Applying EtherNet/IP in Real-time Manufacturing
Agenda

EtherNet/IP Enabling Network Convergence

Stratix Industrial Ethernet Switch Product Overview

Embedded Switch Technology Overview – Device Level Ring (DLR)

Lab Agenda
EtherNet/IP

- **The same Ethernet technology:**
  - as Email, voice, video, the Internet, webpages
  - as the corporate network
  - known by IT professionals
  - on your home and office computers

- **Running Common Industrial Protocol (CIP):**
  - The most widely used standard, application layer industrial protocol globally
  - Standardized through IEC, ISO, ODVA and others
  - Same technology as DeviceNet & ControlNet
  - Rockwell Automation & Cisco as well as other major vendors like Schneider, Omron, Bosh Rexroth & 300+ others

One Standard Network Technology
Common Industrial Protocol

- Standard set of services for accessing data and controlling industrial device operation
- Standard to integrate I/O control, device configuration and data collection in industrial automation and control systems
Typical Plant – Fragmented Control Disciplines

- Safety
- Drive
- Discrete
- Continuous
- Batch
- Motion
Industrial Network Convergence
Continuing Trend

EtherNet/IP – Enabling & Driving a Single Network Architecture of Industrial Control and Information with IT
EtherNet/IP – Industrial Grade Services

- Enabling automation integration with IT
- Enabling high speed synchronized motion control
- Enabling integration of automation with safety control
- Enabling process device integration

Mission critical performance ...
Plant-wide disciplines ...
Future proof (e.g. energy management) ...
via standard / unmodified Ethernet
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Today’s Pain Points

- Ethernet networks continue to grow:
  - Each machine adds another 5 - 50 Ethernet nodes
  - Every line adds another 250 - 1,000 Ethernet nodes
  - Every time we launch a new product, we solve a new problem & add more nodes
  - And a consequence of convergence is so many more devices connected to the same flat network

Our focus is on products that help make the network more manageable
Get the Right Information to the Right Person, at the Right Time

Plant Management View
• Provide performance rollup
• View asset utilization/yields

Maintenance View
• Keep your machines running in peak condition to increase your OEE
• Identify root cause to minimize MTTR

Operator View
• Simplify your machine operations
• Diagnostics where you need them

Increase end-user value by simplifying the integration of your machine into their existing network infrastructure
The Stratix Portfolio
Integrating industrial and IT environments

Addressing the needs of automation professionals...

Switches for:
- Applications for small to complex networks
- Monitor and control distributed devices
- Plant floor and enterprise integration

- Productivity
- Energy Savings
- Safe Operations

Stratix 8000/8300
Layer 2, Layer 3

Stratix 5700
Layer 2

Stratix 6000
Layer 2

Stratix 2000
Unmanaged

Machine Builder
Performance
Optimize the Effectiveness of Machine Building

- Time to Market
- Scale & Modularity
- Protecting IP

Stratix ETAPs

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The Stratix Portfolio
Integrating industrial and enterprise environments

... as well as operations & IT professionals

Technology that offers:
- Scalable solutions
- Common, familiar tools
- Cisco IOS & Configuration tools
- Premier Integration within RA Integrated Architecture
- Advanced switching, routing & security features
- Operator / maintenance-ready with built-in back-up
Stratix 8000 & 5700 Family
Layer 2 & 3 Managed Switches w/ Cisco Technology Inside

A unique product family in the market....

