elevate government solutions

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?

The biggest challenge to adopting Open RAN technology in both public and private networks is that the many vendors servicing the space have not done true end-to-end call flow testing. In both public and private networks call there are high-level of service availability required in order to serve the customer use cases. MNOs have a distinct advantage in that they create labs and select specific vendor configurations in order to ensure high level SLAs and the ability to meet specific KPI's that have been established by a competitive marketplace.

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

The first challenge is the underlying cabling and physical infrastructure is often not properly dimensioned to handle the high bandwidth required of modern deployment. The second is that many legacy wireless systems are designed with specific spectrum bands in mind that may not propagate in a similar fashion to the new spectrum available for private networking. As a result, the network design and antenna layout may not be optimal to properly propagate the newly available spectrum driving the Private Network marketplace, for example, CBRS.

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

To fund and enable easily accessible lab environments that will allow various hardware, software, system integrator, and application providers a place to move beyond 3GPP standards actively deploy end-to-end use cases with an eye towards codifying, successful deployment that can be repeated and marketed to the ecosystem.

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

The 3GPP standard does not need to be banked in order for this ecosystem to thrive. The innovation fund could be used as a tool to encourage and require the different vendors in the ecosystem to cooperate in a way that would encourage a more healthy overran environment without each vendor, looking to capture the full end and solution, in today's environment, the

cost of developing a workable solution that meets the SLA and KPI requirements of the customers often forces the vendors to target a larger portion of the overall wallet spend because of the high overhead of R&D and development. The innovation fund could play the role of enabling (through funding) vendors to specialize in smaller portions where their expertise might excel, and encourage them to work more closely with other partners, knowing that their overhead costs will be lower and the well developed market will provide the proper income to sustain their company.

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

NTIA should reward cooperation and interoperability. Collaborative efforts with clear SLA goals between companies should be rewarded, encouraged, and made visible to the larger ecosystem with the help of the NTIA.

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?

Most of the workforce constraints for Open RAN development reside in the competitive environments that exist between companies that are protective of their intellectual property and have an understandable need to capture as much revenue from a project, often leading to scope overreach and inefficient deployment. The NTIA could use their funding platform to encourage a breakdown in these naturally occurring competitive walls to encourage co-development, interoperability, call and shared rewards of intellectual property developed under these programs.

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?

The uncertainty of a loosely organized ecosystem without clear and specific product bundles for customers to select without a high degree of integration service costs and industry understanding has left the investment community confused about the ability to pick winners and losers. The overly open nature of the Open RAN ecosystem as it currently exists, prevents the development of end-to-end solutions that are easily selectable by a customer, and therefore difficult for the investment community to understand and invest in emerging market, trends, and company trajectories.

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?

No comment.

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?

The 3GPP standards most benefit the core providers as the 5G specs lend themselves to software development and innovation. The physical infrastructure from the backhaul providers to the gNode, and CU/DU functions is the area that needs the most attention. This physical infrastructure is where most of the SLA breakdowns occur and require a high-level of interoperability to succeed. This is why the tier 1 wireless operators have always maintained and funded such a robust lab environment to ensure a high level of availability and service.

7. Are the 5G and open and interoperable RAN standards environments sufficiently mature to produce stable, interoperable, cost-effective, and market-ready RAN products?

See above

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

Lack of affordable and accessible lab environments for individual vendors and partnering to create an end-to-end solution with a target SLA and KPI objectives. And each vendor does not have the resources to provide their own to compete with the close lab environments of the tier 1 wireless operators. The ecosystem cannot expect all the wireless operators to open their own lab given that those environments are created to differentiate their services and sustain their market share.

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

See above

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

The NTIA call should help to encourage the lab environments and define successful interoperability criteria and certifications.

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?

See above

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?

The industry is full of people who have worked to create the highest available call nationwide wireless networks that we take for granted. These professionals understand how network elements should move from a basic 3GPP compliant design, followed by base level, lab interoperability, using industry established metrics, KPI's, and SLAs, followed by field lab deployment, followed by FOAs (first office applications), followed by highly monitored field deployment, followed by Network acceptance. This time honored process should not be changed but rather followed with the encouragement of NTIA, funding and government support.

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

Plugfests don't solve the problem because there is not a clear commercial path for a company's revenue which is the true driver of innovation and development. Plugfests are helpful and informative but rarely do the outcomes translate into significant commercial outcomes.

