P802.1Qdq/D0.4 comment resolution

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Current status

- Resolving the comment submitted with TG ballot on D0.4
- 12 of 13 comments are resolved.
- The last one is comment #13.

Comment #13 on TG Ballot against D0.4

Cl **X** *SC* **X.3.2** *P* **23** *L* **5** # 13

Turner, Max Ethernovia

Comment Type **TR** *Comment Status* **X**

The Latency calculated in Q-Annex L is less than that claculated in [BA].

SuggestedRemedy

Rference BA and Annnex L and point out the difference in assumptions.

Proposed Response *Response Status* **W**

DISCUSS

X.3.2 Credit-based shaper algorithm

Per-hop latency imposed by credit-based shaper algorithm (8.6.8.2) against a single frame is discussed in Annex L. Network Latency is derived from the sum of per-hop latency along the path.

Resolution proposed by the editor

ACCEPT IN PRINCIPLE

Insert the following sentences at the last of X.3.1:

Estimation of A_{max} depends on selection of mechanisms which are used in the forwarding process on bridges and Talker transmission process on end stations. Combination of multiple mechanisms causes complexity, whereas knowledge of traffic pattern enables better estimation. The series of profile standards, for instance, IEEE Std 802.1BA-2021 provides useful information and helps implementers.

This clause introduces the related mechanisms and the references to their description hereinafter.

Insert the following sentences at the last of X.3.2:

IEEE Std 802.1BA-2021 also provides a method of latency calculation.

Calculation of Max Latency for Class A

802.1Q-2022 Annex L

The worst-case latency for a single hop from Bridge to Bridge, measured from arrival of the last bit at Port *n* of Bridge A to the arrival of the last bit at Port *m* of Bridge B, can be broken out into the following components:

a) Input queuing delay. (There are no input queues in the IEEE 802.1 architecture, but if present, the implementation must account for them.)
b) Interference delay (L.3.1).
c) Frame transmission delay. (The time taken to transmit one maximum frame at *portTransmitRate*.)
d) LAN propagation delay. (A variable delay that depends on the length of the LAN connection to the next Bridge; this is measurable using the mechanisms defined in IEEE Std 802.1AS.)
e) Store-and-forward delay. This includes all other elements of forwarding delay that are a consequence of the internal processing of the Bridge, assuming that the input and output queues are empty, such as:
    1) The time needed to pass a frame from the input port to the output port, assuming empty queues.
    2) The time delay between a frame being available for transmission on a Port and the Port being ready to transmit the frame.

NOTE 2—For example, in the case where the MAC/PHY has entered a power saving mode, there may be a delay incurred in switching the Port back to normal operation.

    3) The difference, if any, in the delay incurred by a frame that bypasses an empty queue, vs. that incurred by a frame that must be enqueued.
    4) The time added (subtracted) by the lengthening (shortening) of the frame due to addition (removal) of frame headers such as Q-tags or MACSec-tags.
    5) The time needed to encrypt a MACSec frame.

802.1BA-2021

$$\text{Max Latency} = t_{\text{Device}} + t_{\text{MaxPacketSize+IPG}} + (t_{\text{AllStreams}} - t_{\text{StreamPacket+IPG}}) \times \frac{Rate}{MaxAllocBand} + t_{\text{StreamPacket}} \quad (6\text{-}1)$$

$$t_{\text{AllStreams}} = \frac{MaxAllocBand \times t_{\text{Interval}}}{Rate} \quad (6\text{-}2)$$

where

t_{Device}	is the internal delay of the device (in increments of 512 bit times)
$t_{\text{MaxPacketSize+IPG}}$	is the transmission time for a maximum size interfering frame (1522 octets to 2000 octets) plus its preamble and start-of-frame delimiter (SFD) (8 octets), and the following interpacket gap (IPG) (12 octets)
$t_{\text{StreamPacket}}$	is the transmission time for the maximum frame size of the stream that is being reserved, plus its preamble and SFD (8 octets)
$t_{\text{StreamPacket+IPG}}$	is the transmission time for the maximum frame size of the stream that is being reserved, plus its preamble and SFD (8 octets) and the following IPG (12 octets)
$Rate$	is the portTransmitRate R0 as per L.3.1.1 of IEEE Std 802.1Q-2018
$MaxAllocBand$	is the maximum allocatable bandwidth, the maximum amount of bandwidth the AVB system is able to allocate for Class A streams on the port (maximum of idleSlope as per L.2 of IEEE Std 802.1Q-2018)
t_{Interval}	is the Class A observation interval or 125 µs
$t_{\text{AllStreams}}$	is the sum of the transmission times of all Class A stream frames the AVB System is able to allocate in an observation interval (125 µs) on a port

Where is the difference?

