Business white paper

Prepare for software-defined networking

Build the foundation for SDN with OpenFlow

Table of contents

Who should read this paper?

Read this paper if you are a CTO, CIO, IT manager, or network architect interested in making your enterprise network more agile and adaptable to changing business needs. This paper describes the benefits of software-defined networking (SDN) enabled by OpenFlow technology.

SDN, enabled by OpenFlow, holds the promise of breaking the logjam in network agility by eliminating legacy human middleware and paving the way for innovation.

Executive summary

Many enterprises are unable to achieve business innovation because of aging networking environments. Enterprise network design and architectures have remained largely unchanged for more than a decade. While applications and systems have evolved to meet the demands of a world where real-time communications, rich-media, and mobility are the norm, the underlying network infrastructure has not kept pace.

A new paradigm in networking is emerging. SDN represents an evolution of networking that holds the promise of eliminating legacy human middleware and paves the way for business innovation. With SDN, IT can orchestrate network services and automate control of the network according to high-level policies, rather than low-level network device configurations. By eliminating manual device-by-device configuration, IT resources can be optimized to lower costs and increase competitiveness.

The desire for automated and dynamic control over network resources is not new. However, with the emergence of technologies such as OpenFlow, the ability to implement SDN to increase agility has never been simpler.

HP is a leader in enterprise networking and as part of its commitment to deliver innovative solutions it has developed the HP Virtual Application Networks framework for delivering SDN solutions. OpenFlow is a key enabling technology for these solutions.

SDN architecture

"... In the SDN architecture, the control and data planes are decoupled, network intelligence and state are logically centralized, and the underlying network infrastructure is abstracted from the applications ..." – Open Networking Foundation.

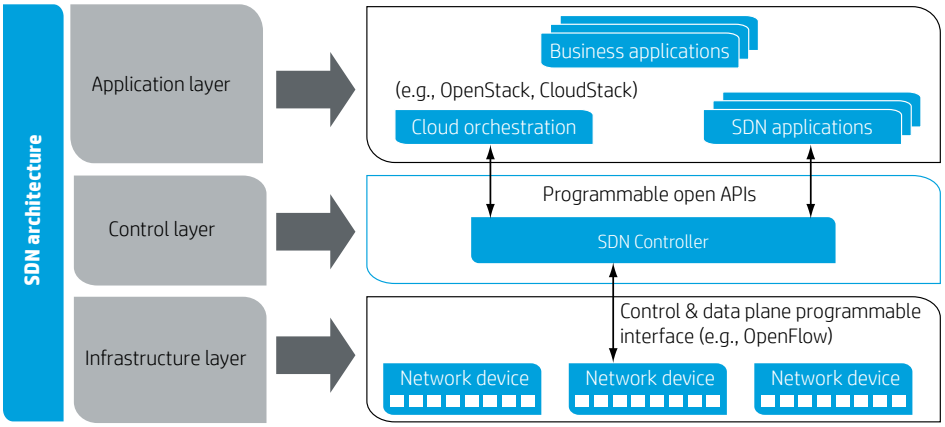
The SDN architecture departs from legacy solutions by building networks from three abstractions or layers.

First, the infrastructure layer acts as the foundation for an SDN architecture. The infrastructure consists of both physical and virtual network devices such as switches and routers. These devices implement the OpenFlow protocol as a standards-based method of implementing traffic forwarding rules.

Second, the control layer consists of a centralized control plane for the entire network. The control plane is decoupled from the underlying infrastructure to provide a single centralized view of the entire network. The control layer utilizes OpenFlow to communicate with the infrastructure layer.

Third, the application layer consists of network services, orchestration tools, and business applications that interact with the control layer. These applications leverage open interfaces to communicate with the control layer and the network state.

Figure 1. Software-defined networking architecture.



SDN simplifies campus and data center networks

SDN solutions have applicability across many environments from the data center to the enterprise campus. One of the key solutions that SDN can deliver is network virtualization.

Network virtualization can be used to support multi-tenancy in large data centers, while individual enterprises retain control. Network virtualization can also be used to span multiple data centers.

Many organizations have found that their networks cannot accommodate the demands of server virtualization and workload mobility. Virtualized networks, enabled by OpenFlow, simplify the challenge of moving virtual workloads across data centers. IT managers can define network policies that support the massive amounts of traffic that are moved for workload automation, “big data” applications, and business continuity objectives. Network bandwidth can be automatically expanded to meet dynamically changing application and service requirements.

Network virtualization can also facilitate IT experimentation on the network. Few organizations want to risk experimenting on a production network. Laboratory test beds are too small to represent real-world networks. Now, IT can use an OpenFlow-enabled network to run more realistic tests in virtualized slices of the network. IT architects can have a practical way to experiment and explore new network technologies and protocols.

