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

O_3 Project launched for achieving the world's first wide area SDN

- Reducing time to construct wide area networks by about 90% -

Tokyo, September 17, 2013 - 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 launch of the "Open Innovation over Network Platforms" research and development (R&D) project. Also known as the "O_3 (O Three) Project," (*1) this project is based on research consigned via the Ministry of Internal Affairs and Communications' "Research and Development of Network Virtualization Technology," and is jointly promoted by the five companies.

This is the world's first R&D project that seeks to make a variety of wide area network elements compatible with Software-Defined Networking (SDN*2), including platforms for comprehensively integrating and managing multiple varieties of wide area network infrastructure and applications.

While SDN has already been introduced in corporate networks, such as those at data centers (DCs), this project facilitates research and development in order to apply SDN to wide area network infrastructure, such as that of telecommunications carriers and Internet providers.

The project aims to achieve wide area SDN that will enable telecommunications carriers to reduce the time to design, construct and change networks by approximately 90% when compared to conventional methods. This will enable service providers to dramatically reduce the time needed to establish and withdraw services.

Details of the project will be provided at SDN Japan 2013 (http://www.sdnjapan.org/), held September 18-20, 2013.

1. Background

With the expansion of cloud services, the number of applications using networks has also been increasing. Moreover, the widespread use of smartphones has also been accompanied by the rapid growth in the number of users, along with an expanding need for services. Responding to the speed of change in services, DCs that provide cloud services face the challenge of reducing time to construct and change networks. To resolve this, there is a greater need for introducing SDN to networks within DCs and between DCs, since the SDN will make the construction and the changing of networks more flexible and faster, in addition

to reducing the lead-time for providing DC services. Some providers have already launched commercial SDN services (*3).

It is expected that as corporate infrastructure to ensure business continuity is strengthened and globalized, collaboration will be needed between dispersed DCs and users around the world. As a result, there will be greater need for reducing the lead-time to provide services while assuring service quality for users across a wide area network, such as networks between DCs and between the DC and users.

2. Challenges that Telecommunications Carriers and Service Providers Face in Wide Area Networks

(1) Wide area networks support communications services across many types of networks, including optical networks and wireless networks. As telecommunications carriers and service providers work on the design, construction and operations of services for each network, it is challenging to construct networks to meet a wide range of service requirements, including network performance, protocols and processing, and to start services promptly.

(2) Existing wide area networks have network devices and operation management systems for each network type (layer), and operation management is conducted separately in each respective layer. Therefore, when a fault occurs in a lower layer, it is difficult for operation managers in upper layers to identify its location and quickly address it.

(3) Since operation management is carried out separately in each respective layer, telecommunications carriers and service providers have difficulty in coordinating low-cost, high-performance resources throughout all of the layers in order to optimize service construction costs when they allocate network resources (network equipment, transmission routes, etc.) to services.

3. Objective of this Project (Appendix item 1)

In order to solve the above challenges, this R&D project aims to establish network virtualization technology that enables multiple telecommunications carriers and service providers who share network resources to design and construct networks and manage their operations freely to suit their needs. This will enable telecommunications carriers to reduce the time for designing, building and changing their networks to about 10% of the previously required time over a wide area network. As a result, service providers will be able to dramatically reduce the time required to open and withdraw services. Moreover, user satisfaction should be enhanced through faster access to their desired services.

This project aims to verify and commercialize research and development results through prototypes and verification testing of network virtualization technology. At the same time, the project also aims to share and standardize research results globally, making some of the results open to the public, and providing them to domestic and overseas telecommunications carriers and service providers and vendors.

4. Outline of Research and Development (Appendix item 2)

(1) Technology for developing network management and control platform software
This technology is used to develop SDN platform software that enables the construction of networks while meeting service requirements and enabling fast provision of services.

Specifically, it integrates a wide area network by ensuring common handling of information for controlling diverse networks, such as optical, wireless and packet communications (network configuration information, communications status information, etc.), and develops platforms to flexibly and promptly perform control.

(2) Technology for developing software for network design, construction and operation management
This technology is used to develop software for network design, construction and operation management that runs on the platform developed in item 1.

Specifically, it develops design software required for applying SDN to a wide area network (verification of designed networks), construction software (interconnection with existing networks, transition from existing networks to SDN), and operation management software (identifying faults between layers and responding to them faster, controlling service quality).

(3) Technology for developing virtualization compatible network devices
This is used to develop SDN network devices that can be controlled by points 1 and 2 outlined above.
Specifically, it develops the interfaces and driver functions that enable use of low-cost, high-performance resources through all layers, optimization of service construction costs, and control of existing optical and wireless network devices, as well as software communications devices that can freely change configurations and functions.

