

# IEEE802.3bu: Detection and Classification Requirements

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# Purpose

- The purpose of this presentation is to relax the fault tolerance requirements on PDs in plug-and-play systems that use classification.
- The technical changes I am requesting are:
  - As opposed to all PDs presenting a valid detection signature:
    - PDs not supporting classification shall present a valid detection signature
    - PDs supporting classification may present a valid or invalid detection signature
  - PDs that have invalid detection signatures are required to implement classification using SCCP.
  - A PD that presents a valid detection signature shall not be damaged when connected to any PSE as defined in sub-clause 104.4.

# PoDL Objectives

- Specify a power distribution technique for use over a single twisted pair link segment.
- Allow for operation if data is not present.
- Support voltage and current levels for the automotive, transportation, and industrial control industries.
- Do not preclude compliance with standards used in automotive, transportation, and industrial control industries when applicable.
- Support fast-startup operation using predetermined voltage/current configurations and optional operation with run-time voltage/current configuration.
- Ensure compatibility with IEEE P802.3bp (e.g., EMI, channel definition, noise requirements).

Clearly we intended this standard to support but not be limited to 1000/100BASE-T1!

Let's not force requirements that limit this standard's applications.

# PD Detection Requirements

Existing Text:

## 104.5.4 PD signature

A PD shall present a valid detection signature when VPD is less than Vsig\_enable. When VPD is greater than Vsig\_disable a PD shall remove the current draw of the detection signature.

New Text (changes in red):

## 104.5.4 PD signature

Any PD that does not perform classification, shall present a valid detection signature when VPD is less than Vsig\_enable. A PD that performs classification may present a invalid detection signature greater than Vbad\_hi max when VPD is less than Vsig\_enable.

When VPD is greater than Vsig\_disable a PD shall remove the current draw of the detection signature.

# PD Classification Requirements

Existing Text:

## **104.7 Serial communication classification protocol (SCCP)**

Implementation of SCCP by the PSE and PD is optional.

New Text (changes in red):

## **104.7 Serial communication classification protocol (SCCP)**

Implementation of SCCP by ~~the~~ PSEs and PDs that present valid detection signatures is optional. PDs that do not present a valid detection signature shall implement SCCP.

# Fault Tolerance Requirements

Existing Text:

## 104.6.2 Fault tolerance

The PI shall meet the fault tolerance requirements as specified in 96.8.3.

A PD shall not be damaged when connected to any PSE as defined in sub-clause 104.4

The PSE PI shall withstand without damage the application of short circuits between the wires within the cable for an indefinite period of time.

New Text (changes in red):

## 104.6.2 Fault tolerance

The PI (PSE?, PD?, Both?) shall meet the fault tolerance requirements as specified in 96.8.3. Why is this a requirement of PoDL? I understand that it is part of 1000/100BASE-T1 but PoDL could work with other/no PHYs.

A PD that presents a valid detection signature shall not be damaged when connected to any PSE as defined in sub-clause 104.4

The PSE PI shall withstand without damage the application of short circuits between the wires within the cable for an indefinite period of time.

# PSE Detection

Existing Text

## 104.4.4 PSE detection of a PD

...If a valid signature is not detected, the PSE shall wait at least  $T_{\text{restart}}$  before re-attempting detection. A PSE may successfully detect a PD but then opt not to power the detected PD.

New Text (changes in red):

## 104.4.4 PSE detection of a PD

...If a valid signature is not detected **and classification is not enabled**, the PSE shall wait at least  $T_{\text{restart}}$  before re-attempting detection. A PSE may successfully detect a PD but then opt not to power the detected PD. If a valid signature is not detected **and classification is enabled**, the PSE shall complete classification.

Alternative Text (changes in red):

...If a valid signature is not detected, the PSE shall wait at least  $T_{\text{restart}}$  before re-attempting detection. **A PSE with classification enabled may attempt to complete classification if the voltage on the link segment during detection is greater than  $V_{\text{bad\_hi\_PSE}}$ .**

# PSE Classification

Existing Text:

## 104.4.5 PSE classification of a PD

...If classification is not completed before the TClass timer expires, a new detection cycle shall be completed before any subsequent application of full operating voltage.

New Text (changes in red):

## 104.4.5 PSE classification of a PD

If classification is not completed before the TClass timer expires, **the PSE shall transition to RESTART.**



# PSE State Diagram

Existing Text:

## 104.4.3.1 Overview

...If an external wakeup request is received or if a valid wakeup current signature is detected at the PI, the PSE confirms that a valid PD is present by re-performing detection before re-applying operating voltage to the PI.

New Text (changes in red):

## 104.4.3.1 Overview

...If an external wakeup request is received or if a valid wakeup current signature is detected at the PI, the PSE confirms that a valid PD is present by re-performing detection **and, if enabled, classification** before re-applying operating voltage to the PI.

# PSE and PD State Diagrams

- Both state diagrams will need to be updated to reflect any of the changes here that are adopted.

# Compatibility with SCCP

- PD signature creates high voltage level of SCCP
  - PSEs have a required maximum open-circuit voltage of 5.5V.
  - Change VPUP max to 5.5V (PSE pull up voltage for SCCP).
    - This should be done no matter the outcome of the other changes, otherwise it inherently makes the open-circuit requirement 5V instead of 5.5V.

# Miscellaneous Fixes

- There is no general shall associated with Table 104-2 and thus parameters such as Voc have no shall associated with them.
- The PD detection signature is specified for  $VPD < V_{sig\_enable}$ , and is defined for  $VPD > V_{sig\_disable}$ . However, there is an undefined range between these (4.3 to 5.75).
  - The detection signature should depend on the direction the voltage is coming from in this range, but this is not in the text anywhere.
- No matter the result of the other changes, checks should be added in the PSE state diagram so that if a PSE implements classification, it only applies operating power to a PD that's voltage requirements it can meet.
  - This includes both high and low voltages (A 12V PSE shouldn't power a 24V PD, A 24V PSE shouldn't power a 12V PD).
- There is not a single sentence in section 104.3 (just a table). A sentence or two describing the table would be nice.

# Other Possible Solutions

- Create separate detection signatures for the different voltage classes.
  - The 12V classes would use the current signature while the 24V and 48V classes could have higher voltage signatures.
- Create a 2<sup>nd</sup> “valid” detection signature that requires classification to be completed before applying operating power.
  - Would be used by any PD requiring classification as opposed to having an “invalid” signature.
  - May be difficult to squeeze 2<sup>nd</sup> signature in for 12V classes where this would do the most good.