The ability to virtualize networks creates benefits for organizations from the smallest businesses to the largest enterprises.

Virtualized networks, enabled by the OpenFlow protocol, will make it easier for organizations to configure and manage their applications and resources across campus networks. For instance, a retailer can ensure regulatory compliance using virtualized networks to provision payment devices. This helps retailers comply with Payment Card Industry (PCI) security regulations in a way that is simpler and easier than ever before.

IT can create virtual networks to handle the real-time demands of video or voice applications, ensuring that users have the quality experience they demand. IT can gain unified control over wireless and wired LANs, making it easier for mobile users to stay seamlessly connected to their applications and services, no matter where they are.

SDN enabled by OpenFlow

At the foundation of enabling SDN is an emerging open standard called OpenFlow, which ultimately allows the network to be more responsive to business needs. OpenFlow has been in development since 2007, led by Stanford University and the University of California at Berkeley. It became a standard that is now defined by the Open Networking Foundation (ONF) since 2011.

OpenFlow hides the complexity of the individual pieces of network devices. OpenFlow centralizes the control of those devices in a virtualized manner, simplifying network management for network managers.

The OpenFlow protocol uses a standardized instruction set, which means that any OpenFlow controller can send a common set of instructions to any OpenFlow-enabled switch, regardless of vendor.

OpenFlow is an open-standards way of virtualizing the network. Network managers can specify different policy rules for different groups of devices and users, which create multiple virtualized networks regardless of the physical network connections. This allows network managers to easily customize and manage these virtualized networks to ensure proper policies such as forwarding path, QoS and security.

OpenFlow is designed to be programmable. The OpenFlow instruction set allows network managers to try new ideas or create new protocols to solve problems specific to their organizations' network needs. This allows network architects to experiment with new services and protocols on a real-world network that cannot be simulated in a test lab—or is too risky to undertake in a production network today.

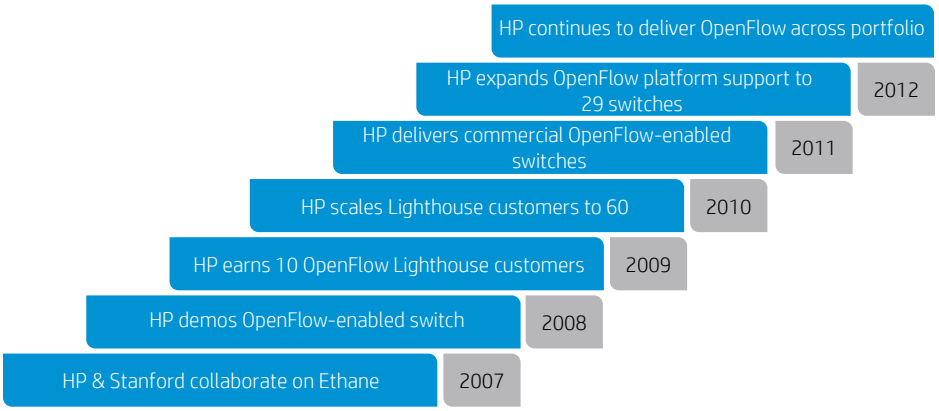
In building SDN-ready network architecture, it is important to prepare the infrastructure layer for standards-based programmability. It is recommended that businesses ensure that all network infrastructure devices support the OpenFlow standard. OpenFlow support will future proof the network for SDN and provide investment protection without requiring a forklift upgrade. When business are ready, they can easily build out an SDN solution on top of the OpenFlow-enabled infrastructure.

HP OpenFlow leadership

The OpenFlow protocol is emerging from its roots in the research and education community and expanding to the enterprise. HP OpenFlow-enabled solutions have been a top choice for academic and commercial researchers. HP demonstrated the first commercial, hardware-based switch implementation of OpenFlow at ACM SIGCOMM in 2008. HP also participated in a public demonstration of OpenFlow at InteropNet Lab in May 2011.

