Leveraging Dell EMC PowerEdge Servers for CSP Edge Deployments

July 2021

H18858

White Paper

Abstract

This white paper describes how Dell Technologies is helping to shape the future of Open RAN solutions with our partnerships and our high-performance, purpose-built XR11 and XR12 PowerEdge Servers designed for Open RAN and edge deployments.

Dell Technologies Solutions

D&LL Technologies

Copyright

Contents

PowerEdge XR11/XR12 – Designed for O-RAN and Far Edge

If you were to describe the future of telecommunications in a single word, it might be open. There are, for example, new revenue opportunities that 5G will open, from virtual reality to self-driving vehicles. There is the open, cloud-native architecture that will deliver the telecommunication services of tomorrow. And there is an open ecosystem of partners beyond the past proprietary network equipment vendors that will help build this new architecture.

One of the more exciting aspects of this open future is Open RAN.   Open RAN provides opportunities to replace the proprietary, purpose-built RAN appliances of the past with standardized, virtualized hardware that can be deployed anywhere—at the far edge, regional edge, or centralized data centers, with Intelligent Controllers to provide optimized performance and enhanced automation capabilities to improve operational efficiency.

Open RAN is an industrywide movement that promotes the adoption of open and interoperable solutions at the RAN. The O-RAN Alliance is where network equipment vendors and telecommunications providers are partnering on a roadmap for the future. Open RAN solutions allow telecom operators to disaggregate elements of the RAN, with the goals of reducing costs, extending scale and accelerating deployment cadence. With a virtualized Open RAN solution, telcos can deliver faster, richer 5G experiences by moving applications and services closer to consumer or enterprise user.

In this white paper, we'll discuss how Dell Technologies is helping to shape the future of Open RAN solutions with our partnerships and our high-performance, purpose-built XR11 and XR12 PowerEdge Servers designed for Open RAN and edge deployments.

Introducing the Dell PowerEdge XR11 and XR12

The O-RAN Alliance creates the open interfaces between the O-RU, O-DU, and O-CU that can be disaggregated and deployed independently. In the O-RAN frameworks, the Baseband Unit (BBU) of the traditional RAN can be separated into virtualized Distributed Unit (vDU) and virtualized Centralized Unit (vCU) components that can be scaled independently as control and user plane traffic requirements dictate. In building an open hardware platform for a vRAN architecture, six critical factors need to be considered:

- Form factor
- Environment
- Components
- Security
- Automation and management
- Supply chain

With the growing number of edge deployments required to support 5G O-RAN services, edge-optimized cloud infrastructure is essential. These six factors ensure that telco providers build their 5G RAN on a scalable, highly available, and long-term sustainable foundation. Dell Technologies took each of these factors into consideration when designing their PowerEdge XR11 and XR12 servers, which are built specifically for O-

RAN and edge environments, including multi-access edge computing (MEC) and content delivery network (CDN) applications. Let's take a closer look at how the XR11 and XR12 servers meet, and in many cases exceed, the criteria for O-RAN and edge deployments across these six critical factors.

A Compact, Flexible Form Factor

RAN deployments often face tight space constraints, with the result that BBUs have evolved to deliver significant performance in a small frame. Dell PowerEdge XR11 and XR12 servers are designed to go anywhere that BBUs can go, with a short-depth 400mm frame that fits easily into existing RAN facilities and far-edge enclosures. In addition, the XR11 and XR12 servers provide easy front access for maintenance, reversible mounting options, and reversible airflow systems for optimal flexibility in a small footprint.

Figure 1.   Dell PowerEdge XR11 (left) and XR12 (right) Edge Optimized Servers

Built for Harsh Environments

Unlike data centers, which are carefully controlled environments, RAN components are often subject to extreme temperature changes and less-than-ideal conditions such as humidity, dust, and vibration. For years, the telecommunications industry has used the Network Equipment-Building System (NEBS) as a standard for telco-grade equipment design. The PowerEdge XR11 and XR12 are designed to meet or exceed NEBS Level 3 compliance (i.e., meets/exceeds the GR-63-CORE and GR-1089-CORE standards) and meet military and marine standards for shock, vibration, sand, dust, and other environmental challenges.

Fully operational within extreme temperature ranges from -5° C (23°F) to 55° C (131° F), XR11/12 servers can be deployed in almost any environment, even where exposure to heat, dust, and humidity are factors. The XR11/12 series is designed to withstand earthquakes and is fully tested to the NEBS Seismic Zone 4 levels. As a result, you can trust Dell's PowerEdge servers to keep working no matter where they are deployed.

