White Paper

The Network as an Open Platform: Driving New Market Value for Telcos

Prepared by

Caroline Chappell
Senior Analyst, *Heavy Reading*
www.heavyreading.com

on behalf of

BROCADE

www.brocade.com

June 2014

Introduction

As virtualization technology strikes deep into the network, the days of most physical appliances are numbered. The industry has long recognized that the box-based construction of the network leads to wasteful duplication of hardware, and that its growing operational complexity is the stuff of nightmares. So it has been working hard on solutions, including the virtualization of network components, the introduction of open protocols and control and the centralization of network intelligence in the control plane.

At first, the relationships between these individual developments was unclear. Today, it is increasingly evident that they all belong together as components of a software-defined **network platform**. *Heavy Reading* defines the network platform as ***an integrated set of software-based components that together provide the functionality of the network and its associated management capabilities***.

Not only will the network platform provide a holistic, "software-defined" view of the network that was unachievable when it consisted of individual physical boxes, but it will also drive new value for the telecom industry. For more than 30 years, software-based platforms, whether operating systems (OSs) such as Microsoft Windows or Apple iOS, or Web-based platforms, such as Google and Facebook, have demonstrated their ability to drive new sources of innovation and revenue. Now it is the turn of the software-defined network (SDN) platform to create and support a new ecosystem of developers and their innovations.

At such an early stage of the network-as-a-platform evolution, there are numerous vendors trying to establish themselves as network platform builders. But operators consistently argue that the network platform is too strategic and complex to be left to a single vendor alone. Instead, there is growing support for an open network platform based on open technologies, such as an open network OS, open network controller and open infrastructure management and orchestration.

This white paper looks at the arguments for an open network platform and what its constituent components would look like. It discusses the characteristics of such a platform, including its level of modularity and support for *de facto* industry standards, which operators should evaluate when deciding which network platform ecosystem to adopt.

Section II describes the way in which different starting points for network virtualization are coalescing around the concept of the network platform and the implications of such a platform for the telecom industry.

Section III explores the components that make up the network platform and the key tenets that open platform implementers should uphold.

The Rise of the Network as a Platform

The End of an Era for Network Appliances

Since its invention, the telecom network has been conceived as a set of discrete physical boxes cabled together. Over the years, new networking technologies have led to a proliferation of boxes, each addressing a specific function at a different level of the Open System Interconnection (OSI) stack. The box-based construction of the network leads to wasteful duplication of hardware and its growing operational complexity is the stuff of nightmares.

In recent times, the networking industry has been working on multiple ways of addressing these problems, including:

- The standardization of network hardware, moving network functions onto Advanced Telecommunications Computing Architecture (ATCA) and commercial-off-the-shelf (COTS) x86 boxes.

- The virtualization of network components, turning them into "pure" software functions and ending their dependence on physical boxes.

- The specification of an open protocol – OpenFlow – that can talk to any box or virtual network component.

- The separation of the network control plane from the forwarding plane, so that the control plane is a central point of management and routing intelligence for the network. The control plane decides when each physical or virtual network component under its command should receive traffic flows and takes care of their configuration and management. Forwarding plane components, either physical or virtual, direct traffic flows appropriately, under instruction from the control plane.

- Programmability of the control plane through application programming interfaces (APIs). Since the control plane is a piece of software, and the network components it controls are also becoming virtualized, software-based functions, the network is being abstracted into software that is much easier and faster to manage, manipulate and automate than siloed, vertically-integrated and manually-configured boxes.

Individual products that address one or more of these developments have been appearing on the market, e.g., network functions virtualized for COTS x86 hardware, COTS x86-based boxes that talk OpenFlow and separate control plane solutions.

However, the industry now realizes that complete transformation of the network, away from an historic box-based model, is only possible if all these developments are brought together in a coherent way. This is leading to the concept of the network as a **platform**.

What Do We Mean by a Network Platform?

