Network Element Drivers for Cisco NSO Enabled by Tail-f

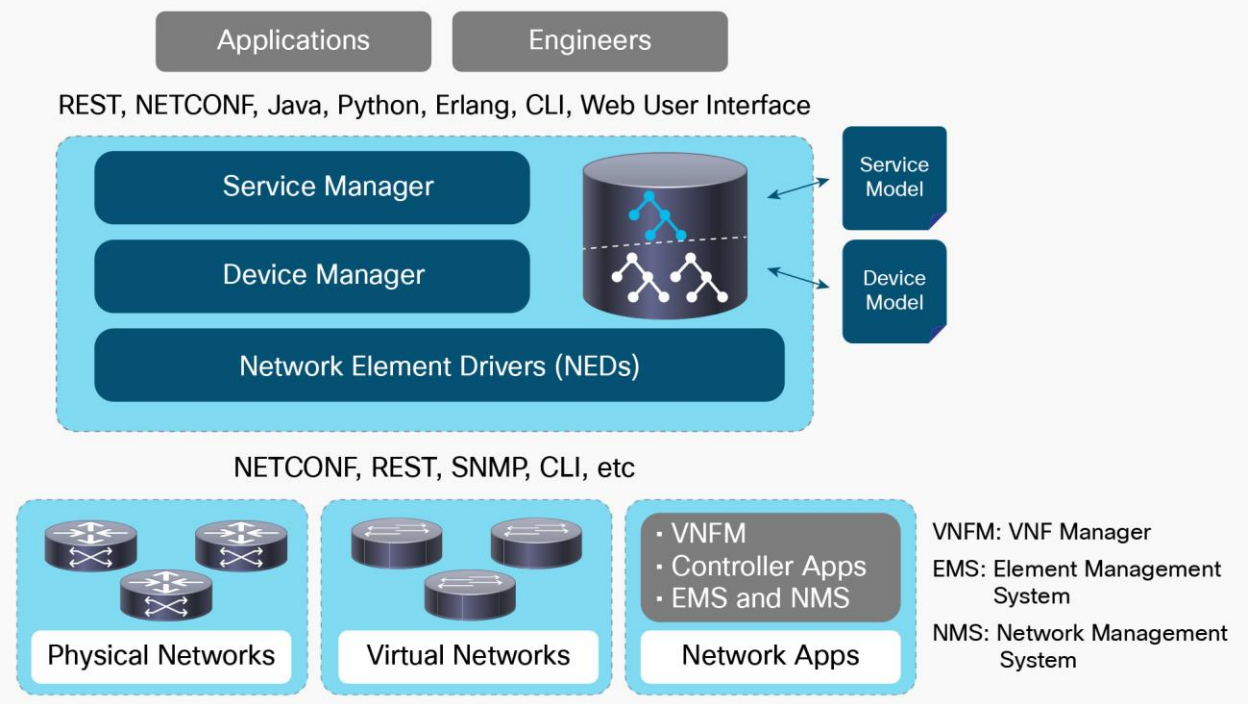
Exceptional Multivendor Support through Network Elements Drivers

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.
- If the device offers a NETCONF/YANG interface then no development is required, as the NED can be generated automatically from the device model. In this case there is no charge for the NED, so integration is free!
- 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 Aireos	Affirmed Acuitas	Huawei VRP
Cisco APIC DC (ACI)	ALU OmniSwitch	IDirect Pulse
Cisco ASA	ALU SAM	Infoblox
Cisco DCNM	ALU SR	Juniper JunOS
Cisco ESA	Amazon AWS	MRV Optiswitch
Cisco GSS	Arista EOS	OneAccess OneOS
Cisco IOS & IOS XE	Avi Vantage	Openstack
Cisco IOS XR	Aviat	Overture 1400
Cisco ME1200	Brocade Ironware	Overture 5K
Cisco ME4600	Brocade NOS	Overture 6K
Cisco Meraki	Ceragon IP10	Palo Alto Networks Panos
Cisco NXOS	Checkpoint	Procera PLOS
Cisco PNR	Ciena ESM	Quagga BGP AOS
Cisco QPS	Ciena SAOS	Redback SE
Cisco SMA	Citrix Netscaler	Riverbed Steelhead
Cisco STAROS	Clavister COS	Secure64 SourceT
Cisco UCS	Coriant SDNTC	Sumitomo EPON
Cisco WAAS	Datacom DM	Telco Systems Binox
Cisco WSA	F5 BigIP	Unix Bind
A10 ACOS	F5 BigIQ	VmWare Vcenter
Accedian NID	Fortinet FW	Vyatta VC
ADTRAN AOS	HPE VCM	ZenOSS
Adva-825	Huawei iManager	ZTE XPON

Note that the NEDs listed in Table 1 is a subset of those available as of July 2017. 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.
Low cost of device integration	NETCONF/YANG NEDs are generally free, and NEDs for legacy protocols are sold at a fixed price without recurring development charges.

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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