

Key Features

- Deployment flexibility with 800G (dual 400G), 400G, 100G, 50G, 40G, 25G, 10G or 1G modules.
- Hot swappable to maximize uptime and simplify serviceability
- Data rates from 1GbE to 25GbE supported using the SFP form factor, for the smallest, and lowest power solutions
- SFP+ Optical interoperability with 10GbE XFP, X2 and XENPAK pluggable form factors
- QSFP+ Universal transceiver for 40G operations over duplex multi-mode and single-mode fiber. Interoperable with IEEE 40GbE LR4 and LRL4 for easier migrations from 10G to 40G and to single mode fiber
- 100G QSFP pluggable transceivers and cables for high density 100G deployments. Optical interoperability with 100GbE CFP, CFP2 and CPAK
- Parallel QSFP transceivers for both multi-mode and single-mode enable flexible 4x25G and 4x10G options for gradual migration from 10G to 40G and 25G to 100G connectivity
- 100G SFP-DD and DSFP cables for cost effective NIC connectivity
- 200G QSFP optics, AOCs and cables for simple upgrade from 100G
- A Broad range of 400GE optics, AOCs and cables, in both OSFP and QSFP-DD form-factors
- 400G-ZR optics, with pluggable line-system for simple, cost effective DCI
- Flexibility of media and interface choice on a port-by-port basis
- Support for tunable 10G and 400G DWDM for DCI and long-haul optical fiber networks

Overview

Arista's Optical Modules and Cable portfolio offer a wide variety of high-density and low-power 800G (dual 400G), 400G, 200G, 100G, 50G, 40G, 25G, 10G, 1G, and 100M Ethernet connectivity options over fiber or copper.

To accommodate an increasing spectrum of applications, Arista offers a wide choice of OSFP, QSFP-DD, QSFP, SFP, SFP-DD and DSFP transceivers and cables that comply with industry standards, offering a broad range of connectivity options. Each module is optimized for different media and reach (ranging from 0.5 meters to 80 kilometers).

All interface speeds, from 1G to 400GE have connectivity options that include Direct Attach copper Cables (DACs), Active Optical Cables (AOCs), multi-mode fiber and single-mode fiber transceivers.

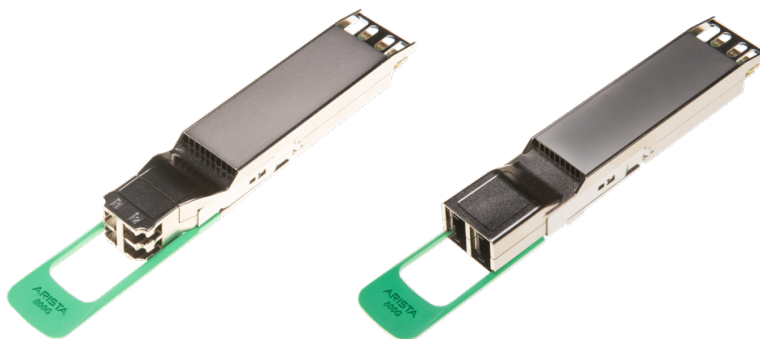


800G OSFP Options

PHY Type	Reach
800GBASE-CR8 / 2x 400GBASE-CR4	Twin-ax passive copper cables with link lengths of 1m - 2m.
800GBASE-AOC / 2x 400GBASE-AOC	Active Optical Cable with link lengths of 1m to 30m pre-terminated
2x 400GBASE-XDR4	Dual 400G optics, up to 2km over parallel single-mode fiber (optical interoperability with 4 x 100GBASE-FR up to 2km)
2x 400GBASE-PLR4	Dual 400G optics, up to 10km over parallel single-mode fiber (optical interoperability with 4 x 100GBASE-LR up to 10km)
2x 400GBASE-FR4	Dual 400G optics, up to 2km over single-mode fiber
2x 400GBASE-LR4	Dual 400G optics, up to 10km over single-mode fiber

800G QSFP-DD Options

PHY Type	Reach
800GBASE-CR8 / 2x 400GBASE-CR4	Twin-ax passive copper cables with link lengths of 1m - 2m.
800GBASE-AOC / 2x 400GBASE-AOC	Active Optical Cable with link lengths of 1m to 30m pre-terminated
2x 400GBASE-XDR4	Dual 400G optics, up to 2km over parallel single-mode fiber (optical interoperability with 4 x 100GBASE-FR up to 2km)
2x 400GBASE-PLR4	Dual 400G optics, up to 10km over parallel single-mode fiber (optical interoperability with 4 x 100GBASE-LR up to 10km)
2x 400GBASE-FR4	Dual 400G optics, up to 2km over single-mode fiber
2x 400GBASE-LR4	Dual 400G optics, up to 10km over single-mode fiber



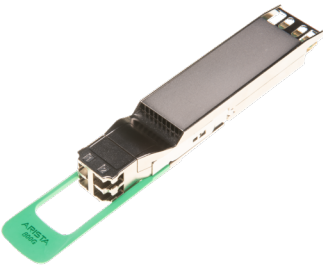
800G (Dual 400G) OSFP and QSFP-DD Optics (OSFP models shown above)

800G Cable Specifications

PHY Type	Connector Type	Wavelength (nm)	Cable Type	Max Reach
800GBASE-CR8 / 2x 400GBASE-CR8	OSFP to OSFP	–	Twinax Copper	1, 2m
	QSFP-DD to QSFP-DD	–	Twinax Copper	1, 2m
800GBASE-AOC / 2x 400GBASE-AOC	OSFP to OSFP	–	–	1m to 30m
	QSFP-DD to QSFP-DD			

800G Optical Specifications

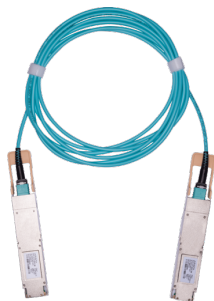
PHY Type	Connector Type	Wave-length (nm)	Cable Type	Core Size (um)	Modal Bandwidth (MHz*Km)	Tx power (dBm)	Rx power (dBm)	Max Reach
800GBASE-2FR4 (2x 400GBASE-FR4)	2x LC	1271, 1291 1311, 1331	SMF	G.652	–	-3.3 to +3.5 /lane	-7.3 to +3.5 / lane	2km
800GBASE-2LR4 2x 400GBASE-LR4	2x LC	1271, 1291 1311, 1331	SMF	G.652	–	-2.7 to +5.1 /lane	-9 to 5.1 /lane	10km
800GBASE-2XDR4 (2x 400GBASE-2XDR4)	2x MPO-12 APC	1310	SMF	G.652	–	-2.4 to +4.0 /lane	-6.4 to +4.5 /lane	2km
800GBASE-PLR4 (2x 400GBASE-2PLR4)	2x MPO-12 APC	1310	SMF	G.652	–	-1.4 to +4.0 /lane	-7.7 to +4.5 /lane	10km



