RCR Wireless News

INTELLIGENCE ON ALL THINGS WIRELESS

AUGUST 2022

Open RAN in 2022

Enabling a continuous flow of innovation

By Sean Kinney

What is the state of the Open RAN ecosystem? An operator, a vendor and analyst weigh in

Vodafone: 30 percent of European network will be Open RAN by 2030

Open RAN, while certainly a set of technologies, is often described as a movement—a vision of collaboration that will enable a mix and match approach to radio systems that, if done correctly, can cut operator TCO, foster a more robust vendor pool and enable new types of innovation that benefit network consumers. In addition to the description of Open RAN as a movement, it's also often characterized as encompassing an ecosystem of hardware and software specialists, system integrators and operators engaged in an exchange of ideas in pursuit of a common goal.

Vodafone is one of the biggest global operators to embrace Open RAN and has set a target of deploying the disaggregated radio systems in 30% of its European footprint by the end of the decade. The company has also called in a whitepaper for a new, more collaborative approach to lab-based multi-vendor integration, pre-staging and ongoing network operations support.

Speaking to RCR Wireless News, Vodafone's Paco Martin, head of Open RAN, picked out the cooperative integration necessary to make the technology scale. "Collaboration is key for this to be successful. We are very busy on rollouts which essentially means planning for more because we need to make sure we support the technology with the rollouts and we make sure that money flows into the system." Other work is focused on silicon development and otherwise driving advancement in Open RAN. "We are… very busy supporting the Open RAN vendor ecosystem, trying to get the right level of maturity."

For Open RAN, "that train has certainly left the station"

For its part Mavenir has been a very active member of the Open RAN ecosystem and Senior Vice President of Business Development John Baker a major individual contributor to fostering mutli-party engagement. "Open RAN is really gaining momentum in the industry," he said. "I think the biggest challenge that I've seen still at conferences and in marketing information is just generally the confusion…that's being thrown out there to protect incumbent positions, protect monopoly positions, about

Vodafone UK's first 5G Open RAN site
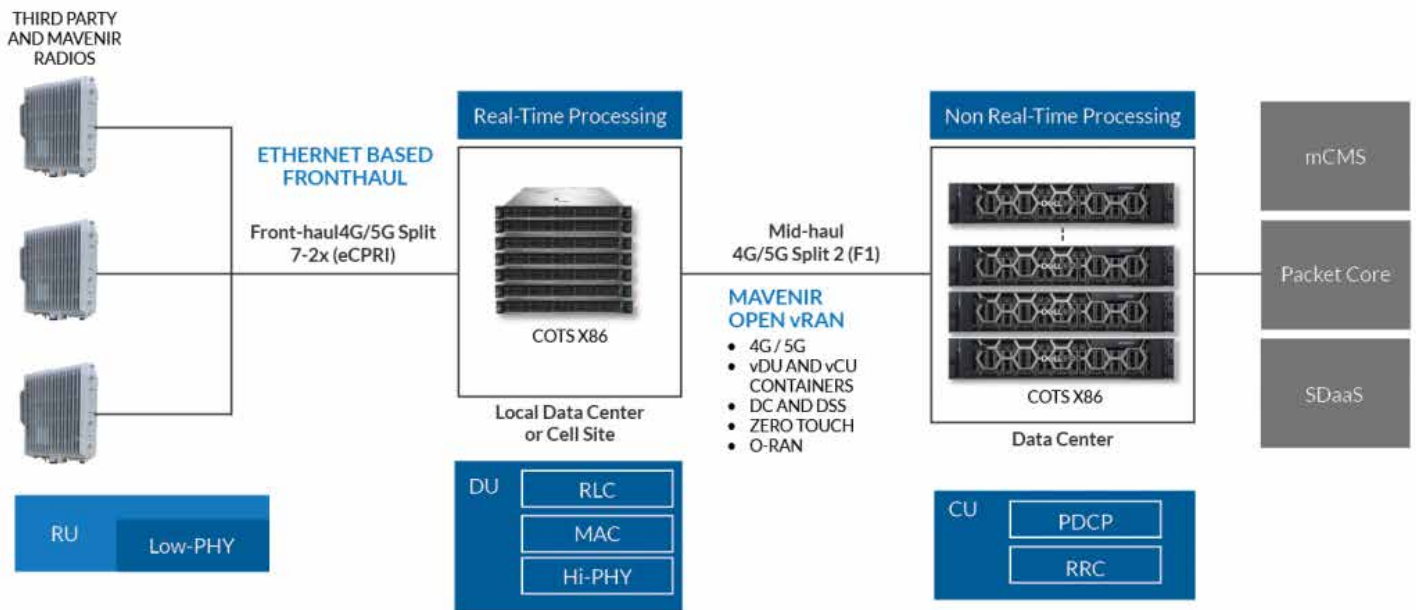
Image courtesy of Vodafone

THIRD PARTY AND MAVENIR RADIOS

ETHERNET BASED FRONTHAUL

Front-haul4G/5G Split 7-2x (eCPRI)

Real-Time Processing

COTS X86

Local Data Center or Cell Site

Mid-haul 4G/5G Split 2 (F1)

MAVENIR OPEN vRAN
- 4G / 5G
- vDU AND vCU CONTAINERS
- DC AND DSS
- ZERO TOUCH
- O-RAN

Non Real-Time Processing

COTS X86

Data Center

mCMS

Packet Core

SDaaS

RU | Low-PHY

DU | RLC / MAC / Hi-PHY

CU | PDCP / RRC

Image courtesy of Mavenir

This diagram shows an Open vRAN example deployment.

simply even the definition of what Open RAN is."

Baker drew a distinction between virtual RAN, cloud-based RAN–both implementations that can be proprietary or aligned with O-RAN Alliance open interface specifications–and Open RAN and open, virtual RAN. Beyond a precise technical definition, Baker noted the spirit of Open RAN involves a multi-vendor radio system. "We've done probably 11 integrations now with different companies on radios… When you actually have a multi-vendor system, you get some of these nuances, but that's what the ecosystem is about-help each other debug the problems and come up with a more reliable and a more secure supply chain. So any single vendor that comes along that says, 'I've got Open RAN in my solution, but it's my solution only,' then I don't believe that's open and I push back on that aspect."

Appledore Consulting's Robert Curran called out the description of ecosystem as an "ecological analogy" meaning something that's "vibrant, adaptive and constantly changing, and that's what makes the system as a whole work. It's not that everything is fixed in place. There's a constant interplay between the elements of an ecosystem. It's not a supplier hierarchy and so what we should expect to see from an ecosystem is that activity."

From his point of view as industry analyst, Curran sees Open RAN sitting at the intersection of disaggregation as a concept, opening up interfaces, virtualization and softwarization. "Open RAN is another slice through all those at the same time. It is an opportunity and it is complicated in the sense that it's a big opportunity, but I think that's what we are seeing." Another thing Curran noted tying together ecosystem and activity is knowledge generation and sharing. "When people talk about things like CI/CD and velocity and service lifecycles and so on, we have some good reference points. [Operators] have pulled a collaborative set of vendors along with them and I think there's a lot of learning going on."

When it comes to Open RAN, prove it or lose it

To Curran's comment around softwarization and Martin's reference to broad vendor engagement, Baker picked up the thread to point out that given the nature of Open RAN, if

a vendor doesn't perform to expectations, they risk rapidly losing a piece of business. "I think it keeps us on our feet and keeps us aware, given that we're disaggregated platforms, it's virtualized, containerized, we can be removed out of a network tomorrow if we don't perform. So I think that's the one big change that is already seen in the ecosystem is that we have to do what we say we're going to do and deliver what we promise. The speed at which some of these networks are now being built using virtualized, containerized platforms as such, there's no assumption you'll be there forever. You've got to prove your worth and demonstrate your wares."

Back to Martin on Vodafone's Open RAN timeline and what it'll take to hit that target. "I think to get there in 2030, you need to start virtually now. We are very busy building our plans to get there which means working in multiple countries with this, making sure we understand very well the ecosystem of suppliers. We are working today with over 50 companies across all areas in Open RAN. And you need to make sure who the best ones are, and you also need to be able to select a few of them but not all of them because then it becomes too crowded and too complex. We need to make sure we have solid plans. We cannot delay them too much."

