(News Release)

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Nippon Telegraph and Telephone Corporation
National Institute of Information and Communications Technology

On-Demand Gigabit-class Video Transmission Successfully Proven on Testbed Network
- Synergy of video applications and IP-optical networking to be showcased at SC09 -

Nippon Telegraph and Telephone Corporation (NTT) has developed a novel technology that enables on-demand transmission of gigabit-class wideband video. NTT verified their achievement in a wide area experiment in cooperation with National Institute of Information and Communications Technology (NICT).

With this advancement, users can achieve steady transmission of high-density video such as HDTV[*1] by acquiring a path in the network whenever it is needed, without allocating additional network resources or re-optimizing the provisioned network resources.

The experiment was carried out using GEMnet2[*2] and JGN2plus[*3], the R&D testbed networks provided by NTT and NICT, respectively. We plan to demonstrate these results at the upcoming SC09[*4] held in Portland, Oregon (USA), November 14-20, 2009, by international connection between the test network and the exhibition booth. The achievement was sponsored in part by NICT, under the "Research and Development of Dynamic Network Technology" project.

Background

NTT laboratories had previously developed a technology to transmit uncompressed video streams through IP networks, which they called i-Visto.[*5] However, since it required a very large bandwidth of more than a gigabit per second, users could not immediately start the transmission unless they waited for the network operator to allocate network resources along the transmission path.(Figure 1)

Moreover, in order to prevent quality degradation, it is essential to verify the accuracy of the video stream packets, and to do so at multiple points in the network. However, because that requires special equipment that is too expensive to distribute to many points in the network, it was not feasible.

Achievements

We have developed a basic technology[*6] to provide stable and on-demand transmission of gigabit-class wideband video using high-speed IP-optical networking.[*7] This consists of a technology that automatically sets up a very large bandwidth circuit in the optical network on demand - upon the user's request to start video transmission; and PC-based technology that can be placed at many points in the network with the ability to observe any minute change in the behavior of the video stream packets - changes which could result in quality deterioration.(Figure 2)

We also succeeded in verifying our concept through the actual deployment of uncompressed HDTV transmission in a wide area experiment network. We believe that these achievements will lead to widespread use of gigabit-class video transmission.

Future Plans
We are planning further enhancements to network and video collaboration that will allow greater functionality, such as adaptive control, so that it can be employed by broadcasters and other high-end users. Furthermore, our aim is for this technology to eventually be used in many other arenas that can benefit from high-resolution video, including telemedicine and e-learning.

Footnotes
*1 HDTV
High Definition Television. Experiments were done using 1920x1080 resolution images at 60 interlaced fields per second. An uncompressed video interface (HD-SDI) signal for broadcast use consumes about 1.5Gbps of network bandwidth.

*2 GEMnet2
GEMnet2 is an R&D testbed network provided by NTT laboratories.
http://www.ntt.co.jp/journal/0802/files/jn200802034.pdf

*3 JGN2plus
JGN2plus is an advanced testbed network for R&D provided by NICT.
http://www.jgn.nict.go.jp/

*4 SC09
SC is the international conference for high performance computing, networking, storage and analysis. SC09 will be held in Portland, Oregon (USA), November 14-20, 2009.
http://sc09.supercomputing.org/
The following is a link pertaining the NICT booth at SC09.
http://www.jgn.nict.go.jp/japanese/research/sparc/sc09_091114.html

*5 i-Visto
i-Visto is NTT Laboratories' core technology which enables the ingest, edit, and playout of high-quality video through an IP network for video production use by broadcasters. NTT Laboratories has developed a low-latency video transmission mechanism for high-quality video used in broadcasting; an ultra-high speed server system architecture which enables the recording and playing of multiple high-quality video formats, including DVCproHD, uncompressed HD, and uncompressed 4K-resolution video; and a high-speed transcoding system architecture.

*6 Basic technology
(1) Stream-oriented and user triggered network control
This technology establishes a network path for ultra-wideband video transmission dynamically when video transmission is activated by the user. User applications for wideband video transmission collaborate with the server to provide IP-optical networking control in creating a gigabit-class circuit on demand. When encountering network congestion, it reconfigures the IP network topology by switching the optical paths in order to optimize the network usage.
(2) Cooperative high-density measurement for video streaming
The development of PRESTA 10G, a PC-based network measurement system, has enabled the evaluation of video stream packets transmitted through a 10Gbps network in microsecond-order resolution. The packets are measured using an optical splitter for observing minute changes such as latency and jitter that might cause degradation of the video quality.

*7 IP-optical networking
IP-optical networking enables the user to set up a very large bandwidth circuit by interconnecting the IP routers with an optical path. It also enables reconfiguration of the IP network topology by dynamically switching the optical paths in response to environmental changes such as traffic overload or network breakdown. These controls are expected to provide significant improvements in the user's communication quality.

- [Figure 1: Problems in gigabit-class video transmission.](#)
- [Figure 2: Overview of a developed technology](#)

< For more information, contact >

NTT Information Sharing Laboratory Group
Tel. +81-422-59-3663
E-mail : islg-koho@lab.ntt.co.jp

National Institute of Information and Communications Technology (NICT)
Tel. +81-42-327-6923Fax. +81-42-327-7587
E-mail : publicity@nict.go.jp

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