# IEEE P802.3at Task Force
## Power Via MDI Enhancements
## Simultaneous Operation of ALT A and B
## 4P Adhoc
## March 19  2008

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# Agenda

- ❑ Objectives
- ❑ Background
- ❑ Work done in 802.3af
- ❑ Work done in 802.3at
- ❑ Proposed Coarse of action
- ❑ Proposed baseline concept for discussion
- ❑ 2 x 2P concept Summary
- ❑ Possible operation modes of 2x2P PD
- ❑ Investigating Interoperability: What we can implement Today?
- ❑ High level Fundamental questions
- ❑ Preparing list of questions/concerns
- ❑ Resolving list of questions/concerns
- ❑ Summary
- ❑ Ad hoc recommendations

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# Objectives

- Resolving N x 2P comments
  - With minimal changes in 802.3
  - Without adding additional requirements for 2P specifications

- Focus on system architecture that
  - allows flexible PD implementations and applications
  - allows simple and clear standard
  - No additional requirements for 2P PSE or PD specifications

*Adhoc agree*

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# Background

■ In January interim a proposal was made for resolving the 4P bucket.

■ The proposal was based on treating the simultaneous operation of ALT A and ALT B both in PSE or PD as "out of scope of the standard" in similar way to the 1G Midspan in the 802.3af.

■ The ideas behind this approach were according to the supporters:

– Reduce the amount of new requirements to the specification.

– Not to disallow solutions that are feasible and coexist with 802.3

■ Some members of the group raise questions regarding if there are interoperability issues if we leave the text just as "out of scope" and may be we should add some text to exclude some configurations.

■ The purpose of the ad hoc is to learn the subject and come up with recommendations for the desired text.

Adhoc agree

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# Background - Current text of 802.3 and suggested remedy from Jan 2008 meeting

**PSE section: 33.2.2  Page 22 line 49-52:**

A PSE shall implement Alternative A or Alternative B, or both, provided the PSE meets the constraints of 33.2.3. Implementors are free to implement either alternative or both. 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~~. simultaneous operation of Alternative A and Alternative B is out of scope of the standard.
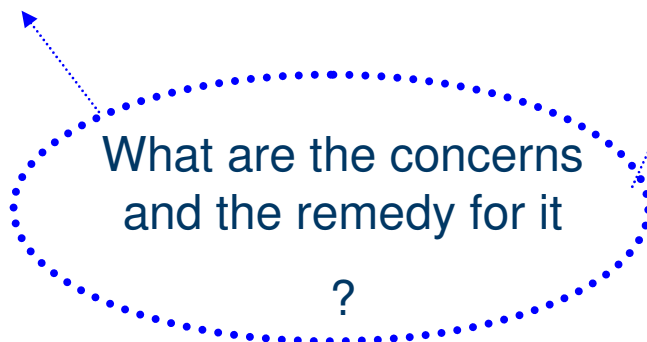
**PD section: 33.3.1  Page 49 line 41-42:**

NOTE—PDs that implement only Mode A or Mode B are specifically not allowed by this standard. PDs that may simultaneously receive ~~require~~ power from both Mode A and Mode B are ~~specifically not allowed by~~ out of scope of this this standard.

Original Text

~~Suggested to delete~~

New text

What are the concerns and the remedy for it

?

This proposal we want to examine

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# Demonstration of IEEE802.3af current text. Figure 1



This PD is equivalent to a compliant PD behavior. The difference is different implementation.
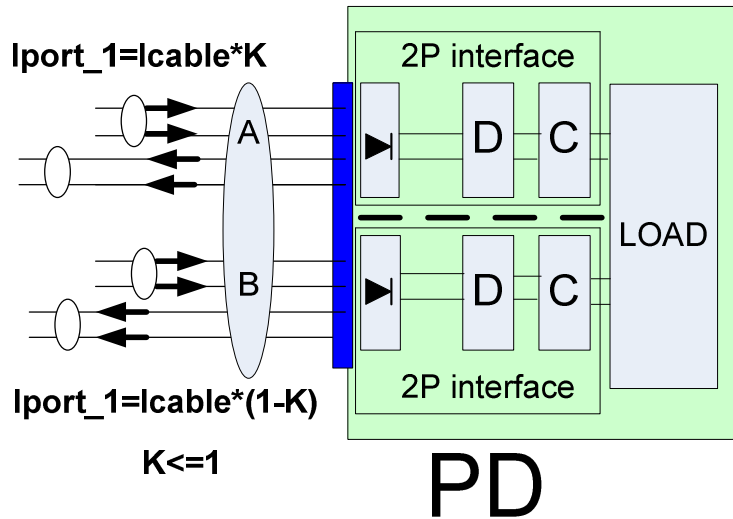
This is a compliant PD

Iport_1=Icable*K

2P interface

D C

LOAD

Iport_1=Icable*(1-K)

2P interface

K<=1

PD

Figure 1-2

However according to the current text, we can't do it..

Iport=Icable

2P interface

D C

LOAD

2P interface

PD

2P system requirements defined here.

Figure 1-1

Both PDs will work with any PSE (2P, 2x2P)

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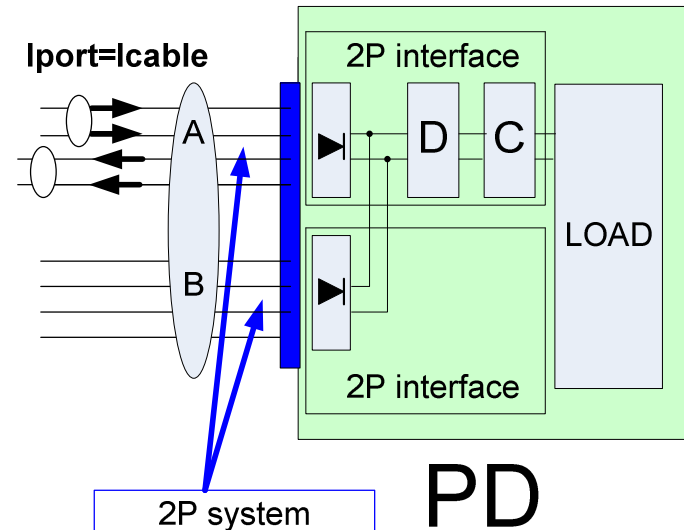
# Background - Previous work - 802.3af

- 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 agree*

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# Background - Previous work - 802.3at

- Two concepts were discussed

- 1$^{st}$ concept: 4P PD as special PD type e.g. AF PD, 2P AT PD, 4P AT PD.

- 2$^{nd}$ concept: After a year or so of discussions we made a progress by recommending of more general approach which is Nx2P while 2P is the basic building block (see reference 3.10 at page 17) . This approach is significantly reducing the amount of work required to specify a 4P PD operation by requiring the PD will meet the requirements of 2P operation over each two pairs.

- See the reference list <u>at the end of this presentation</u> which addresses the following topics discussed at the group:

  - Technical feasibility

  - Economical feasibility

  - Market need and applications

  - Motions, Decisions and straw polls

*Adhoc agree*

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# Proposed Coarse of action

- Using the "out of scope" proposal

- If necessary, to investigate interoperability issues in case we would like to exclude some configurations or all, or supply information at the informative section of the standard
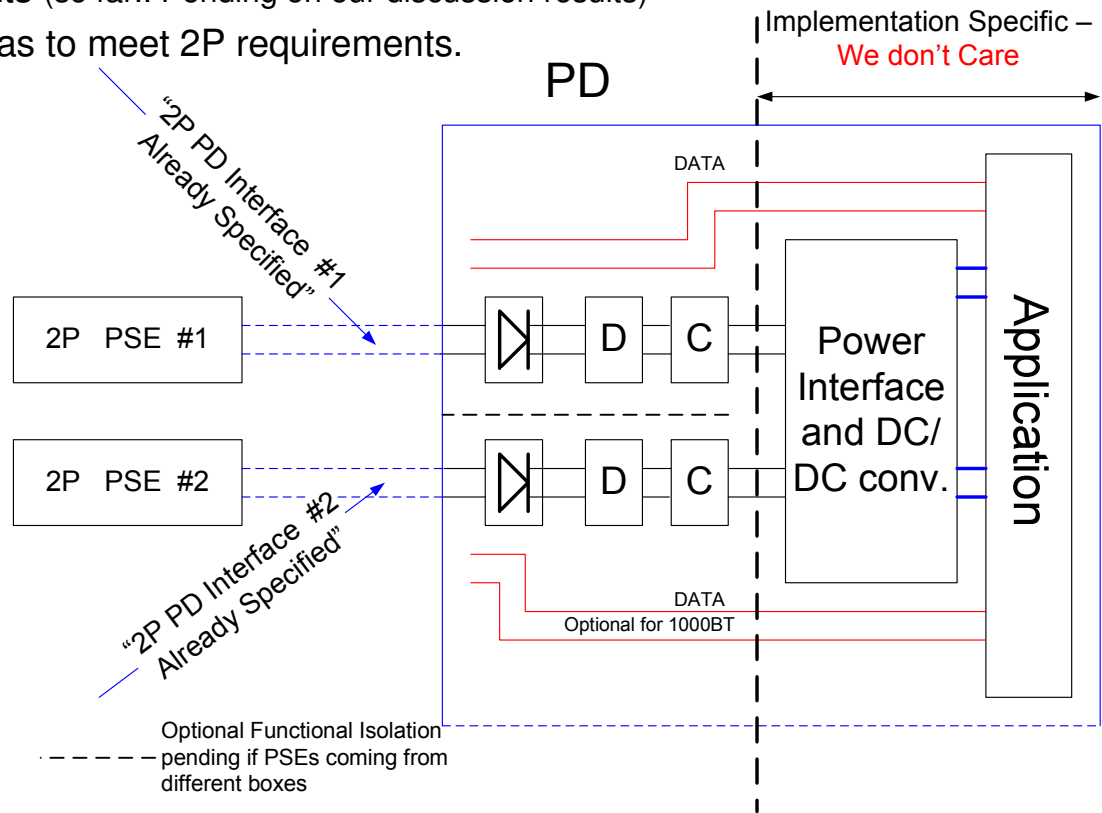
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# Proposed baseline concept for discussion

- **PD**
  - Receives multiple 2P power source
  - Each 2P in the PD has 2P interface and meets 2P system requirements
  - Power levels, Power partition and Power combining are the PD business pending on power level, applications and implementations as usual.

