

SD-PON: Transforming the Fixed Network

By: Rishi Raj Maulick

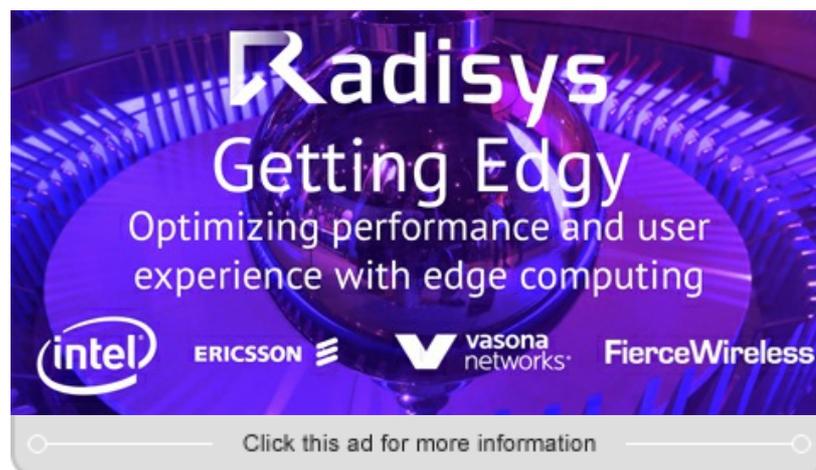
The telecom industry is undergoing a massive transformation as service providers across the board seek to transition their networks from proprietary closed box solutions to more open SDN and NFVI-based architectures. The goal of these network transformations is to reap the benefits associated with economies of scale, reduced CapEx and OpEx, as well as gain the agilities of service introduction. As part of this effort, broadband service providers are turning to new software-centric technologies to redefine their network architectures and achieve these benefits. SD-PON solutions fit the bill, enabling broadband service providers to transition their legacy OLTs (optical line terminals) to white box hardware with SDN control.



What is SD-PON?

SD-PON—or Software-defined Passive Optical Network—is a new term that defines the “softwareization” of the functions that originally resided on legacy OLT boxes in a broadband network. By moving these functions from proprietary black boxes to commodity platforms as software form factors and leveraging white box platforms for access specifics, service providers will be able to disaggregate their networks, driving down costs and breaking vendor lock-in. SD-PON also adds programmability to the network, enabling broadband service providers to leverage SDN control and manageability.

Another important point to note is that SD-PON aims to deliver a common software platform that can be used across a number of broadband access technologies, from GPON to XGSPON to NG-PON2 and more. By being “access technology agnostic,” broadband service providers can leverage one solution across their networks.



Understanding the Market Drivers for SD-PON

There are many drivers that are causing broadband service providers to evaluate SD-PON solutions for their networks.

Growing number of subscribers

There has been a significant increase in the number of subscribers, with traditional broadband services and use cases rapidly expanding beyond residential subscribers to include enterprises as well. And these new services are being diversified, including triple-play (phone, TV, internet), TV-to-TV calling, and more. Broadband service providers need to be able to support a growing number of subscribers and use cases with a network that delivers performance and scalability.

NG-PON2 adds much-needed speed

Broadband service providers leverage passive optical networks (PONs); a PON is a point-to-multi-point network that leverages one distribution network that splits via passive splitters to serve multiple homes or enterprises. Service providers are now evolving their Gigabit PON (G-PON) networks to Next-Generation PON (NG-PON) in order to keep pace with subscribers' exploding bandwidth requirements.

The need for 5G backhaul

With the advent of 5G, service providers will need to leverage a backhaul channel that can handle 5G network requirements for capacity and extremely low latency. While millimeter waves in 60 GHz offer one solution, broadband networks will also be tapped.

FTTX penetration in Europe and Asia

FTTX, or Fiber to the x, is critical to driving next-generation access for broadband deployments. It provides a significant upgrade to broadband services in terms of speed and quality. FTTH (Fiber to the Home) is one flavor of FTTX that uses optical fiber to provide the last mile to a single premise. As FTTX becomes increasingly prevalent, primarily in Europe and Asia today, broadband service providers will be able to use SD-PON solutions to manage their networks.

SD-PON: Transforming the Broadband Network Architecture

It's important to note that deploying SD-PON solutions does not change broadband service providers' overall deployment model. Changing fiber is the most expensive step a service provider could take. Instead, the critical transformation comes in changing the OLT from an expensive and proprietary "black box" solution to open and disaggregated "white box" solutions built with bare minimum silicon, x86 hardware, and general-purpose commodity platforms, as seen in Figure 1 below.

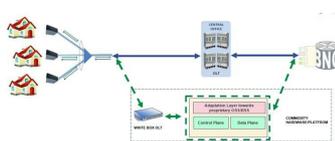


Figure 1: SD-PON Solution Deployed in the Network
(Click to Enlarge)

By moving to a white box solution where the software is disaggregated from the hardware, the key benefit that SD-PON brings to the table is reduced OpEx. In the traditional model, CapEx and OpEx costs are passed on as a blended cost from the single-source vendor. With the SD-PON model, CapEx costs are reduced, but the service provider still needs to cover the costs for the silicon, x86 servers and commodity platforms. However, OpEx costs are significantly reduced as it is a software-driven and an open management solution, enabling service providers to easily make changes or enhancements while leveraging a flexible supply chain of vendors.

In Phase 1 of deploying white-box solutions at the OLT, broadband service providers can disaggregate the control and management plane. As the network matures, broadband service

providers will be able to move to Phase 2 and disaggregate the data plane as well, but still all on the same general-purpose platform.

The SD-PON solution can also be deployed in the central office or at the network edge, providing broadband service providers with flexibility to deploy the solution where it is needed most to meet their subscribers' requirements for quality of service, performance and latency.

Insights from Early SD-PON Trial Deployments

Broadband service providers have begun to trial SD-PON-based solutions in their networks, with several service providers in the “walk” phase of a “crawl-walk-run” deployment model, with “run” being a full network deployment. While service providers around the globe are trialing SD-PON, the majority of definitive activity is taking place in Europe and Asia.

[Deutsche Telekom](#) is one provider that has spoken publicly about its plans to deploy next-generation fixed broadband access using a combination of bare metal hardware, cloud technology, and open source software for its Access 4.0 program. With Access 4.0, Deutsche Telekom plans to deploy geographically distributed edge data centers—that are technically aligned with SD-PON—to deliver broadband services to its subscribers. According to the company, the key benefits of this approach include scalability, efficiency, and reduced time to market.

Similarly, a large tier-one service provider in Asia is trialing SD-PON solutions at the edge in its broadband network to achieve the benefits of SDN, disaggregation, and a multi-vendor ecosystem.

The Future of Broadband Networks

The growing number of residential and enterprise subscribers, the increase in number of devices per user, and the explosion in bandwidth-intensive applications is causing broadband service providers to rethink their access network design for the last mile. Broadband service providers must address these challenges while balancing deployment, upgrade and maintenance costs. Unlike the traditional closed and proprietary systems that dominate broadband networks today, forward-looking broadband access solutions must embrace open software-controlled infrastructure.

SD-PON solutions—disaggregated and open—will define the way future broadband networks are deployed. Service providers will be able to reduce overall costs and accelerate new service introduction, all while maintaining the highest quality of experience for their subscribers.