



Bringing Efficiency to Light™

The Market Potential of Lighting Controls

January 27, 2017

What's your perception of Advanced Lighting Controls?



Designers



Contractors

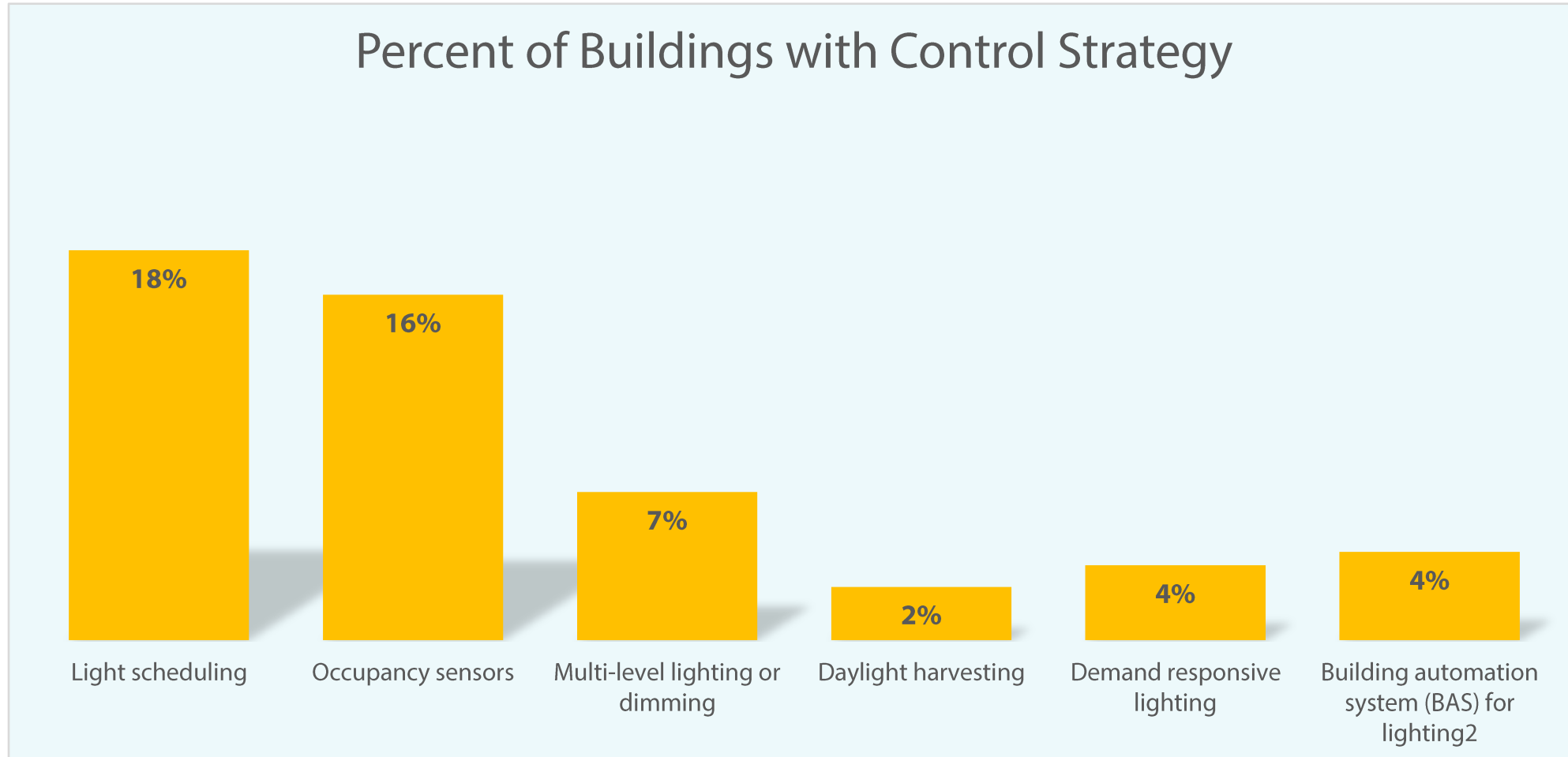


Facility Managers



Building Occupants

Advanced Lighting Controls have not been widely adopted



Source: 2012 Commercial Buildings Energy Consumption Survey, US Energy Information Administration



