Network Element Drivers for Cisco Crosswork Network Services Orchestrator (NSO)

Contents

Exceptional Multivendor Support through Network Elements Drivers

Cisco® Network Services Orchestrator (NSO) provides a single pane of glass for orchestrating a multivendor network. To offer support for an exceptional range of multivendor devices, it uses Network Element Drivers (NEDs). Traditionally, device adaptors are a major roadblock, since they cannot be upgraded at the same pace as device interfaces, and adding support for new devices can take months. Cisco NSO NEDs, in contrast, are either generated automatically from the device YANG model, or can add new commands and devices in a matter of weeks. Using NEDs, NSO makes device configuration commands available over a network wide, multivendor Command Line Interface (CLI), APIs, and user interface. In addition, NSO services, like VPN, can configure a complex multivendor network.

NED overview

Network element drivers comprise the network-facing part of NSO. They communicate over the native protocol supported by the device, such as Network Configuration Protocol (NETCONF), Representational State Transfer (REST), Extensible Markup Language (XML), CLI, and Simple Network Management Protocol (SNMP).

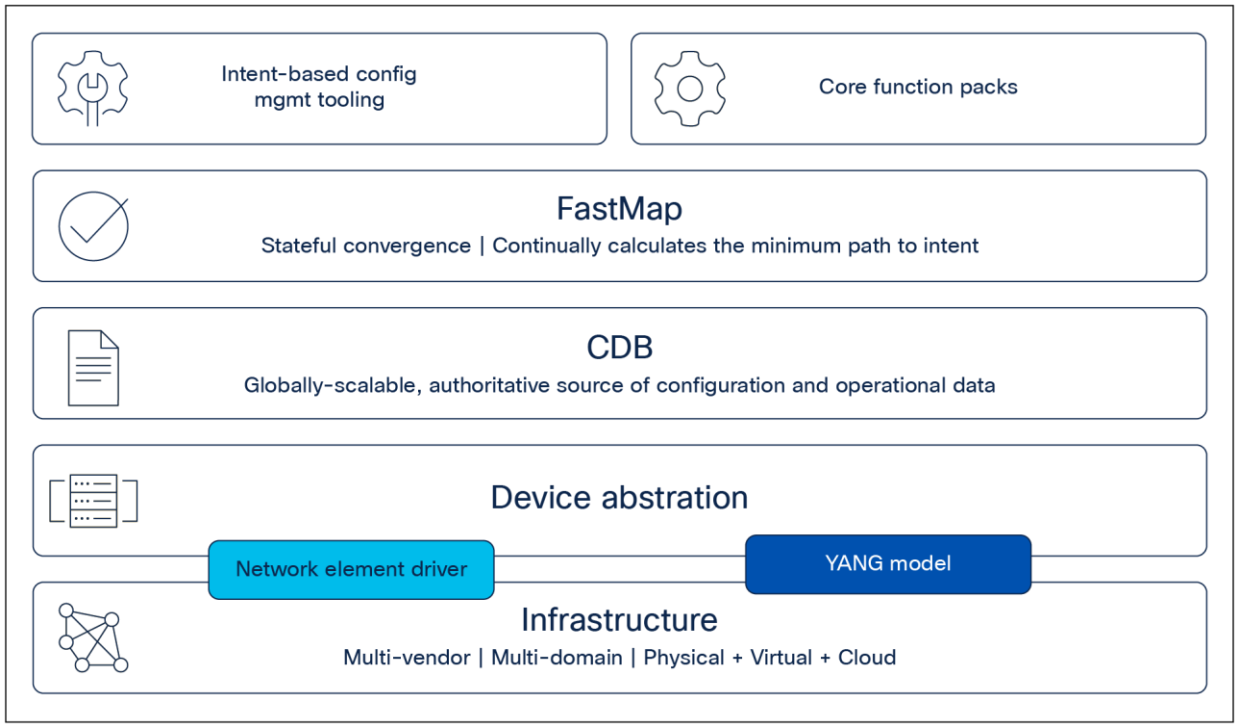

Figure 1.
NEDs in Cisco NSO

Drivers are rendered based on a Yet Another Next Generation (YANG) data model, which provides several benefits:

- Drastically shortened development and update cycles: In other systems, adaptors are normally handcrafted. In NSO, however, the NEDs are rendered from a YANG data model that can automatically generate the corresponding commands, such as CLI commands. Typically adding new commands to an existing NED takes a couple of weeks, and creating a new NED takes six to eight weeks. This may however vary with the size and complexity of the configuration.
- Uniform data model across the network: Across the NSO interfaces and APIs, it appears as though all devices support YANG, although the underlying mechanism can be CLI or REST, for example.
- NSO NEDs also provide transactionality for nontransactional devices. The NSO transactional engine can drive the NEDs to do atomic changes and rollback on failure, even when a device has no native support for transactions. Transactional behaviour significantly reduces the volume of code, cost of development and maintenance, and time to market for your service applications.

Table 1. Snapshot of available NEDs

Cisco and third-party NSO NEDs			
A10 ACOS	Cisco DCNM	Coriant SDNTC	Overture 5K
Accedian NID	Cisco ESA	Datacom DM	Overture 6K
ADTRAN AOS	Cisco GSS	F5 BigIP	Palo Alto Networks Panos
Adva-825	Cisco IOS & IOS XE	F5 BigIQ	Procera PLOS
Affirmed Acuitas	Cisco IOS XR	Fortinet FW	Quagga BGP AOS
Amazon AWS	Cisco ME1200	HPE VCM	Redback SE
Arista EOS	Cisco ME4600	Huawei iManager	Riverbed Steelhead
Avi Vantage	Cisco Meraki	Huawei VRP	Secure64 SourceT
Aviat	Cisco NXOS	IDirect Pulse	Sumitomo EPON
Brocade Ironware	Cisco PNR	Infoblox	Telco Systems Binox
Brocade NOS	Cisco QPS	Juniper JunOS	Unix Bind
Ceragon IP10	Cisco SMA	MRV Optiswitch	VmWare Vcenter
Checkpoint	Cisco STAROS	Nokia OmniSwitch	Vyatta VC
Ciena ESM	Cisco UCS	Nokia SAM	ZenOSS
Ciena SAOS	Cisco WAAS	Nokia SR	ZTE XPON
Cisco Aireos	Cisco WSA	OneAccess OneOS	
Cisco APIC DC (ACI)	Citrix Netscaler	Openstack	
Cisco ASA	Clavister COS	Overture 1400	

Note that the NEDs listed in Table 1 is a subset of those available as of April 2023. New NED types are added every month resulting from customer requests.

Table 2. Features and benefits

Feature	Benefit
Multivendor library	Orchestrate the Cisco network, as well as all other major vendors.
Rendering from data models	Turn around new or updated NEDs in days or weeks.
YANG data models	Abstract vendor protocols for significantly faster service definitions and OSS integrations.
Transactionality	Reduce error handling.

Multivendor service agility

Cisco NSO enabled by Tail-f simplifies the process of provisioning and controlling applications and services in both physical and virtual networks. It decouples network services from specific components, while automatically configuring the network according to the service specifications.

Few other products on the market can perform network service orchestration with the multivendor capabilities supported by the NEDs. Real networks are always a mix of vendors. To reduce cost and introduce new capabilities, this mix is constantly changing, and devices are upgraded. If an orchestrator cannot address these changes, the network very soon degrades.

Because the list of NSO NEDs is constantly growing, the Cisco NSO allows true multivendor service agility as changes are implemented, today and in the future.

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