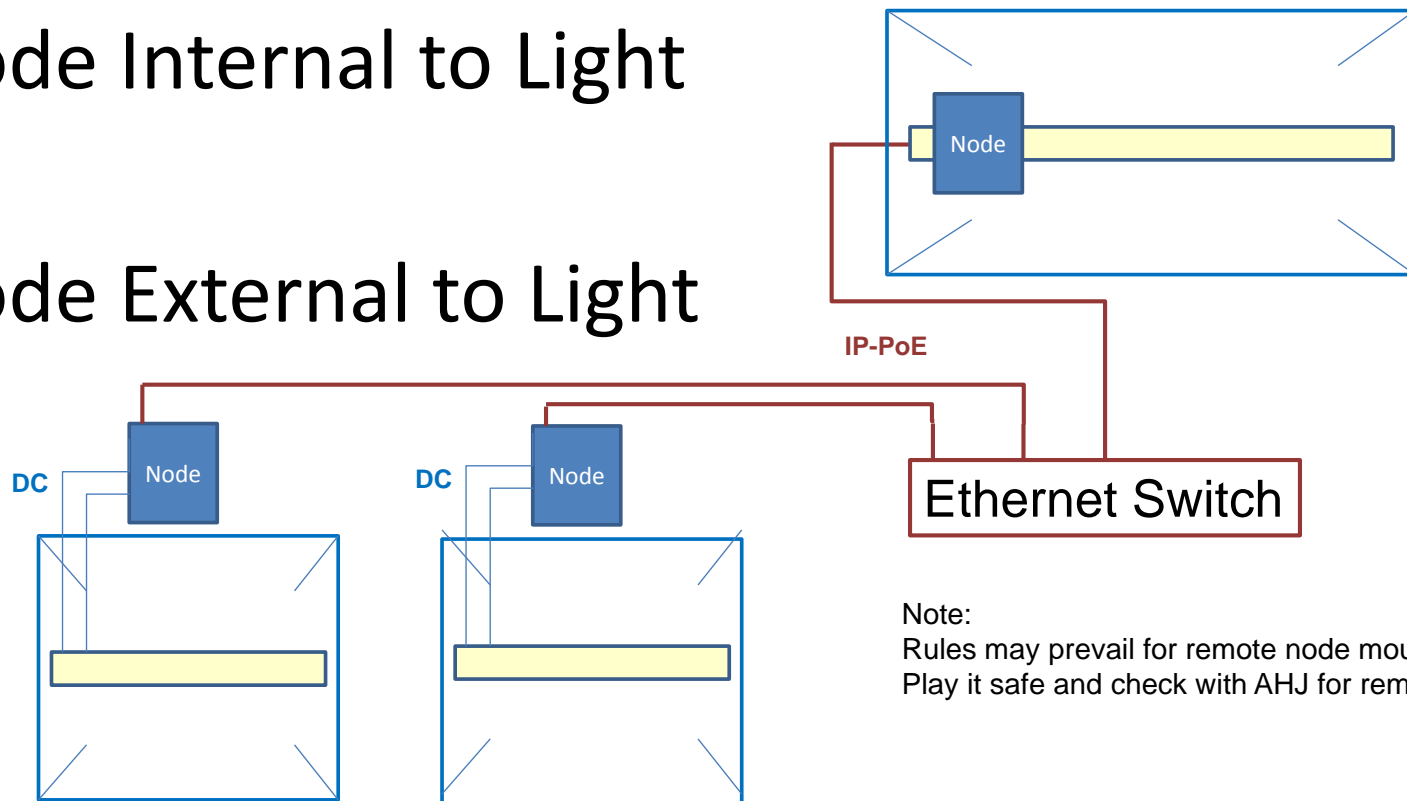
- Ethernet Network Interface
- Node Connectivity
  - Ethernet PoE
  - Lights
  - Wall Control (on, off, dimming)
  - Sensors
  - Additional I/O
    - 24VDC
    - Relay control
    - Ground
- Common Sensors
  - Occupancy / Vacancy
  - Ambient Light
    - Daylight Harvesting
- Common Wall Control
  - Momentary Push-Button
    - On, Off, Dimming
    - Gestures
- Plenum Rated

