Ingress and egress delay impact on 802.1AS clause 13 (preso-V.3)

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Special thanks to Geoff for correcting my mistakes!

Background of problem

- The previous draft used the message transmission times as the reference points
- When we changed to use the MPCP counter, we needed to add the ingress and egress latencies
- The formulas we generated in San Diego are not quite right
- Here, we calculate the right values

MPCP and reference planes

MPCP
Counter

OLT
egress

ONU
ingress

MPCP
Counter

ONU
egress

MPCP
Counter

OLT
ingress

MPCP
Counter
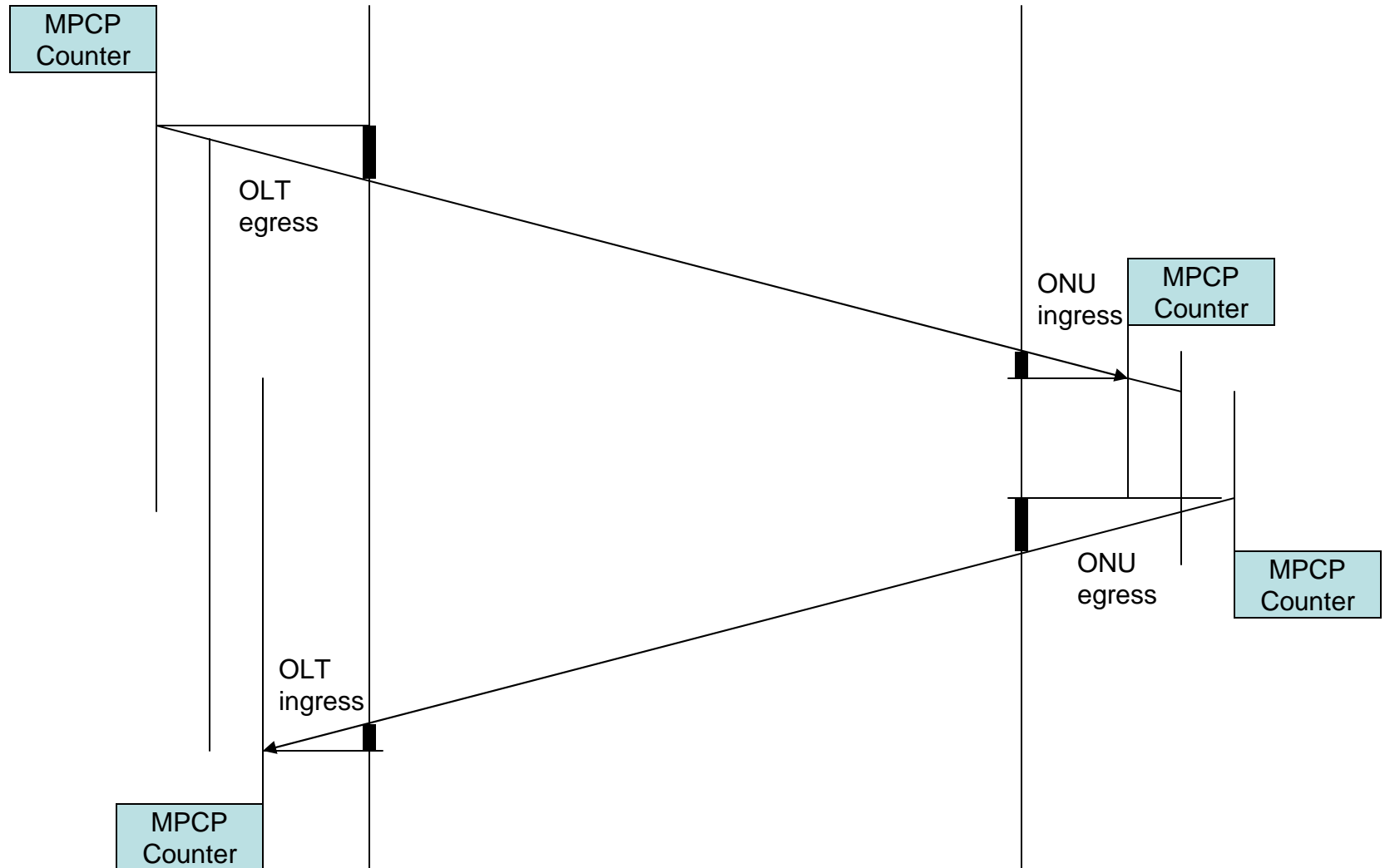
- Eq(13-1) in 802.1AS 7.0:
  - ToDx,i = ToDx,o + RTT* K / RateRatio
    - Assume K = IndexFactor = Nup / (Ndown + Nup)
- As noted in another comment, we should multiply by the RateRatio, not divide. So, the repaired eq. is:
  - ToDx,i = ToDx,o + RTT* K * RateRatio
- RTT measured in EPON
  - RTT = OLTegress + downchannel + ONUingress + ONUegress + upchannel + OLTingress
  - I.e, RTT = (OLTegress + OLTingress) + (downchannel + upchannel) + (ONUingress + ONUegress)
- Note: the egress and ingress latencies are measured in the local clock timebase

The way we have it now:

- The ideal calculation of ToDx,i
  - If ToDx,i* is the time when the ONU MPCP counter equals X, and
  - ToDx,o* is the time when the OLT MPCP counter equals X,
  - Then: ToDx,i* = ToDx,o* + [OLTegress + (downchannel + upchannel)•K + ONUingress] * RateRatio   Eq. (1)
- The calculation in Eq.(13-1)
  - ToDx,i = ToDx,o + [(OLTegress + OLTingress) + (downchannel + upchannel) + (ONUingress + ONUegress)] • K
- These two don't match quite right…

- **Starting from our Equation 1:**

  ToDx,i* = ToDx,o* + [OLTegress + (downchannel + upchannel)•K + ONUingress]*RR

- **Move the RateRatio to get it out of the way**

  ToDx,i*/RR = ToDx,o*/RR + OLTegress + (downchannel + upchannel)•K + ONUingress

- **Add the appropriate terms to both sides**

  ToDx,i*/RR-ONUingress +K•(ONUingress+ONUegress)=
  -ONUingress +K•(ONUingress+ONUegress) +ToDx,o*/RR
  -OLTegress +K•(OLTingress+OLTegress) +OLTegress -
  K•(OLTingress+OLTegress) +OLTegress + (downchannel +
  upchannel)•K +ONUingress

- **Simplifying ….**

  ToDx,i*/RR-ONUingress +K•(ONUingress+ONUegress) =
  ToDx,o*/RR +OLTegress -K•(OLTingress+OLTegress)
  +K•(OLTingress+OLTegress) +K•(ONUingress+ONUegress)
  +(downchannel+upchannel)•K

- **To yield the RTT form of Eq. 13-1**

  ToDx,i*/RR-ONUingress +K•(ONUingress+ONUegress) =
  ToDx,o*/RR +OLTegress -K•(OLTingress+OLTegress) + RTT •K

The right way

- If we define:
  - ToDx,i = ToDx,i*-[ONUingress - K•(ONUingress+ONUegress)]*RR
  - ToDx,o = ToDx,o* +[OLTegress - K•(OLTingress+OLTegress)]*RR
- Then we can say
- ToDx,i = ToDx,o +RTT •K •RateRatio
  - This is what we want for equation 13-1
- The key definitions:
- ToDx,i is the time when the MPCP counter at clock slave i equals X minus the ONUlatencyfactor.