ITIF | INFORMATION TECHNOLOGY & INNOVATION FOUNDATION

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Fort Meade, MD 20755-0549
USA

RE: **Request for Information regarding Dynamic Spectrum Sharing**
Product Service Code: D399 - IT AND TELECOM
NAICS Code: 541511 - Custom Computer Programming Services

The Information Technology and Innovation Foundation (ITIF), the world's leading science and technology think tank, appreciates the opportunity to comment on the Request for Information (RFI) regarding Dynamic Spectrum Sharing (DSS).[1]

THE RFI ITSELF UNDERMINES U.S. LEADERSHIP IN 5G

At the outset, ITIF must note the broad and vague nature of the Request for Information (RFI) which makes it difficult to craft useful comments. Some of the questions the Defense Information Systems Agency (DISA) asks around spectrum sharing are legitimate and good for the organization to think through. Other questions are more concerning, indicating DISA is contemplating something very different from how spectrum has traditionally been shared with the commercial sector.

Several media reports indicate that this RFI grows out of continued efforts by Rivada and others to establish a national 5G network that would serve the Department of Defense (DoD) and share wholesale capacity or spectrum usage rights with commercial operators.[2] For reasons explored below, this is a terrible idea.

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1 Founded in 2006, ITIF is an independent 501(c)(3) nonprofit, nonpartisan research and educational institute—a think tank. Its mission is to formulate, evaluate, and promote policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress. ITIF's goal is to provide policymakers around the world with high-quality information, analysis, and recommendations they can trust. To that end, ITIF adheres to a high standard of research integrity with an internal code of ethics grounded in analytical rigor, policy pragmatism, and independence from external direction or bias. See About ITIF: A Champion for Innovation, https://itif.org/about.
2 See e.g., Kyle Daly, "White House pushes Pentagon to jumpstart a national 5G network," Axios (Oct. 2020), https://www.axios.com/white-house-pushes-pentagon-to-jumpstart-a-national-5g-network-c47ac4b2-628e-4d40-935b-dd98cbc601ec.html.

Continued speculation around any flavor of a nationalized or wholesale network adds uncertainty and confusion to ongoing efforts to deploy and make use of 5G networks. The contemplation of a government-funded wholesale network or allowing a middleman to control access to critical mid-band spectrum, which this RFI contributes to, undermines one of the United States' great strengths: a dynamic, complex, competitive process to uncover the most effective 5G architectures.

This is not to say policymakers should sit back and leave the future of this critical technology to the market altogether: There are number of opportunities to improve the pace of deployment and innovation in 5G networks, as well as their security—both in the long and short term. ITIF explored many of these opportunities in a recent report titled "A U.S. National Strategy for 5G and Future Wireless Innovation."[3]

ITIF recommends DISA abandon any efforts to build an independent 5G network or institute any complex spectrum sharing regime for 5G. A request for proposals, which is reportedly being contemplated, should not be pursued. If DISA aims to advance U.S. leadership in 5G, it should first focus on what we know works well: Identifying bands that can be repurposed for commercial use, and then licensing those bands through the FCC's auction process. This process gets the spectrum into the hands of those who are most confident they can put it to its highest valued use, and gives them the certainty that the spectrum will be available and under their control well into the future. This certainty is necessary if operators are to invest the billions of dollars necessary to build and maintain networks.

To the extent that DISA is interested in legitimate opportunities to expand novel methods of more intensive spectrum sharing, it should clarify that it does not intend to build a wholesale capacity network or otherwise pursue cumbersome, untested large-scale spectrum sharing regimes. This cloud over the RFI distracts from what could otherwise be a useful conversation around more targeted opportunities to build on prior sharing techniques and expand access to critical mid-band spectrum in a way that expands U.S. competitiveness and maintains DoD's ability to achieve its mission.

