IEEE/IEC 60802 cTE introduction

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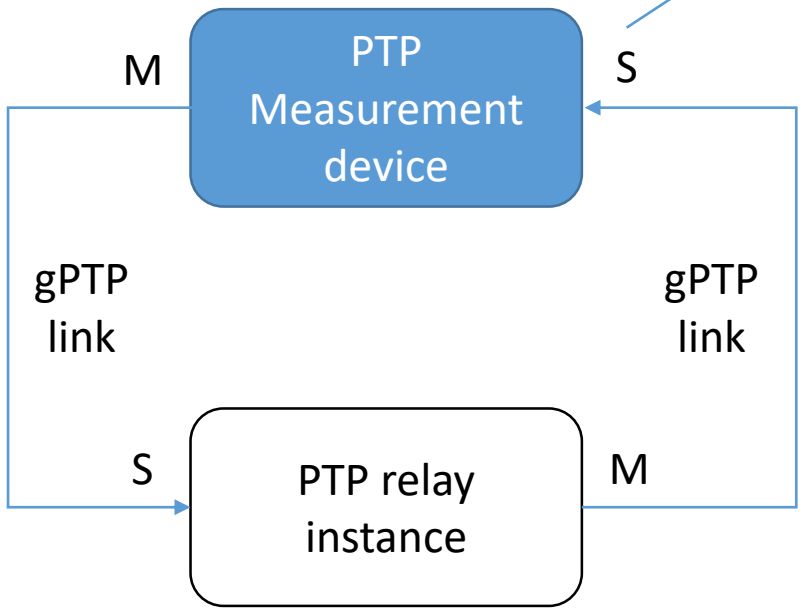
Introduction

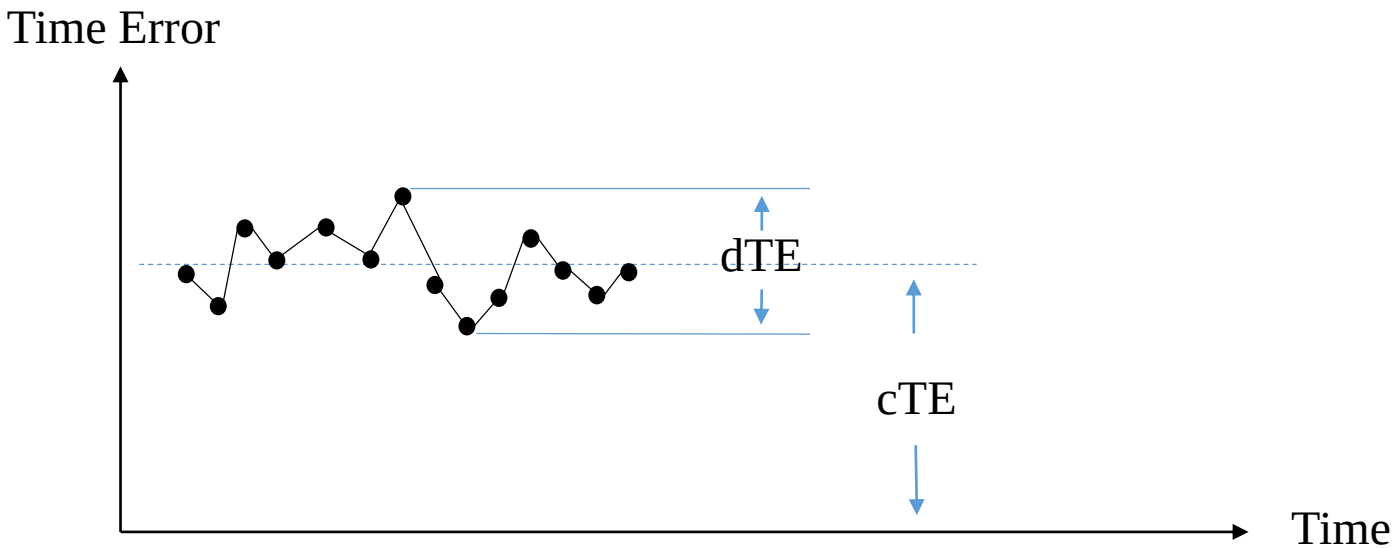
- The presentation (Further Analysis of cTE Budgeting for an IEC/IEEE 60802 Network, Based on Multiple Replication dTE simulations with Variable Inter-message Intervals) provided some consideration about time error budget allocation, including dTE (dynamic Time Error) and cTE (constant Time Error)
- The definition of cTE and dTE are specified in ITU-T G.8260
  - cTE: the constant component of the time error sequence, could be averaged with the time error sequence
  - dTE: the dynamic component (random noise) of the time error sequence, could be expressed by the peak-to-peak, MTIE or TDEV of the time error sequence.

