Developing a range of GPON products to be produced by the domestic industry allowing to provide complete solutions of this technology, in terms of active components, both in terms of passive components, to be inserted in the new generation of optical networks with the operator telecommunications.

**GENERAL MOTIVATION AND OBJECTIVES**

GPON-IN-A-BOX project aimed to assess the possibilities of using optical technology in multi-gigabit access networks. This project has developed and validated a laboratory prototype based on several alternative low-cost components. It was intended also to assess the cost and reliability of the technology used in order to enable development of a commercial application. This proposal observed the feasibility of developing an ‘extender box’ that extends the reach of GPON devices regenerating the signal of an active, yet without any electronic processing that may that would interfere with the evolution to new scenarios (eg Next Generation Networks).

**CHALLENGE**

Implement a ‘in-a-box’ GPON solution that is able to regenerate GPON signals, extend the reach, allows the migration from GPON to WDM-PON in an efficient and low cost approach.

**WORK DESCRIPTION AND ACHIEVEMENTS**

One of the core aims of this project was to develop a set of GPON products that can be produced by the national industry that enable the deployment of solutions (with active and passive components) for the next generation of optical networks. In order to achieve this, several tasks were carried out. We start first with the technical-economic studies with the identification of technical solutions which enable a migration with reduced impact to customers and are economically affordable for the operator. Then, we develop a technical-economic model for the operating costs of WDM-PON technology as well as a scenario of coexistence of both technologies (GPON and WDM-PON). The estimation of OPEX was extended with the development of models for the costs of installation and operation, as well as a techno-economic model for the costs of migration. Regarding the topic of energy consumption, that is nowadays paramount for optical networks deployment, we also estimated and compare both GPON and WDM-PON technologies.

As stated above, the major challenge of GPON-in-a-Box was the implementation of a ‘in-a-box’ GPON solution among other features, extend the reach, thus the extender box was one of the projects achievements. We recall that by using an extender the number of central offices and aggregation nodes will be decreased. The prototype was specified and built with the appearance of the picture in the cover and capable of extending up to 60 km reach using SOA and a 1.64 s and 25kW power consumption, which can be used for multichannel amplification co-existence with XG-PON1. Security issues were also approached. It was demonstrated that there might be a very serious threat in security of GPON network when various clients are sharing the same splitter with an attacker being verified that the attacker’s success highly depends on the photo-detector used in which the APD provided the preferable choice. Clients and industries have been demanding bandwidth that only Passive Optical Networks (PON) can achieve and a crucial feature for the evolution of Gigabit Passive Optical Networks (Gpon) is a higher capacity Wavelength Division Multiplexed-Passive Optical Networks (WDM-PON) as the reuse of existing infrastructure WDM allows coexistence between two or more PON generations over the same infrastructure by provisioning multiple channels on the PON allowing deployment of different migration technologies or capacity extensions transparently where devices of a generation are unaware of the coexistence with other generations. Furthermore, WDM-PON requires the replacement of the optical Power Splitter by an Arrayed Waveguide Grating (AWG) at the Remote Node (RN). WDM-PON architecture was specified considering the simplest approach: an AWG in the OLT to allow single-fiber working, a direct modulated laser or array of this laser for OLT transceivers, an APD or PIN receiver or array of these photo detector receivers for OLT receiver, a tunable laser for colorless ONU transceiver and tunable filter and receiver for ONU receiver.