Adaptive Cyclic Transmission Operation for Energy-efficient NG-EPON

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***Abstract*— To address the growing demand of high-speed and low-latency communications in access network segments, IEEE 802.3ca task force developed Next Generation Ethernet Passive Optical Network (NG-EPON). In this network, an Optical Line Terminal (OLT) and an Optical Network Unit (ONU) can have multiple transceivers which allow them to communicate through multiple channels simultaneously (channel bonding) to achieve aggregated high transmission rate. Due to the use of a large number of transceivers in this network, the energy consumption should be supposedly high. In this paper, we propose an Adaptive Cyclic Transmission Operation (ACTO) scheme for NG-EPON with the objective of reducing energy consumption using sleep mode without compromising performance requirements. In particular, ACTO sets transmission cycle duration of each channel taking into consideration the traffic delay performance requirements. It also presents mechanisms how energy consumption for the idle channel(s) can be minimized and how signaling associated energy consumption in OLT/ONU transceivers can be saved. Performance evaluated based on simulation shows that the proposed solution conserves 15\% of energy in ONUs even during high traffic load conditions. Furthermore, the OLT side energy consumption is also reduced by approximately 13.5\% in ACTO compared to a conventional solution.**

***Keyword*— NG-EPON, IEEE 802.3ca, sleep mode, channel bonding, cyclic transmission.**

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