GATE/REPORT Behavior

Duane Remein, Huawei
Glen Kramer, Broadcom

Goal

- Allow deterministic reporting of LLID queue state for a large number of LLIDs while minimizing bandwidth consumed by the REPORT MPCPDUs.

- Homework from New Orleans

New GATE MPCPDU Format

- Sent to PLID
- Contains up to 7 LLID Grants
- May be sent on any of the downstream channels listened to by the ONU
- Channel assignment is a bitmap for 4 upstream channels
  - In case of a GATE for multiple channels, Grant Length is per each channel, not the total.
- **Force Report (FR)** flag requires ONU to generate a queue report for the given LLID
- **Fragmentation (F)** flag informs ONU whether it is allowed to fragment a new frame from the given LLID.
- Grant length is in EQ (bytes).
  Maximum grant duration per LLID is
  - 10.7 ms @ 25 Gb/s
  - 26.8 ms @ 10 Gb/s

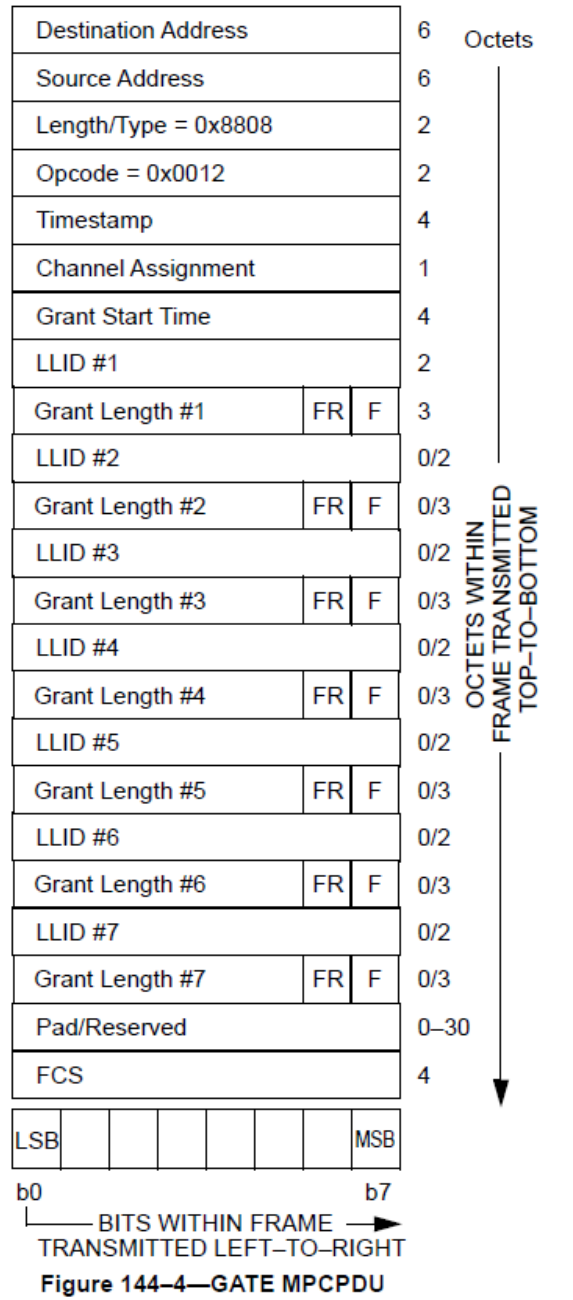


Figure 144–4—GATE MPCPDU

Granting and Reporting Administrative Traffic

- If PLID carries both MPCPDUs and OAMPDUs, OLT scheduler is unable to tell ONU how many REPORTs to generate.
- Proposal: During ONU registration, the REGISTER message shall assign two LLIDs to the registering ONU:
  - Physical Layer ID (PLID) to carry just MPCPDUs
  - Management Layer ID (MLID) to carry any other traffic that is sourced and sunk by the ONU (OAMPDUs, maybe 1588, other control protocols, such as NetConf)
- PLID assignment is as proposed in New Orleans motion #9 (Register MPCPDU), assignment of MLD is TBD.

