

A photograph of two factory workers, a woman on the left and a man on the right, both wearing white hard hats and high-visibility yellow safety vests over grey work shirts. They are standing in a factory environment, looking at a tablet held by the man. The background is filled with industrial machinery and lights, creating a bokeh effect. A white diagonal graphic element is present on the left side of the image.

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Digitalization guide to
make connected workers
a reality in manufacturing

Making the parts work together to boost worker safety, collaboration, and productivity

As a manufacturer, you know that more efficient and productive operations are critical to business success. And you're constantly evaluating new ways to increase worker safety, collaboration and engagement, and to build and maintain critical workforce skills and expertise. In every case, connecting workers to colleagues, information, assets and systems will help to achieve your goals and digital transformation, but concerns about technology maturity and fears of implementation complexity and high costs may have stopped you from pushing ahead.

In this connected worker digitalization guide we look at the best strategies to improve worker safety and collaboration, speed up training and boost productivity. We show how manufacturing companies need to use digitalization and automation to accelerate their Industry 4.0 initiatives. Importantly, we also illustrate how the key to successful implementation is to combine pervasive, reliable connectivity with edge computing, digital applications and industrial devices to make sensors and machines, robots and connected workers all work as one.



Let the ecosystem work to your advantage

Here are four facts why you should connect your manufacturing workforce.

1 Technologies and spectrum are ready for use

The private wireless networks, industrial edge solutions, applications and devices that are needed to connect workers are available today, and have been proven in real-world deployments. With private wireless network frequencies for enterprises becoming available around the world and mobile network providers actively participating in deployments, finding spectrum is getting easier all the time.

2 Ecosystems have formed beyond private wireless networks 4.9G/LTE & 5G

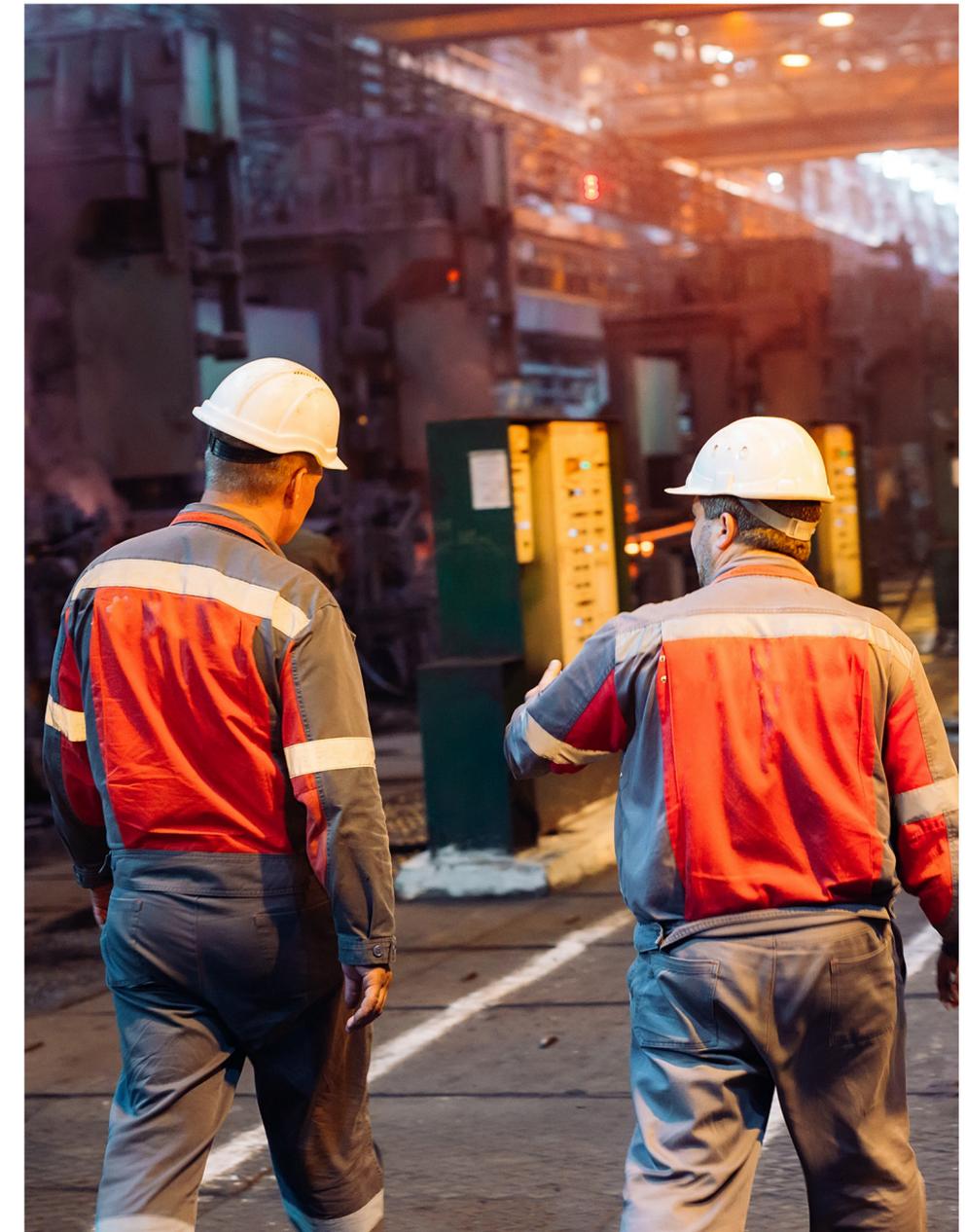
Technology vendors recognize they can't offer end-to-end solutions on their own, so they're collaborating to deliver all of the necessary hardware and software with verified interoperability. The result: Complete solutions for all workers' use cases with maximum simplicity and the best available technologies end-to-end.

