CORNING

NextGen Data Transport Architecture

High Speed Data Delivery in Military and Federal Facilities to the Edge

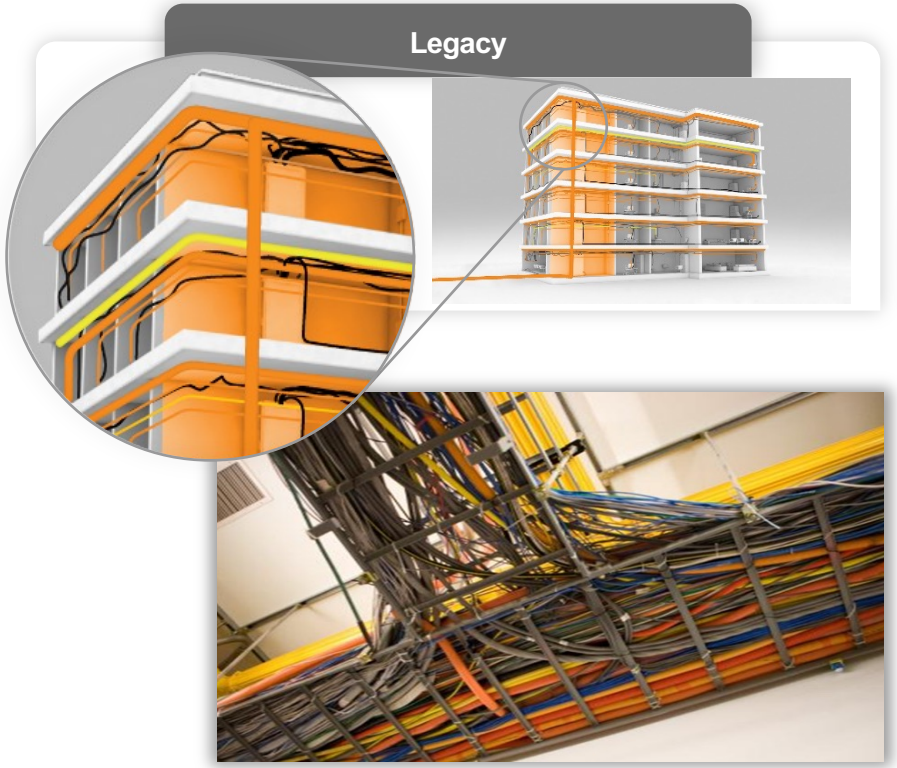
*"***DoD is a data-centric organization that uses data at speed and scale** *for operational advantage and increased efficiency…***DoD needs a foundation for a new networked way of war that brings together sensors and machines** *that will revolutionize the battlespace and the logistics and support functions behind the front lines."*

