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Consideration on bt classification signature

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Motivation

- ~~Investigate the classification signature for the bt standard.~~
- **Explain why “the bt PD shall present one, and only one, classification signature during classification”.**

Outlines

- Recap：AF/AT Classification Signature
- Two classification signatures on each channel
- Uncertainty of the “different” classification signature on each channel
- The “gray zone” makes things more complex
- Summary

Recap：AF/AT Classification Signature

1. IEEE802.3-2013 session 33.5.1

33.3.5.1 PD 1-Event class signature

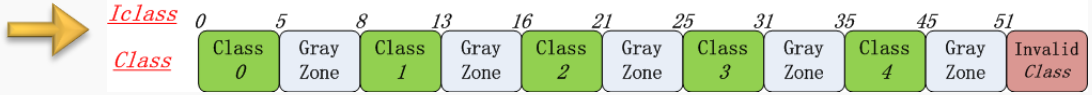
In addition to a valid detection signature, PDs shall provide the characteristics of a classification signature as specified in Table 33–16. A PD shall present one, and only one, classification signature during classification.

2. IEEE802.3-2013 session 33.2.6.2：

Table 33–9—PD classification

Measured I_{Class}	Classification
0 mA to 5.00 mA	Class 0
> 5.00 mA and < 8.00 mA	May be Class 0 or 1
8.00 mA to 13.0 mA	Class 1
> 13.0 mA and < 16.0 mA	Either Class 1 or 2
16.0 mA to 21.0 mA	Class 2
> 21.0 mA and < 25.0 mA	Either Class 2 or 3
25.0 mA to 31.0 mA	Class 3
> 31.0 mA and < 35.0 mA	Either Class 3 or 4
35.0 mA to 45.0 mA	Class 4
> 45.0 mA and < 51.0 mA	Either Class 4 or invalid class

NOTE—A Type 1 PSE may ignore I_{Class} and report Class 0.



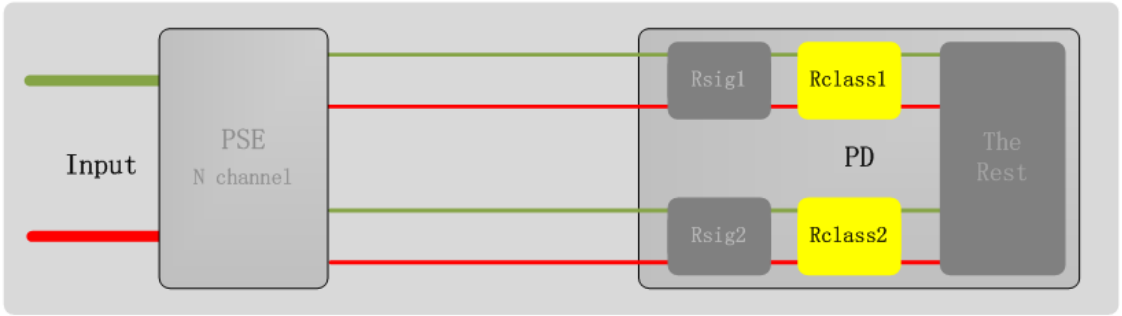
Gray Zones exists for "may" decision

- A PD shall present one, and only one, classification signature during classification.
- There is always a gray area of classification signature between adjacent classes which brings optional choices for PSE side, which might affect the overload current on the channel.

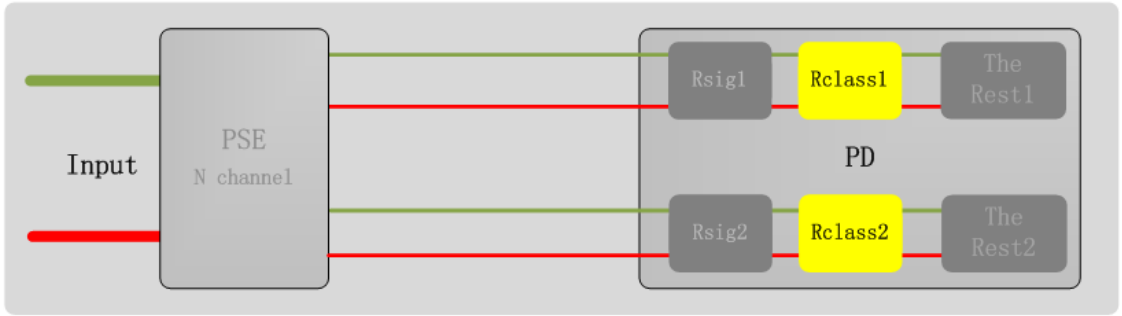
Two classification signatures on each channel

When a PSE connects to a PD with two classification signatures, we have the architectures as below:

Two classification signature- One Load



Two classification signature- Two Load



What is the classification signature and its overload current on PSE side?

