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Industry Voices—Rysavy: DoD's proposed 5G spectrum sharing fraught with problems

by Peter Rysavy | Oct 12, 2020 5:13pm

(Pixabay) Engineers actually designed 5G to share spectrum, just not in the way envisioned by the DoD.

When time is of the essence to stay ahead of China with 5G, why would the United States embark on completely unproven spectrum-sharing and capacity-sharing approaches? Exploring such unproven technology is exactly what a new Department of Defense (DoD) request for information suggests.

Of even greater concern, the DoD plan targets midband spectrum, spectrum not only critical to the success of 5G in the United States, but also currently in short supply. Countries around the world, including China, have made large amounts of midband spectrum available for 5G.

Midband spectrum provides the perfect blend of performance and capacity, with speeds in the hundreds of megabits per second and cells much larger than mmWave spectrum allows.

Midband spectrum in the United States includes T-Mobile's 2.5 GHz spectrum, CBRS from 3.55 to 3.70 GHz, and C-band from 3.70 to 3.98 GHz planned for auction in December. Still on the table, however, is 3.1 to 3.55 GHz, currently used by the DoD and the target of the DoD plan.

The DoD RFI is thin on details, but two technical approaches stand out: dynamic spectrum sharing, in which the 5G signal shares spectrum with DoD radar and other military systems, and capacity sharing, in which a DoD-controlled network would presumably lease capacity to commercial operators. Both approaches face huge obstacles.

First, no commercial dynamic spectrum sharing technology exists for 5G that would allow it to interoperate with DoD systems in the proposed 3.1 to 3.55 GHz band. CBRS does provide limited sharing, but I doubt the DoD considers this a suitable solution given the ambitions of some of the participants, such as Google, a participant in the Defense Innovation Board.

Engineers actually designed 5G to share spectrum, just not in the way envisioned by the DoD. One 5G capability, called Dynamic Spectrum Sharing (DSS), enables a radio channel to support both 4G LTE and 5G. 5G also allows spectrum sharing in unlicensed bands between 5G devices and Wi-Fi devices. Both capabilities are deeply baked into 5G standards and took many years to develop and standardize.

CBRS demonstrates the extended development timeframes required to implement new access approaches. The FCC's notice of proposed rulemaking for CBRS occurred in 2012, but the FCC did not conduct its auction for Priority Access Licenses until this year, eight years later. If DoD and sharing advocates wish to pursue a sharing strategy for the future, they should be realistic about timeframes. Consistent with technologies of comparable complexity, this would entail spending the next three to five years researching and evaluating technical solutions. The goal might then be to integrate final approaches into 6G standards during the second half of this decade and plan for deployment in the 2030s.

Even if some spectrum sharing technology for 5G magically came into existence, the idea of a DoD-constructed network, or even a third-party network built from some RFP process, faces other obstacles. Operators are now transitioning to what is called Standalone Architecture (SA). With SA, operators can provide robust coverage by using carrier aggregation between low bands, which carry control signaling and provide coverage, and midband, which provides capacity. Additionally, operators can aggregate across midband frequencies or with mmWave frequencies, creating powerful, robust networks based on a portfolio of spectrum resources. In contrast, a wholesale network would presumably operate only in midband frequencies, resulting in a network with compromised coverage, performance, and reliability compared to commercial networks.

Furthermore, the DoD RFI suggests that a DoD-controlled wholesale network could somehow share capacity with commercial networks. But 5G standards do not support a mode of operation in which a user obtains bandwidth from two different networks simultaneously. The

alternative of breaking the connection with the commercial provider and roaming onto the DoD network would also be a poor solution for multiple reasons, including the aforementioned less robust operation of the DoD network. Additionally, the wholesale network would likely not support the multiple valued-added services being planned for commercial 5G networks, such as edge computing.

Numerous other challenges exist, as explained in my previous piece on this topic last year, including the fact that neither the government nor any of the other players influencing the DoD sharing plan, such as Rivada, have any expertise in building cellular networks.

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About the only realistic way for a shared network to come into being in the shorter term would be along the lines of FirstNet. Under FirstNet, a commercial operator provides first-responder services to its consumers by using public safety spectrum when public safety does not need the capacity. Along these lines, an existing commercial network operator could partner with DoD to provide DoD the services it needs while using DoD spectrum, and currently unavailable sharing technology, to augment its own capacity for its commercial operations.

All of these spectrum and capacity sharing ambitions will take time. None are inherently bad, but if their realization takes away spectrum in the short term, the consequences could undermine current commercial 5G deployments. Specifically, NTIA and DoD have already gone through an extensive analysis to determine that 3.45 to 3.55 GHz can be made readily available to industry with few restrictions. The FCC is moving forward to conduct an auction for this spectrum in 2021. U.S. operators, already deploying and planning for midband with CBRS and C-Band can readily add this spectrum to enhance 5G capabilities. Considering any other use of this specific frequency band, such as for a DoD shared network, will needlessly diminish U.S. 5G capabilities.

Furthermore, 3.45 to 3.55 GHz is only 100 MHz, and relative to all midband spectrum (2.5 GHz /3.45 GHz/CBRS/C-band), represents only 14% of midband spectrum. A new government-controlled network based on this spectrum alone would simply not have enough capacity to make a difference and would be a huge distraction for the industry.

The United States is engaged in a global race. 5G technology, now mature and stable, is ready for widescale deployment. China's 5G networks are not using any form of spectrum sharing; the way to compete in this race is with proven methodology. While sophisticated spectrum sharing between disparate systems may eventually be the norm, perhaps in the 2030s, using such sharing as a strategy to remain competitive globally over the next five years will be a strategically poor decision.

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