

## Cisco Ethernet to the Factory



Today, plant-to-enterprise convergence is driving significant change in manufacturing organizations, systems, and networks. As silos of information and collaboration are broken down, companies are gaining a tremendous opportunity to reduce costs and transform operations through innovative business processes. However, convergence can present a number of challenges. Manufacturing and IT organizations must work more closely to provide architectures that not only support integration of plant automation and enterprise-level systems, but also meet the security and performance requirements of industrial automation and control applications.

### OVERVIEW

**The Cisco Ethernet-to-the-Factory solution enables manufacturing companies to:**

- Globalize operations by integrating industrial automation and control with business systems to enable secure plant-to-business convergence, driving strategic business decisions backed by real-time data from the plant floor.
- Improve operational costs and efficiency, thanks to ease-of-use features and familiar tools and capabilities. Secure remote access speeds response to issues on the plant floor.
- Mitigate risks by improving network uptime and equipment availability with industry-leading security features and a defense-in-depth approach that protect critical manufacturing assets.

These benefits are delivered through an integrated architecture designed specifically for industrial automation and control systems, and validated with leading automation system providers, such as Rockwell Automation, for proven performance.

The Cisco® Ethernet-to-the-Factory (EttF) open-standard networking solution helps manufacturing companies successfully connect plant and business systems to achieve business objectives. This enables a more flexible, responsive system that encompasses both real-time data from the production floor and information from business applications. Such an end-to-end networking architecture provides connectivity, collaboration, and integration from the device level to enterprise business systems. Based on Cisco's secure, resilient network platform using standard technologies such as Ethernet and IP, the EttF solution is designed to meet the needs of IT and industrial applications, and is validated with actual industrial and automation control system devices and applications.

### The Challenges Facing Manufacturers

Manufacturing companies are increasingly expanding their global operations to address new opportunities and reduce operating costs. They are also seeking to continuously improve efficiency and drive down costs for existing facilities and processes. Recent studies indicate that reducing costs is by far the greatest business pressure for the majority of manufacturers across different industries.



Achieving the goals of globalization and operations excellence requires improving connectivity between plant and business systems for real-time visibility to information and effective collaboration. This helps to assure consistent quality and performance across global operations, and to reduce the cost of design, deployment, and support of distributed manufacturing and IT systems. Manufacturers must be able to balance production with demand to optimize material usage and asset utilization, while continuing to meet increasingly exacting customer requirements and metrics for on-time delivery. Manufacturers also need to improve response to events that occur on the plant floor, regardless of location, while implementing more flexible and agile operations in order to react to rapidly changing market conditions.

However, lack of connectivity and collaboration is impacting manufacturers' ability to achieve these goals. A number of studies over the last several years have noted that few companies have effective linkages between business and plant metrics and KPIs; improving alignment in objectives and KPIs is a top priority for many organizations. To achieve these objectives, manufacturers are looking to increase and leverage visibility into manufacturing operations, synchronize performance objectives between plant and business, and improve collaboration across functions.

Historically, though, industrial automation and control networks have inhibited manufacturing companies from implementing such capabilities. Along with manufacturing applications, these networks are traditionally somewhat isolated from business systems: They are generally accessed through proprietary interfaces that prevent the control and business networks from communicating with each other. Automation systems may not even be integrated throughout the plant, creating islands of functionality and information that increase the IT burden and add to operating costs. As well, automation and control networks frequently differ from plant to plant and even application to application, resulting in significant inefficiencies and slow deployment as manufacturers cope with inconsistent standards and complexity on a global scale.

Traditional industrial automation and control system networks also often lack the capacity and capabilities needed to support new manufacturing applications and devices, resulting in poor performance and system downtime. Such inefficiencies, coupled with a lack of visibility into real-time information from the plant floor, can actively hold manufacturers back from competing successfully.

The keys to resolving all of these challenges are better access to information, and the collaborative tools and processes that enable manufacturers to act upon that information quickly and effectively. Based on these capabilities, companies develop more efficient ways to connect globally with suppliers, employees, and partners, and are able to effectively meet the needs of customers.

## Deploying Ethernet and IP in the Factory

The pressures of competition have led to the adoption of open-standard technologies to support cost-effective and flexible manufacturing systems. One of the most transformative of these changes is the adoption of Ethernet and IP-based automation and control systems. Open-standard networking technologies enable more resilient and efficient automation networks, improved connectivity and collaboration for remote workers and partners, and efficient plant-to-business convergence to drive improved performance and responsiveness.

