

Welcome!



2020 Regional Optical LAN Seminar Series





Plan

Build

Operate

Passive Optical LANs



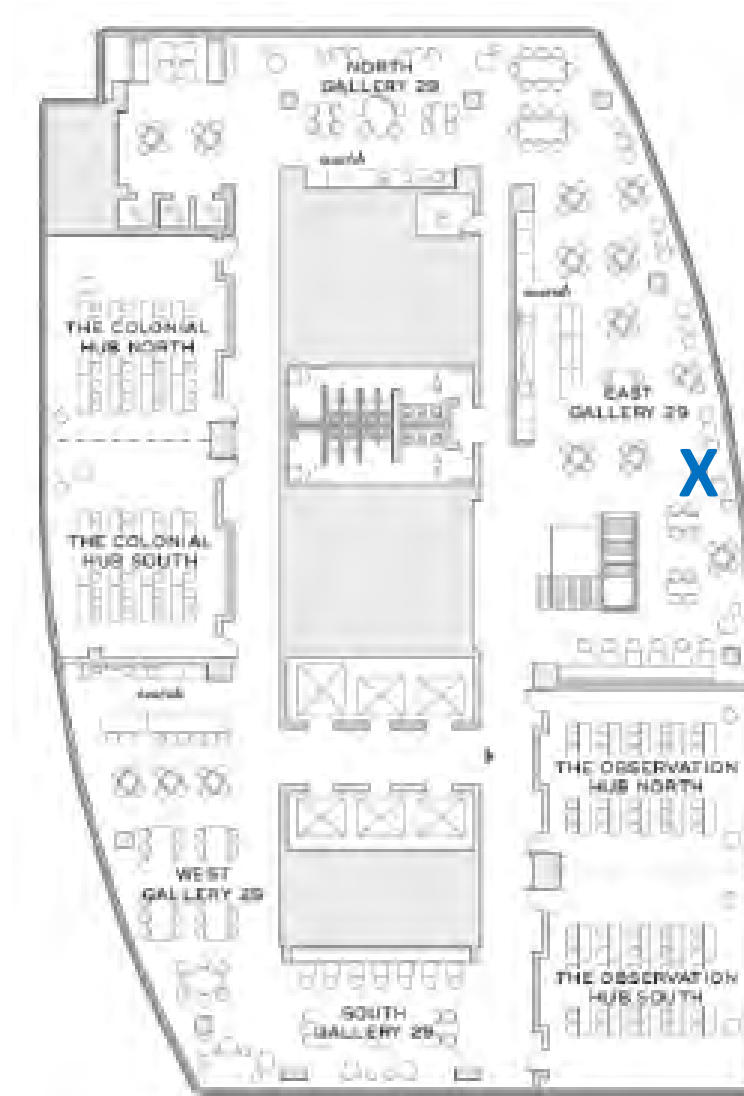
slide 2



Start	Duration		Topic	Presenter	
9:00 AM	60		Registration & Breakfast	***	00
9:00 AM	60		***Tellabs Advantage Partner Program Update***	Tellabs	
10:00 AM	5	Plan	(10:00 am START) Welcome, morning logistics and seminar purpose	John Hoover	01
10:05 AM	15		State of the POL Industry	Rich Schroder	02
10:20 AM	20		Flexible connectivity choices with Optical LAN	John Hoover	03
10:40 AM	20		Best practices for fiber-based infrastructure for buildings and campuses (OCC)	Joe Cook	04
11:00 AM	20		break & interaction at tables	***	
11:20 AM	20	Build	Optical LAN cost comparison and migration to 10 gigabit connectivity	Joel Fischer	05
11:40 AM	20		Competitive Analysis, Unique Differentiators and Futures	Tom Dobozy	06
12:00 PM	20		Best Practices for Powering OLAN equipment (EPS)	Jeromy Kendall	07
12:20 PM	55		Lunch & interaction at tables (Live PON Manager Demo, w/Cobb and Novak)	***	
1:15 PM	5	Operate	Afternoon Seminar Logistics	John Hoover	08
1:20 PM	20		Best Practices for securing fiber-based networks (CyberSecure IPS)	Scott Rye	09
1:40 PM	20		Best Practices for distribution and integration (WESCO)	Andy Inkeles	10
2:00 PM	20		Services to Plan, Build and Operate your Optical LAN	Joel Fischer	11
2:20 PM	20		Break & interaction at tables	***	
2:40 PM	20	Delight	Electronics, Layer-1, Services and Powering Technical Panel	All	12
3:00 PM	30		Plan, Build and Operate OLANs Customer Panel (Amtrak, Montgomery County, Fish and Wildlife)	Customers	13
3:30 PM	20		Open Q&A	Tom Parisi	14
3:50 PM	10		Closing Remarks	Rich Schroder	15
4:00 PM	120		Social Mixer	***	
6:00 PM			End		



SSID = Convene
Password = stayconnected



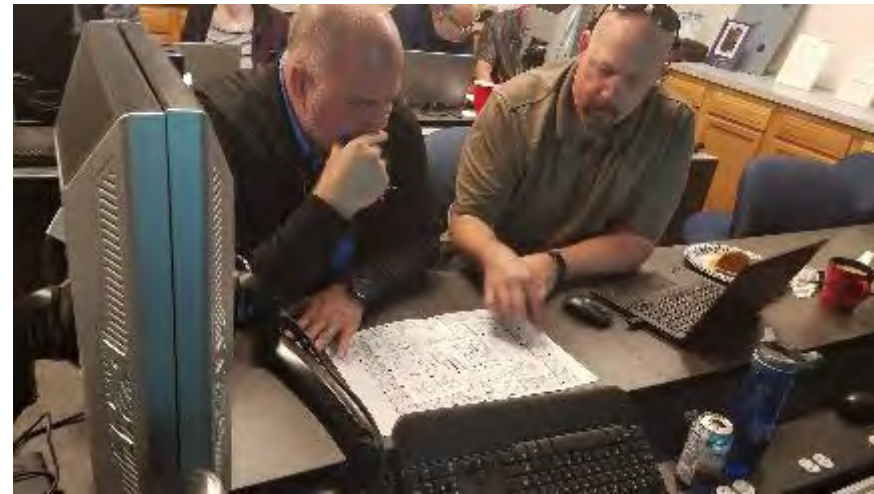
**Optical LAN
Installs Viewing**



Optical LAN Technical Training

- OLAN NPD/OPM-Lite Training at the “new” TIA headquarters on February 20th.
- This is a 1-day passive Optical LAN that will include ½ day of network planning and design, plus a ½ day of operations, provisioning and maintenance curriculum.
- You will earn five (5) BICSI CECs for completing this OLAN technical training courses.

Thursday, February 20th
TIA Headquarters
1310 North Courthouse Road, Arlington
9:00 am to 4:00 pm



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State of the POL Industry and Tellabs Optical LAN Strategy

Rich Schroder, Tellabs President and CEO



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Welcome to the Regional OLAN Seminar Series

Today's seminar will give you firsthand knowledge concerning new advancements with our true enterprise Tellabs FlexSym Series Optical LAN solution

- ✓ Access to best-of-breed partners for distribution, infrastructure, powering, and security
- ✓ Gain valuable insight into how OLAN can drive success for you, your company and the greater industry in 2020!



Vendor Alliance Partners

Leaders in Passive Optical Networking Innovations

CyberSecure IPS

- We are the world's first U.S. Government certified secure interactive infrastructure monitoring solution to protect the most critical infrastructures and assets around the globe.

EdgePower Solutions

- With over 250 successful GPON and DAS projects under EPS power, the consensus is that EPS products provide for a cleaner and more efficient installation. The success has led to crossover uses in other markets such as DAS/Distributed Antenna Systems and Building Controls

Optical Cable Corporations

- When we first built our reputation as pioneers in fiber optic cable, OCC made a commitment to quality, performance, and service. Today, we are leaders in the engineering and manufacturing of a variety of high-performance, top-tier cabling and connectivity solutions.

WESCO

- With nine distribution centers and roughly 500 branches worldwide, we are a global strategic partner who efficiently and consistently supports our customers' operations, wherever they are located.



DoD Endorsement of PON

Source: *Digital Modernization Strategy 2019-2023*



Appendix A: Technologies Offering Promise to DoD

Looking toward the future, the Department is exploring a number of technologies that have the promise to provide increased effectiveness, efficiency, and security. Representative technologies include AI, Big Data Analytics, Evergreen IT approaches, DevSecOps, Hyper-Converged Infrastructure, Serverless or Event-Driven Computing, Software Defined Networking (SDN), Block Chain, Cryptographic Modernization, Quantum Computing, Internet of Things (IoT), 5G, Internet Protocol version 6 (IPv6), **Passive Optical Network (PON)**, and Zero Trust Security. These technologies are briefly described below, along with discussion of how each technology might increase the Department's effectiveness, efficiency, and security. A number of these technologies can work together to provide the Department with the potential for quantum leaps in capability.

Passive Optical Network (PON)

A passive optical network is a form of fiber-optic access network that implements a point-to-multipoint architecture, in which unpowered fiber optic splitters are used to enable a single optical fiber to serve multiple end-points. Therefore, PON requires far less infrastructure since it reduces the amount of fiber and central office equipment required, compared with point-to-point architectures.

The main benefits of PON are listed below:

- Lower network operational and maintenance costs
- Lower infrastructure costs
- Large bundles of copper cable are replaced with small, single mode optical fiber cable
- PON provides increased distance between data center and desktop (>20 kilometers)
- Fiber is more secure than copper; it is harder to tap



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State of Tellabs Optical LAN

Strong performance in 2019

Launched FlexSym Brand

- New platform that is flexible enabling 10G symmetrical and GPON on same OLT

Strong YoY Customer Growth

- Optical LAN recognized as a superior solution
 - ✓ Large food and beverage companies
 - ✓ International Airports
 - ✓ Multi-national companies
 - ✓ Government Entities

Increased Investment in Sales & Business Development

- Added Director of Business Development and Technology – Bill Buck
- Added Sales Account Executive in the West – Marcia Mark
- Added Sales Executive Account Manager in Texas – Marcus Bellard
- Added Sales Systems Engineer – James Cobb

Continued Expansion of our Service Offerings

- Expanding our professional services offerings with tight partnership with our systems integrators
- Onboarded a new professional services program manager – Matt Hunt, USMC Veteran
- Rolled out our Digital Credentialing program



Tellabs 2020 Strategy

Positioned for accelerated growth

Leverage FlexSym Series 10G Capabilities to Optimize Customer Networks

- Multi-rate capabilities allow you to seamlessly mix GPON and 10G
 - ✓ 10G backhaul for WiFi-6 WAP's
 - ✓ GPON for lower speed requirements
 - ✓ Intermix on same OLT and same fiber infrastructure
- 10G is same per-port cost as GPON
 - ✓ Quadruple the bandwidth, Symmetrical 10G/10G

Expand Market Applications

- Enabling reuse of existing infrastructure while providing benefits of Optical LAN
 - ✓ Legacy Ethernet Switch Replacement using new ONT248
 - ✓ Conserving existing copper cable infrastructure when rip and replace not cost effective
 - ✓ Unified management of entire network from a single Panorama EMS platform
- Creates new brownfield opportunities during switch refresh cycles
 - ✓ Promotes migration strategy from traditional ethernet to Optical LAN

Expand Market Presence

- ✓ Western and Central US region
- ✓ Multi-national
- ✓ State, Local and Education (SLED)



Tellabs Product Investments

Products that advance the LAN network

Tellabs FlexSym Series – Available Today

- Dual-mode GPON/XGS-PON OLT
 - ✓ Quadrupled density, 10G at the same price per line as GPON
- 10G ONT with WiFi-6 WAP support
- 8 port GPON ONT for higher port density
- Hardened GPON ONT for outdoor applications
- Enhanced PON protection – critical for very high availability deployments
- Multi-mode fiber capabilities

Tellabs FlexSym Series – 2020 Product Launches

- OLT1 – 1RU, 8 port OLT
- ONT248 – 48 port 10G ONT for copper reuse
- ONT202 – 2 Port 10G Multi-rate ONT for WAP's

Tellabs Products in Planning and Development

- OLT Mini – 2 port GPON/10G outdoor OLT
- BOLT - 16 port modular stackable 1 RU OLT with advanced processing



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Flexible Connectivity Choices with Optical LAN

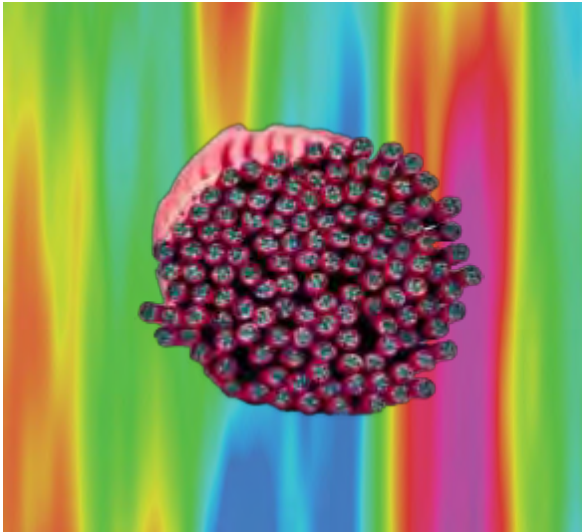
John Hoover, Tellabs Marketing Director

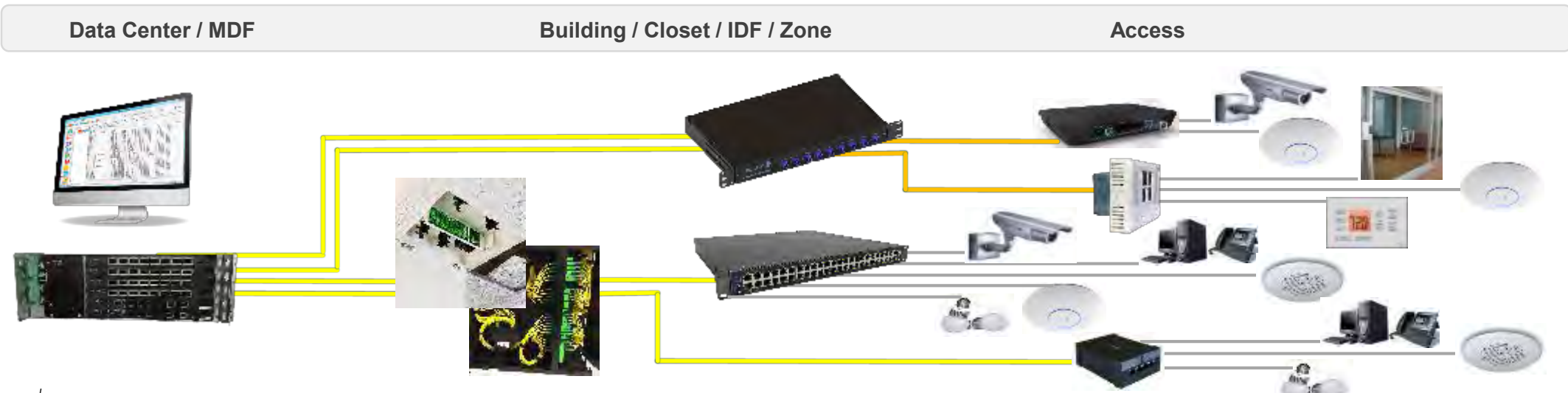


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- How can you better align real space, energy, heat, noise, radiation, and costs impacts, with your true enterprise bandwidth requirements?





- √ Choose management interface
- √ Choose global profiles to automate provisioning for more M2M actions
- √ Choose PON speed
 - √ Choose infrastructure SMF, MMF, CATx, optical splitters, and power
 - √ Choose ONT location in closet, plenum, floor, wall, furniture, cubes or desktop
 - √ Choose Ethernet speeds at the ONTs
 - √ Choose services, devices and users connected

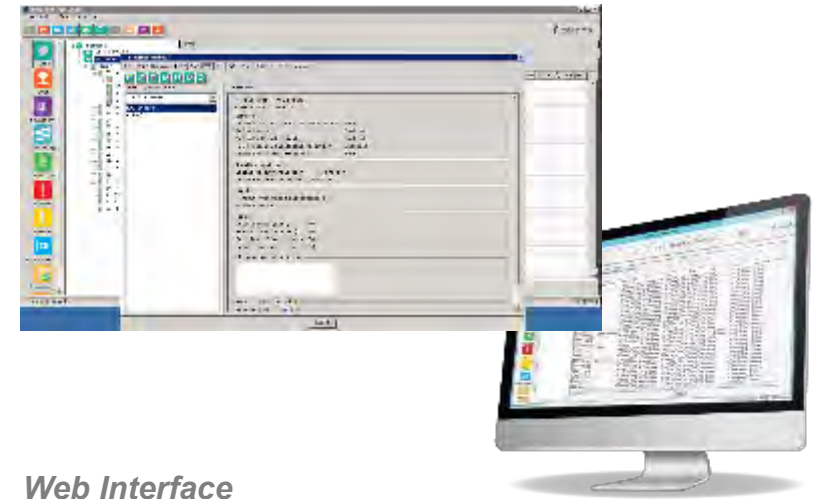
Flexible design choices for inside building and extended campus networks



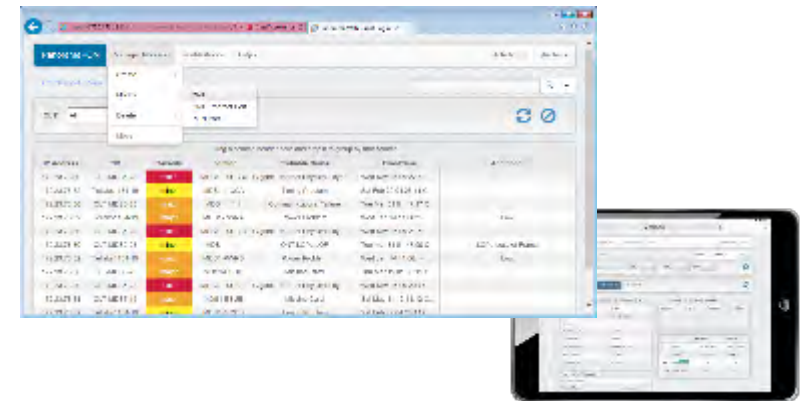


- One screen and one virtual switch
- Virtual Ethernet port extension and software defined LAN functionality
- Global profiles orchestrate error-free, and more secure, M2M automation
- These global profiles set QoS, b/w & security - for services, devices & users
- Less human touch directly improves network security and reliability!
- Management options for desktop, laptop, and smart phone

Full Client



Web Interface





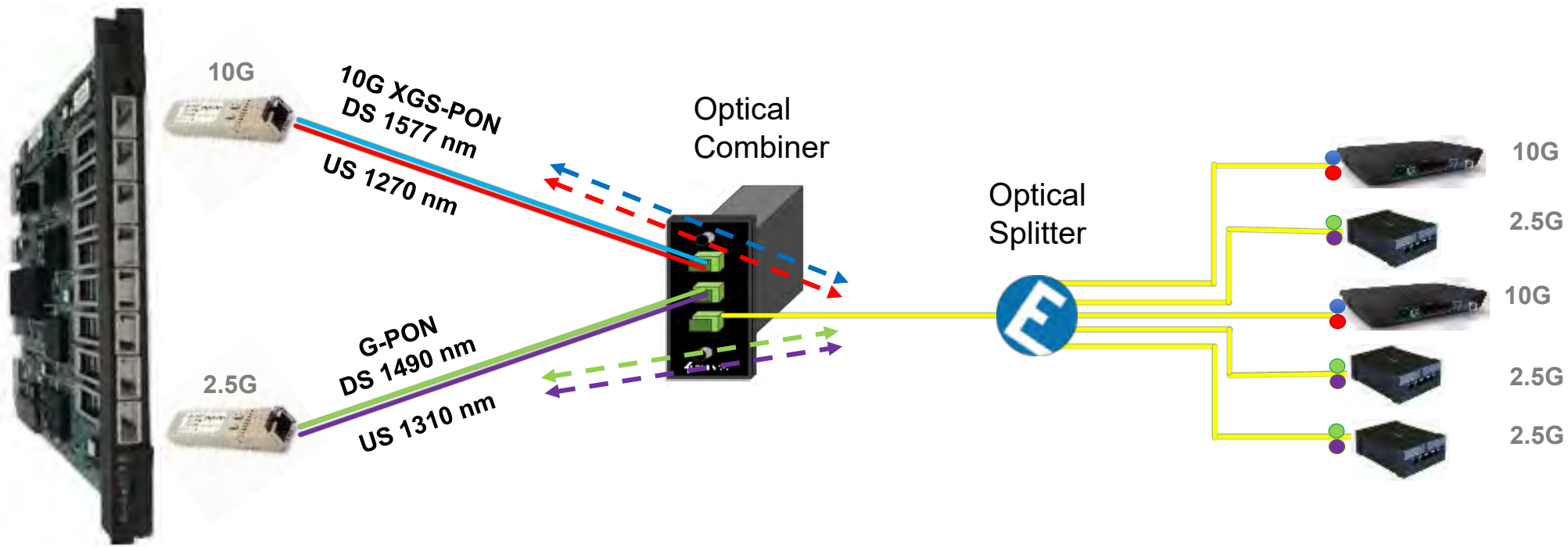
- Either G-PON or symmetrical 10G XGS-PON
- XFPs choice determines G-PON or XGS-PON
- The hardware is ready for 25G or 40G NG-PON
- Many choices for connectivity to the WAN

FlexSym Optical Line Terminal Six (OLT6)



FlexSym Optical Interface Unit (OIU8)





Data Center / MDF

Building / Closet / IDF / Zone

Access



- 1 rack unit and 19" wide form factor
- AC powered with redundant power supplies
- 8-port XFP selectable G-PON or 10G XGS-PON choice
- Up to 512 ONTs (64-way split) and up to 4,096 Ethernet
- 4-ports gigabit Ethernet and 2-ports 10 gigabit Ethernet
- Environmentally hardened with many mounting options

FlexSym Optical Line Terminal One (OLT1)



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Data Center / MDF

Building / Closet / IDF / Zone

Access

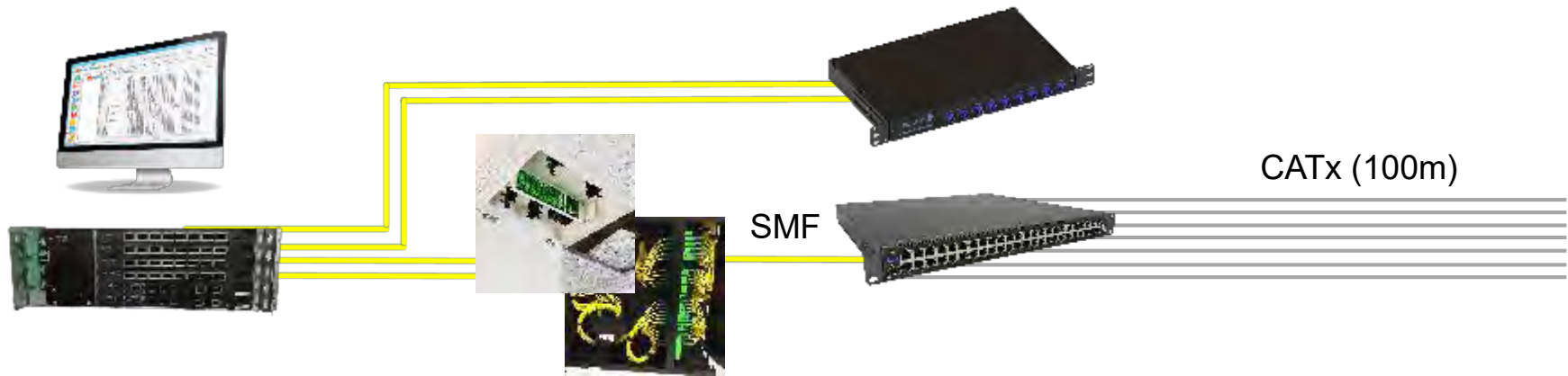


- Many splitter options for ceiling, floor, wall, MDF or IDF placement
- Choose centralized, distributed or cascade optical splitters design
- Match true bandwidth requirements with split ratio
- Optional support of Type-B PON redundancy for 99.9999% uptime



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Data Center / MDF Building / Closet / IDF / Zone Access

