

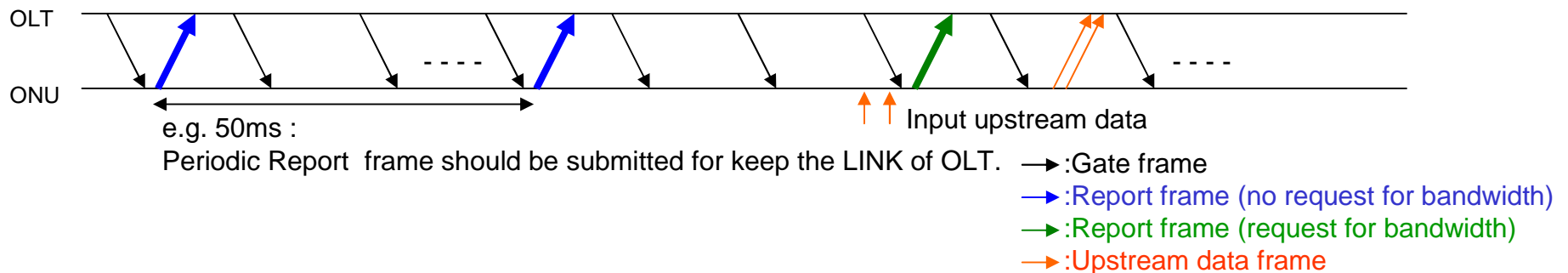
Consideration for Power-Saving functionality

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I introduced that a concept of functional changes which contributes for emerging telecom Power Saving issues at Orland meeting (3av_0803_kuroda_1.pdf). In this presentation, proposals of sequence for REPORT frame transmission are going to be introduced.

<Concept of Power Saving : Reduction of the number of Report frame transmission>

- If the upstream data does not exist at ONU, only minimum number of Periodic Report frame should be submitted for keep the LINK of OLT.
- If the upstream data exist at ONU, Report frames are submitted normally.



The sequence example #1 of GATE/REPORT in Clause 93



< Outline of operation >

> OLT

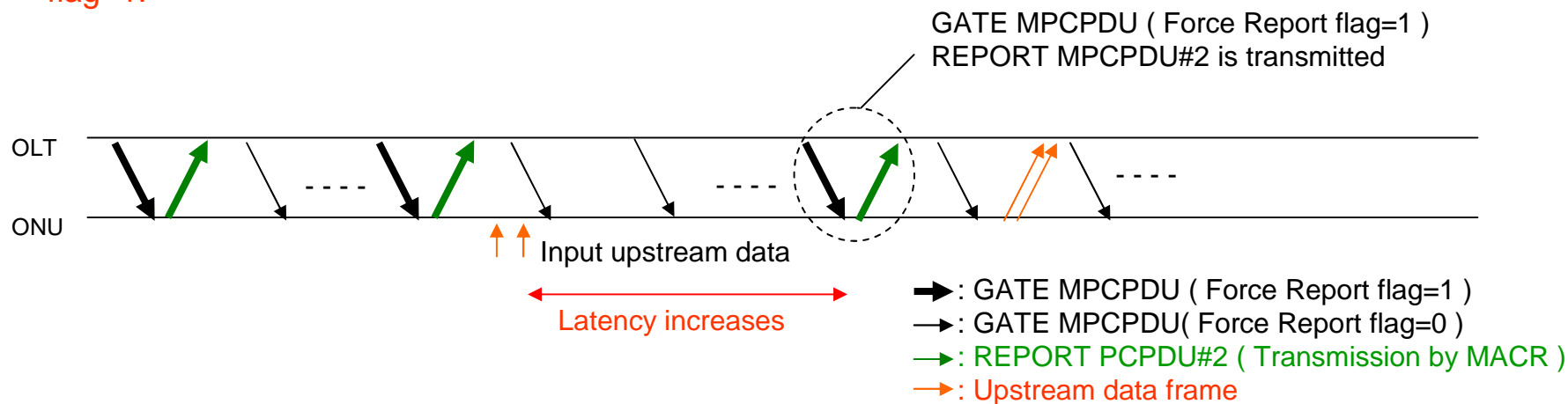
- GRANT is regularly provided by GATE MPCPDU.
- GATE MPCPDU which has Force Report flag=1 appears with some interval.

