Software-defined networking

A pragmatic approach to increasing network agility from HP Network Services

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Executive summary

The promise of software-defined networking (SDN) goes well beyond increased automation. Its true value is its ability to free IT to focus on the quality-of-business experience—rather than on network operations—in order to enable more innovation. This is the network of the future, and if you start preparing for it today, then you are in a better position to take full advantage of SDN as the underlying technology matures.

Simply put, a new approach to networking is needed, one that can keep pace with accelerating—and fast-changing—business demands. With SDN becoming more mainstream, you might wonder what it can do for your organization. Is it simply a matter of adding software as an overlay to your existing network? Is it implementing network services on virtual machines? Does availability of proprietary APIs for hardware devices constitute SDN? And what to make of the proliferation of SDN-labeled products that are only tangentially related, if at all, to software-defined networking? This white paper will explain why SDN represents the network architecture of the future and how HP's approach can benefit organizations such as yours.

SDN: A new networking paradigm

Moving beyond your traditional, legacy network environment
Network resources and operational processes have been stressed and stretched thin for years. The increasing deployment of cloud infrastructures and use of personal devices to access corporate data—combined with exponential data growth, bandwidth-intensive multimedia, and broader adoption of unified communications—continue to expose the rigidity and shortcomings of conventional networks.

Traditional networks lack the flexibility to keep pace with ever-growing requirements because multiple control planes are distributed across physical routers and devices. That means in order to implement changes, each network device needs to be configured individually. In some cases, devices need to be configured manually through command line interface (CLI) coding—a time-consuming task that can take days or even weeks.

Software-defined networking offers a new approach that delivers the performance and agility demanded by today's highly virtualized, data-intensive computing. SDN separates the control plane from the data/forwarding planes. In this type of environment, flow control—specifically, decisions controlling how traffic is forwarded across the network fabric—is decoupled from hardware and handled centrally by a software application called a controller.

The controller abstracts the distributed control planes into one central plane. This enables the network to be programmed as if it were a single entity, with features readily added or expanded as needed from a central controller. Data flows can be adjusted dynamically to meet application needs amid changing network conditions. Rules for network switches can be changed on the fly.

Implementing virtual overlay networks or virtualized network appliances solves some of the problems facing networks today, yet fails to realize the true potential offered by this new approach to networking. In essence, SDN inserts both service intelligence and application intelligence into the infrastructure layer for a more robust network with hardware-independent flexibility.

It's more than just automation
By eliminating the so-called "human middleware" problem—error-prone manual configuration— you'll achieve significant benefits. But, automation is only part of the SDN story. Enterprises can already streamline the configuration of individual devices through a centralized network management system (NMS), such as HP Intelligent Management Center (IMC).

It is through the simplification and abstraction of the network that SDN is able to go beyond automation by allowing the network fabric to be externally controlled, which should bring it in line with the rest of your technology infrastructure. Your network then becomes a flexible resource that can be programmed as needed to meet ever-changing business needs, similar to today's compute and storage resources.

By facilitating dynamic network provisioning based on network conditions and application requirements, SDN provides a bridge between applications and the network. If you treat SDN primarily as a mechanism for automation, you'll shortchange its true promise: establishing a better user experience through optimized business application delivery.

The promise of SDN: making your business run better

Managing the quality of the business experience
SDN is very much a business-enabling investment, which makes for a solid argument when you're requesting budget dollars. Its power lies in its ability to more easily meet the needs of business applications by unlocking the network's infrastructure layer. SDN enables business applications to talk directly to the network. Communicating directly with the SDN control plane lets applications specify what they need from the network to deliver required business services. These service-specific needs are then communicated to network elements by the controller for dynamic reconfiguration at run-time.

For example, commands issued by a process control application to an automated manufacturing device are typically a high priority, requiring guaranteed packet delivery. With SDN, the application can request this service dynamically, as opposed to network administrators configuring the network to identify and address this differentiated traffic. The SDN controller would be intelligently aware of the quality of service (QoS) requirement, and kept informed of the application's status.

The result is a network optimized for applications—a network that allows IT to move beyond managing the availability and stability of your infrastructure to one that manages services that deliver measurable business value.

