DELL Technologies

The Future Is Open: An Introduction to Open RAN

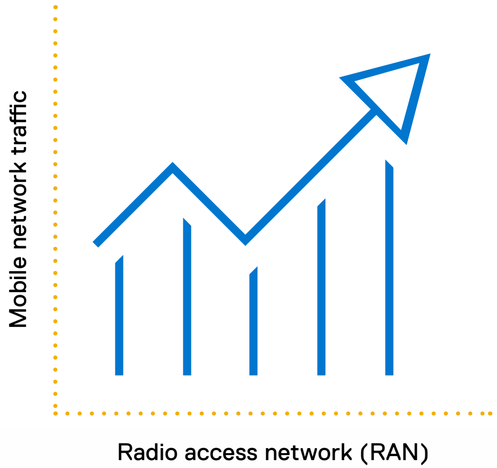
Get Started >






What is Open RAN, and why does it need to be open?

The **radio access network** (RAN) is arguably the most important — and traditionally most expensive — part of a mobile telecommunications network. The RAN is responsible for the speed, size and quality of communications that travel between mobile devices and the telco operator's "nerve center," the core network.



The bigger the RAN, the more traffic that mobile networks can handle. And **bigger** is exactly where mobile networks are headed, as the growing demand for wireless video and data traffic will soon double the amount of RAN capacity needed — and continue to grow at never-before-seen levels with the popularization of 5G and the Internet of Things (IoT).

For the average mobile consumer, the RAN is largely invisible except for the occasional radio tower. For mobile service providers, however, scaling RAN capacity is the sort of thing that keeps them awake at night. RANs are expensive for a few reasons: they are complex to build, are costly to maintain and have traditionally been offered by only a handful of specialized equipment providers.

More RAN capacity equals more cost and complexity at a time when mobile consumers expect the same (or better) service at the same (or lower) prices. A Hiver report suggests that more than 80% of consumers in the US expect customer support to get more empathetic or responsive — or both.[2]

The global RAN market is exploding — and projected to reach

$44.78 billion by 2026.[1]

[1] Allied Market Research, Radio Access Network Market Outlook — 2026, January 2020.
[2] Markets Insider, 80% consumers expect better customer service during COVID-19, finds Hiver research, October 2020.

What is Open RAN, and why does it need to be open?

So, how will mobile service providers handle more RAN traffic without increasing costs and limiting services? It's a question that has found its answer in Open RAN solutions. Instead of relying on proprietary, expensive, standalone RAN systems to provide network connectivity, Open RAN proposes that mobile service providers use the same open, cloud-based architecture models adopted for enterprise networks and core telecommunications networks to bring more vendors, modular components and greater efficiencies of scale to RAN systems.

By creating standard interfaces to virtualized RAN elements, vendors can offer mix-and-match, best-of-breed solutions that can run on common-off-the-shelf (COTS) servers and can be quickly deployed and cost-effectively scaled nearly anywhere in the world.

What are the benefits of Open RAN?

Eliminate vendor lock-in.
Faster deployments.
Ready access to innovation.

These are just some of the reasons mobile service providers are excited about Open RAN solutions. If these benefits sound familiar, they should; they're some of the same benefits associated with virtualization and the cloud, both of which play an important role in the Open RAN architecture.

By opening the RAN to virtualized network functions, COTS hardware, industry-standard interfaces and cloud technologies such as containers and Kubernetes®, Open RAN also opens the field to more vendors. Now, instead of being locked into a single RAN vendor's vision and proprietary hardware and software, mobile service providers can mix and match vendor solutions for the best combination of price, performance and features — and the agility to add new innovations as they become available.

In the world of 5G and IoT, the RAN becomes much more than an access gateway to the mobile network. As network intelligence and services move from the core to the edge of the network, the RAN system provides a unique opportunity for network and service differentiation.

The faster that mobile service providers can deliver and scale services at the edge, the more effectively they can compete for critical enterprise and 5G services. As with virtualized RAN (vRAN) systems, Open RAN systems enable disaggregation of RAN functions — such as the radio unit, centralized unit and distributed unit — so that mobile service providers can quickly scale user and control planes independently for better performance and value.

