

Hogan Lovell's Winnik Forum on O-RAN: Unofficial Notes: March 24, 2023, Washington, D.C.



Financial, Valuation, and Industry Consulting

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NOTICE: These notes were taken live at the 2023 Hogan Lovells Winnik Forum, Washington D.C., March 23, 2023. They are a good-faith representation of our impressions of the events and what was said by participants. However, we cannot guarantee the accuracy of any specific comment. These notes are not endorsed by Hogan Lovells in any way. This document is not a recommendation to buy or sell any security. Please consult with appropriate professional advisors before making significant business decisions. Comments and corrections are welcome.

Executive Summary

Hogan Lovells' 2023 Winnik Forum focused on Open RAN ("O-RAN").¹ The major elements of the event were 1) Two policy keynote speakers - Anne Neuberger, Deputy National Security Advisor, and Senator Mark Warner; 2) Two panel discussions - An operator panel and a technical panel; and 3) a cocktail hour to finish the event. Amanda Toman from the NITA's Innovation Fund, and Umair Javed, Chief Counsel to FCC Chair Jessica Rosenworcel gave shorter presentations.

The consensus was that O-RAN has much promise for increasing competition, lowering equipment prices, and spurring innovation. However, it is in its early days. DISH Networks' new greenfield wireless network was the first fully O-RAN network. Their representative admitted it was much more difficult than they expected. Virtually every speaker acknowledged that O-RAN would be more difficult to roll out in an existing ("brownfield") network.

One large source of difficulties with O-RAN seems to lie in the challenges of integrating different hardware from different vendors. There was significant discussion about vendors publishing their specifications in greater detail, having independent bodies do compatibility testing, etc. As the O-RAN hardware is more cloud-managed, initial compatibility might not be sufficient. *[AM Comment: Some readers may remember the earlier days of personal computers when you might upgrade your operating system, and then your printer would not work]*

The policy angle by the two government speakers seemed to focus on the potential for O-RAN to eventually lower prices to make it more competitive with Chinese equipment manufacturers. Operators would not need to choose between a closed system of, for example, Ericsson or Nokia – they could mix and match vendors. Smaller new entrants would not need to provide an end-to-end solution but could come to market with only one or two network elements. They would not need to have an end-to-end suite of products. The government speakers seemed eager to encourage O-RAN and even to subsidize it to achieve economies of scale faster.

While O-RAN was touted as improving national security by creating a cost-effective alternative to Huawei and ZTE, it comes with other security issues. O-RAN's open API architecture means multiple vendors may be accessing the API. With multiple vendors accessing the API, the risks of each vendor need to be evaluated together and not just independently, massively increasing the risk analysis. However, because O-RAN is largely cloud-based, operators have a greater ability to see all parts of their networks to detect security problems. There was also no consensus about whether O-RAN is more energy efficient than classical RAN.

¹ RAN definition per Wikipedia: A radio access network (RAN) is part of a mobile telecommunication system. It implements a radio access technology. Conceptually, it resides between a device such as a mobile phone, a computer, or any remotely controlled machine and provides connection with its core network (CN). Depending on the standard, mobile phones and other wireless connected devices are varyingly known as user equipment (UE), terminal equipment, mobile station (MS), etc. RAN functionality is typically provided by a silicon chip residing in both the core network as well as the user equipment

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A. Tribute to Joel Winnik by Eric Loeb

- Mr. Loeb is currently the executive vice president of government affairs at Salesforce.com
 - He started his legal career at Hogan Lovells and was mentored by Joel Winnik
- Joel Winnik was a nice guy, a family man, a very good lawyer, and taught people he worked with a lot.
 - Was able to think unconventionally
- It's good to be in the office to be able to personally help people as Joel Winnik did throughout his career

B. Anne Newberger, Deputy National Security Advisor, White House

Introduced by Katy Milner, Hogan Lovells

- Spent 15 years in the intelligence community – telecom operators are important to protect the country from surveillance
- Telecom is a foundation of national security and the next generation of applications
 - Trusted vendors much be economically viable in the face of Chinese subsidies for their equipment
 - Encourage allies to use trusted vendors even though they have trouble competing economically with untrusted vendors
- O-RAN puts more of the technology in software and lowers the cost
 - It's gaining more and more credibility – recent deployments are “proof points”
 - Open standards and interoperability will help trusted vendors compete
- Open RAN has significant and persistent security advantages
 - Ability for operators to “see into their systems” is greater with Open RAN
 - Vulnerabilities in closed systems can have broader impacts
 - Need a common framework for certain software
 - Large greenfield deployments [no existing network or customers], but no major brownfield deployments [existing operating network] yet
- Brownfield operators have an existing business at risk and need more confidence before they adopt
 - Vendors need to step up and provide data, etc., so operators can have confidence