Introduction

- This slide gives a simpler explanation on how to get cTE and dTE.



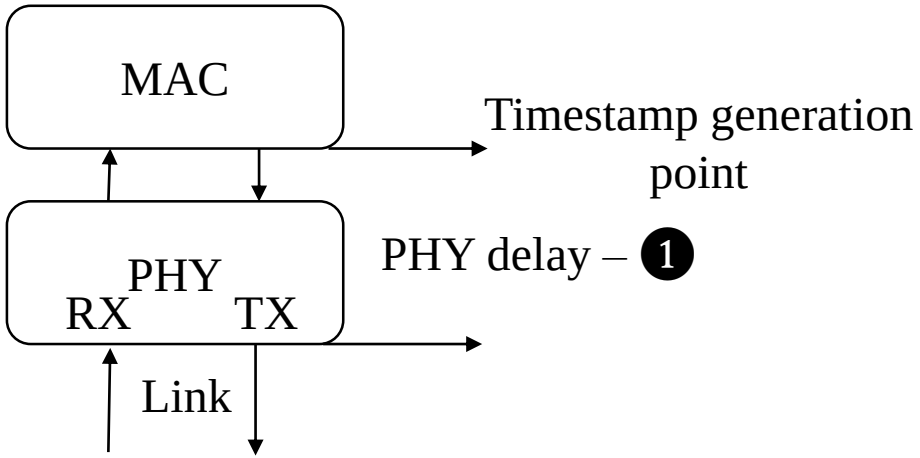
Step 1: Get the time error sequence,
e.g., t2 – t1 - meanLinkDelay

