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CommScope Technical Family

Power Up!

Best Practices for Power Over Datacom Infrastructure

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Power Up!

Best Practices for Power Over Datacom Infrastructure

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- Introduction – Power Up!
- Some history and where we are today
- DC power application
- Where are we headed?
- Class 4 Power – Fault Managed Power Systems
- System Architecture
- Design Benefits and Limitations
- Potential Use Cases
- Review
- BICSI Continuing Education Credit
- Questions and Answers

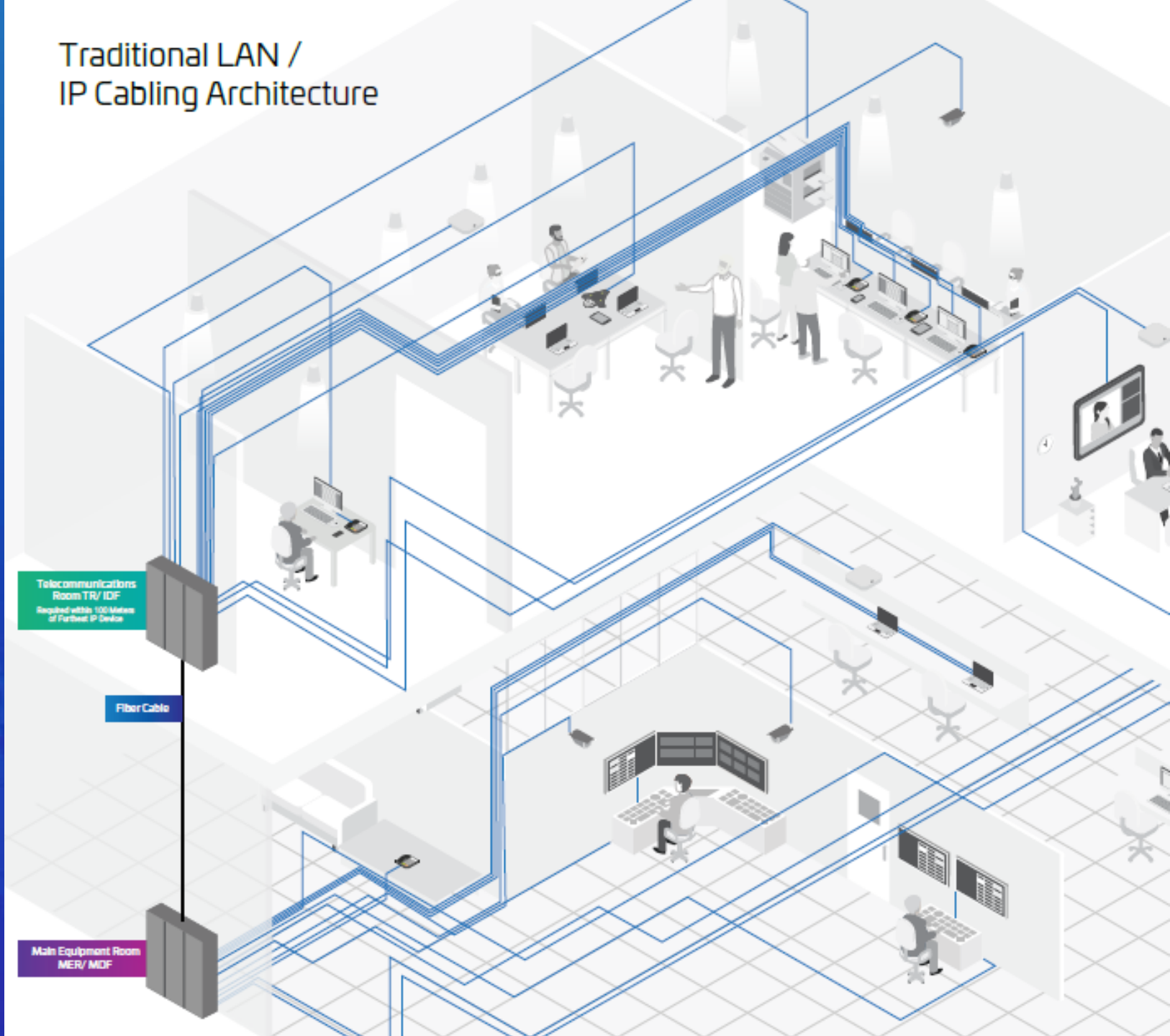


Traditional LAN / IP Cabling Architecture

A quick look back...

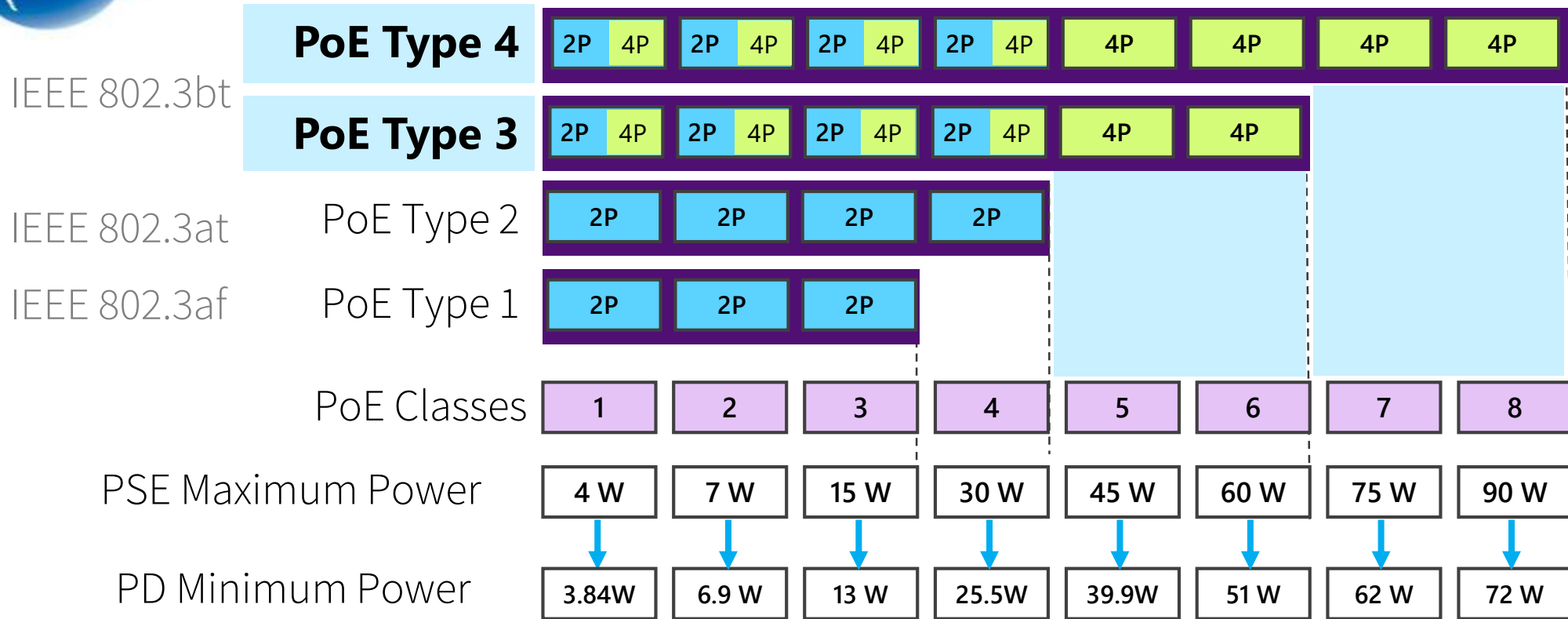
Traditional LAN/IP Cabling Architecture

- Up to 100M Reach
- Administration on Every Floor
- Supports up to 10Gb
- Power up to 100W





IEEE 802.3 PoE Types and Classes



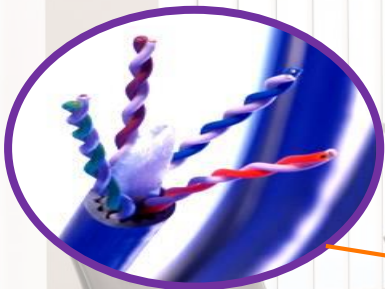
Maintain Power Signature (MPS)