3 Existing solutions continue to deliver value

Very few manufacturers can afford to rip out and replace existing networks, systems and technologies, and there's no need. You can connect legacy assets to leverage existing investments while smoothly introducing the solutions needed to support key connected worker use cases.

4 Connected workers are already a reality

Leading manufacturers across industries are already taking advantage of connected worker solutions that help them get more done, faster, safer and more cost effectively. Manufacturers who don't act now risk falling behind.



The business benefits are proven

A private wireless network and industrial edge are the foundation for Industry 4.0 use cases, including connected workers, and early adopters are already seeing impressive real-life results. Together with GlobalData, we surveyed 79 early adopters, all multinational corporations in mature countries, half of them manufacturers:

80%

achieved return on investment (ROI) within six months, 21% within one month

95%

report increased worker collaboration and decision-making

74%

have increased production quality

69%

have reduced operational costs

61%

have increased productivity and worker safety

“The Nokia 5G private wireless network enabled us to provide uninterrupted virtual inspection service to our aircraft engine services customers — without a single minute of unpredicted downtime.”

Lufthansa Technik

Choose connected worker use cases that align with your top priorities

The use cases you focus on first will depend on your most pressing operational needs, current environment and long-term goals for digitalization. Our experts and ecosystem partners help you choose, tailor and smoothly implement the most beneficial new capabilities for your requirements and ensure rapid and willing adoption by workers.

All connected workers solutions are designed to simplify evolution, maximize flexibility and minimize risks:



Seamless integration with existing networks, systems and technologies helps you extract maximum value from your investments, reduce disruption and accelerate the learning curve when new capabilities are introduced.



Scalable solutions let you start small - maybe with a pilot project around a machine or a process - then smoothly expand use of the new capability when its value is proven and accepted.



Secure solutions are designed for mission-critical operational technology environments and meet industrial enterprise requirements for communications and data isolation, protection and encryption.



Connected worker solutions deployed on the Nokia MX Industrial Edge

Remote expert support

Improve worker support with interactive voice and video communications to on-site experts and remote experts.

1 2 3 5 6



Digital content distribution

Accelerate problem resolution with instant access to step-by-step guidance, process information and remote assistance from tablets and handhelds.

1 2 5 6



Self-guided assistance and training

Make learning more engaging and realistic with virtual reality contextual information delivered through smart glasses, tablets and handhelds.

1 2 3



Work evidence collection

Improve accountability and processes by empowering workers to create video, audio and text proof of work.

1 2 3 5 6



Voice and video communications everywhere

Increase worker collaboration, efficiency and safety with push-to-talk and push-to-video communications everywhere.

