

The Brocade SDN Controller in Modern Service Provider Networks

The OpenDaylight-based Brocade SDN Controller combines SDN innovations with modular software engineering and model-driven network management for a cost-effective, flexible, and readily approachable platform for migration to SDN and control of the service provider network.

Open, Flexible, Focused, and Supported

The Brocade® SDN Controller (formerly the Brocade Vyatta® Controller) is a Software Defined Networking (SDN) controller continuously built from the Linux Foundation OpenDaylight open source project. As a commercial distribution of OpenDaylight, the Brocade SDN Controller is open, combining SDN innovations with modular software engineering and model-driven network management concepts to realize the industry's most flexible SDN controller. (See Figure 1.)

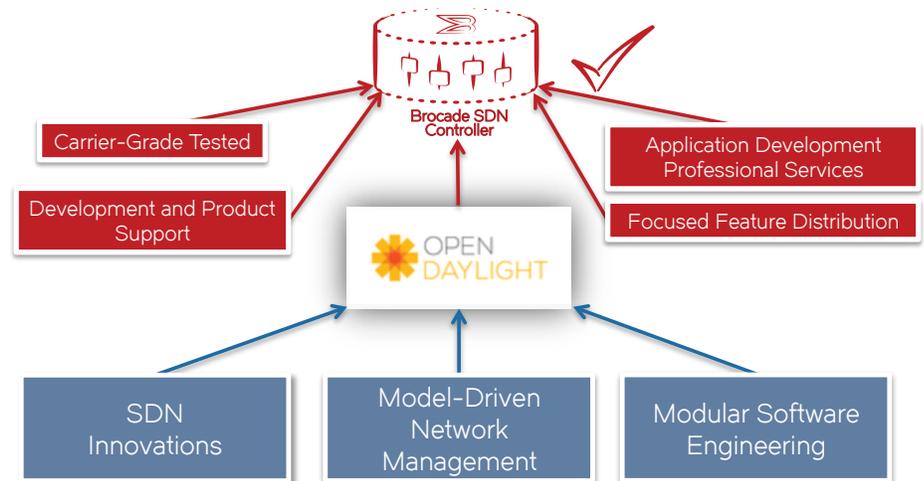


Figure 1. The Brocade SDN Controller and OpenDaylight.

The key difference between the Brocade SDN Controller and OpenDaylight is that the Brocade distribution delivers a tested and supported subset of the OpenDaylight community projects and features, based primarily on the maturity and stability of those project modules. As this paper describes, the fundamental power of the Brocade SDN Controller is its open, community-driven architectural extensibility, which allows users to integrate the Brocade SDN Controller into their specific environments according to their own unique requirements.

SDN and the Powers of Separation and Abstraction

SDN separates the network control and forwarding planes in order to increase network resource efficiency and agility. The control plane becomes logically centralized, positioned between the service operator's application—for example, customer services, Business Support Systems (BSS) and Operations Support Systems (OSS)—and network layers. The goal is to abstract network details away from applications so that they can be developed and operated with direct linkage to the underlying network through programmatic interfaces, independent of network vendor and technology specifics.

To understand the benefits of inserting this layer of abstraction, think of the web server model, where web services are developed by customer-facing business thinkers independently of network operations personnel, who are tasked with keeping the network running. These are two different skill sets with two different agendas. A “meeting point” between the two must always exist, but striving for an elegantly minimal “contract” between business and network operations organizations rewards the service provider with increased service agility and efficient resource usage. The more you can decouple the dependency of either group on the other, the more each group can spend time doing what it needs to do and what it organically does well.

Historically, at one end of the spectrum you find the Public Switched Telephone Network (PSTN), which is a single network optimized for single-application, fixed audio telephone calls. At the other end of the spectrum, you find today’s Over-the-Top (OTT) service providers, such as Google and Netflix, who develop profitable services without regard to the networks that deliver them. As smartphones and tablets drive the explosion of broadband services consumption, OTT service providers are driven to build out their own physical networks (such as Google Fiber) and even to entertain content-sponsored agreements with access and transit service providers (such as Netflix and ESPN). This transition from siloed application networks, through network-agnostic applications, to today’s requirement for application-responsive networks places SDN directly in line with subscriber expectations and, therefore, with revenue (see Figure 2). The days of overbuilding capacity, slowly and conservatively delivering services, and being locked into closed and pseudo-open technologies are over. Because SDN defines a programmatic network framework, open SDN controllers such as the OpenDaylight-based Brocade SDN Controller are able to offer a genuinely open and modular network model.

