Evolving your DAA

By CommScope

Operators that avoid delay in choosing between either R-MACPHY or R-PHY will speed down the road to 10G quicker than those who hesitate.

Dan Torbet

Dan Torbet is a Director of Systems Engineering at CommScope. In this role, Dan manages multiple projects and Architects working on the CommScope's Distributed Access Architectures. Dan has been with CommScope/ARRIS for 22 years and has been a frequent participant on multiple Industry Standards efforts at CableLabs including DOCSIS (1.0-4.0) PacketCable voice, CableHome, Remote PHY, and Flexible Mac Architecture. Dan has also been active with the Consumer Technology Association and ETSI/ DVB. Dan also served as the co-Chair of the Rocky Mountain IPv6 Task Force and successfully ran multiple IPv6 Summits promoting IPv6 adoption in industry.

Craig Coogan

Craig Coogan is a Senior Director of Product Management at CommScope, where he has specific focus on the Converged Cable Access Platform (CCAP), Cable Modem Termination System (CMTS), and Distributed Access Architecture (DAA) products, including the Remote PHY and/or MACPHY Devices, Video & Data Cores, and the software products that make deploying DAA systems easy. Craig has worked at CommScope/ARRIS for 21 years in a variety of roles, including R&D, Sales Engineering, and Product/Market Management.

Craig manages a team or Product Managers who work with cable operators around the world to ensure that the CommScope CCAP/CMTS and DAA products have the features to meet their needs for offering advanced triple-play services—high speed data, telephony, and video—to their residential and business customers for many years to come.

Key considerations for evolving your distributed access architectures

The majority of network operators understand that Distributed Access Architectures (DAAs) hold the key to their future HFC network. For most, the road to 10G is a multi-year, multi-stage journey –and as we look ahead at the next phase of DAA, the decision of where to locate the MAC and how to integrate this chosen architecture with other network components and stages of evolution is complicated by a current lack of standardisation. This is where Flexible MAC Architecture (FMA) comes in.

The case for FMA

FMA standardises the way that Flexible MAC architectures are implemented in the DOCSIS network – providing the ability to create interoperable multi-vendor solutions that support the deployment of the MAC, wherever it resides. FMA clearly paves the road to Remote MACPHY (R-MACPHY), and its ability to aid interoperability is a large part of designing a best-of-breed network for 10G. One of the key advantages of FMA will be the integrated management and aggregation of the many devices in the field into a single, modern interface.

Today, FMA is in the early phase of development, and the specifications for this phase are only now becoming fully formal. In subsequent phases, an optional Remote

MAC Core will come into play, followed by a fully virtualised access network. Interoperability events have already started in 2022 to test solutions in multi-vendor FMA and Remote MACPHY environments. What this means for operators is simply that FMA is moving along, but not all the pieces are yet in play.

R-PHY vs R-MACPHY

Until very recently, operators had to choose upfront between either Remote MACPHY and Remote PHY (R-PHY) as they planned their DAA solutions. These choices provide different ways to eventually address the 10G delivery of subscriber data traffic.

