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Keio University
Nippon Telegraph and Telephone East Corporation
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Press Release

Joint Experiment of Broadband Network for Intelligent Social Infrastructure in the 21st Century

- Application of world's fastest 43-Gbit/s testbed system transmitting a DVD movie in 1 second -

Keio University (Minato-ku, Tokyo; President: Yuichiro Anzai), Nippon Telegraph and Telephone East Corporation (NTT East; Shinjuku-ku, Tokyo; President: Satoshi Miura), and Nippon Telegraph and Telephone Corporation (NTT; Chiyoda-ku, Tokyo; President: Norio Wada), began application of the world's fastest 43-Gbit/s ultrahigh-speed testbed system in an actual field environment.
Since the signing of an agreement on July 15, 2003 for a joint experiment, the construction of testbed systems began on an ultrahigh-speed campus network etc. After the participants completed preparations for the test, the operation of the testbed network began on October 24, 2003.

Based on the next generation application research such as the 21st Century COE project promoted by Keio University called the "Next Generation Media and Intelligent Social Infrastructure" and other various projects, the aim of this joint experiment is to implement a next generation network using an ultrahigh-speed network that can support the broadband applications that Japanese society will need in the future.

1. Background

The progress in broadband access networks such as FTTH and xDSL has accompanied the fundamental spread of the Internet. We can expect a rapid increase in data traffic and diversification of services from now, and the advanced application technology based on high-capacity networks will spread to provide the new services such as image system content-streaming delivery, peer-to-peer (P2P) communications, Internet delivery of broadcast programs, and large file transfer systems. On the other hand, core optical networks that can provide capacity greater than 1 terabit per second through a fiber have emerged, and such network can flexibly handle various interface protocols has become a necessity.
This time, Keio University, which developed various large-volume contents and wide-area applications to establish the future intelligent social infrastructure, in conjunction with NTT East and NTT Network Innovation Laboratories will clarify the requirements for high-capacity networks in the broadband era, evaluate the network quality of the long-term application of these networks, and select subjects for application of the network system.
As a result of this joint experiment, new broadband applications will be created that fully utilize the ultrahigh-speed network characteristics and system development will progress aiming at ultrahigh-speed high-capacity backbone networks of the Internet

and high-speed information transmission networks between data centers etc. We anticipate that these will be useful towards implementing the intelligent social infrastructure required by Japanese society in the future.

2. Synopsis of Experiment

A 43-Gbit/s OTN line-terminal multiplexer developed by NTT Network Innovation Laboratories and an optical repeater system capable of transmitting a 43-Gbit/s optical signal are installed between the Yagami Campus and Shonan-Fujisawa Campus of Keio University. Large-volume content data, which belong to the university, are transmitted using the next generation application between the Yagami Campus and Shonan-Fujisawa Campus. Based on this, we can realize the envisioned future data-centric communication environment, and be able to evaluate and verify the connection reliability, multiprotocol transmissions, network monitoring and control, and the stability of long-term application.

(1) Test period: October 2003 to March 2005

(2) System configuration of Joint Experiment: Figure 1.

3. Roles of Participants

(1) Keio University
Keio University provides the actual field sites at the Yagami Campus and Shonan-Fujisawa Campus for the test, adjustment of the large-volume content delivery environment, high-definition content delivery application development, and construction of the wide-area distributed IP storage. The practical usability and data transmission quality of the ultrahigh-speed testbed network will be jointly evaluated. Furthermore, development and evaluation of the transport protocol applied to the high-speed and low-latency network will be performed. By putting into practice the advanced experiment of the 21st Century COE project, the test participants will study the architecture of the intelligent social infrastructure.

(2) NTT East
In order to construct the 43-Gbit/s ultrahigh-speed testbed network, an optical transmission line and the 43-Gbit/s OTN testbed system are integrated into the Keio University backbone network through the NTT East network for the actual operation in the field.
During the test period, the network operation and maintenance are performed on the actual field application for the "end-to-end" 43-Gbit/s transmission, the applicability of maintenance and remote supervision are evaluated as a prerequisite to long-term application, and service quality control and system integration know-how, which will be required by the future data-centric communications environment, must be accumulated.

(3) NTT Network Innovation Laboratories
NTT Network Innovation Laboratories present the world's first 43-Gbit/s OTN testbed system employing the new international standard for optical network that use wavelength division multiplexing (WDM). By using OTN (Optical Transport Network)*1 based on 43-Gbit/s channel, the standard proposed by NTT, the 43-Gbit/s system used in this experiment achieves a 32-channel GbE (Gigabit Ethernet) signal at high quality and without processing of client signal. Furthermore, by applying a

bandwidth-efficient line coding (CS-RZ format *2) proposed by NTT and based on an automatic dispersion compensation function, the tone modulation of the CS-RZ signal, upgrading into long-distance WDM transmission with the capacity over terabit per second. In this joint experiment, a stability test is conducted based on long-term application in an actual field, and the verification and evaluation of the system design are performed during testing.

<Glossary>
*1: OTN (Optical Transport Network) - The OTN is an optical network employing wavelength division multiplexing and optical switching. The network node interface for OTN is standardized in ITU-T(International Telecommunication Union - Telecommunication Sector) recommendation G.709.

*2: CS-RZ format (Carrier Suppressed Return to Zero format) -
The CS-RZ is an optical transmission format that is appropriate for high-capacity long-haul WDM transmission and enables easy implementation of automatic compensation technology, which is the indispensable for accommodating the transmission impairment after transmission at the data rate of 43 Gbit/s.

- Fig.1 System configuration of Joint Experiment

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