Network simplification for better TCO, increased efficiency
As today's networks increase in complexity, it's more difficult than ever to maintain a sustainable cost structure. Software-defined networking can reduce both capital and operating expenses, delivering a lower total cost of ownership.

Abstracting end-to-end services away from device-by-device, port-by-port configuration will bring down your operating expenses. With SDN, you can establish policies one time to enforce everything within the controller's purview, rather than individually managing policy configurations for each device.

In addition, SDN eliminates the need to deploy racks of dedicated appliances to deliver basic network services such as load balancing, proxy, and QoS. This extends the life and value of your investment in middle boxes, which can then focus on delivering higher-level, more complex functions.

SDN also addresses the typical, and costly, underutilization of the physical infrastructure within data center networks. Rather than have excess network capacity held in reserve to meet QoS requirements, your network elements can be dynamically reconfigured to meet service-specific needs. And increasing the utilization of your internal network resources always benefits your bottom line.

Innovation at the speed of business
The decoupling of network features from infrastructure opens the door to unprecedented levels of innovation and choice. While innovation in today's networks is limited by the need for vendor-issued updates to individual device software, the qualities of SDN enable you to design new network services at your own pace, either on your own or by working with software providers and/or services partners. With SDN, you'll gain greater flexibility and responsiveness, enabling you to develop and deploy new capabilities more quickly. By making it easier to implement new network capabilities, SDN will accelerate the deployment of business services dependent on them. This can break down barriers between the network and the business and pave the way for more innovation. That, in turn, will help you enhance your competitive edge.

HP's SDN strategy: increasing agility through the enterprise

Standards-based technologies
In October 2012, HP announced the industry's first SDN standards-based technologies that span infrastructure, control software, and application layers with a single control plane. These technologies enable enterprises and cloud providers to simplify and maximize agility across data center, campus, and branch networks.[1]
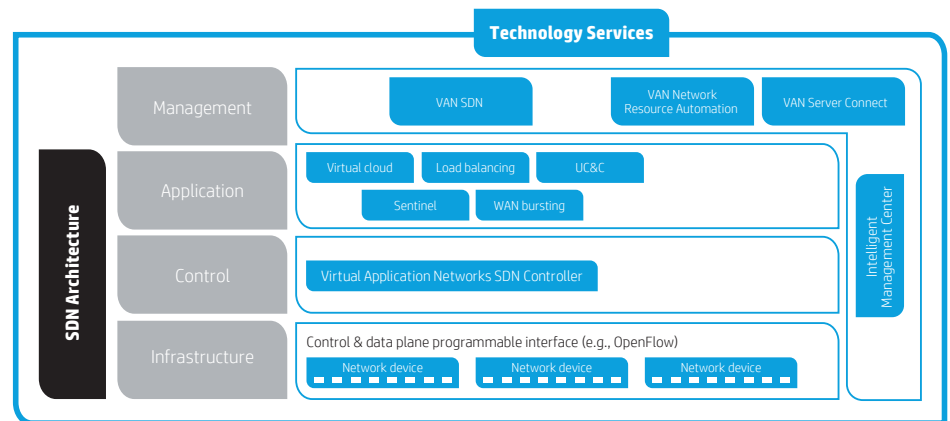
HP's support of open standards promotes a thriving ecosystem of HP and third-party applications that deliver services on top of the SDN control layer. Unlike proprietary APIs, standards-based technologies allow you to choose your preferred suppliers and build your own ecosystem.

The HP Virtual Application Networks (VAN) provide a framework for SDN. It includes the HP Intelligent Management Center (IMC), which provides multivendor management from a single pane of glass and offers automated orchestration of virtual machines and automatic synchronization of network connectivity information. A key enabler of SDN is HP IMC's VAN Manager, which introduces service intelligence into the management layer. This type of tight integration between the SDN controller and HP VAN Manager is critical in order to manage the network to meet the desired quality-of-business experience.

