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Will Ethernet Fiber-Optic Transceivers Influence the Choice of Fiber-Optic Connectors Again?

Very Small Form Factor (VSFF) connectors - a closer look

Contents

What happened?

With the definition of 400 Gigabit Ethernet (GbE) by the IEEE, two new fiber-optic transceiver types have been defined to provide the 400 Gb bandwidth to switches:

• QSFP-DD (Quad Small Formfactor Pluggable—Double Density) and

• OSFP (Octal Small Formfactor Pluggable)

The industry associations defining the hardware specifications for these transceivers (qsfp-dd.com resp. osfpmsa.org) have included so-called very small form factor (VSFF) connectors in their list of optical interface options.

There are three VSFF connectors defined in the transceiver hardware specifications:

• The CS connector

• The SN connector

• The MDC connector

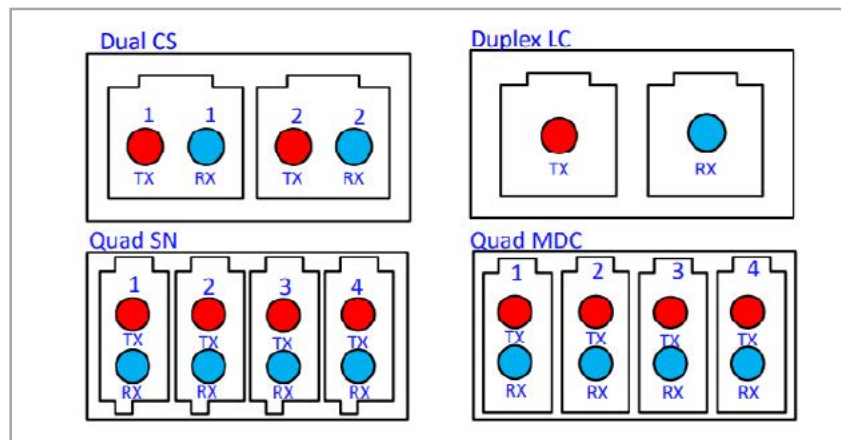Here is an excerpt from the QSFP-DD specification, showing the interfaces.

Figure 1: Two fiber connector options for QSFP-DD transceivers

All three VSFF connectors are based on the 1.25 mm ferrule technology used in the LC connectors for over 20 years.
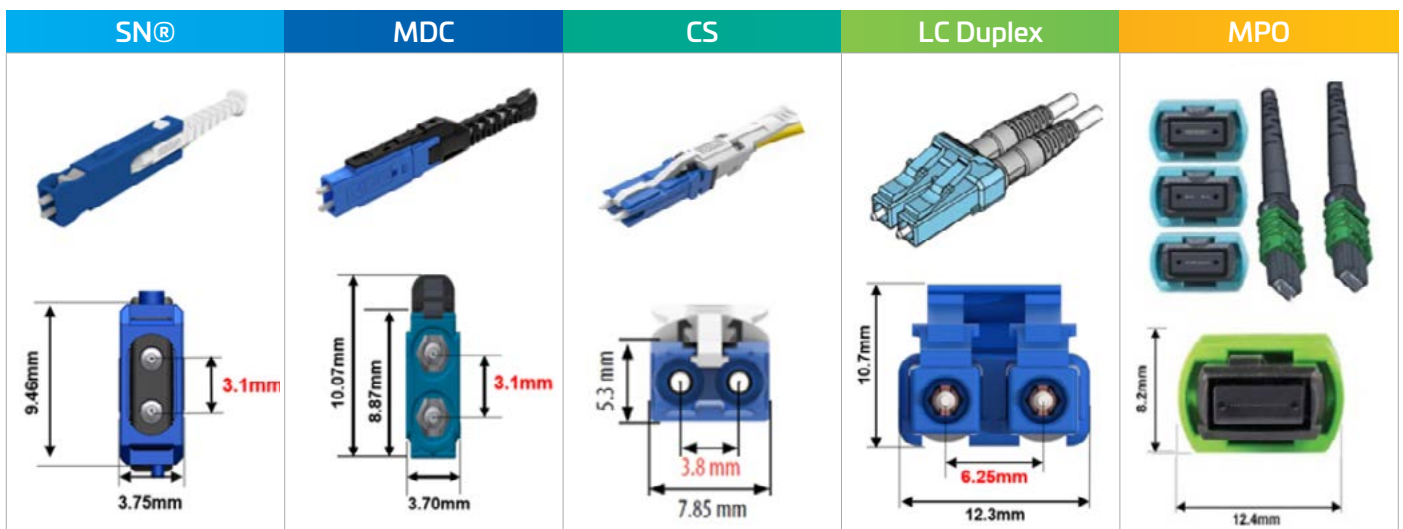

