



## 400G BiDi MSA Frequently Asked Questions (FAQ)

### 1. What will the 400G BiDi MSA group define?

The MSA group is dedicated to defining optical data link specifications based on a dual wavelength bidirectional transmission technology on multimode fiber (MMF) that enables a reduction in fiber count relative to other solutions. The 400 Gbps BiDi solution leverages both the widely adopted 40 Gbps and 100 Gbps BiDi solutions for Ethernet applications and is compatible with the widely available and deployed parallel multimode optical fiber cabling infrastructure.

The 400G BiDi MSA group will define optical specifications for transmitting 400 Gbps Ethernet traffic over “4+4” MPO connectorized multimode optical fiber (OM3, OM4 and OM5) – consistent with the optical fiber and connector currently used for 40GBASE-SR4 and 100GBASE-SR4. This enables a migration path for existing fiber infrastructure towards higher speeds. This optical interface is capable of being implemented in various form factor types, such as QSFP-DD and OSFP.

Multimode Link Distance 400G BiDi MSA

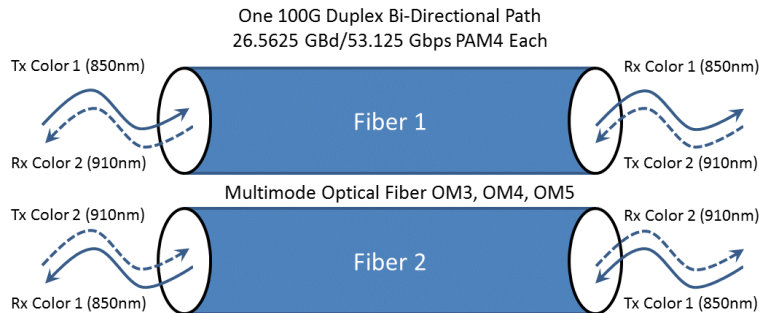
OM3 Operating Range	OM4 Operating Range	OM5 Operating Range
0.5 m to 70 m	0.5 m to 100 m	0.5 m to 150 m

### 2. Who are the members of the 400G BiDi MSA?

Founding members of the 400G BiDi MSA include Alibaba, Broadcom, Cisco, Corning Incorporated, Foxconn Interconnect Technology, InnoLight Technology, Inphi Corporation and Sumitomo Electric. The MSA membership is well represented across component and fiber suppliers, module manufacturers, system providers and end users who are working to ensure that any viable technology that could be used has been considered while developing the specifications.

### 3. What are the key features of 400G BiDi solutions?

Optical bidirectional technology allows each single fiber to carry signals in both directions, thereby improving fiber utilization relative to existing 400G MMF standards. For a 100G BiDi link, one fiber pair is required (consistent with commonly installed infrastructure such as a duplex LC) running 53.125 Gbps on each fiber in both directions for an aggregate of 106.25 Gbps. The 400G BiDi specification is a quad version of the 100G BiDi approach utilizing four fiber pairs (consistent with commonly installed infrastructure such as a 4+4 fiber MPO). For all BiDi implementations, only one laser is launched into each fiber end, simplifying optical design and keeping costs low.



#### 4. Why does the industry need another 400 Gbps optical specification?

The successful industry adoption of MMF BiDi technology is based on its ability to support the commonly installed fiber infrastructure at new, higher speeds. While there is a robust series of 400G optical interfaces being specified for single mode fiber solutions, the only 400 GbE multimode standard that has been defined by the IEEE is 400GBASE-SR16 (Clause 123 of IEEE Std 802.3-2018) using 16+16 optical fiber. The IEEE has begun standardization of 400GBASE-SR8 (expected to be an amendment to Clause 138 of P802.3cd) using 8+8 optical fiber, but this solution is not compatible with existing and commonly deployed 4+4 optical fiber infrastructure (such as used with 100GBASE-SR4 and 40GBASE-SR4). The 400G BiDi specification provides a solution for 4+4 optical fiber.

#### 5. What does the 400G BiDi specification define?

The 400G BiDi specification defines the 50 Gbps per lane PAM-4 optical signaling, modulation encoding, lane assignments and link characteristics for 400 Gbps MMF Ethernet applications. It does not define a physical form factor, FEC or electrical interface.

#### 6. What is the name of the new specification?

The specification will be named 400G-BD4.2, to identify the bidirectional use of four lasers each of two colors. Using the 400G-BD4.2 specification, two transceivers communicate over lengths up to 70 meters (OM3), 100m (OM4) and 150m (OM5).

#### 7. Is the 400G BiDi MSA dependent on other outside standards or MSA activities?

It is anticipated the 400G-BD4.2 optical performance specifications will leverage the individual lane optical specifications defined in IEEE P802.3cd Clause 138, but will differ in optical physical configuration due to the bidirectional nature of 400G-BD4.2. The optical interface defined by the 400G BiDi MSA is expected to be implementable in common industry form factor MSAs such as QSFP-DD and OSFP for 400 Gbps operation using an 8x50G (400GAUI-8) electrical interface configuration. In addition, the optical specifications are compatible with use at 100 Gbps using QSFP28, in a 2x50G configuration.

#### 8. What about the IEEE ? Why has the MSA formed rather than doing this in the IEEE?

The MSA members recognize the value having optical interfaces being defined in IEEE specifications for their long term utility and adoption by the industry. The MSA members, seeing the short term industry need to establish some industry specifications quickly, decided to work together to enable rapid dissemination of common specs across the industry. The members

expect that the IEEE will progress on these important industry specifications and therefore the MSA members have chosen to very closely follow IEEE methodologies in their technical work with the hope that when the IEEE initiates its work, they will be able to strongly leverage the work of the MSA

9. When will the first specifications be released?

The MSA anticipates that the first specification will be publicly released in Q3 calendar 2018.

10. Will the MSA define speeds beyond 400G?

At this time, the MSA has not made any plans to define specifications beyond 400 Gbps, however the MSA technology using bidirectional MMF optical channel is scalable to higher aggregate bandwidth. The MSA could consider extending the scope of the MSA charter.

11. Does the 400G BiDi require a custom Forward Error Correction (FEC) code?

No, the MSA will refer to IEEE Std 802.3-2018 for electrical interface and FEC/PCS specifications, including the usage of the Reed Solomon (544, 514) FEC code also known as KP4. For 400G applications, it is assumed implementations of 400G-BD4.2 in QSFP-DD or OSFP form factors will use the 400GAUI-8 electrical interface as defined in IEEE 802.3-2018 Annex 120E.

12. Is 400G BiDi compatible with prior 100G BiDi solutions in the industry?

Yes, the 400G-BD4.2 8x50G bidirectional MMF optical specifications are, in 2x50G pairs, compatible with 100G BiDi QSFP28 solutions in the industry.

13. How do I join the MSA or find out more information?

The membership of the MSA is currently limited to the initial founding members so that they can make rapid progress and publish the first draft of the MSA specifications publicly as soon as possible. Once this has happened, the MSA will open up its membership to Contributor members to join. For more information, click Contact Us on the MSA website.