Radisys

Radisys response to

NTIA Public Wireless Innovation Fund – Request for comment

January 2023

Before the

DEPARTMENT OF COMMERCE

National Telecommunications and Information Administration

Washington, DC 20230

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

Contents

1 Executive Summary

Radisys is pleased to respond to NTIA's Request For Comments (RFC) on Public Wireless Supply Chain Innovation Fund. We appreciate this opportunity to provide our comments and inputs based on our long experience in being a solutions provider, leadership and contributions in open standards bodies and our deep partnership in the telecom ecosystem.

In this document, Radisys provides its comments on the questions in RFC, in addition to our alignment with the response provided through Open RAN Policy Coalition (OPRC), the organization in which Radisys is a member of. Some of the comments in this document are based on ORPC's comments, being submitted separately by ORPC.

2 Radisys – A brief introduction

Radisys is a global leader in **open telecom technology solutions and services, headquartered in Hillsboro, Oregon providing open telecom hardware and software for more than 3 decades.** We have been a proponent of open and standards-based telecom solutions through our leadership and contributions in various standards bodies and industry forums. We have been providing standards (3GPP, O-RAN and Small Cell Forum) based 3G, 4G and 5G RAN solutions.

- Radisys is a pioneer and significant contributor in various standards bodies and industry forums such as 3GPP (ETSI), O-RAN Alliance, Open RAN policy Coalition, Small Cell Forum, OnGo Alliance, Next G Alliance (ATIS), ONF, 5G ACIA & Linux Foundation
- Radisys has been a member of Technical Oversight Committee (TOC) in O-RAN open-source community under Linux Foundation. With its project technical lead position and contributing team, Radisys has been contributing to open-source O-DU development since 2019.
- Radisys RAN software powers more than 50+ RAN OEMs, Private 5G, Government and defense 5G equipment OEMs and Test & Measurement equipment vendors
- Radisys has been providing whitebox open hardware based designed with COTS (Commercial Off The Shelf) components for wireline (OLT) and base station (DU and CU) deployments.
- Radisys is a Systems Integrator with a comprehensive partner ecosystem across Hardware, Chipsets, Accelerators, RU vendors and Cloud Technology as well as hyper scalers. Network integration and consulting services organization dedicated to providing independent consulting and full lifecycle services to help telecom operators build and operate highly secure & scalable and high-performance networks at an optimum total cost of ownership

3 State of the Industry

Q-01. 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?

Open RAN solutions in the market have matured significantly from year 2020, thanks to the widespread industry efforts across the globe through various forums and coalitions, supportive policies and funding from various governments and interest from telecom operators to modernize their networks. This has been greatly helped by intense efforts in making mature standards available from O-RAN alliance. Organizations like ORPC (Open RAN Policy Coalition) and TIP (Telecom Infrastructure Project) have played a tremendous role in furthering the journey of Open RAN. Telecom operators across the globe are firmly moving ahead to modernize their network by adopting open and software-centric evolution of their networks and getting rid of vendor lock-in and dependency on untrusted sources telecom equipment supply chain. There are challenges still as the large-scale Open RAN deployments are yet to be realized. The challenges are very similar in case of private networks too.

1. **Interoperability and System Integration:** Most of the challenges are due to testability and test infrastructure and this is fast maturing in implementation support.

2. **Feature parity with closed RAN solutions:** Open RAN solutions may not match traditional closed RAN solutions in all features. Again many Open RAN vendors already support priority features required by global telecom operators.

3. **Trusted supply of telecom hardware components:** With supply chain challenges and lack of design or manufacturing capabilities in desired locations, Open RAN vendors rely on a global network of such providers. Now with countries friendly to US gearing up further in design and manufacturing, more options are available while the component supply challenges still remain.

Q-01.a What are the challenges for brownfield deployments, in which existing networks are upgraded to incorporate open, interoperable, and standards-based equipment?

There are additional challenges in brownfield deployments, primarily due to the difficulties in interworking with closed RAN vendors who have had a control on the interfaces. Without support from these traditional closed RAN vendors, telecom operators and Open RAN vendors have been effectively blocked in realizing true open and interoperable networks. The interfaces provided by the closed RAN vendors are proprietary, locked in and not available for other vendors to interoperate.

Q-02 What ongoing public and private sector initiatives may be relevant to the Innovation Fund?

There have been several US government funded programs to promote semiconductor manufacturing, broadband penetration and secure wireless networks.

In the **United Kingdom, policy support and funding**[1] from the UK government to promote vendor diversity and secure telecom supply chain. This initiative supports R&D funding and innovation, including multi-vendor test labs for realizing open and end-to-end interoperable solutions.

