National Telecommunications and Information Administration

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Public Wireless Supply Chain Innovation Fund Implementation

We at Innovate5G Inc. thank the NTIA for an opportunity to respond to request for comments and provide our inputs and recommendations for consideration in the development and implementation of the NTIA Innovation Fund Program.

Questions on the State of the Industry

1. What are the chief challenges to the adoption and deployment of open and interoperable, standards-based RAN, such as Open RAN? Are those challenges different for public vs. private networks?

Innovate5G Inc. Response-

Standardization of interfaces is happening as we write this. However, the main challenges lie in making this information publicly and freely available. Publishing these standard interfaces to a public forum such as a standardizing body like the 3GPP is vital. Making information seamlessly accessible to everyone not just standard body or consortium participants but having all companies, especially Startups who don't have the resources to invest heavily on the Standards end of the discussion to have access to this standardized interface freely without having to run pillar to post between various OEMs an vendors to get access to these interfaces.

In the software world, we are very attuned to working with APIs that are publicly published over commercial platforms for access (charged as well as free). Developers are aware where these pools of API reside and how to access them to build a solution.

As long as, there are well published APIs for these standardized interfaces, the playing field is even for both small, medium and large organizations to participate including Startups.

The challenges are the same for both public and private network networks.

Innovation and innovation lead adoption is guaranteed to be spurred more often in Startups than in incumbents.

a. What are the challenges for brownfield deployments, in which existing networks are upgraded to incorporate open, interoperable, and standards-based equipment?

Innovate5G Inc. Response-

The main challenges in brownfield deployments is interoperability with legacy equipment. Talking to OEMs to try and interface with legacy equipment and provide back compatibility is highly challenging. Much of the interfaces even if constructed as APIs, is considered proprietary information and third party developers do not get access or only a selected few are allowed.

2. What ongoing public and private sector initiatives may be relevant to the Innovation Fund?

a. What gaps exist from an R&D, commercialization, and standards perspective?

Innovate5G Inc. Response-

R&D is largely considered as Large Corporation or Institution activity. However, the barrier to entry for Startups is diminishing in being able to access resources for R&D and much cutting edge R&D can be performed by Startups also.

There is a critical need to involve Innovation coming out of US based Startups in this area and minimize the gaps mainly in accessing funding for Startups as well as access to well documented, well published and accessible Standards and commercialization processes for Startups.

b. How might NTIA best ensure funding is used in a way that complements existing public and private sector initiatives?

Innovate5G Inc. Response-

I think the process should be very democratic and open and not just accessible to a few that have the resources to put a funding team together. Mainly, I'm looking for accessibility from a Startup perspective that are usually lean, agile teams trying to make innovation happen at neck break speeds. Access to funding is crucial for them to allow ground breaking R&D to emerge from a small, lean stack that does not have resources to dedicate towards lobby or hiring of expensive consultants to navigate the funding landscape.

3. What kind of workforce constraints impact the development and deployment of open and interoperable, standards-based RAN, such as Open RAN? How (if at all) can the Innovation Fund help alleviate some of these workforce challenges?

Innovate5G Inc. Response-

The Workforce constraint is very real. The Innovation Fund should be open and democratic in setting up guest worker programs initiative not just with our neighbors in Canada and Mexico but inviting talent from Asia, Europe and elsewhere.

Making visa and guest worker programs, along with training and education of local workforce by talent sourced from outside of US is crucial.

Talent needed in the Networks arena is highly specialized and does not necessarily match the skills of more Applications oriented industry.

With the recent layoffs at Amazon, Google etc. has brought a lot of talent back to the market and even though this talent does have cloud skills much needed for Networks, they lack more specialized knowledge of the Network Stack, which is huge learning curve. Hence, re-training or upskilling is also a potential initiative that will aid in the availability of Workforce talent for the ORAN and Networks industry.

4. What is the current climate for private investment in Open RAN, and

how can the Innovation Fund help increase and accelerate the pace of investment by public and private entities?

Innovate5G Inc. Response-

Most of the funding that exists can be classified in three broad categories:

1. Large OEM Corporations such as Nokia, Ericsson etc. or Operator Corporations, such as AT&T, T-Mobile etc. funding their own R&D and Product Development for ORAN. This could be considered funding with a private interest.

