MPCP IN EPOC

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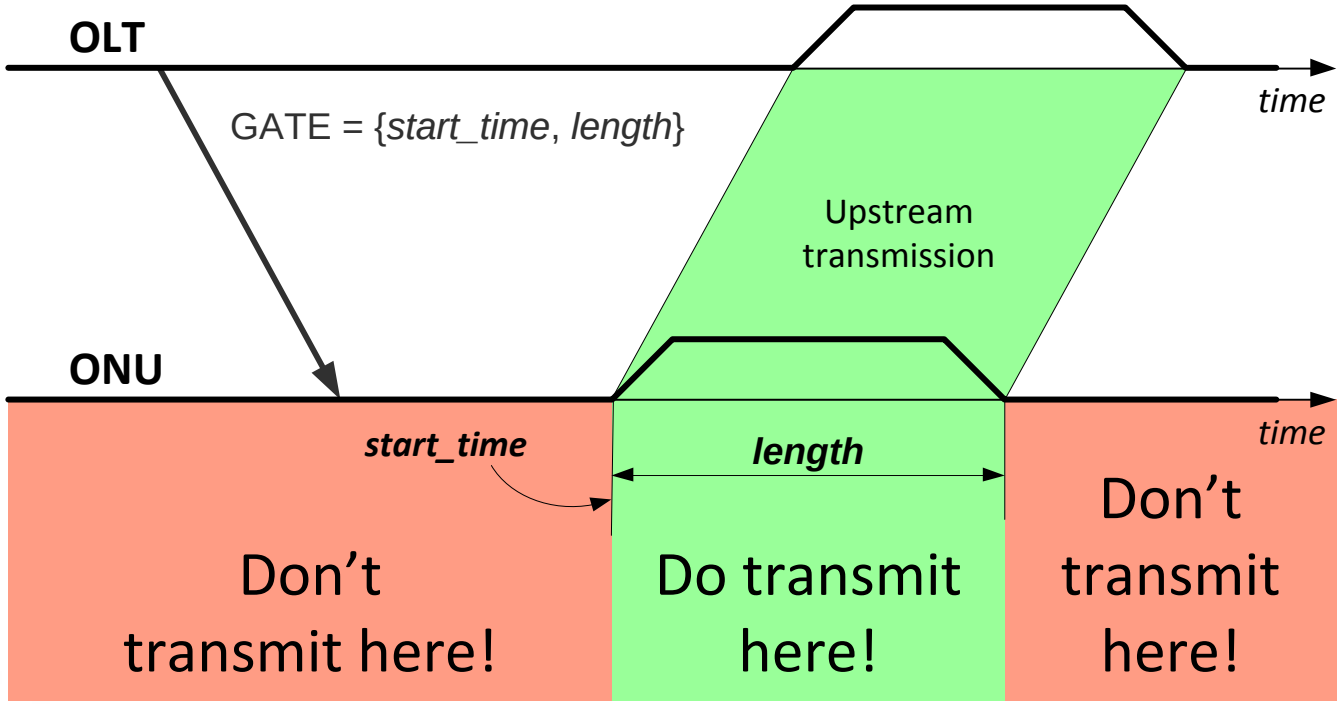
HOW TO MAP BITS TO TQ?

- **TQ is 16ns**
  - The bits per TQ will vary based on FEC and rate.
- **The 10G EPON MAC operates at 10Gbps**
  - REPORT frames
    - Report queue lengths are at 20Bytes per TQ
  - GATE frames
    - Enable transmission for Grant Length * TQ
    - The number of Bytes transmitted is based on the IDLE insertion rate
- **The Ethernet MAC uses IDLE insertion to adapt data rates**
  - 802.3 adjusts for MAC to PCS rate differences by increasing the inter-frame gap
  - EPON uses IDLE insertion to account for optical FEC overhead.
    - maintains MPCP timestamp alignment
  - EPoC should use this method to account for FEC overhead and data rate.
  - EPoC PCS removes the IDLEs to meet the PMD data rate.

SEMANTICS OF EXISTING GATE

- GATE tells the ONU for how long it can “occupy” the PON.
- ONU may decide how efficient or inefficient it wants to be within the allocated grant time.
- But ONU can never step outside the grant boundaries, because this will cause collision with other ONUs and impact services of other users.
- Collision-less transmission is arbitrated without OLT’s knowledge of ONU’s data rate, overhead, etc.