Disaggregate RAN functions to quickly and independently scale user and control planes for better performance and value.

Three more important benefits of Open RAN solutions are cost, security and supply chain stability. Increased vendor competition is expected to yield lower costs for RAN systems over time, particularly for vRAN technologies. Open RAN systems can also provide more security visibility through better analytics.

And, finally, using standardized components, such as COTS hardware and cloud-based tools, opens the supply chain, preventing a single vendor's supply chain issues from impacting the future.

CHAPTER 3

What does the Open RAN architecture look like?

In many networks, the RAN represents the last stronghold of proprietary hardware and software. While the mobile core is progressing to a virtualized, cloud-based architecture, the RAN remains rooted in vendor-based appliances such as the radio unit (RU) and baseband unit (BBU).

In between these appliances, communications take place over proprietary protocols and interfaces based on vendor specifications rather than open industry standards. So, if you want to upgrade your RAN or increase its capacity, you need to return to the original vendor to add RUs and BBUs.

> **Scale intelligently as the number of devices and amount of traffic scale independently.**

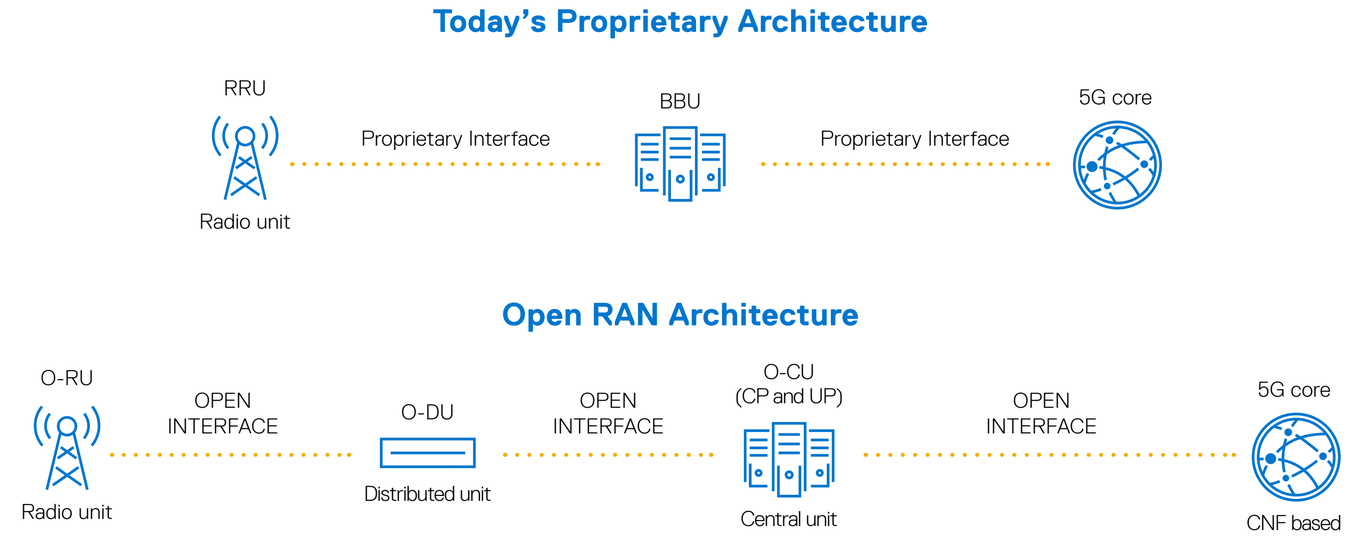


Figure 1. A high-level comparison of closed vs. open RAN systems.

Open RAN disaggregates the BBU into distinct network functions — the centralized unit (CU) and distributed unit (DU) — that can be virtualized and deployed on standard COTS hardware. In addition, the CUs and DUs can be deployed locally or centrally, based on control- and user plane traffic requirements, allowing mobile operators to scale intelligently as the number of devices and the amount of traffic scales independently. At the same time, Open RAN virtualizes the RU function for similar scaling and cost efficiency (see figure 1).

