

Industrial Smart Solutions: Connecting the Factory to the Enterprise

Cisco Manufacturing White Paper

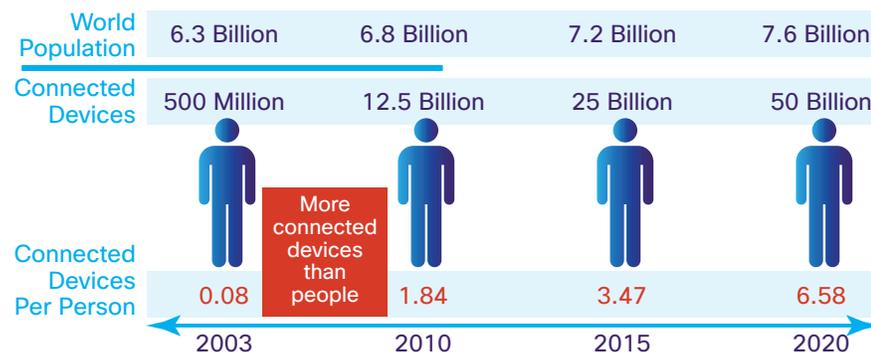
Gearing Up for the Manufacturing Revolution

The world’s manufacturing sectors continue to advance and morph at a dizzying rate. It goes without saying that manufacturing is more global than ever before. Virtually every major industrial enterprise from General Motors to Caterpillar to Samsung operates on a worldwide stage, with supply chains that crisscross time zones and continents. Manufacturing operations are broadly dispersed, as are relationships with suppliers and customers. But constant technology innovation is adding a new dimension to the global battleground: More manufacturers are tapping a new breed of network architecture to gain a remarkable competitive advantage.

The result is what the *Economist* magazine calls the “Third Industrial Revolution,” in which Internet-based manufacturing networks are uniting the factory floor with enterprise-based systems and decision makers. Taking a page from the *Economist*, IDC forecasts the creation of a “Third Productivity Platform” that wraps together cloud applications, Big Data analytics, social business solutions, and mobility into a single solution – in effect converging formerly distinct manufacturing and business domains.

In this “revolutionary” landscape, more machines are being outfitted with sensors that connect to the cloud, enabling communication with other machines and their human operators in real time (Figure 1). This will have a number of effects, from making supply chains more “traceable” to animating automobiles with connections that alert drivers and service centers when maintenance is needed.

Figure 1. Rise of the Connected Machine



The coming revolution will see deepening connections between the plant floor and the business and to the ecosystem surrounding the manufacturer, leading to tighter collaboration between contract manufacturers and headquarters-based engineers, managers, and executives. The basis of this change is the increasing adoption of secure networking technologies, typically incorporating new communications and collaboration capabilities, that link the plant floor to the wider world of business decision makers, contractors, and other factories and supply chains feeding the manufacturing process. According to the Aberdeen Group, 70 percent of manufacturing executives are focusing on plant-floor data initiatives to drive operational and business excellence, faster time to market, and immediate access to data from machines on the factory floor.

Greater network convergence and connectivity will help manufacturers address challenges they have been striving to overcome for decades. These include eliminating recurring supply chain disruptions, filling skilled worker shortages, neutralizing cyber threats, and boosting asset utilization.

The Rise of Converged Networks

How is the “convergence revolution” playing out in the manufacturing world today? We can already see the automotive industry, for example, embracing a host of converged-network initiatives and innovations. Chief among these are “smart manufacturing” systems that connect plant systems with the automaker’s broader networks of suppliers, engineers, and marketers. Adopters of these models are reporting reduced downtime, lower new product deployments, and better overall equipment efficiency (OEE).

In the consumer packaged goods industry, top firms are implementing converged and Internet-connected manufacturing systems, which some observers see as the next step beyond lean manufacturing. Here, CPG firms are using converged manufacturing networks to gain plantwide visibility to cut downtime and quickly shift production to match demand. And they are embedding sensors on the line that issue updates and alerts to engineers located miles away, speeding issue resolution.

Manufacturers refer to this convergence in terms of integrating the “little m” world of the plant floor with the “big M” world outside the factory. Validated, secure network architectures underpin the best of these models, supplying the interoperability and cyber defenses that are essential in highly competitive industrial environments. In many cases, the mix of data streams are pulled together in dashboards that present converged plant and business data in a single, secure view that can be tailored to the information needs of individual users.

“The paradigm beyond lean will be driven by the availability and exploitation of real-time information across the manufacturing enterprise (big M) to optimize the value chain from suppliers through manufacturing plants and into the distribution channel.”

