Dell PowerEdge XR4000 with VMware Edge Compute Stack for Edge Computing

A joint effort between Dell Technologies and VMware

Overview

Edge is a distributed digital infrastructure for running workloads across a number of locations close to where data is produced and consumed, and where the physical world meets the digital world. Organizations in multiple industries are using the edge to deliver intelligent and immersive digital experiences—for example, delighting retail customers, optimizing manufacturing plant operations, and so on.

Enterprises want to build and operate applications that have low latency requirements to process and analyze real-time data, and they want to provide intelligence for smarter decision-making at the edge. However, they face many challenges: aging infrastructure, limited edge-computing resources, environmental factors, and lack of IT staff to deploy and support applications across many edge sites.

This document provides an overview of a combined edge platform built on Dell PowerEdge XR servers and VMware Edge Compute Stack to solve these challenges. It describes key use cases in retail, manufacturing, and other industries.

The PowerEdge XR server series is built to capture and process more data at the edge, with enterprise-grade compute abilities providing high performance with low latency for the edge. The XR servers can withstand unpredictable and challenging deployment environments. XR4000 is the new high-performance multi-node XR server, purpose-built for ultra-short depth and low power, and with flexible configurations. These configurations are also available on our Dell vSAN Ready Nodes.

- 1S Intel® Ice Lake Xeon-D® with integrated security and cyber-resilient architecture

- 355-mm-deep chassis with wall-mount option

- Rugged operating range from –5°C to 55°C (32°F to 131°F)

- Flexible 1U and 2U compute sled; self-contained 2-node for VMware vSAN cluster

Edge Compute Stack (ECS) is a fully integrated edge platform for customers with many edge sites. ECS empowers IT and OT to deliver intelligent real-time solutions, offering flexibility, consistency, security, and extensibility:

- Flexibility to run virtual and container applications, standard and real-time operating systems

- Consistent interoperability across edges, data centers, and clouds

- Security to protect applications, users, devices, and data against threats

- Open platform that offers component choices and extensibility

This document includes a combined XR4000 and ECS reference architecture validated and supported by Dell Technologies and VMware. It also provides sample configurations for customers and partners to use as a starting point to design and implement the combined edge platform.

Customer use cases

Key use cases for the solution are in the retail, manufacturing, and government sectors.

Retail

Retailers adapted to the pandemic with increased use of self-service checkout and new delivery mechanisms. They are deploying edge applications to improve customer experience and profitability:

- **Self-checkout**—Camera and computer vision solutions help prevent loss from missed scans and switched products or price stickers by instantaneously matching products with prices.

- **Optimal shelf provisioning**—Inventory tracking and data analysis solutions can optimize shelf-provisioning to increase sales.

- **Immersive experience**—Interactive mirrors in apparel stores give customers an immersive experience when they are trying out an item by providing additional colors or variations.

- **POS**—Virtualize and extend the point-of-sale life cycle and realize impactful ROI through faster innovation, a transformative customer experience, and proactive management of retail infrastructure.

The XR4000 and ECS platform provides high flexibility and performance to deploy and run these retail solutions while optimizing expensive retail space and meeting store environmental requirements.

Manufacturing

The Industry 4.0 movement is digitizing manufacturing for greater efficiency and flexibility. Manufacturers are deploying edge applications for the following use cases:

- **IT/OT convergence**—Virtualization of industrialized PCs and programmable logic controllers (PLCs) enabled skilled operators to work from anywhere with low latency while allowing OT and IT applications to run on the same hardware for greater efficiency.

- **Predictive maintenance**—Solutions that use smart sensor data can reduce machine downtime by 50 percent.

- **Simulated manufacturing**—Digital twin software creates a simulation running in parallel to physical machines to optimize operational efficiency.

- **Quality control**—Computer vision can spot defects to increase quality and yield.

The XR4000 and ECS platform provides a foundation for these solutions for machine aggregation and virtualization, OT/IT translation, industrial automation, and AI inferencing.

Government

Defense, law enforcement, and emergency response organizations have specific requirements for tactical and mobile edge deployments:

- **Tactical edge**—Military and civil defense organizations are implementing real-time analytics solutions using ruggedized form factors at the tactical edge.