# Node Connectivity



# Node Connectivity

- Node Internal to Light
- Node External to Light

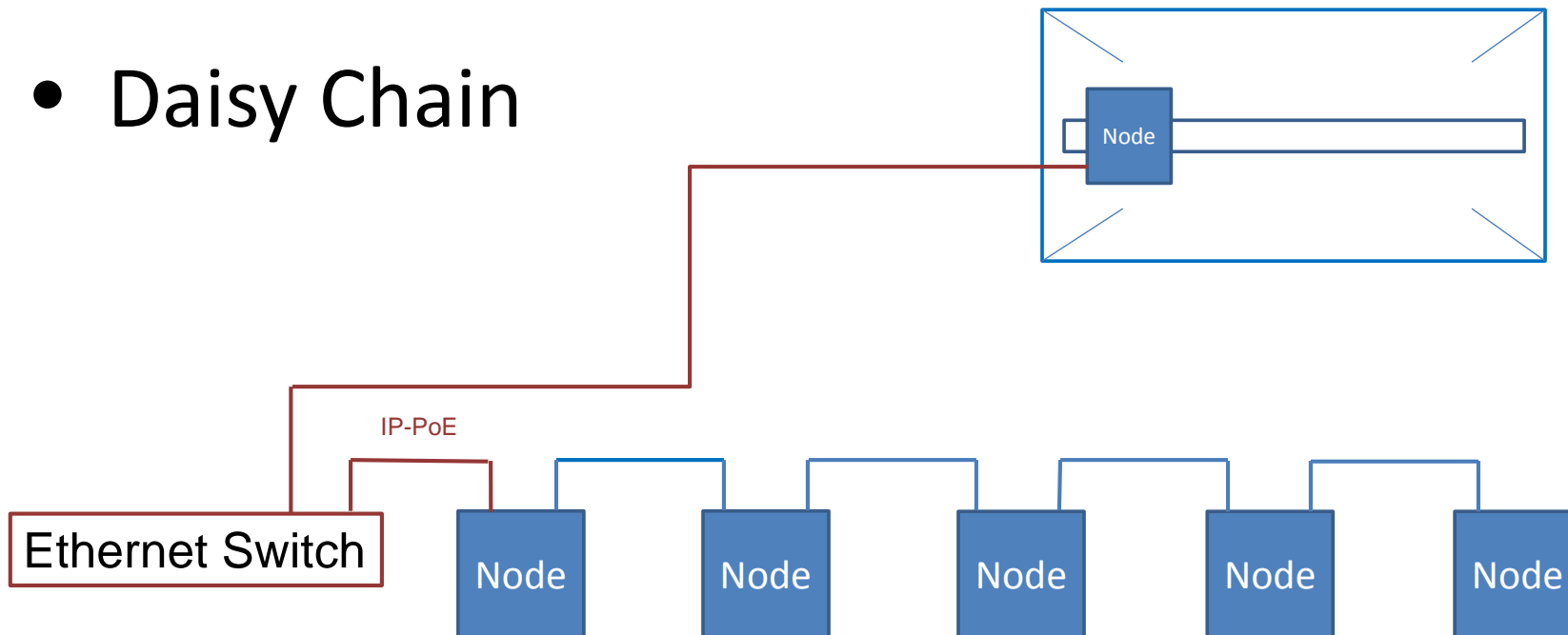


Note:  
Rules may prevail for remote node mounting.  
Play it safe and check with AHJ for remote nodes



# Node Connectivity

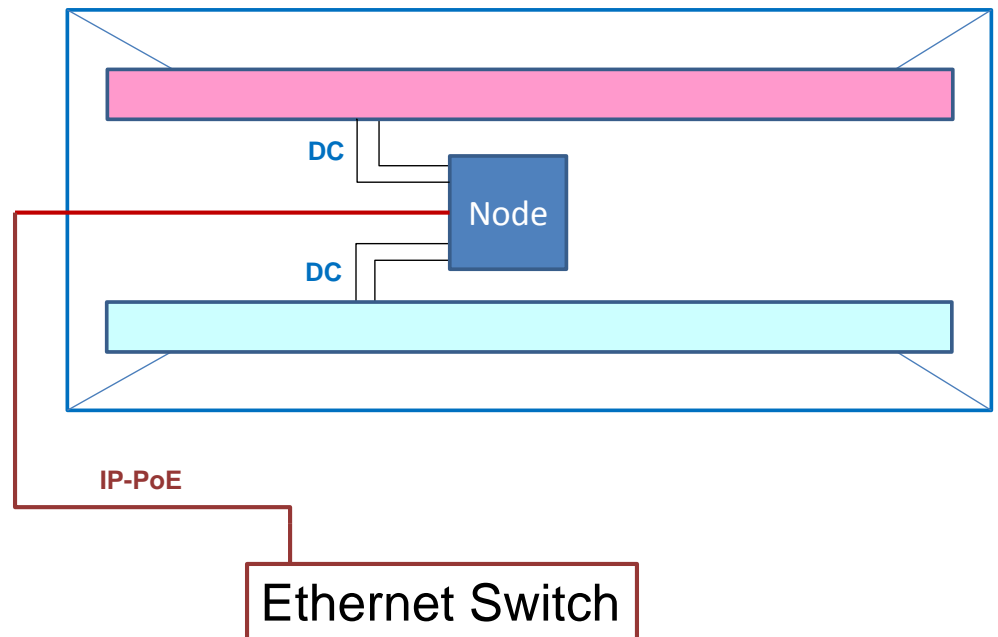
- Daisy Chain



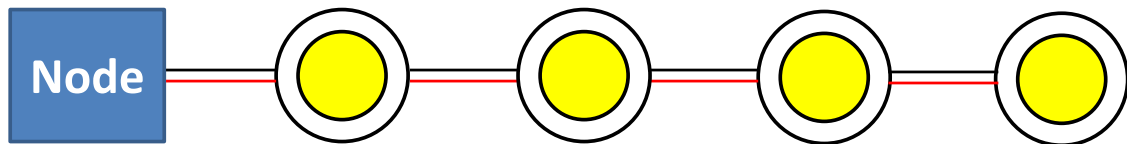
# Node Connectivity

## Tunable White

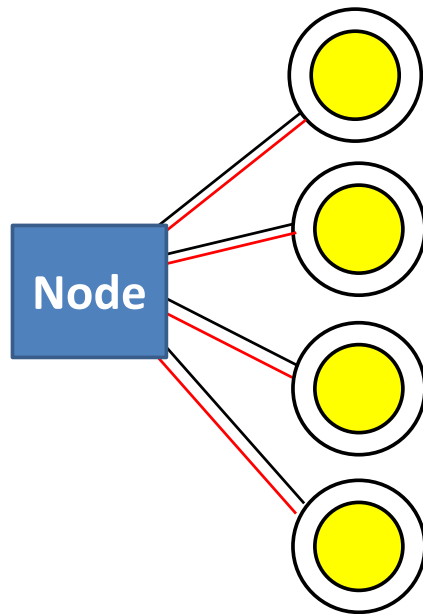
- 2 light connections
- Different color temperatures
- Each connection addressable
- SDN
- Match sunlight
- Circadian rhythm



