Acuity Controls

Control Solutions Overview

Lighting Controls

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LIGHTING CONTROL
SOLUTIONS

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LIGHTING CONTROLS

Identifying opportunities

Most importantly-

You require a "Sequence of Operation" for every individual space

Without this, you cannot accurately determine their control needs

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Project Name: William Fremd High School Library Renovation December 28, 2016
Location: Palatine. Illinois

Sample Sequence of Operations

SPACE TYPE	OCCUPANCY SENSOR				TIME CLOCK			WALL SWITCH					DAYLIGHT SENSOR			
	VACANCY MODE (MANUAL ON)	OCCUPANCY MODE (AUTO ON)	SENSOR TIME OUT PERIOD (IN MINUTES)	HIGH/LOW OPERATION: OCCUPIED: 100% / VACANT: 30%	SCHEDULED ON AT	SCHEDULED OFF AT	OVERRIDE SWITCH (2 HOUR)	ON / OFF ONLY	DIMMER SWITCH	KEY SWITCH	SCENE SWITCH	GRAPHICAL WALL STATION	INDOOR - ON / OFF ONLY	INDOOR - DIMMING	LIGHT LEVEL MAINTAINED AT (IN FOOTCANDLES @2'-6" A.F.F.)	EXTERIOR PHOTOCELL - ON/OFF
Zones 1, 4 & 5		X	10		8:00AM	6:00PM			X							
Zones 2, 3 & 6		X	10		8:00AM	6:00PM			X			X				
Zones 7 - 9		X	10		8:00AM	6:00PM			X							
Zone 10					8:00AM	6:00PM			X							
Zone 11		X	10		8:00AM	6:00PM			X							
Zone 12		X	10		8:00AM	6:00PM			X							
Zones 13 & 14		X	10		8:00AM	6:00PM			X							
Zones 15 & 16		X	10		8:00AM	6:00PM			X							
Zone 17		X	10		8:00AM	6:00PM			X							
Zone 18		X	10		8:00AM	6:00PM			X							

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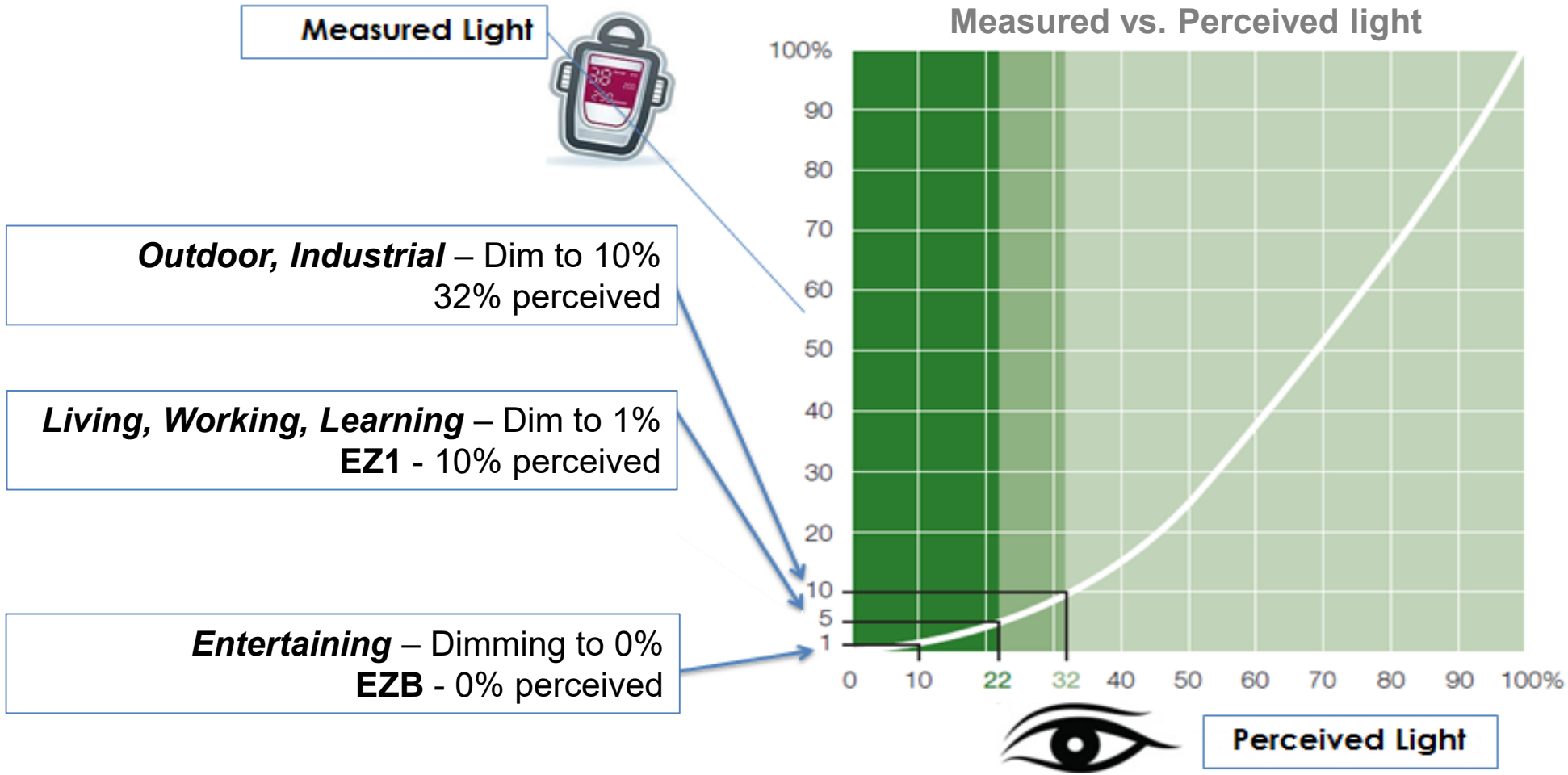
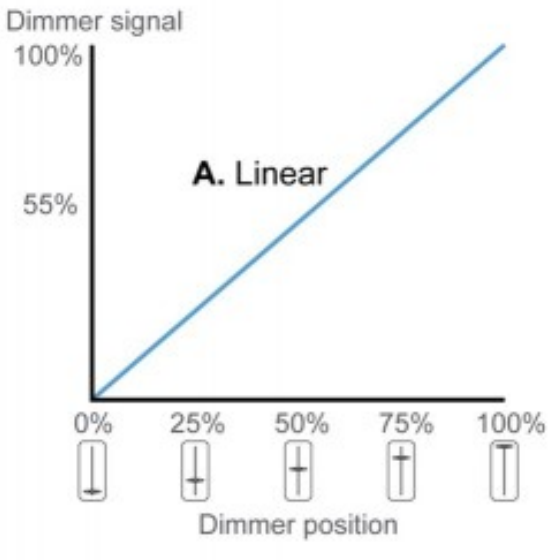
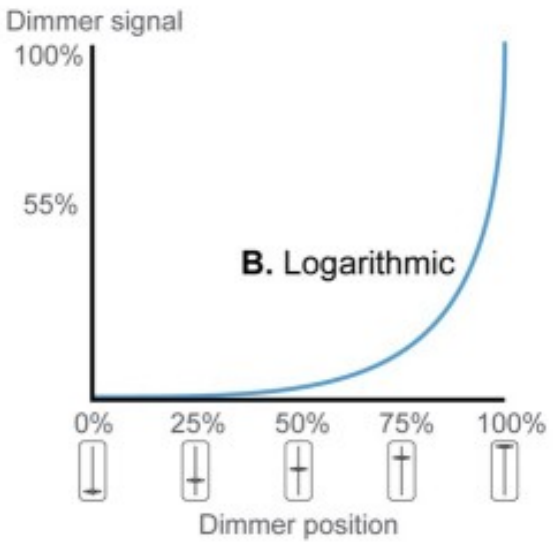
Natural Dimming: Dim to Dark

