Driving innovation through connected manufacturing

Unlocking efficiency, resilience, and innovation across production

Brochure

Alcatel·Lucent Enterprise

Manufacturing is evolving at an unprecedented pace, driven by technological innovation and shifting global demands; the pace of this evolution is reshaping everything from factory floors to the manufacturing workforce. Specifically, manufacturing is undergoing rapid transformation in four main ways:

1. **Digital transformation and connected manufacturing**
2. **Sustainability and supply chain resilience**
3. **Workforce evolution and a growing skills gap**
4. **Convergence of IT/OT**

To stay competitive organizations must deliver higher-quality products at lower prices, adapt to customer demands and remain resilient in the face of inevitable supply chain disruptions, increased cyberattack risk, the growing skills gap and always-present chance of cascading operational inefficiencies.

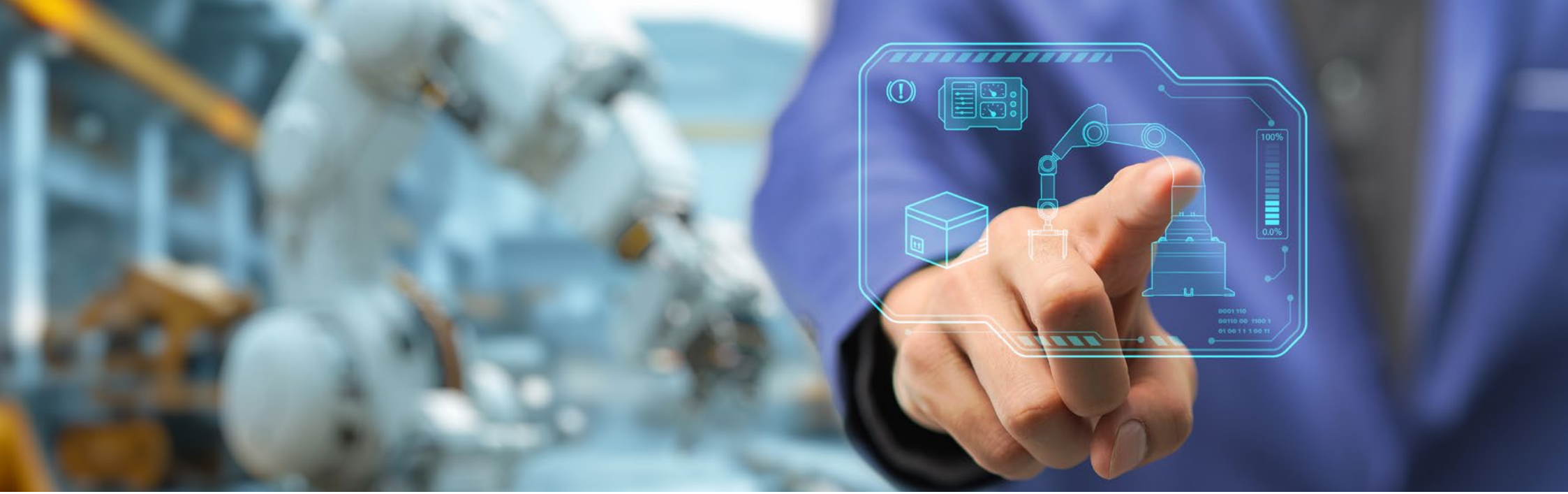
Technology is the key to overcoming these challenges. By creating a connected manufacturing environment underpinned by real-time insights, automated workflows and built-in cybersecurity, businesses can bring together people, machines and processes into a secure, intelligent ecosystem.

