DELIVERING THE AI-ENABLED EDGE WITH DELL TECHNOLOGIES

ENTERPRISE AT THE EDGE

Nurses in a hospital depend on edge devices to monitor and interpret signals from dozens of sensors that alert them when a patient needs attention.

Edge devices in a chemical refinery predict, in real time, equipment failures before they occur by continuously analyzing hundreds of data points.

Cameras inside a retail store notice that inventory is running low and automatically dispatch an employee to replenish with merchandise from the backstock.

These examples of AI-enabled edge computing just scratch the surface of what's possible when extending IT infrastructure beyond the traditional walls of the enterprise.

Deploying IT infrastructure at the edge enables organizations to quickly generate insights and deliver value where data is generated. As a result, edge computing extends the reach of enterprise IT, enabling new and impactful use cases that change the way many businesses operate.

FIGURE 1: EDGE COMPUTING APPLICATIONS
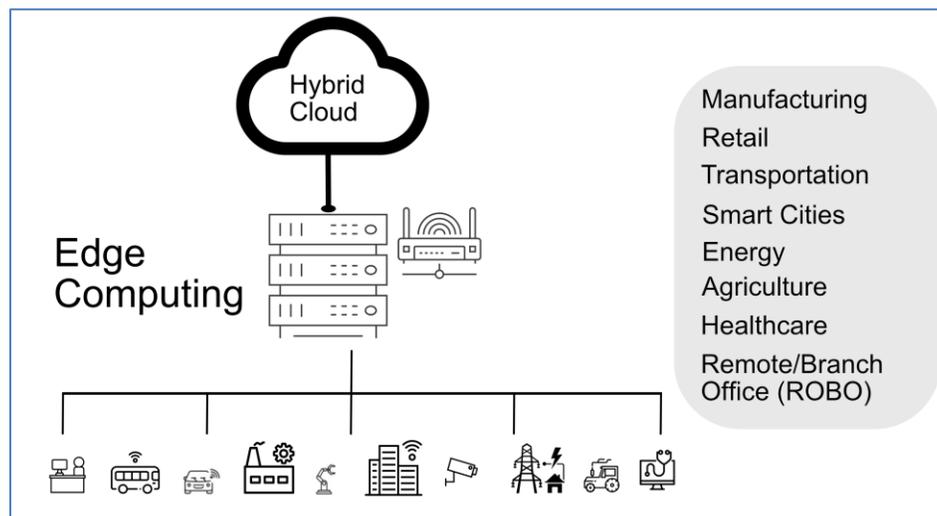
Source: Moor Insights & Strategy

It's no wonder that a recent survey of IT professionals found that nearly 54% of organizations deploy edge compute solutions today, with an additional 30% planning to evaluate edge computing within the next 12 months.[1] This survey reveals that edge computing is driven from the top down, with 35% of organizations indicating the decisions to deploy at the edge are happening in the C-suite.

Edge computing is proving to be transformational, not just to the parts of a business that leverage the provided capabilities, but also to the IT organizations that deploy and manage these new technologies. At the same time, extending IT to the edge can be a complex and challenging endeavor.

Infrastructure at the edge takes core capabilities and critical resources out of the security of the enterprise data center and places them in often unprotected and unpredictable environments. Deploying workloads to a fleet of edge devices requires management tools that allow for flexible deployment and configuration. Overall, edge computing requires a fresh way of thinking about IT architecture to avoid adding excessive complexity to your overall operation.

THE AI-ENABLED EDGE

Edge computing isn't the only disruptive new capability impacting the way that organizations function. Artificial intelligence (AI) also has a foothold within the enterprise as businesses have learned how to leverage the capabilities offered by advanced analytics and machine learning to derive new insights from their data.

Nowhere is data as meaningful as the point at which it is generated. In many cases, the value of data is highest when insights are generated and appropriate actions taken nearly instantaneously – sometimes in just fractions of a second. The ability to generate insights and actions at the edge, coupled with the widespread availability of affordable, high-performance AI processing capabilities, has led to AI being the number one workload for edge deployments.[2] Indeed, some of the most exciting applications enabled by edge computing depend upon it.

