International Journal of Innovative
Computing, Information and Control
Volume 4, Number 9, September 2008

 ISSN 1349-4198
pp. 2171–2185

ADAPTIVE DBA: AN ALGORITHM FOR EPON BASED ON ALL ONU REPORT MESSAGES

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Received September 2007; revised February 2008

Abstract. *To prevent data collision and ensure efficient transmission, an EPON must employ a media access control (MAC) protocol to allocate the shared resource of a common upstream transmission medium. Although most researches adopted a polling algorithm to achieve good bandwidth utilization in each transmission cycle, they could not make use of the idle period between cycles more effectively and reduce the redundant overhead of REPORT messages under heavy traffic load. Therefore, an adaptive DBA algorithm based on the statuses of all ONU REPORT messages to effectively eliminate the idle time is proposed. It is able to fully utilize the idle time between cycles as long as at least one ONU requests a long enough transmission window; or compensate for the idle time by transmitting all REPORT messages before data when no ONU request long enough. Besides, the proposed algorithm also includes a queue management scheme, which improves the efficiency further by decreasing the number of REPORT messages when the ONU queues are long. Event-driven simulations show that adaptive DBA can significantly improve network performance in terms of packet delay, average queue length and throughput, as compared with the well-known IPACT and DBA2 algorithms.*
Keywords: DBA, EPON, Polling, Idle time

1. **Introduction.** Over the past decade, Internet applications such as electronic commerce, storage area networks (SANs), voice-over Internet protocol (VoIP), and multimedia file sharing [1] have led to an enormous increase in bandwidth requirements. This tremendous growth of Internet traffic has aggravated the lag of access networks. The "last mile" between local area networks (LANs) and metropolitan area networks (MANs) remains the main bottleneck. The most widely deployed broadband solutions today are digital subscriber line (DSL) and cable modem (CM) networks. These networks, however, do not provide enough bandwidth to support the growing demand. An effective solution must not only provide more bandwidth to end users, but also meet the low cost requirements of access networks.

Passive optical networks (PONs) have received some attention from both industry and academia as a possible cost-effective solution. A great deal of effort has gone into developing and standardizing various PON technologies. Asynchronous transfer mode (ATM) PON and Gigabit PON [2], for example, have been standardized by the International Telecommunication Union (ITU-T). ATM, however, has a significant shortcoming: a dropped or corrupted cell will invalidate the entire IP datagram. When this happens, any remaining cells carrying portions of the invalid datagram will continue to propagate, consuming network resources unnecessarily. Furthermore, ATM imposes a cell tax on variable-length IP packets [3].