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**Rockwell
Automation**

Top 10 Recommendations for Plantwide EtherNet/IP Deployments

With cyber security and network performance at the forefront, follow a plan to help ensure the best industrial network design for your plant.

Rockwell Automation and Cisco Four Key Initiatives:

- **Common Technology View:**
  A single system architecture, using open, industry standard networking technologies, such as Ethernet, is paramount for achieving the flexibility, visibility, and efficiency required in a competitive manufacturing environment.

- **Coverged Plantwide Ethernet Architectures:**
  These manufacturing focused reference architectures, comprised of the Rockwell Automation Integrated Architecture™ and Cisco's Industrial Intelligence, provide users with the foundation for success to deploy the latest technology by addressing topics relevant to both engineering and IT professionals.

- **Joint Product and Solution Collaboration:**
  Stratix 8000™ Industrial Ethernet switch incorporating the best of Cisco and the best of Rockwell Automation.

- **People and Process Optimization:**
  Education and services to facilitate Manufacturing and IT convergence and allow successful architecture deployment and efficient operations allowing critical resources to focus on increasing innovation and productivity.

To deploy EtherNet/IP plantwide at your facility, you need an industrial network design methodology. Following a plan helps you create structure and hierarchy to help maintain real-time network performance.

In addition, it helps enable the convergence of multiple control and information disciplines, including data collection, configuration, diagnostics, discrete, process, batch, safety, time synchronization, drive, motion, energy management, voice and video (see **Figure 1**).
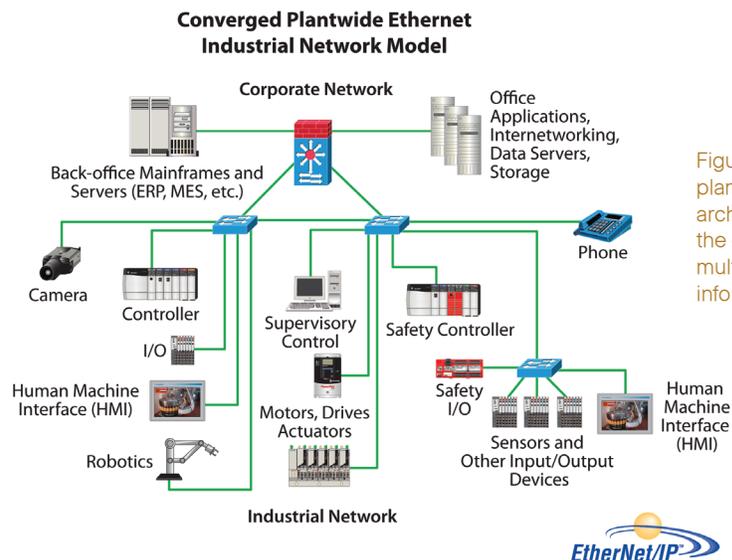
Figure 1. A converged plantwide EtherNet/IP architecture enables the convergence of multiple control and information disciplines.

To **design** and plan a plantwide EtherNet/IP network, first consider each level of the logical model shown in **Figure 2.** Then generate a network requirements document using industry best practices and standards. Be sure to include any required future expansion capabilities.

Next, take an inventory of devices and applications with network dependencies within the logical model to help define a physical and logical topology for the requirements document.

Implement the installation, procurement and configuration of the network following the generated requirements document. Then audit the network against standards to help ensure that the network requirements were met.

To maximize network availability, **manage** change control, and monitor the network to identify issues early.

Assess network moves, additions and changes as part of the change-control process to protect the integrity of the requirements and your network performance.

10 Recommendations for EtherNet/IP Deployment

Industrial managers who want to deploy plantwide EtherNet/IP can follow these 10 industrial network design recommendations from Rockwell Automation and Cisco:

1. Understand a networked device's application and functional requirements.
These include data requirements such as communication patterns and traffic types (industrial and nonindustrial).

2. Enable a future-ready network design.
Use industry and technology standards, reference models and reference architectures, such as the Cisco and Rockwell Automation Converged Plantwide Ethernet (CPwE) Architectures.

Figure 2. To design and plan a plantwide EtherNet/IP network, first consider each level of the logical model shown here.
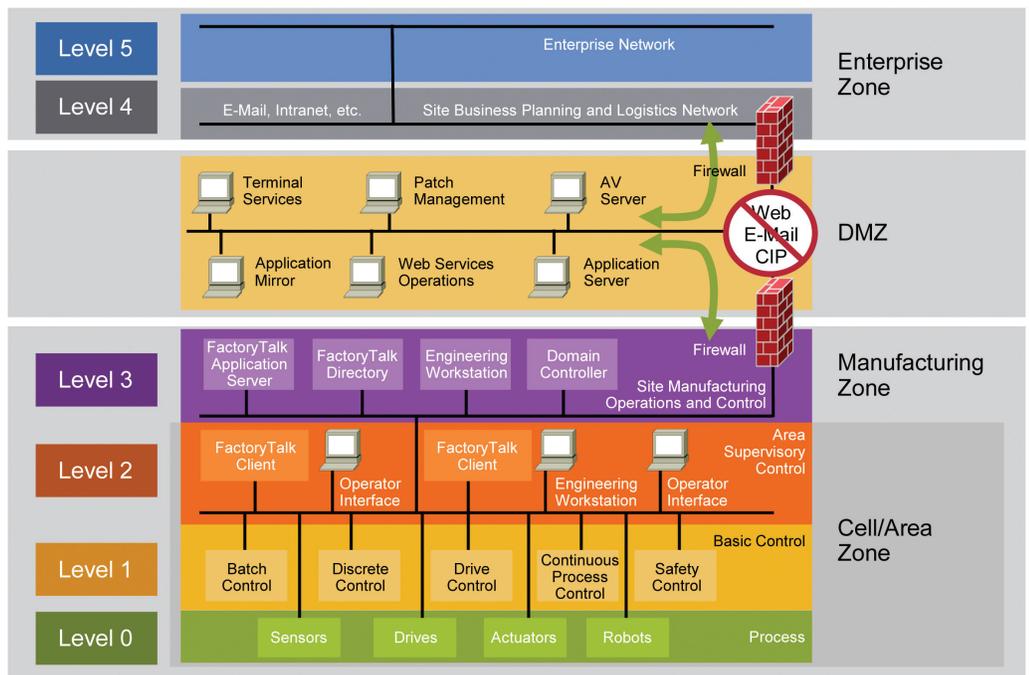
3. Create structure within the plantwide EtherNet/IP network.
Develop a logical topology that uses both a multi-tier switch hierarchy (Layer 2 and Layer 3) and the logical model shown in **Figure 2.**

