Hybrid WDM/TDM PON for next generation access technologies- Promises,

Challenges and Future Trends

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Abstract

Passive optical networks (PONs) are an attractive access network solution thanks to their low operational expenditures (OPEX) and huge bandwidth. Today, TDM PONs are widely deployed, but these single channel systems are unable to provide sufficient bandwidth for emerging services like high-definition video or interactive gaming. The introduction of a WDM dimension on top of a TDM PON is the natural evolution to increase its capacity.

In this talk we describe different hybrid WDM/TDM PON architectures and will compare them from a functional and techno-economic perspective (based on capital expenditures, CAPEX). Our aim is to provide a range of solutions with different levels of flexibility and a varying cost per customer, so that a service provider can choose among the solutions that suits best for its requirements. For our study, we consider a 10G PON technology and different ranges of flexibility, such as fully flexible dynamic bandwidth allocation (DBA) against partially flexible and even fixed wavelength allocation schemes. We also consider wavelength allocation with overall broadcast, selected multicast and unicast.

Hybrid WDM/TDM PON combines WDM and TDM technologies. The most common solution consists of several TDM PONs embedded in a WDM PON system. However the real advantage identified with respect to putting multiple TDM PONs in parallel is the possibility to manage the optical bandwidth in a flexible way. For example, if the load on a specific wavelength is high, the demand for bandwidth on this wavelength can impose a critical load impacting all the services already connected. If there is a possibility to look for a new wavelength operating at a low load, then this new wavelength will be preferred to limit the interruption of services on the previous wavelength. In addition, CAPEX and OPEX are greatly reduced since only one network has to be installed and operated, instead of several TDM PONs. This last point is important when addressing long-distance PONs, where the installation and maintenance cost of the feeder fibre can make the difference.
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