5. Main Division of Work for the Five Participating Companies

- NEC: Development of network management and control platforms, making wireless communications systems compatible with SDN (1-3 in the above)
- NTT: Making software communications devices compatible with SDN (3 in the above)
- NTT Com: Creating the guidelines for design, construction and operation of SDN (1 in the above)
- Fujitsu: Making optical communications systems compatible with SDN (1-3 in the above)
- Hitachi: Making packet transport systems compatible with SDN (1-3 in the above)

6. Future Plans and Outlook (Appendix item 3)

This project was consigned via the Ministry of Internal Affairs and Communications' "Research and Development of Network Virtualization Technology." In June 2013, five companies began to work jointly on research and development for conducting verification tests. The final results will be reported to the Ministry by the end of March 2016. Aiming to verify and commercialize these technologies, five companies will promote to share and

standardize the results of research globally. For example, the project will open website for providing related information in FY 2013. In addition, the project will make some of the results open to the public, and provide them to domestic and overseas telecommunications carriers, service providers and vendors in FY 2014.

In the future, when these technologies are realized, enterprises will be able to enjoy services by simply installing the specialized application for the services, such as bigdata application, 8K HD video broadcasting and global enterprise intranet, and at the same time, optimum network for the services will be provided promptly.

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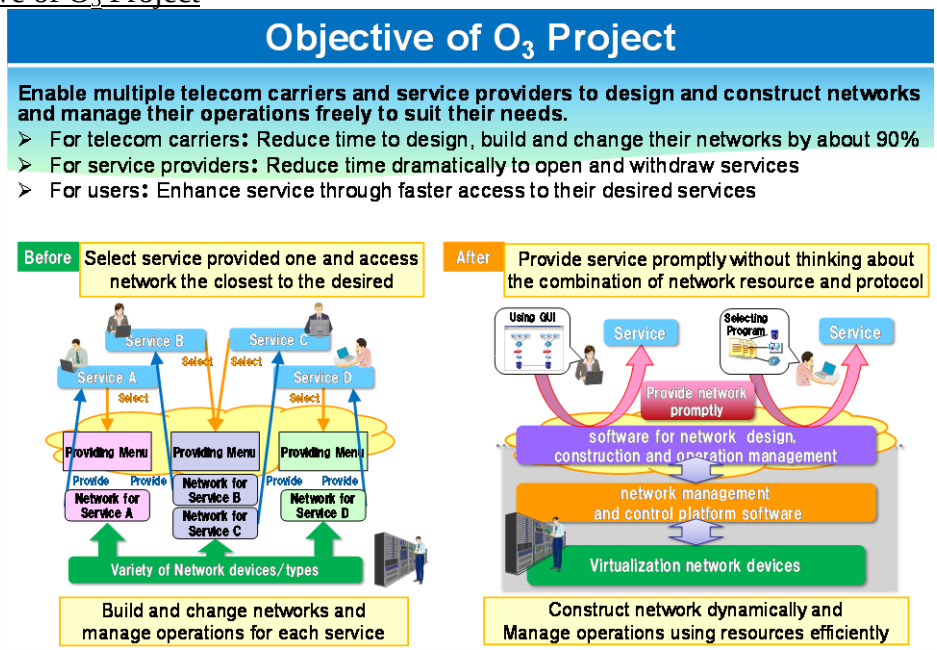
Notes:
*1) O_3 stands for the overall concepts of this project: open, organic and optimum

*2) Network that enables the definition and control of the functions and configurations by using software

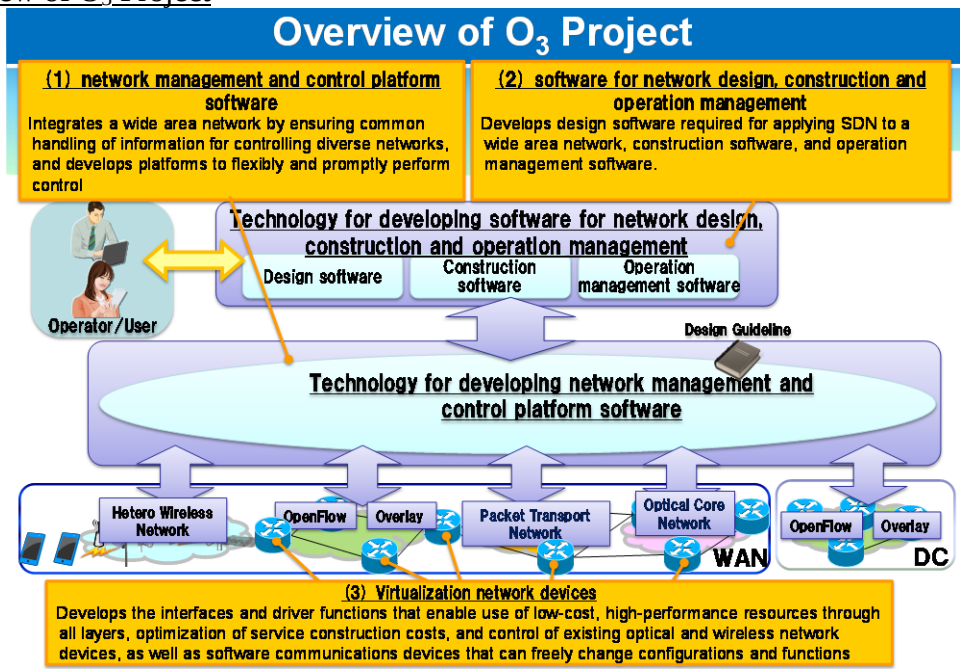
*3) NTT Communications' cloud service, "Biz Hosting Enterprise Cloud", provides SDN to networks within DCs and between DCs in 11 places, 9 countries.