1 2 3 6



Key technologies

- 1 Private Wireless or WiFi
- 2 MX Industrial Edge
- 3 Nokia Team Comms
- 4 Positioning (HAIP)
- 5 Taqtile Manifest® (XR)
- 6 HHRA industrial handheld
- 7 Bosch connected tools

Scanning for asset intelligence

Improve worker responses to planned and unplanned events with instant access to digital information about assets.

1 2 5 6



Connected tools

Improve productivity, processes and quality with wireless tools such as automated nutrunners and tighteners.

1 7



Workforce geo-positioning

Increase efficiency and worker safety with precise knowledge of workers' real-time locations.

2 4



Essential applications for connected workers



Nokia High Accuracy Indoor Positioning (HAIP) - Instantly locate people and assets with high precision

Find people and assets within minutes to improve safety, asset usage, inventory control and billing for shared assets. Nokia HAIP computes all data locally to ensure it remains securely within your premises.



Taqtile Manifest® - Deliver mixed reality work instructions to connected workers

Taqtile Manifest® presents mixed reality content on a tablet, mobile device or heads-up display in real time. Workers have convenient and intuitive access to the information and instructions they need to complete tasks more efficiently and safely.



Nokia Team Comms - Connect workers with campus-wide communications

Nokia Team Comms connects workers with integrated voice and video communications. Workers have secure and reliable one-to-one and one-to-many communications so they can quickly and easily collaborate throughout your manufacturing campus.



Onboard your industrial app to MX Industrial Edge - your ecosystem neutral and unification platform

Nokia has a variety of Nokia and third party applications on-boarded on MXIE. However you may have your own or another 3rd party application that you prefer to run on MXIE to gain latency benefits of the high capacity on-premises edge compute. The Nokia application onboarding process supported by MXIE developer portal enables fast and smooth application onboarding and automated application lifecycle management.

Industrial grade devices for connected worker systems

All **Nokia Industrial devices** come with smart management tools and communications applications for our private wireless solutions to ensure workers, machines and sensors can quickly and easily share information:

- Handhelds offer push-to-talk, push-to-video and access to live data
- Headsets, light earpieces, push-to-talk microphones and wearable cameras simplify information access and sharing
- Workpads provide a larger interface to manage operations and run applications, and can be vehicle-mounted
- Field routers connect to complex systems and support industrial protocols such as PROFINET, OPC-UA, EtherCAT and Modbus for integration with legacy systems
- Dongles bring instant wireless connectivity to vehicles, robots and PC-based solutions
- Hotspots make it easy to connect WiFi equipment to private networks
- Customer premises equipment (CPE) supports fixed wireless access connectivity.



Simplify your journey with Nokia's one platform for industrial digitalization

As a manufacturer, we understand the need to continuously improve operational efficiency, worker safety and sustainability in your daily operations.

We know first-hand that IT and operational technology (OT) are often incompatible with complex processes, certification requirements and workforce skillsets. And we share your need to accelerate digital transformation and adopt new applications and devices while keeping production lines running.

That's why we developed the Nokia one platform for industrial digitalization. Provided as a service, this secure and robust platform is at the heart of every connected worker and Industry 4.0 use case you implement. It includes everything you need to connect your manufacturing assets, machines and workers so you can smoothly evolve to data-driven operations and adopt zero-touch automation to transform your operations:

- Secure and reliable wireless connectivity
- Industrial edge computing
- A catalog of ecosystem-neutral applications
- Ruggedized and certified industrial devices.

Join forward-thinking enterprises across industries that already rely on the Nokia one platform for industrial digitalization to take their plans from vision to reality.



