White Paper

Benefits of Cisco Application Centric Infrastructure and OpenStack

What You Will Learn

Data center infrastructure is quickly transitioning from an environment that supports relatively static workloads confined to specific infrastructure silos to a highly dynamic cloud environment in which any workload can be provisioned anywhere and can scale on demand according to application needs. This transition is an exciting one and will undoubtedly empower developers to build the next generation of IT applications. However, it also places new requirements on the computing, storage, and network infrastructure.

Cisco® Application Centric Infrastructure (ACI) and OpenStack were both designed to help IT administrators navigate this transition to cloud architecture. Cisco ACI offers an exciting, new approach to managing infrastructure designed to increase flexibility, scalability, and performance through a centralized policy-based framework. The solution was designed to span both physical and virtual infrastructure while still providing deep visibility and real-time telemetry. Additionally, Cisco ACI was built for open APIs to allow integration with both new and existing infrastructure components.

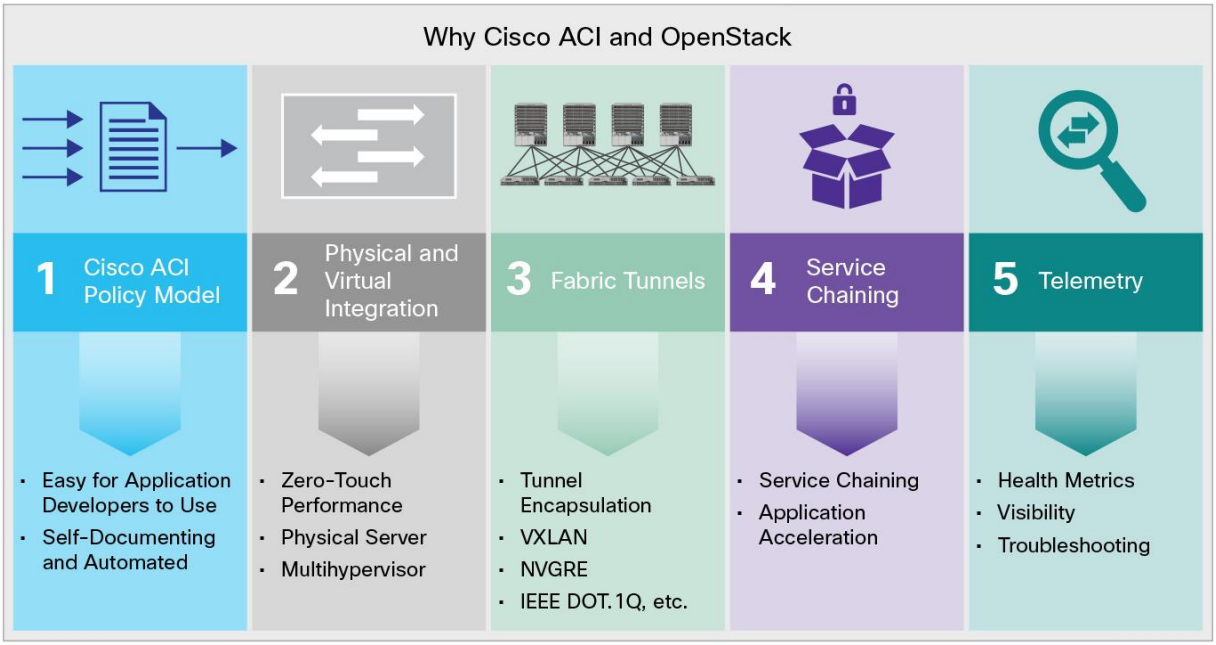
OpenStack is the leading open source cloud orchestration tool available today and is backed by a growing community of more than 125 companies. OpenStack was designed as a building block for public and private clouds, allowing automated management of computing, storage, and networking resources in a very flexible manner.

Cisco has developed an open source plug-in for OpenStack Neutron that allows OpenStack tenants to transparently configure and manage a network based on Cisco ACI. This plug-in, Cisco Application Policy Infrastructure Controller (APIC), automatically translates OpenStack Neutron API commands for networks, subnets, routers, etc. into an application network profile. The goal of this document is to discuss the advantages of deploying Cisco ACI and OpenStack for both tenants and cloud operators and the collaborations this solution allows.