Source: IESNA Handbook, 9th edition,
Measured vs. Perceived light



Dimming Curves





Dimmer	Driver		LED		Eye		Perceived changes in brightness
Linear	Linear	→		→		→	Bad
Logarithmic	Logarithmic	→		→		→	Bad
Linear	Logarithmic	→		→		→	Good
Logarithmic	Linear	→		→		→	Good

nLight CONTROL

Building a complete system

KSA LIGHTING & CONTROLS

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LIGHTING CONTROL SOLUTION

What makes-up a lighting control system?

Control Devices:

- Occupancy sensors
- Photocells
- Dimmers
- Relays
- Manual Stations

Controllable Devices:

- Recessed LED luminaires
- LED Downlights
- Industrial fixtures
- Suspended luminaires
- Fixtures with imbedded controls

Backbone Devices:

- Networking devices
- Master controller

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Configuration Software:

- Set schedules
- Adjust operating parameters
- Monitor for failures

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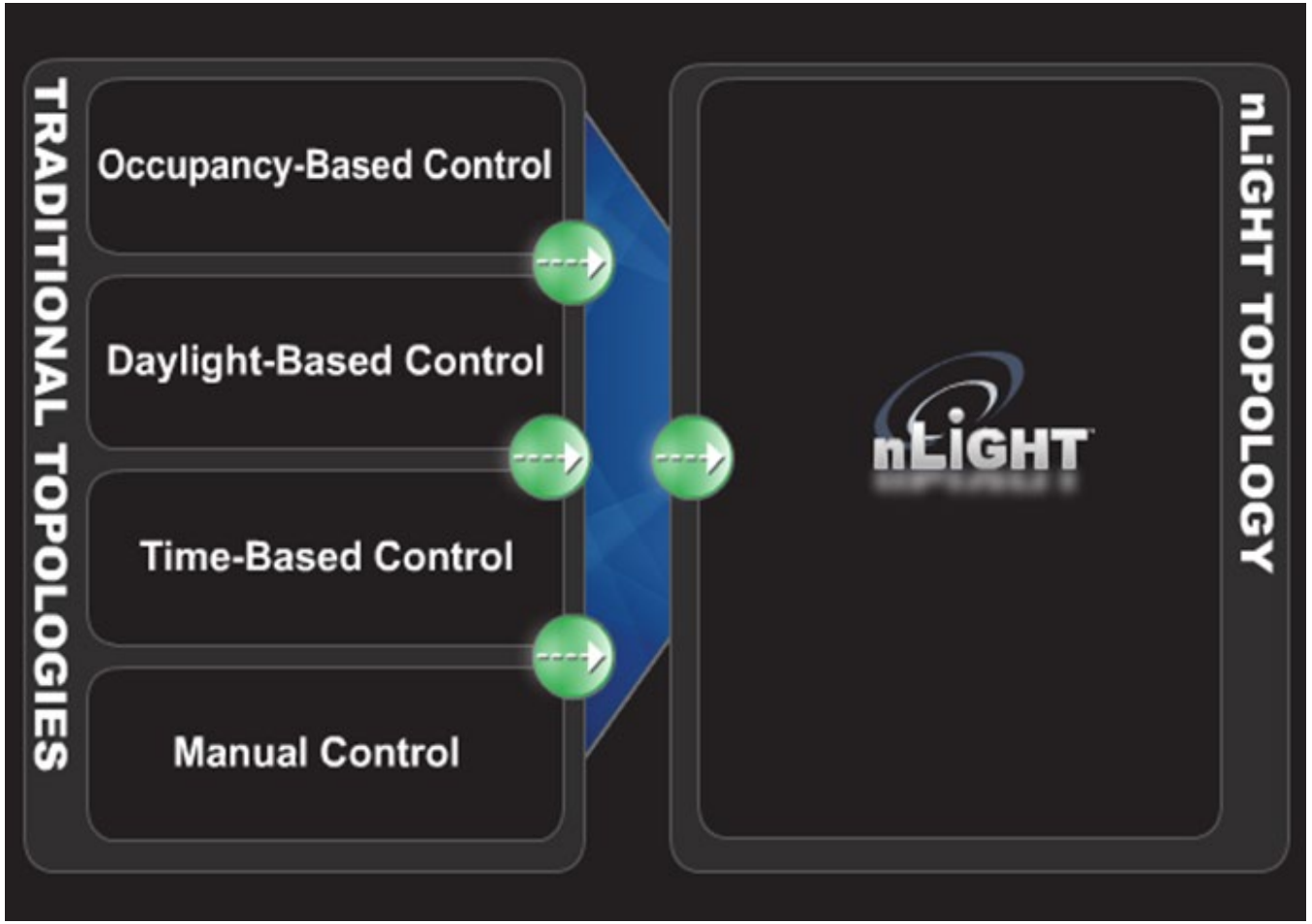
nLight CONTROL

What is nLight?



nLight is a networked digital lighting control system that provides both energy savings & increased user configurability by cost effectively integrating time-based, daylight-based, sensor-based & manual lighting control schemes.

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nLight CONTROL

Basic nLight zone

nLIGHT Ceiling Sensor

(e.g. **nCM PDT 9 ADCX RJB**)

CAT5e

CAT5e

nLIGHT enabled Luminaire

(e.g. with factory installed **nIO EZ** device)

nLIGHT WallPod

(e.g. **nPODM DX**)

<u>Out of the Box Functionality</u>

Dual Tech Occupancy Detection

Daylight Harvesting Photocell

On/Off

Raise/Lower

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nLight AIR

Embedded control without wires

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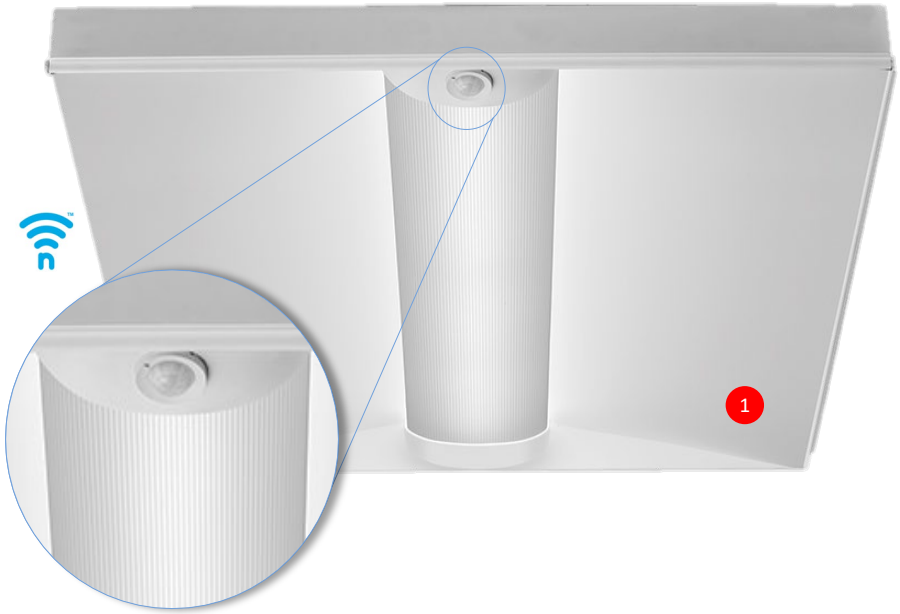
nLight AIR

Control without wires, sinple as 1,2, 3.



