

IEEE 802.3cg MDI connector Limitations

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Background

- IEEE 802.3cg D2p2 clauses 146.8.1 and 147.9.1 specifies MDI connectors that may be used for Single Pair Balanced cabling meeting the requirements of IEC 63171-1 (MICE 1 environments) or IEC 61076-3 (MICE 2/3 environments). The plug connector is used on the balanced cabling and MDI Jack connector on the PHY (end device for example a switch)
- Current IEC 63171-1 and IEC-61076-3 do not cover expected use cases

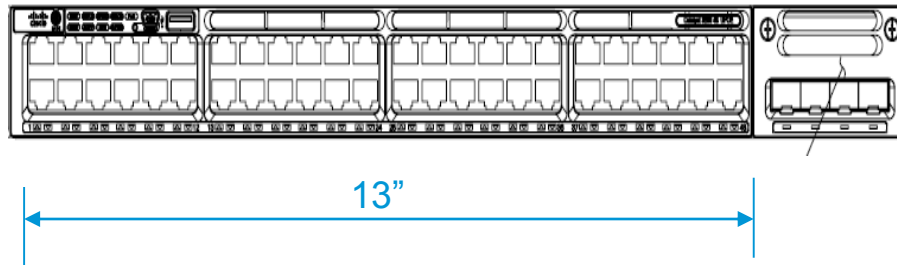
Problems

- IEC 63171-1 specified connector size does not support 18 AWG cable. 18AWG is a significant use case for installed and new cabling. Requiring a patch panel or cable adapter to support 18AWG is a significant burden to system vendors and users (D2p2 comment #279)
- IEC 63171-1 does not support MICE 2 – Industry common practice uses the same connector for MICE 1 and MICE 2. Using a different connector in these environments is a significant burden to system vendors and users (D2p2 comment #280)
- No PHYSICAL interoperability (mating surface and pin pitch are different) between IEC 63171 and IEC 61076 and other configurations such as 1x2, 2x2 etc. (D2p2 comment #281)

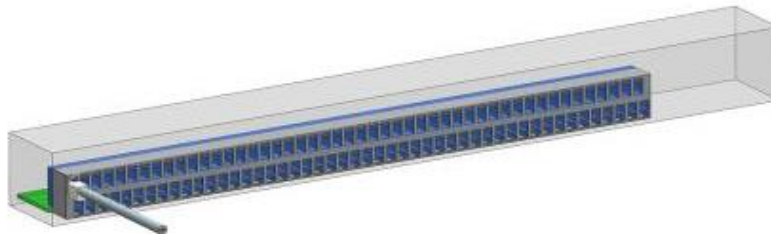
Enabling wide adoption of Single Pair Ethernet

- Support same connector for 18 – 26 AWG capable of high port density on a switch

Current 48 port Switch (1RU) using 4 Pair Stacked RJ45



Future 96 port Switch (1RU) using Single Pair Stacked connectors 22 AWG to 26 AWG



Same switch using every second port with 18 AWG, but same connector/pin pitch

Enabling wide adoption of Single Pair Ethernet

- Current Ethernet equipment does not use full MICE 1/2/3 requirements – BUT uses subset of feature based on the application
 - (M1, I1, C1, E1) OR (M1, I2, C1, E2). (M3, I3, C3, E3) is a very small use case for high industrial applications
 - Current Ethernet equipment uses IP66/IP67 for “I” in MICE
- MICE 1/2/3 should have same mating surfaces and pin pitch. External body of the connect can be adopted to meet M3, I3, C3, E3 for Industrial applications
- Examples



IP67-rated weatherproof stranded STP CAT6 cable assembly provides watertight industrial Ethernet connectivity in harsh environments

What are the critical requirements for the connector?

- Electrical requirements - Insertion Loss/Return etc, defined in clause 146.8
- Mechanical Dimensions – pin pitch and mating surfaces
- Electromagnetic Compatibility – EMC Emissions and EMC Immunity
 - Connector require non-shield (E1 and E2) and shielded cable (E1/E2/E3) options
 - All other requirements are at system level – based on local, state and country requirements
- Connector should allow higher current capacity (2A) and electrical performance for up to 10G beyond 802.3cg requirements for the future
- Ability to terminate connector/cable in the field (like RJ45 with simple tool)
- Latch/locking mechanisms

Advantages of a Common Connector

- Re-use of the switches and end devices across different applications
- Lower cost due to larger combined volumes
- Avoid patch panels and special patch cables
- Avoid different cable/connector termination schemes

- **Proposed text for the same paragraph in IEEE 802.3cg draft 2.2 Clause 146.8.1**
- Connectors meeting the requirements of IEC 63171-1 or IEC 61076-3-125 may be used as the mechanical interface to the balanced cabling. The plug connector is used on the balanced cabling and the MDI jack connector on the PHY. These connectors are depicted (for informational use only) in Figure 146–26 (IEC 63171-1), Figure 146–27 (IEC 63171-1), Figure 146–28, (IEC 61076-3-125), and Figure 146–29 (IEC 61076-3-125). The assignment of PMA signals to connector contacts for PHYs is shown in Figure 146–30 (IEC 63171-1) and Figure 146–31 (IEC 61076-3-125). These two connectors may be used, with adaptations if needed, for the link segment local environments given in Table 146–7, for E1, E2, or E3.
- These connectors should support compatible mating surface and pin pitch for 18AWG to 26 AWG single pair balanced cabling.

Summary

- IEEE 802.3cg D2p2 clauses 146.8.1 and 147.9.1 specified MDI connectors do not meet wide market adoption
- Further work is required to address 10SPE use cases.

Thank you.