In **India**, policy measures and incentives[2] to support for all vendors to promote local manufacturing, with an outlay of around $5 billion.

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[1] DCMS Diversification Funding Program, https://www.gov.uk/guidance/open-networks-research-and-development-fund

[2] PLI Scheme of Govt of India, https://www.meity.gov.in/esdm/pli

Multiple global industry forums (O-RAN alliance, ORPC, TIP to name a few) have been established to promote Open RAN and many regional consortia have been formed. These industry bodies are funding projects and labs to develop and test Open RAN solutions meeting various needs of global telecom operators. In addition, many vendors have formed multiple ecosystem collaborations, showcasing their success in tradeshows and Plugfest like interoperability tests, sharing more information about Open RAN solutions in public.

Q-02.a What gaps exist from an R&D, commercialization, and standards perspective?

While the progress over last 3 years has been tremendous in Open RAN solution availability, interoperability and deployment, there remain gaps to be addressed for large scale commercial success.

Product features (Hardware and Software) parity: This is due to combination of several factors including the advantage enjoyed by incumbent closed RAN vendors over generations of wireless technology, their own R&D investments with support from their respective regional governments. Significant further investments are needed to achieve feature parity in hardware and software aspects. Many Open RAN vendors are not comparable in their size and revenue with these large incumbents. Intense R&D investments are required to provide feature parity that telecom operators mandate for replacing incumbent vendors on introducing Open RAN vendors in their network. This is also further aggravated by the global situation of silicon, chipset supply chain, with availability of critical components and their pricing. Smaller vendors are not able to compete on price points due to lack of volume business as they do not get priority or favourable pricing from the supply chain ecosystem. Open RAN vendors will have to rely on industry partnerships, policy and funding support from governments to surmount these problems.

Standards maturity and interoperability: The Open RAN standards, primarily O-RAN specifications have been broadly adopted in the industry with the exception of some closed RAN vendors. Standards Development Organizations (SDOs) and various industry consortia, regional coalitions have been working relentlessly to expedite standardization and interoperability. The current set of standards, from base 3GPP reference to various O-RAN specifications covering various interoperability and deployment aspects, are mature enough of global adoption and rollout in telecom networks. The challenges in testing for interoperability and commercial readiness is an area for improvement in this direction.

Q-02.b How might NTIA best ensure funding is used in a way that complements existing public and private sector initiatives?

Telecom industry will greatly benefit from NTIA playing a catalyst role in Open RAN advancements. This will involve establishing appropriate funding criteria to encourage Open RAN vendors and rolling out funding programs at the earliest as the 5G deployments across the globe are happening at a great pace. The funded programs will in turn ensure that the Open RAN companies are able to influence and contribute to the evolution of open technologies to become the base of 6G global standards.

Q-03 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 challenge?

Open RAN vendors, with limited workforce in R&D and other functions, are globally competing against much larger and well entrenched closed RAN solution providers, The Innovation Fund can significantly enhance the workforce

development through funded programs, enabling Open RAN vendors co compete in the US and global market. This will have the long-term effect of building and reskilling a large talent pool that can shape the future of telecom industry through highly innovative and high-tech products for 5G and beyond.

> **Q-04 What is the current climate for private investment in Open RAN, and compatibility of new 5G equipment with future open, interoperable, and standards-based equipment? how can the Innovation Fund help increase and accelerate the pace of investment by public and private entities?**

While the advent of Open RAN has expanded the ecosystem and market space with new entrants as Open RAN solution providers, the levels of private investments made so far are not in proportion to the larger demand for capital needed in the industry to make a transformative change. While startups and smaller companies are seeking and securing investments, timely support through Innovation Fund can help accelerate the market success by addressing critical aspects of product development, workforce development and establishment of appropriate lab and test facilities both within Open RAN companies and shared lab infrastructure and testing facilities.

> **Q-05 How do global supply chains impact the open, interoperable, and standards-based RAN market, particularly in terms of procuring equipment for trials or deployments?**

One of the biggest challenges being faced by Open RAN vendors is related to the state of global supply chain. In addition to the current situation of global silicon shortage, there is often a critical dependency on key components needed for radio network hardware, especially radio unit (RU) and antenna components. This is complicated further by the differential pricing adopted by component providers favouring bigger incumbent players, compared to Open RAN players. Overriding all these concerns, is the challenge of securing these components from trusted sources. Government policy measures and appropriately designed funding support can ensure innovation, design and manufacture of all these required components in US and other countries of origin that can be classified a trustable source.

