Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of Promoting the Deployment of 5G Open Radio Access Networks	GN Docket No. 21-63

COMMENTS OF GOOGLE LLC

Google is working with other stakeholders in the wireless ecosystem to deliver on the promise of Open Radio Access Networks (ORAN), including through Google Cloud.[1] In particular, ORAN's modularity and open interfaces create additional options for network configurations. Together with 5G standards and plans for Next G systems, these new opportunities will bring new Radio Access Network (RAN) providers and innovative applications to the marketplace. ORAN allows for software centricity in the evolved RAN architecture, enhancing the speed and agility of operators in configuring and updating their networks. It also makes possible automation and standardization that will help operators leverage the power and storage capabilities of the cloud to support modern and next-generation radio networks.

ORAN offers tools for network security, but does not alone guarantee secure networks. Moreover, ORAN is distinct from virtualized RAN (vRAN). If properly implemented, both ORAN and vRAN can lead to better security, automation, and other

[1] *See, e.g.*, Shailesh Shukla, *Partnering with Intel to accelerate cloud-native 5G*, Google Cloud Blog (Feb. 23, 2021), https://cloud.google.com/blog/topics/partners/speeding-up-cloud-native-5g-networks-with-intel-and-google-cloud.

features for networks. But distinguishing between the two concepts is important as the Commission develops a record in this proceeding.

Finally, Google recommends that the Commission focus its efforts on maintaining room for technological growth and encouraging research and experimentation. The federal government has an important role to play in supporting development and testing of ORAN and vRAN. At present, more restrictive measures like technology mandates or set-asides in Commission programs could be counterproductive.

I. THE BENEFITS OF ORAN

With the evolution of telecommunications networks, there is a shift toward IT-based cloud infrastructure and away from the rigid, proprietary systems of legacy telecommunications networks. ORAN is part of this shift, and refers to a "disaggregated approach to deploying mobile networks by using open and interoperable protocols and interfaces, which allows for increased flexibility over traditional RAN systems."[2] Where traditional RAN approaches typically rely on proprietary radios, hardware, and software, ORAN allows "networks to be built using subcomponents from a variety of vendors."[3] ORAN is not itself a technology, but its modular approach provides a framework for new technologies, capabilities, and approaches.

ORAN is closely associated with the automation and standardization of network functions. Open interfaces facilitate continual monitoring of "network performance and

[2] *What is Open RAN?*, Open RAN Policy Coalition, https://www.openranpolicy.org/wp-content/uploads/2020/11/Open-RAN-Infographic-FINAL.pdf (last visited Apr. 26, 2021).
[3] *Id.*

network resources . . . with little human intervention"; because the interfaces are standardized, operators can use multi-vendor deployments customized to their needs.[4] This openness also helps network operators standardize operational functions such as monitoring, alarming, and ticketing, among others.

ORAN's benefits thus include: (1) modularity, (2) the ability to deploy a wider range of software applications and to leverage the cloud, and (3) intelligence that enables automation. First, modularity creates more options for network architecture and configuration. Operators with smaller footprints can design their RAN architecture with more flexible options, potentially from different vendors. Similarly, increased customizability and interchangeability of network components make new enterprise applications available, and at lower cost.

Second, ORAN allows data traditionally confined within closed, proprietary network systems to be shared with software applications and cloud processors. For example, the shift to cloud processing and software-driven data management allows operators to respond quickly to market demands and changes based on data analysis, and to access exponentially greater computing power and data storage resources. Likewise, network access to the cloud makes possible the use of "best of breed" security software for an entire radio network and centralizes the ability to deploy other

[4] O-RAN Alliance, *O-RAN Use Cases and Deployment Scenarios: Towards Open and Smart RAN*, 7 (Feb. 2020), https://static1.squarespace.com/static/5ad774cce74940d7115044b0/t/5e95a0a306c6ab2d1cbca4d3/1586864301196/O-RAN+Use+Cases+and+Deployment+Scenarios+Whitepaper+February+2020.pdf.

software applications. Cloud processing also allows carriers to deploy an entire software stack for the RAN running on commodity hardware and accelerators. This architecture reduces both capital and operating expenses by more efficiently scaling and managing workloads.

