

# Dell Technologies Open RAN Reference Architecture with Mavenir, VMware<sup>®</sup> and Intel<sup>®</sup> Tech Preview

## Summary

The Dell Technologies Open RAN reference architecture tech preview is an end-to-end 5G Open RAN solution featuring industry-leading components from Dell Technologies, Intel, Mavenir, and VMware. It supports virtualized and cloud-native 5G RAN functions deployed in a disaggregated, flexible architecture built around Open RAN specifications. This reference architecture tech preview helps CSPs accelerate their transformation to Open RAN while reducing costs and minimizing risk.

## The road to Open RAN and 5G is an open road

Open RAN is a vital component to the future success of 5G and gives Communications Service Providers (CSPs) more choice and flexibility in how they deploy their radio networks. The ability to extend radio capacity quickly, efficiently, and cost-effectively will be a significant driver that allows CSPs to accelerate the deployment and monetization of 5G services.

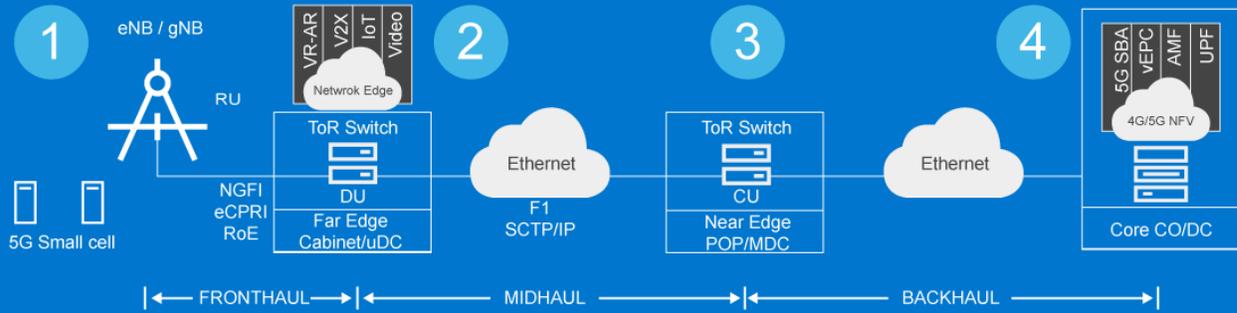
Open RAN not only opens up the RAN interfaces but also opens up innovation to a broad, multivendor ecosystem. Standards Development Organizations such as 3GPP and the O-RAN Alliance have defined standard interfaces and protocols that promise to drive down the RAN cost while also giving CSPs more flexibility and control as they deploy the 5G networks of the future. Dell Technologies commits to open, standards-based solutions and is leading this industry-wide initiative by working closely with O-RAN standards bodies and an open network ecosystem of partners to bring advanced, best-of-breed Open RAN solutions to market.

## Dell Technologies Architectural Vision for Open RAN

Dell Technologies' architectural vision for Open RAN is an end-to-end approach that allows CSPs to strategically and efficiently build out and support network investments from the core to the edge to the RAN. Our Open RAN architecture (see figure below) provides flexible deployments at four critical points in the 5G network:

- At the cell/tower site, CSPs can deploy a Radio Unit (RU) that supports 4G or 5G (5G mmWave, Sub-6GHz) spectrum concurrently
- At the far edge of the network, CSPs can deploy virtual Distributed Units (vDUs) to support resource pooling of virtualized/cloud-native network functions (VNFs/CNFs) for the user plane, multi-access edge computing (MEC) applications, or local breakout capabilities
- At the near edge of the network, CSPs can deploy virtual Centralized Units (vCUs) to host VNFs/CNFs as needed to support optimized control-plane and user-plane activities
- In the converged 4G/5G mobile core, CSPs can choose evolved packet core (EPC) or 5G Core (5GC) solutions from a variety of RAN/vRAN vendors

# Dell Technologies Open RAN architecture vision



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|--|---|---|---|
| <p><b>1</b></p> <ul style="list-style-type: none"> <li>Partnership for single/multicarrier RU</li> <li>5G millimeter wave/sub 6 GHz</li> </ul> | <p><b>2</b></p> <ul style="list-style-type: none"> <li>Hardened, reduced form factor distributed unit</li> <li>Multi-RAN technologies</li> <li>VNF/CNF resource pooling</li> <li>MEC</li> <li>Local breakout</li> </ul> | <p><b>3</b></p> <ul style="list-style-type: none"> <li>Centralized unit for improved system capacity</li> <li>Coordination of important 5G capacity improvement features</li> <li>VNF/CNF resource pooling</li> </ul> | <p><b>4</b></p> <ul style="list-style-type: none"> <li>Converged core architecture</li> <li>vEPC to 5G CNF migration</li> </ul> |
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This end to end architecture will enable the use of the new 5G QoS schema which which allows the setting of QoS attributes on a much more granular level than 4G LTE (on a per-service data flow level versus the bearer level), and also enables Network slicing.

