Additional DTE Simulation Input

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Background

- https://www.ieee802.org/1/files/public/docs2021/60802-Hantel-Sync-Applications-0721-v01.pdf
- https://www.ieee802.org/1/files/public/docs2021/60802-Hantel-Sync-Temperature-Rates-0721-v01.pdf

Requested Test Parameters – Case 1

- **Objective: max|TE| of 1 µs over 64 hops, stretch goal of 100 hops**
- Mean Sync Interval: 1s
  - Variation: ±10% about mean, with 90% probability (based on Gamma distribution) and max equal to twice the mean
- Mean Pdelay Interval: 1s
  - Variation: uniform distribution over range [1.0 s, 1.3 s] (i.e., 30% variation)
- neighborRateRatio measured using window size of 7, and median
- Residence time: 1ms
- Timestamp Granularity: 8ns
- Dynamic timestamp error: ±8 ns each with 0.5 probability
- Temperature Range: 0-60°c
- Temperature Rate of Change: 1°c per 10 seconds, with dwell time of 30 s between upward and downward ramps
- Single replication; number of temperature cycles to be chosen based on run time
- Other assumptions same as in previous simulations

Requested Test Parameters – Case 1A

- **Objective: max|TE| of 1 µs over 64 hops, stretch goal of 100 hops**
- Mean Sync Interval: 1s
  - Variation: ±10% about mean, with 90% probability (based on Gamma distribution) and max equal to twice the mean
- Mean Pdelay Interval: 1s
  - Variation: uniform distribution over range [1.0 s, 1.3 s] (i.e., 30% variation)
- neighborRateRatio measured using window size of 7, and median
- Residence time: 1ms
- Timestamp Granularity: 8ns
- Dynamic timestamp error: ±8 ns each with 0.5 probability
- Temperature Range: 0-60°c
- Temperature Rate of Change: 1°c per 10 seconds, with dwell time of 30 s between upward and downward ramps
- Single replication; number of temperature cycles to be chosen based on run time
- Endpoint PLL parameters: $K_pK_o = 11$, $K_iK_o = 20$
  - Note: This corresponds to 3dB bandwidth f_{3dB} = 2.03 Hz, damping ratio of 1.2298, and gain peaking of 0.9 dB; the 3dB bandwidth is still likely too large relative to the 1 s mean Sync interval (i.e. average sampling rate for the PLL). (The current simulations, with $K_pK_o = 11$, $K_iK_o = 20$, correspond to 3dB bandwith of 2.6 Hz, damping ratio of 0.68219, and gain peaking of 1.3 dB)
- Other assumptions same as in previous simulations

Requested Analysis

- Can these test parameters which address 80+% of the industrial market, when run with the best clock filters from the simulations that have been done so far, meet the overall objective?
- If they do, stop. If not, analyze case 2

Requested Test Parameters – Case 2

- **Objective: max|TE| of 1 µs over 64 hops**
- Mean Sync Interval: 125ms
  - Variation: ±10% about mean, with 90% probability (based on Gamma distribution) and max equal to twice the mean
- Mean Pdelay Interval: 125ms
  - Variation: uniform distribution over range [.125 s, 0.1625 s] (i.e., 30% variation)
- neighborRateRatio measured using window size of 7, and median
- Residence time: 1ms
- Timestamp Granularity: 8ns
- Dynamic timestamp error: ±8 ns each with 0.5 probability
- Temperature Range: 0-60°c
- Temperature Rate of Change: 1°c per 10 seconds, with dwell time of 30 s between upward and downward ramps
- Single replication; number of temperature cycles to be chosen based on run time
- Other assumptions same as in previous simulations

Thank you!