> ONU

- ONU sends REPORT MPCPDU whenever it receives the GATE MPCPDU which has Force Report flag=1.
- Although ONU doesn't have the upstream traffic, it sends REPORT MPCPDU.
- ONU doesn't send any REPORT MPCPDU when the GATE MPCPDU has Force Report flag=0.

< Features >

- Output power is saved because ONU doesn't send any REPORT MPCPDU when the GATE MPCPDU has Force Report flag=0.
- The upstream latency increases because ONU waits for the GATE MPCPDU which has Force Report flag=1.



The sequence example #2 of GATE/REPORT in Clause 93



< Outline of operation >

> OLT

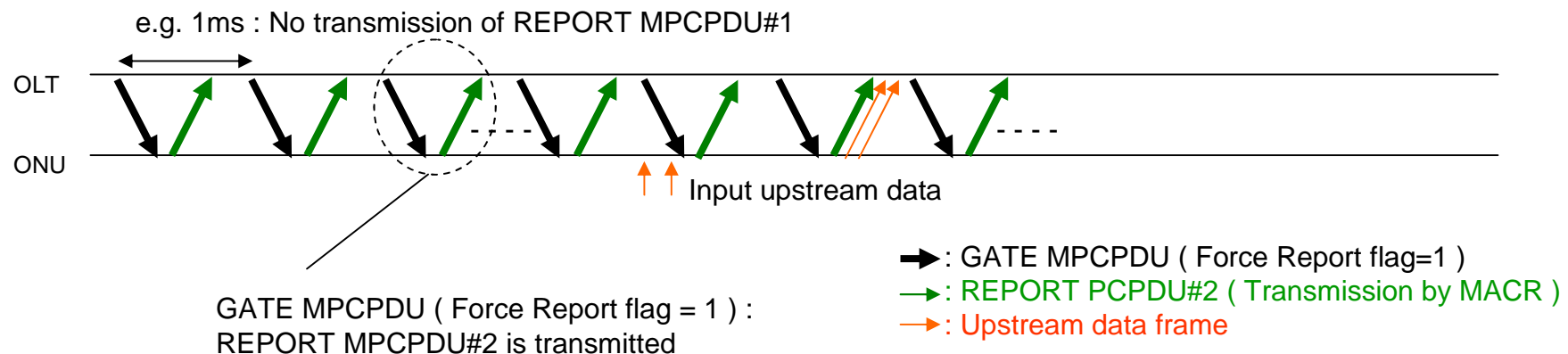
- GRANT is regularly provided by GATE MPCPDU.
- Set every GATE MPCPDU which has Force Report flag =1.

> ONU

- Although ONU doesn't have the upstream traffic, it sends REPORT MPCPDU.
- ONU sends REPORT MPCPDU whenever it receives the GATE MPCPDU.

< Features >

- The upstream latency is smaller than example #1 because ONU sends REPORT MPCPDU instantly.
- The power is larger than example #1 because ONU sends REPORT MPCPDU in response to every GATE MPCPDU.