The problematic nature of even posing some of these questions helps explain the outcry from industry, political leaders, and other commentators. A broad coalition of trade associations wrote to the White House complaining about "any effort" of federal entry into commercial wireless markets "as currently contemplated

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3 Doug Brake, "A U.S. National Strategy for 5G and Future Wireless Innovation" ITIF (April 2020), https://itif.org/publications/2020/04/27/us-national-strategy-5g-and-future-wireless-innovation.

by the Department of Defense."[4] A coalition of Republican Senators also wrote to the administration to express concerns with the instant RFI.[5] Similarly House Democrats have been vocal about their concerns, writing to both National Telecommunications and Information Administration (NTIA) and the Government Accountability Office questioning the legality of projects DoD seems to contemplate.[6] On the broader question of a government built wholesale wireless network, National Economic Council Chair Larry Kudlow, all five commissioners of the Federal Communications Commission, and President Trump himself have quite clearly denounced the idea.[7] While policymaking is not a popularity contest, this remarkably uniform opprobrium is a strong indication DISA should reconsider this venture, abandon any RFP pursuing a government-directed wholesale network.

The RFI asks how DoD would build a 5G network—this is not an easy undertaking. 5G is not a monolith: It can be deployed with a wide variety of technologies assembled in different possible configurations or architectures. Building high-performance wireless networks is an incredibly complicated undertaking—it is not as simple as throwing a lot of money at infrastructure using relatively small band of spectrum. A wireless network planned through the government procurement process would likely be out of date before it was built. Moreover, it would represent an enormous waste of societal capital because it would "overbuild" what will be at least three nationwide 5G networks being constructed by U.S. wireless providers.

To the extent some White House or campaign officials are pressuring DoD to explore building a 5G network, as has been reported, it would appear these individuals are unfamiliar with the complexities of wireless operations and have been unduly influenced by rent-seeking opportunists—namely Rivada Networks.[8]

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4 CTIA et al., Letter to Honorable Donald J. Trump (Oct. 2020), https://www.ustelecom.org/wp-content/uploads/2020/10/10.9.2020-Multiassociation-5G-Letter.pdf.

5 Senator John Thune et al., Letter to Honorable Donald J. Trump (Sept. 2020), https://www.thune.senate.gov/public/_cache/files/b38cc513-e694-461e-b52c-8454ff8f1726/67C00068B5E4353BFFD8E3548F61C8E9.9.30.20-potus-dod-rfi-letter.pdf.

6 Congressmen Frank Pallone and Mike Doyle, Letter to Honorable Gene L. Dodaro (Oct. 2020), https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/10.9.2020%20Letter%20to%20GAO%20re%20DOD%20RFI.pdf; Letter to Adam Candeub (Oct. 2020), https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/10.9.2020%20Letter%20to%20NTIA%20re%20DoD%20RFI.pdf.

7 See e.g., David Shepherdson, "Trump says he opposes nationalizing U.S. 5G network," Reuters (April 2019), https://www.reuters.com/article/us-usa-wireless-trump/trump-says-he-opposes-nationalizing-u-s-5g-network-idUSKCN1RO1WC.

8 See Daly, supra.

Rivada is a relatively untested company (certainly untested compared to those actually building wireless networks) who appears to have more experience with lobbying for exclusive contracts and lawsuits when they don't get them than with success in competitive markets.[9] To the extent its cadre of security-minded advocates are behind this RFI, it is unfortunate the process got this far.

Private wireless operators in the United States are already vigorously competing to deploy next generation wireless networks. They are investing a tremendous amount of capital in vigorous competition to develop the most effective 5G networks. Supporting this process and then contracting for 5G services where appropriate is likely the best way DoD can advance U.S. interests.

WE SHOULD NOT PANIC IN THE RACE FOR 5G

There seems to be a sense of panic in some circles when it comes to 5G deployment. This may be a result of over-inflated expectations of the technology. Gartner, in its famous "Hype Cycle" analysis of technological development, put 5G at the very peak of hype in its 2019 report.[10] Excitement around new technology can be positive where it motivates companies, consumers, and policymakers to support innovation. But building up 5G too much risks cynicism from dashed expectations. Even worse, framing 5G as a stand-in for a country's overall technological prowess invites bad policymaking made from misguided national security or geopolitical fears.