## Dell Technologies Open RAN Reference Architecture Tech Preview

In partnership with Mavenir, VMware, and Intel, Dell Technologies offers CSPs a best-of-breed path to Open RAN. This solution brief provides an overview of an upcoming thoroughly tested reference architecture currently planned for Q3 of 2021. The forthcoming reference architecture solution combines industry-leading RAN hardware and software from Mavenir, Intel, VMware, and Dell. Dell is taking the first step to helping CSPs accelerate Open RAN and, ultimately, launch new 5G services by bringing together the components from industry leading Open RAN vendors.

The solution includes the following:

- Mavenir:** Centralized Management Service (mCMS), Smart Deployment as a Service (SDaaS), Analytics, 5G Centralized Unit-Control Plane (CU-CP), Centralized Unit-User Plane (CU-UP), 5G Distributed Unit (DU), and Mavenir Telco Cloud Integration Layer (MTCIL)
- VMware:** Virtualized Infrastructure, Platform as a Service (PaaS), Container as a Service (CaaS) and the Orchestrator and Automation layers
- Dell Technologies:** PowerEdge XR11, XR12, and R750 servers power the Open RAN solution
- Intel:** 3<sup>rd</sup> generation Xeon Scalable server processors, eASIC hardware acceleration, and FlexRAN 5G reference architecture

## Mavenir 5G NR Open vRAN Solution

The Mavenir 5G NR Open vRAN solution is fully containerized and virtualizes the baseband unit functions into the Open Centralized Unit (O-CU), the Open Distributed Unit (O-DU), and third-party Open Radio Units (O-RU). The O-CU is consolidated in one or more data centers on O-RAN-based open interfaces and distributed geographically by virtualizing the control plane and user plane functions. This architecture provides several benefits, including:

- Scalable Architecture:** Provides a software architecture in CU-CP, CU-UP, and gNB DU that scales with the available cores.
- Network Densification:** Provides a flexible radio infrastructure that adapts to usage patterns for improved coverage and enhanced user experiences.
- Scalability:** Cloud-native design guarantees scaling, availability, and performance in a fully virtualized environment.

- **Adaptability:** Open standardized interfaces for a disaggregated vRAN (3GPP + O-RAN) and continuous adaptation for interoperability.
- **Simplicity:** Focus on simplifying operational complexity leading to zero-touch COTS deployments.

## VMware Telco Cloud Platform RAN

### *Dell Technology Open RAN Solution*

VMware Telco Cloud Platform RAN is powered by a field-proven virtualized compute solution coupled with VMware Tanzu Basic for RAN, a telco-grade Kubernetes distribution, and VMware Telco Cloud Automation. The platform paves a clear RAN modernization path: CSPs can move from their traditional RAN to vRAN to O-RAN.

VMware Telco Cloud Platform RAN also transforms the RAN into a 5G multi-services hub that enables CSPs to develop and deploy custom 5G applications alongside vRAN functions while delivering superior quality of 5G services and customer experience from RAN sites. As a result, CSPs can monetize the RAN.

Through VMware Telco Cloud Automation, the platform is capable of automatically provisioning thousands of instances across distributed RAN sites. Furthermore, by understanding the requirements, such as latency and bandwidth, of each vRAN function intended to be instantiated, the platform programmatically configures the underpinning resources for better utilization. This intelligence enables CSPs to dynamically adjust where the functions should be deployed with cloud-first lifecycle management, simplifying Day 0, Day 1, and Day 2 operations while providing telco-grade resiliency and service availability.

