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PoE and IoT Smart Building Technology: The Net-Zero Solution

MHT Technologies, Igor, Sinclair Digital

Speakers

Akram Khalis “AK”
Founder & CTO
MHT Lighting

Luis Suau
Founder & CBO
Sinclair Digital

Dwight Stewart
Founder & CTO
Igor

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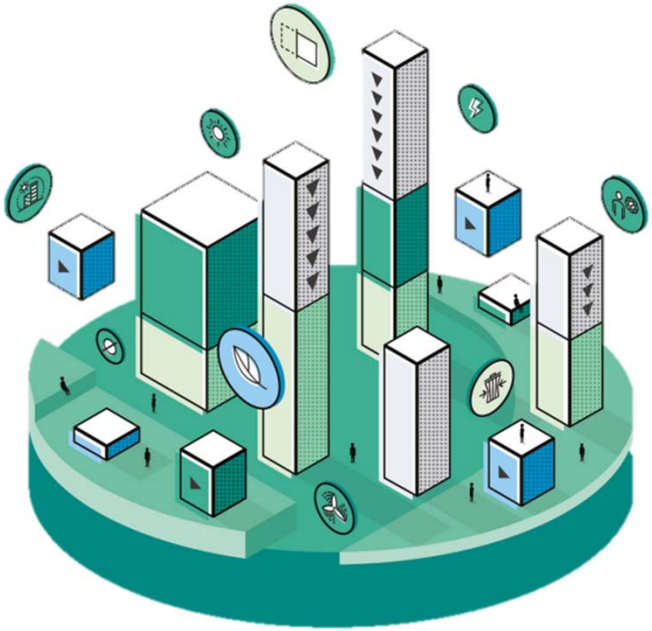
Sustainability and Net-Zero

What is Net Zero?

Net-Zero Energy is when the building can **offset** or counterbalance the amount of energy required to **build *and operate*** throughout its lifetime in all aspects of the site, source, cost, and emissions.



Net-Zero Energy

Net-Zero Carbon

Zero Energy Building

Two Type of Carbon

Embodied Carbon
The emissions from manufacturing, transportation, and installation of building materials.

Operational Carbon
The emissions from a building's energy consumption.

Image source: https://www.greenbiz.com/article/how-lay-foundation-net-zero-carbon-building-projects

The Goal:

\+ Onsite **GREEN** Energy Production

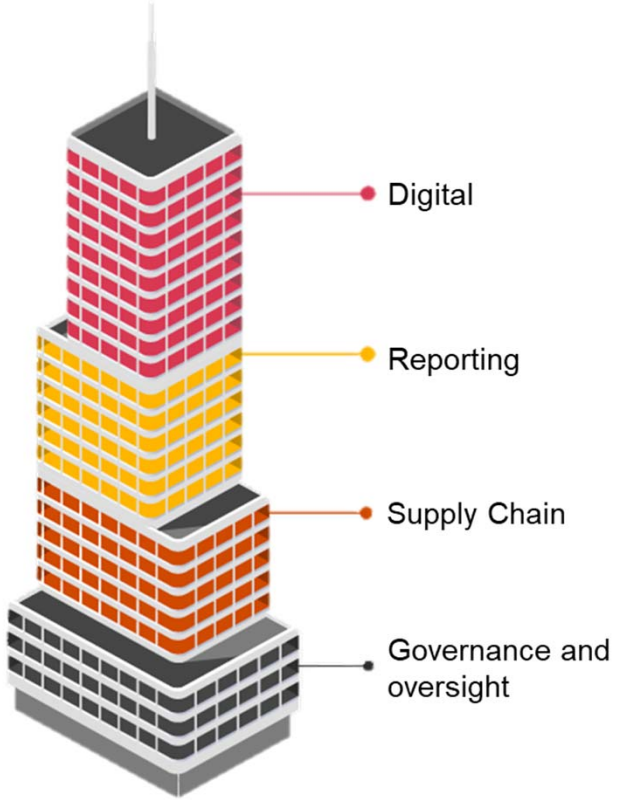
\- Total Energy Consumption

= ZERO (or positive!)

Net Zero Energy Building

Net Zero Buildings Require a Total-Building Mindset

- Building design optimization
- Strategic daylighting
- Energy-efficient lighting
- Onsite energy production
- Reduced plug loads
- Infrastructure digitalization
- Single control software
- Data for reporting