What does the Open RAN architecture look like?

With an Open RAN architecture, communication between the various RAN elements takes place over open standards rather than proprietary interfaces, which enables mobile service providers to mix and match components from different vendors within their virtualized RAN (vRAN) ecosystem. In addition, the Open RAN specifications define a new capability called the RAN Intelligent Controller (RIC) that is tasked with managing and optimizing RAN resources.

The RIC is split into non-real-time and near-real-time functions that use policies to optimize network performance and reduce costs. The RIC helps to bring third-party applications into the RAN for increased innovation and lower total cost of ownership.

Disaggregation alone doesn't equal an Open RAN system.

Some vendors have chosen to disaggregate RAN components while keeping the system closed through proprietary interfaces. This approach offers moderate improvements in scale but remains limited in terms of vendor choice and new innovations.

Real-world use cases for Open RAN

- Manufacturing
- Healthcare
- Retail
- Government/smart cities
- Oil and gas

While Open RAN investments are expected to increase in the next five to ten years —

> **accounting for more than 10% of the overall RAN market by 2025[3]**

— mobile service providers are already looking to Open RAN solutions to address growth and new market opportunities. Vertical applications are the big opportunities for communications service providers (CSPs).

Dell Technologies, in concert with leading Open RAN equipment providers and mobile operators, is helping to lead the next generation of RAN solutions through a variety of groundbreaking initiatives that are currently underway and serve as a roadmap for how Open RAN technology will fit into the future.

[3] The Fast Mode, Open RAN Market to Reach $10B by 2025, Forecasts Dell'Oro Group, February 2021.

CHAPTER
4

Real-world use cases for Open RAN

In Europe, **Vodafone** is building new edge-based solutions using Dell's 5G technology. The Vodafone® project represents Europe's first commercial Open RAN network and will initially feature Dell PowerEdge servers at 2,500 base-station sites across the United Kingdom.

vodafone

Edge services, standalone 5G networks and private 5G networks for enterprises are some of the early use cases for Open RAN technology, but the future of Open RAN has much broader implications as new applications such as virtual reality, autonomous vehicles, remote healthcare and IoT become commonplace. These innovations will not be created in a vacuum but will be driven by a multivendor ecosystem of hardware, software and telecommunications technology providers working within an open, standardized framework.

Dell, Mavenir and VMware: An Open RAN reference architecture

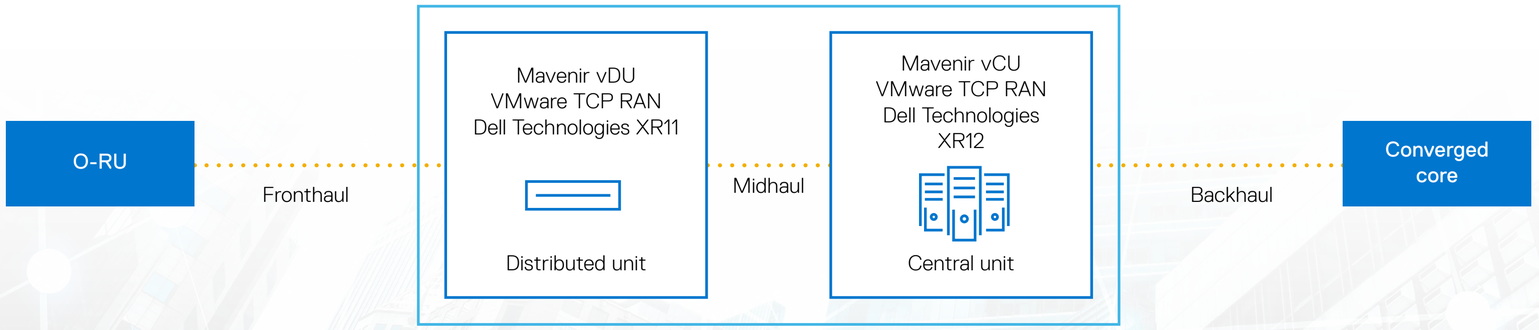
The idea behind Open RAN solutions is that vendors can come together to do what they do best in order to develop true best-of-breed RAN solutions. A good example of this is the Open RAN architecture developed by Dell Technologies, Mavenir and VMware.

