Public Wireless Supply Chain Innovation Fund Implementation

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Comments from **Software Radio Systems** (SRS)
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About Software Radio Systems:

Software Radio Systems Limited (SRS) (www.srs.io) is an EU-based SME headquartered in Ireland. SRS develops complete RAN software solutions for 4G and 5G. We are known for our open source projects, srsLTE and srsRAN, that have made performant and customizable software radio solutions available to the R&D community since 2015. We help our commercial partners in the U.S. to build and launch innovative new products and services based on our open-source RAN software platforms. These include a commercial air-to-ground network with complete coverage across the continental U.S.A. to provide broadband connectivity to business jets and a ground-breaking LEO satellite network providing direct-to-mobile broadband connectivity. We have also worked with a number of U.S.-based partners on DoD and NSC-funded programmes to support 4G and 5G developments targeting niche defense requirements. Since late 2021 we have been developing a clean-slate 5G Open RAN CU/DU software stack. Next month, February 2023, we will publicly release this software under the open-source AGPL license. This is an all-software L1/L2/L3 RAN stack solution, 100% owned and developed by SRS. Our Open RAN solution is ideally suited as a platform on which to build and launch innovative products and services.

Comments:

SRS welcomes the opportunity to provide comments to the NTIA on their implementation of the Public Wireless Supply Chain Innovation Fund (PWSCIF). We have provided some additional information inline below in response to some particular questions set out in the RFC but we summarize our response here:

1. The PWSCIF should be used to promote innovation in the area of Open RAN by stimulating and promoting a vibrant multi-vendor ecosystem. As such, it should not be distracted by calls for research-oriented funding which may be better provided by other funding sources. The process of innovating new products and services is a

distinct challenge from that of advancing the field of telecommunications through research and development.

2. The PWSCIF should establish mechanisms to champion the voice and needs of smaller private network operators and the vendors and Systems Integrators who will provide solutions to their network needs. There is a risk that larger operators may dominate the space and choke off innovation that threatens their market position. Private, enterprise and niche network challenges based around 5G and Open RAN present opportunities for new vendors with compelling solutions to provide relatively quick wins. Solving and demonstrating multi-vendor Open RAN in a private network is a more addressable task than solving it for large-scale, country-wide networks. The solutions and insights gained from private networks may provide guidance for the path towards adopting Open RAN at scale.

3. The PWSCIF should support the establishment of permanent certification facilities that will allow for the ongoing testing and certification of Open RAN solutions throughout their life-cycle. In funding such facilities the NTIA should ensure that they meet the needs of smaller and newer market entrants.

4. The grant eligibility criteria used by the PWSCIF should not restrict funding solely to U.S.-based companies. There is a lot of Open RAN innovation happening outside the U.S.A. which is complementary to solutions being developed by American companies and may also be necessary for the success of innovations happening within the U.S.

5. Finally, we would urge the NTIA to think big when formulating funding calls under the PWSCIF such that this funding is used to really move the needle on Open RAN adoption and the creation of a vibrant multi-vendor ecosystem.

   SRS would argue that there is a strong and urgent need for the provision of an open source reference software architecture for the RAN stack to catalyze innovation in the 5G, 5G Advanced, and Beyond 5G space. A performant and real-world-deployable open source RAN stack could establish itself as the *Linux of Open RAN*, providing a common *respected* platform for Open RAN innovation across the US.

Questions on the State of the Industry:

Understanding the current state of the telecommunications industry is important to determining how any topics should be prioritized in the Innovation Fund, and what level of funding a topic should receive.

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?

Current RAN solutions on the market do not provide the kind of openness, accessibility and adaptability that allows integrators and operators to pull together multi-vendor-based solutions targeting their specific needs.

Private networks will likely need a variety of solutions and responses that address their particular needs. In particular, enterprise networks will have service level targets that are quite differentiated from national public networks. A successful market will involve many service providers, system integrators (SIs) and OEMs working together to tailor solutions that address these particular challenges.

The growth of 5G-based private networks should see the entry of new kinds of network operators into the market. These new entrants will be trying to compete with the large-scale public network operators who currently dominate the provision of 4G and 5G services to enterprises. New operator entrants will be more reliant on SIs to assemble the whole network solution from the available Open RAN component solutions on the market. However, in order to deliver on that vision vendors will need to embrace both the letter and the spirit of Open RAN.