1. Factory integrated smart sensor - rES 7 (occupancy and daylight sensor) with Acuity Brands LED fixtures(1)

2. Battery-powered, wire-free wall switch (rPODB)

3. Simple, intuitive mobile app-based start-up and configuration (CL***AIR***ITY)

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Product Review

rCMS 6/9/10 G2

rSBOR 6/10/40 G2

rSDGR G2

rIO G2

rES7 G2

rPODB G2

rPODB 2P G2

rPODB DX G2

rPODB 2P DX G2

rPP20 (D) G2

rPP20 (D) EM/ER G2

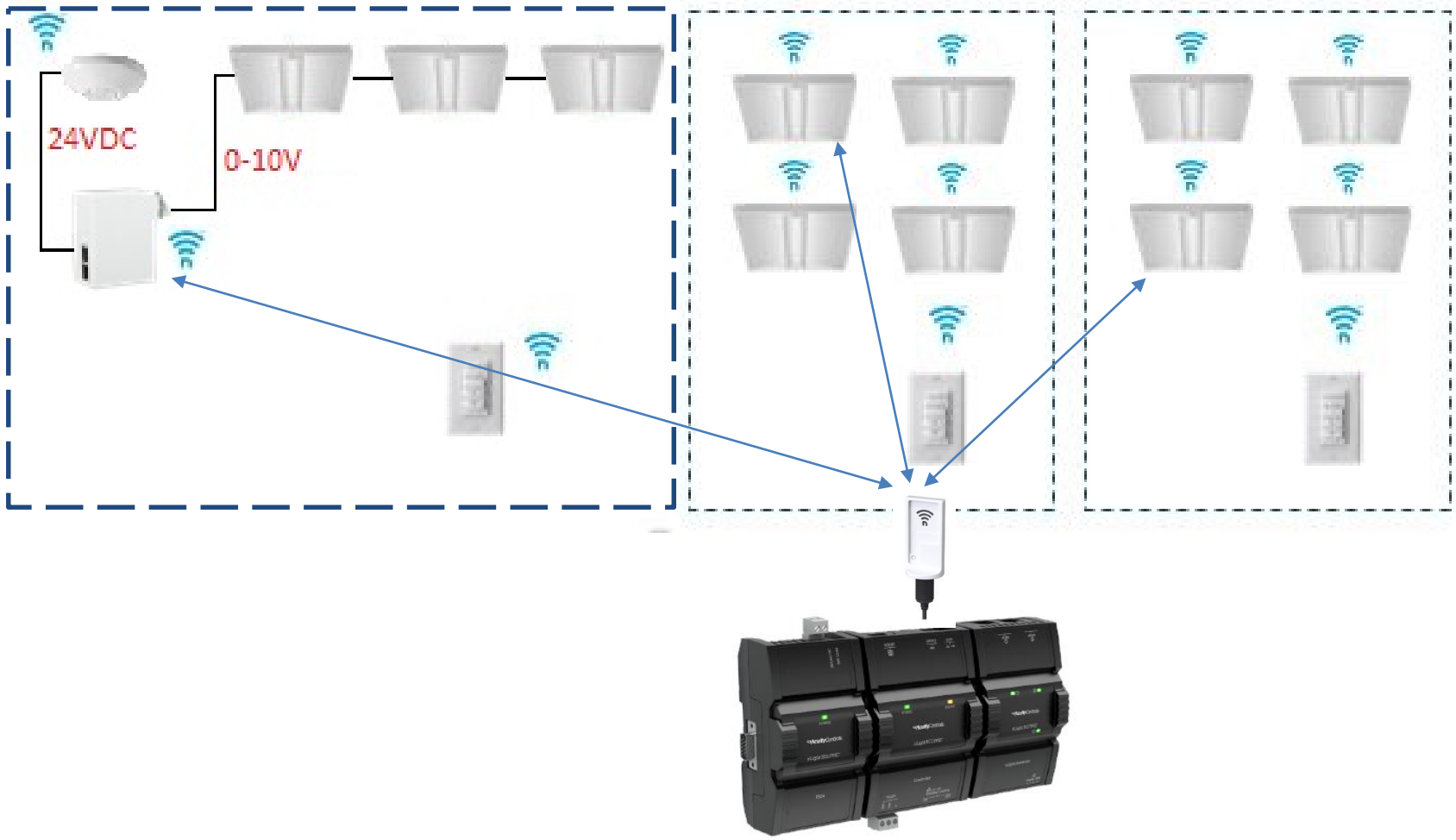
nECYD NLTAIR G2

nECY MVOLT ENC
GFXK

rLSXR 0/6/9/10/50 G2

nLight AIR System Communication

- Point-to-point communication



nLight AIR 5-Tier Security Architecture

Application Data Encryption

Application data is encoded in such a way that only valid devices on a network can decrypt and use the data leveraging AES-128bit encryption.

Most competitive systems stop here

Mutual Entity Authentication

Both communicating devices in a session to provide each other with assurance of their identity prior to exchanging data

Message Authentication

Confirms that the message came from the valid device (its authenticity) and the integrity of the message is in tact. Provides protections against replay attacks.

Message Confidentiality

Devices communicate securely using encryption. The communication cannot be monitored (sniffed) by untrusted hosts.

