Implementation Considerations for PHY Delays

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Characteristic Intrinsic Delays

- **Some functions in PHYs have varying intrinsic delays**
  - The intrinsic delay variation often follows a repeating pattern
  - The intrinsic delay variation pattern on Tx is often a mirror of the intrinsic delay variation pattern on Rx, and the sum of the two intrinsic delays is a constant value
    - This must be true if the Tx stream before the Tx function and the Rx stream after the Rx function are identical
- **IEEE 802.3 took advantage of this type of delay characteristic to simplify PTP timestamping with RS FEC**
- **Should we use it to simplify PTP timestamping for all functions that have such delay characteristics?**

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Concatenated Functions

- **Example PHY with 4 concatenated functions**
  - Multi-lane distribution
 - FEC
  - etc
  - etc
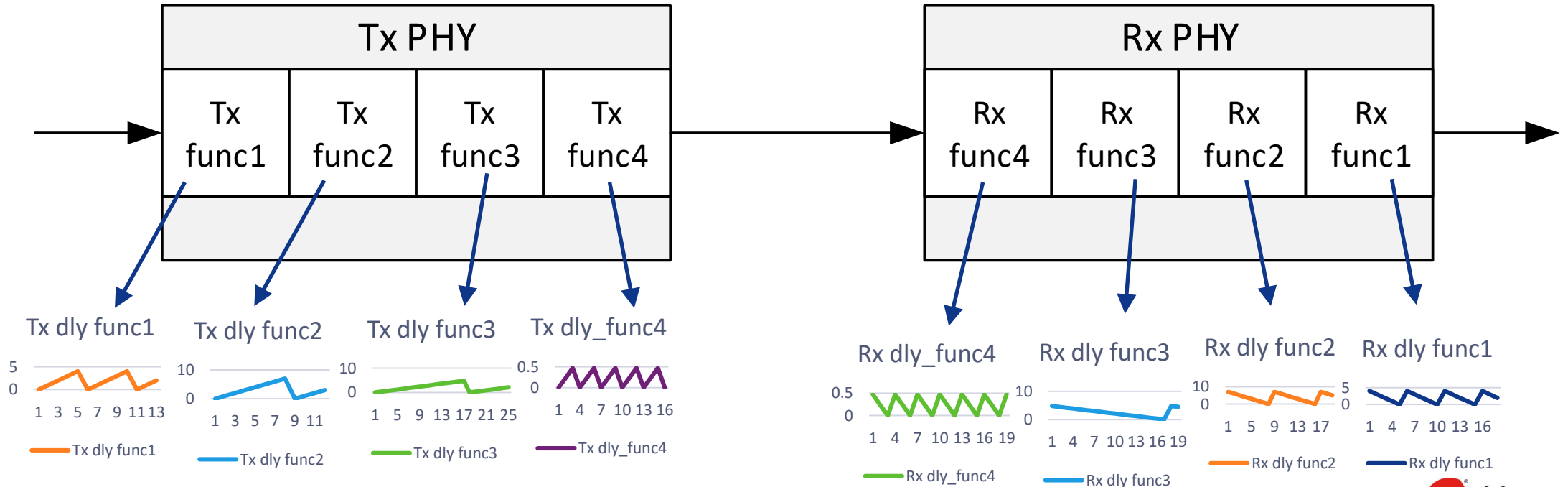
Total PHY Delay of Concatenated Tx Functions

- **For 1-step Sync timestamping, the total Tx PHY delay must be predicted in advance so the originTimestamp can be inserted before the PTP message enters the Tx PHY**
- **Predicting the total Tx PHY delay of the message timestamp point through a series of concatenated Tx PHY functions can be difficult**
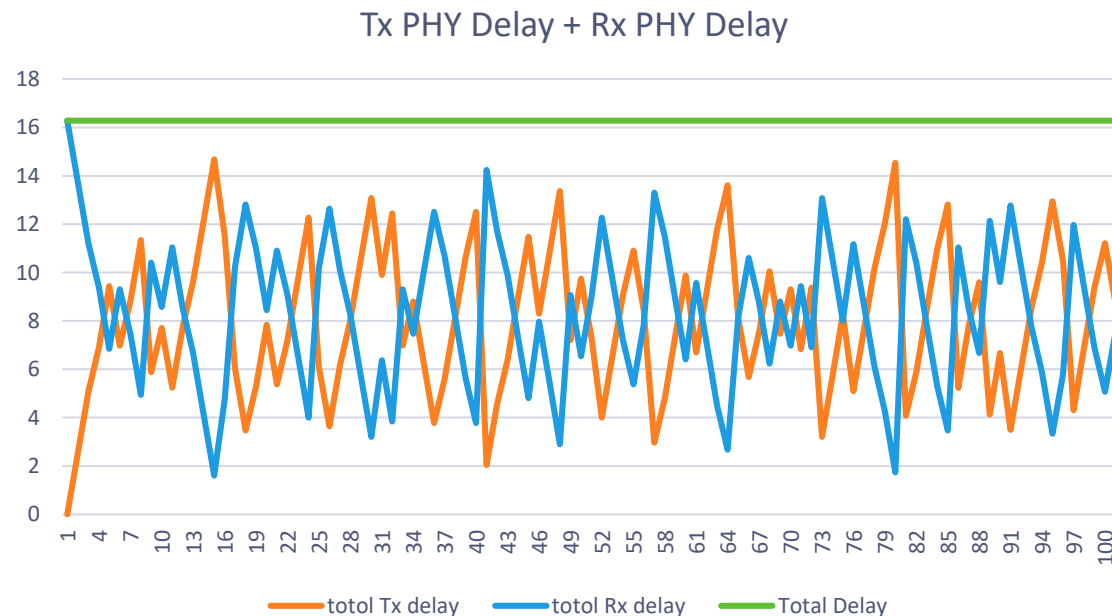