Advanced Lighting Controls have not been widely adopted

Northwest Region Indoor Lighting Power by Control Type and Building Type

Control Type	All (n=791)	Assembly (n=104)	Food Service (n=43)	Grocery (n=69)	Lodging (n=69)	Office (n=113)	Residential Care (n=68)	Retail (n=129)	School (n=72)	Warehouse (n=43)	Other (n=81)
Manual	2,087 73% ± 2%	279 77% ± 6%	53 87% ± 7%	63 72% ± 8%	121 86% ± 3%	448 68% ± 6%	118 91% ± 3%	447 68% ± 7%	139 61% ± 8%	211 83% ± 7%	208 76% ± 6%
Occupancy Sensor	224 8% ± 1%	27 7% ± 4%	0 0% ± 0%	1 1% ± 1%	1 1% ± 1%	73 11% ± 4%	3 2% ± 2%	12 2% ± 1%	34 15% ± 5%	43 17% ± 7%	32 12% ± 4%
EMS System	256 9% ± 2%	33 9% ± 4%	2 3% ± 4%	6 7% ± 5%	0 0% ± 1%	45 7% ± 4%	1 1% ± 1%	120 18% ± 5%	30 13% ± 6%	0 0% ± 0%	18 7% ± 4%
Dimming	24 1% ± 0%	10 3% ± 2%	4 7% ± 5%	0 0% ± 0%	4 3% ± 1%	1 0% ± 0%	1 0% ± 1%	0 0% ± 0%	1 0% ± 0%	1 0% ± 1%	2 1% ± 1%
Timeclock	74 3% ± 1%	7 2% ± 2%	0 0% ± 0%	2 2% ± 3%	2 1% ± 1%	31 5% ± 3%	1 0% ± 0%	28 4% ± 3%	2 1% ± 1%	0 0% ± 1%	2 1% ± 1%
Photocell	13 0% ± 0%	0 0% ± 0%	0 0% ± 1%	0 0% ± 0%	1 0% ± 0%	4 1% ± 1%	0 0% ± 0%	8 1% ± 1%	0 0% ± 0%	0 0% ± 0%	0 0% ± 0%
Other	126 4% ± 1%	5 1% ± 1%	0 0% ± 0%	5 6% ± 3%	0 0% ± 0%	50 8% ± 4%	0 0% ± 0%	33 5% ± 3%	24 10% ± 5%	0 0% ± 0%	9 3% ± 2%
None (Continuous)	54 2% ± 0%	3 1% ± 0%	1 2% ± 4%	11 12% ± 6%	13 9% ± 3%	6 1% ± 0%	6 5% ± 2%	10 2% ± 1%	0 0% ± 0%	0 0% ± 0%	4 2% ± 1%



Barriers to Adoption

- Poor past experiences
- Unfamiliar with technology
- Too complex
- Not standardized
- High costs
- Weak value proposition



The Good News

- Technology is changing and improving... FAST!
- Systems designed from the ground up to reduce complexity and cost
- Easier (and less costly) to install, commission, use than ever before
- New system capabilities that provide new value to customers



