Cisco and Red Hat: Application Centric Infrastructure Integration with OpenStack

Cisco and Red Hat Extend the Cisco ACI Policy Framework to Red Hat Enterprise Linux OpenStack Platform Enabled Environments

Overview

Cisco and Red Hat are collaborating to offer customers an Application Centric Infrastructure (ACI) that is integrated with Red Hat Enterprise Linux OpenStack Platform (RHEL OpenStack Platform). The solution will enable the next-generation cloud deployments that drive business agility, lower operational costs and avoid vendor lock-in.

Cisco's vision for ACI is to provide highly flexible application policy and infrastructure control that can dramatically accelerate application deployment and operations through centralized configuration, testing, monitoring of network connectivity, security and other L4-7 services. Red Hat is a leading supplier of open source solutions offering compelling enterprise ready OpenStack cloud solutions through RHEL OpenStack Platform. Together, Cisco and Red Hat are extending the Cisco ACI policy framework to OpenStack environments, to enable customers to build rich application driven network policies in their cloud environments.

Cisco and Red Hat offer a certified, supported, turn-key ACI based OpenStack solution. This solution enables customers to deploy the full range of service and deployment models with OpenStack to meet the most demanding needs of their cloud deployments.

Challenges

Businesses today are unable to scale cost-effectively. Increasingly, they are looking for innovative, open technologies to reduce costs and avoid vendor lock-in while maintaining existing infrastructure investments.

In addition, new cloud applications with mobile, social and big data workloads are much more dynamic due to higher demand peaks, more distributed users, broader device support, varying performance needs, 24x7 global usage and changing security vulnerabilities. Furthermore, to run economically at scale with performance and availability, these applications need a mix of virtualized and dedicated, "bare-metal" resources.

In order to simplify IT operations and bridge across different technology and organizational silos such as network, compute, storage, application, security, cloud, there is a need to provide a unified interface for policy, orchestration, reporting and automation across their physical, virtual and cloud infrastructure.

Enterprise and IT leaders want solutions based on OpenStack as their unified interface to swiftly deploy and scale IT infrastructure without sacrificing security or performance. They are looking for OpenStack integrated solutions that deliver on the flexibility and speed of software, without compromising on the performance and scale of hardware.

Increasingly, customers expect OpenStack to evolve and provide the same level of richness provided today by the leading cloud infrastructure vendors. They are looking for leading infrastructure vendors to embrace OpenStack and enable the functionality and reliability they need for their cloud environments.

Solution: Integrating Cisco ACI fabric with Red Hat Open Stack

Cisco's ACI Fabric has three critical integration RHEL OpenStack Platform and Red Hat Enterprise Linux. These solutions tie together the APIC and ACI Fabric, RHEL OpenStack Platform, and the KVM hypervisor running Open vSwitch with OpFlex.