AI consists of two major elements: training and inferencing. First, a data set, such as a catalog of images, is used as input to train an AI model. This model can then be used to recognize and act on new data as it comes into the system. This process often runs on

---

[1] Eclipse Foundation 2021 IoT & Edge Commercial Adoption Survey
[2] Ibid.

powerful servers equipped with GPUs, which leads to training typically occurring in a data center or cloud infrastructure.

FIGURE 2: EXAMPLE EDGE APPLICATIONS THAT BENEFIT FROM AI

Industry	Application
Agriculture	• Livestock tracking • Soil and crop conditions • Farm equipment predictive maintenance
Energy	• Smart power grid • Oil well efficiency & optimization • Pipeline and equipment inspection • Human safety • Smart meters
Facility Management	• Energy management • Automated security
Healthcare	• Assisted radiology diagnostics • Rural and remote medicine • Patient monitoring, both in-hospital and at home
Logistics	• Automated warehouses • Shipping scheduling and optimization • Fraud detection
Manufacturing	• Predictive maintenance • Automated quality assurance • Supply chain • Process optimization
Retail	• Self-checkout • Shoplifting detection • Inventory optimization • Staff optimization based on predicted consumer behavior • Customer relationship management (CRM) at point-of-engagement
Smart Cities	• Policing • Traffic management • Structural monitoring • Water quality
Transportation	• Autonomous vehicles • Mass-transit schedule management and route optimization • Predictive maintenance

Source: Moor Insights & Strategy

Delivering the AI-Enabled Edge with Dell Technologies   August 2021

Using trained models to derive insights from data is called "inferencing." The mechanics of the inferencing process vary based on the complexity of the model and may require the use of devices with special capabilities for acceleration. This may be as simple as deploying a server with a processor containing extended inferencing instructions or a server that uses a dedicated inferencing accelerator. Inferencing capabilities are now common on edge devices. Figure 3 illustrates this overall AI pipeline and workflow.

FIGURE 3: THE AI LIFE CYCLE
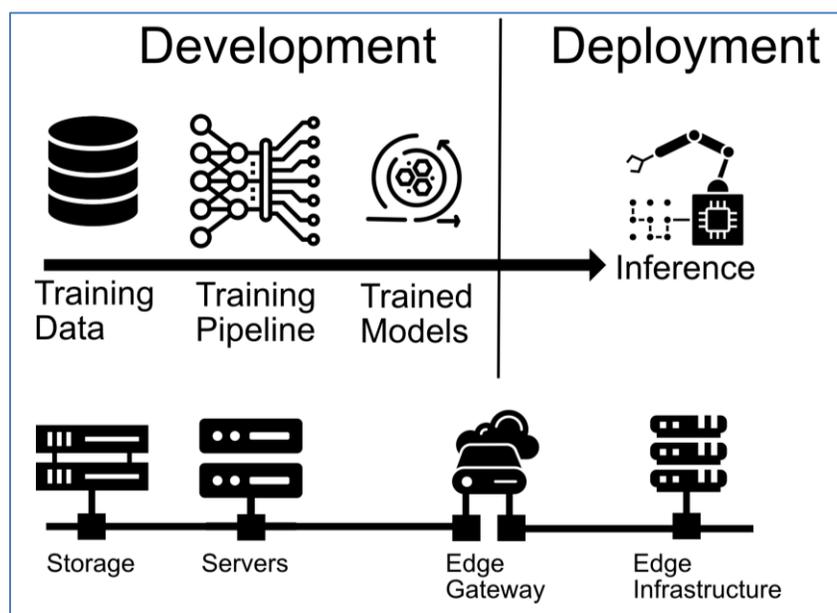
Source: Moor Insights & Strategy

A typical example is computer vision, where data scientists teach an AI model how to understand what is in a picture or video stream. A model trained to recognize people, for instance, can be used in a smart retail environment to count customers or notify store management when a customer is lingering in a section of the store and may need assistance. Computer vision is also used in manufacturing environments to identify defects in products and materials that flow across an assembly line. It can also be used in healthcare to provide diagnostic assistance, such as in identifying potentially abnormal results and flagging medical scans for follow-up by physicians.

