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The Power of PoE

Myths and Misconceptions

Paul F. Weintraub
RCDD, RTPM, ESS, TECH, CAE
Head of International Business

SUPERIOR ESSEX
Everywhere You Live and Work®

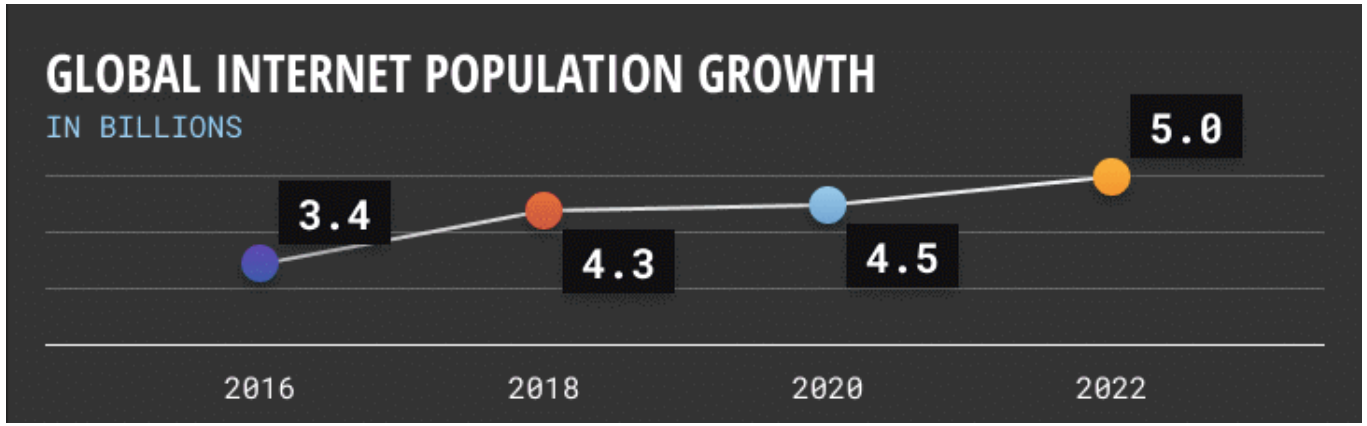
Overview

- Introduction
- What is Power over Ethernet?
- Case Studies
- Myths and Misconceptions
- Maximizing the ROI
- Conclusions

INTRODUCTION

181 Zettabytes by 2025!

- In April 2022 Internet Reached 63% of the Worlds Population (~5B)
  - 93% Social Media Users (4.65B)
- Data Consumed in 2021 = 79 zettabytes
- Data Consumed in 2022 = 97 zettabytes
- Projected Increase of 229% from 2021 - 2025

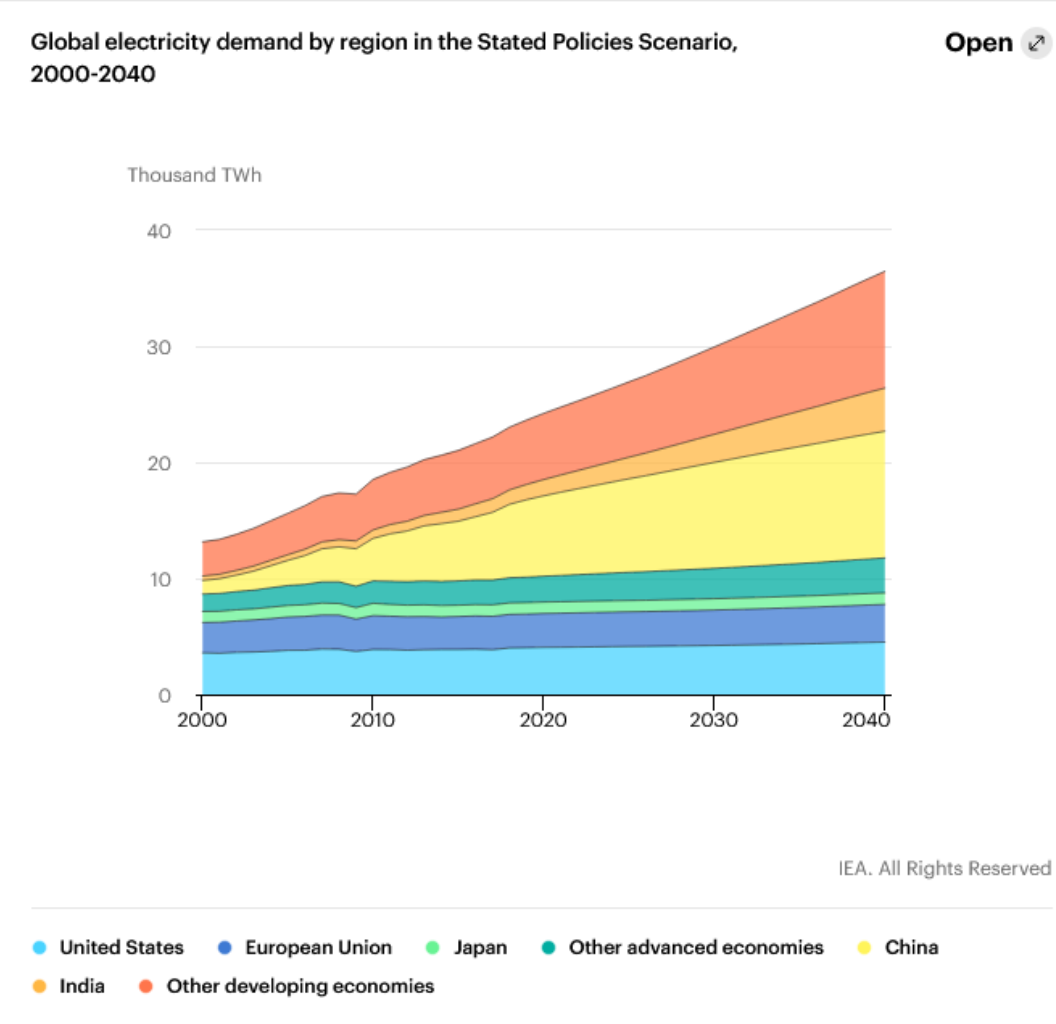


A zettabyte = 1,000,000,000,000,000,000,000

A zettabyte is a unit of digital information bytes or **a trillion gigabytes**. Each byte is made up of eight bits, each bit being a 1 or a 0

Sources: DOMO
Exasol - Zettabyte

Global Electricity Demand 2000 - 2040



Electricity demand follows two distinct regional paths.

- **Advanced economies:** future growth linked to increasing digitalisation and electrification is largely offset by energy efficiency improvements.
- **Developing economies:** rising incomes, expanding industrial output and a growing services sector push demand firmly up.
  - Contribute nearly 90% of global electricity demand growth to 2040.
  - Demand per person remains 60% lower than in advanced economies.