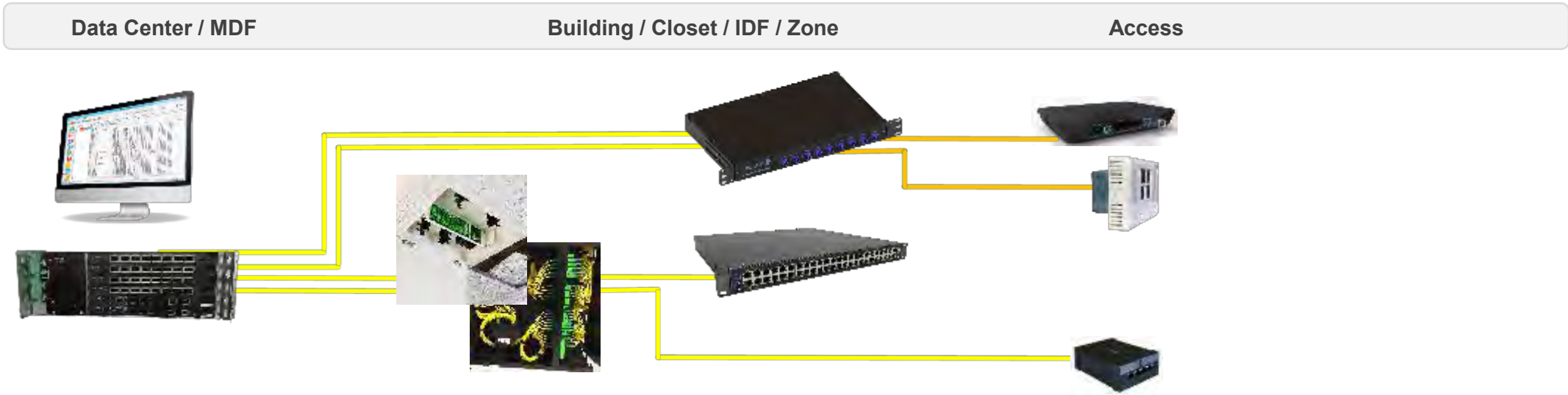


48-port GbE rack mounted 10G XGS-PON ONT



- 10G XGS-PON 48-port GbE closet-based ONT with up to 2100W PoE
- One-to-one closet-based switch replacement
- Power, cable, and cable management all stays the same
- Reuse last 100m CATx cables in the horizontal, walls and drops
- Fewer cables with multiple bidirectional wavelengths on single fiber
- Extended temperature range lowers impact of AC in telecom room





Deep fiber ONTs



- Mounting options for floor, ceiling, plenum, wall, desk, facades, furniture, etc...
- Options for PoE support for 802.3af/at/bt, including class 4 and 4PPoE negotiations
- ONTs can be either G-PON, or 10G XGS-PON
- Focus G-PON ONTs for x< 1Gbps connectivity
- Add 10G ONTs (bi-directional encryption) only where bandwidth is truly needed
- Virtualized Ethernet port extension can be multi-rate 10M, 100M,1G, 2.5G, 5G or 10G



PON
10/10G SMF
2.4/1.2G SMF
10/10G MMF
2.4/1.2G MMF

28dBm



CATx (100m)

Ethernet

10 or 5 or 2.5 Gbps
1 Gbps
1 Gbps
100 Mbps
10 Mbps

PoE

15W
30W
60W

1. 10G or 2.5G PON over SMF or MMF support
2. From 4 to 48-ports with multi-rate 10M, 100M, 1G, 2.5G, 5G or 10G
3. Options to deliver PoE for 15W, 30W, and 60W to powered devices, with LLDP power management
4. Wide range of mounting and extended temperature range
5. Analog voice (POTS) or VoIP options, plus RF video and all forms of enterprise IP video choices
6. Remote and local powering and with battery backup options



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ONT131W



ONT140W



ONT140C



ONT142R



ONT180C



ONT729GP



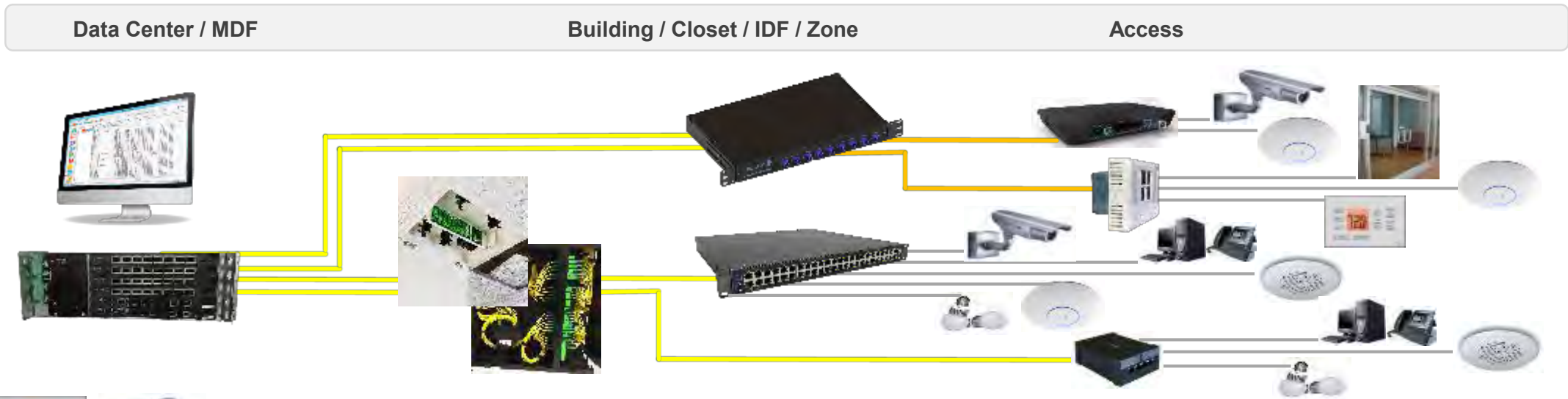
tellabs | FlexSym Series

FlexSym ONT205



FlexSym ONT248





- Global profiles orchestrate error-free, and more secure, M2M automation
- Greater Ethernet density in a smaller footprint for **IoT** and **smart building** connectivity
- Connect four **Wi-Fi 6** (IEEE 802.11ax) at 2.5G over 10G perfectly aligns with 5-port ONTs
- End-to-end QoS ensures better user experience for **cloud-based** and **OLAN as a Service**
- Singlemode fiber, and NG-PON2, are leading choices for 5G wireless infrastructure

Passive Optical LAN's flexible design choices for building and campus networks



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Best Practices For Fiber Infrastructure

Washington DC

Joe Cook, Business Development – OLAN and FedGov



Introduction

Who is Optical Cable Corporation

Plant Locations

Roanoke, VA - Corporate Headquarters & Fiber Optic Cable

Asheville, NC - Enterprise Connectivity

Dallas, TX - Military and Harsh Environment

Key Details

275,000 Sq. Ft. of Manufacturing

ISO 9001:2008 Certified

MIL-STD-790F Certified

370 Employees

Lean Manufacturing

Small Business



Choosing the proper cable

Context Drives Product Selection

- **Optical LAN**
 - SMF
 - Hybrid – Plenum and Riser rated – I/O
 - Custom colors
 - ILA, Rodent resistant, etc.
- **Military**
 - Tactical deployable
 - Pre-terminated
 - Connectorized
 - SMF/MMF/Power Connectors
- **Industrial** (multiple offerings)
 - Mining
 - Broadcast
 - Oil & Gas
 - Transportation
 - Petrochemical
 - Power Generation
 - Water Treatment
 - Security



Key Optical LAN Installs

TS Mission Critical DoD Back-Up Facility

Key to Success

Providing LC/APC Splitters with Stacking option and Red, Green, and Yellow Adapter Plates
Encouraged to Contact OCC by another Integrator

Amtrak World HQ

Key to Success

Developed a robust Slimline Cable design and exceeded lead time to finish job early.
Hands on Working relationship between OCC and the Integrator

Amtrak Chicago Rail Yard

Key to Success

Indoor/Outdoor Harsh Environment Composite Cable Construction (CX Cable)