Limited Anonymity

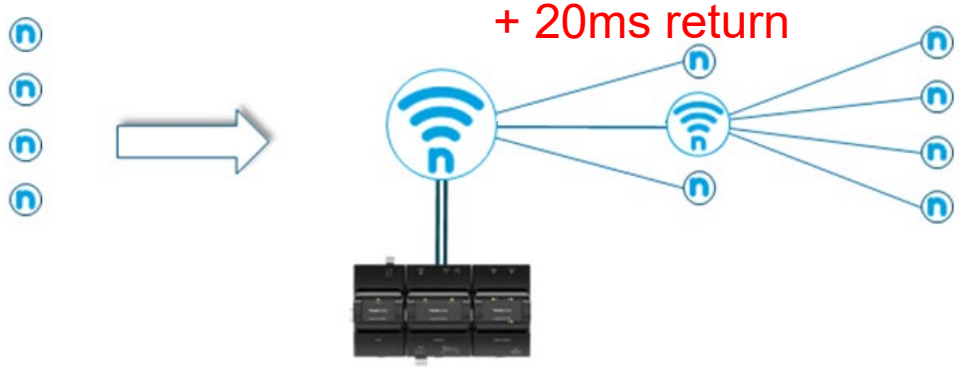
Communication link does not disclose identity of the devices communicating

Impact to Profile Rollout

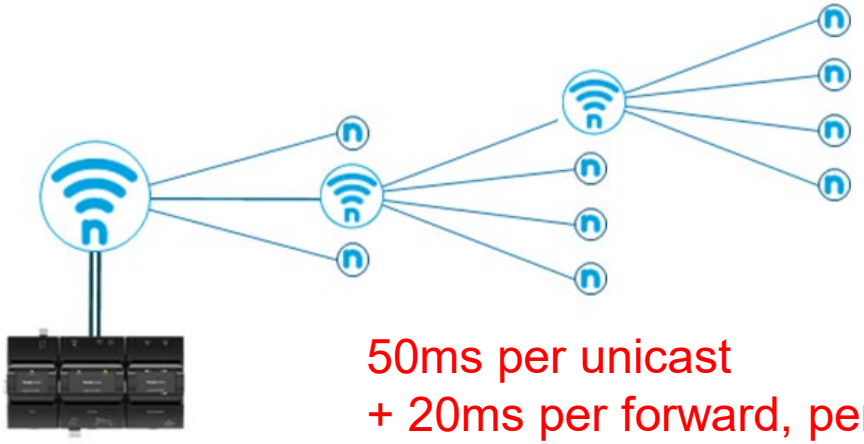
Notes:

- Profiles are unicast
- nLight AIR tries 4 unicast messages before moving to the next device
- Delays in an Ideal Scenario:
  - Hop Layer 1 = 50ms
  - Hop Layer 2 = 90 ms
  - Hop Layer 3 = 130 ms
- This results in profile rollout speeds similar to nLight Wired.

50ms per unicast
+ 0ms reply time



50ms per unicast
+ 20ms per forward
+ ~0ms reply time
+ 20ms return

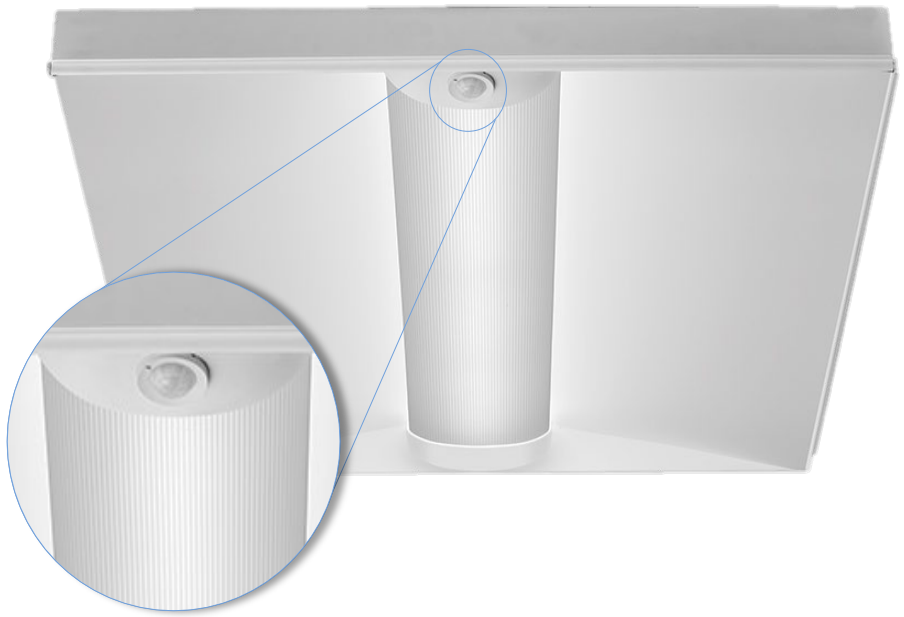


50ms per unicast
+ 20ms per forward, per layer
+ ~0ms reply time
+ 20ms per return, per layer

nLight AIR

Makes difficult control jobs easy

Wireless Controls allow complicated scenarios like sequential stair to be done very easily.