2. Consortium Funded Organizations such as ORAN Alliance that allow several organizations to come together and fund the common initiative in ORAN. This could be considered funding with a public interest.

3. Academic Institutions such as Universities working through grants on ORAN initiatives. This can be considered funding with a public interest.

The above funding is all relegated to the space of Large Companies, Institutions and Organizations. There is no funding available for Startups. True Innovation is spurred by Startups rather than incumbents.

What is missing is private funding such as Venture Capital Funds for Startups. Venture Capital flowing into creation of new technologies is mainly relegated to Applications arena and not

necessarily in infrastructure innovation such as Network Product Development. Venture Capital funding in the software sector has been very successful.

However, as more Networks are becoming more Software oriented and Hardware is becoming general purpose, it is time for Venture Capital deal flows to look at investing capital into the development of cutting edge Network Technology Startups.

It is not uncommon for several Venture Funds to participate to complete a funding round in the Startup World.

Innovation Fund can create an incentive for Venture Capital Firms to participate with co-venture investments alongside Innovation Fund where some parts of the fund can be initiated by Innovation Fund and the rest of the funding is satisfied by other Private Venture Capital Firms participating alongside Innovation Fund to mainly fund Startups.

The inclusion of the Silicon Valley Venture Capital eco-system is a key to foster more advanced Startups investing in R&D in ORAN and Network Technologies.

5. How do global supply chains impact the open, interoperable, and standards-based RAN market, particularly in terms of procuring equipment for trials or deployments?

Questions on Technology Development and Standards

6. What open and interoperable, standards-based network elements, including RAN and core network elements, would most benefit from additional research and development (R&D) supported by the Innovation Fund?

Innovate5G Inc. Response-

Some of the key aspects of a major shift will be realized not just by R&D in Hardware components but the Softwarization of Network is essential. Creating a robust, open, marketplace of third party developer eco-system that can get access to the massive amounts of data available in the Network can allow for innovative solutions to be built that minimize the cost of the Network both in terms of CAPEX and OPEX.

Allowing solutions such as generative Artificial Intelligence to learn and evolve a Network around Experience should be a new paradigm and area of focus away from traditional ways of thinking about the Network.

7. Are the 5G and open and interoperable RAN standards environments sufficiently mature to produce stable, interoperable, cost- effective, and market-ready RAN products? If not:

a. What barriers are faced in the standards environment for open and interoperable RAN?

b. What is required, from a standards perspective, to improve stability, interoperability, cost effectiveness, and market readiness?

c. What criteria should be used to define equipment as compliant with open standards for multivendor network equipment interoperability?

8. What kinds of projects would help ensure 6G and future generation standards are built on a foundation of open and interoperable, standards-based RAN elements?

Questions on Integration, Interoperability, and Certification

9. How can projects funded through the Innovation Fund most effectively support promoting and deploying compatibility of new 5G equipment with future open, interoperable, and standards-based equipment?

a. Are interoperability testing and debugging events (*e.g.,* ‘‘plugfests’’) an effective mechanism to support this goal? Are there other models that work better?

Innovate5G Inc. Response-

Creation of an open & democratic eco-system such as a marketplace similar to Amazon or the App Store to allow many to contribute towards this innovation is key.

To foster the true spirit of innovation, Hackathons/plugfests are effective forums if their outcomes can be followed through with effective incubation measures.

This should be open globally to allow for ideas arising outside of the US but providing the steps and processes for those ideas to come setup shop in the US as a US based entity and having access to the incubation offered by US.

10. How can projects funded through the program most effectively support the ‘‘integration of multi-vendor network environments’’?

11. How do certification programs impact commercial adoption and deployment?

a. Is certification of open, interoperable, standards-based equipment necessary for a successful marketplace?

b. What bodies or fora would be appropriate to host such a certification process?

12. What existing gaps or barriers are presented in the current RAN and open and interoperable, standards-based RAN certification regimes?

a. Are there alternative processes to certification that may prove more agile, economical, or effective than certification?

b. What role, if any, should NTIA take in addressing gaps and barriers in open and interoperable, standards-based RAN certification regimes?