- **PSE**
  - Has no special requirements (so far.. Pending on our discussion results)
  - Each PSE power source has to meet 2P requirements.

Implementation Specific – We don't Care

PD

"2P PD Interface #1 Already Specified"

"2P PD Interface #2 Already Specified"

2P PSE #1

2P PSE #2

DATA

D | C

Power Interface and DC/ DC conv.

Application

DATA
Optional for 1000BT

Optional Functional Isolation pending if PSEs coming from different boxes

Adhoc agree

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# 2 x 2P concept Summary

- Due too the need that PD will support both ALT A or ALT B (33.3.1), current 802.3af/at is a 4P interface in any case. It is always 2x 2P interface.

- At each 2P at the RJ45, we see Detection, Classification, PD indication etc.

- 2P System is the basic building block. 4P powering system may be constructed by 2x2P independent systems

- N Pairs systems is constructed by N/2 x 2P systems.

- Hence a PD that requires power over 4 pairs is actually a PD that is connected to 2x2P systems and each 2P system has all 2P functions.

- As a result, questions such:

  - Current sharing or not?

  - Current Balancing or not?

  - Interoperability issues

- Became easy to answer due to the fact that the multi 2P powering systems that is suggested herein doe's not require any correlation between the individual 2P powering sub system. Such correlation may be an implementation feature of the PD which is beyond the scope of this standard like any other implementation specific feature.

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# Possible operation modes of 2x2P PD

| PSE Inputs | | PD Possible **INTERNAL** Operating Modes | | | PD **EXTERNAL** operating Modes | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | | PD Inputs | | |
| 1 | 2 | Mode 1 | Mode 2 | Mode 3 | 1 | 2 | Notes |
| AF | - | Type 1 | | | AF | - | |
| - | AF | Type 1 | | | - | AF | |
| AT | - | Type 1 | Type 2 | | AT | - | |
| - | AT | Type 1 | Type 2 | | - | AT | |
| AF | AF | 2 X Type 1 | | | AF | AF | |
| AF | AT | 2 X Type 1 | Type 1, Type 2 | | AF | AT | |
| AT | AF | 2 X Type 1 | Type 1, Type 2 | | AT | AF | |
| AT | AT | 2 X Type 1 | Type 1, Type 2 | 2 x Type 2 | AT | AT | |

• **INTERNAL** Operating Modes are transparent to the user

• **EXTERNAL** Operating Modes are defined by the standard for each 2P

• **Examples:**

• PD detects Type 1 PSE. PD takes up to 12.95W and operate single Radio load. PD detects Type 2 PSE. PD takes >12.95W and operates 2nd Radio load ➔ Dual Mode operation.

• PD detects Type (1 or 2) PSE on input 1 and Type (1 or 2) PSE on input 2 and operate **WHATEVER**

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# Possible operation of 2x2P PD

| PSE Inputs | | PD Possible **INTERNAL** Operating Modes | | PD **EXTERNAL** operating Modes | | |
|---|---|---|---|---|---|---|
| 1 | 2 | Implementation. We Don't Care | 1 | 2 | Notes |
| AF | - | | | AF | - | |
| - | AF | | | - | AF | |
| AT | - | | | AT | - | |
| - | AT | | | - | AT | |
| AF | AF | | | AF | AF | |
| AF | AT | | | AF | AT | |
| AT | AF | | | AT | AF | |
| AT | AT | | | AT | AT | |

- **INTERNAL** Operating Modes are transparent to the user
- **EXTERNAL** Operating Modes are defined by the standard for each 2P
- <u>**Examples:**</u>
- PD detects Type 1 PSE. PD takes up to 12.95W and operate single Radio load. PD detects Type 2 PSE. PD takes >12.95W and operates 2$^{nd}$ Radio load ➔ Dual Mode operation.
- PD detects Type (1 or 2) PSE on input 1 and Type (1 or 2) PSE on input 2 and operate **WHATEVER**

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# Investigating Interoperability:
# What we can implement Today?

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# Demonstration of IEEE802.3af current text. Figure 1

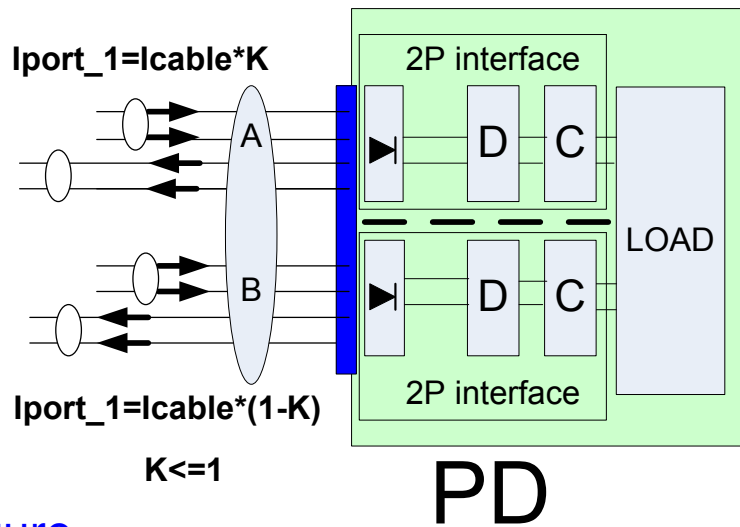This PD is equivalent to a compliant PD behavior. The difference is different implementation.

This is a compliant PD

Iport_1=Icable*K

2P interface

A

D C

LOAD

B

D C

2P interface

Iport_1=Icable*(1-K)

K<=1

PD

Figure 1-2

However according to the current text, we can't do it..

Iport=Icable

2P interface

A

D C

LOAD

B

2P interface

PD

2P system requirements defined here.

Figure 1-1

Both PDs will work with any PSE (2P, 2x2P)

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# Today We Can Do The Following….Figure 2
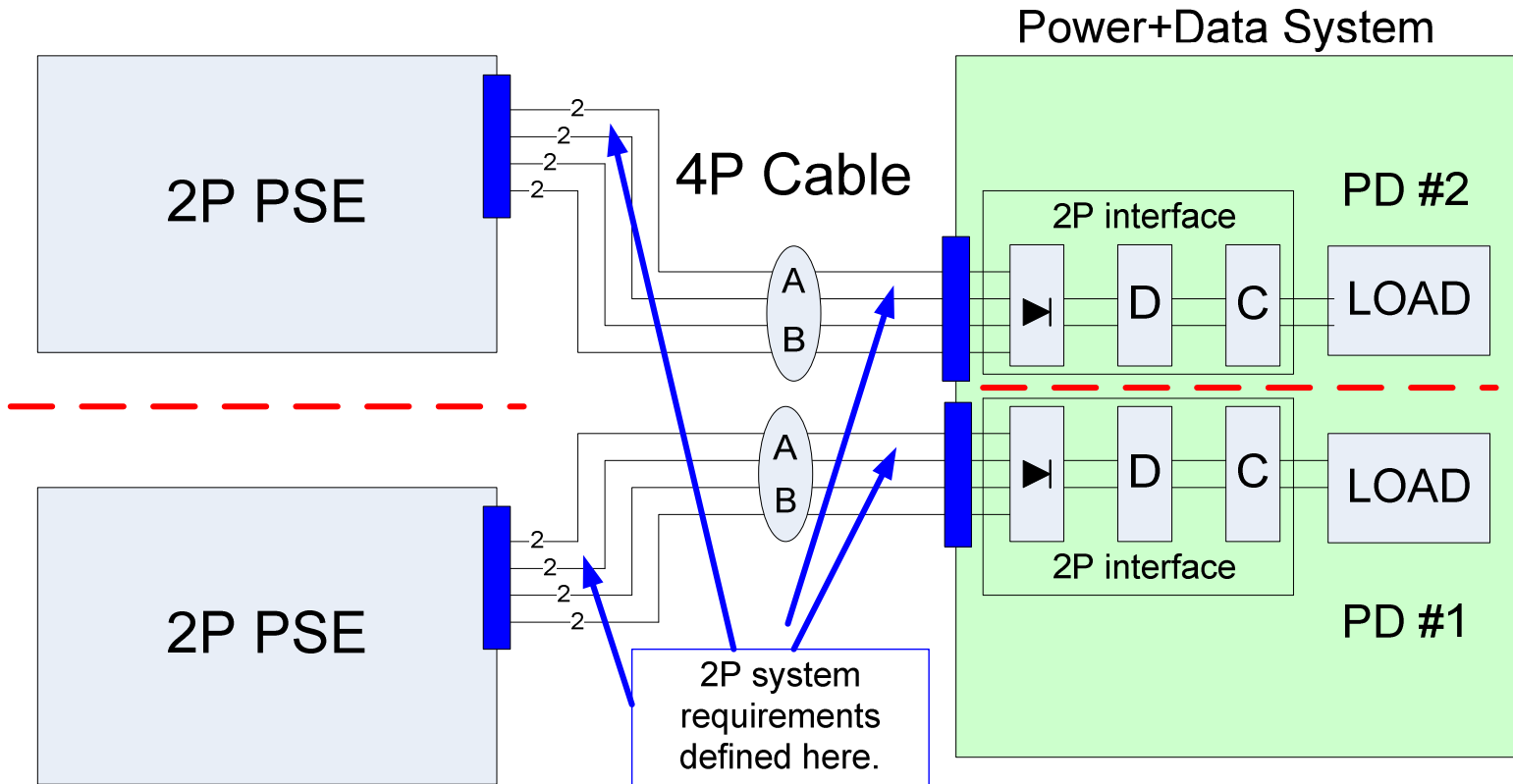