Best of Rockwell Automation

- Premier (CIP) interface to Integrated Architecture
  - Studio 5000 for configuration (AOP)
  - Predefined Logic tags for diagnostics
  - FactoryTalk View Faceplates

Best of Cisco

- Secure integration with plantwide network
  - Cisco internetworking operating system (IOSTM)
  - Cisco CatalystTM switch architecture and feature set
  - Familiar tools for IT professionals: command line interface (CLI), Cisco Network Assistant (CNA) and Device Manager

Best for the Plant Floor Environment

- Easy to Integrate and Maintain
  - Default configurations for Industrial Automation
  - Removable storage cards for one step device replacement

... integrating the IT and Industrial Environments
Stratix 8000 Family Modular Design

- Layer 2 – Stratix 8000
- Layer 3 – Stratix 8300
- Configurable up to 26 ports
  - Base Unit
    - 6 or 10 port
  - Expansion Modules
    - 8 port cooper
    - 8 port fiber
- SFP for multi & single mode fiber
  - Wide variety of SFPs available
  - Compatible with Cisco SFPs
- CompactFlash card
  - Stores configuration and IOS
- Advanced feature set

Flexible deployment options to best fit the application
Stratix 8300 – Layer 3 Switching

- Multi-Layer switch supports routing between subnets and VLANs
  - Built from Cisco Catalyst 3560 IP Services Image technology
  - Compatibility with other Cisco enterprise platforms
- Inter-VLAN routing and advanced routing protocols
  - Static and Dynamic Routing
  - Open Shortest Path First (OSPF)
  - Enhanced Interior Gateway Routing Protocol (EIGRP)
  - Border Gateway Protocol (BGP)
- Advanced Feature Set:
  - VRF Lite
  - Multicast Routing
  - Support of large number of IGMP groups
  - IPv6 support

Supports Integration of IT and industrial networks
Stratix 5700
Layer 2 Ethernet Switch

- Fixed port, compact size
  - Scalable Configurations
    - 6, 4+2, 8+2, & 16+4 platforms
    - SFP slots for Multi mode & Single mode fiber
  - 2 Gig ports option
- Software options
  - Lite - Base switching functions
    - Ideal for small applications
  - Full - Expanded features
    - Convergence Ready (IT Friendly)
- Hardware Features
  - Flexible Power Inputs
    - +/-12V DC, +/-24V DC, +/- 48V DC power
    - Dual power source for redundancy
  - Alarm Relay
    - 12V/24V/48V alarm relays
  - Switch configuration storage - option
    - SD card stores configuration of switch for ease of replacement

Compact and scalable to optimize your network to your application requirements
Stratix 6000 Managed Switches

- Fixed port managed switches
  - 4 port
  - 8 port with optional fiber uplink (SFP)
- Control system integrated
  - CIP communications for:
    - Diagnostics (tags)
    - Configuration (RSLogix 5000)
    - Port security
  - DHCP per port for automatic end device IP address assignment
  - Unauthorized user identification
  - Traffic level monitor with alarms
  - FactoryTalk View faceplates

Tight integration with Logix and Integrated Architecture
Stratix 2000 Unmanaged Switches

- Designed for Isolated control networks
  - Scalable port configurations
    - 3 port copper + 1 fiber
    - 5 port copper
    - 6 port copper +1 fiber
    - 8 port copper
  - Operating Temperature - 0º to 60ºC

- New developments for 2012
  - 16 port
    - 16 copper, 14+2 MM fiber
  - All Gig ports
    - 5 & 6+2 SFP offering
  - Additional fiber options
    - 2 ports - Single & Multimode
  - Extended temperature ranges
    - (-40º to 85ºC)
Configure, Manage and Diagnose your network with familiar tools

- Automation Professionals
  - FactoryTalk Services
    - Tightly integrates into the Integrated Architecture (IA)
- IT Professionals
  - Cisco CNA, CLI, CiscoWorks
    - Tightly integrates into joint Cisco and Rockwell Automation Converged Plantwide Ethernet (CPwE) Reference Architectures

The right tools for the right person
Stratix 8000/5700 Global Macros

- Express Set-up:
  - Configured with global macro tailored for industrial automation apps

- Sets many parameters including:
  - Enables IGMP snooping and Querier
  - Enables CIP
  - Configures QoS settings and classifies CIP, PTP and other traffic
  - Enables alarms, SYSLOG, and SNMP notifications
  - Enables Multiple Spanning Tree (MSTP), resiliency and loop prevention