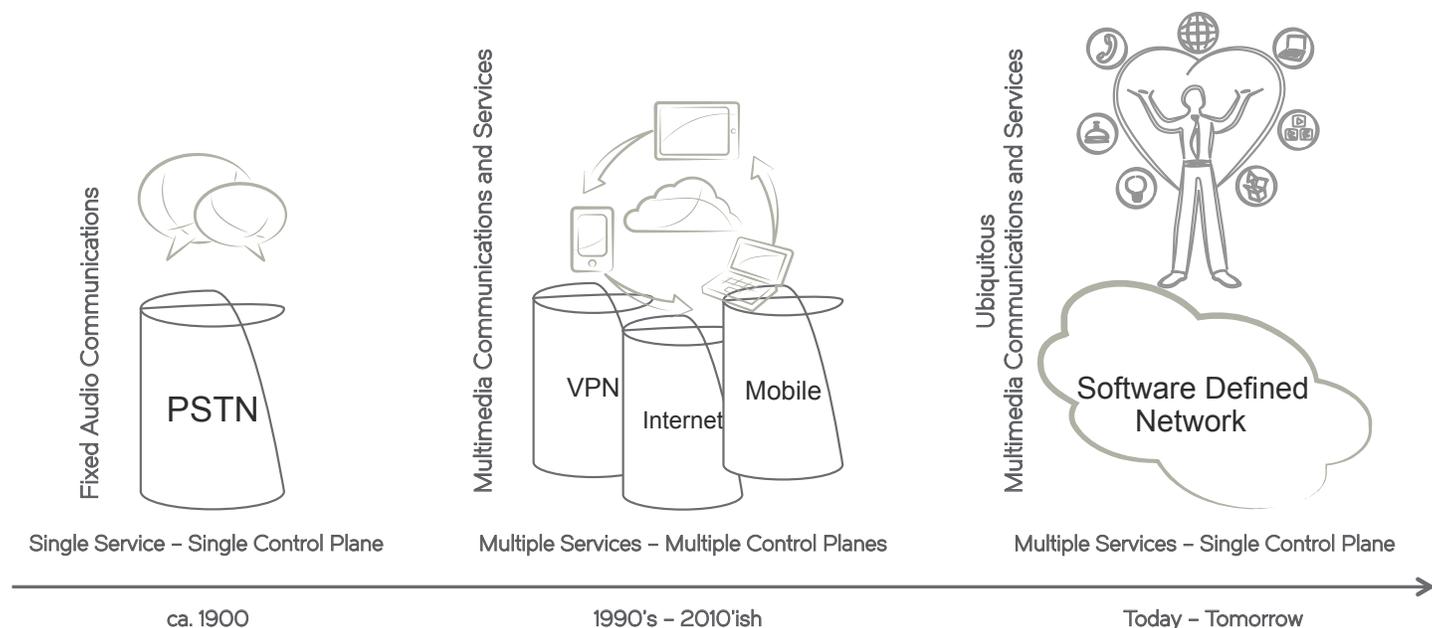


Figure 2. The communications control plane evolution.

Network Programmability Business Drivers

How is network programmability useful to service providers? What are real business drivers for abstracting the network from applications and services? To begin to answer these questions, it helps to frame the business objectives. Is the initial goal to transform business models, or simply to improve the operations of those services currently offered? In the case of business transformation (see Figure 3), the example of driving down data center costs commonly begins with Network Functions Virtualization (NFV) and then leverages SDN to lay the foundation for service innovation. If priorities dictate service innovation without an initial move to NFV, you will likely start the migration to SDN directly with the controller between new and enhanced services and the existing, traditional physical network elements. If the initial business driver priorities are to focus on improving operations, which often is done through service provisioning and asset management, the starting point is commonly to implement the SDN controller, and then move towards virtualizing as much of the network that makes sense technically and from an investment perspective.

Consider the following design example of an SDN service that benefits from both objectives of business model transformation and operations improvements. To minimize impact on the existing infrastructure and ease the path to these objectives, you might want to evolve an existing business service based on physical or virtual network elements, introducing a significantly improved customer experience and an optimization of service provider service delivery costs. The first aspect of improving the customer experience can be realized through a business service selection portal that presents the customer with a targeted service catalog, along with associated service configuration and scheduling options. These service configuration options empower end customers with ways to tailor the service to their own unique requirements, and provide the service provider with a portal to introduce service up-sell opportunities, such as antivirus security and higher levels of bandwidth.