Open and interoperable solutions should provide SIs with the flexibility to tailor network solutions in a way that existing offerings do not. A truly multi-vendor ecosystem should give SIs and operators access to best-of-breed solutions whether that's the RAN, the radio, the core or other elements.

As the ecosystem of suppliers grows, providing more choice to end-users and SIs, there is the potential for the growth of complexity and friction that will stymie the uptake of multi-vendor solutions. One of the objectives that all vendors should follow is that of simplifying, where feasible, the integration and operation of ORAN-based solutions.

Solutions that are truly open and scrutable would lower the barriers to integration and innovation beyond the benefits brought by adopting standardized interfaces. Open solutions which make source code available would enable SIs and operators to understand how their network operates. Open RAN's success will be reliant on it being more than a collection of interconnected black boxes.

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

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?

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

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?

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?

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:

Understanding the current state of open and interoperable, standards-based RAN and the standards that inform its development will assist NTIA in maximizing the impact of grants. Questions in this section will be used to assess the maturity of the technology and related standards to help determine which topics should receive additional investment.

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?

The RAN stack, from L1 to L3, is a key component for the development of any 5G network. At present there are very few solutions available on the market that meet both technical requirements and vision of Open RAN. Innovation in and around the 5G RAN is stymied by the lack of access to a performant RAN stack.

SRS believes that the NTIA should use this fund to drive the development and provision of an open source RAN stack.

Such a reference architecture would be standards-compliant, performant, well-written, maintained, real-world deployable and truly open-source.

- *A reference RAN stack should meet both 3GPP and ORAN Alliance requirements.*
- *It should be a performant solution that offers both stability and throughput requirements demanded by the market.*
- *It should be written in such a way that it is easily extended, customized and understood.*
- *It should be maintained over the medium to long term by a professional cohort of engineers.*

- *It should be available under an OSI-approved open-source license.*

*We liken this approach to creating the **Linux of Open RAN**. A respected, well-maintained software platform that can be adopted by anyone to meet different technical and business needs.*

A performant open source stack would form the basis for ongoing development by providing a common RAN framework against which vendors in the ecosystem can develop their solutions. It could also be used to develop the essential building blocks of later 5G releases; 5G Advanced, and Beyond 5G and into 6G.

The NTIA should consider funding mechanisms or competitions that would stimulate the market to provide a reference RAN stack that would meet these requirements.

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:

Challenges associated with systems integration and component interoperability can hinder the adoption of open and interoperable, standards-based RAN. This section will help NTIA structure the NOFOs in a way that most effectively addresses these challenges and facilitates adoption.

NTIA also welcomes feedback on the effectiveness of certification regimes in driving open and interoperable, standards-based RAN adoption.

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?

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?

        For newer and smaller vendors certification programs by trusted third parties would increase the adoption and deployment of new Open RAN products. SRS would encourage the NTIA to fund programmes that provide certification or badging for solutions to provide additional assurance to SIs and end customers.

    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:

A key aim of the Innovation Fund is to promote and deploy technologies that will enhance competitiveness of 5G and successor open and interoperable, standards-based RAN. We have seen a range of Open RAN trials, pilots, and use cases underway across the United States and internationally to date. This section will inform the types of NOFOs NTIA publishes and administers as the Department works to accelerate adoption.

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:

Strengthening supply chain resilience is a critical benefit of open and interoperable, standards based RAN adoption. In line with the Innovation Fund's goal of "promoting and deploying security features" to enhance the integrity and availability of multi-vendor network equipment, and Department priorities outlined in the National Strategy to Secure 5G Implementation Plan, this section will inform how NTIA incorporates security into future Innovation Fund NOFOs.

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:

The Innovation Fund is a historic investment in America's 5G future. As such, NTIA is committed to developing a program that results in meaningful progress toward the deployment and adoption of open and interoperable, standards-based RAN. To accomplish this, we welcome feedback from stakeholders on how our program requirements and monitoring can be tailored to achieve the goals set out in 47 U.S.C. 906.

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"?

    The grant eligibility criteria used by the PWSCIF should not restrict funding solely to U.S.-based companies. Much of the current innovation around Open RAN is happening outside the U.S.A. in allied countries. A multi-vendor ecosystem that excludes these complementary vendor solutions is one that will not necessarily be accessing the best-of-breed solutions in the marketplace. As such we would urge the NTIA to be as flexible as possible in its grant criteria with regard to vendors who are not U.S.-based.

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

Additional Questions:

NTIA welcomes any additional input that stakeholders believe will prove useful to our implementation efforts.

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?