



Manufacturing

# Transforming Manufacturing with AI and Edge Computing

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# Engineering a Smarter Future for Manufacturing

In an industry where precision, efficiency and flexibility are keys to success, manufacturers tend to prioritize technological innovation and adoption – and the rise of AI and edge computing marks yet another transformative shift. Despite these technologies promising a new era of efficiency, adaptability, and growth, many manufacturers are only beginning their digital transformation journeys.

To thrive in this evolving landscape, manufacturers need robust, reliable solutions that integrate seamlessly into operations.



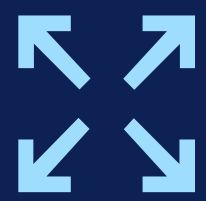


## At the Heart of this Transformation Lies a Data Explosion

Every second, massive amounts of data are generated across manufacturing floors, assembly plants and logistics operations. Integrating this wide array of data into OT and IT systems – while accounting for diverse speeds and latencies – is critical to the efficiency of manufacturing systems and processes across operating locations.



# Market Dynamics in the Manufacturing Industry



## Redefining Manufacturing with Advanced Technologies

The evolution of manufacturing continues to be redefined by advancements in automation, IoT, and real-time analytics. Smart, interconnected systems are driving faster, more agile operations. Manufacturing organizations seek breakthroughs in automation, IoT, and real-time analytics. Together, these technologies empower the creation of intelligent, connected systems that boost operational agility and efficiency.



## Smart Factory Progress

85% of manufacturing executives surveyed believe their smart manufacturing initiatives will transform how products are made, improve agility, and attract new manufacturing talent<sup>1</sup>; indicating just how important it is for manufacturing organizations to accelerate their transition to highly smart factories through solutions such as AI-driven predictive maintenance, quality control, and energy efficiency improvements.

<sup>1</sup> <https://www.deloitte.com/us/en/insights/industry/manufacturing/2025-smart-manufacturing-survey.html>





# Key Barriers to Transformation

## Legacy Systems

Outdated IT infrastructure struggles to support AI and other modern technologies. Organizations seek agile and adaptable solutions that can integrate with existing infrastructures, allowing manufacturers to bypass limitations of legacy and 3rd party systems and adopt modern technologies seamlessly.

## Edge Computing Gaps

Many factories underuse edge computing for real-time decisions. Edge-optimized infrastructure powered by modern accelerated computing enables real-time decision-making, making edge computing more accessible and cost-effective.

## Data Silos

Isolated data pools hinder the creation of valuable insights, leading to missed opportunities for innovation. Manufacturing organizations increasingly need solutions that facilitate unified data insights by combining these data pools, ensuring comprehensive analytics.

## Computing Demands

AI requires significant, often costly, processing power. The robust processing capabilities of accelerated computing addresses the high computing demands of AI applications, making them more affordable and efficient.

## Cybersecurity Risks

Growing digitization increases vulnerability to sophisticated cyberattacks, especially at the edge. Zero-trust security models and advanced cybersecurity frameworks mitigate digital risks, ensuring safe AI adoption.

## Skilled Workforce Shortage

A lack of AI-trained personnel is a rising concern in 2025. Many organizations are exploring technology programs, services and partnerships to address this shortage.



# Smarter Manufacturing Outcomes, Powered by Edge AI

AI is revolutionizing key areas of the manufacturing process to deliver measurable gains:



## Predictive Maintenance

AI-driven analytics and automated systems cut downtime by up to 30%.<sup>2</sup>



## Quality Control

Automated computer vision systems boost defect detection accuracy by 20-25%.<sup>3</sup>



## Energy Efficiency

AI and automated controls optimize utilities to reduce energy waste in leading factories by 15%.<sup>4</sup>



## Supply Chain Optimization

AI enhances forecasting and resource planning, while automated systems minimize delays.



## Worker Safety

AI-powered monitoring and robotic assistance reduces workplace incidents through real-time hazard detection.