Autoclass

Power Demotion

Support for 2.5G/5G/10Gbps

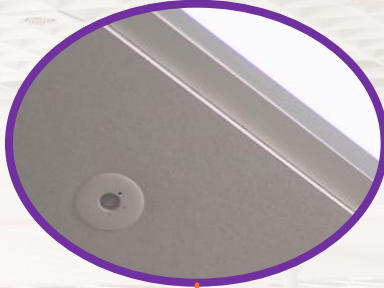
Category 6A and High Performance Fiber



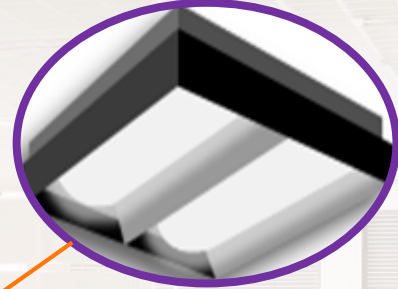
Intelligent Connectivity



Sensor Network and Analytics



Intelligent Lighting



In-Building Wireless Solutions



Universal Connectivity Grid

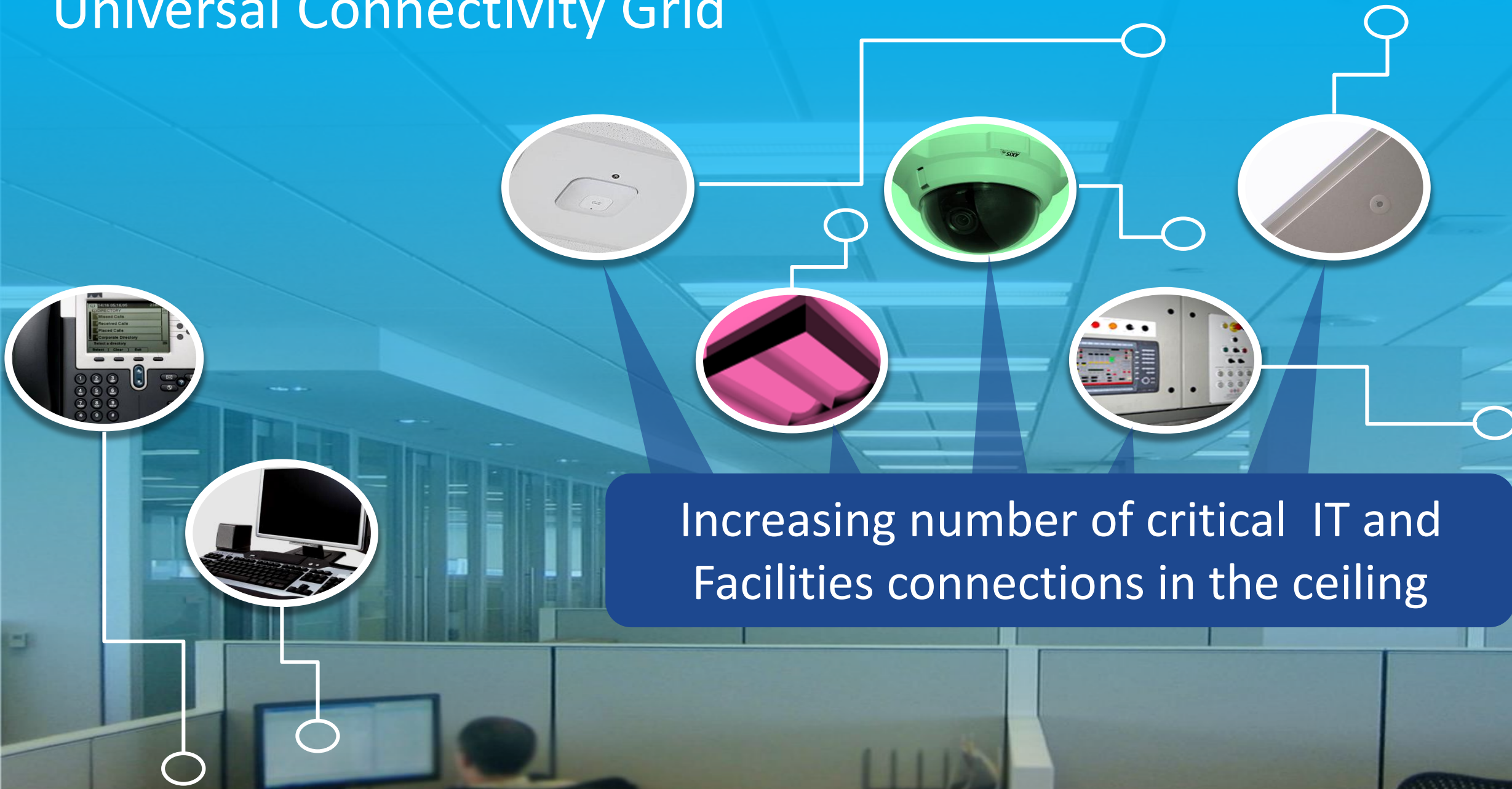


Universal Connectivity Grid

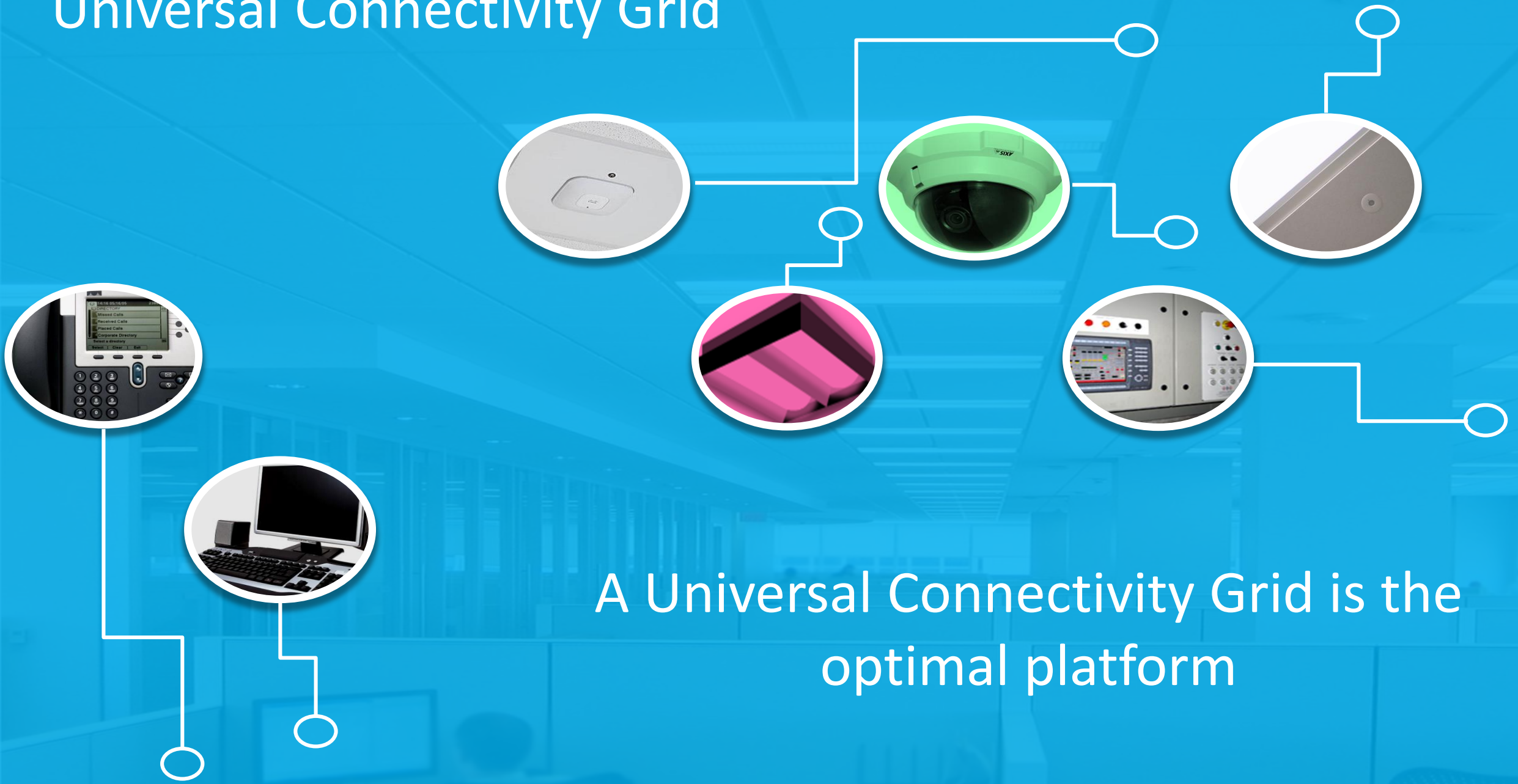
IT traditionally concerned only with voice/data at the desk



