RFI RESPONSE:
NTIA PUBLIC WIRELESS SUPPLY CHAIN INNOVATION FUND IMPLEMENTATION

INTRODUCTION

Booz Allen Hamilton (Booz Allen) is pleased to submit our response to NTIA's request for comment on the implementation of the Public Wireless Supply Chain Innovation Fund, as directed by the CHIPS and Science Act of 2022, docket number NTIA-2022-0003.

BOOZ ALLEN'S 5G PORTFOLIO/OFFERINGS:

Booz Allen understands the complexity of the 5G landscape, helping clients formulate and implement 5G-enabled infrastructure and applications that fit their missions while mitigating cybersecurity risk. We combine our telecommunications, cloud, network, AI, and security expertise with our investment in a premiere 5G lab facility, delivering mission-focused secure and resilient solutions. Booz Allen's offerings include capabilities to:

- **Plan** – Develop tailored 5G strategies grounded in the identification and prioritization of high mission impact 5G use cases, align plans and resources for use case implementation based on a nuanced understanding of technical readiness, and develop policies and standards for 5G ecosystem operation and management

- **Build** – Deliver 5G mission platforms and applications by designing secure network architectures, completing network slicing and radio frequency/spectrum engineering, and integrating the full stack of 5G ecosystem technologies

- **Protect** – Secure mobile networks, edge computing resources, and 5G devices and applications through threat-based identification and management of risks, assessment of 5G-relevant vulnerabilities, and hardening and continuous monitoring of 5G environments

- **Research** – Pivot differentiated adversary insight and world-class cyber tradecraft into the early identification of novel 5G system vulnerabilities, development of leading-edge countermeasures, and delivery of tailored intelligence analysis

TRIALS, PILOTS, USE CASES, AND MARKET DEVELOPMENT

QUESTION 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?

Open, interoperable and standards-based networks have the potential to enable significant telecommunications and network infrastructure innovation. The benefits are well-documented but include the ability to open up the 5G RAN ecosystem, allowing different companies that are part of the 5G ecosystem to specialize and focus on different 5G components. For example, entities with specific expertise in building radio units can interoperate with other vendors with leading edge CU/DU products. Initiatives such as Open RAN have the potential to lower overall equipment costs by avoiding "vendor lock-in". Most importantly, an open and interoperable network will enable third-party network application development companies to introduce new types of applications (e.g., xApps, rApps) that can tailor the network to meet unique requirements. Ultimately, the introduction of r/xApps can provide the most significant benefit to

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public and private 5G networks where artificial intelligence (AI) can be applied to the network to tailor different network implements to meet unique customer needs. Some examples include the following:

- **Spectrum Sharing:** Spectrum remains a scarce resource with pressures building to re-use various parts of the spectrum for commercial/5G use. With the advent of x/rApps and a RAN Intelligent Controller (RIC), operators can develop and implement an App that can interface with standard "northbound" interfaces to allow for the operation of multiple communication systems within a particular frequency band.

- **Security:** The implementation of x/rApps can assist in better securing the RAN and associated user endpoint devices (UEs). For example, operators and technical organizations can develop applications that leverage AI and/or machine learning (ML) algorithms to better detect anomalous behavior within the network that previously would not have been detected.

- **Network Provisioning:** Open RAN deployments can use x/rApps to more efficiently allocate RF resources to UEs. Traditionally, resources are allocated statically across cell sites. However, these Apps, together with a non-real time and real time RIC, can prioritize user traffic during periods of traffic congestion. In addition, strategies can be implemented to adapt to the performance of different UEs within a cell coverage area rather than treating each of them uniformly.

While Open RAN is frequently cited as a way to lower CAPEX costs, its greatest promise is in allowing for open interfaces that developers can use to inject greater intelligence into the network. The use cases identified above are only a few of the dozens of types of new capabilities that can be incorporated into wireless networks, enhancing the agility of the infrastructure to support a multitude of new types of applications and devices.

QUESTION 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?

The Federal Government can incentivize and accelerate the deployment of Open RAN technologies through both trials and proofs of concept. The acceleration of Open RAN deployments should occur both within private and carrier networks to maximize the benefits that can be achieved through the implementation of open interfaces and to expand the ecosystem of Open RAN vendors.

For private networks, proofs of concepts should focus on piloting new Open RAN capabilities enabling new technical capabilities while emphasizing multi-vendor interoperability. Three types of private network Open RAN pilots include the following:

1) **RAN Intelligence:** A set of pilots can be used to test and experiment use cases that incorporate new types of dynamic capabilities into the RAN. This could include the application of AI and ML to RAN operations, the improvement of Quality of Service (QoS) through automated re-configurations of the network based on real-time performance metrics, and the dynamic allocation of resources to different network slices.