Heavy Reading defines the network platform as ***an integrated set of software-based components that together provide the functionality of the network and its associated management capabilities.*** The platform manifests the network to the external world as a seamless layer of software, analogous to data center middleware, which can be reconfigured, enhanced and extended rapidly and, in many scenarios, automatically, through programmatic interfaces.

The network platform provides a holistic, "software-defined" view of the network that was unachievable when it consisted of individual physical boxes. Critically, the network platform enables constituent components to:

- Be managed in the same way through common capabilities built into the platform.

- Expose their functionality through platform APIs, to each other, to network operations staff and externally to third-party applications and network service developers.

Platforms Drive Market Value

For more than 30 years, software-based platforms that have opened themselves up to an ecosystem of third-party developers have demonstrated the ability to drive enormous innovation and value. Examples of such platforms include Microsoft Windows, the World Wide Web, Apple iOS and Google Android. Microsoft's partner ecosystem numbers hundreds of thousands of businesses, all making money on the back of Windows. In 2013, just six years after it introduced the iPhone, Apple generated revenues of $10 billion from iOS apps, paying out $5 billion to developers. Like Microsoft before it, Apple has created a completely new market and opportunities for thousands of entrants.

Software platforms have been responsible for world-changing innovation: Google itself is an example of the explosive impact of the Web. So the idea of turning the network into a platform has exciting implications for the telecom industry. Network platforms will spawn ecosystems of participants able to plug into the platform's common capabilities through its APIs and to build new features and services into it. Ecosystem application developers will be able to create new uses for, and combinations of, the network functions the network platform contains. They are highly likely to generate new sources of revenue from these innovative network services, given the track record of software-based platforms.

As the originators of telephony services, operators were early creators of a network effect. They understand this economic theory and its application to the concept of the network platform. For platform ecosystems to be useful and valuable, there can't and won't be many of them: ecosystems need to coalesce round a few network platforms to create critical mass. At such an early stage of the network-as-a-platform evolution, there are numerous vendors trying to establish themselves as network platform builders and many more evaluating which network platform ecosystem with which to align themselves.

The Argument for an Open Platform

As future providers of network platform-based services, operators face a critical decision over which platform technologies to implement. There are obvious frontrunners in the platform race, but each of them requires a different level of lock-in to the vendor's platform vision and technologies.

Or there is another way: the open network platform. According to *Heavy Reading* research, operators are all too aware of the dangers of vendor lock-in. As they evaluate the network functions virtualization (NFV) and SDN technologies that will form a fundamental part of the network platform, they are showing a strong preference for open components that are being developed by communities of cooperating members and/or standards bodies.

The reasons operators want to implement a network platform based on open components are clear:

- First and foremost, they want complete freedom to choose the components that make up the platform, whether these are common capabilities, network services or applications. They expect to be able to plug and play different best-of-breed suppliers of those components into a platform. This is only possible if the platform is based on open components that expose their capabilities publically to external users.

- A network platform is considerably more complex than an OS platform, Web technologies, social media or search platforms or even the compute and storage environment abstracted as a cloud platform. The definition and development of the network platform is therefore a massive undertaking for the telecom industry. It is unlikely that any one vendor can develop the myriad components needed within a network platform.

- In addition, networking is inherently a multi-vendor environment. Operators question whether a single-vendor platform can attract a wide enough number of partners, including possible competitors of the network platform builder with rival functionality, to support their entire vendor base. Operators don't want multiple, siloed network platforms that would simply reproduce the fragmented operational and service delivery landscape they have in the network today.

- Open communities are creating strong market momentum for themselves, tapping into the "zeitgeist" of openness that is sweeping through all Internet-related markets at the moment. This trend toward openness is expected to accelerate as the first generation of "digital natives" enter the workplace. Companies and communities creating open components are becoming leading sources of innovative development since they naturally attract partners that want to explore and extend them.