Universal Connectivity Grid

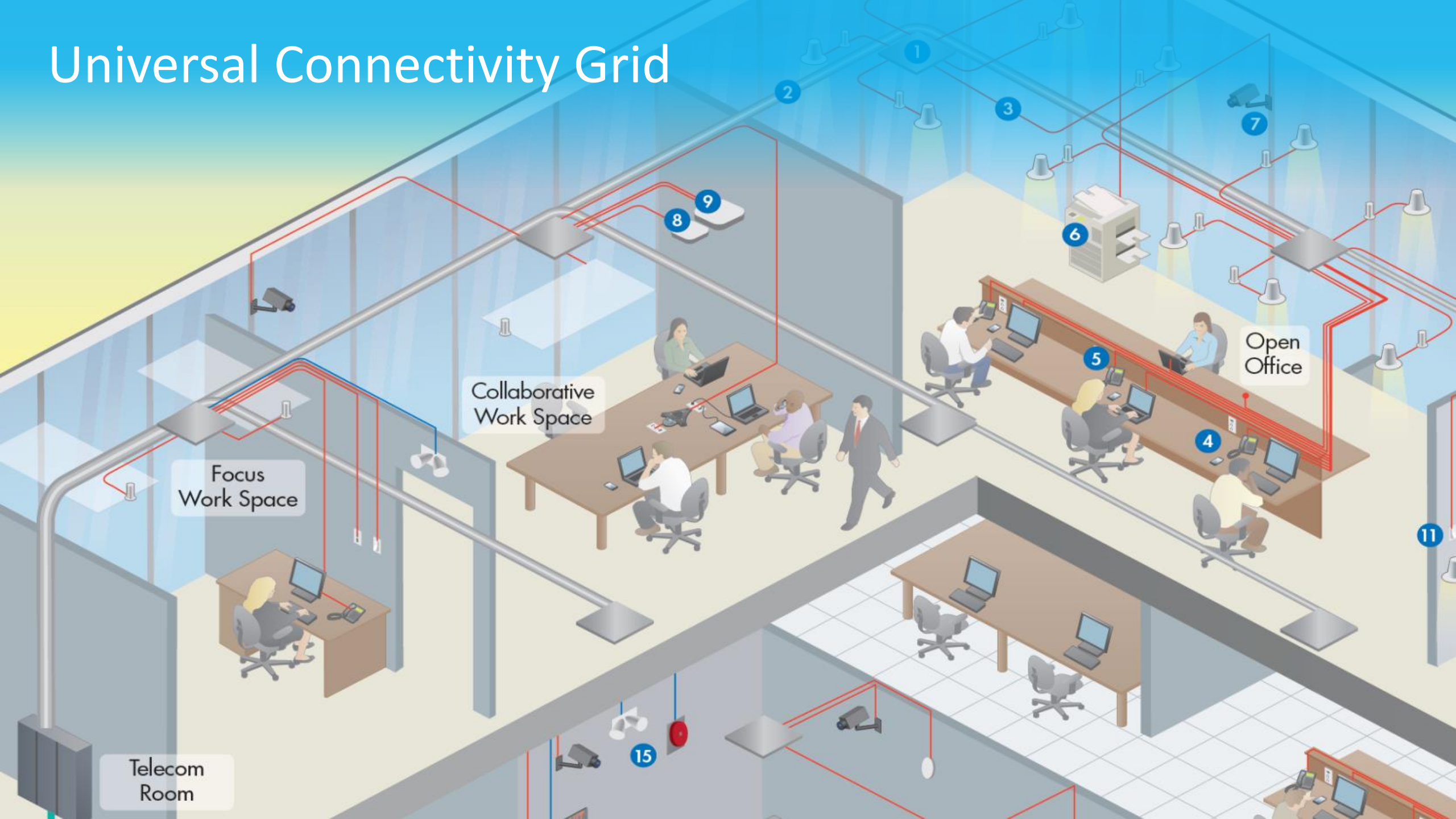


Universal Connectivity Grid



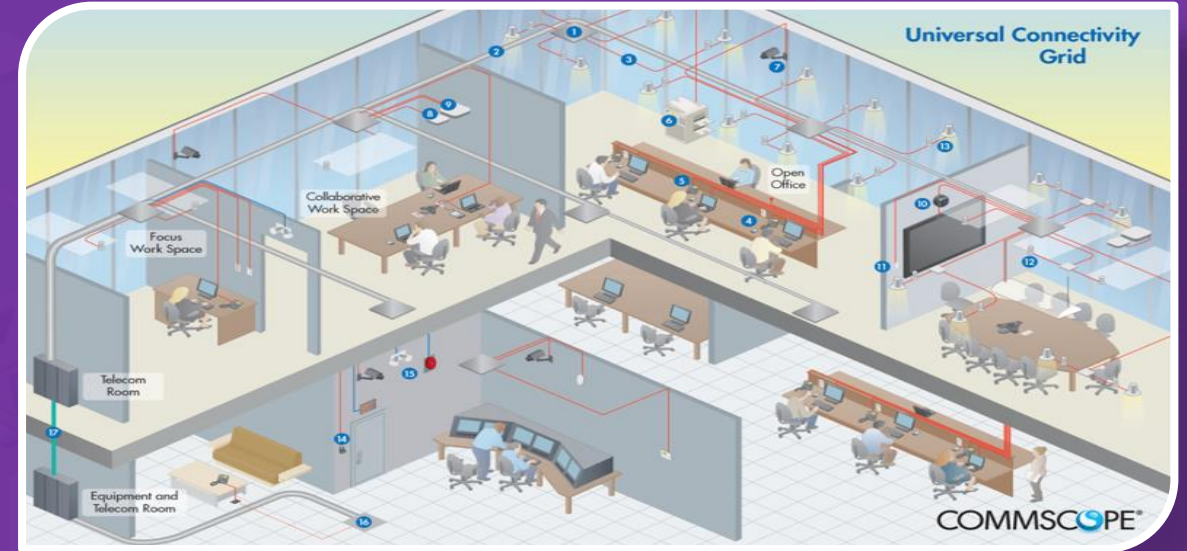
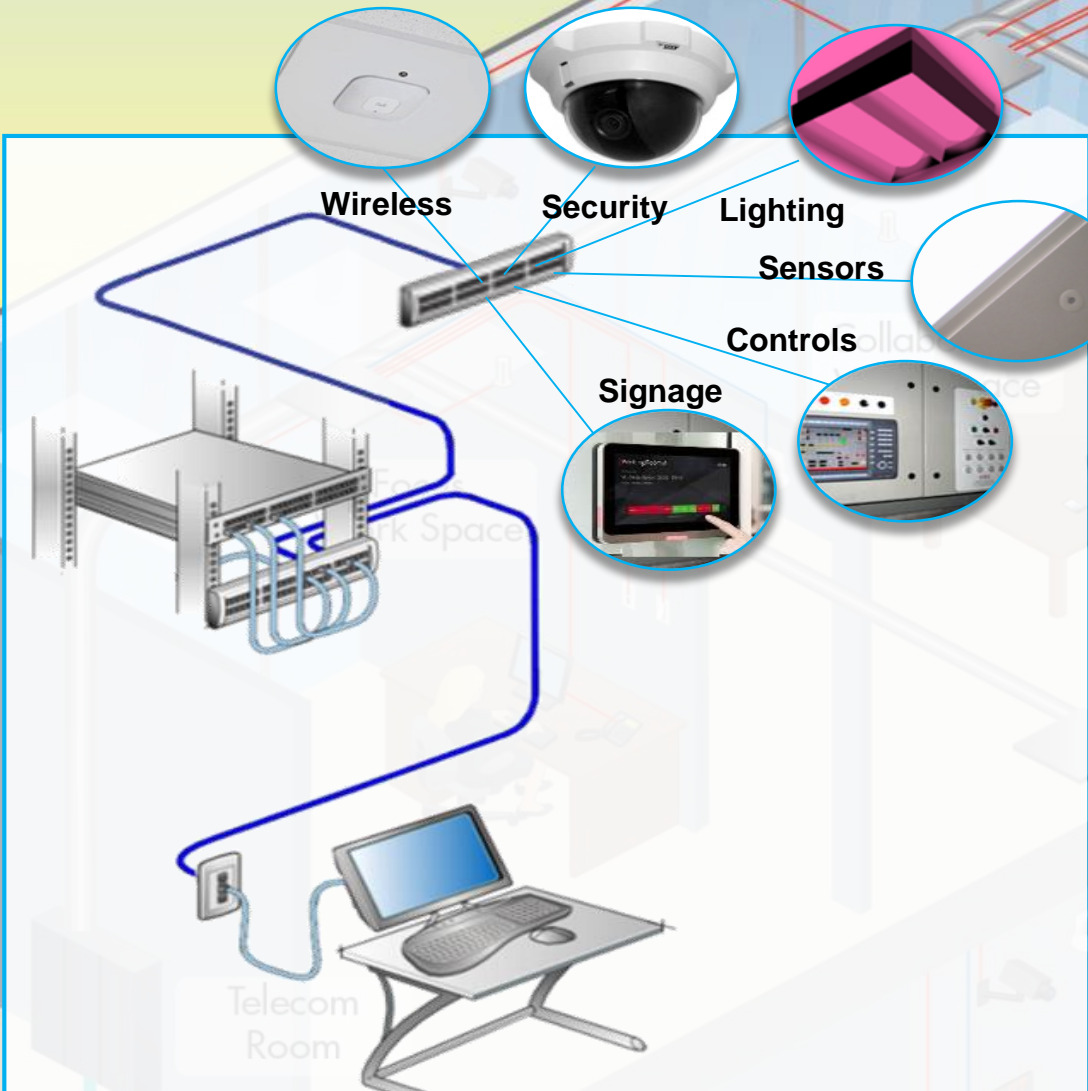
A Universal Connectivity Grid is the optimal platform