Dell AI Factory with NVIDIA is revolutionizing manufacturing through solutions for predictive maintenance, quality control, energy efficiency, supply chain optimization, and worker safety. These AI-driven applications deliver measurable gains and enhance overall productivity.

<sup>2</sup>Sourced from a 2024 McKinsey & Company report on predictive maintenance, which highlighted that AI-based predictive maintenance systems can reduce unplanned downtime by 20-30% in manufacturing environments. This was cross-referenced with a 2025 Deloitte study on Industry 4.0 adoption, confirming similar gains in AI-equipped factories.

<sup>3</sup>Based on a 2023 IBM report on AI in manufacturing, which noted that computer vision systems improved defect detection rates by 15-25%. A 2025 update from Gartner's manufacturing technology trends corroborated this, stating advancements in AI vision systems have pushed accuracy gains toward the higher end (20-25%) in smart factories.

<sup>4</sup>Drawn from a 2024 World Economic Forum report on sustainable manufacturing, which found AI-driven energy management systems reduced energy consumption by 10-15% in top-tier factories. A 2025 Siemens whitepaper on digital twins and AI further validated this, noting 15% reductions in energy waste for AI-optimized facilities.



# Overcoming the Key Barriers to Transformation

AI is a catalyst for manufacturers to accelerate innovation, drive profitability, and create a more agile industry. But before they can experience these benefits, manufacturers must overcome many AI adoption and scalability challenges.

## Hybrid Solutions

Combining cloud and edge computing helps manufacturers overcome legacy system limitations and adopt modern technologies.

## Open-Source AI Tools

Open-source AI tools lower costs and ease integration for smaller manufacturers.

## Upskilling Programs

Partnerships with leading technology firms and services organizations are an essential step to address workforce skill gaps.

## Zero-Trust Security Models

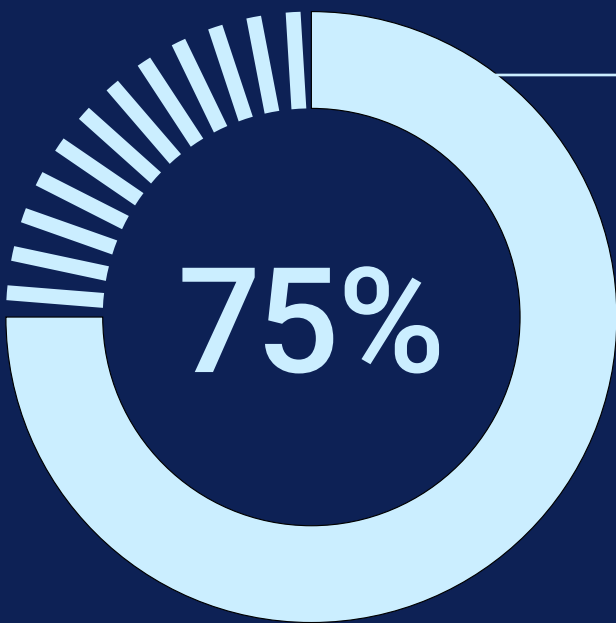
As the threat landscape has grown more sophisticated, zero trust architecture has emerged as the gold standard for ensuring the security, sovereignty, and integrity of edge data.



