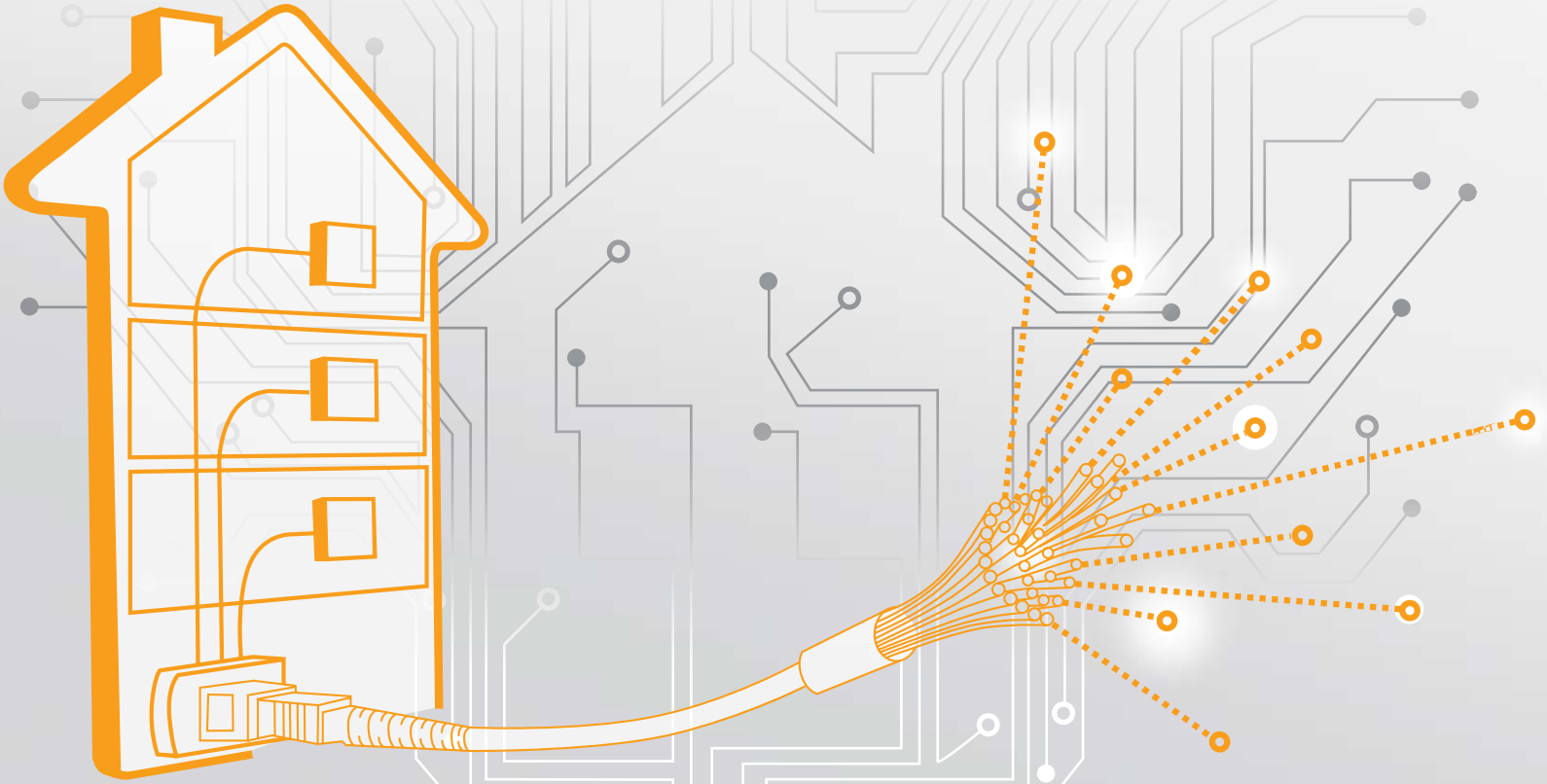
EXECUTIVE BRIEF

EXTENDING FIBER DEEPER INTO THE NETWORK:

Enhance Capacity and Performance While Reducing Network Complexity



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Extending Fiber Deeper into the Network: Enhance Capacity and Performance While Reducing Network Complexity

Demand for bandwidth in the access network continues to grow, driven by 'billboard speeds' and the sharing of rich media content as a favorite pastime. As such, Service Providers are feeling the pressure to raise the bar and deliver experiences with ever-increasing quality and reliability. Based on projections of bandwidth required to deliver video (IP, QAM, SDV and VOD) and data services, most Service Providers are expected to reach full capacity on their networks within the next decade.

