SIEMON™

40G to 400G Optical Transceiver Breakout Links

Tech Brief

Reading Time: 5 minutes

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This tech brief will highlight how to breakout signals from 40G to 400G optical transceivers or optics. A breakout link is also known as an aggregation link. The two terms describe which way the optical signal is traveling in the channel. When connecting switch-to-switch, Ethernet spine-to-leaf switches or Fibre Channel director to edge switches, the connection is most often a direct connect. For instance, one Ethernet 100GBASE-SR4 optic to another 100GBASE-SR4 optic or one Fibre Channel 128GFC optic to another 128GFC optic. When cabling 400 Gigabit Ethernet (GE) or 256 Gigabit Fibre Channel (GFC) optics, the same basic components are used except singlemode fiber would most often be used instead of multimode fiber. When connecting the leaf or edge switch to a server, the individual parallel optic port is broken out into four duplex optics or ports that operate at lower speeds: for example, (1) 100GE port into (4) 25GE ports. An example of these links is shown in Figure 1 below with connectivity beginning from a spine switch and ending at a server.

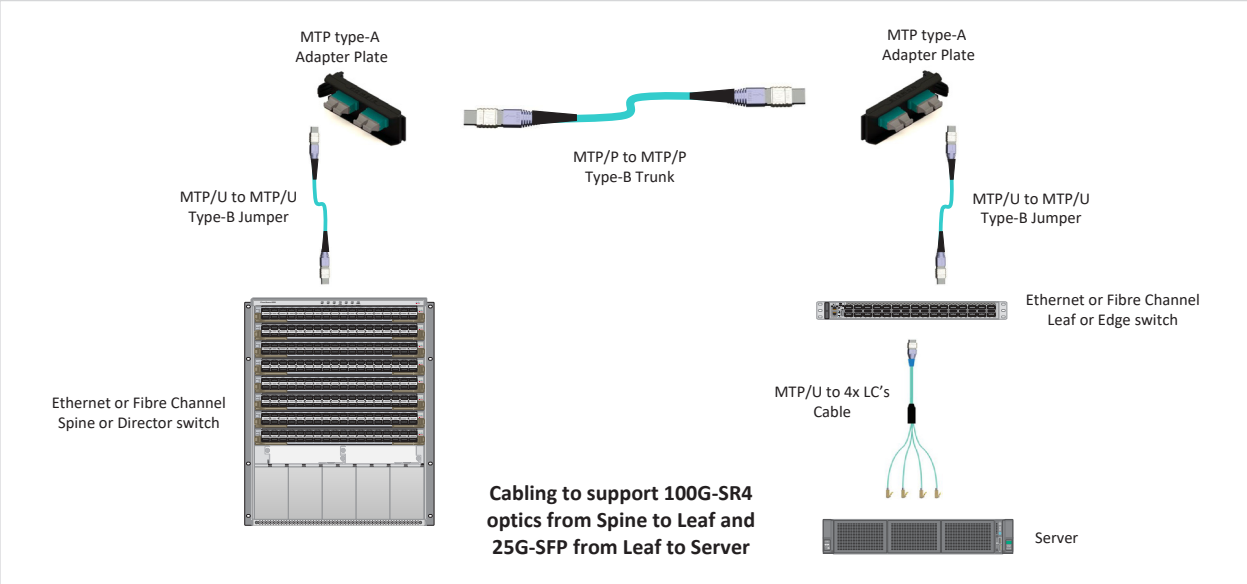


Figure 1: 100GBASE-SR4 Channel

The most common speed of the downlink to server today is 10GE with many new installs moving to 25GE or 32GFC. Also available are downlinks of 50GE and 64GFC. For Ethernet applications, 100GE to the server looks to be the upcoming target speed and can be accomplished via 200GE to 2x 100GE or 400GE to 4x 100GE. The leaf or edge switch to server connection is usually under 100 meters and can be connected with multimode fiber, specifically OM4, for these higher speed applications.

