Infrastructure Overview

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About Model-Driven Programmability

The model-driven programmability of the NX-OS device allows you to automate the configuration and control of the device.

Data Modeling

Data modeling provides a programmatic and standards-based method of writing configurations to the network device, replacing the process of manual configuration. Data models are written in a standard, industry-defined language. Although configuration using a CLI may be more human-friendly, automating the configuration using data models results in better scalability.

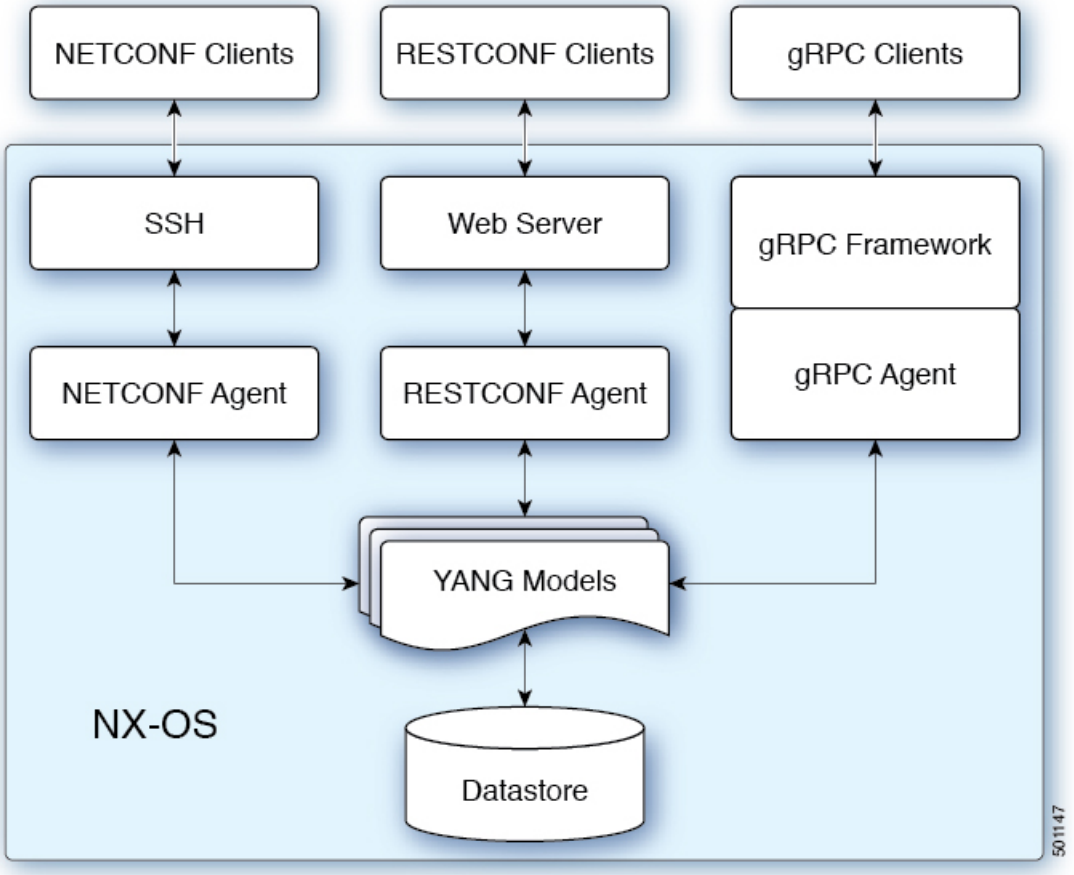
The Cisco NX-OS device supports the YANG data modeling language. YANG is a data modeling language used to describe configuration and operational data, remote procedure calls, and notifications for network devices.

Programmable Interfaces

Three standards-based programmable interfaces are supported by NX-OS for operations on the data model: NETCONF, RESTConf, and gRPC.

About the Programmable Interface Infrastructure

This section provides a brief overview of the NX-OS Programmable Interface infrastructure.



When a request is received whether via NETCONF, RESTConf, or gRPC, the request is converted into an abstract message object. That message object is distributed to the underlying model infrastructure based on the namespace in the request. Using the namespace, the appropriate model is selected and the request is passed to it for processing. The model infrastructure executes the request (read or write) on the device datastore. The results are returned to the agent of origin for response transmission back to the requesting client.

NX-OS Programmable Interface Agents

Agents provide an interface between the Device and clients. They specify the transport, the protocol, and the encoding of the communications with the Device. NX-OS Programmable Interfaces support three agents: NETCONF, RESTConf, and gRPC, each providing different interfaces for configuration management of the Device via YANG models.

Note Supported YANG models for each Cisco NX-OS release are provided at https://devhub.cisco.com/artifactory/open-nxos-agents.

Table 1: NX-OS Programmable Interface Agents

Agent	Transport	Protocol	Encoding
NETCONF	SSH		XML
RESTConf	HTTP	draft-ietf-netconf-restconf-10[1]	XML or JSON
gRPC	HTTP	gRPC Protocol Spec[2]	Google Protobuf

The protocol specifications are described in the following documents:

- [1] RESTCONF Protocol draft-ietf-netconf-restconf-10 https://tools.ietf.org/html/draft-ietf-netconf-restconf-10
- [2] Cisco NX-OS gRPC Protocol Specification

Model Infrastructure

The Model Infrastructure takes requests that are received from the Agent, determines the namespace that is associated with the YANG model in the request, and selects the model component matching the namespace to process the request. When the selected model component completes request processing, the processing results are sent to the requesting Agent for transmission back to the client. The Model Infrastructure is also responsible for handling protocol initiation requests involving authentication, handshaking, and so on, as specified by the Agent protocol.

Device YANG Model

The Device Configuration is described in a YANG model that is called a Device Model. The Device Model is manifested in the Model Infrastructure as another model component with the Device namespace.

Common YANG Models

A Common Model is another kind of model component that contains within its elements, YANG Paths to the equivalent Device Model elements. These equivalent Device Model elements are used to read and write Device Model data in the Device YANG context.

Additional YANG References

Additional information about YANG can be found at the *YANG Central Wiki* https://handwiki.org/wiki/YANG (M. Bjorklund, Ed.)