



# HP Virtual Application Networks SDN Controller

The building block of HP SDN ecosystem

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HP Virtual Application Networks SDN Controller is the central building block of HP SDN network and creates a platform for application innovation.

## Executive summary

The world is moving faster than ever. Transactions must be processed at lightning speed. Mountains of data must be transformed into insights. Customers want exceptional service. Employees want access to information and applications from any device. Delivering on those expectations requires data centers that are more powerful, agile, and automated than ever before, and a campus environment that responds to a dynamic and changing workforce.

Server and storage architectures have modernized to keep pace with the unyielding expectations of an always-on world, but the underlying network has not. The data center network itself, while certainly bigger and faster, has largely been built the same way for two decades. Evolution of campus networks has been slow, despite the mobility revolution.

Whether in the data center or on the campus, when legacy networks are pushed to the limit, they become fragile, difficult to manage, vulnerable, and expensive to operate. Manual configuration and operation simply won't scale to the demands of today's applications, users, and business requirements. Businesses whose networks are at this breaking point risk missing the next wave of opportunity.

This technical white paper provides an overview of the HP Virtual Application Networks (VAN) SDN Controller and how we are fostering the development of a vibrant SDN ecosystem to help enterprises, cloud providers, and developers unleash new levels of automation and efficiency in data center and campus networks.

## Simplify and transform with SDN

At HP Networking, we've been leading the way in simplifying and transforming the network to meet your organization's needs for mobility, virtualization, high-definition video, rich-media collaboration tools, and cloud computing. With the HP FlexNetwork architecture, your business gains an open and standards-based network solution designed to scale on three dimensions—security, agility, and consistency.

By embracing a software-defined network, you'll be able to reap the full value of your network investment. SDN, delivered through our market-leading solutions, will help your users and organization experience applications as never before. It will free your IT administrators from the drudgery of manual network configuration and reconfiguration because the network will be automatically tuned to application and business needs. Your IT staff can focus more on the quality of the business experience, and spend less time managing the details of the underlying networking infrastructure.

Our SDN strategy is built on the foundation of our open and scalable HP FlexNetwork architecture, which covers the entire path from the end user to the data center, as well as the technology stack from infrastructure to management.

HP has been leading SDN development since its earliest days. We demonstrated the first commercial, hardware-based switch implementation of OpenFlow at ACM SIGCOMM in 2008. We also participated in a public demonstration of OpenFlow at InteropNet Lab in May 2011. Our engineers have taken leadership positions in key SDN initiatives including the Open Network Foundation, the ETSI Network Function Virtualization committee, the OpenStack initiative, and OpenFlow, the standard communications interface defined between the control and forwarding layers of an SDN architecture.

HP Virtual Application Networks are at the core of our SDN strategy. With HP Virtual Application Networks, you can move to service-centric management and orchestration and gain business agility. To help ease your move to an SDN architecture, we've enabled OpenFlow in more than 50 of our switch models. And we plan to extend support across the FlexNetwork architecture. We're also building a vibrant third-party SDN developer ecosystem to further drive the open and extensible nature of the HP Virtual Application Networks SDN Controller.

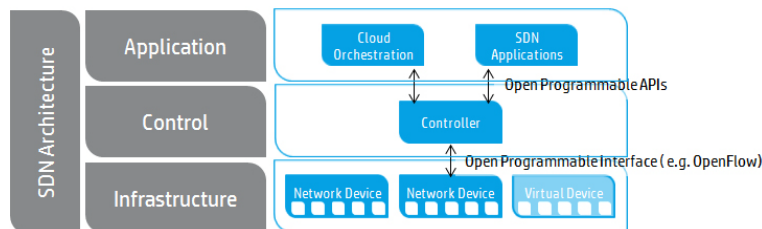
## The benefits of an open and extensible SDN controller platform

HP Virtualized Application Networks SDN Controller provides centralized control and automation for your SDN network. The HP SDN Controller controls policy and forwarding decisions, which are communicated to the OpenFlow-enabled switches in the data center or campus network. A variety of HP and third-party SDN applications can leverage the SDN controller to automatically deliver the necessary business and network service levels.

The SDN architecture separates the network control plane from the forwarding hardware. Control—essentially the brains of the network—is centralized, while forwarding—remains distributed. By separating the control plane from the forwarding plane, SDN makes it possible for the network status and capabilities to be exposed directly to the business service layer, so that business systems can request services from the network directly. SDN applications thus provide higher level application direction to the SDN controller. And freed from the control function, the forwarding plane can then provide optimized packet processing at very high speeds.