Best-of-Breed Components

Traditionally, telecommunications providers have had limited vendor choices when selecting RAN components for their networks. With O-RAN, this changes, as a broader ecosystem of vendors can now deliver multivendor, best-of-breed solutions. O-RAN opens the door to broader innovation from industry-leading chip manufacturers, storage solutions, networking technology, etc.

The PowerEdge XR11 and XR12, for example, provide significant flexibility over purpose-built, all-in-one appliances, by leveraging the industry's most advanced best-of-breed components. The current XR11/XR12 server configurations feature:

- High-performance processor: Third-generation Intel® Xeon® scalable processor with up to 36 cores

- Spacious memory: Up to 8 x DDR4 3200MT/s RDIMMs/LRDIMMs (1TB maximum or 768GB plus Intel Optane™ Persistent Memory 200 Series)

- High-capacity storage: Up to 4 (XR11) or 6 (XR12) x 2.5-inch SAS/SATA or NVMe SSD plus Dell BOSS-S1 internal drive (2 x M.2) for boot; PowerEdge RAID Controller 10.5 & 11 plus NVMe RAID

- Peripherals for enhanced performance including: Fixed 4 x 25GbE LAN on Motherboard (LOM); one PCIe low-profile slot Gen4 (x8) and up to 2 (XR11) or 4 (XR12) x PCIe full-height slots Gen4 (x16/x16); the Intel-based vRAN dedicated ACC100 FEC accelerator from Silicom; up to 2 x SW GPUs (XR11) or up to 3 x SW GPUs or up 2 x DW GPUs (XR12)

By providing multiple CPU, storage, peripheral, and acceleration options, PowerEdge XR11/12 servers offer telecommunications providers the flexibility to deploy their vRAN systems in a variety of different environments. These servers can be customized to meet specific density, space, and performance requirements. For example, XR11/12 servers can be configured to specific applications, such as:

- High-performance computing featuring a higher core/node density per rack, density-optimized compute, and low-latency I/O configurations to support rendering, vectorization, advanced vector extensions, and other compute-intensive applications

- Scale-optimized deployments that require high performance and additional features to allow telco providers to scale-out vRAN systems while avoiding over-provisioning efficiently

- Edge-optimized deployments that can be configured to support both tier-one operator networks and enterprise customer networks with considerations for minimal footprint, remote management, and additional security as needed

- GPU-optimized deployments that deliver hardware acceleration to support demanding workloads, including high-performance computing applications, artificial intelligence, and machine learning applications, data analytics, and virtual desktop infrastructure (VDI) environments

Enhanced Security

Multi-access edge computing (MEC), private mobile networks, and other enterprise edge applications often have stringent security, privacy, and compliance requirements. Enhanced security is a critical component for any edge hardware platform. The PowerEdge XR11/12 servers are designed with a "security-first approach" to deliver proactive safeguards through built-in hardware and software protection. This security extends from a hardware-based silicon root of trust to asset retirement across the entire supply chain. From the moment a PowerEdge server leaves our factory, we can detect

and verify whether a server has been tampered with, providing a foundation of trust that continues for the life of the server.

Dell's Integrated Dell Remote Access Controller (iDRAC) is the source of this day-zero trust. iDRAC checks the firmware against the factory configuration down to the smallest detail once the XR11/12 server is plugged in. If memory is changed, iDRAC detects it. If the firmware is changed, iDRAC detects it.

Every PowerEdge server is also built with a cyber-resilient architecture that includes firmware signatures, drift detection, and BIOS recovery. You can learn more about PowerEdge security features in the PowerEdge security white paper available at https://www.delltechnologies.com/resources/en-us/asset/white-papers/products/servers/cyber-resilient-security-with-poweredge-servers.pdf.

Automation and Ease of Management

Telecommunications providers can improve scalability, flexibility, security, and agility through infrastructure automation. The ability to automate vRAN configurations, balance workloads (in and out of the cloud), and quickly spin up/down new services delivers a clear competitive advantage in the new world of 5G. Dell PowerEdge XR11/12 servers combine ease of management with automation to reduce operational complexity and cost while accelerating time-to-market for new services.