APIC Driver for Neutron

APIC Driver for Neutron is one of the key components of the joint integration. The APIC Driver run alongside the Open vSwitch Driver in the ML2 plugin transparently communicating with the APIC's open APIs. The solution supports the standard Neutron interfaces includes networks, routers, and security groups and transparently generates application profiles based on Neutron configuration. Behind the scenes, the APIC then automates network policy enforcement, instantiating policies as needed within the physical infrastructure as virtual machines are created. This approach allows users to leverage existing investments in OpenStack automation and APIs while leveraging the APIC as an operational console across the physical and virtual networking environments.
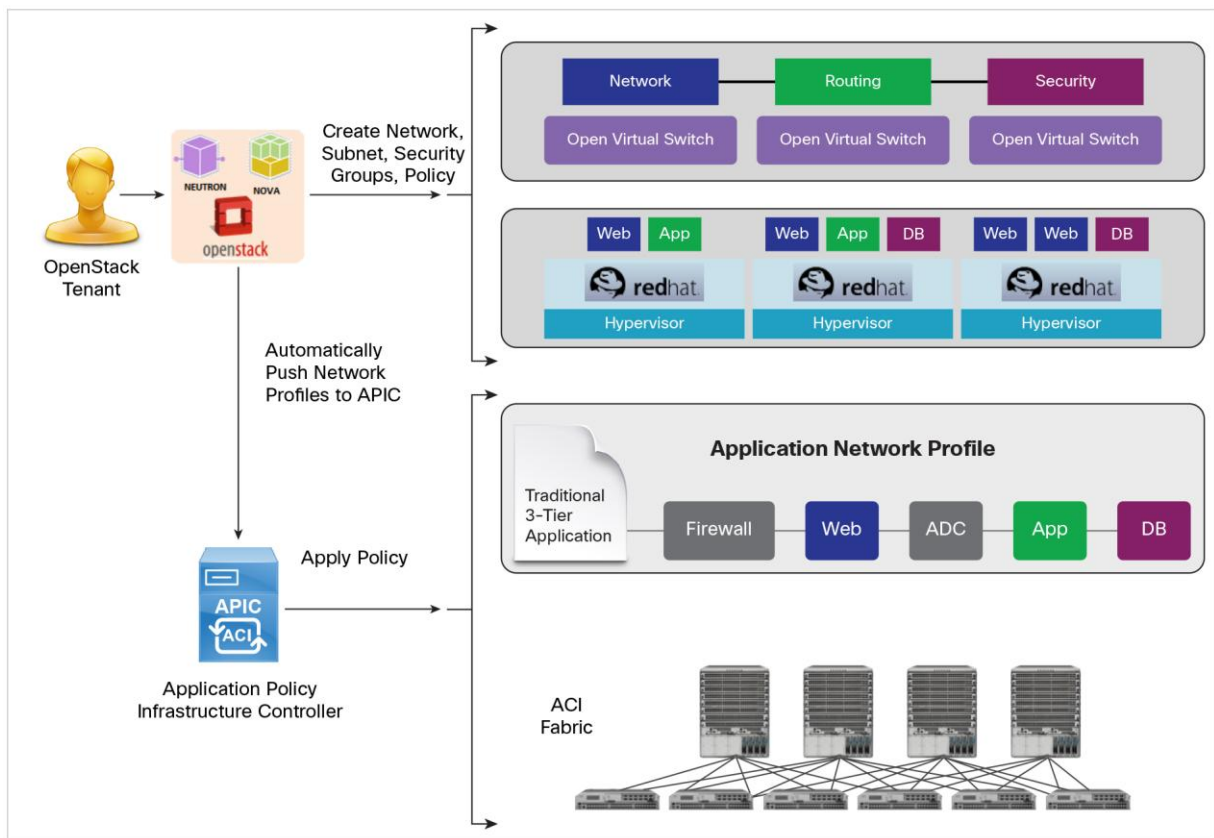
The APIC Driver is tested and certified on RHEL OpenStack Platform without modifications to the OVS Driver or Open vSwitch.