Who is buying Open RAN? Market sizing, outlook

Open RAN investment grows from less than 1 percent of total RAN spend in 2019 to 3-5 percent in 2022

While there are distinctions between Open RAN, open virtualized RAN, cloud RAN and further sub-combinations of those architectures, these new approaches to building the radio access network are making inroads in the real world, according to Stefan Pongratz, vice president of research firm Dell'Oro Group. At the moment operators in the Asia Pacific and North American regions—think Rakuten Mobile and Dish which are building greenfield networks
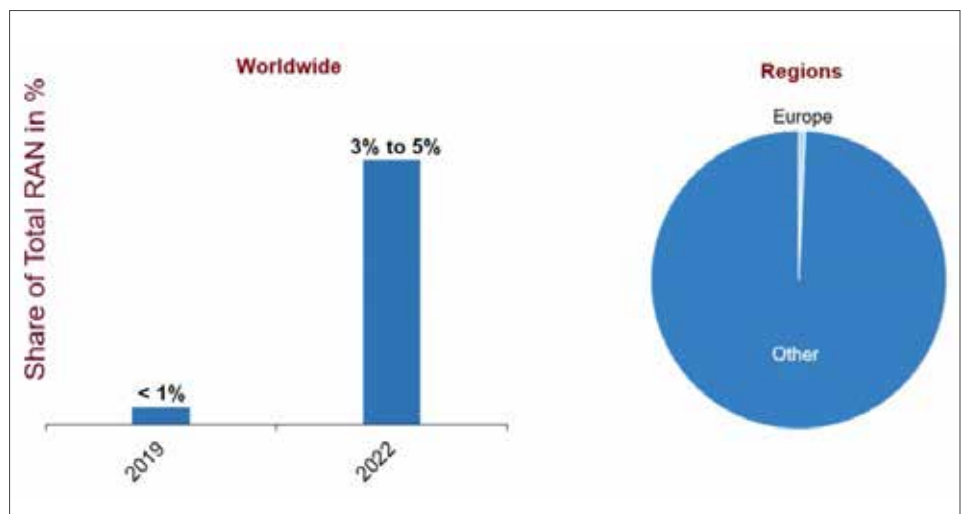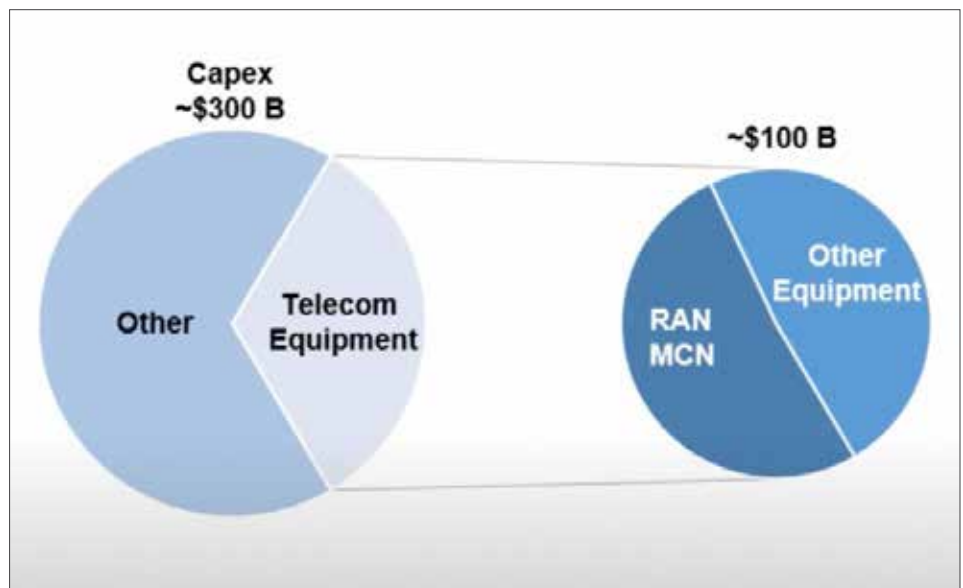
Images courtesy of Dell'Oro Group

using this approach—are leading investments, but that will likely change as we approach 2030 given the massive commitments from multinational European telcos.

"When it comes to the type of Open RAN," Pongratz said, "I think it's important to acknowledge that Open RAN isn't just one technology or architecture. We think of it as a movement encompassing multiple architectures and technologies. Everyone is going to take a different approach here. We see a wide disparity right now in terms of the operators' engagement…especially the European operators. They want to

"In Europe I think they're taking a little bit more time partly because they're looking at a more holistic Open RAN and not just a small portion of Open RAN."
Stefan Pongratz, Vice President, Dell'Oro Group

take a more holistic approach and not a tiny sliver of Open RAN. It's taking a little bit of a longer time. European operators are lagging a bit when it comes to commercializing."

By the numbers, Pongratz posited that operators globally spend around $300 billion annually in capital outlay, a third of which goes toward network equipment. If you take out that $100 billion, there's approximately an even split between RAN and mobile core network spend and then all other equipment. Of the RAN investment, his research suggests that Open RAN spend was less than 1 percent of the total in 2019 and has grown to between 3 percent and 5 percent this year.

Pongratz explained that while Open RAN investment will obviously include radio equipment, he pointed to Telecom Infra Project work that looks into open fronthaul gateways, transport network elements, and even Wi-Fi. The market, he said, is "going to expand in terms of the scope from an equipment perspective and probably, more importantly, the services." The Open RAN vision is "also going to modularize more so the services aspect and change the business model there…The overall market opportunity is fairly significant."

Open RAN in Europe is lagging but likely not for long

The biggest Open RAN deployments are regionally concentrated

with notable investment from Rakuten Mobile in Japan and Dish in the U.S. which are both building greenfield networks. But over the next decade, expect significant momentum in Europe given long-term commitments from operators, including Deutsche Telekom, Orange, Telefonica and Vodafone.

As Pongratz said, "Europe is still a little bit of a small sliver of the total market right now. Asia Pacific, North America [are] probably the lion's share. The European operators are definitely ahead when it comes to committing and announcing targets…They have outlined clear targets in terms of 2025 and 2030…In Europe I think they're taking a little bit more time partly because they're looking at a more holistic Open RAN and not just a small portion of Open RAN."

All that said, the path forward isn't without some risks. "I would just say it's still early when it comes to understanding a lot about the value and the total cost of ownership," Pongratz said. The TCO question mark relates to the newness of Open RAN—it's impossible to gauge product lifecycle TCO without any proof points as to TCO over the lifecycle of Open RAN. "Operators and enterprises are going to have to work with the solution that is most flexible and gives them the best TCO regardless of what that is. Let the markets decide that."

For Open RAN innovation to flourish, you've got to get the plumbing right

The RAN Intelligent Controller is seen as a key way that Open RAN can provide operators with all manner of network optimization capabilities that drive efficiency while also serving as a platform that can enable innovation, differentiation and, potentially, new service revenues. But before the industry reaches a point where this is possible at scale in the real world, the foundation has to be well-built. This is where semiconductor firm Picocom is focused.

The very nature of the RIC in an Open RAN network lends itself to being responsive to changing conditions in near real time. Because of this, there's a growing realization among operators that the best place to experiment with this technology is in real world conditions. "This is a very powerful way to go," Picocom President Peter Claydon told RCR Wireless News. "We do see people now saying, 'I've tried the RIC, it just doesn't work at all.' The expectation here of how quickly this is going to go is possibly unrealistic. You've got to get the plumbing to start with. That's the sort of thing that companies like Picocom are concerned with."

One way to hasten this ability to see impactful results while supporting the clear desire for innovation rests in creating commonality, in creating scale; this problem (or opportunity) has led operators to work more collaboratively with their vendors to go through the necessary process of achieving common interfaces and common management systems to operate disaggregated radio systems. "That's kind of the boring part," Claydon said. "Instead of having to do this every time you do an integration with a different operator…if there's just one thing, it's going to help a lot. It's going to

leave people free to innovate rather than doing boring stuff."

Reflecting on the opportunity for disruption of the semiconductor industry in parallel with the disruption opportunity presented by Open RAN, Claydon likened it to how a small number of semiconductor firms support a large number of Ethernet or Wi-Fi equipment companies. "This is something which we're just seeing starting to come to fruition in Open RAN where we're getting that vertical cooperation between organizations," he said. Claydon also noted that operators are now taking a much closer look at semiconductor architecture--Vodafone's establishment of a dedicated facility in Spain, for instance. "I think this is very healthy," he said. "Open interfaces, I think, are a friend of the semiconductor company."

Back to this point around commonality, Picocom sees this maturing as it relates to RAN interfaces--open fronthaul and eCPRI, both of which are incorporated into the company's chips. Claydon also noted support for the Small Cell Forum's Functional Application Platform Interface (FAPI) that standardizes how the physical layer works with higher-layer software stacks. Picocom is working with Radisys to deliver to customers joint 5G Open RAN platforms using the former's small cell SoC and the latter's Connect RAN 5G software. "The cooperation up and down that ecosystem…has been encouraging," he said. "Next year, once you've got that fundamental base of things that actually works, that's what allows you to build innovation on top of that."

To that potential for innovation, "Operators,

> "We need a healthy ecosystem of semiconductor vendors in the Open RAN world selling chips that are freely available to anyone that wants to buy them."
> *Peter Claydon, President, Picocom*

they're obviously getting excited about this possibility," Claydon said, listing off opportunities around neutral host networks in buildings and on campuses, as well as delivering private networks or end-to-end network slices in support of myriad enterprise digital transformation initiatives.

Slicing, he said, hit something of a mindshare peak more than a year ago which has since been tamped down a bit in industry discussion. But, with the maturation of the RIC, there looks like a path to RAN slicing in a fashion that could deliver guaranteed network parameters. "It does seem the RIC is something that can enable that sort of thing. There's a huge scope for innovation in that area."