Enabling the requirements of Connected Worker and Industry 4.0 digitalization

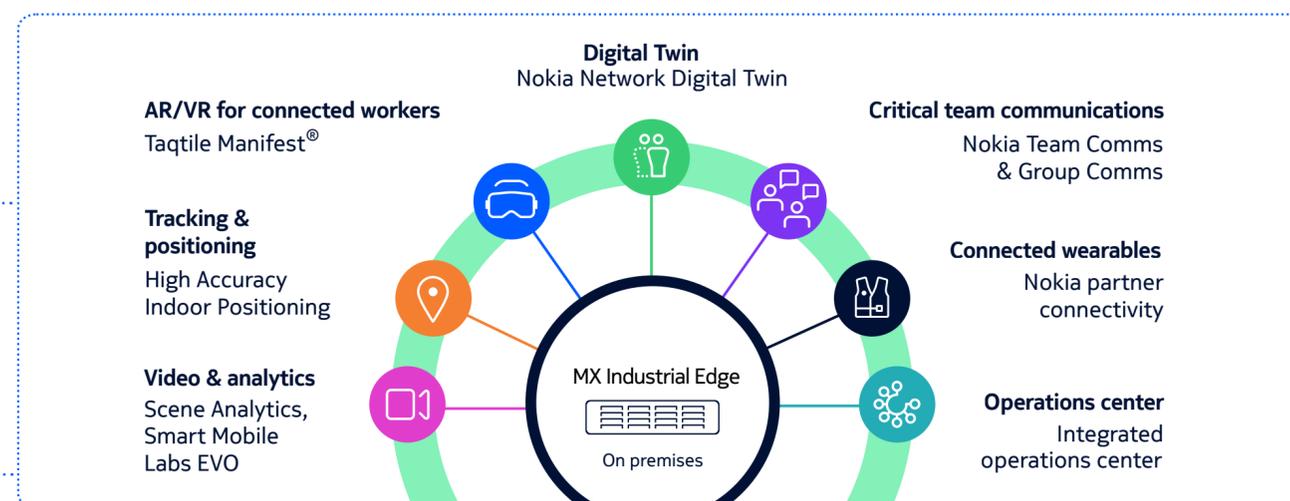
One platform for mission-critical Private Wireless and Industrial Edge

Deploy directly from the Nokia app catalog

Choose from a continuously growing app portfolio from Nokia and a wide ecosystem of best-in-class partners.

Powered by Nokia MX Industrial Edge

Mission critical availability, low latency performance & OT data stays local with on-premise Industrial Edge for increased security.



As a service model

Cloud-based management
Digital Automation Cloud enables seamless deployment, updates and maintenance from one central location.

Private Wireless connectivity

4.9G 5G Wi-Fi

MX Boost- Wireless connectivity aggregation for increased capacity and reliability

For all assets using industrial devices

AR / VR Handhelds / Smartphones Workpads Cameras Routers / Hotspots Dongles / Trackers

On-premise edge connectivity Industrial connectors Siemens MindConnect®

For every industry, at any scale

- Manufacturing
- Logistics
- Airports, harbours
- Mining
- Energy
- Public safety



Complete connectivity solutions for smart factories and supply chains

Get wireless connectivity for any requirements: 4.9G/LTE, 5G, WiFi and more

Our innovative, secure and reliable wireless connectivity solutions are easy to deploy and eliminate complexity so you can concentrate on what you do best:

- Industrial private wireless**

Nokia Digital Automation Cloud (DAC) gives you plug-and-play private wireless connectivity as-a-service; with our 5G-ready Modular Private Wireless (MPW) solution, you can build and deploy private 4.9G/LTE and 5G networks for small to very large industrial sites and field area networks.

- Nokia MX Boost** combines different connectivity technologies — including WiFi — into a single wireless connectivity system so you never need to worry about choosing the right technology for your use cases.

Drive OT transformation with an industrial edge

With reliable, high-capacity edge processing on-site, your OT data stays local and your connected workers can stay engaged with business processes, benefits from lower latency applications and use real-time OT data to make more informed decisions on crucial operations at the point of work.

The **Nokia MX Industrial Edge** is a future-ready, on-premise edge solution that helps you increase efficiency, agility and workflow automation to quickly adapt to changing customer

and market needs. It combines the flexibility and simplicity of an edge-as-a-service model with a high-performance, resilient and secure edge architecture that meets the mission-critical needs of even the most asset-intensive industrial environments.

Accelerate digital transformation with click-to-deploy applications

Connected workers, autonomous robots, automated guided vehicles (AGVs), computer vision-based analytics and other use cases are at the forefront of change in manufacturing. But these advances rely on applications that act as powerful digital enablers.

The **Nokia Industrial Application Catalog** gives you fast and easy access to a wide range of tested and proven applications developed by our experts and by third parties. You can start with applications that enable connected worker use cases and evolve to take advantage of applications for industrial IoT, video analytics, digital twins, and many other Industry 4.0 use cases. All applications are ecosystem-neutral, offered as-a-service and instantly deployable on the Nokia MX Industrial Edge.

