



U.S.-Japan Focus on Scaling Up Open RAN Technology Can Support Secure 5G Globally

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Introduction

The U.S. and Japanese governments have been trying to promote the global deployment of secure fifth-generation (5G) telecommunications networks in recent years by supporting Open Radio Access Network (RAN) technology, which can accommodate greater vendor flexibility when building those networks. While Open RAN has great promise from the perspective of technical benefits and economic security, there are still areas that should be improved. In order to promote Open RAN globally, it is necessary to accelerate the maturity of the technology through government funding and collaborative verification efforts, as well as expanding the size of the market by promoting its adoption in developed markets too. Combining this activity with diplomatic efforts in developing countries can then maximize the impact. The Open RAN ecosystem includes several U.S. and Japanese operators and vendors that are both competing and collaborating as they work to develop this market, so bilateral and multilateral cooperation might not always be smooth. Still, there are opportunities for government coordination to support the entire ecosystem that can serve U.S.-Japan interests as they try to expand the market globally.

U.S.-Japan Diplomatic Efforts

Since the Trump administration, U.S. policymakers have become more sensitive to the strategic importance of 5G networks as a foundation for critical infrastructure, as well as the risk of untrusted Chinese vendors dominating the hardware in those networks. Now, Democrats and Republicans alike see the building of secure

5G networks at home and abroad as a high priority for America's economic security. Initial U.S. diplomatic efforts to simply exclude certain Chinese vendors internationally did not gain support always from other countries, partly because of the lack of affordable alternatives, and so the policy goal has shifted to diversification of 5G telecom vendors to gain wider support. As such, policymakers have seized upon Open RAN technology as a way to allow wider competition and more choice regarding vendors. Consistent with the Biden administration's emphasis on cooperation with like-minded countries (including Japan) as a foreign policy strategy, the administration has pledged to work on vendor diversification and Open RAN promotion through both bilateral and multilateral frameworks cooperation.

Bilaterally, the United States and Japan launched the "U.S.-Japan Competitiveness and Resilience (CoRe) Partnership" at a Summit meeting in April 2021, where they committed to cooperating in secure information and communications technology (ICT) including the promotion of secure and open 5G networks and Open RAN.¹ At the same time, the allies established a new "Global Digital Connectivity Partnership (GDCCP)" as a comprehensive framework for advancing U.S.-Japan digital cooperation in third countries.² As a part of these initiatives, the two governments are trying to persuade third country governments to enhance 5G security, expand vendor diversification, and utilize Open RAN. They also provide capacity-building opportunities for policymakers and telecom operators through seminars and other means.

In parallel with these high-level political commitments, the U.S. and Japanese governments have continued diplomatic efforts to build an international consensus for 5G security and vendor diversification. In September 2021, leaders of Quad countries (Japan, United States, Australia, and India) confirmed their commitment to foster an open, accessible, and secure technology ecosystem. Recognizing the importance of government-industry partnership toward these goals, they launched a Track 1.5 public-private dialogue on Open RAN deployment and adoption, coordinated by the industry group Open RAN Policy Coalition (ORPC).³ Two months later, the allies and several other partner countries introduced the Prague Proposals on Telecommunications Supplier Diversity at the third Prague 5G Security Conference, and efforts are continuing to boost the number of endorsing countries.⁴

Open RAN Promises and Challenges

¹ "Fact Sheet: U.S.-Japan Competitiveness and Resilience (CoRe) Partnership," The White House, April 16, 2021, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/16/fact-sheet-u-s-japan-competitiveness-and-resilience-core-partnership/>.

² "Joint Statement on the 12th U.S.-Japan Policy Cooperation Dialogue on the Internet Economy," U.S. Department of State, November 18, 2021, <https://www.state.gov/joint-statement-on-the-12th-u-s-japan-policy-cooperation-dialogue-on-the-internet-economy/>. The GDCCP followed and expanded the scope of the former framework under the U.S.-Japan Policy Cooperation Dialogue on the Internet Economy Dialogue led by the Department of State and Japan's Ministry of Internal Affairs and Communications, has functioned as a multi-agency policy coordination process regarding promotion of secure digital infrastructure and human resource development for third countries.

³ "Fact Sheet: Quad Leaders' Summit," The White House, September 24, 2021, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/24/fact-sheet-quad-leaders-summit/>.

