Transforming the Headend
for Fibre Deep Deployments

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Network migration at the headend does not have to be daunting. The transformed platform will be able to take on capacity to enter new markets, such as wireless backhaul, and support business-class subscribers.

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> ## So, for every change in the outside plant, there needs to be an equally significant change at the headend.

It's no secret that OTT service providers, such as Netflix, Hulu and Amazon Prime, are currently thriving. For MSOs, this means that, despite the threat to their traditional revenues, providing high-quality internet services for their customers has never been more important.

There are several approaches that MSOs can take to meet these growing bandwidth demands and improve performance. When considering the best approach for the outside plant, the headend is an important and sometimes overlooked element of network transformation strategy. Even the most efficiently deployed outside plant network can miss the operator's service targets if the headend services are not in place. So, for every change in the outside plant, there needs to be an equally significant change at the headend.

Inherent challenges

There are, however, a number of inherent challenges that come with the headend's physical constraints, including footprint limitations and cooling and powering requirements. These constraints are among the reasons why we are hearing less about full-spectrum transmitters and more about network functions virtualisation (NFV) and virtual cable modem termination system (vCMTS) platforms. Both approaches help to deliver bandwidth where and how a subscriber wants it while also moving some of the headend functionality into the outside plant where there is more room to grow. Consequently, today's headend is looking less like a headend and more and more like a data centre. This concept of headend re-

architected as a data centre (HERD) is a good approach for MSOs to create a streamlined network which can be scaled effectively.

Inside the headend, the traditional RF cabling and quadrature amplitude modulation (QAM) equipment are giving way to Gigabit Ethernet switches and virtual machines running on traditional server platforms. This headend re-imagining affects cabling and connectivity because operators are essentially replacing the heavy coax infrastructure with high-density fibre-optic cabling, cross-connects and dense wavelength division multiplexing (DWDM) capabilities.

Linked to this trend is a continued drive to push the network closer to the end-user to provide better service. By using a fibre deep deployment and pushing the optical-to-electrical conversion closer to the subscriber, MSOs can further improve performance as well as cut power and maintenance operational costs. While this isn't a solve-all solution for MSOs, it will certainly bring savings on operational costs and power consumption.

Dense but modular fibre management solutions can help cable engineers to manage the daunting task of making changes at the headend that can support today's fibre deep deployments, as well as any future migration toward Remote PHY and/or fibre-to-the-home. Let's look at three categories of usability and density improvements that enable headend transformations without service interruptions.

Structured cabling

Traditionally, cabling in the headend has adhered to the classic interconnect architecture. Cables "interconnect" to a main distribution frame (MDF), which then provides access to the outside plant nodes. MDFs are then segmented by how many fibres are needed for each node.

Today, operators must look towards an integrated architecture where they may choose a cross-connect structured cabling platform to help support additional demarcation and flexible moves, adds and changes (MACs). Although demarcation additions and MACs may not be common in a traditional HFC environment, the expansion of business-class services and the possibility of new service capabilities in the outside plant (such as small cell backhaul) will require a common and consistent cabling architecture.

Integrated cable assemblies

It is certainly not uncommon for your typical headend to be a disorganised mess of jumpers. At first, running jumpers between bays begins as a temporary installation practice but then inevitably turns into standard operating procedure. The resulting jumper cluster is an eyesore, and even worse, the very picture of inefficiency in a network with little tolerance for practices that can compromise service.

Doing it right doesn't have to be hard, however. Integrated cable assemblies can connect services from origin to termination point easily, while enabling easy expansion by parking lots within the passive frames - no untangling required.

Dense, modular DWDM

With migration to Remote PHY, operators are now able to consider tightly-spaced DWDM channel plans. But deploying 48-channel muxes throughout the headend is not the answer. Instead, operators should deploy just what is necessary today, with a canny eye toward expansion. Even if it's not in the forecast, future expansion shouldn't require a re-cabling with this modular approach. It is, however, important to ensure that modular capacity expansion is available and easily achievable.

Network migration at the headend does not have to be daunting – it is possible. Even without impacting service delivery to existing subscribers, it is possible to expand the network's services within existing congested footprints in perfect alignment with the work being done in the field.

Once complete, the payoff is visible with less coax and more fibre in the headend with ten times greater connectivity and more space to expand. The transformed platform will be able to take on capacity to enter new markets, such as wireless backhaul, and support business-class subscribers.

Beyond this, by driving fibre closer to the subscriber, MSOs can make significant savings on power and operational costs.