How is Open RAN evolving?

NEC's Patrick Lopez, global vice president of product management, lays out the four elements of Open RAN

Q Could we start with a bit of a retrospective look at why NEC has decided to pursue the Open RAN opportunity and what are some of your high-level goals in the space?

A NEC has been a prominent and reputable vendor in the telecom space for a long time, but it's been focusing mostly for telecoms in its domestic Japanese market. From that perspective, very early on NEC embraced the trend of open and disaggregated networks. NEC was actually the first company to commercialize an OpenFlow-based SDN controllers about six, seven years ago. And that kind of opened the gate to a new generation of networks, networks that are more cloud capable. And those first implementations actually took place in Japan with customers like NTT DOCO-MO, for instance.

Naturally, when Open RAN emerged and became an interesting trend to follow, NTT DoCoMo was one of the first companies to investigate it and then adopted it. And elected NEC to deploy what we believe were the first open radio units in a commercial network at scale.And for those who know the Japanese market, you understand that it's a very high density, very urban environment. So the requirements in terms of performance, and in terms of stability, and in terms of radio frequency interference management are very high.

Being successful there first NTT DO-COMO and Rakuten Mobile have basically projected the NEC brand outside of Japan in the telecoms world. And as a result, NEC was invited to a number of evaluations from vendors that are interested in Open RAN and we've been able to use our experience of deploying the world's first massive MIMO Open RAN [network] in a dense urban environment. And that has proven quite successful with other operat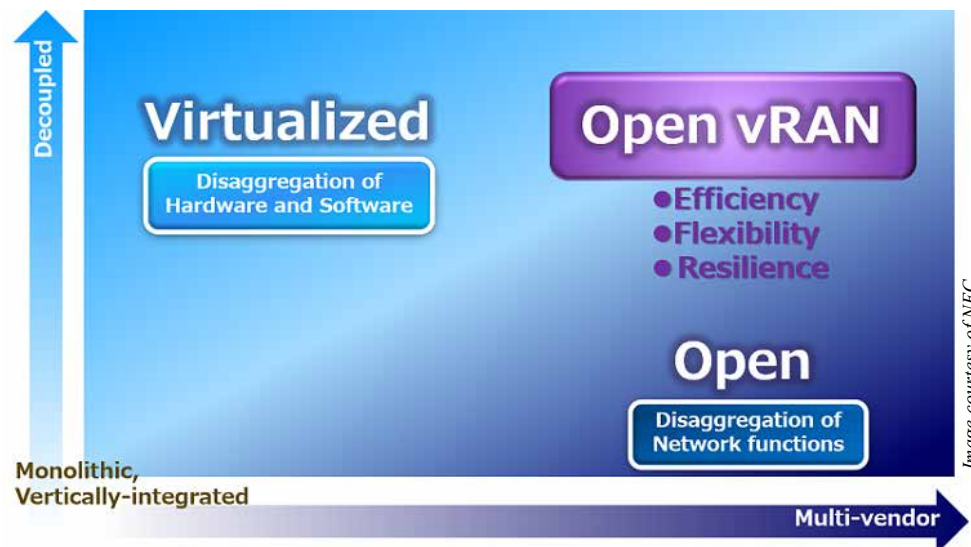ors as well outside of Japan, particularly Western Europe, but also in other parts of Asia Pacific and in North America.

Open RAN "is about enabling choice and innovation"

Q From your perspective, from NEC's perspective, what makes a radio system open?

A There's a lot of talk about open and it might mean different things for different people. Open RAN means that basically you're breaking down the radio access network into separate elements. So what used to be essentially one appliance connected to an antenna that was provided by a single vendor with proprietary interfaces and optimization is now broken down in at least three elements, which is the radio unit, the centralized unit, and the distributed unit.

We'll talk about RIC maybe a little later. That's the fourth element. But basically, the concept of Open RAN is that you break those elements so that

Image courtesy of NEC

NEC built this 5G Open RAN radio unit for use by Rakuten Mobile.

Image courtesy of NEC

it can scale independently from each other. You separate the hardware from the software and you deploy on commercial off the shelf hardware. And most importantly, you have open API and open interfaces between each of those elements. That allows you to scale more efficiently.

And it allows you also to mix and match in terms of vendors for those elements. So multi vendor is a true important part of Open RAN. And that's where the limit is between Open RAN and virtual RAN, if you want. There are a lot of vendors that have announced virtual RAN capabilities, which is basically the separation of the hardware and the software and the virtualization of the software to maybe a container or virtual machine-based environment. But that does not guarantee that you have open interfaces between the element and that you can deploy multi-vendor environment. Actually, a lot of virtualized RAN solutions are still from a single vendor. From our perspective, Open RAN is about enabling choice and innovation and that comes from opening up with interfaces and allowing different vendors to participate.

Q Tell us a little bit about some of the work you're doing in Western Europe. I'm particularly interested in the projects you've got going with Telefónica in several of their markets. And can you discuss the process of going from lab-based interoperability testing and verification to putting that into a commercial network and then scaling it up?

Telefónica as proof that NEC Open RAN can scale

A Open RAN, like any new technology, requires maturation because essentially you're taking one system that was proprietary and tightly integrated by a single vendor and you break it down and you're implementing new interfaces, but also you bring in new vendors. There's a certain level of complexity that comes with that. And Open RAN is fairly new. I think four or five years ago, the term Open RAN emerged and now we see it commercially deployed at scale. So it's been really fast going, but there's still maturation that needs to happen. And a large part of that maturation is in the integration between the different elements and the different vendors. A lot of operators have different aspirations towards that. You have some vendors that would like to do it themselves and take the role of integration of all those vendors and all those elements. You have some vendors that would like to do it, but realize that they might not be able to do it just now either because of skillset, because of capacity, or because they need to learn. And then you have operators that are just not interested to do that at all. They want an integrator to come in and to do it all for them. So across that spectrum basically, our experience has been to deploy those systems and to help you to integrate an end-to-end system with multi-vendor environments.

This is why we launched NEC Open Networks at Mobile World Congress. NEC Open Networks is basically a market promise, which is that we will deliver radically open systems, multi vendor, but no strings attached and no compromise in the sense that a system, an Open RAN system, can be open and multi vendor, but there's no sacrifice to performance, to stability, to availability. We are able to guarantee end-to-end the same or better level of performance and capability than an integrated proprietary environment.

Telefónica, they have trusted us with the prime integration of their Open RAN project in four different countries, Spain, Germany, U.K., Brazil. And Telefónica is a large operator and each of those networks is a different network with different conditions,

Upcoming Digital Forums

Open RAN GLOBAL FORUM

September 20th
9AM-4PM EST
Virtual Event

The Next Chapter of Open Ran

This third edition of the Open RAN global forum will take the discussion to the next level. Years have passed and Open RAN is still evolving. The many lab, field tests and collaborations have led 2022 to be the cornerstone of a new Open RAN deployment era. However, much needs to be consolidated and many questions and barriers remain: integration costs, slow deployment, immaturity of the technology to name a few.

www.openranforum.com

PRIVATE NETWORKS EUROPEAN FORUM

October 4th
9AM UK / 10AM CET
Virtual Event

Europe's Dedicated Private Networks Virtual Forum

With a specific focus on European market activity, this event will connect key stakeholders to discuss - are private networks the key to driving enterprises into the Industry 4.0 era? We will examine the latest private network deployments, European spectrum liberalization and management, and which deployers are dominating this market. We will evaluate the technical and financial considerations of roll outs and the benefits which private networks can bring to enterprises.

www.privatenetworksforumeu.com

5G Manufacturing Forum

November 1st
9AM-4PM EST
Virtual Event

Leveraging 5G Connectivity for Smart Manufacturing

The manufacturing industry is one of the key enterprise verticals tipped to truly reap the benefits which 5G connectivity can bring. The low latency, high reliability, and increased speed offered by 5G is critical to support emerging technologies and applications in the smart manufacturing space. At this event we seek to discuss the how Industry 4.0 can leverage 5G to improve industrial processes, create cost and operational efficiencies to build smart, digital manufacturing businesses.

www.5gmanufacturingforum.com

Explore all upcoming events at RCRWireless.com/events

different spectrum, different vendors. And it's really, I think, the proof for the entire industry that Open RAN is ready and is mature. If you can deploy that in all those different networks, under all those different conditions, with a different variety of vendors, and it works equally across all those, it means that Open RAN is ready to become a technology that can be deployed in all environments moving forward. That's really in that case, the capacity to demonstrate that not only Open RAN works in the greenfield environment, we've seen some announcement that some operators have done that, where it's relatively less complex if you don't have to integrate with an existing infrastructure, but here what we are doing is demonstrating that you can deploy and industrialize Open RAN in the brownfield environment that has existing legacy systems.

Q Could you share with us that vision of a programmable RAN, what it'll mean for operators and what it'll mean for even the end user?

