# Cisco Extensible Network Controller (XNC)

## Overview

With the exponential growth in network traffic, customers are looking for a solution that can intelligently route and monitor traffic for critical applications, making the network application aware. Cisco is addressing such business requirements by introducing programmability functions on its platforms and Software-defined networking (SDN).

SDN is an approach to programmable networks that separates and abstracts some of the control-plane functions from the network devices and places them in a centralized controller. To accommodate adoption of SDN in both existing (brownfield) and new (greenfield) networks, Cisco has taken a hybrid approach.

In this approach, some traditional control-plane functions will continue to exist in the network devices for conventional network operations, and some will be extracted to a centralized external controller to accommodate SDN solutions. Cisco Extensible Network Controller (XNC) address these requirements and emerging trends by providing much greater automation and orchestration of the network fabric, and by allowing dynamic, application-driven configuration of networks and services.

The Cisco® XNC is a software application built on OpenDaylight, and is the first commercial version of OpenDaylight controller. It can run on Linux-based x86 server, such as Cisco Unified Computing System™ (Cisco UCS®). Adding Cisco XNC to the network allows network operators to directly connect to business applications and automate specific network behavior changes using the applications and a single management pane. The Cisco XNC provides APIs based on programming languages such as Java and bidirectional Representational State Transfer (REST) to facilitate direct connection between business applications and controller. These APIs are commonly referred to as northbound interfaces.

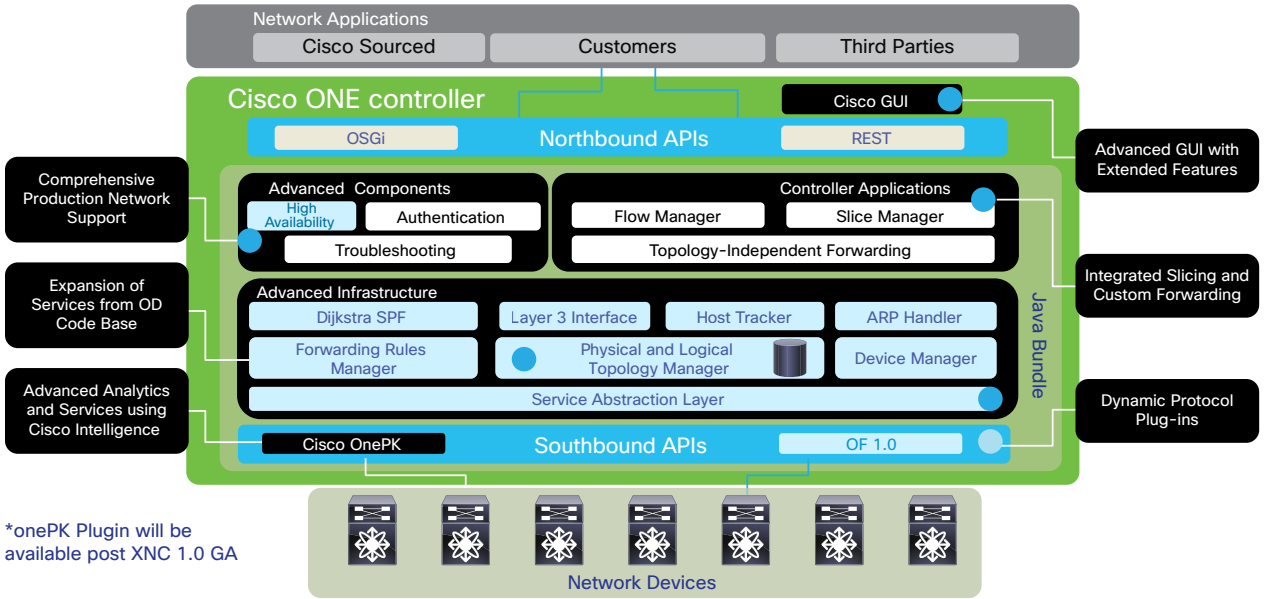
The Cisco XNC uses policies that can be configured using northbound interfaces to push forwarding rules onto the network devices based on decisions that the business applications make about how the network should behave. The controller communicates with the network devices using southbound interfaces. The Cisco XNC is capable of supporting multiple southbound protocols, and in the first version it supports both OpenFlow and Cisco ONE Platform Kit (onePK).

## Cisco XNC Architecture and Main Features

The Cisco XNC uses the Open Services Gateway initiative (OSGi) framework, which provides the modularity and extensibility required for business-critical applications. Applications or components on the controller can be dynamically installed, started, stopped, updated, and uninstalled without the need to restart the controller, providing native In Service Software Upgrade (ISSU). This capability is an important consideration when deploying SDN-based controllers in a production network, because in such environments, massive removal and replacement of components is often not an option.

Figure 1 presents a high-level view of the Cisco XNC architecture.