Third, open interfaces and data make possible significant network operation and security benefits due to automation powered by Artificial Intelligence (AI) and Machine Learning (ML). With the benefits of open interfaces and AI optimization, vendors can offer network operators better quality of service and quality of experience through products that manage network resources, steer traffic, and more. For example, ORAN enables closed-loop automation of RAN elements, allowing for more efficient use of spectrum and wireless assets, as well as an improved quality of experience for advanced streaming video and mobile gaming applications.

Because 5G deployments require a massive number of cells compared to legacy networks and a more granular understanding of the spectral environment, they cannot be managed efficiently at scale without software- and cloud-based support. AI and ML applications can help operators deploy base stations in a cost-effective manner and on a scalable timeframe, while open network design makes it easier to access computing power and cloud-based intelligence to support those functions.[5] Today, Google supports

[5] *See* O-RAN Alliance, *O-RAN: Towards an Open and Smart RAN*, 7 (Oct. 2018), https://static1.squarespace.com/static/5ad774cce74940d7115044b0/t/5bc79b371905f4197055e8c6/1539808057078/O-RAN+WP+FInal+181017.pdf ("[w]e cannot bring service agility and cloud scale economics to the RAN without openness," and "with the advent of 5G, . . . networks must be self-driving" and "able to leverage new learning based technologies to automate operational network functions").

integration of advanced network planning software using the latest geodata software[6] with network management systems to optimize Citizens Broadband Radio Service (CBRS) network deployments and co-existence. The opportunities for applying such capabilities will grow under ORAN, with automation allowing for more efficient handling of network planning, co-existence, and interference reporting and mitigation. ORAN's benefits extend to both the expansion of existing deployments and greenfield builds, although sourcing decisions may be easier for greenfield deployments as they generally have less need for new ORAN components to interact with legacy components.

II. ORAN'S RELATIONSHIP TO CYBERSECURITY AND vRAN

Perhaps because ORAN techniques and standards are still under active development, certain misconceptions exist. Among the most important, while ORAN can help reduce supply chain risks by facilitating vendor diversity, it is not intended to directly address challenges related to cybersecurity.[7] A network component using the open, standardized interfaces made possible by ORAN may be secure or insecure, depending on many factors. Accordingly, use of ORAN itself will not result in secure networks. However, ORAN can provide the transparency, vendor choice, and common (and thus more extensively vetted) control software that enable more secure

[6] *See* Google Network Planner, https://www.google.com/get/spectrumdatabase/network/ (last visited Apr. 26, 2021).
[7] *See*, *e.g.*, *In the Matter of Promoting the Deployment of 5G Open Radio Access Networks,* Notice of Inquiry, GN Docket No. 21-63, ¶ 40 (2021) (*Notice of Inquiry*) (seeking comment on the extent to which "Open RAN address[es] supply chain risk management issues and enable[s] the deployment of secure and reliable networks in the United States").

implementations. 5G solutions will require massively more scalable control infrastructure than previous generations of communications technologies, and the vendor-agnostic approach of ORAN can empower the RAN community to make this infrastructure less vulnerable to error and manipulation.

The difference between ORAN and vRAN also deserves emphasis. Fundamentally, ORAN is the specification of open, standardized interfaces. It allows radio networks to utilize components from different vendors and avoid vendor lock-in. It also facilitates the use of AI and ML tools to analyze and automate network functions. vRAN, by contrast, involves virtualization of the RAN or of a RAN component, such as on virtualized network servers. vRAN allows adoption of scalable and agile cloud practices that drive innovation. It is possible to build ORAN without vRAN (*i.e.*, without virtualization). Indeed, many operators are doing so today until vRAN achieves the same performance as traditional RAN. Likewise, it is possible to implement vRAN (*e.g.*, a virtualized baseband unit (BBU) or part of a BBU) on proprietary hardware.

