



The bridge to possible

White paper
Cisco public

Cabling Deployment with the Cisco Catalyst PON Series

Panduit and Cisco implementation of zone-based
enterprise passive optical networks

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Introduction

A Passive Optical Network (PON) is a point-to-multipoint architecture that employs a single strand of single-mode fiber and unpowered optical splitters to deliver converged IP voice, video, data, and building automation to multiple users (or devices). PONs, widely deployed by service providers in the outside plant for over 25 years, leverage the distance and bandwidth capabilities of single-mode fiber to cost-effectively distribute their services. Passive optical LAN (POL), which is based upon mature PON standards, is an emerging network architecture for the on-premises environment, especially as it relates to campus networks, large enterprises, military/government, and hospitality applications.

The three main network components of a POL are the optical line terminal (OLT) at the core layer, the passive optical splitter at what would normally be the distribution layer, and the optical network terminal (ONT) at the access layer.

By using passive optical splitters, a POL can substitute the distribution switching layer, present in traditional active Ethernet architectures, and reduce the amount of infrastructure required. Optical LANs built with PON technology can deliver voice, data, and video at gigabit speeds over secure optical fiber.

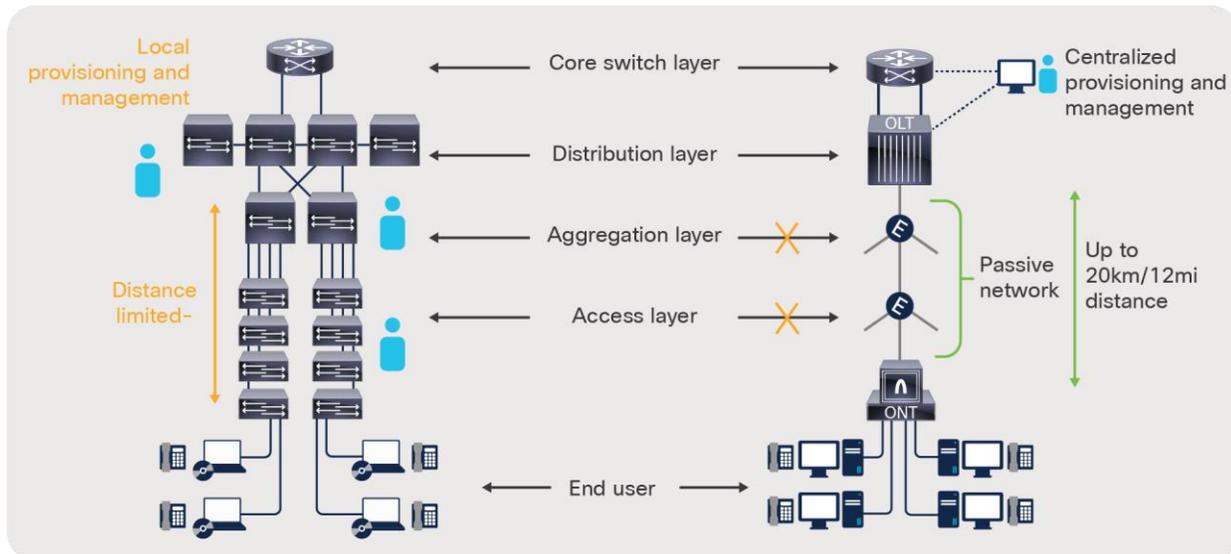


Figure 1.
Active Ethernet network vs. passive optical LAN network

Each fiber-optic cable can be shared by up to 128 ONTs, minimizing the amount of fiber cabling required. Although multiple users share the same Passive Optical Network (PON), Cisco provides robust Quality of Service (QoS) and bandwidth mechanisms that help ensure that the traffic is correctly prioritized and peak bursts enabled so that each user or device gets the bandwidth they need.

Cisco Catalyst OLT lineup

The Cisco® Catalyst® Gigabit PON (GPON) solution is based on the CGP-OLT models in the Catalyst PON Series coupled with the Cisco Catalyst PON Manager, which presents an innovative and comprehensive solution for enterprise fiber networks.