Margaritaville

Key to Success

Exceeded lead time, drop/ship without a penalty and complete

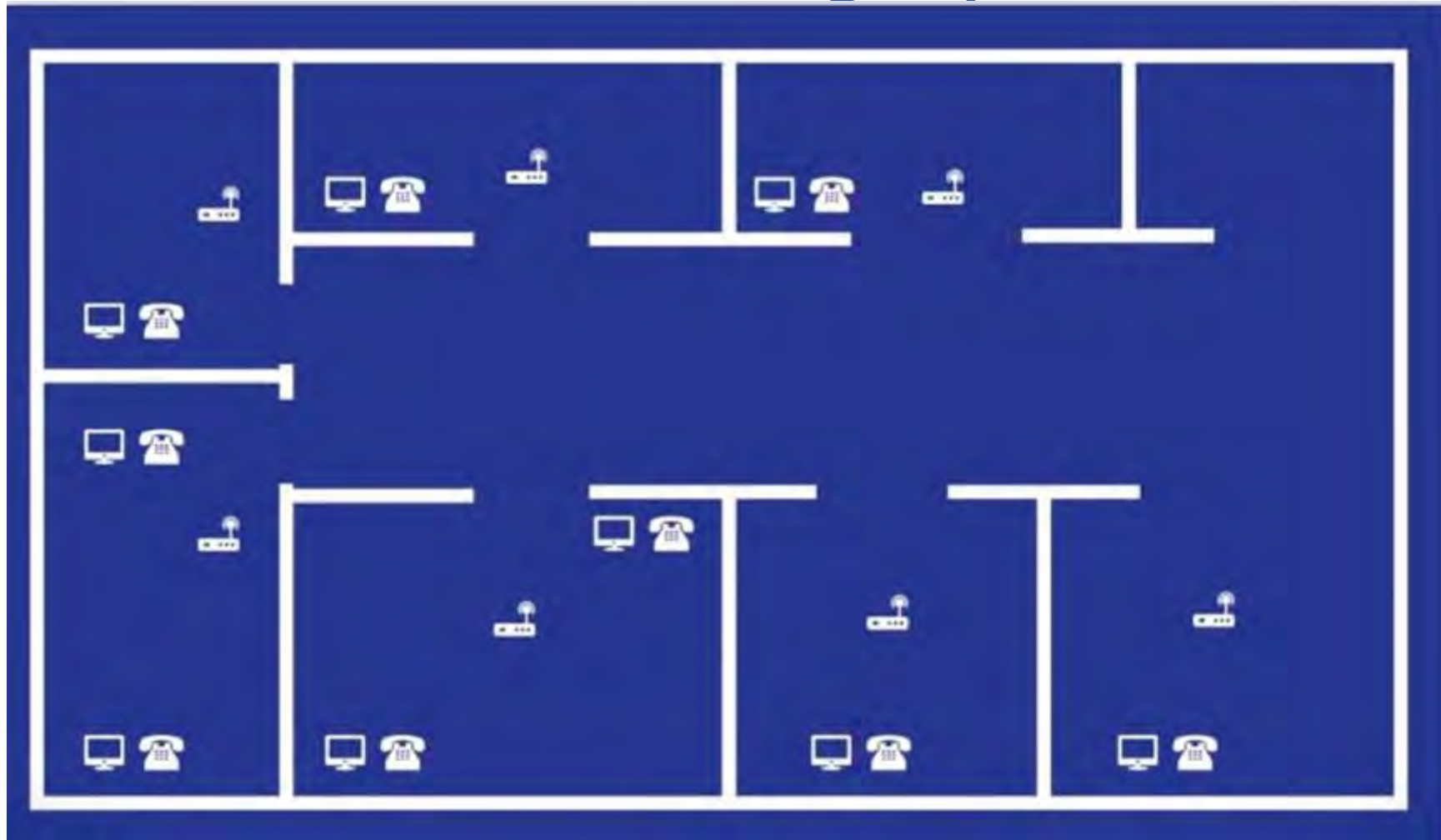
Custom Slimline Color Request

Key to Success

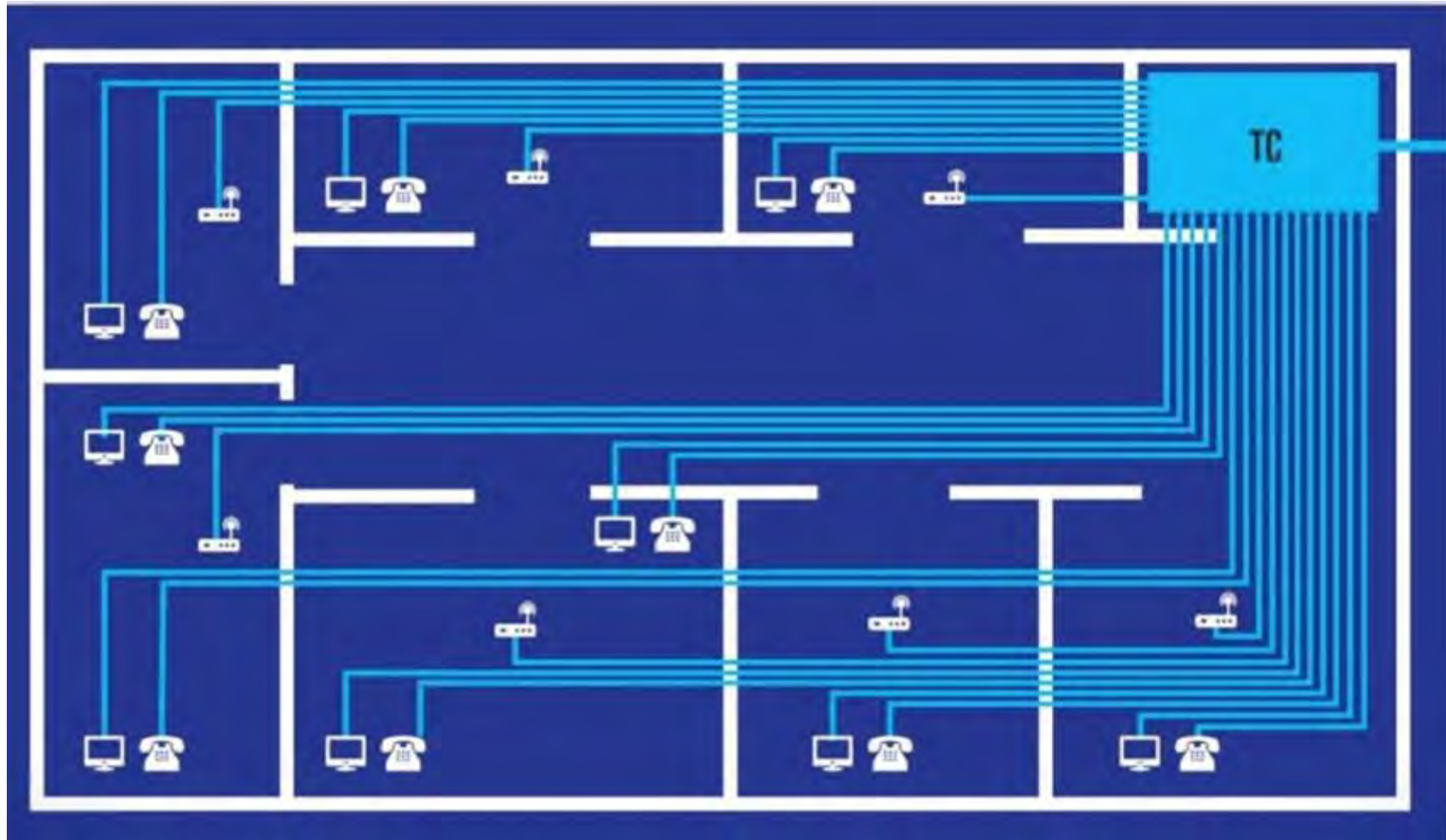
White Jacket



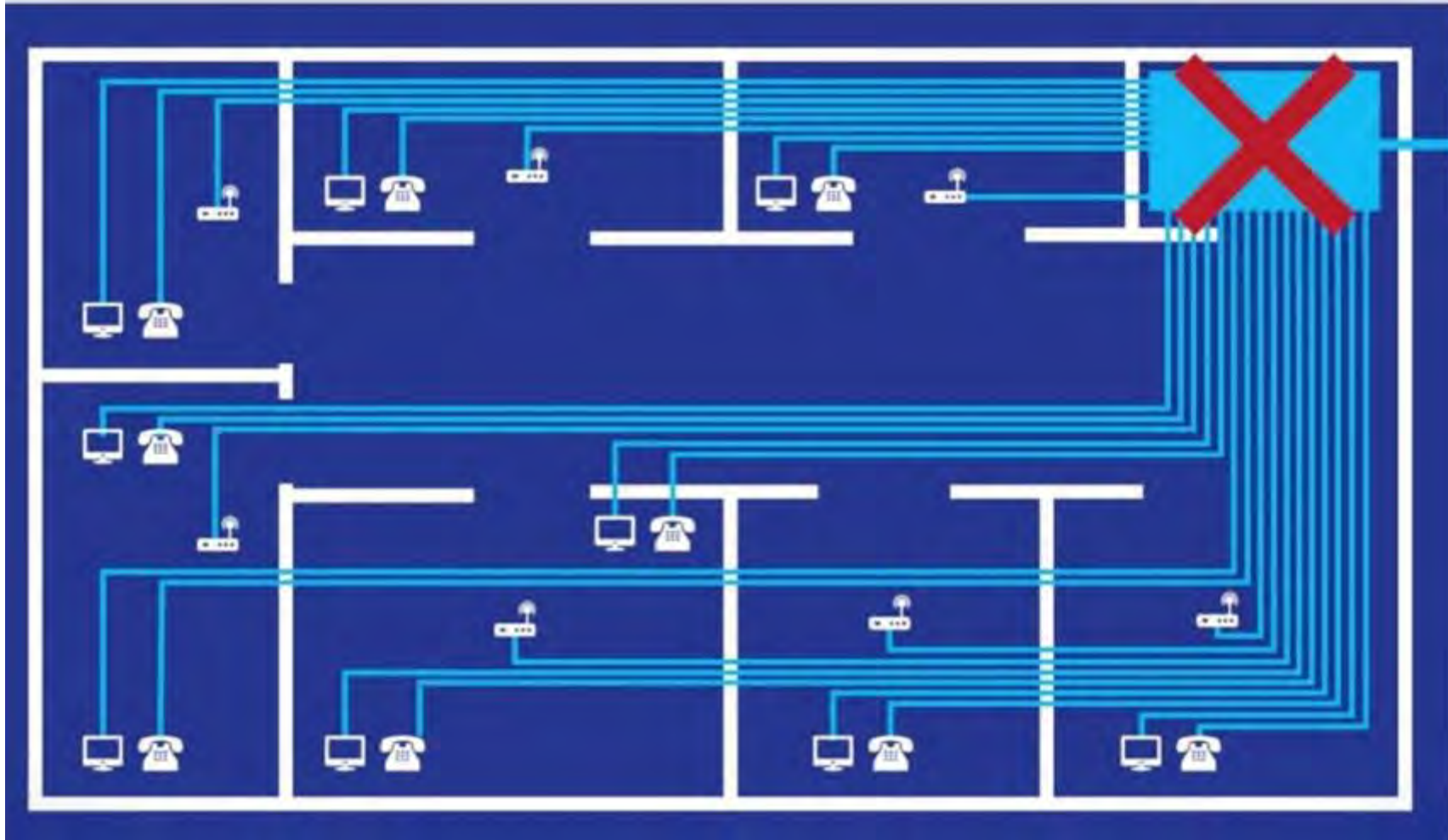
Traditional Office Cabling Options



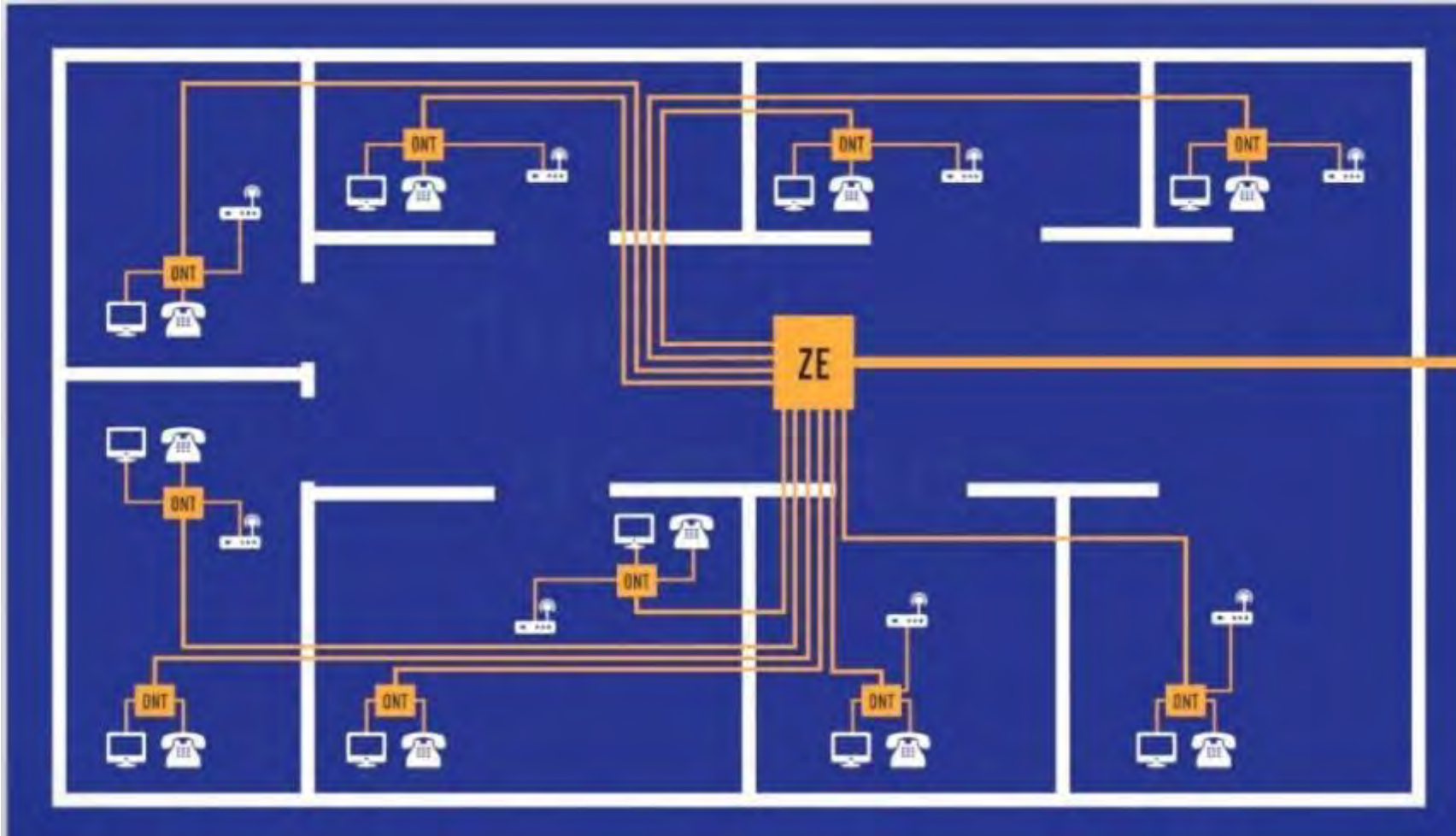
Traditional Cabling Local TR



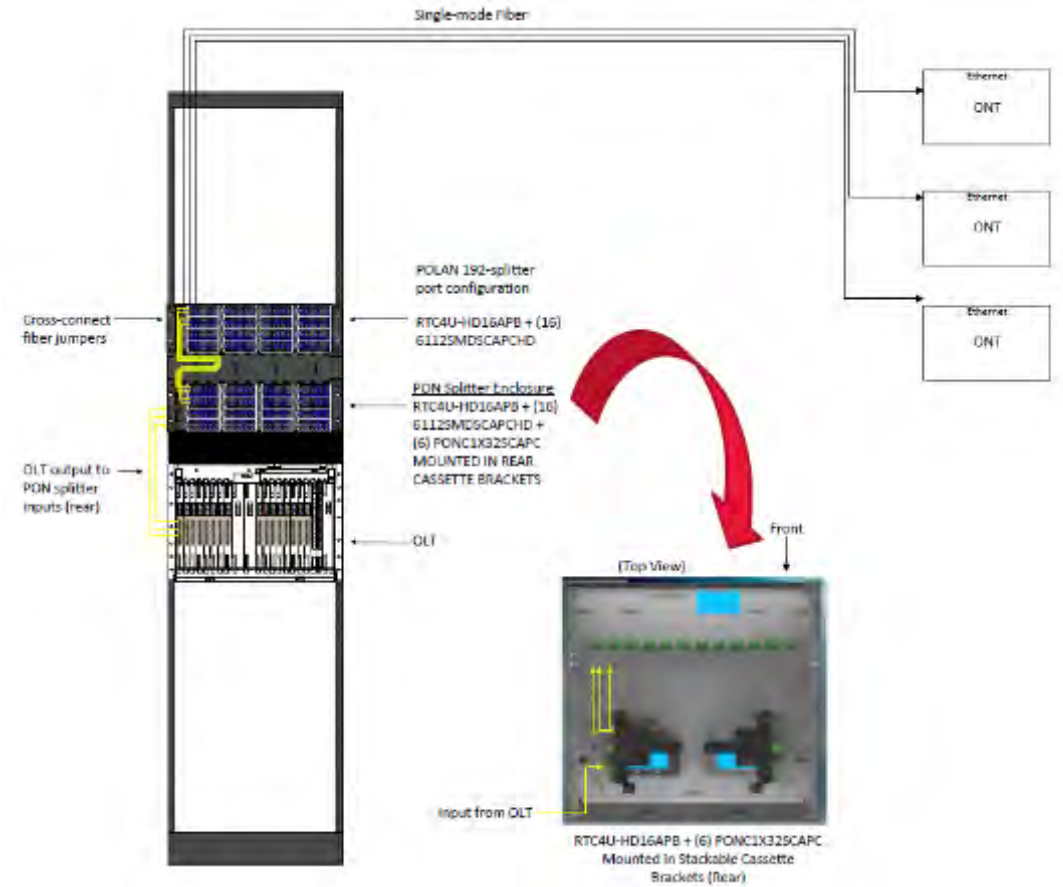
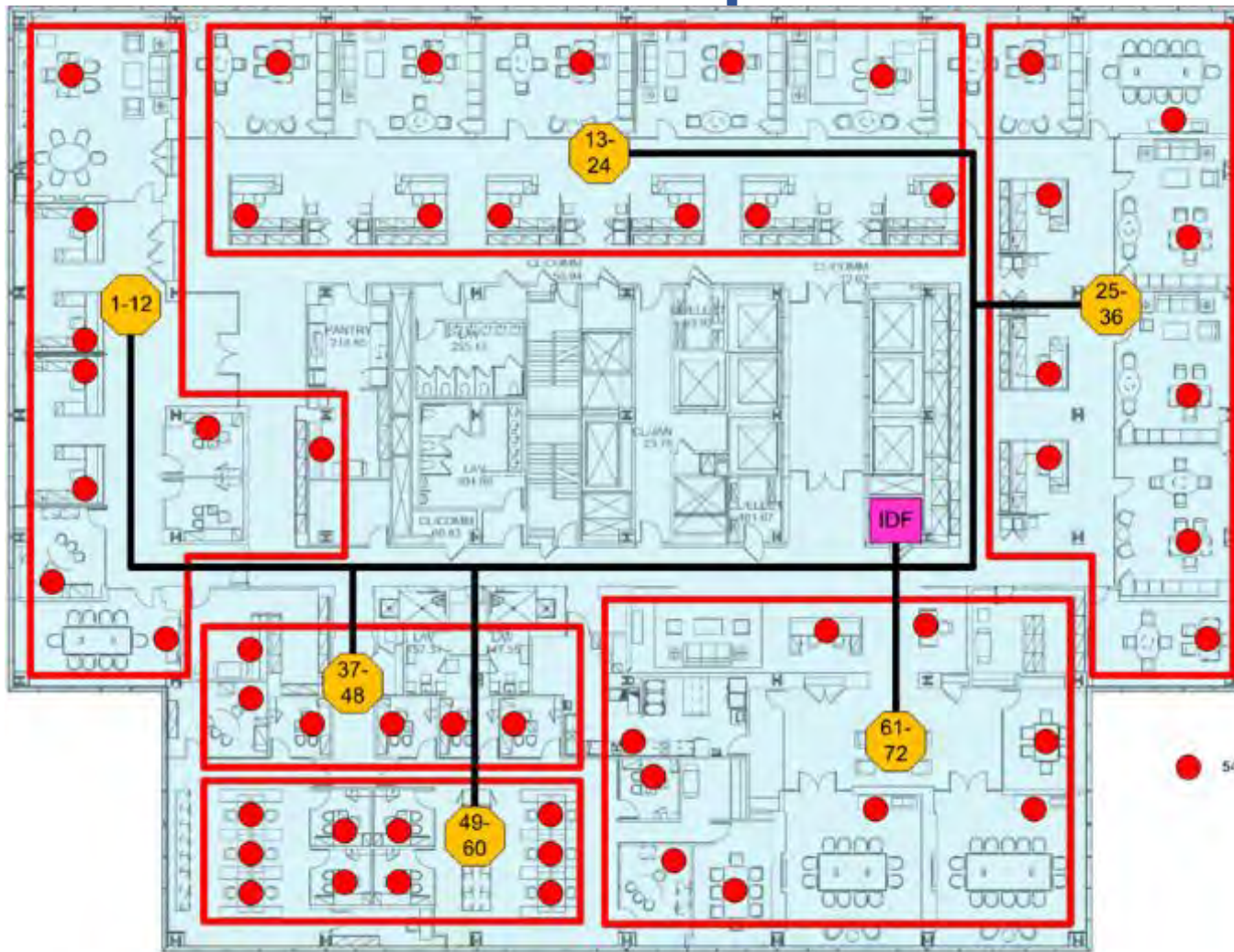
OLAN Reduces TR Requirement



Zone Design Replaces TR



Centralized Split Reduces IDF

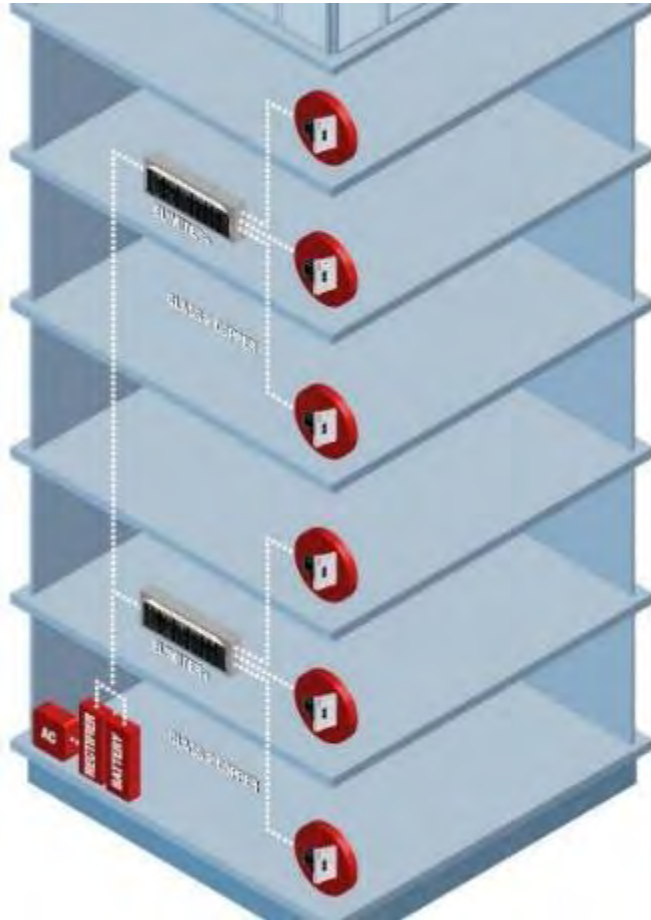


Infrastructure Powering Your Design



Infrastructure to Power Your OLAN

Centralized DC Power Plant



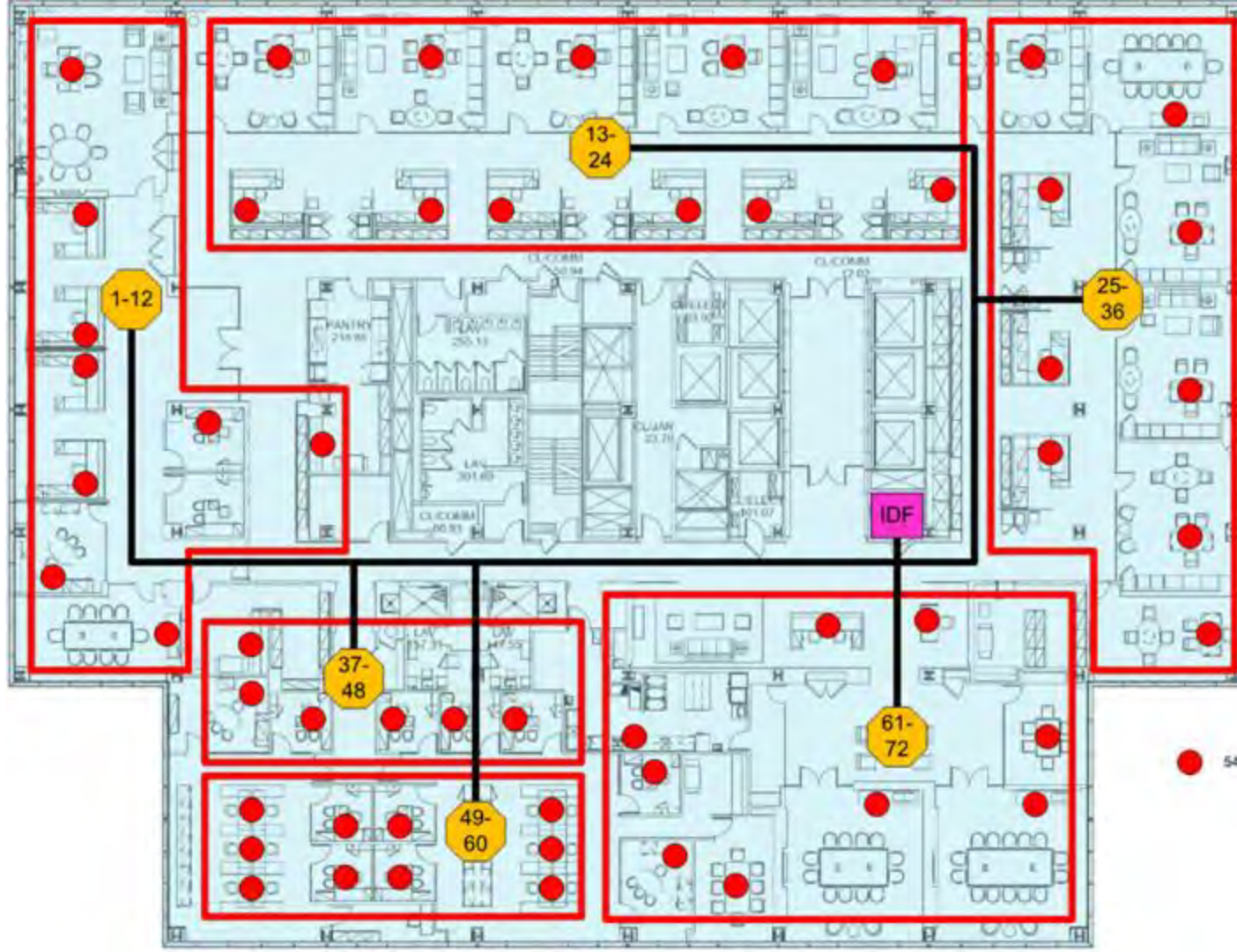
Pros

- Single DC plant and batteries to maintain (OPEX)
- Less space per floor required
- Less AC power and potential HVAC needs

Cons

- Cabling cost to run Class 1 circuits (CAPEX)
 - Conduit
 - Electrician
 - Large AWG cable





Infrastructure to Power Your OLAN

Distributed DC Power Plant



Pros

- All DC cabling will be NEC Class 2 compliant
- Lower Installation & Equipment cost (CAPEX)
- No electrician or conduit needed

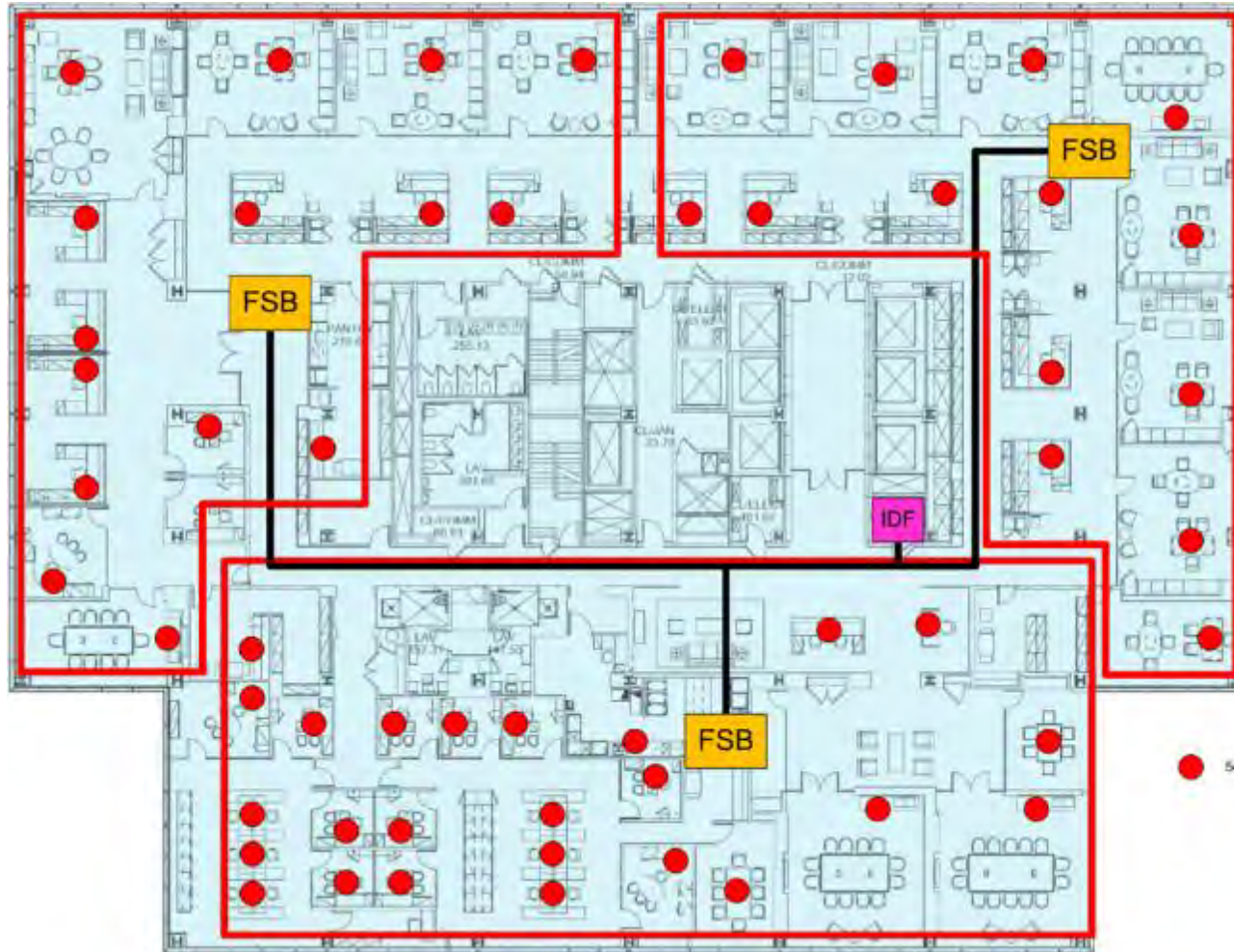
Cons

- Space must be found for power equipment in IDFs
- Distributed batteries (OPEX)
- Additional AC circuits required to each rectifier location and potential HVAC



Infrastructure for Remote Power

Distributed DC Power Plant





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Total Cost of Ownership and Cost Modeling

Joel Fischer, Director Sales Engineering



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Cost Modeling

- Design Styles
- ROM Estimating
- Pricing Comparison
- Total Cost of Ownership
- Tools
- Best Practices in Modeling
- Benefits Not Captured in a Model



Design Styles

Switched Ethernet



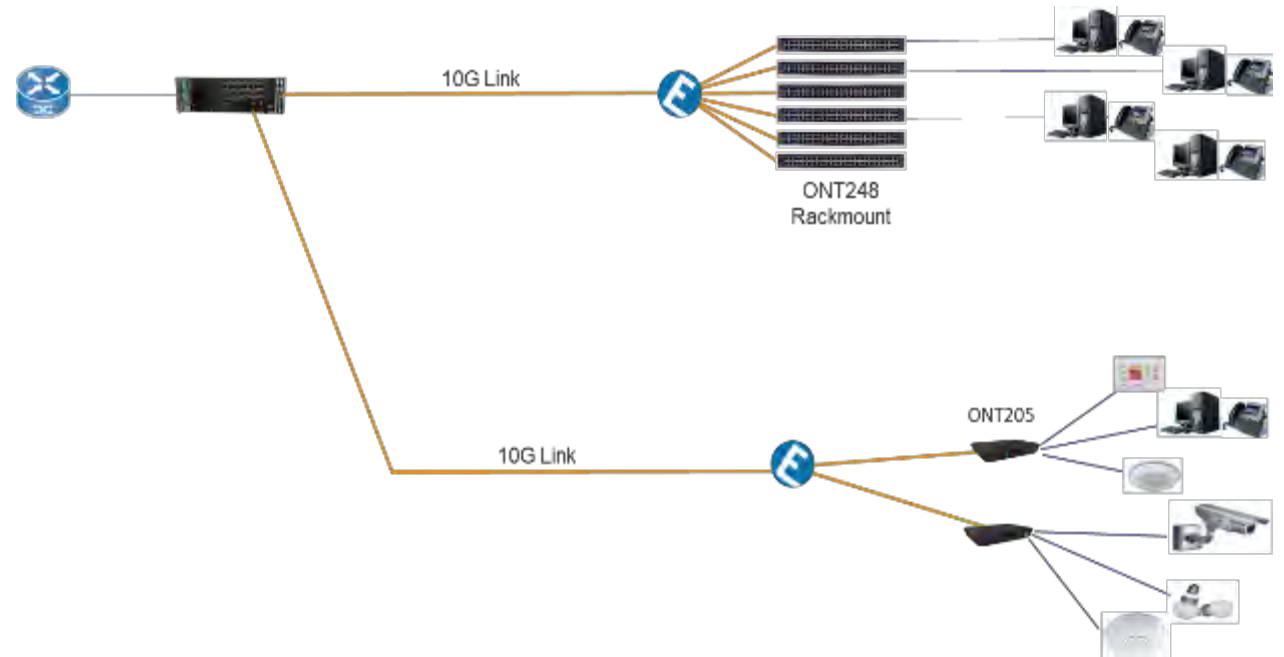
Design Styles

PON is almost to **Flexible!!**



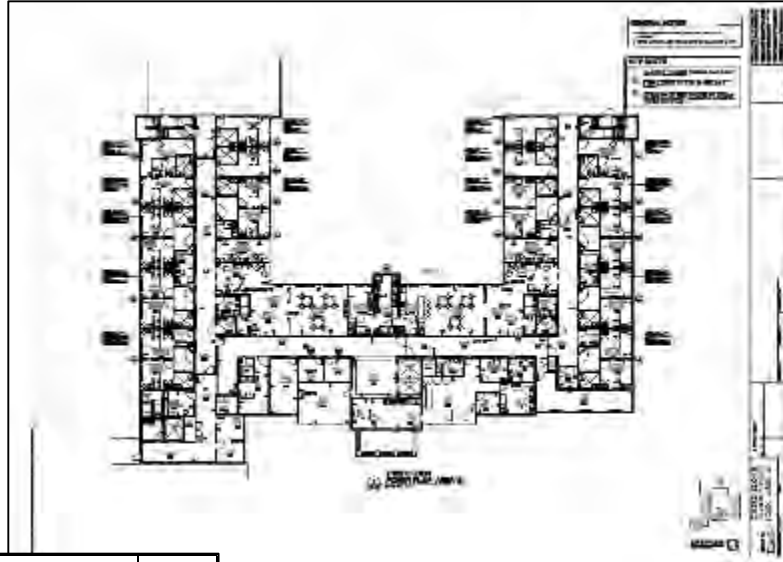
Design Styles

- Splitters in Zone Enclosures
- Splitters in the IDFs
- Splitters in the MDF
- ONTs at the Desk
- ONTs in Zone Enclosures
- ONTs in the closet



ROM Estimating

- BOM
- Floor Plan
- Rough Numbers



Part #	Description	Qty
81.11S-OLT1	FlexSym XGS-PON OLT 1	1
81.11T-XFPGPON-IT	FlexSym XFP, GPON 2.5G/1.25G, B+, I-TEMP	8
C.11T-XO192SR1851M	XFP: 10G, SX, 850NM, MM	2
C.11T-S1GBER450030	SFP: GBE, ELECTRICAL, RJ-45, I-TEMP (note: replaces 4195102)	2
81.SR313BASEOLT1	OLAN Software Release OLT1 Base SR31.3	1
81.SR313AOOLT1	Advanced Operations OLT1 SR31.3	1
81.SR313AAOLT1	Advanced Availability OLT1 SR31.3	1
81.SR313ASOLT1	Advanced Security OLT1 SR31.3	1
81.SR313ANOLT1	Advanced NAC OLT1 SR31.3	1
81.11G-ONT140C-R6	ONT140C 4GE	240
81.11P-PWIL81WM	PWR IN LINE ADPT 54V, 1.5A NO CORD W/MOLEX	170
81.11W-C5TYPB-R6	PWR AC CORD C5 TO TYPE B US	170
81.11G-ONT140WN-R6	ONT140 WALL UNIT, 4GE w/POE, w/o POWER MODULE	90
81.11K-ONT140WP-R6	KIT ONT140 WALL POWER MODULE 10CT	9

