Power over Ethernet, The Platform of the Future for Intelligent Building Subsystems

There's a Revolution Happening in our Buildings!

Bob Allan, LEED GA
Global Business Development Manager for Intelligent Buildings
@ballan32
Bob_allan@siemon.com

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BICSI

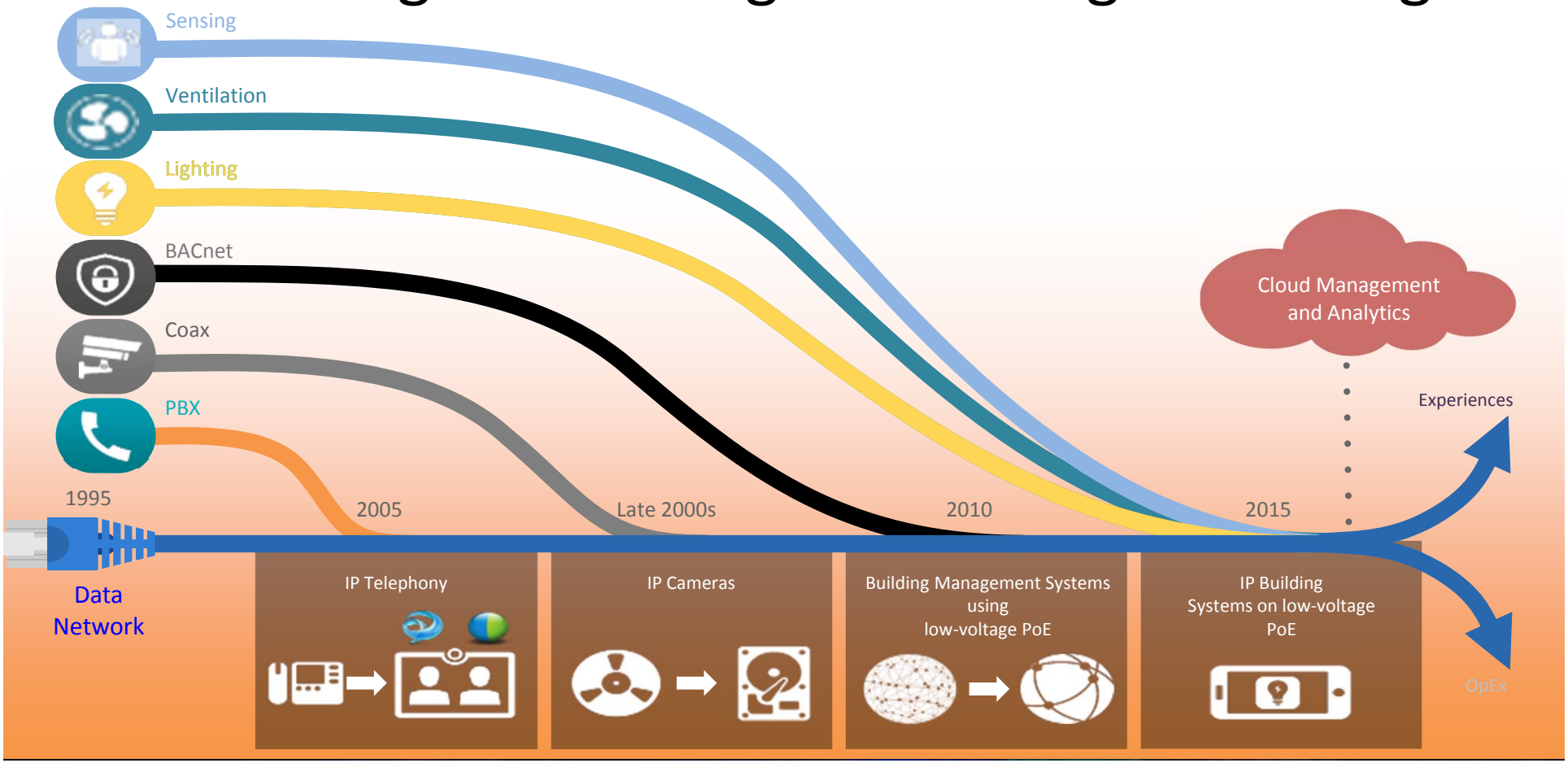
Total Convergency

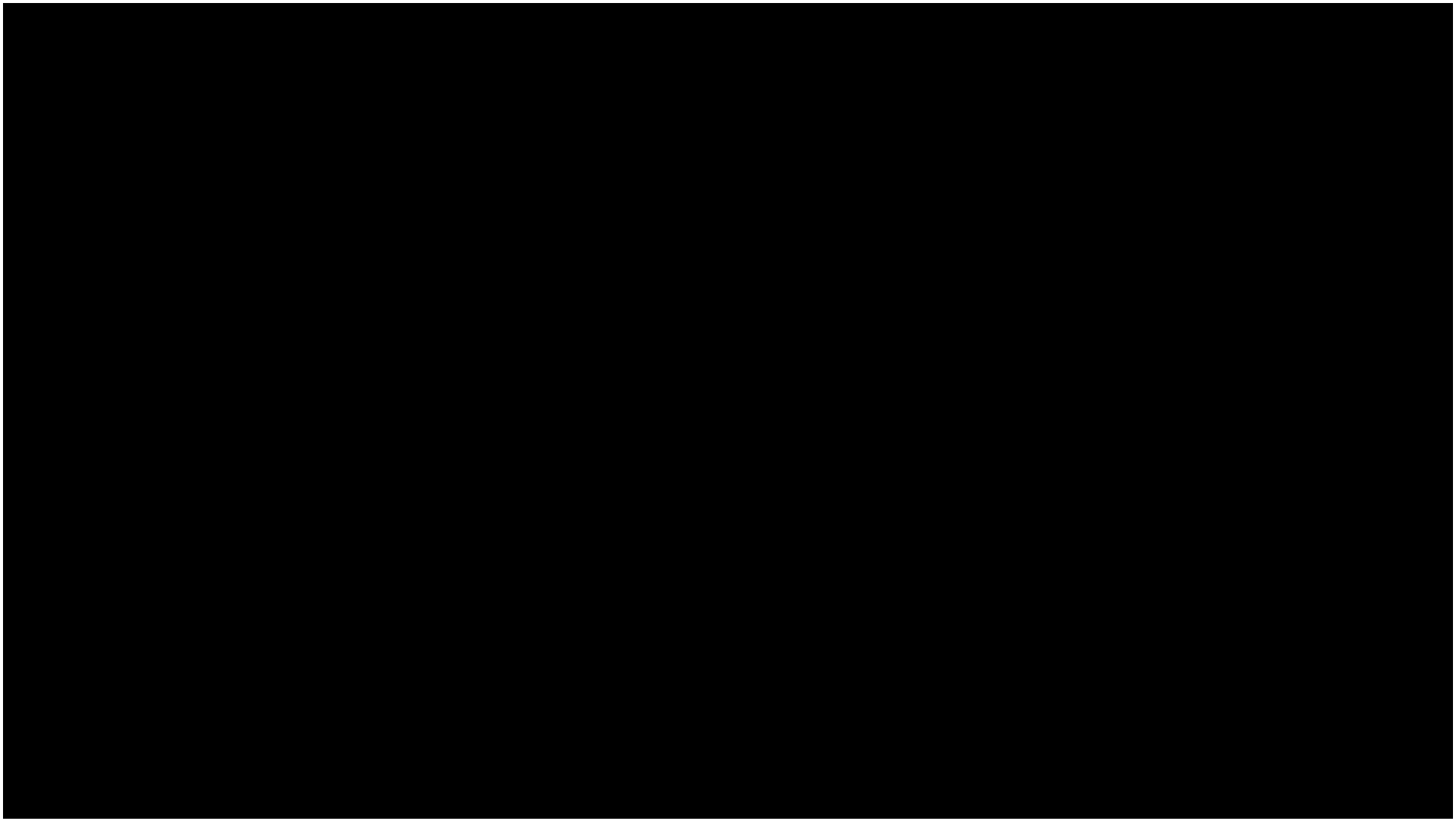
- ConvergeIT is an Intelligent cabling solution
- Multiple building systems can be run over a single IT cabling infrastructure
- Power and control over the same infrastructure
- Zone topology deployment
- These systems can include
  - Lighting
  - Voice/data
  - Wireless
  - Video surveillance
  - Access control
  - DAS
  - Audio/video
  - Fire alarms/safety
  - Energy management
  - HVAC
  - Digital signage

Traditional – Multiple systems, multiple proprietary cabling types

ConvergeIT – Multiple systems, one structured cabling infrastructure

IP Convergence for Digital Building Technologies

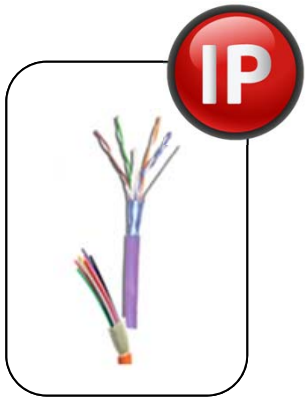




Today's and Future Intelligent Buildings

- Today's building communication systems are moving towards IP Convergence

Data/IP Network Cable



- One infrastructure using a zoned cabling topology, means substantial CAPEX savings