⁴ "5G Security and Emerging and Disruptive Technologies," (Prague 5G Security Conference, virtual conference, November 30 – December 1, 2021, <https://www.prague5gsecurityconference.com/>).

These diplomatic efforts are critical steps in aligning the goals of countries toward secure 5G networks, and the United States and Japan are making steady progress. On the other hand, there are still challenges to overcome in order to move closer to the ideal of Open RAN, where various vendors' equipment can be easily plugged-and-played. Moreover, an expanded marketplace and competition among vendors will help drive down prices.

Open RAN technology utilizes base station facilities of different vendor devices connected via open interface specifications. It can enable telecom carriers to flexibly select products from multiple vendors and mix and match them to develop the most appropriate network function for various 5G needs. At the same time, from an economic security perspective, Open RAN is expected to avoid the lock-in effect of single integrated vendors such as Huawei, Nokia, and Ericsson, thus increasing opportunities for new entrants and contributing to supply chain security.

On the other hand, at present, system integration and testing efforts are still required to integrate various devices, and this complexity can place a greater burden on telecommunications carriers compared to using integrated single-vendor products. Also, discussions continue about how best to secure multi-vendor networks from cyber-attacks. In addition, while new entrants building new networks (greenfield operators) find it relatively easy to adopt Open RAN, and pioneering carriers have emerged in Japan, the U.S. and Europe, carriers with existing customers and legacy systems (brownfield operators) have to overcome higher compatibility hurdles migrating to Open RAN without disrupting their network operations. Although Open RAN's share increased rapidly over the past few years, it has only reached a low-single digit share of the world's overall 2G-5G RAN market in 2021.⁵ Given the importance of the next two years in terms of 5G deployment overall, facilitating Open RAN integration is a high priority.

U.S. Market: Open RAN Adoption in Progress

Major "brownfield" telecommunications carriers in the United States are beginning to work on Open RAN implementation in their commercial network. AT&T and Verizon have been strong supporters of Open RAN technology, but they are methodical in verifying implementation in their own networks. They announced the schedule of introducing Open RAN in phases,⁶ starting with indoor facilities in late 2021.⁷ DISH, a "greenfield" operator building a new network, announced its adoption of Open RAN from the beginning and collaborates with several Open RAN vendors. DISH's deployment schedule aims for 20 percent population coverage by June 2022 and 70 percent by 2023.⁸

U.S. rural carriers have concerns about Open RAN. In October 2021, in a response to the Notice of Inquiry by the Federal Communications Commission (FCC) asking about promotional measures of Open RAN, the Rural Wireless Association stated that without the big three nation-wide providers' adoption of Open RAN

⁵ Stefan Pongratz, "Open RAN moving faster than expected – Dell'Oro," interview by Ken Wieland, *Light Reading*, January 24, 2022, <https://www.lightreading.com/open-ran/open-ran-moving-faster-than-expected---delloro/d/d-id/774780>.

⁶ Mike Dano, "AT&T preps for hiring spree, open RAN deployment," *Light Reading*, September 1, 2021, <https://www.lightreading.com/open-ran/atandt-preps-for-hiring-sprees-open-ran-deployment/d/d-id/771838>.

⁷ Mike Dano, "Verizon to start deploying open RAN gear this year," *Light Reading*, March 11, 2021, <https://www.lightreading.com/open-ran/verizon-to-start-deploying-open-ran-gear-this-year/d/d-id/768021>.

⁸ Linda Hardesty, "Dish's Stephen Bye updates on network progress at FCC's open RAN event," *Fierce Wireless*, July 14, 2021, <https://www.fiercewireless.com/operators/dish-s-stephen-bye-updates-network-progress-at-fcc-s-open-ran-event>.

and FCC support, they cannot afford to utilize Open RAN in their own networks.⁹ While some local operators announced Open RAN deployment with reimbursement from FCC's "Rip & Replace"¹⁰ program in mind, the program has also seen instances of simply swapping one single-vendor solution for another (i.e., Huawei for Nokia or Ericsson).¹¹ These concerns about Open RAN technology can be shared to some extent by existing telecommunications carriers in developing countries that currently rely on integrated vendor solutions. Meanwhile, some software companies see business opportunities in addressing these concerns through systems integration.