The CGP-OLT switches are centralized 1RU access points for the entire LAN, capable of serving from hundreds to thousands of users and devices. They have market-leading capacity: up to 108 Gbps switching capacity, up to 95 Mpps forwarding capacity, and a reach of up to 20 km (12.5 miles) to ONT endpoints. The CGP-OLT switches support GPON to give every user gigabit speeds today and can smoothly evolve to next-generation fiber technologies to meet the demands of tomorrow with minimal or no change to the physical cable plant.

The CGP-OLT switches are available in two sizes (the small 8T and the larger 16T) suitable for all types of deployments: office buildings, large enterprises, military bases, hotels and resorts, hospitals, large campus applications, sports venues, or any other environment requiring a LAN.

The Cisco and Panduit approach to passive optical LAN allows organizations to evolve their LAN in a gradual and cost-efficient way, using the same access node and in-building cabling, while making minimal changes in electronics today and going forward (to new generations of PONs).

The market-leading capabilities of the CGP-OLT switches enable organizations to achieve:

- Lower operational costs (savings in power, floor space, and centralized management)
- Long-term value with fixed architecture over generations of PONs
- Secure communication with a fiber-based infrastructure

Cisco Catalyst PON OLT platform

This cabling applications guide will assist you with the specification and design of a Panduit® fiber-optic cabling system supporting a Cisco PON platform.

Table 1. Cisco Catalyst PON optical line terminal lineup

OLT model	CGP-OLT-8T	CGP-OLT-16T
		
PON ports	8 GPON ports	16 GPON ports
Ethernet uplink ports	4x 1 GE combo ports (copper RJ45 + SFP optical) and 2x 10 GE SFP+ ports	4x 1 GE combo ports (copper RJ45 + SFP optical) and 2x 10 GE SFP+ ports
Optical connectivity	SC-APC	SC-APC
Endpoints supported	1024	2056

Cisco Catalyst PON ONT switches

Cisco optical network terminals are the user access point controlled by the OLT. The Cisco ONT switches deliver superior services with high bandwidth to every user.

The variety of ONT models meets every need: they can be deployed in a variety of locations and support wired and wireless Gigabit connectivity, Power over Ethernet, and a selection of user interfaces.

Table 2. Cisco Catalyst PON optical network terminal lineup

Desktop ONT model		PON ports	POTS ports	CATV ports
CGP-ONT-1P		1 PoE+	n/a	n/a
CGP-ONT-4P		4 PoE+	n/a	n/a
CGP-ONT-4PV		4 PoE+	2 (RJ11)	n/a
CGP-ONT-4PVC		4 PoE+	2 (RJ11)	1 Coax
Wireless ONT		PON ports	POTS ports	CATV ports
CGP-ONT-4TVCW		4	2 (RJ11)	1 Coax

All ONTs have 1 GPON uplink port (SC-APC receptacle); wireless ONT is 2.4 GHz/5 GHz.

Panduit PON cabling solutions

Panduit provides a wide range of products for more traditional enterprise PON installations, which can be ideal for greenfield installations with proper preplanning to maximize the effectiveness and potential cost savings for this type of architecture. In cases where network owners prefer a structured approach to cabling infrastructure, Panduit also offers active zone cabling components, which minimize installation costs while providing a flexible and manageable cabling solution.

The traditional approach to enterprise PON installations houses the OLT at the switch layer and puts an application-specific wall mount enclosure in a telecom closet on each floor to house the inactive splitter device(s), which then break out one single-mode signal to several signals, ending at the access layer where the ONT resides. From the ONT, often mounted in the wall, runs of copper patch are distributed to the individual devices.

Each splitter device acts as a distribution point for, typically, a whole floor or as a pass-through for the single-mode signal to another distribution point or floor. These splitters can be pre-connectorized for a more plug-and-play solution, or spliced inline for a more discrete transition. A pre-connectorized version allows for some flexibility, while the inline splicing model forces a measure of permanence that by necessity calls for preplanning.