Universal Connectivity Grid



Universal Connectivity Grid

Planning for Integrated Low Voltage Infrastructure

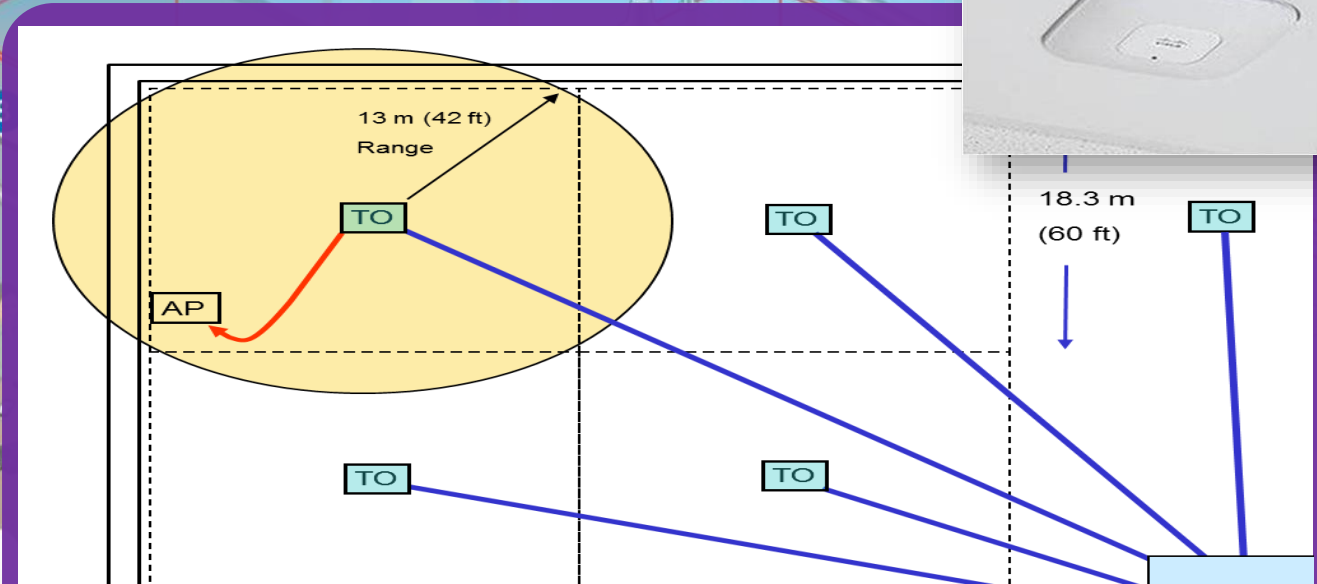
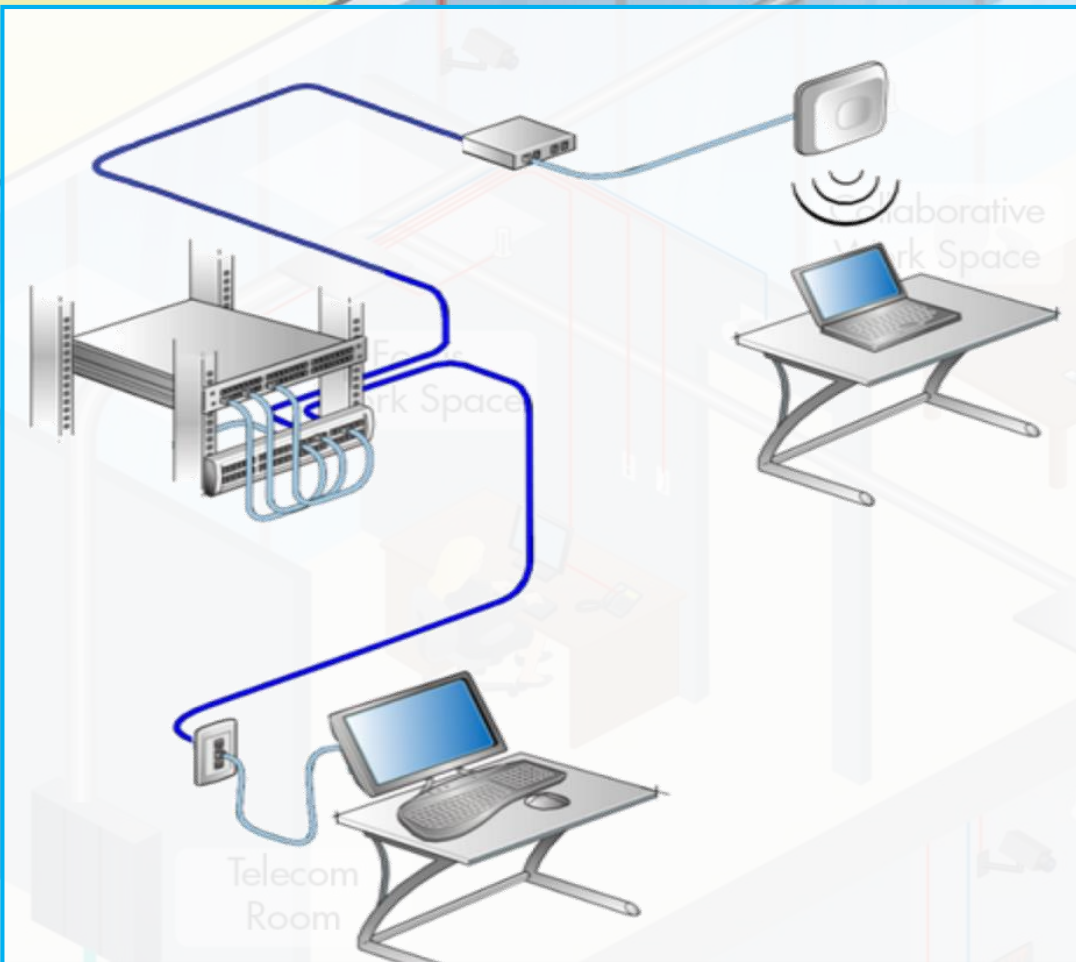


Additional Planning Recommendations

- Security & Access Control
- Lighting and Sensors
- Building Controls
- Digital Signage
- Work Area Cabling

Universal Connectivity Grid

Planning for Wireless – the Next Utility



Planning Recommendations

- 2 outlets per cell for WiFi
- 2 additional outlets for IBW + spare
- Maximum cell size per TIA/ISO*
- Category 6A horizontal cabling
- OM3/OM4 riser backbone

