REMOTE PHY FUNDAMENTALS

What is Remote PHY?

The term Remote PHY refers to the ability to place the DOCSIS PHY chip "remotely" while keeping the rest of the hardware and software centralized. By saying remotely, this PHY chip can end up in a HFC node or potentially a PHY shelf that resides in a hub site (see example diagram). Remote PHY utilizes traditional IP pseudowire over the existing IP infrastructure, instead of RF, to get from your CMTS to the edge of the network. Remote PHY is the industry name for the CableLabs MHAv2 standard.

Why would you deploy Remote PHY?

There are a few reasons to look at how a Remote PHY architecture could benefit an operator, with the final goal of increasing speed packages towards 1+ Gbps.

To describe the main reason, we need to take a step back and look at a few notable points in the DOCSIS 3.1 standard. The main reason for DOCSIS 3.1 is to create more efficiency in the RF spectrum and increase overall bits / Hz. This happens in two ways.

- More spectral efficiency using a modulation called OFDM(A) as opposed to A-TDMA.
- The enablement of higher order modulations like 1024, 2048 & 4096 QAM.

In order to do the latter of these two, you need to have quality SNR values on your plant. There again are two ways to achieve this.

- The new error correction mechanism, Low Density Parity Check (LDCP) offers a 3-5 dB effective "gain" in SNR on the plant which allows modulations to work at lower SNR values .
- Remove some of the SNR by removing today's traditional analog RF optical link and moving to Remote PHY. By turning this link to a digital IP link, we have effectively removed a large portion of the aggregate SNR that is seen in both directions of the CMTS/cable modem link.

DOCSIS 3.1 SNR Requirements/ Throughput Increase

Modulation Order	SNR	bits/ Hz PHY % Increase
256-QAM	29 ~ 30 dB	
512-QAM	31 ~ 33 dB	12.5%
1024-QAM	34 ~ 36 dB	25%
2048-QAM	37 ~ 39 dB	37.5%
4096-QAM	40 ~ 42 dB	50%

Other Benefits of Remote PHY:

- The ability to make use of a flexible IP infrastructure for fiber conservation and resiliency.
- Minimizing the amount of full CMTS chassis spread throughout a network, allowing centralization and minimization of configuration.
- Reduction in scaling of CMTS ports in the Headend when doing node splits due to parts being all IP.
- Reduction in complicated and sometimes constraining combining/splitting networks.

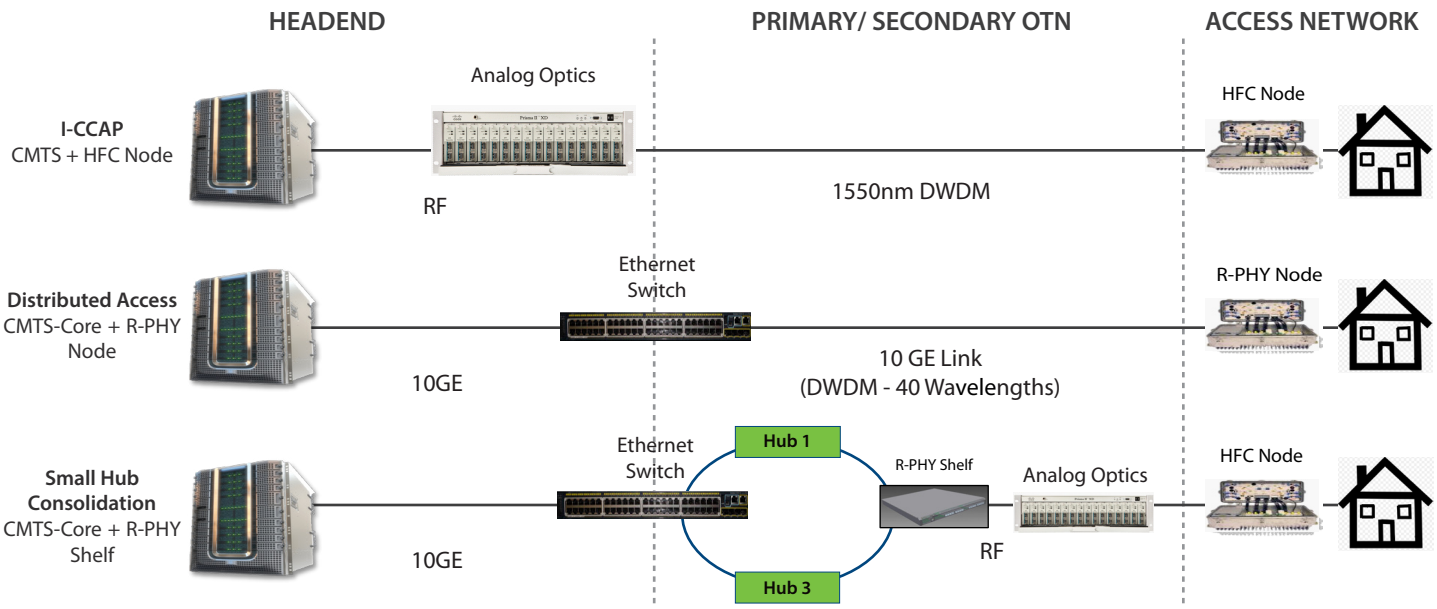
How will I deploy Remote PHY?

