Cisco Ethernet to the Factory

The Cisco® Ethernet to the Factory (ETTF) open-standard networking solution securely connects the factory to the corporate office, improving the efficiency and flexibility of production operations. The solution enables more responsive manufacturing operations by providing the enterprise-wide visibility needed to make strategic business decisions backed by real-time data from the production floor.

OVERVIEW

The Cisco Ethernet to the Factory solution provides:

- **Visibility:** Enables real-time visibility and integration between the production and other business processes, enabling strategic business decisions that are backed by real-time data and performance from the plant floor.
- **Productivity**: Facilitates new applications and capabilities based on real-time access to plant control systems, such as remote monitoring and asset-maintenance applications.
- **Security:** Incorporates industry-leading Cisco security solutions, optimized for automation networks, to protect and help secure critical production networks and assets.
- **Flexibility:** Provides an intelligent network platform, utilizing industrial Ethernet switching and advanced networking technologies, to create a more flexible and scalable infrastructure.

As a complete end-to-end solution, Cisco ETTF provides increased efficiency through the use of open standard networking technologies, highly secure real-time visibility, and integration of automation systems with business applications. This allows managers to access real-time plant performance information, including process performance, work-in-process inventory, and asset utilization.

The solution incorporates Cisco's industry-leading industrial Ethernet switching to prioritize and secure control traffic, and network-based security solutions to protect critical manufacturing production systems while allowing authorized access to manufacturing personnel, remote employees, and vendors. With the secure network platform in place, manufacturers can also extend the access by implementing wireless applications, increasing productivity by enabling workers to be mobile and by tracking valuable assets and resources with location-based services.

This is all made possible by a phased network approach in which:

- A highly secure, Ethernet-based network maintains control of manufacturing processes.
- A plant services network consolidates advanced technologies such as IP communications (voice, video, etc.) and general wireless access.

- Controls and services networks are secured and deployed to address the unique requirements of manufacturing networks.
- A business can migrate at its own pace, deploying additional technologies and capabilities as its needs and technology evolve.

The Challenge

Today's manufacturers face unprecedented challenges. In a global economy, they are competing against important new competitors for large untapped markets in emerging countries. At the same time, customers are demanding more products tailored specifically for them, requiring manufacturers to innovate more quickly and have a deeper understanding of their customers. As a result, companies must increase their flexibility and responsiveness, while becoming more efficient and productive in their operations. To accomplish this, manufacturers need to increase the real-time visibility of information across the extended enterprise.

Information is the critical driver of any modern manufacturing enterprise. With a constant flow of data, companies can develop more efficient ways to connect globally with suppliers, employees, and partners, and to more effectively meet the needs of customers. Manufacturers that harness the power of information have greater visibility into their operating environments and a competitive advantage in today's global marketplace.

Some of the most crucial information for your manufacturing business is the data stored and used in plant control and automation networks. Real-time visibility and access to this information helps you to achieve optimum productivity, flexibility, and responsiveness, by allowing you to:

- Access real-time performance data from worldwide manufacturing operations, vital to efficiently monitoring operations, increasing performance and efficiency, and quickly resolving issues.
- Have visibility into production status and work-in-process (WIP) inventory, along with the ability to change orders quickly, respond to changing customer and market conditions, and avoid costly overproduction.
- Oversee asset management and maintenance to enable more efficient and predictive maintenance, as well as third-party support and diagnostics, improving event notification and response time, which reduces expensive production downtime.

- Integrate manufacturing data into systems for enterprise resource planning (ERP), supply chain management (SCM), and customer relationship management (CRM) to increase efficiency and responsiveness.
- Comply with regulatory requirements to collect, store, and integrate information into business applications in reliable and highly secure processes.

Manufacturers have, however, traditionally built control systems that are separate from business networks. Each network is generally accessed through proprietary interfaces, which prevents the control and business networks from communicating with each other, creating isolated information systems. Operating multiple, isolated networks is inefficient, increases the burden on system support, and adds operating costs throughout the enterprise. Such inefficiency, coupled with a lack of visibility into real-time information from the plant floor, can prevent manufacturers from achieving the flexibility and responsiveness they need in today's competitive global manufacturing environment.

The Solution

Manufacturing networks have unique requirements due to the critical nature of their assets, the severe implications of failure, and the technical performance requirements and limitations of devices and applications on the manufacturing floor. The Cisco Ethernet to the Factory (ETTF) solution consists of a set of architectures specifically designed to meet the unique requirements of manufacturing networks, from the devices on the plant floor through enterprise business systems. These lab-tested architectures have been developed with leading automation and control system vendors, and support real-time performance requirements and industrial protocols required for factory networks.