Accelerating Maturity and Market Expansion

So, alongside with U.S.-Japan diplomatic efforts to support the deployment of Open RAN in third countries, more effort is needed to support accelerating the maturation of Open RAN technology and its use in their own countries. Of course, this technology development should be industry-led, but the U.S. and Japanese governments can support leading domestic companies in their efforts to improve interoperability and performance. Also, in cooperation with European telecom carriers, efforts can be made to encourage the adoption of Open RAN in developed markets to scale up the market quicker. This will help reduce prices and remove hurdles for developing countries to adopt Open RAN products. As a growing number of countries start adopting 5G rollout policies, the United States, Japan, and like-minded countries should share a sense of urgency in terms of delivering practical alternatives to single-vendor products.

In terms of Open RAN deployment, Japan has some pioneering telecom operators. NTT DOCOMO, the largest incumbent operator, has been working on network development on multiple vendors since the 4G era, and in March 2020, it became the first in the world to start 5G commercial service with a full-scale multi-vendor network using O-RAN interface.¹² New entrant Rakuten was the first in the world to deploy a commercial service that virtualized the entire 5G network, attracting international attention. NTT DOCOMO launched 5G Open RAN Ecosystem with 12 Japanese and U.S. companies in 2021,¹³ and in February 2022, it announced the launch of a "shared open lab" that will allow overseas telecom operators to verify virtualized base stations from abroad.¹⁴ Rakuten announced, in August 2021, the launch of Rakuten Symphony, its new business organization, to offer cloud-native Open RAN platform solutions to telecom operators worldwide based on

⁹ Carri Bennet and E. Alex Espinoza, "NOTICE OF EX PARTE," letter from the Rural Wireless Association to Marlene H. Dortch at the FCC, October 22, 2021, [https://ecfsapi.fcc.gov/file/1023207781008/RWA%20ex%20parte%20\(10.22.21\)%20-%20FINAL.pdf](https://ecfsapi.fcc.gov/file/1023207781008/RWA%20ex%20parte%20(10.22.21)%20-%20FINAL.pdf).

¹⁰ "Secure and Trusted Communications Networks Reimbursement Program (SCRIP)," Federal Communications Commission, accessed March 18, 2022, <https://www.fcc.gov/supplychain>.

¹¹ Mike Dano, "Nokia, Ericsson start winning Huawei replacement deals," *Light Reading*, September 20, 2021, <https://www.lightreading.com/security/nokia-ericsson-start-winning-huawei-replacement-deals/d/d-id/772191>.

¹² O-RAN is a specification of Open RAN interfaces and architecture defined by O-RAN Alliance, a global community of mobile operators, vendors, and research & academic institutions.

¹³ "5G Open RAN Ecosystem Whitepaper," NTT DOCOMO, June 2021, https://ssw.web.docomo.ne.jp/orec/5g_open_ran_ecosystem/en/.

¹⁴ "DOCOMO Opens vRAN Verification Facility to Global Mobile Operators," NTT DOCOMO, press release, February 28, 2022, https://www.docomo.ne.jp/english/info/media_center/pr/2022/0228_00.html.

their experience in Japan.¹⁵ The examples of carriers already operating Open RAN on commercial networks nationwide and their concrete solutions for carriers abroad can help prove the viability of Open RAN to third countries.

It is worth highlighting that inside the networks of these companies, along with Japanese Open RAN equipment vendors such as NEC and Fujitsu, many U.S. companies with system integration and virtualization technologies also are participating. These Japanese and U.S. companies are also members of ORPC and the O-RAN Alliance. So, even as they compete with one another, they are working in unison toward the goal of promoting Open RAN as an emerging standard. The U.S. and Japanese governments should keep an eye on the growing collaboration in the Open RAN ecosystem and support companies in both countries in areas where they can cooperate.

