

Passive Fiber Optic User Access Equipment and Routers



Overview

A passive optical network (PON) is a fiber-optic telecommunications network that uses only unpowered devices to carry signals, as opposed to electronic equipment. In practice, PONs are typically used for the last mile between Internet service providers (ISP) and their customers.

Key Takeaways

Passive Optical Networks (PONs) use unpowered splitters to deliver fiber broadband from a single Optical Line Terminal (OLT) to multiple end users, with routers and Optical Network Units (ONUs/ONTs) managing connectivity at the user end. Core Components of a PON

Optical Line Terminal (OLT): Located at the service provider's central office, the OLT is the active device that converts electrical signals into optical signals for transmission over the fiber network. It also manages upstream traffic from multiple users and coordinates multiplexing to prevent collisions . Passive Optical Splitters: These unpowered devices divide the optical signal from the OLT into multiple branches, enabling a single fiber to serve many subscribers. Splitters require no electricity and can be deployed in the field, reducing operational costs . Optical Network Units (ONUs) / Optical Network Terminals (ONTs): Installed near the end user, ONUs/ONTs convert optical signals back into electrical signals for devices such as computers, phones, or routers. They also handle upstream transmission back to the OLT .

Integration with Routers

Routers, including metro or edge routers like Juniper's ACX Series, can integrate with PONs to provide broadband services. Smart-pluggable OLT modules can be inserted into router SFP+ ports, enabling flexible deployment and pay-as-you-grow scalability. This setup allows service providers to combine routing, broadband gateway functions, and PON access in a single network architecture . Broadband Network Gateway (BNG) Technology: Routers connected to PONs often include BNG functionality to manage subscriber sessions, authentication, and traffic policies, ensuring quality of service for residential, business, and mobile users .

Network Architecture and Standards

PONs typically use a point-to-multipoint (P2MP) topology, where one OLT port serves multiple ONUs through splitters. Common standards include GPON (Gigabit PON) and 10G-PON, supporting high-speed downstream and upstream traffic over distances of 20–30 km . The Optical Distribution Network (ODN) consists of fibers and passive splitters connecting the OLT to ONUs/ONTs.

Advantages

- **Cost Efficiency:** Fewer fibers and central office equipment are needed compared to point-to-point architectures .
- **Scalability:** Additional users can be added by deploying more splitters or ONUs without major infrastructure changes .
- **Energy Savings:** Passive components require no power, reducing operational expenditure .
- **High-Speed Access:** Supports triple-play services (voice, data, video) and is compatible with FTTH, FTTO, and FTTC deployments .

Latest Equipment Trends

Modern PON deployments focus on 10G-PON and beyond, with smart-pluggable OLTs, industrial-rated metro routers, and open PON ecosystems that interoperate with third-party distribution devices. This approach allows service providers to avoid vendor lock-in while delivering high-speed fiber broadband efficiently . In summary, passive fiber optic user access equipment consists of OLTs, passive splitters, and ONUs/ONTs, while routers integrate with these networks to manage subscriber traffic, provide routing and gateway functions, and enable scalable, high-speed broadband delivery.

Article Content

Passive Optical Network (PON) | HPE Juniper Networking US

Juniper combines a smart-pluggable optical line terminal (OLT) with select ACX Series Universal Metro Routers,

Passive optical network

OverviewComponents and characteristicsHistoryNetwork elementsUpstream bandwidth allocationVariantsEnabling technologiesFiber to the premises

A passive optical network (PON) is a fiber-optic telecommunications network that uses only unpowered devices to carry signals, as opposed to electronic equipment. In practice, PONs are typically used for the last mile between Internet service providers (ISP) and their customers. In this use, a PON has a point-to-multipoint topology in which an ISP uses a single device to serve many end-user sites using a system suc

Optical Access

Based on PON technology, passive all-optical network access solutions enable access by any media, tailored to enterprises, ISPs,

Semtech PON Solutions | Fiber-to-the-X Access Network Technology

Semtech's PON-X family delivers high-performance analog laser drivers, TIAs and CDR products for passive optical networks.

What Is Passive Optical Networking (PON)?

Passive optical networking (PON), like active optical networking, uses fiber-optic cabling to provide Ethernet connectivity from a main

Cisco Routed PON Solution

Support high-throughput fiber access by using validated XGS-PON ONTs with PoE, multi-GE, and voice ports. Boost efficiency

Passive Optical Network Architecture

PON architecture, or Passive Optical Network architecture, is defined as a passive optical network deployed in a point-to-multipoint

Design, implementation and evaluation of a Fiber To The Home

The FTTH networks have evolved to find cost effective solutions . The development of using a single fiber for both

What is a Passive Optical Network (PON)? | Glossary | HPE

Because a PON service can support multiple clients from a single router/switch port and uses unpowered splitters to

The Definitive Guide to Passive Optical Network (PON): Architecture ...

By the 1980s and 1990s, the economic and technical viability of fiber networks had been firmly established, paving the

GPON – Gigabit Passive Optical Network

In addition to efficiency, gigabit passive optical networks provide a low cost solutions to adding users through splitters which make

The FOA Reference For Fiber Optics

In a Ethernet LAN with structured cabling architecture, Ethernet switches in the main equipment room connect to routers for Internet

GPON Explained: What Is Gigabit Passive Optical Network?

What is GPON? GPON stands for Gigabit Passive Optical Network, a widely used fiber-access technology under the

What Are Passive Optical Networks (PON) and How Do They Work

Passive optical networks use fiber and unpowered splitters to deliver fast, reliable internet from providers to multiple

Passive Optical Networks

4.1 Background A passive optical network, or PON [1-3], is a network in which fiber optic cables (instead of copper) bring signals all

Fiber ONT

Small form-factor pluggable (SFP) For devices like Ethernet switches, wireless backhaul equipment, EADs, routers, DSLAMs, and

Introduction to Passive Optical Network

Introduction to Passive Optical Network A passive optical network (PON) or Gigabit Passive Optical Network (GPON) is a point-to

Passive Fiber Optic Devices Offer Simple Reliability

A fiber optic attenuator is a passive device that connects to an optical signal chain and reduces the power of the

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