**Figure 1.** Software-defined Network structure

### Open Networking Foundation standard definition of SDN



You don't need to transition your entire network to SDN or to transform your complete operational model to SDN to begin to see tangible benefits. Our switches support hybrid modes of operations, where responsibility for certain labor-intensive functions, such as QoS or security provisioning, can be passed to the SDN controller. Other functions, such as traditional routing functions, can be handled by the normal distributed control plane. You can migrate incrementally, adapting to SDN as your staff and the organization build experience with the new network paradigm.

The HP SDN controller delivers:

- **Open programmable interfaces.** Our SDN controller delivers tight integration between the network and business system, with open, programmable interfaces that enable the orchestration of applications and automation of network functions. Your developers can use the language of their choice and leverage the extensible RESTful API for the creation of SDN applications that will unleash new levels of innovation.
- **Centralized, resilient control.** Our controller provides centralized, resilient control of the SDN network, including functions such as discovery of the network topology and shortest path forwarding through the network.
- **Highly available and scalable.** We designed our SDN controller to meet high availability and scaling requirements through a scale-out teaming model. Our SDN controller can be clustered, so that if any one controller in the network fails, another in the cluster will take over.
- **Robust security.** Security is an important factor of our controller. It uses robust authentication and authorization methods so that SDN applications can interact with the controller while preventing unauthorized applications from gaining network access. The southbound connections between the OpenFlow switches and the HP SDN controller are also secured and encrypted.
- **Full Integration with HP Intelligent Management Center (IMC).** Administrators can use the HP Intelligent Management Center (IMC) SDN Manager for full fault, configuration, accounting, performance, and security management for the HP SDN controller and OpenFlow infrastructure. HP SDN Manager leverages flow monitoring, topology mapping, and troubleshooting to provide full SDN management through the same interface as the wired, physical, and virtual network. IMC provides full controller application life cycle management and monitoring, enhanced reporting, and SDN network visualization.

## A new era of SDN application innovation

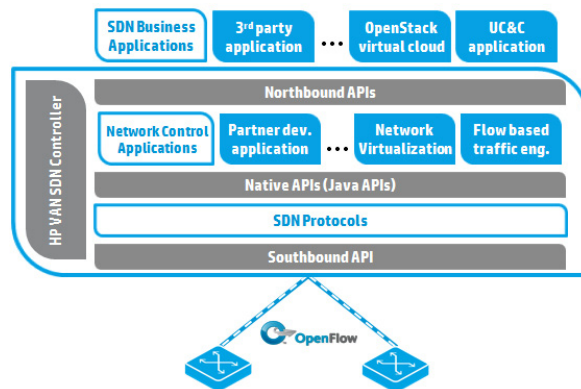
With SDN, the network can automatically adapt to meet your business and application performance requirements, whether in the data center, cloud, or campus. An ecosystem of HP and third-party SDN applications is emerging rapidly to realize this vision.

SDN applications are analogous to the protocols that run on legacy networks, but SDN applications provide a true end-to-end service level for network performance, quality of service, and security, which can be tuned to applications' needs. For example, SDN applications can provision the network, inspect flows, or perform other network control functions via the HP SDN controller.

SDN applications can be network-service oriented, but also they can accommodate virtually any business service use case. For example, for applications that require fast response, such as IP voice or high-frequency trading, an SDN application can establish programmatically the precise level of control, and the policy will be enforced across the enterprise network by the SDN Controller.

The fundamental extensibility and open APIs of the HP SDN Controller will allow innovative new applications to be created that make requests of the underlying network, without the need to physically uproot or reconfigure the underlying infrastructure.

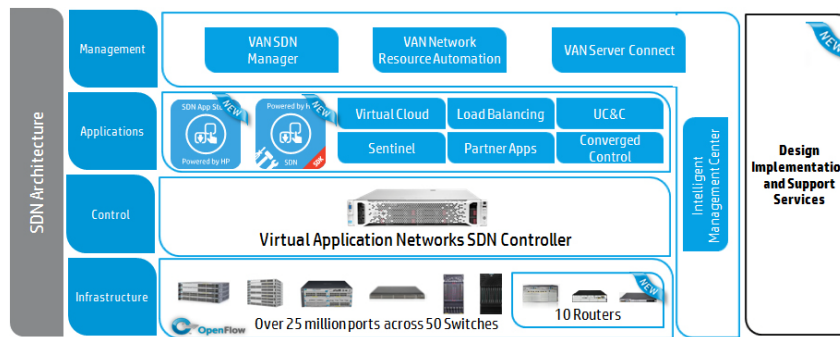
**Figure 2.** HP VAN SDN Controller Architecture



The SDN Controller supports the highly integrated Network Control applications and the SDN Business application. Northbound APIs utilize the REST architecture and provide easy access to applications that are integrated directly in the controller or off the controller. Native APIs, provided in Java, deliver support to Network Control applications that are integrated directly in the controller.

