

SDN FOR ACCESS NETWORKS: A MOSAIC OF SERVICE PROVIDER OPPORTUNITY

BUSINESS TRANSFORMATION HINGES ON OPENNESS, PROGRAMMABILITY AND SCALABILITY



INTRODUCTION: NEW MARKET AND NETWORK REALITIES

A LOOK AT THE COMPETITIVE LANDSCAPE

Today's home broadband networks are bigger and better than ever before, and are capable of enabling a bold new connected world. Trends like smart home and the Internet of Things (IoT), digital content and hybrid TV service, bandwidth-on-demand and app-centric, mobile-friendly personalized communications are here to stay—and there's no shortage of players ready and willing to deliver service packages to meet consumer demand.

For service providers (SPs), this means more and more competition with over-the-top (OTT) providers, as consumers demand more personalized, app-based, user-driven services. "OTT services are experimenting with a variety of models in order to differentiate and find their niche within the crowded North American market," said Ruby-Ren Bond, a research analyst with Parks Associates. "Start-ups and incumbents alike are experimenting in balancing content offerings, content costs, revenue generation and consumer appeal."

To compete effectively, traditional telcos and cable MSOs must transition quickly to be able to provide a fresh set of revenue-generating offerings beyond their traditional bases of voice, video and data. They also need to make existing services more operationally efficient and flexible. Addressing both goals will allow them to bolster customer loyalty and provide service differentiation, especially as OTT competition and traffic levels increase.

“Large cloud services providers such as Amazon, Google, Facebook, etc., are reinventing the way in which IT services can be delivered,” said Cameron Haight, research vice president at Gartner. “Their capabilities go beyond scale in terms of sheer size to also include scale as it pertains to speed and agility. If enterprises want to keep pace, then they need to emulate the architectures, processes and practices of these exemplary cloud providers.”

THE DRIVE TOWARDS SDN

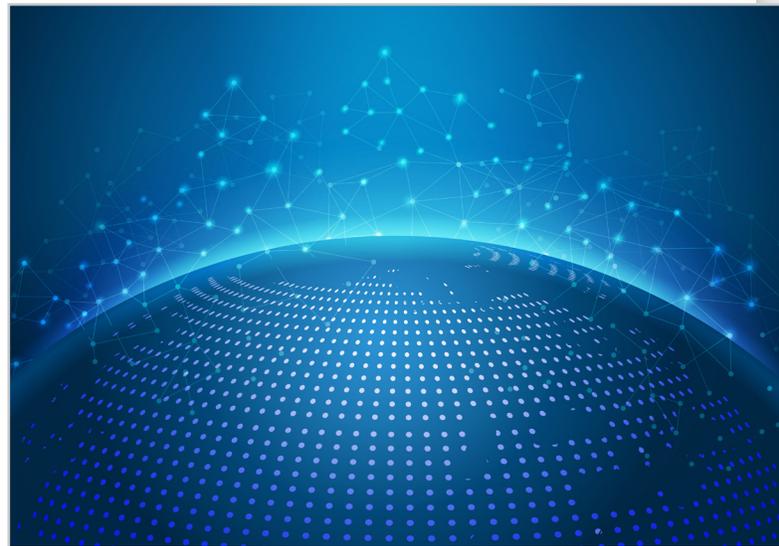
One of the most innovative ways to transform networks to meet these new market realities is to embrace software-defined networking (SDN). SDN enables the automated provisioning of services across available hardware and virtual inventory, OSS and back office systems, and network elements themselves, and can do so in a centralized, automated fashion.

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“SDN simplifies the connectivity between physical and virtual network elements at Layer 2/Layer 3 via network virtualization protocols such as OpenFlow,” explained Deloitte Consulting, in a research brief.¹ “NFV and SDN together offer an elegant solution

for CSPs looking to address the challenges driven by business dynamics and operational considerations for today’s telecom networks.”