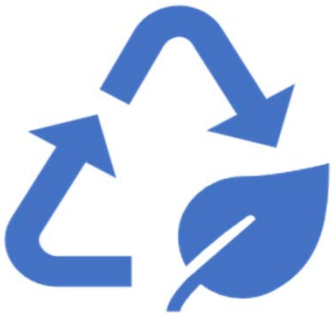


Market Forces Driving Net Zero

Business risk mitigation

Government climate goals

Global energy instability



Corporate governance

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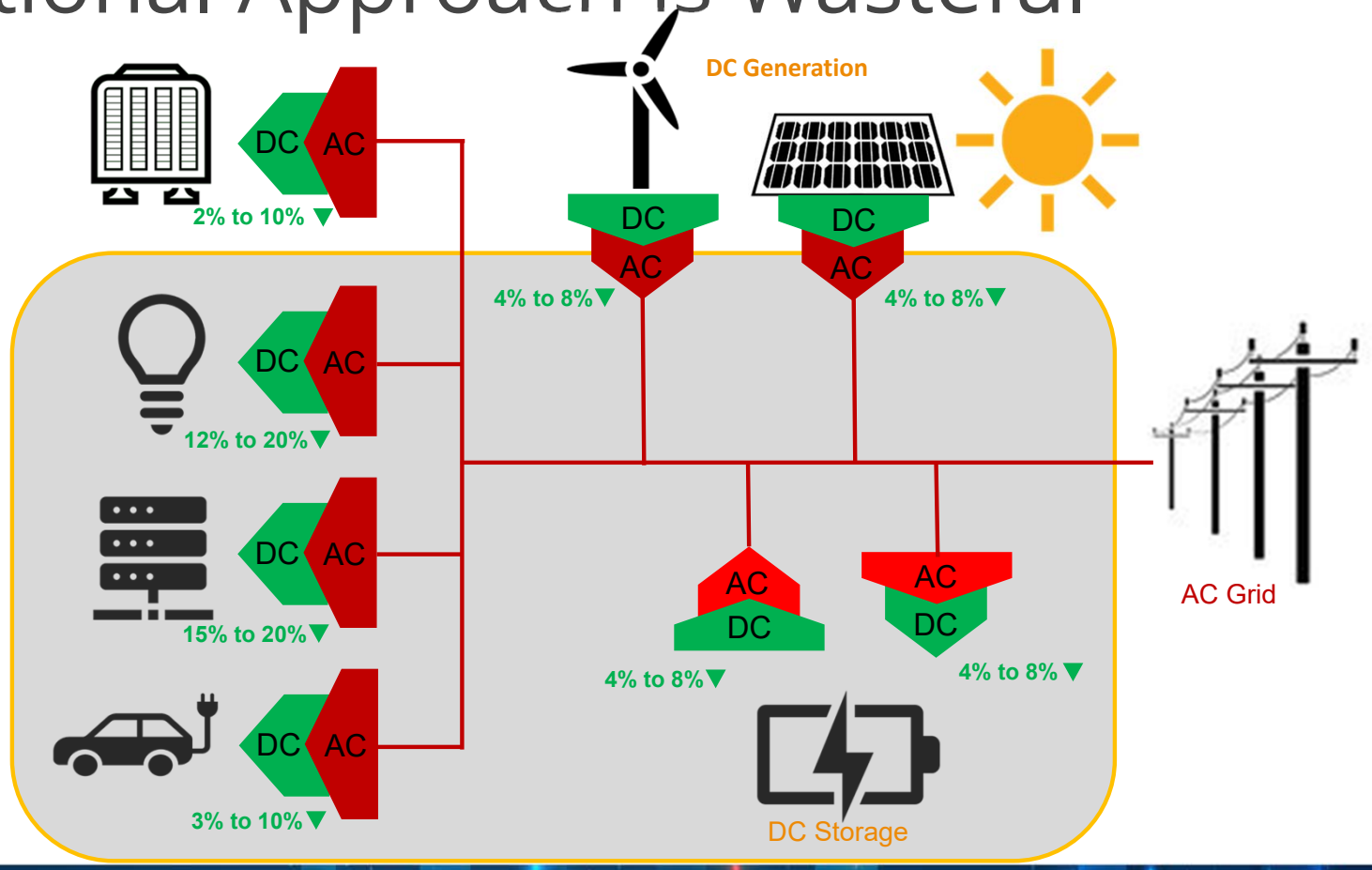
Fault Managed Power and POE