# Node Connectivity

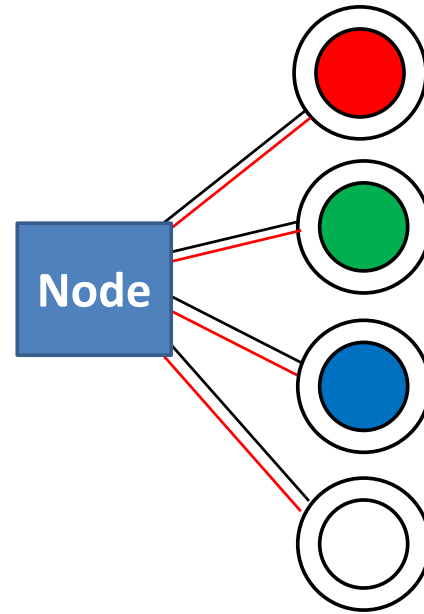


String is addressable, but not individual lights



All lights addressable

Total lights per node  
cannot exceed PD  
power budget





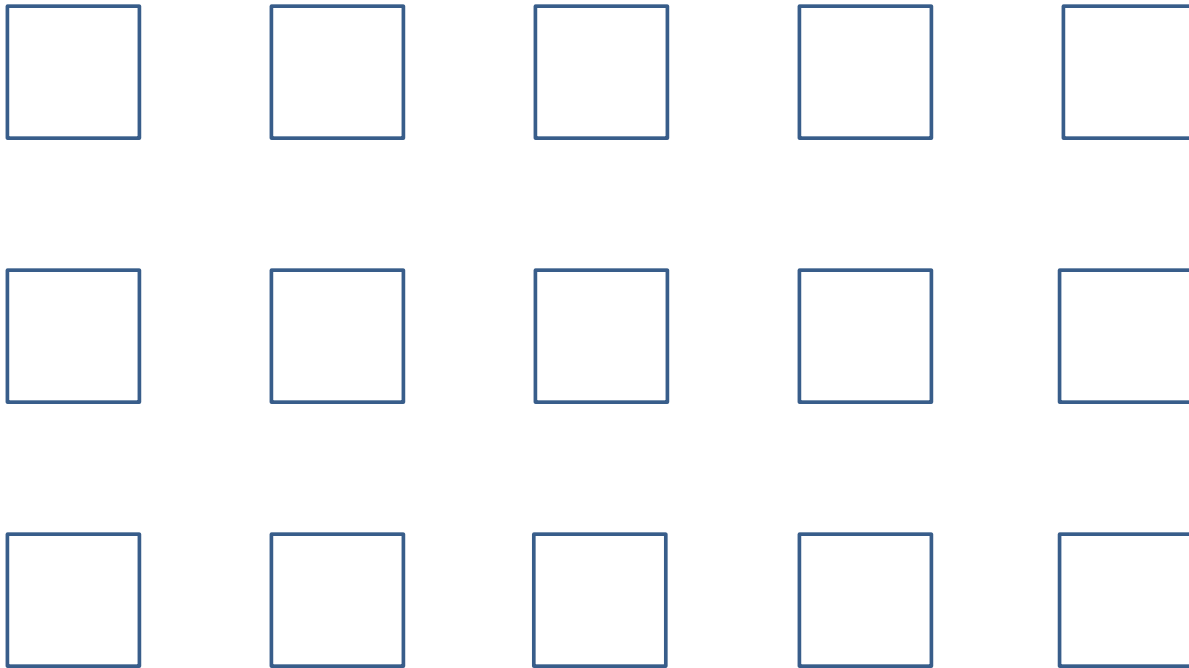
# Software Defined Network

## More Than On, Off, and Dimming

- Advanced Controls
  - Spaces
  - Actions
  - Schedules
  - Devices
  - Policies
- Advanced Programming
  - Application Programming Interface (API)
  - Polling
  - Web Hooks