Questions on Trials, Pilots, Use Cases, and Market Development

13. What are the foreseeable use cases for open and interoperable, standards- based networks, such as Open RAN, including for public and private 5G networks? What kinds of use cases, if any, should be prioritized?

14. What kinds of trials, use cases, feasibility studies, or proofs of concept will help achieve the goals identified in 47 U.S.C. 906(a)(1)(C), including accelerating commercial deployments?

a. What kinds of testbeds, trials, and pilots, if any, should be prioritized?

15. How might existing testbeds be utilized to accelerate adoption and deployment?

16. What sort of outcomes would be required from proof-of-concept pilots and trials to enable widespread adoption and deployment of open and interoperable, standards-based RAN, such as Open RAN?

Questions on Security

17. ‘‘Promoting and deploying security features enhancing the integrity and availability of equipment in multi- vendor networks,’’ is a key aim of the Innovation Fund (47 U.S.C

906(a)(1)(C)(vi)). How can the projects and initiatives funded through the program best address this goal and alleviate some of the ongoing concerns relating to the security of open and interoperable, standards-based RAN?

a. What role should security reporting play in the program's criteria?

b. What role should security elements or requirements, such as industry standards, best practices, and frameworks, play in the program's criteria?

18. What steps are companies already taking to address security concerns?

19. What role can the Innovation Fund play in strengthening the security of open and interoperable, standards- based RAN?

20. How is the ''zero-trust model'' currently applied to 5G network deployment, for both traditional and open and interoperable, standards-based RAN? What work remains in this space?

Questions on Program Execution and Monitoring

21. Transparency and accountability are critical to programs such as the Innovation Fund. What kind of metrics and data should NTIA collect from awardees to evaluate the impact of the projects being funded?

22. How can NTIA ensure that a diverse array of stakeholders can compete for funding through the program? Are there any types of stakeholders NTIA should ensure are represented?

23. How (if at all) should NTIA promote teaming and/or encourage industry consortiums to apply for grants?

24. How can NTIA maximize matching contributions by entities seeking grants from the Innovation Fund without adversely discouraging participation? Matching requirements can include monetary contributions and/or third-party in-kind contributions (as defined in 2 CFR 200.1).

25. How can the fund ensure that programs promote U.S. competitiveness in the 5G market?

a. Should NTIA require that grantee projects take place in the U.S.?

b. How should NTIA address potential grantees based in the U.S. with significant overseas operations and potential grantees not based in the U.S. (*i.e.,* parent companies headquartered overseas) with significant U.S.-based operations?

c. What requirements, if any, should NTIA take to ensure ‘‘American-made’’ network components are used? What criteria (if any) should be used to consider whether a component is ‘‘American-made’’?

26. How, if at all, should NTIA collaborate with like-minded governments to achieve Innovation Fund goals?

Additional Questions

27. Are there specific kinds of initiatives or projects that should be considered for funding that fall outside of the questions outlined above?

28. In addition to the listening session mentioned above and forthcoming NOFOs, are there other outreach actions NTIA should take to support the goals of the Innovation Fund?

About Innovate5G Inc.

Innovate5G Inc. is a US based Women Owned Minority Startup.

Innovate5G Inc. leads innovation in the public and private telecom space by developing AI/ML Platforms and APIs for 4G/5G Cellular Networks in the areas of ORAN RIC, Software Automation, 5G Slicing.

With Innovate5G’s patent pending platforms IoT, UAVs and Metaverse Applications as well as RAN Intelligent Controller (RIC) rApps Network Applications can now observe Performance over Cellular Networks to optimize Applications and Networks in real time with APIs.

Observe the performance of Cellular Networks. Adapt real time to Network conditions. Evolve your Customer's Quality of Experience (QoE).

Innovate5G Inc. has participated as a Solution Integrator in building School Networks in the US. Innovate5G Inc. is a preferred vendor of MiCTA.

Innovate5G Inc. also hosts an independent, multi-vendor 5G Stand Alone Lab for interoperability and integration testing.