Automatic initial set-up of the switch
Smartports

- Are a set of recommended configurations that can be set on a specific switch port
- Pre-defined settings for common devices like Logix controllers, I/O, ETAPs, Desktop devices
  - Optimizes traffic through the network
  - Minimizes latency
- Create, modify, import, export and develop custom Smartport macros
  - Select the device to the assigned port, the configuration parameters are assigned to the port
  - Create your own Smartport to customize and develop your own standards

Simplifies deployment and commissioning of equipment
Integrated into Studio 5000™

**Simplifies configuration and maintenance**

- Add On Profile (AOP)
- Add Stratix switches into the project just like you would I/O, drives, communication modules
- Simple configuration and diagnostic tags available in the profile
- Advanced diagnostics, including broken wire detection

You don’t need to be an IT professional to configure or manage the switch
FactoryTalk™ View Faceplates

Pre-engineered faceplates for network monitoring

Helps provide the diagnostics where you need them to get equipment back up and running... quickly
Agenda

- EtherNet/IP Enabling Network Convergence
- Stratix Industrial Ethernet Switch Product Overview
- Embedded Switch Technology Overview (DLR)
- Lab Agenda
Embedded Switch Topology Overview

Technology that can help:

- Reduce port count requirements on base Ethernet switch
- Simplify configuration of the network
- Reduce cabling requirements
- Increase network resiliency
  - Device Level Ring – (DLR)
How does DLR work?

- Supervisor blocks traffic on one port
- Sends beacon frames out of both ports to detect a break in the ring
Physical layer failure

- Link status messages are sent from the surrounding ring nodes to the ring supervisor to indicate the location of the break. Link status is in the form of MAC ID and IP Address information.
Configuration after link failure

- After failure ring supervisor unblocks one port
- Network configuration is now a linear topology (faulted ring)
- Fault location is readily available
- If ring is restored, supervisor hears beacon on both ports, and transitions to normal ring mode
DLR Faceplate for FactoryTalkViewSE

- Displays how many nodes are participating in the DLR
- Displays how many total rings faults have occurred
- Displays who is the DLR supervisor
- Also displays where the break is in the ring for ease of troubleshooting
DLR Enabled Products

- ControlLogix EtherNet/IP module
  - 1756-ENxTR
- CompactLogix™ New PACs
  - L1xER, L2xER, L3xER
- Stratix™ ETAPs
  - 1783-ETAP – 2 port copper
  - 1783-ETAP1F – 1 port copper 1 port fiber
  - 1783-ETAP2F – 2 port fiber
  - Enable single-port devices to join linear or ring topology
- EtherNet/IP Devices
  - Point I/O Adapter (1734-AENTR)
  - ArmorPoint I/O Adapter (1738-AENTR)
  - ArmorBlock I/O (1732E) – several versions
  - Kinetix 6500 control modules – several versions
  - Flex I/O Adapter (1794-AENTR(XT)
  - SLC I/O Adapter (1747-AENTR)
  - ArmorStart
  - E1 & E3 Overloads
  - RFID products
Agenda

EtherNet/IP Enabling Network Convergence

Stratix Industrial Ethernet Switch Product Overview

Embedded Switch Technology Overview (DLR)

Lab Agenda
Lab Agenda

- Lab 1 – Stratix 8000 hardware familiarization
- Lab 2 – Configuring a Stratix 8000 switch and Flex™ I/O on an Ethernet/IP network
- Lab 3 – Stratix 8000 AOI and Diagnostic Faceplates
- Lab 4 – Device Level Ring (DLR) Topology
- Lab 5 – (Optional) System Time Synchronization using CIP Sync/ SOE

*Lab should take about 1 hour and 20 minutes to complete without optional section. Only start Lab 5 if you have approximately 30 minutes.*
Questions?

Note: There are additional slides in this presentation including links to resources and design guidelines
Thank you for participating!

Please remember to tidy up your work area for the next session. We want your feedback! Please complete the session survey!