

By Daniel Feldman – VP Business Development, Analog Mixed Signal Group

1. Introduction

Power over Ethernet (PoE) technology has been used since its invention by Microsemi in 1999 to deliver power and Ethernet data over a single Category 3 or better cable. Since its inception, PoE has been used to deploy applications which require 99.999% availability (such as IP telephony), hard-to-access locations (such as WLAN Access Points) or a combination of both (such as IP Cameras). The mission critical nature of these applications makes it important to quickly and efficiently identify and rectify issues in PoE power delivery.

2. PoE Terminology

The PoE standard, with its latest revision specified at IEEE802.3at-2009, defines the following entities:

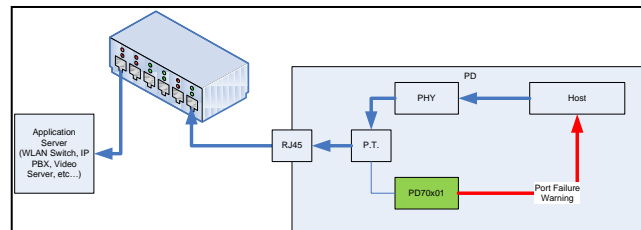
Power Sourcing Equipment (PSE): Supplies power in a safe manner, after performing detection and classification. Can be of two types:

- Endspan (a.k.a. PoE Switch): integrated into the Ethernet switch.
- Midspan (a.k.a. PoE injector): separate box, located between a non-PoE switch and the device being powered.

Powered Device (PD): receives power. Responsible for notifying the PSE the amount of power it will consume worst case, as well as identifying how much power the PSE is capable of delivering.

3. Port Failure Warning

Port Failure Warning (PFW) is a signal generated by the PD70101, PD70201 or PD70211 PD Front End IC's with integrated PWM controller, or by the LX7309 PWM controller. PFW indicates that power is no longer received by the PD, and is connected to the PD host/SoC processor.



Upon receipt of the PFW signal, the PD processor can save its status (including the PFW event itself), and send a Dying Gasp packet to the Application Server over the wired network indicating the PFW event.

Examples of Applications Servers:

- IP Telephony: IP PBX or IP Centrex
- WLAN: WLAN Switch
- Physical Security: Video Server
- 3G/LTE: Radio Network Controller (RNC)
- Thin Computing: Data Center Server

4. Troubleshooting Power Failures

While PoE is a reliable technology, there are certain scenarios in which a PD can stop functioning due to power failure. The scenarios are described in the following sub-sections, along with the method to identify them. For an IT manager remotely located to the facility in which the PD is located, it is critical to understand what the failure source is, in order to fix it and avoid its recurrence.

- a) The Midspan PSE power supply malfunctions
- b) The PSE power supply malfunctions
- c) The PSE power supply is over-allocated and low priority PDs need to be shutdown
- d) The cabling infrastructure stops conducting
- e) The cable is disconnected
- f) The PD power circuitry malfunctions
- g) There is an AC power failure

The table below can be used to identify the cause of power failure and fix the issue. It assumes the server can no longer communicate with the PD.

Server gets PFW	PSE Type	Server can communicate with PSE or adjacent switch	PSE still powers PD	Diagnosis	Recommended Action
No	Midspan/Endspan	No	No	Ethernet Switch/Router <u>and</u> Midspan Malfunction	Check AC power availability, Ethernet Switch/Router and Midspan
No	Midspan/Endspan	No	Yes	Ethernet Switch/Router Malfunction	Check Ethernet Switch/Router
No	Midspan/Endspan	Yes	No	PD disconnection	Check PD cable
No	Midspan/Endspan	Yes	Yes	PD Power Circuit Malfunction	Remotely reset PD (if repeated, replace PD)
Yes	Midspan	No	No	Midspan failure	Check Midspan
Yes	Midspan/Endspan	Yes	No	PD turned off due to power management	Move PD to different PSE or buy additional power supply to PSE

5. Microsemi Products with built-in PFW

At the time of writing, the following Microsemi products have built-in PFW support:

PD70101 IEEE802.3af PD front end with built-in PWM Controller

PD70201 IEEE802.3at PD front end with built-in PWM Controller

LX7309 Synchronous PWM Controller