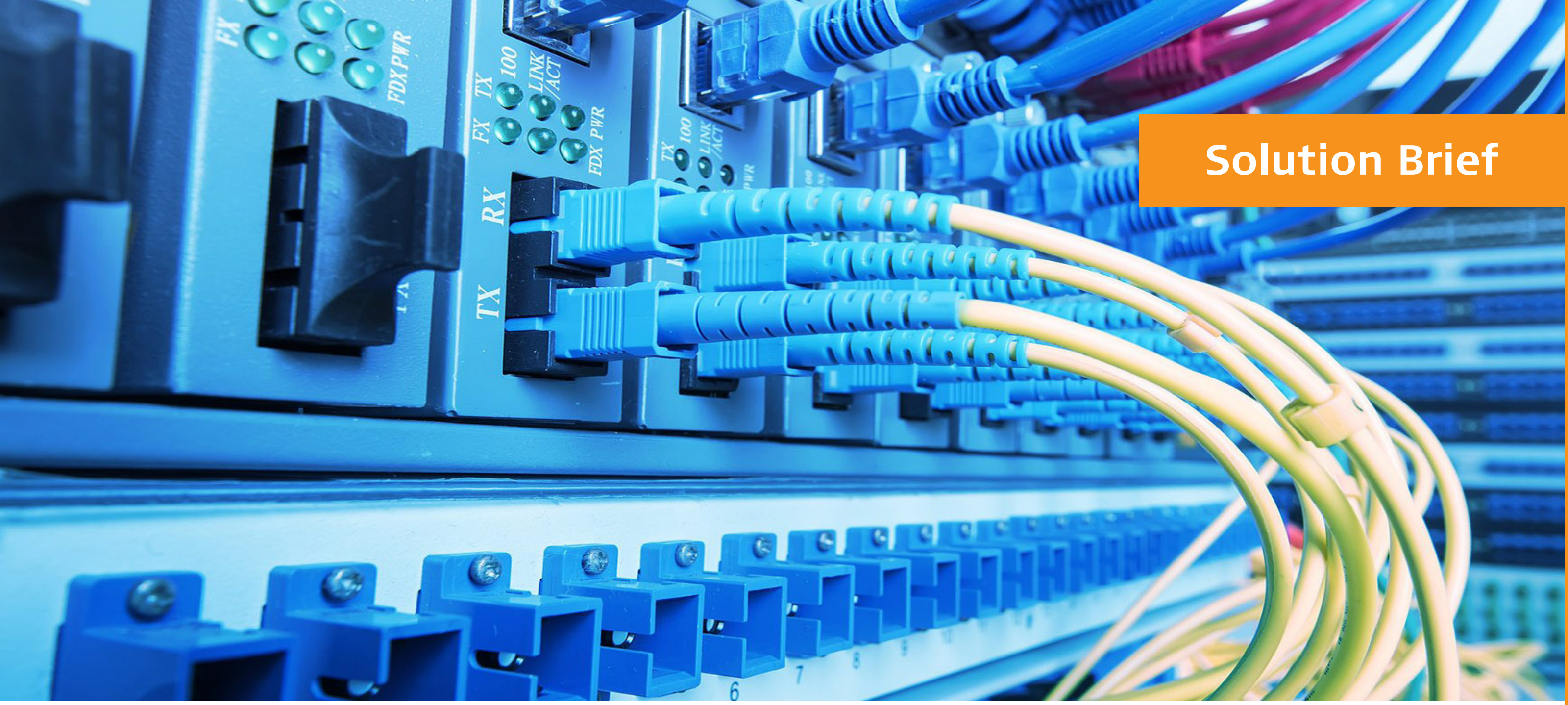

Solution Brief

Turning Dual to Single Fiber for 50% Fiber Savings

Challenge: How to optimize an existing network and serve more customers without trenching more fiber, deploying tech teams, or complex field replacement. The current setup is to deploy standard dual fiber optical transceivers to serve a larger audience. Could BiDi be the answer?

