**3.8 message time stamp point:** A temporal point, within the PHY-layer signal instantiating an event message, serving as a reference point. A timestamp is defined relative to the instant a message time stamp point passes the reference plane of a clock.

**3.x time stamp measurement plane:** An assumed plane, possibly distinct from the reference plane, with respect to which event message time stamp measurements are captured. Protocol operations adjust such measured time stamps by <ingress_latency> and <egress_latency> corrections in order to obtain time stamp values referenced to the instant the corresponding message time stamp point passed the reference plane.

**3.x station clock:** a local clock function presenting a timescale which is autonomous from the operations of the PTP protocol (i.e. free-running or externally sourced). All time stamp measurements in a node are performed with reference to the station clock.

[clause 7.6]

When an Ethernet frame enters an 802.3 PHY from the network, the SyncPort entity signals the event of the message passing a reference point in the PHY termed the time stamp measurement plane. The signaling is done as an ISO/IEC event notification. The PTP TS agent receives the signal and notes the time of the event relative to the station clock. This value of time is the time stamp. The TS agent provides both the time stamp and a notification to PTP TS filtering. Simultaneously with these processes, the Ethernet frame that triggered the event passes from the PHY to the MAC, IEEE 802.1AE MACsec, and PTP TS filtering. The signaling of the event by the SyncPort, time stamping of the event by the TS agent, providing the time stamp to PTP TS filtering, and passing of the message from the PHY to PTP TS filtering may occupy a significant time duration. If these processes are assumed to be sufficiently fast compared to the incoming PTP message rate that, at any given time, only one message and one corresponding time stamp will be presesnt at PTP TS filtering, then it is not required that PTP TS filtering to queue messages and time stamps and correlate the two. If an implementation violates this assumption it must provide an equally effective method for correlating each time stamp measurement with its message at the PTP TS filtering entity. [NOTE: Cryptographic operations, in particular, are likely to cause large pipeline delays; Table 10-1 of 802.1AE defines delay limits for compliant MACsec implementations.]

The above process occurs for every Ethernet frame; however, only PTP event messages need to be time stamped. PTP TS filtering determines if the Ethernet frame contains a PTP message by examining the Ethertype field and, if so, whether the message is an event message by examining the most significant bit of the messageId field of the PTP header (see XXX). If the most significant bit is 0, the message is an event message and the time stamp is passed to the PTP layer. If the most significant bit is 1, the message is a general message and the time stamp is discarded. In both cases, the message is passed from PTP TS filtering through bridge port transmit and receive and the LLC to the PTP layer. At the PTP layer the event message (delivered through the LLC) is correlated with the corresponding timestamp (delivered through the PTP TS filtering entity).

The time interval between the message time stamp point passing the reference plane and the time stamping of the corresponding event by the TS agent is assumed to be fixed. The time interval comprises components due to (1) separation of the time stamp measurement plane from the reference plane, (2) signal transformation within the PHY, and (3) systematic delays in the SyncPort entity and TS agent. The jitter, wander, and time accuracy of the synchronization signal depend on both the magnitude and frequency content of the time history of this time interval for the successive PTP event messages of each type. The value of this time interval may be made available to the PTP application through the latency variables defined in 8.4.3.

[clause 8.4.3]

### 8.4.3 Generation of event message time stamps

**Deleted:** by

**Deleted:** time stamp point

**Deleted:** reference

**Deleted:** The reference plane resides in the (G)MII.

**Deleted:** syntonized clock if a P2P TC function is present in the node and relative to the synchronized clock if an S-BC or OC, but no P2P TC, function is present

**Deleted:** . With this assumption

**Deleted:** signaling of the event by the SyncPort

**Deleted:** negligible

All event messages are time stamped on egress and ingress. The time stamp value used in protocol operations shall be the time at which the event message time stamp point passes the reference plane marking the boundary between the node and the network.

NOTE - In general, the time stamps are generated at the time stamp measurement plane, which is a point removed from the reference plane. Furthermore, the time offset from the reference plane is likely to be different for inbound and outbound event messages. To meet the requirement of this clause, the generated time stamps shall be corrected for these offsets. Figure 8-2 illustrates these offsets. Based on this model the appropriate corrections are

<egress timestamp> = <egress measured timestamp> + egress_latency

<ingress timestamp> = <ingress measured timestamp> − ingress_latency,

where the actual time stamps <egress timestamp> and <ingress timestamp> measured at the reference plane are computed from the measured time stamps by their respective latencies. Failure to make these corrections will result in a time offset between the slave and master clocks.

Deleted: NOTE 1 - If an implementation generates event message time stamps using a point other than the message time stamp point, then the generated time stamps should be appropriately corrected by the time interval between the actual time of detection and the time the message time stamp point passed the reference plane. Failure to make these corrections will result in a time offset between the slave and master clocks.¶

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[subclause 11.2.2.1]

### 11.2.2.1 Event message class

The event message class consists of the following message types:

a) Sync: A Sync message is transmitted by a master to its slaves. The appearance of a Sync message at the reference plane of a PTP port is an event to which a local clock shall assign a time stamp, the <sync-event-ingress-timestamp> or <sync-event-egress-timestamp>, based on the value of the station clock and the <ingress_latency> or <egress_latency> variable. The Sync message is followed by a Follow_Up message containing the <sync-event-egresstimestamp>.