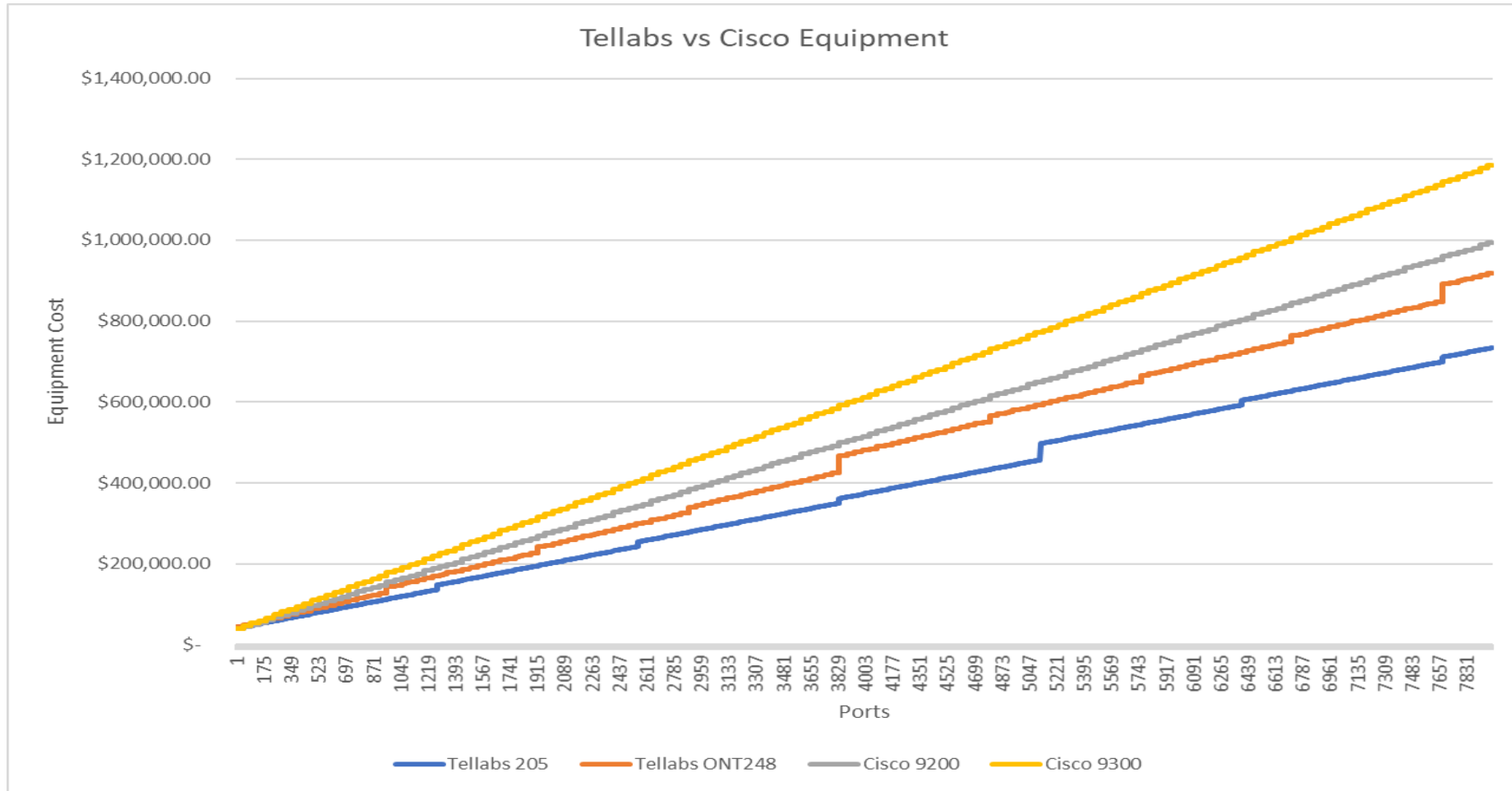


Cost Comparison

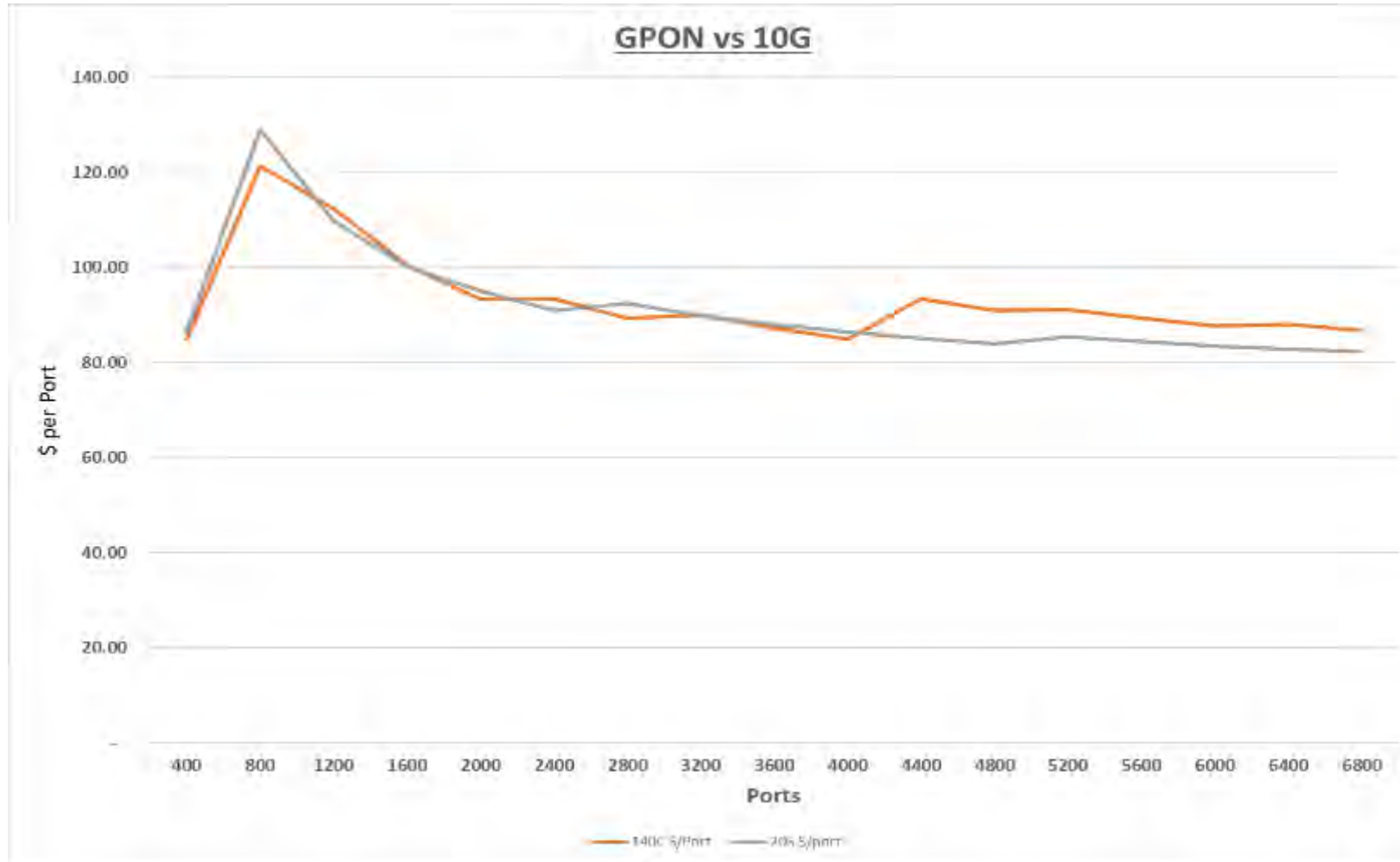
- Requires More Information
- Requires Technology Decisions
- Limited in Comparison Scope



Cost Comparison



Cost Comparison



Total Cost of Ownership

- This Model is More Complicated
- Requires a More Detailed Design
- Questions:
 - Floor Plans
 - Design Style
 - Technology Choices
 - Do Closets Really Go Away
 - Aesthetics



Tools

- Developing Tools to Help Model
- Initially
 - Quick BOM Generation and Pricing
 - Multiple Design Styles
 - Competitive costing



Tools

- Initially By
 - Square Feet
 - Closet/Port Count
 - Office/Cubicle Count

By Square Foot	
Total Square Feet:	100000
Total Required Drops:	3000
Access Points:	63
OLT:	OLT 1
Redundant Chassis:	No
Software Options:	Base + Ops
Split Ratio:	x:32
Uplink Bw per OLT 24Gbps Avail:	20 Gbps SMF 1 Gbps MMF 1 Gbps Copper
Remote Power:	No
ONT Overage:	0%
Expected Discount:	0%
Estimate After Discount:	\$ 730,658.00
Total mGig Ports:	0
Total 1Gbps Ports:	0
Total Ports:	0
Tellabs Price per Port:	0

By Closet	
Total Ports:	5000
Total Ports/Closet:	1250
Closets:	4
Access Points:	0
Access Points/Closet:	0
Access Point ONT Ports per Closet:	0
OLT:	OLT 1
Redundant Chassis:	No
Software Options:	Base + Ops
Split Ratio:	x:32
Uplink Bw per OLT 24Gbps Avail:	20 Gbps MMF 1 Gbps Copper 3 Gbps SMF
Remote Power:	Yes
ONT Overage:	0%
Expected Discount:	0%
Estimate After Discount:	\$ 1,337,661.00
Total mGig Ports:	0
Total 1Gbps Ports:	5184
Total Ports:	5184
Tellabs Price per Port:	\$ 258.04

By Count	
Wall Offices:	100
Cubicles:	400
Drops per cubicle:	2
Access Points:	0
OLT:	OLT 1
Redundant Chassis:	No
Software Options:	Base + Ops
Split Ratio:	x:32
Uplink Bw per OLT 24Gbps Avail:	0 Gbps SMF 4 Gbps Copper 0 Gbps SMF
Remote Power:	Yes
ONT Overage:	0%
Expected Discount:	0%
Estimate After Discount:	\$ 287,224.00
Total mGig Ports:	0
Total 1Gbps Ports:	2080
Total Ports:	2080
Tellabs Price per Port:	\$ 138.09

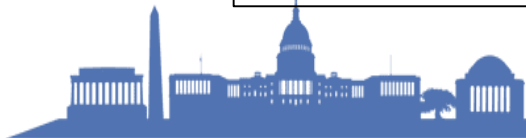


Tools

- Outputs
 - BOM
 - Estimated List Pricing
 - Cost Comparison

Tellabs Equipment			By Square Foot		By Count		By Closet	
Part #	Long Description	List	Qty	List Extended	Qty	List Extended	Qty	List Extended
OLT								
81.11S-OLT1	FlexSym XGS-PON OLT 1	\$ 35,900.00	2	\$ 71,800.00	2	\$ 71,800.00	3	\$ 107,700.00
81.11S-OLT6	FlexSym XGS-PON OLT 6	\$ 8,450.00	0	\$ -	0	\$ -	0	\$ -
81.4115094FS	FlexSym OLT6 FAN ASSEMBLY	\$ 930.00	0	\$ -	0	\$ -	0	\$ -
81.11P-1134ACPW-R6	PWR, 1134AC, AC-DC, 48-53.5V, 800W	\$ 1,503.00	0	\$ -	0	\$ -	0	\$ -
81.11W-PC-C13-B-R6	PWR CORD 14AWG C13 TO 3 PRONG 1.8M	\$ 22.00	0	\$ -	0	\$ -	0	\$ -
81.11C-ESU32FS	FlexSym ESU32	\$ 27,156.00	0	\$ -	0	\$ -	0	\$ -
81.11C-OIU8-R6	FlexSym OIU8 - 8 PORT XGS/GPON OLT LINE CARD	\$ 26,955.00	0	\$ -	0	\$ -	0	\$ -
81.11T-XFPXGSPON	FlexSym XFP, XGS-PON - OLT	\$ 2,800.00	12	\$ 33,600.00	0	\$ -	21	\$ 58,800.00
81.11T-XFPPGPON-IT	FlexSym XFP, GPON 2.5G/1.25G, B+, I-TEMP	\$ 825.00	0	\$ -	10	\$ 8,250.00	0	\$ -
4195098	XFP, TDM, 10Gbps, 1310nm, industrial temp 5/3.3/1.8V - 10 Km	\$ 2,252.00	4	\$ 9,008.00	0	\$ -	0	\$ -
C.11T-XO192SR1851M	XFP: 10G, SX, 850NM, MM	\$ 1,126.00	0	\$ -	0	\$ -	6	\$ 6,756.00
C.11T-S1GBELX1131S	SFP Wideband 1310nm 1.25Gbps - 10km	\$ 844.00	0	\$ -	0	\$ -	9	\$ 7,596.00
128211	GbE SFP Wideband 850nm (1000Base-SX) - 550m	\$ 422.00	2	\$ 844.00	0	\$ -	0	\$ -
C.11T-S1GBER450030	SFP: GBE, ELECTRICAL, RJ-45, I-TEMP (note: replaces 4195102)	\$ 253.00	2	\$ 506.00	8	\$ 2,024.00	3	\$ 759.00
Software								
81.SR313BASEOLT1	OLAN Software Release OLT1 Base SR31.3	\$ 4,080.00	2	\$ 8,160.00	2	\$ 8,160.00	3	\$ 12,240.00
81.SR313AOOLT1	Advanced Operations OLT1 SR31.3	\$ 3,270.00	2	\$ 6,540.00	2	\$ 6,540.00	3	\$ 9,810.00
81.SR313AAOLT1	Advanced Availability OLT1 SR31.3	\$ 3,270.00	0	\$ -	0	\$ -	0	\$ -
81.SR313ASOLT1	Advanced Security OLT1 SR31.3	\$ 3,270.00	0	\$ -	0	\$ -	0	\$ -
81.SR313ANOLT1	Advanced NAC OLT1 SR31.3	\$ 3,270.00	0	\$ -	0	\$ -	0	\$ -
81.SR312BASEOLT6	OLAN Software Release OLT6 Base SR31.2	\$ 8,647.39	0	\$ -	0	\$ -	0	\$ -
81.SR312AOOLT6	OLAN Feature Rel - AO OLT6 SR31.2	\$ 7,317.02	0	\$ -	0	\$ -	0	\$ -
81.SR312AAOLT6	OLAN Feature Rel - AA OLT6 SR31.2	\$ 7,317.02	0	\$ -	0	\$ -	0	\$ -
81.SR312ASOLT6	OLAN Feature Rel - AS OLT6 SR31.2	\$ 7,317.02	0	\$ -	0	\$ -	0	\$ -
81.SR312ISOLT6	OLAN Feature Rel - IS OLT6 SR31.2	\$ 7,317.02	0	\$ -	0	\$ -	0	\$ -
ONT								
81.11G-ONT205	FlexSym ONT205, 4GE, 1-10G,APPOE	\$ 775.00	0	\$ -	0	\$ -	0	\$ -
81.11G-ONT248-T	FlexSym ONT248, 48GE, 48PPOE, TAA	\$ 8,750.00	64	\$ 560,000.00	0	\$ -	108	\$ 945,000.00
81.11P-PW715W	FlexSym 715W POWER SUPPLY	\$ 875.00	128	\$ 112,000.00	0	\$ -	216	\$ 189,000.00
81.11G-ONT140C-R6	ONT140C 4GE	\$ 563.00	0	\$ -	0	\$ -	0	\$ -
81.11P-PWL181WM	PWR IN LINE ADPT 54V, 1.5A NO CORD W/MOLEX	\$ 55.00	0	\$ -	0	\$ -	0	\$ -
81.11W-CSTYPB-R6	PWR AC CORD C5 TO TYPE B US	\$ 22.00	0	\$ -	0	\$ -	0	\$ -
81.11K-BKONTBBU-R6	BRACKET ONT140C OR BBU 10 PACK	\$ 100.00	0	\$ -	0	\$ -	0	\$ -
81.11G-ONT180C-R6	ONT180C 8GE W/POE	\$ 995.00	0	\$ -	200	\$ 199,000.00	0	\$ -
81.11P-PWL150W	PWR IN LINE ADPT 54V, 2.8A NO CORD (C13)	\$ 120.00	0	\$ -	0	\$ -	0	\$ -
81.11W-C13TYPB-3	PWR AC CORD C13 TO TYPE B US 3FT	\$ 30.00	0	\$ -	0	\$ -	0	\$ -
81.11K-ONT205BK-R6	BRACKET 142R, 180C, 205 - 10 COUNT	\$ 172.50	0	\$ -	20	\$ 3,450.00	0	\$ -
81.16G-729GPOPB-R6	ONT729GP - 24P, 24GE with PoE, MDU; 1 RU 19-inch Rack. 100-240V AC power	\$ 5,200.00	0	\$ -	0	\$ -	0	\$ -
81.11G-ONT140WN-R6	ONT140 WALL UNIT, 4GE w/POE, w/o POWER MODULE	\$ 563.00	0	\$ -	100	\$ 56,300.00	0	\$ -
81.11K-ONT140WP-R6	KIT ONT140 WALL POWER MODULE 10CT	\$ 350.00	0	\$ -	10	\$ 3,500.00	0	\$ -
			List Pricing:		\$ 730,658.00		\$ 287,224.00	
			Expected Discount:		\$ -		\$ -	
			Expected Pricing:		\$ 730,658.00		\$ 287,224.00	

Tellabs Core			By Square Foot		By Count		By Closet		
Part #	Grp	Long Description	List	Qty	List Extended	Qty	List Extended	Qty	List Extended
Core									
C9404R		Cisco Catalyst 9400 Series 4 slot chassis	\$ 2,040.00	0	\$ -	0	\$ -	1	\$ 2,040.00
C9400-PWR-2100AC		Cisco Catalyst 9400 Series 2100W AC Power Supply	\$ 2,040.00	0	\$ -	0	\$ -	2	\$ 4,080.00
C9404-FAN=		Cisco Catalyst 9400 Series 4 slot chassis Fan Tray	\$ 556.00	0	\$ -	0	\$ -	1	\$ 556.00
C9404-SHELF-KIT=		Cisco Catalyst 9400 Series 4 slot chassis Shelf Install Kit	\$ 250.00	0	\$ -	0	\$ -	1	\$ 250.00
C9400-DNA-E-3Y		Cisco Catalyst 9400 DNA Essential 3 Year License	\$ 3,670.00	0	\$ -	0	\$ -	1	\$ 3,670.00
C9400-SUP-1		Cisco Catalyst 9400 Series Supervisor 1 Module	\$ 14,280.00	0	\$ -	0	\$ -	1	\$ 14,280.00
C9400-SUP-1/2		Cisco Catalyst 9400 Series Redundant Supervisor 1 Module	\$ 14,280.00	0	\$ -	0	\$ -	1	\$ 14,280.00
C9400-LC-24XS		Cisco Catalyst 9400 Series 24-Port 10 Gigabit Ethernet(SFP+)	\$ 22,480.00	0	\$ -	0	\$ -	1	\$ 22,480.00
SFP-10G-LR		10GBASE-LR SFP Module	\$ 3,995.00	0	\$ -	0	\$ -	0	\$ -
Power									
EPS-32-v2-(S)		EPS with 1:32 integrated splitter, 100W per Output, 1900W total output @ 120VAC	\$ 3,200.00	0	\$ -	0	\$ -	0	\$ -
			List Pricing:		\$ -		\$ 50,075.00		
			Expected Discount:		\$ -		\$ -		
			Expected Pricing:		\$ -		\$ 50,075.00		



Best Practices in Modeling

- Don't Ignore the Small Things
- Don't Be Too Detailed
- Don't Forget Licensing
- Don't Forget About Support
- Product Lifecycles are Different



PON Benefits Not Captured in a Model

- Flattens and Simplifies the Network Architecture
- Reduces Device and Operational Attack Surface
- Provides a Software Defined LAN Today
- Lowers Operational Costs
- Shifts Staffing Requirements



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Unique Differentiators and Futures

Tom Dobozy, Tellabs Engineering and Product Management VP



OLAN Roadmap & Topic of the Year

Looking Forward

- ✓ Tellabs OLAN 2020 and Beyond
- ✓ Last Year's Topic Revisited
- ✓ Topic of the Year: Are You a CAT Hoarder?
- ✓ How do we stack up with the competition?



Tellabs OLAN Roadmap 1Q 2020

System Release 31.3

Recently Released ONT 248 for Limited Availability

- ✓ 48 x 1 Gbps UNIs with 10G uplink interface
- ✓ Redundant Power Supplies
- ✓ 4PPoE Support
- ✓ Closet-based switch poised for legacy switch replacement
- ✓ Reuse existing CAT cabling
- ✓ Bandwidth appropriate for desktop usage
- ✓ GEM encapsulation for securing/isolating individual port traffic
- ✓ Uses Panoram PON management interface
 - ✓ Security: One IP address for 8,000 ports
 - ✓ Machine to machine software defined management



Enhanced PON Protection with 802.1x on OIU8

- ❖ All ONTs supported, including new 248 ONT
- ❖ Spanning tree path to core failures result in PON protection switches
- ❖ Machine learning to detect traffic failures and engage PON protection



Tellabs OLAN Roadmap 1Q 2020

End of 1st Quarter



OLT1

- RoHS, NA and International certifications
- 1 RU+ (1.75”), 19” rack mount
- (2) x 10GbE, (4) x 1GbE pluggable uplinks
- (8) PON ports supporting XGS-PON or GPON pluggable optics
- up to 512 ONTs with 64:1 split
- 100/240 VAC power
- Industrial temp rated
 - -40C to +65C
- PPG Enabled Redundancy



Tellabs OLAN Roadmap 4Q 2020

*****Confidential*****

Please contact your Tellabs' sales executive for 2020 roadmap briefing



The Future

Looking Forward

- ✓ ~~Let's look at Tellabs in 2020 and beyond~~
- ✓ Last Year's Bandwidth Topic Revisited
- ✓ Tom's Topic of the Year: Are You a CAT Hoarder?
- ✓ How does this stack up against competition



2019 Cloud User Bandwidth – It's Miniscule

Microsoft recommends **512Kb/s** per user on average

Overestimate approach

Use your current bandwidth figures for Exchange. Caution! Now you will tolerate SMTP traffic.	Use your current bandwidth figures for SharePoint.	Determine how much you will allow for OneDrive for Business and Skype for Business Online.	Round up to the next random number.
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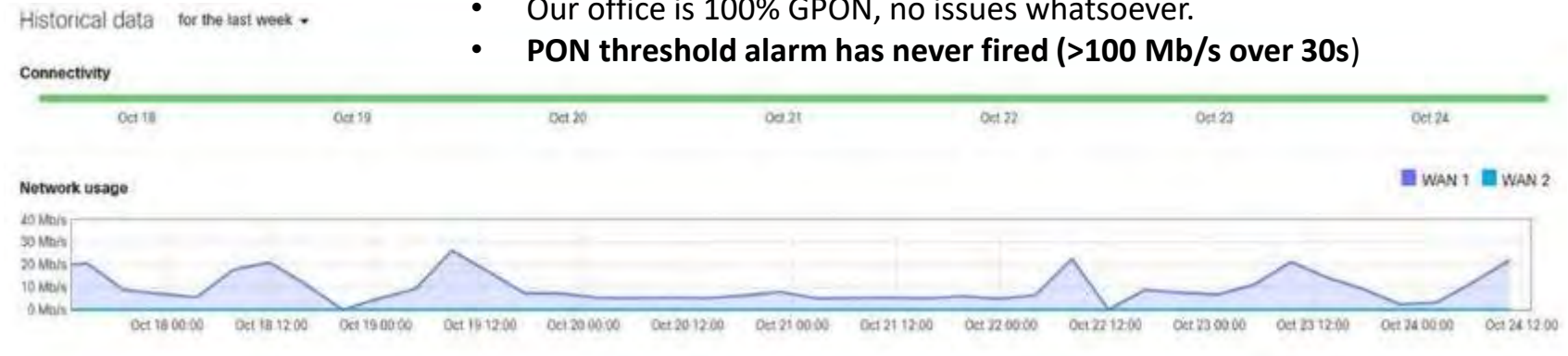
MSIT uses 400Kbps per user as a starting point.
Most of my customers have seen an average increase of ~20%.

- Cloud Adoption poses no issues for PON
- Virtual Desktop poses no issues for PON
- Tellabs and many customers do this every day on PON systems with no issues

512Kbps = .000512 Gbps!!
1,000 Office Users ~.5 Gbps
10,000 users ~ 5 Gbps
40,000 users ~ 20 Gbps

Tellabs Test Data

- Cloud Based – Mail, Office 365, cloud backup, One Drive, etc.
- Tellabs tested at headquarters
 - 473 Kb/s average per user bandwidth
- Our office is 100% GPON, no issues whatsoever.
- **PON threshold alarm has never fired (>100 Mb/s over 30s)**



2020 Update – Enter WiFi-6 and HD Cameras

Higher Bandwidth is Needed in Some Cases

WiFi-6

- Theoretical Speeds up to 10Gbps – actual results vary greatly
- WAPs use 802.3bz Ethernet interfaces (2.5 and 5Gbps) to seek out more bandwidth over existing copper
- More bandwidth going to a single port

HD Cameras

- Very high-resolution cameras for facial recognition in secure areas
- Single stream with MPEG4 encoding at can reach 76 Mbps of sustained traffic

Result: *mixture of low-bandwidth end-user services mixed with high bandwidth demand devices such as WAPs and Cameras*



Tellabs OLAN to the Rescue!

We have a GEM of A Solution

Tellabs OLAN Provides:

- GEMs!! And They Are Better!
 - A GEM is supported by specialized hardware used in PON networking. Think of it as an encrypted tunnel with its own CoS policy
 - GEMs provided an encrypted path for each type of services on an ONT port (one GEM for a user's PC and a separate one for the phone)
 - GEMs also provide fine-grained user bandwidth guarantees. Unlike traditional networking switches, these GEMs pass through the distribution layer without losing CoS policy
 - Every type of ONT supports GEMs
- Hardware
 - 248 ONT
 - Closet based switch to preserve existing copper wiring
 - Access to user desktop for end-user networking needs
 - 205 ONT
 - High speed multi-gig (1/2.5/5/10 Gbps) interface for high bandwidth needs (e.g. WAPs and Cameras)
 - Plenum rated



Tellabs OLAN to the Rescue!