The result is the game-changing ability to enhance order turn-up times to the point of being on-demand, paving the way for all kinds of new residential use cases, like self-service bandwidth upgrades, advanced cloud DVR functionality, dynamic parental controls or smart home applications. SDN in the access network provides tremendous time-to-market (TTM) advantages for on-boarding new technologies, and services.



The result? More flexible, scalable, user-driven service innovation, and more efficient operations for existing offerings.

A NEW DEFINITION OF ACCESS

While SDN for network operators is most commonly seen in the context of managing network functions virtualization (NFV) and the core, the access piece is critical to enabling the promise of the next-generation network. Service providers want to allow the creation of a user-driven service architecture that matches user behavior

in an app-driven economy. But a programmable service architecture falls short if the component that actually delivers the service to the end user is not updated as well. That's why software-defined networking for the access network (SD-Access) should be a critical part of SP investment.

It should be noted that the access network is undergoing a period of unprecedented modernization. Residential demand for things like online video, cloud apps and real-time digital services is forcing SPs to increase the bandwidth that they provide, leading to the deployment of three compelling new access technologies: G.fast (copper), 10-Gig PON (fiber) and DOCSIS 3.1 (coax).

As a result, the SP access network of the future is a mosaic of various IP-based physical technologies, which are capable of supporting Gigabit access and beyond. They enable a new definition of access as being the link between the data center's edge and the end-user device. With this rapid change in the physical layer, it's important to take a technology- and vendor-agnostic approach to managing it through flexible software approaches.

"SDN entails the separation of the forwarding plane from the control plane in a network. This helps in effective data flow control and provides network administrators with a software-based approach to manage the network," explained Grandview Research, in an SDN market analysis.² "In comparison to SDN, which offers a centralized controller, in traditional network architectures, each network device needs to be configured separately. As a result, there exists a high degree of dependency on vendor-specific tools and instructions. SDN promotes flexibility and scalability in the network along with helping streamline operations... Additionally, SDN facilitates the establishment of an efficient network and ensures virtualization, cloud services, agility, etc., which is expected to propel market growth."

BUILDING THE PROGRAMMABLE ACCESS NETWORK OF THE FUTURE

Leveraging SD-Access for successful business transformation hinges on three key aspects: The next generation of networks must be open, scalable and programmable.

SD-Access offers more flexible, scalable, user-driven service innovation, and more efficient operations for existing offerings.

While many vendors say they're open, many are not truly interoperable with third parties. With an open-architecture approach, service providers have the freedom to choose best-of-breed elements and control the introduction and network rollout of new customer applications and broadband technologies. In today's world, where everything from the data center to the device has evolved to being part of the access network, it's important to view SD-Access in a cohesive way.

This is accomplished by implementing management and control features as software applications created on top of open-source network control and service orchestration systems. This approach is of course an architectural shift from networks that have historically relied on closed, siloed systems being managed by vendor-specific management systems. It's an evolution that enables operators to support the desired rapid creation of new revenue-generating services, while vastly lowering their cost to build, operate, innovate and maintain their networks.

"Service providers have made massive investments in people and processes centered on these proprietary tools and technology, thus creating multiple organizational silos," Deloitte noted.

“Operations will need to evolve from service/operational silos to standardized cross services operations management.” Krish Prabhu, the CTO and President of AT&T Labs, adds. “So the first advantage of SDN is to be able to handle 4 to 8 times the traffic with the same amount of CapEx. It gives us a high degree of modularity in where we deploy the capital.”

On the scalability front, SPs should enable highly elastic approaches that use a modular, component-based software architectures that have been abstracted from the hardware layer. They can gain further efficiencies by implementing a micro-services architecture and virtualized service delivery systems, so that dedicated software compartments for virtualized network functions can be orchestrated and used as needed, on-demand. Further, open, Linux-based micro-services allow the SP to scale its application development or reuse open source content across multiple technologies and across multiple vendors. This greatly speeds market-wide service rollout at web-scale.

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Programmability meanwhile enables rapid service delivery, ubiquitous access to data assets and pervasive innovation across the operator organization, customers and partners. Automation enables service providers to simplify network and back-office operations, streamlining new subscriber adds and upgrades, while reducing truck rolls and supporting self-service, on-demand models.