# Addressable Lights



Software Defined

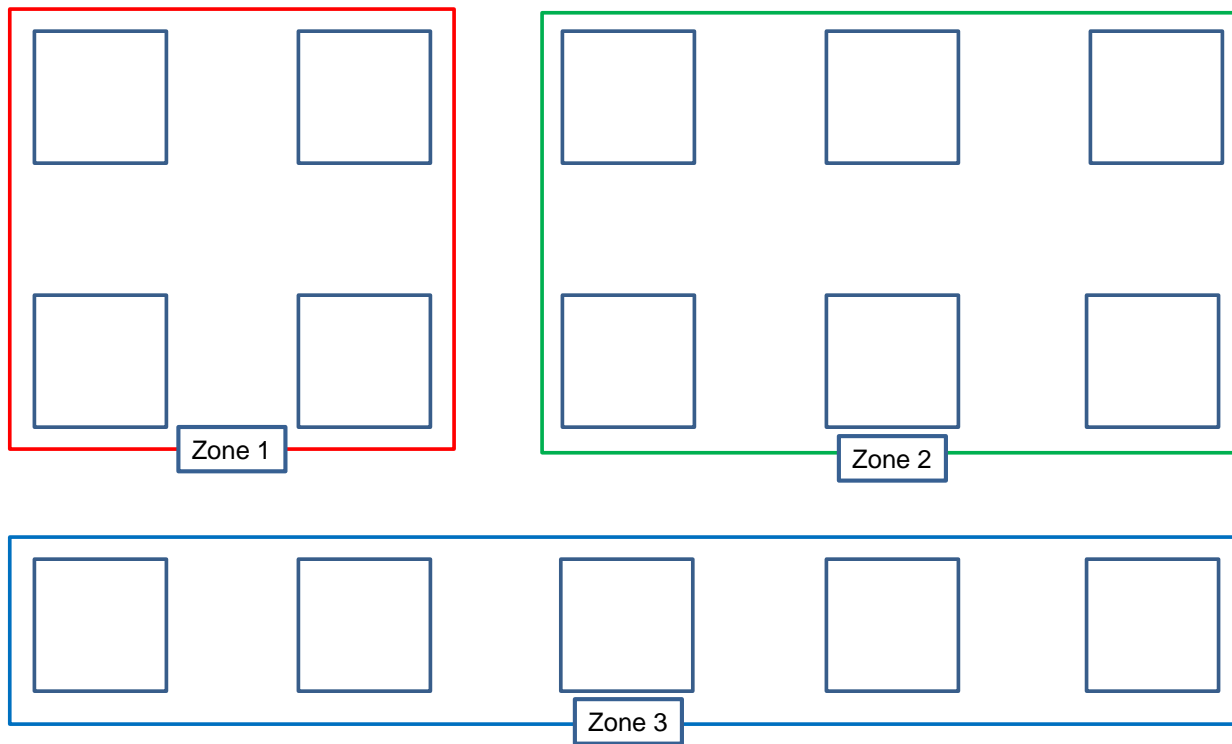
Addressable Components

Programmable

Commissioning



# Spaces



Software Defined

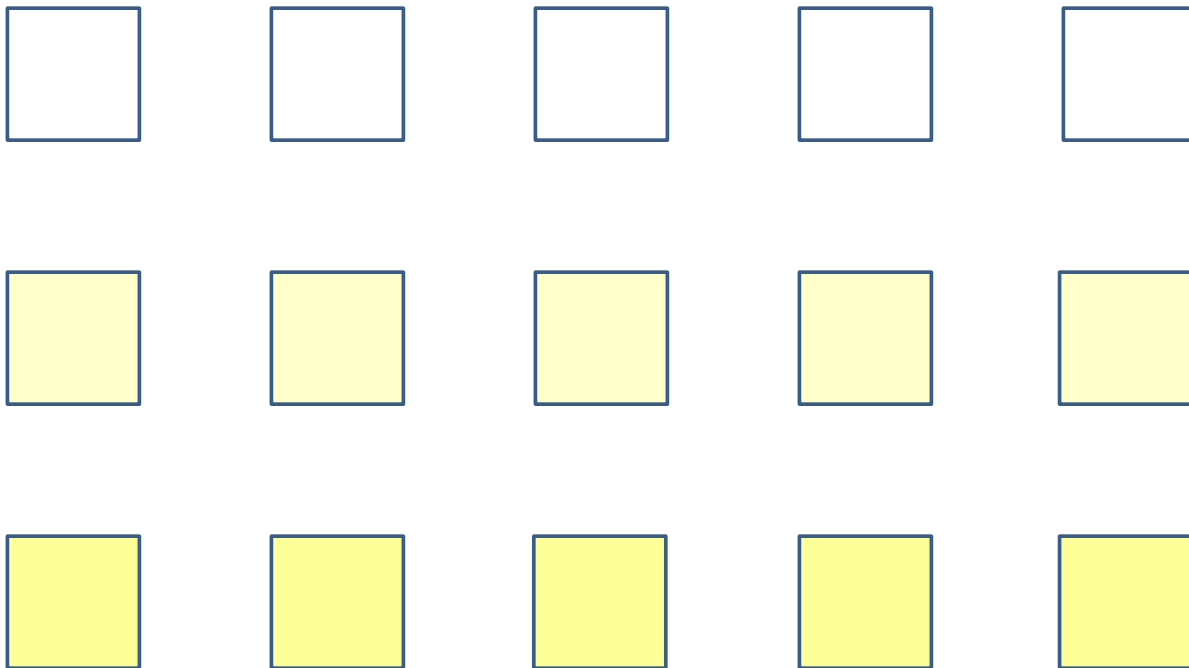
Addressable Components

Programmable

Commissioning



# Light Scenes



Software Defined

Addressable Components

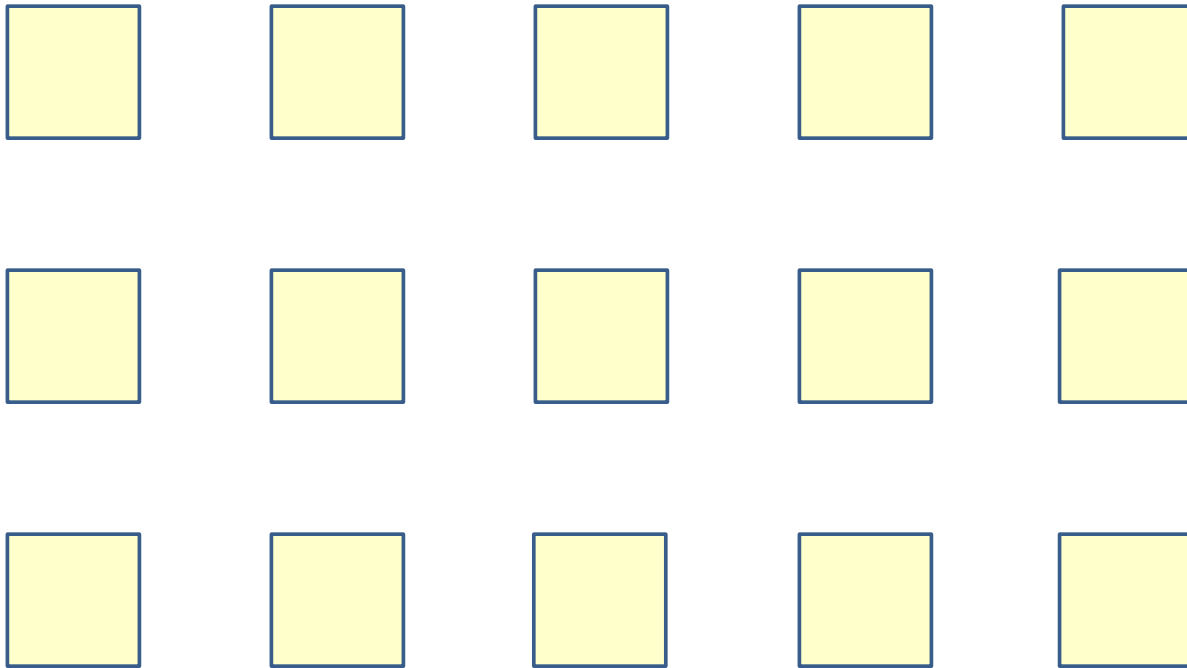
Programmable

Commissioning



Hubbell Premise Wiring

# Actions



Software Defined

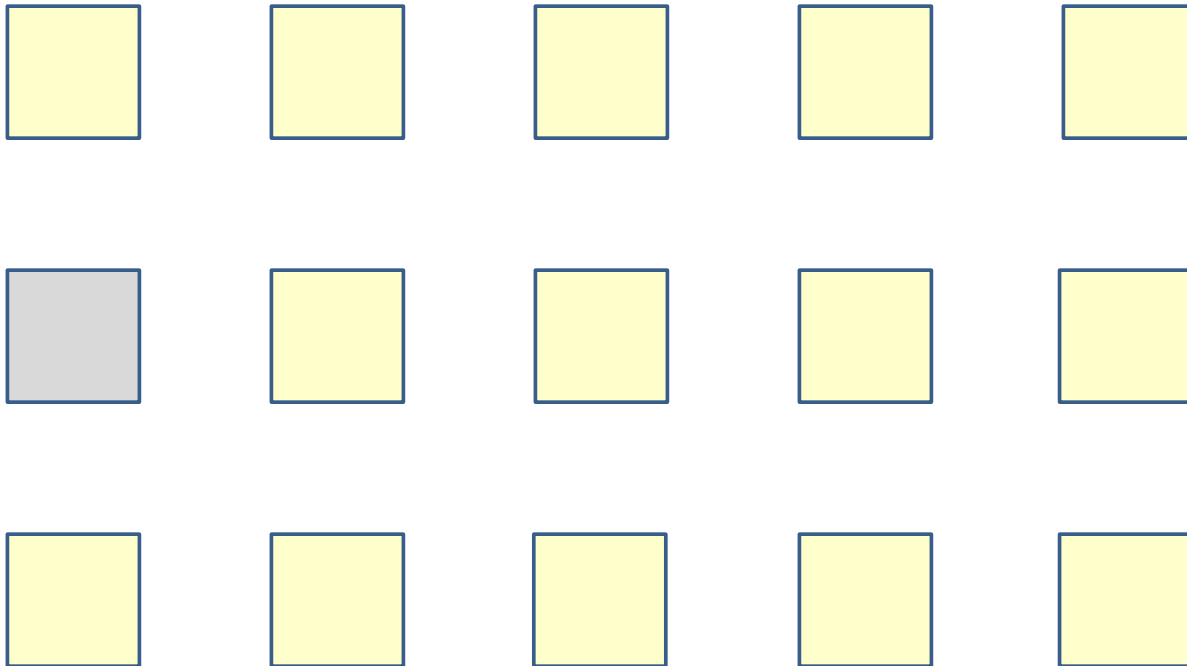