Challenges faced by today's manufacturers

Manufacturers today face a complex and uncertain business climate, from supply chain disruptions, to cybersecurity issues and a significant shortage of skilled labor:

- 91% of manufacturing leaders report facing obstacles to innovation, including difficulty finding reliable supply chain partners[1]
- The daily cost of a supply chain disruption in manufacturing averages around $610,000[2]
- 77% of executives say insufficient resources, such as workforce and budget, hinder their ability to manage supply chains effectively[3]
- 53% of manufacturing executives cite talent shortages as a top challenge[4]
- The manufacturing sector faced more than 630 ransomware attacks in 2023, making it the single most targeted industry for ransomware[5]

Manufacturers have already begun addressing these challenges by undergoing rapid transformation around connected manufacturing, supply chain resilience, workforce evolution and converging IT/OT. But to truly overcome these issues, manufacturers need technology solutions that integrate connectivity, automation and intelligence while keeping costs down.



Digital transformation and connected manufacturing

The Fourth Industrial Revolution, defined by advanced robotics, internet of things (IoT), artificial intelligence and other advanced technologies, is transforming manufacturing. Highly automated, interconnected and data-driven factories leverage a suite of advanced technologies:

Automation: The digital backbone of connected factories, orchestrating industrial internet of things (IIoT)-enabled machines and real-time data to autonomously optimize production, reduce errors and boost throughput.

IIoT and real-time insights: A network of sensors and connected devices collects real-time data from machinery, allowing for constant monitoring, process improvement and predictive maintenance to reduce downtime.

Built-in cybersecurity: Built-in security keeps connected factories operational by enforcing zero-trust access, segmenting IT/OT networks and continuously monitoring assets so a single breach doesn't cascade into a larger problem (and costly downtime).

Supply chain resilience and sustainability

A growing emphasis for manufacturers is on making supply chains more robust and processes more environmentally sustainable.

Resilient supply chains: Vulnerabilities exposed in global supply chains – especially during the Covid-19 pandemic, have led manufacturers to prioritize flexibility and resilience. Strategies include diversifying suppliers and using technologies to optimize supply chain efficiency, transparency and traceability.

Green manufacturing: Manufacturers are under pressure by consumers and governments to reduce their environmental impact by adopting renewable energy sources, minimizing waste and implementing eco-friendly production processes.

Workforce evolution and human-machine collaboration

There's a growing mismatch between the advanced skills companies need and the skills of the available workforce.

- The rapid shift to connected factories featuring AI and automation requires new expertise in technology, programming and critical thinking
- Experienced workers are retiring in large numbers, taking their knowledge with them. As a result, millions of high-tech manufacturing jobs could soon go unfilled, a global issue that in the case of the U.S. could cost that country's economy $1 trillion by 2030[6]

Rather than replacing human workers entirely, the trend in manufacturing has shifted towards collaboration between people and machines, with advanced robotics taking over repetitive or dangerous tasks, along with re-skilling current employees to work alongside automated systems.

Convergence of IT/OT in manufacturing

The trend of integrating operational technology (OT) such as robotics, sensors and supervisory control and data acquisition (SCADA) systems with information technology (IT) such as enterprise networks and cloud analytics onto a unified, segmented network continues to gain momentum in manufacturing.

This approach helps manufacturers:

- Improve operational efficiency by reducing downtime and simplifying maintenance
- Lower infrastructure costs through converged cabling and network consolidation
- Strengthen network security across production and enterprise systems with proper segmentation

While the advantages of IT/OT integration are clear, there are challenges. Previously isolated OT devices, for example, are now exposed to online threats they weren't designed to mitigate. Many IIoT devices and systems don't have built-in security, and the SCADA architecture commonly used to monitor and control these devices lacks any inherent security. Operational teams also often lack cybersecurity knowledge, since they traditionally haven't needed it. As a result, even a simple security breach could compromise mission-critical systems.

Overcoming manufacturing challenges with technology and digital transformation

The future of manufacturing belongs to those who embrace digital transformation. The right technology is key to overcoming challenges and capitalizing on (or alleviating) the latest modern manufacturing trend by bringing together people, machines and processes into a secure, intelligent ecosystem.

Connected manufacturing also helps scale worker productivity and shrink the skills gap by digitizing work instructions and delivering real time guidance to accelerate onboarding, reduce errors and enable fewer, less experienced workers to run complex lines productively, all while the knowledge of more experienced workers is retained.