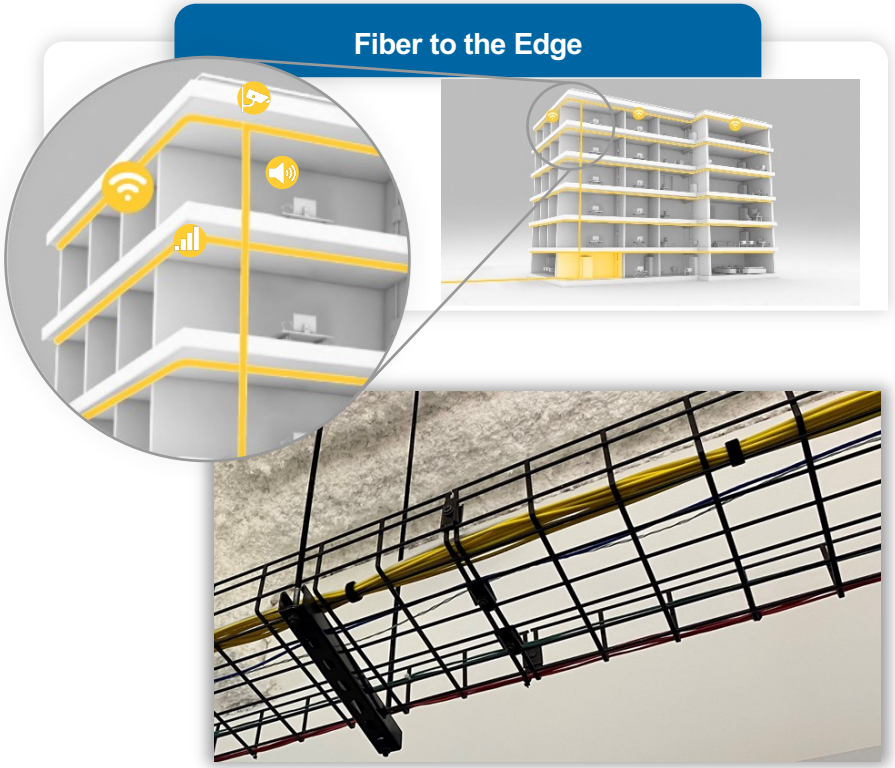
- DoD 2020 Data Strategy

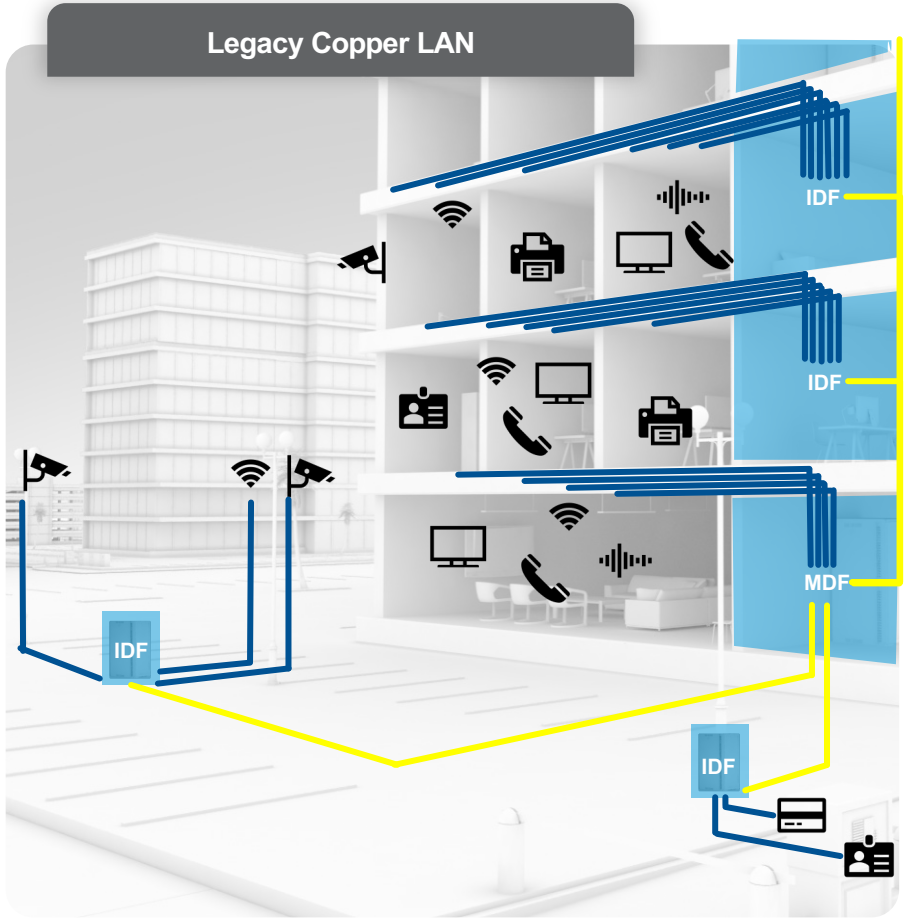
Buildings are increasingly becoming more connected and are exceeding the limitations of legacy LAN deployments