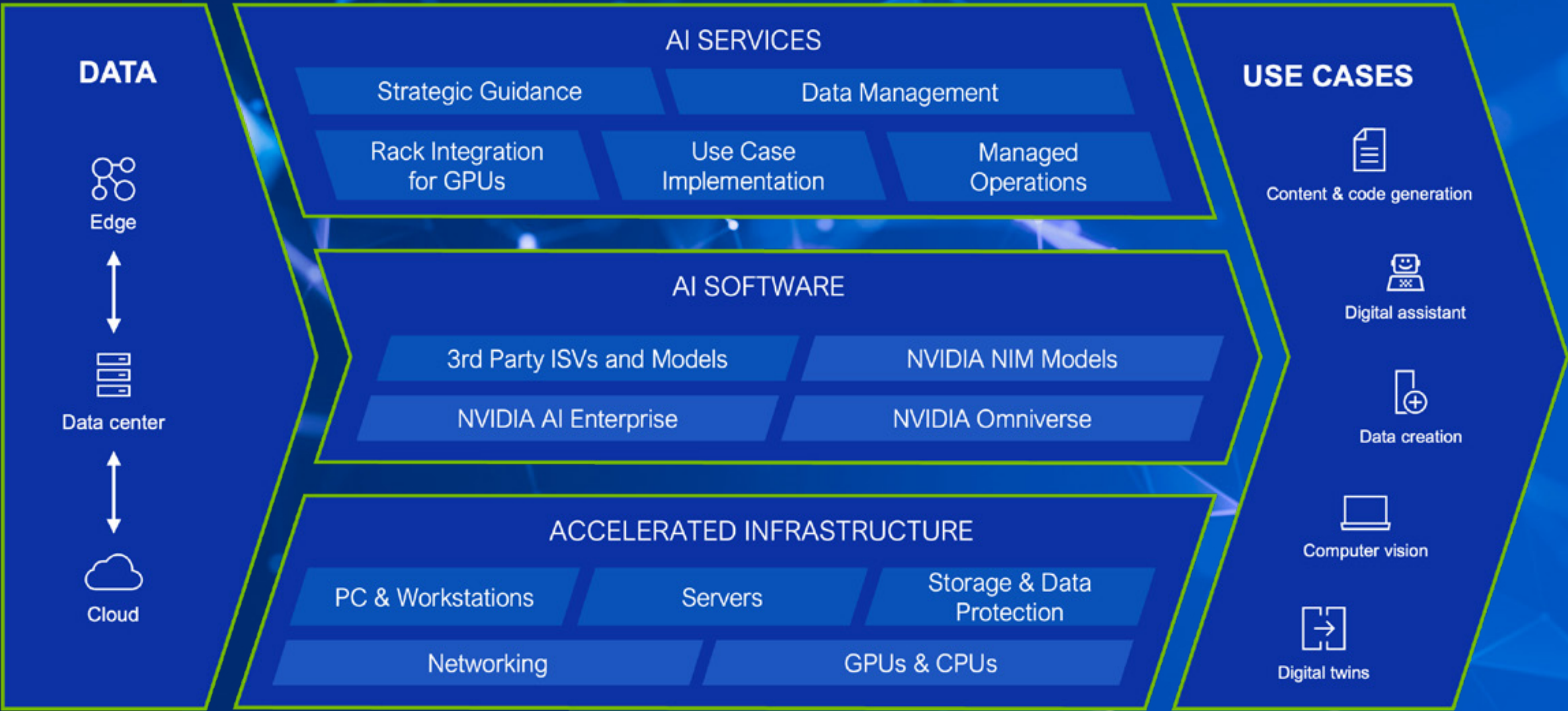


# The Dell AI Factory with NVIDIA Accelerates AI Innovation

The Dell AI Factory with NVIDIA provides the foundation for modern AI computing and is the industry’s first end-to-end AI enterprise solution.<sup>5</sup> It’s a framework that helps maximize the value of data, which is increasingly generated at the edge.



In fact, Gartner predicts that 75% of enterprise-managed data will be created and processed outside of the core data center or cloud.<sup>6</sup>



<sup>5</sup> Based on Dell analysis, July 2024.

<sup>6</sup> Gartner, “Innovation Insight for Edge AI,” Arun Chandrasekaran & Eric Goodness, April 10, 2024



# Dell AI Factory with NVIDIA Delivers Desired AI Outcomes

## Optimize Production Processes

The Dell AI Factory with NVIDIA enables manufacturers to leverage digital twin technology to simulate, troubleshoot, and optimize production processes before they hit the factory floor. By creating accurate virtual representations of real-world entities and processes that are synchronized in real-time, manufacturers can reduce downtime, minimize costs, and accelerate time to market while improving operational efficiency.