Programmable networks, Open RAN and the promise of 5G

A Programmable networks have been an important part of our value proposition and our strategy at NEC. Some might not know but Netcracker is a wholly-owned subsidiary of NEC and it's one of the leaders in the service management orchestration and automation field end-to-end. Let's take a step back from Open RAN for a second. What is the promise of 5G? The promise of 5G is to create connectivity products that are going to be adapted for different use cases, different verticals, different industries, different devices. Whereas today, we all have the same connectivity and we all share that connectivity and it's kind of the best effort and the only difference from one operator and another is how much you pay. You might have a different performance profile on a different cell site, but it's all the same.

Now going forward, we all understand that an autonomous car, that collaborative robots, that an application for remote controlling a construction system, they all have different needs from the connectivity and from the network. And it's not possible to satisfy all those needs simultaneously with a best effort network, which is everything that we've done up to 4G and even 5G NSA. In order to satisfy those needs, you need to be able to do slicing and you need to do orchestration and automation across all domains, core, transport, and radio. And now if we go back into Open RAN, an exciting part of the innovation is the radio controller because it allows that RIC basically to have a management system across all the RAN in a multi-vendor environment and for the first time orchestrate the experience of RAN.

What does it mean? The precursor of that technology was a self organizing network, but it was really centered around specific vendors and it didn't work very well in the multi-vendor environment. And it was basic. Now, you can imagine a network that is Open RAN, and that has RIC, and you can imagine that for instance that network is composed of massive MIMO antennas. And at the network level, for the first time you're probably going to be able to detect interferences between the beams themselves of massive MIMO and in real time to reorient those beams so that they don't interfere with each other. And what we found from our studies…is that in some cases more is not better in the sense that more beams have capacity to create more interference, to actually degrade the user experience. But if you're able to focus those beams where you need them, and even to shut down some beams that might be adjacent and might be interfering with it, you can actually achieve a better user experience and better overall network health. So I think that's what's exciting about the RIC is that it opens up a number of new optimization capabilities to reduce power consumption, to increase user experience, or to create very specific connectivity products for specific industries, and use cases, and devices.

Q You made the comment about how the way we have built networks results in not much differentiation. When you think big picture about running RAN and other network

workloads in a multi-cloud environment, any thoughts on what operators need to do organizationally with their people and their workflows to fully take advantage of the flexibility and the speed that would come with investments in cloud-native networks?

"Cloud is a revolution"

A   I think cloud is a revolution, right? And you can argue that 5G networks, particularly 5G Standalone network and advanced 5G networks, they're more cloud than telco. And the difficulty is probably not in the connectivity itself…The difficulty is the orchestration and automation of that system at launch, because all of sudden, if a large part of your network is composed of virtual elements and those virtual elements basically pop in and out of existence or scale in and scale out based on demand and based on specific conditions, well, it's no longer a network that you can manage manually like we've done before.

Before, we know that to do any change into a mobile network, it's 18 months, and $5 million, and it involves somebody physically going into a data center and physically accessing a console on a server and making changes. That's been telecoms for the last 20 years. Now with the cloud, all of a sudden, well, you don't need somebody to physically go somewhere, that you can with a single pane of glass actually have a good visibility of the network,

understand how the different workloads articulate, and where they are based, and you can programmatically manage your network experience. But obviously in order to do that, it requires different skills than just pure telco engineering. And I think most network operators have recognized that and they're scaling up and they are hiring specialized skillsets in order to do that, but it's a process, it's a journey, so it's going to take a little bit of time. So in the meantime, they're relying on a lot of companies to help them along this journey. And best case, at NEC, we're not only a vendor of telecom products, but we're also a full SI company and we are helping many of our customers basically scaling up…in order to make their network more programmable.

Greenfield vs. brownfield: Where's the Open RAN sweet spot?

Nokia: The Open RAN business case isn't yet established for new or existing networks

If you look at scaled Open RAN deployments today, it will become immediately obvious that the largest builds are from greenfield operators–1&1 in Germany, Dish in the United States and Rakuten Mobile in Japan. It's undeniable that implementing new technologies is easier when you're starting with a blank state. But if you look forward

"Getting equivalent performance to a single-vendor solution remains quite challenging."
Adrian Hazon, Vice President, Global Product Sales, Nokia

at planned Open RAN deployments, operators with expansive existing networks, the likes of Orange, Telefonica and Vodafone, for instance, plan to introduce disaggregated radio systems into their existing networks. So how will this dynamic play out?

It depends, according to Adrian Hazon, vice president of global product sales at Nokia. In terms of whether these greenfield builds provide a model for other future greenfield builds, "I think it depends if those networks…can successfully demonstrate that O-RAN can really deliver the cost savings and the equivalent performance that's expected. That's the key challenge to this and it's not close to being proven yet.

6G
The Next Generation of Wireless Communication

Although the first 6G consumer devices may be years away, thought leaders from academia and industry at the forefront of these cycles already are experimenting and building an understanding of key technologies critical for standardization. As we look at 6G's possibilities and promise, four candidate technologies stand out in terms of business opportunity and viability:

Integrated Sensing and Communication (ISAC)

The 6G experience requires more data as well as more environmental sensing and awareness. ISAC explores how to use the radio signals that cellular devices emit for radar. Autonomous vehicles, for example, have sophisticated sensing systems powered by machine-learning algorithms fusing data from cameras, lidar, and radar sensors. The advanced communications systems in these vehicles use cellular networks for streaming infotainment, environment and performance data, and vehicle-to-everything communications. The extent to which these two traditionally separate functions merge will depend on regulatory and technical factors, but the combination could potentially define 6G.

Sub-Terahertz Bands

The perpetual demand for more data bandwidth is pushing researchers to explore underutilized spectrum in the sub-THz frequency bands. Frequency bands between 90 GHz and 300 GHz offer many times the amount of spectrum currently used for cellular communications, but pathloss is one of the biggest hurdles in moving to sub-THz bands. While expanding to sub-THz bands may seem premature given the delay in 5G mmWave deployments to date, researchers are hopeful it could significantly increase network capacity.

MIMO

Building on popular multi-antenna techniques, MIMO promises potential benefits across many use cases and frequency bands. While beamforming is key to overcoming sub-THz pathloss challenges, multi-user MIMO improves spectral efficiency for the heavily used sub-6 GHz bands. In bands where antenna size becomes excessively large, distributed MIMO disaggregates the large antenna arrays into multiple, geographically separated radio heads that are significantly smaller. The expansion of MIMO aims to increase cell capacity and provide improved location services.

Artificial Intelligence and Machine Learning

As complexity increases and we seek to squeeze every bit of bandwidth out of the available spectrum, AI/ML offers one way to help optimize the communications system. AI/ML-driven design or adaptation could offer improvements through capabilities such as automatic spectrum allocation, beam management, and RF nonideality cancellation. Deploying AI/ML at the application layer can optimize Quality of Service (QoS), which considers application-specific requirements, along with the environment, for factors such as latency or energy efficiency. The availability of big, open datasets for AI/ML wireless communication research and training will play a significant part in 6G development.

What's more important than technology?

In addition to technology buzzwords like immersive extended reality and KPIs such as 1 Tb/s data rates, 6G discussions now include social and sustainability goals such as "connectivity for all." As we work to develop 5G by extending it beyond enhanced mobile broadband, and as the definition of 6G coalesces, we need to answer these business and social questions as well as the technical ones.

ni
ni.com

National Instruments
is now NI.

Open RAN, RIC and CHIPS:

A discussion with Mavenir

While Mavenir's John Baker, senior Vice President of business development, is clear-eyed about challenges, both technical and business, the Open RAN ecosystem and other stakeholders need to work through, he sees material progress in adoption of open, multi-vendor radio systems as well as a long tail of innovation there for the taking. With regard to the RAN Intelligent Controller, Baker explained that harnessing network data to make dynamic optimizations will enable service providers to tune networks in a manner never before possible while also tying back to the Open RAN value proposition of lowering TCO but in a more nuanced way then simply lower capital and operating costs.

On the RIC: "This is a great area where operators can actually differentiate their networks," he said, calling out improvements in ability to understand and respond to consumer behaviors, improve mobility, make more efficient use of spectrum in dense network environments, and optimize power consumption, among other benefits. "You start to get TCO benefits that have not truly been discussed in the industry." With imminent commercial deployments that "will start to prove this," Baker said, "You're going to start to see cost and saving benefits that are extremely large and are baked into licensing policy, spectrum assets and a number of areas. The RIC needs to have open interfaces, the APIs need to be open. The RIC is where the true benefits of Open RAN, outside of the diversification from vendor lock, are going to be seen in the future."

For Open RAN, should common components command a common price?

As for challenges to Open RAN adoption, and the fostering of a vibrant, competitive ven-dor pool wherein smaller players are capable of competing against large RAN vendors, Baker discussed component procurement as an area ripe for reshaping. This relates to the fact that many Open RAN systems rely on commercial off the shelf components, servers and chips particularly. He acknowledged this was a "provocative" position but said semiconductor vendors are hindering the growth of smaller companies in the space, and in turn hindering the parallel goals of vendor diversification and innovation, by sticking to long-standing volume-based pricing models.

