SPMD Power Up Procedure, again

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Propose a power up scheme for SPMD

Objectives to satisfy (objectives 9, 10, 11):

- Specify optional plug-and-play power distribution over the mixing segment
- PSE shall only energize the mixing segment when at least one PD is connected
- Support addition and removal of a node or set of nodes to a continuously operating powered mixing segment

Objectives 10 and 11

PSE shall only energize the mixing segment when at least one PD is connected

Support addition and removal of a node or set of nodes to a continuously operating powered mixing segment

- These objectives require a detection and negotiation scheme
- Detection is a physical layer function
- Negotiation cannot be an unpowered physical layer function in a cost-effective manner. Therefore, a power budget must be allocated for the various states in negotiation.

Negotiation

- This happens after a PSE has applied power to the initial PD, or after a PD or string of PDs is added to an already energized mixing segment
- Negotiation is the method for the PD to request a power budget from the PSE and for the PSE to grant or deny the request
- Need requirements for the PD for negotiation power draw and for the denied power state
- Need a process for negotiation that minimizes the reserve power budget

90W PSE output power

- This number has never been formalized by the TF
- Looking for consensus that SPMD will mimic 4P PoE, conforming to LPS requirements

Negotiation Power

- Propose that P802.3da adopt 1W as power allowed to PD for negotiation
- Propose that P802.3da adopt 0.1W as the power allocated for the standby or denied power state
- Looking for consensus that these two power values are sufficient for each state

How this works

- Power is applied to PD
- PD powers up in NEGOTIATION mode (1W) and communicates to PSE via LLDP, requesting POWER UP value
- PD moves to STANDBY mode (0.1W) and waits for reply
- Question: can the PD process the PSE reply in standby? May need to allow the PD to return to 1W power draw to process reply. This should be OK – but we will have to bound the time for this.
- PD moves to POWER UP or DENIED power state

Worst Case

- Worst case has to be powering a full string of unpowered PDs
  - But this is rather simple as no PSE power has been allocated and therefore (90/(number of PDs))W is available per PD
- Another possible worst case is a mixing segment with one PD powered and then adding a string of PDs to the already powered mixing segment
  - What if the one PD is consuming a large part of the PSE budget?
  - Additional PDs could cause PSE to violate 90W max out

PSE output power

- The PSE is not concerned with policing power at 90W
  - This is simply the power the PSE must be guaranteed to deliver
- The PSE is more concerned with ensuring it doesn’t supply more than 100W for more than 4s
  - We do have headroom to go beyond 100W for limited periods and duty cycle

There will be onus for the user

- We cannot craft a foolproof scheme that prevents the PSE from removing power from a mixing segment
- The user HAS to be responsible to understand the power budget and not oversubscribe the PSE

What about idle PDs

- I’ve heard many express the desire to enable PDs that only power on occasionally and therefore don’t count against the PSE budget
- I’ve not seen any proposals to describe how this works
- I’m not smart enough to solve this problem
- Therefore, my solution ignores this
- Proposals are welcome
  - Problems to solve: PD inductance (comm and power), PSE oversubscription (at power up when adding a string), wakeup scheme (also oversubscription), inrush

Removal Detection

- PD removal detection is crucial so the PSE can maintain an accurate PSE power budget.
- LLDP requires periodic messaging, use this to note removed PDs

Steps for Negotiation

- Power is applied at the PI (i.e. PD is connected to a mixing segment)
- PD powers up in a LOW power mode and uses LLDP to request power from PSE
- PD goes to standby (but monitors data)
- PSE signals uniquely to PD the response to the power request

  Two possible results:

    PSE replies 'YES': PD fully powers up

    PSE replies 'NO': PD moves to denied power state

Summary

- Agree that PSE is 90W out
- 57V max, 50V min? 52V min?
- Agree that negotiation power is 1W - Need data
- Agree that standby/sleep/denied power is 0.1W - Need data
- Agree that LLDP is used for negotiation (LLDP TLV) and removal detection
  - Could use DPLCA for removal detection
- Agree that this is not foolproof, and the user is responsible for power budget

In-meeting Discussion

- PSE power allocation order is beyond the scope of the standard
- DPLCA could be used as a node count function
- There is desire to allow PSEs to not supply 90W – need proposals for how this is specified and works.
- Low duty cycle power allocation can happen via LLDP
- Need a way to relinquish power (LLDP TLV)
- Max PSE power warning TLV?
- Reuse Cl33/145 underpowered text for PDs in denied state

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Objective 9

- Specify **OPTIONAL** plug-and-play power distribution over the mixing segment
- Implies support for SPMD devices that don't require power
- Implies PDs that don't require power need to 'tolerate' PSE voltage

This is covered in 147.9.3:

The DTE shall withstand without damage the application of any voltages between 0 V dc and 60 V dc with the source current limited to 2000 mA, applied across BI_DA+ and BI_DA−, in either polarity, under all operating conditions, for an indefinite period of time.

- This text will also need to be included in P802.3da

Objective 10

- PSE shall only energize the mixing segment when at least one PD is connected
- Implies a detection scheme.
- After detection, PSE applies power.
- PD required to perform negotiation

Objective 11

- Support addition and removal of a node or set of nodes to a continuously operating powered mixing segment
- Implies that one can plug in a string of PDs
- Need method to allow multi-PD detection
- PDs would still need to perform negotiation