There are many ways that an operator will go about approaching the topic of bringing Remote PHY into their network. No two networks are created the same and thus the deployment strategies will vary. The great part of Remote PHY is that it is a very flexible technology. No matter if your serving area is a single Headend or a multi-state Headend/ Hub architecture, there are ways to deploy.

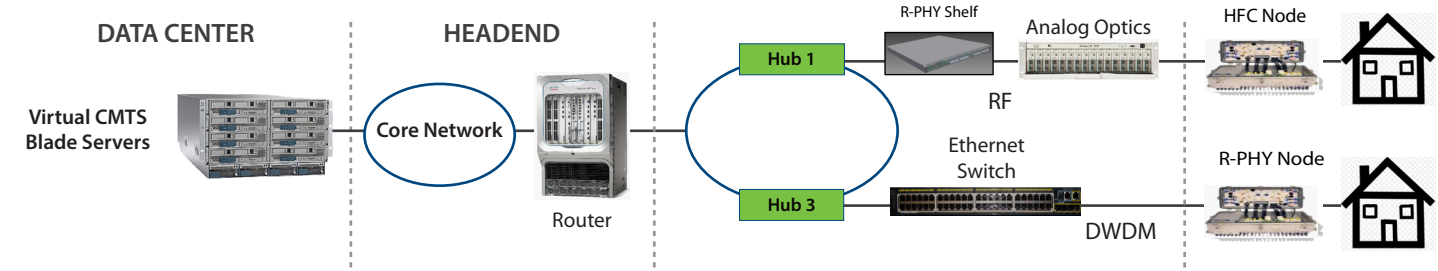
The below graphic depicts how a majority of architectures are deployed by using a traditional CMTS to analog optical transport and then to a traditional HFC Node. As you look at the next two rows, you can see multiple options of having either a complete IP link all the way to the node or by using a higher density shelf system that may sit in an aggregation hub site and then retransmit out over analog optics again for a very short local distance. You will also note the ability to have the IP traffic as part of rings to gain resiliency in the backbone.

The final column shows the future path of then moving to a fully virtualized CMTS that can reside in an extremely scalable data center type of architecture. This is due to the fact that the input and output of the vCMTS is all IP at this point.

DEPLOYMENT SCENARIO



PHASE 2



In all cases, a proper set of solution migration plans should be created prior to deciding on any specific method. It will be very common to have multiple methods employed in a single network as the migration happens over time and subscriber demands change. The important point is that both DOCSIS 3.1 and Remote PHY offer very flexible combinations of solutions to meet the challenges facing operators today and tomorrow.

Make one call - to CCI

Our certified experts are ready to take a closer look at your network and determine if Remote PHY is right for you. For more information on Remote PHY contact CCI Systems at (800) 338 - 9299.