

4PPoE Architecture Proposal 2.0

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Goals

- Define valid four-pair channel
- Modify text to allow four-pair power
 - Type 1: keep as is + enable 4P “green” power
 - Type 2: keep as is + enable 4P “green” power
 - Define new Type 3:
 - Must power all four pairs
 - Maximizes interoperability with all existing PoE++ solutions

Define Four-Pair Channel

- Modify 33.1.4 to require continuity on all four pairs for new “four pair” devices (green or Type 3)
- Modify Table 33-1 to add Type 3 column
- Modify 33.1.4.1 and 33.1.4.2 to add Type 3 labels

Channel Baseline Text

- 33.1.4 ~~Type 1 and Type 2~~ **System parameters**
 - A power system, consisting of a single PSE, link segment, and a single PD, defined as either Type 1, ~~or~~ Type 2 **or Type 3**, has certain basic parameters...
 - I_{cable} is the current on one twisted pair in the multi-twisted pair cable. **A minimum of two twisted pairs are required to source I_{cable} for Type 1 and Type 2 devices**—one carrying (+ I_{cable}) and one carrying (– I_{cable}), from the perspective of the PI. **Four twisted pairs, all connected from the active PSE to the PD, are required to source I_{cable} for Type 3 devices—two carrying (+ I_{cable}) and two carrying (– I_{cable}), from the perspective of the PI.**
 - It should be noted that the cable references use “DC loop resistance,” which refers to a single conductor. This clause uses “DC pair loop resistance,” which refers to a ~~pair of~~ **two or four** conductors in parallel. Therefore, R_{Ch} is related to, but not equivalent to, the “DC loop resistance” called out in the cable references.
- 33.1.4.1 **Cabling requirements for Types 2 and 3**
 - Modify text as appropriate to add “Type 3” throughout
- 33.1.4.2 ~~Type 1 and Type 2~~ **Channel requirements**
 - Type 1, ~~and~~ Type 2, **and Type 3** operation requires...

Channel Baseline Text

- Table 33-1:

Parameter	Symbol	Units	Type 1 value	Type 2 value	Type 3 value	Additional information
Nominal highest DC current per pair	ICable	A	0.35	0.6	TBD	
Channel maximum DC pair loop resistance	RCh	Ω	20	12.5	6.25	
Minimum cable type			twisted-pair cabling per 14.4 and 14.5a	Class D	Class D	See 33.1.4.1, 33.1.4.2

Legalize Four-Pair Power

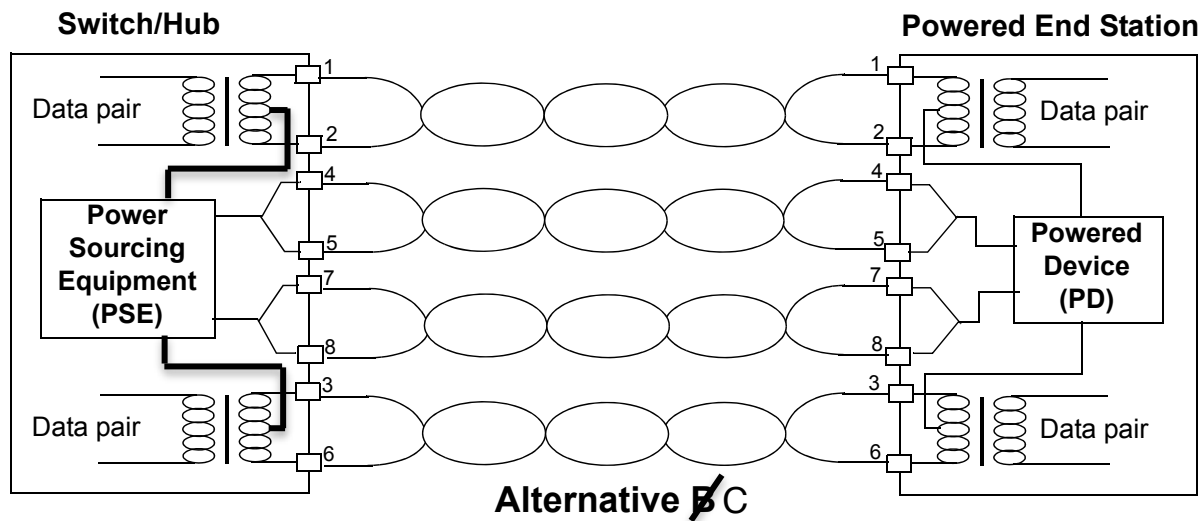
- Add new “Alternative C” to 33.2.1, Figures 33-4... 33-7, and Table 33-2
 - Modify PSE to touch all 4 pairs (PDs already touch all 4 pairs)
 - Define a single Alt-C polarity (like Alt-B)
 - Edit PSE state machine 33.2.4.7 to add Alt-C
- Change 33.2.3: allow PSE to power using Alt-C
- Change 33.3.1: allow PD to receive Mode A and Mode B power simultaneously
 - “Mode C” not needed the way the text is currently written

Four-Pair Baseline Text

- 33.2.1:
 - Alternative A, ~~and~~ Alternative B, **and Alternative C** Endpoint PSEs and Midspan PSEs are illustrated in Figure 33–4, Figure 33–5, Figure 33–6, and Figure 33–7. PSEs can be compatible with 10BASE-T, 100BASE-TX, and/or 1000BASE-T. PSEs may support ~~either~~ **any of** Alternative A, Alternative B, or ~~both~~ **Alternative C**.
 - **[10GBE text can be added separately]**
- 33.2.3:
 - A PSE shall implement Alternative A, Alternative B, or ~~both~~ **Alternative C**. ~~While a PSE may be capable of both Alternative A and Alternative B, PSEs shall not operate both Alternative A and Alternative B on the same link segment simultaneously.~~
- 33.3.1:
 - NOTE—PDs that implement only Mode A or Mode B are specifically not allowed by this standard. ~~PDs that simultaneously require power from both Mode A and Mode B are specifically not allowed by this standard.~~
- 33.2.4.7:
 - Minor state machine edits to add Alt-C

