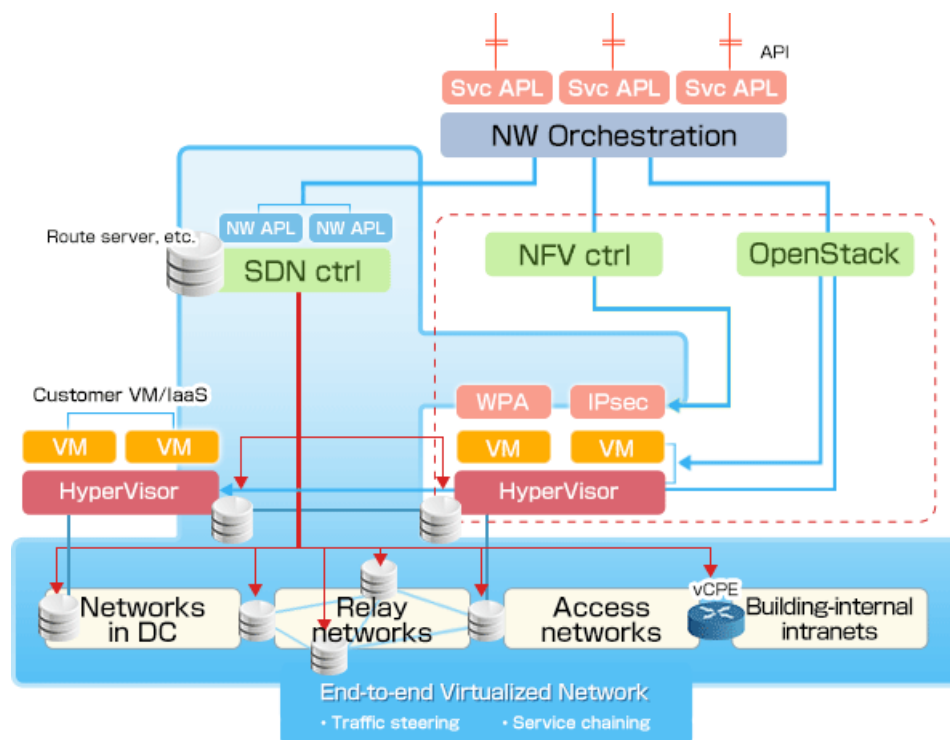# SDN Technology

**Research Themes**

**SDN Technology Working Groups**

The SDN Technology Working Group performs technology verification, interconnectivity testing, performance evaluation, and demonstration testing using testbeds for technologies related to SDN. Using the knowledge thus acquired, this Working Group establishes reference models and publishes them in documentary form.

## Overview of Activities

The communications services of the future will use SDN technology to achieve using software features hitherto unavailable even using dedicated hardware and appliances. Features once controlled by protocols will be controllable through software APIs. Services providing communication protocols consisting of packet-based distributed controls will deliver centralized policy control tailored to each service.

Under this concept of virtualization ("softwarization") of communications technologies, a steady stream of new network technologies related to SDN are arriving. In applying these technologies to real-world network environments, users must consider how to use the new technologies in parallel with existing network environments and form plans for an efficient and convenient network environment overall.

Currently, however, standard response measures that can serve as a model have not been established, posing a formidable barrier to the spread, promotion and expansion of SDN and cloud computing. The objective of the SDN Technology Working Group is to eliminate those barriers to SDN and cloud computing by verifying and evaluating the performance of new and old technologies in working together and testing prototypes.

Below we describe some of the details of the verification, research and development efforts of the Working Group, their methods, and the results expected.

Details of Verification, Research and DevelopmentIn the current fiscal year, the first fiscal year of the Okinawa Open Laboratory, the SDN Technology Working Group is verifying the following SDN technology environments.

(A)Verification of the SDN Evaluation Environment

SDN technologies are a focus of great interest among ICT provider and user companies alike. Currently, however, the number of situations in which a wide variety of devices can be combined to verify and confirm the operation of systems using SDN are extremely limited. The SDN Technology Working Group introduces the latest commercially available technologies to build the necessary SDN verification environments, conducting evaluation and verification of world-leading SDN equipment and software. The Working Group also constructs an evaluation environment suited to the publication of the verification results to the broader community.

(B)Verification of Control by OpenFlow Controller (OFC)

It is likely that SDN-related devices will be announced in the market within the next few years. When this happens, even if protocols are standardized, differences in software compatibility and command implementations will create differences in terms of how well each product is supported. Examples of this problem particularly abound in the case of system development using OSS. In the early days of any technology, the collection of information on such cases and active dissemination of it to users is a vital element in promoting its widespread adoption. The SDN Technology Working Group mounts a wide range of features that add OpenFlow Controller to serve as an OSS, to absorb the differences in control capability among the broad spectrum of SDN-related devices. By publishing the results of these efforts, the Working Group contributes to the interoperability of these systems.

(C)Construction and Verification of Environments for Verifying the Development of High-speed Packet Transmission Technologies

Network functions virtualization (NFV) is a technology that uses standard IT virtualization technologies to integrate a wide range of network devices on general-purpose, high-capacity servers. Making this technology available for real-world operations requires a number of innovations. For example, a network-processor environment must be mounted on general-purpose servers, and an OpenFlow switch must be developed using a high-speed packet-processing library. Development of control software is also required. The SDN Technology Working Group constructs the environments that make all of this development work possible.

Proving, Research and Development Methods

(A)Verifying the SDN Evaluation Environment

The SDN Technology Working Group examines various performance factors in OpenFlow-related network devices, then selects and purchases the devices necessary to construct an OpenFlow network verification environment. The Working Group then evaluates factors such as the number of flow tables and flow processing performance for the OpenFlow-related network devices.

(B)Verification of Control from OFC

The SDN devices used in "(A) Verification of the SDN Evaluation Environment" above are expected to provide the basis for a wide range of future research activities. For this purpose, the Working Group is verifying control of OSS via OFC and the running of a wide variety of OpenFlow applications. The Working Group is also verifying control for various OpenFlow commands.

(C)Construction and Verification of Environments for Verifying the Development of High-speed Packet Transmission Technologies

The SDN Technology Working Group mounts OpenFlow switching software in the devices selected and purchased in (A) above, borrowed network processor environments and high-speed packet-processing libraries. The Working Group also constructs the environments necessary for verification of development.

(D)Evaluation Report on Network Software Technologies/dt>

The Working Group collates and publishes the results of the above evaluations in a report.


Expected Results

•Evaluation Report on SDN Verification Environments

•Evaluation Report on Network Software Technologies