The SDN controller presents a programmatic interface to the network for orchestration applications that operate above it, so that the selections presented via the web portal to the customer can be translated directly into operations that communicate with the network through the controller. As such, no manual intervention is required to provision the service in the network, which improves operations costs as well as service turn-up response time. What could take days is now accomplished in seconds. The SDN controller layer and presentation of software programming interfaces to the network significantly enhance the user experience through tailored service customization and service delivery time, as well as improving network operations and efficiency.

Stepping back again from this specific SDN business value use-case example, you can identify other business opportunities enabled by SDN by focusing on the fundamental shift away from proprietary network device configuration files and Command-Line Interfaces (CLIs) into standard provisioning protocols like OpenFlow and NETCONF, which are carried by common web and server-based programming languages through well-defined Application Programming Interfaces (APIs). From there, you can envision not just modest changes to existing services, like the example above, but the power to quickly deliver innovative multimedia services without quality issues.

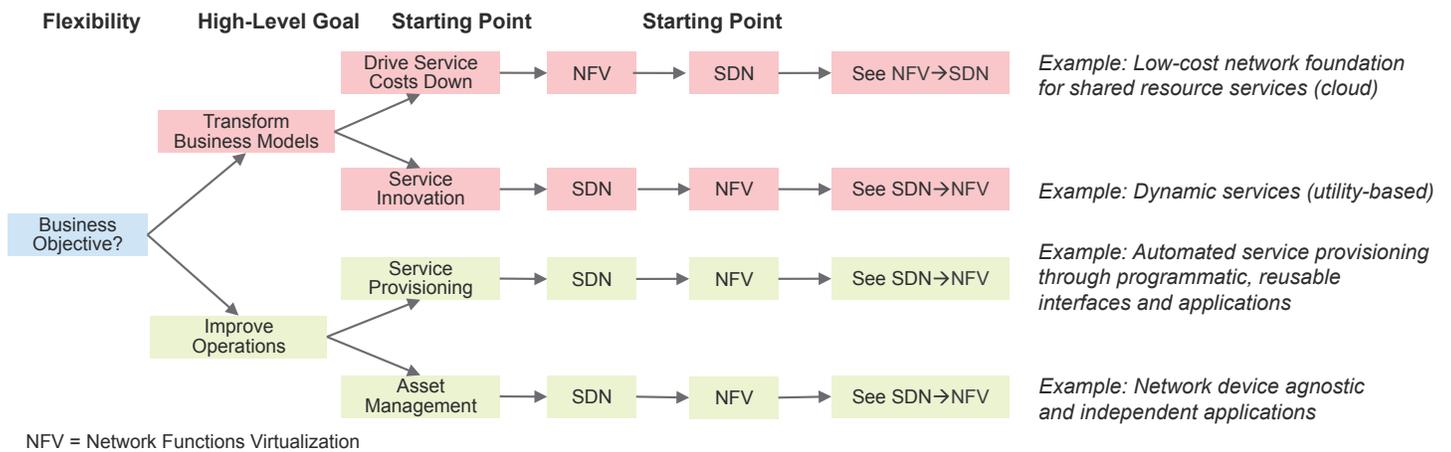


Figure 3. High-level SDN migration paths.

SDN Migration: Achievable Today

In an ideal world, you would implement dramatic network upgrades by first building the new network, then moving all of your business over to it, then turning off the old network—but such a scenario is not possible in the real world. When you look closely at the business and operational value that SDN offers, its implementation might look daunting at first. Yet, in reality, a planned and reliable migration from existing network resources and designs to SDN is achievable today.

After identifying a project suitable for embarking on SDN, the operator selects an SDN controller on which to build associated services and applications. At this point, the operator plans a migration path to SDN based on an actionable starting point and subsequent implementation steps.

Operators can approach their initial SDN controller deployments through one of three fundamental models (see Figure 4 on the following page). The first model is an off-the-shelf “turnkey” controller that uses the Brocade SDN Controller with Brocade or third-party OpenDaylight-based applications. While this approach represents the easiest way to start, it places more dependence upon discovery of off-the-shelf orchestration and controller platforms and integration with existing BSS/OSS systems. While even an off-the-shelf controller still requires integration with both orchestration applications and the existing BSS/OSS infrastructure, the Brocade SDN Controller developer toolkit provides a number of tools to support this step. Over time, both Brocade and the broader OpenDaylight community will continue to simplify the implementation of the controller alongside new and existing orchestration applications.