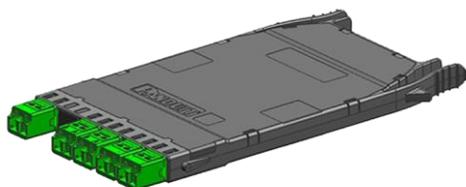


Figure 2.
1x8 (or 2x8) PON splitter cassette



Figure 3.
1x16 (or 2x16) PON splitter cassette

Zone cabling products (telecommunications enclosures and zone cabling) for open office applications are typically used to deploy ONTs (such as the CGP-ONT-4P), wireless access points and wireless ONTs (such as the CGP-ONT-4TVCW), smaller Ethernet workgroup switches, and connected building gateways.

In enterprise PON deployments using zone cabling, the ONTs are secured from end users in zone enclosures residing close to users in the ceiling or floor or mounted to a wall. Single-mode fiber cabling (yellow in Figure 4) is terminated in a small patch panel inside the enclosure and patched to the ONTs with fiber patch cords. Short runs of copper cabling (blue in Figure 4) are terminated in the enclosure in a patch panel and run to end-user outlets.

Similarly for the remote IP camera use case shown, single-mode fiber cabling is terminated in a small patch panel inside of a smaller enclosure and patched to a single-port ONT with a fiber patch cord. Short runs of copper cabling (blue in Figure 4) are terminated in the enclosure in a patch panel/outlet and run to the proximal IP camera. Patch panels are deployed for fiber and copper to provide for testable infrastructure (cameras and zone boxes may be remote from the main distribution area that houses OLTs) and to allow for zone distribution of multiple cameras.

For this use case and the home-run use case for PON wireless access points, power to each device can be delivered either locally (if available) or through a hybrid copper/fiber cabling system in remote telecom rooms.

