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What is 5G? And How Do You Future Proof Your Backhaul Network for It?

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You can't read a telecom magazine or go to a tradeshow these days without running into the hype of 5G. The marketing seems endless, and predictions on when the technology will be adopted are already being made, as well as speculation on the mobile applications it will enable.

However, there is still one major stumbling block – the standard for 5G has yet to be defined. In fact, the timing is further delayed when you consider that the key elements and hallmarks of 5G are not agreed upon yet, and agreement on the definition of the standard is still expected to take three to five years. That said, there are now industry drivers pushing for pre-standards releases of 5G equipment, specifically in Japan in support of the 2020 Olympics, and in Korea for the 2018 Olympics. This creates a tremendous challenge for operators currently deploying LTE networks over the next few years. In concert with the deployment of their LTE networks, operators are modernizing and deploying new backhaul networks. At the same time, only a few years after these backhaul networks are deployed, a new access technology will begin to roll out, and operators do not want to have to replace their backhaul network again in support of 5G.

Although we do not know the details of 5G specifications and the resulting backhaul requirements, we do know some of the key objectives. Understanding those can help operators to better future-proof their ongoing backhaul deployments. The first bedrock of 5G, as with the previous two generations of mobile networks, will be capacity. However, there is a wide range of estimates in terms of the increase in capacity, anywhere from a 50 percent increase to a 10-fold increase. The second area of focus for 5G effecting backhaul is delay. There appears to be a common objective of end-end delay of 1 ms to enable next-generation real-time services. The last major element of how 5G will impact backhaul is likely to be a significant increased density of base stations. There will be a drive to have base stations much closer to the user, to maximize spectrum use, increase user capacity, and potentially enable use of new, higher frequencies for access. The density is still unknown, and could range from having a base station at each street corner, to having one in each house.

So how can knowing these three expected characteristics of 5G network help future-proof today's LTE backhaul deployments? If we start at capacity, deploying technologies that have room for greater than two times the scalability is feasible, even in microwave deployments, by leveraging higher modulations, bulk compression, and higher frequency bands with wider channel bandwidths such as V and E-Band. Addressing latency comes hand in hand with capacity. Higher capacity microwave systems typically have lower delay, often below .1ms. These delays will make packet-based backhaul technologies a must and it is important that operators make careful selection of the lowest delay systems, and work to minimize the number of hops, in order to minimize total network delay. The hardest area to future-proof the network will be the density. It is impossible to know the number and location where 5G base stations will be deployed. So deploying at those locations for a 4G network is impossible. However, as the 5G network will be denser, the assumption is that it will likely reuse and expand from most of the existing 4G sites. In this case, engineering an end point backhaul site to be a future aggregation link can enable an evolution to increased future capacity. This can be achieved through engineering scalability and adding extra interfaces for future expansion and aggregation.

While there are many more unknowns than knowns about the characteristics of a 5G network, the three trends discussed above are widely accepted objectives to achieve higher capacity, lower delay and increased density. Taking these trends into consideration when deploying backhaul networks today will extend the life of current capital investments, better prepare for the next evolution in access technology, and ultimately streamline backhaul deployments as we move to 5G.

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