Bandwidth "Where" and "As" It's Needed

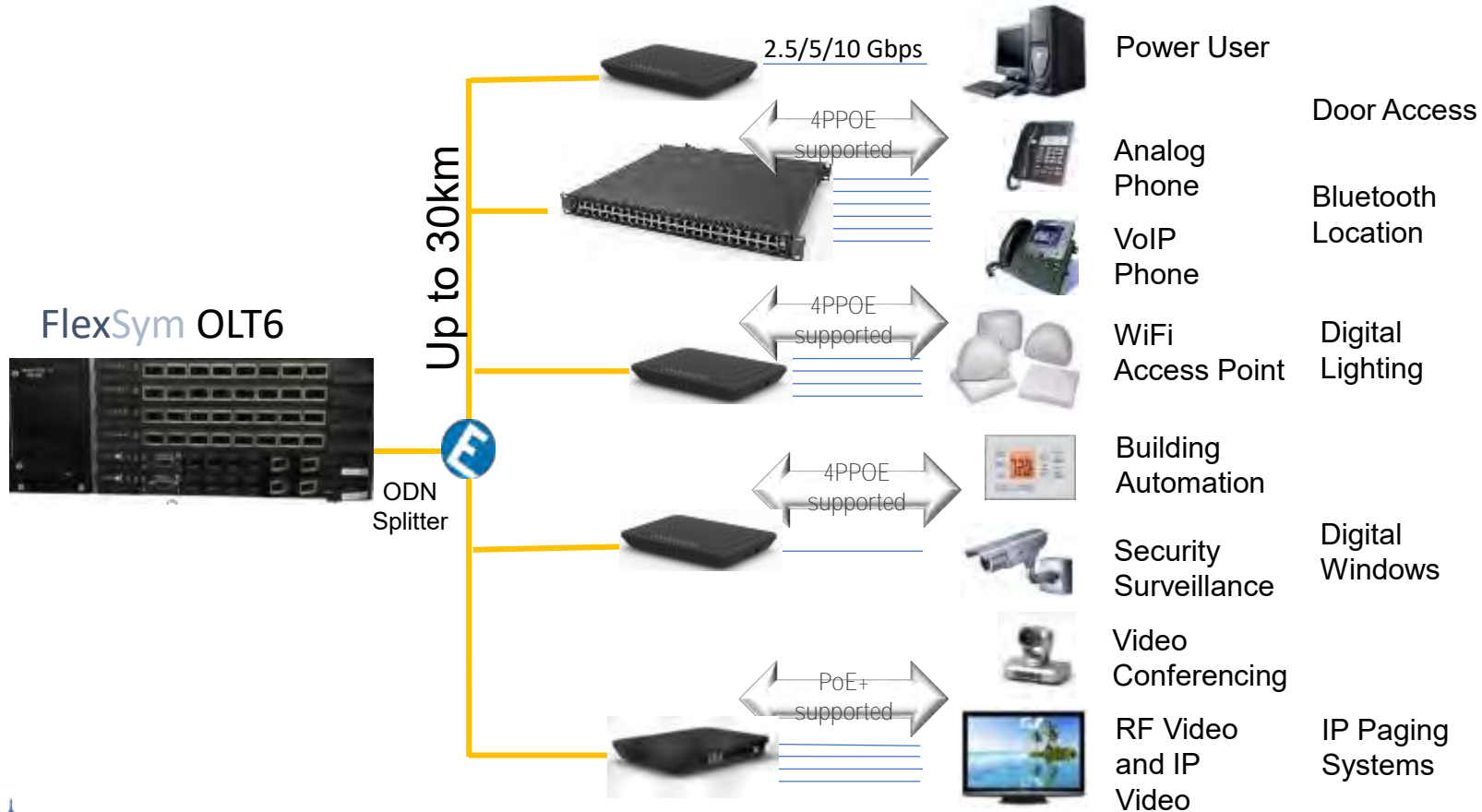


Network

Tellabs Optical LAN

Services

-  Packet Voice
-  IP/Ethernet Data
-  IP Video
-  RF Video



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The Future

Looking Forward

- ✓ ~~Let's look at Tellabs in 2020 and beyond~~
- ✓ ~~Last Year's Bandwidth Topic Revisited~~
- ✓ Tom's Topic of the Year: Are You a CAT Hoarder?
- ✓ How does this stack up against competition



CAT Cabling History

Are You or Someone You Know a CAT Hoarder?

CAT 5

- Introduced in 1995
- 10/100 Mbps capable

CAT 5e

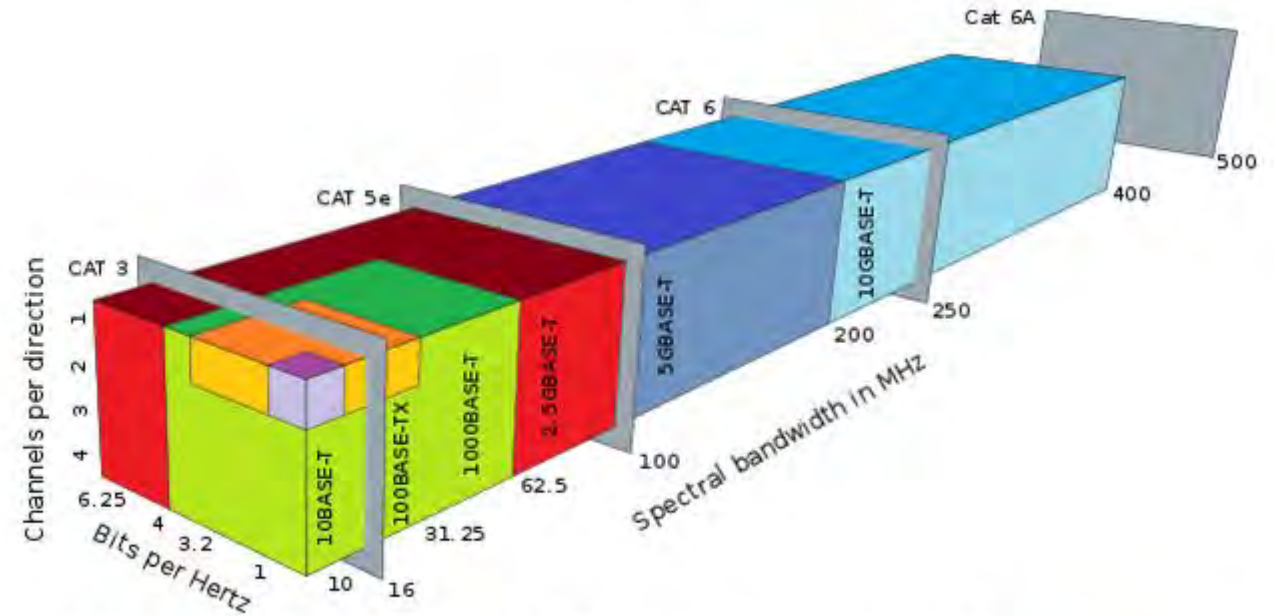
- Introduced in 2001
- Minimized Crosstalk for higher speeds
- 2.5Gbps capable @ 100M

CAT 6

- Introduced in 2002
- Minimized Crosstalk for higher speeds
- 5Gbps capable at 100M
- 10Gbps at up to 55M

CAT 6A

- Introduced in 2008
- Connectors need grounding
- 10Gbps capable at 100M



A handy diagram showing the various properties of different twisted-pair Ethernet standards.

[Per Meidal Rasmussen](#)

CAT 7

- Introduced in 2010
- 40 Gbps at 50M
- 100 Gbps up to 15M



The CAT is out of the Bag!

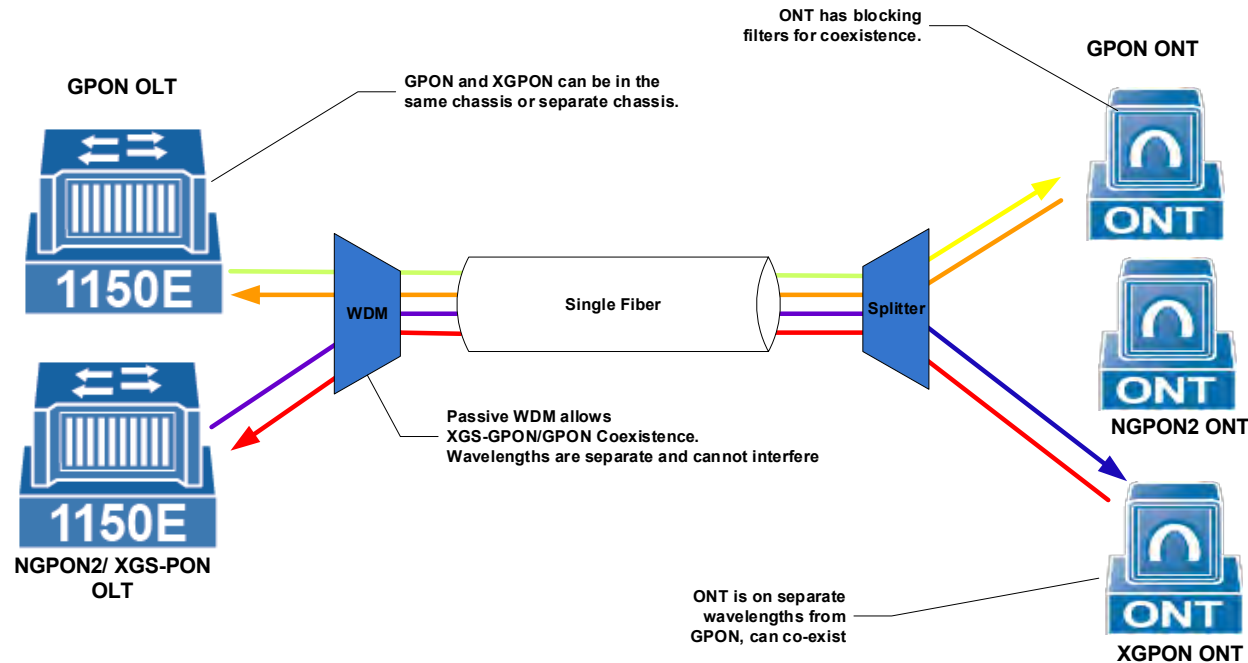
Single Mode Fiber is the Path to the Future

SMF First Installed	Sept 1970
GPON introduced (2.4/1.2)	2003
XGPON1 (10/2.5G)	2010
40G NGPON2 introduced	2013
XGSPON introduced (80Gbps possible)	2016 (lower cost)
4x25G BT 100G PON Demo	2017
50G Single Wavelength Demo	Mar 2019

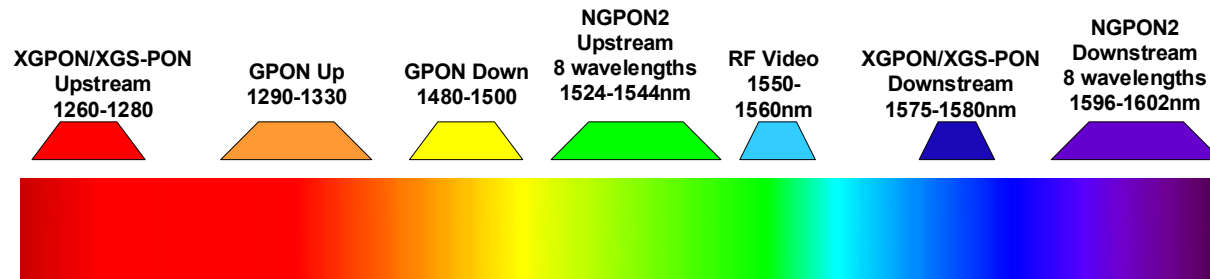


Wavelengths are the Cat's Meow!

With Tellabs OLAN Many Wavelengths Mean Options



- ✓ XGSPON supports the same 8 wavelengths possible with NGPON2
- ✓ Bandwidth can be allocated to ONTs by changing optics
- ✓ Optical wavelengths can be used to separate traffic
 - ✓ Separate tenants
 - ✓ Separate traffic types (e.g. HIPAA vs. internet traffic)
- ✓ Distances up to 30km depending on desired split ratios



The Future

Looking Forward

- ✓ ~~Let's look at Tellabs in 2020 and beyond~~
- ✓ ~~Last Year's Bandwidth Topic Revisited~~
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- ✓ How does this stack up against competition



How Does Tellabs Stack-Up Against Competition?

Don't Be A CAT Hoarder! Begone Active Ethernet

Tellabs OLAN is the most secure, economical, and future-resilient solution for Networking:

- **Supports Security appliances such as Cisco ISE, Aruba Clearpass, and ForeScout.**
- **Better Quality of Experience controls than traditional networking**
- **GEMs provide multi-tenancy traffic separation**
- **Wavelengths for tenants and/or more bandwidth**

*Physics doesn't lie. New copper cabling will be required for every jump in speed for traditional active Ethernet. **Winner: Tellabs Optical LAN***

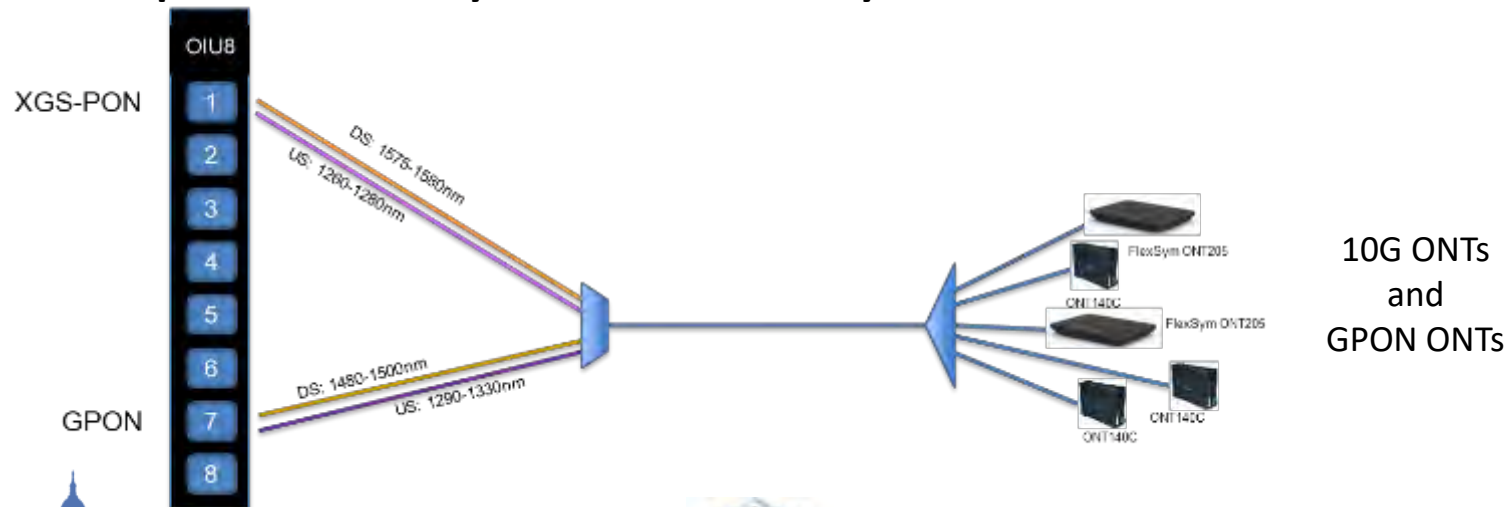


See How Tellabs Stacks-Up Against Competition?

We Can Be Stacked On Top of the Competition - Literally

Tellabs is Ahead of Other OLAN Manufacturers:

- Tellabs is the first to the OLAN market with symmetrical 10G offering – Others don't have it.
- Our 10G offering is at price parity with our competitively priced GPON offering
- Our 10G offering, with the use of a passive wavelength filter/combiner, allows our equipment to be placed on “top” of our competitors' equipment.
 - Perhaps OLAN customer needs 10G in some areas – overlay with Tellabs
 - Perhaps customer has security needs that installed OLAN vendor cannot meet – overlay Tellabs
 - Perhaps multi-tenancy is desired – overlay Tellabs!



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Optical LAN Power Options

Jeromy Kendall, RCDD/OSP, EdgePower Solutions President and CEO



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Optical LAN Power Options

Introduction to Edge Power Solutions

- Founded by Optical LAN Industry Professionals
- TAA compliant Manufacturer
 - Fixed Power Solutions
 - Custom Power Solutions
 - Power Infrastructure Accessories
- Consulting and Systems Planning



Optical LAN Power Options

Local Power vs Remote Power

- LOCAL POWER
 - Advantages
 - Possible Cost Savings
 - TC space savings
 - Disadvantages
 - Not best option for in-wall, ceiling or remote ONTs
 - Aesthetics
 - Non-centralized backup



Optical LAN Power Options

Local Power vs Remote Power

- REMOTE POWER (NEC Class 2)
 - Advantages
 - Aesthetics
 - Concentrated Power Distribution
 - Centralized Backup
 - Centralized Maintenance access
 - Intelligent power control capabilities.
 - Disadvantages
 - Slightly more TC space required
 - Possible higher cost



Optical LAN Power Options

Design Considerations

EPS
Edge Power Solutions

Wire Size: 14

DC Input Voltage: 56

Cable Distance: 1500

Distance Type: Feet

Load Current (Amps): .5

(Total Watt Draw / Input Voltage = Load Current)

CALCULATE!

Voltage Drop = 3.79
Voltage Drop percentage = 6.76 %
Voltage at OMT = 52.21 VDC



Optical LAN Power Options

EPS TRADITIONAL POWER / 8 PORT PDU

- Wall Mount Design
- AC input cord for below ceiling applications
- Direct wire AC input for above ceiling applications
- 14 ¼" H x 12 ½" W x 5 ¼" D (7.4lbs)
- Available with or without integrated splitter
- 56VDC Outputs
- NEC Class 2
- 8 98W outputs
- Individual Resettable Breaker per port
- 110VAC-240VAC Input
- Standard 2Yr Warranty
- Available with High Voltage DC Interface
- 16 Port IPS Series (Available Q2 2020) **



Optical LAN Power Options

EPS TRADITIONAL POWER / 16 PORT PDU

- Rack or Wall Mountable
- 1RU 1.75”H x 16”D x 17”W (16.2lbs)
- Available with or without integrated splitter
- 56VDC Output
- NEC Class 2
- 98W output per port
- Individual Resettable Breaker per port
- 110VAC-240VAC Input
- Standard 2Yr Warranty
- Available with High Voltage DC Interface



Optical LAN Power Options

EPS TRADITIONAL POWER / 32 PORT PDU

- Rack or Wall Mountable
- 2RU 3.5”H x 16”D x 17”W (22.2lbs)
- Available with or without integrated splitter
- 56VDC Output
- NEC Class 2
- 100W output per port
- Individual Resettable Breaker per port
- 110VAC-240VAC Input
- Optional Redundancy
- Standard 2Yr Warranty
- Available with High Voltage DC Interface



Optical LAN Power Options

EPS Intelligent Power Series / 16 PORT PDU

- Rack or Wall Mountable
- 1RU 1.75”H x 16”D x 17”W (15.2lbs)
- Available with or without integrated splitter
- (16) NEC Class 2 56VDC Outputs
- 95W output per port
- Front panel reset buttons, Serial, USB and Network Interface
- Remote output reset
- Remote port monitoring - power, current, fault status
- Software controlled parallel grouping
- Software controlled redundancy grouping
- Enhanced inrush current protection
- Over voltage, over current, and fault detection
- 110VAC-240VAC Input
- Available with High Voltage DC Interface
- Standard 2Yr Warranty



Optical LAN Power Options

EPS Intelligent Power Series / 32 PORT PDU

- Rack or Wall Mountable
- 2RU 3.50”H x 16”D x 17”W (21.4lbs)
- Available with or without integrated splitter
- (32) NEC Class 2 56VDC Outputs
- 95W output per port
- Front panel reset buttons, Serial, USB and Network Interface
- Remote output reset
- Remote port monitoring, power, current, fault status
- Software controlled parallel grouping
- Software controlled redundancy grouping
- Enhanced inrush current protection
- Fault detection - Over voltage, over current, short
- 110VAC-240VAC Input
- Optional Redundancy
- Available with High Voltage DC Interface
- Standard 2Yr Warranty
- ** 1RU 32 Port coming Q2 2020



Optical LAN Power Options

EPS Custom Power Solutions

- Custom Enclosures
- Variable Input / Output
- Site Specific Solutions



INDUSTRIAL &
AUTOMATION



TEST &
MEASUREMENTS



BROADCASTING



INFORMATION
TECHNOLOGY



slide 90

Optical LAN Power Options

EPS Lithium ION UPS units

- Available 1KVA, 2KVA, 2.2KVA, 3KVA, 6KVA
- 120V and 208V Output options
- Online Double Conversion
- Longer Backup Runtime
- Shorter Recharge time
- Communications and Management ports included standard
- Battery Management, Auto Balancing, Charge Balancing
- **15Year Battery Design – 10 Year Battery Warranty**
- Higher Temperature Environmental Rating



Optical LAN Power Options

EPS Lithium ION UPS units

APC 2200 vs EPS/N1C 2200

- APC 1800W / 2200VA EPS 1980W / 2200VA
- APC Recharge = 3Hrs EPS Recharge = 2Hrs
- RUN Time
 - APC Backup @ 1800W = 3.3 Minutes
 - EPS Backup @ 1800W = 30 Minutes
- Warranty
 - APC 3Yr Warranty 2Yr Battery
 - EPS 10 Year Warranty 10 Year Battery
- Operating Environment
 - APC – Loss of ½ battery life every 10 degrees above 71F.
 - EPS – Up to 140F without loss of battery life.

APC SRT2200RMXLA PRODUCT COMPARISON

MANUFACTURER	APC	EPS/N1C	
MODEL	SMART2200RMXLA-NC	EPS L2200	
OUTPUT			
Output Power Capacity	1800 Watts / 2200VA	1980 Watts / 2200VA	
Nominal Output Voltage	120V	120V	
Efficiency at Full Load	95%	95%	
Output Voltage Distortion	Less than 5% at full load	Less than 2% at full load	
Output Frequency	50/60Hz	50/60Hz	
Topology	Offline Double Conversion	Online Double Conversion	
Output Connections	(L) LS-20R, (S) S-20R	(G) S-15/20R	
INPUT			
Nominal Input Voltage	120V	120V	
Input Frequency	50/60Hz +/- 3% (auto sensing)	50/60Hz +/- 3% (auto sensing)	
Input Connections	NEMA 5-20P	NEMA 5-20P	
BATTERIES & RUNTIME			
Battery Type	Maint Free Lead Acid	Lithium Iron Phosphate	** A Lithium battery has a life expectancy of up to 10-15 years vs. 3-5 years for a Lead Acid Battery. Faster recharge time means the ability to protect your system sooner, in the event of multiple outages in a short period of time.
Typical Recharge Time	3 hours	2 hours	**
Backup at 1800W	3.3 Minutes at 1800W	30 Minutes at 1800W	**
Battery Monitoring	Not Available	Includes Battery Management, Auto-Balancing, Charge Balancing, Auto Disconnect	** The batteries are the heart of your UPS system, and they cause 50% of all UPS failures. Monitoring them is priceless.
Transfer Time	Instant	Instant	
COMMUNICATIONS & MANAGEMENT			
Interface Port(s)	RJ-45 Serial, USB, SNMP INCLUDED	EPO, USB, SNMP Card INCLUDED	
Software Management	Included	Included	** A robust Software Suite is standard with N1C UPS units. The software has the ability to manage up to 1000 units from the same desktop, including other brands.
Control Panel	LCD Status Display	LCD Status Display	
Audible Alarm	Standard	Standard	
Emergency Power Off (EPO)	Standard	Standard	
PHYSICAL			
Maximum Height	3.5"	3.5"	
Maximum Width	17.0"	17.2"	
Maximum Depth	28.0"	28.6"	** A key advantage of Lithium is its high power density. The ability to provide more power on runtime in the same or a smaller package.
Rack Height	2U	2U	
UPS Net Weight	75 lbs	60 lbs	**
Mounting Hardware	Tower Feet and 4 Post Rack Kit INCLUDED	Tower Feet and 4 Post Rack Kit INCLUDED	**
ENVIRONMENTAL			
Operating Environment	32-104°F	32-140°F	** Lithium batteries can withstand temperatures up to 140F without loss of battery life. Lead Acid batteries lose half of their life for every 10 degrees above 71F.
Operating Relative Humidity	0-90%	0-95%	
CERTIFICATION			
UL/ETL Certification	Yes	Yes	
WARRANTY			
Standard Warranty	1 Year Warranty (if registered) Battery 2 Year Warranty	Lifetime (10 Year Exchange UPS), 10 Year Exchange Battery	** EPS Lithium UPS units are designed for you to "set them and forget them". Lead Acid systems will likely have to replace batteries 3 times during the life of 1 Lithium battery.