Figure 2: Size comparison: VSFF connectors vs. LC and MPO

It's been a while since a new generation of fiber-optic connectors has been released into the industry. Hence, the VSFF connectors are getting quite some attention in the marketplace for several reasons. Let's have a closer look at the use cases for these new connectors.

Use cases for VSFF connectors

One advantage of using a VSFF transceiver interface is the direct access to the SerDes (lane) speed of the switch, at the transceiver interface, without having to use breakout cabling or conversion modules.

Let's evaluate the access options with the following example using the Arista 400 Gb/s transceiver OSFP-400G-XDR4. This transceiver uses parallel transmission of 4 x 100 Gb lanes to form the 400 Gb application. The transceiver is available with two interface options: MPO and SN.

Figure 3 shows the MPO version of the transceiver, using eight fibers with an MPO connector (two fibers per lane, with each lane at 100 Gb). To access a lane speed of 100 Gb in this example, the cabling-based options are either a breakout cable assembly (disadvantage: complex cable management and routing) or an MPO cord to a breakout module (advantage: more flexible and a trusted structured approach).
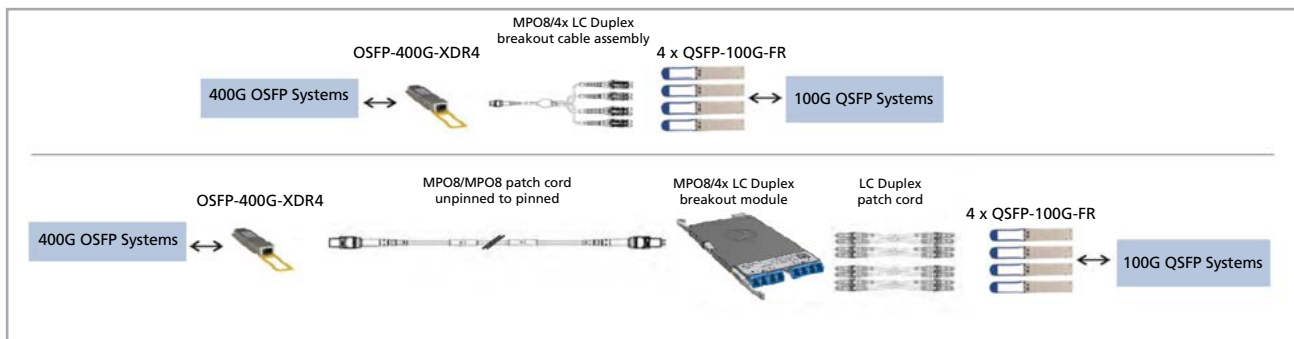

Figure 3: Breakout options with cabling

The VSFF version of this transceiver (OSFP-400G-XDR4-S with the SN connector) allows an individual pair of fibers to access the 100 Gb lanes directly at the transceiver. See Figure 4.

OFC 2022 Arista Demo

Figure 4: Breakout directly at the Arista transceiver with SN connectors

It is up to the the reader to decide whether the direct access to the lane speed of a switch justifies the use of a third connector in a data center cabling system (MPO and LC Duplex are there anyway).

A second advantage of the VSFF connectors appears when they are used in the structured fiber cabling system in a data center. Because of their size, the density per RU in a patch panel can be at least doubled when compared to an LC Duplex connector. This offers advantages in both new and existing installations.

