February 10, 2021

Rebecca Dorch
National Telecommunications and Information Administration
U.S. Department of Commerce
325 Broadway
Boulder, CO 80305

Re: Open RAN Policy Coalition Comments on 5G Challenge Notice of Inquiry, Docket No. 210105–0001, RIN 0660–XC04

Dear Ms. Dorch:

Dell Technologies Inc. ("Dell Technologies") respectfully submits this Comment Letter in response to the request for public comments issued by the National Telecommunications and Information Administration ("NTIA") issued on January 11, 2021 (86 FR 1949) regarding the creation of a 5G Challenge that would accelerate the development of the open 5G stack ecosystem in support of Department of Defense (DoD or Department) missions.

Dell Technologies is very supportive of this Challenge. It represents an excellent initiative on the part of the NTIA and DoD that has the potential to demonstrably drive development and innovation of an open 5G ecosystem. As the U.S. continues to make strides to emphasize the importance of 5G, it is vital that we work to develop and deploy a national strategy to ensure that there is a domestic supply chain available. To foster a competitive, domestic marketplace and guarantee our economic and national security, we need to bring new businesses of all sizes to the telecommunications industry and open 5G networks represent a critical enabler for that goal. Competition will create a diverse industrial base where all businesses can participate and prevent vendor lock in that would continue to limit diversity in the 5G supply chain, leading to both increased risk and increased cost. However, successful incubation of an open 5G ecosystem will require support and commitment from all stakeholders and short-term economic incentives could present a hurdle for some organizations to make that commitment. With its influence (both technical and economic), the DoD will lead the industry down the best path.

I. Challenge Structure & Goals

A. How could a Challenge be structured such that it would take advantage of DOD's role as an early U.S. Government adopter of 5G technology to mature the open 5G stack ecosystem faster, encourage more participation in open 5G stack development including encouraging new participants, and identify any roadblocks to broader participation?

The DoD should require that suppliers be compliant with the ORAN standard for all the key interfaces. Vendors could provide evidence of compliance through other industry forums established for this purpose or, should they be deemed insufficient, DoD or NTIA could establish a lab environment to certify compliance. The use of ORAN systems will allow for additional entrants to the market as technology can be interoperable across systems and not tied to any proprietary telecommunication system. Additionally, we recommend the Challenge:

- Fund 5G innovation based on open, interoperable standards, including prioritizing Open RAN in all funded 5G programs;
- Incentivize expansion of a trusted vendor radio equipment supply chain (including manufacturing) through R&D tax credits and other incentive vehicles;

- Incentivize expansion of trusted vendors developing open and interoperable RAN technology by utilizing public/private partnerships;
- Create a pipeline of R&D and industrialization funding for continued development of open and interoperable RAN;
- Increase grant opportunities and grant amounts to qualified U.S. vendors; and
- Design a program to incentivize investment and job creation in the U.S. by offering R&D credits and other incentives for network technology suppliers.

B. How could a Challenge be structured to focus on the greatest impediments to the maturation of end-to-end open 5G stack development?

The next-gen network is not simply an evolution of 4G; it requires massive transformation, demanding new distributed architectures using software-defined networks. As governments around the world look to rebuild economies and invest in technology infrastructure, 5G gives all communities an opportunity to close the connectivity gap. The high speed, low latency performance of 5G will profoundly change the connectivity speeds, density and intelligence to consumers, enterprises and Internet of Things (IoT). However, in order to expand 5G and future wireless capabilities, we must also look to expand the current ecosystem which does not currently include a U.S.-based, at scale, 5G RAN solution company.

In the early phases of development, an end-to-end open 5G solution could have deficiencies compared to existing commercial offers that are supplied but a single vendor and not open. The Department must also invest in research and development that accelerates the development of 5G infrastructure that utilizes the U.S.'s strengths in silicon, software, and cloud. The broad technology ecosystem, which includes hundreds of U.S. companies and innovators, are increasing their focus on 5G to provide content for these systems. In order to accelerate development and rollout of 5G infrastructure domestically, U.S. government policy needs to support U.S. technology companies and the technologies they are bringing to market. As additional technologies mature, the overall ecosystem and industrial base will grow to support the various uses that the Department will have in its deployment.

C. What should be the goals of a Challenge focusing on maturation of the open 5G stack ecosystem? How could such a Challenge be structured to allow for the greatest levels of innovation? What metrics should be used in the assessment of proposals to ensure the best proposals are selected?

Due to the critical nature of 5G networks to our overall telecommunication networks, one major factor that needs to be considered in evaluating success is supply chain. The U.S. does not have an at scale provider for all components of 5G networks. The goals of the challenge should be increasing participation in the marketplace and ensuring that the DoD is not overly reliant on a handful of solutions providers.

By opening the architecture of 5G communication systems, we allow for more innovation and additional trusted participants to help fulfill mission critical needs. As such, the challenge should emphasize the need for open infrastructures over proprietary systems. Metrics could be developed that evaluate elements such as compliance to open interfaces between solution elements and also the portability of software solutions between different hardware platforms with the goal that software be completely independent from hardware.

D. How will the open 5G stack market benefit from such a Challenge? How could a Challenge be structured to provide dual benefit to both the Government and the open 5G stack market?