Addressable Components

Programmable

Commissioning



# Actions



Software Defined

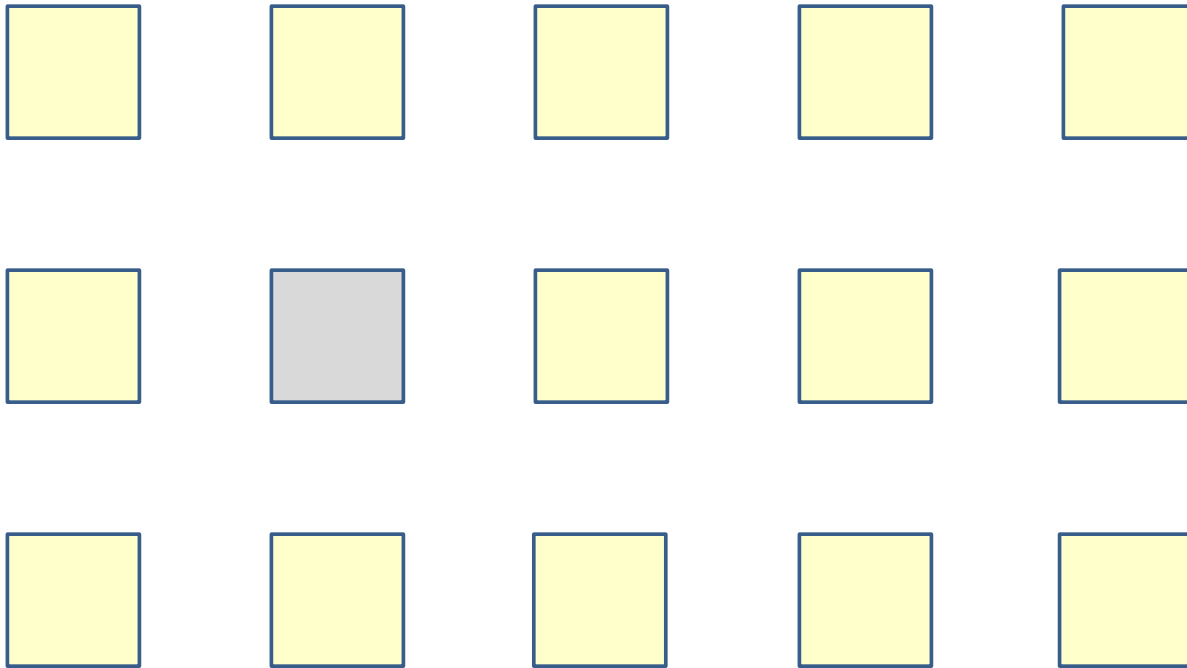
Addressable Components

Programmable

Commissioning



# Actions



Software Defined

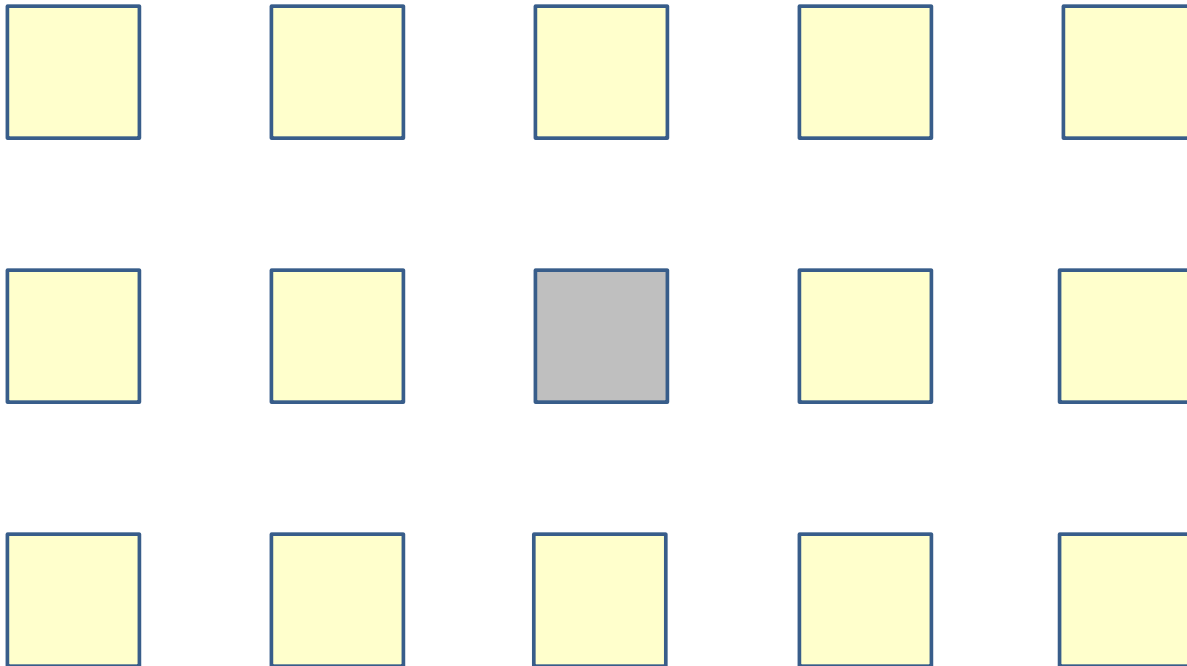
Addressable Components

Programmable

Commissioning



# Actions



Software Defined

Addressable Components

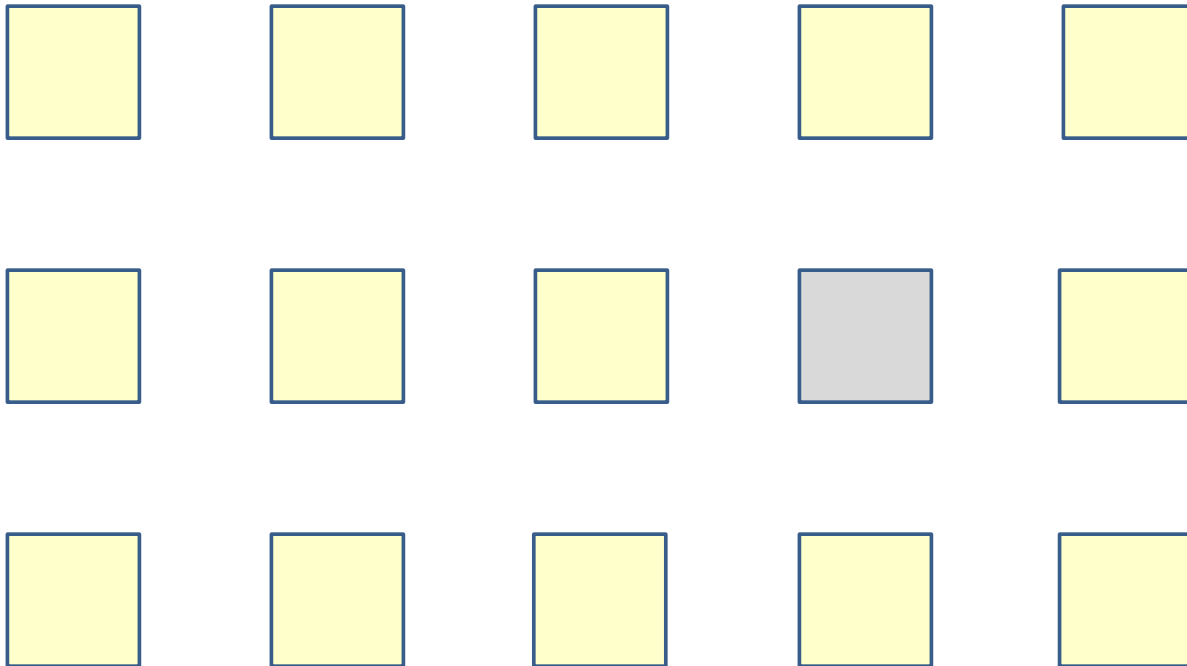
Programmable

Commissioning





# Actions



Software Defined

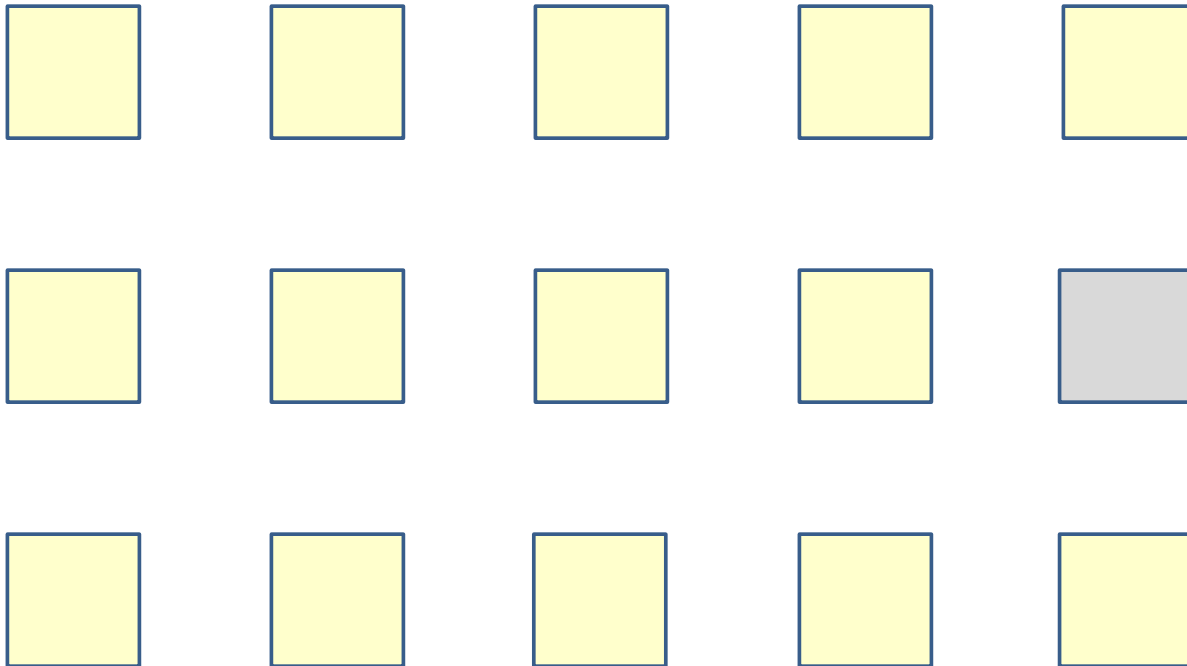