**Power+Data System**

2P PSE

2P PSE

4P Cable

PD #2

PD #1

2P interface

2P interface

LOAD

LOAD

D    C

D    C

A
B

A
B

2
2
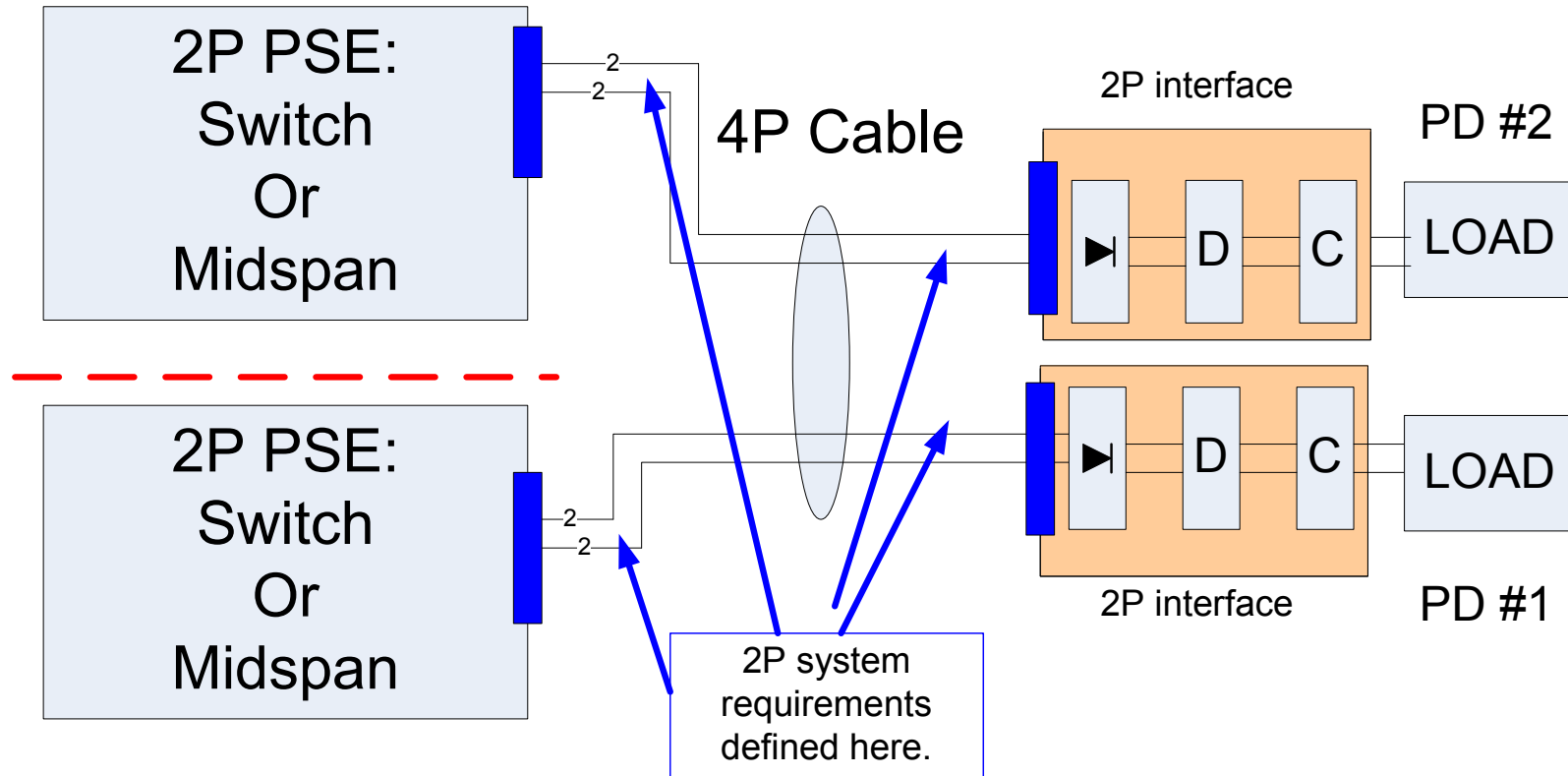2
2

2
2
2
2

2P system requirements defined here.

– – – –  Environment A or B isolation as defined by IEEE802.3af

Connector. The 2 x 2P PSE may be located in the same or different box.

**2 Cables. May be integrated to a single cables. All cables are simultaneously powered.**

Adhoc agree

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# The spec is not prohibiting Y connection – Figure 3



2P PSE: Switch Or Midspan

2P PSE: Switch Or Midspan

4P Cable

2P interface

PD #2

2P interface
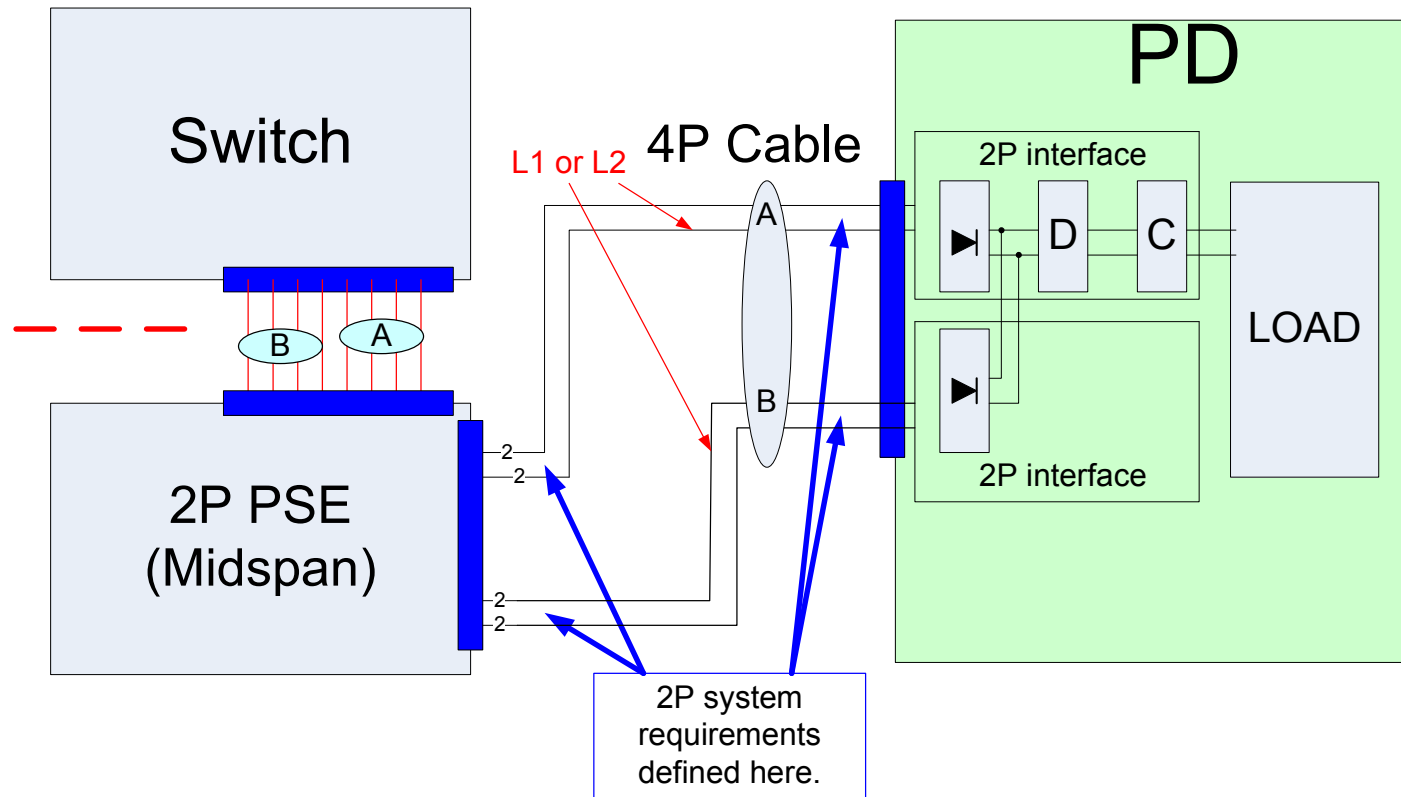
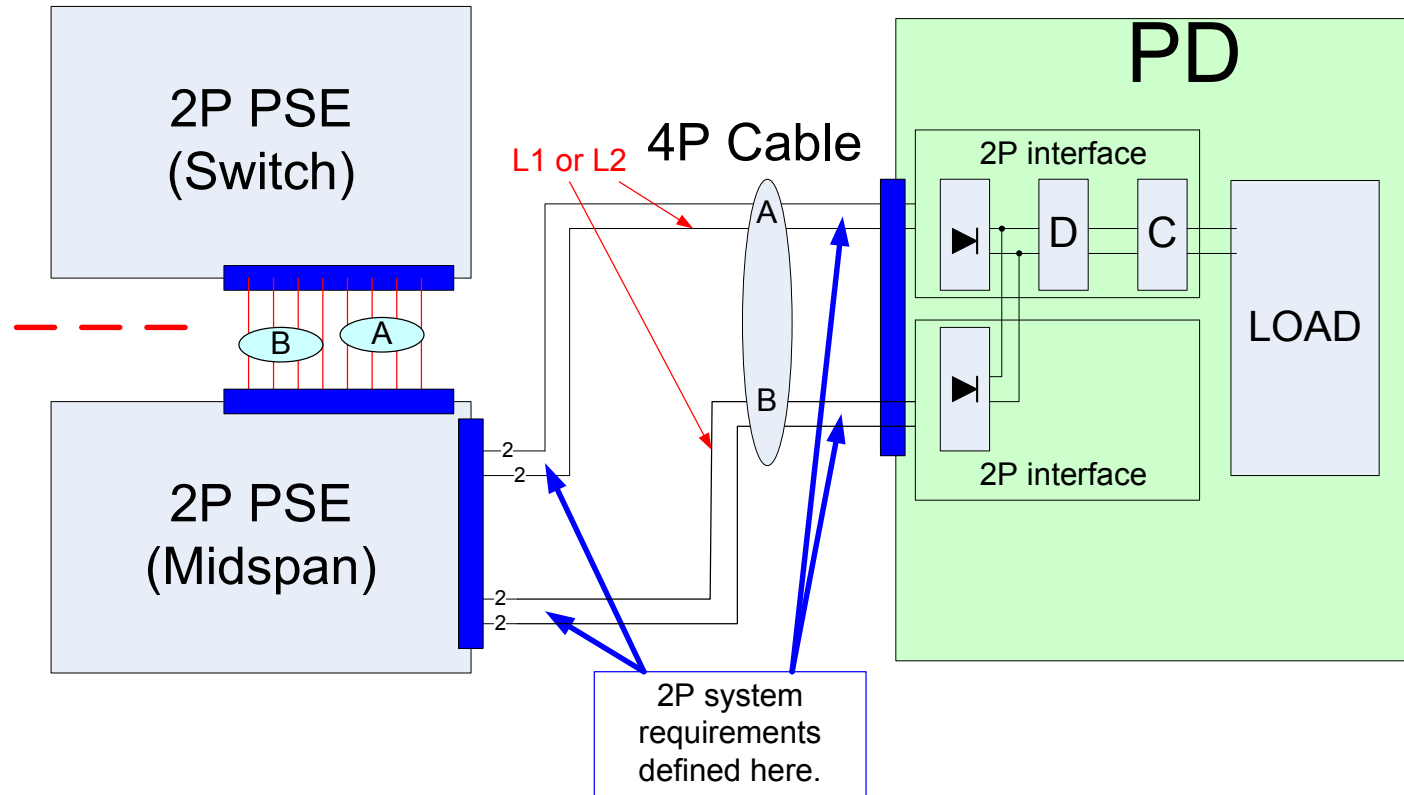PD #1