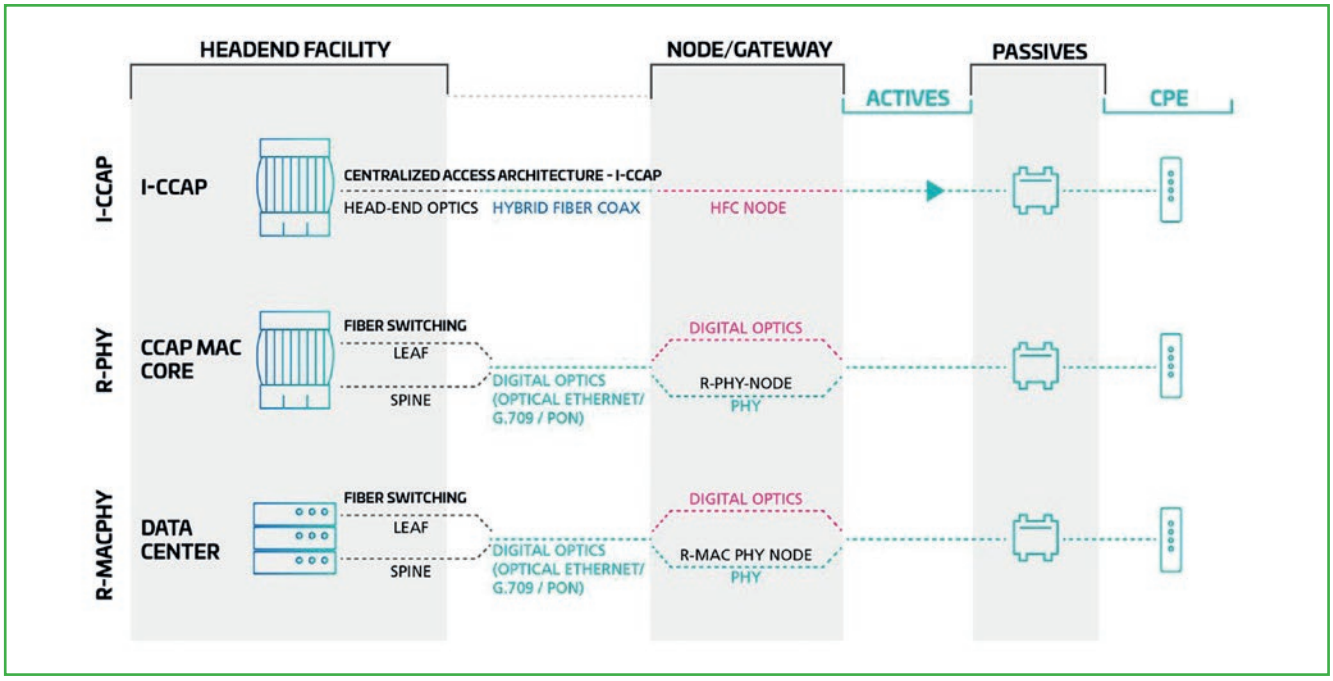
There are some distinct differences between R-PHY and R-MACPHY. For instance, with R-PHY the PHY layer is moved to the fibre node or to an R-PHY shelf, while the Media Access Control (MAC) layer is retained in the hub or headend. This arrangement allows the recycling of the physical or virtualised CCAP Core and has the added benefit of slightly lower power consumption in the hub or headend as compared with Integrated CCAP (I-CCAP). R-PHY architectures have a smaller cost in the fibre node but higher in the headend, where it requires higher power and more rack space. It also imposes more operational complexity, requiring an IEEE 1588 grand master clock and timing network – and has higher transport latency, because the MAC and the PHY are separated.