The Traditional Approach is Wasteful

Up to **20%** of power wasted in conversion loss

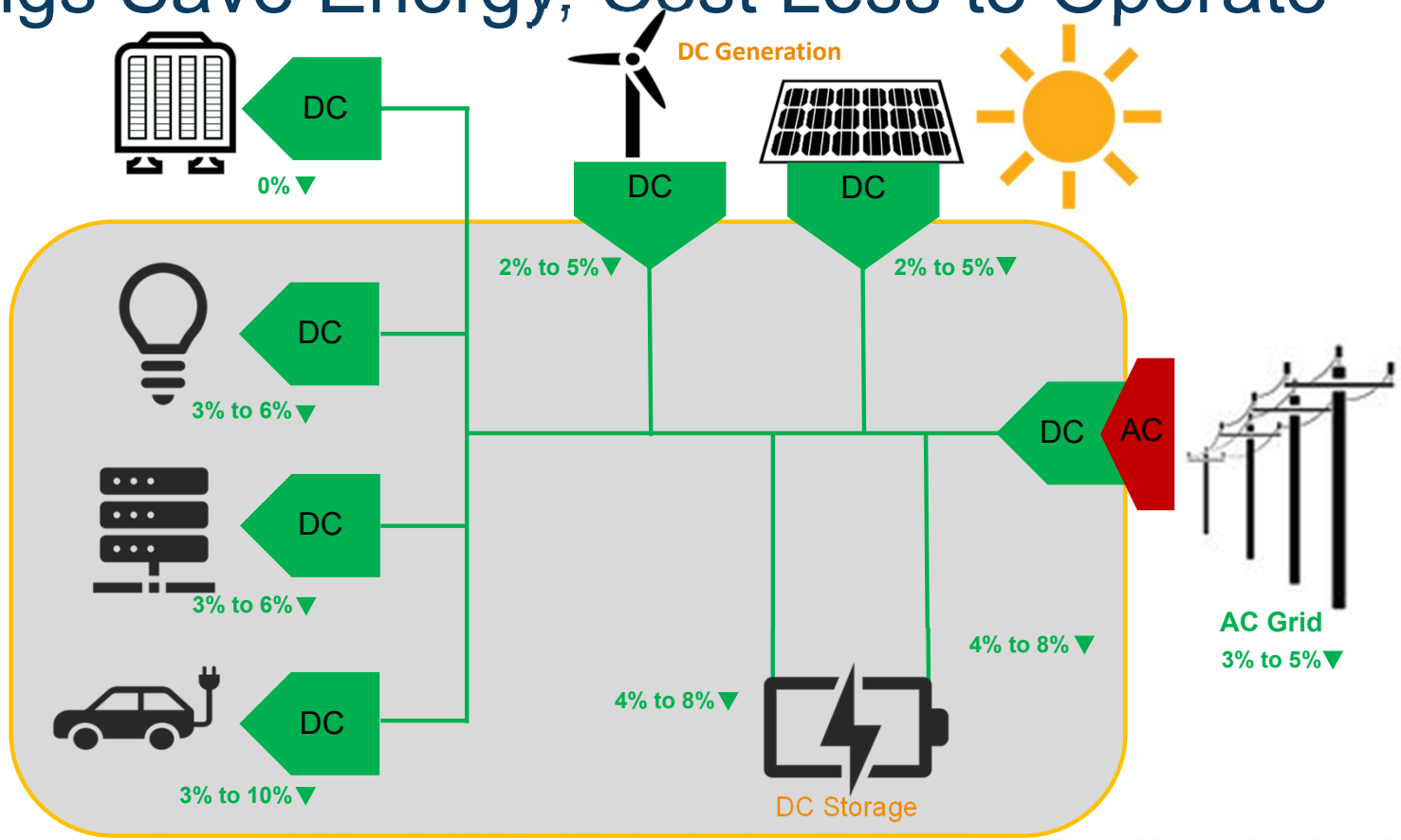


Source: CSA Group

Smart Buildings Save Energy, Cost Less to Operate

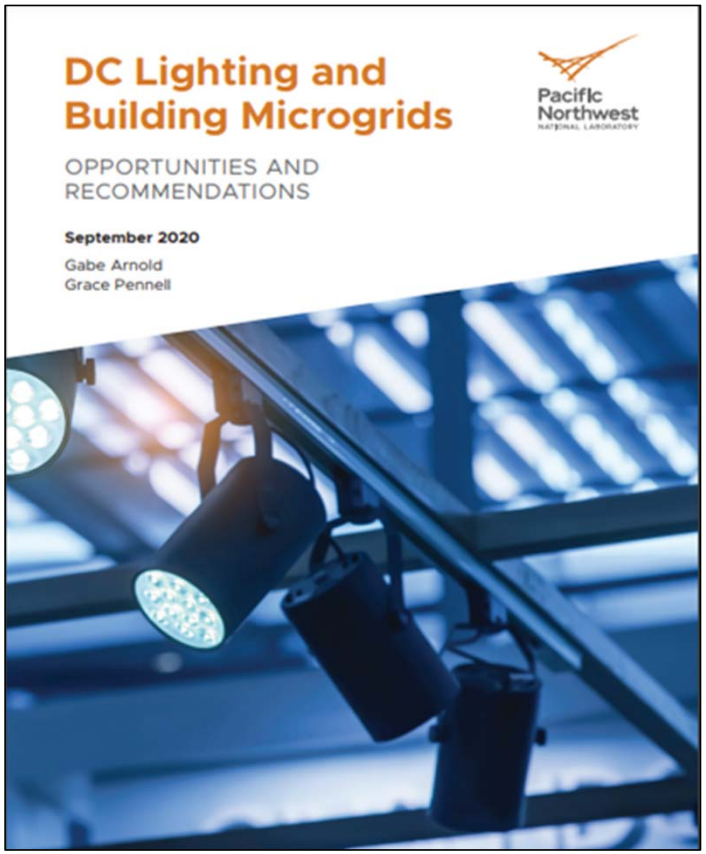
45%+

Reduction in energy waste by using DC power



Source: CSA Group

Energy Efficiency drives Digital Infrastructure



802.3bt

POE

- Low Voltage Power
- Facilitates adds, moves, changes
- IP data driven

Std 3.2

USB-C

- Low Voltage Power
- Facilitates adds, moves, changes
- Can facilitate data connectivity

2023 NEC Article 726

Fault Managed Power

- Class 4 power
- High Voltage, Pulsed DC
- Safety Driven

Existing IP/POE Digital Building Endpoints:

A Growing List of POE Products and Manufacturers


Light Fixtures


Height Adjustable Desks

Shot Detection

Raspberry Pi POE Hat

Hospital Room Patient Display

NFC Reader

Ceiling Fans

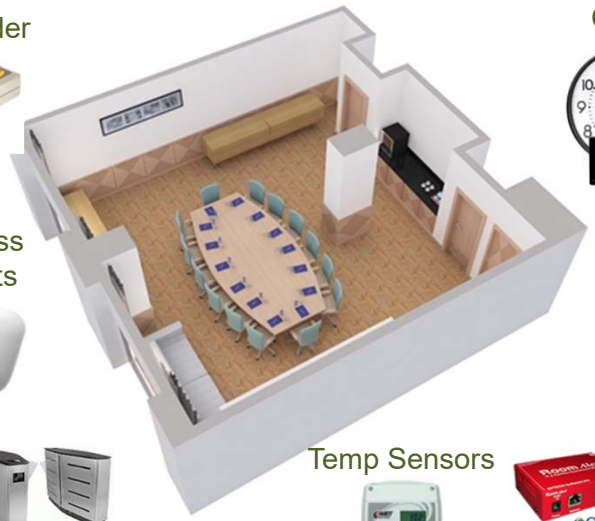

USB-C Chargers

Biometric Door Locks

Intel NUCs

Window Blind Shade Motors

RFID Reader



Clocks


HVAC VAV's

Cameras


Laptop Chargers


Digital Mirrors


Minibars


IP Call Tower

Facial Recognition Systems

Access Points


Badge Readers


Power Meters


Touchscreen PC's


Signage


Horns and Sirens


Curtain Motors

Meeting Room Nameplate


IP Call Stations


Phones

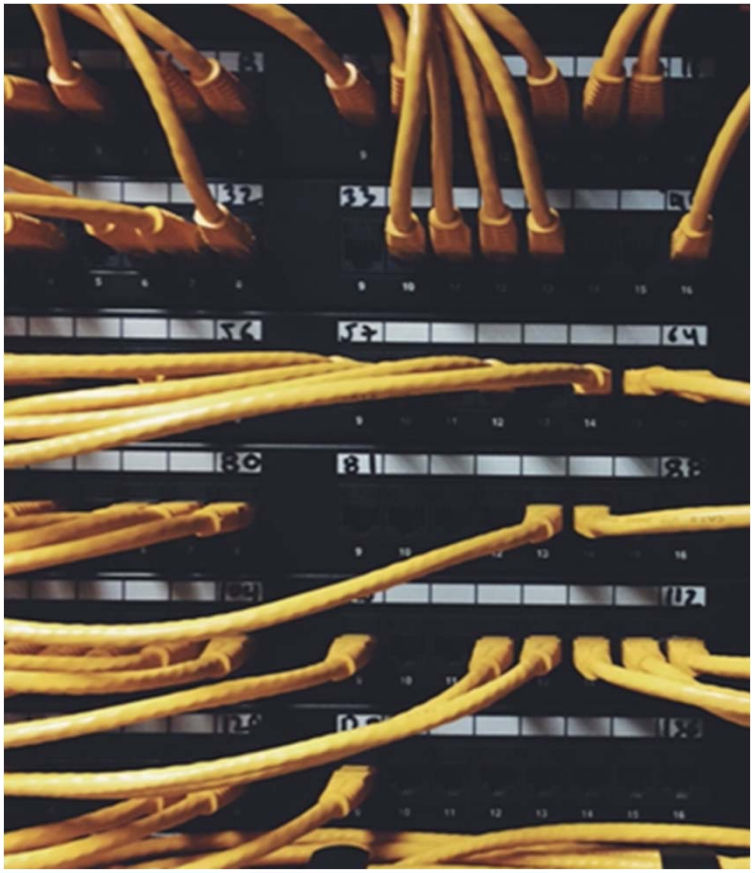

POE Displays

Entry Barriers


Temp Sensors


Environmental Sensor Hubs

POE Infrastructure Summary

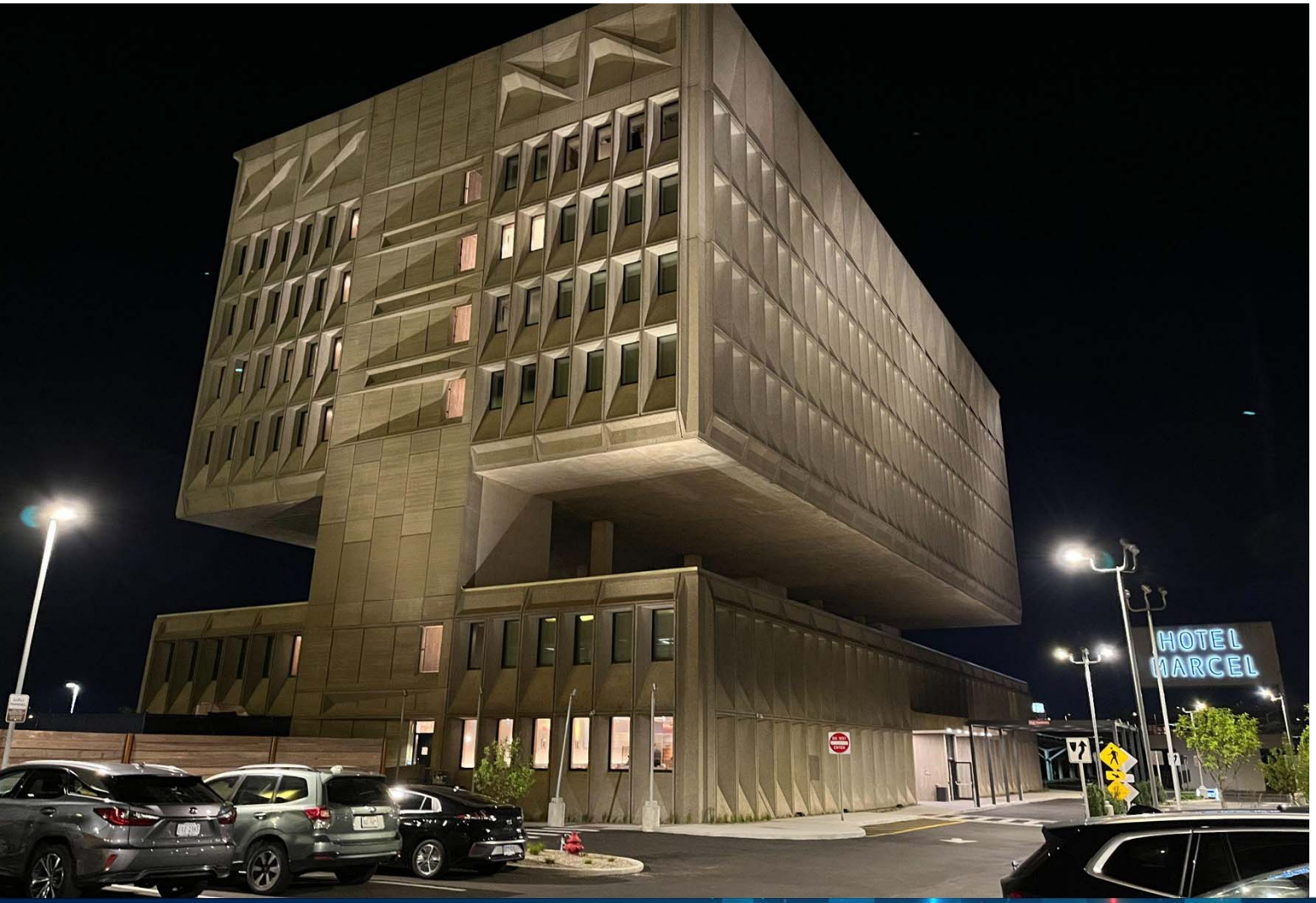


- Enhanced Building Experiences (data is exposed and shared)
- Safer (reduced shock and fire risk)
- Flexible (adds/moves do not require power off)
- More sustainable (less metal and copper cable)
- Better managed (IT tools)
- May have lower TCO

- **Millions of square feet deployed**
- **Millions more in process**

Digital Electricity™ (Packet Energy Transfer) for Power Distribution Considered a type of Fault Managed Power

- Safe to touch
- NRTL listed NEC 62368-1 limited power source
  - As a limited power source, it qualifies to be installed under NEC (2020) Article 725
- Each pulse power packet is checked for:
  - High Current
  - Ground Fault
  - Arc Fault
  - High Resistance (loose connection)
  - Touch (resistive load)
- When conditions occur, transmitter stops sending pulses
- Range up to 2KM
- 500W Guaranteed up to 1KM on 1 pair of 18AWG cable



USE Case: The Marcel Hotel

a Hilton Tapestry Collection Hotel, New Haven, CT

Marcel Hotel, New Haven, CT

First Net-Zero Hotel in the USA

- Designed by famous Brutalist Architect Marcel Breuer
- Historic adaptive reuse project, formerly Headquarters for Pirelli Tire USA.
- Now a Hilton Tapestry Edition Hotel
- Passive House design
- Triple pane windows
- Dual 500 KWHr Energy Storage Systems
- 500 Solar Panels (roof top and in parking structures)
- No Natural Gas Use (all electric)
- Digital Building Technology:
  - POE Lighting
  - POE Shades
  - Touchscreen controls
  - Integrated HVAC controls
  - Sensors (Occupancy, Temperature)
  - Automated scenes
  - Integrated Site Lighting (Line Voltage)

Marcel Hotel, New Haven, CT

Infrastructure implementation inspired by the Sinclair Hotel:

- Dual Lithium-Ion ESS (Life Safety Approved)
- Digital Electricity™ (Fault Managed Power) for remote powering of network POE switches
- POE for Lighting and motorized Window Treatments
- Integration of HVAC controls in touchscreens

Digital Electricity (FMP) Power Distribution

- 5 Transmitter shelves, 208VAC fed, normal power
- 1 Transmitter shelf, 208VAC, emergency power