Source: IEA

A New Paradigm for the Building Industry

CAR INDUSTRY

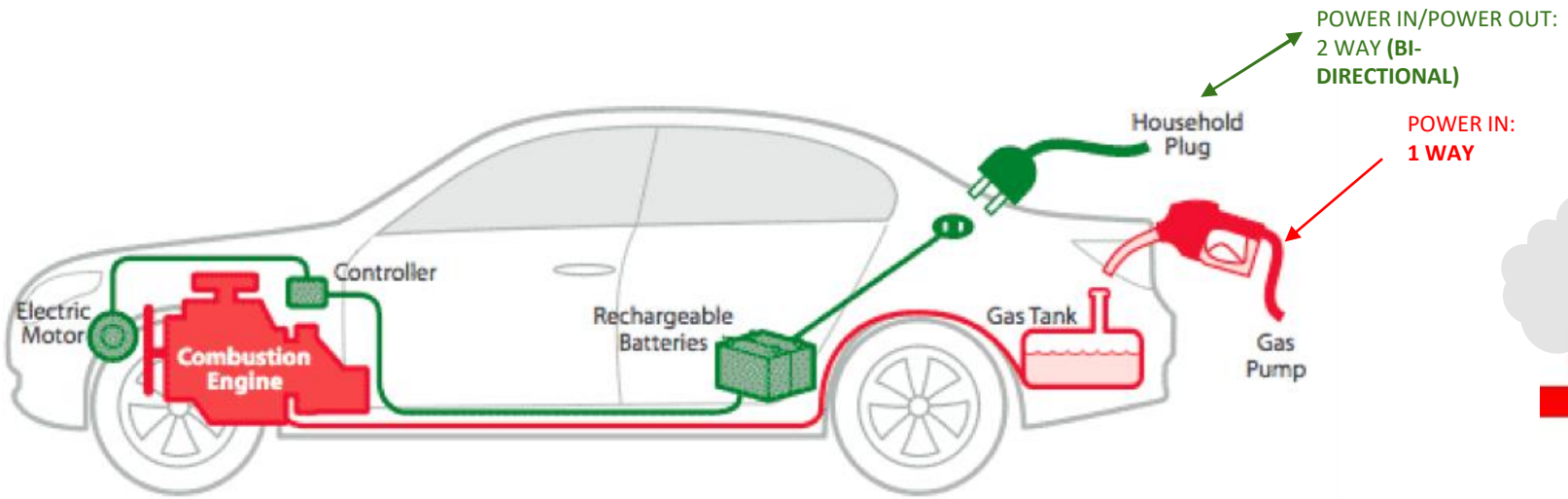
ELECTRIC vs GASOLINE

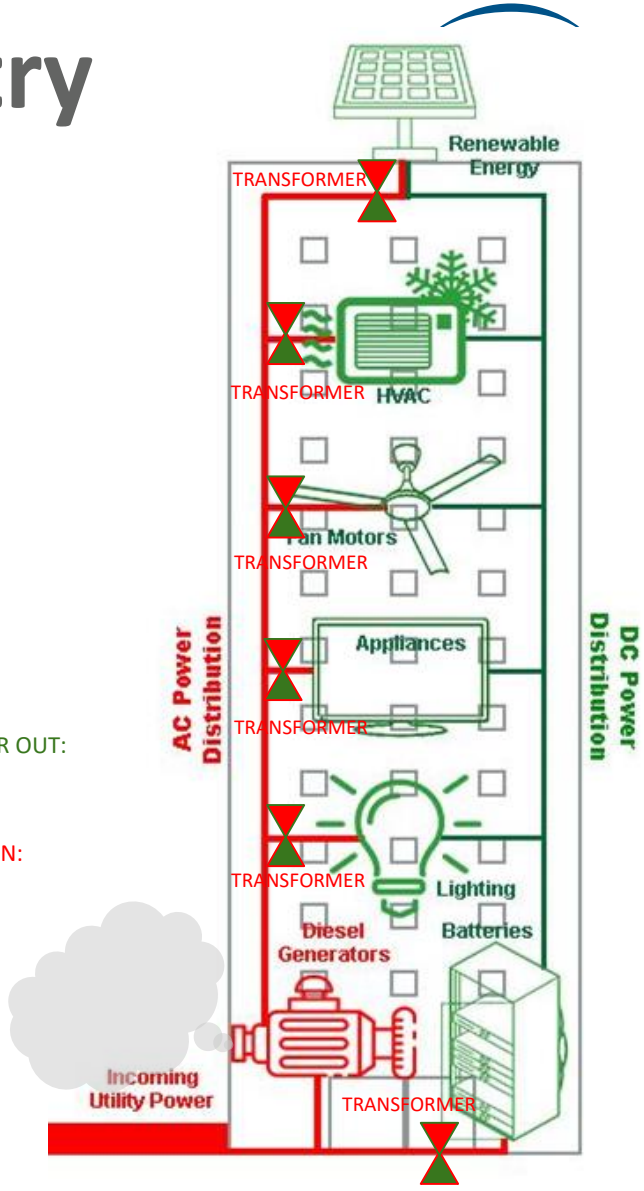
- Entirely new vehicle power plant
- Propelled by regulation
- Software plus batteries
- Vehicles are simpler & require less maintenance
- No emissions means healthier people

BUILDING INDUSTRY

DC vs AC

- New building power system
- Propelled by new regulations
- Software plus batteries & renewables
- Simpler to build, simpler to maintain means less embodied carbon
- Less (soon to be no) emissions means no climate change





WHY SUSTAINABLE SMART BUILDINGS?

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ENHANCED OCCUPANT SATISFACTION

Guests can experience advanced control and customization using connected technology, and Operations will be made easy with accessible centralized control and notification platforms

CAPEX & OPEX COST SAVINGS

By using less physical materials, utilizing less expensive labor, and reducing energy consumption, luxury hospitality projects can save money on both capital and operational costs

REDUCED ENVIRONMENTAL IMPACT

Using DC Technology, we can eliminate the use of fossil fuels, and substantially reduce the operational and embodied carbon being used in the project

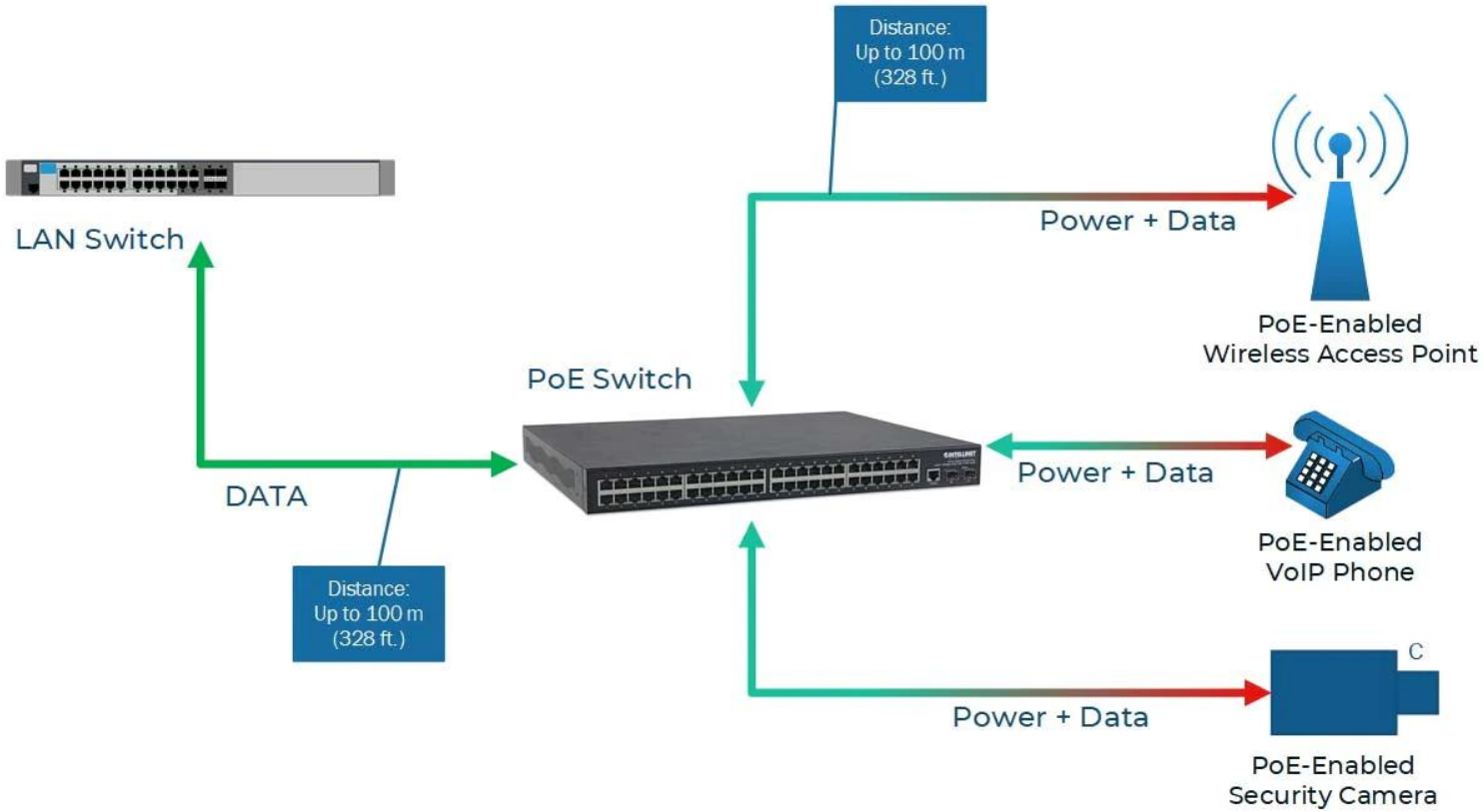
MORE USABLE SPACE

Using intelligent distributed design gives the opportunity to generate more usable space by eliminating the need for IDFs and Electrical Closets

WHAT IS POWER OVER ETHERNET?

What is PoE?

Power over Ethernet (PoE) is a technology that passes electric power over twisted-pair Ethernet cable to powered devices (PD), such as wireless access points, IP cameras, and VoIP phones, in addition to the data that cable usually carries. It enables one RJ45 cable to provide both, a data connection and electric power to PDs instead of having a separate cable for each



Source: Intelligent Network Solutions

PoE Standards

PoE Standard	PoE Common Name	Power Output	Year	Comment
IEEE 802.3af	PoE	15.40 W	2003	12.95 W power available for connected device (PD)
IEEE 802.3at	PoE+	30 W	2009	25.50 W power available for connected device (PD)
IEEE 802.3bt Type 3	4PPoE, Ultra PoE, UPoE	60 W	2018	51 W power available for connected device (PD)
IEEE 802.3bt Type 4	Ultra PoE, UPoE	100 W	2018	71 W power available for connected device (PD)

Source: Intelligent Network Solutions

Electrical Specifications of PoE Standards

For most users, the "Minimum power for PD" value is the most significant, as that value dictates which PoE standard provides sufficient power for the required application.

PoE Standard	Voltage @ PD	Voltage @ PSE	Minimum power for PD*	Minimum output @ PSE	Supported Modes	Maximum cable length
IEEE 802.3af	37-57 V	44-57 V	12.95 W	15.40 W	Mode A + B	100 m
IEEE 802.3at	42.5-57 V	50-57 V	25.5 W	30 W	Mode A + B	100 m
IEEE 802.3bt Type 3	42.5-57 V	50-57 V	51 W	60 W	Mode A + B, 4-pair mode	100 m
IEEE 802.3bt Type 4	41.1-57 V	52-57 V	71 W	100 W	Mode A + B, 4-pair mode	100 m

* Short distances via high-quality cable result in power values that are closer to the power output at the PSE.

