

Experimental tests on WDM EPON access

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For future services very wide bandwidth accesses will be required and we believe that a scalable and efficient access architecture is the one based on a Passive Optical Networks (PON), where an OLT is connected by means of a fibre tree topology to different ONU's. At the moment GPON and EPON standards are available and allow each ONU to operate with high capacity (in downstream 1.25 Gb/s for EPON, 2.5 Gb/s for GPON). Such a huge capacity could be becomes a limitation in the presence of further bandwidth requirements from the users; in fact a user bandwidth of 100 Mb/s could be a future target in next few years, that means that only 10 users could be feeded by an EPON network (20 for GPON). Such bandwidth requirements could come from P2P communications, especially if based on very high information as in the case of High Definition TV.

Due to this reason we believe to upgrade the PON architecture with the WDM technology by using, for each ONU, a GbE wavelength for upstream and downstream. For upstream transmission the WDM transmission is also more interesting since it solves the problems of the packet collisions without using the TDM approach. This is the reason why in this contribution the experiments are made by taking into account only the WDM transmission from the ONUs to the OLT.

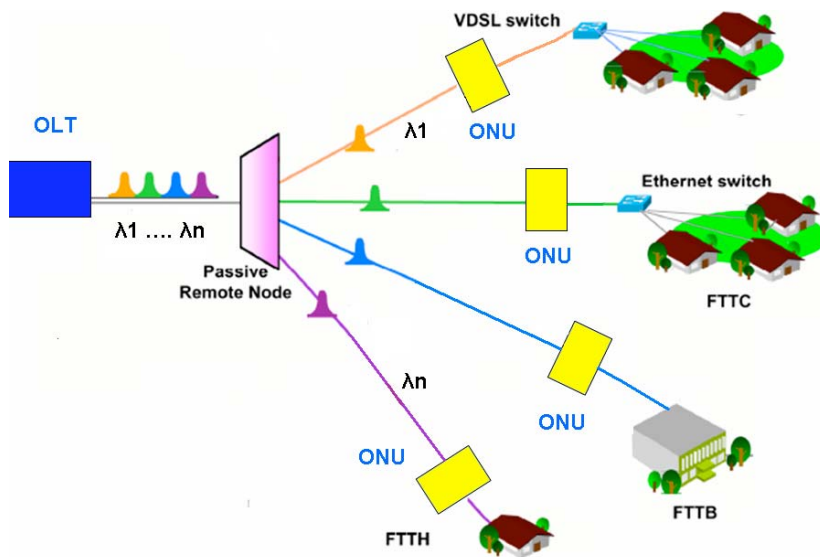


Fig. 1: WDM PON applications.

The WDM EPON has an other important aspect that consists in the fact the each ONU has GbE interfaces and as a consequence is open to all the Ethernet solutions to improve the QoS and in particular it is open to Carrier Ethernet services.

According to the current Italy access infrastructures we assume to locate the OLT in a buiding location (FTTB) and to reach the users either with VDSL systems or UTB cable (for new buildings).

We made some WDM EPON tests by using some elements of the ISCOM/FUB test bed [1] and in particular we used a M10 for OLT and two M10 for ONUs are reported in fig. 1, where the WDM transmission was used only for the upstream in a link 50 km long. The downstream transmission was obtained in different fibre 50 km long; however by using other optical filters downstream and upstream wavelengths can be transmitted in the same fibre.

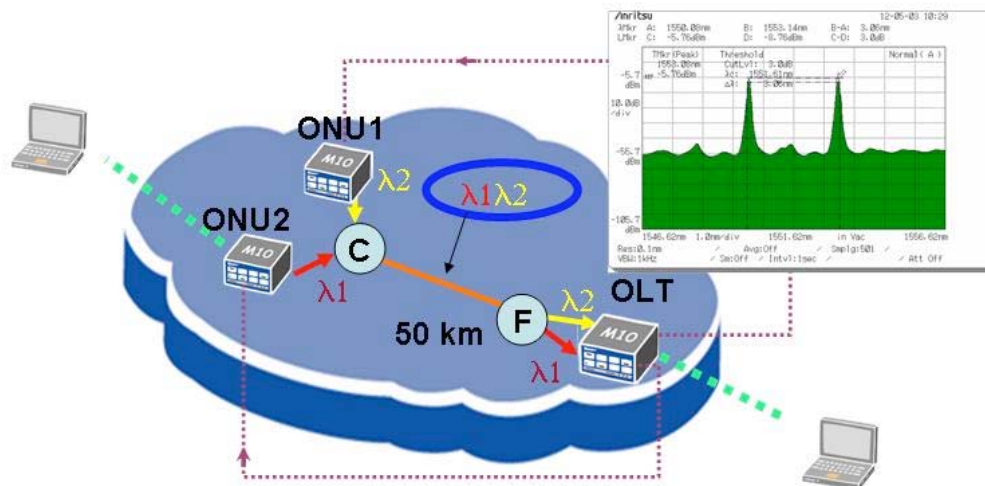


Fig. 2: WDM EPON based on the WDM transmission in the upstream direction.