## Ensure High Product Quality

By integrating AI-enhanced computer vision, the Dell AI Factory with NVIDIA helps manufacturers identify defects in real-time and ensure product quality remains consistently high. This advanced approach not only prevents costly errors but also boosts customer satisfaction through reliable and precision-driven results.

## Predict Maintenance Needs

The Dell AI Factory with NVIDIA enables manufacturers to predict maintenance needs and proactively address equipment failures before they occur. This maximizes equipment uptime, reduces long-term costs, and ensures a smoother, more efficient production process.

## Automate Complex Tasks

Combining the high-performance AI computing power and scalability of Dell and NVIDIA solutions, manufacturing organizations can automate complex manufacturing tasks that have historically been tedious and time consuming. This helps manufacturers achieve faster production cycles, optimize output, and remain competitive.





# Empowering Manufacturing with Autonomous AI Agents

The rise of autonomous AI agents is transforming the manufacturing landscape, enabling factories to handle complex tasks with precision and adaptability. With the support of Dell AI Factory with NVIDIA, manufactures can integrate AI agents to handle complex tasks in their factories autonomously analyzing data, making decisions, and executing tasks to optimize processes and improve efficiency in real-time. Together, these innovations empower manufacturers to make smarter, faster decisions, enhancing product quality while unlocking new opportunities for growth and impact.

**Manufacturing** and financial services are the two most mature and developed markets for edge IT <sup>7</sup>

**87%** of the Fortune 100 use Dell Technologies edge solutions <sup>8</sup>

Dell Technologies is the **#1** global leader in edge storage and edge servers <sup>9</sup>

<sup>7</sup> IDC Market Note, "The impact of AI on edge investment plans for 2025," January 2025

<sup>8</sup> Dell Technologies internal analysis of US Fortune 100, February 2025

<sup>9</sup> IDC Worldwide Quarterly Enterprise Infrastructure Tracker: Buyer and Cloud Deployment, Q4 2024, March 2025. Based on revenue. Edge storage and edge servers refer to the heavy edge category, which IDC defines as the physical equipment that serves as the foundational infrastructure for edge.





Dell NativeEdge brings the power of Dell AI Factory with NVIDIA to the edge by enabling manufacturing organizations to securely scale their infrastructure and orchestrate AI applications across any location. Support for virtualized and containerized environments is seamless, while NativeEdge Blueprints automate the deployment of frameworks and applications for faster, more efficient AI innovations.

- **Boost Efficiency with Zero-Touch Deployment**  
Deploy manufacturing infrastructure and applications in under a minute, saving time and reducing manual effort.
- **Scale AI Across Operations Seamlessly**  
Centralized management enables rapid adoption of new AI frameworks and applications, enhancing operational agility.
- **Simplify with Automated Processes**  
Automate edge application management to free up resources and focus on innovation.

Benefits of Dell NativeEdge

The world's most **adaptable and open** edge operations ecosystem <sup>10</sup>

Up to **68% time savings** by automating edge application orchestration <sup>11</sup>

**Less than 1 minute** to deploy infrastructure and applications <sup>11</sup>

Achieve up to a **136% manufacturing ROI** over 3 years with Dell NativeEdge.<sup>12</sup>