* Smaller size should be considered for high density areas

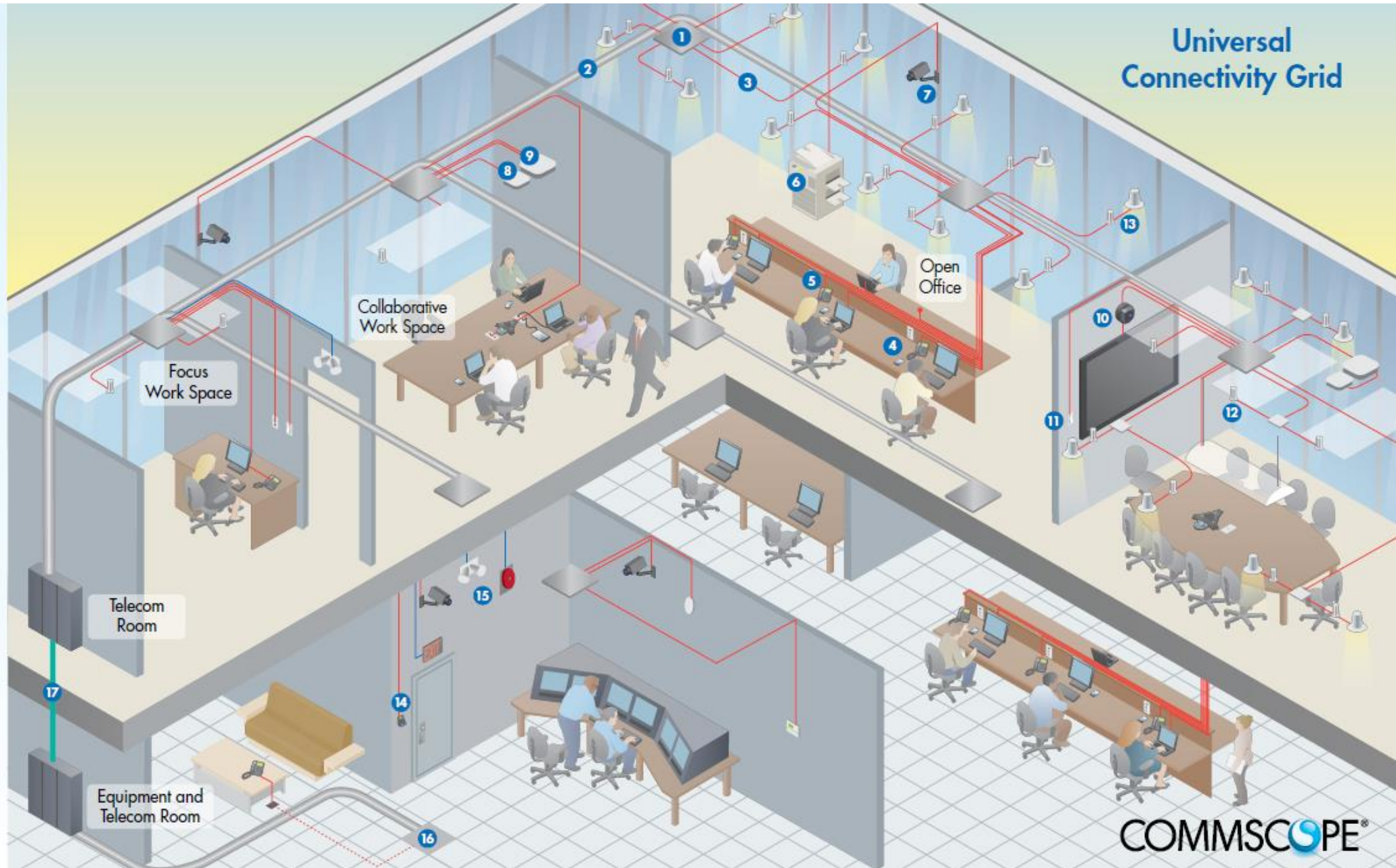
Universal Connectivity Grid

Problem: Provide the optimal infrastructure to support and manage the various disparate communications infrastructures in the building, including wired LAN, wireless technologies, occupancy sensors, intelligent lighting, audiovisual services, building automation and access control.

Solution: A common connectivity platform provides infrastructure efficiencies from the design phase to the operations phase of an intelligent building. Product cost and installation efficiencies can be identified at the design phase and realized at the installation phase by addressing common media and pathway requirements. Maximum operational efficiency can be realized by deploying a grid-based layout with distribution boxes to improve administration and minimize the cost and disruption when providing additional services or space reconfigurations.

Category 6A cabling provides high bandwidth and remote powering capabilities to support legacy and emerging intelligent building applications, and provides the foundation for a Universal Connectivity Grid in state-of-the-art Intelligent Buildings.

- | | |
|-----------------------------|--|
| 1. Ceiling Distribution Box | 10. Video Conferencing |
| 2. Category 6A Cable Bundle | 11. Light/Temperature Control |
| 3. Individual Cable | 12. Occupancy/Daylight Sensor |
| 4. Workstation | 13. Light Fixture with Sensor |
| 5. VoIP Phone | 14. Access Control |
| 6. Printer/Copier | 15. Fire Detection and Evacuation* |
| 7. IP Camera | 16. Floor Distribution Box |
| 8. Wi-Fi Access Point | 17. Multimode (OM3 or Better Backbone Cabling) |
| 9. IBW Access Point | *consult local codes |



Universal Connectivity Grid

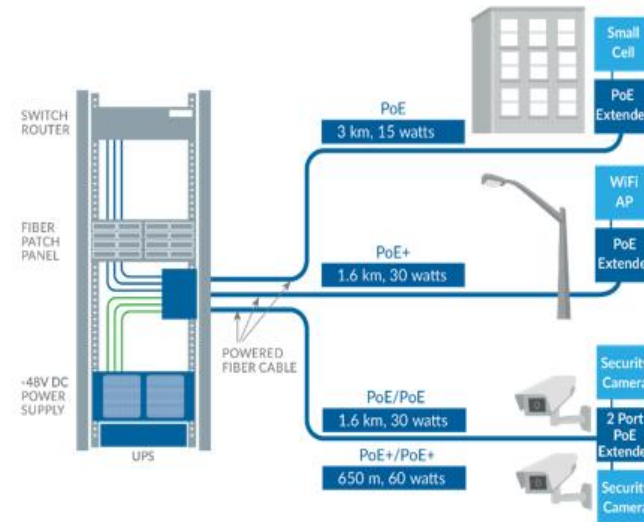




DC Power to the Edge

Powered Fiber Cable Solution (PFCS) is one option for extending direct current power to edge devices

Powered Fiber Cable and Ethernet Extenders



Power Express Class 2, shown here "fully loaded" with four 8 port modules



UP TO 12 OPTICAL FIBERS SMF OR MMF

EXTREMELY FLEXIBLE CABLE DUE TO SPECIAL STRANDED CONDUCTORS

AVAILABLE IN 12 AWG or 16 AWG





Powering Up!!!

Network Densification

Building networks must provide lower latency data performance and more power at the edge. Trends demonstrate that the number of connected devices will double from 2018 to 2025. Some will be dedicated to IT networks, others to OT, and still others to IoT or IIoT.

Deployment Speed

As the building network's value and the cost of downtime increase, deployment speed is emerging as the new currency. Being able to quickly and flexibly deploy network assets will be imperative as building population needs grow and evolve over time. When we speak of deployment, we're primarily referring to design and installation.

Power Up with Direct Current!

- Dramatically reduce the amount of cabling and deployment time
- Less trades involved
- Extended distances
- Leverage existing centralized power backup
- Easily scale and reconfigure to support converged, segmented, and hybrid networks



Number of global active IoT Connections (installed base) in Bn

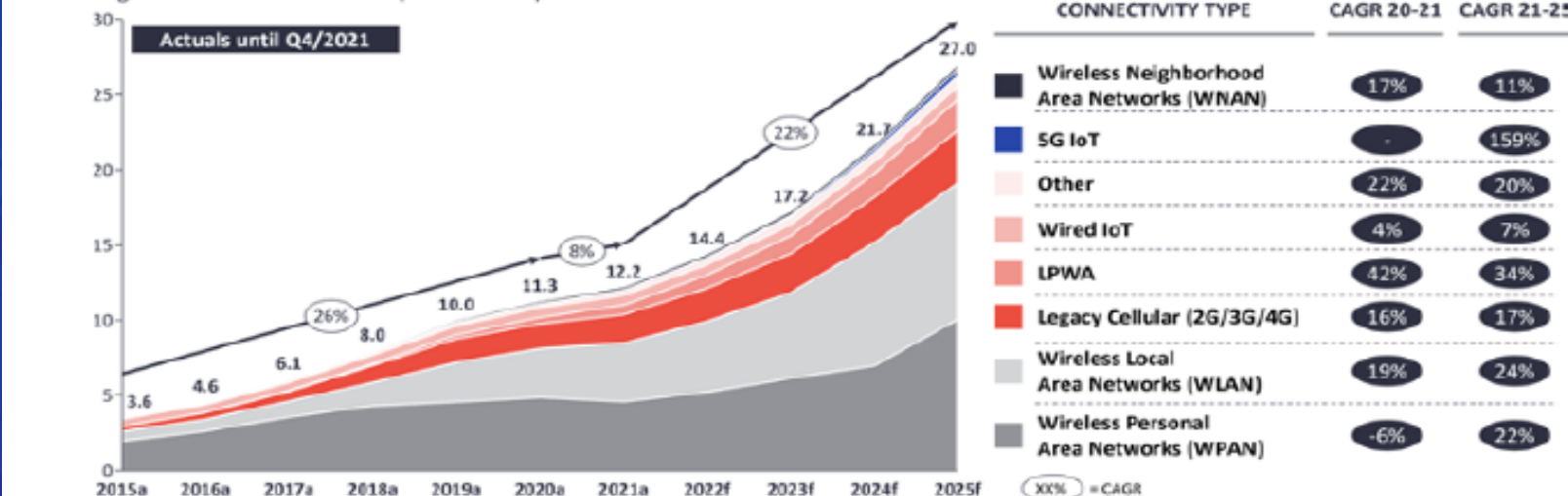


Figure 2: Global IoT connections in billions

Source: IoT Analytics, May 2022



And a look ahead...