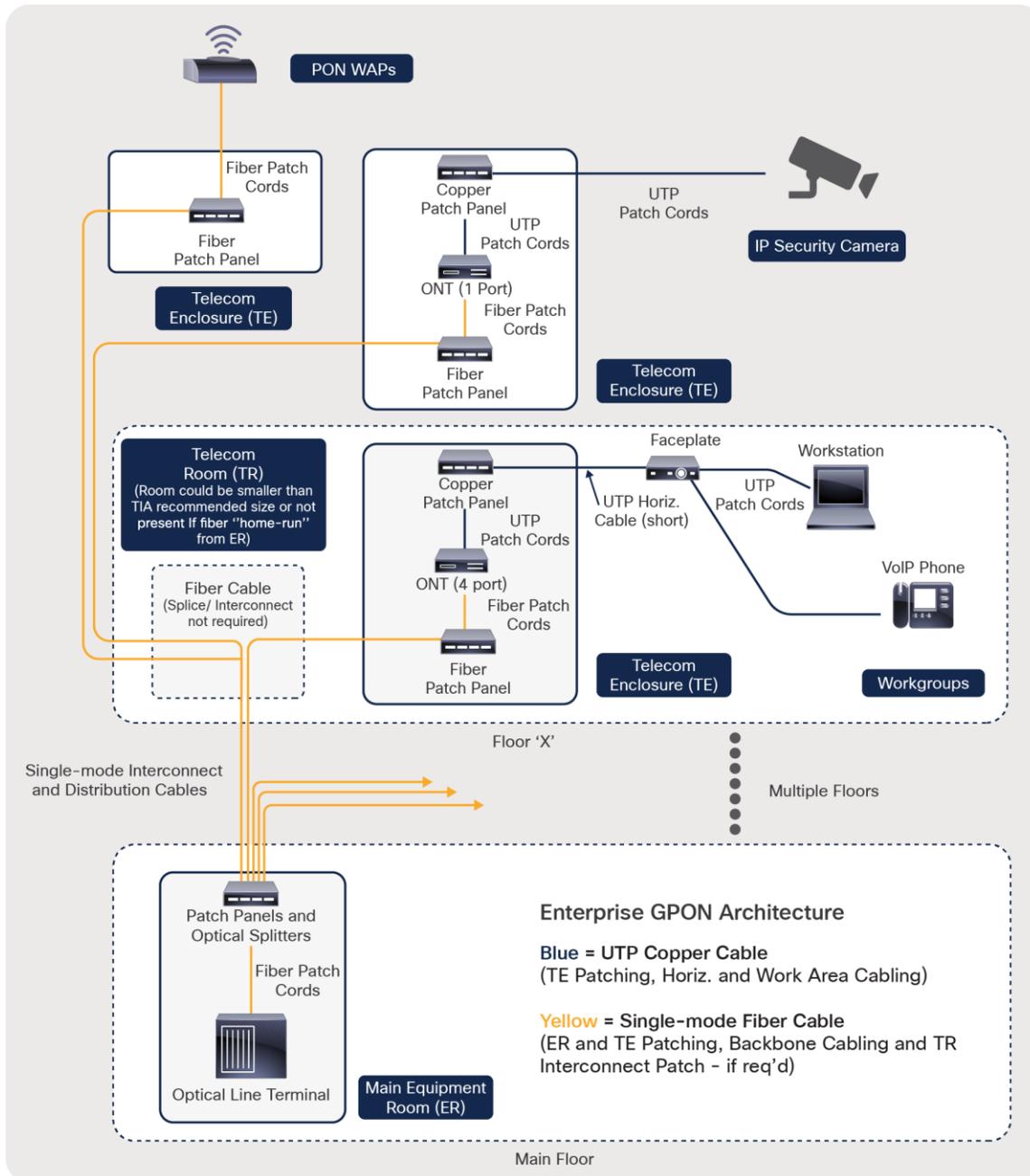


Figure 4. Deployment of zone-based ONTs via telecom enclosures

Main equipment room (ER)

- Fiber patch cords (simplex single-mode)
- Single-mode fiber splitters, patch panels, Fiber Adapter Panels (FAPs), and enclosures
- Labeling and ID products

Backbone riser cabling

- Single-mode simplex OptiCam connectors
- Single-mode distribution cable and pathways
- Labeling and ID products
- Telecom room/CP
- Consolidation/wall mount enclosures and FAPs (may include splitters)

Telecom enclosure (TE)

- Zone enclosure
- Fiber and copper patch cords
- Fiber patch panels, FAPs, and enclosures
- Copper patch panels

Work area

- Zone cords (copper horizontal)
- Copper outlets and patch cords

Each zone enclosure serves as a cabling distribution point for a particular zone, increasing network flexibility, manageability, accessibility, and efficiency. Using a distributed network and a zone cabling topology for your physical infrastructure can solve telecommunication room congestion. In addition, PON fiber backbone cables to the zone enclosures extend the reach of your network beyond copper limitations.

The above scenario shows splitters home-run from the equipment room to individual TEs. For larger installations it may be more effective (depending on the physical environment) to place splitters in racks in telecom rooms or in individual zone enclosures as shown below (the floor enclosure is shown as an example for very large installations).



Figure 5.
Fiber distribution (closet application)



Figure 6.
Raised floor enclosure (zone application)

Summary

Cisco and Panduit have partnered to offer a wide range of products for today’s GPON architecture needs, along with the trusted quality and support users have come to expect. Cisco provides the active component via the Catalyst OLT switches and Catalyst PON Manager software to drive a premium user experience all the way down to the end user, with a variety of ONT devices to meet network needs. Panduit supports the Cisco active devices through a wide range of physical infrastructure, including connectorized or fusion-spliced splitter devices, fiber-optic cable, field-terminable connectors, adapter panels, zone enclosures, outlets, and more. With such a wide range of products available, users can design the network that best meets their needs, whether it is a new network or an update to existing infrastructure.