**Figure 3.** Virtual Application Networks deliver automation, agility

### Programmable network aligned to business applications



Together with our partners we've created several SDN applications, and this ecosystem will continue to grow. These applications include:

- HP Virtual Cloud Network**—This application provides scalable cloud automation for multitenant data centers and supports integration of public and private clouds. HP Virtual Cloud Network uses the OpenStack Neutron RESTful APIs to help you achieve the automation benefits of private or public clouds. This solution is available through a variety of integrated HP solutions for converged infrastructure, such as HP CloudSystem 8, HP next-generation cloud infrastructure.
  - Unified Communications and Collaboration (UC&C) SDN Application**—This application aims to improve the user experience of products such as Microsoft® Lync® within campus networks. It automates the deployment of quality-of-service policies and dynamically adjusts network priorities to securely support voice, video, and collaboration traffic, even in an environment integrating soft phones and BYOD user endpoints.
  - HP Sentinel Security Application**—The result of a partnership with enterprise-security specialists HP Tipping Point and ArcSight, this application enables real-time threat detection and security policy enforcement at the edge of campus networks. Sentinel can be used to secure BYOD. Sentinel security can also be deployed across a campus network to protect you from more than one million malware, spyware, and botnet threats.
- Sentinel leverages the Virtual Application Networks SDN Controller and OpenFlow to program the network infrastructure with security intelligence from the [TippingPoint RepDV Labs](#) database, which has a reputation score for each domain name. Sentinel compares the domain name system (DNS) queries from user machines against the reputation scores. If the site is legitimate, the query is forwarded to the access layer switch. However, if Sentinel detects a threat, the user is prevented from accessing the threat site and the prevention is logged by [HP ArcSight logger](#).
- Intel and Verizon Dynamic WAN bandwidth provisioning**—Intel® and Verizon are collaborating with the support of HP CMS service organization on an SDN application that enables service providers to automate the provisioning of cloud data centers to support on-demand scalability and business-continuity requirements. This third-party use case demonstrates the flexibility of the SDN architecture in diverse environments.

These are just a few examples of possible SDN applications that can be developed with the HP SDN Controller and ecosystem.

## An ecosystem of HP partners to improve your networks

Industry experts predict a swift migration to SDN. SDN market will reach \$3.7 billion by 2016. Nearly \$670 million will come from SDN applications.<sup>1</sup>

SDN will unleash a new cycle of network innovation for developers, enterprises, and cloud providers, but the true value of SDN can only be realized with broad industry support for SDN standards from all vendors and developers. HP is driving this realization with the development of programming standards to create a vibrant SDN ecosystem.

<sup>1</sup> IDC #240557, Technology Assessment: The Impact of SDN on Datacenter and Enterprise Network Architectures, April 2013.

HP is actively building an SDN application developer ecosystem to foster the creation of SDN applications. HP is offering an SDN developer community, as well as forums, events, and other services, to help developers and go-to-market partners build and sell SDN applications. Third-party SDN applications will be available through an HP App Store. And HP is working with partners to sell SDN applications as part of a broader effort that encompasses the application, network, and services sales.

Visit [hp.com/SDN](http://hp.com/SDN) to learn more about our SDN strategy and our growing ecosystem of SDN partners and applications.

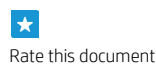
## Getting started with SDN

SDN promises to bring new levels of automation and efficiency to data center and campus networks. It's important to understand the potential of SDN for your business, and to take proactive steps so you can make the move under your own terms. Here's how to start:

1. Deploy OpenFlow-enabled switches so you can move to SDN when you're ready.
2. Understand how SDN applications can enable your organization to deliver the business-service levels that your users expect.
3. Partner with an SDN vendor that provides open, scalable, and secure SDN solutions and simplifies the development of SDN applications.
4. Build a proof-of-concept test for SDN in your labs to understand how network virtualization and automation can help you deliver higher service levels.

**Learn more at**  
[hp.com/networking/sdn](http://hp.com/networking/sdn)

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