
Time Sync Performance Test Approach

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July 2024 IEEE 802 Plenary – 802.1 TSN

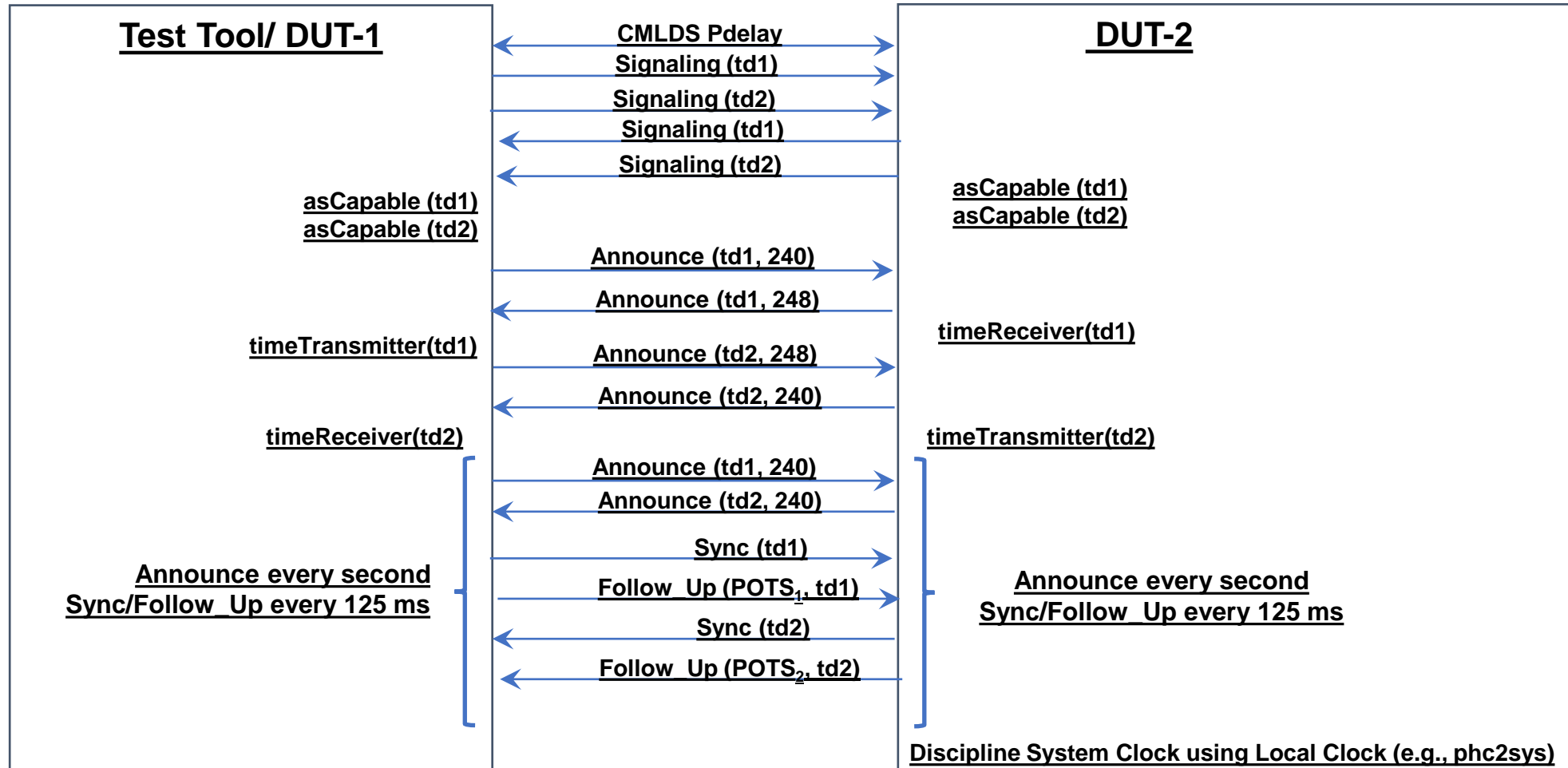
Abstract

- Time Synchronization over IEEE802.1AS Performance
 - Difference between the timeReceiver's clock to the timeTransmitter's clock
 - instantaneous
 - Statistics over a large sample of instantaneous performance metrics (mean and variance)
- Several techniques have been proposed and discussed both in IEEE802.1 and in IEEE1588 (see References slide)
 - Some of them have been developed in other organizations (e.g., Avnu Alliance) and discussed here
 - All these techniques require additional (optional) support in the implementation
- This contribution proposes a light-weight approach to assessing performance:
 - No additional implementation needed for testing
 - Additional [light-weight?] implementation needed for performance monitoring in real-time
 - Can be used with other proposed techniques (e.g., 1PPS, Reverse Sync, etc.)
- Solicit feedback from this forum