Three Technology Innovations that Reduce Cost and Complexity of Install

1. Integrated or “Embedded” Sensors and Controls
2. Wireless
3. Apps or Software-based Tools to Configure the System

1. Integrated or Embedded Sensors



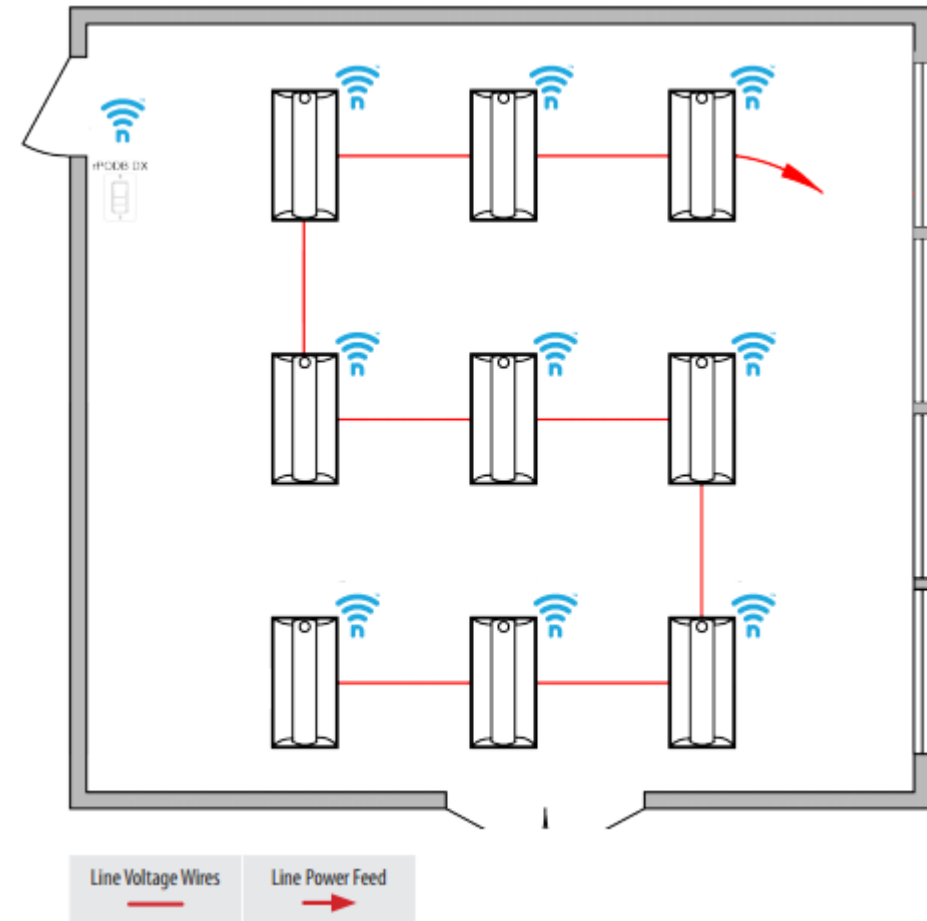
1. Integrated or Embedded Sensors

- ✓ Pre-installed means you don't have to install them
- ✓ Pre-configured for out-of-the-box functionality
- ✓ Fewer components
- ✓ Single Warranty
- ✓ No control wiring between components
- ✓ Eliminates task of figuring out where to place sensors
- ✗ May have higher equipment costs
- ✗ Limited choice of fixtures available



2. Wireless

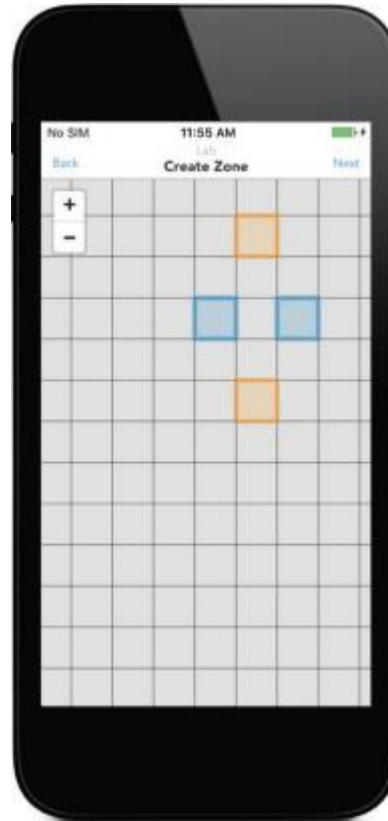
- ✓ Reduces or eliminates control wiring and terminations
- ✓ More flexibility in how devices are connected and configured
- ✗ Distance limitations
- ✗ May experience interference with some systems in some applications



3.App or Software Tools to Configure



See Light Fixtures and Devices in Room by Signal Strength. Flash to identify.