Deleted: local

b) Pdelay_Req: A Pdelay_Req message is transmitted by a PTP port to another PTP port as part of the peer delay mechanism (see 11.5.5 and 11.5.6) to determine the delay on the link between them. The appearance of a Pdelay_Req message at the reference plane of a PTP port is an event to which a local clock shall assign a time stamp, the <pdelay-req-event-ingress-timestamp> or <pdelay-reqevent-egress-timestamp>, based on the value of the station clock and the <ingress_latency> or <egress_latency> variable.

Deleted: local

c) Pdelay_Resp: A Pdelay_Resp message is transmitted by a PTP port in response to the receipt of a Pdelay_Req message. The Pdelay_Resp message contains the <pdelay-req-ingress-timestamp> of the Pdelay_Req message that it it transmitted in response to. The appearance of a Pdelay_Resp message at the reference plane of a PTP port is an event to which a local clock shall assign a time stamp, the <pdelay-resp-event-ingress-timestamp> or <pdelay-resp-event-egress-timestamp>, based on the value of the station clock and the <ingress_latency> or <egress_latency> variable. The Pdelay_Resp message is followed by a Pdelay_Resp_Follow_Up message containing the <pdelay-resp-event-egress-timestamp>.

Deleted: local

Event messages shall be assigned the time stamps defined above, in accordance with 8.4.3.

[sublause 11.2.8]

### 11.2.8 Event message time stamp point

The message time stamp point for a PTP event message shall be the beginning of the first symbol following the start of frame delimiter. NOTE: in terms of a recovered symbol clock, this point is midway between the mid-cell clock transition for the last (or only) symbol of the start of frame delimiter and the mid-cell clock transition for the subsequent symbol.

<<The following sentence was formerly in clause 8, and was moved to clause 11 because it is a mediadependent statement. It must be moved to an appropriate place in clause 11.>> The measured time stamp captured and reported by the TS Agent for a PTP event message shall be the time of the event signaled by the SyncPort entity when the message passes the time stamp measurement plane. NOTE: The measured time stamp is subsequently adjusted as described in 11.2.2.1 and 8.4.3.

Deleted: time stamp point

Deleted: reference

[subclause 11.4.2.1]

#### 11.4.2.1.3 timestamp (UScaledNs)

The timestamp is the value of the time stamp of the event message (i.e., Sync, Pdelay_Req, Pdelay_Resp) that was just transmitted or received.

NOTE - In a P2P TC, event messages are timestamped using the station clock. Since the station clock is used to measure time intervals but is not synchronized to any master or grandmaster, the UScaledNs data type is used.

**Deleted:** syntonized

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**Deleted:** required to be

**11.4.4.3.4** compute_prop_time(): computes the mean propagation time on the link attached to the P2Pport entity, as

$$mean\text{-}propagation\text{-}time = \frac{(t_4 - t_1) + r(t_2 - t_3)}{2}, \quad (11\text{-}1)$$

where:

*mean-propagation-time* is the mean propagation time on the link attached to the P2PPort entity, expressed in ns,

$t_4$ = <pdelay-resp-event-ingress-timestamp> for the Pdelay_Resp message received in response to the Pdelay_Req message sent by the P2PPort entity, expressed in ns,

$t_1$ = <pdelay-req-event-egress-timestamp> for the Pdelay_Req message sent by the P2PPort entity, expressed in ns,

$t_2$ = sum of (i) the ns field of the requestReceiptTimestamp, (ii) the seconds field of the requestReceiptTimestamp multiplied by $10^9$, and (iii) the correction field divided by $2^{16}$ (i.e., the corection field is expressed in ns plus fractional ns), of the Pdelay_Resp message received in response to the Pdelay_Req message sent by the P2PPort entity, and

$t_3$ = sum of (i) the ns field of the responseOriginTimestamp, (ii) the seconds field of the responseOriginTimestamp multiplied by $10^9$, and (iii) the correction field divided by $2^{16}$ (i.e., the corection field is expressed in ns plus fractional ns), of the Pdelay_Resp_Follow_Up message received in response to the Pdelay_Req message sent by the P2PPort entity.

$r$ is the estimated ratio (local station clock frequency)/(responder station clock frequency).

<<note: must define an algorithm for estimating $r$; e.g.

$r = (t1\_current - t1\_previous)/(t2\_current - t2\_previous)$ >>

**Deleted:** NOTE - A P2P TC is required to maintain syntonized time but not synchroninzed time, and its syntonized time may be expressed in ScaledNs. In this case, the seconds fields of the requestReceiptTimestamp and responseOriginTimestamp are zero.