Building Edge Infrastructure

- Extended Distances
- Less Real Estate
- Improved Throughputs
- More Power and Devices

COMMScope®

Building Edge Infrastructure

LEGEND

- High powered fiber cable
- IP devices
- Powered fiber for ERA® UAP-2
- Edge convergence point
- IP BAS controller with power
- BAS device wiring

Main Equipment Room



Figure 4: Building Edge Infrastructure

Source: CommScope



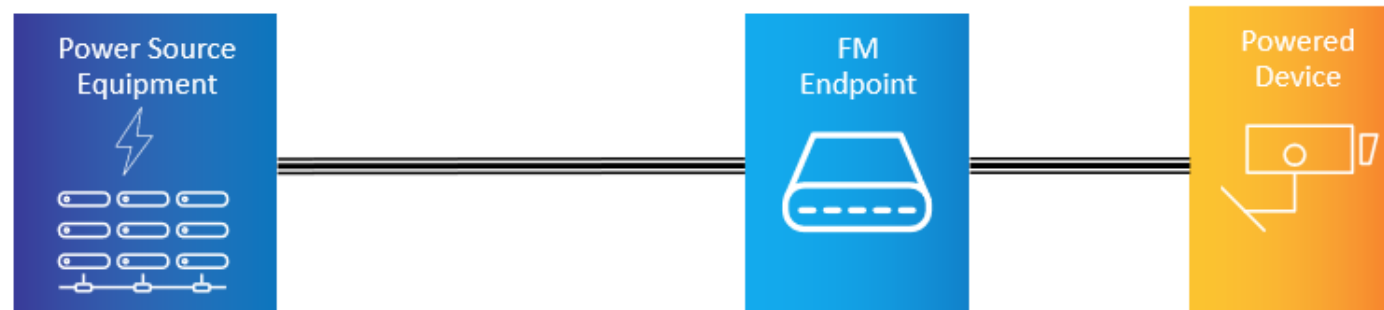
What's New in Power Codes

Class 4 Power

- Fault-Managed / Limited Power System
- Up to 450 Volts

Fault-Managed Power Systems USA NEC Class 4 Power Code 2023 Publication UL standards (1400-1 & 1400-2)

Class 4 power systems consist of a Class 4 power transmitter and a Class 4 power receiver connected by a cabling system. These systems are characterized by monitoring the circuit for faults and controlling the power transmitted to ensure that the energy and power delivered into any fault is limited. Class 4 systems differ from Class 1, 2, and 3 systems in that they are not limited for power delivered to an appropriate load. They are power limited with respect to risk of shock and fire between the Class 4 transmitter and Class 4 receiver.



Why It Matters

- New opportunities to power even more network devices, optimize and enable edge access architectures.
- Class 4 Power safely transmits more power over less copper than traditional powering technologies.
- New code removes requirements around electrical circuit installation and conduit. Significantly reducing materials and labor required on a project.
- We want to ensure our partners and customers can take advantage of Class 4 design and installation applications.



Digital Electricity™ Explained

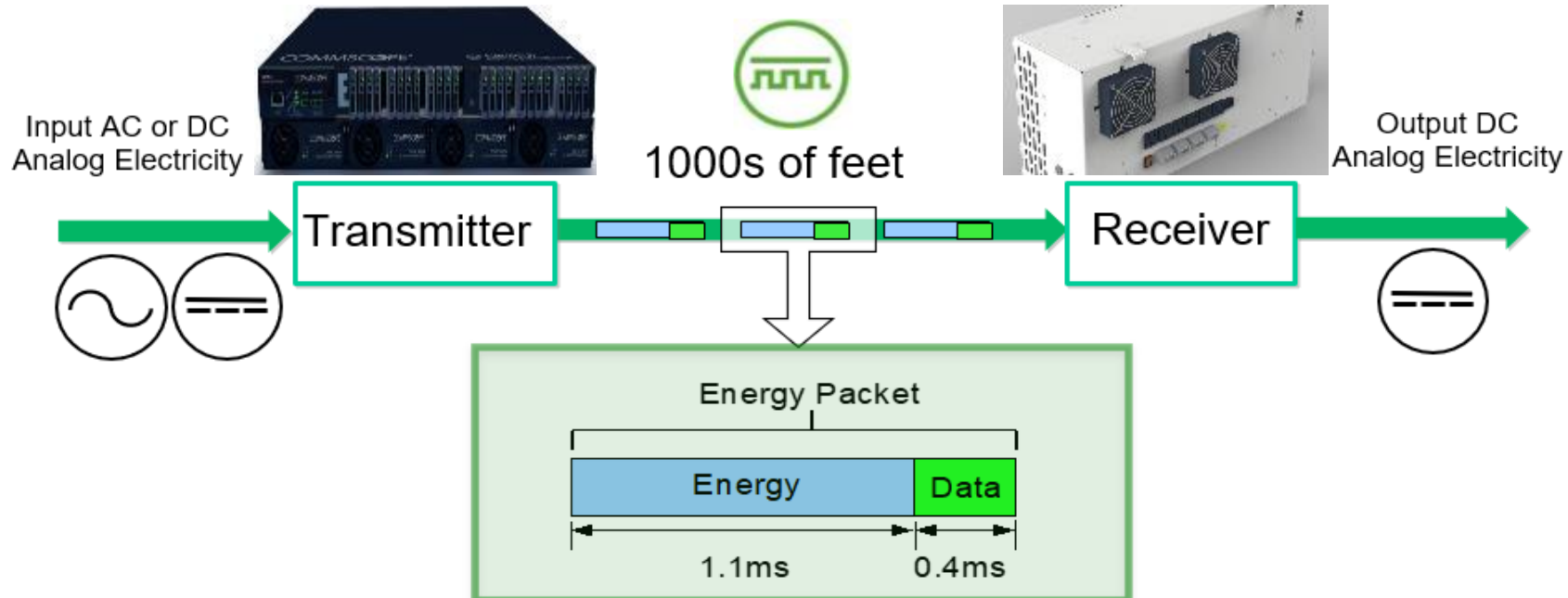
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SOLUTION:

- Significant Power
- Significant Distance
- Skinny Conductors
- Safely

DELIVERING POWER:

- Where it is needed
- In the format it is needed
- With speed, lower cost & resiliency

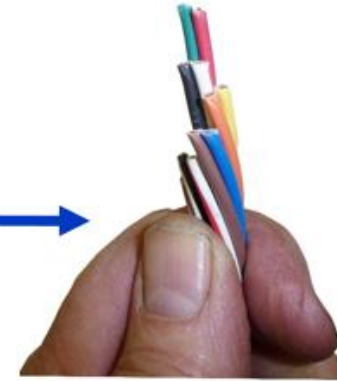


- 1) Monitor line condition
- 2) OK? Energize Line and Send Energy Packet, NOT OK STOP
- 3) De-Energize Line then perform Analog/Digital safety verification
- 4) OK? send another, otherwise STOP

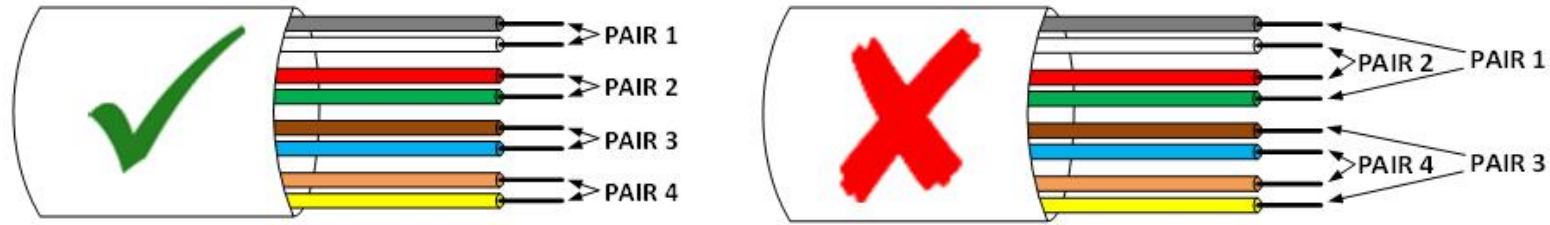


FMPS Requires Pairs – not just conductors

- Paired conductors have mutual capacitance and inductance
 - Mutual effects create a constant Impedance for the line
- ⚠️ • Conductors MUST BE side-by-side in straight laid cables
 - Follow color code listed in DATA SHEET
 - ELSE Verify with VISUAL INSPECTION →



2. Insulation	
2.1. Material:	Plenum Rated Polyvinylchloride
2.2. Wall Thickness:	0.009"
2.3. Color Code:	Black, White, Red, Green, Brown, Blue, Orange, Yellow, Purple, Gray, Pink, Tan, White/Black, White/Red



- ⚠️ • MIS-PAIRED cables CAUSE DE™ FAULTS

Twisted Pair cables offer the BEST results

- Excellent electrical characteristics – dramatic reduction of wiring errors



Whereas traditional multi-layer networks are based on legacy technology and design constraints, the concept of a Building Edge Infrastructure (BEI) is technology/application agnostic and is far less limited.

