



# THE CONNECTIVITY CHALLENGE

CONNECTING INDUSTRY 4.0

## THE NEW INDUSTRIAL REVOLUTION: INDUSTRY 4.0

**Manufacturing and logistics companies are transforming at a pace and scale unmatched in decades. This transformation 'Industry 4.0' applies internet technology to connect machines, workers and corporate systems – accelerating operations, improving quality and boosting financial performance. The third industrial revolution changed business through the adoption of digital computing. Today, Industry 4.0 transforms business by embracing connectivity in an 'Industrial Internet of Things' (IIoT), connecting the full scope of business operations.**

CEOs are talking about IIoT in earnings calls, and 72% of manufacturers report having a strategy to transform to Industry 4.0. Companies are making big investments – the global IIoT market reached \$322 billion in 2022 and is estimated to grow at 20-25% annually through 2030. Why? Because affordable processors and sensors that provide real-time access to information along with advancements in network connectivity and artificial intelligence, are increasing capabilities and reducing costs.

Inexpensive sensors, fast networks, advances in software including artificial intelligence and machine learning, and industrial globalization have created an environment where factories, supply chains, workers, consumers and investors can be connected everywhere, all the time – this is Industry 4.0, propelled by the Industrial Internet of Things.

Connectivity is the essential enabler for Industry 4.0. Cisco CEO Chuck Robbins makes this link explicit:

*"The Internet of Things is not just about connecting devices; it's about connecting people, processes, data, and things to make networked connections more valuable than stand-alone devices."*

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Chuck Robbins, CEO at Cisco

Industry 3.0 presented choices and hard decisions for managers implementing enterprise computing. What challenges confront today's business leaders seeking business advantages from Industry 4.0? Three 'Connectivity Challenges' need to be addressed:

## THREE CONNECTIVITY CHALLENGES ON THE PATH TO INDUSTRY 4.0

Leaders who want to capture the business benefits of Industry 4.0 and the IIoT can expect a difficult path. Three challenges – all related to increased connectivity – stand between today's

business architectures and the Industry 4.0 future. These challenges are defeating malicious actors, integrating global supply chains, and fully implementing the capabilities of high-performance networks.

## Malicious Actors

### New Vectors for Attacking Industry 4.0

The watchman at the factory gate cannot protect Industry 4.0 factories and their supply chains from disruptive and damaging attacks from an array of malicious actors. Recent attacks against Industry 4.0 operations demonstrate the scope of this new vulnerability:

- A global semiconductor company had to shut down some of its fabs after malware spread through the production network.
- A disgruntled engineer with access to a water and sewage company's supervisory control and data acquisition (SCADA) system opened valves so that the system dumped sewage.
- Hackers took control of production management software and then the industrial control system at a steel mill, causing massive physical damage.
- Remote attackers changed process parameters in the recipe for a food product by altering process controller code, increasing the quantity of salt to three times what it should be.

Adopters of Industry 4.0 link production and logistics systems to networks that can be accessed by suppliers and consumers. Previous security practices designed for minimally networked systems often relied on isolation and local access controls. Those practices are fundamentally inadequate when industrial systems are 'constantly connected' through SCADA and other industrial connectivity protocols. Without constant surveillance and rapidly evolving network security practices, any Industry 4.0 solution can create unprecedented vulnerability to severe damage.

## Global Supply Chains

### From Telemetry to Value-Chain Integration

Basic industrial control systems have evolved from mechanical governors (Industry 1.0) to sensor-driven telemetry and feedback loops (Industry 3.0). Achieving the full benefit of Industry 4.0 requires an additional step – from telemetry to full integration of supply chain performance data, including telemetry with enterprise resource planning (ERP) and other corporate management systems.

This 'step after SCADA' requires planning because the amount of available telemetry data allows almost any aspect of factory performance or environmental conditions to be integrated. Direct

connection with supplier systems can create a fully integrated supply chain to improve inventory planning, identify bottlenecks and reduce operating costs. Correctly implemented, integrating the supply chain and pushing telemetry data into enterprise systems can offer important business advantages, including:

- **Better visibility into end-to-end business processes and their share in the cost structure.** Integrated supplier data and telemetry helps managers see dependencies and potential areas for performance improvement.
- **Enhanced analysis and forecasts.** Combining telemetry with ERP data supports joint analysis across the full value chain – not just internal departments – to find unexpected interrelations and predict how systems and business processes will perform under future conditions.
- **Systematic cost optimization.** Integration can contribute to improved understanding of cost drivers, supporting initiatives to reduce costs while achieving performance improvements.

Simply implementing factory automation may improve operational performance with telemetry, but to fully exploit industry 4.0, companies will also need to connect supplier and partner systems with their enterprise resource planning systems.

## High-Performance Networks

### Speed and Power for Better Insight

Early SCADA and industrial control systems could operate efficiently on rudimentary networks because they relied on intermittent transmission of small elements of data such as changes in temperature, on/off status and other low-content packets. Industry 4.0 presents a different challenge.