This Open RAN reference architecture supports a proven, tested Open RAN solution that brings together telco-grade hardware, cloud, and virtual RAN (vRAN) technology for the rapid, cost-effective deployment of 5G RAN systems. The reference architecture features Dell telco-grade servers with Intel® FlexRAN™ technology, Mavenir® vRAN software to address the virtual CU and DU (vCU and vDU) functions, and VMware® Telco Cloud Platform™, which includes RIC capabilities.

With this architecture, mobile operators can implement and automate 5G solutions across their network, including:

- At the cell/tower site, vRU elements that support 4G and 5G spectrum concurrently at the cell/tower location to ease the transition to 5G
- At the far edge of the network, multi-access edge computing (MEC) applications featuring vDU elements that can be easily scaled to handle greater bandwidth and processing requirements
- At the near edge of the network, vCUs to flexibly support more users
- In the mobile core, evolved packet core technology that ensures seamless experiences between 4G and 5G users

Open RAN Reference Architecture (Tech Preview)



DELL Technologies

- PowerEdge XR11
- PowerEdge XR12
- Professional services
- System integration
- System engineering

MAVENIR

- vCU
- vDU
- 5G Core on Mavenir Webscale Platform
- EMS

vmware

- Telco Cloud Platform (TCP) RAN
- Telco Cloud Automation™

intel.

- RAN software stack (FlexRAN)
- eASIC Accelerator cards
- Intel 3rd-generation Xeon® chips
- System engineering

Accelerating Open RAN solutions for the future

The primary advantage of a proprietary RAN solution is the presumption that everything will work together out of the box. Multivendor solutions such as those proposed by Open RAN require integration, testing and validation to ensure smooth interoperability. This isn't an insurmountable challenge, of course, as multivendor solutions have become commonplace in the telecommunications industry, but it does represent an added element of complexity.

To address this challenge, Dell Technologies has launched the Open Telecom Ecosystem Lab (OTEL) to bring vendors and 5G operators together for testing, validation and the creation of new services. OTEL is a state-of-the-art facility that features advanced equipment, standards-based solutions and deep telco expertise to test and develop the 5G solutions of tomorrow (see Figure 2). By offering a collaborative and secure environment for 5G solutions testing, OTEL enables operators, enterprises and network equipment vendors to deploy Open RAN solutions faster and with less risk.