This solution provides reliable, highly secure connectivity for diverse networks based on the Ethernet open standard. The use of open standards such as Ethernet and TCP/IP in manufacturing offers many advantages. The ubiquitous IP address enables visibility to any device from anywhere, while Ethernet's increased bandwidth supports the addition and integration of multiple technologies and applications to the network. By complying with the Ethernet requirements of the leading automation control companies, Cisco can offer a flexible, highly secure, IP-enabled network that integrates efficiently and cost-effectively with your extended enterprise.

Improved Efficiency and Maximized Performance

Your business can achieve significant increases in productivity and efficiency by using Ethernet in control and automation networks. Ethernet allows you to use commercial off-the-shelf (COTS) technology and it increases visibility and integration with the rest of the enterprise and extended value chain. Open standard protocols enable you to use more standard equipment, take advantage of widely available skill sets, simplify network cabling and integration, and benefit from industrywide investment and innovation in standard networking technologies. With open standard interfaces and protocols, improved diagnostics, and the ability to support systems remotely, personnel can also resolve problems more quickly, increasing uptime and efficiency.

Given the performance requirements and critical nature of manufacturing networks, any Ethernet-based solution must be built with the appropriate architecture. The lab-tested architecture in the Cisco ETTF solution is specifically designed for manufacturing networks. It incorporates industry-leading network technologies in optimal configurations and utilizes features that help enterprises achieve maximum production performance and reliability at all levels. Manufacturers also benefit from the solution's tight integration with Cisco IT management systems and enterprise applications, which use the same technologies and capabilities.

Intelligent Industrial Ethernet Switching – Secure and Easy to Use

Cisco offers a portfolio of robust, easy-to-use, secure switching products for harsh environments, including the Cisco Catalyst® 2955 Series and the new Cisco IE3000 Series industrial switches. These switches combine features that are important for industrial automation networks with the rich suite of features included in Cisco IOS® Software. Ruggedized features such as DIN rail mounting and extended environmental performance help ensure that the switches are suitable for industrial applications. The switches also offer features that simplify deployment, management, and replacement. These features include support of industrial protocols, swappable flash memory for quick and easy replacement, and Smartports templates for industrial automation. Support of industry standards, such as quality of service (QoS) and Internet Group Management Protocol (IGMP), and advanced security features help ensure the secure and predictable performance required for highly demanding automation networks.

The industrial switches are incorporated into the Cisco ETTF solution architecture to provide an intelligent network platform that protects and prioritizes critical control traffic, and enables secure

integration with the rest of the enterprise. By incorporating intelligent industrial switches, the Cisco ETTF solution allows you to utilize Ethernet for the automation network with confidence, knowing that valuable control data is secured, prioritized, and available as needed.

Protect Vital Manufacturing Assets

Manufacturing automation and control systems are critical, and any network solution must provide robust, integrated, and proactive security capabilities. Security incidents in a manufacturing environment can lead to costly downtime, loss of intellectual property, and damage to systems, products, the environment, or personnel. Additionally, technology limitations, delays or difficulties in implementing updates and patches, and the need to allow outside vendor access to factory floor systems increase the potential for security incidents.

Incorporating solutions from the Cisco Self-Defending Network, Cisco ETTF provides a multilayer defense solution optimized for factory environments. With a wide range of security solutions, Cisco can implement multiple technologies at different points in the network, providing security within factory automation and control systems, as well as facilitating highly secure integration with enterprise networks and business systems. The Cisco ETTF solution also enables guests and remote users to have highly secure access to automation and control systems, allowing manufacturers to securely achieve productivity and efficiency gains. The solution's components include:

- **Secure multilayer switches and routers:** Cisco offers a wide range of switching and routing technologies that provide an integrated, highly secure, end-to-end network foundation for connecting Ethernet-based factory automation networks to the rest of the enterprise, business partners, and the Internet. Offering integrated services and network management, Cisco supports advanced security, communication, and mobility solutions.
- **Adaptive security appliances:** Cisco ASA 5500 Series Adaptive Security Appliances offer firewall, anti-X, intrusion prevention, and VPN capabilities to protect crucial automation and control networks and to provide highly secure connectivity to remote users over public networks. The Cisco ASA 5500 Series is available in a wide range of configurations, and has multiple ports to support different networks and create a demilitarized zone (DMZ), which serves as the first line of defense between manufacturing, the rest of the enterprise, and outside contact through the Internet.
- **Intrusion detection and prevention solutions:** Enterprise networks face an ever-increasing number and variety of malicious attacks. The Cisco Intrusion Prevention System (IPS) is a comprehensive network-based defense system that is designed to accurately identify, classify, and stop malicious traffic – including worms, spyware, adware, network viruses, and application abuse – before it can affect network performance. The Cisco IPS is supported as modules on the adaptive security appliances and on network sensor appliances, and plays an important role in the multilayer strategy of the Cisco Self-Defending Network. As part of this overall solution architecture, the Cisco IPS can detect and prevent malicious traffic before it reaches critical automation and control networks. Sensors can also be configured in detection mode for locations that may be negatively impacted by latency but would still benefit from intrusion detection, such as between different cells or the zones within automation and control networks.
- **Cisco Security Agent:** Cisco Security Agent software provides threat-protection capabilities for server and desktop computing systems based on common operating systems. As manufacturing deploys more common operating systems such as Windows and