Almost all modern optical transceivers utilize two fibers to transmit data between switches, firewalls, servers, routers, etc. The first fiber is dedicated to receiving data from network equipment and the second fiber is transmitting data to it.

Solution: However, transceivers can now both transmit and receive data to and from interconnected equipment through a single optical fiber. This technology has led to the development of bi-directional transceivers, or BiDi transceivers for short.

Service providers, fiber owners, and primary users can effectively double the capacity of their fiber infrastructure without the need for SFP replacement.

The benefit of BiDi is that it uses passive optical technology to redirect the light of two sources RX and TX into a single strand. In addition, BiDi is compatible with any SFP, 1G/10G/25G/40G/100G/400G rates.

RAD

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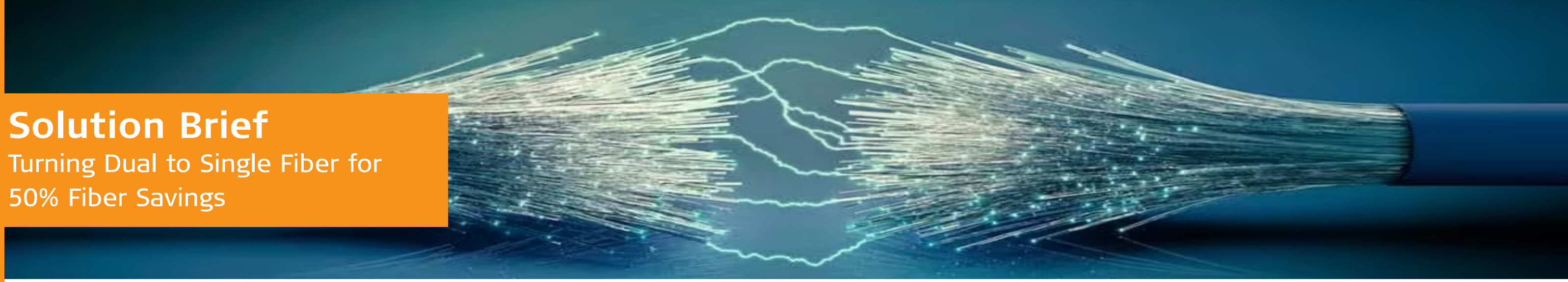


What is a BiDi transceiver?

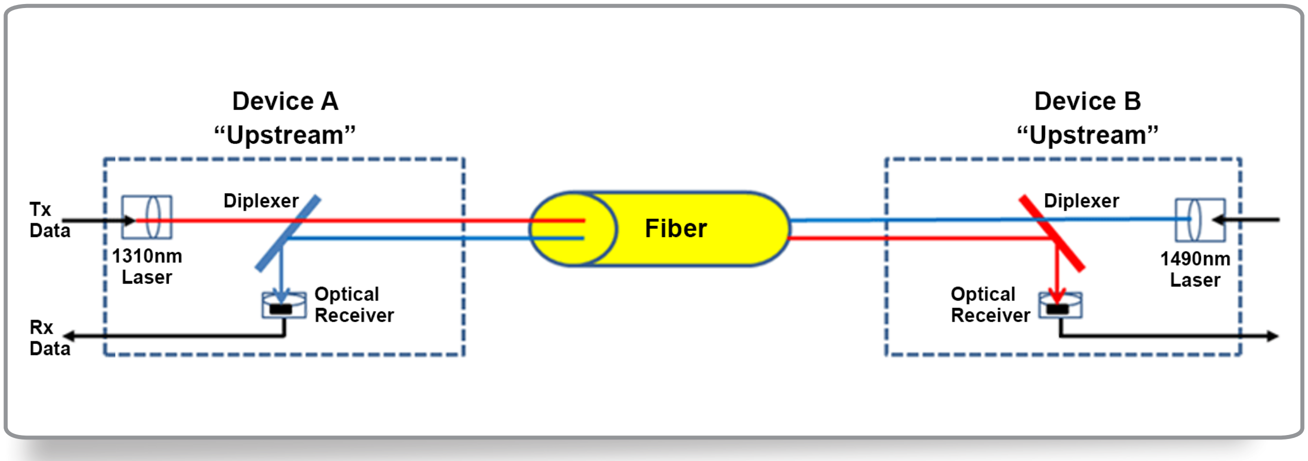
The main difference between BiDi transceivers and traditional two-fiber transceivers is that the former are fitted with wavelength division multiplexing (WDM) couplers, also known as diplexers. They combine and separate data transmitted over a single fiber based on light wavelengths. For this reason, BiDi transceivers are also referred to as WDM transceivers.