A high-quality cable may achieve power and data transmission beyond the 100m standard

Source: Intelligent Network Solutions

Benefits of PoE

REDUCE INSTALLATION COSTS UP TO 25%

PRE-INTEGRATED LIGHTING CONTROLS

FEEDBACK AND INTELLIGENCE

FLEXIBLE AND ADAPTABLE

CONTRIBUTES UP TO 20+ LEED CREDITS

INCREASE OCCUPANT COMFORT

ENDLESS INTEGRATIONS

SPACE UTILIZATION

DATA-DRIVEN INSIGHTS

PoE: Driving A New World of Building Endpoints

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Base building services


Access Points


HVAC VAV's


Ceiling Fans


Smoke alarm


Power Meter


Touchscreen PC's

Tenant Access & Security


Surveillance cameras


Biometric Door Locks


Facial Recognition Systems


Entry Barriers And Turnstiles


Badge readers


IP Call Tower

Workspace Transformation

Meeting Room Nameplate

POE Displays


Temp Sensor


Light Fixtures

Status Signs


Horns and Sirens

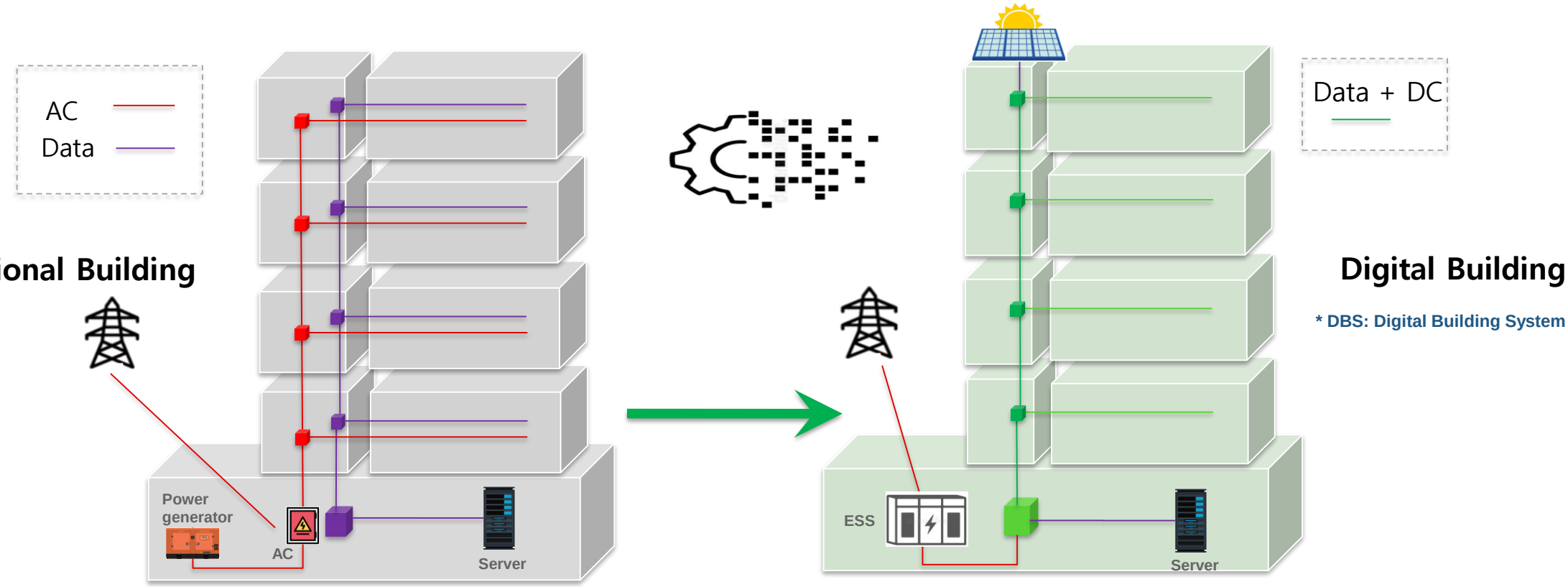

IP Call Stations

Environmental Sensor Hubs


Blind Motors


Curtain Motors

PoE: Enables Digital Transformation of Buildings



- High Installation Cost
- Longer Project Period
- High Energy Consumption
- Not Sustainable or Green Friendly

- 10% – 40% Lower
- 10% – 25% Shorter
- 30% – 50% Energy Reduction
- Carbon Neutral - Sustainable

PoE: Enables Greater ROI for IT/OT Convergence

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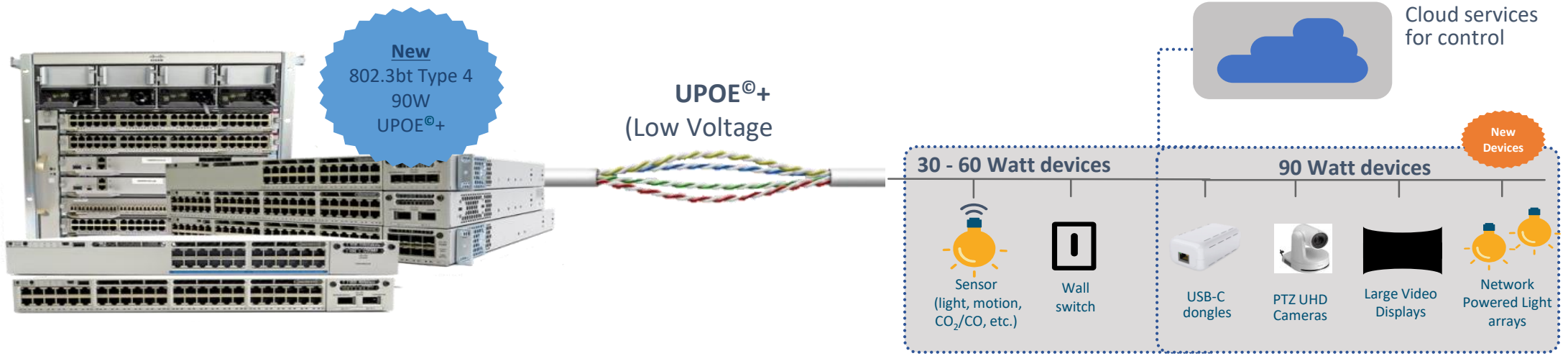
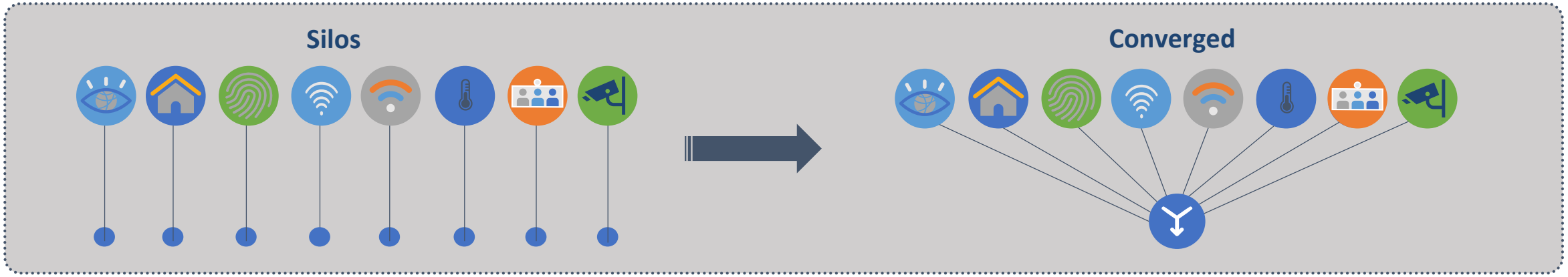




End-to-end solution managed by central IT provides lowered costs, intelligent control, new experiences

CASE STUDIES

The Sinclair Hotel

A Marriott Autograph property

Fort Worth, Texas

Sinclair Hotel - Overview

- The first hotel in the world to use PoE (Power over Ethernet) to power all lighting, mini-refrigerators, smart mirrors, and motorized window treatments.