800GBASE-2FR4 OSFP



800GBASE-2XDR4 OSFP



800GBASE-AOC OSFP



800GBASE-CR8 OSFP

Order Number	Product Description
800G OSFP Twinax Copper Cables	
C-O800-O800-1M	800GBASE-CR8 (2x 400GBASE-CR4) OSFP to OSFP Twinax Copper Cable 1 meter
C-O800-O800-2M	800GBASE-CR8 (2x 400GBASE-CR4) OSFP to OSFP Twinax Copper Cable 2 meter
800G OSFP Active Optical Cables	
A-O800-O800-1M	800G OSFP to OSFP Active Optical Cable, 1m
A-O800-O800-3M	800G OSFP to OSFP Active Optical Cable, 3m
A-O800-O800-5M	800G OSFP to OSFP Active Optical Cable, 5m
A-O800-O800-7M	800G OSFP to OSFP Active Optical Cable, 7m
A-O800-O800-10M	800G OSFP to OSFP Active Optical Cable, 10m
A-O800-O800-15M	800G OSFP to OSFP Active Optical Cable, 15m
A-O800-O800-20M	800G OSFP to OSFP Active Optical Cable, 20m
A-O800-O800-25M	800G OSFP to OSFP Active Optical Cable, 25m
A-O800-O800-30M	800G OSFP to OSFP Active Optical Cable, 30m
800G OSFP Optics	
OSFP-800G-2XDR4	8x 100GBASE-FR (or 2x 400G-XDR4) OSFP Transceiver, 2x MPO-12 APC connectors, up to 2km over parallel SMF
OSFP-800G-2PLR4	8x 100GBASE-LR (or 2x 400G-PLR4) OSFP Transceiver, 2x MPO-12 APC connectors up to 10km over parallel SMF
OSFP-800G-2FR4	2x 400GBASE-FR4 OSFP Transceiver, 2x duplex LC connectors, up to 2km over duplex SMF
OSFP-800G-2LR4	2x 400GBASE-LR4 OSFP Transceiver, 2x duplex LC connectors, up to 10km over duplex SMF

Order Number	Product Description
800G QSFP-DD Twinax Copper Cables	
C-D800-D800-1M	800GBASE-CR8 QSFP-DD to QSFP-DD Twinax Copper Cable 1 meter
C-D800-D800-2M	800GBASE-CR8 QSFP-DD to QSFP-DD Twinax Copper Cable 2 meter
800G QSFP-DD Active Optical Cables	
A-D800-D800-1M	800G QSFP-DD to QSFP-DD Active Optical Cable, 1m
A-D800-D800-3M	800G QSFP-DD to QSFP-DD Active Optical Cable, 3m
A-D800-D800-5M	800G QSFP-DD to QSFP-DD Active Optical Cable, 5m
A-D800-D800-7M	800G QSFP-DD to QSFP-DD Active Optical Cable, 7m
A-D800-D800-10M	800G QSFP-DD to QSFP-DD Active Optical Cable, 10m
A-D800-D800-15M	800G QSFP-DD to QSFP-DD Active Optical Cable, 15m
A-D800-D800-20M	800G QSFP-DD to QSFP-DD Active Optical Cable, 20m
A-D800-D800-25M	800G QSFP-DD to QSFP-DD Active Optical Cable, 25m
A-D800-D800-30M	800G QSFP-DD to QSFP-DD Active Optical Cable, 30m
800G Ethernet QSFP-DD Optics	
QDD-800G-2XDR4	8x 100GBASE-FR (or 2x 400G-XDR4) QSFP-DD Transceiver, 2x MPO-12 APC connectors, up to 2km over parallel SMF
QDD-800G-2PLR4	8x 100GBASE-LR (or 2x 800G-PLR4) QSFP-DD Transceiver, 2x MPO-12 APC connectors, up to 10km over parallel SMF
QDD-800G-2FR4	2x 400GBASE-FR4 QSFP-DD Transceiver, 2x duplex LC connectors, up to 2km over duplex SMF
QDD-800G-2LR4	2x 400GBASE-LR4 QSFP-DD Transceiver, 2x duplex LC connectors, up to 10km over duplex SMF

Standards Compliance & Certifications

EMC Emissions & Immunity	Subpart B, Part 15 FCC Class A, ICES-003 Issue 7 EN 55032:2015, BS EN 55032:2015, EN 55035:2017, EN 300 386 V2.1.1
Safety	EN 62368-1:2014 + A11:2017, IEC 62368-1:2014 21CFR-1040.10 LN#50, Laser Class 1 or 1M IEC 60825-1, Laser Class 1 or 1M EN 60825-1,
Certifications	CE South Korea KCC Australia RCM UKCA
European Union Directives	2014/35/EU Low Voltage Directive 2014/30/EU EMC Directive 2012/19/EU WEEE Directive 2011/65/EU RoHS 2015/863/EU Commission Delegated Directive

Warranty

Arista pluggables and cables include a one-year limited hardware warranty, which covers parts, repair, or replacement with a 10 business day turn-around after the unit is received.

Service and Support

Support services including next business day and 4-hour advance hardware replacement are available. For service depot locations, please see: <http://www.arista.com/en/service>

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Arista 800G Transceivers and Cables: Q&A

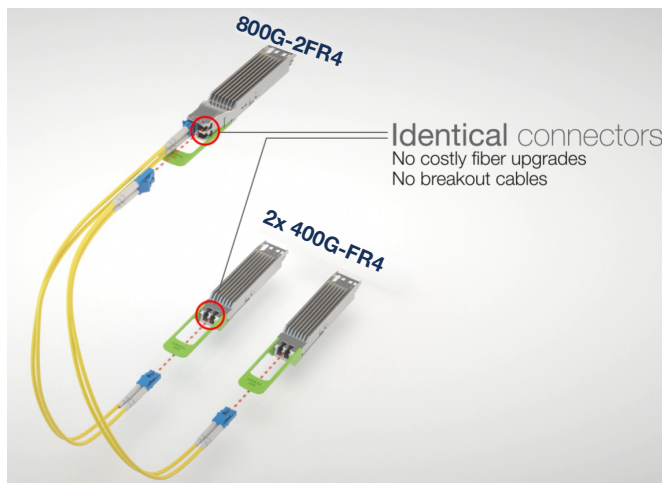
What are the benefits of moving to 800G technology?

Arista's 800G platforms allow data centers and high-performance computing environments to address growing needs for higher bandwidth at lower cost and power per gigabit. Key benefits include:

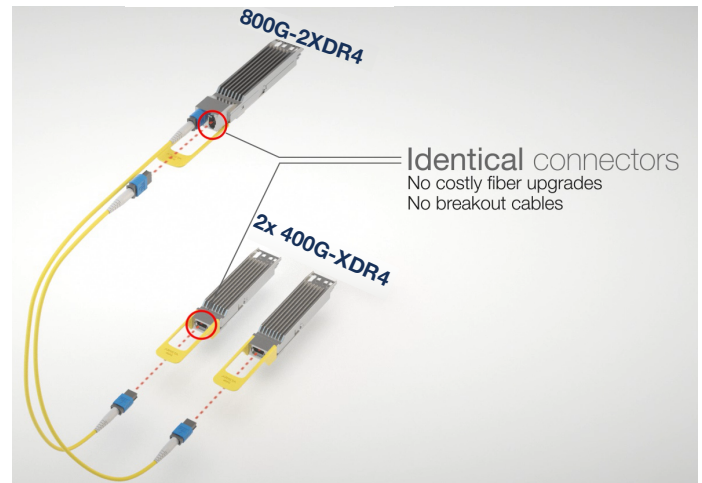
- Increase switching bandwidth by a factor of 2 when compared to 400G/port systems. Migrating from a 32x 400G/port to a 32x 800G/port system doubles the bandwidth density from 12.8T / RU to 25.6T / RU.
- Easy aggregation of 400G links: All 800G/port systems can be configured as 2x 400G, and all Arista 800G optics allow 2 physically distinct 400GE links without the need for optical breakout cables.
- High density 400G and ultra-high density 100G: A 32 port 1RU 800G system enables 64 ports of 400GE, or 256 ports of 100GE in a single RU. Arista offers 800G optics that enable 2x 400GE and 8x 100GE connectivity that interoperate with existing 400G and 100G optics.

