At the FD t_5, the ONU reports its request using the DBRu field, which is represented by the symbol R in the Fig. 3. The request R is the total packet length of a queue of the ONU. The OLT collets the requests of ONUs during the FD t_6, then the requests are used at the FD t_7 to update the requests of T-CONT types 2, 3 and 4.

We explain the request update mechanism for the T-CONT type 2. Because of the pipelined scheme, at the end the FD t_1, the T2 stage generates the grant result $G2(t_1)$ which may contain the grant for the ONU. Suppose the request R is the request of a queue of T-CONT type 2 in the ONU. When the ONU sends the request R, the grant result $G2(t_1)$ has not been delivered to the ONU. It means that the grant result $G2(t_1)$ is not reflected in the request R. Similarly, $G2(t_2)$,…, $G2(t_6)$ are not reflected in the request R. Since the ONU sends the DBRu field before it transmits its packets [1], the grant result $G2(t_0)$ is not reflected in the request R. Therefore, to get the correct request of the queue of the T-CONT type 2, the OLT needs to remember the most recent seven grants and then subtract them from the request R at the beginning of T2 stage. That is, the correct request is calculated by

$$r_2 = R - \sum_{i=0}^{6} G2(t_i) \tag{1}$$

where the variable r_2 is the true request for a queue of the T-CONT type 2. In a similar way to the request update of the T-CONT type 2, we can compute the true requests for the T-CONT types 3 and 4.

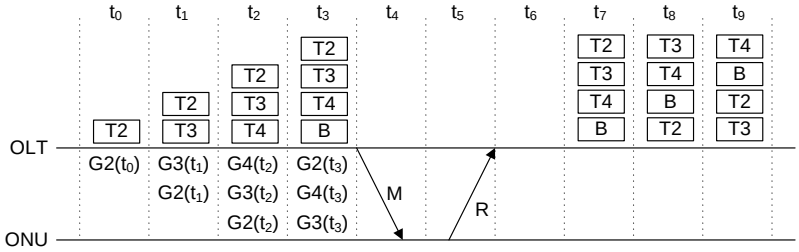

Fig. 3. Request update mechanism of PDF

References

1. ITU-T Rec. G.987.3 Rev.2, 10-Gigabit-capable passive optical networks (XG-PON): Transmission convergence (TC) specifications, (2010)
2. Dixit A., Lannoo B., Colle D., Pickavert M., Demeester P.: Novel DBA algorithm for Energy Efficiency in TWDM-PONs, 39th European Conference and Exhibition on Optical Communication (ECOC), pp. 1--3, (2013)
3. Dixit A., Lannoo B., Colle D., Pickavert M., Demeester P.: ONU Power Saving Modes in Next Generation Optical Access Networks: Progress, Efficiency and Challenges, Optics Express, vol. 20, no. 16, pp. B52--B63, (2012)
4. Bellaouar A., Elmasry M.: Low Power Digital VLSI Design: Circuits and Systems, Kluwer Academic Publishers (1995)
5. Han M. S., Yoo H., Lee D. S.: Development of Efficient Dynamic Bandwidth Allocation algorithm for XGPON, ETRI Journal, vol. 3, no. 1, pp. 18--26, (2013)