New REPORT MPCPDU Format

- Sent to PLID
- Contains up to 7 LLID Reports
- Proposal #1:
  Replace Multi-Part Report field with Number of Non-empty Queues (LLIDs)
  - Multi-Part Report: number of additional REPORT2 MPCPDUs waiting in the ONU
  - Number of Non-empty Queues: the total number of LLIDs that have any queued frames (excluding GLIDs)
- PLID GrantLength explicitly indicates to the ONU how many REPORT MPCPDUs to generate. REPORTs will never be generated if they cannot be sent.

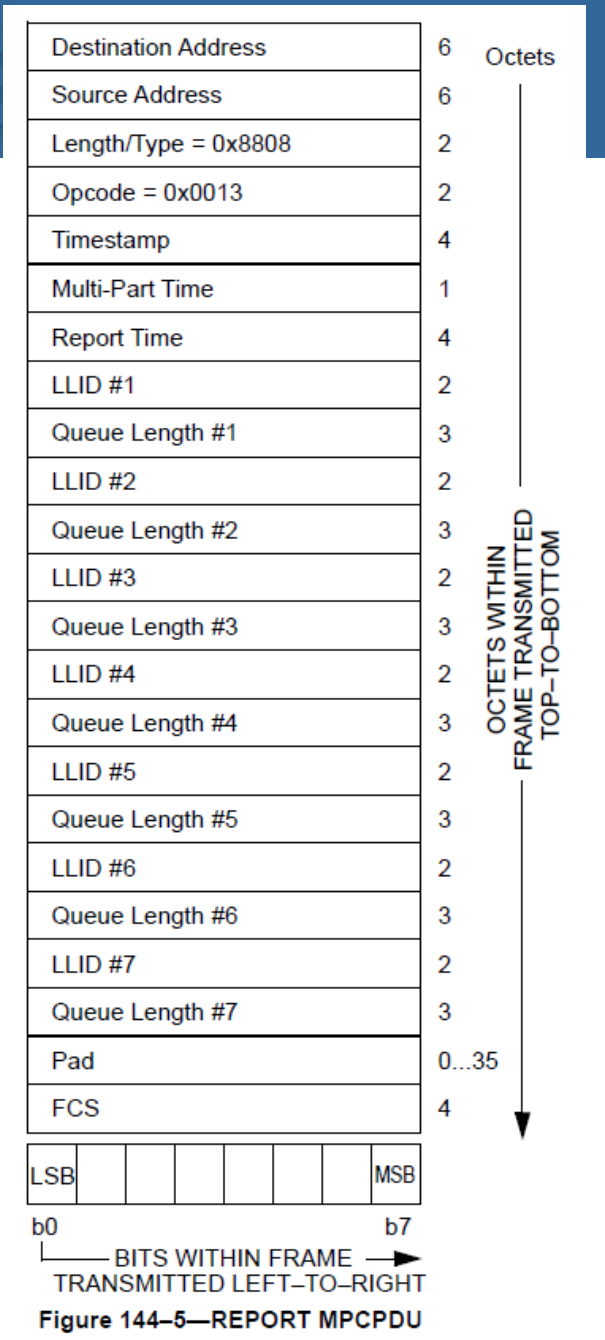


Figure 144–5—REPORT MPCPDU

Definitions

- **"LLID Report"** is a tuple consisting of two values: **$LLID_{16}$** and **$QueueLength_{24}$**
  - LLID can be either MLID, ULID, or a GLID
  - QueueLength is length of this LLID's queue in units of EQs
  - If LLID = MLID, the QueueLength represents the length of the eOAM queue (OAMPDUs).
  - If LLID = GLID, the QueueLength represents the sum of lengths of all MLID/ULID queues that are members of this GLID
  - PLIDs are never reported, because PLID queue is always zero and REPORT MPCPDUs are generated just-in-time for transmission

- **"Mandatory LLID Report"** – a report that was explicitly requested by the OLT via setting of the FR flag to 1 in a previous LLID grant.

- **"Gratuitous LLID Report"** – a report sent by the ONU without an explicit request by the OLT.