Easy 800G to 2x 400GE Connectivity: No change to fiber plant

800G-2FR4 to 2x 400G-FR4



800G-2XDR4 to 2x 400G-XDR4



What form-factors are used for 800G optics and cables?

800G optics and cables use the same form-factors used by 400G optics, the OSFP and the QSFP-DD. Arista supports both form-factors, and Arista 800G platforms are offered in both OSFP and QSFP-DD variants.

- **The OSFP:** The OSFP stands for “Octal Small Form-factor Pluggable”. It is described as an “Octal” module because the electrical interface of an OSFP connector consists of 8 electrical lanes. When used for 800G, each electrical lane is modulated at 100Gb/s, for a total of bandwidth of 800Gb/s.
- **The QSFP-DD:** The QSFP-DD stands for “Quad Small Form-factor Pluggable (QSFP) – Double Density (DD)”. The QSFP-DD form factor is similar to the QSFP form factor, with an additional second row of electrical contacts to increase the number of high-speed electrical lanes from 4 (in a QSFP) to 8 (in a QSFP-DD). When used for 800G, each electrical lane of the QSFP-DD is modulated at 100Gb/s, for a total bandwidth of 800Gb/s.

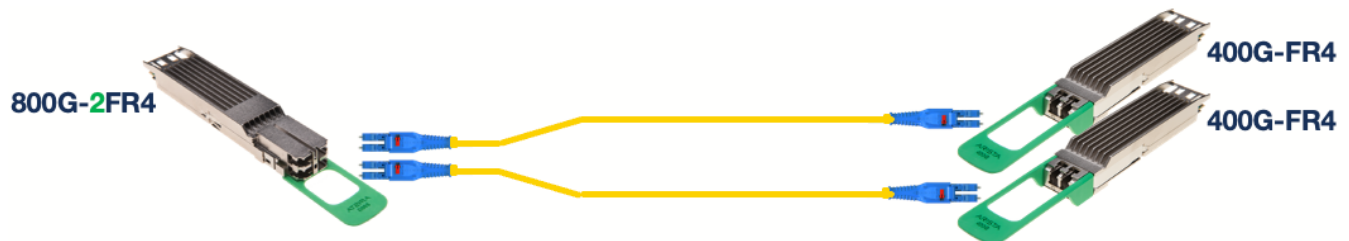
What 800G Transceivers and Cables are available from Arista?

Arista supports a range of 800G optical transceivers, Active Optical Cables (AOCs), Direct Attach Copper cables (DACs), and Active Electrical Cables (AECs) in both OSFP and QSFP-DD form factors. The tables below summarize the 800G connectivity options supported. Additional media types will be added over time.

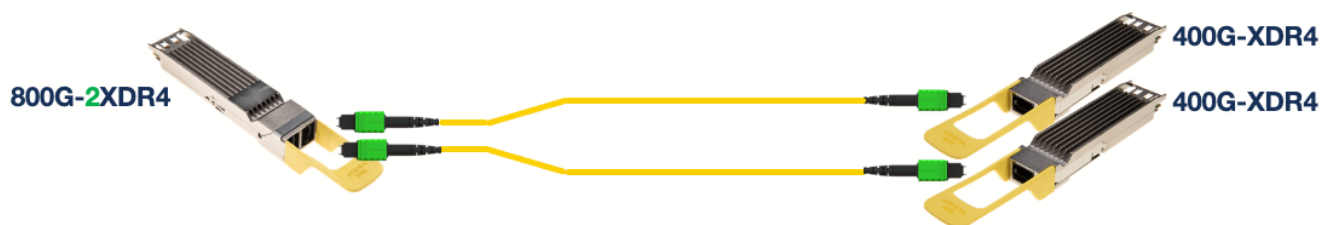
800G Optical Transceivers		
OSFP Part No.	QSFP-DD Part No.	Product Description
OSFP-800G-2FR4	QDD-800G-2FR4	2x 400GBASE-FR4 / 200GBASE-FR4 Dual-Rate Transceiver, dual LC connectors, up to 2km over dual duplex SMF. Interoperates with 2x 400G-FR4 OSFP / QSFP-DD, or 2x 200G-FR4 QSFPs.
OSFP-800G-2LR4	QDD-800G-2LR4	2x 400GBASE-LR4 / 200GBASE-LR4 Dual-Rate Transceiver, dual LC connectors, up to 10km over dual duplex SMF. Interoperates with 2x 400G-LR4 OSFP / QSFP-DD, or 2x 200G-LR4 QSFPs.
OSFP-800G-2XDR4	QDD-800G-2XDR4	2x 400GBASE-XDR4 Transceiver, Dual MPO-12 connector, 2km over parallel SMF. Interoperates with 2x 400G-XDR4 OSFP / QSFP-DD, and 8x 100G-FR QSFPs.
OSFP-800G-2PLR4	QDD-800G-2PLR4	2x 400GBASE-PLR4 Transceiver, Dual MPO-12 connector, 10km over parallel SMF. Interoperates with 2x 400G-PLR4 OSFP / QSFP-DD, and 8x 100G-LR QSFPs.

The diagrams below illustrate connectivity between 800G optics to 2x 400G optics, and breakout to 8x 100G links.

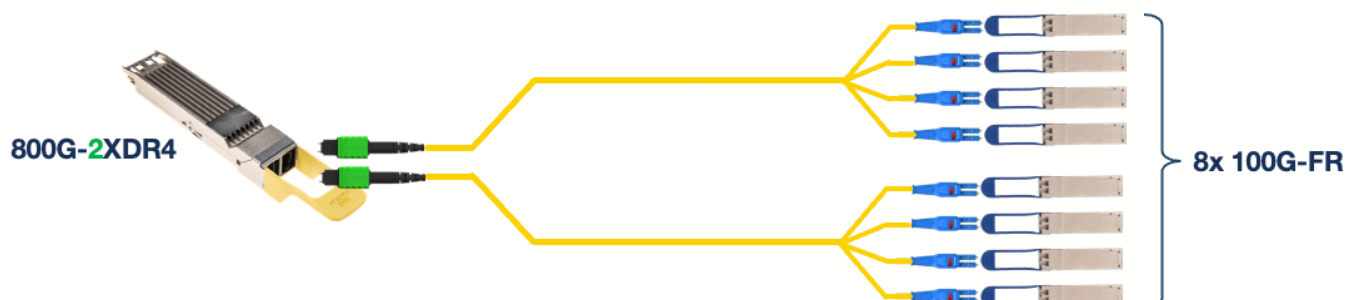
800G-2FR4 to 2x 400G-FR4: No breakout cables required



800G-2XDR4 to 2x 400G-XDR4: No breakout cables required



Breakout from 800G-2XDR4 to 8x 100G-FR links



800G AOC (Active Optical Cables)		
OSFP Part Number	QSFP-DD Part No.	Product Description
A-O800-O800-1M	A-D800-D800-1M	800G AOC, 1 meter (OSFP to OSFP, or QSFP-DD to QSFP-DD)
A-O800-O800-3M	A-D800-D800-3M	800G AOC, 3 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)
A-O800-O800-5M	A-D800-D800-5M	800G AOC, 5 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)
A-O800-O800-7M	A-D800-D800-7M	800G AOC, 7 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)
A-O800-O800-10M	A-D800-D800-10M	800G AOC, 10 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)
A-O800-O800-15M	A-D800-D800-15M	800G AOC, 15 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)
A-O800-O800-20M	A-D800-D800-20M	800G AOC, 20 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)
A-O800-O800-25M	A-D800-D800-25M	800G AOC, 25 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)
A-O800-O800-30M	A-D800-D800-30M	800G AOC, 30 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)

