

A journey to manufacturing excellence with edge AI

LENOVO + NVIDIA® SOLUTION BRIEF



Drive operational efficiency, optimize processes, and harness real-time data with edge technologies and AI applications

The situation

Manufacturing: A market in transition to Industry 4.0

The manufacturing market is complex and challenging. Following decades of globalization, the industry is experiencing intensified competition, expanding regulatory requirements, and a chronic skills shortage. The situation is exacerbated by the fallout from the COVID-19 pandemic, supply chain disruption, and rising operational expenses, primarily driven by escalating material prices, energy rates, and labor costs. Additionally, the explosion of manufacturing technology has created a fundamental dependency on equipment reliability and technical expertise while elevating the risk to cybersecurity, with the industry becoming a target for malicious actors.

At the same time, manufacturers are under pressure to embrace sustainable practices and meet stringent EHS (Environment, Health and Safety) and ESG (Environmental, Social, and Governance) commitments, prompting a critical reassessment of their processes and supply chains. This transformation necessitates significant technological integration and investment in safe, eco-friendly manufacturing practices.

Despite this complex landscape, the sector is undergoing a radical shift. Adopting artificial intelligence (AI), the Internet of Things (IoT), and edge computing is revolutionizing operations, driving efficiency, enabling real-time data processing, and enhancing security. Edge AI has emerged as a pivotal player in this evolution, enabling predictive maintenance, superior customer experiences, smart inventory management, and secure data infrastructure.

AI's role in supply chain management is pivotal, facilitating swift responses to economic fluctuations and disruptions. This integration of transformative technologies is steering the manufacturing sector toward Industry 4.0, heralding an era of unprecedented innovation and efficiency. As we navigate this thrilling journey, it is evident that edge AI will continue to play a vital role in shaping the future of manufacturing.

Seizing the opportunities of edge and AI

The AI manufacturing market size was US\$1.82 billion in 2019 and is projected to reach US\$9.89 billion by 2027, at a CAGR of 24.2%.¹

IDC² predicts that from 2023 more than 50% of new enterprise IT (Information Technology) infrastructure deployed will be at the edge rather than in corporate data centers.

A 2022 study by PwC³ found that 89% of manufacturers have implemented or are rolling out AI and analytics. Similarly, 73% of the surveyed manufacturers have implemented or are rolling out smart technology.

A recent insights report by AT&T⁴ shows:

78% of manufacturing respondents globally are planning, have partially implemented, or have fully implemented an edge use case.

50% of manufacturing respondents stated they are in the mature stage of deploying edge initiatives.

A recent IDC survey⁵ revealed the majority of manufacturers are investing in multiple AI technologies, with 59% planning to increase investment in digital AI quality and compliance, 56% in autonomous AI factory operations, and 54% in advanced AI digital simulation.

According to Deloitte,⁶ 61% of manufacturers partner with specialized technology companies, with 30% utilizing in-house resources.

¹ Fortune Business Insights, 2020, Automation: Artificial Intelligence (AI) in Manufacturing Market

² MIT Technology Review, Edge Computing: Powering the Future of Manufacturing

³ PwC, 2022, PwC Digital Factory Transformation Survey 2022

⁴ AT&T Cybersecurity Insights™ Report, 2022, Securing the Edge: Focus on Manufacturing

⁵ SAS, 2022, AI in Manufacturing: Enabling Business-driven Factory Innovations

⁶ Deloitte, 2023, 2023 manufacturing industry outlook

Empowering smart manufacturing solutions with Lenovo and NVIDIA® edge AI



In partnership with NVIDIA, Lenovo edge AI solutions empower data-centric manufacturers to optimize internal processes and operations. With computing power at the edge, AI can run locally, automating and improving processes while benefiting from low latency and central control through connections to cloud-based nodes. It's powerful computing when and where it is needed.

Lenovo's AI-ready edge portfolio comprises purpose-built devices designed to be networked on-premises. The NVIDIA AI Enterprise Suite runs on Lenovo's infrastructure, accelerating the speed at which developers can build and deploy AI applications. The fully integrated AI solution delivers best-in-class availability, security, and scalability with enterprise-level manageability and high-performance data analytics. These innovative solutions help manufacturers establish agile, intelligent, and sustainable operations to deliver business value through smart production, supply chain and transportation, and industrial field services.