LOAD

LOAD

2P system requirements defined here.

– – – – Environment A or B isolation as defined by IEEE802.3af

Connector. The 2 x 2P PSE may be located in the same or different box, on the same cable.

**Simultaneous power all pairs.**

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# Mispan-Switch Combinations – Figure 4



Environment A or B isolation as defined by IEEE802.3af

Connector. The 2 x 2P PSE may be located in the same or different box, on the same cable.

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# The 802.3 doesn't prohibit the Mispan-Switch Combinations – Figure 4.1



- - - - Environment A or B isolation as defined by IEEE802.3af

Connector. The 2 x 2P PSE may be located in the same or different box, on the same cable.

*Simultaneous power on ALT A and ALT B is not allowed per 802.3af which we would like to investigate compared to other configurations that are allowed by the specifications*

Adhoc agree.
Keith ???

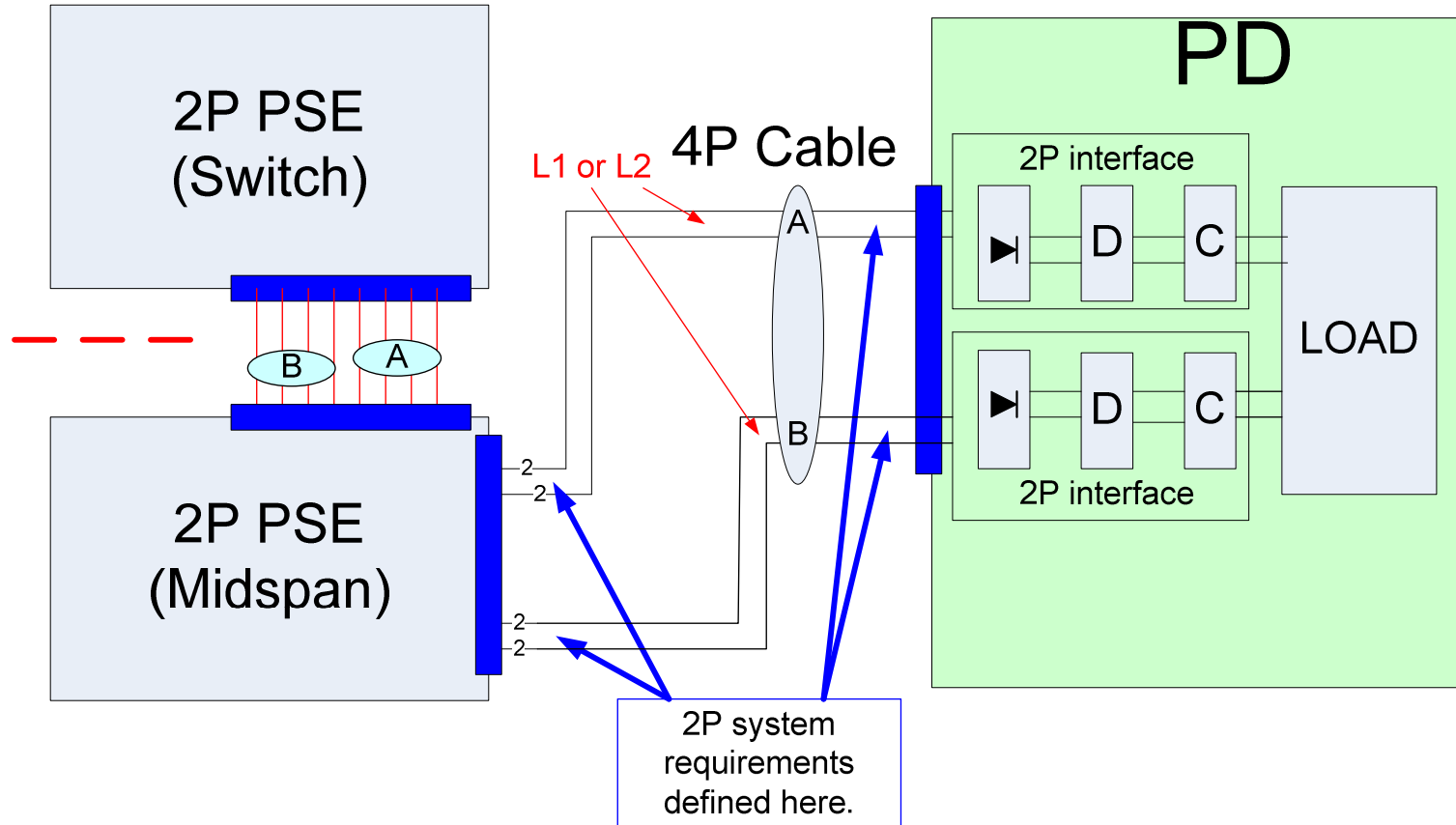**Microsemi.**      **www.microsemi.com**

# Comments for Figure 4-1

- The following Midspan-Switch Combination is not expressly forbidden. This type of configuration is addressed by the back off function for allowing the Switch to have priority in powering.

- If we want to use it as 2x2P configuration, it would only work if all switches use ALT A. See later in the percentage of ALT A switch in the market.

- This input is relevant only if we require 2x2P PD to work only with 2x2P interface. If that PD designed to work in dual mode, then it doesn't matter.

- If 2 separate source (Switching Power Supplies) are used in Midspan and Switch there are known potential unreliable operation when PD does not have isolation (Functional Isolation. It is not a safety issue) between A and B sources.