Previous measurements tested the stability of the wavelengths and compatibility with the filters. In particular we measured an output power from the GbE interface between -3 and 2 dBm, an input power range for receiver between -23 and -3 dBm, a filter loss equal to 2.25 dB and a coupler loss equal to 3.05 dB.

Since we used a G.652 fibre, after 50 km no effect of Four Wave Mixing in fibre was observed (the input power was around 0 dBm for both the wavelengths); and by means of a Cerriot measurement device we verified that no degradation is induced in the ONU-OLT path by the

presence of the other wavelength.. This confirmed that each ONU has at disposal a full GbE capacity as shown by the figure 3.

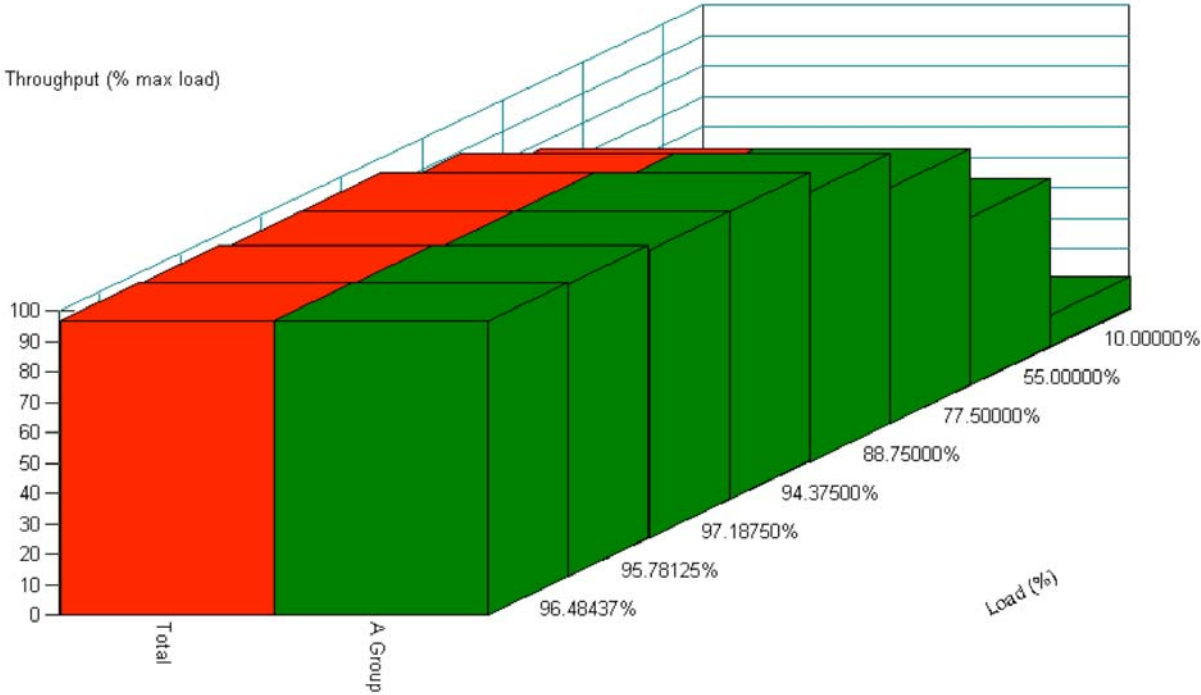


Fig. 3: Responce of the WDM GbE channel to the load obtained by means of Ethereal.

REFERENCE

[1] F. Matera, F. Matteotti, P. Pasquali, L. Rea, G. Tosi-Beleffi, A., V. Baroncini, G. Del Prete, G. Gaudino, "Quality of Service Measurements over an Optical GMPLS Wide Area Access Network", Fiber & Integrated Optics, Volume 25, Number 3 / May-June 2006, pp. 245 – 255