The solution is described in Figure 1

Figure 1: Cisco APIC Integration with RHEL OpenStack Platform
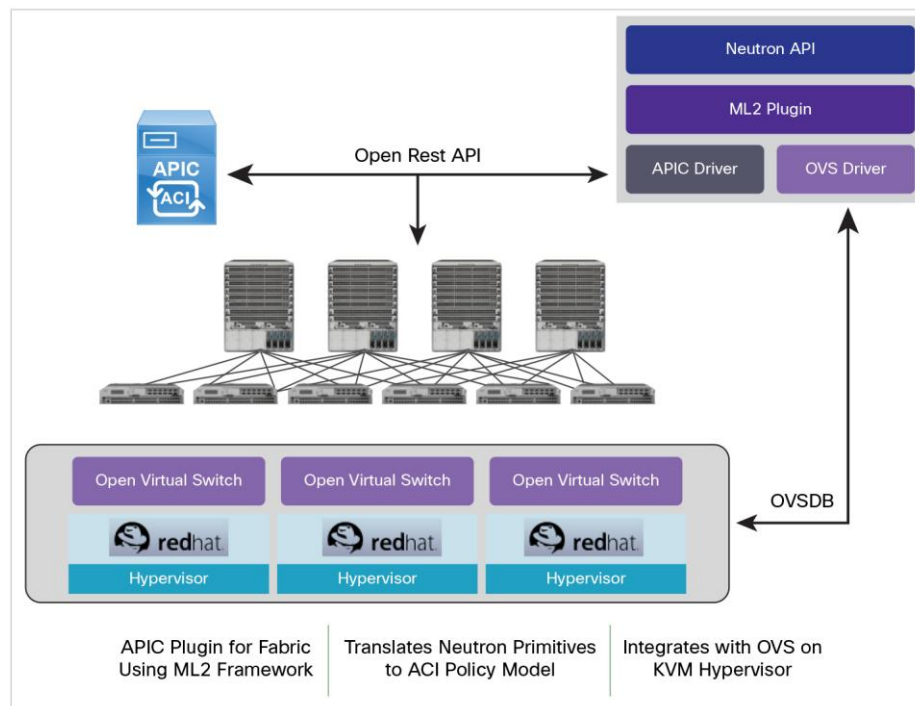
**Figure 2:** Cisco ACI Integration with RHEL OpenStack Platform

Group-Based Policy

Red Hat and Cisco have also collaborated to create a set of policy extensions for OpenStack called Group-Based Policy (GBP). GBP offers a policy API that runs on top of Neutron and can be used with any existing Neutron plugin or directly connected to a policy-enabled SDN controller such as APIC. GBP runs within the RHEL OpenStack environment, offering users a new policy API through CLI, Horizon, and Heat integration.

GBP brings a powerful new feature set to the RHEL OpenStack environment. It allows users to directly create application-centric models in their OpenStack clouds by creating Groups, Policy Rule sets, and Service Chains. These primitives capture the relationships between services running in the OpenStack cloud and hide the complexity of the underlying infrastructure. When used with APIC, GBP brings forward the full power of ACI's policy model and network service automation.

GBP will be available with APIC starting with the RHEL OpenStack Platform 6 release.

Figure 3: OpenStack GBP Architecture
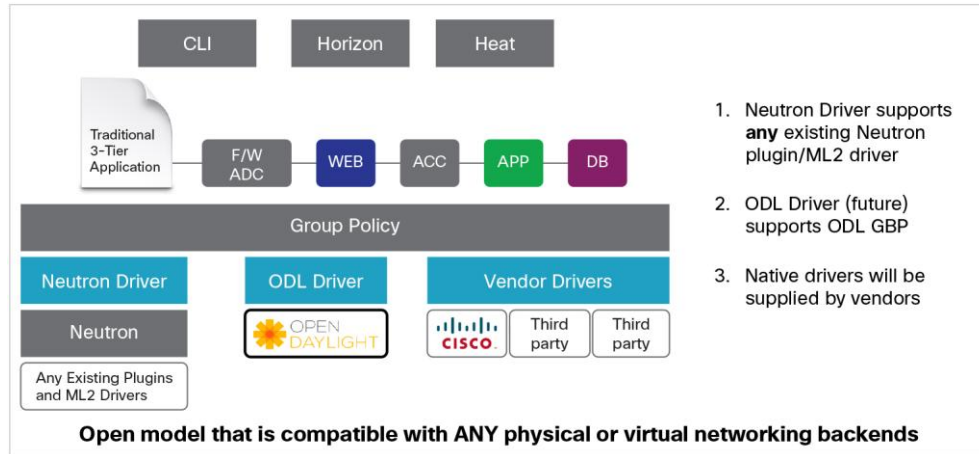
OpFlex and Open vSwitch

Finally, Cisco and Red Hat are collaborating to extend ACI policies directly into the KVM hypervisor and enforce them through Open vSwitch. This integration is built around OpFlex, an open policy protocol designed to exchange policy between a controller and network devices. The joint solution includes an OpFlex agent running within the Red Hat Enterprise Linux hypervisor, which is capable of communicating with an OpFlex proxy running inside the Nexus 9000 switches. The OpFlex agent for Open vSwitch, which is 100% open source, receives policy commands from Cisco ACI and converts them into OpenFlow commands that can be directly enforced through the Open vSwitch to allow local policy enforcement.