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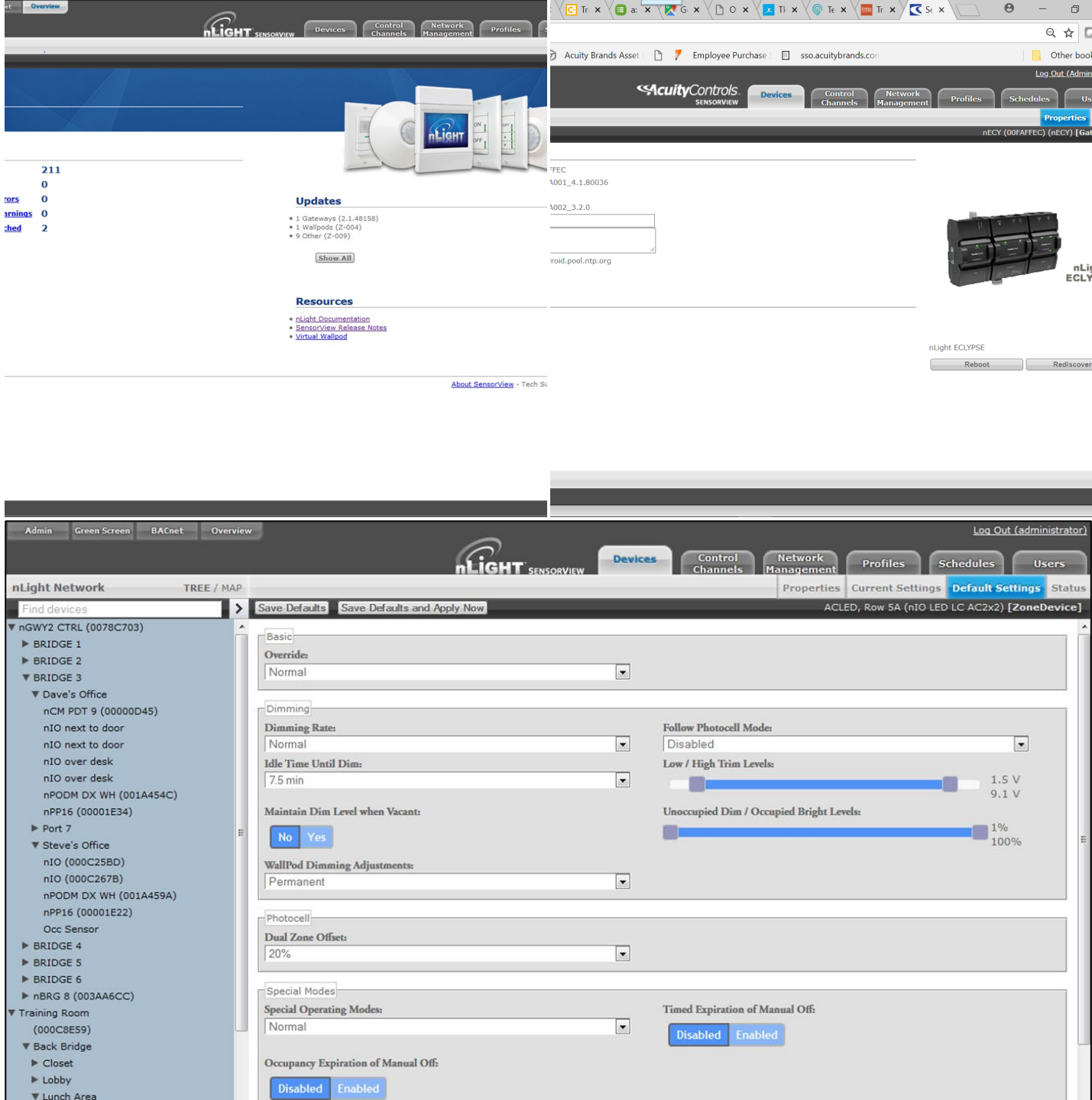
SensorView

Programming and setup software



Lighting Floorplan

HVAC Visualization

Unified Building Control …

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nLight ECLYPSE Building Controller

DISTECH CONTROLS

Distech ECLYPSE HVAC Controls

nLight™ & XPoint Wireless Digital Lighting Controls

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nLight ECLYPSE

Front End Control without a third party

Features with Gateway

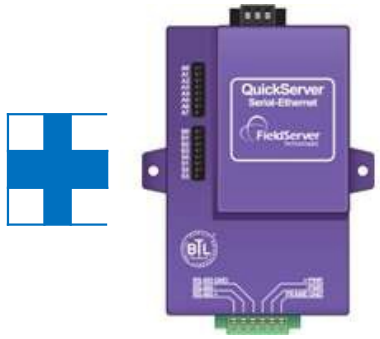
- Time clock synchronization and scheduling options
- BACnet Interface: Building Controller (B-BC, BTL listed)
- Local logging, alarming, and scheduling functions
- Each Gateway can manage 750 nLight and/or nLight AIR devices with a line-of-site range of over 1,000 feet.
- SensorView software - central point of access, control, and configuration of an nLight network and all its devices
- SiteView Software – Building and Lighting controls integrated dashboard and analytics

nLight ECLYPSE

Front End Control without a third party

(Ethernet/IP to BACnet Gateway) for Common Industrial Protocol CIP)

nECY with BACnet



CIP Gateway

- What is it?
  - Converter device that translates from Ethernet/IP to BACnet/IP for Industrial Equipment to Communicate to an nLight ECLYPSE
- What information can it translate?
  - BACnet Information
  - Read online/offline status of control device at the fixture
  - For a light or groups of lights: turn on/off or adjust the dim level
  - For fixtures with photocells, read the light level
  - For fixtures with occupancy sensors, see if the area is occupied
  - Activate/deactivate profiles
  - Primarily for industrial projects
  - Supports 250 or 500 points*