Aside from adding bandwidth capacity to their networks, Service Providers are looking to simplify their infrastructures for services including high speed data, voice, program channels, Video on Demand (VOD) and new services such as home security and IoT. But upgrading the network can be difficult with aging technology, full-to-overflowing headends and limited system capacity, making the task of reducing network complexity seem arduous. But Service Providers know they need to act now because today's consumers expect better, faster and seamless service for all of their connected devices. Anything less can pose a risk for customer churn.

How do you get there from here?

As Service Providers move toward providing gigabits of IP bandwidth for video and broadband services, they must do so without constantly investing in new platforms. The strategy is to evolve the access networks. In doing so, Service Providers can migrate their hybrid fiber coax (HFC) networks to extend fiber deeper into the network. Let's briefly take a look at three architectural approaches for migrating HFC networks to FTTx.

Fiber to the home (FTTH) with analog modulation

A radio frequency over glass (RFoG) network is capable of seamlessly delivering functionality and services to subscribers in a manner that is comparable to current HFC systems. It's an analog optics technology that provides a migration path to FTTx or xPON architectures by replacing the coax portion of an HFC network

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with a single-fiber passive optical network to increase capacity, while continuing to use existing back office infrastructure and CPE. It provides an FTTH PON like architecture without requiring Service Providers to select or deploy a PON technology and the necessary headend and CPE changes. RFoG eliminates RF amplifiers and RF line extenders from the network, reducing failures, maintenance and power requirements for a distinct performance advantage over current HFC networks.

Distributed Access Architecture

A Distributed Access Architecture (DAA) can be implemented gradually in concert with normal plant and service upgrades, at first leaving legacy services untouched, then gradually migrating RF functionality to the node. It extends the digital portion of the headend to the node (or PHY shelf), and places the digital to RF interface at the optical to coax boundary within the node (Remote PHY). Replacing the analog optics from the headend with a digital fiber Ethernet link increases the available bandwidth and improves fiber efficiencies with regard to both wavelengths and distance. The migration roadmap can include both Remote PHY and Remote MAC-PHY architectures as part of the access network evolution framework, which provides modular solutions for multiple network upgrade paths. This approach extends the value of HFC network investments, while enabling a seamless and profitable future transition to a completely IP network for all current and future services.

Fiber to the home (FTTH) with digital modulation

For Service Providers where capacity, or competition from other fiber services, is such that multi-gigabit symmetrical (upstream and downstream) services are required, FTTH via an Ethernet passive optical network (EPON) is the best option. Primary deployment architectures for FTTH are based on either a centralized or distributed approach. With the centralized approach, the optical line terminal (OLT) is housed in the headend, and the distance limitation typical for EPON of 20 km can be extended to as much as 80 km with active PON extenders. In the distributed approach, the OLT is a remote OLT module housed in the node or cabinet location, and the typical EPON distance limitation of 20kms remains the same, but from the node to home vs. headend to home. PON offers a cost-effective, low maintenance approach for adding higher data rates for video and other Internet services, without having to deploy an individual fiber to each subscriber.

Decision drivers for choosing a migration path

Each Service Provider is unique with varying network requirements, legacy equipment, level of HFC investment and business objectives, to name a few. That means every Service Provider must follow its own network migration path. So how does each provider decide which path is the right one? Service Providers need to consider certain criteria in order to determine which solution best supports their needs. The criteria include the following:

- Headend capacity – where space, power or other facility constraints may prevent the addition of new headend equipment
- Capital and operating costs – particularly the desire to leverage existing investments vs. performing inside plant, outside plant and CPE upgrades
- Deployment considerations – where fiber installation for new home construction costs less than replacing coaxial cable with fiber at a later time
- External factors – such as real estate costs, zoning regulations, power distribution, plant configuration and other factors that may affect the choice between indoor and outdoor equipment
- Product availability and specification approvals – which can impact the feasibility of some network evolution paths

Taking the first step

Service Providers realize that they need to add capacity while reducing network complexity — all while maintaining the highest quality of service. However, with multiple migration options and several different approaches to take for each, it can sometimes be difficult for Service Providers to compare apples to oranges.

By working with a partner to devise an access network evolution framework, Service Providers can employ a flexible migration plan that meets their current and future network requirements while extending the investments they've already made in HFC. By deploying the architectures that work for their own situation, Service Providers can increase capacity, improve network quality and upgrade throughput to all subscribers. Once on the right migration path, Service Providers are in a stronger position to reduce congestion on the network and deliver the quality of experience that consumers demand.

*For more information about extending fiber deeper into the network, please visit **arris.com.***

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