The sequence proposal #1 of GATE/REPORT for Power Saving

< Outline of operation >

> OLT

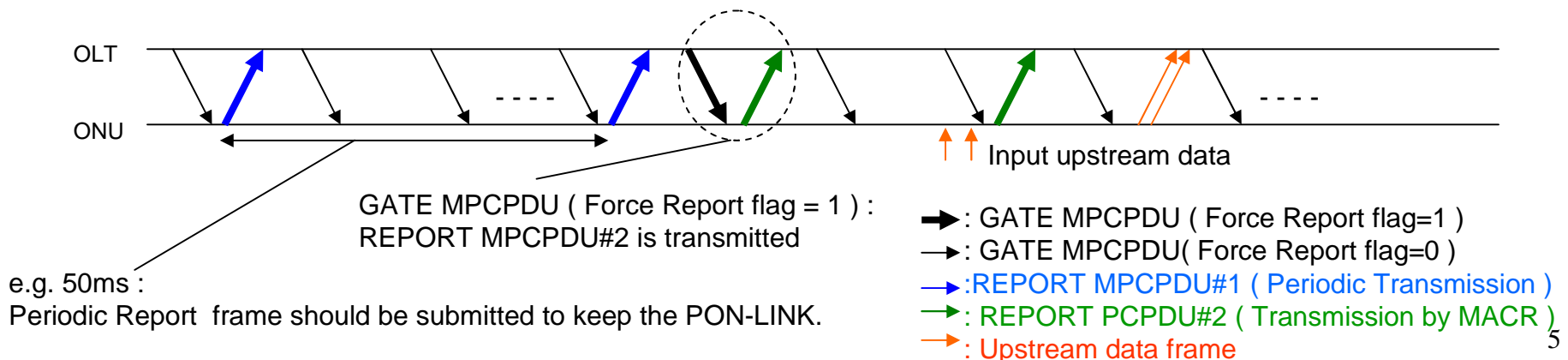
- GRANT is regularly provided by GATE MPCPDU.
- Usually, set GATE MPCPDU which has Force Report flag =0.
- It is allowed that OLT sends GATE MPCPDU which has Force Report flag=1.

> ONU

- ONU responds to the GATE MPCPDU that has Force Report flag=0. REPORT MPCPDU contains;
 - (a) A REPORT MPCPDU #1 (Periodic Transmission) with maximum interval if ONU requires no upstream traffic.
 - (b) A REPORT MPCPDU #2 (Transmission by MACR) if ONU requires upstream traffic.
- ONU sends REPORT MPCPDU #2 (Transmission by MACR) whenever it receives the GATE MPCPDU which has Force Report flag=1.

< Features >

- Output power is saved because ONU sends minimum number of REPORT MPCPDU.
- The upstream latency is smaller because ONU sends REPORT MPCPDU instantly.
- ONU sends REPORT MPCPDU whenever it receives the GATE MPCPDU which has Force Report flag=1



The sequence proposal #2 of GATE/REPORT for Power Saving

< Outline of operation >

> OLT

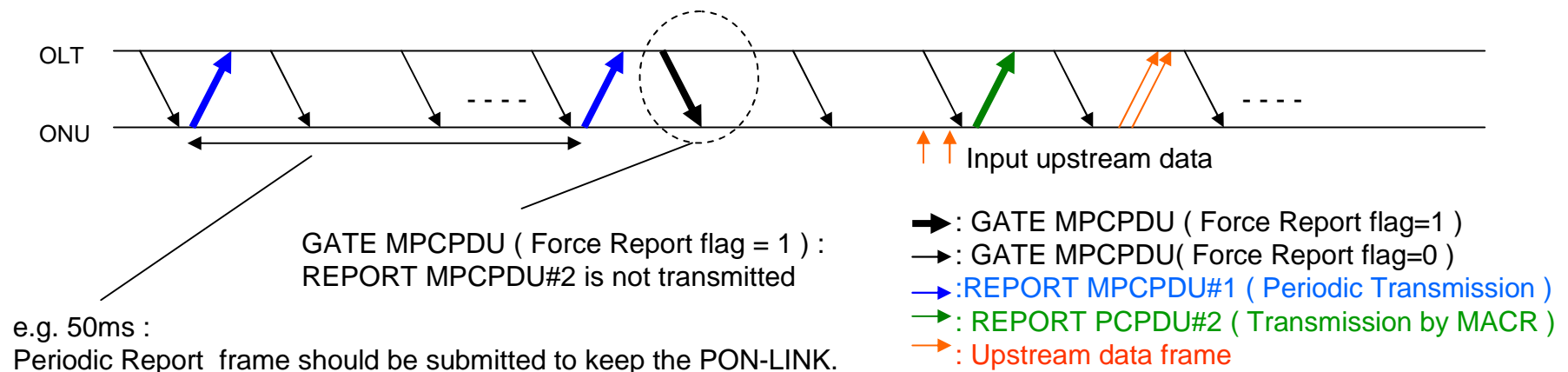
- GRANT is regularly provided by GATE MPCPDU.