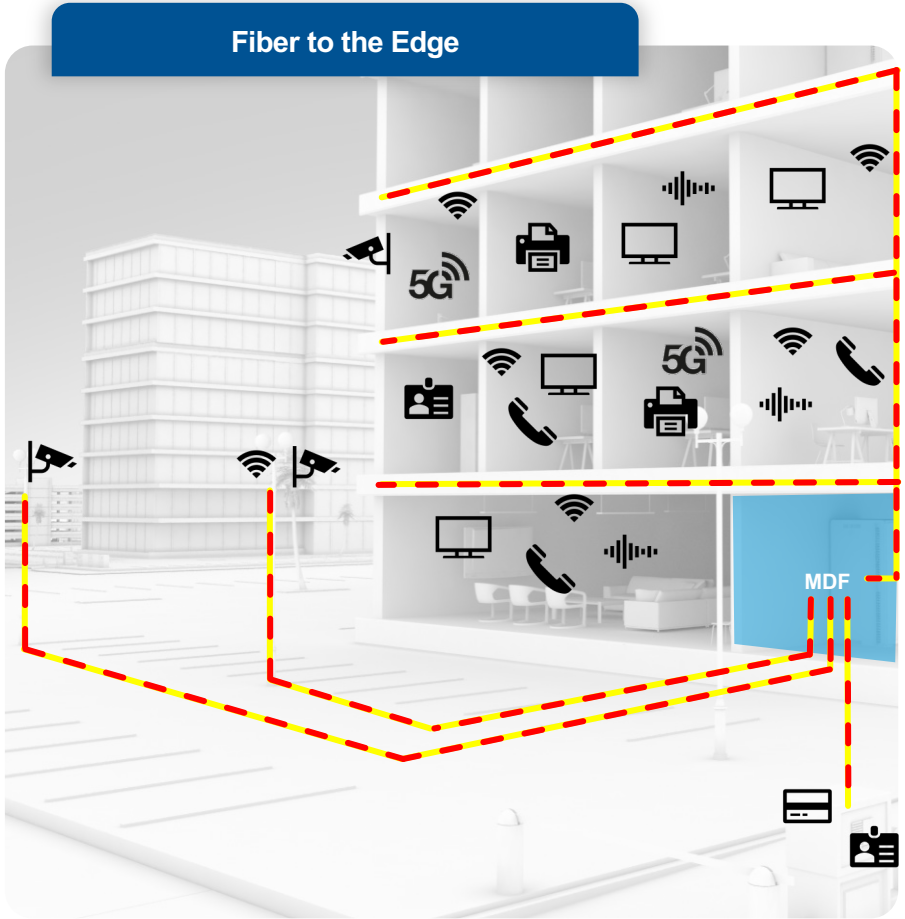
- Status quo architecture is limiting
- Too many devices to connect each with independent cable
- Rising demand for bandwidth and power
- Distance limitations of copper are too confining
- Security concerns

Fiber to the Edge – Streamlined, future-flexible architecture






Legacy Copper LAN
IDF
IDF
MDF
IDF
IDF


Fiber to the Edge
5G
5G
MDF

Madera Cyber Innovation Center

Enabling cadets for tomorrow

Corning is a proud donor of future flexible infrastructure!

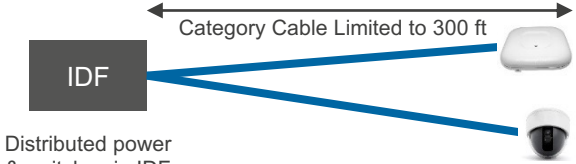
"The Madera Cyber Innovation Center positions the Academy as an innovation hub, revolutionizing the employment of cyber and artificial intelligence technologies to ready cadet leaders for the future fight," said Dressler. "The collaboration space will bring academia, industry and military operators together to educate and train the Air and Space Forces' future officers as forward-thinking leaders in advanced technological warfare."

Paul '78 and Joan Madera provided the lead gift for the center, with donors contributing more than $39 million to the project, including gifts in kind — surpassing the private support goal of $30 million. Cisco, Siemens and Corning Inc. have donated technology upgrades to the center. Support from donors supplements the $30 million in funding allocated by the federal government for the construction of the building.