While standard network technologies and integrated plant networks offer great potential benefits for manufacturers, they do need to be properly implemented to address the challenges of integrated systems. The unique characteristics of plant systems must be considered when implementing converged networking to ensure the availability, resiliency, and performance required for industrial automation and control systems.

For example, automation and control systems frequently have unique patch schedules and technology limitations (older operating systems, memory, processing power, etc.), as well as requiring high levels of performance and uptime. At the same time, increased connectivity and access to partners and employees elevate the risk of more frequent security incidents; even enterprise-level business systems and trusted partner connections can present a significant threat vector to automation networks.

Such systems also need to support the very high performance demands of automation networks, which require reliable transmission times ranging from milliseconds at the controller level to larger, less frequent and less time-sensitive communications at the MES and enterprise levels. To support such demands, networks need to be both resilient and extremely predictable.



### The Solution—Cisco Ethernet-to-the-Factory

The Cisco EttF solution is an end-to-end architecture specifically designed to provide predictable performance and system resiliency for industrial applications, from plant devices to MES and business systems, as well as remote users and partners. Its industrial features and architecture are based on best practices from leading manufacturers, aligned to major industry standards (including ISA S95 and S99), with system-level design, testing, and validation to reduce risk and simplify deployment. Key industrial products and features supported throughout the architecture provide the predictable performance and system resiliency needed for industrial applications.

**Designed for industrial applications:** Cisco EttF is built from the system level up specifically for use in industrial automation and control systems. The features and architecture are designed to meet the network requirements of factories to support automation and control applications, providing low latency and jitter, and highly reliable, predictable performance for real-time applications. The EttF solution is validated for industrial environments, reducing risk and simplifying deployment in the most demanding environments.

**Highly secure:** The Cisco EttF solution is founded on a multilayered defense-in-depth architecture that incorporates security solutions optimized for plant networks, protecting industrial automation and control systems and sensitive data. Organizations meet the requirements of both IT and the plant floor by safeguarding manufacturing assets and information. They also help ensure uptime by leveraging visibility of data and protecting internal networks from outside interference.

**Flexible and efficient:** Cisco offers a range of easy-to-use tools that speed deployment and simplify management to help cut costs. The EttF solution's support of common manufacturing tools such as Rockwell FactoryTalk and Siemens Simatic, along with IT tools such as CiscoWorks, improves worker productivity and plant efficiency. At the same time, the solution enables secure remote access—speeding incident response, providing remote support for both IT and manufacturing assets and improving productivity of resources.

**Complete IT integration:** Based on Ethernet and IP-enabled technologies, the EttF solution offers a scalable network platform for plant-to-business integration and collaboration between manufacturing and enterprise functions. It also prepares the way to support new capabilities over time, such as adding wireless for mobility and control applications or integrating voice and video, helping to drive productivity and transform business processes.

Based on these key elements, reliable, high-performance industrial automation and control system networking is delivered through an integrated architecture.



