Wavelength conversion and Routing Strategies in Opaque Optical Networks

Eugenio Iannone
Pirelli Cavi & Sistemi – Viale Sarca 20126 Milan, Italy
Tel. +39-02-64429890 – e-mail eugenio.iannone@pirelli.com

ABSTRACT

A general consensus exists among operators and system vendors that WDM is the suitable technology to satisfy the challenging requirements posed on the transport network. WDM transmission allows the fiber bandwidth to be more efficiently exploited. Moreover WDM technique can alleviate the complexity of high bit-rate Digital Cross-Connects and Add/Drop Multiplexers by the use of the corresponding optical nodes: Optical Cross-Connects and Optical Add/Drop Multiplexers. Before implementing WDM networks a strategy to effectively exploit the fiber plant and the available technology, should be worked out.

Technology and network management seems to be not completely mature to allow completely transparent, high capacity-long distance WDM networks to be deployed. Besides transmission problems, integration of multi-vendor equipment in the network is almost impossible in the absence of complete network standardization. On the other side, while a single vendor can provide metropolitan and small regional networks, this is not suitable for large networks on a national area.

These considerations suggest that an intermediate step is required on the way to the optical transparent network: the opaque network. In an opaque network, optical switching occurs in the network nodes but transmission problems and integration of multivendor equipment are alleviated by the use of electronic regeneration and wavelength adaptation at the boundaries of the switching nodes.

In this paper, the concept of opaque network is introduced in the case of meshed network and it is shown that the concepts of Wavelength Path and Virtual Wavelength Path routing strategies introduced in the case of transparent networks have to be

0-7803-4947-4/98/$10.00 ©1998 IEEE

revised for the opaque network. Particular attention will be devoted to the function of opto-electronic wavelength converters. In the opaque network they can be used only for wavelength adaptation among optical systems using different optical carriers to compose the WDM comb or also to alleviate routing problems. In this second case, different types of Partial Virtual Wavelength Path routing can be considered, depending on the internal connectivity degree of the optical switching fabric.

Some conclusions will be drawn at the end of the presentation on the connectivity degree that is needed to meet inside the optical switching fabric to effectively exploit the optical network.

Acknowledgment: The author wishes to tank Filippo Bentivoglio for his active participation to the work that originates this paper.