Text Contribution for P802.1Qdq

16 March 2023

Toru Osuga, Satoko Itaya, Fumiko Ohori, Takeshi Matsumura (NICT),
Hiroki Nakano (CAHI Corporation)

Overview

- We have investigated the following comment and propose our remedy in this presentation.
  - Comment about neglecting ε
    - [802.1 - 14985] [Qdq] Some Thoughts on Equation (X-5)

[802.1 - 14985] [Qdq] Some Thoughts on Equation (X-5)

As indicated in one of my comments and discussed during comment resolution, (X-5) at this point does not give very good guidance to the user of this document. I have done some playing around and would want to hear your thoughts on it:
I use the following nomenclature, trying to stay close to the document draft:

B ... BlockData size (different from text)
D ... DataSize (different from text!)
n ... number of Frames per cluster
(I stick with Frame for now, although I think Packet would be better to use!)
F ... FrameLength
RM ... RequiredMinimumShapingRate
BL ... BoundedLatency
AL ... AccumulatedLatency

[802.1 - 14985] [Qdq] Some Thoughts on Equation (X-5) (Cont.)

If we use
D = F * n … (a simplification of (X-1)),
then Epsilon (ε) in (X-5) actually becomes:
ε = 1/n * F/(BL - AL)

Quantifying the fragmentation overhead of line 3 page 24 as
B … fragmentation overhead per Frame
we can expand:
D = B + O * n
and (X-5) can be expressed as:
RM = (B + O * n)/(BL - AL) * (1 – 1/n)
= (F * n)/(BL - AL) * (1 – 1/n)

If we look at (V-8) or (V-10) of IEEE Std 802.1Q-RevD1.0 or (6-1) of IEEE Std 802.1BA-2021, it is a good assumption that AccumulatedLatency in the network actually will depend on FrameLength, so you likely do not get to pick these parameters (F and n) independently (for a given B).

Assuming AL was determined for a MaximumFrameSize FM, we get:
D = (B + O * n) = FM * n
and
RM = (FM * n)/(BL - AL) * (1 – 1/n)

If we arbitrarily choose the error introduced by neglecting ε'=1/n to be:
ε' < 1%, then
n > 100
and therefore
B > 100 * (FM – O)

Is it worthwhile to give this or a similar criterion to the reader?

Response to the commenter

- We agree with the commenter that there is the case ε is too large to be neglected.
- Application developers can take advantage that neglecting ε enables the whole of the BlockData to reach the Listener within the bounded latency regardless of the position of the reference points.
- Therefore, we define ε in detail and then transform Equation (X-4) to Equation (X-5) by using this definition.
- Since the derived variable “RequiredMinimumShapingRate” includes such kind of design decisions, the equations from Equation (X-9) onward are changed to equations using this variable.

Proposed remedy 1

~~Removed~~
Added

- Change Page 27 Line 1 and 2 to:

~~DataSize(i) is much larger than the length of the last frame (i.e. FrameLength(iworst)), therefore RequiredMinimumShapingRate can be simplified by introducing a small positive value e as follows;~~ Letting FrameLength(i_{worst}, $n_{i_{worst}}$)/(BoundedLatency - AccumlatedLatency) denote as ε, Equation (X-4) is transformed as follows;

Proposed remedy 2

~~Removed~~
Added

- Change after Page 27 Line 4:

  ~~ε can be zero in actual implementations.~~
  Neglecting ε makes RequestedMinimumShapingRate larger, therefore the reference of the last frame reaches earlier than configured by bounded latency. Especially, in order to neglect ε completely, that is, as zero, ~~In case that an application developer requests to assure bounded latency until the last bit of BlockData delivers,~~ consider the (n+1)th frame and its reference point that are imaginary.

- Insert after Page 27 Line 10 (Equation X-6)

  Equation (X-6) is equivalent to Equation (X-5) where ε is zero. This enables the whole of the BlockData to reach the Listener within the bounded latency regardless of the position of the reference points.

Proposed remedy 3

X.4.3 Equation X-9

$$\text{CommittedInformationRate} = \frac{\text{MaximumDataSize}}{\text{BoundedLatency} - \text{AccumulatedLatency}} \qquad \text{(X-9)}$$

changes to

$$\text{CommittedInformationRate} = \text{RequiredMinimumShapingRate}$$

Proposed remedy 4

X.4.4 Equation from (X-10) to (X-13) includes fraction

$$\frac{\text{MaximumDataSize}}{\text{BoundedLatency} - \text{AccumulatedLatency}}$$

for instance,

$$\text{MaxIntervalFrames} = \left\lceil \frac{1}{\text{MaxFrameSize}} \cdot \frac{\text{MaximumDataSize}}{\text{BoundedLatency} - \text{AccumulatedLatency}} \cdot \text{classMeasurementInterval} \right\rceil \quad \text{(X-11)}$$

- This fraction is changed to “RequiredMinimumShapingRate”

Summary

- We answered the comment about neglecting ε.
- In some case, ε is too large to be neglected.
- On the other hand, neglecting ε has an advantage for application developers.
- Therefore, we defined ε properly and changed the related sentences and equations.