IEEE802.3bt 4 Pair PoE

A Classification Technique

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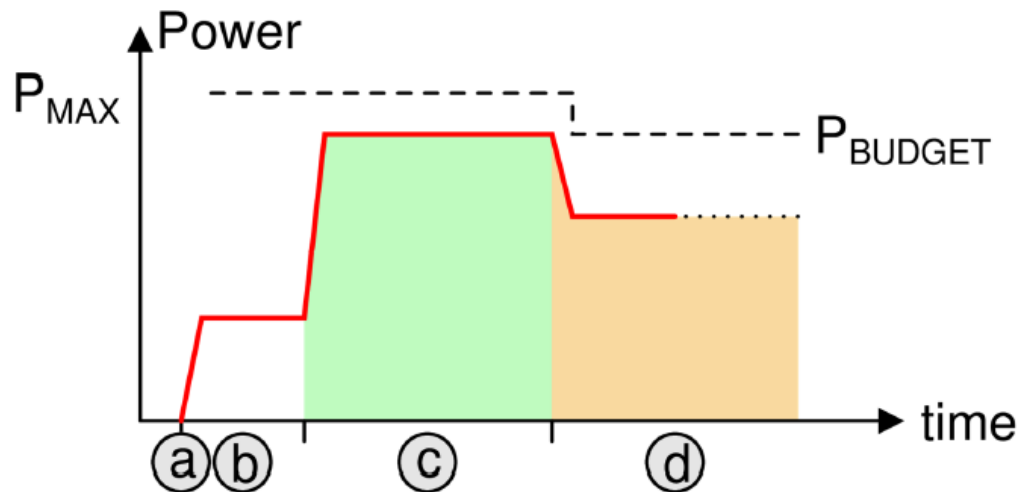- Gaoling Zou (MAXIM)
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Goal of This Presentation

- Consider the benefits of allocating current (power) to a PD by measuring current just after power up (inrush)

From August 2013

PHILIPS

Autodetect Power Class

a) Cable inserted
b) Controlled inrush (power budget allocation initially maximum possible)
c) PD start up – PD must consume maximum power that device can ever need
   PSE measures power consumption
d) PSE reallocates PD power budget to measured value (+ margin)

Technique

- Identify a .bt PD by a technique similar to the one we use now (add third pulse or change the second one or ??)

- Power up the PD with the PSE's Icut set to the maximum value (similar to the 2-pulse at method)

- Wait (50ms?)

- PD goes to full power

- PSE measures current

- Icut is set to this current plus margin

Benefits: Allows for an Efficient Use of PSE Power

- 'Continuously variable
- Doesn't require LLDP
  - Can be used by Midspans
  - LLDP is always available for those that want it
- Self-calibrating: Corrects for variations manufacturing
  - PD (parasitic resistances, power supply efficiencies, …)
  - PSE (references, sense resistors, …)
- Corrects for cable length

Costs

- PD
    - Requires the PD to be able to go to full power for (say) ~100mS
    - In general one would think a PD could do this
    - Could optionally switch in a dummy load worst case
- PSE
    - Requires the PSE to be able to measure current within the specified time (again, say 100mS)
    - Current measurement is not a stretch for today's PSEs

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What Gets Self-calibrated For the PD

- PD
  - Power supply input voltage regulation: 2%
  - Power supply parasitic variation: 2%
  - PD resistance variation
    - Hotswap MOSFET 0.5 ohms pp
    - Magnetics variation 0.25 ohms pp
    - Total 0.75 ohms pp
    - Power 1.2A^2 * 0.75 ohms = 0.1W (insignificant)
- Total ~4% of 51W or 2W

What Gets Self-calibrated For the Cable

- For at
  - 30W – 25.5W = 4.5W
  - 4.5W / 25.5W = 17.6%
- If bt is twice the power of at: 51W
  - 2 X at or 9W
  - Still 17.6%

What Gets Self-calibrated For the PSE

- Icut current measurement generally involves:
  - Voltage reference: 1%
  - Sense resistor: 1%
  - ADC or comparator: 1%
- Because Icut can now be set at full load (plus margin)
  - These three errors are 'calibrated out'
- Without this self-calibration this 3% needs to be added to the overall power allocation for Icut

Total Self-calibration Benefit

- Total 24.6%
  - PD: 4%
  - Cable: 17.6%
  - PSE: 3%
- Automatically corrects allocated power for cable type
  - Lower resistance cables

Conclusions

- Determining Icut (power allocation) by measuring a PD at full power is a relatively easy and cost effective way to determine Icut

- This technique can greatly reduce allocated power uncertainty which can provide better utilization of PSE power supplies

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