

**Before the
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
of the
DEPARTMENT OF COMMERCE
Washington, D.C.**

Public Wireless Supply Chain Innovation
Fund Implementation

Docket No. 221202-0260

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COMMENTS OF JABIL INC.

Jim Durcan
Director, Wireless
Jabil Inc.
10560 Dr. Martin Luther King Jr.
St. North
St. Petersburg, Florida 33716
(727) 577-9749
Jim_Durcan@jabil.com

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INTRODUCTION AND SUMMARY

Jabil Inc. (“Jabil” or “Company”) submits these comments in response to the Notice of Request for Public Comments on Public Wireless Supply Chain Innovation Fund (“Innovation Fund” or “Fund”) Implementation published by the National Telecommunications and Information Administration (“NTIA”) of the Department of Commerce, 87 Fed. Reg. 76182, (December 13, 2022) (“Notice”), seeking to “obtain vital input and recommendations for consideration in the development and implementation of NTIA’s Innovation Fund grant program.”¹

Headquartered in the Gateway Area of St. Petersburg, Florida, Jabil is a large, financially stable U.S. domiciled corporation with deep roots in 5G wireless technologies. Indeed, it is a market leader in the manufacturing of 5G wireless radios, with unique large-scale manufacturing and global supply chain capabilities. Over the past 5 years, Jabil has invested substantially in wireless radio design capabilities, which it offers as advanced services to its customers. Consequently, Jabil is quite well placed within the broader 5G ecosystem.

A member of the O-RAN Alliance, Jabil has unique qualifications to participate in the NTIA’s development of plans and criteria for the implementation of the Innovation Fund and thereby support the Congressional objectives laid out in the Notice. Given Jabil’s interest in this endeavor, it participated in the NTIA Listening Session on January 24, 2023, and is providing its comments on selected questions from the Notice.

Jabil focuses its comments on selected questions posed relating to the (a) State of the Industry, (b) Technology Development and Standards, (c) Integration, Interoperability and

¹ Notice, at 87 Fed. Reg. 76183, Section II. Objectives of This Notice.

Certification, (d) Program Execution and Monitoring, (e) Trials, Pilots Use Cases, and Market Developments, and (f) Program Execution and Monitoring.

Jabil urges the NTIA to establish criteria that will permit a broad array of candidate stakeholders to offer their expertise and recommendations for use of the Fund, consistent with the overall objective of “driving the adoption of open, interoperable, and standards-based RAN and supporting a more competitive and diverse supply chain.”² In that vein, Jabil makes the following major points in its comments below.

First and foremost, Jabil believes that truly disaggregated networks, where radio units (“RUs”) from any vendor may interoperate with a distribution unit (“DU”) from another vendor, are essential to implementing the spirit of the O-RAN initiative. Further, to sustain investment in the 5G ecosystem, it is crucial to establish policies and projects which enable substantial volumes of O-RAN product deployment, sooner rather than later. Finally, the O-RAN standards are sufficiently mature such that investment in development of O-RAN compliant products makes commercial and technological sense.

Jabil suggests several initiatives which are essential to enable the foregoing indicators of success. Projects to enhance the stability of O-RAN deployments to fully support commercial, carrier-grade key performance indicators (“KPIs”) will be fundamental. To drive the scale necessary for the commercial success of O-RAN, projects which support the proliferation of O-RAN compliant RU configurations and variants also will be critical.

Jabil looks forward to working with the NTIA and the broader 5G ecosystem on this crucial endeavor.

² Notice, at 76182, Section I., Background.

COMMENTS

In accordance with the Notice’s instructions, Jabil lists each of the Questions under each Section of the Notice for which it is providing comments.

I. QUESTIONS ON THE STATE OF THE INDUSTRY

Question No. 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?

Jabil Comment: There are several chief challenges to the adoption and deployment of open and interoperable networks. First, such adoption requires that products be available from multiple vendors supporting Open RAN interface standards for every required network element. Second, the integration and certification of disaggregated Open RAN network elements present funding and execution challenges. These include Open RAN product performance and the economics of the same, particularly before non-traditional vendors achieve large scale volume adoption. Third, a major challenge relates to the operators’ willingness to open their networks to new vendors offering Open RAN technologies and equipment.

Question No. 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?

Jabil Comment: Companies developing Open RAN products frequently locate design and development centers in multiple countries to access engineering talent, which is widely distributed across the world. This applies to both the hardware (“HW”) and software (“SW”) aspects of such product development.

Question No. 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?

Jabil Comment: Currently, companies must make significant upfront and long-term investments to develop Open RAN products that meet the commercial requirements of Tier 1 wireless operators. A challenge for capital allocation includes the risk that developers of disaggregated RAN products rely on availability and interoperability with RAN products from a limited number of sources to allow complete solutions. These third-party dependencies represent risks to developers that can affect capital aggregation and allocation.

Question No. 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?

Jabil Comment: RAN products rely on hundreds, if not thousands, of commercial semiconductor and electronic components. Sourcing and supply chains for these components are complicated and worldwide. Lead times for critical components are frequently long, in some cases, up to a year. The long lead times make planning for trials and procuring equipment a lengthy process, driven by the global supply chain climate at the time.