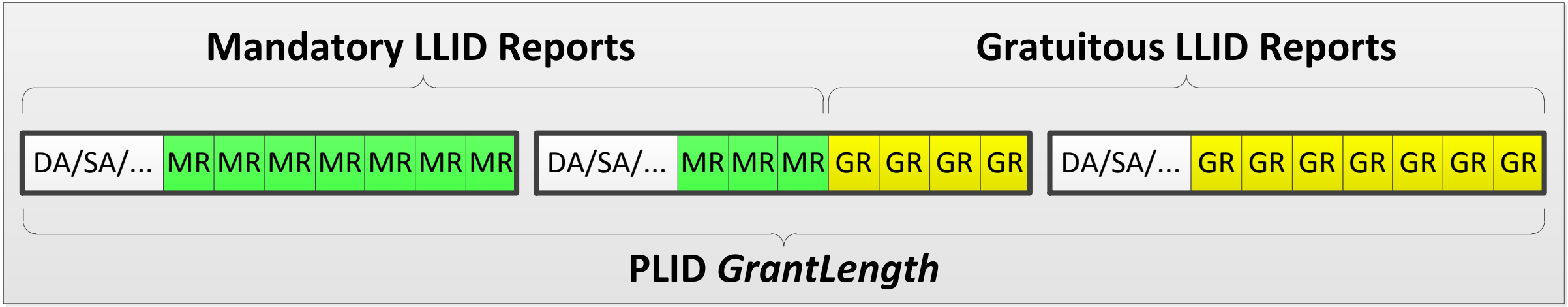
ONU FR Rules

1. In case of multi-channel GATE, if $FR_{LLID\_A}=1$, only one LLID Report is generated for LLID A per ONU transmission, not a separate report per each channel
2. Mandatory LLID reports have priority over Gratuitous reports
3. The number of REPORTs sent by the ONU is determined by the PLID ***GrantLength.***
   a. If the ONU has generated more REPORT MPCPDUs than can fit in PLID *GrantLength*, the "unsent" REPORTs are discarded (i.e., FR flags do not carry over to future grants).
   b. Typically an OLT grants sufficiently long PLID grants for the number of FR flags that are set to 1.

Gratuitous Reports

- The OLT may grant to an ONU more space for LLID Reports than the number of FR=1 flags set for the current grant.
  - REPORT MPCPDU carries 7 LLID Reports, so after the last mandatory LLID Report, there may be 1 to 6 extra slots in the same REPORT MPCPDU
  - OLT may even grant extra space for additional full REPORT MPCPDUs

- After generating the mandatory LLID Reports, the ONU shall fill the remaining LLID Report slots with Gratuitous LLID Reports



LLID Reporting Priority

- The ONU shall fill the available LLID Report slots in the following priority order:

Priority	ForceReport flag	Last reported QueueLength	Changes since last report	
1	1	n/a	n/a	
2	0	0	New data arrived	
3	0	> 0	Queue became empty	
4	0	> 0	New data arrived	
5	0	> 0	No new data arrived	
6	0	0	No new data arrived	optional

Polling of an ONU

- **Goal:** reduce polling overhead to a minimum
  - An idle ONU (ONU without any user traffic) should generate one REPORT MPCPDU, regardless of how many LLIDs are provisioned
- Polling GATE contains only a single grant for PLID:
  - Length = 10EQs (80 bytes) for one REPORT MPCPDU
  - FR = n/a (ignored by ONU)
  - F = 0
- The polled ONU will generate one **REPORT MPCPDU**
- According to Gratuitous Reporting rules (see slides 8,9), this REPORT will be filled with **Gratuitous LLID Reports**
  - It is extremely rare for more than 7 LLIDs to become non-idle in the same polling interval (2-4 ms?).
  - But if that happens, the **Number of Non-empty Queues** field in REPORT MPCPDU will show the total number of non-idle LLIDs

OLT FR Rules

- Probably will not be mentioned in 802.3ca
- OLT does not need to request a report for busy LLIDs in every grant
  - Example:
    - ONU reported {LLID A, QueueLength = 100,000 EQs}
    - OLT DBA grants LLID A no more than 2000 EQs in one grant
    - OLT can issue ~48-49 grants to LLID A with FR=0, before it needs to issue a grant with FR=1.
    - Often, while serving LLID A with FR=0, a Gratuitous Report for this LLID will be generated according to the Gratuitous Reporting rules (slide #7, #8), so the OLT won't need to issue FR=1 to LLID A for an even longer time.

Thank You

Motion

Adopt the behavior described for the flags, Fragment and Forced Report, and the fragment definitions given in remein_3ca_1_0717.pdf slides 4-9.

Moved: Duane Remein

Second:

For: _____

Against: _____

Abstain: _____

Motion Technical (≥ 75%)

Motion Passed/Failed