–Group Manager of a major global automaker

Coming Next: The Internet of Things

For the last few years, technology market watchers have been tracking the rise of the “Internet of Things,” a phenomenon in which embedded intelligence enables billions of *things* to become connected through the Internet (Figure 2). Today, more than 20 percent of Internet traffic originates from non-computing devices. Experts say that by 2020, some 50 billion machines will be plugged into the Internet. The Cisco® Industrial Smart Solution is engineered to help firms capitalize on the rise of intelligent machine networks.

Figure 2. The Internet of Things



Making Convergence Work: Cisco’s Industrial Smart Solution

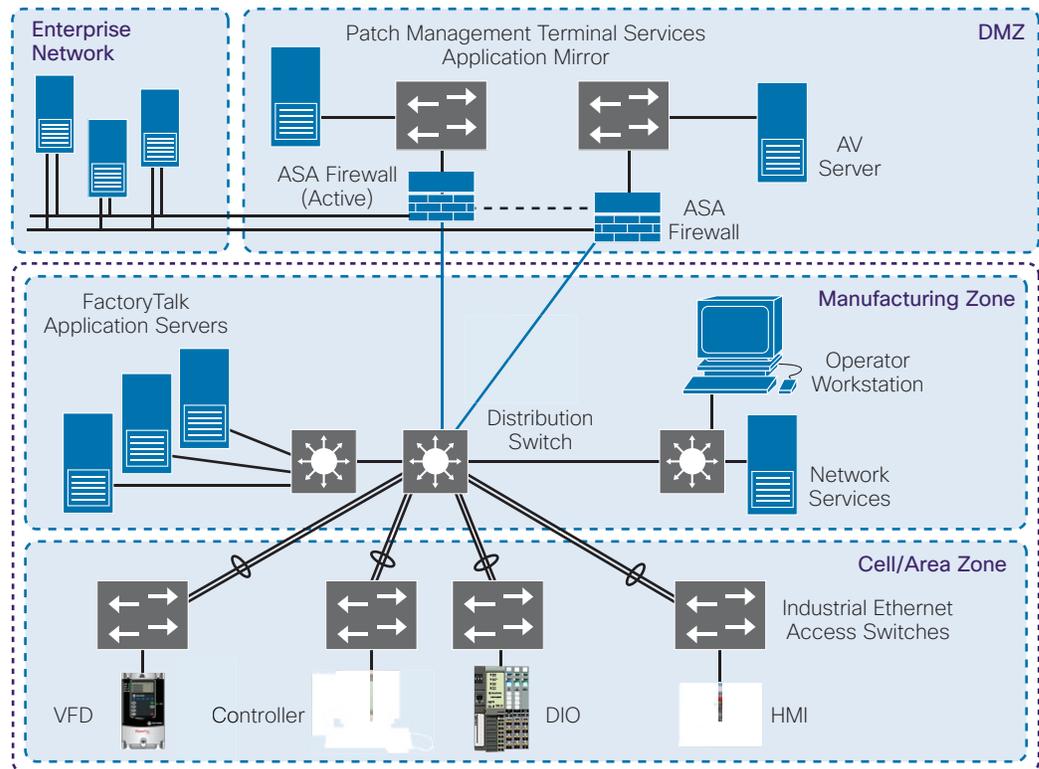
In their bid to gain a competitive edge, global manufacturers are racing to design and deploy a range of innovative converged networks. Not surprisingly, many are turning to Cisco, which supplies the secure, intelligent network technologies that lie at the heart of the most advanced of these converged manufacturing systems. A pioneer in this sector, Cisco has assembled a portfolio of validated IP-networking technologies called the Cisco Industrial Smart Solution that connects factory automation and control systems to enterprise business systems, and advances the efficiency and flexibility of production operations.

Manufacturers are gravitating to the Cisco Industrial Smart Solution in part because it’s built according to strict guidelines and proven network designs that tie together factory automation systems, enterprise applications, and the wider ecosystem of supplier and partner solutions (Figure 3). Derived from the joint Cisco and Rockwell Automation architecture known as the Converged Plantwide Ethernet (CPwE), components of the Cisco Industrial Smart Solution include:

- Common architecture for ruggedized Industrial Ethernet and enterprise networks
- Standards-based Industrial IP Ethernet switching and security services
- Cisco enterprise-level technology delivered on an industrial platform with scalable, secure, real-time performance predictability and remote access
- Validated and documented architecture guidelines based on open standards, supporting rapid deployments, reliable performance, and network security while accommodating design nuances required by individual industrial networks
- Integrated Cisco and partner solutions and roadmaps – an ecosystem supporting a converged plant floor and enterprise networks

- Comprehensive support and service network, including lifecycle services, five-year product warranty, and financing options to preserve cash flow

Figure 3. Cisco Industrial Smart Solution Architecture



Benefits of the Cisco Industrial Smart Solution

How does convergence translate into a business edge for manufacturers? In the case of the Cisco Industrial Smart Solution, industrial firms are reporting benefits ranging from a boost in labor productivity and collaboration, to greater overall equipment efficiency, better market agility, and positive customer experiences. Key capabilities of the Cisco offering are described next.