Dell OpenManage provides a single systems management platform across all Dell components instead of splitting systems management tools between different products. This makes it easier for telecommunications providers to manage their hardware components remotely, from configuration to security patches. In addition, Dell delivers powerful analytics capabilities to help manage server data and cloud storage. iDRAC can analyze telemetry data on vRAN servers. At the same time, Dell CloudIQ uses artificial intelligence and advanced machine learning to troubleshoot and resolve hardware issues, improve server performance and assist with predictive capacity planning.

With Dell automation tools, telecommunications providers can eliminate costly manual provisioning and configuration errors while reducing the time spent on operational tasks. The result is a zero-touch, error-free environment that can support the rapid deployment, update, and management of thousands of servers. iDRAC's agent-less server monitoring also allows telecommunications providers to proactively detect and mitigate potential server issues before impacting production traffic. By analyzing telemetry data, iDRAC can detect the root cause for poor server performance and identify cluster events that can predict hardware failure in the future.

Secure Supply Chain

In the last year, the importance of a secure and stable supply chain has become apparent while many manufacturers struggle to adapt to widespread supply chain disruption. As telecommunications providers look to ramp up 5G services, they need partners they can depend on to deliver, innovate, scale and support their plans for the future. Because we are the world's largest supplier of data center servers, telecommunications providers can depend on Dell Technologies. Dell operates in 180 countries worldwide, including 25 unique manufacturing locations, 50 distribution and configuration centers, and over 900

parts distribution centers. Our global, secure supply chain means that telecommunications providers can grow their business with confidence.

Dell EMC Open RAN Reference Architecture

Dell Technologies doesn't stop at the server. We work closely with our open partner ecosystem to integrate and validate our technology in multivendor solutions that provide a best-of-breed, end-to-end vRAN system. You'll find this partnership at work in our latest technology preview of the Dell EMC Open RAN Reference Architecture featuring VMware Telco Cloud Platform (TCP) 1.0, Intel FlexRAN technology, and vRAN software from Mavenir. Our O-RAN solution architecture delivers the disaggregated components that compose the RAN network—vRU, vCU and vDU—and can be deployed in hybrid (private/public) clouds as well as bare-metal server environments. Having a pre-built, integrated solution allows telecommunications providers to deploy O-RAN solutions quickly and confidently, knowing that they have the power of Dell's global supply chain and expert services behind them.

Real-World Success Stories

Telecommunications providers are deploying O-RAN solutions today, and they're deploying them on Dell technology. DISH Networks and Vodaphone are two customers that are leading the O-RAN movement. Read what they have to say about Dell:

DISH NETWORKS

"By collaborating with Dell Technologies, we will have the hardware and software infrastructure needed to harness the power and potential of 5G. Dell's open ecosystem approach will help us scale our RAN network with agility, speed and consistency, bringing about new business opportunities for both enterprise customers and consumers, completing our cloud strategy. We chose to leverage Dell's technology because they have a demonstrated track record of transforming networks and a willingness to work with us on designing and implementing infrastructure as code."

-- Marc Rouanne, DISH chief network officer

VODAFONE

"Open RAN provides huge advantages for customers and communities through a diverse and open vendor ecosystem. Partnering with Dell Technologies gives us a platform for innovation and the ability to further extend connectivity, bringing new opportunities to industries and communities alike."

-- Francisco Martin, head of Open RAN

Conclusion

With many initial 5G core network transformations complete, telecommunications providers are now turning their attention to the RAN. For them, there are several paths to choose. They can continue to work with legacy vendors by growing out their proprietary RAN systems, missing out on the opportunity to build a best-of-breed RAN solution from multiple partners. Or they can follow the path of Open RAN and with Dell Technologies as

a trusted partner to assemble and manage the right pieces from the industry's O-RAN leaders.

Dell PowerEdge XR11/12 servers are the latest examples of Dell's commitment to open 5G solutions. These servers are built by telco experts specifically for telco edge applications, using a security-first approach and featuring high-performance compute, storage, and analytics components. In addition, they have been bundled with our broader Open RAN Reference Architecture to form the foundation of a seamless, complete vRAN solution that includes hardware, software, and services.

O-RAN is more than the edge of the future. It's a competitive edge for telecommunications providers that need to quickly deliver and monetize 5G services, from private mobile networks to high-performance computing applications. Make Dell Technologies your competitive edge and ask your Dell representative about our portfolio of telco-grade edge solutions.