A few of the largest and most advanced operators have the full range of network platform skills and deep enough pockets to invest in integrating and deploying an open network platform for themselves.
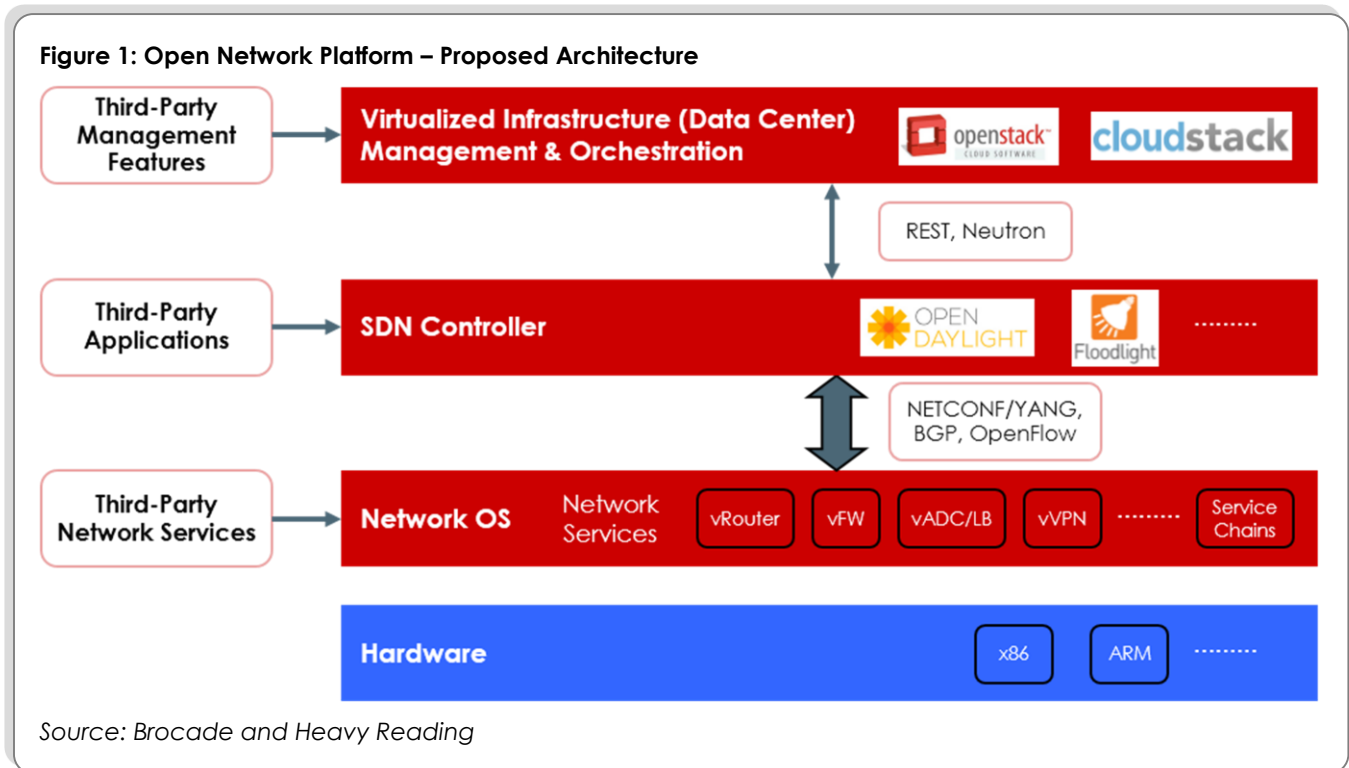
However, *Heavy Reading* believes that over the course of the next few years, competing vendor implementations of an open network platform will emerge, aimed at operators that either don't have, or don't want to acquire, the skills to build, manage, customize and maintain such a platform. This is a tried-and-tested model in the IT market, which is increasingly relevant to the networking world.

"Productized" open network platforms will contain common, open components, such as OpenStack and OpenDaylight, but the vendor will be responsible for ensuring the quality and reliability of their implementation, the complete interoperability of components from different sources and for carrying out post-deployment support and customization. The vendor will also provide potential partners with the information and tools they need to plug into its platform, encouraging the widest possible number of component providers to join forces with it.

Building the Network Platform

Key Components of the Network Platform

The network platform architecture is a work in progress, but three fundamental layers can be identified (see **Figure 1**): a network OS, a network controller, and a virtualized infrastructure management and orchestration tool.