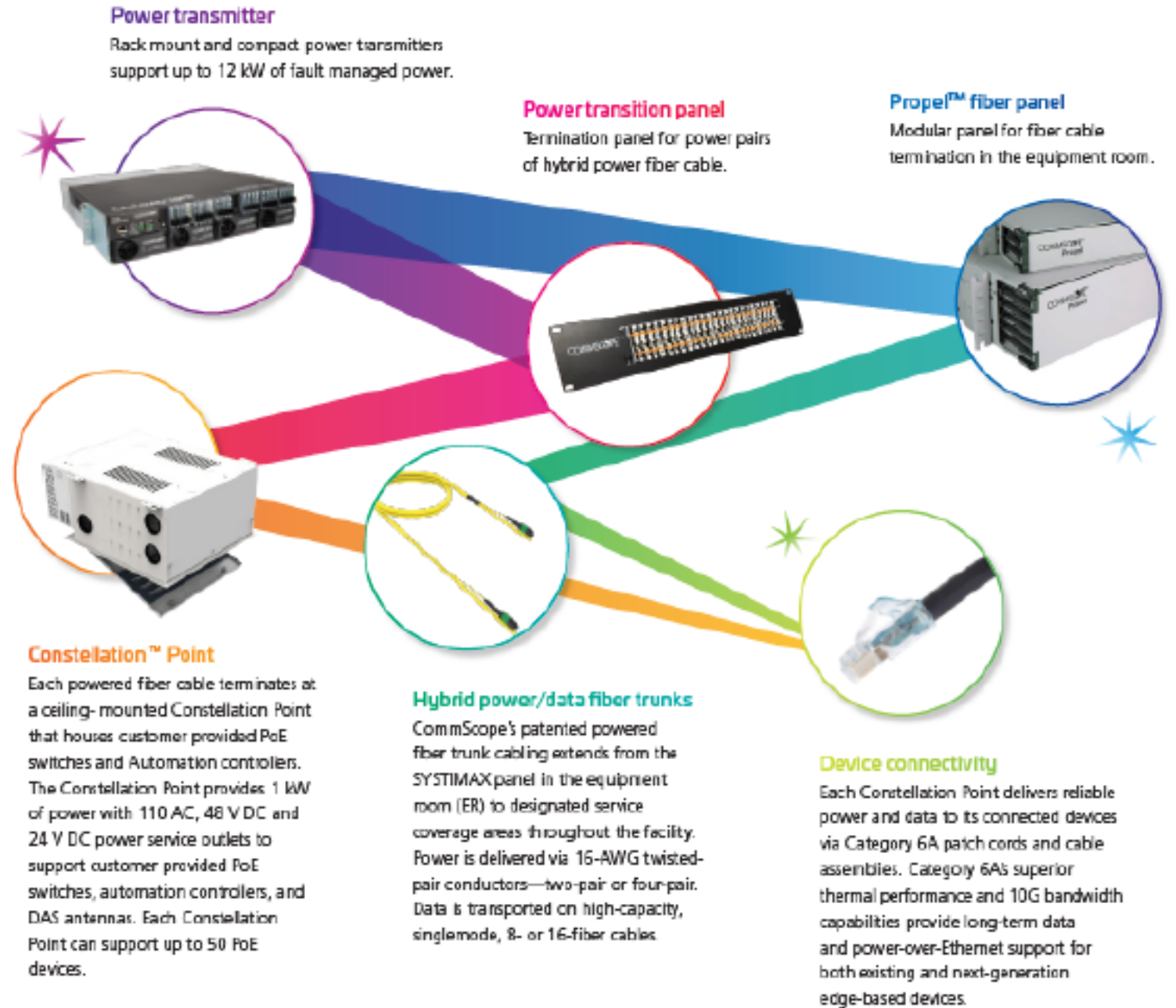
What It Is:

- Another tool in the bag
- Another arrow in the quiver



What It Isn't:

- The end all, be all
- The right fit for every opportunity





Building Edge Infrastructure Components – Powering it Up!

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Equipment Room

Propel Fiber Shelves and Modules



Power Transition Panel



Power Jumpers



Power Transmitter

Media



Pre-term Assemblies



Pre-term to Blunt Assemblies



Field Term Fiber Solutions

Service Area



Convergence Point



Panels

Device Connectivity



SYSTEMAX®

Pre-terminated Solutions

RJ-45- RJ-45 Patch Cords

Cable Assemblies RJ-45 to MGS600

Cable Assemblies RJ-45 – Blunt



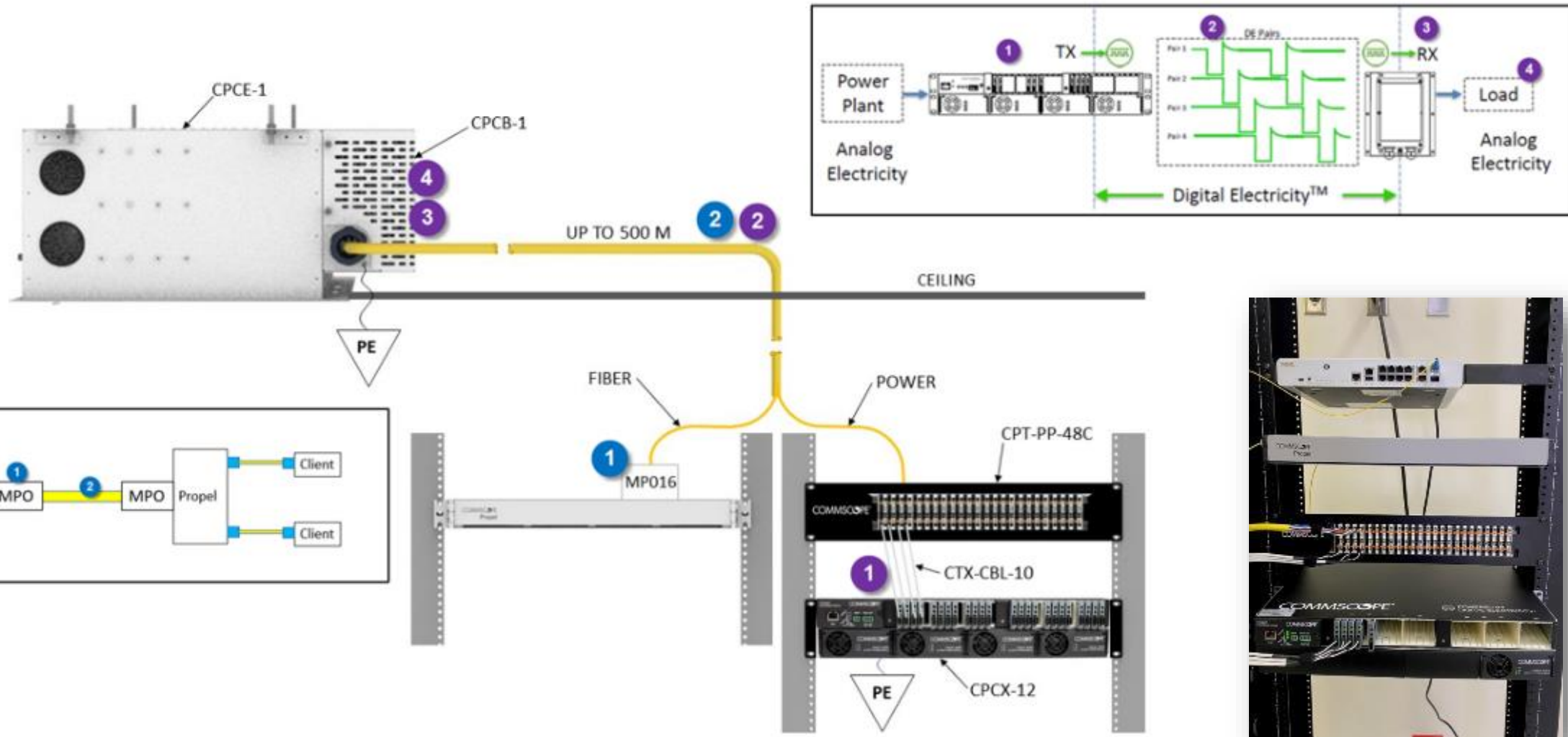
SYSTEMAX®

Cat 6A Field Terminated Options



Putting It All Together Full System Architecture

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Design Elements

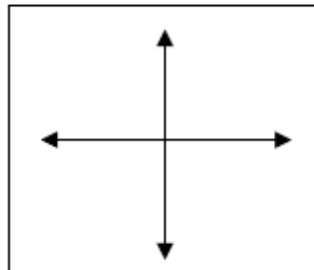
Let's keep it simple...

Power Budget will be key

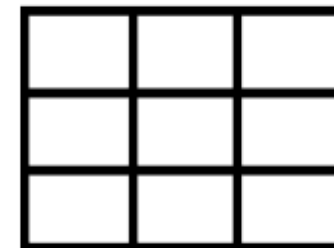
Every CP Supports

- Multiple fiber links 8F & 16F options (16F better suited to support DAS)
- 1000 watts (1KW) of power and can support up to 50 devices in a service area/ cell.

Determine cell size by device density, power requirements and applications included



Create your service area / cell layout to determine quantity of CPs



Cable distance from TR determines cable type and qty of TX cards

Up to 150M
2 Pair Cable
**2 Cards in the
Power Transmitter**

Up to 350M
4 Pair Cable
**3 Cards in the
Power Transmitter**

Up to 500M
4 Pair Cable
**4 Cards in the
Power Transmitter**





Potential Use Cases

- Warehouses
- Large Distribution Facilities
- Manufacturing Facilities
- Office Spaces
- Large Retail Stores
- Shopping Malls
- Large Entertainment Venues/Stadiums
- Hospitals
- Airports
- Education

Venues/Stadiums, etc.

