NEC Corporation
Nippon Telegraph and Telephone Corporation
NTT Communications Corporation
Fujitsu Limited
Hitachi, Ltd.

Technologies developed for providing flexible wide area networks with SDN, a global first

Tokyo, March 7, 2014 - NEC Corporation(NEC; TSE: 6701), Nippon Telegraph and Telephone Corporation (NTT; TSE: 9432, NYSE: NTT), NTT Communications Corporation (NTT Com), Fujitsu Limited (Fujitsu; TSE: 6702) and Hitachi, Ltd. (Hitachi; TSE: 6501) today announced the development of technologies that enable Software-Defined Networking (SDN, *1) compatibility for wide area networks, including platforms for comprehensively integrating and managing multiple varieties of wide area network infrastructure and general-purpose network control applications used with those platforms. These technologies were developed through the "Open Innovation Over Network Platforms" research and development project. Also known as the "O_3 (O Three) Project" (*2), this initiative was launched in June 2013 based on research consigned by the Ministry of Internal Affairs and Communications' Research and Development of Network Virtualization Technology, and has been promoted jointly by the five companies (*3).

1. Technological achievements of the project

The project has defined unified expressions of network information and built a database for handling them, allowing network resources in lower layers such as optical networks to be easily handled at upper layers such as packet transport networks. This enables the provision of software that allows operation management and control of different types of networks based on common items. With these technologies, telecommunications carriers can quickly and easily provide virtual networks that combine optical, packet, wireless and other features.

Foremost, these achievements allow service providers to inform telecommunications carriers about their desired network configurations by, for instance, easily entering them via a website. Telecommunications carriers will be able to build virtual networks that satisfy the needs of service providers by flexibly combining optical and packet transport networks. They will also be able to comprehend *what* is happening *when* and *where* on the virtual networks, instantly and accurately. Moreover, in the future, telecommunications carriers will be able to reduce the time to design, construct and change networks in response to service providers' requests by approximately 90% compared to conventional methods, by having network devices in different layers coordinate with each other.

Details of the achievements are as follows:

1) Unified network information database and resource allocation technology

To permit management of each network comprising multiple wide area networks under unified rules, an expression system for common handling of necessary information (including network configuration and communications status information) was defined, and a network information database for handling it was built. This enables easy connection between the optical network as the lower layer and an upper layer (packet transport network), as well as coordination among related devices, which enables path-setting in multiple layers.

Fast provision of network services was also enabled by automatic allocation of resources, including band frequency needed in the optical and packet layers, based on the network information database.

2) Technologies for common control and management of networks

A software technology that permits operation management and control of multiple networks was developed using the above network information database.

Specifically, the rapid building of a new virtual network compatible with an existing large-scale network was made possible. This was enabled by leveling the control load through virtualization of functions needed for the mutual connection between a new network and existing network. A network transfer technology, which supports gradual transfer from an existing network to a new network for their mutual connection, was also developed. Provision of optical core network resources optimal for band frequencies requested by end users was also enabled.

3) Technology for developing virtualization-compatible network devices

Basic technologies for SDN network devices, which can be controlled by points 1 and 2 above, were also examined.

- SDN-compatible software transfer node: Targeted transfer performance at 100,000 flows was achieved.
- SDN-compatible optical core node: A prototype of a function for directing packet signals to line signals transferred on optical networks and housing the signals there was produced to fulfill quality requirements, such as reduced delay of packet signals.
- SDN-compatible packet transport node: PTN (*4) control and driver technologies were developed. These shorten the time needed to provide more than 10 types of service quality requested from a virtual network, from the previous several months to only a few minutes.
- SDN-compatible overlay switch: Setting of the optimal transfer path for each of the flows with different characteristics was enabled.

An outline of this project and the achievements made will be presented at "O_3 Symposium 2014," which will be held at Akihabara UDX on March 14, 2014.

2. Future Plans and Outlook

This project aims to commercialize results of research and development on network virtualization and to promote their global popularization and standardization. Disclosure of information related to the project began online and through other outlets in FY2013, and some of the research and development results will be made open to the public in FY2014. The project aims to clarify the contents of the research and development results, results of verification tests, etc. by March 2016 to provide them to domestic and overseas telecommunications carriers and service providers and vendors.

When these technologies are commercialized, businesses, for instance, will be able to build optimal networks and start utilizing services instantly only by applying specialized software for applications, such as the use of big data, high-quality broadcasting, and a global corporate intranet.

Notes:
*1: Software-Defined Networking (SDN) is a concept for controlling a network via software.
*2: O_3 stands for the overall concepts of this project: open, organic and optimum.
*3: See the press release, "O_3 Project launched for achieving the world's first wide area SDN."
http://www.hitachi.com/New/cnews/130917c.html
*4: PTN stands for packet transport network, which is a network in which telecommunications data are divided into small units called packets and transmitted in that form.

# # #

Information contained in this news release is current as of the date of the press announcement, but may be subject to change without prior notice.
