Meru Networks®

WHITEPAPER

SDN for Wi-Fi

OpenFlow-enabling the wireless LAN can bring new levels of agility

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Table of Contents

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Executive summary

For business professionals to doctors to middle school students—and everyone in between—there is never enough Wi-Fi. With mobile devices and cloud services reshaping how we work, live and play, people expect fast, reliable Wi-Fi everywhere. For IT, meeting the exploding mobility demand requires a more agile wireless LAN. As the network edge transitions to all-wireless, software-defined networking (SDN) and OpenFlow are emerging as a way to bring new levels of agility and enable IT to meet users' expectations for a superior application experience from their mobile devices.

Introduction

When people make calls, collaborate and access applications from their tablets and laptops, they want the same responsiveness as when using a wired connection. In the classroom, the Wi-Fi is being called on to engage students with digital learning and measure progress with online assessments. On the hospital floor, clinicians need ready access to patients' medical records and medical images from their tablets. Hotel guests video chat and stream movies from their rooms, and in stadiums and arenas, fans use smartphones and tablets to share their experiences.

Tablets, smartphones and laptops are just the beginning. Billions of other devices will be connected wirelessly, continuing to drive productivity, efficiency and fun. Gartner estimates that 26 billion devices will be connected to the Internet of Things by 2020. Other market watchers peg the number even higher—75 billion in the same timeframe, according to Morgan Stanley.

With the rapid growth of mobility and cloud services, the wireless LAN is becoming the primary access method. With next-generation 802.11ac technology delivering gigabit throughput today, the transition to an all-wireless access network will only accelerate.

To achieve the full promise of mobility, wired and wireless LANs must be provisioned faster and managed more easily. Today, applications and services depend on two physically separate networks. The user experience differs when using applications over the wired or wireless LAN. IT must manage and secure wired and wireless access networks separately, with discrete tools and consoles. The difficulty of provisioning and managing these infrastructures independently is a barrier to achieving the scale that is required.

Why SDN at the edge

SDN can have a transformative power on campus networks. To date, the industry discussion around SDN largely has been focused on the data center. As organizations move to virtualization and the cloud, they see that the manual configuration of legacy data center networks is time-consuming and error-prone. A virtual server can be created in minutes, but changing the underlying network may take days or weeks. SDN has emerged to remedy this problem.

SDN-enabling the edge network can pave the way to deliver consistently high performance for essential business applications. Key applications can be prioritized over the virtual network, which ensures a consistent user experience. A more agile access network can better meet the exploding demand for applications and services, allowing IT to deliver more network services at a faster pace with fewer or the same resources.

The SDN market is expected to be large in its own right. IDC predicts the SDN and OpenFlow market will grow to almost $2 billion by 2016, driven by the need for increased scalability and network programmability.

[1] "Gartner Says the Internet of Things Installed Base Will Grow to 26 Billion Units By 2020," December 12, 2013, http://www.gartner.com/newsroom/id/2636073

[2] "Morgan Stanley: 75 Billion Devices Will Be Connected To The Internet Of Things By 2020," Business Insider, October 2, 2013, http://www.businessinsider.com/75-billion-devices-will-be-connected-to-the-internet-by-2020-2013-10

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Five benefits of SDN-enabling the wireless LAN

SDN for Wi-Fi enables organizations to:

1. **Create and enforce unified policies network-wide.** With SDN, IT policies are defined once and then are enforced consistently across the wired and wireless LANs. Users have a uniform experience, regardless of their access method.

2. **Build a smarter campus network that adapts to business needs programmatically.** With SDN, the campus network becomes more intelligent and changes dynamically in response to application and business needs. With SDN enabled across the network, IT can enforce service levels to automatically deliver the necessary network performance, quality of service or security. Open, standards-based APIs make it easy to create SDN applications, which directly and programmatically communicate their network requirements and desired network behavior to the SDN controller.

3. **Unify management of the wired and wireless network.** Having single-pane-of-glass management for the wired and wireless LAN simplifies network operations and lowers costs. Administrators can view clients using a single tool, no matter which network they're on, and they gain greater visibility into the unified network. Network administrators finally can put an end to swivel-chair management.

4. **Have greater choice of vendors.** SDN is open and standards-based, and it enables IT to mix and match network components from different vendors. Ultimately, greater choice creates competition in the market, and that drives innovation.

5. **Simplify network provisioning and lower total cost of ownership.** Because an SDN-enabled network responds dynamically to changing policies and traffic loads, the network administrator is freed from manual, time-consuming tasks. That allows administrators to focus more on strategic work, rather than configuring and reconfiguring network devices to meet the business needs. And ultimately, that lowers the cost of network operations.

What's needed to bring SDN to the wireless LAN

SDN logically abstracts the network infrastructure from the applications and services. The SDN architecture consists of three distinct layers (see Figure 1).

