Before the
DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, DC 20230

In the Matter of	)
	)
Public Wireless Supply Chain Innovation Fund	) Docket No. 221202-0260
Implementation	) RIN 0693-XC05
	)

COMMENTS OF THE PLATFORMS FOR ADVANCED WIRELESS RESEARCH (PAWR) Project Office (PPO)

The PAWR Project Office (PPO) appreciates the opportunity to respond to the National Telecommunication and Information Agency's ("NTIA's") request for comment ("RFC") on implementing the Public Wireless Supply Chain Innovation Fund ("Wireless Innovation Fund" or "WIF").

I.   INTRODUCTION

The Platforms for Advanced Wireless Research Project Office (PPO), co-led by US Ignite and Northeastern University, manages the $100 million PAWR program, which was created and funded by the National Science Foundation (NSF) in partnership with a consortium of 30 companies in the telecommunications sector, including major vendors, operators and device-makers. It collaborates closely with the academic, industry, and government research communities, and it has unique insights into the challenges and opportunities associated with accelerating the development and deployment of open radio access network (Open RAN) technologies.

To that end, the PPO is providing comments to the NTIA on the Wireless Innovation Fund in the following format:

- Recommendations for program execution and collaboration to achieve NTIA's goals;
- An overview of the Open RAN gaps that exists in the current state of the industry;
- Analysis on how to accelerate integration and interoperability of Open RAN technologies;
- Insight on how testbeds can be used to support Open RAN trials and proof-of-concept pilots;
- Suggestions on how the NTIA can optimize program execution and monitoring

II.   RECOMMENDATIONS FOR PROGRAM EXECUTION AND COLLABORATION TO ACHIEVE NTIA'S GOALS

Despite a number of successful ongoing Open RAN deployments worldwide, the Open RAN ecosystem is still under development. To unlock the full potential of Open RAN for 5G, Beyond 5G, and 6G, additional resources are needed to make it easier for more players (e.g., equipment suppliers, network integrators) to participate in both basic and applied research and development, and to deliver innovations that meet the greatest challenges of next-generation wireless connectivity.

The PPO believes there are two major categories of Open RAN R&D efforts needed that are not addressed by current 5G labs and testbeds. The first is interoperability and performance parity testing, which will provide the assurances required by operators to deploy Open RAN technologies commercially. The second is advanced Open RAN research and development to accelerate innovation and significantly expand the telecom supplier ecosystem.

Both categories require funded efforts to: make testing resources available at scale and on demand; drive targeted testing and research outcomes; and lower the barrier to entry for innovators pursuing network research and development.

To achieve these goals, the PPO recommends funding the following initiatives.

1. An at-scale, multi-vendor Open RAN test and development platform – leveraging prior investments made through the NSF PAWR program and other testbed initiatives, but with funding to support Open RAN equipment and personnel needs – that allows US innovators to demonstrate Open RAN viability through badging and certification, prove system integration capabilities, and develop new features and functions within an Open RAN architecture. This platform may span multiple locations.

2. A neutral organizational entity in charge of working with industry and academic researchers to formulate research, testing, and data collection challenges that are then funded and executed through the test and development platform.

3. A grant program to subsidize usage of the test and development platform for smaller organizations, non-traditional vendors, and academic innovators that might otherwise not have the resources to participate in necessary Open RAN R&D.

4. A grant program to create US university-led graduate and certificate programs for workforce development to support Open RAN and related wireless fields of study.

5. Funding to support open source software development and/or reference architectures that will lower the barrier to entry for both academic and commercial groups pursuing Open RAN innovation and prototyping.

III.   AN OVERVIEW OF THE OPEN RAN GAPS THAT EXISTS IN THE CURRENT STATE OF THE INDUSTRY

In answer to NTIA questions 1, 2, and 3 on the state of the industry, the PPO submits that there are still significant challenges to the "adoption and deployment of open and interoperable, standards-based RAN, such as Open RAN." First, network operators need assurances that new technologies are in fact Open RAN compliant, as well as interoperable with network components from a variety of vendors, and at performance parity with existing systems. The continued development of Open RAN specifications and standards will help in part with this challenge, as will the creation of badging and certification programs.

Second, there needs to be an increase in advanced Open RAN research and development efforts to accelerate innovation and significantly expand the telecom supplier ecosystem. One of the major concerns for Open RAN development cited in a recent study by the National Spectrum Consortium[1] is that most research facilities today are not accessible to non-traditional telecom technology providers. This limits both the speed of innovation that can be achieved in wireless networking and the diversity of participants in the telecom ecosystem.

The Innovation Fund can help with both challenges as described above by investing in an at-scale, multi-vendor Open RAN test and development platform. This could be an extension of the existing system of Open Test and Integration Centres (OTICs) as designated by the O-RAN Alliance. Such a platform or program would need funding for more Open RAN-specific testing equipment and expert personnel, and it would require investments to subsidize access by non-traditional technology innovators.