> ONU

- ONU responds to the GATE MPCPDU that has Force Report flag=0 and 1. REPORT MPCPDU contains;
 - A REPORT MPCPDU #1 (Periodic Transmission) with maximum interval if ONU requires no upstream traffic.
 - A REPORT MPCPDU #2 (Transmission by MACR) if ONU requires upstream traffic.

< Features >

- Output power is saved because ONU sends minimum number of REPORT MPCPDU.
- The upstream latency is smaller than example #1 because ONU sends REPORT MPCPDU instantly.
- In case of ONU doesn't meet with condition of (a) and (b), it doesn't send REPORT MPCPDU even if Force Report flag=1



Pros & Cons (Example #1, #2, Proposal #1, #2)

	Example #1	Example #2	Proposal #1	Proposal #2
Power Saving	Output power is saved because ONU doesn't send any REPORT MPCPDU when the GATE MPCPDU has Force Report flag=0.	The power is larger than example #1 because ONU sends REPORT MPCPDU in response to every GATE MPCPDU.	Output power is saved because ONU sends minimum number of REPORT MPCPDU.	Output power is saved because ONU sends minimum number of REPORT MPCPDU.
Latency	The upstream latency increases because ONU waits for the GATE MPCPDU which has Force Report flag=1.	The upstream latency is smaller than example #1 because ONU sends REPORT MPCPDU instantly.	The upstream latency is smaller than example #1 because ONU sends REPORT MPCPDU instantly.	The upstream latency is smaller than example #1 because ONU sends REPORT MPCPDU instantly.

Pros
Cons

study of the current specification



As for the sequence of GATE and REPORT processing, current MPCP specification allows implementation of not only proposal#1 and #2, but also example#1 and #2 or others **since it does not specify behavior of MACR from MAC control client and given GRANT depend upon DBA mechanism which are both out of scope of IEEE802.3.**

	OLT				ONU		
	MACR	gate_periodic_timer	Force Report flag	Grant	MACR	report_periodic_timer	Reception of Force Report flag=1
Current Clause 93	None	less than 50 ms	None (It is decided by operating MACR.)	None (It is decided by operating MACR.)	None	less than 50 ms	A REPORT frame should be issued.
Example #1	None	less than 50 ms	Force Report flag=1 appears with some interval.	GRANT is regularly provided by GATE MPCPDU.	(* 1)	less than 50 ms	A REPORT frame should be issued.
Example #2	None	less than 50 ms	Force Report flag = 1	the same as above	None	less than 50 ms	A REPORT frame should be issued.
Proposal #1 (for Power Saving)	None	less than 50 ms	Force Report flag = 0	the same as above	(* 2)	50 ms	A REPORT frame should be issued.
Proposal #2 (for Power Saving)	None	less than 50 ms	None (It is decided by operating MACR.)	the same as above	(* 2)	50 ms	None (Standard violation)

(* 1) When Force Report flag=0, ONU doesn't send REPORT.

(* 2) (a) A REPORT MPCPDU #1 (Periodic Transmission) with maximum interval if ONU requires no upstream traffic.

(b) A REPORT MPCPDU #2 (Transmission by MACR) if ONU requires upstream traffic.

Conclusions

1. Reduction of the number of REPORT frame transmission

As conclusion of my study, in order to achieve the reduction of the number of REPORT frame surely, current CL93 may have to be modified in order to restrict improper implementation such as example#1 and 2.

However, on the other hand, it seems that concept of MPCP specification is more like framework and open for various venders to implement their policies of DBA mechanism. Therefore, it is not exactly good idea to restrict any kind of Implementation.

2. Proposal

From the reason above, I propose that some text which contain the attention for DBA implementer to reduce the number of REPORT frame transmission as much as possible for Power Saving requirement as informative message if this is allowed in IEEE rule.