THE ALCATEL-LUCENT ENTERPRISE OMNISWITCH PLATFORM WITH OPENFLOW: OPTIMIZING NETWORKS FOR CRITICAL APPLICATIONS

APPLICATION NOTE

Alcatel·Lucent
Enterprise

EXECUTIVE SUMMARY

Network architects are starting to adopt software defined networking (SDN) principles as they seek ways to maximize their Ethernet networks to support the business-critical applications. The dynamic nature of virtualized computing requires complex software systems to manage both servers and Ethernet networks. SDN has become the chosen method to solve these issues by offering a programmatic way for application requirements to influence and even direct the operations of network infrastructure.

OpenFlow™ is a widely used protocol in SDN-enabled networks. The OpenFlow protocol allows a special computer system called a controller to direct the flow of traffic in a network. Each network device supporting OpenFlow implements a software task called an agent, which is responsible for communicating through the OpenFlow protocol with a controller. The agent software translates OpenFlow protocol commands from the controller into the appropriate settings on its host device. This allows the controller to produce consistent, network-wide operation without relying on the devices to make independent decisions.

Controllers, by themselves, do not determine the requirements of the network. A controller typically has extensible programming interfaces, called northbound interfaces, that allow network operators and external systems, such as application servers, to build customized forwarding rules that best match application needs. These interfaces allow the controller to change the network operation in response to the evolving needs of the applications or virtualized resources that the Ethernet network infrastructure serves. Alcatel-Lucent Enterprise has implemented OpenFlow capabilities on its OmniSwitch™ platforms, allowing network architects to design SDN-based solutions.
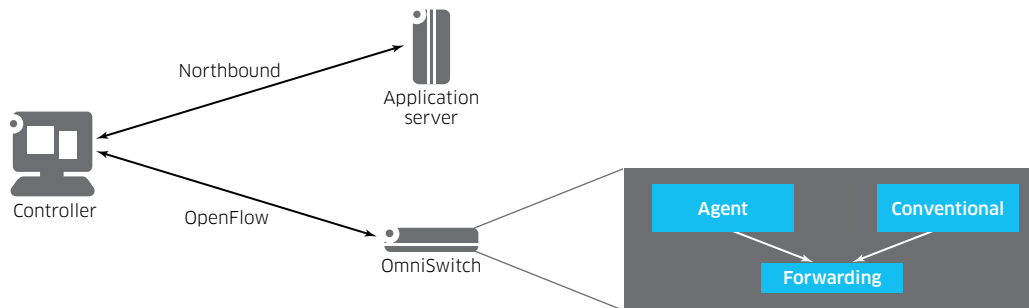
OMNISWITCH OPENFLOW CAPABILITIES

OpenFlow on the supported OmniSwitch local area network (LAN) switching platforms is built to provide network architects a flexible way to integrate these switches in an SDN. The OmniSwitch software supports the OpenFlow 1.0 and 1.3.1 versions of the protocol. It has been tested to work with various controllers, including Floodlight.

The OmniSwitch supports a hybrid approach to OpenFlow, a flexible way to rely on both conventional and controller-based switch operation. An OmniSwitch can be divided between conventional and OpenFlow-based operation on a port-by-port basis. In addition, up to three different controllers can manage designated ports trough OpenFlow. Ports assigned to controllers operate completely under the control of OpenFlow and are not affected by the operation of the non OpenFlow ports. The OmniSwitch also supports redundant connections to controllers that support active-active and active-standby redundancy schemes.

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Figure 1 depicts a controller in the middle of an application and a switch supporting OpenFlow.

Figure 1. A controller between an application and a switch supporting OpenFlow.

The OpenFlow Application Programming Interface (API) Mode

The OmniSwitch OpenFlow implementation supports an API mode to offer network operators greater operational flexibility. In many scenarios, the network operator has an existing network and does not need a controller to manage all flows, but would like to use the OpenFlow protocol to enhance or alter some aspects of the network operation.

OpenFlow API mode allows a controller to insert flows into the switch's normal packet processing to alter the treatment of frames, as desired. These flows are essentially access control list (ACL) entries, giving the controller numerous ways to modify the switch's packet handling to match the flow. These actions can include packet redirection, QoS adjustment, drop, or modification. Packets that do not match the flows are forwarded according to conventional switch configuration and operation.

The API mode is a very flexible way for controllers to alter operation anywhere in the network to best meet the application needs without otherwise modifying the operation of the network.

CONCLUSION

OpenFlow on the OmniSwitch platform addresses network architects' need to optimize their networks for critical applications. The hybrid OpenFlow and conventional operation of the OmniSwitch can be combined to allow optimal designs for highly dynamic and (partially) software-driven networks. Finally, the flexible approach of the OpenFlow implementation allows architects to set up a conventional network and eventually migrate it to be controlled using OpenFlow at their own pace, without costly forklift upgrades.

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