ESS & Batteries

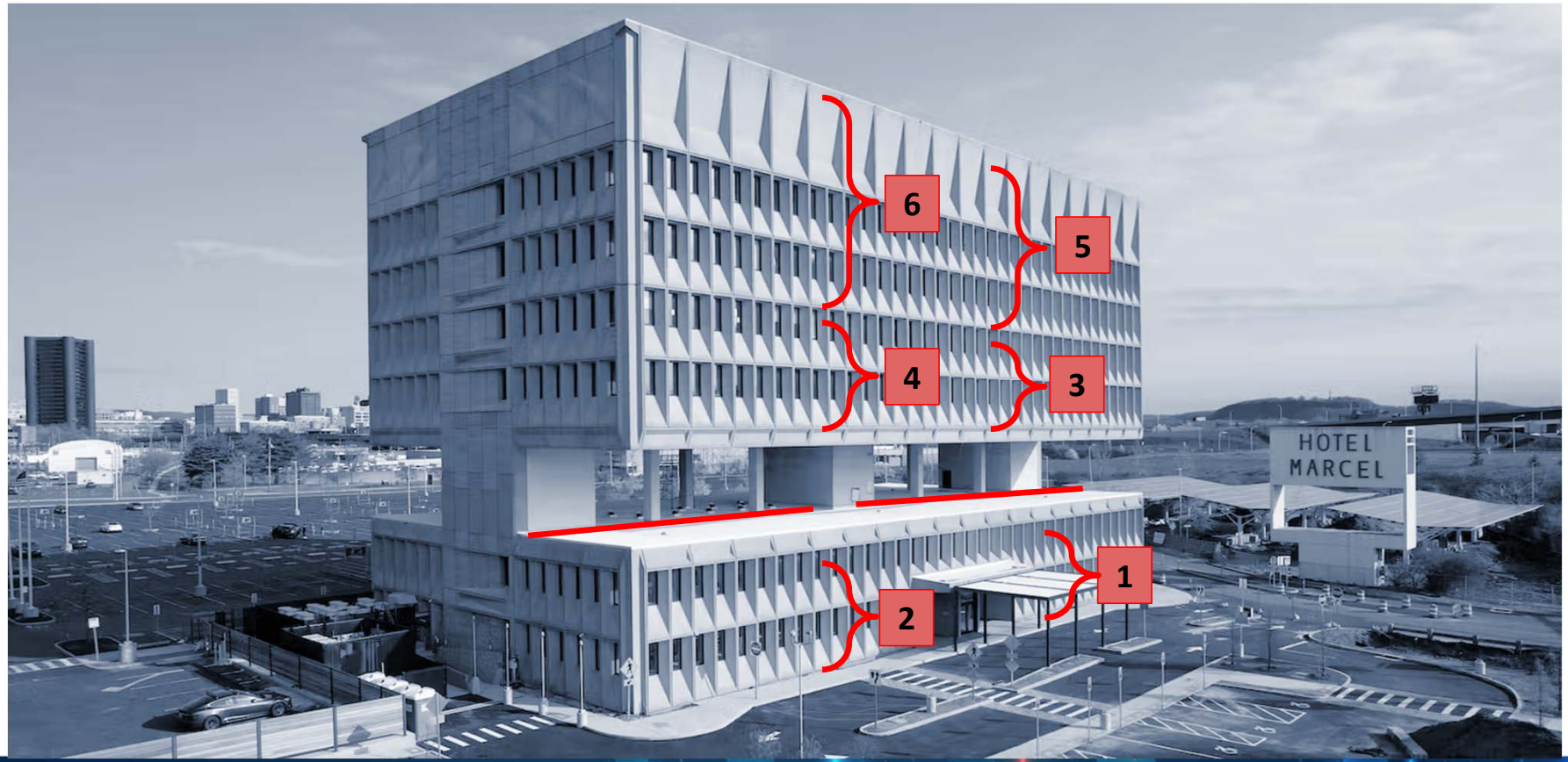
Parking Solar

ESS Controls

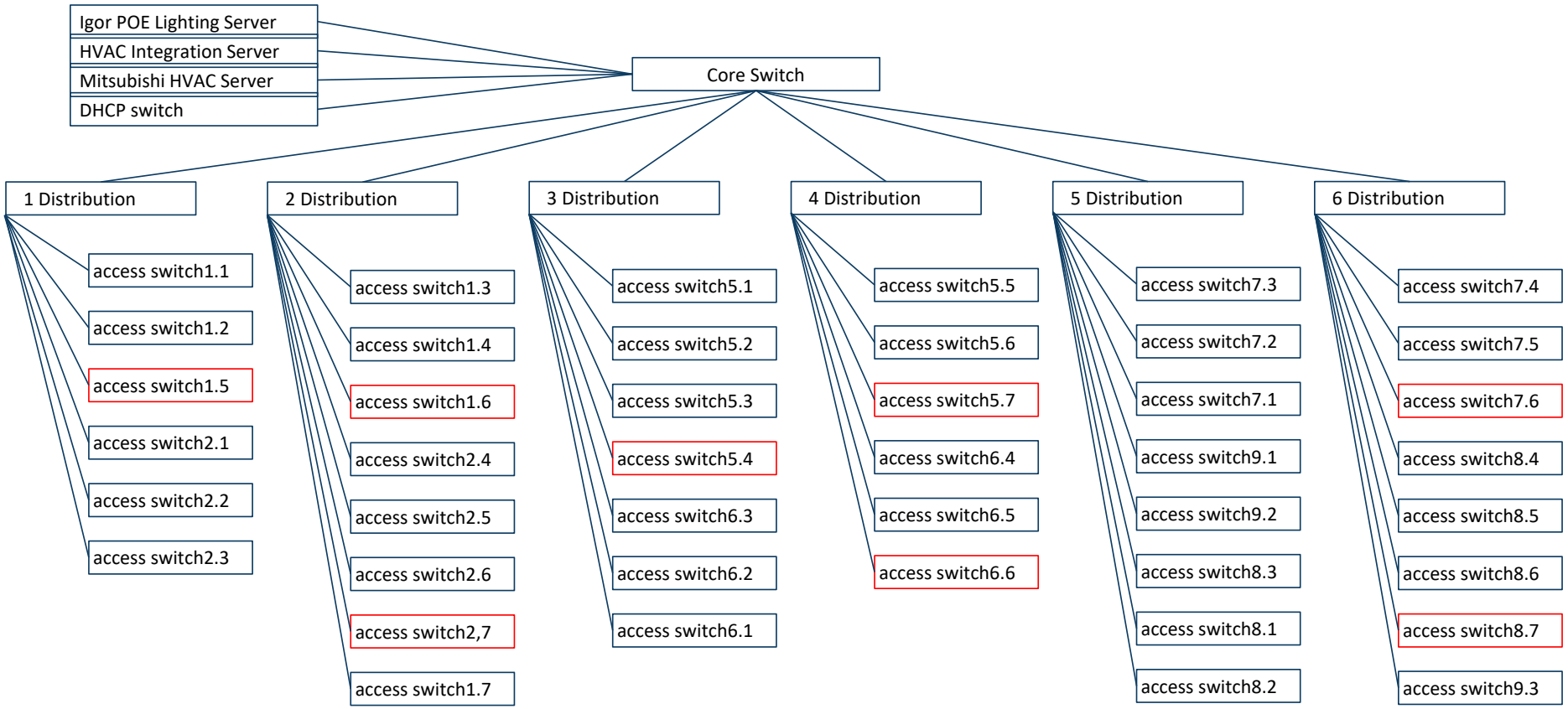
Fault Managed Power - Digital Electricity™ Transmitters