Table 3. Panduit products for PON installations

	Fusion splice splitters	
	FPONSS1X4	Fiber Optic PLC Splitter, 1x4 Ratio, with 1 Bare Fiber to 4 Bare Fibers
	FPONSS1X8	Fiber Optic PLC Splitter, 1x8 Ratio, with 1 Bare Fiber to 8 Bare Fibers
	FPONSS1X16	Fiber Optic PLC Splitter, 1x16 Ratio, with 1 Bare Fiber to 16 Bare Fibers
	FPONSS1X32	Fiber Optic PLC Splitter, 1x32 Ratio, with 1 Bare Fiber to 32 Bare Fibers
	SC-APC connectorized splitters	
	FPONCS1X4	Fiber Optic PLC Splitter, 1x4 Ratio, with 1 SC-APC to 4 SC-APC Connectors
	FPONCS1X8	Fiber Optic PLC Splitter, 1x8 Ratio, with 1 SC-APC to 8 SC-APC Connectors
	FPONCS1X16	Fiber Optic PLC Splitter, 1x16 Ratio, with 1 SC-APC to 16 SC-APC Connectors
	FPONCS1X32	Fiber Optic PLC Splitter, 1x32 Ratio, with 1 SC-APC to 32 SC-APC Connectors



HD Flex™ PON splitter

FHP9N-LA1X02	OS2 HD Flex 1X2 Splitter Cassette, 1 LC-APC (In) to 2 LC-APC (Out)
FHP9N-LA1X04	OS2 HD Flex 1X4 Splitter Cassette, 1 LC-APC (In) to 4 LC-APC (Out)
FHP9N-LA1X08	OS2 HD Flex 1X8 Splitter Cassette, 1 LC-APC (In) to 8 LC-APC (Out)
FHP9N-LA1X16	OS2 HD Flex 1X16 Splitter Cassette, 1 LC-APC (In) to 16 LC-APC (Out)



Rack-mounted splitter trays

FCP9PP-1083GG	Optical Splitter Tray, 1x8 split, single SC-APC input, 8 SC-APC outputs, 19" rack mount, PLC
FCP9PP-1163GG	Optical Splitter Tray, 1x16 split, single SC-APC input, 16 SC-APC outputs, 19" rack mount, PLC
FCP9PP-1323GG	Optical Splitter Tray, 1x32 split, single SC-APC input, 32 SC-APC outputs, 19" rack mount, PLC
FCP9PP-2083GG	Optical Splitter Tray, 2x8 split, dual SC-APC inputs, 8 SC-APC outputs, 19" rack mount, PLC
FCP9PP-2163GG	Optical Splitter Tray, 2x16 split, dual SC-APC inputs, 16 SC-APC outputs, 19" rack mount, PLC
FCP9PP-2323GG	Optical Splitter Tray, 2x32 split, dual SC-APC inputs, 32 SC-APC outputs, 19" rack mount, PLC
FCP9SP-1083GG	Optical Splitter Tray, 1x8 split, single splice input, 8 SC-APC outputs, 19" rack mount, PLC
FCP9SP-1163GG	Optical Splitter Tray, 1x16 split, single splice input, 16 SC-APC outputs, 19" rack mount, PLC
FCP9SP-1323GG	Optical Splitter Tray, 1x32 split, single splice input, 32 SC-APC outputs, 19" rack mount, PLC
FCP9SP-2083GG	Optical Splitter Tray, 2x8 split, dual splice inputs, 8 SC-APC outputs, 19" rack mount, PLC
FCP9SP-2163GG	Optical Splitter Tray, 2x16 split, dual splice inputs, 16 SC-APC outputs, 19" rack mount, PLC
FCP9SP-2323GG	Optical Splitter Tray, 2x32 split, dual splice inputs, 32 SC-APC outputs, 19" rack mount, PLC



HD Flex 4-port fiber enclosures and panels

Enclosures

FLEX1U04	1 RU HD Flex 4-Port Enclosure
FLEX2U04	2 RU HD Flex 4-Port Enclosure
FLEX4U04	4 RU HD Flex 4-Port Enclosure

