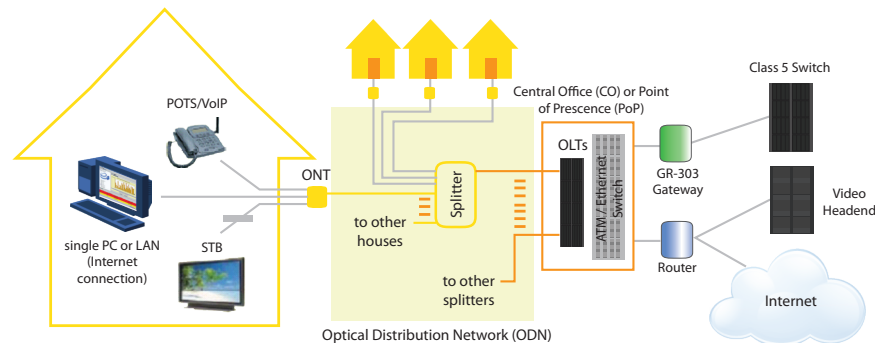


Dynamic fiber connectivity enables a more efficient optical protection network architecture. It reduces the amount of protection circuits while it increases the availability. The result is significant CAPEX savings and improved SLA success rate.

Passive Optical Network (PON) Architectures

PON architectures consists of the following equipment:

- An Optical Line Termination (OLT) located in a Central Office (CO) and controls the bidirectional flow of information across the network
- An Optical Network Termination (ONT) located directly at the customer premises
 - The ONT provides an optical connection to the local customer equipment
- An Optical Distribution Network (ODN) that consists of optical cables and passive splitters



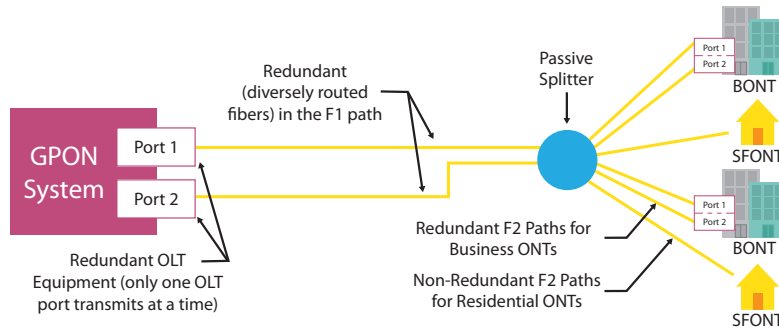
A PON usually provides an unprotected economical fiber drop to homes for residential services. On the other hand, businesses require redundancy for high reliability, and they are willing to pay a premium for their service. However, there is a trade-off between the OLT cost of protection and the level of service reliability.

PON Costly Protection Schemes

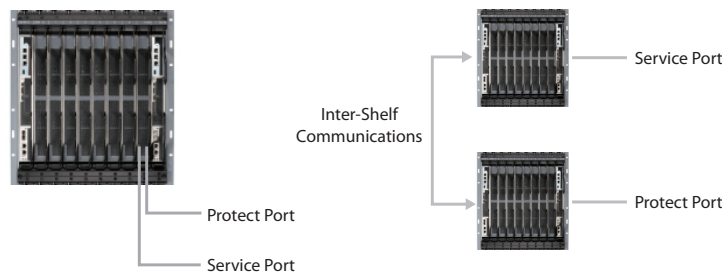
There are five basic elements that can be protected within the PON infrastructure:

- The OLT PON Port
- The F1 Facility (from the CO to the splitter)
- The Passive Optical Splitter
- The F2 Facility (from the splitter to the customer premises)
- The ONT PON Port

The global standard for PON protection schemes are referred to as Types A, B, C, and D. The vast majority of OLT equipment redundancy consists of industry standard Type B protection. Type B protection duplicates the shared part of the PON, that is, the Fiber Feeder and optical interface ports at the OLT. In the following diagram (which is the Type B method), both the OLT ports and the F1 facilities are protected. The splitter is a 2xn splitter, meaning that it has two ports on the network side and n ports on the access side. Each of the OLT ports is redundant, but only one of them can transmit at a time.



Actual equipment deployments of Type B protection yield the following OLT equipment configurations:

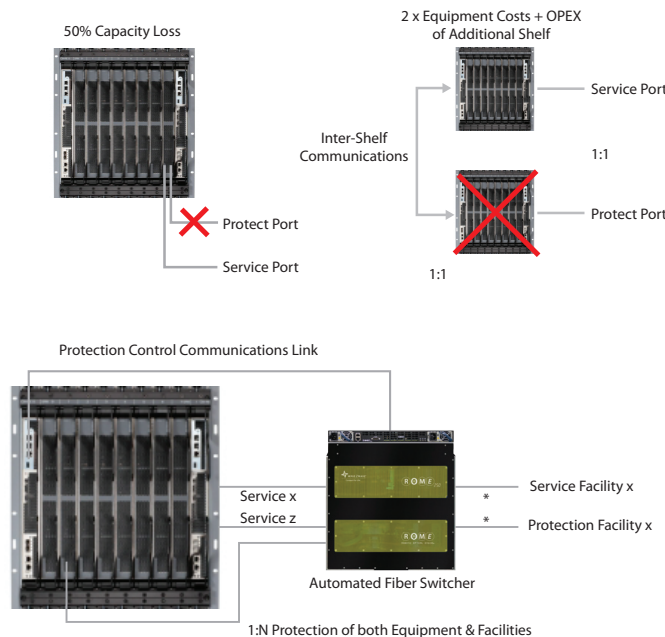


Vendor OLT Protection Designs

Making Automated Optical Switches Part of The PON Ecosystem

Both above implementation options waste 50% of the in-service deployed OLT equipment, and increase OPEX expenses of provisioning and protection. Since economical tradeoffs are critical in large scale Telco networks, improving reliability performance by duplication of OLTs and ports as typically done is considered extremely expensive.

The only PON ecosystem component that can alleviate this duplication expense is an Automated Optical Switch as shown below:



With automated fiber switching, service providers can minimize network outages and restore service more quickly when they occur. In addition, this architecture reduces OPEX via a reduction in truck rolls and technician labor by automating fiber management. Physical fiber connections can be performed remotely by network operations staff. This approach also enables Telcos to remotely configure connections without risky manual patching, and without exposing high usage connections to human error. Remote access to the physical layer network characterization testing, troubleshooting, and fault work-arounds can be centralized at the Network Operations Center (NOC).

The many benefits of automated fiber switching as an integral PON ecosystem component include:

- Faster time to revenue
- Reduced provisioning times
- Increased customer satisfaction
- Fewer truck rolls, leading to direct labor savings
- Remote testing and troubleshooting
- Sharing of centrally located test equipment
- Minimized downtime and fewer outages
- Efficient use of capex and central office space
- Cost-effective open network access
- Accurate record keeping

The only effective way to manage PON costs is to minimize equipment and labor requirements. Specifically, it is imperative to minimize the need for duplicate OLT equipment and technicians being deployed into the field to manually provision, test, maintain and troubleshoot PONs. Since optical access networks typically have a 20-year depreciation life, automated fiber switches should be a key ecosystem component in the Telco arsenal to address PON economics and ongoing operations concerns.