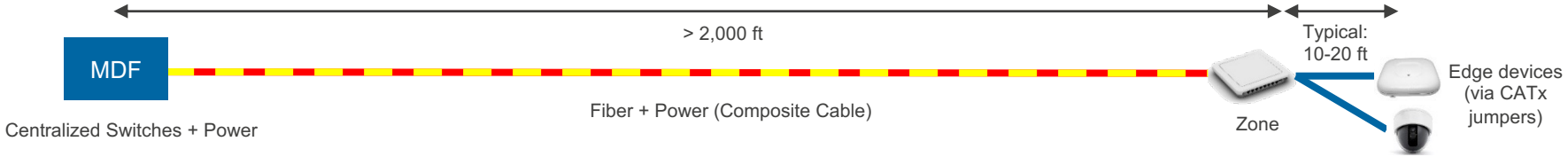
Comparing network architectures

Legacy Copper LAN vs. Fiber to the Edge

Legacy Copper LAN

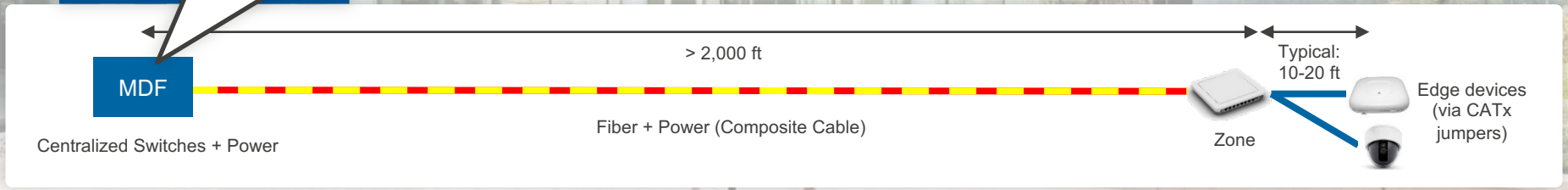


Fiber to the Edge



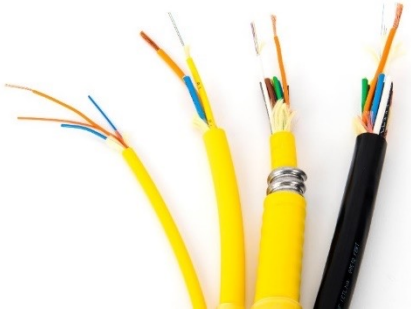
MDF

- Consolidate power and switching equipment
- Reduce IDF closets / ancillary components
- Reduce electronics, power, & cooling
- Reclaim revenue-generating space

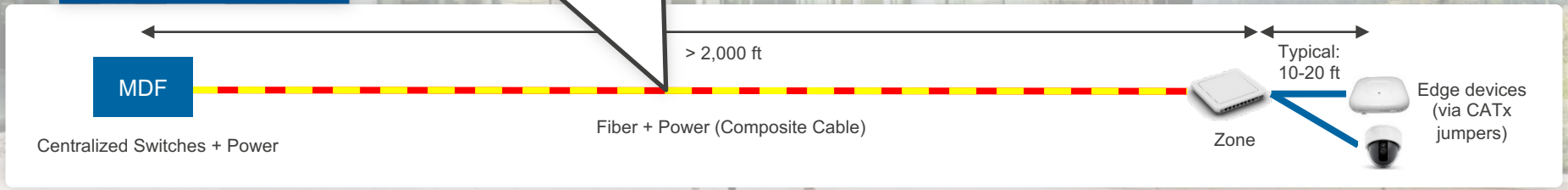


Horizontal

- Deliver data and power with a single Composite cable
- Composite Cable has copper conductors and fiber together in one cable jacket
- Extend reach beyond 2,000 ft to enable remote devices
- Save pathway space with smaller, lighter, fewer cables