EDGE COMPUTING WITH DELL TECHNOLOGIES

Edge computing isn't just about deploying isolated infrastructure into remote locations. As a fully integrated element of an enterprise's overall IT infrastructure, an edge solution needs to be just as enterprise-grade as anything in the traditional data center. At the

same time, the unique requirements of AI and the edge require a fresh way of thinking about IT infrastructure and manageability to avoid introducing unnecessary complexity. A comprehensive, well-planned edge architecture will aim for simplicity in hardware, operation, and data management.

The capabilities needed for edge solutions mirror those of traditional IT infrastructure while also exceeding traditional needs in many places.

- **Environmental.** Edge solutions may be deployed in environments that are physically exposed or have an uncertain climate. This may drive special packaging, ruggedizing, or even physical security considerations.
- **Connectivity.** Edge infrastructure may not always be connected to a corporate network and may rely on third-party communications infrastructure such as 5G carriers. The edge devices might also be placed where connectivity isn't guaranteed to be reliable. Edge applications must continue to provide service even when disconnected from the network.
- **Manageability.** Edge capabilities often deploy to sites with limited, if any, IT presence. These solutions are also often deployed at scale, with many sites being managed simultaneously. This drives the need for intelligent management solutions that employ automation and technologies that allow for flexible deployments and reconfiguration.
- **Reliability.** Edge applications may be business-critical while also being remotely located, increasing the need for reliability and specialized maintenance planning.
- **Security.** Edge solutions often exist outside the physical confines of a typical enterprise, leading to increased concerns about security and access control. This requires comprehensive security capabilities that meet the needs of edge applications while also seamlessly integrating into the existing enterprise infrastructure.

IT organizations can pave a path to the AI-enabled edge alone, but the most successful organizations understand the value of leveraging strong technology partnerships. Deploying complex emerging technologies and architectures, such as AI at the edge, is often best approached with a technology partner that can deliver a wide breadth of technology solutions – solutions needed to address the unique requirements of the enterprise edge.

Dell Technologies is a natural partner for any IT organization extending its infrastructure to the edge. As a leader in delivering IT solutions to enterprises of nearly every size and

industry, Dell Technologies' portfolio of offerings includes a full range of solutions for the AI-enabled edge.

FIGURE 4: DELL TECHNOLOGIES AT THE EDGE
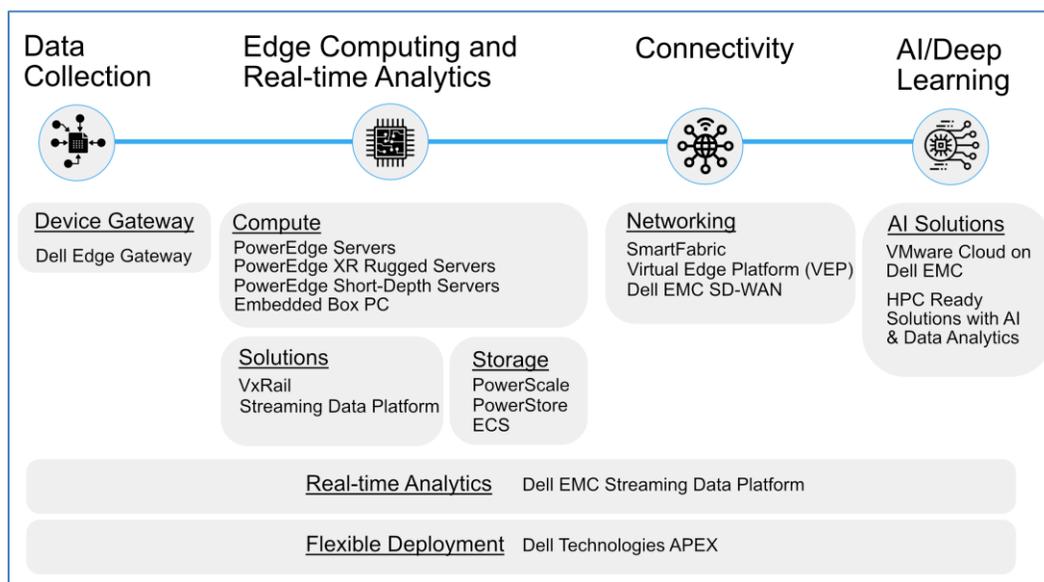
Source: Moor Insights & Strategy

