

Evolve your IT architecture for smart manufacturing

Benefit from connectivity, networking and security investments.

According to one estimate, spending on smart manufacturing technology will reach \$950 billion by 2030.¹

The future of manufacturing promises to be more autonomous, agile and intelligent. The Industrial Internet of Things (IIoT) — and the continuous stream of data it produces — offers new ways to empower employees, adapt to changing market conditions and increase reliability.

According to one estimate, spending on smart manufacturing technology will reach \$950 billion by 2030.² Manufacturers can only realize these benefits if their networks can keep pace. Scalable, reliable bandwidth is essential to growth and technology leaders will also need to manage increasingly complex network architectures while keeping IT secure. This guide discusses key areas of connectivity, networking and security that are an essential part of investments in smart factories.

Connectivity to empower employees and support customers

In mid-2023, there were about 600,000 job openings in manufacturing.³ Companies facing a shortage of skilled workers will need to lean on technology to help their teams accomplish more. Advances in automation and investment in smarter, connected equipment can empower workers to increase productivity. Ongoing IIoT adoption and advanced analytics informed by a continuous stream of data from equipment sensors can identify production efficiencies, reduce costs, improve preventative maintenance and give employees a more holistic view of the production process.

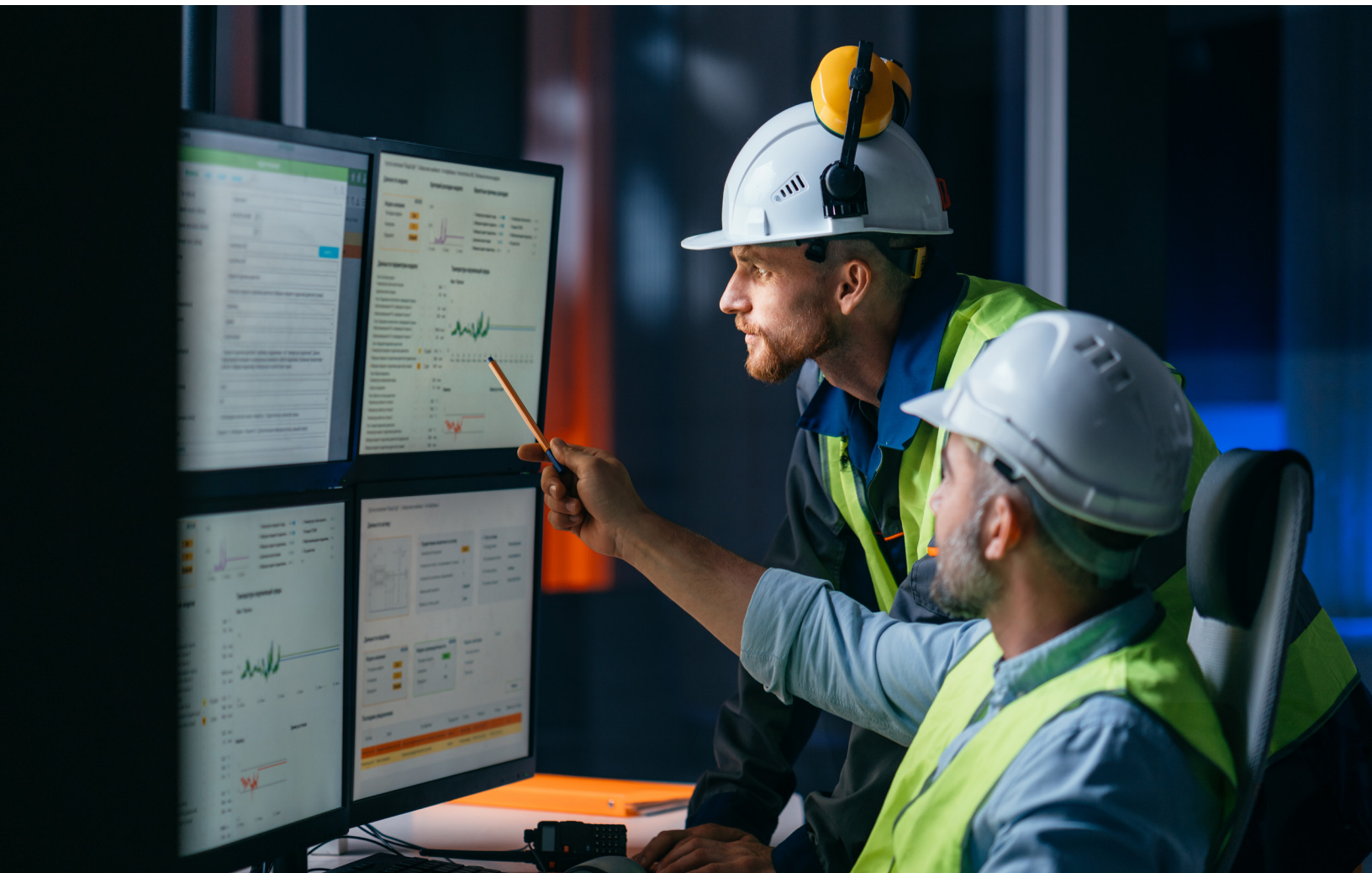
Connected equipment is only part of the solution. The networks that manufacturers rely on to support their equipment require flexible, low-latency bandwidth for reliable access to data. Fiber connections need to scale seamlessly to accommodate new technologies and expanding capabilities, with more facilities requiring connection speeds of up to 100 Mbps. 5G connectivity can also increase available bandwidth and make assembly line configurations more tractable with equipment that connects to mobile networks. For traffic routed among sites and data centers, manufacturers also need scalable Ethernet solutions and direct, secure connections to resources in the cloud.