Faster Time to Market

Manufacturers deploying converged industrial and business networks say they are reaping benefits from opening up information flows between plant systems and business applications. As these information silos disappear, disconnects between the floor and the business are diminishing. For example, R&D departments are now working in tandem with manufacturing planners, streamlining the introduction of new products. Using dashboards and mobile devices, managers and engineers react immediately to shifting production needs, operational issues, and market scenarios. The result, managers say, is like having an “enterprise-wide decision engine” that enables them to speed new products to market and execute supply chain adjustments faster than before.

Operational Excellence, Improved Productivity

The Cisco Industrial Smart Solution promotes a new class of operating assets, often embedded with sensors and actuators, that are “self-aware” and capable of communicating with other machines without human intervention. These networks of intelligent machines adjust automatically to changing

“Anglo Platinum’s cost of ownership fell to one-half the industry average after the Cisco deployment. Now, we can ensure the availability of systems and support from a central location and have comprehensive visibility and reporting.”

Theo van Staden, head of infrastructure (IT), Anglo Platinum

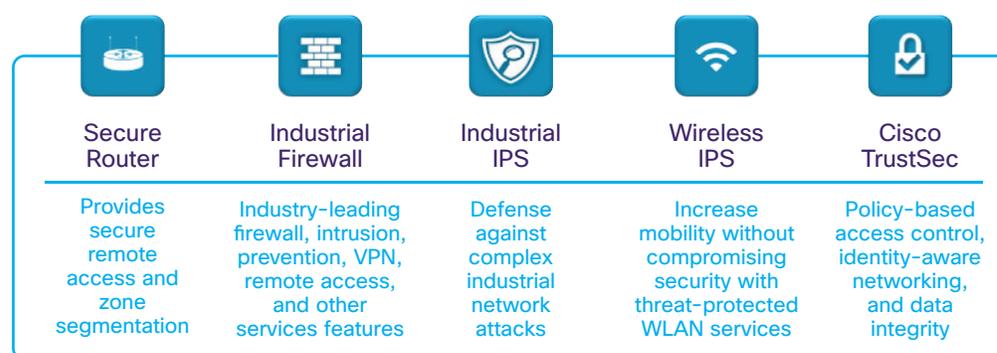
operating conditions and alert operators to maintenance needs in advance of breakdowns (from “break-fix” to a “fix-before-break” model). Consequently, equipment efficiency increases and the risk of downtime declines. Meanwhile, costs are controlled automatically through proactive maintenance programs that rely on devices, based on sensor data, communicating across industrial networks.

Strengthened Security, Reduced Risk

Security-conscious manufacturers are attracted to the Cisco Industrial Smart Solution because its validated, rigorously tested architecture offers ultimate protection against cyber criminals and accidental breaches of information. Cisco currently secures network operations at organizations ranging from NASDAQ and other financial firms responsible for safeguarding consumer data to government agencies handling classified intelligence.

Manufacturers argue that similar security protections, including tight access management for remote and mobile users, are essential in industrial environments. “Gaining visibility into this world of previously undetected cyber-threats helped reassure our team that we were doing the right thing by adding intrusion prevention technology across our industrial network,” says Charles Harper, the director of national supply and pipeline operations at Air Liquide, the world’s leading producer of gases for industry, health and the environment. Figure 4 shows the range of security capabilities that are built into the Industrial Smart Solution.

Figure 4. Cisco Industrial Smart Solution Security Portfolio



Extending Value Through a Global Partner Ecosystem

The Cisco converged industrial platform encompasses a broad ecosystem of manufacturing applications from leading vendors such as Rockwell Automation, Honeywell, and Emerson. The Industrial Smart Solution architecture is built to integrate with these partner solutions, enabling manufacturers to design a complete solution that combines industry-specific applications with Cisco’s converged network technologies and lifecycle services.

“Another point not to be overlooked is Cisco’s reputation for the build-quality of its existing product lines and the fact that, as a company that has been closely involved in the manufacture of product hardware for over 20 years, it’s had plenty of experience of life on the factory floor.”