Edge computing is already making significant strides in the manufacturing industry, with experts foreseeing a robust trend with a Compound Annual Growth Rate (CAGR) of 37% projected from 2020 to 2027.⁴ With distributed technology, free from the shackles of standalone data centers, Lenovo edge AI solutions provide the complete platform to help start or accelerate an edge AI journey.

Edge AI in every manufacturing sector



Aerospace & Defense



Auto



Food & Beverage



Industrial



IT



Pharmaceuticals



Semiconductor & Electronics



Supply Chain



Transport

An industry-leading edge AI infrastructure solution

Optimized performance at the edge:

Personalized end-to-end GPU-accelerated solutions from Lenovo and NVIDIA offer fast insights to drive customer experience, productivity, and performance improvements.

A trusted partnership: Lenovo and NVIDIA combine core competencies to power the AI journey for world-leading enterprise organizations. Through a strategic partnership, Lenovo and NVIDIA collaborate on R&D initiatives, AI Labs, and AI Centers of Excellence, helping customers at every stage of their technology adoption process.

Easy and secure edge management:

Lenovo and NVIDIA provide complete, pre-validated, edge-optimized infrastructure with record-setting performance and low total cost of ownership (TCO). The integrated solution enables the user-friendly and secure operation of AI applications with existing infrastructure management frameworks, and facilitates faster AI deployment and time to value.

Management and implementation: Lenovo Open Cloud Automation (LOC-A) offers faster ROI and insights, saving time and money — and reducing carbon footprints — by automating all the manual tasks required to get an entire edge infrastructure network up and running. LOC-A operates at scale in hours, not days or weeks, as previously required. The provisioning process is simplified by using a zero-touch secure utility running on a smartphone or laptop, configuring, validating, and then onboarding the entire spectrum of Lenovo ThinkEdge clients and servers, with limited skillsets required and minimal travel needed.

And with enhanced XClarity management functionality, edge customers get an easy, one-stop management platform across all of Lenovo's edge devices. They no longer have to work in separate applications and screens to ensure their edge servers are online, up to date, operating efficiently, and delivering the data needed to make important, fast business decisions.

Whether on-premises or in-cloud, customers get device management capabilities with minimal footprint but with a scalable architecture.

⁴ AT&T Cybersecurity Insights™ Report, 2022, Securing the Edge: Focus on Manufacturing

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Harnessing the power of edge AI: Reshaping manufacturing, streamlining supply chains, and empowering field services

The rise of enhanced smart manufacturing

Intelligent manufacturing: Use IoT to capture data to drive efficiencies and optimize operational processes and Material Requirements Planning (MRP) with AI data analysis in real time and after-time.

Factory planning: Use cognitive computing to support factory planning, digital twinning, and continuous improvement of operations and worker experiences.

Improved quality: Use computer vision and deep learning to detect and prevent defects throughout manufacturing, from component assembly to shipment.

Increased productivity: Optimize equipment effectiveness and production, aided by real-time Intelligent Video Analysis (IVA) on assembly lines.

Cost optimization: Analyze operational patterns, integrate OT (Operational Technology) and IT, and drive decision-making to enable optimization and cost reduction.

Enhanced customer experience: Provide customers with real-time information on inventory and live communication throughout production and delivery.

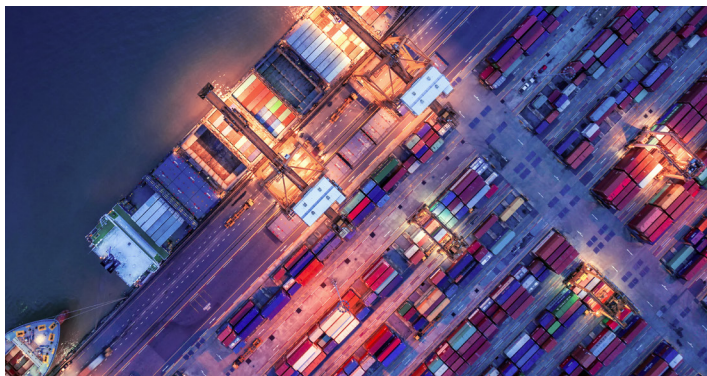
Advanced robotics: Enhance service quality, human experiences, and efficiency by automating manufacturing processes such as production line work.