Funding for Research, Development, and Deployment

One concrete measure to promote Open RAN technology is continued funding for research, development, and deployment. Japan introduced a tax incentive to promote secure 5G deployment from 2020 to 2021, later extended to 2024. The New Energy and Industrial Technology Development Organization (NEDO), a research and development management organization under the Ministry of Economy, Trade and Industry, established in 2019 a 200 billion JPY (approximately 1.7 billion USD) fund dedicated for R&D of post-5G information and communication systems and semiconductor technologies, which includes multi-vendor interoperability verification technology as one component.¹⁶ Meanwhile, in the United States, the National Defense Authorization Act (NDAA) of 2021 authorized two funds: a “Public Wireless Supply Chain Innovation Fund” to promote domestic adoption of 5G Open RAN equipment, and a “Multilateral Telecommunications Security Fund” that supports the development and adoption of secure and trusted telecommunications technologies in coordination with foreign partners.¹⁷ However, the law appropriating that funding has not been enacted. Still, the House and Senate appear to be in agreement on appropriating \$1.5 billion to the former,¹⁸ and a part of the \$500 million for the latter,¹⁹ so expectations from the Open RAN industry are high. Also, the industry expects the positive effect of other government budget programs including FCC’s rip and replace program and

¹⁵ “Rakuten Launches Rakuten Symphony to accelerate adoption of cloud-native, Open RAN-based mobile networks worldwide,” Rakuten, August 4, 2021, https://global.rakuten.com/corp/news/press/2021/0804_04.html?year=2021&month=8&category=corp%20ir.

¹⁶ “ポスト 5G 情報通信システム基盤強化研究開発事業 (The Project for Research and Development of Enhanced Infrastructures for Post 5G Information and Communications Systems),” NEDO, last modified August 3, 2021, https://www.nedo.go.jp/activities/ZZJP_100172.html.

¹⁷ William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Pub. L. No. 116-283, 134 Stat. 3388 (2021), <https://www.congress.gov/116/plaws/publ283/PLAW-116publ283.pdf>.

¹⁸ The United States Innovation and Competition Act of 2021 (passed the Senate in June 2021) and America COMPETES Act of 2022 (passed the House in February 2022) both have provisions of direct appropriation of \$1.5 billion to the “Public Wireless Supply Chain Innovation Fund” (Section 9202(a)(1)) in NDAA2021.

¹⁹ The United States Innovation and Competition Act of 2021 and America COMPETES Act of 2022 both have provisions of establishing “Chips for America International Technology Security and Innovation Fund” to provide for international information and communications technology security and semiconductor supply chain activities and appropriate \$500 million. This fund implements the “Multilateral Semiconductors Security Fund” (Section 9905) and “Multilateral Telecommunications Security Fund” (Section 9202(a)(2)) in NDAA 2021.

new broadband subsidies created by the Infrastructure Investment and Jobs Act for accelerating the introduction of Open RAN.²⁰

One thing to consider is who will have access to these funds. For example, the Infrastructure Act includes a Buy American Act requirement, which stipulates that at least 55 percent of manufactured goods must be made in the United States in order to count as American, although several U.S. telecommunications industry groups have called for a waiver from this provision.²¹ One Japanese vendor commented, “Some actors in the Open RAN community argue that the U.S. government funds should be allocated to domestic companies. However, the Buy American approach should not be adopted for initiatives that benefit the entire Open RAN community, such as Open RAN interoperability verification which will help advance the maturity of the technology.” It is natural for governments to want to support domestic companies, but at the same time, careful consideration should be given to the application of Buy American Act principles for areas such as Open RAN, where there is a closely interconnected ecosystem of domestic and foreign operators, and where the returns could be greater if the entire ecosystem is supported collectively.

Testbed Collaboration

Another area for potential international cooperation lies in facilitating interoperability among multi-vendor devices, which is a major challenge for Open RAN technology and requires verification through multiple testbeds. Various initiatives are currently underway. The O-RAN Alliance has qualified several laboratories as vendor-independent testbeds called Open Testing and Integration Center (OTIC) with four in Europe, one in Taiwan, and one in China, where certification and badging can be issued for O-RAN-approved solutions that pass the tests.²² In the United States, the Institute for Telecommunication Sciences (ITS) under the National Telecommunications and Information Administration (NTIA) announced a project to evaluate performance, interoperability, and standard maturity of Open RAN equipment on its testbed.²³ Also the FCC designated two innovation zones for advanced wireless communication research to help the development and integration of Open RAN.²⁴ In Japan, the Ministry of Internal Affairs and Communications (MIC) built a testbed at Yokosuka Research Park in the fiscal year 2021 and started verification tests with selected telecom operators and vendors. In addition, telecom operators and vendors have been building their own private testbeds in various locations.