- **Mobile edge**—Law enforcement and emergency response organizations are adopting vehicle-based mobile edge solutions.

XR4000 is highly portable and hardened for dusty, hot/cold operations. It is tested with NEBS Level 3 and MIL certifications. With ruggedized ATA-compliant compact and mobile systems from Dell OEM partners, the XR4000 and ECS platform is ideal for tactical and mobile edge workloads.

Features

Figure 1 illustrates the combined XR4000 and ECS reference architecture. It consolidates VMs and the Kubernetes management cluster in the central data center. It also includes self-contained 2-node vSAN and TKG Multi-Cloud (TKGm) clusters at every edge site. A purpose-built vSAN witness node XR4000w (Nano Processing Unit, shown in Figure 2) is integrated within several XR4000 chassis options, enabling a highly efficient and reliable edge stack. An optional SD-WAN virtual edge can provide optimal connectivity and additional security. The centralized VMware vCenter and TKG management cluster simplify vSAN and TKGm deployment at the edge sites.
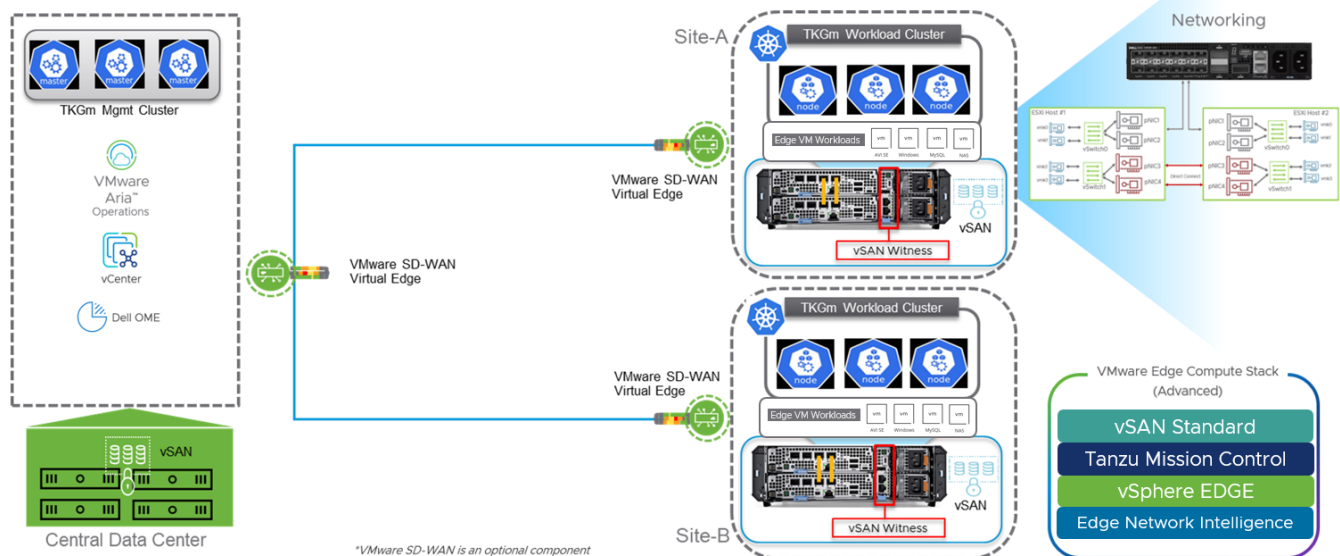

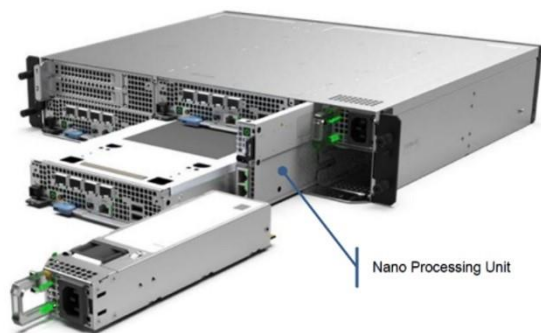**Figure 1.   XR4000 and ECS reference architecture**

