# Infrastructure Overview

## 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.
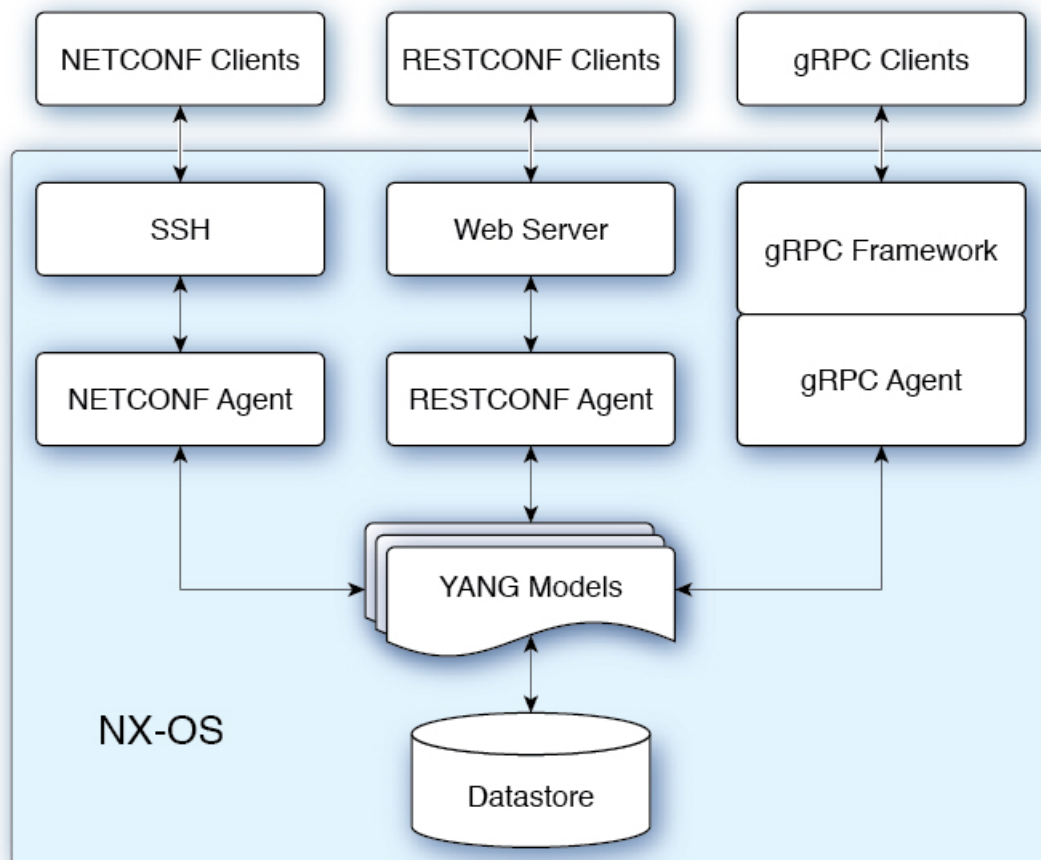
When a request is received whether via NETCONF, RESTConf, or gRPC, the request is converted into an abstract message object that distributed to the underlying model infrastructure based on the namespace in the request. Using the namespace, the appropriate model is selected and the request is passed to it for processing. The model infrastructure executes the request (read or write) on the device data store returning the results 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 supports 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 | RFC 6241[1] | XML |
| RESTConf | HTTP | draft-ietf-netconf-restconf-10[2] | XML or JSON |
| gRPC | HTTP | gRPC Protocol Spec[3] | Google Protobuf |

The protocol specifications are described in the following documents:

- [1] R. Enns, Ed., RFC6241: *Network Configuration Protocol (NETCONF)* http://www.rfc-editor.org/rfc/rfc6241.txt

- [2] RESTCONF Protocol draft-ietf-netconf-restconf-10 https://tools.ietf.org/html/draft-ietf-netconf-restconf-10

- [3] Cisco NX-OS gRPC Protocol Specification

### Model Infrastructure

The Model Infrastructure takes requests received from the Agent, determines the namespace 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 forth as specified by the Agent protocol.

### Device YANG Model

The Device Configuration is described in a YANG model 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

The YANG modeling language is described in the following document: M. Bjorklund, Ed., RFC6020: *YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)* http://www.rfc-editor.org/rfc/rfc6020.txt

Additional information about YANG can be found at the *YANG Central Wiki* http://www.yang-central.org/twiki/bin/view/Main/WebHome (M. Bjorklund, Ed.)