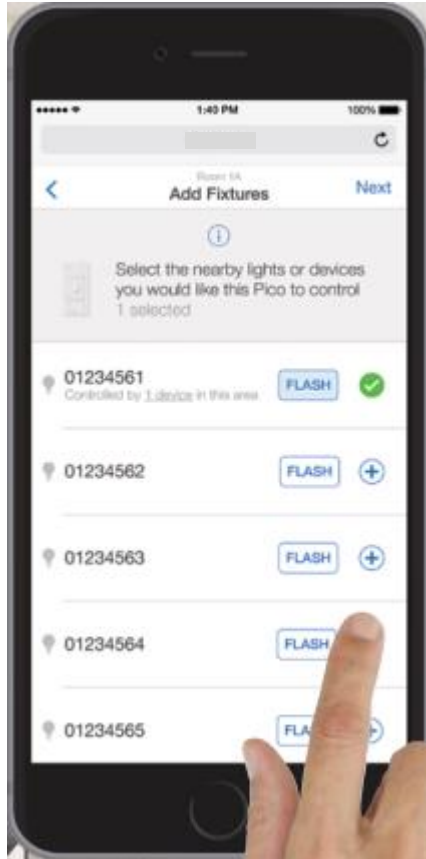


Click to Select or Drag and Drop into group

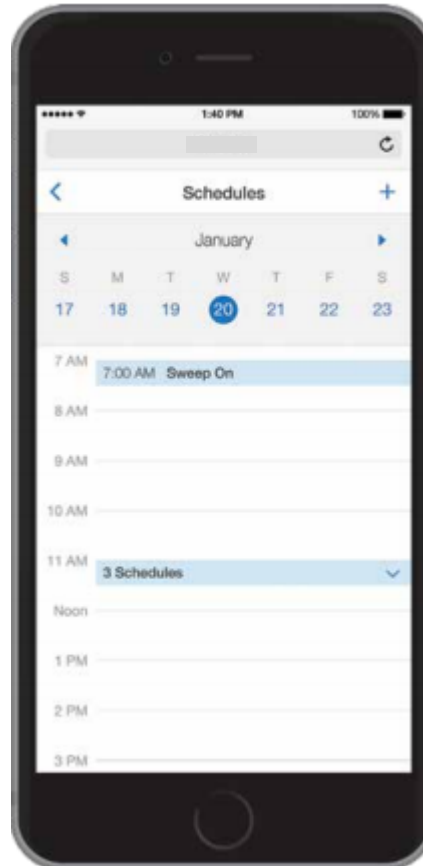


Configure Settings

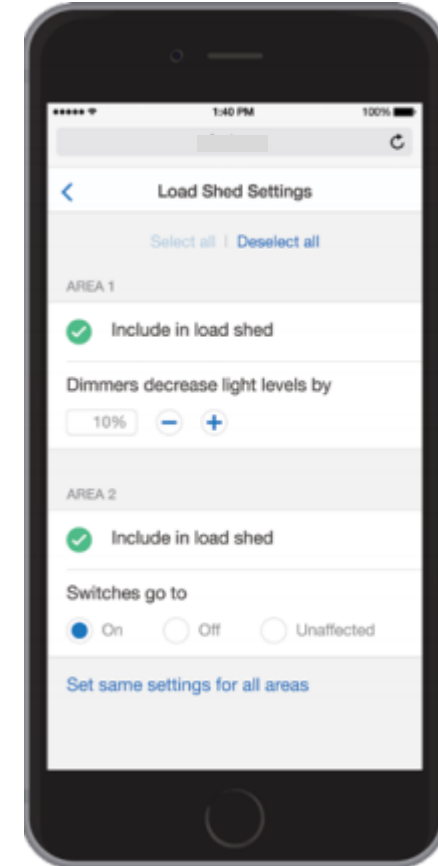
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See Light Fixtures and Devices in Room by Signal Strength. Flash to identify.

