IEEE802.3at Task Force

Vport ad hoc

Fusing equation: how it was derived in 802.3af
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Objectives

- To explains the considerations behind the fusing equation used in IEEE802.3/af figure 33C.4 and in 802.3at figure 33-9a

Equation derivation

- Earlier number for TLIM was 100msec in 802.3af draft.
- ILIM was set to 0.45A in the specifications and rounded up to 0.5A.
  - PCB traces and connector contacts are designed to meet at least 0.5A continuous current
- The goal was that max. energy limitation will be kept for any time duration below TLIM_MAX=100msec.
- The Fusing equation I=(K/t)^0.5 is well describing the above inputs

  Hence I^2*t = K= 0.5^2*100msec = 0.025 A^2xSec
- ➔ I=(0.025/t)^0.5

- The 802.3af standard ended with Tlim_max=75msec which adds additional margin for K.
- In reality K is much higher then 0.025 A^2xSec (by a factor of at least 3-4) due to the following reasons:
  - PCB traces can handle more then 0.5A/trace and each pair use two of it.
  - In normal operation the energy for 60sec time (long term) duration is 0.35A^2*60sec=7.35 A^2xSec for Type 1 and 31.1 A^2xSec for Type 2 while during short circuit it will be 0.45^2*0.075=0.015 A^2xSec for type 1 and 0.229 A^2xSec for Type 2 which is sufficient design margin to prevent damage.

- Note: The units for K is A^2xSec = Joule/ohm and not Joule as presented in previous version of this presentation