Marcel Hotel, New Haven, CT

Marcel Hotel, IDF Layout



Marcel Hotel High Level Network Topology



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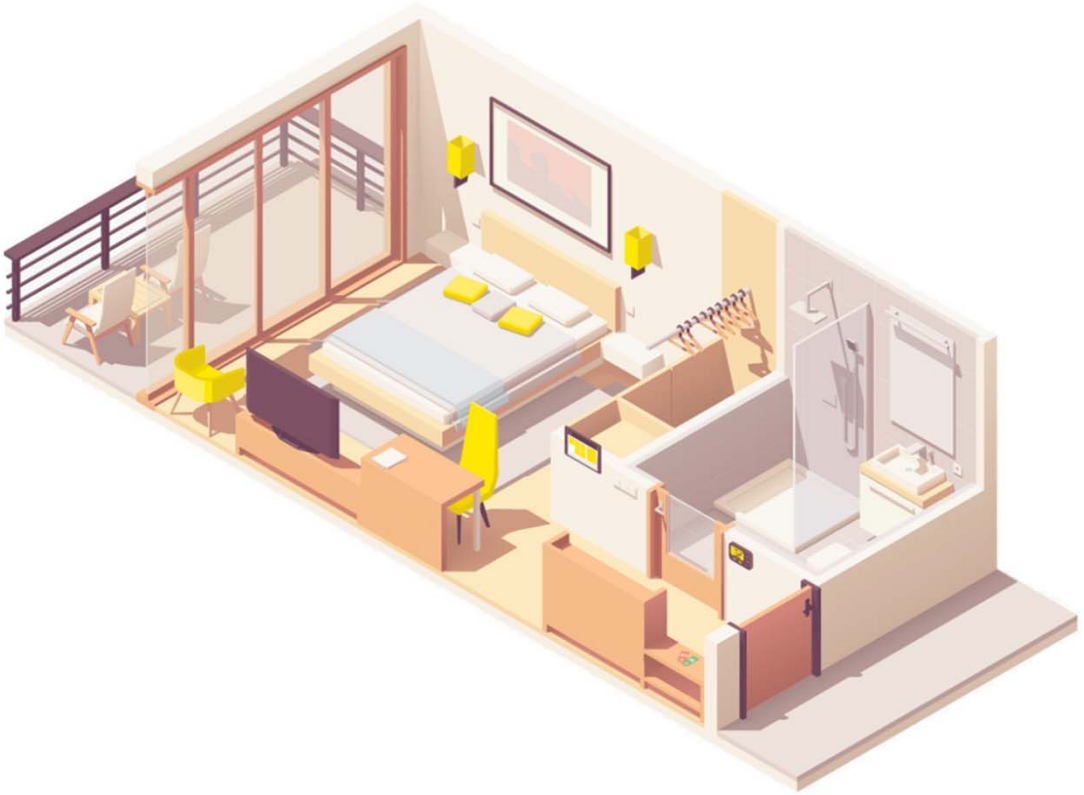
POE Lighting and Controls

Overview of Hotel

Hotel guests are looking for a superior and customizable experience they will remember for years to come.

This level of customizability and innovation is available through the connecting IoT devices.

- Connected, customizable lighting
- Smart wall controls
- Occupancy sensors
- Automatic shades
- Climate and air quality

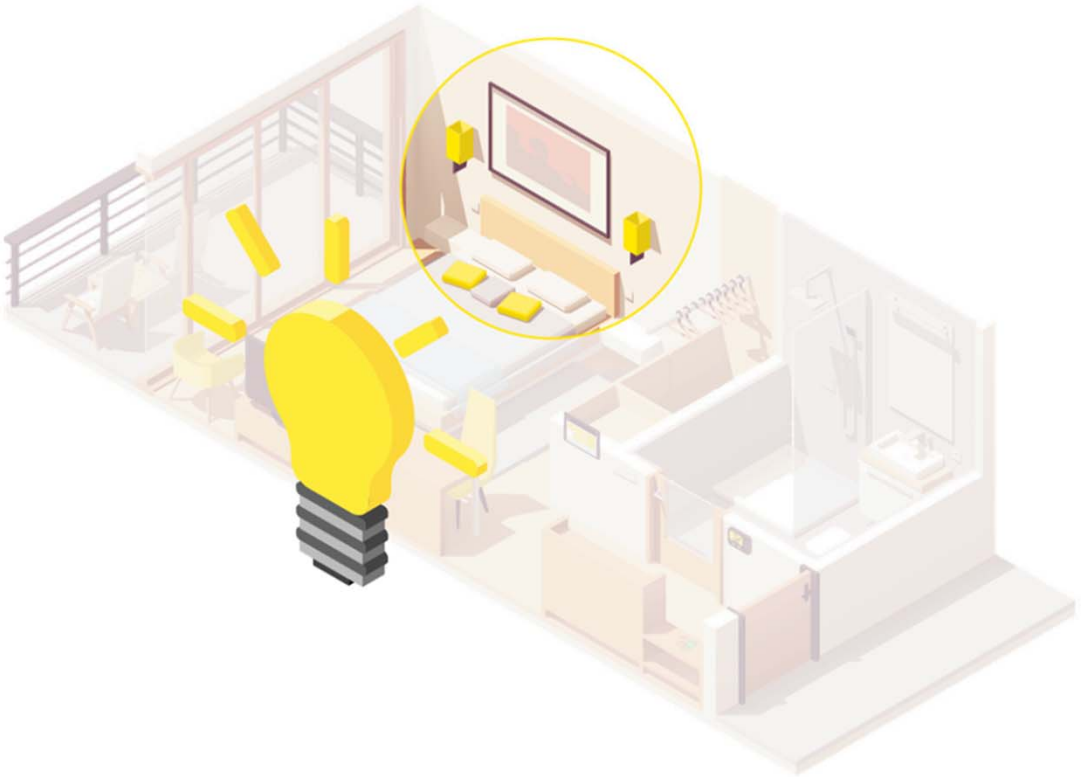


Lighting

Guest comfort in a hotel is greatly impacted by the lighting options within the hotel and in guest rooms.