Planning for future connectivity needs also benefits customers. Networks with reliable unified communications help ensure a good experience with external partners by fostering more effective collaboration. Networking solutions that can prioritize traffic, like video and voice connections, give IT professionals better tools to manage the expanding volume of data moving across their networks. Scalable internet connections also facilitate instant data sharing between manufacturers and their clients, improving the digital customer experience and building loyalty.

Network enhancements to support new technology

In addition to the growing bandwidth required by smart factories, manufacturers will need to enhance their private network infrastructure. As more connected machines come online, it's critical to consider investments in switches, routers, wireless access points and other hardware needed for a reliable local area network (LAN).

Advancements in industrial robots increasingly leverage machine learning and other data-intensive technologies requiring uninterrupted, low-latency LAN connectivity. For example, autonomous mobile robots (AMRs) can now assess and integrate a continuous stream of sensor data to adapt to the ways they complete tasks. This can alleviate repetitive and potentially unsafe tasks from employees. With capabilities like 360-degree obstacle avoidance, AMRs have the potential to reduce injuries from human errors on the factory floor and can work continuously in ways people can't. In one application, a clothing manufacturer was able to triple production capacity by adding additional equipment after replacing a conveyor system with a fleet of AMRs.⁴ Benefits like these are made possible with network designs that can adapt quickly to new advances in robotics and IIoT.



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Technology to increase reliability

In today's factories, network reliability and equipment reliability are often one in the same. Any upgrade and redesign of connectivity to plants and data centers should rely on an internet and Ethernet provider that can design dual fiber entry, path diversity between sites, multiple options for connectivity and automatic failover to backups. Network interruptions that affect connected equipment can have significant consequences. In 2022, unplanned downtime cost manufacturers at least 50% more than it did just two years earlier.⁵

To keep production running, manufacturers also need to reinforce network reliability to support smart environmental sensors that help identify conditions that could impact revenue and delivery to customers. Temperature sensors can alert employees to parts failures or environmental conditions that exceed operating specs. Motion sensors and smart cameras monitor access to restricted areas. Humidity and air quality monitoring also have the potential to identify harmful conditions before they cause problems. As a result, one survey estimates that 57% of manufacturers employ temperature sensors at their facilities and 42% monitor air quality.⁷ Networks that support these elements of IIoT can help support a more reliable production line and potentially reduce their environmental impacts by gaining a more holistic view of energy use and emissions.