### Industrial Ethernet Switching

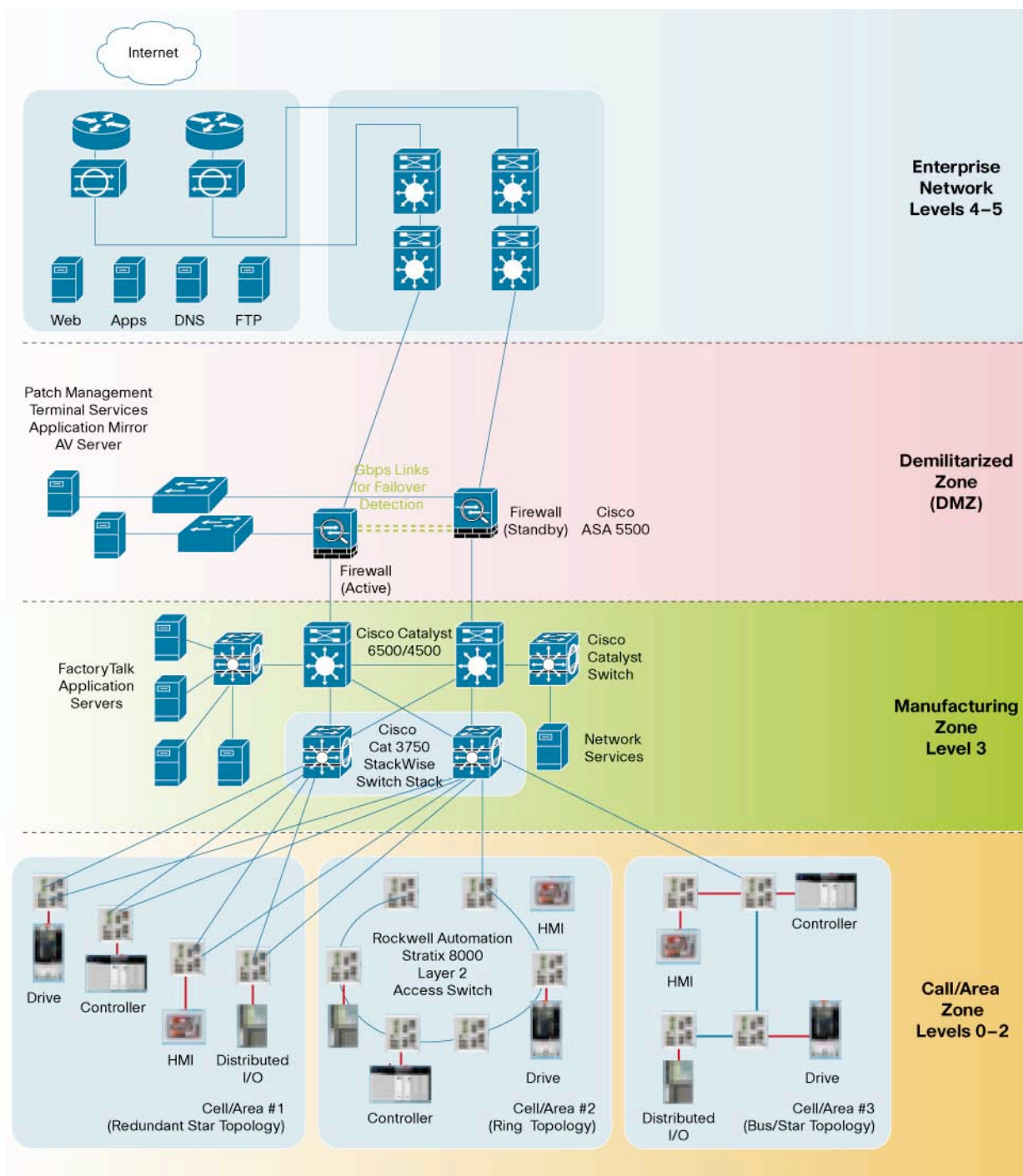
A key component of the solution is the Cisco IE 3000 Series of Industrial Ethernet switches, which deliver innovative features, robust security, and superior ease of use. This series offers industrial design and compliance, integrated network security, and tools for easy management and deployment. Industrial features include DIN rail mounting and support for leading industrial protocols such as Common Industrial Protocol (CIP) and PROFINET, Resilient Ethernet Protocol (REP), DHCP per port allocation, IEEE1588v2, Layer 2–4 access control lists (ACLs), and Internet Group Management Protocol (IGMP).

The Cisco IE 3000 Series switch is also available in a version that provides Layer 3 routing capabilities to integrate different cell zones and provide connectivity to enterprise-level networks. Cisco works with Rockwell Automation to deliver the Allen-Bradley Stratix 8000 Series of switches, which provides the capabilities and features of the Cisco IE 3000 Series along with simple and effective integration into the Rockwell Automation Integrated Architecture.

## LAN Switching

Cisco also offers a wide range of switching and routing technologies that provide an integrated, highly secure network foundation for connecting Ethernet and IP-based industrial automation and control networks to the rest of the enterprise, business partners, and the Internet. These switching platforms, including the Cisco Catalyst® 2960, 3750, and 4500 Series, include consistent features, software, and management tools, and have integrated security features to help ensure system uptime and availability. Many of the switching features and software versions are consistent between the industrial Ethernet and LAN switching platforms, creating a true end-to-end network platform for integrated industrial automation and control systems (see Figure 1 below).