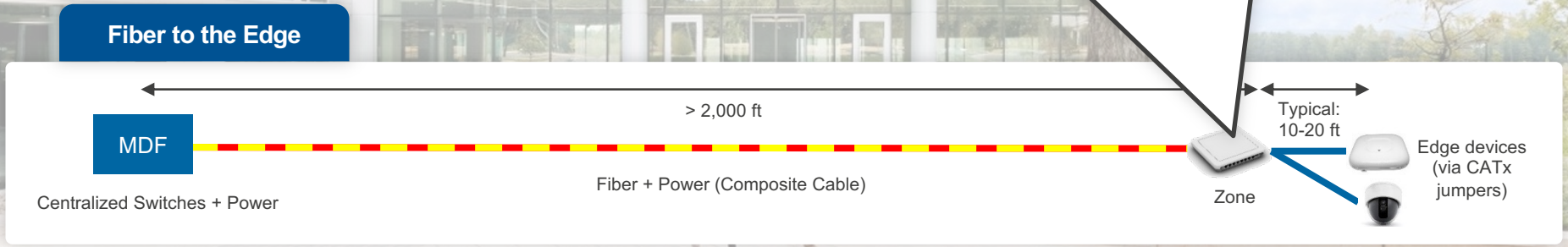


Fiber to the Edge



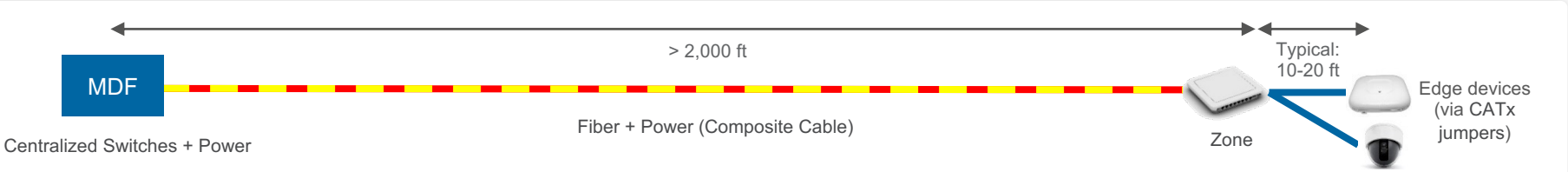
Zone / Edge

- Enable multiple devices in a zone with a single composite cable
- Leverage remote power instead of adding costly local power outlets
- Deploy Fiber to the Edge to any environment



Future-ready connectivity for the enterprise

SD-LAN and Fiber to the Edge Architecture



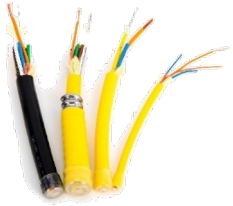
White Box Appliances

1G/10G/40G Optical Switching Fabrics

PoE/PoE+/PoE++

Full SFP portfolio

Broad ActiFi Composite Cable Portfolio



Up to 2,000 ft. reach

1-24 F / 2-12 Cu

12-20 AWG

Reel-in-a-Box

Edge Devices – Optical to Ethernet w/ PoE

Dual-mode software-defined access nodes

10G HPoE Media Converters

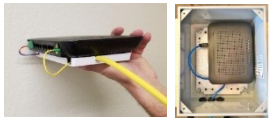
Low Voltage, Intelligent Power Solutions

CIP: 0-800W, redundant, 24V or 56V available

Aggregation; step-down accessories

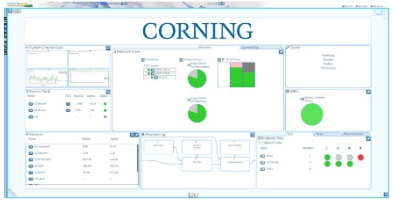
Compatible Structured Cabling

Fiber/Copper Management



Connectivity & Enclosures

Advanced Software Defined Network Orchestration Software



JITC Status

DODIN Approved Product Listing

Current test effort under Assured Services LAN Product Category

Testing is complete!

- End-to-End Corning Everon SD-LAN Platform testing now completed
- Cyber Testing ✓
- Interoperability (IO) Testing ✓
- Expected DODIN APL Listing as AS-LAN by November 2023

- Additional testing cycle planned under PON Category in 2024

Proven Technology, New Architecture

Secure, Agile, Affordable Value for all Stakeholders

Mission Owners – Bandwidth Ready for Weapon Systems

- **Unlimited data throughput**– multitudes times additional ports - ready for new missions
- **More Secure** – No EM signature
- **Enhanced network monitoring** through network orchestration
- **Data scale does not matter** – Support for current needs and in the future without the typical expense and disruption of upgrades

Installation Engineers – "Future Proofing"

- **Significant cost savings to** install, operate, upgrade
- **Remote power embedded in cable** – no separate A/C power
- **Future capabilities** installed now with a fraction of the servers, cabling, closets - Less runs, less labor, less configuration time
- **Sustainable solution** - less power/cooling impact on environment
- **Ready for wireless flexibility** in labs, depots, shipyards, backshops, arsenals, mission support facilities, etc)