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- Operators also need to step up as they have the most to gain – for example, by making commitments to O-RAN to help O-RAN vendors justify the necessary investment
- The US is investing in laying the foundation of Open RAN and working with international partners also by investments, such as the \$1.5 billion Wireless Innovation Fund managed by NTIA *[AM Comment: This seems to be a massive example of government intervention in technology development. Separately, I asked about Rip & Replace funding, but she did not directly addressing the gap between the importance of Rip & Replace and the lack of full funding]*

C. First Panel – Service Providers

- Moderators
 - Kelly Ann Shaw, Hogan Lovells
 - Charles Mathias, Hogan Lovells
- Chris Boyer, AT&T – Chair of Open RAN Policy Organization
 - Open RAN is designed to open the interfaces between the various components that make up the RAN (radio, baseband, software, etc.)
 - Open RAN will provide a wide range of vendors and a richer supply chain
 - Can get things like open API
 - Move to radio with an open interface
 - Can move to a multi-vendor environment
 - More of the network moves to the software layer
 - Faster deployments and more modular networks
 - O-RAN will happen, but it's a matter of time – harder for brownfield operators
 - AT&T has not deployed O-RAN yet. Working on 5G, C-band, etc., as well as O-RAN – want to be sure equipment we deploy today can be used with O-RAN down the road – looking for O-RAN “insertion points”
 - Need to make sure the performance at scale works, feature parity, and that there is a cost advantage
 - Optimistic O-RAN will happen for AT&T, but it is a matter of when
 - Want to be sure the equipment we deploy today can meet O-RAN Alliance specifications when we find an insertion point to deploy O-RAN
 - Need to be sure the performance at scale is good and that the total cost is favorable
 - Operators need to share information. Optimistic issues will be sorted through

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- There are connections between 5G and O-RAN, but O-RAN does not need to be 5G
- O-RAN opens opportunities for smaller companies as existing vendor's permission is not needed
- It will be helpful if there are interoperability tests/certifications that can help operators pick from smaller vendors, and a large amount of the testing has been done

- Sadayuki Abeta, NTT DoCoMo
 - NTT DoCoMo has 60 million 5G customers out of 86 million total
 - Using new 3.7 GHz band as well as 4.5 GHz and 28 GHz bands for 5G
 - Network is merged vendor interoperable.
 - Have 3 CU/DU [Central Units/Distributed Units] vendors and 4 RU [Resource Unit] vendors for O-RAN – can choose best solutions based on price and performance
 - Many O-RAN trials among customers, but most have not yet been introduced in commercial networks due to complexity.
 - Challenges with inter-operability, power consumption, and operational impact
 - Lots of network upgrades make life cycle management difficult, but we have some ways to simplify it
 - Interoperability test period was six months, then three months, and now as low as one week in some cases
 - Standards are not completely stable yet – trying to simplify test process
 - Offering pre-integrated solutions to reduce work for customers
 - Sharing is key, and we are sharing information with other operators
 - Brownfield operators should take a hard look at the total cost of ownership and performance of O-RAN vs. competitors – working to improve power consumption
 - It's easier for small vendors to enter the O-RAN market as long as they support an open interface
 - Japanese government has supported O-RAN with tax breaks
 - *[AM Comment: I may have missed or misunderstood some of Mr. Abeta's comments. Nonetheless, his English is far better than my Japanese 😊].*

- Jeff Blum, DISH
 - Needed to build a wireless network that is better and cheaper
 - Decided in late 2019 to go with O-RAN
 - US Government has done a lot to bring it together
 - Have 90 partners who came together to figure out how to build the network
 - It was much harder than we expected, but most are now behind us