Linux in automation and control applications (such as human machine interfaces [HMIs], historians, and asset management applications), the threats associated with traditional IT systems have a great impact on vital manufacturing operations. At the same time, because of the availability and performance requirements of manufacturing systems, it is often difficult to install patches and updates in a timely manner. Cisco Security Agent provides an industry-leading defense against targeted attacks, spyware, rootkits, and day-zero attacks. Cisco Security Agent also offers proactive protection against new variants and threats developed to take advantage of published and unpublished vulnerabilities. These capabilities provide increased levels of protection and the potential to implement a more manageable, scheduled patch-management program, due to the zero-update behavior-based protection method (as opposed to signature-based solutions).

- **Security monitoring, analysis, and response:** The Cisco Security Monitoring, Analysis, and Response System (MARS) provides security monitoring for network security devices and host applications made by Cisco and other providers and is a primary component of the Cisco ETTF solution. Cisco Security MARS focuses on the monitoring, analysis, and response to security-related events, and it maintains policies and oversees configuration across the various devices, software, and processes. This allows your business to efficiently analyze threats and security solution effectiveness to provide optimal protection at all times.

Increase Visibility and Responsiveness

Aside from increasing enterprise efficiency through its use of open standards technologies, the Cisco ETTF solution also promotes increased visibility of real-time information directly from the factory floor across the enterprise and extended value chain, including integration with business systems such as ERP, CRM, SCM, and Asset Maintenance and Management systems. This allows you to quickly and efficiently respond to changing operational and market conditions, implement innovative preventive and predictive maintenance solutions to maximize asset use, and monitor plant performance in real time from anywhere in the world. Because the Cisco ETTF solution is an end-to-end set of architectures and incorporates robust security technologies, it enables real-time information sharing and integration with business systems in a highly secure manner, as opposed to individual, application-specific products.

A Scalable Network Platform

Given the rapid pace of change in the global manufacturing market, today's network solution must be flexible and constantly evolve to support changing business needs. By building on an intelligent network platform, the Cisco ETTF solution allows you to efficiently deploy new solutions and technologies over time to achieve higher levels of efficiency and productivity, while maintaining the network performance required for automation and control systems. For example, the manufacturing technology roadmap may include:

- **Mobility solutions:** The efficient deployment of a unified wired and wireless infrastructure, with Cisco management and security tools, allows manufacturers to extend network access and increase productivity. Mobility solutions also enable capabilities such as location-based services to track assets, increasing the effectiveness of asset-management solutions.
- **Voice and communications:** Voice traffic can be run over the same network, allowing you to integrate and automate voice alerts, including older two-way radio systems, with production control systems.

- **Video surveillance:** Video can be added to an existing network and integrated with control systems applications for remote video monitoring and physical security.

When you start with the foundation provided by the Cisco ETTF solution, you can securely and reliably add these and other solutions over time. Building on this scalable, integrated platform, your business can protect its current investments while planning for the future.

The Cisco Advantage

Cisco has been a global leader in networking technologies for the past 20 years and is acknowledged as the primary provider of networking services. The Cisco ETTF solution supports the vision of Connected Manufacturing from Cisco, a suite of collaborative solutions that enable you to improve responsiveness across the entire manufacturing workflow. The integration of information and business processes gives your company secure visibility across the manufacturing value chain, enabling strategic business decisions backed by real-time data. These solutions are in widespread use by manufacturing organizations worldwide.

By working with Cisco, your business can benefit from:

- Proven performance, reliability, and security
- A broad range of technical experts and engineers who understand the unique requirements of the manufacturing industry
- Award-winning customer support services that help companies get the most out of their investment and extend the life of their network assets
- Ongoing investments in research initiatives benefiting the manufacturing industry
- Sustained value with upgradeable, standards-based solutions
- A phased approach to support integration of new technologies or responses to new mandates
- Best practices based on design validation and actual customer deployments
- Detailed architecture design guidance and roadmaps designed specifically for factory networks

Cisco provides a broad product portfolio with built-in intelligence, performance, and security, as well as strong relationships with industry-leading partners who can provide specific expertise and knowledge of the manufacturing industry.

Next Steps

For more information on successful real-world implementations and best practices, visit: http://www.cisco.com/web/strategy/manufacturing/ettf_overview.html

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For related product information, visit the following online resources:
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Cisco Catalyst 2955 Series Switches: http://www.cisco.com/go/2955

Cisco IE3000 Series Switches: http://www.cisco.com/go/ie3000

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

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Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
168 Robinson Road
#28-01 Capital Tower
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

Europe Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: +31 0 800 020 0791
Fax: +31 0 20 357 1100

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at **www.cisco.com/go/offices.**

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