II. QUESTIONS ON TECHNOLOGY DEVELOPMENT AND STANDARDS

Question No. 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?

Jabil Comment: The creation and availability of disaggregated RAN network elements allowing interoperability between network equipment developed by independent companies is the driver of the Open RAN vision. Fostering the availability of such network elements would benefit most from additional research and development supported by the Innovation Fund. Thereby, stakeholders can further educate the NTIA and other policymakers on the architecture and details of the various network elements and the research and development needs.

For example, within the Open RAN ecosystem, there is a large challenge to ensure standard compliance and interoperability between the O-RU and O-DU network elements developed by different companies. This specifically presents as both a hardware and software challenge. The hardware needs to be capable of meeting 3GPP specifications and operator requirements for features, performance, reliability, and cost. On the other hand, interoperability is primarily a software development challenge that depends on hardware. As such, Fund investment in research and development could help to establish a US-based Open RAN infrastructure design, development, and manufacturing capability, and accelerate the development of hardware and software feature sets being asked for by operators. The O-RU element, which requires the broadest set of hardware components and software functionality, would particularly benefit from such investment. Hardware components include high power RF amplifiers, filters, digital and analog signal

processing chipsets, general purpose processing computing cores, memory chipsets, networking clocking and synchronization chipsets, and a wide range of passive and power related components.

Question No. 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:

Jabil Comment: The open and interoperable RAN standards environments continue to mature. Open RAN hardware needs to be future proof as 3GPP and Open RAN standards evolve. Such products need to provide flexibility for software upgrades in support of future standards releases for a number of reasons, including operators maintaining competitive flexibility and to avoid operators stranding large capital investments.

Further, there are different classes of products that must be able to evolve over time. For traditional macrocells through 8T8R, the standards are mature enough to facilitate successful DU and RU integration. While currently these elements are not plug and play between different vendors, there are examples of successful integration. For mMIMO class products at 16T and above, there is significantly greater complexity in the RU. In addition, the DU-RU integration is more challenging. The O-RAN splits that ultimately are used in the field may evolve beyond the presently assumed 7.2b. Ongoing work items within the O-RAN community, and changes to Open RAN standards that may result, could impact hardware and software compatibility in the future. However, as with macro class products, there are examples of integration within the presently defined Open RAN standards. For these reasons, among others, it is important to drive O-RAN technology and product development across the product categories.

Question No. 7.c. - What criteria should be used to define equipment as compliant with open standards for multivendor network equipment interoperability?

Jabil Comment: Compliance-related feature and performance requirements are defined by 3GPP and the O-RAN Alliance. Satisfaction of 3GPP requirements defined in documents such as TS 37.104 and TS 38.104 are used to establish O-DU and O-RU infrastructure performance criteria. Furthermore, the O-RAN Alliance WG4 has defined a number of Interoperability Profiles and Fronthaul Interoperability Test Specification which provide a standard configuration and criteria as a starting point to evaluate O-DU and O-RU fronthaul interoperability. Satisfaction of the foregoing criteria, when coupled with complete testing of the aforementioned 3GPP requirements, is largely sufficient to establish interoperability between O-DU and O-RU network elements for traditional macro radios. Jabil proposes that the NTIA should adopt criteria based on these specifications in determining what would constitute compliant equipment.

III. QUESTIONS ON INTEGRATION, INTEROPERABILITY, AND CERTIFICATION

Question No. 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?

Question No. 9.a. - Are interoperability testing and debugging events (e.g., “plugfests”) an effective mechanism to support this goal? Are there other models that work better?

Jabil Comment: Plugfests are useful demonstrations of pre-integrated O-DU and O-RU equipment; however, they are not an environment to perform actual integration activities. On the other hand, integration, and interoperability testing (“IOT”) involves the execution of detailed and comprehensive test scenarios. Generally, this process is

expected to take months to complete. In addition, code changes may be required in some instances to resolve issues found during IOT testing. It is imperative that O-DU and O-RU network elements developed by different companies be required to be included in comprehensive IOT and debugging campaigns.

Question No. 11 - How do certification programs impact commercial adoption and deployment?

Jabil Comment: Operators generally require a number of product certifications as part of their procurement and acceptance processes. These include regulatory and 3GPP-related certifications. Certification requirements against Open RAN WG4 IOT profiles and test cases are evolving. They are expected to become an important consideration in product qualification affecting vendor selection. The operator will generally require IOT to successfully perform against both IOT profiles and operator specific network configurations in both lab and field environments prior to deployment.

Question No. 11.a - Is certification of open, interoperable, standards-based equipment necessary for a successful marketplace?

Jabil Comment: Certification is a starting point and is a necessary component to drive a diverse ecosystem, which in turn will help drive accelerated innovation and favorable economics. It is also a critical step to removing risk and barriers for operator adoption of multi-vendor network architectures. Widescale deployment of multi-vendor disaggregated Open RAN networks is necessary to sustain a viable ecosystem of Open RAN vendors and products.