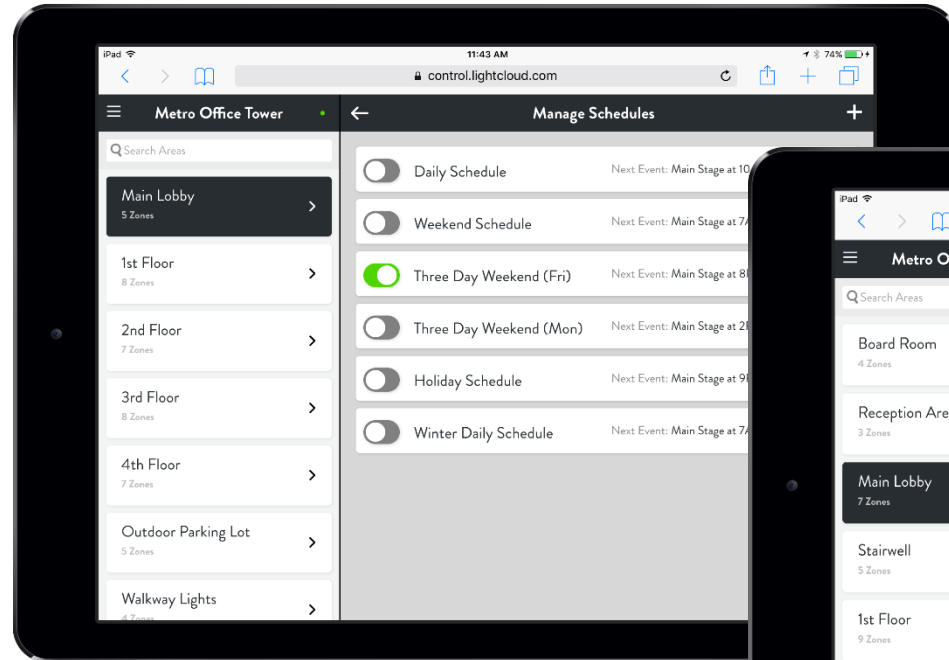


Timeclock/Schedules are much easier to set up

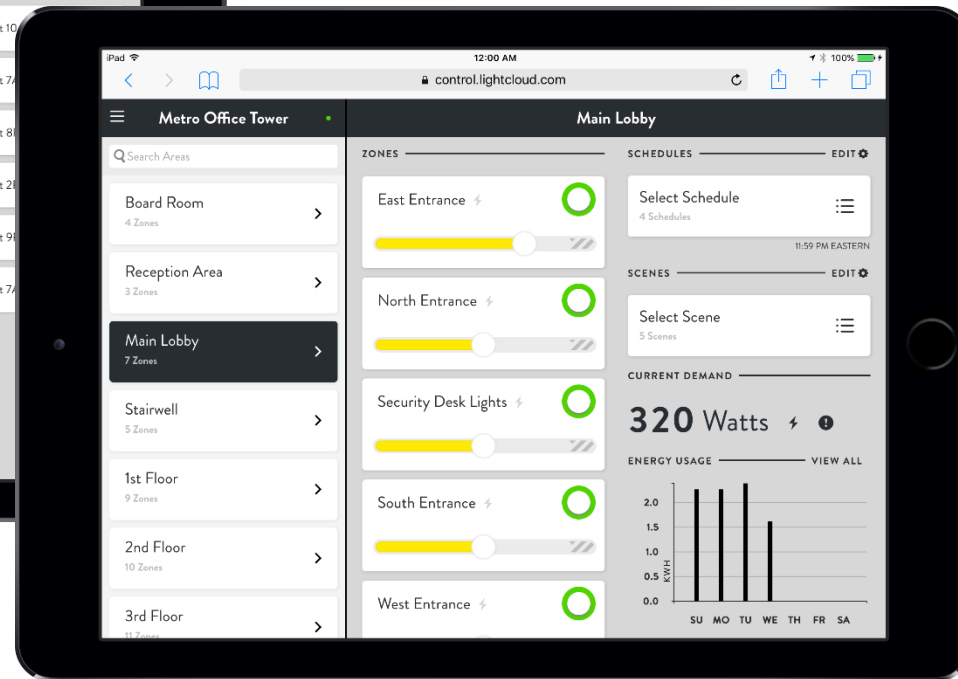


Configure Load Shed Settings

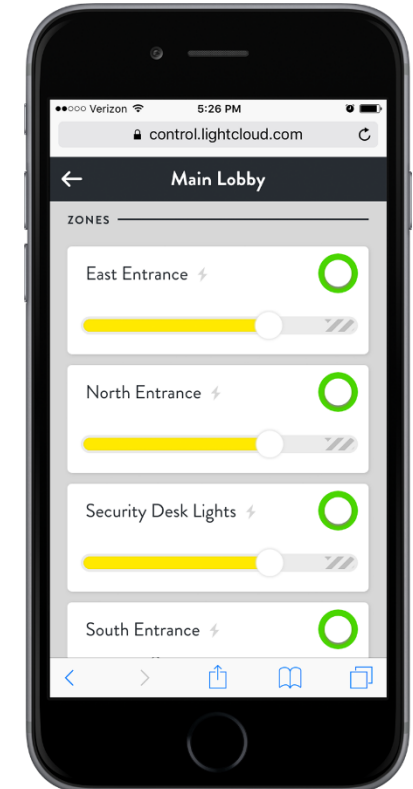
3. App or Software Tools to Configure



Easy Schedule Programming



Intuitive Dashboards



Easily identify and tune lights

Limitations of the Past

Sensor Layout

Grouping/Zoning

Driver / Controller /
Sensor Compatibility

Control Strategy
Design

Low Voltage Control
Wiring

Complex
Commissioning



Possibilities of the Future

Sensor per Luminaire

Auto-Grouping/Zoning

Pre-Installed, Pre-Wired,
Compatible

Pre-Programmed,
Out-of-the-box

Wireless / PoE

Simple Configuration w/
Auto-Commissioning

Another Trend: Integrated Power Meters in Drivers, Sensors, and Controllers

New metering microchips embedded directly into lighting equip.