  - In this configuration we could have failures to detect legal PDs and false disconnects. The route cause is the common mode EMI corrupting the detection and measured values for current. It is possible that a good Midspan, a good switch and good PD that play well but fail in the configuration without functional isolation.
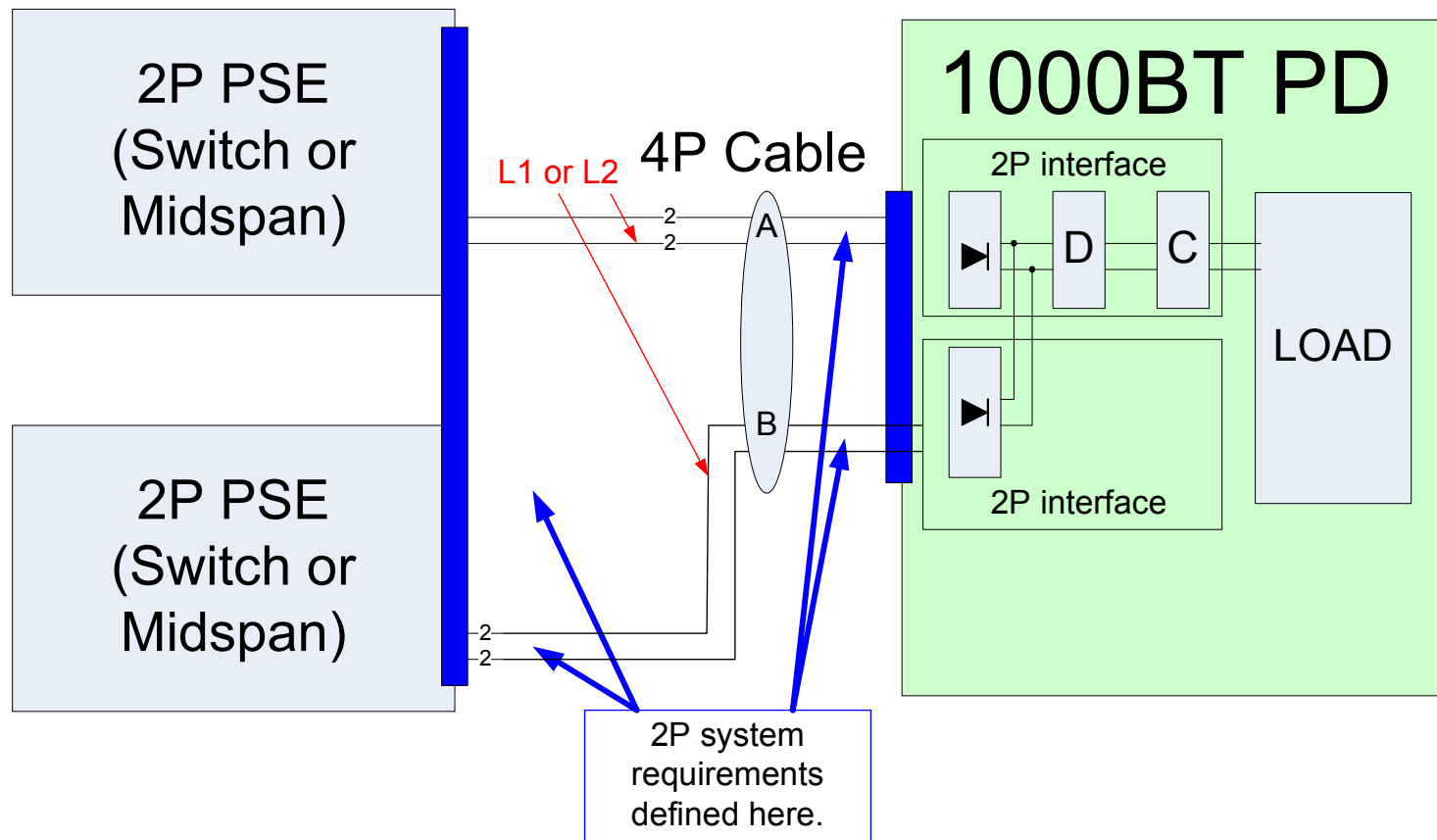
# Figure 5: This is equivalent to Figure 4.1



2P PSE (Switch)

2P PSE (Midspan)

4P Cable

L1 or L2

B    A

PD

2P interface

D    C

LOAD

D    C

2P interface

A

B

2P system requirements defined here.

– – –  Environment A or B isolation as defined by IEEE802.3af

▬▬▬  Connector. The 2 x 2P PSE may be located in the same or different box, on the same cable.

*Simultaneous power on ALT A and ALT B is not allowed per 802.3af which we would like to investigate compared to other configurations that are allowed by the specifications*

Adhoc agree

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# 1000BT operation: We allowed to do it- Figure 6



2P PSE (Switch or Midspan)

L1 or L2

4P Cable

A

B

1000BT PD

2P interface

D

C

LOAD

2P interface

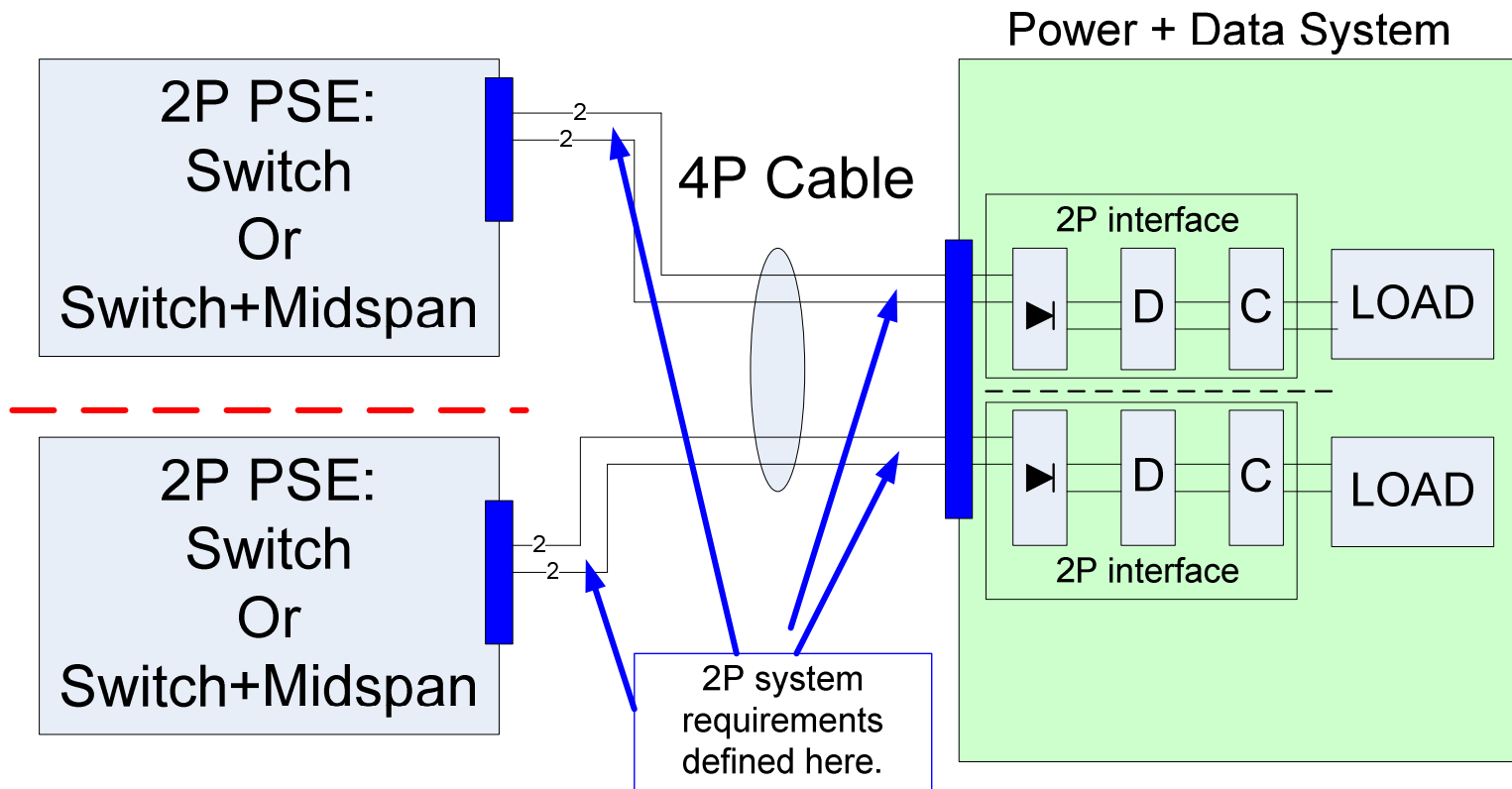2P PSE (Switch or Midspan)

2P system requirements defined here.

Adhoc agree

– – –  Environment A or B isolation as defined by IEEE802.3af

▮  Connector.

*Simultaneous power on ALT A and ALT B is not allowed per 802.3af which we would like to investigate compared to other configurations that are allowed by the specifications*

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But according to current 802.3af text we can't do Figure 7 which is = to
Figure 2  for multi-port on the same or different cables and = to
Figure 3   for simultaneous operation which is allowed and = to
Figures 4 and 5 for multiple 2P systems on the same cable which are not precluded.

Power + Data System

2P PSE:
Switch
Or
Switch+Midspan

4P Cable

2

2

2P interface

D

C

LOAD

2P PSE:
Switch
Or
Switch+Midspan

2

2

D

C

LOAD

2P interface

2P system requirements defined here.

Figure 7

– – – – –   Functional Isolation

– – – –   Environment A or B isolation as defined by IEEE802.3af
Connector. The 2 x 2P PSE may be located in the same or different box or port.
According to the current text, we can't simultaneously feet power on ALT A and B

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# Analysis of Figure 1-2 compared to Figure 1-1 (2P PD)

| Parameter | Behavior | Notes |
|---|---|---|
| **Functional** | 802.3af/at | Identical to figure 8-1 |
| **Interoperability** | | |
|   - Works with2P PSE | Yes | |
|   - Works with2x2P PSE | Yes | |
| **Additional Requirements to PD** | NO | |
| **Additional Requirements to PSE** | NO | |
| **Is it mandatory to support it** | NO | It is "out of scope". It is implementer choice. |
| | | |

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# Summary of configurations vs. current spec. status

| Fig. | Configuration | | Segments | Cable | Simultaneous power | Simultaneous data |
|---|---|---|---|---|---|---|
| | Name | Spec. | | | | |
| 2 | Multi-port | Allowed | Different | Different, Same | Allowed | Allowed |
| 3 | Y con. | Allowed | Different | Same | Allowed | Allowed |
| 4 | Switch+ Midspan | Allowed | Same | Same | Not allowed | Allowed |
| 4.1 | Switch+ Midspan, 2P Equivalent. | Allowed | Same | Same | Not allowed | Allowed |
| 5 | 1000BT Switch/ Midspan | Allowed | Same | Same | Not allowed | Allowed |
| 6 | 1000BT Switch/ Midspan | Allowed | Different | Different, Same | Allowed | Allowed |
| **1** | **Current Text** | **Not allowed** | **Same** | **Same** | **Not allowed** | **Allowed** |
| **7** | **Current Text** | **Not allowed** | **Different** | **Same** | **Not allowed** | **Allowed** |

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# Summary of configurations is raising fundamental questions

- If segments are different- No limitations in the spec.

- If same segment – we are limited in using simultaneous power on ALT A and B

    - But same segment is easier to handle then different segments..

- 1000BT allows aggregating data from same or different segments

    - Why not allowing aggregating power?

- Interoperability? Let's discuss it in the next slide.

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# Interoperability

- So far ad hoc agree to the following findings:

- 1. If 2x2P is in the box, same segment then no issues for 10/100/1000BT.