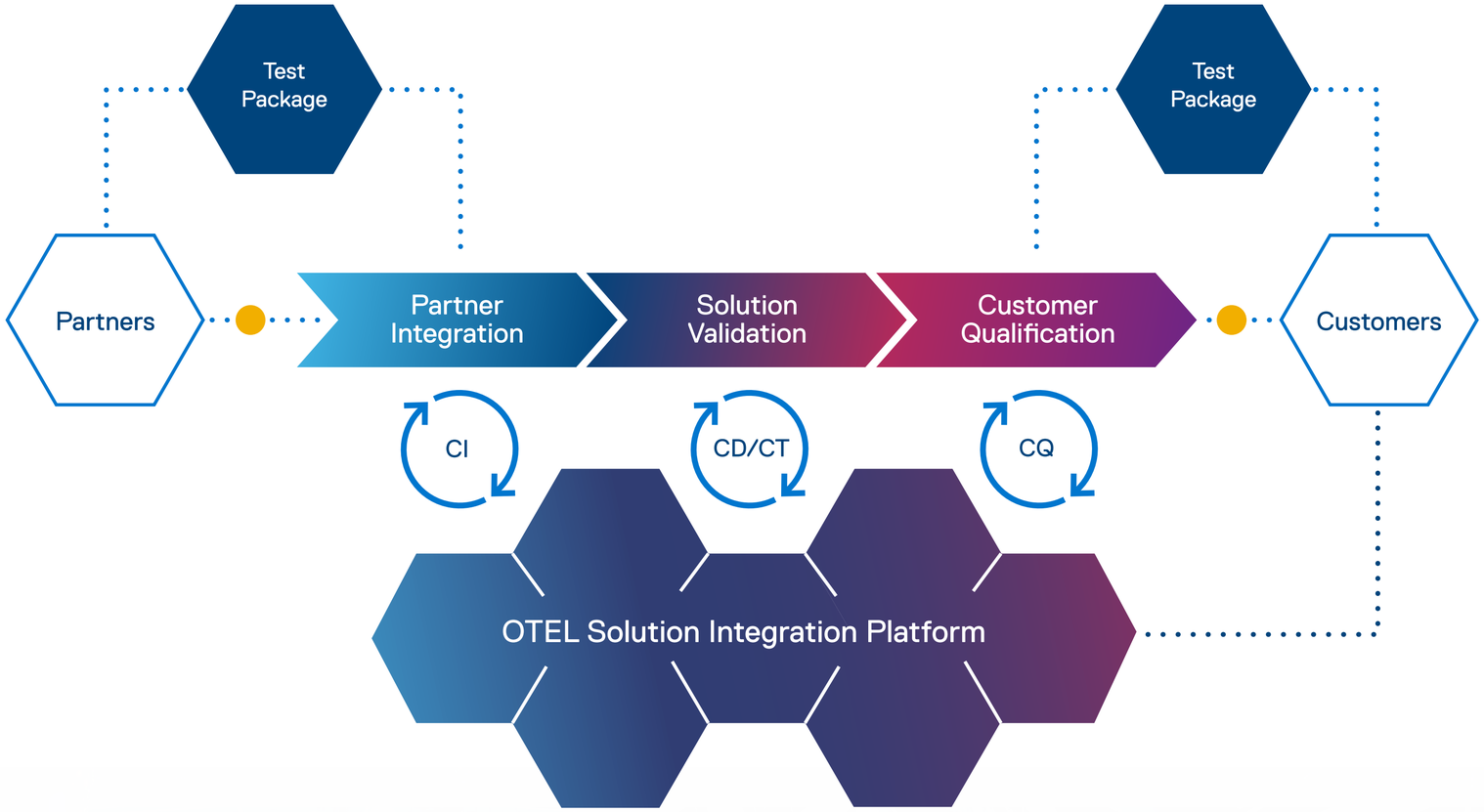


Figure 2. OTEL Solution Integration Platform.

Accelerating Open RAN solutions for the future

Open RAN solutions need to deliver the high performance, cost efficiency and innovation that 5G services require. To date, however, vRAN solutions have struggled to achieve price/performance parity with purpose-built RAN appliances. Dell, working together with Marvell Technology, has addressed this issue by jointly developing the industry's first layer one inline accelerator card for vRAN and Open RAN servers.

Leveraging the same Marvell® chipset featured in RAN appliances from leaders such as Nokia® and Samsung®, Dell's Layer 1 inline accelerator card enables COTS servers to now deliver the same (or better) price/performance as purpose-built appliances (see Figure 3) while allowing mobile service providers to mix and match RAN products from a wide variety of software and hardware vendors.