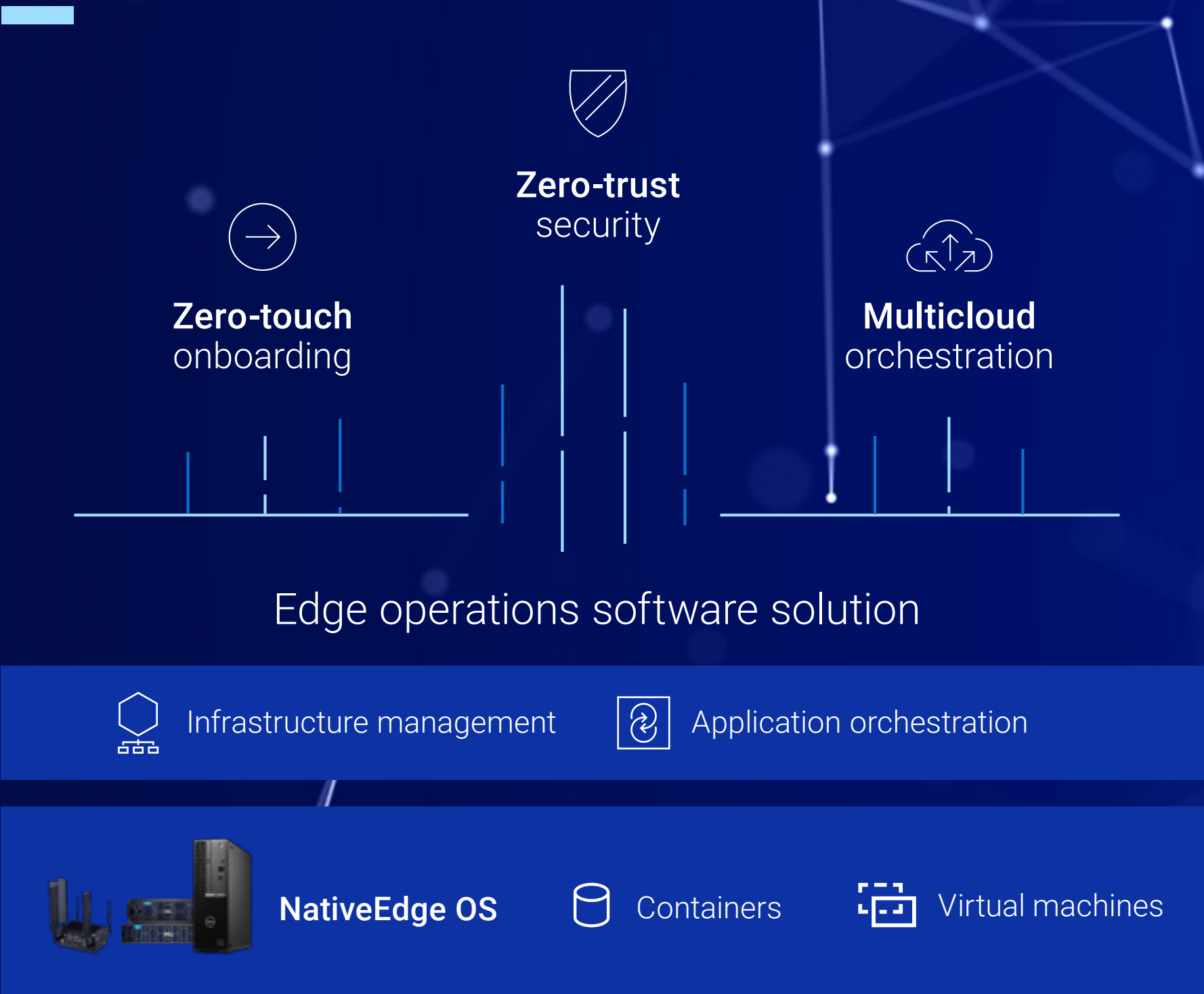
<sup>10</sup> Based on Dell Technologies internal analysis, February 2025

<sup>11</sup> Enterprise Strategy Group by TechTarget Technical Validation commissioned by Dell Technologies, "Dell NativeEdge - Edge Operations Software Platform," February 2025

<sup>12</sup> Dell internal analysis, February 2025. Based on 3-year model comparing pre-NativeEdge vs. post-NativeEdge deployment across 40 composite manufacturing sites. Actual results may vary.