800G 'Straight Through' Passive Copper Cables (or Direct Attach Cables or 'DACs')		
OSFP Part Number	QSFP-DD Part No.	Product Description
C-O800-O800-1M	C-D800-D800-1M	800G Passive DAC, 1 meter (OSFP to OSFP, or QSFP-DD to QSFP-DD)
C-O800-O800-2M	C-D800-D800-2M	800G Passive DAC, 2 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)

800G 'Straight Through' Active Electrical Cables		
OSFP Part Number	QSFP-DD Part No.	Product Description
E-O800-O800-1M	E-D800-D800-1M	800G Active Electrical Cable, 1 meter (OSFP to OSFP, or QSFP-DD to QSFP-DD)
E-O800-O800-2M	E-D800-D800-2M	800G Active Electrical Cable, 2 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)
E-O800-O800-3M	E-D800-D800-3M	800G Active Electrical Cable, 3 meters (OSFP to OSFP, or QSFP-DD to QSFP-DD)

Can OSFPs be plugged into a QSFP-DD port, or QSFP-DD's plugged into an OSFP port?

No. The OSFP and the QSFP-DD are two physically distinct form factors. For OSFP systems, OSFP optics and cables must be used, and for QSFP-DD systems, QSFP-DD optics and cables must be used.

Can an OSFP on one end of an 800G link interop with a QSFP-DD on the other end of a link?

Yes. The OSFP and QSFP-DD describe the physical form factor of the module. If the Ethernet media types are the same, the OSFP and QSFP-DD modules will interop with each other.

Can 400G OSFP / QSFP-DD modules be plugged into 800G OSFP/QSFP-DD ports?

Yes. Arista 400G modules will be detected and enabled upon insertion into Arista switches, provided that the physical form-factor is compatible (i.e. OSFPs cannot be plugged into QSFP-DD ports and vice versa).

Can 800G OSFP / QSFP-DD optical transceivers be plugged into 400G OSFP/QSFP-DD ports?

In some instances - under two conditions.

- i) The 800G module must be capable of operation at 1/2 speed (with each electrical lane running at 50G PAM-4 instead of 100G PAM-4). The 800G-2XDR4 / 2PLR4 optics are not capable of dual-rate operation, so they cannot be used in 400G ports. Arista's 800G-2FR4/LR4 transceivers, AOC and DAC cables can operate at 1/2 speed.
- ii) The 400G switch port must be capable of supporting the higher power draw of 800G modules. 800G modules draw more power than 400G modules, so should only be used in 400G platforms capable of powering and cooling the 800G modules. Refer to the transceiver and cable datasheet for transceiver power consumption, and Arista 400G switch platform datasheets for details on specific systems.

Can QSFP optical modules be used in OSFP ports?

Yes. An QSFP (40G or 100G) optical module can be inserted into an OSFP port by using a simple mechanical adapter. This adapter is available from Arista, with part number ADPT-O-Q-100G. The adapter, and the adapter with a QSFP plugged into it, are shown below.

OSFP to QSFP adapter (ADPT-O-Q-100G)



OSFP to QSFP adapter, with a 100G QSFP plugged in



When using a QSFP module in an OSFP port, the OSFP port must be configured for a data rate of 100G (or 40G), instead of 400G or 800G.

Can I plug a 100G QSFP module into a QSFP-DD port?

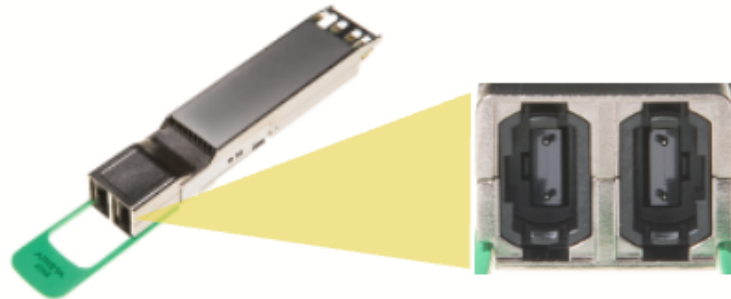
Yes. A QSFP (40G or 100G) module can also be inserted into a QSFP-DD port (without a mechanical adapter). When using a QSFP module in a QSFP-DD port, the QSFP-DD port must be configured for a data rate of 100G (or 40G), instead of 400G or 800G.

What do the suffixes “400G-XDR4 / PLR4, 400G-FR4 / LR4, 800G-2XDR4 / 2PLR4, and 800G-2FR4 / 2LR4” stand for?

The letters are reach specifications, and the number refers to the number of optical channels:

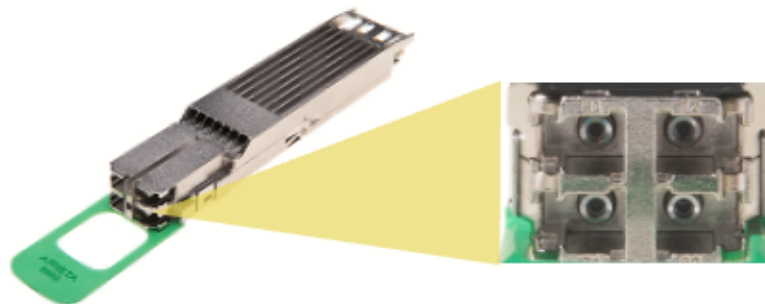
- i) **400G-XDR4 and 400G-PLR4:** “XDR” stands for “eXtended Reach DR”, and “PLR” stands for “Parallel Long Reach”. XDR4 / PLR4 optics have a reach of 2km / 10km using single-mode fiber, and the “4” indicates there are 4 optical channels. Each of the 4 optical channels are carried on separate fibers, resulting in a total of 4 pairs of fibers (4 fibers for Tx and 4 fibers for Rx). Each optical channel operates at 100Gb/s, enabling a total bandwidth of 400G. 400G-XDR4 / PLR4 interfaces use an MPO-12 connector to connect to 4 fiber pairs.
- ii) **800G-2XDR4 and 800G-2PLR4:** Refers to 2x “400G-XDR4” or 2x “400G-PLR4” interfaces, as described above. 800G-2XDR4 / 2PLR4 modules have 2x MPO-12 connectors, enabling 2 physically distinct 400G-XDR4/PLR4 links from each 800G transceiver without the need for optical breakout cables. The image below illustrates the dual MPO-12 connectors used in an OSFP-800G-XDR4 transceiver.

Dual MPO-12 connectors on 800G-2XDR4 / 2PLR4 Transceivers



- iii) **400G-FR4 / LR4:** “FR” / “LR” refers to 2km / 10km reach using SMF, and “4” indicates there are 4 optical channels. All 4 optical channels from a 400G-FR4 / LR4 module are multiplexed onto one fiber in each direction (1 Tx fiber and 1 Rx fiber). Each optical channel operates at 100Gb/s, enabling 400G for each 400G-FR4/LR4 interface over a single fiber pair. 400G-FR4 / LR4 modules use a duplex LC optical connector.
- iv) **800G-2FR4 / 800G-2LR4:** Refers to 2x “400G-FR4” or 2x “400G-LR4” interfaces as described above. 800G-2FR4 / 2LR4 modules have 2 duplex LC connectors, enabling 2 physically distinct 400G-FR4/LR4 links from each 800G transceiver without the need for optical breakout cables. The image below illustrates the dual LC-duplex connector used on the OSFP-800G-2FR4 transceiver.

