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EANTC tests Nokia Network Services Platform, validates multivendor support

March 2022, EANTC Berlin

Executive Summary

Overview

Nokia has obtained independent validation of the multivendor support provided by our Network Services Platform (NSP) from the European Advanced Networking Test Center (EANTC), an international test center recognized for their objectiveness and vendor-neutral network performance testing for manufacturers, service providers and enterprise customers.

Nokia was invited to participate in the EANTC Interoperability Test Events that took place in November 2020, April 2021 and March 2022, which focused on the NETCONF protocol and transport network-specific YANG models.

Nokia has participated in EANTC test events for years with our Service Router Operating System (SR OS) and Network Services Platform (NSP), including testing on topics such as Multiprotocol Label Switching (MPLS), Segment Routing (SR) and Path Computation Element Communication Protocol (PCEP). However, these interoperability test events narrowed their focus to investigate a primary area of the Nokia NSP's scope: the management plane between controllers/orchestrators and the network of routers and switches.

Figure 1: EANTC multivendor interoperability showcase at MPLS, SD & AI Net World Congress 2022 in Paris

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Why EANTC interoperability events matter

The goal of EANTC events is to help the industry to:

- Improve multivendor network management (provisioning, reconfiguration, fault management and performance monitoring) using the NETCONF protocol
- Provide a neutral, collaborative and amicable place for the whole industry where new NETCONF/YANG implementation aspects can be evaluated outside competitive labs and service provider proofs of concept (PoCs)
- Promote the use of standardized YANG models where available and feasible and encourage the multivendor alignment of YANG models for standard device and service configuration aspects
- Understand and improve how third-party orchestrators can cope with supplier-defined YANG models (some of which will always remain non-standardized due to competitive differentiation).

Based on these test events, EANTC publishes interoperability reports that are respected by service providers and raise customer awareness of the state of implementation for innovative network solutions. The reports describe use case scenarios and design blueprints that service providers can adopt for their network designs. These reports have also helped to kick off network innovation projects, to fulfill RFP requirements regarding interoperability, and to avoid individual PoCs covering similar technical questions.

Participation with EANTC accelerates multivendor interoperability and standards compliance of the NETCONF protocol and standard YANG model implementations. In the 2020 pilot event, participants included Nokia, Cisco and Huawei. Ciena and IP Infusion joined Nokia and Cisco for the 2021 event.

Events results summary

The interoperability test events investigated integrating NETCONF applications and YANG models (OpenConfig, IETF and supplier proprietary) for several key use cases, including topics for network management and automation functions in a multivendor environment:

- **Configuration**: NETCONF/YANG for devices, Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), MPLS, SR and functions such as Bidirectional Forwarding Detection (BFD) telemetry streaming, define and apply access control lists (ACL) and router-policies.
- **Assurance**: Configure and execute OAM endpoints and test, and retrieve results
- **System management**: RADIUS, Domain Name System (DNS), contact, hostname, location
- **Network administration**: To retrieve interface packet frame sizes distribution
- **Layer 2 and Layer 3 VPN service provisioning**: Ethernet VPN (EVPN) and IP-VPN
- **Monitoring, data export and alarm management**: Streaming telemetry with the transport protocol gNMI for a set of gRPC/YANG operations
- **5G stations-related clocking management**: Precision Time Protocol (PTP)

During the 2020 pilot test event, several NETCONF- and YANG-related interoperability issues were identified. In the 2021 event, a new device family (Cisco) and new devices (Ciena, IP Infusion) were tested. The general impression was that things have worked well at the protocol level while the main challenges concerned suppliers' OpenConfig implementations.

During the 2020 pilot event, EANTC validated Nokia interoperability for the IETF interfaces model. In addition, EANTC validated the configuration of telemetry/gRPC settings (dial-in and dial-out) and streaming telemetry subscriptions using gNMI (dial-in).