HP software-defined networks ecosystem
By allowing access and openness at the application, control, and infrastructure layers, SDN improves agility across the enterprise. At the infrastructure layer, network devices can be programmed through the standards-based OpenFlow interface. At the control layer, the abstraction of multiple control planes into one enables network elements to be programmed as if they were a single entity. The application layer can include capabilities for network virtualization, network access control, and cloud orchestration. Business applications such as online transaction processing, messaging, IP telephony, and unified communication span the network and can be programmed to connect to users more readily.

[1] "HP Advances Software-Defined Networks with Integrated Infrastructure, Controller and Application Solutions," October 2, 2012, www8.hp.com/us/en/hp-news/press-release. html?id=1300459#.UPh7RHfaujo.

Virtual Application Networks deliver automation and agility

Industry-first SDN offerings to smooth your path

HP offers the first services in the industry specifically designed for SDN implementation, including:

- **HP Transformation Experience Workshop**: A highly interactive session that brings together IT and business stakeholders to create an aligned vision, strategy, and pragmatic next steps for your unique SDN journey.

- **HP SDN Baseline Discovery Service**: This service focuses on understanding the network's current state, and where SDN can positively impact network services to the business.

- **HP VAN Proof of Concept**: Assists your IT staff with examining the benefits of implementing products defined within our VAN framework in a carefully planned way.

- **HP SDN Road Map Service**: This service provides the expertise you need to help build your business case for SDN and guide you through the roadmap development of your SDN.

- **HP SDN Architecture Service**: Skilled HP consultants help you create architectural SDN blueprints.

Begin with a predefined services catalog

It's essential to assemble a catalog of predefined services in order to deploy SDN effectively. Leveraging predefined services that hide the complexity of the underlying network allows requests for standard services to be fulfilled more quickly and less expensively. Modularity of tasks and components provides for automated workflows that can easily be defined, executed, and maintained. Changing technological components won't impact workflows and will only require you to replace well-defined modular operational tasks.

HP has developed a catalog that combines off-the-shelf and custom services to solve specific issues. The patent-pending approach for data center service-oriented networking has demonstrated measurable improvements in proof-of-concept deployments: up to 90 percent reduction of scripting complexity; up to 95 percent reduction in the time required to execute provisioning, change, and de-provisioning processes; and 100 percent reuse of resources after de-provisioning.[2]

Preparing today for the network of tomorrow

Owning your SDN journey

SDN is expected to gain widespread acceptance. Carriers and cloud service providers are among the early adopters because their business models are built around highly scalable and agile infrastructures that can accommodate the requirements of dynamic application deployments.

Enterprises are also beginning to recognize the value of the SDN approach. According to one survey, four percent of IT organizations in North America have already implemented SDN and another five percent are testing it.[3]

As commercial SDN product development accelerates, it's important that you carefully consider every option to make sure you're positioned to gain full advantage of the technology's benefits. Your goal should be a focus on efficiently managing the quality of the business experience.

By starting on your SDN journey today, you can position yourself to take full advantage of its capabilities and promises. You'll also be able to leverage the benefits of quick wins to improve today's performance and free-up resources. To optimize your SDN efforts, HP offers the following guidelines based on our extensive experience in network services:

Take a comprehensive SDN view

Shifting the focus from infrastructure availability to managing the quality of the business experience requires changes to governance, processes, and skill sets, as well as technology. Experienced consultants can help you develop a holistic, transformative view of SDN and identify the required changes and their impact. It will also give you a clear picture of how to move from making investments based on infrastructure capabilities to investments based on enabling the business.

Approach SDN pragmatically

SDN transformation is by no means a rip-and-replace initiative. The transformation should be a phased approach that takes into account your current environment and your desired business end-state. Given the impact and benefits of SDN across so many areas, HP recommends that you start with an HP Transformation Experience Workshop. This highly interactive, results-oriented session draws on a proven methodology and the knowledge of experienced consultants to bring together key business and IT stakeholders to provide a framework for your SDN initiative.