Increase connected worker flexibility with ruggedized and certified industrial devices

Ruggedized devices that are certified to meet industrial requirements give your connected workers new flexibility to communicate, collaborate and access mission- and business-critical information.

<p>Wireless connectivity</p>  <p>e.g. LTE/5G, WiFi, CBRS, domain proxy</p>	<p>Communications</p>  <p>e.g. Team Comms</p>
<p>Solutions O&M</p>  <p>e.g. Nokia Network Digital Twin</p>	<p>Video analytics</p>  <p>e.g. Eviden Quality Inspector</p>
<p>Tracking and positioning</p>  <p>e.g. High Accuracy Indoor Positioning (HAIP)</p>	<p>Robotics and mechatronics</p>  <p>e.g. Nokia Drone Networks</p>
<p>Industrial connectivity</p>  <p>e.g. Siemens MindConnect Software Agent</p>	<p>Cloud connectivity</p>  <p>e.g. Microsoft Azure IoT Edge</p>
<p>Connected worker & XR</p>  <p>e.g. Taqtile Manifest®</p>	<p>IIoT & digital twin</p>  <p>e.g. Nokia Integrated Operations Center (IOC)</p>
<p>Video enablers</p>  <p>e.g. Smart Mobile Labs EVO</p>	<p>Enterprise security</p>  <p>e.g. Palo Alto Networks NGFW</p>

The most common I4.0 applications deployed on MX Industrial Edge

Benefits – Manufacturing

Why choose Nokia one digital platform for your Industry 4.0 journey?



Support continuous operations

Minimize downtime with a robust communications network that supports remote maintenance and keeps your business- and mission-critical systems up and running.



Optimize performance, productivity and cost

Speed processes, lower OPEX and improve visibility and quality with high-performance network, edge and device solutions that support applications such as digital twins, real-time video analytics and collaborative robots.



Connect everyone and everything

Meet the needs of connected workers, devices, machines, AMRs and vehicles with scalable and flexible solutions that deliver consistently high data rates and low latency.



Improve worker safety and efficiency

Avoid accidents and get the best from every worker with ruggedized handhelds and group communications applications that improve situational awareness and safety.



Protect your data and intellectual property

Keep hackers and cyber criminals out with cellular technology that features built-in encryption and authentication (zero trust network access), and an edge computing platform that keeps your data on your premises.



Support effortless mobility

Untether your operations with pervasive and secure wireless connectivity that supports advanced applications on mobile assets such as AMRs.



Increase operational control and agility

Use the flexibility and scalability of 4.9G/LTE and 5G to retool your processes as demands change or optimize network performance for specific applications.

Work with a partner that helps the world act together

We've helped numerous leading manufacturers around the world make connected workers and other Industry 4.0 use cases a reality, and we're ready to bring that real-world experience and expertise to your business. No matter which technologies and systems you're using today, or where you are on the path to Industry 4.0, we can take you from here to there.

A central player in Industry 4.0 ecosystems

Our technologies are crucial to making connected workers a reality in manufacturing, from private wireless connectivity solutions that provide a robust and secure foundation, to industrial edge computing, applications and industrial user devices.

We also have strong relationships with leading technology companies so you can benefit from end-to-end solutions that combine the strengths of our technologies with those of our ecosystem partners. Your journey to connected workers is faster, easier and more cost-effective, and you have a smooth path to continue transforming your operations over time.

Continuously innovating to take you further, faster

Connecting your workforce is just one of the many ways we help manufacturers digitally transform to more efficient, productive, safe and sustainable operations. In addition to the connected worker examples highlighted here, we've helped manufacturers around the world:

- Improve automated guided vehicle (AGV) operation
- Monitor equipment operation in real time
- Use video analytics to increase safety and security
- Introduce robotic processes
- Streamline and optimize logistics
- Upgrade to driverless ground vehicles
- Use drones for remote inspections
- Leverage digital twins for simulations
- Accelerate massive operational data transfers.