Four-Pair Baseline Text

- Fig 33-4 (others similar):



Four-Pair Baseline Text

- Table 33-2:

Conductor	Alternative A (MDI-X)	Alternative A (MDI)	Alternative B (All)	<i>Alternative C (All)</i>
1	Negative Vpse	Positive Vpse		<i>Negative Vpse</i>
2	Negative Vpse	Positive Vpse		<i>Negative Vpse</i>
3	Positive Vpse	Negative Vpse		<i>Positive Vpse</i>
4			Positive Vpse	<i>Positive Vpse</i>
5			Positive Vpse	<i>Positive Vpse</i>
6	Positive Vpse	Negative Vpse		<i>Positive Vpse</i>
7			Negative Vpse	<i>Negative Vpse</i>
8			Negative Vpse	<i>Negative Vpse</i>

New Type 3

- Modify 33.2.5 to require a Type 3 PSE to power all four pairs if a PD is connected via a valid four-pair channel
- Add new sections 33.2.6.3 and 33.3.5.3 to describe Type 3 classification
 - Classification details TBD
 - Define new class power levels TBD, adjust Table 33-11 and 33-18 limits accordingly
 - Modify both state machines for new class behavior

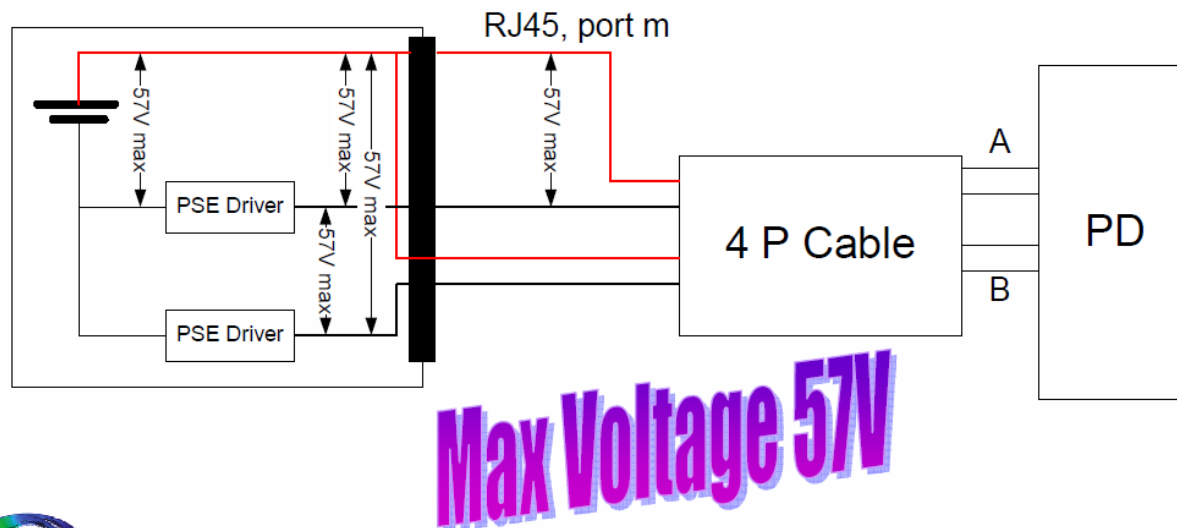
Type 3 Baseline Text

- 33.2.5:
 - The PSE shall turn on power only on the same pairs as those used for detection. ***The PSE shall provide power on all pairs that connect to the detected PD.***
- 33.2.6.3:
 - (new PSE Type 3 Class details TBD)
- 33.3.5.3:
 - (new PD Type 3 Class details TBD)
- Tables 33-11, 33-18
 - (new power levels TBD)
- State Machines 33.2.4.7, 33.3.3.5
 - (new Type 3 Class details TBD)

Appendix – July 2008 4P Adhoc

Isolation and 120V issue

- Per the proposal: Simultaneous operation ALT A and B PSE sources that are located at different link segments are not allowed.
Only the following configuration is allowed.



Appendix – July 2008 4P Adhoc

Background - Previous work - 802.3af

- Technical work regarding simulations operation of ALT A and ALT B was not done at the 802.3af project.
 - A 4P concept were presented on single slide w/o detailed discussion (confirmed with the presenter).
 - Popularity of 2P CAT3 cables installations were discussed as a potential reason for interoperability issues however this argument was not examined for potential solutions such 2x2P concept. In addition 2P cable argument is not relevant today as 4P cable installations are required (10/100/1000BT) and 2P cables are out of scope of the standard.
 - See CFI presentations
 - See page 10 at http://www.ieee802.org/3/power_study/public/july99/stapleton_1_0799.pdf
 - See page 8 at http://www.ieee802.org/3/power_study/public/july99/lehr_1_0799.pdf
 - No further discussions at Study group or Task Force
 - The reason was the belief that 15.4W is sufficient for most applications so we didn't invest time on it
 - It was not in the objectives nor at the promises of the CFI
 - Time pressure to meet the objectives and project time table hence no body bother to check or verify or discuss on it.
- If somebody has documented information on the subject from the 802.3af project, please send it to the 4P ad hoc.

Adhoc agrees