Data center operators are breaking out switch ports to reduce per port expense. For example, a 32-port Ethernet switch with 40GE QSFP28's that can breakout to support 128 ports at 10GE SFP's vs a traditional Top of Rack (ToR) switch with 48 ports of 10GE for downlinks. Breaking out the 40GE ports reduces the cost on a per port basis. This principle works the same for 100GE breaking out into four 25GE ports or 400GE into four 100GE ports as shown in Figure 2.

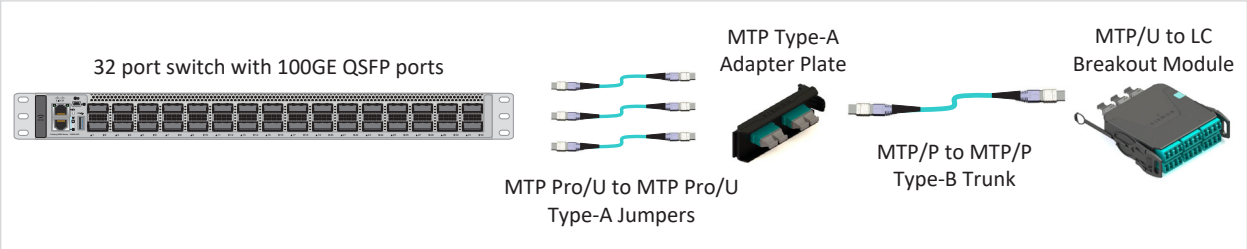


Figure 2: 32-port 100GE Switch Breakout

There are three common breakout links used in the data center space. The first is MTP-to-LC equipment cords; the second is a MTP-to-MTP jumper to a MTP-to-LC breakout module; and the third is a MTP-to-MTP jumper to a MTP adapter plate to a MTP-to-MTP trunk to a MTP-to-LC breakout module. The three different links are used depending on how far apart the switch is to the server.

The first of the three common breakout links would be in-cabinet with the switch mounted in the top or middle of the rack. With this type of layout, a breakout cable can be used to make the connection as shown in Figure 3. The MTP is connected to the parallel optic port in the switch and the four LC ends of the equipment cord plug into four different server duplex optics. This option has challenges with the lengths of the LC legs or ends. If the four LC ends are all the same length some of the lengths will be longer than needed and that cabling needs to be routed and managed properly. This configuration becomes more difficult to manage as the server density of the rack increases.

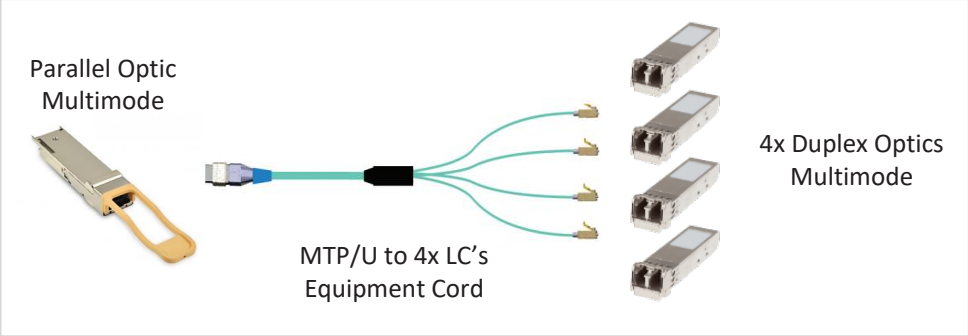
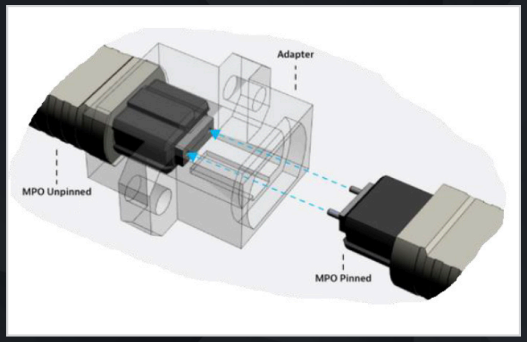