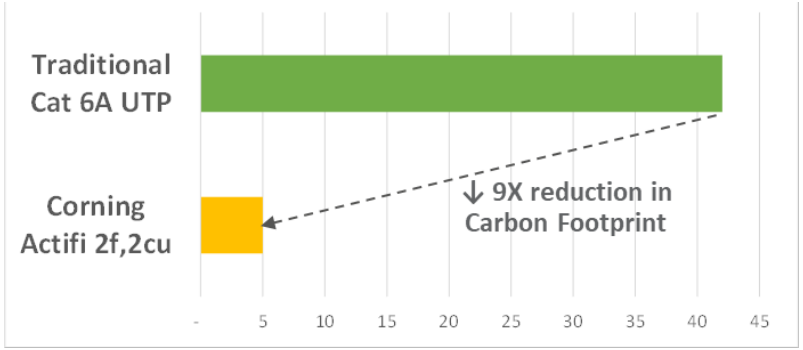
Comm/IT – 21st Century Network

- **Future network flexibility** with SD-LAN minimizing network disruption
- **Technology neutral approach** - supports active P2P Ethernet and PON
- **Zero trust** extending to the access layer policy to the edge port, 802.1X, authenticate everything
- **Single-pane-of-glass orchestration** and management of multi-tenant services
- **Network Visibility** provisioning automation from edge ports to WAN
- **Network Source of Truth** Central controller/policy, continuous audit, automatic remediate & alert anomalies

Sustainable in practice, by design

Embodied Carbon

Life Cycle Assessment (LCA)* Cable Comparison:



Net Carbon Reduction for full cable deployment:

27X reduction (**147 MT CO2e**) or 2% of total building carbon footprint over 30-yr building lifetime, assuming only 3 technology refreshes

Operational Carbon

Reduction of Telecom Rooms:

- From 6 TRs to 1 main MDF for network electronics with less overall rack space needed
- Less HVAC for cooling network electronics, less UPS backup

Net Carbon Reduction from reduced energy needs:

- **82 MT CO2e /year** or **2,460MT CO2e** over 30 year lifetime
- Equivalent to 1% reduction per year of total building energy consumption

30 year Carbon Emission Reduction Equivalents

Greenhouse gas emissions driven by avg. gasoline powered vehicle : **6 million miles**

Carbon Sequestered by US forests: **2,870 acres**

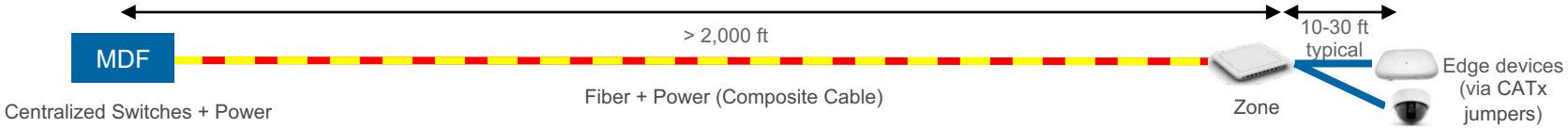
* Prelim 3rd party LCA for composite cable and published EPDs for Cat 6A cable

Source: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

New Technologies to Meet Military Requirements

Next Gen Data Transport Architecture with Smart Base Hub

Build a highly capable robust network that can support secure technologies



ASSET MANAGEMENT

Base-Wide Asset Performance Analytics

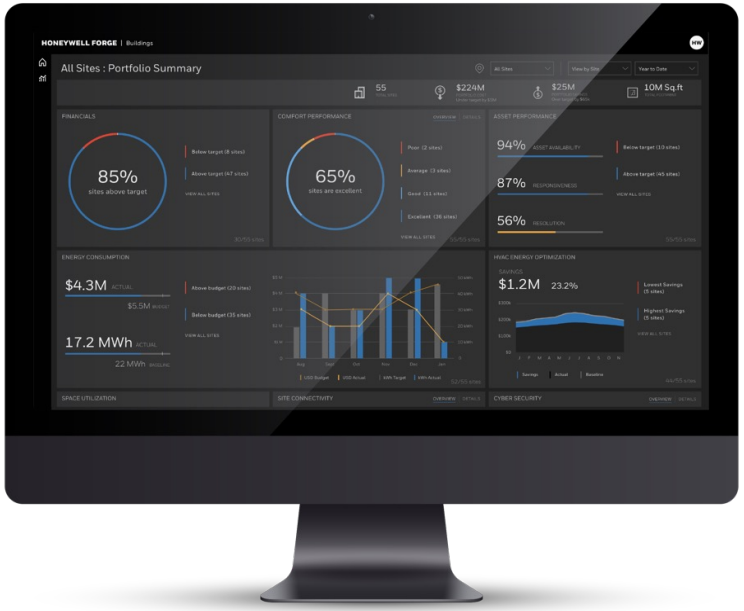
Visibility into Financial, Energy, Space and Comfort performance across the military enterprise.

