IEEE802.3at Task Force

802.3at Classification Ad Hoc

Possible PDs Market. Support it or not? This is the question.

May 2006

Rev 001

Yair Darshan
PowerDsine

Purpose of this presentation

- Focusing on the fact that what ever we do should meet our List of Objectives and 5 criteria.
- One of the 5 Criteria requires Broad PDs Market.
- Broad PD market requires PDs Driven Architecture
- PDs Driven Architecture means
  - Flexible PD implementations as long as technically and economically feasible (also one of 5 Criteria)
  - Ensuring interoperability
  - Functional reliability
  - Safety
  - Keep Heat Dissipation Low
- Resulting with More ports in PDs market
- More PSE/Ethernet port

Questions such..

- Single signature or Dual signature
- Current sharing or not
- Where to locate current sharing
- And others
- Are secondary in importance and are function of PD or System Configuration needed to be supported.

- Hence first we need to decide:
  - Which PD architecture we wish to support
  - What System configuration need to be supported.
  - Then we will reduce the amount of work and unknowns ..

Terms, Abbreviations and legend

- MP = Medium Power
- HP= High Power = 2x MP
- P=Power [W]
- O = Need to be met by objectives
- 5C= Need to be met by 5 Criteria

Possible PD implementations in the market

#	PSE Port	PD type	PD load	Cable	Requires Current Sharing
1	802.3af	-802.3af (O,5C)	single	2P or 4P	NO
2	802.3at 2PMP	-802.3af (O,5C) -802.3at 2PMP	single	2P or 4P	
3	802.3at 4PHP	-802.3af (O,5C)	single	2P	
		-802.3at 2PMP		2P or 4P	
4	802.3at 4PHP (Same port, box, Ground and Voltage Diff <TBD= ENV A)	-802.3at 4PHP	single	4P	**YES,** if TBD<P<MP **NO,** if P<TBD **or** functional isolation at the primary side of the PD.
5			Dual independent		**NO**, if each channel is functionally isolated at the PD side. It is the same PD hence works with layer 2.

Notes

1. Current sharing is not required only if **|I1-I2|<Idiff<Icut** otherwise overload condition will happen. **Idiff** is function of **pair (I1) to pair (I2)** channel imbalance model.

2. If current sharing is located in PD then no special signature required for case 4 and 5.

3. If in **case 5** the loads are different i.e. **P1 and P2** then **dual class signature** is required if we need to know who gets what **(due to additional info received from layer 2)** and not only the total power. In addition it helps PSE to decide if turn off all channels in case 4 or not in case 5 for mission critical applications which use redundant hardware in PD

Possible PD implementations in the market

	PSE Port	PD type	PD load	Cable	Requires Current Sharing
6	802.3at 4PHP (Same Box, Port and Ground. Voltage Diff<TBD)=ENV A **Layer 2 issues**	2 x 802.3af 2 x 802.3at 2P MP Splitted TOs	Dual independent	4P	NO. Each channel is functionally isolated
7	2 x 802.3at 2PMP **OR** 2 x 802.3at 4PHP **Different boxes	2 x 802.3af 2 x 802.3at 2P MP Splitted TOs	Dual independent	4P	NO
8	2 x 802.3at 2PMP (or 2x802.3af) **Different boxes	802.3at 4P HP	single	4P	YES for any P. ** -Requires ENV B isolation. -Reduced available power -Increase power dissipation -Increased cost. -No issue if in PD and is not precluded by the standard
9	2 x 802.3at 2PMP (or 2x802.3af) **Different boxes	802.3at 4P HP	Dual independent	4P	NO

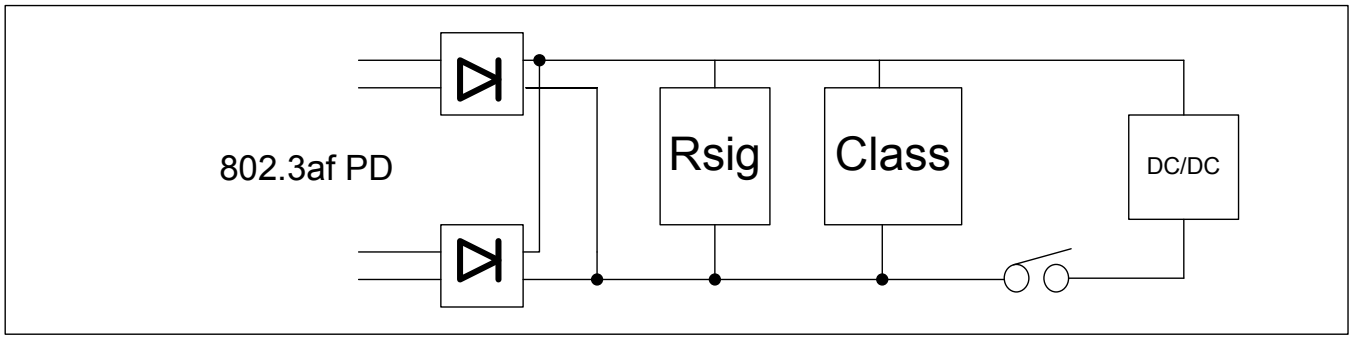
Possible non operational conditions

	PSE Port	PD type	PD load	Cable	Comments
9	802.3af	802.3at 2PMP	single	2P or 4P	-May not work. -PD indication is issued. (O)
		802.3at 4PHP	Single or Dual	2P or 4P	-May not work. -PD indication is issued. (O) -Do we need separate indication for 4P?
10	802.3at 2PMP	802.3at 4PHP	Single	4P	
11	802.3at 2PMP	802.3at 4PHP	dual	4P	-May work