With real-time insights, automated workflows and built-in cybersecurity, manufacturers can achieve operational continuity while increasing efficiency and reducing costs. A connected digital foundation not only ensures resilience and safety, but also empowers manufacturers to innovate and scale with confidence.

The importance of connectivity

Meeting this new manufacturing reality requires more than just a network. Digital transformation has redefined connectivity, transforming it from a basic utility to a critical enabler of efficiency, resilience and growth.

Today's manufacturers need networks that ensure operational continuity, seamlessly integrate IoT and automation, deliver real-time data for smarter decisions and safeguard against ever-growing cyber threats. A modern, intelligent network isn't just about connecting machines: it's about powering the future of manufacturing.

Brochure
How connected manufacturing enables the factory of the future

How Alcatel-Lucent Enterprise supports modern manufacturing

Alcatel-Lucent Enterprise enables secure, connected manufacturing through advanced networks, communications and cloud solutions (CapEx or OpEx based) focused on three key areas:

- **Autonomous production:** Solutions that enable critical production environments with industrial IoT integration
- **Supply chain optimization:** Enabling efficient collaboration, AI-driven business processes and asset tracking
- **Connected warehouses:** Connectivity for factories, warehouses and logistics for smarter, secure operations

Here's how we do it.

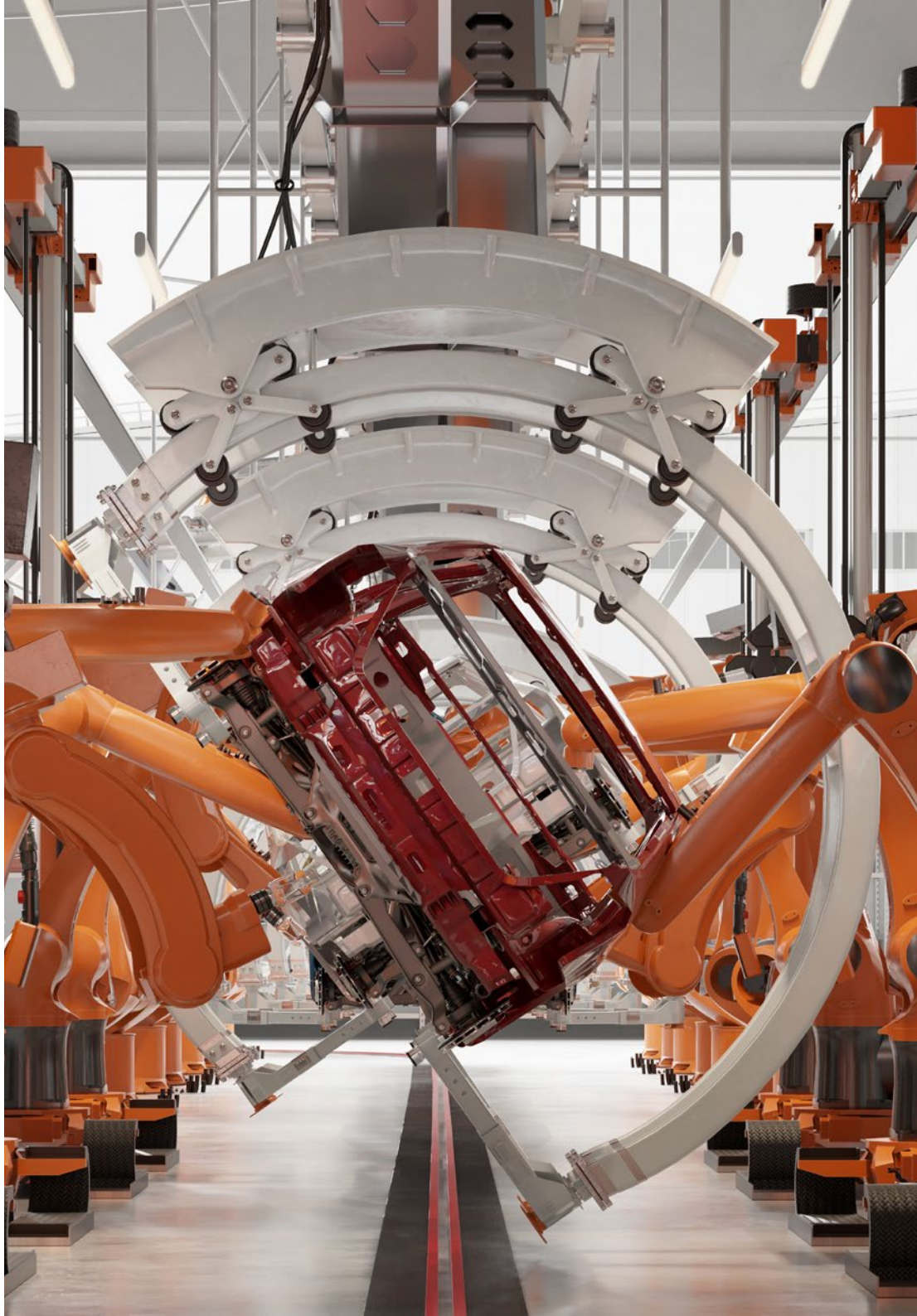
Autonomous, simplified networks

ALE provides autonomous networks built on zero-trust architecture, helping to scale employees and simplify operations. With one operating system for all switches and a common management interface for both switches and Wi-Fi, it reduces complexity and total cost of ownership (TCO). AI-driven maintenance with OmniVista Network Advisor shifts operations from reactive to proactive, helping minimize unplanned downtime.

Agility through automation

Network automation streamlines deployment and daily operations across the factory floor. This enables manufacturers to adapt quickly to shifting demands while maintaining high levels of performance and efficiency.