Define zones and segmentation, then place industrial automation and control system devices, servers or other communicating end-devices within the logical topology based on their location, function, availability and performance requirements.

4. Segment the logical topology into modular building blocks.

Create smaller Layer 2 networks to minimize broadcast domains. Use virtual local area networks (VLANs) within a zone to segment different traffic types, such as industrial and nonindustrial. Minimize the number of devices to less than 200 within a zone and VLAN. Use firewalls to strongly segment the manufacturing and enterprise zones, creating a demilitarized zone (DMZ) that enables secure sharing of applications and data between the zones.

5. Use managed industrial switches.

These provide key network services such as loop prevention, resiliency, segmentation, prioritization, time synchronization, multicast management, security and diagnostics.

6. Design and implement a robust physical layer reflecting availability and resiliency requirements.

Overlay the logical topology over the plant physical layout to create the physical topology. Use 1 gigabit-per-second fiber uplinks and redundant paths between switches for optimal network resiliency.

Ensure the end devices and network infrastructure devices communicate at the best possible speed and duplex. Deploy physical cabling corresponding to plant conditions and requirements.

In addition, deploy a defense-in-depth approach to help prevent noise coupling through techniques such as bonding, EMI segregation, shield barriers and filtering.

7. Determine application and network security requirements.

Establish early dialogue with IT, considering applicable IT requirements. Implement a defense-in-depth security approach at multiple application layers such as physical, device, network and application, using an industrial security policy that's unique from and in addition to the enterprise security policy.

8. Reduce network latency and jitter by using standard network protocols.

Protocols include time synchronization using IEEE 1588 precision time protocol (PTP), quality of service (QoS) for control data prioritization and Internet Group Management Protocol for multicast management.

9. Increase control and information data availability.

Implement a redundant path network topology such as a ring or redundant star.

In addition, use a resiliency protocol to avoid Layer 2 loops while helping to ensure fast network convergence time. These considerations affect how quickly the network will recover from a disruption, which may result in application timeouts and system shutdowns.

10. Deploy a hierarchical network model using Layer 3 switches.

Layer 3 switches support inter-VLAN routing between cell/area (Layer 2 network) zones and plantwide applications and servers. Layer 3 switch capabilities enable design recommendation 4. If the application requires industrialized Layer 3 switches, consider products such as the Allen-Bradley® Stratix 8300™ Layer 3 managed switch.

Learn more about design guidance and recommendations from Cisco and Rockwell Automation by visiting http://www.ab.com/networks/architectures.html.

Additional Resources

Rockwell Automation References Architectures Website
http://www.ab.com/networks/architectures.html

Rockwell Automation EtherNet/IP Website
http://www.ab.com/networks/ethernet/

Rockwell Automation Network and Security Services Website
http://www.rockwellautomation.com/services/networks/

Reference Architectures for Manufacturing Whitepaper
http://literature.rockwellautomation.com/idc/groups/literature/documents/wp/enet-wp004_-en-e.pdf

Converged Plantwide Ethernet Architectures Design and Implementation Guide (DIG)
http://literature.rockwellautomation.com/idc/groups/literature/documents/td/enet-td001_-en-p.pdf

Network Infrastructure for EtherNet/IP: Introduction and Considerations – ODVA
http://www.odva.org/Portals/0/Library/Publications_Numbered/PUB00035R0_Infrastructure_Guide.pdf

EtherNet/IP Media Planning and Installation Manual – ODVA
http://www.odva.org/Portals/0/Library/Publications_Numbered/PUB00148R0_EtherNetIP_Media_Planning_and_Installation_Manual.pdf

Guidance for Selecting Cables for EtherNet/IP Networks Whitepaper
http://literature.rockwellautomation.com/idc/groups/literature/documents/wp/enet-wp007_-en-p.pdf

Rockwell Automation Knowledgebase
http://rockwellautomation.custhelp.com/

To learn more about how Cisco and Rockwell Automation can help you, please visit:

www.rockwellautomation.com/partners/cisco.html
http://www.cisco.com/web/strategy/manufacturing/cisco-rockwell_automation.html