802.3af PDs – PD side

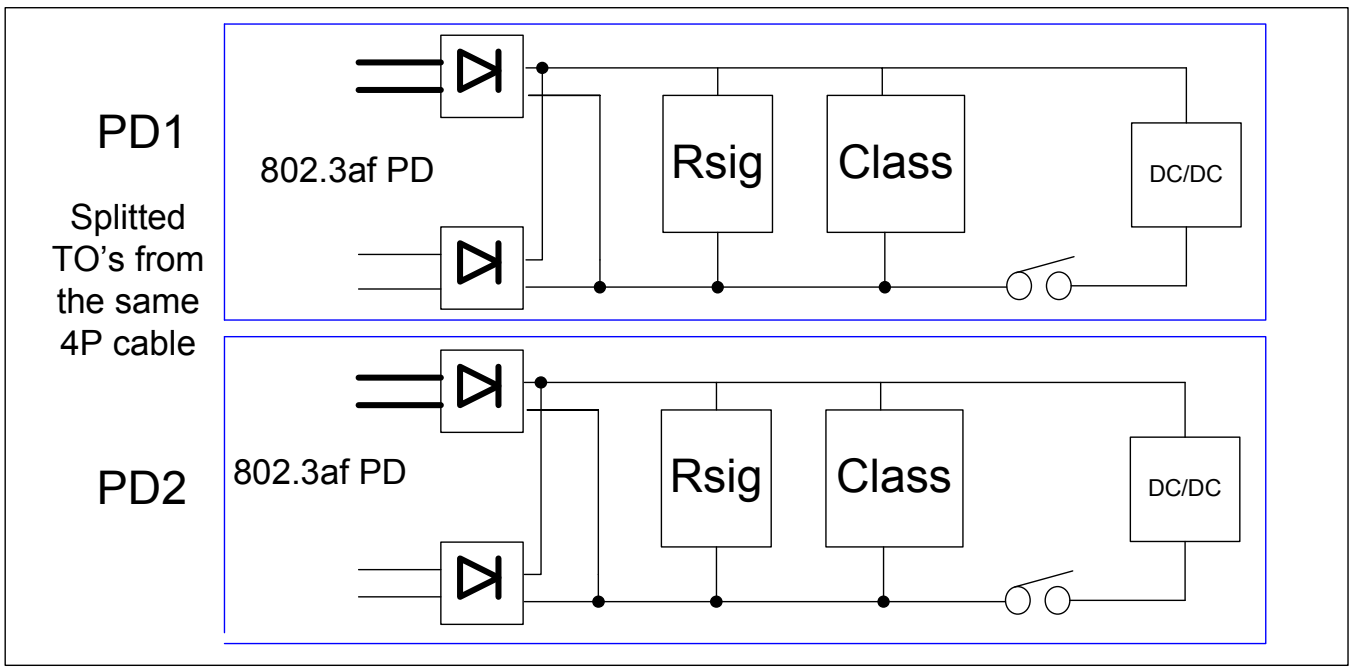
-Single Signature

-Need to be supported by objectives

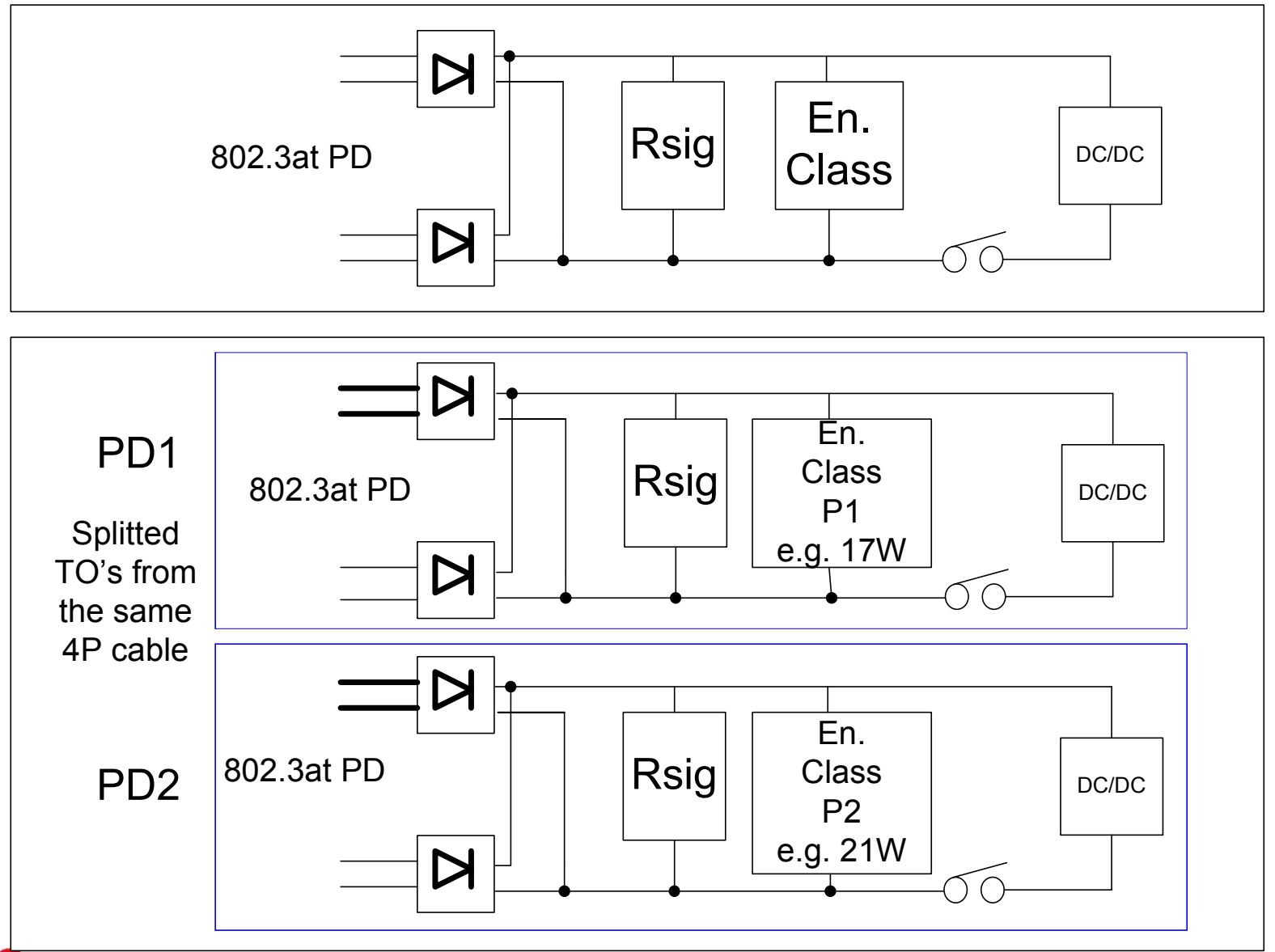


-Single Signature

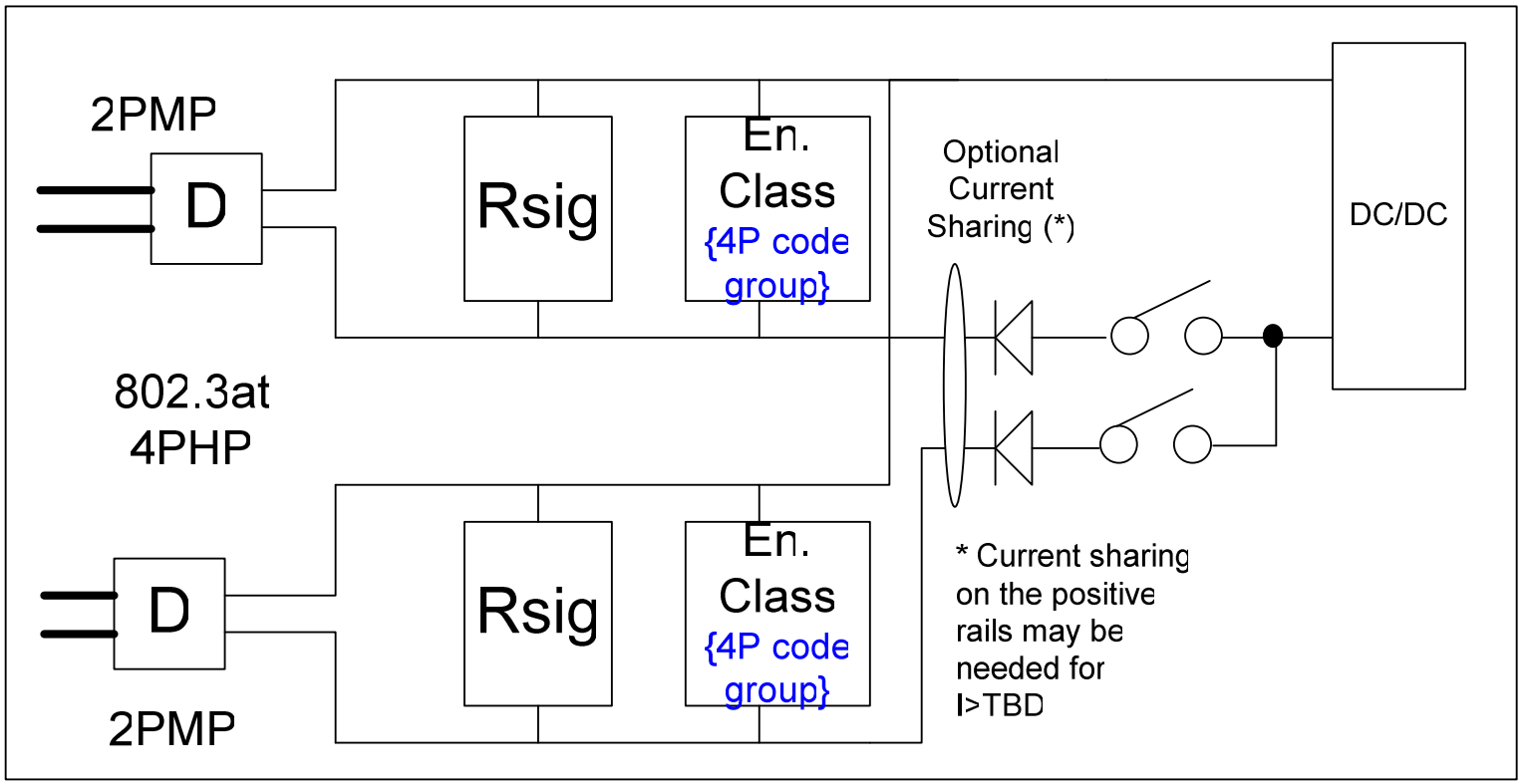
-Need to be discussed



802.3at 2P MP PDs – PD side



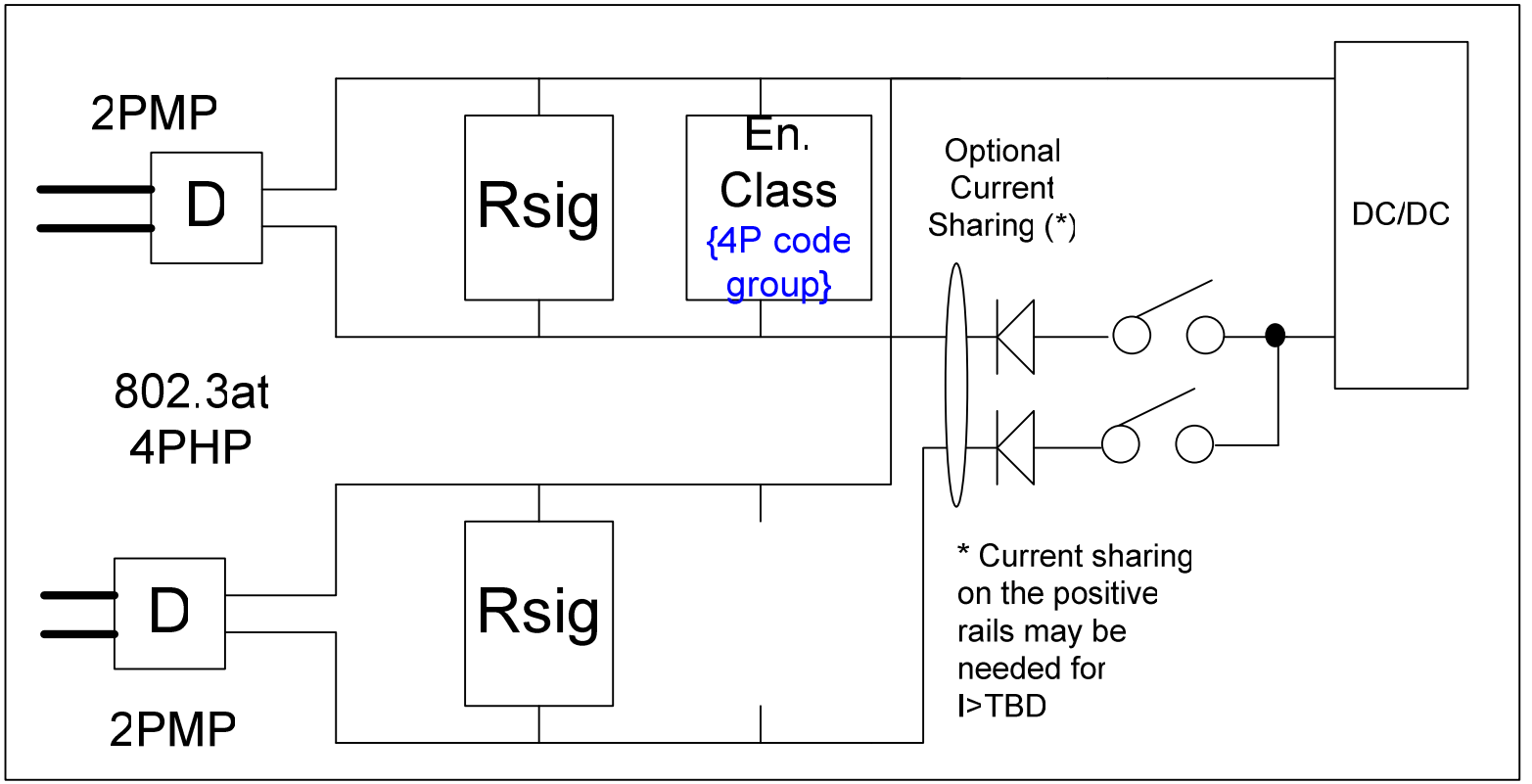
802.3at 4P HP PDs – PD side, dual class sig.



In this example each 2P advertise a 4P class on each pair. e.g for 60W PD, each 2P advertise Class 60W which is detected as 30W per each 2P.

Unique identification between single load 4P PD and 4P PD with dual independent loads

802.3at 4P HP PDs – PD side, single class sig.



In this example single class is used to identify 60W single load PD.