Overall, SD-Access networks enable SPs to make the most of a range of transformational opportunities:

- **Automates the Network/Orchestrates Services:** SDN programming via open application programming interfaces (APIs) and the adoption of service automation and orchestration reduce service provisioning times, human error and IT complexity, while enabling customer self-service capabilities.
- **Speeds Time to Market:** programmable and cloud-controlled control of access networks reduces service creation intervals and streamlines the on-boarding of new Gigabit broadband access technologies by taking a cohesive management approach to multi-domain, multi-vendor networks.
- **Assures Residential Quality of Experience:** Elastic, pay-as-you-grow architectures and hitless component-based service architectures reduce service interruption and network congestion improving the overall customer experience.
- **Addresses Multi-vendor Network:** Allows operators to efficiently address best-of-breed networks—multi-technology and multi-vendor—through programmable orchestration.
- **Enables New Use Cases:** SPs can deliver user-driven services that are available to customers 24/7 and do not require a truck roll or service technician. By logging into a secure Web portal, users can do everything from upgrade their service package to sign up for home monitoring or security services. This also supports new revenue-generation models based on content access, premium-tier SLAs, managed security and so on.

“Data center architectural principles need to be applied to access,” said Jay Wilson, Senior Vice President, Technology and Strategy, ADTRAN. “We can utilize SDN to create highly automated and programmable networks, and adopt a policy that disaggregates and breaks apart the monolithic proprietary systems out there today. This will

eliminate the high cost of network overhead and enable the creation of rapidly differentiated services, while assuring subscriber QoS.”

ADTRAN SD-ACCESS SOLUTIONS

ADTRAN’s own SD-Access architecture, ADTRAN Mosaic™, serves as the foundation for all of ADTRAN next-generation platforms, including its NG-PON2 and G.fast solutions, which are being trialed by leading Tier 1 carriers around the world. These Gigabit broadband-enabling programmable network functions are natively integrated into an open microservices architecture that spans the entire network, from cloud edge to subscriber edge - from data center to device.

The key components of Mosaic include:

- **Mosaic Cloud Platform:** Combines modular apps that have been developed in a microservices software architecture with open source control and orchestration platforms to create open, SDN-based network programmability
- **Mosaic OS:** Modular OS that has been optimized for SDN-programmability, virtualization, high availability and multi-vendor app integration
- **Programmable Network Functions:** Multi-vendor networking solutions, whether physical network elements or cloud-based virtual functions, that are integrated natively within the Mosaic cloud platform any other open, SDN controller-based management architecture.

“Service providers today are tasked with delivering dynamic service portfolios, and ADTRAN is dedicated to supporting their needs for agile, open, software-based network solutions that enable them to swiftly keep pace with demands for cloud connectivity, the Internet of Things and bandwidth-rich services,” said Wilson. “Mosaic will enable a fundamental transformation of the access network, streamlining service innovation, eliminating vendor lock-in, optimizing network programmability and creating the framework for user-defined service creation.”

CONCLUSION

SD-Access networks allow SPs to prioritize new revenue-generation options, reduce operating expenses and improve customer experiences, with a transition to user-driven networks that enable subscriber self-service models. Traditionally, service provider networks have been monolithic, closed structures rooted in proprietary systems; but now, operators now must quickly transition to the future access network, one that is open, programmable and scalable. There has never been a better time to enable business transformation, giving the unprecedented rate of access network modernization.

ADTRAN Mosaic simplifies and accelerates the deployment of these open networking platforms with a complete set of programmable cloud-based applications and physical network elements that are needed for carrier-grade deployment environments. To find out more, please visit adtran.com/mosaic.

¹Operationalizing SDN and NFV Networks

²Software Defined Networking (SDN) Market Analysis By End Users (Enterprises, Cloud Service Providers, Telecommunications Service Providers), By Solutions (SDN Switching, SDN Controllers, Cloud Virtualization Applications) And Segment Forecasts To 2020

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