4 Technology Development and Standards

> **Q-06 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?**

Open RAN standards are bringing in a transformation in the telecom networks to be completely open, transparent, secure, automated and programmable, lowering the Capex and Opex spend for current and future generations of wireless technology.

1. While there is a lot of US leadership in cloud computing and related technologies, fundamental research, innovation and development of radio network related technology needs more investments. Innovation and new product development in developing radio solutions in Sub-6 GHz, Giga Hertz (milli-meter wave) and Tera Hertz (for 6G) is one such area. This will also enable development of deployment of highly spectrum and energy efficient massive MIMO radios that can cater to urban and rural deployments.
2. Another equally important need is the research and development of Artificial Intelligence and Machine Learning enabled products to control the radio networks through RIC (RAN Intelligent Controller) nodes.

3. There is scope for a lot more innovation and new feature development in base stations to develop spectrum efficient and energy efficient solutions.
4. Research and further significant enhancements from current state of art in network security to build resilient networks, with all visibility and transparency providing protection from potential cyber attacks.

All of the above will involve substantial efforts, investments and collaboration among academia, industry and government agencies to ensure US leadership in critical communication infrastructure and success in global markets.

Q-07 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

While the available 3GPP and O-RAN 5G specifications are mature and detailed enough for product design of Open RAN solutions, more needs to be done to ensure interoperability and cost effectiveness.

Q-07.a What barriers are faced in the standards environment for open and interoperable RAN?

Multi-vendor interoperability among Open RAN vendors, end to end network testing for features, performance and deployment readiness aspects are hindered by lack of sufficient lab infrastructure and open radio environments with appropriate spectrum bands to test.

Q-07.b What is required, from a standards perspective, to improve stability, interoperability, cost effectiveness, and market readiness?

Well funded and fully equipped open interoperability labs with adequate number of trained personnel are required for Open RAN vendors to ensure interoperability and performance benchmarks in a neutral environment, potentially involving independent system integrators. This assures telecom operators looking for interoperability tested and deployment ready products, accelerating Open RAN adoption.

Q-07.c What criteria should be used to define equipment as compliant with open standards for multivendor network equipment interoperability?

O-RAN alliance and TIP (Telecom Infrastructure Project) are leading industry efforts to develop standardized test plans to check for available standards and mapped to telecom operator requirements. The availability of extensive test plans had led to a newer array of conformance and interoperability test equipment. O-RAN alliance approved OTIC (Open Testing and Integration Centre) labs and TIP labs are now available is select locations across the globe. O-RAN OTIC labs have started certification of some of the radio network nodes. TIP has a tiered badging program based on well established test criteria. If these certificates and badges are globally accepted by telecom operators, it will greatly help Open RAN vendors. Additionally, Open RAN vendors should ensure that hardware components used are from trusted sources and appropriately certified. With the emphasis on security, all vendors should satisfy Zero Trust architecture[3] and NTIA's criteria for minimal elements of Software Bill of Materials (SBOM).

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[3]NIST Zero Trust Architecture https://doi.org/10.6028/NIST.SP.800-207

> **Q-08 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?**

Project focused innovation and research in radio network evolution, especially in topics including the non-exhaustive list below, are highly likely to ensure a truly open and interoperable standards based evolution in to 6G and further as the societal and economic needs for uber-connectivity, high bandwidth, reliable and secure communication infrastructure.

- Artificial Intelligence and Machine Learning

- RF, antenna, spectrum characteristics and waveforms

- Non-terrestrial communication

- Green energy

- Autonomous and programmable networks

- Specialized chipsets and high performance compute architecture

- Sophisticated base station procedures and algorithms

5 Integration, Interoperability and Certification

> **Q-09 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**

Vendors participating in programs utilizing Innovation Fund should ensure that they meet specific interoperability goals, identified at the start of such programs. Appropriate tests and certification criteria can be established based on O-RAN or TIP test specifications and/or certificates or badges. This will lead to vendors meeting the required level of interoperability while being commercially available for deployment.

> **Q-09.a Are interoperability testing and debugging events (e.g., "plugfests") an effective mechanism to support this goal? Are there other models that work better?**

Plugfest type of interoperability events are a great vehicle for achieving breakthrough results in short time among vendors on new level of interoperability and Open RAN feature support. While this moves the industry forward significantly, longer term and ongoing efforts are needed to ensure that the work is carried forward and meets all the criteria for deployment. This can be ensured via independent labs with appropriate capabilities in addition to the lab infrastructure available with telecom operators and vendors.