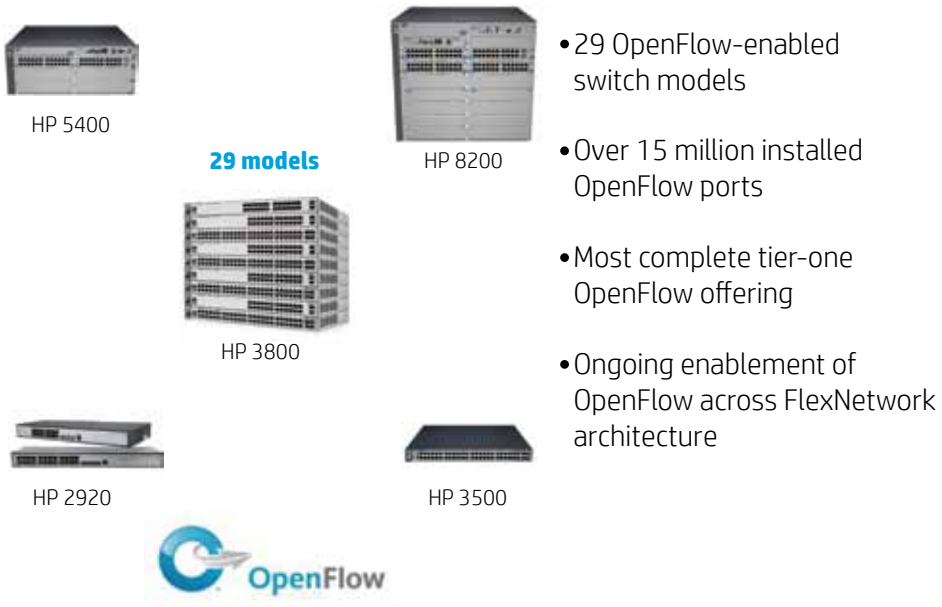
HP has been an active contributor to the OpenFlow standards effort and is a founding member of the Open Networking Foundation. HP continues to work closely with partners such as Indiana Center for Network Transactional Research and Education (InCNTRE) to drive research in SDN and enable multivendor interoperability for OpenFlow-enabled solutions.

Figure 2. HP OpenFlow leadership milestones.



HP is a leader in implementing OpenFlow across its FlexNetwork portfolio with the broadest portfolio support of any tier-1 networking vendor and the largest install base of OpenFlow enabled ports.

Figure 3. HP OpenFlow supported platforms.



HP Virtual Application Networks

Virtualization has redefined how applications, servers, and storage are deployed, and the same unstoppable force is heading toward the network. Once a brittle bottleneck standing in the way of dynamic IT, the network's future is one of greater agility, scalability, and security. Now is the time to make that future a reality.

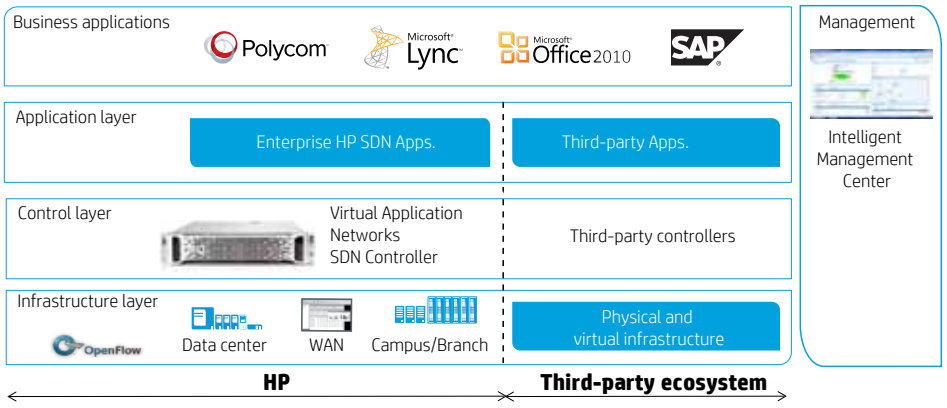
HP Virtual Application Network is a complete, end-to-end framework for delivering SDN solutions to enable businesses to create a scalable, agile, and secure network that empowers IT staff and streamline business operations. With Virtual Application Networks, businesses can focus on connecting users to business applications and on the quality of experience—rather than on the details of configuring the network, device by device.

Together, HP FlexNetwork architecture and Virtual Application Networks create a unified platform through a programmable end-to-end control plane for dynamic and rapid deployment of applications and services giving the agility businesses need.

Virtual Application Networks are built on the tenets of application characterization, network abstraction, and automated orchestration to ensure consistent provisioning of resources to meet the service level expected by users.

With Virtual Application Networks you can spend more time connecting users to applications and less time on managing complex infrastructure.

Figure 4. End-to-end SDN solutions vision.



Resources

HP and OpenFlow Technology
hp.com/networking/openflow

HP Virtual Application Networks
hp.com/networking/van

HP FlexNetwork
hp.com/networking/flexnetwork

For more information

To learn more about HP and OpenFlow technology contact your HP sales representative or hp.com/go/networking

Sign up for updates
hp.com/go/getupdated

Share with colleagues

Rate this document

4AA3-8562ENW, February 2013