Attributes of Connected and Converged

- Reduce installation, infrastructure, training, and operational costs
- Change, Update, Add, and Refresh Subsystems without changing the Platform
- Offer unique services to all departments, students, vendors, patients and visitors
- Collect and analyze facility and usage data through IP enabled sensors
- Leverage Cisco wireless and video infrastructure to enable analytics based services and marketing
- Realize measurable return on investment

Case Study

- 50,000 sq. ft. enterprise space at a manufacturing facility
- Drawings were 60% complete when engaged
- Tasked to find construction savings without any material changes in the current designs
- Suggested to change the specification to utilize Power over Ethernet
- Savings came from reduce cabling and power cost.
- The savings would have been much greater if the engagement was earlier in the design process.

Capital Cost Savings

	PoE Access Control	PoE HVAC VAV Box	PoE HVAC Fan Coil Box	PoE Lighting	Total Savings
Traditional cost per device	$351.50	$275.00	$425.00	$375.00	
PoE per device cost	$280.50	$355.00	$550.00	$350.00	
Savings per device	$71.00	-$80.00	-$125.00	$25.00	
Savings on devices	20%	-29%	-29%	7%	
Estimated number of devices	35	24	24	700	
Total device savings	$2,485.00	-$1,920.00	-$3,000.00	$17,500.00	
Estimated system cost with AC building power	$38,552.50	$24,600.00	$28,200.00	$617,500.00	
Estimated cost using PoE over structured cabling	$18,567.00	$14,520.00	$19,200.00	$432,250.00	
Savings per CCSM	$22,470.00	$8.160.00	$6,000.00	$202,750.00	$239,380.00

23k square foot building – Erie, PA

Systems Identified

- HVAC
- Lighting
- Generators
- UPS
- Elevator
- Access Control
- Utility Meters
- Fire Life Safety

Possible Additions

- IP Video
- IoT Devices
- Appliances
- Printers/Copiers

Hard-Wire and Integrate Eight (8) Disparate Systems per Current Specifications = $970,937

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Hard-Wire and Integrate Eight (8) Disparate Systems per Current Specifications = $970,937

- or -

Modify Design and Integrate "Single Pane of Glass" = $480,300

Outcomes of Integration

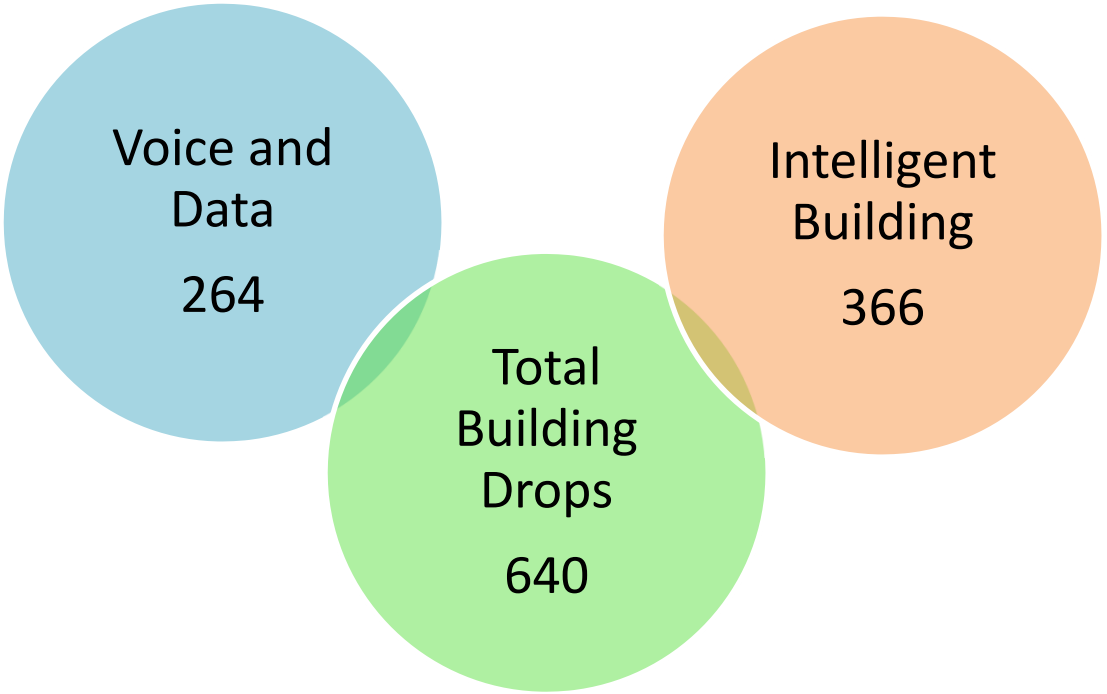
- Reduce Controls First Costs by 49%
- Optimize Building Performance
  - Maximize Occupant Productivity
  - Reduce Utility Consumption
  - Reduce Operating Expenses
  - Reliability-Centered Maintenance
- Minimize Risk
  - Minimize/Eliminate Downtime
  - Reduce Unplanned Capital Repairs
- Visibility (meaningful data)
- Showcase/Marketing