Admittedly, having widespread, high-performance 5G networks will give a country something of a first-mover advantage when it comes to developing and adopting next generation applications that can leverage its performance enhancements, but policymakers should not be seeking to rush 5G networks out the door as soon as possible. Some seem to wrongly believe a DoD-directed nationalized or wholesale network could be quickly deployed. Such an approach would likely take 5-10 years or more, but even if it could be rushed, this would likely result in a poorly performing network. Of course, we should seek to accelerate 5G deployment and use. The FCC's many efforts under the 5G Fast plan, aiming to reduce red tape in the permitting process and modernizing outdated regulations, are more appropriate tactics to improve conditions for private sector

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9 See Kelly Hill, "Rivada Mercury loses FirstNet lawsuit, takes battle to states" RCR Wireless (March 2017), https://www.rcrwireless.com/20170320/network-infrastructure/lte/20170319network-infrastructurelttefederal-judge-rules-in-favor-of-firstnet-in-rivada-mercury-case-tag6.

10 Kasey Panetta, "5 Trends Appear on the Gartner Hype Cycle for Emerging Technologies, 2019," Gartner (Aug. 2019), https://www.gartner.com/smarterwithgartner/5-trends-appear-on-the-gartner-hype-cycle-for-emerging-technologies-2019/.

competition, innovation, and investment. There is no need to panic—a country's lead time of months (or even a year or two) in having a 5G network of some kind would not outweigh the benefits of robust network built with a diversity of low-, mid-, and high- band spectrum that is well integrated with edge applications. The biggest benefits from 5G come from the widely dispersed, iterative exploration of new applications that can only be done well by the private sector pursuing new technological and business opportunities.

Many of the applications that benefit most from 5G—areas where the technology outperforms 4G—still have yet to be developed. High-performance augmented reality is probably closest to widespread adoption, but many of the more exotic industrial or enterprise applications will be developed over time. There is not likely to be the same initial explosion of mass-market applications as there was with app stores and basic wireless broadband—the low-hanging fruit has been picked with 4G. Huawei founder Ren Zhengfei has recognized this, noting that "human societies do not have an urgent need for 5G."[11] He added, "[w]hat people need now is broadband, and the main content of 5G is not broadband."[12]

Some worry that we face a so-called "chicken and egg" problem, needing to first steamroll out the networks for the innovation on top to then flourish. This framing is wrong. Rather, policymakers should aim to support the entire ecosystem of wireless deployment and application development, as well as support norms and expectations around a globally interconnected, open Internet such that successful U.S. firms can compete abroad. Along these lines, ITIF commends DoD for its recently announced $600 million for 5G testbeds and experimentation at five installations.[13] This is the type of work that will be far more effective in seeing flourishing 5G networks and applications than any wholesale or nationalized network.

Indeed, efforts to win the "race" and have the first 5G networks risk backfiring if done poorly. There are indications that the Chinese model of more centrally planned, non-market oriented 5G deployment is already facing challenges. Huawei executive Ryan Ding recently went so far as to call Chinese operators' 5G "fake,

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11 John Xie, "Chinese 5G Not Living Up to Its Hype" Voice of America News (Oct. 2020), https://www.voanews.com/east-asia-pacific/voa-news-china/chinese-5g-not-living-its-hype.
12 Ibid.
13 U.S. Department of Defense, "DOD Announces $600 Million for 5G Experimentation and Testing at Five Installations" (Oct. 2020), https://www.defense.gov/Newsroom/Releases/Release/Article/2376743/dod-announces-600-million-for-5g-experimentation-and-testing-at-five-installati/.

dumb, and poor."[14] The executive elaborated on the problems which included poorly planned integration of 5G with 4G networks, inaccurate representation of 5G coverage, poor availability of 5G devices, etc.[15]

It is also likely that many reports overstate the extent of Chinese operators' deployment. For instance, the Chinese Government itself, through its Ministry of Industry and Information Technology (MIIT) called upon operators to "clean up" reporting of 5G subscription numbers.[16] The MIIT's order came across the backdrop of reports that providers were strongly encouraging or even forcing customers to upgrade to 5G subscriptions regardless of their actual need, use, or device capabilities.[17]

There also remains a lack of clarity around the accuracy of base station reporting by Chinese operators. This includes concerns regarding how "base station" is being defined. Some reporting highlights confusion as to whether or not "base station" is being used as a label for individual logical sectors versus a conglomeration of sectors hosted at one physical site (as is more commonly how "base station" is defined).[18] In the event the number of "base stations" is in fact the number of logical sectors, reported Chinese numbers could easily be misrepresented as three to four times higher.[19] Further complications arise when determining how base stations, shared by multiple providers with both shared spectrum and independent spectrum, may be defined or reported.[20] Different definitions and potential double (and beyond) counting could easily misrepresent the scale of 5G deployment. DISA should not make rash decisions in the face of inaccurate reports of Chinese operators' deployment.