The end result is a unified policy solution that stretches across the physical and virtual networking environment. OpFlex and Open vSwitch integration will be available in the second half of 2015.

Figure 4: OpFlex Hypervisor Switch Integration
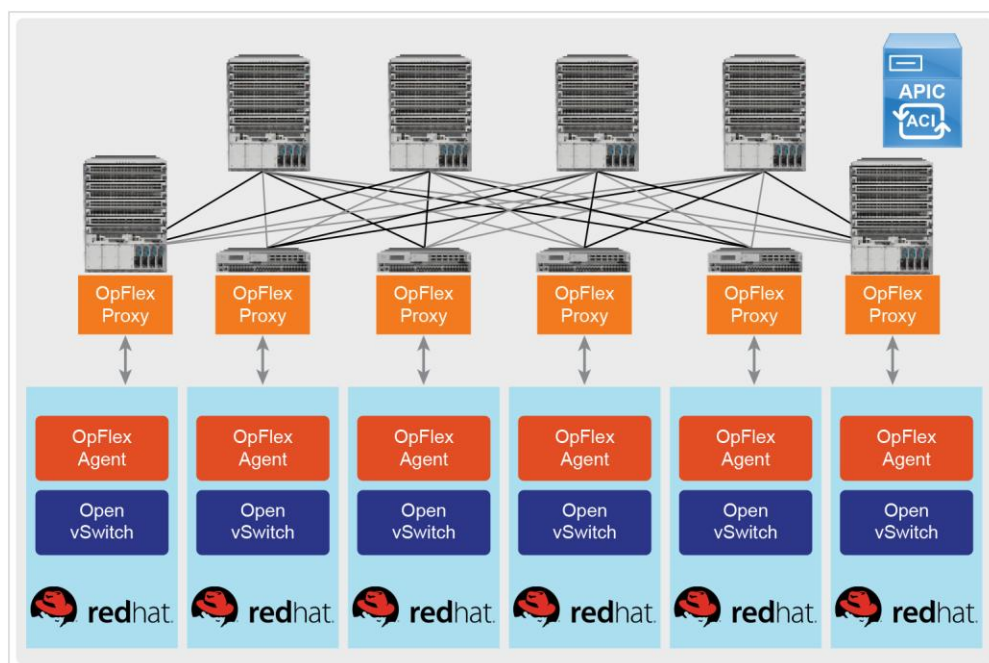
Solution Benefits

Cisco ACI integration with RHEL OpenStack Platform delivers the following benefits:

- Provides certified, supported, integrated, and deployable solution for running RHEL OpenStack Platform on application centric networking infrastructure

- Simplifies and accelerates deployment and management of applications and infrastructure in private, public, and hybrid clouds using OpenStack

- Enables scalability, performance, and agility in cloud environments by combining the flexibility of software (RHEL OpenStack Platform and Cisco ACI) with the performance of hardware (Cisco ACI)

- Provides the capability to build comprehensive application-based network policies in the cloud

- Benefits the open source community through the evolution of network concepts using extensions to the OpenStack networking model to achieve a more application centric infrastructure

- Provides enhanced automation and programmability capabilities through open APIs to enable a broader ecosystem

For More Information

- Cisco ACI strategy: http://www.cisco.com/go/aci

- Red Hat: http://www.redhat.com/products/enterprise-linux/openstack-platform/

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