Nokia offers

Industrial Edge

that caters for a neutral partner ecosystem

Industrial devices

as-a-service for flexibility and scalability

End-to-end digital platform

including private wireless and WiFi connectivity, Industrial devices, Industrial Edge and applications catalog

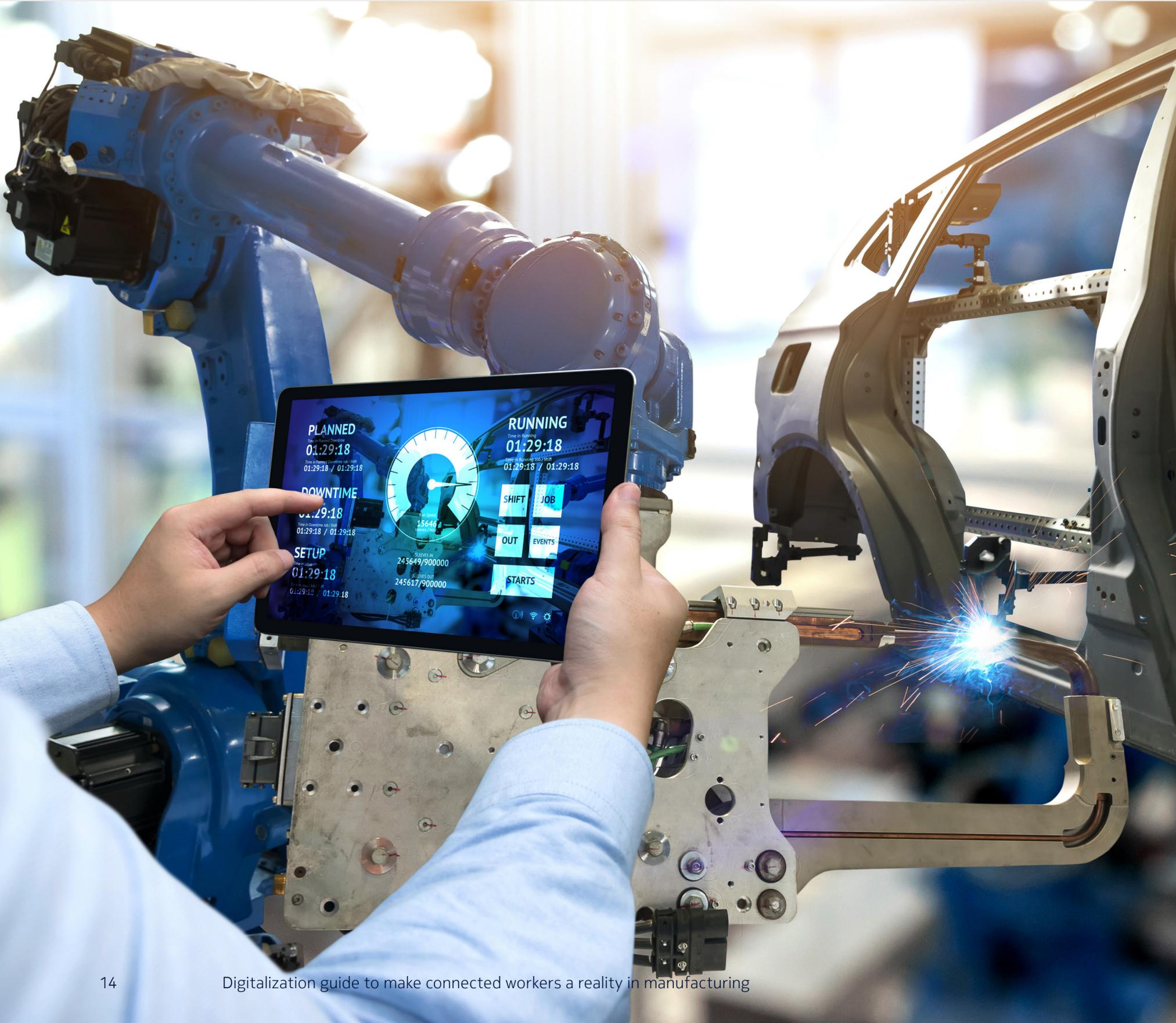


Deep industrial expertise

to provide clear business outcomes including productivity, safety and sustainability for high ROI

An as-a-service solution

to make it easier to deploy, operate and integrate with legacy environments



Manufacturing

Let us help you make Connected Workers a reality

**To learn more and start connecting your
manufacturing workforce, contact us today.**

We're ready to help you accelerate your Industry 4.0 initiatives and support use cases that make your production operations more agile, efficient and profitable.

[Learn more about altafiber's wireless solutions and
request a free consultation](#)

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About Nokia

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

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