Endpoint Filter & dTE Normative Requirements

IEC/IEEE 60802 – 14th March 2025

David McCall

Current Situation

- Kilian Brunner, Research Associate & Lecturer at Zurich University of Applied Science has built one of the first implementations of IEC/IEEE 60802
- In short: in works as expected.
- It has, to quote him:
  - “…shown significant improvements in accuracy—especially during startup when switches are warming up” and
  - “…allowed me to demonstrate that the Drift Tracking TLV seems to be the only effective method for compensating [for] high [oscillator] drift rates of 1 ppm/s”.
- This is great news. But…

Issue with End Instance “Endpoint” Filter

- His implementation of the Endpoint filter is a discrete implementation of a 2nd order filter with 8 Hz sample rate (roughly matching 125 ms Sync Interval)
- Has trouble meeting specified filter performance requirements, and…
- Doesn’t meet -145 ns dTE normative requirement when there is clock drift
  - Note: -145 ns requirement is what this should be; it was erroneously changed to -15 ns in d3.1

Discussion to Date

- Online discussion between Time Sync experts
- Geoff Garner did a lot of work on the issue (thank you Geoff!)
- There is probably more work to be done, including with Kilian, before we have a final, confirmed answer, but…
- It appears that the normative requirements can be met with a discrete implementation of a 2^{nd} order filter with a higher sample rate
- It's possible to use other filters (e.g. 3^{rd} order filter) if so desired, but simulations for 60802 were done with 2^{nd} order discrete filter with a higher sample rate

Proposal

- Leave limit as is for now (-145 ns dTE)
- Work with Kilian to see if he can meet the normative requirements
- Gather feedback from others on whether they see the current requirements as problematic
- If necessary, make a change during the next ballot

Thank You!