nLight ECLYPSE BACnet Points

Object Name	Type	Units	Range	Read	Write	COV	Inactive State (0)	Active State (1)	Notes
Occupied (Px)	BI	-	-	X	-	X	Unoccupied	Occupied	The occupancy state provides feedback on whether an occupancy sensor is occupied or unoccupied (e.g. nCM PDT 9, XPA CMRB). For multi-pole occupancy sensors (e.g. nCM 9 2P), two BACnet objects will be available.
Relay State (Px)	BV	-	-	X	X	X	Relay Open	Relay Closed	The relay state provides feedback on whether the relay in a device is open or closed (e.g. nPP16 D, XPA CMRB).
Dimming Output Level (Px)	AV	Percentage	0 - 100	X	X	X	-	-	The dimming output level provides the intensity of a dimming devices (e.g. nPP16 D, nLight Enabled Fixture, nSP5 PCD, nIO D, XPA RL1).
Measured Light Level	AI	Foot-Candles	0 - 212	X	-	X	-	-	The measured light level provides an analog foot-candle reading from a device with a photocell (e.g. nCM ADCX, nWSX LV, nCM PDT 9, XPA SBOR).
Photocell Inhibiting (Px)	BI	-	-	X	-	X	Not Inhibiting	Inhibiting	When a photocell device is programmed to turn lights off or inhibit lights from turning on, photocell inhibiting provides indication when the photocell has provided this "off/inhibit" command. This point is available with nLight devices only (e.g. nCM PC).
Active Load	AI	Watts	0 - 4432	X	-	X	-	-	The active load provides an analog power consumption reading of the lighting load connected to a device with the current monitoring feature (e.g. nPP16 IM, XPA RL1, XPA SBOR).
Dimming Input Level	AI	Percentage	0 - 100	X	-	X	-	-	The dimming input level provides an analog reading of the input percentage on the signal to an input device. This point is available with nLight devices only (e.g. nIO 1S).
Online	BI	-	-	X	-	X	Device Offline	Device Online	The online status provides indication whether a device is communicating with nLight ECLYPSE controller or not.
System Profile[1]	BV	-	-	X	X	X	Profile Inactive	Profile Active	The system profile object provides feedback on whether a profile is active/inactive.
Channel Occupied[1,2]	BI	-	-	X	-	X	Unoccupied	Occupied	Aggregate state of all occupancy sensors broadcasting on an occupancy channel: Unoccupied = all occupancy sensors on the channel are unoccupied. Occupied = one or more occupancy sensors on the channel are occupied.
Channel Relay State[1,2]	BV	-	-	X	X	X	Inactive	Active	The channel relay state provides feedback on whether the relays in a channel are open or closed.
Channel Dimming Output Level[1,2]	AV	Percentage	0 - 100	X	X	X	-	-	This value represents the average of all dimming output levels on the respective switch channel. Writing to this value is the equivalent of sending an nLight switch "go to level" command.
Automated Demand Response Level	MS	Level	1 - 4	X	-	X	-	-	This setting is only exposed if a valid license for ADR has been added to an ECLYPSE. This value represents the current status of a system responding to demand response.

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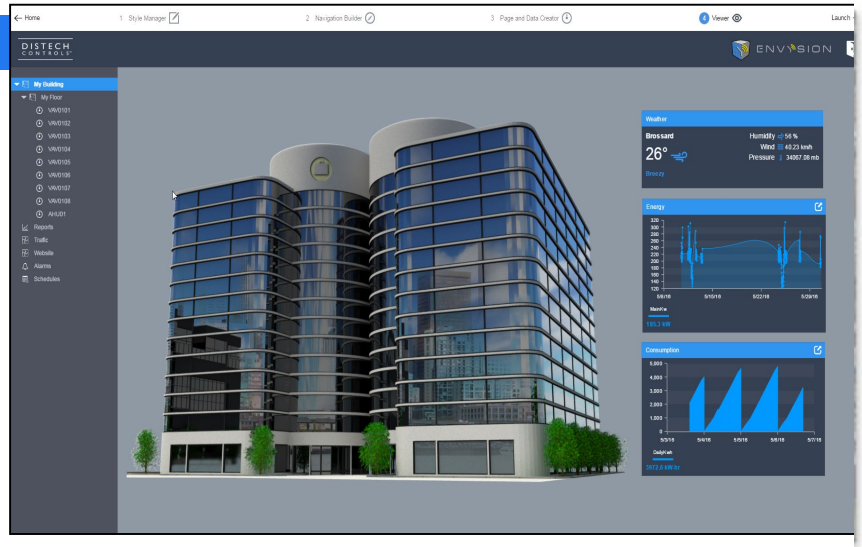

