Dynamic Bandwidth Allocation for Ethernet PON with FTTH traffic pattern

E-mail: 9501289@mail.dyu.edu.tw

ABSTRACT

Recently, there has been a dramatic evolution of the network technology. A technology that has been considered to improve the performance of local loop is the Ethernet passive optical network (EPON). EPON is considered an attractive solution because it provides the high bandwidth associated with optic fiber. It also has no active components between the customer premises and the exchange that significantly reduces the cost. In the downstream direction, an EPON is a point-to-multipoint network in which the OLT broadcasts data to each ONU. In the upstream direction, an EPON is a multipoint-to-point network in which multiple ONUs transmit data to the OLT, these ONUs share the common upstream channel. Hence, it uses multiple access method to avoid collision. Polling based algorithm is a common used multiple access method. However, a drawback of the polling based algorithm is that it causes unnecessary signaling traffic while an ONU is idle. This paper proposes a novel dynamic scheduling algorithm, which is termed CW+LBA (Contention Window and Limited Bandwidth Allocation), to solved that problem. The FTTH (Fiber to the Home) traffic simulated result shows that throughput and mean queuing delay is significantly outperform others.

Keywords: Interleaved Polling with Adaptive Cycle Time (IPACT); Time Division Multiple Access (TDMA); Multi-Point Control Protocol (MPCP)

Table of Contents

REFERENCES

[1] G. Kramer, B. Mukherjee, and G. Pesavento, "IPACT: A Dynamic Protocol for an Ethernet PON (EPON)," IEEE Commun. Mag., vol. 40, no. 2, pp. 74-80, February. 2003.

[2] G. Kramer, B. Mukherjee, and G.Pesavento, "Ethernet PON (ePON): Design and Analysis of an Optical Access Network," Phot. Net. Commun., vol. 3, no. 3, pp. 307–19, July 2001.

[3] Shami, Xiaofeng Bai, C. M. Assi, N. Ghani," Jitter performance in ethernet passive optical networks," Lightwave Technology j., vol. 23, pp. 1745–1753, April 2005.

[4] M. Assi, Y. Ye, S. Dixit, and M. A. Ali, "Dynamic bandwidth allocation for quality-of-service over Ethernet PONs," IEEE J. Select. Areas Commun., vol. 21, pp. 1467–1477, November 2003.

[5] M. Ma, Y. Zhu, and T. H. Cheng, "A bandwidth guaranteed polling MAC protocol for Ethernet passive optical networks," in Proc. IEEE

INFOCOM, vol. 1, pp. 2– 31, March 2003.

[6] Xue Chen, Meihong Yu, Yang Zhang, Yu Deng, " A novel upstream dynamic bandwidth assignment scheme for Ethernet PONs, " Communication Technology Proceedings, 2003. ICCT 2003. International Conference, vol. 1, pp. 748– 750, April 2003.

[7] Yuanqiu Luo, N. Ansari, " Bandwidth allocation for multiservice access on EPONs," IEEE Commun. Mag., pp. 16-21, February 2005.

[8] C.-J. Chae et al., " Optical CSMA/CD Media Access Scheme for Ethernet over Passive Optical Network," IEEE Phot. Tech. Lett., vol. 14, no. 5, pp. 11– 13, May 2002.

[9] Chuan Heng Foh, Lachlan Andrew, Elaine Wong, Moshe Zukerman, " FULL-RCMA a high utilization EPON" IEEE Journal on Selected Areas in Communications, vol. 22, no.8, pp. 1514 – 1524, October 2004.

[10] Gumaste, I. Chlamtac, " A protocol to implement Ethernet over PON, " ICC '03. IEEE International Conference. vol. 2, pp. 1345 – 1349, May 2003.

[11] H.-J. Byun, J.-M. Nho, and J.-T. Lim, " Dynamic bandwidth allocation algorithm in Ethernet passive optical networks," IEEE Electron. Lett., vol. 39, pp. 1001– 1002, June 2003.

[12] Tang Shan, Ji Yang, Cheng Sheng, " EPON upstream multiple access scheme," Info-tech and Info-net, 2001. Proceedings. ICII 2001 - Beijing. 2001 International Conferences, vol. 2, pp. 273– 278, November 2001.

[13] Onn Haran, " MPCP: Timing Model," PDF Presentation (2002, March).

[Online]. Available: http://www.ieee802.org/3/efm/ public/mar02/haran_1_0302.pdf [14] IEEE std. 802.3ah, " Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Amendment: Media Access Control Parameters, Physical Layers, and Management Parameters for Subscriber Access Networks" 2004.

[15] Jerry Banks, John S. Carson, II, Barry L. Nelson and David M. Nicol, " Discrete-Event System Simulation 3rd Edition," Pretice Hall, 2001.