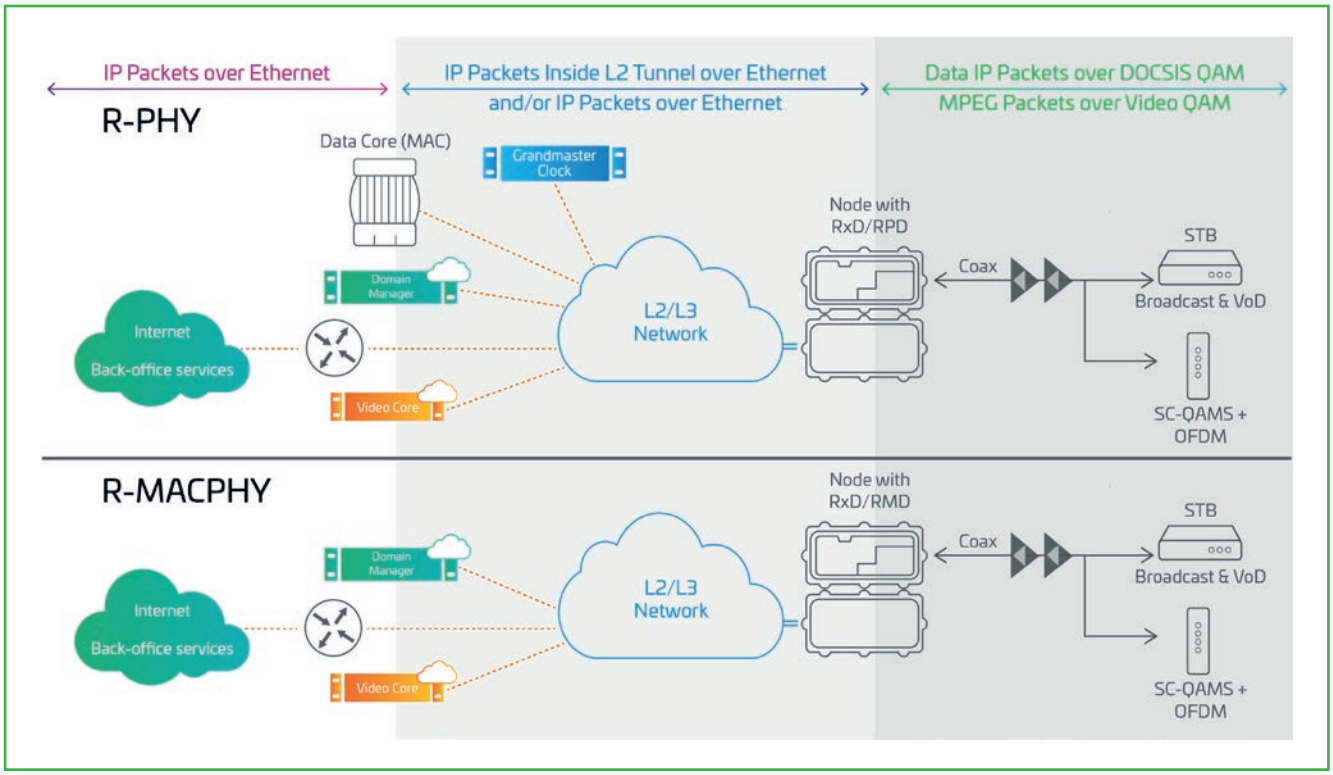
R-MACPHY is different given it moves both the MAC and the PHY layers to the fibre node. With both functions being moved closer to the subscriber, better RF performance due to the conversion of analogue optics to digital optics and more immediate MAC scheduling being included in the fibre node enable higher service levels and more flexibility for operators to achieve 10G. Overall it is a simpler, all-in-one architecture that is much easier to operate, does not require a CCAP Core and can be deployed without a grand master clock, which means less rack space, power, and cooling required for headends. This architecture provides the lowest latency – making it more appropriate for applications with low latency tolerance.

Some product offerings allow the operator to deploy R-PHY functionality and then later field upgrade to R-MACPHY functionality at a later date, enabling a smoother transition to the Flexible MAC Architecture (FMA) for the MSO operations and back-office systems. MSOs can continue to leverage their current back-office systems with R-PHY while preparing for the disaggregated management plane architecture embraced by FMA.

Operator priorities

Flexibility, cost and performance will be the leading factors for operators when making decisions around when to implement FMA. The dilemma of how deep to drive fibre and the implications for topographies and timing is one of the biggest factors to consider when investing in the fibre networks of the future. For most operators, the goal is to create a more stable and cost-effective network that delivers competitive performance, with few in a position to fully adopt Remote MACPHY to the exclusion of current architectures.





In fact, the ability to leverage current back-office systems with confidence, while training up technicians to install and service new disaggregated equipment, is one of the most compelling reasons to make a more gradual transition to FMA. It is important to bear in mind that FMA is not necessarily a single, network-wide decision or one that must be implemented from the start. An early move to FMA requires the vision and commitment to work with a standard that is still in development, with the understanding that the availability of appropriate end-to-end network solutions may be gating items in a full network rollout.

Operators who are bullish on FMA must consider how those specifications might evolve over time and how their subsequent need for available FMA solutions will drive their schedule of equipment purchases. These same operators are making significant investments into greater degrees of automation, and FMA is enabling this by providing access to telemetry data using more modern open-source tools and protocols.

For operators to bridge effectively to FMA, they must have a comprehensive plan for porting back-office operations and processes. To capitalise on the efficiencies and operational advantages of FMA, they'll also need to map their implementation to the standard's evolution and availability of related infrastructure components. Operators must work with vendors who have a deep understanding of the latest FMA developments and how they translate into a unique set of requirements, components, and processes for each network.

In summary, despite the relatively new FMA standards, operators are already deploying DAAs, and the future of R-MACPHY and R-PHY looks even more promising. Both solutions have tremendous potential to help operators achieve their 10G milestones. Operators that avoid delay in choosing between either R-MACPHY and R-PHY will speed down the road to 10G quicker than those who hesitate, so consideration of both is a must sooner rather than later.

For more information, see www.commscope.com