Figure 3:
MTP/F-to-LC Hybrid Equipment Cord

GENDER

A key factor to consider is the design of the MTP connector. Siemon uses an MTP connector which is a high performance MPO style connector. The MTP connector has two available gender options: with alignment pins (pinned) or without alignment pins (unpinned). As two MTP connectors are mated, one connector needs the alignment pins to ensure proper alignment of the fibers together. Note that all transceivers have alignment pins, so require the use of unpinned jumpers. Graphic 1 demonstrates the two options as pinned with an M and unpinned with an F after the MTP designation.



Graphic 1: MTP Gender Type

The second link can be used in the same scenario as the first but another option for in-cabinet is to replace the MTP-to-LC equipment cord with a Type-B MTP to MTP jumper and a MTP-to-LC breakout module into the link as shown in Figure 4. This design helps relieve congestion in the rack by using appropriate length LC jumpers into each needed server port. The MTP-to-LC module is mounted into an enclosure to help store and route the fiber in higher density applications. Besides being an in-cabinet connection, this configuration can also be used for in-row designs. This type of design has the switches mounted in End of Row (EoR) or Middle of Row (MoR) racks and the switch ports are replicated in the MTP-to-LC module that's mounted in an enclosure.

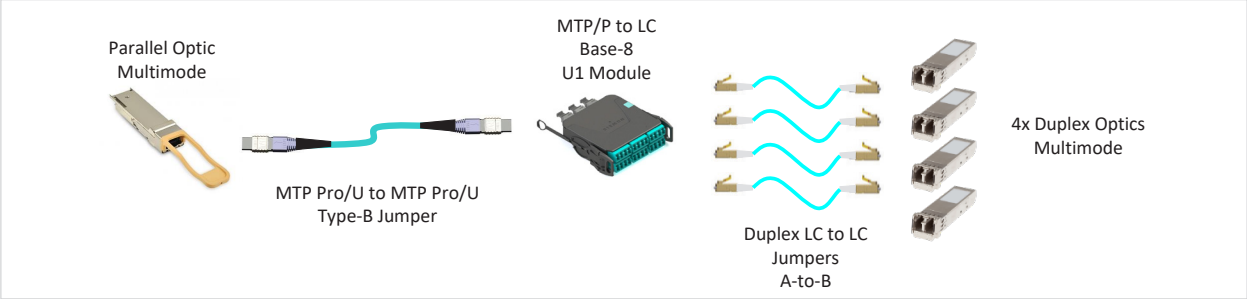


Figure 4: MTP/M-to-LC Breakout Module

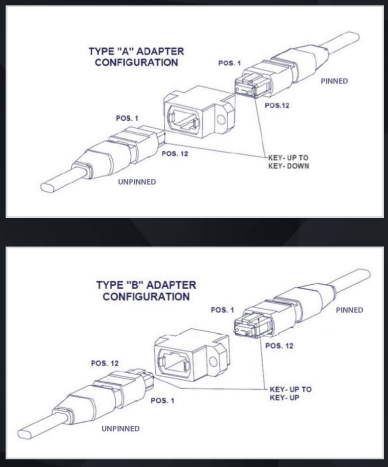
The third option is for longer distances where a link uses a Type-B MTP-to-MTP jumper into a Type-A MTP adapter plate along with a Type-B MTP-to-MTP trunk into the backside of a MTP-to-LC breakout module as shown in Figure 5. In this scenario, an enclosure with MTP adapter plates is mounted above the spine or director switch. A MTP-to-MTP jumper plugs into the parallel optic in the switch and then in the front of the MTP adapter. The MTP-to-MTP trunk is plugged into the rear of the MTP adapter plate to where the spine or director switch ports are needed on the data center floor. If the distance is greater than 100 meters, it is recommended to switch from multimode to singlemode fiber as singlemode fiber can carry the signal for a longer distance.