Figure 1: Open Network Platform – Proposed Architecture

Source: Brocade and Heavy Reading

The **network OS** runs across COTS-based forwarding plane boxes and virtual switches, and provides virtualized OSI networking functions such as routing, firewalling, load balancing, encryption, network address translation and deep packet inspection. The network OS provides a fundamental fabric of network functionality for the network platform, but in an open platform, this does not mean that all the functions need be provided by the same supplier. An open network OS is architected so that operators can easily replace its basic, native functions with more sophisticated plugins from specialist vendors, such as a best-of-breed virtual firewall or load balancing vendor.

The **network controller** has two roles. It provides a single point of attachment for applications that want to use the networking functionality embedded in the network OS. The controller also coordinates the delivery of the appropriate network functionality to those applications. In order to carry out this task, the network controller understands how and where networking functions are physically distributed across the platform, how to configure ("program") them and how to connect data flows across them so that applications are supported by the right function(s) on demand. The network controller replaces manual provisioning of network hardware, enabling network functionality to be turned up faster at minimal cost.

The **virtualized infrastructure management and orchestration tool** manages network OS access to the compute and storage resources it needs to execute. The network functions that form part of the network OS will be instantiated in virtual machines (VMs) that need to be created, managed, secured and connected. If the network OS needs to be extended to a new batch of servers, for example, the virtualized infrastructure management and orchestration tool will create VMs on those servers for the OS's virtual network functions to run in. The tool will coordinate with the network controller so that the latter configures the connectivity to the new servers at the same time.

Key Tenets of the Network Platform

An open network platform has three key principles:

- **It is completely modular**. The three layers – network OS, network controller and virtualized infrastructure manager – are separate entities that can interoperate with each other. Each layer is also modular in that each can contain components from multiple participants in the ecosystem.

- **It is built round open APIs**. Each modular component of the network platform exposes public APIs that give users access to root capabilities within the component. In an open platform, there is no concept of "super partners" with privileged access to platform functionality. Components are completely malleable so that they can be extended and changed to suit the needs of the platform implementer.

- **It uses open, public protocols**, such as OpenFlow, for communications with forwarding plane hardware and virtual devices and NETCONF/YANG for their configuration.

There are already key contenders for open network platform components, such as Brocade Vyatta vRouter in the network OS layer, OpenDaylight for the network controller layer and OpenStack for virtualized infrastructure management and orchestration.

Conclusion

The industry is working on several approaches to virtualization, most commonly categorized as software-defined networking (SDN) and network functions virtualization (NFV). As both these technology developments progress, it is clear that they are transformational when they are brought together in a coherent way. They each provide important ingredients for creating the network as a platform. Like other software-defined platforms before it, the network as a platform has the potential to create a new market and new value for the telecom industry.

The network platform inherits the combination of business benefits envisaged for SDN and NFV, including hardware capex and opex savings and the ability to deploy, upgrade, scale and enhance network functionality faster and more flexibly. It adds, however, access to completely new functionality and innovation created by an ecosystem of developers motivated to work with the platform's APIs.

Open platforms have a track record of attracting more developers than vendor-controlled platforms, and the expectation is that an open network platform will lead to an explosion in the number of new network applications and capabilities available to the market, unprecedented in telecom history.

Many operators are in the process of deciding which network platform with which to align themselves; many more are struggling to understand the concept of the network platform. Their choices will define their networks, their network capabilities and the business they can drive from those networks for years to come. Operators should evaluate the industry momentum and broad ecosystem building behind the open network platform, especially if they want maximum control over their destinies in the years ahead.

About Brocade

Brocade provides innovative network solutions that help the world's leading organizations transition smoothly to a virtualized world where applications and information can reside anywhere. These solutions deliver the unique capabilities for a more flexible IT infrastructure with unmatched simplicity, non-stop networking, application optimization, and investment protection.

As a result, organizations in a wide range of industries can achieve their most critical business objectives with greater simplicity and a faster return on investment.