Lighting via PoE and automations enhance the guest experience and energy efficiency.

- Easy control throughout hotel spaces
- Customizable lighting options
- Transferable personalized profiles
- Easily tracking energy usage and data



Smart Wall Controls

Impress guests with intuitive visually engaging touchscreen user experiences.

Touchscreen wall controls allow hotel guest to customize a variety of aspects in the space including lighting levels, automatic shading, temperature controls, and more.

People Sensing

Providing a welcoming and personable environment for hotel guests.

React to people being present.

- Turning lights on and off when people enter or exit a room
- Alerting housekeeping to the occupancy of a space
- Opening and closing automatic shades based on occupancy
- Amount of people in public areas

Automatic Shades

Use natural lighting to elevate a guest's stay and automation provides a wows guests.

Automatic shades powered by PoE provide a holistic experience:

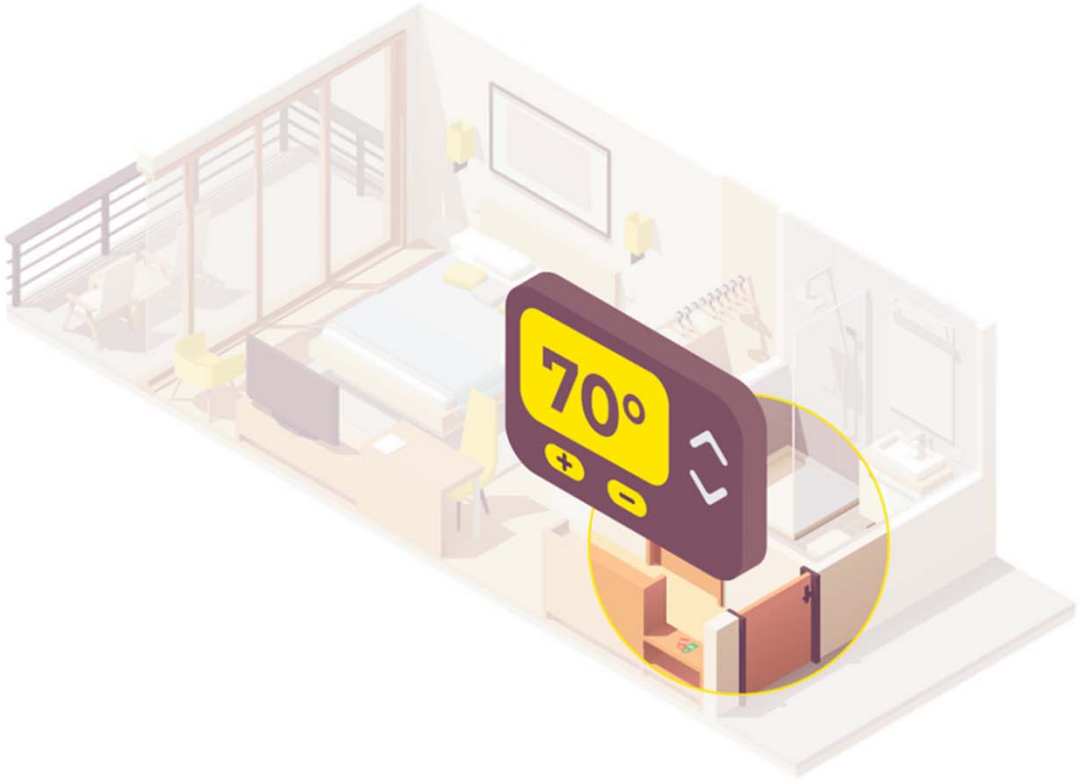
- Automatically open and close shades upon entering or exiting
- Guests control natural light preferences
- Improve energy efficiency by using natural light
- Provide customizability that goes well beyond guest expectations

Climate and Air Quality

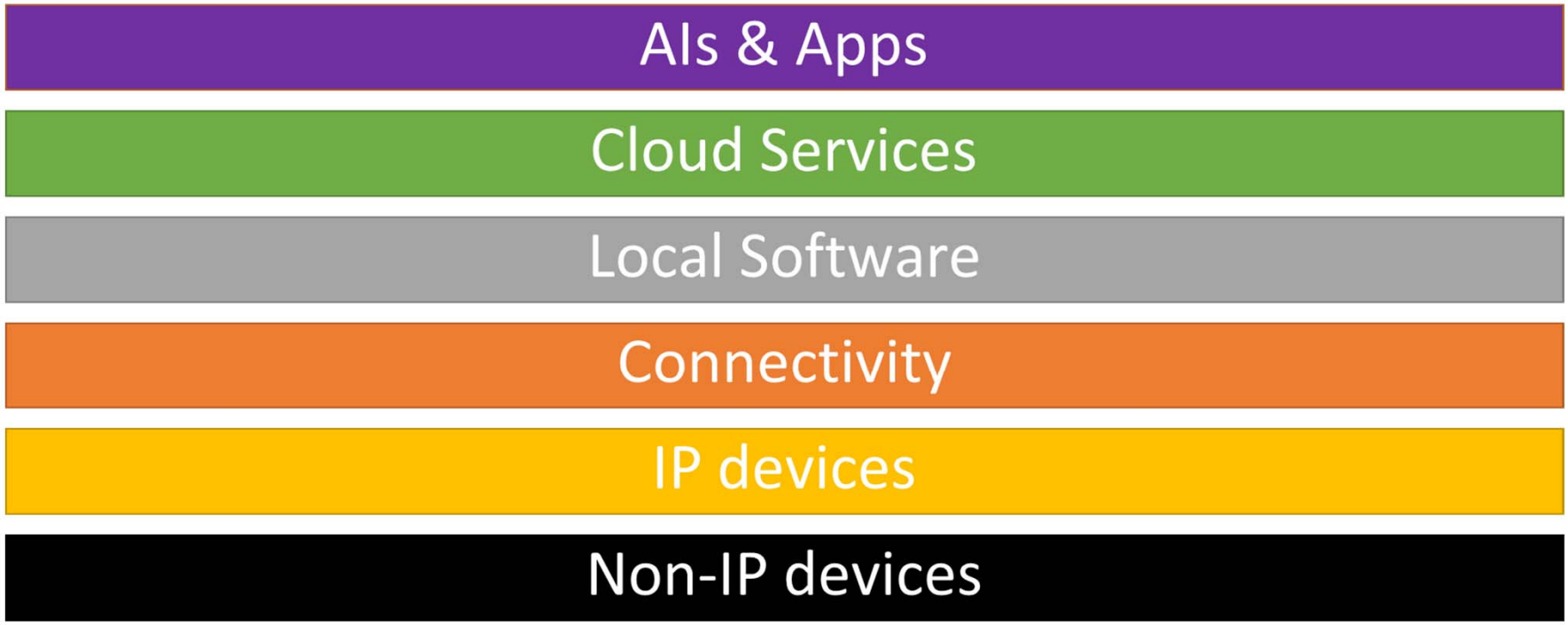
A room that is too warm or too cool can negatively impact a guest's experience.