- Results:
  - 39% Energy savings month to month vs. pre-renovation
  - 16% CapEX Savings (1st Install construction savings)
  - 50% fewer electrical and IDF closets
  - Reduction of incoming power to building from 3000 Amps to 2500 Amps
  - Decreased Construction Time
  - Substantial Reduction of electrical labor and materials

Source: Sinclair Digital, LLC


PoE
DEVICES
LIGHTING
SHADES/
DRAPES
PHONE
DATA
DEVICES


SHADES/
DRAPES
LIGHTING
TV
MINI-BAR
PHONE


MIRROR
TV
LIGHTING

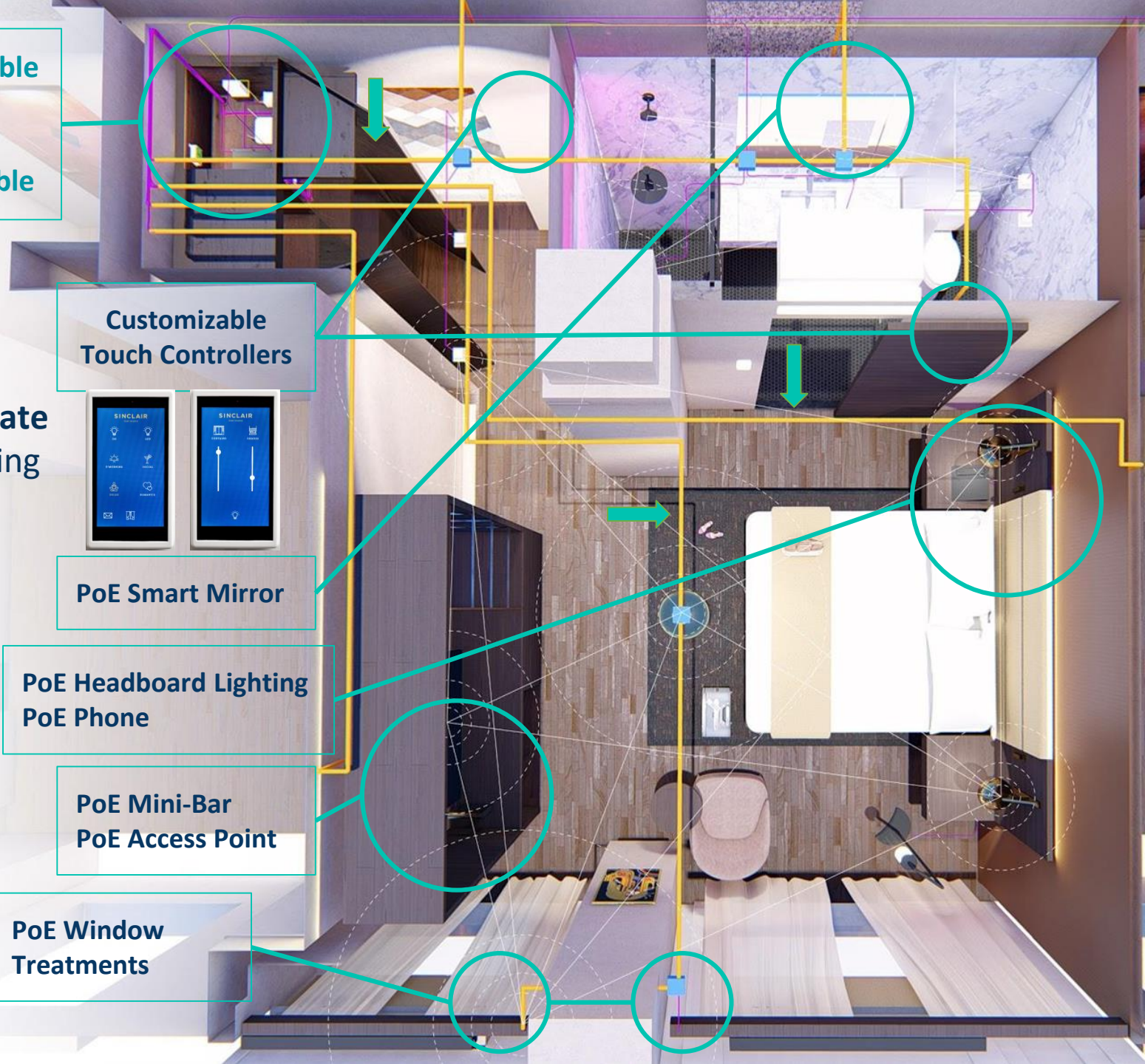
Network Switch: 1X CAT Cable
GPON: 1X Fiber
DE Receiver: 1X 18/2
Lighting Drivers: 4X CAT Cable

SINCLAIR HOTEL ROOM TYPICAL TOPOLOGY

Hotel rooms use a distributed network to **eliminate IDF closets** from the floor by locating the switching and GPON components inside the room.

Other key features include:

- Use of conduits behind sheet rock to enable future proofing of infrastructure
- Customizable Touch Panels: 2X Category Cable
- PoE smart mirror: 2X Category Cable
- LV light fixtures: 10X 18/2
- PoE mini-refrigerator: 1X Category Cable
- PoE window treatments: 3X Category Cable
- Bluetooth sensors enabling occupant detection, associate alert, people counting, and device tracking: 1X Category Cable



Customizable Touch Controllers

PoE Smart Mirror

PoE Headboard Lighting
PoE Phone

PoE Mini-Bar
PoE Access Point

PoE Window Treatments

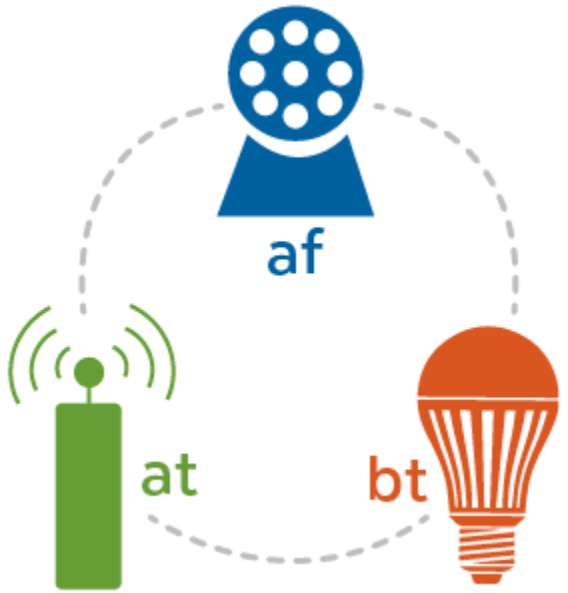
CISCO Penn 1 – NYC

Source: Cisco on LinkedIn

MYTHS AND MISCONCEPTIONS

The New PoE Standard, 802.3bt, Doesn't Require New Hardware

- The IEEE 802.3bt is entirely backward-compatible with IEEE 802.3af (12.95 W) and IEEE 802.3at (25.5 W), allowing a mixture of PoE standards to coexist in the same network. Therefore, new PSEs or PDs on an existing network will not be needed



TRUE

Source: Versa Technology - 7 Myths About Power over Ethernet (PoE)

PoE is Not Cost-Effective

Cable Costs

- PoE provides —power and communications—over a single cable, which cuts the cost of cable in half. In addition, there is no need to install a power outlet next to a powered device (PD) because the power is supplied by the PoE switch or PoE injector (PSE) over the Ethernet cable
- PoE is simple and easy to install by IT teams and does not require an electrician's expense
- PoE is Cost Effective

FALSE

Design Flexibility

- Power over Ethernet makes networking improvements that reduce costs further. With PoE, network devices such as IP cameras or sensors can be mounted away from a power grid without installing more AC lines

Energy Consumption

- Reducing monthly overhead is paramount. Managed Ethernet switches include Simple Network Management Protocol (SNMP) that increases power consumption control. SNMP is available on managed industrial devices; however, it increases the effectiveness of PoE by allowing the monitoring, reporting, and management of power consumption of each interface. With PoE, the devices do not require individual AC to DC converters that consume extra power

Source: Versa Technology - 7 Myths About Power over Ethernet (PoE)

PoE has Limited Application

- Earlier versions of PoE technology may have had limited application. However, the latest version—IEEE 802.3bt—allows 100W of power

- Today, the semiconductor industry is actively driving down individual transistors' power consumption, which allows integrated device manufacturers (IDMs) to accomplish more with less power. As a result, the industry has more power available to a PD, and PDs require less power to do more

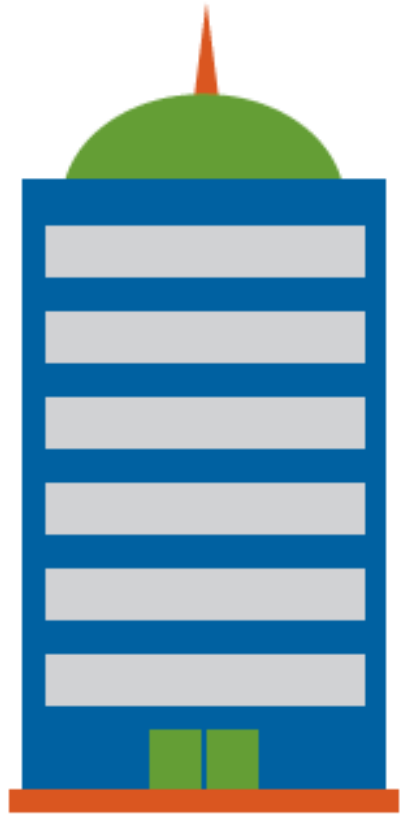
- Engineers now have larger power budgets to work with before considering offline power and all its attendant expenses. With these facts in mind, it is accurate to say that PoE can meet more application requirements than ever before

FALSE

Source: Versa Technology - 7 Myths About Power over Ethernet (PoE)

PoE Cannot Be Used to Outfit a Building

- Power over Ethernet is revolutionizing smart buildings
- Initially, POE was used mainly for VoIP phones and IP security cameras
- Today, PoE technology has evolved to the point that now it is used to enable numerous devices, which include human-centric lighting, occupancy sensors, asset tracking, access control, and more



