

Network Telemetry across Geographic Areas based on Programmable Network Technology

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Abstract

To investigate the programmable network technology over large-scale topology, we integrate NICT and NCHC/NIAR's domestic P4 Testbeds through international circuits of JGN and TWAREN. Such international testbed will contain heterogeneous P4 targets (Tofino from NCHC and BMv2/SmartNIC from NICT) for research and experiment. In addition, we will utilize the testbed to allocate inter-site network scenarios for research on In-band Network Telemetry (INT) over geographic area. In addition, SRv6 has been attracting attention recently, especially in the field of mobile areas. By separating the INT management domain, the proposed solution could resolve the bottleneck of INT and monitor the network status over geographic areas in real-time effectively, and by combining INT and SRv6, the foundation of a high-performance mobile network could be built.

Goals

In this NRE demonstration, we will perform the cross-site INT monitoring between Taiwan and Japan with the following challenges:

- (1) Interconnecting of heterogeneous P4 switches, including Tofino switch, SmartNIC, and software BMv2.
- (2) By extending standard INT with management functions on inter-site links, network status across geographic areas could be monitored in real-time. The results will illustrate the performance difference between cross-Pacific and intra-Asia links.

In the future, we could make AI-enhanced routing decisions from the monitored network states. We could also perform the source routing with SRv6 implemented with P4 language for better software-defined granularity.

Impacts

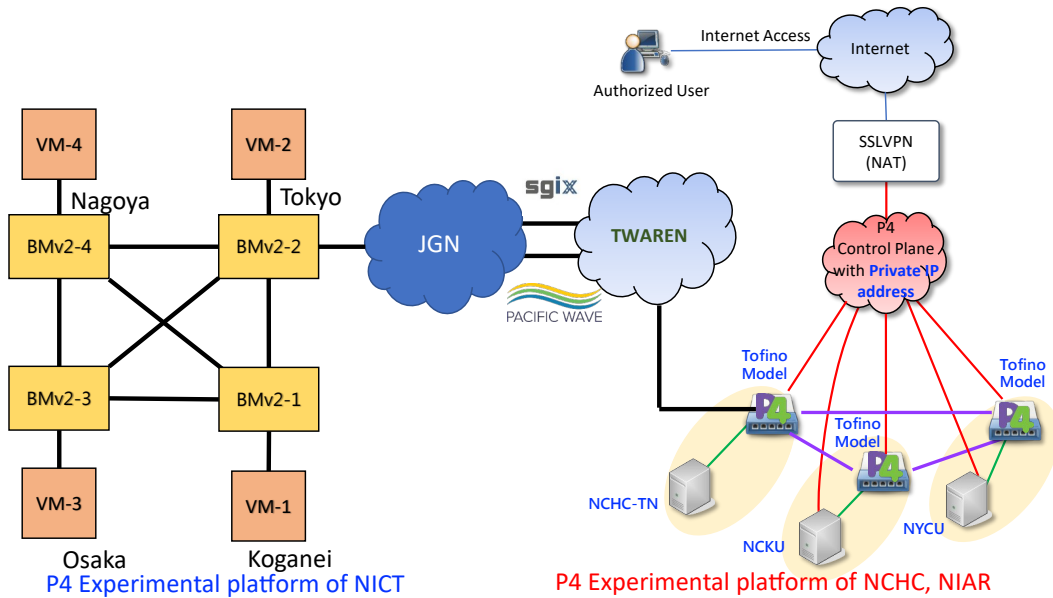
This research has developed and evaluated the INT in a cross-border (between Japan and Taiwan) and cross-implementation (between Tofino and BMv2/SmartNIC heterogeneous) environment. In our next step, this research will be extended to include 100G+ transmission and smart routing capability on this international heterogeneous testbed.

Resources

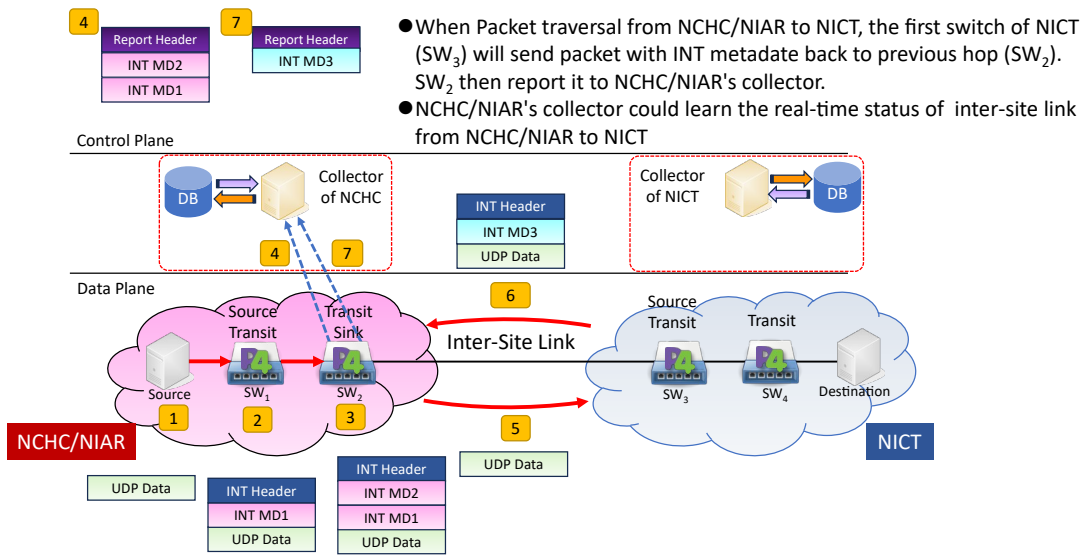
- (1) Programmable switch Testbed resources in NCHC/NIAR and NICT, including Tofino P4 switches, SmartNICs, servers and VMs.
- (2) Interconnection of the testbeds at Internet exchange points, including PacificWave and SGIX.
- (3) International circuits of TWAREN and JGN that bring the Testbeds from NCHC/NIAR and NICT to the Internet exchange points at PacificWave and SGIX.

Involved Parties

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Cross-site P4 Testbed Topology between NCHC/NIAR and NICT



Operation of Inter-Site Telemetry