

What Is Ethernet to the Factory (ETTF)?

Traditionally, first-generation factory control systems were constructed on isolated networks, using proprietary protocols. This isolation denied visibility into the operations of these systems, as well as restricting their integration into the larger front office/back office supply chain.

As networks and requirements evolved, industry associations such as the Open DeviceNet Vendors Association (ODVA); the Instrumentation, Systems, and Automation Society (ISA); and the Fieldbus Foundation all supported Ethernet as the protocol for next-generation manufacturing control networks.

Ethernet provides a standards-based approach that enables real-time information access through a common communications architecture, helping manufacturers to more effectively serve customers while operating more productively and profitably.

What Problems Does ETTF Solve?

An ETTF solution, unlike first-generation control systems, provides the ability 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, including remote and 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.
- Run multiple applications and protocols over a single network based on open standards, easing integration and reducing total cost of ownership.

Cisco Catalyst Series Switches in Manufacturing

Cisco has proposed an architecture for successful deployment of ETTF solutions. Central to that architecture are the Cisco® Catalyst® Series switches.

For the factory floor itself, Cisco offers a portfolio of robust, easy-to-use, secure switching products for harsh environments, including the Cisco Catalyst 2955 Series Switches and the new Cisco IE 3000 Series industrial switches.

Figure 1. Cisco IE 3000 Series Switch



Specifically designed for use in Industrial environments, these switches:

- Permit operation in extended temperatures
- Feature certification for elevated shock and vibration
- Use passive cooling: no need for fans
- Support elevated surge protection
- Use removable memory, allowing you to replace a switch without having to reconfigure

For integration with the front office, back office and manufacturing control networks, the Cisco Catalyst 6500, 4500, 3560-E, and 3750-E Series Switches provide you with a scalable set of options for deploying secure, highly available, and manageable solutions.

The Cisco Catalyst Series switches address the most stringent Ethernet requirements of the manufacturing environment, including:

- **Bandwidth scalability:** Ethernet scales from 10 megabits up to 10 gigabits, providing you a growth path and investment protection unseen in first-generation control systems.
- **Secure isolation of traffic:** VLAN segmentation on Cisco Catalyst switches provides a robust way to restrict the visibility of the shop floor network to trusted employees. Common user traffic can be separated from manufacturing-specific traffic at either Layer 2 using VLANs or Layer 3 using Virtual Routing and Forwarding instances.
- **Real-time responsiveness:** All Cisco Catalyst Series switches support industry-leading Cisco quality-of-service (QoS) capabilities. With Cisco QoS, you can make sure of deterministic behavior of critical control traffic and also prioritize it over other network traffic.
- **High availability:** Lost production time equals lost profits. Ethernet has built-in high availability, through the use of redundant paths and dynamic routing protocols. These protocols can dynamically reconfigure your network to bypass any failures. If you are looking for even higher levels of availability, Cisco In-Service Software Upgrade and Cisco Nonstop Forwarding with Stateful Switchover can provide network recovery in the subsecond range.

- **Integrated security:** At the device level, the Cisco Catalyst Series switches support a common set of infrastructure protection capabilities, known collectively as the Cisco Catalyst integrated security features. These capabilities protect your manufacturing network from common intrusion or denial-of-service attacks. In addition, all Cisco Catalyst Series switches support per-port 802.1x authentication, restricting users' access to the manufacturing network until they have been properly identified, thus maintaining the privacy of factory floor data.
- **Flexibility:** Unlike traditional control system networks, the Cisco Catalyst Series switches are multipurpose, providing additional services and capabilities that can be used to modernize the factory floor without significant capital outlay. One example is Power over Ethernet, which allows you to distribute power to end devices such as IP phones, surveillance cameras, and wireless access points. This capability allows you to deploy these devices in locations where access to traditional power outlets might be limited.
- **Rugged:** The Cisco IE 3000 is designed to survive in harsh environments and has ease-of-use features that are critical in a plant floor environment. These features include configuration and management at the touch of a button, integration with industrial management applications, and swap drive for zero configuration environments. The industrial switch provides consistent capabilities and integration with the rest of the Cisco Catalyst switching family.

Integrated Services on the Cisco Catalyst 6500 Series Switch

The flagship of the Cisco Catalyst Series switches, the Cisco Catalyst 6500 Series Switch is especially well suited as a front end to ETTF networks. Its modular design allows for the insertion of multiple service modules, each of which can provide additional services to your ETTF network.

Figure 2. Cisco Catalyst 6500 Supervisor Engine 32 PISA



- **Firewall Services Module:** Provides integrated virtual firewall services to restrict access to the ETTF network.
- **Intrusion Detection System Services Module:** Enables organizations to minimize risk and maximize business continuity by rapidly identifying unauthorized access.
- **Wireless Services Module:** To maximize efficiency and mobility, many ETTF control systems are becoming wireless. The Cisco Catalyst 6500 Series Wireless Services Module offers centralized security policies, wireless intrusion prevention system (IPS) capabilities, and Layer 3 fast secure roaming for WLANs.
- **Programmable Intelligent Services Accelerator (PISA):** Enables industry-leading integrated security through authentication and threat defense features to help ensure network availability and the integrity of communications for manufacturing control systems.

Why Cisco for Ethernet to the Factory?

Cisco has been one of the leaders in the networking industry in providing customers with architectural guidance for deploying manufacturing solutions.

- The Cisco EttF Validated Architecture provides design and implementation guidance, architectural views of how to build a manufacturing network, and device-specific configurations for each component in the network.
- Cisco Catalyst Series switches provide scalable platform choices, so that the network can be "right-sized" to your particular performance requirements and budget.
- Cisco offers a choice of deployment models, which are adaptable to your internal operational requirements. Manufacturing networks can be constructed with an integrated services model, where the majority of capabilities are integrated into the network switch itself. Alternately, Cisco offers network appliances for each service function, so that they can be managed separately.
- Cisco Advanced Services perform readiness assessments and remediation services for customers deploying an ETTF network and monitoring services to help manage and support the network postdeployment.

Additional Resources

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

Cisco Catalyst Series switches:
<http://www.cisco.com/go/switching>

Cisco EttF Design and Implementation Guide:
http://www.cisco.com/web/strategy/manufacturing/ettf_overview.html