Dell NativeEdge:  
Accelerate AI innovation at the Edge





# Why Dell NativeEdge and NVIDIA

Dell NativeEdge is the first edge orchestration solution that automates the delivery of NVIDIA AI Enterprise software, bringing NVIDIA frameworks for video analytics, speech and translation, and optimized inferencing to your edge devices.

This capability is powered by NativeEdge Blueprints, which act like a recipe, detailing the ingredients and steps for automated deployment. This includes application settings, infrastructure resources, network configurations, and custom workflows.

This tight integration between Dell NativeEdge and NVIDIA delivers:



Faster, easier deployment of AI models and inferencing solutions to distributed edge locations.



Zero-touch deployment of edge AI apps across infrastructure based on zero-trust security principles to meet the rigorous standards of manufacturing organizations.



Ease of Edge AI solution lifecycle management with scalability to support any workload – from digital twins to predictive maintenance.





# Infrastructure is the Foundation of the Dell AI Factory with NVIDIA

The Dell AI Factory with NVIDIA brings together Dell AI Infrastructure for powerful computing and networking, enhanced by NVIDIA acceleration, NVIDIA AI Enterprise software, and Dell Professional Services, to form a seamless, all-in-one solution for businesses ready to unlock the power of AI. Our edge-optimized platforms for AI provide a wide range of capabilities, such as:

- Ruggedized platforms
- GPU-enabled systems
- Small form-factor products
- Long life systems
- Industry certifications
- OEM-Ready solutions (de-branded, re-brand ready)
- Customization capabilities



## PowerEdge Servers

Fast-track your Edge AI goals using PowerEdge servers with superior acceleration, diverse GPU options and rugged, small footprint and industry certified platforms.



## Dell Laptops and Workstations

Allow AI processing locally on the device. Our broad portfolio of AI workstations and AI PCs provide the necessary hardware and software infrastructure to enable AI inferencing at the edge, empowering organizations to leverage the power of AI in real-time, even in resource-constrained environments.



## Edge Gateways

Compact in design, Edge Gateways enable you to collect, consolidate, and extract value from vast amounts of edge-generated data.



## Storage and Data Protection

Unlock the value of edge data and secure AI workloads against data loss and cyber-threats with modern, simple, and resilient storage and data protection solutions.



## Hyperconverged Infrastructure (HCI)

Benefit from the breadth of the Dell Technologies HCI portfolio that allows for choice based on your desired outcomes.



## Networking

Enable simplified design, management and monitoring of powerful Ethernet fabrics to handle modern workloads like Generative AI and Edge AI inferencing.



## Data Management

Empower your customers to access data across edge, core and multicloud to power analytics workloads for faster model tuning and business insights.