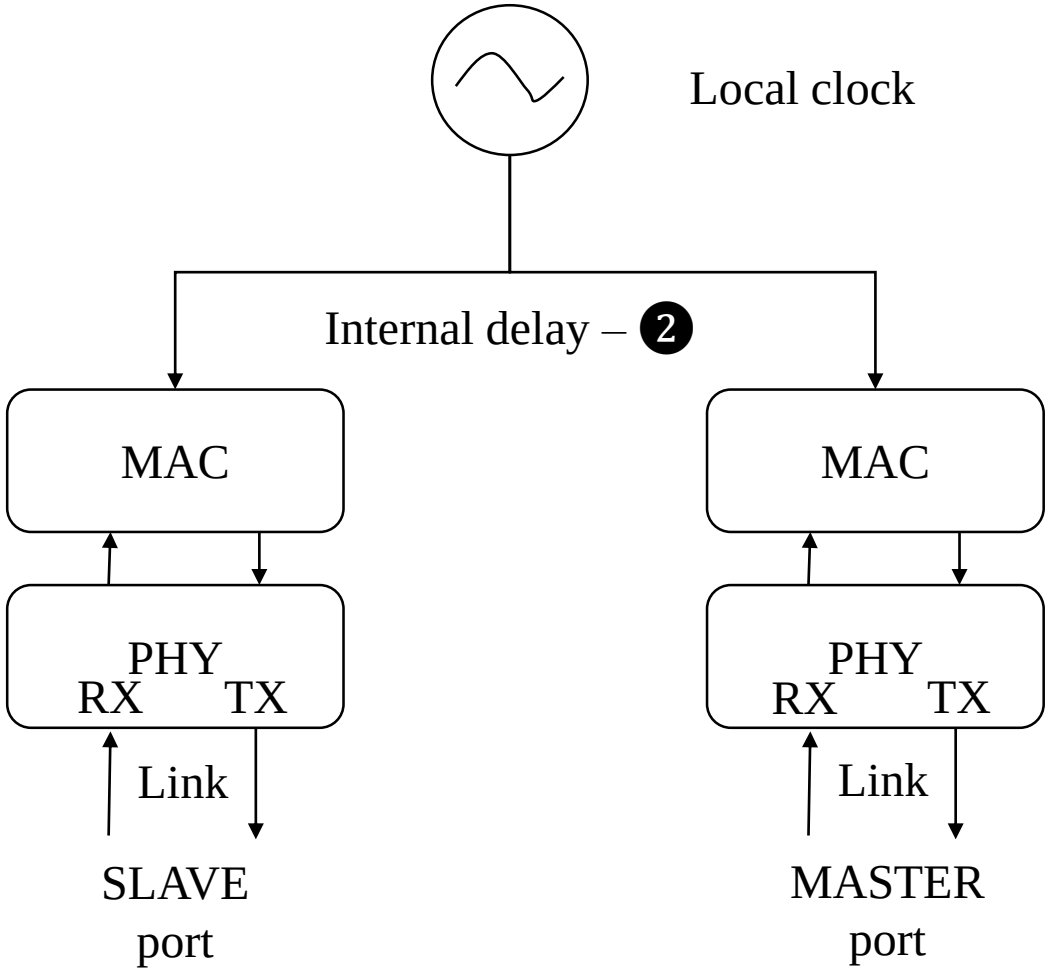


Step 2: Estimate dTE (e.g., peak-to-peak) and cTE (averaging).

Factors of cTE

- The cTE could be caused by fiber asymmetry, or PTP devices.
- For PTP devices, the factors include the asymmetry of timestamp generation, internal delay compensation or others.



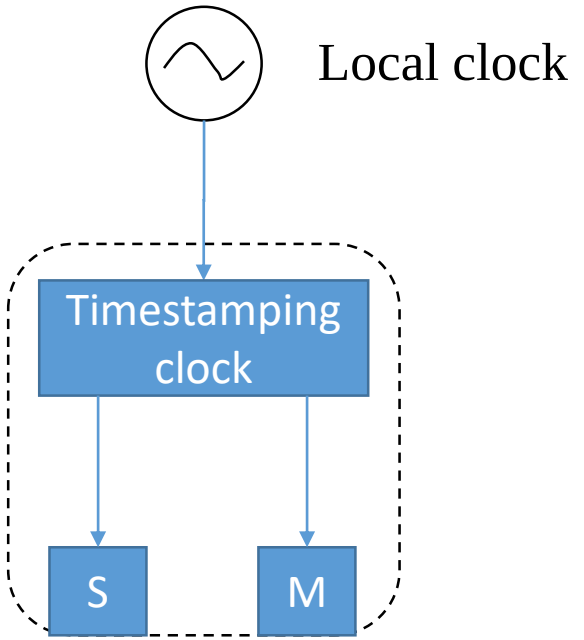


❶ : PHY needs to report its RX and TX delay to the MAC layer, and the delays or the asymmetry should be compensated to generate the timestamps at the MAC layer