Today's advanced sensors and processors allow a broader range of data to move across IIoT networks. Worker biometric data, changing ambient environmental conditions, surveillance camera video, augmented reality and other dense digital information is now available – *if* networks can transport it.

Advanced sensors and analytical software can exploit data for business advantages when the data moves over broad-bandwidth, high-speed connections. Standard Ethernet connectivity delivers only 10 Megabits per second. But today's advanced Ethernet and 5G cellular networks are much faster, allowing speeds up to 10 and 20 Gigabits per second respectively. Industry 4.0 applications for these networks include advanced predictive maintenance, autonomous mobile robots, real-time inventory management in warehouses, and even augmented reality solutions for lone workers doing maintenance or assembly operations.

Lone-worker augmented reality – impossible without 5G network speeds – is currently implemented by companies including Lufthansa (remote support for engineers) and Schneider Electric, which uses an augmented reality application to superimpose data and virtual objects onto cabinets and machines.

## THE CONNECTIVITY CHALLENGE: GAINING BUSINESS ADVANTAGES FROM INDUSTRY 4.0

Steam engines, mass-production assembly lines and business computers revolutionized management thinking about technology. With the arrival of Industry 4.0, malicious actors, global supply chains and high-performance networks promise business advantages and require new ways of thinking and acting. Companies that succeed with Industry 4.0 are likely to be those that adopt three innovation practices:

### Innovation Practice 1

#### Build Cybersecurity Practices Into the Industry 4.0 Solution

Connectivity is essential to realize the full value of Industry 4.0, but expanded network connectivity has created a new level of vulnerability. Building security into Industry 4.0 solutions is essential to address the vulnerabilities created by increased connectivity.

Leading companies adopt a risk-based mindset as part of their transformation program. At each step – from development of target operating models to implementation of each solution element – companies involve the Chief Technology Officer (CTO) and Chief Information Security Officer (CISO). The operating risks and required countermeasures related to network and device security are evaluated with the same rigor as financial risks and expected returns. Employee training, operational security and regular audits are incorporated as key elements of the transformation plan.

Because suppliers and partners are closely integrated within an Industry 4.0 solution, prudent executives require IoT-related vendors (hardware and software vendors, service providers, consultants and others) to deliver security plans, regular audits and patches.

Most Industry 4.0 transformations include actions and programs to align with U.S. or international cybersecurity standards such as NIST SP 800-53 or ISO 27001. Companies dealing with the U.S. government or international business partners may be required to comply with these useful guidelines.

### Innovation Practice 2

#### Create Connected Global Logistics

Factory automation is not the only element of the Industry 4.0 Internet of Things solution. Leading companies recognize that connecting the global supply chain into a well-integrated logistics process offers improvements in speed, profitability and customer service.

New types of internet-connected sensors, high-speed networks and advanced analytics set the conditions for connected global logistics along two dimensions:

- **Connected procurement** is possible when supplier networks exchange data with enterprise systems, allowing predictive analytics to guide or automate decisions about the size and timing of purchases.
- **Connected inventory management** relies on autonomous robots and material-handling systems to bring the right articles to shipment docks or factory locations based on demand signals from the ERP.

### Innovation Practice 3

#### Upgrade to Edge/Cloud Infrastructure

As the assembly line and office networks were the backbones of Industry 2.0 and Industry 3.0, the emerging Internet of Things infrastructure is the backbone of the connected global enterprise in Industry 4.0.

Low-performance legacy networks, sensors and even physical connections that were adequate in less-connected environments must be transformed to deliver Industry 4.0 benefits. In fact, the underlying architecture of an Industry 4.0 network is fundamentally different from earlier approaches.

**Efficient Industry 4.0 infrastructure includes four elements**, comprising an Edge/Cloud approach. The **Edge** element includes the physical sensors and devices to capture information. The **Network** element transports this data from the Edge to the third element – a **Cloud** infrastructure where the data can be stored and analyzed. Finally, the fourth element – the **User Interface** – enables users of the infrastructure to apply data for business purposes. When the performance of each infrastructure element is optimized, the enterprise can expect to achieve the real benefits of the fourth Industrial Revolution and the emerging Internet of Things.

In Industry 4.0, advanced sensors, networks and analytics promise competitive advantages for companies that effectively address the new Connectivity Challenge.



## FISCHER CONNECTORS IS THE INDUSTRY'S PARTNER FOR THE INDUSTRY 4.0 CONNECTIVITY CHALLENGE

Fischer Connectors enables companies to implement Industry 4.0 with connectivity solutions for moving data, signals and power. Making connections that enable digital transformation is the core skill of Fischer Connectors. From simple, reliable connectors and cables designed to meet demanding Industry 4.0 standards, to converters and custom connectivity solutions, Fischer Connectors provides real answers to the Connectivity Challenge facing today's CEOs. Fischer Connectors has the **innovation skills** to capture the business advantages of Industry 4.0, the **agility** to work on accelerated timelines, and the rigorous **attention to detail** in design and manufacturing to meet the most stringent technical and business requirements.

Fischer Connectors is part of Conexivity Group.

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