The VMware Telco Cloud Platform RAN allows CSP to:

- Run virtualized baseband functions, virtualized distributed units (vDUs), and virtualized central units (vCUs) in accordance with stringent RAN performance and latency requirements
- Optimize the placement of DUs and CUs through programmable resource provisioning
- Use the same common platform to virtualize the RAN and migrate to O-RAN
- Deploy and operate both RAN and non-RAN workloads on a horizontal platform
- Transform the RAN into a 5G multi-services hub
- Use a security-hardened real time Linux host called Photon OS that is optimized for running containers on VMware vSphere®
- Isolate containerized network functions (CNFs) on virtual machines and the VMware hypervisor, VMware ESXi™, to establish a strong security boundary
- Automate lifecycle management of infrastructure, Kubernetes clusters, vRAN functions, and 5G services

## Dell EMC PowerEdge Servers

The Dell EMC PowerEdge XR11 and XR12 servers, powered by 3<sup>rd</sup> Generation Intel Xeon Scalable processors, are high-performance, high-capacity servers explicitly built for demanding workloads at the edge. They have a reduced form factor (400mm or 16 inches deep) and are NEBS3 compliant. These features make them ideal for more challenging deployment locations at the far edge, where space and environmental conditions become more demanding.



*Dell EMC PowerEdge XR11 Server*

The Dell EMC PowerEdge XR11 and XR12 servers include:

- certification to operate in rugged, dusty environments ranging from -5C to 55C (41F to 131F)
- multi-accelerator support
- reversible mounting with front-facing I/O & power supplies
- MIL-STD qualified for shock, vibration, dust, and other environmental variants



*Dell EMC PowerEdge XR12 Server*

The Dell EMC PowerEdge R750, powered by 3rd Generation Intel Xeon Scalable processors, is a rack server that optimizes application performance and acceleration. The R750 is a dual-socket 2U rack server that delivers outstanding performance for the most demanding workloads. It supports 8 channels of memory per CPU and up to 32 DDR4 DIMMs at 3200 MT/s speeds. In addition, to address substantial throughput improvements, the PowerEdge R750 supports PCIe Gen 4 and up to 24 NVMe drives with improved air-cooling features and optional Direct Liquid Cooling to support increasing power and thermal requirements. These capabilities make the R750 an ideal server for data center standardization on a wide range of workloads, including Open RAN, requiring performance, extensive storage, and GPU support.

### Hardware accelerator card

The demanding Open RAN physical layer processing required by 5G necessitates an outboard PCIe hardware accelerator card. Dell Technologies plans to leverage Silicom's Lisbon ACC100 Forward Error Correction (FEC) card. Silicom's eASIC ACC100 FEC Accelerator server adapter is based on the Intel vRAN Dedicated Accelerator ACC100.



*Silicom Lisbon ACC100 Card*

### High-performance systems

Dell Technologies brings the latest technology innovation to the telecommunications industry, from high-performance microprocessors to scalable storage, hybrid cloud architectures, to hyper-converged infrastructure. By fast-tracking innovation to CSPs, Dell opens up a new world of possibilities to improve network performance, reduce network costs, and deploy 5G networks in highly flexible, scalable configurations. In addition, we work tirelessly with our technology partners to ensure that our solutions can leverage the latest advancements to deliver a competitive advantage to our customers.

### Integration and trust

Dell is a trusted partner globally, with a global supply chain that delivers millions of servers and computers on time, year after year. CSPs trust Dell to work closely with their network teams and partners to customize and create open solutions that meet their unique requirements. Dell can help CSPs tailor an Open RAN solution that combines the right silicon, performance, total cost of ownership, and security with professional services to reduce the risk and accelerate 5G network deployments.

### An open, validated approach to innovation

Dell Technologies offers reference architectures of open solutions that accelerate the CSP transformations of tomorrow. With its commitment to Open RAN, Dell is leading a cross-industry initiative to bring technology from the world's leading IT vendors to bear on the most critical challenges that CSPs are facing today. Our deep and long-standing relationships with VMware, Intel, and Mavenir allow us to develop and test solutions that embrace open standards, multivendor ecosystems, and the latest market innovations.

Open RAN technology is critical to the success of 5G. It opens the future to more innovation, smoother and more reliable supply chain operation, and competitive pricing. Dell Technologies is committed to Open RAN technology through its partnerships, industry alliances, and growing investment in 5G research, development, and services.

## Solution Highlights

The Dell Technologies Open RAN reference architecture tech preview can support end-to-end 5G RAN systems through a best-of-breed solution that includes:

- Dell Technologies XR11 and XR12 ruggedized and short-depth servers featuring Intel third-generation Xeon Scalable processors, eASIC hardware acceleration, and FlexRAN 5G reference architecture
- Mavenir virtual RAN (vRAN) Open vRAN software including DU, CU, and the element management system (EMS)
- VMware Telco Cloud Platform RAN and Telco Cloud Automation software