Sampling error of gPTP timestamp

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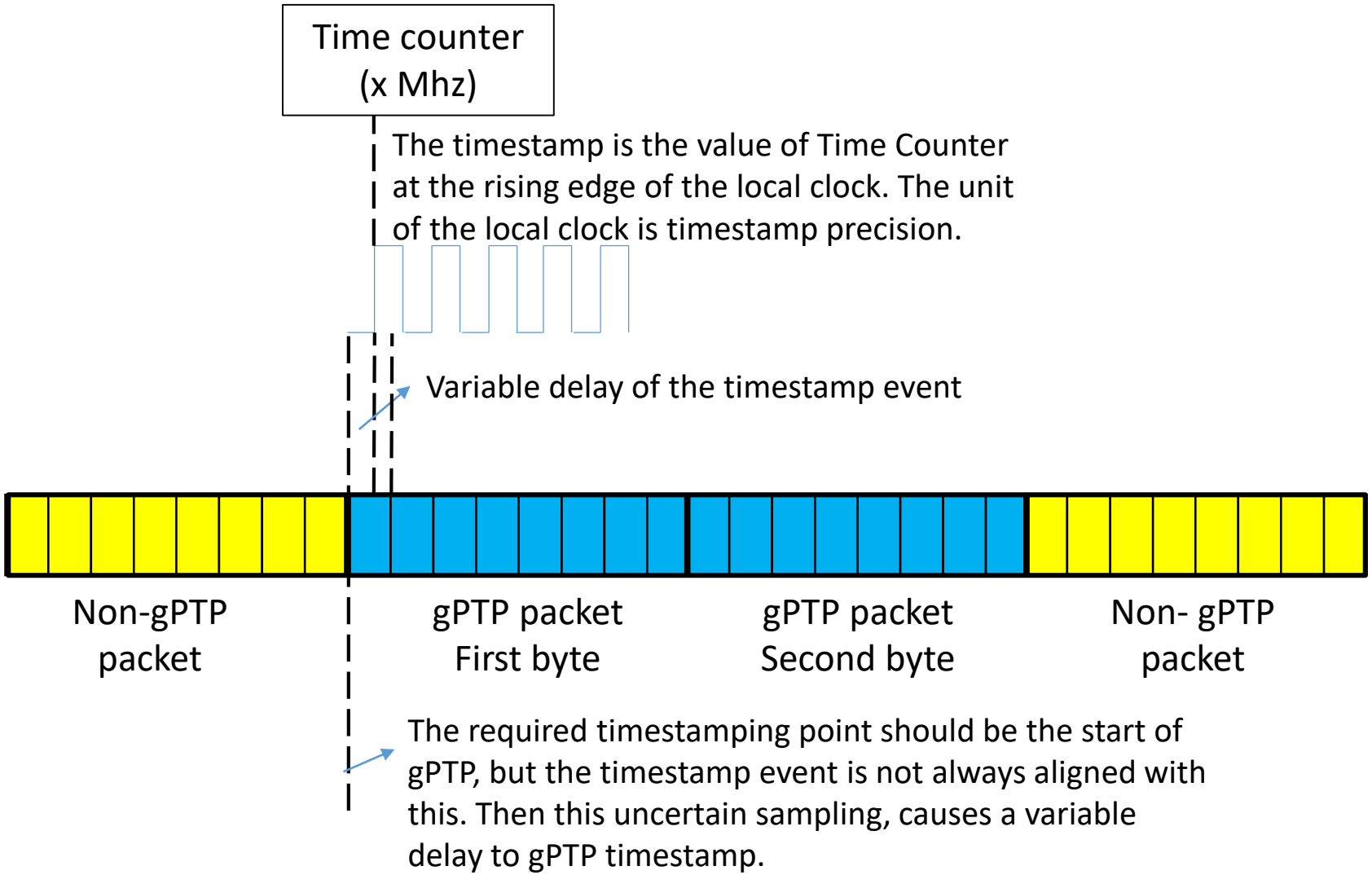

- The granularity of the counter is the timestamping precision. Legacy implementation uses 125MHz (8ns precision), and new implementations could use 500 MHz clock (2 ns precision)
- The legacy implementations detects the byte of gPTP message to generate timestamp, and the variable delay is bounded by the byte border
- Newer implementations could detect the bit to generate the timestamp, and in this case the variable delay is bounded by 1-bit uncertainty

PHY speeds

The timestamp error due to sampling error will be different based on the PHY speeds (reference from 1.4.468 of IEEE 802.3-2018)

- For 1GE, the delay of one bit is 0.8ns, and one byte is 6.4ns;
- For 1000BASE-T, the delay of one bit is 8ns, and one byte is 64ns;
- For 100BASE-X, the delay of one bit is 8ns, and one byte is 64ns;
- For 100BASE-T1, the delay of one bit is 15ns, and one byte is 120ns;
- For 100BASE-T2, IEEE 802.3 specification for a 100 Mb/s CSMA/CD local area network over two pairs -> the delay of one bit is 40ns, and one byte is 320ns;
- For 100BASE-T4, IEEE 802.3 specification for a 100 Mb/s CSMA/CD local area network over four pairs -> the delay of one bit is 40ns, and one byte is 320ns;

Summary

- The sampling error of gPTP timestamp can affect the performance
  - It could be an issue for lower rate PHYs
  - It is less of an issue for higher rate PHYs
- This needs to be considered depending on the required performance on each clock in the chain