Dual duplex-LC connectors on 800G-2XDR4 / 2PLR4 Transceivers



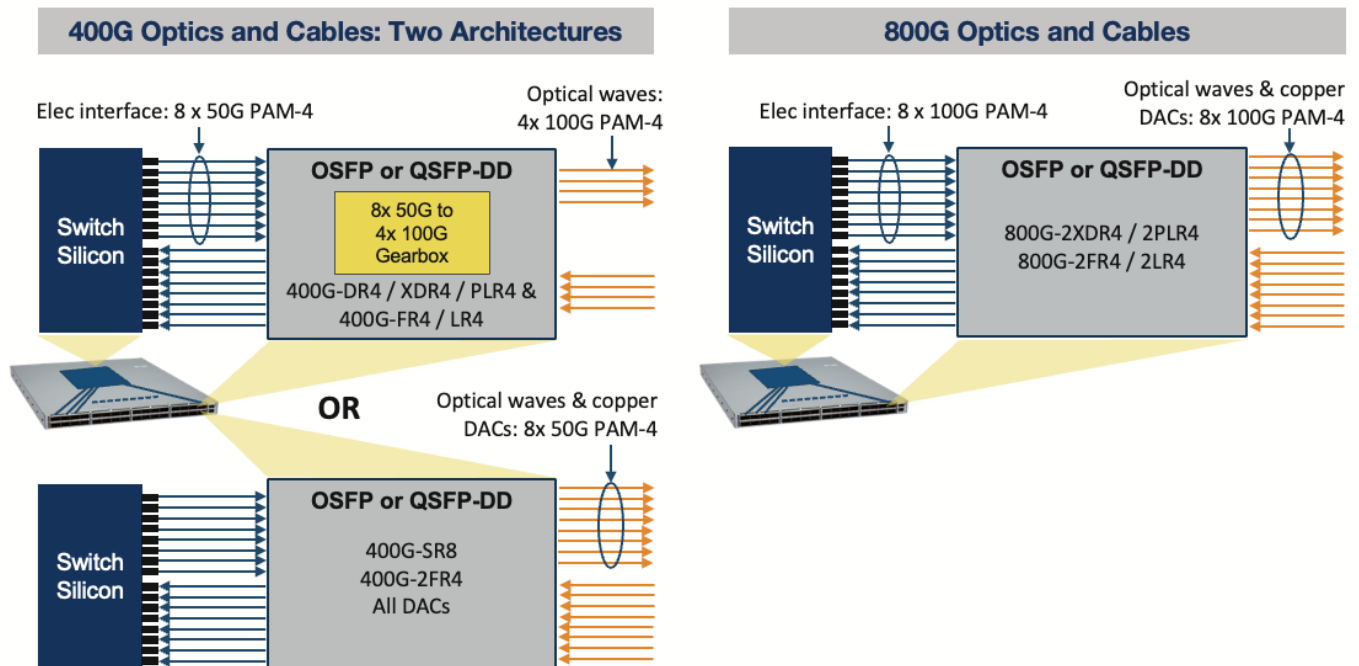
What are the speed and modulation formats used by 800G OSFP / QSFP-DD modules, and how does this compare to 400G OSFP / QSFP-DD modules?

All 800G modules and cables utilize 8x electrical lanes in each direction (8 transmit lanes and 8 receive lanes), with each lane running at a data rate of 100G PAM-4, enabling an aggregate bandwidth of 800Gb/s per module. The optical output of all 800G transceivers also consist of 8 optical waves modulated at 100G PAM-4 per lane.

All 400G modules and cables utilize 8x electrical lanes in each direction (8 transmit lanes and 8 receive lanes), with each lane running at a data rate of 50 PAM-4, enabling an aggregate bandwidth of 400Gb/s per module.

Some 400G optical transceivers (such as the 400G-FR4 and 400G-DR4) use an 8:4 gearbox to convert the 8x 50G PAM-4 electrical signals from the switch silicon to 4x 100G PAM-4 optical signals. Other 400G optical transceivers (such as 400G-SR8) do not use a gearbox, and simply perform electrical-to-optical conversion to enable an 8x 50G PAM-4 optical interface.

The basic data path architecture of 400G and 800G modules is illustrated in the diagram below.



What is the reach, fiber type, connector, and optical modulation for each 800G transceiver type?

The table below summarizes the key parameters for the Arista's 800G optical transceivers

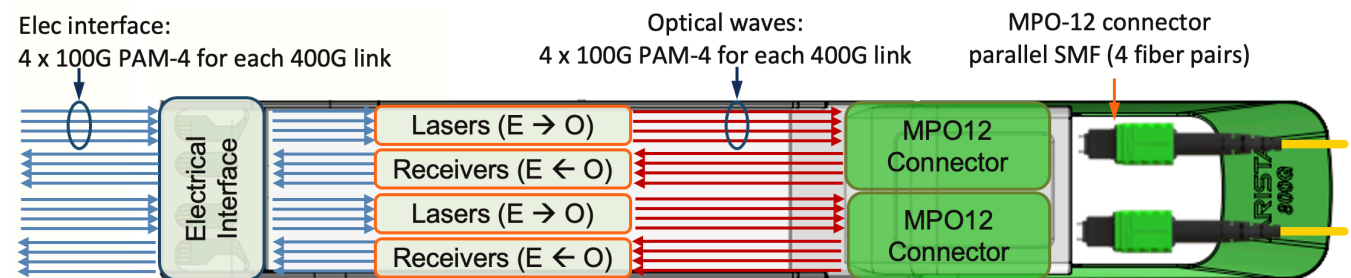
OSFP & QSFP-DD Part Numbers	Reach	Fiber type	Optical connector	No. of Fiber pairs	Optical waves per fiber	Optical modulation
OSFP-800G-2XDR4, QDD-800G-2XDR4	2km	Parallel SMF	2x MPO-12	8 (4 pairs per MPO-12 connector)	1	100G PAM-4
OSFP-800G-2PLR4, QDD-800G-2PLR4	10km	Parallel SMF	2x MPO-12	8 (4 pairs per MPO-12 connector)	1	100G PAM-4
OSFP-800G-2FR4, QDD-800G-2FR4	2km	Duplex SMF	2x LC Duplex	2 (1 pair per LC duplex connector)	4	100G PAM-4
OSFP-800G-2LR4, QDD-800G-2LR4	10km	Duplex SMF	2x LC Duplex	2 (1 pair per LC duplex connector)	4	100G PAM-4

Note that all transceivers listed above use 8x optical channels, with each channel modulated at 100G PAM-4.

