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Mobile broadband networks should not be hampered by net neutrality constraints

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INDUSTRYVOICES

With throughput speeds in the tens of megabits per second, using mobile broadband can feel just like using a wireline broadband connection. Users can stream music and video, browse, check email, and socially engage. However, mobile broadband based on cellular technologies is different from wireline broadband in so many dimensions that it practically operates in a parallel universe. Despite innumerable technical and operational differences, the fact that users can access their favorite movie through their smartphone and their desktop has many mistakenly calling for the FCC to subject wireless and wireline broadband networks to the same operational parameters in the FCC's proposed rulemaking, "Protecting and Promoting the Open Internet." Doing so could have catastrophic consequences for the mobile industry, technological innovation and wireless consumers.

The source of the difference is obvious--radio--but not as obvious are the technical implications. First and foremost is capacity: Wireless networks have only a miniscule percentage of the capacity available to wireline networks. Second, radio is a finicky, unpredictable medium. It reflects, bends, gets absorbed, and interferes with itself, sometimes reaching its destination as a strong signal, but moments later or inches away, arriving as a faint signal thousands of times weaker, if it arrives at all. In addition, mobile networks have to accommodate huge variations in load as users move across cells or cluster in stalled traffic, stadiums, conventions and other dense areas. A further challenge is that one YouTube video can consume the same amount of radio resources as more than a hundred phone calls.

Of the differences just described, the capacity difference has the most profound consequences. To understand why capacity is so constrained, consider how much capacity a 4G network has in a coverage area and compare that with what users can throw at the network. According to a research report just published by 4G Americas, an LTE network in a 2X2 Multiple-Input-Multiple-Output (MIMO) smart-antenna configuration has spectral efficiency of 1.4 bps/Hz in the downlink; in a 4X2 configuration, 1.7 bps/Hz.

A typical deployment uses 10 MHz radio channels, resulting in shared downlink capacity of 17 Mbps across the coverage area. A single user might be delighted to have this much capacity, but unfortunately that user has to share that capacity with many other people--hundreds in fact. Now factor in how much bandwidth a video user consumes: 1 Mbps for smartphone-suitable resolution all the way to 5 Mbps for high-definition Netflix. The math is simple. Divide the 17 Mbps aggregate capacity by 5 Mbps/user and the answer is that just four HD Netflix users can consume all of the capacity of that cell sector. Relative to the average number of subscribers in a coverage area in the U.S., four users are just over 1 percent.

In contrast, as explained in my recent report for technology policy group Mobile Future, a single fiber-optic cable has more than 10 times the capacity of all the spectrum available to 100 GHz. Because mobile spectrum is 0.5 percent of that 100 GHz, fiber has more than 2,000 times the capacity that can be extracted from all mobile spectrum. And once the capacity of a fiber strand is consumed, another strand is available right alongside.

Operators are currently beefing up their networks using more spectrum, such as in the AWS bands at 1.7 GHz, but the inescapable problem remains: mobile broadband networks cannot simultaneously provide multi-megabits per second of throughput to each subscriber in the same location. Giving users the best possible experience requires that network management tools available to operators be as flexible as possible.

One tool is prioritization of different traffic streams. For example, LTE employs a quality-of-service (QoS) architecture that enables certain applications to operate reliably—such as Voice over LTE. If LTE voice packets had to compete with data packets in high-load situations, voice calls would simply disintegrate. Thus, any mandate of equal priority across all application types makes no sense. This same QoS framework will benefit applications involving public safety, healthcare, the smart grid, and education, but not if hampered by neutrality constraints. 4G networks also must manage and prioritize traffic at lower layers in order to maximize spectral efficiency.

The success of the mobile broadband industry is due in part to a light regulatory touch that has encouraged massive investments and resulted in one of the most successful industries of all time. This industry, however, is still in the relatively early stages and will grow and evolve in ways that cannot be predicted. It will be successful to the extent that unnecessary regulatory strangleholds, especially ones that treat wireless and wireline equally, do not hold it back.

For detailed analysis of this topic, see this Rysavy Research report, *How Wireless is Different - Considerations for the Open Internet Rulemaking.*

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