FALSE

Source: Versa Technology - 7 Myths About Power over Ethernet (PoE)

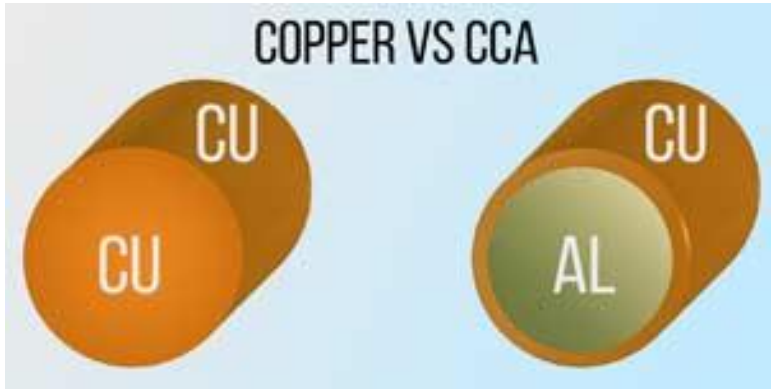
PoE is Not Suitable for Internet of Things (IoT)

- PoE technology has become the new favorite of the IoT
- The number of IoT endpoints increases each year. For example, smart sensors or actuators that use only small amounts of power but must be connected to the Internet
- Many of today's more popular wireless protocols struggle to provide IP addressability. As a result, they must be connected utilizing a local gateway that connects to the Internet using a wired Ethernet connection
- Adding PoE to these local gateways is an inexpensive option. Wireless endpoints require power, often supplied by primary cell batteries (that need replacement) or the utilization of offline power (that needs an AC-DC converter). PoE eliminates the need for primary cell batteries, offline power, and wireless connection
- IoT security is always a concern and is closely linked to wireless connectivity. These concerns are greatly lessened with a wired Ethernet connection, as it requires physical access to the endpoint
- Finally, PoE is reliable, stable, and does not experience problems such as RF congestion or dropped packets needing re-sent

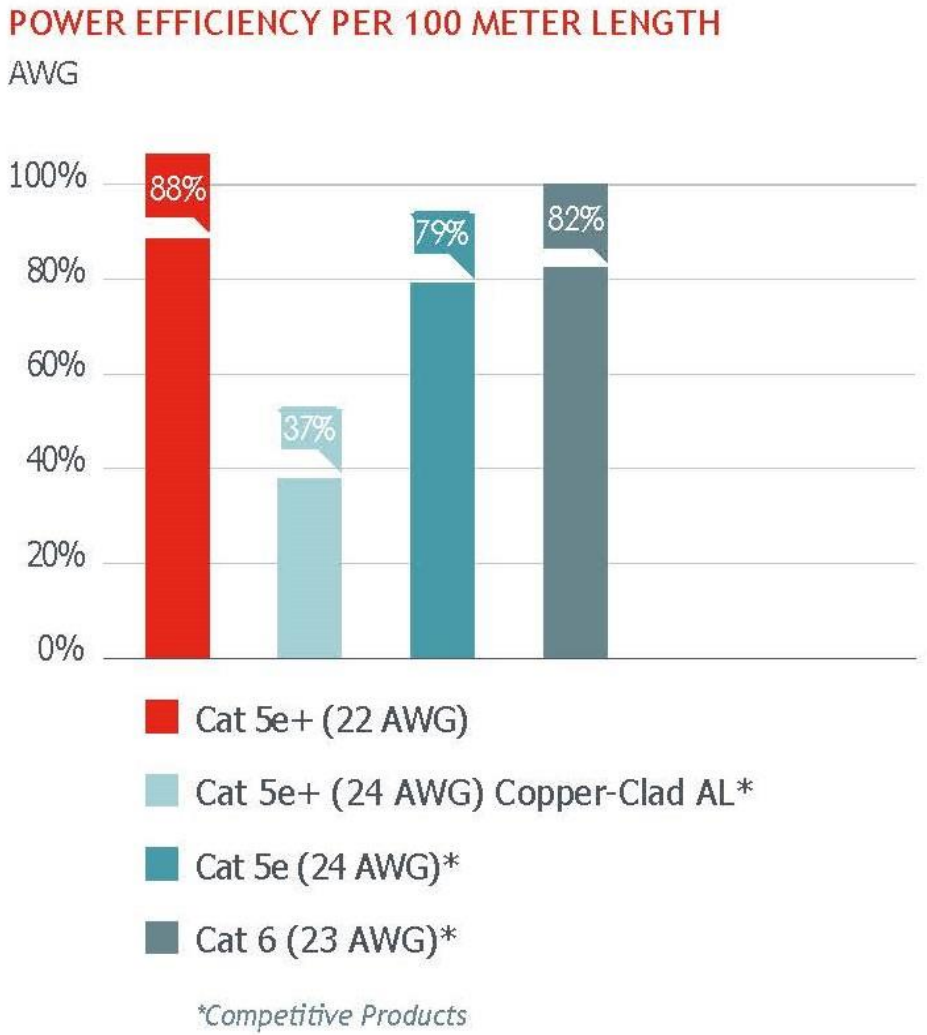
FALSE

Source: Versa Technology - 7 Myths About Power over Ethernet (PoE)

CCA Cables Are Good for PoE Applications



FALSE



Source: Fluke Networks, Legrand, Superior Essex White Paper - Considerations for the Design & Field Testing of an Optimized High-Power PoE Cabling System

Power Dissipation in the cable is an issue with PoE

- Engineers are understandably concerned with signal integrity and power dissipation when it comes to conductors initially designed purely for data. So, it is important to note that the IEEE 802.3 specifications were developed with these issues in mind

- PoE Cable For example, the IEEE 802.3bt standard requires the following:
  - That 90W power must be delivered over all four twisted pairs within the cable
  - A maximum cable length of 100 meters
  - With the use of only two twisted pairs, the maximum DC loop resistance should not exceed 12.5 Ohms
  - The use of a cable that is Cat5 or higher

- As long as these specifications are met, power dissipation will not be an issue

FALSE

Source: Versa Technology - 7 Myths About Power over Ethernet (PoE)

Length of the Cable is Limited

"With PoE, cables can't run too long; according to the Department of Energy, a maximum of 50 meters between the fixture and PoE server switch will result in loss of 5% or less."

DEPENDS

Source: Electrical Contractor Magazine - PoE's Rise to Intelligence: Power and data fuel LED lighting

Electrical Specifications of PoE Standards

For most users, the "Minimum power for PD" value is the most significant, as that value dictates which PoE standard provides sufficient power for the required application.

PoE Standard	Voltage @ PD	Voltage @ PSE	Minimum power for PD*		Minimum output @ PSE	Supported Modes	Maximum cable length
IEEE 802.3af	37-57 V	44-57 V	12.95 W	16%	15.40 W	Mode A + B	100 m
IEEE 802.3at	42.5-57 V	50-57 V	25.5 W	15%	30 W	Mode A + B	100 m
IEEE 802.3bt Type 3	42.5-57 V	50-57 V	51 W	15%	60 W	Mode A + B, 4-pair mode	100 m
IEEE 802.3bt Type 4	41.1-57 V	52-57 V	71 W	29%	100 W	Mode A + B, 4-pair mode	100 m

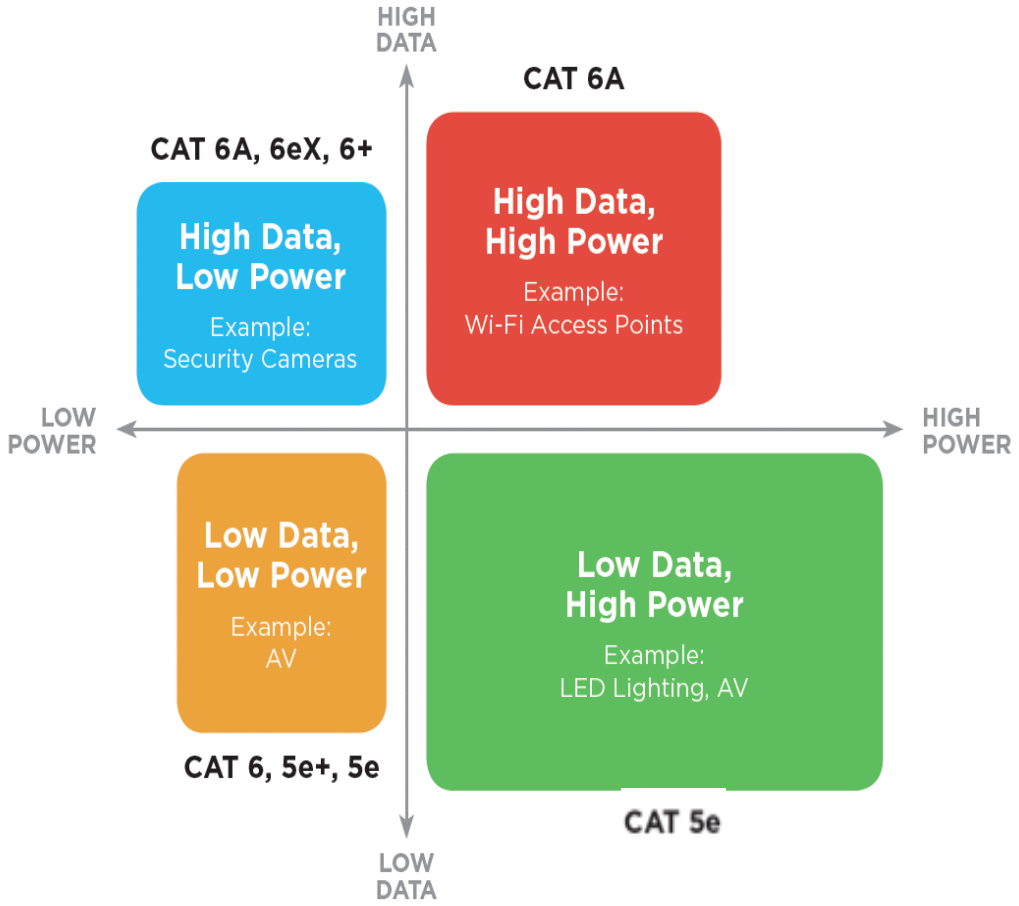
* Short distances via high-quality cable result in power values that are closer to the power output at the PSE.