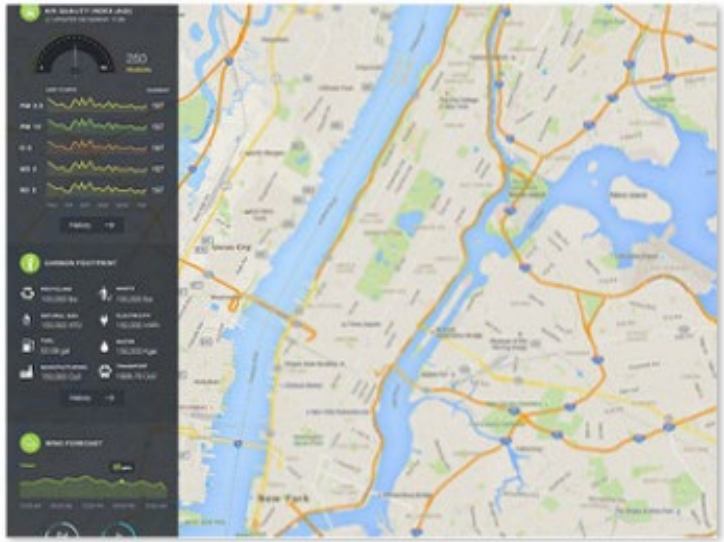

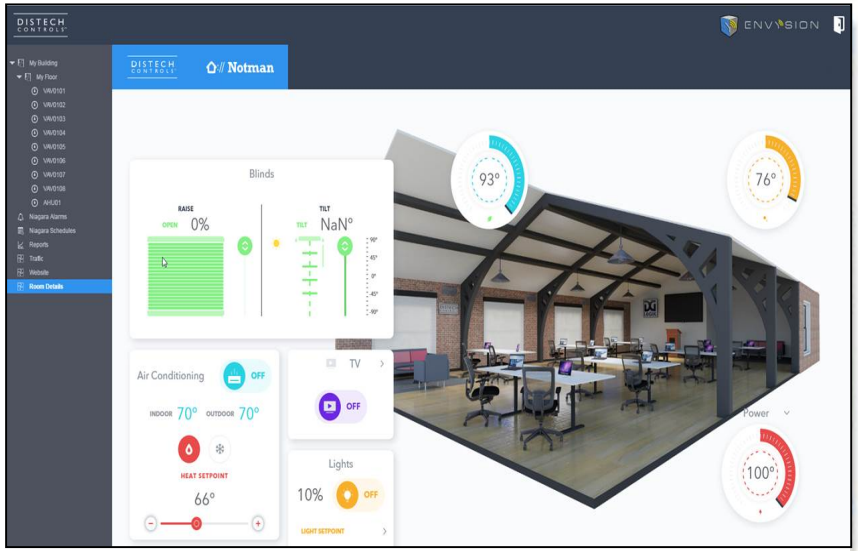

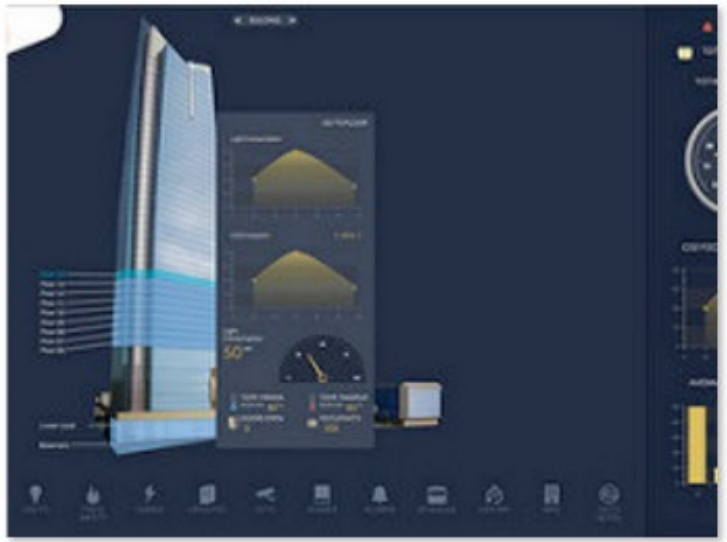

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THANK YOU FOR YOUR TIME

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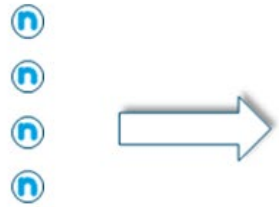
Impact to BACnet Polling

Notes:

- Polling is unicast
- nLight AIR tries 4 unicast messages before moving to the next device
- Delays in an Ideal Scenario:
  - Hop Layer 1 = 50ms
  - Hop Layer 2 = 90 ms
  - Hop Layer 3 = 130 ms
- Device state is maintained in a table, so when the nECY is polled by BMS, it yields last known state, so BMS responses are fast.

50ms per unicast
+ 0ms reply time



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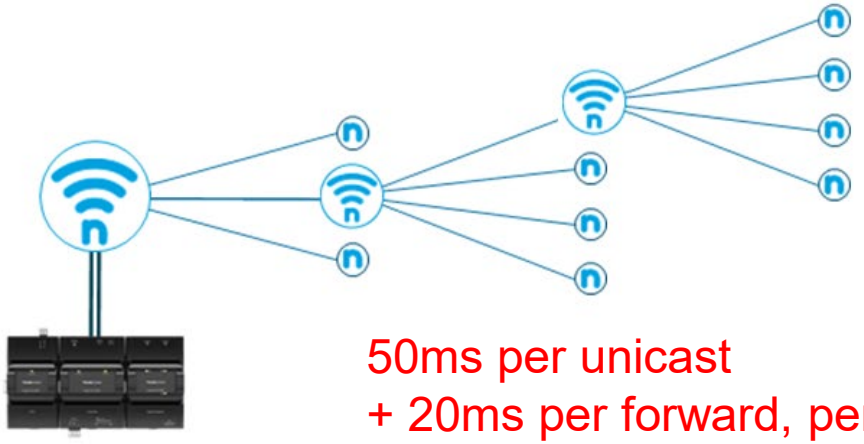

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