Dell Technologies has a full range of storage, compute, and networking capabilities ideal for nearly any edge deployment. Just a sampling of its infrastructure offerings includes:

- **Compute.** Dell Technologies offers a full range of AI-ready compute solutions for the edge, including its industry-leading Dell EMC PowerEdge servers powered by the latest generation Intel Xeon processors, its integrated VxRail hyperconverged infrastructure (HCI) solutions, and its Dell Edge Gateways. Many of these offerings directly target edge deployments, with Dell PowerEdge servers available in reduced sizes for constrained environments, rugged configurations for environmentally harsh conditions, and even fully radio-frequency shielded racks for sensitive edge locations where radio emissions must be tightly controlled.

- **Storage and data management.** Data at the edge is often stored at the edge, and Dell Technologies storage solutions scale from the edge to the data center to allow maximum flexibility. At the same time, the value of data at the edge lies in the ability to use that data to derive quick insights. Dell Technologies enables these insights with intelligent data-driven workflows, supported by the Dell EMC

Streaming Data Platform (SDP). The Dell EMC SDP allows an enterprise to store and manage data where it makes the most sense for the solution. This allows the solution to address the special considerations unique to edge environments, such as limited storage and compute resources to provide comprehensive analytics at the edge.

- **Networking.** Dell Technologies provides a range of networking solutions that are well-suited to integrating edge devices into an enterprise's existing network. Its networking solutions include switches, the Dell EMC Virtual Edge Platform (VEP), and the Dell EMC SD-WAN Solution powered by VMware. Dell Technologies also has a growing number of partner-enabled 5G telecom-focused solutions.

Infrastructure is only part of an edge solution. Deploying resources at the edge requires new ways of thinking about manageability, security, and even services and support.

- **Manageability**: Dell Technologies supplements its edge products with a fully integrated management experience that allows seamless integration of edge installations with an enterprise's IT infrastructure. It embeds management of edge infrastructure into many of its solutions. These include remote server management with Integrated Dell Remote Access Controller (iDRAC), data management with the Dell EMC SDP, device management with Dell Edge Gateways, and even automated lifecycle management with Dell EMC VxRail solutions for edge computing.
- **Security**: The dominant concern at the edge is security. Dell Technologies' edge-targeted solutions provide intrinsic security both at the edge and across an enterprise's hybrid-cloud infrastructure. In addition, the reach of Dell Technologies in security extends below the operating system, with both hardware security and supply chain assurance. This provides a strong foundation for integrating into any IT infrastructure.
- **Flexible deployment and consumption-based models**: Dell Technologies APEX delivers flexible deployment and consumption models for storage and compute with its as-a-Service approach to IT infrastructure. Dell APEX scales beyond the traditional data center, allowing infrastructure to be deployed anywhere within an enterprise, including the edge.
- **Service and support**. Dell Technologies delivers expertise that extends beyond storage and server hardware. As a result, it can service the needs that arise when deploying and managing IT infrastructure – whether in the data center, in a hybrid-cloud environment, or at the edge.

This paper just begins to touch on the range of edge-targeted solutions and services that Dell Technologies brings to the table as a partner for your IT organization. Its portfolio of edge products and solutions enables enterprises to modernize edge technology that scales with the organization's needs.

REAL-WORLD EXAMPLE

Let's look at how Dell Technologies has helped one of its customers deliver on the potential of AI at the edge. The EDAG Group is the world's largest independent engineering partner for the automotive industry. EDAG was called to help one of its large customers implement a modern predictive maintenance solution to proactively detect irregularities in its manufacturing line to optimize maintenance and avoid outages. EDAG engaged Dell Technologies to help engineer an AI-driven edge solution.

The goal of the project was to minimize downtime on the automotive maintenance and production lines of EDAG's customer. Downtime on a production line, whether for scheduled inspections or unscheduled failures, can be a costly and productivity-limiting activity.

EDAG designed an intelligent AI-enabled solution extending its customer's data center to the manufacturing line itself. It turned to Dell Technologies to provide the underlying infrastructure for a pilot project.