Addressable Components

Programmable

Commissioning



# Actions



Software Defined

Addressable Components

Programmable

Commissioning

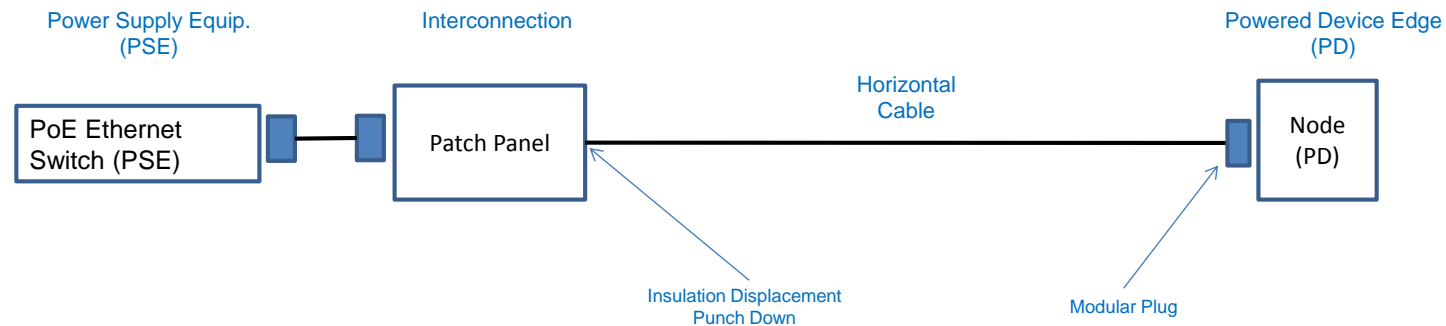


# Intelligent Building (IoT)

- Occupancy Volume (mass)
- Load Control
  - Wiring devices
  - AC circuit relays
- Temperature
- Humidity
- Gasses
- Circuit Monitoring
  - Electricity consumption
  - Demand responses
- Motor Control
  - Shades
- Locating
  - Wayfaring
  - Beacons
- On the horizon
  - LiFi



