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As the 5G era moves through its early stages of deployment, the network service provider (NSP) community is exploring how the different manifestations of this technology (millimeter wave, mid-band, and low-band 5G) can best be harnessed to serve consumers while optimizing the revenues. In so doing, carriers will have to evaluate the pros and cons of dedicating spectrum to burgeoning demand for mobile services while looking for ways to enhance broadband access to connected homes.

Establishing the right balance is likely going to be different for every single NSP. The directions operators take with 5G will depend on the regions in which they operate, the nature of their subscriber base, the disposition of local infrastructures, and the competitive posture of other players offering mobile and terrestrial broadband services in their markets.

### **5G Achieving Critical Mass of Industry and Consumer Acceptance**

Once the winners of the 5G auction are announced, NSPs can expect spectrum assets to nearly double in size. These new frequency resources will enable NSPs to enhance existing services and deliver new value propositions. Compared to what has been achieved so far with the technologies previously available -- such as 4G LTE -- 5G comes with substantial capacity improvements, elevating the experience of consumers who have 5G-capable devices.

Some mobile device manufacturers -- especially those in the Android market -- immediately jumped in over the course of 2019 in anticipation of demand for 5G services. Others, notably

Apple, waited until the infrastructure build-out took on a clearer shape. By the end of 2020, however, it became clear that 5G successfully established itself as the new standard of service, a fact illustrated by the roll out of the iPhone 12, a 5G device.

As a result, a critical level of enthusiasm has been reached, and consumers now seem ready -- even eager -- to embrace a future of enhanced wireless connectivity. However, while the overall trajectory of 5G deployment is positive, the pace at which the enabling infrastructure is being deployed varies greatly from one geographic region to the next.

Countries like South Korea, Australia, the United Kingdom, Germany, and the United States have seen the most aggressive roll-out of 5G infrastructure and deployment of 5G services, with a second wave of adopters -- including Switzerland, Finland, Italy -- also moving rapidly with 5G deployment plans.

The rest of the world has had a chance to see the progress of early 5G movers. While many operators in this third wave have made announcements to accelerate their own 5G plans, the COVID-19 crisis has presented challenges that have delayed the wireless infrastructure modernization initiatives of many operators.

### **Allocating 5G Across Mobile and Broadband Access is Complicated**

While frustrating, the delays have provided an opportunity for executives to carefully assess where NSPs can get the most bang for the buck in harnessing the power of 5G to deliver profitable services to their subscribers. With 5G enhanced mobile broadband, NSPs have three basic options:

- Enhance mobile wireless services.
- Enhance broadband access to connected homes; or
- Determine an optimum mix for using 5G spectrum among these options.

The key to choosing the correct strategy requires careful analysis of broadband access technologies currently available to different consumer segments within any given market.

In the U.S. market, for instance, urban consumers have adopted gigabit services. Eager to meet demand, NSPs are currently delivering broadband access through either DOCSIS 3.1 or fiber-to-the-home. This is why we have seen early deployment of millimeter-wave technology with the availability of the new high frequency bands. And 5G millimeter wave offers a possibility to compete on speed thanks to the very high bandwidth available in this frequency range. But as soon as you go in suburban areas the situation is pretty different.

While millimeter wave 5G technology delivers a clear improvement in performance -- and experiences -- for mobile users in certain coverage areas, as a practical matter we will see a much bigger deployment of low- and mid-band (also called sub6) 5G infrastructure over the next few years. Coverage is expected to expand quickly as operators seek a return on spectrum investments. This will create more opportunity for subscribers to connect their homes via 5G which will be beneficial for residents of areas where fiber has not been deployed. However, it is important to recognize that 5G (sub6) in the field does not reach the gigabit+ performance of GPON and DOCSIS 3.1 broadband access technologies.

This reality, however, does not mean that 5G should be excluded from the NSP broadband access toolbox. While a lot of wired (fiber and cable) infrastructure has been built out over the past few decades, it is not entirely ubiquitous. There are many consumer segments that are unserved by these technologies, including consumers in densely populated urban environments and those in sparsely inhabited rural areas.

NSPs simply need to do the math and select profitable areas for investments that match the right technologies with the appropriate market conditions. In many brown-field areas, 5G technologies offer new options for upgrading the broadband service experience. Homes that have been connected with copper for more than 15 years without an upgrade, for instance, are ready for change because of the suboptimal connectivity these legacy networks deliver in today's market -- a situation that has been brought into sharper relief over the past pandemic year. In such scenarios, we can easily expect 5G to emerge as the right technology for the home.

### **Optimizing Broadband Access to -- and Within -- the Home**

As these opportunities present themselves, 5G providers will have to develop skill sets and expertise to serve the connected home market. 5G broadband access providers, for instance, will be under just as much pressure as cable and fiber operators to optimize wireless networking

performance within the home.

The number of connected devices inside households is growing. On average there were approximately a dozen devices accessing Wi-Fi home networks prior to COVID-19. It is a number that has likely grown since. 5G broadband access providers will be expected to manage the complexity and throughput of data shared by devices inside the connected home as it pulls and pushes a growing amount of data to and from external cloud resources.

Nuance, in short, is the key to success for NSPs that choose to leverage the innovations of 5G to provide broadband access to the connected homes of consumers around the world. Important business decisions will have to be made to ensure profitable mobile wireless services are not cannibalized, as specific scenarios are evaluated to determine if 5G fixed wireless broadband access can deliver a viable comparative advantage in the connected home market.

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