> **Q-10 How can projects funded through the program most effectively support the "integration of multi-vendor network environments"?**

This goal can be achieved through appropriately designed programs that encourage vendors to collaboratively in projects that integrate components/nodes from multiple vendors proving interoperability and end to end performance. Such programs will have the catalyst effect on producing long term collaboration among vendors compared to the highly locked in single vendor scenario that is limiting telecom operator choices today.

Q-11 How do certification programs impact commercial adoption and deployment?

Certification programs assure operators and private enterprises adopting Open RAN solutions of the features, performance and interoperability of the products. This removes many barriers in acceptance and deployment of Open RAN solutions, even though telecom operators might ask vendors to undergo additional tests and acceptance before deployment.

Q-11.a Is certification of open, interoperable, standards-based equipment necessary for a successful marketplace?

Certifications help easy adoption by industry. In telecom markets especially, a variety of regulatory (like FCC certification for RF and EMI) and additional certifications as required by telecom operators are widely in use. A good analogy in this case will be mobile devices certification from bodies like GCF[4] and PTCRB[5]. While the mobile devices are built as per 3GPP standards compliant, these additional certifications ensure operators of the required compliance and performance before those devices are active in the network. Certified Open RAN products can be adopted in the industry far mode widely in near future.

Q-11.b What bodies or fora would be appropriate to host such a certification process?

Currently OTIC labs recognized by O-RAN alliance and TIP labs are the forums leading this effort. Since both of these are global industry forums, these bodies are likely the most appropriate are hosting the certification process.

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

The certification program by O-RAN alliance OTIC labs and badging by TIP are in the early stages of adoption by industry. And these programs are being improved and updated by the respective organization in terms of scope of coverage and criteria for certification. Availability of more such lab infrastructure and recognition of these certificates by industry will have to improve for this to become a standard practice in the industry.

Q-12.a Are there alternative processes to certification that may prove more agile, economical, or effective than certification?

Self-certification of compliance and interoperability by vendors is one of the approaches that can be taken. Here again, the test equipment and lab infrastructure can be significant and may force vendors to rent labs or equipment and this may not be economical. Ensuring that well established labs recognized by industry that are affordable and available to all vendors is the best way to help Open RAN solution providers.

Q-12.b What role, if any, should NTIA take in addressing gaps and barriers in open and interoperable, standards-based RAN certification regimes?

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[4] Global Certification Forum https://www.globalcertificationforum.org
[5] PTCRB https://www.ptcrb.com

NTIA can monitor advances in ongoing certification efforts by O-RAN alliance (through OTIC labs) and TIP labs and provide feedback for improvements needed, if any. Programs like 5G Challenge by NTIA are a great way for NTIA to assess the maturity and extent of adoption by different industry players in this respect.

6 Trials, Pilots, Use Cases and Market Development

Q-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?

Since all of the Open RAN solutions are based on 3GPP standards, all the 5G use cases are applicable in Open RAN as well. However, given the beneficial impacts to end users and industries, many of the 3GPP Release 15 and Release 16 use case like eMBB (enhanced Mobile BroadBand), URLLC (Ultra-Reliable Low Latency Communications) and mMTC (Massive Machine Type Communications) are appliable in public and private networks. Some of the other use cases like IAB (Internet Access Backhaul) and NTN (Non-Terrestrial Network) can also be Open RAN compliant but may not be mainstream for a while.

Q-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?

Currently most of Open RAN trials are focused on base (3GPP Release 15) 5G use cases and deployments. As the standards mature, there will be a need to pilot and trial many advanced use cases of Release 16 and beyond.

Q-14.a What kinds of testbeds, trials, and pilots, if any, should be prioritized?

The following are the kind of test environments that are needed for Open RAN vendors to trial their products to be deployment ready:

- Open radio environments with permissions to radiate in certain spectrum band (in limited geographical areas and meeting regulatory emissions criteria)
- Lab infrastructure that focus on management, automation and control through orchestration and RIC (RAN Intelligent Controller)
- Test beds with Physical and cloud based compute infrastructure to test centralized (data centre) and edge nodes based deployments
- Replica networks with appropriate transport (fronthaul, midhaul and backhaul) and timing (PTP, GPS) infrastructure to test network equipment infrastructure
- Environment to test commercial UE (User Equipment) and UE simulation equipment to conduct signalling and traffic test, including aspects like handover, drive test RF performance etc.

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

The existing testbeds are already being fully leveraged by various vendors for testing interoperability. With the available number of labs, equipment and staffing levels, the industry demand is more than what is available.