Just like Open RAN has opened up interfaces, it's time for an "opening up of the semi-conductor business," Baker said. "A lot of vendors end up using the same chips with the same interfaces and essentially the same part number number one those chips. As a company you buy x components and pay x price. Small companies are actually being charged [the same as larger companies] and…have a barrier to entry for the size of the company. I think this is clearly the next level of challenge…If it's a common part that everybody is using in their radio or compute platform, then everyone should be paying the same price for it."

There's a political angle here as well. In the U.S. President Joe Biden recently signed into law the bipartisan CHIPS and Science Act which will provide $280 billion to expand domestic semiconductor manufacturing and R&D, and included is $1.5 billion for Open RAN which. Open RAN Policy Coalition Executive Director Diane Rinaldo said in a statement, "The funding for Open RAN research and development included in this legislation is critical to increasing supplier diversity and catapulting the next

> "The RIC is where the true benefits of Open RAN… are going to be seen in the future."
>
> **John Baker, Senior Vice President of Business Development, Mavenir**

generation of telecommunications network innovation." In the U.K. the Department for Digital Culture, Media and Sport recently published a set of Open RAN principles that speak to the goal of Open RAN as a vector of supply chain diversification given the criticality of mobile networks. The U.K. is also working with Korean counterparts to fund and support Open RAN R&D with a particular focus on power efficiency.

Citing examples of global momentum for open and cloud-based networking, Baker said, "We're firm believers in open interfaces and trying to ensure the market doesn't step backwards in terms of the progress that has been made in opening interfaces and vendor diversification."

It's also, I think, fair to suggest that there aren't huge amounts of large-scale greenfield networks waiting out there to be built, and that does rather limit the market possibilities out there."

Acknowledging that supplier diversification is a stated goal of Open RAN, "More competition doesn't necessarily lower the cost or improve the performance," Hazon continued, calling out that Nokia itself is currently comprised of numerous acquisitions of other radio suppliers. "From a Nokia point of view, we welcome the competition, we welcome the innovation that it drives."

To that point around innovation, Hazon noted that Open RAN is much more than open fronthaul interfaces, although it certainly includes that. "It's also the near-real-time RAN Intelligent Controller…that offers up capabilities through which the network operators can differentiate and improve cost-efficiency, network performance…I would say some [operators] may follow this approach if the integration complexity and cost can be dealt with. So, yeah, interesting times."

Can Open RAN live up to the plug-and-play "hype"?

Hazon said that his conversations with brownfield operators on Open RAN are a balance of needing to keep an eye on emerging technology trends that could add shareholder value while facing the reality of tremendous capex and opex pressure. New innovations are necessary "to generate more revenue essentially. And that's the appealing backdrop of it, and that's what they're trying to understand… If O-RAN does start to deliver on the hype–I use hype because 5G was hyped and now O-RAN is hyped again–you've got to get to the nitty gritty of what it actually delivers. I think if by keeping a close eye on O-RAN, both fronthaul and RIC, and making sure it's well understood, then the brownfield operators can move quickly if they need to."

He also addressed the desirable idea of mixing and matching hardware and software from different vendors in a plug-and-play manner which in theory gives operators a huge amount of flexibility and optionality. "That can help address potentially some of the supply issues and some of the different spectrum scenarios. But, of course, the concern there is that we're some way off from having open fronthaul plug-and-play. Getting basic functionality working between someone else's RF and baseband, that can be done and it has been proven by some of our customers…We've done it as well with third parties, but it's taking that basic plug-and-play and getting that working to the full standards that you need to do with the full capability. So getting equivalent performance to a single-vendor solution remains quite challenging, particularly if you're looking at massive MIMO and these complex radio scenarios."
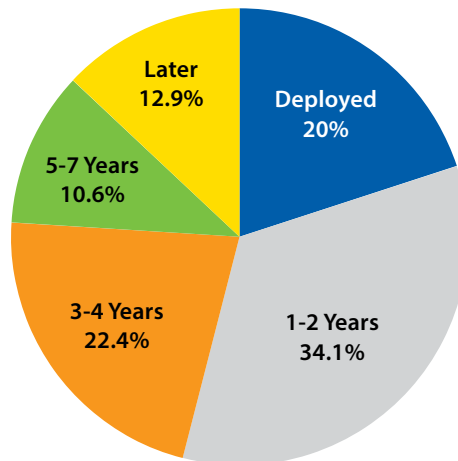
The three Ps of Open RAN

If it's current brownfield operators looking to incorporate Open RAN or for future greenfield operators evaluating use of the architecture, Hazon said they'd look at three Ps: price, power and performance. "It has to hit the same price point as a classical sort of deployment. It's got to be at least as efficient as the…specialist solutions that are out there from vendors like ourselves. And it's got to have the same level of performance. So until we hit those three Ps, then it's going to be a challenge."

But what does that mean for Nokia which is active in Open RAN but obviously inclined to sell its fully-integrated solutions as opposed to selling parts of a multi-vendor solution? "We're open about this discussion," he said. "We have to be open with our customers…You have to start by explaining what we see as the complexity and distinction between the open fronthaul and the RIC, and also the integration…When you're in this world of mixing multi-vendor on the fronthaul, RF and baseband, it's quite complicated. Large-scale vendors have been doing this for 30 years. And to get to this point, it's taken quite a lot of work and R&D effort. So when you're introducing new vendors into that complex environment, you have to understand there's quite a lot of testing and interoperability that we do that's behind the scenes."

Do you think Open RAN is just hype, or will it be a reality?

Hype 11%

Not Sure 125

Reality 77%
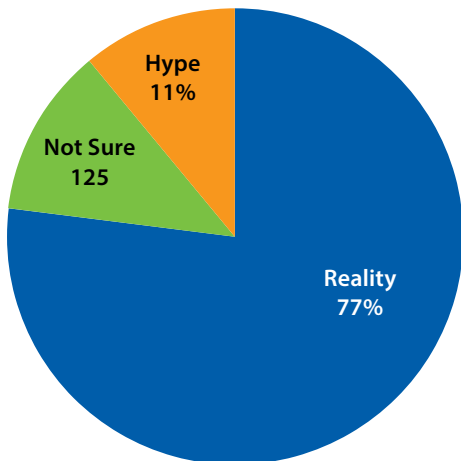
Will you be considering deploying Open RAN now or in the future?

Later 12.9%

5-7 Years 10.6%

3-4 Years 22.4%

Deployed 20%

1-2 Years 34.1%

What is, or will be, the main driver for you to deploy Open RAN?

1. Cost Reduction

2. Vendor Diversity

3. Network Flexibility

4. Easy/Seamless Deployment

Top 5 Open RAN operator considerations—and the survey says…

TCO reduction and vendor diversification are Open RAN deployment drivers

For part of the recent Open RAN European Forum, RCR Wireless News surveyed 100 members of our audience to gain a better understanding of how they're thinking about Open RAN deployment. Top motivations include cost reduction and vendor diversification, while concerns range from ongoing interoperability testing to ease of use for private networks. Here we'll present the survey results along with expert commentary from Mavenir's Baker and Viavi Solutions' Owen O'Donnell, TeraVM marketing manager.

Question 1: Do you think Open RAN is just hype, or will it be a reality?

In response to those unconvinced about the future of Open RAN, "Time will tell and I've always said it's not a revolution, it's an evolution," Baker said. "It's going to take several years to get there and I think proof is in the eating."

O'Donnell called out work done by greenfield operators Dish and Rakuten Mobile, as well as commitments from brownfield operators like Telefonica and Vodafone as evidence of Open RAN momentum. "The fact that it's moving, I think really quickly, should show those that are a little bit apprehensive that you need to get on board."
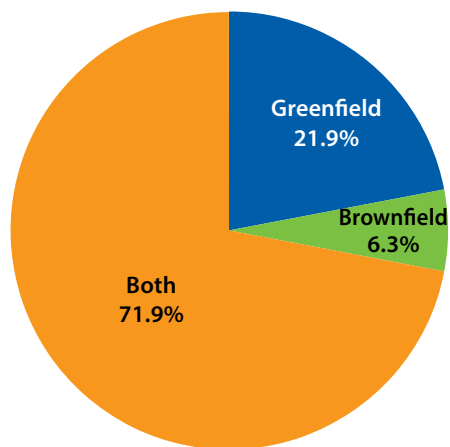
Question 2: Will you consider deploying Open RAN now or in the future?

"70% of the operators are looking at Open RAN in the next four years which is a huge number," Baker said. "I think Open RAN…is really all about open interfaces and interoperability. It's not a technology per se. To that extent there's absolutely no reason it can't get deployed today…Whether it's 4G, 5G, 6G, it doesn't really matter. We should have open interfaces…level the playing field so suppliers can compete. That's what this whole thing is about."

O'Donnell acknowledged interoperability issues that do and will need to be resolved and that success will be by proving out parity with integrated RAN solutions. "Operators themselves want to see those [interoperability issues] fixed and to make sure the KPIs their networks need to show have to be as good as if not better than their traditional network deployments." He also called out the promise of the RAN Intelligent Controller for automating network operations which he sees progressing significantly in the next four years.

