

# Proposed Contribution from 802.3

## Issue at hand

The IEEE 802.3 Working Group (WG) is aware that SC25/WG3 is drafting standards and technical reports (e.g. ISO/IEC 11801-1 Amd1 and ISO/IEC TR 11801-9911) that support use and reuse of 4P/multipair Category cabling classes to be used in 1P applications with the restriction of 0.75A per pair.

This restriction breaks the IEEE 802.3 'plug-and-play' interoperability model. As such, the WG feels the need to make a presentation to ISO/IEC JTC 1/SC 25, something that hasn't happened before as the work between the two groups has always had common goals.

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## The problem with 0.75A

- Using 4P cabling in 1P applications disallows the full current capabilities of Single Pair Ethernet (SPE)
- Cabling would limit PSEs to 0.75A
  - IEEE 802.3 PSEs or PDs do not know what kind of cabling is connected. Allowing a 0.75A option constrains ALL options to 0.75A – which is well below the current needed to deliver the power levels desired, for both current classes and future planned classes.
    - Note that this is a problem with having any two levels of maximum current.
- Installation guidance becomes overly complicated
  - A lot of work has gone into appropriate bundle sizing for 4P cabling, designed around the worst case 90W PoE current of 0.433A (particularly in the United States' National Electrical Code). A 'second tier' of 0.75A limit complicates this carefully crafted guidance.
    - The possibility of 1, 2, or 3 pairs being energized in shared-sheath cabling as well as grounding issues further complicate the guidance.

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## Future SPoE Plans

- Limiting SPoE to 0.75A will keep 11801-1 cabling and perhaps SPoE from addressing the full market
  - Note that 750mA only supports up to PoDL Class 14, which is 20W at the PD.
- Similar to 4P PoE, there are plans to raise the power from an SPE PSE to what's allowed under LPS, i.e. 100W max (90W with margin)
- Of course, this power is only extended to systems that can efficiently provide the power. This implies a max allowed loop resistance which further implies reach limitations. This is a long way of saying the 1km SPE links won't be capable.
  - PoDL Class 15 power can be delivered up to 158 meters and 400 meters with 18 AWG and 14 AWG twisted pair, respectively.
- The present requirements of Clause 104 are only a single example. Other powering schemes, outside of IEEE Std 802.3 use the full extent of NEC Class 2 limits of 2A. Today, non-802.3 power sources dominate the single-pair powering landscape.

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## Use Cases

- Powering beyond 20W delivered are required for a variety of applications
  - Media converters extending line powering to existing Class 4 PoE devices will require this (30W PoE pass thru + power of device)
  - Line-powered PoE field switches, will require greater than 20W even with minimal PoE capability (multiple PoE pass thru ports, likely at 15.4W at each port + device)
  - Many sensors, such as field cameras with pan-tilt-zoom and/or heat element capability today require > 20 W delivered
  - High-transient-current actuators would require additional cost of local energy storage without the ability to provide > 0.75A
- Class 2 power supplies today are used for a variety of non-Ethernet applications on single pairs that SPE seeks to replace
- Experience with 4-pair PoE has shown a need to deliver as much power as possible (initial release at 15.4W, revised twice to raise power).

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## IEEE 802.3 Requests

- The IEEE 802.3 WG requests that reuse of 4-pair cable for SPE be abandoned. The addition of cable reuse permits sections of the cable plant to not meet the full requirements, converting this from a plug and play system to an engineered system.
- Separate 1P from 4P
  - Remove all single pair information from 11801-1 Amd 1 and placed in a new standard, avoiding confusion
  - Many other standards point to 11801 assuming 4P cabling; the inclusion of 1P will require some rewrite of those other standards

# Proposed Contribution from 802.3 Requirements if Use of 4P Cable for 1P Applications is Maintained

- **CURRENT CARRYING CAPACITY SHOULD MATCH FROM BEGINNING TO END**
  - Wire gauge shall match end-to-end, or at least be no smaller than that presented at the user interfaces (disallow hiding smaller wire gauge behind a larger gauge at the user interface)
- **CLEARLY IDENTIFY ANY RESTRICTED CURRENT CHANNELS**
  - Examples might be different color connectors or mandatory labelling
- **PREVENT ACCIDENTAL MISCONFIGURATION**
  - Different or keyed connectors to disallow interconnection of the disparate channels
    - One might think it's ok to plug a 0.75A cable into a 2.0A as the 2.0A channel can support the 0.75A requirements, but the guidance must disallow a 2.0A cable being the visible connection with 0.75A cable behind the wall.
- **DISCOURAGE USE OF 4P CABLE FOR 1P APPLICATIONS FOR NEW INSTALLATIONS**

# Proposed Contribution from 802.3 Backup

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## 802.3 Actions

- Members of the IEEE 802.3 Working Group are discussing adding text to expressly require cabling with current capacity of at least 2.0 A for SPE applications with IEEE 802.3 defined powering



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## Previous experience of IEEE 802.3

- Some have suggested that multiple current capabilities is no different than having different category cables for performance or too great of cable resistance for PoE
  - The primary effect of either of these is that the system does not perform to IEEE Std 802.3 specifications – no harm is done, and within the scope of 802.3
- Allowing reduced current carrying capacity could create a situation where the current carrying capacity of the link is exceeded by the attached application
  - Requires IEEE Std 802.3 to disallow easily misconfigured cabling or risk additional restrictions placed on the use of SPoE by other standards such as IEC 60364 Low-voltage electrical installations originating in IEC TC64