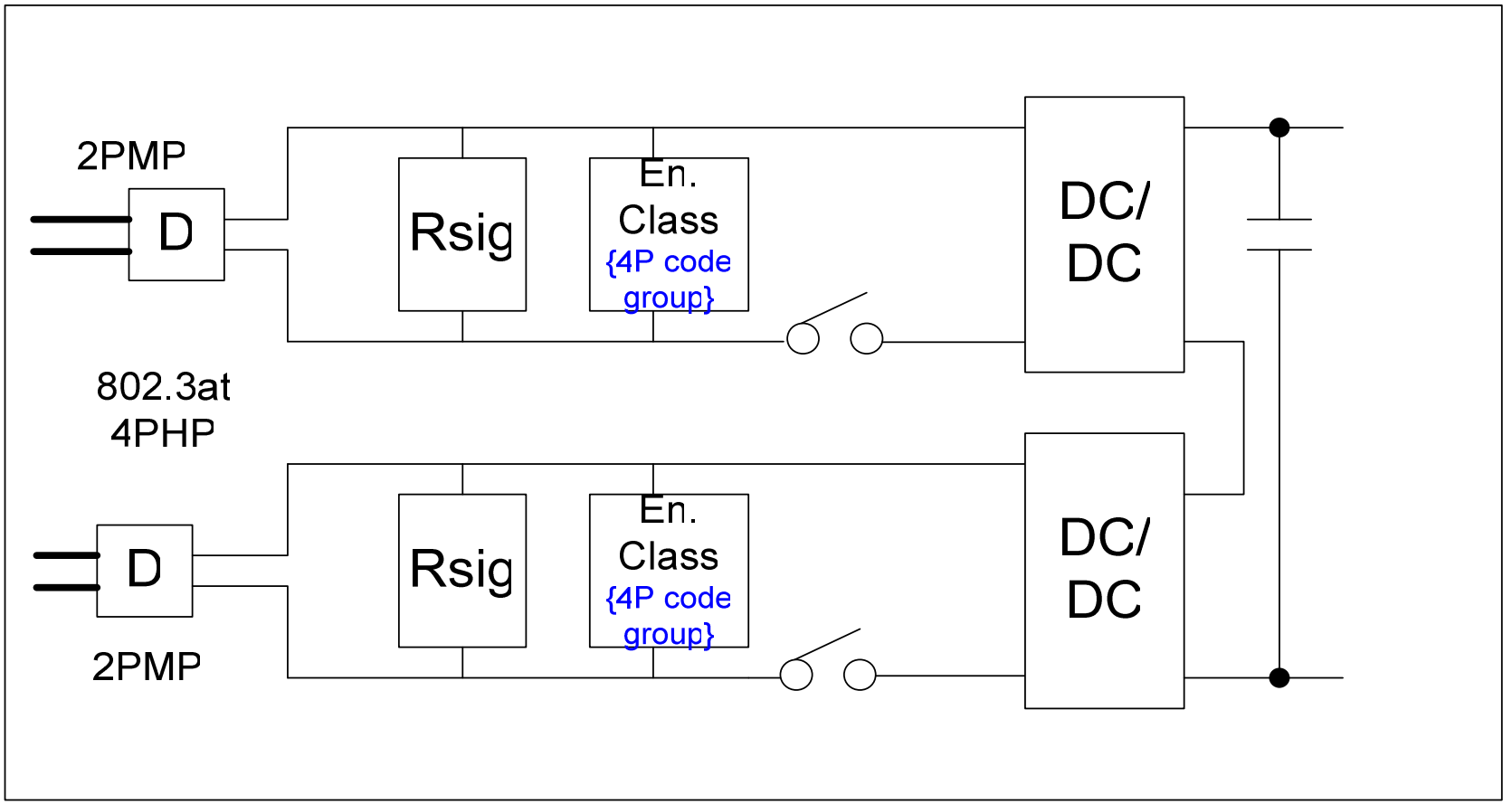
Problem: If current sharing in PSE, overload problems or excessive heat in PSE when 4P PD with independent loads is used.

Possible Solution:

-Current sharing is located in 4P PD and not in PSE.

- If 2P cable is used, class may be not red (cross cable or ALT B configuration) hence unique identification will not be achieved (af vs at..) hence dual class code may solve this issue.

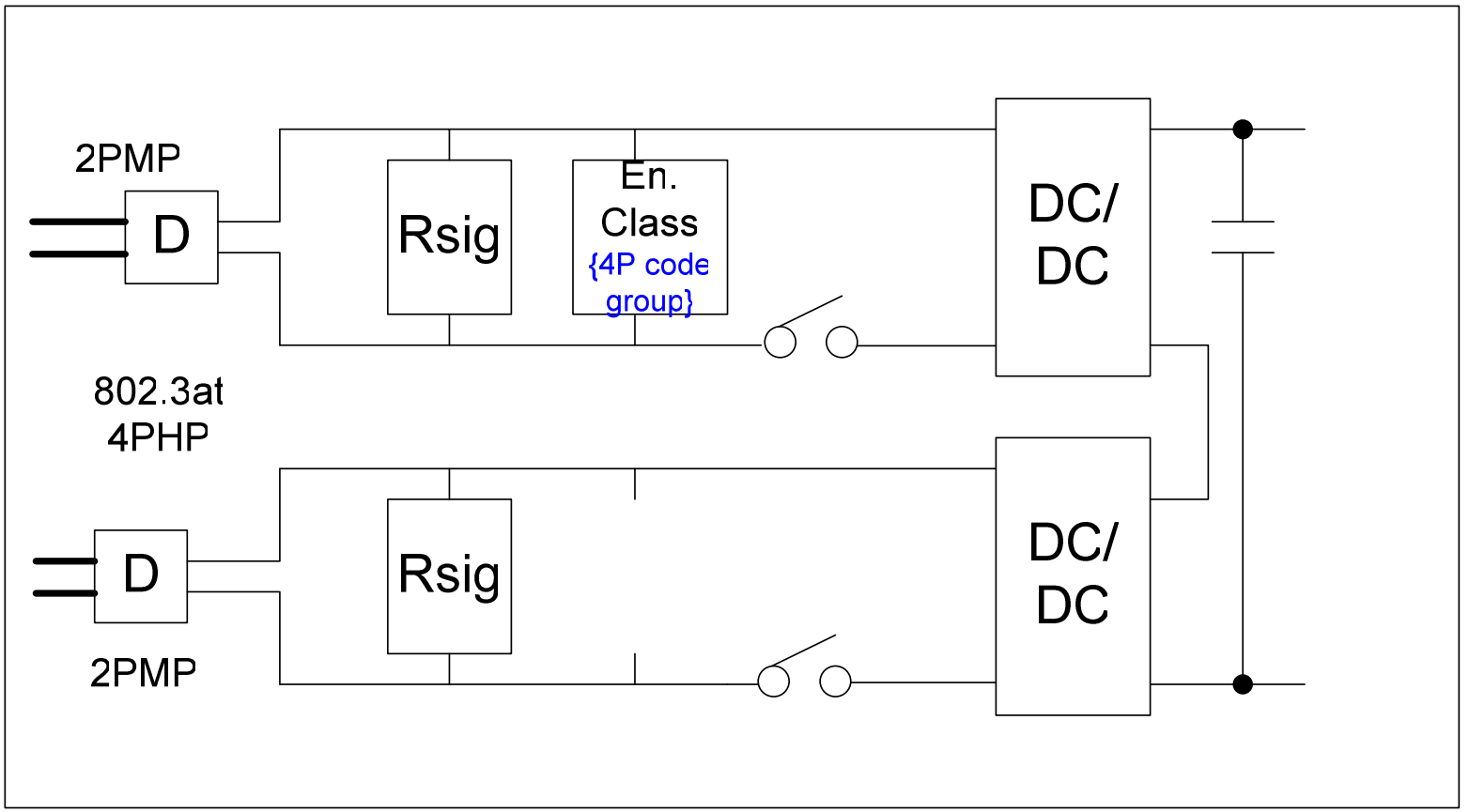
802.3at 4P HP PDs – PD side , dual class sig.