What does Intelligent Buildings Mean to an Installer?

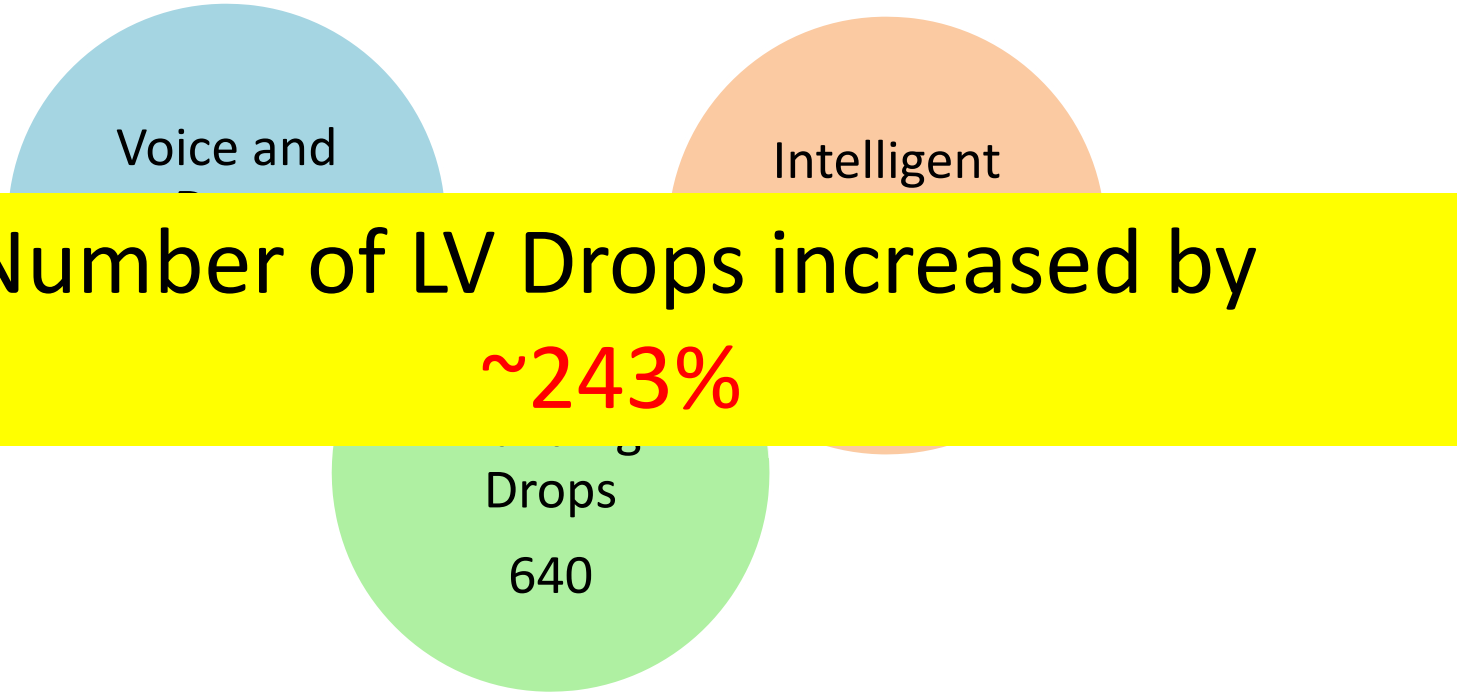
Voice and Data BOM	
Description	Number of Drops
Office Drops	128
Cubical Drops	136
Total Drops	264

