Development of an Optical Cross Connect (OXC) System

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In order to cope with the recent explosive increase in IP traffic, an innovative network system that makes the utmost use of new technology is required. NTT Laboratories have been researching and developing a photonic network that introduces the concept of an optical path that employs wavelength as the unit. Here, we report on an optical cross connect (OXC) system that has been developed at the NTT Laboratories. That system is based on silica-based PLC** type optical switches which have features of high reliability, and stable operation. It also offers excellent expandability, allowing flexible response to increases in traffic demand.

The optical switch scale of the OXC can be expandable from 8X8 to 64X64 in units of 8X8 according to the traffic demand. The core switch fabric employs a DC-SW** architecture that is based on PLC optical switches and has the capability of cross connection in the optical domain without using optical-electrical and electrical-optical conversion. The system is equipped with 10-Gbit/s (STM*-64/OC*-192) SDH**/SONET** interfaces, allowing connection to IP routers and existing SDH transport equipments.

OXC's are connected via optical fiber or existing WDM*** link systems, optical paths are defined between any two OXC's and transports STM-64/OC-192 signals. In order to maintain high levels of integrity and communication quality whenever a failure occurs, OXC system employs 1+1 optical path protection mechanism. Each optical path can be set one of two recovery grades; 1+1 protection and unprotected. A 1+1 optical path protection enables protection times less than 50 ms. OSS** can set-up and tear-down optical paths remotely, and manage and supervise OXC network remotely.

In future work, we intend to increase the cross connect capacity, make the equipment smaller and more economical, and introduce the GMPLS*** concept, with the objective of implementing a resonant network environment.

** PLC: Planar Lightwave Circuit
** DC-SW: Delivery and Coupling Switch
** STM: Synchronous Transfer Mode
** OC: Optical Carrier
** SDH: Synchronous Digital Hierarchy
** SONET: Synchronous Optical Network
** WDM: Wavelength Division Multiplexing
** OSS: Operation Support System
** GMPLS: Generalized Multi-Protocol Label Switching

Condominium IT Kit: Transmission System for Providing Broadband Services in Closed Areas

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An increasing number of local governments and companies are deploying optical fiber with the goal of implementing broadband Internet environments. However, the quality and performance of such environments are not more capable than those provided by the common carriers. To address this situation, it is necessary to investigate a scheme for building a new user-side network that improves user convenience and promotes the deployment of a broadband environment.

Recent work has culminated in the development of a condominium IT kit, a system for implementing fiber-optic-based user networks targeting specific areas. Deployed at user initiative, the system extends an optical fiber broadband environment into condominium complexes, school campuses, and other bases. The condominium IT kit also incorporates several key carrier-grade technologies developed by NTT Laboratories into user networks including optical video transmission technology, PDS** transmission technology, enhanced robustness in poor reception environments, and advanced operations support.

By combining these technologies, we achieved three key functional components: a 100-Mbit/s throughput delivery function providing a high-speed communication environment, a broadband video transmission function across the 2.6-GHz band covering the entire frequency band from digital terrestrial broadcasting to satellite broadcasting, and a communication function providing lowest bandwidth guarantee for monitoring and control. In order for these various functions to be applied to different user network environments that vary widely in terms of network scale and functional requirements, we have adopted an architecture in which the functions are implemented as autonomous kits. This permits users to add, remove, modify or otherwise tailor the functions to their specific needs in block or package units. In addition, the functions all support optical wavelength division multiplexing transmission to take full advantage of user optical fiber facilities.

In the coming months we plan to implement speech communication, security, and other functions in kit form, and to promote the formation of optical user network platform communities by providing other application technologies that interwork with the high-speed communication environment.

** PDS: Passive Double Star

Installation in condominium (Condominium IT Kit)