- 2. If 2x2P coming from different boxes then;

  a) No issues with 10/100BT PD                                              b)
  L2 issues with  1000BT PD                                    c) PD
  needs functional isolation between ALT A and B.

  3. PD can work with dual (or triple) modes. Happen today, allowed and even supported by standard (Type 2 PD that support only type 1 until 2 fingers OR L2 is detected)

- 4. (1) + (3) allows the same level of interoperability that we have today

- 5. There is a question is 2x2P is a new type of PD?

  Opinion 1: No it is always Type 1 OR Type 2. It is always 2x2P interface. It can work in internal dual or triple modes but the external modes are always Type 1 and Type 2.

  Opinion 2: It is different type or different product. Group to discuss.

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# List of issues discussed or to be discussed

- Q1. Do we need to define maximum voltage difference between PSE sources?

- Q2. What are the possible PSE-PD permutations

- Q3. What are the relevant architectures? (depend also on the answer for Q1)

- Q4. ALT A may have L2 and ALT B may not. How it will affect the operation?

- Q5. Do we need current sharing?

- Q6. Do we need current balancing?

- Q7. Do we need isolation between each 2P at the PD?

- Q8. How to address 2x2P from marketing point of view? Is it different product?

- Q9. What happen if 2 x 2P Type 1 PD is connected to PSE Type 2?

- Q10. Some of the switches powers on ALT B. How it affect operation?

- Q11. More questions ?

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# Resolving Concerns – Discussion  Q1

Q1. Do we need to define maximum voltage difference between PSE sources?

–   Max. voltage difference between power sources affect the operating range of potential current sharing function in the PD.

–   At maximum voltage difference possible 14V to cover both Type 1 and Type 2 PSEs combinations.

–   Under this worst case condition, Current Sharing Function is depend on the imementation of the PD power architecture which is pending on the power level, Ppd_max (Ppd_max=Max PD input power).

- ■   Below Ppd_max there is no need for current sharing at any voltage difference (it is like standard 2P).

- ■   Above Ppd_max, the need for current sharing is function of the power supply architecture.

    - –   Single power supply will require current sharing
    - –   Dual power supply will not need it.

–   Hence it became implementation (architecture) and application (power level and load architecture)  issues ➔ Out Of Scope of this standard

–   See permutation table for more details.

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# Resolving Concerns – Discussion  Q2

■ Q2. What are the relevant PSE-PD combinations?    1-3

| Table 1 | | PD Type | | | | Notes |
|---|---|---|---|---|---|---|
| PSE #1 ALT A/B | PSE #2 ALT B/A | Type 1 | | Type 2 | | |
| Same PSE segment | | 2P (13W) | 2 X 2P (26W) | 2P (30W) | 2 X 2P (60W) | |
| **2** AF | AF | OK | OK | OK **Case 6** | OK **Case 6** | **Working if using Dual Mode.** |
| **3** **AF** | AT | OK | OK | OK **Case 6** | OK | |
| **4** AT | **AF** | OK | OK | OK | **Case 6** | See note 1 and 2 |
| **5** AT | AT | OK | OK | OK | OK | Normal operation |
| AT | - | OK | OK **Case 6** | OK | OK **Case 6** | See notes 1 and 2 |
| **6** **AF** | | | | **May or may not work** | | **See notes 1 and 2 for current standard status for reference** |

**Note 1**: Dual Mode operation means: PD can work as type 1 PD unless it knows that he can get more power. Currently supported by the standard.

**Note 2**: Dual mode concept can be extended to from 2P to 2 x 2P operation i.e. Type 1 PD, Type 2 PD, Type 2 PD with or without 2x2P operation. All of it is transparent to the user.

**ALL MARKED PERMUTATIONS ARE HANDELED WITH *IMPLEMENTATIONS SPECIFIC SOLUTIONS* WHICH JUSTIFYING  "OUT OF SCOPE" APPROACH**

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| Table 2 | PD Type | | | | |
|---|---|---|---|---|---|
| | Type 1 | | Type 2 | | |
| Single PSE source | 2P | 2 X 2P | 2P | 2 X 2P | Notes |
| AF ALT A/B With or without L2 | OK | Implementation dependent | OK **Case 6** | May not work, Implementation dependent | **Working if using Dual Mode.** See note 1 and 2 |
| AT ALT A/B With or without L2 | OK | OK | OK | OK **Case 6** | |
| | | | | | |
| | | | | | |
| | | | | | |

**Note 1**: Dual Mode operation means: PD can work as type 1 PD unless it knows that he can get more power. Currently supported by the standard.

**Note 2**: Dual mode concept can be extended to from 2P to 2 x 2P operation i.e. Type 1 PD, Type 2 PD, Type 2 PD with or without 2x2P operation. All of it is transparent to the user.

**ALL MARKED PERMUTATIONS ARE HANDELED WITH *IMPLEMENTATIONS SPECIFIC SOLUTIONS* WHICH JUSTIFYING "OUT OF SCOPE" APPROACH**

- 1000BT 2x2P PD connected to 2x2P PSE. What are the limitations for such configuration

- Discussion

- <u>Regardless of power</u>, 1000BT need to be connected to 2x2P transmit/receive interface.

- Now if it has power on ALT A or B it will work

- If it has power on ALT A and ALT B it will work too..

- If ALT A and ALT B are coming from <u>different ports or different boxes</u> then <u>data</u> may not work ➔ It is implementation issue at the Switch-PD high level architecture.

- If power is coming from different ports/segments/boxses then it may work ➔ depend on implementation.

- So we are not adding problems to what we have already➔ These are implementation issues

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# Resolving Concerns – Discussion  Q4

Q4. ALT A may have L2 and ALT B may not. How it will affect the operation?

Due to the fact that each 2P is independent power channel then:

ALT A: Detect, Classify (L1 or L2 or both..) and power..

ALT B: Detect, classify (L1 or L2 or both..) and power..

- No difference from standard 2P channel operation.

- If the 2P PSE use L2 it will have L2 if not it will have to use L1..*this is the spec for 2P..*

- In L2 operation, at the PD, the data received on ALT A.

- Data may received on ALT B if not it is also normal specified behavior of L1.. (Such Midspan)

- In the PD application part, power management data can be played back and forth from ALT A to ALT B and vice versa. It is implementation issue.

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# Resolving Concerns – Discussion  Q5 and Q6

- Q5. Do we need current sharing?

- If we consistent with the concept of two independent 2P channels then we don't need to specify current sharing due to the fact that PD is responsible to meet the specification for each 2P. Only the PD has the knowledge about power levels, application and as a result, the implementation so it is designed accordingly to meet the 2P specifications.


- Q6. Do we need current balancing?

- If we don't need it for 2P then we don't need it for N x 2P..So the answer is NO.

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# Resolving Concerns – Discussion 7

- **Q7.** Do we need isolation between each 2P at the PD?

- Discussion

- In 802.3 ENV A device, there is no requirement for isolation between ports nor between pairs. (In ENV B we must.)

- Most systems are ENV A (Indoor, lower cost..)

- If we use x 2P for the same PD we don't need isolation in terms of ENV A or B. At the most we need "functional" isolation which can be implemented in many ways if it requires. It depends on Power level, Power partition, Application and Implementation

- So the Answer is: Isolation is not required due two 2x2P in terms of ENV A and B.

- **Q7-1** Do we need functional isolation?

- Functional isolation is the isolation required to maintain proper operation per specification. It can be any number between 0V to TBD Volts and it is direct function of Application and Implementation which is transparent to the user. If the requirement is to meet 2P requirement over each 2P then you done. (If due to your implementation you had to isolate and you didn't, then you will not meet some of the 2P requirements such max. current per 2P.

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# Resolving Concerns – Discussion 8

- Q8. How to address 2x2P from marketing point of view? Is it different product?

- Discussion:
- There are only two PD types: Type 1 and Type 2.
- There is no 4P Type PD. It is always 2P PD + 2P PD …+N x 2P PDs enclosed in a single BOX.
- So how 2x2P PD is to be addressed from Marketing point of view?
  - Option 1:Different Part Number with the relevant data sheet information
  - Option 2: As a PD with additional 802.3 power source for enhanced performance
  - Option 3: As 1000BT PD that can get power on each 2P for higher power applications
  - Option 4: Combinations of 1,2 and 3
- PD can be designed to be connected to:
  - Type 1 PSE and
  - 2 x Type 1PSE and
  - Type 2 PSE and
  - 2 x Type 2 PSE
  - It is transparent to the user. For each "mode" the PD can do new things based on available power.
    Example: Type 1 PSE: Basic functions, single Radio if it is AP. If it detects 2 x Type 1 then it can activate 2nd Radio. If it detects 2 x Type 2 it can activates 3rd and more Radios.
    There are such equipments currently at the market that works with multiple modes.

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# Resolving Concerns – Discussion 9

- What happen if 2 x 2P Type 1 PD is connected to PSE Type 2?
- <u>Case 1:</u> If The PSE was 2x2P type 1➔ Works
- <u>Case 2</u>: If The PSE is Type 2 then
- <u>Option 1</u>: It will work if it the PD was designed to work at this scenario➔ It is implementation specific.

   (It is equivalent to the questions:

1. What happen if PD requires ENV B and is connected to ENV A PSE..

2. What happen if Type 2 PD is connected to Type 1 PSE

3. What will happen if 1000BT PD connected to 10/100 Switch

- <u>Option 2</u>: If it is "out of scope", we don't care. It is depend on the designer to take care of it.

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# Resolving Concerns – Discussion  Q10

- How Endspan that uses ALT B can affect operation.

- Discussion.

- Today we allow Switch to be connected to Midspan.

- Switch can use ALT A or B or both.

- Midspan can use ALT A or B or both.

- The mix between them is currently covered by the standard.