This includes capabilities such as automatic device onboarding and profiling, where new machines, sensors and controllers are instantly recognized, configured and secured without manual intervention as they join the network. It also extends to high-availability network architectures with built-in self-healing, enabling automatic recovery during disruptions to ensure continuous connectivity and reliable operations.



Built-in security

Our zero-trust framework with micro and macro segmentation authenticates every device and contains threats before they spread. The result: Stronger resilience and uninterrupted production without added complexity.

With IT/OT convergence, security is now required across all IT/OT devices. Enabling remote access for management and maintenance procedures could easily become a backdoor for cyber criminals. ALE ensures all environments, regardless of complexity, benefit from robust and automated protection mechanisms, including:

- Secure, automated IoT connectivity
- Zero-trust network access powered by private 5G microslicing technology for both macro and micro segmentation
- Operating system (OS) hardening and independent verification
- A secure supply chain for hardware and software components
- Compliance with global security certifications

Optimized for IIoT and industrial traffic

With expanding IIoT integration, ALE prioritizes real-time industrial protocols for control and monitoring such as Process Field Network (PROFINET). Application awareness ensures mission-critical traffic runs securely and efficiently without performance trade-offs.

Connectivity in challenging environments

Connectivity on the factory floor must withstand harsh, dynamic and potentially unpredictable conditions. ALE's Private 5G network, powered by our partnership with Celona, complements Wi-Fi with secure, high-performance wireless coverage. Fully integrated with ALE OmniSwitch, it bridges IT/OT environments and delivers low-latency mobility for Industry 4.0 devices.

Smarter network management

OmniVista Network Advisor uses AI-driven analytics for proactive maintenance and guided remediation. Its integration with Milestone video management software (VMS) allows operations and security staff to directly manage connected cameras – such as restarting a device – without IT intervention.

Unified visibility and control

OmniVista offers a single management platform for wired, wireless and data center networks. This end-to-end visibility reduces complexity, accelerates troubleshooting and supports IT/OT convergence – giving manufacturers the agility to modernize while lowering total cost of ownership.