Optical LAN Power Options

Accessories

- Power Patch Panels 1RU 32 Port
- Power Patch Cords
- Termination Ferrules
- Ferrule Termination Tools



Optical LAN Power Options

Successful Tellabs – EPS Projects

Cincinnati Union Terminal

Cincinnati Union Terminal entrusted EPS to provide remote power to over 500 Tellabs ONT's in its' newly renovated historic facility. EPS is proud to have been a small part of this \$300 Million project that returned this iconic location back to its' glory.

The ability of EPS to provide remote power & splitter connections in variable unit sizes was integral to the GPON design. The flexibility allowed power to be placed close to the edge in sparse and high concentration areas.

The small form factor of EPS PDU's allowed for the use of smaller TC's for less architectural impact in this historic facility.



Optical LAN Power Options

Successful Tellabs – EPS Projects

The District Wharf, Washington, DC

The District Wharf in Washington DC chose EPS to provide remote Optical LAN power for it's \$2.5 Billion Phase I development.

- 6 Mixed Use Highrise Towers
- 6000 Seat Anthem Auditorium
- 3 Multiuse Piers
- 2 Hotels , 20 Restaurants
- ½ Mile 2 Level Under Ground Garage

EPS PDUs provide remote power to ONTs located from end to end of this expansive waterfront development.

The Site-Wide Optical LAN System provides Wi-Fi, network, BMS, Security and AV connections for the entire site.



Optical LAN Power Options

Successful Tellabs – EPS Projects

American Woodmark Headquarters, VA.

American Woodmark chose EPS to provide remote power for the Tellabs Optical LAN system in their new \$40 million headquarters. EPS PDUs are providing power for more than 600 ONTs

Key factors in the decision:

- More efficient use of limited rack space
- Flexible unit sizes
- Reliability MTBF 16.5 Yrs.
- Ease of installation and use.



Optical LAN Power Options

Successful Tellabs – EPS Projects

DC Hilton National Mall

EPS was selected to provide remote GPON power to this newly renovated property near the National Mall

Project Details:

- Silver LEED Certified Hotel
- 367 Rooms
- World Class Meeting Space and Dining.

The compact design of EPS PDUs allowed for a higher concentration of connections allowing for all 390 ONTs to be serviced from a single Telecommunications Closet.





- **For more information please visit www.edgepowersolutions.net**
- LinkedIn Company - <https://www.linkedin.com/company/edgepowersolutions>
- Email: sales@edgepowersolutions.net
- Phone: 321-499-1919



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- Twitter - <https://twitter.com/Tellabs> and @Tellabs and using #OpticalLAN
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- Instagram - <https://www.instagram.com/tellabs/>



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Best Practices for Securing Fiber Networks

Scott Rye, CyberSecure IPS President and CEO



Secure Passive Optical Networks (S-PON)

U.S. Government Applications

Unified Cyber-Physical Protection (UCP)

Commercial / Government Applications



Secure Passive Optical Networks (S-PON)

U.S. Government Applications



Traditional Copper Vs. GPON

Encryption: Typical Point to Multipoint encryption deployment using TACLANE on 10 Gigabit Network

100 Users
Uplink: 2.5 Gbps
Users: 25 Mbps

75 Users
Uplink: 2.5 Gbps
Users: 25 Mbps

25 Users
Uplink: 2.5 Gbps
Users: 100 Mbps

50 Users
Uplink: 2.5 Gbps
Users: 25 Mbps

Encrytor Capacity: 10 Gbps

Alarmed Carrier PDS: Typical Point to Multipoint deployment using Alarmed Carrier PDS

100 Users

75 Users

25 Users

50 Users

No bandwidth or connection restrictions

(18) Active Ethernet Racks Supports Up to 2,016 end users

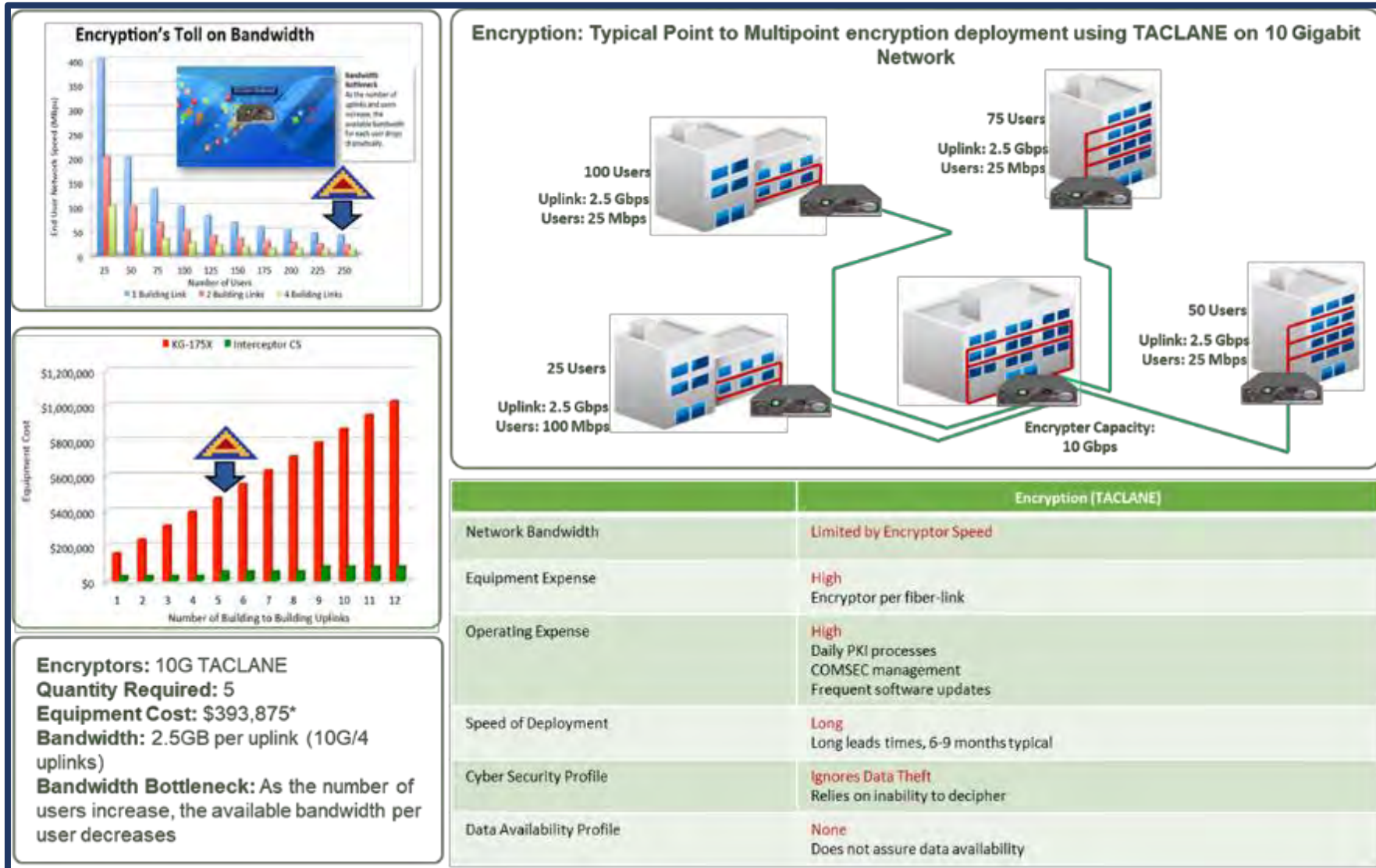
- Expensive
- Limited by Encrytor Speed
- Deployment requires 6-9 month lead times
- Requires PDS, and daily checks by staff, not flexible, or agile enough to add or remove networks
- Occupies multiple spaces within our HQ, and requires large power consumption

(1) Optical LAN Supports 8,192 end users

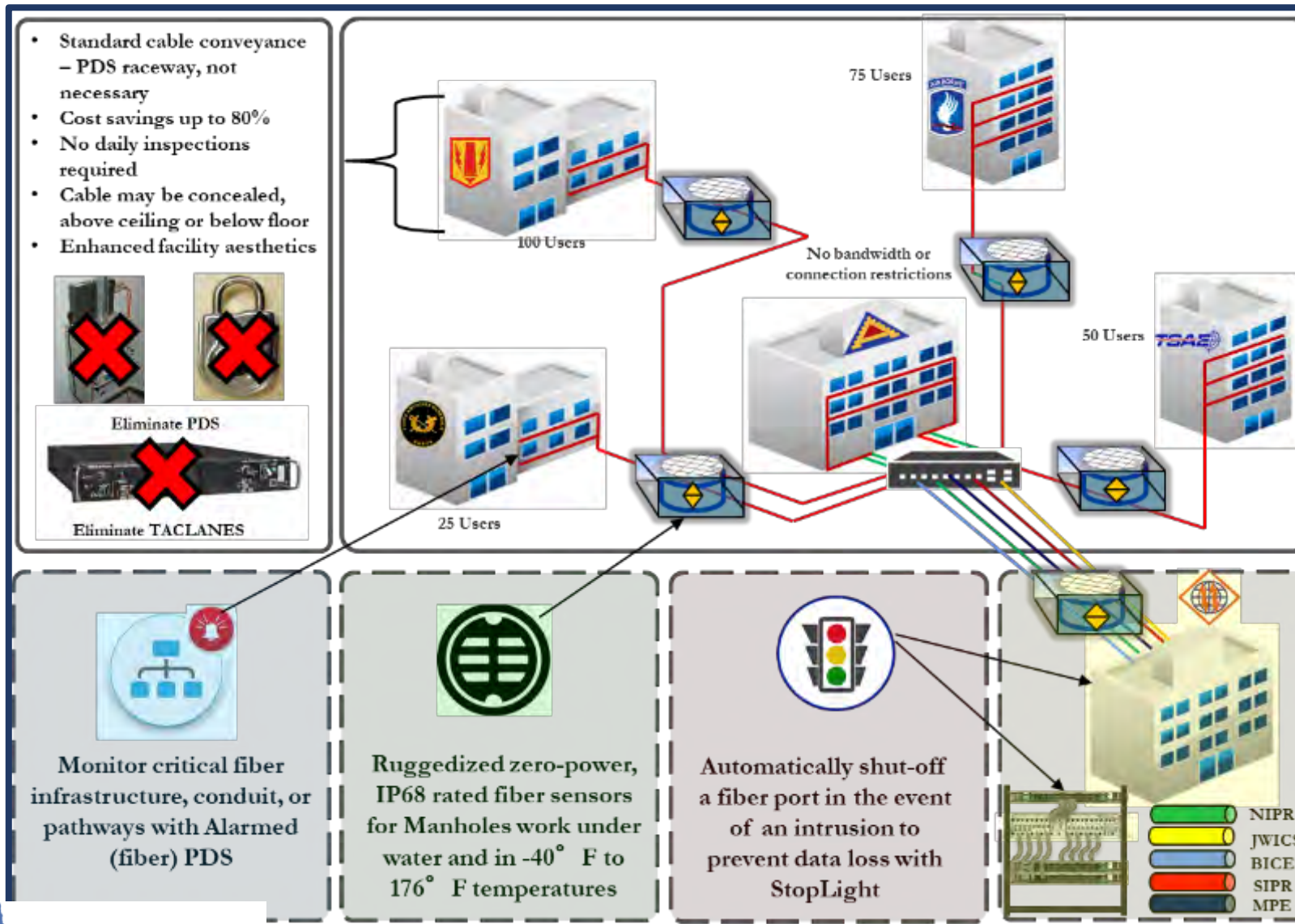
- Lower electronics cost: up to 70%
- Lower power consumption: up to 80%
- Lower space consumption: up to 90% (floor, rack, pathway, closet space)
- Lower cable cost: up to 60% (fiber vs copper)
- Lower cabling installation cost: up to 60%



Encryption (TACLANE)/ Traditional LAN



Alarmed Carrier PDS Deployment



Added Benefits of Alarmed Carrier PDS

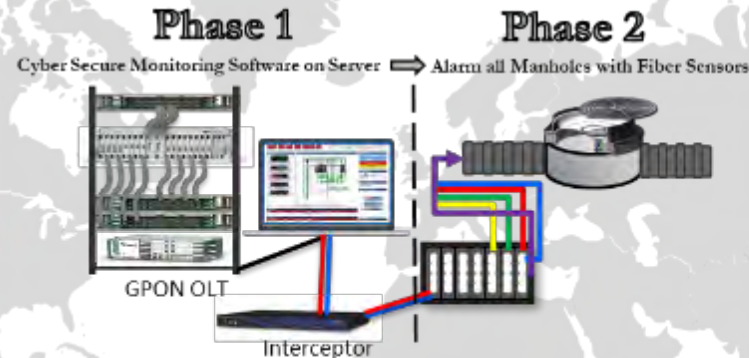
- Each Alarmed PDS zone allows unlimited number of network connections at any bandwidth
- Network adds/changes are made with zero impact to existing communications paths across Alarmed PDS zones
- Connection needs can be established on day of requirement
- All PDS devices networked and centrally-managed via monitoring software

Rough Order of Magnitude



EDI lines of effort are:

- (1) Increased Presence
- (2) Exercises and Training
- (3) Enhanced Prepositioning
- (4) Improved Infrastructure**
- (5) Building Partnership Capacity.



Encryptors: 10G TACLANE
Quantity Required: 5
Equipment Cost: **\$393,875***
Bandwidth: 2.5GB per uplink (10G/4 uplinks)



1/2
Price

HARDWARE	/COMMISSIONING SERVICES/SUPPORT	Item Cost	Total's
CSS MH Sensors	QTY: 800	\$888	\$ 710,400
CSS-16ch ContL	QTY: 2	\$163,952	\$ 327,904
CSIMS-400 Onsite Plus	QTY: 1		\$ 72,576
CSIMS-GOLD	QTY: 1		\$29,678
CSIMS-SVC-400	QTY: 1		\$43,948
SUBTOTAL FOR HARDWARE:			\$1,184,506

* Note: In addition, there will be a mass reduction in network cabinets, switches, media convertors, and computers once GPON is fully implemented!



Combining the Benefits: PON + Alarmed Carrier PDS

S-PON



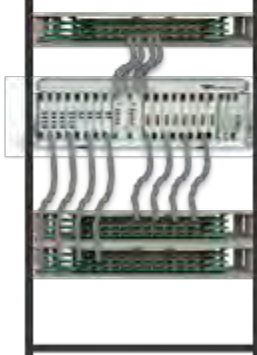
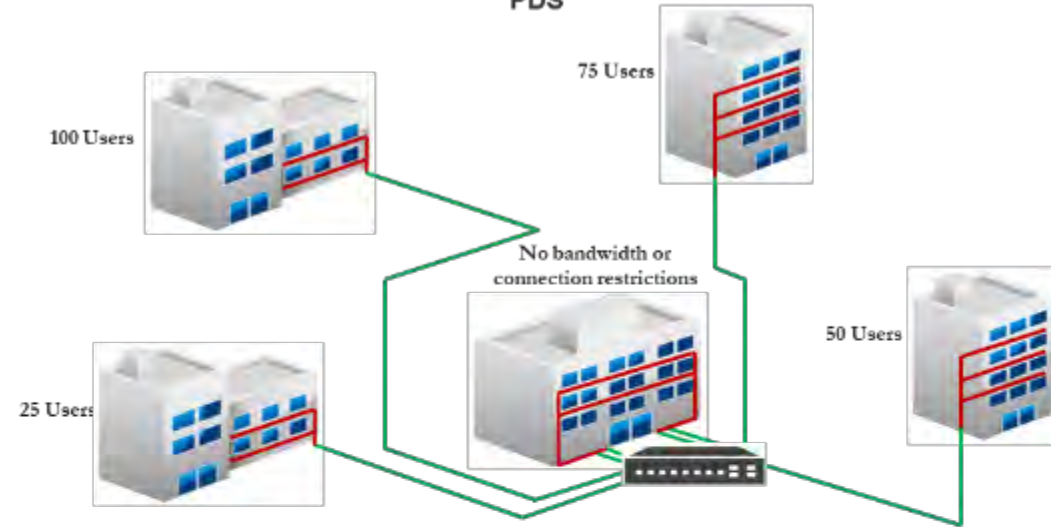
Secure Passive Optical Lan (S-PON)

Alarmed Carrier PDS: 4 Port Single Mode
Quantity Required: 1
Equipment Cost: \$57,567*
Bandwidth: Virtually unlimited – no bandwidth or number of connection restrictions

ALARMED CARRIER PDS BENEFITS:

- No bandwidth limitations
- Reduce or eliminate visual inspections (PVI)
- Reduce or eliminate epoxy requirements
- Aesthetics
- Smaller footprint
- OSP approved
- Under floors, above ceilings

Alarmed Carrier PDS: Typical Point to Multipoint deployment using Alarmed Carrier PDS



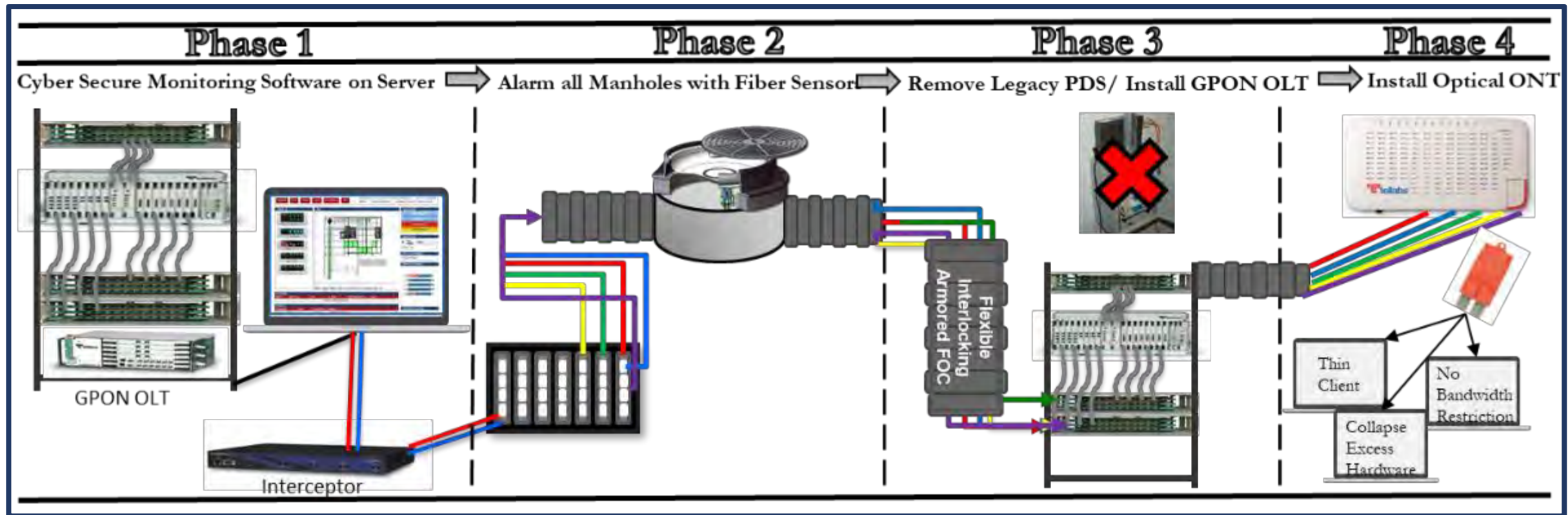
* Inter-Locking Armored FOC is flexible and easy to handle, made of lightweight aluminum, interlock armor is called out in the CNSSI 7003 standard. This design eliminates the need for inner duct or conduit and the cost associated with the installation of either.

	Alarmed Carrier PDS
Network Bandwidth	Unlimited: No Bandwidth Restrictions Unlimited number of network-to-network connections
Equipment Expense	Low All fibers in PDS can run classified
Operating Expense	Very-Low to Low Automated alarm circuit verification Human inspection upon alarm Infrequent software/firmware updates
Speed of Deployment	Fast Typical installation is 5 days
Cyber Security Profile	Prevents Data Theft Detects tapping of fibers
Data Availability Profile	Continuous Monitoring Detects tampering with cables



S-PON: Phased Implementation Plan

Solve Immediate Risks: Command Cyber Readiness Inspections



DoD Accreditations

- *Risk Management Framework (RMF) Accreditation (Active)*
- *Authority to Operate (ATO) (Active)*
- *Eligible for RMF Accreditation Reciprocity for ALL DoD Customers*
- *Referenced in EMASS*

Appt Date	AO Name & Title	Organization	Previous AO	Acronym	System Name	APMS #	AO NIPR E-Mail	AO SIPR email	AODR & Contact Information	P-ISSM & Contact Information	AO Training Certification Date	AO Training Status Current or Expired	Date System Validated in eMASS & ID
9/5/2018	Philips, BG John H., U. S. Army Europe (USAREUR) Chief Information Officer (CIO) / Deputy Chief of Staff G-5	USAREUR / HSD	Gannon, John J. Parker, COL Charles R. Holt, COL Matthew J. Hall, COL Jimmy L. Jr. Kligo, COL Mitchell L.	MCC_PDS SYSTEM	MCC Alarmed Carrier PDS (EUR)	DA305672	john.h.phillips24.mil@mail.mil	john.h.phillips24.mil@mail.mil	Gannon, John J. DSN (314) 537-6002 john.j.gannon4.civ@mail.mil Brunsey, COL Corey L. 06111435376009 corey.l.brunsey.mil@mail.mil	Galindo, Holvin DSN 314-537-5213 holvin.galindo.civ@resat.mil	25-Jun-17	Current	8/8/2019 SIPR eMASS ID 36

Solid Past Performance References Readily Available

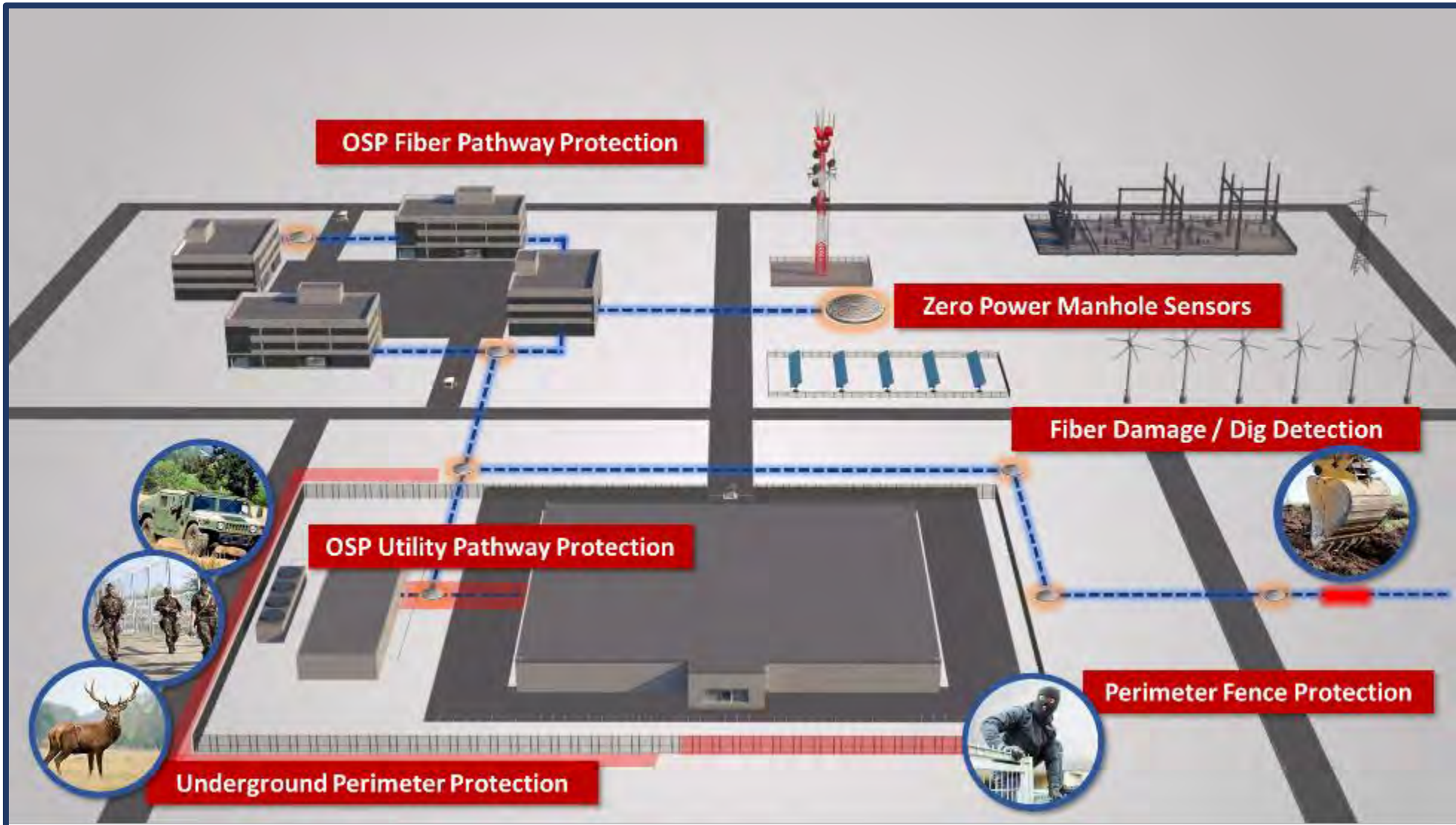


Unified Cyber-Physical Protection (UCP)