Main Benefits

The Cisco ACI network fabric and OpenStack environment offer five main benefits (Figure 1).

Figure 1. Benefits of Cisco ACI and OpenStack



Cisco ACI Policy Model

In a Cisco ACI network fabric, the applications running on the network are coupled with a policy that defines communication between application components and the outside world. This workflow is achieved through an abstract application-centric policy language, which can be translated into concrete network requirements such as VLANs, subnets, and application control lists (ACLs). By introducing this concept of policy, Cisco ACI allows application developers to succinctly and easily describe their network requirements, with these requirements transparently mapped to network hardware. This process allows both network and application developers to use a common requirements language and ultimately accelerate application deployment. This approach can augment, or in the future even replace, OpenStack's current networking APIs, which are very network centric and based on VLANs, subnets, and ACLs.

Physical and Virtual Integration

Cisco ACI was designed to bring together physical and virtual networking to offer an end-to-end solution. For example, Cisco ACI provides transparent support for a mission-critical physical database workload working in conjunction with virtualized web servers and applications. This feature allows operators to support multiple hypervisors, including Citrix Xen, Linux Kernel-based Virtual Machine (KVM), VMware hypervisors, and Microsoft Hyper-V, and connect physical servers on the same Cisco ACI network fabric. As open projects such as OpenStack Ironic continue to evolve, the capability to span these different environments will become an essential element of any cloud. The Cisco ACI network fabric allows OpenStack Neutron networks to transparently span physical and multihypervisor virtual environments.

Fabric Tunnels

Cisco ACI was also designed to offer a hardware-based tunneling environment that does not need to be configured device by device. This approach offers full line-rate performance with no penalty on the hypervisor and the capability to manage physical and virtual environments in the same way. Tunnels are automatically established within the network fabric, and any form of encapsulation (Virtual Extensible LAN [VXLAN], Network Virtualization using Generic Routing Encapsulation [NVGRE], or VLAN) can be passed in as input. The Cisco ACI network fabric is a normalization gateway capable of understanding the different overlay encapsulations and establishing communication between them. The result is very simple administration without the need to compromise performance, scalability, or flexibility.

Service Chaining

The Cisco ACI fabric offers a native service-chaining capability that allows a user to transparently insert or remove services between two endpoints. Furthermore, the Cisco ACI fabric can be configured in real time using the API of the service layer appliance, such as a firewall, load balancer, application delivery controller (ADC), etc. This capability allows both tenants and administrators to deploy complex applications and security policies in a fully automated manner across best-in-class infrastructure. This capability is available through Cisco APIC, and accessibility through OpenStack API extensions is currently in development. Because the Cisco ACI fabric is designed to span physical and virtual infrastructure, the service-chaining function can be applied to physical network service devices as well as virtualized devices running on any supported hypervisor.

Telemetry

Cisco ACI is designed to offer a combination of software and hardware that can provide real-time hop-by-hop visibility and telemetry. Cisco APIC can present detailed information about the performance of individual endpoint groups and tenants in the network. This information includes details about latency, packet drops, and traffic paths and can be sliced at the group or tenant level. Telemetry information can be useful for a wide range of troubleshooting and debugging tasks, allowing an operator to quickly identify the source of a tenant problem across physical and virtual infrastructure. When compared to overlay-based network virtualization with separate overlay and underlay networks, Cisco ACI offers a network that is easier to manage and that can be debugged more efficiently: an extremely valuable feature because it allows intertenant and intratenant networking problems to be identified and resolved quickly.

Conclusion

The Cisco ACI fabric offers a complete and mature foundation for deployment of an OpenStack cloud environment, from a small scale to large scale. It offers telemetry capabilities for troubleshooting, service chaining, fabric tunnels, physical and virtual server integration, and quick time to deployment with an application-centric policy model. Cisco ACI network fabric is designed to offer the flexibility, performance, and scalability required for a dynamic cloud environment and includes a comprehensive set of open APIs that enable tight integration with the OpenStack platform. The Cisco APIC plug-in is available as an open source project component and supports major distributions of OpenStack from the Ice House release, including Canonical, Red Hat, and Mirantis distributions.

For More Information

For More Information, go to: http://www.cisco.com/go/aci.

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Printed in USA C11-732041-00 06/14