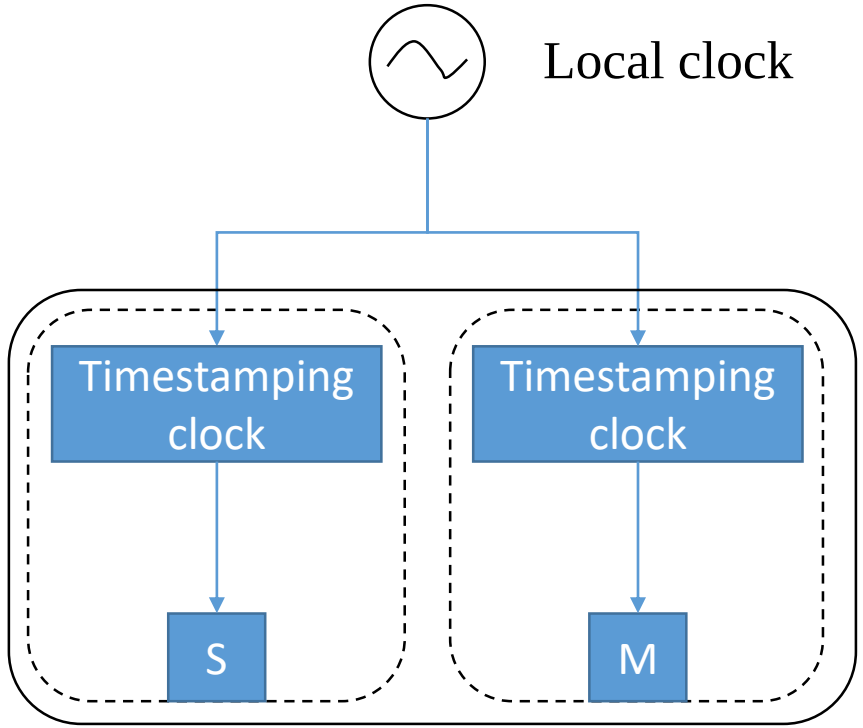
❷ : The delay from the local clock to the timestamping clock at MAC layer should be measured and compensated.

However, even after compensation, some error could still be present, and a fully ideal compensation is not practical.

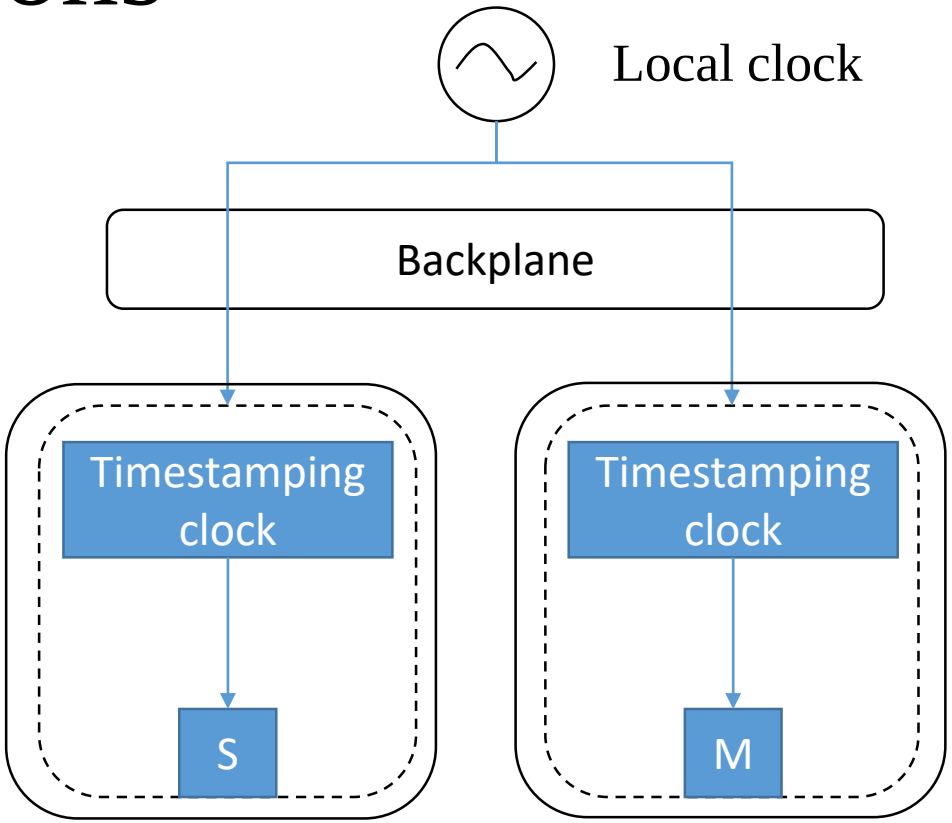
Several possible implementations



Case 1: M and S are from one chip



Case 2: M and S are from one card, but different chips.



Case 3: M and S are from different cards.

➢ cTE should be smaller for case 1, case 2, and case 3 respectively.

Summary

- The cTE specification of PTP relay and PTP end station should be carefully considered.

- A cTE value less than 5ns could be achievable for case 1, i.e.; Slave and Master ports are from one chip.

Thank you