

Cable Current Limits for IEEE 802.3at

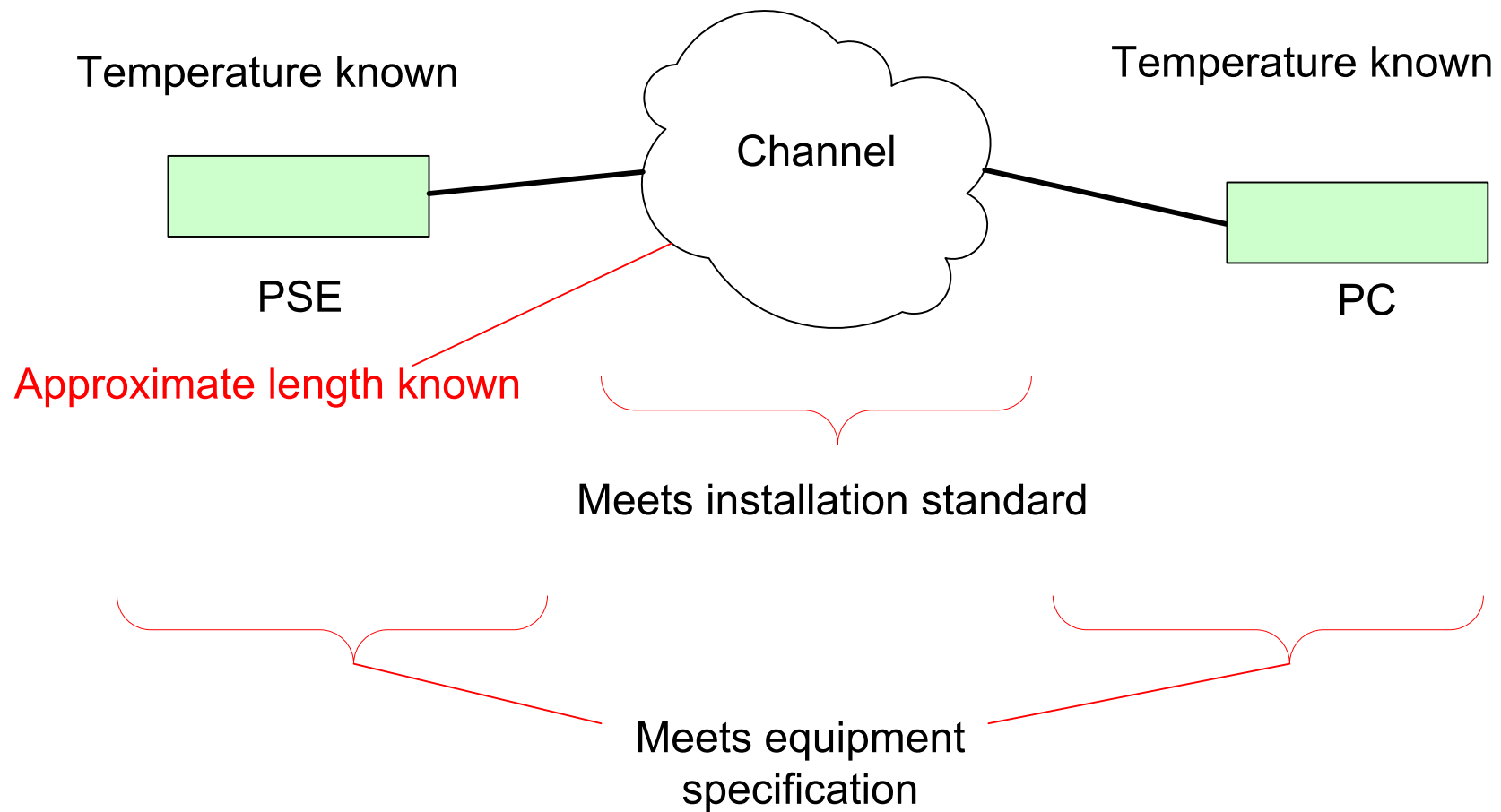
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Agenda