14 Robert Clark, "'Fake, dumb, and poor' – Huawei exec unloads on China 5G," LightReading (Oct. 2020), https://www.lightreading.com/5g/fake-dumb-and-poor-huawei-exec-unloads-on-china-5g-/d/d-id/764654.
15 Ibid.
16 Iris Deng, "China's 5G subscriber numbers to get a correction as carriers ordered to 'clean up' sales practices," South China Morning Post (Jul. 2020), https://www.scmp.com/tech/big-tech/article/3095490/chinas-5g-subscriber-numbers-get-correction-carriers-ordered-clean.
17 Ibid.
18 Joseph Waring, "How many global base stations are there anyway," Mobile World Live (Sept. 2017), https://www.mobileworldlive.com/blog/blog-global-base-station-count-7m-or-4-times-higher.
19 Ibid.
20 Ibid; Juan Pedro Tomas, "China Unicom, China Telecom jointly deploy over 300,000 5G sites," RCR Wireless News (Sep. 2020), https://www.rcrwireless.com/20200928/5g/china-unicom-china-telecom-jointly-deploy-over-300000-5g-sites; Robert Clark, "China releases 700MHz for 5G," LightReading (May 2020), https://www.lightreading.com/5g/china-releases-700mhz-for-5g/d/d-id/758667.

Finally, there is no national security imperative for DoD funding a 5G rollout. President Trump rightly banned Chinese gear from U.S. 5G networks. All U.S. providers of 5G network services are American headquartered companies, and they will be buying equipment from our close allies, principally in Europe. This proposal is a solution in search of a problem.

A SPECTRUM SHARING SYSTEM THAT CIRCUMVENTS TREASURY PAYMENTS IS LIKELY UNLAWFUL

While ITIF would like to focus more on the policy reasons for not pursuing a national 5G network which shares capacity or spectrum with commercial users, there are legal consideration DISA should be aware of as well. More specifically, the Communications Act, the Miscellaneous Receipts Act, and the Anti-Deficiency Act all seem to limit the possibility of a nationalized 5G network. The Communications Act makes clear it is the FCC, not DoD, with the authority to assign spectrum for non-federal use and make all "allocation and licensing decisions."[21]

Both the Miscellaneous Receipts Act and the Anti-Deficiency Act functionally limit payments—in-kind or otherwise—from private parties directly to the government instead of being deposited with the Treasury.[22] Without further action from Congress, these laws likely limit DoD from spending money or contracting with a commercial entity to develop a network using spectrum currently assigned to DoD.

Furthermore, seeking authority from Congress to circumvent the normal payments to Treasury of an FCC run auction would likely be against DoD's interest. To the extent a spectrum sharing regime contemplated by DISA successfully and lawfully circumvents payments to the Treasury, there would also not be deposits to the spectrum relocation fund (SRF). The SRF is an important tool for federal agencies to explore opportunities to update outdated systems and dispose of under-utilized spectrum, but it depends on proceeds from auctions.

OPPORTUNITIES TO IMPROVE SPECTRUM SHARING SHOULD BE TARGETTED AND INCREMENTAL

Spectrum is a limited resource that faces ever increasing demand from a variety of different users. This ever-increasing demand has pressured researchers and policymakers to explore opportunities around sharing spectrum in time, frequency, space, and other dimensions. Depending on how closely together systems are designed to operate along any of these dimensions, spectrum sharing can take on a wide variety of characteristics and forms. Efforts to maximize the efficiency of spectrum use (to the extent that spectrum

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21 47 USC §§ 303, 305; 47 USC §§ 927(a)and(b).
22 31 U.S.C. 1341; 31 U.S.C. 3302.

efficiency is cognizable) requires ever more complicated systems that add complexity, risk of failure, and harmful interference.

