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Development of a Terabits/sec-Class Photonic MPLS Router that Dynamically Controls Photonic Networks
- Live Demonstration at Supercomm2001 -

Nippon Telegraph and Telephone Corporation (NTT) challenges to evolve the IP network architecture to be suitable for coming "Optical Era", and have become the first company to develop a Terabits/sec-class photonic MPLS router system that dynamically controls light-path routing and bandwidth. NTT Network Innovation Laboratories mainly developed the photonic MPLS router. NTT plans to provide a live demonstration of this photonic MPLS router at Supercomm2001 to be held at Atlanta, Georgia in the United States on June 3, 2001 (Fig. 1). This photonic MPLS router will be employed to achieve data communication networks including the Internet with even higher levels of capacity, reliability, and economy. Moreover, it is planed to study the application of this achievement to the global IP network held by NTT Communications Corporation.

The newly developed photonic MPLS router (Fig. 2) has the three features.
(1). Dynamic light-path setup/tear-down control is achieved by adding distributed light-path setting/switching function based on G-MPLS[*1] (also called MPλS) label-switching technology, which is now being discussed in IETF[*2] and other organizations, to an optical cross-connect switch (OXC[*3]) that incorporates an advanced wavelength conversion function developed by NTT Network Innovation Laboratories.
(2). The co-operation between the OXC and an MPLS router[*4], which applies labels and transfer IP packets, and has recently come to be used in IP-VPN[*5], is achieved. Due to the co-operation, IP packet transfer performance is much enhanced.
(3). The OXC mentioned above achieves fast light-path switching by employing compact and high-reliability optical switches that have been fabricated based on Planar Lightwave Circuit (PLC) technology developed by NTT Photonics Laboratories.
Due to the three functions, seamless path control in optical layer is achieved, which can dynamically absorb the macro IP traffic fluctuations.

Up to now, high-capacity links have been achieved by ultra-large-capacity Dense Wavelength Division Multiplexing (DWDM) transmission technology. This development of a photonic MPLS router will make it possible to eliminate node bottlenecks by adding wavelength routing function and to make existing photonic networks even more autonomous and flexible.
NTT Network Innovation Laboratories intends to enhance the performance, operability, compactness, and economy for the photonic MPLS router. The photonic

MPLS router evolves the IP network to the next generation broadband photonic IP/MPLS network.

Terminology
*1 MPλS (Multi-Protocol Lambda Switching): As an extension of MPLS, a technology that controls the switching of paths identified by labels in a more generalized format is called as G-MPLS (Generalized Multi-protocol Label Switching). In case that optical wavelength is used for the label, it is called as MPλS.

*2 IETF (Internet Engineering Task Force): An origination that publishes standards and implementation techniques for constructing and operating the Internet.

*3 OXC (Optical Cross-connect): It originally means the system that switches each optical wavelength channel signal employing optical devices such as optical switches. Recently, however, many vendors sell switching devices employing electrical LSI switching devices as the name of "OXC". These electrical OXCs may not be able to support the network architecture change such as signal format conversion or transmission speed conversion because such electrical OXCs supports only limited functions of the pure optical OXCs.

*4 MPLS Router (Multi-Protocol Label Switching Router): MPLS means a packet transfer/control system that simplifies the transfer of packets to their destinations in a complex IP network resulting from a dramatic increase in traffic and diversified quality needs. MPLS is being widely adopted as a technology for realizing IP-VPN. MPLS Router is integrated system of IP router function and switching function developed for MPLS.

*5 IP-VPN: Internet Protocol based Virtual Private Network.

- Fig.1 Photonic MPLS Router for Demonstration
- Fig.2 Configuration of Photonic MPLS Router

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