A high-quality cable may achieve power and data transmission beyond the 100m standard

Source: Intelligent Network Solutions

PoE Cables – Power Efficiency

- What is the Application?
  - High-speed Data vs. High power vs. Mix
  - Is AWG more important than the cable performance category?
- If high power is your main application, a high-performance category cable may not provide the best ROI



Example – PoE Optimized Cables XD Performance

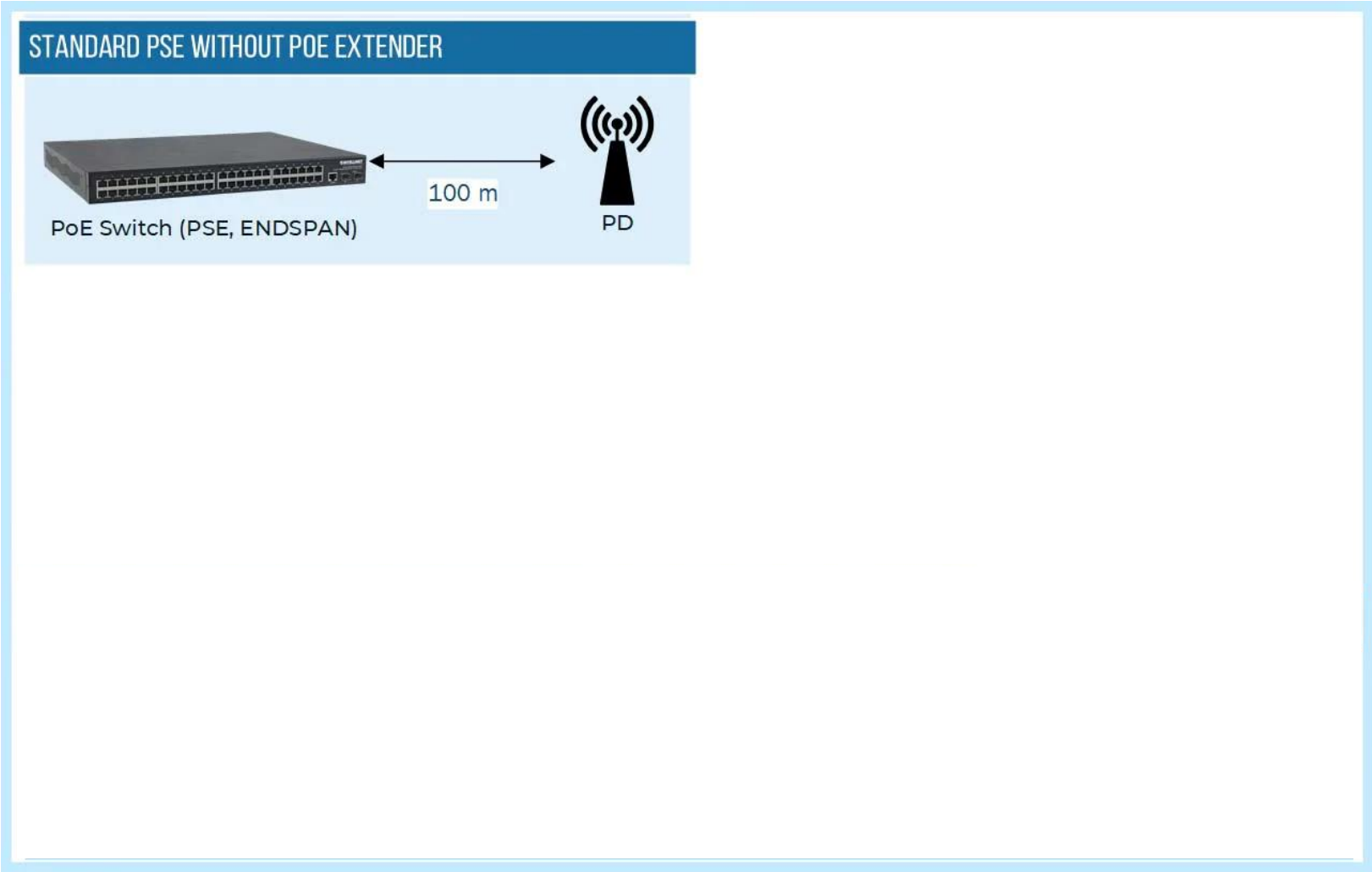
PowerWise® Extended Distance Maximum Supported Lengths

PowerWíse® 1G				PowerWise® 10G	
Direct Attach[1] Application	Transmlssion Standard	BER @ Amblent 20°C[2] Type 1 & 2	BER @ Max 70.1°C[2] Type 3 & 4	BER @ Amblent 20°C[2] Type 1 & 2	BER @ Max 70.1°C[2] Type 3 & 4
Data & Power (Bandwidth & Speed)	Max Distance @ 100 Mb/s	200m	140m	195m	190m
Data & Power (Bandwidth & Speed)	Max Distance @ 1 Gb/s	160m	140m	155m	145m
Data & Power (Bandwidth & Speed)	Max Distance @ 10 Gb/s	120m	105m	110m	105m

Distance		Camera type	PoE	Bandwidth
ft	m			
656	200	Any IP security camera any PTZ	60W	100Mbps
800	244	Any IP security camera	30W	<10 Mbps
1000	305	Any IP security camera	15W	2Mbps

Source: Superior Essex Communications - PowerWise®

Extending Distance with PoE Extenders



Source: Intelligent Network Solutions

Extending Distance with PoE Extenders - Limitations

Number of extenders	Distance	Maximum power available from PSE (input)	Maximum power for PD (output)
1	200 m	25 W	20 W
2	300 m	20 W	15 W
3	400 m	15 W	10 W
4	500 m	10 W	5 W

The figures above assume that the PoE extender draws 5 watts for itself. While that is on the high side to be sure - you may only lose 4 watts per extender - it is good to be conservative about power availability in scenarios like these.

Other things to keep in mind with PoE extenders:

- Some PoE extenders can be used outdoors, but not all
- Some PoE extenders can be daisy-chained, but not all
- Not all PoE extenders support Gigabit speeds; some are only Fast-Ethernet
- Some PoE extenders have two outputs and allow you to connect two PDs to the PSE at a distance of 200 meters

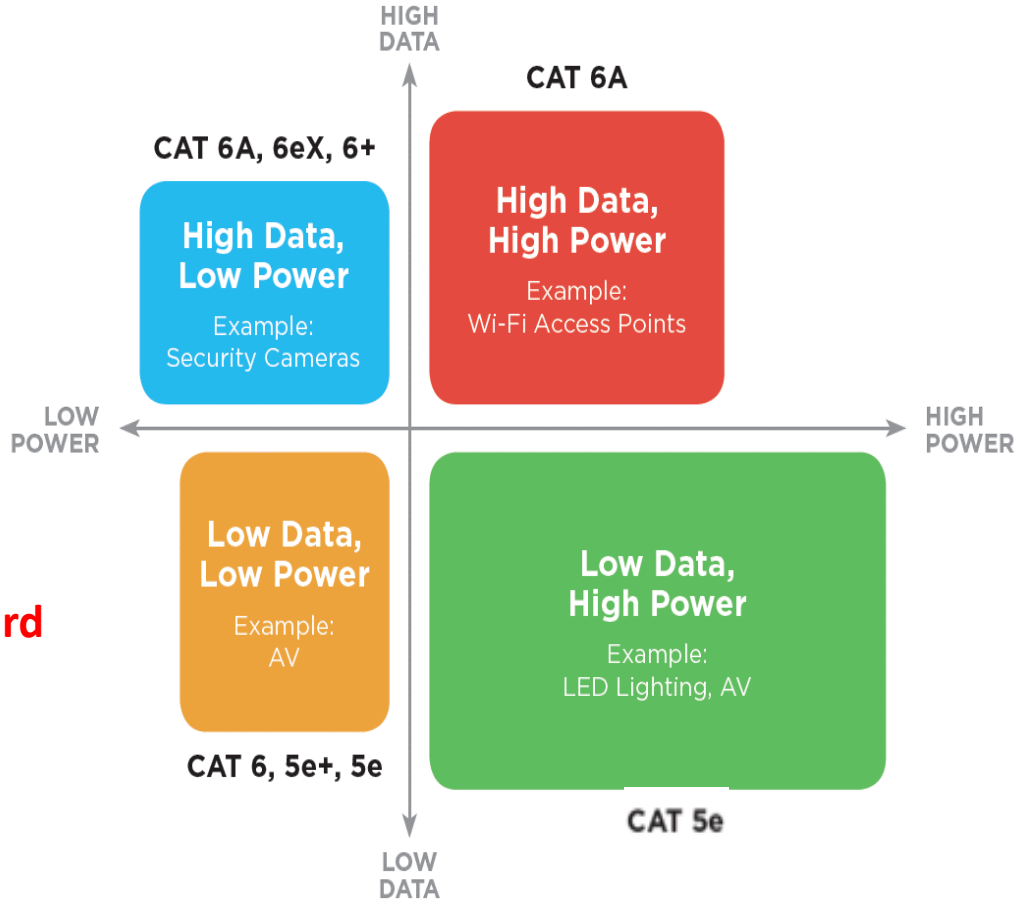
Source: Intelligent Network Solutions

Can PoE go Beyond 100m Over Copper?