Do you foresee Open RAN being deployed for greenfield, brownfield or both?

- Greenfield 21.9%
- Brownfield 6.3%
- Both 71.9%

What do you think is the top priority for the industry to address with regards to scaling Open RAN?

1. Interoperability
2. Vendor Collaboration
3. Integration
4. New and Sustainable Solutions
5. Cost Reduction

Question 3: What is, or will be, the main driver for you to deploy Open RAN?

"I think the elements are there to encourage cost reduction," O'Donnell said. "You've got the option of at least going to different vendors. You're not tied to the one vendor who basically has you over a barrel. You can shop around and you can look for companies that are looking to be a bit more cost effective when it comes to supplying components."

Additional vectors for Open RAN as a way to reduce, O'Donnell explained, include the use of commercial-off-the-shelf components the scalability that comes with moving functions into cloud platforms. With the advanced of the RIC and attendant applications, "You have choice when it comes to

xApp developers and vendors. You can bring them onto your RIC, you can pick the ones that suit your network the best." And back to the relationship between automation and TCO, "If you can take away some of the manpower required to run a network, that's going to bring that cost reduction as well."

Baker said the TCO piece has been verified through existing Open RAN deployments. "The reason I honed in on vendor diversity is the whole geopolitical situation and the fact that what you've actually got in the marketplace today is a monopoly situation. The current choice of two is not allowing operators to be profitable or differentiate themselves."

Question 4: Do you foresee Open RAN being deployed for brownfield, greenfield, or both?

While scaled, macro Open RAN deployments today have been greenfield builds, there aren't necessarily many of those opportunities left as noted by Nokia's Adrian Hazon. What there is, however, is a huge opportunity around private enterprise networks, all essentially greenfield deployments, that could benefit from Open RAN.

"It's just taking a small little 5G network and dedicating it to a factory," O'Donnell said. "You have all the concerns you'd have for a bigger network only more dedicated. You just need to match them to your factory. No reason why Open RAN won't work there."

"It needs to be a plug and play network and IT guys need to handle it the way they handle a Wi-Fi network today," Baker said of the Open RAN/ private networks outlook.

Question 5: What do you think is the top priority for the industry to address with regard to scaling Open RAN?

With Viavi's expertise in test and measurement processes underlying Open RAN interoperability, O'Donnell picked that as the place "where we see the biggest issues, the biggest challenge, and also where can help hugely." Calling out the importance various dedicated test labs and plugfests, he said, "There's a huge amount of testing that needs to be done. And that's not going to go away. The interoperability is never going to go away. It's going to be continuous."

Three Open RAN hurdles: Servers, RIC testing and optionality

In a bit of circularity, the Open RAN promise of full optionality between hardware and software components is also an overarching difficulty in deploying Open RAN at scale. How do you unify management of a disaggregated system? How do you procedurally run through the essentially open-ended number of test cases and interoperability validations? And, at a higher-level, is there such as a thing as too much optionality?

Picocom specializes in silicon for small cells which company President Peter Claydon acknowledged as "very specific." He cited the challenge of plugging an inline accelerator card into a server; it sounds simple but it isn't. "You look at all the different varieties with servers and the people we're integrating with, different versions of operating systems, completely different methodologies…That is one of the challenges. Not really so much the software integration…but actually the servers."

Testing the RIC—every problem is an opportunity in disguise

In theory Open RAN specifications as defined by the O-RAN Alliance should be implemented in a consistent, uniform manner. But there's obviously deviations that come to light in the test process, O'Donnell of Viavi

Solutions said. "Sometimes companies or product developers do misinterpret the specs…and they will join up with another product where they just won't interoperate." But, he said, that's to degrees the point of plugfests and rigorous interoperability testing.

Beyond straight interoperability, O'Donnell honed in on the RAN Intelligent Controller, along with attendant

xApps and rApps, as "one of the most complicated of the Open RAN systems because it's handling intelligence."

He continued: "It uses AI, it uses ML, and then it's supposed to send back instructions to the RAN. And the RAN has to assume these instructions will actually improve things. And that's a lot of trust being put into something which could be xApps from different
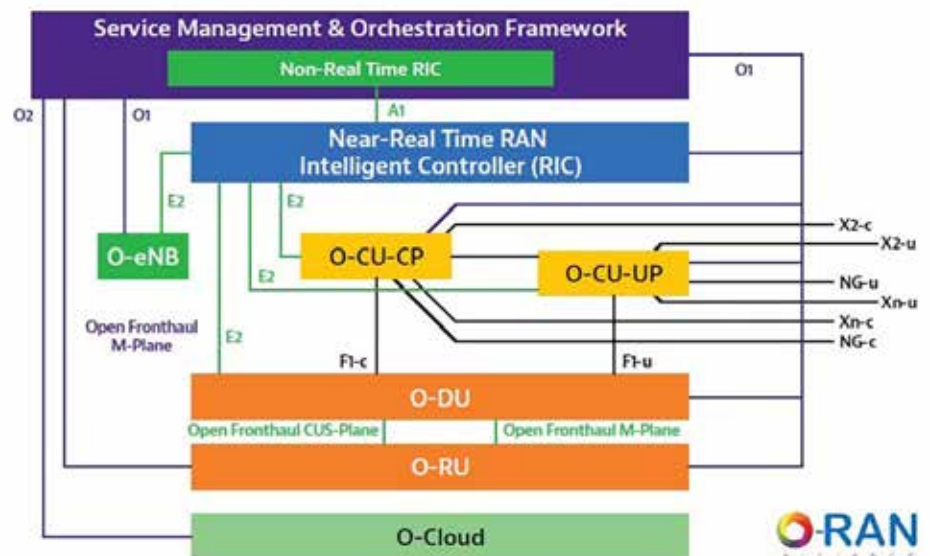

Image courtesy of Viavi Solutions

companies." This has led to a focus on RIC conformance testing. "But secondly," O'Donnell elaborated, "[customers] want a lot of RAN scenarios that can be generated for them to train their xApps. And then the third point of RIC testing is making sure that the instructions back to the RAN do, in fact, improve this situation and they don't undo something that another xApp has done. Each one is a new challenge. Each one gets resolved. And for us it's a huge learning curve, but we're getting there.

The Open RAN menu—á la carte or prix fixe?

Historically telecom infrastructure is a consolidated sector given the high barrier to entry and the sheer global scale necessary to make money. In many ways Open RAN is pushing back on the status quo in that regard but, at the same time, there are early signs of another consolidation wave (e.g. Rakuten's acquisition of Altiostar and Robin.io, and the firm's bundling of the Rakuten Mobile approach--hardware, software and integration--into the Rakuten Symphony product. This speaks to how operators are accustomed to procuring network technologies.

Disruptive Analysis Founder Dean Bubley likened this to a prix fixe menu rather than complete mixing and matching. This would potentially include pre-integrated reference designs and pre-integrated component

combinations. A vendor could offer an operator a "menu of three DUs, three CUs, whatever," he said. "You can imagine that maybe a Rakuten Symphony…it could be an IBM, it could be NEC, there's a bunch of companies that might end up looking as not purveyors of fully-integrated RANs, but with sort of moderate levels of mix and match with like 80% of the work done."

Bubley also pointed out the link between Open RAN as a vector for programmability and automation and larger operator cloud strategies. "Is it public cloud, private cloud, and for what parts of the infrastructure…So to some extent, Open RAN might get sort of pulled into that much bigger discussion about the cloud and virtualization strategy. And then you're on a sort of completely different trajectory there."

BT's Open RAN philosophy: "Build and discover"

For Chris Simcoe, BT's director of Network Applications Architecture, Open RAN is all about building and discovering. "We use the technology where we can, discover how we can move it into adjacent areas and address the concerns we have there, or find places where it's not applicable to be used. There's a lot of talk about TCO. It's not really where we're focused. I want to reduce the cost of running the network, but that might

be through automation and things like the RIC rather than really running everything on COTS hardware or something like that."

In addition to some of the aforementioned obstacles the industry is in process of working through, Simcoe noted nuances like optical interfaces between distributed and radio units as a trouble area. While this doesn't rise to some of perhaps more interesting aspects of disaggregation and virtualization, it does align with core Open RAN principals in terms of opening up physical interfaces. "Base practicality factors that come up as you're putting these things together with all these combinations, you end up with combinations that have to be lined up," he said. "And before you know it, you're kind of stuck, once again, in a silo… And we need to kind of break out of that reality."

With problems identified and solutions in progress, it seems to be a matter of when rather than how as it relates to Open RAN. Bubley gave a bit of a reality check on the timeline. "I like the broad contours and concept of open and disaggregated and, frankly, more generally cloud-based RAN. However, my view is that we are on a very long-term trajectory that essentially there's almost like a sort of seven to 10 year development cycle… Open RAN has benefits and challenges. Clearly for certain operators in certain places, it makes sense.