**Figure 1.** Six-Level Plant Network Architecture



## Security Solutions

Cisco's industry-leading security solutions combine security products with a system-level approach for industrial automation and control networks. The EttF architecture implements appropriate security solutions to provide integrated, defense-in-depth security without compromising the performance of automation systems. Key security elements include the Cisco ASA5500 Series adaptive security appliance, which combines firewall, IPS/IDS, and VPN (SSL and IPsec) capabilities; network and host-based IPS/IDS; and a security management toolkit. With these functionalities, manufacturers can maximize uptime and protect their company assets.

## The Cisco and Rockwell Automation Strategic Alliance

Cisco maintains a strategic alliance with industry leader Rockwell Automation, whose industrial automation and control systems, combined with Cisco networking products and services, deliver complete, integrated industrial solutions. This partnership includes mutual support of open standards and intelligent networks for automation and control systems; collaboration on architectures for manufacturing, training, education, and awareness for both IT and manufacturing professionals; and development of industrial Ethernet switching products.

Cisco and Rockwell Automation jointly developed the Converged Plantwide Ethernet solution, which is the combination of Cisco Ethernet to the Factory and the Rockwell Automation Integrated Architecture. The architecture has been designed, tested, and documented to meet the specifications of Rockwell applications, including communication cycle times, traffic patterns, and convergence requirements.

It includes the Allen-Bradley Stratix 8000, an industrial Ethernet switch that includes major features from both Rockwell Automation and Cisco. The solution runs Cisco IOS<sup>®</sup> Software, with features that are similar to those of the Cisco Catalyst Family of switches, and supports Cisco network management tools. The Stratix 8000 also enables seamless integration with Rockwell Automation FactoryTalk applications and Logix platform.

## Business Benefits

The EttF solution and Cisco's strategic alliance with Rockwell Automation provide real value to manufacturers and help them achieve their business objectives by:

- Reducing capital expenses through use of common management tools, multi-application networks, and simplified design and deployment
- Lowering operating costs through ease-of-use tools that reduce training requirements, common features and Cisco IOS Software, and simplified integration with manufacturing applications
- Mitigating risk through integrated security and system-level validated design, resulting in improved uptime and overall equipment effectiveness (OEE)
- Improving productivity through remote access capabilities, the use of familiar tools, and improved information access
- Transforming business processes and achieving objectives such as providing real-time performance information across global operations, improving demand and production visibility to optimize production and tighten scheduling cycles, improving inventory management, and improving overall asset utilization

By delivering business value on multiple levels, the Cisco EttF solution helps manufacturing companies achieve their objectives of optimizing global manufacturing operations, reducing operational risk, and improving efficiency. Together, Cisco and industry leader Rockwell Automation deliver a complete solution that enables secure plant-to-enterprise integration to help manufacturers surpass the competition in today's challenging global environment.

## The Cisco Advantage

Manufacturers that harness the power of information have greater visibility into their operating environments and a strong advantage in today's global marketplace.

Cisco has been a global leader in networking technologies for the past 20 years, and is acknowledged as the primary provider of networking services. Cisco offers a broad product portfolio with built-in intelligence, performance, and security, as well as strong relationships with leading industry partners. These solutions are in widespread use by manufacturing organizations worldwide.

The integration of information and business processes gives organizations secure visibility and collaboration that enables strategic business decisions backed by real-time information. The Cisco EttF solution supports a true vision of Smart+Connected Manufacturing, enabling manufacturers to improve responsiveness across the entire value chain.



## For More Information

For more information on successful real-world implementations and best practices, visit:

[http://www.cisco.com/web/strategy/manufacturing/ettf\\_overview.html](http://www.cisco.com/web/strategy/manufacturing/ettf_overview.html)

You can also contact your Cisco account manager or partner. Cisco has more than 200 sales offices worldwide. To find the address, phone, and fax number of the nearest office, visit:

<http://www.cisco.com/web/siteassets/contacts/offices/>

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For related product information, visit the following online resources.

Cisco IE 3000 Series Switches: <http://www.cisco.com/en/US/products/ps9703/index.html>

Cisco Catalyst 2960 Series Switches: <http://www.cisco.com/en/US/products/ps6406/index.html>

Cisco Catalyst 3750 Series Switches: <http://www.cisco.com/en/US/products/hw/switches/ps5023/index.html>

Cisco Catalyst 4500 Series Switches: <http://www.cisco.com/en/US/products/hw/switches/ps4324/index.html>

Cisco Catalyst 6500 Series Switches: <http://www.cisco.com/go/6500>

Cisco integrated security solutions: <http://www.cisco.com/go/security>




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