- It's not a question of Category
- It Depends on the Application
- It Depends on the Cable Type
- It Depends on the Number of Connections

Most cables are designed and manufactured to the 100m Standard

DEPENDS



PoE is a Reliable Power Source

- The fact is that Power over Ethernet IS exceedingly reliable. PoE relies on Ethernet, which means it is merely a different take on a well-known technology. A local IT team can easily incorporate PoE into an existing network

- PoE has limited interference and enhanced security features and includes the manageability of power sources and battery backups that protect against outages and power spikes

- And PoE has a flexible design. PoE can be positioned wherever needed because this technology does not require an outlet connection. PoE is particularly applicable to wireless access points and digital security cameras

TRUE

Source: Versa Technology - 7 Myths About Power over Ethernet (PoE)

MAXIMIZING THE ROI

CAPEX ROI Advantages of PoE

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LINE VOLTAGE

- High Incoming Power Requirements
- Backup Power Generation Requirements
- Environmental Impact
- Longer Installation Time
- Requires Electrical Contractor
- Increased Electrical Spaces
- Increased Conduits
- Increased Code Requirements

POE

- Reduced Incoming Power Requirements
- Reduced Backup Power Generation Requirements
- Reduced Environmental Impact
- Shorter Installation Time
- Accomplished by Communications Contractor
- Reduced Electrical Spaces
- Reduced Conduits
- Reduced Code Requirements

Source: MHT Lighting - Insepxtor

OPEX ROI Advantages of PoE

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LINE VOLTAGE

- Higher Power Consumption
- Higher Backup Generation Maintenance Costs
- Increased Electrical Maintenance Costs
- Scalability – Expensive Post Install
- Safety Concerns

POE

- Reduced Power Consumption
- Reduced Backup Generation Requirements
- Reduced Electrical Maintenance Costs
- Scalability – Flexible Lower Costs Post Install
- PoE is Safe

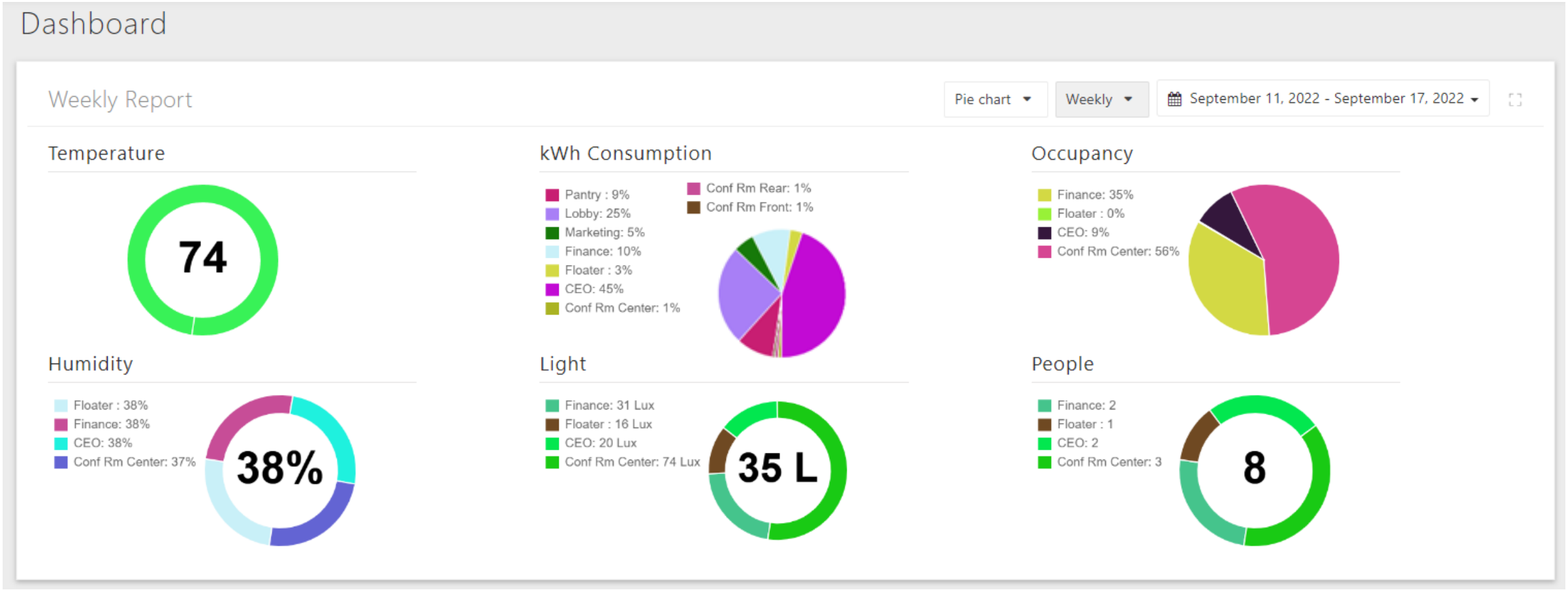
Source: MHT Lighting - Insepxtor

Smart Building ROI Challenges

The Challenge	Software Solution
Room by room facility utilization unknown	Daily, weekly, and monthly detailed reporting on space utilization – area by area, room by room, group by group
High energy consumption leading to over-spending and unnecessary environmental harm	Reduce costs through vacancy/occupancy sensors and daylight harvesting controls
Not scalable – new technologies are expensive to implement post-install	Adaptable platform to any IoT technology – quickly and inexpensively by utilizing category cable and data
Security of system	Inspextor offers advanced security protocols and has been third-party tested
50% of employees say lighting is a significant issue in their work environment	Customized lighting based on time of day or personalized app preferences to adjust entire floors, rooms, or single fixtures
37% of employees want better sound privacy	Simple and pleasant sound masking via integration of speakers