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- Over 15,000 towers, each with multiple radios – many vendors co-exist at same levels
- World's first 100% standalone 5G virtualized cloud-native network in the world – over 13,000 towers completed
- Have a zero-trust model
 - Will always have attacks, but with so much in the cloud, we are able to identify and have more options to attack it and shut it down
 - We have more flexibility to detect intrusions and deal with them
 - Can offer different levels of service/security for private 5G
- It's harder for brownfield operators with 2G, 3G, 4G, etc., but it will get easier over time – lots of progress already since 2019
- O-RAN is able to meet 3GPP specs and to offer new technologies, including VoNR (as opposed to VoLTE)
 - DISH's VoNR is now certified by Samsung on their handsets
- Samsung is happy with DISH Network, and they can sell the latest handsets for it
- 5G and O-RAN are different. O-RAN architecture can be more easily upgraded, including to 6G etc., over time. Don't need to go to sites to upgrade
- We like it when there is competition, and we can trade between vendors
- Seeing significant cost savings due to competition between vendors and this will drive growth in O-RAN demand
- Agree that an O-RAN test bed is needed to certify vendor offering – it would be great if the NTIA grant program did this
- Nicoletta Patroni, Vodaphone [Remote from England]
 - Vodaphone is moving telcom from communications to platforms for innovation
 - O-RAN hardware and software are not intrinsically linked as with proprietary hardware/software in most of today's networks
 - Open RAN standards mean element of the O-RAN network is interoperable allowing any hardware provider to work with any software vendor
 - Lowers the barriers of entry for new suppliers and smaller companies
 - Creates greater resilience due to vendor options
 - Offers energy efficiency gains [AM Comment: NTT DoCoMo many have a conflicting view]
 - Acts as a catalyst for innovation
 - Offer resource agility as software and hardware are vendor agnostic
 - Vodaphone was an early O-RAN supporter, with the goal of 30% of Vodaphone's EU network on Open RAN by 2030
 - An active participant in the O-RAN alliance and has an O-RAN test facility in the Newbury, UK, and a research center in Spain.

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- O-RAN Alliance is a global organization and has over 300 members – and is providing specifications and blueprints for O-RAN vendors
- Need to pull the industry together to realize the benefits of O-RAN
- Moving to O-RAN to stimulate innovation, the level of product maturity has been enhanced over the last few years
- O-RAN is spectrum agnostic and can be used in currently use spectrum bands
- Expect to have O-RAN on 30,000 sites – 4G and 5G
- O-RAN performance is similar to the incumbent systems, but we see it as enabling [greater] innovation, including related to silicone, RF technology, and AI

[AM Comment: There was remarkable agreement among the panelists about the current state of O-RAN]

D. Mark Brennan, Hogan Lovells Technology and Telecom Lead

- Hogan Lovells has many offerings and can align teams around clients and industries, including ESG, supply chain management, and AI – It just launched an AI working group
- New HL AI marketing handouts are now available!
 - Includes many training events

E. Senator Mark Warner

Introduced by H.P. Goldfield, Hogan Lovells

- Co-founded company that became Nextel – started in 1982
- Has been very active in telecom issues
- Technology competition with the Chinese Government
 - National security will be about who wins the technology competition in a series of domains – even more than who has the most tanks, etc.
- No price competitive alternative to Huawei and ZTE, and they are also flooding the zone in standards committees – they were setting the rules that reflected their values *[AM Comment: It's an odd criticism that Huawei and ZTE were industry leaders in setting 5G. Shouldn't he be complaining that Western companies weren't stepping up? But then he suggested the US Tax Code does not encourage US companies to participate – but would that be lawmakers' fault?]*
- Tik Tok is another example of technology coming from an authoritative government, and we have no framework to deal with it. *[AM Comment: Is the fear that China will destroy the US economy by addicting workers to watching cat videos?]*

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- 2017 revamp of Chinese laws makes the top responsibility of Chinese companies to the Communist party – Tik Tok could be asked to turn over all info about US consumers to the Chinese government
- Need to make sure O-RAN money is used for O-RAN and not for general cyber security training
 - Need to make sure we don't lose the standards battle – there are tax disincentives for US companies to participate in standard-setting boards
 - Need to make sure there is no proprietary O-RAN
 - Need to push for more test beds for O-RAN
 - Need all of the great software expertise to collaborate together
- Q&A
 - Need to subsidize O-RAN to keep Huawei at bay, particularly in rural areas. Economic development finance arms in Sweden and Finland need to put their money where their mouth is with respect to subsidies
 - O-RAN deployment announced in Jordan
 - Trying to make sure Rip & Replace is fully funded and also need for provide gap financing until there are fully functional system to make O-RAN price competitive [*AM Comment: If they can't find another ~\$3 billion for Rip & Replace after all this time, how seriously do they take it as a security threat? Perhaps Chinese telecom equipment is seen by Congress as more as a long-term threat that Huawei's technology might become too dominant*]
 - FCC's spectrum auction authority needs to be reauthorized. Also need to do a spectrum inventory, including with the DoD, and also look harder into government spectrum sharing – but incumbents are resistant
 - If 98% of the country does not have high-speed wireless in three years, it's not for lack of federal money [~\$65 billion at the federal level]; it will be for lack of execution. Wide open to ideas about wired, wireless, and satellite interconnecting. Incumbents have spent even more [than \$65 billion] on fiber alone.
 - Not many policymakers know what O-RAN is. The US can't do it alone. O-RAN needs to be done in collaboration with other countries.