- Wireless Smart Sensor with built-in meter



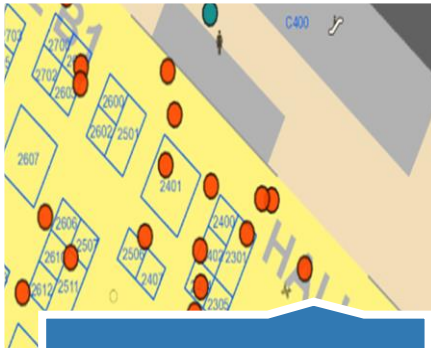
- Wireless Fixture Controller with built-in meter



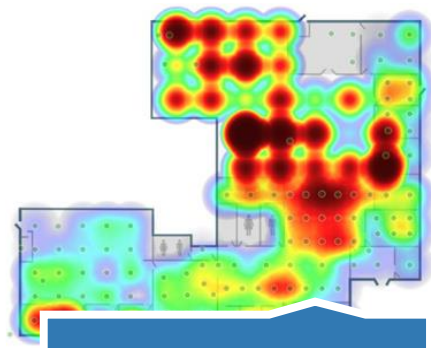
- LED Driver with built-in meter



Some systems have advanced features that go beyond lighting



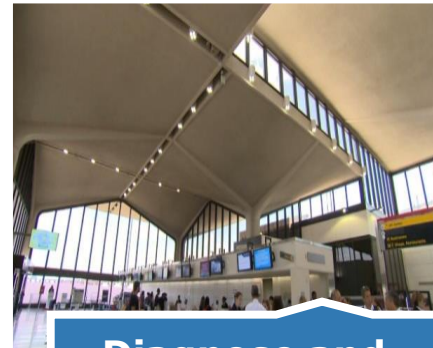
Asset Tracking



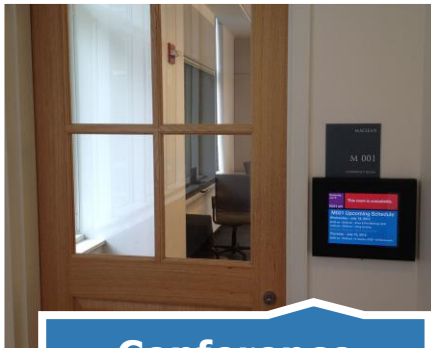
Space Utilization



Indoor Positioning



Diagnose and Report



Conference Room Scheduling



Security



Energy Tracking



Integrate with BMS/HVAC

Not everyone needs these bells and whistles...

Two categories or “buckets” of Networked Systems



- Simpler/Easier to install and use
- Fewer features and capabilities



- More difficult to install and use
- Advanced features and capabilities

Characteristics



Simplified Systems

- Out-of-the-box functionality
- No computer server, central gateway, or cloud internet connection required
- Simple commissioning by contractor
- Does not require sophisticated Facility Manager or 3rd party to manage system
- Basic control strategies (occupancy, daylight, high-end trim)
- Single room or building
- More likely to be wireless
- May have integrated sensors to reduce complexity



Comprehensive Systems

- Customized by application
- May require computer server or cloud internet connection
- Commissioning by or with support of manufacturer or rep
- Requires capable Facility Manager or 3rd party to manage system
- Basic + Advanced control strategies (scheduling, demand response)
- Campus or Enterprise
- Advanced Capabilities (energy monitoring, remote diagnostics, shade controls, and more...)

Examples of Available Systems



Simplified Systems

- Lutron Vive
- Philips SpaceWise
- Acuity nLight Air
- Cree SmartCast Wireless



Comprehensive Systems

- Lutron Quantum
- Philips Dynalite
- Acuity nLight
- Cree SmartCast PoE

The lines between simplified and comprehensive systems will become more blurred over time. We'll see the categories converge so that a single system can be installed in a basic, simplified configuration, or optional components added to be an advanced, comprehensive system. This is good!

Where can this lead?

- A new Energy Data Ecosystem
- Living, breathing, transactive future
- Connectivity from luminaire to powerplant, exchanging energy data and responding

Thank You!

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