Question No. 12 - What existing gaps or barriers are presented in the current RAN and open and interoperable, standards-based RAN certification regimes?

Jabil Comment: There are a number of hurdles that are slowing down Open RAN equipment adoption. One example is that IOT is expensive and time consuming. Equipment and engineering personnel and resources are required from both the O-DU and O-RU vendors, which is costly. Further, test lab space and test equipment are needed. The test equipment required for IOT easily can exceed \$100,000. Open RAN equipment adoption is also slowed by the fact that equipment suppliers must be open to allowing and supporting integration with competitor's equipment. To mitigate this challenge, the NTIA should establish programs that require multi-vendor IOT to be achieved and maintained for products to be considered Open RAN compliant.

Question No. 12.b. - What role, if any, should NTIA take in addressing gaps and barriers in open and interoperable, standards-based RAN certification regimes?

Jabil Comment: The NTIA can help address the gaps and barriers in a several ways. First, the NTIA can address the gaps by lowering the initial costs to support IOT by funding third-party integration labs and providing test equipment. Second, the NTIA can address the gaps by incentivizing equipment suppliers to participate in and support IOT testing and certification. The NTIA can do so by requiring that certification be performed in a multi-vendor environment. Third, the NTIA can help address the barriers by the establishment and maintenance of a permanent integration testing facility, possibly including over the air testbeds where large and small operators can observe and conduct testing in an end to end environment. Such a facility can help ensure that products which have achieved initial certification remain certified as software features and standards

evolve. It is expensive, and unrealistic, for every vendor to maintain a lab with third-party network elements to ensure interoperability as software changes with each new software release.

IV. QUESTIONS ON TRIALS, PILOTS, USE CASES, AND MARKET DEVELOPMENT

Question No. 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?

Jabil Comment: A number of steps normally are followed before a new network architecture and new network elements are commercially deployed. For new Open RAN products, the following must typically be planned for from an O-RU perspective:

1. O-RU product certification against 3GPP and regulatory requirements
2. IOT between O-DO and O-RU
3. Network level integration lab testing by operator
4. Field trial by operator
5. Commercial deployment

Question No. 14.a. – What kinds of testbeds, trials, and pilots, if any, should be prioritized?

Jabil Comment: Facilitation of the above, and particularly Steps 2 and 3 can help accelerate Open RAN adoption and deployment.

Question No. 15 – How might existing testbeds be utilized to accelerate adoption and deployment?

Jabil Comment: Existing testbeds can be used to provide a long-term, ongoing environment for Open RAN equipment vendors to perform IOT. Acceleration can be achieved through several steps. One is in the reduction in time required for test planning. This can be minimized by the reuse of existing and proven testbed network architecture, equipment, and test procedures tied to O-RAN Alliance IOT guidelines. In addition, the use of standing test set-up and equipment, including certified O-DU emulators and reference commercial O-DU's from participating vendors can accelerate adoption and deployment. Similarly, basic fronthaul integration and testing protocols could be established to limit confidential or optional feature testing and thus accelerate adoption and deployment.

V. **QUESTIONS ON PROGRAM EXECUTION AND MONITORING**

Question No. 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?

Jabil Comment: The NTIA can prioritize stakeholders' proposals which include a diverse set of participants and promote disaggregated product vendors. In addition, the NTIA can require O-DU and O-RU elements to be provided by different vendors for product development and testing activities.

Question No. 25 - How can the fund ensure that programs promote U.S. competitiveness in the 5G market?

Jabil Comment: Program selection criteria should include the following:

1. U.S. domiciled companies represent the majority of the program spending (percentage to be determined).
2. Testing activities occur within the U.S.
3. Development activities must include U.S. based engineering organizations, although not exclusively.
4. Management of program activities must occur in the U.S.

Question No. 25.a. - Should NTIA require that grantee projects take place in the U.S.?

Jabil Comment: See the response to Number 25.

Question No. 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?

Jabil Comment: See the response to Number 25.

CONCLUSION

For the foregoing reasons, Jabil respectfully requests that the NTIA consider the foregoing comments in preparing its criteria for implementing the Innovation Fund. In establishing the criteria, the NTIA should be to satisfy the Congressional objective of “driving the adoption of open, interoperable and standards-based RAN and supporting a more competitive and diverse supply chain.” As the Notice provides the Innovation Fund is intended to “support U.S. leadership in the global telecommunications ecosystem, foster competition, lower costs for consumers and network operators, and strengthen our supply chain.”³

³ Notice, 87 Fed Reg at 76182, Section I., Background.

Jabil urges the NTIA to be guided by those objectives and would welcome the opportunity to meet with the NTIA staff in person if there are any questions or to further elaborate on its views.

Respectfully submitted,
/s/ Jim Durcan _____
Jim Durcan
Director, Wireless
Jabil Inc.
10560 Dr. Martin Luther King Jr.
St. North
St. Petersburg, Florida 33716
(727) 577-9749
Jim_Durcan@jabil.com

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