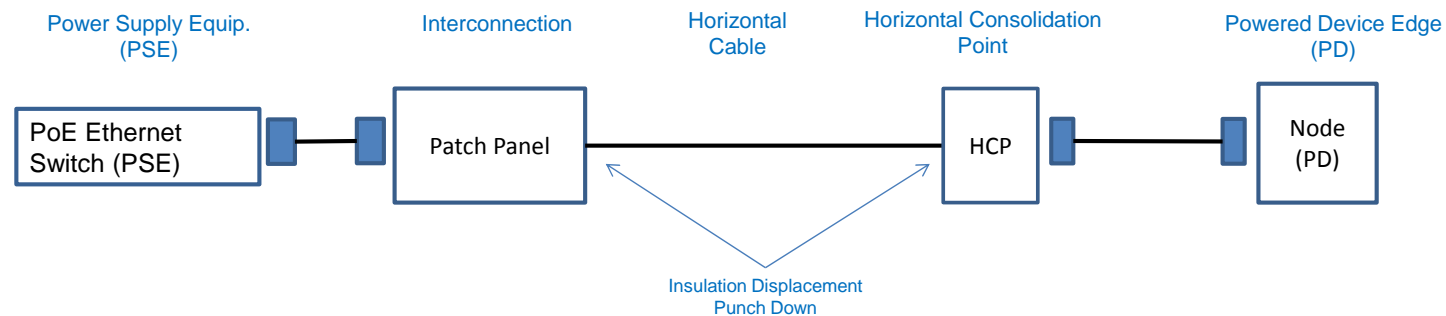
# Modular Plug Terminated Link (MTLP)



- Standards legitimize a common practice
  - ANSI/TIA 568.2-D
  - ANSI/BICSI 007-2017
- Not always the best / economical solution



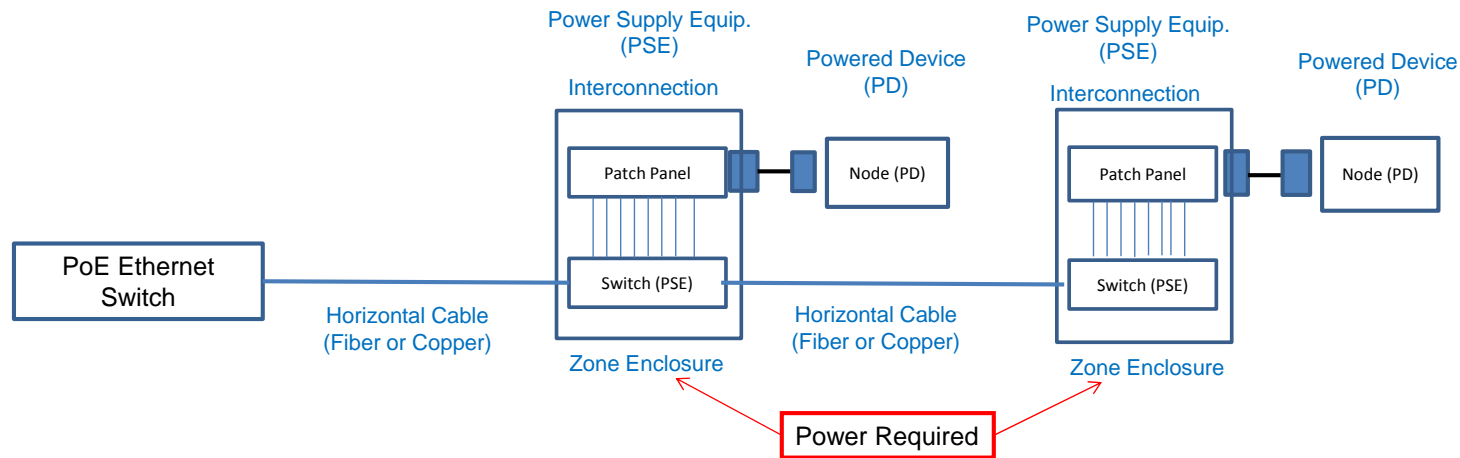
# Zone Cabling



1. Install Horizontal Cabling early in the construction and leave the job.
  - Easier to install without ceiling grid, etc.
2. Return for easy finish work. Install lights with patch cords.