- **Most Networks**
- **The Problems**
- **Some Interesting Data Points**
- **More Challenges**
- **Is it a Matter of Degrees?**
- **Next step**

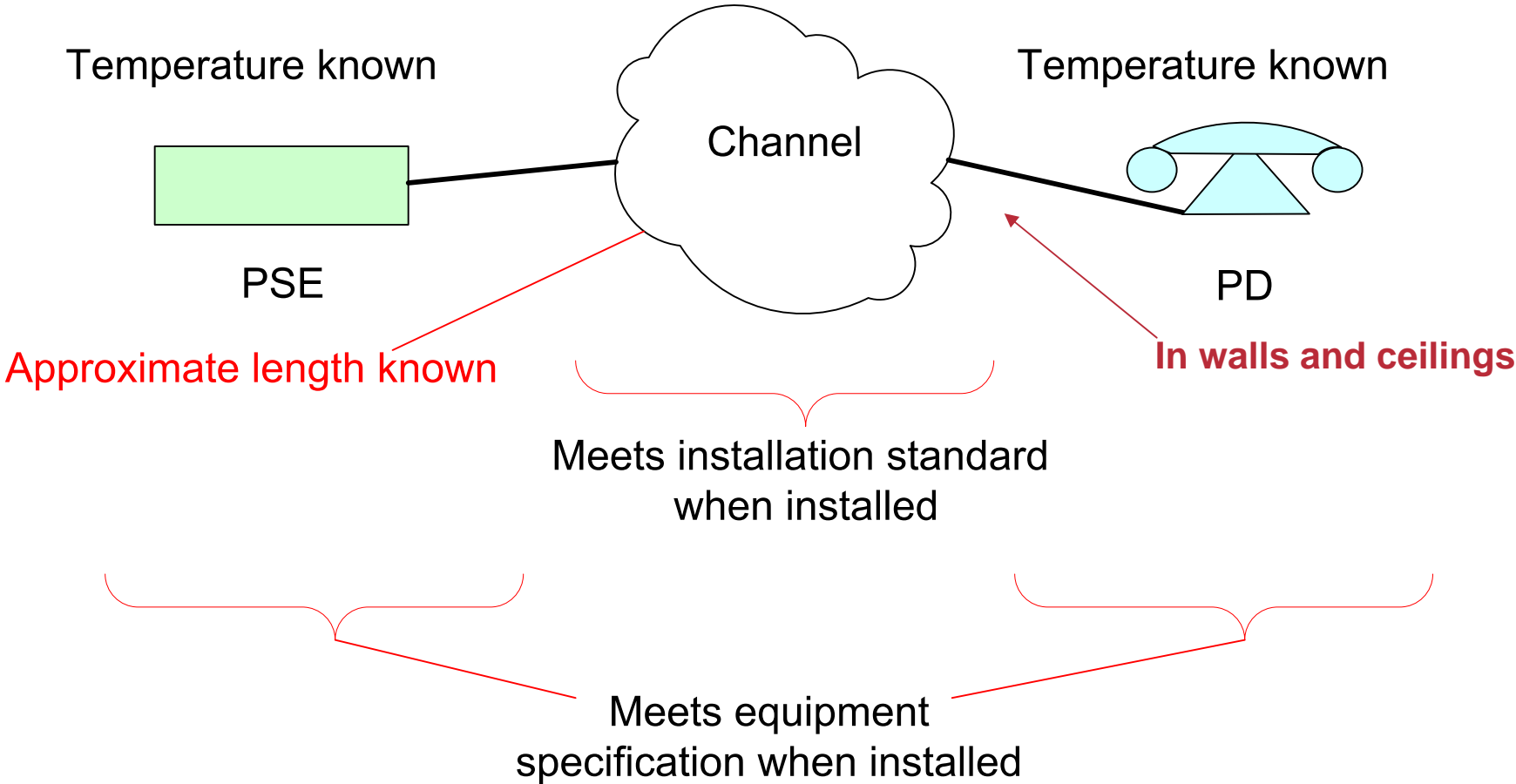
Most Networks prePoE

Temperature known



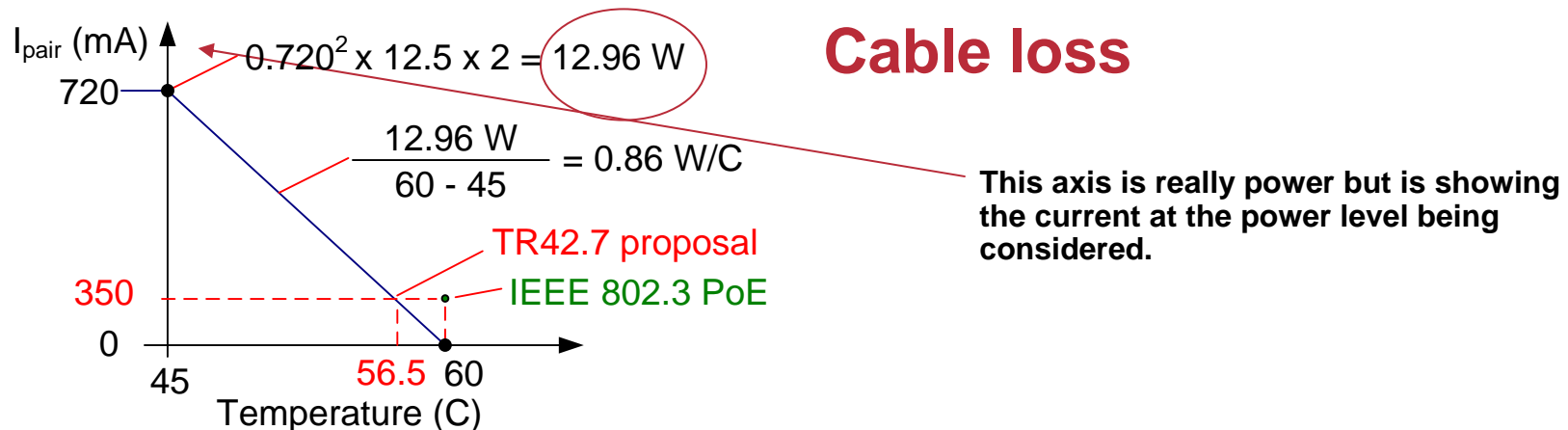
Most Networks

Temperature unknown



The Problem

- Broad market acceptance is impeded by complex restrictions. ex/ requalifying the cabling plant
- These restrictions are an operational challenge for deploying PoE. How do you find the hottest spot?
- The cable plant needs to be requalified in order to meet the TR42.7 recommendations for a 29.5 W PD.



$$P_{ch} = 12.96 - 0.86(T - 45) = I^2 R_2$$

TR42.7 provided the data points shown as a . .

More Problems

- **System behavior is dependent on the operating environment it is in.**

PD power is reduced on some channels in order to be compliant.

- **Systems may have to enforce this behavior based on user input. Not all systems are able to do this.**

This requires power negotiation abilities.

- **It may be too easy for users to ignore system requirements.**

Will a significant portion of the cables be used without a requalification?

- **The IEEE 802.3at task force needs to put a more focused effort into cable standard communications and evaluations.**

Some Interesting Data Points

- **ISO/IEC 11801:2002, 9.2.2.6 Current carrying capacity**

Minimum d.c. current carrying capacity **per conductor shall be 175 mA.**

This shall be supported at a maximum ambient **temperature of 60°C**; conformance achieved by design. IEC test reference is under development.