Before jumping ahead to the most technologically sophisticated sharing regimes (which again, increase complexity, risk of interference, costs, and performance overhead) policymakers should instead seek to repurpose under-utilized spectrum for general-purpose, flexible systems using as simple of sharing mechanisms as possible. 5G is a quintessential flexible, general purpose system that can take on many roles that previously may have used segregated spectrum resources. As a general rule of thumb, we would be better off getting more clean, exclusively licensed spectrum into the hands of those with existing infrastructure and other spectrum assets—wireless operators—than setting up some new network with a limited selection of DoD spectrum. The flexibility built into the 5G specification and inherent to the IP-based communications allows for large networks with economies of scale to better serve the needs of a wide variety of applications suitable to the architecture (including those of DoD).

Even relatively rudimentary spectrum sharing mechanisms have faced challenges. Consider for example, existing mechanisms to share RADAR spectrum with unlicensed devices in the 5 GHz band. In 2003, the FCC made 255 megahertz of spectrum from 5.47 to 5.725 GHz available for unlicensed use. Access to this spectrum, which contained incumbent RADAR users, was contingent on the ability of unlicensed devices to detect-and-avoid incumbent users through dynamic frequency selection (DFS).

NTIA, in a 2019 study examining the "lessons learned" from implementation of dynamic spectrum sharing in the 5 GHz band noted several points relevant to DISA's questions.[23] NTIA noted, for example, that developing dynamic spectrum sharing systems (DSS) for a new band of spectrum takes a long time— "something on the order of a decade."[24] Other important lessons include that DSS systems require permanent, ongoing government expenditures, and they increase the potential for interference "no matter how carefully it is initially devised."[25] The cost overhead of implementing DSS in the 5 GHz bands has also limited the use of this band by mass-market equipment, greatly undermining its value. Any DSS system that DoD investigates now may well not be ready until it is time for 6G—DISA should consider reframing its

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23 Frank H. Sanders et al., "Lessons Learned from the Development and Deployment of 5 GHz Unlicensed National Information Infrastructure(U-NII) Dynamic Frequency Selection (DFS) Devices," NTIA Report 20-544 (Dec. 2019), https://www.its.bldrdoc.gov/publications/details.aspx?pub=3231.
24 Ibid at xiv.
25 Ibid.

questions regarding DSS considering at a much longer time horizon, and instead aim to get mid-band spectrum needed for 5G out and into the commercial sector quickly through the traditional licensing process.

The 3.5 GHz Citizens Band Radio Service (CBRS), is a more recent and sophisticated attempt at spectrum sharing. It is still too early to see how that system develops, and if it is able to give the certainty needed for large-scale networks. In many ways the CBRS system was designed for smaller scale deployments, such as enterprise networks or industrial applications, that require internal control over the network and spectrum protected from interference. It is not yet clear that this type of sharing system is well suited to wide area access networks. DISA would be wise to wait and see the level of investment and any potential problems related to CBRS before attempting a similar system. This is not to say that considering sharing scenarios for future spectrum bands or considering new tools and mechanisms to make spectrum transition is not worthwhile. There are certainly opportunities for Congress to improve incentives for federal agencies to better economize their use of spectrum and dispose of under-utilize assets.[26]

CONCLUSION

DISA should first and foremost remove the cloud of potential nationalization of a wholesale 5G network from this process. Then, DISA and DoD should focus on the short-term opportunities to clear and reallocate spectrum for 5G purposes to best leverage the capabilities of 5G and advance U.S. competitiveness. Then long-term planning on future spectrum sharing opportunities can receive the focus it is due.

Thank you for your consideration.

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26 See e.g., Karen Gordon et al., "A Review of Approaches to Sharing or Relinquishing Agency-Assigned Spectrum" IDA (Jan. 2014), https://www.ida.org/-/media/feature/publications/a/ar/a-review-of-approaches-to-sharing-or-relinquishing-agency-assigned-spectrum/p5102final.ashx; Dorothy Robyn, "Buildings and Bandwidth: Lessons for Spectrum Policy from Federal Property Management" Brookings (Sept. 2014), https://www.brookings.edu/wp-content/uploads/2016/06/23_buildings_bandwidth_spectrum_property.pdf.