802.1Q-2022 Annex L

The worst-case latency for a single hop from Bridge to Bridge, measured from arrival of the last bit at Port *n* of Bridge A to the arrival of the last bit at Port *m* of Bridge B, can be broken out into the following components:

a) Input queuing delay. (There are no input queues in the IEEE 802.1 architecture, but if present, the implementation must account for them.)

b) Interference delay (L.3.1).

c) Frame transmission delay. (The time taken to transmit one maximum frame at *portTransmitRate*.)

d) LAN propagation delay. (A variable delay that depends on the length of the LAN connection to the next Bridge; this is measurable using the mechanisms defined in IEEE Std 802.1AS.)

e) Store-and-forward delay. This includes all other elements of forwarding delay that are a consequence of the internal processing of the Bridge, assuming that the input and output queues are empty, such as:

1) The time needed to pass a frame from the input port to the output port, assuming empty queues.
2) The time delay between a frame being available for transmission on a Port and the Port being ready to transmit the frame.

NOTE 2—For example, in the case where the MAC/PHY has entered a power saving mode, there may be a delay incurred in switching the Port back to normal operation.

3) The difference, if any, in the delay incurred by a frame that bypasses an empty queue, vs. that incurred by a frame that must be enqueued.
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5) The time needed to encrypt a MACSec frame.

802.1BA-2021

a+e

c+d

$$\text{Max Latency} = t_{\text{Device}} + t_{\text{MaxPacketSize+IPG}} + (t_{\text{AllStreams}} - t_{\text{StreamPacket+IPG}}) \times \frac{Rate}{MaxAllocBand} + t_{\text{StreamPacket}} \quad (6\text{-}1)$$

$$t_{\text{AllStreams}} = \frac{MaxAllocBand \times t_{\text{Interval}}}{Rate} \quad (6\text{-}2)$$

where

t_{Device}	is the internal delay of the device (in increments of 512 bit times)
$t_{\text{MaxPacketSize+IPG}}$	is the transmission time for a maximum size interfering frame (1522 octets to 2000 octets) plus its preamble and start-of-frame delimiter (SFD) (8 octets), and the following interpacket gap (IPG) (12 octets)
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Interference delay

802.1Q-2022 Annex L

L.3.1 Interference delay

The interference delay for frame X can be broken out into the following components:

a) **Queuing delay:** The delay caused by the frame that was selected for transmission an arbitrarily small time before frame X became eligible for transmission selection, plus the delay caused by queued-up frames from all stream frames with higher priority than frame X's class (i.e., the "*maxBurstSize*" for SR Classes with higher priority than X—see L.1). This is what is referred to as *maxInterferenceSize* in L.1. Queuing delay is analyzed in detail in L.3.1.1.

b) **Fan-in delay:** The delay caused by other frames in the same class as frame X that arrive at more-or-less the same time from different input Ports. Fan-in delay is analyzed in detail in L.3.1.2.

c) **Permanent delay:** The delay caused by frames that reside in a buffer for a long time, relative to the output queuing delay, because of the history of activity in the network. Permanent delay is analyzed in detail in L.3.1.3.

Permanent delay does not occur if queues empty out every cycle.

802.1BA-2021

a

$$\text{Max Latency} = t_{\text{Device}} + t_{\text{MaxPacketSize+IPG}} + (t_{\text{AllStreams}} - t_{\text{StreamPacket+IPG}}) \times \frac{Rate}{MaxAllocBand} + t_{\text{StreamPacket}} \quad (6\text{-}1)$$

$$t_{\text{AllStreams}} = \frac{MaxAllocBand \times t_{\text{Interval}}}{Rate} \quad (6\text{-}2)$$

b?

where

t_{Device}	is the internal delay of the device (in increments of 512 bit times)
$t_{\text{MaxPacketSize+IPG}}$	is the transmission time for a maximum size interfering frame (1522 octets to 2000 octets) plus its preamble and start-of-frame delimiter (SFD) (8 octets), and the following interpacket gap (IPG) (12 octets)
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“Difference in assumption”?

- Any concrete description in 802.1BA?