ALE solutions support IT/OT convergence by enabling:

- Infrastructure consolidation: Connect and manage IT/OT devices through a unified, high-performance network across both office and industrial environments
- Network security: Apply enterprise-grade segmentation and threat containment to protect critical OT systems from lateral attacks and service disruption
- Operational efficiency: Streamline operations with centralized management and AI-driven insights that reduce downtime and optimize performance

Communication anywhere (desktop or mobile)

Modern communication is about solving problems faster, protecting workers and keeping production moving. Effective communication and collaboration are essential for managing daily operations, ensuring service quality and responding quickly to unexpected situations.

ALE provides advanced communication tools enabling instant collaboration across the factory, the enterprise and the supply chain. From emergency alerts to remote troubleshooting, our solutions help teams work smarter, safer and more efficiently, minimizing delays, reducing costs and maintaining safety.

Reliable 5x9s flexible and secure communication

OmniPCX® Enterprise Purple provides resilient telephony with high availability and encryption. Devices like DeskPhones, digital enhanced cordless telephone (DECT) handsets (with emergency buttons, pull cords, no movement or man-down detection and geolocation, along with explosion protected models) and softphones support diverse roles, especially in factories and warehouses.

Efficient collaboration tools

Rainbow™ by Alcatel-Lucent Enterprise delivers chat, file sharing, screen sharing and video conferencing on mobile or desktop. Seamlessly complements OmniPCX® Enterprise Purple with one-number solutions.

Automated call handling and contact centers

Automated attendants, multimedia contact centers, dispatch consoles and call recording simplify interactions with suppliers, partners and customers.

Integration into business processes

OmniPCX® Open Gateway and Rainbow™ CPaaS offer APIs to embed communication features, from call control to video conferencing, directly into business apps to improve speed, coordination and decision-making during critical events. Advanced functions include chatbots, translation, sentiment analysis and natural language processing (NLP).

For example, when a worker triggers an emergency call, geolocation data can automatically synchronize the nearest video surveillance feed with the OCC (operations control center) agent's interface. This contextual awareness allows the agent to instantly see the situation unfolding in real time, enabling faster assessment, more targeted response and a safer workplace.

Emergency alerts and mass notifications

Visual Notification Assistant (VNA) routes emergency calls and sends alerts via email, SMS or chat. Works with internal and third-party systems using standard protocols, all through a no-code interface, making it possible to send evacuation alerts on a SIP loudspeaker or control IoT (to limit access to an identified area, for example).

Smart alarm management with IoT & AI

When IoT devices or systems trigger alerts, automated workflows contact first responders or launch crisis meetings. VNA and Rainbow can connect with AI or databases to support decision-making and real-time coordination.

Video surveillance integration

CCTV feeds can be linked with emergency calls and integrated into Rainbow conference calls, providing situational awareness during incidents. Efficiently manage operations, anticipate problems and maintain production quality with fully integrated communication and collaboration solutions.

A commitment to sustainability

Sustainability is at the core of ALE. We're driven by a deep commitment to environmental sustainability, social responsibility and corporate governance (ESG).

Alcatel-Lucent Enterprise: Built for modern manufacturing

Alcatel-Lucent Enterprise enables the future of manufacturing with secure connectivity, intelligent communications and cloud innovation. From autonomous production to optimized supply chains and connected warehouses, our solutions drive smarter, safer and more sustainable operations while helping manufacturers accelerate digital transformation and achieve lasting value.

For more information about Alcatel-Lucent Enterprise manufacturing solutions, visit our connected manufacturing page.

1 "What is the state of manufacturing and supply chain in 2025?" Forbes, April 30 2025.
2 "Supply chain statistics - 70 key figures of 2025," Procurement Tactics, 2025.
3 "What is the state of manufacturing and supply chain in 2025?" Forbes, April 30 2025.
4 "Meeting the challenge of supply chain disruption," Deloitte, 2022.
5 "Cybersecurity statistics 2025," Fortinet, 2025.
6 "Why manufacturing companies now see safe workplaces as a competitive advantage," WeForum, Sept. 16 2025.

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