Ideally, investments should also be directed toward the development of reference architectures, likely including open source software, to lower the barrier to entry for new innovators in the working on Open RAN development. Beyond ensuring interoperability, creating a cycle of continued innovation with a broader set of technology creators will drive incentives for Open RAN adoption.

Any Open RAN development initiative supported by the Innovation Fund could and should also take advantage of existing network research programs, of which the NSF PAWR program is a strong example. Through investments by both the National Science Foundation and the wireless industry, the PAWR program has existing infrastructure based on open networking systems. The NSF PAWR testbeds are also open to all researchers and have mechanisms in place to on-board and support users across the startup, academic, government, and enterprise landscape.

Beyond creating a test and development platform, and in answer to NTIA question 3, workforce development is also a critical challenge that the Innovation Fund can help address. It is becoming increasingly difficult to find talent in the US to support the research needs of the wireless industry. Creating university-led graduate and certificate programs to support Open RAN and related wireless fields of study would buttress NTIA innovation investments by ensuring a workforce pipeline for continued industry growth and competitiveness.

IV. ANALYSIS ON HOW TO ACCELERATE INTEGRATION AND INTEROPERABILITY OF OPEN RAN TECHNOLOGIES;

Responding to NTIA questions 9 and 10, the PPO believes that promoting interoperability among radio access network equipment and technologies will require efforts beyond the Open RAN plugfest events that take place today.

Specifically, the wireless community needs access to a wide mix of commercial equipment (traditional RAN and Open RAN) and software available on demand. It is not enough to configure hardware and software for a one-time, pre-planned plugfest. These components must be acquired, installed, and maintained for ongoing usage.

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[1] Report on U.S. Resources and Capabilities for Accelerating Open RAN, Executive Summary, January 24, 2023 https://www.nationalspectrumconsortium.org/wp-content/uploads/2023/01/NSC-_Open-RAN-Advisory-Group-Report_Executive-Summary_01.24.23.pdf

In addition to a test and development platform supporting ongoing interoperability testing, the PPO submits that there needs to be a neutral organizational entity in charge of working with technologists to drive integration efforts and to implement certification and badging initiatives. Having a neutral entity is critical to ensure broad participation from across the technology ecosystem, and to provide assurance to network operators that claims of interoperability can be proven outside of a vendor-sponsored lab.

V. INSIGHT ON HOW TESTBEDS CAN BE USED TO SUPPORT OPEN RAN TRIALS AND PROOF-OF-CONCEPT PILOTS

In response to questions 15 and 16, the PPO cites the findings of the National Spectrum Consortium's Report on US Resources and Capabilities for Accelerating Open RAN. The report found that there is a solid foundation for continued Open RAN development, and for facilitating Open RAN technologies so they can be adopted into commercial networks. However, it also concluded that not everything needed to accelerate Open RAN is available through research facilities today.

More specifically, among the existing labs and testbeds that make themselves available to external users (i.e., are not vendor-sponsored or internal to mobile network operators), there is a need for additional hardware and software, including Open RAN-specific testing equipment. *No facility currently has the necessary volume and diversity of hardware and software to support wide-scale testing and experimentation, including meaningful Open RAN trials and proof-of-concept pilots.*

Likewise, most existing labs and testbeds do not have sufficient personnel (operational staff and advanced researchers) to accelerate Open RAN development work and support innovative trials and demonstration deployments.

The PPO believes that targeted investments in these areas would make it possible to create an at-scale, multi-vendor Open RAN test and development platform.

Regarding NTIA question 16, the PPO suggests that input be gathered from across the wireless ecosystem to determine specific outcomes that should be pursued in research initiatives including proof-of-concept pilots and trials. As previously stated, the PPO recommends the creation of a neutral organizational entity in charge of working with industry and academic researchers to formulate research, testing, and data collection challenges. These challenges should have defined metrics for assessment, and the neutral entity should monitor progress and report on outcomes to further wireless innovation.

VI. SUGGESTIONS ON HOW THE NTIA CAN OPTIMIZE PROGRAM EXECUTION AND MONITORING

The PPO has expertise working across industry, academia, and the government in wireless research and development. We strongly recommend that NTIA include mechanisms through its Innovation Fund awards to encourage collaboration across these stakeholder groups. This could take the form of requiring grant applicants to prove they have representation from multiple stakeholder communities. It could also be done by weighting the evaluation process toward

applicants who can demonstrate they are meeting a diverse set of research needs rather than those of a single stakeholder group.

Many of the diverse research and development needs needed to accelerate Open RAN are described by the PPO in this document. We hope this can serve as a useful reference guide as the NTIA shapes new programs under the Innovation Fund.

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Respectfully submitted,

PAWR Project Office

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January 27, 2023