Extending integrations with non-PoE systems such as heating and cooling.

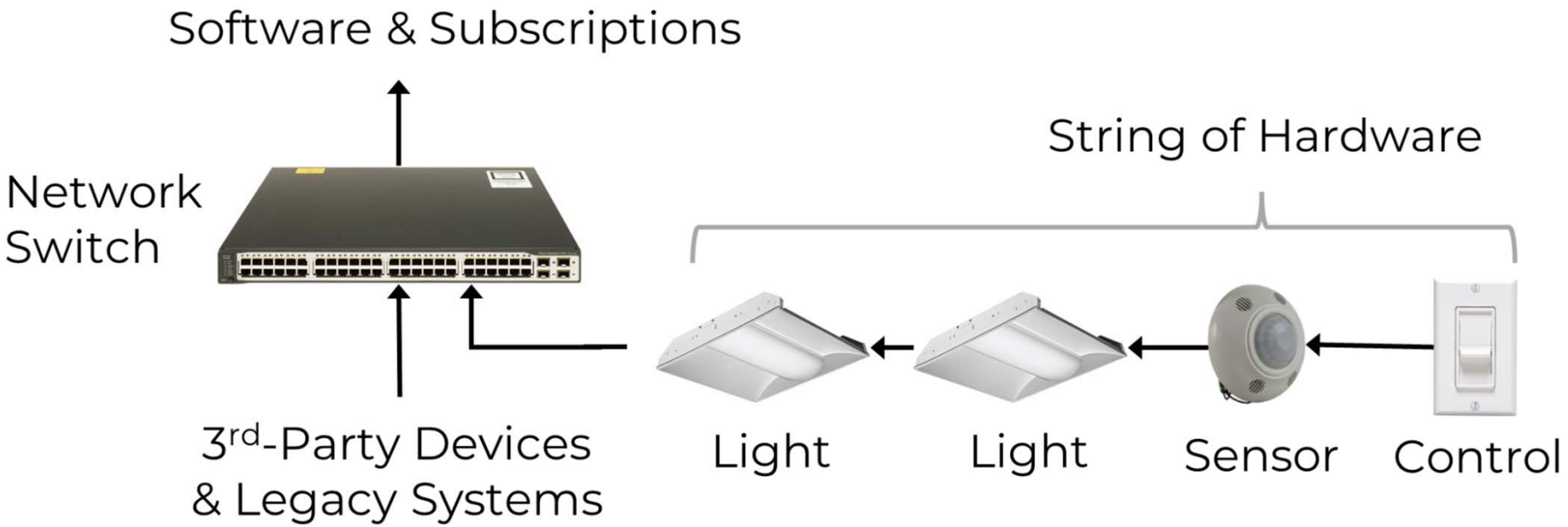
- Easily deploy sensors
- Guests intuitively change temperatures
- Guest preferences can become a guest profile that can follow guests in future
- Reduce cooling & heating within unoccupied spaces
- Critical data insights provide owners knowledge that guests are happy



Abstract


AIs & Apps
Cloud Services
Local Software
Connectivity
IP devices
Non-IP devices

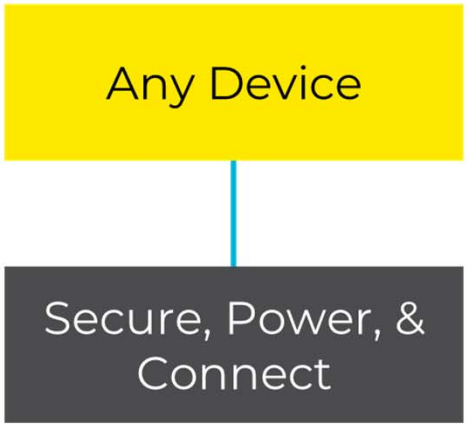
Architecture



Node

Secure, Power, & Connect 3rd-Party Devices using standard **Power-over-Ethernet (PoE)** as a secure backbone.

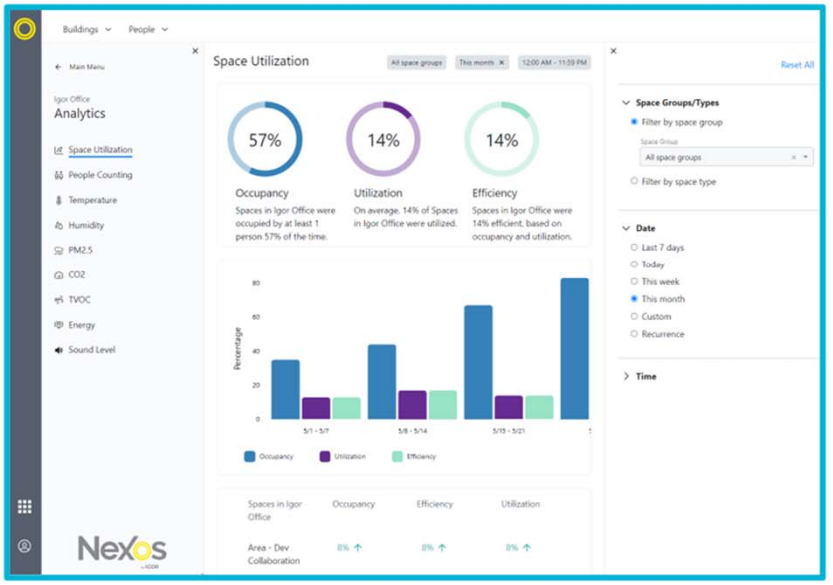
- UL924 Emergency Listed (Patented)
- Rated 99W
- Daisy-chaining (Patented)
- LEDs, analog, digital, USB, serial



Software and Services

Digital Twins model real-world physical devices.

Users to share, automate, analyze, and control.



Integrations used in Marcel

- Mitsubishi HVAC (climate control) via BACnet Ethernet
- Sensors via USB
- Wall control touchscreens via USB
- Motorized Shades via PoE

Panel Discussion

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