The storage and processing of the huge amounts of data involved are handled by a Dell Technologies infrastructure, both in the data center and on-site at the customer's factory. This infrastructure includes a mix of Dell EMC PowerEdge servers, including the XR2 servers; the Precision 3930 Rack Workstation; the OptiPlex XE3 Desktop PC; Latitude 5000 and 7000 notebooks; and 3000 and 5000 Series Embedded Box PCs and Edge Gateways.

The pilot was a success. It achieved all the predictive maintenance benefits that EDAG's customer hoped for: better planning of maintenance and service intervals, fewer service personnel deployments, fewer unplanned machine failures, optimized spare parts management, higher machine performance, and better machine knowledge through analysis of the collected data. Reduced downtimes increased the key figure Overall Equipment Effectiveness (OEE) by 2%.

"Although that might sound insignificant at first, this improvement in overall plant efficiency is excellent in an automotive sector that has already trimmed its processes to maximum efficiency. We initially assumed the figure would be lower, so the customer is really happy," said Mark Kramer, head of production IT (Smart Factory Solutions) at EDAG Production Solutions GmbH & Co. KG.[3]

The pilot project will now be rolled out to other plants and factories worldwide and the data analytics cluster will be further expanded.

CONCLUDING THOUGHTS

Nearly every enterprise is extending its reach to the edge, delivering data-driven insights at the very location where data is generated. AI-enabled applications can lead to instant decisions, providing immediate value to the enterprise.

At the same time, deploying infrastructure to the edge can be a complex process that touches every IT function. Edge computing demands special considerations that go beyond the typical manageability, security, reliability, service, and support requirements of an enterprise data center.

IT organizations that are ready to embrace the edge need both a strategy and a partner that has experience with AI and the edge. Dell Technologies has the expertise, products, services, and reach to simplify the edge with intrinsic security and deliver insights where they're needed the most. This enables the consolidation of operations, data, and infrastructure as edge deployments expand. Dell Technologies should be on the short list of potential technology partners to accelerate innovation at the edge.

Learn more about the products, services, and expertise that Dell Technologies can bring to your edge solution at its edge website.

---

[3] Dell Technologies EDAG Case Study

IMPORTANT INFORMATION ABOUT THIS PAPER

CONTRIBUTOR
Steve McDowell, Senior Analyst at Moor Insights & Strategy

PUBLISHER
Patrick Moorhead, Founder, President, & Principal Analyst at Moor Insights & Strategy

INQUIRIES
Contact us if you would like to discuss this report, and Moor Insights & Strategy will respond promptly.

CITATIONS
This paper can be cited by accredited press and analysts but must be cited in context, displaying author's name, author's title, and "Moor Insights & Strategy". Non-press and non-analysts must receive prior written permission by Moor Insights & Strategy for any citations.

LICENSING
This document, including any supporting materials, is owned by Moor Insights & Strategy. This publication may not be reproduced, distributed, or shared in any form without Moor Insights & Strategy's prior written permission.

DISCLOSURES
This paper was commissioned by Dell Technologies and Intel. Moor Insights & Strategy provides research, analysis, advising, and consulting to many high-tech companies mentioned in this paper. No employees at the firm hold any equity positions with any companies cited in this document.

DISCLAIMER
The information presented in this document is for informational purposes only and may contain technical inaccuracies, omissions, and typographical errors. Moor Insights & Strategy disclaims all warranties as to the accuracy, completeness, or adequacy of such information and shall have no liability for errors, omissions, or inadequacies in such information. This document consists of the opinions of Moor Insights & Strategy and should not be construed as statements of fact. The opinions expressed herein are subject to change without notice.

Moor Insights & Strategy provides forecasts and forward-looking statements as directional indicators and not as precise predictions of future events. While our forecasts and forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could cause actual results to differ materially. You are cautioned not to place undue reliance on these forecasts and forward-looking statements, which reflect our opinions only as of the date of publication for this document. Please keep in mind that we are not obligating ourselves to revise or publicly release the results of any revision to these forecasts and forward-looking statements in light of new information or future events.

©2021 Moor Insights & Strategy. Company and product names are used for informational purposes only and may be trademarks of their respective owners.