Engineering and Technology Magazine, May 2012

Promoting a Culture of Innovation

Innovation may be hard to define, but manufacturers have found that breaking down walls between operational domains – and the data silos they hold – promotes collaboration and spurs creativity. Manufacturers say this is one of the most valuable byproducts of the tightly integrated Industrial Smart Solution, which builds and sustains connections between different groups of workers, from plant floor engineers to remote experts to partnering firms. Already, companies are using the Cisco platform to launch new service models that incorporate sensor-enabled, network-aware devices. Among other capabilities, these solutions send out alerts when pre-defined conditions are met and automatically launch collaboration and troubleshooting sessions involving the appropriate mix of experts.

Tapping the Internet of Things

Looking ahead, observers predict that the latest generation of converged networks will give manufacturers more opportunities for capitalizing on the emerging Internet of Things. In the years ahead, sensor-embedded, internet-ready machines will become increasingly commonplace as manufacturers seek to boost productivity, cut waste, and design more personalized user experiences. But tapping their potential will require a new generation of networking and analytical platforms capable of processing and securing vast new streams of industrial data. This is precisely what the Cisco Industrial Smart Solution is designed to do.

Smarter Is Better

Converged Network Benefits

**Best-in-Class
Manufacturers
Top 20%**

- 8 hours of downtime per year (99.91% Uptime)
- 11% total cost of ownership reduction for industrial network
- 90% Overall Equipment Effectiveness (OEE)
- +25% operating margin vs. corporate plan

67% Converged Industrial Ethernet Adoption Rate

Taking the Lead

Manufacturers today are searching for technology platforms that make sense in an increasingly fast-paced, interconnected, and mobile marketplace. In this world, earlier technology architectures that carve up manufacturing operations into separate factory and business silos are swiftly becoming outmoded and uncompetitive. That’s why forward-thinking manufacturers are embracing converged networks that securely integrate factory floors with business systems, seamlessly link to partner solutions, and exploit the emergence of networks of intelligent machines and sensors known as the Internet of Things.

Industrial Smart Solutions in Action

- **Smart Assembly:** Seeking to reduce disconnects between the manufacturing and enterprise networks, many of the world's top manufacturers are adopting Cisco Industrial Smart Solutions. These converged intelligent networks are reducing downtime by allowing remote access to systems and partners and delivering precision, resiliency, and reliability from the plant floor to the enterprise.
- **Visual Factory:** Manufacturers need better visibility into equipment performance, resource needs, and security threats. Cisco Industrial Smart solutions provide companies with a dashboard view of the multi-plant environments, enhancing efficiency, safety, and return on assets.
- **Body-Paint-Powertrain-Assembly Plant: Vehicle manufacturers** are constantly seeking to reduce time to launch new models while reducing overall assembly costs. Leveraging Cisco Smart Business Architecture, top automakers deploy common end-to-end network architectures, enabling greater flexibility within the plant (and across plants) and simplifying cyber security defenses.
- **Plant-wide Visibility:** Industrial firms with globally dispersed production sites need better integrated production systems to shorten lead times. The Cisco Industrial Smart Solution integrates enterprise applications with real-time production data, allows faster information flows, faster decisions, and greater market responsiveness.
- **Integrated Energy Management System:** Manufacturers worldwide are getting hit by rising energy prices. Cisco's converged networks integrate energy and IT management systems to collect real-time energy metrics from sensor networks and allow companies to better understand and control energy costs.
- **Plant Alarm and Event Resolution:** Factories often lack the ability to issue real-time notifications when equipment fails on the line. With Cisco Industrial Smart Solutions, manufacturers deploy open standards to connect with sensor-level networks that detect malfunctions instantly, and often before they occur, lifting overall equipment effectiveness (OEE) to new levels.

Cisco's Industrial Smart Solution has been specifically designed to help manufacturers thrive in this converged environment. The new solution gives manufacturers greater speed and agility, real-time visibility across factories, equipment, and supply chains, and immediate access to remote talent. Not least, the Industrial Smart Solution provides unprecedented industrial security and threat prevention across every converged network.

For manufacturers eager to take the lead, Cisco's Industrial Smart Solution is rapidly deployed, thanks to the validated, pre-tested designs. It's also an architecture that readily plugs into a rich ecosystem of partner solutions, forming the foundation of broadly applicable and versatile industrial platforms. In a converging world, Cisco offers a proven portfolio of network technologies that equip manufacturers to take on the opportunities ahead.

For More Information

Visit: www.cisco.com/go/industrial