Appendix

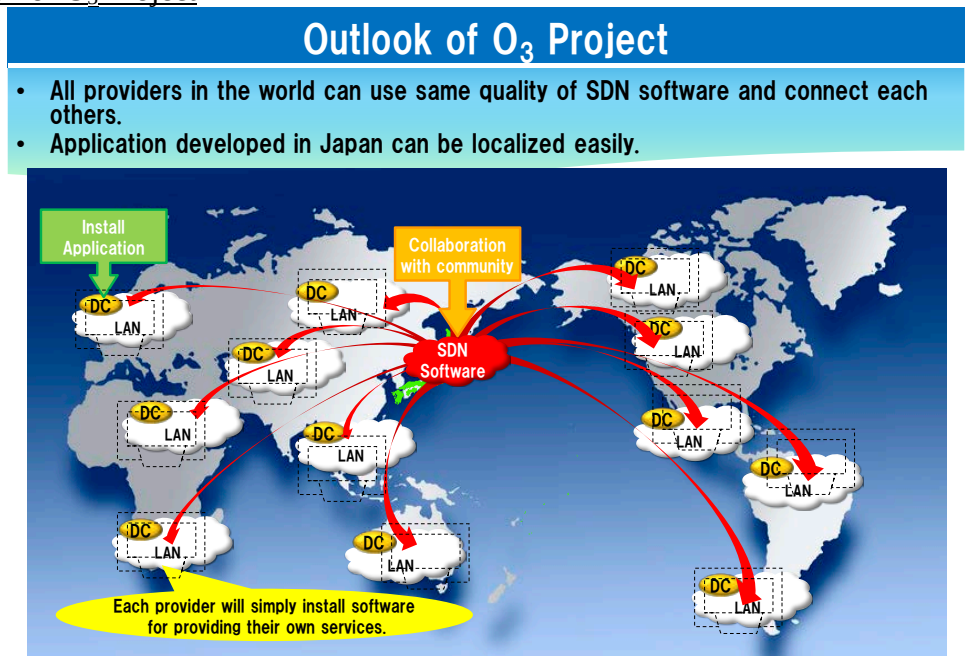
1. Objective of O_3 Project



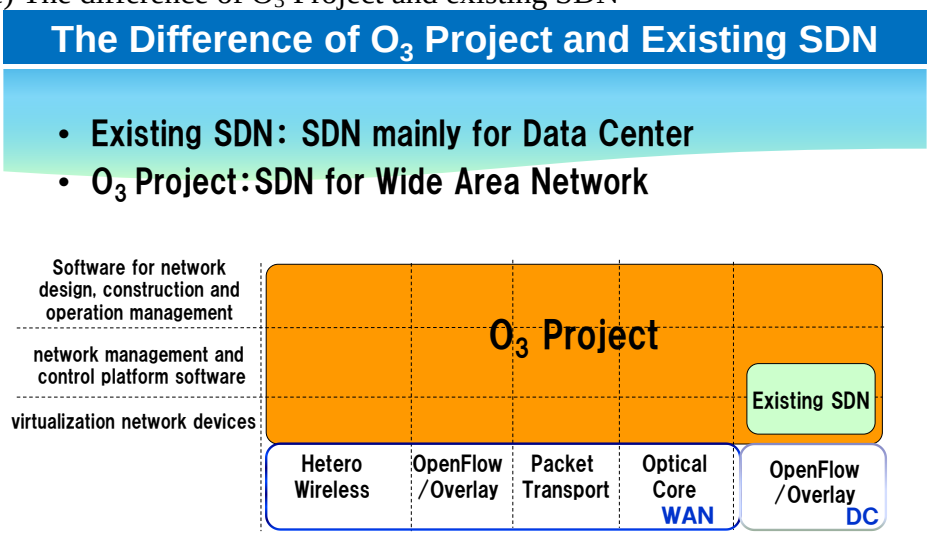
2. Overview of O_3 Project



3. Outlook of O_3 Project



(Reference) The difference of O_3 Project and existing SDN



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.