What's the innovative potential of Open RAN? It's all about the RIC

Looking past the TCO benefits associated with Open RAN, the real value operators are chasing (and vendors are working to prove out and monetize) has to do with new, innovative ways of operating disaggregated networks. There's consensus that, with regard to Open RAN, the real innovative potential sits in the RAN Intelligent Controller (RIC). A good analogy--potentially coined by Baker--is like an app store where operators can select particular xApps and rApps that turn network telemetry into potential actionable steps for various types of optimizations.

And getting to that goal will also be the result of innovation, according to Picocom's Claydon. "As we're seeing a great increase in complexity with 5G… being able to manage that complexity across different vendors is certainly an area where we can get innovation," he said. To the RIC, "This provides a common interface to the RAN. So I think that's an area where I think we see things happening."

The coming rise of Open RAN app developers

xApps and rApps are network automation tools. They maximize the radio network's operational efficiency. rApps are specialized microservices operating on the non-real-time RIC. xApps and rApps provide essential control and management features and functionality. xApps are hosted on the near-real-time RIC and optimize radio spectrum efficiency.

The non-real-time RIC operates from within the RIC's Service Management and Orchestration (SMO) framework. This software functions centrally on the operator's network. The non-real-time RIC communicates with the near-real-time RIC's counterpart applications, called xApps, to provide policy-based guidance.

The SMO supports open software

interfaces to facilitate rApp communications. This open design keeps RAN software vendors from locking down network features. Operators can and should update and optimize the network automation software continuously as part of a DevOps process.

O'Donnell from Viavi Solutions referred to the RIC as "the playground" of Open RAN where new players with specialized skills, xApp and rApp developers for instance, will come to the fore. "We're seeing research institutes, we're seeing universities, we're seeing startups who don't have the background in telecoms because they don't need to for some of the xApps and rApps that are being developed. One example would be energy saving or an energy consumption saving xApp—when do you switch off the transmitter, when can you power down cells, when can you switch users to different frequencies and take down part of the cell so you can have energy savings."

Translating Open RAN data into improved customer experience

Simcoe of BT said the operator "is very keen on what we can get out of the RIC." But he noted that using software-based intelligence in the lab is very different from doing it in the real world; he gave the example of cell anomaly detection. "You try

and do those things in the lab with simulators, you just don't get the behavior of actual people…And to that extent, I think that the intelligence and automation we can come up with may actually turn out to be very different in different countries based on user behavior."

Looking bigger picture at what the ability to understand and action on granular user behavior in specific service areas, Simcoe called it "a real opportunity to tune the optimization very much down to those differences we see in user experience, not just urban, rural, that sort of thing, but very much based on user behavior that we see from our customers."

Beyond the RIC, he circled back to infrastructure-driven efficiencies that Open RAN can enable. "Whenever we disaggregate things," Simcoe said, "we can potentially change the topology of the network. And usually that's where we get gains in changing the cost structure of things as we roll out new technologies."

How are operators thinking about Open RAN integration?

One of the animating conceits of Open RAN as a technology set and what's often characterized as a "movement," is enabling operators to mix-and-match

"We need to radically change the way that we do things and what Open RAN brings is a catalyst to do that."

James Grayling, Head of
O-RAN Product Integration and
Performance, Vodafone

hardware and software from multiple vendors into a radio system optimized for a particular deployment scenario. Offsetting that is one of the major recurring questions Open RAN faces: how do you reaggregate something once you've disaggregated it. To answer that question, a range of system integration models have emerged with, in some cases, operators leading their own effort, hiring a specialized system integrator—think 1&1's engagement with Rakuten Mobile, and companies with long pedigrees in enterprise IT system integration pivoting to address a nascent telecom opportunity.
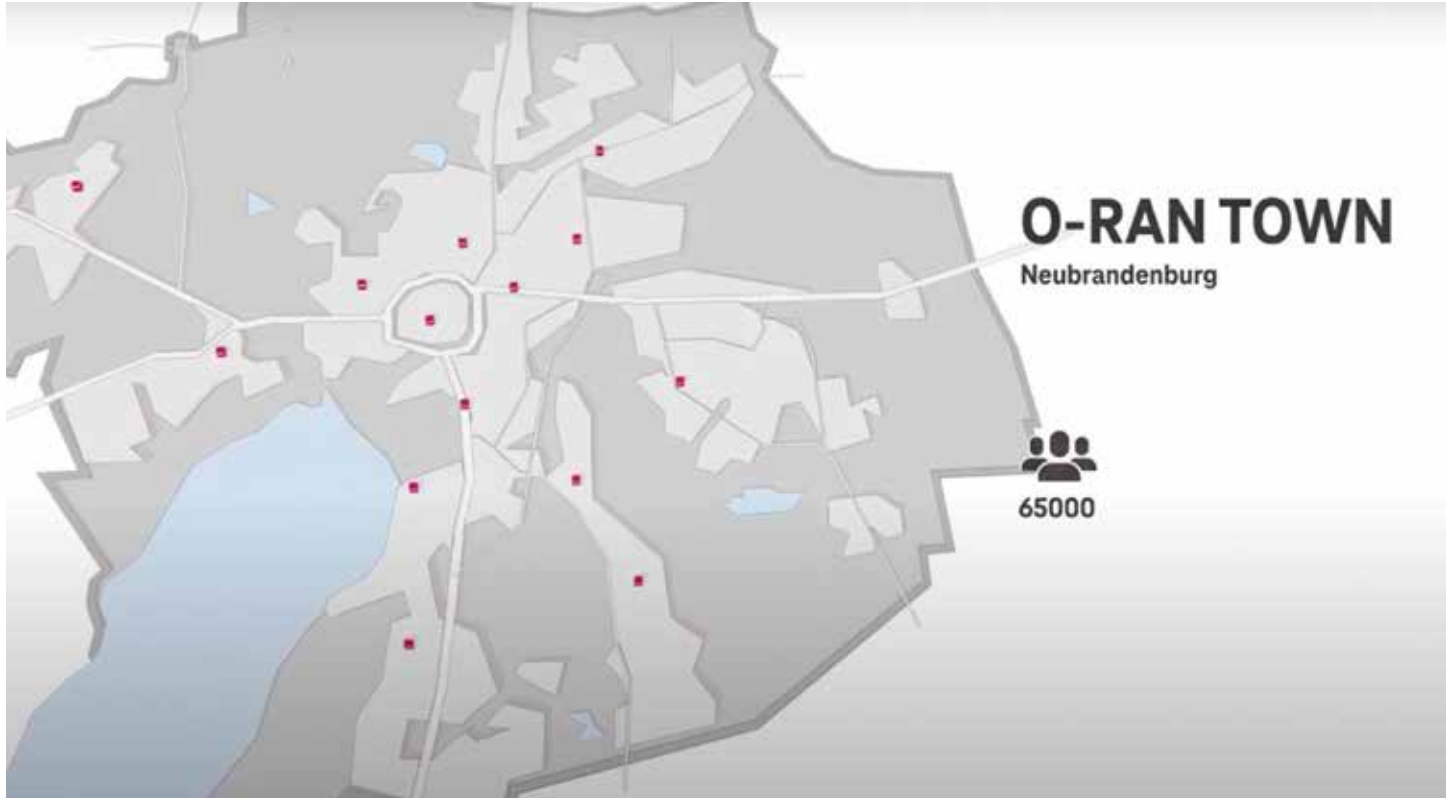
O-RAN TOWN

Neubrandenburg

65000

Deutsche Telekom has a live Open RAN network in Neubrandenburg.

Vodafone wants 30% of its European network footprint to be made up of Open RAN systems by 2030 so obviously this integration question, both before and after a site is brought live, is top of mind. So much so, in fact, that the paper published a white paper laying out their vision for multi-party support through the entire process. Vodafone's James Grayling, head of O-RAN Product Integration and Performance, walked RCR Wireless through the company's vision

Open RAN as a catalyst for radical change

"We need to radically change the way that we do things and what Open RAN brings is a catalyst to do that," Grayling said. "What I mean by that is that the way that we're working with our incumbents vendors today doesn't allow any flexibility, doesn't allow any efficiencies with regards to rollout, pre-staging

and so on. The objective…[is] to create a discussion within the industry to say, 'This is Vodafone's ambition. This is how we see system integration progressing and gaining feedback.

Grayling further broke that vision down into three elements requiring some degree of collaborative system integration work. FIrst, distributed labs for interoperability testing and verification tuned to the needs of particular market; second, pre-staging various kit configurations where they're need to hasten deployment timelines. And third, ongoing support for the network once it's made operational.

Grayling further broke that vision down into three elements requiring some degree of collaborative system integration work. FIrst, distributed labs for interoperability testing and verification tuned to the needs of particular market; second, pre-staging various kit configurations where they're need

to hasten deployment timelines. And third, ongoing support for the network once it's made operational.

Automation to take Open RAN from the lab to the field

While all three elements are important to Open RAN success, the operational piece is particularly interesting given the notion of innovation on the back of a dynamic, responsive RAN requiring long-term multi-vendor/operator working relationships. Automation will be key here, Grayling said. "Automation will play a massive role within the system integration, creating efficiencies again. But also how is it going to be managed in life? Is it going to be managed by a single entity, or is it going to be managed by the operator but governed by a system integrator?"