Intelligent Building BOM	
Description	Number of Drops
PoE Doors	66
Security Cameras	7
PoE Light Nodes	283
Access Points	10
Total Drops	366

23k square foot building – In Summary…



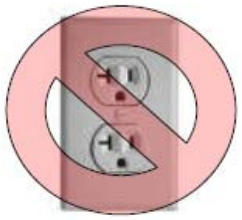
23k square foot building – In Summary…



Number of LV Drops increased by

~243%

Utilize PoE Wherever Possible



- Part of the DC Micro Grid
- No Vampire power loss

Cost Savings with PoE

- The cost of a power outlet includes conduit, wire, a back box for the outlet and the labor of an electrician
- PoE Example: Purdue University installed over 1,100 PoE wireless access points and saved up to $1,000 per location
- An average cost to provide typical power to a device is about $1,000, the whole cost of a PoE network port plus the structure cable drop is $250 per drop

PoE
Power over Ethernet

=

PoE Applications

- Access Control
- Computer Systems
- Building Automation Systems
- CCTV
- HVAC
- WLAN
- Smart Signs/Web Signs
- Vending Machines
- Gaming Machines
- Audio And Video Juke Boxes
- Electronic Point Of Sale (EPOS) Information Systems
- Time And Attendance Systems
- Battery Chargers For Mobile Phones And PDAs
- Electronic Musical Instruments

Average Number of Drops per Device

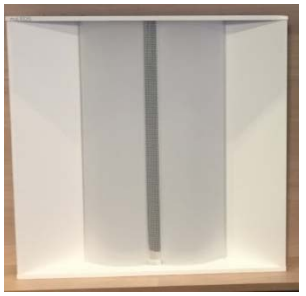
Per 10,000 square feet

Device Type	Number of devices	CAPEX Savings
PoE Lighting	115	$82,250
Wireless Access Points	10	$7,500
Public Address	4	$3,000
Access Controls	4	$3,000
Security Cameras	4	$3,000
HVAC	4	$3,000
Life Safety	4	$3,000
Digital Signage	2	$1,500
IP Clocks	2	$1,500
Intercom	2	$1,500
Other	22	$16,500
Totals:	**169**	**$126,750**

IT Network for LED Lighting Systems



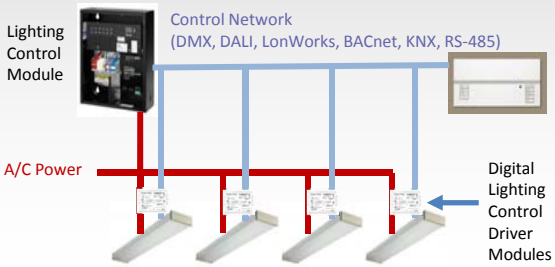




The Transition to a Digital Building

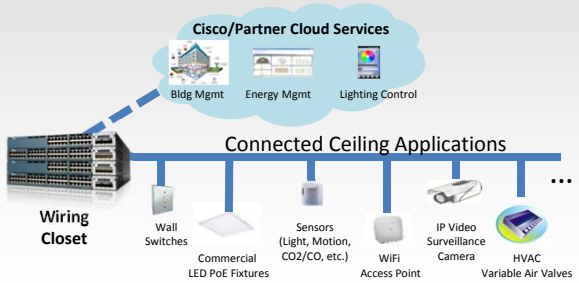
Traditional Lighting Infrastructure

- High voltage cabling for lighting (110V or 277V Power)
- Legacy RS-485 protocol for control



Connected Building Infrastructure

- Switch PoE power LED light and other edge devices
- Both power and control through RJ-45 Ethernet cable



- Lower TCO: reduced material & labor cost, energy savings
- Intelligent IP platform, software analytics for broader building automation initiatives