Predictive maintenance: Predict machine failure and schedule maintenance to prevent costly breakdowns and production disruptions.

Energy efficiency: Monitor and adjust operations to identify abnormal energy consumption patterns for sustainability and significant cost savings.

Operational safety: Enhance EHS compliance using IVA to monitor human actions with advanced warning technology on manufacturing assembly lines.

Upgraded connectivity and security: Enable faster and secure data processing with localized data hosting to reduce reliance on latency and bandwidth.



Powering the supply chain and transportation

Decision-making: Power logistics and resource allocation decisions with real-time and after-time facility management data and analysis to drive decision-making.

Inventory management: Identify inventory shortages and surpluses to enable proactive replenishment, management, and supply chain performance.

Product availability: Use AI forecasting to anticipate consumer demand and eliminate product delays, ensuring availability.

Warehouse robotics: Boost efficiency and reduce manual workload with advanced robotics automating warehouse processes such as picking and packing.

Proactive inspections: Use IVA to identify broken packages, damaged containers, inspect warehouses and rail routes to catch issues before they escalate.

Route optimization: Use edge AI to optimize routes in real time based on traffic, weather, and other factors.

Enabling excellence in industrial field services

Deep learning: Analyze large data sets with deep learning to capture insights and functional information for decision-making.

Federated learning: Facilitate machine learning among devices without data transfer, enhancing performance, ensuring data privacy, optimizing bandwidth, and contributing to sustainability through reduced cloud traffic and energy consumption.

Infrastructure management: Build valuable manufacturing models, proactively monitor and repair infrastructure, preempting breakpoints to reduce costs and increase service availability.

Empowered workforce: Equip workers with powerful technology, including IVA, collect real-time data to boost performance and effective workload management.

Customer service: Improve customer service through real-time information and analytics, predictive maintenance, reduced latency, better data security, and personalized service delivery.

Work order optimization: For field service technicians, optimize work order scheduling and routing to increase efficiency and reduce travel times.

Improved sustainability: Promote ESG and a green future by reducing cloud traffic, energy consumption, and carbon emissions with edge AI and local data processing.

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Lenovo and NVIDIA edge AI: The transformational technologies driving innovations across the manufacturing industry

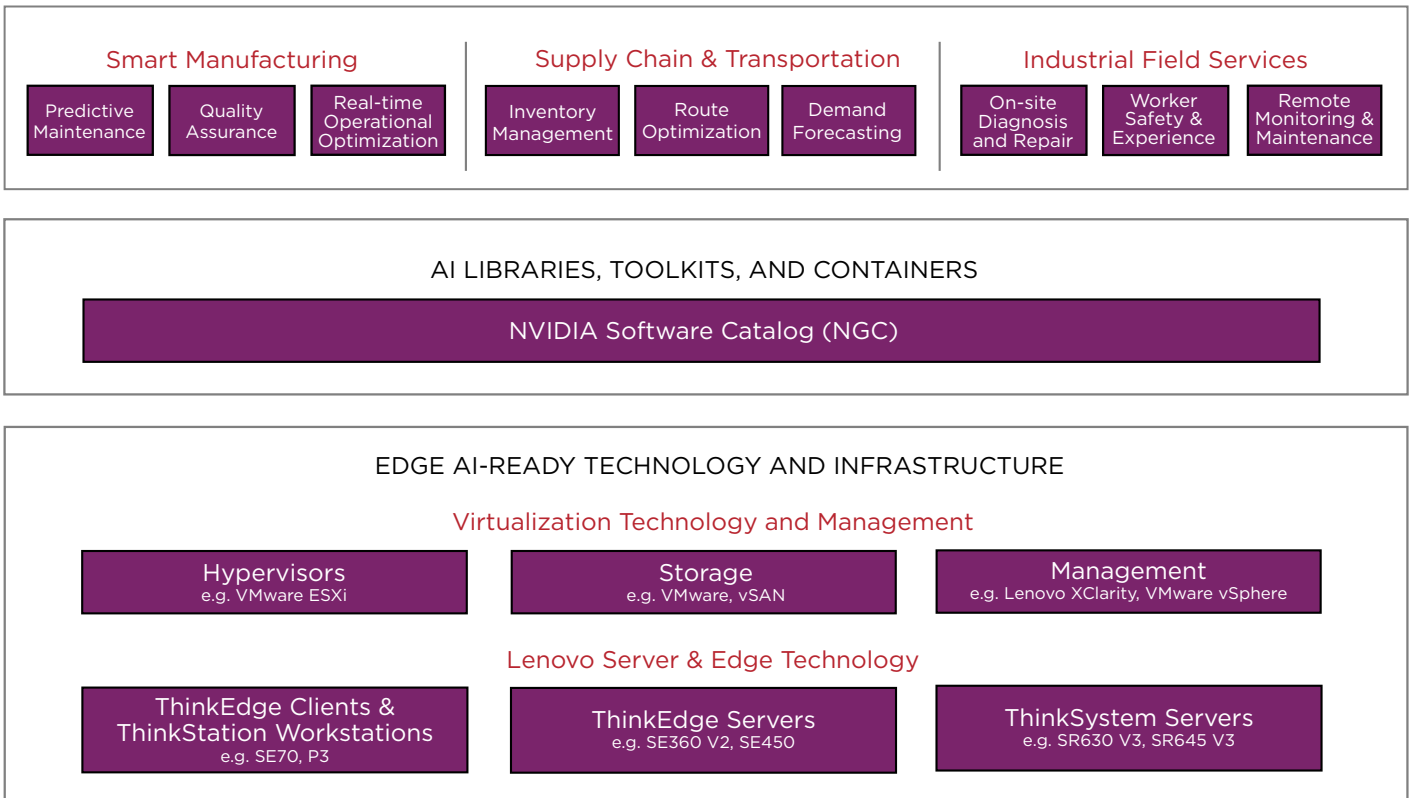
Computing: Lenovo offers a breadth of purpose-built and edge computing solutions to power industry-leading performance, security, and manageability.

