NEWS RELEASE

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IP Optical Traffic Engineering Technology for Integrated Traffic Control of the IP and Optical Networks

-Both Flexibility and Reliability Can Be Greatly Achieved in an IP Optical Backbone Network-

Nippon Telegraph and Telephone Corporation (NTT; Head Office: Chiyoda-ku, Tokyo; President: Norio Wada) is pleased to announce the development of an IP optical traffic engineering (TE) server for an IP optical backbone network composed of IP routers and OXCs (*1). This server utilizes network resources, responds flexibly to unexpected changes in traffic demand, and restores operations quickly in the event of system failures or natural disasters.

Test-bed trials have shown that this server technology can perform dynamic network control in an IP optical backbone network consisting of node equipment such as IP routers and OXCs. The IP optical TE server controls the IP optical backbone network using an original traffic control algorithm that applies to both IP routers and OXCs, thereby achieving both flexibility and reliability in the backbone network.

In addition, the above traffic control algorithm is implemented in the IP optical TE server separated from node equipments, thus enabling traffic-control policies of a carrier to be reflected. This makes it possible to achieve both flexible and reliable backbone network by using the GMPLS (*2)-based network control technology promoted by NTT Laboratories (Fig. 1).

NTT will be giving presentations related to this technology at the iPOP2006 (*3) international conference to be held on June 22 and 23 at the Meiji Kinenkan complex in Tokyo. At this time, NTT will also participate in an interoperability showcase consisting of multi-vendor equipments and will give a demonstration of this technology.

1.Development Background

Traffic generated by data services, especially IP-related traffic, is expected to grow exponentially as the bandwidth availability increases, along with the diversion of network services due to the spread of broadband access. Indeed, Voice over Internet Protocol (VoIP) and video delivery services using streaming and other means are growing rapidly as broadband access expands. In the future, as unexpected new services appear, dynamic traffic fluctuation will occur. In addition, the spread of broadband access makes communication networks important as one of the social infrastructures, which may be highly influenced by network failures.

It is required for network to be both flexible and reliable: flexibility regarding unexpected traffic fluctuations should be improved and highly-reliable services should be provided while network resources are efficiently utilized. Therefore, it becomes necessary that network topology is controlled with an integrated management of both IP routers and OXCs.

However, network architecture based on commercially available technology can only

manage the IP routers and OXCs separately; hence, it has become clear that existing technology cannot deal effectively with dramatic changes in traffic. Therefore, it is proposed that an integrated management for both layers is to be introduced in the network.
Against the above background, NTT Network Service Systems Laboratories undertook the research and development of an IP optical backbone network that could realize the integrated management of both IP and OXCs. Here, NTT developed an IP optical TE server for linking the IP and OXCs in an IP optical backbone network and controlling traffic, and conducted successful test-bed trials of dynamic network control in an IP optical backbone network configured with IP routers and OXCs.

2.Technical Features

There are two main features in this traffic engineering technology that integrates traffic control into an IP optical backbone network.

(1) IP optical traffic control technology (Fig. 2)
The IP optical TE server manages a network consisting of IP routers and OXCs. It computes optimal paths between these layers. Also, to deal quickly and flexibly with fluctuations in traffic demand and sudden changes in network status due to system failures, the IP optical TE server can reconfigure network topology using an original traffic control algorithm. In addition to sophisticated network operations, this can also reduce the amount of resources that are needed in order to provide stable and reliable network services.

(2) Traffic control function separation technology (Fig. 3)
Implementing this IP optical traffic control algorithm for the IP optical backbone network in the IP optical TE server separated from node equipments enables a carrier to apply traffic control polices considering quality of service, reliability, and efficiency. This allows the carrier to differentiate network operations from others. Here, a control interface between the server and node equipment is currently being standardized in the Path Computation Element (PCE) Working Group of the Internet Engineering Task Force (IETF) based on the participation of NTT, several overseas telecommunication carriers, and communications equipment vendors

3.Test-Bed Trials

The following functions were tested in an IP optical backbone network consisting of an IP optical interlinking server, IP routers, and OXCs.
-Path computation between the IP and OXCs
-Dynamic reconfiguring of network topology in response to traffic fluctuation
-Reflection of traffic control policies in the IP optical TE server with respect to the above functions

4.Future Developments

In the future, in anticipation of unexpected traffic changes, we plan to promote international standards at IETF, conduct interconnectivity trials with vendors, and add functions in accordance with operation and control scenarios in actual networks.

Glossary

*1 OXC (Optical Cross Connect)
OXC is node equipment that connects to wavelength division multiplexing (WDM)

equipment. An OXC is capable of switching gigabit-class high-speed optical signals.
*2 GMPLS (Generalized Multi-Protocol Label Switching)
As an extension of Multi-Protocol Label Switching (MPLS) technology used to configure a logical packet-switched network on an IP network, GMPLS is a communications technology that enables standardized network control by configuring a switched network using wavelengths as labels in addition to conventional MPLS labels. GMPLS is being standardized at the Internet Engineering Task Force (IETF).
*3 iPOP (IP + Optical network)
iPOP is an international conference and exhibition whose aim is to share new discoveries and achievements in IP and network technology between industry and the academic community. It is attended by carriers, vendors, and standardization bodies from the world over at the forefront of R&D in IP optical backbone networks. iPOP 2006 will include a GMPLS interoperability showcase, exhibits of new GMPLS equipment, and paper presentations.

- Figure 1:Innovation through an IP optical backbone network
- Figure 2:IP optical traffic control
- Figure 3:Traffic control function separate from node

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