PoE Slashes Cabling Cost for New Construction

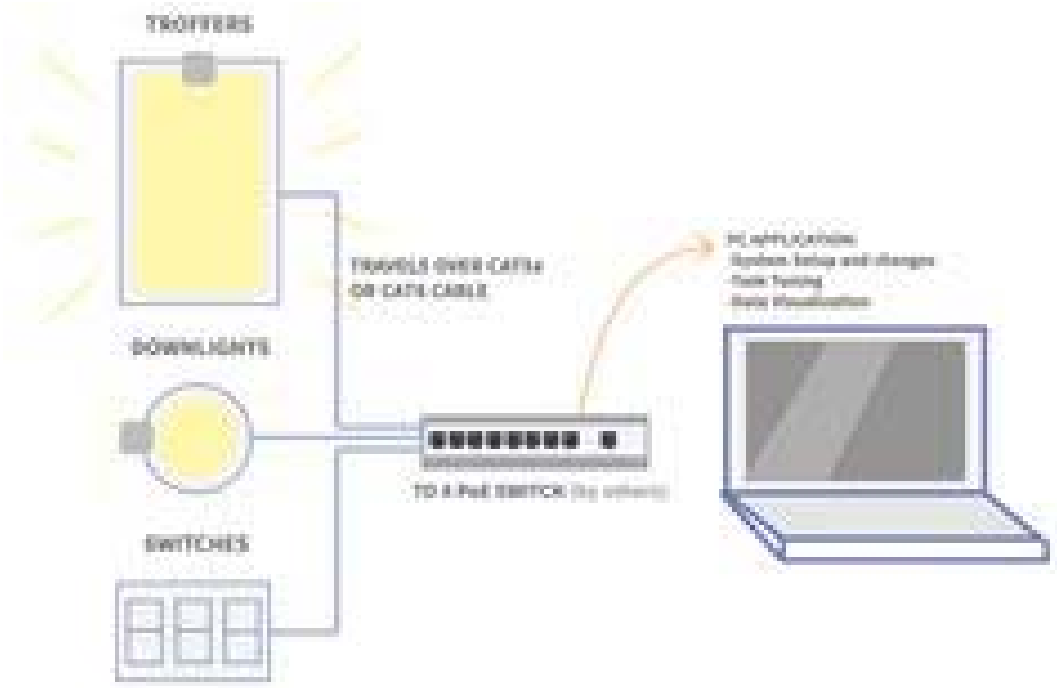
AC conduit

- Electrician wage rates
- Bending conduit
- Electrical code

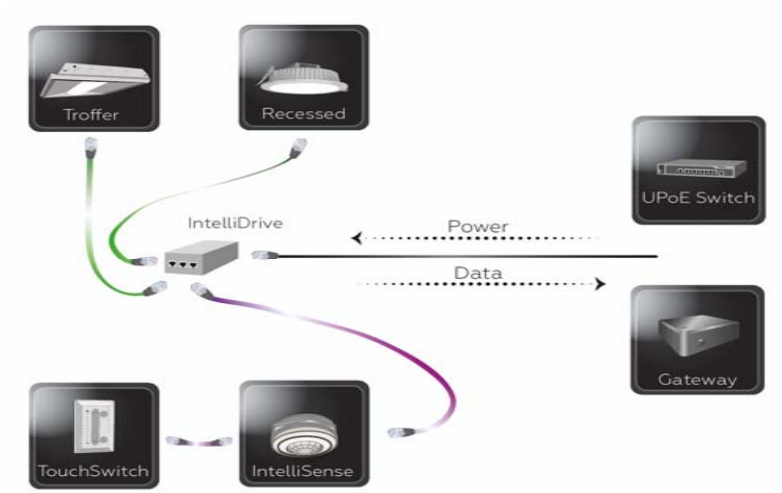
Structured cabling

- Structured cabling cost structure
- Pull bundles
- Low-voltage

Fixture Centric

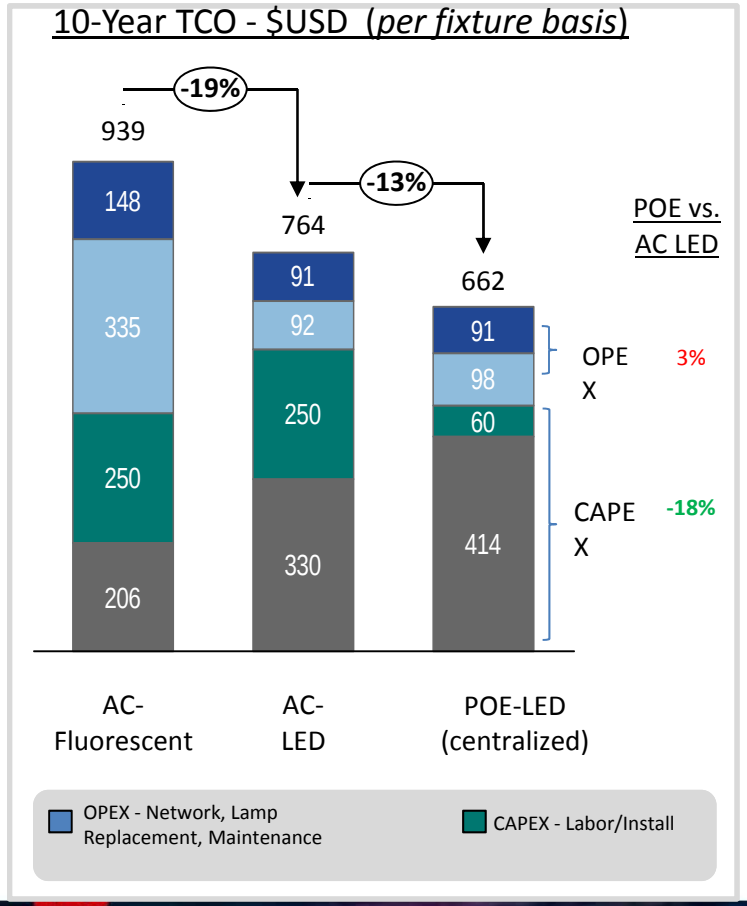


PoE Lighting Sensor and Topology



PoE Lighting Sensor and Topology

- LiFi network connectivity
- Occupancy sensors
- Switches
- AV Integration
- Advanced scheduling
- CO2 sensors
- Humidity sensors
- Ambient light
- Energy consumption
- Daylight harvesting