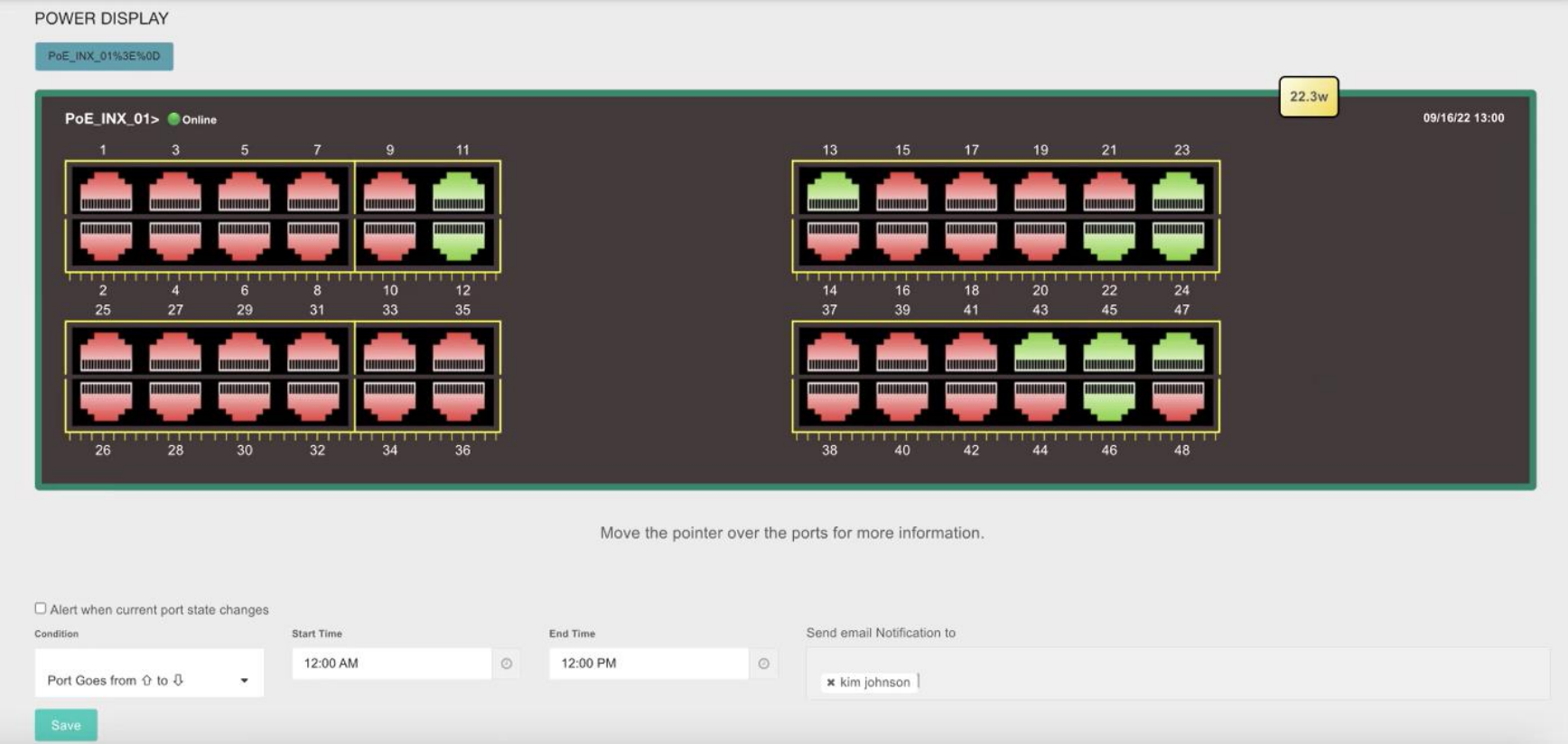
Source: MHT Lighting - Insepxtor

Establish Dashboards



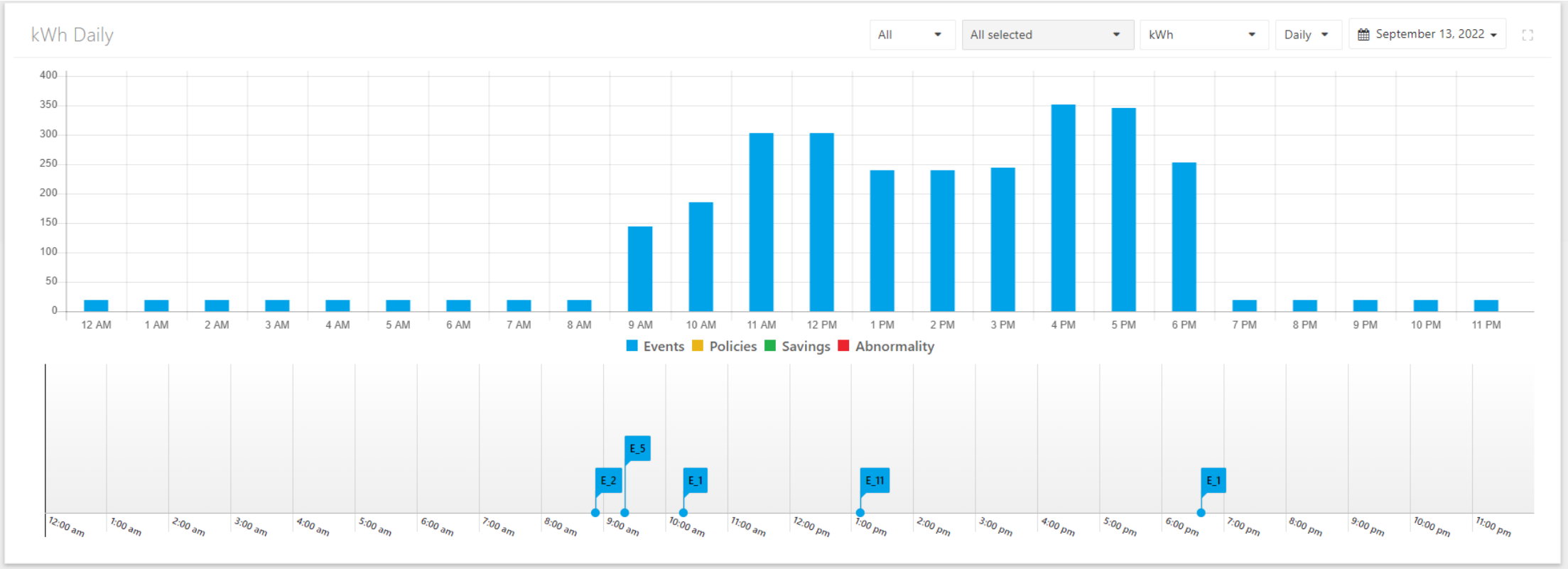
Source: MHT Lighting - Insepxtor

Understand the Health and Power Consumption of Every Port



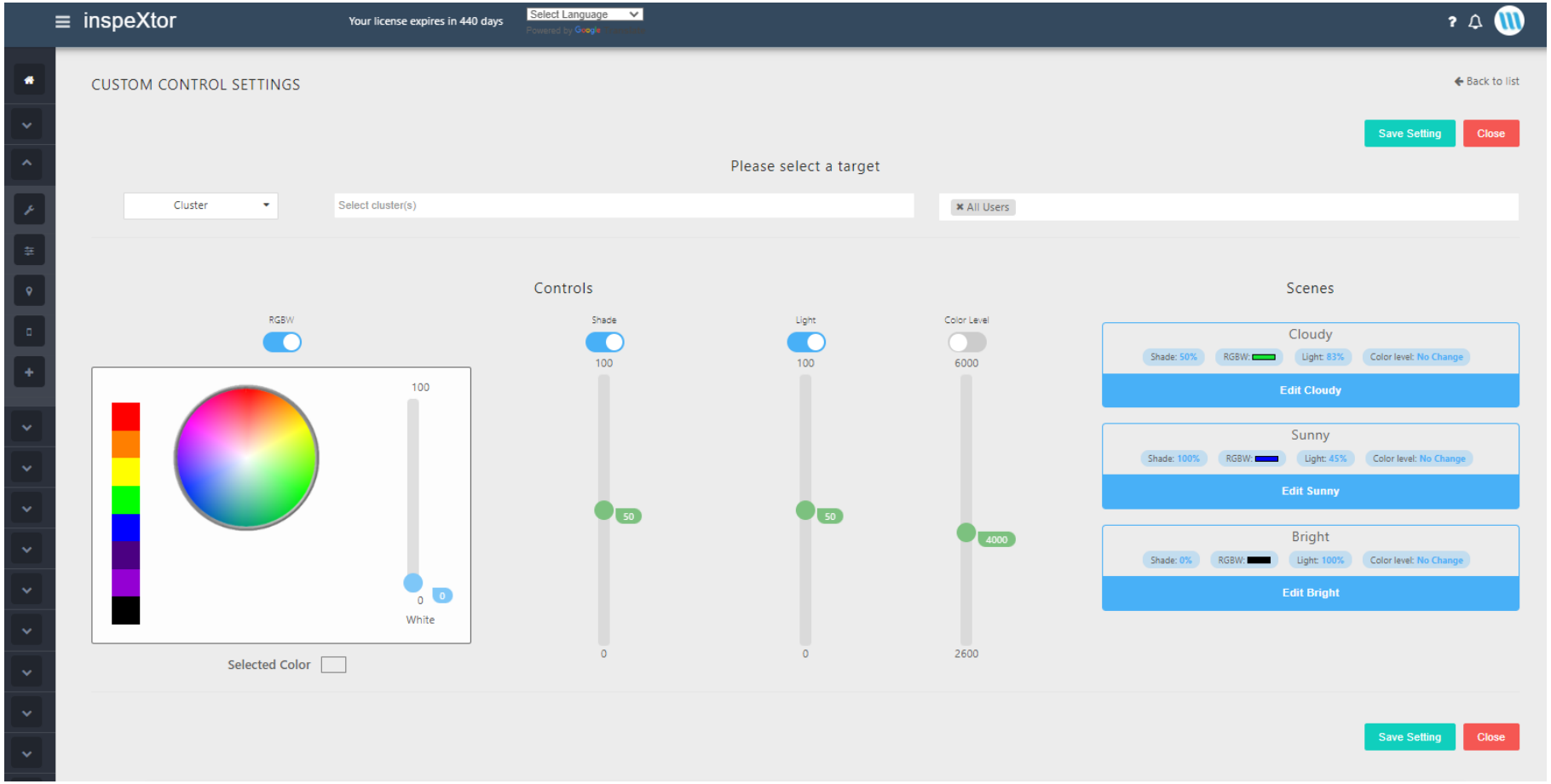
Source: MHT Lighting - Insepxtor

Understand Events



Source: MHT Lighting - Insepxtor

Create Custom Controls and Scenes with Flexibility



Source: MHT Lighting - Insepxtor

CONCLUSIONS

In Conclusion . . .

- PoE has kept pace with the evolution of IoT devices and is a safe, reliable power source
- More and More PoE Devices Are Becoming Available Every Day
- PoE—802.3bt—Has a Higher Power With More Efficient Delivery and Backward Compatibility
- PoE Maximizes the ROI of Technology and Power Distribution Deployment
- PoE Technology is Sustainable and Prepares for the Future Today!

Thanks!

Paul F. Weintraub

RCDD, RTPM, ESS, TECH, CAE

Head of International Business

Paul.Weintraub@spsx.com

+1 (407) 832-0285