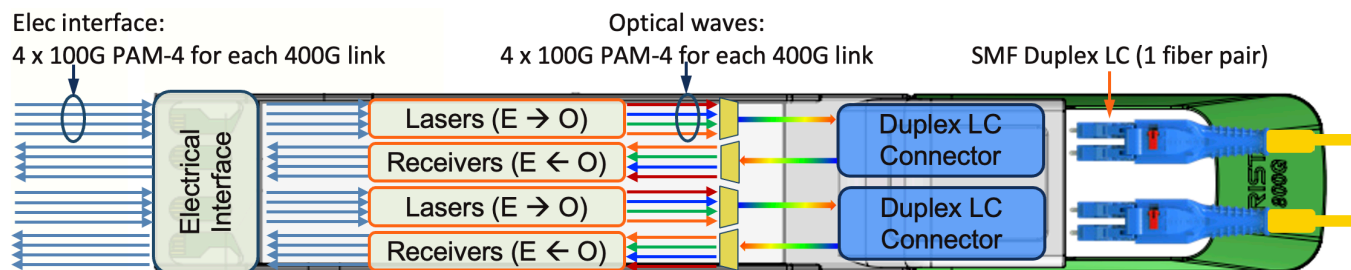
The 800G-2XDR4 / PLR4 transceivers use a total of 8 fiber pairs (4 fiber pairs per 400G link), with a single 100G optical wave per fiber.

The 800G-2FR4/LR4 transceivers use 2 separate fiber pairs (1 fiber pair per 400G-FR4/LR4 link), with 4 different optical wavelengths multiplexed into each fiber. The diagrams below illustrate the data path architecture of the 800G-2XDR4 / PLR4 and 800G-2FR4/LR4 modules.

Data path block diagram of 800G-2XDR4 / 2PLR4 modules



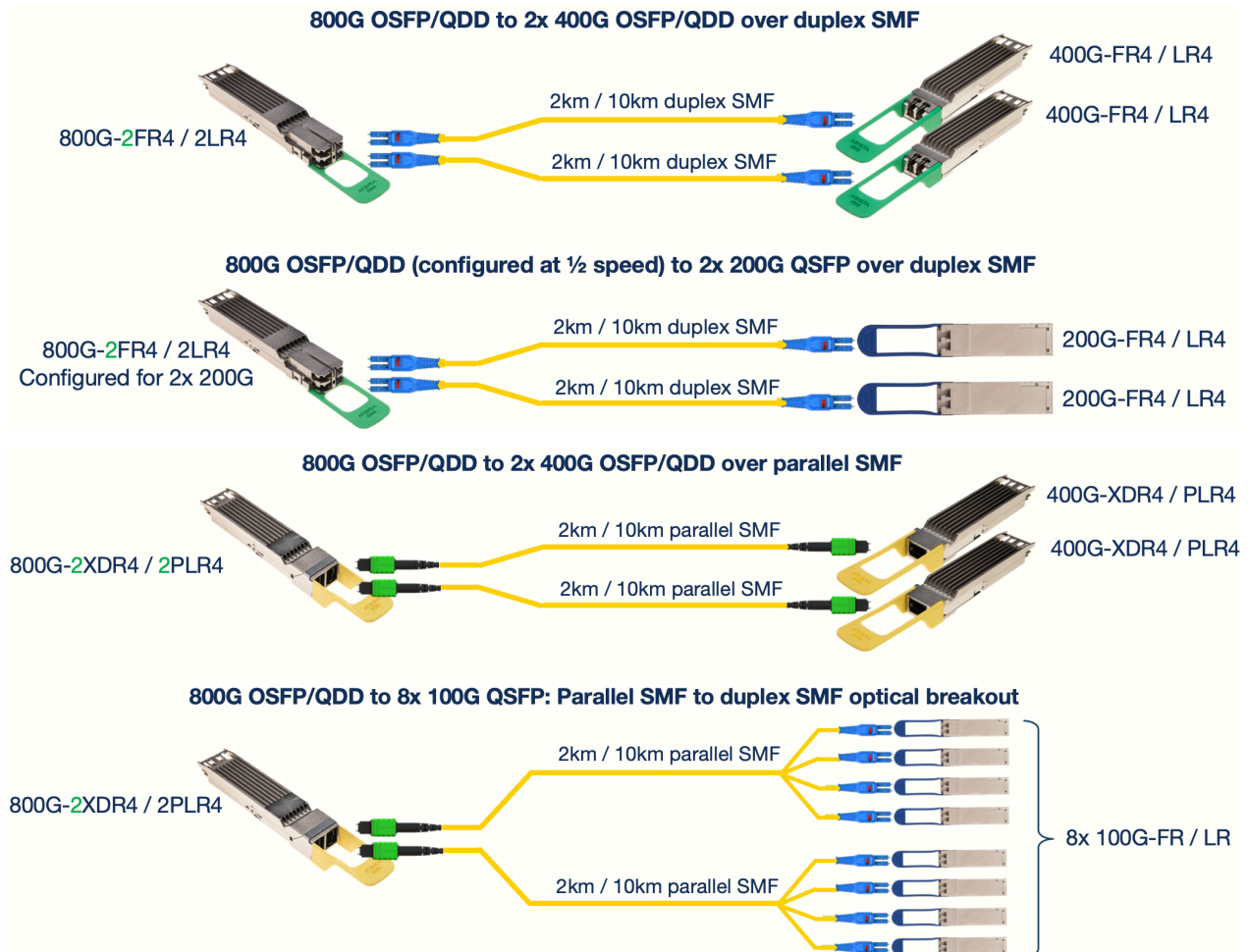
Data path block diagram of 800G-2FR4 / LR4 modules



Which Arista 800G Transceivers and Cables can be used for optical or electrical breakout?

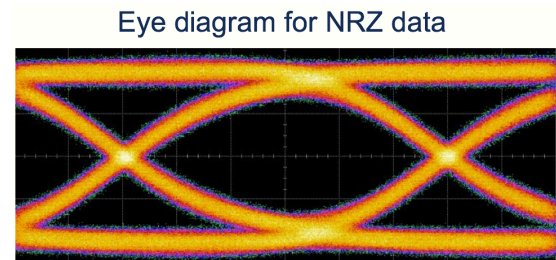
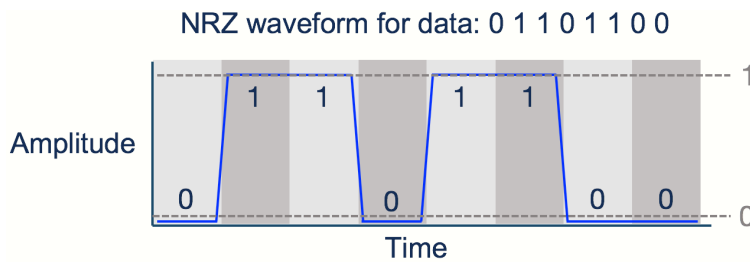
Arista 800G QSFP optics that support breakouts are summarized below. Arista 800G copper cables that support breakouts are described on the following page. In the tables below, the term “near end” transceiver refers to the transceiver / cable plugged into the 800G OSFP or QSFP-DD port, and the “remote end” refers to the “broken out” transceiver / cable connected to a 400G OSFP/QSFP-DD, 200G QSFP or a 100G QSFP.