ADAPTER POLARITY

MTP adapters are available with two polarity options: Type-A and Type-B (see Graphic 2). The MTP connector has a key molded into the body that ensures the connector plugs into the MTP adapter in the proper orientation. Type-A adapters are key up on one side and key down on the other side—also known as opposed. Type-A adapters are used for Method A, C and U1 polarity channels. Type-B adapters are key up to key up on both sides—also known as aligned. Siemon Type-B adapters are not compatible with singlemode fiber links because of the angled connector end face on singlemode MTP connectors.

MTP® PRO

The MTP is also available as an MTP PRO connector. The advantages of the MTP PRO connector are that the alignment pins can be added or removed, and the key can be moved to change the polarity of the MTP-to-MTP cable from a Type-B to a Type-A and vice versa. The ability to change the polarity from Type-B (flipped with Fiber 1 to Fiber 12) to Type-A (straight with Fiber 1 to Fiber 12) can turn the MTP-to-MTP cable from a direct connect from optic to optic into an extender cable to properly manage the optical signals. All Siemon MTP-to-MTP jumpers feature MTP PRO connectors, and they are an option on MTP-to-MTP trunks.



Graphic 2: MTP Adapter Types

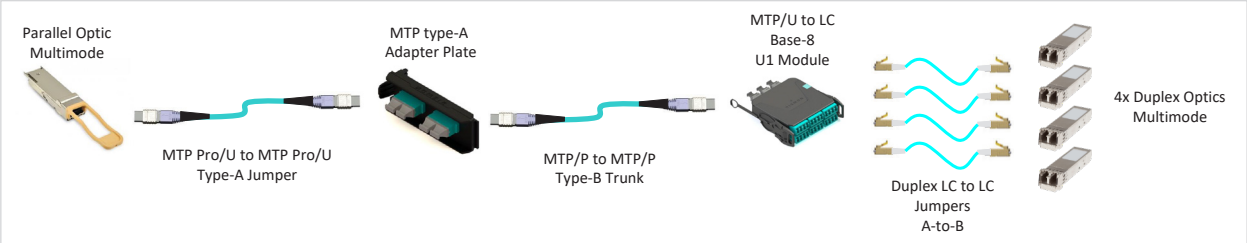


Figure 5: MTP Adapter and MTP-to-LC Breakout Module

The new Siemon LightVerse™ MTP-to-LC U1 breakout module is designed and built to support direct connection links to support duplex optics, migrate to parallel optics and breakout parallel optics into duplex optics. With duplex optical links, the same module is used on each end of the MTP-to-MTP trunk as shown in Figure 6. If this configured link would need to transition to a parallel breakout to duplex design, simply remove one of the MTP-to-LC modules and insert a MTP adapter plate in its place as shown in Figure 5.

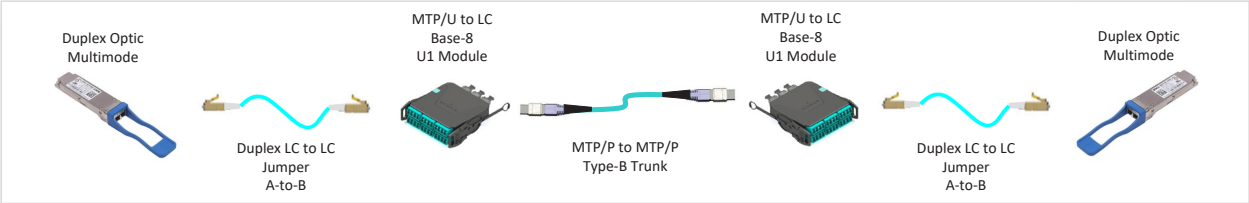


Figure 6: Duplex LC to Duplex LC Link

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