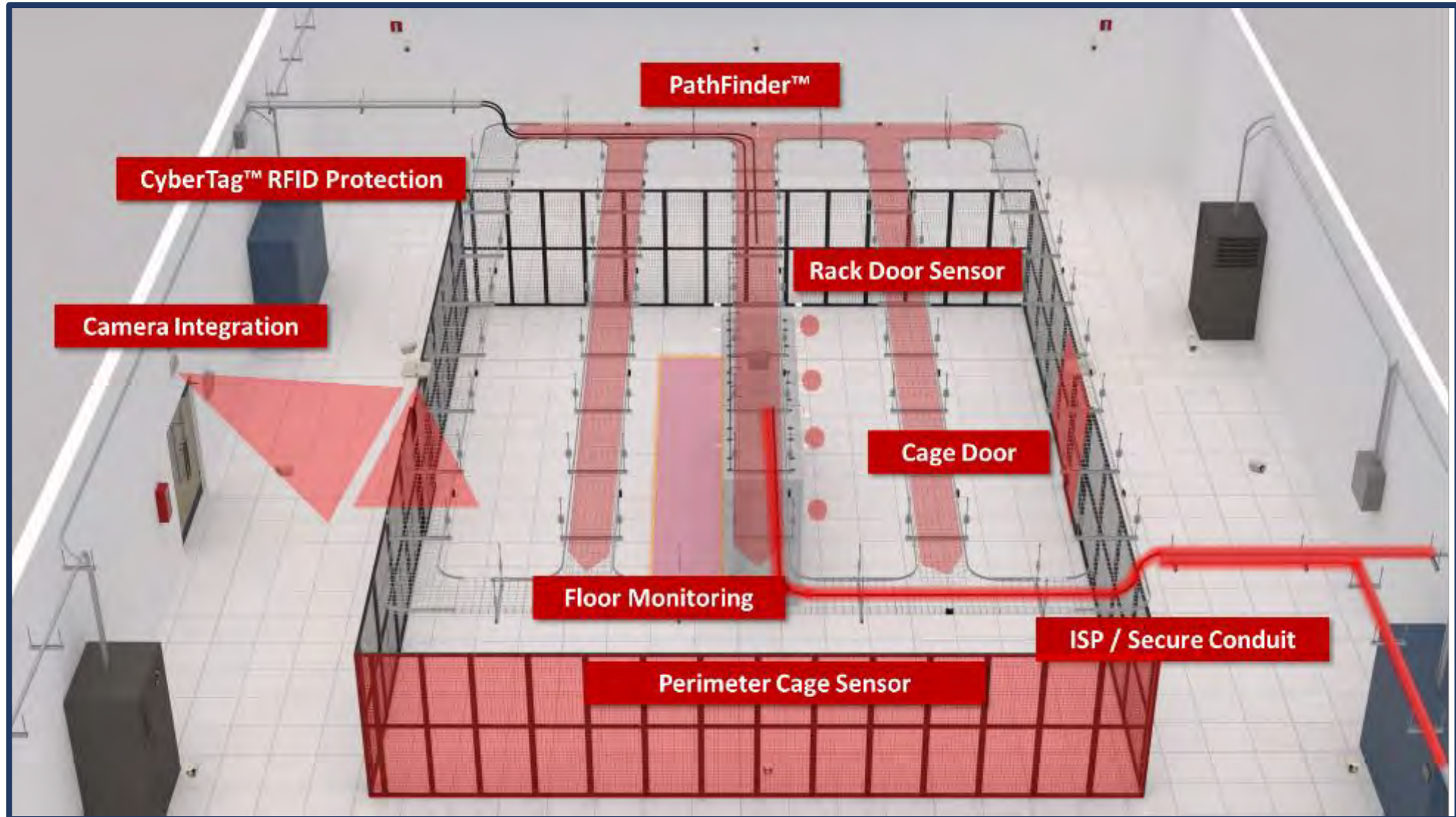
Commercial / Government Applications



UCP – Outside Plant Protection




UCP – Inside Plant Protection



CyberSecure IMS – Centralized Management

Monitor the Entire Cyber-Physical Environment with a Single Dashboard



Outside Plant Protection

- Underground Perimeter Protection
- Perimeter Fence Protection
- OSP Utility Pathway Protection
- Zero Power Manhole Sensors
- OSP Fiber Pathway Protection
- Fiber Damage / Dig Detection

Inside Plant Protection

- ISP / Secure Conduit
- PathFinder™
- Perimeter Cage Sensor
- Cage Door
- Rack Door Sensor
- Floor Monitoring
- Lockbox Sensor
- CyberTag™ RFID
- Camera Integration

Centrally Managed
Just Press Play™ Rapid Troubleshooting



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WESCO Distribution Overview

Ed Malinowski and Andy Inkeles, WESCO



slide 116



WESCO Profile

- Fortune 500 Company (NYSE: WCC)
 - Headquartered in Pittsburgh, PA
 - Approximately 9,100 employees
 - Approximately 500 locations around the world
- A leading provider of electrical, industrial, and communications MRO and OEM products, construction materials, and advanced supply chain management and logistics services
 - Serving over 70,000 customers
 - Partnering with 30,000 suppliers
 - Over 1 million different products shipped annually
- International operations and global sourcing capabilities

Vision: Be a world-class B2B distribution company focused on products, services and solutions that drive value for our customers.

Mission: Partner with leading suppliers and industry experts to transform world-class branded products and industry-leading service capabilities into cost-effective, innovative supply chain solutions.

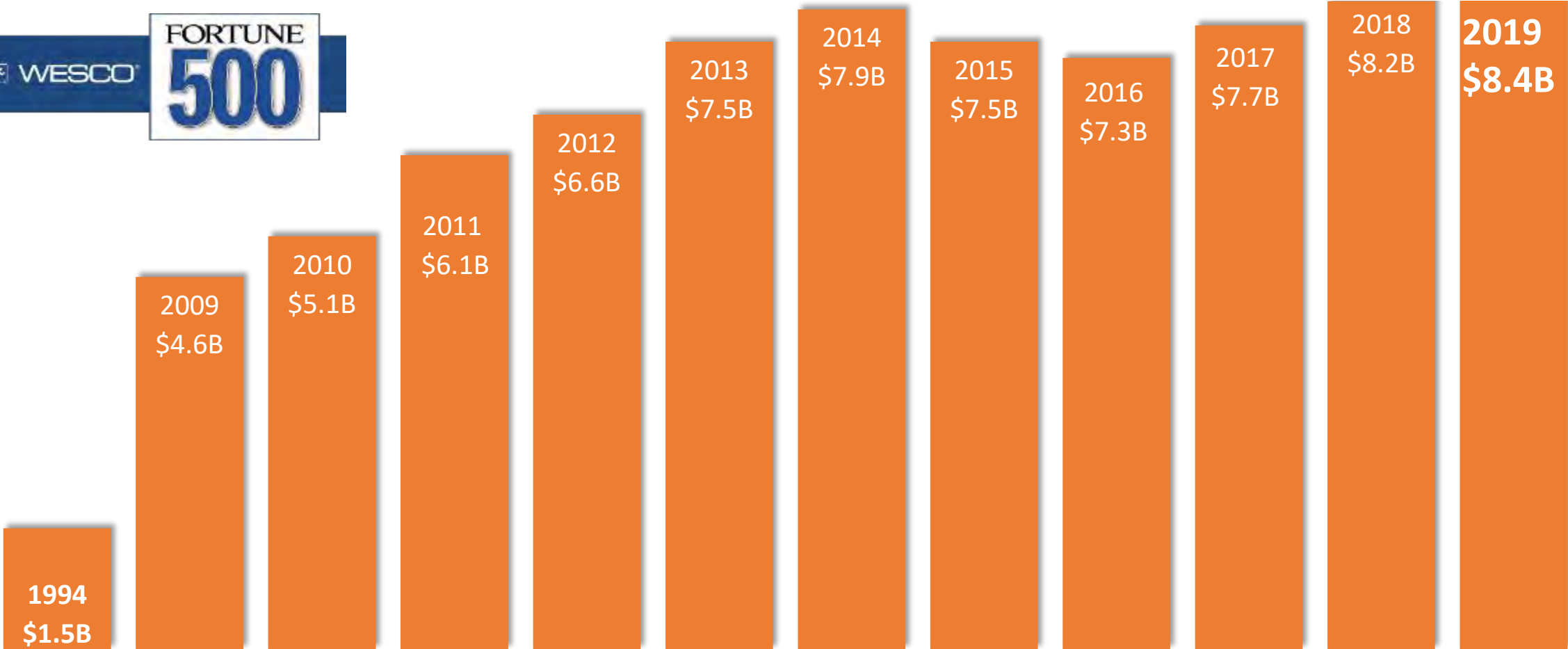
We help our customers build, operate, connect, and power their businesses to improve their bottom line and sustain the world we live in.

The International WESCO Network

- Branch inventory is tailored to meet local demand
- Flexible, time-sensitive delivery by local WESCO vehicles
- Late order cut-off times for same-day shipment
- Emergency shipments direct to customers
- Emergency 24/7 service is available



WESCO Sales



Expanding Our Product Portfolio with Strategic Acquisitions

SPUN OUT OF WESTINGHOUSE IN 1994 | MORE THAN 40 ACQUISITIONS SINCE THEN

2019

ENERGY SOLUTIONS

2012

SAFETY

2011

AUDIOVISUAL

2010

BROADBAND

2006

DATACOM

2005

FASTENERS | ELECTROMECHANICAL

1999

ELEVATOR | SPECIALTY LIGHTING

1998

INTEGRATED SUPPLY | MRO | INTEGRATED FACILITY SYSTEMS

1996

AUTOMATION | HIGH VOLTAGE

1995

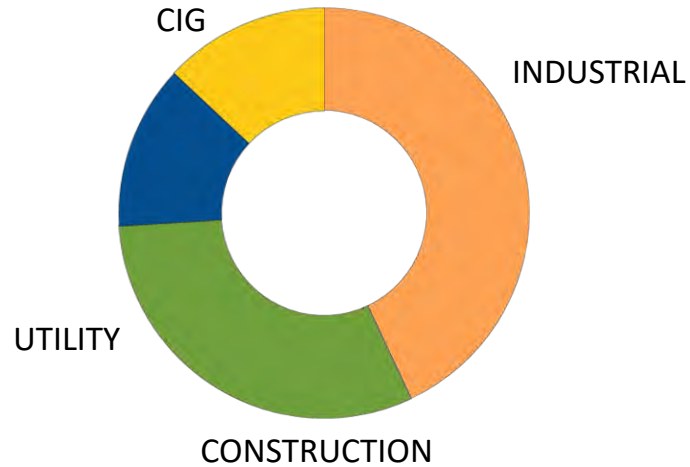
MANUFACTURED STRUCTURES

1994

ELECTRICAL

WESCO Profile

MARKETS & CUSTOMERS



Industrial

- Global Accounts
- Integrated Supply
- OEM
- General Industrial

Construction

- Non-Residential
- Residential

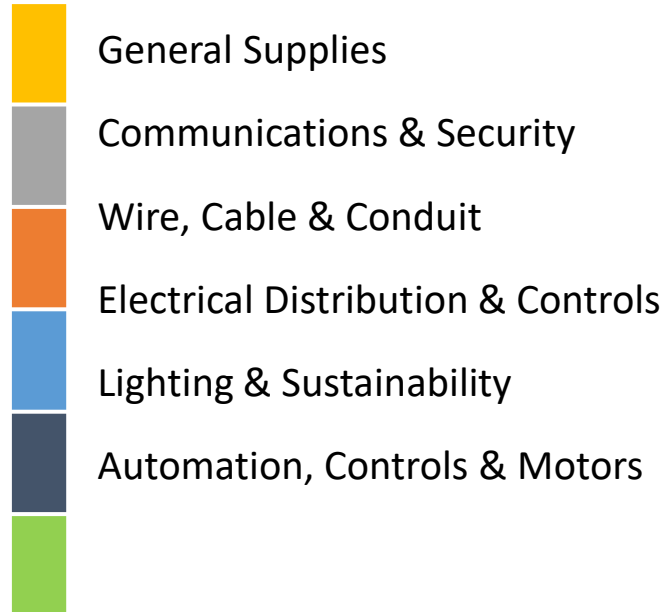
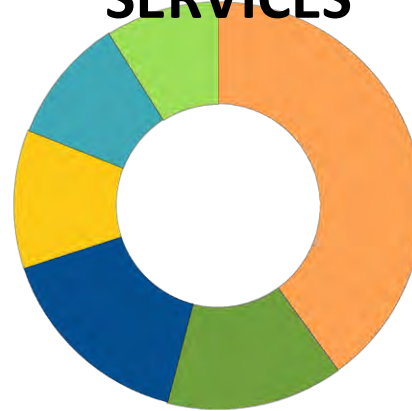
Utility

- Investor Owned
- Public Power
- Utility Contractors

CIG

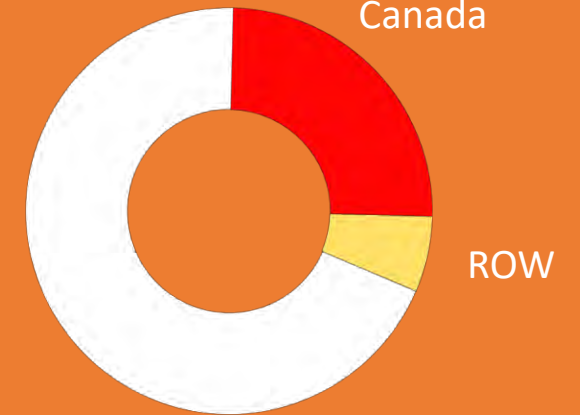
- Commercial
- Institutional
- Government

PRODUCTS & SERVICES



GEOGRAPHY

U.S.



The majority of WESCO's 500+ locations around the world are in North America.

Core Supply Chain Solutions

PRODUCTION SUPPORT

Save time and simplify production or construction projects with pre-fab systems, assembly services, kitting, and more.

eBUSINESS

In an always-on world, our eBusiness solutions keep you connected.

SUPPLY CHAIN OPTIMIZATION

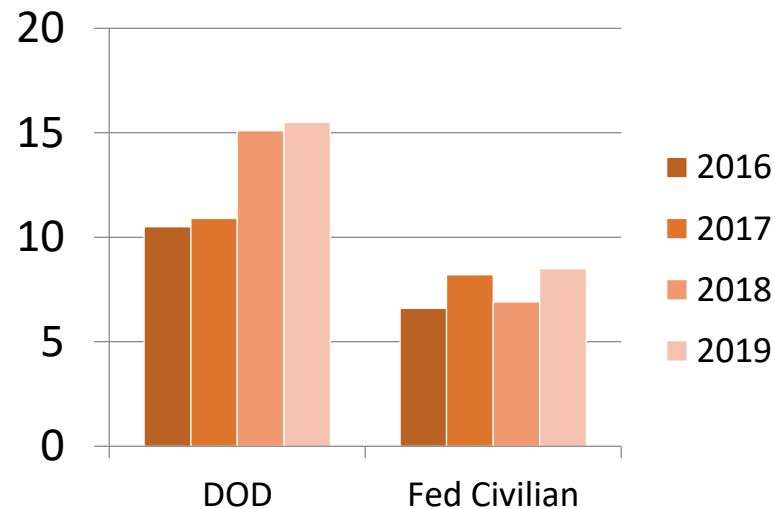
The services may be complex but we offer you a simple proposition: the right material, at the right time, in the right place, for the right price.



Sizing up the Federal Market

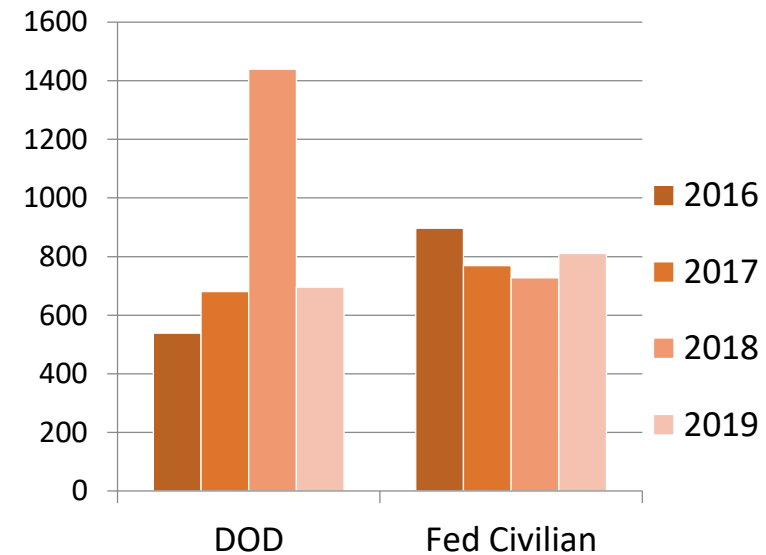
Construction Spending (\$B)

Based on Construction NAICS 236210 & 236220
Includes: Typically Includes New, Renovation, Modernization



Electrical, Datacom, Physical Security Specific Contract Spending (\$M)

Based on Construction NAICS 238210 & 561621
Includes: Typically Includes installation



WESCO's Total Addressable Spend for New Construction & Renovation Projects ~\$3B Annually

Government Market Approach

Commercial, Institutional, and Government (CIG) Team

- Chartered business growth engine for federal, state, local and education markets
- Recently expanded to COLO Data Center & Healthcare
- Roles & Responsibilities
 - Administrative: Contract Management/Compliance
 - Operational: Train and equip field sales representatives to penetrate markets in sales territory
 - Value to Stakeholders:
 - Internal: Create new business and cultivate accounts to manageable relationship for branch
 - External: Reinforce customer business development and manage new or market-specific accounts to bring supply chain solutions to customers (Example: Defense Industrial Base)

Strategic Account Managers (GSAM)

- Focus on end user agencies & organizations
- Manage defense contractor and aerospace industry accounts
- Understand spending methods and upcoming opportunities
- Focus Agencies
 - Department of Defense
 - US Army Corps of Engineers (USACE)
 - Naval Facilities Engineering Command
 - Federal Civilian Agencies
 - US Postal Service
 - US State Department
 - Department of Veteran's Affairs
 - GSA

Regional Govt. Managers (RGM)

- Develop branch target and new business plan for FED and SLED markets
- Create interest in federal business through budgetary/contractual/policy evidence

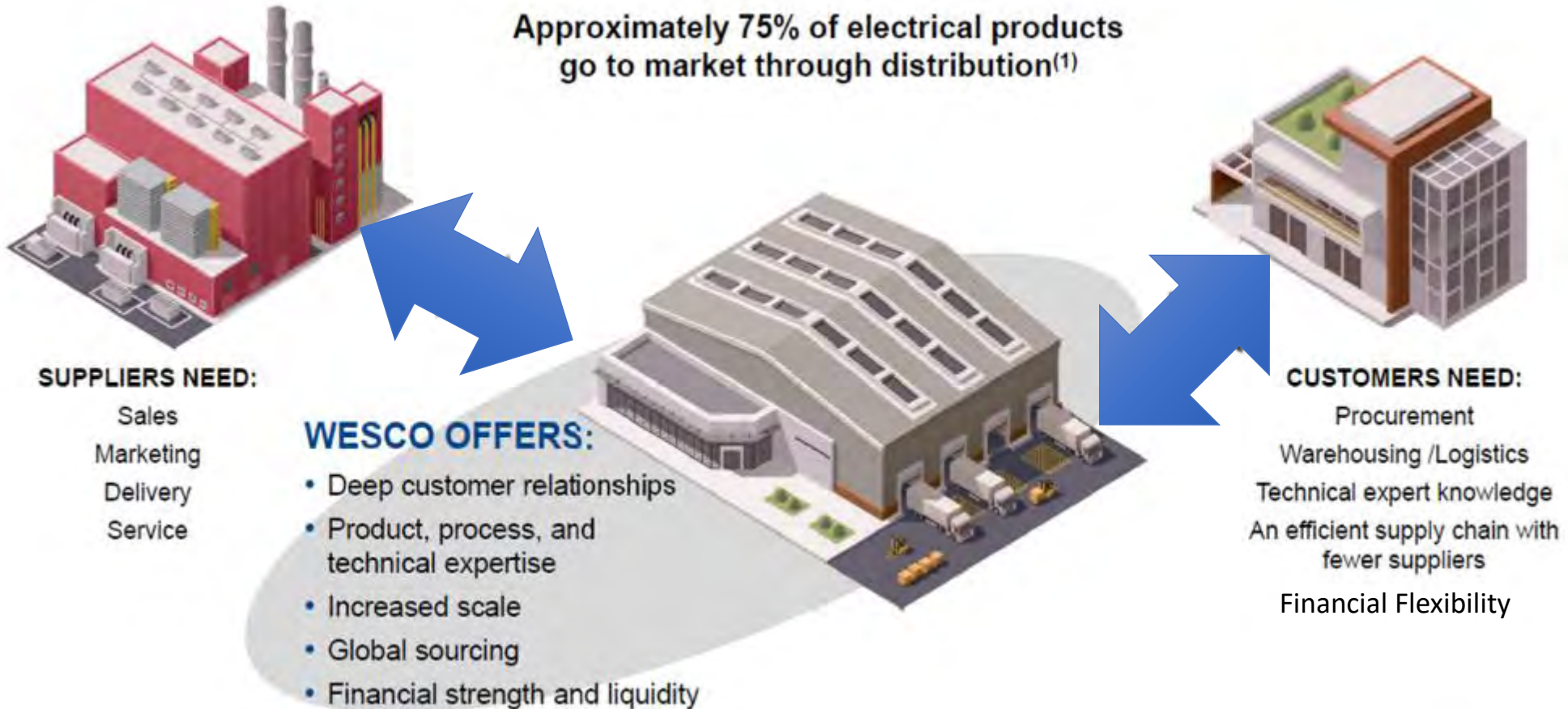


**US Army Corps
of Engineers**®



WESCO®

The Importance of Distribution



Why Choose WESCO?

- We are a financially strong company, with North American coverage and global operations.
- Our manufacturer relationships are solid, and we have the breadth and depth of product to satisfy your needs.
- WESCO's industry-leading global accounts program gives you the benefit of our purchasing power.
- A variety of tools, programs, and processes target the inventory management, e-business, and technical support requirements of your plants or job sites.
- We will help reduce your costs!



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- Twitter - <https://twitter.com/Tellabs> and @Tellabs and using #OpticalLAN
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Tellabs Services Briefing

Joel Fischer, Director Sales Engineering



Services

- Certified Deployment Partner Program
- Professional Services
- Training
- Support
- Technical Publications Changes



Partner Types

Sales Channel Partners

- Monetary Targets
- Sales & Marketing Certification
- Network Planning & Design
- Relies on Tellabs for Implementation Solutions

Deployment

- Site Survey
- Design
- Interop Testing
- Program Management
- Implementation & Testing
- OLAN Deployment Certification
- Network Planning & Design

Hybrid

- Partners with capabilities to perform both product sales and implementation



Certified Deployment Partner

High Level Steps

A green circular icon with a white checkmark inside, indicating a completed or successful step.

Capability
Evaluation

A green circular icon with a white checkmark inside, indicating a completed or successful step.

Network
Planning &
Design (2)

A green circular icon with a white checkmark inside, indicating a completed or successful step.

Deployment
Certification
(2)

A green circular icon with a white checkmark inside, indicating a completed or successful step.

On-Site
Mentoring

A green circular icon with a white checkmark inside, indicating a completed or successful step.