# Distributed Ethernet Switches

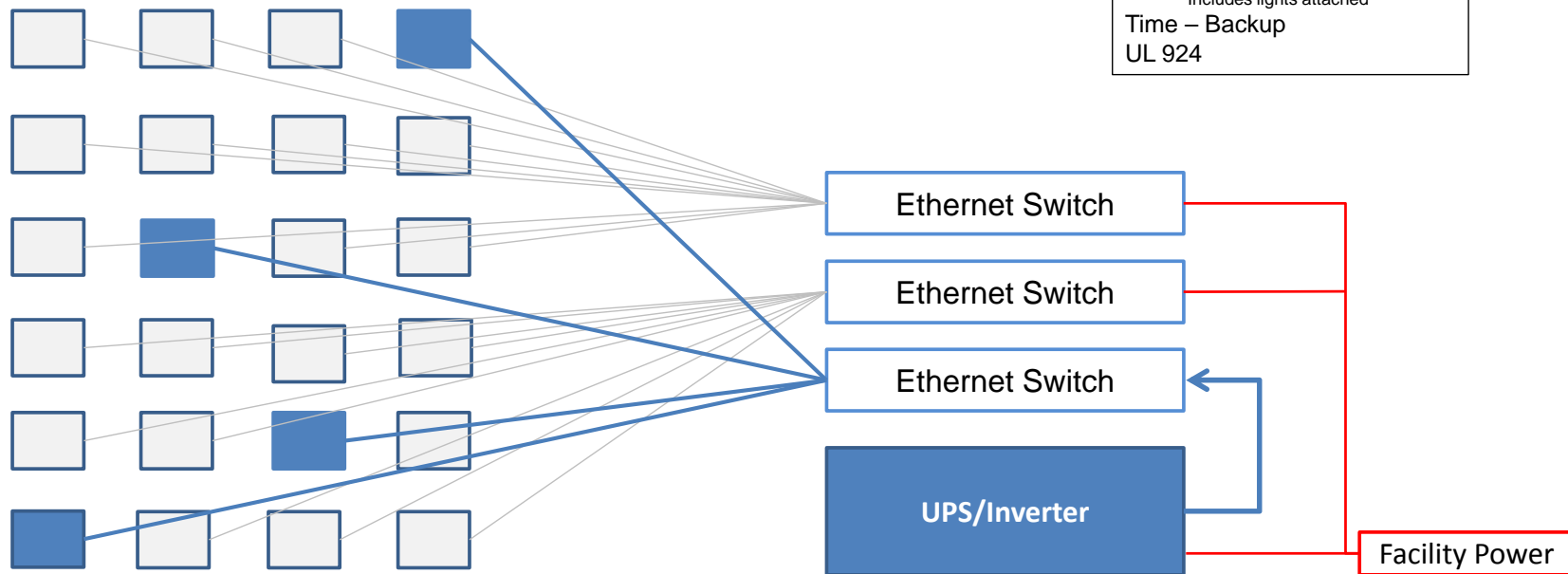


- Repetitive Zones (rooms) with multiple IP Ports
- Hospitality, Healthcare, Sr. Living, Education

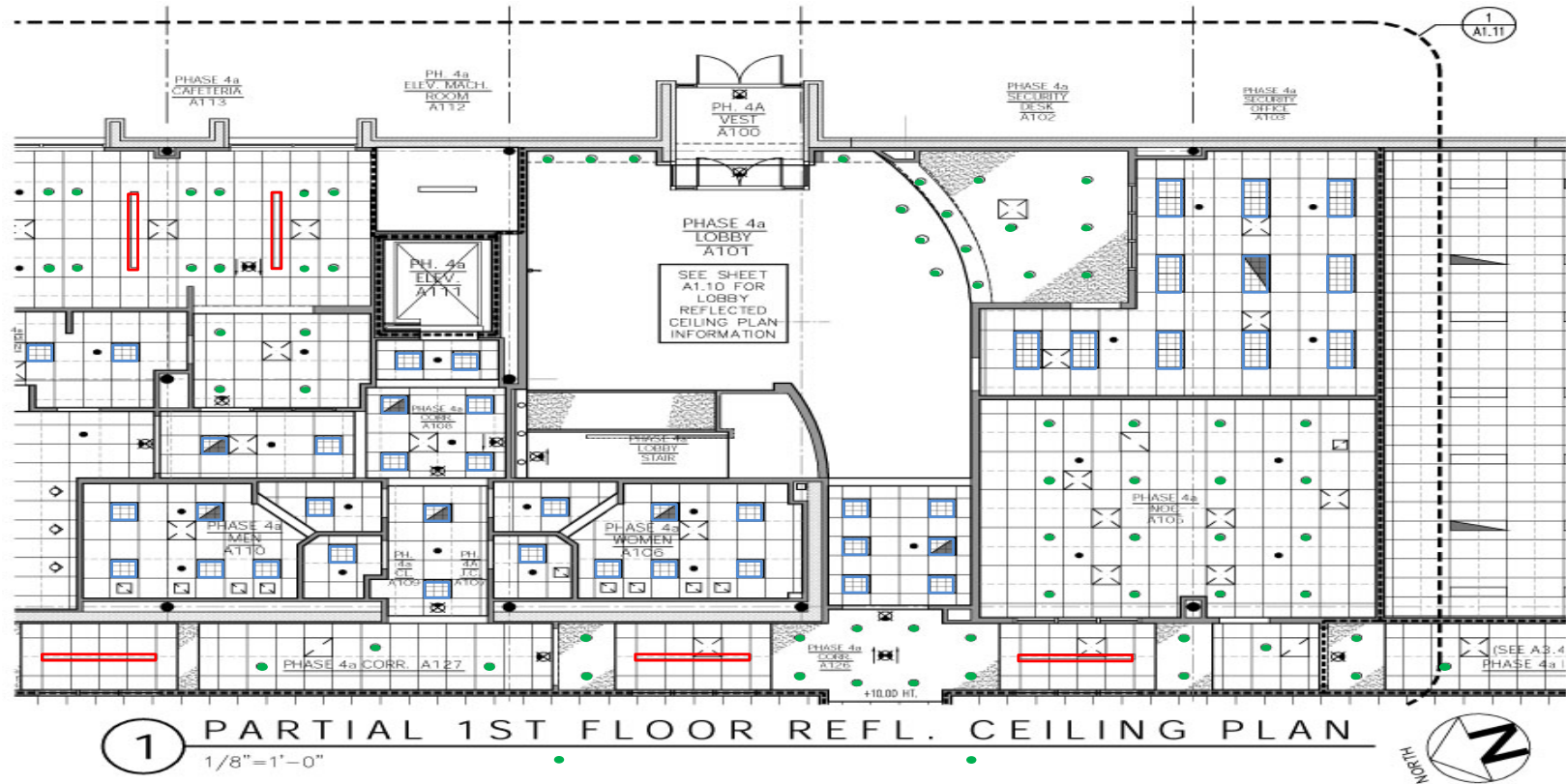


# Emergency Lights

**Emergency Lighting Factors**  
Load - Ethernet Switch  
Includes lights attached  
Time - Backup  
UL 924







# Reflective Ceiling Plan





# Planning

Luminaire Type	Symbol	Watts per Light	Qty	Lights per Switch Port	Number of Switch Ports	Number of Switches
Recessed Can 6"			64			
Troffer 2 x 4			11			
Troffer 2 x 2			32			
Linear Pendant			5			

## More Calculations

- Nodes
- Wall Controls
- Sensors
- Cabinets
- Pathway
- Connectivity
- UPS
- Switches





Hubbell Premise Wiring

2020 **BICSI WINTER**  
Conference & Exhibition





# BLUES

*HEAVEN*