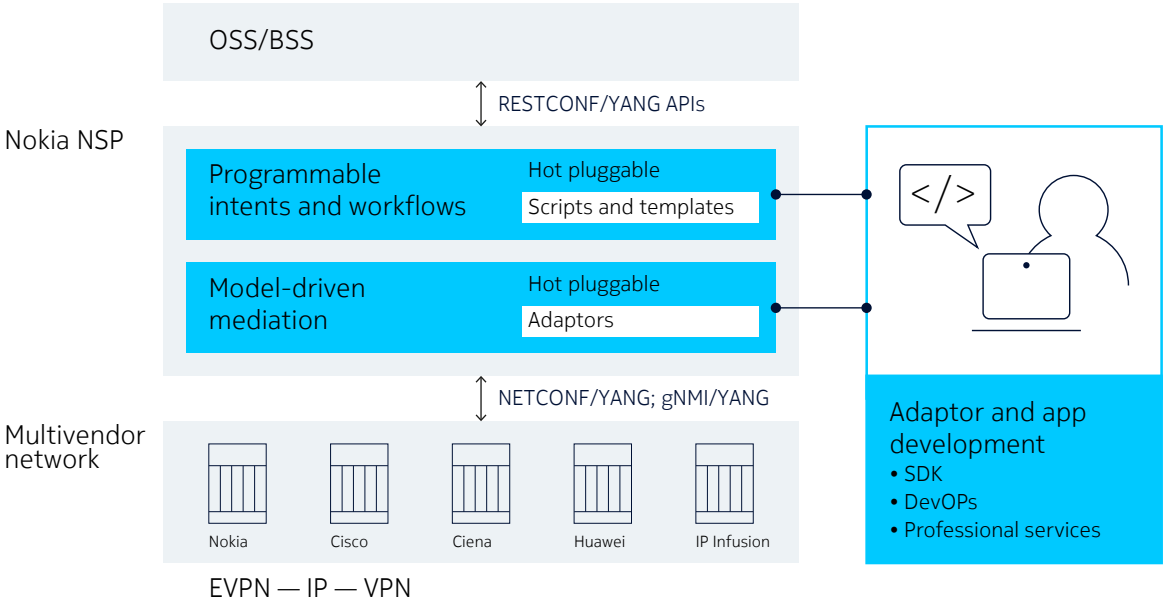
During the 2021 and 2022 events interoperability between the Nokia NSP used as orchestrator and Cisco's Network Services Orchestrator (NSO) used as controller to configure Ciena equipment was successfully tested using the IETF L2 EVPN and L3VPN models.

During both events, all suppliers demonstrated basic support for OpenConfig YANG models. While there is the hope from some service providers and the Telecom Infra Project (TIP) that the adoption of OpenConfig helps reduce integration time and cost, leading to near-instant interoperability, it was proven that the real enabler for on-the-fly integration is the applicability of model-driven principles (including transactional execution, idempotency, and separation of configuration and state) from equipment up to controllers and orchestrators, using modern configuration protocols such as NETCONF, RESTCONF and gNMI.

Nokia NSP multivendor support

The Nokia NSP used its model-driven mediation software development kit (SDK) to build discovery/configuration adaptors that supported the multivendor network. DevOps-style integration was achieved using the NSP Device Configurator, Intent Manager and Workflow Manager. Protocols such as NETCONF and gNMI in combination with YANG-defined data models were key to enable multivendor integration for a significant number of use cases in less than a week.

Figure 2: Nokia NSP model-driven management principles for multivendor support



Using an open, programmable platform such as the Nokia NSP enabled DevOps principles to be applied while reducing the integration time to a bare minimum—for both standard models and supplier-defined models. Open-source DevOps tools have been the efficient, multipurpose solution for ad hoc integration and troubleshooting. Some of these DevOps tools, such as gNMIc and ncproxy, were contributed by Nokia employees. Intuitive model-driven web user interfaces were very helpful in simplifying aspects of programmability.

Key takeaway from the 2020 and 2021 events

During those EANTC test events, the Nokia NSP demonstrated its ability to quickly discover and configure Layer 2 and Layer 3 VPN services on multivendor networks made of equipment from various suppliers (Cisco, Huawei, Ciena, IP Infusion), either directly as a controller or indirectly as an orchestrator through other controllers (Cisco NSO).

Even though the equipment—which had never before been integrated with the NSP—used models that are either standards-based (OpenConfig, IETF) or proprietary, the NSP was able to interoperate with all of the equipment within a week. This was possible because of the **programmable** nature of the NSP, the quick development of **pluggable adaptors**, which allow the NSP to support and mediate any data model, and a comprehensive range of management protocols and interfaces.

This flexibility to support a mix of standard and proprietary interfaces in a multivendor network is inevitable. The reality today is that configuration YANG modules require frequent updates driven by networking innovation. Many equipment suppliers implement deviations, augmentations and other custom extensions to light-weight standards to quickly meet evolving market demands and enable detailed configuration and implementation.

For more information about the EANTC test events, read the following EANTC white papers:

- "Multi-Vendor NETCONF/YANG-Based SDN Management Interoperability Test 2020"
- "Multi-Vendor NETCONF/YANG-Based SDN Management Interoperability Test 2021"
- "Multi-Vendor NETCONF/YANG-Based SDN Management Interoperability Test 2022"

For more information on network automation and programmability with the Nokia NSP, read the Nokia application note.

EANTC is internationally recognized as one of the world's leading independent test centers for telecommunications technologies. Based in Berlin, Germany, the company has offered vendor-neutral consultancy and realistic, reproducible, high-quality testing services since 1991. Customers include leading network equipment manufacturers, tier-1 service providers, large enterprises, and governments worldwide. EANTC's POCs, acceptance tests and network audits cover established and next-generation fixed and mobile network technologies.

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