- If a Switch which power on ALT B connected to a Midspan that powers also on ALT B then according to the specification the Midspan will power and the Switch will not which is OK. The reason is that Midspan required to prevent backward powering so the there is no DC path between Midspan and Switch, only AC path.

- Therefore we didn't see issues on this matter.

- **Data:**

- UNH: 40%. It is no sufficient information since there  are more then 100 different brand names for Switch. (Even much more) so it is not clear to us how many used ALT B from How many tested? So it cold be 4 out of 10? I don't know.

- Source #2:  out of average of 40 brand names, 5% used ALT B.

- Source #3:  Out of average of 20 brand names, 2% used ALB B.

- Source 4:    Similar to source #3

- In addition for the last 8 years we couldn't find any complains regarding this combination which is allowed by the spec.

- The above data will be less important if we first check what possible issues we can have from this input.

-  See above for conclusions.

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# Summary 1-2

- If we consider each 2P as a 2P system per the N x 2P concept then we are not adding interoperability issues beyond what we allowed to do according to the specifications.

  - If Type 2 PD connected to Type 1 PSE it may not work.

    - PD indication is issued in addition to status registers

    - It is allowed by the standard

    - PD may be design to work in dual mode ➔ Implementation issue

  - If Type 1 PD connected to PSE type 1 it may not work.

    - If PSE doesn't have enough power

    - If "from any reason" ="system decision" PSE may not power the PD.

    - No indication is issued beyond status registers

  - If 1000BT PD is connected to 10/100BT it may not work fully

    - It may work if it was designed to. ➔ Implementation issue

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# Summary 2-2

- If 2 x2P PD was connected to 2P PSE. No difference with the upper previous cases.

    - It will work if it was designed to. ➔ Implementation issue

- Do we add requirements to the PD?

    - No

    - It is PD implementation issue. PSE sees standard 2P system.

- Do we add requirements to the PSE

    - No. All PSEs (and PDs) are basic building blocks of 2P system.

- Do we add new PD type?

    - No. It is Type 1 PD or Type 2 PD with:

    - 2P  PoE power source or with

    - 2P PoE power source + External power source (AC adapter) or

    - 2P PoE power source + additional 2P PoE power source etc.

    - We already allow it with different segments which is with higher complexity. To allow it on the same segment is simpler.

- If we consider each 2P as a 2P system per the N x 2P concept then we are not adding interoperability issues beyond what we allowed to do according to the specifications.

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# Finalizing ad hoc recommendations

■ Figure 8-2 is identical in behaviour to 8-1 which we allow. How we address this case?

   – It will work with different segments, different boxes

   – It will work with the same segment

   – Works in ENV A or B or mixed environment

   – Works like it was only ALT or only ALT B.

■ The other configurations can be analyzed by similarity

   – Let's discuss at the March IEEE meeting meeting next week.

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# List of references and previous discussions – preliminary

- **1. Market opportunities**
- http://www.ieee802.org/3/poep_study/public/nov04/Feldman_1_1104.pdf
- http://www.ieee802.org/3/poep_study/public/jan05/feldman_1_0105.pdf
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- http://www.ieee802.org/3/poep_study/public/mar05/nordin_1_0305.pdf
- **5. Consensus Proposals**
- http://www.ieee802.org/3/at/public/nov05/darshan_2_1105.pdf
- **6. Straw polls and motions for having 4P in the standard**
- http://www.ieee802.org/3/poep_study/public/sep05/minutes_0905.pdf

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# Typical PD implementations

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# 802.3af/at 2P PDs – PD side.