Test Requirements

- No additional implementation requirements on the DUT
- Provide a meaningful estimate of performance
- Other 'like-to-have' requirements
 - Enables test automation
 - Does not require additional test equipment (e.g., oscilloscope)
 - With minimal effort enable real-time monitoring of performance

Proposal: Leverage multiple time domain support (end stations)

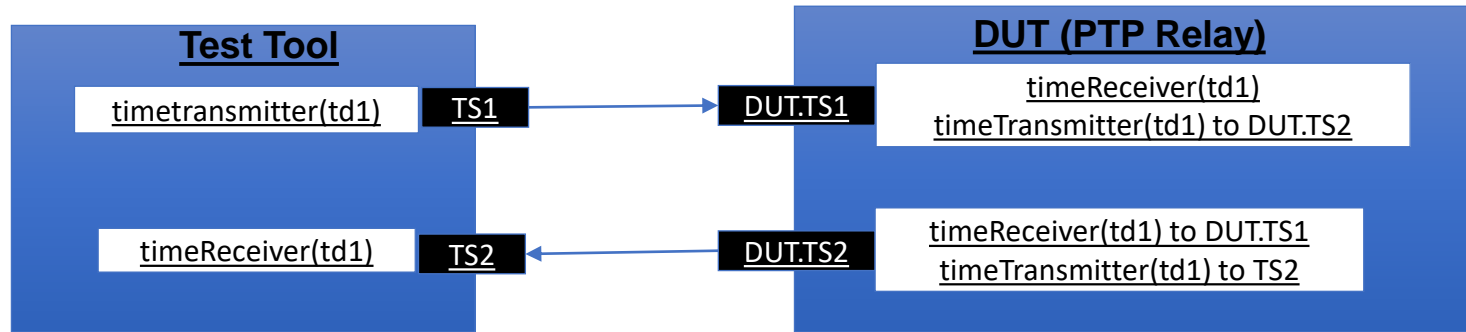


$$\text{Instantaneous Time Sync Error} = \text{POTS}_2 - \text{POTS}_1$$

Proposal: Leverage multiple time domain support

- Support IEEE802.1AS-2020 and at least two time-domains (*td1* and *td2*)
- Configure *td1* such that the Test Tool is *timeTransmitter* (and Grand Master) and *td2* such that the DUT is the *timeReceiver*
 - Over *td1* discipline the clock at the DUT to synchronize itself with the *td1 timeTransmitter* at the Test Tool
 - e.g., run `phc2sys – servo` parameters are `<tbd>`
 - Over *td2*, the DUT sends the synchronized time information (as Grand Master) to the Test Tool
 - The Test Tool can compare the time it transmitted over *td1* (as *timeTransmitter*) with that it received over *td1* (as *timeReceiver*) and assess time synchronization performance.
- In an InterOp setup, repeat previous step reversing the role of DUT1 (*timeReceiver*) and the DUT2 (*timeTransmitter*)
- Bundles all errors in the performance estimate
- Can be deployed in production networks to monitor goodness-of-time-synchronization in real-time and take corrective actions, if needed.

Proposal: Relays



SyncLocked setup (sync interval is the same at all timeTransmitters)

$$\text{Instantaneous Time Sync Error} = \text{POTS}_{\text{TS2}} - \text{POTS}_{\text{TS1}}$$

- Support for one time domain is sufficient
- Performance estimate is at a high level (i.e., bundles all possible errors)
- Statistics can be derived by sampling a large set of instantaneous Time Sync Error values

References

- <https://www.ieee802.org/1/files/public/docs2016/as-aregev-measuring-recovered-clock-quality.pdf>
- Avnu Whitepaper: https://avnu.org/wp-content/uploads/2014/05/Avnu-Testability-802.1AS-Recovered-Clock-Quality-Measurement-1.0_Approved-for-Public-Release.pdf
- Proposals in IEEE1588:
 - <https://ieee-sa.centraldesktop.com/1588/file/29081938/>
 - <https://ieee-sa.centraldesktop.com/1588/file/40649158/>
- Papers:
 - <https://ieeexplore.ieee.org/document/6644770?arnumber=6644770> (Synchronization monitoring in IEEE1588 synchronization networks by Opher Ronen; presented at the ISPCS September 2013)