Simplified 4P PD without the need for Active Current Sharing in most high power applications

In this example each 2P has DC/DC however they operate as a single 4P PD (Single load) uniquely identified by special 4P class code.

802.3at 4P HP PDs – PD side , single class sig.



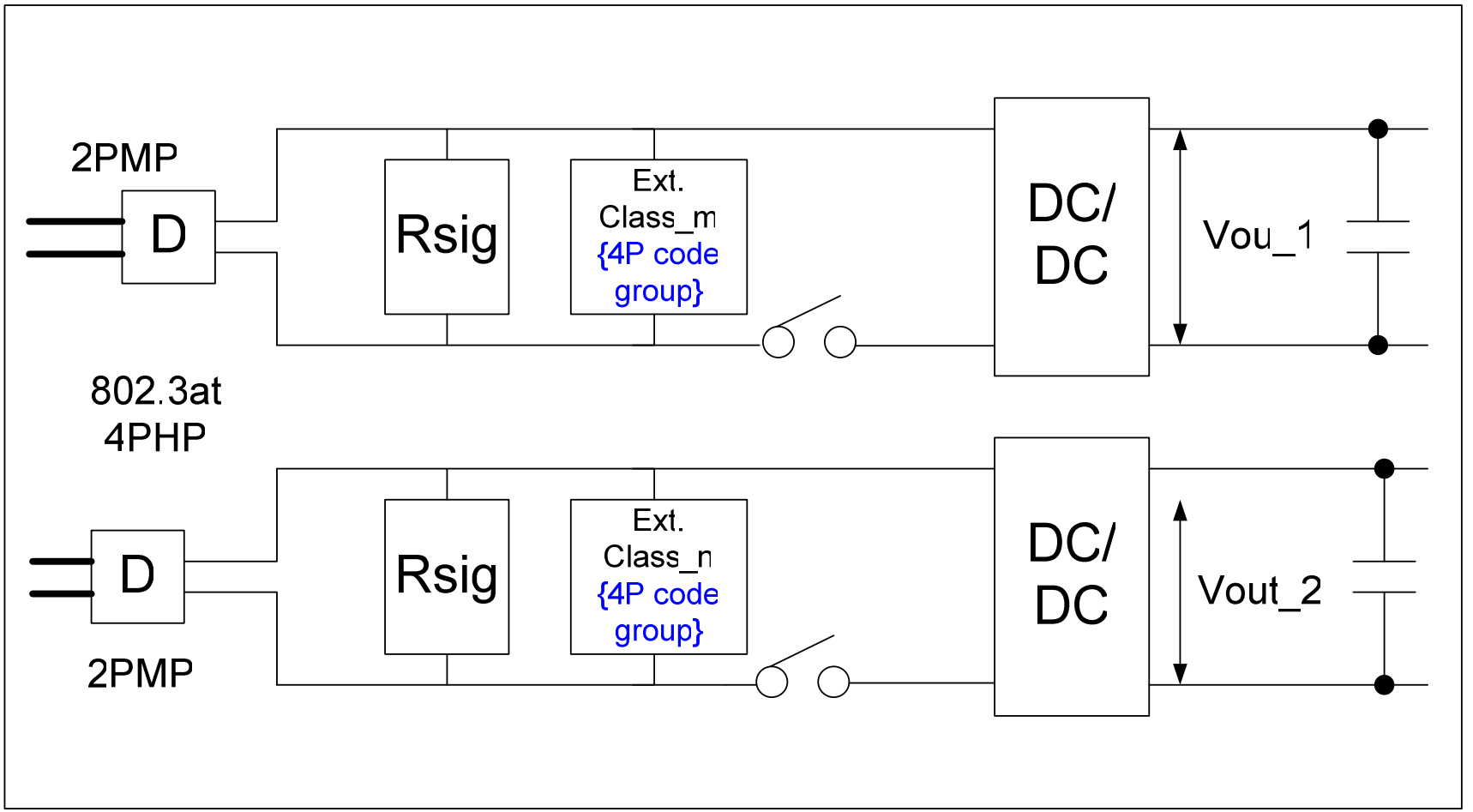
Simplified 4P PD without the need for Active Current Sharing in most high power applications

In this example each 2P has DC/DC however they operate as a single 4P PD (Single load) .

Problem: how to distinguish between single load 4P PD and dual load 4P PD? It may affect PSE power off after OVLD behavior (to turn off both channels or only one in mission critical applications?)

Solution: to use dual load. 4P class code (e.g. 60W) on each pair for single load. 2P class code (e.g. 30W or P1,P2) on each pair for dual independent load.

802.3at 4P HP PDs – PD side , dual class sig.

