

OCDMA-WDM-PON — SOLUTION PATH TO NEXT GENERATION OPTICAL ACCESS NETWORK

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Abstract. A novel scheme of high capacity and large branches optical access using hybrid Wavelength Division Multiplex (WDM) and Optical Code Division Multiplexing Access (OCDMA) is investigated to support large numbers of subscribers. The scheme combines the advantages of both WDM and OCDMA, avoids the limitation of available wavelengths and addresses codes to access capacity, supports more subscribers by providing multiple users with the same code at different wavelength channels. System performance is theoretically analyzed and simulated. In this paper, we introduce chaotic spread spectrum sequence to OCDMA. The simulation results demonstrate that the proposed scheme performs well.

Keywords. Wavelength Division Multiplexing (WDM), Passive Optical Network (PON), Optical Code Division Multiplexing Access (OCDMA), Optical access, Chaotic spread spectrum sequence

1 Introduction

Recently, there has been a renewed interest in Optical Code Division Multiplexing Access (OCDMA) [1]. Networks based on OCDMA are widely reported [2]-[3]. However, much of research done in this area has focused on code design [4]-[6] and system performance [7]-[9]. OCDMA as an asynchronous multiple-access method deserves for Passive Optical Network (PON) is rarely investigated.

PON has been a promising approach for future gigabit optical access networks as it can break through the bottleneck of the last mile. Time Division Multiplex (TDM) PONs, such as Ethernet PON (EPON) and Gigabit PON (GPON), are the main techniques for PONs and have reached practical success. But the inherent disadvantages of TDM mechanism prevent the bandwidth of per user and the total number of users.

The introduction of Wavelength Division Multiplex (WDM) is an advanced step of PON systems. WDM-PON offers high transport capacity, high per-subscriber bandwidth, protocol transparency, line rate independent, high security and upgradeable. High transport capacity is obtained by implementing multiple wavelength channels, each of which can be assigned for certain services or for certain customers. However, it is difficult to realize high split due to the limitation of available wavelengths.