How can these testbed initiatives collaborate or allocate roles with each other? A telecom operator staff member presented his thoughts that government testbeds can focus on verifying basic conformance tests from

²⁰ The Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021), <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf>.

²¹ Brendan Bordelon, “Broadband head softens stance on ‘Buy America’ rules,” *Politico*, February 17, 2022, <https://www.politico.com/newsletters/morning-tech/2022/02/17/broadband-head-softens-stance-on-buy-america-rules-00009712>.

²² “Open Testing and Integration Centres,” O-RAN Alliance, accessed March 18, 2022, https://www.o-ran.org/testing-integration/#Anchor_OTIC.

²³ “NTIA’s Institute for Telecommunication Sciences Announces Plan to Procure Open RAN Equipment for Testing,” NTIA, June 4, 2021, <https://www.ntia.doc.gov/press-release/2021/ntia-s-institute-telecommunication-sciences-announces-plan-procure-open-ran>.

²⁴ “FCC to Vote on Designating Boston & Raleigh as Newest Innovation Zones,” FCC, July 14, 2021, <https://www.fcc.gov/document/fcc-vote-designating-boston-raleigh-newest-innovation-zones>.

a vendor-neutral standpoint and provide improved access for startups and small/medium sized vendors to facilities through inexpensive fees. In addition, if OTICs and those public testbeds can provide authentication to verified products, then private testbeds can focus on verification for more use-case-specific performance tests. The need for collaboration among testbeds also has been recognized in the Quad process, and in March 2022, the ORPC held an event on testbed collaboration. The U.S. and Japanese governments can work together to leverage each other's resources, share demonstration results and lessons learned, and lead efforts for globally recognized interoperability authentications.

Collaborative Finance for Digital Infrastructure

When deploying secure 5G in third countries, another issue of how to compete with untrusted operators' proposals, which are significantly lower than the market price with state support, cannot be overlooked. Policymakers' expectations are high for U.S. and Japanese development finance institutions (DFIs) to make co-financing deals for secure digital infrastructure, while also strengthening cooperation with other countries and international DFIs. For example, in November 2018, the U.S. International Development Finance Corporation (DFC), Japan Bank for International Cooperation (JBIC), and Australia's Department of Foreign Affairs and Trade signed a trilateral agreement on development finance collaboration in the Indo-Pacific region.²⁵ While so far there has been no publicly announced co-financing project for 5G infrastructure by this framework, one Japanese DFI official commented, "Trilateral DFIs have been working positively toward the formation of co-financing projects for 5G Open RAN, focusing mainly on Indo-Pacific region."

This official added, however, that "we must evaluate the bankability of the project and keep a balance between the national security perspective and project viability. For unprofitable projects, we need to take measures to improve their bankability, including negotiating with the host country for policy cooperation (such as introducing tax incentives or grants), and it takes time. For projects in low-income countries, 'blended finance' in cooperation with grant institutions might be an option." In addition, he continued, "in order to provide loans in strategically important regions such as Central and Eastern Europe, the current rule that limits DFC loans to low- and middle-income countries needs to be revised for more flexibility. Moreover, in order to identify high-priority regions and projects, it is also important to increase communication among the DFIs and telecom-sector stakeholders (government agencies and private companies)."

Conclusion

The U.S. and Japanese governments have been making steady progress in their multilateral/bilateral diplomatic efforts. Still, the allies should continue programs to advance the maturity and scalability of Open RAN through the provision of funding and support for testing environments. They can also promote domestic adoption of Open RAN to accelerate growth in the market. This can be done in parallel with diplomatic efforts and capacity-building programs. The allies should also watch carefully growing collaboration in the Open RAN ecosystem and support companies in both countries in areas where they can cooperate for collective benefit. With regard to the collaborative financing for digital infrastructure by DFIs, they should continue efforts to clarify priorities and speed up implementation by strengthening inter-agency coordination. The allies are on the right track, but

²⁵ "US, Japan, Australia Sign First Trilateral Agreement on Development Finance Collaboration," DFC, November 12, 2018, <https://www.dfc.gov/media/opic-press-releases/us-japan-australia-sign-first-trilateral-agreement-development-finance>.

they need to share a sense of urgency for addressing the gap between the near-term timeline for 5G deployment and the continuing evolution of the Open RAN ecosystem.



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