- Fine-grain indoor location tracking system

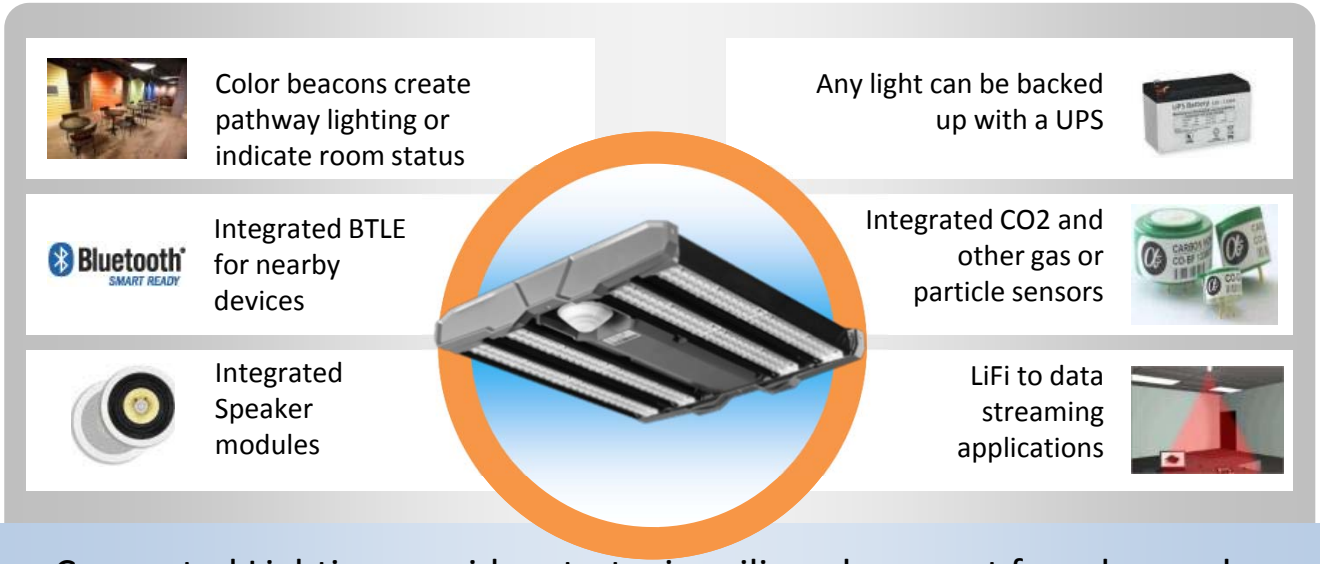


Connected Lighting - Lower TCO

- Key factors driving lower TCO for UPoE-LED
  - Lower installation costs
  - Incremental energy savings
  - Future PoE light fixtures will cost less
- TCO expected to improve
  - LED price/performance increase 20% per year
  - LED luminosity efficiency will continue to improve

*US NYC customer, 35K Sq Ft space

Connected Lighting – Part of a Digital Building



Connected Lighting provides strategic ceiling placement for advanced sensor technologies and other devices