The second starting point model for SDN controller deployment leverages the existing Brocade SDN Controller core services with service provider applications developed on top of it. This starting point is, in many ways, the ultimate vision for the Brocade SDN Controller, as it offers a readily usable SDN controller as a platform for the development of user extensions at the application layer, rather than at the relatively more complex internal controller services layer. While this model may represent a desirable balance

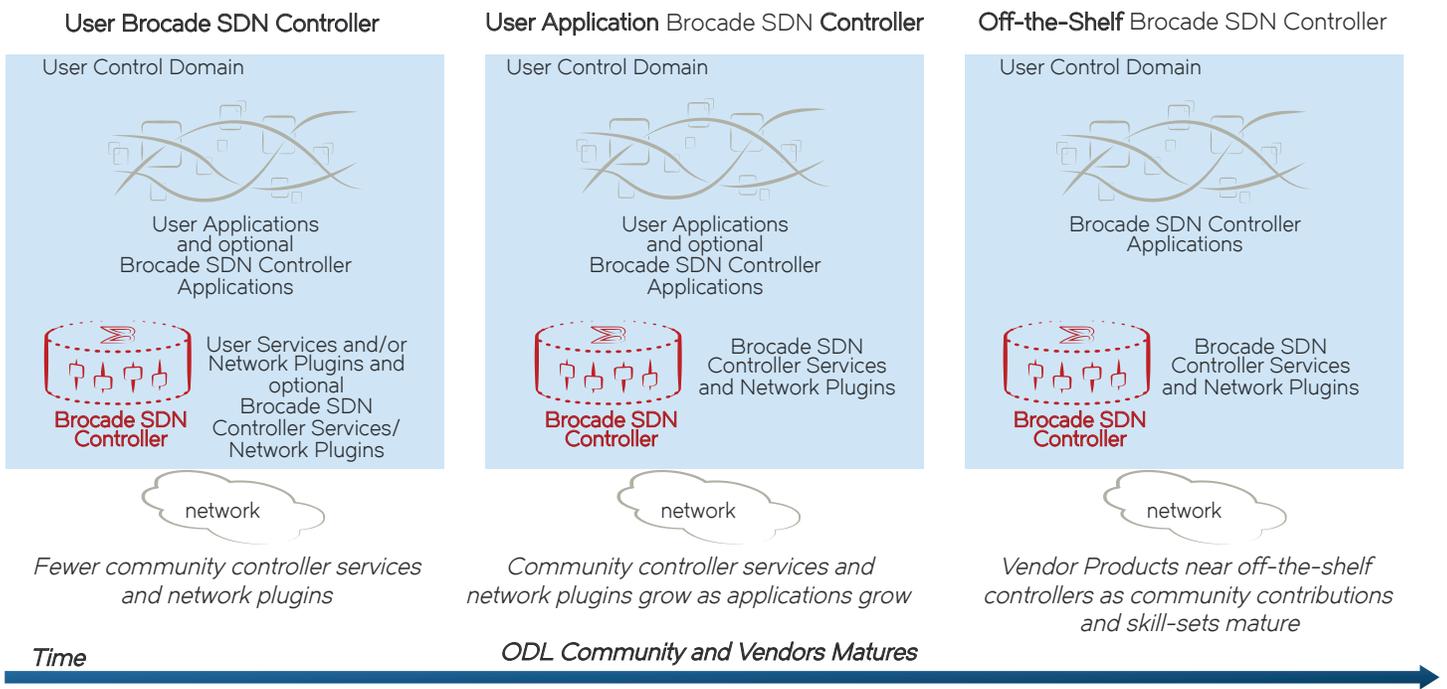


Figure 4. The Brocade SDN Controller: Typical starting point models.

of ease of use and value, the user organization is likely to want the ability to extend the controller at the internal services layer. Although this ability is more complex than application development, it is readily achievable with basic Java and YANG software skills. To support the ability to extend the controller or build external SDN applications, Brocade offers both software development and development support professional services.

The third starting point model for SDN deployment model is the most finely-tuned to offer support of the operator's preferred SDN migration pace, as it fully leverages the Brocade SDN Controller's extensibility. With this starting point model, the operator develops local or community-destined applications and controller services.

The State-of-the-Art Brocade SDN Controller

The Brocade SDN Controller wraps the incredible power of network programmability into a readily approachable platform for migration to SDN and control of the service provider network. Designed from the ground up to be extensible and modular, the Brocade SDN Controller represents the state-of-the-art for building an agile and efficient network that delivers innovative and differentiable services to realize deterministic business goals. From the SDN principles that drive its design, to the implementation process and professional support for both operations and developers that use the Brocade SDN Controller, you are invited to take the next step into the world of SDN, with Brocade behind you to support your journey.

For More Information

To learn more about the Brocade SDN Controller, please consult your local Brocade representative or visit www.brocade.com/sdncontroller.

About Brocade

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