Introducing 400G

While many data centers are still transitioning to 100G networks, the first components of the next generation, 400G, have already been developed.

The demand for higher speeds is fueled by the constant growth of data traffic. Cloud Hyperscalers, IoT, and 4K streaming are among the applications driving the need for faster connectivity. In response to this need for change Arista and Cisco were among the first companies to announce their 400G product lines in early 2019. With the introduction of 400G switches, the need for transceivers supporting 400G connections also arose. 400G transceivers, based on the IEEE802.3bs standards were developed in order to provide reliable, high-speed connections.

An important aspect of 400G technology is the energy consumption. The per bit energy consumption of 400G transceivers is lower than that of its predecessors. An additional feature to achieve a lower energy consumption is the support for Energy Efficient Ethernet (EEE). This feature allows to reduce and stop power consumption during periods of low data activity.

400G transceivers (QSFP-DD) as well as cables have been developed and are available for purchase. DAC cables (including breakout cables) and a variety of Fiber Optic cables can be used to establish the connection that warrantees the quality needed.

The following table shows the most common specifications defined in the 400G 802.3bs.

Specification	Fiber type	# of wavelengths	Fibers per connector	Connector type	Gbits per lane	Supported Distance *
400G Base FR-8	SM	8	2	LC duplex	50	100m
400G Base FR-4	SM	4	2	LC duplex	100	2km
400G Base LR-8	SM	8	2	LC duplex	50	10km
400G Base DR4	SM	1	8	MPO12 (8)	100	500m
400G Base SR-8	MM	1	16	MPO16/MPO24	50	100m
400G Base-SR4.2	MM	2	8	MPO12 (8)	50	100m
400G BD4.2	MM	2	8	MPO12 (8)	50	100m
400G Base SR-16	MM	1	32	MPO 2x16	25	100m

Depending on the grade of the cable (e.g. OM3 distance will have a shorter than OM4 distance).

In addition to the QSFP-DD, the OSFP (Octal Small Form Factor Pluggable) and CFP8 ("C" Form Pluggable-8) are transceiver types available to transfer data at 400G speeds. However, both the OSFP and CFP8 have a higher power consumption and limited or no backward compatibility. For these reasons QSFP-DD will likely be the most used 400G capable transceiver.

	QSFP56-DD	OSFP	CFP8
Power Consumption	Max 12W	Max 15W	Max 24W
Backward Compatibility with QSFP+, QSFP28 and QSFP56	Yes	With the use of an adapter	No
Thermal Management	Indirect	Direct	Indirect