F. Second Panel – O-RAN Vendors

- David Fritz, Hogan Lovells, Engineer (Moderator)
- John Godfrey, Samsung Electronics
 - Samsung is the O-RAN market share leader according to Dell'Oro Group's analysis – but this is less than 10% of the RAN market, but it is growing

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- It's real, and it works and has already achieved performance and efficiency parity with existing hardware-bound RAN alternatives and offers more flexibility
 - Shipped 24,000 radios to DISH and live with 10,000 O-RAN sites with Verizon
 - Some brownfield operators are taking a step with a single vendor O-RAN and then bringing in new vendors later – so this helps move to more flexible networks
 - Wireless Innovation Fund should help fund testing equipment. Brownfield operators need more testing to gain confidence
 - Samsung equipment is running in O-RAN networks – networks with multiple vendors are getting easier. O-RAN Alliance standard specs help, and as standards get more stable, interoperative testing will be less needed. It will become more like “plug-n-play”, but likely not exactly plug n play
 - Government Innovation Fund should not be used as a science experiment – look at the performance of different architecture choices, making integrations smoother and easier, etc.
- Grace Koh, Nokia
 - Nokia is more than a “classical RAN” provider and is fully invested in O-RAN
 - Open RAN is coming and is part of the next generation of networks – Nokia is at risk if it is not involved
 - Nokia has 24% of the RAN market. O-RAN will enable Nokia to get into networks that are now closed [due to proprietary systems]
 - Nokia has the largest US RAN R&D staff -600 RAN patent filings and is involved in some standards-related working groups
 - Customers are demanding O-RAN – this is where the industry is moving
 - RICS allows new applications to develop – one is being used for dynamic spectrum sharing and another for load balancing
 - Want to distinguish where there are benefits of O-RAN vs. classical RAN
 - Government Innovation Fund \$1.5 billion – should help some of the smaller players in the O-RAN alliance, address integration challenges that stymie deployment, manage radio device profiles, funding deployments (see Nokia public comments).

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- John Baker, Mavenir
 - Running the 5G and O-RAN initiative for Mavenir
 - A disrupter in the telecom market, started by taking out physical hard switches in 2G, now in 5G with 39% global market share in IMS core space
 - Want a level playing field in O-RAN
 - O-RAN is not a technology, but a convergence of technology with an open interface and interoperability
 - Need to actually try vendors' products together to see if they are really open and interoperable
 - Tried to get an interface with Nokia, but it still has not happened – we need cooperation in the marketplace *[AM Comment: He seemed suspicious of Nokia's stated support of O-RAN]*
 - If we don't get more cooperation, we may go back to close systems
 - DISH is at 10,000 sites, the equivalent of 150k radios
 - Brownfield integration is about interfaces designed to be open, not being open
 - Regulators should say that interfaces designed to be open should remain open – it would make the industry very different
 - Most networks don't mix vendors in the same area/function due to Xn and X2 interfaces have been kept closed even though they were designed to be open
 - Much of the savings with O-RAN will come with scale
 - O-RAN has opened the market for competition and new innovation – more innovation now than at any time in the industry's history and increased supplier diversity
 - This innovation will drive cost savings
 - O-RAN is only about being open and not a specific design (types of silicon or not, accelerator cards or not, etc.), but software-based hardware is here to stay
 - Certification for the O-RAN Alliance is available and open for business. There are two test centers in the US (one at Cable Labs) and ten around the world. More coming on how products will be certified/badged and results be stored
 - O-RAN security is not new other than it has a single interface to the outside world that is now specified *[AM Comments: Seems to be a disagreement with Palo Alto Networks]*