To work effectively, BiDi transceivers must be deployed in matched pairs, with their diplexers tuned to match the expected wavelength of the intended transmitter and receiver.

For example: If paired BiDi transceivers are being used to connect Device A (upstream) and Device B (downstream), as shown in the figure below, then:

Transceiver A's diplexer must have a receiving wavelength of 1490nm and a transmit wavelength of 1310nm.

Transceiver B's diplexer must have a receiving wavelength of 1310nm and a transmit wavelength of 1490nm.



Matched Pair of BiDi Transceivers

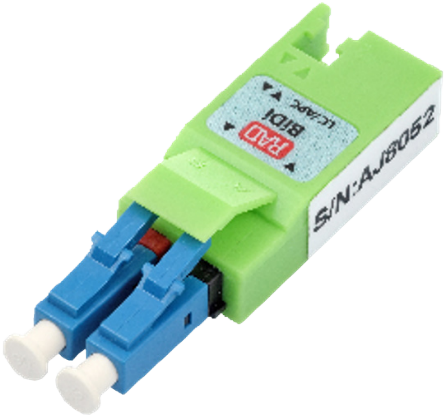
RAD’s Patented BiDi QSFP Adaptor and How It Works

The advantage of utilizing BiDi transceivers, such as SFP+ BiDi and SFP-BiDi transceivers, is the reduced fiber cabling costs, achieved by reducing the number of fiber patch panel ports, the amount of tray space dedicated to fiber management, and the required fiber cables.

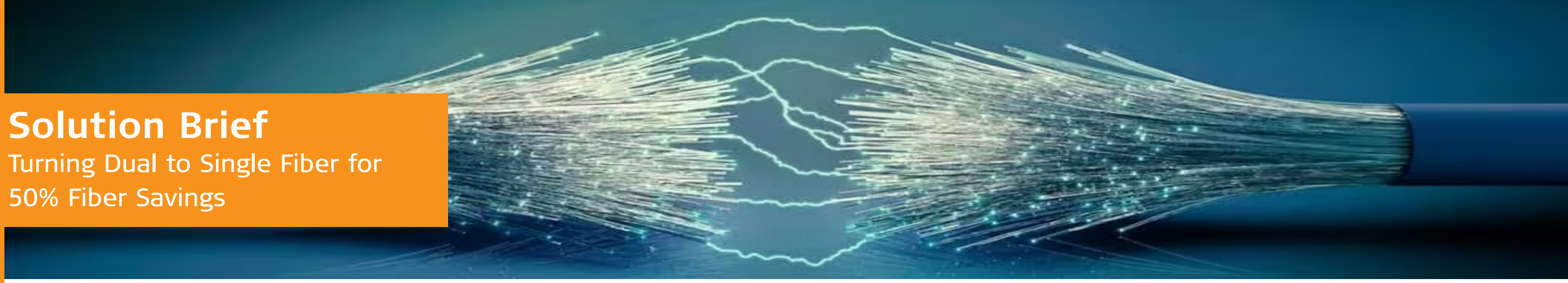
BiDi transceivers might be more expensive than traditional two-fiber transceivers, however they utilize half the amount of fiber per unit of distance. For many networks, the cost savings of utilizing less fiber is enough to more than offset the higher price of BiDi transceivers.

Most optical transceivers installed today are “traditional” two-fiber types. Therefore, replacing them with BiDi transceivers demands time and possible re-configuration and might cause interoperability issues.

With this issue in mind, and to make the transition from dual-fiber optical transceivers to single fiber easier, RAD had developed the patented BiDi QSFP adaptor.