**Figure 1.** Cisco XNC Architecture

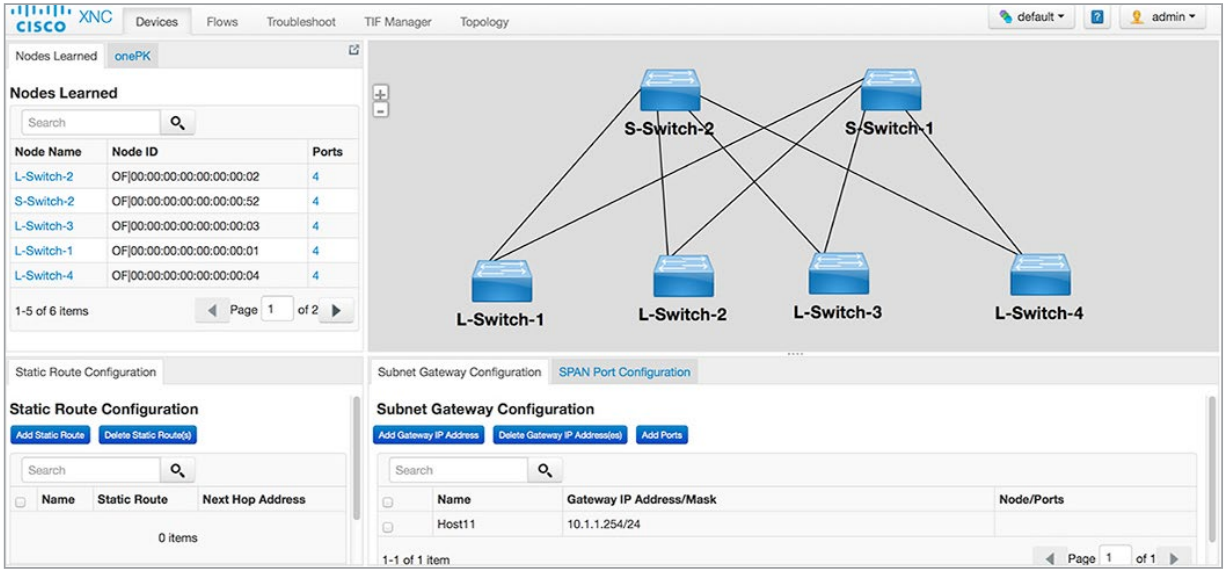


The Cisco XNC provides the following main functions:

- The industry's first multiprotocol interface support capability using OpenFlow and Cisco onePK[1]
- Functions to support network visibility and programmability, such as network topology discovery, network device management, and forwarding rules programming, plus access to detailed network statistics
- Service abstraction layer (SAL), which enables Extensible southbound interface support, such as support for OpenFlow and Cisco onePK
- Consistent management access through the GUI or through Java or REST northbound APIs
- High Availability using active-active deployment model
- Security features such as role-based access control (RBAC); integration with the enterprise authentication, authorization, and accounting (AAA) infrastructure; and secure control protocols
- Troubleshooting tools that provide flow-level visibility for each device

The Cisco XNC comes with a built-in GUI. Figure 2 shows an example of the GUI and its layout.

**Figure 2.** Cisco XNC GUI




## Cisco XNC Applications

The following three applications are available in Cisco XNC 1.0:

- **Monitor Manager:** Application that applies the SDN approach to provide visibility into the network traffic
- **Network Slicing:** Capability to partition the network based on physical or logical (flow) criteria
- **Topology Independent Forwarding (TIF):** Ability to define forwarding path in the network based on application requirements

[1]Cisco onePK Plugin will be made available post XNC 1.0 GA

Table 1 Summarizes the problem statement and key features/benefits for each application

| Application | Problem Statement | Features/Benefits |
|---|---|---|
| **Monitor Manager** | IT departments need to find ways to maintain visibility into the traffic in scalable and event driven manner as there massive increases in data going through the datacenter. Cisco addresses this requirement and challenges that exist with conventional tapping approach using Cisco XNC, Monitor Manager application and Nexus 3000 switches. | Cisco's SDN based solution address the challenges that exists with conventional tapping approaches:<br>• Replacement of purpose-built hardware with familiar production switches saves capital expenditures (CapEx) and operating expenses (OpEx) over time, also increasing the scalability of the solution.<br>• SDN enables the controller to enforce policy in real time and through event-based activities.<br>• Controller northbound interfaces provide a programmatic option to develop custom tools to capture traffic details and trigger policies dynamically. |
| **Network Slicing** | As enterprise IT infrastructure expands, customers are looking for ways to create logical network separation that goes beyond VLANs and also can be created programmatically on an as needed basis. | Network Slicing allows the network administrator to partition the network based on physical and logical criteria for multiple user communities. Slicing provides the logical separation required to manage the network traffic domains. A slice can be based on:<br>• Network devices (a network device can be shared by multiple slices)<br>• Network device interfaces (an interface can be shared by multiple slices)<br>• Flow specification (source and destination IP addresses, protocol, or source and destination TCP ports)<br>Two or more slices can share the same physical switch and interface, because each data flow is individually assigned to a slice based on the flow specification |
| **Topology Independent Forwarding** | As network traffic increases, using conventional techniques, IT administrators are finding it impossible to configure and maintain traffic forwarding path for mission critical applications. | Topology Independent Forwarding application on Cisco XNC allows IT administrators to configure forwarding path not only using conventional metrics but also other custom metrics such as bandwidth, monetary cost for the link, etc., TIF includes logic that is capable of computing the optimal path, based on a given property and criteria there by making network application ware or network aware applications can request forwarding path meeting certain criteria before sending the traffic, there by enhancing the application experience for the end users. |

## For More Information

For more information about the Cisco XNC, visit http://www.cisco.com/go/xnc or contact your local account representative.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