Servers and storage: Lenovo ThinkEdge and ThinkSystem servers provide a full range of ruggedized, industry-leading solutions, delivering performance, security, and scalability at the core, near edge, and far edge, backed by enterprise-grade support. Lenovo's easy-to-manage storage offers compact flexibility and manageability, explicitly designed for edge environments.

Kubernetes: Lenovo and NVIDIA offer a leading purpose-built solution for deploying, managing, and monitoring applications at the edge. The NVIDIA GPU Operator and NVIDIA Network Operator standardize and automate the deployment of all components for provisioning Kubernetes clusters.

NVIDIA AI Enterprise: NVIDIA AI Enterprise is an end-to-end, cloud-native suite of AI and data analytics software, optimized for every organization to excel at AI, certified to deploy on Lenovo NVIDIA-Certified Systems, and includes global enterprise support so AI projects stay on track, allowing organizations to focus on harnessing the business value of AI.

EDGE AI SOLUTIONS FOR MANUFACTURERS



Lenovo ThinkEdge and ThinkSystem solutions enabling edge AI

Lenovo delivers NVIDIA-certified high-performance AI servers, digital twin-ready infrastructure, and ruggedized edge servers as the foundation to edge AI solutions for every industry.



Lenovo ThinkEdge SE70: ThinkEdge Clients (such as the SE70 shown) combine rugged utility and versatility for remote use at the far edge in locations such as factories, plants, and warehouses.



Lenovo ThinkEdge SE360 V2: Ruggedized, resilient Lenovo ThinkEdge servers (such as the SE360 V2) offer AI-enabled performance and robust security for the most challenging environments. With a minimal acoustic footprint and optimal cooling, ThinkEdge servers drive agility, intelligence, and sustainability at the edge.



Lenovo ThinkEdge SE450: Is an advanced processor-based server with a 2U height and short depth case that can go almost anywhere. It can be hung on a wall, stacked on a shelf, or mounted in a rack. This rugged technology can handle continuous operating temperatures from 5°C to 45°C, with designs configured to meet NEBS and ETSI requirements for 96-hour operating excursions from -5°C to 55°C as well as tolerance for locations with high dust and vibration.

Why Lenovo and NVIDIA

Working in partnership with NVIDIA, Lenovo is developing world-changing technologies to create a more efficient, connected, and digital society. By designing, engineering, and building the world's most complete portfolio of innovative, AI-ready devices and infrastructure, Lenovo and NVIDIA are leading an Intelligent Transformation — to create better experiences and opportunities for millions of customers worldwide.

To find out more, visit <https://www.lenovo.com/nvidia-edge-ai/>.

