

## How to expand network capacity using a broadband optical splitter



### Overview

An optical splitter is a device used in fiber optic networks to divide a single optical signal into multiple signals.

### Key Takeaways

Optical splitters allow a single fiber line to serve multiple endpoints, enabling cost-effective and scalable network expansion. How Optical Splitters Work

An optical splitter is a passive device that divides a single optical signal from a central source, such as an Optical Line Terminal (OLT), into multiple outputs for endpoints like Optical Network Terminals (ONTs) or devices in a building or campus. This eliminates the need for dedicated fibers to each endpoint, reducing infrastructure costs and simplifying network management. Splitters operate without power, making them low-maintenance and energy-efficient.

### Splitter Types and Selection

Two main types of splitters are commonly used:

- PLC (Planar Lightwave Circuit) Splitters: Provide uniform signal distribution, support high split ratios (1:32, 1:64, or higher), and are stable across temperature variations. Ideal for large-scale deployments.



- FBT (Fused Biconical Taper) Splitters: Cost-effective for small splits (1:2, 1:4), but less suitable for wide deployments or high split ratios . Choosing the right splitter type is critical, as it affects signal quality, scalability, and long-term reliability.
- Deployment Architectures

Two primary deployment strategies are used to expand network capacity:

- Centralized Splitter Architecture
  - A single high-ratio splitter (e.g., 1:32 or 1:64) is placed near the central office.
  - Fibers run directly from the splitter to each endpoint.
  - Advantages: simpler maintenance, easier troubleshooting, fewer field splice points.
  - Disadvantages: higher fiber count and potential signal loss over long distances .
- Distributed (Cascaded) Splitter Architecture
  - Splitting occurs in stages, e.g., a 1:4 splitter near the central office feeding multiple 1:8 splitters closer to users, achieving an overall 1:32 split.
  - Advantages: reduces fiber usage, lowers signal loss, and allows flexible network expansion.
  - Disadvantages: more complex management and multiple splitter locations .

#### Practical Steps for Network Expansion

- Assess Network Requirements: Determine the number of endpoints, bandwidth needs, and geographic layout.
- Select Splitter Type and Ratio: Use PLC splitters for high-density or large-scale networks; FBT splitters for small-scale or cost-sensitive deployments.
- Choose Deployment Architecture: Centralized for dense urban areas; distributed for wider or less dense regions.
- Install and Connect: Connect the main fiber to the splitter, then run individual fibers to each endpoint.
- Plan for Scalability: Opt for splitters with higher output ratios if future expansion is anticipated, allowing additional endpoints without major infrastructure changes .

#### Benefits

- Cost Efficiency: Reduces the number of fibers and active components required.
- Scalability: Easily add new endpoints by connecting additional outputs.
- Low Maintenance: Passive operation eliminates power and cooling requirements.

- **Space Saving:** Compact design allows integration in data centers or edge locations . By carefully selecting the splitter type, ratio, and deployment architecture, network operators can expand broadband capacity efficiently while maintaining signal quality and minimizing costs.

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