Figure 2.   Nano Processing Unit

PowerEdge XR4000 and Edge Compute Stack configurations

Dell PowerEdge XR4000 is a rugged multi-node edge server available in two unique and flexible form factors. The "rackable" chassis supports up to four 1U sleds; the "stackable" chassis supports up to two 2U sleds. The 1U sled is provided for dense compute requirements. The 2U chassis shares the same "1st U" and common motherboard with the 1U sled but includes an additional riser to provide two more PCIe Gen4 FHFL I/O slots. Customers who need additional storage or PCIe expansion can choose a 2U sled option. All XR4000 chassis support both front-to-back and back-to-front airflow.

Sample configurations

The following table provides details for two sample configurations—one rackable and the other stackable.

Table 1.   Sample configurations

	Rackable configuration 2 x 2U	Stackable configuration 2 x 1U
Edge Compute Stack (ECS)	VMware ECS Advanced (vSphere Edge, vSAN Standard for Edge, Tanzu Mission Control Advanced), 1/3/5-year term license, up to 128 cores per edge instance	
Chassis	Dell PowerEdge XR4000r 2U, 14 inches deep,19 inches wide	Dell PowerEdge XR4000z 2U, 14 inches deep, 10.5 inches wide
Mounting options	Mounting ears to support a standard 19-inch-wide rack	Deployed in desktop, VESA plates, DIN rails, or stacked environments
Power supply	Front port access, dual, hot-plug (1+1), 1400 W, RAF	
Operating range	−5°C to 55°C (32°F to 131°F)	
Witness node	1 x Dell PowerEdge XR4000w, VMware Certified	
Server	2 x Dell PowerEdge XR4520c sleds, VMware Certified	2 x Dell PowerEdge XR4510c sleds, VMware Certified
	Total capacity of 2 x 2U sleds	Total capacity of 2 x 1U sleds
Security	Trusted Platform Module 2.0 V3	
CPU cores*	32 cores (2 x 1S Intel Ice Lake Xeon-D 16 cores CPU)	
Memory*	256 GB (8 x 32 GB RDIMM)	128 GB (8 x 16 GB RDIMM)
Boot drive	2 x BOSS-N1 controller card + with 2 M.2 960 GB - RAID 1	2 x BOSS-N1 controller card + with 2 M.2 480 GB - RAID 1
Storage*	15.2 TB (8 x 1.9 TB, SSDR, 2E, M.2)	

Network	4 x 10 GbE Base-T or SFP for 4/8 core CPU; 4 x 25 GbE for 12/16 core CPU (integrated)	
GPU (optional)	2 x NVIDIA Ampere A2, PCIe, 60 W, 16 GB Passive, Full Height GPU, VMware Certified	Not Applicable
System management	iDRAC9, Dell OpenManage Enterprise Advanced Plus, integration for VMware vCenter	

In a High Availability (HA) 2-node vSAN cluster, for failover to work properly, total consumable CPU, Memory, and Storage for application workloads should not exceed the available resources of a single node.

Engage Dell and VMware

The edge platform built on Dell PowerEdge XR4000 server and VMware Edge Compute Stack aims to help retail, manufacturing, and government customer organizations build and operate applications that provide intelligence for smarter decision-making and deliver immersive digital experiences at the edge. The combined reference architecture and configuration examples described in this document are designed to help our joint customers in designing and implementing a consistent, flexible, secure, and extensible edge solution.

To learn more about the flexible configurations of the Dell XR4000 chassis and compute sleds, see PowerEdge XR Rugged Servers.

For more information about VMware Edge Compute Stack, see VMware Edge Compute Stack and contact the VMware team at edgecomputestack@vmware.com.

References

- Dell PowerEdge XR4000 Specification Sheet

- Dell PowerEdge XR4000r Chassis

- Dell PowerEdge XR4000: Multi-Node Design

- VMware SASE and Edge

- How is VMware Edge Compute Stack Accelerating Digital Transformation Across Industries?

For more info, visit the Servers Info Hub

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