Tx PHY Delays

Legend: Tx dly func1, Tx dly func2, Tx dly func3, Tx dly_func4, totol Tx delay
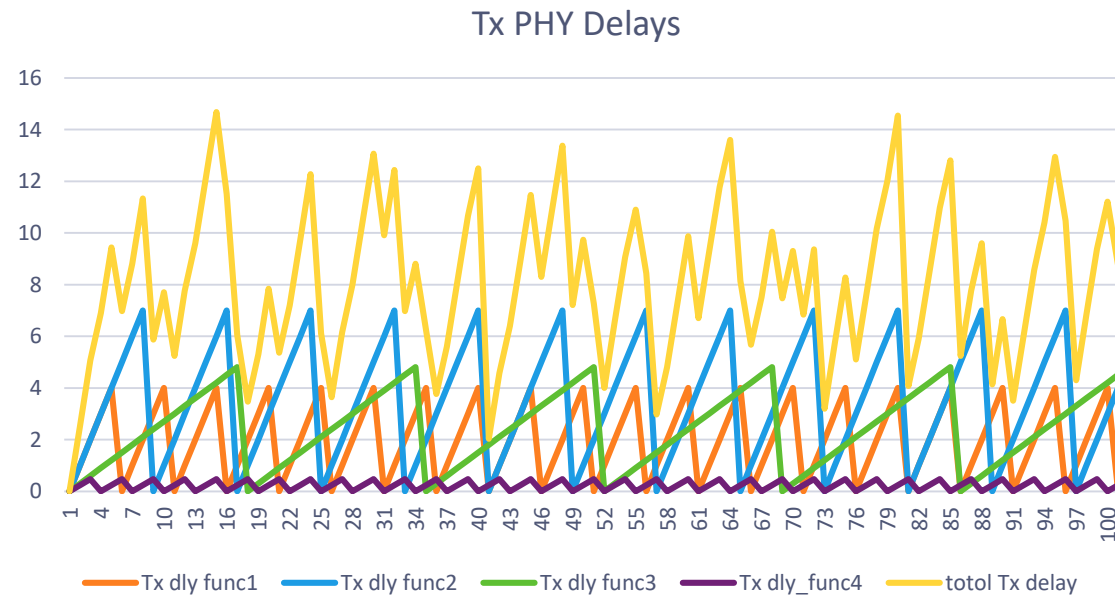
Total PHY Delay of Concatenated Rx Functions

- **Rx PTP messages are most easily detected after it exits the Rx PHY**
- **Tracing back the message timestamp point through a series of concatenated Rx PHY functions can be difficult**

Rx PHY Delay
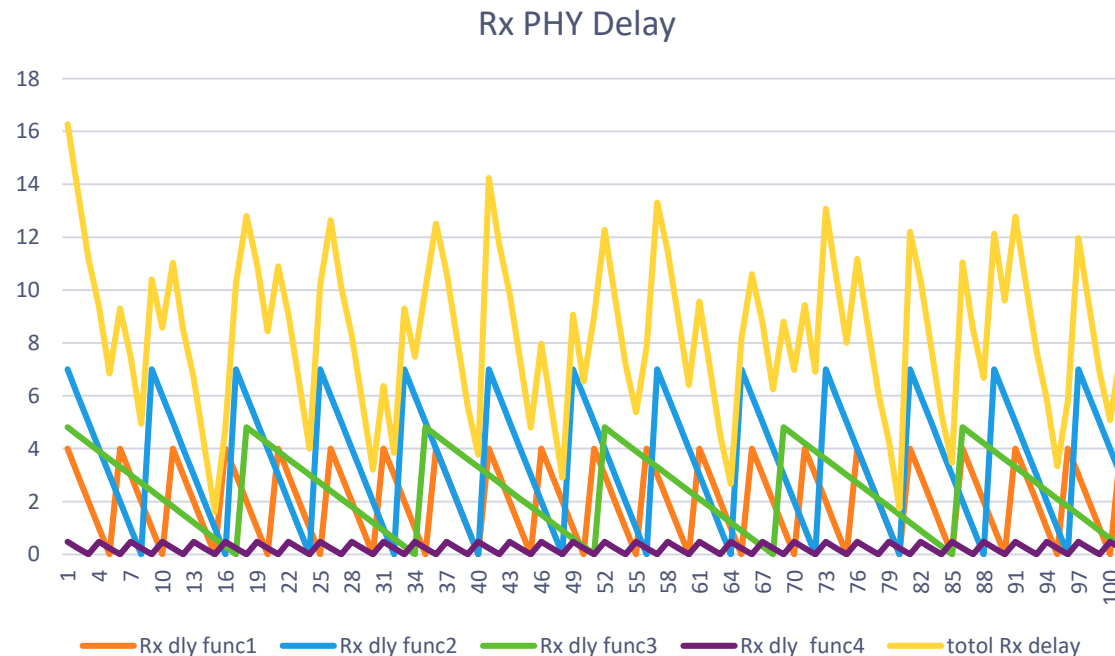
Total Delay of Tx + Rx PHYs

- **If each of the intrinsic Tx and Rx functional delays are mirrors of each other, then the end-to-end delay is a constant value**
  - One doesn't need to track the delay of the message timestamp point through either the Tx or Rx PHYs
  - One can simply standardize the allocation of a portion of the total constant delay to the Tx side and the rest to the Rx side

Tx PHY Delay + Rx PHY Delay

Proposal

- **Always deal with PHY delays of this nature by using the constant sum of Tx and Rx delays**
    - For example, the Tx and Rx lane distribution delays of a multi-lane PHY should use option C and method 2, per tse_3cx_02_0420

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Questions?

Thanks!