- The Application Layer consists of the end-user business applications that consume the SDN communications services. The Application Layer and Control Layer communicate via an API.

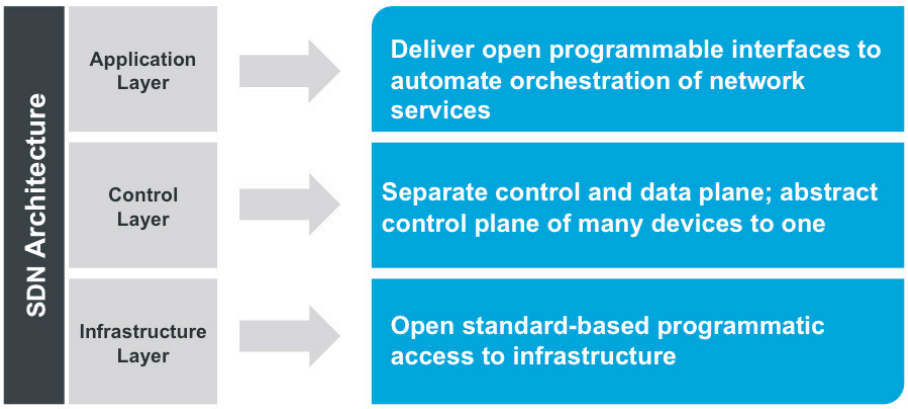

Figure 1: The SDN architecture consists of three distinct layers: Application, Control and Infrastructure.

[3]"Technology Assessment: The Impact of OpenFlow on Data Center Network Architectures," June 2012, IDC #235074

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- The Control Layer provides the consolidated control functionality that supervises the network forwarding behavior through an open interface.

- The Infrastructure Layer consists of the network elements and devices that provide packet switching and forwarding.

In this architecture, wired switches, wireless controllers, wireless access points, routers or other network devices support the OpenFlow protocol, which provides access to the data plane (see Figure 2). Network devices then communicate with the SDN controller, such as the open source OpenDaylight or Floodlight OpenFlow Controller or from a third-party vendor. The SDN controller functions as the control plane for the network. It also supports the open APIs that are used to communicate with business applications, cloud orchestration tools and SDN applications.

SDN Wi-Fi in practice: Four use cases

Let's look at several examples of how SDN can make the wireless LAN more agile.

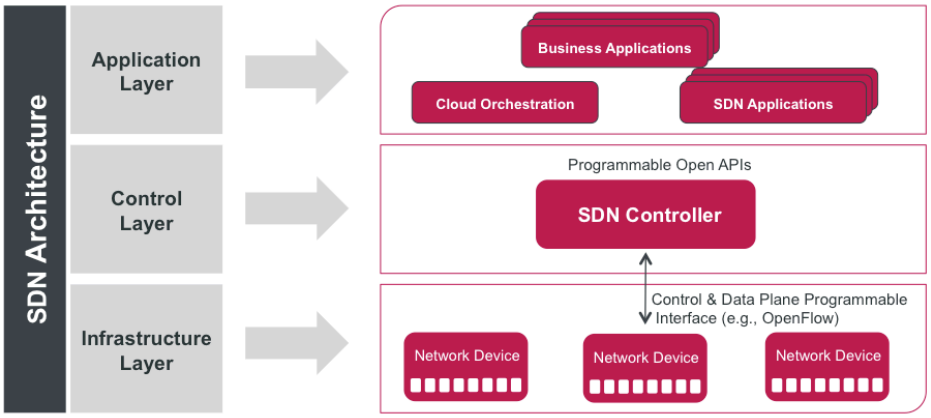

Figure 2: Network devices, such as switches, wireless controllers, wireless access points and routers, make up the infrastructure layer. The SDN controller is the brains of the network, and communicates with SDN applications, such as cloud orchestration tools or business applications.

- **Consistent user profiles across wired and wireless networks.** Today, users are faced with one username, password and access method for the wired network and a different username, password and access method for wireless. With SDN, users can have a single profile and access method that grants the appropriate rights and enforces the appropriate security, while always using the same logon credentials.

- **Control and configure wireless access points.** SDN can be used to monitor network traffic flows at the edge and specify how traffic should be routed, and which application flows should have priority access to the RF. In this way, SDN can program the traffic flow over the air to ensure that users and applications gain the connectivity they need.

- **Enforce policies network-wide.** In essence, SDN is a general-purpose policy engine for the network. IT can implement policies to govern application quality of service, security profiles or even specific devices.