**Need to be supported by objectives**

**Common implementation**

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# 802.3at : 2x 2P Interface



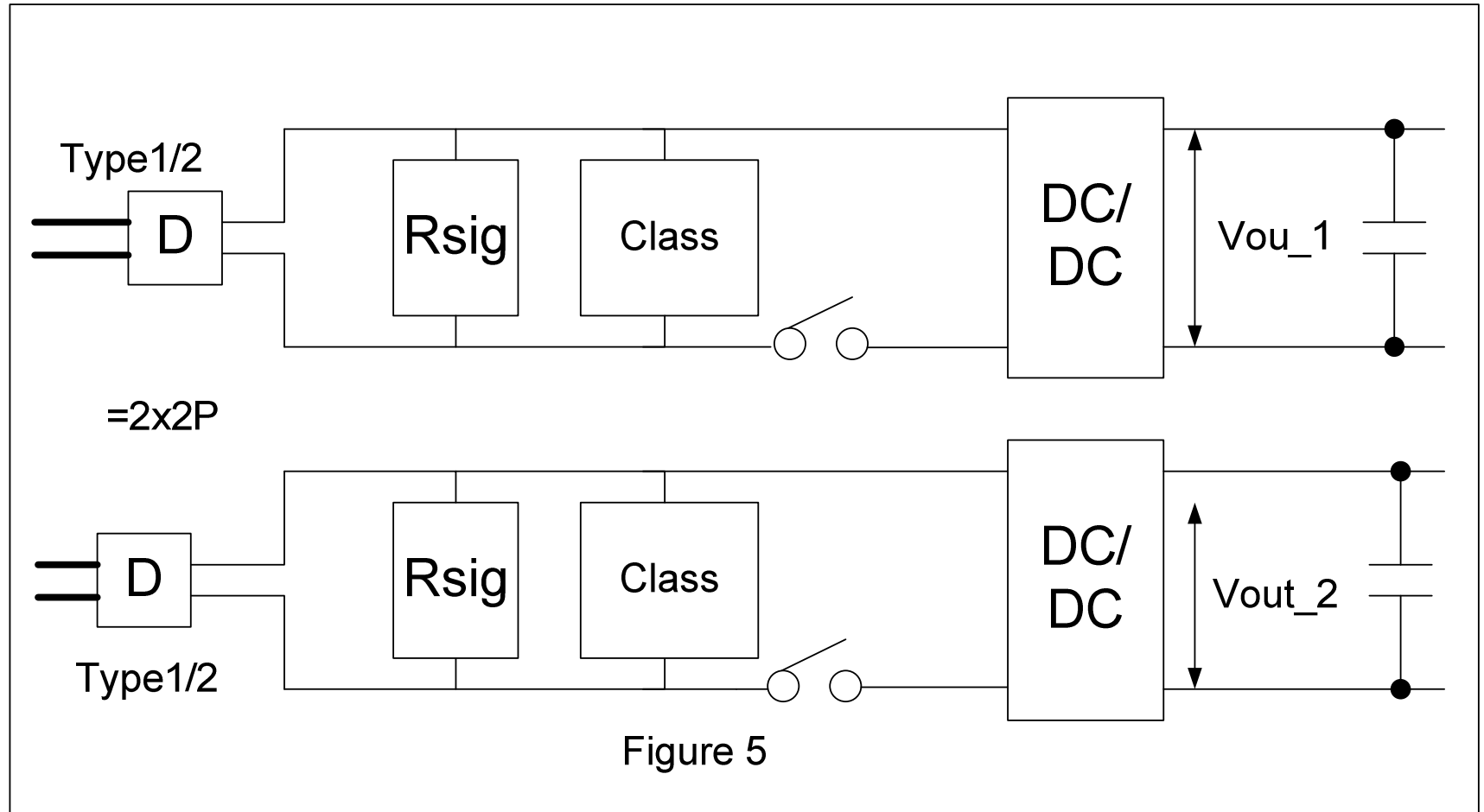Figure 3

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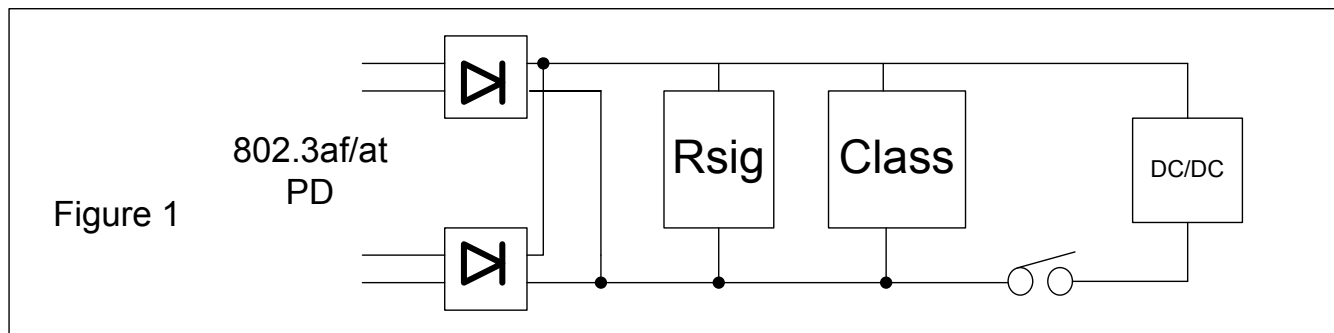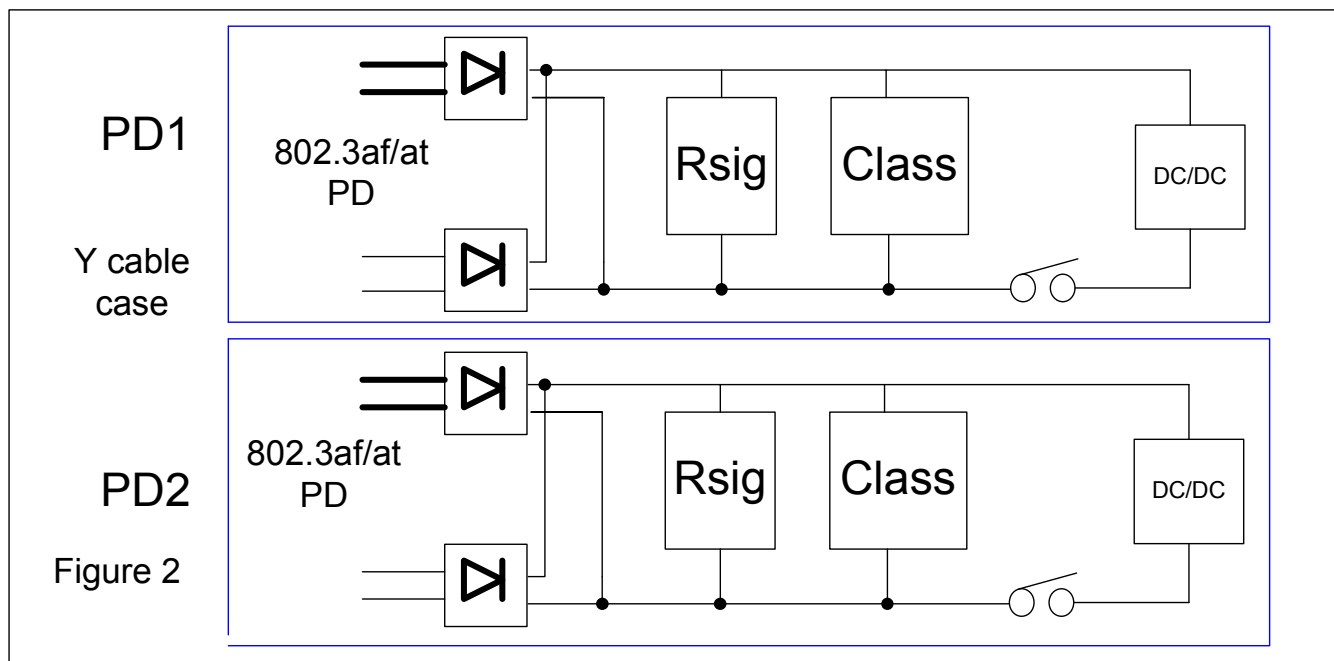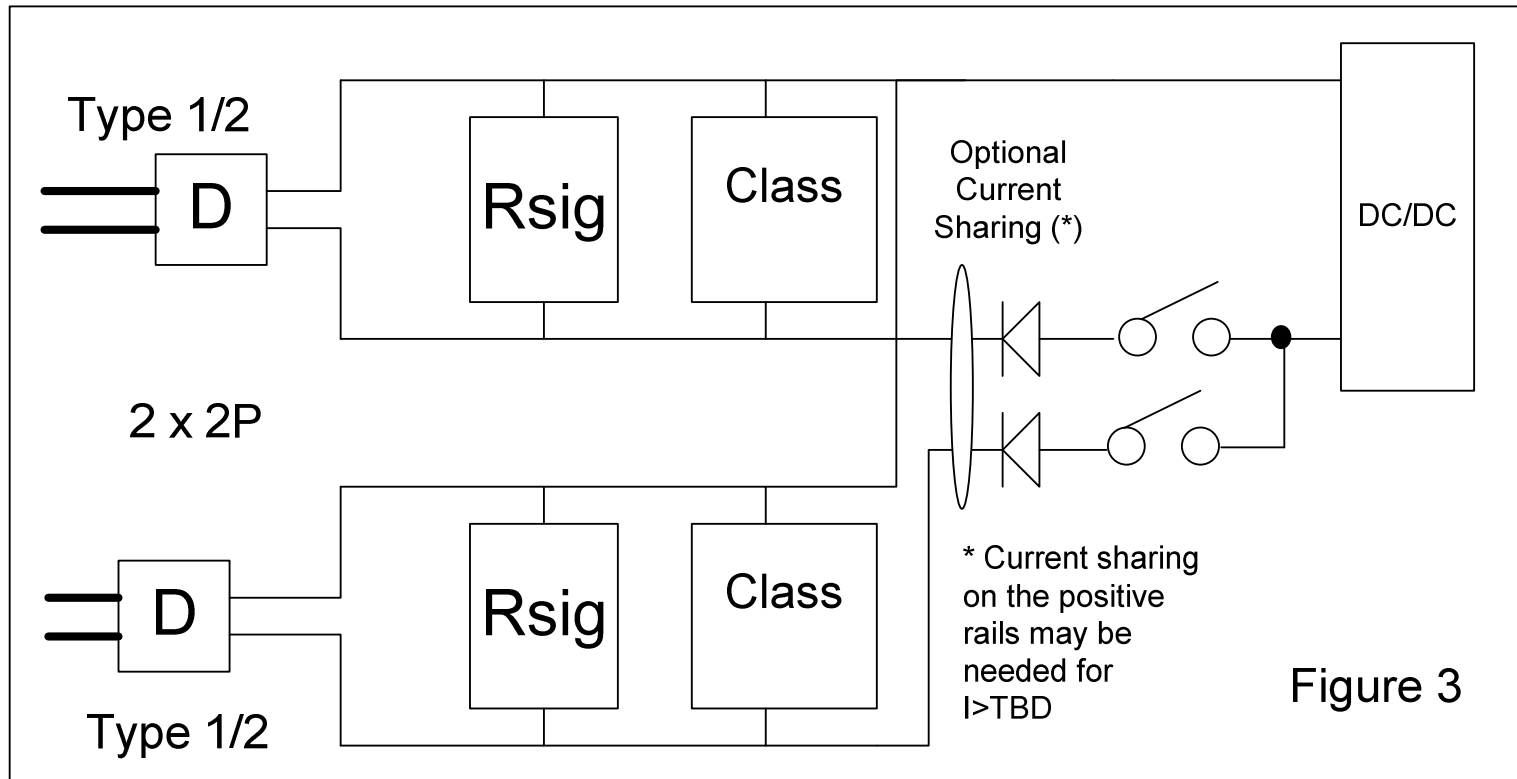
# 802.3at : 2x 2P Interface
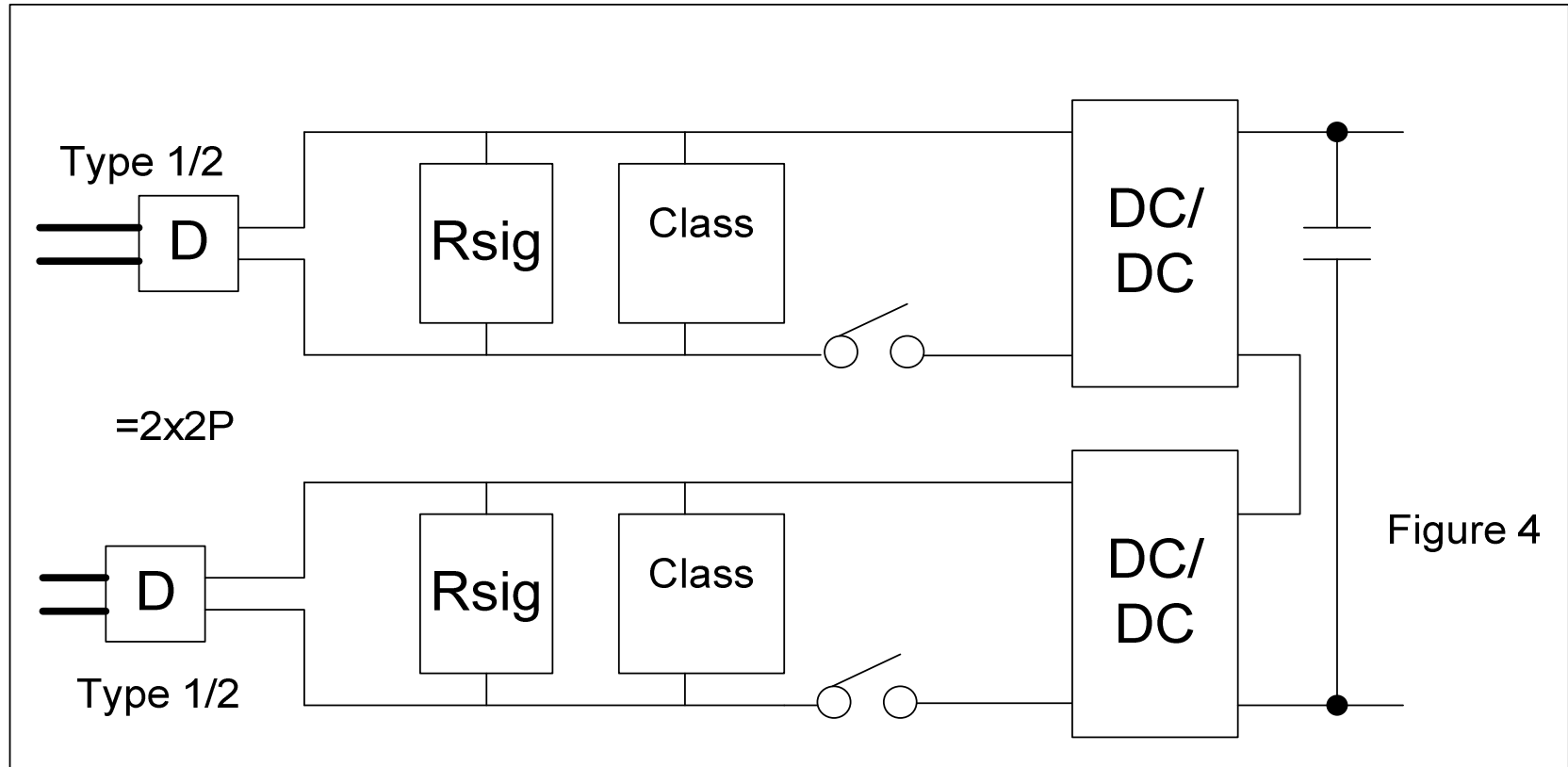


Simplified 2 x 2P  PD without the need for Active Current Sharing in most high power applications

• In this example each 2P has DC/DC however they operate on a single PD load

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# 802.3at : 2x 2P Interface



Figure 5

Simplified 2 x 2P  PD without the need for Active Current Sharing

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