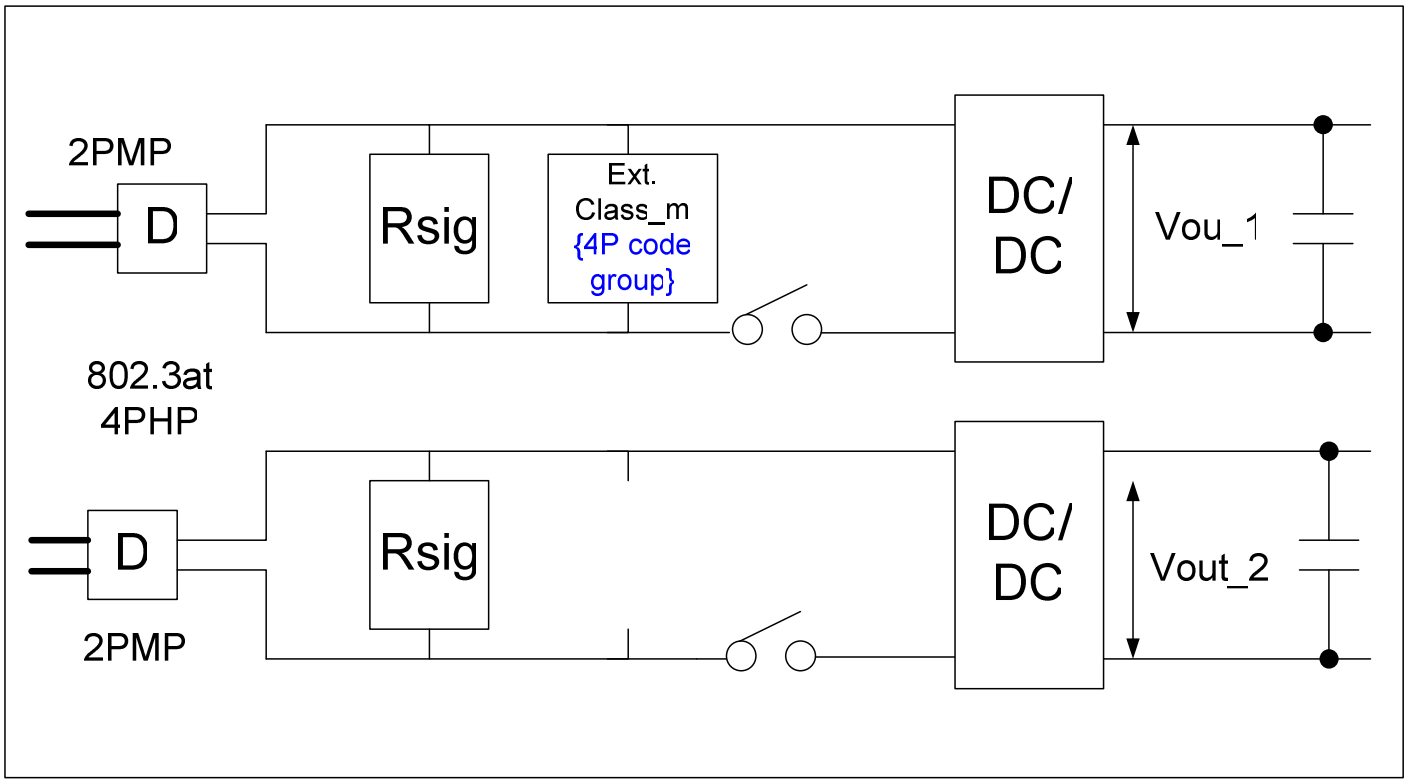


Simplified 4P PD without the need for Active Current Sharing in most cases

-In this example each 2P has DC/DC supporting independent loads however they operate as a single 4P PD uniquely identified by special 4P class.

-Other alternative in this PD is to use 2P class code on each pair if splitted TOs case is ruled out from the standard.

802.3at 4P HP PDs – PD side, single class sig.



Simplified 4P PD without the need for Active Current Sharing in most cases

In this example each 2P has DC/DC supporting independent loads however they operate as a single 4P PD uniquely identified by special 4P class.

Problems:

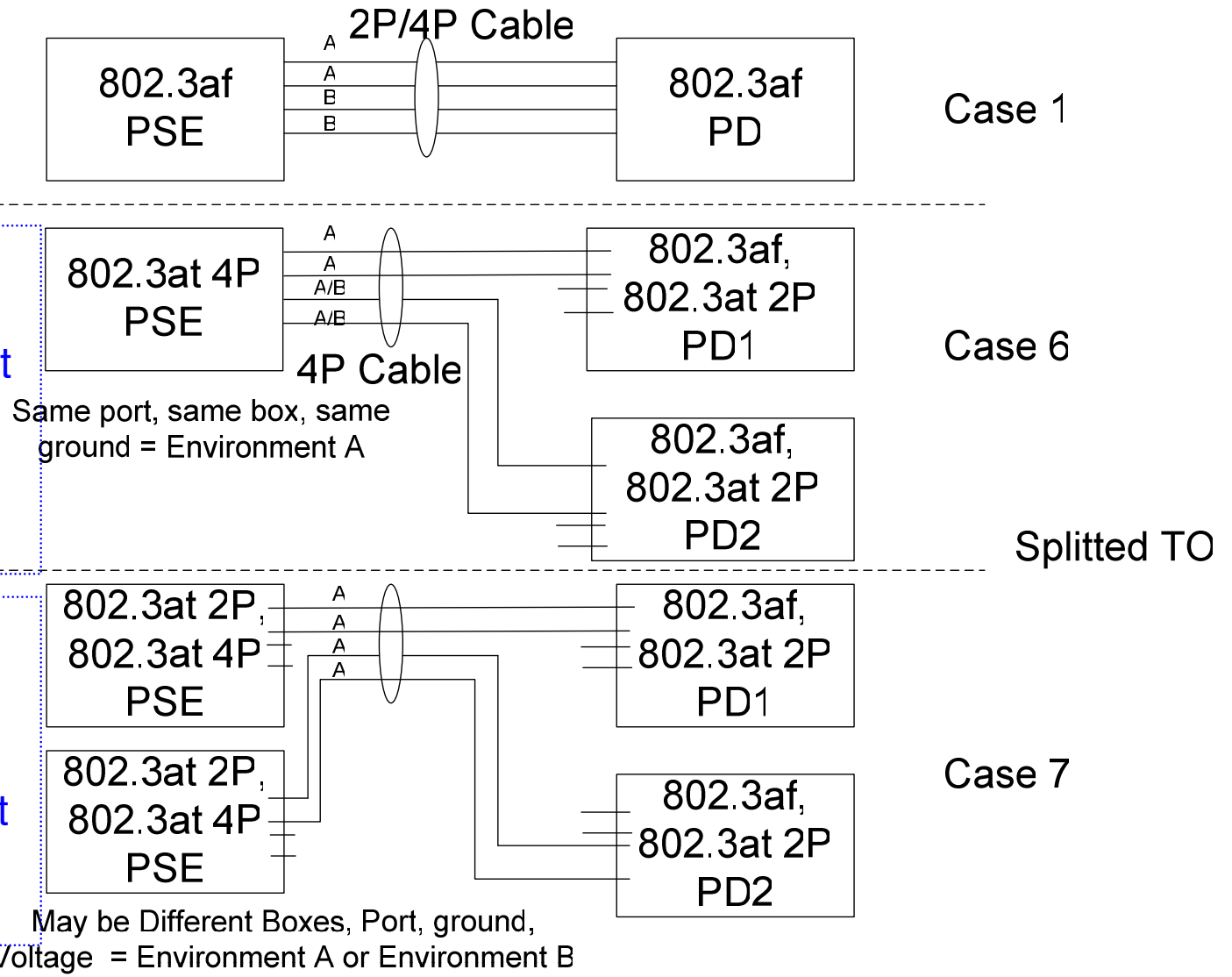
-With single signature how we know how much power to allocate for each 2P?

-Is it single load 4P PD (60W, current share) or splitted TO (P1,P2 for each 2P w/o current sharing)

-or is it dual load 4P PD? It may affects shut down policy after OVLD.

-Do we need all these information?

802.3af, 802.3at 2P MP PDs – System Description



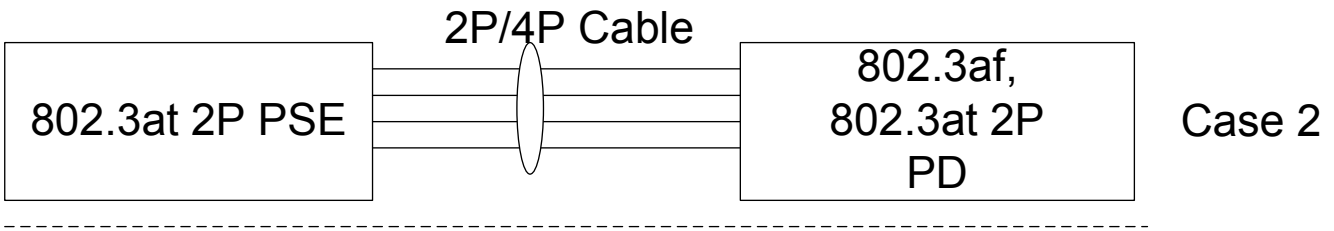
-Need to be discussed if it is compliant Ethernet configuration in 10/100 or 1G ?