In new installations, the higher VSFF density per RU reduces the number of RUs used for cabling. This space can be used for additional active equipment.

SN vs. LC-Duplex -> Double Density

144 x SN / 1U

8 x SN Cassette

72 x LC Duplex / 1U

4 x LC Duplex Cassette

1728 fibers SN

1728 fibers LC Duplex

In existing installations with LC Duplex, the change to a VSFF connector doubles the port density—resulting in less interruptive re-work caused by additional patch panel installations in case of higher port needs.
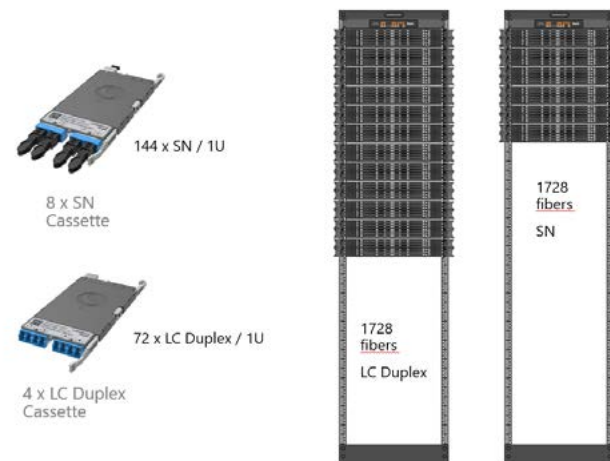
Will history repeat itself?

Around the turn of the millennium, several transceiver manufacturers chose a new small form factor (SFF) fiber connector, called MT-RJ, as their transceiver interface.

Without being defined by any international cabling standard, the MT-RJ had some success, and some customers selected this connector as an interface of their structured cabling system in data centers and for the office cabling. The customers obviously liked the idea of having just one connector in their fiber systems for both switches and cabling, and therefore followed the transceiver offerings.

Those who remember the MT-RJ know how it ended. The rival of the MT-RJ at that time, the LC connector, eventually won the SFF connector battle by being chosen by the international standard ISO/IEC 11801 as the fiber connector for structured cabling systems back in 2002, replacing the SC connector. As a result, the MT-RJ disappeared over time and is virtually non-existent in fiber cabling systems today.

When trying to project the past into today, it appears that the three VSFF connectors (and together with them, their potential customers) are in the same situation and trying to answer the same question: What is the best fiber connector choice for my cabling system?

No matter which VSFF is chosen, there are risks that have to be assessed:

• Will the cabling standards standardize VSFF connectors? If yes, which one(s)?

• What happens if my choice hasn't been selected by the cabling standard?

Caveat emptor, an attempt to answer:

Standardized connectors are sold in higher volumes, resulting in lower pricing. Hence, a customer gains some financial advantages when selecting the market-leading VSFF connector(s). The required cable assemblies for less common connectors within the cabling system will most likely be available, but at a higher price than the ones with a standardized connector.

It all comes down to commercial aspects, not technical ones. There must be a reason when a data center owner considers a VSFF connector. In this case, the important question is,

"Does the use of a VSFF connector provide recognizable value to the data center operator?"

Eliminating the risk: CommScope's Propel™

CommScope's Propel solution is a new end-to-end, high-speed, modular fiber platform for data centers. The Propel solution is the first global fiber platform to incorporate native 16-fiber technology while supporting 8-, 12- and 24-fiber applications. Additionally, it supports VSFF connectors in its distribution modules.

With its modular platform design, Propel offers all the advantages of using VSFF connectors today while eliminating the risks by preventing vendor lock-ins on the connector front. The Propel concept allows the integration of many connectors, including VSFF connectors, in the same platform. This provides a future-proof and flexible cabling design.

The Propel platform is also designed to be a greener, more sustainable solution. Find out more about the **Propel solution.**

Figure 5: Propel distribution module MPO8 to 4 x SNs

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