

How much uplink bandwidth does the first-stage optical splitter have

Article Overview

In a typical GPON network, the first-stage optical splitter shares an upstream bandwidth of 1.244 Gbps among all connected ONTs.

Overview

The first-stage optical splitter in a PON network passively divides the optical signal from the OLT to multiple ONTs. In GPON, the OLT provides an upstream capacity of 1.244 Gbps, which is shared among all subscribers connected through the splitter using Time Division Multiple Access (TDMA) . The actual bandwidth available to each ONT depends on the split ratio and network traffic patterns.

Split Ratios and Bandwidth Sharing

- o 1:32 Splitter: One OLT port connects to 32 ONTs. Each ONT can theoretically access up to $1.244 \text{ Gbps} / 32 = 38.9 \text{ Mbps}$ upstream, though practical throughput is typically 70-80% of theoretical values due to protocol overhead .
- o 1:64 Splitter: One OLT port connects to 64 ONTs. Each ONT can theoretically access 19.4 Mbps upstream, again reduced in practice by overhead and network conditions . Higher split ratios reduce the per-subscriber uplink bandwidth but allow more subscribers to share a single OLT port. Network designers must balance subscriber density, distance, and bandwidth demand when choosing the first-stage splitter .

Practical Considerations

- o Centralized vs. Cascaded Splitting: Centralized splitters (e.g., 1:32 at the head-end) maximize OLT efficiency and simplify management, while cascaded splitters (e.g., 1:4 followed by 1:8) can reduce feeder fiber requirements but may slightly increase optical loss .
- o Optical Loss: Each split introduces insertion loss ($\sim 15 \text{ dB}$ for 1:32, $\sim 18 \text{ dB}$ for 1:64), which affects signal quality and maximum reach .
- o TDMA Scheduling: Upstream bandwidth is dynamically allocated among ONTs, so actual throughput per user varies with network load .

Summary

The first-stage optical splitter does not increase the OLT's uplink capacity; it simply divides the existing 1.244 Gbps upstream bandwidth among connected ONTs. The per-ONT bandwidth depends on the split ratio, network overhead, and traffic conditions, with typical values ranging from $\sim 20 \text{ Mbps}$ (1:64) to $\sim 40 \text{ Mbps}$ (1:32) per ONT in GPON networks .

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At the same time, higher split ratio splitters reduce bandwidth per ONU (optical network unit). And there will be increased optics cost

What are Beam Splitters? A beam splitter (or beamsplitter, power splitter) is an optical device which can split an incident light beam

Unearth in-depth insights into FTTH Network Design. Learn about the critical role of optical splitters, understand

Testing a splitter or other passive fiber optic devices like switches is little different from testing a patchcord or cable plant using the

An optical splitter is a crucial passive fiber optic device that splits and combines optical

Optical splitters play an important role in FTTH PON networks where a single optical input is split into multiple output,

Optical splitters are vital in FTTH PON systems, distributing a single signal efficiently. Key parameters, Split Ratio and

Understanding the Split Ratios and Splitting Level of Optical Splitters Optical splitters play an important role in FTTH PON networks

The choice between them depends on your application requirements. ... For most modern FTTH applications, PLC

Not quite. Splitters only lower the optical power--not the bandwidth. Every endpoint still gets the full data stream; the

For example, a 1x4 optical splitter can distribute the optical signal in one optical fiber to four optical fibers in equal

Understanding Optical Splitter Loss - What Insertion Loss Really Means Insertion loss tells you how much weaker

Selecting the right splitter is crucial for building a reliable fiber optic network. PLC splitters are based on planar

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It is possible to have more than two splitting stages in a cascaded system, and the overall split ratio may vary ($1 \times 16 = 4 \times 4$, $1 \times 32 = 4 \times 8$,

Choosing the right split ratio depends on three interrelated factors: distance, bandwidth demand, and cost. Optical

Learn about the critical role of optical splitters, understand different splitting levels and ratios, and discover how to

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