[2] Based on test cases from the HP Italy Innovation and Transformation Center in 2012.
[3] Jim Metzler, "Understanding Software-Defined Networks," InformationWeek Reports, ID: R5451012, October 2012.
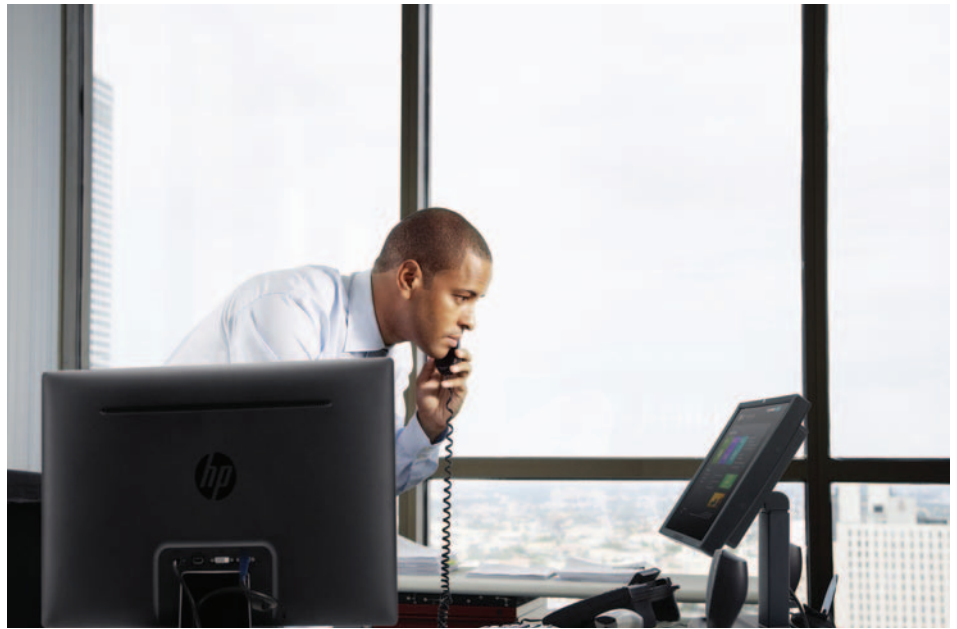
Understand where your network is today
Once you have established business and IT alignment, a logical next step is to clearly define your current-state network and identify traffic patterns in which SDN can make a positive impact on the delivery of business services. HP can provide an SDN Baseline Discovery Service to help make these determinations and lay the foundation for your SDN initiative.

Develop a roadmap for the future
As a transformative approach, SDN necessitates a detailed roadmap that leverages your existing investments and highlights technologies and standards to help you achieve your targeted goals. This will help you avoid pitfalls that can impact performance. Working with skilled network consultants can help you establish the most effective strategy for your business needs and current environment.

Start transforming your management layer now
Centralized network management is a core element of SDN. Because infrastructure management must be tightly integrated with the control plane in order to achieve a successful SDN deployment, you should begin your planning with a thorough understanding of what you need to transform your infrastructure management practices. The management advantages of abstraction through a logically centralized control point will deliver value in every network regardless of when you move to SDN. So the sooner you centralize network management, the sooner you realize its benefits.

Identify opportunities for SDN-enabled products
In general, any network device that determines the flow of data is a natural fit for SDN. The virtual edges of your data center and campuses often represent the most logical places to deploy SDN-enabled products. As you consider your infrastructure buying plans, you can get a head start on future SDN implementation by adding SDN-capable products to your procurement policy. This will promote the introduction of SDN-capable hardware via your technology-refresh buying process.

Summary

As today's networks become increasingly complex and inflexible, interest in SDN is rapidly accelerating. SDN simplifies the networking landscape, streamlines legacy operations, lowers costs, and enables a true multivendor strategy. By unlocking the infrastructure layer and opening the door to innovation, SDN enhances the responsiveness of your network to meet business demands. It shifts the focus of network management from infrastructure availability to the quality of the overall business experience.

To increase your chances for a successful SDN deployment, it's critical to undertake a progressive and thorough transformation of your network architecture and operations. HP recommends a phased, pragmatic approach that lets you realize both short- and longer-term benefits. As a transformative architecture, SDN will impact governance, processes, and skill sets—as well as the network infrastructure itself. Working with experienced consultants can help you identify how SDN will enhance business services delivery today as you develop an effective roadmap for the future.

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