zTOUCH
zTouch Networks Inc.
Newton, MA
02459-3308

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Subject: Comments to the NTIA Public Wireless Supply Chain Innovation Fund RFC, Docket No. 221202–0260

Please find below the comments that reflect zTouch Networks Inc. vision on how small businesses operating in the Open RAN domain like us can benefit (and contribute) the most from the $1.5B Public Wireless Supply Chain Innovation Fund designed to support the promotion and deployment of open, interoperable, and standards-based radio access networks (RAN).

About zTouch Networks Inc. We are a small business incorporated in Fall 2022 that develops solutions to simplify and automate the entire network intelligence lifecycle (from data collection to Artificial Intelligence (AI) training, testing and deployment) for Open RAN systems. We focus on private cellular applications, and our mission is to reduce cost to operate by simplifying the way private customers interact, customize and monitor their private cellular network to realize their use cases.

Comments

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?

When looking at the status of private investments, it is quite immediate to notice the large disconnect between the amount of investment that goes into cellular networking and that that falls within the umbrella of cloud computing. Historically, the cellular market has been considered a high risk market due to (i) closed architectures that offer minimal room for disrupting the ecosystem; and (ii) the high cost of the cellular infrastructure which dictates the (slow) pace at which new "Gs" are deployed. Open RAN is still considered as a risky investment due to its infancy, but it has opened new paths toward innovation thanks to cloud-based deployments that make is cheaper to upgrade the architecture, faster to move from one G to another and, more importantly, to innovate and disrupt. To put things in perspective, Software-Defined Networking (SDN) is now a well-established technology that has completely disrupted the closed market of cloud networking and, over the last decade, has thrived with private investments spanning both software and hardware domains. Notably, SND builds upon the very same virtualization, softwarization and openness principles that lay the basis for the Open RAN. It is not unrealistic to expect that the Open RAN will inevitably follow the same trend, which indeed has created an optimistic climate around the Open RAN. The main concern that private investors have around the Open RAN paradigm is that the underlying technology is still not mature and largely underspecified, making the technology not yet ready for large investments. We believe that the Innovation Fund will play a huge role in accelerating and de-risking private investments in the Open RAN by offering the initial seed that the ecosystem needs to develop and demonstrate a technology that has not yet a stable and well-defined market. The Innovation Fund allows small and large businesses to focus on the technology development rather than the immediate revenues, thus giving the Open RAN industry the opportunity to create a more profitable and low-risk ecosystem that can attract private investments and, therefore, be self-sufficient.

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?

Although the end-to-end aspects of the network indeed play a role in the evolution of cellular networks, it is undeniable that the element that the most need fundamental and substantial R&D is the RAN. While there are already many commercially available core networks, the same does not hold for RAN elements which are still largely closed and do not offer room for the customization level required by the majority of 5G use cases (both for private and public applications) such as AR/VR, smart warehouses and manufacturing, to name a few. The reason why the RAN elements are still lagging behind is primarily due to the time scale at which those components are required to operate (less than a millisecond for scheduling and beamforming tasks, among others), which make opening them to enable full customization an issue due to improper configurations or policies. Although the Open RAN and the O-RAN Alliance herald the near-real-time and non-real-time RAN Intelligent Controllers (RICs) as enablers of fine-grained customization, the reality is that we are not yet at the point where customization can be performed at all times in a reliable and robust manner, so as to avoid potentially inefficient (or dangerous) custom configurations. Indeed, both public and private cellular operators cannot tolerate inefficiencies in their networks and often prefer a more deterministic and predictable approach to controlling their networks at the cost of not being able to fully customize the RAN and tailor it to current network and traffic conditions. For example, even if operators might be able to already enforce network slicing policies in their core networks, they cannot do the same at the RAN level where, despite 3GPP standards on network slicing support at the RAN, how to reliably allocate RAN resources to URLLC, eMBB and mMTC slices at the millisecond timescale is still a largely unexplored problem. Similarly, although AI has been identified as a key technology to control and monitor the network, the current

state of AI for cellular networks is not yet close to its widely adoption. As of today, the Open RAN needs technologies capable of orchestrating and distributing network intelligence (even by extending control to the CUs and DUs directly [1] and not only the RICs) by determining which AI solution should be deployed (and where), while at the same time meeting operators' intents and avoiding conflicts between a fabric of AI solutions taking decisions autonomously. The Innovation Fund will be key in funding those R&D efforts and advance the domain of network intelligence orchestration, as well explainable, general, distributed, and robust AI for data-driven and advanced RAN control and monitoring. These are fundamental technologies that stem from practical requirements and are necessary to build the next generation of cellular systems.

[1] S. D'Oro, M. Polese, L. Bonati, H. Cheng and T. Melodia, "dApps: Distributed Applications for Real-Time Inference and Control in O-RAN," in IEEE Communications Magazine, vol. 60, no. 11, pp. 52-58, November 2022, doi: 10.1109/MCOM.002.2200079.

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?

We believe that, although the public 5G ecosystem possesses a larger share of the cellular market, private 5G applications and use cases are a much more suitable playground for Open RAN development. Private 5G use cases include smart warehouses, ports, plants and mines where 5G-aided asset tracking, robotics, manufacturing and automation really need Open RAN technologies to be enabled and being monetized. Moreover, the private 5G ecosystem is much more agile than the public one due to less stringent spectrum (e.g., CBRS) regulations and licenses, cheaper infrastructure, and smaller coverage areas, which offer the low hanging fruit to start operationalizing Open RAN technologies.

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

As a small business, we extensively use open and programmable testbeds such as Colosseum (https://www.northeastern.edu/colosseum/) to develop, test and advance our products. Those testbeds offer Open RAN capabilities with support for end-to-end experimentation and product testing, which is an invaluable resource for our business. We believe that such testbeds should be widely adopted by the community as they generally offer a sandbox environment with actual radios that support the development of high-risk features (e.g., AI-based network slicing and spectrum sharing) which cannot be otherwise tested on production networks without severely constraining the action space that the AI can explore to take decisions.

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?

Being a traditionally closed market, NTIA should ensure that small businesses should be fairly represented and considered for funding opportunities under the Innovation Fund. If funding is reserved to players that already possess the largest share of the market, the Innovation Fund will eventually result in creating another closed ecosystem around the Open RAN. NTIA should promote solutions based on modular and multi-vendor hardware and software components, thus fostering interoperability and participation from entities that can be disruptors in specific aspects of the architecture. We believe that a diversified ecosystem promotes technological advancement through competition, and diversification should be the foundation of the Open RAN. Moreover, the NTIA should promote the creation of a shared, common and standard reference platform to support integration and testing activities among the different stakeholders. In this way, the different activities funded by this program can all gravitate around the same reference platform, and thus promote convergent research and development and reduce time to market.

Sincerely,

zTouch Networks Inc.