-Layer 2 issues?

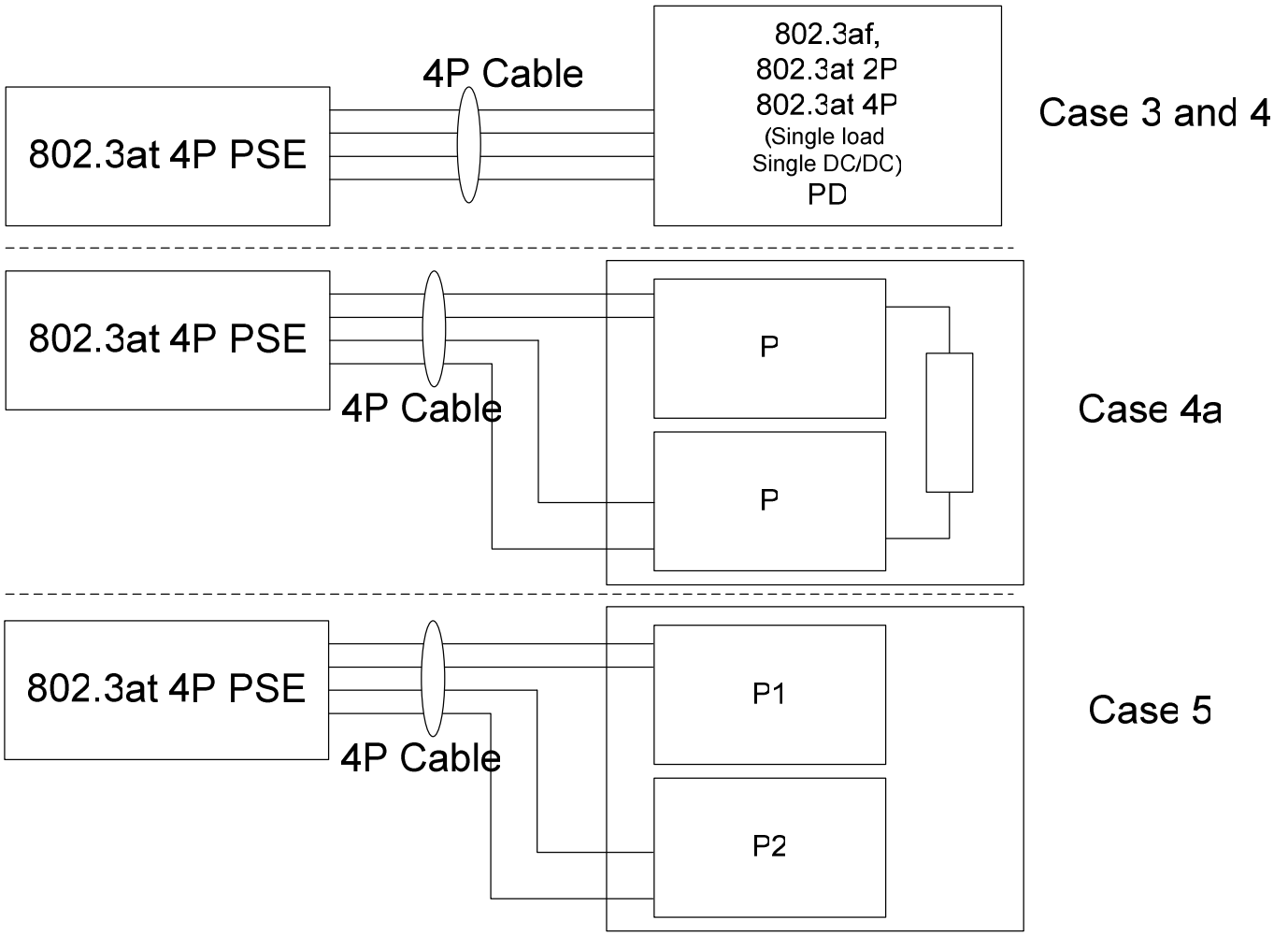
-No known technical issues.