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

See lab comments above.

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

Certifications can be marketed as part of a product offering and receive preferential support over loosely certified or uncertified competitors.

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

Yes

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

No comment

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

No comment

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

No comment

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

No comment

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?

Private networking and Open RAN lend themselves to a few key use cases that the NTIA should consider. The first is in the area of operational technology (OT) use cases where sensors and other control mechanisms are connected over a band 48 or other spectrum to take advantage of the efficiency and security inherent in a 3GPP deployed cellular network. Traditionally, these OT have been deployed over low-voltage wiring or Wi-Fi. Operating future OT networks using wire connections is not feasible given the diverse number of controllers and sensors that need to be distributed in order to provide the right level of service. It is neither commercially nor physically practical to wire all of these devices as Wi-Fi does not serve the use case as the spectrum used does not propagate broadly enough to serve large geographic areas, and the underlying spectral efficiency does not meet the SLAs required of some of this critical infrastructure cellular networks serve the space well due to their ability to schedule services within a core network and deliver a highly specialized device connections based off of the profiles built within a 4G or 5G core.

Another use case that should be attractive is the ability to use Cohran and private Network technology to deliver and stand up fast temporary cellular networks for both DOD and commercial purposes. The ecosystem has matured to the point where these tactical cellular networks can be designed, built and deployed in hours, not months to serve many use cases, such as temporary, public gatherings, short term, military, tactical deeds and public safety.

A third use case that should be attractive is the use of Open RAN and Private Networks to help with public safety in urban and densely populated areas, where a private Network could be leveraged to allow a population to report on public safety issues, such as crime incidences, fires, infrastructure failures. A private network could be built to service targeted areas and take

it vantage of the spectral efficiency of cellular wireless to cover a high level of coverage and quality to allow seamless interaction between public safety, officers and the community they serve

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?

See above. Leveraging and funding trade groups (CTIA), consortiums (National Spectrum Consortium), academia, PAWR/OTIC and FFRDC (MITRE) to sponsor events and environments where technologies can be sought out and evaluated at minimal cost to the owner.

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

Interop Labs with both virtual access, physical indoor interop areas and outdoor testbeds to complete the end-to-end process.

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

See above. Testbeds have been surveyed and identified and now need a mechanism to be leveraged. Various organizations have the authority to fund the desired activities inside of these labs but the guidance, policy and contracts need to be in place.

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?

Proven and documented end-to-end call flows, and equipment interoperability should be openly shared for both developers and parties looking to purchase Open RAN and private networking technology through their commercial or government purposes. The outcome of these lab trials should be to productize certain configurations with a high level of testing and SLA expectations to give the marketplace confidence about deploying these testing configurations

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?

Again, NTIA should reward cooperation and interoperability. Collaborative efforts with clear SLA goals between companies should be rewarded, encouraged, and made visible to the larger ecosystem with the help of the NTIA. Security issues are everyone's responsibility.

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

Security must be a requirement for funding any development beyond initial R&D or T&E. Most innovators begin with security in mind regardless but early stage technology can and should be allowed to be developed without a hard requirement for security. Everything should be evaluated on a case-by-case basis but standards should be established to serve as targets for development and ultimately requirements for deployment.

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

See above.

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

The major players in the wireless industry are already vested in security for obvious reasons. Much can be learned from their advances and best practices by encouraging and enabling collaboration.

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

Again, leveraging and funding trade groups (CTIA), consortiums (National Spectrum Consortium), academia, PAWR/OTIC and FFRDC (MITRE) to sponsor working groups, events and environments where technologies can be sought out and evaluated. Security elements should be addressed early and often with clear guidance and expectations.

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?

No comment.

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?

No comment.

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?

Leveraging and funding trade groups (CTIA), consortiums (National Spectrum Consortium), academia, PAWR/OTIC and FFRDC (MITRE) to sponsor working groups, events and environments where technologies can be sought out and evaluated from any and all interested parties.

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

See above.

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).

No comment.

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.?

YES

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?

Implement requirements identical or similar to those implemented in FAR/DFAR.

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"?

Implement requirements identical or similar to those implemented in FAR/DFAR.

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

Collaboration with allies should follow models and agreements already in place and accessible through interagency cooperation with DoD, etc.

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?

No comment.

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?

No comment.

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