Partner
Case Pack
Support



Certified Deployment Partner *Locating Program Details*

- Nexus
 - <https://nexus.tellabs.com>
 - Partner Programs → Certified Deployment Partner Guidelines
- Navigational Buttons at the Top and Bottom of each page guide you through:
 - Assessment
 - Training
 - Mentoring
 - Support



Tellabs Certified Optical LAN Deployment Partner Program Guidelines

Scope

This document provides an overview of the requirements for Tellabs Partners that will be providing product deployment services to their customers. It shall be used as a guide to develop, maintain and update the Partner deployment service functions, processes and infrastructure requirements, along with the service performance objectives.

Service Organization and Processes for Quality Service

Deployment Services are all activities and operations necessary to implement a Tellabs product in the customer's network. "Tellabs Product" can mean the implementation of a new system in the customer's network, the upgrade of an existing system and/or the addition of new functionality to a system. The essential activities and responsibilities for each function of the deployment process are summarized below. While a separate resource is not required for each area, the Partner should be competent in all of these functional areas prior to accepting any customer orders for Tellabs product Deployment Services.

Project Management

The Project Management function is responsible for the management and control of project deployment. The goal of the project manager is to complete the project, execution and the project acceptance by the customer on time, within budget and with the quality that the customer expects. The Partner will have at least one person with project management skills. During the adaptation phase of the program, the number of people dedicated to project management will be agreed upon based on a function of the installed base complexity and the number of customers.

Based on size, some projects may have more than a single individual performing project manager functions; in this case, a single "lead" individual should be identified for the project.

Project Management tasks may include:



Certified Deployment Partner *Capability Assessment*



Certified Deployment Partner Capabilities Assessment

The first step in becoming a Tellabs Certified Deployment partner is an assessment of your current capabilities and certifications.

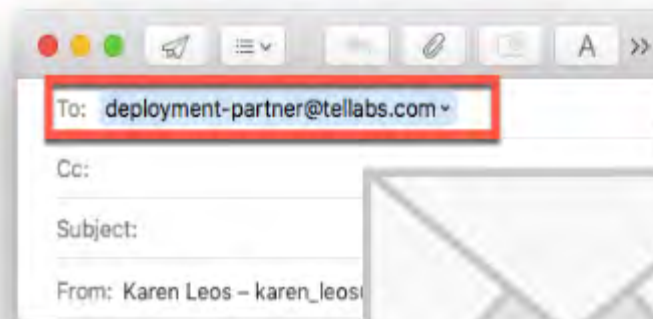
Scheduling Your Assessment

To schedule your assessment, please e-mail the [Deployment Partner Program Administrator](mailto:deployment-partner@tellabs.com).

Assessment Areas

- Project Management Capabilities
- System Design Engineering
- Detail Engineering Certifications & Practices
- Procurement & Logistics Process
- Project Installation
- Number of Personnel
- Training & Experience
- Tools & Equipment
- Fiber Optic Installation Certification and Practices
- Installation Standards Practice and Documentation
- Quality Assurance Processes
- Customer Survey and Feedback Processes
- Collection of References for your work

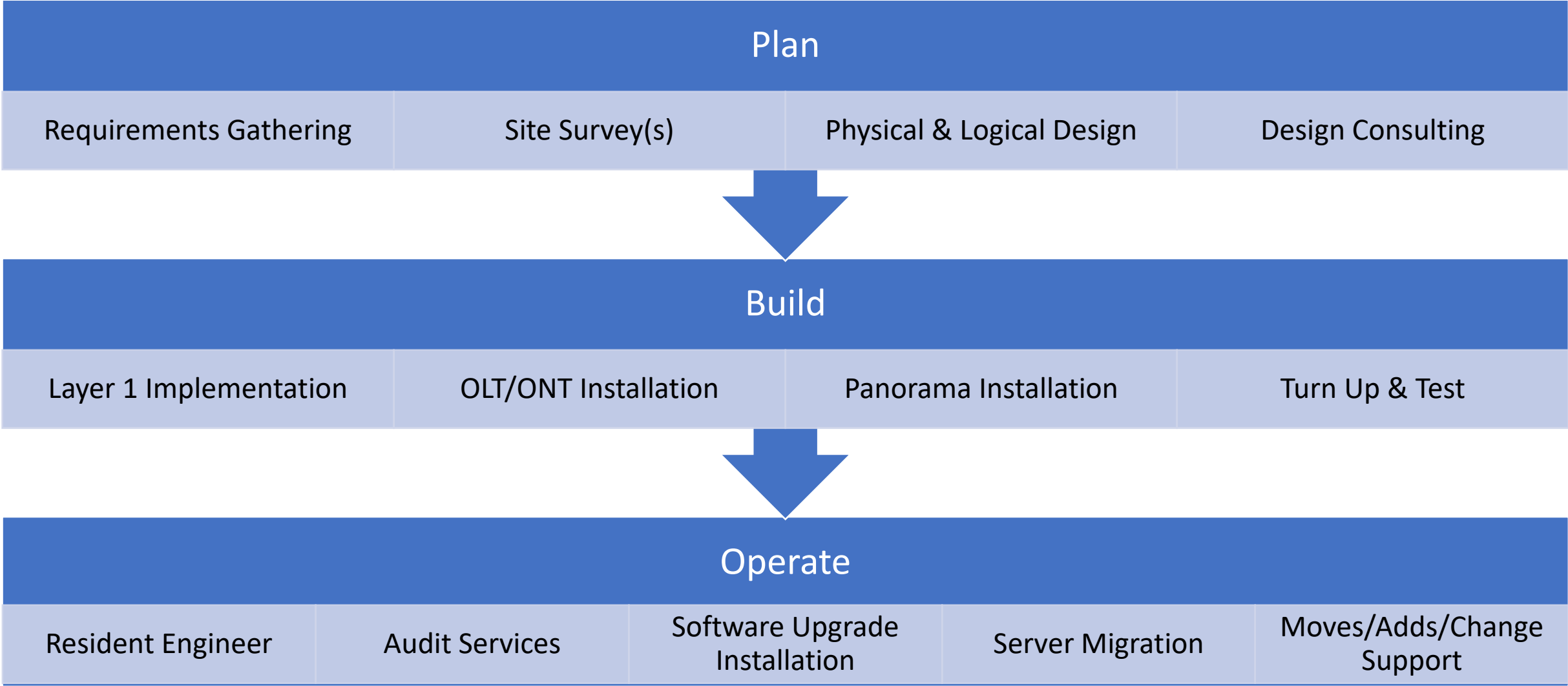
[Review Full Certified Deployment Partner Guidelines](#)



Professional Services *Supplemental Support*



Professional Services



Training

Plan

- Network Planning & Design (BICSI CEC Eligible)

Build

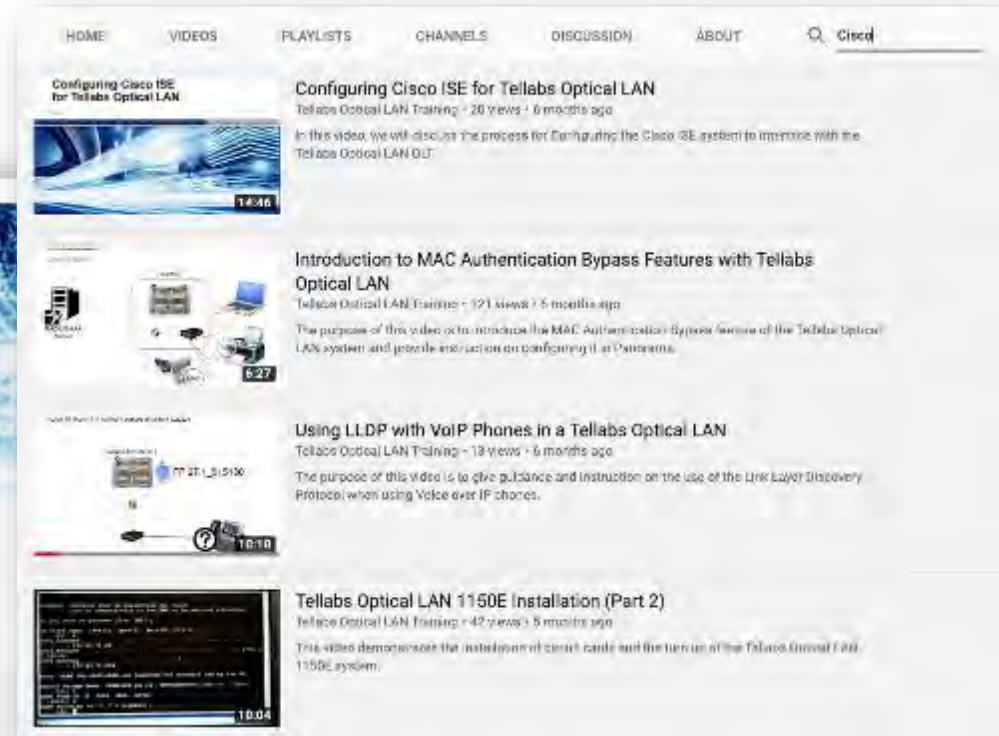
- Optical LAN Deployment Certification
- *Certified Fiber Optic Technician (FOA Certified)*

Operate – End User Focus

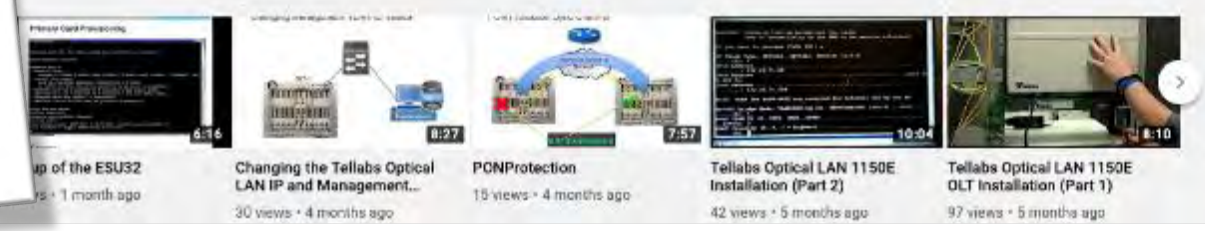
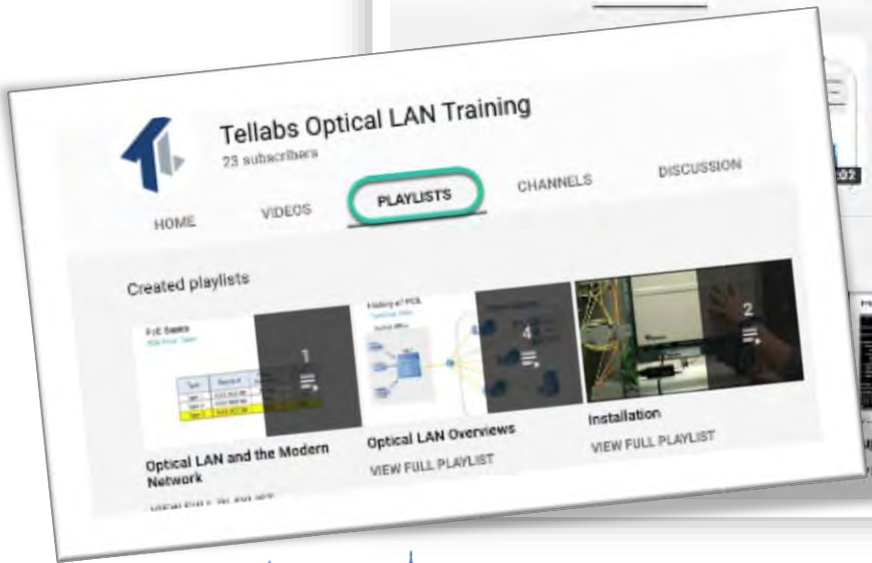
- Optical LAN Operations, Provisioning & Maintenance (OPM)
- *Optical LAN OPM + Advanced Troubleshooting*



Training YouTube Channel



Introduction to Optical LAN
Tellabs Optical LAN Training • 57 views • 6 months ago
The objective of this video is to provide a solid understanding of Passive Optical LAN or PDL. The topics addressed include a definition for PDL, the basic components of a PDL network, the history ...



Training Digital Credentialing Program



Sample Tellabs digital badge

Tellabs Digital Badge Tracks

- OLAN Planning & Design (Knowledge, Associate, and Certified)
- OLAN Deployment (Knowledge, Associate, and Certified)
- OLAN Operations (Knowledge, Associate, and Certified)
- OLAN Trouble Clearing (Associate)
- Fiber Optic Technician (Certified)
- OLAN Sales Specialist (Certified)

How does it work?

Once you've earned a badge, you'll be notified via email to claim it at our partner Acclaim's website.

To claim and share your badge:

1. Click the link in the email.
2. Create your Acclaim account.
3. Claim your badge.
4. Share on your social media profiles, websites, and in your email signature!



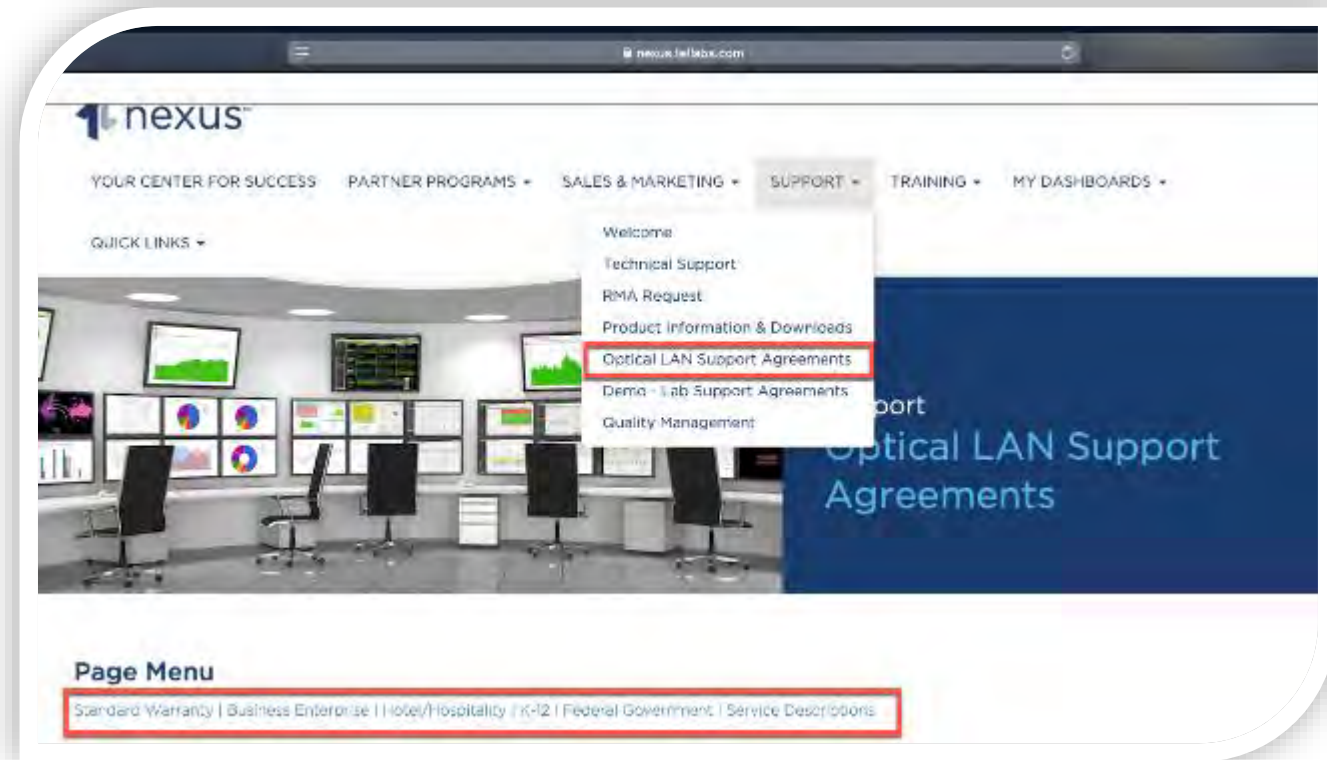
Hank Matthews
Senior Sales Engineer
Tellabs Enterprise Systems
Mobile: (404)796-1771



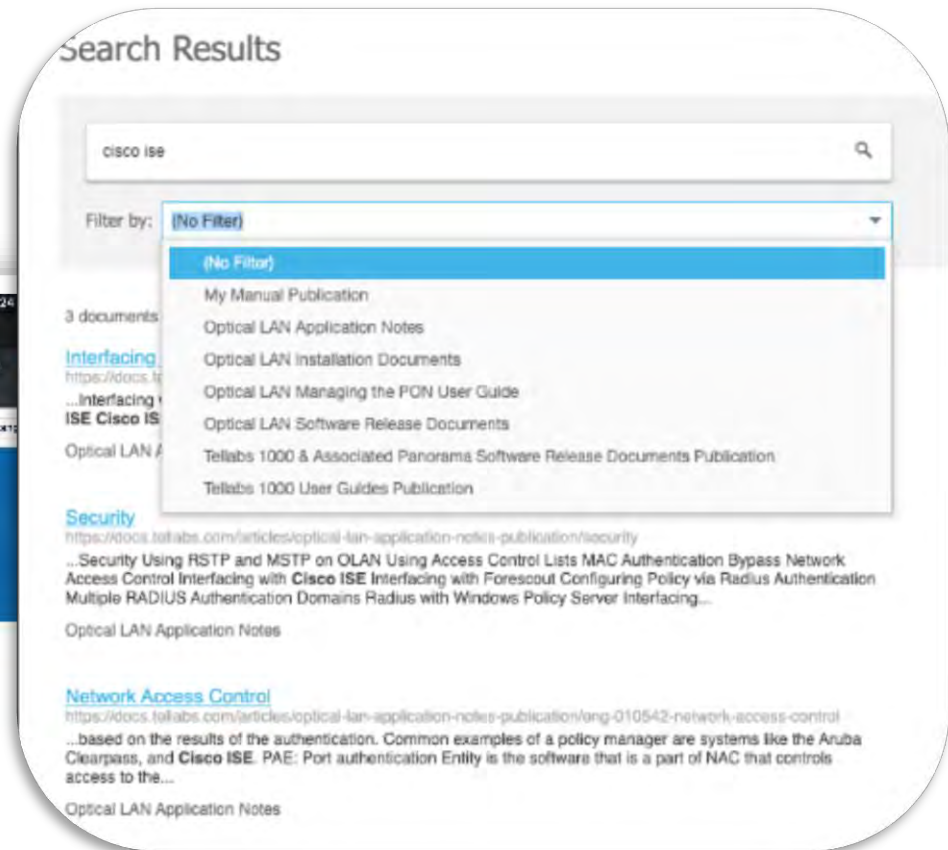
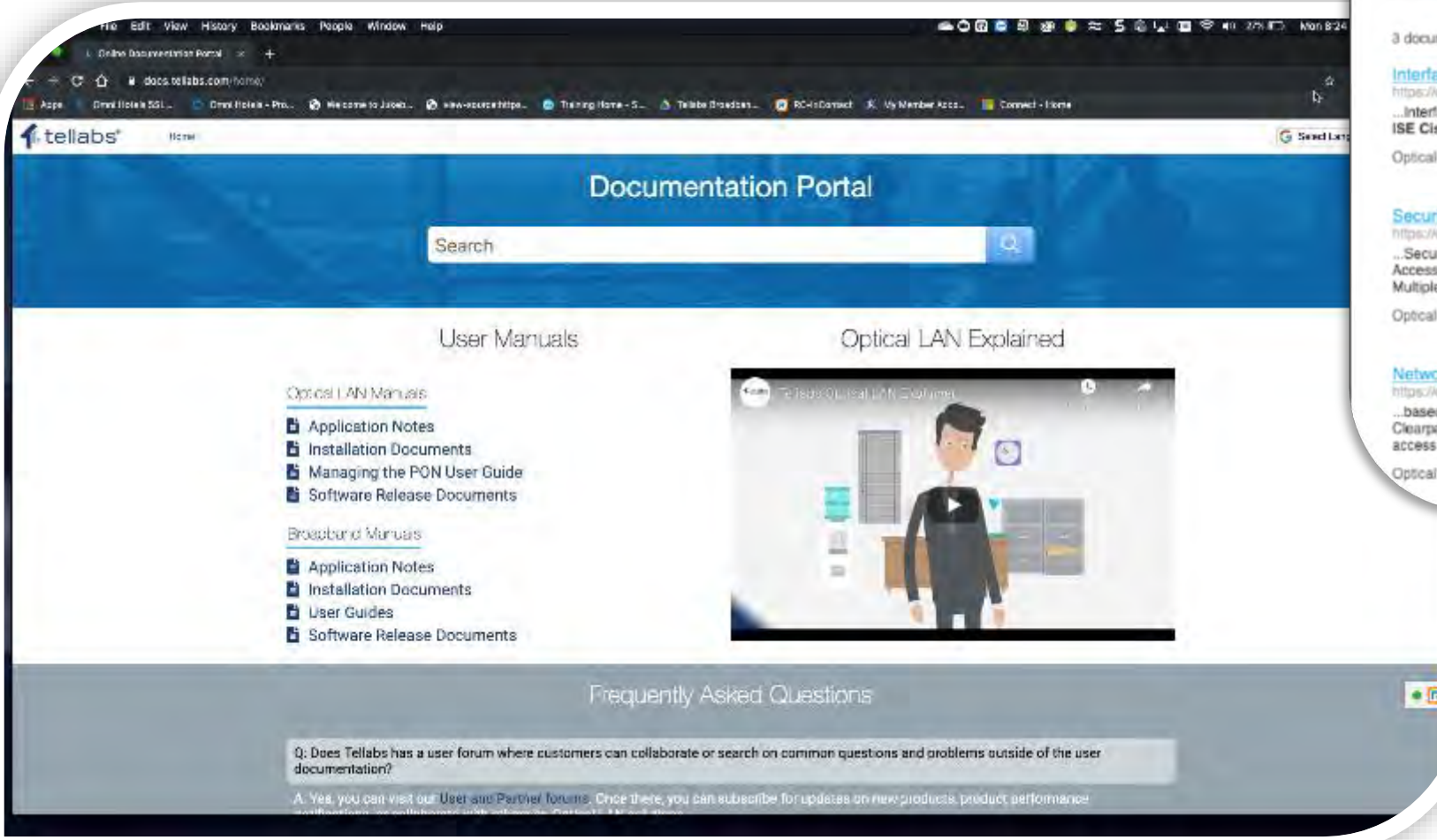
Support

Packages for Every Market Segment

- Multi-Year Discounts
- Technical Support
- Software Updates & Upgrades
- Extended Hardware Warranty
- Advanced Services
 - On-Site Support (Varying SLAs)
 - Software Installation (Remote or On-Site)
- Support Renewals
 - Deal Sheets submitted with PO contain important required information
 - Contacts – Special Instructions
 - 90-60-30 Day Reminders



Technical Publications 2020 Overhaul



- Integrated into the public web
- Searchable
- YouTube videos integrated for applicable application note content



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Technical Panel

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Optical LAN Customer Panel



Karin Christensen
Information
Technology Chief



Richard Thompson II
Director-Network
Planning & Engineering



John Castner
Enterprise Network
Architect



Karin Christensen

Department of the Interior

The US Fish and Wildlife Service



- 8,000+ employees
- 562 National Wildlife Refuges
- 38 Wetland Districts
- Encompassing more than 150,000,000 acres

Installations:

- National Conservation Training Center, WV
- Patuxent National Wildlife Refuge, MD



The U.S. Fish and Wildlife Service is the oldest federal conservation agency, tracing its lineage back to 1871, and the only agency in the federal government whose primary responsibility is management of fish and wildlife for the American public.

Richard Thompson, Director Network Planning and Engineering



- Over 8000 Ethernet ports with OLAN
- Installations
 - Stations, Yards, Office Buildings and other ancillary facilities
- Services
 - Voice
 - Data
 - Revenue systems
 - Security cameras
 - Access control
 - Customer
 - BOH WIFI
 - Passenger Information Displays
 - Room Schedulers and AV systems



John Castner, Enterprise Network Architect

- Installations
 - Multi Agency Service Park
 - Wheaton Library & Rec Center
 - Rockville Office Building
 - Council Office Building
 - Executive Office Building
- Six OLTs serving five locations
- 1,316 ONTs
- Under Construction - The Wheaton Redevelopment Building - ~1,000 ONTs





Karin Christensen
Information
Technology Chief



Richard Thompson II
Director-Network
Planning & Engineering



John Castner
Enterprise Network
Architect



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Open Q&A

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Thank You!