800G Optical Module	Near end port config	Fiber type	Reach	Remote end
OSFP-800G-2FR4, or QDD-800G-2FR4	2x 400G-4	2 pairs of duplex SMF	2km	2x OSFP-400G-FR4 or 2x QDD-400G-FR4
	2x 200G-4			2x QSFP-200G-FR4
OSFP-800G-2LR4, or QDD-800G-2LR4	2x 400G-4		10km	2x OSFP-400G-LR4 or 2x QDD-400G-LR4
	2x 200G-4			2x 200G-LR4 QSFP modules
OSFP-800G-2XDR4, or QDD-800G-2XDR4	2x 400G-4	Parallel SMF (2x MPO-12)	2km	2x OSFP-400G-XDR4 or 2x QDD-400G-XDR4
	8x 100G-1			8x QSFP-100G-FR
OSFP-800G-2PLR4, or QDD-800G-2PLR4	2x 400G-4		10km	2x OSFP-400G-PLR4 or 2x QDD-400G-PLR4
	8x 100G-1			8x QSFP-100G-LR

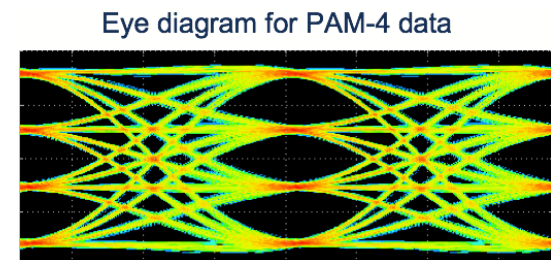
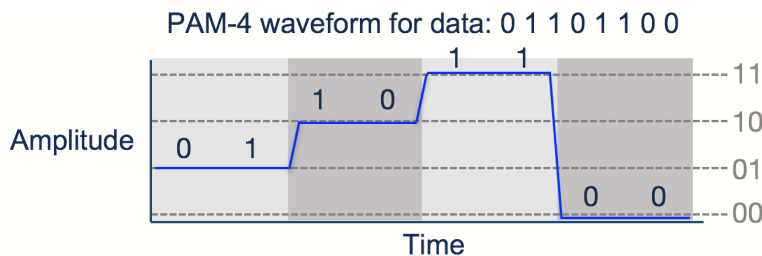


What does it mean when an electrical or optical channel is PAM-4 or NRZ?

NRZ stands for “Non Return to Zero” modulation, and describes an electrical or optical data channel where there are only two allowed amplitude levels (or symbols), with one amplitude level representing a digital ‘1’ and the other level representing a digital ‘0’. This is the predominant modulation scheme for transmitting data up to 25Gb/s, and is the simplest way to transmit digital data. The diagram below shows an example of an NRZ waveform, along with an ‘eye diagram’ for NRZ data. An eye diagram is simply a way of viewing a modulation scheme with each symbol superimposed on each other.



PAM-4 stands for Pulse Amplitude Modulation – 4, where ‘4’ refers to the number of different amplitude levels (or symbols) of the electrical or optical signal carrying the digital data. In this case, each amplitude level (or symbol) represents two bits of digital data. This enables a PAM-4 waveform to transmit twice as many bits as a NRZ waveform at the same symbol (or “Baud”) rate. The diagram below shows an example of a PAM-4 waveform, along with an eye diagram for PAM-4 data.



When a signal is referred to as “25Gb/s NRZ” or “25G NRZ”, it means the signal is carrying information at 25 Gbit / second with NRZ modulation. When a signal is referred to as “50G PAM-4”, or “100G PAM-4” it means the signal is carrying data at a rate of 50 Gbit / second, or 100 Gbit / second, respectively, using PAM-4 modulation.

What do the terms 100G-2, 100G-4, 200G-4, 400G-8, 400G-4 and 800G-8 mean?

These terms describe the bandwidth of an ethernet link, and the number of lanes used to achieve this bandwidth.

Every front panel port in an ethernet switch consists of one or more electrical lanes that transmit and receive ethernet data. For 10G SFP, 25G SFP or 50G SFP ports, a single electrical lane is used (in each direction) and modulated at 10G, 25G or 50G. For higher data rates, multiple lanes are required.

For example, a 100G QSFP port uses 4 lanes, with each lane running at 25Gb/s, or a '100G-4' interface. The number before the letter 'G' indicates the bandwidth of the ethernet link, and the number after the '-' indicates the number of data lanes required to achieve this bandwidth.

The table below summarizes the terminology used to describe common ethernet speeds, the number of lanes required to achieve this bandwidth, and some applications of these interface types:

Ethernet link	Link bandwidth	No. of lanes	Modulation of each lane	Common applications
10G	10Gb/s	1	10G NRZ	All 10G SFP+ ports
25G	25Gb/s	1	25G NRZ	All 25G SFP ports
50G	50Gb/s	1	50G PAM-4	All 50G SFP ports
50G-2	50Gb/s	2	25G NRZ	QSFP100 and QSFP200 ports on an Arista switch can often be configured to operate as 2x 50G-2 Ethernet links. 50G-2 QSFP interfaces are sometimes found in 50G NICs. Only 2 lanes (out of the 4 lanes available on a QSFP connector) are used. The Arista CAB-Q-2Q-100G-xM passive breakout cables can be used to breakout a 100G-4 QSFP port to 2x 50G-2 QSFP ports.
100G-4	100Gb/s	4	25G NRZ	All 100G QSFP ports. All Arista 200G QSFP ports can also be configured to operate at 100G-4.
100G-2	100Gb/s	2	50G PAM-4	400G OSFP or QSFP-DD ports can be configured to operate as 4x 100G-2 Ethernet links, and a QSFP200 port on an Arista switch can be configured to operate as 2x 100G-2 Ethernet links.
100G-1	100Gb/s	1	100G PAM-4	All 800G OSFP and QSFP-DD modules can be configured to operate as 8x 100G-1 Ethernet links. The electrical and optical interface of all 800G modules use 8 lanes at 100G PAM-4.
200G-4	200Gb/s	4	50G PAM-4	All 200G QSFP ports. A 400G OSFP or QSFP-DD port on an Arista switch can often be configured to operate as 2x 200G-4 Ethernet links. The Arista CAB-O-2Q-400G-xM and CAB-D-2Q-400G-xM passive breakout cables can be used to breakout a 400G OSFP or QSFP-DD port, respectively, to 2x 200G-4 QSFP ports.
200G-2	200Gb/s	2	100G PAM-4	800G ports on an Arista switch can often be configured to operate as 4x 200G-2 Ethernet links.
400G-8	400Gb/s	8	50G PAM-4	All 400G OSFP and QSFP-DD ports.
400G-4	400Gb/s	4	100G PAM-4	All 800G ports on an Arista switch can be configured to operate as 2x400G-4 Ethernet links.
800G-8	800Gb/s	8	100G PAM-4	Initial Arista 800G / port systems support 2x 400GE per 800G port. Future systems will support native 800GE as defined by the Ethernet Technology Consortium in 800GBASE-ETC-R and the IEEE in 802.3df (in progress).

What are the complete set of ethernet speeds that each 800G optical transceiver supports?

Each of Arista's 800G optical transceivers and cables can support several different operating modes, summarized in the tables below. The column labels "Lane 1", Lane "2", ... "Lane 8" represent the 8 lane electrical interface at the 800G OSFP or QSFP-DD port. The values in the "Lane" columns refer to the speed configuration of the 800G switch port, while the text in parenthesis indicates the corresponding optical standard.