- This assumes CAT-3 with all conductors carrying current.

$$20 \text{ ohms} \times (175 \text{ mA})^2 \times 8 \text{ conductors} = 4.9 \text{ W}$$

- Using CAT-5e

$$12.5 \text{ ohms} \times I_{\text{wire}}^2 \times 4 = 4.9 \text{ W}, I_{\text{wire}} = 313 \text{ mA}$$

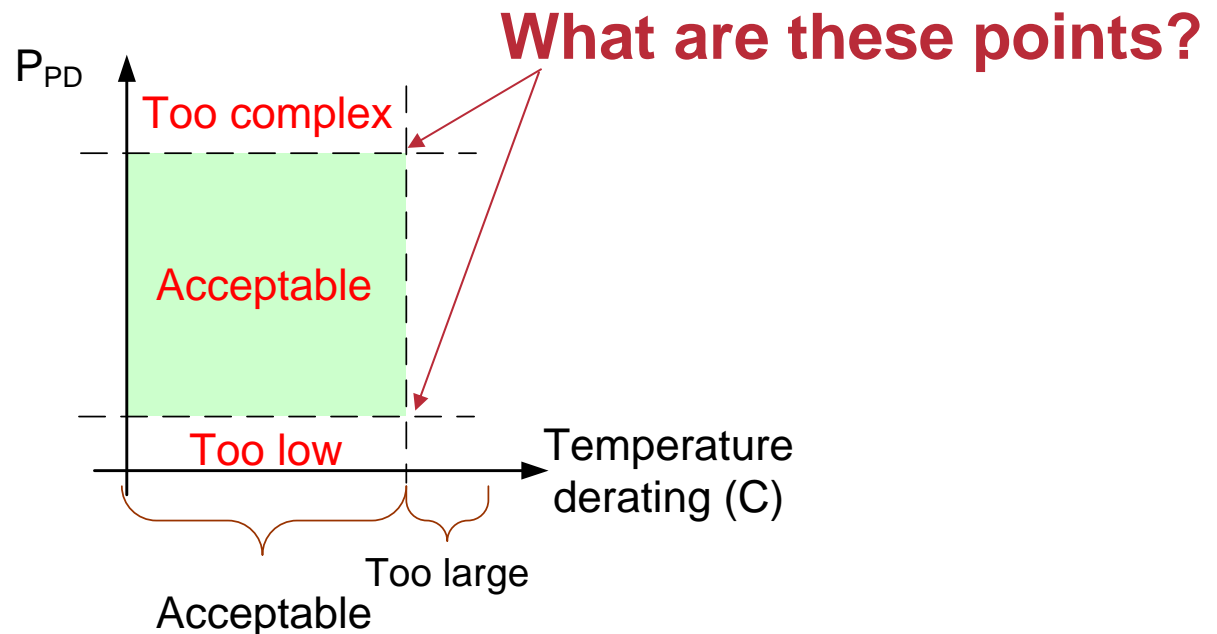
2-pair at PD 26.5 W

$$12.5 \text{ ohms} \times I_{\text{wire}}^2 \times 8 = 4.9 \text{ W}, I_{\text{wire}} = 221 \text{ mA}$$

4-pair at PD 39.5 W, 2-pair at PD 19 W

More Challenges

- **PoE is pervasive.**
Convenient, no permits, no inspections, easy to install
- **How do we ensure IEEE 802.3at also becomes pervasive?**



Is it a Matter of Degree?

- **No power can be dissipated in an ambient of 60 C?**

Ethernet data dissipates power on the cable.

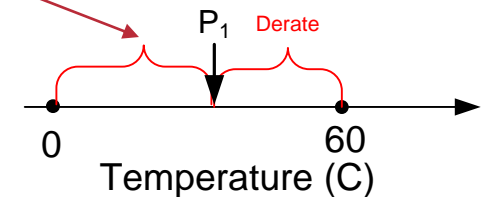
- **If a cable plant meets existing requirements before using PoE what will change when PoE is used?**

Is a derating of 5 to 10 C easier than 15 C?

If the most likely cable hot spot is measured, and there is temperature margin before hitting a specified temperature limit, a cable requalification is more likely to be approved.

- **A lower PD power level makes it more probable that an installation is compliant.**

Increase this



Next Step

- **Determine if the task force prefers a lower power level with simpler compliance targets.**
ex/ PD 25.5 W, 600 mA, ~50 C ambient
ex/ PD 23.7 W, 550 mA, ~51 C ambient
- **Provide time during this IEEE 802.3at meeting for the task force to create a liaison letter that addresses remaining questions to the cable standards.**