2) **Interoperability:** NTIA has done tremendous work in leading the recent 5G Challenge to test Open RAN interoperability between different RAN vendors. These efforts should be expanded to pilot multi-vendor Open RAN networks that provide private 5G services to a population of users. Feasibility studies can then be conducted to understand the complications in monitoring, operating, and managing Open RAN networks. The results of these types of studies can then be used to compare the CAPEX and OPEX of single vendor closed solutions with those of multi-vendor networks that use open standards.

3) **Security:** Some organizations have raised concerns associated with the security of Open RAN since it potentially increases the attack surface across multiple interfaces. As a result, a set of pilots and feasibility studies could involve building an Open RAN network that incorporates O-RAN and 3GPP recommended security configurations and other security functionality. Feasibility studies could then be conducted to understand how these types of configurations can help thwart future threats while also understanding how this type of security functionality impacts performance.

In addition to private networks, the adoption of Open RAN technologies needs to be accelerated in carrier networks to lower costs and improve performance to public network customers. As a result, trials in select cities could be sponsored where only multi-vendor networks leveraging open standards are funded. In addition, policies set by the Federal

Government where they, as customers, will only acquire services from Open RAN networks can further accelerate the adoption of standards compliant 5G networks using open interfaces.

QUESTION 14. A. WHAT KINDS OF TESTBEDS, TRIALS, AND PILOTS, IF ANY, SHOULD BE PRIORITIZED?

Open RAN has not been widely adopted yet. As a result, testbeds, trials, and pilots that highlight the benefits and feasibility of Open RAN networks need to be prioritized to prove to industry why it is so critical to adopt Open RAN, while also showing how its potential challenges can be mitigated. As a result, example testbeds, trials, and pilots to be prioritized include the following:

1) **Interoperability testbeds**, like those implemented by NTIA, can test how different vendors implement standards and the effectiveness of multi-vendor open networks. These testbeds can be used to develop methods and procedures for compliance assessment and certification programs that will be needed in the future to support multi-vendor Open RAN deployments

2) Trials involving the **evaluation of new types of x/rApps and RIC functionality** can help exemplify the benefits of intelligent RAN design.

3) Pilots highlight **new types of 5G use cases** leveraging Open RAN networks will highlight to industry how 5G can deliver benefits and efficiencies to end users, businesses, and Government organizations. For example, programs could be established to fund and sponsor efforts that pilot new 5G-enabled smart bases, smart warehouses, and smart border protection technologies.

QUESTION 15. HOW MIGHT EXISTING TESTBEDS BE UTILIZED TO ACCELERATE ADOPTION AND DEPLOYMENT?

Several 5G and Open RAN testbeds are already deployed, allowing the Government to avoid duplication of effort. Some examples include the following:

1) **Government Testbeds:** The Government has already funded and sponsored the implementation of a number of 5G testbeds across the country. These testbeds could be used, for example, to test new types of 5G and Open RAN military and Government-centric use cases.

2) **Consortium-type labs:** NTIA could coordinate with industry groups and innovation labs to identify new types of interoperability tests and "plug fests". In addition, through these types of consortia, a large ecosystem of new start ups building new innovative 5G and Open RAN enabled products can be accessed to accelerate the adoption of new software, applications, and UE devices.

3) **Industry Labs:** A number of consulting/integrator companies, R&D labs, and technology vendors have already built and are operating 5G and Open RAN testbeds. These resources can be used for proofs of concepts to highlight how networks using open interfaces can provide benefit.

4) **Compliance Assessment**: Testbeds can begin to provide services to assure buyers of Open RAN products that they will work and interoperate as advertised, increasing confidence in Open RAN and enabling its wider acceptance in the industry.

Most importantly, across these different types of testbeds, collaboration and coordination should be encouraged to avoid unnecessary re-testing of use cases and to allow for organizations to build upon the results of tests conducted at other facilities. This type of collaboration can occur through industry forum (e.g., O-RAN Alliance, IEEE Future Networks World Forum).

QUESTION 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?

The outcomes of proof-of-concept pilots and trials should directly address the areas that many across industry have identified as roadblocks for the widespread adoption of Open RAN:

1) **Engineering integration and operational costs:** The pilots and trials should be designed and conducted to highlight how multi-vendor and open standard 5G networks do not lead to a substantial increase in integrational and operational costs. This will increase confidence in deploying Open RAN networks and reduce deployment costs and risks.

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2) **Security:** Open RAN pilots and trials should address how security standards can be implemented within Open RAN networks to alleviate security concerns.

3) **New capabilities:** Pilots and trials that are conducted should further prove the new types of advanced and cognitive network technologies that can be implemented through the use of Open RAN x/rApps and RICs. The results from these types of proofs of concept can further showcase the types of efficiencies and enhanced performance that can be achieved.

4) **Incentives:** By sponsoring and, more importantly, funding pilots and trials, integrators, vendors, and carriers will be further incentivized to build products that meet Open RAN requirements that are defined as part of these efforts. As a result, more Open RAN compliant products could reach the commercial market due to the funding emanating from pilots, trials, and test activities.