

Fronthaul: Is it More than a Sexy Name for DAS Backhaul

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Whether you've heard about it at a recent trade show or have come across it in the media, one of the major areas of hype has been around the newly coined term "Fronthaul". While this technology seems to have risen out of nowhere, it brings to mind the question -- Is it really any different to the previously off-ignored DAS (Distributed Antennas Systems) backhaul?

DAS have been around for quite a while, with deployments rising over the past five years for unique sites that serve high densities and have difficult propagation characteristics, such as conference centers, airport and stadium. DAS are essentially remote radio heads that are installed at different locations than the basestation controller in order to improve the basestation coverage. Enabling this communication to the radio head requires specific protocols, with CPRI being the most common one that is emerging. CPRI requires very high capacities, which vary depending on the basestation technology and rate being used, although LTE (News - Alert) rates commonly are 2.5 Gbps and expanding to 6 Gbps. Because CPRI is used to control the radio head, there is a low latency requirement of less than 10 microseconds. DAS backhaul has been around for many years, but due to the high capacity, low latency and primarily indoor applications, it has been served almost entirely by fiber.

There have been a number of factors that are increasing the use of this architecture, and changing the applicable backhaul technologies. As access networks are becoming capacity and spectrally strained,

operators are starting to look at DAS, or what is now being called Cloud RAN architectures, for outdoor deployment. This is providing capacity and coverage improvements in advance of adopting full small cell architectures.

At the same time, the capacity of wireless backhaul systems has been increasing. Using multiple channels, higher modulations, wider spectrum and E-band, many systems can now deliver multiple gigabits of capacity. These systems are now also starting to offer transparent, low delay modes with only a few microseconds of delay. In addition, there are some technologies being used to compress the Fronthaul connection, by factors being touted from two to 10, enabling CPRI connections to be carried by more traditional microwave systems.

Ultimately, Fronthaul certainly looks to be DAS backhaul, but it has come to be associated with the broader applicability that is emerging. And, its much “catchier name” is geared toward the broader acceptance and larger market that appears to be on the horizon for this architecture.

However, there are still many challenges to be addressed that don’t appear to be getting broad discussion. The first and most significant one that comes to mind is manageability. Due to the low delay and high capacity requirements of the Fronthaul protocols, all the systems coming to market are providing transparent, dedicated CPRI connections. These connections will essentially represent a new transport network that is very separate from the existing TDM and Ethernet transport networks. And CPRI is not equipped with the same OAM capabilities that have been in TDM for decades, and that were later incorporated into Ethernet to make it a manageable transport protocol. Capabilities such Ethernet OAM, integrated delay and throughput measurements are not incorporated into the CPRI protocol. As a result, each vendor will tackle the problem in a different manner, without a widely drawn upon and consistent solution. The one saving grace concerning this may be that CPRI generally looks to be limited to a single hop, and therefore may not require as extensive operations and management capabilities as complex multi-hop networks. There is also some discussion about supporting CPRI over Ethernet, but there are still significant technical challenges to accomplish this due to delay issues.

The second challenge, which will ultimately limit how widely cloud RANs are deployed and lead to the rise of small cells, is the reachability. With a single hop limit due to the delay requirements and limited

ability to aggregate due to the delay and capacity requirements, Fronthaul network will ultimately be limited in reach from the basestation, and may not have broad coverage. Of course, this could be addressed by deploying more basestations, yet, at that point, small cells and Cloud RANs will start to become muddled together.

The third challenge is survivability of the Fronthaul connection. With a single hop limitation, protection options are limited to 1+1 architectures, eliminating ring and mesh protection options. This means diversity may not be feasible, although creative architecture, such as using fiber for the primary route, and microwave for the backup route, are being considered.

Now that DAS backhaul has been given the new and more exciting name Fronthaul, it will be interesting to see if the challenges can be addressed, and if operators will widely adopt this architecture, allowing Fronthaul to live up to all the hype that's been seen lately. Another scenario could also see Fronthaul continuing to be a niche play, with operators moving straight to broad small cell deployments. The jury is still out on that one. In the meantime, it seems the industry has added another "enticing term" to the technologies we follow.

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