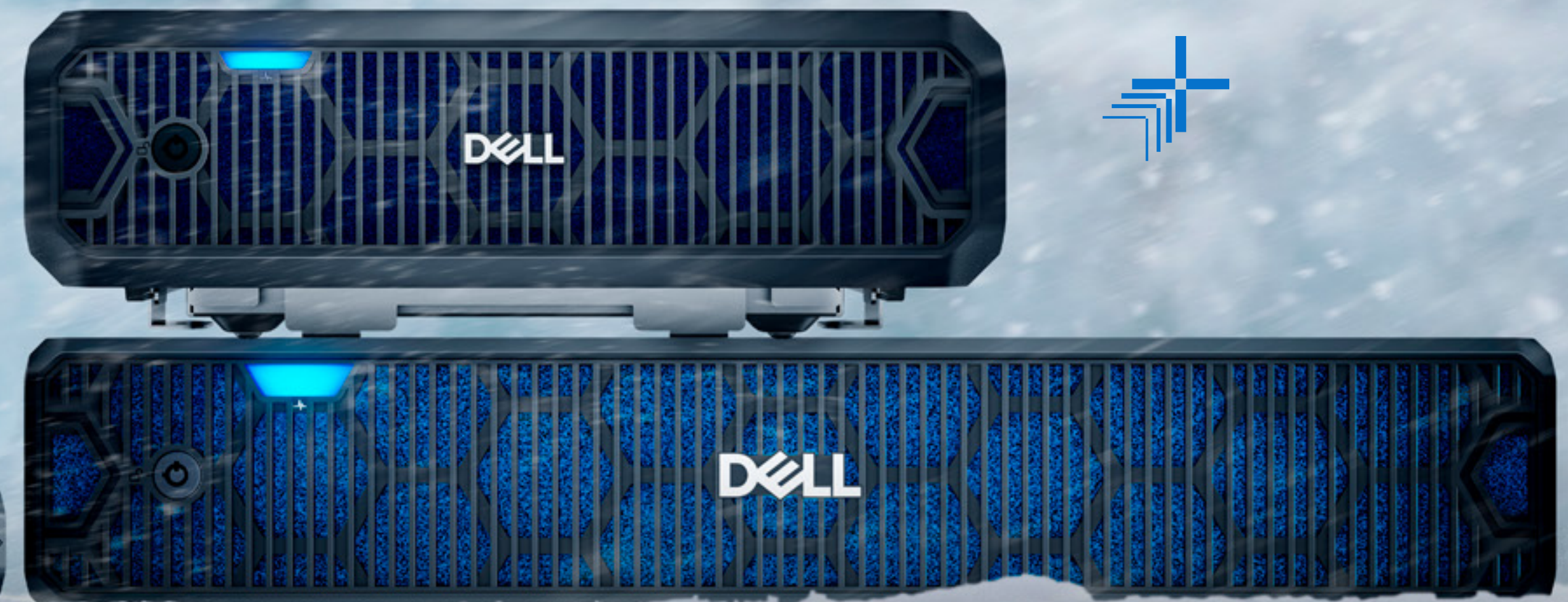


# Enabling Edge AI Innovation with Advanced Server Hardware

As manufacturers face increasingly digitized environments, the demand for reliable, robust, secure, and high-performance infrastructure has become a top priority. Dell PowerEdge XR servers, powered by NVIDIA accelerated computing, are engineered to meet these demands head-on, delivering powerful, scalable solutions for AI applications at the edge. With real-time data analysis capabilities, these servers ensure low latency and high performance beyond the traditional data center, even in space-constrained or challenging environments.

## Built to withstand the toughest environments:

- Extreme heat and cold
- Dust
- Shock and vibration of factory floors
- Construction sites
- Mobile command centers
- Other extreme environments





# Take the Next Step

The **Dell Accelerator Workshop** is a great first step for manufacturers looking to begin their AI and edge journey. This half-day program focuses on the activities required to achieve your desired end state, concluding with next steps to further advance your business and IT strategies.

Your team will work with Dell experts to develop a point of view on important GenAI questions and create a vision for your future state. Utilizing our “AS-IS” / “TO-BE” methodology, we’ll conduct interviews and review your existing environment to identify challenges, opportunities and drive consensus for GenAI, synthesized in an Executive Overview.

Interested in validating the capabilities of NativeEdge in your edge environment? Contact your Dell sales representative to discuss the possibility of deploying an onsite proof-of-concept experience for Dell NativeEdge.

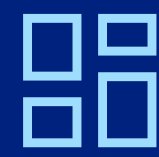
Accelerate and simplify your AI journey with Professional Services



Develop a  
Generative AI  
strategy and  
roadmap tailored to  
your organization



Prepare your data  
for Generative  
AI integration,  
inferencing,  
and model  
customization



Build your  
Generative AI  
operations with  
training and  
infrastructure  
management  
expertise



For more information about Dell NativeEdge and AI solutions for manufacturing, visit <https://www.dell.com/en-us/lp/dt/industry-manufacturing>.



# Dell AI Factory

WITH NVIDIA

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