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- Innovation fund is should not be for science experiments – O-RAN is now about scale. US does not have a domestic radio manufacturing facility – where can US companies find a way in, where can silicon be found at reasonable prices, can operators share experience so they don't all need to start over, how can the prices be lower – about re-establishing the US wireless industry and ensuring there is a level playing field for US companies to compete globally.
- Keith O'Brien, Palo Alto Networks
 - Founded in 2005, Palo Alto Networks is arguably the largest cyber security pure play in the world. Made a large push to service provider and operator security services and is working with all Tier-1 carriers in the world. DISH is a major client
 - When you open interfaces such as O-RAN you need visibility to catch attacks and see lateral movement of events
 - RICs have open API, and multiple vendors working on the same open API introduce security risk – API security is one of the top things to look
 - Taking zero-trust 5G core and applying to O-RAN
 - Building security controls to catch it in the packaging of the container and fix it before it gets to the network – but still, we need run-time security
 - Most attacks will be coming in from a side channel, such as within a configuration error, as opposed to “head on”
 - Want to use the developer pipeline to catch errors before they are in the network
 - Should have all code in a code repository so it can all be rebuilt at will if necessary
 - Also want to run some AI around this and how different vendors might interact – much of this can be automated
 - Critically important to build an O-RAN security operation center due to the multi-vendor environment – need to put the information from all of the vendors into one data lake and run analytics to look for interactions *[AM Comment: This highlighted the increased complexity of O-RAN security]*
 - This level of security is new to telecom but not new to the [cyber] security industry or web-scale sector
 - Working with MITRE attack framework – focused on IT/Enterprise networks – also developing one for mobile networks called FiGHT™ (“5G Hierarchy of Threats”). Most O-RAN testing is not done from a security perspective

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- Mariam Sorond, VMware
 - New O-RAN requires management of vertical disaggregation hardware and software.
 - Disaggregation of hardware and software with O-RAN allows VMware to be on the RAN side
 - O-RAN was driven by operators, not the vendors – this is different from most other technology changes
 - Multiple definitions of O-RAN and all are correct – O-RAN is an overall definition that includes cloud-RAN, V-RAN, and distributed RAN
 - There is a whole RAN evolution
 - In 5G, low latency is needed, and lots of things need to come together in the network development to make it happen
 - DISH has incorporated all of this
 - Brownfields have a very different evolution and may happen in phases
 - There will be different monetization approaches
 - RAN Intelligent Controller (RIC) is one of the pillars of O-RAN
 - Give you the power to do programmability and run more efficiently
 - Gives 3rd party app developers the ability to do things directly without going to RAN vendors
 - Near real-time and non-real-time RICs
 - DISH can do near real-time as its architecture enables it
 - Non-real-time RICs may allow a brownfield operator to move forward
 - 5G security is the same as for 4G, etc. [AM Comment: Disagreement with Palo Alto Networks]

G.Amanda Toman, Director, NTIA's Innovation Fund

Introduced by Charles Mathias, Hogan Lovells

- Worked in Defense Department for 20 years before NTIA
- Open architecture and open networks provide an opportunity to invigorate the market and re-establish the US industrial base and invigorate the [telecom] market globally
- Innovation Fund is a Congressionally Mandated fund with \$1.5 billion to spend over ten years

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- Still figuring out the fund's strategy to drive innovation, interoperability, and standards
- At the end of the day, carriers need to buy into how open networks operate
- Had a listening session and evaluated where notice of funding opportunity should go and had a request for comments – 1st grant should be August 8th
- Lots of excitement in the next few weeks when notice of funding opportunity (“NOFO”) goes out *[AM Comment: NOFO is a new acronym for me 😊]*
 - Will lay the groundwork for the fund as a whole
 - Want to work with the industry about where things will go with respect to standards, plug-n-play, etc.

H. Umair Javed – Chief Counsel for FCC Chair Jessica Rosenworcel

Introduced by Michele Farquhar, Hogan Lovells

- Ms. Rosenworcel started to advocate for open networks in 2019
 - Many carriers had only four options, and Chinese equipment was cheaper due to China's industrial policies
 - O-RAN was considered “pie in the sky” at the time, but we've come a long way
- Multiple O-RAN deployments worldwide and lots of testing and CHIPS Act provides funding
 - ExIm is also supporting O-RAN exporting to level the playing field
- FCC is committed to maintaining an enabling environment for open networks via lots of initiatives
 - Created first public record on state of development and deployment of O-RAN networks in the US. That record became the foundation for Congressional and other initiatives
 - Stood up two innovation builds, one in Boston and one in N. Carolina, where O-RAN testing can happen
 - Offered to fund carriers' transitions to O-RAN deployment through secure and trusted networks act reimbursement program *[AM: Comment: This is “Rip & Replace” but most carriers aren't using O-RAN due to concerns O-RAN is not ready yet]*
 - Brought carriers and vendors together with various showcases

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I. Cocktail Hour

- Cocktails and hors de oeuvres were held on Hogan Lovells beautiful roof-top terrace
- Featured three kinds of shrimp and some nice wines

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