- Distance
- Flexibility
- High power and bandwidth for wireless applications



Indoor applications for time being

Warehouse/Distribution/Manufacturing

- Distance
- Flexibility
- High power and bandwidth for wireless applications



Commercial Office Space

- Dynamic and Hybrid workplaces
- Wi-Fi First Initiatives
- Enhanced CRE tenant space management



Healthcare

- Density
- High power and bandwidth for wireless applications
- Ceiling enclosure designed for ICRA



Large Retail & Shopping Malls

- Distance
- Flexibility
- High power and bandwidth for wireless applications
- Enhanced tenant space management



Airports

- Distance
- Flexibility
- High power and bandwidth for wireless applications
- Enhanced tenant space management



Education

- Fiber to the class
- Future proof for high bandwidth learning tech AR/ VR/ AI in classroom
- Collapsed campus distribution for Higher Ed and Community Colleges

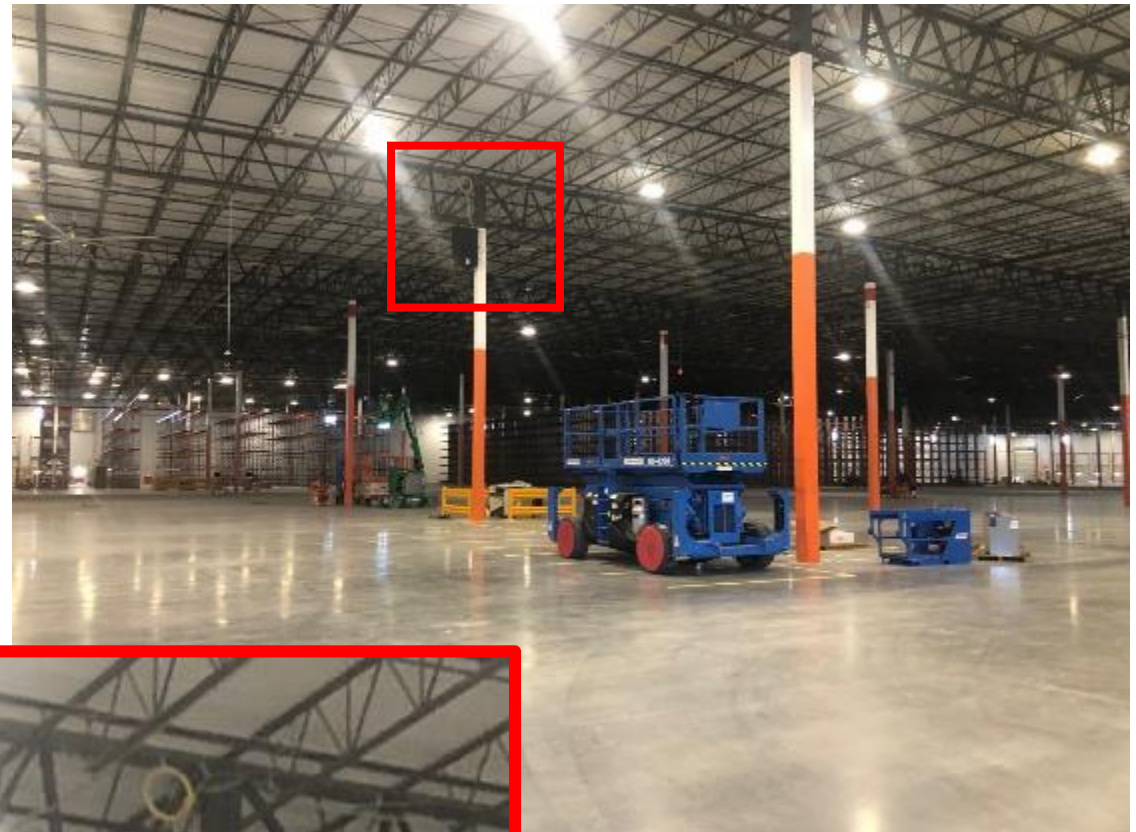




Personal Experience

HUGE Retail Distribution Warehouse in Colorado

- Active Telecom Enclosures
- Many twisted pair cables for PoE devices – APs and Cameras
- Cable drops to the floor for station cabling





Reference Material & Design Tools

Brochure with Ordering Guide

Configurator and BOM Development Tool

White Paper

Building Edge Infrastructure: Re-thinking how networks can support the hyperconnected building

Wayne Hopkinson, Engineering Fellow
Ronna Davis, Director Strategy and Technology
Jason Bautista, Solutions Architect



Not available to be scheduled for April 2023. Product and design guidelines are subject to change. Visit www.commscope.com for the latest information.

reference solution

Material ID	Product Number	Description
ENR100	ENR100	Convergent Power Transformer 375VA 100V
ENR101	ENR101	Convergent Power Transformer 375VA 100V
ENR102	ENR102	Convergent Power Transformer 375VA 100V
ENR103	ENR103	Convergent Power Transformer 375VA 100V
ENR104	ENR104	Convergent Power Transformer 375VA 100V
ENR105	ENR105	Convergent Power Transformer 375VA 100V
ENR106	ENR106	Convergent Power Transformer 375VA 100V
ENR107	ENR107	Convergent Power Transformer 375VA 100V
ENR108	ENR108	Convergent Power Transformer 375VA 100V
ENR109	ENR109	Convergent Power Transformer 375VA 100V
ENR110	ENR110	Convergent Power Transformer 375VA 100V

reference cable assemblies

Material ID	Product Number	Description
ENR111	ENR111	Convergent Power Transformer 375VA 100V
ENR112	ENR112	Convergent Power Transformer 375VA 100V
ENR113	ENR113	Convergent Power Transformer 375VA 100V
ENR114	ENR114	Convergent Power Transformer 375VA 100V
ENR115	ENR115	Convergent Power Transformer 375VA 100V
ENR116	ENR116	Convergent Power Transformer 375VA 100V
ENR117	ENR117	Convergent Power Transformer 375VA 100V
ENR118	ENR118	Convergent Power Transformer 375VA 100V
ENR119	ENR119	Convergent Power Transformer 375VA 100V
ENR120	ENR120	Convergent Power Transformer 375VA 100V

reference panels

Material ID	Product Number	Description
ENR121	ENR121	Panel 100V 100V
ENR122	ENR122	Panel 100V 100V
ENR123	ENR123	Panel 100V 100V

reference racks

Material ID	Product Number	Description
ENR124	ENR124	Panel 100V 100V

reference material

Qty	Part Number	Description	Unit
1	ENR100	Convergent Power Transformer	EA
1	ENR101	Convergent Power Transformer	EA
1	ENR102	Convergent Power Transformer	EA
1	ENR103	Convergent Power Transformer	EA
1	ENR104	Convergent Power Transformer	EA
1	ENR105	Convergent Power Transformer	EA
1	ENR106	Convergent Power Transformer	EA
1	ENR107	Convergent Power Transformer	EA
1	ENR108	Convergent Power Transformer	EA
1	ENR109	Convergent Power Transformer	EA
1	ENR110	Convergent Power Transformer	EA
1	ENR111	Convergent Power Transformer	EA
1	ENR112	Convergent Power Transformer	EA
1	ENR113	Convergent Power Transformer	EA
1	ENR114	Convergent Power Transformer	EA
1	ENR115	Convergent Power Transformer	EA
1	ENR116	Convergent Power Transformer	EA
1	ENR117	Convergent Power Transformer	EA
1	ENR118	Convergent Power Transformer	EA
1	ENR119	Convergent Power Transformer	EA
1	ENR120	Convergent Power Transformer	EA

Additional products

Qty	Part Number	Description	Unit
1	ENR121	Panel 100V 100V	EA
1	ENR122	Panel 100V 100V	EA
1	ENR123	Panel 100V 100V	EA

Constellation Power Delivery System

How to use this configurator

Convergence Points

Number of Convergence Points: 1

AC Input Cables

Item	Length (meters)	Cable Type
1	50	3 Phase MV-MPTCABLES
2	178	3 Phase MV-MPTCABLES
3	178	3 Phase MV-MPTCABLES
4	1200	3 Phase MV-MPTCABLES

Configure and Download Bill of Materials

Let's Review

Building Edge Infrastructures – The Benefits

- Familiar Components
- Easy to Install
- Extended Distances
- Faster Deployment Times
- Flexible, Scalable, Repeatable

Questions and Answers

Join the CommScope Technical Family!

You'll gain access to cabling industry standards news, solution updates, design and engineering best practices, product use and installation recommendations as well as webinars, newsletters and more!

www.commscope.com/ctf

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Thank you

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