Deutsche Telekom's Petr Ledl, vice president and head of network trials and integration lab, echoed Grayling's

One Network.
Any Cloud.
All Software.

Building the Future of Networks
with Cloud-Native Software

3G

4G

5G

2G

Trust the Future

MAVENIR

www.mavenir.com/RCR-report

point around the foundational role of Open RAN. "Automation is the key here," he said. "Test automation and automated deployment…That's what we also learned–how important this is in order to make sure that this can be done efficiently."

DT has been working with Open RAN for some time, and last year set up the "[O-RAN Town](#)," a live, 25-site 4G and 5G network built in Neubrandenburg. Before how, maybe it's prudent to ask why given that Duetsche Telekom has around 90% population coverage with its 5G network. So what role could Open RAN play given the relatively maturity of the current offering.

"The main opportunity that we are looking at in the context of Open RAN," Ledl said, "is really how do we assure long-term ecosystem sustainability? How do we gain flexibility, programmability and how do we ensure that we can also contribute efficiently into the solution and design and deployment. Here we see the main opportunity in the high-power, high-capacity, outdoor macro deployment." He also called out potential applicability to private networks–"very important and also very relevant for us. And we will also use the Open RAN when it is beneficial and when it is relevant for these use cases."

On the how piece with regard to system integration, Ledl described a vertical and horizontal integration effort wherein "a lot of upfront coordination is required." He also picked up integrating the radio system into the service management and orchestration framework. In multi-vendor environments, "You have a lot of permutations and increased complexity compared to what we are doing today with the tightly-integrated solution." One other aspect that's related to testing, validation, integration, operationalization, the whole thing, is sufficient transparency so redundant work isn't slowing things down. "The process of integration is really important so that we can drive efficiency of integration complexity." So back to automation.

For Open RAN, "It's not all about TCO," Grayling said

In the even earlier days of Open RAN, the value narrative was simple–this new approach lowers capex and opex and therefore better. As the technology has matured, the value narrative has too with a current focus on flexible RAN architectures and systems hosted in cloud environments becoming programmable and automated. Part of this too is a growing pool of smaller hardware and software suppliers, fostering competition, and (again) innovation by virtue of a more competitive landscape. Form an operator perspective, heightened competition would also, probably, circle back to the lower capex/opex motivation.

But, "It's not all about TCO," Grayling said. "TCO is a really big driver and that has to be one of the biggest things that we push, so it's got to come in equivalent or better than the incumbent vendors that we have today…And where I'm leading there is the real true benefits are innovation and competition, because it gives the flexibility… What it does is it promotes the capability for the operator and the industry to go to the smaller players, the smaller startup companies for argument's sake to say, 'Look, I need a specific radio or a specific DU to address this particular market.'…TCO is the big strap line, but what Open RAN does is it brings other opportunities that we just couldn't have tapped into today by working with one of the proprietary vendors."

How close are we to fully-automated Open RAN networks?

Open RAN has been the subject of earnest development for a number of years and has seen large-scale commercial deployment by three major global operators building new networks with significant commitments from many large brownfield CSPs. Reducing TCO through vendor competition, component commoditization and cloud-scale are major investment drivers but there's also the promise of new types of innovation derived from

the RAN Intelligent Controller. As a cloud-based RIC ingest network telemetry, it can provide near-real-time network visibility and optimization capabilities that further the move toward network automation. But how close are we to fully-automated Open RAN networks?

In a panel discussion at the [Open RAN European Forum](#), LightCounting Principal Analyst Stelyana Baleva talked through the current state of network automation, the future outlook and the role of Open RAN with industry experts. While there was agreement that network complexity is rapidly increasing which raises additional challenges, the opportunity is there and that's a good thing as operator's face lack of differentiation and stagnant service revenues that can be combated by end-to-end automation.

Open RAN extends programmability

Henri Helanterä, a business manager with Elisa Polystar, an offshoot of Finish operator Elisa specialized in network automation solutions for CSPs, explained: "I think Open RAN brings a lot of capabilities to programmatically manage the radio access network at the level that has not been possible in the past, but then at the same time, this disaggregated architecture, so both horizontal disaggregation and vertical disaggregation, it also adds some complexity that needs to be addressed. So it brings some solutions, but it also brings some challenges for zero touch operation of the network."

CommScope's Colin Bryce, senior director of product line, tracked the movement from self-configuration, self-healing and self-optimization into the world of software-based service management and orchestration in virtualized and disaggregated networks. "I think it really is about end-to-end orchestration of the network and then controlling the physical layers and the

software implementations to deliver those services and manage them automatically," he said.

As for the role of Open RAN, it's not strictly necessary, Bryce said but, "I think openness and particularly defining data structures and defining protocols makes it much, much easier to allow the concept of network management to be implemented end-to-end across the network. "

The role of the RIC in Open RAN automation

Bryce called the RIC "one of the more important aspects of the Open RAN architecture" in terms of automation capabilities. He called out development of xApps and rApps that could run on the RIC and focus on specialized applications as filling a gap in current telecom domain expertise. "Let's face it: most of us in the mobile industry today are telecoms experts. We're not AI experts. We're not machine learning experts. But if we can deliver the APIs and we can deliver the structures of data to guys who really are experts in those fields, they will be able to drive those self-learning algorithms into our industry."

xApps and rApps hosted on the RIC, Helanterä said, cover control of handover, dual connectivity, carrier aggregation, and potentially beamforming, will need "a standardized platform or framework created for running these applications…These applications could come from different providers, and therefore, those application providers could focus on the application logic without having to recreate all the data management and security infrastructure."

Exposing Open RAN data for further RIC development

In terms of the RIC in the broader context of automation and its maturation, Helanterä gave a bit of a reality check. "There are of course a lot of loaded expectations that machine learning will bring some kind of a magic into the way that we manage these networks and the way we automate these networks by creating adaptable and generalized logic that can span across different kinds of network deployments without a need to tweak the logic between different instances."

To get to that point, it's important, he said, to think practically and focus on exposing data for use in machine learning model development which further requires modern data platforms and good data management. "I think these kind of architecture initiatives that we see with the O-RAN Alliance, for example, that is certainly taking us to the right direction there."

Bryce noted the delta between the technological ability to automate a network function and operators' comfort levels with putting that into real-world practice. The first step toward building confidence will be delivering on specified KPIs to demonstrate, "Hey, we can take the human out of the loop, as it were, and let these machine algorithms begin to manage the network. But, I think, psychologically, for a lot of network operators, I think there's going to have to be that initial step of not just turning this on and hoping for the best and seeing that it improves, but actually comparing the performance with some idealistic plan and giving us the confidence that this really is going to bring the benefits that we see."

Conclusion

"The main positives here are cost reduction, choice and innovation," O'Donnell summarized. "Obviously there will be issues, but then they get ironed out and then things start working together." Easier said than done but it's certainly being done by a growing and active ecosystem of stakeholders. While there may be disagreement on the replicability of the Open RAN business case, there's clear consensus that programmable and automated radio access networks are the future. ((·))

Picocom

Picocom is a multi-award-winning semiconductor company that designs and markets Open RAN standard-compliant baseband SoCs and carrier-grade software products for 5G small cell infrastructure. Our aim is to empower wireless innovation by delivering class-leading technology and products.

NI

National Instruments provides platform-based systems that enable engineers and scientists to solve the world's greatest engineering challenges. NIs flexible platform is used by researchers in both industry and academia to help usher in the next generation of 5G wireless communications, including advancements in mmWave and Massive MIMO as candidate technologies for 5G.

Mavenir

Mavenir is building the future of networks and pioneering advanced technology, focusing on the vision of a single, software-based automated network that runs on any cloud. As the industry's only end-to-end, cloud-native network software provider, Mavenir is focused on transforming the way the world connects, accelerating software network transformation for 250+ Communications Service Providers and Enterprises in over 120 countries, which serve more than 50% of the world's subscribers.

RCR Wireless News
INTELLIGENCE ON ALL THINGS WIRELESS

Need guaranteed leads? Thought leadership? Incremental content marketing opportunities?

Sponsor an *RCR Wireless News*' multi-platform, editorial program and receive the following benefits:

Editorial Webinar – sponsorship includes 250 guaranteed leads, participation as sponsored guest and recognition as sponsor in all promotional materials. Sponsors will receive webinar registration and attendee list, responses to pre and post surveys and polling responses gathered during webinar.

Editorial Feature Report – in addition to recognition as sponsor in program promotion, sponsorship includes 250 guaranteed leads, distinct from webinar leads, one-page ad spread or advertorial in feature report, and responses to lead capture survey questions.

For information contact sales@rcrwireless.com

Fast facts about *RCR Wireless News* digital network

- 382,000 monthly page views
- 170,000 unique monthly visitors to websites
- 81,000+ opt in newsletter subscribers
- 220,526 monthly video minutes viewed on *RCR Wireless News* Youtube channel
- 45,000 leads generated annually
- Industry leading demand generation programs and results

http://www.rcrwireless.com/category/free-reports