-Exists today for 802.3af and is not precluded by 802.3af

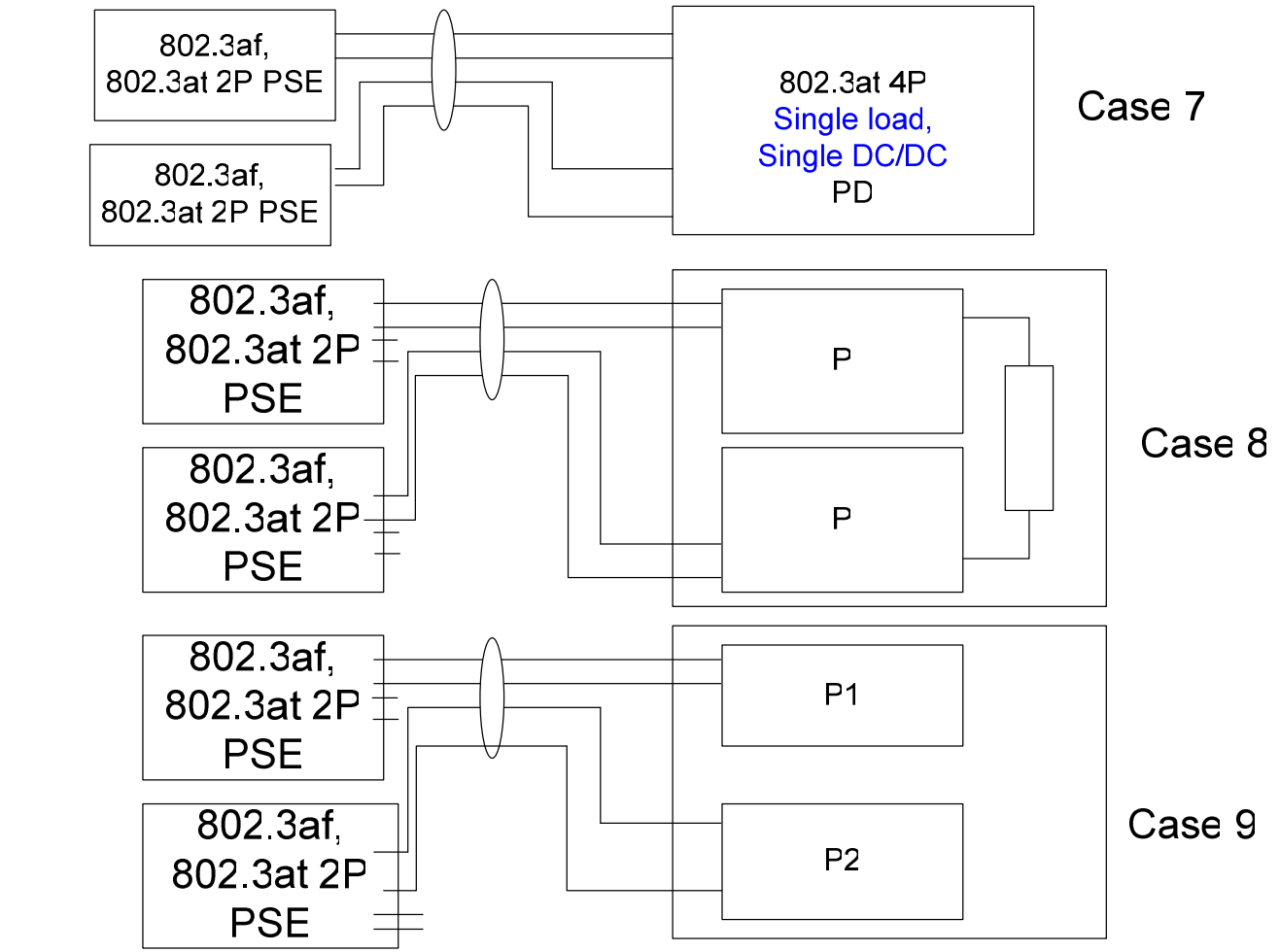
802.3at 2P MP PDs – System Description



802.3at 4P HP PDs – System Description

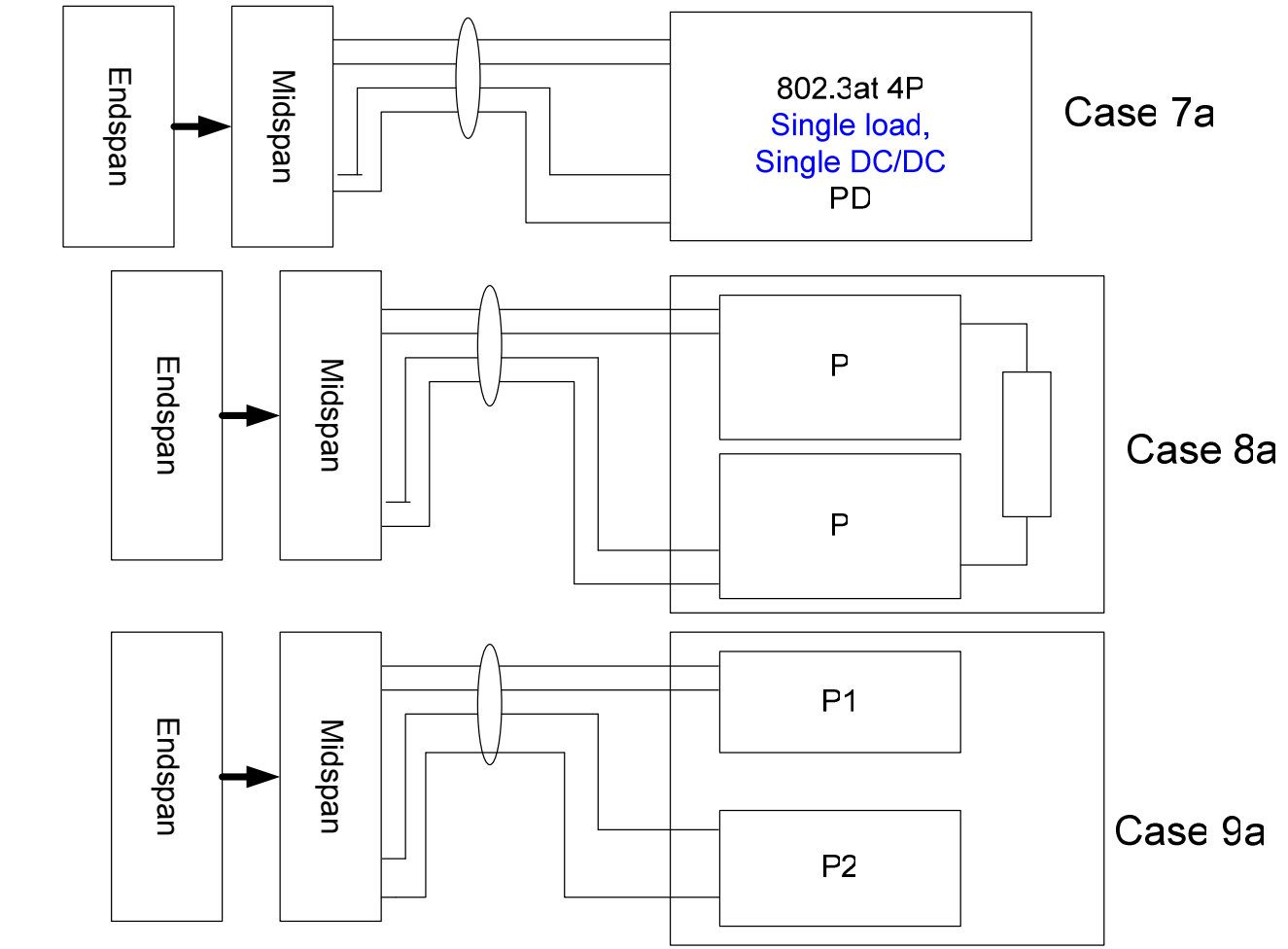


802.3at 4P HP PDs – System Description



Different Boxes, Port, ground, Voltage = Environment B

802.3at 4P HP PDs – System Description



Different Boxes, Port, ground, Voltage = Environment B

Summary

- PDs can be implemented in many ways according to application
- Systems may be configured in many ways as well
- We need first to sort out which system configuration we don't want to support in the standard
  - We should try to support all as long as it is technically and economically feasible
- Next step: to address the other questions

Proposed PDs/System Configuration filtering process

- Step 1: Those who required by Objectives/5C
- Step 2: Required by Market Needs
- Step 3: Those who we want to preclude from the standard.
- Step 4: Not support those who violating Objectives/5C and prior decisions

Annex

Classification Table - Example

Class code #	PD type	2P MP	4P HP	PD Power[W]	Notes
0	802.3af	802.3at 2P		0.44 – 12.95	
1	802.3af	802.3at 2P		3.84	
2	802.3af	802.3at 2P		6.49	
3	802.3af	802.3at 2P		12.95	
4		802.3at 2P		2	
5		802.3at 2P		9	
6		802.3at 2P		15	
7		802.3at 2P		20	
8		802.3at 2P		25	
9		802.3at 2P		30	
10		802.3at 2P		Reserved	
11		802.3at 2P		Reserved	
12			802.3at 4P	20	Do we want to support lower value for overlapping in order to increased efficiency and utilization?
13			802.3at 4P	25	
14			802.3at 4P	30	
15			802.3at 4P	35	
16			802.3at 4P	40	
17			802.3at 4P	45	
18			802.3at 4P	50	
19			802.3at 4P	60	
20			802.3at 4P	Reserved	