OSFP-800G-2XDR4 / 2PLR4 & QDD-800G-2XDR4 / 2 PLR4 supported modes								
Logical port configuration								
Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6	Lane 7	Lane 8	Notes
400G-4 (400G-XDR4 / PLR4)				400G-4 (400G-XDR4 / PLR4)				1
800G-8 (800G-XDR8 / PLR8)								2
200G-2		200G-2		200G-2		200G-2		3
100G-1 (100G-FR / LR)	100G-1 (100G-FR / LR)	100G-1 (100G-FR / LR)	100G-1 (100G-FR / LR)	100G-1 (100G-FR / LR)	100G-1 (100G-FR / LR)	100G-1 (100G-FR / LR)	100G-1 (100G-FR / LR)	4
Notes <ol style="list-style-type: none">Dual 400G mode is the default configuration of an 800G-2XDR4 / 2PLR4 module. Commonly used to aggregate 2x 400G-XDR4 / PLR4 links into a single 800G port.Used for point-to-point 800GE links – supported only in platforms that support a single 800GE MAC per port.This mode of operation is less common and could be used if the 800G port configuration is required to be 4x 200GE logical links. Can breakout into 4 physically separate 200G-2 links may interop with third-party transceivers.8x 100G mode is commonly used to aggregate 8x 100G-FR / 800G-LR optics into a single 800G port.								

OSFP-800G-2FR4 / 2LR4 & QDD-800G-2FR4 /2LR4 supported modes								
Logical port configuration								
Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6	Lane 7	Lane 8	Notes
400G-4 (400G-FR4 / LR4)				400G-4 (400G-FR4 / LR4)				1
800G-8								2
200G-2		200G-2		200G-2		200G-2		3
100G-1	100G-1	100G-1	100G-1	100G-1	100G-1	100G-1	100G-1	4
200G-4 (200G-FR4 / LR4)				200G-4 (200G-FR4 / LR4)				5
Notes 1. Dual 400G mode is the default configuration of an 800G-2FR4 / 2LR4 module. Commonly used to aggregate 2x 400G-FR4 / LR4 links into a single 800G port. 2. Used for point-to-point 800GE links – supported only in platforms that support a single 800GE MAC per port. 3. This mode of operation is less common. May be used if the 800G port is required to be configured as 4x 200GE logical links. Because the 800G-FR4 / LR4 has only two physical duplex LC optical connectors (with a total of 2 pairs of fiber), it does not support optical breakout into 4 physically separate 200GE ports								

4. This mode of operation is less common. May be used if the 800G port is required to be configured as 8x 100GE logical links. Because the 800G-FR4 / LR4 has only two physical duplex LC optical connectors (with a total of 2 pairs of fiber), it does not support optical breakout into 8 physically separate 100GE ports
5. When the module is run at ½ speed, each fiber pair can be used to interop with 2x 200G-FR4 or 2x 200G-LR4 links.

What are the CLI commands to configure an 800G port for different speeds & logical interfaces?

For 2x 400G-4 operation:

```
switch(config)#interface Ethernet1/1,1/5
switch(config-if-Et1/1,1/5)#speed 400g-4
```

For 4x 200G-2 operation:

```
switch(config)#interface Ethernet1/1,1/3,1/5,1/7
switch(config-if-Et1/1,1/3,1/5,1/7)#speed 200g-2
```

For 8x 100G-1 operation:

```
switch(config)#interface Ethernet1/1-8
switch(config-if-Et1/1-8)#speed 100g-1
```

For 2x 200G-4 operation (800G port operated at ½ speed):

```
switch(config)#interface Ethernet1/1,1/5
switch(config-if-Et1/1,1/5)#speed 200g-4
```

What is the maximum power consumption of 400G OSFP and QSFP-DD transceivers?

The power consumption of 800G client transceivers range from 16W to 18W per port. Refer to the transceiver data sheet for power consumption values of individual modules.

What are the pros and cons of using OSFPs or QSFP-DDs?

Arista supports both the OSFP and the QSFP-DD form factors – in other words, Arista will provide OSFP compatible hardware, and QSFP-DD compatible systems.

The QSFP-DD form factor is based on the QSFP form factor with an extra row of electrical pins added. It allows strict backwards compatibility with 40G and 100G QSFP modules. To dissipate the larger power of 400G modules, the QSFP-DD relies on an external heatsink that is part of the switch platform – i.e. when a QSFP-DD module is inserted into a QSFP-DD port, the platform must provide a heatsink that makes contact with the QSFP-DD module with sufficient pressure to guarantee a low thermal resistance interface.

The OSFP form factor was designed from the ground up for optimal performance at 400G and 800G. It allows for backwards compatibility to 40G and 100G QSFP optics using the ADPT-O-Q-100G passive adapter. A key difference of the OSFP is that the heatsink is integrated into the module case itself. This has the advantage of ensuring the best possible thermal contact between the power dissipating components and the heatsink, enabling better thermal performance. The OSFP also has approximately 50% more surface area than the QSFP-DD, enhancing the ability of the module to dissipate heat. OSFP modules run between 5C – 15C cooler than QSFP-DD modules in equivalent systems. This allows support for a large range of optics, and operating optics at lower temperature improves reliability.

What does “APC” or PC/UPC mean when it comes to optical connectors? Which optical connectors use APC, and which use UPC?

PC and UPC refers to “Physical Contact” or “Ultra Physical Contact” fibers. APC refers to “Angled Physical Contact” fibers.

These terms refer to geometry of the end face of the optical fiber that is used. In PC/UPC fiber connectors, the end face of the fiber is “flat”. With APC connectors, the end face of the fiber is polished at an angle to reduce back reflections.

The following table summarizes what type of fiber termination should be used with Arista optics.

Optics type (SMF or MMF)	Parallel or duplex fiber	Optical connector	Required fiber end polish	Comments
SMF and MMF	Duplex	Duplex LC	PC / UPC	Duplex LC connectors are widely used, and all Arista optics with duplex LC use PC / UPC fiber connectors
SMF	Parallel	MPO-12	APC	All Arista optics with SMF MPO-12 connectors use APC fiber connectors.
MMF	Parallel	MPO-12	UPC	All Arista optics with MMF MPO-12 connectors use UPC fiber connectors.
MMF	Parallel	MPO-16	APC	The MPO-16 connector is used in the 400G-SR8 and 400G-SR8-C modules. It requires an APC connector.

What industry standards are associated with each of the 800G Transceivers and Cables?

The table below summarizes the Arista 400G transceivers and cables and the associated industry standards.

Arista Products	Associated Industry Standard
C-O800-O800-xM and C-D800-D800-xM	800G-ETC-CR8, as defined by the Ethernet Technology Consortium, based on IEEE802.3ck
OSFP-800G-2XDR4, and QDD-800G-2XDR4	Optical specs identical to the 100G-FR, as defined in the 100G Lambda MSA
OSFP-800G-2PLR4, and QDD-800G-2PLR4	Optical specs identical to the 100G-LR, as defined in the 100G Lambda MSA.
OSFP-800G-2FR4, and QDD-800G-2FR4	400G-FR4/LR4, as defined in the 100G Lambda MSA. http://100glambda.com/
All OSFP transceivers	The OSFP MSA: https://osfpmsa.org/
All QSFP-DD transceivers	The QSFP-DD MSA: http://www.qsfp-dd.com/

What additional resources are available on Transceivers and Cables?

Below is a list of additional resources available on the transceivers and cables page of www.arista.com.

Document	Description
Arista Transceivers and Cables Datasheet	Detailed specifications and ordering information
Transceiver and Cable Guide	Arista EOS support, physical attributes, laser safety and fiber cleaning instructions
400G Transceivers and Cables: Q&A	400G Optics and cables FAQ
200G Transceivers and Cables: Q&A	200G Optics and cables FAQ
100G Transceivers and Cables: Q&A	100G Optics and cables FAQ
Corning 400G Cabling Guide Leviton 100G/400G Cabling Guide Siemon Cabling Guide for 100G and 400G Fiber Optics	Partner documents: Fiber cabling reference guides and loss budget guidelines from Cabling companies like Corning and Leviton