Environmental & Energy Monitoring

Compare base asset portfolio performance between buildings, regions and communities

Capital Investment Programs

Data-driven project selection to Extend the useful life of assets across portfolio.



BASE OPERATIONS

Energy Optimization

Energy savings via autonomous control and continuous optimization of assets.

Digitized Maintenance

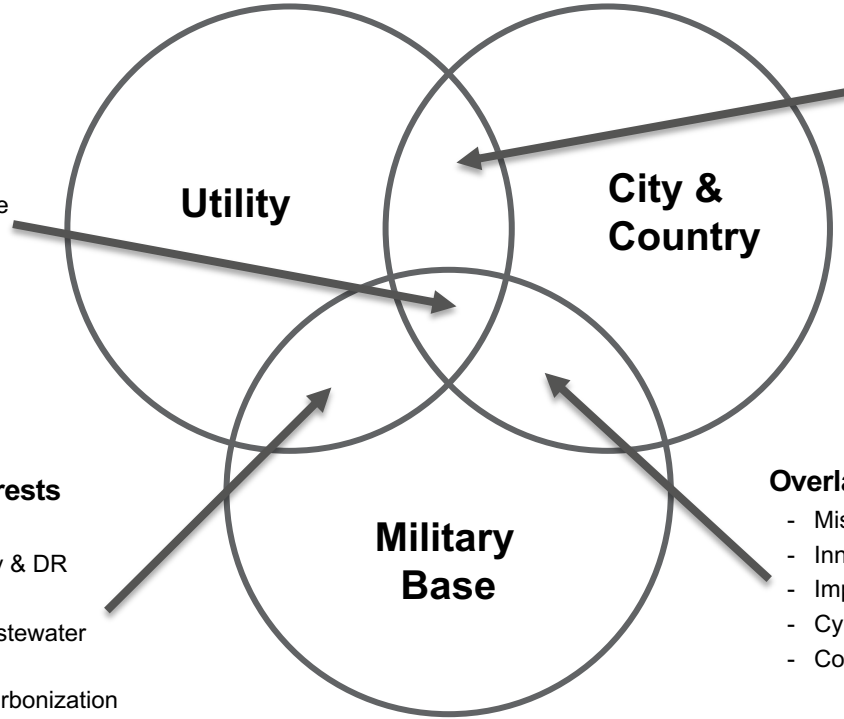
Just-in-time maintenance model enabled through predictive recommendations.

Critical Asset Health

Predictive Models and continuous Machine Learning that maximizes asset longevity.

Smart Bases Need a Robust Resilient Network

Overlapping Interests
- Connected Warfighter
- Energy System Reliability
- Hardened, Resilient Infrastructure
- Cyber Secure
- Transportation Electrification



Overlapping Interests
- Grid Reliability
- Emergency Response
- LED / Smart Streetlighting
- Fleet Electrification
- Quality of Life Improvements

Overlapping Interests
- Grid Reliability
- Energy Efficiency & DR
- EV Infrastructure
- Smart Water/Wastewater
- Cyber Security
- Addressing Decarbonization

Overlapping Interests
- Mission-Ready Solutions
- Innovation Test Beds
- Improved Quality of Life Programs
- Cyber Security
- Continued development of future military personnel

Case Study: Corporate HQ

Capabilities at Scale

180,00 FT²	TRADITIONAL	FTTE	SAVINGS
MATERIAL	$972,831	$739,170	25%
LABOR	$242,209	$137,669	43%
TOTAL	**$1,215,040**	**$867,839**	**29%**

- 180,000 sq ft
- 800 employees
- Open office environment
- Wi-Fi access points
- 4K HDR A/V conferencing
- In-building cellular
- VoIP soft phones
- Sound masking
- Security cameras
- Printers, workstations

Enabling More

Day 1 Applications:

Smarter Network Design:

- WiFi-first environment
- Extended network reach for outdoor connectivity
- Reduced cable tray by 50%
- Used 70% less linear feet of cable
- Eliminated 80% of TRs, saving $50k per TR buildout
- Prepared for 5G speeds
- Upgrade from WiFi6 to WiFi7 without adding cables
- Supporting bandwidth-demanding audio/visual needs

Case Study: Large Venue/Hospitality

Capabilities at Scale

4.3B Construction Project	
Rooms	**3500** Guest Rooms/Suites
Additional Spaces	**100,000 sq ft** video screen **220,000 sq ft** Pool complex **5,000** person theater **100,000+ sq ft** Mixed Use Dining/Nightlife Space
Connectivity	**2,000+** security cameras **20,000+** connected devices **5+** connected devices/room **BMS/IoT/Elevators** **AP, VoIP, IPTV, Data** **Redundant Head-Ends** **Fiber dense gaming floor**

Enabling More

Advantages Gained Through Fiber:

- **8:1 Reduction in homerun cabling in 3500 Rooms**
- Fully converged infrastructure
- Remote Power, centrally backed up
- 130+ TRs reduced to 24 TRs
- Reduction of UPS/HVAC/Cable Tray
- 3+ Spare connections ready at every guest room
- Future Flexible Infrastructure for Cell Overlay

Case Study: Mixed Use Campus / Smart City

Capabilities at Scale

Size	**50** City blocks and buildings **250** 4K HDR A/V locations
Additional Spaces	**Arena** **Corporate HQs** **Mixed-use spaces** **Parking Lots**
Connectivity	**130** WiFi Aps **130** Security cameras **Outdoor** speakers, WiFi VoIP soft clients Digital signage Neutral host DAS Building management Wired LAN

Enabling More

Advantages Gained Through Fiber:

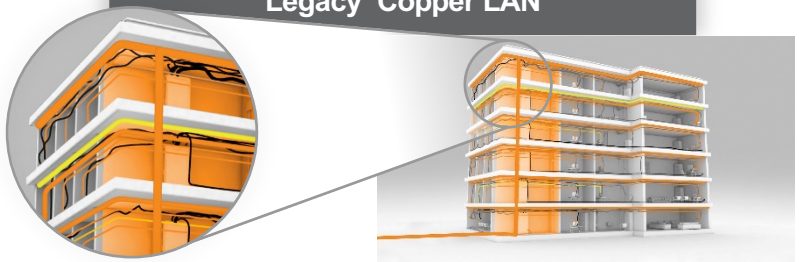
- **"100 Year Building" – Future proofed environment**
- Less space and power required
- Future Ready Infrastructure – capable of adapting to evolving demands
- Lower OPEX = .5 FTE savings & Smartnet $50k/yr. vs SD-LAN $10k/yr.)

1.5x the number of ports provided at 84% of the cost

Summary

Fiber to the Edge enables sustainable, smart buildings

Legacy Copper LAN

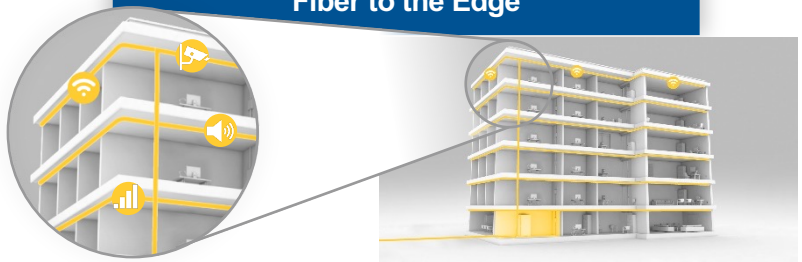


Limited flexibility to enable upgrades.
Dedicated infrastructure for each network application
Rip and replace every technology upgrade

Capital and resource intensive.
A cable for every device – duplicative layers
User disruption for any moves/adds/changes

Complex and inefficient.
Network closet on every floor – more cost, wasted energy

Fiber to the Edge



Less Cost. Simple.
30% Capex reduction on network build
Converged infrastructure uses 70% less linear feet of cable, 50% less cable tray

More Resilient.
Save 50% on future upgrades
No more rip and replace, less disruption

More capable and sustainable.
Future Flexible – Enable 5G, IoT, WiFi7 and beyond
27x reduction in carbon footprint, 6.8% carbon reduction over 30 years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