

# IEEE 802.3cg MDI connector Limitations

Amrik Bains - Cisco Systems  
George Curtis - Cisco Systems  
Ed Kliewer - Cisco Systems

# 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

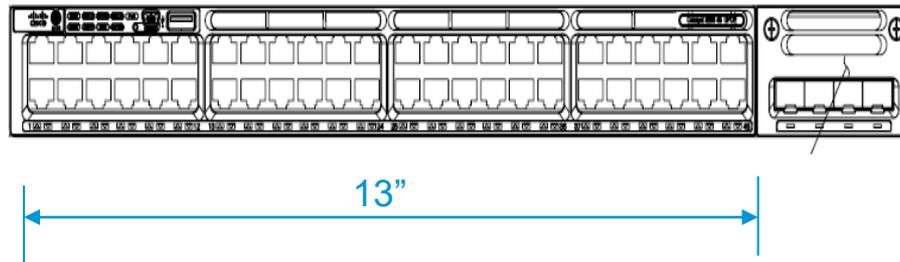
# Problems

- 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 (page 153 line 14)

"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. The IEC 63171-1 plug and jack are depicted (for informational use only) in Figure 146-26 and Figure 146-27 respectively and the mating interface is depicted in Figure 146-30. The IEC 61076-3-125 plug and jack are depicted (for informational use only) in Figure 146-28 and Figure 146-29 respectively and the mating interface is depicted in Figure 146-31. The assignment of PMA signals to connector contacts for PHYs are given in Table xx. These two connectors may be used, with adaptations if needed, for electromagnetic classifications for the link segment given in Table 146–7.

These connectors should support link segment DCR characteristics for 18AWG to 26AWG in Table 146B-1."

- NOTE: Add 26 AWG to table 146B-1.

## Proposed text for the same paragraph in IEEE 802.3cg draft 2.2 Clause 147.9.1 (page 198, line 51)

"Connectors meeting the requirements of IEC 63171-1 (commercial building environments) or IEC 61076-3-125 (light industrial and industrial environments) 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. The IEC 63171-1 plug and jack are depicted (for informational use only) in Figure 147-21 and Figure 147-22 respectively and the mating interface is depicted in Figure 147-25. The IEC 61076-3-125 plug and jack are depicted (for informational use only) in Figure 147-23 and Figure 147-24 respectively and the mating interface is depicted in Figure 147-26. The assignment of PMA signals to connector contacts for PHYs are given in Table xx.

These connectors should support link segment DCR characteristics for 18AWG to 26AWG in Table 146B-1."

- NOTE: Add 26 AWG to table 146B-1.



# 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.