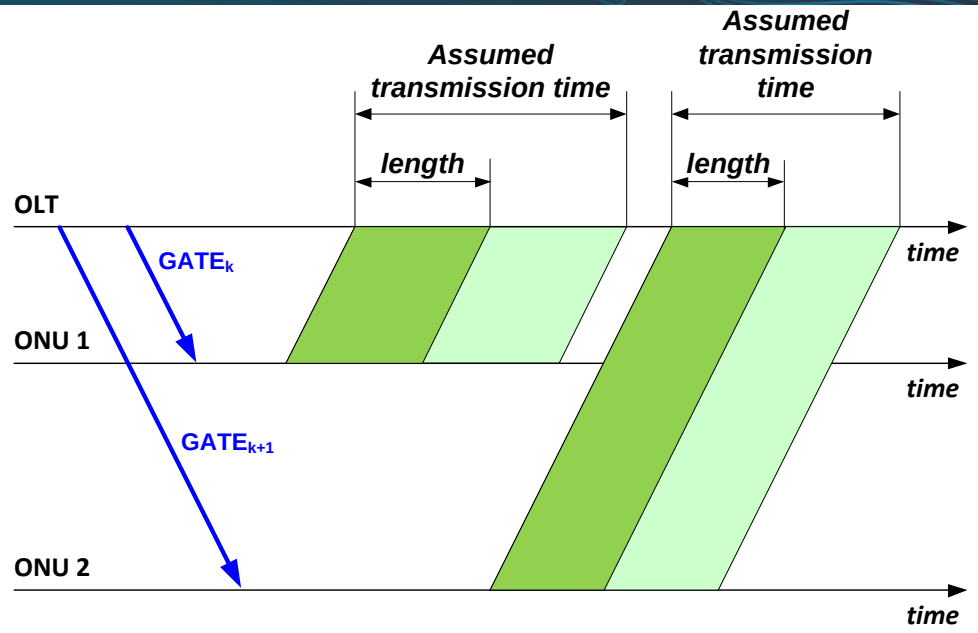


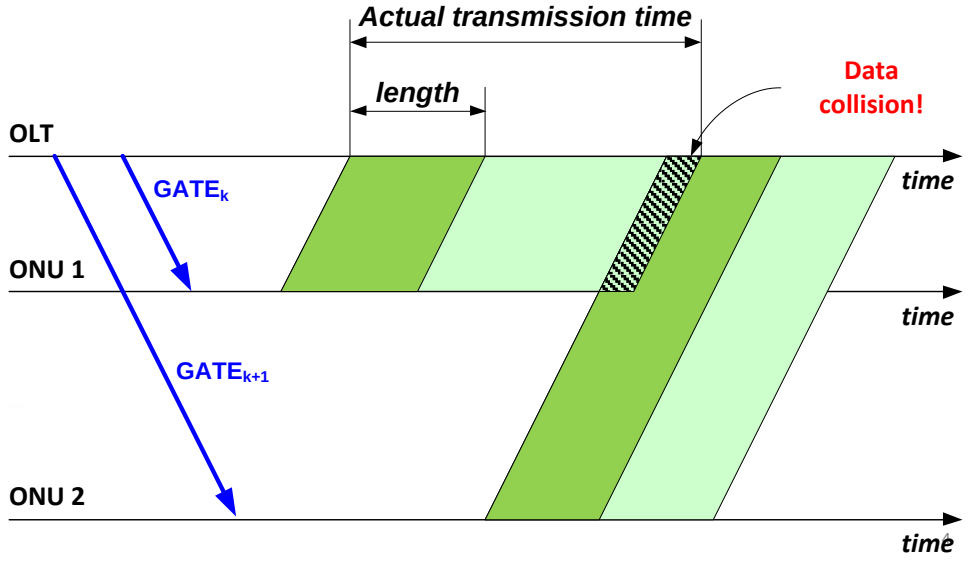
NEW GATE DEFINITION

- If the GATE length parameter represents the net amount of data to be transmitted, then the OLT should have the exact knowledge of ONU's data rate (or transmission overhead).

- If the data rate or the overhead can change dynamically, or if OLT's knowledge becomes miss-synchronized with the actual ONU state, data collisions may happen.

The Grant Length must represent the MPCP time duration of the Grant.





GRANT LENGTHS

- **The CLT should be responsible for adding in FEC overhead**
  - Same method as 10G EPON standard
  - Grant lengths are not required to equal reported queue length
  - The CLT can modify the Grant Length to adjust for FEC, rate, and overhead
  - DBA translates the Report Length to Grant Length
    - The DBA function is out of scope of IEEE 802.3
    - An optimized DBA can utilize the ONU IDLE insertion function to convert the Queue Length to an equivalent Grant Length

- **The CNUs MAC will enable transmission for the period of time in the Grant Length**
  - The MAC will insert IDLEs on each frame
  - This follows the same structure already defined in the EPON MAC
    - The IDLE insertion function will need to be updated with an EPoC FEC/Rate/Overhead formula

GRANT START TIME

- The CLT may assign the Grant Start Time to any MPCP value
  - The CNU data detector must align TX enable to Resource Blocks
    - The first RB will be filled with IDLE until the first packet.
    - The last RB will be filled with IDLE after the end of last packet.
    - The number of RBs used for a given grant length may vary based on the bit loading
  - Grant Start Times are not aligned to RBs
    - The MAC and MAC Control layers are not aware of PMA alignment.

MPCP JITTER

- **EPON defines**
  - Downstream jitter is 8TQ
  - Upstream jitter is 12TQ
- **The start of the MAC DA is the timing reference point**
  - The MPCP is generated at the MAC Control (above FEC)
  - The PMA must de-jitter overhead due to FEC Parity
- **MPCP tracks byte times across the PMA**
  - MPCP time will vary across different bit loadings (not track ‘wall’ time)
  - Each byte within an RB maps to an MPCP time (from MAC post Idle deletion).
  - The PMA will insert idles to realign MPCP to ‘wall’ time at the receiver.
  - Mean bit rate can be used in the Idle Insertion function simplifying the calculation.

PROPOSED MOTION

- **Move that EPoC shall follow the same MPCP method as 10G EPON(IEEE 802.3av).**
  - Gate messages shall set the length of the grant with a grant length of 16ns/TQ.
  - The Grant Length shall be inclusive of grant overhead.
  - Report messages use 20B/TQ for queue lengths and not include overhead.
  - The IDLE insertion formula shall be modified to include the EPoC PMA overheads.

- **Moved by:**
- **Seconded by:**