The open 5G stack market needs to get through its early development phases through to maturity. There is a high risk that this will not happen without specific support due to the economic forces that favor incumbents. While incumbent suppliers will publicly support open interfaces, in practice, such suppliers have no incentive to ensure their adoption and success in the market. The DoD, and the US Government more broadly, need to be demonstrative and prescriptive to help the industry get through these early phases.

Additionally, as the technology is developed further and additional entrants to the market compete, the costs of the services will lower as there are more vendors to choose from, thus making the technology more accessible for other sectors of the economy, including small businesses, industrial uses, as well as facilitating connectivity of states, localities, and schools.

II. Incentives and Scope

A. What are the incentives in open 5G stack ecosystem development that would maximize cooperation and collaboration, promote interoperability amongst varied open 5G stack components developed by different participants, and mature desired featured sets faster with greater stability?

The DoD and NTIA should recommend federal economic incentives, including eliminating the cap on R&D tax deductions for 5G, to stimulate the domestic development of 5G technology. While 5G remains a priority for many companies, it is one of several priorities that the industry is working on including quantum computing and artificial intelligence. By providing economic incentives for 5G, it would allow companies additional flexibility in how they structure their research and development budgets and incentivize companies to prioritize 5G deployment.

B. Could a Challenge be designed that addresses the issues raised in previous questions and also includes test and evaluation of the security of the components?

It could. Below in our response to section III (A) of this notice we are suggesting that DoD establish an interoperability lab for the purpose of confirming compliance to open standards. The same facility could be used to test and evaluate the security of each component and also end-to-end security of the complete system with different mixes of components from different vendors.

C. Could a Challenge be designed that would require participants to leverage software bill of materials design principles in the development of components for an open 5G stack?

It is certainly possible for the Challenge to be prescriptive in terms of software design principles however Dell believes this is less important than ensuring open interfaces and portability of software to different hardware platforms. These factors will lower barriers to entry to facilitate development of a more robust ecosystem and supply chain. Enforcing a specific bill of materials may have the unintended consequence of reducing the opportunity to innovate without meaningfully contributing to the goals of the Challenge. That said it would not be surprising if the most successful solutions did follow such an approach.

D. Many open 5G stack organizations have developed partial implementations for different aspects of an open 5G stack. What portions of the open 5G stack has your organization successfully developed with working code? What portions of the open 5G stack does your

organization believe can be developed quickly (6 months or less)? What development support would best enable test and evaluation of the different elements of an open 5G stack?

Dell Technologies is an end-to-end provider for many product lines that enabling our customers across the globe to create remote workforces, secure critical data, and scale without disruption. In this role, we not only provide hardware platforms that meet the core requirements of Telecom Service Providers and Enterprises in their deployment of 5G, we team with partner companies to explore development of innovative software elements to support an open 5G stack. Due to our large partner network and internal capabilities, Dell has working solutions available in the market today that support the ORAN standards to varying degrees. Additionally, while focused on the lower level foundations of the RAN stack, Dell Technologies has existing partnerships with the major virtualization layer providers and core software vendors as part of its overall solutions capability.

With appropriate support from government, these solutions have the capability to mature and be competitive with the proprietary solutions that are more typical in the market today. As such, Dell is currently evaluating expanding its involvement in 5G to include more of the core RAN technology elements.

E. What 5G enabling features should be highlighted in the Challenge, such as software defined networking, network slicing, network function virtualization, radio access network intelligent controller, radio access network virtualization?

All of the functions described here should be part of the Challenge. The goal should be an end-to-end capable 5G system made up of components from different vendors following open interfaces at all levels and with the ability for software elements to work on multiple hardware platforms.

III. Timeframe & Infrastructure

A. What software and hardware infrastructure will be needed to successfully execute this Challenge?

DoD should establish an interoperability laboratory environment. This could be done as a stand-alone initiative or in concert with other industry organizations. Vendors would be required to supply their solution to this facility and provide technical support for execution of tests confirming conformance to standards and interoperability with solution elements from other suppliers. DoD would need to provide physical facilities inclusive of the ability to conduct live radio testing as well as staff to execute tests and work the candidate vendors as they bring their solutions to the lab for evaluation.

B. What is a reasonable timeframe to structure such a Challenge? Should there be different phases for such a Challenge? If so, what are appropriate timelines for each suggested phase?

The course of the challenge should be over the next three years. There is early momentum in ORAN product development, particularly from U.S.-domiciled companies, but the industry has not reached a tipping point whereby it becomes clear that an open 5G ecosystem will become the established norm in the market. A Challenge from DoD that mandates compliance to the ORAN standard, offers facilities to confirm interoperability between vendors and holds out the potential for contract awards to vendors that are compliant will create a meaningful incentive to all players in the industry.

In terms of phases, the Challenge could initially focus on basic functionality and then set out a timetable for some of the more advanced features mentioned in section II (E) of this Notice (e.g. network slicing).

Conclusion

Dell Technologies appreciates the opportunity to comment on this Notice and supports NTIA's efforts to facilitate 5G deployment at the Department of Defense. Should you have any questions on our comments, please contact Eminence Griffin.