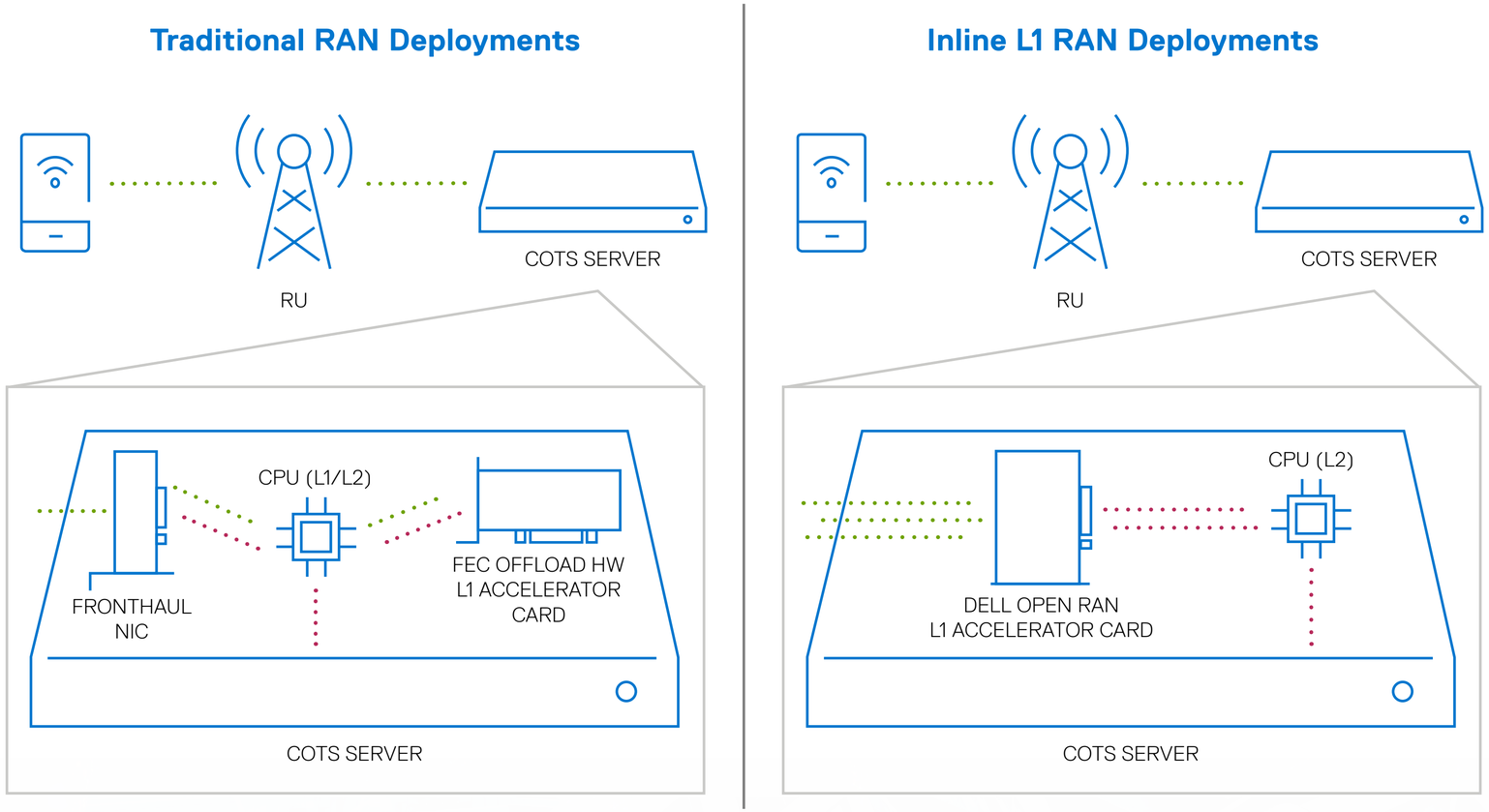


Figure 3. Comparison of traditional RAN deployments vs. RAN deployments with Dell Technologies Layer 1 inline accelerator card.

Are you ready for Open RAN?

At Dell, we believe that Open RAN is the future, but we also understand that the future is different for everyone. While it's critical that operators prepare for the future, they also need the flexibility to innovate and evolve at their own pace. For some, this can mean a phased migration from 4G to 5G. For others, it can mean the ability to quickly deploy standalone 5G networks in new regions or markets.

The key to the success of 5G and Open RAN is collaboration. The best ideas are rarely created in isolation. Instead, they occur when partners share resources and expertise in the pursuit of a common goal. For Open RAN, that goal is nothing less than a new era of mobility where automation, artificial intelligence, intelligent devices and rich-media experiences transform the way we work and live.

Open RAN can enable a new era of mobility — where automation, AI, intelligent devices and rich-media experiences transform the way we work and live.

Maybe you're ready for Open RAN right now. Maybe you're simply ready to learn more about it. We invite you to discover everything that Open RAN has to offer — both today in Dell's market-ready solutions and tomorrow in the joint initiatives that Dell and its partners are currently developing.

To start your journey, visit us at Dell.com/ORAN.

DELL Technologies