Smarter IT to drive efficiency

The benefits of a modernized network in a smart factory can only be realized with sufficient technical talent in the organization. In one survey, 86% of CIOs said they face more competition for qualified IT candidates than in the past and 73% were worried about attrition.⁸ With the shortage of skilled manufacturing personnel, leaders in the industry often must supplement limited human resources in IT with more efficient technology.

One way to simplify networking is adoption of software-defined wide area networks (SD-WANs). Compared to legacy technologies, SD-WANs require substantially less hardware to configure or install should location needs change. They are also easier to manage, as an IT administrator can modify the network at any location from the cloud. The comparable simplicity, flexibility and cost savings have led six in 10 large manufacturers to implement SD-WAN in recent years.⁹

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large manufacturers have adopted SD-WAN.¹⁰

Other cloud-based solutions can reduce IT workloads by bringing routine tasks into a single dashboard. These include managing phone systems, updating network policy settings, managing traffic and monitoring alerts. Working with a single managed network services partner can also provide hardware, setup and maintenance — shifting capex to opex while removing the day-to-day responsibility of operating many network components. All-in-one managed solutions can bring multiple services into a single platform for easier management. These can include SD-WAN, LAN, switching, enterprise cloud services and other enterprise technology solutions.

Security is another critical area where network modernization can help relieve shortages of IT staff. Firewalls, including next-generation firewalls, can be updated automatically by a trusted service provider.

Solutions, such as zero trust network access (ZTNA), cloud access security broker (CASB) and VPN access, help manufacturers implement cybersecurity safeguards for all employees, regardless of location.

At the same time, managed network services have become essential for many businesses to support cloud computing, enable mobility and efficiently connect people and data. Managed services free IT professionals from the need to set up, monitor and manage network infrastructure and operations. By offloading these tasks to experts in enterprise network solutions, organizations can allow IT to stay focused on more important priorities while reducing costs, minimizing risk and improving performance for end users.

The right partner for the future of smart manufacturing

From the expanding capabilities of IIoT to the ongoing automation of manufacturers' operations, network modernization remains essential to ensure smart factories achieve the bandwidth, reliability and IT flexibility that advancing technology requires. Enhancing connectivity and networking capabilities calls for a partner with managed services capabilities and the experience to design and deploy solutions at the scale manufacturers demand.

Spectrum Enterprise® offers a comprehensive portfolio of solutions to help industrial organizations meet their bandwidth, network modernization and security needs. Backed by 24/7/365 U.S.-based support, we can deliver the underlying network technology that supports advanced manufacturing operations, logistics and IT — helping your factory discover new levels of efficiency, growth and sustainability.

Learn more

1. ["Smart Manufacturing Spend Climbs Over \\$950 Billion in 2030 and 37 Other Technology Stats You Need to Know,"](#) ABI Research, February 10, 2022.
2. Ibid.
3. ["Job Openings Levels and Rates by Industry and Region, Seasonally Adjusted,"](#) U.S. Bureau of Labor Statistics, accessed October 24, 2023.
4. Dennis Scimeca, ["Clothing Manufacturer Triples Production Capacity with Autonomous Mobile Robots,"](#) IndustryWeek, September 22, 2022.
5. ["The True Cost of Downtime 2022,"](#) Siemens, April 3, 2023.
6. Ibid.
7. ["A Business Case for Smarter Manufacturing Spaces,"](#) Cisco, 2023.
8. ["Do Recent Layoffs Mean the Tech Talent Crunch Is Over?,"](#) Gartner Newsroom, March 7, 2023.
9. ["SD-WAN Transforms Retail, Business Services and Manufacturing,"](#) Omdia's Brian Washburn for Expereo, May 2, 2022.
10. Ibid.

About Spectrum Enterprise

Spectrum Enterprise, a part of Charter Communications, Inc., is a national provider of scalable, fiber technology solutions serving many of America's largest businesses and communications service providers. The broad Spectrum Enterprise portfolio includes [networking and managed services solutions: Internet access, Ethernet access and networks, Voice and TV solutions](#). The Spectrum Enterprise team of experts works closely with clients to achieve greater business success by providing solutions designed to meet their evolving needs. For more information, visit enterprise.spectrum.com.