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As an example, Microsoft Lync SDN APIs allow vendors to integrate Lync and SDN controller APIs to provide better tools for network monitoring, diagnosing and ensuring guarantee of service for a unified network. By integrating similar capabilities in a WLAN managed OpenFlow controller, similar QoS decisions can be made at a centralized location for the whole network and be deployed uniformly across wired and wireless networks (see Figure 3).

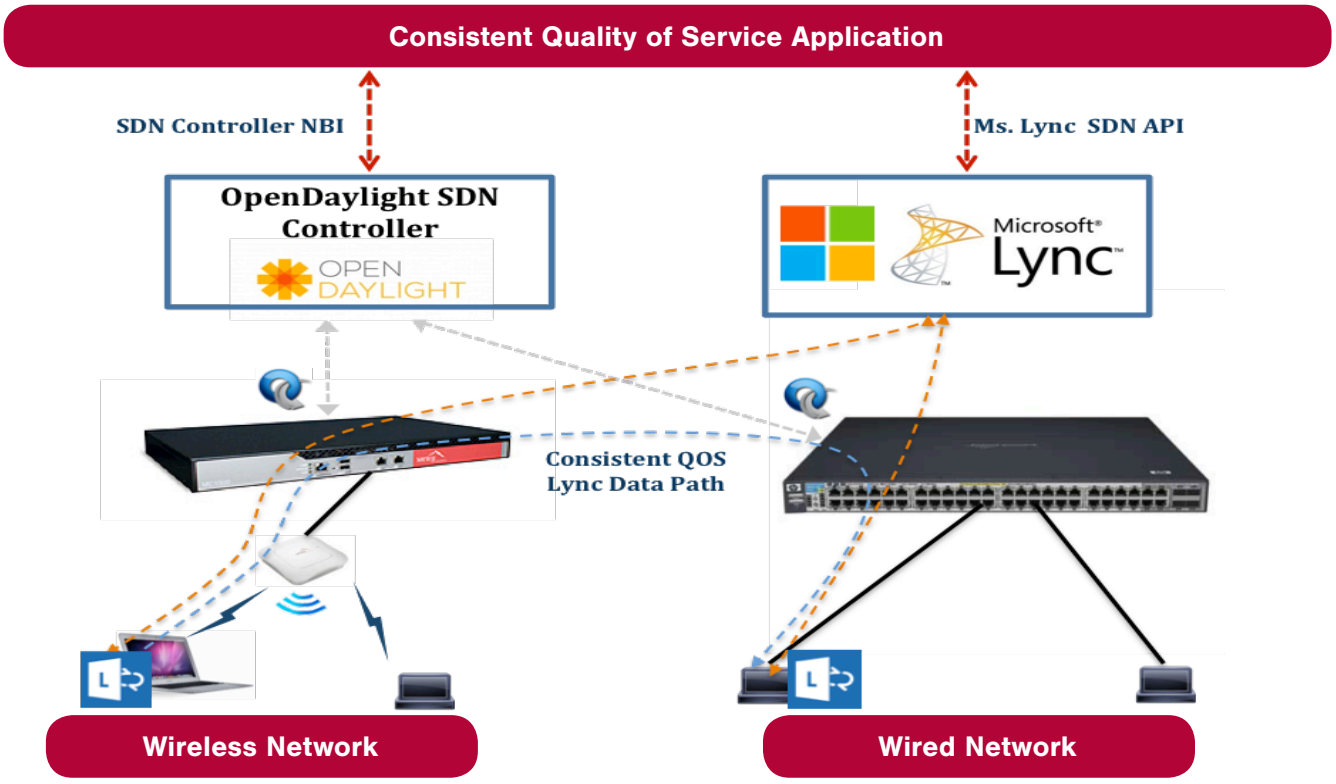

Figure 3 – Microsoft Lync voice call over wireless/wired SDN.

- **Provision bandwidth for key applications.** Ensuring the performance of critical business applications is a common IT objective. If the CEO is hosting a virtual meeting for employees, it's essential that everyone can view the video. Before the meeting, an SDN application can automatically provision the network to allocate bandwidth and enforce quality of service to ensure that the broadcast of the CEO's session gets top priority on the network. To ensure these service levels today requires a huge amount of manual configuration across both the wired and wireless networks, but with SDN, provisioning is automated and easy.

Making SDN a reality for Wi-Fi

2014 is going to be a very exciting year for network virtualization and SDN.

The promise of SDN is that networks are no longer closed, proprietary and difficult to program. But the extent of that openness and flexibility ultimately depends on each vendor's implementation and adherence to the standards. Limited implementations or proprietary twists will serve only to hamstring the progress of SDN with customers.

To deliver on the promise, SDN must work for all users and across all networks, with true interoperability among network components via OpenFlow. With open programmable access to the wireless infrastructure, network-aware applications can communicate directly with the wireless controller and the network can change dynamically in response. And customers can reap the full benefits of SDN.

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