Uncertainty of the “different” classification signature on each channel

For bt PDs, it can reuse AT classes and add new classes for higher power levels. If we have the “different” classification signature on each channel, there will be plenty of classification results.

Channel 2# Classification	Channel 1# Classification						
	Class 0	Class 1	Class 2	Class 3	Class 4	Invalid	Bt new classes, may class5, 6, 7…N
Class 0	result=0	result= 1 or 0 ?	result= 2 or 0 ?	result= 3 or 0 ?	result= 4 or 0 ?	result= unknown or 0 ?	New bt classes will have more results due to new added classes
Class 1	result= 0 or 1 ?	result=1	result= 2 or 1 ?	result= 3 or 1 ?	result= 4 or 1 ?	result= unknown or 1 ?	
Class 2	result= 0 or 2 ?	result= 1 or 2 ?	result=2	result= 3 or 2 ?	result= 4 or 2 ?	result= unknown or 2 ?	
Class 3	result= 0 or 3 ?	result= 1 or 3 ?	result= 2 or 3 ?	result=3	result= 4 or 3 ?	result= unknown or 3 ?	
Class 4	result= 0 or 4 ?	result= 1 or 4 ?	result= 2 or 4 ?	result= 3 or 4 ?	result=4	result= unknown or 4 ?	
Invalid	result=0 or unknown ?	result=1 or unknown ?	result=2 or unknown ?	result=3 or unknown ?	result=4 or unknown ?	result= unknown	
Bt new classes, may class5,6,7...N							

- ***There should be only one classification signature on PD during classification, what is the classification signature of the PD with “different” classification signatures?***
- ***What is the overload current?***

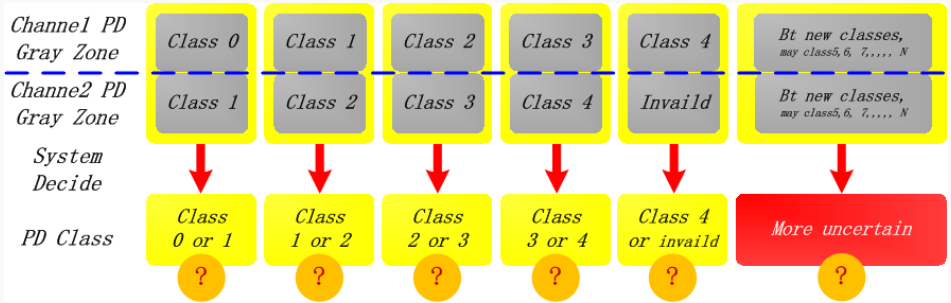
The “gray zone” makes things more complex

Even if the classification signature is designed to be the same on Mode A or Mode B. When the classification signature falls within the Gray zone, there are 5 possible results for at classes, and more possible results for new bt classes.

PD	Classification Result					
	Result 1	Result 2	Result3	Result4	Result 5	More results
Channel 1#	Class 0note1#	Class 1note1#	Class 2note1#	Class 3note1#	Class 4note1#	Bt new classes, may have class5, class6, class7,,,,,class Nnote2#
Channel 2#	Class 1note1#	Class 2 note1#	Class 3note1#	Class 4note1#	invalidenote1#	Bt new classes, may have class5, class6, class7,,,,,class Nnote2#

Notes:

1. note1#: For AT, there are 4 classes. When the signature falls within “Gray zone”, PSEs may identify PD on each channel separately as the two adjacent classes.
2. note2#: For BT, there will be more classes which bring more classification results.



- ***There should be only one classification signature on PD during classification, what is the classification signature of the PD when its signature within the “Gray zone”?***
- ***What is the overload current?***

Summary

The presence of the "different" classification signature on each channel
complicates the PD classification and increases the probability of interoperability issues.

1. Different classification signatures on each alternative brings uncertain results during classification.

- Class X or Class Y? (PD shall present one signature during classification)
- Icut of Class X or Icut of Class Y?

That makes system design more complex.

2. Signature within "Gray Zone" makes it more complex:

- Classification brings more results even the classification signature is designed to be the same on Mode A or Mode B.
- Generate additional vendor support issues

The same as AT PD, the bt PD shall present one, and only one, classification signature on Mode A or Mode B or Mode A&B during classification.

Thank you!