Connected Lighting – Part of a Digital Building

Color beacons
pathway lighti
indicate room

t can be backed
up with a UPS

Bluetooth SMART READY

Integrated BTL
for nearby
devices

grated CO2 and
other gas or
particle sensors

Integrated
Speaker
modules

LiFi to data
streaming
applications

Connected Lighting
sens

ment for advanced
ces

Power over Ethernet (PoE) Trends

- Over 100 million Power over Ethernet (PoE) enabled ports are shipping annually
- Cisco® 60w Universal PoE (UPOE) technology is driving the adoption of virtual desktop infrastructure (VDI)

- Power over HDBaseT (POH) technology can deliver up to 100w over twisted-pair cable, supporting full HD digital video, audio, 100BASE-T and control signals in television and display applications
- The IEEE 802.3bt DTE Power via MDI over 4-Pair Task Force is developing a new remote powering application that will provide superior energy efficiency compared to a two-pair application which will significantly expand the market for PoE systems

Imagine Configuring Lights to Match your Work

A Cisco Example:

- White-Tuneable Connected Lighting in Audio Privacy Rooms (APRs)
- Cisco HQ Connected Lighting user interaction:
  - Find Vacant APRs
  - Scan QR Code to reserve rooms
  - Choose room color mood and intensity
- This is a PROTOTYPE GUI

Top Use Cases

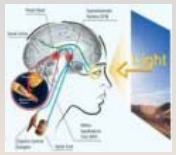
Incremental Energy Savings

Incremental energy savings based on highly dense sensor network and individual fixture control

- Electrical Load Shedding
- Personalized Workspaces
- Granular Occupancy
- Granular Daylight Harvesting
- Highly Flexible Scheduling

Productivity & Health/Comfort

Human Centric Lighting



Change lighting temperature to follow the circadian rhythm of workers and students

Generic Lighting Applications

Real time conference room availability

Customized lighting for retail stores

Emergency pathway lighting for first responders

Code blue visual indicator

Digital ceiling unlocks the power of IoT analytics

Integrated Sensors
- Light
- Occupancy / motion

Integrated radios
- WiFi
- LiFi
- BTLE

Metering

Analytics

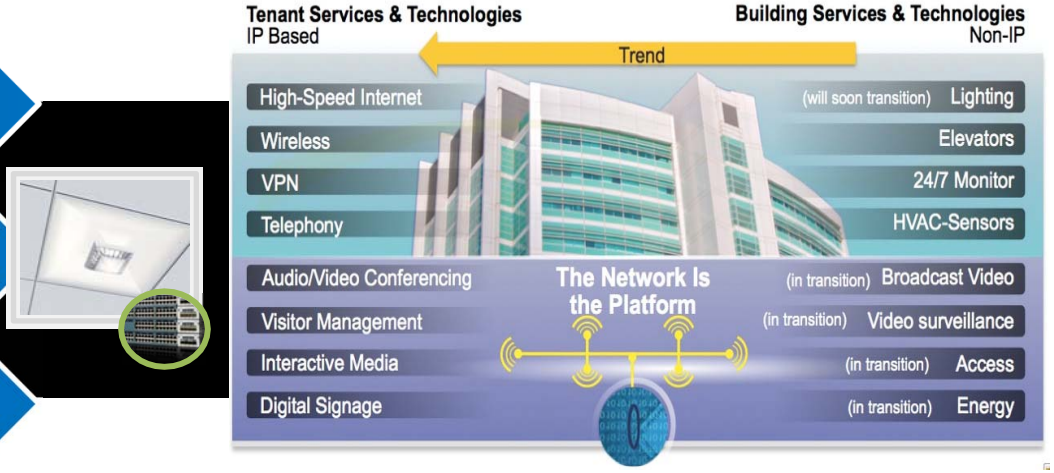
- Energy
- Resources
- Space / occupancy
- Grouping / interactions

Summary

Part of the Next-gen Workspace Experience

Robust, Scalable and Lower TCO thru IP Convergence

Digital Ceiling enables future IoT Applications



Creating the Next-generation Workspace Experience

Cisco Digital Ceiling

WaterPark Place III

Create an Innovative and Efficient Workspace

Challenge

- Build an innovative, energy-efficient workspace

Digital Transformation

- PoE-powered lighting with Catalyst switches
- Sensor-based access to workspaces
- Analytics with fixture-level visibility

Business Outcomes

- Converge five networks—HVAC, metering, lighting, CCTV, access—into one
- Lower CapEx (~10%) and OpEx (~$600k)
- Reduce energy costs by 50% by replacing fluorescent lights with LEDs and using PoE
- Anticipate earning Toronto's first Enterprise Leadership in Energy and Environmental Design (LEED) Platinum Certification