RAD’s BiDi QSFP adaptor is a passive, small-factor dual to single fiber adapter that can be plugged into existing SFPs, providing immediate savings for 1G, 10G, 100G, and 200G fiber infrastructure. There is no need to replace the installed SFP and or encounter interoperability issues. For 1G and 10G SFPs the utilization of RAD’s BiDi QSFP adapter delivers performance with no range degradations, up to 80 km (50 Mi) for 1G and up to 40 km (25 Mi) for 10G. For 100G QSFPs, RAD’s BiDi is effective up to 25 km (15.5 Mi).



Solution Brief

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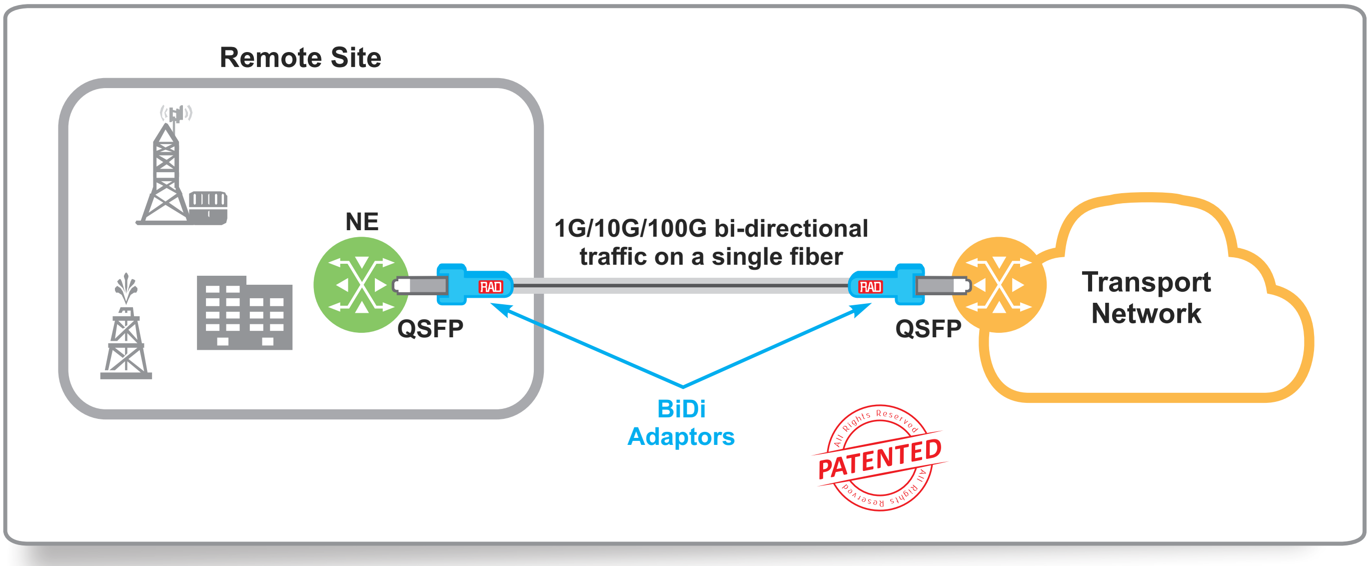

The benefits for service providers are twofold

Network Link Capacity Expansion: When network operators build transmission networks, the scale of optical cables is deployed according to expected business volume and fiber core ratio. However, with the continuously increasing number of fiber users in recent years, there is a gradual shortage of optical cable core resources. Reconstructing new optical fibers would require a long construction cycle and prohibitive costs. This can be effectively solved by reducing the number of fibers per customer, realizing the rapid improvement in network link capacity and saving the cost of network construction in the meantime.

Enhanced Network Link Maintenance: If a fiber fails in a dual fiber by using BiDi it can work in a single fiber link, reducing the downtime to replace the cable that contains many fibers and effecting customers.

BiDi's Versatility: The device is passive and therefore BiDi is agnostic to the actual data rate that can starting from 10GB and going up to 400GB.

To learn more about RAD's BiDi QSFP adaptor, read here.

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