Google supports both ORAN and vRAN. Both, when implemented the right way, can lead to better security, automation, and other positive network features. Google Cloud, for example, follows standardized ORAN interfaces and leverages commodity hardware. It is also capable of running virtualized Distributed Units and virtualized Central Units[8] as containers using vRAN. Moreover, Google Cloud is flexible enough to operate both centrally and at the network edge. It supports a large number of tools for

[8] *See id.* ¶ 6 (describing functions of Distributed Units and Central Units).

data ingestion, processing, analytics, and machine learning, which can be configured to enable non-real-time and near-real-time closed loop automation through ORAN Radio Access Controllers. Google's commitment to ORAN and vRAN also includes its membership in the Open RAN Policy Coalition, as well as its anticipated membership in the O-RAN Alliance, to be formalized in the coming weeks.[9]

III. THE FCC'S ROLE IN ORAN

The *Notice of Inquiry* asks what steps the Commission should take to promote the development and deployment of ORAN and vRAN.[10] Given that ORAN is a flexible set of options made possible by open, standardized interfaces (rather than a particular technology), Google recommends that the Commission look for opportunities to *support* ORAN's development and implementation instead of adopting new rules to *govern* it.

First, the FCC's approach should foster and support innovations in wireless networking that utilize ORAN and other technology solutions. ORAN has developed primarily through industry initiatives, and the Commission should leave room for the market to continue to develop. Based on current approaches, it need not adopt mandates, set-asides, or preferences for ORAN (or for vRAN). The Commission should instead support policies and initiatives that promote market actors' advancement to ORAN. One potential model, for example, is the National Telecommunications and Information Administration's "5G Challenge" currently under consideration.[11] The federal

[9] *See* Open RAN Policy Coalition Members, https://www.openranpolicy.org/about-us/members/ (last visited Apr. 28, 2021).
[10] *See generally Notice of Inquiry* ¶¶ 60-83.
[11] 5G Challenge Notice of Inquiry, 86 Fed. Reg. 1949 (Jan. 11, 2021).

government, including the Commission, can play an important role in encouraging broad market participation in developing and improving technologies that use ORAN and vRAN.

Second, the FCC should promote development and testing of ORAN and vRAN. In particular, it can support initiatives either with its own available funding or by offering expertise to support other agencies and non-governmental organizations that are exploring the use of open and interoperable networks and 5G use cases. Testbeds and demonstration projects, for example, will advance ORAN- and vRAN-based applications, showcase them to the broader marketplace, and simulate real-world challenges, among other things. The Commission can support such projects as it liaises with other agencies and can encourage the development of incentives for ORAN research, such as in innovation funds, inter-agency challenge competitions, and inter-agency agreements like the recent agreement between the FCC, National Telecommunications and Information Administration, and National Science Foundation (NSF) to support NSF's Spectrum Innovation Initiative.[12]

Third, the FCC should continue to acknowledge publicly the role that the cloud can play in securing 5G networks and future network technologies. As noted above, ORAN is not inherently a security solution. But the openness and disaggregation of

[12] FCC*, FCC Joins Federal Partners in Spectrum Innovation Cooperation Agreement*, Press Release (Feb. 1, 2021), https://docs.fcc.gov/public/attachments/DOC-369633A1.pdf.

ORAN can aid security efforts.[13] More transparent networks can help suppliers and operators develop better security standards. Likewise, modular and containerized network functions can be more resilient and adaptable, including through the ability to deploy security updates at massive scale more quickly and at lower cost than otherwise possible. The Commission's development of a record on these benefits can help encourage 5G providers to consider cloud solutions or migrating to the cloud.

IV. CONCLUSION

Google supports both ORAN and vRAN and appreciates the Commission's development of a record on both subjects via the *Notice of Inquiry*. We look forward to working with the Commission and other stakeholders on these important developments in wireless networking.

Respectfully submitted.

Austin C. Schlick
Director, Communications Law

Megan Anne Stull
Counsel
Google LLC

Paul Margie
Jason Neal
Harris, Wiltshire & Grannis LLP
1919 M Street NW, 8th Floor
Washington, D.C. 20036
(202) 730-1300

April 28, 2021

[13] *See* Amy Zwarico et al., *The O-RAN ALLIANCE Security Task Group Tackles Security Challenges on All O-RAN Interfaces and Components*, O-RAN Alliance Blog (Oct. 24, 2020), https://www.o-ran.org/blog/2020/10/24/the-o-ran-alliance-security-task-group-tackles-security-challenges-on-all-o-ran-interfaces-and-components.