Panels

FLEX1UPN04	1 RU HD Flex 4-Port Panel
FLEX2UPN04	2 RU HD Flex 4-Port Panel
FLEX4UPN04	4 RU HD Flex 4-Port Panel



HD Flex 6-port fiber enclosures and panels

Enclosures

FLEX1U06	1 RU HD Flex 6-Port Enclosure
FLEX2U06	2 RU HD Flex 6-Port Enclosure
FLEX4U06	4 RU HD Flex 6-Port Enclosure

Panels

FLEX1UPN06	1 RU HD Flex 6-Port Panel
FLEX2UPN06	2 RU HD Flex 6-Port Panel
FLEX4UPN06	4 RU HD Flex 6-Port Panel



HD Flex 12-port fiber enclosures and panels

Enclosures

FLEX1U12	1 RU HD Flex 12-Port Enclosure
FLEX2U12	2 RU HD Flex 12-Port Enclosure
FLEX4U12	4 RU HD Flex 12-Port Enclosure

Panels

FLEX1UPN12	1 RU HD Flex 12-Port Panel
FLEX2UPN12	2 RU HD Flex 12-Port Panel
FLEX4UPN12	4 RU HD Flex 12-Port Panel

	Fusion spliced APC connectors	
	FSCS2/9SOCA9AG	Fiber SC-APC Splice-On Connector for 250/900um Fiber, 9um Singlemode
	FLCS2/9SOCA9AG	Fiber LC-APC Splice-On Connector for 250/900um Fiber, 9um Singlemode
	PON enclosures	
	FPONE1	Fiber Enclosure for Passive Optical LAN, Small 9.17 in. W x 2.48 in. D x 7.87 in. H (233mm x 63mm x 200mm)
	FPONE2	Fiber Enclosure for Passive Optical LAN, Medium 12.48 in. W x 3.93 in. D x 9.25 in. H (317mm x 100mm x 235mm)
	FPONE3	Fiber Enclosure for Passive Optical LAN, Large 16.53 in. W x 4.33 in. D x 13.78 in. H (420mm x 110mm x 350mm)
	FPONE4	Fiber Enclosure for Passive Optical LAN, X-Large 19.09 in. W x 5.31 in. D x 15.75 in. H (485mm x 135mm x 400mm)
	BISMF fiber-optic cables	
	FSIRA01Y	9um (G.657.A1) OS2 1 Fiber Indoor Distribution Cable, Riser (OFNR), 900um Buffered Fibers
	FSDRA02Y	9um (G.657.A1) OS2 2 Fiber Indoor Distribution Cable, Riser (OFNR), 900um Buffered Fibers
	PanZone in-ceiling enclosures	
	PZICE	Zone Cabling Passive In-Ceiling Enclosure
	PZICEA	Zone Cabling Active In-Ceiling Enclosure
	HD Flex zone enclosure	
	FLEX-ZRFEG	HD Flex Zone Raised Floor Enclosure, Gray

For more information

For more information, please contact Cisco at: <https://www.cisco.com> or Panduit at <https://www.panduit.com/> or <https://www.panduit.com/panduitciscoalliance>.

About Cisco

Cisco (NASDAQ: CSCO) is the worldwide leader in networking that transforms how people connect, communicate, and collaborate. Information about Cisco can be found at: <https://www.cisco.com>.

For ongoing news concerning Cisco, please visit: <https://newsroom.cisco.com>

About Panduit

Panduit is a world leader that engineers flexible, end-to-end electrical and network connectivity physical infrastructure solutions that help businesses stay connected in a global world. Our high-performance products improve productivity and offer a lower total cost of ownership to create a competitive business advantage. Strong alliances with industry leaders, a global staff, and unmatched service and support make Panduit a valuable, trusted partner.

For the latest news on Panduit, please visit our media resource page at <https://www.panduit.com/en/about/media-resources.html>

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