> **Q-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?**

As of now, most of the PoC pilots and trials tend to be highly operator/geography centric and Open RAN vendors often repeat the exercise for another operator or geography. With a well established lab test and certification regime that is recognized by government bodies and telecom operators, it will be easier for Open RAN solution providers, to undergo a certification once and go through only incremental additional tests to get the products deployed.

7 Security

> **Q-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. 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?**

O-RAN alliance has a working group focused on security aspects. Security implementation recommendations are being regularly published by O-RAN alliance. These are built on top of the globally accepted concepts and frameworks in IT security. In addition, the O-RAN alliance focus is on

- Interface security
- Transport security
- Cloud security
- Zero Trust architecture
- Management security and authorizations
- Security protocol recommendations in each node and interfaces

Most of the plugfest events and ongoing tests and trials have not focused on node level and end-to-end security aspects of Open RAN networks. It will help to establish such security focused test environments, conduct Plugfest events focusing on security and encourage ongoing testing of products.

> **Q-17.a What role should security reporting play in the program's criteria?**

This should be one of the key success criteria for vendors aiming deployment. Vendors should report current security compliance in their offering and further improvements planned, when they avail program funding.

> **Q-17.b What role should security elements or requirements, such as industry standards, best practices, and frameworks, play in the program's criteria?**

At a minimum the programs should report sources of hardware and software components. Compliance to different security protocols recommendations at interfaces should also be considered.

> **Q-18 What steps are companies already taking to address security concerns?**

Many Open RAN vendors have already adopted "Security by Design" approach. Secure Software Development Lifecyle for product development, combined with a design based on Zero Trust architecture ensures the products meet the common security requirements of many telecom operators and enterprises.

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

Open RAN vendors will be greatly helped by Innovation Fund towards security focused infrastructure and test reports approved by independent labs. This will go a long way in dispelling any scepticism in adopting Open RAN solutions in the global market.

> Q-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?

It is not clear what the traditional closed RAN vendors have implemented with respect to security protocols. On the other hand, O-RAN alliance has published recommendations on security protocols on various interfaces and security practices. While enough has been done on the recommendations, availability of exhaustive test plans to ensure compliance of these recommendations is work in progress.

8 Program Execution and Monitoring

> Q-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?

Proposals for grant should be vetted based on feasibility and capabilities. Well defined success criteria (product/feature compliance and interoperability etc.) and regular assessment on interim milestones will ensure successful and transparent execution of such programs.

> Q-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?

The funding program should encourage participation from entire spectrum of industry, right from research oriented entities to commercial product vendors. Representation from different size of companies (startups to big companies), vendors providing solutions to public and private networks, software centric vendors, hardware vendors, application providers, multiple platform vendors, test and measurement vendors to name a few categories.

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

NTIA can draft rules in program funding to encourage collaborative projects while leaving the opportunity for individual vendors for any significant product development efforts of their own.

> Q-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).

The Innovation Fund should be accessible and affordable to all and any constraining condition like matching contribution might leave out smaller but valuable companies. It is better that such conditions are not imposed while program funding guidelines are formed.

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

Many of the Open RAN vendors are US based or have significant US presence. To ensure US leadership in the market, the funded programs should address US market specific needs, including products supporting spectrum band auctioned in US (C-band, CBRS, milli-meter wave bands). Also since rural coverage is a challenge in many parts of the US, Open RAN solutions targeting FWA and FDD band based wide coverage should be given priority. Since these deployment use case scenarios can also be monetized globally, this ensures companies provided the grant can compete in the global market as well.

Q-25.a Should NTIA require that grantee projects take place in the U.S?

The funded programs might require collaboration and execution across different regions for achieving the goals. As long as these are trusted sources, the project execution can spread across countries with significant leadership from the US soil.

Q-25.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?

Companies based out of the US or with significant presence in US can be given priority in funding as the companies in other regions might get additional support in respective regions.

Q-25.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''?

Products designed by US based companies with global partners may still be considered as "American-made".

Q-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?

Already countries in the Quad Forum on collaborating in the topic of Open RAN. This is being monitored and interaction channels are already facilitated by ORPC.

9 Additional Questions

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

For a robust future and leadership in the telecom industry, the government should continuously support and encourage fundamental research, academic programmes in the wireless communication and semiconductor domains.

Q-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?

Significant international efforts are being driven by organizations like ORPC to synergize and benefit from the industry and government initiatives in other regions. It will be great to tap in to the insights from ORPC.

10 Summary

Radisys strongly believes that the future of communication networks is open, disaggregated, intelligent, programmable and essentially multi-vendor in nature. With this submission, we hope the industry will move forward in the right direction with adequate support of government policy measures and funding to ensure evolution in to modern and secure communications for future.

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